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# ТЕМАТИЧЕСКИЙ РЕФЕРАТИВНЫЙ СБОРНИК № 24-2/2

## “Ground Penetrating Radar”
## («Подповерхностная радиолокация»)

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## "Interworking between GPRS AND ISP for Wireless Internet Service of Mobile ISP Subscriber"

In this paper we illustrate how visited mobile ISP subscriber can access home ISP via GGSN (gateway GPRS support node) on GPRS (general packet radio service) network. We also introduce messages between GGSN and ISP for wireless Internet access of visited ISP subscriber, and a specific DHCP relay which can provide dynamic IP to visited ISP subscriber, and signaling for IP management using RADIUS authentication and account server for wireless Internet service. The contribution of this paper is to suggest interworking solution between ISP and GPRS network for seamless Internet service [C1568]

## "Cellular building blocks and SoCs"

First Page of the Article [C1569]

## "Indoor Localization Using Camera Phones"

There has been a shift in the focus of indoor localization research from improving accuracy to minimizing infrastructure requirements [4, 6, 1]. The reason is well understood: since location information only serves as a parameter to location-based services, the cost of deploying localization systems should be a minute fraction of the total cost of provisioning location-based services. We demonstrate the possibility of determining user's location indoors based on what the cameraphone "sees". [C1570]

## "Architecture of a Context-Aware Vertical Handover Decision Model and Its Performance Analysis for GPRS-WiFi Handover"

The common desire to be connected "anytime, anywhere, anyway, and to anything" leads to explosive growth of mobile computing and speedy emergence of new wireless technologies, applications, and devices in recent years. In this array of heterogeneous systems, intelligent handover (HO) decision, beyond traditional ones that are based on only signal strength, is needed so that terminals can select the best option available from diverse networks and services as per user requirements. In the process, it would enable user applications to switch automatically between active interfaces that best suit them based on application requirements and interface capabilities, and to use multiple radio interfaces simultaneously. To fulfill the above requirements, this paper describes the architecture of a context-aware vertical HO decision model suitable for multimode mobile devices in heterogeneous networks and evaluates its performance for vertical HO between GPRS and WiFi. [C1571]

## "A 120Mvertices/s multi-threaded VLIW vertex processor for mobile multimedia applications"

A 3D vertex processor with a floating-point 4-threaded and 4-issue VLIW architecture and a TnL vertex cache is implemented for mobile multimedia applications in a 0.18mum 4M CMOS process. The proposed architecture efficiently reduces the total energy consumption and achieves 120Mvertices/s with a 2.5GFLOPS datapath using 157mW when operating at 100MHz [C1572]

## "Ultra-wideband and low-profile hybrid EBG/ferrite ground plane for airborne foliage penetrating radar"

High performance airborne foliage penetrating radar requires an antenna design that is low-profile while providing ultra-wideband operation at lower frequencies (100s of MHz) while optimally offering unidirectional radiation. To achieve the desired unidirectional radiation, a ground plane must be implemented that can match the ultra-wideband operation of the antenna being implemented. The needed ground plane must meet these specifications while being low-profile to maintain an overall low-profile antenna design that will efficiently fit in the aircraft. This paper presents a novel ultra-wideband and low-profile hybrid ground plane design that implements ferrite absorbing material with a mushroom structure EBG design. The presented EBG/ferrite hybrid design offers an operational bandwidth exceeding 12:1 starting at 170 MHz [C1573]

## "Complex reflection signatures of buried dielectric objects for a ground penetrating radar with different antenna concepts"

Two promising antenna designs that have been presented recently, namely, a modified TEM double-ridged horn antenna and the Orion-type forward impulse radiating antenna are integrated in a complex simulation of a ground penetrating radar environment in order to compare the received reflection signatures of differently shaped test objects, that have been placed inside a homogeneous soil [C1574]

## "Teletraffic analysis of access and transmission rate fairness in EGPRS networks"

In this paper, the performance of three fair resource allocation strategies for packet data transmission in EDGE/GPRS networks are mathematically analyzed. The strategies aim at achieving, respectively, fair access, fair transmission rate and, simultaneous fair access and transmission rate. The differences in terms of QoS and GoS caused by link adaptation (LA) and multi-slot allocation experienced by data users in EGPRS networks is smoothed by these strategies through the use of multiple resource reservation and/or dynamic resource allocation strategies, which, at the same time, compensate users with poor radio channel conditions. Also, the performance of the proposed strategies is evaluated by means of teletraffic analysis tools in terms of packet blocking probabilities and throughput [C1575]

## "Iterative Detection of Linear Objects in GPR and Seismic Images"

An iterative technique for detecting linear features in 2D images based on the Radon transform is developed. The algorithm is suitable for processing ground penetrating radar (GPR) and seismic images to find underground pipes and tunnels. Detection is performed in the Radon transform space. The length and width of the linear object area are estimated and the corresponding portion of the image is removed at each iteration. The algorithm has the advantage of detecting very weak linear objects, which are barely detected by existing detection algorithms, in Radon transform space. The proposed algorithm is tested on both simulated and experimental data measured from a laboratory scale model area. Results show successful detection of strong and weak linear objects [C1576]

## "Determining the Height of Buried Objects Comparing a 1d Transmission Line Method and a 3d GPR Field Simulation"

Within this contribution two different simulation techniques, namely, a 1d transmission line method and a numerical 3d field simulation of a ground penetrating radar including the antenna structure, the soil and the buried object are compared with respect to the achievable accuracy when the height of different buried objects is to be determined [C1577]

## "A Power Management Scheme Controlling 20 Power Domains for a Single-Chip Mobile Processor"

A power-management scheme for a single-chip multi-CPU processor uses 20 power domains. The scheme enables the minimization of leakage currents in each operating mode: 299muA in paging operation and 7muA in stand-by. The techniques for controlling and implementing power domains are also described [C1578]

## "A Fully Integrated SoC for GSM/GPRS in 0.13/spl mu/m CMOS"

A single-chip radio for quad-band GSM/GPRS applications integrates the RF, analog/mixed-signal blocks, DSP, application processor, RAM/ROM, and audio. It is implemented in a 0.13mum CMOS process. The RX achieves -112.5dBm/-110.5dBm sensitivity and the TX meets all the spectral mask requirements while using a 1.5V supply [C1579]

## "Integrating UMTS and Mobile Ad Hoc Networks"

Although cellular networks such as GPRS (2.5G) or UMTS (3G) have achieved both circuit switching and packet switching services with wide area coverage, they still fall short of meeting the high data rate demands of mobile users. Integrating cellular network with other high-speed and low-cost wireless technologies is a key challenge for migrating to 4G. The IEEE 802.11 technology that has been well-developed and widely used in local area networks seems to be a proper choice for fulfilling users' expectations in hotspots. Its ad hoc mode of operation allows mobiles users to achieve connectivity with low infrastructure support. This paper proposes a design to achieve the internetworking between 802.11 mobile ad hoc network (MANET) and UMTS. The key approach in our design is to model inter-system handover as inter-SGSN handover, and connect gateway in the ad hoc

network with the GGSN [C1580]

## "A Tabu Search Heuristic for the Global Planning of UMTS Networks"

In this paper, we propose a tabu search heuristic to find "good" feasible solutions for the global planning problem of universal mobile telecommunications system (UMTS) networks that is composed of three subproblems: the cell, the access network and the core network planning subproblems. Since this global planning problem has been proven to be NP-hard, we concentrate our efforts on the development of an efficient heuristic. Numerical results show that quasi-optimal solutions (on average, within 0.21% of the optimal solution) can be obtained with the proposed approach [C1581]

## "Dynamic Load Balancing Based on Sojourn Time in Multitier Cellular Systems"

Efficient load balancing algorithm is indispensable to serve more mobile stations in the heterogeneous wireless networks. In this paper, we propose a dynamic load balancing algorithm based on sojourn time for heterogeneous multitier wireless networks consisting of macrocell cellular network and microcell cellular network. The sojourn time is calculated by the velocity, direction of motion and position of mobile station. This algorithm is able to balance loads by transferring some ongoing calls with longer sojourn time from overloaded cells to overlapping under-loaded heterogeneous cells. The number of transferred ongoing calls per load balancing period is calculated by the new calls arrival rate of overloaded cells and the workload states of overlapping cells. In addition, high-speed mobile stations can hand off from macrocells to microcells and slow mobile stations can hand off from microcells to macrocells, which can decrease the call dropping probability. Simulation results show that call blocking probability, call dropping probability and overall system utilization using our proposed dynamic load balancing algorithm are improved significantly [C1582]

## "An Alternative Architecture for WLAN/GPRS Integration"

In this paper, we propose a new WLAN/GPRS integration architecture from the point of view of a GPRS operator's WLAN implementation. We introduce a new node, called serving GPRS access router (SGAR), and its associated protocol stack. SGAR acts as WLAN's access gateway to GPRS network so that a mobile terminal (MT) can use GPRS control signaling in WLAN networks in both tight and loose coupling modes. This avoids the requirements of extensible authentication protocol (EAP), implementing RADIUS servers and using expensive SS7 signaling link. NS-2 based simulation results show that the handoff delay in the proposed SGAR based integration technique is considerably less than that with RADIUS based authentication, under increasing packet sizes and/or increasing numbers of transmitting GPRS MTs. In fact, SGAR based tight coupling reduces the latency significantly, as shown in our experimentations [C1583]

## "Modelling PTT Packet Delay in the GPRS/GSM Uplink"

Push-to-talk (PTT) is a new mobile service which enables fast-access two-way communication between two or more users. This paper provides an approximate evaluation model for PTT delay performance using the general packet radio service (GPRS) over Global System for Mobile Communications (GSM) networks and taking account of GSM and GPRS traffic loading. Cases with and without provision of strict priority for PTT traffic over GPRS data are considered. Our PTT/GPRS/GSM model is based on the following three modelling assumptions: (1) a quasi-stationary assumption on the behaviour of GPRS under GSM voice loading, (2) a M/G/1 processor sharing (PS) queueing model to analyse PTT packet queueing delay performance, and (3) independence between retransmission traffic and original traffic. The model is validated by simulation. We present numerical and simulation mean delay results to illustrate the effect of traffic load and various design parameters on PTT packet delay [C1584]

## "Active Queue Management in EGPRS"

Active queue management (AQM) schemes such as random early detection (RED) or explicit congestion notification (ECN) for TCP-based traffic are important components of the general packet radio service (GPRS) system performance because of potential traffic bottlenecks caused by, e.g., limited radio capacity. Poorly implemented or configured AQM may lead to intolerable end-to-end buffer delays in the serving GPRS support node (2G-SGSN) as well as reduced overall throughput when the system load increases. Although the usefulness of AQM in the fixed Internet is well known, the need for adequate AQM in GPRS or enhanced GPRS (EGPRS) has not been much documented. In this paper, we evaluate the performance of various AQM schemes by means of simulations and we show that RED and ECN are among the most efficient for reducing buffer delay and improving overall end-user experience [C1585]

## "Broadband Aggregation Networks for Fast Moving Users through Hierarchical Ethernet"

Delivering broadband services to fast moving users (e.g. in trains or cars) involves both wired and wireless networks. In this paper, we motivate that a hierarchical Ethernet aggregation network in combination with Ethernet-based access networks is an interesting approach for realizing broadband access to fast moving users. The focus is on the tunnel management in the Ethernet aggregation network for providing broadband services to trains. A hybrid approach is presented, which allows to minimize tunnel setup times and provides accurate tunnel setup triggers. The hybrid approach is described in detail, together with performance measurements on commercially available switches. The achieved tunnel setup times and measured packet loss are presented. [C1586]

## "New electronic funds transfer services over IP"

This paper shows a complete description of a new EFT (electronic funds transfer) service over IP for the current payment terminals. These new EFT services carry all the electronic transactions from the POS (point of sale) terminals to the authorization centres (host) through an IP network with special TCP-X.25 gateways. These services establish a secure connection with the gateways to make the electronic transactions. This work presents two kind of solutions depending on the transmission technology used: GPRS (general packet radio service) or ADSL (asymmetric digital subscriber line). The security of the system has been the main objective of this investigation. This paper describes all the security algorithms implemented and it presents the results obtained in a real installation [C1587]

## "The virtual but real patient in the ICU"

We intend to take the patient virtually from the ambulance to the I.C.U. (intensive care unit), and the staff from the I.C.U. virtually to the ambulance. We propose a low-cost system of hybrid communication equipped with a wireless device in narrow band (radio-modem), with analysis, treatment and safe transmission of data in real time, which are received in movement and in situations out of range (due to orographic barriers), through UMTS/GPRS and a microcomputerized system (radio-cable) with Ethernet connection, for establishing transmissions via cable (Internet-virtual net). The system has shown to be valid with the information obtained, even if the repeater units are not situated in the best places for transmission of signals [C1588]

## "Image Watching System with Remote Direct Based on Mobile Communication"

Nowadays mobile communication has become widespread. Mobile phones are used not only voice communication but also to send different data types (voice, image, text), for entertainment (listening music, playing games), for remote access and remote control. Now, mobile phones have become handy computers. The mobile phone manufacturers which stand in competition with each other have begun to put on the market new models which have new capabilities. Mobile phones software development market has grown up with these developments. The developers who interested in this technology must challenge with many obstacles. One of these obstacles is the documentation shortness. By passage of time this technology will become prevalent and samples codes and documents will increase. In this way development time period will decrease and costs will drop [C1589]

## "Locating Subsurface Targets Using Minimal GPR Measurements"

This paper describes a novel approach which finds probable target areas in ground penetrating radars (GPR) with minimal number of measurements. A subsurface GPR target creates a hyperbolic signature in the space-time domain. Conventional algorithms use these signatures to image and detect subsurface targets. Our approach uses the time delay differences (TDD) in consecutive GPR A-Scan measurements to localize the target. For further reduction of measurement numbers regions of low target probability are determined to eliminate redundant measurements. Results from the experimental data from a model mine field show that the target positions can be found accurately using much fewer measurements than the conventional imaging algorithms [C1590]

## "Impact of an ARQ Scheme in the MAC/LLC Layer on Upper-layer Packet Transmissions over a Markovian Channel"

In this paper, we capture the impact of an ARQ scheme in the MAC/LLC layer with a forward error-correcting code on upper-layer packet transmissions over a Markovian channel by examining the performance of a single service data unit which may be either a TCP segment or a UDP packet. We assume that the ACK/NACK delay of ARQ blocks belong to a single service data unit is less than the transmission period of each ARQ block. The performance measures of a single service data unit transmission are derived in terms of the transmission

success and failure probabilities given a retransmission time-out value, retransmission timeout probability and the moments of transmission delay. Further, the queueing performance of a service data unit transmitter is also presented by varying average received signal-to-noise ratio, mobile velocity, number of ARQ blocks needed to transmit a single service data unit, number of retransmissions for each ARQ block and error-correcting capability applied to an ARQ block. From numerical examples, renegotiation between a serving base station and a mobile station is needed, when the mobile station is far from the serving base station in order that a service data unit is fragmented into a larger number of ARQ blocks in order to apply high error-correcting capability for each one [C1591]

## "Synchronisation and Timing Groups for GSM Networks"

GSM networks are optimised for voice services using compact frequency re-use schemes such as 1/1 with fractional loading. GPRS/EDGE codecs require better quality channels to support higher data throughput, i.e. channels with lower collision rates and better average carrier-to-interference ratio (CII). With the continuing growth of mobile data traffic, networks must improve channel quality in a compact re-use environment. To achieve this, we recommend the introduction of timing synchronisation for base stations (BS) in a GSM/GPRS/EDGE network. Our analysis shows that BS synchronisation leads to a reduction in collision rates that can be exploited for either C/I or capacity improvement. More importantly, we propose timing groups (TG) for a synchronized network. In conjunction with frequency planning, TG offers greater flexibility in network design by providing superior quality channels to a category of users without dividing the available spectrum into carrier groups with different re-use schemes [C1592]

## "On the Effectiveness of a GPRS based Intelligent Transportation System in a Realistic Scenario"

The work deals with the impact evaluation of an intelligent transportation system (ITS) based on the GPRS (general packet radio service) technology to alert vehicles approaching an accident. The last ten years saw an unexpected increasing of wireless communication technologies, first for circuit switching services, then also for packet switching applications. This kind of technologies can now be used not only for communication issues. Here we show the application of the GPRS wireless technology to ITS in a realistic scenario to promptly alert vehicles approaching difficult and unexpected situations such as accidents and queues. The aim of this work is to show the validity of a GPRS radio system on board in order to provide warning services to vehicles near an imminent crash situation on a highway. The great advantage of the proposed solution is the adoption of the well known and spread GPRS infrastructure to improve safety on roads. Numerical results, obtained by means of a simulation tool implementing realistic traffic models, show the great improvement, in term of safety, derived by the use of an embedded alerting system [C1593]

## "A UWB Antenna for Impulse Radio"

A UWB antenna, which is adopted from a ground penetrating radar (GPR) antenna, is proposed for impulse radio application. The antenna has dimensioning of 7 cm by 1.5 cm and is based on a modified bow-tie structure. It employs improved resistive loading for transmission of 0.2-ns monocycles with minimal ringing. The antenna radiation efficiency is enhanced by creating discontinuities in the antenna that serve as secondary sources of radiation. Numerical analysis of the antenna was performed using the FDTD method and the method of moments. It has been found that antenna ringing is adequately suppressed after less than 3 times the pulse radiation. This will set the potential limit of the data rate at more than 1 Gbit/s. Furthermore, the antenna shows a relatively flat gain and input impedance in the 3-10 GHz frequency range. Within this bandwidth the antenna is omni-directional and has stable radiation pattern [C1594]

## "Study the Traffic Difference of Online Games Between GPRS/EGPRS and ADSL Networks"

From network point of view, accurate traffic analysis of the online games is proved useful in the design of mechanisms for media access, resource management, admission control, etc. Furthermore, from application point of view, in order to properly design and evaluate performance of the online games, accurate traffic models are also highly required. Therefore, in this paper we focus on performance analysis and traffic modeling of the massive multiplayer online role playing game (MMORPG) in the presence of different access networks which include GPRS/EGPRS and ADSL. Our results show that being affected by network bandwidth and delay parameters, the statistic characteristics of the online game traffic behave differently in these heterogenous access networks, leading to different game performance and player experience [C1595]

## "Terminal-Centric Location Services for the IP Multimedia Subsystem"

Location-based services in 3G and beyond networks depend on high-accuracy location data. Today's 2G and 3G access networks determine user location in a network-centric manner. The accuracy of these location

mechanisms depends on the radio infrastructure near the user's geographical position and is typically limited to hundreds or thousands of meters. This precision is inadequate for typical location-based services like city maps or route planners. In this paper we present a terminal-centric location enabler that integrates seamless with the existing IP multimedia subsystem presence architecture and interoperates with network-centric location mechanisms. We argue that the user terminal itself, equipped with location sources like GPS receivers, can determine the geographical position with an optimum of accuracy. In consequence, the user terminal should be used as the primary source for location information. We extend the existing and well-known concept of presence by defining location as a type of presence information that is of interest to users. Terminal-based triggers and filters reduce the amount of traffic on the air interface and enable a scalable location architecture. We present the implementation of a J2ME-based mobile terminal prototype, which uses GPS as location source and interfaces with IMS location services [C1596]

## "Performance evaluation of L2 handover mechanisms, for Inter-Radio Access Networks"

B3G networks will provide seamless data handover between different radio access technologies (RAT). In a near future, the WLAN access will be integrated in GPRS and UMTS radio access networks (RAN). During their communications, the subscribers will be able to switch automatically between the two technologies. In that case, their previous data transfer need to be re-established in the new RAT. This process must be carried out while minimizing the breakdown time and the data loss. This paper intends to evaluate the performances of handover policies between GPRS/UMTS and WLAN RAT and to propose adapted data handover strategies at layer two [C1597]

## "Impact of heterogenous wireless link characteristics on the performance of IP-based group communications"

Group communication services in cellular networks have attracted a lot of attention recently and provide an entirely new way of communication in cellular networks. To guarantee acceptable service quality, special focus needs to be put on the impact of heterogenous wireless link qualities within one group of users. In this paper, we propose a light-weight IP-based group communication system, which relies on a network-assisted peer-to-peer architecture. We present results of performance evaluations related to the efficiency of group communication in heterogenous environments (i.e. using different wireless link technologies and operating the system across network boundaries). From the detailed results a "key performance indicator" (KPI) for group communication services is derived, which provides a generic mark to rate a push group-communication system. Furthermore we derive recommendations for the use of floor control mechanisms in situations, where some users within a group are affected by strong link delays [C1598]

## "Comparison of probabilistic models used for diagnosis in cellular networks"

In the forthcoming years, different radio access technologies (GSM, GPRS, UMTS, etc.) will have to coexist within the same cellular network. In this scenario of increasingly complex networks, automated management is becoming a crucial issue to provide high-quality services. In this paper, a system for automatic fault diagnosis of the radio access part of a mobile communication system is presented. For this purpose, a probabilistic diagnosis model based on discrete Bayesian networks (BNs) is proposed. There is always a trade-off between accuracy and complexity of the model. Hence, two alternative structures to code the dependencies among elements in the model are compared with regard to their simplicity and performance. Empirical results are examined, based on data from a live GSM/GPRS network. Taking into account the experiments, a BN structure is selected for diagnosis in cellular networks [C1599]

## "Proposal for an ELF Radar of D-Region Ionospheric Anomalies Analyzed using a 3-D Geodesic FDTD Model of the Earth-Ionosphere Waveguide"

This paper proposes a novel extremely low frequency (ELF: 3-300 Hz) radar for locating and characterizing ionospheric anomalies within ~100 km of the Earth's surface. Employing a well-characterized controlled ELF source (as opposed to natural sources having a random occurrence and random properties), the proposed radar could provide continuous, inexpensive monitoring capabilities of the ionosphere within ~100 km of the Earth's surface. For this study the recently developed three-dimensional (3D) geodesic whole-Earth electromagnetic wave propagation model based upon the finite difference time domain (FDTD) solution of Maxwell's equations is used [C1600]

## "Wireless Monitoring System of Train Speed Based on RCM3000"

In this paper, design method of the train speed wireless monitoring system is discussed, and the configuration of

its hardware and software is introduced. The monitoring system integrates the technologies of sensor, Ethernet, and GPRS, and realizes the real-time data acquiring, wireless network transporting, and data managing for train speed. The scheme also applies to other data acquiring and state monitoring systems, which lie in the remote area or locomotors system [C1601]

## "Investigations of induced currents in human bodies due to exposure to EMF from low voltage appliances"

Extremely Low Frequency Electromagnetic Fields (ELF) due to low and medium voltages are normally low. But with the wide spread and increase in the use of electrical energy, the potential for exposure has increased considerably. Exposure to man made electrical appliances generally ranges from 15 V/m up to 100 V/m for electric fields and from 0.1 Г‚ВїT to more than 30 Г‚ВїT for magnetic field. Our main topic in this research is to investigate the effect of electric field and magnetic fields at power frequency and analysis of the interaction between these fields and the living organisms. Since the wavelength of the ELF electric and magnetic field is sufficiently greater than greater than the dimensions of the biological object, so the electric and magnetic fields can be independently treated. This paper fa concerned with the calculation methods of electric fields, magnetic fields and currents induced in the human body due to these fields, The developed technique can decide the most accurate method for calculations and the degree of precision .This research investigated the degree of danger due to the induced currents from both magnetic and electric fields individually on his own. It was concluded that the induced currents due to the electric fields are normally insignificant to be considered in calculations and the main concern will be induced currents due to the magnetic fields. In the range of 10 -100 mA/m induced currents biological effects have been established, but these induced current densities from short-term exposure (few hours) may cause minor transient effects on health. [C1602]

## "Static Detection of Vulnerabilities in x86 Executables"

Several approaches have been proposed to perform vulnerability analysis of applications written in high-level languages. However, little has been done to automatically identify security-relevant flaws in binary code. In this paper, we present a novel approach to the identification of vulnerabilities in x86 executables in ELF binary format. Our approach is based on static analysis and symbolic execution techniques. We implemented our approach in a proof-of-concept tool and used it to detect taint-style vulnerabilities in binary code. The results of our evaluation show that our approach is both practical and effective [C1603]

## "Binary self-dual extremal codes of length 92"

In this note a construction of an extremal binary self-dual code of length 92, possessing an automorphism of order 15, is presented. Thirteen new codes are found. All of them have weight enumerators of the third type and no example of such codes has been known up till now [C1604]

## "Study of the induced voltage on an overhead line due to lightning discharge"

The paper presents a study of the voltage induced on an overhead line due to lightning discharge. Lightning discharge releases energy over a large frequency band, generally from few hundreds of hertz to megahertz. The bulk of the radiated electromagnetic energy within VLF and ELF band, which is horizontally polarized, is picked up by the electrical power lines, and the interfering signal appears in the form of a surge on these lines. This surge propagates along the transmission line, and affects all equipment and appliances connected to the mains supply. Any lightning strike induces voltage in an open wire overhead line, communication line and other similar structures. The current that flows from cloud to ground is of transient nature and is expressed as superposition of two decaying exponentials with rise and fall time constants as parameters and peak current amplitudes. The nature of the return stroke current waveform is used in accordance with the one considered in. From the expression of current in time domain, the frequency spectrum covered by the lightning discharge can be estimated using Fourier Integral transform. Several studies, both theoretical and practical have been carried out by many researchers to provide insight of the lightning induced voltages. The induced voltage on an overhead line is related to the field produced by the transient current resulting from the lightning discharge. The transient voltage induced on the overhead line as well as communication line produces over-voltage effect to the system connected to the line. The field induced on the overhead lines can be estimated from knowledge of per unit length (PUL) parameters of the line and its geometrical structure and alignment. The PUL parameters are considered for a two conductor line with dielectric coating and having separation between them and the parameters are obtained following the method in reference. [C1605]

## "Evolving UMTS towards IP: Evaluation of the SIPRAN Architecture"

The adoption of packet-switched technologies in mobile communication systems has enabled the provision of IP-

based services to mobile users. Yet, these systems, such as the UMTS network, are not flexible enough to leave space for IP-oriented protocols to dominate nor are they able to meet the stringent QoS requirements imposed by multimedia services. This paper presents an innovative Beyond 3G network architecture, denoted as SIPRAN, posing an evolution to the standard UMTS network. According to the proposed concept, the GPRS Support Nodes are integrated into a single entity, while the Session Initiation Protocol is adopted for performing mobility and session management; these modifications result in the smooth evolution of the UMTS Core Network towards IP, while accomplishing a significant performance gain. In order to evaluate the target architecture and substantiate its actual effectiveness, a series of experiments was carried out, by utilizing a fully-functional emulator. [C1606]

## "Interconnecting WLANs with UMTS networks"

Since the early nineties, wireless communications grew substantially in our societies to satisfy the latent need for mobile communications, with the main focus being communicate "whenever and wherever" one wants. Many protocols were proposed, of which 2.5G GSM/GPRS (Global System for Mobile Communications / General Packet Radio Service) and 3G UMTS (Universal Mobile Telecommunication Systems) as wide expensive network architectures and the IEEE wireless suite that aims to provide low cost wireless connectivity. Today, it seems obvious that both architectures, combined together, would lead to the best resource utilization, the greatest field cover at the lowest cost of installation. In this paper, we are interested in using Wireless Local Area Networks (WLANs) as access networks for the UMTS. We introduce a new WLAN protocol with hybrid properties based on 802.11e in order to comply with the strict Quality of Service (QoS) UMTS uses for its flows. It aims to fill the weaknesses of 802.11e in terms of delay adaptation with this 3G network. [C1607]

## "GPR Zone of Influence of a Modern Electric Power Network"

In this paper, the GPR zone of influence is analyzed for a typical real case scenario. The overhead and underground portions of the electric network around the 230 kV substation including transmission lines, distributions lines and the underground pipe network of a nearby town have been modeled. The total extent of the grounding network exceeds 10 miles. The zone of influence has been analyzed for different fault locations. It is demonstrated that the borders of the zone of influence represent a very complicated pattern even for this relatively simple scenario and that this pattern changes tremendously depending on the fault location. The computation method used in the analysis is based on the electromagnetic field theory approach [C1608]

## "A Study on Evaluating Authentication Traffics in the Next Generation Wireless Networks"

There are two major contributions in this paper. The first is to exam the Poisson assumption for the authentication traffic process triggered by the location update (LU) requests. For this, we develop an analytical model and efficient, recursive algorithm to derive the LU inter-arrival time in static as well as dynamic location management scheme. The analysis is validated by simulation and the numerical investigation indicates that the Poisson process is invalid in approximating the authentication requests. The second goal is to investigate the issue: whether different mobility management schemes have a significant effect on the authentication traffic evaluation. To answer this, we propose a system model to incorporate different LU policies. Via simulation, we evaluate the authentication traffics under static and dynamic location management schemes. The comparison demonstrates that, due to the diverse network architecture as well as the different event triggering LU message, there are significant discrepancy in generating authentication traffic load. The result reveals the fact that the performance of security management and the mobility management in wireless mobile networks interact with each other. [C1609]

## "Design and Implementation of Intelligent Vehicle Monitoring and Management System Based on the Multi-Net"

In this paper, an intelligent vehicle monitoring and management system (IVMMS) based on the multi-net is designed. First, its architecture and functions are introduced. It uses many technologies fusing GPS, GPRS/CDMA, GIS, RS and Internet, and is composed mainly by two major parts: the Mobile Terminal and the Monitoring Center. Especially, GPRS/CDMA technology is the reliable technical support for wireless communication smooth transition from the 2.5G to the 3G; then, the principles and the key technologies of Mobile Terminal and Monitoring Center are discussed respectively in detail, and figures of their structures are also shown below; finally, a novel vehicle scheduling model based on ant algorithms are proposed and the course of scheduling tasks is also introduced. It is indicated that, the vehicles scheduling efficiency is enhanced greatly. The system not only can be used in the vehicles scheduling, but also in the vessel and other fields, and the solid technical support will be provided for the ITS research [C1610]

## "Triple-mode Five-band Power Amplifier LTCC Module for WLAN/GPRS/WCDMA Applications"

A compact power amplifier module (PAM) integrated with a power detector utilizing low temperature co-fired ceramic (LTCC) technology is presented for the IEEE 802.11a/b/g, GPRS and WCDMA applications. All MMICs' matching circuits were fabricated with the input and inter-stage matching circuits realized on-chip so that the PAM size is significantly reduced. The output matching circuit was implemented on an LTCC substrate to reduce power loss based on the advantages of high-Q ceramic components. The proposed PAM provides high power added efficiency and good linearity. Moreover, the measured results indicate the excellent performance of this PAM [C1611]

## "A UWB micro-strip antenna design and simulation"

We are concerned, herein, with the conception and the design of printed UWB antennas and with the analysis of their performances through figures of merit. State of the art gives the opportunity to exploit some empirical considerations about the shape and the methodology of conception. A simple structure is simulated by means of CST microwave studio to show the possibility of fulfilling, at a defined level, UWB antenna requirements such as matching, fidelity and quasi-isotropy of the radiation pattern with a simple micro-strip design and a standard technology [C1612]

## "Segmentation of GPR Images"

In this paper the threshold segmentation rules for GPR data are considered. Bayesian and conditional extremum approaches are used for choosing the threshold. The suggested approaches are compared using both model and real GPR data. The results of the image segmentation are given [C1613]

## "A UWB micro-strip antenna design and simulation"

We are concerned, herein, with the conception and the design of printed UWB antennas and with the analysis of their performances through figures of merit. State of the art gives the opportunity to exploit some empirical considerations about the shape and the methodology of conception. A simple structure is simulated by means of CST microwave studio to show the possibility of fulfilling, at a defined level, UWB antenna requirements such as matching, fidelity and quasi-isotropy of the radiation pattern with a simple micro-strip design and a standard technology [C1614]

## "An Alternating Service Model with Self-Similar Input to Provide Guaranteed QoS in Wireless Internet"

Over the past few years, we have witnessed a growing popularity of new wireless architectures such as 3G, Wi-Fi and Wi-Max due to the increase in demand for wireless Internet access. The all-IP based future mobile and wireless network model is expected to be the most dominant architecture for QoS provisioning in next-generation wireless networks, mainly due to its scalability and capability of inter-working heterogeneous wireless access networks. Recently, the rapid growth of various wireless infrastructures and the interesting mixture of wireless traffic generated by large number of devices (PDAs, Laptops and cell-phones) have diverted the attention of wireless research community towards understanding the nature of traffic carried by different wireless architectures. A series of recent studies on GPRS aggregated traffic, WAP and Web traffic has proven that wireless traffic exhibits strong long-range dependency. However, much of the current understanding of wireless traffic modeling builds on classical Poisson distributed traffic, which can yield misleading results and hence poor wireless network planning. In this paper, we contribute to the accurate modeling of wireless IP traffic by considering two different types of traffic that exhibit long-range dependency and self-similarity. We consider a model of two queues based on G/M/l queueing system and analyze it on the basis of 1-limited polling service and find exact bounds on packet delay. [C1615]

## "A Perspective on Radio Resource Management in B3G"

Beyond 3G usually refers to heterogeneous scenarios where different radio access technologies (RATs) coexist and operate in a coordinated way. This brings a new challenge to offer services to the users over an efficient and ubiquitous radio access. In this way, the user can be served through the RAT that fits better to the terminal capabilities and service requirements, and also a more efficient use of the radio resources can be achieved. This challenge calls for the introduction of new radio resource management (RRM) algorithms operating from a common perspective that take into account the overall amount of resources offered by the available RATs. In this context, this paper presents the framework for developing RRM algorithms in the B3G scenarios, including some possible approaches. [C1616]

## "Design and Realization of Embedded Image Transmission System Based on GPRS"

The embedded image transmission system introduced in this paper is realized in advanced RISC machines (ARM9) platform and embedded Linux system which has excellent network function, and it is connected to net through the general packet radio service (GPRS) module. Image is transmitted by multimedia messaging service (MMS). MMSprotocol stack, the design principle, the hardware structure and main software process to transmission image are introduced in detail, and put the system into wireless intellectual home safeguard control system, also it can be used in other watch field. [C1617]

## "Wireless Generations: Transitions and Multimedia Suitability"

Wireless technology is accelerating so rapidly. With the evolution of wireless technologies (GPRS, EDGE, cdma2000, W-CDMA), wireless networks is aiming to alter from voice-centric networks to an efficient and flexible data networks. This development beside the advancements in wireless computing and devices had allowed an increased number of multimedia applications to appear in our era. Many components are coming together to make mobile multimedia a reality. This paper will investigate the road map of mobile data networks, their evolution and capabilities to handle today and future increased-demand for wireless multimedia applications. The focus will aim third generation (3G) wireless networks and the amendment toward fourth generation (4G) [C1618]

## "Handoff Protocol for Heterogeneous All-IP-based Wireless Networks"

Next generation wireless networks (NGWN) or 4G are envisioned to be a combination of different architectures and wireless technologies. This brings several design and deployment challenges, such as mobility management, quality of service (QoS) provision and networks interworking. Mobile IPv6 (MIPv6) and its extensions, like HMIPv6 and FMIPv6, have been proposed for IP layer mobility management in NGWN. However, these protocols are hindered by several shortcomings; they fail to ensure seamless communications and support of real-time applications. This paper proposes a new and efficient mobility management protocol namely, handoff protocol for integrated networks (HPIN), based on score function, fast handover and anticipated resources reservation principles, to alleviate service disruption during users roaming by allowing selection of the best available network. The implementation of HPIN has been subject to extensive tests and results obtained show its benefit in terms of QoS than traditional and existing handoff protocols [C1619]

## "Agent Based Adaptive Management of Non-Homogeneous Connectivity Resources"

In this paper, a middleware architecture that enables transparent inter-operability between two different wireless networks is presented. In particular, access to the communication channel is maintained by adaptively switching between GPRS (General Packet Radio Service) and Bluetooth interfaces, both established automatically with the assistance of an RFID tag. The access channels are continuously monitored, allowing the device to switch to the Bluetooth interface, whenever this lower-cost alternative is available. A preliminary field trial has been set up, which has demonstrated the effectiveness of the approach in supporting seamless handover procedures within a heterogeneous network as envisioned for future wireless communications systems. [C1620]

## "GPRS Congestion Control Algorithm Based on Fuzzy Kernel Neural Networks"

An algorithm of fuzzy optimization design based on neural networks is presented as a new method for GPRS congestion control. The combination system adopts a new fuzzy neuron network which can appropriately adjust input and output, and increase robustness, stability and working speed of the network. Besides FNN, wavelet transform also be applied to compression algorithm for a higher and controllable compression rate. As shown by experimental results, the algorithm is capable of significantly preventing the congestion control, which proves that it is a more practical and more effective method than traditional methods for congestion control in wireless networks, and it is especially better at video data transmitting [C1621]

## "Sentry: A Binary-Level Interposition Mechanism for Trusted Kernel Extension"

Several commodity operating systems have used kernel extensions to extend or replace their functionalities. Generally, since the kernel extensions are executed in the same address space with the kernel, a mere fault in the extensions may lead the whole system to be corrupted. So naturally, studies on the kernel extension are mainly proposed with the goal of isolating extension faults from the system. However, previous schemes require the static analysis of the extension module and the modification of kernel source code. The goal of this paper is to remove such overhead stages. This paper proposes Sentry; a lightweight kernel subsystem that provides dependable execution environment for the kernel extensions. We show the efficiency of Sentry through practical implementation on Linux. [C1622]

## "Comparison of Available Bandwidth Estimation Techniques in Packet-Switched Mobile Networks"

The relative contribution of the transport network towards the per-user capacity in mobile telecommunication systems is becoming very important due to the ever increasing air-interface data rates. Thus, resource management procedures such as admission, load and handover control can make use of information regarding the available bandwidth in the transport network, as it could end up being the bottleneck rather than the air interface. This paper provides a comparative study of three well known available bandwidth estimation techniques, i.e. TOPP, SLoPS and pathChirp, taking into account the statistical conditions of the available bandwidth and assessing the variability of their estimations. Simulation-based studies on a mobile transport network show that pathChirp outperforms TOPP and SLoPS, both in terms of accuracy and efficiency [C1623]

## "A Seamless Service Continuity Scheme for Enhanced Network Performance in UMTS/WLAN Networks"

The proliferation of wireless access technologies, mostly wireless LANs, along with the ubiquitous coverage of cellular networks, has spurred many researchers to consider schemes for integrated network provision. In overlaying network environments, flexible resource management and service continuity during handover play a crucial role in the quality-of-service seen by the user. This paper describes an integrated UMTS/WLAN architecture that manages to establish every connection in a mobile terminal through the most appropriate access network, based on both network policies and user preferences. Moreover, connections are handed over independently between UMTS and WLAN, aiming at seamless service continuity. A detailed simulation model is used to measure the performance of the proposed architecture against existing schemes [C1624]

## "Behavior of R/S Statistic Implementations under Time-Domain Operations"

Complex correlation structure of current communications network traffic requires the use of algorithms for detecting the degree of dependence in a sample path of the network traffic process. Several algorithms for accomplishing the above exists with varying degrees of accuracy and convergence. In this paper we study the R/S statistic, in particular, the accuracy, convergence and its effectiveness under time aggregation for several long-memory characteristics (fGn and FARIMA). We present the selection of the optimal values of the low and high-ends in the linear fit for three implementations of the R/S statistic. Based on the above we show that different implementations give varying degrees of accuracy, convergence and effectiveness under time aggregation [C1625]

## "Soil Moisture and Surface Roughness Effects in Ground Penetrating Radar Detection of Land Mines"

Nonmetallic mine detection with GPR is challenging because of poor target/soil contrast and clutter from the random rough ground surface. Greater soil moisture implies higher dielectric constant, which in turn increases contrast and scattering of radar waves, but also increases the contrast between the air and the soil, increasing clutter. The finite difference time domain method for modeling impulse radar is use to quantify the effects of clutter on the target signal for both ideal smooth ground surfaces and rough surfaces for uniformly dry, wet, and a profiled moisture distribution characteristic of short-time watering. Results indicate that each uniform moisture case offers detection features that allow for the distinct temporal and spatial separation of target and clutter signals, but that non-uniform soil moisture makes nonmetallic mine detection problematic [C1626]

## "Observation of Co-seismic Electromagnetic Waves in VHF Band Associated with Earthquakes"

We have developed a novel dual frequency method to observe electromagnetic (EM) phenomena associated with earthquakes. Our observation started from 1998, during our observation, co-seismic EM phenomena have been observed on three earthquakes, Tottori-ken-seibu EQ in 2000, Geiyo EQ in 2001 and Ibaraki-ken-oki EQ in 2002. In this paper, we describe our observation method and co-seismic observation results associated with the earthquakes [C1627]

## "Modeling & Monitoring of Product DPPM with Multiple Fail Modes"

A method to model and de-rate product DPPM using existing production EFR (early failure rate) and burn-in data is proposed. This approach incorporates multiple classes of reliability fail modes. Changes in process, test, or design may then be employed to optimize product outgoing defect levels. These changes will be based on the defect acceleration kinetic parameters, instead of just the reliability fail-fraction or wafer sort yield. Monitoring of low part-per-million defects is also critical in maintaining general quality and a new method is discussed [C1628]

## "Optimized Closed Loop Polar GSM/GPRS/EDGE Transmitter"

An amplitude-only closed-loop EDGE transmitter using a PA with low AM-PM distortion is presented with a comparable size to existing open loop EDGE PA modules and added closed loop current <20mA. The complete PA/controller consumes 700mA at 28dBm and <80mA at 6dBm. RMS EVM is <2.1%, ACPR margins are >5dB, and RX band noise is <-81dBm/100KHz at 20MHz offset. Reflected power amplitude feedback allows the transmitter to meet ORFS/EVM specifications under antenna VSWR as high as 6:1 [C1629]

## "A Statistical Analysis of the Effect of Capacity Limitation and Retry for Hierarchical Wireless Hybrid Networks"

We investigate a hierarchical wireless hybrid network, implementing two different network paradigms: ad hoc and infrastructure-based systems, where mobile gateways, equipped with both cellular and infrastructure-less air interfaces, allow integration of the two separate paradigms. The paper reports results achieved through a mathematical analysis of the topology of wireless links, providing the distribution of the number of lowest-level nodes attached to the highest level. Nodes have a maximum capacity, and seek service at the upper level through a retry mechanism where the nodes are addressed according to a ranked list based on the level of received power. The mathematical analysis provides a means to allow access control, depending on the maximum number of radio resource units available at each node and the maximum number of retries at each level. Wireless nodes at different levels are uniformly distributed over the bi-dimensional plane with different densities; path loss and shadowing are included with different propagation parameters, different air interfaces are used, and different hard capacities characterise the nodes at the different levels. With respect to other papers recently presented by the authors to other conferences, this work focuses on the role of the node capacity limitations and the maximum number of retries [C1630]

## "Vertical Handover Support for Multimode Mobile Terminal using Multi-Homed MIPv4"

Basic mobile IPv4 (MIPv4) operation constraints applications bound to the same home address (HoA) to use the same physical interface because traffic is only tunneled towards a single care-of-address (CoA) by the home agent (HA). This prevents different applications from using different physical interfaces. Solutions to address this problem have been proposed that require configuration of filters in the HA to tunnel traffic towards different CoAs but these require modifications to the network, and additional signaling between the mobile terminal (MT) and the network. This paper describes a solution to support multimode operation using MIPv4 with no changes to the network, as well as the multimode MT architecture supporting such MIPv4 operation. [C1631]

## "A GPS-based Mobile Coordinated Positioning System for Firefighting Scenarios"

In hazardous situations, fire fighters are presented with a series of difficulties related to the coordination of several crews at the scene. This paper describes a possible solution for this coordination problem based on the integration of mobile communication terminals with positioning modules. The implemented system displays, in real time, the position of every user at the scene. It also allows the exchange of text messages and sketches, created by the users. The use of personal digital assistants as the core of the portable units results in a user friendly interface with the system. The units are connected through GPRS/UMTS/Wi-Fi. Each user's position is provided by GPS. Positions and sketches are displayed over digitalized map images or satellite photos. Field trials, conducted at the faculty campus, are presented. [C1632]

## "Auction-based Congestion Pricing for Wireless Data Services"

Due to the surprising growth of mobile subscribers, GSM networks have been experiencing congestion, especially in their data services. Pricing of network resources could help resolve congestion. However, due to the absence of an accurate user demand estimation, determining suitable congestion prices for the mobile networks can be problematic. In this paper, we propose an auction-based pricing approach for resource allocation in mobile data networks, specifically GPRS networks. In addition, the impact of the reserve prices of the auction mechanism on the mean system delay of the networks is investigated. The numerical results show that, by increasing the auction reserve price, the level of network congestion is significantly reduced, as indicated by the reduction of the mean system delay of the network. The tradeoff between performance improvement, due to the proposed model, and revenue optimization is also investigated. [C1633]

## "PODoJA: Packaging Optimizer for Downloadable Java Applications"

Applications are often distributed and accessible on the network for being downloaded when needed. However, the way applications are created does not usually consider the optimization of downloading time and bandwidth usage. This is a relevant problem for applications that are deployed in relatively slow networks. When the

download time means cost, like usually for the GSM/GPRS communication network, applications that are packaged for reducing the average downloading time in a set of classical execution scenarios will improve the user experience. This paper presents an approach and supporting toolset for packaging a Java application as a set of jar files so that the downloading time/cost for a set of execution scenarios is minimized. The approach relies on run-time analysis performed by executing scenarios over a dynamically downloaded and traced application, and uses genetic algorithms for determining the sub-optimal packaging of classes/resources in jar files [C1634]

## "GPRS Based System for Atmospheric Pollution Monitoring and Warning"

This paper presents the synthesis of a SCADA (supervisory control and data acquisition) system, named Pollution Guard, designed to collect and process atmospheric pollution data measured in several strategic points of a region. Pollution Guard makes use of the GPRS (general packet radio service) data communication infrastructure from a mobile communication provider that covers a very large area, practically the air pollution data being collected from every place in the country. In comparison to other similar systems, the new functionalities provided by Pollution Guard are the SMS (short messaging system) and e-mail alerts generated when the level of toxic substances exceeds some given values, chosen with regard to respiratory illness [C1635]

## "Performance Analysis of Non-Cosited Evolved 2G and 3G Multi-Access Systems"

An efficient combination of radio access technologies, integrated in a multi-access network, will be a key enabler in future provisioning of mobile data services. This paper addresses a scenario where an incumbent mobile network operator, with an existing 2G and 3G infrastructure, has deployed a dense WCDMA/HSPA macro-cell network in an urban area. With this high capacity network deployed, upgrading previous 2G and 3G systems with EDGE and HSPA respectively may seem obsolete. However, even though these systems may not support the intended data rates alone, they could, thanks to favorable propagation characteristics and the additional spectrum available, be useful as complements. Simulation results indicate that upgrading GPRS base stations with EDGE, or a sparse WCDMA macro cell layer with HSPA, mainly would benefit uplink transmission. For this case, the data rate that can be guaranteed with 95% area availability (coverage) can be increased with approximately 40-100%. In the downlink, though, the dense WCDMA/HSPA system alone supports user data rates of 500 kpbs for all relevant user densities. Thus, upgrading legacy infrastructure would be obsolete [C1636]

## "Performance of Admission Control Strategies for Dual Transfer Mode in EGPRS Networks"

Dual transfer mode (DTM) has been defined by 3GPP for EGPRS networks. It provides simultaneous usage of GSM and GPRS services without requiring a full fledged GPRS class A terminal. DTM relies on the usage of half rate coders that make it possible to share a timeslot between a voice call and a data session. The data session can be extended to more time slots if necessary. This work examines an optimal policy adapted for resource allocation in a cell providing DTM capability. At the end of one part of a DTM call, the policy decides whether the released half slot should be reallocated to an existing data session or not. In earlier work, this optimal policy was proven to be a threshold strategy. The optimal policy is compared with the two policies where the same decision is taken regardless of the state of the system. Its performance is evaluated with respect to system load and configuration parameters [C1637]

## "Real-Time WLAN Monitoring in a 4G Multiplatform Environment"

Real-time monitoring in 4G networks is of prime importance for network operators of present and future generation. Nowadays operators utilize stored historical data from their data warehouses to improve networks and services, at the same time the number of mobile subscribers rapidly increases and additionally, the new data-technologies for wireless access add extra traffic to the already overloaded networks, often causing serious problems to their performance. A real-time monitoring tool is necessary to operators in order to guarantee high quality of service. In this paper a novel 4G multiplatform real-time monitoring system is presented and analyzed, giving emphasis to WLAN part. The main idea of this system is to collect reports from numerous network elements in such way that the system is compatible and operational in any kind of network of any manufacturer and operator. Additionally the system architecture discussed in this paper is capable of accommodating and supporting 4G networks effectively [C1638]

## "Integrating Inter-Vehicle Communication with Roadside Wireless Access Points to Provide a Lower-Cost Message Broadcasting Service on Highways"

Intelligent transportation systems (ITS) is an important research topic. One important function of ITS is to broadcast emergent traffic information to vehicles so that they can avoid a dangerous or congested zone in time. This paper investigates the use of inter-vehicle communication to assist roadside wireless access points to

provide a lower-cost message broadcasting service on highways [C1639]

## "Radio resource management in beyond 3G systems"

Beyond 3G systems is usually the term used to refer to the new scenarios in the wireless arena where different radio access technologies (RATs) coexist and operate in a coordinated way. This cooperation must indeed be regarded as a new challenge to offer services to the users over an efficient and ubiquitous radio access. In this way, the user can be served through the RAT that fits better to the terminal capabilities and service requirements, and also a more efficient use of the radio resources can be achieved. This challenge calls for the introduction of new radio resource management (RRM) algorithms operating from a common perspective that take into account the overall amount of resources offered by the available RATs. In this context, this paper presents the framework for developing RRM algorithms in the B3G scenarios, including some possible approaches [C1640]

## "Load balancing based on velocity and position in multitier cellular system"

First Page of the Article [C1641]

## "Improving AAA message forwarding lookup latency for WLAN roaming in cellular/PWLAN environment"

First Page of the Article [C1642]

## "Redefining connectivity: unifying mobile communication with the internet"

First Page of the Article [C1643]

## "An approach to transport layer handover of VoIP over WLAN"

First Page of the Article [C1644]

## "Influence of Sinusoidally Modulated Visual Stimuli at Extremely Low Frequency Range on the Human EEG Activity"

The purpose of this study was to investigate whether sinusoidally modulated visual stimuli at extremely low frequencies (ELF) of 50, 16.66, 13, 10, 8.33 and 4Hz could influence the changes in EEG activity in 33 human subjects. An improved design of visual stimulator system has addressed an issue of electrical interference from electrical signals driven by LED arrays onto simultaneously recorded EEG. A comparison between 1 and 3-Way ANOVA was performed in order to evaluate whether visual stimuli at ELFs could influence the EEG in humans to compliment the currently active medical research in seasonal affective disorder (SAD) and photic driving. The results revealed that under evaluation of 1 and 3-Way repeated-measures ANOVA tests, the Theta, Alpha2 and Gamma EEG bands exhibited a common significant difference between ELF visual stimuli [C1645]

## "Development and Evaluation of a Bluetooth EKG Monitoring Sensor"

With the adoption of 2G and 3G cellular network technologies, mobile phones now have the bandwidth capability to stream data back to monitoring stations in real-time. Our paper describes the design and evaluation of a Bluetooth electrocardiogram sensor that transmits medical data to a cell phone. This data is displayed and stored on the phone. Future development of the system will relay this data over a cellular GPRS network. The current system provides a low cost and lightweight alternative to existing EKG event monitors. The final GPRS connected system will provide continuous monitoring of a patient 's heart anywhere cellular coverage is available [C1646]

## "Push-to-Talk over Bluetooth"

Push-to-Talk over Cellular (PoC) is an emerging service enabling a walkie-talkie-like service over GPRS. An open standard for PoC has been specified by the Open Mobile Alliance (OMA) [1]. OMA PoC is based on an IP/UDP/RTP protocol stack and a client-server based architecture. Group management, floor control1 etc are administered by PoC servers. The systems exploits the SIP signalling capabilities of the IP Multimedia Subsystem (IMS) [2]. The objective of this paper is to propose an outline for a Push-to-Talk (PTT) system that utilizes a Bluetooth scatternet and the Personal Area Networking (PAN) profile for data communications [3], [4]. The proposed system is thus fully independent of cellular networks. A reasonable range of several hundred meters can be obtained with multihop communications between Bluetooth class 1 devices, whose range is up to

100 m. The proposed outline for Push-to-Talk over Bluetooth (PoB) comprises e.g. methods for group formation, network formation, communication, and floor control. The network formation method, which can be utilized in other applications as well, is based on creating a scatternet among a predefined set of devices and on avoiding loops. This approach enables usage of a simple broadcasting based communication method, in which the devices bridging the piconets into a scatternet act as repeaters. [C1647]

## "Alterations in Human EEG Activity Caused by Extremely Low Frequency Electromagnetic Fields"

This study has investigated whether extremely low frequency (ELF) electromagnetic fields (EMFs) can alter human brain activity. Linearly polarised magnetic flux density of 20 muT (rms) was generated using a standard double Helmholtz coils and applied to the human head over a sequence of 1 minute stimulations followed by one minute without stimulation in the following order of frequencies 50, 16.66, 13, 10, 8.33 and 4 Hz. We collected recordings on 33 human volunteers under double-blind counter-balanced conditions. Each stimulation lasted for two minutes followed by one minute post-stimulation EEG recording. The same procedure was repeated for the EMF control sessions, where the order of control and exposure sessions was determined randomly according to the subject's ID number. The rest period between two conditions (exposure and control) was 30 minutes. The results indicate that there was a significant increase in Alpha1, Alpha2, and Beta1 at the frontal brain region, and a significant decrease in Alpha2 band in parietal and occipital region due to EMF exposure [C1648]

## "Using SCTP to improve performances of hybrid broadcast/telecommunication network system"

First Page of the Article [C1649]

## "A Boundary Integral Formulation on Unstructured Dual Grids for Eddy Current Analysis in Thin Shields"

A three-dimensional boundary integral method (3D BIM) capable of analyzing the magnetic field at extremely low frequency (ELF) next to thin conducting shields is presented. This novel approach is formulated in terms of global variables (loop currents), avoiding field discontinuities across the shield. Using non-orthogonal dual grids the unknowns can be defined on nodes, thus greatly reducing computing requirements compared to traditional Galerkin's formulations. The procedure is validated using an axisymmetric problem. It is shown that analytical and numerical results are in good agreement even at few millimeters from the shield surface [C1650]

## "Multi-objective optimization of bow-tie antennas for radar assessment of concrete structure"

In order to resolve closely spaced targets in a planar surface normal to the beam, the antenna used in the radar assessment of concrete structures should have a narrow beam width which means a higher directivity. This work presents a procedure to optimize the field pattern of a bow-tie antenna using multi-objective genetic algorithms in conjunction with a MoM direct solver [C1651]

## "Helping to collect traffic information using RFID tag implemented on urban-bus for traffic information"

In this paper, we propose a website to exhibit the traffic information for every 5 minutes at certain places of street measured by three radio frequency identification (RFID) readers for 125 tags installed on two different urban-bus companies and transmit those information via GPRS modem from testing point to control center. Each data can be used to indicate the exact point of traffic condition in a big city. The result is very valuable for the local government to make a decision on the adjustment of urban-bus for their future use. The result shows that the application of RFID tag and reader is an alternative way to extract the traffic information instead of traditional loop detector. It is suggested that the vehicle speed estimated by 2 tags from RFID reader is more accurate than that of by 1 tag compared with historical data. [C1652]

## "Fully-integrated CMOS RF transceivers"

The market for cellular wireless handsets demands very high levels of sophistication and also low component cost and power. In addition to wide-area network interfaces such as GPRS, EDGE, and WCDMA, wireless connectivity features such as GPS, Bluetooth, WLAN, and mobile digital TV are now becoming commonplace. This has driven the demand for many air interfaces to be supported in a single handset design. Conventional silicon integration, employing separate digital baseband, analog, and RF components for each air interface would result in far too many components for an efficient integration. As a result, CMOS SOC devices that integrate all of these functions into single-chip components have become increasingly popular. This paper explains the motivation and challenges of SOC integration in deep submicron CMOS. Examples of SOC devices are provided along with experimental results. [C1653]

## "UWB Spatial Fading and Small Scale Characterization in Underground Mines"

This paper reports on experimental results of UWB channel propagation in underground mines. Because the mine architecture and topology is often irregular and composed of interconnected corridors, two cases were treated, namely LOS and NLOS. The goal of this work is not to formulate a channel model for UWB systems or to provide a universal model for all environments in which UWB devices will be operating, but rather to provide a set of tools that can be used to fairly evaluate the performance of different UWB physical layer proposals in real channels such as underground mines. This work was carried out by the Underground Communications Research Laboratory, LRCS, in the MMSL-CANMET experimental mine (Mining and Mineral Sciences Laboratories-Canadian Center for Minerals and Energy Technology) in Val-d'Or, Canada [C1654]

## "Integrated Management Architecture for FMC Based on IMS/NGN"

Integrated management architecture for FMC based on IMS/NGN is overviewed with WiBro which is a new and promising access technology that supports end-to- end QoS with SBLP. KT's integrated control platform for FMC services is described as well. [C1655]

## "Delivering 3D advertising to mobile phones"

Directing advertising to mobile phones currently is limited to commercial text messages, short-code text-back messages, two dimensional (2D) images, or wireless access protocol (WAP) clickable push links. All of these traditional methods do not facilitate advertising approach were consumers can interact with prospective purchases. In this paper we introduce a novel and highly interactive location- and permission-based advertising system that allows 3D product adverts to be displayed on users' mobile phones. The paper provides a thorough discussion of the system covering its performance, implementation structure, platform-dependent optimizations and suggestions for future work. With mobile phones and 3D interactive tools, advertising becomes more engaging, rewarding and entertaining and provides marketing executives with new means of directing their campaigns to a more specific target audience. [C1656]

## "Software Development for Local Data Transfer for Mobile Applications Using GPS and GPRS Technology"

First Page of the Article [C1657]

## "Design and Development of Application Software Systems for the Acquisition and Storage of Local and Remote Data for Mobile Applications Using TCP/IP Protocols and GPS/GPRS Services"

First Page of the Article [C1658]

## "Mobile RFID — A Case from Volvo on Innovation in SCM"

Utilization of Radio Frequency Identification (RFID) is often presented as improving supply chain management even though there are still few in-depth studies that support the hype. In this work, the feasibility of a mobile RFID solution in the automotive business-to-business of Volvo has been studied. Currently, due to costs of fixed infrastructure installations, many RFID solutions can only be financially justified in a setup with high volumes and high value items. In this setup, an innovative mobile RFID solution, utilizing cellular networks with data package communication (GSM/GPRS), web technology and integration has been evaluated. This is done from the perspectives of operational reliability, usability and productivity. The empirical evidences come from more than 3.000 readings that together with qualitative research explore a unique context of mobility in which existing infrastructure is leveraged. The advantages and disadvantages of the solution are summarized into a business case feasibility. Recommendations include design constrains and development strategies. [C1659]

## "Subsurface illumination and propagation in Ground Penetrating Radar"

It is desirable for ground penetrating radars to accurately determine positions of buried objects. This paper uses a combination of a ray-tracing technique and the finite difference time domain technique to assess the performance of a novel deployment strategy for ground penetrating radar where the transmitter is placed in an available structure underground. Promising characteristics are seen offering operation of the radar with lower dynamic range and higher bandwidths. The deployment system also appears to offer satisfactory illumination over a relatively large area. [C1660]

## "Radar cross section of some simple and collected targets to be used for classification"

The goal of this paper is to analyze the scattering properties of different kind of targets, from simple shapes to collected targets made up of several objects, from 400 MHz to 7400 MHz to be used as patterns in a Ground Penetrating Radar in the classification stage. The data have been collected in an anechoic chamber with a vector network analyzer (VNA) set to work as a Stepped Frequency Continuous Wave Radar (SFCW). The data are analyzed in frequency and time domain in order to picture the radar cross section dependency of frequency, incident angle, polarization and targetГ‚Вїs shape. The measurement have been carried out using a bistatic arrangement with two TEM horns for linear polarization and two spiral antennas for circular polarization. [C1661]

## "Pulsed UWB array and beam steering"

The system performance of a beam steering array for a transmitting UWB system will be presented in the context of FCCГ‚Вїs emission mask for surveillance radar. The results include radiation patterns and pulse-width distortions and spectrum will be discussed. [C1662]

## "Development of a hemi-spherical wideband antenna array for breast cancer imaging"

Using similar techniques to Ground Penetrating Radars, microwave detection of breast tumours is a potential non-ionising and non-invasive alternative to traditional body-imaging techniques. [C1663]

## "C-scan representation by FDTD simulation in realistic environment: Application to the analysis of multisensor GPR capacity"

Electromagnetic wave propagation, in an heterogeneous medium, is analysed using a method based on the finite-difference time-domain (FDTD) algorithm. This paper deals with the C-scan representation for ground penetrating radar (GPR). A GPR monostatic configuration will be presented as well as a multisensor antennas model. Moreover, performances and signal to noise ratios of these two models will be compared. [C1664]

## "An Efficient Radio Admission Control Algorithm for 2.5G/3G Cellular Networks"

We design an efficient radio admission control algorithm that minimizes blocking probability subject to the condition that the overload probability is smaller than a pre-specified threshold. Our algorithm is quite general and can be applied to both TDMA-based cellular technologies, such as GPRS and EDGE, and CDMA-based technologies, such as UMTS and CDMA2000. We extend prior work in measurement-based admission control in wireline networks to wireless cellular networks and to heterogeneous users. We take the variance of the resource requirement into account while making the admission decision. Using simulation results, we show that our admission control algorithm is able to meet the target overload probability over a range of call arrival rates and radio conditions. We also compare our scheme with a simple admission control algorithm and also show how to use our approach for the carrier selection problem [C1665]

## "Form based Structured Mobile Messaging Framework for Mobilizing Business Applications"

This short paper describes a form based Message oriented business application framework developed on the Symbian platform, hereafter referred to as mobileForms. MobileForms framework enables usage of forms over different communication infrastructure, such as: multimedia media messages (MMS), Bluetooth (Bth) messaging, Email and also over the conventional channel i.e. HTTP in cellular networks via GPRS/3G connections. The different addressing mechanisms corresponding to the above communication channel are supported respectively. The mobileForms application framework has been developed to function in an offline mode (locally cached, rendered, used and processed). We will discuss in this paper the motivation why we developed the mobileForms prototype in addition to the architecture and implementation aspects taken into consideration [C1666]

## "Miniature ground penetrating radar, CRUX GPR"

Under NASA instrument development programs (PIDDP 2000-2002, MIDP 2003-2005, ESR&T, 2005), we have been developing miniature ground penetrating radars (GPR) for use in mapping subsurface stratigraphy from planetary rovers for Mars and lunar applications. The Mars GPR is for deeper penetration (up to 50-m depth) into the Martian subsurface at moderate resolution (1.5 m) for a geological characterization. As a part of the CRUX (construction & resource utilization explorer) instrument suite, the CRUX GPR is optimized for a lunar prospecting application. It will have shallower penetration (5-m depth) with higher resolution (15 cm) for construction operations including ISRU (in-situ resource utilization). The GPR is a short-pulse type system, which responds to interfaces between materials of differing dielectric permittivity. Currently, the CRUX GPR (technology readiness level 4) has miniaturized radar electronics (2 boards, 10 cm times 5 cm times 2 cm, 1 W

power, total 45 g), with 2 batteries (9 V, 2 times 45 g) operating at 800-MHz center frequency. Field testing of the prototype has been conducted extensively. When deployed for lunar missions, the CRUX GPR data will help prospecting possible construction sites [C1667]

## "Using the Liberty Alliance Architecture to Secure IP-level Handovers"

This paper presents a novel authentication and authorization architecture for mobile terminals while performing an IP-level handover. The proposed architecture is based on the liberty alliance single sign-on architectural framework. Using the foundation provided by this architecture, we also present a protocol to enable these security functions during the handover process. Later, we present the results of a performance comparison of the proposed protocol against the current specified mechanism for 3 GPP2-WLAN interworking. We then perform a detailed threat analysis to show that the proposed solution is secure. The solution proposed in this paper is a scalable practical solution to authenticate and authorize handovers in future generation mobile networks, leveraging on the liberty alliance architecture that operator may have deployed for authenticating service requests within a Liberty Federation [C1668]

## "FDTD Simulation of Substrate Environments"

Ground penetrating radar (GPR) waves in inhomogeneous medium are analyzed by numerical methods in this paper. The theory analysis provides physical interpretation of a calculation model for characteristics of subsurface layers. In this model, the thickness and permittivity of subsurface layers would be estimated by traveling time of reflection wave in GPR measurement. A 3-D finite-difference time-domain (FDTD) code is used to simulate electromagnetic fields in multi-layer ground. Numerical simulations of the responses of GPR are described. Responses of different offset radars are studied in this paper. The thickness of the planar layer is calculated by simulated results. The results calculated from FDTD simulations verify the accuracy of the model for estimating the parameters of ground by GPR [C1669]

## "A VPN-driven Infrastructure for Vertical Handovers"

Mobile PCs are equipped with a multitude of network access technologies, such as IEEE 802.11 WLAN, GPRS over GSM or wire-based Ethernet. If the user wants to access the Internet he has to choose one of the technologies and has to use it for the whole duration of the session. But this is problematic when the user wants to be mobile and has to change network access technologies. It was quite problematic so far to start a session using Ethernet (Г‚Вї laptop at work) and then perform a seamless vertical handover to WLAN when the user becomes mobile. The protocols used in the Internet were not designed with mobility in mind. Some proposals were made to circumvent these problems, for example by using enhancements like Mobile IP or IPv6, but a solution that could easily be applied to a multitude of different "real-world systems" has not been presented yet. We developed a method that implements a data transfer mechanism that is able to handle the problems caused by mobility and vertical handovers. Our first approach made use of the universal proxy protocol SOCKSv5 (RFC 1928) to relay all data to a central proxy server using a handover-capable transport mechanism. Here, "socksified" applications were needed, which was not feasible in all possible scenarios [Evers, 2004]. This paper presents our latest enhancement that makes use of a Virtual Private Network (VPN) in combination with our handover capable transport mechanism. [C1670]

## "Resource allocation policies for aggregated QoS enabled pipes in multi-domain IP environment"

Next generation Internet should offer support for end to end (E2E) multimedia services with quality of services (QoS) guarantees. In IP multi-domain environment this is still an open issue. One method to solve the E2E QoS problem in scaleable manner is to establish multi-domain end to end aggregated (in the core part of the E2E chain) paths having controlled QoS characteristics. The resources for these pipes should be allocated and installed in each domain by the domain managers. The instant of actual allocation decision in one domain may be in advance or after getting responses from the downwards domains. This paper focuses on such specific aspects, in the framework developed in the research project ENTHRONE IST-507637. It studies several allocation methods, from point of view resource utilization degree of resources versus the amount of required signalling when considering a whole chain of domains. The proposed method is currently implemented in the research project mentioned above [C1671]

## "Analysis and Mitigation of the Electromagnetic Coupling Problem Associated with Multi-Conductors in Three-Phase Systems"

This paper derives various common arrangements of power lines that produce intense magnetic fields to assess magnetic field exposure accurately. The sources of the extremely low frequency (ELF) electric and magnetic fields, and the asymmetric distribution in the magnetic coupling problem associated with multi-conductors in

three-phase systems are discussed. Theoretical simulation (using the MATLAB software package) and on-site testing are used to investigate interference from power distribution lines with the electromagnetic force (EMF) of devices. Finally, some strategies for attenuating the high magnetic field intensity and mitigating the electromagnetic coupling problem are proposed [C1672]

## "Evaluating different one to many packet delivery schemes for UMTS"

It is known that multicasting is an efficient method of supporting group communication as it allows the transmission of packets to multiple destinations using fewer network resources. Thus, service providers are increasingly interested in supporting multicast communications over wireless networks and in particular over UMTS. Multicasting is a more efficient method of supporting group communication than unicasting or broadcasting, as it allows transmission and routing of packets to multiple destinations using fewer network resources. In this paper the three above mentioned methods of supporting group communication are analyzed in terms of their performance [C1673]

## "Effective Testing Principles for the Mobile Data Services Applications"

Wireless communication technologies like GPRS, UMTS and WLAN, combined with the availability of high-end, affordable mobile devices enable the development of advanced and innovative mobile services. Devices such as mobile phones and personal digital assistants let the users access a wide range of new offerings whenever and wherever they happen to be. A strategic approach for the quality assurance of these mobile data services should take into account a number of characteristics unique to the mobile paradigm such as the increased complexity of emerging handheld devices, the greater sensitivity to security and load related problems in wireless infrastructure and increased complexities of scale. This paper identifies the major factors influencing the development and testing strategies for these applications and works out effective quality assurance principles to ensure productive and scalable mobile data services [C1674]

## "Optimization of vertical handover decision procedure using an experimental MIPv6 testbed"

The paper presents an experimental geographical testbed used to analyze the handover performance of the mobile IPv6 (MIPv6) protocol. The analysis carried out using a current implementation of MIPv6 protocol has allowed us to identify that a relevant contribution to handover latency can be associated to the handover decision. In the standard implementation, this procedure is triggered by the layer 3 neighbor unreachability detection algorithm. To overcome this problem, we have developed and tested a kernel module devoted to the dynamic management of the network interfaces of a mobile node. The developed interface management module (IMM) works in cooperation with the mobile IPv6 implementation, extending Its functionalities to better support interface selection and movement detection. The experimental performance analysis highlights the ability of the proposed IMM to reduce the vertical handover decision time [C1675]

## "Simulative analysis of access selection algorithms for multi-access networks"

It is expected that future wireless systems will consist of several distinct radio access technologies (including WCDMA/HSDPA, GSM/EDGE/GPRS, WLAN and others) forming a multi-access system that offers advanced voice and multimedia services. Previous works have shown that the combined capacity region of such systems depend on the service allocation policy that assigns user sessions to the available subsystems. The currently available service allocation policies typically operate off-line implying that the actual service mix is assumed to be known prior to the service allocation taking place. In this paper we consider the on-line problem according to which sessions arrive one after the other and no assumptions on the service mix can be made. We adopt four on-line bin-packing algorithms to the multi-access environment and study their performance by means of simulation in terms of the class-wise blocking probability and throughput. We find that the algorithm termed Less Voice provides the best performance in terms of the blocking probabilities and imposes the least slow down for elastic sessions [C1676]

## "An MPLS/HMIPv6 based mobility management framework for GPRS/WLAN integration architecture"

During the last couple of years, the cellular system becomes one of the popular wireless communication mediums. But in the hot spot region, the use of WLAN is increased due to its high data rate and low installation cost. So there is a requirement for suitable integration technique of 3G/GPRS and WLAN to increase the area of coverage and high data rate. In this paper, we present an integration of GPRS and WLAN in connection with multi protocol label switching (MPLS). The mobility is managed by hierarchical mobile IPv6 (HMIPv6). The aim of this paper is to design seamless mobility with low signaling overhead and provision for optimal quality of service

(QoS). Performance analysis of the integrated framework is done for signaling overhead. Simulation result based on ns-2.26 indicates better throughput and faster switching. Thus ensure optimal QoS for the integrated framework [C1677]

## "Closed-loop power control of radio frequency power amplifier module with an on-chip embedded power detector"

A quad-band GSM/GPRS power amplifier module is designed with a built-in ability of RF power transmitting control. Within the RF power transmitting control loop, a RF power detecting circuit with another reference circuit are embedded together onto the same InGaP/GaAs HBT power amplifier chip to achieve a good temperature compensation. Such power chips are then assembly with a silicon CMOS comparative chip by the multi-chip module technology and functions as a closed- loop power controlled GSM/GPRS power amplifier module. It had successfully demonstrated as play for all quad-band operations (GSM850, EGSM900, DCS1800, PCS1900). [C1678]

## "Techniques supporting threadprivate in OpenMP"

This paper presents the alternatives available to support threadprivate data in OpenMP and evaluates them. We show how current compilation systems rely on custom techniques for implementing thread-local data. But in fact the ELF binary specification currently supports data sections that become threadprivate by default. ELF naming for such areas is thread-local storage (TLS). Our experiments demonstrate that implementing threadprivate based on the TLS support is very easy, and more efficient. This proposal goes in the same line as the future implementation of OpenMP on the GNU compiler collection. In addition, our experience with the use of threadprivate in OpenMP applications shows that usually it is better to avoid it. This is because threadprivate variables reside in common blocks and they impede the compiler to fully optimize the code. So it is better to keep threadprivate as a temporary technique only to ease porting MPI codes to OpenMP [C1679]

## "A new bi-processor SmartPhone: evaluation of the perfomance generating GPRS data traffic"

In this work we introduce a new type of SmartPhone: a bi-processor SmartPhone equipped with a network interface GSM/GPRS/EDGE/UMTS. The architecture used, with two processors, is introduced to take advantage from the subdivision of the functionalities realized through the two processors. This results in a better distribution of different functions, all above when multi-media traffic is considered. Moreover the interaction between the two processors has to be realized in a convenient manner to better take advantage from the sub-division. The form of communication established between the two processors we have chosen is the serial communication based on the standard RS232. Before to realize the product we propose to evaluate the performance of a similar project. To do this last we built a simulator focusing our attention on the communication between the two processors and we generated different types of data traffic (voice call, sms, etc.). Furthermore we considered GPRS connections on our simulator to verify that a similar architecture, when correctly developed and dimensioned, can support this type of data traffic [C1680]

## "The Application of GPS on the Buoy Monitoring System"

First Page of the Article [C1681]

## "On the impact of unwanted traffic onto a 3G network"

The presence of "unwanted" (or background) traffic in the Internet is a well-known fact. In principle any network that has been engineered without taking into account the presence of unwanted traffic might experience troubles during periods of massive exposure to it, e.g. large-scale infections. A concrete example was provided by the spreading of Code-Red-II in 2001, which caused several routers crashes worldwide. Similar events might take place in 3G networks as well, with further potential complications due to the functional complexity and the scarcity of radio resources. In this explorative paper, we show that unwanted traffic is present also in GPRS/UMTS, mainly due to the widespread use of 3G connect cards for laptops. Based on a mixture of real-world measurements and theoretical speculations, we investigate the potential impact of such traffic onto the underlying network. We show that under certain hypothetical network configuration settings unwanted traffic, and specifically scanning traffic from infected mobile stations, can cause large-scale wastage of logical resources, and in extreme cases starvation. We urge the research community and network operators to consider the issue of 3G robustness to unwanted traffic as a prominent research area. The goal of this paper is to trigger interest and at the same time move a first pioneering step in this direction [C1682]

## "Borehole radar performance characteristics and applications for underground change detection"

Low-frequency borehole radars have proven useful in recent years as tools for locating underground features, such as rock fissures and voids. In fact, these radar systems are now commercially available at multiple operating frequencies. Most of the borehole radar applications to date have utilized the systems in a tomographic mode because of its capability to locate a target between two boreholes. In this paper, we focus on the use of a borehole radar system in a reflective mode because of its capability to detect a target anywhere in the vicinity of the radar. As expected, the detection range of the system is severely limited due to two-way attenuation through the earth. Nonetheless, we show that it is possible to form a roughly focused range-vs.-depth image of the region surrounding the borehole. More importantly, by developing and implementing some straightforward signal processing techniques, we are able to detect the introduction of a target into an adjacent borehole in both the focused and the unfocused imagery. [C1683]

## "Investigation of GPR configurations by ray-tracing methods"

Methods for locating and identifying buried assets are one focus of a large research project entitled 'mapping the underworld'. As of part of the project we are studying novel configurations for ground penetrating radar (GPR). There are two of important specifications for the GPR configurations: the bandwidth and the dynamic range. In this paper, the bandwidth and dynamic range of a GPR are investigated through simulations. Media that are typical of street environments were modeled is used in the simulations. A 2D ray-tracing model is used to simulate propagation in the ground to identify signal levels, bandwidths and dynamic ranges. A novel In-Pipe deployment and a conventional deployment scheme for GPR are examined using ray-tracing. Comparison of the results shows that the In-Pipe deployment scheme for the GPR has immediate advantages over the conventional one, in terms of having a wider available bandwidth and therefore resolution, and in having a lower dynamic range requirement. [C1684]

## "Extraction of the signature of a buried object using GPR"

This paper deals with the possibility of remotely detecting buried objects using impulse radiating GPR. Most GPR systems involve the B-scan or the C-scan of the ground requiring the usage of advanced imaging techniques. Identification of a buried target is done using only a single snapshot of the ground. An electromagnetic pulse is sent into the ground from a transmitting antenna. The target reflects the pulse and the reflection is received by a receiving antenna. A single temporal scan of the ground is utilized for identification of the target characteristics. The antenna responses are deconvolved out from the receiver response. The deconvolution is carried out by using the conjugate gradient method. Finally, the target response is identified by extracting the natural resonance frequencies by applying the matrix pencil method on the transient waveform. Successful identification of buried targets is achieved through this methodology. [C1685]

## "End-to-end modeling and simulation of GMTI target detection from space"

The design of space based radars for detection of ground moving targets must consider several factors to be operationally effective. The high speed of the satellite coupled with unknown motion patterns of the ground moving vehicles requires efficient detection and geolocation algorithms, as well as dynamic tasking of the satellite. An end-to-end simulation of the process has been constructed and a realistic scenario has been analyzed in terms of the detection statistics and effects of satellite and spacecraft motion and deformation errors. Three analytic META models have been constructed to evaluate antenna and signal processing architectures, while maintaining an effective simulation throughput. The effects of these META models on signal to noise ratio, probability of detection and minimum detectable velocity are examined. Examination of key measures of performance provides insight into sensor design and tasking requirements. [C1686]

## "Classification of ground penetrating radar echo signals using wavelet packet and RBF"

Ground penetrating radar (GPR) is an electromagnetic detecting device widely applied in geological survey. In practical application, the GPR echo signal shows non-stationary characteristic due to the inhomogeneous underground media. In order to identify the holes in the wall, the wavelet packet analysis is employed to extract feature vectors and the radial basis function (RBF) network is applied to classify the feature vectors. This proposed method is tested on GPR data and shows efficient classification result and promising practicability. [C1687]

## "LibsafeXP: A Practical and Transparent Tool for Run-time Buffer Overflow Preventions"

This paper presents a practical tool, LibsafeXP, to protect the software against the most common and severe attack, buffer overflows. As a dynamic shared library and an extension to Libsafe and LibsafePlus, LibsafeXP contains wrapper functions for all the buffer related functions in C standard library. These wrapper functions are enforced to check the source and target buffer's size using the following information: global buffer knowledge

extracted from the program symbol information, heap buffer knowledge by intercepting memory allocation family functions, and stack buffer bound information by dynamically determined from the frame pointer. Compared with other approaches, LibsafeXP is more transparent to programs: it works on binary mode, and neither requires the source code nor any debugging information. The performance and effectiveness evaluation indicates LibsafeXP could be used to defend against buffer overflow attacks and impose about 10 percent overhead on the protected software [C1688]

## "Co-evolutionary self-adaptive Differential Evolution with a uniform-distribution update rule"

Differential Evolution (DE) is a simple evolutionary algorithm which is inherently adaptive. This is due to the fact that the mutation amount is derived from the difference of randomly chosen members of the population, which is automatically reduced as the population diversity drops. The process is however governed by an important weighing parameter F, to which the global properties of the DE are very sensitive. Large F can lead to significant reductions in convergence speed, whilst small F can cause the algorithm to get stuck. In this paper, a simple co-evolutionary process is proposed to automatically update the F parameter during the optimization process based on a uniformly distributed update rule. The behavior of the adaptive DE is studied and investigated with some benchmark functions. [C1689]

## "Mobile Learning: Is Anytime + Anywhere = Always Online?"

The new e-learning trend, called mobile learning opens variety of questions to solve. To allow access to learning content anytime and anyplace a technique called hoarding is sometimes indispensable for covering the periods of disconnection. In this paper we show the outcomes of the hoarding sub-system of Mobile ELDIT system, developed at the University of Trento. Our results demonstrate that in certain scenarios anytime, anywhere m-learning might be reached even without online access available [C1690]

## "CopperCore Service Integration-Integrating IMS Learning Design and IMS Question and Test Interoperability"

This article describes a framework for the integration of e-learning services. There is a need for this type of integration in general, but the presented solution was a direct result of work done on the IMS learning design specification (LD). This specification relies heavily on other specifications and services. The presented architecture is described using the example of two of such services: CopperCore, a LD service, and APIS, an IMS question and test interoperability service. One of the design goals of the architecture was to minimize the intrusion for both the services as well as any legacy client that already uses these services [C1691]

## "Solving projected generalized Lyapunov equations using SLICOT"

We discuss the numerical solution of projected generalized Lyapunov equations. Such equations arise in many control problems for linear time-invariant descriptor systems including stability analysis, balancing and model order reduction. We present solvers for projected generalized Lyapunov equations based on matrix equations subroutines that are available in the subroutine library in control theory (SLICOT) [C1692]

## "A SAR-Based Algorithm for Imaging of Landmines with GPR"

First Page of the Article [C1693]

## "GPR Data Processing Using the Component-Separation Methods PCA and ICA"

First Page of the Article [C1694]

## "GSM/GPRS single-chip in 130nm CMOS: challenges on RF for SoC integration"

Since CMOS GSM-radio-transceiver are established on the market a few years ago the next evolutionary step is a complete GSM/GPRS baseband-RF-SoC integration. It promises lowest production cost, easiest board integration and the highest flexibility in system optimization. However, crosstalk from digital into analog and RF blocks is a severe constraint. In this paper we have presented the main cross coupling effects and challenges for the RF integration. Potential countermeasures to fulfil GSM performance are discussed. The achieved RF performance was demonstrated with measurement results [C1695]

## "A WCDMA, GSM/GPRS/EDGE receiver front end without interstage SAW filter"

A dual mode RF receiver for DCS band in 90 nm CMOS is presented. The receiver uses direct conversion for

WCDMA mode and uses 100 kHz low IF for GSM/GPRS/EDGE (GGE) mode. The receiver does not use an interstage SAW filter between LNA and mixer. The mixer stage is followed by a variable gain amplifier. Two times LO clock is provided from external source and a divide by two is used to generate quadrature clocks. The receiver has a NF of 2.9 dB and meets all the out of band and in band linearity requirements for both WCDMA and GGE modes [C1696]

## "Classifying dielectric mine-like objects using the Huynen-Fork polarization parameters"

We present a polarimetric approach that can be used to characterize subsurface targets by means of ground-penetrating radar. Several quantities related to the Huynen-Fork parameters are basic to the study. These quantities are all expressible in terms of the elements of Sinclair matrix S, which in turn, can be determined as functions of frequency by an application of the method-of-moment (MoM). The method is applied to a mine-like object buried at various depths in a soil of specified dielectric and moisture properties. The quantities in question are the Stokes parameters, the elevation, azimuth, and polarizability angles, as well as the polarization ratios and the scattering eigenvalues which optimize the backscattered power. Some of these quantities are studied here and displayed in various graphs. These frequency dependent graphs exhibit useful symmetry properties. The plots of the polarizability angle (β) vs. frequency seem to remain invariant with target depth, and exhibit resonance features that are later shown to agree well with other standard methods to estimate resonances such as Prony method. A simple analysis of the early-time resonances thus estimated is used to obtain acceptable mine dimensions. The agreement found implies that polarimetric techniques, such as present one, can also be used in the arsenal of techniques yielding target-ID clues. [C1697]

## "Multi-parameter Hopf-bifurcation in HHM Model Exposed to ELF Electric Field"

The variation of cell trans-membrane voltage exposed to extremely low frequency (ELF) electric field is analyzed; a modified Hodgkin-Huxley model of muscle (HHM) is established by introducing a new parameter denoting the effect of external electric field, and the bifurcation caused by the new parameter as well as leakage conductance and sodium ions anti-electromotive force is studied. The algebra criterion in high dimension equations is employed to perform the analysis of multi-parameter dynamical bifurcation. The results are of biological significance and suggest that the aberration of dynamics in bio-systems may be accounted for diseases caused by electric exposure [C1698]

## "Analysis of Body Hair Movement in ELF Electric Field Exposure"

For the study of the perception of ELF electric field, a fundamental study was conducted on the movement of body hair in field exposure. The electric force exerted on a hair was given from the force component at dielectric discontinuity. With this force, the equation of the hair displacement in field exposure was derived. The displacement evaluated by the equation agreed well with experimental results. Finally, the hair movement in field exposure was formulated theoretically. The derived equation well describes the real movement of body hair in field exposure. With the equation, the mechanisms of the threshold variation in the field perception was made clear [C1699]

## "A Dynamic Blood Information Management System Based on RFID"

As a patient and recipient of a blood transfusion, it is important for him or her to receive the safest blood possible. Information about the donated blood should be under the track to guarantee the quality of the blood source. In this paper, we present a RFID-based blood information management system that aims at ensuring the quality of the blood and increasing the efficiency of operation management. In this system, the fingerprint sensor is adopted to enable the process of identifying blood donor more reliable and credible and RFID tag is used to make the management more convenient. In addition, GPRS is applied in this system so that real-time data can be transmitted between the bloodmobile and blood center through wireless Internet [C1700]

## "The Research of Telemedicine System Based on Embedded Computer"

In this study a telemedicine system based on embedded computer system is presented, which is designed specially for the need of immediate medical treatment in remote areas. In the system embedded Linux is cut down, customized and ported into the monitor terminal. Data interchange between the monitor center and the terminal via Internet and GPRS is introduced. This system which is convenient, portable and high cost-effective, can tele-monitor four vital bio-signals, such as cardiograph, blood pressure, respiration and temperature through GPRS or Internet, which is of great improvement for development of telemedicine in developing countries [C1701]

## "Tunable monocycle doublet generator"

This paper introduces a technique for generating tunable UWB monocycle doublets. The time separation of the monocycles can be easily tuned, independent of the pulse repetition rate. It does not require the use of wideband or high frequency delay lines to generate the doublets. Several prototypes were fabricated and measured. The results verify that the proposed technique is suitable for generating monocycle doublets with tunable characteristics. [C1702]

## "Efficient application of IPsec VPNs in wireless networks"

Modern wireless networks allow a mobile node including smart devices or sensing devices to communicate with each other regardless of the time it wishes to access and the place where it is. Moreover the current wireless network technologies are trying to offer high data rates with low error rates. This is especially important for so called field workers, who work outside a company's building or even a fixed location but have to access the corporate LAN. VPNs enable corporations to extend services to mobile employees and partners without the risk of compromising their existing security standards. A mobile VPN (MVPN) extends the VPN to mobile workers who establish an VPN tunnel over the Internet using wireless connections such as GSM, GPRS, WLAN or UMTS. The security mechanisms integrated into the VPN technology cause a considerable data size expansion which is especially in wireless networks undesirable. In this paper we present a mechanism that enables the application of header compression techniques in IPsec secured VPNs which as a result reduces data size expansion and consequently the packet-loss rate and transmission costs. [C1703]

## "Local Linear Regression (LLR) for Pose Invariant Face Recognition"

The variation of facial appearance due to the viewpoint (/pose) degrades face recognition systems considerably, which is well known as one of the bottlenecks in face recognition. One of the possible solutions is generating virtual frontal view from any given non-frontal view to obtain a virtual gallery/probe face. By formulating this kind of solutions as a prediction problem, this paper proposes a simple but efficient novel local linear regression (LLR) method, which can generate the virtual frontal view from a given non-frontal face image. The proposed LLR inspires from the observation that the corresponding local facial regions of the frontal and non-frontal view pair satisfy linear assumption much better than the whole face region. This can be explained easily by the fact that a 3D face shape is composed of many local planar surfaces, which satisfy naturally linear model under imaging projection. In LLR, we simply partition the whole non-frontal face image into multiple local patches and apply linear regression to each patch for the prediction of its virtual frontal patch. Comparing with other methods, the experimental results on CMU PIE database show distinct advantage of the proposed method [C1704]

## "A 90 nm CMOS receiver front-end for GSM/GPRS/EDGE"

A GSM/GPRS/EDGE receiver front-end realized in 90 nm CMOS technology is presented. With a low power of 46 mW, it achieved 31.5 dB gain, 2.1 dB integrated noise figure, 5 dB of noise figure under blocking condition and -9.5 dBm of inband IIP3. The measured LO leakage at the LNA input is 125 dBm. Total active area occupies 1.4 mm2. [C1705]

## "A holistic framework for mobile environments"

Due to the large variation in capabilities in mobile devices and the lack of true standards, it is hard to develop applications for the mobile environment that will behave similar on all devices and in different environments. This article introduces the concept of a Holistic Framework that uses several different implementations for one specific use case. The performance of each implementation is evaluated at runtime ensuring that the optimal implementation is always used. We describe the architecture and discuss the feasibility of the framework. As a part of the evaluation we develop a simple chat application with a seamless connection that evaluates and switches between connections in real time. The test environment is a J2ME CLDC application that transfers data with Bluetooth and GPRS over the JXTA network. [C1706]

## "Secure 3G user authentication in adhoc serving networks"

The convergence of cellular and IP technologies has pushed the integration of 3G and WLAN networks to the forefront. Gaining secure access to 3G services from 802.11 WLANs is a primary challenge for this new integrated wireless technology. Successful execution of 3G security algorithms can be limited to a specified area by encrypting a user's authentication challenge with spatial data defining his visited WLAN. With limited capacity to determine a user's location only to within a current cell and restrictions on accessing users' location due to privacy, 3G operators must rely on spatial data sent from visited WLANs to implement spatial authentication control. A potential risk is presented to 3G operators since no prior relationship or trust may exist with a WLAN

owner. Algorithms to quantify the trust between all parties of 3G-WLAN integrated networks are presented to further secure user authentication. Ad-hoc serving networks and the trust relationships established between mobile users are explored to define stronger algorithms for 3G-WLAN user authentication. [C1707]

## "A service creation environment for interactive, menu-driven mobile services"

In this article, we describe a service creation environment (SCE) that allows for protocol- and technology-independent development, deployment, and maintenance of interactive, menu-driven mobile services for cellular networks. The presented SCE eases the maintenance of mobile services, in particular by means of versioning and access right management. The SCE even allows third-party content providers to deploy services on their own by remotely accessing the SCE residing at a mobile network operator (MNO). The presented SCE is based on an open source content management system and currently supports maintenance of HTML-based service descriptions. [C1708]

## "Exploiting multipath propagation for GMTI in urban environments"

This paper evaluates the potential for exploiting multipath propagation for improved radar detection of moving ground targets in dense urban environments. In particular, the radar coverage offered by exploiting non-line-of-sight (NLOS) propagation from an airborne radar platform is considered. A quasi-analytical model for NLOS propagation assuming multiple specular reflections off buildings is derived to evaluate radar coverage as a function of target range, aircraft altitude, building height and separation, and relative target position on a street. A statistical characterization of the urban environment is used to compute probabilities of line-of-sight versus non-line-of-sight propagation and surveillance sweep width. Comparison of sweep width for LOS versus at least one NLOS path indicates that NLOS could offer a significant improvement in coverage rate. In essence, NLOS propagation permits radar surveillance at longer ranges with lower altitude radar platforms. In addition to radar coverage, the Cramer-Rao lower bound (CRLB) for estimation of target position in a specular multipath environment is derived. The CRLB indicates that, in theory, range accuracy improves with multiple paths and that only three paths are required to jointly estimate target range, position within the street, and street width. [C1709]

## "A Fast Handover System Evaluation in an All-IPv6 Mobility Management-Wireless Broadband Access based Hotspot Network Environment"

The ongoing convergence of wireless networking and IP networking more and more requires solutions for transporting realtime application data to IP enabled mobile devices and mobile networks. Even though the basic Mobile IPv6 protocol suite performs sufficient in macro environments with non realtime traffic, seamless mobility requires some more enhanced protocol procedures in between the mobile node and the involved network entities.Limiting the effect of handovers has the potential to considerably improve handover performance in terms of latency, packet loss, signaling overhead, and scalability. This contribution is going to present an extensive simulation study on the performance of the Fast Handovers for Mobile IPv6 approach. The demonstrated simulation scenario comprises 9 access router and up to 70 Mobile Nodes that communicate in accordance with the popular IEEE 802.11 wireless LAN standard. [C1710]

## "Distributed mobility prediction in a hierarchical infostation systems"

The infostations system, small and separated islands of coverage, provides intermittent but very high speed rate. The short time the mobile terminal spends in the coverage area has direct impacts on the network performance. Thus, it is essential to avoid the bandwidth wasting due to the overall delay by performing mobility prediction. A new mobility prediction protocol called distributed neighbor discovery protocol (DNDP) is proposed. DNDP handles a neighbor graph table that dynamically configures itself according to the terminals' mobility. The simulation shows that the terminals service continuity is significantly improved thanks to DNDP. [C1711]

## "3G Networks in Emergency Telemedicine-An In-Depth Evaluation & Analysis"

The evolution of telecommunications technologies in connection with the robustness and the fidelity these new systems provide, have opened up many new horizons as regards the provision of healthcare and the quality of service from the side of the experts to that of the patients. The purpose of this paper is to evaluate the third generation telecommunications systems that are only recently being deployed in Europe, as well as argue on why a transition from 2G and 2.5G to 3G telecommunications systems could prove to be crucial, especially in relation to emergency telemedicine. The experimental results of the use of these systems are analyzed, the implementation of a tele-consultation unit is presented and their exploitation capabilities are explored [C1712]

## "Hip Prosthesis Detection based on Complex Natural Resonances"

Resonance based radar target detection has been applied to ground penetrating radar (GPR) applications for the detection and recognition of landmines. Target detection is achieved by searching for certain target dependent complex natural resonances (CNRs), which could be considered as a feature set for identification. In this paper, detection of a hip prosthesis under human tissues using resonance based target detection technique is investigated [C1713]

## "CCSMOMS:A Composite Communication Scheme for Mobile Object Management System"

In this paper, we discuss the design and implementation of a mobile object management system that makes use of the existing GSM (Global System for Mobile Communication) networks and it's extension-GPRS (general packet radio service) for data communication. We use a novel composite communication scheme (CCS), which uses SMS (short message service) and GPRS to achieve reliable and economical communication between mobile objects and the control center. We also use unified data management (UDM) for control center management, which significantly reduces the cost of maintaining separate data centers. We have deployed our services in two medium-sized cities with real users. The cost evaluation shows the high performance, usability and cost-effectiveness of this service in real production environment [C1714]

## "A Wireless PDA-based Electrocardiogram Transmission System for Telemedicine"

A wireless electrocardiogram (ECG) transmission system is developed which integrates current personal digital assistant (PDA) technology and general packet radio service (GPRS) technology. This PDA-based system is comprised of a designed ECG signal acquisition module, a pocket PC (Legend 5100) and a GPRS communication module. The specific objective of this system is to facilitate accurate and reliable monitoring and transmission of patient's ECG signal. This system is able to acquire ECG signals, display the ECG waveform on the LCD screen of the PDA and wirelessly transmit them to an authorized remote medical ECG management server. The transmission function of this system is tested and the results show that this system is able to accurate and reliable transmit the ECG signal [C1715]

## "A genentic algorithm-based cross-correlated back projection scheme for UWB radar imaging"

This paper presents a novel genetic algorithm (GA)- based cross-correlated back projection (CBP) scheme for the reconstruction of UWB radar images. CBP eliminates the smearing of radar images by cross correlating the array element outputs to the output of a reference element. So the performance of CBP depends largely on the selection of location of the reference element. In this work, GA is utilized to obtain the optimum location of the reference element. In comparison to standard CBP, this scheme produces images of superior quality with better cross-range resolution and smaller sidelobe levels. The performance of the new imaging algorithm is demonstrated on numerical examples. [C1716]

## "A Real-time Boat Surveillance System Using GPRS"

In this paper, a real-time boat surveillance system using GPRS is deeply researched and the system's architecture is showed. As the basic two part of the system: mobile terminals and GIS server, both of them are particularly analyzed from construction of software and hardware. The idea of multi-GPS positioning is adopted in the design of mobile terminals, it can improves the positioning precision and lows the cost of the system [C1717]

## "The GPRS Mobile Payment System Based on RFID"

As a kind of mobile data service, mobile payment service has approached people's lives. It becomes the focus and will be a field where telecom service providers compete. After analyzing the current mobile payment service in China, this paper puts forward an optimization design of the GPRS mobile payment system based on radio frequency identification (RFID) as a transitional solution before the prevalence of the NFC (near field communication) cellphone. And then the system structure, service flow and security are described. By virtue of RFID, the telecom service provider can provide diversified mobile payment services with high privacy. On the other hand, the framework of the system is simple and takes full advantage of the existing GSM mobile communication network compared with the mobile payment system based on CDMA in Japan and Korea. Moreover, this system does not require user to change their cellphone to support RFID chip. [C1718]

## "Intelligence Supervisory System of Greenhouse on GPRS"

In the paper, the remote data collection and supervisory system based on GPRS network is designed and implemented. It discusses chiefly a scheme, which uses INTEL80C196KC microcontroller to control TC35i

module and make use of SMS to complete remote data collection and supervision, and supplies a design program of the hardware and software, the communication way has better timeliness, does not have the limitation. [C1719]

## "Greedy forward selection algorithms to Sparse Gaussian Process Regression"

This paper considers the basis vector selection issue invloved in forward selection algorithms to sparse Gaussian Process Regression (GPR). Firstly, we re-examine a previous basis vector selection criterion proposed by Smola and Bartlett [20], referred as loss-smola and give some new formulae to implement this criterion for the full-greedy strategy more efficiently in O(n2kmax) time instead of the original O(n2k2max), where n is the number of training examples and kmax Lt n is the maximally allowed number of selected basis vectors. Secondly, in order to make the algorithm linearly scaling in n, which is quite preferable for large datasets, we present an approximate version loss-sun to loss-smola criterion. We compare the full greedy algorithms induced by the loss-sun and loss-smola criteria, respectively, on several medium-scale datasets. In contrast to loss-smola, the advantage associated with loss-sun criterion is that it could lead to an algorithm which scales as O(n2kmax) time and O(nkmax) memory if coupled with the sub-greedy scheme. Our criterion is similar to a matching pursuit approach, referred as loss-keert proposed very recently by Keerthi and Chu but with different motivations. Numerical experiments on a number of large-scale datasets have demonstrated that our proposed method is always better than loss-keert in both generalization performance and running time. Finally, we discuss the drawbacks of the sub-greedy strategy and present two approximate full-greedy strategies, which can be applied to all three basis vector selection criteria discussed in this paper. [C1720]

## "An Adaptive TCP Algorithm to Support Handoffs in Heterogeneous Overlay Networks"

In this paper, an adaptive TCP algorithm is proposed to support handoffs in heterogeneous overlay networks. The algorithm is implemented as a collection of units. The main body, namely the TCP implementation unit, considers the optimization of TCP parameters over different wireless networks. This unit is decomposed into three modules: transmission control, congestion control, and error detection. Based on this module decomposition, several TCP versions are re-constructed, and the different combinations of their congestion control and error detection modules are studied. Aided by other units in our adaptive TCP algorithm, such as the realtime report and throughput evaluation units, when a mobile user experiences acute changes in access parameters due to handoffs, the adaptive TCP algorithm will be triggered to reconfigure TCP parameters or TCP module combinations in the TCP implementation unit, thus optimizing the TCP performance over heterogeneous wireless networks [C1721]

## "The Software-as-a-Service Model for Mobile and Ubiquitous Computing Environments"

An area of unique opportunity for SaaS is the mobile and ubiquitous computing space. The SaaS model has a number of advantages that are uniquely suited to a resource-constrained mobile computing environment. This short paper gives a high level overview of the SaaS which brings significant opportunities in this space and further presents the architectural considerations for SaaS providers and mobile computing environments [C1722]

## "Criticality Analysis in Activity-on-Arc Networks with Generalized Precedence Relations (GPRs)"

Critical activity and inflexible activity are two important types of activities in the activity-on-arc network with generalized precedence relations (AOA-GPRs), which are very useful for project managers and practitioners to allocate and adjust resources in practice. This paper discusses and defines some important concepts, and studies the effect on the project makespan of changes in the duration of a given activity, the classification procedure of critical activities, the relations between activity criticality and activity inflexibility in AOA-GPRs. Furthermore, we deduce that there are some necessity relations between the activity inflexibility and the activity criticality just under some strict restrictions [C1723]

## "Research on the Improvement Methods of Network Model with Generalized Precedence Relations (GPRs)"

The network with generalized precedence relations (GPRs) is very useful for project managers. However, it is limited to be used widely in real projects due to its very complex graphical representation which makes it difficult to be understood by the project managers and practitioners. Therefore, some methods are proposed to make the GPRs model structure more clear and concise, which include the conditions of adding backward arcs and the methods of eliminating cycles. And then, an illustrative example manifests that the improved GPRs model is helpful for searching and discriminating all network paths which can be searched by the depth-first-search algorithm efficiently [C1724]

## "A Measurement Based Solution for Service Quality Assurance in Operational GPRS Networks"

First Page of the Article [C1725]

## "Railway Substructure Lacuna Detection Using a Forward-Looking SAR GPR"

Detection of railway substructure lacunas is an urgent problem for monitoring condition of super ballast layers. In this paper, we describe our work about using a forward-looking ground penetrating radar (FLGPR) to detect the cavity under the railway substructure. Main advantage of FLGPR that is able to look forward by more than several meters includes ability to make detections at greater standoff distances. So trains can run on schedule when a FLGPR is detecting. After processing the data collected and using the synthetic aperture algorithm, we got the distinct radar image of the cavity beneath the substructure 1.2 meters depth [C1726]

## "Aspect-invariant feature extraction and associated landmine detector in UWB SAR"

Vehicle- or air-borne ultra-wide band synthetic aperture radar (UWB SAR) can perform landmine detection over large areas, where too many false alarms is the major problem for UWB SAR application in practice. In this paper, landmine aspect-invariant feature extraction using the space-wavenumber distribution (SWD) and its associated support vector machine (SVM) with a hypersphere classification boundary are proposed in landmine detection procedure. The proposed methods have been tested by the real data collected with the rail-GPSAR system [C1727]

## "Improved Resistive Loading Profile for Ground-Penetrating Radar Antenna Applications"

One of the most critical hardware components for the performance of the GPR system is the antenna and the resistive loaded antenna is one of common antennas used in the GPR system. The author extends Wu-King linear current distribution to the double exponential current distribution and modifies the inaccurate part of the Wu-King loading profile and deduces an improved resistive loading profile with high efficiency. The broadband performance of the improved resistive loading profile has been studied; the concept of lengthening coefficient is created and the optimum parameter design curve of the antenna is provided. Numerical calculation shows that the maximum bandwidth and efficiency of antenna can be achieved with the improved loading profile simultaneously. The impedance bandwidth is as high as 40:1, which is much greater than the 3:1 bandwidth of Wu-King distribution when the voltage standing wave ratio is below 3. It exhibits better efficiency than Wu-King profile. The loading profile can reduce the late-time ringing and be widely applied to other resistive loading antenna for GPR applications [C1728]

## "A Rail-mounted UWB SAR Landmines Detection System --- Rail-GPSAR"

A standoff landmine detection system, rail-GPSAR, was built for the purposes to evaluate feasibility and effectiveness of landmine detection using UWB SAR. The system architecture of rail-GPSAR is introduced firstly, and then some new approaches to RFI/coupling suppression; near-field SAR imaging and detection of the buried landmines are proposed. Finally the detection performance of rail-GPSAR is validated by a series of field experiments [C1729]

## "Ultra-wide band SAR subsurface metallic landmine images: simulation and measurement"

Air- or vehicle-borne ultra-wide band synthetic aperture radar (UWB SAR) has the capability to detect landmines over large area from a standoff distance quickly, which is the trend of landmine detection. The study of electromagnetic characteristic of landmine is eagerly required to improve the landmine detection performance. In this paper, simulation and measurement of UWB SAR subsurface metallic landmine images are compared. Simulation and measurement results both show that metallic landmines have double-peak characteristic, which is valuable for landmine detection [C1730]

## "A Practical Intelligent Home System Based on Power Line Communication"

This paper presents a practical, cost-effective intelligent home system based on power line communication, in which manual keypad control, speech control and GSM/GPRS remote control are implemented. In this system, speech control is for old men and handicapped people who are unable to operate home appliances. A focusing fuzzy template matching algorithm is proposed to improve the accuracy of speech recognition under noisy background. GSM/GPRS remote control makes operation of home appliances and home surveillance feasible anywhere. Because of the implementation of power line communication technology, no rewiring is required, thus making the installation of such system simple, low-cost and efficient, which is favorable for the popularization of intelligent home. An experimental mini intelligent system is presents in the end. [C1731]

## "Seeing the Difference in IP Traffic: Wireless Versus Wireline"

First Page of the Article [C1732]

## "A postfilter method for refraction and dispersion effects compensation in GPSAR image"

Refraction and dispersion make the subsurface targets defocus in ground penetrating SAR (GPSAR). In this paper, a postfilter is proposed to compensate the refraction and dispersion effects, which is more computationally efficient than the previously proposed prefilter method. The postfilter method is tested by the field data of the rail-GPSAR system to yield satisfactory results [C1733]

## "Clutter Reduction Based on Apex Shifted Radon Transform in Sub-surface Forward-Looking Ground Penetrating Radar"

In this paper a method is proposed to reduce none-apex hyperbola clutter due to target being located at the outside of imaging region and the inside of electromagnetic wave field in forward-looking ground penetrating radar (FLGPR) measurements. This clutter reduction method is based on apex shifted Radon transform which maps the none-apex hyperbola clutter in radargram to an energy congregate region in the tau-q domain. The none-apex hyperbola clutter is estimated by using a q band-pass filter and the inverse transform. Then the estimated clutter is removed by subtraction method. Finally, remainder surface clutter is reduced by scale and shift. The effectiveness of the approach is demonstrated with an experimental data set, and it increases the signal-to-clutter ratio of near-surface target [C1734]

## "Distributed Measurement System Based on Wireless Mobile Device and Application Repository Server"

The innovative software architecture of the wireless distributed measurement system (W-DMS) including the Web-enabled measurement application repository server (MARS) is proposed. The duties of the MARS are devoted to permit the connectivity by the various wireless communication protocols, such as GPRS/UMTS, WiFi and Bluetooth, and to supply the mobile devices, as personal digital assistant and smartphone, with the measurement application in order to manage and control the measurement instruments. The proposed architecture shares in increasing the adaptability and the flexibility characteristics of the W-DMS to the new requirements of the industrial applications. The aspects concerning the design and the architecture of the MARS are discussed. In order to evidence the innovative features, the applicative example is shown [C1735]

## "Assessment of Human Exposure to Power Substation Electric Field"

The paper deals with human exposure to extremely low frequency (ELF) electric fields generated by transformer substation. The problem is twofold, i.e. it requires the calculation of power substation electric field and current density induced inside the human body. ELF electric field generated from a power substation is assessed by solving the Scalar Potential Integral Equation (SPIE) using the Source Element Method (SEM), a variant of the Indirect Boundary Element Method (IBEM). Knowing the electric field due to the substation the current density induced within the human being exposed to such field is obtained by solving the Laplace equation variant of the continuity equation using the direct Boundary Element Method with domain decomposition (BEM-DM). Some illustrative computational results for external electric field and internal current density are presented. [C1736]

## "Simulation-based Design Tool for GSM/GPRS Networks"

GSM cellular mobile networks accommodate for voice codecs and data services with different service quality requirements. We have designed a planning tool that evaluates service performance based on the proposed network architecture. The tool uses a database of discrete-event inter-cell interference simulations. The tool quantifies performance of the network and assesses potential for improving capacity and channel quality. Since interference models are calculated in advance, performance evaluation is near-instantaneous. We also assess the benefits of carrier groups as a solution to the increasing number of services supported by GSM networks [C1737]

## "Online Survey of Children's Understanding of Mobile Phones and EMF: Preliminary Results"

An ongoing global online survey was initiated in October 2005 to compile and analyse information on the understanding of mobile phone technology and EMF among school children. Since November 2005 and till July 23, 2006, a total of 1,711 responses were recorded from 60 countries. The number of male respondents (n = 653, 38.2%) roughly equalled the female (n = 626, 36.6%), with an average age of 14.0 (plusmn2.8 SD) years.

