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Challenges & Evolution of Next Generation in Mobile Communication Network

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Abstract— Subscribers now a day's look for appropriate package including all the advance features as they are becoming aware of the mobile phone technology transformation. This drives the main intention of the cell phone giants to search for the new technology to outperform their competitors. The main purpose behind the fifth generation of wireless networks (5G) is planned to design the best network in the world which is beyond limitations and bug free than earlier generations, 5G technology will change the way most high bandwidth user access their Mobile Radio Communication (MRC), and this gives their users an edge over earlier generation networks. This paper represents the great evolution from 1G to 4G yield 5G, Introduction to 5G, The need for 5G,Advantages of 5G,Exceptional applications, Quality of services(QoS), 5G network architecture - The MasterCore as well as hardware/software for the 5G MasterCore Technology

Keywords— 5G, All IP Network, Cloud Computing, 5G architecture-The MasterCore, Quality of Service (QoS), 5G-IU

I. INTRODUCTION

The past few years have witnessed a phenomenal growth in the wireless industry, both in terms of mobile technology and subscribers. The first- generation mobile systems were the analogue (or semi-analogue) systems, which came in the early 1980s - they were also called NMT (Nordic Mobile Telephone). They offered mainly speech and related services and were highly incompatible with each other. 1G refers to analog cellular technologies; it became available in the 1980s. 2G denotes initial digital systems, introducing services such as short messaging and lower speed data. CDMA2000 1xRTT and GSM are the primary 2G technologies, although CDMA2000 1xRTT is sometimes called a 3G technology because it meets the 144 kbps mobile throughput requirement. EDGE, however, also meets this requirement. 2G technologies became available in the 1990s. 3G requirements were specified by the ITU as part of the International Mobile Telephone 2000 (IMT- 2000) project, for which digital networks had to provide 144 kbps of throughput at mobile speeds, 384 kbps at pedestrian speeds, and 2 Mbps in indoor environments. UMTS-HSPA and CDMA2000 EV-DO are the primary 3G technologies, although recently WiMAX was also designated as an official 3G technology. The present time is just right to start the research of 4G mobile communications because of:

I. Possibility, according to the historical indication of a generation revolution once a decade, and now we are near the end of 3G standardization phase and the beginning of 3G deployment.
II. Necessity: according to 3G goals, 3G is necessary but not sufficient to the mobile communication strategy, in which many problems are only partly solved and there are still many problems left to be solved in the next generation, i.e. 4G.

Next generation mobile networks, commonly referred to as 4G, and are envisaged as a multitude of heterogeneous systems interacting through a horizontal IP-centric architecture. The 5G core is to be a Re-configurable, Multi-Technology Core. The core could be a convergence of new technologies such as Nanotechnology, Cloud Computing and Cognitive Radio, and based on All IP Platform.

II. EVOLUTION OF WIRELESS OLD TECHNOLOGIES

This section mentions in short the evolution of wireless and cellular systems based on the four main key aspects: radio access, data rates, bandwidth and switching schemes

A. Review of Previous Fourth Generations Systems:

1) First-Generation System (1G): The 1st generation was pioneered for voice service in early 1980's, where almost all of them were analog systems using the frequency modulation technique for radio transmission using frequency division multiple access (FDMA) with channel capacity of 30 KHz and frequency band was 824-894 MHz, which was based on a technology known as Advance Mobile Phone Service (AMPS)[1].

2) *Second Generation Systems (2G):* The 2nd generation was accomplished in later 1990‘s. The 2G mobile communication system is a digital system; this system is still mostly used in different parts of the world. This generation mainly used for voice communication also offered additional services such as SMS and e-mail. In this generation two digital modulation schemes are used; one is time division multiple access (TDMA) and the 2 nd is code division multiple access (CDMA) and frequency band is 850-1900 MHz. In 2G, GSM technology uses eight channels per carrier with a gross data rate of 22.8 kbps (a net rate of 13 kbps) in the full rate channel and a frame of 4.6 milliseconds (ms) duration .The family of this generation includes of 2G, 2.5G and 2.75G [1].
3) *Third Generation Systems (3G):* Third generation (3G) services combine high speed mobile access with Internet Protocol (IP)-based services. The main features of 3G technology include wireless web base access, multimedia services, email, and video conferencing. The 3G W-CDMA air interface standard had been designed for ―always-on‖ packet-based wireless service, so that computer, entertainment devices and telephones may all share the same wireless network and be connected internet anytime, anywhere. 3G systems offer high data rates up to 2 Mbps, over 5 MHz channel carrier width, depending on mobility/velocity, and high spectrum efficiency. The data rate supported by 3G networks depends also on the environment the call is being made in; 144 kbps in satellite and rural outdoor, 384 kbps in urban outdoor and 2Mbps in indoor and low range outdoor. The frequency band is 1.8 - 2.5 GHz [1].

