Third Generation (3G) Wireless

What is 3G?

3G is the next generation of wireless network technology that provides high speed bandwidth (high data transfer rates) to handheld devices. The high data transfer rates will allow 3G networks to offer multimedia services combining voice and data. Specifically, 3G wireless networks support the following maximum data transfer rates:

o   2.05 Mbits/second to stationary devices.
o   384 Kbits/second for slowly moving devices, such as a handset carried by a walking user.
o   128 Kbits/second for fast moving devices, such as handsets in moving vehicles.

These data rates are the absolute maximum numbers. For example, in the stationary case, the 2.05 Mb/second rate is for one user hogging the entire capacity of the base station. This data rate will be far lower if there is voice traffic (the actual data rate would depend upon the number of calls in progress).

The maximum data rate of 128Kbits/second for moving devices is about ten times faster than that available with the current 2G wireless networks. Unlike 3G networks, 2G networks were designed to carry voice but not data.

3G wireless networks have the bandwidth to provide converged voice and data services. 3G services will seamlessly combine superior voice quality telephony, high-speed mobile IP services, information technology, rich media, and offer diverse content.

Some characteristics of 3G services that have been proposed are:

o   Always-on connectivity. 3G networks use IP connectivity, which is packet based.
o   Multi-media services with streaming audio and video.
o   Email with full-fledged attachments such as PowerPoint files.
o   Instant messaging with video/audio clips.
o   Fast downloads of large files such as faxes and PowerPoint files.
o   Access to corporate applications.

Is there a 3G Standard?

The International Telecommunication Union (ITU) is responsible for standardizing 3G. After trying to establish a single 3G standard, ITU finally approved a family of five 3G standards, which are part of the 3G framework known as IMT-2000:

o Three standards based on CDMA, namely CDMA2000, WCDMA, and TD-SCDMA.
o Two standards based on based on TDMA, namely, FDMA/TDMA and TDMA-SC (EDGE).

The CDMA standards are the leading 3G standards.

Europe, Japan, and Asia have agreed upon a 3G standard called the Universal Mobile Telecommunications System (UMTS), which is WCDMA operating at 2.1GHz. Note that UMTS and WCDMA are often used as synonyms. In the USA and other parts of Americas, WCDMA will have to use another part of the radio spectrum. Incidentally, most of the world's wireless operators have chosen to use UMTS.

What are the Advantages of 3G?

3G networks offer users advantages such as:

o New radio spectrum to relieve overcrowding in existing systems.
o More bandwidth, security, and reliability.
o Interoperability between service providers.
o Fixed and variable data rates.
o Asymmetric data rates.
o Backward compatibility of devices with existing networks.
o Always-online devices. 3G will use IP connectivity, IP is packet based (not circuit based).
o Rich multimedia services.

What are Some Disadvantages of 3G?

There are some issues in deploying 3G:

o The cost of upgrading base stations and cellular infrastructure to 3G is very high.
o Requires different handsets and there is the issue of handset availability. 3G handsets will be a complex product. Roaming and making both data/voice work has not yet been demonstrated. Also the higher power requirements (more bits with the same energy/bit) demand a larger handset, shorter talk time, and larger batteries)
o Base stations need to be closer to each other (more cost).
o Tremendous spectrum-license costs, network deployment costs, handset subsidies to subscribers, etc.
o Wireless service providers in Germany and Britain who won spectrum licenses in auctions, paid astronomical prices for them. As a result, they have little

money left for building the infrastructure. Consequently, deployment of 3G in Germany and Britain will be delayed.

What Applications will 3G enable?

3G represents a paradigm shift from the voice centric world of the previous generations of wireless networks to the multi-media centric world of 3G. Reflecting the high 3G bandwidth and the fact that it is packet based, 3G devices will offer capabilities that are a combination of a phone, PC, and a TV. Examples of services that will be 3G networks can offer are:

o   Always-on connection with users paying only when sending or receiving packets.
o   Web surfing.
o   Instant messaging and email with multimedia attachments.
o   Location based services.
o   Personalized services, where content can be pushed to users.
o   Broadband multimedia data services like video conferencing and streaming video.
o   Receiving faxes.
o   Global roaming capability.
o   Getting maps and directions with a multi-modal user interface.
o   Customized entertainment.
o   Simultaneous access to multiple services, each service offering some combination of voice, video, data, etc.

Potential Killer Applications

The high bandwidth of 3G networks will lead to the creation of new services, some of which we have no idea about at this time. The big question is what services will be big revenue makers for the wireless service providers. In 2G networks, the big winners have been short text messaging in GSM networks (Europe and countries other than USA) and image downloads and forwarding on iMode networks in Japan. Two candidate services for big winners in 3G networks are

o   video conferencing and
o   video messaging.

Where Can I Find More Information About 3G?

o   IMT-2000 (3G standard), International Telecommunications Union (ITU). (http://www.imt-2000.org/).
o   CDMA (http://www.cdma.com/).
o   GSM (http://www.gsmworld.com).

Information about 3G networks and products can also be found at the websites of the telecommunications equipment manufacturers:

o   Erricsson (http://www.ericsson.com/).

- o [Lucent](http://www.lucent.com/) (http://www.lucent.com/).
- o [Nokia](http://www.nokia.com/) (http://www.nokia.com/).
- o [Nortel](http://www.nortelnetworks.com/) (http://www.nortelnetworks.com/).
- o [Siemens](http://www.siemens.com) (http://www.siemens.com).