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ABSTRACT

5G Technology stands for 5th generation mobile technology. 5G denote the next major phase of mobile telecommunication standards beyond the upcoming 4G standards.

5G technology will change the way most high bandwidth users access their phones. With 5G pushed over a VOIP enabled device, people will experience a level of call volume and data transmission never experienced before. 5G technology is offering the service in Product Engineering, Documentation, supporting electronic transactions, etc..

As the customer become more and more aware of the mobile phone technology, he or she will look for a decent package all together including all the advanced features a cellular phone can have. Hence the search for new technology always the main motive of the leading cell phone giants to out innovate their competitors. The goal of a 5G based telecommunication network would ideally answer the challenges that a 4G model would present once it has entered widespread use.

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1.INTRODUCTION

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 child's play. Earlier with the infrared feature you can share data within a line of sight that means the two devices has to be aligned properly to transfer data, but in case of blue tooth you can transfer data even when you have the cell phone in your pocket up to a range of 50 meters. The creation and entry of 5G technology into the mobile market place will launch a new revolution in the way international cellular plans are offered. The global mobile phone is upon the cell phone market. Just around the corner, the newest 5G technologies will hit the mobile market with phones used in China being able to access and call locally phones in Germany.

Truly innovative technology changing the way mobile phones will be used. With the emergence of cell phones, which are similar to a PDA, you can now have your whole office within the phone. Cell phones will give tough competitions to laptop manufacturers and normal computer designers. Even today there are phones with gigabytes of memory storage and the latest operating systems .Thus one can say that with the current trends, the industry has a real bright future if it can handle the best technologies and can produce affordable handsets for its customers. Thus you will get all your desires unleashed in the near future when these smart phones take over the market. 5G Network's router and switch technology delivers Last Yard Connectivity between the Internet access provider and building occupants. 5G's technology intelligently distributes Internet access to individual nodes within the building.

2. EVOLUTION FROM 1G-5G NETWORKS

Cell phones are used millions and billions of users worldwide. How many of us know the technology behind cell phones that is used for our communication? I have also intrigued about the type of technology used in my phone. What are 1G, 2G, 3G and 4G technologies? 1G, 2G, 3G & 4G ("G" stands for "Generation") are the generations of wireless telecom connectivity. In 1945, the zero generation (0G) of mobile telephones was introduced. Mobile Telephone Service, were not officially categorized as mobile phones, since they did not support the automatic change of channel frequency during calls. 1G (Time Division Multiple Access and Frequency Division Multiple Access) was the initial wireless telecom network system. It's out-dated now. The analog “brick phones” and “bag phones” are under 1G technology. Cell phones era began with 1G.The next era, 2G has taken its place of 1G. Cell phones received their first major upgrade when they went from 1G to 2G. This leap effectively took cell phones from analog to digital. 2G and 2.5G were versions of the GSM and CDMA connections. And GSM is still the most popular technology, but with no internet. Fortunately, GPRS, an additional service, is provided over GSM for the purpose of internet access. GPRS has been developed and thus, EGPRS was created. It's more secure and faster than GPRS.

Then 3G came, the new Wireless CDMA technology. It is the first wireless telecom technology that provides broadband-speed internet connection on mobile phones. It has been specially made for the demand of internet on smart phones. Further development led to the creation of 3.5G, which provides blazing fast internet connection on phones, up to the speed of 7.2 MBPS. A smart phone can be connected to a PC to share its internet connection and 3G and 3.5G are ideal for this. But, as this WCDMA technology is not available in all regions, its not as popular as GSM yet. Before making the major leap from 2G to 3G wireless networks, the lesser-known 2.5G was an interim standard that bridged the gap. Following 2.5G, 3G ushered in faster data-transmission speeds so you could use your cell phone in more data-demanding ways. This has meant streaming video (i.e. movie trailers and television), audio and much more. Cell phone companies today are spending a lot of money to brand to you the importance of their 3G network. The above systems and radio interfaces are based on kindred spread spectrum radio transmission technology. While the GSM EDGE standard

("2.9G"), DECT cordless phones and Mobile Wi MAX standards formally also fulfil the IMT-2000 requirements and are approved as 3G standards by ITU, these are typically not branded 3G, and are based on completely different technologies.