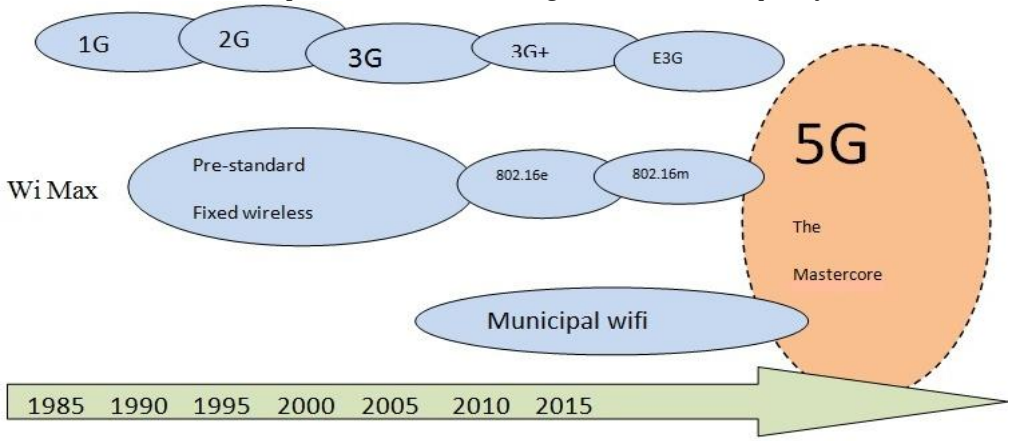

Figure 1: Evaluation of Mobile Technologies

Third generation (3G) services combine high speed mobile access with Internet Protocol (IP)-based services. The main features of 3G technology include wireless web base access, multimedia services, email, and video conferencing. The 3G W-CDMA air interface standard had been designed for ―always-on‖ packet-based wireless service, so that computer, entertainment devices and telephones may all share the same wireless network and be connected internet anytime, anywhere. 3G systems offer high data rates up to 2 Mbps, over 5 MHz channel carrier width, depending on mobility/velocity, and high spectrum efficiency. The data rate supported by 3G networks depends also on the environment the call is being made in; 144 kbps in satellite and rural outdoor, 384 kbps in urban outdoor and 2Mbps in indoor and low range outdoor. The frequency band is 1.8 - 2.5 GHz [1].

3G has the following enhancements over 2G and previous networks:

a) Enhanced audio and video streaming;
b) Several Times higher data speed;
c) Video-conferencing support;
d) Web and WAP browsing at higher speeds;
e) IPTV (TV through the Internet) support [3].

The following standards are typically branded 3G:

a) The UMTS system, first offered in 2001, standardized by 3GPP, used primarily in Europe, Japan, China (however with a different radio interface) and other regions predominated by GSM 2G system infrastructure. The cell phones are typically UMTS and GSM hybrids. Several radio interfaces are offered, sharing the same infrastructure:
b) The original and most widespread radio interface is called W-CDMA.
c) The TD-SCDMA radio interface was commercialized in 2009 and is only offered in China.
d) The latest UMTS release, HSPA+, can provide peak data rates up to 56 Mbit/s in the downlink in theory (28 Mbit/s in existing services) and 22 Mbit/s in the uplink.
e) The CDMA2000 system, first offered in 2002, standardized by 3GPP2, used especially in North America and South Korea, sharing infrastructure with the IS-95 2G standard. The cell phones are typically CDMA2000 and IS-95 hybrids. The latest release EVDO Rev B offers peak rates of 14.7 Mbit/s downstream.

B. Limitations of 3G

1) It is difficult to extend to higher data rate in CDMA.
2) It is difficult to provide a full range of multi-rate services and not a fully integrated System.
3) There is also a propagation problem in CDMA.
   It may not work in multi path systems from private to public and indoor to wide area [4].

III. FOURTH GENERATION SYSTEMS (4G)

The evolution of mobile service from the 1G (first generation) to 4G (fourth generation) are discussed in this section. This process began with the designs in the 1970s that have become known as1G. The earliest systems were implemented based on analog technology and the basic cellular structure of mobile communication. Many fundamental problems were solved by these early systems. Numerous incompatible analog systems were placed in service around the world during the 1980s.The 2G (second generation) systems designed in the 1980s were still used mainly for voice applications but were based on digital technology, including digital signal processing techniques. These 2G systems provided circuit-switched data communication services at a low speed.

