

A Survey on Development of Mobile Technology

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Abstract— Now a day's everything has gone wireless. This is the era of wireless communication. Mobile wireless technology is developed superior techniques. This technology has made incredible growth in the last fifteen years. Through a common wide-area radio-access technology and flexible network architecture WiMAX and LTE has enabled convergence of mobile and fixed broadband networks. This development of mobile technology allows users to utilize common realistic applications such as internet access, location based services, video-on-demand, video conferencing system, mobile financial services, mobile entertainment services and many more applications ,anytime anywhere. This paper gives overview and comparative study of of mobile technologies .The First generation(1G) of wireless telecommunication technology is known as analog cellular telephone. 1G device was comparatively heavy and expensive. Second Generation mobile phones used GSM technology, uses digital modulation and it improves voice quality with limited data service.3G provide faster communication and accommodate web based application and audio video files. Fourth Generation has global mobility support anytime anywhere. Fifth generation focus on (Voice Over IP) VOIP-enabled devices that user will experience a high level of call volume and data transmission. Fifth generation technology will fulfil all the requirements of customers who always want advanced features in cellular phones.

Keywords-1G, 2G, 3G, 4G, 5G, GSM

I. INTRODUCTION

Mobile communication has become more popular in last few years due to fast revolution in mobile technology. This revolution is due to very high increase in telecoms customers. This revolution is from 1G- the first generation, 2G- the second generation, 3G- the third generation, and then the 4G- the forth generation,5G-the fifth second generation.

The first generation system is also called as NMT (Nordic mobile Telephone), introduced in 1980s.1G system were analog systems which offered mainly speech related services and highly incompatible with each other.[1].Voice telephony, limited local and regional coverage and low capacity were the main challenges of 1G network. The increased demand for high frequency ranges in telecommunication sector caused development in analog to digital transmission techniques. In the early 1990s second generations (2G) arrived to meet the capacity demands of rapidly increasing voice plus telephony, text messaging and limited circuits switched data services.[2].Because of digital transmission techniques the efficiency of compression of signal increased which result in more packet transmission using same bandwidth and less power.

Because of drawbacks such as low speed, and incompatible technologies used in previous generations third generation arrived, in 2000.The third generation allows higher data transmission rates and increased capacity for traditional voice

calls, global roaming, internet ,mobile video conferencing, video calls and 3D gaming. It gives location based services available to mobile users. Fourth generation is advanced mobile technology introduced in 2010.4G is boon for mobile users which allows to access mobile multimedia anytime, anywhere with global mobility support. It has higher data rates than previous generations well over 100 Mbps,low latency, efficient spectrum use and low cost implementation[2] Fifth generation(5G) is packet switched wireless mobile communication system with extensive area Coverage with high throughput, hence it is called as wireless world wide web(www)[3].Fifth generation(5G) focus on VOIP(Voice over IP) enabled devices that user will experience a high level of call volume and data transmission. Fifth generation technology will fulfill all requirements of customer who always want advanced features in cellular phones. The main features in 5G network is that user can simultaneously connect to the multiple wireless technologies and can switched between them. [4]

II. EVOLUTION OF MOBILE TECHNOLOGY

Following figure shows evolution of mobile technology from 1G to 5G,with year of introduction. All these generations are discussed in following points.

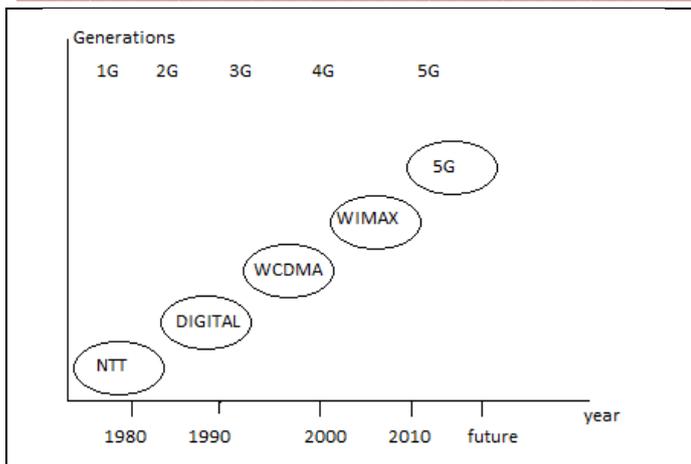


Figure 1. Evolution of mobile technology

A. 1G Mobile Communication System

First Generation system developed from analogue signals technology, which based on circuit switching technology.. Analog System was the first mobile wireless communication system used in 1G, which was based on an Advance Mobile Phone Service (AMPS) technology. AMPS system was based on frequency modulation radio system using Frequency Division Multiple Access (FDMA) with 30 KHz as the channel capacity and frequency band was 824-894 MHz it allows only voice calls. Its speed up to 2.4 Kbps [5].

