An Overview on fifth generation (5G) mobile wireless Technology

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ABSTRACT:
5G stands for fifth generation. The Mobile and wireless networks incredible growth in the last fifteen years. There are various wireless technology are invented such as 1G, 2G, 3G and 4G but 5G technology provide fastest connectivity than others. Fast revolution in mobile computing changes our day to day life that is way we work, interrelate, study etc. 5th generation network provide reasonable broadband wireless connectivity with very high speed. 5G technology is to make use of mobile phones within very high bandwidth. The 5G technologies include all types of advanced features which make 5G technology most important technology in near future.

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

I. INTRODUCTION

A. Classical 0G:
Wireless telephone ongoing with what you might call 0G if you can learn back that far. The great antecedent is the mobile telephone service that became existing just after World War II. Technologies used in 0G systems incorporated PTT (Push to Talk), MTS (Mobile Telephone System), AMTS (Advanced Mobile Telephone System), OLT (Norwegian for Offending Landmobil Telefoni), IMTS (Improved Mobile Telephone Service)[7].

B. 1G: GSM
0G vision proved wrong when the GSM concretely came to life in 1990-91 in Finland.1G was old analog system and supported the 1st generation of analog cell phones speed up to 2.4kbpsofiena d the Advance mobile phone system (AMPS) was first launched and is a 1G mobile system. It system allows users to make voice calls in one country. 1G technology replaced 0G technology, which featured mobile radio telephones and such technologies as Mobile Telephone System (MTS), Advanced Mobile Telephone System (AMTS), Improved Mobile Telephone Service (IMTS), and Push to Talk (PTT)[7].

C. 2G:
2G cellular telecom networks were commercially launched on the GSM standard in Finland by Radio linja in 1991. 2nd generation technologies enabled the various mobile phone networks to provide the services such as text messages, picture messages and MMS (multimedia messages). The more capable technology is 2G technology. For voice transmission with digital signal and the speed up to 64kpbs it will be planned.2G technology holds enough security for both the correspondent and the recipient[10]. Every text messages are digitally encrypted. This digital encryption allows for the transfer of data in such a way that only the planned receiver can receive and read it. 2nd generation 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. Full form of GSM is Global system for mobile communication. Now 212 countries in the world are used GSM. GSM technology was the first one to help establish international roaming[7].
D. 2.5 G:
For that last aim (9.6Kbytes/sec doesn’t allow you to surf the Net or up/download an image). Telco operators came up with the GPRS which could allow much faster communications(115Kbytes/sec)[10], but the Marketplace decided it was still not enough compared to what they had at home[7].

2.75G EDGE:
Which is an attractive recent standard allows for downloading faster. Since mobile devices have become both a TV and a Walkman or music player, people needed to be able to watch streaming video and download mp3 files faster with the use off’s precisely what EDGE allows for and that’s for the good news. The bad news is that if EDGE rock sat downloading, it’s protocol is a balanced hence making EDGE suck at uploading i.e. broadcasting videos of yours for instance. The data packets can effectively reach 180 kbytes/sec EDGE is now widely being used Still an interesting achievement[7].

E. 3G: UMTS
International Mobile Telecommunications-2000, better known as 3G, is a production of values for mobile phones and mobile telecommunications services satisfying condition by the International Telecommunication Union. The use of 3G technology is also able to convey packet switch data proficiently at better and increased bandwidth[10]. Transmission speeds from 125kbps to 2Mbps. In 2005, 3G is ready to exist up to its performance in computer networking and mobile devices area. Voice calls are interpret using circuit switching, right of entry to Global Roaming and simplicity in voice calls. Fast Communication, Internet, Mobile T.V, Video Conferencing, Video Calls, Multi Media Messaging Service (MMS), 3D gaming, Multi-Gaming etc. are also available with 3G phones[7].

F. 3.5G or 3G: HSDPA
It is in theory 6 times faster than UMTS (upto3.6Mbytes/sec). basically talking, the downloading an mp3 file take approximately 30 sec. or an another of rather like 2minutes[7].

G. 4G:
3G Technology has fast data transfer rates. However this feature is not now working properly because, ITU 200 is still making judgment to fix the data rates. Network authentication has won the belief of users, because the user can rely on its network as a reliable source of transferring data. 4G is a theoretical construction and a conversation point to address future needs of a high speed wireless network. It is estimated to appear around 2010 – 2015[10]. 4G should be able to provided very smooth global roaming far and wide with lower cost. Some of the applications are:

1. Mobile TV – a supplier redirects a TV channel directly to the subscriber’s phone where it can be watched.
2. Video on demand – a provider sends a movie to the subscriber’s phone.
3. Video conferencing – user can see as well as talk to each other.
4. Location-based services – a provider sends localized weather or traffic conditions to the phone, or the phone allows the subscriber to find nearby businesses or friends.
5. Mobile ultra-broadband (gigabit speed) access and multi-carrier transmission.
6. Mobile WiMAX (Worldwide Interoperability for Microwave Access)[7]

H. 5G:
5G technology has altered the income to use cell phones within very high bandwidth. User never experience ever before such a high rate technology. The 5G technologies include all type of advanced features which makes 5G technology most powerful and in vast demand in near future[10]. 5G technologies which are on hand held phone offering more power and features than at least 1000 solar modules. A user can also clip their 5G technology cell phone with their Laptop to get broadband internet access. In 5G technologies, it including camera, MP3 recording, video player, large phone memory, dialing speed, audio player and much more you never imagine. For children rocking fun Bluetooth technology and Pico nets has become in market[7].