The competitive rush to design and implement digital systems led again to a variety of different and incompatible standards such as GSM (global system mobile), mainly in Europe; TDMA (time division multiple access) (IS-54/IS-136) in the U.S.; PDC(personal digital cellular) in Japan; and CDMA (code division multiple access) (IS-95), another U.S. system. These systems operate nationwide or internationally and are today's mainstream systems, although the data rate for users in these system is very limited. During the 1990s, two organizations worked to define the next, or 3G, mobile system, which would eliminate previous incompatibilities and become a truly global system. The 3G system would have higher quality voice channels, as well as broadband data capabilities, up to 2 Mbps. Unfortunately, the two groups could not reconcile their differences, and this decade will see the introduction of two mobile standards for 3G. In addition, China is on the verge of implementing a third 3G systems. An interim step is being taken between 2G and 3G, the 2.5G. It is basically an enhancement of the two major 2G technologies to provide increased capacity on the 2G RF (radio frequency) channels and to introduce higher throughput for data service, up to 384 kbps. A very important aspect of 2.5G is that the data channels are optimized for packet data, which introduces access to the Internet from mobile devices, whether telephone, PDA (personal digital assistant), or laptop. However, the demand for higher access speed multimedia communication in today's society, which greatly depends on computer communication in digital format, seems unlimited. According to the historical indication of a generation revolution occurring once a decade, the present appears to be the right time to begin the research on a 4G mobile communication system.

A. Technologies of 4G

1) *OFDMA:* Orthogonal Frequency Division Multiplexing (OFDM) provides clear advantages for physical layer performance and also a framework for improving layers performance by proposing an additional degree of freedom. Using OFDM, it is possible to exploit the time domain, the space domain, the frequency domain and even the code domain to exploit radio channel usage. It ensures very robust transmission in multi- path environments with reduced receiver complexity. OFDM also provides a frequency diversity gain, improving the physical layer performance .It is also compatible with other enhancement Technologies, such as smart antennas and MIMO.OFDM modulation can also be employed as a multiple access technology (Orthogonal Frequency Division Multiple Access; OFDMA). Here, each OFDM symbol can transmit information to and from several users using a different set of sub carriers (i.e. sub channels). This provides additional flexibility for resource allocation (increasing the capacity) and also enables cross layer optimization of radio link usage.
2) *WiMax-World Interoperability for Microwave Access:* IEEE 802.16 Standards: The current WiMax revision is based upon IEEE 802.16e- 2005, approved in December 2005. It is a enhancement to the IEEE Std 802.16-2004, and so the actual standard is 802.16- 2004 as amended by 802.16e-2005. Thus, these specifications need to be considered together.

IEEE 802.16e-2005 improves upon IEEE 802.16-2004 by:

a) Adding support for mobility (soft and hard handover between base stations).
b) Scaling of the Fast Fourier transform (FFT) to the channel bandwidth in order to keep the carrier spacing constant across different channel bandwidths (i.e 1.25 MHz, 5 MHz, 10 MHz or 20 MHz).
c) Denser sub-channelization, thereby improving indoor Penetration Introducing Turbo Coding and Low-Density Parity Check (LDPC).
d) Introducing downlink sub-channelization, allowing administrators to trade coverage for capacity or vice versa.
e) Adding an extra QoS class for VoIP applications.

Application of WiMax

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There are two major applications of WiMax:

I. Fixed WiMax (IEEE 802.16-2004): Fixed WiMax applications are point-to-multipoint enabling the delivery of last mile wireless broadband access as an substitute to cable and DSL for homes and businesses. Fixed WiMax Adoption is currently available however the adoption rate is impacted by the high cost of equipment in comparison to cable or DSL. It provides greater benefits for developing countries that do not already have physical infrastructure to support wired broadband access.
II. Mobile WiMax (IEEE 802.16-2005): Mobile WiMax offers the full mobility of cellular networks at true broadband speeds. Mobile WiMax Adoption Mobile WiMax equipment will arrive to carriers toward the end of 2007. However, mobile equipment testing typically takes between 12 to 18 months before the equipment is introduced to the consumer market.

