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A BRIEF CASE STUDY ON 5G CELLULAR TECHNOLOGY

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ABSTRACT

We are known about 1g, 2g, 3g, and currently all wireless industry is busy with the standardization of the 4th generation (4G) cellular networks. The 4G concept shave already moved to the standardization phase, we must begin to work on the building blocks of the 5G wireless networks. 5G Technology stands for fifth Generation of Mobile technology. From generation 1G to 2.5G and from 3G to 5G this world of telecommunication has seen a number of improvements along with improved performance with every passing day. This fast revolution in mobile computing changes our day to day life that is way we work, interact, learn and many more. The major difference, from a user point of view, between current generations and expected 5G techniques must be something else than increased maximum throughput; other requirements include low battery consumption, more secure. We refer to this paper also focuses on all preceding generations of mobile communication along with fifth generation technology. Fifth generation network provide affordable broadband wireless connectivity (very high speed). The paper shortly describes the network architecture of fifth generation technology. In fifth generation researches are being made on development of many new technologies like World Wide Wireless Web (WWWW), Dynamic Adhoc Wireless Networks (DAWN) and Real Wireless World. 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 fulfill all the requirements of customers who always want advanced features in cellular phones. The main features in 5G mobile network is that user can simultaneously connect to the multiple wireless technologies and can switch between them. This forthcoming mobile technology will support IPv6 and flat IP. Fifth generation technology will offer the services like Documentation, supporting electronic transactions (e-Payments, e-transactions) etc.

Keywords: 0G, 1G, 2G, 3G, 4G, 5G, Evolution from 0G to 5G,

I. INTRODUCTİON

Wireless communication has started in early 1970s. In next four decades, a mobile wireless technology has evolved from 1G to 5G generations. The present cell phones have it all. Today phones have everything ranging from the smallest size, largest phone memory, speed dialing, video player, audio player, and camera and so on. Recently with the development of Pico nets and Bluetooth technology data sharing has become a Fifth generation technology. And also it offer very high bandwidth that user never experienced before. The Fifth generation technologies offer various new advanced features which makes it most powerful and in huge demand in the future. Now days different wireless and mobile technologies are present such as third generation mobile networks (UMTS- Universal Mobile Telecommunication System, cdma2000), LTE (Long Term Evolution),

WiFi (IEEE 802.11 wireless networks), WiMAX (IEEE 802.16 wireless and mobile networks), as well as sensor networks, or personal area networks (e.g. Bluetooth, ZigBee). Mobile terminals include variety of interfaces like GSM which are based on circuit switching. All wireless and mobile networks implements all-IP principle, that means all data and signaling will be transferred via IP (Internet Protocol) on network layer. The fifth generation wireless mobile multimedia internet networks can be completely wireless communication without limitation, which makes perfect wireless real world – World Wide Wireless Web (WWWW). Fifth generation is based on 4G technologies. The 5th wireless mobile internet networks are real wireless world which shall be supported by LAS-CDMA (Large Area Synchronized Code-Division Multiple Access), OFDM (Orthogonal frequency-division multiplexing), MCCDMA (Multi-Carrier Code Division Multiple Access), UWB(Ultra-wideband), Network-LMDS(Local Multipoint Distribution Service), and IPv6. Fifth generation technologies offers tremendous data capabilities and unrestricted call volumes and infinite data broadcast together within latest mobile operating system. Fifth generation should make an important difference and add more services and benefits to the world over 4G. Fifth generation should be more intelligent technology that interconnects the entire world without limits. This generation is expected to be released around 2020. The world of universal, uninterrupted access to information, entertainment and communication will open new dimension to our lives and change our life style significantly.

II. EVALUATİON OF MOBİLE TECHNOLOGY

2.1 Classical 0G

Wireless telephone started with what you might call 0G . 0G used frequency division multiple access or (FDMA).The first 0G system was called MTS (mobile Telephone system),came about in 1946 by bell Telephone .basically linked the mobile and the wireless communication to the telephone system. and it also used PTT (Push to Talk), IMTS (Improved Mobile Telephone Service), AMTS(Advanced Mobile Telephone System), OLT (Norwegian for Offending Landmobil Telephone). After 0G our technology developed day by day and 1G,2G 3G ,4G,and future 5G come .

