



5G Mobile and Wireless Networks

R. Suganya¹, G. Sowmiya², B. Maheswari³

¹Assistant professor, Sri Krishna Arts and Science College, Coimbatore, India

^{2,3}Student, M.Sc(Computer Science), Sri Krishna Arts and Science College, Coimbatore, India

Abstract- In this paper explains about next generation 5G networks. 5G (5th generation mobile networks or 5th generation wireless systems) denotes the proposed next major phase of mobile telecommunications standards beyond the current 4G/IMT (International Mobile Telecommunication)-Advanced standards. 5G planning includes Internet connection speeds faster than current 4G, and other improvements. 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. 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.

Keywords-5G, Radio Access Technology (RAT), VOIP (voice over Internet Protocol), D2D communication.

I. INTRODUCTION

The new 5th generation, 5G technology for cellular systems will probably start to come to fruition around 2020 with deployment following on afterwards. The deployment of any wireless or cellular system takes many years; development of the 5G technology systems is being investigated. The new 5G technologies will need to be chosen developed and perfected to enable timely

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and Japan launched the “2020 and Beyond Ad Hoc” for 5G.

II. NETWORK ARCHITECTURE

Cellular-based network architecture design, from traditional circuit switch (CS) + packet switch (PS) 2G to all-IP flat 4G, enables mobile communications to achieve unprecedented success. Today, the cellular networks have evolved into a huge multi-radio access technology (multi-RAT) and multi-layer heterogeneous network. Architecture of 5G is highly advanced; its network elements and various terminals are characteristically upgraded to afford a new situation. Likewise, service providers can implement the advance technology to adopt the value-added services easily.

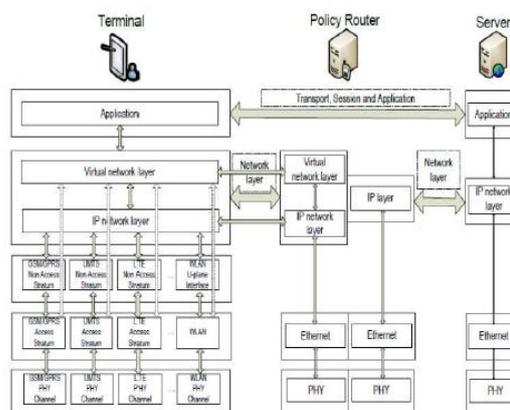


Fig.1 5G Architecture

The system comprising of a main user terminal and then a number of independent and autonomous radio access



technologies. Each of the radio technologies is considered as the IP link for the outside internet world. The IP technology is designed exclusively to ensure sufficient control data for appropriate routing of IP packets related to a certain application connections i.e. sessions between client applications and servers somewhere on the Internet. The system model of 5G is entirely IP based model designed for the wireless and mobile networks.

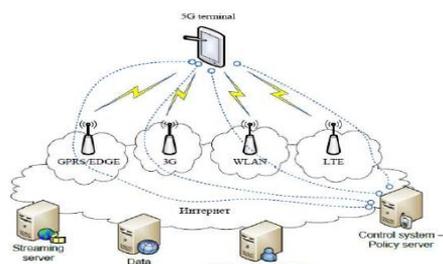


Fig.2 5G Network Architecture

III. DEVICE-TO-DEVICE COMMUNICATIONS

Proximity-based D2D communications under laying cellular networks are a highly efficient way to enhance system capacity and improve spectrum efficiency because it can directly communicates with each other by sharing network frequency resources. Besides, D2D UEs (User Equipment) (DUEs) can act as transmission relays for each other to set up multi-hop communication links. Therefore, it also helps to improve and extend network coverage by DUE relaying. The gain of D2D communications depends on the number of available DUE pairs in various application scenarios. D2D communications will play a more important role. To apply this new technique to 5G systems, the following issues need to be addressed at least:

- **Direct discovery:** Devices must know their neighbors before directly communicating with each other. Thus, proximity-based device discovering and services discovering are two of the major issues in D2D Communications. Direct discovery includes two models: model A and model B. In model A, discoverer UE announces its existence with certain information about itself; discoverer UE will read and process the information only if it is interested. In model B, discoverer

UE transmits a request with certain information about what it is interested to discover; discoverer UE will respond if it meets such a request.

- **Interference management:** As D2D communications share resource in cellular networks, it inevitably generates interference among UEs. In D2D communications, CUEs communication has higher

priority. Power control is used to control the transmit power of DUEs so as to keep the interference from DUEs to CUEs below a certain level.

- **Direct communication:** In 4G systems, physical channels of direct communication link reuse physical uplink shared channel (PUSCH) structures. As single carrier frequency division multiple access (SC-FDMA) has low peak-to-average power ratio (PAPR), it reduces the dynamic range requirements of power amplifier (PA) and improves power efficiency. While in 5G systems, the available frequency resources may disperse in several frequency bands. To flexibly utilize these dispersed frequency resources, new multi-carrier technologies like filter bank multi-carrier (FBMC) are considered.

IV. 5G REQUIREMENTS

Beyond 4G, in next generation networks, the increasing density of the mobile devices. Wireless network coding allows optimization of the two-way communication instead of decoupling.

Data rates	1-10 Gbps/100s of Mbps
Capacity	36TB / 500 Gb/month /user
Spectrum	Higher frequencies & flexibility
Energy	~10% of today's consumption
Latency	~ 1ms
D2D	NSPS, ITS, resilience ...
Reliability	99.999% within time budget
Coverage	>20 dB of LT
Battery	10 years
# devices per area	300.000 per access node

V. 5G MOBILE SYSTEMS STATUS

The current status of the 5G technology for cellular systems is very much in the early development stages. Very many companies are looking into the technologies that could be used to become part of the system. In addition to this a number of universities have set up 5G research units focused on developing the technologies for 5G. In addition to this the standards bodies, particularly



3GPP are aware of the development but are not actively planning the 5G systems yet.

Many of the technologies to be used for 5G will start to appear in the systems used for 4G and then as the new 5G cellular system starts to formulate in a more concrete manner, they will be incorporated into the new 5G cellular system.

The major issue with 5G technology is that there is such an enormously wide variation in the requirements: superfast downloads to small data requirements for IoT than any one system will not be able to meet these needs. Accordingly a layer approach is likely to be adopted. As one commentator stated: 5G is not just a mobile technology. It is ubiquitous access to high & low data rate services.

VI. CONCLUSION

In this paper, a number of potential techniques for the future 5G systems are explained. Although these techniques may be only a small portion of what would be used in 5G systems. 5G technology is the upcoming technology and the bandwidth for this is very high and was having higher data transfer rate. And we also expect that the new network architecture and techniques would come up to promote the current cellular systems. The development of the mobile and wireless networks is going towards higher data rates and all-IP principle. So this paper also explains the architecture of the 5G wireless and mobile network.

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