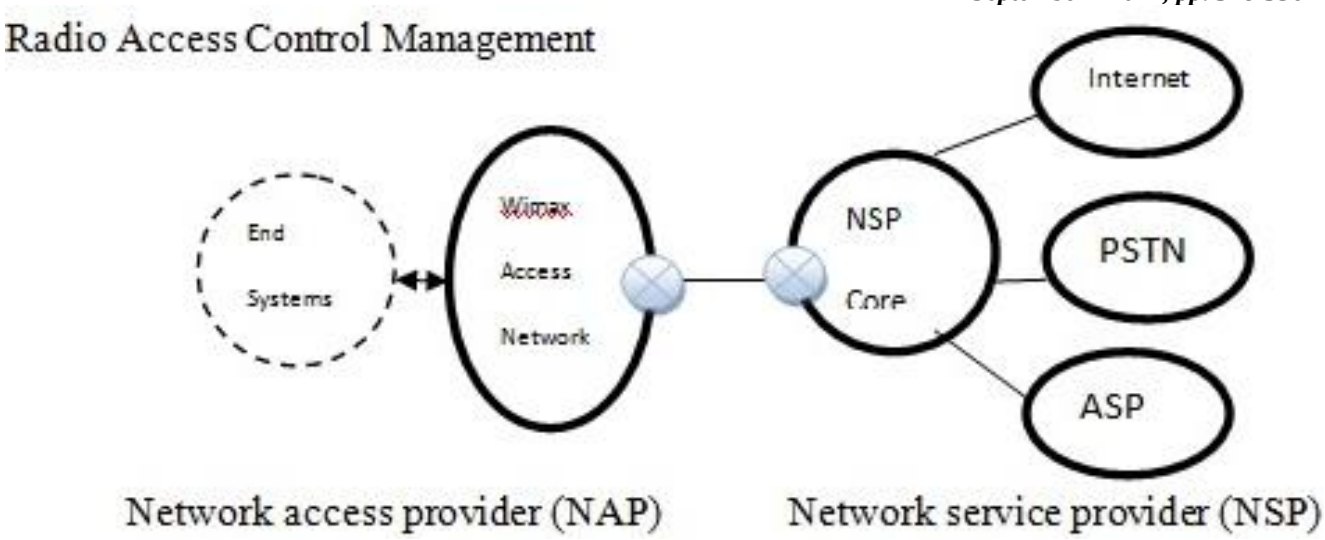

Figure 2: Mobile WiMax architecture

3) Software Defined Radio

Software Defined Radio (SDR) benefits from today's high processing power to develop multi-band, multi-standard base stations and terminals. Although in future the terminals will adapt the air interface to the available radio access technology, at present this is done by the infrastructure. Several infrastructure gains are expected from SDR. For example, to increase network capacity at a specific time (e.g. during a sports event), an operator will reconfigure its network adding several modems at a given Base Transceiver Station (BTS). SDR makes this reconfiguration easy and flexible**.**

4) Multiple Input Multiple Output (MIMO)

MIMO uses signal multiplexing between several transmitting antennas and time or frequency. It is well matched to OFDM, as it is possible to process independent time symbols as soon as the OFDM waveform is correctly designed for the channel. It refers to the technology where there are multiple antennas at the base station and multiple antennas at the mobile device. The usage of multiple antenna technology includes cellular phones with two antennas, laptops with two antennas (i.e. built in the left and right side of the screen), as well as CPE devices with multiple sprouting antennas. This aspect of OFDM significantly simplifies processing. The signal transmitted by m antennas is received by n antennas. Processing of the received signals may deliver several performance improvements: range, quality of received signal and spectrum effectiveness. In principle, MIMO is more efficient when many multiple path signals are received. The performance in cellular deployments is still subject to research and simulations. However, it is generally acknowledged that the gain in spectrum efficiency is directly related to the minimum number of antennas in the link [5].

B. Challenges of 4G

1) *Security and Privacy:* In the development of 4G Networks, security measures must be established that enable data transmission to be as safe as possible. Specifically, "The 4G core addresses mobility, security, and QoS through reuse of existing mechanisms while still trying to work on some mobility and handover issues". Therefore, it is necessary for the organization to develop an effective series of tools that support maximum 4G security measures as a means of protecting data that is transmitted across the network from hackers and other security violations. Because of the nature of the 4G network, there is an increased likelihood of security attacks, and therefore, multiple levels of security, including increased requirements for authentication, will be necessary to protect data and information that is transmitted across the network. One of the main goals of G4 networks is to blanket very wide geographic area with seamless service. Obviously, smaller local area networks will run different operating systems. The heterogeneity of these wireless networks exchanging different types of data complicates the security and privacy issues. Furthermore, the encryption and decryption methods being used for 3G networks are not appropriate for 4G networks as new devices and services are introduced for the first time in 4G networks. To overcome these security and privacy issues, two approaches can be followed. The first is to modify the existing security and privacy methods so that they will be applicable to heterogeneous 4G networks. Another approach is to develop new dynamic reconfigurable, adaptive, and lightweight mechanisms whenever the currently utilized methods cannot be adapted to 4G networks
2) *Quality of Service:* With respect to network quality, many telecommunications providers are promising that there will be enhanced connectivity, and the quality of data that is transmitted across the network will be of the highest possible quality, as in the case of Ericsson's 4G Network for TeliaSonera . The company promises that "The new 4G network will do for broadband what mobile telephony did for voice. With real-time performance, and about 10 times higher data rates compared to today's mobile broadband networks, consumers can always be connected, even on the move" . As a result, it is important for providers to develop an effective approach to the 4G Network that will enhance quality, provide effective security measures, and will ensure that all users are provided with extensive alternatives for downloading video, music, and picture files without delays. The main challenge that 4G networks

are facing is integrating non-IP-based and IP-based devices. It is known that devices that are not IP address based are generally used for services such as VoIP. On the other hand, devices that are IP address based are used for data delivery. 4G networks will serve both types of devices. Consequently, integrating the mechanisms of providing services to both non-IP-based as well as IP-based devices is one of key challenges 4G networks have to address [6].

