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5g wireless technology: Future of technology

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Abstract

5G will be an advance technology on 4G. The last four generations give us many benefits in cellular technology. 5G will be future of cellular technology. 5G will provide high carrier frequencies with large bandwidths, large base station, and large number of antennas In This paper we will discusses all challenges to occur in future research and 5G standardization activities. 5G will provide speed up to 10Gbit/s, wider frequency band range. A comparison is given between the all generations so that compare 5G technology is better. Fifth generation network provide a good broadband wireless connectivity (with very high speed). Fifth generation technology will complete all the demands of customers those who always want advanced features in cellular phones, 5G will bring new user experiences and enable the introduction of innovative services. Creative deployment scenarios, such as ultra-dense deployments, will become possible. In addition, 5G will support fast growing areas such as Point-to-Point (P2P) communication that require increased network latency and reliability in order to deliver their full potential as compare to previous generations.

Keywords: 5G standardization activities, different generations of communications

Introduction

Cellular networks technology has made remarkable development in the last few years. We will discuss here the evolution of the different generations of communications and need for 5G technology, its architecture, advantages, and disadvantages. The cellular networks are evolving through several generations.

The first generation (1G) wireless mobile communication network was analog system which was used for voice service. The second generation (2G) is based on digital technology and network infrastructure. 3G systems refer to the developing technology standards for the next generation of mobile communications systems. The 4th Generation LTE (4G) wireless mobile internet networks are research items in academy, which will integrate current existing cellular networks and Wi-Fi networks to support wireless mobile internet as the same quality of service as fixed internet, which is an evolution not only to move beyond the limitations of 3G, but also to increase the quality of services, to enhance the bandwidth and to minimize the cost of the resource.

5G will bring new user experiences and enable the introduction of innovative services. Creative deployment scenarios, such as ultra-dense deployments, will become possible. The 5th wireless mobile multimedia internet networks can be completed wireless communication without limitation.

The 5th wireless mobile internet networks are real wireless world which shall be supported by LASCDMA (Large Area Synchronized Code Division Multiple Access), OFDM (Orthogonal frequency-division multiplexing), MCCDMA (Multi-Carrier Code Division Multiple Access), UWB (Ultra-wideband), Network-LMDS (Local Multipoint Distribution Service), and IPv6.

Differences between the previous generations of mobile networks and 5g? 1. First Generation-1G

1G is the next version of 0G technology. These are the analog telecommunications standards that were introduced in the 1980s. After that 2g launched, although both systems use digital signalling to connect the radio tower to 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 150MHz and up.

2. Second Generation-2G

2G was launched under the GSM standard in Finland in 1991 for the first time, call could be encrypted and digital voice calls were significantly clearer with less static and background crackling. For the first time, people could send text messages, picture messages, and MMS on their phones. And use the bandwidth of 30 to 200 KHz. It provided data bandwidth up to 64 kbps. Although 2Gs transfer speeds were initially only around 9.6kbit/s, operators rushed to invest in new infrastructure such as mobile cell towers. By the end of the era, speeds of 40kbit/s were achievable and EDGE connections offered speeds of up to 500kbit/s.

3. Third Generation-3G

3G was launched by NTT DoComo in 2001 and aimed to standardize the network protocol used by vendors. This meant that users could access data from any location in the world as the data packets the drive web connectivity were standardized. This made international roaming services a real possibility for the first time.3G's increased data transfer capabilities also led to the rise of new services such as video conferencing, video streaming and voice over IP in 2002, the Blackberry was launched, and many of its powerful features were made possible by 3G connectivity.

4. Fourth Generation-4G

4G was first deployed in Stockholm, Sweden and Oslo, Norway in 2009 as the Long Term Evolution 4G standard. The basic feature of 3G Technology is fast data transfer rates up to 1 gigabit per second for stationary users. 4G is in current use and is quite efficient. The technology used by 4G is WiMax LTE Wi-Fi. It provides data bandwidth of up to 1Gbps. 4G offers a downloading speed of 100Mbps.4G provides same feature as 3G and additional services like Multi-Media Newspapers, to watch T.V programs with more clarity and send Data much faster than previous generations. LTE (Long Term Evolution) is considered as 4G technology

5. Fifth Generation-5G: 5G will drive the future evolution of the internet itself.

• Implementing the next generation of ultra-broadband network infrastructure will require a rethinking,

restructuring and redesigning of approaches to mobile network construction and expansion.

• Integration of mass-scale cloud architectures will infuse mobile networks with capabilities for flexibly delivering services at unprecedented speeds while meeting forecasts for tremendous growth in mobile data traffic, diversification of mobile app innovation, IoT connectivity, and security.

To achieve these goals, developments in 5G will primarily focus on two fundamental aspects for eliminating infrastructure bottlenecks: massive capacity and massive connectivity.

5G technology going to be a new mobile revolution in mobile market. Through 5g technology now you can use worldwide cellular phones and this technology also strike the china mobile market and a user being proficient to get access to Germany phones as a local phone.