4G, which is also known as “beyond 3G” or “fourth-generation” cell phone technology, refers to the entirely new evolution. Developers are now going for 4G (OFDMA), which will provide internet up to the speed of 1 GBPS! It is said to be able to overcome the problems of weak network strength and should provide a much wider network, making sure that the users get high-speed connectivity anytime anywhere. No doubt, 4G will open new doors of revolutionary internet technologies, but for now, 3G and 3.5G are the best. 4G will allow for speeds of up to 100Mbps. 4G promises voice, data and high-quality multimedia in real-time form all the time and anywhere.

3. 1G WIRELESS SYSTEM

First Generation wireless technology (1G) is the original analog(An analog or analogue signal is any continuous signal for which the time varying feature (variable) of the signal is a representation of some other time varying quantity), voice-only cellular telephone standard, developed in the 1980s. The main difference between two succeeding mobile telephone systems, 1G and 2G,is that the radio signals that 1G networks use are analog, while 2G networks are digital. Although both systems use digital signalling to connect the radio towers (which listen to the handsets) to the rest of the telephone system, the voice itself during a call is encoded to digital signals in 2G whereas 1G is only modulated to higher frequency, typically 150 MHz and up. One such standard is NMT (Nordic Mobile Telephone), used in Nordic countries, Eastern Europe and Russia. Others include AMPS (Advanced Mobile Phone System) used in the United States, TACS (Total Access Communications System) in the United Kingdom, JTAGS in Japan, C-Netz in West Germany, Radio com 2000 in France, and RTMI in Italy. Analog cellular service is being phased out in most places worldwide. 1G technology replaced 0Gtechnology, 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)

- Developed in 1980s and completed in early 1990's
- 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
- Allows users to make voice calls in 1 country

4. 2G WIRELESS SYSTEM

2G is short for second-generation wireless telephone technology. Second generation 2G cellular telecom networks were commercially launched on the GSM standard in Finland in 1991. 2G network allows for much greater penetration intensity. 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. 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 timeslots. 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 connections in many different countries of the world's is based on digital signals ,unlike 1G technologies which were used to transfer Analogue 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. In comparison to 1G's analog signals, 2G's digital signals are very reliant on location and proximity. If a 2G handset made a call far away from a cell tower, the digital signal may not be enough to reach it. While a call made from a 1G handset had generally poor quality than that of a 2G handset, it survived longer distances. This is due to the analog signal having a smooth curve compared to the digital signal, which had a jagged, angular curve. As conditions worsen, the quality of a call made from a 1G handset would gradually worsen, but a call made from a 2Ghandset would fail completely. Data transfer in speeds is up to 64kbps.

5. 3G WIRELESS SYSTEM

International Mobile Telecommunications-2000 (IMT--2000), better known as 3G or 3rdGeneration, 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. 3G mobile technologies proffers more advanced services to mobile users. The spectral efficiency of 3G technology is better than 2G technologies. Spectral efficiency is the measurement of rate of information transfer over any communication system. 3G is also known as IMT-2000.

- 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)
- Data are sent through technology called packet switching
- Voice calls are interpreted using circuit switching
- Access to Global Roaming
- 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 with3G phones.

6. 4G WIRELESS SYSTEM

4G refers to the fourth generation of cellular wireless standards. It is a successor to 3G and 2G families of standards. The nomenclature of the generations generally refers to a change in the fundamental nature of the service, non-backwards compatible transmission technology, and new frequency bands.3G technologies make use of TDMA and CDMA. 3G (Third Generation Technology) technologies make use of value added services like mobile television, GPS (global positioning system) and video conferencing.

The basic feature of 3G Technology (Third Generation 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. It is expected that 2 Mbit/sec for stationary users, while 348 Kbits when moving or travelling. ITU sell various frequency rates in order to make use of broadband technologies. Network authentication has won the trust of users, because the user can rely on its network as a reliable source of transferring data.3G technology is much flexible, because it is able to support the 5 major radio technologies. These radio technologies operate under CDMA, TDMA and FDMA.CDMA holds for IMT-DS (direct spread), IMT-MC (multi carrier). TDMA accounts for IMT-TC (time code), IMT-SC (single carrier). FDMA has only one radio interface known as IMT-FC or frequency code. Third generation technology is really affordable due to the agreement of industry. This agreement took place in order to increase its adoption by the users. 3G (Third Generation Technology) system is compatible to work with the 2G technologies. 3G (Third Generation Technology) technologies holds the vision that they should be expandable on demand. The aim of the 3G (Third Generation Technology) is to allow for more coverage and growth with minimum investment. The bandwidth and location information available to 3G devices gives rise to applications not previously available to mobile phone users.

