

Future and Challenges of 5G Technology in India

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INTRODUCTION

In India, the Department of Telecommunications is working on the important spectrum auction of 5G bands, which is expected to play a crucial role in the radio frequency spectrum over the next 10 years. Experts predict that 5G's application will meet the growing demand for telecommunications. Currently, the world is entering the fourth phase of the industrial revolution, where 5G technology is considered essential by global leaders. Economically, it will be very significant for India over the next decade. In this scenario, spectrum auction strategies will play a pivotal role.

The 5G communication revolution is related to the fifth generation and encompasses LTE mobile network upgrades. In practice, the 5G network's download speed will reach up to 20 gigabits per second and upload speeds of up to 10 gigabits per second.

However, operational speeds will be up to 100 megabits per second for downloads and 50 megabits per second for uploads. Currently, this speed is quite limited because the current 4G LTE network supports an ideal data rate of 300 Mbps for downloads. In real-world scenarios, only 40 Mbps for downloads and 25 Mbps for uploads are being achieved.

5G Frequency Spectrum Bands:

5G primarily operates in three bands: low, mid, and high frequency bands, which cater to different use cases and limitations.

- **Low Band:** Offers a maximum speed of 100 Mbps, making it suitable for general users. However, it does not meet the requirements for industrial applications.
- **Mid Band Spectrum:** Provides higher speeds than the low band but lacks sufficient spectrum capacity for massive-scale industrial use.
- **High Band Spectrum:** This band provides the best speed among all three but has severe limitations in coverage.

Coverage and Network Penetration Capability:

Phases of Communication Revolution

1. **1G or First Generation:** This was the initial phase where communication was possible, but its capability and efficiency were limited.
2. **2G or Second Generation:** For the first time, clear voice services were available, along with SMS and mobile internet services.
3. **3G or Third Generation:** Enabled advanced communication over the internet, allowing website access, video streaming, music listening, and email services.
4. **4G LTE:** The system was designed to deliver speed-centric communication. It introduced a new kind of wireless connectivity where high-speed data reduced download and upload times significantly. However, its speed is still insufficient for modern requirements.

Differences between 4G and 5G:

The main distinctions between 4G and 5G networks are as follows:

- The 5G network offers a superior network compared to 4G.
- 5G's data capacity is measured in gigabits per second, while 4G offers 2 megabits per second.
- 5G's latency is much lower compared to 4G.
- 5G consumes less battery power than 4G.
- 5G permits faster data transmission, enabling it to support advanced applications.

India and 5G Technology:

India planned to launch 5G services swiftly in 2018. The development aimed to enhance the country's network capabilities. By providing high-speed connectivity, India could strengthen its position in the technological arena. Various institutes and research centers were also proposed for the development and implementation of innovative technologies.

All three private telecom service providers— Reliance Jio, Bharti Airtel, and Vodafone India— along with the Department of Telecommunications, are calling for a clear roadmap for the allocation of spectrum and the 5G frequency band. This demand is crucial for proper planning. However, Indian Railways and Vodafone India's spectrum utilization is becoming a significant problem.

In this context, India has discussed the development of 5G technology in collaboration with Israel and the United States. Recently, Reliance Jio has also partnered with companies like Facebook.

Challenges for India in the Context of 5G:

- There are still areas in India where the communication revolution has not reached. In this situation, 5G technology will help bridge the digital divide, especially in less developed regions.
- The environmental and health impacts of 5G technology operations cannot be ignored. Experts believe that the advent of 5G could lead to an increase in heart-related illnesses.
- Technological advancement may create a digital exclusion for those unfamiliar with advanced technologies.
- Indian society must also safeguard itself from the potential misuse of 5G and mitigate stress-related societal impacts. This will pose a challenge for India's legal and technical departments.
- Building strong 5G infrastructure will be another hurdle.
- Many of today's globally used websites are foreign-owned. Indian developers need to create robust software applications.

What Are the Benefits of 5G?

The key features of this new technology include its ability to enhance automation in the automobile sector, improve utilities management, and bolster internal security. These systems will become faster and more reliable than ever before.

- 5G technology will provide super high-speed internet and enable better connectivity in critical locations.
- The introduction of this technology will significantly boost industrial productivity and services, enabling better integration and communication.