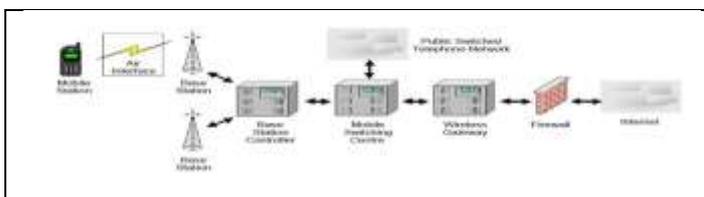


Figure 2. Architecture of Advance Mobile Phone Services (AMPS)

It was developed for voice not for data. First Generation of wireless networks used analog radio signals for communication. Through 1G, a voice call gets modulated to a higher frequency of about 150MHz and up as it is transmitted between radio towers. This is done using a technique called Frequency-Division Multiple Access (FDMA). 1G has low capacity, unreliable handoff, poor voice links and no security at all since calls were played back in radio towers. The efficient use of spectrum was not possible and roaming was also not possible. 1G was developed on earlier stage to communicate with the mobile phones through the network of distributed transceivers. After 1G, second generation evolved which has overcome many drawbacks of first generation.

B. 2G Mobile Communication System

Digital systems are used in second generation mobile communication system. It allowed users to avail short Messaging service (SMS). Its bandwidth is 30-200kbps. During 2G subscribers and value added services increases exponentially. 2G mobiles used GSM technology in 1990s. 2G

had good voice quality but limited data services. It had additional services like faxes, text message and voice mail. It uses GPRS (General Packet Ratio Services) which delivers packet switched data to existing GSM network. GSM provides many more services than original network.[3]

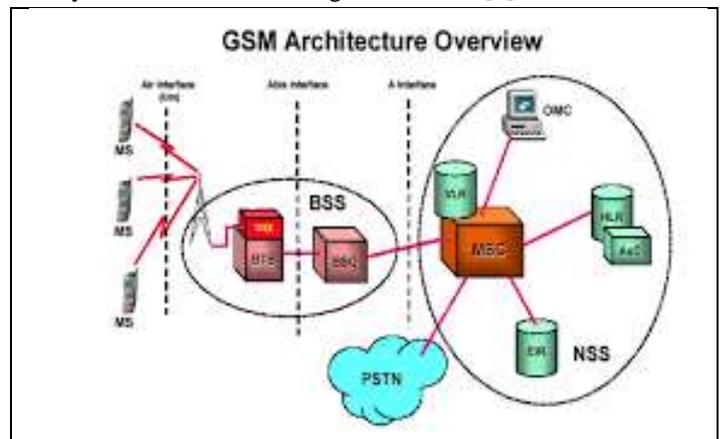


Figure 4. 2G GSM Architecture

C. Third Generation

The third generation mobile technology is based on Wide band wireless network .It provides data rates of at least 200 Kbit/s. 3G functions in the range of 2100 Hz. Its bandwidth is 15-20 MHz It has enhanced clarity and perfection like the real conversation. 3G offers a vertically- integrated, top-down and service-provider approach to delivering wireless Internet access. Mobile service providers use licensed spectrum which provide wireless telephone coverage over large geographic serving area. It offers (near) ubiquitous and continuous coverage e.g. a consumer can carry on a telephone conversation while driving along a highway at 100Km/hour. 3G can support data rates of 384Kbps up to 2Mbps. 3G offers narrower bandwidth but over a wider calling area.

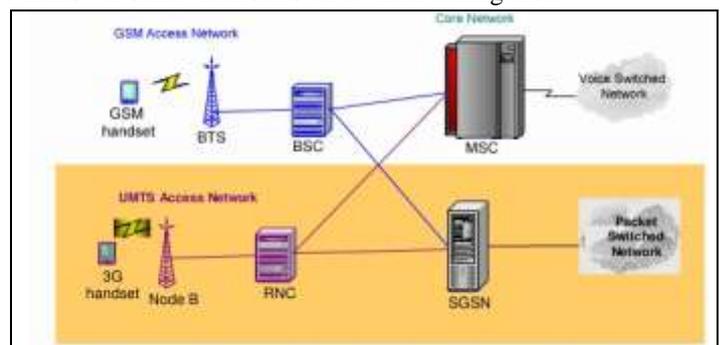


Figure 3. 3G network architecture

D. Fourth Generation

4G is short for Fourth (4th) Generation Technology. 4G Technology is basically the extension in the 3G technology with more bandwidth and services offers in the 3G.

the 4G technology is basically the high quality audio/video streaming over end to end Internet Protocol. If the Internet Protocol (IP) multimedia sub-system movement achieves. The main features of 4G services of interest to users are application adaptability and high dynamism users traffic, radio environment ,air interfaces, and quality of service.[2]

