

5.4. Third Generation (3G) wireless systems

The Third Generation (3G) wireless systems offer services and thereby reduce the distinction between the range of services of wire line and wireless. It is an advanced technology and it enhances the features of second generation and adds its own advanced features. Updating cellular telecommunications network around the world are using 3G technologies.

The main reason for the evolution of 3G was due to the limited capacity of the 2G networks.

2G networks were built for voice calls and slow data transmission. But these services were unable to satisfy the requirements of present wireless revolution. International Telecommunication Union (ITU) has defined the demand for 3G in the International Mobile Telecommunication (IMT)-2000 standards to facilitate growth, increase bandwidth, support diverse applications.

The development like 2.5G or GPRS (General Packet Radio Service) and 2.75G or EDGE (Enhanced Data rates for GSM Evolution) technologies resulted in the transition to 3G. These technologies act like bridge between 2G and 3G.

Features of 3G

It provides cost efficient high quality, wireless multimedia applications and enhanced wireless communications.

It supports greater voice and data capacity and high data transmission at low cost. 3G mobiles can operate on 2G and 3G technologies.

It offers greater security features than 2G. It supports network access security, network domain security, user domain security, application security.

It supports video calls and video conferences. It provides support from localized service like accessing traffic and high end services like weather updates. We can listen to music, watch videos online and can download huge files with in less time.

Advantages of 3G

All the functions in a normal 2G mobile devices can be performed in 3G at a higher speed.

It provides faster connectivity, faster internet access and music with improved quality.

Applications of 3G

- The 3G mobile can be used as a modem for computer which can access internet and can download games and songs at high speed.
- It provides high quality voice calls and video calls.
- It provides weather updates, news headlines and TV broadcasting in mobile phone.
- It provides high speed internet facility for many applications. It can provide data transmission speed up to 2Mbits /sec.
- It provides multimedia services such as sharing of digital photos and movies. It provides location based services and real time multi player gaming.
- It supports virtual banking and online selling.
- It supports teleconferencing.

Drawbacks

There are few drawbacks:

Upgrading the base station and cellular infrastructure to 3G incurs very high costs.

- Service provider has to pay high amount for 3G licensing and agreements.
- Problem with the availability of handsets and few regions and their

costs.

- High power consumption.

IMT Family

The International Telecommunication Union (ITU) identified the long-term spectrum requirements for the future third-generation (3G) mobile wireless telecommunications systems. In 1992, the ITU identified 230 MHz of spectrum in the 2 GHz band to implement the IMT (International Mobile Telecommunications)-2000 system on a worldwide basis for satellite and terrestrial components. The aim of IMT-2000 is to provide universal coverage enabling terminals to have seamless roaming across multiple networks. The ITU accepted the overall standardization responsibility of IMT-2000 to define radio interfaces that are applicable in different radio environments including indoor, outdoor, terrestrial, and satellite.

The above figure provides an overview of the IMT family. IMT-DS is the direct spread (DS) technology and includes WCDMA systems. This technology is intended for UMTS terrestrial radio access (UTRA)-FDD and is used in Europe and Japan.

IMT-TC family members are the UTRA-TDD system that uses time division (TD) CDMA, and the Chinese TD-synchronous CDMA (TD-SCDMA). Both standards are combined and the third-generation partnership project (3GPP) is responsible for the development of the technology. IMT-MC includes multiple carrier (MC) cdma2000 technology, an evolution of the cdma one family.

