

5G Network

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ABSTRACT

5G technologies 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 ordering the services in Product Engineering, Documentation, supporting electronic transactions (e-Payments, e-transactions) etc. As the customer becomes 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. Recently apple has produced shivers all around the electronic world by launching its new handset, the Iphone. Features that are getting embedded in such a small piece of electronics are huge. The 5g design is based on user-centric mobile environment with many wireless and mobile technologies on the ground. In heterogeneous wireless environment changes in all, either new or older wireless technologies, is not possible, so each solution towards the next generation mobile and wireless networks should be implemented in the service stratum, while the radio access technologies belong to the transport stratum regarding the Next Generation Networks approach. In the proposed design the user terminal has possibility to change the Radio Access Technology -RAT based on certain criteria. For the purpose of transparent change of the RATs by the mobile terminal, we introduce so-called Policy-Router as node in the core network, which establishes IP tunnels to the mobile terminal via different available RATs to the terminal.

General Terms

In traditional mobile communications networks, the primary goal is to enrich people's life through communication. Users may communicate by text messages, voice calls, and video calls, or surf Internet or access app services using smart phones. However, 5G is no longer confined to individual customers. It's not simply about having a faster mobile network or richer functions in smartphones. 5G will also serve vertical industries, from which a diversity of new services are going to stem. In the context of vertical industry, security demands could vary significantly among services. For instance, mobile Internet of Things (IoT) devices require lightweight security while high-speed mobile services demand high efficient mobile security. The network based hop-by-hop security approach may not be efficient enough to build differentiated end-to-end (E2E) security for different services. As IoT is gaining momentum, more people will be able to remotely operate or "talk" to networked devices, for instance, instructing facilities at a smart home to get up. Therefore, there is a need of a more stringent authentication method to prevent unauthorized access to IoT devices. For example, biometric identification could be part of the authentication in smart homes.

Keywords :-5G, Optical Networks, Wireless Networks, NFV, SDN, RAT.

1. INTRODUCTION

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 Bluetooth 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 marketplace will launch a new revolution in the way international cellular plans are ordered. 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 once 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 smartphones take over the market. 5G Network 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 Network

The Internet architecture was designed in the 1970s and it is host-centric till now. The hosts in the Internet are generally named by their IP addresses, the current Internet network does not have a mechanism for directly naming data (files, streams, etc.) and services (processes that are remotely invoked by clients). Instead, both are named in association with domain names. Today's Internet traffic is associated with applications where users are interested in the data and not in the source where the data resides. On the other side, the current Internet architecture is host-centric rather than data-centric. This motivates a new network architecture that can efficiently support both data-centric and host-centric services. This paper describes an implementation of an incrementally deployable Data-Centric Network Architecture (DCNA) for the Internet. DCNA is based on a shim layer or service binding (SB) layer between the application layer and the transport layer and the appropriate interfaces to efficiently connect these layers. From the perspective of the new and existing end hosts, it is desirable that we only need to make the minimum changes to the host stack. There are a few design choices for the Internet to move towards data-centric while being incrementally deployable.

2.1 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 signaling 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, JTACS 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 0g Technology, which featured mobile radio telephones and such technologies as Mobile Telephone System (MTS), Advanced Mobile Telephone System (AMTS), and Improved Mobile Telephone Service (IMTS), and Push to Talk (PTT). Developed in 1980s and completed in early 1990s. 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.

2.2 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 time slots. CDMA allocates each user a special code to communicate over a multiplex physical channel. Different TDMA technologies are GSM, PDC, iDEN, IS-136. CDMA technology is IS-95. GSM has its origin from the Group special Mobile, in Europe. GSM (Global system for mobile communication) is the most admired standard of all the mobile technologies. Although this technology originates from the Europe, but now it is used in more than 212 countries in the world. GSM technology was the first one to help establish international roaming. This enabled the mobile subscribers to use their mobile phone connections in many different countries of the worlds 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. 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 2g Handset would fail completely.

2.3 3G Wireless System

International Mobile Telecommunications-2000 (IMT{2000}), better known as 3G or 3rd Generation, 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, Multimedia Messaging Service (MMS), 3D gaming, Multi-Gaming, etc. are also available with 3G phones.

2.4 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 \times the data rates. It is expected that 2 Mb/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), IMTMC (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.
- Tele-medicine a medical provider monitors or provides advice to the potentially isolated subscriber.
- Mobile ultra-broadband access and multi-carrier transmission.

2.5 What is 5G and 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 ordering 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. 5G technology including camera, MP3 recording, video player, large phone memory, dialing speed, audio player and much more you never imagine. For children rocking fun Bluetooth technology and Pico nets has become in market. 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 $_rst$ 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.