IV. DIFFERENTIATION BETWEEN 3G & 4G

3G is currently the world's best connection method when it comes to mobile phones, and especially for mobile Internet. 3G stands for 3rd generation as it just that in terms of the evolutionary path of the mobile phone industry. 4G means 4th generation. This is a set of standard that is being developed as a future successor of 3G in the very near future.

The biggest difference between the two is in the existence of compliant technologies. There are a bunch of technologies that fall under 3G, including WCDMA, EV-DO, and HSPA among others. Although a lot of mobile phone companies are quick to dub their technologies as 4G, such as LTE, WiMax, and UMB, none of these are actually compliant to the specifications set forth by the 4G standard. These technologies are often referred to as Pre-4G or 3.9G.

4G speeds are meant to exceed that of 3G. Current 3G speeds are topped out at 14Mbps downlink and 5.8Mbps uplink. To be able to qualify as a 4G technology, speeds of up to 100Mbps must be reached for a moving user and 1Gbps for a stationary user. So far, these speeds are only reachable with wired LANs.

Another key change in 4G is the abandonment of circuit switching. 3G technologies use a hybrid of circuit switching and packet switching. Circuit switching is a very old technology that has been used in telephone systems for a very long time. The downside to this technology is that it ties up the resource for as long as the connection is kept up. Packet switching is a technology that is very prevalent in computer networks but has since appeared in mobile phones as well. With packet switching, resources are only used when there is information to be sent across. The efficiency of packet switching allows the mobile phone company to squeeze more conversations into the same bandwidth. 4G technologies would no longer utilize circuit switching even for voice calls and video calls. All information that is passed around would be packet switched to enhance efficiency.

1. 3G stands for 3rd generation while 4G stands for 4th generation.
2. 3G technologies are in widespread use while 4G compliant technologies are still in the horizon.
3. 4G speeds are much faster compared to 3G.
4. 3G is a mix of circuit and packet switching network while 4G is only a packet switching network.

A. Features of 3G:

3G telecommunications, is a generation of standards for mobile phones and mobile telecommunication services fulfilling the International Mobile Telecommunications- 2000 (IMT-2000) specified by the International Telecommunication Union.] Application services include wide- area wireless voice telephone, mobile Internet access, video calls and mobile TV, all in a mobile environment. To meet the IMT-2000 standards, a system is required to provide peak data rates of at least 200 kbit/s. Recent 3G releases, often denoted 3.5G and 3.75G, also provide mobile broadband access of several Mbit/s to smart phones and mobile modems in laptop computers.

The following standards are typically branded 3G:

a) The UMTS system, first offered in 2001, standardized by 3GPP, used primarily in Europe, Japan, China (however with a different radio interface) and other regions predominated by GSM 2G system infrastructure. The cell phones are typically UMTS and GSM hybrids. Several radio interfaces are offered, sharing the same infrastructure:
b) The original and most widespread radio interface is called W-CDMA. o The TD-SCDMAradio interface, was commercialized in 2009 and is only offered in China.
c) The latest UMTS release, HSPA+, can provide peak data rates up to 56 Mbit/s in the downlink in theory (28 Mbit/s in existing services) and 22 Mbit/s in the uplink

B. Features of 4G

1) Terminals: Till date the "terminal" for accessing mobile services has been the mobile phone. With the advanced 3G and also the 4G in future, we can also expect to see a broadening of this concept. User interfaces of terminals will vary from traditional keyboard, display, and tablet, to new interfaces based on speech, vision, touch, soft buttons, etc. These will be general-purpose computing and communication devices, and devices with more specific purposes to serve particular marker segments. There will still be recognizable mobile phones. But many of these will have larger screens to display Internet pages or the face of the person being spoken to. There will be smaller "smart-phones" with limited web browsing and e-mail capabilities. The addition of mobile communication capabilities to laptop and palmtop computers will speed up the Convergence of communication and computing, and bring to portable computing all the functions and features available on the most powerful desktop computers. There will be videophones, wrist communicators, palmtop computers, and radio modem cards for portable computers. Innovative new voice based interfaces will allow people to control their mobile communication services with voice commands

2) Networks: Worldwide roll-out of 3G networks are delayed in some countries by the enormous Costs of additional spectrum licensing fees. In many parts of the world 3G networks do not use the same radio frequencies as 2G, requiring mobile operators to build entirely new networks and license entirely new frequencies. So that a number of spectrum allocation decisions, spectrum standardization decisions, spectrum availability decisions, technology innovations, component development, signal Processing and switching enhancements and inter-vendor cooperation have to take place before the vision of 4G will materialize.

