ABSTRACT

The wireless and mobile communication has the vital action of the information exchange system in the world. By that each and every users need to access the data at huge data rate speed, bandwidth and precise reliability network protocol. Therefore year by year develop the technology with its domain scenario. In this paper proposed the evaluation of cellular and mobile communication at available of different technology in International Standards. With the help of latest technology of 7.5G improves the efficient of peak download and upload the data speed.

Keywords: Space Division Multiple Access (SDMA), Line Terminal (LTE), WIMAX (Worldwide Interoperability for Microwave Access), Cellular Generations 3G, 4G, 5G, 6G, 7G and 7.5 G, Wireless LAN (WLAN).

I. INTRODUCTION

The origins of cellular lie surprisingly deep in the past. As early as 1947, at essentially the same time that the first 150 MHz system was installed in St Louis, the Bell System (AT&T) proposed a “broadband urban mobile system,” and requested 40 MHz for its implementation somewhere in the region between 100 and 450 MHz. At that time, the idea that a large geographic area could be served using many small coverage areas had already been put forward at Bell Laboratories, primarily to allow low-power radios to be used. The FCC denied this request, citing the unavailability of frequencies in that range. In 1949, the FCC considered allocation of the band from 470 to 890 MHz, but chose to reserve this band for the vast educational and entertainment opportunities thought to be offered by the newly proposed UHF TV band. Once again, in 1958, the Bell System requested an allocation for mobile telephone, this time in the range of 764-840 MHz, and once again the FCC declined to take action. By this time, however, the essential ingredients of the cellular system were under discussion—the use of small cells and the reuse of channels that would increase dramatically the number of simultaneous calls per channel.

There are two different concepts such as wireless transmissions & mobility. One can be used mobile while using wired technologies - nomadism: move between several offices. A few things can be fixed while using wireless technologies e.g: a fixed host using IEEE 802.11b. The other can be physically mobile but fixed at the network layer e.g.: move within the coverage area of a 802.11 base station.
Cellular began as an “automobile” system, with relatively large trunk-mounted radios that were connected by cables to dashboard-mounted “control units.” Even as service began, however, “satchel” units were offered that provided a “portable” option. More significantly, Motorola soon introduced the “DynaTAC,” a 2-pound hand-held unit that was about the size of a brick, and could be carried in an attaché case. The evolution toward the pocket phone had begun. The evolution to the tiny pocket phones of today has had tremendous significance.

A telephone attached to an automobile may provide great utility (and in fact was an extremely popular service), but was still a location-based phone rather than a “personal” device. In the 1980s, when we called a car phone, it was because we expected someone to be in a particular vehicle. It might have called a home or office with the same expectation.

II. ANALOG CELLULAR SYSTEMS (1G)

The first generation of cellular systems used analog radio technology. Analog cellular systems consist of three basic elements: a mobile telephone (mobile radio), cell sites, and a mobile switching center (MSC). Figure 2.1 shows a basic cellular system in which a geographic service area such as a city is divided into smaller radio coverage area cells. A mobile telephone communicates by radio signals to the cell site within a radio coverage area. The cell site’s base station (BS) converts these radio signals for transfer to the MSC via wired (landline) or wireless (microwave) communications links. The MSC routes the call to another mobile telephone in the system or the appropriate landline facility. These three elements are integrated to form a ubiquitous coverage radio system that can connect to the public switched telephone network (PSTN). It support speed up to 2.4kbps. Major contributors were AMPS (Advance mobile phone system) was first launched by the US, NMT, and TACS.

The demerits of AMPS are unreliable handoff, poor voice links, no security at all since voice calls were played back in radio towers, and making these calls susceptible to unwanted eavesdropping by third parties.

III. SECOND GENERATIONS (2G)

It is based on GSM or in other words global system for mobile communication. It was launched in Finland in the year 1991. It was the first digital cellular networks, which had a number of obvious benefits over the analog networks they were supplanting: improved sound quality, better security, etc.
2G technologies enabled the various mobile phone networks to provide the services such as text messages, picture messages and MMS (multi media messages). It is more efficient. 2G technology holds sufficient security for both the sender and the receiver. All text messages are digitally encrypted. This digital encryption allows for the transfer of data in such a way that only the intended receiver can receive and read it.

