

HIGHLIGHTING

W-CDMA

W-CDMA: plenty of data while on the move

The initial step in the history of information technology was the invention of the telephone some 120 years ago. The second step was made about 60 years after that: around 1940 the first computers were built. At that time no one could imagine that by the end of the 20th century people would be carrying around telephones and computers in form of small mobile units.

It was not until 20 years ago that the computer set out to conquer the world.

The PC made its way into all fields of work, first as a stand-alone unit, later as a workstation within company-wide networks (intranets), which by now also provide Internet access for more and more PCs. The Internet not only serves for conveying electronic mail between companies, but it allows the worldwide exchange of information of any type, be it text, graphics, photos or, thanks to advanced data-compression technologies, even audio and video sequences.

The PC saw the same development as the once stationary telephone, which eventually became a mobile. Today, it is a matter of course for the businessman to be on the move with a mobile PC (laptop, notebook) as well as a mobile phone. What is still missing, however, is the virtual link of the mobile laptop to the company network and the Internet from any place in the world. We are now at the threshold to this logical next step in the evolution of mobile communications. This new way



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of communicating will require high data transmission rates, so it will rely on innovative mobile radio systems of the third generation, which will be based on wideband CDMA technology for data transmission.

The breakthrough in mobile radio, the systems of the second generation

The first mobile-radio generation, e.g. the AMPS network in the US, NMT in Scandinavian countries and the C network in Germany, Portugal and South Africa, made use of analog technology. These analog systems were very successful in the regions in which they were used. The worldwide breakthrough, however, came with the introduction of the GSM technology, which today is used in more than 100 countries all over the world. GSM belongs to the second mobile-radio generation, which is characterized by digital speech encoding and transmission,

allowing a more efficient utilization of the communication channels. CDMA (IS-95) is also a technology of the second generation. It was first used in the US and has strengthened its position on the market worldwide in recent years. The Japanese PDC system also belongs to the second generation, however in contrast to the other systems its use is limited to Japan.

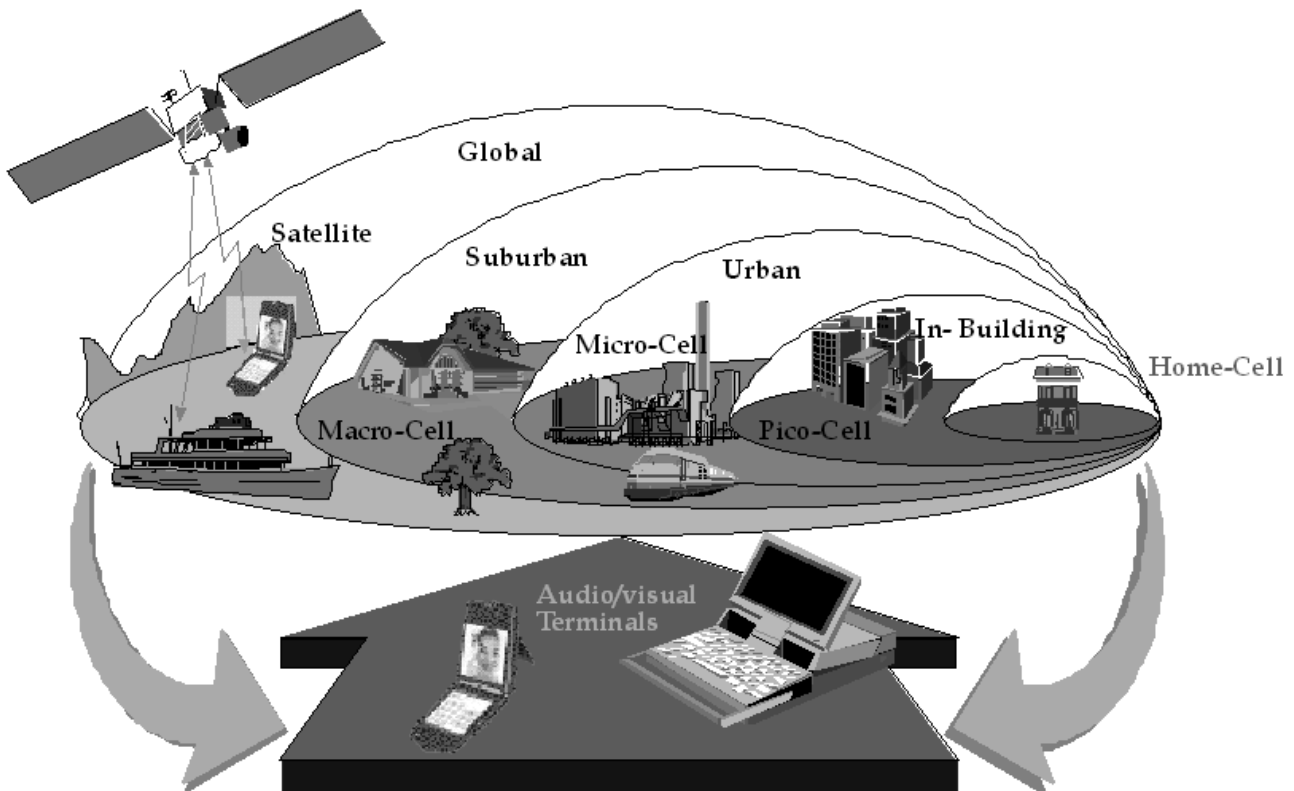
Higher data rates, the extension of the second generation

