A Review Of Wireless Communication

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Abstract

This Survey report proposes a theoretical analysis of Third Generation (3G) of mobile devices and services that will transform wireless communications in to many real time connectivity. 3Gwireless technology will allow an individual user to have immediate access all services that offer information on demand. The first generation of mobile phones were analog models that appeared in 1980s. The second generation of wireless technology appeared in 1990s. That is ten years later along with the first digital mobile networks. During the second generation, the telecommunications industry realized the exponential growth both in terms of subscribers as well as many new types of services. Mobile phones are becoming the one of the most important of personal communication. The efficient deployment of new wireless data and Internet services has emerged as a critical priority for communications equipment manufacturers. The Network components that enable wireless data services are fundamental to the next-generation network infrastructure. This paper presents an overview of current technology trends in the wireless technology and it gives the comparison of how the communications industries are planning to implement 3G wireless technology standards to give the growing demand for wireless multimedia services.

Keywords— 3G, Wireless Networks, Codes, 3G Parameters.

1. Introduction

3G services for mobile devices have been introduced by various operators. The first 3G network for commercial use was launched in Japan by NTT DoCoMo and that network had the brand name of FOMA and it was introduced in May 2001 on a WCDMA technology. The initial commercial launch of 3G was done by NTT DoCoMo in Japan on October 1, 2001. The SK Telecom from South Korea was the second network that was released commercially live and this was on the 1xEV-DO technology dated on January 2002. In May 2002, the second 3G network from South Korea was developed as EV-DO. Isle of Man by Manx Telcomm was the first commercial network released from Europe. The Telenor opened the first commercial network in Europe for business in December 2001. In that time there was no commercial handsets, so there was also zero clients. These were called as W-CDMA technology.

2. 3G in United States

The first 3G network in the United States that was released by Monet Mobile Networks. This was called as CDMA2000 1xEV-DO technology. Later the network provider had to shut down operations. After that Verizon Wireless released the second 3G network operator in the United States on October 2003. This was called as CDMA2000 EV-DO, with a strongly growing network, since more and more countries adopted the changing technology and incorporated the use of 3G with mobile phones and handsets. Today, 3G is a very common feature among modern models and designs, with more innovations and increased efficiency being introduced every year.

3. About 3G

3G cellular technology is defined as the wireless broadband data and information services that is given to a person's mobile unit. In terms of speed the 3G promises it is ranging from 144 Kbps to 2.4Mbps, which is 3 times faster compared to the traditional

56K dial-up modem connection, which is very near cable-modem speed. The 3G networks allows to browse quickly through web pages, watch on-demand video programs, download and play music, videos and 3D games, watch streaming videos and music videos and video conferences.

4. Developments

The High speed Downlink Packet Access (HSDPA) is a new technology, which may also be called 3.5G, offers fasters speeds of up to 7.2 Mbps and also promises the likes of 14.4 Mbps. The interface is very much different on a cellular phone, but other feels like downloading, streaming, web browsing and sending messages and email can be very comparable to a computer broadband connection. As of the present, there are 3 big carriers that introduced and launched 3G services. There is also a wide range of 3G-enabled handsets now. In early 2005, Verizon Wireless first marketed the devices after that Sprint and Cingular followed. Cingular is now known as AT&T. T-Mobile is also joining the pack as it introduces its new 3G network in 2008

A. The Accesses: Currently, 3G technology is the most recent in mobile communications. The 3G technology is planned for the real multimedia cellular phone, also known as smart phones. These tools feature higher bandwidths and transfer rates to cater to web-based applications and phone-based video and audio data files. The most common is CDMA2000, which is based on code division multiple access, TD-SCDMA, which stands for Time-division Synchronous Code division Multiple Access and WCDMA or UMTS which stands for Wideband Code Division Multiple

B. 3G Networks 3G networks have the capability of transferring speeds up to 3 Mbps which is equivalent to around 15 seconds for every download of a 3-minute MP3 song, and the speed limit range from 144Kpbs, which is equivalent to around 8 minutes to download a 3-minute MP3 song. The high data rates of 3G are recommended when downloading or acquiring information online, as well as sending and receiving huge multimedia files. 3G phones are comparable to small laptops that can cater to several broadband applications like browsing the internet, receiving streaming videos online, video conferencing and sending and receiving faxes. The towers are among the most important element of the group, allowing the data to be transferred from one Phone to another. 3G basically is a cellular phone network protocol [1].

