

Revolution of 5g Wireless Technology-Future Direction

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Abstract: 5G technology is the fifth generations mobile technology. form the generation of 1G to 2.5 G and 3G to 5G, the world of communication experienced many improvements and improvements in performance every day this rapid revolution in mobile computing brings about changes, such as work, interaction and learning in daily life. fifth generation network provide affordable high-speed wireless broadband connectivity. This document highlights the 5th generation network technology architecture. Currently, the term 5G is not officially used. the fifth generation is developing WWW (world wide web), DAWN (dynamic adios wireless network) and real wireless world. The fifth generation is focused on VOIP devices that support VOIP and provide users with high bandwidth and data transfer.

Index Terms- 5G, Evolution from 1G to 5G, Comparison for 1G to 5G, Architecture of 5G.

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I. Introduction

Wireless communication began in the early 1970's. over the next 40years cellular technology has grown from the first generation to the fifth.the technology of the fifth generation provides a very high throughput, which we have not experienced before. The technology of the fifth generation offers many new and complex functions, which makes it the most powerful and popular solution in the future. Provides various network services such as Wi-Fi (wireless IEEE 802.11network), WIMAX (wireless network and IEEE802.16 cellular network), a sensor network, or a private network (E.g. Bluetooth). The cellular terminal includes various interfaces such as GSM, based on circuit switching. All wireless and circular networks adhere to the principles of IP. All data and signals are sent to the internet protocol level. 5th generation technologies such as cameras MP3 players video players, mass storage and audio players and user never laugh at children using Bluetooth and picante technology. fifth generation wireless multimedia wireless internet network are completely wireless in their wireless capabilities, creating a complete wireless world. World Wide wireless Network (WWW). fifth generation is based on 4G technology fifth wireless cellular internet is a true wireless network that must be supported by large code division multiple access (LASC DNA) orthogonal frequency multiplexing (OFDM), multi-carrier multi-access codes (MCCDMA), and local multi point service (LMDS). wireless environment the fifth-generation technology provides extensive data transfer capabilities, unlimited call values and unlimited data transfer capabilities in the latest mobile operating system. the fifth generation should be of a great value and provide more service and benefits than 4G.the 5th generation should be smarter than technology that connects the world without limits. this generation is may going to announce in 2020.the world of universal, uninterrupted access to information, entertainment and communication will open a new dimension to change people to our way of life



Fig: wireless communication system

II. Evolution Of Wireless Technology

Cellular communication has gained popularity in recent years because of the rapid revolution in cellular technology. This revolution is due to very high increase in telecom customers. this revolution is from 1G- The first Generation ,2G-TheSecondGeneration,2.5Generationand2.75Generations,3G-ThirdGeneration,4G-TheForth Generation,5G-The Fifth Generation.

I. FIRST GENERATION(1G):

The first generation of cellular network was introduced in japan in 1979by the Nippon Telephone and Telegraph Company (NTT) in Tokyo. This system usesanalogy signals and has many disadvantages due to technical limitation.

Key feature of 1G:

- Frequency of 800MHz and 900 MHz
- Speed :10 MHz (666 duplex channels with 30KHz bandwidth).
- Technology: analogswitching.
- Modulation: frequency modulation.
- Service type: only language.
- Access technology: double frequency access division

II. SECOND GENERATION(2G):

The second-generation mobile communication system introduces a new digital wireless transmission technology, also known as the Global Mobile Communication System (GSM). GSM technology has become a fundamental standard for further development of radio standards. this standard supports speeds of up to 14.4 to 64 kbps, which is sufficient for SMS and Email services. the CDMA (code division multiple access) system developed by QUALCOMM will also be introduced an implemented in the mid -1990s. CDMA offers more GSM capabilities in terms of spectral efficiency, number of users and data rate

Key feature of 2G:

- Digital system (switching).
- SMS service is possible.
- Roaming is possible.
- More security.
- Coded voice transmission.
- First internet with slower speeds.