Almost 60% of the respondents do not own a mobile phone; and almost 60% of the respondents admitted that they did not know that mobile phones use EMF to function. Roughly two-thirds of the respondents also reported to not knowing that mobile phones can cause harmful effects. Out of those who believed so, a majority reported headache as the main problem [C1738]

## "Geometrical aspects of 3D human body exposed to extremely low frequency high voltage electric fields. A BEM approach"

The paper deals with the three dimensional modelling of the human body exposed to extremely low frequency (ELF) high voltage electric fields by mean of the boundary element method (BEM). Numerical results along head, neck, torso, abdomen, arms, legs and ankles are presented and discussed in the case of grounded subject standing under power distribution lines. The objective is to characterise the influence of different shape and geometrical factors on the current distribution inside the body and electric field in the near field. The inclusion of legs and arms with different orientations with respect to the incident field are considered. The main contribution is to present new results of the BEM for extremely low frequency exposure and to evaluate the relationship between degree of detail in 3D modelling and the corresponding fluctuation of results for induced currents [C1739]

## "The evidence framework applied to fuzzy hypersphere SVM for UWB SAR landmine detection"

The fuzzy hypersphere support vector machine (FHS-SVM) has stronger generalization capability than the hyperplane SVM (HP-SVM) in UWB SAR landmine detection. In this paper, the evidence framework is applied to optimize the hyperparameters of FHS-SVM. Firstly, the equivalence between FHS-SVM training and the level 1 Bayesian inference of the evidence framework is proved. Next, the FHS-SVM hyperparameter optimization iterative method is proposed based on the evidence framework. The proposed method has been validated with the ultra-wide band synthetic aperture radar (UWB SAR) landmine detection data [C1740]

## "Estimation of Value Added Services in Bosnia and Herzegovina"

Intention of all operators is to expand its profit as a well as to attract the business subscribers as they generated more traffic and have a high ARPU. The non voice services are the way to attract business subscribers, by identifying the needs of the companies for the non voice services. In the article we present situation on Bosnia and Herzegovina market and the possible way to earn revenue by offering the value added services based on GPRS. Different VPN models are shortly described and some of possible ways of assembling the non voice services are introduced [C1741]

## "RESEARCH ON DUAL-INTERFACE SIM AND FINGERPRINT RECOGNITION FOR MOBILE PHONE"

Smart cards are often designed for applications of electronic purse and access control. A mobile phone with SIM card is used for voice, SMS, entertainment and some others. Here, a dual-interface SIM card is designed to take the place of the old one, while an electronic purse is built in the SIM card. Thus a mobile phone with a new SIM not only performs the original functions of phone, but also transactions of the electronic purse. In addition, fingerprint recognition method is proposed for access control to prevent unauthorized use [C1742]

## "A Novel Method of Landmines Detection Based on Improved SVM"

To detect landmines in real SAR images, detection process based on PCA and SVM techniques is proposed in this paper. Firstly, a referential deflection-optimal linear-quadratic(DOLQ) detector is presented. Then, the proposed centering PCA+SVM method is developed and compared with the above benchmark. A morphological processing procedure is used to remove the isolated spurious pixels and to form landmine objects in the binary images. Finally, the experimental results show that the novel method can constantly outperform the DOLQ detector in terms of POD(probility of detection) and the SVM method in terms of training and classification times in landmine detection. [C1743]

## "Controller Area Networks: Evolution and Applications"

This paper presents controller area networks (CAN), their architecture, protocol, and standards. As a result, an overview of CAN applications, in both the industrial and non-industrial fields, is surveyed. We also propose the extension of CAN applications to home automation. The proposed system is a stand-alone single-chip embedded system equipped with 5 CAN ports to monitor and control home appliances locally. Home owners can also remotely access their homes via GPRS modem to control and monitor their home appliances [C1744]

## "Vehicle GPS Real Time Monitoring Communication System Base on GPRS/CSD"

A method of combining the two types of data service CSD and GPRS based on GSM applied to GPS vehicle real time monitor system was proposed. The network structure of the system above was put forward. Then it implements the CSD and GPRS hardware Interface and software flow based on the ERICSSON GR47 communication module. Compared with conventional single mode of GPRS, this method makes up the disadvantage of the high time delay and the incertitude of the time delay in data transfer. In this case, the real time of data transfer of the system gets guarantee. It indicates that this method has the properties that the system alarming time is less than 3 seconds, the data bit-error rate is nearly zero and the positioning error is less than 10 meters, which has high practicability and validity for the GPS vehicle real time monitoring system [C1745]

## "Anti-personnel Mine Detection and Classification Using GPR Image"

The automated anti-personnel mine (APM) detection and classification is currently a broad issue. The detection success depends on the feature selection that we obtain from the sensors. Ground penetrating radar (GPR) is one of the established sensors for detecting buried APM. In this paper, we introduce a method which improves the accuracy of detecting APM by using GPR imaging. This method adopts a segmentation technique for feature extraction and neural network as a pattern classifier. A seeded region growing algorithm is applied as region based segmentation for pattern construction following the median filtering and threshold of the original GPR image. A feed forward neural network (FFNN) with backpropagation training is employed for classifying the patterns. The FFNN takes the patterns (APM signature) that are constructed from each salient region and generate the classification. This method significantly improves accuracy in the detection and classification of APM [C1746]

## "Signal Processing of Earthquake Precursor at ELF Band"

In this paper, the signal processing technology of EM precursors for predicting earthquakes is discussed. The observed signals contain local signals related to earthquakes as well as global background noise which is stronger than the local signals. A method of global noise elimination by independent component analysis (ICA) is discussed. The second signal processing is to extract the sign of anomaly relevant to earthquake prediction. For the processing, the linear predicting coefficient (LPC) method is applied. The LPC error is well acknowledged as a precursor of large earthquakes exceeding magnitude seven [C1747]

## "ICT Business and Related Technologies in Japan; From Wired BB to Mobile BB"

First Page of the Article [C1748]

## "A quad-band receiver for GSM/GPRS/EDGE in 90 nm digital CMOS"

A quad-band GSM/GPRS/EDGE receiver front-end including I and Q ADCs designed in 90nm digital CMOS technology is presented. The low band receiver designed for GSM850/GSM900 achieves 33dB gain, 1.9dB noise figure, 7.5dB of noise figure under blocking condition and -20dBm of in-band IIP3 with a power of 68mW, while the high band DCS/PCS receiver achieves 32dB gain, 2.2dB noise figure, 9.3dB of noise figure under blocking condition and -20dBm of in-band IIP3 with a power of 72mW. Total active area occupies 3mm2 [C1749]

## "An analysis of Wi-Fi security vulnerabilities in Malaysia: A survey in Golden Triangle Kuala Lumpur"

The widespread use of Wi-Fi in the US and Europe has brought a new security concern among Wi-Fi owners and developers. However this concern and awareness are still low in Malaysia. A survey using the NetStumbler and a GPS receiver to locate the coordinates of detected Wi-Fi APs was carried out in the Golden Triangle area of Kuala Lumpur, Malaysia. This paper will describe how far the owners and administrators in Malaysia secure their Wi-Fi networks and subsequently create security awareness among Wi-Fi owners and administrators. [C1750]

## "SMERT: energy-efficient design of a multimedia messaging system for mobile devices"

Customized multimedia content delivery has become one of the most desirable applications to mobile device users. However its intense usage of wireless and user interfaces poses a great challenge to device usability and battery lifetime. In this paper, we describe our design and implementation of an energy-efficient multimedia messaging system to address this challenge. We construct a hierarchical system for users to access multimedia content, leveraging widely available short message service (SMS), an embedded system-based new interfacing

device, and the Internet capability of mobile devices. Being the first of its type, the new system not only reduces energy overhead but also improves the usability of the service [C1751]

## "Profiling Bluetooth and Linux on the Xilinx Virtex II Pro"

In this paper, we present profiling results of the Bluetooth standard implemented on the Xilinx Virtex II Pro device. The investigation is performed in two stages. First, we solely focus on the Bluetooth standard and its internal functions. Second, we focus on the Bluetooth standard in conjunction with an operating system. In both stages, we determine the most time-consuming junctions by pinpointing the most computationally intensive or most data-intensive functions. The results of the first stage show that there are eight most time-consuming functions within Bluetooth. The results of the second stage show that (excluding interrupt related functions) the most time-consuming function is memcpy. This function is called inside of the Bluetooth standard in order to move received packets to another memory location (allowing new packets to be copied to the same memory location) and to reassemble a frame with all the received packet., memcpy is also called within other standard Linux networking protocols which should similarly benefit from an hardware implementation of this junction [C1752]

## "Implications of IMS and SIP on the Evolution of Mobile Applications"

The emergence of IMS and SIP has major ramifications for the whole of mobile industry including network providers, end users and application developers. This paper focuses on the evolution of mobile entertainment applications towards the utilization of rich multimedia content coupled with presence and localization awareness and how Java, the dominant development platform for mobile phones, will cope with these new challenges [C1753]

## "A Real-time Control System for Home/Office appliances automation, from mobile device through GPRS network"

There are numbers of publications addressing control systems for home/office appliance involving infrared remote controls but there is no such publication/protocol/standard addressing solution for mobile-to-home/office appliance controlling through general packet radio services (GPRS) networks without involving any Internet based servers. This paper addresses recent research and development efforts in constructing wireless real-time control system based on server/client architecture through GPRS networks. This paper includes an implementation example designed to control home/office appliance from anywhere & anytime even when user is not at home/office. The paper demonstrates a micro Java application as example of real-time control system for home/office appliances and addresses the development-time and implementation-time experiences. [C1754]

## "A New Simple UWB Monocycle Pulse Generator"

A new simple ultra-wideband (UWB) monocycle pulse generator based on step recovery diode is presented. This pulse generator uses nonlinear components with a single power supply and microstrip transmission lines. It is made up of three parts: a Gaussian pulse generator, an impulse-shaping network, and a monocycle-pulse forming circuit. The proposed circuit allows to generate ultra-short Gaussian monocycles of 270-ps pulse duration with a bandwidth of 9-GHz and a pulse repetition rate of 100-MHz. [C1755]

## "Optimal Equalizers and Targets for Detection in ISI Channels"

In this paper we consider the alternate approach of designing the equalizer and target jointly so that they minimize the overall bit-error rate in the system. Our main result is theoretical analysis that shows that the MMSE equalizer and the monic GPR target do indeed perform the best (compared to other designs) for uncoded inputs. However, for spectrally shaped coded inputs, the proposed design produces filters that are different from those GPR design. Thus, we predict a gain with the new design over the monic GPR design for coded signals. [C1756]

## "A 2nd Order 1-bit Complex Switched Capacitor Sigma-Delta ADC with 90dB SNDR in a 180kHz Bandwidth"

A complex switched capacitor sigma-delta ADC is described. The ADC is used in the VLIF RX path of a GSM/GPRS/EDGE phone and has an SNDR of 90 dB in a 180 kHz bandwidth, with the VLIF centered at 123 kHz. The use of a complex noise transfer function allows for a more optimal use of noise shaping. The ADC is 2ndorder, 1-bit, with a sampling rate of 52 MHz implemented in 90 nm CMOS. [C1757]

## "SAR Imaging Simulation for Subsurface Target Detection"

In surface mapping synthetic aperture radar (SAR), homogeneous media is usually assumed, through which transmitted and reflected signals propagate. In ground penetrating SAR (GPEN SAR) system designed for detecting buried targets, we must take account of multiple media condition. It brings several factors which affect the quality of SAR image, such as refraction on air-soil interface and wave attenuation in the soil. These effects will be quantitatively analyzed in this paper. Also some simulation results show the comparison between surface target image and buried target image. [C1758]

## "Ray Tracing Method for Ground Penetrating Radar Waves"

Ray tracing is the key to ray-based GPR simulations and tomography. We develop a ray tracing method for GPR transmission and reflection based on the wave front expanding approach. It is a flexible and available means to determine the transmitted and reflected ray paths. Its main advantage over the conventional methods is that it can trace the curved ray within a strongly heterogeneous media, and find simultaneously all reflected ray paths from one complicated interface for a pair of transmitter and receiver. Several numerical testing examples show its good results. [C1759]

## "Numerical and Experimental Analysis of Linear-End Wire Bow-tie Antennas"

In this paper the properties of the transmitting waveforms and the footprints with the linear-end wire bow-tie antenna are measured and simulated by the FDTD method. The results of the simulations and the measurements are contrasted. The two types of results are in basic agreement. These results are beneficial to the deep studies about the linear-end wire bow-tie antennas. [C1760]

## "Near-Field Radar Imaging Simulation using FDTD Method"

In this paper, a two-dimension near-field imaging model is simulated by the finite difference time domain (FDTD), and two different imaging approaches are used to process the recorded data: back-projection (BP) and phase-shift migration. In the model, we assume a point source to emit a modulated Gauss pulse, and an array of receive sensors to collect object echoes. We first apply matched filtering to the raw data, and then use back-projection and phase-shift migration algorithms to image the objects by the processed data. The imaging results are presented to verify that these two algorithms can effectively image the near-field targets. [C1761]

## "A Processing Detection Project Research of Weak Targets in the Complex Ground Clutter"

The paper present a project of improving the weak targets detection capability in the complex ground clutter at the same time maintaining the hardware's simplicity for the air-ground millimeter-wave terminal guidance radar. The project use the wide band chirp-subpulse stepped-frequency signal to detect targets, and get the target region's quasi two dimension image by processing the echo signal both in the time and frequency domain, thereby improving the weak target detection capability and providing the real guidance information. The theoretical analysis and computer simulation result proved the project's validity. [C1762]

## "A study on application of partial response maximum likelihood channel to magnetic recording system using patterned media"

The approach to find a suitable partial response maximum likelihood (PRML) channels for the R/W channels using patterned media is studied. The results show that the R/W channel using the double layered media shows the good performance, and the FR channel is suitable for the first target for GPR channel in the region of higher bit error rate (bER) than 10-5. [C1763]

## "A specific neural network used on a portable system for classifying activities in ambulatory monitoring"

Our modern societies are confronted to a new growing problem: the global ageing of population. In order to find ways to encourage elderly people living longer at their own home, ensuring the necessary vigilance and security at the lower cost possible, some tele-assistance systems are already available commercially. This article presents a specific neural network used on a portable system for classifying activities in ambulatory monitoring. After more precisions about this specific neural network in the second part we will present some results from our prototype stemming from gerontologic institute Ingema. [C1764]

## "Ground Response Tracking for Improved Landmine Detection in Ground Penetrating Radar Data"

Recent advances in ground penetrating radar (GPR) fabrication and signal processing have made high fidelity

detection of buried anti-tank landmines a practical possibility under field scenarios. However, detection of subsurface landmines at a low false alarm rate (FAR) requires the effective removal of the response from the air/ground interface (ground-bounce response). This in turn requires accurate and automatic tracking of the time of arrival of the air/ground interface in time-domain GPR data. Such tracking of the ground bounce response can be difficult to perform under certain conditions including the presence of surface-laid landmines, surface vegetation, snow drifts, and multiple subsurface structures like buried roadbeds. In this work, we will explore the application of a low- latency Kalman filter applied to ground bounce tracking in GPR data and resulting performance improvements for pre-screening algorithms under extreme weather conditions. [C1765]

## "A Fully Three-Dimensional Simulation of a Ground-Penetrating Radar over Lossy and Dispersive Grounds"

A 3-D finite difference time domain (FDTD) simulation is done on a ground penetrating radar (GPR) operating above lossy and dispersive grounds. The radar consists of a pair of resistor-loaded bow-tie antennas and the ground consists of Puerto Rico clay loam. The clay loam is modeled by using a two term Debye model with a static conductivity. The simulation results show the GPR response of buried metal and plastic pipes. The results are more realistic as the simulations include commercially used antennas and real ground conditions. The target signatures and target polarization characteristics of the pipes are also studied in the paper [C1766]

## "A New Approach of Automobile Localization System Using GPS and GSM/GPRS Transmission"

This paper presents a low cost automotive localization system using GPS and GSM-SMS services. The system permits localization of the automobile and transmitting the position to the owner on his mobile phone as a short message (SMS) at his request. The system can be interconnected with the car alarm system and alert the owner, on his mobile phone, about the events that occurs with his car when it is parked. The system is composed by a GPS receiver, a microcontroller and a GSM phone. Additional, the system can be settled for acquiring and transmitting of information, when requested, about automobile status and parameters (engine status, speed, direction, etc.) or alert when it started engine, exceed a given speed limit or if leave a specific area. By using the PC connection, the system can be used as navigation system. Optional, the system can be used as car tracking system if connected with GSM/GPRS phone. The presented application is a low cost solution for automobile position localizing and status, very useful in case of car theft situations (alarm alert, engine starting, localizing), for adolescent drivers watching and monitoring by their parents (speed limit exceeding, leaving a specific area), as well as in car tracking system application. The proposed solution can be used in other types of application, where the information needed are requested rarely and at irregular period of time (when requested). [C1767]

## "Combined Ground Penetrating Radar and Seismic System for Detecting Tunnels"

An experimental system to collect co-located ground penetrating radar (GPR) and seismic data was developed to investigate possibilities of using the sensors individually or in a cooperative manner to detect shallow tunnels. These sensors were chosen because they sense very different physical properties. The seismic sensor is sensitive to the differences between the mechanical properties of a tunnel and the soil while the GPR is sensitive to the dielectric properties. Raw and processed data from both sensors are presented. [C1768]

## "Mobile Newspaper Development Framework: Guidelines for newspaper companies for creating usable mobile news portals"

Newspaper companies have been providing online services to readers through the online newspaper for the last decade. Today, the newspaper companies are facing many challenges when readers start to access information via Mobile Internet by using various mobile devices such as mobile phones or personal digital assistants (PDAs). Thus, a major concern in the industry is on creating a usable mobile portal to serve the increasingly diverse array of devices used in Mobile Internet. The mobile newspaper development framework (MNDF) is a framework created (i) analyse the existing services of online newspaper, (ii) outline an appropriate design approach for mobile newspaper, (iii) develop a mobile newspaper application and (iv) evaluate the usability of the mobile newspaper application. MNDF aims to provide useful guidelines to newspaper companies before marching into the mobile Internet market with minimal effort. [C1769]

## "Performance Evaluation of a Cellular Data Network using Generalised Processor Sharing Model"

In this paper, we investigate the performance of a cellular network using an M/G/n-GPS queue to model the network nodes. We present the performance analysis of a queuing network having multiple chains of customers, using classical queuing networks theory. We only determine the performance evaluation of elastic data transfers

in cellular networks. Hence all the chains are assumed to be closed chains. The state probabilities for the closed chains are obtained using multidimensional convolution algorithm and hence the performance measures are calculated which includes sojourn time and average number of customers at all nodes. [C1770]

## "Digital Height Modeling (DHM) of Tropical Forests using Multi-frequency InSAR Methodology"

The objective of this study was to verify how digital elevation models (DEM) built by P-band repeat pass synthetic aperture radar (SAR) interferometry (InSAR) and X band InSAR can be used for estimating a digital height model (DHM) of forested environments and assess its quality. P band signal penetrates towards the forest floor which potentially generates a ground level DEM. X band radar reflects on the top of the vegetation cover, so X band InSAR produces a digital surface model (DSM). The DSM-DEM difference is a map of the vegetation cover height, the DHM. The estimated DHM can be used for forest volume estimation over large areas and used for improving SAR image interpretation either in P or X band. In September 2000, the National Institute for Space Research of Brazil (INPE) and the Brazilian Army Cartographic Service Division (DSG) conducted a mission over the Tapajo acutes National Forest, Para acute State, Brazil when X and P band InSAR data was obtained. Extensive ground data collection, forest inventory, land cover identification and differential GPS altitude measurements was done over the area to permit proper results assessment. It was concluded that the estimated DHM has a good relationship with the vegetation cover height, (r2~0.96) estimated from forest parameters measured on the ground survey. [C1771]

## "SAR Interferometric Approaches for the Analysis of Structural Forest Parameters: State of the Art and Perspectives for Brazilian Studies"

This paper presents three practical examples of airborne InSAR data application to improve the knowledge of forest structures. Two experiments were done in the Amazon tropical forest to study the spatial distribution of VLTs in the primary forest using LM filtering and a series of Markov processes and others, to map and model the estimation of biomass variations in primary and secondary forests. The third experiment refers to the relation of SAR data and the volumetric configuration of Eucalyptus sp. stands. The advances on the analysis of PolInSAR data are very helpful to increase, in the near future, the regional inventorying of land cover changes in the Brazilian territory. [C1772]

## "GPRS Communication System Designed for High Congestion Risk Circumstance"

A GPRS communication system is presented in this paper, including image data fusion with the help of neuro-fuzzy, image data compression with controllable compression rate, effective congestion control. The combination system adopts a new fuzzy neuron network (FNN) which can appropriately adjust input and output, and increase robustness, stability and working speed of the network. Besides FNN, wavelet transform also be applied to compression algorithm for a higher and controllable compression rate. As shown by experimental results, the communication system can obtain composite image data effectively, can compress and decompress image data dynamically, can prevent the congestion significantly, which proves that it is a more practical and more effective method than traditional methods for communication in wireless networks, and it is especially better at video data transmitting [C1773]

## "Principal Component Analysis of Mobility Data from an Operational GPRS Network"

We present a preliminary analysis of mobility data collected from an operational GPRS network. The input data are time-series counting the number of mobile stations present in each of 126 sample routing areas at equally spaced instants (5 min) during one full week. The time-series were extracted from packet-level traces captured by passively monitoring a subset of the Gb links of the network of Mobilkom Austria AG & Co KG during October 2004. We apply the principal component analysis (PCA) to this dataset. The PCA offers a simple method for classifying the routing areas into two main groups, residential and business areas, plus a few "atypical" ones. Additionally, we address the problem of robustness of the PCA to temporary local gaps in the input data [C1774]

## "ISE03-1: A New Framework for Indicating Terminal Capabilities in the IP Multimedia Subsystem"

The standardization of the IMS as a multi-access network implies that it can be accessed by different classes of terminals. Even at the heart of the same class of terminals (mobile phones for example), we are witnessing an increasingly divergent range of hardware and software capabilities (screen size, memory, OS). As a result of this heterogeneity, users may receive content that is not compatible with their device capabilities, and may even be unable to display this content. In order to ensure a better service and an optimal user experience, terminals should be able to communicate their capabilities to the network. The network could then use these capabilities to adapt its services and it may communicate them to other users as well. In this paper, we establish a state of the art concerning existing methods for indicating terminal capabilities in IMS. This state of the art will be used to

design the architecture and the necessary mechanisms to implement this service in IMS, while taking into account the particularity of the IMS architecture and the possibility of integrating this service with presence. [C1775]

## "Design of GPS/MM/GPRS Integrated Location System for the Mobile Robot"

A MM (map matching) method based on credibility algorithm is proposed in this paper to improve location precision of GPS (global positioning system) for the mobile robot. It can find the exact road on which the robot moves in the electronic map quickly when the longitude and latitude of the robot is known. How to extract longitude and latitude from GPS data stream is also introduced. AT commands are used to establish GPRS (general packer radio service) link for transmitting location messages and telecommands between the robot and control center. The analysis of map matching diagram and simulation are given in the final. A great deal of on-the-spot experiments prove that this system has the better positioning precision than that of positioning of single GPS receiver [C1776]

## "The GPRS-based location system for the long-distance freight"

With the development of the modern traffics, it becomes more important to locate the vehicle running on the highway. This paper introduces the location system for the long-distance freight vehicles, which is based on the global system for mobile communication (GSM) network. The control center and client can communicate to each other based on short message service (SMS) and general packet radio service (GPRS). The client is designed in 8-bit microprocessor to send global positioning system (GPS) information by SMS or GPRS. And the control center adopts a geographic information system (GIS) to track vehicles to display the position information on the electronic map. [C1777]

## "The Calibration Processing for Impulse Ground Penetrating Radar"

In order to meet the requirement of high measurement precision for ground penetrating radar (GPR), the geometrical calibration processing methods of the antenna are proposed to solve the measuring deflection problem and the antenna vibration problem for the bistatic impulse system. The calibration measurement method for the layer thickness is also presented to reduce the thickness measurement error. These calibration methods have been applied into the practical pavement detection and evaluated by means of the RadarEye GPR system. The pavement experiment results can show the satisfying measurement precision after the calibration processing [C1778]

## "A Novel KICA Method for Ground Bounce Removal with GPR"

Nowadays ultra wideband ground penetrating radar (GPR) is widely used in landmine detection. For shallowly buried plastic landmines, the ground bounce is usually much stronger than the weak return from landmines and their arrival time is very close with each other, so ground bounce removal is very important for the following detection, imaging and target recognition. In this paper, kernel independent component analysis (KICA) is first introduced to ground bounce removal with GPR. A novel scheme is proposed for the automatic independent component (IC) selection, which is vital for any ICA based ground bounce removal algorithms. Experimental results based on field-test data show that the proposed method has good performance [C1779]

## "Ray-based Simulations of Received Signals from Ground Penetrating Radar"

Numerical simulation of ground penetrating radar (GPR) signals is potentially valuable in both survey design and data interpretation. We develop a method for numerically synthesizing GPR received signals using geometrical ray theory. The GPR reflected ray tracing scheme is implemented using wave front expanding method, based on Fermat's principle, reciprocity principle, and Dijkstra's shortest path algorithm. This method is good for complex layered models with inhomogeneous material and undulate interfaces, and can trace all reflected ray paths from one non-planar interface at one time, for a pair of source and receiver. Simulation experiments show it is effective [C1780]

## "Novel Ground Bounce Removal Algorithms Based on Non-homogeneous Detector"

In this paper, a non-homogeneous detector (NHD) is developed for ground penetrating radar (GPR) for the first time. The homogeneousness of ground bounce (GB) and the number and position of buried targets (or target-like objects) can be determined by the general likelihood based NHD. Combined with NHD, principal components analysis (PCA) based and blind source extraction (BSE) based methods are also presented for GB removal, which are referred to as NHD-PCA and NHD-BSE algorithm, respectively. For NHD-PCA algorithm, PCA is only taken on target areas to avoid leakage of target signals energy and descend of signal noise ratio (SNR) in target

areas. For NHD- BSE algorithm, since the number of targets can be priorly determined by NHD, it has much less number of components to be extracted than that needed by independent component analysis (ICA), therefore less computational load is required. Meanwhile, all sources selection strategies needed by ICA are unnecessary for NHD-BSE because of the known number of extracted sources. The experimental results show the good performance of proposed methods [C1781]

## "WLCp1-06: A Field Study on Terrestrial and Satellite Location Sources for Urban Cellular Networks"

This work presents a statistical field study of the availability of time sources for location in a true wireless network. Terrestrial (base stations) and satellite (GPS) sources were investigated in three different urban scenarios. The density function of a specific number of sources available for triangulation is presented along with other statistical data in order to assess coverage. Since the fusion of terrestrial and satellite sources to obtain the location in wireless networks has been proposed as a way of improving coverage, the joint density function and cross-correlation between the availability of both types of sources are also presented. This correlation depends on the scenario, leading to the conclusion that the improvement obtained through the fusion of sources depends on both the fusion type and the scenario. [C1782]

## "WLCp2-09: Novel IP Header Compression Technique for Wireless Technologies with Fixed Link Layer Packet Types"

This paper focuses on the header compression for wireless technologies with fixed link layer packet types. Exploiting specifics of packet transmission over air in this situation, a novel IP header compression scheme is developed. The novelty of the scheme consists in the unique CONTEXT repair mechanisms that ensured high robustness and at the same time does not degrade bandwidth savings. After the general concept of the novel scheme is introduced, it is illustrated by an example of Bluetooth technology. By means of extensive simulation study, we show the performance of the introduced approach. Simulation results verify the robustness of the novel scheme and its ability to deal with characteristics of the wireless channel. [C1783]

## "The Influence on an Activity's Total Float of a Change in its Duration in Networks with Generalized Precedence Relations (GPRs)"

This paper proposes the concepts of node's early (later) realization time (ER, LR), node's early (later) possible realization time (EPR, LPR), and gives the formulas of ER, LR, EPR, LPR, total float. And then, we classify the preconditions which determine the change of activities' total floats. Furthermore, the laws of the influence of a change in an activity's duration on its total float are explored and a computational example is presented. [C1784]

## "Automatic Land-mine Detection System using Adaptive Sensing with Vector GPR"

Ground penetrating radar (GPR) is a promising sensor for landmine detection, but there are two major problems to overcome. One is the non-planer (e.g. rough and/or undulating) ground surface. It remains irremovable clutters on a sub-surface image output from GPR. Geography adaptive scanning is useful to image objects beneath non-planer ground surface. The other problem is the distance between the antennas of GPR. When imaging the small objects such as an anti-personnel landmine close to antennas, it increases the nonlinearity of the relationship between the time for propagation and the depth of a buried object. In this paper, we modify Kirchhoff migration so as to account for not only the variation of height and pose of the sensor head, but also the antennas alignment of the vector radar. The validity of this method is discussed through application to the signals acquired in experiments [C1785]

## "Positioning in Underground Mines"

In this paper the problem of estimating the position of a user relative to a map of an underground mine is explored. A positioning system consisting of a set of sensors and a digital mine map is proposed and modeled using a state space representation. The non-linear positioning system uses a particle filter to estimate the state and thus the position. The particle filter based positioning system is implemented in a MATLAB simulation. Simulation results are presented for various filter configurations demonstrating this is a promising system for mine positioning [C1786]

## "Anticipatory Event Detection via Sentence Classification"

The idea of event detection is to identify interesting patterns from a constant stream of incoming news documents. Previous research in event detection has largely focused on identifying the first event or tracking subsequent events belonging to a set of pre-assigned topics such as earthquakes, airline disasters, etc. In this

paper, we propose a new problem, called Anticipatory Event Detection (AED), which aims to detect if a user-specified event has transpired. AED can be viewed as a personalized combination of event tracking and new event detection. We propose using a sentence classification approach to solve the AED problem for a restricted domain; detecting articles that describe final game results from NBA basketball news. Experimental results demonstrate the feasibility of our proposed AED solution. [C1787]

## "Microstrip Antenna For Detecting Buried Land Mines"

Two patch array antennas have been proposed for detection of buried land mines using the mutual coupling effect. Mutual coupling among the edges of a patch or among the edges or nearby patches can influence the performance of microstrip antennas and arrays. The finite-difference time-domain method (FDTD) is used. The patch array antennas (sensor) have been simulated to detect various types of targets (nylon plate, stycast plate, and metal plate targets) in different types of soil properties [C1788]

## "General Packet Radio Service Performance Evaluation Considering Adaptive Overlapping"

General packet radio service (GPRS) is a part of the evaluation path towards 3G. This paper investigates the effect of using adaptive overlapping between adjacent cells on the data sessions within GPRS system. A simulator model was developed to study the behavior of data transmission between a GPRS server and data terminals via air interface. Simulation results show the trustworthiness and validity of the proposed approach even at high offered traffic [C1789]

## "Real-time Health Information Acquisition and Alarm System Based on Bluetooth and GPRS Communication Technologies"

Introducing medical monitor information integrated application system which is used to enhance the people's health guarantee. It integrated the circadian detecting technology, Bluetooth technology, GPRS technology, artificial intelligence medical diagnosis technology and alarm technology. It is an uninterrupted real-time working system which includes the subsystem of medical detecting, long distance transmission, date storage and analysis, alarm etc. It is mainly used to detect the blood pressure and pulse of the cardiovascular and cerebrovascular disease patient, send the monitor data to the information analyzing center by the aid of Bluetooth and mobile communication device. After the analyzing to these data using the artificial intelligence technology, the system will give out the alarm information to the patient, his neighbors, doctor and emergency aid center according to the severity degree of the patient, to gain the salvage time of the emergent patient. [C1790]

## "On the Sensitivity of a Non-Critical Activity's Duration to Activities' Total Floats in Networks under Generalize Precedence Relations"

This paper proposes a classification for the relationships between non-critical activities. And then, we explore the influence of a change in a non-critical activity's duration to its early (later) realization time, and give sensitivity analysis of a non-critical activity's early (later) realization time to other activities' total floats. The results of a computational example manifest the efficiency and effectiveness of the proposed methods. [C1791]

## "Architecture of IP Multimedia Subsystem"

IP multimedia subsystem (IMS) is standardized network architecture for telecom operators that want to provide mobile and fixed multimedia services. IMS-enabled networks provide access to these services from both IP networks and circuit-switched PSTN/PLMNs. This paper describes the IMS architecture and explains its benefits. It concentrates on the main IMS system components and briefly summarizes their key system functions. However, the IMS is a rapidly evolving standard and modifications to the IMS architecture are envisaged. This paper provides a base for future research and work in this domain [C1792]

## "The development of a motion-compensated, vehicle mounted, ultrawideband radar for buried landmine detection"

The performance of a vehicle mounted mine detection radar system, developed by QinetiQ, has recently been enhanced by the inclusion of a position and attitude measurement system, using the combination of a differential GPS receiver and an inertial measurement unit. In this paper we present the development of a motion-compensation scheme based upon data from these sensors. Previous to this development, high quality radar images could only be produced from data gathered on relatively flat and even terrain, where uncompensated antenna motion caused by vehicle attitude changes was minimal. However, the new motion compensation

scheme has been shown to successfully track the antenna feed positions to within 1 cm accuracy, thus enabling data collection over far more arduous terrain [C1793]

## "Ridged Horn Antenna for Ground Penetrating Radar"

In this paper dielectric filling is presented as a simple way of adapting ridged horn antenna for ground penetrating radar (GPR). The requirements for GPR antenna were described to justify the choice of dielectric ridged horn as a simple handheld device aimed to landmines finding. An attempt of detection of the buried metal plate is also shown. [C1794]

## "UWB Radars for Chalenging Applications"

A number of challenging radar applications (such as antipersonnel mine detection and human being detection) has been discussed. In these applications UWB technology has a number of advantages of over the traditional narrow-band approach, in particular very high positioning accuracy, rigidity to multi-path propagation and target classification abilities. On a number of examples recent advances of UWB technology in radar have been demonstrated and remaining challenges have been discussed [C1795]

## "Detection and Discrimination of Land Mines based on Edge Histogram Descriptors and Fuzzy K-Nearest Neighbors"

This paper describes an algorithm for land mine detection using sensor data generated by a ground penetrating radar (GPR) system. The GPR produces a 3-D array of intensity values, representing a volume below the surface of the ground. First, a computationally inexpensive pre-screening algorithm is used to focus attention and identify regions with subsurface anomalies. The identified regions of interest are then processed by a feature extraction algorithm to capture their salient features. We use translation invariant features that are based on the local edge distribution of the 3-D GPR signatures. Finally, a fuzzy K-nearest neighbor rule is used to assign a confidence value to distinguish true detections from false alarms. The proposed algorithm is applied to data acquired from three outdoor test sites at different geographic locations. [C1796]

## "The GPR Response of a Subsurface Objects and its Use for Target Detection"

The present work reports the results of laboratory measurements of the real part of dielectric permittivity epsiv' and dielectric loss tangent tg(delta) of sandy and clayey soils as a function of soil moisture (X) uniformly distributed throughout the volume and of electromagnetic field frequency. Also, the theoretical research of the dependence the reflected signal shape on the humidity profile was realized [C1797]

## "Environment-Adaptive Antipersonnel Mine Detection System-Advanced Mine Sweeper"

In this paper, we propose an environment-adaptive antipersonnel mine detection system called Advanced Mine Sweeper. Advanced Mine Sweeper is developed based on sensing technologies, access-control technologies and system integration technologies for safe and effective demining procedure after the Level II survey. Advanced Mine Sweeper consists of a sensing vehicle/unit, an access vehicle, and an assist vehicle. The sensing vehicle/unit is composed of an integrated sensor and a small-reaction sensor head manipulator. The access vehicle is parked facing a mine field in order to control the sensing unit position in a global area using its boom. The assist vehicle is parked keeping some distance from a mine field. It controls the sensing vehicle/unit and access vehicle and then displays the processed sensing information for landmine detection, receiving sensing information and sensing position. By using this system, experiments in the field buried dummy landmines were carried out for the utility and performance evaluation [C1798]

## "Data Path Design of an Embedded MCU Core"

In this paper, the MCU core is partitioned into data path units and control units. Since the data path is one of the key factors that influence the performance of MCU, much effort has invested to its design. A data path model is elaborately designed. ALU is optimized using operand isolation for power reduction. Four-level read scheme is adopted for general purpose registers design in order to reduce the fan-out of the data bus. The HDL models for the bidirectional data bus and the design of special function registers are also presented. Experiments showed that the design implementation and optimization were very successful [C1799]

## "Multi-Stage Sensor Fusion for Landmine Detection"

This paper proposes a multi-stage approach for landmine detection. It is based on a feature-level data fusion which combines data from several nonspecific sensors. The sensor fusion process is analysed and divided in

three stages in order to improve the final result. During the first stage all suspected objects are detected against a background. Then, the detected objects are classified to be a man-made or natural object. And, finally, the landmines are distinguished among the identified manmade objects. The last two stages are described in detail in this paper, demonstrating the advantages for their separation. Classification features, which enable the sensor fusion, are also presented in this work together with an approach for their integration. The proposed ideas are tested using real experimental data obtained from pulsed and continuous metal detectors, infrared camera and ground penetrating radar [C1800]

## "Decreasing FCD Processing Delay by Deploying Distributed Processing System"

A field test for floating car data (FCD) based traffic information processing & provisioning system is carrying on in Beijing, with over 2,000 floating cars uploading FCD every 90 seconds. However, as a practical system targeted by the government, 20,000 or more floating cars will be deployed for FCD collecting. Ten times more amount of FCD might lead to the unacceptable processing delay. Multiple servers based distributed FCD processing system is a cost efficient way to achieve the low processing delay and high availability. This paper suggests the structure of distributed system and algorithms of optimizing the distributed system by efficiently balancing work load, which can effectively keep the processing delay within an acceptable level [C1801]

## "Study for Public Transport Vehicle Location and Navigation System Based on GPRS"

Based on analysis requirement of function for public transport vehicle location and navigation system, and the characteristic of General Packet Radio Service (GPRS), the method of making up public transport vehicle location and navigation system using GPRS communications platform is studied. The system architecture for public transport vehicle location and navigation system based on GPRS is put forward. The system composition and function is described [C1802]

## "Normalization of Feature Distributions for Linear-Quadratic Fusion in Landmine Detection Using GPR"

Successful detection of antipersonnel landmines often requires decision making on the basis of more than one decisive feature. The fusion of the available features should be done in a statistically optimal way. Theoretically this might be achieved by Bayesian-based criteria. However application of Bayes' criteria in general form is computationally difficult and may lead to overtraining of classification algorithms. To avoid this situation linear and quadratic fusion rules are often used in practice. However these rules produce optimal results only when the decisive features are normally distributed, which is not always guaranteed in practice. To improve the performance of the linear and quadratic detectors we suggest a normalization of the decisive features by means of Johnson's transform prior to the fusion. We describe the normalization algorithm and demonstrate that it improves performance of the linear and quadratic classifiers. The performance is judged in terms of the ROC curves [C1803]

## "Multitemporal SAR interferograms simulator"

Many are the examples of SAR and differential SAR interferometry application as well for ground elevation measurements as for surface deformation monitoring. A large number of interferometric techniques use instead of a single interferogram a database of multitemporal interferograms covering the same region. This paper, propose a new multitemporal interferogram simulator. The originality of this simulator is that it takes into account geometrical and temporal decorrelation noise. The generated data set of multitemporal interferograms may be very useful in validation or performances measurements of ground monitoring techniques [C1804]

## "Widening UWB System Coverage Zone by Repeaters-Regenerators"

The Federal Communications Commission (FCC) of the USA has limited communication coverage zone for pulse UWB systems by implementing power density mask on all transmitting devices. As result the UWB coverage area is not exceed a hundred meters. But it is possible to increase this area, still fulfilling the FCC limits, by adding one or more UWB repeaters around or along the path toward a destination receiver(s). The paper deals with the idea of such repeaters-regenerators and their implementations [C1805]

## "The GPRS Communication Platform and DNP Protocol as the Best Choices to Communicate the SCADA with IEDs in the EDC Distribution Network"

This paper describes the features of the GPRS platform and how the DNP 3.0 protocol is used to provide communication among devices. It explains why DNP 3.0 has been chosen as one of the most complete, versatile protocols for electric applications under a GPRS network and how combining the two decreases service costs,

enhances efficiency and increases event transmission speed. By implementing the GPRS platform, C.A. La Electricidad de Caracas (EDC) was able to achieve significant savings, as compared to the previous platform, as well as multiple other technical benefits [C1806]

## "ELF Electric and Magnetic Fields Exposure Assessment of Live-Line Workers for 132 kV Transmission Line of SEC"

This paper presents an exposure assessment study for live-line workers exposed to transmission line power frequency electric and magnetic fields. A double circuit transmission line is selected. Practical exposure scenarios which represent actual working conditions for live-line workers have been identified. The charge simulation method has been adopted to compute the external electric field around the selected 132 kV transmission line. A method based on Ampere law has been chosen to compute the external magnetic field around the transmission line. Both methods are numerically solved using the EPRFs EMF Workstation software. A comparison between the values of external electric and magnetic fields, with the allowable exposure limits set by the international standards has been conducted. The paper concluded that the levels of workers exposures to extremely low frequency electric and magnetic fields are below the recommended international standards limits for the scenarios considered in this work [C1807]

## "A Ground Penetrating UWB Radar System"

A new low-cost pulse based ultra-wideband radar system working up to 6.4 GHz has been developed. The main focus was on the use of cheap off the shelf components. Pulse generation in the transmitter was solved with a simple transistor circuitry. In the receiver the down conversion is realized with a sampling phase detector combined with a direct digital synthesizer. To control the radar system and for transmitting the digitized data to the PC a USB-controller is used [C1808]

## "Software for Image Simulation in Ground Penetrating Radar Problems"

The computer program LtSEMPGt simulating GPR profiles that can display the subsurface ground structure consisting of any quantity of objects and layers of any geometrical form and with any electrical parameters, has been developed for wide application. The structure and general characteristics of basic modules of the developed software have been considered. The examples of some calculations have been cited [C1809]

## "Ultrawideband Signal Scattering from a Wirelines Buried in a Ground"

Model of ultra wideband signal scattering from the subsurface wirelines which diameter is small in comparison with length of a sounding wave and depth of its location in ground is considered. The created algorithm allows calculating the signals reflected by a cable which axis is parallel to air-ground interface, at any polarization and direction of an illumination. Results of calculations of ultra wideband signals reflected by cables, located in a lossy, dispersive ground, for various conditions of illumination are demonstrated and discussed [C1810]

## "Coupling Effects in Resistive UWB Antenna Arrays"

The self- and mutual impedances of elements in the dissipative antenna array are known to involve radiative resistances and loss resistances. This paper is dedicated to analyzing the structure of the mutual impedance between resistive load elements and its effect on the radiation efficiency of the array [C1811]

## "Pulse-Doppler UWB Radar"

The paper contains measurement results of moving targets by pulse-Doppler UWB radar. The description of a radar, principle of operation and technical specification are presented. Conditions and results of measurements are described. Feature of the presented measurements: Doppler signals of linear moving targets whose linear sizes exceed resolution of radar [C1812]

## "Remote Monitoring and Controlling System of Factory Aquatic Products breeding"

The paper briefly introduces the constitution and the theory of operation of a computer-based remote monitoring and controlling system of factory aquatic products breeding with multi-environmental factors. This system is composed of many single-chip microcomputers used as fishponds controlling computers and two industrial control computers, one is used as remote monitoring computer and the other as field monitoring computer. It takes GPRS radio communication and Internet technology to communication between remote monitoring computer and field monitoring computer. The system can detect and control the breeding environmental factors such as temperature, content of dissolvent Oxygen, pH, water level, opacity and so on. It realizes the real-time

monitoring and controlling the growth of the fish by computer image processing technology and it takes fault tree analysis technology to make the system reliability design. Once the system fault happens and the fish occurs pathological changes and unwell, the system can give an alarm in time and inform the manager automatically by short messages [C1813]

## "PolluMap: A Pollution Mapper for Cities"

PolluMap is a new automated system that monitors the air quality of urban cities and displays the information using a Web service. The system collects pollution data using mobile hardware modules, transmits the data regularly using GPRS to a back-end server, and integrates the data to generate a pollution map of the city using its geographical information system. The pollution map is available at anytime from an easy-to-view Website. Unlike previous pollution mappers, the new system provides continuous update of pollution information in addition to maximum coverage. It can be easily expanded to new areas and is cheap to employ. The system has been implemented and tested in Dubai. Initial results show the effectiveness of the proposed system [C1814]

## "Measurements of magnetic fields due to the operation of distribution transformers and transmission lines"

This paper presents magnetic field measurements with a frequency of 50 Hz caused by the operation of indoor power distribution transformer and near transmission lines The measurements are carried out for two hundred power distribution transformer and near transmission lines (220 kV). Magnetic Field in indoor power distribution transformers is higher than near transmission lines. [C1815]

## "An Integrated Framework for Seamless Soft Handoff in Ad Hoc Networks"

We present an integrated architecture for seamless soft handoff in mobile ad hoc networks, where various managers residing on multiple layers are proposed to tackle handoff issues in a cross-layer and cooperative manner. At the link adaptation layer, the virtual interface provides link transparency to the upper layers and session management is handled at the interface manager. At the network layer, most IP-based ad hoc routing protocols can be accommodated. At the transport layer, the transport manager is instructed by the interface manager to adapt the transmission rate according to the new wireless link. Finally, at the application layer, the security manager handles various aspects of security concerns. Simulation results show that our approach can deliver low packet loss, low latency, and smooth handoff solutions with minimum packet overhead. Further, our research on IEEE 802.21 reveals that current media independent handover (MIH) may serve as a component in our integrated architecture. In conclusion, our work represents the first complete solution that provides seamless soft handoff in ad hoc networks with minimum service disruption [C1816]

## "Multi-channel Noise Radar"

A noise radar system consisting of an array of K transmit antennas and M receive antennas is considered. Two implementations are considered: in the first, a single noise source is, after appropriate phase shifting, transmitted; in the second approach K independent noise sources are transmitted. The two approaches are compared and an architecture for the latter that no longer requires steering phases on transmission is presented. A radar's ability to avoid detection by surveillance (ESM) receivers is a feature of modern radar design and this aspect of the proposed approaches is compared [C1817]

## "Push to Talk over Cellular Traffic Modeling"

This paper proposes traffic modeling and group behavior modeling for Push to Talk Over Cellular (PoC) traffic. The behavior of users in group forming service, and PoC traffic are investigated by simulations. It is assumed that the arrival process of PoC calls is Poisson, while the offered PoC service time and floor holding time are exponentially distributed. The proposed group generation follows Binomial model. The floor traffic is modeled as a limited source ON-OFF traffic. Based on proposed traffic models, PoC environment and PoC calls are simulated. Two invitation methods in PoC service are considered: one by one invitation, and batch invitation. The influence of stop talking actions, floor request habits, and maximum group size in PoC traffic are studied. [C1818]

## "Interaction of ELF Magnetic Fields with Human Body Organs Model Underneath EHV Transmission Lines"

The current densities and the specific absorption rate are important factors to evaluate the biological effects associated with exposure to ELF magnetic fields. These important factors depend on the characteristics of the external magnetic fields and the human organs. In this paper a standard human model is considered. The

important human organs are taken into consideration, wherever the maximum, minimum and average magnetic fields are calculated in these organs under central line conductor, under outermost conductor and at the edge of right-of-way. The maximum and average current densities at the above three situations underneath the line are calculated and discussed. Also, the specific absorption rates are computed and discussed. The magnetic field can be as high as 49.87 muT, the induced current density 615 muA/m2, the specific absorption rate 29times10-12 watt/kg in the human model brain. While in the human model heart the magnetic field can be as high as 47.44 muT, the induced current density 403 muA/m2, the specific absorption rate 29times10-12watt/kg in the human model heart [C1819]

## "Traffic Modeling for Massive Multiplayer On-line Role Playing Game (MMORPG) in GPRS Access Network"

Investigation of the multiplayer on-line game traffic is not only interesting but also important. From network point of view, accurate traffic models are highly required to generate a characteristic load for analysis or simulation approach. In this paper we focus on source modeling of the massive multiplayer on-line role playing game (MMORPG) traffic in mobile networks. Our results show that because of the extremely large number of the on-line players and special communication requirement of the role playing game style, the server-generated traffic of the MMORPG becomes much complicated and has a tight relationship with specific game design [C1820]

## "Adaptive Connectivity Management for Hybrid Wireless and Mobile Networking Environment"

The adaptive management of heterogeneous wireless networks is crucial to the emerging pervasive computing paradigm. A lot of research has been carried out for the management of wireless multiaccess systems. However, little research considers a hybrid wireless environment in which the networking resources include both infrastructured backbone and dynamic ad hoc infrastructureless connectivity. This paper proposes an architecture for the adaptive connectivity management of hybrid wireless networking resources that is available to user's mobile device. Channel is introduced to wrap hybrid networking resources. The adaptations include to choose the best connection for channel creation, and to perform channel connection switching when network situation is changes. Detailed design is described in the paper [C1821]

## "NoteBOX With a Unified Messaging System"

Messaging services are most widely used applications in both Internet and mobile networks. Since each current messaging service uses different protocols and has specific applications, a problem of interoperability amongst them remains. This paper describes an effort to build NoteBOX an application which is based on Internet protocol (IP). Our goal is to design and implement an application and content system which provides users with information and knowledge. NoteBOX employs a unified messaging system which enables the integration of different messaging services so that all can be used like a single system. This paper describes our preliminary effort to realize an architecture and protoype for a unified messaging system at mobile networks based on Internet protocol (IP) [C1822]

## "WiBro: Migration Strategy of KT toward FMC based on IMS"

Integrated management architecture for FMC based on IMS/NGN is overviewed with WiBro which is a new and promising access technology that supports end-to-end QoS with SBLP. KT's integrated control platform for FMC services is described as well [C1823]

## "MOBIDIS: A Pervasive Architecture for Emergency Management"

Current mobile and pervasive technologies (e.g., PDAs, GPRS/UMTS and WiFI connections, etc.) enable the development of adaptive peer-to-peer software infrastructures for supporting collaborative work of human operators in emergency/disaster scenarios. In this paper, we present a novel architecture, named MOBIDIS (Mobile @ DIS), currently under development in the context of an 1ST research project, in which operators, equipped with hand-held devices, are coordinated by a workflow management system able to adaptively change the process schema in order to cope with anomalies. Some preliminary experimental results are also presented [C1824]

## "The GPOF-based Ground Return Deembedding in Stepped Frequency Ground Penetrating Radar"

The work is devoted to a problem of detecting shallow underground objects like anti-personnel mines using ultra-wideband ground penetrating radar (GPR). In case of step-frequency radar, an inverse discrete Fourier transform (IDFT) is a standard data processing technique to convert the raw radar data into the range profile. The latter

can be used for detecting buried targets and estimating their depth. Here, an advanced data processing algorithm based on a general-pencil-of-functions (GPOF) method is proposed to improve the radar performance. [C1825]

## "Low-Latency Live Video Streaming over Low-Capacity Networks"

This paper presents an effective system for streaming over low-capacity networks (such as GPRS and EGPRS) of live videos with low latency. Existing solutions are either too complex or not suitable to our scope. For this reason, we developed a complete, ready-to-use streaming system based on H.264/AVC codec and UDP/IP stack. The system employs adaptive controls to achieve the best tradeoff between low latency and good video fluency, by keeping the UDP buffer occupancy at the decoder side between two given levels. Our experiments demonstrate that this system is able to transmit live videos at CIF format and 10 fps over GPRS/EGPRS with very low latency (1.73 sec on average, basically due to the network delay), good fluency and average quality, measured with PSNR, of 31 dB on GPRS at 23 kbps at 10 fps [C1826]

## "The Collection and Issuance System of The Hydrographic Information"

The hydrographic information system based on GPRS network achieves inquiring of remote information, by collecting the hydrographic data form the measure station and sending it to the mobile terminals. It serves for redeploying water resource and flood prevention. The system uses three tiers: measuring station-information center-mobile terminal, the measure stations use microcontroller technology to collect the data of rain and water level of rivers or reservoirs, and then send to the information center by ultrashort wave. The information center manages the hydrographic data after receiving and sends them to the mobile terminals by GPRS Network. Experiments indicate that the system runs dependable, has good real time performance, and can be widely used and has good future [C1827]

## "The Design and Realization of Embedded MMS Protocol Module Based on GPRS"

This article introduces the design and realization of embedded MMS (multimedia messaging service) protocol module. Discussed MMS protocol stack, given the hardware structure and main software process to transmission MMS by Siemens firm MC35i GPRS module, and put the module into wireless intellectual home safeguard control system [C1828]

## "Clutter Suppression in GPR Using Chaos Modulation"

In this paper, a chaotic radar is designed in which the transmitted signals are formed through modulating the amplitude of ultra wideband (UWB) signals using chaos. It is illustrated that the proposed radar has an excellent resolution performance as well as the capability of sidelobe suppression that is significant in ground penetrating radar (GPR) applications. Additionally, an expectation maximization (EM) based method is proposed to form a non-coherent receiver that conducts blind ground clutter equalization. The identification and equalization performance of the proposed EM receiver shows its robustness in blind equalization while achieving non-blind performance. Numerical electromagnetic simulations using finite difference time domain (FDTD) method under near ground penetrating situations with hidden targets are executed to illustrate the advantages of the proposed technique. [C1829]

## "Analysis of Distributed Intelligent Agent Model for QoS Dynamic Scheme in GSM/GPRS Network"

In this paper we study dynamic quality of service scheme in GSM/GPRS wireless network. A load balancing architecture constructed by distributed intelligent agent has been presented to support real time or burst data services. Fuzzy neural network was employed to predict GPRS traffic by learning examples. Meanwhile, we have presented a traffic estimation algorithm and a simple decision mechanism to deal with special applications such as burst data transmission. The simulation shows that distributed intelligent agent architecture could significantly reduce packet delay, route cost and relieve GPRS bottleneck [C1830]

## "Analysis of Ultra Wide Band Noise Radar with Randomized Stepped Frequency"

Step frequency radar has been used for a long time in wide-band radar applications, such as turntable ISAR, airborne VHF SAR and ground penetration radar. The frequency is stepped linearly with constant frequency change, and range cells are formed after FFT-processing of the received frequency samples. The total covered bandwidth defines the range resolution, and the length of the frequency step restricts the non-ambiguous range interval. Random choice of the transmitted frequencies suppresses the range ambiguity and improves the ECCM performance. In this paper, the ambiguity function and the noise floor limiting the possible side lobe suppression are analyzed. Experimental results are compared with theoretical predictions using sets of randomly distributed

radar raw data obtained from linear step frequency radar measurements. [C1831]

## "Performance Analysis of Dynamic Resource Allocation with Channel De-allocation/Re-allocation in GSM/GPRS Networks"

Resource allocation is a critical issue that determines the quality of service of GSM voice calls and GPRS data packet transmissions in an integrated GSM/GPRS network. In this paper, we investigate dynamic resource allocation schemes employing channel de-allocation (DAS) and re-allocation (RAS) schemes in such a network. An analytic model with general GPRS data channel requirement is developed to evaluate the performance of the schemes in terms of the GSM voice call blocking probability, GPRS data packet dropping probability, average GPRS data packet transmission time, channel utilization and system award. Our results indicate that RAS can considerably improve the system performance by combing different DAS strategies. It is also shown that the decision to choose the most appropriate dynamic resource allocation scheme has to be made based on the QoS requirement of the system [C1832]

## "Global operations in SIMD cellular processor arrays employing functional asynchronism"

We present a new approach to execution of global image processing operations on massively parallel cellular processor arrays. Combining conventional synchronous processing with simple asynchronous propagations we achieve performance increase on global operations without additional hardware cost. By the example of watershed transformation we demonstrate the benefits of mixed synchronous/ asynchronous approach. In addition, we investigate asynchronous grey-scale data processing and its applications in image processing. [C1833]

## "Architecture of an Always Best Connected Vehicular Communication Gateway"

MobilitY and CollAboRative Work in European Vehicle Emergency NeTworks (MYCAREVENT) is an European Project of the 6th Framework Program [1], and aims to optimize the European market for automotive after sales services and repair. MYCAREVENT develops innovative applications and services, which can always be accessed seamlessly and securely using mobile communication. Maintenance situations like car breakdowns or minor failures happen everywhere. Wherever such an unpleasant situation appears, the driver needs help and advice-most likely provided by a roadside patrol. To support roadside technicians and drivers with MYCAREVENT products and services, a mobile communication following an "always best connected" approach facilitates the communication between the mobile users within a collaborative work environment. This paper presents the vehicle communication gateway (VCG) and its protocol architecture developed in MYCAREVENT. [C1834]

## "Impact of Handover Between UMTS and GPRS on TCP/IP: An Empirical Approach"

Availability of GPRS and UMTS networks constitutes a significant piece in the path towards a ubiquitous Internet. To ensure continuity of service, handover from UMTS to GPRS (U2G) and vice versa (G2U) is a key feature for mobile operators and user experience. This paper presents an empirical study on the impact of intersystem handover (ISHO) over the TCP/IP protocol suite. Trials include a variety of different conditions, such as two mobile operators' GPRS and UMTS public networks, uplink and downlink data transmissions, as well as indoor and outdoor scenarios. Measurements have been performed at both IP and TCP layers. Results show that significant connectivity gaps, dramatically increased delays and varying amounts of losses take place as a result of ISHO. We describe the harmful effects of such phenomena on TCP. [C1835]

## "Optimizing Technology Choices for Handsets"

Summary form only given. The mobile handset is arguably the most significant consumer device driving the use of compound semiconductors and other technologies. We estimate that in this year alone over two billion square millimeters of GaAs will be shipped into mobile handsets. There is no question that the dominant technology for implementing power amplifiers for GSM, GPRS, EDGE, CDMA, WCDMA, HSPA and WiFi is now GaAs and InGaP/GaAs. Switches using GaAs pHEMT, as well as GaAs low noise amplifiers also see significant use in the handset. CMOS is becoming the technology of choice for the bulk of the other cellular handset functions such as direct conversion receivers, modulators, synthesizers, VCOs, PA regulators, DC-DC converters, as well as the digital baseband and applications processors. MEMS is becoming attractive for future use in switches and filters as it offers the benefits of lower insertion loss and ease of integration. This presentation addresses the various technologies used today inside mobile handsets. Further, integration options are presented that will lead to the optimum combination of existing and future technologies needed to meet the ever-growing demands for cheaper, smaller and more reliable handsets [C1836]

## "The Application of GSM and GPRS Technology in Monitoring System for HVDC System Earth Pole"

The paper presented application and realization of GSM and GPRS network in on-line monitoring system of earth pole system. In its on-site unit, which is solar energy technology, the value of the current, temperature and depth of water variables are obtained from different sensors . These data are preprocessed in a DSP chip and then transmitted GSM and GPRS wireless communication networks. Based on software of system management ,the operating condition of HVDC system earth pole can be diagnosed. The monitoring system raise the fault alarm for based on SM. [C1837]

## "Motion Control of Landmine Detection Vehicle Equipped with Low-Ground-Pressure Tires"

Most of landmine detection robots proposed before have been strongly restricted to locomote because they have not been able to enter the minefield. So we have proposed a mine detection vehicle which can enter minefield with low-ground-pressure tires and scan landmines directly using GPR. Low-ground-pressure tire decrease ground contact pressure. And we are intended to make accurate map that point out the position where landmines are buried. The position of the vehicle is able to be observed with internal sensors (for the posture measurement) and external sensors (for the position measurement). However, when controlling the vehicle, the sampling time of external sensors and communication time from external sensors to the vehicle cannot be disregarded. Exact position of the vehicle must be predicted with dynamical model of the vehicle. We therefore propose dynamical model of the vehicle for low-ground-pressure vehicle. Based on experimental results, the dynamical model for low-ground-pressure vehicle is in consistency with actual behavior of it [C1838]

## "UMTS-WLAN Interworking Strategies for Reducing Handover Delays"

During handover between heterogeneous networks such as the 3G mobile telecommunication systems and the Wireless LAN systems, a subscriber authentication, the Mobile IP operations for IP mobility and an accessing to a data gateway are heavy burdens due to its time-taken operations and overheads. So they are main factors of handover delays. This paper proposes the handover strategies for reducing handover delays in the UMTS (Universal Mobile Telecommunications System) and the Wireless LAN overlay networks. For decreasing the delays, mandatory use of a fast re-authentication is applied and newly added features of one for the UMTS are introduced. And simplified MIPv6 operations and an optimized gateway approach to minimize the network access time are proposed. These proposed approaches are analyzed and evaluated with the results of an authentication test bed and a network simulation. [C1839]

## "Sensor Fusion Based Fuzzy Rules Learning for Humanitarian Mine Detection"

In this paper, a sensor fusion based fuzzy rules for humanitarian demining are presented. A fuzzy learning algorithm for extracting fuzzy fusion rules from experimental data of robot-manipulated ground penetrating radar (GPR) and metal detector (MD) is presented. The inputs to the fuzzy learning algorithm are features extracted from both a GPR and an MD while its output is a set of fuzzy rules. Applying the learnt fuzzy fusion rules and knowing GPR and the MD features of a given scan, it is possible to decide if there is a land mine and its approximate depth underground. The features chosen for this fusion algorithm are the peak amplitude of a processed GPR output signal and the peak value of the cumulative sum of amplitudes of MD output signal for the same scanned area. Experimental test results are presented for verifying the validity of the proposed learnt fuzzy fusion rule base [C1840]

## "GPS Real Time Vehicle Alarm Monitoring System Base on GPRS/CSD using the Embedded System"

It proposed a method of combining the two types of data service CSD and GPRS based on GSM applied to GPS vehicle real-time monitoring and alarming system. Based on this method, basic constitution and network structure of the system is given out, and then it implements the CSD and GPRS hardware interface and software flow based on the GR47 wireless communication module. Arm embedded system was used as the central processing unit (CPU) and uLinux was used as the appropriate operation system (OS) to the circuit design. Compared with the conventional single mode of GPRS, this method makes up the disadvantage of the high time delay and the incertitude of the time delay in data transmission. In this case, the real-time data transfer of the system gets guarantee, and the daily maintenance expense of the system is reduced. GIS is applied to track and alarm the hardware clients on the electronic map. The test indicates that this method is appropriately used in the instantaneous information real-time transmission, and has high practicability and validity [C1841]

## "Inter-System Handover Parameter Optimization"

With WCDMA networks being deployed in Europe and throughout the world, one of the big challenges is to make cell reselection and handover between WCDMA and GSM work smoothly. In this paper, we highlight different strategies for inter-system handover, discuss the impact of intra-frequency handover parameters on inter-system handover performance, and study inter-system handover parameter settings by processing field measurement data collected in different networks. Optimization trade-offs are illustrated with examples and a recommended set of parameters that led to significant reductions in call drop rates in commercial WCDMA networks is provided. [C1842]

## "An Approach for Cell Assignment in UMTS Networks"

This paper proposes a new mathematical formulation to address the problem of cell assignment in UMTS network. To solve the problem, an adaptation of the tabu search metaheuristic is proposed. In this adaptation, applicable movements are well defined in order to efficiently explore the search space. Each movement has an associated gain that helps assess the degree of improvement of a current solution. Simulation results enable to evaluate the heuristic parameters that give the best solutions. [C1843]

## "Improved Latency Performance with GSM/EDGE Continued Evolution"

The world's largest and most widespread cellular technology today is GSM/EDGE. EDGE is capable of offering an attractive solution for 3rdgeneration cellular services in existing GSM networks. However, the introduction of new and more delay sensitive services may require improved latency performance. Reducing the delay and increasing the bandwidth efficiency in EDGE systems is important for services with stringent latency requirements, such as conversational VoIP, but will be beneficial also to other services. Proposed is to reduce the transmission time interval from 20 ms to 10 ms, in combination with novel procedures for faster feedback. Simulation results show that LLC delays may be reduced by 20-40% depending on traffic scenario. Furthermore, channel resource requirements for VoIP could be substantially reduced. [C1844]

## "Self-Synchronization Strings in Huffman Equivalent Codes"

Possession of self-synchronization strings (SSSs) is a favorable feature of Huffman equivalent codes. In this paper, first, we show that SSSs in a Huffman equivalent code are in fact codewords or concatenation of codewords and then give a method to find those short SSSs without exhaustive search. Second, we present a closed-form solution to show how often the SSSs can be encountered in a coded sequence [C1845]

## "ULTRA: Wideband Ground Penetrating Radar"

The frequency range employed in ground penetrating radar (GPR) systems is generally limited to 2 GHz because media loss increases dramatically at higher frequencies. Nevertheless, a series of applications exists in the Cultural Heritage field where the development of high frequency systems would significantly benefit, in terms of resolution, from an increased operating band. This article presents ULTRA, a wideband GPR (800 MHz-4000 MHz) system, using a CW-SF technique developed for this type of surveying [C1846]

## "A mobile based approach to strong authentication on Web"

The rapid increase of the phishing phenomenon states that the Web authentication systems not based on one time password (OTP) are definitively ineffective in providing financial services. Existent Web authentication systems have been developed on the classic username/password mechanism using a single channel, either mobile or Web, generating an expensive or inadequate authentication system. The proposed solution is a combined Web/mobile authentication system. The basic authentication mechanism is integrated with a challenge/response process and an OTP. The challenge is issued from an authentication server and has to authenticate a mobile device, typically a cell phone. This device can communicate with any other involved parts through a fixed terminal, typically a personal computer, via a Bluetooth connection. The mobile device, once accepted, performs the authentication with the web site or application. This final step is accomplished using a temporary one-time password [C1847]

## "CMOS Impulse Radar"

A novel CMOS impulse radar for CMOS implementation is proposed exploring the concept of swept-threshold sampling. Time-domain signal processing with counter-based integration in parallel structures is used. With continuous time delay line based parallel sampling topologies we achieve a sampling rate in excess of 20GHz. A functional CMOS impulse radar is implemented in silicon with measured system performance [C1848]

## "Magnetic Sensors for Navigation and Security Applications"

Magnetic sensors are key elements in many security, military, and navigation systems. Fast development of new sensor types such as AMR (Anisotropic MagnetoResistors), GMR (Giant Magneto-Resistance), SDT (Spin-Dependent Tunelling) and GMI (Giant Magneto-Impedance) brings new opportunities; but not all new is better. The purpose of this tutorial is to critically review the principles and properties of modern magnetic sensors and show how they presently are employed in navigation and security applications and what is their future potential. The emphasis will be given for mine and UXO (Unexploded Ordnance) location. 1. Principles and techniques:-principles of DC magnetic sensors suitable for security applications (incl. AMR, GMR, SDT and miniaturized resonant and fluxgate sensors)-eddy-current methods-induction magnetometers-electromagnetic methods including ELF and Ground Penetrating Radar-imaging techniques, signal processing, recognition-gradiometric techniques, sensor fusion-calibration and error corrections 2. Applications-Mine detection-UXO location-Detection and recognition of vehicles (incl. submersible)-Detection frames and other sensors for border security-Magnetic labels and anti-theft systems-Navigation systems-Magnetic tracking-Distance measurement-Distributed sensors and sensor areas [C1849]

## "Limited Multi-Static Calibration Technique without a Phantom for the Detection of Breast Cancer"

Breast cancer is a serious disease that affects many women each year. The current benchmark in detection is the mammogram but recent efforts have been made in alternative detection methods, the most promising is microwave detection. The method focused on works by illuminating the breast with a pulse and detecting any reflected signals, making it similar to ground penetrating radar. A key problem though is the reflection of the pulse from the skins surface and direct signals between adjacent antennas. Calibration to remove these commonly uses a breast phantom however there is wide variability in tissue properties making a universal phantom unrealistic. Using a mismatched phantom results in performance degradation. This paper introduces a new method to calibrate a system using only received signals through a preset antenna layout and averaging scheme, which overcomes the conventional method problem and improves the system performance [C1850]

## "Research of State Monitoring and Pre-warning System of Cable Joint in Distribution power grids"

The failure caused by the cable joint seriously threatens the safe running of distribution power grids. In this article, we have proposed a supervising system using wireless communication technique in order to realize a real-time monitoring and pre-warning of cable joint in distribution power grids. In this paper, we mainly introduce the framework of the system, principles as well as the software designing. [C1851]

## "Remote Monitor and Control System for Wreath Net Cabinet Based on GPRS Technology"

At present, wreath net power supply has good economic performance and high reliability in the distribution network. The Wreath Net Cabinet is one of the main equipments of the wreath net power supply, and now has been applied extensively. So its safe operation is one of the key factors to guarantee Distribution Network's safety and reliability. This paper combines the hardware collecting the device, the GPRS wireless communication modem and the relative communication protocol, and the self-designed on-line monitor software to monitor the Wreath Net Cabinet. So it can carry on the on-line supervision to the temperature and current, and achieve to these functions, such as: remote measurement, remote signaling and remote control etc.. [C1852]

## "Influence of Ground Potential Rise on Recloser Control Broad in Distribution Lines"

This paper presents the numerical analysis method of current distribution electromagnetic fields, using grounding and soil structure analysis (CDEGS) software to interpret apparent resistances field measurement result. The steepest descent method is the function of least-square criterion which is adopted to translate and to explain the field measured result. When the ground fault occurs in any location in power system, the zero-sequence fault current will return to the power system grounded sources through the earth. They make gradient potential and ground potential rise (GPR) in the vicinity ground source. When the GPR is high, it produces shocks and makes damage to equipments. Which they have affected the stability and reliability of distribution lines during operation. So, it is essential to study and to analyze for the influence of GPR. This study has been simulated and evaluated the GPR by using CDEGS software. [C1853]

## "Using Quick-Start to Improve TCP Performance with Vertical Hand-offs"

Vertical hand-offs between different wireless access technologies have become more relevant after the introduction of multi-access mobile terminals with wireless LAN (WLAN) and wireless WAN (WWAN) technologies. While the IP mobility mechanisms are rather well known, the performance of TCP still has problems when moving between WLAN and WWAN accesses. First, with a high-latency WWAN link technology

such as GPRS it takes several seconds before the TCP congestion window has reached the path capacity. Second, when the notification of the first packet loss arrives at the TCP sender, several packets have already been lost due to the slow-start overshoot and the TCP sender needs to retransmit a large number of the packets from the last transmission window. Third, after a vertical hand-off the path characteristics might have changed dramatically in which case the TCP congestion control state is not valid any more. In this paper we investigate Quick-Start, a mechanism for avoiding the initial slow-start delay, in the context of wireless multi-access terminals. We also propose an enhancement to Quick-Start to alleviate the effects of slow-start overshoot and apply Quick-Start after a vertical hand-off to quickly learn the available capacity on the new end-to-end path. An explicit cross-layer hand-off notification is employed to trigger Quick-Start when the hand-off completes. We conduct simulations with different hand-off models, and our simulations yield promising results with Quick-Start [C1854]

## "GPR Zone of Influence of a Typical Electric Power Network"

The zone of influence of the ground potential rise is analyzed based on a real case scenario. It is shown that the concept of zone of influence is quite complex if not totally blurred in the context of a modern convoluted topology involving transmission lines, distribution lines, water pipes of small towns and villages, and it is difficult to predict the location of zones of high potentials without the appropriate computer simulations. [C1855]

## "Development and Application the Finite Elements Modeiling Scheme of Electromagnetic Fields in Radar-Tracking Sounding Tasks"

First Page of the Article [C1856]

## "About the Initial Field Calculating Problem That Appears in Process of Solving Nonstationary Axisymmetric Problem using the Vector Finite Element Method"

First Page of the Article [C1857]

## "The Harmonic Electromagnetic Fields Modeling for Solving Tasks of Magneto-Telluric Sounding"

The method of 3D harmonic electromagnetic fields modeling for solving tasks of magneto-telluric sounding (MTS) has been developed and realized. The scheme with field separation to normal and anomalous components has been used for the modeling of natural electromagnetic Earth field. Nonregular parallelepiped and hexahedral elements have been used for the finite element approximation. For acceleration of calculation of the field from local near-surface heterogeneities the multilevel scheme of 3D field separation has been developed. [C1858]

## "Impulse Ground Penetrating Radar Hardware System Design"

Hardware design methods for impulse ground penetrating radar (GPR) are presented. The designed impulse GPR system mainly consists of ultra wideband (UWB) transmitting and receiving antennas, impulse generator, sampling down converter, time varying gain amplifier, timing and synchronization controller, high accuracy digitizer, and so on. All these modules were designed and realized. The GPR system can operate from 100 to 1000 MHz to obtain different detecting depth and precision. An experimental GPR system had been completed and field test proved this design was successful [C1859]

## "Phase Distortion Correction for See-Through-The-Wall Imaging Radar"

See through the wall (STTW) applications have become of high importance to law enforcement, homeland security and defense needs. In this work surface penetrating radar is simulated using basic physical principles of radar propagation. Wavenumber migration is employed to form 2D images of objects found behind a wall. It is shown that this technique cannot properly image with the wall present because of an unknown phase delay experienced by the electromagnetic waves as they pass through the wall. Two approaches are taken to estimate this phase by looking at the direct backscatter signal from the wall. The first is a dual phase approach, which uses a non-parametric technique to find the phase at every frequency. The second method is a dual frequency approach. The two frequencies are close enough together that the reflection coefficients are approximately equal. This approximation allows for more observations than unknown parameters. The surface reflection coefficient, back wall coefficient, and phase are simultaneously determined using an iterative, non-linear (Newton-Raphson) successive approximation algorithm. Comparisons are performed for a simple scenario of three point scatterers with and without phase correction [C1860]

## "Mobile Ravin: Intrusion Detection and Tracking with Organic Airport Radar and Video Systems"

Currently, airport perimeter intrusion detection primarily relies on visual surveillance by security personnel and is often augmented with video cameras. This approach is limited to day light hours and degrades with bad weather. We are developing a proof of concept system, mobile RAVIN, that detects intrusions as small as a human, works at all hours and all weather conditions, and provides rapid situational awareness to security personnel. The mobile RAVIN (radar and video integrated on mobile object architecture) system has been installed and tested at Seattle-Tacoma International Airport (SeaTac) in February 2006. It uses the airport security display processor (ASDP)-an integrated radar signal processor, track processor, and display processor system that derives threat information from the FAA's airport surface detection equipment (ASDE-3) ground surveillance radar systems. This approach leverages existing airport assets to provide a cost effective suite of security sensors. The mobile RAVIN system performs filtering and tracking on the ASDE-3 radar data, initiates and maintains video tracks of objects, and fuses radar and video tracks for operator display. It also allows operators to slew a video camera to a radar track location which reduces false alarms and nuisance alarms. Finally, we developed a display to show the radar and video tracks overlaid on a map of the airport [C1861]

## "The Software for a Choice of Coefficient of Criterion of a Minimum of the Resulting Root-Mean-square Error and Small Parameter for Linear Automatic Control Systems"

The theme of this work is research of influence of weight coefficient of criterion of a minimum of a root-mean-square error on a resulting error of linear system. The various approaches to a choice of weight coefficient of criterion and software for automation of a choice of optimum meaning of small parameters of system with use of the given criterion are considered. The program allows numerically and graphically to determine meaning of small parameter of an automatic control system by minimizing an error of system, and also to keep results and to print them. [C1862]

## "Enhanced Discrimination for Boundary and Material of Buried Objects in Concrete Structure using Microwave Subsurface Radar"

In this report, a novel signal and image processing method for microwave subsurface radar is proposed, which enables to estimate the internal construction in concrete structures. By using proposed method, enhanced information of buried objects such as boundary and material are discriminated. As the objects are buried near the concrete surface, signal processing is complicated because a reflected wave is often interfering with a transmitting wave in an observed signal. In order to reduce an influence of the interference, transmitting wave subtracting method is adopted, which calculates the difference between the observed signal and a typical transmitting waveform identified from the observed signal without buried objects, and boundary and material of the buried objects are discriminated precisely. Next, a boundary back projection histogram method is newly proposed. The boundary model fitness whose shape is the normal distributions having characteristics of the original model fitness is introduced to sharpen the boundary on electrical characteristics in propagation medium (which represents the boundary of the buried object). The boundaries of the buried object are discriminated clearly in the back projection images calculated by using boundary model fitness. An effectiveness of these proposed methods has confirmed by experimental application to several concrete structure samples [C1863]

## "Wave field decomposition of multi-offset GPR data based on the one way wave equation"

{no data available} [C1864]

## "A linear inverse scattering algorithm for the multi-monostatic GPR configuration"

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## "Accounting for multiple reflections and antenna radiation pattern in gpr signal modeling and experimental validation"

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## "Data fusion for accurate detection of pipe geometry using GPR"

{no data available} [C1868]

## "Peer-to-peer content delivery over mobile networks: a techno-economic analysis"

The concept of peer-to-peer has been receiving greater attention in recent years. The initial surge in popularity among users is mainly attributed to free content delivery and easier availability. However, such services lack a profitable business model for the players involved. Moreover, it has been a phenomenon seen largely in fixed Internet. With the emergence of mobile data services, peer-to-peer has emerged as a possible candidate for content delivery over mobile networks such as GPRS and UMTS. In this paper, we study the case for peer-to-peer content delivery over mobile networks by finding answers to questions such as "when", "why" and "how". We analyse the conditions necessary for a mobile operator to achieve profitability using peer-to-peer mode of content delivery, the reasons why mobile networks are in a better position to exploit the benefits of this mode of delivery and the possible strategies for successful rollout of services using peer-to-peer mode of delivery. [C1869]

## "Digital RF CMOS transceivers for GPRS and EDGE"

A GPRS RF solution using sigma-delta modulation and an EDGE RF solution using digital polar modulation are presented. The single-chip, quad-band transceivers have been implemented in a 0.13 µm CMOS technology. The lock-in time of the sigma-delta modulator with integrated loop filter is less than 120 µs with a phase error of 1.2° RMS and an output power of 3.5 dBm; it is fully compliant to the GSM specification. The EDGE transceiver shows a nominal margin of 11 dB to the critical 400 kHz specification with a transmit EVM of 2.5%. [C1870]

## "Ground penetrating radar as a quality assurance method for paved and gravel roads in finland"

{no data available} [C1871]

## "A digital-to-RF-amplitude converter for GSM/GPRS/EDGE in 90-nm digital CMOS"

We present the first 90-nm digital CMOS RF power amplifier. This PA contains a large array of NMOS switches, and performs a direct digital-to-RF-amplitude conversion, filtering and buffering in a fully-integrated GSM/EDGE transmitter. Power control is fully digital. 40% efficiency is obtained at 10-dBm output power from 1.4 V and it occupies 0.005 mm2. [C1872]

## "Link triggers assisted optimizations for mobile IPv4/v6 vertical handovers"

This document describes a mechanism that enhances mobile IP protocols to smoothly manage handovers for MNs equipped with multiple interfaces and moving across different links. For this purpose, the document provides precise indications on how to use the link layer events information to accelerate IP movement detection and optimize vertical inter-technology handovers. Experimentation results on vertical handovers between WLAN and GPRS networks are also given. [C1873]

## "A reprogrammable EDGE baseband and multimedia handset SoC with 6 Mb embedded DRAM"

A 0.13 µm 6M CMOS EDGE baseband and multimedia handset SoC features a 6 Mb embedded-DRAM DSP instruction memory to allow dynamic upgrade of DSP software, such as applications downloaded from the network. Full-chip standby current is 690 µA which gives 500 h complete GSM/EDGE terminal autonomy when using an 800 mAh battery. [C1874]

## "A single-chip quad-band GSM/GPRS transceiver in 0.18 µm standard CMOS"

A 0.18 µm CMOS single-chip fully integrated quad-band GSM/GPRS transceiver is presented. The low-IF receive section achieves -110dBm sensitivity at the antenna and -15dBm IIP3. The offset-frequency PLL transmitter achieves 1.2° rms phase noise, -65dBc modulation mask at 400kHz, and -165dBc/Hz noise at 20MHz. The chip occupies 17mm2and dissipates 95mA/112mA in receive/transmit mode. [C1875]

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## "Linear and non linear tomographic approaches for imaging dielectric targets embedded in an inhomogeneous medium"

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## "Mobile streaming services in WCDMA networks"

Third generation (3G) mobile phones are leading the telecommunications world into a new era. 3G networks offer increased speed for mobile users and enable new services. Mobile streaming applications benefit from these new capabilities, although streaming doesn't strictly requires a 3G network to work. The purpose of this paper is to show how 3G can improve the performance of streaming applications. In particular, we reference the 3GPP packet-switched streaming service (PSS). [C1878]

## "Large disturbance voltage stability assessment using extended Lyapunov function and considering voltage dependent active loads"

The main concern of this paper is the proposal of an extended Lyapunov function (ELF) for a power system model that does not have Lyapunov function in the usual sense. More precisely, an ELF is proposed for a network preserving model where both, the active and reactive load powers depend on voltage. Then the proposed ELF is used for short term stability analysis including voltage and angle instability phenomenon. The results show that the proposed function can be used to obtain good estimates of the critical clearing time. [C1879]

## "Polar loop transmitter for GSM/GPRS/EDGE"

An EDGE transmitter using a nonlinear GSM type PA is presented. It is based on a polar loop architecture that employs separate feedback control of the amplitude and the phase of the output signal. With this approach, the problems with AM-to-PM as well as AM-to-AM of the nonlinear PA are essentially eliminated. There is no mode change between GMSK and EDGE, and the transmitter operates seamlessly in multi-slot EGPRS. The polar modulation transmitter meets all the GSM type approval requirements for both EDGE and GMSK in the quad band (850/900/1800/1900 MHz). It is part of an RF subsystem which is in production. [C1880]

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## "The MTCR Scheme for the Integrated Multiple Rate Mobile Data Networks"

A multiple threshold channel reservation (MTCR) scheme that partitions the system channels into several regions according to call priority for multiple data rate services of the integrated WLAN and GPRS network is proposed. The effect of the overlaid WLAN area size on the traffic performance is investigated. The simulation results demonstrate that compared with the complete sharing (CS) scheme, the proposed MTCR scheme can provide the same new call blocking probability for the different data rate services and lower handoff failure probability in the integrated GPRS/WLAN networks [C1884]

## "Back Cover"

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## "The practical application of numerical modelling for the advanced interpretation of ground-penetrating radar"

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## "UWB signal bandwidth expansion and synthesis using Prolate and wavelet functions"

This paper discusses how to generate UWB signals and extend their bandwidths using Prolate Spheroidal and wavelet functions. It also compares the achievable bandwidths. Bandwidth synthesis and expansion in the frequency domain is proposed based on convolution, superposition, modulation and multiplication. It is shown that convolution and addition of signal spectra can be used to expand UWB bandwidth with some functions by orders of more than 4.5 times. Daubechies wavelets are used in this paper. [C1890]

## "Introduction of 3rd generation wireless services in a multi-enterprise VPN environment: case of the port of Rotterdam"

The needs as well as the bottlenecks are analyzed in the deployment and use of wireless services in a networked environment of companies sharing some common supply chain processes. The specific case is the multi-enterprise networks around the port of Rotterdam, researched as part a large project on value-added wireless services in this environment, sponsored by KPN mobile. New services, operational requirements, decision processes as well as tariffs and organizational problems are reported. [C1891]

## "The effect on familiar mobile device and usage time on creating perceptions towards mobile services"

The adoption patterns for new technology such as mobile services are essential to understand for developing them further. Hence, it is important to study how willing people are to try new mobile services and do "facilitating" conditions have an effect on the consumers' adoption readiness. This study analyses how the mobile devices and the initial trial time used effect the initial mobile service usage experience and how this experience affects the likelihood of continuous usage. We will argue that the duration of the trial does not effect consumers' perceptions about mobile services when first trying them out, but familiarization of the device used has an impact on experience. We will go through the theoretical aspects of adoption of new technologies and specific aspects of the mobile business and present results from the field trial conducted last summer. The theoretical and practical implications are presented at the end of this paper. [C1892]

## "Analysis and calibration of gpr shielded antennas"

{no data available} [C1893]

## "Full-wave inversion of off-ground monostatic GPR signal focused on the surface reflection for identifying surface dielectric permittivity"

{no data available} [C1894]

## "GA design of broadband thin-wire antennas for GPR applications"

{no data available} [C1895]

## "A novel vertical handoff strategy for integrated IEEE 802.11 WLAN/CDMA networks"

The integration of WLANs and CDMA networks has recently evolved into hot issue. We propose a vertical handoff algorithm between WLAN and CDMA network. In this algorithm, a vertical handoff is classified into handoff decision making and MIP (mobile IP) registration process. Then, a handoff initiation is decided by the received signal strength (RSS). To reduce the unnecessary handoff probability, we consider a hand-off initiation model based on the criteria of RSS. As a mechanism of network selection, we also propose a context based network selection and the corresponding algorithms between WLAN to CDMA network, based on wireless channel assignment. We focus on a handoff initiation criteria which uses both the RSS and the network selection method which uses context information such as dropping probability, blocking probability, GOS (grade of service), velocity. As a decision making criterion, velocity threshold is determined to optimize the system performance. The optimal velocity threshold is adjusted to assign available channels to the mobile stations. The proposed scheme is validated by computer simulation. [C1896]

## "Direct Lyapunov method in the theory of replicator system with entropy-like applications"

In this report I summarize the results in the application of Direct Lyapunov method to the classical and generalized replicator systems. Based on this results it is shown that there are exist two types of Lyapunov functions: fitness-like and entropy-like. As example it'll be establish that practically all known entropy measures may be obtain from entropy-like Lyapunov function for replicator systems. [C1897]

## "Wireless link dimensioning: priority versus sharing"

The introduction of the multiple access service GPRS (general packet radio service) on GSM networks (global system for mobile communications) increases the use efficiency of radio resource through the sharing of data and voice users on the available channels in GSM networks. A comparison of two techniques for wireless link dimensioning of telecommunications networks is presented in this paper. The synthesis models are developed considering that the resources are shared between voice and data users. Schemes considering Markovian model and priority model are presented. Traffic overload simulations were made in order to analyze the behavior of the resulting quality of service parameters. [C1898]

## "Application-perceived throughput process in wireless systems"

Motivated by the central role and the importance of network throughput for the performance of net-worked applications and thus for user experience, this paper investigates the process of user-perceived throughput. This throughput is measured on rather small time scales and interpreted with aid of summary statistics, histograms and autocorrelation coefficients. The results including GPRS, UMTS and WLAN measurements reveal a clear influence of the network, seen from variations of application-perceived throughput on the one-second time scale, which has to be considered when choosing the right kind of network for a specific task. The different statistical metrics considered will later be used in our research to maintain the QoS of the service decided by the user. While theoretical throughputs are yielded as expected in UMTS, both GPRS and WLAN do not reach the promised throughput values. [C1899]

## "Wireless phone threat assessment for aircraft communication and navigation radios"

Emissions in aircraft communication and navigation bands are measured for the latest generation of wireless phones. The two wireless technologies considered, GSM/GPRS and CDMA2000, are the latest available to general consumers in the U.S. A base-station simulator is used to control the phones. The measurements are conducted using reverberation chambers, and the results are compared against FCC and aircraft installed equipment emission limits. The results are also compared against baseline emissions from laptop computers and personal digital assistant devices that are currently allowed to operate on aircraft. [C1900]

## "Framework architecture and mathematical optimization of vertical handover decision on 4G networks using mSCTP"

Wireless data services are expected to see in the forth generation (4G) network the same growth in demand that Internet services and wireless voice services have seen in recent years. This paper presents twofold purposes. The former, an architecture for heterogeneous networks that relies on mobile stream control transmission protocol to reach mobility value added services. The latter purpose is aiming to probe an investigation of a mathematical optimization of handover decision to ensure a seamless vertical handover over heterogeneous environment. The simulation of the multi-streaming feature of mobile stream control transmission protocol has shown the effect on reducing latency while users are moving through various networks. [C1901]

## "Perfect identity concealment in UMTS over radio access links"

Identity concealment is viewed as a standard identity privacy feature. UMTS provides partial concealment. This work extends the UMTS mutual authentication protocol such that the true identity of a mobile equipment cannot be discovered by an attacker eavesdropping over the radio access link interface. Three different solutions using aliases are proposed. Each of them provides perfect identity concealment to mobile equipment over the radio access link part of an UMTS connection. [C1902]

## "The lower characteristic ELF altitude of the Earth-ionosphere waveguide: Schumann resonance observations and aeronomical estimates"

Propagation of ELF fields in the Earth-ionosphere waveguide is treated in terms of a two-dimensional method with two complex characteristic altitudes as actual propagation parameters. The day-to-night variations of the lower characteristic altitude are estimated in two different ways: theoretically, on the basis of the parameter's physical model and representative day- and night-time conductivity profiles for the lower ionospheric D-region, and experimentally, from systematic observations of the background electromagnetic signal in the Schumann

resonance (SR) frequency range. A simple technique for considerably eliminating undetectable factors (the average current moment, the ionospheric properties over sources, etc.) and smoothing resonance effects in experimental data is applied. It is found that theoretical-aeronomical and experimental estimates are in a reasonable agreement, showing an approx. 20 to 25% day-to-night increase in the lower characteristic altitude within the lower SR frequency range (SR I to III). [C1903]

## "Model of diurnal/seasonal variations of ELF natural radio signal based on OTD data"

Knowledge of expected parameters of natural extremely low frequency (ELF) radio signal arriving from the global lightning activity to observatory is necessary when one looks for the signals originating from other sources, in particular, for the electromagnetic precursors of a future earthquake shock. The radio waves of seismic and cosmic origin might be expected in the bands of ultra-low (ULF, 0.01-3 Hz) and ELF (3 Hz-3 kHz), i.e., at frequencies where natural electromagnetic radiation exists in the Earth-ionosphere cavity. Radiation from the magnetosphere or from underground electric activity provides additional signals to be discriminated from the ordinary lightning induced pattern. We construct the model variations of natural ELF radio signal on the daily and monthly scales. The maps of global distribution of lightning flashes are used as initial data. These were recorded by the OTD satellite (optical transient detector) and by LIS (lightning image sensor). The model developed provides expected variations of the ELF power on the diurnal and seasonal scales thus describing typical behavior of Schumann resonance background. [C1904]

## "Managing PI-resources in 4G wireless systems: the opportunistic way"

Integration of different radio access networks will become a reality in the near future. Our interworking architecture assumes a ubiquitous primary network (the cellular one) and secondary networks used on an availability basis. Secondary networks form islands of coverage providing partial and intermittent (PI) resources with greater quality of service as the user moves along. This paper describes an application architecture that manages these resources in an opportunistic way. It makes use of the open service access (OSA) to control the core network and the OSA application servers to host the new applications that can take advantage of the PI-resources. These applications create a context for secondary networks and the context can survive losses of coverage. [C1905]

## "Project WISQY: a measurement-based end-to-end application-level performance comparison of 2.5G and 3G networks"

The imminent transition from 2.5G to 3G networks is generally considered to be a keystone for the future economic success of mobile telecommunications. This paper presents a practical comparison of GRPS and UMTS network performance, based on measurements in the live network of Mobilkom Austria and comparing the results to dedicated lab trials. Starting from raw TCP/IP download and upload transfer rates and ICMP Ping round-trip-times, we end up with page response times and file transfer rates for simulated HTTP/1.0 scenarios. The presented results are especially interesting for a realistic calibration of forthcoming 3G and beyond simulation tools. [C1906]

## "Systematic Performance Modeling and Characterization of Heterogeneous IP Networks"

Accurate measurement and modeling of IP networks is essential for network design, planning, and management. Efforts are being made to detect the state of the network from end-to-end measurements using different techniques and paradigms. In this paper we present a novel concept to use in the modeling of real network scenarios under measurement and analysis. We called this new concept service condition. We explain our proposal's motivations and we show how to apply the service condition concept to the study of real heterogeneous network scenarios. To show the real applicability of our proposal results from a performance evaluation study over real heterogeneous networks (where the integration of LAN, UMTS and GPRS is present) are given [C1907]

## "Step frequency synthetic radar techniques for free-space and sub-surface imaging"

{no data available} [C1908]

## "Optimal pricing for broadband wireless Internet access service"

This paper analyzes optimal pricing of two different platforms of broadband wireless access to the Internet when one provider uses 3G and the other uses WiFi using game theory. In this model, we assume an imaginary area in which two different providers compete with different service delivery platforms (3G vs. WiFi) and different network deployment strategies. They optimize their profit using different pricing in the same market. Several

scenarios are made based on (I) population density (big city and small city), (2) user's preference (bandwidth and coverage), (3) user's willingness-to-pay, (4) the number of hot-spots, (5) cost structure of deployment, and (6) a market penetration rate. Through an equilibrium analysis, we demonstrate which provider has a better market position and what level of pricing is optimal in the future competitive environment. [C1909]

## "A simulation study on the performance evaluation of UMTS with multi-service"

UMTS system supports a variety of services and applications, providing high data rate access to mobile terminals and cross-domain services to the users. It is divided into two groups: radio access network (RAN) and core network. Simulation results and experimental analysis helps to evaluate the performance, in which the simulation code designed on the top of UMTS networks. [C1910]

## "Roncalli-position dependent in-vehicle real time information for road users-an overview"

This paper describes the outcomes of the projects Roncalli and Roncall 12, two ITS projects that deal with road safety information for the driver and the trading of traffic data in general at a market place. A client-server architecture for delivering road safety information directly to the driver and the resulting services is described. Furthermore, the design of a market place for traffic data is outlined. [C1911]

## "Area wide hazardous goods monitoring on the TERN in Austria-project SHAFT"

This paper deals with scribes actions involving the deployment of transport telematic technologies to efficiently handle hazardous and heavy goods transports in an efficient manner first of all in Austria. It focuses on the project SHAFT (standardized hazardous goods transport alerting field trail), which develops a prototype for the monitoring of hazardous goods over the whole Austrian road network. As its major achievement, SHAFT would provide a system concept that allows all involved authorities and operators to get information about the position and the status of each heavy goods truck (HGT) using the Austria roads. [C1912]

## "A single package transceiver for quad band EGPRS (GSM/GPRS/EDGE) class 12 applications"

This paper describes a multi component mixed process "system-in-a-package" (SIP) transceiver suitable for wireless quad band EGPRS applications. The unique approach of pursuing this SIP enables faster time to market, mitigates risk and reduces customer's development cycle time. This solution offers antennae-to-bits functionality using less than 250mm2of valuable board space. The Tx and Rx performance results are shown and the technology developed to implement the transceiver solution is described. The module integrates three ICs; 0.18 µm RF-CMOS for RF/analog, 0.13 µm CMOS for mixed signal analog/digital/DSP and GaAs for integrated passive devices (IPD). It contains a quad band balun plus surface mount devices (SMD) for loop filter and RF bypass. It has the complete transmit line up from digital bits (as per DigRF standard) to power amplifier interface, as well as receive function from LNA inputs to bits (per DigRF standard). [C1913]

## "Automatic mobile sports highlights"

We report on our development of a real-time system to deliver sports video highlights of a live game to mobile videophones over existing GPRS networks. To facilitate real-time analysis, a circular buffer receives live video data from which simple audio/visual features are computed to detect for highlight-worthiness according to a priori decision scheme. A separate module runs algorithms to insert content into the highlight for mobile advertising. The system is now under trial over new 3G networks. [C1914]

## "Data acquisition system based on mobile sources"

Having in mind the current trend of industry, both civil and military, a data acquisition system (DAS) that was developed and tested is presented in this paper. [C1915]

## "Load-sharing in wireless multi-homed systems"

In the field of mobile communications, there coexist various access technologies that support wireless connections, such as Bluetooth, IEEE 802.11 and GPRS. These technologies are diverse in terms of bandwidth, delay, coverage area, etc. It is not uncommon that a mobile device is equipped with multiple wireless network interfaces to achieve efficient and ubiquitous communications. In wireless overlay networks, the mobile node can even utilize multiple network interfaces simultaneously to achieve greater QoS performance. This paper presents the design of such a system that supports multi-homed communications. In particular, we design the policy for mapping different network flows to different interfaces, and propose a load-sharing algorithm based on weighted-round-robin channel selection and jump-ahead packet scheduling. Simulation results show that the algorithm can

efficiently distribute data packets among multiple channels to achieve bandwidth aggregation. [C1916]

## "A non-linear binary integer programming model for location management design of GPRS"

Location management consists of the two activities, paging and location updating, both of which are structured around a subdivision of the network service area called the registration areas, either location areas or routing areas. The ways in which the service area is partitioned has a direct impact on the amount of radio bandwidth to be spent on location management. However, paging and location updating share an antagonistic relationship, and finding the optimal registration areas partitioning that strikes a balance between the two is a challenging design problem. Although the design of optimal location management has been studied extensively for GSM, it is surprising that little, or possibly no, attention has been given to the consideration of location management design for GPRS, given that it is fast becoming a de facto system. The objective of the paper is to find the optimal registration areas partitioning of a GPRS that minimises the total location management signalling cost. [C1917]

## "FDTD simulation of videopulse scattering by elliptic objects in different media"

The results of computer simulation of videopulse scattering in inhomogeneous media containing conductive cylinder objects are presented in this work. The finite difference time domain method (FDTD) and Mur's absorbing boundary conditions of second order were used to solve the problem. The GPR images of the researched objects were built. The analysis and comparison of scattered electromagnetic fields for different sizes and locations of conductive objects were carried out. [C1918]

## "Hand-held operational demining system"

The paper presents selected results from theoretical and experimental investigations concerned with radar backscattering from typical antipersonnel land mines (APL) in the frequency range of about 200 MHz to 8 GHz in order to improve the conventional metal detector demining technology presently still widely in use. [C1919]

## "Optimized coding schemes for wireless data communications"

This paper presents the design, the analysis and the optimization of some efficient channel coding schemes for the enhanced data services provisioning within next generation wireless systems, specifically the TETRA Release 2 system. Three different turbo codes schemes are compared: the parallel and serial concatenation of convolutional codes, respectively, PCCC and SCCC, and block turbo coding (BTC). Basing on the specific-services, some practical rules are drawn to lead to an efficient codes design, while respecting the physical and MAC layers features. By means of numerical simulations, SCCC are proved to outperform not only BTC but also PCCC, though the latter is the scheme widely accepted within the majority of communications standards. Besides, the advantages obtained both in terms of performance and complexity, afford the high-speed, interactive and QoS-oriented multimedia services supply. [C1920]

## "Optimizing profit and performance for multi-homed mobile hotspots"

Broadband Internet access in mobile hotspots (e.g. public transport vehicles) through high-speed on-board local area networks and mobile routers is becoming an increasingly popular area of research and development. Mobile hotspot operators can provide faster, cheaper, and more stable communication services to on-board passengers using the multi-homing technique; whereby the mobile router is connected to a diverse array of wireless access technologies (e.g., GPRS, UMTS, 802.11) through a multiplicity of wireless service providers. As the set of available access networks may change frequently during each trip, the challenge for the mobile hotspot operators is to decide on how to "best" distribute the user data traffic among the multiple access networks. In this paper, we proposed a new business model and a user traffic distribution algorithm that aims to maximize the profit for the mobile hotspot operator while providing an acceptable level of service. We also provide results from a detailed simulation study of this algorithm under various usage probability distributions. [C1921]

## "Design and analysis of GPRS-WLAN mobility gateway (GWMG)"

This paper presents the design and analysis of GPRS-WLAN mobility gateway (GWMG) for the integration of GPRS and wireless LANs (WLANs). The proposed architecture leverages mobile IP as the mobility management protocol over WLANs. The interworking between GPRS and WLANs is achieved by the GWMG which resides on the border of GPRS and WLAN systems. The design goal is to minimize the modifications in GPRS and WLANs as that both systems are widely available in the markets already. By deploying the GWMG, users can seamlessly roam among two systems. Both mathematical analysis and simulation are developed to analyze the performance. The proposed GWMG has also been implemented in a commercial GPRS system. The results

show that the GWMG could achieve the design goal to effectively integrate GPRS and WLANs. [C1922]

## "Addressing of software downloads to reconfigurable terminals in third-generation mobile networks"

Over-the-air software download is a key enabler for many aspects related to the reconfiguration of terminals based on software-defined radio (SDK). In this contribution, mechanisms for advertising the availability of a software upgrade to a group of SDR terminals are evaluated. In order to exploit efficiencies in terms of transmission and processing, addressing strategies that allow the subsequent download to be performed in a multicast fashion are considered. A novel scheme for advertising a software download to only those terminals that are targeted by the download is introduced. Based on a cost analysis, it is shown that the proposed scheme performs favourably compared with other viable schemes for performing software upgrade announcements. [C1923]

## "Packet-level error models for digital wireless channels"

Packet-level error models have great significance for the design and performance evaluation of higher layer wireless communication protocols. These models aim to characterize the statistical behavior of bursty packet error sequences encountered in digital wireless channels. In this paper, target packet error sequences are generated by computer simulations of a coded General Packet Radio Service (GPRS) system with a typical urban (TU) channel and co-channel interference. A general design procedure of a generative model is then proposed by using a properly parameterized and sampled deterministic process with a threshold detector and two parallel mappers. Simulation results indicate that the proposed deterministic process based generative model (DPBGM) allows us to approximate very well the characteristics of the target packet error sequences with respect to the gap distribution (GD), error-free run distribution (EFRD), error cluster distribution (ECD), error burst distribution (EBD), error-free burst distribution (EFBD), block error probability distribution (BEPD), and packet error correlation function (PECF). Importantly, it is shown that both the accuracy and the efficiency of the suggested DPBGM outperform those of a widely used Markov model. [C1924]

## "Exploiting diversity to enhance multimedia streaming over cellular links"

Wireless wide area networks (WWANs) are becoming ubiquitous across most geographic regions, enabling simultaneous coverage from multiple providers. WWAN channels exhibit both uncorrelated and correlated behaviour on a variety of levels. In this paper we examine the statistical properties of WWAN links, and illustrate the benefits in heterogeneity that can be exploited to improve statistical throughput and multimedia quality. Our results are based on real network measurements. We describe the design and implementation of a high quality multimedia streaming application that implements WWAN streaming optimisations utilising unequal error protection coding techniques, and we evaluate the performance over an operational WWAN network. [C1925]

## "WebMODE: a framework for development of Web-based tools for management of educational activities"

Although there are many Internet-based educational applications available today, they usually do not allow functionality extensions, change or reuse. In this context, this paper presents a framework, based on the J2EE component architecture, for helping the development of more customizable educational applications. In order to reach its goal, it merges significant features from popular CMS (such as pluggable modules) to the MVC architecture, found in most popular frameworks for Web development. [C1926]

## "Simulation model of UMTS packet switched data transfer over UTRAN"

In this paper we examine the performance of packed oriented data traffic over the UMTS terrestrial radio access network (UTRAN). Performance measurement was done via simulation model for constant bit rate (CBR) traffic over dedicated channels (DCH) with different downlink bit rates and transmission time intervals (TTI) [C1927]

## "Indoor Localization Using Camera Phones"

Indoor localization has long been a goal of pervasive computing research. In this paper, we explore the possibility of determining user's location based on the camera images received from a smart phone. In our system, the smart phone is worn by the user as a pendant and images are periodically captured and transmitted over GPRS to a web server. The web server returns the location of the user by comparing the received images with images stored in a database. We tested our system inside the Computer Science department building. Preliminary results show that user's location can be determined correctly with more than 80% probability of success. As opposed to earlier solutions for indoor localization, this approach does not have any infrastructure requirements. The only cost is that of building an image database. [C1928]

## "Large-scale RTT measurements from an operational UMTS/GPRS network"

In this paper we present some observations about TCP RTT as captured in the live traffic of an operational GPRS/UMTS network. RTT samples are extracted from traces collected by passive monitoring the Gn interfaces of one of the major providers in Austria, EU. We compare results for GPRS and UMTS, and expose some methodological issues involved in performing this type of analysis, for instance the potential bias introduced by heavy users. We also explore the correlation of RTT with time-of-day. The primary motivation for this research is to gain a better understanding of the dominant causes that shape the behaviour and the distribution of RTT across the TCP connections that populate a GPRS/UMTS network. The results presented here are useful for the scientific community, for instance to set more realistic simulation scenarios for other research activities. In addition, RTT measurements as obtained by large-scale passive monitoring can be used in combination with other indicators to build a summary indicator of the performances experienced by the TCP users at the scale of the whole network, i.e. a global RTT-based KPI (key performance indicator). [C1929]

## "Real time charging negotiator (RTCN)"

General packet radio service (GPRS) provider wishes to enable charging for GPRS services that will be offered to prepaid users in mobile network. Real time charging negotiator (RTCN) and policy rating server (PRS) are two new nodes introduced in telecommunications network. RTCN converts the diameter SCAP (service charging application protocol) for charging into the specific protocol used by the prepaid system (PPS) for real-time charging of prepaid users. GPRS prepaid solution should enable charging of services such as wireless application protocol (WAP) browsing, e-mail, video streaming, Java download etc [C1930]

## "Improved channel estimation in TDMA by reproduction with applications in GSM/GPRS under co-channel interference"

Finding an estimate of the channel impulse response (CIR) by correlating a received known (training) sequence with the sent training sequence is commonplace. Where required, it is also common to truncate the longer correlation to a sub-set of correlation coefficients by finding the set of N sequential correlation coefficients with the maximum power. This paper presents a new approach to selecting the optimal set of N CIR coefficients from the correlation rather than relying on power. The algorithm reconstructs a set of predicted symbols using the training sequence and various sub-sets of the correlation to find the sub-set that results in the minimum mean squared error between the actual received symbols and the reconstructed symbols. The application of the algorithm is presented in the context of the TDMA based GSM/GPRS system to demonstrate an improvement in the system performance with the new algorithm and the results are presented in the paper. However, the application lends itself to any training sequence based communication system often found within wireless consumer electronic device. [C1931]

## "Multi-layer neural network for precursor signal detection in electromagnetic wave observation applied to great earthquake prediction"

Summary form only given. It is well known that the electromagnetic (EM) waves that radiate from the Earth's crust are useful for predicting earthquakes. We observe electromagnetic waves in the extremely low frequency (ELF) band of 223 Hz. These observed signals contain several undesired signals due to fluctuations in the magnetosphere or the ionized layer, lightning radiation from the tropics, and so on. This paper proposes a multilayer neural network (NN) using compression data for precursor signal detection. Input data are reduced by wavelet transform. Moreover, we discuss an implementation of the hidden layer. It is shown that the proposed neural network is useful for precursor signal detection. [C1932]

## "An encrypted mobile embedded surveillance system"

This manuscript addresses the design and implementation of an encrypted mobile embedded surveillance system, EMESS, including a wireless server and mobile devices. Not only the mobility of the hand-held devices, but also the surveillance system can work in a moving body, then, a real mobile surveillance system is provided. In the security applications of vehicles, EMESS also can provide the images of thieves and robbers to the vehicle owner. We complete the related works of EMESS and the corresponding application programs for wireless communication of hand-held devices. [C1933]

## "Performance evaluation of SCTP over E-GPRS air interface for HTTP traffic"

SCTP has been originally designed to transport PSTN signaling messages over IP networks. It does not suffer from the head of line blocking issue inherent to TCP due to its multi streaming functionality. This work

investigates the influence of the multi streaming when used to transport web pages in HTTP 1.0 transaction over SCTP. This solution is compared to the more classical case of HTTP 1.0 over TCP. Simulations results are obtained for a EGPRS air interface, for different cell loads and for a non congested network. Loss of data is only due to transmission errors. The results show that SCTP performs better than TCP when serveral streams are activated at SCTP level and that the multi streaming feature is not unfair for TCP. [C1934]

## "Airfield runway inspection using 3 dimensional GPR"

{no data available} [C1935]

## "Low latency optimisation of content based publish subscribe for real-time mobile gaming applications"

In recent years real-time multi player networked gaming has grown in popularity due to exciting challenges posed by competing with human opponents. It is therefore very likely that the introduction of more powerful portable wireless hand held devices will motivate a similar demand for fast action collaborative multi player gaming capabilities on those platforms also. In this paper we argue that the commonly used communication architectures for today's multi player gaming applications will not work in the mobile wireless domain. We address this argument by introducing our own architecture based on publish subscribe and structured peer to peer that offers a novel interest managed, spatially partitioned solution. Finally we evaluate this approach and suggest that an optimal solution also requires knowledge of both the network interface in use and of the underlying network topology. [C1936]

## "ZAL: Zero-Maintenance Address Allocation in Mobile Wireless Ad Hoc Networks"

The allocation of IP addresses in hybrid wireless networks is one of the most critical issues in all-IP converged wireless networks. The reason is that centralized IP address allocation mechanisms may not be available in networks comprised of heterogeneous mobile wireless devices. In this paper, the authors proposed zero-maintenance address allocation (ZAL), a fully distributed address allocation algorithm with extremely low communication overhead. ZAL outperforms existing solutions in many important aspects, and eliminates permanent duplication of IP addresses. ZAL is completely free from periodical maintenance messages, timeouts, delays, and modification of existing network protocols. Theoretically, it is proven that ZAL suffers negligible probability of temporary address duplication, while minimizing the usage of address space. In the experiments, addresses to a network of 480 nodes with no duplication of IP addresses when the size of available address space is 1024 (210) or larger can be allocated. Even for an available address space of size 512, in average, temporary address duplication can be resolved within 60 seconds after the node joins the network [C1937]

## "Position-adaptive uav radar for low-alfitude sensing applications"

First Page of the Article [C1938]

## "Mobile terminal location discovery schemes for a 'beyond 3G' inter-worked network"

An increasingly popular paradigm for beyond 3G (B3G) telecommunications considers clusters of co-operating networks, which offer the user seamless access through a range of technologies such as GPRS, UMTS, WLAN or DVB. We introduce a digital video broadcast (DVB) technology from the perspective of B3G interworked services, providing an overview of the technology and an introduction to the MobileVCE Core III project and our IoN (interworking of networks) UMTS-DVB interworked architecture. We present and analyse three original proposals for providing mobile terminal (MT) location discovery in an efficient manner across the interworked network and conclude that our proposed 'hybrid' UMTS plus DVB paging scheme offers promise for efficient MT discovery. Furthermore, we briefly introduce other aspects of research that must be addressed in order that our architecture proposal can function effectively. [C1939]

## "Effective TARO pattern generation"

TARO test patterns are transition fault test patterns that sensitize each transition fault to all of the outputs that can be reached from the fault location. We were not able to identify any ATPG tool that can generate TARO test patterns directly. This paper describes a technique to use an existing transition fault ATPG tool to efficiently generate TARO test patterns. This technique was used to generate TARO patterns for the ELF35 test chip. When these patterns were applied to the ELF35 chips, all of the defective chips were discovered (no test escapes). [C1940]

## "Presence and its effect on network"

Presence is the ability to provide real-time information about a user. Presence can be based on geography (i.e. information based on physical locations) or reachability (i.e. how a user can be reached based on the type of device used) or retrieving information intelligently (e.g. call forwarding in call centers). Multi-resource presence-aware communication, by definition, implies communication solutions that incorporate presence awareness at a device, user, and group level. The study of presence services lead to the fact that the means of transferring data is one of the most important factors while providing presence services. The auxiliary technology necessary to launch presence services is discussed in this paper. A careful study of the threats and impact on network resource consumption is presented in this paper, to overcome the fundamental hurdles of manageability and security. The issues discussed are useful for the service providers so that they are on the right side of the instant messaging (IM) revolution. This paper also focuses on inherent real-time nature of IM and presence and tries to logically bridge the gap between telephone and the rich data infrastructure. [C1941]

## "Improving the performance and reliability of wireless in mobile streaming media"

Delivering media to large numbers of mobile users present challenges due to the stringent requirements of streaming media, mobility, wireless channels and scaling, to support large numbers of users. In this paper, we study the major sources of packet delay in the GPRS wireless network. The wireless channels may be shared by other users, and may be afflicted by interference which leads to packet delivery over lossy channels and busy channels. We study the packet delay and channel sharing across the air interface of GPRS systems, based on channel availability. [C1942]

## "Simulative performance evaluation of a mobile peer-to-peer file-sharing system"

Peer-to-peer (P2P) file-sharing has become the killer application in the wired Internet and might also be highly attractive for mobile networks. In particular since UMTS operators are searching for new applications which do both: a) exploit the potential of the UMTS technology and b) motivate the user to adopt the new technology. In this work we are investigating the performance of an eDonkey-based mobile P2P file-sharing system by means of time-dynamic simulation. Mobile networks differ from wireline networks by the limited capacity of the radio link and the mobility of the users. P2P networks, in contrast, are overlays which consider the transport network in an abstract way. In a mobile environment, the question arises, whether the abstraction can be maintained and what will be the performance impact if there is any. We will show in detail how the mobile access technology (GPRS or UMTS), the churn behavior of mobile users, the file size of mobile specific content, and special infrastructure entities, such as a cache peer, influences the performance of the suggested mobile P2P file-sharing service. [C1943]

## "Extension of GPRS over optical networks"

General Packet Radio Service (GPRS) is a new service which provides packet radio access for users based on the Global System in Mobile Communications (GSM) technology. It is an important step towards packet switching paradigms in mobile communications. The integration of GPRS into GSM has created conditions to extend mobile communications over public packet networks, such as the Internet or corporate intranets where leased lines or virtual private networks (VPNs) are used to interconnect GPRS support nodes. A tendency now is to use the optical technology to transport data over public networks. In this case, dedicated optical channels or optical VPNs (OVPNs) are used to support GPRS over optical networks. This paper considers the extension of GPRS over optical networks. As the impact of GPRS roaming, a based-agent model is also proposed for dynamic management and configuration of OVPNs. [C1944]

## "Generic communication requirements of ITS-related mobile services as basis for seamless communications"

In order to meet user expectations and to be of efficient help for people using or implementing Intelligent Transport Systems and Services (ITS), mobile ITS-related services need efficient support from the underlying communication systems, which in turn requires profound knowledge of those needs. As a first step towards an optimal automatic choice of communication technologies in order to provide for seamless communications, this paper groups services into generic groups and presents a framework to classify their needs in terms of availability, performance, security and cost in a generic manner. These needs are consequently seen from the user's perspective, but formulated in a way such that they can be matched towards known network parameters. Upon comparing needs with offers, the feasibility of a certain communication technology for a certain type of service can be determined both proactively and reactively, which helps to automatically select the right kind of connectivity in order to yield the desired degree of availability, performance, security and cost. We motivate for instance the need for determining and monitoring application-perceived speeds, a multi-level security models and

the one-stop service concept. We also provide an example on how these needs can be matched to offers by different networks. [C1945]

## "Support of multimedia broadcast/multicast service in UMTS networks"

First Page of the Article [C1946]

## "Ultra wideband dual polarised arrays"

The paper describes two printed ultra wideband fixed-beam dual polarised arrays. The first consists of plain diamond dipoles, each with an integrated unbalanced-to-balanced transformer (balun), formed by a tapered microstrip line. The second array modifies the first by introducing a shorted Minkowski fractal pattern onto the diamond elements forming the dipoles. Both perform well over a 3:1 bandwidth with low cross-polarisation. The design and performance of these arrays are discussed. [C1947]

## "A facility for UWB antenna measurements in time domain"

The IRCTR, Delft University of Technology (TU Delft), Netherlands, and the Bandung Institute of Technology (ITB), Indonesia, have been collaborating in a research project on the development of ultra-wideband (UWB) antennas for ground penetrating radar (GPR) applications. In the research, a facility for UWB antenna measurements in the time domain is needed. The paper describes such a facility which has been developed at ITB in the framework of the collaborative project. The UWB antenna measurement facility has been developed based on a technique introduced and implemented by IRCTR (Lestari, A.A., PhD Dissertation, TU Delft, 2003). Additionally, a feature for measuring radiated transient fields using a vector network analyser (VNA) has been included due to the unavailability of time-domain measuring equipment, such as pulse generators and sampling oscilloscope. The measurement facility has been used for measurements of the radiated near fields and input impedance of the UWB GPR antennas developed by IRCTR and ITB (Lestari et al., Proc. 10th Int. Conf. on Ground Penetrating Radar, GPR 2004, vol.1, p.141-4, 2004). [C1948]