Connectivity Will Achieve Further Development and Purity:

With the advent of 5G technology, new progressive avenues are opening up in fields such as driverless cars, healthcare, virtual reality, and cloud gaming. According to Qualcomm, 5G technology has already contributed approximately \$13 trillion to the global economy, creating around 22.8 million new job opportunities worldwide.

5G Network Launch Date in India:

The Department of Telecommunications (DoT) has confirmed the establishment of 5G networks in 13 cities across India by the end of 2022. These cities include Mumbai, Delhi, Kolkata, Chennai, Gurugram, Bengaluru, Chandigarh, Ahmedabad, Jamnagar, Hyderabad, Pune, Lucknow, and Gandhinagar.

The Connection Between 5G Networks and COVID-19: Myths and Misconceptions:

Recently, several social media platforms have been abuzz with claims that 5G technology testing has accelerated the spread of the corona virus and is the root cause of the virus's origin. These types of rumors about 5G technologies are circulating widely on various social media platforms.

So, is it true that deaths are occurring due to 5G? Let's explore this matter. These claims about 5G technology are nothing but myths. The World Health Organization (WHO) has shared official information clarifying this issue.

WHO stated that the corona virus cannot be transmitted from one place to another via mobile phone networks or radio waves. Furthermore, they pointed out that the virus is prevalent even in countries where 5G testing has not been conducted or where 5G mobile networks have yet to be established. Despite this, the virus continues to spread there.

Therefore, there is no connection between 5G technology and COVID-19.

Prime Minister Narendra Modi to Launch 5G Services on October 1:

The wait for 5G services in India is coming to an end. Prime Minister Narendra Modi will launch the 5G services on October 1 at the Asia's largest technology exhibition, Mobile Conference, held at Pragati Maidan, Delhi. This information was shared by the National Broadband Mission.

The mission stated that with the launch of 5G services by Prime Minister Modi, India will achieve new heights in digital transformation and connectivity. A few days ago, the Ministry of Electronics and Information Technology announced that 5G services would begin in October, followed by their expansion.

Suggestions for 5G Network:

- **Reducing Spectrum Costs:** Lowering the cost of spectrum to make it more affordable.
- **Bridging Urban-Rural Divide:** Addressing the technological gap between urban and rural areas and extending network access to every household in the country.

The ultimate goal is to develop a technology that caters to the needs of both urban and rural users while meeting the requirements of the telecommunications sector. While 5G will undoubtedly make our lives easier, its extremely high-frequency waves may impact small leaves, birds, and plants, potentially causing disorientation.

Blood Pressure and Impact on Wildlife: The extremely high-frequency waves of 5G technology may cause an increase in blood pressure in small creatures, and insufficient access to food could lead to their demise.

5G Technology and India's Progress: 5G technology aims to propel India forward, as advancing the nation requires growth in specific sectors. However, people in rural areas might face some challenges with the advent of 5G networks. While other countries may progress, there is a concern that India might lag behind by 200 years. In January 2022, a surgeon in China performed a liver operation remotely, 30 kilometers away, using 5G technology due to its exceptionally fast speed.

Need-Based Implementation of 5G: Not everyone requires such high speeds, especially for activities like gaming or social media. Expanding 5G networks based on need would be more beneficial. Just as it took 10 years for 4G to reach its current scale, 5G could take a few more years to reach widespread adoption, and discussions around 6G might begin.

It is clear that 5G will act as a catalyst for growth. Gradually, it will aid in improving transport, energy, logistics, and more. The government should plan in such a way that 5G networks are utilized only where they are needed, so that the radio waves emitted by 5G do not harm living beings, animals, birds, trees, and plants. There should be minimal need to install excessive towers. The most important thing is to invest in 5G networks only where they are required so that India can achieve its goals at a lower cost without putting too much strain on the economy. 5G networks will aid in tele-surgery, allowing doctors to perform surgeries from thousands of kilometers away with ease. It is crucial that processes are executed very quickly. In 5G networks, this will happen in less than a millisecond.

Different tasks require different levels of latency. In terms of speed and capacity, networking should not involve increasing the speed of the entire network; rather, it should be enhanced based on specific needs. Thanks to network slicing, operators can provide services tailored to different needs simultaneously. This means it won't be necessary to build separate infrastructures for sectors like automobiles, manufacturing, infrastructure, and broadband. Collaboration with relatives in different cities will also become easier.

However, this transformation will not happen overnight. Even today, many people do not have phones or devices compatible with 5G. It will take a few more years for ultra-high-speed networks to become widely accessible.

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