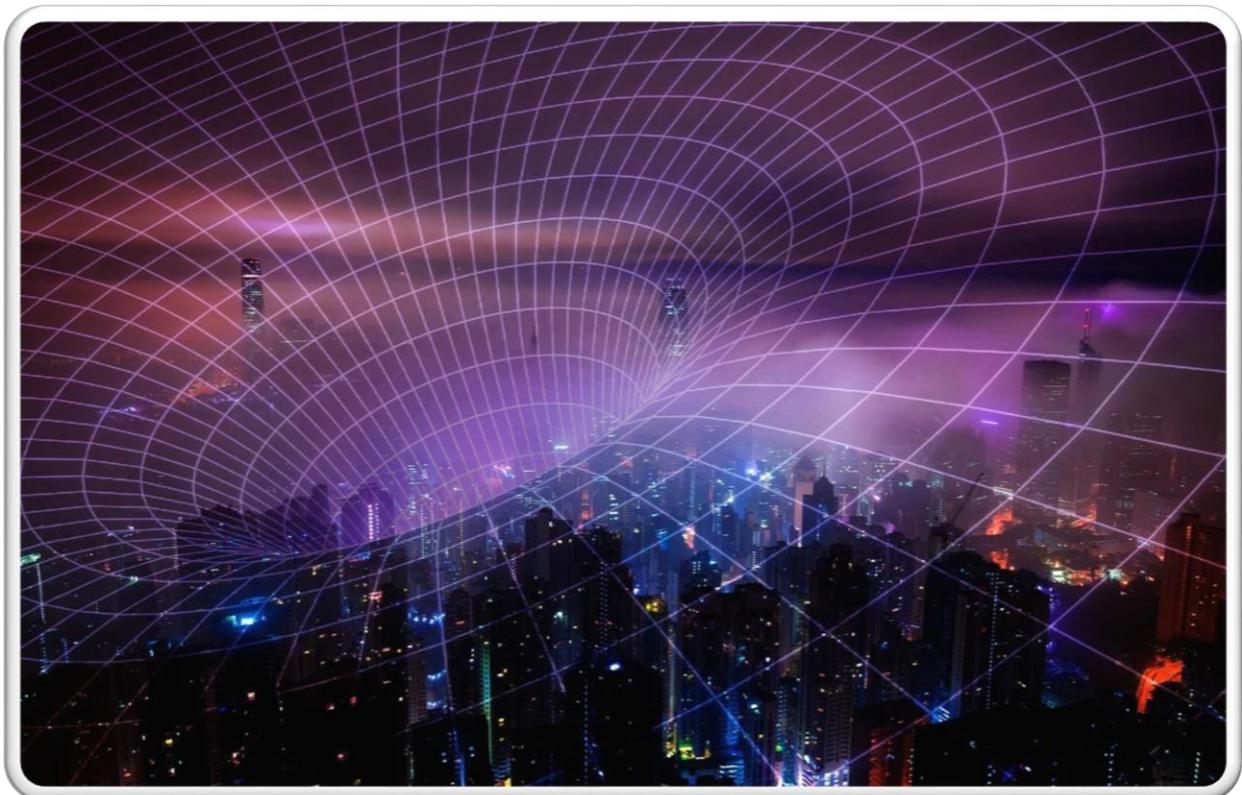# DEPARTMENT OF INFORMATION TECHNOLOGY

IT- BULLETIN

DECEMBER-2023

5G Technologies

Welcome to the edition of the IT-BULLETIN on 5G Technologies Newsletter! In this monthly publication, we bring you the latest news, trends, and developments in wireless cellular technologies, namely, 5G.

# INTRODUCTION

5G Technology:

5G technology represents the fifth generation of wireless communication networks. It is a revolutionary advancement over its predecessors, offering significantly faster speeds, lower latency, and enhanced connectivity. Here are some key characteristics of 5G technology:

- **High-Speed Connectivity:** 5G networks provide blazing-fast download and upload speeds, enabling seamless streaming, high-quality video calls, and rapid data transfer.

- **Low Latency:** 5G networks have remarkably low latency, reducing the delay between sending and receiving data. This low latency is crucial for real-time applications like online gaming and autonomous vehicles.

- **Increased Capacity:** 5G networks can support a massive number of connected devices simultaneously. This scalability is vital for the growing number of IoT devices and smart technologies.