## "Small UWB antenna with improved efficiency for pulse radiation"

The paper describes an ultra-wideband (UWB) antenna developed for impulse ground penetrating radar (GPR) applications. The antenna is a modified bow-tie antenna designed for short-range GPR applications such as road inspection and non-destructive testing of concrete. For these applications, the transmitted pulses should have minimal ringing to avoid masking of targets. This can be achieved by the application of resistive loading at the expense of radiation efficiency. We have attempted to improve a conventional bow-tie antenna usually used in GPR by reducing the antenna size and minimizing ringing, while at the same time improving the antenna radiation efficiency. [C1949]

## "Real-time billing throughput analysis of wireless telecommunication systems"

Real-time billing is one of the most important functionalities in a telecommunication service system. In GPRS network, the load of billing traffic depends on the load of call traffic and the size of billing records. During busy hours, the GPRS network might not be able to transfer billing records on a timely basis if new billing records are generated too fast. This paper considers the capacity of the billing record collection and transfer system of the GPRS network. Stochastic timed Petri nets are employed to establish a template for the analysis of the capacity versus various factors. [C1950]

## "GPRS based power quality monitoring system"

A cost effective scheme was proposed to realize real-time power quality monitoring for remote distribution system. The key point is to realize the communication between monitoring substations and monitoring centre. The communication can be carried out based on general packet radio service (GPRS). And it has the merit of always on-line, flexible structure and low cost. The design scheme was applied to power quality monitoring systems and satisfactory results were achieved. The scheme can work where the monitoring substations were located in remote wild farms or on mountains. The communication method can also be used in applications where the data flow is not so heavy and there is difficult in wire communication. [C1951]

## "AAA solution for interworking between mobile networks and wireless LANs"

First Page of the Article [C1952]

## "Forecasting mobile market development"

First Page of the Article [C1953]

## "An approach to traffic engineering and dimensioning of GPRS networks"

First Page of the Article [C1954]

## "DualRTT: detecting spurious timeouts in wireless mobile environments"

Retransmission ambiguity, arising from delay spikes in a wireless mobile environment, results in poor TCP performance. Eifel improves the performance of TCP by using the timestamp option, which requires additional header bytes, resulting in increased overhead in bandwidth constrained wireless networks. Moreover, the destination needs to support the timestamp option. In this paper, we propose a new algorithm, called DualRTT, which increases the performance of TCP in the presence of delay spikes, without requiring any additional header bytes. It requires changes only at the sender, and hence is easier to deploy in the existing Internet infrastructure. It also does not require the destination to support the TCP timestamp option. Results show that DualRTT increases the performance of TCP, and also achieves a higher transport layer efficiency than previous algorithms. [C1955]

## "A mechanism for admission control of the input traffic to the UMTS backbone network"

As the demand for multimedia applications on the Internet grows, it is hoped that UMTS backbones supports different applications with QoS, mainly those that are sensitive to delay and jitter. In this paper, we propose a mechanism that makes the admission control of the ingress edge routers. Such a mechanism provides a differentiated treatment to the traffic of several flows in the network. The results obtained from modeling and simulation show that the proposed mechanism treats the incoming traffic in a differentiated way, offering a certain level of QoS [C1956]

## "Accessing ubiquitous services using smart phones"

The integration of Bluetooth service discovery protocol (SDP), and GPRS Internet connectivity into phones provides a simple yet powerful infrastructure for accessing services in nomadic environments. In this paper, we discuss the design and implementation of SDIPP, a protocol for provisioning services on smart phones. Although several service discovery protocols have been proposed earlier, such as SLP, Jini, UPnP, Salutation, they all have their own infrastructure requirements and target audiences, Bluetooth SDP is an on-the-fly service discovery protocol. However, it is not nearly as powerful as its counterparts. SDIPP works by augmenting Bluetooth SDP with Web access and personalization. Payment of services has been overlooked in the protocols proposed earlier. SDIPP provides a novel protocol for anonymous payment, based on the idea of Millicent scrips. We have implemented a few services to illustrate our protocol. We report on our experiences and experimental results. In particular, we analyze and provide an application level solution to the Bluetooth inquiry clash problem that was discovered in the process. [C1957]

## "Adaptive Inter-System Handover for Heterogeneous RF and IR Networks"

Due to the complementary nature of radio and optical wireless (infrared) both in capacity and coverage, the combined use of both for data transmission could have advantages over a single technique. Varying network and traffic conditions put a big challenge on the mobility management of such an integrated network. The strength of fuzzy logic is employed by proposed vertical handover (VHO) scheme to handle uncertainty and achieve an excellent performance under all studied circumstances. [C1958]

## "Evolution to 4G wireless: problems, solutions, and challenges"

Summary form only given. Today, there is a generally held view that the next step for wireless technology is a natural progression to support high data rates over a wide area and facilitate roaming among a variety of systems. 4G wireless has the potential to provide these features and many more, which can significantly change the way we use mobile devices and lead to a wide variety of new applications. However, such technology doesn't come without its challenges. Some of these challenge are radio access methodologies, mobility management across different networks and the physical and functional model to be employed. This paper aims to give an insight into these issues, outline some of the proposed solutions to these problems and identify some of the benefits of this technology. [C1959]

## "Performance modelling of GSM/GPRS cells with different radio resource allocation strategies"

In this paper, we present an analytical model for the performance evaluation of GSM/GPRS cells with different

resource allocation schemes. The presented model is based on the modified Engset model with a finite number of users generating ON/OFF sessions in the cell. The closed formula following from the model is applicable for calculating different performance parameters like user throughput, blocking probability and radio resource utilization. Our study is focused on two main radio resource allocation strategies: complete partitioning and partial sharing. [C1960]

## "Synchronous and multiplexed time slots and radio blocks allocation for mobile packet data networks"

This paper studies the radio resource allocation for GPRS (general packet radio service) downlink traffic supporting two class of mobile terminals with different bandwidth requirements. We proposed a complete time-slot partitioning and complete radio-block sharing scheme. The allocation strategy can not only characterize the practical multiplexing scheme but also provide high performance. By both theoretical analysis and computer simulation, the result showed that the proposed resource allocation strategy offers high utilization as well as low blocking probability to users under various traffic conditions. [C1961]

## "BlueMobile-a mobile IP based handoff system for Bluetooth, 802.11 and GPRS links"

Ad-hoc networks using Bluetooth technology has gained immense popularity among the networking community. Nowadays electronic devices like cell phones come shipped with Bluetooth. Whereas Bluetooth technology has certain obvious advantages like low power consumption and reliable connection but it suffers some inherent problems including low area of operation, limit of 7 slave devices per master device. 802.11 technology on the other hand, has a wider area of operation and therefore very useful as access points and higher bandwidth to the order of 11 Mbps in 802.11b. But 802.11 have higher power consumption than Bluetooth. Cellular networks have a much wider coverage in geographical area than 802.11. Complementing Bluetooth with 802.11 and cellular network technology like GPRS would solve the shortcomings of these three technologies. With this idea we designed a handoff system called BlueMobile to integrate Bluetooth, 802.11 and GPRS technologies, by introduction of a simple extension to the already existing mobile IP implementation. [C1962]

## "Mapping of file-sharing onto mobile environments: enhancement by UMTS"

Peer-to-peer (P2P) file-sharing has become the killer application in the Internet with respect to traffic volume which is even surpassing Web usage. This characteristic makes P2P commercially attractive to network operators interested in increased traffic. In parallel, the demand for wireless services has caused wireless networks to grow enormously. We assume that P2P file-sharing will be mapped onto mobile environments by its users. This results in a mobile P2P file-sharing service. In this paper, we examine the feasibility of the eDonkey file-sharing service in GPRS and UMTS mobile networks, detect problems of the interaction between P2P and the mobile network, and outline first solutions to overcome them. The goal is the analysis of feasibility for an Internet-based file-sharing application in mobile networks and to provide real-world measurements. The measurements have been carried out in networks of two German GPRS network operators and, for the first time, for a UMTS network. [C1963]

## "MOCHA: modular and configurable handset software architecture"

This paper describes Mocha, an open mobile S/W platform and application developed by Samsung Electronics. Mocha's key features are its efficiency (it fits in regular phones), its portability (it covers different stack/OS/chipsets for CDMA, EV-DO, GSM/GPRS, and UMTS), its modularity and configurability (it meets customers' varying needs), its extensibility (it can he adapted to include new features and interfaces), its interoperability based on de-facto standards such as OMA, 3GPP, 3GPP2, CDG; and its security (it can withstand the attack of malicious applications). Among these key features, in this paper, we outline the multimedia messaging service (MMS) that inspired this system and then describe its design, architecture, and prototype implementation. [C1964]

## "Application of ground penetrating radar technology for near-surface interface determination in coal mining"

The use of ground penetrating radar (GPR) for detecting near-surface interfaces is a scenario of special interest to the underground coal mining industry. The problem is difficult to solve in practice because the radar echo is often dominated by unwanted components such as antenna crosstalk and ringing, ground-bounce effects, clutter, and severe attenuation. These nuisance components are also highly sensitive to subtle variations in ground conditions, rendering the application of standard signal pre-processing techniques largely ineffective in the unsupervised case. As a solution to this problem, we develop a novel algorithm which utilizes a pattern

recognition-based approach using features derived from the bispectrum of the radar data. We show that, unlike traditional second order correlation based methods such as matched filtering which fail in known conditions, the new method reliably allows the determination of layer interfaces using GPR to be extended to the near surface region. [C1965]

## "Imaging of subsurface targets using a 3D quadtree algorithm"

The imaging of subsurface targets using ground penetrating radar (GPR) is becoming an increasingly important area of research. Conventional image formation techniques expend large amounts of computation to resolve a region fully, even a region of clutter. However, by using multi-resolution techniques, e.g, quadtree algorithms, potential targets and clutter can be discriminated in a computationally efficient way. Prior work has focused on the development of 2D quadtree algorithms for surface targets. For mine detection, target depth adds another dimension; thus, we have developed a 3D quadtree algorithm, and applied a multi-stage detector that uses the energy change between quadtree stages to discriminate target and clutter regions. This algorithm is then tested on computer-generated data, as well as experimental data collected from a model mine field. Results show that target location information can be obtained even under near field and small aperture conditions. [C1966]

## "Robust transmission of JPEG-2000 images over peer-to-peer mixed wired and wireless links"

Robust image transmission over mixed wired and wireless networks constitutes a significant challenge due to limited bandwidth, the error prone and time varying characteristics of the wireless radio channel and the highly dynamic nature of a heterogeneous network topology. The latest JPEG-2000 image standard provides efficient and flexible image compression based on coding an image into multiple quality layers. The paper presents a multi-quality transmission scheme in a distributed network architecture for robust transmission of JPEG-2000 images over a peer-to-peer mixed wired and wireless link. The network is ad-hoc in nature, with each peer within the network sensing each of the others for best effort image transmission. Experiments over various distributed mixed wired and wireless network topologies show that this scheme guarantees successful image transmission as long as good links are available among peers, even though the direct link between initiating and destination peers may be congested or broken. The scheme improves end-to-end processing time when more intermediate peers are available in the network. The advantages of employing multiple layer image transmission are: (1) non-initiating peers are allowed to participate in image routing and to share the additional bandwidth with fair QoS support, which is especially beneficial in the low bandwidth network architecture involved, such as GPRS; (2) cost-effective solutions are provided for visual communications among ad-hoc mobile peers with smaller screen-size and lower processing power. [C1967]

## "A proxy-based framework to enhance user level performance of GPRS/UMTS networks"

This paper presents a proxy-based framework for Internet access through GPRS/UMTS networks. The proxy, deployed at the network boundary, is able to employ some scheduling strategies to assist the wireless network in charge of incoming traffic according to system capacity and user demand. In particular, we investigate the system performance on flow level and consider the impact of some user behaviors. The objective is to maximize utilization of the network by exploiting the property of delay tolerance, and to improve user-level performance such as response time. In addition, the proxy splits TCP connections into two halves, the wired and wireless sides. The TCP stacks on the wireless-facing side of the proxy can be modified to enhance the performance over the wireless link, while keeping compatibility with the conventional TCP implementations on mobile hosts. The effectiveness of this approach is illustrated by analysis and simulations. [C1968]

## "Analysis and experimentation over heterogeneous wireless networks"

Wireless and mobile networks represent an enabling technology for ubiquitous access to information systems. However, there are critical issues that still prevent the widespread use of these technologies. In this paper we analyze and discuss our experience over a real ubiquitous network testbed capable to provide a seamless hand-off among heterogeneous networks. We describe Mobile IPv6/IPv4 interoperability and an efficient mechanism, based on link-layer information, for a seamless handoff among wired and wireless networks. We present the solutions adopted in setting up a real testbed and provide an evaluation of the observed performance, including a characterization of interoperability among three wireless access network technologies: 802.11 WLAN, GPRS, and UMTS. [C1969]

## "IMS-based push-to-talk over GPRS/UMTS"

This paper reports the design of a push-to-talk service operated over a GPRS/UMTS network (push-to-talk over cellular-PoC). The new service was built based on the 3GPP IP multimedia subsystem (IMS). We discuss the key design decisions made for our solution and describe how the IMS supports the new service. The

contributions of this paper are: [1] the verification of the overall PoC approach through an implementation; [2] a discussion of design details that were not defined in the original PoC specifications; and [3] the measurement results achieved in a live network based on existing GPRS access technology. [C1970]

## "Simplifying mobile commerce through a trusted transaction broker"

Due to the emergence of 2.5G and 3G networks, the mobile Internet has evolved to a high bandwidth, reliable, dependable medium for accessing information. However, in spite of this, mobile commerce (m-commerce) does not enjoy the same acceptance as e-commerce. Commercial transactions over mobile devices remain at a low level, since it is difficult to build a trust infrastructure purely based on the mobile Internet. There needs to be an interim solution, which can provide convenience, trust and confidentiality in m-commerce transactions. As in a normal e-commerce transaction, it requires to give out accurate information about the credit card, such as number, provider, expiry date, names, authorization code, etc. This information is transmitted to the payment gateway in a secure encrypted manner. This paper presents a method to enable people to carry out day-to-day m-commerce transactions with minimal effort but in a trusted and secure manner, thus enabling m-commerce to become integrated into the daily lives of mobile users. [C1971]

## "Anticipatory approach at the MSR level in GPRS architecture"

The increased demand for wireless data access at comparatively lower cost and varied environment (rural and urban setup) with capacity to integrate with universally and commercially acceptable GSM 2G mobile networks led to new coding schemes like GPRS 2.5G (packet-switched-service), being the most acceptable one. The focus of our paper is on efficient GPRS access by making an anticipatory cache at the MSR level and exploiting the parameters of GPRS phase I with other identifiable variable parameters of the cell based structure at the link layer. By using a simple application at the MH (mobile host) and verifying this information with base transceiver stations (BTS) we can find the nature of loss in the network and try to minimize the damage arising out of such a situation, thus making access possible even at vehicular mobility rate and other varied environments. [C1972]

## "GPRS measurement methodologies and performance characterization for the railway environment"

The railway environment presents a unique challenge for cellular radio coverage. European cellular operators, among others, have realized the potential of the mobile user on railways and have constantly sought to improve the performance of cellular networks to accommodate current and next generation wireless services. Improving cellular coverage and services on railways is becoming increasingly important, considering the serious efforts of various European nations to boost public rail usage. However, performance limitations that certain environments such as railways might place on current technologies such as 2.5G general packet radio service (GPRS) have yet to be accurately verified. This paper highlights operational challenges and introduces strategies for defining, measuring and verifying GPRS key performance indicators (KPIs) on railways, describes manual and automated field-testing concepts, and presents selected KPI results from a trial campaign conducted in the UK. [C1973]

## "Mobile 4-in-6: a novel IPv4 / IPv6 transitioning mechanism for mobile hosts"

It is becoming increasingly apparent that the IETF mobile IPv6 protocol will have a role to play in future mobile and wireless networks. However, it is extremely likely that even after a real world deployment of IPv6, a considerable number of 'legacy' IPv4 applications and devices will remain in regular use for many years to come. Recently, much work has been focussed on developing protocols and tools to ease the transition from IPv4 to IPv6, yet despite mobile systems being one of the primary motivations for IPv6 deployment, none of these protocols and tools are designed to operate in a mobile environment. This paper documents the motivation, design, implementation and experimental evaluation of mobile 4-in-6, a mobile aware IPv4/IPv6 transitioning technology based upon the mobile IPv6 standard, that provides transparent support for IPv4 only applications in IPv6 only environments [C1974]

## "A study on SIP session timer for wireless VoIP"

The session timer mechanism for the session initiation protocol (SIP) has been proposed to track the states of the communicating sessions for proxy servers. Upon the occurrence of the session failure (e.g., radio link disconnection), the proxy server can quickly release the resources allocated for the failed session by using the SIP session timer. Based on the SIP session timer, we propose a dynamic session refreshing approach to adjust the session timer depending on the radio link conditions for wireless VoIP subscribers. The study indicates that with our dynamic session refreshing approach, the session failure can be efficiently detected without a considerable increase of signaling traffic. [C1975]

## "Current trends and challenges towards wireless Internet"

The wireless Internet, which was a dream just a few years ago, is now progressing so fast that it could revolutionize the whole framework of the telecommunications industry. In this paper we firstly review the main related network technologies and then note some of the current trends and challenges toward wireless Internet. These trends include those within the telecommunications technology as principles and those within the Internet applications. By 'network technologies' we refer to either the cellular or wireless networks being able to provide Internet access (such as 3G or WLANs), while by using the terms "challenges" we refer to those issues that will play the most important role in coupling Internet services with network architectures (such as mobility management or QoS). [C1976]

## "Mapping of file-sharing onto mobile environments: feasibility and performance of eDonkey with GPRS"

Peer-to-peer (P2P) file-sharing has become a major application in the Internet with respect to traffic volume which is even surpassing Web usage. This characteristic makes P2P commercially attractive to network operators interested in increased traffic. In parallel, the demand for wireless services has caused wireless networks to grow enormously. We assume that P2P file-sharing will be mapped onto mobile environments by its users. This results in a mobile P2P file-sharing service, which we denote as mobile P2P. In this paper, we examine the feasibility of the eDonkey file-sharing service in GPRS networks, detect problems of the interaction between P2P and the mobile network, and find solutions to overcome them. Furthermore, this paper measures and analyzes the characteristics of mobile P2P and gives first empirical performance values. Summarizing, the goal is the analysis of feasibility for an Internet-based file-sharing application in a mobile network and to provide first measurements from two real-world networks. [C1977]

## "Effects on bacterial cells by exposure to VLF magnetic fields"

In this study, an investigation on whether very low frequency magnetic fields (VLFMF) or induced eddy current cause DNA damage or physiological abnormality in the bacterial cell using lysogenic bacteriophage λ. The bacteriophage λ can multiply by either a lytic or a lysogenic pathway in the E. coli bacterium. When the bacteriophage is growing in the lysogenic state, damage to the cell (e.g. DNA damage by exposure to UV light or mitomycin C) causes the integrated viral DNA (prophage) to exit from the host chromosome and shift to lytic growth, regarded as bacteriophage induction. In this study, the E. coli W3130 lambda_857, which have lambda of lysogenic state (as prophage), was exposed to extremely low frequency (ELF) magnetic fields and the induction of phage was measured by plaque assay. By exposure to 1 mT magnetic fields for about 8 hours, the bacteriophages shifted to lytic growth 1.34 times as often as control. On the other hand, the mitomycin C, mutagenic reagent, showed a shift in bacteriophages from lysogenic to lytic growth 46-times as often as control in this system. These results suggest the following two points: (1) VLF magnetic fields (20 kHz, 1 mT) dose not induce DNA damage strongly in the bacterial cell as mitomycin C action. (2) The induced eddy current rather than VLF magnetic field causes some damage to E. coli cells and the prophages are induced to lytic growth. [C1978]

## "Early-time GPR signal analysis: implications for water content measurement"

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## "Steam injection pilot study in a contaminated fractured limestone (Maine, USA): modeling and analysis of borehole radar reflection data"

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## "Validity of ray tracing in modeling ground probing radar for detecting groundwater in the desert"

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"Clutter reduction and detection of landmine objects in ground penetrating radar data using singular value decomposition (SVD)"

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"Joint IRCTR/TNO-DS&S measurement campaign for AP-mine detection with VIR GPR"

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"Environmental and agricultural applications of GPR"

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"Modeling and monitoring permafrost thawing in a controlled laboratory experiment"

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"Effective permittivity of layered samples"

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"On the attenuation factor measurements of glass beads/magnetite mixtures and on the effective frequency evaluation by time domain reflectometry"

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"Channel-based connectivity management middleware for seamless integration of heterogeneous wireless networks"

This paper presents a middleware architecture for the adaptable management of heterogeneous wireless resources. The main application of the proposed architecture is the optimal utilization of multiple wireless access networks, in particular integrated WLAN and 3G environment. The architecture is based on the adaptive maintenance of communication channel during its creation as well as I/O operation. We present our architecture and describe an implementation of a system based on the architecture. Experiments were performed in a GPRS-WLAN integrated environment. Performance metrics were measured and analyzed. [C1999]

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## "IEEE Proceedings of the 3rd International Workshop on Advanced Groupd Penetrating Radar-Cover"

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## "Proceedings of the 3rd International Workshop on Advanced Ground Penetrating Radar-IWAGPR 2005-Title Page"

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## "Proceedings of the 3rd International Workshop on Advanced Ground Penetrating Radar-IWAGPR 2005"

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## "Wearable ECG recognition and monitor"

ECG (electrocardiogram) recognition and monitor are inevitable to trace and determine heart diseases. As self-health being focused on and social medical grade being progressed, ECG monitors with features such as portable/wearable, wireless, use-friendly, low-cost and convenient at home, are more and more necessary. Unfortunately, such kind of equipments couldn't be got currently. Thus, wearable ECG recognition and monitor instrument is developed. Palm, mobile phone and PC could be acting as display and relay terminals, where ECG signals would be transmitted to service center (e.g. hospital) through GSM/GPRS/CDMA and Internet. After introducing system architecture, the paper describes software design, direct ECG recognition method with morphology parameters based on specialists' experiences. The first generation product includes wearable monitor and palm is ready now, which has huge market. [C2005]

## "Testing system for measuring and calibrating the transmission power of EDGE mobiles"

In this paper, we propose an alternative process in measuring and calibrating (M&C) the transmission power of EDGE mobiles. First, we propose using a fixed symbol sequence to modulate the carrier of the 8-PSK modulator. Such an arrangement can significantly reduce the number of 8-PSK bursts required in computing the transmission power of the mobile, thus reducing the M&C time. In addition, we re-arrange the transmission of the GMSK and 8-PSK data bursts such that the transmission power of the two corresponding modulators, namely the GMSK modulator and 8-PSK modulator, can be measured within one GSM frame duration. Furthermore, the power levels of the modulators are adjusted automatically between consecutive GSM frames such that all power measurements can be accomplished in the shortest possible time. By reducing the M&C time, the production throughput of the mobiles can be improved. Finally, the new process is implemented in the testing equipment and the actual M&C time based on the new process is presented and compared with that of the conventional process. [C2006]

## "The circuits and physical design of the synergistic processor element of a CELL processor"

A 32b 4-way SIMD dual-issue synergistic processor element of a CELL processor is developed with 20.9 million transistors in 14.8mm2using a 90nm SOI technology. CMOS static gates implement the majority of the logic. Dynamic circuits are used in critical areas, occupying 19% of the non-SRAM area. ISA, microarchitecture, and physical implementation are tightly coupled to achieve a compact and power efficient design. Correct operation has been observed up to 5.6GHz at 1.4V supply and 56°C. [C2007]

## "Modeling of ground-penetrating radar for detecting buried objects in dispersive soils"

A three-dimensional (3-D) time-domain numerical method is used for simulation of ground penetrating radar (GPR) on Debye-dispersive soil. The radar unit is modeled with two transmitters and one receiver in order to eliminate undesired signals. The impact of radar frequency, soil parameters and object depth upon the ability to detect buried targets is investigated through several FDTD simulations. [C2008]

## "Deep ground penetrating radar (GPR) WIPD-D models of buried sub-surface radiators"

The proliferation of strategic subsurface sanctuaries has increased the need for enhanced remote sensing techniques providing for the accurate detection and identification of deeply buried objects. A new ground penetrating radar (GPR) concept is proposed in this paper to use subsurface radiators, delivered as earth penetrating non-explosive, electronic "e-bombs", as the source of strong radiated transmissions for GPR experiments using ground contact or airborne receivers. Three-dimensional imaging techniques for deeply buried targets are being developed based on two-dimensional synthetic aperture radar (SAR) data collection techniques. Experiments over deep mine shafts have been performed to validate the 2D SAR processing algorithms. WIPL-D models have been used to verify the significant enhancement in the received signal-to-noise ratio obtained by burying the transmitter under the surface of the earth. Simple ray-tracing techniques have also been used to confirm the enhancements. [C2009]

## "Workshop Organization"

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## "Mine action: status of sensor technolo.gy for close-in and remote detection of antipersonnel mines"

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## "Affordable gpr technology"

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## "Background subtraction in the frequency domain for focusing ground-penetrating radar data"

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## "Wavelet packets for GPR detection of non-metallic anti-personnel land mines based on higher-order-statistic"

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## "Foreword"

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## "International Scientific Review Panel"

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## "Automated selection of fusion parameters through a segmentation of multi-sensor ROC curves"

This research builds upon a mathematically proven optimal decision fusion technique exploiting the Neyman-Pearson (N-P) test. The algorithm requires three parameters for each sensor input, so the number of fusion parameters increases linearly. A new method presented in this paper, relies on two meaningful external parameters defined by an operator. They trigger an automated selection of the remaining internal parameters for all sensory inputs. The outcome is a set of quasi-optimal parameters. The method exploits a segmentation and alignment of individual ROC curves into similar regions of compatible confidence levels. Experimental results are shown for synthetic test data and real-world mine hunting data. This new method allows for an automated dynamic integration of system components into a system, gives consistently better performance, and requires two parameters only regardless of the number of sensor inputs. [C2021]

## "Non parametric target tracking in non uniform clutter"

Target tracking algorithms have to operate in an environment of uncertain measurement origin, in the presence of randomly detected target measurements as well as clutter measurements from unwanted random scatterers. Most data association target tracking algorithms incorporate a measure of clutter density. Quite often the clutter density is non-uniform, especially in ground target tracking, or when the radar beam "touches" the ground. Non-parametric target tracking assume a priori unknown clutter density, however the assumption is that it is uniform within the selection gate. Complex selection gates, which are created for a number of multi-scan and/or multi target tracking algorithms, can encompass a large volume where the clutter density will vary widely. We propose an alternative clutter density estimation scheme for non-parametric target tracking, which does not assume uniform clutter within the selection gate. Instead, clutter density is estimated on a measurement by measurement basis, prior to a posteriori target track update. The scheme is adaptive and has no bias in estimated inverse of clutter density at the measurements coordinates. A simulation study shows the benefits of adaptive clutter estimation based on single target tracking algorithms in an environment of heavy and non-uniform clutter. [C2022]

## "Multi hypothesis track extraction and maintenance of GMTI sensor data"

This contribution presents an application of a multi hypothesis tracking (MHT) algorithm to the case of ground moving targets detected by GMTI (ground moving target indicator) sensors. We describe in some detail how the following tracking tasks are performed: track extraction, prediction, filtering, track maintenance and retrodiction (smoothing). The experimental implementation has been successfully tested in a NC3A (NATO Consultation, Command and Control Agency) testbed with simulated GMTI data of various ground surveillance sensors. Ongoing developments and improvements are discussed. [C2023]

## "Unusual signal detection using electromagnetic wave observation with multi-layer neural network"

It is well known that the electromagnetic (EM) waves that radiate from the earth's crust are useful for predicting earthquakes. We observe electromagnetic waves in the extremely low frequency (ELF) band of 223Hz. These observed signals contain several undesired signals due to fluctuations in the magnetosphere or the ionized layer, lightning radiation from the tropics, and so on. We proposed a multi-layer neural network (NN) with a compressed data. The proposed NN is useful for precursor signal detection, however, detection sensitivity is not discussed enough. In this paper, the artificial signal is used for obtaining a detection rate. This uses as a parameter to avoid an over-fitting. Moreover, the uniform random number (RN) is added to input signal for improving generalization capability. It is shown that proposed NN is effective to improve a generalization capability of the problem of a precursor signal detection. [C2024]

## "Extending the ArchC language for automatic generation of assemblers"

In this paper, we extend the ArchC language with new constructs to describe the assembly language syntax and operand encoding of an instruction set architecture. Based on the extended language we have created a tool which can automatically generate assemblers. Our tool uses the GNU Binutils framework in order to produce the assembler, generating the architecture dependent files necessary to retarget the GNU assembler and the Binutils libraries. We have generated assemblers for the MIPS-I and SPARC-V8 architectures based on ArchC models using our tool. The assemblers generated for both architectures were compared with the default gas assemblers for a set of files taken from the MiBench benchmark, and the ELF object files generated by each pair of assemblers were equivalent in both cases. [C2025]

## "A Multi-Sensor System for Mobile Services with Vision Enhanced Object and Location Awareness"

We describe a system which proposes a solution for multi-sensor object awareness and positioning to enable stable location awareness for a mobile service in urban areas. The system offers technology of outdoors vision based object recognition that will extend state-of-the-art location and context aware services towards object based awareness in urban environments. In the proposed application scenario, tourist pedestrians are equipped with a GPRS or UMTS capable camera-phone. They are interested whether their field of view contains tourist sights that would point to more detailed information. Multimedia type data about related history might be explored by a mobile user who is intending to learn within the urban environment. Ambient learning is in this way achieved by pointing the device towards the urban sight, capturing an image, and consequently getting information about the object on site and within the focus of attention, i.e., the user's current field of view. The described mobile system offers multiple opportunities for application in both mobile business and commerce, and is currently developed towards an industrial prototype [C2026]

## "Reconstruction of the Heterogeneity Distribution Outside of the Scanning Region in Subsurface Radiotomography based on the Synthetic Aperture Radar"

The radiowave systems for detection and investigation of hidden underground objects are actively developed. One of the most effective systems for solving of this task is the subsurface radiotomography based on the synthetic aperture radar technology (SAR). Using of non-directed antennas allows detecting back-scattered radiation from all points of investigated medium. Thereby, while scanning of some region of surface by SAR receiver antenna also receives back-scattered radiation from points outside of the scanning region. This fact gives the ability of heterogeneities distribution reconstruction outside of the scanning region. Heterogeneity reconstruction algorithm in the scanning region is based on antenna system focusing. [C2027]

## "m-Mag: The Mobile Magazine Services Platform"

The m-Mag platform advances the state of the art in mobile services by bridging the gap between mobile Operators and content Publishers, enabling the creation of a new category of mobile service called a mobile magazine. An m-Mag mobile magazine is a next generation mobile publishing service that is made available from a mobile operator's portal, that is integrated with value added mobile data services and that uses the operator's billing capabilities to charge consumers for access to the magazine. Using Parlay/OSA as an open approach, the m-Mag platform can integrate into an operator's network using standardised APIs and is portable across different operator networks. A discussion of the commercial potential analyses the route to the market [C2028]

## "Low cost multisite testing of quadruple band GSM transceivers"

Multisite low cost production testing of quadruple band GSM/GPRS RF transceivers was designed for a low cost mixed signal tester with new RF sources, frequency mixing circuits, combiners, splitters, and switches. Special design considerations for the device under test load board have reduced cross talk between parallel sites and signal layout traces. Final production testing on dual sites have shown that a low cost test solution as implemented has higher throughput and better capabilities in several of the key tests on the device specification for GSM/GPRS transceivers, such as the Gaussian minimum shift keying (GMSK) modulated spectrum mask test, Synthesizer frequency lock time and transmitter frequency settle time tests, as well as receive channel noise figure tests [C2029]

## "Mobile Price Comparison Services"

Price comparison services are becoming more and more important. Besides their use in electronic commerce today, they will also provide prices for local retail shops in the near future. More than 200 services are online worldwide. But today only few services can be comfortably used on small devices such as PDAs, smart-phones and cellulars via SMS, WAP, iMode, GPRS/UMTS or WLANs. As a result of unique Web pages provided by these services or microbrowsers on small devices full functionality, easy personalization, secure payment and location based services are available. Despite broad mobile supply of German-speaking price comparison services, till now, mobile price comparison could not become widely accepted yet. This paper addresses the state of art concerning Mobile Price Comparison Services. It presents various limiting factors, and outlines what needs to be done to get mass acceptance of mobile price comparison services [C2030]

## "Time-frequency representations for classification of ground penetrating radar echo signal"

This paper deals with the classification of ground penetrating radar (GPR) echo signal using time-frequency representations. The algorithm fulfills automatically feature extraction and classification of the ground penetrating

radar echo signal. We first use auto-ambiguity function as signal representation, which does not use time-frequency smoothing kernel to reduce cross-term. Cross-term is interference for visualization interpretation, but for classification it may be valuable information. Then we use Fisher's discriminant ratio to rank the discriminant information of features, and in combination with using classification error rate of learning vector quantization neural network as evaluation function to select optimal features subset. Experimental results based on simulated and measured GPR data are presented. [C2031]

## "Imaging of stepped frequency continuous wave GPR data using the Yule-Walker parametric method"

Ground penetrating radar for humanitarian demining has a large bandwidth. It should discriminate small objects against a complex background. The stepped frequency continuous wave radar of IRCTR has a synthesized bandwidth of 4.5 GHz. Classical methods for generating an image of the subsurface include synthetic aperture processing for cross-range resolution and inverse Fourier transform to generate the range profile. This paper presents a novel scheme, based on Yule-Walker auto regression. This method is widely known as an estimator of the power spectral density based on time domain signals. But here it is interpreted as an estimator of the range profile based on frequency domain signals. The result is a significantly improved detectability and range-resolution if the signal is not too weak. The paper presents some results on the effect of the order of the Yule Walker model and a comparison with the MUSIC method [C2032]

## "Effect of the data pre-processing on GPR mine detector performance"

The performance of GPR as an anti-personal mine (APM) detector heavily depends on the quality of the acquired data. A scheme of the quantitative evaluation of the quality of the raw GPR data in terms of stability of certain parameters and the set of the procedures, which compensate the instabilities found are presented. We demonstrate the performance of the data pre-processing chain (DPPC), which includes spectral filtering of A-scans, control of the mutual alignment of B-scans, and time and voltage axis's instabilities compensation in the whole C-scan. The performance of the DPPC is judged both in terms of the stabilization of certain statistical parameters of the data, and by its effect on the receiver operation characteristics (ROC) curve [C2033]

## "UWB radar for human being detection"

UWB radar for detection and positioning of human beings in complex environment has been developed and manufactured. Novelty of the radar lies in its large operational bandwidth (11.7 GHz at -10 dB level) combined with high time stability. Detection of respiratory movement of a person in laboratory conditions has been demonstrated. Based on experimental results human being radar return has been analysed in the frequency band from 1 GHz till 12 GHz. Novel principle of human being detection is considered and verified experimentally [C2034]

## "Development of ground penetration radar using impulse technology"

We developed ultra-wideband impulse type ground penetrating radar (UWB-GPR) system with 100-300MHz frequency band at -10dB bandwidth. The prototype of the system was tested in real environment and 2D visualization of raw data was achieved. Experimental results show that UWB-GPR system has a good ability in detecting for buried metal objects between 0.5m and 3m depth under ground in domestic field. [C2035]

## "Alternating-sign windowed energy projection of SAR focused GPR data"

The automated detection of plastic-cased antipersonnel landmines in 3-D high-resolution UWB radar images is considered. The 3-D images are projected in different ways onto 2-D confidence maps, in which the automated APM detection is made by marking local maxima in the maps followed by thresholding. Specifically, we consider the confidence maps of the following types: energy projection (EP), windowed energy projection (WEP) and introduced here alternating sign windowed energy projection (ASWEP). The latter is shown to allow diminishing of the false alarms number in comparison for the other two techniques for most of the considered cases. The advantages of the new technique are described by means of receiver operator curves (ROC). The ROC curves are built for the datasets acquired over several minefield simulation sites under different environmental conditions [C2036]

## "Prioritisation of data partitioned MPEG-4 for streaming video in GPRS mobile networks"

With the advancement of multimedia systems and wireless mobile communications, there has been a growing need to support multimedia services (such as mobile teleconferencing, mobile TV, telemedicine, and distance learning) using mobile multimedia technologies. Despite the research done in the field of mobile multimedia,

delivery of real-time interactive video over noisy wireless channels is still a challenge for researchers. This paper presents a method for prioritising data partitioned MPEG-4 video in a way suitable for transmission over a mobile network. The effectiveness of the technique is demonstrated by examining its performance when the transport of the prioritized video streams can be accomplished using packet switching technology over the general packet radio service access network infrastructure. [C2037]

## "Ubiquitous video streaming through wireless overlay networks"

With the availability of various wireless link-layer technologies, such as Bluetooth, WLAN and GPRS, in one wireless device, ubiquitous communications can be realized through managing vertical handoff in the environment of wireless overlay networks. In this paper, we develop a ubiquitous video streaming system through wireless overlay networks. One of the main features of the developed system is that it can support seamless communications. In other words, the developed system enables wireless devices to roam among different wireless networks without affecting the ongoing multimedia applications. Another feature is that our developed video streaming application can be adaptively adjusted to match the significant change of wireless link characteristics due to vertical handoff. Our contribution lies in the integration of various existing techniques to build a real system. [C2038]

## "An Optimal Route & Vehicle Assignment Fleet Management System with Real-Time Monitoring"

This paper presents a GIS based fleet management system with optimal vehicle assignment. The system is designed on top of a mesh based communication infrastructure for the mobile nodes to communicate. Communication network comprises of multiple networks i.e. VHF gateways, GSM and GPRS network to ensure reliability. The mesh based communication approach enables easy deployment of the system in real world. OLSR routing protocol is used for establishing an ad hoc network for peer-to-peer communication which is best suited for the applications where the number of hosts is too large for normal network infrastructure to handle, like in transportation industry. The paper involves research in the fields of mobile communication and tracking in collaboration with state of the art technologies like GPS and GIS.GPS and GIS technologies are used for fleet tracking, monitoring and display of vehicle on the map. [C2039]

## "Efficient Techniques for the Evaluation of Low Frequency Magnetic Field in Buildings"

In this paper a model for the simulation of wire bundles has been presented. This model can be used to provide an estimation of the magnetic induction generated by an electrical switchboard. Moreover, a logical tree representation of a power network has been discussed. Such representation allows an efficient determination of the currents flowing into conductors from load demand. Hence, magnetic field generated by a power line network inside a building can be then easily determined. A real-life case study has been provided, showing a good agreement between simulation and measurement results [C2040]

## "A handy surveillance system for e-life applications"

This paper presents a handy surveillance system design and implementation for e-life applications. This system includes GPRS data communication, microprocessor control, I/O data processing, and energy management. A TCP/IP embedded GPRS module is adopted to simplify the circuit by activating using an 8051 microprocessor with memory. Through design process, this finish system is miniaturized into battery-supply for long lasting operation. Tests have been carried out to verify some important functions with reliability and stability [C2041]

## "Developing Mobile Services: Balancing Customer and Network Value"

Designing mobile services and the business models behind them is a complex undertaking. A business model can be seen as a blueprint of four interrelated components: service offering, technical architecture, and organizational and financial arrangements. How these different components are related to one another, is hardly been object of research. In this paper the connections between these components are explored by analyzing the critical design issues, e.g. targeting, branding and customer retention in the service domain, security, quality of service and system integration in the technology domain, network governance in the organization domain, and revenue sharing in the finance domain. These critical design issues are linked to each other and to expected customer value and expected network value in a conceptual model [C2042]

## "Utilization of human-computer interaction in wireless transmission of arterial pulse waveforms"

The shape of the arterial pulsations depends upon the thickness of the blood vessels and contractility of the heart as well as the state of the vascular smooth muscle in the vessel wall. Photoplethysmography (PPG) is by definition an optoelectronic method for measuring and recording changes in volume of a body part. The shape

and stability of the PPG waveform can be used as an indication of possible motion artifacts or low perfusion conditions. Furthermore, the photoplethysmogram reveals circulatory depression and arrhythmia. In the paper, we propose a system that allows wireless transmitting of peripheral arterial pulse waveforms with use of a GPRS network. Selected examples of results, which were obtained during investigations made on a number of real PPG signals, are presented. [C2043]

## "An extended energy function for voltage and transient stability analysis considering voltage dependent active loads"

The main concern of this paper is the proposal of extended Lyapunov function (ELF) for power system model that does not have Lyapunov function in the usual sense. The proposed ELF is used in angle and voltage stability analysis purposes considering the system loads modeled as voltage dependent terms. The proposed energy function was applied on a 3-bus test system. The results show that the proposed function can be used to obtain good estimates of the critical clearing time. [C2044]

## "The application development for third generation (3G) mobile telephones"

{no data available} [C2045]

## "Imaging of subsurface targets using a 3dDquadtree algorithm"

{no data available} [C2046]

## "Yapay acikli radar mantigi bazli degisik radar goruntuleme algoritmalari"

{no data available} [C2047]

## "Inverse problems of subsurface probing"

In order to improve the reliability of identification of subsurface areas and objects the approach of their geometrical and physical properties reconstruction is offered. Presented in this paper are the results of numerical simulation of the basic stages [C2048]

## "Ground return deembedding in stepped-frequency ground penetrating radar"

Two different signal processing techniques, namely a principal component analysis (PCA) and wavelet-based scan have been analyzed from the viewpoint of their viability for ground return removal in subsurface sensing [C2049]

## "Optimization of antenna spacing in antenna array for ground penetrating radar"

The optimal distance between transmitting and receiving antennas in the array for detecting antipersonnel mines buried at shallow depth has been determined. The scanning method with small step has been proposed [C2050]

## "Application of heuristic frequency optimizing GSM/GPRS networks"

Frequency optimization is one of unique and key works in GSM/GPRS network optimizing, and its theoretical basis is channel assignment problem (CAP). A practical heuristic CAP algorithm HFA is proposed. The algorithm ranks the calls in descending order of "assignment difficulty coefficients ADC". The concept of hotspot cells is introduced, and calls in hotspot cells are allocated radio channels at first. The rules to build the channel separation matrix are suggested. The performances of the proposed algorithm have been verified by the 21-cell benchmark. Based on the proposed CAP algorithm, frequency optimizing system "FOS" has been developed and applied to optimize the GSM/GPRS networks in several cities in Liaoning province. [C2051]

## "Consideration of UMTS-WLAN seamless handover"

By mutual complemented reason of wide coverage and high data transmission, the integration and handover of SG network and WLAN is regarded as an important function for 3G beyond (B3G) mobile communication systems. The seamless mobility is one of the basic requirements for handover between these heterogeneous networks. In this paper, we present a seamless handover mechanism for UMTS and WLAN within the framework of handover architecture, IP mobility and authentication mechanism. Firstly, we review the 3GPP-specific integration architecture of UMTS and WLAN, WLAN UE-initiated tunnel mechanism, IP mobility and authentication mechanisms of both networks. Then we propose the configuration of mobile IPv6 based UMTS-WLAN overlay network and the security mechanism for reducing the handover delay. Lastly we show the

operation of seamless handover in our proposed network model. [C2052]

## "A discrete time quad-band GSM/GPRS receiver in a 90nm digital CMOS process"

We present the receiver in the first single-chip GSM transceiver that incorporates full integration of quad-band receiver, transmitter, memory, power management, dedicated ARM processor and RF built-in self test in a 90 nm digital CMOS process. The architecture uses direct RF sampling in the receiver and an all-digital PLL in the transmitter. The receive chain uses discrete-time analog signal processing to down convert, down- sample, filter and analog-to-digital convert the received signal. An auxiliary feedback is provided at the mixer output that can linearize the entire receive chain. The receiver meets a sensitivity of -110 dBm at 60 mA in a 1.4V digital CMOS process [C2053]

## "QoS multicasting over mobile networks"

Based on multimedia broadcast/multicast service architecture(MBMS), this paper proposes an efficient QoS-based multicast approach for the universal mobile telecommunications system (UMTS). Our approach adopts the existing scalable-coding technique to provide multiple levels of service quality to diverse mobile devices in the UMTS system. In this approach, two kinds of transmission modes are developed to utilize fully the network resources for wireline and wireless links. An analytic model is presented to investigate the performance of our approach and the 3GPP 23.246 approach. The numerical results indicate that in terms of transmission costs of core/radio networks, our approach outperforms the 3GPP 23.246 approach [C2054]

## "Dynamic resource allocation in integrated voice/data wireless networks with link adaptation"

In this paper, the performance of dynamic resource allocation and channel de-allocation in integrated voice/data wireless networks with link adaptation is mathematically analyzed and evaluated. To our knowledge, all previous related works published in the literature have considered only link adaptation (LA) or dynamic resource allocation (DRA) separately. Additionally, a DRA strategy with link quality-aware prioritized channel de-allocation (called DRA LA DAS) is proposed. With the DRA LA DAS scheme that calls with the greatest number of channels and the worst link quality are degraded first. In this way, in DRA LA DAS preference is given to data users with good quality link which, on average, retain resources less time than data users with bad quality link. Numerical results show that the proposed DRA LA DAS strategy significantly improves system performance. The GSM/GPRS system is used as a case study. The GSM voice new call blocking and forced termination probabilities, GPRS packet dropping probability, average GPRS packet transmission time, and channel utilization are analyzed [C2055]

## "Capacity optimizing channel allocation scheme supporting multiple services with mobile users in cellular system"

In this paper, we study the performance of mobile users, in terms of call blocking and dropping probabilities, with our proposed idea of channel partitioning (CP). CP is based on the fact that different services may require different signal-to-interference ratios, and thus different reuse factors. We apply this CP with fixed channel allocation (FCA) scheme called fixed channel partitioning (FCP) in cellular systems. With FCP scheme, each cell is allocated two or more sets of channels. Each set of the channels supports a service in the way that the required reuse factor for that service could be satisfied. A three-dimensional Markov chain is first developed to analyze the impact of the mobile user. Then a simpler model, which can be used to estimate the numeric results from the closed-form solution, is presented to make the analysis easy. Finally, the analytical results are verified with simulation results. The results of this paper show that, for equal voice and data call arrival rate, the proposed FCP scheme can provide about 32% capacity improvement at 1% grade of service (GoS) as compared with FCA scheme. The changing of mobile speed and GoS factor do not affect this improvement. Our proposed FCP scheme could apply in current GSM, GPRS EDGE and future cellular OFDM systems, in which reuse factor plays a very important role [C2056]

## "Coal seam thickness estimation using GPR and higher order statistics-the near-surface case"

{no data available} [C2057]

## "Parallel telemetric data warehouse balancing algorithm"

One of the most important requirements of data warehouses is query response time. Amongst all methods of improving query performance, parallel processing (especially in shared nothing class) is one of the giving practically unlimited system's scaling possibility. The key problem in a parallel data warehouses is data allocation between system nodes. The problem is growing when nodes have different computational characteristics. In this

paper we present an algorithm of balancing parallel data warehouse built on mentioned architecture. Balancing is realized by setting dataset size stored in each node. We exploited some well known data allocation schemas using space filling curves: Hilbert and Peano. Our conception is verified by a set of tests and its analysis. [C2058]

## "Waveform based detection of anti-personnel mines with an UWB radar"

The present paper deals with feature-based landmine detection by means of UWB ground penetrating radar (GPR). A waveform of target response is used as a discriminative feature for two feature-based detection schemes. The output of each DPS is a confidence map obtained by means of energy projection of a 3D distributed feature onto a 2D surface. An automated detection is made over the obtained confidence maps and mines detectability is analyzed on the basis of the receiver operation characteristic curves. Performances of the feature- and energy-based data processing schemes (DPS) applied to the experimental data are compared. It is shown that suggested waveform based detection is stable to the change of the environment. [C2059]

## "Enhancement of GPRS surveillance system into real time control"

Mobile communication has presented its wide coverage, high reliability of data transmission with acceptable delays in surveillance applications. A CPU is designed to activate transmission control protocol (TCP) to connect into Internet through general packet radio service (GPRS). For real time control, this route can reversely be implemented to switch into user datagram protocol (UDP) to receive command and forward to actuators. A microprocessor control circuit is designed to enhance real time control function into one single embedded system architecture. The proposed system architecture is discussed with demonstration of a remote car control and airship control. [C2060]

## "Coexistence study on ultra-wideband and mobile cellular systems"

This paper presents the results of a series of laboratory and field measurements conducted for the co-existence study on ultra-wideband (UWB) and mobile cellular systems. In these studies, we introduced UWB interference to the GSM/GPRS and IMT-DS handsets in two circumstances, firstly in the lab under controlled conditions, and subsequently in the field using commercial GSM and pre-commercial IMT-DS networks. In the laboratory, we determined how the BER (for GSM) or BLER (for GPRS) of the radio downlink varies with the C/IUWBratio for 30 different impulse-based UWB signal types. Measurement results obtained in the laboratory showed that a C/IUWBratio of 11 dB and 10 dB should be used as the condition of coexistence between a UWB device and a GSM (1800 MHz) handset, and between a UWB device and a GPRS (1800 MHz) handset respectively. For IMT-DS, results obtained using voice and data services showed that all the threshold EIRP values (for different UWB signal types used) are higher than the level currently permitted by the FCC's emission mask for handheld UWB systems i.e. -63.3 dBm/MHz for 1610-1900 MHz band and -61.3 dBm/MHz for 1 990-3 100 MHz band. This study also validates the assumption that UWB power adds up in a simple linear manner. [C2061]

## "Handover of packet-switched services in GERAN A/Gb mode"

Due to strict quality of service requirements on low latency and packet loss, real-time packet-switched (PS) services require a minimal service interruption on the data transfer during cell change. Existing GPRS cell change mechanisms with network assisted cell change (NACC) enable a theoretical minimum service interruption of 0.7-1.2 second, while real-time PS services of conversational class do not tolerate a service gap longer than 0.15 seconds. Therefore in GERAN A/Gb mode a PS handover procedure is being designed to allow for conversational services in GPRS that would improve the network performance for any PS service. PS handover follows the GSM circuit-switched handover principle of allocating radio resources in the target cell prior to changing cell. In this paper PS handover procedure is described and its performance evaluated in terms of service interruption by means of network simulations [C2062]

## "A method for combining focused monostatic and bistatic GPR to reduce multipath effects"

Imaging of buried objects using subsurface microwave technology can result in images with numerous undesirable artifacts due in part to noise and multipath scattering. In order to alleviate the problem of multipath scattering, the authors propose the combined use of monostatic and bistatic systems. Focusing both images and compensating the bistatic system enables us to place the direct path scatterers at the same position as in the monostatic case. A multiplication of the final images will attenuate the scatterers that are formed by multiple reflections and will therefore reduce artifacts. Results are shown using simulations in which the signatures of several point scatterers overlap for the direct reflections and where the multipath signatures do not; thus allowing the multiplication to enhance the final image. [C2063]

## "Multidomain pseudo spectral time-domain modeling of waveguide structure"

In this paper, the design of excitation source is discussed when the characteristic of the waveguide is analyzed using multidomain pseudospectral time-domain (MPSTD). The S parameters of a typical 3D waveguide bend are calculated using MPSTD. The numerical results are compared with the FDTD, and which confirm accuracy and efficiency of the MPSTD. This paper presents a scheme to analyze the waveguide structure accurately, which extends application field of the MPSTD. [C2064]

## "On designing a burst-sensitive RED queue at GPRS links in a heterogeneous mobile environment"

In the context of a heterogeneous mobile environment, we analyze the RED queue design guidelines specifically for GPRS links, and show the benefits of deploying active queue management (AQM) strategies at wireless access links. Moreover, addressing the general problem (an insensitivity to input traffic load variation) of current AQM schemes, we introduce the burst-sensitive RED (BSRED) algorithm, and demonstrate its improved performance on burst detection by simulation. With a properly set BSRED queue, the GPRS link queue length can be maintained in a desired range, so that the GPRS link capacity can be fully utilized without introducing too long queuing delays, and the overflow possibility of the GPRS link buffer is kept low on vertical handoffs [C2065]

## "Extended Erlang-B law for performance evaluation of radio resources sharing in GSM/(E)GPRS networks"

In this paper, we derive a simple and accurate Erlang-like law for the dimensioning of radio resources in GSM/GPRS/EDGE networks taking into account the voice and data traffic mix in a cell. Resources are assumed to be shared according to the so-called partial partitioning scheme whereby some circuits are dedicated to voice, others to data, and the remaining are shared but voice traffic can preempt them [C2066]

## "Full-rate speech quality on half-rate performance comparison of GMSK and 8-PSK modulated AMR-NB codec modes in GERAN mobile radio networks"

Growing traffic load in today's wireless networks brings up new challenges with respect to capacity. Simultaneously the demands for high quality voice services are rising. AMR half-rate in 8-PSK modulation combines both aspects and provides doubling the GERAN capacity just at a slight degradation of the perceived speech quality. A detailed performance study of 8-PSK modulated AMR half-rate codec modes is presented based on network planning studies and profound system level simulations. In addition a performance comparison to GMSK modulated AMR half-rate and full-rate codec modes has been provided. This analysis is focused on speech quality, coverage and capacity by AMR-NB in GERAN networks applying different frequency re-use patterns ranging from relaxed 4times3 to tight 1times1. The trade-off between quality and capacity has been demonstrated as well as the gain provided by 8-PSK modulated AMR half-rate. Network configurations offering full-rate quality by the allocation of half-rate channels have been identified. The capacity gain can be used to serve additional subscribers and/or to increase the quality and capacity of GPRS/EDGE data services [C2067]

## "Interworking between the multimedia messaging service (MMS) and the 3G IP multimedia subsystem (IMS) instant messaging service"

The multimedia messaging service (MMS) allows the asynchronous delivery of media-rich messages in GPRS networks and beyond, whereas the IMS instant messaging service allows almost real-time messaging interactions among users. Since both messaging services will coexist in 3G mobile networks, a natural interworking mechanism between these systems would be extremely convenient for the deployment of a common messaging framework, to ensure a smooth user migration, and to increase compatibility with legacy systems. This paper analyses the requirements and issues for interoperability between MMS and the IMS instant messaging service, in order to propose an interworking model and a translation gateway architecture for subsystem interconnection, finally, the most illustrative interworking use cases are analysed and the accomplished prototypes and validation experiences described [C2068]

## "Common radio resource management: functional models and implementation requirements"

Common radio resource management strategies are devoted to achieve an efficient usage of the pool of radio resources available in a heterogeneous radio access network context. This paper describes the functionalities associated with the common vision of radio access technologies, the different possibilities in the functional model split and the corresponding implementation considerations [C2069]

## "An Efficient Approach to ECG Signal Transmission via GPRS"

Nowadays, ECG monitors represent necessary diagnostic devices. A typical electrocardiogram monitoring device generates massive volumes of digital data. Thus, the compression of ECG signal data is of the great practical significance. This paper presents an ECG compression method for efficient ECG signal transmission via GPRS network. It is based on predictive coding using ARX model. Tests on clinically measured ECG signals confirm a very good performance in terms of compression ratio [C2070]

## "Virtual elastic wall based motion control for teleoperated demining system"

In this paper we proposed a new bilateral teleoperation based soil removing technique for demining system which is supported by geometric virtual wall concept. The virtual wall model was reflected to bilateral telemanipulation system to restrict a motion of the slave manipulator beyond the geometrical virtual wall. The algorithm was experimentally applied to a bilateral telemanipulation system. The experimental results showed that virtual wall can guarantee a generation of smooth surface and dig out the soil without applying too much force to the suspected object in a laboratory environment. [C2071]

## "Spectral Properties of Ultra Wideband Signals with General Time-Hopping Codes"

Spectra of ultra wideband (UWB) signals are restricted to frequency masks defined by regulation authorities like the Federal Communications Commission (FCC) in the United States or the Regulierungsbehorde fur Telekommunikation und Post (RegTP) in Germany. To make optimum use of these frequency masks, technologies that smooth the peaks in the signals' power spectral density (PSD) should be implemented. This contribution investigates the influences of various modulation schemes as well as different time hopping codes with general probability density functions on the PSDs of impulse radio UWB signals [C2072]

## "A game theoretic approach to energy efficient cooperative cache maintenance in MANETs"

There have been an increasingly large number of mobile handsets equipped with dual or multiple network interfaces. The server interface (e.g., GPRS, EDGE, UMTS) is responsible for communicating with the network operator, while the peer interfaces (e.g., Bluetooth, IEEE 802.11) are used to connect with other computing devices. However, they are usually used separately. In this paper, we investigate the use of both network interfaces to support energy efficient data applications among mobile clients. Specifically, we proposed a fully distributed protocol for mobile handsets to form cooperative groups to maintain cache consistency with minimal communication with the network operator. Our proposed protocol takes advantage of the low power consumption and high data rate of the peer interface. The aim is to reduce the use of the server interface, which is typically slower and involves higher power consumption. Furthermore, we also consider the presence of selfish clients. It is shown that groups formed by the proposed protocol constitutes a pure Nash equilibrium. This suggests that our protocol is robust even in the presence of selfish clients. Simulation results confirm that, given the same energy resource, mobile clients running the proposed protocol complete more queries, experience longer lifetime and achieve smaller query latency [C2073]

## "Dynamic management of multiple mobile routers"

Network mobility (NEMO) support is used to maintain the Internet connectivity of a group of terminals located into a network that changes its point of attachment to the Internet. The Internet access is made through a number of interfaces on a mobile router acting as a gateway of the mobile network. The overall bandwidth can be increased and redundancy can be provided by serving the mobile network through multiple mobile routers. However, this raises a number of issues related to multihoming. We therefore propose a multiple mobile router management (MMRM) system which allows nodes in the mobile network to be connected transparently to the Internet through multiple mobile routers. Mobile routers can dynamically join and leave the mobile network. They cooperate in order to share their Internet access within the entire mobile network. The proposed system is implemented and evaluated. Evaluation results show that the overhead of our system is negligible while redundancy and the overall bandwidth for the nodes in the mobile network are increased. [C2074]

## "A SCTP based OAM system of 3G cellular network"

OAM (operations, administration and maintenance) system is a very important component of the 3G cellular network. In order to acquire overall management, fast response and steady operation, a SCTP (stream control transmission protocol) based OAM (SOAM) system is proposed. The SOAM system implements the new characters of SCTP such as multi-stream, enforced SACK and heartbeat mechanism on its transport layer, which helps to decrease the message transmission delay and accelerate the link failure detection. Moreover, a new component named SOAM agent is introduced to improve the operation efficiency of the SOAM system. Test

results prove that SOAM system achieves better performance on signaling transmission compared with conventional TCP based OAM system [C2075]

## "Verification of Remote Vehicle Control Using Mobile Communication"

This paper presents a solution of real time remote control for vehicles using mobile communication. The development system integrates GPS, GIS, GPRS, with embedded system servo control mechanism into a powerful real time remote surveillance and control system. To transmit the control commands and downlink surveillance data, GPRS mobile communication technology is adopted as the bridge. Through GPRS mobile communication system, the operator can control the vehicle without boundary within mobile communication coverage. To verify the adaptation of the proposed mobile communication solutions, a mobile vehicle test in a region. A vehicle is used for tests to examine the real performance and control effect [C2076]

## "GPRS-Based Embedded Remote Power Management System"

This paper implements a GPRS-based embedded system for load management system in real time remote operation to power equipments in general applications. The proposed system is designed using a 32-bit ARM-7 embedded microprocessor system to carry on power data processing and relay control through GPRS mobile communication. In order to provide a cost-effective, wireless, always-connected, two-way data link function capability, the proposed system establishes a remoter monitor and control center to manage power equipment operation data, power parameters and outage signals. To activate the data flow, GPRS is used to handle real time message in two ways, from equipments to the control server, and from operator to the equipments. In this paper, the proposed system is successfully built up, and a full function of real time remote operation is tested with data collection, especially at a system outage. This paper verifies the proposed system is useful and effective to power equipment monitor and control in a real time and mobile condition [C2077]

## "Design and Performance Evaluation of an Inter-System Handover Algorithm in UMTS/GSM Networks"

In this paper, we present the performance of a (UMTS harr GSM) inter-system handover algorithm which uses two pairs of UMTS and GSM HO thresholds (Ec/Iothreshold for UMTS and RSSI threshold for GSM); one pair of thresholds for making a decision to handover from UMTS to GSM and another pair of thresholds for making a decision to handover from GSM to UMTS. We have designed and implemented the algorithm based on a simulation model of a 37-cell UMTS/GSM system consisting of an island of 7 UMTS cells surrounded by 30 GSM cells. The simulation model includes mobility of all users in the system and spatial correlation of the log-normal shadow losses in the 2.1 GHz (for UMTS) and 900 MHz (for GSM) frequency bands. The test mobile is allowed to move along the boundary of the UMTS and GSM cells and evaluated the performance of the algorithm with the handover rate as a function of the various handover thresholds in both the networks. We show that by properly building a hysteresis between the UMTS- to-GSM HO threshold pair and the GSM-to-UMTS HO threshold pair, a good compromise between call drop rate, and intra- and inter-system handover rates can be achieved. Further, we have analysed the effectiveness of the algorithm by applying time hysteresis values and also by measuring the signal parameters in compressed mode. [C2078]

## "Statistical Properties of Broadband ELF Electric Field Fluctuations Associated with Ion Acceleration and Outflow as Observed by the Fast Satellite"

Summary form only given. Broadband ELF (BBELF) electric field fluctuations are commonly observed in association with ion acceleration and outflow from the terrestrial auroral zone and ionosphere. These fluctuations are the conduit by which energy is transferred from macroscopic field and current systems to the ambient ion populations, and are thus an important part of the mass and energy flow between the magnetosphere and ionosphere. We will review the current state of the observations of BBELF and ion acceleration as found on sounding rockets and satellites. In particular, we will focus on and present the observations of BBELF by the FAST satellite, which has found that the BBELF phenomenon at intermediate altitudes (3000-4000 km) is due primarily to low-frequency (f<fci), short-wavelength (L perpLtelectron skin depth) fluctuations that are Doppler-shifted into the ELF frequency band by spacecraft motion. This has important ramifications for theories of both the source of the BBELF, as well as its interactions with the ambient ion populations, as it rules out temporal turbulence and simple gyro-resonant mechanisms, respectively [C2079]

## "Performance of a GSM/GPRS System Subject to Interference"

In this paper, we present a performance analysis of an integrated voice/data access system in a GSM/GPRS network, where the radio channels are subject to transmission impairments. Circuit-switched GSM voice and

packet-switched GPRS data users share the N channels, with priority given to voice. We incorporate transmission impairments by a Markovian two-state channel model, where one state is characterized by a very low BER (good state), and the other by a much higher BER (bad state). The results indicate that the delay performance of the GPRS data users can be drastically affected by the channel impairments [C2080]

## "Automatic Network Management for Mobile Devices"

Mobile devices increasingly find themselves immersed in a sea of potential wireless network connectivity. Our prior work showed that, in urban areas, users encounter multiple 802.11 access points on virtually every scan. Not all of these are usable, however, and the connection quality provided by each varies widely with regard to bandwidth and latency to the network core, and with regard to allowed port traffic. This paper presents an automatic network management for mobile devices [C2081]

## "Indoor Localization Using Camera Phones"

There has been a shift in the focus of indoor localization research from improving accuracy to minimizing infrastructure requirements. The reason is well understood: since location information only serves as a parameter to location-based services, the cost of deploying localization systems should be a minute fraction of the total cost of provisioning location-based services. We demonstrate the possibility of determining user's location indoors based on what the camera-phone "sees" [C2082]

## "Roaming Procedures in General Packet Radio Service"

When the common European GSM standard was introduced, operators used it to promote roaming between European countries and then later worldwide. By offering transmission over a continuous connection, the GPRS standard has significantly increased speeds for data transmission. Until GPRS was introduced, mobile operators had only partially installed bridges between their switched networks and data networks. The purpose of this document is to illustrate architectures for GPRS roaming and aims to provide a standardised view on how GPRS networks can interwork in order to provide GPRS roaming capabilities when users roam onto foreign networks. [C2083]

## "Development of On-Line Diagnostics and Real Time Early Warning System for Vehicles"

On-board diagnostics (OBD) system is developed to detect vehicle system error and malfunction for health diagnosis, OBD generates warning signals to vehicle operators as well as the maintenance engineers. However, once a warning signal is being generated, most operators are not knowledgeable to take any action on it. Data acquisition has to rely on maintenance engineer using special tools. Based on such a practical demand, this paper presents a new vehicle on-line diagnosis and real time early warning system to acquire OBD signals and transmit to a Server of Maintenance Center via GPRS mobile communication for immediate actions. In this paper, hardware and software in both design and implementation are discussed with preliminary tests. The test functions of the proposed system fulfil the rising requirements for modern vehicle system [C2084]

## "Web-Based Distributed Control using GPRS Enabled Embedded Devices"

Supervisory Control and Data Acquisition (SCADA) is a field of constant development and worth billions of dollars around the world as it is used in many types of industries. Existing SCADA systems are divisible into two groups -cheap and inflexible control and expensive but flexible control. This project attempts to take a step towards the best of both worlds -cheap and flexible SCADA i.e. creating an extremely low cost device which can be adapted to many different SCADA applications via some very basic programming and plugging in relevant peripherals. Much of the price in some expensive SCADA applications is a result of using specialized communication infrastructure. By using existing infrastructure, in this case, the mobile GSM network, not only can price be kept down, but scalability and generic nature of the device is maintained. This project deals with the creation of an inexpensive, yet adaptable and easy to use SCADA device and infrastructure using mobile telephone network, in particular, the General Packet Radio Service (GPRS). The hardware components making up the device are relatively unsophisticated, yet the custom written software makes it re-programmable over the air, and able to provide a given SCADA application with the ability to send and receive control and data signals at any non predetermined time. [C2085]

## "A UWB impulse subsurface imaging radar"

An advanced UWB impulse subsurface imaging radar (SIR) system-RadarEye is introduced in this paper. A time-delay and amplitude modified back projection (TAM-BP) imaging algorithm is presented. Indoor experiments show the high performance of this system in the applications of surface penetrating imaging. [C2086]

## "The using multifrequency airborne radar complex MARS for subsurface remote sensing"

This paper presents some results of using airborne radar multifrequency complex MARS for subsurface remote sensing. Experimental data and theoretical basis are given. [C2087]

## "Building a robust packet control unit with network processors"

GPRS (general packet service) is a 2.5G technology based on GSM networks which can offer more capacity and flexibility for the user. As the core part of GPRS, PCU (packet control unit) is responsible for handling packet-related resource and process packets encapsulation/decapsulation between RLC/LLC and BSSGP protocols. Due to the complexity of its function, all the PCU used today are made of common chips. It is very difficult to meet the incrementing speed of incoming packets while still performing signaling management at the same time. Using IXP2800 processor can solve this problem easily. This article introduces a mode of PCU using Intel IXP2800 chips. Illustrated its functional blocks and how it works. [C2088]

## "Alternating-sign windowed energy projection of SAR focused GPR data"

The automated detection of plastic-cased antipersonnel landmines in 3D high-resolution UWB radar images is considered. The 3D images are projected in different ways onto 2D confidence maps, in which the automated APM detection is made by marking local maxima in the maps followed by thresholding. Specifically, we consider the confidence maps of the following types: energy projection (EP), windowed energy projection (WEP) and introduced here alternating sign windowed energy projection (ASWEP). The latter is shown to allow diminishing of the false alarms number in comparison for the other two techniques for most of the considered cases. The advantages of the new technique are described by means of receiver operator curves (ROC). The ROC curves are built for the datasets acquired over several minefield simulation sites under different environmental conditions. [C2089]

## "Environmental control system based on mobile devices"

The impact of the use of mobile devices by means of GPRS (general packet radio service) technology to access environmental information in real time, provided by sensors strategically placed in a metropolitan area has been studied with the objective of using this information to find out rainfall volume and phreatic levels in times of emergency. This allows the technical services to make the correct decisions in the management of a large network of pump stations, flood gates, etc. It is demonstrated that this is a reliable system with an acceptable response time. The system being tested is integrated into a powerful supervision and control system that works in the purification network of the city of Valencia. It has been developed jointly by the "Ciclo Integral del Agua" and the Technical University of Valencia [C2090]

## "A GSM/GPRS receiver front-end with discrete-time filters in a 90 nm digital CMOS"

An RF receiver front-end for a GSM/GPRS radio system-on-chip in a 90 nm digital CMOS technology is presented. The circuit consisting of low noise amplifier, transconductance amplifier and switching mixer, offers 32.5 dB dynamic range with digitally-configurable voltage gain of 40 dB down to 7.5 dB. A series of decimation and discrete-time filtering follows the mixer and performs a highly-linear second-order low-pass filtering to reject close-in interferers. The front-end gains can be configured with an automatic-gain-control to select an optimal setting to form a trade-off between noise figure and linearity and to compensate the process and temperature variations. Even under the digital switching activity, noise figure at the 40 dB maximum gain is 1.8 dB and +50 dBm IIP2at the 34 dB gain. The variation of the input matching versus multiple gains is less than 1 dB. The circuit in total occupies 3.1 mm2. The LNA, TA and mixer consume less than 15.3 mA at a supply voltage of 1.4 V. [C2091]

## "Enhancement on the robustness of a quad-band power amplifier module for GSM/GPRS handsets"

Device ruggedness is the major concern about the adoption of power amplifier module in the mobile phone industry. A resistive network was employed to stabilize the sub-harmonic (f/2) loop oscillation for the large periphery device, especially on the output stage. Not only the spurious emission being minimized, but also the robustness of power amplifier is strengthened as operating under severe mismatch condition (VSWR 10:1). Such power chips were integrated with a logarithmic power detecting controller and functioned as a linearly closed-loop power controlled GSM/GPRS power amplifier module. It had successfully demonstrated a highly mismatch susceptibility for all quad-band operations (GSM850, EGSM900, DCS1800, PCS1900). [C2092]

## "Study about the radiation characteristics of bow-tie antennas with discrete resistor-loaded"

The ground penetrating radar (GPR) system is an effective tool for nondestructively sensing subsurface environment. One of the most critical hardware components for the performance of the GPR system is the antenna, and the bow-tie antenna is one of common antennas used in the system. The conventional bow-tie antennas with perfect electrical conductors (PEC) panels have variable characteristics that depend on operating environment. In this paper, a bow-tie antenna with exponential discrete resistor-loaded is present. Radiated waveforms, input impedances, and footprints of resistor-loaded bow-tie antenna are investigated through the finite difference time domain (FDTD) method. The results show that the antenna with exponential discrete resistor-loaded can terminate the reflections at the end of antennas, and it is considerably less sensitive to their environment than the conventional bow-tie antenna with PEC panels. [C2093]

## "Supports for components loading and binding at boot-time for component-based embedded operating systems"

This paper presents the process of boot-time components loading and binding for TICK, a component-based embedded operating system targeted at resource-constrained devices. Based on the memory configuration information exported from the hardware abstraction layer, service components are loaded one-by-one through a configurable tunnel between the target and a hosting machine. Since the relocation information is provided in each self-contained component, the binding module in the component run-time establishes required connections among components. Interfacing members of all loaded components are resolved during the boot-time instead of during the link-time, thus different types of bindings between components can be implemented. Evaluation experiments show that the performance impacts induced are acceptable, while the infrastructure enables a flexible configuration of the target system. [C2094]

## "An embedded adaptive live video transmission system over GPRS/CDMA network"

The provision of video communication over wireless links is a challenging task because there is difficulty to get better video quality guarantee for video transmission over the current wireless networks include GPRS or CDMA. In this paper, we developed a embedded adaptive live video streaming transmission system on GPRS/CDMA network based on MPEG4 video compression standard. This system presents a performance enhancement for real-time video transmission by employing an adaptive sender rate control scheme, which estimates the available channel bandwidth between the sender and receiver, then adjusts the output rate of encoder side using R-D framework and frame-skip control mechanism according to the estimated time-varying channel bandwidth. [C2095]

## "A new embedded car theft detection system"

A new embedded car theft detecting system has been introduced in this paper. This system is based upon machine vision technology, acids a new level of car theft detecting, and it is no intrusive on the drivers. This system uses face detecting and recognition technology. When the unauthorized driver is driving the car, it will detect him and alarm by sending his image to police or car owner. [C2096]

## "Click&Find: an Internet service for full tracing and tracking"

This paper presents the architecture, the system implementation and the performance evaluation of an innovative Internet-based service for object position tracing and tracking (T&T). It supports "full" T&T, as tracking data are not limited only to warehouse check-ins/checkouts, but are extended to the whole transport process, i.e., even when the traced item is on the road, taking advantage of GPS and GPRS technologies. The system works as an Internet component, made available to other systems such as factory automation systems and enterprise resource planners, easily integrated through Web or Web services interfaces. Wide area coverage, high-precision and real-time characteristics make the system suitable for the integration with factory automation tasks, whenever such tasks need to extend beyond the plant area boundaries [C2097]

## "Implementation of Network-computing and NN based Remote Real-time Oil Well Monitoring System"

This paper introduces a real-time oil well monitoring system based on network computing and neural network (NN) technologies. In the system, some enterprise computing techniques such as browser/server Web mode, JMS, message-oriented middleware (MOM) and Java Applet are employed. In addition, GPRS wireless communication is used to achieve remote transmission of oil well data. This scheme makes adopts Java Applet that operates at client side (Web browser) to receive messages "pushed" by server through JMS (Java Message

Service). In this way, server and client are able to communicate in time so that client side can reflect the real-time oil well data and the fault diagnosis result. In remote monitoring center, the fault diagnosis station takes the responsibility for the fault detection and diagnosis of oil pumping units by means of neural networks and evolutionary computation. This solution accomplishes network share of oil well information, improves the efficiency of system development. The system has already been applied successfully to an oil field, and has got the anticipated results [C2098]

## "Research On Vehicle Anti-theft and Alarm System Using Facing Recognition"

In this paper, a vehicle anti-theft system has been developed. When the car starts, this system begins to work, it captures the driver's video images using an active IR illuminator, then locates the driver's eyes and recognizes the driver's face using PCA algorithm. If the current driver is found to be unauthorized by compared his face image with the face images prestored, this system would alarm and send the unauthorized driver's image to car owner or police through CDMA or GPRS networks. This system was tested in a simulating environment with subjects of different ages, with/without glasses, and under different illumination conditions, and it was found very robust, reliable [C2099]

## "A transceiver module for quad band EGPRS (GSM/GPRS/EDGE) class 12 applications"

This paper describes the design, technology selection and performance of a compact mixed signal transceiver module for wireless quad band EGPRS applications. The module uses 6 layers of HDI-organic substrate, integrates three IC technologies-0.18 mum RF-CMOS for RF/Analog, 0.13 mum CMOS for mixed signal analog/digital/DSP and GaAs for an integrated passive devices (IPD) quad band balun-plus surface mount devices (SMD) for loop filter and RF bypass. It has the complete transmit line up from digital bits (as per DigRF standard version 1.1) to power amplifier interface, as well as receive function from LNA inputs to bits (per DigRF standard) [C2100]

## "QoS guaranteed vertical handoff signaling scheme for heterogeneous networks"

Signaling process of vertical handoff with QoS support between GPRS and WLAN is developed. Schemes of handoff preparing loop (HPL) and layer 3 (mobile IP layer) bi-direction connections between GPRS and WLAN are proposed in order to provide QoS guarantee. However, bi-direction connection will occupy more network resources. To solve this problem, a parameter "connecting lifetime" is introduced. The latency analysis and simulation results show that systems could achieve better performance in terms of handoff latency and outage probability. [C2101]

## "Study about the radiation properties of an antenna for ground-penetrating radar"

The ground penetrating radar (GPR) system is an effective tool for nondestructively sensing subsurface environment. One of the most critical hardware components for the performance of the GPR system is the antenna. The system demands an antenna with fewer multiple reflections of the input signal from different parts of the antenna. There are only a few types of antennas that are widely used in GPR systems, such as resistively loaded cylindrical monopoles, resistively or resistor-loaded bow-tie antennas, TEM horns and their modification, and spiral antennas. In the paper, a GPR antenna with discrete exponential resistive loading is present, and it can terminate the ringing. The near-zone radiation pattern and waveform of the antenna are analyzed through the finite-difference time domain (FDTD) method. At last, the comparison of the simulation and measured results were shown when the transmitter and receiver antennas on the above of the dry sand. [C2102]

## "Assesment of Human Exposure to Extremely Low Frequency Electric Fields Using Different Body Models and the Boundary Element Analyisis"

The paper deals with the boundary element modeling of the human body exposed to extremely low frequency (ELF) electric fields. Two models are presented throughout this work; a multidomain body of revolution and the realistic representation of the human body. The formulation of the problem is based on the quasi-static approximation and the related Laplace equation variant of the continuity equation which is solved by the boundary element method (BEM) thus providing the distribution of scalar potential and the induced current density inside the body. Some illustrative computational results, arising from both models, are also presented in this work [C2103]

## "A study of seismic inverse methods for radar signal processing"

The subject of seismic migration is one of the most varied in seismic data processing. Many algorithms have been developed to perform this task, including Kirchhoff migration, finite-difference reverse time migration, and

several types of phase shift migration. The purpose of this study is to investigate the possibility of using seismic inversion algorithms for radar signal processing to improve signal quality and reduce the effects of clutter based on the study of known geophysical inversion algorithms. The finite-difference reverse time migration method was studied in detail since it is one of the most accurate and general depth migration algorithms. It uses the finite difference wave equation modeling as a means of migrating seismic data. Preliminary experiments on the synthetic data generated from different models (a geophysical model and models similar to radar cases) were performed using the reverse-time migration algorithm [C2104]

## "Realistic modelling of interference in pacemakers by ELF magnetic fields"

Many experimental studies gave different proofs on the pacemaker's susceptibility by ELF magnetic fields, nevertheless it's still difficult to trace currents and voltages that invade the pacemaker input stage, determining in this way anomalies in the implantable device. Luckily, modern computational resources, joined to the detailed conductivity models of human body, with a precision of the fraction of millimeter, make of the numerical models a valid technique for the valuation of the various interferences. In this way, in the present work, a vectorial simulator was developed. It's able to determine, to compute and to plot the electromagnetic parameters (current density, electric field, magnetic field, voltage) induced in any biological volume, where a representative structure of pacemaker is inserted, all of this is plunged in a time-varying magnetic field. A numerical model of Maxwell equations were introduced and computing techniques for the solution of sparse systems were implemented in C programming language. Programs for the definition of the conductivity outline whether for the biological tissues or the metallic and insulating structures where also developed. Finally a powerful graphic interface were applied with all the capabilities of visualization that a vectorial 3-D plotter can offer with great effectiveness [C2105]

## "Estimation of Medium Permittivity for Subsurface Radar Imaging Based on Conditional Entropy Metrics"

In order to obtain a high resolution inverse synthetic aperture radar image, the kinematic parameters of the target must be estimated in order to focus the image. Entropy metrics have been a popular technique to achieve good estimates. For subsurface radar imagery, the parameter needed for focusing purposes is the permittivity of the medium. Unlike airborne radar, subsurface back scattering occurs in a noisy environment and the use of this traditional metric does not yield good results. In this paper, the authors proposed the use of a denoising technique and a conditional entropy metric that overcomes the difficulties encounter when using an entropy calculation as a focal quality indicator [C2106]

## "Assessment of Maximal Magnetic Flux Density Value from a Power Substation Based on the Discrete Measured Data"

A procedure for the assessment of the maximal power frequency magnetic flux density from a power substation is proposed in the paper. The present technique is based on a multiquadric approximation of magnetic flux density obtained using the discrete measured data. The approximation sufficiently handles multidimensional multiextreme functions by interpolating their scattered values accurately. Subsequently, the maximal flux density value is evaluated by minimizing the negative multiquadric approximation via a stochastic optimization method-differential evolution. Therefore, the procedure provides the maximal flux density assessment on the basis of a limited number of measured values, thus reducing the measurement effort [C2107]

## "Simulation of an ultra-wideband antenna for step-frequency ground penetrating radar using method of moments"

Presented in this paper are the results of simulation of ultra-wideband antennas for step-frequency ground penetrating radar (GPR) using IE3D software realizing method of moments. Features of planar antenna currents distribution, influencing on radiations parameters are discussed. Ways of improvement of antenna characteristics accounting for the features of the antenna utilization are proposed. The simulation data for planar tapered slot antennas (TSA) covering frequency range as wide as 11:1 are given. The antenna VSWR does not exceed 2 almost in the full frequency band, whereas the antenna gain is of 6-8.5 dBi. [C2108]

## "Design and realization of a compact, low-cost, ultra wideband ground penetrating radar system"

The ground penetrating radar (GPR) is currently one of the most convenient sensors used for the detection of the dielectric objects buried under the ground. Ultra wideband (UWB) GPR has a significant advantage due to benefit from both low and high frequencies, which means long-range detection with better resolution respectively. In this paper, a compact, low cost GPR using an impulse waveform is developed. The UWB GPR system is mainly composed of an impulse generator, UWB transmitting and receiving antennas, timing circuit,

signal conditioner, high accuracy digitizer, and a laptop computer for data storage and image processing. An experimental UWB GPR system is designed and tested. [C2109]

## "On evaluating beyond 3G radio access networks: architectures, approaches and tools"

This paper discusses the common radio resource management problem in beyond 3G systems. Different architectures for CRRM operation together with a description of the simulation requirements for performance evaluation are presented. Finally, some illustrative results leading to the definition of RAT selection policies are assessed. [C2110]

## "Improvement of fast retransmission algorithm over GPRS network"

In this paper, a practical test-bed is set up to monitor the performance of TCP over GPRS. From the observations of our experiment, it is found that the efficiency of fast retransmission algorithm in GPRS network is not as good as that in wired environment. Thus a modified version of this method is proposed in this paper. The experiment results show that the modified algorithm can reduce the delay of retransmission and achieve better performance over GPRS network. [C2111]

## "Subsurface water-filled fracture detection by borehole radar: a case history"

Borehole radar is a special mode of ground penetrating radar. It has several distinguished features from surface radar. For examples, by means of borehole access to deep regions below the surface, the radar sonde can be located relatively close to the anomalies or targets to be measured, this results in more precise targets response than surface measurement. The experimental site is located on the top of a granite hill west of Beijing, China. There are a group of boreholes intersected by many fractures. The measured single-hole reflection data are processed and interpreted. The radial detecting range is more than 30 meters at this site. The subsurface fracture distribution can be imaged very clearly. Many fractures can be "seen", and their distance from borehole and their dip angle can be determined. The azimuth determinations for these fractures are possible in some situations. It is concluded that the borehole radar is an effective tool for subsurface imaging. [C2112]

## "Realizing MPEG4 video transmission based on mobile station over GPRS"

Video over mobile telephone has a wide range of current and future potential applications. The integration of two new technologies, namely GPRS and MPEG4, makes it possible to transmit MPEG4 bit streams over GPRS Network. This paper presents the implementation details of MPEG4 coded video transmission over GPRS network. Mobile telephone is responsible for video data subsampling and is used as a player device. A testing result obtained after actual video transmission is presented in this paper. Based on the principium of RTP and the features of MPEG4 standard, we put forward a RTP payload format and a packetization algorithm for MPEG4 video, which achieves both efficiency and robustness. We present an end-to-end feedback congestion control scheme based on RTP/RTCP. [C2113]

## "Comparison of FMCW and pulse type groundpenetrating radar(GPR) for water leakage detection"

{no data available} [C2114]

## "A new GPR calibration method for high accuracy thickness and permittivity measurement of multi-layered pavement"

{no data available} [C2115]

## "QoS-based optimal buffering for short message transfer in GPRS/UMTS networks"

The newly introduced multimedia messaging service (MMS), which can be used over the general packet radio service (GPRS)/Universal Mobile Telecommunication (UMTS) short message service (SMS) network demands on an efficient mechanism for handling the message traffic. In this paper, we consider the system's quality of service (QoS) requirements to the new and forwarded messages and design an optimal buffering scheme for short message transfer in GPRS/UMTS networks, such that the requirements are met. An analytic model is developed that employs one-dimensional continuous-time Markov chain. Based on the model, a search algorithm is designed to find the optimal parameters of the system. [C2116]

## "Internet traffic analysis and optimization over a precommercial live UMTS network"

3G wireless networks such as UMTS are currently providing wide area Internet access. However, the Internet

protocols exhibit a suboptimal performance in such scenarios. In this paper we first characterize a live UMTS link from the IP level. We identify critical features such as high latency, delay spikes, high packet loss probability and connectivity gaps, specially when the user moves between cells. Next, we test a set of TCP configurations, demonstrating that TCP performance can be optimized over UMTS by the usage of adequate end-to-end mechanisms and parameter values. Finally, we perform a preliminary study of applications behavior over UMTS. [C2117]

## "Mobile information systems providing estimated time of arrival for public transport users"

Walking out of the house on cold and wet winter morning to catch the bus knowing with confidence that arrival is imminent would be a dream for many users of public transport. With one look at the mobile phone not only it is possible to see the exact time of arrival at a user's stop but also the next departure from the central terminal and its estimated time of arrival. In this paper we present a public information system that can provide up to date and comprehensive information on metrobus services through a variety of means to the user's mobile phone. [C2118]

## "3D ground adaptive synthetic aperture radar for landmine detection"

In this paper, we propose a new algorithm which shows a buried landmine clearly in an underground image captured by a ground penetrating radar (GPR). By using GPR, we could extract the buried object signals from a raw underground data of GPR. In addition, we could create a high resolution underground image which focuses on buried objects. The extraction of buried object signals from raw GPR data is achieved by using two methods which are a feature extraction processing method of underground image and a ground adaptive manipulation method which manipulates the sensor head of GPR along a ground surface. Moreover, we propose novel synthetic aperture radar processing, which could be applied to an uneven ground surface of a minefield, for detecting the landmine clearly. The high resolution underground image is obtained by the proposed synthetic aperture radar processing which is referred to as ground adaptive synthetic aperture radar algorithm. We developed a landmine detection robot, in which the proposed methods were implemented. To evaluate the proposed methods, experiments concerning landmine detection are done and experimental results illustrate the validity of the system. [C2119]

## "Analysis of the QoS requirements under radio access network planning aspects for GPRS/EDGE and UMTS"

The upcoming teleservices in mobile networks require quality of service (QoS) support, which have to be considered during the radio access network (RAN) planning. QoS becomes one of the most important points for the network planning process. Mobile network providers that want to offer information services based on QoS, have to plan their networks and their network capacity according to user demands. Traditional RAN planning tools consider only "best effort" service for all applications since RANs were not able to guarantee QoS before release 99 of 3GPP specifications. This has consequences in network planning and user satisfaction; therefore it is necessary to take the QoS requirements of each application of every user into account during the planning process. This paper presents an analysis of the available 3GPP QoS mechanisms in the different releases in order to include factors in RAN planning for QoS support. Finally, the differences in the RAN dimensioning between "best effort" and QoS support are exemplified. [C2120]

## "Push services for dynamic addresses in 2.5/3G space"

Push data services are an easy way to communicate with mobile users and a great marketing tool. Service and information industry constantly encourage their customers/patrons to register mill them in order to receive updates on their mobile devices. Most of push technologies use circuit switch network for either sending the data to MS or for asking MS to activate its PDP context. Inherently low bandwidth circuit switch network becomes a bottleneck if too many messages are being pushed to MS, which don't have active PDP context. In this paper we are presenting an architecture that leverage for user's mobility by assigning it a dynamic address and utilizes packet switched network to resolve MS's current address. [C2121]

## "Performance analyses of DAPSK in a very high mobility environment"

In this paper the performance of non-coherent differential amplitude phase shift keying (DAPSK) modulation over fast frequency nonselective and frequency selective fading channels are evaluated, respectively, through comprehensive simulations. The existence of hounds on DI6APSK and D64APSK for fast Rayleigh fading channel is verified. Based on the bound, a Doppler spread restriction on DAPSK operation in very high mobility environment, such as the high-speed railway communications, is found. Moreover, the ISI impact on high Doppler multi-path environment for DAPSK is investigated and analyzed. [C2122]

## "Experimental analysis of multi interface mobility management with SIP and MIP"

We provide an experimental analysis of MIMM (multi-interface mobility management) demonstrated in a heterogeneous network involving 802.11b and CDMA access technologies. We have experimented WAN-LAN handoff for real-time service (voice and video) in the testbed. The subnet handoff managed by MIMM was done seamlessly in this environment and is proved to support real-time application effectively. Both application layer and network layer mobility management were used in the experiment and their results were analyzed for real-time traffic. [C2123]

## "Proactive mobile IPv6 for context-aware all-IP wireless access networks"

A major challenge in building 'all-IP' wireless access networks, besides the use of IP as the unifying layer, relates to transparency of the IP hand off process as the mobile node (MN) transits across heterogeneous wireless network domains in IPv6 mobility management. Transparency in IP handoffs, however, must be effected in two separate contexts: IP-addressing and (re-)connection latency. Excessive delays during an IP handoff degrades the seamlessness of IP transmission between the MN and its peers. In this paper, we assess experimentally how transport protocols such as TCP and subsequently applications can under-perform as the MN performs an IP handoff between two heterogeneous wireless networks, namely WLAN and GPRS. We discuss why dynamic establishment of IP context-state can help address these limitations that seem inherent in heterogeneous environments. To this end, we evaluate by means of simulations, the proactive mobile IPv6 as a means of effecting advance context-state establishment, between candidate points of attachment, for the purposes of reducing/eliminating IP handoff delay while providing IPv6 handoff selectivity. [C2124]

## "Drill head mounted obstacle avoidance radar"

Horizontal drilling in soft soil provides an efficient and cost effective solution for the installation of utilities. However, with the increased congestion of underground utilities, the probability of damaging mislocated or unknown utilities increases, reducing the financial benefits of this technology and increasing the possibility catastrophic damage such as striking gas lines. It is hence important to develop instrumentation that is capable of locating obstacles lying along the bore paths. This paper discusses the development of a obstacle avoidance system based on ground penetrating radar technology. The system is a stepped frequency continuous wave (SFCW) radar that has been designed to fit within a standard 2.75 inch diameter drill head. The only above-ground components are the human machine interface (HMI) and power supply. Communication and power are transmitted underground via a wireline technique. An advanced demonstration model has been built and tested. The paper provides an overview of the requirements of an obstacle avoidance radar system. This is followed by a brief discussion of radar and antenna development required to implement the system. Finally results of indoor and outdoor field trials will be provided. [C2125]

## "3G wireless core network dimensioning in the presence of self-similar traffics"

Future all-IP 4G wireless networks will be based on the IP protocol and will be characterized by a 3G core network architecture. All-IP 4G systems supports multimedia traffics with heterogeneous characteristics. It is anticipated that the integrated traffics at the core network level exhibits long-range dependent behaviors and self-similar characteristics, as those in the current Internet backbone. This paper deals with an analytical approach for dimensioning networks with such traffics, modeled as fractional Brownian traffic. By imposing a total network cost, we derive the optimum capacity allocation minimizing an end-to-end delay metric. The results of our dimensioning technique (supported by simulations) highlight significant improvements with respect to the classical capacity allocation problem for Jackson networks. [C2126]

## "Evaluation of an array type directional borehole radar system"

An array type directional borehole radar system employing passive sensors, optical electric field sensors was developed. The system uses a dipole antenna for transmission and four optical electric field sensors for reception. Four sensors are evenly arranged in the circumferential direction to constitute an antenna array. Although an optical electric field sensor itself does not have directivity, azimuth angle of a target can be known from phase differences among the four sensors. Difficulty of this approach lies in the fact that, due to the size of a borehole, the spacing between sensors is limited to a few centimeters that is significantly smaller than the wavelength. As a result, phase difference to be extracted is small and easily subject to noise. In addition, mutual coupling between the antenna elements may causes distortion of target signal. In this paper, we discuss feasibility of target azimuth detection. A laboratory experiment was carried out to examine capability of extracting a small phase difference and to evaluate the mutual coupling between antenna elements. [C2127]

## "Integrating 3G cellular and WLAN-a framework approach"

WLANs cover small areas and provide limited mobility. 3G cellular systems have well-established quality support, wide coverage, and high mobility. Integrating these two technologies is of interest since it would result in cheaper voice calls and better data rates for the users. This awareness has led to research activities directed towards inter-system and global roaming across these two technologies. The authors propose global mobility management framework to support seamless roaming across heterogeneous wireless networks. In this article are highlighted details on the application of the framework to support roaming across 3G cellular and wireless local area networks (WLAN). The framework has a robust architecture for mobility management for varying user mobility spans, provisioning for QoS mapping and intersystem message translation. Performance of the framework is presented and discussed. [C2128]

## "Multiuser Scheduling with Multi Radio Access Selection"

In this paper we address the problem of multiuser scheduling with multi-radio access selection, i.e., the data flow of a given user can be scheduled over multiple radio access technologies of different operators. We show that performance gains are possible and come from multiuser diversity as well as multi-radio diversity, as both the best user and the best radio access can be selected, at any given time, to get to optimal performance. We compare a terminal-based strategy where users compete to choose the best radio access, and a network-based case where the network choose the users to serve at a given time. This work assesses the performance gain due to both multi radio access and multiuser diversity with respect to the no-multi-radio case, where users are constrained to connect to the same single radio access [C2129]

## "Effective 3D GPR survey and its application to the exploration of old remains"

Since the buried cultural relics are three-dimensional (3D) objects in nature, 3D survey is more preferable in archeological exploration. 3D ground penetrating radar (GPR) survey based on very dense data in principle, however, might need much higher cost and longer time of exploration than other geophysical methods. We developed a small-scale continuous data acquisition system which consists of two sets of GPR antennas and the precise positioning device tracking the moving-path of GPR antenna automatically and continuously. Besides this hardware system, we adopted a concept of data acquisition at arbitrary locations not along the pre-established profile lines, since the high cost of field work may be partly attributed to establishing many profile lines. Using the developed system, we performed 3D GPR survey to investigate the possible historical remains of Baekje Kingdom at Buyeo city, South Korea, prior to the excavation. Owing to the newly devised system, we could obtain 3D GPR data of this survey area having a real extent over about 17,000 m2within only six-hours field work. Although the GPR data were obtained at random locations not along the pre-established profile lines, we could obtain high-resolution 3D images showing many distinctive anomalies, which could be interpreted as old agricultural lands, waterways, and artificial structures or remains. This case history led us to the conclusion that 3D GPR method is very useful not only to examine a small anomalous area but also to investigate the wider region of the archeological interests. [C2130]

## "Tomographic inverse scattering approach for radar imaging with multistatic acquisition"

{no data available} [C2131]

## "GPR clutter reduction and buried target detection by improved Kalman filter technique"

The reduction of background signal, or clutter, from ground penetrating radar (GPR) measurements is an area of active research. The weak reflection signal obtained from subsurface targets is usually blurred by such strong clutter, which mainly comes from flat or rough ground surfaces, underground inhomogeneities, and coupling between the transmitting and receiving antennae. In this paper, the improved Kalman filter techniques have been studied and applied to reduce the background interference signals and detect the buried targets in GPR dataset. The effectiveness and validities of the proposed improvement methods in this paper for processing GPR detection data are studied. The processed results prove that the proposed methods are effective and adaptive for reducing clutter and detecting subsurface targets. [C2132]

## "ELF magnetic fields generator, variable in intensity and frequency for biological applications"

This article presents the design of an equipment that generates magnetic fields in extremely low frequencies (ELF), with variable intensity in the magnetic field, frequency and exposure time, to be used in biological tissues. The system consists of a Helmholtz coil and a programmable instrumentation to produce magnetic field intensities from 2 to 85 gauss, in a continuous or pulsed option. The duration of the pulses may vary from 1 to 10 seconds and the frequency can be programmed between 1 and 300 Hz. The testing time can be selected

from 5, 10 and 15 minutes. The main use of this system is to explore the effect of the magnetic fields in MDCK-type cell cultures. [C2133]

## "Application of spatial information technology for emergency response in traffic accident"

{no data available} [C2134]

## "GPR signal simulations in the course of freeze/thaw process for a permafrost area"

{no data available} [C2135]

## "Estimation of a buried pipe location by borehole radar"

A new parametric inversion technique to estimate a buried pipe location was developed for borehole radar cross-hole measurements. This technique evaluates the shapes of the approximated and measured arrival time curves instead of the first arrival time itself or wavefield in conventional inversion or tomographic techniques. In this study, we propose an algorithm of the technique and demonstrate its performance for synthetic and measured datasets. [C2136]

## "Bistatic GPR by using an optical electric field sensor"

In order to apply to land mine detection effectively, bistatic GPR using an optical electric field sensor as a receiver has been developed. The optical electric field sensor is very small and uses optical fiber instead of metallic coaxial cable. With the combination of these advantages and the bistatic radar system, it can be possible for an operator to measure quite flexible and safely. The sensor has been tested in stepped frequency radar system with frequency which consists of a vector network analyzer, a fixed double ridged horn antenna as transmitter and computer controlled receiver-positioner for 2D scanning. For considering effectiveness in real field, we applied impulse radar system, which consist of a digital oscilloscope and an impulse generator to produce the impulse with 250 psec pulse width and the diffraction stacking has been adopted for 3D image reconstruction. Detection of a PMN2 mine model was carried out by the impulse radar system at a sand pit with two modes of data acquisition: the stepped data acquisition and the continuous data acquisition. The PMN2 were detected clearly with sufficiently high resolution in TM mode measurement in both modes, the target contrast was almost the same while the scanning time decreased down to 1/18, 9 min/m2 in case of continuous data acquisition mode which satisfies the requirement for practical use. [C2137]

## "Man-made targets pose estimation using time-frequency distribution in UWB SAR"

{no data available} [C2138]

## "GPR signals de-noising by using wavelet networks"

The de-noising issue of ground-penetrating radar (GPR) signal is essential GPR's performance on detecting subsurface objects. This paper introduces a wavelet neural networks (WNN) based GPR signal de-noising algorithm. WNNs own the property of time-frequency localization of wavelet transform, as well as the excellent characteristics of artificial neural networks, self-learning and fault-tolerance, which make it a powerful tool for removing noises from noisy ground-penetration radar signals. Experimental results show that the proposed WNN based de-noising algorithm can achieve good de-noising performance and hold the useful detail of GPR signals. [C2139]

## "Design and implementation of vehicle monitoring system based on GPRS"

By analyzing the shortcomings in traditional vehicle communication system, this paper presents an intelligent vehicle monitoring system and describes the design procedure of hardware and software in details. By comparing the two data transmission protocols in GPRS network, this paper takes UDP/IP as the vehicle communication protocol. The data transmission delay is studied in this paper at last. [C2140]

## "Quasi mobile IP-based architecture for seamless interworking between WLAN and GPRS networks"

Fixed local service and cellular operators around the world have shown interest in providing wireless local area network (WLAN) services to their subscribers together with traditional packet data cellular services in a hybrid infrastructure in which subscribers can roam seamlessly. This document specifies the system description for a seamless interworking between a general packet radio service (GPRS) system and a wireless local area

network. The main objective is to extend the services available in IP networks (e.g. Internet) providing session persistence to both cellular packet data network subscribers and WLAN users. A quasi mobile IP architecture is proposed as a suitable solution together with a network discovery and roaming algorithm. The proposed framework allows for independent system engineering, reuse of current infrastructure, charging, robustness and security. A new node is introduced called home agent and minimal changes on MN software providing the necessary seamless interconnection capability to any user which owns a terminal with GPRS and WLAN interfaces as well as valid credentials to access both networks. [C2141]

## "Modeling and performance evaluation of dynamic Abis for E-GPRS"

The enhanced general packet radio service (E-GPRS) has been standardized to improve the data transport efficiency and data rates in GSM/GPRS air interface. GPRS relies on a static mapping of resources between the Abis and the air interface (made by provisioning). This current approach does not provide enough resources on the Abis interface to transport traffic from the air interface when the coding scheme has a data rate superior to 16 kbits/s. E-GPRS will then require more resources on the Abis. This paper investigates the performance of two dynamic allocation policies for the Abis interface for E-GPRS systems. The first strategy is called micro circuit strategy. The second strategy is referred as buffered strategy. Performance evaluations are performed by computer simulation. [C2142]

## "Traffic distribution schemes for multi-homed mobile hotspots"

Providing broadband Internet access in mobile hotspots (e.g. public transport vehicles) through high-speed on-board local area networks and mobile routers is becoming an increasingly popular area of research and development. Mobile hotspot operators can provide faster, cheaper, and more stable communication services to on-board passengers using the multihoming technique, whereby the mobile router is connected to a diverse array of wireless access technologies (e.g., GPRS, UMTS, CDMA, and 802.11) through a multiplicity of wireless service providers. For mobile hotspot operators, how to "best" distribute the user traffic among the set of available access networks; which may change frequently during the trip; becomes a challenging task. In this paper, we propose and compare two traffic distribution schemes: in-transit and pre-transit, which are designed to take the benefit of multi-homing. The intransit scheme computes optimum traffic distribution on-the-fly, while the pre-transit scheme exploits the repetitive route of a public transport vehicle and computes the whole set of traffic (re)distributions before the trip starts. The objective of the traffic distribution computations is to optimize the profit and performance for the mobile hotspot operator. Using a generic public transport mobility model, we provide results from a detailed simulation study of these two schemes under different user demands. [C2143]

## "Flow-based fast handover performance analysis in mobile IPv6 for Linux environment"

In this paper we present a performance analysis of a recently proposed method flow-based fast handover method for mobile IPv6 (FFHMIPv6) in a real mobile IPv6 environment. The FFHMIPv6 uses the flow-state information and encapsulation to reduce the packet loss during the location update processes of mobile IPv6. In the experiments, the FFHMIPv6 handover is compared with the mobile IPv6 handover using the MIPL-based (mobile IPv6 for Linux) real network scenario. The effect of the distance of the nodes MN is communicating with, VoIP traffic and the processing delay caused by the FFHMIPv6 method are considered in the experiments. Also, some security aspects of the method have been considered. The FFHMIPv6 method has been found to be an efficient and a simple way to reduce the handover delay. [C2144]

## "Adaptive wire bow-tie antenna for ground penetrating radar"

In this paper the basic design of an adaptive GPR antenna is introduced. The antenna is able to adapt its input impedance to a variation in the antenna elevation and soil type to keep reflections at the antenna's terminal minimum. As a result, the energy radiated by the antenna into the ground for different antenna elevations and soil types would be maximized. The antenna is based on a wire bow-tie structure with variable flare angle for adjusting the antenna's input impedance. The flare angle variation is realized by short-circuiting the gaps which separate the wires from the antenna feed point. Electronic switching devices such as PIN diodes could be used to allow fast and convenient control of the antenna's flare angle. [C2145]

## "Landmine imaging by a hand-held GPR and metal detector sensor (ALIS)"

We are developing a new landmine detection system, namely advanced landmine imaging system (ALIS), which is equipped with metal detector (MD) and ground penetrating radar (GPR). Despite it is a hand-held system, we can record the MD and GPR signals together with the sensor position information acquired by CCD camera. Therefore, MD image and GPR image can be obtained after signal processing. Since ALIS is a hand-held system, the sensor position is random when it is operated in the field. So interpolation processing is needed to

provide a gridded data set for both MD and GPR. A good MD image can be achieved after interpolation. Also, interpolation can prepare the gridded data set for migration. 3D Kirchhoff migration is used to enhance the signal-clutter ratio for effective image reconstruction. The ALIS was tested in Afghanistan in December 2004 and showed a good performance. In particular, the GPR could obtain a good image of anti-personnel (AP) mine buried at more than 20 cm depth. Also images from both sensors could be combined to distinguish a mine from a metal fragment. [C2146]

## "Sharing and multiplexing of downlink traffic resources in mobile packet data networks"

This paper studies the radio resource allocation for GPRS (general packet radio service) and GSM (global systems for mobile communications) on downlink traffic. We proposed an allocation strategy with partial time-slot sharing and complete radio-block sharing simultaneously. The radio-block based allocation strategy can characterize the practical multiplexing scheme for GPRS. We assumed that the system supports two classes of GPRS mobile terminals with different bandwidth requirements. We also assumed that the system can handle both new call and handover call for GSM requests. By both theoretical analysis and through computer simulation, the result showed that the proposed time-slot and radio-block based resource allocation strategy offers high utilization as well as low blocking probability to GPRS users under various traffic loadings. [C2147]

## "Evolution of 3GPP streaming for improving QoS over mobile networks"

Streaming is one of the key 3G mobile multimedia services provided by network operators. Traditional streaming applications need to be redesigned in order to work well over wireless. 3GPP has standardized streaming services for Release 4, 5 and 6 specifications. The last release overcomes the technical challenges posed by wireless and best effort networks. This paper describes the solution standardized in Release 6 for adaptive streaming. [C2148]

## "Multi-constraint dynamic access selection in always best connected networks"

In future generation networks, various access technologies, such as Wi-Fi, Bluetooth, GPRS and UMTS, etc., are simultaneously available to mobile devices. They vary in characteristics (communication range, power consumption, security, etc.) and QoS parameters (bandwidth, delay, etc.) The notion of always best connected (ABC) enables people to run applications over the most efficient combination of access technologies with continuous connectivity. Access selection is the key functional block in ABC solutions, as it chooses the most suitable access networks for application traffic flows. However, it is important that access selection decisions be dynamically made, minimizing the power consumption on mobile devices while satisfying QoS requirements and user/application preferences. In this paper, we model the problem of multi-constraint dynamic access selection (MCDAS) as a variant of bin packing problem. A series of approximation algorithms derived from the first fit decreasing (FFD) algorithm are proposed for finding near-optimal solutions. Simulation studies show that the algorithms we propose gradually improve performance towards quasi-optimal solutions in terms of power consumption and preference satisfaction. [C2149]

## "Improved channel allocation and RLC block scheduling for downlink traffic in GPRS"

This paper investigates the radio resource management (RRM) approaches for GSM/GPRS networks. The effort was put on access control (AC), time-slot (TS) allocation, and radio link control (RLC) packet scheduling for down-link performance enhancement. A new credit-based algorithm was proposed and implemented in a system level simulator. The simulation results for overall cell throughput as well as throughput per user show an improvement for the proposed scheme in comparison to a best effort algorithm, in particular in high-load scenarios. [C2150]

## "A node architecture for disaster relief networking"

In this paper we present node architecture for a personal node in a cognitive ad-hoc disaster relief network. This architecture is motivated from the network system requirements, especially single-hop distance and jamming-resilience requirements. It is shown that the power consumption of current-day analog to digital converters (ADCs) limits the channel bandwidth that can be used, both for a baseband processing system and the scanning system. We therefore propose to use a form of frequency hopping time division multiplexing (FH/TDD) system, similar to Bluetooth. However, we propose to use OFDM as modulation scheme instead of GFSK and show that the OFDM symbol length for the frequency range at hand (400-1000 MHz) is consistent with a Bluetooth-alike FH/TDD scheme. We propose to modify the FH/TDD scheme to incorporate a radio-spectrum measurement phase. Based on these measurements carriers in the OFDM-based scheme are selected in such a fashion that legacy users are avoided. In case of too much legacy-user spectral usage hopping patterns may be altered [C2151]

## "Context Based Preferences with Mobile Electronic Personality"

The preferences of people depend on different contexts from location to current role. Therefore the context has to be taken into account when service is personalised. In this paper mobile electronic personality (ME) is enhanced so that the context is taken into account before personal information is sent to service [C2152]

## "Improving ground penetrating radar signal analysis through FFT superimposition"

The paper deals with the signal analysis problem encountered with ground penetrating radar (GPR) applications that use the fast Fourier transform (FFT). A technique for improved signal analysis based on superimposing multiple FFT analyses from the same data is presented. Results from applying the technique are seen to reduce the side lobes with minimal increase in main lobe width. [C2153]

## "Joint ACE ground penetrating radar antenna test facility at the Technical University of Denmark"

A ground penetrating radar (GPR) antenna test facility, established within the ACE network at the Technical University of Denmark (DTU), is described. Examples of results from the facility obtained from measurements of eight different GPR antennas are presented. [C2154]

## "Doppler radar detection of mechanically resonating objects"

The limitations of existing counter-mine technology have motivated the development of an acousto-electromagnetic technique for detecting landmines and other buried objects (Lawrence, D. and Sarabandi, K., IEEE Trans. on Antennas and Propag., vol.49, p.1382-92, 2001). This hybrid method exploits the acoustic resonance of an object to discriminate it from soil, plant matter, rocks, and other clutter that cause false alarms for GPR. An object is distinguished based on the Doppler signature imparted to radar signals scattering off the object's vibrating surface. We investigated whether small vibrations in objects can be detected by a sensitive Doppler radar. Objects with known acoustic resonant frequencies (tuning forks) were excited (by a speaker), and their Doppler signatures measured using a CW radar system. In the resulting Doppler return, the carrier signal is frequency modulated by a pure tone. Our Doppler radar succeeded in detecting resonant tuning forks even when the vast majority of the receive power was clutter. The primary limitation on our system's performance was not the sensitivity of the radar, but rather the ability to couple acoustic energy into the forks from a remote source. [C2155]

## "Personalized Service and Network Adaptation for Smart Devices"

The availability of smart devices with integrated GSM/GPRS/WiFi and the rollout of public hotspots allow users to be always online at reasonable costs. Personalised and context aware applications will become available in the forthcoming years due to the wide availability of smart devices and the interest of telecom operators and service providers to provide personalised services. For the user to access his preferred network and services in a particular context we need to have some mechanisms in place and an infrastructure that reacts autonomously on behalf of the user. This paper proposes a solution based on context-aware user profiles and their associated user preferences. It describes a smart device centered solution and a prototype has been built for Microsoft Windows Mobiletrade Pocket PCs to validate the ideas [C2156]

## "Application of tomographic inverse scattering techniques to microwave imaging radars"

The application of tomographic inverse scattering techniques to imaging radars is presented to realize high quality imaging in this paper. Radar imaging is treated from the viewpoint of tomographic inverse scattering. Multistatic data acquisition and the reconstruction algorithm in diffraction tomography are applied to ground penetrating radar (GPR) and ultra wideband synthetic aperture radar (UWB SAR) imaging. Spatial frequency coverage is exploited to evaluate the imaging characteristics. Theoretical and numerical results show the feasibility initially. This research has a great potential value for novel imaging radar systems. [C2157]

## "Combined Mobility between H.323 Multimedia Systems and GPRS/IMT2000 Networks: Architecture & QoS Aspects"

This paper describes a reference architecture which enables a H.323 user, to get access to H.323 based-multimedia services also outside her/his corporate network domain via an IMT2000 based mobile network. The appropriate mechanisms to handle the mobility management between an H.323 based environment and IMT2000 based mobile networks (combined mobility) are explained. The article also considers the appropriate requirements to achieve defined conditions for an end to end service with a guaranteed quality. Furthermore the

demand of corresponding service level agreements between all involved parties is identified [C2158]

## "Special GPR antenna developments for landmine and UXO surveys"

Ground penetrating radar (GPR) is a promising technique for detecting and identifying buried landmines and UXOs. The antenna plays a critical role in determining the performance for tasks and requires to have a broad bandwidth, minimal ground dependency, fast or no antenna ring-down, desirable polarization and pattern characteristics. Three unique UWB dual-polarization GPR antenna designs are discussed. A dielectric rod antenna, covering from 1 GHz to 6 GHz, is suitable for shallow (less than 12 inches) targets, such as landmine detection/identification. The other two antennas, covering frequencies from 20 MHz to 800 MHz, are suitable for general GPR applications, such as the detections of pipes, utility lines, UXOs, AT mines, etc. [C2159]

## "Investigation of resistive vee antennas for a multi-static ground-penetrating radar"

A resistive vee antenna (RVA) is a vee shape configuration of resistively loaded arms. A refined version of the RVA has been designed and implemented for use as an antenna in GPR systems, and its performance has been demonstrated in previous work (Kangwook Kim and Scott, W.R., Jr, 2004; Scott et al., 2004). We further improve the implementation of the RVA and demonstrate its use as an antenna in a multi-static GPR system, which is developed to study potential multi-static inversion algorithms. [C2160]

## "The circuit design of the synergistic processor element of a CELL processor"

A 32b 4-way SIMD dual-issue synergistic processor element of a CELL processor is developed with 20.9 million transistors in 14.8mm2using a 90nm SOI technology. CMOS static gates implement the majority of the logic. Dynamic circuits are used in critical areas, occupying 19% of the nonSRAM area. ISA, microarchitecture and physical implementation are tightly coupled to achieve a compact and power efficient design. Correct operation has been observed up to 5.6GHz at 1.4V supply and 56°C. [C2161]

