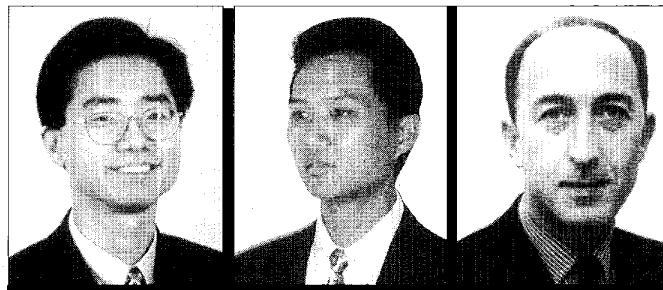


# Broadband Wireless



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**A**dvances in wireless broadband communications have progressed steadily over the last few years. In particular, third-generation wireless networks (3Gwireless) are being developed and deployed in Europe this year.

The dramatic success and exponential growth of the Internet along with novel applications such as data broadcasting and multicasting have resulted in the requirement for significantly higher speeds in network access. Currently, traditional access techniques cannot fulfill the demand for higher bandwidth. It should be emphasized that the mobility issue is also manifesting itself in the widespread use of cellular telephony. Digital cellular systems have become a service and technology driver in many parts of the world. The third generation of cellular phones will provide fairly high-speed access to the Internet and multimedia services.

Broadband wireless access techniques are, therefore, becoming increasingly important. The new digital TV broadcasting standard (DVB) for terrestrial cable and wireless as well as satellite systems provides an efficient means for TV distribution, but can also support dissemination of Web content and interactive services at high speeds.

High-speed wireless communications plus the ability to support multimedia is an important characteristic of future wireless broadband networks. There are many challenging technical issues associated with these wireless broadband systems based on wireless ATM, and currently there are several standardization activities within the International Telecommunication Union (ITU) International Mobile Telecommunications in 2000 (IMT-2000) committee on 3Gwireless and beyond.

Next-generation wireless networks are taking on new dimensions in terms of network architectures. There have been proposals to separate core networks from access networks, and the use of software radios to allow separation of radio-dependent and independent functions and obtain higher communication performance. New protocol designs are needed to provide radio transport, resource management, and mobility-related functions.

In addition, future broadband wireless networks are likely to be heterogeneous, and interoperability will therefore be a major concern. Interoperability of ATM- and IP-based wireless mobile systems is critical to allow mobile users to

communicate without barriers under different network transport technologies. Issues related to media access, routing, location management, handoff management, mobile connection management, quality of service (QoS), error control, interoperability, reconfigurability, and so on are present in this new generation of broadband wireless networks.

In this special issue we have selected four articles covering different aspects of broadband wireless. The first article, "Supporting IP QoS in the General Packet Radio Service," proposes a framework to support QoS in GPRS. As the number of mobile users increases, efficient location management operations such as location tracking, paging, and queries become important. Wireless ATM is viewed to support wireless multimedia readily with its advanced QoS reservation and handoff mechanisms. Handoffs of mobile connections are critical in mobile networks since supporting user and terminal mobility is indispensable in such networks. The second article, "Location Management for Next-Generation Personal Communications Networks," provides a discussion on location management techniques for future 3Gwireless. The third article proposes a scalable QoS-based IP multicasting mechanism for label-switched wireless ATM networks. Moreover, the need to support bandwidth-intensive multimedia services introduces new and challenging demands on satellite systems and networks. Flexibility, efficiency, mobility, and the ability to guarantee end-to-end QoS are desirable factors. Therefore, next-generation satellite systems are likely to be broadband to support universal roaming and global multimedia communications. Our fourth and last article discusses IP transport and routing architecture for such networks.

We would like to express our thanks to Bartolome Arroyo-Fernandez from the European Commission, who played an important role in this special issue. We would also like to thank all other people involved, including IEEE staff and the authors. We hope you enjoy reading this special issue on next-generation wireless broadband networks.

