Emergence of 3G Network and its Challenges

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ABSTRACT Over the last years mobile phones had a remarkable evolution. From a simple device for voice communication, it became a full blown multimedia device with multiple features and appealing services. Wireless broadband technology is now in motion toprovide higher data rate, wider coverage and improved mobility. Towards this, the 3G - network is an integration of various wireless technologies and expected to provide seamless mobility. The paper reports the emergence of 3G network and its various advantages in terms of its functions, connectivity, speed and so on. It also reports the various challenges facing it in terms of low network connectivity, energy consumption, emergence of other generations of cellular communications e.t.c. Nevertheless, the role played by 3G network cannot be overlooked because it's benefits to many phone users.

Key Words: 3G, network, 3G network.

1. Introduction

In this world of latest technology, every new generation comes up with something new, different, and unique than the older generation and same is the case with 3G network that is also commonly called as third generation cell phones. In the field of communications, 3G has come up has the hottest mobile technology innovation not only because of its advancement from its earlier versions but also due to its benefits and advantages over 1G and 2G generations of cellular communications. The third generation is characterized by convergence of data and voice with the wireless Internet. In simple words, it can be said that 3G is a system that is suitable for high data transmissions and advanced multimedia applications. 3G networks have helped network operators in offering its users a vast range of advanced services. 3G systems use protocols that support high data rates and are targeted for applications beyond audio and voice. MP3, video conferencing, motion video, and lightening fast Internet access are some of the advantages of 3G network over 1G and 2G. NTT DoCoMo in Japan began operating 3G networks in 2001, in some parts of Asia and Europe in 2002, and in the U.S. and other countries after that. Through improved spectral efficiency, a 3G network is able to achieve greater network capacity. Also in the recent years, 3G networks are able to achieve speeds of more than 384 kbps which allows full mobility to 3G phone users traveling at a speed of 120 km/hour in outdoor settings. 3G systems are also able to achieve a maximum speed of 2 Mbps which allows 3G users with limited mobility walking less than 10 miles per hour in short-range indoors or stationary environments.

Technically speaking 3G is a network protocol which refers to the generations of mobile phones and telecommunication equipment which are compatible with the International Mobile Telecommunications-2000 (IMT-2000) standards stated by International Telecommunication Union (ITU). The basic requirement for compiling to IMT-2000 standards is that the technology should provide peak data rates of at least 200 kbit/s. It's worth mentioning that speed isn't the only criteria for deciding whether the network protocol is 3G or not. 3G isn't just any high speed network but a protocol which has its own standards defined under IMT-2000 by ITU.

3G stands for the third generation of wireless communication technology and the industry direction are to raise speeds from 9.5K to 2M bit/sec. According to 3gnewsroom.com, devices will fall into four categories. The first category includes the basic 3G phones will be used mainly for talking and will store all their information on the network. The second category will support video-streaming, and will provide the user with news and web content. More sophisticated models will be information centres which let users download information from the Internet and store data on the device.

Third generation or **3G networks** represent an international standard for wide-area cellular networks that are replacing 2G networks.3G networks also represent the natural evolution from previous standards. Increasingly cellular phones and handheld mobile devices have incorporated additional services to telephony. Today's mobile devices offer high-speed World Wide Web access, emailing, messaging, video phone and multimedia services. People want to be able to watch streaming movies on their cellular phones, download and play music, store data and share files with other cellular users. 3G networks offer faster, slicker ways to do this.

Based on the International Telecommunications Union standards, the 3Gnetwork is the third generation of mobile networking and telecommunications. It features a wider range of services and advances network capacity over the previous 2G network. The 3Gnetwork also increases the rate of information transfer known as spectral efficiency. Telephony has received a wider area and more range, while video and broadband wireless data transfers have also been positively affected. These criteria are identified as the IMT-2000 standard.

Under the background which comes out from the networkenvironment and favorable mobile information industry, the3G technology reflects its powerful advantage in its owndevelopment as well as what the first generation and the second generation of mobile communication system did nothave.

2. Its Characteristics

1) The Broadband of Mobile Information

In the second generation of mobile communication, themain priority is given to the voice communication, and in thepast two years message as the carrier of the value of thebusiness really made operators glad unceasingly. On the third generation mobile communication, along with the increase ofbandwidth, although the basic business will still give priorityto voice communication, video communication will graduallydevelop. At the same time, the original text messages whichgave priority to multimedia will gradually transfer to the MMS. In addition, the location business appeared in 2G, withthe bandwidth enhancement of 3G, running in its basedapplication increases, and thus will also get a rapiddevelopment.