C. 3G Technologies: There are many 3G technologies such as W-CDMA, GSM EDGE, UMTS, DECT, Wi Max and CDMA 2000. Enhanced data rates for GSM evolution (EDGE) is termed as a backward digital technology, because it can operate with older devices. EDGE allows faster data transfer than existing GSM. EDGE was introduced by AT&T in 2003. EDGE has increased the GSM coverage up to three times more. EDGE is a 3G Technology (Third Generation Technology), it can be used for packet switched systems. Universal mobile telecommunications systems(UMTS) belongs to ITU standard. It is complex network and allows for covering radio access, core network and SIM (subscriber identity module). EDGE is relatively an expensive technology for the network operators because it requires new and separate infrastructure for its coverage. The GSM is the base of this technology. CDMA technology is also referred to as International Mobile Telecommunications – Multi carrier(IMT-MC). This technology is closer to 2G technology. Digital enhanced cordless telecommunications (DECT) is another 3G Technology (Third Generation Technology). DECT was developed by European telecommunications standards institute and it is now popular in the other countries of the world, as it runs over a frequency of 1900Mhz. WiMax is also a 3G Technology (Third Generation Technology) and it is referred to as worldwide interoperability for microwave access. It is a wireless technology. It transmits variety of wireless signals. It can be operated on the multi point and point modes. It is a portable technology and this technology is based on the wireless internet access. This technology removes the need for wires and is capable enough to provide 10mbits/sec speed to connect hotspot.

D. Recent Technologies: 3G technology includes UMTS and 1xEV-DO ranging from 144 Kbps up to 2 Mbps. Some of the important features are full-motion video, quick web browsing, 3D games and streaming music. 3.5G technology includes HSDPA which is an upgrade for UMTS and 1x EV-DV, with speeds ranging from 384 Kbps up to 14.4 Mbps. Its Features include video conferencing and on-demand video. 4G and more features speed from 100 Mbps up to 1Gbps. Some of the outstanding features include high quality video conferencing, high quality streaming video and voice-over-IP telephony.
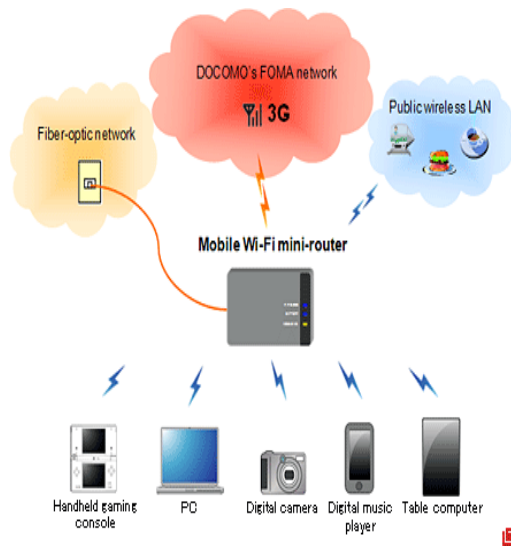
Figure . 1 Connectivity via Mobile Wi-Fi Mini Router

5. Comparison of Wireless Technologies

1G Systems: It is an analog systems such as AMPS that grew rapidly in the 1980s and are still available today. Many metropolitan areas have a mix of 1G and 2G systems, as well as emerging 3G systems. The systems use frequency division multiplexing to divide the bandwidth into specific frequencies that are assigned to individual calls.

2G Systems: Second-generation systems are digital, and use either TDMA (Time Division Multiple Access) or CDMA (Code Division Multiple Access) access methods. The European GSM (Global System for Mobile communications) is a 2G digital system with its own TDMA access methods. The 2G digital services appeared in 1980s, providing expanded capacity and unique services such as caller ID, call forwarding, and short messaging. A critical feature was seamless roaming, which lets subscribers move across provider boundaries.

3G Systems: 3G describes cellular data communications with a data rate of 2 Mbits/sec. The International telecommunication Union (ITU) defines 3G in its IMT-2000 standard, which specifies global wireless frequency ranges, data rates, and availability dates. The global standard was difficult to implement due to different frequency allocations around the world. 3G devices will be a personal, mobile, multimedia communications device that supports speech, color pictures, and video, various kinds of information content. 3G systems will support more phone calls per cell

The following table show the differences between the generations of wireless telecommunications. Each table covers a different aspect of the standards:

1. Dates & Cool New Features
2. Technology in Use
3. Speeds
4. Frequencies and Carriers
5. Primary Countries

TABLE .1 It shows the differences in technology and its features.

	Year	Features
1G	70's to 80's	Wireless phones are introduced, and only for voice.
2G	90's to 2000	Multiple users on a single channel hence the performance is increased, used for data as well as voice.
2G	90's to 2000	Increased performance, used for data as well as voice.
2.5G	2001-2004	Data transmission. Enhanced multimedia and streaming video but limited web browsing.
3G	2004-2005	Multimedia and streaming video capabilities are increased. universal access and portability Ex: Telephones, PDA's, etc.
4G	2006+	40 Mbps speed. Enhanced multimedia, streaming video, access and portability are increased, world-wide roaming.