• Features

- a) 5g technology offer high resolution for crazy cell phones user and bi-directional large bandwidth shaping.
- b) The advanced billing interfaces of 5g technology makes it more attractive and effective.
- c) 5g technology also providing subscriber supervision tools for fast action.
- d) The high quality services of 5g technology based on policy to avoid error.
- e) 5g technology is providing large broadcasting of data in gigabit which supporting almost 65000 connection.
- f) 5g technology offer transporter class gateway with unparalleled consistency.
- g) The traffic statistics by 5g technology makes it more accurate.
- h) Through remote management offered by 5g technology a user can get better and fast solution.
- i) The remote diagnostics also a great feature of 5g technology.
- j) The 5g technology is providing up to 25 Mbps connectivity speed.
- k) The 5g technology also support virtual private network.
- The new 5g technology will take all delivery service out of business prospect

Generation	Speed	Technology	Key Features
1G (1970–1980s)	14.4 Kbps	AMPS,NMT, TACS	Voice only services
2G (1990 to 2000)	9.6/ 14.4 Kbps	TDMA,CDMA	Voice and Data services
2.5G to 2.75G (2001-2004)	171.2 Kbps 20-40 Kbps	GPRS	Voice, Data and web mobile internet, low speed streaming services and email services.
3G (2004-2005)	3.1 Mbps 500- 700 Kbps	CDMA2000 (1xRTT, EVDO) UMTS and EDGE	Voice, Data, Multimedia, support for smart phone applications, faster web browsing, video calling and TV streaming.
3.5G (2006-2010)	14.4 Mbps 1- 3 Mbps	HSPA	All the services from 3G network with enhanced speed and more mobility.
4G (2010 onwards)	100-300 Mbps. 3-5 Mbps 100 Mbps (Wi-Fi)	WiMax, LTE and Wi-Fi	High speed, high quality voice over IP, HD multimedia streaming, 3D gamming, HD video conferencing and worldwide roaming.
5G (Expecting at the end of 2019)	1 to 10 Gbps	LTE advanced schemes, OMA and NOMA	Super fast mobile internet, low latency network for mission critical applications, Internet of Things, security and surveillance, HD multimedia streaming, autonomous driving, smart healthcare applications.

Fig 1: Comparison of 1G to 5G technology

5G Architecture



Fig 2: Architecture for 5G mobile Networds

5G mobile systems model is all-IP based model for wireless and mobile networks. The All-IP Network (AIPN) is increasing demands of the cellular capable to communications market. It is a common platform for all radio access technologies. The AIPN uses packet switching and its continuous evolution provides optimized performance and cost. In fifth generation Network Architecture consist of a user terminal (which has a crucial role in the new architecture) and a number of independent, autonomous radio access technologies (RAT). In 5G Network Architecture all IP based mobile applications and services such as Mobile portals, Mobile commerce, Mobile health care, Mobile government, Mobile banking and others, are offered via Cloud Computing Resources (CCR). Cloud computing is a model for convenient on-demand network access to configurable computing resources (e.g., networks, servers, storage, applications, and services). Cloud computing allows consumers to use applications without installation and access their personal data at any computer with internet access. CCR links the Reconfigurable Multi Technology Core (RMTC) with remote reconfiguration data from RRD attached to Reconfiguration Data models (RDM). The main challenge for a RMTC is to deal with increasing different radio access technologies. The core is a convergence of the nanotechnology, cloud computing and radio, and based on All IP Platform. Core changes its communication functions depending on status of the network and/or user demands. RMTC is connected to different radio access technologies ranging from 2G/GERAN to 3G/UTRAN and 4G/EUTRAN in addition to802.11x WLAN and 802.16x WMAN. Other standards are also enabled such as IS/95, EV- DO, CDMA2000...etc. Interoperability process-criteria and mechanisms enable both terminal and RMTC to select from heterogeneous access systems.

Advantages' of 5G

• It provides Very High speed, high capacity, and low cost per bit.

- It provides multimedia, voice, video, Internet, and other broadband services.
- 5G technology offers Global access and service portability.
- It offers the high quality services due to high error tolerance.
- It is providing large broadcasting capacity up to Gigabit which supporting almost 65,000 connections at a time.
- More applications combined with artificial intelligent (AI) as human life will be surrounded by artificial sensors which could be communicating with mobile phones.
- 5G technology use remote management that user can get better and fast solution.
- The uploading and downloading speed of 5Gtechnology is very high.
- 5G technology offer high resolution for crazy cell phone user and bi-directional large bandwidth shaping.
- 5G technology offer transporter class gateway with unparalleled consistency

Conclusion

5G technologies is the upcoming technology and the bandwidth for this is very high and was having higher data transfer rate. However, now we are using the 3G technology efficiently and in some countries the people are using the 4G but in future we can use the 5G technology. Many big countries are investing huge amount of money on this project as it was having high demand in the future. It will altogether manufacture flexibility, limit, degree, comparability and meeting. Thusly, it will satisfy the growing solicitations of rising big-data, cloud. Point-to-Point, and diverse applications.

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