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Future Technology of 5G in Mobile Network

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ABSTRACT:

At early times the first generation of mobile network is wireless technology introduced in 1980 also known as 1G introduced in Tokyo, in second generation of mobile network is Global System for Mobile Communications(GSM) in 1991 also known as 2G, in third generation focused on standardizing vendor's protocol in 2001 also known as 3G, in fourth generation of mobile network uses for commercial use introduced in 2001 and the latest technology of mobile network is 5G introduced in 2019 uses less latency.

Keywords- LTE, IOT, SMS, FDMA, CDMA, MIMO, mm Wave, ms

I. INTRODUCTION

5G refers to the next wireless technology used in mobile technology uses low bandwidth and low bandwidth. It provides wireless connection with the broadband facility provides internet access in homes, colleges and offices at a very high speed at low cost. Cellular Phone Companies began deploying 4G network mobile phones in 2019 and introduced 5G mobile phones and 5G mobile networks across all over the world. 5G Mobile Networks are made up of wireless connections, in which the services are divided into geographical areas into small areas called cells. Due to huge demand in world for more connection the mobile communication network have to get

advanced rapidly to meet the needs of users. It provides LTE (long-term evolution) advanced mobile network with ahigh speed of data and multimedia experience. To achieve high data rate, the goal of 5G, it will use mili-meter waves and bandwidth spectrum for data transmission and exchange of messages. 5G provides complex technique formodulation of data which enables better mobile experience network using

Internet of Things (IOT).

It has revolutionized the new era in the world in which we connect and communicate among people. It promises andlead new industries such as healthcare, entertainment, transportation and manufacturing. The range of download speed up to 10 gigabits per seconds, as it provide users to download large amount of data such as audio, video, games and movies. This high-speed connectivity enhances productivity of work and enriches user experience, making tasks easier that once took minutes now possible within seconds. A fifth generation mobile networks have the ability to support a high number devices per unit area. It also improves the device density using less resources and more efficient use of scalability needs of IOT deployments.

Fig 1 : 5G OFFICIAL LOGO

Source logo image url :- https://telecom.economictimes.indiatimes.com/ne ws/5g-technology-gets-a-new-official- logo/57119487

II. EVOUTION OF MOBILE NETWORK GENERATION FROM 1G TO 5G

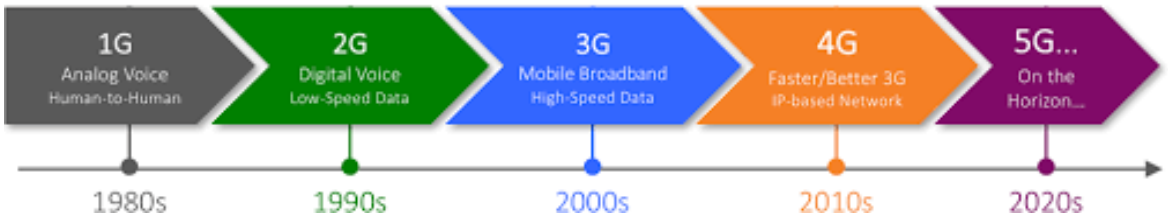

Fig 2: Mobile Cellular Networks

Source logo Image Url :- https://www.researchgate.net/figure/Evolutional-Changes-in-Mobile- Technologies7_fig2_339557457

III. COMPARISON OF ALL MOBILE NETWORKS FROM 1G TO 5G GENERATIONS

1. TABLE OF ALL GENERATIONS OF MOBILE NETWORKS

Factors	**1G**	**2G**	**3G**	**4G**	**5G**
Invented by	Amoes Joel & Martin Cooper	Joel Engel & Richard Frenkiel	Henning Schulzrinne	Martin Cooper	Organizations of Ericsson, Nokia , Samasung
Introduced in Where and Year	Japan , United States in 1980s	Northern Europe in 1980-1990s	United States, South Korea in early 2000s	Sweden, Norway in late 2010s	South Korea, China in 2020s
Speed of Data Transfer Rate	2.4 to 9.6 kilobites per second (kbps)	9.6 to 35 (kbps)	100 (mbps)	100 mbps to user location	Gigabites per second
Cost	It is based on voice minutes and duration of calls	It depends on voice call plans	It is a combination of voice and data charges	It is based on service provider and region	It is based on specific plans depends on country, region.
Bandwidth	30 kHz to 200 kHz	around 200 kHz	few megahertz to around 20 MHz	5 MHz to 20 MHz	5MHz to 100 MHz
Services	focuses on providing voice call communication	introduces digital communication and SMS facility	data transfer rates and enabled mobile internet access	faster data speed and low latency	Faster data speeds and ultra low latency
Multiplexing	FDMA	TDMA, CDMA	CDMA	CDMA	CDMA
Drawbacks	It provides very less network for calling	It is provides digital signals which is harmful for animals	accommodates lowernetwork capacity	being deployed	limited coverage, Infrastructure Requirements

IV. FEATURES OF 5G

1. It provides faster data speed to transfer the data in seconds
2. It aims to deliver the data with a massive devices simultaneously ultra low latency between the sender and receiver It supports virtual private network
3. The information of data transfer rate is more reliable and accurate number of devices simultaneously
4. It aims to divide the physical network into multiple virtual networks .
5. It produces dynamic spectrum sharing and optimize use of network resources.
6. It also gives high capacity, improved coverage and better experience in mobile phones.

