

An Architectural Survey of Emerging Future Technology-5G

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Abstract – 5G stands for fifth Generation mobile broadband technology. The fast revolution in computing the mobile changes our routine life that is the way we work, interact, learn etc. It provides affordable broadband very high speed wireless connectivity. This generation has the ability to lower the data buffers and it is capable to withstand many calls and data traffic. The downloading speed of data is very high than 3G/4G. The future 5G deployment that is ultra-dense small cell networks creates unpredictable opportunities to provide an advanced localization system that satisfies the demands of future engineering development and their functionalities. The main features in 5G networking is that user can connect to the multiple wireless technologies simultaneously and can access between them. 5G technologies will offer the services like Documentation, supporting e-Payments, e-transactions.

Keywords - OFDM, Cloud Computing, Nanocore.

I. INTRODUCTION

Wireless network refers to the transmission of signals (voice or data) over high frequency waves. The wireless local area network (WLANs) provides wireless connection with high speed and it also supports to access information from everywhere all the time. The requirement for stable transmission of data in WLANs is becoming even more significant due to the evolution of different communication networks [1]. WLANs has wide range of applications, which may include web browsing, file transferring and recent ongoing applications such as video streaming and conferencing [2]. Wireless communication has started in early 1970s. In next forty years, there will be an unimaginary evolution in mobile computing. 5G technology offers very high bandwidth that user never experienced before. It also offers innovative advanced features which makes it most powerful and in huge demand in the future. Now days at present different wireless and mobile technologies such as third generation mobile networks (UMTS-Universal Mobile Telecommunication System), LTE (Long Term Evolution), Wi-Fi (Wireless networks IEEE 802.11), WiMAX (Wireless and mobile networks IEEE 802.16), as well as sensor networks, or personal area networks (e.g. Bluetooth, ZigBee). 5G need to make an important benefit over 4G to rock in the world. Fifth generation should be more creative technology that interconnects the entire globe without limits. This technology is expected to be released around 2020. The fifth generation wireless mobile multimedia internet networks would be completely a limitation less wireless communication which makes accurate wireless real world – World Wide Wireless Web (WWW) The universal world, uninterrupted

information access, entertainment and communication will develop a new dimension to our lives and life style also changed significantly. Most of the telecommunication companies like NTT DoCoMo, Nokia, Fujitsu, Samsung are focusing mainly on 5G related innovations.

II. EVOLUTION OF GS

Due to fast revolution in mobile technology, mobile communication has become popular in last few years. This is due to very high increase in telecommunication customers. This evolution is from 1G, 2G, 3G, then the ongoing 4G, and now revolutionary 5G-the fifth second generation.

A. First generation 1G

The 1G otherwise known as First generation of wireless telecommunication technology was developed in 1980. The main difference between today's evolution and 1G was invention of cellular technology in which the signals are analog. This technology used analog transmission techniques which were normally used for transmitting voice signals. 1G consists of various standards. The popular standards were Advance Mobile Phone Service (AMPS), Nordic Mobile Telephone (NMT), and Total Access Communication System (TACS). All these standards uses basic frequency modulation techniques for voice signals and all the incoming and outgoing were managed at the Base Stations (BS). First the spectrum within cell was spitted into number of channels and every call is allotted a dedicated pair of channels. Data transmission between the wire part of connection was done by means of packet switching.



Fig1: First generation of mobile communication.

B. Second generation 2G

2G is the short form of second-generation wireless telephone technology which was introduced in 1991. Three primary benefits of 2G networks over 1G were that conversations over phone were digitally encrypted, 2G systems were more efficient on allowing the spectrum for longer penetration

levels and it also introduced data services, starting with SMS text messages. Various mobile phone network services such as text, picture messages multimedia messages (MMS) has been evolved in 2G. All text messages, which has been sent over the second generation are encrypted digitally. It allows the data in such a way that only the specific receiver can receive and read it. The technologies used in this generation are time division multiple access (TDMA) and code division multiple access (CDMA).



Fig2: Second generation of mobile communication.

C. Third generation3G

Each generation is evolving with high data rates, new frequency bands and stable transmission. The 3G networks were introduced in 1998 Due to the information about location and bandwidth which is available in 3G devices gives rise to innovative applications that has not been used by mobile phone users. Some of the applications are GPS (Global Positioning System) Services related to location Mobile TV as Cast Screen, Video Conferencing. Later 3G releases such as 3.5G and 3.75G.It also provide broadband access in mobile network with high data rate to smart phones and mobile modems in laptop computers.



Fig3: First generation of mobile communication.

D. Fourth Generation4G

Carriers that use a new technology OFDM(Orthogonal frequency Division Multiplexing) instead of TDMA and CDMA are increasing reached a great privilege as 4G.According to recent discovery a 4G network needs a mobile device which can be able to exchange data at a rate of 100 MB/s while 3AG offers very low as 3.84 MB/s. In

consumer point of view this has been more marketing due to high data rates.



Fig4: Fourth generation of mobile communication.

E. Fifth Generation5G

Fifth generation technology is a future technology eliminating all those drawbacks in present and past generations.5G is focusing on internet connecting speeds and high data rates with large number of mobile broadband users per area in Giga bytes range. The World Wide Wireless Web is mainly due to the emerging Wireless Fidelity IEEE802.11ac in which the data rates are high as well as the data buffering and data retransmission threshold exceeded will be considerable comparatively. The receiver performance is good due to high throughput and because of MIMO technology.



Fig5: Fifth generation of mobile communication.