- Mobile TV- a provider redirects a TV channel directly to the subscriber's phone where it can be watched.
- Video on demand- a provider sends a movie to the subscriber's phone.
- Video conferencing- subscribers can see as well as talk to each other.
- Tele-medicine a medical provider monitors or provides advice to the potentially isolated subscriber.
- Mobile ultra-broadband(gigabit speed) access and multi-carrier transmission.

7. WHAT IS 5G & WHAT IT OFFERS

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. The 5G technologies include all type of advanced features which makes 5G technology most powerful and in huge demand in near future.

The gigantic array of innovative technology being built into new cell phones is stunning. 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 5Gtechnology cell phone with their Laptop to get broadband internet access. 5G technology including camera, MP3 recording, video player, large phone memory, dialling speed, audio player and much more you never imagine. For children rocking fun Bluetooth technology and Pico nets has become in market.

As per the present status all over the world WCDMA is commercially launched .Some nations has planned to launch LTE within next quarter. Operator is looking ahead for wide-scale deployment of LTE in 2012. Operators will also find that the timing is right to make the switch because much of the first generation of 3G equipment will need to be upgraded soon. LTE networking equipment and handsets, already under development, will become available in 2010, and should be rolled out in large quantities in Europe by 2012. clearly shows that within 2020 LTE will become the latest trend for wireless communication all over the world. But yet our question remains unanswered. Why there is a need for 5G.

Even though LTE provides wide range of growth for present wireless telecommunication. People are not in a circumstance to make use of those benefits in an effective manner LTE might be rigorously used in Commercial/Industrial areas. But think of a common man who utmost utilize LTE for downloading a movie or make a video call. Fact is that there is no such ground-breaking application exists in real world to be utilized by a common man. You might doubt how this verdict is applicable for current innovative world, where have enormous splendid real time applications. Concern is that our present wireless telecommunications is bottlenecked to use those applications in an effective manner. This paper mainly focuses on how a 5G network can provide more approach to a common man to utilize his available possessions in an immense way to make him to feel the real progress.

- If you can able to pay all your bills in a single payment with your mobile.
- If you can able to sense Tsunami/earthquake before it occurs.
- If you can able to visualize lively all planets and Universe.
- We can lock our Laptop, car, Bike using our mobile when you forgot to do so.
- Our mobile can share your work load.
- 5G Mobile can identify the best server.
- Mobile can perform Radio resource management.
- If your mobile can intimate you before the call drops.
- Mobile phone get cleaned by its own. Can able to fold your mobile as per your desire.
- If you can able to expand your coverage using your mobile phones.
- If you can able identify your stolen mobile with nanoseconds.
- If you can able to access your office desktop by being at your bedroom.
- Mobile can able to suggest you possible medicine as per your healthiness.
- Mobile can estimate the quality of your new build house.
- Mobile can able to provide recent worth on products using its barcode.

8. BASIC ARCHITECTURE OF 5G TECHNOLOGY

8.1. Ubiquitous Computing

5G would be about "ubiquitous computing", that is, having the ability to access the applications want from any platform, anywhere, any time. To create such an environment, one needs to integrate various applications, emerging from various engineering practices. Human life will be surrounded by intelligent sensors, which will bring radical change to human life's daily approaches of doing things, as:

- Your intelligent car will send SMS to your cell phone, from your car.
- Your home security camera is attached to secured internet. So that you can view your sitting room on your laptop/mobile phone screen, by accessing secure website.
- You are receiving regular MMS from your hospital about your medication need and next doctor appointment.

8.2. Aggregator

Existing telecom networks are fashioned in hierarchical way, where subscriber traffic is aggregated at aggregation point (BSC/RNC) and then routed to gateways. (As shown in figure).Flat IP architecture will lessen burden on aggregation point and traffic will directly move from Base station to Media gateways. Vision of Super Core is based on IP platform. All network operators (GSM, CDMA, Wimax, and Wireline) can be connected to one Super core with massive capacity. This is realization of single network infrastructure. The concept of super core will eliminate all interconnecting charges and complexities, which is right now network operator is facing. It will also reduce number of network entities in end to end connection, thus reducing latency considerably.