2) Mobility and Portability

In terms of users who treat two things with the samefunction, they often put portability in the first place, and thenmake its last choice. The mobile phone as a terminal of 3G,provides the high mobility, and also provides the perfectphysical medium for instant to quickly spread informationresources. In addition, as the communications tools in people'sdaily lives mobile phone's portable characteristics have deeplyreceived users' favor. And with 3G technology going into more users' lives, it offers more convenience so that users cancollect, upload, transmit information resources at anytime andanywhere.

3) Interactive

The interactive of 3G is mainly reflected in the phoneinternet business. Interactive is one of the highlights in 3Gmobile media. As a kind of combined media, it reaches anunprecedented scale on the interaction frequency andinteractive content richness aspects with the audience, makingthe effect of feedback strengthened and the audienceparticipation improved. Current mobile phone with 3Gtechnology makes phones and internet integrated, and realizesits portability macros. At present the user can receive theinformation very conveniently and interact after gettinginformation sources .The time devoted and economic costs aregetting smaller as 3G mobile media has very stronginteractivity.

3. Its Existence

On 14 December 2009, Telia Sonera announced in an official press release that "We are very proud to be the first operator in the world to offer our customers 4G services. With the launch of their LTE network, initially they are offering *pre-4G* (or *beyond 3G*) services in Stockholm, Sweden and Oslo, Norway. 3G networks have been in operation globally since December 2005 and are continuing to spread. Some telecommunication companies in the U.S., Canada, Asia and Europe use a flavor of 3G called *W-CDMA (Wideband Code Division Multiple Access)*. Others use *CDMA2000*, a non-compatible, competing 3G standard that includes a small family of protocols. These are known as *CDMA2000 1xRTT (1 times Radio Transmission Technology)*, *CDA2000 EV-DO (Evolution Data Only)*, and *CDMA EV-DV (Evolution Data/Voice)*. Two popular mobile carries that use CDMA technology are Sprint and Verizon.

3G was relatively slow to be adopted globally. In some instances, 3G networks do not use the same radio frequencies as 2G so mobile operators must build entirely new networks and license entirely new frequencies, especially so to achieve high-end data transmission rates. Other delays were due to the expenses of upgrading transmission hardware, especially for UMTS, whose deployment required the replacement of most broadcast towers. Due to these issues and difficulties with deployment, many carriers were not able to or delayed acquisition of these updated capabilities.

In December 2007, 190 3G networks were operating in 40 countries and 154 HSDPA networks were operating in 71 countries, according to the Global Mobile Suppliers Association (GSA). In Asia, Europe, Canada and the USA, telecommunication companies use W-CDMA technology with the support of around 100 terminal designs to operate 3G mobile networks.

Roll-out of 3G networks was delayed in some countries by the enormous costs of additional spectrum licensing fees. The license fees in some European countries were particularly high, bolstered by government auctions of a limited number of licenses and sealed bid auctions, and initial excitement over 3G's potential.The 3G standard is perhaps well known because of a massive expansion of the mobile communications market post-2G and advances of the consumer phone. An especially notable development during this time is the smartphone (for example, the iPhone, and the Android family), combining the abilities of a PDA with a mobile phone, leading to widespread demand for mobile internet connectivity. 3G has also introduced the term "mobile broadband" because its speed and capability make it a viable alternative for internet browsing, and USB Modems connecting to 3G networks are becoming increasingly common.

A recent initiative by four leading handset manufacturers–Ericsson, Motorola, Nokia and Siemens–plus the messaging companies CMG, Comverse and Logica was motivated by the launch of 3G. The companies hope to create awareness and foster development of multimedia messaging service (MMS) by making audio, video, photographs and other images to accessible to handsets.

4. 3G Features

1. With 3G, the information is split into separate but related packets before being transmitted and reassembled at the receiving end. Packet switched data formats are much more common than their circuit switched counterparts.
2. The World Wide Web (WWW) is becoming the primary communications interface. People access the Internet for entertainment, services, and information collection, the intranet for accessing enterprise information and connecting with colleagues and the extranet for accessing customers and suppliers. These are all derivatives of the World Wide Web aimed at connecting different communities of interest. Information and other resources are being stored in remote Web servers, which serves the various needs of human beings through Web browsers at their ends.
3. Speeds of up to 2 Megabits per second (Mbps) are achievable with 3G. The data transmission rates will depend upon the environment, the call is being made in, however, only indoors and in stationary environments that these types of data rates will be available. For high mobility, data rates of 144 kbps are expected to be available.