3) *Applications:* The emerging applications for 3G and 4G wireless systems typically require highly Heterogeneous and time varying quality of service from the underlying protocol layers. So adaptability will be one of the basic requirements to the development and delivery of new mobile services. Promising techniques and possible topics may include: Mobile application should refer to a user's profile so that it can be delivered in a way most preferred by the subscriber, such as context-based personalized services. This also brings the applications with adaptability to terminals that are moving in varying locations and speeds. Techniques such as adaptive multimedia and unified messaging take the terminal characteristics into account and ensure that the service can be received and run on a terminal with the most suitable form to the host type. The 4G technology will be able to support Interactive services like Video Conferencing (with more than 2 sites simultaneously), Wireless Internet, etc. The bandwidth would be much wider (100 MHz) and data would be transferred at much higher rates. The cost of the data transfer would be comparatively very less and global mobility would be possible. The networks will be all IP networks based on IPv6. The antennas will be much smarter and improved access technologies like OFDM and MC-CDMA (Multi Carrier CDMA) will be used. Also the security features will be much better.

Long-Term (Radio) Evolution or LTE is also part of 3G technology. It's a 3GPP its research item for Release 8. It's also known as 3.9G or "Super 3G" by some researchers. It's planned to commercialize in 2009. It was aims at peak data rates of 200 Mbps (DL) and 100 Mbps (UL).

The WiMax lobby and the people who are working with the WiMax technology are trying to push WiMax as the 4G wireless technology. At present there is no consensus among people to refer to this as the 4G wireless technology. I do not think this is popular with the researching community. WiMax can deliver up to 70 Mbps over a 50Km radius. As mentioned above, with 4G wireless technology people would like to achieve up to 1Gbps (indoors). WiMax does not satisfy the criteria completely. Also WiMax technology (802.16d) does not support mobility very well. To overcome the mobility problem, 802.16e or Mobile WiMax is being standardized. The important thing to remember here is that all the researches for 4G technology is based around OFDM. WiMax is also based on OFDM. This gives more credibility to the WiMax lobby who would like to term WiMax as a 4G technology. Since there is no consensus for the time being, we have to wait and see who would be the winner [2].

V. FIFTH GENERATION SYSTEMS (5G)

5G Wireless Communication System is not deployed yet. The big challenge for the design and deployment of 5G wireless system can be faced easily as proposed features and architecture (mentioned below) that will increase system capacity and quality within the limited available frequency spectrum, whose frequency band and Data Bandwidth will be _3-300GHz' and _1Gbps & higher (as demand)' successively. The remarkable issue, there don't have any limitation in 5G as respect to user demands in the next 200 years. The 5G also implies the whole wireless world interconnection (WISDOM—Wireless Innovative System for Dynamic Operating Mega communications concept), together with very high data rates of the Quality of Service (QoS) applications [1].

A. Why is there a need for 5G

5G network can provide more facilities approach to a common man to utilize his available possessions in an enormous way to make him to feel the real progress. As a user point of view, the major difference between current generations and expected 5G techniques must be something else than increased maximum throughput; other requirements include:

1) It could make better revenue for current global operators as well as interoperability will become more feasible.
2) Improved and innovative data coding and modulation techniques, which includes filter bank multi carrier way in schemes.
3) For wireless access and back haul use of millimeter wave frequencies is very useful.
4) With the support of different conduction points with related coverage and surrounding the option of a supple usage of resources for uplink and down link transmission in each cell is achieved by superior intrusion and mobility management.
5) To make 5G practical for all sorts of radio access technologies there should be a common platform unique for all the technologies.
6) Lower battery consumption.
7) Lower outage probability.
8) Better coverage and high data rates available at cell edge.
9) Multiple concurrent data transfer paths.
10) Possible to1Gbps and higher data rate in mobility.
11) More secure; better cognitive radio/SDR Security.
12) Higher system level spectral efficiency.
13) World Wide Wireless Web (WWWW), wireless-based web applications that include full multimedia capability beyond 4G speeds.
14) More applications combined with Artificial Intelligent (AI) as human life will be surrounded by artificial sensors which could be communicating with mobile phones.

15) Not harmful to human health.
16) Cheaper traffic fees due to low infrastructure deployment costs.
17) Smart beam antenna systems.

B. Exceptional applications

The 5G MasterCore has some exceptional applications with common features as:

1) One can know weather, temperature, and location etc. of each other when conversation is going on.
2) Students can attend any class of any institute of the world without going there (by WCSM).
3) A doctor can treat patients of other countries from a place.
4) Possible to monitor any place of the world from anywhere.
5) Batteries can be charged by using network without charger.
6) It could be possible to visualize lively all the planets and the Universe.
7) One can complete his/her works without going to the office.
8) One can be able to locate his/her child when she/he is unfortunately missed.
9) One can be able to predict tsunami/earthquake before it occurs [1].