8.3. Flatter IP concept

At regular interval, semiconductor manufacturers advance to a new generation with smaller feature sizes. This allows them to incorporate more functions into a given area of silicon and, hence, more features or new capabilities into electronic devices like cell phones, Increased processing capacity will be allow Mobile devices (cell phones, PDAs, etc) to do more tasks (instructions per minute) then before. This will lead to even the Flatter IP network. As Flat IP has shifted some of the BSC/RNC's radio resource functions to Base station, Flatter IP will shift some of the RR functions, to Mobile devices from Base station. Finally your cell phone will not be just access device but, it will also perform some of the Radio Resource Management functions.

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.

9. 5G : Nano Core

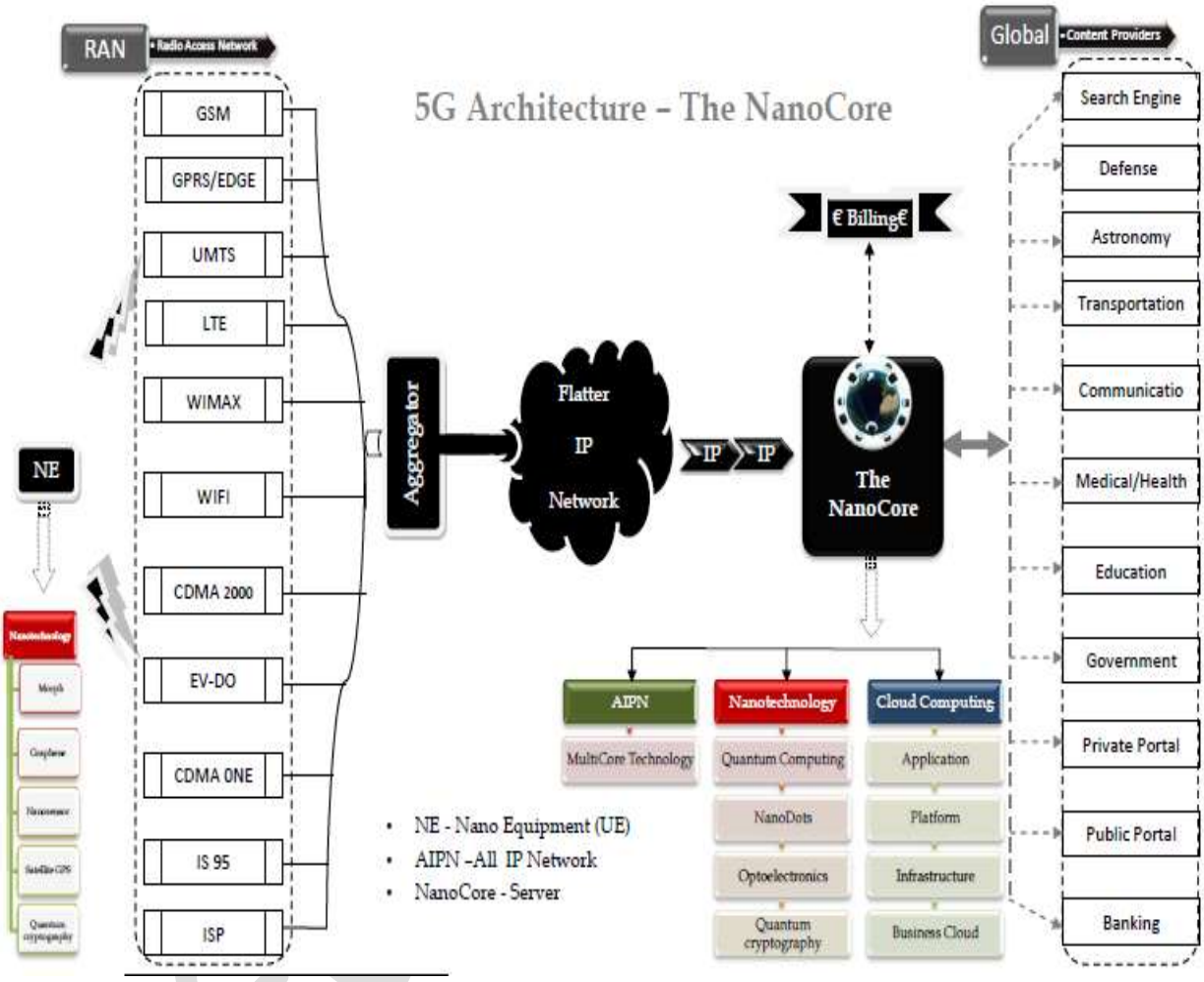

Fig 1

Sophisticated technology has enabled an age of globalization. Technological convergence is the tendency for different technological systems to evolve towards performing similar tasks. What Nicholas Negroponte labelled the transformation of "atoms to bits," the digitization of all media content. When words, images and sounds are transformed into digital information, it expands the potential relationships between them and enable them to flow across platforms.