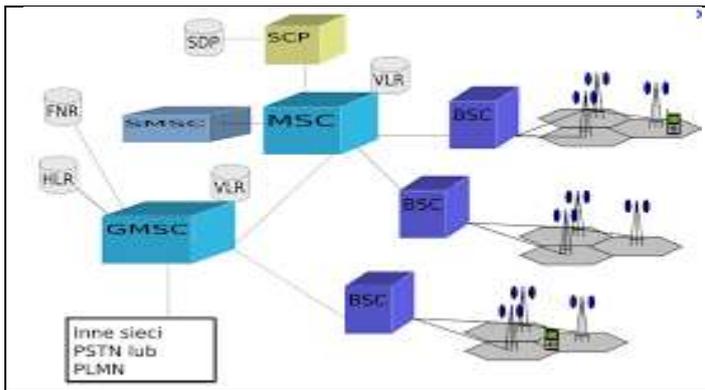


Figure 5.3G Architecture

At the most common level, 4G architecture will contains three basic areas of connectivity: Personal Area Networking (such as Bluetooth), local high-speed access points on the network together with wireless LAN technologies and cellular connectivity. Under this shade, 4G calls for a wide range of mobile devices that support global roaming. Each device will be able to interact with Internet-based information that will be customized on the fly for the network being used by the device at that instant. To sum up, the roots of 4G networks lie in the idea of pervasive computing [6].

E .5G Technology

From a technology perspective, 5G will include a new Radio Access Technology (RAT) and the evolution of 4g LTE.It will also include evolved network architecture. It will also include evolved network architectures and core network technologies. On the other hand from mobile operators business perspective,5G is end to end ecosystem which enables a fully mobile and connected society as stated in[7]

E.1 5G Requirements

Taking into account recent market trends and services, high-level targets which are most relevant to 5G are described in the

following:

Higher system capacity – It is estimated that the volume of mobile traffic in 2020s will be at least 1000-fold larger compared to that in 2010. Thus, 5G must be able to manage traffic volumes which are many orders-of-magnitude larger than today’s networks. This will be the most-challenging requirement for 5G mobile broadband.

Higher data rate – 5G must practically provide higher data rates than are deployed today. Also, considering the rapidly emerging trends to richer content and cloud services, 5G should target higher-data-rate services along with more uniform quality of user experience, compared to LTE.

Massive device connectivity – 5G must allow massive numbers of devices to be connected simultaneously to the network in order to support all-time connected cloud services even in a crowd of people, and more machine/appliance-based devices for the Internet of Everything (IoE), known also as Internet of Things (IoT).

Reduced latency – 5G must provide not only higher data rate, but also a userplane latency of less than 1ms over the Radio Access Network (RAN), a large leap from the 5ms of LTE. In some specific cases, even 1ms end-to-end latencyis declared to be needed. Lower latency will enable future cloud services and new potential services such as tactile Internet, augmented reality, and real-time and dynamic control for Machine-to-Machine (M2M) use cases.

Energy saving and cost reduction – 5G system must provide increased capacityper unit network cost and be energy-efficient and resilient to natural disasters.

In particular, for M2M terminals, efficient energy saving is essential for achieving longer battery life (e.g., more than 10 years).[8]

Comparative study on 1G,2G,3G,4G and 5G networks.

Following table shows comparative study on all generations.

Table 1.Comparative study of mobile network generation

Generation Features	1G	2G	3G	4G	5G
Years	1980s	1990s	2000s	2010s	2020s
Data Bandwidth	2kbps	64kbps	2Mbps	200Mbps	1Gbps

Standards	AMPS	TDMA, CDMA,GSM, GPRS	Single unified standards	WCDMA	Single unified standards
Technology	Analog cellular	Digital Cellular	Broadband with CDMA, IP Technology	Unified IP & Seamless combination of broadband , LAN,WAN & WLAN	Unified IP & Seamless combination of broadband, LAN,WAN & WLAN,WWWW
Services	Mobile technology (voice)	Digital Voice, SMS, Higher Capacity Packetized	Integrated high quality audio, video & data	Dynamic information access, wearable Devices	Dynamic information access, wearable Devices with AI capabilities
Multiplexing	FDMA	TDM/CDMA Packet	CDMA All Packet	CDMA All Packet	CDMA
Switching	All Packet	All Packet	Packet	All packet	All packet

III. CONCLUSION

Mobiles are the most important need of our life. Mobile technology achieved lots of progress. In this paper we tried to take a review on development of generations of mobile technologies, with their advantages, disadvantages, application and performance. In future research work next technology with advanced features and applications will be introduced. Which offer services with no limitations and wired devices. This future technology will bind whole world together like a family.

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