BROADBAND WIRELESS ACCESS TECHNOLOGIES AND APPLICATIONS

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There has been tremendous interest recently in broadband wireless access systems (WAS), scheduled to start services worldwide this year; they have been a hot subject of much research and many standardization activities throughout the world. ITU-R JRG 8A-9B, ETSI HyperAccess, and IEEE 802 are taking the initiative to produce proposals for radio transmission technologies and advanced systems prototypes for WAS. The objective of this featured issue is to gather the research, development, and business updates in this field, and present an overview of the state of the art of this WAS wireless storm, globally or locally, as well as perspectives on future development in order to promote future research activities as well as business strategies.

This technology is becoming more and more important worldwide, especially in developing countries where people demand fast deployment and low cost for broadband wireless Internet access. By 2005, WAS business in developing countries will be over $80 billion (source: DELSON GROUP), which makes this a great potential business opportunity.

In this Feature Topic worldwide leaders give us updates on WAS technologies, performance, and system demonstration.

The first article, by William Webb of Motorola, predicts the communications environment of the next 20 years and looks at the role of fixed wireless access within that environment, which involves assessing how fixed access systems will interface and integrate with in-home wireless networks, how their architecture will enable multiservice operators to utilize the same core network across a range of different access technologies, and how they will act as a channel to carry mobile traffic originating within the building and provide future-proof broadband fixed wireless platforms.

Mobile wireless communication systems for fourth-generation (4G) mobile are being explored. Key are broadband and high-quality communications to support multimedia services, and the use of millimeter- or centimeter-wave band and automatic repeat request (ARQ) techniques are being considered to realize such communications. Noriyuki Fukui *et al.* of Mitsubishi propose a new ARQ scheme for WAS systems which shows very good performance improvement in terms of throughput, cell loss rate, and cell transfer delay on a pseudo Rayleigh fading channel.

The issue continues with an article by Josué Kuri *et al.*, of ENST who investigated the capacity of local multipoint distribution service (LMDS) to support ATM services in the local loop. By evaluating the performance of the MAC protocol for this system when transporting voice and IP traffic using the variable bit rate and guaranteed frame rate service categories of ATM, they found that this MAC protocol is well suited for voice traffic, but in general lacks efficient bandwidth management mechanisms to support the more dynamic bandwidth requirements of IP traffic.

The fourth article from Harris provides an overview of a fixed low-frequency broadband wireless access system for point-to-multipoint voice and data applications. Operating frequency bands are 2–11 GHz, and the base station can use multiple sectors capable of supporting smart antenna technology. Since the market for this kind of system is potentially huge, the authors present a detailed implementational framework as well as the design requirements.

The last article, by Hossein Izadpanah from HRL Labs, reports design scenarios for a gigabit-capacity high-data-rate WAS demonstrator. The system is based on the WAS concept and implementation techniques utilizing millimeter-wave and newly introduced free-space optical wireless high-speed links. The demonstration platform is to provide broadband "last mile" access and networking solutions to Internet users in densely populated areas and businesses in need of high bandwidth not served by fiber infrastructure.

The convergence of wireless mobile and wireless access will be the next wave in wireless communications. 4G mobile, supported by the ITU and many research institutes over the world, reflects the perfect model of this convergence. With this system architecture, the WAS will handle most broadband services (over 2 Mb/s–100 Mb/s), while the mobile system will carry 64 kb/s–2 Mb/s. The terminal is really integrated, converged, and compact. The user is absolutely "personal" with only one number instead of too many numbers (home, office, mobile, etc.) as in current systems.

Because the space in this issue is limited, we will continue to report on more emerging wireless issues in coming issues of this magazine.

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BIOGRAPHY

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