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## FOURTH-GENERATION MOBILE INITIATIVES AND TECHNOLOGIES

**F**ourth-generation mobile communications (4G mobile) involves a mix of concepts and technologies in the making. Some can be recognized as derived from 3G and are called *evolutionary* (e.g., evolutions of WCDMA and cdma2000), while others involve new approaches to wireless mobile and are sometimes labeled *revolutionary* (e.g., OFDM/WCDMA or converged broadband wireless core). What is important, though, is the common understanding that technologies beyond 3G are of fundamental relevance in the movement toward a new wireless world that is a total convergence of wireless mobile and wireless access communications. Any of these terms are meant to signify fundamentally better wireless mobile communications in the future.

The converged broadband wireless system (wireless mobile and wireless access) is the future trend in the wireless industry in consideration of the emerging issues on spectrum efficiency, dynamic bandwidth allocation, secured wireless application, improved quality of service, revolutionary digital transceiver technologies, and so on.

This converged system will be extremely important in developing countries to greatly improve the wireless infrastructure and provide the solutions of low cost, secured applications, and integrated services to huge volumes of mobile subscribers.

The research on this emerging wireless communications has been launched worldwide in major companies as well as academic institutes.

The first article by Bob Berezdivin from Raytheon summarizes the major drivers toward ubiquitous wireless communications and services, and describes some of the technologies that provide a basis for the evolution toward the 4G mobile wireless. These technologies provide a new paradigm for a new generation of converged wireless communications with value-added features and applications.

Access control is always one of the most critical issues for next-generation mobile systems. Weihua Zhuang from the University of Waterloo proposes an efficient media access control protocol with fair packet loss sharing (FPLS) packet scheduling for 4G wireless CDMA communications. This improved MAC protocol exploits both time-division and code-division multiplexing. The simulation results demonstrate the effectiveness of the FPLS scheduler for the upcoming 4G mobile systems.

Wireless communication infrastructure is characterized by an increasing multitude of heterogeneous systems. At the same time, service provider models are established and services designed to span physical networks irrespective of the access method used. To provide infrastructure-independent

access to services and applications for highly mobile users, Wolfgang Kellerer presents an open communication gateway architecture as an important component of 4G wireless communication systems.

The framework for 4G mobile quality of service (QoS) is essential for the open multiple air interfaces. This framework should be based on the paradigm of services classes wherein each class can exhibit a characteristic behavior in terms of resource allocation over the common air interface. Using this QoS framework, the future 4G mobile network operators can define their own set of service classes, and offer class-based application schemes. A class-based dynamic bandwidth allocation scheme is also described as a mechanism to implement this QoS framework over 4G mobile air interfaces. All these findings and analysis are presented by Yile Guo from Nokia Research.

To support different air interfaces in 4G mobile communications, a new mobility management scheme is very important, especially for all-IP wireless networks. Archan Misra from Telcordia proposes an improved fast handoffs and paging solution to handle this issue, which is getting hot in the wireless industry.

The guest editor would like to thank the authors and reviewers who have given so generously of their time to make this issue a reality. Thanks are also given to the Delson Group (delson.org) and its 3Gwireless 2001 Conference for full support in promoting education, research, and academic advancements. It is the intention of the editor to bring articles on 4G mobile on a regular basis to this magazine.

### BIOGRAPHY

WILLIE W. LU [M] (wwlu@ieee.org), is senior principal wireless architect at Siemens-Infineon and a member of the Technological Advisory Council of United States Federal Communications Commission (FCC). He is also an internationally very well recognized expert in emerging wireless technologies and has been a technical advisor for over 15 telecommunications authorities in more than 10 countries. He is an independent technical examiner for lots of high-tech venture capitals in Silicon Valley and elsewhere, and listed in major *Who's Whos* in the world. He has guest-edited over 20 special issues on emerging wireless communications in IEEE, IEICE, ACM, and other major publications, and over 120 papers published in major professional publications. He is chair of numerous IEEE conferences including GLOBECOM, WCNC, VTC, and featured wireless editor of *IEEE Communications Magazine*, *IEEE Transactions of Wireless Communications* (former J-SAC Wireless), and others. He is a frequent keynote and featured speaker at lots of global technical fora, and a well-known wireless pioneer in Silicon Valley. He is a member of IEEE, ACM, IEICE, CIC, SIGMA XI, and others.