

# **3G MOBILE COMMUNICATION TECHNOLOGY**

## **Abstract**

3G stands for third generation, and is a wireless industry term for a collection of international standards and technologies aimed at increasing efficiency and improving the performance of mobile wireless networks.

3G wireless services offer enhancements to current applications, including greater data speeds, increased capacity for voice and data and the advent of packet data networks versus today's switched networks.

3G (Third Generation) is a generic name for a set of mobile technologies which use a host of high-tech infrastructure networks, handsets, base stations, switches and other equipment to allow mobiles to offer high-speed Internet access, data, and video and CD-quality music services.

This paper presentation describes the 3 generations of mobile technology features and services offered by 3G mobile Technology .



## **GENERATIONS OF WIRELESS COMMUNICATIONS:**

**1G** (or 1-G) is short for first-generation wireless telephone technology, cell phones. These are the **analog** cell phone standards that were introduced in the 1980s and continued until being replaced by 2G **digital** cell phones.

**2G networks** (GSM, CDMA One, DAMPS) are the first digital cellular systems launched early 1990s. **2G services** are frequently referred as Personal Communications Service. 2G technologies can be divided into **TDMA**-based and **CDMA**-based standards depending on the type of multiplexing used.

The main difference between two succeeding mobile telephone systems, **1G** and 2G, is that the radio signals that 1G networks use are analog, while 2G networks are digital. Note that both systems use digital signaling to connect the radio towers (which listen to the handsets) to the rest of the telephone system. But the call itself is encoded to digital signals in 2G whereas 1G is only modulated to higher frequency (typically 150MHz and up).

**2.5G networks** (GPRS, cdma2000 1x) are the enhanced versions of 2G networks with data rates up to about 144kbit/s. While the terms "2G" and "3G" are officially defined, "2.5G" is not. It was invented for marketing purposes only.

**2.5G** is a stepping stone between 2G and 3G cellular wireless technologies. The term "second and a half generation" is used to describe 2G-systems that have implemented a packet switched domain in addition to the circuit switched domain. It does not necessarily provide faster services because bundling of timeslots is used for circuit switched data services (HSCSD) as well.

**3G networks** (UMTS FDD and TDD, cdma2000 1x EVDO, cdma2000 3x, TD-SCDMA, Arrib WCDMA, EDGE, IMT-2000 DECT) are the latest cellular networks that have data rates 384kbit/s and more

## **3G**

### **BACKGROUND:**

At the UMTS Congress in Monte Carlo, nine global leaders in wireless communications - AT&T Wireless Services, Inc., British Telecommunications Plc, Rogers Cantel Inc., Ericsson, Lucent Technologies, Nokia Corporation, Nortel Networks Inc., Telenor AS, and Telecom Italia Mobile - announced the formation of a new focus group to promote an Internet Protocol (IP) based wireless system for third generation (3G) mobile communications technology.

The newly initiated focus group will go by the name **3G.IP**. The nine companies have committed to support the development of next-generation wireless services such as voice, high speed data and Internet access, imaging and video conferencing on an all IP based network architecture using a common core network based on evolved General Packet Radio System (GPRS).

The 3G.IP group plans to set the direction and requirements for the work towards the development of an IP based system for 3G mobile communications technology using W-CDMA and EDGE broadband air interfaces, which are ideally suited to support IP enabled voice and high-speed data transmission for global 3G services. .

The combination of a common network, harmonized air interfaces and multi-mode terminals will give customers seamless access to 3G IP services around the world, while satisfying the varied needs of each carrier.

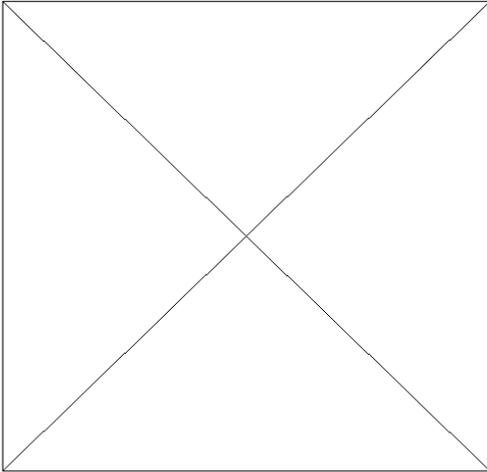
The 3G.IP member companies will cooperate closely and share information in the development of standards for advanced communications systems that will meet or exceed all of the requirements for 3G services established by the International Telecommunications Union (ITU) and regulatory bodies.

The focus group expects that standardization activities related to an all IP based architecture for third generation systems should continue rapidly in the appropriate standard and specification development bodies, and the Group will fully support these standards development processes.

### **STANDARDS OF 3G:**

International Telecommunications Unit (ITU): IMT-2000 consists of five radio interfaces

- W-CDMA
- CDMA2000
- CDMA2001
- TD-CDMA / TD-SCDMA
- UWC-136



3G is a generic term covering a range of future wireless network technologies, including **WCDMA, CDMA2000, UMTS and EDGE.**

3G combines high-speed mobile access with Internet Protocol (IP) based services. This doesn't just mean fast mobile connection to the World Wide Web - by liberating us from slow connections, cumbersome equipment and immovable access points, 3G will enable new ways to communicate, access information, conduct business and learn. This is summarized in the diagram on below produced by Allied Business.