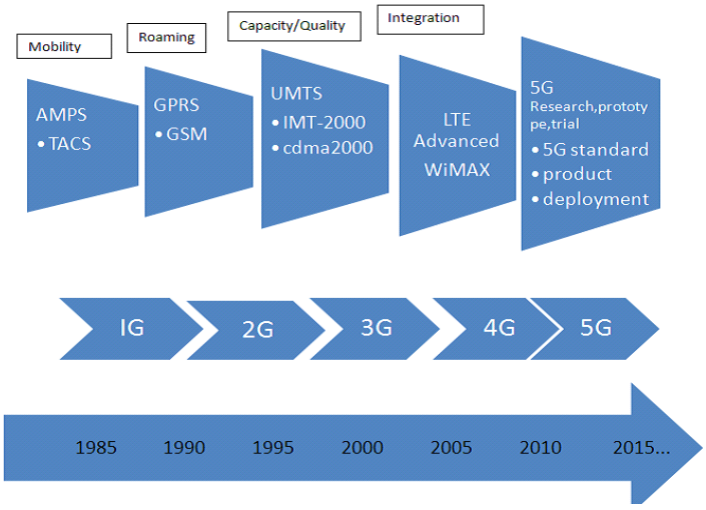

Figure 1: Mobile Cellular Network Evolution Timeline [3]

2.2 1G: GSM

1G was Introduced in 1980.the main different between then existing system and 1G was invent of cellular technology and hence it is also known as first generation of analog cellular telephone in 1G or first generation of wireless telecommunication technology the network contain many cells and so same frequency can be reused many time which result in great spectrum usage and thus increased the system capacity i. e. large number of user could be accommodated easily 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 2.4kbps. Advance mobile phone system (AMPS) was first launched by the US and is a 1G mobile system. It allows users to make voice calls in one country

2.3 2G

2G cellular telecom networks were commercially launched on the GSM standard in Finland by Radio linja in 1991. 2G technologies enabled the various mobile phone networks to provide the services such as text messages, picture messages and MMS (multimedia messages). 2G technology is more efficient.. It was planned for voice transmission with digital signal and the speeds up to 64kbps.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. Second 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,
I.S-136. CDMA technology is IS-95. GSM has its origin from the Group special Mobile, in Europe. GSM is also stands for Global system for mobile communication. Now GSM is used in more than 212countries in the world. GSM technology was the first one to help establish international roaming. In comparison to 1G's analog signals, 2G's digital signals are very reliant on location and proximity It provides facility of SMS(Short Message Service) and use the bandwidth of 30 to 200 KHz.

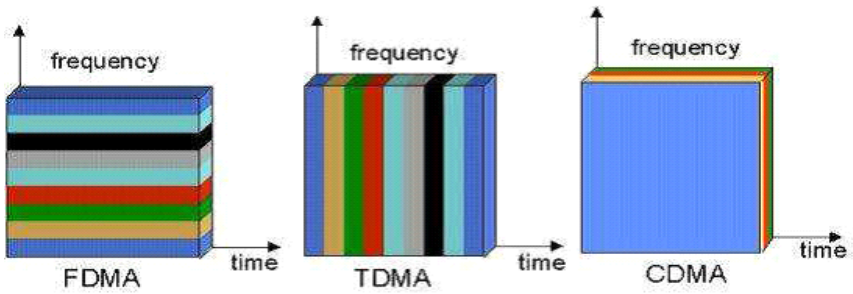

Figure 2:. Multiple Access Technology[8]

2.4 5 G

For that last reason(9.6Kbytes/sec doesn't allow you to browse the Net or up/download an image),Telco operators came up with the GPRS which could enable much faster communications(115Kbytes.sec), but the market decided it was still not enough compared to what they had at home 2.5G system uses packet switched and circuit switched domain and provide data rate up to 144 kbps. E.g. GPRS, CDMA and EDGE [3]

2.5 5G EDGE

Which is a pretty 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 that´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 symmetrical hence making EDGE suck at uploading i.e. broadcasting videos of yours for instance. Still an interesting achievement thanks to which data packets can effectively reach 180 kbytes/sec EDGE is now widely