III. 2.5G and 2.75G SYSTEM:

To maintain high data rates, a GPRS services has been introduced and successfully implemented. GPRS supports data rates of up to 171 kbps(maximum). EDGE-the evolution of advanced GSM data has also been developed to increase the speed of data transmission in GSM network. EDGE can transmit up to 437.6kbps(maximum). other popular CDMA2000 technologies have also been introduced to support higher data rates of CDMA networks. This technology can provide data rates up to 384kbps (maximum).

IV. THIRD GENERATION(3G)

Third-generation cellular communication beganwith the introduction of universal mobile terrestrial/telecommunication system (UMTS). UMTS has a data transfer rate of 384kbps and is the first to support video calls on mobile device special applications are being developed for functional smartphones with multimedia chat,email, video chat, games, social-network and healthcare.

Key feature of 3G:

- Higher data transfer.
- Video calling
- Saved security, more users and Foci streaming mobile free rolls.

V. FOURTH GENERATION(4G):

The 4G system is an enhanced version of the 3Gnetwork developed by IEEE, providing higher data rates and more sophisticated multimedia services. LTE and advanced LTE wireless technology are used in 4th generation system, it is also backward compatible, which makes it easy to develop and update LTE and LTE advanced networks.

In LTE system, the data transfer rate can be significantly increased, allowing you simultaneously transmit voice and data. all services, including voice, can be sent via IP packets. complex media modulation and aggregation schemes are used to double the downlink/downlink throughput. Wireless transmission technologies such as WiMAX are embedded in 4G systems to improve data transfer speed and network performance.

Key feature of 4G:

- Significant data security up to 1 GBPS.
- Increased safety and mobility.
- Reduced latency for key applications.
- Streaming video and HD games.

VI. FIFTH GENERATION(5G):

5G uses the latest technology to provide customers with very fast access to the internet and multimedia. in the future, the LTE network is expected to be converted to 5G network. To achieve higher data rates, 5G technology uses millimetre waves and data transmission spectrum without resolution.

Key features of 5G:

- 10 Gigabit/ super-fast cellular internets.
- Low latency in milliseconds (critical for critical applications).
- Reduce overall data costs.
- High security and reliable network.
- Use technology such as a small cell that forms a beam to increase efficiency.
- Future compatibility networks provide further improvements in the future.
- Cloud infrastructure provides energy efficiency, ease of maintenance and equipment upgrades.

COMPARISION OF 1G TO 5G

	1G	2G/2.5G/2.75G	3G	4G	5G
Band Width	2kbps	14-64kbps	2mbps	200mbps	>1 GBPS
Technology	Analog	Digital	CDMA2000, UMTS, EDGE	Wi-Fi max , LTE, WI-FI	WWWWW
Core network	PSTN	PSTN	packet network	Internet	Internet
Multiplexing	FDMA	TDMA	CDMA	CDMA	CDMA
Switching	Circuit	Circuit and packet	packet	all packet	all packets
Primary services	Analog phone cell	Digital phone call and messaging	phone calls, messaging, data	All IP services (including voice message)	High speed, high capacity and provide broadcasting of data in GBPS
Key differentiator	Mobility	Secure, mass adoption	Better internet experience	Faster broadband internet, lower latency.	Better coverage and no dropped calls, much lower latency, better performance
Weakness	poor spectral efficiency	Limited data rates, difficulty to support demand for internet	Real work fails to match type, failure of WAP for internet access	Battery use is more, required complicated and expensive hardware	????????