TABLE .2 It shows the various of technologies and its standards.

	Technology			
1G	Analog	CMRT, AMPS		
2G	Digital and Circuit Switched	D-AMPS	GSM	CDMA
2.5 G	Digital and Packet Switched	GPRS	EDGE	
3G	Digital and Packet Switched	UMTS	W-CDMA	CDMA 2000
4G	Digital Broadband system	802.11		

TABLE .3 It gives the various frequency ranges of technologies.

		Frequency Range	Carrier Frequency
1G		800 MHz	30 kHz
2G	D-AMPS	800 MHz or 1.9 GHz	30 kHz
	GSM	800 MHz or 1.9 GHz	200 kHz
	IS95A/B	800 MHz or 1.9 GHz	1.25 MHz
2.5G		800 MHz or 1.9 GHz	200 kHz
3G	UMTS	2 GHz	5 MHz
	WCDMA	2 GHz	5 MHz
	CDMA2000	2 GHz	1.25 MHz / 3.75 MHz
4G		In Development stage	In Development stage

TABLE .4 It shows the countries list which is using the following technologies.

Wireless Technology		Countries
1G		Worldwide
2G	D-AMPS	USA
	GSM	Europe
	IS95A/B	USA
2.5G		Europe, Asia, USA
3G		Europe, Japan, USA
4G		In Development

6. Code Assignment in 3G

A. WALSH CODE

It is a basic code which recovers the original part of code with high probability. A system used to expand traffic channels in a wireless communications which includes a method for generating a forward link signal includes encoding each of a first set of channels with a mutually corresponding channel code knows as a Walsh code. Is is selected from a predetermined set of channel codes, and encoding each of a second set of channels with the same mutually corresponding channel codes.

B. SCRAMBLE CODE

A scramble code is applied to the encoded to a second set of traffic channels, which is combined with the encoded first set of traffic channels, to form an extended forward link signal. Each channel code is divided into two forward link channels, which are decoded using the scramble code

C. ORTHOGONAL VARIABLE SPREADING FACTOR CODE

CDMA supports variable spreading factor codes. These codes have different lengths and it is required that these variable length codes be orthogonal to each other. Since during spreading, each information bit is multiplied by an entire codeword, that means that longer codes are associated with lower bit rates. When two messages with different code words and spreading factors are transmitted at the same time, the shorter codeword, modulated by its information message, will get repeated a number of times for each transmission of one longer codeword.

This means that the longer code that is derivable from a smaller code is not orthogonal [5]. In terms of the tree structure of the codes, this translates to the condition that a code is not orthogonal to all the codes below it in the code tree. The codes in the tree are generated recursively by generating two codes from one code at each level [6].

D. TURBO CODE

Turbo codes used in 3G mobile communications and satellite communications as well as other applications where designers seek to achieve reliable information transfer over bandwidth or latency-constrained communication links in the presence of data-corrupting noise. Turbo codes are nowadays competing with Low Density Parity Check (LDPC codes), which provide similar performance.[2],[3].

7. Advantages of 3G

Nowadays 3G Technology is the fastest mode of data communication. It is a wireless technology and can be used anywhere and everywhere. 3G improves the efficiency of data transfer such as cellular phone or a data card. The data transfer rates for third generation mobile telecommunications is much more than 2G or 2.5G in use.

Previously mobile phones were using GPRS or EDGE technology for data transfers. The rate of transfer was so slow in that technology. The main advantage of 3G is that all data transfer over the phone can now take place at a much faster speed. 3G internet has not only made our mobile handset better equipped but our PC or laptop also. 3G Data Cards or 3G USB Modems have been launched by most of the leading Internet Service Providers. It just needs to plug in our 3G modem into the USB slot, and access internet on our computer at lightning speed. 3G technology is basically all about speed and high data transfer rate.

It is possible to conduct video-conferencing, and also can see the person to whom we are talking when we make calls, provided the other person also is using a 3G enabled device. The 3G enabled handset can determine its current location on the inbuilt map, and can give directions to go to a certain place from its present location. It can even give driving directions. Online shopping, online banking, and even watch the ups and downs in the share market, is also possible in 3G technology.

A summary of advantages and key attributes of 3G over the conventional 2G are diagrammatically illustrated below:

Figure. 2 Diagrammatic illustration of 3G

8. Conclusions

This survey concludes that the 3G technology provides new changes and advanced methods in telecommunication. The new 3G cellular phones are actually costlier when compared to traditional models. Users can do video conferencing only with other 3G subscribers are available. There are several enhancements and features and applications possible in 3G. The New technologies available are s 4G and 3.5G. The main features of 4G is faster transfer times, good security and greater information exchanges. 4G can access internet and wireless services in terms of higher gigabits. The technologies can be Wi-Fi, UMTS, EDGE, or any other future access technology.

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