5. 3G Applications

3G facilitates several new applications that have not previously been readily available over mobile networks due to the limitations in data transmission speeds. These applications range from Web Browsing to file transfer to Home Automation (the ability to remotely access and control in-house appliances and machines). Because of the bandwidth increase, these applications will be even more easily available with 3G than they were previously with interim technologies.

6. Advantages of 3G

The main advantage of 3G networks is use of a wider radio spectrum resulting in faster data transmission for advanced multimedia services and a larger network capacity. Carriers can deliver these advantages at a reduced cost compared to 2G network technologies, though physical implementation of a 3G network can be expensive in some cases. 3G Technology is designed for multimedia communication. It provides services like higher data transfer rates. One of its key visions is to provide seamless global roaming, enabling users to move across borders while using the same number and handset. According to ITU it is expected that IMT-2000 will provide higher transmission rates: a minimum of 2Mbit/s for stationary or walking users, and 348kbit/s in a moving vehicle.

3G has provided a new way of life among mobile phone and handset users. Consumers are quickly getting on the bandwagon and investing in 3G-powered devices and tools. 3G can change the way you look at network, with the various features and effects. You can get ahead and take advantage of the highest details and gadgets by understanding the functions and uses of the system, as well as the available networks.

Another advantage of 3G is that it is available in most places. If you have something to do in which you need the internet to do, then 3G comes in handy. Also if you're a business person who hasn't got time to sit in front of a computer to check your emails, you can have the emails come straight through to your phone through using 3G.The biggest benefit of these connections is that the speed the 3G lets you surf the internet.

- Overcrowding is relieved in existing systems with radio spectrum
- Bandwidth, security and reliability are more
- Provides interoperability among service providers
- Availability of fixed and variable rates
- Support to devices with backward compatibility with existing networks
- Always online devices – 3G uses IP connectivity which is packet based
- Rich multimedia services are available
- Increased mobile internet speed

6.1. *The Functions*

People can perform a lot of functions such as sending information and data and acquiring these via wireless access. You get to have data regardless of the time and location. 3G is the latest mobile technology and is now the fastest growing host among mobile units and handsets. 3G provides you with the highest speed possible, compared to other technologies before it. You get to have faster connectivity, music entertainment with better quality and faster access to the internet. The advantages are very side. You can also avail of the benefits of video calling because of the faster speed. You get to enjoy calls to family and friends all over the world with video call facility. The quality and clarity are enhanced, with the facility enjoyable as long as the two parties are using the 3G technology.

6.2. *Using the Technology*

People can use their handsets and let it function as a modem for their computer to mail and send necessary documents. Downloading songs and games will be much faster compared to older technologies. People can also enjoy and download their favorite games via their mobile units and play simultaneously. The latest music videos and songs can be acquired very easily. The technology also allows very quick downloads, so you need only a few minutes to download albums and movie clips.

6.3 . *Getting Information*

Getting information is one of the best features of 3G technology. You can also watch the latest news and headlines, getting data like the weather, sports and economic details. You get to

acquire the latest scores in an ongoing baseball match and other favorite sports. The 3G cellular phones with the very advanced feature can feature highlights of popular sports and shows. The improved quality of services and speed of 3G phones can allow you to watch music videos and movie clips with crisp and clear photos, compared to 2.5G technology phones.

6.4. Higher Speed

With 3G technology, you get to enjoy data transmission speed leading up to 2Mbps, considering that you have a phone in stationary mode. It also gives you high degree of connectivity and higher networking, plus resistance to noise. The technology has enhanced the bit rate, allowing service providers to give high speed internet facilities, higher call volumes and host of the multimedia applications that can be given to the customers. All the services can be given to the customers based on the data quantity transmitted and not on the time used for the service. The services rendered to clients
are cheaper overall.

6.5. *On Price*

Despite the new speeds and features of 3G technology, the prices of handsets and mobile units are relatively the same. The most recent models, however, may be priced higher compared to those featuring 2.5G. You can avail of discounts and other promos by visiting web sites and other private sellers on the market.

6.6. *3G and the Growth of the Wireless Mobile Market*

The wireless mobile market is set to explode and this will provide fresh graduates with exciting job opportunities. According to Will Daugherty's The Growth of Wireless Mobile in Business 2.0, there will be 3 waves of mobile data services. The first wave is linked wireless access to existing information and data applications. The current second wave takes advantage of wireless-specific functionality. The third wave will bring rich graphics, video, real-time multiplayer games.