The 5G Nancore is a convergence of below mention technologies. These technologies have their own impact on exiting wireless network which makes them in to 5G.

- Nanotechnology.
- Cloud Computing.
- All IP Platform.

9.1. Nanotechnology:

Nanotechnology is the application of Nano science to control process on nanometer scale. i.e. between 0.1 and 100nm.The field is also known as molecular nanotechnology (MNT). MNT deals with control of the structure of matter based on atom-by-atom and molecule by molecule engineering. The term nanotechnology was introduced by Nori Taniguchi in 1974 at the Tokyo international conference on production engineering. Nanotechnology is the next industrial revolution, and the telecommunications industry will be radically transformed by it in a few years. Nanotechnology has shown its impact on both mobile as well as the core network. Apart from this it has its own impact on sensor as well as security. This is considered as a most significant in telecommunication. We will be discussing the same in our further slides.

9.2. Nano Equipment (NE):

Mobile phone has become more than a communication device in modern world it has turned into an identity of an individual. In 5G Nanocore these mobile are referred as Nano Equipment as they are geared up with nanotechnology. One of the central visions of the wireless industry aims at ambient intelligence: computation and communication always available and ready to serve the user in an intelligent way. This requires that the devices are Mobile. Mobile devices together with the intelligence that will be embedded in human environments – home, office, public places – will create a new platform that enables ubiquitous sensing, computing, and communication

Specifications of Nano Equipment are given as follow:

• Self Cleaning – the phone cleans by itself
• Self powered – the phone derives its energy/power from the sun, water, or air.
• Sense the environment – the phone will tell you the weather, the amount of air pollution present, etc.
• Flexible – bend but not break
• Transparent – "see through" phones

9.3. Cloud Computing:

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 Nanocore where the user tries to access his private account form a global content provider through Nanocore in form of cloud. The development of cloud computing provides operators with tremendous opportunities. Since cloud computing relies on the networks, it shows the significance of networks and promotes network development. It also requires secure and reliable service providers, capabilities that operators have deep expertise in. Operators can enter the cloud computing market and create new value-added services and experiences by integrating industry content and applications in the digital supermarket model.

This could make our user to obtain much more real-time application to utilize his 5G network efficiently. Secure and reliable service can be provided with the help of quantum cryptography. Cloud computing customer avoids capital expenditure for the Nanocore thereby also reducing the cost of purchasing physical infrastructure by renting the usage from a third party Provider(Content Provider). The Nanocore devours the resources and pay for what it uses.

Segments of Cloud Computing:

Cloud computing has three main segments which are as follows:

1. Applications – It is based on, on demand software services. On demand software services come in different varieties. They vary in their pricing scheme and how the software is delivered to the end users. In the past, the end-user would purchase a server that can be accessed by the end user over the internet.
2. Platform - The platform segment of cloud computing refers to products that are used to deploy internet. Net Suite, Amazon, Google, and Microsoft have also developed platforms that allow users to access applications from centralized servers. Google, Net Suite, Rack space cloud, amazon.com and sales force are some of the active

3. Infrastructure – The third segment in cloud computing, known as the infrastructure, is the backbone of the entire concept. Infrastructure vendorsG environments such as Google gears allow users to build applications. Cloud storage, such as Amazon's S3, is also considered to be part of the infrastructure segment.

5G Nanocore will efficiently utilizes all the above 3 segments to satisfy his customer demands. The concept of cloud computing will reduce the CAPEX of 5G network deployment. In turn this will create a less billing to the end user for all kinds of services that he utilizes through Nanocore.

9.4. All IP Network:

As already discussed for converging different technologies to form a single 5G Nanocore, We require a common platform to interact, Flat IP architecture act as an essential part of 5G network. The All-IP Network (AIPN) is an evolution of the 3GPP system to meet the increasing demands of the mobile telecommunications market. To meets customer demand for real-time data applications delivered over mobile broadband networks, wireless operators are turning to flat IP network architectures. Primarily focused upon enhancements of packet switched technology, AIPN provides a continued evolution and optimization of the system concept in order to provide a competitive edge in terms of both performance and cost.