**WCDMA - Wideband Code Division Multiple Access:** A technology for wideband digital radio communications of Internet, multimedia, video and other capacity-demanding applications. WCDMA has been selected for the third generation of mobile telephone systems in Europe, Japan and the United States. Voice, images, data, and video are first converted to a narrowband digital radio signal. The signal is assigned a marker (spreading code) to distinguish it from the signal of other users. WCDMA uses variable rate techniques in digital processing and it can achieve multi-rate transmissions. WCDMA has been adopted as a standard by the ITU under the name IMT-2000 direct spread.

**CDMA 2000 - Code Division Multiple Access 2000:** Commercially introduced in 1995, CDMA quickly became one of the world's fastest-growing wireless technologies. In 1999, the International Telecommunications Union selected CDMA as the industry standard for new "third-generation" (3G) wireless systems. Many leading wireless carriers are now building or upgrading to 3G CDMA networks in order to provide more capacity for voice traffic, along with high-speed data capabilities. Today, over 100 million consumers worldwide rely on CDMA for clear, reliable voice communications and leading-edge data services.

**CDMA 20001X for Voice and Data:** CDMA2000 1X technology supports both voice and data services over a standard (1X) CDMA channel, and provides many performance advantages over other technologies. First, it provides up to twice the capacity of earlier CDMA systems (with even bigger gains over TDMA and GSM), helping to accommodate the continuing growth of voice services as well as new wireless Internet services. Second, it provides peak data rates of up to 153 kbps (and up to 307 kbps in the future), without sacrificing voice capacity for data capabilities. CDMA2000 1X phones also feature longer standby times. And because it's backwards-compatible with earlier CDMA technology, CDMA2000 1X provides an easy and affordable upgrade path for both carriers and consumers.

**CDMA 20001xEV- DO for Faster Data:** For those who want higher-speed or higher capacity data services, a data-optimized version of CDMA2000 called 1xEV-DO provides peak rates of over 2 Mbps, with an average throughput of over 700 kbps - comparable to wire line DSL services and fast enough to support even demanding applications such as streaming video and large file

downloads. CDMA2000 1xEV-DO also delivers data for the lowest cost per megabyte, an increasingly important factor as wireless Internet use grows in popularity. 1xEV-DO devices will provide "always-on" packet data connections, helping to make wireless access simpler, faster and more useful than ever.

### **UMTS - Universal Mobile Telecommunications System:**

The name for the third generation mobile telephone standard in Europe, standardized by ETSI. UMTS offers tele-services (like speech or SMS) and bearer services, which provide the capability for information transfer between access points. It is possible to negotiate and renegotiate the characteristics of a bearer service at session or connection establishment and during ongoing session or connection. Both connections oriented and connectionless services are offered for Point-to-Point and Point-to-Multipoint communication.

### **EDGE - Enhanced Data for Global Evolution:**

A technology that gives GSM the capacity to handle services for the third generation of mobile telephony. EDGE was developed to enable the transmission of large amounts of data at a high speed, 384 kilobits per second. EDGE uses the same TDMA (Time Division Multiple Access) frame structure, logic channel and 200 kHz carrier bandwidth as today's GSM networks, which allows existing cell plans to remain intact

### **Features:**

The most significant features offered by third generation (3G) mobile technologies are the momentous capacity and broadband capabilities to support greater numbers of voice and data customers - especially in urban centres - plus higher data rates at lower incremental cost than 2G.

3G uses 5 MHz channel carrier width to deliver significantly higher data rates and increased capacity compared with 2G networks.

The 5 MHz channel carrier provides optimum use of radio resources for operators who have been granted large, contiguous blocks of spectrum. On the other hand, it also helps to reduce the cost to 3G networks while being capable of providing extremely high-speed data transmission to users.

It also allows the transmission of 384kbps for mobile systems and 2Mbps for stationary systems. 3G users are expected to have greater capacity and improved spectrum efficiency, which will allow them to access global roaming between different 3G networkings.

The main characteristics of 3G are to provide mobile multimedia services at transmission rate of **144kbps** at the highspeed **384kbps** at the speed of walking **2Mbps** indoors