### Biographies

C.-K. TOH (SM) (cktoh@ece.gatech.edu) was educated at the EEE Department, University of Manchester Institute of Science & Technology, and the Computer Laboratory, Cambridge University, England, in electrical engineering and computer science. He has performed pioneering research work on wireless ATM since 1993 and

wireless ad hoc networks since 1994. He authored the book *Wireless ATM and Ad-Hoc Networks* (Kluwer, 1996; reprinted 1997, 1998, 2000). He is an Editor for *IEEE Journal on Selected Areas in Communications*, an Area Editor on wireless networking for *IEEE Communications Surveys*, a Feature Editor for *ACM Mobile Computing & Communications Review*, and serves as an Editorial Board member for *IEEE Network* and Springer-Verlag *Personal Technologies Journal*. He serves as Technical Chair and Technical Program Committee member for several major IEEE and ACM conferences. He had also presented technical tutorials on WATM and Ad Hoc Networks for IEEE. He is a Chartered Electrical Engineer, and is listed in MARQUIS Who's Who in the World. He is currently a faculty member with Georgia Institute of Technology, School of Electrical and Computer Engineering.

WILLIE W. LU [SM] (wwlu@ieee.org), principal senior wireless architect at Siemens-Infineon, has extensive research, publication, consulting, and industrial experience in the design and analysis of advanced wireless telecommunication systems and networks, computer communication systems, local, metropolitan, and wide area communications networks, marketing analysis, and planning. He has profound expertise in the implementation of software-definable base station technology, wireless mobile ATM technology, third-generation wireless communications, broadband wireless access, wireless mobile Internet, and high-speed packet networks, as well as IP/ATM network interconnections. He is also chair of the Wireless Mobile ATM Task Force, CDMA Technical Forum, and 3Gwireless Technical Forum. Previously, he served as guest scientist at the German National Research Center for Information Technology (GMD), Berlin. He served or is serving as general chair of IEEE wmATM '98, wmATM '99, 3Gwireless 2000, GLOBECOM 2000 Broadband Wireless, and 3Gwireless 2001. He was/is guest editor of special issues on wmATM, BWA, and 3Gwireless technologies, and other topics in *ACM/Baltzer Journal of Wireless Networks*, *ACM/Baltzer Journal of Mobile Networks and Applications*, *Computer Networks*, *IEEE Communications Magazine*, *IEEE Personal Communications*, *IEEE Network*, *Proceedings of the IEEE*, and *IEEE JSAC*. He is also a voting member of Sigma Xi, ACM, IEICE Japan, and CIC China, and has been listed in numerous Marquis Who's Who for Telecommunications Advancement. Willie is a Feature Editor of the wireless communications series in *IEEE JSAC* and *IEEE Communications Magazine*, and has over 100 professional publications.

CENGİZ EVCİ [SM '89] (cengiz.evci@alcatel.fr) received his B.Sc. degree in electronics engineering from the University of Birmingham and his M.Sc. degree in digital communications and electronics from the University of Loughborough, United Kingdom, in 1974 and 1976, respectively. In 1982 he obtained his Ph.D. degree from the University of Loughborough on speech coding and applications in mobile communications. After working as a visiting professor in the French Electronics Engineering School (ESIEE), Paris, in 1982, he joined TRT (currently Lucent Technologies). He worked on speech coding for ITU standards and on low bit-rate image coding for videophone applications in the framework of the EUREKA project. He was also heavily involved in research activities on fast Kalman filtering techniques. In April 1988 he joined ALCATEL CIT -Radio Communications Department, France, and was actively involved in European R&D (RACE I and RACE II) mobile projects for UMTS. Then he was technical project manager of the European ACTS AWACS project for ATM broadband wireless access communications. He was also manager of European affairs at ALCATEL Corporate Research Center for Radio Communications. Since January 1999 he has been chief frequency officer at ALCATEL Headquarters, Paris, France, where he is heavily involved in ALCATEL technical preparations for WRC 2000. Also, with different business divisions in the company, he coordinates technical strategies for spectrum management, and pricing

and refarming of spectrum for future uses. He is author and co-author of almost 60 scientific papers, published in international journals and conference proceedings. His special interests cover speech and video coding for future mobile systems, ATM broadband access, and wireless multimedia systems. Due to recent activities, he is also interested in spectrum sharing and technical novelties for efficient spectrum pricing. In that context, for ALCATEL he is actively involved in the European Radio Spectrum Policy Group, CEPT/ERC, UMTS Forum-Spectrum Aspects Group, and ITU-R for 3G systems. He is actively involved within IEEE activities in conference organizations as a member of various IEEE Technical Evaluation Committees and Chair of many Conference Sessions.

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