Comparison table from 1G to 5G

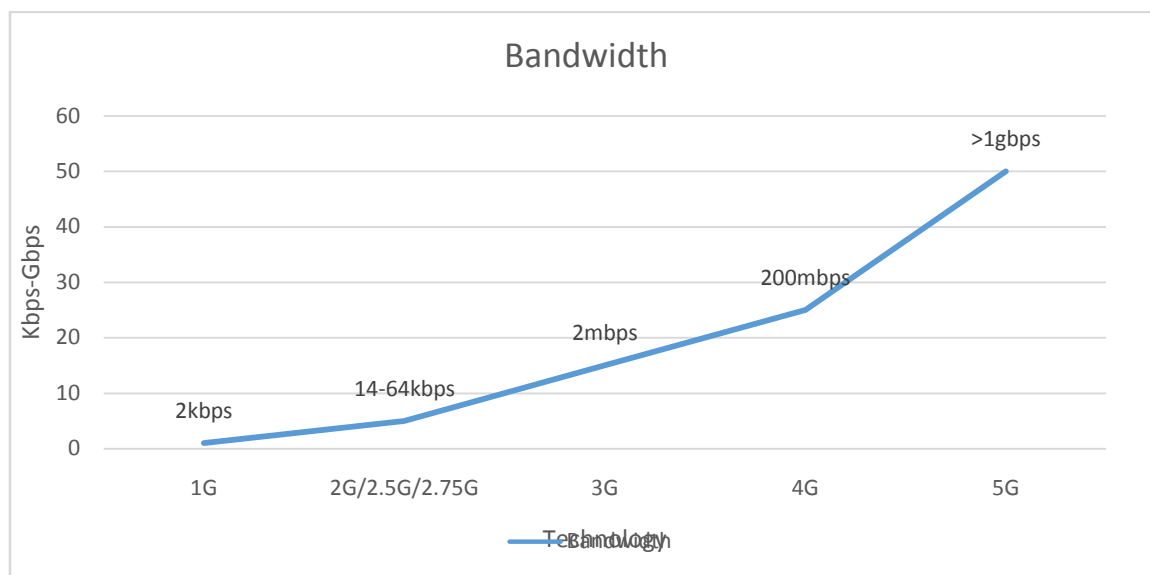
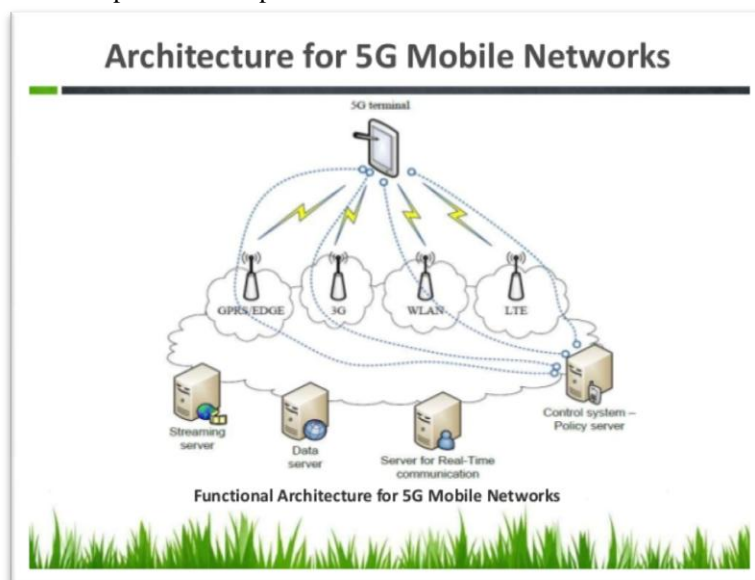


Fig: line chart to show the bandwidth of various technologies

III. Architecture For 5g Mobile Network

GPRS (GENERAL PACKET RADIO SERVICE)

- used to transfer data at a speed of 60 kbps



- Also reduce battery consumption when sending, receiving or searching the internet.

FIG: architecture of 5G

EDGE (EXCHANGED DATA RATE FOR GSM EVOLUTION):

- This is an enhanced version of GPRS
- Provides data transfer rate of 473 kbps.
- 3G video allows you to make calls over the cellular network.
- It also provides an efficient way to surf the internet over the cellular network.

WALN(WIRELESS LAN):

- Wireless LANs provide a high-speed wireless connection for transmitting data over short distance between cellular device that use wireless signals.

LTE (LONG TERM EVOLUTION):

- LTE stands for cellular for high speed cellular data
- Speed up to 100 mbps.