IV. TDMA, CDMA & GSM

2G technologies are either time division multiple access (TDMA) or code division multiple access (CDMA). TDMA allows for the division of signal into time slots. CDMA allocates each user a special code to communicate over a multiplex physical channel. Different TDMA technologies are GSM, PDC, iDEN, iS-136. CDMA technology is IS-95. GSM has its origin from the Group special Mobile, in Europe. GSM (Global system for mobile communication) is the most admired standard of all the mobile technologies. Although this technology originates from the Europe, but now it is used in more than 212 countries in the world.

GSM technology was the first one to help establish international roaming. This enabled the mobile subscribers to use their mobile phone a connection in many different countries of the worlds is based on digital signals. GSM has enabled the users to make use of the short message services (SMS) to any mobile network at any time. SMS is a cheap and easy way to send a message to anyone, other than the voice call or conference. This technology is beneficial to both the network operators and the ultimate users at the same time. Another use of this technology is the availability of international emergency numbers, which can be used by international users anytime without having to know the local emergency numbers.

1. On 2G platform, digitals systems are designed for low power consumption and this makes the handset and equipment less expensive.
2. Digital signals are considered environment friendly.
3. The use of digital data service assists mobile network operators to introduce short message service over the cellular phones.
4. Digital encryption has provided secrecy and safety to the data and voice calls.
5. Since it uses digital multiplexing, more calls can be accommodated into same amount of bandwidth.

V. 2.5G TECHNOLOGY

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. The evolution from 2G to 3G ushered in faster and higher-capacity data transmission. Some added feature of these are features such as packet-switched connection and enhanced data rates. 2.5G networks include EDGE (Enhanced Data GSM Environment increases transmission speeds on GSM networks and enables the transmission of large amounts of data at 384Kbps) and GPRS (General Packet Radio Service is a radio technology for GSM networks that adds packet-switching protocols. GPRS enables high-speed wireless Internet and other data communications.). GPRS is a service commonly associated with 2.5G technology having a data transmission rates of 28 kbps or higher and has came after the development of the Global System for Mobile (GSM) service.
These networks (EDGE & GPRS) support WAP, MMS, SMS mobile games, and search and directory. Since they have data transmission rates of 144 kbps or higher, may qualify as 3G technology. However, they are usually classified as 2.5G technology because they have slower network speeds than most 3G services.

**Figure 4. NOKIA 3230 is a Standard 2.5G Mobile Phone**

VI. 3G TECHNOLOGY

The third generation of mobile systems provides high-speed data transmissions of 144kbps and higher. It comes with enhancements over previous wireless technologies, like high-speed transmission, advanced multimedia access and global roaming. 3G is mostly used with mobile phones and handsets as a means to connect the phone to the Internet or other IP networks in order to make voice and video calls, to download and upload data and to surf the net. 3G will support multimedia applications such as full-motion video, video conferencing and Internet access. The data are sent through the technology called Packet Switching. Voice calls are interpreted through Circuit Switching. It is a highly sophisticated form of communication that has come up in the last decade.

**Features – 3G**

1. Several times higher data speed.
2. Multiple mobile applications and clarity of digital signals.
3. Enhanced audio and video streaming;
4. Video-conferencing support;
5. Web and WAP browsing at higher speeds;
6. IPTV (TV through the Internet) support.

**Figure 5. Apple iPhone 3G Mobile Phone**

The transfer rate for 3G networks is between 128 and 144 kbps (kilobits per second) for devices that are moving fast and 384 kbps for slow ones (like for pedestrians). For fixed wireless LANs, the speed goes beyond 2 Mbps. 3G is a set of technologies and standards that include W-CDMA, WLAN and cellular radio, among others.

**Table 1. Generation of 1G, 2G & 3G**

<table>
<thead>
<tr>
<th>Generation</th>
<th>Type</th>
<th>Time</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>Analog</td>
<td>1980s</td>
<td>Voice centric, multimedia standard (NMT, TACs, etc)</td>
</tr>
<tr>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>Digital</td>
<td>1990s</td>
<td>Voice centric, multimedia standard (GSM, TDMA, CDMA)</td>
</tr>
<tr>
<td>2.5</td>
<td>High Rate Data</td>
<td>Last 1990s</td>
<td>Introduction of new higher speed data services to bridge the gap between the second and Third Generation, including services such as General Packet Radio Service (GPRS) and Enhanced Data Rates for Global Evolution (EDGE).</td>
</tr>
<tr>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>Digital Multimedia</td>
<td>2005</td>
<td>Voice and data centric, single standard with multiple modes.</td>
</tr>
</tbody>
</table>
VII. 4G