- **Enhanced Reliability:** 5G technology offers improved reliability and stability, ensuring consistent connectivity even in densely populated areas or high-traffic environments.

- **Network Slicing:** 5G allows for network slicing, enabling the creation of virtual, customized networks tailored to specific applications or services. This flexibility enhances efficiency and resource utilization.

- **Support for Emerging Technologies:** 5G technology is the backbone for innovations like augmented reality, virtual reality, and IoT applications. Its high speed and low latency are instrumental in delivering immersive AR/VR experiences and enabling IoT devices to communicate seamlessly.

In summary, 5G technology signifies a significant leap in wireless communication, offering unparalleled speed, low latency, and capacity. It plays a pivotal role in shaping the future of various industries, including healthcare, entertainment, smart cities, and beyond, by enabling innovative applications and services.

MARKET SIZE:

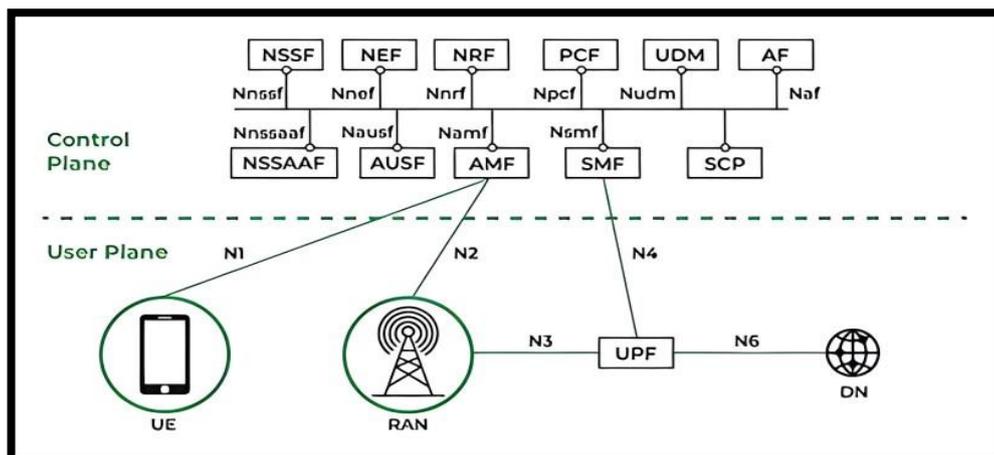Number of Mobile 5G Subscriptions, in Million, Worldwide, 2019 to 2027
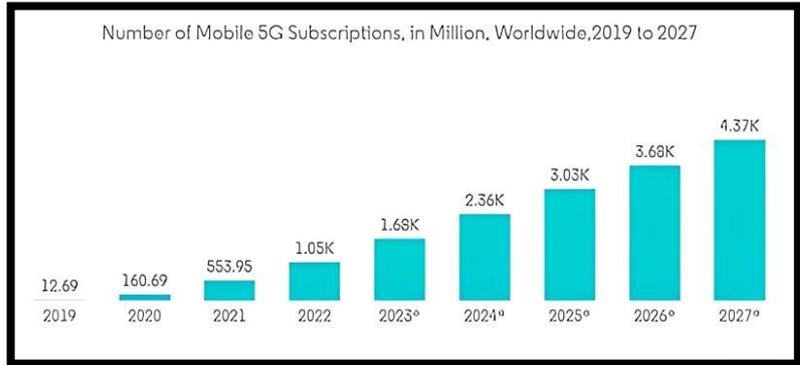
The global 5G technology market has been experiencing rapid growth. In 2020, it was valued at **5.53 billion U.S. dollars**, and it's projected to skyrocket to **667.79 billion U.S. dollars** by 2026. This growth is driven by the increasing demand for high-speed internet and broad network coverage with reduced latency and power consumption.