As shown in the above image the 5G model is a complete IP based model for the wireless and cellular networks. The system consists of the main user terminal and a number of independent autonomous wireless access technologies. Each radio technologies are considered as the IP connection to the outside world. IP technology was developed solely to provide the appropriate control data for the transfer of IP packets associated with a particular application connection. Session between web client and server application. Package delivery must also be determined according to user instruction. (shown in the image given below).

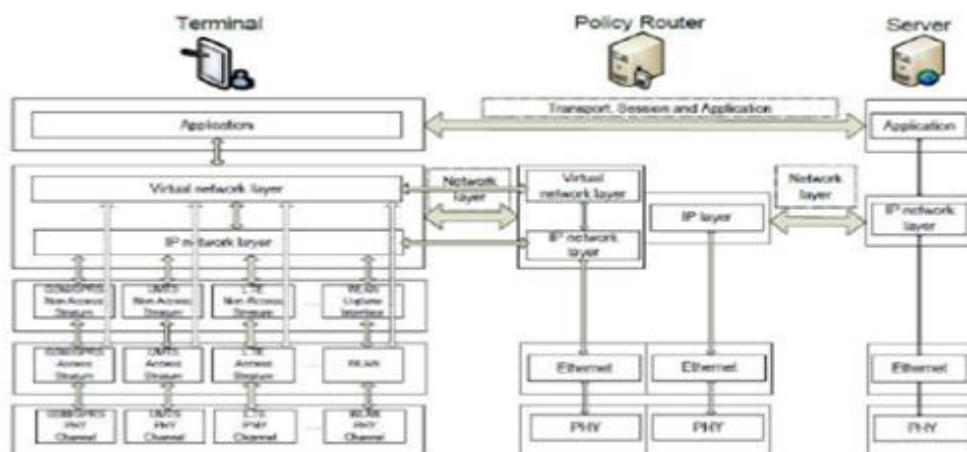


FIG: network architecture of 5G

HARDWARE OF 5G

- UWB (ultra-wide band) network with higher BW at lower energy levels.
- BW is 4000 mbps,400 times faster than modern wireless networks.
- Use smart antenna
- Uses CDMA (code division multiple access).

SOFTWARE OF 5G

- 5Gwill become an integrated standard for various wireless networks, including LAN technologies, wireless LAN/WWW networks, unified IP addressed and a full combination of broadband access.
- Software is determined by radio. encryption, flexibility, virus protection.

ARTIFICIAL INTELEGNCE

New technologies, such as IOT and cloud, process large amount of data online. Automation is needed for better network planning and connectivity.usually, a mesh something through a node and then performs an action that an ordinary human controller wants.

AI based intelligent grid applications, such as precision algorithms, can provide intelligent network operations and simplify maintained. artificial intelligence also provides automated network development, self-optimization and self-processing’s, complemented by high computing performance and data analysis.

An intellectual property network can be viewed as something more than a correlation program, and can provide a result-based scenario (“what do you want to do?”).in the future, artificial intelligence can not only distinguish cause effect from correlation, but also actively engage in choosing their own problems outside of human programming and before clients realize the problem (“I can take care of myself”)

HOW ARTIFICIAL INTELLIGENCE WILL INTEGRATE TECHNOLOGIES?

All software and hardware must be added. They will help you build critical network systems and distributed architectures for these solutions. WithSDA (software defined), the network can respond to situations without unbelievable changes to system components. With AI, the SDN/NFV is powerful network assessment and deployment tool.it it effective. this can help you overcome concern about analysing large amounts of consumer detection information, exceptions, and potential security problems, this helps optimize profit margins by improving network performance and reconfiguring networks, as well as restoring or reducing service levels when attacking cybersecurity.

IMPLEMENTATION OF 5G USING ARTIFICIAL INTELLIGENCE

If the 5G delay is low, IOT device at the network edge can perform more data calculations before sending to the cloud. Forexample, AI interacts with the cloud and uses the computational power of a smartphone

to display images instead of delaying user interaction. “consumer and businesses don’t always want to send data to the cloud,” he said. “5G will be an important factor in improving network capabilities and reducing cloud dependency. Computer technology can also mean a better understanding of the situation in which a device operates.ultimately,this makes artificial intelligence an integral part of everyday applications.” AI is actually an exercise in computer activity, previously only in the human sphere.” “but when you make a good AI, you need to understand certain situations or information.