A 4G system may upgrade existing communication networks and is expected to provide a comprehensive and secure IP based solution where facilities such as voice, data and streamed multimedia will be provided to users on an "Anytime, Anywhere" basis and at much higher data rates compared to previous generations. One common characteristic of the new services to be provided by 4G is their demanding requirements in terms of QoS. Applications such as wireless broadband access, Multimedia Messaging Service (MMS), video chat, mobile TV, HDTV content and Digital Video Broadcasting (DVB) are being developed to use a 4G network. 4G is a research item for next-generation wide-area cellular radio and having features like

1. 4G is a conceptual framework and a discussion point to address future needs of a highspeed wireless network.
2. It offer both cellular and broadband multimedia services.
3. Theoretically, 4G is set to deliver 100Mbps to a roaming mobile device globally, and up to 1Gbps to a stationary device.
4. 4G will bring almost perfect real world wireless or called — WWWW: World Wide Wireless Web

(i). 3GPP Long Term Evolution (LTE)

The pre-4G technology 3GPP Long Term Evolution (LTE) is often branded "4G-LTE", but the first LTE release does not fully comply with the IMT-Advanced requirements. LTE has a theoretical net bit rate
capacity of up to 100 MBit/s in the downlink and 50 MBit/s in the uplink if a 20 MHz channel is used and more if multiple-input multiple-output (MIMO), i.e. antenna arrays, are used. The physical radio interface was at an early stage named High Speed OFDM Packet Access (HSOPA), now named Evolved UMTS Terrestrial Radio Access (E-UTRA). The first LTE USB dongles do not support any other radio interface.

Data Speed of LTE is:
- PEAK DOWNLOAD 100 MBit/S
- PEAK UPLOAD 50 MBit/S

(ii). Mobile WiMAX (IEEE 802.16e)

The Mobile WiMAX (IEEE 802.16e-2005) mobile wireless broadband access (MWBA) standard (also known as WiBro in South Korea) is sometimes branded 4G, and offers peak data rates of 128 MBit/s downlink and 56 MBit/s uplink over 20 MHz wide channels.

Data Speed Of WiMAX:
- PEAK DOWNLOAD 128 MBit/S
- PEAK UPLOAD 56 MBit/S

IX. NEED FOR 5G

The 4G mobile system is an all IP-based network system. The features of 4G may be summarized with one world integration. The 4G systems are about seamlessly integrating different technologies and networks to satisfy increasing user demands. 4G technologies shall combine different current existing and future wireless network technologies (e.g. IPv6, OFDM, MC-CDMA, LAS-CDMA and Network-LMDS) to ensure freedom of movement and seamless roam from one technology to another. These will provide multimedia applications to a mobile user by different technologies through a continuous and always best connection possible. 4G networks are integrated with one core network and several radio access networks. This kind of integration combines multiple radio access interfaces into a single network to provide seamless roaming/handoff and the best connected services. The main distinguishing factor between 3G and 4G is the data rates. 4G can support at least 100Mbps peak rates in full-mobility wide area coverage and 1Gbps in low-mobility local area coverage. The speeds of 3G can be up to 2Mbps, which is much lower than the speeds of 4G.

X. 5G

At the data transfer rates of the earliest cellular phones on the so-called 1G network, our “e-Bible” could be downloaded in about 1.75 hours, although no mobile device at that time could display or even store that amount of data. On a present day 3G mobile network, the download time drops to approximately 6 seconds. On a 4G network, that time drops to 0.06 seconds. What could be the data rates and download speeds that we can expect for a 5G technology which is still in the phase of conceptualization? Mobile broadband is becoming a reality, as the internet generation grows accustomed to having broadband access wherever they go and not just at home or in the office. Of the estimated 3.4 billion people who will have broadband by 2014, about 80 percent will be mobile broadband subscribers and the majority will be served by High Speed Packet Access (HSPA) and LongTerm Evolution (LTE) networks.
There is strong evidence supporting predictions of increased mobile broadband usage. This clearly shows that within 2020 LTE will become the latest trend for wireless communication all over the world. common man to utilize his available possessions in an immense way to make him to feel the real progress.