## "Working in a difficult environment: GPR sensing on the railroads"

Selecting antenna systems for ground penetrating radar along railroad tracks is a challenge. The antennas must provide sufficient depth of investigation (roughly 2 m), and yet have sufficient resolution to detect and map changes in ballast gravel and the ponding of centimeter thicknesses of water. They must operate in high cross winds during high speed rail travel, with at least 20 centimetres of ground clearance. They must also tolerate the high EMI/RFI environment from railroad communications and automation, and the high clutter environment from metallic objects, and yet provide an adequate field of view to see sub-meter scale variations in subsurface properties along and across the track and between the ties, as well as the condition of the ties themselves. The antenna mounting must be flexible to fit on a variety of rail vehicles and be easily reconfigurable to accommodate frequent track changes. Frequency, antenna type, mounting, position, orientation, and polarization of the antennas are important. Field experiments have proven the utility and effectiveness of one configuration of antennas utilizing 1 GHz air launched horns with one orientation and polarization between the rails and another outside the rails beyond the end of ties. Antenna and radar system calibrations are required to turn the data into true cross sectional images and to model for water content in the subsurface, and such calibrations are challenging. [C2162]

## "Handheld GPR and MD sensor for landmine detection"

A novel landmine detection sensor system, called ALIS (advanced landmine imaging system), which combines a metal detector and GPR, has been developed. This is a handheld equipment, which has a sensor position tracking system, and the sensor output can be visualized in real time on a head-mounted PC display. A field evaluation test of ALIS was conducted in Afghanistan, and we demonstrated that it can detect buried antipersonnel landmines, and can also discriminate metal fragments from landmines. [C2163]

## "A Frequency Reuse Scheme for GPRS Network"

In this paper, a novel frequency reuse scheme, 2*6 reuse, is proposed for the GPRS network. The simulation results show that 2*6 reuse outperforms the 1*3 frequency reuse scheme, which is usually considered as optimal. Moreover, compared with recent proposals such as 3*3, and 2*2 reuse schemes, 2*6 demonstrates superior performance. For example, with 5 hopping transceivers in a cell and 29 hopping frequencies, the average overall cell area throughput enhancement over 1*3 reuse is about 40% for the 2*2 reuse, 55% for the 3*3 reuse and 85% for the 2*6 reuse. The 2*6 reuse scheme also provides the highest cell capacity. Importantly, that in contrast to other simulated reuse schemes, the 2*6 reuse brings the average throughput with CS3 coding scheme very close to the achievable maximum and provides good throughput even in remote locations within

the cell [C2164]

## "Authentication platform for seamless handover in heterogeneous environments"

This work tackles the hot issue of user handover from one network to another, or generally from one radio access technology (RAT) to another, in a 4G heterogeneous mobile and wireless environment without the interruption of an ongoing service (seamless handover) with user authentication support. This paper proposes an authenticated seamless handover mechanism and describes the authentication platform for two network environments: an operator with both GPRS and WLAN networks (the user performs a vertical handover). Two different WLAN operators (the user performs a horizontal handover) [C2165]

## "Resource allocation framework for QoS provisioning in HSDPA"

{no data available} [C2166]

## "GSM/GPRS Erlang capacity analyses and simulations under air traffic loading conditions"

This paper looks at the general packet radio system (GPRS) technology as an alternative communications technology for the air traffic users within a managed air space. This technology can compliment, or back up the more conventional links such as VHF digital link modes VDL 2,3,4. Theoretical maximum speeds of up to 171 kilobits per second (kbps) are achievable with GPRS. In addition, it is a widely accepted migration step toward Third generation universal mobile telecommunication system (3G UMTS) which will provide even more capabilities through the use of wideband code division multiple access (W-CDMA). This study involved the computation of availability/blockage of voice and controller pilot data link communications (CPDLC) data over GSM/GPRS. The Erlang B was used for the voice, while the Erlang C was used for the data services to compute the availability of each. Traffic loads are obtained for the airport, terminal, and enroute airspace domains. Several parameters that effect the availability results were studied including the outage definition time, range of service data, number of available TDMA logical channels, and buffer size. The results show very good availability for busiest airspace demand rates for year 2015. Overall, the voice communications will reduce the system availability the most, followed by the data applications. The most significant reduction of ideal maximum capacity is probably the limitation of the controller's human capability to handle a large group of aircraft within a sector. Nonetheless, automation advancements may improve that limitation in the future [C2167]

## "COSIME: Real-life Cellular Network on the Desktop"

Development of software for mobile environment is often complicated by difficulty of "real-life" testing. Functional testing could be run against network emulator(s), but this is often not enough for performance testing. The latter includes, for example, testing of response times or quality of end-to-end service. For such tasks, emulation of live network is necessary. This paper describes the inexpensive, easy to use, and fully configurable testing tool, developed at Nokia Research Center. The testbed named COSIME (COmbined SIMulator and Emulator) provides real-life network environment for testing the mobile phone software, from the network-specific protocol stack up to user's applications [C2168]

## "Adaptive Transmission Scheme Based on Rician Channel k-factor for EGPRS Systems"

To utilize the spectrum efficiently, nine modulation and coding schemes had been specified in the EGPRS standard. This paper proposes a new closed-loop link adaptation by selecting the transmission mode according to the Rician channel k-factor. The proposed link adaptation incorporates only three identical modulated schemes due to the considerations of hardware complexity and implementation feasibility. Applying the proposed method to a real channel measured at urban Taipei city, the simulation results show that the adaptive scheme outperforms the fixed mode transmission by 58% while the block error rate is maintained below 10-2 [C2169]

## "Mobile-to-mobile IM: a real time chatting system for GPRS networks"

There are a number of Internet based instant messengers and mobile-to-Internet instant messengers but there is no such publication addressing mobile-to-mobile instant messaging solution for wireless text based communication through General Packet Radio Services (GPRS) networks without involving Internet based servers. This paper addresses recent research and development efforts in constructing wireless real-time chat server/client through GPRS networks. It discusses the server and client system architecture, design, and technologies. The paper demonstrates an application example of real-time chat server/client and addresses the development-time and implementation-time experiences [C2170]

## "Conception et impl~mentation d~une plate-forme de services de localisation"

The paper begins by discussing the principal characteristics of the platform and goes on to consider the sectorisation of the cells and localisation processes [C2171]

## "An architecture for sentient GPRS-enabled MicroBots"

Ambient intelligence is a user-centered concept which combines several computing disciplines with the purpose of enhancing/facilitating the user's daily activities. We deem that autonomous or semiautonomous (remotely controlled) sentient MicroBots may also be first-class citizens within ambient intelligence. Those MicroBots would interact with their surrounding environment assisted by their built-in sensors, effectors and communication facilities, on behalf of the users they serve. In essence, they would also profit as users do from Ambient Intelligence to achieve their programmed goals. In this paper, we contribute with a solution to enable the realtime remote control of GPRS-accessible semiautonomous sentient MicroBots. Moreover, we discuss the extensions necessary to convert those MicroBots into care assistants for disabled and elderly people. [C2172]

## "Vehicle localization in underground mines using a particle filter"

In this paper a particle filter is applied to the problem of tracking the position of a moving vehicle in an underground mine using only inertial sensors and a digital map of the mine. This is useful for several applications, one of which is tracking the position of a ground penetrating radar system. The ground penetrating radar is used to ascertain the current condition of the mine ceiling and evaluate its risk of failure (i.e. collapse). A ground penetrating radar system is driven along a tunnel and measurements are logged. It would be useful to record position information along with the radar since there are many of kilometers of mine tunnels. Although particle filters have been applied to vehicle tracking before, they have not been applied to the problem of tracking a vehicle in an underground mine environment. A particle filter is a probabilistic approach to estimating the next state based on the current observation. There are three main components to a particle filter. They are particle generation (sampling), determining and normalizing the importance weights (importance), and resampling the particles (resampling). Each of these components are described for the given application. The vehicle tracking model is presented and its particle filter implementation is described [C2173]

## "Drive test based EDGE radio network performance evaluation"

{no data available} [C2174]

## "Wireless fair service for EGPRS"

{no data available} [C2175]

## "Wideband cavity backed spiral antenna for stepped frequency ground penetrating radar"

A 1.7 turn cavity backed coplanar waveguide to coplanar strip-fed logarithmic uniplanar spiral antenna is presented and compared to a 1.5 turn spiral antenna. The 1.7 turn spiral antenna has a wide beamwidth, are circular polarised and has a bandwidth with a return loss better than 6 dB in the frequency band from 0.25 GHz to 4.5 GHz (18:1). The antenna is useful for ground penetrating radar (GPR) [C2176]

## "A delay-line loaded tapered slot antenna"

In this paper, a delay-line loaded Vivaldi TSA has been realized, which is fed by a microstrip line. The slot-line is etched on the ground plane of the microstrip line, and one of its sides is a narrow open port and the other side is a gradually widening slot as radiating port. At the ends of tapered flare slot, there are about 1 m long delay-lines. The unvarnished currents will go along the delay-lines without radiating energy until they go to the ends of the delay-lines. In this way, the time of appearance of the ring will be delayed about 10 ns. Without a loss of radiation efficiency, we achieve to avoid the interference between ring and target signals [C2177]

## "SAR/ISAR imagery from gapped data: maximum or minimum entropy?"

In UWB synthetic aperture radar (SAR) or inverse SAR (ISAR) imagery, there are several special cases leading to the collections of fragmented (or gapped) data. Both spectrally fragmented waveforms and interrupted SAR data collection result in data gaps, which in turn lead to sidelobe severely corrupted radar images. In these cases, innovative image processing techniques must be developed to recover the degraded images. Different algorithms have proposed in the past. We concentrate on radar imagery from randomly gapped data. Two image processing algorithms based on either maximum or minimum entropy, namely, the Burg algorithm and the alternative iteration deconvolution based on minimum entropy (AIDME) are compared. The performance

comparison of the two algorithms suggests a new processing procedure to combine the merits of both techniques for optimal SAR/ISAR imagery from gapped data. [C2178]

## "Mobile Bristol: A City of Pervasive Experiences"

The Mobile Bristol project is funded by the Department of Trade and Industry in the United Kingdom, with the founding partners being Hewlett Packard Laboratories, the University of Bristol and the Appliance Studio. Mobile Bristol investigates how mobile devices and pervasive information technology can be used to enhance the ways in which residents and visitors experience and interact with their physical environment and with each other in urban and public spaces. Imagine a digital landscape overlaying the physical world. As you walk around this landscape, you can activate by your presence and actions digital sounds, sights and interactions that are located in the environment. The digital landscape is formed from a dynamic and overlapping set of mediascapes which are context-sensitive combinations of digital media and interactions created and deployed by various authors using the authoring tool we have developed. [C2179]

## "A compact ultra-wideband antenna for time- and frequency-domain applications"

A new type of single-element wideband antenna is proposed that can provide wide bandwidth and consistent polarization over the frequency range for which the antenna is impedance matched. The antenna is composed of two parallel sectorial loop antennas (SLAs) that are connected along an axis of symmetry. The novel ultra-wideband coupled sectorial loop antenna has an 8.5:1 impedance bandwidth. The antenna has consistent radiation parameters over a 4:1 frequency range with excellent polarization purity over the entire 8.5:1 frequency range. Modified versions of this UWB antenna, with reduced metallic surfaces and similar radiation parameters, were also designed, fabricated, and measured. Measurement results indicate that these modifications do not adversely affect the UWB behavior of the antenna. [C2180]

## "Test research on vehicle information wireless communication system"

Information is the core and soul of intelligent transportation system (ITS). If there were not enough information then ITS aims wouldn't be achieved ideally. The wireless transmission of vehicles information is an important parts in whole ITS communications system. Research platforms for GSM and GPRS network in lab have been established respectively. Then test researches based on above platforms for transmitting remote vehicle information have been processed in paper. The results could offer some references for the selection of transmission network for remote vehicle information communications, analog or digital. [C2181]

## "Mathematical methods for analysis of GPRS systems quality operation"

Discussed in the paper are the methods for estimation of service of claims, which come to the base station of GPRS system. [C2182]

## "A wideband planar antenna for in-body imaging"

Breast cancer is the most common cancer in women. X-ray mammography is currently the most effective detection technique, however it suffers from a relatively high missed- and false-detection rates, involves uncomfortable compression of the breast and also entails exposure to ionizing radiation. Microwave detection of breast tumours is a potential non-ionising alternative being investigated by a number of groups. In these microwave-based systems, in a similar fashion to ground penetrating radars, microwaves are transmitted from an antenna or antenna array, and the received signals, which contain reflections from tumours, are recorded and analysed. A pre-requisite for all of these systems is a suitable antenna. This contribution presents in detail for the first time, an inexpensive, wideband, planar antenna design, specifically designed to radiate into breast tissue [C2183]

## "Detection of buried objects such as landmines using a forward impulse radiating antenna (IRA)"

A novel forward impulse radiating antenna (IRA) is presented. The design of this antenna has been optimized for the detection of buried objects using the 3D field simulator Microwave Studio (MWS). The antenna yields images of subsurface objects with outstanding resolution when an appropriate calibration technique is applied. This technique locates the reference plane inside the ground and therefore allows the air-ground reflection and antenna mismatch and losses to be removed. A prototype of the new forward impulse radiating antenna has already been constructed and preliminary experimental results are presented. [C2184]

## "An ultra wideband tapered slot antenna"

A typical tapered slot antenna (TSA) consists of a gradually widening slot in a metallic plate printed on a substrate. The bandwidth of TSA is limited mainly by the transition of the feeding line and slot-line, which varies with frequency. A wideband Vivaldi TSA, fed by a microstrip line, has been realized. The slot-line is etched on the ground plane of the microstrip line; one side is a narrow open port and the other side is a gradually widening radiating port. The microstrip is very close to the open port of the slot-line. At the end of the microstrip, a shorting pin, which is also close to the slot-line, is connected to the ground plane. In this way, all reflecting waves from the open port of the slot-line and the shorting pin, along with the original waves, radiate at almost the same time towards the wide radiating port of the antenna. [C2185]

## "3-D FDTD modeling of ULF/ELF propagation within the global Earth-ionosphere cavity using an optimized geodesic grid"

We discuss an emerging application of finite-difference time-domain (FDTD) computational electrodynamics: modeling transient ultra-low frequency (ULF) and extremely low frequency (ELF) propagation within the global Earth-ionosphere cavity. This permits for the first time a direct, three-dimensional, time-domain calculation of round-the-world ULV/ELF propagation accounting for arbitrary horizontal as well as vertical geometrical and electrical inhomogeneities and anisotropies of the excitation, ionosphere, lithosphere, and oceans. [C2186]

## "On the use of energy density spectra for discriminating between landmines and clutter objects"

The paper studies the use of energy density spectra (EDS) derived from ground penetrating radar (GPR) measurements on a sub-surface target to discriminate between landmines and clutter objects. The GPR used to collect the data is frequency swept and has a bandwidth of 1.4 GHz. Our investigation indicates that the EDS reveals distinct characteristics between landmine targets and many clutter objects, and hence can be exploited for their discrimination. Experimental results based on data measured at a government test site corroborate the effectiveness of the proposed approach. [C2187]

## "Real 3G WCDMA networks performance analysis"

Third generation (3G) technologies are becoming more widely deployed. However, a prerequisite for the successful deployment of such services is the measurement of practical performance characteristics offered by the underlying wireless network (e.g. 3G). This paper presents the results of a number of experiments aiming to identify the performance of a real WCDMA (wideband code division multiple access) -based wireless network for different types of applications: FTP, HTTP, VoIP, and audio and video streaming. Moreover, the paper discusses the impact on the measured performance by assigning different QoS profiles to end-users. Based on the evaluation results, the paper provides a set of recommendations for both operators and service developers when designing and deploying applications on such wireless networks. These recommendations can also help researchers in accurately validating 3G wireless network research proposals [C2188]

## "The semi-analytic mode matching (SAMM) algorithm for efficient computation of scattered near fields from 3D dielectric targets buried in lossy soil"

The 3D semi-analytic mode matching (SAMM) algorithm is used to determine the nearfield scattering from spherical, prolate spheroidal and oblate spheroidal targets buried in lossy soil. Scattering is described by moderately low-order superpositions of spherical modes originating at user-specified coordinate scattering centers (CSCs); the mode coefficients are found numerically by least-squares fitting all boundary conditions at discrete points along the relevant interfaces. Spherical buried target scattering is modeled with CSCs located at the sphere center and its image in air; with the latter modeling reflections from the underside of the plane back towards the target. For prolate spheroids, additional CSCs along the major axis of the target are necessary, while for oblate spheroids, the additional CSCs lie in the equatorial plane of the target. For a favorable choice of CSCs and a careful selection of fitting points, the SAMM algorithm converges with increasing mode number. [C2189]

## "Enhanced detection and classification of buried mines with an UWB multistatic GPR"

We present a resonance-based classification technique for the identification of plastic-cased antipersonnel (AP) land mines buried in lossy and dispersive soils under rough surfaces by a stepped-frequency ultra-wideband (UWB) downward-looking ground penetrating radar (GPR) with an array of receivers. For this application the multistatic ground probing sensor is positioned just above the ground surface and operates from UHF to C-band frequencies. Novel physics-based models based on the finite difference frequency domain (FDFD) technique simulate the characteristic resonating multi-aspect target frequency responses for several realistic buried land mine detection scenarios. Matched filter detection results are presented which assess the GPR's performance in identifying a simulated mine buried under a rough surface at varying depths in dry sand and a dispersive clay

loam soil and distinguishing them from false targets such as buried rocks. [C2190]

## "Ground penetrating radar antenna measurements based on plane-wave expansions"

The plane-wave transmitting spectrum of the system consisting of the ground penetrating radar (GPR) antenna and the air-soil interface is measured using a loop buried in the soil. The plane-wave spectrum is used to determine various parameters characterizing the radiation of the GPR antenna into the soil. The procedure is tested on a spiral antenna. [C2191]

## "Ground penetrating radar antenna system analysis for prediction of earth material properties"

The electrical properties of the ground directly beneath a ground penetrating radar (GPR) antenna very close to the Earth's surface (ground-coupled) must be known in order to predict the antenna response. In order to investigate changing antenna response with varying ground properties, a series of finite difference time domain (FDTD) simulations were made for a bistatic (fixed horizontal offset between transmitting and receiving antennas) antenna array over a homogeneous ground. We examine the viability of using an inversion algorithm based on the simulated received waveforms to estimate the material properties of the earth near the antennas. Our analysis shows that, for a constant antenna height above the earth, the amplitude of certain frequencies in the received signal can be used to invert for the permittivity and conductivity of the ground. Once the antenna response is known, then the wave field near the antenna can be determined and sharper images of the subsurface near the antenna can be made. [C2192]

## "GPR migration algorithm for landmines buried in inhomogeneous soil"

Accident caused by antipersonnel (AP) landmines remaining from past conflicts have received considerable public exposure in the last several years. Detection of minimum-metal or plastic landmines by conventional metal detectors in a difficult and challenging task. Ground penetrating radar (GPR) can be an effective subsurface imaging tool for solution to landmine detection, because it can detect both the metal and nonmetal objects based on the dielectric properties. However, the detection of buried landmines by GPR normally suffers from very strong clutter that would decrease the signal-clutter ratio and deform the image of the landmine in GPR data. For enhancement of the signal-clutter ratio and improvement of the image quality, we developed a stepped-frequency continuous-wave array antenna ground penetrating radar system, called SAR-GPR. The system can acquire CMP data instead of generic common-offset data. Some data processing techniques have been in use to process CMP data, including velocity analysis, CMP stacking and migration. Also vertical variable velocity model is estimated and applied to normal moveout correction (NMO) and Kirchhoff migration [C2193]

## "Exact and approximate underground wavefront shape determination from an above ground GPR source"

Waves radiated from a ground penetrating radar in air above soil refract at the planar ground surface, and change from a circular to a flattened shape resembling a hyperbola. It is useful to predict analytically the shape of this wavefront in the underground half space. The exact wavefront shape is derived, along with a hyperbolic approximation with specific parameters depending on the dielectric constant of the half space, ε' (= n2), the height of the source, h, and p, the propagation time from source to wavefront multiplied by the wave velocity in the half space. [C2194]

## "Surface effects on ground penetrating radar imagery"

Ground penetrating radar (GPR) is emerging as viable technology for rapid and accurate landmine detection. Although GPR has been successfully used for land mine and subsurface object detection, the performance of GPR is affected by surface roughness of the soil medium. There have been theoretical studies showing that surface roughness degrades GPR performance, but few empirical studies have been performed. In this paper, we report on an empirical study of the effect of rough, flattened, and smooth surfaces on GPR images of an easily understood target. [C2195]

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"Gain/bandwidth programmable PA control loop for GMS/GPRS quad-band applications"

The analog power amplifier (PA) control loop of a fully-integrated GSM/GPRS quad band transceiver by Duvivier et al. (2003) is presented. The control loop is based on a fully-integrated PA controller which meets all GSM/GPRS specifications. Both the gain and the bandwidth of the PA control loop are programmable as well as the stand-by voltage delivered to the PA. These features, together with a high driving capability (8.4 mA @ 2.5 V), make this solution capable to interface vast combinations of PAs, couplers and detectors. The proposed PA controller has been integrated in a BiCMOS SiGe 0.35 μm process and measures 0.33 mm2. The current consumption is 2.8 mA without load and 7.2 mA in the application (using Hitachi PF08109B PA) from a single 2.8 V power supply. [C2318]

## "Omnicon:a mobile ip-based vertical handoff system for wireless LAN and GPRS links"

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## "Cached memory performance characterization of a wireless digital baseband processor"

We present performance analysis results of the MSP500 digital baseband (DBB) platform, a system developed at Analog Devices Inc., targeted at cellular handsets supporting the GSM, GPRS, and EDGE communication standards. We focus on a particular member of the MSP500 family, the AD6532 device, which integrates a Blackfin® core, and examine the execution time performance of a number of wireless physical layer software components from the perspective of an instruction- and data-cached memory hierarchy. The Blackfin is a 16-bit fixed-point core that combines some of the best features of DSPs and micro-controllers, and has support for a cached memory system. [C2320]

## "3D nonlinear electromagnetic inversion for buried objects in layered media"

Electromagnetic (EM) inverse scattering in ground penetrating radar (GPR) is complicated and doubly challenging: one is that EM wave propagation is essentially a 3D wave phenomena and waves interact in a complex way with ground surface, subsurface layers, and objects; the other is that this class of nonlinear and ill-posed inverse problem involves intensive computation. In the practical use of GPR, the shallow earth may be necessarily modeled by one or more overburden layers. Thus, it is necessary to extend the existing inverse scattering methods developed for a homogeneous background or half-space to a multilayered medium. In this regard, here we deal with such a 3D EM nonlinear inverse scattering problem in multilayered media as a new step toward 3D image reconstruction of buried objects. [C2321]

## "Optimal pulse penetration in Rocard-Powles-Debye model dielectrics using the Brillouin precursor"

When an ultrawideband electromagnetic pulse penetrates into a causally dispersive dielectric, the interrelated effects of phase dispersion and frequency dependent attenuation alter the pulse in a fundamental way that results in the appearance of precursor fields. For a dielectric described by the Rocard-Powles extension of the Debye model, the dynamical field evolution is dominated by the Brillouin precursor as the propagation depth typically exceeds a single penetration depth evaluated at the carrier frequency of the input pulse. This is because the peak amplitude in the Brillouin precursor decays only as the square root of the inverse of the propagation distance. Because of its unique nonexponential peak decay, the Brillouin precursor has direct application to foliage and ground penetrating radar, remote sensing and wireless communications in adverse environments. Of equal importance is the frequency structure of the Brillouin precursor which exhibits a complicated dependence on both the material dispersion and the input pulse characteristics. A Brillouin pulse is then defined and shown to possess near optimal (if not indeed optimal) material penetration. [C2322]

## "Broadband impedance compensation for ground penetration radar antenna using genetic algorithms"

For ground penetration radar (GPR), a broadband antenna is important for system performance. However, in low operating frequency ranges, impedance matching conditions can be satisfied but at the cost of lower antenna gain. Impedance compensation seems to be an efficient way for fulfilling both the antenna gain and impedance matching requirements. A genetic algorithm (GA) is introduced to design the broadband impedance compensation network in which there is no need for any equivalent circuit nor an analytical function for the antenna and network. The experimental data of the broadband ground radar antenna is processed directly to synthesize the compensation network. Complex conjugate matching conditions, provided by the compensation network on the antenna input port to allow an overall return loss of -10 dB across the frequency band, are design specifications for the GA. [C2323]

## "Inverse scattering computational algorithm for the reconstruction of random rough surface profiles"

A fast algorithm for reconstructing the profile of a random rough surface is presented. This algorithm uses the 3D electromagnetic waves scattered from rough ground surfaces to retrieve the unknown surface profiles. The proposed algorithm is based on merging a 3D fast forward solver and an efficient optimization technique. The preliminary results show the potential success of the inversion algorithm. [C2324]

## "A novel channel predictor based on constrained hidden Markov model"

In order to realize the potential of link adaptation, reliable channel prediction is necessary. In this paper, we propose a novel channel predictor based on constrained hidden Markov model (CHMM), By partitioning the

range of the received signal envelope into several intervals, a CHMM can be constructed with the high efficiency algorithm. Then an improved prediction method is presented, which is more accurate than the simple prediction method of the largest transition probability. Finally, simulation results are given to show the effectiveness of the CHMM channel predictor. [C2325]

## "A CMOS WLAN/GPRS dual-mode RF front-end receiver"

A dual-mode, triband RF front-end receiver for GSM-900, DCS-1800 and IEEE 802.11b/g is introduced. With advanced architecture selection and frequency plan, only a single VCO and frequency synthesizer are required for both GSM/GPRS cellular and IEEE 802.11b/g WLAN. The receiver front-end has been realized in a 0.25 μm CMOS process. It dissipates about 30 mA from a 2.7 V supply for all modes and exhibits noise figures of 3 dB for the GSM-900 band, 5.9 dB for the DCS-1800 band, and 5.7 dB for 2.4 GHz WLAN. [C2326]

## "Cellular handset evolution-convergence of high-speed data services"

Summary form only given. Modem cellular handset designs are incorporating a wide variety of wireless interfaces. Wide area network (WAN) technologies are rapidly migrating from second generation voice interfaces to GPRS, EDGE, CDMA2000, WCDMA, and HSDPA that offer voice along with high speed data. WLAN technology, IEEE802.11a/b/g, is finding its way into handset designs and offers an attractive interface for high speed wireless data and voice over IP (VOIP) services. Wireless personal area networks (PAN) such as Bluetooth are also finding wide adoption. On top of this, GPS now ships in millions of handsets each year, digital broadcast television holds promise for widespread adoption within a few years, UWB products are coming to market, and advanced interfaces such as 4G WANs and cognitive radios are under discussion for the future. This offers a view of how all these standards will impact wireless services and what it will mean for handset design. [C2327]

## "GLRT-detection performance in subsurface sounding"

The performance of subsurface deep sounding is investigated with reference to the radar sounder, MARSIS (Mars advanced radar for subsurface and ionosphere sounding), aboard the Mars Express mission, designed to investigate the presence of water-related interfaces in the subsurface of Mars. The analysis aims at providing the necessary tools for (i) performance prediction and (ii) data processor design. Using well known models for the backscattered signal, we compare the expected signal-to-clutter ratio values under most of the instrument's operating conditions. The generalized likelihood ratio (GLR) approach is followed for subsurface interface detection, and along-track integration is introduced in order to achieve the desired performance. In particular, we address the design of the integration window, and the requirements of data homogeneity. A thorough performance analysis is presented to cope with the expected MARSIS scenarios. In particular, we investigate several sources of mismatch between the assumed model and collected data, and derive the performance degradation due to each source. [C2328]

## "Session TU4C: Cellular Transmitters and Transceivers"

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## "Technology development of short range ultrawide-band radar system"

Ultrawide-band (UWB) short-range radars (SRRs) are one of the attractive applications for UWB systems. Considerations of both automotive SRR applications and their physical layer design for the system using the 24 GHz-band is introduced. The status of our development as a collaboration research project at Yokosuka Research Park is also described. [C2330]

## "A single-chip RF transceiver for quad-band GSM/GPRS applications"

This paper presents a single-chip quad-band GSM/GPRS transceiver with fully-integrated VCOs in a 0.35 μm BiCMOS technology. The transceiver consists of an image-rejected low-IF receiver, an OPLL transmitter with TxVCO, a fractional-N frequency synthesizer with a RFVCO and LDO regulators. The receiver has a maximum gain of 100 dB with more than 110 dB dynamic range and the static reference sensitivity is better than -108 dBm. The transmitter delivers 5 dBm output power with 6° peak-to-peak and 2° rms phase errors and the 400 kHz modulation spectrum is better than -65 dBc. The power consumption during receiving and transmitting modes are 68 mA and 120 mA, respectively. This chip is housed in a 56-pin QFN package. [C2331]

## "A single chip direct conversion CMOS transceiver for quad-band GSM/GPRS/EDGE and WLAN

## with integrated VCO's and fractional-N synthesizer"

This paper presents the first WWAN + WLAN integrated radio transceiver. The 0.18 µm CMOS chip includes a fully integrated receiver, transmitter and frequency synthesizer. The device includes a direct conversion receiver that converts the RF signal to quadrature analog baseband while yielding a high IIP2 (>+45.0 dBm) and low LO radiation ( [C2332]

## "FDTD validation on an improved virtual transmission-line conversion model of open-ended coaxial probe"

A GPR (ground-penetrating radar) system for locating leakage points of a water supply pipe is to be tested using a plastic tank filled with dry sand. To design our wide-band GPR antenna, we must know the electrical properties of dry and wet sand. An open-ended coaxial probe is effective in measuring complex permittivities of materials in a wide frequency range. A model of the open-ended coaxial probe is used to convert the measured reflection coefficient into the corresponding complex permittivity. We find that the deviation between the given and our measured complex permittivities of ethanol, whose electrical properties are similar to those of saturated sand, grows as the measured frequency increases. This discrepancy may be generated from experimental errors or the conversion model. To verify whether our conversion model is erroneous or not, we need the exact reflection coefficient without errors. One suitable tool may be the FDTD method. The FDTD simulation results lead us to conclude that our conversion model is very accurate in a wide range of frequency. [C2333]

## "Session 4B: Wideband wireless communication"

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## "Design of an LTCC tri-band transceiver module for GPRS mobile applications"

This paper presents the results of a low-temperature co-fired ceramic (LTCC) module for tri-band GPRS mobile applications. The proposed transceiver module integrates the tri-band (EGSM/DCS/PCS) antenna switch, surface acoustic wave (SAW) filters for band selection, and a fully integrated tri-band transceiver IC into one LTCC package. Integrated passive devices include the diplexer, low-pass filters for harmonic rejection, transmission lines, and circuit elements for wiring/impedance matching. The module size is 13.8 mmЧ8.1 mm, with a packaged height of 1.8 mm. The module is compliant with the ETSI regulations and is currently working on commercially available mobile phones. [C2335]

## "Performance of Pastry in a heterogeneous system"

We study how Pastry performs in a heterogeneous network environment of varying size. The large traffic overhead for management traffic makes the overlay nonfunctional if it grows too large. This can be circumvented by partitioning the routing tables at the cost of increased path lengths and response times. [C2336]

## "Buried object detection by using GPR"

The process of detecting buried objects using ground penetrating radar (GPR) is presented. Background removal, filtering and correlation within a window are used to reveal the target's reflected energy. When a considerable increase in the reflected energy is observed, a detection warning signal is created, depending on a parameter explained in the algorithm. The warning signal is activated over the buried objects, until the energy level falls to its initial trigger level. Thus, the buried object position is determined. A pulsed GPR system with 1 GHz bandwidth is used. [C2337]

## "Roaming dynamics in GPRS and beyond: options and strategies"

Roaming is a service that allows a subscriber of one operator to use the services of another operator when inside the latter's coverage area. Over 20000 roaming agreements have made the GSM service available around the world; the same is expected also for GPRS, and further for 3G. Operators are now implementing GPRS roaming using so called "home network" model where traffic from visited network is routed back to home network using GRX networks. The model offers good service quality, security and control of customers, but some issues with content roaming still exist. While implementing roaming, an operator has to make several decisions that affect the operator's business in various, complex ways. We provide an insight into the end-to-end roaming models in the mobile communications industry and identify the possible roaming business model scenarios for GPRS and beyond. We discuss the key business and technological triggers that would encourage an operator to adopt one of these identified models. We also highlight the major concerns an operator has while choosing a roaming model. The basic assumptions and constraints considered for our model have also been listed in this

paper. Roaming dynamics has been explained based on MOB, a mobile business game being developed at Helsinki University of Technology. [C2338]

## "Buried object detection-EMI and IR sensors"

Several sensors have been used to detect buried objects, such as GPR (ground penetrating radar) and EMI (electromagnetic induction) sensors. IR (infrared) and acoustic sensors are supportive sensors which are used with an EMI sensor or GPR. The paper focuses mainly on two sensors, a main EMI sensor and a support IR sensor. The EMI sensor's output signal and IR sensor's output image are determined and also how to get mine detection information from these outputs. Landmine detection, which is important for military and humanitarian purposes, is used as a case study. [C2339]

## "Time-frequency-power analysis of ground penetrating radar signals and identification of buried objects"

In some ground penetrating applications, it is required to deduce the physical properties, such as size, shape and electrical characteristics, of the medium or object under study from the transient scattered field measured at a set of receivers outside the scatterer by means of a collection of transmitters. A wideband antenna and radar system is considered. The FDTD method is used to solve the transient scattering problem in an arbitrary two-dimensional inhomogeneous, isotropic medium. The measured transient response of the object is analyzed. A two dimensional detection algorithm is developed using the frequency domain Green's function. Some results are given, and comparisons are made between different physical configurations. [C2340]

## "A 1GHz CMOS analog-front-end for a partial-response read channel"

An analog front-end including a continuous-time equalizer to shape the received waveform into a 6-sample target, and a DFE-driven timing recovery loop is presented. With soft Viterbi detection, sensitivity is within 1.5dB of simulations at a rate of 24/25 and user density of 3.4. The 0.35 µm CMOS chip consumes 240mW at 800MHz, and 380mW at 1 GHz clock rates. [C2341]

## "Landmine detection using fractional Fourier features"

This paper addresses the problem of detecting anti-personnel landmines, in an environment that could contain clutter, using features extracted via the fractional Fourier transform. The focus is on identifying and using fractions of the Fourier transform that lead to better detection performance assuming that the landmine is within a reasonable depth variation below the surface. The performance of the proposed detection scheme is assessed in terms of detection rate and false alarm rate using real landmine signatures. The effects of removing ground clutter are examined, and the effects of knowing the mine depth a priori are also discussed. [C2342]

## "Simulation of a ground penetrating radar environment by means of FDTD methods using an automatic control approach"

A novel approach for the design and the simulation of a ground penetrating radar (GPR) environment by means of FDTD methods is presented. Simulating GPR data is essential for the development and comparison of algorithms using exactly defined data. The development of the model and the selection of optimum parameters for the electromagnetic FDTD field simulator are addressed. Also discussed is how to solve the problem of necessary changes to the model by means of an ActiveX server control, which allows control of the whole functionality of the FDTD solver from an external Win32 application, providing a possibility for the automation of the GPR simulation. Several simulation results are presented. The success of the approach is presented through the excellent quality of the results achieved. [C2343]

## "Development of an ultra wideband ground penetrating radar (UWB GPR) for nondestructive testing of underground objects"

A compact ground penetrating radar (GPR) using an impulse waveform is developed. The UWB GPR system is composed of an impulse generator, ultra wideband transmitting and receiving antennas, high speed digitizer, and a laptop computer for data storage and image processing. By considering the maximum measuring depth and soil properties, a proper impulse generator is made and then a novel compact traveling wave monopole antenna is designed to transmit the impulse and receive the reflected signal. Also, image processing for visualization of buried targets is performed. For verification, a UWB GPR prototype is built and tested. It is shown that the system has very good depth and spatial resolution. [C2344]

## "Numerical analysis of microwave detection of breast tumours using synthetic focussing techniques"

Microwave detection of breast tumours is a non-ionising and potentially low-cost and more certain alternative to X-ray mammography. Analogous to ground penetrating radar (GPR), microwaves are transmitted using an antenna array and the reflected signals, which contain reflections from tumours, are recorded. The work presented here employs a post reception synthetically focussed detection method developed for land mine detection (R. Benjamin et al., IEE Proc. Radar, Sonar and Nav., vol. 148, no.4, pp. 233-40, 2001); all elements of an antenna array transmit a broadband signal in turn, the elements sharing a field of view with the current transmit element then record the received signal. By predicting the path delay between transmit and receive antennas via any desired point in the breast, it is then possible to extract and time-align all signals from that point. Repeated for all points in the breast, this yields an image in which the distinct dielectric properties of malignant tissue are potentially visible. This contribution presents a theoretical evaluation of the breast imaging system using FDTD methods. The FDTD model realistically models a practical system incorporating wide band antenna elements. One major challenge in breast cancer detection using microwaves is the clutter arising from skin interface. Deeply located tumours can be detected using windowing techniques (R. Nilavalan et al., Electronics Letters, vol. 39, pp. 1787-1789, 2003); however tumours closer to the skin interface require additional consideration, as described herein. [C2345]

## "Quad-band GSM/GPRS/EDGE polar loop transmitter"

An EDGE transmitter, using a non-linear GSM type PA, is presented. A dual feedback loop ensures robust performance even under VSWR variations. No isolator or external PA filtering is required. The EDGE spectral mask is met with an RMS EVM of [C2346]

## "Broadband counter-wound spiral antenna for subsurface radar applications"

A new antenna structure called the counter-wound spiral antenna (CWSA), which is suitable for subsurface radar applications, is examined. The CWSA has a broad bandwidth and a linear polarization with a controllable plane of polarization from a compact planar geometry. This dual linear polarization property offers a reduction in antenna polarization loss when a radar is imaging long slender targets, and allows the extraction of maximum information from the echoes. CST Microwave Studio simulations were used to examine the return loss and axial ratio as a function of several design parameters, such as spacing between the two spirals. The CWSA far-field polarization was shown to be linearly polarized when an appropriate delay was set to the excitation input of the front planar antenna to compensate for the physical spacing. The research has resulted in a successful design that has a broad bandwidth and linear polarization with an electronically controllable plane of polarization from a planar geometry. [C2347]

## "Improved resistively-loaded vee dipole for ground-penetrating radar applications"

A new RVD has been designed. The new RVD has curved arms and is loaded with a modified Wu-King resistive profile. The RVD showed improved responses in a broad range of frequency, which make it more suitable to use in a GPR system than a typical RVD. One way of implementing the antenna was shown. [C2348]

## "Towards an Erlang-like law for GPRS/EDGE network engineering"

A model for GPRS/EDGE network engineering is developed in order to obtain an Erlang-like law. It is based on a discrete-time Markov chain. It captures the main features of the GPRS/EDGE radio resource allocation and assumes an ON/OFF traffic (infinite sessions with geometric distributions of ON/OFF sizes) performed by a finite number of users over the cell. The Markov chain is simplified by Taylor series expansion and a simple and accurate Erlang-like law is obtained. [C2349]

## "The architecture of a novel tool for network management using GSM/GPRS mobile devices"

Computer network management is a highly demanding task because network managers have to deal with urgent requests to solve network problems. Unfortunately, a network manager may be situated in a location where there is no Internet-connected computer to perform remote network management tasks. To solve this problem, the paper describes the architecture of a novel tool for network management using GSM/GPRS mobile devices. First, the paper presents some general concepts about network management and GPRS technology. Then it focuses on the description of the architecture for the development of applications for network management. The paper also describes implementation details of a network management tool, particularly the interface for mobile devices. Finally, it shows results by depicting the screens of several mobile devices which provide network management information. [C2350]

## "Robust and adaptive transmission of compressed video streams over EGPRS"

Today, multimedia transmission over wireless networks encounters several problems and the result is a poor video quality perceived by the end-user. The paper investigates the feasibility of video streaming transmission over EGPRS mobile networks. Then, a simple system of variable-to-fixed length code is proposed to get a more robust compressed data. Hence, more robust data can be transmitted with less error protected EGPRS modulation and coding schemes which allow higher data rates. [C2351]

## "Quality and reliability of GPRS connections"

Lately, as wireless communication has become more and more popular, the quality and reliability of communication has become an issue. GPRS is the first step towards an all-IP system and is a kind of development environment when developing quality and reliability in wireless mobile applications. The paper handles quality and reliability of GPRS connections. Phenomena which affect quality or reliability are covered first. Measurement results are presented. Connection quality and reliability are discussed and prospects concerning quality and reliability in future wireless solutions are expressed as well. [C2352]

## "Image processing techniques of landmines: a review"

There are mainly two types of landmines which kill or maim people around the world, are anti-tank mine (ATM) and anti-personnel mine (APM). Much research effort has been devoted in trying to detect and remove APM, because APM is much smaller than ATM and is more difficult to detect. Some of the common mine detection techniques include using sensors, signal processing, image processing and decision processes. In this paper we review the signal processing, image processing and decision processes technique to detect or locate a mine and discuss the possible future techniques. [C2353]

## "UMTS core network planning model and comparison of vendor product performance"

First Page of the Article [C2354]

## "A new technique for testing GPRS mobiles"

First Page of the Article [C2355]

## "An inter-band handover technique for testing tri-band GSM mobiles efficiently"

First Page of the Article [C2356]

## "Accessing SMIL-based dynamically adaptable multimedia presentations from mobile devices"

Current business presentations are commonly multimedia-based and with the realization of the mobile enterprise, accessing of such presentations stored on servers from mobile devices becomes increasingly common. However as a roaming mobile device user moves, factors that change include the local wireless network technology, the available bandwidth, the currently closest source of the media files and even the continuity of wireless access. The XML-based standard, synchronized multimedia integration language (SMIL), provides a format to specify the display sequence and layout of media files in a multimedia presentation. We present a SMIL-based system for mobile devices that is able to dynamically adapt presentations in response to such changing mobile computing-related factors as those given above. [C2357]

## "Performance improvement for GPRS, WLAN integration using ad hoc networks"

As the wireless technology evolves, one can access the Internet almost everywhere via many wireless access networks such as wireless LAN and GPRS. People would like to use the wireless networks with high data rate, large coverage and low cost. Some networks such as GPRS can provide large coverage, but they only provide low data rate; some networks like wireless LAN can provide high data rate, but the access points are not widely deployed. None of the wireless networks can meet all requirements of a mobile user. Heterogeneous networks solve parts of the problem. In heterogeneous networks, users can roam among different kind of networks such as 802.11 wireless LAN and GPRS through vertical handoffs. But in heterogeneous networks, each kind of wireless networks provide different quality of services. Users roaming among the wireless networks suffer enormous change of quality of services. We propose three access network selection strategies that keep mobile users staying in the wireless networks with higher quality services longer and thus improve the average available bandwidth and decrease the call blocking probability. [C2358]

## "Performance issues with vertical handovers-experiences from GPRS cellular and WLAN hot-spots integration"

Interworking heterogeneous wireless access technologies is an important step towards building the next generation, all-IP wireless access infrastructure. We present an experimental study of inter-network mobility between GPRS Cellular and 802.11b-based WLAN hot-spots, and deeply analyze its impact on active transport TCP flows. Our experiments were conducted over a loosely-coupled, Mobile IPv6-based, GPRS-WLAN experimental testbed. Detailed analysis from packet traces of inter-network (vertical) handovers reveals a number of performance bottlenecks. In particular, the disparity in the round trip time and bandwidth offered by GPRS and WLAN networks, and presence of deep buffers in GPRS, can aggravate performance during vertical handovers. This paper, therefore, summarizes practical experiences and challenges of providing transparent mobility in heterogeneous environments. Based on the observations, we propose a number of network-layer handover optimization techniques, e.g. fast router advertisements (RA), RA caching, binding update (BU) simulcasting and layer-3 based soft handovers that improve performance during vertical handovers. The paper concludes with our experiences of migrating TCP connections, thereby also improving application e.g. FTP, Web performance in this environment. [C2359]

## "An assessment of GSM/GPRS link in a navigation system for visually impaired pedestrians"

This paper presents the results of performance assessment, which was carried out to evaluate the suitability of GSM and GPRS mobile communication links for application in a system for navigation of visually impaired pedestrians. [C2360]

## "A secure m-commerce model based on wireless local area network"

The focus of this paper is on a secure mobile commerce model based on wireless local area network (WLAN). The model is investigated through the accessing procedure, the roaming management procedure, and the electronic trade procedure. To solve the security problem in the WLAN, a novel authentication method is proposed, in which the mobile node (MN) is validated twice by an access point (AP) and a mobile agent (MA), and all the devices are authenticated in a register procedure with the PKI/CA mechanism. Finally, the advantages of the model are analyzed. [C2361]

## "A two-tier architecture for automated mobile applications"

Emerging high bandwidth wireless infrastructure such as WiFi and Bluetooth networks make possible mobile applications that involve automated "conversations" between mobile devices and other land-based systems. By automated is meant that communication does not necessarily require human initiation or intervention. Such applications have been previously economically unviable on GSM/GPRS networks due to the costs per call and/or per data volume and technically challenging as providing for run-time flexibility in such communication poses semantic encoding difficulties. Nevertheless such applications are particularly well suited to mobile device interfaces, which have input and display limitations, as they minimize the required level of human user input. In this paper we propose a two-tier architecture for simple database-centric mobile applications, capable of such automated communication, that uses polymorphism to achieve run-time flexibility. [C2362]

## "Mobile Internet access in BAS"

We discuss the mobile Internet access in the context of project BAS (business as usual), which plans to develop a system that connects all the public service buses as nodes in an ad hoc network and use this network to provide a wide range of services that are perceived to be useful to commuters. In our system, the heterogeneous communication between wireless bus ad hoc network and Internet is established with the installation of specific access routers along the road, which serves as gateways between these two types of networks. However, the integration of wireless bus ad hoc network with the Internet faces many challenges, such as gateway discovery, mobility management and routing. We propose an architecture that addresses these issues. Additionally, this architecture allows passengers to access the Internet with their mobile devices via this bus ad hoc network, and possibly reducing their access and usage costs. [C2363]

## "A novel tool for network management using a WAP interface"

Computer network managers are often requested to solve urgent network problems. Many times, they cannot access a computer to perform remote network management tasks. Aiming at solving this problem, this paper presents a novel tool for network management that uses a WAP interface, and focuses on the description of the architecture and the associated application modules. This paper also describes and analyses the several solutions employed to overcome the limitations imposed by the low screen resolution of mobile devices. [C2364]

## "Application of beam domain STAP techniques to space-based radars"

This paper deals with beam-based space-time adaptive processing (STAP) algorithms for a low-earth-orbit (LEO) space-based radar (SBR). The performance of a subarray-based joint-domain-localized (JDL) algorithm is first examined for different parameters. Then, a combined beam-domain STAP algorithm approach that combines JDL with difference (Δ) beams is presented. It is shown that the combined JDL-Δ algorithms offer less system complexity and provide performance similar to that of the JDL with higher degrees of freedom. It is also shown that the earth's rotation induces a crab angle, which makes the clutter range-Doppler spectrum range dependent. This paper shows that this crab angle severely degrades STAP performance. [C2365]

## "Integrating SIP, presence and FTP to provide wireless multimedia messaging"

Building on the success of short message service (SMS), the use of multimedia messaging service (MMS), is taking off on global system for mobile (GSM) communications, General packet radio service (GPRS) and universal mobile telecommunications system (UMTS) networks. Multimedia messages for person-to-person communication greatly enhance the messages users now routinely exchange via SMS and provide operators with new opportunities to offer new appealing services and generate additional revenue. However, MMS uses a proprietary implementation by the mobile phone vendors, e.g. Nokia, Logica CMG. At the same time, internet protocol (IP) technology has provided an effective nonproprietary infrastructure for internet multimedia services. With the adoption of IP protocols into the wireless network and convergence with fixed line networks, e.g. in GPRS and UMTS, the challenge becomes to deliver multimedia messages in a nonpropriety manner to wireless users. This paper will examine the session initiation protocol (SIP), presence and FTP through a nonproprietary open technology architecture to deliver multimedia messages wirelessly. [C2366]

## "Performance analysis of GSM/GPRS system with channel impairment"

In a wireless environment, the impairment of communication channels can affect significantly the performance of broadband wireless system. This paper presents an analytical model on the performance of a GSM/GPRS system with channel impairment. The model incorporates the interfering effects causing by the bit error rate of affected channels and the possibility of corrupted channels. Our model is based on a Markov-modulated Poisson process (MMPP) used for traffic integration of voice and data in a GPRS system. With the effect of interference embedded in the model, the result would provide valuable realistic information for the design and implementation of such systems. [C2367]

## "Session aware network controlled interface selection for multihomed hosts"

This paper proposes network-controlled architecture to enable multihomed devices-devices that have multiple network interfaces independently connected to different networks-to effectively use all the available interfaces. The salient features of our approach are that it is session aware, i.e. the choice of network interface is based on the network state and session characteristics. Furthermore, it does so without exposing a user's location and preferences to the correspondent nodes thereby preserving user privacy. Network control using a middle-box as opposed to an end-to-end mechanism ensures fast response, optimal network use, minimal changes to end hosts and support for legacy applications and provides a detailed instantiation in the context of a SIP based call model. This paper also discusses deployment issues and details of our implementation. [C2368]

## "Performance evaluation of SCTP as a transport layer solution for wireless multi-access networks"

Future communication systems might be characterized by an integration of multiple access systems, and people are expecting excellent multi-access solutions for better services. However, currently proposed solutions in different layers are unable to completely fulfill the requirements. In this paper, we put forward the stream control transport protocol (SCTP) as a transport layer approach for multi-access, and propose an efficient SCTP load-sharing enhancement. The evaluation of performance has been investigated in the key multi-access scenarios with theoretical analyses, simulations in NS and some Linux-kernel experiments. Since SCTP supplies an effective multi-homing mechanism and the transport layer solutions for multi-access can quickly adapt to the fluctuating network conditions, our SCTP approach is able to bring more throughput for the simultaneous multi-access perform seamless behavior during the vertical handover between heterogeneous access networks, and provide better robustness and connectivity than other solutions in the wireless multi-access scenarios. [C2369]

## "Efficient support of java RMI over heterogeneous wireless networks"

Distributed object-oriented platforms are increasingly important over wireless environments to provide frameworks for collaborative computations and for managing a large pool of distributed resources. For beyond

3G environments, distributed object-oriented platforms can provide the framework and toolkits for application developments with heterogeneous wireless environments. In this paper, we present our support for Java RMI over Bluetooth, GPRS, and WLAN environments. We propose a software mechanism which can be used to dynamically adapt RMI over different networks with optimization-related strategies. This is an important middleware for component communications. We will show how to employ Java Dynamic Proxy and exception handling techniques to help perform roaming and resource scheduling among heterogeneous wireless environments. Java Grande benchmarks are used to demonstrate that our RMI implementations over GPRS, WLAN, and Bluetooth environments are effective in supporting parallel and distributed control of Java layers over heterogeneous wireless environments. [C2370]

## "Mobile ECG detector through GPRS/Internet"

In modern society, requirements on medical insurance are increased rapidly with economy grown and living conditions improved. As human being self-health being focused on and social medical grade being progressed, human biosignals monitors whose features are portable, wireless, easy-diagnosing, low-cost and convenient at home, are more and more necessary. We therefore develop mobile wearable detector for wireless ECG transportation based on bluetooth protocol though GPRS/Internet to be used as self-ECG monitor. The paper introduces system architecture and its module, and describes wearable detector, Bluetooth implementations in details. We believe that minimizing and wireless will be widely applied in medicine and health fields. GPS will be integrated into the detector in the future. [C2371]

## "Modeling for dimensioning and configuring general packet radio service networks"

This paper presents an analytical model that enables network dimensioning and configuration investigations for a general packet radio service (GPRS) network. The model accounts for transmission control protocol (TCP) using a detailed mathematical representation and introduces a 'TCP factor' metric and procedure to model TCP behavior. The analytical model results, for a web browsing application, are validated by means of discrete event simulation. The ability of the analytical model to perform accurate network dimensioning and admission control is also demonstrated. [C2372]

## "Toward SSL integration in SIM SmartCards"

The Global System for Mobile Communications (GSM) specifications introduce the 03.48 standard to allow the OTA (on-the-air) platform to securely communicate with SIM (subscriber identity module) cards. This standard operates above unreliable links such as SMS instead of reliable transport protocols such as TCP. In this paper, we propose to introduce the SSL (secure sockets layer) protocol in order to assure an end-to-end security and reliability between the SIM card and the OTA server transparently to the terminal. This would have an impact on new services independent of middlemen. A computation of the cryptographic loads demonstrates the enhancement our proposed protocol provides. [C2373]

## "GPRS simulation in NS for WLAN and GPRS integration"

This work presents the GPRS simulation in NS for WLAN and GPRS integration. The interoperability between the access network WLAN and GPRS is of high importance in order to provide seamless mobility of the mobile user roaming between different access networks. Many architectures were proposed to ensure this interoperability relying on MIP as the mobility protocol for vertical handoff providing seamless roaming between different access technologies. The end-to-end performance during handover from WLAN to GPRS and vice-versa is studied. [C2374]

## "The Weaves runtime framework"

Summary form only given. We present a language independent runtime framework-called Weaves-for object based composition of unmodified code modules that enables arbitrary (selective) sharing of state between multiple control flows through a process. Furthermore, the framework allows dynamic instantiation of code modules and control flows through them. In effect, Weaves create intra-process modules (similar to objects in OOP) from code written in any language. Applications can be built by instantiating Weaves to form Tapestries of dynamically interacting code. The Weaves paradigm allows objects to be arbitrarily shared-it is a true superset of both processes as well as threads, with code sharing and fast context switching time similar to threads. Weaves do not require any special support from either the language or application code-practically any code can be weaved. Weaves also include support for fast automatic checkpointing and recovery with no application support. We present the elements of the Weaves framework and results from our implementation that works by analyzing source-code independent ELF object files. [C2375]

## "Secured mobile multimedia communication for wireless Internet"

Wireless Internet roaming may include several radio access networks involving different layer 2 technologies such as 802.11b, CDMA and GPRS. As a mobile user moves around and switches between wireless cells, subnets and domains, it needs to maintain the session continuity. At the same time security of signaling and transport media should not be compromised. A multi-layer security framework involving user authentication, packet based encryption and access control mechanism can provide the desired level of security to the mobile users. Architecture, implementation and performance of a similar framework in a mobile environment is presented here. Results and performance analysis of the implementation are of immense value for wireless Internet service providers, before it is actually deployed in a wide scale manner. [C2376]

## "Dynamic control and optimization of buffer size for short message transfer in GPRS-UMTS networks"

This work focuses on the problem of dynamically determining the optimal buffer threshold for message transferring services (SMS, MMS) in GPRS-UMTS networks. An infinitesimal perturbation analysis (IPA), based on stochastic fluid models (SFM) is used to obtain sensitivity estimates of the performance measure of interest with respect to the control parameter and the near-optimal buffer threshold is obtained by using stochastic approximation techniques. As a result, these approaches are used continuously to adjust the buffer size when the traffic condition changes. [C2377]

## "Service performance monitoring for EGPRS networks based on treatment classes"

GPRS/EDGE networks provide an opportunity for operators to offer new services to their potential and existing subscribers. Unlike circuit switched services, EGPRS services are dependent on a multitude of factors to guarantee a timely content delivery. To ensure that the contracted QoS is sustained, it is not sufficient to overprovision resources, fn addition, operators need to have tools for monitoring the QoS experienced by diverse packet flows in different network segments. This paper presents theoretically, and confirms experimentally, a simple mechanism to monitor throughput of distinct services across EGPRS networks, which enables a proactive and timely supervision of service level agreements and quality. The approach is based on the treatment class concept, which maps services with different performance requirements onto distinct QoS profiles. By means of treatment classes, defined by a subset of the bearer attributes, i.e. bit rates, priorities and traffic classes, it is possible to formulate metrics to measure the performance of distinct services within the network domains, without any visibility of the content carried by upper layer protocols. Experimental results show good agreement between throughput measurements in the network and the corresponding measured values at the application layer in the mobile terminals. [C2378]

## "PROTON: a policy-based solution for future 4G devices"

We present PROTON, a policy-based solution for 4G mobile devices-it allows users to seamlessly connect to highly integrated heterogeneous wireless networks. The key motivation behind PROTON stems from the statement that handover process complexity will increase in 4G systems, creating the need for augmented knowledge about context, as well as more flexibility. This paper demonstrates (1) how a flexible policy-based approach is suitable for 4G scenarios, and (2) how to incorporate richer context into policies and still maintain a light weight solution appropriate for mobile devices. [C2379]

## "Live information update services over GPRS"

This paper presents a novel live information update service for mobile phones working over GPRS C. Anderson (2001). The design presented deals with the delivery of updates to the phone with least possible delay, from the time of event and keeps the amount of data transferred, and thus cost, to a minimum. Therefore, the application created not only costs far less then the traditional update services working over SMS, its end-to-end timing is much more predictable. Further, since the application is created in J2me [V. Piroumian (2002), W. John (2002)] it is able to run on any Java enabled phone-supporting GPRS. [C2380]

## "Efficiency of network initiated detach of inactive subscribers for GPRS"

In today's GPRS networks, low service usage often coincides with a considerable large number of subscribers, which are booked into the SGSN-registers of the core network. Network initiated detach of inactive subscribers (NID) may be used to remove those subscribers from the SGSN, which do not really use GPRS. Within This work model calculations are presented, which are based on current traffic measurement results. They show that this approach achieves a gain in subscribers of factor 2-4 at given SGSN-capacity. [C2381]

"New fast SAR method for 3-D subsurface radiotomography"
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"Modelling and migration of two dimensional GPR images"
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"An approximate solution of 1D inverse problem"
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"Designing of a low frequency ultra wideband(UWB) antenna and its application in ground penetrating radar(GPR) system"
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"Effective automatic picking of traveltime data with high precision"
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"MoM analysis of circular array resonance to design directional borehole radar"
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"GPR antenna pattern analysis for impulse excitation UWB transmitter on arbitrary distance"
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"Compact UWB radiator for short-range GPR applications"
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"Comprehensive experimental analysis of GPR antennas"
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"Testing a new low-frequency GPR antenna on karst environments of central Italy"
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"Calibration procedures for antenna footprint measurement of stepped frequency CW radar"
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## "Proceedings of the Tenth International Conference on Ground Penetrating Radar"

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## "Extraction and visualization of architectural structure based on cross references among object files"

Reverse engineering of legacy systems is a knowledge-intensive process to reconstruct the understanding of a system. A semi-automatic process that can extract architecture level structure from legacy systems is introduced in This work. Exact facts related to cross-references among ELF objects are extracted from files automatically, and then partitioned into hierarchical groups by close cooperation between domain experts and an assistant tool DEREF. By resolving the cross references among these groups, the architectural structure is reconstructed and then visualized using auto-layout techniques. A case study on three embedded operating system demonstrates that this process can be used to obtain a comprehensive understanding about legacy systems even without any a priori knowledge about its design. [C2424]

## "Proceedings of the Tenth International Conference on Ground Penetrating Radar"

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"Near-surface radar pulse propagation in complex terrain environments: preliminary results"

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## "Differential antenna feeding system for short range UWB radar"

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## "Subsurface structure detection using a novel signal processing method"

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## "Efficient mobile content delivery by exploiting user interest correlation"

Accelerating multimedia content delivery to mobile devices is challenging because we must not only address long and unpredictable latency created by the error-prone air interface, but also meet mobility-specific requirements such as efficient terminal power consumption. In this paper, we present a novel architecture for content delivery in the mobile environment (ACME) that significantly accelerates interactive mobile services such as Web browsing. ACME exploits the key concept of user interest correlation (the interest in the same content among different users) to push content to mobile users efficiently. Trace-driven simulations show that ACME achieves 50% effectiveness of content broadcasting by, on average, pushing content to only 0.7% to 6% of all users, thus substantially reducing mobile terminal power consumption. Furthermore, ACME has superior scalability as the push group size increases by only 62% when the total number of users increases by 16 times [C2448]

## "Uluru: a platform for adaptive mobile multimedia applications"

Uluru is a software platform that provides a number of enabling services to mobile multimedia applications including content personalisation and charging. The paper describes the design of such an enabling platform and explores its applicability from a business perspective. We describe the platform's functionalities and overall architecture, and discuss Callsong, an application that makes extensive use of Uluru's personalization and charging services. [C2449]

## "Object detection in 3D UWB subsurface images"

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## "The effects of frequency dependent soil parameters and incident wave polarizations on GPR performance"

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## "Measurement of the complex dielectric pen-nittivity of homogeneous media with dipole antenna sensors"

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## "A robust neural network tool for the identification of buried cylinders by a subsurface radar system"

First Page of the Article [C2453]

## "3G-based access control for 3GPP-WLAN interworking"

The integration of WLANs and 3G networks has recently evolved into a very hot topic. In order to provide a convenient access to both networks in different environments, the integration of 3G and WLAN authentication procedures would be highly beneficial. We propose a novel access control mechanism which reuses the existing 3GPP authentication procedures over a secure 3GPP infrastructure to obtain WLAN access. The proposed method, based on a loose coupling architecture, can be deployed over WLAN networks with or without IEEE 802.11x and employs a single set of control procedures for both WLAN and 3GPP accesses. [C2454]

## "Multimedia communication in policy based heterogeneous wireless networks"

We present a system for IP based networks which allows policy based handover between different access network technologies. The policy rules for selection of the access network are provided by the network/service provider. An interface selection subsystem on the mobile terminal triggers the handover according to these policy rules, and a service subsystem initiates adaptation of the media streams to match the network resource availability. We provide performance measurements to analyze the handover behaviour of our system during a running video session. These measurements show that with the proper interworking between interface selection in the mobile terminal and media adaptation in the video server, an almost seamless policy based handover between heterogeneous wireless networks is possible. [C2455]

## "Shared GTP tunnels for multicast data in 3G networks"

With the evolution of communication technology, 3G networks claim to provide bandwidths of up to 144 kbps to 2 Mbps. On the other hand, the latest mobile handsets are equipped with novel devices such as cameras. It is easy to foresee diverse multimedia services, e.g. on-line live sports events, on-line games. Then, as bandwidth-consuming multimedia services become popular, resources in the core network and the radio network become scarcer. The multicast mechanism was designed to economize network resources in the Internet when data are sent to multiple users at the same time. To apply the same concept to 3G networks, a new multicast mechanism must be designed because of the innately different network architecture. In 3G networks, two GTP (GPRS tunnel protocol) tunnels are built for each connection. According to the standard procedure, for users in the same multicast group, different tunnels are built for each user even when they are within the same cell. The procedure results in multiple unicast connections. That does not carry out multicast. The main contributions of our proposed mechanism are hierarchical multicast group management and shared GTP tunnels in the core network. [C2456]

## "Flexible outer Reed-Solomon coding on RLC layer for MBMS over GERAN"

In this work, we present the multimedia broadcast multicast services (MBMS) framework for GSMEDGE radio access network (GERAN). Flexible outer Reed-Solomon coding is introduced in the GERAN MBMS environment. Performance estimations are presented. These performance estimations are used to compare the flexible RS coding scheme with simple repetition schemes. It is shown that at a target C/I of 7.5 dB and a maximum throughput of 40 kbit/s can be supported. Applying the flexible Reed-Solomon coding we also show that, e.g. for a C/I of 15 dB, even more than 90 kbit/s can be supported by MBMS. [C2457]

## "Context-aware vertical handovers between WLAN and 3G networks"

Vertical handovers can transform heterogeneous networks into an integrated communication environment. Such integration can lead to seamless communication if context information is used to support vertical handovers. Seamless communication environments are needed for future pervasive/ubiquitous systems, which are context aware and can adapt to context changes, including network disconnections, changes in network quality of service and changes in user preferences. This paper describes a generic, context-aware handover solution for multimedia applications and illustrates how this handover works for redirection of communication between WLANs and GPRS or UMTS networks. A description of a prototype for WLAN/GPRS handover and the results of handover experiments are also presented. [C2458]

## "GPRS network simulation model in NS-2"

The objective of the general packet radio service (GPRS) network simulation is to obtain accurate enough implementation of GPRS network in Network Simulation 2 (NS-2), so that IP optimization features can be tested. In this paper, we try to afford such a model The simulation model concentrates on the Um Interface, Gb Interface, Gn Interface and Gi Interface respectively. Each part is represented as node, agent, queue or link in NS-2. At last, a simple analysis of one scenario is given to demonstrate how to use this model. [C2459]

## "Smart handoff scheme for supporting roaming between WLAN and GPRS networks"

Recent advancement in personal communication services (PCS) provides wireless multimedia services for users on the move. For establishing the convenient access environment, the evolution of IP-based integrated scheme becomes very urgent for public wireless access systems. In this paper, we clarify the well-known issues of integrating the general packet radio service (GPRS) network and IEEE 802.11 wireless local area network (WLAN). These issues include the inconsistence in transmission rate and coverage area, the difficulty in seamless handoff, the complexities of mobile IP and address translations, and so on. Based on classified cases, we propose the circular probe strategy (CPS) to measure the precise handoff latency of a mobile node roaming from one network to another. This information helps mobile nodes and its home agent (HA) to decide the

appropriate handoff timing, to maximize the data transmission rate and to perform seamless handoff in the heterogeneous system. [C2460]

## "Architectural options for the WLAN integration at the UMTS radio access level"

Integration of UMTS and WLAN networks can be done at different levels. A promising interworking approach, expected to support seamless vertical handovers, is the one where the WLAN is embedded in the UMTS radio access network. It is suitable for 3G operators, which are provided with extra license-free bandwidth in hot spots. This paper addresses this type of integration, discussing two types of network architecture. These architectures differ in the UMTS interface at which the WLAN is integrated. The focus is put on the WLAN integration at the Iub interface. Several possible architectural options and necessary modifications are discussed. An Iub-based option, where user data is transferred via the WLAN, while the signalling is exchanged over the WCDMA interface is presented more in detail. [C2461]

## "Robust frequency burst detection algorithm for GSM/GPRS"

GSM/GPRS uses a combination of FDMA and TDMA. A frequency correction burst (FCH burst) and synchronization burst are used in the acquisition phase of frequency and timing synchronization, respectively, by the mobile station (MS). A prior knowledge of timing is required for the MS to capture the FCH burst. A timing sync algorithm cannot be used to get timing information unless frequency sync is achieved. So there is it need to identify the time of occurrence of the FCH burst before timing acquisition is achieved. In this paper, we proposed a robust algorithm that exploits the properties of the FCH burst to identify its location accurately enough to perform frequency sync. The convergence property of an adaptive line enhancer (ALE) in the FCH burst is used for detection of the FCH burst and the divergence property of the ALE at FCH burst transition is used to identify the edges of the FCH burst. Some simulation results are illustrated to show the effectiveness of the proposed algorithm. The algorithm is robust enough to perform well even for large frequency mismatches between MS and base station and low SNRs. The algorithm is computationally efficient without sacrificing performance. [C2462]

## "Design and performance of a GPRS based mobile satellite system"

This paper describes the design and performance of a geo-synchronous mobile satellite system based on enhancements to terrestrial general packet radio service (GPRS). The system provides IP data services with a bidirectional throughput of approximately 144 kbps using transportable laptop sized terminals. The terrestrial GPRS standard was significantly enhanced to achieve better spectral efficiency and improved throughput for satellite operation that is characterized by long delays, spectral scarcity and limited link margins. Enhancements were primarily in the radio specific layers, namely physical layer and MAC/RLC layers, to achieve the necessary spectral efficiency and throughput improvement. The system implements a delay optimized bandwidth on demand (BoD/DAMA), dynamic link adaptation (DLA/DBRA), link layer ARQ, multiple levels of QoS, policy based resource management, load balancing and position based admission control and billing. It permits user mobility across spot-beams within the satellite system as well as between satellite system and terrestrial GPRS. [C2463]

## "Design of a Wearable Device for ECG Continuous Monitoring Using Wireless Technology"

This project focuses on the design and implementation of an intelligent wearable device for ECG continuous acquisition and transmission to some remote gateway using Bluetooth technology. The acquisition device has been designed for having very low power consumption and reduced size. The Analog Devices' ADuC831 Micro-Converter for achieving the analog to digital conversion and the CSR's BlueCore2 chip for the Bluetooth transmission are the core of the device. The designed device is an important component of a complete prototype for remote ECG continuous monitoring of patients with diverse cardiac diseases. [C2464]

## "Performance investigation of multi standard radio resource management for packet switched services"

The plurality of currently available mobile communication systems is increasing. Now, after 2G and 2.5G systems, like GSM/GPRS, have achieved a coverage of close to 100% in many parts of the world, 3G systems, like WCDMA/UMTS, enter the market. In addition to these cellular systems, systems based on wireless LAN technologies are also experiencing a strong growth. With these systems being independent to a large extent, the utilization of their resources is suboptimal. To combine the resources of the formerly separated systems, the article describes an approach for applying "multi standard radio resource management" for packet switched traffic. To achieve better utilization of cell resources, in order to improve the system performance in terms of user data rate and system capacity, three strategies are presented and evaluated based on simulation results. The results show that a significant improvement of overall system performance can be achieved. [C2465]

## "A-bis interface dimensioning for EGPRS technology"

The introduction of a new technology, EGPRS (enhanced general packet radio service), in the former existing GSM/GPRS networks requires a detailed analysis of the impact in the existing networks and an accurate estimation of the additional resource requirements. The paper focuses on the impact of the introduction of EGPRS technology in the A-bis interface. The A-bis interface is based on pulse code modulation (PCM). The main impact analyzed is the additional need of A-bis resources for each radio timeslot occupied by an EGPRS user. The paper presents the A-bis pool concept, and introduces an analytical model for the dimensioning of the optimum size of this A-bis pool. Finally, a comparison with real network results is presented. [C2466]

## "Performance analysis of a mobility gateway for GPRS-WLAN integration"

To integrate GPRS and WLANs, we propose a GPRS-WLAN mobility gateway (GWMG) which resides on the border of the GPRS and WLAN systems. The design goal is to minimize the modifications in GPRS and WLANs, as both systems are already widely available in the market. By deploying GWMG, users can seamlessly roam between the two systems. The paper presents analytical models to quantify the performance of the design. Handoff latency and buffer size on the GWMG are analyzed. The results show that the GWMG can achieve the design goal to integrate GPRS and WLANs effectively. [C2467]

## "SDR approach to 3G cellular/PCS and position location services"

In the past few years. third generation (3G) mobile communication systems, where the spectrum of the services now extend up to 60 MHz to 75 MHz, have emerged. In this process, new communication waveforms, such as WCDMA (TDD and FDD) cdma2000 and TD-SCDMA. are now joining the legacy communication waveforms such as GSM/EDGE/GPRS and cdmaOne, to form a large set of services that are used throughout the world. CellularWS manufacturers are now facing various challenges in supporting multiple services as these services have different frequency, bandwidth and protocol structures. Furthermore, in 2001, USA FCC has mandated the E911 requirements for user location services. To meet these requirements radio manufacturers have investigated methods of position location for user equipment. The main objective is to develop the position location solution that is synergistic with the cellular/PCS technology while minimizing the change of current base station infrastructure. In this paper, the SDR architecture for 3G cellular/PCS services and location services is addressed along with the technologies that make this advanced architecture feasible. [C2468]

## "A scheduling algorithm for uplink data services in wireless networks"

We propose a new scheduling algorithm based on concave maximization of a revenue function. The model is useful in rate allocation schemes for real-time, delay-sensitive UMTS services. [C2469]

## "JADE: a versatile run-time for distributed applications on mobile terminals and networks"

As a consequence of the introduction of always-connected wireless networks (GPRS, UMTS, WLAN) and of the continuous growth in power and resources of handheld devices, wireless and wire-line environments are progressively integrating with each other. Agent technology and the peer-to-peer communication paradigm respond very well to the needs of new distributed mobile applications that benefit from distributing intelligence and information on the devices. This paper focuses on JADE, an open source agent oriented middleware that allows reducing the time-to-market for the deployment of hybrid peer-to-peer applications in the wireless world, and describes its characteristics in terms of flexibility, sociability, reliability and interoperability. All these features, extensively tested by an ever-growing community of users, make JADE mature enough to be adopted by the business industry to deploy mobile applications in an open environment. [C2470]

## "Extending WLAN coverage via utility pipes"

In this paper, we propose an inexpensive solution to the extension of wireless local area networks (WLAN) coverage. Our work shows that one can use antennas connected to the utility pipes (e.g., natural gas pipes, drinking water pipes, etc.) to extend the coverage of WLAN. Furthermore, this approach eliminates handovers from high to low data rate networks; e.g., handovers that occur from WLAN to a general packet radio service (GPRS) network. Therefore, the proposed approach avoids the drastic drop in the data rate when handovers occur from high to low data rate wireless networks. We also develop an analytical framework to evaluate the performance of the proposed approach. [C2471]

## "Concept and deployment of Internet ITS"

The concept of Internet ITS is proposed with analysis of some of the key issues to achieve its goal. Our Internet

ITS demo system for real-time traffic information collection and distribution via Internet which is composed of probe cars with on-board systems and server and use commercial GPRS network is then introduced. Performance of the current GPRS network for providing data services in Internet ITS is also evaluated and our field test results showed that the limited bandwidth and large delay of GPRS defers it from further deployment in ITS. High-speed dedicated road-to-vehicle communication (RVC) system is absolutely needed for future Internet ITS. [C2472]

## "Provision of an emergency warning service through GPRS: performance evaluation"

The investigation presented is focused on the methodologies to take advantage of the new communications technologies in vehicular traffic, improving security and efficiency. In this work, we show how to provide traffic and road information to users in vehicles coming up to dangerous situations through the use of the GPRS (general packet radio service) network and we analytically evaluate the probability to avoid the high risk zone for an equipped GPRS vehicle next to an accident. The results presented were obtained in the framework of the GITS (GPRS for intelligent transportation system) project, whose aim was to exploit the GPRS network to collect traffic information concerning the vehicles transiting in a covered area and to transmit traffic information to the drivers. [C2473]

## "New planar compact duel mode filters for mobile communications"

A new type of dual mode filter is proposed for mobile communications systems in 900 MHz frequency bandwidth such as GSM or GPRS. The planar filters were developed on a 0.635 mm substrate with a 10.8 dielectric constant. Several methods of modes coupling were investigated. Each dual mode resonator has a square-shape with the edge 20.5 mm and contributes with two poles to the filter response. [C2474]

## "A concept for hip prosthesis identification using ultra wideband radar"

Ultra wideband (UWB) radar has been extensively investigated both theoretically and practically for the identification buried artifacts. Ground probe radar (GPR) concentrates on the identification of lightly buried land mines, unexploded ordnance (UXO) and archeological targets. The same technology is proposed in a similar context for the rapid identification of in vivo implanted metallic prostheses. The technique is based on resonance based target identification and the paper investigates UWB scattering from a metallic hip prosthesis in free space as a first step in the identification process. [C2475]

## "Service based prioritization in (E)GPRS radio interface"

General packet radio service (GPRS) and its enhanced version, EGPRS, provide data services with a limited capacity. that is evenly shared by the users. The introduction of prioritization algorithms permits a more intelligent assignment of radio resources, which allows prioritization based on the type of end user service. We use simulations to study capacity improvement in the network by changing the priorities for different services. A weighted round robin queuing algorithm is used for this purpose. Optimal queue weights are calculated which maximize the total amount of traffic carried by the network while satisfying specific quality criteria defined independently for each service. The performance of the network is benchmarked against an identical network with no prioritization. It is shown that the prioritized network can carry more than twice the load compared to the network with no prioritization. Finally, the mutual portions of different end user service volumes are changed to see the effect on optimal queue weights. Using the old queue weights with the new service proportions wastes roughly 10% of the capacity, compared to optimal weights for the new service mix. [C2476]

## "An adaptive buffer allocation mechanism for token bucket flow control"

In this paper, a dynamic mechanism for per-flow buffer allocation is proposed and analyzed in a multi-flow environment with token bucket flow control. The mechanism detects burstiness of data traffic by measuring the relative rates of token bucket draining and data arrival, and adjusts the per-flow data buffer size accordingly. By exploiting variations in burstiness among a large group of users, this mechanism increases buffer allocation for users with instantaneous high traffic demand while decrease buffer allocation for users with instantaneous low traffic demand. Our results show a substantial benefit in reducing packet loss with this mechanism, especially when the variance of traffic among users is outstanding. In addition, this buffer size adaptation significantly reduces the signaling overheads for the negotiation and change of the token bucket parameters between the two network elements. The mechanism can be applied widely where there is token bucket flow control, such as between the SGSN and the PCU of a GPRS network. [C2477]

## "Efficient call admission control and scheduling technique for GPRS using genetic algorithms"

In future wireless packet networks, it is anticipated that a wide variety of data applications, ranging from WWW browsing to Email, and real time services like packetized voice and videoconference will be supported with varying levels of QoS. Therefore there is a need for packet and service scheduling schemes that effectively provide QoS guarantees and also are simple to implement. This paper describes a novel dynamic admission control and scheduling technique based on genetic algorithms, focusing on static and dynamic parameters of service classes. A performance comparison of this technique on a GPRS system is evaluated against data services and also a traffic mix comprising voice and data. [C2478]

## "The IP multimedia domain in wireless networks: concepts, architecture, protocols and applications"

The IP multimedia subsystem (IMS) is defined by the 3rdGeneration Partnership Project (3GPP) as a new core network domain. IMS provides a service control platform that allows creation of new multimedia and multisession applications utilizing wireless and wireline transport capabilities. In this paper we cover the concepts and standards defining IMS and review the network architecture from a mobile perspective. We see how IMS interacts with the packet switched domain (e.g. wireless LAN, GPRS, and UMTS networks), the circuit switched domain (e.g. GSM networks), the Internet, and application services. We examine the key IMS capabilities and show how they can be combined to create new mobile IP services. Finally, we present the software architecture that allows development of unique applications (with multimedia/multisession functionality, single/multiuser, service to user), enabled by IMS. [C2479]

## "Enriched media-experience of sport events"

This paper describes a system where Internet-enabled sensor technology was integrated into a context-aware platform to give viewers of sport events an enriched media experience. The system was developed as a proof of concept and was evaluated during real-life use at the Vasaloppet crosscountry ski event. Using Bluetooth wireless ad-hoc networking and GPRS technology, sensor data was transmitted from contestants to the context-aware platform Alipes, which in turn presented the sport event viewer with a personalized, context-aware view. In this paper, we discuss the system architecture and integration of components. The system was evaluated both from technical and user perspectives, where the evaluation results confirm our approach to be technically feasible and that the system provide an enriched media-experience for the majority of viewers. [C2480]

## "The IP datacast system-overview and mobility aspects"

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## "Context-aware design of adaptable multimodal documents"

In this paper we present a model and an adaptation architecture for context-aware multimodal documents. A compound virtual document describes the different ways in which multimodal information can be structured and presented. Physical features are associated to media instances, while properties describe the context. Concrete documents are instantiated from virtual documents by selecting and synchronizing proper media instances based on the user context: the situation, the environment, the device and the available communication resources. The relations between the context features and the media properties are described by a rule based system. [C2482]

## "Problems and promising lines of development of UWB ground penetrating radiolocation"

Some problems existing in modern UWB ground penetrating radiolocation are analyzed. Possible ways of further development of GPR engineering are discussed. Approaches to a problem of primary radar data improvement are proposed. [C2483]

## "Radar images of the covered trenches FDTD simulation"

Results of computer simulation of the video pulse electromagnetic wave scattering in the media containing a dielectric insertion of rectangular or trapezoidal form imitating the backfilled trenches are presented. The finite difference time domain (FDTD) method and the second-order Mur absorbing boundary condition are used for the task solving. Radar images of rectangular form trenches have been analyzed in dependence on depth and width of the trench and on the spacing between the sounding field source and observation point (in other words on the separation between the transmitting and receiving antennas of the GPR). It is ascertained common properties, typical for the radar images of all type of trenches and individual properties typical only for the trenches either, one or another type. It is investigated distinctions of the radar images. [C2484]

## "Modelling GPRS data traffic"

The paper presents results from an analysis of traffic measurements taken at the Gbinterface of a GPRS network. Data was captured in one-week long data sets between November 2002 and March 2004. The paper provides new results, based on three of these data sets, and extends our previous work (Ivanovich, M. et al., 16th ITC Specialist Seminar, 2004). The data was analysed to characterise the aggregate workload statistics, including marginal distribution and autocorrelation, and identify any trends over this timeframe. A study of models that adequately characterise the traffic was also undertaken We find that the aggregate work process (bytes "departing" the SGSN) has a marginal distribution closely matching a negative exponential; however, this does not allow us to conclude that the packet arrival or departure processes are Poisson. The "burstiness" of the traffic (i.e. the coefficient of variation) was found to become smaller over time, i.e. the traffic became smoother. This occurred due to a greater level of aggregation, as a direct result of more "low traffic" users connecting to the network. This may be indicative of an increase in WAP and mobile e-mail usage. Four potential models for the aggregate work process were investigated. The latest data shows that the trend towards a more Gaussian-type marginal distribution model continues. Of the four models studied, the Poisson Pareto burst process gave the best fit to the queueing performance compared with the recorded traffic traces. The fit to the most recent data traffic measurements has substantially improved compared with the earlier results. [C2485]

## "2004 Second International Workshop Ultrawideband and Ultrashort Impulse Signals (IEEE Cat. No.04EX925)"

{no data available} [C2486]

## "Traffic estimation in wireless networks using filtered doubly stochastic point processes"

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## "Deducing local ELF field values from large sense coil fluxmeter measurements"

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## "Data service performance analysis in GPRS systems"

We describe an analytical approach for deriving the packet delay distribution in a cell of a wireless network operating on the general packet radio service (GPRS) standard. Based on that, the average packet delay and packet loss probability are also computed. Our approach is based on a decomposition of system behavior into short-term and long-term behaviors to simplify the analytical modeling. In addition to the effect of voice call handoffs, the impact of packet forwarding and dedicated data channels on data service performance is also taken into consideration. The performance estimates produced by the analytical approach are compared with those generated by simulation experiments. The comparison results confirm the relative accuracy of the analytical approach. [C2489]

## "Design of a wireless ARM-based automatic meter reading and control system"

This paper implements a wireless ARM-based automatic meter reading and control system (WAMRCS) for distribution automation. The WAMRCS is designed based on a 32-bit ARM microprocessor to deal with power data processing and relay control. In order to provide a cost-effective, wireless, always-connected, two-way data link between utility company and WAMRCS, the WAMRCS sends information of utility usage, power quality and outage alarm to utility company via GPRS network. Compared with analog utility meter reading by manpower, WAMRCS is more accurate, reliable, cost-effective, quick and free from man-made errors. It can provide extra capabilities such as distribution automation, load management and time-of-use rate. [C2490]

## "A comparative study of mobile application development in symbian and J2ME using example of a live football results service operating over GPRS"

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## "Analysis of the performance of hybrid (broadcast/mobile) networks"

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## "Landmine detection with ground penetrating radar using fuzzy k-nearest neighbors"

This paper introduces a system for landmine detection using the sensor data generated by a ground penetrating

radar (GPR). The GPR produces a three-dimensional array of intensity values, representing a volume below the surface of the ground. First, a constant false alarm rate (CFAR) detector is used to focus the attention and identify the candidates that resemble mines. Next, we apply a feature extraction algorithm based on projecting the data onto the dominant eigenvectors in the training data. The training signatures are then clustered to identify a few representatives, and a fuzzy k-nearest neighbor rule is used to distinguish true detections from false alarms. [C2493]

## "Continuous Choquet integrals with respect to random sets with applications to landmine detection"

A hit-miss transform is defined using Choquet integrals with respect to random sets. In this context, random sets represent random shapes defined on the plane. Random sets are characterised by their capacity functional. Capacity functional is fuzzy measures. Choquet integrals with respect to random sets are interpreted as stochastic morphological operations. Specifically, the integrals represent the average probability that sets either intersect or are contained in the random sets. Formulas are defined for random erosions and dilations of disks and annuli with Gaussian radii. Applications to landmine detection are given. [C2494]

## "High speed equalizer for GSM/GPRS"

In mobile communication the equalizer removes intersymbol interference (ISI) introduced by the multipath fading signals. Sequence estimation algorithms are used in the equalizer for their better performance. MLSE is one such sequence estimation technique in which the Viterbi algorithm is used. In this work, we propose various optimizations, which bring down the computational complexity and memory requirements significantly for the GSM/GPRS equalizer. The redundancies in the computation of branch metrics and trace-backs are avoided in the optimizations. This equalizer can be implemented on any general purpose DSP, as the optimizations are performed on the algorithm and are not specific to any processor. These optimizations resulted in 66% reduction in arithmetic computations per Viterbi butterfly. On TMS320C55x, the proposed implementation takes only 3.4 million cycles per second (MCPS) whereas the state of art implementation takes 12 MCPS. [C2495]

## "GPR-based adaptive sensing: GPR manipulation according to terrain configurations"

In this paper, we introduce an adaptive sensing method to a landform using a ground reflection of a ground penetrating radar (GPR). When GPR scans a ground surface, an antenna of GPR should be put on a ground as an ideal condition. The farther an antenna is put away from a ground, the shallower the sensing depth becomes, because a ground surface reflects most of the electromagnetic wave radiated by the antenna. Practically an antenna should be manipulated, keeping a small distance from a ground in order to avoid a collision with a ground. Besides, the distance should be controlled so as to observe the ground reflection at a constant position in B-scan image, which is eliminated by a simple algorithm. There are many sensors to measure a ground configuration, but we propose an adaptive sensing which does not require any additional sensors such as laser range finder. In addition, the ground reflection in B-scan image is precisely eliminated by manipulating the sensor head according to GPR sensor information. We show some experimental results to confirm its effectiveness and its performance. [C2496]

## "The VIY-2 ground penetrating radar"

The VIY-2 ground penetrating radar (GPR) with unique sounding possibilities and use simplicity is presented at this paper. The VIY-2 GPR combines all units (synchronizer, transmitting and receiving modules, power supply and antenna system) into single case. The VIY-2 GPR communicates with computer via standard interface RS232 or USB 1.0. Utilized by the VIY-2 GPR technical solutions reduce deployment time and simplify survey process. The VIY-2 GPR design features and its components interaction are considered. Some field results are also presented. The VIY-2 GPR design concept allows reducing the data acquisition time, optimizing the time-varying gain control function, applying depth-stacking dependence, controlling the survey window position and interference reducing by pulse repetition frequency randomizing. [C2497]

## "Link quality control benefits from a combined incremental redundancy and link adaptation in EDGE networks"

A performance analysis of link quality control (LQC), comprising incremental redundancy (IR) and link adaptation (LA) in EDGE networks has been provided. Both simulated and real system measurement results demonstrate the superiority of the proposed combined IR+LA strategy over pure IR. LLC and TCP/IP protocol stack simulations show that a pure IR strategy causes upper layer protocol implications as well as frequent TCP retransmissions resulting in considerable throughput degradations especially under bad C/I conditions. In this case, a combined IR+LA strategy reduces the TCP/IP packet delay and avoids upper layer timer expiries by switching to a more robust coding scheme. Hence, under bad radio conditions, with IR+LA the application

throughput is preserved at an optimum level. [C2498]

## "WLAN coverage planning: optimization models and algorithms"

The impressive market spread of IEEE 802.11 based wireless local area networks (WLAN) calls for quantitative approaches in the network planning procedure. It is common belief that such networks have the potential to replace traditional indoor wired local networks and allow flexible access outdoors, eventually competing with classical cellular systems (GSM, GPRS, UMTS, etc.). The appropriate positioning of the access points (AP) is crucial to determining the network effectiveness. In a companion paper we argue that previously proposed approaches to coverage planning neglect the features of the IEEE 802.11 access mechanism, which limits system capacity when access point coverage areas overlap. We describe the optimization models with hyperbolic and quadratic objective functions that directly accounts system capacity and we propose heuristics combining greedy and local search phases. Computational results show that our heuristics provide near-optimal solutions within a reasonable amount of time. [C2499]

## "Quality of service in GPRS/EDGE mobile radio networks"

An advanced QoS strategy comprising 3GPP QoS parameters along with operator specific weighting factors is used to define the appropriate QoS priority of each service type and user profile. A deterministic up- and downgrading strategy as well as admission control is applied to ensure both a minimum service level, defined by the operator for low-priority services, and a full bandwidth for delay time sensitive services and premium users. The simulation results show that, especially in highly loaded and even overloaded GSM/GPRS/EDGE networks, the introduction of QoS provides significant benefits for the end user and offers means to increase the service revenues according to the charging policy adopted by the network operator. The introduction of an appropriate QoS strategy is the prerequisite for an overlay deployment strategy of GSM/EDGE and UMTS. The efficiency of QoS management is crucial for all mobile network technologies and has high impact on fulfilling the demands of mobile subscribers with continuously growing expectations. [C2500]

## "A modified bow-tie antenna design for step-frequency subsurface radar applications"

A modified bow-tie antenna for step-frequency ground penetrating radar is proposed. The flared dipole arm consists of a metal sector gradually converting into a strip-slot structure loaded by resistive films. For the comparison, a TEM horn is used. The synthesized pulse waveform is computed from the frequency-domain data using a calibration procedure and inverse Fourier transform. The antenna performance is demonstrated in several examples of detecting small shallowly buried subsurface targets. [C2501]

## "The eigenvector-based identification of shallow buried targets in ground penetrating radar"

A new approach to the super-resolution eigenvector method implementation, in step-frequency ground penetrating radar (GPR), is proposed. The pseudospectrum determination, fulfilled by the eigenvector algorithm, is followed by a procedure of more precise signal parameter estimation. Accordingly, the distance to the object obtained by the eigenvector algorithm is considered more reliable. Then, complex amplitudes of the determined signal components are calculated, which allows distinguishing different types of buried objects. [C2502]

## "Applications (communication, radar, GPR, medicine)"

First Page of the Article [C2503]

## "A UWB impulse surface penetrating radar system for pavement evaluation"

An advanced UWB impulse surface penetrating radar (SPR) system-RadarEye is introduced in This work. It provides high resolution pavement thickness estimation and subsurface objects imaging for civil structures inspection. Super resolution time delay estimation algorithm based on wavelet transform and TAM-BP imaging algorithm are presented with high accuracy on layer thickness estimation and high spatial resolution on subsurface imaging. Both indoor and outdoor experiments show the feasibility of this system. [C2504]

## "Based on two-port network theory simulation of electromagnetic wave propagation in multilayer medium"

The simulation program for analysis of impulse electromagnetic wave propagation in multilayer medium providing to take into account the frequency dependence of electrophysical parameters of layers (dispersion) was developed based on two-port network theory. [C2505]

## "Recognition of objects on their complex natural resonance at ultra wideband sounding"

In this report, the RSO (radar subsurface objects) complex resonance frequencies are used as features of their recognition proposed. From these features the basis of the prior information about identifiable object scattering characteristics is described. However, for practical implementation of described algorithm of RSO recognition it is necessary to explore and to take into account effect of some complicating factors such as deformation of observed data. Thus from this report the algorithm of recognition of RSO is designed. [C2506]

## "An experimental UWB module-based sensing and communication system"

An experimental UWB system is developed, designed, prototyped and tested to support a number of multitask sensing and telecommunication applications in the 0.1-3.0 GHz band, viz. subsurface radar or GPR, intrusion sensor, "trough-wall seeing" scanner, indoor comm. & geolocation and so on. As such, a set of hardware modules has to be created that can be combined/assembled in a particular fashion/architecture for each specific mission including functioning with receiving and transmitting UWB arrays (a part of our ongoing R&D efforts). The basic system components involve: (1) transmitter (Tx), (2) receiver (Rx), (4) antennas, (5) control unit, (6) digitizer and comp interface. As well, controlling and processing software is an inherent part of each such system that has to be configured for each specific operational task [C2507]

## "The automatic determination of soil permittivity using the response from a subsurface local object"

The method for determining permittivity of soil containing a local object is proposed. The method based on the Hough transform is one of effective means to detect hyperbolic reflections from such objects on the GPR profile image. On the basis of the same method the iterative algorithm, which allows automatic determination of exact value of permittivity of ground using the results of subsurface radiolocation, has been developed. Its efficiency is shown using the simulated GPR profile example. [C2508]

## "The use of the monopulse type antenna system in GPR for increasing accuracy of horizontal coordinate measurement"

The possibility to increase accuracy of horizontal coordinate measurement of the local near surface object by means of using the monopulse type antenna system is presented. The basic principles of designing such an antenna are discussed. It is shown that if the receiving (or transmitting) unit is placed in the center of the antenna system there is a possibility to form in the symmetry plane an electromagnetic field with zero amplitude or absence of signal reflected from the object located in the symmetry plane owing to symmetry of antenna system and inverse driving of the antenna elements. It is proposed to use this phenomenon to increase accuracy of GPR measurements. Experimental GPR data illustrate high contrast of radar image of the object if these data are acquired by GPR with monopulse type antenna system. Such a design of the antenna system provides high electrodynamic isolation between the transmitting and receiving units of antenna system [C2509]

## "Application of the audio interface for ground penetrating radar data representation and interpretation"

The present article offers a description of software complex, which supports reception and preliminary processing of ground penetrating radar (GPR) information, development of flag description, generation of radar displays and synthesis of their audio representation in the tasks of underground sounding data interpretation. A method of image-to-sound conversion is described, with the storage of image information at the level of attainable resolution. Technical feasibility of the replacement of visual perception with acoustic perception has been substantiated. Practical limitations of the parameters of conversion have been defined, and the conformity of the coded values with the level of perception of audio information has been verified. [C2510]

## "Service discovery in heterogeneous wireless networks"

In this paper we describe a possible solution to the problem of service discovery in heterogeneous wireless networks. This solution involves introduction of a network independent service discovery layer, with as main goal the improved robustness of applications running on top of it. A possible implementation, based on special usage of the JINI middleware (W.K. Edwards, 1999) offering spontaneous service interaction for distributed computing, is proposed. It has been realized in the scalable personal area services platform (SPEARS) aimed at demonstration of the ad-hoc facilitation of the communication between and co-ordination of, emergency relief personnel (professionals as well as volunteers) in disaster areas and under extreme conditions. [C2511]

## "Communication and service platform for public safety personnel"

This paper describes a communication and service platform for public safety personnel. The platform demonstrates just in time provisioning of data and scalable communication services and operates in a heterogeneous network environment with high survivability. As an example use case the design is aimed at the ad-hoc facilitation of the communication between and co-ordination of firefighters in disaster areas. The principle network mechanism between the network nodes is multi-hop ad hoc routing with a gateway function to cellular networks. Jini is selected as the middleware technology to enable the service provisioning, service access and network handovers. The service applications are derived from interviews and discussions with firefighters. [C2512]

## "Imaging of electromagnetic waves for bridge deck evaluation"

Visual inspection is the commonly used method for bridge deck inspection. However, this method depends on the intuition of the inspector and his experience. The deteriorated condition of the nation's infrastructure requires better techniques for evaluation. Nondestructive evaluation can verify the integrity of a structure or any of its components without compromising its ability to perform in service. Several nondestructive techniques are implemented on concrete bridge decks evaluation. However, ground penetrating radar (GPR) is one of the promising methods in this area. Radar scans are collected and transferred into images where information about the subsurface can be extracted. This paper discusses the basis of GPR along with the advantages and disadvantages of the method. In addition, a case study of a bridge deck with asphalt overlay will be presented. [C2513]

## "IPv6 addressing management in 3GPP packet-switched cellular networks"

This paper describes IPv6 addressing issues especially in relation to 3GPP defined cellular networks. The focus is on the IPv6 address management and the allocation of the IPv6 address space for 3GPP cellular operators. Extensive background information on IPv6 addressing architecture, IPv6 addressing policy and GPRS is given. Finally, the paper recommends an approach to the IPv6 address management for 3GPP networks. [C2514]

## "Versatile robust Capon beamforming: theory and applications"

The standard Capon beamformer (SCB) has better resolution and much better interference rejection capability than the data-independent beamformer provided that the array steering vector corresponding to the signal-of-interest (SOI) is accurately known. However, whenever the knowledge of the SOI steering vector is imprecise (as is often the case in practice), the performance of the Capon beamformer may become worse than that of the data-independent beamformer. Most of the early suggested robust adaptive methods are rather ad hoc in that the choice of their parameters are not directly related to the uncertainly of the steering vector. In this paper we provide a review of the recently proposed robust Capon beam-former (RCB) and doubly constrained robust Capon beamformer (DCRCB), which directly address the uncertainty of the steering vector and naturally extend the covariance fitting formulation of SCB to the case of uncertain steering vectors by enforcing a double constraint on the steering vector, viz. a constant norm constraint and an uncertainty set constraint. We also present several extensions and applications of RCB including constant-powerwidth RCB (CPRCB) and constant-beamwidth RCB (CBRCB) for acoustic imaging, rank-deficient robust Capon filter-bank (RCF) approach for spectral estimation, and rank-deficient RCB for landmine detection using forward-looking ground penetrating radar (FLGPR) imaging systems. The excellent performances of RCB, DCRCB, and the various extensions of RCB are demonstrated by simulated and experimental examples. [C2515]

## "Device independent mobile application controller for remote administration of a server over a GPRS link using a J2ME cellular"

Unhindered connectivity to a computer is the need of the hour. The ability to connect to a remote machine and control it will have infinite advantages. J2ME (Java 2 micro edition) is a platform created to enhance application development for mobile phones. Using this platform we have created an application which can control any desktop computer or a server by sending the required commands over an HTTP connection. [C2516]

## "Decision type of injury subscriber line for the case of busy subscriber module"

The problem of decision type of injury subscriber line, incipient at exploitation of a cross-connect equipment -both decade-step, and coordinate is consider. The measurement algorithm and calculation of subscriber lines parameters, and also schemas of measuring circuits is given [C2517]

## "Antenna footprint measurements of stepped frequency CW radar on the air/ground interface [CGPR for landmine detection]"

This paper presents the antenna footprint measurements of a stepped frequency continuous wave radar. To image a subsurface, a knowledge of the wave fields radiated by the radar below the surface is necessary. Due to the complexity of the system it is hard to compute the emitted wave fields accurately in the ground. A remedy for this problem could be measurement of the antenna footprints on the air/ground interface and then apply synthetic propagation of the wave fields into the subsurface by using the Huygens principle. The footprint of a spiral antenna has been measured by using a 1 cm shielded loop antenna as a probe antenna positioned on the air/ground interface. Subsequently, the same measurement is repeated by positioning the probe in free space at the same elevation as the air/ground interface in order to analyse the correspondence between the measurements. The footprint patterns obtained after performing calibrations were comparable for both measurements. [C2518]

## "The vertically polarized magnetic field has no effect on the content of pteridine in mouse liver"

We investigate the content of pteridine levels in mouse liver under exposure to a 50 Hz linearly (vertically) polarized magnetic field. Tetrahydrobiopterin (BR4), neopterin (NP), biopterin (BP) and GTP-CHI activity were measured. Five week-old mice were exposed continuously to 50 Hz, 0.35 mT (RMS) for periods of 1, 3 and 6 weeks. The level of BH4in the exposed group was no different from that of the sham-exposed group. The levels of NP in both groups became almost the same. Due to no changes in NP and BH4level, it is suggested that the vertically polarized magnetic field does not affect the immune system and biosynthetic pathway from q-BH2to BH4in mice. There were no changes in the level of BP between the two groups. From these results, the vertically polarized magnetic field does not affect the pteridine level in mice. [C2519]

## "Ionospheric propagation of ELF/VLF waves radiated from earthquake"

Anomalous phenomena associated with earthquakes have been reported using satellite observations. Before earthquake generation, electromagnetic wave emissions are frequently observed as high noise levels in wide bands. We compute rigorous wave intensities on the ground surface and in the ionosphere caused by earthquakes, using full-wave analysis. We assume the seismic source is an electric dipole located underground as the combination of much smaller dipole polarizations created around the epicenter. The inhomogeneity of the ground and the inhomogeneity and anisotropy of the ionosphere are taken into consideration. Especially, the effects of the geomagnetic field on the wave propagation are considered. The computed results in the frequency range from 10 Hz to 10 kHz show the difference in spatial distributions of the wave intensities due to the whistler-mode propagation in the ionosphere. By using these results, the wave intensities which would be observed on the Earth's surface and in the ionosphere are determined as a function of seismic source strength. [C2520]

## "On packetization of JPEG2000 code-streams in wireless channels"

The JPEG2000 standard adopts an error-resilient structure to organize its code-stream. Meanwhile, this robust structure also provides potential optimization space for packetization algorithms. In this paper, we study the optimal packetization issue for JPEG2000 code-streams over wireless channels. We first discuss the best strategy for packetization hits from an individual code-block into channel packets. Then, we extend it to bits from a group of code-blocks. Experimental results indicate that our scheme is outperforming the normal method by significant margins. [C2521]

## "Restore of broadband radar pulse distorted by the Martian ionosphere"

The signal distortion and restoration of Gauss pulse and rectangle pulses when they propagate through the ionosphere of the Mars are presented. A modified matched filter is proposed for the restoration of Gauss pulses. The restoration of rectangle pulse can be done by measuring the total electron content using the I-Q channels. [C2522]

## "Study of process of convergence of relative method to correction"

Explored process of convergence of compensator-patch.in the relative method of correction. [C2523]

## "System of removal information from rolling overland objects"

Offered system, allowing in conditions of earning one's living hindrances to ensure a well-timed collection numerical information from onboard systems official locomotives. Cited An Instance system realization in conditions railway railroad yard [C2524]

## "Syntheses of relative method to correction and analysis of its features"

Is Designed, and explored, relative method to correction and determined its, main technical features [C2525]

## "System of mobile communication and information technology"

{no data available} [C2526]

## "Classification of SAR image based on gray cooccurrence matrix and support vector machine"

In this paper, the classification method of SAR image based on support vector machine (SVM) with extracting the gray feature, texture feature (gray cooccurrence matrix) was proposed. Compared the results of different kernel functions with the result of maximum likelihood classifier, this approach was proved to be able to classify those patterns that can't be distinguished exactly by the maximum likelihood classifier. On the other hand, experimental results showed the classification precision of SVM with linear kernel function is higher than that with Gauss kernel function. [C2527]

## "The research of the forward-looking ground penetrating radar SAI"

Based on the fact that the forward looking ground penetrating radar (FLGPR) wave propagates through two layers of air and ground, a new off-ground down-looking ground penetrating radar (DLGPR) synthetic aperture imaging (SAI) method is introduced basing on the Snell theorem. Then based on the oblique illumination of the FLGPR, the phase amendment method of the antenna viewing angle is introduced. Finally, based on the offset between the receiving antenna and the transmitting antenna, the phase correction method of the bistatic FLGPR is introduced. Correct the phase by correcting the velocity model. The treatment comparisons of the measurement data show the proposed method is effective. [C2528]

## "An antarctic deployment of the NASA/JPL tumbleweed polar rover"

The Tumbleweed rover, currently under development at the Jet Propulsion Laboratory (JPL) in Pasadena, California, is a large, windblown, inflated ball, which carries an instrument payload in its interior. Such rovers offer an effective and simple means of gathering data over large spatial extents of Earth, Mars, and other solar system bodies. Tumbleweeds could prove to be a safe and economical way of deploying instruments such as a ground penetrating radar or a magnetometer in numerous hostile environments. The latest version of the rover was recently deployed in Greenland, where it completed a more than 130 km autonomous traverse across an ice sheet. Communicating via the Iridium satellite network, the rover in question successfully and reliably relayed live GPS, temperature, and pressure data to a ground station at JPL for nearly ten days. The follow-on rover is currently being readied for a traverse from the South Pole to the coast of Antarctica some 2000 km away. The Antarctic test is set to take place in February of 2004 and serves to verify Tumbleweed as an effective means of harvesting data in extreme and remote settings [C2529]

## "Anomalous signal detection using multi-layer neural network for electromagnetic wave radiation"

It is well known that the electromagnetic waves that radiate from the Earth's crust are useful for predicting earthquakes. We observe electromagnetic waves in the extremely low frequency (ELF) band of 223 Hz. These observed signals contain several undesired signals due to fluctuations in the magnetosphere or the ionized layer, lightning radiation from the tropics, and so on. This paper proposes a multi-layer neural network using compression data for precursor signal detection. Input data are reduced by the wavelet transform. Moreover, we discuss an implementation of the hidden layer. It is shown that the proposed neural network is useful for precursor signal detection. [C2530]

## "HF ground wave radar sea clutter cancellation based on chaotic prediction"

In the background of signal detection for HF radar, the sea clutter is quite significant and can mask some weak target signals. This paper reports a chaotic local prediction based sea clutter cancellation method to improve the SNR of the target. Recent observation shows that HF sea clutter may be modeled as a nonlinear deterministic dynamical system. Then it can be assumed that the chaotic prediction error of target echo is greater than the prediction error of sea clutter. A local chaotic predictor is used to construct a sea clutter cancellation technique. Real sea clutter, simulated target data and real target data were used to show that a chaotic prediction based clutter cancellation method is a promising technique to suppress sea clutter and enhance target detection. [C2531]

## "A new GPR targets feature extraction based on kernel method"

A new ground penetrating radar target feature (GPRTF) extraction method based on kernel method is proposed. This paper also explains that the unsupervised methods (PCA or KPCA) aren't fit for the GPRTF extraction. The conventional GPRTF extraction method is the LDA (also called as FDA).It can minimize the within class scatter and maximize the between class scatter, but it extracts the GPRF in the low dimension GPR data space and the discriminability is limited. The kernel method can map the GPR data to the high dimension space by the non-linear transformation and can so enhance the discriminability. Combine the virtue of the kernel and the LDA and make up for the flaws of them will benefit for the GPRTF extraction. The treatment comparisons of the measurement data show that the method proposed is superior to the others. [C2532]

## "Impulse wave estimation based on analytic wavelet in UWB-radar"

A method is discussed in this paper for analysis of received ultra wideband pulse in noise based on analytical wavelet transform. Using analytical version of wavelet, the feather of the impulse shape and position can be identified from the transform results. The impulse samples can be reconstructed and have a noise reduction by employing a thresholding technology to deal with the coefficients. The echo time delay of dispersed target components can be estimated in favor of further processing of range profile of UWB-radar. [C2533]

## "A study of detecting linear wakes in SAR images based on Radon-transform"

Detecting linear wakes from spaceborne SAR images is significant. But it is not easy because of the speckle noise in SAR images. The speckle noise is too strong to detect wakes using traditional edge-detection methods. This paper presents an approach based on Radon-transform to detect linear wakes in SAR images. We use some spaceborne SAR images to test this method. The result is better. [C2534]

## "Application of a sliding window protocol in GPRS-based radio access networks"

In order to obtain good performance of data transfer over general packet radio service (GPRS) networks, we have designed a communication protocol architecture model based on user datagram protocol (UDP). In this paper we present a basic overview of GPRS networks and sliding window protocol communication mechanism first, and then design a sliding window protocol (SWP) in our application layer and gave elaborate presentation of its algorithm. The application results show that our approach improves the communication performance of GPRS networks greatly. [C2535]

## "Remote online power system monitoring system based on multiinformation acquisition technology"

This paper presents a novel and practical system that can realize remote online monitoring on the basis of multiinformation acquisition technology in power system. The technology differs from fieldbus, and Ethernet, power line carrier, SMS, GPRS, ADSL and other communication means are applied to realize data transmission between data acquisition modules and data collection center. Even though there are "no new wires" or "few wires" in the system, the center can transmit and receive the data stream of digital meters or other power monitoring systems reliably. All network protocol and functions are accomplished by a single chip protocol stack. The scheme provides a low cost, operable, embedded, integrated and valid network solution. The practice manifests that the system has high reliability and it is fit for data collection in power monitoring systems. [C2536]

## "A seamless QoS provisioned micro-mobility management scheme"

Wireless cellular networks are largely based on circuit switching technology and are optimally tuned to carry voice traffic. Some extensions to these networks such as GPRS are deployed to support data traffic for e-mail and Internet access. Mobile IP is a proposed standard for mobility management in a packet switched technology but lacks quality of service (QoS) provisions and is inefficient for handling micro mobility related issues. RSVP has known strength in dealing with QoS guaranteed session but mobility constraint limits it performance. In this paper a QoS complaint handoff scheme is presented with the major aim of preserving the RSVP session during the mobility by keeping simultaneous binding between two access routers and transferring of QoS state to the new access router using a context transfer mechanism. Handoff latency has been minimized by sensing link-layer triggers and maintaining a soft state of handoff. The proposed mechanism enhances overall handoff performance by optimized utilization of scarce resources in wireless access networks. The proposed scheme is tested in a simulated environment using network simulator-2. The simulation results demonstrate that the proposed mechanism can sustain traffic streams during mobility and bring significant performance benefits against non QoS complaint solutions. [C2537]

## "Distributed system for pollution analysis based on GPRS mobile communications"

In this paper the implementation of a distributed system for the control of a chemical analysis system is

proposed. This work presents the design of the proposed distributed system, describing the nodes architecture, communications system, control strategies, etc. as well as the chemical implementation aspects, such as selection of parameters to be monitored, analysis techniques, acceptable values, and so on. From the chemical point of view, the parameters to be controlled and their acceptable levels are based on the current legislation. As for the methods of analysis for the detection of pollutants, well-known electrochemical methods are proposed. The communication among the nodes that form the distributed system is implemented by means of the utilization of data transmission services (like GPRS) provided by a mobile telephone operator. The information is processed, integrated and stored in a control centre. These data can be retrieved-through the Internet-so as to know the real-time system status and its evolution. [C2538]

## "Adaptive media streaming in heterogeneous wireless networks"

In this paper we present a system for IP based networks which adapts media streams to the respective characteristics of different (wireless) access networks. Inside the mobile node, an interface selection subsystem monitors characteristics of network interfaces and triggers vertical handovers based on policies supplied by the operator. A service subsystem initiates media stream adaptation to match network resource availability and provider constraints. A media subsystem on mobile and correspondent node transmits the media streams and applies appropriate error correction mechanisms (like FEC, ARQ) depending on network characteristics. We evaluate vertical handover behaviour of our system in a combined GPRS-WLAN testbed and analyze the impact of several error correction mechanisms on the perceived video quality. [C2539]

## "A bumpy journey with GaAs IC foundries in Taiwan and new perspectives of HBT technology readiness for wireless communications in Asia Pacific market"

This paper reviews a commercial available InGaP-HBT technology in the region that yields linear power amplifiers for IEEE 802.11a/b/g applications. A few examples of product-oriented power amplifiers and building blocks with rf performance are discussed for multimode GSM/GPRS and future trend of PA development for EDGE and WCDMA. [C2540]

## "Subsurface imaging of buried objects from FDTD modeled scattered field"

The ground penetrating radar (GPR) finite-difference time-domain (FDTD) simulation method and an improved back projection (BP) imaging algorithm are presented. Because of the close proximity of the elements in the GPR system, the system cannot be easily modeled by considering its individual components separately. A generalized perfectly matched layer (GPML) absorbing boundary condition (ABC) is employed to terminate the FDTD computational domain. In GPR imaging, the traditional BP algorithm is restricted by the air-soil interface and the conductivity property of the soil. An improved BP algorithm is presented. Numerical simulations and measurements using the HRGPR-01 system are provided to illustrate the performance of the GPMLABC technique. The imaging result is also shown. [C2541]

## "Asymptotic behavior of earliest-deadline-first scheduling with a large number of flows"

Providing quality-of-service in a wireless network where channels are unreliable will require an efficient scheduling algorithm that can offer certain statistical delay guarantees. In a system with a large number of users, providing such guarantees demands a careful design of an admission control scheme, which requires the characterization of the schedulable region. In this paper we propose a framework for designing an efficient admission control scheme based on the asymptotic behavior of the system as the system capacity increases with the number of users. We show that as the system capacity scales with the number of users in the system, the system behavior can be approximated by a deterministic process that can be computed recursively. Moreover, the fluctuation of system behavior around its expected behavior can be typically captured by Gaussian random variables whose parameters can be computed iteratively. [C2542]