2.6 3G: UMTS

The 3G (UMTS and CDMA2000) research and development project stared in 1992.UMTS ,Short for (Universal mobile telecommunication system)The original 3G UMTS/W-CDMA Standard provided a maximum download speed of 384 kbps. International Mobile Telecommunications-2000 (IMT- -2000), better known as 3G, is a generation of standards for mobile phones and mobile telecommunications services fulfilling specifications by the International Telecommunication Union. The use of 3G technology is also able to transmit packet switch data efficiently at better and increased bandwidth. Transmission speeds from 125kbps to 2Mbps. In 2005, 3G is ready to live up to its performance in computer networking (WCDMA, WLAN and Bluetooth) and mobile devices area (cell phone and GPS).Voice calls are interpreted using circuit switching. Access to Global Roaming and Clarity 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

2.7 3.5G or 3G:HSDPA

It is theoretically 6 times faster than UMTS (upto3.6Mbytes/sec)! Practically speaking, this would mean downloading an mp3 file would take about 30sec. instead of something like 2 minutes.

2.8 4G

The basic feature of 3G Technology is fast data transfer rates. However this feature is not currently working properly because, ITU 200 is still making decision to fix the data rates. Network authentication has won the trust of users, because the user can rely on its network as a reliable source of transferring data. . 4G is a conceptual framework and a discussion point to address future needs of a high speed wireless network. It is expected to emerge around 2010 – 2015. 4G should be able to provided very smooth global roaming ubiquitously with lower cost.

Some of the applications are:

1. Mobile TV – a provider 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 – subscribers 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)

2.5 5G

5G Technology stands for 5th Generation Mobile technology. 5G is a name used in some research papers and projects to denote the next major phase of mobile telecommunications standards beyond the upcoming 4G standards. Currently, 5G is not a term officially used for any particular specification or in any official document yet made public by telecommunication companies or standardization bodies such as 3GPP, WiMAX Forum or ITU-R. New standard releases beyond 4G are in progress by standardization bodies, but at this time are not considered as new mobile generations since implementation and rollout of systems compliant with 4G is still under way; the goals of a 5G-based telecommunications network would ideally answer the challenges that a 4G model would present once it has entered widespread use. 5G technology has changed the means to use cell phones within very high bandwidth. User never experienced ever before such a high value technology. The 5G technologies include all type of advanced features which makes 5G technology most powerful and in huge demand in near future. 5G technologies which are on hand held phone offering more power and features than at least 1000 lunar modules. A user can also hook their 5G technology cell phone with their Laptop to get broadband internet access.

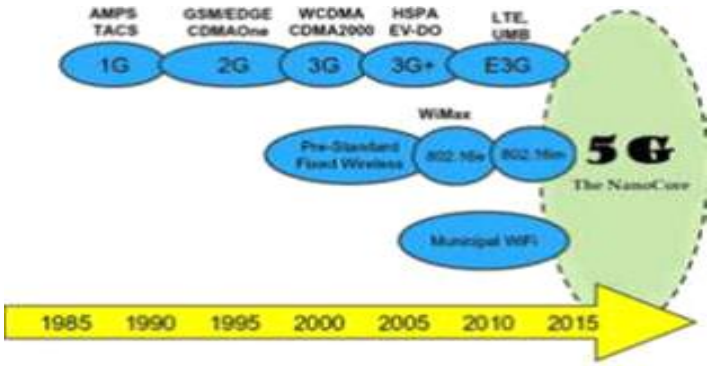

Figure.3: Evolutional changes in mobile technologies[9]

III. OBJECTİVES OF 5G

Elevated Service Quality and User Experience- Consumer expectations for mobile broadband service quality are growing in parallel with traffic complexity and increase usage. Complex and constantly evolving multi-vendor networks and services are placing considerable demands on service management. The focus shifting towards managing the delivery of high-quality services i.e., support service centric and user-centric management [1].