**Features – 5G**

1. Minimize system latency and enable applications with a lower tolerance for delay; upcoming latency enhancements on the radio link can also be fully realized5.
2. Evolve radio access and packet core networks independently of each other to a greater extent than in the past, creating greater flexibility in network planning and deployment6.
3. Develop a flexible core network that can serve as the basis for service innovation across both mobile and generic IP access networks

**XI. 5G - APPLICATIONS**

1. It can able to charge your mobile using your own heart beat.
2. It provides to perceive your grandmother sugar level with your mobile.
3. It know the exact time of your child birth that too In Nano seconds.
4. The mobile rings according to your mood.

**XII. 6G**

The mobile communication networks can integrate satellite communication networks and 5G to make global coverage. The networks consist of navigation satellite networks, telecommunication satellite networks and Earth imaging satellites networks.

The navigation satellite networks are used for global position, the telecommunication satellite networks are used for global telephony, multimedia video and high-speed Internet connectivity and the Earth imaging satellite networks are used for resource monitoring and weather information. To integrate these three kinds of satellite networks to provide position identifier, multimedia and internet connectivity, and weather information services for mobile users are key objectives for 6G.
Global Navigation Satellite Systems (GNSS). Actually, US military has deployed Global Position System (GPS) many years. European Galileo, Chinese COMPASS and Russian GLONASS have been developed and deployed by military only and Since 5G is migration from 4G which is based on MCCDMA standard, if 6G integrate 5G with these four satellite networks, 6G should have four standards. On the other words, there are four technologies, networks and systems on 6G. Handoff/roaming must happen on space between any two networks and systems and technologies.

XII. 7G

The 7G system can be supported by the global navigation satellite system, the telecommunication satellite system, the earth image satellite system and the 6G cellular system.

The global navigation satellites systems are determine a use’s position. The telecommunication satellite system can supply the voice and multimedia data for user’s communication requirement. The earth image satellite system contains the weather information as extra service for mobile users. Comparing with the satellites, cellular base stations are much cheaper and stable. The satellites are so expensive and to do movement to cover larger area. In fact, these satellites are constantly moving at speeds of roughly 7,000 miles an hour, which are making two complete orbits in less than 24 hours. Thus, the handoff/roaming must happen between each satellite. Furthermore, any two different satellite systems are necessary for handoff/roaming when mobile users moving from one country to another. This kind of handoff/roaming is space handoff/roaming.

XIII. 7.5G

<table>
<thead>
<tr>
<th>The Time of Year</th>
<th>Mobile Generation</th>
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<tbody>
<tr>
<td>1980</td>
<td>1G</td>
</tr>
<tr>
<td>1990</td>
<td>2G</td>
</tr>
<tr>
<td>2000</td>
<td>3G</td>
</tr>
<tr>
<td>2010</td>
<td>4G</td>
</tr>
<tr>
<td>2020</td>
<td>5G</td>
</tr>
<tr>
<td>2030</td>
<td>6G</td>
</tr>
<tr>
<td>2040</td>
<td>7G</td>
</tr>
<tr>
<td>2045</td>
<td>7.5G</td>
</tr>
</tbody>
</table>

It provides the very high speed of peak download and peak upload of data rate. Here space time block codes are used to view the high definition of video broadcasting. Within a second we can download the five films that is 20 GB files and upload the 15 GB files or any datum. Therefore it also navigates the satellite networks techniques, hence using the OFDM methodology and FEC for the speed of communication process. It is possible technique only when achieve the higher bandwidth and improves the satellite cell sensitivity with its signal fidelity. The benefits of 7.5 G can easily communicate to the other even they are in the centre of the sea.
XIV. CONCLUSIONS

In this paper reviewed the generation mobile communication and latest technology of networks. By addition to that the future generation of 6G, 7G and 7.5G. The main aim of this generation to create fastest and reliability mobile network which will access all the users with high speed of peak upload and download methodologies.

![Figure 10. Data rate – Types of Generation](image)

![Figure 11. Success Rate – RRT](image)

![Figure 12. iPod NANO 7](image)

XV. ACKNOWLEDGMENT

It is a great opportunity for us to write about the domain like “Latest Technology of Mobile Communication and Future scope of 7.5 G”. We have tried hard and soul to gather all relevant documents regarding this area.

REFERENCES