## "A dynamic pricing model for data services in GPRS networks"

GPRS data services are subject to severe performance degradation due to limited network resources. The technical approaches taken to alleviate the problem are not sufficient to encounter a complete range of incoming scenarios. In this paper, we define and study analytically a performance model for GPRS data services that takes into account prices that change dynamically, depending on the congestion in the system. The model is based on a Markov modulated Poisson process (MMPP), where the arrival rates are affected by a demand function. Performance metrics are also calculated. We believe that the proposed model captures the effect of dynamic pricing on the performance of GPRS data services in a realistic manner. [C2543]

## "The diffusion of a new technology into the marketplace implementing UMTS"

One of the biggest challenges for the telecommunications environment has always been the introduction of a new technology into the market. Introducing a new technology in the market differs greatly from introducing a product as it is not tangible, which necessitates a different approach to the enabling of customers on a new technology. New technologies are generally expensive and therefore there is always a certain resistance in accepting these new technologies. In structuring the diffusion process to the customer at an early stage makes the acceptance of the new technology much easier and less painful. Through tapping into a worldwide base of technology sharing, a company can benefit tremendously from new and innovative solutions that can be utilised in order to apply a technology in the South African market. One such technology is UMTS (Universal Mobile Telecommunication System). [C2544]

## "Development of a data source model for field force automation systems"

This work presents the development of a suitable data source model, for field force automation systems, that can be used in network and traffic simulations. Most new mobile field force automation systems use mobile access technologies like GPRS, which in reality is still not quite broadband and is therefore sensitive to model variations. The development of the model is divided into two parts; the first is the development of a model for a single field force automation call. The second is the development of a call frequency model which, when used in combination with the first model, gives an overall model for field force automation behaviour. The influence of different model parameters is also addressed. [C2545]

## "A business case for the sharing of processing power between 2.5G mobile phones"

Current 2.5G mobile phones, and the coming wave of mobile phones conforming to the specifications of 3G and beyond, have great potential to be utilized as nodes in what is referred to as "wireless grids". Many modern mobile phones have processing power comparable to that of personal computers of a few years ago. This attribute, in combination with the vast numbers of mobile phones being sold every year and their various connectivity options, make mobile phones interesting candidates for distributed processing nodes. The ad-hoc networking benefits of Bluetooth and "always-online" characteristic of GPRS are networking benefits that could well compensate for relatively low user-level data rates of 2.5G networks when compared to that of conventional computer networks. The programming options provided by Java, Microsoft and Symbian environments on modern mobile phones enable development of the client-side software necessary for the wireless grid [C2546]

## "Application of an adapted evaluation process using numerical & qualitative weighted sum techniques"

In this paper, we present an adapted MCDA (multiple-criteria decision aid) evaluation process/method. In this adapted process/method, evaluation techniques that are intended for the detailed evaluation of subsections of a system are used for evaluation from a higher point of view (a broader evaluation). The techniques that are implemented in the MCDA method are NWS (numerical weighted sum) and QWS (qualitative weighted sum). The implementation of this evaluation process is focused specifically on the functionality evaluation of the field units that can be used in a field force dispatching system of large corporations. The evaluation of three field units in three different types of classes is done (PDA, cell phone and laptop) as a case study [C2547]

## "Performance comparison of channel allocation techniques in packet-switched mobile communication networks"

Channel allocation techniques are responsible for deciding which available channel is assigned to new transmissions. Since channel quality conditions and dynamics experienced during data transmissions can be affected by the mechanism used to assign free channels, this paper proposes and evaluates different channel allocation techniques in an adaptive packet-switched mobile radio network. The common criteria used for all the techniques under consideration is to assign incoming calls the available channel that experienced the best channel quality in previous transmissions. The difference between the proposed algorithms is the metric used to evaluate the channel quality. In particular three metrics are considered: BER, BLER and mean CIR. The results obtained highlight considerable performance improvements compared to other traditional techniques, such as random channel allocation. [C2548]

## "Guaranteeing quality of service in mobile radio networks by means of link adaptation algorithms"

Link adaptation has been proven to be an efficient technique to enhance the performance of mobile communication systems. The design of link adaptation has mainly concentrated on improving throughput performance. Although this design strategy can be considered appropriate for best effort services, multimedia

services have important constraints in terms of transmission delay and error rates that can be tolerated without considerable degradation in the quality of service that the user might experience. In this context, this paper presents link adaptation algorithms that are able to control the experienced error rate and also to trade-off between throughput and error rate. The proposed algorithms are evaluated for real-time H.263 video transmissions in a packet-switched mobile radio network based on the GPRS standard. [C2549]

## "The effect of single-antenna interference cancellation on GPRS performance"

Single antenna interference cancellation (SAIC) is a very interesting and promising technology currently being standardized in 3GPP as part of GERAN Release 6. It is based on the latest developments in advanced receiver design. In the most advantageous interference conditions, SAIC can improve the signal-to-noise ratio over 10 dB. In this paper, we report on a study of the effect of SAIC on the capacity of a typical GSM network in terms of GPRS data throughput. Our results verify that SAIC provides a significant increase in network capacity not only for speech traffic but also for GPRS data traffic. Since current SAIC receiver algorithms are generally optimized for GMSK modulated signals, we were also interested in the proportion of GMSK and 8-PSK signals in a typical GSM network with EDGE data traffic. We found that in the case of a typical distribution of speech, GPRS and EGPRS traffic, the proportion of 8-PSK signals is relatively small. We can therefore expect that EDGE will not significantly diminish the effectiveness of SAIC in GSM networks. [C2550]

## "Multi-slot capability increases GPRS network performance"

In this paper, we analyze the performance of GSM/GPRS networks with the emphasis on the study of the adaptive characteristics implied by multi-slot capability. Previous work employing the multi-slot service commonly assume that one or two channels are required by a GPRS data request for the sake of analytical simplicity. In this paper, we remove this assumption and generalize the GPRS data channel requirement (M channels). In addition, we propose a channel re-allocation schemes (RAS) upon channel release by re-allocating the released channels to the GPRS data which is currently using less than M channels with the potential to fully utilize the available resources. The result shows that RAS can significantly decrease the voice call blocking probability and the GPRS packet transmission time, and simultaneously increase the channel utilization with negligible penalty on GPRS packet blocking probability. Small M (e.g. M = 2) underestimates the performance achievements of the prior channel allocation scheme as well as RAS, which shows that the multi-slot capability in GPRS network is able to increase the system performance. [C2551]

## "Dynamic tunnel management protocol for IPv4 traversal of IPv6 mobile network"

The paper specifies a mechanism for enabling IPv6 mobile network containing mobile network nodes to traverse through IPv4 networks that are comprised of wireless LAN, CDMA and GPRS. The traversal is possible by a dynamic tunnel management protocol that dynamically updates the information of tunnel end point between mobile router and home agent, including a new IPv4 address of the mobile router. [C2552]

## "The 3G wireless technology in tactical communication networks"

Third generation mobile systems are seen as the technology to bring new broadband services to the mobile user. This paper discusses UMTS/GPRS technologies applying to tactical communication networks. A detailed description of the 3G technologies is provided, and their application in military environments is studied in depth. The paper discusses the introduction of new services into military networks, which improves tactical effectiveness, while also dealing with major improvements in spectrum efficiency, capability and functionality compared with today's non-voice mobile services. The schemes and mechanisms for controlling the traffic in order to achieve the per-hop behavior is still an open problem in the military wireless environment. GPRS and UMTS can provide military with access to many different demanding tactical services. Nevertheless, in order to preserve the unique characteristics of military systems, a number of vital issues have to be carefully addressed, including security mechanisms and fraud detection. Thus, the UMTS/GPRS tactical network is a challenge for military telecommunication. It will provide a massive boost to mobile data usage and usefulness. Although many problems are still not solved, for instance effective radio access schemes and traffic management, the information that can be transferred in this tactical network environment is very useful except for communications and for the command and control systems. [C2553]

## "Performance of streaming services in GERAN A/Gb mode"

The ongoing growth of GSM users as well as the increasing availability of IP based real-time services leads to the necessity for enabling real-time services in GSM/EDGE radio access network (GERAN) A/Gb mode. In this paper, the performance of real-time services, specifically streaming services in GERAN A/Gb mode is evaluated by means of simulation and live network measurements. The most critical GERAN A/Gb mode procedures for

the performance of streaming services are cell and routing area changes. This is due to data transfer interruptions, which cause delay variation and packet losses. The presented results show that streaming services are feasible in GERAN A/Gb mode and that the performance can be improved further with sizing of the client buffers according to the delay introduced by the cell/routing area change taking into account the effect of reduced radio quality at the cell border. [C2554]

## "Improving GPRS/EDGE end-to-end performance by optimization of the RLC protocol and parameters"

The end-to-end performance in both GPRS and EDGE is strongly related to the efficiency of the RLC/MAC protocol. In this paper, we focus on the optimization of several parameters like RLC polling period, RLC roundtrip time and RLC window size. Furthermore, we discuss specific implementation options as well as control mechanisms provided by the standard. The optimum settings of these parameters and their mutual interaction evaluated by simulations have been confirmed by PING and application throughput measurements in a real system. In addition, different architectural aspects such as PCU embedded either in the BSC or in the BTS and 64 kbps vs. 16 kbps based Abis interface have been discussed. The new concept of "RLC frequent retransmission prevention" on the sender side allows fast polling by simultaneously avoiding retransmission of RLC blocks with pending acknowledgement status. The novel fast polling strategy provides about 3 dB to 4 dB link level gain as well as user throughput enhancement in the order of 20% for GPRS and 30% for EDGE. [C2555]

## "Synergy between admission control and link adaptation in integrated voice/data cellular networks"

The capacity maximization of integrated voice/data wireless cellular communication systems with link adaptation (LA) is addressed using the GSM/GPRS system as a case study. Only coding schemes CS-1 and CS-2 are used. Two different quality zones differentiated by signal quality are used and mapped to the two coding schemes. Data users in the good quality zone make use of CS-2 only; data users in the bad quality zone make use of CS-1 only. Also, we provide an overview of reported system performance analyses of integrated voice/data cellular systems. Finally, a resource allocation strategy, called triple link quality-aware fractional channel reservation (TLQAFCR), is proposed; it differentiates data users in the different quality coverage zones. Numerical results show that TLQAFCR effectively increases system capacity relative to strategies without user location differentiation. This is because, in TLQAFCR, preference is given to data users in the good quality (CS-2) zone which, on average, retain resources less time than data users in the bad quality (CS-1) zone. Numerical results also show that the use of the LA technique increases approximately 20% data system capacity and that the synergy between admission control and link adaptation yields more than 387% capacity gain. [C2556]

## "Admission control strategies for dual transfer mode service in EGPRS networks"

Dual transfer mode (DTM) has been defined by 3GPP for EGPRS networks. It provides simultaneous usage of GSM and GPRS services without requiring a full fledged GPRS class A terminal. DTM relies on the usage of half rate coders that makes it possible to share a time-slot between a voice call and a data session. The data session can he extended to more time-slots if necessary. This work intends to demonstrate that the optimal control policy adapted for the resource allocation in a cell providing DTM service is a threshold strategy. After a short introduction of the DTM capability, a traffic model for a cell providing the DTM service is introduced. Then, a reward function is defined to determine the structure of the optimal control policy. The numerical computations realized in the full paper show that the optimal policy is a threshold policy. The optimal policy is the policy that maximizes the reward function. [C2557]

## "Network selection in WLAN-3GPP interworking system"

Research on WLAN-3GPP interworking is regarded as a case of implementation of heterogeneous networks which are the tendency of future mobile communication systems. The paper describes a WLAN-3GPP interworking system, describes the issues existing in current networking selection procedures and analyses the disadvantages and advantages of the current solutions in detail. The efficiency of network selection determines the performance of system accessing, especially handover. Finally, two schemes are proposed to improve the procedure to meet the requirements of seamless handover when performing vertical handover between WLAN and UMTS. [C2558]

## "On the performance of a link-adaptive cellular system"

We present a simple analytical approach to characterize the performance of a link adaptive wireless packet data system. We use this approach to compare the performance of an EDGE (enhanced data rates for global evolution) receiver (Ariyavisitakul, S.L. et al., 1999) that has two antennas with the performance of a receiver

that uses a single antenna. It is shown that a receiver with two-antenna spatial diversity can offer over 50 kbps increase in the 50th percentile average throughput and 15% reduction in retransmission rates in a typical urban environment. Comparison with system simulation shows that the ARQ mechanism afforded by the EDGE RLC layer is quite robust in combating random wireless losses, except at low SINRs, where excessive delays at the RLC layer trigger TCP time-outs and lead to areas with very poor performance. One of the major benefits of receive spatial diversity is the alleviation of such cellular "dead spots" for data services. [C2559]

## "A portable and wireless data transmission potentiostat"

We propose a portable and wireless data transmission potentiostat and further exert the pH sensor to verify its performance. This potentiostat can be used to process the long-distance remote electrochemical signals of the amperometric sensor and the potentiometric sensor. Based on the popular general packet radio service (GPRS) communication systems, a personal digital assistant (PDA) cell phone, instead of personal computer (PC) in the conventional potentiostat, is used to control and collect the data of potentiostat. The collected data from the electrochemical sensor is transmitted to the telecom server. Then, the data stored in the telecom server can be retrieved by the PDA cell phone or Internet in any time and any place. Our experimental results show that the proposed potentiostat has the merits of moderate accuracy, low cost, and long-distance wireless data communication. [C2560]

## "Unexploded ordnance detection by measuring object symmetry via linear prediction"

Humanitarian demining has become a serious international issue nowadays due to the post-war buried unexploded ordnance (UXO) and land mines. In this research, a new technique based on linear prediction is proposed to discriminate UXO from non-UXO targets. The proposed technique takes into account the symmetry of the ground penetrating radar (GPR) signal returning from a buried object. We use the GPR data set collected by Battelle company and the Ohio State University from the Jefferson Proving Ground (JPG), U.S.A. in the experiments The results evaluated in terms of receiver operating characteristic (ROC) curves show that our proposed technique has a better detection performance than a traditional detection technique based on energy. The false alarm reductions at 100% detection by the baseline technique and the proposed technique are about 11% and 23%, respectively, compared to a situation where no technique is applied. [C2561]

## "WiMax access over GSM/GPRS in rural areas"

GPRS access technology is not well-adapted for providing a data service to rural areas where there exist very localized demands for service. Under these circumstances, WiMax could be a better solution for providing access. This paper deals with the way to interface a WiMax network, based on a point to point configuration, to a GSM/GPRS core network, using a PC equipped with a linux kernel modified in order to add a new protocol under IP layer. [C2562]

## "Design and performance assessment of a prototype wireless controlled robot"

The aim of this research was to develop a mobile robot, exploiting the GSM and GPRS technologies in an existing mobile telephony network for remote control and communication purposes. The robot (MGM1) is used as a technology demonstrator in centres and exhibitions with the purpose of making known to the public the importance of services such as SMS, MMS, Bluetooth and Web surfing using a phone browser. The robot is controlled remotely via GPRS using a mobile phone as a command centre. It is able to receive SMS and MMS messages sent to it and then reply back. Also, it takes pictures and sends these out on request as MMS. The work presented in this paper is about the system design and performance assessment, with a discussion of some of the main system sub-units. [C2563]

## "Fusion aspects of the rapid route and area mine neutralisation (RRAMNS) mine detection system"

Rapid route and area mine neutralisation system (RRAMNS) is a capability technology demonstrator (CTD) conducted by the Defence Science and Technology Organisation (DSTO) in Australia and industry partners Tenix Defence Industries and Minelab Electronics Inc. The detection system consists of three sensors: a metal detector array; a ground penetrating radar array (GPR); a forward-looking infrared and visual imaging system. Each sensor in this multisensor platform is targeting to detect different properties of buried and surface landmines. Fusion of detections from all sensors provides a complete automatic target detection system for a wide variety of threat mines. The paper describes the fusion architecture implemented to RRAMNS multisensor system for automatic target detection. [C2564]

## "Design of a portable potentiostat for electrochemical sensors"

In this paper, we propose a portable and wireless data transmission potentiostat and further exert the amperometric morphine sensing and the potentiometric pH sensing to verify its performance. The proposed potentiostat has the ability to process the long-term electrochemical signals in both the amperometric and potentiometric modes at a remote site. Based on the popular General Packet Radio Service (GPRS) communication systems, we adopt a personal digital assistant (PDA) cellular telephone, rather than a personal computer (PC), to control and collect data. The sensed data collected by PDA cellular telephone is transmitted to a telecommunication server. In addition, the data stored in the telecommunication server can be retrieved by a PDA cellular telephone or by a remote PC through the Internet at any time and any place. Our experimental results show that the proposed potentiostat has the merits of moderate accuracy, low cost, and long-distance wireless data communication capability. [C2565]

## "Topological design of 3G wireless access networks"

Wireless access networks have importantly become a part of the telecommunication infrastructure that provides voice, data and multimedia services to mobile users. As traffic increasingly becomes data instead of voice, existing wireless access networks need an appropriate and efficient infrastructure for the delivery of bursty data packet services. This paper presents a network optimization model for topological design of 3G wireless access networks. The main objective of the model is to optimize the network design cost of 3G wireless backhaul networks with acceptable quality of service requirements. This paper also presents an efficient heuristic method to solve large network design problem sizes within a reasonable computational time while obtaining a near optimal solution. [C2566]

## "Power transmission line magnetic fields: a survey on 120 kV overhead power transmission lines in Malaysia"

The concern on electromagnetic fields (EMF) which may has detrimental effects on human health has heightened public awareness towards the overhead power transmission lines. Frequency of the electrical power lines is typically in the range of 50/60 Hz and yet is classified as extremely low frequency (ELF). Recent studies conducted, are concentrating mainly towards the existence of electric field intensity (E-field) and magnetic flux density (B-field). In this paper, emphasis is placed on the ELF magnetic fields because this is the subject that is believe to have more effect to human health. Basic properties of power lines are described and investigated. Spot magnetic field method was used for measurement, but varieties of methods are also being described here. The data obtained here are useful in order to provide the basic understanding of magnetic fields generated by the power transmission lines. [C2567]

## "Analysis of communication alternatives over public networks for a supervision and control system of metropolitan scope"

In this work different communication alternatives for a supervision and control system based on communications services provided over public networks are evaluated in order to determine which offers the best services and costs. Three communication alternatives for the interconnection of the remote station and the central station are analysed, all of which are situated in the metropolitan area of a large city: point-to-point connections over ISDN (integrated services digital network), (virtual private networks) VPN's/IP over ISDN, and VPN over ADSL (asymmetric digital subscriber line). For the communication between the central station and the mobile remote clients, the connection via GPRS (general packet radio service) is evaluated. For the measurements and posterior analysis control information and images have been transmitted. The viability of these types of solutions in the proposed scenarios is shown and the costs involved in each solution are analysed. [C2568]

## "Design and implementation of Java-based HTTP input channel for integrated WLAN and GPRS networks"

HTTP is the most crucial protocol enabling client-server applications. With the Internet converging and becoming mobile accessible, to adaptively manage HTTP connection is challenging. This paper describes the design and implementation of architecture for Java-based HTTP input channel for multiaccess wireless networks. A HTTP input channel can adapt its behavior to the changing network status. Adaptation includes both sensible selecting and dynamic switching the underlying connection used, as well as to cope with disconnection situation. Experiments were performed in a GPRS-WLAN integrated environment to demonstrate the operational correctness of the architecture. Performance metrics were measured and analyzed. [C2569]

## "Handover performance with HIP and MIPv6"

Mobility management in the current Internet is designed to work with mobile IPv4 and, when IPv6 is available,

with mobile IPv6. These solutions are based on the current architecture in the Internet, where the IP address represents both the locator and the identifier of the node. In the IETF, identity and location information separation has raised a lot of discussion and new ideas have emerged to separate these. Host identity protocol is one candidate that can be used for this separation. It introduces also a new way of handling mobility management taking advantage on the mentioned identity and location separation. [C2570]

## "Breaking down the mobile service response time"

A mobile service consists of an application in a user terminal, wireless access networks and servers that provide chargeable content to the users. This paper proposes a novel method of estimating the latency times contributed by a mobile terminal, wireless network and content server to the total end-to-end mobile service response time experienced by end users. A mobile phone-based method of measurement is useful for service users, service developers, service providers and network operators in measuring the performance of mobile services using real telecommunication networks and terminals. [C2571]

## "Antenna development for UWB impulse radio"

First Page of the Article [C2572]

## "A TAM-BP imaging algorithm in GPR application"

In airborne SAR, the principle of BP algorithm is delay and sum. However, in GPR imaging, traditional BP algorithm is restricted by the air-soil interface and the conductivity property of the soil. To obtain precise objects location and reflection intension, BP algorithm must be modified in time-delay and amplitude calculation. In this paper, a TAM-BP algorithm is presented. Measurement data using the HRGPR system are provided to illustrate the performance of the TAM-BP imaging technique. [C2573]

## "Multiple access interfaces for mobile nodes and networks"

With the progress of wireless technologies today, mobile terminals with multiple access interfaces are emerging (e.g. laptops, personal digital assistants). However, multiple interfaces cannot yet be used simultaneously nor can they be switched without breaking ongoing connections. This paper explores the benefits and issues of having multiple access interfaces when mobile nodes and networks employ layer-3 mobility protocols of Internet protocol version 6 (IPv6) to access the Internet while changing their points of attachment to the Internet. To overcome some of the identified problems, we propose a tunnel re-establishment technique. Simulation results show that this technique would allow mobile nodes and networks to benefit from permanent (and even uninterrupted) access to the Internet using different access technologies without requiring special services provided by the access routers. [C2574]

## "Scheduler based flow control under QoS aspects in GPRS/EDGE networks"

The demand for minimization of the exploitation costs in the modern world of mobile communication has achieved the point where the network operators require new networks that are able to reconfigure themselves according to the current network state and user activities. This implies new research in the area of self-configurable networks. This paper presents the results of investigation of the QoS aware GPRS/EDGE networks focused on the flow control at the Gb interface. A new approach for the flow control is presented, which introduces a scheduler architecture instead of a "leaky buckets" architecture. The STFQ algorithm is used as a scheduler in the new architecture. The simulation results show that a significant increase in system performance can be achieved by minimizing the effect of the "cascaded leaky buckets phenomenon". [C2575]

## "Hydraulic parameter estimation with a constant water flux boundary using zero-offset borehole radar"

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## "A non destructive geophysical protocol for estimating near-surface porosity, water content and water conductivity"

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## "Electromagnetic features of ground penetrating radars for the exploration of martian subsurface"

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"Estimation of hydraulic property of an unconfined aquifer by GPR"
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"GPR and magnetic minerals at mars temperatures"
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"Experimental investigation of profile distribution of complex dielectric permittivity of soils"
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"Permittivity evaluation for a vertically stratified soil using a GPR antenna"
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"Dipole antenna sensors for measurement of complex dielectric permittivity of soils and their application under field conditions"
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"Autonomous UXO classification using fully polarimetric GPR data"
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"Wide-area landmine survey and detection system"
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"Landmine detection with GPR using super resolution signal processing algorithm"
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"High-resolution mapping of near-surface internal snow layers with a wideband radar"
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"Reversing the roles of high and low frequency to profile the dynamics of an ice shelf"

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"Avalanche rescue using ground penetrating radar"

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"Test site for the analysis of subsoil GPR signal propagation"

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"Stepped frequency GPR field trials in potash mines"

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"Radiobrightness contrast variations of dry and moisture ground with air-ground boundary chaotic roughness"

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"A 5.3 GHz step-frequency GPR for glacier surface characterisation"

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"LOTUS-a real time integrated sensor suite for anti-personnel mine detection, incorporating the MINEREC GPR"
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"Evaluation of road settlements on soft ground from GPR investigations"
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## "Graphical presentation of 50/60 Hz magnetic field contours as an engineering tool for minimizing ELF fields"

Since IARC classified ELF magnetic fields as possibly carcinogenic to humans, the fear of 50/60 Hz magnetic field exposure has increased. Subsequently, environmental protection organizations increased their pressure on governments to reduce the allowable ELF magnetic field exposure to much lower values than are recommended by ICNIRP-1998. As an example, the present Environmental Ministry in Israel recommendation is to lower the ELF Field exposure to 10 mG averaged over 24 h. As a result, electrical engineers who are involved in the deployment and installation of large and medium electrical utilities are much more aware of the need to employ special measures and methods to reduce the magnetic fields that might be emitted from such utilities. There are few computer codes that are capable of analyzing with great accuracy magnetic and electric fields surrounding single phase and three phase electrical utilities in a 3D system. The best presentations of analysis results are by equi-value contours depicting electric and magnetic fields. This graphical presentation is a powerful design tool that enables better deployment and installation design aimed at reducing magnetic field emissions from high-power electrical utilities. The paper describes various types of graphical presentations available for ELF field contours, the dependent and independent variables and parameters, magnetic field animation for optimization of power line installation and routing, and finally an example that demonstrates the usefulness of the graphical presentation tools. [C2641]

## "A decomposition approximation for the performance evaluation of non-preemptive priority in GSM/GPRS"

Decomposition approximations in the past have been successfully applied to the performance analysis of preemptive priority based GSM/GPRS networks. In this paper, we propose a decomposition technique for the performance analysis of GSM/GPRS networks where GSM voice calls have non-preemptive priority over GPRS data packets. In other words, when demand exists for GSM circuit switched channels, the GPRS user can continue its transmission until the ending of packet transmission resulting in a delayed release of the channel. It is shown that such an approximation can be quite accurate in predicting both the impact of delayed release on GSM voice queuing as well as for comparison of immediate versus delayed release of channels on GPRS data queuing delays. [C2642]

## "Performance if transceiving JPEG-2000 images over peer-to-peer wireless link"

This paper presents the performance evaluation of transceiving JPEG-2000 image over peer-to-peer wireless links. The latest image codec JPEG-2000 is implemented [2000], and a peer-to-peer transceiver model is established for wireless transmission. The standard test images are compressed by the codec within the transceiver, and subsequently transmitted from peer to peer over IEEE 802.11b wireless LAN (Wi-Fi) [1999] and General Packet Radio Service (GPRS) [1998] networks. For Wi-Fi, due to its substantially high data rate, image transmission time is not as critical. For GPRS, due to the restricted data rate and power resources, it is meaningful to investigate the performance of image transmission over GPRS-involved wireless links. Therefore, in this paper, JPEG-2000 images are compressed in lossy mode and transmitted over GPRS-GPRS and GPRS-Wi-Fi links. Since network usage time and amount of data transferred are cost-determining factors, transmission times for various compression ratios are recorded. Levels of compression can be evaluated using both objective and subjective criteria, yet subjective criteria is more dominant for the smaller screen-size and lower processing power of GPRS-supported devices [C2643]

## "Global geolocation of intense lightning strokes associated with TLEs based on ELF measurements from single-station"

A new, improved algorithm has been developed to geolocate intense lightning strokes around the globe. In the ELF (extremely low frequency) range, radio waves from lightning propagate in the Earth-ionosphere cavity and quasi-TEM is effectively the only radiated mode. The spectra depend on the distance between the source (lightning) and the observer. Based on theoretically predicted spectra, a numerical data base was established to compare with our experimental data. The algorithm allowed us to determine SOD (source-observer distance) with high resolution (50 km) while the source bearing was determined through a Lissajous figure for the magnetic field and Poynting vector components using a least-squares fitting method. The algorithm and ELF electromagnetic data from other groups allowed us to geolocate lightning strokes associated with TLEs (transient luminous events) which were observed from the Columbia space shuttle during MEIDEX with the first Israeli astronaut, Ilan Ramon, aboard. [C2644]

## "NASA/JPL Tumbleweed polar rover"

The Tumbleweed rover, currently under development at the Jet Propulsion Laboratory (JPL) in Pasadena, California, is a large, windblown, inflated ball, which carries an instrument payload in its interior. Such rovers offer an effective and simple means of gathering data over large spatial extents of Earth, Mars, and other solar system bodies. Tumbleweeds could prove to be a safe and economical way of deploying instruments such as a ground penetrating radar or a magnetometer in numerous hostile environments. The latest version of the rover was recently deployed in Greenland, where it completed a more than 130km autonomous traverse across an ice sheet. Communicating via the Iridium satellite network, the rover in question successfully and reliably relayed live GPS, temperature, and pressure data to a ground station at JPL for nearly ten days. The follow-on rover is currently being readied for a traverse from the South Pole to the coast of Antarctica some 2000km away. The Antarctic test is set to take place in February of 2004 and will serve to verify Tumbleweed as an effective means of harvesting data in extreme and remote settings. [C2645]

## "Geopaging: a novel multicast approach to IP paging delivery"

This paper introduces a new global solution in order to achieve a very efficient IP paging delivery. This efficiency is accomplished in terms of number of messages sent in both, wireless access and core networks. Reduction of signalling is achieved using a distance-based dynamic strategy combined with multicast. [C2646]

## "Intelligent transportation systems-travelers' information systems the case of a medium size city"

Intelligent transportation systems and associated travelers' information systems can dramatically influence the way people decide to travel, thus the way of living in urban areas. In this paper a bus arrival time prediction and the associated travelers' information system of a medium size city is presented. The system uses the latest GPS technology for automatic bus location and GPRS technology for communications. The real time availability of all buses' exact locations and speeds enables the system to have very clear traffic information of the city's main streets and to predict arrival times with satisfactory accuracy. Some financial aspects of the project are discussed as well. [C2647]

## "Design and implementation of two-tier mobile ad hoc networks with seamless roaming and load-balancing routing capability"

Due to its flexibility, mobile ad hoc network (MANET) has attracted a lot of attention recently. Most existing works, however, limit a MANET as a stand-alone network. In this paper, we propose a two-tier MANET by extending the connectivity of the MANET to the Internet. Some hosts in the MANET are equipped with cellular interfaces and are called gateways, which can provide Internet connections. Such extension would greatly improve the connectivity of MANET. To maintain seamless connectivity, we modify the mobile IP to make traversing private networks (i.e., NAT) of cellular networks possible. We also propose a load-balancing routing protocol to utilize the cellular interfaces of gateways, which are likely to be bottlenecks to the Internet. A prototype is implemented and performance results obtained from the testbed is reported. [C2648]

## "Landmine detection in high resolution 3D GPR images"

This work describes a novel landmine detection and classification algorithm for high resolution 3D ground penetrating radar (GPR) images. The algorithm was tested on data measured with a video impulse radar (VIR) system developed by the International Research Centre for Telecommunications-transmission and Radar (IRCTR). The algorithm detected all landmines (including the difficult to detect M14 mines) and classified almost all specific landmines features correctly with a reasonably low false alarm rate. The feature on a small height object demonstrates an effective reduction of false alarms. [C2649]

## "Ultra-wideband technology today"

In this paper, the current status of ultra-wideband technology is presented and an overview of its main applications including radar and telecommunications are discussed. For these applications we compare the advantages and disadvantages of the time domain and frequency domain approaches. [C2650]

## "A large-scale, passive analysis of end-to-end TCP performance over GPRS"

In this paper a passive methodology for TCP performance evaluation over general packet radio service (GPRS) networks is presented that relies on traffic monitoring at the GPRS ingress/egress router interface (Gi). Based on the IP and TCP headers of the packets we estimate the end-to-end performance of TCP connections such as connection setup behavior and data transfer goodput. In order to identify the effects behind the measured performance the introduced algorithms estimate round trip delays, packet loss ratios, available channel rates, throughput and cany out bottleneck analysis. Large-scale GPRS measurements in seven countries are presented

to analyze TCP performance and demonstrate the applicability of the method. The effects of different TCP parameters such as maximum segment size, selective acknowledgements, timestamp usage and receiver window size are also quantified. GPRS measurement results are compared to a wireline dial-up network to identify the effects specific to the wireless environment [C2651]

## "Architecture of the automatic position reporting system (APRS)"

Location-based service (LBS) development is firmly based on the reliable and accurate position reporting system. In addition to rover-based positioning performance requirements, the position reporting system has to provide secure means of transferring position-related data between rover and location server. Here we describe the realisation of the position reporting system, based on GPS, HTTPS and GPRS technologies. Our approach allows secure position-related data transfer, with solution simplicity maintained. The automatic position reporting system (APRS) architecture is in compliance with current trends in telecommunications, promising successful integration with emerging mobile communications technologies. [C2652]

## "Congestion analysis during outage, congestion treatment and outage recovery for simple GPRS networks"

This paper deals with congestion analysis of a simple GPRS network composed by two cells partially overlapping. In particular, we consider that one of the two cells is affected by an outage and we analyze the effectiveness of applying a class of congestion treatment techniques that ultimately results in a switching of users from the congested cell to the other one. For this purpose, we introduce a modelling technique to support a proper calibration of the parameters involved in a reconfiguration action, in order to successfully treat the congestion phenomenon. The effectiveness of a reconfiguration action is evaluated in terms of indicators that represent the quality of service (QoS) perceived by the users in the congested and adjacent cells. [C2653]

## "Streaming over EGPRS"

Enhanced general packet radio service (EGPRS) is a new technology that provides higher bit rates and better error protection for packet-switched data transmissions, compared to the traditional GPRS technology. Especially video streaming which requires higher bitrates in order to achieve sharp image quality and fluent motion. GPRS allowed the introduction of streaming service with adequate quality, but better technology is needed in order to provide a more enjoyable service. The purpose of this article is to show what new benefits EGPRS brings to packet-switched streaming service (PSS). [C2654]

## "A new mobility management scheme for the integrating of WLAN and wireless cellular network"

The integrating of wireless cellular network and wireless LAN can take full advantage of each other, and provides consumers with much more comprehensive wireless service. This paper is dead against the scarcity in the current integrating technology of this aspect, and proposes a new mobility management scheme based on mobile IP technology, for the sake of reducing the handoff delay time, resolving the triangle routing problem rooted in mobile IP technology, etc. This will bring benefit to the upgrade and development of mobile communication network. [C2655]

## "Ground penetrating radar for sub-service detection (GPR-SSD)"

The paper describes a prototype radar, the "ground penetrating radar for sub-service detection" (GPR-SSD), realized in a V framework EU project. GPR-SSD has been designed from G.P.Tecno S.r.l. (Italy) in order to realize a reliable and low-cost apparatus able to detect sub-services (electrical cables, metallic and non-metallic pipes, i.e. gas pipes, etc.) without the need of skilled operators. [C2656]

## "Fast imaging of a target in inhomogeneous media for pulse radar systems"

Many works have been done to develop efficient imaging algorithms for ground penetrating radars. We have developed a new imaging algorithm SEABED for homogeneous media and confirmed its performance. This algorithm has an advantage that the calculation time is quite short because it is based on a reversible transform. However, its performance for inhomogeneous media has not studied yet. In this paper, we examine the performance of SEABED for inhomogeneous media [C2657]

## "Estimation of snow water equivalence with two Ku-band dual polarization radar"

Snow water equivalence is an important parameter for studies of the natural sciences, particularly in hydrology and climatology. This study demonstrates a concept of estimating snow water equivalence under the

consideration of a dual frequency Ku band (13.4 GHz and 17 GHz) and a dual polarization system [C2658]

## "Analysis and optimization of the (E)GPRS RLC protocol by simulations and measurements"

A detailed analysis of the GPRS and EGPRS RLC/MAC protocol and its influence on the overall end-to-end performance has been performed. The end user application throughput depends on several parameters, such as the RLC polling period, the RLC window size, the RLC roundtrip time, and specific protocol implementation issues. Simulation and measurement results for optimum adjustment of the above parameters are given; they also demonstrate the superiority of the improved EGPRS protocol stack versus the original GPRS one. Additionally, a protocol performance improvement both for GPRS and EGPRS has been proposed by introducing a new concept of "RLC frequent retransmission prevention" on the sender side, allowing fast polling by simultaneously avoiding retransmission of RLC blocks with pending acknowledgement status. Fast polling is referred to as the introduction of a very short RLC polling period, with, e.g., 8 RLC blocks, versus moderate polling periods, e.g., of 16 or 24 RLC blocks. The proposed strategy for fast polling proves to provide a user throughput gain in the order of 20% for GPRS and 30% for EDGE. [C2659]

## "Peer-to-peer content sharing in wireless networks"

A very efficient peer-to-peer application layer architecture is analyzed as a potential candidate for wireless peer-to-peer applications. Its performance in terms of generated traffic and load balance are simulated for different network sizes. A number of candidate cluster topologies are proposed. Based on the simulation results, the optimal cluster topology and cluster size are identified. We conclude that cluster sizes that are the square root of the number of nodes generate uniform traffic. The cluster topology should be star, ring or a compromise between the two, 'planned N'. We show that, for these topologies, the traffic increases less than linearly with the number of nodes in the network, making it highly scalable. Our conclusions are valid for uniform query and update distributions. In addition to the approach from earlier work (Csucs, G. et al., 2002), maintenance aspects are also dealt with; we briefly describe the basic link management procedures that make such networks feasible, but we do not cover their performance analysis. Neither do we treat query topologies. [C2660]

## "Improving landmine detection using frequency domain features from ground penetrating radar"

Landmine detection is an important and yet challenging problem remains to be solved. Ground penetrating radar (GPR) is an effective sensor to detect landmines that are made of plastic or have low metal content. Most GPR signal processing algorithms apply processing in the time (depth) domain. This paper proposes to use the frequency domain features from the GPR signal to improve the detection of weak plastic mines and to reduce the number false alarms due to clutter objects. The motivation comes from the fact that the energy density spectrum may be different between mine targets and clutter objects, although both may have strong GPR signal return in the time domain. Experimental results based on clutter lane data collected at a test site corroborate the effectiveness of the proposed spectral features to increase the accuracy for landmine detection [C2661]

## "Application of texture feature classification methods to landmine/clutter discrimination in off-lane GPR data"

Recent advances in ground penetrating radar (GPR) fabrication and algorithm development have yielded significant performance improvements for anti-tank landmine detection in government sponsored blind tests. However, these blind tests are typically conducted over well-maintained homogeneous testing lanes specifically designed to test landmine detection performance in low-clutter population situations. New GPR data collections over targets emplaced in un-maintained off-lane soils have much higher GPR anomaly populations and provide more stringent tests of landmine detection algorithms. In this work, we focus on the application of feature-based class separation techniques to lower false alarm rates in heterogeneous off-road soils. In particular, we explore the application of texture feature coding methods (TFCM), which have previously shown promise in fields like tumor detection [C2662]

## "Measured spectrum and polarization of wideband radar signal from forest stand"

We report on an experiment regarding the spectra of super-wide band radar (SWBR) backscatter amplitude generated by forest canopy. The larch forest stand of 100 Ч 100 m2, used as an object of study, was located 50 km to the north from the city of Krasnoyarsk, Russia, with the average tree height, diameter, and density of trees being of 14.2 m, 0.116 m, and 0.38 trees/m2. All data were recorded in August 2003. The SWBR, radiating pulses with duration of 1.5 ns and 0.15 ns, was mounted on the tower at the height of 21.5 m, the range and viewing angle being of from 3 to 100 m and from 50° to 75°, respectively. The backscatter was recorded as a function of distance. Noticeable correlation was found between the positions of peaks of the backscatter signal and those of single trees. This suggests similarity in spatial structure of the radar signal and inhomogenieties

inside the forest canopy. Subsequently the record of backscatter was turned into the analytical signal. Finally, the module of analytical signal was processed to evaluate its spatial spectrum. Thus attained spectra were shown to follow a combination of the power laws, with two exponents being distinguished at the low and high frequencies. This type of spectra remained for vertical, horizontal, and cross polarizations. The discovered features of the backscatter spectra were proposed to be applied for the classification of forests, using SWBR technique. [C2663]

## "Combined seismic, radar, and induction sensor for landmine detection"

An experimental system to collect co-located ground penetrating radar (GPR), electromagnetic induction (EMI), and seismic data was developed to investigate the possibility of using the sensors in a cooperative manner and to investigate the benefits of the fusion of the sensors. These sensors were chosen because they can sense a wide range of physical properties. The seismic sensor is sensitive to the differences between the mechanical properties of a landmine and the soil while the GPR is sensitive to the dielectric properties, and the EMI sensor is sensitive to the conductivity [C2664]

## "A simple approximation of transmitted wavefront shape from point sources above lossy half spaces"

Many subsurface sensing problems require knowledge of the shape of a wavefront in a half-space originating from a point source above the half-space. Impulse ground penetrating radar and air-coupled acoustic underground sensing systems usually have their emitters in air, transmitting waves through a quasi-planar interface into soil or water. The waves radiated by the emitter can be approximated as circular, but once they enter the half-space, they propagate with wavefront shape that resembles a hyperbola. The objective of this paper is to derive the exact shape and show that it is well approximated by a hyperbola with specific parameters depending on the dielectric constant of the half-space epsi'(=n2) the height of the source h, and the propagation time from source to wavefront multiplied by the wave velocity in the half space p. In addition, a correction formula is provided to reduce the error between the approximate hyperbola and the exact shape [C2665]

## "Texture classification using optimized support vector machines"

Support vector machines (SVMs) have been developed during the last two decades and recently acknowledged as very effective methods for general purpose pattern recognition. The important key in using a SVM is to select the appropriate parameters of its kernel function. In this paper, we present techniques on adjusting kernel parameters of SVMs to improve their performances with two remote sensing texture classification problems. [C2666]

## "Advanced quality of service strategies for GERAN mobile radio networks"

Customer demand for wireless data services is rapidly increasing. The introduction of GPRS, EDGE and UMTS providing high bit rate radio bearer, however, is not the complete response for satisfying the demands of these new high quality services. An advanced quality of service QoS management is necessary to handle the characteristic requirements of both different service types and user expectations. A new QoS strategy is proposed and analyzed comprising 3GPP QoS parameters along with operator's specific weighting factors to define the appropriate QoS priority of each service type and user profile. Admission control as well as a deterministic up-and downgrading strategy are applied to ensure a minimum grade of service for low-priority applications. Furthermore, delay time sensitive services and premium users are granted a full bandwidth. Simulation results are provided to qualify the behavior of the proposed QoS strategy under different packet data load conditions. Especially in highly loaded and even overloaded GERAN networks the introduction of QoS provides significant benefits for the end user and offers powerful means to increase the service revenues according to the charging policy adopted by the network operator. The introduction of an appropriate QoS strategy is the prerequisite for an overlay deployment strategy of GSM/EDGE and UMTS. [C2667]

## "A comparison on texture classification algorithms for remote sensing data"

Ground penetrating radar (GPR) systems are widely used to inspect underground structures. We have collected GPR images to detect and identify structures beneath rail tracks. Several approaches, including a statistical edge detector and machine learning methods, have been applied to analyze the images. Our results show that the edge detector efficiently enhance the layer boundaries that separate ballast, subballast, and clay. The machine learning approaches are promising means to detect these layers automatically. [C2668]

## "Scattering analysis using fractional Fourier with applications in mine detection"

This paper uses the fractional Fourier transform to identify dispersive scatterers in a GPR signature. The motive

is that certain dispersive scatterers that uniquely define an object can be better localized in the fractional Fourier spectrum. These scattering features that are extracted via the fraction Fourier transform are then presented to a nonparametric landmine detection scheme. The motive is to detect landmines based on specific scattering mechanisms thus avoiding the use of the significant ground return as a primary feature [C2669]

## "Design and evaluation of a link adaptation algorithm for enhanced video service provision within mobile radio environments"

The paper presents and evaluates a link adaptation algorithm for real-time video transmission within a mobile radio environment. The aim of the algorithm is to improve performance, not only in terms of throughput, but also in terms of delay. The results show that the objectives set by the proposed algorithm are more effectively fulfilled compared to more traditional algorithms aimed at system throughput optimisation. [C2670]

## "Analysis of surrogate indicators for evidence of subsurface preferential flow pathways: impact of subsurface preferential flow on variability of NDVI"

Watershed-scale processes governing chemical fluxes to adjacent ecosystems are so poorly understood that effective strategies for mitigating chemical contamination cannot be formulated. Characterization of hydrologic processes and chemical behavior at the watershed scale is critical to the development of sustainable agricultural practices. Identifying locations for monitoring hydrologic processes like subsurface preferential flow is difficult because conventional sampling methods are inadequate for measuring this highly variable, yet critical process. A method for detecting and mapping subsurface preferential flow pathways based primarily on ground-penetrating radar (GPR) data and digital elevation maps (DEM) was developed. This procedure was confirmed for a Maryland cornfield using real-time soil moisture data, maps of within-field grain yield, and remotely sensed imagery. Unfortunately, it is economically unfeasible and logistically impractical for producers to use the GPR-DEM procedures to map subsurface preferential flow pathways for all crop fields. It may, however, be possible to use remotely sensed imagery, grain yield maps, and a DEM as surrogate indicators of subsurface preferential flow pathways occurring at or near crop rooting depth. The normalized difference vegetation index (NDVI) shows an increase with distance from primary, secondary and tertiary preferential flow pathways during above-normal rainfall growing seasons. There appears to be a decrease of NDVI with distance from preferential flow pathways for a dry/drought year. Imagery collected during drought conditions appears especially useful as only within-field locations with subsurface irrigation from preferential flow pathways maintain vigor. Maps of vegetative productivity derived from remotely sensed imagery may be more useful than within-field grain yield maps for detecting and delineating locations of subsurface preferential flow pathways. The ability to delineate field locations with a high probability of subsurface preferential flow pathways will allow producers to better manage crop production, and mitigate losses of agricultural chemical inputs to neighboring ecosystems and waterways. [C2671]

## "Penetrating radar study of the collapse features in a Nantou earth slide, Central Taiwan"

This paper shows that ground-penetrating radar is an indispensable tool to study the internal configuration of a slide mass. The georadar facies and sliding surface are easily recognizable on the GPR profiles. The study area in this paper had undergone at least two earth slides. The internal configuration of the slide mass details the mechanism of this mass movement. Ten georadar facies were observed on the GRP profiles. They are chaotic, contorted, disrupted, hummocky, lenticular, oblique, onlap, overlap, subparallel, and reflection-free. At the head or crown part of the slide mass, chaotic, contorted, disrupted, oblique, and onlap facies are dominant. At the toe part, contorted, oblique, onlap, ad reflection-free facies are most common. In the main body of the slide mass, chaotic, contorted, disrupted, hummocky, lenticular, overlap, and subparallel facies dominate. Chaotic, contorted, and disrupted facies exist throughout the slide mass. Chaotic facies indicates severe movement, including rotation. Contorted facies results from a checked gravity sliding, whether checked by friction or blockade. Disrupted facies is caused by extension from gravity sliding. Similar studies can be extended to other areas prone to earth slide, so preventive measures can be adopted to abate the landslide hazards [C2672]

## "A new approach for serving radio network controller relocation in UMTS all-IP network"

To support real-time multimedia services in UMTS all-IP network, 3GPP TR 25.936 proposed two approaches to support real-time serving radio network controller (SRNC) switching, which require packet duplication during SRNC relocation. These approaches significantly consume extra system resources. This paper proposes the fast SRNC relocation (FSR) approach that does not duplicate packets. In FSR, a packet buffering mechanism is implemented to avoid packet loss at the target RNC. We propose an analytic model to investigate the performance of FSR. The numerical results show that packet loss at the source RNC can be ignored. Furthermore, the expected number of packets buffered at the target RNC is small, which does not prolong packet delay. [C2673]

## "Dynamic resource allocation scheme with maximum channel utilization in GSM/GPRS networks"

An improved dynamic resource de-allocation scheme with and without maximum channels for GPRS packets (MCP) in GSM/GPRS networks is proposed and analyzed. In GPRS, multiple channels may be allocated to a user to increase the transmission rate. When there are no free channels in the system, some of the multiple channels allocated to the user may be de-allocated to serve other calls with higher priority. When a channel is released, the system should adjust the channel allocation to achieve better performance. The paper proposes a de-allocation scheme with MCP, which allows a packet-holding user to occupy idle channels for transmission when some channels are released. It is shown that, compared with the existing de-allocation scheme, the proposed de-allocation scheme with MCP can further reduce voice blocking probability, achieve lower packet blocking probability, higher channel utilization and smaller packet transmission time. [C2674]

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## "The use of ground penetrating radar as a risk mitigation tool"

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## "Performance evaluation of channel de-allocation schemes for GSM/GPRS networks"

Several channel de-allocation schemes in GSM/GPRS networks are proposed, such as DA_RANDOM, DA_RICHEST, DA_POOREST, DA_OLDEST, DA_YOUNGEST, and schemes where channel de-allocation is on demand are studied. DoD (de-allocate on demand) was originally proposed for wireless local loop networks; we expand this work to accommodate GSM/GPRS networks, and de-allocation schemes with DoD or with AD (always de-allocate) are studied. Our study quantitatively indicates that DoD may outperform channel de-allocation schemes with AD or ND (no de-allocation), and for de-allocation schemes with DoD, random de-allocation on demand (DoD_R) is better than other schemes. [C2677]

## "A novel method for clutter reduction in the FLGPR measurements"

A new method of removing rough-surface clutter in forward looking ground penetrating radar (FLGPR) is proposed based on the physical optics model. The Wigner-Ville distribution (WVD) is proposed to perform a time-frequency analysis. The instantaneous power is worked out to do further processing. By imaging the instantaneous power, we can detect a target more accurately. The treatment comparisons of the experimental data show that the clutter-reduction method presented is better than the conventional method. [C2678]

## "Research on fast synthetic aperture imaging method for ground penetrating radar in subsurface object detection"

The paper analyzes the received data of shallow subsurface ground penetrating radar (GPR), and proposes to decide the useful information distribution area in the whole received data by the variance characteristic and A-scan energy of the data. A new fast synthetic aperture imaging (SAI) method is achieved by using only those useful GPR data. The results of processing experimental data show that this method is very effective, the effect of the fast synthetic aperture imaging method corresponds with the general synthetic aperture imaging method, and the computational load is reduced greatly compared with the general synthetic aperture imaging method. [C2679]

## "A novel inter-system handoff scheme in wireless overlay networks"

The wireless overlay network will play an important role in future mobile communications and Internet access. It will be an IP-based network, which includes various wireless access methods and provides all kinds of services such as voice, data and multimedia. Handoff is a critical issue of the wireless overlay network, because it can guarantee seamless roaming among different networks. Based on a WLAN-GPRS wireless overlay network model, and considering channel characteristics, service types and factors influencing the handoff process, a novel inter-system handoff scheme is proposed and relative decision benchmarks are discussed. Simulations on the key parameters, such as throughput, packet loss and handoff delay, prove that the proposed handoff scheme can provide powerful support for seamless handoff and continuous communication. [C2680]

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## "A Σ-Δ fractional-N synthesizer with a fully-integrated loop filter for a GSM/GPRS direct-conversion transceiver"

This paper presents a fractional-N synthesizer with a 3-bit 4th-order interpolative Σ-Δ modulator for a GSM/GPRS direct conversion transceiver. With an integrated VCO and an integrated loop filter, the synthesizer achieves the phase noise performances less than -78dBc/Hz at close-in offset and less than -116dBc/Hz at 400kHz offset. The chip was fabricated and evaluated in a 0.35 μm SiGe BiCMOS process. [C2689]

## "A wireless Internet-based measurement architecture for air quality monitoring"

This paper prevents a wireless monitor and control system using mobile communication. This system includes the remote measurement units (RMUs), GPRS network, Internet and a server computer. The GPS, GPRS modem and advanced RISC machine (ARM) are employed to achieve the functions of RMU. The measurement data are transmitted from RMUs into the server computer via Internet protocol (IP) address. In this way, the server computer can be very far away from RMUs and it can be also flexibly assigned. The server computer can support several RMUs with flexibly assigned functions. Therefore, the measurement results can be widely spread via Internet access in real time. The proposed measurement system is applied to an example to monitor the ambient air quality. The experimental results demonstrate the performance of overall system. [C2690]

## "Earth surface potentials measuring device for large grounding systems testing"

Substation grounding system characteristics need to be examined periodically in order to check that protective functions have not been degraded over a longer period of time. The most important safety parameters are the values of touch and step voltages. However, the surface potential distribution contains additional information concerning grounding grid status and possible characteristics degradation trends. Inspection procedure needs to be well prepared prior to actual measurement during which the great deal of measuring information has to be acquired. General-purpose multimeters are inconvenient for the efficient conduction of measuring procedure and data management tasks. A novel application-specific measuring system for earth surface potentials measurement needed to be developed and realized. It consists of the smart measuring device accompanied with the integrated program environment on a personal computer for inspection planning and analysis. [C2691]

## "A wireless network of EIS devices [Csensor networks]"

By using a sensor connected to a generic wireless embedded Internet system (EIS) platform, data can be presented on-line over the Internet using a standard WWW-browser. When started, the EIS device automatically

searches and connects to other devices providing Internet connectivity. The EIS can also provide Internet access for other devices, for example other EIS platforms, thus creating a local network. In this paper we focus on mobile phones with GPRS as the means for wireless Internet connectivity as it provides enhanced area coverage in today's networks. To overcome the problem of non-public IP addresses, a basic server based solution is developed. Our experiments confirm that within GPRS coverage, the EIS device successfully provides Internet access and presents data for on-line monitoring over the Internet. [C2692]

## "The ultra-wideband signal propagation"

In the ultra-wideband (UWB) system the pulses are transmitted at a very low level, where the signal looks like low level noise to the other wireless system. Therefore, a good understanding of the UWB signal propagation is necessary. Moreover, UWB communications rely on an unusual wireless technology (a carrier free and huge bandwidth), so that designing of UWB system raises a number of questions. This paper describes a theoretical study of the UWB propagation and losses. This study is based on two ray model in the case of short range line of sight UWB transmission. The model takes into account both frequency dependent parameters and distance. [C2693]

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## "Neural network approach to precursor signal detection"

It is well known that the electromagnetic waves that radiate from the earth's crust are useful for predicting earthquakes. We observe electromagnetic waves in the extremely low frequency (ELF) band of 223 Hz. These observed signals contain several undesired signals due to the events in the magnetosphere or the ionized layer, lightning radiation from the tropics, and so on. This paper proposes a multi-layer neural network for precursor signal detection. It is shown that the proposed method is useful for precursor signal detection. [C2695]

## "Dynamic radio resource management in GSM/GPRS using scalable resource allocation technique"

A scalable resource allocation (ScRA) algorithm is developed to improve the mobile network radio resource utilization. The traditional mobile dimensioning is based on the "busy hour" traffic intensity, and this static resource allocation (StRA) methodology does not seem to be able to provide efficient radio resource utilization for the future/present multiservices environment, with their expected spatially and temporally varying loads. This is a hindrance for the introduction of wireless IP based services, for which the demand is rapidly increasing. This paper provides an extension analysis by incorporating single slot FIFO and single slot round robin (single slot RR), blocked-call cleared (BCC) and blocked-call delayed (BCD) strategies in the ScRA scheme. By employing the ScRA scheme in an example GSM and GPRS network, we specifically investigate and evaluate the system throughput for both the circuit-and packet-switched networks. The findings show that single slot FIFO ScRA and single slot RR ScRA schemes obtained no difference in system throughput. On the other hand, when BCD is implemented in the ScRA scheme, there is significant throughput gain. [C2696]

## "Deploying traffic information service applications in any type of cellular networks"

Location is a strategic asset of cellular network providers. Location based mobile services are a new type of wireless communication service that exploit the knowledge of the mobile terminal's location, enabling many innovative and useful applications for the mobile terminal users. In this study, we present an architecture and the corresponding application for supporting the transmission of road traffic information to mobile users. A detailed investigation of the signaling load for any type of cellular network (GSM, GPRS, UMTS) takes place trying to utilize the position information that is recorded in the cellular network provider databases for resource management or billing purposes. Robust and flexible services can be accomplished by transferring LBS applications to IP networks by using the active network technology. [C2697]

## "Dynamic optimization of quality of service in cellular multi-class networks using variable number of guard channels"

In this paper we propose a novel strategy for channel allocation in multi-class mobile networks with prioritized handovers, which uses dynamically variable guard channels to improve network utilization under given quality of service (QoS) constraints. We define user classes, each of them with different utilization of network channels. We consider the guard channel policy where certain number of channels is dedicated to handover calls, and also, the policy in which this number of channels is dynamically adapted to the network requirements. Our target is to obtain the influence of this methodology over performance parameters, such as call blocking and call

dropping probability. Traffic, network and mobility parameters are also taken into account, such as cell capacity, traffic intensity, as well as number and distribution of subscribers per classes. [C2698]

## "Programmable PA controller for GSM/GPRS quad-band applications"

The programmable analog power amplifier (PA) control loop of a fully-integrated GSM/GPRS quad-band transceiver (Duvuvier et al., 2003) is presented. The control loop is based on a fully-integrated PA controller which meets all ETSI GSM/GPRS requirements. Both the gain and the bandwidth of the PA control loop are programmable as well as the stand-by voltage delivered to the PA. These features, together with a high driving capability (8.4mA @ 2.5V), make this solution capable to interface vast combinations of PAs, couplers and detectors. The proposed PA controller has been integrated in a BiCMOS SiGe 0.35µm process and measures 0.33mm2. The current consumption from a single 2.8V power supply is 2.8mA without load and 7.2mA in the application (using Hitachi's PF08109 PA). [C2699]

## "An end-to-end hardware approach security for the GPRS"

An end-to-end security architecture and its VLSI implementation for the GPRS is proposed in This work. The security offered by GPRS is similar to that offered by the Global Mobile System (GSM). Three algorithms are needed. The A3 and A8, for authentication and ciphering key generation, and the GEA3 algorithm for data confidentiality. The A3 and A8 are based on the RIJNDAEL block cipher, while the GEA3 is based on the KASUMI block cipher. For both ciphers efficient implementations are proposed. The whole design was coded using VHDL language and for the hardware implementations of the designs FPGA devices were used. Detailed analysis is shown, in terms of frequency, throughput, and covered area. [C2700]

## "Identification of power frequency industrial magnetic field sources for shielding purposes"

In any industrial installation power frequency electric systems generate extremely low frequency (ELF) magnetic fields. Field amplitude values must fulfill the limits related to health effects or to disturbances on electromagnetic devices and a shielding system could be necessary. The design of a magnetic field shielding apparatus requires the simulation of the sources and of the shields in order to evaluate the main shielding parameters like geometry, material and position with respect to sources. An alternative approach is proposed in this paper which requires to measure a spatial distribution of the magnetic field amplitude without any information on the time phase shifts among the components at each measurement point. Actual field sources are simulated by means of suitable simplified sources handled by analytical relations. An identification process of measured magnetic fields is performed using a genetic algorithm applied to the simplified source. The proposed simplified sources are a suitable combination of three-phase ones and it seems able to create a realistic magnetic field distribution both in space and in time. The paper presents the proposed method and its application to the design of a conductive shielding to reduce the leakage fluxes of a three-phase transformer without tank. The magnetic field to be shielded is evaluated with a simple 3D model of a transformer constituted by three windings in air with current values deduced from the equivalent magnetomotive force, which is considered the actual source. Unshielded fields on a plane region are used to identify the simplified source and the effects of a conducting aluminum shielding are compared using actual and simplified sources. The influences of some parameters of the simplified sources on the results are discussed. The case of harmonic fields with a negligible harmonic content is analyzed. [C2701]

## "A DSP engine for an extensible media embedded processor"

An extension interface for a configurable processor enabling implementation of an application specific programmable DSP is described. A DSP engine for mobile applications with 32-bit dual MAC architecture based on the extension was designed. The engine can also run separately as stand-alone processor decoupled with the configurable CPU core. A test chip was successfully fabricated using 0.13µm CMOS technology and has measured 0.23 mW/MHz for random logic of the engine and the core. [C2702]

## "The study on implementing GPRS intelligent network and its services"

The current trend in the mobile telecommunication market is to provide variable value-added data services over GPRS networks. The evolution from the GSM intelligent network (IN) system which has been widely deployed towards the GPRS IN system allows the operators to build new data services in a cost-effective, speedy way. In order to achieve this evolution smoothly and efficiently, it is necessary to consider the essential differences between the GSM IN and the GPRS IN which would do virtually effect on the system implementation. Those differences, together with the corresponding key technologies are discussed and analyzed in this paper. In this study, we also propose some value-added data services which can hopefully be deployed primarily on the commercial GPRS IN system. It is believed that some enhancements to the architecture specified by the 3rd

Generation Partnership Project (3GPP) could enrich the features and types of the GPRS IN service, which are also topics for our further study. [C2703]

## "Wavelet-based impulse reconstruction in UWB-radar"

In this paper we present a technique for evaluating shape and position of an ultra wideband pulse in noisy data, based on the continuous wavelet transformation. By using a complex extension for both the signal and the mother wavelet, the received impulse can be completely characterized by only four parameters, without the necessity of exact knowledge of the pulse shape. With this novel approach, the impulse shape is characterized by the angle information of the complex wavelet transform. This allows e.g. the reduction of the amount of data for further processing. [C2704]

## "Camera based motion tracking for data fusion in a landmine detection system"

First Page of the Article [C2705]

## "A state-machine based design of adaptive wireless MAC layer"

A large number of non-converging 2.5G and 3G wireless standards have emerged, over the past, such as, GSM/GPRS, EDGE, IS-95, IxRTT, IxEV -DO, IS-54, IS-136, and IMT2000/UMTS etc. In parallel, unlicensed broadband wireless networks such as IEEE 802.11 and HIPELAN/2 are also spawning across the world. The failure to agree, worldwide, on a unique radio access mode, for economic and political reasons, is forcing the telecommunications community to explore reconfigurable user terminals. Such a reconfigurable radio system will allow the user to roam across geographic areas offering radio access connections using differing standards. To date research into reconfigurable MSs or handsets, also known as SDRs, has predominantly focused on converting physical layer processing into a modularized programmable environment. Although necessary, this only represents a fraction of the overall support and technology required to realize the potential of the concept. Reconfigurability of the higher layers of the protocol stacks is equally important. This paper proposes a software configurable wireless MAC layer design based on the state machine approach. The design exploits the existence of common characteristics in different wireless protocols such as slotted Aloha, p-persistent CSMA, GPRS RLC/MAC protocol and 802.11 MAC protocol. The generic MAC layer design can be re-configured by the software to adapt to a specific wireless MAC layer and be a basis for SDR (software defined radio) mobile station. A methodology for configuring the MAC layer design is also introduced. [C2706]

## "Packet delay analysis in GPRS systems"

In this paper we describe an analytical model to compute the packet delay distribution in a cell of a wireless network operating according to the GSM/GPRS standard. GSM (Global System for Mobile communications) is the most widely deployed wireless telephony standard, and GPRS (Generalized Packet Radio Service) is the technology that is now available to integrate packet data services into GSM networks. By comparing the performance estimates produced by the analytical model against those generated by detailed simulation experiments, we show that the proposed modeling technique is quite accurate. In addition, we show that the results produced by the analytical model are extremely useful in the design and planning of a wireless voice and data network. [C2707]

## "GPRS radio network performance simulation and optimization with dynamic simulator"

This paper discusses GPRS network performance optimization with a dynamic simulator. Simulator models the GSM/GPRS system and a realistic cellular environment with accurate models of e.g. propagation environment, user mobility and traffic distribution. All the relevant details of GPRS protocol stack (LLC, RLC/MAC and physical layer) are taken into account, but less focus is put on GPRS core network, signaling and IP transport layer effects. After defining a set of key performance indicators (KPI) as the basis for the analysis, a real network configuration scenario was applied with the simulator. This setup was then used when GPRS network performance was investigated in order to find the maximum capacity for both GPRS and voice services. At the same time the effect of different radio resource management (RRM) algorithms and parameter alternatives were studied, together with the dynamic interaction between circuit and packet switched services. As a result of this study, a set of optimized and tuned parameters are suggested, which could help operators to go towards more aggressive network deployments with more advanced RRM schemes and at the same time provide higher quality of service (QoS) to the end users with maximized capacity. [C2708]

## "Flow aggregation for enhanced TCP over wide-area wireless"

Throughout the world, GSM cellular mobile networks are being upgraded to support the "always-on" General

Packet Radio Service (GPRS). Despite the apparent availability of levels of bandwidth not dissimilar to that provided by conventional fixed-wire telephone modems, the user experience using GPRS is currently considerably worse. In this paper we examine the performance of TCP and HTTP over GPRS, and show how certain network characteristics interact badly with TCP to yield problems such as: link under-utilization for short-lived flows, excess queueing for long-lived flows, ACK compression, poor loss recovery, and gross unfairness between competing flows. We present the design and implementation of a transparent TCP proxy that mitigates many of these problems without requiring any changes to the TCP implementations in either mobile or fixed-wire end systems. The proxy transparently splits TCP connections into two halves, the wired and wireless sides. Connections destined for the same mobile host are treated as an aggregate due to their statistical dependence. We demonstrate packet scheduling and flow control algorithms that use information shared between the connections to maximise performance of the wireless link while inter-working with unmodified TCP peers. We also demonstrate how fairness between flows and response to loss is improved, and that queueing and hence network latency is reduced. We conclude that installing such a proxy into GPRS network would be of significant benefit to users. [C2709]

## "Traffic model of WAP over GPRS"

Based on the real WAP trace collected on GPRS network, a novel WAP model is put forward in this paper. This model is composed of 3 layers-session, transaction and packet. And the packet is divided into signaling packet and service packet, because they are comparable in size and quantity but have different characteristics in distribution. The self-similarity of real trace and that of the trace generated by this model captures the characteristics of real WAP traffic. [C2710]

## "Open wireless architecture-the core to 4G mobile communications"

Fourth generation (4G) mobile communications should not focus only on the data-rate increase and new air interface. 4G mobile should instead converge the advanced wireless mobile communications and high-speed wireless access system into an open wireless architecture (OWA) platform which becomes the core of this emerging next generation mobile technology. Based on this OWA model, 4G mobile will deliver the best business cases to the wireless and mobile industries, i.e. TD-SCDMA/ WLAN/ GPRS 3-in-1 product, WCMDA/OFDM/WLAN 3-in-1 product, etc. Asia is the most dynamic market of new generation mobile communications with over $50 billion investment in the next five years. The 4G mobile technology-convergence of wireless mobile and wireless access, will definitely drive this growth. [C2711]

## "IP traffic transmission over the general packet radio services"

One IP terminal can occupy a multiple number of slots within time frames in the GPRS networks. A limited number of radio resources (slots) are allocated in a base station for such IP terminals. If one IP terminal can occupy only one slot discontinuously in a time frame, for a real time packet transmission, the number of accepted calls is obtained by dividing the number of radio resources during that time by the maximum allowed number of IP calls. The real time IP traffic flow over the GSM-GPRS network is discussed in [J.H. Sarker and S.J. Halme, 2002]. An analysis for the non-real time bursty IP packet transmission over the GPRS air interface that measures the channel efficiency and the probability that a packet is forced for queuing and the header/payload ratio are executed in this paper. Results show that the channel efficiency as well as the probability that a packet is forced for queuing increases with increasing call intensity, maximum number of admitted IP calls and the burstiness factor. The channel utilization decreases with the increase of header/payload ratio. [C2712]

## "A generic way for wireline and wireless access authentication"

With the developments of broadband wireless techniques, one thing we can be sure is that multi access methods (e.g. GPRS, Bluetooth, IEEE 801.11) would coexist together in the access field in the future and IP could provide a simple unique platform for convergence of different techniques. Based on the analysis of different authentication methods (ppp, 802.x) now exist in this field, the paper proposes an IP carrier based authentication method which support smooth interaction between mobile terminals and access networks while roaming, and also provides the original model of the implementation based on ICMP/IP. [C2713]

## "Experimental performance studies of SCTP in wireless access networks"

The stream control transmission protocol (SCTP) is a new general-purpose transport layer protocol developed by the IETF. Compared with TCP, SCTP has two distinct features: multi-homing and multi-stream. Our work investigates the SCTP performance in various network environments, and its availability for different applications. This paper proposes a SCTP multi-homing scheme as the transport layer solution for wireless multi-access

networks, using GPRS for retransmission when WLAN connection is interfered, collided or congested. We also evaluate the transport protocol behaviors for e-commerce applications. Through the experiments based on the Linux kernel implementation, we find the SCTP scheme can provide better throughput and more robustness in wireless access networks. [C2714]

## "Different behavioral characteristics of Web traffic between wireless and wire IP network"

Web service has become the largest consumer of Internet resources and is a promising 3G wireless service. Constructing an accurate model of Web traffic is essential for networking experiments involving end-to-end performance. In this paper, we employ an approach of analyzing TCP/IP header to obtain Web traffic model. By comparing Web traffic of wireless and wire network, we present some different characteristics between them that reflect the influences of wireless limited bandwidth and high tariff. Furthermore, Hurst parameter shows that the self-similar nature of wireless Web traffic still exists. [C2715]

## "Processing of polarimetric infrared images for landmine detection"

Infrared (IR) cameras are often used in a vehicle-based multi-sensor platform for landmine detection. Additional to thermal contrasts, an IR polarimetric sensor also measures surface properties and therefore has the potential of increased detection performance. We have developed a polarimetric IR setup, which has to be used in a forward-looking manner. This paper describes all the steps to reach detection performance. The first step is the acquisition of the polarimetric IR image data. The next step is the pre-processing to (re)construct polarimetric images. A subsequent segmentation step is made to identify objects. Features, like intensity, reflectivity and shape, of these objects are measured. For independent performance analyses, the data set is divided into a training and evaluation section. A classifier is trained on the training section and evaluated on the classification section. The detection performance of the forward-looking IR camera is shown in receiver operator characteristics (ROC) curves. [C2716]

## "Multistatic antennas and non-linear inversion for mine-detection GPR"

This paper deals with the utilization of "angular diversity" in GPR, an approach, which in comparison to the widespread "fixed-offset" GPR helps to improve clutter robustness as well as image resolution. The latter can be achieved by means of enhanced processing techniques-compared to the widely used SAR or tomographic approaches-which rely on the availability of angular diversity data. The paper discusses data acquisition by means of multistatic measurement setups and numerical MoM simulations. The "factorization method" is proposed as an image formation scheme, which, amongst other advantages, requires only low computational effort. 3-D imaging results from numerical datasets in free-space and a stratified background are presented and discussed. [C2717]

## "Neural networks trained by scattered electromagnetic data for GPR applications"

This paper is intended to give a presentation of the first results we have achieved in the field of reconstructing buried objects starting from the data extracted from the time-domain waveform of the scattered electromagnetic field which can be available at the receiving terminals of a GPR equipment. To this aim, neural network methodologies are exploited to face the inverse scattering problem. The main attention has been devoted to identify sets of data that can be "easily" extracted from the transient field. These data, however, represent the "electromagnetic signature" of the investigated scenario and thus they be chosen to be closely related to the geometric as well as the dielectric properties of the target. Preliminary results are shown concerning the localisation of the target and the reconstruction both of its dimension and of its relative dielectric permittivity. [C2718]

## "Fusion of polarimetric infrared features and GPR features for landmine detection"

Currently no single sensor reaches the performance requirements for humanitarian landmine detection. Using sensor-fusion methods multiple sensors can be combined for improved detection performance. This paper focuses on the feature-level; fusion procedure for a sensor combination consisting of a polarimetric infrared imaging sensor developed by TNO and a video impulse GPR developed by Delft University of Technology. Feature-level sensor-fusion is the process where specific information (i.e. features) from objects detected by different sensors are combined and classified. The single sensor detection methods and the feature-level sensor-fusion methods are evaluated using a leave-one-out evaluation method. This evaluation method provides an independent evaluation set while retaining the largest possible training set. The detection results of both single sensors and the sensor-fusion methods are both presented in receiver operator characteristics (ROC) curves. They show that on the training set feature-level sensor-fusion always outperforms the best single sensor. Furthermore, on the independent evaluation set, there are ROC points of the feature-level sensor-fusion

methods that are better than the best sensor. [C2719]

## "Subsurface imaging using measured antenna footprints"

For the detection of landmines, images of the subsurface are made using a bistatic stepped frequency continuous wave radar system. During the measurements, the system moves along the surface and due to the presence of objects in the subsurface changes in measured voltages are observed. These changes are formulated as a convolution of a complex contrast function with a sensitivity function. In fact, this sensitivity function is the vectorial inner product of the incident and the total electric wavefield. Using the Born approximation, the sensitivity function is obtained as the inner product of the field emitted by the transmitter and the field from the receiver operating in transmitting mode. For imaging purposes, knowledge of the wavefields in the subsurface is needed. Since it is difficult to model the radiation characteristics very accurately, we measure the footprints of the antennas at one level and propagate the emitted wavefields using Huygen's principle. After we verify the usability of this principle, we create synthetic data using measured patterns and apply back-propagation on the data to localize objects. [C2720]

## "The effect of the elevation of GPR antennas on data quality"

In many GPR-measurement situations it is possible to measure with the antennas of the GPR-system in contact with medium containing the unknown objects. In this paper, we have tested the performance of a commercial Pulse Ekko 1000 system at various heights above a sand-surface. We show measurements over the same area with the antennas of this near-surface GPR system at four different heights above the surface. We show that the decrease in signal to noise ratio is small for two-way distances between antenna and surface is smaller than one third of the dominant wavelength. For larger distances, the signal quality decreases rapidly for data processing purposes and object detectability. [C2721]

## "Estimation of constitutive parameters using a loop antenna"

A method for estimating the constitutive parameters of soil using a loop antenna is proposed. The method is based on comparing measured and numerically calculated input admittances for the loop. [C2722]

## "Multi-component GPR imaging for different heights of source and receiver antennas"

For imaging ground penetrating radar (GPR) data, three of the most important parameters are the wave speed, polarisation and amplitude. Choosing an appropriate forward model that incorporates these three parameters is a critical aspect of imaging. A new multi-component imaging algorithm that takes into account the polarisation and vectorial radiation characteristics of GPR data has recently been developed. The forward model used to calculate the imaging operators in this imaging algorithm is based on far-field expressions for the radiation characteristics of a dipole present on an interface. Here, multi-component images obtained using elevated source and receiver antennas are presented. As the height of the antennas above the surface is increased, the bandwidth of the scattered data decreases. This results in decreasing spatial resolution for increasing height of the antennas. [C2723]

## "Scalable resource allocation algorithm for GPRS"

This paper compares the proposed scalable resource allocation (ScRA) and static resource allocation (StRA) schemes for a mixed packet as well as circuit switched traffic sharing a common pool of spectrum. To evaluate the performance, a computer simulation model of a GSM/GPRS system was developed. Results show that the ScRA scheme can optimally allocate radio resources to time varying circuit switched and packet switched traffic while maintaining the specified quality of service (QoS) for each type of traffic. The novelty of the scheme resides in the derivation of a threshold level for the packet switched session for different sets of QoS requirements. This investigation can be used for call admission control in an integrated network. [C2724]

## "Modeling and analysis of combined mobility management based on implicit cell update scheme in general packet radio service"

General packet radio service (GPRS) is a system for efficient packet-switched data transmission, which is used in conjunction with the global system for mobile communications (GSM) for circuit-switched voice communication. In GPRS, ready, standby, and idle states are defined accommodating packet traffic characteristics, contrary to two states, i.e. busy and idle in GSM. In GSM, location update and paging are performed based on location area (LA). On the contrary, in GPRS, they are carried out based on cell or routing area (RA), which is smaller than LA. Combined RA/LA update and circuit-switched paging via serving GPRS support node (SGSN) have been proposed in 3GPP in order to save the network and radio resources. In this

paper, an implicit cell update scheme based on GSM voice call arrivals is proposed and a combined mobile station (MS) state model accommodating both GSM and GPRS states is made based on the implicit cell update scheme and the effect of combined mobility management on the performance of GPRS system is analyzed. [C2725]

## "Self organizing maps application in a remote water quality monitoring system"

First Page of the Article [C2726]

## "Performance evaluation for integrated voice/data wireless networks with link adaptation"

Link adaptation (LA) allows the selection of a proper coding/modulation scheme based on the channel conditions in order to cope with the radio channel quality during the connection period of a call. The effectiveness of LA is generally demonstrated in terms of spectral efficiency (b/s/Hz/sector) at the link level. In this paper, the performance of integrated voice/data service is analyzed from the system point of view. Numerical results show that the improvement in data throughput is about 128%, and that in the mean data delay is about 26% if LA is used for data service. The system level performance is obtained through queueing analysis while the link level performance is simulated using RUNE. [C2727]

## "Traffic control algorithms for a multi access network scenario comprising GPRS and UMTS"

Next generation wireless communication systems will bring new architecture concepts, new spectrum allocation policies and smart resource management in a multi-network environment [ R. Berezdivin, et al., March 2002]. Within this context the IST DRiVE project [IST DRiVE Project Website, http://www.ist-drive.org/] aims at enabling a spectrum-efficient high-quality wireless IP in a heterogeneous multi-radio environment to deliver in-vehicle services. This paper assumes a multi-network scenario comprising GPRS and UMTS radio access networks (RAN) and proposes several schemes for controlling and distributing the network traffic over these two RANs, increasing the spectrum efficiency of the whole system by ensuring that mobile terminals are served by the optimum radio access technology available. This is achieved by assigning a cost to each service that the network can provide, taking into account both system load and system resource availability, and enabling the mobile terminal to select the most efficient RAN, retaining the quality the user asks for. The results show that a gain, in terms of percentage of satisfied users, of more than 15% can be obtained by the multi-network system compared to the case of no traffic distribution process, thus leading to a more efficient spectrum usage. [C2728]

## "Author Index"

First Page of the Article [C2729]

## "Dimensioning of signaling capacity on a cell basis in GSM/GPRS"

Accurate dimensioning of signaling capacity is decisive for the efficient operation of mobile telecommunication networks. In this paper, an automatic optimization algorithm for adaptation of permanent signaling resources in GSM/GPRS is proposed, which is based on statistical measurements of signaling and call traffic. Analysis of real network indicators demonstrates that overall revenue losses caused by blocking effects may be greatly minimized. [C2730]

## "Optimization of handover margins in GSM/GPRS networks"

Optimization of handover boundaries has been suggested to cope with non-homogeneous traffic distribution in GSM/GPRS networks. In this paper, an automatic optimization algorithm is proposed, which is able to maximize the overall traffic carried in the network by equalizing long-term blocking effects. Field trial results indicate that system capacity can be significantly improved with respect to homogeneous handover parameter settings. [C2731]

## "Video streaming on embedded devices through GPRS network"

We introduce a PDA-based live video streaming system on GPRS network based on MPEG-4 video compression standard. Due to the limited computational resources of PDA, all the key modules of MPEG-4 codec are efficiently implemented and optimized such as multithreading, buffer design, wireless communication, encoder and decoder. Several novel techniques are developed in the coding, streaming as well as the post-processing stages of the system. [C2732]

## "Global three-dimensional FDTD modeling of impulsive ELF propagation about the Earth"

This paper has reported the initial application and validation of the FDTD method to model impulsive ELF propagation within the entire Earth-ionosphere cavity. This technique permits direct, 3-D, time-domain calculation of impulsive, round-the-world ELF propagation accounting for arbitrary horizontal as well as vertical geometrical and electrical inhomogeneities and anisotropies of the excitation, ionosphere, lithosphere, and oceans. We expect that this model will be useful in studies of ELF propagation phenomena which form the physics basis of important remote-sensing investigations of lightning and sprites, global temperature change, and subsurface structures. [C2733]

## "Implementation solutions and issues in building a personal sensor network for health care monitoring"

An implementation of a personal sensor network for health care monitoring is presented. It comprises several smart sensor nodes and a control node organized into a Bluetooth piconet. Remote users can access the network, query and control sensors via GPRS network using methods provided by the control node. The main characteristics of the implemented system and various observed issues are presented. [C2734]

## "Practical evaluation of GPRS use in a telemedicine system in Cyprus"

The unceasing emergence of new technologies in wireless and mobile telecommunication networks, combined with the simultaneous rapid advances in information technology, are leading to many new solutions in the field of telemedicine, thus offering more opportunities for improving further existing and supporting new advanced services for healthcare. The objective of this paper is to carry out a practical evaluation of the performance of the GSM and GPRS systems in the transmission/reception of X-ray images and video in emergency orthopedics cases. As expected, the performance of GPRS is superior to that of GSM. The data transfer rate achieved with GPRS were in the range of 32 Kbps with the download time for typical X-ray images of a file size of 200 Kbytes to the mobile device to be in the region of 60 seconds. Similar performance was also recorded in the case of a moving station (simulating the ambulance) for the biggest part of the journey. In conclusion, although the medical imaging downloading timing was in the range of a few minutes, the physicians were very pleased by the benefits offered by the system through the freedom of access, anywhere and anytime even in motion. [C2735]

## "Ground penetrating radar (GPR) studies at the ElectroScience Laboratory (ESL)"

There are a number of factors to be considered in making many GPR measurements. These include (a) electronic hardware (b) antenna systems (c) electromagnetic properties of the ground (d) target identification arid remote sensing concepts and (e) use of numerical simulations. The purpose of this paper is to review the contributions made at the ESL for these factors and to discuss future potential advances in the state of the art. [C2736]

## "Optimization of the dielectric embedded dipole antenna"

Based on the developed theoretical model of the DEDA analysis of its performance and optimization of its structure has been performed. According to simulations the optimized version of the antenna has 50% larger bandwidth, radiates pulse with 1.6 times larger amplitude and has small late-time ringing than the first DEDA antenna. [C2737]

## "FDTD simulations of multiple GPR systems"

In this work, a multiple-GPR detection system has been simulated. The main advantage of such a system is that it saves time by detecting both the transverse and the longitudinal positions of the target by a B-scan measurement, whereas the same detection can be achieved by a C-scan with a single-GPR system. FDTD method is employed to perform the simulations, in which the ground is homogeneous and the target is perfectly conducting. [C2738]

## "Microwave remote sensing research at the ElectroScience laboratory"

The ElectroScience Laboratory (ESL) at The Ohio State University has made many important contributions to the development of microwave remote sensing, both in theory and practice. The term "remote sensing" is very broad, and could be interpreted to include ESL efforts in areas such as ground penetrating radar technologies, studies of microwave propagation through the atmosphere, contributions to the development of polarimetric concepts for radar, studies of the ionosphere, and experiments and modeling of optical propagation in the atmosphere. More general ESL contributions that play a role in the remote sensing area also include the development of new antennas, radar technologies, and general electromagnetic modeling methods. However, this paper focuses specifically on the "microwave remote sensing" area, where applications involve active or

passive microwave sensors used to observe geophysical environments in order to retrieve information about those environments. [C2739]

## "Ground penetrating radar signal processing for road monitoring and damage detection"

Ground penetrating radar (GPR) signal processing is a nondestructive technique, particularly promising for soil characteristics interpretation. In fact, pavement damage is actually one of the most crucial problems in roads. A preliminary detection and a subsequent classification of the pavement damage, based on an automatic GPR analysis, have been performed and experimentally validated. An optimum detection procedure is performed. It implements the classical Neyman-Pearson radar test. All the settings needed by the procedure have been estimated from a training set of measures. The overall performance has been evaluated by looking at the usual receiver's operating curve. The results evidence that a reasonable performance has been achieved by a suited analysis of GPR images exploiting the spatio-temporal correlation properties of the received signal. Although a generalization is not reliable, this study shows that an automatic GPR-based evaluation of subgrade soil characteristics is feasible. [C2740]

## "GPRS and WLAN real networks IP level characterization"

The growth of both the Internet and mobile systems provides the way for wireless access to the Internet. We characterize two currently available radio access links, the general packet radio service (GPRS) and the IEEE 802.11b standards, from the IP level point of view. We analyze the impact of IP parameters on its performance and obtain conclusions on the expectable behavior for higher layers. [C2741]

## "Ultra-wideband (UWB) rules and design compliance issues"

In April of 2002 the FCC published its Report and Order governing the use of UWB devices. This established Subpart 15F of the Rules. UWB technology is used in many applications including imaging devices and communication. This paper will present basics of UWB devices and the FCC's response to their proposed uses and limitations. UWB interfering effects on radio communications and satellite positioning systems are also discussed. Requirements for UWB, including changes published in March 2003, will be presented as well as the implementation of the associated test procedures, published in the FCC's Report and Order. [C2742]

## "Optimizing TCP parameters over GPRS and WLAN real networks"

Internet based applications are mostly based on a reliable transport service. TCP (transmission control protocol) is one of the protocols responsible for applications performance. Mobile users access to Internet services through 2.5 and 3 Generation networks, which have a significant latency due to error mechanisms introduced at the link layer, as well as transmission delays in the radio access networks. High latency produces interaction with timers of upper protocols. Data rate is other limiting characteristic on these networks. Moreover, data rate changes during a TCP connection due to mobility. TCP can adapt its rate when slow data rate changes thanks to its self-clocking propriety. In case of a sudden change, TCP performance is degraded due to spurious retransmission, and the activation of its congestion control mechanisms. This paper will show the effects and optimization of some TCP parameters over GPRS (general packet radio service) and 802.11b real networks. [C2743]

## "A fully integrated zero-IF transceiver for GSM-GPRS quad band application"

A GPRS GSM850/GSM/DCS/PCS fully integrated transceiver occupies 14mm2in 0.35µm SiGe technology. A direct conversion receiver, transmitter, synthesizer, VCO, voltage regulators and loop filters are fully integrated. The chip meets the GPRS specifications including settling time of 105µs in RX mode, NF of 3dB for GSM, TX phase error of 2° RMS, and PLL phase noise of -84dBc/Hz at a 1kHz offset at 3.6GHz. [C2744]

## "Set decoding of convolutional codes with application to gsm/gprs"

First Page of the Article [C2745]

## "The impact on the capacity of a GSM/GPRS system using space-time processing techniques"

The use of space-time filtering is probably one of the most promising techniques for optimizing the utilization of the RF spectrum. Using an array of antennas at the base station, followed by a two-dimensional space-time filtering structure, a capacity improvement can be obtained by jointly reducing the co-channel and intersymbol interferences levels at the receiver. In this paper, simulations are made considering the GSM/GPRS system for different scenarios. The obtained results show that such a system can use not only all the frequencies in every

cell, but also reuse a same carrier inside a single cell, employing spatial division multiple access (SDMA). [C2746]

## "A 1.2-V dual-mode WCDMA/GPRS ΣΔ modulator"

A dual-mode ΣΔ modulator is designed to meet the specifications of a WCDMA/GPRS receiver and is composed of a single-bit second-order modulator followed by a multi-bit stage that adapts performance to broadband signals. The modulator achieves 82dB and 70dB of dynamic range over bandwidths of 100kHz and 1.92MHz, respectively, and dissipates 4.3mW from a 1.2V supply. The circuit is implemented in 0.13µm CMOS technology and occupies an active area of 0.2mm2. [C2747]

## "Oversampled timing recovery for magnetic recording channels"

In this paper, oversampled timing recovery for magnetic recording channels. Performance comparison using PLL gain parameters were designed. We consider normalized recording density for both longitudinal and perpendicular recording channels with media jitter noise, clock jitter noise, and frequency offset were modelled. [C2748]

## "The 3-D multidomain pseudospectral time-domain algorithm for inhomogeneous conductive media"

A three-dimensional multidomain pseudospectral time-domain algorithm has been developed to model electromagnetic scattering by inhomogeneous objects as well as perfect conductors. The numerical results have been validated by analytical solutions and the FDTD method. Compared to the FDTD method, this multidomain PSTD algorithm has shown a marked improvement in terms of sampling density, execution time and memory requirement. The algorithm has been applied to calculate the radar cross section. [C2749]

## "Telematic requirements for a mobile and wireless healthcare system derived from enterprise models"

A challenge of current innovation in healthcare processes is to improve the time to treatment. This paper addresses the benefits of telematic services and mobile & wireless devices such as vital sign sensors and head mounted cameras for healthcare processes. It explores the telematic requirements for a distributed healthcare environment of body area networks of the mobile devices which are connected by wireless (public) networks (e.g. GPRS and UMTS) to healthcare centres. Our main contribution is the development of enterprise models, which are expressed in terms of the unified modelling language, for the purpose of identification and justification of the telematic system requirements. The developed enterprise models separate organizational modelling concerns such as the separation of medical roles from the agents acting in these roles. This separation enables roles to be dispatched virtually to a point of care without transporting along with all the agents, but it requires support of a telematic system to bridge the distance gap. We validate the proposed models against a trauma team scenario and consequently obtain the telematic system requirements which enable improved time to treatment for emergency services. [C2750]

## "Performance evaluation of networked virtual reality services in a gprs network"

First Page of the Article [C2751]

## "Operator's IT road to UMTS"

Years have passed since first GSM networks were built. Although they used benefits of digital technologies, the need for mobility and transmitting voice calls as a primary function required clear separation between the way mobile networks and standard computer networks are functioning. As networks evolved and new standards emerged, this gap between mobile and standard computer networks became to fade. This article will try to show how evolving mobile network architectures lead to combining of two worlds-mobile and standard, fixed computer networks. [C2752]

## "Extending TCP retransmission timeout at mobile IP handoffs for Windows 2000: a case study"

Current mobile IP mechanisms put much emphasis on smoothly roaming around networks based on the performance consideration. However, chances are that the user leaves a network attachment too long to resume the original connection because of retransmission timeout in transmission control protocol (TCP). Against this situation, we justify the connectivity preservation by sacrificing a little performance due to TCP's congestion control at handoffs in mobile IP and propose a mechanism to extend the deadline of retransmission timeout.

After implementation and test, it shows that the time is extended near four times than the unapplied one at Windows 2000 operating system. While the mobile host loses contact with the network attachment, our mechanism can give the connection more chances to survive than mobile IP. [C2753]

## "Polaris Total RadioTM, a highly integrated RF solution for GSM/GPRS and EDGE"

This paper describes how the constant goal to achieve higher functionality at lower cost drives innovation in chip set architectures and accomplishments in integration in RF semiconductors. This paper will discuss a complete GSM/GPRS radio system that has been implemented by use of highly integrated circuits that exhibit levels of integration and features unparallel in the industry. A new, proven radio architecture and it's performance will be shown including the integration of VCOs and associated loop filters, system oscillator, power management, power amplifier power control circuitry, auxiliary DACs and more. System details will be show how the elimination of IF filters is supported by the use of either zero IF (ZIF) or very low IF (VLIF) radio architectures. A comparison between ZIF and VLIF is presented. The use of a fractional N synthesizer based digital GMSK modulator and DSP based digital channel filters will be discussed. Additionally, the benefits derived by use of digital radio-to-baseband interfaces are discussed and the implications to the industry are presented. [C2754]

## "Wireless RF design challenges"

The challenges and opportunities for the RF designer have perhaps never been greater. The drive to higher levels of integration in the extremely competitive cellular chipset market place; the emergence of new wireless communications links such as Bluetooth and WLAN; and the continual need to provide multi-band, multi-mode, multiservice, modulation independent, cost effective transceivers have all produced a great demand for RF design skills. This paper discusses the markets, system level specifications, and RF design challenges. [C2755]

## "Benefits of 3g architecture gradual implementation into the 2G network"

First Page of the Article [C2756]

## "Performance evaluation of GSM handover traffic in a GPRS/GSM network"

The introduction of GPRS services into GSM networks creates new challenges to network planning engineers. One critical challenge comes from the requirement for providing a certain quality of service for GPRS traffic without significantly degrading the performance of existing GSM services. In a GSM/GPRS integrated network, it becomes necessary to reserve exclusive channels for GPRS in order to provide base-line QoS for GPRS users. On the other hand, the exclusive reservation obviously reduces the capacity of GSM traffic so that it has a significant impact on the performance of GSM traffic (especially GSM handover traffic). In this paper, we primarily evaluate the performance degradation of GSM handover traffic due to the introduction of GPRS in a GSM/GPRS network when various priority schemes for handover traffic over new call traffic are applied. A simplified case study of a GPRS/GSM network is simulated by using an event-driven simulator. The effect of an increasing GPRS penetration factor on the performance of existing GSM services is also studied. Our key results show that the performance of existing GSM handover traffic can be significantly degraded by the capacity reduction resulting from the introduction of GPRS but can be amended by using appropriate priority schemes. [C2757]

## "Temporal focusing of composite X-waves transmitted through a planar surface of discontinuity"

A scheme is introduced for focusing pulses generated in one medium at a position in a second medium. The analysis is carried out for the general case of oblique incidence on a planar interface separating the two media. This method depends on constructing a composite pulse from a train of X-waves traveling at different speeds. The initial temporal separation between the individual X-waves is chosen such that the resulting field is focused underneath a surface of discontinuity separating two different media. [C2758]

## "Neural detection for buried pipes using fully-polarimetric ground penetrating radar system"

Ground penetrating radar (GPR) has been widely used for detecting and locating buried objects. However, the detection method using GPR is often subjected to operator interpretation due to large quantities of data and the presence of undesired clutter and noise. The artificial neural network (ANN) technique gives a promising approach to a more systematic and autonomous detection system. An automatic buried pipe detection algorithm, using a two-step ANN scheme on GPR data, is proposed. The detection performance of each ANN in the presence of different signal-to-noise and signal-to-clutter ratios is discussed. Estimating the linearity and orientation of the pipe by fully-polarimetric GPR is reviewed, and applying these factors to pipe detection is discussed. Examples of the two-step ANN detection application to actual field data measured by fully-polarimetric GPR is also presented. [C2759]

## "Investigation of side looking EM field scattering from a buried metallic object to support UXO discrimination"

Detection and identification of buried unexploded ordinance (UXO) remains a challenging problem. Despite limitations due to clutter and ground coupling, ground penetrating radar has shown considerable virtues for UXO discrimination. Recent UWB field tests between 10's of MHz and 100's of MHz have demonstrated that certain of the target's dimensions can be estimated from analysis of complex natural resonances in the signal. The problem becomes much more complicated when objects are placed in layered ground and oriented vertical to the antenna, so the incident field cannot excite currents along the major axes and the scattered field from the object cannot easily be separated from the layer interface response. To investigate this, we pursue simulations here designed to test side looking EM field scattering from a buried object placed in layered ground. The numerical calculation is done using the finite difference time domain (FDTD) method in conjunction with the generalized perfectly matched layer GPML. The results are analyzed for a cylinder placed in a uniform and layered earth. [C2760]

## "Dielectric wedge antenna for ground penetrating radars"

This paper introduces a new GPR antenna: the dielectric wedge antenna. This antenna is based on a dielectric wedge and has a number of similarities with dielectric-filled TEM horns. The main constructional difference of the proposed antenna from a dielectric-filled TEM horn is the tapering of the antenna flairs. An additional difference is that the dielectric base of this antenna does not have a pyramidal shape as in TEM horns but a wedge shape. [C2761]

## "Electrically small magnetic GPR antennas"

This paper examines the application of small magnetic loop antennas for ground penetrating radar (GPR). Making antennas smaller is of considerable practical interest, especially for deeper penetration GPR application that require lower frequency content (i.e., [C2762]

## "Clutter suppression and feature extraction for land mine detection using ground penetrating radar"

In this paper, we discuss approaches for processing ground penetrating radar (GPR) data for land mine detection. We discuss two methods of clutter suppression using ARMA modeling and also examine feature extraction using both ARMA modeling and complex natural resonance (CNR) modeling. The algorithms presented have been tested on laboratory GPR data and been found to be promising techniques. In future work, the feature vectors produced by these techniques will be processed through appropriate detection algorithms. [C2763]

## "Broadband log-periodic normal mode helical antenna"

The normal mode helical antenna (NMHA) is a common antenna used on transceivers for wireless communications due to its omnidirectional radiation pattern, large bandwidth and small physical size. Applications such as ground penetrating radar (GPR) and Croswell radar tomography (CRT) require ranges of frequency in the order of 4 MHz to 1 GHz and can benefit from the use of NMHA. A scale model of a NMHA operating from 0.2 GHz to 10 GHz has been developed for a CRT system at Northeastern University. The antenna must operate with an omnidirectional radiation pattern and be less than 0.01 m in diameter. A new methodology and procedure to enhance the bandwidth of the NMHA is presented. The log-periodic principle is applied to the separation (S) between turns of the NMHA; the bandwidth of this antenna is increased considerably. This technique is based on the three Kraus' criteria to guarantee the helical normal mode operation. Several LP-NMHA antennas designed using this technique were built and tested; the bandwidth is significantly improved for each of them. The frequency range of operation obtained covered from 2.7 GHz to 12 GHz. To verify the normal mode operation, several radiation pattern measurements were performed. [C2764]

## "Modeling of buried biomass effects on ground penetrating radar"

Recent data suggest that the performance of ground penetrating radar (GPR) may be impaired by buried biomass, e.g. tree roots. In this paper, we focus on a model to obtain the scattering characteristics of tree roots, which is the first step in studying the effects of roots on GPR. We begin with the discrete dipole approximation (DDA), an algorithm that can be used to compute fields scattered from dielectric objects of arbitrary shape. Next, the use of the DDA to model scattering from tree roots for the ground-contacting antenna used in experiments is described. Results show that spatial and temporal properties of the simulated data are similar to those of the experiments. [C2765]

## "Bistatic GPR system for landmine detection using optical electric field"

Ground penetrating radar (GPR) is one promising technique for land mine detection, and many researches have been carried out. Most of the ideas for landmine detection by GPR use a monostatic type radar system, which is suitable for detecting land mines buried in shallow soil, which is normally less than 10 cm. On the other hand, bistatic type radar will be suitable for stand-off detection. In this paper, we propose a novel bistatic radar system, which uses an optical electric field sensor as a receiver. Some fundamental field test results are shown in this report. [C2766]

## "Access control in IPv6-based roaming scenarios"

This work deals with the problem of roaming among heterogeneous networks for IPv6-based terminals. When an IPv6 terminal accesses a foreign domain it should perform two main actions: it should authenticate with the new domain (user or terminal authentication), and it should configure the interface according to the current point of attachment to the network (dynamic terminal configuration). In this paper, we investigate how the autoconfiguration procedures provided by IPv6 (both stateless and stateful) can be integrated with the access control functionality supplied by a general AAA framework. The aim is providing a general architecture that allows roaming terminals to efficiently accede to IP services from foreign subnets. [C2767]

## "Performance modeling and QoS evaluation of MAC/RLC layer in GSM/GPRS networks"

In this paper we present an analytical model to study the performance of channel sharing schemes to support both circuit switched voice and packet data services in a GSM/GPRS network. We study three channel sharing schemes: 1) fixed sharing in which cell channels are statically partitioned into two sets one for voice calls and the other for data traffic; 2) partial sharing in which ndatachannels are reserved for data while the remaining N $ndatachannels are shared by voice and data with preemptive priority for voice calls; and 3) complete sharing in which all the channels shared by voice and data with preemptive priority to voice calls. We investigate several key issues such as call blocking rate and mean packet delay for different cell loads with the data source modeled by Markov modulated Poisson process (MMPP). We validate the mathematical model through simulations and quantify the impact of the data source model and the call load on the mean packet delay for different channel sharing schemes. [C2768]

## "Dormant mode operation support for roaming from WLAN to UMTS"

The paper addresses dormant mode operation support for wireless local area network (WLAN)-UMTS roaming for dual-mode users. Dormant mode operation means that the dormant MS stays in its dormant mode when it roams from WLAN to UMTS or UMTS to WLAN and keep its sessions open using mobile IP. Current technology doesn't support dormant mode operation when users roam between inter-technologies. User may roam in one of the technologies only. We propose a methodology to support the dormant mode roaming between inter-technologies, namely wireless local area networks and UMTS (or GPRS). The methodology is based on letting the access point of WLAN or GGSN of UMTS perform necessary registration functions in lieu of the mobile. [C2769]

## "A novel approach to deliver push data to dynamic IP addresses in cellular networks"

This paper details the wireless location-aware and content aware push application delivery over the packet-switched wireless core network. The directory server, which is deployed besides the WAP server in order to support the push applications by storing the user profile, IMSI and user IP address, requires static IP addressing to support such 3G applications. In current system, the incoming IP packets destined for dynamic IP users are discarded at the GGSN level. This paper introduces a methodology to provide push services to dynamic IP addressed-mobile users in 2.5G/3G networks, and minimize the unsuccessful-network-requested PDP context activation for static IP users. The proposed method is based on the protection and mobile user activity procedures, SMS service, and a new signaling mechanism to forward the HLR-based flags to the WAP/directory server. [C2770]

## "Channel allocation and performance study for the integrated GSM/GPRS system"

We propose dynamic channel allocation schemes, which employ techniques such as channel reservation, service priority and queueing strategies (with or without threshold control) etc. Using these techniques allows system designers to differentiate quality of service (QoS) requirements (e.g., new call blocking/handoff forced termination probability and delay) required by different types of service. Via the simulation approach, the improvements offered by different strategies under different parameter sets and different network situations are investigated.