Consistent Connectivity Experience- The next wave of the Digital Society will be characterized by an ICT network's capability for immediate service availability and on-demand adaptability. An instant immediacy in mobile services will lay the foundation for a whole new set of mobile apps to proliferate and push the capabilities of communications beyond what is currently possible. Widespread adoption of M2M services will be encouraged when there would be provision of higher network capacity required for handling enormous connections [1].

Ability to Handle Disruptive Growth in Network Capacity- Server workloads are growing by 10% a year. Network bandwidth demand is growing by 35%. Storage capacity is growing by 50%. Power costs growth is 20%. Throwing more capacity at demand is not the solution; there is a need to optimize capacity in new ways. Over 1.5 billion Web pages are accessible, 450,000 iPhone apps are being accessed, over 200,000 Android apps are being used , 10,500 radio stations are existing. All drives demand for IT [1, 2].

IV. 5G MOBİLE NETWORK

5G networks make use of this flat IP concept to make it easier for different RAN to upgrade in to a single NanoCore network. Our 5G network uses Nanotechnology as defensive tool for security concern that arises due to flat IP. Certainly Flat IP network is the key concept to make 5G acceptable for all kind of technologies. To meet customer demand for real-time data applications delivered over mobile broadband networks, wireless operators are turning to flat IP network architectures. Flat IP architecture provides a way to identify devices using symbolic names, unlike the hierarchical architecture such as that used in "normal" IP addresses. Thisis of more interest to mobile broadband network operators. With the shift to flat IP architectures, mobile operators can:

- Reduce the number of network elements in the data path to lower operations costs and capital expenditure.
- Partially decouple the cost of delivering service from the volume of data transmitted to align infrastructure capabilities with emerging application requirements.
- Minimize system latency and enable applications with a lower tolerance for delay; upcoming latency enhancements on the radio link can also be fully realized.
- 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 deployment.
- Develop a flexible core network that can serve as the basis for service innovation across both mobile and generic IP access networks
- Create a platform that will enable mobile broadband operators to be competitive, from a price performance perspective, with wired networks Flat network architecture removes that voice-centric hierarchy from the network. Instead of overlaying a packet data core on the voice network, separate and much-simplified data architecture can be implemented that removes the multiple elements from the network chain.

V. FEATURES AND BENEFİTS OF 5G

1. High speed, high capacity, and low cost per bit. It Support interactive multimedia, voice, streaming video, Internet, and other broadband services, more effective and more attractive, Bidirectional, accurate traffic statistics.
2. Introduction of a new radio system is possible in which different radio technologies will share the same spectrum. This can be done by finding unused spectrum and then adapting to the technology of the radio technology with which the spectrum is being shared.

3. Every mobile in a 5G network will have an IP address (IPV6) according to the location and network being used.
4. The technology is expected to support virtual private networks and advanced billing interfaces.
5. With 5G Enabled phone, you might be able to connect your phone to your laptop to get access to broadband.
6. 5G technology is providing large broadcasting of data in Giga bit which supporting almost 65,000 connections.
7. The traffic statistics by 5G technology makes it more accurate and it also support virtual private network.

VI. CONCLUSİON

The development of the mobile and wireless networks is going towards higher data rates and all-IP principle. Mobile terminals are obtaining each year more processing power, more memory on board, and longer battery life for the same applications. 5g include latest technologies such as cognitive radio, SDR, nanotechnology, cloud computing and based on All IP Platform. It is expected that the initial Internet philosophy of keeping the network simple as possible, and giving more functionalities to the end nodes, will become reality in the future generation of mobile networks, here referred to as 5G.

VII. FUTURE SCOPE

The future enhancement of Nano-core will be incredible as it combines with artificial intelligent (AI).One can able to control his intelligent Robot using his mobile phone. Your Mobile can automatically type the message what your brain thinks. We might get a circumstance where we don't require any spectrum for communication. The Google hot trends have rated the term 6 gas the 17 the most searched word in the search engines. The iPod 6G comes in seven different colors and has an aluminum body which makes the body strong to with stand constant daily usage. It has a clip on design like iPod shuffle and it attached to shirt firmly. 6g technology haven't been fully revealed yet but search phrases like what is 6g mobile technology, 6g technology, 6g mobile, 6g network, 6g wiki, 6g technology ppt. are getting more familiar with new mobile technology getting evolved.

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