C. A proposed 5G Network Architecture

Terminals and network components are dynamically upgraded (and adapted) to new situation. Network operators use the upgradeability to introduce value-added services more easily. Upgradeability is based on cognitive radio. Cognitive radio technologies include the ability of devices to determine their location and location‘s information (i.e. temperature, weather etc.), sense spectrum used by neighboring devices, change frequency, adjust output power and even alter transmission parameters and characteristics. A cognitive radio is a transceiver (beam) that is able to understand and respond to its operating environment. Thus cognitive radio concerns mobile devices and networks which are computationally intelligent about radio resources and related communications to explore user communication needs and provide wireless services, be appropriate to those needs. Hence, the radio is aware and cognitive about changes in its environment and responds to these changes by adapting operating characteristics in some way to improve its performance. In addition, the appropriate proposed architecture of the 5G MasterCore technology

The MasterCore Architecture

The 5G potential will require the design of a single wireless user terminal able to self-explanatory operate in different heterogeneous access networks.

A fully upgradable terminal changes its communication functions depending on network and/or user demands. In addition, the main challenge for an upgradable MasterCore is to deal with increasing number of different radio access technologies based on solid interoperability criteria and mechanisms.

A core could be a convergence of the aforementioned nanotechnology, Parallel Multimode (PMM) technology, cloud computing and cognitive radio, upgradable and based on All IP Platform and 5G-IU is called the MasterCore.

The 5G MasterCore is an upgradable and multi-technologies core. The MasterCore upgradability could be a self-adaptation and made adaptation to a dynamically-changing environment or mission oriented adaptation to meet a given set of mission requirements with the aim of improving service delivery and spectrum utilization.

The MasterCore changes its communication functions depending on network status and/or user demands. Upgradability could be in both software and hardware. Hardware upgradability is mainly performed by operators, adding additional equipments to increase network capacity at a specific time. However, in software upgradability and with the power of SDR, network is dynamically upgradable, which means that the programs (running on the upgradable processing elements) as well as the communication links between the processing elements are upgraded at run-time. Upgradable hardware and software segments have been shown in the MasterCore Technology (MCT)[1].

Some of the additional applications, benefiting from mobile connectivity are home automation, smart transportation, security, and e-books. IEEE 802.16 is a series of Wireless Broadband standards authorized by the Institute of Electrical and Electronics Engineers (IEEE). It has been commercialized under the name “WiMAX” (from "Worldwide Interoperability for Microwave Access") by the WiMAX Forum industry alliance. IEEE 802.16 standardizes the air interface and related functions associated with wireless local loop.

5G mobile 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 make 5G mobile technology most powerful and in huge demand in near future. For children rocking fun Bluetooth technology and Pico nets has become available in market. Users can also hook their 5G technology cell phones with their Laptop to get broadband internet access. 5G technology includes camera, MP3 recording, video player, large phone memory, dialing speed, audio player and much more one can never imagine.

In fifth generation, Network Architecture consists of a user terminal (which has a crucial role in the new architecture) and a number of independent, autonomous radio access technologies (RAT). 5G mobile system is all-IP based model for wireless and mobile networks interoperability. Within each of the terminals, each of the radio access technologies is seen as the I Plink to the outside Internet world.

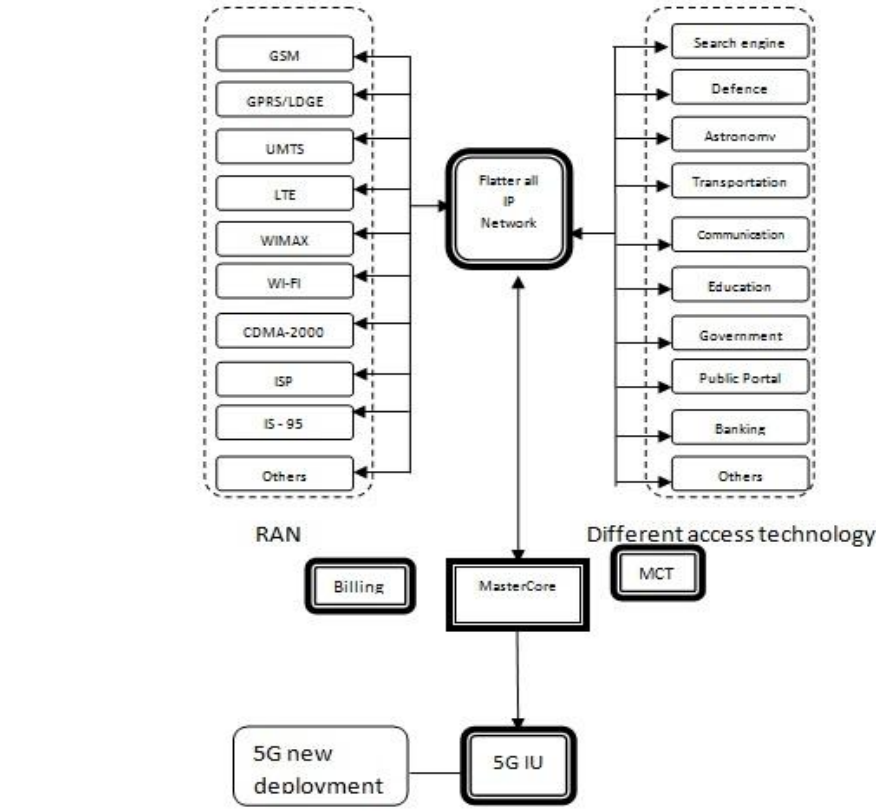

Figure 3: The MasterCore Architecture

VI. APPLICATIONS OF NEXT GENERATION NETWORK

The next generation applications are set to evolve in a multiplatform environment. 4G applications will be available across various wireless technologies like LTE, Wi-Fi, etc. and also in devices like cell phones, laptops, e-readers, digital cameras, printers and so on. 4G applications are very likely to be extended and improved versions of the existing 3G services, but it is still unclear what the capacity of 4G will hold for the mobile world.