6.7. *3G and Mobile Job Interviewing*

With an attached camera in a mobile device, job interviews can be conducted as video-conferencing between the HR manager and the potential job applicant. Initially, the job candidate can answer basic questions like his highest qualification and salary expectation by pressing the key-pad of the mobile device. If successful, he can proceed to have a face-to-
face interview.

6.8. *3G and Mobile Advertising*

3G technology will enable advertisers to send more sophisticated and customized permission-based advertisements to their target audience's mobile devices. This will be an improvement from the current SMS. There will be a convergence between the internet and wireless technology as the target audience can request that more product information be sent as email. It is unlikely that these services will provide a sustainable advantage over the long run but they will shape the brand perception of an operator at the initial stage of the introduction of wireless Internet services. However, with the rise of m-commerce, 'business-webs 'will become even more powerful as every customer will become linked into the web. According to Keith Shank of Ericsson, wireline operators will have to find a way to integrate with wireless by providing a package of combined service capabilities and transparent coverage. Demanding consumers will want convergence of wireline, wireless and data services.

7. Disadvantages

In spite of all the above mentioned advantages, there are still limitations that must be addressed. One major limitation is operating area. Rural areas and many buildings in metropolitan areas are not being served well by existing wireless networks. This limitation of today's networks will carry over into future generations of wireless systems. Moreover new frequencies means new components in cell towers are required. Some other limitations are such as battery usage is more, it is hard to implement, and it need complicated hardware. Another disadvantage is consumer is forced to buy a new device to support the 4G since it is impossible to make current equipment compatible with the 4G network.

- The cost of cellular infrastructure , upgrading base stations is very high
- Needs different handsets.

- Roaming and data/voice work together has not yet been implemented
- Power consumption is high i.e. Drains the battery life of your phone
- Requires closer base stations and are expensive
- Spectrum-license costs, network deployment costs and handset subsidies subscribers are tremendous
- Connectivity

8. Challenges

With the increasing likelihood of a convergence between the net and wireless technology in many facets of social and business interactions, each of us will leave a mirror image of ourselves as we travel around.3G phones offer better services compared to 2G phones,especially regarding bit rate when downloading or uploading data. Moreover they can support data and voice traffic at the same time allowing video calls, for example. However, use of data services is only slowly becoming more widespread, and many costumers still use their phone mainly for voice and Short Message Service (SMS) and in a small portion for data services. Moreover, many areas still have limited 3G coverage and the phone continuously makes hand-offs from 2G to 3G network and vice versa as the mobile phones moves into and out of 3G coverage. Therefore being connected to a 3G network, especially when no data transmission is needed, has an high cost in terms of energy consumption.

One of the main Challenges of 3G connections is the connectivity. If you live in an area where the connectivity is low or non-existent then you will not be able to use this.

The emergence of 4G, the fourth generation of mobile phone communications standards. It is a successor of the 3G and provides ultra-broadband internet access for mobile devices. The high data transfer rates make 4G networks suitable for use in USB wireless modems for laptops and even home internet access. The emergence of other generations which provides faster access to the internet has reduced the demand for 3G by users.

9. Conclusion

The telecommunications world is changing as the trends of media convergence, industry consolidation, Internet and IP technologies and mobile communications collide into one. Significant change will be bought about by this rapid evolution in technology with the arrival of mobile Internet technology.

Mobile phones have appealing services and features which unfortunately drain a lot of the energy stored in a capacity limited battery. It is a common problem among phones manufacturers to find a way to extend battery life of their devices and allow users to use mobile services for a longer time. Furthermore network operators are interested in longer stand by times for the users as that may lead to higher use of their services. 3G networks offer higher data rates with lower consumption in terms of energy per bit. Most users have the possibility to set the network they would like to use, which gives them the possibility to switch between networks depending on the actual used service.

3G networks represent the natural evolution from previous standards. Increasingly cellular phones and handheld mobile devices have incorporated additional services to telephony. Today's mobile devices offer high-speed World Wide Web access, emailing, messaging, video phone and multimedia services. People want to be able to watch streaming movies on their cellular phones, download and play music, store data and share files with other cellular users. 3G networks offer faster, slicker ways to do this.

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Anyone who has never made a mistake has never tried anything new.

~ Albert Einstein