The key benefits of flat IP architectures are:

• Lower costs

• Universal seamless access

• Improved user experience

• Reduced system latency

• Decoupled radio access and core network evolution

The drive to all IP-based services is placing stringent performance demands on IP-based equipment and devices, which in turn is growing demand for multicore technology. There is strong growing demand for advanced telecommunications services on wired and wireless Next Generation Network (NGN) infrastructures, and fast growing demand for the same in the enterprise too. Within a few years, more than 10 billion fixed and mobile devices will be connected via the Internet to add to the more than one billion already connected. All these services are going to be deployed over full IP-based architecture.

9.5. Heterogeneous Wireless Networks Interoperability

The challenge in the design of the terminals is connected to the management of trade between the flexibility of how to use the spectrum and needed space and power to given platform. New methods for partial reconfigurable offer design dimensions that allow the system to adapt to the opportunities and requirements of the terminals in a manner that shall maximize the spectral efficiency and also maximize the battery power. As a result of growing level of acceptance of the wireless technologies in different fields, challenges and types of wireless systems associated with them are changing. In heterogeneous wireless networks the concept is "always best connected" (always associated with the best quality), aimed at client terminals, and is proposed in different researches.

Reviewing the concept of heterogeneous networks inevitably raises the question of inter-working among the radio access technologies in a newly designed system, which will not demand changes in the RATs, but only introduction of control functionalities the core networks. In terms of the user or user applications, heterogeneous system or a heterogeneous network is considered as a unified network and access a single segment which will place the connection with the application servers in and out of operator’s network. To meet the relevant

requirements of the user applications are generally considered two possible models for interoperability between building blocks of radio access technologies within the heterogeneous system. First one refers to a centralized operator access, while the second one defines the Internet model of interoperability. The first model involves introducing a certain level of integration between the radio access technology through which mobile access terminal, in this direction have been made different analysis and developed different standards that should define the levels of architecture connectivity for realizing vertical handover between different access technologies involved in the construction of heterogeneous domain. The introduction of this model implies interoperability protocol interoperability of lower levels of communication in the field of radio access. The second model is called the Internet model, which represents a focus for further development in this paper and refers to providing continuity of customer service in case of independent radio access technologies available to the mobile terminal by connecting on the network level. In this case, interoperability between network technologies is done on the upper (network) protocol levels, i.e. at a level that is common to all access technologies for communication between user applications with the appropriate application servers. The ultimate goal of both models for interoperability is the same and it is providing a transparent transfer of user information between client applications and related application servers without impact on the diversity of access technologies in the communication process and providing continuity of user sessions in the communication process. The main difference between the two models concerns the way in providing interoperability. Apart from this difference, very important are vertical handover between access technologies and the conditions or circumstances which trigger handovers. The first method provides an integrated architecture of radio access technologies that builds heterogeneous network, and as such is applicable in cooperative networks or in networks where the radio access technologies are owned by the same operator or operators who have cooperation. In such networks are strictly defined rules for vertical handovers, mainly dictated by conditions in the radio access networks, or by the operator's preference, while user preferences are taken into cooperative architectures. The second method is more general and relates to interoperate regardless of the user’s operators, which provide access technology for the user equipment. In these methods, generally speaking, vertical handover is accomplished as a result of the conditions under which user applications see main qualitative parameters of service or experience to the user.

