

Third-Generation Wireless Mobile Communications and Beyond



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Third-generation wireless and beyond (3Gwireless and 4Gmobile) have gained increased interest over the last few years. This has been fueled by a large demand for high frequency utilization as well as a large number of users requiring simultaneous multidimensional high-data-rate access for the applications of wireless mobile Internet and e-commerce. 3Gwireless will use a new network architecture (e.g., an all-IP network) to deliver broadband services in a more generic configuration to mobile customers and supports multidimensional services and emerging interactive multimedia communications. Large bandwidth, guaranteed quality of service, and ease of deployment coupled with recent great advancements in semiconductor technologies for wireless applications make 3Gwireless a very attractive solution for broadband service delivery.

Broadband wireless, wireless mobile Internet, software radio, and reconfigurable digital RF are all emerging as a result of the tremendous development in wireless semiconductors.

Driven by the booming wireless Internet applications, the next-generation wireless system will be a converged platform for broadband mobile and broadband access. The system's vision of broadband wireless mobile (e.g., 4Gmobile) is to:

- Provide a technological response to accelerated growth in the demand for broadband wireless connectivity
- Ensure seamless services provisioning across a multitude of wireless systems and networks, from private to public, from indoor to wide area
- Provide optimum delivery of the user's wanted service via the most appropriate network available
- Cope with the expected growth in Internet-based communications
- Opening new spectrum frontiers and creating new market opportunities

This feature topic is based on the published materials from 3Gwireless 2000 (3Gwireless.com) by Delson Group, where some of the hottest issues in 3Gwireless are presented. In our first article, "Enhanced Wireless Access Technologies and Experiments for W-CDMA," M. Sawahashi *et al.* from NTT DoCoMo reviews enhanced wireless access technologies and evaluations of the W-CDMA physical layer employing intercell asynchronous operation with fast cell search algorithm, power control, diversity control, as well as interference cancellation, and so on. The second article, from Siemens, summarizes the standardization activities for 3Gwireless and beyond, outlines the key applications, and provides an overview of the UMTS as specified by 3GPP. Also, a vision for 4Gmobile is developed.

The next article, by Vincent Huang *et al.*, introduces a MAC scheme for TDD-CDMA multimedia wireless communications which exploits both time-division and code-division statistical multiplexing to efficiently accommodate both real-time voice and video traffic and non-real-time bursty data traffic.

The fourth article, "3Gwireless Capacity Optimization for Widely Spaced Antenna Arrays" by R. Jana *et al.*, investigates the capacity improvement potentially achieved via an optimized design strategy by using adaptive arrays and so forth.

The feature topic continues with an article from the University of California at San Diego introducing MobiWeb, a proxy-based network architecture designed to enhance the performance of adaptive real-time streams over 3Gwireless links. Last, Ji-Hoon Lee *et al.*, from Korea University, present a new handoff management scheme that utilizes simultaneous multiple binding in all-IP-based 3Gwireless networks. An adaptive resource allocation scheme is also proposed to allocate connection resources much more efficiently.

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Biography

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, technical teams of telecommunications and wireless communications experts who develop and implement next-generation wireless multimedia systems. Previously, he served as guest scientist at the German National Research Center for Information Technology (GMD), Berlin. His other work has involved the design of the U.S. CDMA system at Nortel and a wireless data network at NTT. He is highly accredited and an invited senior technical advisor by major telecom industries in the United States and Europe as well as a senior consultant to many telecom authorities in the world.