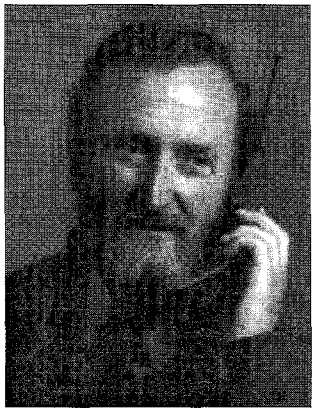
International Mobile Telecommunications–2000 Standards Efforts of the ITU



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With approximately 100 million public mobile users today, and more new mobile systems being rapidly installed all over the world, it does not require much vision to see that wireless will be the access of choice for the future.

Computers are already an essential part of many people's working lives, and individuals are finding that efficient time management and timely availability of information are essential to survival in the modern world.

The phenomenal growth of the Internet, which has doubled in size every year since 1988, confirms the key role of asymmetrical inter-active multi-media "data" traffic (i.e., combinations of voice, text, audio, graphics, and video) in future telecommunications.

Wireless access to global telecommunications is predicted to reach 1 billion users by 2010, which will exceed the likely number of wired access lines at that time. If the growth rate of Internet access continues at its present level, it will eclipse the existing fixed network soon after the year 2000! These two explosively growing customer-driven service requirements will dramatically change the nature of global telecommunications in the next millenium.

However, current mobile users are served by a wide range of different technical standards in many different parts of the radio frequency spectrum (e.g., cellular, paging, cordless phones, mobile data, and wireless LAN). Numerous planned or operational mobile satellite services further complicate the equipment choices for mobile users. There are already multimode and multiband mobile terminal products to link some of these services, but the present situation cannot be described as providing seamless mobile services "anywhere — anytime"!

Current growth rates will ensure that today's mobile networks at least double in size by the year 2000. It is important to harness this vast investment over the next few years, which will require significant enhancements to the various existing standards to assist the convergence of the many essentially competing wireless access technologies.

The Role of Global Standards

The "globalization" trend in all forms of communications, business, and even entertainment requires global standards which have sufficient flexibility to meet local needs and to allow regional/national systems to evolve smoothly toward future global and integrated wired/wireless telecommunications.

The International Telecommunication Union (ITU), the United Nations organization responsible for global telecommunications, has been working for some time to develop a flexible standard for wireless access to the global telecommunications infrastructure which will serve mobile and fixed users in both public and private networks. This work has been driven, in part, by a need for rapid improvement in the quality and level of access to global telecommunications, particularly for developing countries, as a fundamental part of overall economic development. This ITU work aims to exploit the potential synergy between the digital mobile telecommunications technologies being developed as part of the dramatic growth of personal telecommunications, and those rapidly evolving for fixed wireless access (FWA).

Today's global "telephone system" evolved under the guidance of ITU Recommendations (voluntary standards) to provide the essential backbone for worldwide communications. Although, like the analog cellular systems, it was designed for voice traffic, there is also substantial data traffic on existing networks as a result of the ITU modem and facsimile standards.

With the development of appropriate ITU global standards, and harmonized assignment of spectrum by the various national and regional authorities, we can move from today's collection of unique mobile systems, each with its own standards, different range of services and specific allocation of radio spectrum, toward the future world of global personal mobile telecommunications in which a single inexpensive mobile terminal can truly provide communications "anywhere — anytime."

International Mobile Telecommunications–2000

The ITU began its studies on global personal telecommunications in 1986, when the availability of handheld cellular phones offered the potential for global, rather than national/regional, land mobile systems.

The ITU World Administrative Radio Conference in 1992 (WARC-92) identified 230 MHz, in the 2GHz band, on a worldwide basis for the satellite and terrestrial components of Future Public Land Mobile Telecommunication Systems (FPLMTS). International Mobile Telecommunications–2000 (IMT–2000), formerly known as FPLMTS, aims to advance and unify the diverse systems we have today into a common flexible radio infrastructure.

IMT–2000 will be capable of offering a wide range of services, with the quality we have come to expect from the fixed telecommunications networks, around the year 2000 in many different radio environments.

IMT–2000 is intended to provide universal coverage and to enable terminals to be capable of seamless roaming across multiple networks. The concept of a small,

lightweight, and convenient "pocket" communicator is a fundamental part of IMT–2000; however, the new ITU global standard is intended to support a very wide range of terminal products all the way from simple messaging units through to desktop multimedia terminals.

