



Evolution Towards Third Generation Wireless Networks

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Proceedings of the 15th Annual NACCQ, Hamilton New Zealand July, 2002 www.naccq.ac.nz

ABSTRACT

The use of wireless technologies has been increasing very rapidly during the last decade. There has been first generation (1G), then second generation (2G), and in near future we will have third generation (3G) of mobile networks. In this poster we examine the history and application of different generations of mobile systems. This is useful for computer professionals who would like some knowledge of the development and application of wireless systems.

1. Generations of mobile systems

The first generation, or 1G, consisted of mainly voice communications using analogue systems. These systems were emerged in 1980s. Analogue systems were limited in capacity, as each call would use 30KHz of the available bandwidth. The communications was not secure as anyone tuning to that frequency could listen to the communications. First generation of mobile phones used FDMA (Frequency Division Multiple Access) technique. Such systems also are called AMPS (Analogue Mobile Phone Systems). AMPS provided 45 channels per cell using the 824-869 MHz range.

The second generation, or 2G, appeared in 1990s and is the technology currently commonly in use. The second generation provide better voice quality, higher capacity (more users per cell site), lower power requirements, text messaging, better security, and global roaming capabilities. The 2G protocols include GSM (Global System for Mobile Communications), TDMA (Time Division Multiple Access), and CDMA (Code Division Multiple Access) systems. GSM use a mixture of FDMA and TDMA technology and operate in 900MHz and 1.9 GHz range. TDMA provides 3 times more

capacity than FDMA systems by allocating several time slots to each 30KHz.

As second generation of mobiles use digital technology, it is easier to transfer data over the link compared to the first generation analogue systems. It can provide data rate of up to 14.4 Kbps.

Later versions of second generation of mobile phones use CDMA techniques. CDMA is the newer and better technology than TDMA. It can provide higher capacity, better security, better quality, and higher data rates. CDMA technology started its implementation in late 1990s. It can provide up to 20 times more capacity than 1G per cell. Mobiles using CDMA technology (027 phones) are more expensive as they provide more features.

The Third Generation of mobile phones (3G) use packet switching compared to TDMA and CDMA (2G) that use circuit switched technology. Packet switching is much more suitable for combination of voice, video, and data communications. We could therefore expect that the 3G wireless networks provide higher data transmission rates of upto 2.4 Mbps. With this data rate, it would be much more suitable for computer communications applications. Some aspects of 3G are still in research and development stage. The migration path to 3G mobile phones is expected to start in the next few years. 3G systems use W-CDMA (Wideband CDMA) technique that will incorporate a 5 MHz wide carrier to enable systems to support the high data transfer rates (CDMA used 1.25 MHz carrier). It is a spread spectrum technique, as each user will be allocated the whole frequency range available.

High data rate transmission feature of 3G wireless communications will support bandwidth hungry applications like multi-media, full-motion colour video, video conferencing, and better and faster internet access.