All systems of the second generation have a problem which has grown in significance only very recently. Their data transmission rates are not very high, far below those of analog modems in wired networks. There are plans to enhance the existing networks as a stepping stone on the way to the third generation. The data transmission capacity of GSM networks is to be extended through the parallel use of several speech channels. Two new

data services are planned, one for permanent data links (HSCSD) and another for the transmission of data packets (GPRS). Furthermore the data rate of the existing channels is to be increased two- to threefold by the introduction of a new type of modulation (ETSI project EDGE). The standard IS-95C envisages a similar extension for the CDMA system.

Multimedia worldwide, the third generation of mobile communications

The third generation of mobile communications will enable us to be reached at any location on Earth. The global mobile radio network of the future will be composed of a large number of individual networks allowing uninterrupted roaming. The cells used by the various networks will be of different sizes: pico cells inside buildings, micro and macro cells for urban and rural areas, while large-area satellite



Seamless roaming between different mobile radio networks

cells will serve for global coverage. The idea of unlimited global roaming will thus become reality. If the user moves beyond the coverage area of terrestrial radio cells, a satellite link will be set up automatically.

Those new networks will of course offer significantly higher data transmission rates. Transmission rates of up to 2 Mbit/s will be possible, depending on the speed at which the user moves, which will allow the mobile use of multimedia applications.

The technology used in mobile phones of the third generation as well as their operating features will have to offer a high degree of flexibility to deal with these demanding tasks. To allow the full utilization of the new systems, the mobile phone of the future will also have to function as a data and multimedia terminal. To keep the mobile phone small with all these functions

implemented, intelligent solutions are required for the design of the user interface.

The user of the new mobile data terminals will have access to a range of totally new applications. All data services will be available upon registering into a network. This includes access to the Internet by means of new browsers that have been especially developed for small displays as well as completely new data services tailored to the user's needs.

The mobile terminals will be designed to operate in networks using various technologies. New operating softwares will be loaded via air interface, so the terminals can adopt network-dependent parameters such as hand-over algorithms. The terminals will need to be adjusted dynamically to new services which for example require different user interfaces.

A travelling businessman's dream becomes reality

In the future, the travelling businessman will carry a laptop with integrated air interface for the third generation of mobile communications. Switching on the laptop anywhere in the world will establish a virtual link to the company network at home. The user receives e-mail messages directly, all databases are available including the latest updates and data can be loaded from the company server in no time at all. Fast Internet access is also available. The user can also retrieve TV programs from his home station via the mobile radio network and watch them on his laptop.

