Editorial

A new generation of mobile communication systems is currently under development aiming to support a much wider range of broadband (data, voice, video, multimedia) services compared to those of second generation systems. A key component in such systems is the design of the radio interface and of medium access control protocols in particular – the focal point of this issue.

In third generation systems, the old problem of developing efficient multiple access protocols that coordinate transmissions to maximize throughput-delay performance, returns with additional requirements: integration of services with diverse traffic characteristics and Quality of Service (QoS) requirements, provision of QoS guarantees in the radio interface, adaptability to radio propagation and service environments and flexibility.

The papers presented in this issue focus on access control in Personal Communication Systems (PCS), the Universal Mobile Telecommunications System (UMTS) and Future Public Land Mobile Telecommunications System (FPLMTS), and Wireless Local Area Networks (WLAN).

"A contention/reservation access protocol for speech and data integration in TDMA-based advanced mobile systems", by G. Anastasi, D. Grillo, L. Lenzini and E. Mingozzi, proposes an efficient multiple access protocol for speech and bursty data traffic, which is based on the PRMA++ protocol studied within the framework of the TDMA-based version of the European evolving standard for third generation mobile systems. The proposed protocol uses a contention-free handling of data bandwidth requests while meeting speech service requirements via basic PRMA++ mechanisms.

The paper by S. Barberis and E. Berruto, "A CDMA-based radio interface for third generation mobile systems", provides an overview of the usage of a CDMA-based radio interface for third generation mobile systems (UMTS-FPLMTS). The basic requirements of the radio interface such as variable bit rate transmission, adaptability to propagation and service environments and flexibility are outlined, and the ability of the CDMA access technique to cope with these requirements is addressed. The radio protocols architecture of a CDMA-based system is presented and possible technical solutions for each component are discussed along with their advantages and disadvantages.

"Design and performance evaluation of an RRA scheme for voice-data channel access in outdoor microcellular environments", by A.C. Cleary and M. Paterakis, proposes and evaluates a reservation random access scheme for integrating voice and data traffic in microcellular environments. Multiplexing at the talkspurt level is considered for packetized voice and Aloha-type and collision resolution (splitting) algorithms are used to make reservation requests for voice and data packet transmissions. The system performance with respect to voice capacity, packet dropping probability, throughput and delay, is evaluated by analytical means and simulation.

A reservation random access scheme for a cellular system supporting both real-time and data traffic is proposed in the paper by R. Bolla, F. Davoli and C. Nobile, entitled "The RRA-ISA multiple access protocol with and without simple priority schemes for real-time and data traffic in wireless cellular systems". The paper proposes extending the Independent Stations Algorithm (ISA) for use in a cellular environment. To provide priority to the real time traffic, several variations of the extended ISA protocol (RRA-ISA) are also considered. Simulation results indicate that RRA-ISA outperforms other random access schemes based on some type of slotted ALOHA.

The paper "Performance study of access control in wireless LANs – IEEE 802.11 DFWMAC and ETSI RES 10 Hiperlan", by J. Weinmiller, M. Schläger, A. Festag and A. Wolisz, gives an overview of the standardization effort on medium access control for wireless LANs. The performance of the protocols in IEEE 802.11 and ETSI RES10 Hiperlan is analyzed through simulations with respect to key system issues such as number of stations, range extension strategy, presence of hidden terminal and QoS.

"Design and performance evaluation of a MAC protocol for wireless LANs", by M. Conti, C. Demaria and L. Donatiello, proposes a prioritized-access with centralized control MAC protocol for WLANs. The protocol combines random access, for signalling, with collision-free access to the transmission channel, which is controlled by a centralized scheduler. Three classes of users are assumed: voice, high-priority data with real-time constraints, and low-priority unconstrained delay data. Performance analysis shows that the protocol can support the maximum number of voice terminals as an ideal scheduler and guarantee acceptable access delays to real-time data terminal, while attaining an almost complete utilization of the network capacity.

The paper by C. Bisdikian proposes "The n-ary stack algorithm for the wireless random access channel" as an alternative to the widely adopted ALOHA-type protocols. The class of limited sensing or stack algorithms is reviewed

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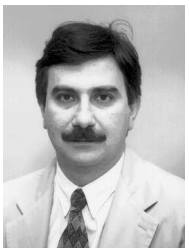
and their qualities are discussed. The performance of the n-ary stack algorithm is evaluated in the presence of capture and feedback errors.

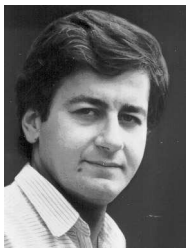
"Retransmission control and fairness issue in mobile slotted ALOHA networks with fading and near-far effect", by T.-K. Liu, J.A. Silvester and A. Polydoros, investigates the effect of retransmission control on performance, taking into account multipath fading and the near-far effect. The results indicate that power control is not as efficient as retransmission control for improving user throughput fairness.

Many good quality papers could not be accepted due to space limitations. We would like to thank all the authors for submitting their work and the reviewers for their high quality reviews.

Lazaros Merakos and Ioannis Stavrakakis
Editors



Lazaros Merakos received the Diploma in electrical and mechanical engineering from the National Technical University of Athens, Greece, in 1978, and the M.S. and Ph.D. degrees in electrical engineering from the State University of New York, Buffalo, in 1981 and 1984, respectively. From 1983 to 1986, he was on the faculty of Electrical Engineering and Computer Science at the University of Connecticut, Storrs. From 1986 to 1994 he was on the faculty of the Electrical and Computer Engineering Department at Northeastern University, Boston, MA. During the period 1993–1994 he served as Director of the Communications and Digital Processing Research Center at Northeastern University. During the summers of 1990 and 1991, he was a Visiting Scientist at the IBM T.J. Watson Research Center, Yorktown Heights, NY. In 1994, he joined the faculty of the University of Athens, Athens, Greece, where he is presently a Professor in the Department of Informatics. His research interests are in the design and performance analysis of high speed networks, mobile networks, and multimedia communications.



Ioannis Stavrakakis received the Diploma in electrical engineering from the Aristotelian University of Thessaloniki, Thessaloniki, Greece, in 1983, and the Ph.D. degree in electrical engineering from the University of Virginia, in 1988. In 1988, he joined the faculty of Computer Science and Electrical Engineering at the University of Vermont as an assistant and then associate professor. Since 1994, he has been an associate professor of Electrical and Computer Engineering at Northeastern University, Boston. His research interests are in stochastic system modeling, teletraffic analysis and discrete-time queueing theory, with primary focus on the design and performance evaluation of Broadband Integrated Services Digital Networks (B-ISDN). Dr. Stavrakakis is a senior member of IEEE and a member of the IEEE communications Society, Technical Committee on Computer Communications. He has organized and chaired sessions, and has been a technical committee member, for conferences sponsored by IEEE, ACM, ITC and IFIP societies such as GLOBECOM, ICC, ICUPC and INFOCOM. He has served as the TCCC representative for the ICC '95 conference and as a co-organizer of the 1996 International Teletraffic Congress (ITC) Mini-Seminar, on "Performance Modeling and Design of Wireless/PCS Networks".