2.6 5G – Nano Core

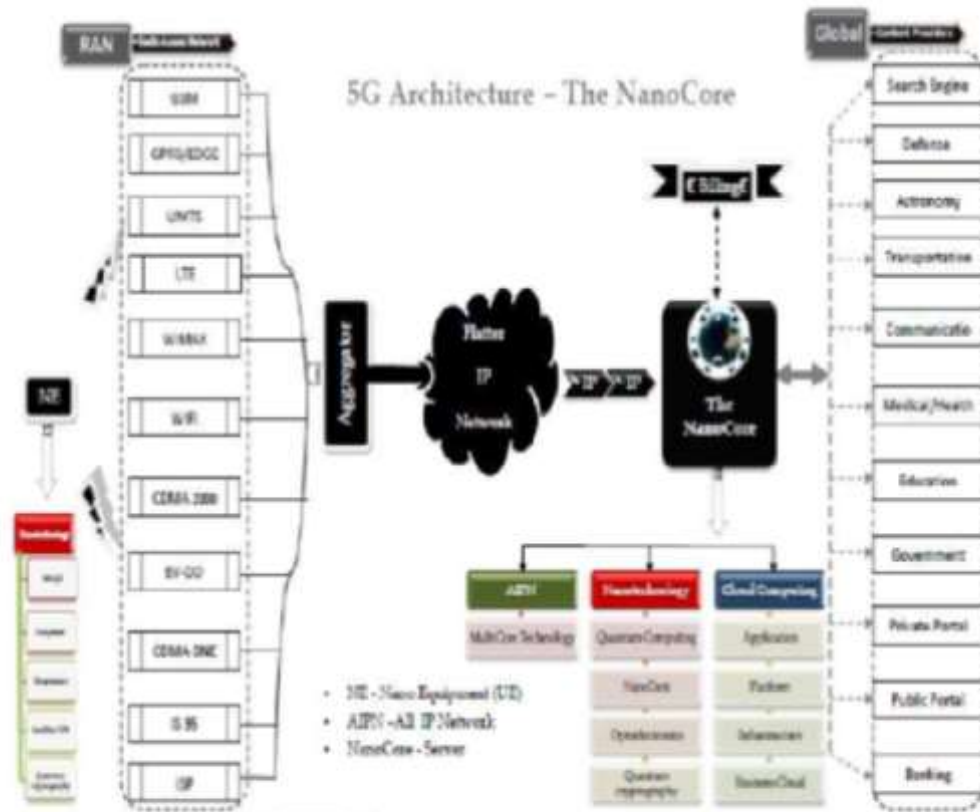


Fig 1

Figure 1: 5G Architecture: The Nano Core

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 below cross platforms. The 5G Nano core is a convergence of below mention technologies. These technologies have their own impact on existing wireless network which makes them in to 5G.

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

3. DESIGN OF 5G MOBILE NETWORK ARCHITECTURE

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.

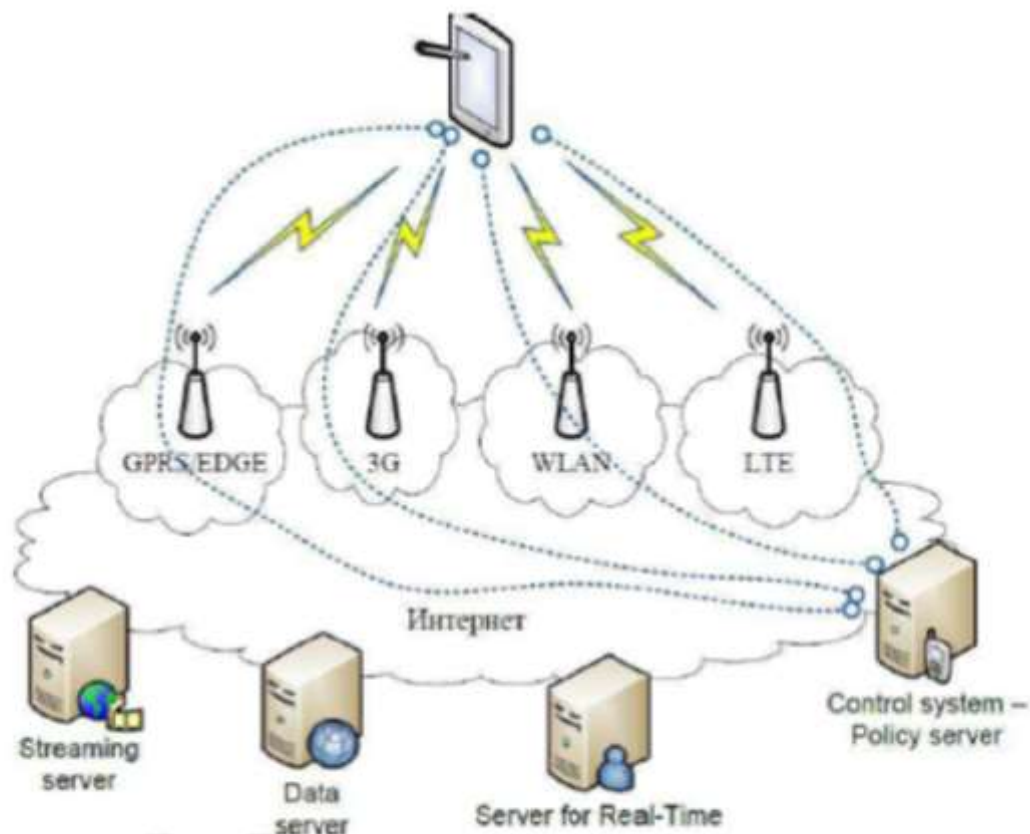


Fig 2

Fig 2 5G MOBILE NETWORK ARCHITECTURE

4. REFERENCES

- [1] Suvarna Patil," Vipin Patil A Review on 5g Technology," International Journal of Engineering and Innovative Technology (IJEIT)
- [2] Saurabh Patel, Malhar Chauhan," Kinjal Kapadiya 5G: Future Mobile Technology vision 2020", International Journal of Computer Applications (IJCA).
- [3] Aleksandar Tudzarov," Functional Architecture for 5G Mobile Network", International Journal of Advanced science and Technology (IJAST).
- [4] Imthiyaz Ali, The 5G Nano core..
- [5] Akhilesh Kumar Pachauri," Ompal Singh, 5G Technology:" Redefining Wireless Communication in Upcoming Years.