A. Applications of next generation networks are:

1) Virtual Presence: This means that 4G and 5G provide user services at all times, even if the user is off-site. Virtual navigation: 4G provides users with virtual navigation through which a user can access a database of the streets, buildings etc. of large cities. This requires high speed data transmission.
2) Tele-Medicine: 4G and 5G will support remote health monitoring of patients. A user need not go to the hospital instead a user can get videoconference assistance for a doctor at anytime and anywhere.
3) Tele-geoprocessing applications: This is a combination of GIS (Geographical Information System) and GPS (Global Positioning System) in which a user can get the location by querying.
4) Crisis management: Natural disasters can cause breakdown in communication systems. In today's world it might take days or weeks to restore the system. But in 4G it is expected to restore such crisis issues in a few hours.
5) Education: For people who are interested in lifelong education, 4G provides a good opportunity. People anywhere in the world can continue their education through online in a cost effective manner.
6) Artificial Intelligence: More applications combined with artificial intelligent (AI) as human life will be surrounded by artificial sensors which could be communicating with mobile phones.
7) Travelling: Introducing the launch of new mobile phone apps; the use of Bluetooth & NFC technology integrated smart phones in the passenger travel process. Technology is likely to play a role in re-ordering these phases over the next decade, allowing, for example, people to experience a destination virtually before transit, or to seek inspiration and share information live, while they are travelling and experiencing a place.
8) Security: This layer also branches across all the layers of the 4G and 5G network architecture which perform the function of authentication, authorization, encryption, establishment and implementation of service policy agreement between the various vendors.

9) Economic growth: Economic growth is supported because these technology changes allow consumers and businesses to benefit from high-value wireless data and content services. This relationship had not yet been explicitly quantified yet [7].

5G Technology stands for 5th Generation Mobile technology. 5G technology has changed the means to use cell phones within very high bandwidth. User never experienced ever before such a high value technology. Nowadays mobile users have much awareness of the cell phone (mobile) technology. The 5G technologies include all type of advanced features which makes 5G technology most powerful and in huge demand in near future [3].

VII. FUTURE PROSPECTIVE OF 5G COMMUNICATION

In the 5G system, each cell phone will have permanent "Home" IP address and "care of address" which represents its actual location. When a computer on the Internet wants to communicate with cell phone after that first, it sends a packet to the home address and subsequently server on home address send a packet to the actual location through the tunnel. Server also sends a packet to the computer to inform the correct address so that future packets will send on that address.

Cloud computing is a technology that uses the internet and central remote server to maintain data and applications. In 5G network this central remote server will be our content provider. Cloud computing allows consumers and business to use applications without installation and access their personal files at any computer with internet access. The same concept is going to be used in Nano-core where the user tries to access his private account from a global content provider through nanocore in form of cloud. The development of cloud computing provides operators with tremendous opportunities. The advanced billing interfaces of 5G technology makes it more attractive and effective with the following future perspectives [7].

5G network technology will reveal a new era in mobile communication technology. The 5G mobile phones will have access to different wireless technologies at the same time and the terminal should be able to combine different flows from different technologies. 5G technology offer high resolution for crazy cell phone user. 5G technology will provide supper and perfect utilization of cellular communication in future. We can monitor any place of the world from anywhere, observe space and watch TV channels at HD clarity in our mobile phones without any interruption. There will be exciting amusement unbelievable services. The 5G mobile phones will be a tablet PC and amazing. Many mobile embedded technologies will evolve [1].

VIII. CONCLUSIONS

We have discussed in this paper about the existing as well future wireless communication generations. We have also discussed the challenges in 5G development and necessity of same. 5G technology is expected to be implemented by end of ongoing decade. We proposed the MasterCore Technology and its hardware /software implementation. This paper will help people working in different fields in creating future concepts of mobile communication, QoS , Internet services, cloud computing , IP networks and concept of MasterCore. 5G technology will be available in market to full fill user demands in affordable rates, bright future and much more reliable with exceptional applications. Our whole office is in finger tips due to mobile wireless communication technology, its new revolution in mobile market. 5G will connect all the network operators with single core and single infrastructure, 4G and 5G techniques will consume low battery, better coverage, high bit rates, no infrastructure fees due to low infrastructure deployment cost, many users can use simultaneously

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