In India, the 5G market is also expanding at a fast pace. From a value of **USD 7,065 million** in 2022, it's expected to reach **USD 1,78,546.1 million** by 2031. The global 5G services market size is estimated to reach **USD 2,208.25 billion** by 2030, up from **USD 60.61 billion** in 2022. These figures underscore the immense potential of the 5G market both globally and in specific regions like India.
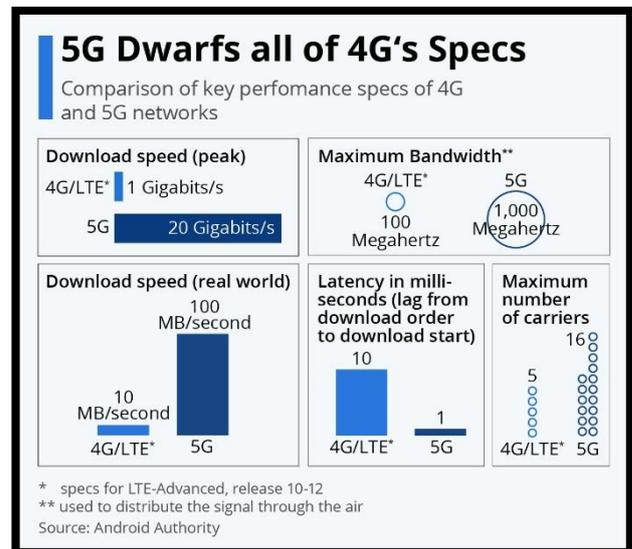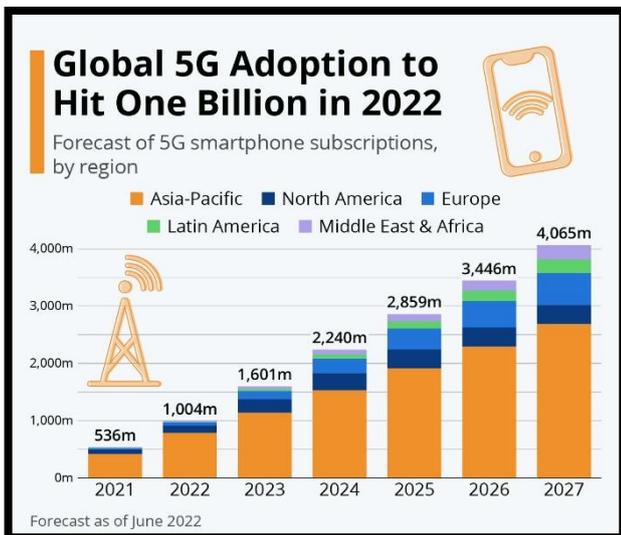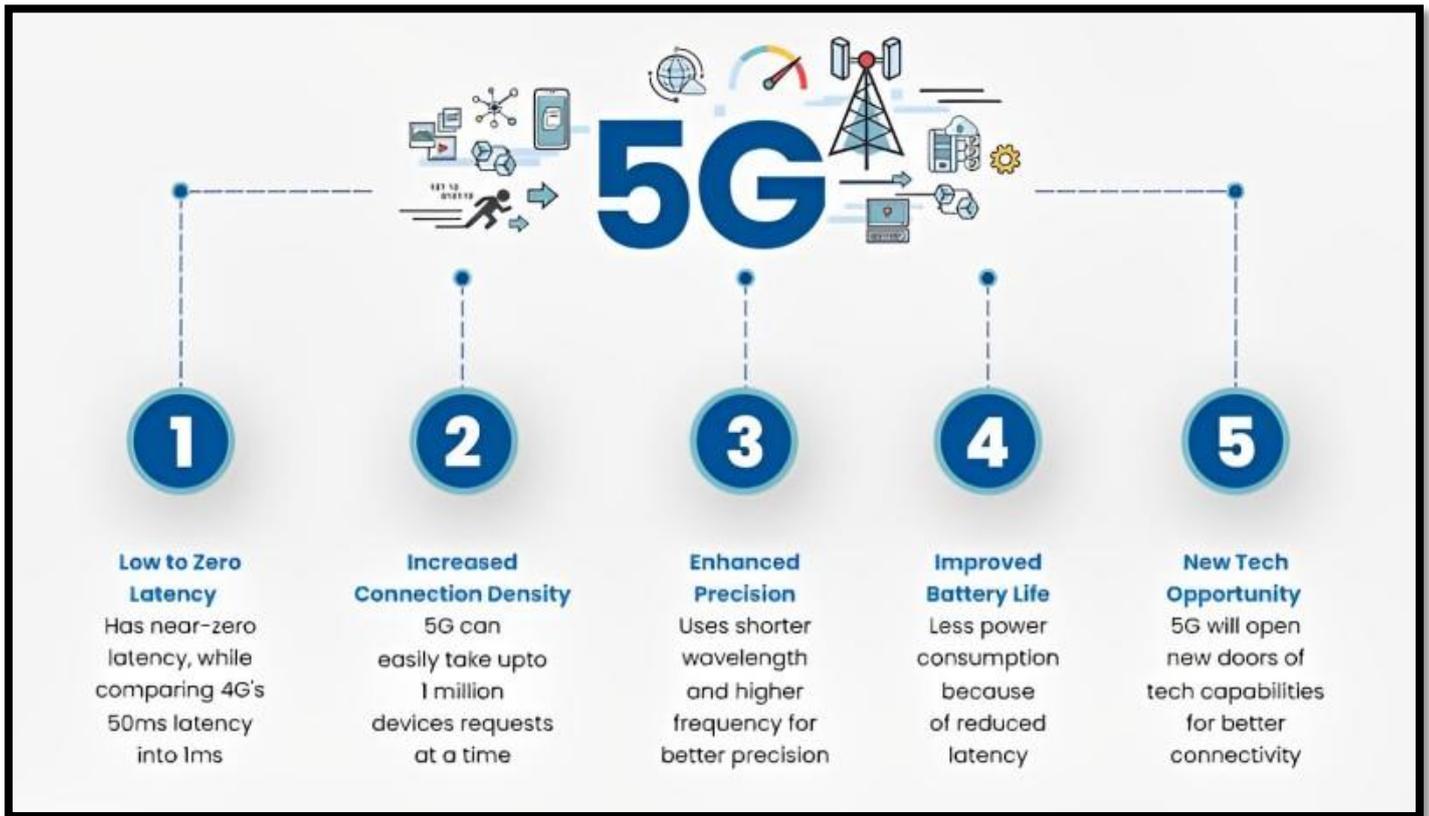
SOFTWARE ARCHITECTURE OF 5G TECHNOLOGIES