The results obtained in this paper provide system designers guidelines of how to provide an excellent channel allocation scheme and how to choose suitable parameters in the integrated GSM and GPRS system. [C2771]

## "Resource sharing in integrated voice and data services"

In this work, the behavior of resource allocation policies for circuit switched integrated voice and data services is considered. A novel configurable allocation strategy is proposed which anticipates congestion and adjusts to it by gradually reducing the rate allocated to new and handed over data sessions. An elaborate simulation tool was used to evaluate, for two different traffic scenarios, the performance of the new scheme and to compare it to the behavior of existing techniques. One of the measures used in gauging the advantages and disadvantages of each method was a new performance metric, which attempts to properly reflect data customer satisfaction. [C2772]

## "WiFi mobility framework supporting GPRS roaming: design and implementation"

To provide IP mobility for wireless users several micro-mobility protocols are currently available. These are capable for supporting this feature inside the scope of a LAN, by means of performing handovers between adjacent WiFi radio-access cells in order to follow users' movements. Also, it is possible to achieve wireless mobility in a larger extent, i.e. across whole network domains. But, in order to do it these protocols have to be used in conjunction with a macro-mobility protocol, like mobile IP. In this context, a problem arises if such domains are so far away from each other that wireless-access gaps exist between them. In fact, this prevents wireless IP users from experiencing access continuity while traveling across these domains. In this paper we describe a solution, which was designed and implemented to cope with the above problem. Starting from the cellular IP protocol, we developed a new mobility framework that extends it to seamlessly manage roaming into the GPRS access network, whenever the mobile host is out of range from any WiFi domain. Also, management of inter-domain macro-mobility is integrated in our framework, eliminating the need to externally rely on mobile IP. [C2773]

## "Compatible improvement of the GSM/GPRS system by means of delay diversity"

On basis of the GSM/GPRS system, we investigate the application of the delay diversity scheme. The delay diversity scheme is a simple special case of a space-time trellis code (STTC). Delay diversity may be offered by network operators even in existing systems, since the standard is not affected at all. The performance improvements obtainable by means of this technique are demonstrated both on basis of analytical and simulation results. A lower bound on the bit error probability is derived and an optimization of the intrinsic delay parameter is considered. [C2774]

## "Interworking between WLANs and third-generation cellular data networks"

In this paper we discuss the motivation for integrating wireless local area networks (WLANs) with third-generation (3G) cellular networks, and we briefly describe two key architectural approaches for such integration. In addition, we introduce a specific approach for tightly coupling a WLAN with GPRS networks and we describe is main characteristics, such as the protocol architecture and the key functional procedures. [C2775]

## "Detection of land mines using fuzzy and possibilistic membership functions"

This paper introduces a new system for real-time land mine detection using sensor data generated by a Ground Penetrating Radar (GPR). The GPR produces a three-dimensional array of intensity values, representing a volume below the surface of the ground. Features are computed from this array and two types of membership degrees are assigned to each location. A fuzzy membership value provides a degree of belongingness of a given observation in the classes of mines, false alarms, and background, while a possibilistic membership value provides a degree of typicality. Both membership degrees are combined using simple rules to assign a confidence value. The parameters of the membership functions are obtained by clustering the training data and using the statistics of each partition. Our preliminary results show that the proposed approach is simple, efficient, and yet, yields results comparable to more complex detection systems. [C2776]

## "Proceedings of the 2nd International Workshop on Advanced Ground Penetrating Radar (IEEE Cat. No.03EX680)"

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## "Bluetooth enables in-door mobile location services"

Several technologies can be applied to enable mobile location services, but most of them suffer from limited accuracy and availability. GPS can solve the problem of determining the location of users in most outdoor situations, but an end-user position inside a building cannot be pinpointed. Other mobile location techniques can also provide the user's position, but the accuracy is rather low. In order to improve the accuracy and make location-based services really attractive, existing approaches must be supplemented by new technologies. Wireless short-range technologies like Bluetooth could be candidates for solving these problems. This paper shows that Bluetooth can act as a key enabler of mobile location services in an in-door environment. The advantage of Bluetooth technology is, that it can provide rather precise location data inside a building or hotspot area, while the Bluetooth terminal is connected to the network. Hence, the users are able to obtain more detailed guidance and information on their sites of interest such as department stores, airports and other public areas. [C2778]

## "Mobility management in integrated UMTS/WLAN networks"

The complementary characteristics of universal mobile telecommunication system (UMTS) and 802.11 wireless local area network (WLAN) networks make them attractive for integration to offer the best of both technologies. However to make their integration effective, seamless mobility between the two networks is necessary. In this paper we address mobility management procedures within and between UMTS and 802.11 WLAN for various integration scenarios. For each integration option we consider, we give the interaction between various networks elements and new procedures required to ensure seamless mobility. [C2779]

## "Solutions for mobility support in DHCP-based environments"

In a wireless mobile scenario it is very important for IP terminals to automatically reconfigure themselves when moving amongst different access networks. Each time that a terminal changes its point of attachment it should rapidly detect new access network, acquire a new IP configuration, according to the new network, and opportunely reconfigure itself. During this operation crucial aspects are the latency of the overall procedure, the processor and packet load, the scalability, the independence from the access technique (WLAN, GPRS, others), and the compatibility with the current implementations of terminal mobility/nomadicity. In this work the problem of roaming amongst IP-based access network is considered and the issues of subnet detection and terminal configuration are focused. Particularly, we propose and describe in detail some solutions that are based on a simple extension of the largely implemented DHCP protocol. The proposed mechanisms are very light, scalable, and could be compatible with current implementations. [C2780]

## "EDGE data receiver design"

Data receiver design is one of the most challenging tasks in EDGE terminal implementation. We outline critical design considerations for data receiver and describe their impact on the receiver performance. Sensitivity of the design to specific receiver parameters is illustrated, showing that overall solution requires complex balance between channel estimation, synchronization, equalization and soft bit information for channel decoding. [C2781]

## "GSM/EDGE evolution, based on 8-PSK"

This paper introduces the migration path from Global System for Mobile Communications (GSM) General Packet Radio Service (GPRS) to 3G multimedia services, and provides insight into certain issues regarding the direction for its standardization within the 3rd Generation Partnership Project (3GPP) Technical Specifications Group (TSG) referred to as GPRS/Enhanced Data for Global Evolution (EDGE) Radio Access Network or GERAN. [C2782]

## "Multi-mode and multi-band polar transmitter for GSM, NADC, and EDGE"

Operators in North and South America are installing GSM/GPRS/EDGE networks over existing NADC (North American Digital Cellular) network installations. Mobile terminals and handsets are required to operate on all of these modes to support these networks. A further requirement is that these mobile devices have economics nearly identical to single-mode GSM voice handsets. Investigations have shown that polar modulation is a viable approach to meet all of these requirements. Performance measurements of such a polar transmitter are reported. [C2783]

## "GPRS location update performance using dynamic counter"

The increasing population of mobile users leads to congestion problems and motivates the development of more efficient resource management schemes to be use in next generation wireless system. Location management enables the network to track the locations of users and their terminals between call arrivals. The operation of

informing the network about the current location of the mobile user is known as location update. A READY timer (RT) mechanism was proposed in 3GPP 23.060 to determine when MS ready to switch from cell tracking to RA tracking. The main idea of location updation is to reduce the unnecessary location update and paging cost. We propose a dynamic counter mechanism to reduce the location update and paging cost in this system. The updation takes place only when the mobile moves to the new routing area (RA). A simulator based on Matlab, which can study the location updation performance, and signalling activities was developed. Initial result shows that the average location updation could be reduced by using dynamic counter. [C2784]

## "Automatic damage detection for railroad tracks by real-time DSP based dual analysis system"

In this paper we explore a dual track approach for detecting sub critical defects in railroad lines on both the surface and subsurface regions of the rail. The surface defects that are usually detected by manual scanning are detected by applying canny edge detection algorithm to videos of rail surface on a real-time basis. Simultaneously using ground penetrating radar, substructure conditions were observed such as thickness of the ballast and sub ballast layers, variations in layer thickness along the track, pockets of water trapped in the ballast, and soft sub grade from high water content [C2785]

## "Foundations of SMS commerce success: lessons from SMS messaging and co-opetition"

As a convenient and low-cost mobile communication technology, short messaging service (SMS) is experiencing very rapid growth. It is reported that 700 million mobile phone users worldwide sent 20 to 30 billion SMS messages every month in 2001. At the same time, SMS commerce applications have emerged to provide mobile users consumer-oriented services. The huge SMS messaging customer base serves as the potential SMS commerce customer base according to K. Kellett and A. Linde (2001) . However, the bloom in messaging business does not automatically lead to the success of general SMS commerce applications. In this paper, we analyzed SMS developments in three different countries to derive three success indicators for SMS messaging and relate them to the success of SMS commerce. Based on the proposed SMS application framework, we postulate four additional hypothesized success factors that could uniquely contribute to the success of SMS commerce. Our findings provide practical implications for promoting SMS commerce applications successfully. [C2786]

## "New monte-carlo calculations of charged particle track-structure in silicon"

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## "Multi-Waveform SFCW radar"

A Stepped Frequency Continuous Wave radar for detecting flush buried and surface laid anti personnel landmines was designed and built. The system covers a frequency band from 400 MHz up to 4845 MHz. The range resolution is 3.4 cm and the maximum unambiguous range is 4.3 m. The antenna set up is a bi-static one with two Archimedean spirals with opposite sense of rotation. A particular property of the radar is that it transmits and receives a set of eight frequencies at the same time. The system parameters are particularly aimed at imaging algorithms exploiting the phase evolution over the antenna footprint. An example of the result achieved after Synthetic Aperture Radar processing is presented. [C2788]

## "Wideband Tapered-Slot Antenna with Corrugated Edges for GPR Applications"

A novel Wideband tapered-slot antenna for GPR applications is proposed. A conventional approach to reduce unwanted interactions between the antenna and the ground surface requires extensive microwave absorbers treatment. For the same purpose we propose to use corrugations along the antenna edges. The corrugations improve directivity and wideband matching of the antenna with free space retaining also good radiation efficiency. Further improvement of the antenna performance has been achieved by patching the corrugated areas of the antenna with the resistance card strips. The elimination of the foam-type absorbers makes the antenna more robust and easier in fabrication. [C2789]

## "Effect of high GSM voice traffic on GPRS data network and the proposed solutions"

GPRS uses the same radio resources of the GSM network. Therefore, co-planning of both GSM and GPRS network is an imminent issue for GSM network operators. GPRS users send their packets on the idle timeslots that are unused by the voice traffic. Although voice users have a higher priority than data users, satisfying data users is very important when it comes to the operating network revenue. In this paper, the correlation between the served load (both voice and data traffic), the required QoS and the available radio resources is studied. We propose different solutions when high data traffic co-exists with high voice traffic. A new software tool, GPRS

Network Design (GND) is developed to give the designer those solutions and the effect of each one on system design. [C2790]

## "Multi-Waveform Full-Polarimetric Video Impulse Radar for Landmine Detection"

A principally new multi-waveform full-polarimetric front-end of a Ground Penetrating Radar has been developed. In comparison with commercially available video impulse GPR systems the key advantages of the front-end are considerably larger bandwidth, ability to measure the polarimetric structure of the scattered field and very high precision of scattered field measurements. A principally new antenna system design and an ability to perform quasi-simultaneous measurements in two different frequency bands with two transmit polarizations are main novelty aspects of the radar. [C2791]

## "Performance of VoIP over GPRS"

We study the performance of VoIP over GPRS by simulation of standard GPRS system with some improvement for real time attributes. It is showed that the VoIP over GPRS has more capacity than circuit switch voice while guaranteeing acceptable QoS. With one radio frequency, the circuit switch system can provide 7 voice connections, while VoIP over GPRS can support 12 voice connections if they use the same 13Kbps speech coder. If VoIP over GPRS uses 5.3Kbps speech coder, it can support 34 voice connections. The uplink voice packet loss comes from the contention for the random access channels and shortage of idle data traffic channels. Because of its random contention characteristics, the access channel effective usage is low. We apply a modified PRMA to increase the access channel utilization, and the maximum voice connections can be increased by 17% compared to the reservation slotted ALOHA. [C2792]

## "WiFi bridge: wireless mobility framework supporting session continuity"

Seamless mobility is a requirement whose importance for Internet users nowadays is growing faster than ever Thus many solutions to manage wireless IP mobile access and inter-working with the fixed Internet are already available and more are currently being studied and improved In this paper we described an actual wireless mobility framework we designed and implemented in our university campus, which is spread over a wide metropolitan area. The aim is to let a mobile host, that is a user equipped i.e. with a PDA device, experience real wireless IP mobility while moving on a large spatial scale, by means of a middleware that leverages from three main wireless access technologies: Bluetooth, WiFi and GPRS. In our framework, these are managed as a hierarch), of spatially overlapping access domains. While the user is on the move, the client-side of the middleware running on our mobile PDA device triggers smart switchings between the currently best available and more appropriate wireless access path, based on locally collected information. On the other hand, the network-side part of the middleware manages mobile host location paging and routing-update functions inside the whole campus area with an approach which extends from the Cellular IP micromobility protocol. We call this approach WiFi bridge since it also adds mobile hosts with the capability to seamlessly travel between disjunct WiFi access domains inside the campus by means of a temporary relay onto the GPRS access domain. We implemented and tested the system in a real testbed using IPaq devices running Linux, obtaining encouraging experimental results. [C2793]

## "Performance of GPRS coding scheme detection under severe multipath and co-channel interference as a function of soft-bit width"

The general packet radio service (GPRS) has been developed for the mobile radio environment to allow the migration from the traditional circuit switched connection to a more efficient packet based communication link particularly for data transfer. GPRS requires the addition of not only the GPRS software protocol stack, but also more baseband functionality for the mobile as new coding schemes have been defined, uplink status flag detection, multislot operation and dynamic coding scheme detect. This paper concentrates on evaluating the performance of the GPRS coding scheme detection methods in the presence of a multipath fading channel with a single co-channel interferer as a function of various soft-bit data widths. It has been found that compressing the soft-bit data widths from the output of the equalizer to save memory can influence the likelihood decision of the coding scheme detect function and hence contribute to the overall performance loss of the system. Coding scheme detection errors can therefore force the channel decoder to either select the incorrect decoding scheme or have no clear decision which coding scheme to use resulting in the decoded ratio block failing the block check sequence and contribute to the block error rate. For correct performance simulation, the performance of the full coding scheme detection must be taken into account. [C2794]

## "Software distribution for wireless devices: a reconfigurable approach"

The dramatic rate of evolution and technology divergence from 2G to 3G and onwards broadens requirements

for interoperability across software systems and wireless devices. These should interoperate seamlessly and be transparent to users, who need only concern themselves with the final result. We address the challenge of providing transparent and reconfigurable content to wireless devices. [C2795]

## "Mobile Internet over IP data broadcast"

When speaking of wireless and mobile Internet, we often assume that a bi-directional access network must be within reach. Usually we see GPRS, UMTS and wireless LANs as carriers supporting the Internet access service. This service consequently provides a basis for browsing and retrieving a wealth of digital multimedia content upon user request. However, there are alternative means to deliver digital content to mobile users. Indeed, general content and content formats are independent from various communication methods. We focus on an alternative content delivery method-content push over terrestrial IP data broadcasting. To give a concrete context for discussion we assume DVB-T as the transmission technology. The unidirectional, wide-band, shared channel suits especially well delivery service that targets multiple end users on the move. Applied to mobile communications, IP data broadcasting proves to complement the traditional mobile Internet access service provided over bi-directional access systems. From the viewpoint of international standards developing organizations, we tackle the issues needed to establish a globally inter-operable IP datacast baseline as a service platform. [C2796]

## "Employing fractionally-spaced equalizers (FSE) for magnetic recording channels"

We propose and investigate the performance of an FSE (oversampled) system in longitudinal and perpendicular recording channels. Results show that the proposed system outperforms the conventional (symbol rate) one whenever there is excess bandwidth, like in longitudinal recording. [C2797]

## "Remote data access scheme supports for wireless access to an online teaching system using SOAP technology"

The Internet and telecommunication system are now used to disseminate information for the education sector. Traditional classroom teaching has transformed into the "far-distance teaching" and "on-line teaching", which both utilize the information transmission via the Internet or telecommunication system. The mechanism of "on-line teaching" enables students to participate in course discussion and learn in any time they wish. On-line teaching is being listed as a necessity in education propagation. The use of SOAP (simple object access protocol) technology as the standard remote data access scheme is emphasized, and is applied by On-line Teaching System to provide access for different mobile devices. SOAP technology will be used to design the on-line teaching system and SOAP functional components on mobile device that use the SOAP technology to access the on-line teaching system. Its communication mechanism, implementation and provided functions are discussed. The SOAP adopting access mechanism is also compared with the traditional access technology implementation. [C2798]

## "QoS of dynamic radio resource management policies in a GPRS network"

The paper introduces a GPRS-like cellular network simulator, where mobile terminals move, initiate and terminate their communications. This tool aims at evaluating the major QoS parameters in realistic propagation conditions and for different resource allocation policies. Our objectives in developing such a simulator are to use it first to compare some existing channel management methods and second to validate a new optimal scheme of allocating the physical channels to mobile users supporting multimedia applications. Our discrete-event simulation tool takes into account both the time variation of the system and its spatial dimension relating to user movement and its effect on the signal propagation and the radio link. The system considered is a GPRS-like (i.e. TDMA) one, i.e. voice and data are integrated over a time division multiple access wireless cellular network. Our scenario considers three traffic classes: best-effort, medium and premium. [C2799]

## "Analysis of georadar reflection responses"

Understanding the nature of the georadar reflection response in terms of the dielectric permittivity and conductivity contrast is important in the realm of interpretation. This motivates the present study, which has the aim to carry out an experiment in a controlled fashion such that the relation can be established between the measurement and the relevant physical parameters. In the present paper, we present the results of such a measurement and an interpretation based upon a 1D model, which is realistic enough to accommodate sophisticated physical parameter models. [C2800]

## "Results of, measurements, processing and modelling of GPR data showing the effect of soil

## moisture content on land-mine detection"

Summary form only given. To be able to predict the performance of a ground penetrating radar system (GPR) under certain environmental conditions, one needs to relate the parameters that predominantly determine the environment, to parameters that directly govern GPR performance. Soil type and soil water content are such environmental parameters. The latter is determined by prevailing (and historic) weather conditions and has a large effect on the electrical permittivity and conductivity of the soil medium. Thus, by relating soil water content to electrical permittivity and conductivity one can gain a better understanding of GPR performance and in principle could even predict GPR performance. For the purpose of land-mine detection it is advantageous to be able to have some idea of GPR performance under given circumstances. Knowledge about the environment will influence the choice of sensor and the moment in time, the de-miner wishes to deploy the GPR as mine detection sensor. In the summer of 2002 detailed GPR measurements were taken at the TNO Physics and Electronics Laboratory (TNO-FEL), mine-detection test-facilities. These measurements were executed under relatively dry as well as moderately wet conditions, in both sand and grassy soils. Data acquisition was done on a high-density grid with several GPR systems. The test facility contains a number of moisture conditions to GPR measurements. In this paper we will illustrate the effect of soil moisture content of different soil types, on the detection of buried land-mines, and compare this with the outcome of a numerical GPR model which takes moisture level and soil type into account. [C2801]

## "GPR design and modeling for identifying the shallow subsurface dielectric properties"

A ground penetrating radar (GPR) system for identifying the shallow subsurface dielectric properties is proposed. It consists in a stepped frequency continuous wave (SFCW) radar operating in the 0.8-4 GHz ultrawide band combined with a dielectric filled TEM horn antenna to be used off ground in monostatic mode. This radar configuration is of practical interest since it responds to subsurface mapping requirements and allows for an efficient and realistic modeling of the radar-antenna-subsurface system. Forward modeling of the system is based on linear system response functions and on the exact solution of the three-dimensional Maxwell equations for damped wave propagation in a horizontally multilayered medium representing the shallow subsurface. The model is validated under controlled laboratory conditions. This model is destined to be inverted to reconstruct the depth dependent shallow subsurface dielectric properties from field observations. [C2802]

## "Landmine detection technology research programme at TNO"

This presentation gives an overview of most of the activities on research and development in the technology area for landmine detection at TNO in the Netherlands. The projects cover the range from military applications to humanitarian demining. In the "conventional" detection systems area the activities on an instrumented prodder, metal detection, ground penetrating radar thermal infrared are covered. Signal processing and sensor fusion are key activities in this area. The focus for these techniques is on vehicle mounted and airborne multi-sensor systems. The activities are supported by more fundamental modelling of the interaction of sensors with the landmines. Especially the effects of the environment of the mines (background clutter, scenario) on this interaction are taken into account. [C2803]

## "GPR imaging of problematic beams ceilings constructed using iron boxes method"

Summary form only given. Ceiling can be made of a complete thick slab of concrete. When large apertures are needed, it can be constructed from separate concrete strips (beams) with a complete thin layer of concrete on top, creating a "T" profile. During the seventies, Israeli builders have started to build beams ceilings using thin wavy iron boxes with a " ⊓ " profile, as a technique to create the voids between the beams. The construction of such ceiling has started with the casting of very thin concrete layer with a thin non-constructing rebar net inside. This method kept the conventional construction roles of beam ceilings, including the appropriate horizontal and vertical rebar array along the beams. Later on, this method have been "improved" by the chief engineers of the Department of Public Works: the thin wavy iron boxes have been used as construction elements instead of the shear rebar and the upper rebar. This problematic method, name "Pal-Kal", has been presented as very economical since it saved time, work and material. As a result many hundreds of buildings have been built using this method. The Pal-Kal method was controversial, therefore has been "improved" again and again during the years with several nuances. In the late nineties the authorities finally prohibit the use of this method. Nowadays, after collapses of several ceilings and houses, the Israeli government has officially concluded that the buildings built with the Pal-Kal method should be inspected and repaired accordingly. In the paper we present structural GPR images of Pal-Kal ceilings and discuss their failure issues and their detectability using GPR. Images of possible delamination inside the concrete, narrow/wide and non-uniform concrete beams, distorted iron boxes and its inconsistent penetration into the lower concrete slab, possible corrosion of the iron boxes and penetration of concrete to the voids are presented and discussed. [C2804]

## "Applications of GPR for surface mining"

Over the past 25 years, a myriad of applications for GPR technology have evolved ranging from archaeology to subsurface mapping on Mars. However, it is only recently that GPR has been applied on a production basis for surface mining. Due to the generally resistive nature of the media, GPR is an obvious candidate for alluvial gold and diamond resource exploration in aggregate-filled paleochannels. By correlating the radar reflectors to known geological features detected by boreholes or trenches, GPR has been used on a large scale for preliminary exploration, as well as on a local scale for the three-dimensional reconstruction of complex braided paleochannel systems. Although GPR has been attempted historically at a variety of placer sites, newly developed visualization techniques have enabled greater exploitation of the richness GPR data affords. Data are presented which illustrate the utility of GPR in the three-dimensional mapping of various fluvial paleofeatures, to depths frequently exceeding 40 m. A demanding application for GPR is that presented by tropical weathering environments. With the dramatic growth of interest in lateritic and bauxitic resource exploration, fueled by increasing demand and new processing technologies, the need for accurate resource delineation and careful mine planning becomes paramount. The traditional use of borehole grids to calculate ore reserves has proven to be neither sufficiently accurate nor cost-effective at many sites due to the complexity of tropical weathering profiles. Although conventional wisdom dictates that radar surveys are usually unsuccessful in regions with a high clay fraction, GPR has emerged as the most suitable geophysical tool to complement borehole grids in addressing project geology, resource delineation, and mine planning issues in the high clay fraction soil found in most tropical weathering environments. [C2805]

## "MINETECT"

This paper describes the MINETECT, combined MD and GPR mine detector, sponsored by the UK Department for International Development and developed by ERA Technology. Using a radically different patented approach from conventional GPR designs, in terms of the man machine interface, MINETECT offers simplicity of use and affordability, both key factors in humanitarian demining operations. The ground penetrating radar employs novel operator audio interface techniques embodied in European patent number 99306164.7. This paper describes the design concept, summarises the trials carried out and provides the conclusions as to requirements for GPR performance. [C2806]

## "Integrated vertical radar profiles (VRP) and multi-fold GPR for site characterization"

Non-invasive characterization of contaminated sites and brownfields is being used to support planning and correlation of sampling and in decision-making and monitoring of rehabilitation procedures. We exploit a combination of surface (linear/azimuthal multi-fold) and borehole [vertical radar profiling (VRP)] techniques for an integrated and constrained assessment of the radar velocity field. The test of the method is performed with a Mala Geoscience system equipped with 100 MHz borehole and 100-250 MHz surface antennas. We test the technique at a disposal site where mixed industrial and solid urban waste is piled on alluvial sequences. The stratigraphic column includes sandy loams with variable fractions of silt and clay, a gravel and coarse sand aquifer, a bottom clay layer of variable thickness. Two shallow layers, an allochthonous soil, 0 to 80 cm thick from topographic surface, lying on coke ashes mixed with industrial debris (100 to 170 cm thick), attenuate the radar wave due to strong scattering and low resistivity. Maximum penetration from surface is restricted to approximately 250 cm. Borehole measurements are used to integrate surface methods and reconstruct the velocity field. Results of the radar experiment are validated by laboratory measurements, performed with a network analyzer, and by FDTD numerical simulation. [C2807]

## "Detection of leaks in buried plastic water distribution pipes in urban places-a case study"

The nondestructive evaluation of leaks on buried tanks, drums and pipes is of interest from a variety of engineering and environmental applications. There is a limited arsenal of tools available for leakage detections. However, the diversity of techniques shows that each has advantages and shortcomings. Geophysical techniques are faster and cheaper generally than excavation and have the advantage that they are safer in hazardous environments. Testing and studying several pipe detection tools such as pulsed induction methods, magnetic locators, EM locators, resistivity methods, acoustic techniques and GPR method, we concluded that, ground penetration radar is the most effective and accurate method to pinpoint buried pipeline leaks without digging. An extensive work using ground-penetrating radar was carried out at the central road of town Kilkis (N. Greece), in order to locate areas of possible water leakages from distribution pipes. [C2808]

## "Application of microwave radiometry for buried landmine detection"

In this paper we illustrate the phenomenological background, the design, and some experimental results of a

multi-spectral low frequency microwave radiometer as a part of a multi-sensor mine detection system. The overall system is intended to work in a hand-held operation allowing the use in areas of difficult access without excluding missions in more friendly environments. Thus the radiometer antenna is operated in an extreme near-field mode to achieve a corresponding ground resolution in the order of the active antenna aperture size. In particular, the radiometer receiver is swept in low-bandwidth steps through a broad microwave (MW) frequency range to vary the penetration depth and the reflectivity properties of the actually observed ground part. This can provide significantly increased information about the location and shape of buried objects for discrimination purposes. The relevant theoretical aspects of this interference based effects are illustrated and attempts to interpret the spectrum for specific layered arrangements as in the case of buried objects are presented. [C2809]

## "Antenna development and a stepped-frequency GPR system for landmine detection"

A project for developing a compact size GPR system for landmine detection was started. It will be based on stepped-frequency radar system for wider application in various kinds of soil conditions. We have developed a prototype stepped-frequency for fundamental evaluation of the system. This system uses a broadband Vivaldi antenna and operates at 2-6 GHz. The system was tested in laboratory and could be used for imaging buried mine-like targets by high resolution. Series of tests were carried out by using sand with rough surface and inhomogeneous soil. We discuss the ability of GPR for landmine detection. [C2810]

## "Advances in microwave tomography: phaseless measurements and layered backgrounds"

A new approach for electromagnetic imaging of scatterers enclosed in a stratified media from only intensity data is proposed and discussed. The developed procedure splits the problem in two different steps. In the first one a phase retrieval problem is solved for the total field, thus estimating the scattered field. Then, the complex permittivity profile is reconstructed in the second step by using the estimated scattered field. Numerical examples are provided in order to check the whole chain (which is done in the case of scatterers located in free space) and a specific inverse scattering procedure capable to deal with a three layers background. [C2811]

## "Stepped frequency continuous wave radar-data preprocessing"

Radar systems have been paid a lot of attention since the end of WWII. Along with performances improvement one has witnessed a diversification of their applications, which range from target detection and parameter measuring to navigation systems, anti-collision systems and subsurface sensing. The last application has had a great importance for humanitarian demining purposes taken into account the number of landmines spread across the world and the danger they pose to humans. Both, continuous wave and pulse radar have been employed for landmine detection. This paper deals with stepped frequency continuous wave (SFCW) radar that operates from 400 MHz to 4845 MHz, in steps of 35 MHz. The novelty of the system, built at International Research Center for Telecommunication-transmission and Radar (IRCTR), consists in the fact that 8 frequencies are transmitted simultaneously, which drastically decreases the data acquisition time. Because of the strong reflection from the air-ground interface one may face some difficulties to "see" the landmines, which are lying on, or just below of the surface. If the antenna system footprint is much more larger than the size of the mine, this is even more difficult as the signal from the mine will be buried in the clutter signal. In order to remove the clutter signal and to improve signal to clutter ratio, average clutter subtraction and synthetic aperture radar have been investigated. [C2812]

## "Full-polametric video impulse radar for landmine detection: experimental verification of main design ideas"

A full-polarimetric ultra wideband GPR front-end has been developed in IRCTR especially for landmine detection application. A number of new ideas have been implemented in the design. A principally new antenna system design and an ability to perform quasi-simultaneous measurements with two transmit polarizations and in two different frequency bands are main novelty aspects of the radar. Additionally in comparison with commercial available video impulse GPR systems the front-end has considerably larger bandwidth, ability to measure polarimetric structure of the scattered field and very high precision of scattered field measurements. Experimental verification of these new design ideas is discussed in this paper. [C2813]

## "Electromagnetic field and material properties in ground penetrating radar"

Electric, magnetic and electromagnetic fields are consequences of the existence, motion and acceleration of electric charge. Complex coupled vector field distributions in space and time result. Most material properties are consequences of EM field interactions between adjacent matter particles at atomic scales. Velocity, attenuation, wavelength, polarization, scattering, relaxation, and resonance are some of the properties and processes important to electromagnetic wave propagation in ground penetrating radar. Such properties and processes

determine the performance limitations of ground penetrating radar systems, and they are also what are measured by ground penetrating radar to describe ground and things buried within the subsurface. Space and time distributions of material properties are described in terms of complex dielectric permittivity and complex magnetic permeability. "Complex" means there are parts describing both energy dissipation and storage, with consequential frequency dependent properties. Dielectric properties are dominantly controlled by the distribution and properties of water in the ground. Magnetic properties are dominantly controlled by the distribution and properties of iron in the ground. Field polarization and scattering processes are dominantly controlled by the geometric orientation and spatial distribution of contrasts in material properties at wavelength scales. Measurement of field properties and processes allows GPR to determine material properties. [C2814]

## "A new bistatic GPR system using a passive optical sensor for landmine detection"

A novel GPR system for stand off landmine detection is discussed. This is a bistatic GPR system, which use a TEM horn antenna for a transmitter and a passive optical electrical field sensor as a receiver. A small size passive optical sensor scans on the ground surface and the acquired signal is used for synthetic aperture processing. Since the receiver is very small, it is suitable for scanning near the ground surface, where landmines can be buried. Fundamental laboratory test shows its capability of imaging of buried objects. [C2815]

## "Linear and nonlinear inversion of GPR data"

We discuss the linear and nonlinear inverse scattering problem. In cases where the Born approximation is valid, we obtain an inverse inverse problem, which is formulated as an optimization problem in terms of the unknown material contrast and the unknown contrast sources. The constitutive relation between these quantities acts as a regularizing constraint. A further regularization with a multiplicative regularization factor is discussed. In this regularization procedure the relative variation of the contrast is minimized as well. We illustrate the robustness of the inversion algorithm for a 2D problem, where we have all the views around the unknown object. In addition, some inversion results for the subsurface sensing problem, both in 2D and 3D, are presented. In the latter example, we show that a full nonlinear inversion scheme may improve the results. [C2816]

## "Phase-based detection of small 3-D dielectric objects beneath rough surfaces"

This paper discusses the detection of small three-dimensional (3-D) dielectric objects with low contrast (relative to their surrounding media) buried near the 3-D rough ground surface by means of stand-off ground penetrating radar. This case scenario was derived from the requirements on detecting small non-metallic anti-personnel (AP) mines in realistic minefields, where AP mines are buried a few centimeters beneath rough ground surfaces. If the dielectric contrast between the objects and their surrounding media is low, and if the objects are small and buried just beneath rough ground surfaces, then scattering from the rough ground surfaces will dominate and hence mask the weaker scattering from these buried objects. Various analyses and numerical simulations have shown the considerable complexity of scattering from rough surfaces and/or the targets buried beneath rough surfaces. In this paper, we present the methodology using measured GPR phase data to deal with this complex problem without using a-priori knowledge about the target and/or ground characteristics. [C2817]

## "Development of a compact MS-GPR radar based on multi-sensors technology"

This paper presents multi-sensors ground penetrating radar (MS-GPR). After a rapid history of the various experiences of Satimo in that domain, we propose a description of the MS-GPR (the array of antennas, the receiver, the sequencer, the wireless communicator, the imager and its migration SAR algorithm, the user interface). We describe the measurement sequence selected (operating mode, calibration, chronogram) and finally we profit from the conclusion to present the future calendar associate with the use of the MS-GPR. [C2818]

## "Phased array technology for GPR antenna design for near subsurface exploration"

The geophysical explorations for near surface investigations for buried objects are carried out by ground penetrating radar (GPR) using sensors operating at radio and microwave frequencies. It is well realized that focused beaming from an antenna into subsurface yields high resolution (with improved illumination of the target area) and results in better delineation of the subsurface targets. ASTRON (the radio astronomy research center of the Netherlands) has been engaged in developing a new generation of all-sky, full sensitive, multibeam radio telescopes for astronomical research at radio frequencies. Using a highly sensitive tapered slot THEA antenna, measurement beams on the sky are electronically formed and steered as desired. Experimental data show great promise in detecting moving objects in the sky. The existing know-how of focused beaming using phased array technology developed at ASTRON could be extended for better illumination of non-moving subsurface objects for GPR investigations. Stacking (adding) of the data gathered using both the beam-forming transmitting and

receiving GPR antennas would result in reduced surface clutter effects and in enhanced detection of the near surface targets. In this paper, the concept of phased array technology in a bistatic mode of operation for GPR application is described. [C2819]

## "The non-uniqueness of the surface integral equations for the scattering from perfectly conducting objects"

The problem of non-uniqueness of the surface integral equations adopted for the determination of the current density over perfectly conducting objects is dealt with. Firstly, the subject is reviewed with reference to a circular cylinder. Then, the case of more scattering objects is investigated and both the strategies for the determination of the non-uniqueness conditions and the countermeasures for facing the problems are given. [C2820]

## "Realistic modeling of surface ground-penetrating radar antenna systems: where do we stand?"

The generation and recording of electromagnetic waves by ground-penetrating radar (GPR) systems are complex phenomena. To investigate the characteristics of typical surface GPR antennas operating in realistic environments, we have developed an antenna simulation tool based on a finite-difference time-domain (FDTD) approximation of Maxwell's equations in 3-D Cartesian coordinates. The accuracy of the algorithm is validated with respect to laboratory measurements for comparable antenna systems. Numerically efficient and accurate modeling of small antenna structures and high permittivity materials is achieved via subgridding. We simulate the radiation characteristics of a wide range of common surface GPR antenna types ranging from thin-wire antennas to bow tie antennas with arbitrary flare angles. Due to the modular structure of the algorithm, additional planar antenna designs can readily be added. Shielding is achieved by placing a metal box immediately above the antenna. Damping is accounted for by filling the shield with absorbing material, by connecting the antenna to the shield with resistors or by continuous resistive loading of the antenna panels. The effects that these features have on the radiative properties of the tested GPR systems and thus on the illumination of the subsurface are investigated for various half-space models. [C2821]

## "System description of a stepped frequency CW radar for humanitarian demining"

A multiple frequency stepped frequency continuous wave radar for detecting flush buried and surface laid antipersonnel landmines was designed and built. The system covers a frequency band from 400 MHz up to 4845 MHz. The range resolution is 3.4 cm and the maximum unambiguous range is 4.3 m. The antenna configuration is a bistatic one with two Archimedean spirals with opposite sense of rotation. The instrumented dynamic range is 40-50 dB per frequency channel. After synthesis of the range profile the dynamic range is significantly higher. The system parameters are aimed at imaging algorithms exploiting the phase evolution over the antenna footprint in particular. One example of the results achieved with and without synthetic aperture radar processing is presented. [C2822]

## "STW project "Advanced relocatable multisensor system for buried landmine detection""

Delft University of Technology has just finished its major efforts in a most challenging project, supported by the Dutch Technology Foundation STW. This four-year project entitled "Advanced relocatable multi-sensor system for buried landmine detection" was the largest project in STW history. Within the scope of this project we have built up a unique expertise and knowledge in the whole GPR chain starting from all aspects in GPR technology and finishing with target classification and soil characterization. The paper describes the goals and results within this project. [C2823]

## "Studies of ground penetrating radar antennas"

Virtually all systems that have been developed in recent years to detect landmines and buried unexploded ordinance (UXO), have included the ground-penetrating radar (GPR) as one of the principal subsystems. Much of the effort reported to date in evaluating these GPRs has focused on obtaining overall end-to-end detection performance metrics (Pd, Pfa). These studies have been useful but they provide little insight into the functioning of individual GPR components and the limitations they may impose on system performance. By contrast, this project concentrates on investigating performance characteristics of the GPR antenna, which is perhaps the most critical component in determining GPR system performance. Some of the antenna issues that remain unresolved are: determination of the most useful bandwidths, defining the role of polarization and polarization diversity, minimizing the effects of self-clutter (also known as "ringdown" or "reverberation"). Over the course of this ongoing program, we plan to investigate a variety of GPR antenna subsystems, including the spiral, the sinuous log-periodic, various dipoles, the TEM horn, the TEM rhombus, tapered slots and forms of the impulse radiating antenna (IRA). In this paper, we report some initial experiments carried out on a transmit-receive pair of Archimedean spiral antennas. To characterize these antennas, we carried out measurements in a conventional

radio frequency (RF) laboratory using a vector network analyzer to synthesize waveforms covering the frequency range from 500 MHz to 5.5 GHz. Transformation of these data to the time domain allows us to gate out extraneous laboratory clutter beyond a 1.5-m (10 nsec) range. The principal measurements reported here are: the gain and phase properties, noise and clutter levels, and the antenna system spatial response footprint. The spatial patterns were measured by raster-scanning a stainless steel sphere through a two dimensional grid located 17 cm (a range typical of GPR applications) from the aperture of the transmit/receive antenna pair. [C2824]

## "Toward true amplitude processing of GPR data"

For proper imaging and inversion, four parameters need to be known accurately. These are position of the transmitter and receiver antennas, the wave velocity distribution in the medium, the polarization and the amplitude characteristics of the antennas used. The position information problem is solved by introducing an automated acquisition frame with high accuracy in horizontal and vertical positioning of the antennas over a fixed area. For object detection and characterization purposes, we use elevated antennas, which implies that at least a two medium background medium must be used for accurate velocity information. The velocity in air is known, while that of the Earth must be obtained from independent measurements. The polarization and amplitude characteristics can be obtained for elevated antennas by modeling the transmitter and receiver and validate the model with measurements in air. When the antenna model is accurate, it is possible and necessary to take direct coupling with the ground into account for surface laid antennas. In general, this leads to formulations of the direct source and receiver problems, which can be solved locally by finite element techniques or by global techniques such as integral equation formulations. For elevated antennas, or when time windowing is possible for surface laid antennas, a second way of obtaining information on the wave field, both polarization and amplitude, that is emitted into the ground is to record it in a certain plane in the air. In a configuration with constant velocity horizontal layers, only the down going wave field in the upper half space below the antennas, contributes to the down going wave field in the layered Earth. Accurate knowledge of this down-going wave-field allows the wave-field extrapolation into the layered Earth, which technique can be used in multi-component imaging algorithms accounting for polarization and amplitude. Here the effects of knowing the four parameters are shown. It demonstrated that the multi-component, or full polarimetric, imaging technique is a tool of full operational value only when all four parameters are accurately known. Only then the required increased acquisition effort pays off. [C2825]

## "Analysis of target responses and clutter based on measurements at test facility for landmine detection systems located at TNO-FEL"

Target responses and natural clutter have been analyzed based on GPR measurements performed in July 2002 at the test facilities for landmine detection systems located at TNO-FEL. The object responses of four different types of antipersonnel mines (surface laid and buried at depths of one, five and six centimeters) in three different types of ground have been analyzed for different polarizations of incident and scattered wave, for different pulse durations and for different antenna configurations. Clutter levels have been defined for two different presentations of raw data and have been determined for three different types of ground. It is shown that detectability of targets by GPR is limited not by the sensitivity or the dynamic range of the radar, but by the clutter. It is demonstrated that it is possible to detect targets below clutter level using the statistical data analysis. [C2826]

## "Experimental and theoretical analysis of different buried object systems using time domain reflected signal analysis"

In this paper, some of the GPR applications at higher microwave frequencies (X and Ku bands) are highlighted. Employing the GPR methodology, different dielectric objects are detected; underground roots are detected and differentiated from other naturally occurring dielectric objects. The theoretical simulation studies of the scattered field from various objects are also carried out to substantiate the experimental results. [C2827]

## "A comparison of segmentation techniques for target extraction in ground penetrating radar data"

In a typical GPR survey, a great amount of data is collected, and only a small percentage of this amount represent useful data (i.e. target data) whereas the majority of the data is considered non-useful. The first of the post-processing stages, which relies heavily on a skilled operator, involves pointing out the areas that may contain targets and suppressing others. Consequently, this process consumes considerable amounts of time and effort, apart from the fact that the existence of the human factor at this critical stage invariably introduces inconsistency and error into the interpretation. In this paper, three techniques for automatic GPR data segmentation are discussed and compared. The techniques rely on the computation of certain features from which a neural network can then arrive at a decision to classify the data segments in question as targets or

otherwise. The first technique is based on extracting three statistical features from A-scan segments while the second technique computes statistical features from B-scan regions to produce the discrimination bases for the neural classifier to distinguish targets from non-targets. In the third technique, some regional properties of B-scan segments accompanied by the statistical features are used to achieve discrimination not only between targets and non- targets, rather between hyperbolic-shaped and non-hyperbolic-shaped targets as well. All three techniques were on different types of GPR data collected from a variety of sites, and they proved to be very efficient to form a robust automatic technique for data reduction and segmentation. [C2828]

## "High frequency penetrating radar data interpretation by means of joint time frequency analysis"

A processing technique able to enhance the range resolution attainable through a continuous wave step frequency (CW-SF) radar on layered structures of few centimeters behind tens of centimeters masonry was tested on experimental data. The technique is based on joint time frequency analysis (JFTA). The simulated signal sweeps a finite bandwidth at discrete frequency values. The investigated medium is represented as an ensemble of four dielectric layers, homogenous and separated by flat interfaces. The transmitted wave propagates in the first semi-infinite medium, and penetrates through the second dielectric layer along the perpendicular direction. A third layer of finite thickness, and the last one supposed to be semi-infinite, follow. A laboratory experiment aimed at comparing simulated and measured results on a masonry test wall has been carried out by means of a CWSF radar system. The test-wall set up consists of a brick and lime wall at a controlled distance from a second thick masonry wall. Radar reflectivity is measured by varying the thickness of the hollow space between the two walls by means of an X band SAR system radar. The technique proved to be a promising tool for detecting stratified structure in masonry, overcoming the resolution limits of the time domain analysis. [C2829]

## "Efficient computation of the wavefield in a two media configuration emitted by a GPR system from incident field measurements in the air"

For proper imaging and inversion, accurate information on the wavefield that is emitted into the ground is of paramount importance. In case of ground-coupled antennas and without the possibility of time windowing, the wave field in the ground can be best modeled by taking this coupling into account in the model. For air launched antennas, with less ground coupling, or when time windowing is possible, we can obtain the wave field in the ground from wave field extrapolation of the emitted wave field, which is recorded in a certain plane in free space. It is shown that in two media configuration, with homogenous layers, only the down going wave field in the upper half space below the antennas, contributed to the down going wave field in the lower half space. This is generally true for laterally homogenous media. The present state of the art in three-dimensional multi-component GPR imaging is to use analytic expression for Green's functions in canonical configurations that do not sufficiently match the real background. The reason is that full computation of the Sommerfeld-type integrals, which have to be solved for each image plane, are too time consuming for imaging GPR data within reasonable time. We show that approximations to the correct two-media Green's functions leads to a more accurate resolution function than exact formulations of the approximate Green's functions of a single homogenous medium. To achieve this, we use a wave field extrapolation method honoring the spectral bandwidth of the data to be imaged. [C2830]

## "Linear inversion algorithms in GPR applications"

This paper deals with the inverse scattering from buried objects within the framework of the Born approximation. It is shown that, for both the multistatic and multimonostatic measurement configuration, the class of retrievable objects is characterized by similar properties with respect to the spatial variations, provided that the working frequency band is wide enough. [C2831]

## "Processing and analysis of polarimetric ground penetrating radar landmine signatures"

The paper presents an analysis of landmine signatures acquired with a polarimetric ground penetrating radar (GPR). First, preprocessing was applied to isolate the target signatures from other reflection events. This included a frequency-wavenumber (f-k) filter to remove unwanted side reflections, followed by background subtraction to remove the direct wave and the ground reflection. The obtained polarimetric signatures of the landmines indicated that these can contain significant cross-polar components, which is in contrast to expectation for a target with a cylindrical casing and most likely a result of internal structure. Making use of the reciprocity property of the scattering matrix, the polarimetric signatures were transformed into the target frame, yielding signatures that are independent of target orientation. From the transformed signatures target impulse responses were estimated using a newly developed deconvolution algorithm. The novelty of the deconvolution algorithm lies in the fact that it computes impulse responses, which adhere to a physical model. Accordingly, the

computed impulse responses can be related to mine properties such as size and dielectric permittivity. An interesting application of this is the estimation of a mine's permittivity from its impulse response and the impulse response of a calibration target, of which an example is given. [C2832]

## "Electromagnetic propagation modeling for GPR exploration of Martian subsurface"

This work presents a study on possible subsurface models for GPR exploration of Martian soil. In particular, based on recent experiments, the electromagnetic properties of Mars soil simulants are reported and relevant GPR performance is calculated in different frequency ranges through a one-dimensional transmission-line propagation model. The presence of statistically-distributed inhomogeneities inside soil is also taken into account by calculating their scattering and attenuation features. [C2833]

## "Optimizing TCP/IP parameters over GPRS and WLAN networks"

The growth of both the Internet and mobile systems provides the way for wireless access to the Internet. Internet based applications are mostly based on a reliable transport service, TCP (transmission control protocol), which is one of the responsible for applications performance. In this paper we characterize two currently available radio access links, the general packet radio service (GPRS) and the IEEE 802.11b standards, at the IP level, and we show the effects and optimization of some TCP parameters in these networks. [C2834]

## "Contrasting GPRS and EDGE over TCP/IP on BCCH and nonBCCH carriers"

The introduction of EDGE in current GSM/GPRS deployments will give operators a significant boost in network capacity and will offer mobile data users high bandwidth packet data services. Intelligent radio resource management allows the allocation of the GPRS/EDGE packet data channels (PDCHs) on the beacon carrier (BCCH) or on nonBCCH carriers. Most key performance indicators (KPIs) such as user data throughput, channel capacity and spectrum efficiency are affected by an appropriate choice of the cell configuration. In this paper detailed simulation results for the end to end performance of GPRS and EDGE over TCP/IP are presented. Today's GPRS 4 timeslot capable mobiles as well as EDGE 2 and 4 multislot mobiles are investigated. The performance of PDCH allocations on the BCCH and nonBCCH carrier has been contrasted for pure GPRS and EDGE services showing the pros and cons for each configuration. Finally mixed scenarios with GPRS and EDGE multiplexing on the same PDCHs are covered. [C2835]

## "Performance analysis of dynamic TDM-transport for GSM voice and GPRS/EDGE packet data services"

Today's GSM and GPRS mobile networks are based on static 16 kbps terrestrial transport on the Abis interface using E1/T1 lines. For the introduction of the high data rate GPRS coding schemes such as CS4 with up to 20 kbps, EDGE with up to 59.2 kbps and high quality wideband adaptive multirate voice codecs with up to 23.85 kbps the terrestrial Abis capacity per air interface radio channel has to be extended. With FAAS a fully dynamic allocation strategy of nЧ16 kbps subslots is proposed on a per site basis for both voice and data to optimally match the capacity requirements of high bandwidth radio channels. The approach includes bringing up and releasing Abis resources out of the Abis resource pool on demand. The interaction with admission control, radio resource management and link adaptation involving upgrade and downgrade procedures is taken into account. To avoid unacceptable voice blocking a new concept for voice protection is included. Detailed simulation results for different cell configurations are presented for voice only and mixed voice and GPRS/EDGE packet data scenarios at varying load, which allow the appropriate dimensioning of the Abis resource pool per site. Depending on the cell load capacity gains up to 70% (typically 30-40% for medium load) can be achieved compared to a static Abis allocation approach promising considerable cost savings for operators. [C2836]

## "The Eifel TCP extension over GPRS RLC: effects of long radio blackouts"

We present a GPRS simulation platform developed as a new module of the UCB/LBNL/VINT network simulator (ns-2). This platform provides the functionalities of the RLC/MAC layer of GPRS with the support of several mobile stations in a single cell. It enables us to evaluate end to end performance of TCP connections over GPRS. Simulations show that long delays caused by long radio blackouts could cause spurious retransmissions of TCP segments. We investigate the performance of the new Eifel TCP extension with respect to this problem. [C2837]

## "WLAN-centric authentication in integrated GPRS-WLAN networks"

A SIM-based authentication is preferable for GPRS operators for the integrated GPRS-WLAN networks. It requires WLAN systems process the GPRS-based authentication and transport the GPRS authentication

messages back to the GPRS networks. This paper presents an alternative WLAN-centric approach based on the perspective of WLAN providers. The proposed WLAN-centric authentication instead leverages the widely used WLAN-based authentication and requires the GPRS operator install an AAA server. The proposed approach is based on loose coupling architecture. In addition, it assumes that the GPRS and WLAN systems are two parallel networks and work independently. Scenarios for GPRS subscribers and WLAN users roaming between two systems are detailed. The proposed approach is implemented in a testbed which comprises most components in GPRS and WLAN systems. Performance analysis based on empirical experiments is discussed. [C2838]

## "Architecture considerations and integrated-passives-based design for a dual-mode GPRS-WLAN SiGe RF transceiver"

Seamlessly roaming user applications in converging GSM-WLAN environments are creating the need for highly integrated, dual-mode transceivers, amenable to single-die integration on silicon. Based on the direct conversion principle, an efficient system architecture that can be switched between both standards is proposed. It is shown that, for implementing the dual-mode radio, the design of wideband RF cells and switches is called for, which is nontrivial. Appropriate design techniques based on the extensive usage of on-chip passives are proposed to address the design of the dual-mode RF circuitry and render their performance on silicon as predictable as possible. The development of a SiGe BiCMOS GPRS-WLAN transceiver is showcased. Measurement results are provided at the cell level, for a 1.8-2.5 GHz 24 dB-gain LNA and an embedded +24 dBm WLAN PA. [C2839]

## "An all-MPLS approach for UMTS 3G core networks"

In this paper, we present an all-MPLS approach for UMTS 3G core networks. GTP-tunnel has been defined by 3GPP as the transport mechanism for UMTS. For each packet transmission, extra GTP, UDP, and IP headers (40-byte) arc required. For short packets, such as VoIP payloads, transmission overhead is very high. Enhanced-GTP was proposed to eliminate the need for a GTP header. Since its operation mode is limited to nontransport mode only, NAT is required in GGSN. Furthermore, its performance improvement is limited, because an extra IP header (20-byte) is still needed. In response to these drawbacks, we propose to integrate MPLS technology to UMTS 3G core networks. We use MPLS-tunnel as the transport mechanism by using two-level MPLS labels (8-byte) to replace the GTP-tunnel. To the best of our knowledge, this is a novel approach, since no MPLS-based approach was ever proposed for UMTS 3G core networks. Our approach is feasible, since more and more routers are MPLS-capable. By reducing header overhead from 40-byte to 8-byte, our new approach improves transmission efficiency from 56.5%  63% to 86.6%  89.5% for VoIP payloads and also enhance packet forwarding efficiency. In addition, our all-MPLS approach offers better load balancing, better service resilience, and better QoS support, compared to existing approaches. [C2840]

## "Resource efficient multicast for 3G UMTS wireless networks"

The European telecommunication standard Institute proposed IP multicast for third generation universal mobile telecommunication system (UMTS) broadband wireless networks. In their proposed approach, multicast messages are sent as multiple unicast messages to all active multicast group members in the UMTS network. As a result their proposed scheme is inefficient in terms of internal infrastructure and radio resource usage; and multicast packets incur significant delays. We propose a resource efficient IP multicast scheme, which significantly reduce radio resource usage and message delay. The proposed scheme uses IP tunnels and efficient unicast routing within the UMTS infrastructure to eliminate unnecessary message duplication and transmission. We also proposed the use common multicast channels in the efficient utilization of radio resources. Common multicast channels are designed to accommodate the varying and channel characteristics of active multicast users. We also propose a secure mechanism to distribute common radio group key to active multicast users. [C2841]

## "Link quality-aware cut-off prioritisation strategy for GSM/GPRS networks with link adaptation"

In this paper, the system level performance (teletraffic analysis) of a GSM/GPRS network where speech and data services coexist is analytically evaluated. In our work, link adaptation for both speech and data services, is considered in the system capacity assessment. For speech service, half- and full-rate vocoders are considered in the analysis. For data services, only those coding schemes that are currently used in practical GPRS systems are used in our analysis: CS-1 and CS-2. Also, a link quality-aware triple threshold reservation (LQA TTR) scheme is proposed. In LQA TTR, preference is given to data users on the good quality zone (CS2) because, on average, they require less time to be served relative to data users on the bad quality zone (CS-1). Numerical results show that the proposed LQA TTR scheme effectively reduces call blocking probabilities relative to the conventional multiple channel reservation strategy. [C2842]

## "FERMI@ELETTRA: the single-pass free-electron laser for the VUV and soft x-ray spectral range at ELETTRA"

The FERMI proposal is an initiative from ELETTRA, INFM and other Italian institutes, to construct a single-pass FEL user-facility, to be located next to the third-generation synchrotron radiation facility ELETTRA in Trieste, Italy. For the initial phase, the project aims for lasing from 100 nm to 10 nm, with the use of the existing 1.2-GeV S-band linac. As a next step, the accelerator system should be extended to reach 1.2 nm. In all stages, reliability and flexibility are of importance. That is, seeding schemes are considered to improve the SASE output. In addition, users of this new source will have full control over both wavelength and polarization of the radiation. The initiative is a response to the Italian government's call for proposals for a multi-purpose pulsed laser X-ray source. In anticipation of a positive decision, the Sincrotrone Trieste has initiated the ELETTRA Linac FEL project (ELF), i.e., an R&D project to facilitate a quick and effective implementation of the first step of FERMI. Here, we describe the main features of the project. Emphasis is given to the implementation and initial steps and the ELF project. [C2843]

## "The brain effects of occupational strength 50 Hz magnetic field"

Human cognitive behavioural and neurophysiological effects during exposure to extremely low frequency (ELF) 50 Hz magnetic field (MF) of 28.4 μT were measured triple-blinded. Forty subjects were exposed to MF and sham in two visits in counterbalanced orders. The visits were scheduled after two training sessions and one baseline session. Two of the 29 parameters assessed were inter-peak latencies of visual evoked response (VER) and auditory evoked response (AER). The other 27 variables were measures of the brain performance, reaction time (RT), learning, memory (spatial, short-term, long-term, working and secondary), storage and retrieval of information (numerical, verbal and pictorial), accuracy, errors, attention, alertness and vigilance. The conclusion was a small decline in the human brain performance and in particular statistically significant deterioration in choice reaction time accuracy (p=0.03), word recognition accuracy (p=0.03) and numerical working memory (p=0.05). This study found no effect in grouped measures of alertness. No adjustment for multiple comparisons has been made, and as such, with 29 outcome variables, the authors acknowledge that any statistically significant result at a 5% level may be due solely to chance. [C2844]

## "Internet-based, GPRS, long-term ECG monitoring and non-linear heart-rate analysis for cardiovascular telemedicine management"

A portable GSM ECG with GPRS communication was developed with an Internet database for the on/off-line analysis of large amount of ambulatory ECG (www.bion.hu). 3 studies were performed determining the role of nonlinear heart rate dynamically in the separation of various disease groups (sudden cardiac death in CHF and in post-infarction (post-MI) patients, malignant ventricular rhythm disturbances in post-MI groups). The Haar wavelet analysis (wavelet SD by scale parameters) showed a good separation in the 3-5 scale range. The multivariate discriminant models with input values of α1, α2, β and the approximate entropy showed a good separation (Wilks' statistics: p [C2845]

## "Measurements of electromagnetic parameters of soil"

A nondestructive method for measuring the dielectric permittivity of soil has been implemented. The sensor is realized as an open-ended semirigid coaxial cable. The measurement procedure is based on measuring the reflection coefficient of the sensor. A computer program for performing the analysis of measured data has been developed. The dielectric constant and conductivity of soil from a test site in Dalmatia, Croatia, has been measured. The results show the dependence of the electromagnetic properties of soil on frequency and on moisture content. The measured results indicate the accuracy of the implemented measurement method. [C2846]

## "Mobile adaptive information systems on MANET: what we need as basic layer?"

In the last few years, we have witnessed an increasing use of mobile devices in several areas, such as e-commerce, e-learning and e-government. At present, there are several kinds of mobile devices, each one already equipped with the most current wireless technologies, e.g., Bluetooth, WiFi (the standard 802.11x) and GPRS (general packet radio system). Such a technological basis allows to build ad-hoc networks (MANETs-mobile ad-hoc networks) among mobile devices, but the mere fact that it is technically possible is not sufficient to allow for effective usage of the resources (in particular software applications) contained within these networks. Up to now, research on MANETs concentrates on routing protocols, but more issues need to be taken into account when designing and realizing information systems for MANETs, such as how to exploit mobility and adaptivity at the application layer. This position paper analyzes ad-hoc network routing protocols in order to determine the minimal services that a MANET network layer should provide for the upper layers. Starting from

such an analysis, a service interface is defined, on top of which to build application layer software, and specifically, an orchestration platform to support cooperative workflows on mobile ad-hoc networks. A scenario is presented showing the opportunity of having cooperative workflow on MANETs. Such a service interface might be a common factor between researchers on MANET routing protocols and researchers on information systems for ad-hoc networks. [C2847]

## "A middleware architecture for inter ad-hoc networks communication"

Complex and decentralized information systems need advanced communication services at the middleware level in order to leverage context-aware distributed applications working, for example, despite node mobility and in a setting where such services can be billed. In this paper, we present a middleware architecture offering a communication service which, in its more general case, is able to provide connectivity between two nodes belonging to distinct mobile ad-hoc networks by taking user profiling into account. The proposed architecture is based on a resource awareness service enabling dynamic resource discovery and composition despite the assumed heterogeneity of the ad-hoc networks building the system. [C2848]

## "Ultra wide band antenna designs for ground penetrating impulse radar systems"

First Page of the Article [C2849]

## "Ellipsoid models for human and guinea pigs exposed to magnetic fields"

Dosimetry is necessary to scale exposures across species to compare biological responses. The functionally equivalent exposure of a human is estimated from animal exposure by dosimetry. Induced electric fields and current densities were calculated for 50 Hz, 10 G, 20 G and 30 G magnetic fields exposures using ellipsoid models representing human standing and guinea pig on all four feet on the ground. E fields induced by 10 G, 20 G and 30 G fields of 50 Hz were calculated as 4.04 mV/m, 8.07 mV/m and 12.11 mV/m respectively for guinea pigs. For the human model these fields were found 12.5 mV/m, 25 mV/m and 37.7 mV/m. Induced current densities were calculated between 0.404 mA/m2and 1.211 mA/m2for guinea pig, between 1.25 mA/m2and 3.77 mA/m2for human by taking the conductivity 0.1 S/m. Average value of human: guinea pig ratios (scaling factor-SF) was calculated as 3.1. The functionally equivalent exposure of human was obtained from SF of 3.1 and found between 3.23 G and 9.68 G. [C2850]

## "A Two-tier heterogeneous mobile ad hoc network architecture and its load-balance routing problem"

The mobile ad hoc network (MANET) has attracted a lot of interest recently. However, most of the existing works have assumed a stand-alone MANET. In this paper, we propose a two-tier, heterogeneous MANET architecture which can support Internet access. The low tier of the network consists of a set of mobile hosts each equipped with a IEEE 802.11 wireless LAN card. In order to connect to the Internet and handle the network partitioning problem, we propose that the high tier is comprised of a subset of the mobile hosts, called gateways, which can access to cellular/infrastructure networks. The high tier is heterogeneous in the sense that the network interfaces in the gateway hosts could be IEEE 802.11 cards, PHS handsets, or GPRS handsets characterized by different bandwidths and latencies. Observing that the gateways could become the bottlenecks of the two-tier network, we propose a set of solutions, namely boundary-moving and host-partitioning solutions, to solve the load-balance routing issue. Implementation issues/concerns of these schemes are discussed. Simulation results are presented to compare these load-balance routing schemes. [C2851]

## "Development of user-friendly software to visualize ELF electric field exposed to human body"

For the study of biological effects of ELF electric fields, a flexible and user-friendly software was developed to calculate the spatial distribution of the ELF electric field and the induced current around and inside a human body. The accuracy of the calculation was confirmed by measurements. [C2852]

## "Evaluation of hair displacement in ELF electric field exposure"

For the study of the biological effects of ELF electric fields, the displacement of a hair exposed in the field was evaluated. In a theoretical study, the formulas for the electric force and the displacement were obtained. It was demonstrated that a 450 kV/m field can move a hair an observable amount. [C2853]

## "Identification of ULF emissions for Izu islands earthquakes in July 2000"

The purpose of this report is to find out any ULF signature for the earthquakes in Izu islands in July 2000

(associated with volcanic activity) by means of a new signal processing method. The ULF data observed at three closely spaced stations in Izu peninsula, are subjected to the principal component analysis (PCA), and we have found that this PCA is very effective in distinguishing among different sources of ULF emissions (geomagnetic variation, man-made noise, and seismogenic emission). While, the first and second principal components are found to be associated with geomagnetic variation and man-made activity, respectively, the third principal component (residual noise like seismogenic emission if it exists) at night has indicated a significant temporal evolution; an enhancement for about 1.5 months (from early May to middle June) and a conspicuous minimum about ten days before the first earthquake on July 1 (magnitude 6.4), followed by a sharp increase a few days before the earthquakes. Furthermore, this component is found to be back to the background level a few months later than the earthquakes. This temporal pattern is in good agreement with those for previous large earthquake (Spitak, Loma Prieta, Guam and Biak earthquakes), so that this temporal evolution for the third principal component found by PCA is likely to be a precursory ULF signature of those Izu islands' earthquakes with its intensity of the order of 5% of the first principal component. [C2854]

## "An improved diffraction tomographic inversion technique for imaging near-surface buried objects"

A new diffraction tomography algorithm for the detection of near-surface buried objects with ground penetrating radar (GPR) is derived. Improved image quality is obtained by avoiding an asymptotic approximation made by previous algorithms. This new diffraction tomography technique is shown to outperform its predecessor. [C2855]

## "Change in the body color and the urine quantity of goldfish caused by 50 Hz magnetic field exposure"

We have studied the biological effect of the extremely low frequency (ELF) magnetic fields by using goldfish. The body color changes in the goldfish and changes in the amount of urine were examined. As a result, it found that the amount of urine of the goldfish increased when 50 Hz 62 mT magnetic field was exposed continuously for more than 20 hours and at this time flecks in the scale were observed with light microscope. Furthermore, it found that one of causes which these phenomena appeared was an induced current. [C2856]

## "Hopf bifurcation in the Hodgkin-Huxley model exposed to ELF electrical field"

This paper discussed the interference between external electric exposure and biological objects. Based on results of space-time characteristics of trans-membrane voltage, the variation of cell trans-membrane voltage exposed to extremely low frequency (ELF) electrical field was analyzed; the traditional Hodgkin-Huxley model was modified by importing new parameter denoting external electrical fields, and the bifurcation caused by new parameter war found. This paper employed the algebra criterion in high dimension equations to perform the analysis of single parameter dynamical bifurcation. The results were biological significant and suggested that the aberration of dynamics in bio-systems may be accounted for diseases caused by electric exposure. [C2857]

## "On the way to 3G networks: the GPRS/EDGE concept"

This work describes the principles and use of GPRS. The main problems of transition towards the UMTS are also stated. [C2858]

## "Continuous monitoring of vital constants for mobile users: the MobiHealth approach"

MobiHealth aims at introducing new mobile value-added services in the area of mobile healthcare, based on 2.5 (GPRS) and 3G (UMTS) technologies. This is achieved by the integration of sensors and actuators to a Wireless Body Area Network (BAN). These sensors and actuators continuously measure and transmit vital constants along with voice and images/video to health service providers and brokers, improving on one side the life of patients and allowing on the other side the introduction of new value-added services in the areas of disease prevention and diagnostic, remote assistance, para-health services, physical state monitoring (sports) and even clinical research. Furthermore, the MobiHealth BAN system supports the fast and reliable application of remote assistance in case of accidents by allowing the paramedics to send reliable vital constants data as well as audio and video directly from the accident site. Trials are underway focusing on home care, trauma care and ambulatory monitoring. [C2859]

## "Bistatic mapping radar BISAR"

Synthetic aperture radar (SAR) is a system of active prints that are loaded in a sensor able, to carry out the cartography of natural scenes with a better resolution. SAR supplies images based on the waves reflected by the Earth's surface that do not appear on classical optical images. Indeed, radar waves may describe drifted ice in aquatic surfaces; they can penetrate under vegetation and even slightly into the basement. However, the main

problem with this approach is the interpretation of the radar image that is different from usual graphics. When the radar is composed of a simple antenna, we speak about a monochromatic configuration. The antenna works in alternative it will function as a transmitter and then switch to a receiver. The radar can be designed to operate with two separate antenna to perform the transmit and the receive functions, and this may be called bistatic radar. The bistatic system has particular features coming from the separation between the transmitter and the receiver. In this configuration, the transmitter illuminates the scene with beam pointed to its centre. The diffused signal is then picked up by the receiver. Technological progressions enabled to place the receiver and the transmitter aboard satellites, ships, planes or other carrier. The delocalisation of both the transmitter and receiver makes it possible to improve the capacity of detection and identification of the radar, and thus to increase the detection capacity of a furtive target. This paper presents the potential scientific objective of the bistatic synthetic aperture radar (BISAR). First, it begins by an extension of modelling, proposed by literature such as monostatic scalar radar model and vertical model (that take in account the polarisation wave in the transmitter and the receiver) are presented. Then, the next part will be devoted to the development of two bistatic methods that are an extension of monostatic approaches. Namely, method of coherent summation and method of adapted filtering. [C2860]

## "Analysis of downlink coverage and interference in urban clusters of narrow beam hexasectorial supercells"

In this paper, a supercell structure for coverage improvement and reduction of the interference levels in environments of dense traffic is presented. A comparison is made between a conventional trisectorial cell layout with another one constituted by cells of six sectors with narrow horizontal beams, in an urban environment through simulation of down link interference patterns. Our goal is to show that the supercell approach is a solution that requires less economic investment and is feasible from the point of view of the network development and growth, while offering a good performance in terms of coverage and capacity, thus improving the spectral efficiency. [C2861]

## "The tradeoff between coverage and capacity in dynamic optimization of 3G cellular networks"

For 3G cellular networks, capacity is an important objective, along with coverage, when characterizing the performance of high-data-rate services. In live networks, the effective network capacity heavily depends on the degree that the traffic load is balanced over all cells, so changing traffic patterns demand dynamic network reconfiguration to maintain good performance. Using a four-cell sample network, and antenna tilt, cell power level and pilot fraction as adjustment variables, we study the competitive character of network coverage and capacity in such a network optimization process, and how it compares to the CDMA-intrinsic coverage-capacity tradeoff driven by interference. We find that each set of variables provides its distinct coverage-capacity tradeoff behavior with widely varying and application-dependent performance gains. The study shows that the impact of dynamic load balancing highly depends on the choice of the tuning variable as well as the particular tradeoff range of operation. [C2862]

## "The EAP-GPRS protocol for tight integration of WLANs and 3G cellular networks"

In this paper we propose and discuss a new extension of the extensible authentication protocol (EAP), referred to as EAP-GPRS (see also A. Salkintzis, "The EAP-GPRS Protocol"), which allows various types of messages (including UMTS RRC messages and GPRS LLC messages) to be embedded within EAP messages. One of the advantages of this protocol is that it can support signaling procedures embedded within a WLAN access control procedure and therefore facilitate fast handovers in cases when the WLAN is tightly coupled to a 3G cellular network. [C2863]

## "QoS estimation for cellular packet data networks"

There is a lot of effort in the industry for defining adequate and realistic end-to-end QoS indicators for cellular data services, which might be applicable for estimating delivered QoS and for specifying the QoS control mechanisms for the underline transport networks. The paper proposes a set of measurements and a procedure for mapping the results to key quality and performance indicators. The procedure is independent of the network architecture and technology. It is a top down approach for directing the network optimization process, starting from the end user perspective. [C2864]

## "3GPP streaming over GPRS Rel '97"

Mobile streaming is thought to be mainly a 3G service offered with guaranteed bit rates, error rates and delay bounds. In this paper we analyze the feasibility of streaming services in a 2.5G environment. GPRS Rel. '97 allows enough bandwidth for streaming, but it cannot guarantee bit rates or delays. We study different QoS

parameter configurations to find optimal values for streaming over GPRS Rel. '97. Its error protection is good enough, if the correct QoS profile is chosen. GPRS cell reselections cause additional problems for streaming, since several seconds of data can be lost Results show that despite all the limitations, streaming is possible in a GPRS environment and this service can be started even before the deployment of 3G networks. [C2865]

## "Fair scheduling for downlink realtime data distribution"

Information dissemination on downlink channels has been widely perceived to be a dominant application in future wireless mobile communications. Data distribution on the downlink is subject to the influence of location dependent channel errors. To timely deliver data to a mobile recipient through a good-conditioned channel in the spirit of fairness has become a very important issue. This paper has proposed a scheduling algorithm to address this problem. Extensive simulation experiments have been conducted to prove the feasibility of our proposal. [C2866]

## "GPRS/EDGE performance on reserved and shared packet data channels"

Worldwide 2.5G GPRS and 3G EDGE packet data technology shows rapid penetration in voice dominated GSM networks. Efficient radio resource management allows both configuring reserved channels for data and sharing the channels between voice and data on demand. Depending on the offered data traffic load, an appropriate cell configuration has to be introduced to ensure optimum network performance and acceptable user data throughput. Today, operators' revenue, however, is mainly generated by voice traffic. The reservation of excessive radio resources exclusively for GPRS/EDGE packet data services would be inefficient, even though typical mobiles currently available require up to 4 GSM timeslots for maximum data capacity. The resource allocation strategy proposed favors a low number of reserved packet data channels along with an appropriate number of shared ones. Detailed simulation results for different load scenarios and channel configurations are provided and practical dimensioning rules are given. For a typical 4/12 reuse on the BCCH carrier, the simulation results show that dedicating one to two channels for GPRS/EDGE and enabling additional 5 (4 in case of 2 reserved) shared channels provides both sufficient data capacity and user throughput without significant degradation of the voice service in the majority of practical implementations. [C2867]

## "Game theoretic analysis of joint link adaptation and distributed power control in GPRS"

In this paper, using non-cooperative game theory, we present a joint link adaptation and power control algorithm for GPRS (general packet radio service). We propose a utility model and analytically verify the existence of a Nash equilibrium (NE) in the network. We then propose a solution method and validate our work by simulating a seven-cell distributed system. Non-unique NE are shown to exist. The effects of the key parameters of the game are evaluated. We introduce three figures of merit (FOMs) that express the tradeoff between throughput and energy efficiency for the entire network. The FOMs are used to calculate the optimal values of penalty function parameters and to compare different NE. The proposed scheme is finally compared with another multirate power control technique. [C2868]

## "Dual frame motion compensation for a rate switching network"

Standard video coders often use the immediate past frame as a reference frame with motion compensation for video encoding. In this paper, we use dual reference frame motion compensation in the context of high bandwidth to low bandwidth switching such as from an Ethernet connection to a GPRS system. The implementation is based on MPEG-4. Simulation results show that there is a significant gain in the PSNR for relatively static video sequences. [C2869]

## "Three dimensional magnetic field computation inside a high speed train with a.c. electrification"

This work deals with the characterization of the extremely low frequency (ELF) magnetic field inside the new Italian high speed train with alternate current (a.c.) electrification, which will be realized in the next future. In the proposed model the magnetic field sources are assumed to be the 50 Hz currents flowing in the conductors of the railway line, which are calculated by a circuit analysis of the electrified traction line. The magnetic field in a railway car is then calculated by a CAD field simulator. The computed results in two-dimensional (2D) and three-dimensional (3D) configurations are compared and discussed. The calculated field level are also compared with the magnetic field measured inside an existent European high speed train with a.c. electrification. [C2870]

## "A mating strategy for multi-parent genetic algorithms by integrating tabu search"

Multiparent crossovers have been validated their outperformance on several optimization problems. However, there are two issues to be considered-the number of parents and the disruptiveness caused by multiple parents.

We present a tabu multiparent genetic algorithm (TMPGA) to address these two issues by integrating tabu search into the mating of multiparent genetic algorithms. TMPGA utilizes the tabu restriction and the aspiration criterion to sift selected parents in consideration of population diversity and selection pressure. Furthermore, the resulting mating validity further adjusts the number of parents participating in a mating. Experiments are conducted with four common test functions. The results indicate that TMPGA can achieve better performance than both two-parent GA and multiparent GA with the diagonal crossover. [C2871]

## "Regularization of Laplace transform inversion for subsurface conductivity and permittivity profile estimation using GPR signals"

This paper deals with the regularization problem raised by the inversion of GPR radargram. The determination of subsurface conductivity and permittivity profiles leads to Laplace transform inversions for real data. A very recent method to solve this severely ill-posed problem is presented and evaluated using a standard 2D FDTD numerical GPR model for multilayered media. [C2872]

## "Assessment of a digital quadrature demodulator for a stepped frequency radar"

A direct digital demodulator for a stepped frequency radar was modeled and its performance estimated by computer simulation. The performance of a prototype was evaluated. Timing jitter was found to be the most significant cause of error in both cases. [C2873]

## "Secure centralised mobile and web-based control system using GPRS with J2ME"

This paper demonstrates a secure centralized mobile and web-based control system using the Java 2 Micro Edition (J2ME). In this system, clients can use their mobile/web browser to access a remote site via a centralized Web server using the GPRS/HTTP protocol. The centralized server acts as a switch for conducting the tasks required on a specific device within a given remote site. The remote client devices serve as the instrument controllers with a suitable data acquisition system. Issues regarding the system setup, implementation and experimental results are illustrated here. [C2874]

## "Compatible improvement of the GSM/GPRS system by means of space-time block codes"

We investigate the application of the Alamouti space-time block code (STBC) on the basis of the GSM/GPRS system, especially with regard to aspects of compatibility with current specifications. The performance improvements obtainable by means of this technique are demonstrated on the basis of simulation results. A novel trellis-based soft-output equalization and detection algorithm for the Alamouti scheme is presented which is of the same complexity as in the single transmit antenna case. Moreover, appropriate training sequence pairs are derived. In this context, optimized partner sequences with respect to the eight GSM sequences are introduced that significantly outperform any pair of GSM sequences. Analytical results are presented demonstrating the sensitivity of the Alamouti scheme to fast and/or frequency-selective fading as well as to imperfect knowledge of the channel coefficients at the receiver. [C2875]

## "Service management model for integrated 3/4G and wireless LANs"

There are many challenges to transport multimedia traffic over wireless network, because of e.g. bandwidth fluctuation, user mobility and bandwidth resource scarcity. This paper presents management issues how quality of service can be guaranteed when the mobile users are roaming between different wireless networks (WLAN, GPRS, UMTS). [C2876]

## "Packet reservation protocol for personal mobile communications"

A packet/cell reservation protocol is proposed for operation in a GPRS environment. The operation of the protocol exploits the advantages of contending random access protocols for reservation purpose while accommodating a hybrid form of GSM and ATM systems to enable the provision of services to mobile users. The protocol provides reservation priority for voice and inter-active real-time services in a multichannel environment. The protocol also uses a voice activity detector to eliminate unused reserved time slots in any frame payload and then allocate them to other users that have a lower priority. A simulation model has been established to mimic the operation of the protocol for voice and data traffic. The results show better overall channel utilisation together with lower overall time delay for data messages. [C2877]

## "Analysis of GPR scattering by multiple subsurface metallic objects to improve UXO discrimination"

Detection and identification of buried unexploded ordinance (UXO) is an emerging problem worldwide. Recent

ultra wideband (UWB) field tests between 10s of MHz and 100s of MHz have demonstrated that certain of the target's dimensions can be estimated from analysis of complex natural resonances in the scattered signal. However, the problem becomes much more complicated at highly contaminated UXO sites where clutter items, from which subsurface UXO must be distinguished, appear simultaneously within the field of view of the sensor. This often occurs in realistic field conditions, where GPR discrimination capabilities are typically limited by ground clutter, coupling between antenna and ground, and limited view of the target due to innocuous items. Under extreme shielding by clutter, the incident field cannot excite strong currents on the target and in turn the scattered field from the object cannot easily be separated from the responses of the clutter. To investigate this, we pursue simulations here designed to test subsurface side-looking EM field scattering from multiple buried objects placed in a uniform ground. The numerical calculation is performed using the finite difference time domain (FDTD) method in conjunction with generalized perfectly matched layer GPML. The results are analyzed for a cylinder and plate placed in a uniform ground. [C2878]

## "Unsupervised Bayesian reconstruction of microwave images from real data"

We address the problem of non-linear microwave imaging for the reconstruction of dielectric profiles. We propose a statistical based inversion algorithm, adopting the Bayesian (MAP) framework and a complex Gaussian MRF model for the image. The use of statistical algorithms for the estimation of the complex MRF parameter leads to a robust and effective non-linear inversion method. Some experiments on real data are able to show the good performance of the method. [C2879]

## "A source estimation method to locate anomalous electromagnetic source in ELF band with global noise separation by ICA"

The Japanese Islands are located in an active position of seismic activity and have therefore often been afflicted by the damage of an earthquake. There is a report that disorder of an electromagnetic (EM) wave occurs in nature as a precursor of crustal activity. In order to detect the sign, we have measured EM waves of 223 Hz at about 40 sites in Japan. Our final goal is to sense seismic activity and to predict earthquakes. To locate local sources radiating anomalous EM waves, we need to separate global noise components due to tropical thunder in the equatorial region from observed data. Therefore, in this paper, in order to separate global noise components, we perform independent component analysis. Our goal in this paper is to estimate a local anomalous EM wave source. [C2880]

## "High resolution image reconstruction by GPR using MUSIC and SAR processing method for landmine detection"

Landmine detection is a difficult and very sensitive task as it may cost a human life even with a slight mistake or misdetection. In addition, the invention of non-metallic landmines made the scenario much more complicated and difficult. Various landmine detection techniques have been proposed, such as a metal detector, an electromagnetic induction (EMI), and so on. However, the probability of false alarm is very high in such techniques, which is considered as a sever problem. In this paper, ground penetrating radar, which has the capability to detect the non metal and the plastic mines, has been proposed to detect landmines. In addition, super resolution technique MUSIC algorithm and SAR (Synthetic Aperture Radar) has been implemented for the signal processing and image reconstruction of a GPR signal. [C2881]

## "Complex impedance mapping using GPR survey methods"

GPR surveys are normally processed to provide reflection images free of static offsets and long period drift. However in many surveys the raw data is observed to contain systematic decays consistent with Cole-Cole models of complex impedance. The resulting time-constants can be used to provide additional constraints for geotechnical investigations of moisture content and plasticity in soils. [C2882]

## "GPR-based shape reconstruction of metallic objects"

The problem of determining the shape of buried objects for multifrequency plane wave incidence in a 2D geometry is dealt with. The problem is tackled by searching for the support of the currents induced on the contour of the objects, is formulated as the inversion of the linear operator arising from the application of the Kirchhoff approximation and is solved by means of the Singular Value Decomposition approach. The presented numerical results show the effectiveness of the proposed inversion algorithm. [C2883]

## "Combining GPR and EMI data for discrimination of multiple subsurface metallic objects"

Cleanup of subsurface metallic objects such as unexploded ordnance (UXO) constitutes an urgent problem

worldwide. The heart of the problem is discrimination, as opposed to detection. Ultra-wideband electromagnetic induction sensors (UWB EMI), operating from a few Hz up to 100s of kHz, have shown considerable promise in subsurface discrimination of metallic objects. Unfortunately, a great many objects, including widespread clutter items, produce very broad, smooth EMI signal patterns, over a number of decades of frequency. Shape identification is complicated by the sensitivity of EMI fields to metal type. UWB ground penetrating radar (GPR) has also shown definite discrimination capability for characterizing subsurface metallic targets. Uninfluenced by metal type, GPR is capable of registering complex natural resonances from which target length can be estimated. Further, examination of the spatial patterns of GPR signals can indicate the (X,Y,Z) locations of targets, even of multiple targets present simultaneously in the incident beam. In this paper we consider potential collaborative roles of UWB GPR and UWB EMI for discrimination of multiple subsurface metallic objects. Rigorous 3-D FDTD models demonstrate GPR's ability to estimate target positions, orientations, and length even when reflections overlap. These data can then be used to constrain inversion of UWB EMI patterns. Processing of EMI measurements based on prior estimates of object location and orientation successfully extracts distinct frequency response signatures for two very closely spaced objects. [C2884]

## "Study on locating simulation of EM radiation source and transfer characteristic in ELF electromagnetic field"

The Japanese Islands are located in an active position of seismic activity and therefore often have been afflicted by the damage of an earthquake. There is a report that disorder of an electro-magnetic (EM) wave occurs in nature as a precursor of crustal activity. In order to detect the sign, we have been measuring EM waves of 223 Hz at about 40 sites in Japan. Our final goal is to determine the EM source more correctly. To locate the radiation source by multi point observations of EM power, EM wave propagation characteristic needs to be clear. In the presumed method of a generation source, we assume the attenuation model that EM wave intensity declines by the α power of the distance from the EM source. α is an unknown value, however, this paper analyzes α by locating the thundercloud position which generates the EM wave. [C2885]

## "A new diffraction tomography algorithm for ground penetrating radar"

A new diffraction tomography algorithm for the detection of near-surface buried objects with ground penetrating radar is derived. By allowing the transmitter and receiver to move independently improved image quality is achieved. [C2886]

## "Using design pattern to develop the quality MSC simulator software in performance test for GSM and GPRS system"

Design pattern is a solution in the structured format describing the problem and solution that can be applied in the new background. Global system for mobile communication (GSM) and general packet radio service (GPRS) are such backgrounds and they all need good MSC simulator software to guarantee the quality of performance test for the system. This paper introduces the method to develop the simulator software using several design patterns for MSC performance test in GSM and GPRS system. The usage of these patterns in the software is also depicted in detail, especially in the aspect of object-oriented design. From this paper, we can see that it is economical to achieve quality software by using design pattern, which makes the MSC performance test more efficient and economical. So, this paper is hopeful to benefit the other systems which needs software development with good quality and efficiency. [C2887]

## "Multi-waveform full-polarimetric GPR for landmine detection"

A full-polarimetric ultra wideband GPR front-end has been developed in IRCTR especially for landmine detection application. A number of new ideas have been implemented in the design. A principally new antenna system design and an ability to perform quasi-simultaneous measurements with two transmit polarization and in two different frequency bands are main novelty aspects of the radar. Additionally in comparison with commercially available video impulse GPR systems the front-end has considerably larger bandwidth, ability to measure polarimetric structure of the scattered field and very high precision of scattered field measurements. [C2888]

## "Monte Carlo simulations of surface clutter in GPR scenarios"

The clutter caused by scattering from a rough air-ground interface is analyzed numerically. The simulations have been done using Monte Carlo approach. Statistical properties of the scattered field have been analyzed. It has been found that the phase of the reflected electromagnetic field nearby a rough air-ground interface follows the profile of the interface and this phase modulation of the reflected field is responsible for the forming of the clutter. Furthermore it is demonstrated that the correlation function of the phase of the reflected field coincides

with the correlation function of the rough surface, while for the correlation of the reflected field it is valid only if the magnitude of the surface clutter is considerably less than the mean value of the ground reflection. [C2889]

## "Impact of ground clutter on buried object detection by ground pentertaing radar [Cpentertaing read penetrating]"

We performed careful analysis of the measure data to determine the clutter level and responses of different targets in different types of soils under different environmental conditions. We found that even in a dry sand ground clutter level is higher than responses of many types of antipersonnel mines. As a result, the signal-to-clutter ratio for GPR targets becomes nonsufficient for reliable detection by widely used detection procedures. A new detection algorithm, which should partly overcome this problem, has been developed. The performance of the algorithm on real GPR data is encouraging. [C2890]

## "Ultra wideband endfire synthetic aperture radar for landmine detection"

The detection of landmines is an important and challenging application for remote sensing technologies. The use of ground penetrating radar is an established technique but requires close coupling between the antennae and the ground and generally suffers from a poor area coverage rate. In order to clear mines rapidly along a route using a vehicle mounted system, a forward looking sensor is required that can operate effectively in a stand off configuration and detect surface laid, flush and buried mines. Reliable detection is required against a background of vegetation and other, surface and buried mines. Reliable detection is required against a background of vegetation and other, surface and buried, clutter. The Remote Minefield Detection System (REMIDS) is a technology demonstration programme funded by the UK Ministry of Defence designed to use an Ultra Wideband Synthetic Aperture Radar (UWBSAR) and a polarimetric infrared camera. The UWBSAR is a 3GHz bandwidth impulse radar with onboard data collection and offline image processing. The UWBSAR has been successfully trialled against landmines. Previous trials have mounted the radar on an airship and employed a conventional side-looking imaging geometry. In contrast, for the trials reported in this paper, the radar was amounted on a trolley to simulate a ground vehicle and operated in a forward-looking mode. The resulting use of an endfire synthetic aperture radar rather than the more conventional broadside aperture is the principal development reported in this paper. This coarsens the resolution and introduces a left-right ambiguity into the data. Previous trials have also highlighted the lack of a comprehensive data set containing controlled targets and a range of clutter conditions. The current trials were therefore conducted on a purpose built 80m test track which contained five different soil types, a range of surface conditions and over 200 targets of varying types and burial depth. The trials campaign collected over 500 data sets by varying the conditions of data collection in terms of polarisation, antenna height, antenna separation, incidence angle, power levels and pulse repetition frequency. The experimental configuration allowed the track of the platform to be repeated to sufficient accuracy to allo- w the synthesis of multiple baselines in the vertical and horizontal. The principal conclusions from the trials analysis are 1) that the data set collected is of good quality and comprehensive in terms of targets and background; 2) the endfire synthetic aperture configuration worked as anticipated; and 3) the left-right ambiguity can be resolved if a suitable antenna configuration is used. [C2891]

## "Design & implementation of user interface for mobile devices"

The inspiration behind the wireless world came from the need to provide users with mobility and to offer an alternative to the limitations of wired medium. As a result, the user interface and the size of mobile devices in various wireless mobile technologies like GSM, GPRS, WLAN, and Bluetooth are the main concerns in the design of mobile devices. In this paper, we design a single-layered touch screen based user interface. Unlike conventional multi-layered user interface, a single-layered user interface makes the user interface more friendly and reduces the interface size. The memory requirements can be further reduced by implementing it in low-level languages. After design and implementation of user interface, we interface the user interface with the hardware of mobile devices through serial port with the help of AT commands. [C2892]

## "Performance study of GPRS/EDGE systems for voice and data transmission in cellular systems"

With the increasing demand for higher data rate services over current cellular systems, it is necessary for us to incorporate better data services into the existing GPRS system without affecting the quality of voice service. In this paper, we study the impact of data traffic on the performance of voice traffic with 4 different resource allocation schemes. A combination of the schemes was also studied to take advantage of the benefits contributed by each scheme. Performance parameters like system throughput, data user blocking probability and voice call blocking probability were examined. Our study indicates that the 4-carrier, 8-channel, voice with priority resource allocation scheme gives the most optimum data service performance with minimal degradation to voice service. [C2893]

## "Penetration of electric and magnetic field components of Schumann resonances into the ionosphere"

A penetration of electric and magnetic fields of global electromagnetic ELF resonances in the cavity Earth-ionosphere into the ionosphere is investigated numerically. It is shown that a penetration depth for magnetic components is 2-3 times greater than for electric ones and it depends essentially on the orientation of the geomagnetic field with respect to the normal to the Earth's surface. A penetration height for the electric field is about 50ч60 km, for magnetic field it is 100ч150 km. [C2894]

## "Influence of the 50 Hz magnetic field on the body color and the amount of urine of goldfish"

We have studied the biological effect of the extremely low frequency (ELF) magnetic fields by using goldfish. The body color changes in the goldfish and changes in the amount of urine were examined. As a result, it found that the amount of urine of the goldfish increased when 50 Hz 62 mT magnetic field was exposed continuously for more than 20 hours and at this time flecks in the scale were observed with light microscope. Furthermore, it found that one of causes, which these phenomena appeared, was an induced current. [C2895]

## "Landmine detection by a broadband GPR system"

Most of the landmine detection techniques by GPR use a monostatic type radar system, which is suitable for detecting landmines buried in shallow soil, which is normally less than 10 cm. The shallow target is difficult to detect by conventional GPR due to its low range resolution. We developed a broadband Vivaldi type antenna, which operates at 1GHz-10GHz. Using this antenna, we made a prototype of a GPR system, which operates at 2GHz-5GHz. By scanning the antenna on a 2D plane, we could obtain clear 3-D images of mine-like targets buried in dry sand. We proposed an array signal processing technique using CMP method, and found it is effective for rejection of the ground surface clutter, even if the ground surface has roughness. [C2896]

## "GPR for archaeological investigations: real performance assessment for different surface and subsurface conditions"

This paper assesses GPR (Ground Penetrating Radar) performance for archaeological investigations. We exploit extensive data acquisition campaigns to characterize the instrument behavior in different operative conditions and we select ad hoc processing techniques to optimally extract target signatures from the collected data. The extensive analysis demonstrates the real effectiveness of GPR surveys in archaeological investigations. [C2897]

## "Imaging of high-frequency full-vectorial GPR data using measured footprints"

For proper imaging and inversion, four parameters need to be known accurately. These are position of the transmitter and receiver antennas, the wave velocity distribution in the medium, the polarization and the amplitude characteristics of the antennas used. The position information problem is solved by introducing an automated acquisition frame with high accuracy in horizontal and vertical positioning of the antennas over a fixed area. For object detection and characterization purposes, we use elevated antennas, which imply that at least a two-medium background medium must be used for accurate velocity information. The velocity in air is known, while that of the Earth must be obtained from independent measurements. The polarization and amplitude characteristics can be obtained for elevated antennas by modeling the transmitter and receiver and validate the model with measurements in air. A second way of obtaining information on the wave field, both polarization and amplitude, that is emitted into the ground is to record it in a certain plane in the air. In a configuration with constant velocity horizontal layers, only the down-going wave field, in the upper half space below the antennas, contributes to the down-going wave field in the layered earth. Accurate knowledge of this down-going wave-field allows wave-field extrapolation into the layered earth, which technique can then be used in multi-component imaging algorithms accounting for polarization and amplitude. Here, the effects of knowing the four parameters are shown. It demonstrated that the multi-components or full polarimetric, imaging technique is a tool of full operational value only when all four parameters are accurately known. [C2898]

## "SOC technology for future wireless communications"

Summary form only given. Wireless communications technology has gone through very rapid evolution in recent years. Perhaps the most dramatic change is seen is chip sets for cellular phones. In just a few years, the silicon die area to support a GSM cellular digital base band function has shrunk by a factor of 19 which, along with silicon wafer size increase, has resulted in a 60-fold increase in the number of silicon die per wafer. The chip set solutions for cellular phones have changed from several chips and hundreds of external passive components to just three chips and about 50 external components for a GSM GPRS device today. A single chip

implementation of GPRS is expected soon. Besides the current state of the art in SOC, two R&D projects at Texas Instruments illustrate the scope and nature of the R&D work for future wireless communications: multi-antenna MIMO (multi-input, multi output) system for future wireless LANs and a UWB (ultra wide band) effort. [C2899]

## "Experimental validation of a GPR dedicated to the Martian subsurface exploration (Pyla sand dune)"

In the frame of the NETLANDER project, we have developed a ground penetrating radar (GPR) aimed at initial observations of the geological features in the deep Martian subsurface and the detection of potential liquid water reservoirs. Initial ground tests at 2, 3 and 4 MHz were recently performed on the Pyla Dune, which is a sand dune nearly 100 meter high along the south-west Atlantic coast in France. The horizontal reflecting layer located at the base of the dune together with the known permittivity value of the sand offer the opportunity to test the performance of the device in a rather well-documented and simple environment. These first experimental results are reported in the paper. We will focus on the precise measurement of the electric antenna characteristics and the analysis of the backscattered signals using both electric and magnetic components of the received field. Comparisons with numerical simulations taking into account the actual environment of the GPR are also presented for comparisons. [C2900]

## "Effective clutter removal for detecting non-metallic mines in various soil fields"

In this paper, an effective method for removing the clutter effects from the data collected using a stand-off impulse GPR with a small electromagnetic probe is presented. The method requires no a priori knowledge about the target and/or ground characteristics. Essentially, it combines successive processing and spatial variable moving averaging (SVMA) to eliminate the clutter and to enhance the detection of small land mines shallowly buried in different soils. In addition, this method can use measured GPR data to infer the effective soil permittivity. [C2901]

## "Buried land mine detection using complex natural resonances on GPR data"

In this paper, we discuss a modified Prony's algorithm for use in buried land mine detection from ground penetrating radar (GPR) data. The algorithm finds the dominant complex natural resonances (CNRs) for vectors of time-domain GPR data. We consider the identification of objects present in two-dimensional images. The CNR features of an unknown image are processed through distance-based detectors with the CNR features of known objects from an object library. We analyze our algorithm performance versus SNR and also analyze performance for different distance detectors. [C2902]

## "Characterization of shallow underground targets using wideband microwave reflectometry"

In this paper, the use of a combined signal processing technique of target discrimination for the step-frequency ground penetrating radar is investigated. To construct the radar range profile from the backscattered signal, a real part of the inverse discrete Fourier transform is multiplied by the pseudospectrum obtained from the same data via eigenvector method. The signatures of small underground objects can be subdivided in four categories designated conditionally as front wall; back wall; inclusion of high density; inclusion of low density. Experimental studies have shown that the technique is valid for both strong and weak scatterers. The approach can be extended to the discrimination of complex targets such as landmines by creating a set of templates. [C2903]

## "Host medium transformation of the early-time radar response of a buried dielectric target"

This paper addresses the problem of predicting the early-time radar response of a low-metal content landmine buried in a lossy soil given its response in a lossless soil. To make the problem tractable, we consider plane wave scattering from a homogeneous dielectric target embedded in a layered host medium with a global loss model. Using similarity analysis and the Born approximation, a transformation law for the scattered field is derived which relates the early-time target response in the lossy host medium to that in a corresponding lossless host medium. We also present a transformation law for the target impulse response, which follows directly from the transformation for the scattered field. The derived transformation law is tested using early-time responses of a mine-like target obtained from 3D finite-difference time-domain (FDTD) simulations. Based on these tests, the ability of the transformation law to predict changes in the early-time response of a non-metallic landmine as a result of changes in the electromagnetic properties of the host medium is discussed. [C2904]

## "The 3G-based wireless networked & intelligent monitoring system for pharos management"

An intelligent monitoring system of pharos based on GSM/GPRS, GPS and GIS short message service is

introduced. In the system, data collection, data treatment and GSM/GPRS-based data communication are implemented via field instrument. The working states and messages of pharoses, including working current and voltage, unloading voltage, GPS parameters and other environment information, are sent by SMS on GSM/GPRS system. All the information can be sent to control and/management center and the mobile telephone of manager or the watch. So the central computer of the system is able to carry out centralized management of data and remote control for wireless remote monitoring of pharoses. [C2905]

## "Ant colony optimization for resource-constrained project scheduling with generalized precedence relations"

This paper presents an ant colony optimization (ACO) approach to solve the resource-constrained project scheduling problem (RCPSP) with generalized precedence relations (RCPSP-GPR) with the objective of minimizing the project duration. The general ACO is improved by using the ants with backtracking capabilities and several kinds of heuristic information for solution construction. The combination of direct and summation pheromone evaluation methods and the pseudo-random-proportional action choice rule is also used. The ACO algorithm is tested efficient by using a set of benchmark problems generated by the project generator ProGen/max and performs the best on average among several other heuristic methods. [C2906]

## "A novel intelligent transportation monitoring and management system based on GPRS"

In this paper, we review the status of intelligent transportation systems (ITS). We describe a novel intelligent transportation monitoring and management system based on GPRS wireless communication technology designed and realized by us, present the logic structure and functions of this system, and explain its integrated working mechanism. Furthermore, we explore the ways to realize such a system and key technologies involved. Finally, we point out the near-future development directions of ITS in China based on GPRS wireless communication. [C2907]

## "Computing system processing of GPR sounding profiles"

The paper discuss the possible applications of computing systems in processing of GPR sounding profiles, viewed as signal and/or image processing. GPR (ground penetrating radar) is a non-invasive and non-destructive technique of subsurface investigation, similar to other radar-type detection methods. The sounding profile as a result of GPR data acquisition, is a bidimensional image, most usual in gray scale, that often requires preliminary processing in order to reveal significant information. Different types of processing like background removal and various filtering are discussed, and the possibility of neural processing is analyzed for different situations. [C2908]

## "Subsurface surveying by a rover equipped with ground-penetrating radar"

We discuss our experiences in integrating a commercial off-the-shelf ground-penetrating radar unit with an all-terrain rover. Straight-line subsurface surveys were generated in a fully autonomous manner using odometry and a simple visual servoing technique. Survey results for various terrains are presented. We discuss the configuration of the integrated system and make recommendations for both Martian and terrestrial applications. [C2909]

## "3-D image reconstruction from near-field coherently scattered waves"

This work presents a rigorous mathematical derivation of an effective approximate solution to the near-field 3-D inverse scattering/imaging problem for a system where the coherent signals are transmitted, and the scattered signals are subsequently received at individual transmitters and receivers. Potential applications of this technology include a variety of sub-surface imaging modalities such as: UHF foliage penetrating SAR, ground penetrating radar for land mine detection, and electromagnetic millimeter-wave scanning for concealed weapon detection. [C2910]

## "Modern data acquisition system in the road weather stations monitoring"

A modern road weather monitoring stations system in Poland was shown. A new communication and data visualization standard for that stations system was designed. It enables user to collect data from the stations by Internet or mobile technology. Software for the system is based on J2ME, WAP and GPRS standards. The proposed tools enable weather data viewing and managing from every place at every time [C2911]

## "The Intel® PXA800F wireless Internet-on-a-chip architecture and design"

The Intel® PXA800F cellular processor is the first product in the wireless industry to integrate a DSP processor core, a high performance applications processor core, baseband communication logic, with flash and SRAM memories, all on one chip. It is a revolutionary system-on-chip (SOC) product in the cellular industry with dedicated access to integrated memories by both processor cores and which delivers industry-leading performance. This paper presents the key innovative architectural features and the key SOC design and validation issues associated with the design of this product, with preliminary results on system-level performance. [C2912]

## "Ultra wideband ground penetrating radar"

Presented here is description of ground penetrating radar on the basis of continuous wave radiation within the frequency band from 2 GHz up to 8 GHz. The basic performances of the radar and examples of the buried objects detection are given. [C2913]

## "A new multicast protocol for UMTS"

We propose a new multicast protocol for UMTS networks. Our scheme relies on establishing multicast tunnels throughout the network that allow multicast packets to be transferred in an optimal manner on shared links towards multiple destinations. We describe the mechanisms of our scheme in establishing the multicast tunnels and performing group management. We show that our scheme performs particularly well when multicast subscribers are densely populated throughout the network. Given a dense multicast subscriber population, our scheme requires fewer multicast packet transmissions than comparable broadcast or one-to-many unicast schemes. [C2914]

## "Congestion control on spurious TCP retransmission timeouts"

Spurious TCP retransmission timeouts are a considerable problem degrading the TCP efficiency in communication over mobile 2.5G and 3G networks. They cause several unnecessary retransmissions and diminish TCP throughput. F-RTO algorithm can be used to detect spurious TCP RTOs, thus making it possible to avoid unnecessary retransmissions in such occasions and improve TCP performance. In this paper we present a SACK-based enhancement to the F-RTO algorithm that further improves the efficiency of F-RTO in detecting spurious RTOs. Additionally, we evaluate three congestion control alternatives to be applied when spurious TCP RTO is detected under different levels of congestion. The results show that choosing the most efficient congestion control alternative depends on the available link bandwidth, amount of buffering space in the bottleneck router, and the number of parallel TCP connections. If the wireless link has a low bandwidth, sufficient conservativeness at the sender not only prevents congestion losses, but also improves TCP throughput. On a faster link more aggressive congestion control yields better throughput despite of increased number of congestion losses. [C2915]

## "Single antenna interference cancellation: iterative semiblind algorithm and performance bound for joint maximum-likelihood interference cancellation"

In the first part, an iterative receiver for joint channel estimation and cochannel interference cancellation suitable for time-division multiple-access (TDMA) cellular radio systems is proposed. The receiver is based on joint maximum-likelihood sequence estimation (JMLSE). It is blind with respect to the data of the interfering users but training-based with respect to the data of the desired user and is therefore referred to as semiblind. As opposed to concurrent receiver structures where the number of receiving antennas must exceed the number of cochannel interferers, the proposed receiver is suitable for just one receive antenna. No knowledge on the burst structure of the interferer is used. Hence, the proposed receiver is suitable for (but not restricted to) the downlink in asynchronous networks. The proposed receiver is able to operate at a signal/interference ratio of 0 dB in asynchronous GSM/GPRS networks given a single dominating interferer. Furthermore, the results indicate that with proper interference cancellation it is not necessary to synchronize GSM/GPRS networks. In the second part, a lower bound on the bit error probability for joint maximum-likelihood sequence estimation in the presence of cochannel interference (CCI) and intersymbol interference (ISI) is presented. This lower bound is valid for an arbitrary number of interferers. [C2916]

## "ELF: efficient location forwarding in ad hoc networks"

Recently, a new family of protocols has been introduced for large scale ad hoc networks that makes use of the approximate location of nodes in the network for geography-based routing. Location management plays an important role in such protocols, and previous work in this area has shown that the asymptotic overhead of location management is heavily dependant on the service primitives (location registration, maintenance and discovery) supported by a location management protocol. Currently, SLALoM (C.T. Cheng et al., 2002), which is

a grid-based protocol optimized for large node movements, achieves the best known upper bound on the asymptotic worst case overhead of location management. However, the location registration cost in SLALoM dominates other costs for all practical purposes, and thus novel schemes need to be designed to limit this control traffic. In this work, we use the idea of location forwarding to devise a new scheme called ELF that limits the signalling traffic, and thus enhances the scalability of location management in large ad hoc networks. We find that, while the asymptotic overhead cost by such an improvisation matches that of SLALoM, ELF outperforms SLALoM in average case scenarios. [C2917]

## "A Σ-Δ fractional-N frequency synthesizer using a wideband integrated VCO and a fast AFC technique for GSM/GPRS/WCDMA applications"

A fractional-N frequency synthesizer (FNFS) in a 0.5-μm SiGe BiCMOS technology is implemented. In order to operate wideband frequency range, a switched capacitor bank LC tank VCO and an adaptive frequency calibration (AFC) technique are used. A 3-bit 4th order Σ-Δ modulator is used to reduce out-of-band phase noise and to meet a frequency resolution of less than 3Hz as well as agile switching time. The experimental results show -80dBc/Hz in-band phase noise within the loop bandwidth of 25 kHz and -129dBc/Hz out-of-band phase noise at 400kHz-offset frequency. The fractional spurious is less than -70dBc/Hz at 300kHz offset frequency and the reference spur is -75dBc/Hz. The lock time is less than 150 μs. The proposed synthesizer consumes 19.5 mA from a single 2.8-V supply voltage and meets the requirements of GSM/GPRS/WCDMA applications. [C2918]

## "Smart multibeam phased array antenna for GSM, GPRS and EDGE"

Paratek Microwave, Inc. developed a multibeam phased array antenna system at 1.8 GHz, suitable for application as a smart GSM base station antenna. The antenna is also capable of handling GPRS and EDGE extensions to the basic GSM system. The antenna array elements are phased using phase shifters based on Parasca™ voltage tunable materials. An antenna system overview and a description of the basic operation will be given, followed by system simulation and pattern measurement results. [C2919]

## "FLC-based MBWIMA/UMTS protocol for integrated video/voice/data services in UTRA TDD model"

An intelligent medium access control (MAC) protocol based on fuzzy logic control (FLC) is proposed and compared with a general packet radio system in UMTS (GPRS/UMTS) and the movable boundary wireless integrated multiple access in UMTS (MBWIMA/UMTS) protocols. The integrated video/voice/data services of UMTS in UTRA TDD mode have different transmission properties. By fuzzy logic control, the resources of the wireless communication can be intelligent assigned for different types of mediums. The voice-video dropping probability and data packet delay are input to FLC to optimally select the maximum number of voice slots. The simulation results demonstrate that the FLC-based MBWIMA/UMTS protocol can greatly improve the voice-video call dropping probability of the GPRS/UMTS protocol under heavy traffic load conditions, providing low voice-video call completion rate and high voice call arrival rate. The data packet delay of the FLC-based MBWIMA/UMTS protocol is less than that for the MBWIMA/UMTS, priority scheme and GPRS/UMTS protocols. [C2920]

## "Overview of sensor fusion research at RDECOM-NVESD & recent results on vehicle detection using multiple sensor nodes"

First Page of the Article [C2921]

## "Ground penetrating radar as an assisting tool for prospecting for oil"

Ground probing radar (GPR) is a fast and inexpensive method for probing in shallow depths of the earth. Since the weathering lone in some desert regions such the Sahara is relatively shallow, this paper proposes the application of GPR for its mapping for the sake of static correction. The radar survey results could be applied for interpolation between upholes and perhaps for the selection of optimal distances between the upholes. This paper presents simulated results of a new radar design that works on the principle of step frequency. [C2922]

## "GPR antenna simulations and optimizations in time domain"

The development and optimization of transient antennas for ground penetrating radar would be difficult without numerical simulations of their performance. To this end the FDTD algorithm should be considered as a useful and powerful tool for transient antenna analysis. As an example of such analysis we describe simulations of the

dielectric wedge antenna. Good agreement between theoretical predictions and experimental results was observed. Some of the antenna characteristics (like the radial component of the electric field in the near zone, the radiated waveform and the antenna footprint in different grounds) cannot be measured easily, so the correct theoretical (numerical) model is essential for their determination. The numerical model of the antenna can also be used for optimization of the antenna. As an example of such optimization we present a design of the shield for the dielectrically embedded dipole antenna. [C2923]

## "Reconstruction algorithms and experiments with a prototype of holographic subsurface radar"

The paper presents the mathematical basis and numerical implementation of the wave front conversion method for the reconstruction of a scattering object. We also describe a prototype holographic microwave radar and first experimental results. [C2924]

## "Timed-neutron detection for land mines"

We describe a new and novel means for detecting nonmetallic land mines. Timed neutron detection (TND) utilizes the unique neutron-moderating properties common to most explosives and all polymers and incorporates timing aspects to improve the measurement process. TND offers the possibility of a low-cost detector for non-metallic land mines with small radiation exposure. Experimental results with actual land mines and simulants are described. Computer simulations provide an understanding of how the performance of detectors based on this approach will be affected by environmental and operator parameter variations. [C2925]

## "The videopulse scattering in inhomogeneous media containing conductive cylinder objects"

The results of the computer simulation of videopulse scattering on the conductive cylinder objects buried in homogeneous media are presented in this work. The finite difference time domain method (FDTD) and Mur's absorbing boundary conditions of second order were used to regularize the problem. The analysis and the comparison of the scattered electromagnetic fields obtained at different dielectric parameters of the media and different sizes of the conductive objects were carried out. [C2926]

## "Resolving register bank conflicts for a network processor"

We discuss a register bank assignment problem for a popular network processor-Intel's IXP. Due to limited data paths, the network processor has a restriction that the source operands of most ALU instructions must be resident in two different banks. This results in higher register pressure and puts additional burden on the register allocator. The current vendor-provided register allocator leaves the problem to users, leading to poor compilation interface and low quality code. We present three different approaches for performing register allocation and bank assignment. Bank assignment can be performed before register allocation, can be performed after register allocation or it could be combined with the register allocation. We propose a structure called register conflict graph (RCG) to capture the dual-bank constraints. To further improve the effectiveness of the algorithm, we also propose some enabling transformations. Our results show the phase ordering of first doing register allocation and then assigning banks can reduce the number of spills with affordable costs of additional instructions. [C2927]

## "A ground penetrating radar for Mars exploration, the GPR experiment on Netlander"

Several missions are planned which should deposit on Mars a number of landers that will perform detailed observations of the planet's surface, subsurface and atmosphere. The CNES Netlander mission aims at establishing a network of 4 geophysical stations. They will offer a unique opportunity to explore the interior of Mars, its subsurface, atmosphere and ionosphere from 4 landing sites representing different geophysical conditions. One of the most important objectives is the investigation of the underground geological entities and the search for water reservoirs in the form of ground ice or even liquid water. The GPR experiment on Netlander, Berthelier et al. (2000), Ney et al. (2002), Ciarletti et al. is a ground penetrating radar that has been proposed to perform such observations. It is based on a new concept that will allow to explore the subsurface from a fixed position with the goal of achieving a 3D imaging of the underground. Features of instrumentation are discussed. [C2928]

## "The portable measuring sampling unit"

The bandwidth of present-day pulse georadars goes far beyond 1 GHz. The use of signal sampling measuring systems provides highly stable equipment and device sensitivity in a wide bandwidth. The building of measuring sampling units, even those having quite a narrow bandwidth (of the order of 1 GHz), requires the solution of a number of specific problems: satisfying the severe requirements of the clock signal parameters; fitting the circuit technology of the radio-frequency part of the unit. The main part of the sampling unit, namely the sampler, "is

overloaded" with a great number of auxiliary stabilizing circuits, synchronizing circuits, etc. As a result, the sampling unit increases in size, the power consumption goes up and the costs tend to grow. Both the unit dimensions and the consumption current are important in view of portability. The aim is to create a small-size, low-voltage measuring sampling unit with a high sensitivity and wide bandwidth. The paper presents work devoted to the analysis of ways of decreasing the supply voltage, reducing the power consumption and downsizing the sampling unit. The proposed solutions of these problems are tested in practice. [C2929]

## "Solution of the inverse problems of subsurface radiolocation"

A common approach is stated to the solution of an inverse scattering problem from the results of an exploration of a subsurface radio-stage by ultrawideband short-pulse signals. At the first stage, with the help of multiple loggers, the time-space matrix of a scattered electromagnetic field is shaped. The second stage is bound to the definition of the physical properties of the subsurface area. At the third stage, the detection procedure is carried out by shaping a 2D or 3D image of the subsurface area. Examples of 2D images restored by a spectral method are reduced. At the fourth stage, the procedure for reconstructing the geometrical and physical properties of subsurface objects is carried out. The procedure is based on a method of computing diagnostics (MCD). [C2930]

## "Reconstruction algorithm for object determination from ultra-wideband field data"

An inverse obstacle scattering method is presented for reconstructing the shape and effective constituent material parameters of a buried dielectric object from measured scattered field data collected above the surface of an air/ground interface. A forward model is developed based upon the linearised Born approximation and the dyadic Green's function for a single homogeneous medium. The forward model is filtered for noise using the Tikhonov regularization operator and then inverted and back propagated. Experimental results are provided to illustrate the steps involved and the performance of the inverse scheme to extract constituent material parameters. [C2931]

## "Controller for mobile control and monitoring via short message services"

The aim of proposed controller is to enable mobile access to small office and home office (SOHO) appliances via WAP and SMS commands. The appliances and sensors can be connected to RS 485 network or to local I/O ports. The software is written in C++ and allows sending and receiving of sort messages through mobile operator SMS center (SMSC) or SMS to E-mail or E-mail to SMS gateways. [C2932]

## "RF test requirements for cellular formats: a comparative analysis [Cdefense applications]"

With the advent of the Homeland Security Bill, the defense industry has shown interest in mirroring existing cellular networks. These networks would be utilized as a standalone communication backbone in the event of an emergency. The existing cellular formats have significantly different architectures at the RF level, called layer 1, which require unique test requirements. This paper addresses a number of different cellular formats including AMPS, NADC, CDMAOne, CDMA2000, GSM, GPRS, EDGE, and WCDMA. A brief overview of each technology is provided to serve as an introduction into the cellular arena for defense-related engineers. [C2933]

## "Application of ANN's to the classification of radar images"

Artificial neural networks (ANN's) are used to classify simulated images of subterranean geologic features obtained by ground probing radar (GPR). The supervised backpropagation algorithm is used. The aim of classification is for aiding and speeding the process of interpretation and to overcome the lack of experts in the field. Results of this experiment show that this method of classification would be useful in the field. [C2934]

## "Application of genetic algorithms to ground probing radar data"

Velocity of electromagnetic wave propagation into earth layers and the depth of interfaces between them are determined using genetic algorithms. The method is novel and robust. It can tolerate small errors and uncertainties in the measured delay times obtained according the common mid point method. The GA's technique is capable of determination of the dipping angle for an inclines interface. [C2935]

## "Performance models in GSM and GPRS networks"

Queuing networks models are widely used as important tools for the performance modeling and evaluation of both computer systems and communication networks. Exact solutions are generally not attainable except for some special cases. Consequently, numerical techniques and analytic approximations are needed for the study of queuing networks with bursty traffic. This paper presents the performance modeling and evaluation of general

packet radio service (GPRS) for wireless global system for mobile telecommunication (GSM) cells with bursty multi-class traffic under a partial sharing scheme (PSS). The model has been developed using a new powerful tool, MOSEL (Modeling, specification and evaluation language), which is based on numerical methods and the Petri-nets. The proposed model has been validated against simulation and those developed using maximum entry (ME), a well established methodology for approximate solutions. Numerical results demonstrate the credibility of our models. [C2936]

## "An optimization-based approach for distributed project scheduling"

Pressed by market globalization, a recent trend for manufacturers is to have their design teams at different locations to better serve local markets and reduce design costs. Under the concurrent engineering paradigm, tasks in a design project are required to be performed in parallel, however, are often interdependent in a complex way. As a result, effective communication and coordination among teams become vital for a project to be successful. The complex interdependencies have not been adequately addressed in the literature. This paper presents a novel optimization formulation that explicitly models the interdependencies among tasks and the communication activities required. A solution methodology that combines Lagrangian relaxation and the surrogate subgradient method has been developed to solve the optimization problem that is inseparable. Backward/forward Dynamic programming is used to solve task subproblems. Numerical results demonstrate that complex dependencies among tasks are satisfied via communication activities, and near-optimal schedules are efficiently obtained. [C2937]

## "Proactive-WTCP: an end-to-end mechanism to improve TCP performance over wireless links"

Standard TCP suffers in the wireless environment due to channel errors and frequent temporary disconnections of the wireless link. To solve both problems, we propose an end-to-end scheme, proactive-WTCP, in this paper. It only modifies the mobile end. Link layer retransmission scheme is used to deal with the wireless packet corruption. Mobile host withholds the duplicate acknowledgements for a dynamically calculated period in order to allow link layer recovery. Mobile host deals with the temporary disconnections by forcing the TCP sender into the persist mode before disconnection. Acknowledgements sent upon reconnection makes TCP sender exit the persist mode and resume the transmission. We evaluate proactive-WTCP in wireless LAN and GPRS network scenarios using throughput and transfer delay as the performance metrics for comparison. The simulation results show the significant improvements over TCP New Reno and Snoop with multicasting techniques. [C2938]

## "Analysis of profitability of inter-system handovers between IEEE 802.11b and UMTS"

Internet access using relatively fast wireless local area networks (WLANs) is often perceived as a local complement to slower, but widely available access using cellular networks, e.g. GSM/GPRS or UMTS. To benefit from the advantages offered by both radio access networks, a mobile user should be able to seamlessly change the access network while moving, experiencing temporary network congestions or whenever switching to the other network seems profitable. The goal of this paper is to analyse the profitability of performing vertical handovers between IEEE 802.11b and UMTS in case of using mobile IPv4. Such research has not yet been done in detail before. The profitability of performing vertical handovers has been analysed depending on the available UMTS channel bandwidth, channel quality, number of WLAN users and generated traffic type. Several detailed simulations have been carried out using NS2 and results are presented. Based on these results, a general criterion for profitable switching between UMTS and IEEE 802.11b is proposed, analysed and verified by simulations. [C2939]

## "A lossless algorithm for BSSGP flow control in GPRS and EDGE"

In a GPRS or EDGE system, fluctuations in the wireless link rate can cause the buffer in the BSS to either overflow or underflow if the data flow into the BSS buffer from the SGSN is not controlled properly. Currently available algorithms for controlling this data flow rely on imperfect estimates of the wireless link rate and cannot ensure that the BSS buffer will never overflow or underflow. We present a new low-complexity algorithm that ensures that the BSS buffer will never overflow or underflow, without requiring any estimate of the wireless link rate. If there is no feedback delay between the SGSN and BSS, the algorithm is optimal: among all algorithms that ensure that the BSS buffer will never overflow or underflow, it requires the smallest amount of buffering in the BSS. The algorithm also has a fixed point, i.e. if the wireless link rate remains constant, the BSS buffer remains in equilibrium and no flow control updates are required. [C2940]

## "Modified soft output Viterbi algorithm for truncated trellis"

In concatenated codes, the performance of the outer decoder can be improved with a soft output from the inner decoder. Soft output Viterbi algorithm (SOVA) is one such technique when the inner decoder is Viterbi based.