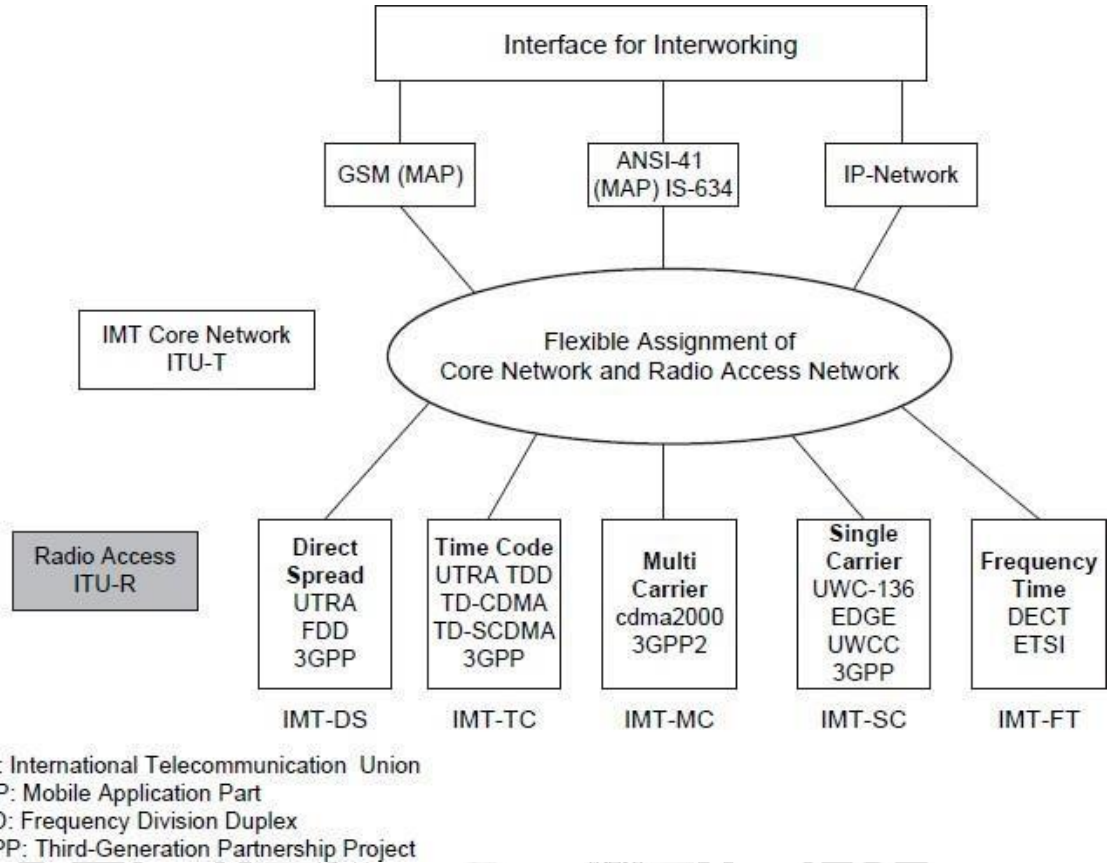


Fig. 3.1 IMT Family

[Source: Text book- Mobile Communications, Second Edition, Pearson Education by Jochen Schiller]★

3GPP2 is responsible for standardization. IMT-SC is the enhancement of the US TDMA systems. UWC-136 is a single carrier (SC) technology. This technology Applies EDGE to enhance the 2 G IS-136 standards. It is now integrated into the 3GPP efforts. IMT-FT is a frequency time (FT) technology. An enhanced version of the cordless telephone standard digital European cordless technology (DECT) has been selected for low mobility applications. The ETSI has the responsibility for standardization of DECT.

In Europe, 3G systems are intended to support a substantially wider and enhanced range of services compared to the 2G (GSM) system. These enhancements include multimedia services, access to the Internet, high rate data, and soon. The enhanced services impose additional requirements on the

fixed network functions to support mobility. These requirements are achieved through an evolution path to capitalize on the investments for the 2G system in Europe, Japan, and North America.

In North America, the 3G wireless telecommunication system, cdma2000 was proposed to ITU to meet most of the IMT requirements in the indoor office, indoor to outdoor pedestrian, and vehicular environment. In addition, the cdma2000 satisfies the requirements for 3G evolution of 2G TIA/EIA 95 family of standards (cdma One).

In Japan, evolution of the GSM platform is planned for the IMT (3G) core network due to its flexibility and widespread use around the world. Smooth migration from GSM to IMT-2000 is possible. The service area of the 3G system overlays with the existing 2G (PDC) system. The 3G system connects and interworks with 2G systems through an interworking function (IWF). An IMT- 2000-PDC dual mode terminal as well as the IMT-2000 single mode terminal is deployed.

UMTS as discussed today and introduced in many countries is based on the initial release of UMTS standards referred to as release 99 or R99. This (release) is aimed at a cost-effective migration from GSM to UMTS. After R99 the Release of 2000 or R00 followed. 3GPP decided to split R00 into two standards and call them release 4 (Rel-4) and release 5 (Rel-5). The version of all standards finalized for R99 is now referred to as Rel-3 by 3GPP. Rel-4 introduces QoS in the fixed network plus several execution environments (e.g., MExE, mobile execution environment) and new service architectures. Rel-4 was suspended in March 2001.

Rel-5 specifies a new core network. The GSM/GPRS-based core network will be replaced by an almost all-IP core network. The content of Rel-5 was suspended