

An overview of Applications, Concepts, Challenges in 5G Technology

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Abstract—This paper provides a comprehensive overview of advance wireless communication technology that is known as 5G. In 5G there are more advancement is happening towards the development of World Wide Wireless Web (WWW), Dynamic Ad-hoc Wireless Networks (DAWN) and Real Time Wireless Communication. The most important technologies for 5G technologies are 802.11 and 802.16, Wireless Personal Area Network. 5G technology will include several standards under a common umbrella, similar to 4G. 5G technology is to make use of mobile phones within very high bandwidth. This paper is also trying to show the future of wireless system to the users of current 4G users.

Keywords— Wireless generations (1G, 2G, 3G, 4G), 5G network, architecture, strategies for 5G network.

I. INTRODUCTION

All previous generations are different from each other due to their improved specifications. 5G technology is on its way to change the whole telecommunication history in near future. 1G technology introduced in the year 1970/1984[1]. And 2G technology introduced in the year 1990/1999 the speed of 64 kbps with bandwidth of 30 to 200 KHz. Next to 2G, 2.5G system uses packet switched and circuit switched domain and provide data rate up to 144 kbps.

3G technology introduced in the year 2000 is seen more as pre 4G. Packet Switching is the technique for data sending in 3G networks. For video chatting and for high speed internet service, this network allows 15-20MHz bandwidth at a range of 2100MHz. The evolution of GSM is also a part of this generation. 3G, 3.5G and 3.75G are family member of this generation. High speed internet service, video chatting are key advantages of 3G[3].

In early 2011, fourth generation 4G technology is presented. 4G offers a downloading speed of 100Mbps to 1Gbps. This generation focuses on additional gaming services, HD mobile TV, video conferencing and 3D Television. This generation includes wireless broad band access, Multimedia

Messaging Service (MMS) and Digital Video Broadcasting (DVB). 4G provides global mobility to support different services and devices.

5G is the fifth Generation Mobile Technology; it would be on ground by year 2020. 5G technology has a very high bandwidth nobody experience this high speed ever before. The 5G technologies include all type of advanced features

which makes 5G technology most powerful and in huge demand in near future, as it provides high speed stream. This paper was supported in part by the Department of Computer Science, Shri, Ram Swaroop Memorial University, Barabanki.

II. CONCEPT OF 5G WIRELESS TECHNOLOGIES

This section of the paper focuses on how a 5G network can provide facilitate environment to a common man. A comparison between generations is provided for better understanding the features of 5G technology. Although LTE provides a circumstances to people that are benefited by effective wide range of present wireless communication technology. Generally LTE is used in commercial areas, it's not create an environment for a common man who can easily download a movie or do video call, in fact it is a bottlenecked for real time applications.[4] This main cause leads the inventors to design or launch a new wireless technology as 5G emerging technology, which overcome all these previous issues.

The 5th generation technology is real wireless world network.

A. Abbreviations and Acronyms

World Wide Wireless Web (WWW), Dynamic Ad-hoc Wireless Networks (DAWN) and Real Wireless Communication, The most important technologies for 5G technologies are 802.11 Wireless Local Area Networks (WLAN) and 802.16 Wireless Metropolitan Area Networks (WMAN), Wireless Personal Area Networks (WPAN).

B. Other Recommendations

Features of 5G Technology:

- 5G wireless network is a real wireless world with no

limitations.

- Increased data rates as compared to previous generations.
- Lower battery consumption is another main goal of 5G technology.
- Smart radio technology to share unused range/bandwidth is a part of 5G networks.
- High resolution applications and large bandwidth can be possible in coming network technology.
- Error control mechanism is a part of 5G networks.
- Remote management environment is presented in 5G for user ease.
- It provides ubiquitous computing as user can simultaneously access the different wireless technologies like (3G, 4G, and 5G).
- The 5G technology is providing up to 25 Mbps connectivity speed.
- Large transmission range by introducing 5G networks.
- Worldwide roaming is easily possible in coming technology.

Challenges in Conversion of wireless network 4G to 5G:

There are many challenges are occur in migration a 4G wireless network into a coming 5G network. As some are following:

- One of the main challenges to migrate from 4g to 5G is high operational cost because cost is directly related to energy consumed for transmission. To overcome the cost of 5g network is to make the wireless communication technology must be energy efficient[5].
- It is hard to handle user account information from many service providers. Bugs can be occurring during introducing new features of software applications[6].
- Current 5G technology is focuses on EE (energy efficiency) because it is the main problem to shift wireless LTE into 5G.

Issues in 5G Network:

- 5G wireless technology can decrease the transmit energy per bit, but it cannot reduce the operating energy.
- In 5G wireless networks, power utilization problems occur in this scenario in which single terminals that can be operate in different wireless networks.[8]
- Wide range and high operability cause a security issue in coming wireless technology.
- By using software radio approach, user can access different wireless networks without any restriction of size and cost of device which is much trouble some in previous technology. This leads some security issues in 5G environment.
- Criminal attacks can be possible in the case of signal transmissions which are sending from fake in vendors.
- Wireless networks are relatively less secure than wired network because of easier access of unauthorized persons. So this issue is also present in 5G technology[9].