The ITU has adopted a top-down systems approach to the overall standardization of IMT–2000, with the aim of defining a "family" of radio interfaces suitable for the wide range of radio operating environments, (e.g., indoor, outdoor, terrestrial, satellite). This flexible approach aims at maximizing commonality within the radio "family" and utilization of common radio-related functions in multiple environments. These common functions are essentially service-independent and ideally also independent of the radio transmission technology in the various operating environments. In this way, flexible, and also scaleable, radio bearers can be defined which are readily adaptable to the real time needs of future mobile multimedia telecommunications.

ITU-R Recommendations on IMT–2000

ITU-R M.687-2 IMT–2000 (Concepts and Objectives)
ITU-R M.816-1 Framework for Services Supported by IMT–2000
ITU-R M.817 IMT–2000 Network Architecture
ITU-R M.818-1 Satellite Operation within IMT–2000
ITU-R M.819-2 IMT–2000 for Developing Countries
ITU-R M.1034-1 Requirements for the Radio Interface(s) for IMT–2000
ITU-R M.1035 Framework for Radio Interface(s) and Radio Sub-system Functionality for IMT–2000
ITU-R M.1036 Spectrum Considerations for Implementation of IMT–2000 in the bands 1 885 - 2 025 MHz and 2 110 - 2 200 Mhz
ITU-R M.1078 Security Principles for IMT–2000
ITU-R M.1079 Speech and Voiceband Data Performance for IMT–2000
ITU-R M.1167 Framework for the Satellite Component of IMT–2000
ITU-R M.1168 Framework of IMT–2000 Management
ITU-R M.1223 Evaluation of Security Mechanisms for IMT–2000
ITU-R M. 1224 Vocabulary of Terms for IMT–2000
ITU-R M. 1225 Guideline for Evaluation of Radio transmission Technologies (RTTs) for IMT–2000

Note: most of the above Recommendations still use the former title of Future Public Land Mobile Telecommunication Systems (FPLMTS).

Next-Generation Requirements

Wireless access systems must attempt to simulate, from the customer's perspective, the high quality and increasingly broadband characteristics of the fixed networks. IMT–2000 users shouldn't notice that one or more radio links have been used to connect their mobile terminal to the world's telecommunication networks.

As wireless becomes a major form of access to global telecommunications, common network components should be able to be used to provide virtually any desired future service combination between wired or wireless access links.

The move from a wide range of market specific products towards common standardized flexible "platforms," which meet the basic needs of most major public, private, fixed, and mobile markets around the world, should allow a much longer product life cycle for these "core" network and transmission components, and offer increased flexibility and cost effectiveness to network operators, service providers, and manufacturers.

The extension of software control to radio characteristics will increase the possibilities for future flexibility in radio transmission systems and allow service and product differentiation within a globally standardized framework.

The key to standardization of IMT–2000 radio transmission technologies will, I believe, be in picking a "family" of radio interfaces which lend themselves well to software adaptation techniques.

This special issue of *IEEE Personal Communications* contains four articles. The first article outlines the service capabilities network operators expect from the next generation of mobile systems, i.e., the "customer" requirements for the new ITU global standard (IMT–2000). The second article provides an overview of the global regulatory scene, i.e., what the regulators will let the operators do!

The remaining two articles outline the ITU standards work under way in the network and radio areas.

Acknowledgements

I would like to acknowledge the important contribution by the individual editors of each of these four papers, whose names are listed first, and the additional editing work by Davide Grillo and Jose Costa.

For up to date information on the progress of work on the standardization of IMT–2000, visit the ITU Web site at http://www.itu.int/imt.

Biography

MICHAEL H. CALLENDAR received a B.Sc. from London University, England, in 1959. He is a Chartered Engineer and a Member of the Institution of Electrical Engineers. He has worked in the communications field in a number of countries before settling in British Columbia, Canada, in 1974. He was in charge of automation of the extensive B.C. Telephone radiotelephone network, which involves both rural and urban components, in the "good old days" before cellular. He moved into Corporate Development and later became a senior member of the technical staff of MPR Teltech Ltd., the Research and Development arm of the BCTel Group of Companies, to create strategies for optimum utilization of the emerging new wireless access technologies. He has been chairman of Task Group 8/1 (TG8/1), in the International Telecommunication Union–Radiocommunication Sector (ITU-R), since the group was formed in late 1985 to study the requirements for Future Public Land Mobile Telecommunication Systems (FPLMTS), now known as International Mobile Telecommunications–2000 (IMT–2000). Since his retirement from BCTel in 1994 he is continuing his role as the chairman of TG8/1, as a representative of Nortel Technology.