10. DESIGN OF 5G MOBILE NETWORK ARCHITECTURE

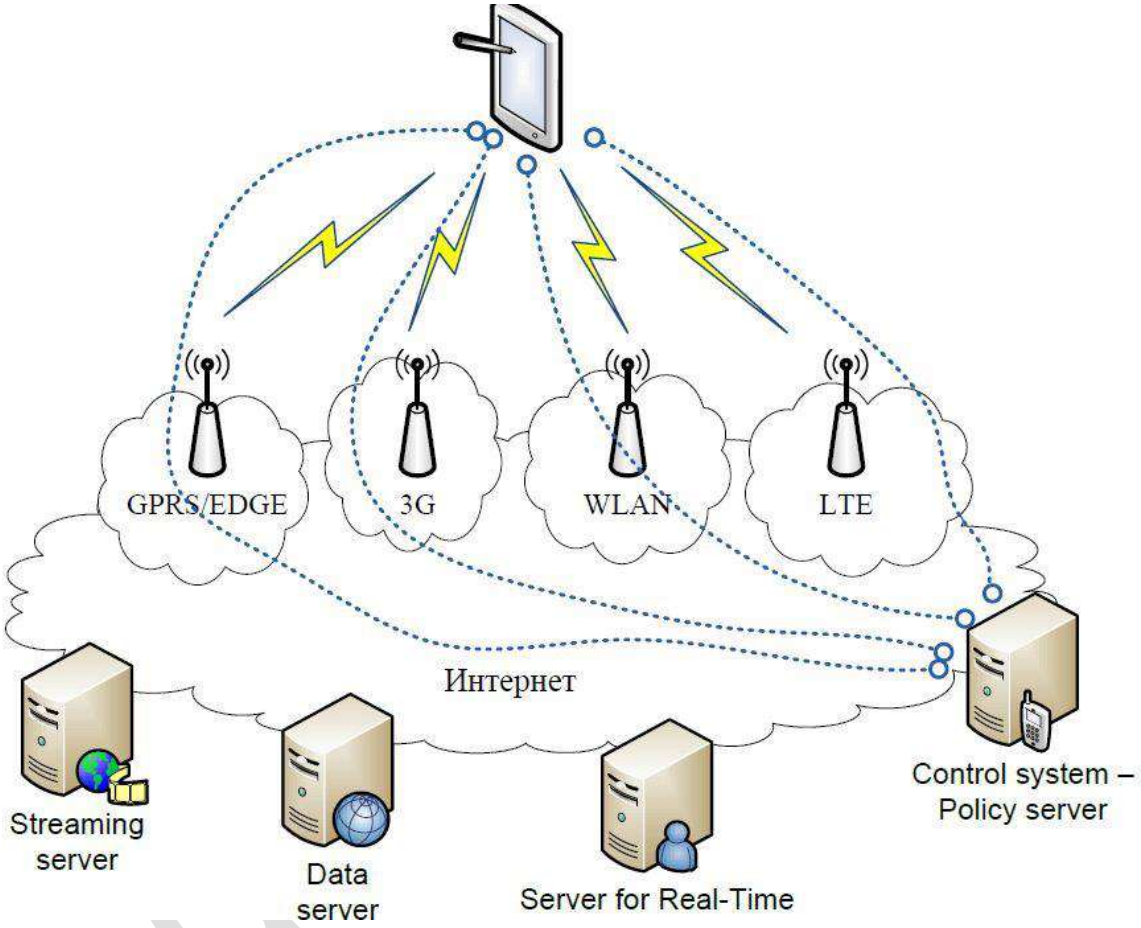

Fig 2

Figure shows the system model that proposes design of network architecture for 5G mobile systems, which is all-IP based model for wireless and mobile networks interoperability. The system consists of a user terminal (which has a crucial role in the new architecture) and a number of independent, autonomous radio access technologies. Within each of the terminals, each of the radio access technologies is seen as the IP link to the outside Internet world. However, there should be different radio interface for each Radio Access Technology (RAT) in the mobile terminal. For an example, if want to have access to four different RATs, need to have four different access - specific interfaces in the mobile terminal, and to have all of them active at the same time, with aim to have this architecture to be functional.

11. BENEFITS OF 5G TECHNOLOGY

- High speed, high capacity, and low cost per bit.
- Support interactive multimedia, voice, streaming video, Internet, and other broadband services, more effective and more attractive, Bi directional, accurate traffic statistics.
- Global access, service portability, and scalable mobile services.
- The high quality services of 5G technology based on Policy to avoid error.
- 5G technology is providing large broadcasting of data in Gigabit which supporting almost 65,000 connections.
- 5G technology offer transporter class gateway with unparalleled consistency.
- Through remote management offered by 5G technology a user can get better and fast solution.

12. CONCLUSION

The development of the mobile and wireless networks is going towards higher data rates and all-IP principle. Currently, there are many available radio access technologies, which provide possibility for IP-based communication on the network layer, as well as there is migration of all services in IP environment, including the traditional telephony and even television, besides the traditional Internet services, such as web and electronic mail as most used among the others. On the other side, mobile terminals are obtaining each year more processing power, more memory on board, and longer battery life for the same applications (services). 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.

Author have defined completely novel network architecture for such 5G mobile networks. The architecture includes introduction of software agents in the mobile terminal, which will be used for communication with newly defined nodes called Policy Routers, which shall be placed in the core network. The Policy Router creates IP tunnels with the mobile terminal via each of the interfaces to different RATs available to the terminal. Based on the given policies, the change of the RAT, i.e., vertical handover, is executed via tunnel change by the Policy Router, and such change is based on the given policies regarding the Quality of Service and user preferences, as well as performance measurement obtained by the user equipment via new defined procedure for that purpose in this paper, called Quality of Service Policy based ROuting (QoSPRO).