However, when the trellis does not terminate to a single final state, the outer decoder performance does not improve substantially. In this work, we propose two methods to restore the performance. Simulation results illustrating the performance of the proposed algorithms are presented. [C2941]

## "Data-aided timing offset estimation for frequency selective fading channels"

In this paper, a novel algorithm for timing offset estimation is proposed for GSM and GPRS handsets, especially for multipath channels with large delay-spread. The timing offset leads to errors in the channel response estimation with a consequent increase in the overall bit error rate (BER). Thus, timing synchronization and tracking are crucial for satisfactory functioning of burst mode mobile communication receivers. In the proposed technique, minimum residual error energy concept is used for capturing multi-path delay profile and correlation based method is used for fine timing offset. Some simulation results are provided to illustrate the effectiveness of the proposed method. [C2942]

## "MPLS based mobility framework in 4G architectures"

An integration framework for 4G-network architecture between the UMTS-GPRS system and IEEE 802.11 WLAN systems using MPLS as the underlying technology is developed. In 4G networks, to suffice the needs of users with relatively low mobility, but yet to provide a substantial amount of bandwidth in hot-spots, it becomes essential to integrate WLAN 802.11 systems with currently existing UMTS-GPRS systems. The integrated network can handle wider mobility of the mobile nodes (MN). Multiprotocol label switching (MPLS) has in-built features that support QoS. Use of MPLS provides better efficiency in the integrated networks. It is shown that MPLS, when used to bridge the UMTS and 802.11 architectures, reduces the location update of the MN with the core network (CN). This is achieved by switching the parameters governing forward equivalence class (FEC) generation and redirection in such an MPLS enabled architecture. An efficient mobility management scheme is discussed when MN moves from one domain to another. Simulation results for signaling overhead in the integrated architecture with MPLS show the better performance of the proposed MPLS based framework. [C2943]

## "Asynchronous multi factor model (AMFM) of security for wireless MAN"

For credit cards and ATM cards, financial institutes around the world use the classical security system. This involves the distribution of keys through asynchronous bearers in space and time, whereas for authentication the keys are used synchronously through multifactor authentication. This methodology of asynchronous and synchronous usage of split keys is considered to be very secure. Due to lack of proper technology to date, there was no electronic equivalent of the same. However, with the emerging technologies in wireless metropolitan area networks (MAN), over GSM, GPRS, or CDMA/3G, it is possible to adopt the asynchronous mode of space and time for key distribution. The paper suggests a model for combining the asynchronous mode of space and time with ideas from quantum cryptography for key distribution to have a secure communication channel for wireless metropolitan area networks. [C2944]

## "Testing 3g-controlled systems: time to rejoice or time to feel pain?"

First Page of the Article [C2945]

## "Novel planar ultra wideband stepped-fat dipole antenna"

This paper presents an ultra wideband (UWB) planar stepped-fat dipole antenna. Comparing to conventional fat-dipole antennas, the novel antenna has stepped arms for impedance matching. The stepped arms make wideband impedance matching. A prototype antenna is designed for an ultra wideband ground penetrating radar (UWB-GPR). From EM simulations, dimensions of antennas are chosen for the better performance. For verification, the antenna is fabricated and measured. It is shown that return loss of the antenna between 0.5 GHz and 2.7 GHz is better than 10 dB. [C2946]

## "Spectrum management issues relevant to the introduction of ultra-wideband technology"

This paper presents some of the challenges that face the introduction of ultra-wideband (UWB) technology in wireless applications intended for commercial use, summarizes relevant regulatory and standards developments, and addresses potential implications on spectrum management and radio regulations. [C2947]

## "Agent based dbist dbisr and its web wireless management"

First Page of the Article [C2948]

## "A quality of service management scheme over GPRS"

A key problem in supporting applications like voice, video and data across wireless networks is managing their different requirements of quality of service (QoS) and the scarce shared bandwidth. QoS mechanisms can provide a differentiated treatment to applications running in different media. We present a QoS management scheme over general packet radio service (GPRS) networks by combining call admission control (CAC), radio resource reservation and scheduling. The simulation results show the effects of the proposed scheme on delay, delay variation and throughput of multimedia traffic while meeting the diversity of QoS requirements of an applications set. [C2949]

## "Mars Advanced Radar for Subsurface and Ionosphere Sounding (MARSIS): subsurface performances evaluation"

According to the Mars Express mission, the MARSIS primary scientific objectives are to map the distribution of water, both liquid and solid, in the upper pot-lions of the crust of Mars. Three secondary objectives are also defined subsurface geologic probing, surface characterization, and ionosphere sounding. In order to obtain the primary objectives the Radar Sounder design was based on the Ice/water interface and Dry/ice interface scenario: defining the material composition of the first layers and porosity and the pore filling materials. Concerning the surface, we have characterized the geometric structure in terms of a large-scale morphology, on which a small-scale geometric structure, due to rocks, is superimposed, taking into account also that recently the structure of the planets surface was described by means of fractals and in particular the new MARS surface models obtained by processing of the MOLA data. According to these models, this paper provides a description of the operational planning approach and expected performances of MARSIS. [C2950]

## "Description and applications of the multipolarized dual band OrbiSAR-1 InSAR sensor"

In the last decade, interferometric SAR (InSAR) has reached a wide acceptance as being a suitable tool to generate high-precision digital elevation models. Especially in tropical areas, with nearly permanent cloud coverage, InSAR provides a cost-efficient means for mapping large areas in short time periods. However, the interaction of microwaves with vegetation is strongly dependant on their frequency, demanding a careful interpretation of the extracted information. Short waves like X-band are mainly scattered back from the top of the canopy, whereas P-band penetrates the foliage and gets reflected from trunk and soil, thus carrying the phase information (and therefore the height information as well) from bald earth. For the generation of topographic maps, generally the ground elevation rather than the surface elevation is required, whereas the surface and ground elevation together enable the estimation of additional physical parameters like vegetation height, density, or biomass. [C2951]

## "A real time GPRS surveillance system using the embedded system"

As for data surveillance, the general packet radio service (GPRS) is the best candidate for always-on connection to any moving vehicles or individuals from the ground up to a few thousand feet above ground. Due to the inherent characteristics of GPRS, the client circuit design requires a central processing unit (CPU) with an appropriate operating system (OS) to activate point-to-point protocol (PPP) as well as IP addressed transmission control protocol (TCP/IP). This paper presents a system designed for clients to carry out GPRS connection, and send GPS and other data to a server system. For surveillance purpose, a geographic information system (GIS) is applied to track the clients on the electronic map. The system architecture and design concept are discussed. Circuit implementation and real world tests are demonstrated and verified. The data transmission delay is estimated within 0.75 seconds, while the surveillance period can be controlled from 5 to 120 seconds. The proposed system has been tested in ground vehicles to ultra light aircraft at 1000 feet with most areas in Taiwan. [C2952]

## "Thermal detection of buried circular objects with a rule-based fast shape detection algorithm"

Abandoned buried objects are global problems for humanitarian and military purposes. Several portable and vehicle mounted remotely operated platforms and sensors have been used to detect these objects. In terms of to performance and applicability sensors are divided into two groups, main sensors and support sensors. While sensors like GPR (Ground Penetrating Radar) and EMI (ElectroMagnetic Induction) sensors are considered as main, others, such as IR (infrared) and acoustic sensors support the information obtained from them. This paper will focus on mainly two phases, observation and image processing. A thermal camera has been used to receive thermal images from the soil surface where objects are buried in different depths and received thermal images were processed by a simple rule-based "Fast Circular Shape Detection" algorithm that we have introduced. The results of image processing participate in fusion of information used in determination and classification the buried

objects. [C2953]

## "Some experience with the use of spiral antennas for a GPR for landmine detection"

Ground penetrating radars for detection of antipersonnel landmines operate in a UWB domain from 400 MHz up to 5 GHz. One of the radar concepts for this kind of application is a stepped frequency CW radar. The requirements on the antenna for this radar is, that it shall have a stable phase centre, frequency independent gain, ultra-wide band, high isolation between the two antennas in a bi-static arrangement and other more common requirements like a low VSWR. The antenna selected for the application is an Archimedean spiral. Such an antenna has a wide beam width and a radiation pattern only slightly dependent on frequency. A basic problem to the use of a spiral antenna when it is elevated above the ground is that the small contribution of the anti personnel mine is surged by the strong reflection off the air/ground interface. This paper is addressing this effect by analysing the impact of the size of the antenna footprint on the SAR-synthesised three dimensional image of the subsurface. Experimental results like the ones presented here are not available to the authors' knowledge elsewhere in the open literature. [C2954]

## "Integrating various features in hidden Markov model using constraint relaxation algorithm for recognition of named entities without gazetteers"

We propose a constraint relaxation algorithm to integrate various features in hidden Markov model (HMM). As an example, a HMM-based named entity recognition system is built without gazetteers. Evaluation on MUC-7 English named entity task shows that our system achieves F-measure of 92.0. It shows that various features can be effectively and efficiently integrated using the constraint relaxation algorithm. It also suggests that gazetteers need not be a bottleneck for named entity recognition in newswire domain. [C2955]

## "QoS augmentation in GPRS via adaptive half-rate speech coding"

Half-rate speech coding in GSM opens up channels for dedication to GPRS. Adaptive half-rate speech coding by the ETSI AMR standard ensures superior quality compared to fixed half-rate systems. Furthermore, adaptive half-rate speech subscribers do not perceive significant loss of call quality compared to the existing enhanced full-rate system. As mobile Internet traffic increases over GSM networks, it makes sense to dedicate channels specifically for use by the general packet radio service (GPRS). In this paper, we show that the use of dedicated channels improves GPRS service quality significantly. GPRS delay and throughput under several adaptive half-rate speech scenarios are presented. We furthermore discuss the effect of such introduction on the frequency re-use rate for the entire system. [C2956]

## "2003 Proceedings of the International Conference on Radar (IEEE Cat. No.03EX695)"

First Page of the Article [C2957]

## "An experimental study on a ground-penetrating radar for detecting water-leaks in buried water transfer pipes"

In this paper, the feasibility of ground penetrating radar (GPR) probing technology was experimentally investigated. Polyvinyl chloride (PVC) tank filled with dry and homogeneous sand is installed in the laboratory. Within meaningful frequency band of the transmitting signal, the electrical properties of the material under test (MUT), such as dry sand and acryl used in experiment, are measured by using an open-ended coaxial probe method. The electrical properties of the drysand are similar to that of acryl. Therefore, to maintain precise position of the buried targets, support is made of acryl and filled with the dry sand. Leaking water could saturate the surrounding medium of leaky pipes. In experiment, however, it is very difficult to maintain moisture content and distribution of wet sand. Equivalent model instead of wet sand is necessary. The electrical property of the wet sand under saturation is very alike that of methanol. Therefore, the box is made of acryl plates and filled with methanol. The box with methanol filling is equivalently considered as water leakage model. We perform B-scan surveys with various situations. And we have investigated the possibility of GPR on detection water leakage as well as the pipe. [C2958]

## "Development of a UWB GPR system for detecting small objects buried under ground"

A ground penetrating radar (GPR) using short-pulse is developed in order to detect small and shallow metal objects buried under the ground. A bistatic mode in which the GPR system uses separate transmitting and receiving antennas is applied. A modified fat dipole antenna is developed for the transmitting and receiving antennas,. The prototype of the system is tested in real environment and 2D visualization of raw data is achieved. It is shown that the developed system has a good ability in detecting underground metal objects, even

small targets of several centimeters. [C2959]

## "Multiple base-stations location based load-sharing scheme in EGPRS: feasibility"

This paper analyses the feasibility of an enhanced EGPRS system allowing better integration of high QoS users (high data rate and time-sensitive applications) in the downlink. With the coming deployment of QoS guarantee in GPRS cellular networks, such users are expected to cause a significant capacity problem. Here we propose to distribute when possible the capacity needed for each high QoS user over several base-stations in order to minimize QoS degradation for other users within the network. The performance of such a scheme depends on the possibility for a mobile to be served jointly by several base-stations. Therefore feasibility is established through multiple base-stations joint coverage statistics: probability for a mobile user to be served simultaneously at a given location by several base-stations, and normalized joint coverage area are evaluated. Statistics of joint coverage are investigated for typical sectorized EGPRS layouts under lognormal shadowing. Influence of shadowing, network load and sectorization on the joint coverage statistics are presented. It is shown that under quite general circumstances and assumptions for system configuration and channel conditions high QoS is achieved when a mobile is served by multiple base-stations. [C2960]

## "Capacity increase in mixed networks with EGPRS downlink power control"

The progressive introduction of packet switched (PS) services in GSM networks involves interference control techniques that preserve the quality of speech communications. downlink power control (DLPC) for (E)GPRS reduces considerably the interference introduced by PS and notably increasing the system capacity Regina Rodriguez et al. (2002). The effect of this feature must be taken into account for network dimensioning purposes. This article presents a mathematical study about the equivalences that can be established in terms of interference between Erlang_PS and Erlang_CS in mixed environments when the downlink power control (DLPC) is applied to GPRS and EGPRS services. [C2961]

## "Teletraffic analysis of wireless mobile communication systems with link adaptation"

In this paper, the performance of wireless mobile communication systems with link adaptation is evaluated by means of a teletraffic analysis. To our knowledge, no similar analysis considering link adaptation exists in the literature. In particular, mathematical expressions for the handoff call arrival rate, the intra-cell handoff failure and the forced termination probabilities are derived. Half- and full-rate vocoders are considered and a link quality-aware dual channel reservation (LQA DCR) scheme is proposed. In LQA DCR, preference is given to users with good link quality because they require fewer resources than users with bad link quality. Numerical results show that the proposed LQA DCR scheme effectively increases system capacity. [C2962]

## "Fokus 3G beyond testbed and its use within the IST project OPIUM for OSA/Parlay interoperability tests"

UMTS networks are going to be provided on a commercial basis within the next twelve month in different European countries. The fast and flexible provision of innovative services, such as location-based services and mobile portals, particularly by third parties, will become a crucial issues for the the success of UMTS. As the UMTS role out will happen stepwise, additionally the interworking with other network technologies, such as WLAN hotspots and GPRS/GSM, for seamless service provision will be an important prerequisite for user acceptance. Thus the virtual home environment, in which services will be provided to users in a personalized way via different end systems and network technologies will have to become reality. Open network APIs, such as OSA/Parlay represent today a globally accepted technological means for providing services transparently on top of different networks. This paper provides an overview of the IST project OPIUM (open platform for integration of UMTS middleware), which investigates within four interconnected European test beds and one test bed in China the practical usage of the OSA/Parlay APIs on top of UMTS and GPRS networks. We will briefly look at the different test beds. However, particular emphasis will be given to the German OPIUM test bed, i.e. the UMTS/3G beyond test and development center at Fraunhofer FOKUS. This test bed will also provide a key location for the upcoming ETSI plug tests for OSA/Parlay interoperability, as it provides in addition to its own platform also access to different remote OSA/Parlay platforms. [C2963]

## "Cellular CDMA capacity in hotspots with limited ad hoc relaying"

In this paper we consider the capacity improvements in a cellular CDMA hotspot with out-of-band ad hoc traffic relaying. Two different multihop relaying options are compared, and an analytic model is used to compute the effects on CDMA uplink and downlink capacities. The results show that significant capacity improvements are possible using ad hoc relaying, but these are dependent upon the ad hoc to cellular coverage ratio and other parameters. It is also shown that in some situations ad hoc relaying should be used to shrink the cells in

question, but in other cases it should be used to shed traffic from the hotspot cell. The results give a useful indication of the potential role of ad hoc relaying in CDMA hotspot traffic situations. [C2964]

## "Adaptive QoS control by toggling voice traffic between circuit and packet cellular networks"

As cellular packet data services become widely deployed by the rollout of the networks such as general packet radio service (GPRS) and 3G cellular networks, packet-switched voice service such as voice over IP (VoIP) can soon be expected to be offered as an alternative to circuit-switched voice service. While circuit-switched voice offers better quality, packet-switched voice offers better resource utilization due to its multiplexing and compression techniques that can be used in packet radio principle. Therefore, the capability of having voice service over either circuit-switched network or packet-switched network provides a tradeoff between voice quality and bandwidth utilization. This paper proposes three schemes that allow users to toggle between circuit-switched voice and packet-switched voice based on the desired tradeoff. The basic idea is to allow ongoing voice traffic to alternate between circuit-switched network and packet- switched network using a 3-way calling mechanism in the SIP-enabled GSM/GPRS cellular network. We also show how these toggle schemes can be used depending on the cell load. Detailed performances of the proposed schemes are evaluated using simulation with realistic parameters of a cellular environment. The result shows our schemes can alleviate cell overloading as well as provide the smooth transition of an ongoing call between circuit-switched network and packet-switched network. Our schemes can be easily deployed in any cellular mobile network where circuit-switched network and packet-switched network coexist. [C2965]

## "A design of home subscriber server for IP multimedia service in all-IP UMTS network"

This paper introduces the All IP UMTS based core networks concept for IP Multimedia service. The focus of the study is designing a Home Subscriber Server (HSS) system that satisfies the functional requirement in the defined 3GPP Release 5 standard for the deployment of IP based multimedia services. Initially, it is expected that the basic UMTS core network (CN) will be deployed, with the functional element of the IP multimedia subsystem (IMS) and the signaling protocol among the elements. Then, we propose a competent design scheme for HSS system to provide IP multimedia service. It is divided two parts, a user profile database and a functional scheme of application for easy implementation. [C2966]

## "Optimized handover procedure based on mobile location in cellular systems"

Future-generation mobile communications will provide broadband multimedia services to users, anywhere and anytime. On the other hand network performance should be guaranteed to support these applications and services. In existing cellular systems handover is one of the procedures that causes serious network shortcomings. This procedure is much more complicated in next generation systems (UMTS) and is of great interest for investigation and optimization. Both these systems and those of the second generation (GSM & GPRS) will require redefined handover algorithms of active connections as the mobility support is a vital issue for cellular systems. In this paper we present a set of location aided handover mechanisms that use the location information to assist safe handover decisions. The implemented algorithms are validated by means of a cellular network simulator that clearly shows the impact of these techniques to the handover performance. Finally, we briefly describe how this can be integrated in the cellular system architecture. [C2967]

## "Improving end-to-end quality of services in 3G wireless networks by wireless early regulation of real-time flows"

In this paper, we propose to adapt the early regulation of unresponsive flows (ERUF) to third generation wireless networks employing link layer retransmissions. Wireless channel degradations may result in backlog of downlink packets at the link layer queue, causing real-time packets with hard delivery deadlines to expire and be dropped at the receiver. We propose to regulate these congested flows by dropping expiring packets at the ingress edge node of the general packet radio service (GPRS)/universal mobile telecommunication services (UMTS) core network to release shared network resources for other flows. Based on an analysis of the characteristics of the radio link control (RLC) layer of the GPRS/UMTS network, we develop a new set of mechanisms based on active queue management to achieve this goal. We present simulation results to show that this new wireless early regulation of unresponsive flows (WERUF) scheme can significantly improve the overall end-to-end quality-of-service of all traffic flows. [C2968]

## "Performance analysis of dynamic resource allocation with finite buffers in cellular networks"

First Page of the Article [C2969]

## "Network-centric context-aware service over integrated WLAN and GPRS networks"

In order to bring together the higher speed of WLAN and the wider coverage of GPRS, solution from service's perspective is necessary. And this kind of integrated service should be context-aware in order to automatically adapt itself to the changing environment. This paper proposes to explore the applicability of using network-centric context-aware service to integrate WLAN and GPRS network environments. Starting from typical scenario description and requirement analysis, a policy-based context model is presented, which takes into account the real implementation of context-aware service in the underlying networks. A context-aware service scenario called modern professor is explored to exemplify this methodology based on the policy-based context-aware service system architecture. [C2970]

## "UWB multiple access performance using time hopped pulse position modulation with biorthogonal signaling"

This paper extends previous UMB multiple access (MA) performance characterization by combining pseudorandomly coded, time hopped pulse position modulation (TH-PPM) with 4-ary biorthogonal communication signaling. Communication performance for the hybrid TH-BPPM technique is first validated for a single user operating over an AWGN channel. Single user results are then extended and MA performance characterized for both synchronous and asynchronous networks containing up to 15 users. In both cases, the proposed 4-ary TH-BPPM technique with Gold coding achieves nearly identical performance as previously demonstrated MA methods employing binary TH-PPM. A key benefit afforded by the 4-ary TH-BPPM technique, given fixed average power and symbol length constraints, is a doubling of the effective data rate while achieving identical bit error rate performance. [C2971]

## "Magnetic field-induced currents in human body in the proximity of power lines"

The paper presents a model for the interaction between humans and ELF magnetic fields generated by power lines. Electric current densities induced due to 50 Hz magnetic fields in a human model placed in a close proximity of 500 kV lines are presented and analyzed. The specific absorption rate (SAR), is investigated for various human model locations under the power lines. Also examined in this work is the case of live line maintenance workers, where they may be located near the central and outermost phase conductors. The induced current density and SAR are computed and discussed. [C2972]

## "Multi-waveform SFCW radar"

A stepped frequency continuous wave radar for detecting flush buried and surface laid anti personnel landmines was designed and built. The system covers a frequency band from 400 MHz up to 4845 MHz. The range resolution is 3.4 cm and the maximum unambiguous range is 4.3 m. The antenna set up is a bi-static one with two Archimedean spirals with opposite sense of rotation. A particular property of the radar is that it transmits and receives a set of eight frequencies at the same time. The system parameters are particularly aimed at imaging algorithms exploiting the phase evolution over the antenna footprint. An example of the result achieved after synthetic aperture radar processing is presented. [C2973]

## "Multi-waveform full-polarimetric video impulse radar for landmine detection"

A principally new multi-waveform full-polarimetric front-end of a Ground Penetrating Radar has been developed. In comparison with commercially available video impulse GPR systems the key advantages of the front-end are considerably larger bandwidth, ability to measure the polarimetric structure of the scattered field and very high precision of scattered field measurements. A principally new antenna system design and an ability to perform quasi-simultaneous measurements in two different frequency bands with two transmit polarizations are main novelty aspects of the radar. [C2974]

## "Wideband tapered-slot antenna with corrugated edges for GPR applications"

A novel wideband tapered-slot antenna for GPR applications is proposed. A conventional approach to reduce unwanted interactions between the antenna and the ground surface requires extensive microwave absorbers treatment. For the same purpose we propose to use corrugations along the antenna edges. The corrugations improve directivity and wideband matching of the antenna with free space retaining also good radiation efficiency. Further improvement of the antenna performance has been achieved by patching the corrugated areas of the antenna with the resistance card strips. The elimination of the foam-type absorbers makes the antenna more robust and easier in fabrication. [C2975]

## "Stand off detection of buried anti-personnel landmines"

A small, low powered, ultra wideband radar using a picosecond switching system has demonstrated the ability to produce radar images of surface laid landmines using an experimental rail SAR setup at a stand off range of 30 feet. [C2976]

## "Multistatic GPR data acquisition and imaging"

This paper proposes multistatic measurements to increase the information content of ground penetrating radar data. Three different acquisition strategies are distinguished. To obtain measurement data, a flexible setup has been realized. Tomographic backpropagation and the nonlinearized factorization method are discussed with regard to their applicability to multistatic data. [C2977]

## "Turbo coding scheme for GPRS system"

In wireless communication systems, error control coding (ECC) is a necessity to provide reliable communications over unreliable channels. The ever evolving applications of 3G mobile systems are so demanding that the most efficient techniques for channel coding should be employed. Turbo codes have been shown to yield an outstanding coding gain close to theoretical limits in the additive white Gaussian noise (AWGN) channel. They have been studied over a Rayleigh fading channel as well and showed a remarkable performance. We propose a turbo coding scheme to replace the convolutional coding already in use in the General Packet Radio Service (GPRS) system (known as 2.5G). Evaluation of the proposed encoder by means of computer simulation has shown performance improvements over the two channel models considered. [C2978]

## "Necessary density conditions for MIMO sampling of multiband inputs"

We consider a sampling scheme where a set of multiband input signals is passed through a MIMO channel and the outputs are sampled nonuniformly. MIMO sampling is a general scheme that encompasses various other schemes, including Papoulis' generalized sampling and nonuniform sampling as special cases. We present necessary density conditions for stable nonuniform MIMO sampling and consistent reconstruction of the multiband inputs. [C2979]

## "Optimization of migration method to locate buried object in lossy medium"

We present an optimized frequency-wavenumber (F-K) migration method to localize buried objects such as landmines in lossy medium. F-K migration has been proposed to find the location of a buried object using ground penetrating radar (GPR) data. This approach makes use of a wave equation in the Fourier domain to back-propagate the received wavefield. For GPR applications however, standard F-K migration assumes that the ground surface is flat and the medium is loss-free which are not true in reality. When implemented in the Fourier domain, the wave equation becomes the Helmholtz equation. It is then straightforward to incorporate a complex index of refraction in the Helmholtz equation to describe wave phenomenon in lossy medium. We generalize F-K migration to the case of rough ground surface and lossy medium. In the framework of Tikhonov regularization, we develop an algorithm that optimally alters the wave propagation velocity and the complex index of refraction to take into account of the ground roughness and lossy medium. In the process of searching the optimal velocity and complex index of refraction, the algorithm is constrained to produce an image of minimum entropy. By minimizing the entropy of the resulting image, better results are obtained in terms of enhanced mainlobe, suppressed sidelobes, and reduced noise. We use examples from field data to demonstrate the performance of our method. [C2980]

## "Ground water migration monitoring by GPR"

In order to understand the capability of monitoring ground water movement by ground penetrating radar (GPR), we carried out a field survey in Mongolia. We controlled water production at a ground water source area and the change of ground water level at about 5 m in depth could be detected by GPR. The change of the ground water level was observed more than 15 m in the radial distance from the pumping well. The change of the vertical water content was also evaluated by GPR. [C2981]

## "Classification of LIDAR data using a lower envelope follower and gradient-based operator"

A new, computationally efficient classification methodology was developed and implemented to classify Light Detection and Ranging (LIDAR) data as ground, vegetation, and man-made features (Weed 2001). The new procedure consists of several components that create ground, vegetation, and building surfaces, which are then used to classify the first and last reflection of each laser pulse. Ground and non-ground data are classified by adapting the concept of a lower envelope follower used to recover information in an amplitude modulated (AM) signal to the problem of extracting the ground surface from the LIDAR signal. The detected ground points include

bare surface pixels and locations where the laser was able to penetrate the vegetation canopy, but exclude buildings and vegetation. Buildings are then classified by detecting the extended low gradient regions on their roofs. The first return LIDAR data points are used to accurately detect building edges distorted by multi-path errors in the last return LIDAR data. The combined roof and edge surfaces are then employed to threshold the first and last return LIDAR height values and detect the LIDAR points reflecting from buildings. Once the building points are classified, the vegetation points are extracted from the remaining LIDAR points using a mask of the regions where there were significant differences in the first and last return of the laser pulse. The technique is robust for classifying LIDAR data acquired over a range of terrains with different vegetation cover and types and sizes of buildings. It requires minimal user intervention for parameter selection. [C2982]

## "A super-resolution locationing algorithm for ultra-wideband phased-array radars"

Super-resolution direction finding algorithms such as MUSIC or ESPRIT methods inherently assume narrow-band signals, which are not applicable to ultra-wideband radars such as GPR (ground penetration radar). We developed a time-domain algorithm to determine the time and direction of arrival pulses with an order higher resolutions than the nominal resolution determined by the aperture size. The received signal waveform at each array element is first analyzed by the recursive nonorthogonal decomposition using a dictionary of basic waveforms. After the delay time of the echoes in each element of the receiving array is determined, the number of targets and their locations are determined by analyzing variation of the delay time over the array with the aid of a Hough transform. The robustness of the proposed algorithm is confirmed by numerical simulations. [C2983]

## "Optimized GPR signal deconvolution using an adaptative conjugate gradient method"

Presents a signal processing method to improve the identification of interface between different layered media, using a deconvolution process. Our methodological approach is based on an inverse problem algorithm, called conjugate gradient method. The emitted pulse is assumed to be known, and the convolution is considered as a linear operator that must be inverted. We take into account the distortion of the signal and the noise of the recorded signal. [C2984]

## "On the use of surface impedance in the detection of buried objects"

A method to detect and locate the objects buried in a half-space is presented. The method is based on the reconstruction of the appearing surface impedance of the half-space through remote field measurements of scattered field for a single plane wave illumination. The existence of the objects causes surface impedance to be a function of location and by observing its variation along the surface one can achieve the detection. The method is applied to several examples to show its efficiency and accuracy. Effects of different parameters on the solution are also demonstrated. [C2985]

## "Detection of variable depth nonmetallic mines using ground penetrating radar"

First Page of the Article [C2986]

## "Use of a wideband radar to track large moving ground vehicles"

First Page of the Article [C2987]

## "Improvement of bow-tie antennas for pulse radiation"

In some applications, such as impulse ground penetrating radar (GPR), one frequently needs a transmit waveform with minimal late-time ringing caused by multiple reflections at the antenna open ends. We propose a novel method in which late-time ringing can be significantly reduced while keeping radiation efficiency high. End reflections are reduced by extending the length of the antenna using an array of conducting strips so as to form an array of narrow slots in front of the open ends. The energy reflected at the open ends is therefore reduced and partly induced on the strips. The method has been implemented on a circular-end bow-tie antenna and experimentally verified using a monocycle with duration of 0.8 ns as input pulse. It has been observed that the transmit waveform has the shape of the time derivative of the input pulse with a very flat tail. The slots/strips profile can be optimized to obtain minimal late-time ringing, and the feed point to first slot distance can be optimized to obtain maximal pulse amplitude which can be as high as nearly twice the amplitude of a conventional bow-tie antenna. [C2988]

## "Impedance characterization of dielectric horn antennas using FDTD"

In this paper, we perform a detailed study of the input impedance of dielectric horn antennas with a two conical

plate transmission line as a launcher, using the finite-difference time-domain (FDTD) method. Dielectric antennas are well known for having properties such as increased directivity, reduced sidelobe level, and wide bandwidth. These properties are particularly attractive for ground penetrating radar (GPR) applications. [C2989]

## "Observation of co-seismic electromagnetic waves associated with the Geiyo earthquake in 2001"

Many observations have been conducted to clarify the relationship between electromagnetic (EM) phenomena and earthquake (EQ) activities. In our observation system, EM waves associated with EQs have been received in the very high frequency (VHF) band. We have newly developed a dual frequency observation method with a highly sensitive synthesized FM tuner. Our observation method can clarify and judge whether a received signal is a broadband EM wave or an FM broadcasting wave. We had the Geiyo EQ (MJ=6.4, d=60 km) and the aftershock of the Geiyo EQ (MJ=5.2, d=50 km) in 2001. Our observation system detected co-seismic broadband EM waves associated with the Geiyo EQ in the VHF band. The observed EM waves reached a peak right after the EQ and slowly returned to a normal level about three hours later. We also describe a new phenomenon: a small fluctuation of about 2 dB occurred about one day before the Geiyo EQ, then, the fluctuation just disappeared at the occurrence of the earthquake. [C2990]

## "Numerical modeling and characterization of fully polarimetric dielectric loaded horn-fed bow-tie (HFB) antenna for GPR applications usingFDTD"

First Page of the Article [C2991]

## "Wideband short-range GPR interferometric phase processing for 3D rough surfaces with correction of antenna phase distortions"

This paper pertains to the distortions in the phase data for near-range wideband interferometric processing and imaging of three-dimensional rough surfaces. These distortions can lead to the anamorphorsis of the wideband image reconstructed in the surface height domain (SHD), and can produce the false information in the surface profile. This paper discusses the method of needed corrections. The results compared with those without implementing the correction procedures show better accuracy and focusing pattern. [C2992]

## "Analyzing quality of service of GPRS network systems from a user's perspective"

With reference to the General Packet Radio Service (GPRS), an extension of the Global System for Mobile Communication (GSM) addressing packet-oriented traffic, this paper contributes to the analysis of the service accomplishment level perceived by GPRS users. The proposed modeling approach builds separately the GPRS and user models; the focus is on the GPRS random access procedure on the one side, and different classes of user behavior on the other side. The overall model is composed of the basic submodels. Quantitative analysis, performed using a simulation approach, is carried out, showing the impact of users' characteristics and network load on identified indicators expressing the QoS as perceived by users. [C2993]

## "Two-dimensional FDTD modeling of impulsive ELF antipodal propagation about the earth-sphere"

First Page of the Article [C2994]

## "Rolled edge ultra-wideband dipole antenna for GPR application"

First Page of the Article [C2995]

## "Fast forward solver for buried dielectric targets at low frequencies"

First Page of the Article [C2996]

## "Application of broadband EMI responses to infer buried object's aspect ratio"

A new broadband electromagnetic (EMI) sensor, operating as lows as 10s of Hz and as high as 100s of kHz, has shown significant improvement for classification of buried metallic objects. EMI responses ("secondary" or scattered magnetic field) are characterized by two components, one inphase and another in phase quadrature with the primary field. Numerical and experimental investigations show that the frequency location of the quadrature peak in EMI scattered fields from metallic objects depends strongly on the major axis length ratio and on the object's orientation relative to the transmitted field. To illustrate potentially useful processing of EMI sensor data, this paper presents results of high fidelity numerical simulations to verify a theory for simple estimation of an object's aspect ratio based on the frequency location of the quadrature peak (permeable case).

Results are shown for a permeable cylinder and spheroid. [C2997]

## "On the use of contrast stretch and adaptive filter to enhance ground penetrating radar imagery"

We propose using an adaptive filter to enhance ground penetrating radar (GPR) images. It is well known that GPR images are usually dominated by the specular ground reflection. The specular reflection makes the object scattered signals difficult to observe, so it first must be removed before more refined detection and classification processing can be employed. To remove the specular reflection, the biggest challenge is that, due to ground roughness, the reflection cannot be satisfactorily subtracted by some simple methods such as a moving-average filter. Using contrast stretch we can enhance the object reflect signal and then use standard background removal method to eliminate most of the specular reflection. During the contrast stretch, the GPR images may have "streaky" artifacts because of the background removal. To overcome this side-effect, we apply an adaptive filter to remove "streaky" artifacts. Using field data, we show that images of higher quality can be obtained by our method. [C2998]

## "Position determination of a subsurface object by combined output of two receive GPR antennas"

A new algorithm is proposed for subsurface object detection and 3D localization using ground-penetrating radar (GPR) data, if GPR antennas are slightly elevated above the ground. Due to an effective approximation, the algorithm solves problems linked to calculating the position of the refracting point of electromagnetic waves on the air-ground interface. We present how the typical hyperbolic object signature can be detected on a B-scan. Then, we argue that only one surface coordinate can be extracted from the hyperbola detected in one B-scan, so that additional information is needed to find the transverse object position. We show that an antenna configuration with two receive antennas solves this problem. The problem of extracting the third object coordinate as well as the propagation velocity of electromagnetic waves in the ground is also addressed. The algorithm is illustrated on a data set acquired by this antenna configuration. [C2999]

## "Characterization of local 3D rough surfaces using UWB near-range phase-based GPR signatures from wide-beamwidth antennas"

This paper pertains to further investigations on using an ultra wideband (UWB) multistatic coherent ground-penetrating radar (GPR) technique for precise profiling of the rough surfaces in three-dimensional space. The method is essentially based on the phase processing of the sliced layers of three-dimensional rough surfaces with multiple sub-frequency bands. The data acquired in the near range by a UWB stepped-frequency continuous-wave GPR with wide-beam antennas over a compound surface are used to verify the method. It was found that in the near-range measurements the range side-lobe interference effects and the reflections from the measurement surroundings sometimes have a significant influence on the target phase and amplitude responses, and consequently degrade the localization of the targets. The present study on this issue shows that within the ultra wideband, some sub-frequency bands are less sensitive to the measurement surroundings, but still sensitive to the target area. With the selected sub-frequency bands the image of the compound surface reconstructed in the surface height domain shows good agreement with the practical geometry of the rough surfaces. [C3000]

## "Estimation of EM radiation source in ELF band"

Our goal is to locate anomalous electromagnetic (EM) source caused by seismic activity for earthquake prediction. For the purpose, we have been measured EM wave of 223 Hz at 35 sites in Japan. This paper analyses relation between EM power attenuation and distance from its source. The relation is necessary to estimate the source location. [C3001]

## "Field experiments of a surface-penetrating radar for Mars"

Using ground-penetrating radars to investigate the subsurface of Mars will be a key scientific objective over the next several years, especially in light of the large possibility that water could exist within the planet. Radars operating from a few megahertz up to a gigahertz will be able to provide valuable information concerning the subsurface electrical structure at resolutions ranging from a few centimeters near the surface to a few tens of meters at greater depths. One of the major goals of the work presented was to develop a lightweight, low-power, frequency-modulated radar system that could be used to detect subsurface deposits of ice and water. An inexpensive prototype system was developed using off-the-shelf connectorized components and evaluation boards. To verify the operation of this prototype system, a preliminary experiment was conducted in Lawrence, Kansas. Next, experiments were conducted over locations containing permafrost and ice in Fairbanks, Alaska. Results from these experiments are presented. [C3002]

## "Radio resource and mobility management in GPRS network"

The General Packet Radio Service (GPRS) is a complex data network which upgrades current second generation GSM networks, offering true high-speed Internet (IP) and X.25 network connectivity over existing GSM cellular networks. The key benefits of GPRS are better use of radio and network resources and completely transparent IP support. The increasing population of mobile users leads to congestion problems in these systems, and motivates the development of more efficient management schemes. Although GPRS offers a major improvement in spectrum efficiency, the capability and functionality compared with today's non-voice mobile services, there are still some key limitations with GPRS such as the transit delay, speeds which are much lower in reality and limited modem of operation. This paper overviews radio resource and mobility management such as location management and handoff management and discusses some of the key problems and method of overcoming these limitation and management problems in the GPRS network. A simulator based on Matlab which can study the location updating was developed in this GPRS system. The initial simulation shows the updating based on cell distance with various speeds. [C3003]

## "An overview of 3G mobile network infrastructure"

The migration from 2nd generation (2G) to 3rd generation (3G) mobile systems (e.g., GSM to UMTS) is ongoing in Europe and Asia-Pacific. The 3G operators are deploying new infrastructure to enable mobile Internet services for end users. Ericsson is committed to making this migration as seamless as possible for the operators and end users. This paper describes the building blocks of 3G network infrastructure. [C3004]

## "Generation of ELF and VLF radiation by ionospheric electrojet modulation using high frequency heating waves"

Summary form only given. Extra and very low frequency (ELF/VLF) wave generation by modulated polar electrojet currents is studied analytically and numerically. Through Ohmic heating by the amplitude modulated HF heating wave, the conductivity and thus the current of the electrojet are modulated accordingly to set up the ionospheric antenna current. The generation efficiency and signal quality of the ionospheric virtual antenna depend on the wave modulation scheme. Thus, four amplitude-modulation schemes are examined and compared. The nonlinear evolutions of the generated ELF/VLF waves enhanced by a stimulated thermal instability are studied numerically. Their spectra are also evaluated. The field intensity of the emission at the fundamental modulation frequency is found to increase with the modulation frequency in consistence with Tromso observations. The efficiency enhancement by the stimulated thermal instability is hampered by inelastic collisions of electrons with neutral particles (mainly due to vibration excitation of N2) which cause this instability to saturate at low levels. However, electron's inelastic collision loss rate drops rapidly to a low value in the energy regime from 3.5 to 6 eV. As the heating power exceeds a threshold level, significant electron heating enhanced by the instability is shown, which indeed causes a steep drop in the electron inelastic collision loss rate. [C3005]

## "Resource management policies in GPRS wireless internet access systems"

In this paper we consider the problem of resource management in GSM/GPRS cellular networks offering not only mobile telephony services, but also data services for the wireless access to the Internet. In particular we investigate channel allocation policies that can provide a good tradeoff between the QoS guaranteed to voice and data services end users, considering three different alternatives, and developing analytical techniques for the assessment of their relative merits. The first channel allocation policy is called voice priority, since it gives priority to voice in the access to radio channels; we show that this policy cannot provide acceptable performance to data services, and we discuss the reasons for this shortcoming. The second channel allocation policy is called R-reservation; it statically reserves a fixed number of channels to data services, thus drastically improving their performance, but subtracting resources from voice users, even when these are not needed for data, thus inducing an unnecessary performance degradation for voice services. The third channel allocation policy is called dynamic reservation; as the name implies, it dynamically allocates channels to data when necessary, using the information about the queue length of GPRS data units within the base station. A threshold on the queue length is used in order to decide when channels must be allocated to data. Numerical results, show that the dynamic reservation channel allocation policy can provide very effective performance tradeoffs for data and voice services, with the additional advantage of being easily managed through the setting of the threshold value. [C3006]

## "Sensitivity properties of all-pole canonical low-pass Gm -C filters"

In the paper, sensitivity properties of all-pole canonical low-pass Gm-C filters are investigated. We present a

general structure of all-pole canonical low-pass filter of arbitrary order as well as its matrix description. The formulas for sensitivity functions are also given. The comparison of sensitivity properties for canonical structures up to 10-th order ones is performed for Butterworth filters. Design guidelines that follow from the presented results are also given. [C3007]

## "Adaptive difference of Gaussians to improve subsurface imagery"

In detection of landmines using ground penetrating radar (GPR), the most significant interference is the specular reflection. Compared with the specular reflection, landmine scattered signals are of small amplitude and difficult to observe. Better detection results can be obtained if the specular reflection can be well separated from the landmine scattered signals. Difference of Gaussians (DOG) is an operation that generates a sharp image from an original image, i.e. in the case of a GPR image, it keeps the specular reflection intact. Therefore by subtracting the DOG output from an original GPR image, we are able to remove the specular reflection and enhance the landmine scattered signals. The DOG takes the difference between two Gaussian curves of zero means and different standard deviations and convolves with the original image. One advantage of the DOG is that the two standard deviations can be chosen properly to suit different applications. We develop an adaptive DOG (ADOG) to process GPR images to improve detection of buried landmines. In the ADOG, the two standard deviations of Gaussians are computed adaptively as a GPR image is scanned from the top to the bottom row. At each row, two windows are used to calculate the two standard deviations and the current row is convolved with the DOG. The output has an unchanged specular reflection while there is a reduced landmine scattered signal. The final image is obtained by subtracting the ADOG output from the original image to remove the specular reflection. The landmine scattered signal is greatly enhanced, allowing more accurate detection. [C3008]

## "Detection and imaging of small buried 3D non-metallic objects with multistatic phase-based GPR signatures"

In this paper the bistatic and monostatic phase-based ground-penetrating radar (GPR) technique for ingenious detection of poor-contrast scattering objects hidden just beneath the air-ground interface is discussed. This technique neither requires a priori knowledge about the background medium nor needs any pure background measurement. It was developed to deal with one of the worst-case scenarios in terms of landmine detection. The method was tested with the data measured from the L-band and S-band stepped-frequency continuous-wave GPR over the compound soil where small non-metallic mines are shallowly buried. The results demonstrate that it is feasible to detect small buried poor-contrast objects by using coherent phase processing and imaging. [C3009]

## "Forest stem volume estimation using high-resolution lidar and SAR data"

Presents a comparison of remote sensing of forests using two complementary, high-resolution sensors; namely the TopEye lidar and CARABAS VHF SAR systems. The lidar data are from a small footprint configuration, allowing discrimination between pulses reflected from the tree crowns, and those penetrating through gaps in the canopy. From these data, measurements of tree height and crown size can be made for individual trees, and the tree volume calculated through empirical relationships. The CARABAS VHF SAR provides a more direct measurement of tree volume, since the long wavelengths penetrate the forest canopy and are scattered by the trunk-ground dihedral. Results of stem volume retrieval for individual trees using data from the two systems are presented, and the possibility of using the complementary measurements discussed. [C3010]

## "A numerical study of the effects of realistic GPR antennas on the scattering characteristics from unexploded ordnances"

The detection and classification of unexploded ordnances (UXOs) is a difficult task, and it is even further complicated by the fact that the ground penetrating radar (GPR) antenna can significantly distort the scattering signal from the UXO. We consider the model of the real antenna which will be used in the numerical study of scattering from UXOs. We consider a rigorous finite difference time domain (FDTD) model of a fully polarimetric horn-fed bowtie (HFB) antenna and study how various modifications of the parameters of the antenna can affect it performance. [C3011]

## "The inversion of subsurface VETEM data-theory and practice"

Very early time electromagnetic system (VETEM) is an efficient tool for the detection of buried targets in very lossy medium. In this paper, we will discuss the inversion of VETEM data using a combination of one-dimensional (1D) and three-dimensional (3D) inverse scattering techniques, where the Born iterative method and distorted Born iterative method have been applied. In order to expedite the 3D inversion, an extended Born-type

approximation is made in the forward solver, together with FFT acceleration technique. The 1D inversion provides a gross image of the subsurface, but the 3D inversion helps to resolve the subsurface image better. [C3012]

## "Advanced classification of buried UXO using a broadband, fully polarimetric ground penetrating radar"

A broadband, fully polarimetric ground penetrating radar (GPR) system has been applied for classification of buried unexploded ordnance (UXO) for the past few years. It utilizes both late-time and early-time signatures extracted from GPR data collected with multiple antenna positions and multiple scan orientations. Various field measurements were conducted from 1999 to 2001 at UXO sites that have quite different environmental conditions. Lessons learned from these tests have led to significant system improvements. [C3013]

## "Estimation of the object depth accurately with GPR"

In this paper, we propose an automatic algorithm for estimating objects depth using f-k migration and velocity scanning method for the homogeneous medium. Experimental results show that the relative estimating error of depth is as low as 10%. [C3014]

## "A microwave sensor for agricultural implements"

For soil preparation, the concept of precision agriculture requires real time measurements of soil characteristics and cultivator behavior. The microwave sensor presented in this paper overcomes the limitations of sensors based on optical or ultrasound devices towards agricultural environment (dust, rain, etc.). The sensor uses the principle of frequency-modulated continuous wave (FM-CW) radar, low cost technology well intended for short range applications. First laboratory results of two major applications are presented. The first one is the distance measurement applied to the control of working depth. Soil-implement distances are computed with the measurement of a beat frequency: a maximum positioning error of ±5 mm is obtained for distances between 0.7 and 1 m. The second one is the evaluation of soil roughness in order to control seedbed quality. The backscattered coefficient, measured at normal incidence with samples of dry soil, is correlated with the rms height. [C3015]

## "Enabling multimedia services in unified access network"

Unified access to VPNs enables considerable flexibility in the way remote locations connect to a VPN. The overall design goal of this approach requires support for all services inherent to VPNs, including multimedia ones. The classical approach to building VPNs, such as ATM or frame relay, can enable strong support for multimedia traffic because of the ability to provide strict QoS guarantees. The architectural requirement of using IP as network protocol can lead to problems in the transport of multicast streams for VPNs based on classical networks. New approaches, such as MPLS VPNs, promise even greater flexibility and scalability through the use of native means for IP packet delivery. Methods that can provide multicast traffic transport in those approaches need to be investigated. Different access technologies have different characteristics regarding the ability to deliver multimedia traffic and are investigated in terms of their usefulness for such purposes. [C3016]

## "Mars high resolution Shallow Radar (SHARAD) for the MRO 2005 mission"

The search for water is a primary focus of Mars exploration. At the surface of Mars, water is present as ice in the polar ice caps and in trace quantities in the atmosphere. To detect liquid water on Mars today probably requires searching below the surface. As noted in the MRO SDT Report, the unambiguous detection of liquid water in the upper crust of Mars and the profiling of ice in the subsurface, particularly within one kilometer of the surface, would be major discoveries in the exploration of Mars. To that end, the MRO SDT recommended that flight of a subsurface sounding radar be considered for MRO, if the radar could confidently detect liquid water and profile ice in the topmost 1 km of subsurface with approximately 10 in vertical resolution. In response to this recommendation a team of italian researchers, sponsored by the Italian Space Agency (ASI), has proposed a Shallow Radar sounder (SHARAD). In this paper the main features of the SHARAD (to be complementary to MARSIS) in terms of the expected penetration performance according to proposed models of the martian crust composition and surface scattering are described. [C3017]

## "Venus radar for subsurface and ionosphere sounding (VENSIS)"

As a subsurface sounder, VENSIS would obtain fundamentally different kinds of geologic Information than Magellan. Mapping of Interfaces of geologic units (e.g. tessera, plains, lava flows, impact debris) could be extended into the third dimension. Reflectivity variations recorded at the surface by Magellan are likely to extend

into subsurface, providing dielectric contrast at interfaces. The VENSIS sounder would also snow detailed characterization of the Venus Ionosphere using active sounding in a frequency range of 100 kHz to 6.5 MHz. In a passive mode, VENSIS can be used to detect lightning the presence of which remains both controversial and critical to understanding the behavior of the atmosphere and the possibility of present day Volcanism. In this paper the Scientific Objectives are described and the system performance am analyzed. [C3018]

## "An effective algorithm for subsurface SAR imaging"

For many applications in subsurface sensing (e.g., landmine detection or road inspection), it is important to make images of the shallow subsurface from the data acquired by a GPR with antennas slightly elevated above the ground. Classical SAR algorithms are not well suited to this purpose. A new SAR algorithm in the space-time domain for a multi-media propagation environment is proposed. In comparison with known algorithms, this algorithm is significantly simplified without loss of accuracy. The simplifications are based on a physical analysis of the sensing wave propagation. We also show that, for a multi-media background, it is not possible to determine correctly the depth of a scatterer and the speed of light in the ground from only one B-scan without additional information about the transverse position of the scatterer. [C3019]

## "QoS provisioning over GPRS wireless mobile links"

The general packet radio service (GPRS) offers performance guaranteed packet data services to mobile users. This paper presents a guaranteed quality-of-service (QoS) provisioning scheme over GPRS wireless mobile links by proposing a guaranteed QoS media access control (GQ-MAC) protocol and an accompanying prioritized handoff call admission control (PH-CAC) protocol to maintain QoS guarantees under the effect of mobile handoffs. The GQ-MAC protocol supports bounded channel access delay for delay-sensitive traffic, bounded packet loss probability for loss-sensitive traffic, and dynamic adaptive resource allocation for bursty traffic. The PH-CAC protocol provides prioritized admission by differentiating handoff requests with different higher admission priorities over new calls via a multiple guard channel scheme. [C3020]

## "Fair and efficient resource management scheme to support transient data recovery for migrating users in wireless multicast networks"

Migrating users in a wireless multicast network may need to recover lost data during handoffs before they can merge into the respective multicast groups in the new cell. The multicast groups in packet switched wireless networks typically share resources on a statistical multiplexed basis. To minimize impact on other users, we allow part of a multicast group's assigned bandwidth to be shared by the handoff users for transient data recovery using the proposed weighted fair share (WFS) method with optimal weight selection. Handoff users are admitted into the new cell using the proposed multicast connection admission control (MCAC) scheme. These schemes constitute the fair and efficient wireless multicast resource management scheme (FEWMS) presented in this paper. Under FEWMS, the migrating user can quickly recover lost data and merge into the existing multicast group during a handoff. Simulations using self-similar traffic sources show that the proposed method reduces the handoff failure probability of migrating users and increases the overall system throughput compared to existing proposals. [C3021]

## "Communication using multiple wireless interfaces"

With the emergence of different wireless technologies, a mobile terminal equipped with multiple interfaces can achieve a much higher bandwidth by aggregating the bandwidth offered by the individual networks. In this paper, we present a system based on Mobile IP that achieves the above objective. We discuss in detail the architectural requirements and algorithms that are needed to support the system. [C3022]

## "Techniques of effective cellular site facility protection"

One of the most challenging electrical protection environments is the cellular/PCS (personal communications system) antenna site. Many failure instances were examined and risk factors have been determined. The results show that typical electrical protection at the network interface does not address certain scenarios likely to occur at cellular tower sites. This article discusses why copper telephone cable and premises equipment are vulnerable to lightning-related events. The National Electric Code (NEC) does not address these lightning-related issues. Some lightning-mitigation techniques used at telephone central offices, which have been addressed previously by BELLCORE, including the concept of isolated ground planes, are discussed as they apply to cell/PCS sites. This article discusses one protection scheme (isolation) for typical telephone facilities into cellular antenna sites and the associated buildings or equipment housing. Also discussed are less specific techniques such as minimizing the ground impedance, eliminating or diverting circulating currents, and special coaxial protection. Ground potential rise (GPR) and electromagnetic induction (EMI) occur at the same time during unbalanced

power line faults. The experimental part of the research examines whether isolation at the network interface at cell sites can address GPR and longitudinal induction due to lightning [C3023]

## "IP header compression in the SGSN"

This paper discusses how protocol header compression schemes can be implemented in the Serving GPRS Support Node (SGSN) as part of the GSM recommendations. We briefly describe details of the two compression algorithms currently selected for implementation by the recommendations committee, followed by an explanation of how these schemes can be implemented in the SGSN [C3024]

## "Design and performance modeling & simulation of self-healing mechanisms for wireless communication networks"

The use of wireless communications networks has gained phenomenal momentum both in the business and individual-user sectors. As a consequence of the increasing reliance of businesses on such networks, service disruption due to network facility failures can cause severe economic impact on the associated business. Hence service survivability-i.e., providing continued service in the midst of network failures becomes an important feature for network providers to incorporate within their network. In this work, we propose appropriate self-healing mechanisms that can be used by network providers/engineers to provide automatic service restoration (hence service survivability) in the event of network facility failures in the wireless networks of today. In particular, our contribution is as follows. We propose appropriate (cost-performance- and complexity-sensitive) self-healing mechanisms that can be used both in the currently deployed GSM-based and the rapidly emerging GPRS-based wireless networks to provide service survivability. We then perform modeling and simulation of portions of the proposed self-healing mechanisms and analyze the performance of the proposed self-healing mechanism in the core network portion of a GSM/GPRS-based system. Our simulations not only help to demonstrate the importance of simulation-based studies towards understanding, modeling and analyzing the performance of the proposed self healing mechanisms but also help provide useful insights into the potential of the proposed self-healing mechanisms. [C3025]

## "Hilbert filter for double-layer perpendicular recording media"

Summary form only given. Readback waveforms from GMR heads in perpendicular magnetic recording are completely different from the regular longitudinal recording waveforms. Proper signal equalization is therefore critical. For this purpose a Hilbert filter is discussed. This filter is known to transform the dipulse response from a single layer perpendicular media into a longitudinal signal, however, for double layer perpendicular media with a soft magnetic underlayer its properties have not been reported yet. In this paper the authors discuss the performance of the Hilbert filter for double-layer perpendicular recording media. [C3026]

## "A GSM/GPRS mixed-signal baseband IC"

First Page of the Article [C3027]

## "A GSM/GPRS mixed-signal baseband IC"

A dual-core baseband processor IC for GSM/GPRS cellular phone applications is built in a 0.13 μm CMOS process with 5 levels of copper interconnect and contains a high level of mixed-signal integration which includes: 1 GHz CMOS synthesizer, 10 b general-purpose ADC, two 14 b ADCs, power amplifier controller, and 13 b voice codec [C3028]

## "A single-chip quad-band [C850/900/1800/1900MHz] direct conversion GSM/GPRS RF transceiver with integrated VCOs and fractional-N synthesizer"

First Page of the Article [C3029]

## "Multiobjective hierarchical location and routing area optimization in GPRS and UMTS networks"

We propose four-layer optimization for UMTS coverage area: (i) cell-oriented intra-SGSN layer, which is optimized RA areas covering the intra-SGSN signaling cost, paging cost and RA load balancing, (ii) RA-oriented intra-MSC layer, which is optimized location areas covering the intra-MSC signaling cost and LA load balancing,(iii) RA-oriented inter-SGSN layer, which is optimized SGSN coverage areas covering the inter-SGSN signaling cost, RNC and SGSN load balancing, (iv) LA-oriented inter-MSC layer, which is optimized MSC coverage areas covering the inter-MSC signaling cost and MSC load balancing. We first calculate the multi-objective cost functions for each layers in UMTS, namely intra-SGSN and inter-SGSN layers. We then simulate

an UMTS network using the niched Pareto genetic algorithm, which deals with multiple objectives by incorporating the concept of Pareto domination in its selection operator, and applying a niching pressure to spread its population out along the Pareto optimal tradeoff surface. We also define geographical footprints, and its impact on the network cost [C3030]

## "Subsurface radar investigation of arched wall aperture"

A subsurface holographic radar using a monochromatic signal has been developed. It is intended for surveying building structures and works. The characteristic feature of this device is the possibility of obtaining in a sounding plan the microwave images featuring a high resolution attaining 2...3 cm. The main application of this device includes the survey of building constructions to reveal their internal structure and defects. An arched aperture in a brick wall was studied with help of the radar to search metallic beams. The goal of investigation was evaluation of the load-carrying ability of the wall. [C3031]

## "Interface identification using a GPR signal: a Monte Carlo Markov chain approach"

This paper presents a new signal processing method to improve the identification of interface between different layered media, using a ground penetrating radar (GPR) recording. Our methodological approach is based on Monte Carlo Markov chain (MCMC) model. The deconvolution of the GPR signal is obtained in considering a stochastic estimation related to a maximum a posteriori criterion. The only known elements are the signal recorded from the GPR backscattering (one dimension approximation), and the order of the ARMA signal model for the emitted pulse. [C3032]

## "Airborne sensor concept to image shallow-buried targets"

This paper develops an airborne sensor concept to detect and image shallow-buried targets with a focus on the remote sensing of landmines. Our ongoing ground-based bistatic ground-penetrating radar (GPR) experiments have demonstrated deep penetration and subwavelength resolution. Simulation software (ground penetrating radar processing-GPRP) was developed and validated using experimental results. Extrapolation of the experimental results to higher frequencies using the simulation software indicates the ability to provide high-quality images of shallow-buried targets. [C3033]

## "Ultra-wideband 3d-imaging Ground Penetrating Radar using Synthetic Waveforms"

This paper reports results from a ground penetrating radar that uses an antenna array for 3-dimensional underground imaging. The radar applies digitally generated waveforms for high system performance using low transmitted power. The antenna array covers a 2.6 meter wide swath, hence the system can collect data fast and efficient over large areas. The system has been applied to utility mapping and railway inspection during 2002 demonstrating high-resolution imaging of concealed targets and underground structures. [C3034]

## "Adaptive Bow-Tie Antenna with Increased Bandwidth"

The paper describes a conceptual approach to develop an ultra-wideband antenna, which can be adapted to the properties of the environment and to the generator spectrum. Such antennas are of special interest for Ground Pentrating Radars, where the antenna should radiate in a similar way into different types of the ground. The adaptive antenna concept has been verified both numerically and experimentally for a slotted bow-tie antenna. It was shown that by varying the position of the straight slot in the antenna flair it is possible to adapt the antenna to different values of the ground dielectric permittivity. A technical solution for controlling the slot position electrically is proposed. [C3035]

## "Global mobility approach with Mobile IP in "All IP" networks"

The purpose of the document is to describe how the EURESCOM project P1013 FIT-MIP evaluates the use of Mobile IP in an IP core network, acting as a mobility management protocol federating heterogeneous access network technologies such as PSTN, WLAN or GPRS. The aim is to provide a wide IP environment with an always-on access to IP applications (VoIP, VPN, mobile Internet, etc.), Mobile IP functionalities enabling seamless mobility through the various networks. [C3036]

## "Dynamic adaptive QoS provisioning over GPRS wireless mobile links"

The General Packet Radio Service (GPRS) offers performance guaranteed packet data services to mobile users. A dynamic adaptive guaranteed quality-of-service (QoS) provisioning scheme is proposed over GPRS wireless mobile links via the guaranteed QoS media access control (GQ-MAC) protocol and the accompanying adaptive

prioritized-handoff call admission control (AP-CAC) protocol to maintain QoS guarantees under the effect of mobile handoffs. The GQ-MAC protocol supports bounded access delay and packet-loss probability for respective delay and loss sensitive traffic, and dynamic adaptive resource allocation for bursty traffic. The AP-CAC protocol provides dynamic adaptive prioritized admission by differentiating handoff requests of different traffic classes with higher admission priorities over new calls via the dynamic multiple guard channels scheme, which adapts the channel capacity limits reserved for the multiple handoff request classes in each radio cell based on the current estimates of their arrival rates derived from the current number of ongoing calls in neighboring radio cells and the mobility pattern. [C3037]

## "Channel capacity fair queueing in wireless networks: issues and a new algorithm"

Wireless fair queueing algorithms have been extensively studied recently. However, a major drawback in existing approaches is that the channel model is overly simplified-a two states (good or bad) channel is assumed. While it is relatively easy to analyze the system using such a simple model, the algorithms so designed are of a limited applicability in a practical environment, in which the level of burst errors are time-varying and can be exploited by using channel adaptive coding and modulation techniques. In this paper, we first argue that the existing algorithms cannot cater for a more realistic channel model and the traditional notion of fairness is not suitable. We then propose a new notion of fairness, which bounds the actual throughput normalized by channel capacity of any two sessions. Using the new fairness definition, we propose a new fair queueing algorithm called CAFQ (channel adaptive fair queueing), which, as indicated in our numerical studies, outperforms other algorithms in terms of overall system throughput and fairness among error prone sessions. [C3038]

## "Performance evaluation of WAP-based applications over GPRS"

Wireless application protocol (WAP) as one application of mobile data services is examined with the aim to provide guidelines for the dimensioning of next generation mobile radio networks. The performance of WAP-based applications over GPRS is evaluated in scenarios where the GPRS radio resources are shared with conventional Internet applications like WWW and e-mail. Simulation results for quality of service measures for the different applications and GPRS system measures are produced with the simulation tool GPRSim that models the application and user behavior, the TCP/IP and WAP protocol architecture, the GPRS protocol architecture and the radio channel. Especially the effect of traffic generated by conventional Internet applications on the WAP performance and vice versa are determined. These results give an estimation of the GPRS network capacity needed for a traffic mix of WAP-based and conventional Internet applications. [C3039]

## "Analytical concepts for GPRS network dimensioning"

This paper deals with analytical concepts for the dimensioning of packet switching mobile radio networks. A realistic characterization of source traffic with means of marked Markovian arrival processes (MMAP) serves as an input process for a queuing model. The analysis of this model permits us to derive the quantities of interest and allows us to determine the achievable quality of service, which is quantified in terms of utilization and packet delays. The applicability of the approach is demonstrated by embedding our analysis into the framework of GSM/GPRS. [C3040]

## "Generalized partial response targets for perpendicular recording"

Summary form only given. A new model for the transition response in perpendicular recording was proposed by Ozgunes et al. (2002), namely g(t) = erf($\sqrt{}$(ln 16)t/PW50), where erf(·) is the error function and PW50is the width of the derivative of g(t) at half its maximum. We propose new generalized PR (GPR) targets based on this transition response and compare their performance. [C3041]

## "Design of a planar broad-band antenna using a genetic algorithm and the MoM"

In this paper a planar broad-band antenna, which can be used as a ground penetrating radar, is designed by a combination of a genetic algorithm (GA) and a method of moments (MoM) technique. The GA optimizes the shape of the metallisation pattern in order to minimize the return loss in the chosen frequency band of 1-6 GHz, while the return loss is evaluated with a MoM-analysis. The optimization is made more efficient by applying the direct matrix manipulation (DMM) method. In order to distinguish symmetric and non-symmetric objects, an antenna which detects cross-polarization is used. [C3042]

## "Adaptive bow-tie antenna with variable current distribution"

In this work we have demonstrated the possibility to adapt a GPR antenna to different environments using electrically controlled reactive loads. It was shown that it is possible to vary the antenna transfer function

spectrum as well as the main pulse amplitude and the antenna ringing. It is suggested to use an antenna with controlled internal resonances for post-processing synthesis of pulses with special waveforms to suppress parasitic reflections from the environment. [C3043]

## "The planar near field antenna system for underground investigation"

This paper is concerned with the detection of underground objects, especially mines. They threaten civil life in many countries and are a serious problem for innocent people far from the hot-war. This work considers objects in the size range of 5-30 cm diameter, and the frequency band is selected to determine this size of mine. We investigate the antenna system and synthesis of the field pattern required. [C3044]

## "Design, implementation and testing of a prototype 1.1-2.1 GHz SFCW GPR for use in landmine detection"

The problem of undetected anti-personnel landmines is both of major political concern and a formidable engineering problem. Currently, no affordable, accurate method for detecting such mines exists. As a solution to the landmine problem this paper gives an account of the design, implementation and testing of an inexpensive, prototype 1.1-2.1 GHz stepped frequency continuous wave (SFCW) ground penetrating radar (GPR) for landmine detection. Initial tests performed in a laboratory based environment using a homogenous Styrofoam ground medium have shown that the design has the potential to accurately detect landmines in a field test situation. [C3045]

## "Near field analysis of a wideband log-spiral antenna for 1-2 GHz GPR"

A log-spiral antenna is described. It is part of the ultra-wideband stepped frequency ground penetrating radar (GPR) for subsurface landmine detection currently being developed at the University of Manitoba. Log-spiral antennas possess many features that are desirable in such a radar system: low profile, high bandwidth, and circular polarization. The design and construction of the antenna are described. The antenna is fitted with a wideband balun to balance the current between the two arms of the spiral. An absorber loaded cavity is used behind the antenna to help direct the energy into the ground and keep it from radiating into the air. A study of the far and near fields of the antenna, via simulations and measurements, is presented. The near fields are measured using short coaxial E-field probes at an electrically short distances from the antenna and agree well with simulations. [C3046]

## "3-D short pulse scattering by moderately rough dielectric interfaces via quasi-ray Gaussian beams"

In the context of ground penetrating radar illumination of moderately rough interfaces, we have recently developed a number of physics-based, computationally efficient, forward scattering models for both time-harmonic and pulsed excitations, using Gabor-based narrow-waisted Gaussian beam algorithms. These forward solvers, so far restricted to two-dimensional configurations, have subsequently been incorporated into adaptive subsurface sensing techniques aimed at detecting, localizing and classifying shallow-buried low-contrast targets. In this paper, we extend the 2D short-pulse physical-optics (PO)-based forward scattering model to the more challenging and realistic case of 3D (vector) configurations. [C3047]

## "Accurate antenna models in ground penetrating radar diffraction tomography"

Linear inversion schemes based on the concept of diffraction tomography have proven successful for ground penetrating radar (GPR) imaging. In many GPR surveys, the antennas of the GPR are located close to the air-soil interface and, therefore, it is important to incorporate the presence of this interface in the inversion scheme (see Hansen, T.B. and Meincke Johansen, P., IEEE Trans. Geoscience and Remote Sensing, vol.38, p.496-506, 2000). Hansen and Meincke Johansen modeled the antennas as ideal (Hertzian) electric dipoles. Since practical GPR antennas are not ideal, it is of interest to investigate the validity of this model. We extend that formulation to hold for arbitrary antennas. For simplicity, the 2.5D case is considered, that is, it is assumed that the scattering object in the soil is invariant in one direction, which, for instance, is the case for a pipe. The arbitrary antennas are modeled by their plane-wave receiving and transmitting spectra. We find these spectra numerically for a resistively loaded dipole using the method of moments. Also, we illustrate, through a numerical example, the importance of taking into account the correct antenna pattern in GPR diffraction tomography. [C3048]

## "Modeling of inclined anisotropic complex permittivity media using the self-consistent impedance method"

The self-consistent impedance method has been shown to accurately model media with inclined, complex

permittivity using the Euler rotation of the inverse complex permittivity tensor. The resultant complex permittivity tensor is diagonally symmetrical so the solutions are valid for groundwave propagation since reciprocity is satisfied. These results are important for high frequency geophysical techniques (e.g.. radio magnetotellurics, ground penetrating radar). Other suggested uses of the self-consistent impedance method include the modeling of transmission lines on active anisotropic, dielectric substrates at higher frequency regimes. [C3049]

## "Quasi-ray Gaussian beam algorithms for subsurface sensing in the presence of a moderately rough air-soil interface"

A major source of variability in ground penetrating radar (GPR) interrogating signals is related to reflection from, and (double) transmission through, the rough unknown air-soil interface which obscures the useful target-scattered signals. These considerations motivated our recent investigations toward a more robust, physics-based, adaptive approach to subsurface imaging in the presence of a moderately (both in height and slope) rough air-soil interface. The proposed approach entails prior estimation of the deterministic gross features of the rough interface and subsequent exploitation of this information to enhance underground target imaging. So far, this approach has been applied to two-dimensional (2D) frequency-stepped and pulsed GPR configurations, for slightly lossy soils and low-contrast mine-like targets, yielding encouraging results. In this paper, we briefly review the proposed framework and discuss some representative results. [C3050]

## "Detection of dielectric targets buried in a very lossy Earth"

In this paper, we propose an efficient method to reconstruct the dielectric objects buried in the lossy Earth using the Born approximation and the Born iterative method. For the detection of buried targets, the diffraction tomographic (DT) algorithm has been an efficient tool. It is fast and stable, and can be used for on-site detection. However, the exact DT algorithm is only valid in the lossless case. Although it was later generalized to the lossy case, the Earth conductivity still cannot be very high. Also, DT algorithms require high-frequency spectrum. Our study shows that DT algorithms provide high-resolution images if the upper frequency is larger than 50 MHz. When the upper frequency is smaller than 30 MHz, DT algorithms become invalid. In this paper, an efficient inversion method is proposed using the least-square minimization and Tikhonov regularization technique, which is valid for the VETEM system. Based on the fast forward solver for buried dielectric objects we developed (Cui et al. 2002), the inversion algorithms are very fast. For a 8 Ч 8 Ч 8 pixelled reconstruction domain, only 10 seconds are required for the Born-approximation inversion, and 160 seconds for each Born iterative scheme. Reconstruction examples are given to test the efficiency of the inversion algorithm. [C3051]

## "Mobile pneumatic robot for demining"

The enormous amount of anti-personal land mines scattered over many countries worldwide is a major humanitarian problem asking for an efficient solution at an affordable cost. The article describes a robust and low cost mobile robot that can transport equipment of about 1.5 times its own weight over natural terrains with inclinations superior to 40 degrees. The robot mechanical structure is optimised for precisely scanning large areas of natural environments with land mine detection sensors. The paper also describes the control architecture of the robot with the possibility to correct the motion direction. The land mine sensing system of the robot is presented. [C3052]

## "Eliminating adjacent-channel interference in satellite-based General Packet Radio Service (GPRS) systems"

This paper presents a method for eliminating adjacent-channel interference (ACI) in satellite-based General Packet Radio Service (GPRS) systems using a new fuzzy adaptive filters (FAF). We validate the reasons for using such a filter by analyzing the Bayesian detector in which some parameter uncertainties exist. A clustering method is used to adaptively design the parameters of the FAF. Simulation results show that the detector based on the new FAF perform better than the maximal-likelihood block phase estimation detector. [C3053]

## "Throughput estimation for EGPRS services based on GSM network measurements"

This paper presents throughput distributions for EGPRS and GPRS services based on measurements from a real network. First, CIR distributions for different frequency reuses are estimated based on mobile measurements reports and in a method here presented. Second, throughput and spectral efficiency values are calculated considering the estimated CIR distributions by means of mapping tables. Finally, the relative throughput and spectral efficiency gains between EGPRS and GPRS are given for different scenarios at the border and at the center of the cell. [C3054]

## "Combined underwater acoustic and radar instruments for assessing fish near seabed and mapping seabed"

An underwater acoustic and marine radar survey was conducted for the assessment of fish near the seabed and for seabed mapping. For the purpose, an underwater acoustic instrument (split beam echo sounder), and ground penetrating radar (GPR) were used around Seribu Island, Jakarta Bay. Research vessel Mina Jaya (30 GT) and various marine research instruments were employed during the survey. The results show that the fish density near seabed is 0.3 to 35.0 fish/1000 m3with fish length up to 44.6 cm. Radar has a higher resolution for subbottom detection than high frequency acoustics. [C3055]

## "Design of a mobile VPN able to support a large number of users"

The paper presents the design of a virtual private network able to support mobility of the user. The VPN has two parts: the access network and the public Internet to connect to the corporate intranet. The access network can be based on GPRS or a WLAN. The system uses the security provided by the access network and IPSec in the public Internet. The mobility of the terminal is supported by the use of Mobile IP that allows maintaining the intranet private IP address when roaming. As mobile VPN is offered as a service, the provisioning is considered an important part of the system. Scalability guides the design and implementation phase to assure a smooth increase of the size in the number of VPNs and users. [C3056]

## "Algorithms for resource allocation in data transfer over EGPRS networks"

The third generation (3G) mobile system will be based on the Global System for Mobile communications (GSM) and will begin with the General Packet Radio Service (GPRS). Finally the additional channel capacity offered by the Enhanced Data-rates for Global Evolution (EDGE) will bring 3G services to users of these systems. This final system is often regarded as part of the 3G family and is referred to as Enhanced GPRS (EGPRS). Our goal is to investigate the efficiency of different algorithms used for resource allocation in data transfer over EGPRS networks. We consider a number of users in a cell that want either to send or to receive data and a centralized controller known as the packet control unit (PCU). The PCU is the part of the base station sub-system (BSS) which performs the arbitration mechanism to share the radio resources between users. The users can use nine different channel coding schemes, each one allowing a certain bit rate, but for the purposes of this discussion it is assumed that users can only use coding schemes one and two (CS1 and CS2) as a higher degree of flexibility is unimportant to this investigation. [C3057]

## "DNA integrity invitro study of human peripheral blood leukocytes exposed to extremely-low-frequency electromagnetic fields using comet assay"

Exposure to extremely-low-frequency (ELF) electromagnetic fields (EMFs) of various intensities is ubiquitous in both domestic and occupational environments. There is a concern over the possibilities that exposure to EMFs might affect the process of carcinogenesis. Controversial information is available on the effect of EMFs on DNA integrity. Hence, the present study was carried out to investigate the invitro effects of ELF-EMFs of varying flux densities (0.2, 0.4, 0.6, 0.8 and 1 mT at 50 Hz) on DNA integrity in human peripheral blood leukocytes using comet assay. All exposures were given at 37°C (i.e., human body temperature). The experimental setup to produce the EMF consisted of an assembly of a dimmerstat, transformer, ammeter and air-cored coils to provide the desired field intensity at the seat of the blood samples. One set of coils was shielded against external, stray electromagnetic fields by housing the set of coils in a mu-metal (extremely-high-relative permeability magnetic material) box. Four types of exposures were studied simultaneously: (1) EMF exposure, samples shielded inside mu-metal box, placed in an incubator; (2) EMF exposure, samples not shielded, arranged inside the same incubator; (3) no EMF exposure, samples not shielded, but placed in dummy coils inside another incubator, and (4) no EMF exposure, no shielding, no dummy coils, but samples placed in a thermos containing water maintained at 37°C. In addition, one set of samples was processed immediately after collection without any treatment. Heparin zed peripheral blood samples were collected from 6 adult males in the age group of 20-24 years. The subjects were non-smokers and non-drinkers of alcohol. Their leukocytes were processed by comet assay in the above mentioned treatments and controls. 100 cells per treatment were scored for comet tail-length which is an estimate of DNA damage. DNA damage increased with exposure dose. The results are similar to our earlier studies. Moreover, DNA damage had the following trend according to the types of exposures mentioned above: non-shielded exposed inside incubator>shielded exposed inside incubator>non-shielded non-exposed inside incubator>non-shielded non-exposed inside thermos>control. [C3058]

## "Impulse ground penetrating radar for nondestructive evaluation of pavements"

A novel impulse ground penetrating radar (GPR) has been developed and demonstrated for nondestructive evaluation of pavements. The GPR is completely fabricated using MICs. It has been used to measure the

relative dielectric constants and thickness of various samples. Good agreement between the theoretical and measured results was achieved [C3059]

## "Subsurface radar examination of an airstrip"

The increasing intensity of air traffic and growing take-off mass of passenger and cargo civil airplanes leads to the growth of a loading on airstrips, taxiways and aircraft parking places of airports. It results in an increased wear of concrete pavement and requires a continuous monitoring of their state and supporting power with the object of ensuring the flight safety. Subsurface radar can be used as one of the means for non-destructive testing of a reinforced concrete airfield. Taking into account large areas of airfield pavements and their constructive features, the carrying out of these jobs will probably require the creation of dedicated equipment and software. [C3060]

## "Flexible resource allocation strategy with prioritisation levels"

A new flexible resource allocation (FRA) scheme called flexible resource allocation strategy with prioritised levels (FRASPL) is proposed. FRASPL meets the upper capacity bound for FRA strategies while providing acceptable quality to the admitted request by using degradation and compensation of all active calls. FRASPL can trade-off capacity and QoS. FRASPL is deliberately designed to cope with several service types defining also prioritisation rules that makes it different to the rest of the strategies previously proposed in the literature. [C3061]

## "Signaling capacity in GSM & (E)GPRS networks"

Due to the introduction of new packet switched services as GPRS and EGPRS in the existing GSM networks, the effects on these networks need to be analysed. We address the effect of (E)GPRS services in the signaling capacity of GSM networks. The standards allow one to have separated pools for traffic channels, in order to make the resources for voice calls and data services independent. Nevertheless, the channels used for signaling purposes can be either the same for both services or different. These channels are the common control channel (CCCH) and packet common control channel (PCCCH). CCCH is used in GSM networks for call establishments and other signaling procedures, and it can also be used for (E)GPRS. PCCCH is an independent channel used only for (E)GPRS, which makes it impossible to degrade GSM calls due to signaling, and also, it presents other advantages, i.e. having different frequency lists and cell reselection criteria from the GSM ones, or allowing one to chose the cells that can be selected for each service. This paper presents a study about the signaling capacity for both options. By means of simulations, first the capacity of CCCH for GSM networks is analysed considering all the needed signaling between the mobile and base station. Then, the remaining resources of the CCCH channel are calculated in order to find out the capacity that can be used for (E)GPRS services. The capacity of the PCCCH is also simulated in order to compare its signaling capacity with CCCH. [C3062]

## "Performance of slotted ALOHA based GSM access network considering the impact of RACH slots"

The performance of a slotted ALOHA based GSM access network is evaluated for various traffic cases. The impact of optimized random access channel (RACH) slots on exponentially increasing total access traffic load is analyzed. The probability of success is estimated and related to the number of RACH slots per time unit. The traffic channel utilization rate is calculated for various channel holding time. The access throughput is presented for different RACH slots. The total access load is found to decrease with the increase in the probability of success for the same new packet generation rate. An optimized relation between the total access load and the new arrival rate for different RACH slots is presented. [C3063]

## "Internet marine transport container global positioning service (IMTCGPS)"

Recently, the development of Internet and satellite positioning technology are roaring, networked application service over GPS becomes a new network service trend for information service providers (ISPs), and it will bring in the revolutionary impact on conventional telecommunication services, especially on very kinds of transportation services. Fundamentally, the networked GPS service through short-messages, general packet radio service (GPRS) transmission channels can take the advantages of service flexibility, and it is an integration system service at least including five aspects: wireless technology, graphic technology, integrated database, statistics application, and networked management technology. Our research goal is to build networked GPS service through short-messages and GPRS transmission channels, and to provide the marine transport container positioning service to business companies for inventory management and truck dispatching management service for promoting business competition capability. [C3064]

## "Propagation time estimation for microwave subsurface radar by novel cross-correlation and envelope method. A study on high resolution microwave subsurface radar image. 2"

For pt.1 ("Identification of Transmitting Wave Form for Deconvolution Process. A Study on High Resolution Microwave Subsurface Radar Image. 1") see ibid., p.1891-3 (2002). A time of a microwave propagation from a transmitter to a receiver via a reflective object in a soil is estimated based on a model fitness. Since the model fitness is expressed as a function of time and has a single-peaked pattern at the propagation time, the propagation time is determined from the time of the peak of the model fitness. It is proven in this paper that the model fitness can be calculated as an envelope of a cross-correlation function between a transmitting wave and a receiving wave. The propagation times are obtained at each measurement point. A point diagram plotted the peak time on x-z coordination shows clearly the position of the object. In this report, detections of three different size of steel pipes are experimentally demonstrated. [C3065]

## "Identification of transmitting wave form for deconvolution process. A study on high resolution microwave subsurface radar image. 1"

A subsurface radar is applied broadly for detection such as cavities, water pipes and gas pipes. However since the vertical resolution is not enough, it is difficult to grasp correctly the position and form of buried object. Then, this research describes the shape of transmitting waveform that is important in deconvolution process. It checks that vertical resolution improves by proposing method. [C3066]

## "Knowledge-based library re-factoring for an open source project"

Software miniaturization is a form of software re-factoring focused on reducing an application to its bare bones. Porting an application on a hand-held device is likely to require a preliminary step of software miniaturization, plus the development of device drivers dedicated to the new environment and hardware architecture. This paper presents the process and lessons learned in re-factoring a large open source application to remove any excess, introduce shared libraries, remove circular dependencies among libraries and, more generally, to minimize inter-library dependencies. While the final goal was to fully exploit shared library capabilities, among the various possibilities we defined a process based on existing knowledge about the application, and aimed to minimize the maintenance effort required by miniaturization activities. [C3067]

## "Implementing wireless networks with transition mechanisms"

The deployment of wireless networks based on IPv4 is spreading quickly all over the world. However, there is a strong shortage of public IPv4 addresses. Because of this, IPv6 has recently, received a new push of development. Most of the advances related to IPv6 are concerned to the development of transition mechanisms allowing IPv6 hosts to communicate through an existing IPv4 infrastructure or yet, permitting the communication between IPv4 and IPv6 hosts. This paper addresses the issue of using private IP addresses for implementing Mobile IP in wireless networks using IPv4/IPv6 transition mechanisms. An overview of the published IPv4/IPv6 transition mechanisms is presented, then, a new mechanism, called Transparent IPv6, which combines features of existing mechanisms, is proposed. The Transparent IPv6 mechanism consists in virtually assigning IPv6 addresses to IPv4 hosts without modifying user devices. This technique could be used to permit the deployment of wireless networks without requiring public IPv4 addresses, using legacy IPv4 equipments. [C3068]

## "Performance optimization results of hierarchical cell structures in GSM and GPRS networks"

First Page of the Article [C3069]

## "Total variation regularized velocity estimation to image subsurface reflectivity"

We propose a modified frequency-wavenumber migration method to enhance subsurface imagery obtained by ground penetrating radar (GPR) array to localize buried landmines and other objects. The method aims to minimize the entropy of processed image by introducing different wave propagation velocity for each array element. The different wave propagation velocity is organized to form a velocity vector. On the other hand, by constraining the total variation of the velocity vector, the method satisfies physics requirement that the velocity shall not change abruptly. The optimization scheme is built in the framework of Tikhonov regularization by selecting proper regularization parameter. We use examples obtained from 2-D GPR images. The frequency-wavenumber method and its optimization can be generalized to 3-D in a straight-forward manner. [C3070]

## "Practical experience with TCP over GPRS"

We present the results of a series of experiments used to characterise the performance of a GPRS (General

Packet Radio Service) wireless data network, hence highlighting issues that software architects should consider when designing applications to run over this soon to be widely-deployed service. In summary, we show that packet round trip time (RTTs) are large (>1000 ms) and can be highly variable, packet losses are relatively rare, and that available bandwidth can be quite variable. These network characteristics do not interact well with current TCP implementations. We show how it takes many seconds before a new TCP connection can expand its congestion window to make use of the full bandwidth available, leading to very poor performance of protocols like HTTP. Beyond the point of full bandwidth utilisation, TCP continues to expand the window needlessly, resulting in excessive queueing at the GPRS router. This leads to greatly inflated RTTs (10s of seconds) and hence poor interactive response and slow recovery should loss occur. We show how a simple transparent proxy interposed between the fixed and GPRS networks can be used to significantly improve TCP connection performance, particularly for activities like Web browsing. [C3071]

## "Performance evaluation of GSM and GPRS systems based on measurement campaigns and statistical analysis"

Today we are moving toward the deployment of new services, mainly based on high-speed data communication. The circuit-switched networks are about to come to the end of their lifecycle and the rapidly increased number of subscribers give a boost to development of new technologies. GPRS is the first step towards this milestone and most cellular GSM operators have already launched services based on GPRS. It is expected that both GSM and GPRS will continue to be operated in a diversified radio environment of the forthcoming years. In this paper we present an in-depth study performed in a cellular DCS system, both for the circuit- and the packet-switched part. We identify problems so that we can indirectly trigger further development of the systems. [C3072]

## "QoS support in the UMTS/GPRS backbone network using DiffServ"

The Universal Mobile Telecommunications System (UMTS) has a number of service classes that require end-to-end QoS support. This requirement imposes on the design of the UMTS backbone bearer service as a part of the UMTS hierarchical QoS architecture. This paper presents a methodology for provisioning QoS in the UMS backbone network based on the Differentiated Services (DiffServ) model, a relatively simple but scalable IP-based QoS technology. This requires proper choices of QoS mapping, router configurations, and admission control. In this paper, the framework for setting a DiffServ-based backbone router as well as the requisite mapping functions for QoS interworking are addressed specifically for UMTS services. Efficient algorithms are introduced for the router model, particularly for the scheduling and buffer management components, to enhance QoS provisioning in UMTS. The effectiveness of this approach is illustrated by computer simulations. [C3073]

## "Application based access system selection concept for all IP mobile terminals"

This paper describes an application based access system selection concept for all IP mobile terminals. The provided concept hides the access technology selections from the user, and makes it possible to carry out selections automatically. The optimal access type is automatically selected based on the required QoS of the service before any user traffic Is transmitted over the all IP mobile Internet. Finally, the provided concept is validated using a use case as an example. [C3074]

## "On the feasibility of video streaming applications over GPRS/EGPRS"

We present our investigation into the potential of the general packet radio service (GPRS) and enhanced GPRS (EGPRS) with respect to video streaming. Taking real video sequences as the basis for a video streaming load generator, the simulation tool GPRSim that comprises a prototypical implementation of the standardized GPRS/EDGE protocols has been extended. Results have been obtained for simulations of actual as well as future scenarios. Both fixed and on-demand packet data channel (PDCH) allocation techniques have been considered to carry the generated traffic which contains video streaming as part of a traffic mix additionally comprising e-mail and World Wide Web (WWW) traffic. The analysis of the traffic performance measurements shows the limited capacities of GPRS networks to carry real-time data. However, the simulation results also indicate that EGPRS, as the enhanced system, is able to be a bearer, on a limited scale, for real-time traffic. [C3075]

## "Models for pre-emption of packet data by voice in slotted cellular radio networks"

Cellular radio networks supporting both circuit switched voice and packet switched data services aim to maximise the resource utilisation through efficient sharing of the resource. These sharing algorithms can use pre-emption to give voice service priority over data, thus preserving the grade of service for voice at the expense of delaying data calls. This paper develops models for a pre-emptive voice and data system, with a particular focus on GPRS. The model is based on an assumption of independence between the voice and data traffic. These

models allow estimates of (i) the probability that a voice call causes pre-emption of a data call, as well as (ii) the probability that a data call will be delayed due to either being pre-empted by a voice call while in progress or due to not finding free resources at its initial attempt. The results show that a Poisson model for data traffic gives the best results for pre-emption probability when compared with measurements taken from a GSM/GPRS network. [C3076]

## "Comparison between surface impulse ground penetrating radar signals and ultrasonic time-of-flight diffraction signals"

Surface impulse ground-penetrating radar (GPR) and ultrasonic time-of-flight diffraction (TOFD) are recent innovations in the respective geophysical remote sensing and non-destructive testing industries. Both techniques have proved highly versatile and valuable applications. This paper provides a brief description of the time-of-flight diffraction (TOFD) signals and the surface impulse ground penetrating radar (GPR) signals. The similarities between the two techniques are highlighted and it is shown how processing techniques developed for GPR data processing may be adapted for use with TOFD data. [C3077]

## "Time-frequency characteristics of ground penetrating radar reflections from railway ballast and plant"

As increasing amounts of government and industry money are invested into the upgrading and maintenance of the European railway infrastructure, there is a growing demand for rapid and reliable non-invasive techniques for the characterisation of railway trackbed (ballast). Ground-penetrating radar (GPR) has been proposed as such a geophysical tool, employing pulses of high frequency electromagnetic radiation to characterise and profile the electrical properties (permittivity and conductivity) of the subsurface. Despite the popularity of this site investigation technique, scientific techniques and results have yet to be published presenting a systematic means to quantify and evaluate the GPR returns, correlating these with the degree of ballast deterioration. This study identifies a number of features extracted from time-frequency representations of GPR returns that are capable of accurately characterising the degree of ballast deterioration in accordance with a number of different ballast deterioration models. [C3078]

## "Miniature microstrip resonators and filters for GSM/GPRS"

The theoretical design principles of new compact resonators are presented. The coupling coefficients between resonators was investigated and their dependence on the coupling gaps is discussed. Two-pole and four-pole preselector filters, for GSM900, have been designed and manufactured. The filter responses demonstrate the feasibility of selective filters developed with the proposed miniature resonators. [C3079]

## "Performance evaluation of MPEG-4 video over realistic EDGE wireless networks"

This paper examines the performance of the delivery of MPEG-4 video over a realistically emulated EDGE (Enhanced Data for GSM Evolution) wireless network. The video delivery system is based on MPEG-4 video simple profile and on the IETF protocols RTSP, RTP, and RTCP for the media delivery and synchronization in compliance with the 3GPP specifications for packet streaming services (PSS). The EDGE network emulator is based on a well-verified Markov chain model. The effect of the different EDGE network parameters is evaluated in terms of video quality. [C3080]

## "Congestion relief through immediate assignment in GSM and GPRS networks"

The paper discusses congestion relief using immediate assignment on the TCH (traffic channel). The impact of various immediate assignment strategies and their implementation in a live network are discussed. The impact of CBCH and alleviation of the resulting congestion by immediate assignment have been computed. The effect of paging load is discussed. The impact of immediate assignment on SMS (short message service), location updates, IMSI (international mobile subscriber identity) attach/detach, directed retry and LAPD concentration is analyzed. The impact of immediate assignment on the TCH strategy in Phase 1 and Phase 2 mobile stations and statistical counters is discussed. Detailed analytical results for each channel allocation profile are presented. [C3081]

## "Performance evaluation of GSM and GPRS systems based on measurement campaigns"

A comprehensive study of the performance of GSM and GPRS is presented. The behavior of the network is classified into traffic load scenarios and key indicators are presented. Network response and logical channel occupation are discussed and the GPRS segment is evaluated according to a measurement campaign. Focus is given. on traffic overload and network congestion. This in-depth study can be used as a basis to evaluate the

efficiency of resource management techniques in cellular systems. [C3082]

## "RF electronics for GSM/GPRS smart antenna"

The development of RF receivers and transmitters for a sixteen element GSM/GPRS adaptive antenna is presented. The receivers must satisfy special requirements on noise rejection, gain and coherence of signals provided by different array elements. The T shaped array allows beamforming in both elevation and azimuth planes. [C3083]

## "Subsurface penetrating radars"

Subsurface penetrating radars (SPR) are designed for subsurface monitoring and are able to execute detection, location determination and diagnosis of subsurface areas and objects at a new quality standard level. Basic problems regarding the design of such radars are examined in this paper. They are: the choice of frequency band for radio probing and the type of probing signal, information acquisition strategy, aperture generating method, estimation of resolution, dynamic range and capabilities of the system; algorithm design for radar imaging with respect to specific character of super wide band probing signal; system components design, including antenna, transmitting and receiving modules, information processing and screening module. [C3084]

## "Wireless multimedia: panacea or reality"

First Page of the Article [C3085]

## "Mobile multi-modal data services for GPRS phones and beyond"

The paper discusses means to build multi-modal data services in existing GPRS infrastructures, and puts the proposed simple solutions into the perspective of technological possibilities that will become available in public mobile communications networks over the next few years along the progression path from 2G/GSM systems, through GPRS, to 3G systems like UMTS, or equivalently to 802.11 networks. Three demonstrators are presented, which were developed by the authors in an application-oriented research project co-financed by telecommunications companies. The first two, push-to-talk address entry for a route-finder, and an open-microphone map-content navigator simulate a UMTS or WLAN scenario. The third demonstrator implements a multi-modal map finder in a live public GPRS network using WAP-Push. Indications of usability are given. The paper argues for the importance of open, standards-based architectures that will spur attractive multi-modal services in the short term, as current economic difficulties in the telecommunications industry put support for long term research into more advanced forms of multi-modality in question. [C3086]

## "Parameters optimization for synthesizing aperture method at practical use of continuous radiation underground radar"

A modification of the aperture synthesizing method aimed at improving the resolution of a subsurface radar is proposed. The results of data processing by this method are presented. The input data had been obtained with the use of a prototype of the step-frequency subsurface radar developed in the Institute of Applied Physics. [C3087]

## "On possibility of Schumann resonance observations within industrial area"

Use of a high resolution ADC allowed us to embrace the dynamic range of both signal and powerful narrow-band interference and, on this basis, to implement a compensative real-time algorithm for suppression of narrow-band interference. The developed algorithm provides suppression of "wings" due to incommensurability of the time interval of a signal undergoing spectral analysis and a period of narrow-band interference. Preliminary results of observations of extremely low frequency (ELF) natural electromagnetic background (Schumann resonance) performed within urban areas are presented in the paper. We demonstrate the possibilities of both registration of average spectra of the Schumann resonance background signal and ELF-transients. [C3088]

## "Performance enhancement of logical link control using channel quality in GPRS"

The Global System for Mobile Communications (GSM) Phase 2+ standard specifies a type of packet data service called General Packet Radio Service (GPRS). GPRS allows dynamic allocation of bandwidth resources. Wireless channels are allocated to a mobile station based on its demand. A communication session. may last for an extended period of time with intermittent packet transmissions. This paper investigates the throughput and buffer utilization in a GPRS network under popular Internet traffic models, such as WWW and e-mail (SMTP), for the (logical link control) LLC and (radio link control/medium access control) RLC/MAC layers in GPRS. The

layers work either in acknowledged (transparent) or not-acknowledged (non-transparent) mode. We propose a new protocol for the acknowledged mode of the LLC layer. We name this mechanism "channel dependent LLC protocol". The new protocol dynamically takes in to consideration the quality of the wireless channel. When the channel is of good quality, the transmission is allowed, but the transmission can not take place while the channel is not in a good condition. [C3089]

## "EDGE: a technology assessment"

EDGE is a narrowband wireless data technology evolution for GSM networks. Some GSM and TDMA operators plan to deploy EDGE as an evolution from GPRS to provide higher data rates and sector throughput. EDGE and GPRS are interim steps for these operators as they evolve to 3G technologies. The paper provides an assessment of EDGE (enhanced data rates for GSM evolution) technology in an era of increasing data demand and scarce spectral resources. Mainly, the paper addresses the question of the viability of EDGE from technical design, performance, implementation, and deployment points of view. EDGE offers higher data rates compared to GPRS but requires better radio propagation conditions. The paper analyzes the spectrum efficiency of the technology, the sector throughput and the extent of the availability of higher data rates offered by EDGE. [C3090]

## "Object detection for surface landmine with mobile robot"

Most landmine detection problems using mobile robots have been solved as a standard navigation and target identification problem implemented for the application of landmine detection. This paper solves the problem of landmine detection using low cost mobile robot from a direct perspective. Locating the object is solved using a grid based map and exhaustive search strategy that is effective in terms of accuracy. The advantage of this method is that the data reduction and analysis is done in real time. [C3091]

## "Three stages flow-shop with job over-passing"

In practical task scheduling it is sometimes required that the components of a system perform consecutively. Such scheduling is called without no-idle periods. In this paper, we study a particular case of three workshops where the no-idle constraint is applied only on the second stage. A heuristic is proposed and experimented. This work is then extended and tested for a larger size of problems. [C3092]

## "Magnetic shielding by large metallic structure in modern buildings"

In high-rise commercial buildings, the concept of raised floors and metal decking is often adopted for various purposes. The shielding performance of these metal structures is of interest. The paper presents an experimental investigation into the shielding properties of raised floors, metal decking and large flat sheets applied in buildings. It is recognized that the shielding performance depends on various parameters, such as shielding material, source orientation, shield thickness, and distance from the shield. These factors should be carefully looked at when magnetic shielding is considered to mitigate background magnetic fields. [C3093]

## "Active shielding design for a MV/LV distribution transformer substation"

The shielding of the low frequency magnetic field is obtained by using a system of fed active coils that produce a magnetic field opposite to the incident one reducing the total magnetic field. In this paper the design of a real active shield system is proposed to mitigate the magnetic field in the MV/LV distribution transformer substation located at the Engineering Building of the University of L'Aquila. The design of the active shield system is developed starting from the experimental data obtained by the measurement of the magnetic field inside the MV/LV substation. [C3094]

## "Application of the electromagnetic field method to study a communication satellite site damaged by lightning"

This paper presents a case study of a satellite communications site at which equipment was damaged during a lightning storm. The transient ground potential rise (GPR) and stress voltages on the damaged equipment (HPA) during a lightning storm are obtained using the electromagnetic field theory method. The stress voltage on the HPA is reduced by 75% (from 25 kV to 6 kV) when the isolated signal ground wire is electrically bonded to a nearby equipment ground. An extended grounding system has little influence on the stress voltages at the beginning of the transient period; however, it reduces the stress voltages significantly (by about 50%) after the first 3 μs. [C3095]

## "Validation of an algorithm for the reconstruction of an inhomogeneous dielectric profile"

As part of an ongoing programme of research conducted at Liverpool University into the characterisation of building materials using nonintrusive test methods, a wide band TEM horn facility has been developed for the reconstruction of electromagnetic properties by direct inversion of the reflected signal from the material. This employs an algorithm based on a novel microwave network theory approach in conjunction with a numerical optimisation technique. This paper summarises the measurements undertaken on various combinations of materials for the validation of this method, along with a detailed description of the microwave network theory adopted within the optimisation model. [C3096]

## "High-resolution full-polarimetric video impulse radar for landmine detection"

A full-polarimetric ultra wideband GPR front-end has been developed. The front-end is suitable for subsurface imaging with resolution sufficient for antipersonnel mine detection and recognition. In comparison with commercially available video impulse GPR systems the key advantages of the front-end are considerably larger bandwidth, ability to measure the polarimetric structure of the scattered field and very high precision of scattered field measurements. A principally new antenna system design and an ability to perform quasi-simultaneous measurements with two transmit polarizations and in two different frequency bands are main novelty aspects of the radar. [C3097]

## "A multifrequency SFCW radar for humanitarian demining"

IRCTR has developed and built a novel design of a stepped frequency continuous wave radar for humanitarian demining. The radar has the important property that it transmits signals at eight frequencies at the same time. Due to this fact and the use of a DDS for the basic signal generation, the total data acquisition time for collecting a set of data sufficient for one synthesized range profile is only 3.3 msec. The total bandwidth of the system is 4445 MHz. The electrical performance allows for sidelobes in the synthesized range profile of better than -50 dB RMS. The bistatic antennas are Archimedean spirals with dual arms. They are balanced and symmetrically fed. The paper shows the diagram of the prototype of the antenna. [C3098]

## "Radar 2002 (IEE Conf. Publ. No.490)"

First Page of the Article [C3099]

## "Adaptive antenna for ground penetrating radar applications"

A concept of adaptive antenna for ground penetrating radar applications is presented. The adaptation is achieved with respect to the antenna footprint in the ground. The shape and size of the subsurface footprint of the antenna can be changed to improve detection and localization of buried targets. The adaptive antenna is based on a wire bow-tie structure since this structure makes it possible to switch on/off its wire elements in order to form a bow-tie antenna with certain flare angle. By adjusting the flare angle in this way, the shape and size of the subsurface footprint can be varied. [C3100]

## "Lossy helical antennas for ground penetrating radar at low frequencies"

Helical antennas, used in the normal mode and horizontally polarised, are modelled using a moment method above typical lossy ground. Distributed resistive loading based on the Wu-King (1964) form was used. The centre frequency of 1 m dipoles was reduced from 250 MHz for the straight resistive wire to 50 MHz for a helix of pitch 2.5 cm and diameter 5 cm. An efficiency reduction of 12 dB was required to maintain the fractional bandwidth for this helix at unity. This conforms with the theory for small antennas in free space. The results were also verified by comparing measurements performed on a monopole resistively loaded helical antenna in a watertank with the numerical model used. [C3101]

## "Wide swathe multi-channel GPR systems for mine detection"

Many national and international programmes are underway to develop more effective detection and clearance system for buried mines. Results from the US national programmes on mine detection suggest that radar can outperform conventional metal detectors, which only respond to the metal content of a mine and hence are insensitive to minimum metal mines. Radar, and in particular ground penetrating radar, used in conjunction with other sensor arrays can result in a improved fused performance in terms of reduced false alarm rate. This paper reviews some key aspects of the performance of radar as a wide swathe sensor, in particular the system design, antenna characteristics, signal and image processing as well as detection performance. Examples of the radar images of mines and the factors that influence the image quality are presented. Current demonstrator radar systems can detect buried AT mines with some confidence, but the reliable detection of AP mines will require

further development of antennas, clutter rejection algorithms and target detection methods. [C3102]

## "A 3-D imaging method using cross-traverse data for ground-penetrating radar"

To save ground-penetrating radar computer time, this paper presents a 3D imaging method using cross-traverse data, which is based on focusing and correlation techniques. Experimental result shows the method is effective. [C3103]

## "Geo-location of detected landmines via mobile robots equipped with multiple sensors"

In the process of landmine remediation, it is necessary to determine the ground coordinates of the mines. This is needed for data association in the case of multiple looks by a single sensor as well as in the case of multiple sensors. It is also required for neutralizing the mine or marking it for avoidance. Earlier the work in this area treated the use of a single radar sensor. This has now been extended to include multiple sensors, forward-looking radar and infrared. It treats the process of combining these measurements for optimal estimation of the mine's ground coordinates as well as tracking the status of each mine with respect to each sensor's field of view. Results of simulations show significant benefits achieved by the use of the multiple sensors. [C3104]

## "GTVP (public way task management)"

GTVP is an innovative and practice solution to improve the operability, reliability, control and information flow, reducing inspection and management costs in the public ways and spaces. This application runs on PDA operating system software. The GTVP is based on GIS tools applications where the spatial data is included for its functionality. [C3105]

## "Delay and data rate decoupled fair queueing for wireless multimedia networks"

This paper proposes a delay and data rate decoupled fair queueing scheme for wireless multimedia, where two separate scheduling algorithms are applied respectively for real time and non-real time flows. For real time flows, we propose an explicit-delay-guarantee algorithm to guarantee the delay deadline, while a conventional fair queuing algorithm is adopted for non real time flows to guarantee fairness and throughput requirements. In erroneous wireless channel, resource swapping is further adopted to guarantee the required quality of service. In addition, a real time flow can easily react to varying channel error condition by controlling the transmission order without degrading the performance of other real time flows. Through simulations, it is shown that the proposed scheme provides not only improved performance in terms of delay but also simplified control operation in dynamic channel error condition. [C3106]

## "Analysis of an enhanced signaling network for scalable mobility management in next generation wireless networks"

In order to support new personal communication services (PCS) in 2.5G and 3G networks, the underlying signaling network must support scalable and fault-tolerant mobility management. A mobility management architecture based on multiple home location registers (HLRs) and multiple gateway GPRS support nodes (GGSN) can meet both of these requirements. We consider an enhanced network architecture in which the mobility management databases, in particular, the HLRs, are interconnected by a TCP/IP network. The primary function of this additional network interface will be to support synchronization of the replicated and/or distributed HLRs. We outline the architecture of the converged signaling network and discuss the integration with the GPRS network. We then present analytical models to quantify the benefit of distributed HLR and replicated GGSN architectures. Our results show that a distributed HLR architecture can reduce the update and query delay. Finally, by appropriately load balancing the multiple GGSNs, the mean packet delay can be significantly reduced. [C3107]

## "Wireless packet scheduling for two-state link models"

Packet scheduling is key to the provision of quality of service (QoS) differentiation and guarantees in a wireless network. Unlike its wireline counterpart, wireless communication poses special problems such as time-varying link capacity and location-dependent errors. These special problems make designing efficient and effective scheduling algorithms for wireless networks very challenging. Although many wireless scheduling algorithms have been proposed in recent years, some issues remain unresolved. This paper introduces a new wireless scheduling algorithm called BGFS-EBA (bandwidth-guaranteed fair scheduling with effective excess bandwidth allocation), which addresses these issues. It is shown that BGFS-EBA distributes excess bandwidth effectively, strikes a balance between effort-fair and outcome-fair, and provides delay bound for error-free flows and transmission effort guarantees for error-prone flows. The new algorithm is compared with some recent wireless

scheduling algorithms. [C3108]

## "CARDIOSMART: intelligent cardiology monitoring system using GPS/GPRS networks"

Cardiosmart project is based on a portable terminal for the acquisition, pre-processing and transmission of cardiac signals and the GPRS network (PAC) used to send the ECG signal to a host computer in the medical services provider centre or a specialist consulting room. The PAC terminal includes a GPRS modem for data transmission, a GPS device to provide an accurate location of the patient, and an intelligent heart pathology detection system. The objective of this project consists of the development of a European Cardiology On-line Monitoring System using GPRS/GSM wireless communication technology. The utilisation of electrocardiogram transmission will improve efficiency of medical care and service for patients if they could be monitored constantly by health care providers. A direct and almost instant medical support is provided, specially to those patients that vanish during a heart attack. [C3109]

## "Analysis of induced current density in ellipsoidal human model exposed to concurrent ELF electric and magnetic fields with phase differences"

In this paper, the characteristics of total current density in a homogeneous ellipsoidal human model exposed to 60 Hz electric and magnetic fields have been discussed in consideration of the phase difference between electric and magnetic fields. According to the calculated results using the values of 1kV/m electric field and 1μT magnetic field, it is found considering the phase difference that the induced current densities in the ellipsoidal model are affected by the relationship between Bx and Ez, and are hardly affected by Bz. As a result, it is clear that the phase difference is a significant factor which affects the total induced current density in the ellipsoidal model. [C3110]

## "Exposure to electric and magnetic fields at 110 kV gas insulated substation (GIS)"

At Tampere University of Technology, the ELF electric and magnetic fields have been studied for several years. The studies have included measurements and calculations, as well as exposure assessments. In previous studies at TUT, electric and magnetic fields at 400 kV and 110 kV air insulated substations were measured. The aim of this study was to measure and analyze the electric and magnetic fields at a gas insulated substations (GIS) using long-term and instantaneous measurements. In addition to field strength measurements, also the harmonic contents of the fields were examined. The highest instantaneous magnetic field value (173 μT, RMS) was measured in the cable subway behind the switchyard. This value is below the ICNIRP (International Commission on Non-Ionizing Radiation Protection) occupational guideline (500 μT at 50 Hz). The highest electric field value was only 0.002 kV/m, which is well below the ICNIRP occupational guideline (10 kV/m at 50 Hz). In these measurements the harmonic content was found to be insignificant. [C3111]

## "ELF magnetic field measurement and calculation in 500 kV gas insulated substation"

In this paper, we discussed the extremely low frequency (ELF) magnetic field environment in a 500 kV/275 kV gas insulated substation. We investigated magnetic field distribution around 3-phase GIS (gas insulated switchgear) by comparing the measurement results with calculation using finite element method (FEM). By simultaneous measurement of conductor current, we could have very good agreement of calculation results with measurement one. Particularly, the drastic mitigation of magnetic field with distance from GIS was characterized and quantified by comparing the one in open-air substation. In addition, the magnetic field distribution in GIS was discussed by analyzing the influence of induced current distribution in GIS sheath. From the results, we characterized the distinct features of magnetic field distribution in 500 kV/275 kV gas insulated substation by comparing with another type of substation. [C3112]

## "The impact of background traffic on TCP performance over indirect and direct routing"

In this paper, the impact of background traffic on TCP performance is examined over indirect and direct routing for mobile computing. Furthermore, the performance is examined for broadband and narrowband mobile user. We design four topology scenarios that describe the relative difference between the indirect and direct routing in the length of routing path (number of hops). The paper concludes that with broadband access the effectiveness of TCP performance improvement of direct routing over indirect routing not only depends on the relative difference of routing path length between the two routings but also on background traffic load-the higher the background traffic load is, the more apparent the effectiveness is. Furthermore, it is shown that the location of bottleneck for data transmission has a significant impact on performance improvement. The bottleneck within wireless local area usually consumes the performance improvement created by the direct routing. [C3113]

## "Global Mobile IPv6 addressing using transition mechanisms"

The adoption of the IPv4 protocol in wireless technologies has considerably increased the number of hosts that can potentially access the global Internet. The pressure for more IP addresses and the almost exhaustion of the IPv4 address space has raised again the interest in the IPv6 protocol. This paper describes an approach for implementing wireless networks with global Internet connectivity using private IPv4 addresses and transition mechanisms published by IETF. The approach described in this paper is called Transparent IPv6. It consists of virtually assigning IPv6 addresses to private IPv4 hosts without modifying end-user devices. The mobile hosts with virtual IPv6 addresses are fully addressable through the global IPv4 Internet by using IPv6 addresses or fully qualified domain names (FQDN). As shown in the paper, it permits the deployment of mobile networks with global Internet connectivity without requiring public IPv4 addresses. [C3114]

## "A CPX8216 hardware system based GPRS inter-broad handoff algorithm"

General Packet Radio Service (GPRS) is an enhancement to existing GSM networks that introduces high-speed packet data transmission. A inter-broad handoff may happen when a routing area update request is received by the SGSN if the GPRS system is implemented by a distributed processing system like the CPX8216 hardware system. Two performance metrics of inter-broad handoff: expected inter-broad overload probability and expected handoff number are presented. An optimal handoff algorithm for inter-broad handoff is the best tradeoff between inter-broad performance and expected handoff number. According to the definition of the adaptive handoff algorithm (Prakash et al. (1999)), we proposed a adaptive inter-broad handoff algorithm. Simulation results show that compared with the inter-broad handoff algorithm with fixed threshold, the adaptive handoff algorithm we propose has less expected handoff number at the same overload probability. [C3115]

## "Design issues of Mobile IP handoffs between General Packet Radio Service (GPRS) networks and wireless LAN (WLAN) systems"

This paper describes the system design and implementation of a demonstrator prototype, running at University of Bremen, which implements Mobile IP handoffs between GPRS and WLAN systems. Mobile IP requires public IP addresses but there is no support of such IP addresses by most mobile operators. To solve the problem of NAT (network address translation) and firewalls resulting from this, several concepts are available. This paper presents a practical implementation of one such concept where Mobile IP handoffs are realised using tunneling functions and an additional Mobile IP foreign agent to provide GPRS network access. Furthermore, this paper presents measurement results of the test bed and shows the quality of the Mobile IP handoffs. [C3116]

## "Management applications of analyzing cellular digital packet data (CDPD) billing data"

This paper investigates the management applications of analyzing CDPD billing data. Using three non-contiguous weeks of data, we demonstrate how to extract usage patterns, detect registration idiosyncrasies and network faults, and chart the impact of signing roaming agreements with other carriers. We describe the fields available in billing data and how to collect parameters of interest with these fields. Demonstrating how to extract usage parameters, we graph the number of successful registrations and packets transmitted on a temporal and geographical basis. We detail an approach to detect and locate faults resulting in discarded packets. We describe the difficulties in detecting mobility patterns. The impact of foreign mobiles on a network is also explored. Further research into the analysis of billing data will help both researchers and service providers learn about their current implementations and plan future networks. [C3117]

## "TIP6: a transition mechanism for implementing mobile networks"

The use of the IPv4 protocol in mobile networks has considerably increased the number of hosts that can potentially access the global Internet. Because the IPv4 address space is almost exhausted, the pressure for more IP addresses has increased again the attention on the IPv6 protocol. Because the transition from IPv4 to IPv6 is supposed to gradually happen, IETF is publishing a set of transition mechanisms that permits communicating IPv6 and IPv4 hosts and network devices. This paper describes an approach for implementing mobile networks with global Internet connectivity using transition mechanisms. It consists in virtually assigning IPv6 addresses to IPv4 hosts without modifying end-user devices. As shown in the paper, it permits the deployment of mobile networks with global Internet connectivity using legacy IPv4 equipments and private IPv4 addresses. [C3118]

## "Improving service availability via low-outage upgrades"

Service availability is of key importance to operations and maintenance systems for mobile telephony networks. This paper describes some of the challenges in providing continuous service and the impact of upgrade related

outages. Potential methods for low outage upgrades are discussed from an industrial perspective, including practical and logistic considerations. [C3119]

## "Characterization of microtrenching on 0.13µm NMOS and PMOS transistors using DAHC and edge FN stress"

The degradation of 0.13µm NMOS and PMOS transistors caused by microtrenching (µT) under hot-carrier and edge FN stress is studied. DAHC stress was found to be a sensitive technique for characterizing the NMOS transistors while edge FN stress was more suitable for the PMOS transistors. Interface state generation was also identified as the dominant degradation mechanism. [C3120]

## "Downlink power control performance in (E)GPRS networks"

The progressive introduction of packet switched (PSW) services in GSM networks sharing the same physical resources involves interference control techniques that preserve the quality of speech communications. This article presents a downlink power control (DLPC) algorithm for (E)GPRS that considerably reduces the interference introduced by PSW in mixed environments, notably increasing the system capacity around 32% for EGPRS, 50% for GPRS (CS1 and CS2) and 33% for GPRS (from CS1 to CS4). [C3121]

## "Traffic engineering for the evolution of GPRS/EDGE networks"

Radio network dimensioning for the evolution of GSM/EDGE networks towards 3rd generation (3G) mobile radio networks is presented. Taking simulation results for GPRS/EGPRS introduction and evolution scenarios as the basis, the radio resources needed for a given offered traffic and for given quality of service (QoS) requirements can estimated. Both circuit-switched voice traffic and packet-switched Internet traffic are considered, sharing the radio resources available in a GSM radio cell. To achieve this, the simulation tool GPRSim is used that comprises a prototypical implementation of the standardized GPRS protocols and stochastic load generators for typical GPRS usage. [C3122]

## "GPRS traffic performance measurements"

With the commercial deployment of the General Packet Radio Service (GPRS) in Europe in 2001, traffic performance measurements in the field have become possible. Selected traffic performance measurement results are presented and compared to the traffic performance of fixed narrowband access technologies like ISDN and analog modem. They are based on a setup measuring the quality of service perceived by one and several mobile GPRS users running WWW and e-mail applications on laptops connected to GPRS terminals in one radio cell of the Vodafone NL GSM/GPRS network in Maastricht. They give an indication of the capabilities of the packet data service and can help to identify the system bottlenecks regarding end-to-end performance. The measurements were executed in the GPRS network and with GPRS-terminals, which were operational at that time but still in stages of improvement. With these cognitions, protocol optimizations can be performed and software problems like unnecessary delays and instabilities can be localized and eliminated. Additionally, the results can support the planning of networks and applications comparing the measured performance characteristics to the requirements of customers and applications performed. These results are compared to simulation results produced by a simulation/emulation tool that comprises load generators representing typical GPRS usage and a prototypical implementation of the GPRS protocols. [C3123]

## "Experimentation of TCP schemes over GPRS & WLAN"

This paper considers improvement schemes of TCP over wireless links. TCP Santa Cruz is selected as the subject of study because of its promising simulation results. Since there is no reported implementation of TCP Santa Cruz, it is first implemented in Linux platform. The performance of TCP Santa Cruz is then assessed in wireless LAN and GPRS, and compared to TCP Reno. In this paper, a new algorithm, which is an improvement of TCP Santa Cruz, is also evaluated. [C3124]

## "Capacity enhancement for indoor picocells using distributed base stations"

The nanoBTS™ from ip.access is a GSM/GPRS distributed base station system specifically designed as an inexpensive and flexible solution for coverage of the indoor environment. Thanks to its low power consumption and ease of installation, these GSM-over-IP modules can be used as in-fills to provide extra coverage and capacity or as a PBX replacement where mobile traffic and signalling are routed through the corporate intranet. However, in order to increase the system trunking efficiency, more efficient channel allocation schemes need to be employed, these may not be required for other type of picocell architectures such as distributed antenna systems. This paper explores such algorithms, which are being used within the wireless in-building solution

offered by ip.access. Simulation results show that by employing a load based allocation algorithm, the call blocking probability is substantially reduced when compared with mobile driven cell selection schemes. [C3125]

## "A GPRS testbed for TCP measurements"

In this paper a GPRS measurement testbed for TCP performance evaluation is presented. Unlike simulations and live measurements, the testbed combines the use of real network equipment and protocol implementations with a precise control over radio channel conditions. Some initial TCP measurements obtained with the GPRS testbed are also presented. The effect of varying numbers of PDCH and of buffering in the GPRS system is investigated. [C3126]

## "Performance evaluation of resource allocation in a shared voice/data 2.5G system taking into account hardware constraints of the MS"

High quality of service (QoS) for simultaneous speech and data calls is an operational requirement in GSM/(E)GPRS systems. Efficient sharing of resources between voice and data calls, based on movable boundary handover least loaded (MBH LL) is a promising algorithm. Following the ideal case analysis (see Ajib, W., "Gestion de transmission d'un flux temporaire de donner'es dans un rer'seau radio mobile d'acce`s TDMA", January thesis report, ENST, 2001), this paper introduces a more realistic evaluation taking into account MS constraints and different MAC options in the GPRS air interface. The results of two MBH LL variants are presented in terms of voice blocking, data GoS (grade of service), and average throughput per call. Simulations show that the MS hardware limitations have little affect on performance in unidirectional data transmission. The same is true for a carefully designed variant of MBH LL for bidirectional operation with multi-slot allocation. Additionally, an enhancement of the algorithm for cell capacity improvement for data calls and a method based on throughput differentiation for data QoS implementation on the radio resource management (RRM) layer are proposed. [C3127]