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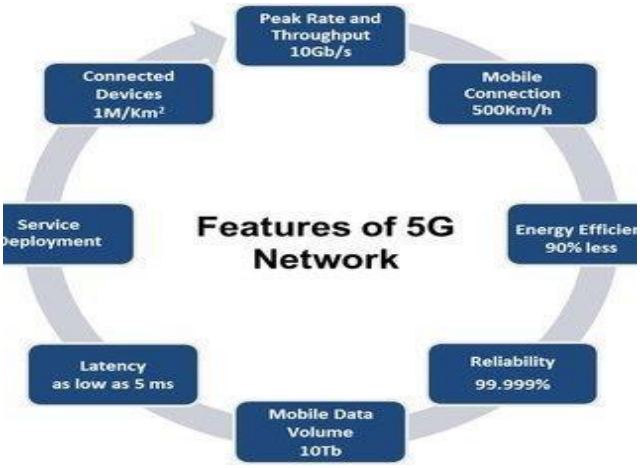

Fig 3: Characteristics of 5G .
Source logo Image Url :- Unique Feature of 5G Networks |

V. CONDITIONS OF 5G MOBILE NETWORK MOBILE NETWORK

The conditions of 5G Mobile network can depend on specific use case and different scenarios are :-

a) It is designed to support peak data rates up to 10 gigabits per seconds**.**
b) It is expected to deliver low signals reducing the delay between sender and receiver.
c) It provides massive device connectivity between the sender and receiver.
d) It is mostly used due to video calling and mobile surfing is decreasing faster.
e) Different service providers are pressurized to reduce the cost of recharges at a minimal cost

Fig 4: 5G REQUIREMENTS
Source logo Image Url :- Download Scientific Diagram 5G: The Hype, the Hope and the Must Have? | Energy Central - EnerNex

VI. WHY DO WE NEED 5G ?

- It supports faster data speed as compared to previous generation of mobile networks.
- It provides ultra low latency which means very less delay in data transmission.
- It gives a explosive growth in different technologies like MIMO (Multiple Input Multiple Output),
- increases network capacity and accommodate handle large number of devices simultaneously.
- It is expected to be the foundation for the widespread of IOT devices like smart phones and enhance efficiency and quality of life.

VII. 5th GENERATION SPECIFICATION'S Here are some of the important specifications of 5G:

- Higher Data Rates: 5G aims to deliver significantly higher data rates compared to previous generations. Itpromises peak data rates of up to 10 Gbps, allowing for faster download and upload speeds.
- Lower Latency: 5G aims to reduce network latency to as low as 1 millisecond (ms). Lower latencyenables real-time communication and enhances applications like online gaming, virtual reality, andautonomous vehicles.
- Increased Capacity: 5G intends to provide increased network capacity to support a massive number of connected devices simultaneously. This is achieved through advanced technology like MIMO Multiple- Input Multiple-Output.
- Enhanced Spectral Efficiency: 5G employs advanced modulation schemes and signal processing techniques to improve spectral efficiency.
- Wider Bandwidth: 5G utilizes wider frequency bands, including both lower frequency sub-6 GHz bands and higher frequency mm Wave (millimeter wave) bands. The availability of wider bandwidth allows forfaster data transmission and improved network performance.
- Network Slicing: Networking slicing allows operators to allocate network resources based on specific usecases, providing tailored connectivity and service characteristics.

VIII. TECHNOLOGICAL CHALLENGES

- While 5G brings numerous advancements, its deployment and implementation also come with severaltechnological challenges. Here are some of the key challenges associated with 5G:

❖ Infrastructure Requirements: 5G requires a significant investment in new infrastructure, including the installation of additional base stations and small cells. The deployment of 5G networks requires a dense network of smaller cells due to the higher frequency bands, which have shorter range coverage compared tolower frequency bands used in previous generations.

❖ Higher Frequency Bands: 5G utilizes higher frequency bands, including mm Wave frequencies, to achieve faster data rates. However, these higher frequency bands have shorter wavelengths, leading to challenges inpropagation and penetration through obstacles. Obstacles like buildings and trees can significantly impact signal strength and coverage.

❖ Signal Interference: The use of higher frequency bands in 5G can be susceptible to signal interference fromvarious sources, including buildings, weather conditions, and foliage. This interference can result in reduced signal quality and coverage, especially in urban areas.

IX. FUTURE SCOPE

In the coming era of new technology 5G will provide very good quality of facilities like less latency and bandwidth which will help to improve the communication to customers. 5G is a wireless technology in which internet access is provided free of cost after buying a new 5G device and 5G sim card. It takes very less to transmitthe data between the sender and the receiver at very less cost.

Around more than 50.000 citizens 5G will provide wide area network communication and wireless connection provides local area network in different areas around the globe. It provides a very crucial role in industries and technologies like enhanced mobile broadband, internet of things and healthcare. It revolutionize transportation system by enabling connected and autonomous vehicles to connect with each other easily. 5G's less latency and high bandwidth will open the doors of new virtualand reality applications.

X. CONCLUSION

5G will appear a signification break forward in wireless communication in mobile network offering less latency, higher bandwidth compared to previous generations of mobile technology. The Internet of Things will begreatly help 5G, as it can help to connect various devices. It will also provide a higher growth in smart cities, smart homes and automation industry leads to increase efficiency in automation and new applications. As with new advancement, 5G technology brings its own set of security and privacy challenges. It is important for government, network operators to address the concern through very effective security measures and regulations.

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