AI ENABLED NETWORKS HAVE FASTER AND SMARTER CONNECTION TO IMPULSIVE DATA5G

connectivity provides grater bandwidth, latency and higher reliability than existing wireless networks, so more data is transferred faster than current 4G technology. for example, LTE reaches 1 gigabit per second, and 5G is designed to deliver 10 gigabytes of data per second. this overcomes the increase in the number of AI services, improving the stability of AI services in various *situation*



Fig: Artificial intelligence on 5G network

Self- powered vehicles provide 5G for immediate response. with greater bandwidth, a digital assistant, such as Alexa, can identify their voice at home, so online services can only accept orders from mom and dad. This allows children to randomly order food, such as dolls or cookies, and break the bank. The computer always works well. When data is provided consistently, structured information and standards, such as: example: numbers and equations. But people and most people deal with unstructured information in audio, video, text and number.

WHY TO USE 5G TECHNOLOGY

- high speed, morecapacity, and low cost per bit.
- it supports interactive, voice, video,internet and other broadband services and provides more efficient, attractive, bidirectional and accurate traffic statics.
- This provides high quality service with high resiliency.
- Provides maximum gigabit bandwidth with support for nearly 65,000 connections.
- More applications in conjunction with artificial intelligence sensors that can communicate with mobile phones.
- 5G technology uses remote control to help users find a faster and better solutions.
- High bandwidth design.
- 5G technology provides unmatched class consistency.

HOW ARE THE COUNTRIES PREPARING FOR THE 5G LUNCH?

Although it absolutely was the U.S. united Nations agency won the race of launching the 4G, currently there are several countries united nation agency is operating arduous to lunch the 5G in their country initial. here could be a preview of however these outstanding countries are making ready for the lunch of 5G.

1 The united states of America:

The USA is one among the advanced countries in providing the technical answer for proving the network in its preparations of launching the 5G ,the federal communication commission can offer a good quantity of spectrum for the wireless communication, smaller sizes of wireless cells and a lot of modulation schemes, belongings a larger range of wireless users share the spectrum .it’s evident that 5G can offer a minimum of one gigabit per second for the affiliation speed, will have shorter delays than 4G and also offers the supporting applications requiring an oversized capability.

2. **JAPAN:**According to the networking department of japan, the 5G technology are 10 times quicker than 4G, japans 3 biggest carriers NTT DoCoMo INC(ADR), KDDI corp. (TYO:9433) and Softbank cluster cooperation.

(TYO:9984), and therefore the personal sector French telephone manufacturer and base station like Panasonic, Fujitsu ltd, and sharp corporation, are operating along for lunching the 5G.

3. INDIA: Even though India fell behind throughout the implementation of 3G and 4G however its within method of building a roadmap to launch 5G in conjunction with different advanced countries. internationally India has gained a stimulating name in providing the IT services, like several different country's Indian telecommunication firms like reliance JIO unitedly with Apple, plan and different firms are engaged on developing the effective atmosphere in India. Bharati Airtel recently partners with the Swedish telecommunication large Ericson to deploy 5G in India and conducted tests .it commented that "5G has an especially high output and ultra-low latency". The TRAI has researched that the 3300-3400 megacycle per second and 3400-3600 MHZ bands within the country suit for the 5G .in conjunction with this GSM Association is additionally collaboration with Indian telecommunication to arrange the roadmap for launching the 5G.

IV. Conclusion

The development of cellular and wireless networks is moving towards higher data rates and IP. Mobile devices provide more computing power, more memory and a longer battery life for the same applications compared to the previous technology. 5G combines the latest technologies such as cognitive radio, SDR, nanotechnology, cloud computing and all IP platforms. The original philosophy of the internet hopes to keep the network as simple as possible and provide more endpoint functionality that will be implemented in next generations cellular networks.

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