## "Paving the road to systems beyond 3G-the IST MIND project"

In systems beyond 3G mobile access will be considerably more diverse than is currently the case with highly integrated cellular technologies. Complemented with new access technologies, such as wireless LANs, future mobile systems will offer a different mix of bandwidth, cost and coverage. There will also be extensions to traditional wireless access networks-both by operators with wireless routers and by users forming ad-hoc networks that attach at the fringe of the access network. Creating services and delivering multimedia over these networks is a very real technical challenge. In this paper the overall approach of the IST MIND project to tackling these issues is described. Further the rationale for an IP-based architecture and how it is being extended to encompass new access concepts of wireless and mobile routers is detailed. Finally the paper looks at how we are enhancing WLAN systems to give greatly increased performance for systems beyond 3G. [C3128]

## "Wireless TCP proposals with proxy servers in the GPRS network"

The General Packet Radio Service (GPRS) system will offer to the users an easy access to Internet applications which work with the TCP protocol. We analyse by means of simulations the performance in the GPRS network of the following wireless TCP proposals that use a proxy server: the Snoop protocol and the Split mechanism. We also describe the impact of the GPRS LLC layer in acknowledged mode in the TCP end-to-end throughput. Unlike previous research we consider two scenarios for the GPRS radio interface: one with several users present in the system, and the other with only one user in it. [C3129]

## "Dynamic network-based secure VPN deployment in GPRS"

A dynamic network-based virtual private network (VPN) deployment, which is established between the general packet radio services (GPRS) border gateway and a corporate intranet gateway, is presented and analyzed. By relying on a sequence of concatenated protection mechanisms (GPRS ciphering and VPN deployment), it is possible to provide secure remote access to mobile users without requiring an extra tunnel overhead on the radio link or the implementation of computationally intense encryption algorithms in the mobile station. The VPN functionality is based on IPsec. For VPN initialization and key agreement procedures, an Internet key exchange (IKE) protocol proxy scheme is proposed, which enables the mobile user to initiate a VPN, while shifting complex key negotiation to the network infrastructure. The required enhancements for security service provision can be integrated in the existing network infrastructure, and therefore, the proposed security scheme can be used as an add-on feature of the GPRS. [C3130]

## "TCP/IP performance over EGPRS network"

The performance of TCP/IP based applications over 2.5 and 3G networks presents problems due to long bandwidth-delay products, link errors and long delay variance. Specific characteristics of underlying technology like link level error recovery algorithms or quality of service procedures have also important influence on the behaviour of TCP layer and affect to the end to end performance. In this paper simulation results for EGPRS network are presented from an end-to-end dynamic simulator that models TCP Reno with some additional features, core network delays and buffering, GPRS RLC acknowledged mode and link level interference calculations. [C3131]

## "Air interface capacity for GPRS/EDGE over GSM traffic load"

The purpose of the paper is to study available air interface capacity for the packet based GPRS/EDGE service when circuit switched GSM speech or data traffic is already loading the air interface in the cellular radio network. The target of the paper is to create planning criteria for the capacity of the combined GSM+GPRS/EDGE air interface. The analysis of the air interface capacity for circuit switched and packet services is based on the comparison of the theory and measurements of the cell load in a live GSM network. The theoretical and experimental results show that there is still reasonably high capacity available for a packet service in a circuit-switched loaded air interface before new transceiver extensions at the base stations are needed. Finally the results give a basis to define planning criteria for different quality targets in combined GSM+GPRS/EDGE networks. [C3132]

## "Measured performance of TCP friendly rate control protocol over a 2.5G network"

As the General Packet Radio Service (GPRS) enters the European market, new services based on multimedia delivery are expected to represent a large amount of traffic in addition to traditional voice flows. Multimedia streaming applications generally require a rate control mechanism, to adapt the sending rate automatically to the time varying channel state. Rate control protocols provided with multimedia streaming stacks should be TCP-friendly, in order to avoid starvation of TCP traffic. The TCP friendly rate control (TFRC) protocol, currently under review by the Internet Engineering Task Force (IETF), has been proposed as a rate control process and has been investigated in the field of multimedia transmission over wired packet-switched networks. We have investigated the TFRC protocol over a real GPRS network and report on the many measurements conducted in order to evaluate its performance over a 2.5G network. [C3133]

## "Game theoretic formulations for network-assisted resource management in wireless networks"

This paper proposes game-theoretic formulations for addressing resource management issues in GSM/GPRS/EGPRS-based and CDMA/HDR-CDMA-based wireless networks. Network-assisted resource management is used, with minimal inter-base signaling costs, to transfer the intelligence and control needed from the terminal to the network. Both non-cooperative and coalitional games are used to address resource management issues such as link adaptation with power control, channel re-allocation, channel re-assignment, and, hard and soft handoffs with power control. [C3134]

## "(E)GPRS hardware dimensioning rules with minimum quality criteria"

After describing the basics of the (enhanced) GPRS system, a set of analytical rules applicable both for initial deployment of GPRS networks and for future network expansion are presented. The same set of rules are fully applicable also to enhanced GPRS (EGPRS). Since they are based on a theoretical model and not on particular measurements or simulations, they can be utilized in any general case. The rules are derived from statistical models to calculate the reduction of user throughput at the link level control (LLC) layer due to user multiplexing on shared time slots (TSL). Statistical models are given for packet switch (PS) only and for PS and circuit switch (CS) mixed scenarios. From these rules it is possible to determine the required (E)GPRS hardware resources to fulfill minimum quality criteria. Furthermore, the analytical results are compared with the results obtained from network simulations. [C3135]

## "The Europa Orbiter radar sounder: Innovative radar design for a challenging mission"

Recent observations of the surface of the Jovian moon Europa indicates the possibility of the presence of a vast ocean beneath the icy surface. Currently the NASA mission Europa Orbiter plans to place several instruments, including a radar sounder, in a 150 km circular orbit around this moon. The science objectives of the EO Mission are: to understand the surface composition, especially compounds of interest to prebiotic chemistry; map the distribution of important constituents of the surface and characterize subsurface interfaces; and characterize the radiation environment in order to reduce the uncertainties for future missions, especially landers. To support these science objectives, the Europa Orbiter will have the following instruments: an ice-penetrating radar; a laser altimeter and an IR-visual imager. [C3136]

## "Subsurface water search by TEM [Con Mars]"

This paper presents the project TESEO (TEM sounding for Geophysical Exploration) for planetary TEM (Time Electromagnetic Methods) survey, focused on the main issue of the search for water on Mars. The project aims to extend the TEM (largely and successfully employed on the Earth) to the planetary environment, where the many unknown variables (above all the background EM noise and the subsoil composition), together with the limited resources availability (mission constraints in mass, time and power) pose a formidable obstacle to performing operations and measurements. In such a context, we first investigated the opportunity for a TEM system to be housed as a payload in a future mission with special attention given to those ones deploying a network of carrier (landers, rovers, robots). Secondly, we evaluated the sounding capability of a TEM for a simple case study verifying the role played by the system and survey parameters. [C3137]

## "Adaptive difference of Gaussians to improve subsurface object detection using GPR imagery"

We present an adaptive difference of Gaussians (ADOG) method to improve landmine detection from ground penetrating radar (GPR) imagery. GPR is widely used for a variety of subsurface sensing problems including landmine detection and localization. In most all applications, specular reflection from the air-ground interface is the most significant source of interference often eclipsing the returns from the buried object. From an image processing viewpoint, the specular reflection constitutes a sharp edge and the landmine reflected signals are more smooth and of low spatial frequency. As an edge-preserving method, the ADOG keeps the specular reflection intact and removes the object reflected signals. Then by subtracting the ADOG output from the original image, we eliminate the specular reflection and obtain an image with enhanced object reflected signals. Using the difference image, we can obtain better result in detecting buried objects. Results from applying our algorithm on a landmine detection application are used to demonstrate the performance of the method. [C3138]

## "Scalable gateway GPRS support node for GPRS/UMTS networks"

In GPRS (general packet radio service) and UMTS (Universal Mobile Telecommunications System) networks, GGSN (gateway GPRS support node) serves as a default gateway while MSs (mobile stations) connect to outside networks such as the Internet. According to the GPRS/UMTS specifications, a fixed GGSN is assigned to serve an MS that attaches to the network and activates a session. The GGSN cannot be changed until the MS deactivates the session. Since packet-switched access is bursty in nature, GGSNs may suffer from unbalanced loads even if the numbers of serving MSs of GGSNs are equal. This paper presents a GGSN relocation method that can re-direct in-service MSs without breaking services and connections. The proposed approach enables a GGSN with a dynamic load balancing feature and improves the scalability of a GGSN system. [C3139]

## "Determination of all possible resources allocations in a packet communication network"

A wireless communication network providing data services is considered. Depending on the number of available resources, their layout on several carriers, the constraints of resources allocation introduced by wireless systems (like multislot capabilities for the mobile stations in GPRS), the number of active users in the network etc., the resources administrator of such a network has to choose, among a large number of solutions, an optimal allocation of resources for the users. This paper enumerates all the possible resources allocations at each decision time, in the case of a single or multi-carrier-system. As the result obviously shows that the total number of possible allocations is too large to lead to a real-time decision of an estimated optimal allocation, the generation of an optimised subset of possible solutions to be scanned at each decision time is proposed, that significantly restricts the computation complexity while guaranteeing the same optimal decision of resources allocation. Finally, an example illustrates the search of the estimated optimal solution of allocation in the subset of possibilities. [C3140]

## "Design and evaluation of UMTS-WLAN interworking strategies"

High tier wireless systems such as GPRS and UMTS provide users with high mobility but less bandwidth. On the other hand, low tier wireless systems such as wireless LAN offer high bandwidth with less mobility. The support of seamless roaming between heterogeneous wireless networks is regarded as one of the key issues in future mobile communication systems. The paper presents the design and evaluation of three possible UMTS-WLAN interworking strategies, i.e. Mobile IP approach, gateway approach, and emulator approach based on the current UMTS, WLAN and Mobile IP specifications. Recommendations to UMTS-WLAN interworking strategies according to different deployment scenarios are also discussed. [C3141]

## "Network level performance evaluation of EGPRS"

In this paper, we investigate the performance of the Enhanced General Packet Radio Service (EGPRS) from both the quality and capacity point of view. The performance evaluation is based on a sophisticated dynamic network level simulator developed at Nokia Research Center. The analysis is made both in a non-hopping and frequency hopping macro cell networks with different network configurations. The focus is on downlink performance since it is assumed that in most applications and scenarios the data flow is clearly asymmetrical in that direction. The key performance indicators considered in this paper are temporary block flow (TBF) throughput, logical link control (LLC) frame delay, spectrum efficiency (SE) and TBF blocking. The quality indicators (throughput, delay) are analyzed from both the average and percentile point of view. As these indicators are measured between the base station controller (BSC) and mobile station (MS), they are not end-to-end values. Those values depend heavily on issues like higher protocol layers (including the application level) and GPRS core network elements. These issues are out of the scope of this analysis. Ultimately, the whole analysis is focused on the characterization of data transport capabilities of the EGPRS BSS according to Release 99 specifications. [C3142]

## "Performance estimation of efficient UMTS packet voice call control"

UMTS was envisaged as a "universal" mobile telecommunications system with multiple access options and full IP packet support. However, 3GPP Rel99 is a single access technology, and its core is still switch centric. Rel4 further optimises the air interface. Rel5 first adds an IP multimedia core network sub-system (IMS) adjunct to the UMTS packet switched (PS) GPRS CN bearer. This adds basic PS call control trial capabilities. Rel6 will provide full UMTS packet call control (CC) capabilities (e.g.: security, emergency & QoS support). The Rel5/6 standards employ the text based call control protocol: SIP. Text based protocols are easier to develop than bit-wise presentations and likely to be more expediently taken to market. However, initial indications as to the delays associated with packet call control using SIP have concerned operators about the viability of IP-based services over a UMTS air interface. This has led UMTS vendors/operators to invest in the standardization of ways to wireless enable the efficient use of SIP with such measures as protocol compression. This paper explains GSM, UMTS circuit switched call control and SIP call control as applied to UMTS and then compares and contrasts the relative performance of both schemes using results derived from a UMTS system simulator called the Framework for Radio Architecture Modelling (FRAM). [C3143]

## "Performance analysis of radio resource allocation in GSM/GPRS networks"

General packet radio service (GPRS) is a packet switched access mode for GSM system to efficiently utilize the radio resources. In this paper, we analyzed the performance of radio resource allocation in GSM/GPRS networks. To guarantee the QoS of voice service not being affected by the introduction of GPRS, preemptive priority is applied for voice calls to preempt GPRS data packets. Three cases of radio resource allocation are considered: no-buffer; buffer-only-for-preempted-GPRS-packets; and buffer-for-GPRS-packets. The results show that employing a buffer for GPRS packets can greatly reduce its blocking probability even under the condition of voice preemption. For real-time data applications, the mechanism of buffer-only-for-preempted-GPRS-packets is suitable since the queueing delay is relatively small. [C3144]

## "Multi-layer protocol tracing in a GPRS network"

The paper presents a performance evaluation of GPRS accomplished by a combination of measurement at the end hosts and tracing inside the network. The multi-layer tracing approach allows not only observing, but also understanding of, the network performance. With end-to-end measurements, we assess data rates, latency, and buffering experienced by users in a live GPRS network. Comparing the results to our previous measurements shows a notable improvement in the network and terminals over the previous two years. Mobility tests while driving in an urban environment quantify the interval, duration and data loss caused by cell reselections. In the test lab, multi-layer tracing of radio, link and transport protocols gives a closer picture of GPRS performance. For instance, TCP interacts inefficiently with resource allocation at the RLC (radio link control) layer and fragmentation at the LLC (logical link control) layer. Finally, we illustrate delay spikes and data losses during cell reselection by tracing signaling messages during cell update and routing area update procedures. [C3145]

## "VGSN: a gateway approach to interconnect UMTS/WLAN networks"

High tier wireless systems such as GPRS and UMTS provide users high mobility but low bandwidth. On the other hand, low tier wireless systems such as wireless LAN offer higher bandwidth with less mobility. To support seamless roaming between. heterogeneous wireless networks is regarded as one of the key issues in the future mobile communication system. The paper presents method and system for seamless roaming between WLAN and UMTS networks. The two networks are assumed to be constructed and to operate independently, but wish

to offer roaming services to their customers. A new logical node, called virtual GPRS support node (VGSN), is designed for this purpose to connect UMTS and WLAN core networks. VGSN is a normal GPRS support node (GSN) in a UMTS system and also acts as an access route in a WLAN network. The node converts control signals and routes data packets between two networks for roaming users. With the presented approach, Mobile IP is not required and users can have seamless roaming between networks based on one IP address. [C3146]

## "Performance of the GPRS RLC/MAC protocols with VoIP traffic"

GSM/GPRS networks have been designed to carry both voice and data traffic. Our aims are to study the behaviour of the GPRS mechanisms (RLC/MAC layer and radio resource scheduler) when the application layer carries packetized voice, and determine if the quality of service provided by the network is suitable for the VoIP service. The paper includes a discussion about the voice source model, an analysis of the effects in capacity of a GPRS carrier when feed with VoIP packets, measurements of statistical parameters of the voice traffic stream and a discussion of the influence in the quality of the service. [C3147]

## "Analysis of downlink scheduling for Web traffics in 2G and 2.5G mobile networks"

This paper compares two possible scenarios for mobile Internet surfing according to the Personalised Access to Local Information and services for tOurists (PALIO) Project (IST-1999-20656). In particular, we consider WAP phones with Short Message Service (SMS) and Personal Digital Assistants (PDA) with General Packet Radio Service (GPRS). Suitable round robin scheduling schemes are analyzed for downlink transmissions. Part of this work has been also contributed to the COST 273 Project. [C3148]

## "An investigation of the impact of mobile phone and PDA interfaces on the usability of mobile-commerce applications"

With the introduction of faster wireless networking standards opportunities arise to transport more e-commerce applications to wireless devices (hence, mobile, or m-commerce). The wireless device with which most people are familiar is the mobile phone. It is in the interests of commercial organizations for people to use their phones for m-commerce tasks. In addition, various handheld and pocket computer platforms have appeared in the market place with wireless connectivity ability (albeit via a mobile phone connection in many cases). Given the different capabilities of the various devices it is important to know whether applications can be developed to run on multiple mobile platforms with little or no platform-specific alteration. We describe a small pilot study to explore some usability and user perception issues of m-commerce across different applications and wireless device platforms. Factors such as task efficiency, user-error rate, user perception, memorability, and user workload were measured on two applications developed using J2ME running on two different wireless devices. The results indicated no significant differences in usability across platform type, thus supporting the notion that with frameworks such as J2ME single applications can be developed and deployed across multiple device platforms with little impact on usability or user perception. Some statistically significant differences were found in performance between the two applications. [C3149]

## "Analytical performance evaluation of Internet access over GPRS and its comparison with simulation results"

We discuss the results of recently published analytical concepts for the performance evaluation of packet-switched mobile radio networks (see Vornefeld, U., Proc. European Wireless 2002, 2002; Proc. Int. Commun. Conf. '02, 2002). We compare them with the results of a simulation system (GPRSim), which emulates the GSM general packet radio service (GPRS) in great detail (see Stuckmann, P., Technical Report, http://www.comnets.rwith-aachen.de/ pst; Stuckmann and Paul, O., Proc. 10th Symp. Wireless Personal Multimedia Commun., p.597-602, 2001). We try to identify possible reasons for deviations between analytical and simulation results in order to support further development in this area. In Vornefeld's analytical modelling framework, source modelling is done by characterization of WWW traffic by means of marked Markovian arrival processes (MMAP); accordingly, GPRS performance measures are derived by analysis of an MMAP/G/1 queue. By evaluation of WWW traffic generated during stochastic simulation, we show that important characteristics of recent Internet traffic are depicted by Vornefeld's analytical source model. We find that the analytical approach is well suited for understanding the general impact of various system parameters. Nevertheless, although the analytical model uses a very detailed characterization of WWW traffic, for quantitative performance analysis, simulation results are still required. [C3150]

## "MMS-the modern wireless solution for multimedia messaging"

MMS (multimedia messaging service) provides a multimedia messaging solution in contemporary and evolving

wireless communications. Both SMS and email have been widely used for messaging in wireless and fixed networks respectively, but none of these is capable enough to fulfill the present and the future demands of wireless messaging. None of the existing messaging systems can also take full advantage of the recent technological advancements in wireless communications. MMS has been designed in both the 3GPP and the WAP Forum to overcome the known limitations and shortcomings of the existing messaging systems. MMS utilizes the capabilities provided by WAP, GPRS and 3G, which offer efficient use of radio resources and improved connectivity. The paper analyses MMS by pointing out its features and functionalities. Architecture, message structure, encoding, information flow and transport of MMS come under scrutiny, from the point of view of both standardization and implementation, to find the feasibility of MMS in the target wireless infrastructure. According to the comparative study, MMS is equipped not only with the positive features of existing messaging systems, but also with some new ones. A predictive study is also made to outline different expected MMS-based services. [C3151]

## "The Mobile IP handoff between hybrid networks"

Future mobile data networks will consist of several tiers, which overlap each other. We introduce two of the main technologies, GPRS network and IEEE 802.11 WLAN, which are likely to be widely deployed. We propose schemes to support mobility between these two networks. We also analyze the Mobile IP handoff between hybrid networks and propose our handoff scheme, which reduces handoff delay and packet loss, and prevents the ping-pong effect by utilizing a dwell timer and multi-tunnel technology. [C3152]

## "Whispering gallery resonators with programmed temperature coefficient of frequency"

This paper describes a new design method of "whispering gallery" resonators (WGR) leading to desirable temperature coefficient of frequency (TCF). The method is based on our preceding results and implicates special shaping of a disk WGR made from uniform anisotropic dielectric. The particular solution looks like a double-sided wedge-shaped groove made on disk butt-ends in the vicinity of a radial electric field maximum. By choosing the groove width and depth, WGR can be tuned at a desirable TCF including frequency-temperature compensation. The described method is general and can be applied to WGRs made from any dielectric crystal having suitable properties. The design of experimental samples was achieved by implementing finite element software. An experimental study also has been performed. [C3153]

## "Capacity evaluation of EGPRS in a frequency hopping network"

We investigate the network level performance of the Enhanced General Packet Radio Service (EGPRS) both from the quality and capacity point of view. The performance evaluation is based on a sophisticated dynamic burst-level network level simulator. The analysis is made in a frequency hopping macro cell network with different network configurations. The focus is on downlink performance since it is assumed that in most applications and scenarios the data flow is clearly asymmetrical in that direction. The key performance indicators considered in this paper are temporary block flow (TBF) throughput, logical link control (LLC) frame delay, spectrum efficiency (SE) and TBF blocking. The quality indicators (throughput, delay) are analyzed from both the average and percentile point of view. As these indicators are measured between the base station controller (BSC) and mobile station (MS), they are not end-to-end values. Those values depend heavily on issues like higher protocol layers (including the application level) and GPRS core network elements. These issues are out of the scope of this analysis. Ultimately, the whole analysis is focused on the characterization of data transport capabilities of the EGPRS BSS according to Release 99 specifications. [C3154]

## "Resource efficient streaming bearer concept for GERAN"

We present a complete concept for providing a resource efficient bearer service for streaming applications in the GSM/EDGE Radio Access Network, GERAN. The concept comprises rules for admission control, service quality monitoring functions and appropriate means to ensure that the service quality stays within the envisaged bounds. Results indicate that the achievable capacity is close to what could be expected from streaming over a best effort bearer, while at the same time QoS guarantees can be fulfilled, ensuring high end-user quality. [C3155]

## "Design of a mobile telecardiology system using GPRS/GSM technology"

This paper presents the design and development of a portable electrocardiograph to allow the on-line remote monitoring and real-time cardiac diseases diagnostics of patients from the specialist. This prototype has been satisfactory implemented finding a good balance between optimal signal processing and power consumption using a GPRS/GSM modem and a SMT low voltage microprocessor board. [C3156]

## "Service disciplines performance for GPRS with link adaptation and heterogeneous traffic"

The general packet radio service (GPRS) system provides a packet switched data service with quality of service (QoS) over a GSM infrastructure. In order to cope with the QoS requirements, packet scheduling strategies are used. On the other hand, GPRS introduces four coding schemes with different degrees of data protection according to the radio channel conditions. The selection of an appropriate coding scheme according to the time variant channel conditions can lead to a substantial increment of the QoS. Two scheduling policies, namely MED (modified earliest deadline) and MLT (minimum laxity threshold) are evaluated, assuming both link adaptation (LA) strategy, based on BLER (block erasure rate) estimation, and heterogeneous traffic. Web browsing, fleet management, SMS (short message service) and e-mail services are assumed. The performance of the proposed scheduling policies is evaluated in terms of throughput and delay. For urban environments with high load conditions, the obtained results show that a simple LA enhances QoS system performances, even though there is a trade-off with respect to the network packet loss. [C3157]

## "Entropy optimized contrast stretch to enhance remote sensing imagery"

This paper presents a contrast stretch (CS) method based on minimum entropy constraint to enhance images obtained in remote sensing applications such as ground penetrating radar (GPR), synthetic aperture radar, and infra-red imagery. The CS enhances contrast of the low-contrast part of an image. In remote sensing, it is usually the desirable signals that are of low contrast while interference of high contrast. The CS modifies the original image such that pixel values above and below preset boundaries are set to Zero and the maximum possible pixel value and the pixel values falling between the boundaries are stretched out to enhance the contrast of the image. Using the CS we can enhance the contrast of desirable signals from, for example, a buried landmine or an object obscured by some interference. On the other hand, the CS inevitably enhances other parts of a remote sensing images, such as clutter and measurement noise. Therefore there is a trade-off in using the CS. It is beneficial to find the correct "cut-off" boundaries in the CS in some optimal sense. We propose using minimum entropy as a criterion of looking for the optimal CS parameter Using field data from GPR application, we show that improved image can be obtained which makes further processing such as detection more accurate. [C3158]

## "Pattern recognition for humanitarian de-mining"

Landmine detection has become a humanitarian problem of great magnitude. It is estimated that there are between 60 and 100 million landmines buried around the world and that someone is killed or injured by landmines every 20 minutes. Pattern recognition problems in this area are discussed. A brief overview of sensors used to collect data is given. Current pattern recognition methodologies in use are described. Future challenges are outlined. [C3159]

## "Steady state analysis of mobile station state transition for General Packet Radio Service"

General Packet Radio Service (GPRS) is a system for efficient data packet radio transmission services which is used in conjunction with the Global System for Mobile Communications (GSM) system. The three mobile station (MS) states idle, ready, and standby are defined for efficient management of radio resources and signaling networks. The MS state transition behavior is modeled and the steady state probability of the MS states is derived using a semi-Markov process approach. The effect of various input parameters on the steady state probability is investigated. These results can be used in analyzing the effect of the input parameters on the tradeoff between location update and paging signaling, and thus, providing guidelines for proper selection of GPRS system parameters. [C3160]

## "WWW performance over GPRS"

We present investigative results of HTTP performance over GPRS (General Packet Radio Service). Following on from an earlier study of GPRS, in which we uncovered a number of performance problems with TCP (e.g. sub-optimal start-up performance, excess queueing, spurious timeouts etc.), we discuss how and to what extent these limitations can impact HTTP. We also examine some other issues specifically linked to HTTP performance over GPRS. Our experimental results show that aggressive behaviour on the part of Web browsers optimized for the wired-Internet does not work well over GPRS. Instead, limiting the number of browser TCP connections, which enables aggressive pipelining of requests, can give significant performance benefits. We show that using a proxy located close to the wired-wireless boundary that implements performance enhancements at both the transport (TCP) and application layer can lead to substantial reduction in Web page download times over GPRS. [C3161]

## "Mobility management for an integrated network platform"

This paper initially, describes the NOMAD test-bed being set up at ComNets for network integration to integrate various bearer technologies (GSM, GPRS, WLAN, Ethernet). It is based on different Mobile IP versions (IPv4 and IPv6) and software for ad-hoc networking using the AODV (Ad-hoc On Demand Vector routing) protocol. The second section describes the Mobile IP implementations and the improvements achieved in the area of handoff delays. The paper also details the results obtained from the ad-hoc network, to determine the performance of AODV when new nodes are added, and explains future research. [C3162]

## "Real-time service accounting"

Offering telematics services to end-users involves inter-domain real-time service provisioning; it therefore can also involve inter-domain real-time service accounting. Recognizing the increasing complexity of accounting services due to the dynamic service usage behavior of end-users, the paper addresses, first, a way to decompose end-to-end service into accountable service components, and second, a way to apply formal modeling and analysis to service component accounting management. [C3163]

## "Supporting dynamic IP addresses for wireless push services in cellular networks"

The paper introduces a methodology to provide push services to dynamic IP addressed-mobile users in 2.5G/3G networks, and minimize the unsuccessful network-requested PDP (packet data protocol) context activation for static IP users during wireless location-aware and content aware push application delivery over the packet-switched wireless core network. The proposed method is based on protection and mobile user activity procedures, SMS service, and a new signaling mechanism to forward HLR (home location register) based flags to the WAP/directory server. [C3164]

## "STREAMOBILE: pay-per-view video streaming to mobile devices over the Internet"

As new mobile communication technologies are becoming broadly available, there is urgent pressure to populate them with services that provide returns for the huge investments made by telecommunications operators. Services around video transmission are expected to play a key role: news broadcasting, videoconferencing, movie channels, on-line gambling, etc. The goal of the STREAMOBILE project is to demonstrate an Internet pay-per-view distribution system toward GPRS and UMTS mobile devices. Copyright-protected contents are streamed to the customer and a micropayment scheme is used so that contents are not paid for in advance, but as they are being received by the customer. This paper presents an evolving prototype., whose client software has been designed in such a way that it can be easily migrated to 3G mobile devices. [C3165]

## "Extensible mobile presence"

Presence is regarded as an important enabler for novel services in third-generation wireless networks (3G) (e.g, instant messaging). Standardization in 3GPP has adopted the IETF model for presence but integrated it into 3G service reachability and control support. Similarly, alternative approaches (e.g., Wireless Village or Messenger/.NET) restrict the user's use of presence in other ways. The paper examines some fundamental properties of mobile presence, what support is available for mobile presence, and limitations caused by this support. Finally, I present an alternative user-centric approach, with an extensible mobile presence which is operator and provider independent, that removes these previous limitations. [C3166]

## "Improving packet delivery in GPRS/UMTS networks"

Mobile telecommunication systems such as General Packet Radio Service (GPRS) and Universal Mobile Telecommunications System (UMTS) provide packet-switched service for mobile terminals. 3GPP Release 4 and Release 5 further offer packet voice over a GPRS/UMTS infrastructure so that IP based communications between mobile to mobile is expected to be one of the major traffic types in the future 3G all-IP network. Considering packet communications between mobile to mobile in GPRS/UMTS networks, every packet has to go to the Gateway GPRS Support Node (GGSN) and then can be delivered to the destinations according to the current GPRS/UMTS specifications. However, packet delivery through GGSN is not efficient if two mobile nodes are in the same base station or the same routing area. This design degrades overall system performance and introduces the extra delay of mobile-to-mobile communications. This paper investigates packet routing/forwarding procedures and proposes a novel approach to improve mobile-to-mobile packet delivery in GPRS/UMTS networks. Simulation results demonstrate that end-to-end latency can be reduced significantly in GPRS/UMTS networks. [C3167]

## "Pulse versus stepped frequency continuous wave modulation for ground penetrating radar"

There has often been debate concerning the relative merits of pulsed ("carrier-less") and stepped frequency continuous wave (SFCW) radars used in ground penetrating radar (GPR) applications. It is sometimes claimed that SFCW has poor time sidelobe performance. In this paper we tease out the definition of resolution and bandwidth, and show that both systems have equivalent resolution and time sidelobe performance if the spectral shapes are properly defined [C3168]

## "The 3G GPRS mobile systems problem of the traffic analysis and dynamic control of QoS"

The development of 3G mobile networks is attended by revolutionary changes in the telecommunication and service technologies of mobile systems. There have been impressive rates of evolution from circuit switching (CS) to packet switching (PS) and IP protocols; from monoservice voice systems, operating on CS principles, to multiservice PS system for integrated transmission of fast data, voice, video etc. with differentiation and quality of service (QoS) control. The amount of traffic with access to broadband Internet services is rapidly increasing. The time principles of payment are substituted by accounts for data volume and quality of service. The new technologies require development of new methods of traffic theory, optimization and design. It is necessary to change from one-dimensional Erlang models for homogeneous traffic in point-to-point channels to develop the theory of the multi-dimensional distributed queues with priority service for integrated traffic in multi-point radio channels with multiple access. This article presents such new methods for the analysis of traffic, optimization and dynamic QoS control for 3rd generation mobile networks, taking GPRS systems as an example. The offered solutions are based on the development of a numerical method of balancing traffic intensities (see Markhasin, A.B., 2nd All-Union Confer. on Multiple Access Systems, pt1, p.146-52, 1999; Markhasin, A.B. and Kokoreva, E.V., Proc. VI Business-Forum "Mobile Systems'01", vol.1, pp.175-81, 2001), and also on the development of our results concerning the analysis of traffic, optimization and dynamic QoS control in integrated packet satellite and radio ATM networks (see Markhasin, IEEE Int. Conf. on Communications, p.1914-18, 2001) [C3169]

## "Borehole Interferometric SAR: A preliminary study"

The objective of borehole radar interferometry is to reconstruct subsurface structures (such as an orebody) in three dimensions, which in turn, will help in optimizing the design of mines. Synthetic aperture radar technology uses the reflected data from two or more antenna tracks and to convert interferogram phase difference to the corresponding height values. To study the potential of SAR technology in borehole environment we have considered the reflection between a homogeneous (εr=9) host rock and a perfectly reflecting surface such as a conductive orebody. Taking into consideration practical exploration borehole geometries and the high attenuation of RP signals in host rock, the boreholes are made non-parallel and the master antenna is kept 100 metre away from near the reflecting surface. The coherence value in slant range, simulated and expected DEM in both slant range and ground range, the error between simulated and expected values in slant range have been calculated. Future work involves the use of 3D vector model to convert the phase values into corresponding height values, multiple boreholes and layered medium EM wave propagation to reconstruct the subsurface [C3170]

## "GPR SAR simulation and image reconstruction"

Subsurface object detection has mainly been carried out using conventional ground penetrating radar (GPR) techniques which use a single receiving antenna from which a number of range profiles (known as "A Scope" images) are assembled to form a two-dimensional data field (known as a "B Scope" image). These GPR system have difficulties with high clutter level, surface reflections, limited ground penetration and the required fine resolution. The resolution in the across track and along track directions is limited by the physical aperture in these directions. This paper describes an imaging technique, which uses a single transmitting/receiving antenna to synthesize a two-dimensional planar aperture. Thus a three-dimensional reflectivity image of a scene is generated. The resolution in the across and along track directions is achieved via a SAR aperture synthesis technique. The depth/range resolution is achieved via the transmission of narrowband stepped frequency continuous w ave (SFCW) signals [C3171]

## "Adaptive compensation of Mars ionosphere dispersion in the MARSIS experiment"

MARSIS (Mars Advanced Radar for Subsurface Ionosphere Sounding), selected as scientific payload of the ESA mission Mars Express, is a low-frequency nadir-looking pulse limited radar sounder and altimeter with ground penetration capabilities, which uses synthetic aperture techniques and a secondary receiving antenna to isolate subsurface reflections. In order to maximize the penetration capabilities of the transmitted pulse MARSIS must operate at a frequency as low as possible (few MHz). Moreover the requirement for fine range resolution calls for a relatively large transmitted bandwidth (1 MHz) so that MARSIS will operate with a very high fractional bandwidth and very dose to the expected Martian ionosphere plasm frequency. This will result in a generally

large phase distortion across the spectrum of the received pulses (due to either the antenna frequency response or the propagation through the ionosphere) which will cause severe degradation of the matched filter performance in term of SNR, pulse spreading and sidelobe level. This paper deals with the definition and implementation of an adaptive range compression algorithm, which makes use of the contrast maximization technique to estimate the phase dispersion spectrum, in order to perform a matched filtering of radar sounder echoes in the presence of phase distortions across the signal bandwidth [C3172]

## "Mars surface models and subsurface detection performance in MARSIS"

The MARSIS (Mars Advanced Radar for Subsurface and Ionosphere Sounding) instrument is a multi-spectral, low. frequency, nadir looking pulse limited radar sounder and altimeter with ground penetration capability. Moreover the detection of a subsurface interface will be possible only if the following conditions are met:-the level of the subsurface reflection is higher than the noise floor-the surface/subsurface dynamic is included in the system dynamic range-the subsurface reflection is higher than the corresponding surface clutter reflection For MARSIS the noise floor has been evaluated to be about 60 dB below the fully coherent surface echo, so that an overall 60 dB dynamic range will be allowed if sidelobes and nonlinearities are controlled and reduced down to the noise level with a proper design. In this case we can assess that the penetration depth can be defined as that depth where the subsurface power is equal to the surface clutter power. In this paper the subsurface to surface clutter ratio will be evaluated, taking also into account the results related to the new fractal models of the structure of the planet's surface and in particular the new MARS surface models obtained from the MGS/MOLA data [C3173]

## "Instantaneous parameters calculation and analysis of impulse ground penetrating radar (GPR) data"

We use the wavelet transform (WT) method to analyse impulse GPR signals received from anti-personnel (AP) plastic mines. The mine radar echoes examined in this work are characterized by an average low amplitude and low signal-to-noise ratio (SNR). We focus on the use of WT to extract such weak transients from the noisy background. In particular, we calculate the instantaneous parameters of the radar signals by means of the WT. Instantaneous wavelet power and energy spectra allow enhanced identification of plastic mines echoes in low SNR. We further propose a novel non-linear transform method to process the results after WT in order to increase the energy difference between the mine signal and the clutter [C3174]

## "A Kalman filter-based approach to detect landmines from metal detector data"

Metal detectors play a significant role in landmine detection. Automatic sensor fusion is required to improve the performance of ground penetrating radar (GPR)-metal detector multi-sensor systems. The existing version of the Kalman filter-based detection algorithm has been adapted for automatic detection and discrimination of landmines in metal detector data. In this algorithm, multi-channel metal detector output data are fused to produce a distribution of probabilities of the presence or absence of a target. Performance of this algorithm has been assessed using data obtained by burying a number of simulant landmines, canonical targets and shrapnel in different soil types [C3175]

## "Integrating multi-source remote sensing data for soil mapping in Victoria"

Mapping of soils at paddock level is being undertaken at 3 selected sites in Victoria by using remote sensing data from a variety of sources. The three sites represent different agricultural practices in high and low rainfall zones across Victoria. The project work is divided into 4 stages: (1) soil analysis at sample points, (2) analysis and integration of remotely sensed information, (3) exploring relationships between soil properties and remotely sensed variables, and (4) extrapolating soil mapping to a wider area using relationships established at stage 3. Detailed soil surveys were initially conducted to characterise the soils of each site at the sub-paddock scale to obtain information on the physical and chemical properties of the soil, particularly those relating to limiting factors such as salinity, toxicity (boron, aluminium), acidity, alkalinity and soil moisture regimes. To achieve this, exploratory soil cores were collected across the site from locations representing different soil types and landform patterns. Soil pits (ranging between 4-10 per site) were then dug. Chemical and physical analyses were also completed for each pit to assist in understanding the soil characteristics across each site and down the soil profile. This site specific soil information is then used to aid soil feature extraction from the remotely sensed data sets. High resolution remote sensing information acquired for this study includes airborne synthetic aperture radar (PACRIM 2 AIRSAR), Landsat 7 ETM+, conductivity measurements from EM38 and EM31, and ground penetrating radar data sets. All data sets are integrated into raster format. The sets of remotely sensed data are treated as explanatory variables with soil properties as response variables. The integrated approach enables a number of space, air and ground borne data sets to be evaluated in terms of their potential to be able to identify

soil components both on the surface and at depth. The differences in the resolution of these sensors also allow evaluation on the type of soil information that can be obtained at varying scales, from the sub-paddock to catchment [C3176]

## "Electromagnetic aspects for sub-surface sounding of planets"

Some aspects of satellite-based planetary subsurface sensing are outlined. One constraint has to do with the fact that at very low frequencies, needed to penetrate the ground, it is difficult or impossible to achieve a narrow antenna beam-width and therefore a large area is illuminated, creating backscatter which interferes with the wanted signal. Another issue is the propagation through the planet's atmosphere and particularly through the ionosphere [C3177]

## "Non-iterative GPR imaging through a non-planar air-ground interface"

It is often advantageous to acquire pulse-echo ground penetrating radar (GPR) measurements from antennas that are offset from a non-planar air-ground interface by a non-negligible distance, either because the ground surface is rough, or because measurements must be collected remotely. To compensate for a non-planar air-ground interface, a modification of the plane-to-plane backpropagation algorithm is formulated for surface variations that are relatively smooth with respect to the radar waveform wavelengths. To facilitate this method, a technique for inferring the surface topography from the radar returns is developed. Finally, examples are given to demonstrate the improvement offered over other non-iterative imaging techniques [C3178]

## "Performance and architecture of SGSN and GGSN of general packet radio service (GPRS)"

GPRS is an emerging ETSI standard for exchanging packet-mode data using the Global System for Mobile communications (GSM) networks. This paper presents a platform architecture (hardware & software), which can act either as SGSN (serving GPRS support node) or GGSN (gateway GPRS support node) or both combined. SGSN and GGSN are two new network elements required for supporting GPRS services. We present the functionality partitioning of GPRS application for one of the possible implementations on this platform to realize these new network elements and present performance results, which have been obtained from a queueing network model [C3179]

## "Multiobjective hierarchical 2G/3G mobility management optimization: niched Pareto genetic algorithm"

We first propose four-layer optimization for a UMTS coverage area: (i) cell-oriented intra-SGSN (serving GPRS service node) layer, which is optimized RAs (routing areas) covering the intra-SGSN signaling cost, paging cost and RA load balancing; (ii) RA-oriented intra-MSC (mobile switching centre) layer, which is optimized location areas (LA) covering the intra-MSC signaling cost and LA load balancing; (iii) RA-oriented inter-SGSN layer, which is optimized SGSN coverage areas covering the inter-SGSN signaling cost, RNC (radio network controller) and SGSN load balancing; (iv) LA-oriented inter-MSC layer, which is optimized MSC coverage areas covering the inter-MSC signaling cost and MSC load balancing. We focus on RA optimization, namely layers (i) and (iii). The optimization of MSC coverage areas and LAs is performed in a similar manner. We propose a schema-based niched Pareto genetic algorithm, which deals with multiple objectives by incorporating the concept of Pareto domination in its selection operator, and applying a niching pressure to spread its population out along the Pareto optimal tradeoff surface. The proposed genetic algorithm uses a schema-based partially matching crossover using tournaments of n size, where the crossover pairs are chosen in two steps, first based on the class ranking and then schema ranking. New offspring are modified using the geographical footprints to converge to the optimal solution faster [C3180]

## "Optimization scheme for mobile users performing vertical handoffs between IEEE 802.11 and GPRS/EDGE networks"

The next generation wireless networks are characterised by anywhere, anytime connectivity, enhanced data services and higher data rates to enduser. New technologies such as IEEE 802.11 WLAN, Bluetooth, HIPERLAN/2, GPRS/EDGE, cdma2000 and WCDMA aim to achieve this. To facilitate new services, and make them flexible and bandwidth efficient, vertical roaming of mobile nodes is a tempting possibility for operators. Benchmarks and metrics are needed to assess these issues. The need for qualitative and quantitative results for these parameters in a real time situation is critical. One such scenario is the effect on the network performance by means of effective throughput and handoff latency perceived by the mobile user, with increasing number of active users or network load. This paper presents simulation results for mean throughput and handoff delay obtained in vertical handoff and horizontal handoff in IEEE 802.11 and GPRS/EDGE networks. An optimization

scheme for mobile users performing vertical handoffs is presented with analysis [C3181]

## "TCP performance in the GPRS system adopting the channel quality aware scheduler"

The General Packet Radio Service (GPRS) networks are already implemented by several companies in different countries, however some problems related to the quality of service (QoS) observed by users and the efficient use of radio resources are not yet adequately addressed. In this framework, we propose a scheduling algorithm implemented at MAC layer, named as channel quality aware scheduler (CQAS). The main feature of the CQAS is that the user to serve is established taking into account the estimated channel quality for each of the active traffic flows. The performance of the proposed algorithm are evaluated in terms of goodput experimented by TCP clients, considering a set of concurrent file transfers and independent time varying channels. The comparisons between the CQAS performance and those obtained using a simple work conserving round robin (WCRR) algorithm, highlight the improvements introduced by the proposed algorithm. Moreover, the analysis emphasizes that the appropriate choice of both the channel coding scheme (CS) and the scheduling algorithm is needed in order to increase the radio resource utilization [C3182]

## "Analysis of TCP performance over hybrid "fast fixed-to-slow wireless" buffered links"

We investigate performance improvements through TCP window size optimisation achievable when TCP Reno is used over a highly heterogeneous network, such as an 802.11b wireless LAN or a GPRS-based internet connection. Initially, our modelling focuses on a constant rate, buffered access link, based on a loss-less wireless channel and with a bandwidth at least one order of magnitude less than its fixed-network continuation into the core. We implement the model guidelines on wireless LAN and GPRS access links, confirming that TCP throughput can be increased by optimising the TCP receiver window size to the link characteristics, and more significantly, that there exists a broad range of near-optimal awnd values [C3183]

## "Sub-surface imaging by combining airborne SAR and GPR: application to water detection in arid zones"

We investigate the penetration capabilities of microwaves, particularly L-band, for the mapping of sub-surface moisture. The experiment site is the Pyla dune, a bare sandy area allowing high signal penetration and presenting large subsurface wet structures (paleosoils) at varying depths. The SAR penetration depth is estimated by inverting a scattering model for which the sub-surface structure geometric and dielectric properties are determined by the GPR data analysis. We observed a specific phase difference between HH and VV channels, due to a wet layer covered by dry sand. Our results suggest that airborne radar systems in a lower frequency range (P-band) should be able to detect sub-surface moisture down to at least ten meters [C3184]

## "Simulation and design of ground-penetrating radar for Mars exploration"

Over the past few years, the interest in exploring Mars has grown, with several missions in the planning stages for the next decade. One motivating theme is the potential of discovering substantial subsurface aqueous reservoirs. This paper outlines the simulation and development of a lightweight, low-power, ground-penetrating radar system intended for the subsurface exploration of Mars [C3185]

## "Imaging and inversion of buried objects using GPR"

The problem of detection of a buried object is formulated as an electromagnetic inverse scattering problem, using algorithms of increasing complexity. Our first approach consists of a back-projection of the measured data and this imaging algorithm enables the location of the suspicious areas, where further investigation is needed. The second approach is effective inversion, where a domain of interest is selected and an effective permittivity and conductivity inside the domain is computed using either a linear or a nonlinear optimization scheme. In our third approach we aim to invert the spatial distribution of the permittivity and conductivity inside the domain of interest. We employ either a linearized inversion scheme based on the Born approximation or a full non-linearized inverse method based on the contrast source inversion (CSI) method [C3186]

## "Static accuracy estimations of the methods of interpretation the subsurface layered Earth radioprobing signals"

Comparative estimates are made of the accuracy of interpretation methods in the radioprobing of subsurface layers. The signals were received during georadar sounding, for remote determination of the layer thickness [C3187]

## "Discrimination between low metal content mine and non-mine-targets using polarimetric ultra-wide-band radar"

In this paper we show that wide band radar polarimetry can be used for discrimination between surface laid AP mine and non-mine targets. To do this we employ two types of coherent radar decomposition theorem applied to wide band chamber measurement data from the European Microwave Scattering Laboratory (EMSL). Our main conclusion is that radar polarimetry should be further investigated as an important way to secure low false alarm rate from radar sensors in stand off mine detection [C3188]

## "Radar Technology for Mine Detection"

Much attention is being given to the challenge of detecting buried non-metallic mines and National and International programmes are underway to develop more effective detection and clearance systems. Reported results from the US national programmes on mine detection suggest that radar can outperform conventional metal detectors, which only respond to the metal content of a mine and hence are insensitive to minimum metal mines. Radar, and in particular ground penetrating radar, used in conjunction with other sensor arrays can result in an improved fused performance in terms of reduced false alarm rate. This paper reviews key aspects of the performance of radar as a sensor, in particular the system design, antenna characteristics, signal and image processing as well as detection performance. Examples of the radar images of mines and the factors that influence image quality are presented. Current demonstrator radar systems can detect buried AT mines with some confidence, but the reliable detection of AP mines will require further development of antennas, clutter rejection algorithms and target detection methods. [C3189]

## "Experimental Multi-Sensor GPR System for Humanitarian Demining"

The paper describes the design of a multi-sensor ultra wideband GPR front-end suitable for subsurface imaging with resolution sufficient for antipersonnel mine recognition. The front-end comprises two sensors: a multi-static video impulse radar and a bistatic stepped-frequency continuous wave radar. In comparison with commercially available video impulse GPR systems the key advantages of the video impulse system are considerably larger bandwidth, high precision of measurements of scattered field, ability to measure polarimetric structure of the scattered field and high pulse repetition rate resulting in fast data acquistion. The principal advantage of the stepped-frequency continuous wave sensor over its predecessors is very short data acquisition time, which is comparable with that of video impulse radars. [C3190]

## "Towards unconstrained mobility [Cintelligent transportation systems]"

In this paper we give an overview of trends, options and new concepts for mobile Internet and intelligent transportation systems (ITS) services in Europe. We review technologies and standards and focus on new initiatives which allow for mobile, personalised and location-sensitive Internet and ITS services with a high degree of flexibility and user-friendliness. We give some examples of European research projects on the integration of cellular mobile radio (GSM, GPRS, UMTS) with broadcasting systems (DAB, DVB-T), satellite navigation systems (GPS, Galileo) and short range communications techniques (IrDA, Bluetooth) [C3191]

## "IPv6 based infrastructure for wireless IP in multi-radio environments with quality of service support"

The European Union funded DRiVE project (dynamic radio for IP services in vehicular environments) aims at enabling spectrum-efficient high-quality wireless IP communication in a heterogeneous multi-radio environment to deliver in-vehicle multimedia services. The IPv6 based network architecture for IP over multi-radio access networks and traffic control aspects within the emerging DRiVE network plays a key role within the project. This paper gives an update of relevant changes of the DRiVE concepts compared to our previous report (see Lin Xu et al., Proc. LCN 2000, 25th Annual IEEE Conf. on Local Networks, 2000). It focuses on the system functions and network elements of the DRiVE IPv6 infrastructure and also considers the provision of quality of service [C3192]

## "Frequency domain reflectometry of buried objects using wideband antennas"

Antenna design for ground penetrating radar (GPR) requires to take into account a number of features related to subsurface sensing. Usually, such antennas are placed very closely to the object surface under investigation. They should be wideband to ensure good resolution, capable to operate on low frequencies to provide reasonable penetration depth, and be sufficiently sensitive and portable. Here we present the results of comparative analysis performed for two types of most popular antennas-the unidirectional spiral antenna and the tapered-slot antenna (TSA) of Vivaldi type, designed and fabricated by the authors. [C3193]

## "Discrimination of Near-Surface Targets in Step-Frequency Radar"

An improved frequency domain method for detecting and discriminating shallow subsurface targets is presented. Conventional signal processing technique in step-frequency ground penetrating radar (GPR) is based on inverse fast Fourier transform (IFFT) of reflection coefficient. However, the synthetic range profile generated by IFFT often cannot be used to detect shallowly buried objects due to lack of resolution. Simple modification of the expression for the synthetic range profile that takes into account both amplitude and phase of IFFT results in enhanced resolution and allows discriminating targets according to their reflectivity phases. Further improvement of the performance of the method has been achieved by extracting the reflection from the ground surface. To this end, radar system has been calibrated using optimization procedure, where input data are reference signals measured with the antenna positioned at different distances from metal plate. Free space has been used as another calibration standard. After calibration, the ground surface response can be easily subtracted revealing shallow objects. Experimental examples are given to illustrate the method performance. [C3194]

## "Service adaptability management in mobile multimedia environments"

First Page of the Article [C3195]

## "An Efficient Ultra-Wideband Bow-Tie Antenna"

In this paper, a transient bow-tie antenna for Ground Penetrating Radar applications is discussed. This antenna exhibits good efficiency and an ultra-wideband property due to a combination of a tapered capacitive and a resistive loading. The tapered capacitive loading is realized by constructing an array of slots on the antenna surface and the resistive loading is obtained by making use of microwave absorber blocks placed on the slotted surface of the antenna. Using a 0.8-ns monocycle as input pulse, the amplitude of its transmit waveform is 70% higher than that of a conventional bow-tie antenna of equal dimension. The transmit waveform is a nearly symmetrical triplet with a late-time ringing level of lower than Г‚Вї33 dB. [C3196]

## "Vehicle Mounted Ground Probing Radar-Results for Mine Detection"

A ground probing radar array demonstrator for inclusion in a vehicle mounted sensor suite for anti-personnel mine detection is presented [C3197]

## "Anti-Personnel Landmine detection using depth fusion"

Detection of Anti-Personnel Landmines is a challenging task for any sensor currently available. Using sensor fusion allows combining individual sensor results such that for each sensor its advantages remain while compensating for its disadvantages by using other sensor types. This paper provides an overview of sensor-fusion results obtained within the EU funded projects GEODE and LOTUS. These projects aim toward a vehicle mounted sensor suite consisting of Ground Penetrating Radar, Metal Detector, and Thermal Infra-Red. [C3198]

## "RISC system design in an FPGA"

Known for their flexibility, Field Programmable Gate Arrays (FPGA) are widely used for ASIC emulation, glue-logic consolidation, or as a solution for applications with high volatility. FPGAs facilitate quick time to market, and their incredible power of re-programmability often makes them the heart of a system. This paper presents the design of a Reduced Instruction Set Computer (RISC) system described using VHDL and the results of researching the implementation of this system in an FPGA. This RISC is a 16-bit processor with high general-purpose register (GPR) orthogonality and communicates to peripheral devices via a serial bus [C3199]

## "Preparing the Joint Multi-sensor Mine-signatures project database for data fusion"

The Joint Multi-sensor Mine-signatures (MsMs) project was started in the year 2000 and has as its main goal to organize and execute an experimental campaign for collecting data of buried land-mines with multiple sensors. These data sets are being made widely available to researchers and developers working amongst else on sensor fusion, and signal processing for improved detection and identification of land-mines. The. outdoor test facility (6Ч80 m) of the Joint Research Centre (JRC) of the European Commission, located at Ispra (Italy), houses the test minefield. Six test strips of 6Ч6 m consisting of different soil types (cluttered grassy terrain, loamy soil, sandy soil, clay soil, soil with high content of organic matter and ferromagnetic soil) are complemented with one reference test strip of 6Ч6 m consisting of pure sand. The list of objects buried in the minefield includes mine simulants of three different dimensions with either a low or a high metal content, reference targets for position referencing and calibration checking, and clutter objects including empty bullet cartridges, metal cans, barbed wire, stones, wood, plastic boxes, etc. This test minefield is going to be left intact for a long period, in order to be

able to perform multiple runs on it. For the test campaign of the year 2000, the core sensors were a metal detector a ground penetrating radar, a microwave radiometer and several thermal infrared imagers. The first data sets are in the process of being released right now. This paper aims to prepare the first results to be obtained by fusing the data coming from these different sensors, by presenting the available datasets [C3200]

## "Study of IRP for UMTS network management"

A unified management strategy is required for the UMTS (Universal Mobile Telecommunications System) management system. IRP (Integrated Reference Point) is proposed by 3GPP (3rdGeneration Partnership Project) and TMF (Telecommunication Management Forum). In this article, we introduce the IRP concept and its development discussed in these forums. We also propose an IRP model for the GPRS network. A new NSM (Network Service Model) concept is introduced to IRP. The future research is discussed [C3201]

## "Investigations on anti-personnel mine detection using microwave radiometers"

Many million anti-personnel mines are polluting the environment in about 60 countries and cause a considerable limitation of the living space for agricultural purposes. The present mine clearance operations are much slower than the mine laying operations. Therefore the principal goals of a mine detection system designer must be focused on the following key requirements: 1) The system should be capable of detecting small surface and subsurface plastic mines with very low metal content under most environmental conditions, 2) the detection probability should be maximised and the false alarm rate minimised, 3) the hardware expense should be as most cost-effective as possible. The optimum solution is the use of multiple sensors, e.g. metal detectors, ground penetrating radars, microwave radiometers, based on different physical phenomena and on data fusion. In this paper we give an overview on relevant physical phenomenology and on our past work in investigating passive microwave sensors for mine detection purposes as a possible contribution to a multi-sensor system. We present experimental equipment and corresponding illustrative measurements results [C3202]

## "Reconstruction parameters of underground objects based on FDTD and optimization method"

The inverse of the parameters of underground targets is still highly in expectation in ground penetrating radar (GPR) applications. In this paper, the FDTD method and time-domain optimization algorithm have been used to reconstruct the permittivities of underground multiple targets. An iterative optimization algorithm has been put forward. The forward scattering data are also calculated by a 2.5 D-FDTD algorithm in order to better simulate the practical GPR situation. The relationship between the convergent rates of the inverse algorithm and the initialization values are studied [C3203]

## "Multistatic GPR for antipersonnel mine detection"

Todays ground penetrating radar (GPR) systems encounter a variety of difficulties when applied to the detection of buried antipersonnel mines, e.g., a high clutter level and strong surface scattering. Angular diversity or "multistatic" data acquisition promises for the cost of additional hard- and processing effort high potential to overcome some of the problems. The paper explains the basic idea, illustrates a hardware realization and processing strategies and presents first results [C3204]

## "Applying UMTS and GPRS technology in existing military communication networks: a case study"

The future of military wireless networks is changing dramatically along with the commercial wireless communication systems. During the last few years, the mobile wireless industry is spending considerable effort to enhance the technical characteristics of existing second generation systems in the goal of upgrading their service provision capabilities and of promoting effective integration with data transport networks (such as GPRS and UMTS). After giving an overview of GPRS and UMTS technologies, the paper proceed to present a set of generic GPRS and UMTS-based architectures, which can be used as migration steps toward third-generation tactical military networks. [C3205]

## "Automatic mapping of linear structures in 3-dimensional space from ground-penetrating radar data"

Non-invasive geophysical techniques such as ground-penetrating radar allow rapid and low-cost investigation of the shallow subsurface for the detection of such features as utilities and plant. This paper presents a pattern recognition approach based on the 3-dimensional Hough transform for the detection of extended linear targets in ground-penetrating radar data. By transforming spatially extended patterns into spatially compact features in parameter space, a difficult global detection problem in data space becomes a more easily solved local peak detection problem in parameter space. Due to the sparseness and variability of the data, the accumulator peak

detection stage is replaced by a novel algorithm called the adaptive non-accumulated Hough transform (ANHT) 3-dimensional clustering algorithm. This technique allows the combination of qualitative site information and ground truth in order to increase the accuracy of the final result. The user is presented with a 3-dimensional site survey report detailing the length, depth and orientations (azimuth and zenith) of any pipes, cables or the like. The ANHT performs substantially superior to the standard Hough transform implementation in computer memory requirement. Our experimental results on the artificial 3-dimensional linear objects indicate that method works quite well under various background conditions. The automatic mapping of linear structures in 3-dimensional space from ground-penetrating radar data is achieved by implementing the ANHT in the detection of linear targets in ground penetrating radar data [C3206]

## "3G wireless standards offer solution to mobile services in the Warfighter Information Network"

The US Army's ongoing "digitization" process involves the networking of several military computer systems to provide battlefield commanders with a common operational picture (COP). However, commanders risk being tied to a fixed location to take advantage of these capabilities as the current tactical communications network does not provide high data rate mobile communications. The emerging third generation (3G) commercial wireless standards could be integrated with the developing Warfighter Information Network (WIN) to provide a solution for mobile voice, video, and data. 3G capabilities include variable and asymmetric data rates, support for different bit error rates (BER), slotted ALOHA packet channels, and multiple connections for a single user. We first present an overview of developing 3G standards, then discuss the WIN mobile communications requirements. Finally, we discuss the "value-added" benefits that the use of 3G wireless offers to military operations in a mobile environment. [C3207]

## "A new way to solve IP QoS in the General Packet Radio Service"

This article presents a novel solution to enhance the General Packet Radio Service (GPRS) architecture. The solution is based on the DiffServ model which is the existing IP QoS support architecture, and introduces new signals in the GPRS tunnel protocol (GTP) to reserve resources in the oPRS backbone network. [C3208]

## "The effect of phase noise in a stepped frequency continuous wave ground penetrating radar"

In the application of stepped frequency continuous wave for a ground penetrating radar, the required range resolution is very high, in the order of a few centimetres. Because weak echoes of landmines must be detected against the strong background of the surface reflection, particular attention must be paid to the phase noise of the generated frequencies. The paper evaluates the effect of phase noise based on a frequency modulation approach. It is shown that due to the very short delay between transmission and reception, the requirements on the phase noise can be met using commercial off the shelf components [C3209]

## "Buried object detection using ground penetrating radar"

A wide variety of sensors could be considered to aid this situation, and generally each will have a particular niche role but the sensor that is of most universal value is ground penetrating radar, or ground probing radar. Its main advantage is that it allows all types of objects to be detected irrespective of their material, operates over a sufficient bandwidth to allow target classification procedures to be implemented and makes use of modern digital electronics allowing wide areas to be searched rapidly. Other sensors provide complementary information that can be fused with radar data to provide a more complete view of the underground environment. [C3210]

## "Two-stage dynamic uplink channel and slot assignment for GPRS"

General Packet Radio Service (GPRS) uses a two-stage mechanism to allocate uplink radio resource to mobile stations (MSs). In stage-1, the base station (BS) assigns several packet data channels (PDCHs) to an MS. Furthermore, a PDCH may be assigned to multiple MSs. In stage-2, therefore, the BS selects one of the multiplexed MSs in a PDCH to use the radio resource. In this work, maintaining a load balance between PDCHs in stage-1 is examined and several selection schemes to lower the mis-selection rate in stage-2 are proposed. From our simulation results, the cost deduced from the poor load balancing and selection schemes render a lower system throughput and a non-negligible increase in packet queuing delay. Among the various stage-2 selection policies, round robin with linearly-accumulated adjustment (RRLAA) has the lowest mis-selection rate and outperforms the one without any heuristic up to 50% [C3211]

## "Novel inverse methods in land mine imaging"

The imaging of buried land mines continues to present significant signal-processing challenges in the development of inverse methods for the detection of plastic mines buried in soil. To address this difficult

problem, mathematical advances in the development of the elliptic systems method are used to generate images of the buried land mines. The-proposed approach adapts earlier methods, successfully applied in laser tomography of breast tumors using the diffusion equation, to the present problem of land mine imaging using the Helmholtz equation. The images generated by the new method represent electromagnetic properties of underground regions, providing effective differentiation of plastic land mines from surrounding soil. Experimental results are presented to demonstrate the new method [C3212]

## "Motion adaptive error resilient encoding for MPEG-4"

Optimising delivery of video codecs such as MPEG-4 is vital to ensure that acceptable quality can be offered to 3G network customers. The error prone nature of mobile channels means that the video codec that is employed must be fairly robust. In the past, such research has required alteration to existing standards. Given the imminent implementation of 3G technologies, changing the standards is not a convenient option. This paper presents a technique for altering MPEG-4 encoding parameters to increase the error robustness of the output bitstream. It exploits the fact that frames with a high degree motion are often more sensitive to error than those with low amounts of motion. Using a simple model, the video packet length and number of adaptive intra refresh (AIR) blocks are varied according to the amount of motion in a frame. Simulations using a GPRS channel are presented to confirm the benefits of the proposed scheme [C3213]

## "Measured performance of GSM, HSCSD and GPRS"

In this paper we present results of measurements on the performance of GSM HSCSD and GPRS data transmission. We used a measurement tool that we have developed to study the performance of various wireless links as perceived by nomadic applications using TCP. The results show that in stationary connections the throughput and response time are stable and, in general, close to the theoretical values. However, the throughput and response time vary a lot when connections are used in motion. One of the reasons is that TCP is not capable to adapt itself properly to the variability of QoS of HSCSD and GPRS, and therefore, it does a lot of unnecessary retransmissions causing performance slowdown. The performance of HSCSD is better than the performance of GPRS. Reliability is adequate in stationary connections, but in moving connections there are unwanted disconnections or long pauses in data transfer [C3214]

## "Statistical properties of silence gap in public mobile telephony channels with application to data transmission"

This paper examines the probability distribution of the channel idle time in mobile public telephony systems: personal communication systems (PCS) and private mobile radio (PMR). Results are used to predict the time available for data transmission on channels dynamically assigned to voice and data, which usually prioritize voice with preemption. The probability of having to interrupt a data block because the channel is preempted by voice is analytically derived. Several strategies can be used to include the most suitable data block first in silence gaps. Different policies should depend on statistical properties of the gap for a specific system to achieve optimal performance [C3215]

## "Enhanced GTP: an efficient packet tunneling protocol for General Packet Radio Service"

General Packet Radio Service (GPRS) is the packet data service for the phase 2+ of the Global System for Mobile Communication (GSM) and it is also included in the 3rdgeneration partnership project (3GPP) which is one of the proposals for the 3rdgeneration mobile communication systems (3G). GPRS defines packet-switched service based on GSM and Internet protocol (IP) core networks. It also provides a tunneling protocol called the GPRS tunneling protocol (GTP) by which packets in different protocols can be encapsulated and carried on the IP core network. However, GTP does not optimize packet encapsulation and introduces overhead in data transmission. In this paper, an enhanced GPRS tunneling protocol is thus elaborated. GTP uses a tunneling identifier to specify a tunnel, which belongs a mobile station. The enhanced protocol extends GTP signaling messages and uses a packet data protocol (PDP) address as a tunneling identifier so that the GTP in the data transmission plane can be eliminated. According to the experiments, the enhanced GTP reduces the tunneling overhead and improves the network throughput to a great extreme [C3216]

## "Providing differentiated services in EGPRS through radio resource management"

Traditionally, packet scheduling has been considered to be the primary technique for providing quality of service in communication networks. In a previous paper (see IEEE Globecom '00 Proc., vol.3, p.1515-21, Nov. 2000) we explored different packet scheduling techniques for providing differentiated services (premium vs. basic service offerings) in the 3G EGPRS (enhanced general packet radio services) system. A premium service is defined here as one with a higher priority, and therefore resulting in a better user experience, than a basic service. This

paper continues the investigation. In particular, we assess algorithms that allocate multiple time slots for premium users. The results show that multi-time slot assignment for premium users is very effective in supporting differentiated service offerings. It provides a better user experience to premium users with little performance degradation to the basic users [C3217]

## "Turbo-equalised H.263-based video telephony for GSM/GPRS"

The performance of turbo-equalised GSM/GPRS-like videophone transceivers is studied over dispersive fading channels as a function of the number of turbo-equalisation iterations. Iteration gains in excess of 4 dB were attained. The proposed system is capable of providing low-resolution videophone services over GSM/GPRS [C3218]

## "Analysis of the effects of outages on the quality of service of GPRS network systems"

The General Packet Radio Service (GPRS) extends the Global System Mobile Communications (GSM) by addressing packet-oriented traffic. Availability is the most important dependability requirement for such communication systems as GPRS. Focusing on the contention phase, where users compete for channel reservation, this paper analyses the GPRS with the objective to understand its behaviour under critical conditions, as determined by periods of outages, which significantly impact on the resulting dependability. In fact, during outages (service unavailability), users trying to access the service accumulate, leading to an overload of the system. When the system resumes its operations, the accumulated users determine a higher probability of collisions on resources assignment (and therefore a degradation of the QoS perceived by the users). Our analysis, performed using a simulation approach, allowed us to gain insights on the impact of outages on the QoS and of the overload that GPRS systems have to face after outages. [C3219]

## "Snoop TCP performance over GPRS"

The General Packet Radio Service (GPRS) system developed to work with the existing GSM infrastructure is basically a packet switching system via radio that will provide an easy adaptation to bursty traffic generated by Internet applications like e-mail, WWW and FTP. These applications use as transport protocol TCP and therefore a good interaction is necessary between TCP and the GPRS protocols. TCP is a protocol initially designed to work in fixed networks, and in order to solve its problems in wireless networks, some proposals have been made in the last years. One of the most important proposals is the Snoop TCP protocol, which was initially designed to work in a wireless LAN environment. We analyze the performance of the Snoop TCP protocol in a GPRS network. We demonstrate that the Snoop agent does not work well in a busy GPRS network [C3220]

## "Necessity of an emulator to validate new resources allocation protocols"

Sharing resources between several users is a need for bandwidth usage optimisation, as well as a challenge for allocation algorithms and protocols (referred to as MAC protocols). The efficiency of the MAC (medium access control) is of major importance for the performances of the supported applications. Furthermore, these application protocols are too many and too complex to be properly analysed and modelled when designing the radio segment. Only a real time connection of the application protocols on an emulated MAC can highlight possible misbehaviours or bad performances. In order to validate new protocols included in radio-mobile networks, we chose to develop an emulator of the General Packet Radio Service (GPRS), the POTOMAC (Protocol Observation Tool for the Optimisation of MAC layers). Each protocol of the stack, for example the radio resource allocation, can be individually focused on and its influence on service performance can be evaluated. Furthermore, the behaviour of application protocols when supported by the radio segment can be analysed [C3221]

## "Dynamic QoS provisioning in wireless data networks"

Providing quality of service(QoS) guarantees in mobile data networks is an inherently challenging task. Mobility of users imposes a spatial demand on resources resulting in overloaded regions that are entirely dependent on mobility pattern of the users, that is often unpredictable. Prior and ongoing work in this area of QoS relies on call admission control (CAC) based on the assumption of random or uniform mobility patterns, and also in most cases are based on local information. The challenge is to design a scalable scheme that can provide QoS under distinct mobility patterns. In contrast to the standard notion of QoS which is based on the handoff dropping probability, another important notion of QoS is based on disallowing handoff drops but minimizing the cell congestion probability that may occur in a given cell. In this paper we explore this notion of QoS by proposing a dynamic CAC scheme that uses a dynamically estimated mobility pattern and distribution of users in different cells to reach an admission decision with the objective of minimizing cell congestion probability. This scheme does not maintain per user state, and can be implemented in a distributed fashion. From simulation results, we

show that across different mobility patterns, the proposed scheme performs better than existing schemes in terms of achieved QoS while providing the minimum level of overall target utilization [C3222]

## "Modeling and performance evaluation of GPRS"

This paper provides an accurate model of the General Packet Radio Service (GPRS). GPRS is modeled as a single server queue in a Markovian environment. The queueing performance of data packets is evaluated by matrix geometric methods. The arrival process is assumed to follow a two state Markov modulated Poisson process (MMPP), and the service rate fluctuates based on voice loading. The analytical results are confirmed by simulation [C3223]

## "A quality-based downlink power control algorithm for General Packet Radio Service (GPRS)"

General Packet Radio Service (GPRS) is a wireless packet data overlay network for Global System for Mobile Communication (GSM) networks. We present a fast-adapting, bit error rate-based downlink power control algorithm for GPRS [C3224]

## "QoS scheduling of mixed priority non-real-time traffic"

Non-real-time (NRT) services will constitute a majority of the services provided by third generation systems. The primary QoS parameter for NRT traffic flows is traffic handling priority (THP) which determines the ratios of specified class performance measures. Good system performance is generally defined by low latency and low likelihood of packet loss. The most common measure for latency is average packet delay; however, we show that this measure does not truly reflect the users perceived packet delay. Instead, we introduce effective packet delay which measures delay from the users perspective. Furthermore, we investigate the ability of existing priority and differential service scheduling algorithms to achieve the prescribed THPs for the above performance measures as well as the effect of varying channel bit rate on scheduler performance. Finally, we introduce a new scheduling algorithm, differential effective service, which outperforms existing schedulers with respect to effective packet delay and provide simulation results [C3225]

## "Characterization of the GPRS radio interface by means of a statistical model"

General Packet Radio Service (GPRS) is the packet switched data service for GSM. The typical Internet applications like WWW, FTP and e-mail will work over GPRS and it is therefore important to know their performance in this system. In order to accomplish this objective, a simulator of the GPRS system is necessary. The fixed network nodes introduced by GPRS are easy to simulate, but the main problem appears when we try to simulate the GPRS radio interface. We present useful types of results of the GPRS radio interface which facilitates the GPRS emulation [C3226]

## "Investigations on the throughput in EDGE- and GPRS-radio networks"

This paper presents simulation conditions and results for GPRS and EDGE networks. These results are based on system level simulations with a dynamic simulator. The influence of the frequency reuse factor and the system load on the data throughput is evaluated. A homogeneous GSM 900 network is considered for these investigations [C3227]

## "Performance of a multi-service GSM/GPRS-capable network under various loading conditions"

The aim of this paper is to investigate the performance of the air-interface of a GPRS-capable network, under various loading conditions and various data services, taking into account environmental conditions, user behavior, services QoS requirements (i.e., data session dropping and blocking probabilities, required slots for data transfer). For this reason, a GSM/GPRS simulation platform has been developed which takes into account both, environmental (e.g., propagation conditions, service characteristics) and network configuration aspects (network elements, interconnections, element capabilities, etc.). Results have shown that in general, the maximum load of a certain service that the system can withstand, depends on the circuit-switched traffic load, the specific service's characteristics (e.g., requested slots in uplink and downlink) and the characteristics of the data services that coexist [C3228]

## "Towards the introduction of the asymmetric cryptography in GSM, GPRS, and UMTS networks"

The logic ruling the user and network authentication as well as the data ciphering in the GSM architecture has been inherited by the General Packet Radio Services (GPRS) and the Universal Mobile Telecommunication System (UMTS) as well. So, in all these systems, three nodes are involved in the corresponding processes,

namely, the mobile station (MS), the visitors location register (VLR), and the home location register (HLR). Moreover, the methods of the conventional cryptography have been adopted by all the three systems. A description of the subscriber authentication is given, as well as of the data ciphering, as they are recommended by the specifications regarding the aforementioned systems. Based on this analysis, we pinpoint the vulnerable points of the VLR-HLR and MS-VLR links, exposed to third party attacks, and we propose for their coverage asymmetric cryptography procedures, consisting of the introduction of public-private key pairs for the transactions between the VLR-HLR, as well as the MS-VLR [C3229]

## "OSA enabled global application roaming"

This paper focuses on an open service architecture (OSA) approach for achieving global application roaming in the mobile network scenario. Applications would be deployed in different public network operator domains as well as both in public network operator domain and in private enterprise domain [C3230]

## "Network intelligence for GPRS"

This paper addresses the classes of services enabled by the network intelligence concept for GPRS. Some possible architectural solutions that a GPRS operator could use to provide these classes of service are also described [C3231]

## "Dynamic scheduling framework on RLC/MAC layer for general packet radio service"

We present a traffic-scheduling framework which can dynamically allocate radio resource to GPRS handsets based on the interference levels of the radio links. Essentially, when a mobile station (MS) is within a high interference region, the proposed scheme uses a low transmission rate to reduce bandwidth wastage due to re-transmissions. On the other hand, when the MS is within a low interference region, a high transmission rate is used, in order to fulfil its quality of service (QoS) requirements. One of our contributions is to derive a rate decision analytical model to determine the high and low transmission rates based on the interference conditions and the delay-bound requirement. The performance results show that our dynamic scheme can effectively utilize the bandwidth to satisfy various QoS requirements in the GPRS system without changing the convolution-coding rate [C3232]

## "vGPRS: a mechanism for voice over GPRS"

This paper proposes vGPRS, a voice over IP (VoIP) mechanism for a general packet radio service (GPRS) network. In this approach, a new network element called VoIP mobile switching center (VMSC) is introduced to replace standard GSM MSC. The vGPRS approach is implemented using standard H.323, GPRS, and GSM protocols. Thus, existing GPRS and H.323 network elements are not modified. Furthermore, both standard GSM and GPRS mobile stations can be used to receive vGPRS service, which need not be equipped with the VoIP (i.e., H.323) terminal capabilities [C3233]

## "A GSM 2+ conversion signal processor for continuous full-duplex EDGE/GPRS applications"

This conversion signal processor (CSP) handles all classes of EGPRS (classes 1 to 29) and is fabricated in a 0.30µm, 3V CMOS process. It is capable of handling all eight consecutive slots for both transmit and receive simultaneously, in contrast to current products which support only 1 to 4 slots (class 8 and 12), and only half-duplex operation. Low power design features include dedicated signal processing functions, a software-programmable GSM-optimized timing control engine extended to support efficient multi-slot operation, analog blocks which power up quickly only when needed, to minimize standby or start-up power. The 100-pin FSBGA chip also includes a complete voiceband CODEC with 16Ω speaker drivers, auxiliary DACs, A5 ciphering, and a 32kHz crystal oscillator [C3234]

## "Confocal microwave imaging for breast tumor detection: a study of resolution and detection ability"

Confocal microwave imaging (CMI) is a recently introduced method of breast tumor detection that utilizes techniques adapted from ground penetrating radar for mine detection. Initial feasibility studies performed with simulated data indicate that CMI is a promising method for tumor detection and localization. In this paper, we explore the detection ability and resolution of the system. The detection ability is examined by imaging tumors of small diameter, while resolution is investigated by imaging 2 tumors located in dose proximity. Results indicate that tumors located 3 cm deep and of 3-mm diameter and greater are detected. Resolution is estimated to be 1 cm for two 6-mm diameter tumors. [C3235]

## "The use of extremely low frequencies (ELF) in pulsed form (PELF) for therapeutic use: a pilot study"

Following a previous Investigation on the therapeutic effects of Extremely Low Frequency in pulsed form-Pulsed Extremely Low Frequency (PELF)-this research explores the possibility of detecting the effects of PELF on the biological system by the use of the Heart Rate Variability (HRV) analysis. It is concluded that there is no overall change in HRV in presence of very weak-less than 25 μT-PELF. However when the HRV is considered together with Heart Rate (HR) and Blood Pressure (BP) some interrelation can be detected. [C3236]

## "A 700 Mb/s BiCMOS read channel integrated circuit"

A read channel IC achieves >1.5 dB SNR improvement over a 32/34 rate EPRML read channel at 2.8 user bit density. The 0.18 μm BiCMOS chip operates up to 700 Mb/s with 1.8 W read mode power using 3.3 V analog and 1.8 V digital power supplies. The die area is 9.64 mm2 [C3237]

## "Influence of antenna dimensions on response of ground-penetrating radar"

The response of ground-penetrating radar with the use of TEM-horns and Vivaldi antennas to metallic cylinders in free space and inside of a concrete wall has been investigated. The influence of distance between antennas on the position of time responses from closely situated objects has been experimentally confirmed. [C3238]

## "Performance analysis of the General Packet Radio Service"

Presents an efficient and accurate analytical model for the radio interface of the General Packet Radio Service (GPRS) in a GSM network. The model is utilized for investigating how many packet data channels should be allocated for GPRS under a given amount of traffic in order to guarantee appropriate quality of service. The presented model constitutes a continuous-time Markov chain. The Markov model represents the sharing of radio channels by circuit-switched GSM connections and packet-switched GPRS sessions under a dynamic channel allocation scheme. In contrast to previous work, the Markov model explicitly represents the mobility of users by taking into account arrivals of new GSM and GPRS users as well as handovers from neighboring cells. To validate the simplifications necessary for making the Markov model amenable to numerical solution, we provide a comparison of the results of the Markov model with a detailed simulator on the IP level [C3239]

## "Future mobile phones-complex design challenges from an embedded systems perspective"

In the coming few years, three trends for mobile phones will be seen. First, new communication standards provide packet-switched high-bandwidth wireless communication globally. Second, user applications are going from simple phone administration and text messaging to advanced multimedia and entertainment applications. Finally, because of Internet access and security support, the phones have the potential to move into a financial instrument for economical transactions. The article mainly covers the two former trends, and describes key complexity issues and design challenges. The concept of future mobile phones is described; communication capabilities and some emerging user application capabilities are outlined. The article describes and discusses complexity issues and some design challenges, and also provides a summary. Overall, the focus is from the digital system architecture perspective, and does not cover challenges in the areas of radio, antenna, or analog/digital integration [C3240]

## "Modelling the performance of realistic ultra-wide band ground penetrating radar (GPR) antennas"

A novel hybrid method based on plane wave spectra interactions has been presented for field calculation of GPR antenna patterns. The method has been employed for two validation cases involving a dipole and a TEM horn antenna. This method offers the possibility to investigate the performance of a wide range of complex antennas operating in the presence of the ground at standoff distances. The advantage of the method is that, it substantially reduces the computational resources needed and additionally, it offers the possibility of selecting the best method for the analysis of the antenna and the ground sub-domains. The analysis of the ground sub-domain leads to a database for the response of the soil plus the target. Using these data, the performance of a complex antenna positioned at any desired distance or orientation relative to the ground, can be modelled and optimised with minimal computational impact [C3241]

## "Some experimental observations of (μ/μ,λ)-evolution strategies"

The multi-recombinant (μ/μ,λ)-evolution strategy (ES) is investigated on a set of real-valued test functions empirically, in order to obtain guidelines for choosing a potential type of recombination in the framework of ESs. Applying the multi-parent versions of intermediate recombination (μ/μI,λ) and discrete recombination (μ/μD,λ) to

both objective variables and strategy parameters, five ESs with different recombination mechanisms are adopted. It has been found that, in most cases, robust performance can be obtained when discrete recombination is applied simultaneously to an object variable-strategy parameter pair [C3242]

## "Inductive and capacitive sensor arrays for in situ composition sensors"

Advances in electromagnetic sensor design provide the potential for high resolution imaging of subsurface objects and material properties at the microscopic (micrometer) and mesoscopic (meter) scales. With quasi-static, capacitive and inductive sensor arrays, objects are detected, identified, and imaged via their perturbations to the applied electric and magnetic fields, rather than through time delays of reflected electromagnetic waves as in ground penetrating radar. Building on the successful application as nondestructive quality assessment and monitoring tools as well as land mine detectors, several subsurface in situ sensors are enabled by this technology. Examples include: an electronic 3D microscope, enabling examination of cell level structures and composition; examination of near surface structures such as soil moisture, permafrost dynamics, soil properties with depth, root growth carbon sequestration, Martian surface aquifers, and buried deposits of carbon dioxide or methyl hydrides [C3243]

## "Implementation of a dispersive matched layer RBC within an FDTD framework, and its application to impulse GPR studies"

The problem of excessive computational resource requirements for modelling of dispersive and lossy materials is addressed with the development of high performance boundary conditions that can operate in such media. The work reports two innovations, firstly the investigation of conductivity profiles using genetic algorithm optimisation methods, and secondly the use of variable permittivity and permeability within the PML layer for effective absorption of evanescent waves. It is demonstrated that such methods can provide order of magnitude improvements in reflection coefficients over analytically derived profiles in both lossless and lossy dispersive materials. The effectiveness of the RBC is illustrated in the application of transient ground penetrating radar in soils with conductive loss using a full 3D model of an impulse GPR system, including antennas and feeds. Results are compared to published measurements [C3244]

## "High-level architectural co-simulation using Esterel and C"

This paper introduces an architectural simulation environment, aimed at defining the best SOC architecture for complex system-level applications. The application is modeled using an abstract timing modeling language, that describes the requests (e.g., memory accesses, I/Os, etc.) that the application makes to the architecture. The abstract architecture is modeled at the cycle-accurate level using a mixture of Esterel (a synchronous language) and C. We discuss the results of the application of this tool to a GSM/GPRS application, including a dramatic speed-up of the architectural exploration phase [C3245]

## "Signal processing of ground penetrating radar using super resolution technique"

Ground penetrating radar (GPR) using electromagnetic pulse requires high resolution due to its narrow bandwidth nature. The rising requirement for high resolution lead to specific demands for improved prediction methods, all requiring many aspects to be examined. The application of the super resolution method MUSIC (multiple signal classification) algorithm and FFT (fast Fourier transform) are examined. The combined processing method (CPM) of the time domain response of MUSIC and IFFT (inverse fast Fourier transform) is proposed for signal processing of GPR for the first time. Simulation and experimental results show that CPM has both higher resolution and higher receiving signal level than other conventional signal processing methods [C3246]

## "In-situ characterisation of building materials"

The knowledge of the electromagnetic properties of building materials is increasingly important in modern wireless communications due to high indoor communications demands. This paper describes a free-space measurement technique based on the ground penetrating radar (GPR) principle to characterise building materials. The constitutive parameters of the material under test such as the number of layers, the thickness and dielectric constant of each layer can therefore be determined. An inverse scattering algorithm for reconstructing these parameters, which is based on the global minimisation of the defined objective function using the multilevel single-linkage method, is developed and applied to this application. Results of measurements on standard sample materials and some building materials are presented and discussed [C3247]

## "A fuzzy cooperative fusion system for seismic image interpretation"

The paper concerns a seismic attribute fusion based on a cooperative approach between the interpreters and the system. A graphical user interface has been developed in order to allow geologists to use the system easily. It provides an original way to adjust some of the fusion system parameters which are understandable and close to the interpreters' language. The numerical aspect of the fuzzy method proposed is managed by the system. The results obtained for the detection as well as for the system manipulation by interpreters show the interest of the proposed method [C3248]

## "New USF codes for RT-EGPRS systems"

In standard GPRS/EGPRS, an RLC/MAC block is interleaved over four TDMA bursts over four consecutive time frames, and the uplink state flag (USF) field is consequently interleaved over four TDMA bursts. This leads to a 20ms USF field decoding delay due to the fact that the USF cannot be decoded until all four TDMA bursts have been received. To reduce this USF decoding delay, a method to transmit the USF with a short interleaving depth over an EDGE system using a new set of USF codes is proposed. These new USF codes compensate for the loss introduced by a reduced interleaving depth for the USF [C3249]

## "Time-domain reconstruction of moderately rough dielectric interfaces via quasi-ray Gaussian beams"

The problem of determining the properties of rough surfaces from electromagnetic scattered field data arises in many importance subsurface sensing problems such as underground imaging using data from a ground penetrating radar (GPR). In GPR systems, arrays of above-ground transmitters and receivers illuminate areas of interest and receive backscattered signals from shallowly buried objects from surface reflections. The shape of the air-ground interface is unknown, and it is a principal corruptor of the backscattered signal from subsurface targets of interest. In order to enhance subsequent detection, classification and inverse scattering processing, it is important to compensate for the distortion introduced by the air-ground interface. As a first step toward this goal, we previously addressed the problem of estimating the profile of one-dimensional (1D) moderately rough dielectric interfaces from a limited number of multifrequency measurements under time-harmonic excitation. In this paper, we extend the approach to the case of time-dependent (short pulse) excitation. The proposed extension is based on a developed Gabor-based narrrow-waisted pulsed-beam representation of short-pulse scattering by moderately rough surfaces [C3250]

## "2.5D far-field diffraction tomography inversion scheme for GPR that takes into account the planar air-soil interface"

A new 2.5D inversion scheme is derived for fixed-offset ground penetrating radar (GPR) that takes into account the planar air-soil interface. The inversion scheme is based upon the first Born approximation and a far-field approximation of the dyadic Green function for a two-layer medium [C3251]

## "Scaling and focusing of the Rotman lens"

With a high dielectric material, the size of the Rotman lens (see Rotman, W. and Turner, R.F., 1963) can be reduced by a factor of $\sqrt{(\varepsilon r)}$. Its design equations and scaling factor can be modified and defined according to the dimensions and materials of the lens and lines. Combining the lens with phase shifters, the lens and antenna array can generate multiple focused beams with a relatively small spot size. In wireless communications, the lens can allow us to increase the channel capacity by adding space division multiplexing and increasing the signal-to-interference ratio, S/I. Focusing the beam adds to both the angular and radial resolution. For application in ground-penetrating radar, a Rotman lens reduces the burden on signal processing as well as its size and weight. Using a ferroelectric material such as BaSrTiO3, we can fabricate the lens and voltage-tunable delay lines (phase shifters) in thin film geometry by laser ablation [C3252]

## "Simulation of TRT-configured ground-penetrating radars over heterogeneous grounds"

The transmitter-receiver-transmitter (TRT) configuration of the ground-penetrating radar (GPR) is a powerful tool to degrade the large undesired signals that dominate the total-received signal. Ground inhomogeneities, especially the ones in the surface of the ground, influence the measurements. However, the signals scattered from the target are still observed at the receiver [C3253]

## "Mine detection under rough ground surfaces using 2-D FDTD modeling and hypothesis testing"

This paper attempts to investigate hypothesis test performance in mine detection, based on numerically simulating the wideband scattering of experimentally measured ground penetrating radar (GPR) signals by realistic, dispersive soil interfaces. We employ a 2D finite difference time domain (FDTD) method to analyze the

delay and amplitude characteristics of ground-scattered waves as a function of roughness parameters. In addition, we apply binary hypothesis tests to the signals obtained using physics-based signal processing techniques to investigate the presence of the target at certain depth. We quantify the detection performance in terms of the spatial distribution of transmitter and receiver [C3254]

## "Ground penetrating radar imaging of buried metallic objects"

During the past decade there has been considerable research on ground penetrating radar (GPR) tomography for detecting objects such as pipes, cables, mines and barrels buried under the surface of the Earth. While the earlier researches were all based on the assumption of a homogeneous background for simplicity, the planar air-soil interface has also been taken into account in two recently developed algorithms (see Hansen, T.B. and Meincke Johansen, P., IEEE Trans. Geosci. Remote Sensing, vol.38, no.1, 2000; Meincke, P., IEEE AP-S International Symposium, 2001). We address a general formulation for GPR imaging of buried 3D metallic objects within the physical optics (PO) approximation which also highlights the analytical background behind the success of methods employed by Hansen and Meincke Johansen and Meincke in identifying high contrast scatterers [C3255]

## "Linearized multi-frequency inversion of ground penetrating radar data"

Although inverse scattering methods have reached a level of considerable sophistication in the past decades, their testing and verification remains predominantly numerical. By inverse scattering methods we understand those mathematical techniques that go beyond the trivial time-domain backpropagation or frequency-domain migration algorithms (sometimes called SAR imaging). The present study is concerned with the application of such inverse scattering methods to a practical problem of landmine detection using commercial ground penetrating radar (GPR) equipment. In particular, we investigate the performance of the so-called linearized inversion, i.e. the one where the description of the scattering process is subject to the Born approximation [C3256]

## "Fully-polarimetric ground penetrating radar application"

The ground penetrating radar (GPR) has broad applications in the fields of geology, civil engineering, archeology and military . It is usually used as a non-destructive inspection sensor for monitoring, inspecting and characterizing obscured objects by means of electromagnetic radiation, propagation and scattering. Unlike radars operated in the open air, the medium between the GPR and the target usually determines the performance instead of the target and the radar. The sensitivity of GPR applications is limited by clutter instead of noise or radar system. The increasing needs for better detection and discrimination capability have driven GPR users and researches to investigate the pattern and polarization characteristics of the GPR antenna designs. New GPR antenna designs were developed to provide improved sensitivity and stability. An example of fully-polarimetric GPR application that has not been seen previously is presented. Some important issues such as clutter sources, radiation patterns and propagation efficiency faced by the most GPR applications are also discussed [C3257]

## "Adaptation capabilities of a wire bow-tie antenna for ground penetrating radar"

We have demonstrated three possibilities of adaptation of a wire bow-tie antenna over different ground types. By varying its flare angle, a wire bow-tie antenna can be optimized to provide one of three aspects: minimal reflection at its terminal, maximal transmitted field strength in the ground, or an optimal size of antenna footprint. The choice of optimization will strongly depend on the application. The given approach is the frequency-domain solution of the electric field integral equation (EFIE) using the thin-wire approximation. The solution is obtained numerically by means of the method of moments. The fields above and below the air-ground interface are calculated using the expressions formulated by Banos (1966). The required time-domain fields are determined by means of the inverse Fourier transform of the calculated frequency-domain data. The characteristic impedance (which corresponds to the input impedance in time domain) of the bow-tie antenna is found by removing reflections in the obtained time history before transforming it back to frequency-domain [C3258]

## "Higham-Cheng algorithm for solving the generalized eigenproblem applied to the computation of the characteristic modes"

In computational electromagnetics many problems are representable in the form $Ax = \lambda Bx$ where the matrices A, Bare Hermitian and Bis positive definite. These problems are solvable with high accuracy by the simultaneous diagonalization of the pair (A, B). However, it may happen that numerical approximations and rounding errors deteriorate the properties of the pair (A, B) in a way that the simultaneous diagonalization procedure results are inapplicable. In this work a new algorithm developed recently by Higham and Cheng (1999) is proposed as a method to be applied in these cases. In particular, the computation of the characteristic modes for the TM2,

scattering by a conducting elliptic cylinder is addressed, and results are analyzed and discussed [C3259]

## "Antenna systems for EGPRS handsets"

The next generation GSM terminals will include EGPRS, offering high data rate services and packet data services. Data rates up to 473.6 kbits/s are theoretically possible, but only at very high SNR (signal-to-noise ratio) and CIR (channel impulse response) levels. Using an antenna system (i.e. more than one antenna port) in the handset, it is possible to combine the signals from the antennas in such a way that both the SNR and CIR level is improved. For data services, an improvement in the SNR and CIR level directly translates into an increased data throughput. This paper investigates the possible data throughput increase for EGPRS that can be obtained by using antenna systems in a handset with two antennas [C3260]

## "Performance analysis of varying the link adaptation BLER switching point in EGPRS"

This paper examines the impact of the choice of the link adaptation BLER switching point on the performance of Enhanced General Packet Radio Service (EGPRS) Phase I, with the aim of determining the optimum switching point. The analysis is carried out by considering outputs from a system level simulator and a system dimensioning and planning tool. Results are presented for both LA and IR for a range of LA switching points. A GSM macrocellular environment, having an interference-limited 4Ч3 re-use pattern, was chosen. The mobiles operate with perfect receivers in a variety of radio channel conditions [C3261]

## "Effect of service modeling on medium access control performance"

Due to the tractability in analytical methods exponential burst distributions are more common in service modeling literature. However, previous traffic measurements findings argue heavy tailed distributions such as Pareto represents burst sizes in WWW browsing and Cauchy distributed burst sizes in e-mail sessions. The effect of long range dependence (LRD) introduced by these heavy tailed distributions results in self similarity in the aggregate traffic. The impact of self similarity is significant in the area of queue delay performance characteristics. This work addresses the issues of service modeling in medium access control (MAC) performance compared to traditional exponential session distributions against the above mentioned distributions in WWW browsing and e-mail sessions applied to an example GPRS MAC system. The results conclude high delay in Cauchy e-mail connection sizes and Pareto WWW burst sessions compared to exponential connections/bursts. Also, once looking in to the matter it can be seen that this delay is mainly due to the congestion caused by different types of bursts/connection distributions. Therefore the bursty traffic such as WWW browsing which demonstrates self similarity at the aggregate level influence the MAC protocol performance greater than in traditional traffic models [C3262]

## "Analysis of a traffic model for GSM/GPRS"

A traffic model for GSM/GPRS, the hybrid radio resource allocation (HRRA) algorithm is evaluated. A dedicated number of GPRS channels plus idle periods between GSM voice calls are used for GPRS data packet transfers. A simulator was developed in order to evaluate the HRRA algorithm, which provides a reasonable forecast on the voice blocking probability and on packet delay for a single cell system. Since the major issue is the correct resource allocation, results are shown for the influence of some choices and assumptions on the overall performance. As expected, blocking probability can reach very high values if the number of dedicated channels increases too much. For the specific case of 4 carries and traffic of 20 Erl, 4 channels dedicated to GPRS still enable an affordable blocking probability, leading to a mean packet delay of 15 s. The results can be used to illustrate the fundamental options that need to be taken by an operator, when implementing GPRS [C3263]

## "A single cell model for the performance analysis of the radio layer in GSM phase 2+ (GPRS) networks under voice and data traffic"

Classically cellular networks have been analysed using Poisson call arrivals and negative exponential channel holding times. This approach has been reasonable for the circuit-switched voice traffic carried by the earlier cellular networks. However, with the advent of GPRS networks, packet switched data traffic now competes with circuit-switched voice traffic for the available resources on the air-interface. We analyse the merging of voice and data traffic in the radio layer of the GSM Phase 2+ (GPRS) networks [C3264]

## "Mobile internet -- research toy or product vision?"

First Page of the Article [C3265]

## "On the frequency-band selection for ground-penetrating radars operating over lossy and heterogeneous grounds"

The finite-difference time-domain (FDTD) method and the the perfectly-matched layer (PML) absorbing boundary conditions (ABCs) is applied to demonstrate the conductivity frequency relations in it three-dimensional ground-penetrating radar (GPR) problem involving lossy and heterogeneous ground. The selection of the center frequency of the source signal can influence the GPR measurements if these measurements are performed above a highly-conducting soil. However, since the skin depth of a typical ground model, with a conductivity value around 0.1 S/m, does not change rapidly, the enhancement of the target detection is not certain with the alteration of the center frequency [C3266]

## "Effective Web caching for GPRS networks"

During recent years, providing Web access to mobile users has become a major focus of the wireless network operations. A number of Web caching schemes have been proposed to improve response time of wireless Web access. Nevertheless, none of these schemes fit well into the GPRS model, which is an IP-based packet-switching extension of GSM. In this paper, various factors that must be considered in designing a Web caching scheme for GPRS are discussed. By taking those factors into account, we employ a known Web caching scheme, CNP, and extend its support of Web access for wireline networks into wireless GPRS environments. We also present how to incorporate CNP to deal with the Web proxy placement problem for GPRS [C3267]

## "Priority schemes for packet data and voice integration on EDGE"

In this paper we describe two priority-based algorithms for data communication considering the length of the packet which improves the performance of packet data transmission on EDGE. We also propose packet voice transmission over EDGE by allowing real-time users to use packet data channels in the same network maintaining both the normalized delay and the low blocking probability [C3268]

## "An auxiliary communication loop for air transport surveillance using GSM/GPRS"

This paper presents the design and implementation of an automatic dependent surveillance (ADS) using mobile communication. Mobile communications of GSM and GPRS are considered. The GSM/GPRS in time division multi-access (TDMA) is adopted as data communication infrastructure to transmit surveillance and control data. A communication protocol is established to enhance surveillance data link at low altitude. An avionics system is designed, implemented and tested using available components. In surveillance, the geodetic information system (GIS) is elected to map positioning data onto a visual friendly display. Under complete system architecture design and verification, the proposed GSM/GPRS-ADS is capable of carrying reliable and efficient data link communication at lower altitude. This paper demonstrates the idea, design, test, implementation of this auxiliary communication loop, and assesses its capability and application [C3269]

## "Signal detection and processing of seismic electromagnetic radiation in ELF band"

In this paper, a new signal processing method appropriate for detecting electromagnetic radiation due to the earthquake activities was proposed. The radiation is usually accompanied by background noises, mainly caused by atmospheric discharges in the tropical regions. A full-band differentiating filter was applied for the received data as a preprocessing. The good performance was obtained to detect a precursor signal of an earthquake by utilizing the proposed method [C3270]

## "Performance simulation for shared voice/data EDGE channel"

This paper proposes a method for system performance modeling of a shared voice and packet data channel. We investigate and simulate the impacts of system configurable parameters on data user perceived channel performance, as well as call blocking rate for a voice user. Two types of voice traffic are simulated including half rate AMR and full rate EFR. The simulation results are useful for a service provider to configure the EDGE channel to meet the QoS requirements to serve both voice and data traffic [C3271]

## "Two and three dimensional images of shallow geological structures"

The purposes of imaging are to gain some understanding of what a ground probing radar (GPR) image would look like, to facilitate interpretation and to test signal and image processing techniques. An interesting structure is the buried valley aquifer due to its potential for storing groundwater. This is investigated by simulation using ray tracing for two dimensional images and facet modelling for three dimensional images [C3272]

## "On Petri Net-based modeling paradigms for the performance analysis of wireless Internet accesses"

In this paper we model a wireless Internet access system based on the GSM/GPRS (Global System for Mobile communications/General Packet Radio Service) technology, with three different Petri net-based paradigms: Generalized Stochastic Petri Nets (GSPNs), Deterministic and Stochastic Petri Nets (DSPNs), and Fluid Stochastic Petri Nets (FSPNs). We show that all three Petri net-based paradigms provide very similar performance predictions for some of the considered realistic configurations of GSM/GPRS systems, and for some of the performance metrics of interest. This proves that FSPNs can be an adequate tool for the performance analysis of wireless Internet access systems, and allow the investigation of large system configurations, thanks to the availability of very efficient solution algorithms for FSPN models. However, we also show that in other cases (which can be clearly characterized), the performance predictions generated by FSPN models may become quite optimistic, and thus not suitable for a careful design and planning of GSM/GPRS systems. In those cases, both DSPNs and GSPNs can provide a viable modeling alternative, at least in the case of medium scale systems [C3273]

## "Mobile datacom networks"

This paper presents new data communication networks, such as: GPRS, EDGE and 3G (UMTS), and new multimedia services through an evolutionary concept of development. Common in this evolution is the IP (Internet protocol). New network elements such as the media gateways, IP-based BSS (base station system) and a new concept of the horizontally layered network are presented [C3274]

## "Evaluation of different analytical methods for the design of ELF magnetic field shields"

The aim of this work is the evaluation of different analytical methods devoted to the study of shielding of extremely low frequency (ELF) magnetic fields with conducting and ferromagnetic materials. In this paper an extensive analysis of some approaches are presented and compared to a numerical method based on a hybrid FEM/BEM formulation. The study wants to underline the accuracy of the different methods, evaluating their limits of validity depending on physical and geometrical shield parameters [C3275]

## "Elimination of leakage and ground-bounce effects in ground-penetrating radar data"

We address the problem of removing specular ground surface reflections and leakage/cross-talk from downward looking stepped frequency ground-penetrating radar (GPR) data. A new model for the ground-bounce and the leakage/cross-talk is introduced. An algorithm that jointly estimates these effects from collected data is presented. The algorithm has the sound foundation of a nonlinear least squares (LS) fit to the presented model. The minimization is performed in a cyclic manner where one step is a linear LS minimization and the other step is a non-linear LS minimization where the optimum can efficiently be found using, e.g., the chirp-transform algorithm. The results after applying the algorithm to measured GPR data, collected at a US army test range, are also shown [C3276]

## "Comparison of PCA and ICA based clutter reduction in GPR systems for anti-personal landmine detection"

This paper presents statistical signal processing approaches for clutter reduction in stepped-frequency ground penetrating radar (SF-GPR) data. In particular, we suggest clutter/signal separation techniques based on principal and independent component analysis (PCA/ICA). The approaches are successfully evaluated and compared on a real SF-GPR time-series. Field-test data are acquired using a monostatic S-band rectangular waveguide antenna [C3277]

## "Polynomial phase signal based detection of buried landmines using ground penetrating radar"

Put simply, the global landmine problem is massive. Ground penetrating radar (GPR) is just one engineering solution currently being investigated. A polynomial amplitude-polynomial phase model is fitted to GPR returns. It is observed that the second order phase coefficient shows deviations from background-only levels when a buried target is present. A bootstrap-based detection scheme is proposed that tests for this change. The technique is applied to real GPR data, with encouraging results [C3278]

## "Signal processing techniques for clutter parameters estimation and clutter removal in GPR data for landmine detection"

Ground penetrating radar (GPR) has become widely accepted as a major technique for subsurface

investigations, mainly in civil engineering. Considerable efforts are put in the development of GPR systems for the detection of shallow buried landmines. However, the GPR performs inadequately due to clutter, which dominates the data and obscures the mine information. The clutter varies with surface roughness and soil conditions and lead to uncertainty in the measurements. It is therefore necessary to overcome these surrounding effects when processing GPR data for detecting small, shallow buried objects. We present improved signal processing techniques which can be used to reduce the clutter through data preprocessing. Several approaches are proposed for the GPR clutter reduction techniques, most of them model the clutter statistically. The proposed clutter reduction technique models the clutter using parametric modeling. The clutter contained in the measurements is treated as an ARMA model. The advantage of such approach lies therein that once the clutter is satisfactorily known, any target will show up as a small anomaly in against the known clutter background. This method suggests that the clutter shows a certain amount of correlation. Experimentally it is shown that the dominant interference in GPR data is correlated clutter, i.e., interference, which has a large correlation coefficient for tags greater than zero. However, the clutter environment cannot be considered completely stationary. An ideal filter would then be an adaptive filter, which estimates the slowly varying local clutter parameters, all the time ignoring the small parameter jumps caused by the buried targets to be detected. Kalman filtering is used for the estimation of the clutter parameters in the presence of random noise, detects jumps that occur at unknown points in time, and provides estimates of the new parameter values, without altering the target return [C3279]

## "Resource sharing for data services (RSDS)"

We present a new flexible resource allocation (FRA) strategy, called resource sharing for data services (RSDS), that dynamically averages the allocated resources to the call requests based on the number of calls in a cell. RSDS accommodates the maximum number of requests while providing acceptable quality to the admitted request through the use of. degradation and compensation techniques. An analytical model (validated by computer simulations) is developed to model RSDS in a scenario with multiple types of service, each of them with different priorities. Preliminary results indicate that the RSDS strategy outperforms some strategies already reported in the literature [C3280]

## "Multiple traffic scheduling for enhanced General Packet Radio Service"

State-of-the-art cellular networks such as General Packet Radio Service systems (GPRS) with enhanced data rates for global evolution (EDGE) air interfaces can support a wide variety of applications, e.g., Web browsing and video conferencing. The desired quality of communication channels, however, for such wireless networks depends on the interference contributed by location errors and elapsed signal strength. To accommodate different quality-of-service (QoS) classes for such widely received applications, an efficient scheduling for air interfaces must essentially be supported. We propose a dynamic scheduling algorithm by together taking the interference and varying QoS requirements into consideration for GPRS with EDGE air interfaces. Conceptually, the proposed scheme assigns priority in order to the conversational, streaming, interactive and background traffic classes defined by ETSI. Each channel is equipped with an A-buffer to gather the acknowledge messages of the successfully transmitted packets to measure the utilization of the associated channel. A global monitoring device tracks each mobile station's state. Based on the measured channel utilization and the states of mobile stations, the proposed scheduling dynamically assigns channels to the ongoing traffic. From the event-driven simulations, the scheme can significantly outperform the scheme without any support of dynamic channel assignment, especially for the interactive and background traffic classes [C3281]

## "QoS analysis in mobile cellular networks supporting voice and class of finite sessions"

This paper presents a queuing analysis for mixed voice and data in mobile cellular radio networks that is germane to GSM/GPRS. The work considers a class that consists of a finite number of open sessions and illustrates the quality of service (QoS) on such systems. We start with a general model description in which an analytical model provides the mean delay and the number of data users that are continuously backlogged. A computational algorithm of this is then formulated which significantly improves facility. Both of these works are novel and topical. For this work, complete sharing scheduling for both real and non real-time services is considered. The real-time service is modelled as circuit switched and non real-time service as packet switched. The results are corroborated using the simulation package OPNET. QoS in terms of mean delay and the access policy for a new data user joining the network is also discussed [C3282]

## "Impact of the cell update mechanism in GPRS"

Cellular packet systems such as GPRS rely on cell update (CU)/routing area update (RAU) mechanisms to provide continuous connectivity within the service area. This paper is aimed to evaluate the impact that these mechanisms have on system performance. We show that the CU/RAU procedure could cause the loss of user

data packets that, in case of reliable data services, can increase the amount of retransmission signaling to cope with such packet losses. In any case, it should be useful to characterize the amount of user data traffic affected in order to take into account this effect when QoS criteria are pursued [C3283]

## "Using time advance information to choose coding scheme in GPRS"

GPRS defines four coding schemes named from CS-1 to CS-4 with different degrees of data protection against transmission errors in the air interface. The former coding scheme is already used in GSM and the others sequentially offer higher throughput rates but less protection. The selection of the best suited coding scheme could be based on link quality estimators but also on more deterministic system parameters such as time advance (TA) information. This paper analyses this latter option and provides results in order to quantify the feasibility of such allocation based on the time advance information. Aspects such as TA resolution, cell coverage, power control policies and system load are taken into consideration [C3284]

## "Modeling and analysis of the behavior of GPRS systems"

The General Packet Radio Service (GPRS) has recently become a standard to extend the services provided by the Global System for Mobile Communications (GSM). GPRS addresses packet-oriented traffic, by allowing a more efficient usage of the radio resources with a consequent improvement in the quality of service (QoS) for subscribers. This paper focuses on a preliminary evaluation of dependability and performance figures of the GPRS, by analyzing its behavior during the contention phase where users compete for the channel reservation. The presented work constitutes the first step towards the analysis of the GPRS under critical conditions, as determined by periods of outages, which significantly impact on the dependability, of the GPRS itself. In fact, outages imply service unavailability, with a consequent accumulation of users actively waiting for making a service request, leading to a higher probability of collisions on requests (and therefore a degradation of the QoS perceived by the users) when the system comes back up again. In this paper, some analyses have been performed using a simulation approach, to gain insights on appropriate settings for the GPRS, at varying values of internal and external system conditions [C3285]

## "The multicall service to support multimedia services in the UMTS networks"

The paper presents a new approach to support multimedia in the circuit-switched sections of 3G networks. The approach is based on a supplementary service named `multicall', which was developed in the 3GPP. The multicall service allows users to control dynamically parallel network connections in the CS domain. We describe the DS-WCDMA technique, which enables the wide bandwidth of the 3G air interface. We discuss how the GSM/GPRS system supports multicall operation differently as it provides multiple connections with the GPRS network. Furthermore, we present alternative techniques for multimedia communication in the UMTS. Finally, we consider how multicall may provide an enhanced way to utilize the 3G network for multimedia applications, while it also provides ways to optimize the user's costs and to reduce the network load. Multicall with multimedia gives many new options for building new types of applications, network services and user equipment [C3286]

## "GSM-GPRS radio access dimensioning"

This paper describes a method for the radio access dimensioning of a GSM-GPRS network. GPRS (general packet radio service) is a data service providing a high speed packet radio access for a GSM mobile station (MS) and a packet switched routing functionality in the GSM infrastructure. Packet switched technology optimises usage of network resources for bursty data transfer and occasional transmission of large volumes of data. Simultaneous presence of voice and data (circuit and packet traffic) does not permit us to evaluate the dimensioning and performance of a GSM cell using the traditional Erlang-B formulas. To solve this problem an ad-hoc model has been developed using queuing theory [C3287]

## "Physical-layer issues for deploying transmit diversity in GPRS/EGPRS networks"

Lindskog and Paulraj (see ICC-2000, June, 2000) proposed a transmit diversity scheme for dispersive channels which by utilizing two transmit antennas and only one receive antenna achieves the same diversity benefit (except for the 3 dB array gain) as can be achieved by using one transmit antenna and two receive antennas. This scheme generalizes Alamouti's (see IEEE JSAC, vol.16, no.8, p.1451-58, 1998) transmit diversity scheme (which works best for flat channels) to dispersive channels. We show how the transmit diversity (TXD) scheme of Lindskog et al. can be deployed in GPRS/FGPRS networks. A low-complexity receiver structure for demodulating Lindskog and Paulraj (LP) encoded signals is presented based on a combination of a novel pre-filter and a delayed decision feedback sequence estimation (DFSE) equalizer. This pre-filter is designed to simultaneously achieve three desired effects: (1) the effective baseband channel seen by the equalizer has half the number of taps of the original baseband channel; (2) the effective response of the baseband channel

becomes minimum-phase; and (3) the effective baseband noise is whitened. An information-theoretic analysis is also presented to demonstrate the advantage of the LP scheme over other TXD schemes (e.g. over delay diversity). A burst format for transmitting LP encoded signals which is compatible with the existing GPRS/EGPRS burst format is also presented. Finally, simulations results are presented to verify the benefit of using the LP scheme in the typical urban channel of GSM/EDGE [C3288]

### "Design, development and implementation of a voice email system using next generation networks technology-a case study"

More companies build the next generation networks for developing applications, it gives birth to more solutions and products for the needs of the market. The voice email system is definitely one of them and it becomes another trend for the technology savvy users. The voice email system becomes a starting point of the voice browsing technologies over the phone where there is a wide spreading of applications and services from different areas, such as stock trading and voice conferencing [C3289]

### "Policy-based QoS control for open services in BcN"

Recently, 3GPP introduced IMS-specific QoS mechanisms and service-based local policy control to support QoS-enabled services including VoIP. The IMS architecture is evolving to a more generic QoS and policy framework to simplify the introduction of new services and to implement service-based control of the access for a whole range of services. In this paper, we proposed the QoS control API for 3 party service provider to demand the required bandwidth onto network operators policy server. Also, QoS control scenario is described to support the video on demand service [C3290]

### "Shielding, Radioabsorbing and Scattering Materials for Decreasing of Disturbances and for Enhance of Efficiency of Radar Work"

Georadar of OKO-M1 type working at 400 MHz central frequency in combinations with different type of radioshielding and scattering materials have been studied to determine a possibility of an improvement of noise immunity and functional characteristics of georadar at various conditions. A number of experimental georadar covers of several types based on radioshielding, radioabsorbing and scattering materials has been produced and tested. The investigations have confirmed the fact that usage of a shielding cover is useful both for suppression of interference with up-land objects and for decrease of aerial disturbances. We found that such georadar cover can decrease a level of the aerial interference disturbance up to 30 dB, and undesirable signal reflected from a metal object placed near over georadar can been decreased on a value of 15...23 dB. A scan picture becomes more clean and readable when georadar shielding cover is used [C3291]

### "The Quantitative Analysis of Ground Penetrating Radar"

A method for presenting the result of ground penetrating radar (GPR) data processing in the form of structural model of the medium being probed that is obtained on the basis of the quantitative analysis of radar traces showing the reflecting boundaries and electrophysical parameters is considered in this paper. The basis for the method developed are results of studying the features of the reflected signal formations in in-homogeneous media. The method enables to algorithmize the construction process for the structural model of the model of the medium being probed, to decrease labour consumption for radar trace processing and to reduce human factor effect [C3292]

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