Worldwide standardization

The ITU (International Telecommunication Union) has worked out recommendations for a global mobile communi-

ITU International Telecommunication Union (IMT2000)



Telecommunications
Industry
Association

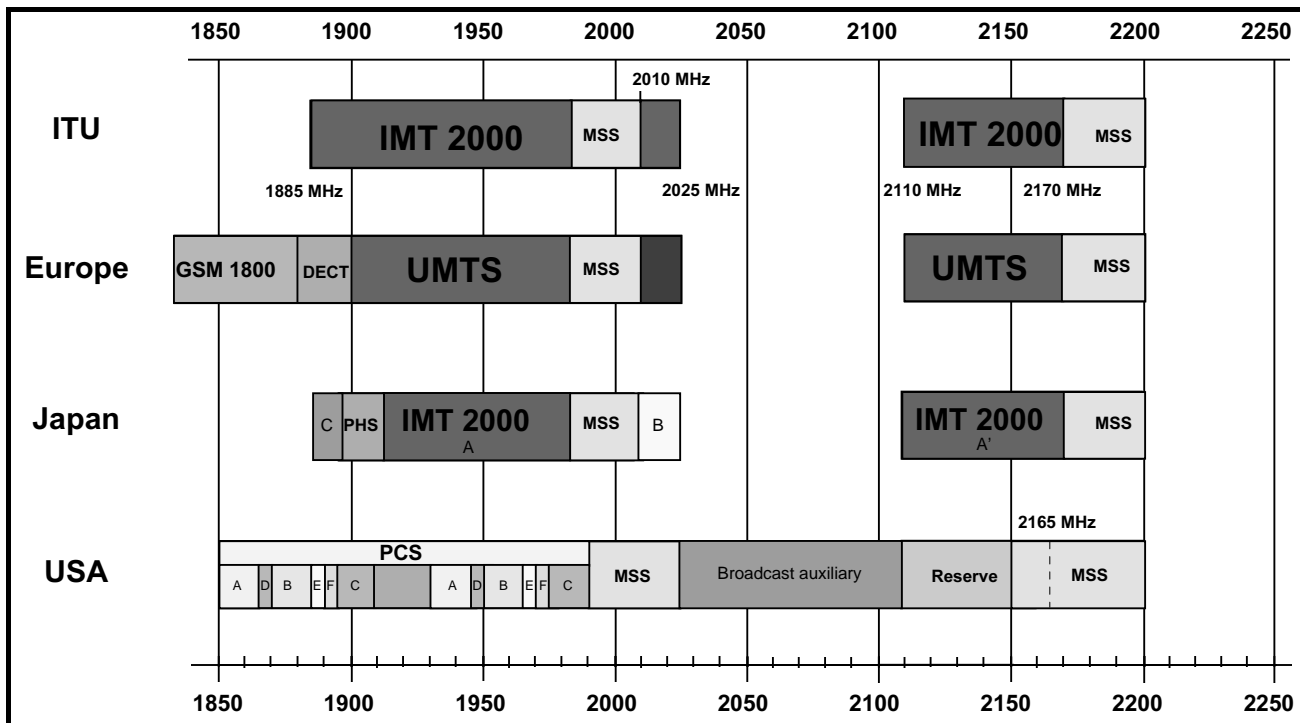


European
Telecommunication
Standards
Institute



Association of
Radio
Industries
and Businesses

Standardization bodies for mobile radio of the third generation



Planned frequency assignment for mobile radio of the third generation

cations standard of the third generation, which have been published under the working title IMT2000. Efforts to define a new mobile communications standard are independently being made in the US, Japan and Europe.

Europe In Europe, the new standard of the third generation is also referred to as UMTS (Universal Mobile Telecommunications System). The new air interface (UTRA = Universal Terrestrial Radio Interface) makes use of the W-CDMA technology supplemented by TD-CDMA for asymmetric data transmission. The latter enables flexible utilization of resources between uplink and downlink.

Japan The W-CDMA technology is in the process of standardization. There is an immediate need to push things forward, because the capacities of the existing PDC system are nearly exhausted, so a successor system has to be set up soon.

USA The existing CDMA technology is under revision to be converted to W-CDMA.

This overview shows that all proposals are based on W-CDMA technology. Europe and Japan propose an almost identical frequency assignment. The future will show whether a unified world standard will be eventually created.

Rohde & Schwarz: measurement technology for W-CDMA

Rohde & Schwarz is world market leader for mobile radio test sets and has a tradition of offering versatile solutions for all problems in the field of mobile radio measurements. Our many years of experience in all mobile radio technologies used worldwide will ensure tailor-made solutions for all applications also in the future. Already today, Rohde & Schwarz offers T&M solutions for the W-CDMA technology of tomorrow. More detailed information is contained in the other sections of this folder.

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