5G systems are designed with cutting-edge software architecture that fundamentally transforms how networks operate. One key aspect is network slicing, allowing the division of the network into virtual segments tailored for specific applications like IoT and high-speed broadband. This customization ensures efficient resource use and optimized performance for diverse user needs. Moreover, 5G embraces cloud-native principles, enabling the deployment of network functions as microservices.

This approach enhances scalability and flexibility, as services can be dynamically managed, scaled, and deployed in response to changing demands. Advanced technologies like Massive MIMO and beamforming are utilized, enhancing network capacity and coverage. Additionally, 5G integrates edge computing, enabling real-time data processing closer to end-users, which is vital for applications such as augmented reality and autonomous systems. These architectural innovations collectively empower 5G networks to deliver high-performance, low-latency, and customized services to users worldwide.

IMPACT OF IMPLEMENTING 5G TECHNOLOGIES

1 Low to Zero Latency
Has near-zero latency, while comparing 4G's 50ms latency into 1ms

2 Increased Connection Density
5G can easily take upto 1 million devices requests at a time

3 Enhanced Precision
Uses shorter wavelength and higher frequency for better precision

4 Improved Battery Life
Less power consumption because of reduced latency

5 New Tech Opportunity
5G will open new doors of tech capabilities for better connectivity

Global 5G Adoption to Hit One Billion in 2022
Forecast of 5G smartphone subscriptions, by region

- Asia-Pacific
- North America
- Europe
- Latin America
- Middle East & Africa

2021: 536m
2022: 1,004m
2023: 1,601m
2024: 2,240m
2025: 2,859m
2026: 3,446m
2027: 4,065m

Forecast as of June 2022

5G Dwarfs all of 4G's Specs
Comparison of key performance specs of 4G and 5G networks

Download speed (peak)
4G/LTE*: 1 Gigabits/s
5G: 20 Gigabits/s

Maximum Bandwidth**
4G/LTE*: 100 Megahertz
5G: 1,000 Megahertz

Download speed (real world)
10 MB/second 4G/LTE*
100 MB/second 5G

Latency in milli-seconds (lag from download order to download start)
10 4G/LTE*
1 5G

Maximum number of carriers
5 4G/LTE*
16 5G

* specs for LTE-Advanced, release 10-12
** used to distribute the signal through the air
Source: Android Authority

Implementing 5G technologies has a profound impact on various sectors, driving unprecedented advancements in connectivity and transforming industries. The increased speed and significantly reduced latency of 5G networks revolutionize communication, enabling seamless real-time experiences such as augmented and virtual reality applications. In healthcare, 5G facilitates remote patient monitoring and telemedicine, enhancing healthcare accessibility and quality. In manufacturing, it enables the widespread adoption of IoT devices and automation, optimizing production processes and improving efficiency. Smart cities leverage 5G for intelligent infrastructure, enhancing services like traffic management and public safety.