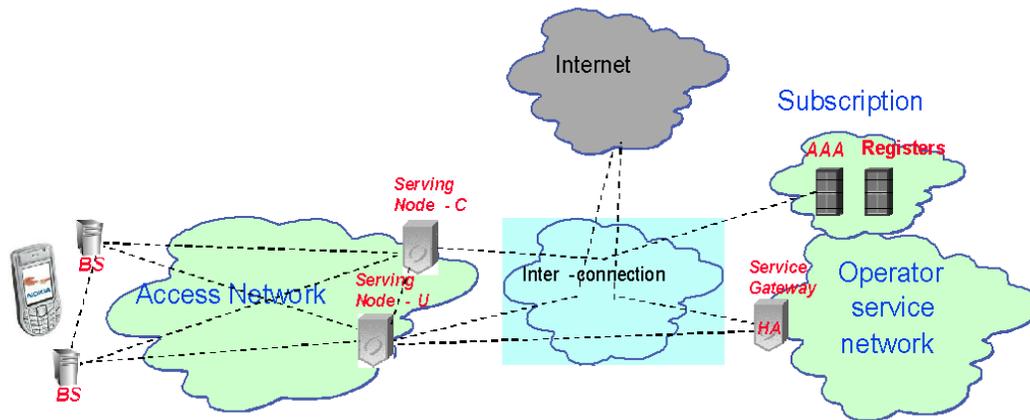
This theoretical maximum (2Mbps) is close to the speed of LAN connections that many households nowadays have. In addition, 3G networks can offer faster data transmission than the slowest.

### **What are the benefits of 3G?**

Packet-based data provides several advantages over the existing circuit-switched techniques used for carrying mobile voice. It allows higher call volumes and support for multimedia data applications, such as video and photography.

Users will be charged on how much data they transmit, not on how much time they are connected to the network, because with 3G you are constantly online and only pay for the information you receive.

## **ARCHITECTURE:**



UE = User Equipment    BS = Base Station    SN-C = Serving Node (Controlplane)  
SN-U = Serving Node (User plane)    SGW = Service Gateway

## **Terminal Availability:**

The availability of user-friendly, affordable terminals is paramount to the speed of adoption of new technologies. It is critical at this stage to gain a clear understanding of vendor plans with regards to multimode and multi-band handset supply for 3G services. Backwards compatibility with existing 2G and 2.5G networks is key to the success of 3G. The upgrade from GSM to UMTS and the availability of dual-mode handsets is confirmed as are the terminals for CDMA and CDMA 1X.

## **A Look At 3g Services –Is There Anything New?**

In general terms, 3G services comprise of  
**Mobile Internet –Browsing the Web from Mobile**

The term mobile Internet, or Internet in mobile, refers to gaining access to the Internet using a handheld, wireless device like a mobile phone or pda. Internet offers the advantage of always being near at hand, and of being a personal tool. On this basis possible successful services might be services developed for traveling purposes like ticketing, checking schedules, traffic reports and related services.

### **Messaging services**

Mobile messaging, referring to short message service (SMS) and multimedia message service (MMS), is expected to be the most utilized mobile service in the future. It is estimated that step-by-step consumers as well as business users will upgrade their messaging from sending simple text messages to multimedia messages including pictures and video clips However, in 3G networks the data transmission speed is depended upon the number of users accessing the network at the same point of time

**Location-specific information** like informing users about the availability of stores, restaurants, gas stations, free parking lots and so on near them .

**Direct access to company networks** business users will have a direct access to company networks while traveling or working outside office.

### **Third Party Organization:**

The combination of 3g and ecommerce is leading to 'always on' technology enabling data to be transferred on a number of ways-not just by making a phone call. This could open up opportunities for the people to be charged by the amount data that they transfer.

### **City On Air:**

This world first development of a live 3g transmission provides a multimedia web based tourist guide with related 'find me the nearest' services, by knowing your location, your terminal can be used to find a certain street, make a hotel booking or calculate your hotel distance from the city center.

Expecting a friend to arrive by train to meet u? Using location aware technology, our 'buddy finder', can track them and notify u when they are within a certain distance.

### **A 3G PHONE:**



**Z1010** is music, video calling and full speed mobile video messaging. With this phone, you can access and enjoy the latest and most advanced operator services. UMTS makes everything go faster and smoother.

With 3G video calling, you can see the person on the other end in full color and real-time movement. And they can see you. Z1010 also has an MP3 player for your favorite songs

And Memory Stick Duo® when you want to store more.

Memory capacity may vary dependant on network provider and content stored/downloaded onto the phone.

**Conclusion:**

3G is considered to be the evolution of existing mobile communications. In the light of the discussion in this paper, there is strong evidence to suggest that the main outcome of using 3G networks and services will be to get access to the same services with faster data connection speed. Furthermore, it seems that the success of 3G lies in its ability to serve not only mobile users but in providing access to the Internet with data cards inserted in laptops. Thus, 3G networks will serve the same purpose as LAN and WLAN networks.

In terms of business opportunities, telecommunication companies' main source of income is still coming from voice-centric services. For example, the mobile operator Hutchinson, offering services purely in 3G networks, announced this autumn 2006 that its main source of income comes from discount packets that offer free speech time in 3G networks. Moreover, as long as the price of the network time is high in 3G, operators cannot wait fast diffusion of data centric mobile services. According to mobile operators, 3G is needed in congested places where the demand on current mobile networks exceeds the capacity.

On this basis, future research that identifies additional factors or views the factors presented in different light would contribute to the understanding of 3G acceptance. Thus, a natural extension of this study is the collection of primary data about the use and acceptance of 3G services in both consumer and business markets.