II. 5G Architecture:
To consider 5G network in the market now, it is unmistakable that the multiple access techniques in the network are almost at a still and requires sudden step up. Current technologies like OFDMA will work at least for next 50 years. Moreover, there is no require to have a change in the wireless setup which had come about from 1G to 4G. Otherwise, there could be only the totalling of an application or amelioration done at the original network to please user desires. This will inflame the package
providers to flow for a 5G network as early as 4G is commercially set up [4]. To meet the demands of the user and to overcome the challenges that have been put forward in the 5G system, a extreme change in the approach of scheming the 5G wireless cellular architecture is needed. A general inspection of the researchers has shown in [1] that most of the wireless users wait inside for approximately 80 percent of time and outside for roughly 20 percent of the time [6].

In current wireless cellular architecture, for a mobile user to communicate whether inside or outside, an outside base station present in the centre of a cell helps in communication. So for inside users to communicate with the outside base station, the signals will have to pass through the walls of the indoors, and this will result in very high saturation loss, which respectively costs with reduced spectral efficiency, data rate, and energy efficiency of wireless communications. To defeat this challenge, a new idea or designing technique that has come in to existence for scheming the 5G cellular architecture is to dissimilar outside and inside setups [4]. With this designing technique, the saturation loss through the walls of the building will be somewhat reduced. This idea will be supported with the help of massive MIMO technology [6], in which geographically diffuse array of antenna’s are deployed which have tens or hundreds of antenna units. Since present MIMO systems are using moreover two or four antennas, but the idea of massive MIMO systems has come up with the idea of utilizing the advantages of large array antenna elements in terms of huge capacity gains. To build or construct a large massive MIMO network firstly the outside base stations will be fitted with large antenna arrays and among them some are disperse around the hexagonal cell and linked to the base station through optical fiber cables, aided with massive MIMO technologies.

Fig 1. 5G architecture

The mobile users there outside are usually fixed with a definite number of antenna units but with cooperation a large virtual antenna array can be constructed, which together with antenna arrays of base station form virtual massive MIMO links. Secondly, every building will be installed with large antenna arrays from outside, to communicate with outdoor base stations with the help of line of display components. The wireless access points inside the building are connected with the large antenna arrays through cables for communicating with indoor users. This will widely improves the energy efficiency, cell average throughput, data rate, and spectral efficiency of the cellular system but at the expense of improved infrastructure cost. With the introduction of such an architecture, the inside users will only have to connect or communicate with inside wireless access points while larger antenna arrays remained installed outside the buildings [4]. For indoor communication, definite technologies like WiFi, Small cell, ultra wideband, and millimetre wave communications [2], and visible light communications [9].
III. COMPARISON OF ALL GENERATIONS OF MOBILE TECHNOLOGIES

The following table gives the comparison of all generation of mobile technology [5].

<table>
<thead>
<tr>
<th>Technology</th>
<th>Features</th>
<th>1G</th>
<th>2G</th>
<th>3G</th>
<th>4G</th>
<th>5G</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Data Bandwidth</td>
<td>2kbps</td>
<td>64kbps</td>
<td>2Mbps</td>
<td>1 Gbps</td>
<td>Higher than 1Gbps</td>
</tr>
<tr>
<td></td>
<td>Technology</td>
<td>Analog Cellular</td>
<td>Digital Cellular</td>
<td>CDMA 2000</td>
<td>WiMax LTE</td>
<td>WWWWW(coming soon)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Technology</td>
<td>Technology</td>
<td>(1xRTT, EVDO)</td>
<td>Wi-Fi</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Service</td>
<td>Service</td>
<td>UMTS, EDGE</td>
<td>Dynamic Information</td>
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<tr>
<td></td>
<td>Multiplexing</td>
<td>FDMA</td>
<td>TDMA, CDMA</td>
<td>Integrated high</td>
<td>Dynamic Information</td>
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<tr>
<td></td>
<td>Switching</td>
<td>Circuit</td>
<td>Circuit, Packet</td>
<td>quality audio,</td>
<td>Information access,</td>
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<td></td>
<td>Core Network</td>
<td>PSTN</td>
<td>PSTN</td>
<td>video and data</td>
<td>Wearable devices</td>
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<td>Dynamic Information</td>
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</tbody>
</table>

Table 1: comparison of all generations of mobile technologies

IV. CONCLUSION:

The 5G evolution will be based on 4G. Thus, 5G should make an important difference and add more services and features to the world over 4G. 5G include latest technologies such as cognitive radio, SDR, nanotechnology, cloud computing and based on All IP Platform. 5G should be more intelligent technology that interconnects the entire world without limits. 5G wireless network architecture has been explained in this paper with massive MIMO technology, network function virtualization (NFV) cloud and device to device communication.

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