Career Paths in 5G Technology

The implementation and rapid expansion of 5G technology has created a wide range of career opportunities in various sectors. Here are some prominent career paths in 5G technology:

- **Network Engineers and Architects:** Network engineers and architects design, implement, and manage 5G networks. They are responsible for ensuring seamless connectivity, high performance, and security of the network infrastructure.

- **Software Developers:** Software developers in the 5G field create applications, services, and solutions that leverage the high-speed, low-latency capabilities of 5G networks. They work on developing applications for sectors such as IoT, augmented reality, virtual reality, and autonomous systems.

- **Telecommunication Engineers:** Telecommunication engineers specialize in designing and optimizing telecommunications systems, including 5G networks. They focus on improving network efficiency, coverage, and overall performance.

- **Cybersecurity Experts:** With the increased connectivity in 5G networks, cybersecurity experts are in high demand to ensure the security and privacy of data transmitted over these networks. They work on developing robust security measures and protocols to safeguard against cyber threats.

- **Data Scientists and Analysts:** Data scientists and analysts analyze the vast amount of data generated by 5G networks to derive valuable insights. They help businesses and organizations make data-driven decisions, optimize network performance, and enhance user experience.

- **Hardware Engineers:** Hardware engineers design and develop the physical components and devices that enable 5G connectivity, such as antennas, routers, and communication modules. They focus on improving the efficiency and capabilities of these devices.

- **Sales and Marketing Professionals:** Sales and marketing professionals in the 5G industry are responsible for promoting 5G technology, networking equipment, and services. They work with businesses, government agencies, and consumers to drive adoption and usage of 5G technology.
- Research and Development (R&D) Specialists: R&D specialists work on innovating and developing new technologies, protocols, and standards related to 5G. They play a crucial role in advancing the capabilities of 5G networks and exploring future applications.

- **Regulatory and Policy Experts:** Professionals in this field focus on regulatory compliance, policy development, and spectrum management related to 5G technology. They work closely with government agencies and industry stakeholders to shape policies and standards.
- These career paths offer diverse opportunities for individuals interested in working with 5G technology, whether they have a background in engineering, software development, data analysis, or business development.
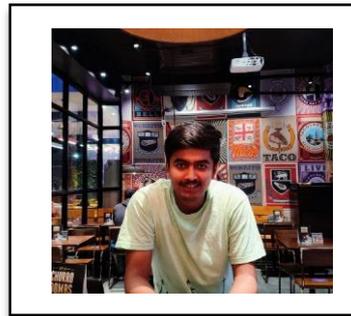
References:

- https://www.qualcomm.com/5g/what-is-5g#:~:text=5G%20will%20bring%20wider%20bandwidths,Gbps%20throughput%2C%20and%20low%20latency.

- https://www.pwc.com/gx/en/about/contribution-to-debate/world-economic-forum/the-impact-of-5g.html

- https://en.wikipedia.org/wiki/5G

- https://aws.amazon.com/what-is/5g/

- https://www.thalesgroup.com/en/markets/digital-identity-and-security/mobile/inspired/5G

- https://www.mckinsey.com/featured-insights/mckinsey-explainers/what-is-5g

Student Editors:

Shreya Tarade

Shreyash Telsang
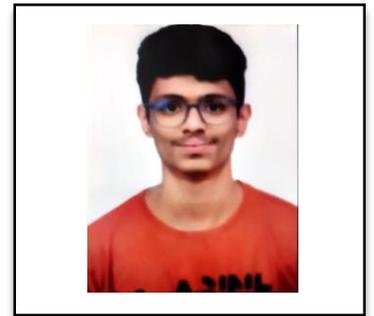
Manthan Thakare

Aniket Thenge

Om Thigale