The proposed architecture for future 5G mobile networks can be implemented using components of the shelf (existing and standardized Internet technologies) and its implementation is transparent to the radio access technologies, which makes it very likeable solution for the next generation mobile and wireless networks.

13. ACRONYMS

1G: Old-fashioned analog mobile phone systems capable of handling very limited or no data at all.

2G: Second generation voice-centric mobile phones and services with limited data rates ranging from 9.6 kbps to 19.2 kbps.

2.5G: Interim hardware and software mobile solutions between 2G and 3G with voice and data capabilities and data rates ranging from 56 kbps to 170 kbps.

3G: A long awaited digital mobile systems with a maximum data rate of 2 Mbps under stationary conditions and 384 kbps under mobile conditions. This technology is capable of handling streaming video two way voice over IP and Internet connectivity with support for high quality graphics.

3GPP: Third Generation Partnership Project. 3GPP is an industry body set up to develop a 3G standard based upon wideband CDMA (WCDMA).

3GPP2: Third Generation Partnership Project 2. 3GPP2 is an industry standard set up to develop a 3G standard based upon CDMA-2000.

3.5G: Interim systems between 3G and 4G allowing a downlink data rate upto 14 Mbps. Sometimes it is also called as High Speed Downlink Packet Access (HSDPA).

4G: Planned evolution of 3G technology that is expected to provide support for data rates up to 100 Mbps allowing high quality and smooth video transmission.

5G: In evolutionary view it will be capable of supporting wwww allowing highly flexible dynamic adhoc wireless networks. In revolutionary view, this intelligent technology is capable of interconnecting the entire world without limits.

Bluetooth: It is a wireless networking protocol designed to replace cable network technology for devices within 30 feet. Like IEEE 802.11b, Bluetooth also operates in unlicensed 2.4GHz spectrum, but it only supports data rates up to 1 Mbps.

CDMA: Code Division Multiple Access, also known as CDMA-ONE or IS-95 is a spread spectrum communication technology that allows many users to communicate simultaneously using the same frequency spectrum. Communication between users are differentiated by using a unique code for each user. This method allows more users to share the spectrum at the same time than alternative technologies.

CDMA-2000: Sometimes also known as IS-136 and IMT-CDMA multicarrier (1X/3X) is an evolution of narrowband radio transmission technology known as CDMA-ONE (also called

CDMA or IS-95), to third generation. 1X refers to the use of 1.25 MHz channel while 3X refers to 5 MHz channel.

EDGE: Enhanced Data rates for Global Evolution technology gives GSM and TDMA the capability to handle 3rd generation mobile phone services with speeds upto 384 kbps. Since it uses the TDMA infrastructure, a smooth transition from TDMA based systems such as GSM to EDGE is expected.

GPRS: General Packet Radio Service provides data rates upto 115 kbps for wireless Internet and other types of data communications using packet data services.

GSM: Global Systems for Mobile Communication is a world-wide standard for digital wireless mobile phone systems. The standard was originated by the European Conference of Postal and Telecommunications Administrations (CEPT) who was responsible for the creation of ETSI. Currently ETSI is responsible for the development of GSM standard.

Mobile phones: Mobile communication systems that uses radio communication and conventional telephone switching to allow communication to and from mobile users.

PSTN: Public Switched Telephone Network is a regular voice telephone network.

Spread Spectrum: It is a form of wireless communication in which the frequency of the transmitted signal is deliberately varied over a wide range. This results in a higher bandwidth of the signal than the one without varied frequency.

TDMA: Time Division Multiple Access is a technology for sharing a medium by several users by dividing into different time slots transmitting at the same frequency.

UMTS: Universal Mobile Telecommunications System is the third generation mobile telephone standard in Europe that was proposed by ETSI.

WAP: Wireless Application Protocol defines the use of TCP/IP and web browsing for mobile systems.

WCDMA: Wideband CDMA is a technology for wideband digital radio communications of multimedia and other capacity demanding applications. It is adopted by ITU under the name IMT-2000 direct spread.

WWWW: A world wide wireless web is capable of supporting a comprehensive wireless based web application that includes full graphics and multimedia capability at beyond 4G speeds.

14. REFERENCES

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