Solutions of issues in 5G Network:

- Data Encryption can be used to avoid criminal attack.
- Wireless networks are relatively less secure than wired

network because of easier access of unauthorized persons, which can be overcome by using several algorithms of security[10].

III. 5G ARCHITECTURE

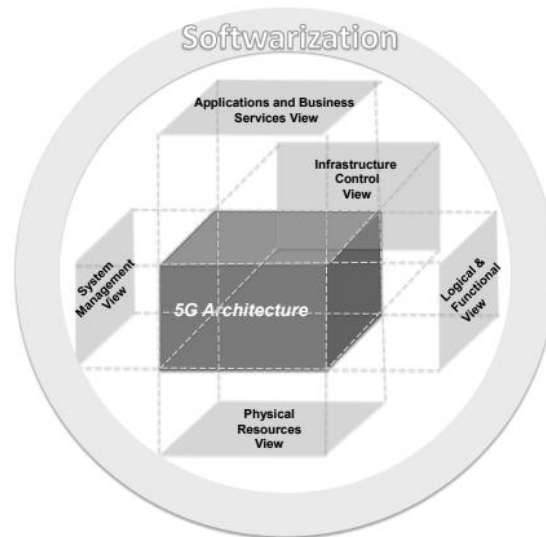


Figure 1: 5G Architecture View

The Figure 1 shows the various related views on emerging 5G design. The softwarization in network and programmability is one of the bases of 5G architecture design which can impact on all identified related views.

The views are further described on the basis of particular aspects about the logical and functional view, the physical resource and infrastructure control view and lastly the system management and applications and business services view.

In the 5G wireless network concept, it is remarkable initiative that user terminals are main focus of 5G mobile networks. The terminals have access to different wireless technologies at the same time and it can also combine some features or aspects from other technologies. 5G totally focused on user-mobility as a mobile phone or terminal intelligently behave to choose stronger wireless scheme to access wireless networks[11].

The overall vision of the 5G network includes a converged heterogeneous network ecosystem and integrating a wide variety of network technologies for radio access with wireless and wired transmission solutions interconnecting a huge number of vastly various and different end users, computer and storage resources[11].

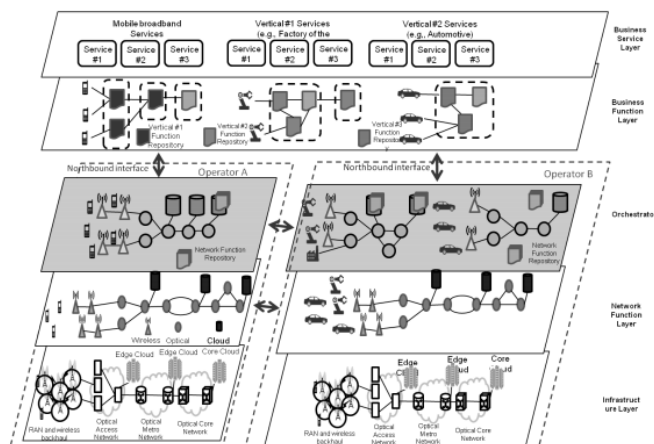


Figure 2: 5G Ecosystem

In Figure 2 the top layer is concerned with the implementation and specification of the business process and the functions related to provisions of application are organized in function repositories. The service provider may offer their services through one or more telecom operators.

To serve such a different ecosystem, the telecom service providers will have to deploy orchestrator functions which will allocate required computing and network resources to the services which are targeting diverse and dedicated for business driven logical networks. The logical networks (network function layer in Figure 2), are called network slices, will have a specialized networking and computing functions that meet the required KPIs of the service providers. 5G networks will also support cross-domain orchestration of services and resources on a multiple administration domains allowing for the flexible sharing schemes. The implementation of such schemes will also require the appropriate interworking among the different telecom operators in the network function layer as well.

The above described evolutions will also have to operate in a ubiquitous and energy-efficient way. The 5G system will also have to be designed in a future-proof way so that it can enable smooth transitions in the future generations.

A faster service instantiation will make a new trust models to support the new business and service delivery models for develop gradually the cyber-threat landscape. This new ecosystem also calls for innovative solutions to address the increasing societal concerns and importance related to user privacy.

IV. CONCLUSION

The main features and characteristics of the 4G technology are being analyzed and enhanced for the inclusion in the upcoming 5G technology. The 5G architecture makes use of different platforms and different layers. In this paper, an overview of emerging 5G wireless technology is provided.

For better understanding of the 5G, all the previous generations are also discussed in the paper. Furthermore, main features goals and challenges of 5G is a part of this paper. As 4G is already launched, the researchers need to focus on the successful development of 5G.

ACKNOWLEDGMENT

This paper is focused on development of 5G technology. The section I of the papers covers the introduction history and background of the 5G technology. The section II defines the concept scope and features of the 5G technology. This section also includes the challenges in conversion of 4G to 5G network, issues in 5G network and some of their solutions.

The section III describes the architecture of the 5G technology. In the end of the paper it has been concluded with an overview of emerging 5G wireless technology is provided and the researcher needs to focus on the development of 5G technology.

This paper inspires me a lot and I will add my new innovations in my next research for the development of upcoming and new emerging 5G technology. The Author thanks to Shri. Ram Swaroop Memorial University, Barabanki for motivating and providing us a platform for the research.

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