III. 5G ARCHITECTURE

Fifth generation model is all-Internet Protocol based model for wireless mobile networks. The All-IP Network (AIPN) has the ability to satisfy the increasing demands of the mobile communications market. Everything around it is radio access technologies. The All-IP uses packet switching and it provides optimized performance and cost. In 5G Network Architecture consist of a user as a main terminal and a number of independent, radio access technologies (RAT). In this architecture it includes main services such as Mobile health care, portals, government, banking via CCR (Cloud computing resources). In order to access a configurable computing resources such as networks, servers, storage, applications etc.Cloud computing is a convenient model for this network. It allows the users to use applications without installation.

A. Data Architecture

The architecture of 5g network includes several layers and mainly two networks: Radio Access Network(RAN) and Flat IP Network. The RAN is for accessing between the terminals and also it provides an interconnection between the cores. The Flat IP Network is used to deliver the real time data over mobile broadband users. 5G Nano core is another main term in architecture in which it deals with the matter structure in a way as atom by atom and molecule by molecule. This Nanocore includes Cloud Computing and All-IP Network.

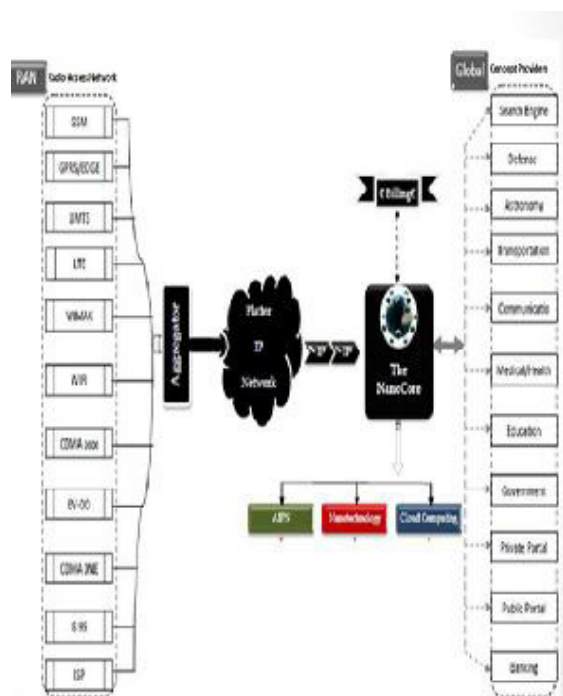


Fig6: Data architecture of 5G.

Cloud Computing

Cloud computing is a more important in this 5G technology. To maintain data and applications this cloud computing uses internet and central remote server. The main advantage is that it allows consumers to use the application without installation and they can access any files at any computer through internet access.

ALL-IP Network

Normally a 5G mobile , needs a permanent “home IP” address along with “care of “address to determine its actual location. Currently, we are using 32 bit IPv4 address. But for multiple address we need to go for 128 bit IPv6 address in which it is divided into two parts. The first part is for home IP and the second part is for care of.

B. Function Architecture

The function architecture consists of mainly five streams in which the total access takes place in wireless connectivity. They are GPRS (General Packet Radio Service), EDGE(Exchanged Data rate for GSM Evolution), 3G, Wireless LAN and LTE (Long Term Evolution).

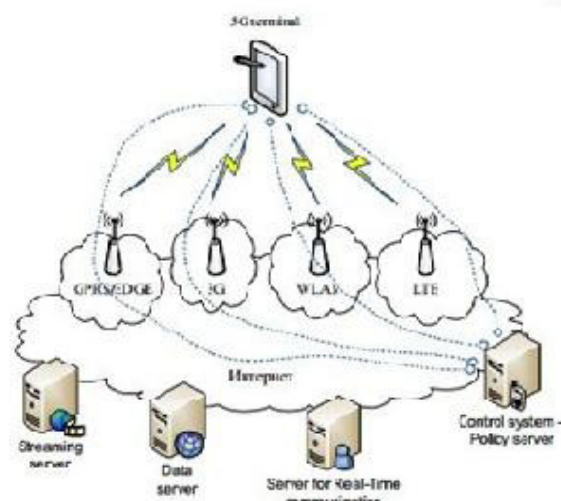


Fig7: Function Architecture of 5G

C. Connectivity -5G

The network infrastructure for 5G technologies requires high capacity because of big size of data to send or receive through tremendous devices like Smartphone, tablets, gadgets and other devices. The connection between the servers is carried out by means of coaxial cable and optical fiber in limited areas. For the next ten years, to connect huge number of devices with internet an alternative technology is required. That particular technology should be capable of withstanding high traffic. This is done by means of 5G Wireless Communication.

D. Advantages of 5G:

- Very High speed, high capacity, and low cost per bit.
- Have Bi- directional, accurate traffic statistics.
- Providing large capacity for broadcasting up to Gigabit
- High uploading and downloading speed in this 5Gtechnology.
- 5G technology offer high resolution for crazy cell phone user and bi-directional large bandwidth shaping.

IV. CONCLUSION

Thus the mobile and wireless networks development is ongoing towards all-IP principle and higher data rates. The latest technologies in this evaluating 5G networks include SDR, nanotechnology, cognitive radio, and importantly cloud

computing. Each year mobile computing is obtaining more processing power longer battery life for some apps and more memory too. It gives more functionalities to the end nodes, will causes reality in the future generation of mobile communication networks, which is referred to as 5G. The next decade is expecting to connect everything to the internet including humans. Every monitoring, security systems, door locks and all mother is connected with million number of sensors and video conferencing should be there with the elimination of direct meeting. An analyst predicts that network connectivity to the internet will increases rapidly from 5 billion to 25 billion in the next decades.

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