5G Technology: Applications and Challenge

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5G Technology Network is the next generation of wireless communication. It's much faster and able to connect with more devices than the existing 4G LTE network. China is the first country to officially announce its entry into the 5G era. 5G Technology is ready to start in India soon as per government planning. 5G is a 5th-generation mobile wireless standard network after 1G, 2G, 3G, and 4G. The whole article will expand the understanding of the 5G Technology in India

5G Technology: The Concept

5G Technology stands for fifth-generation cellular networks, which is the most advanced and fastest wireless technology available currently. After 1G, 2G, 3G and 4G, 5G opens a new world of possibilities and will provide higher multi-Gbps peak data speeds.This will help in making communication smooth, improve efficiency, enable faster streaming and support not just working professionals but also online learners to do more by using the power of the internet.5G Technology will bring more dependability, extremely low latency, a massive network, and increased availability with a fast data speed. 5G Technology will be able to share a huge amount of data and connect people; things virtually have the capacity to store, process, and transmit a huge amount of data at high speed.

Generation Of Mobile Network

Before5G Technology, we had four more networks, which areusedextensively for various things, but the introduction of 5G Technology will change the whole scenario of the digital world; let's talk about some previous networks used in the past and present.

1G: It was introduced in 1980 on radio signal and supported only voice calls
2G: It was introduced in 1990 on radio signal and supported voice and data both
3G: It was introduced in 2000. It has the best speed and support for calling, video, and conferencing.
4G: it was launched in 2010, with a peak speed of 100 Mbps to 1 Gbps supporting 3D virtual reality; this is the network on which we are relying is present.

5G Technology Spectrum Bands

5G Technology operates on three different spectrum bands.
Low-band spectrum - offering exceptional coverage area and wall penetrationMid-band spectrum - provides faster speed and lower latency. However, building penetration is lower than the Low-band spectrum.
High-band spectrum - offers the highest speed, but the coverage area and building penetration are significantly compromised.

5G Technology : APPLICATIONS

The following are the applications of the 5G Technology network in India:
Faster data processing- 5G Technology has a latency rate of 1 millisecond and a speed range of 20Gbps and more. Thus data collected from various sources can be processed at a fast pace.
High-speed mobile network- 5G will reduce buffering and enhance the download speed on our mobiles. It'll also help in good-quality video calling and conferencing.
Internet of Things- 5G Technology will boost development in the field of IoT.
Artificial intelligence- 5G has added advantages for machine learning, robotics and other programming modules. It can provide faster processing of data.
Education- Due to Covid-19, Online learning has gained a lot of momentum. But the speed of the internet set up a big hurdle in education. 5G Technology can help in faster connectivity and a better learning experience. It'll also open new avenues for learning.
Health sector- 5G Technology will help in the field of Telemedicine and biotechnology. It will help in spreading access to medical services to far-fledged areas.
Employment Opportunities- 5G will open new areas of employment in various sectors like the I.T. sector, construction sector and Cyber sector.

According to an estimate, it can lead to employment opportunities for almost 5 crore youth in India.

Government Services- 5G Technology can help in better access and last-mile access to Government services for the citizens. It will help in faster public grievance redress and ensure transparency and accountability.

Infrastructure OverhaulsmmWave is far more complex to design for than low frequency spectrum, and may require advanced levels of training for RF engineers. Challenges of designing for mmWave include poor signal range and increased reflection from building materials. There are also costconsiderationsas in-building mmWaves require an infrastructure overhaul, with new antennae, fiber cabling, and small cells needing to be installed throughout a locale to connect properlyA keyfeature of 5G NR - Beamforming - enables ultra-precise data transfer but requires high-level processing and input during the planning and design stage. It's a powerful tool that demands significant design time investments.

The complexity of reliable, consistent low latency
With 5G set to enable smart technology like self-driving cars and automated medical equipment, latency can be catastrophic. Accurate, well designed 5G networks are essential to minimizing latency in these industries.

The cost of evolution
The enhancements that 5G brings don't come without investment. Most 5G equipment is non-compatible with existing infrastructures, so upgrading a network will mean upgrading its antennae. It's no small feat: rolling out 5G across the US could cost an estimated $300 billion.

How to correctly plan 5G networks?
Operators, engineers, and system integrators are currently publishing research on the optimal strategy for planning 5G networks, but one thing is for sure:5G network design requires powerful software. India's InitiativesBharatnet project was launched in 2017 for providing digital infrastructure on a non-discriminatory basis by affordable broadband connectivity for all households. The objective is to facilitate the delivery of e-health, e-governance, e-banking, e-education, Internet and other services to rural areas.National Optical Fibre Network (NOFN) aims at bringing a broadband revolution in rural areas. Its objective is to connect all the Gram Panchayats in the country with 100 Mbps connectivity. As we have seen earlier, fibre

provides strong backhaul, thus facilitates the adoption of 5G.High-level forum to develop 5G roadmap – Recently, the Department of Telecommunications set up a high-level forum to evaluate roadmaps and create a strategy to adopt 5G in the country by 2020.Waivers for Private telecoms -The government also announced a subsidy of Rs 3,600 crore to private telecom players such as Bharti Airtel, Vodafone India, and Reliance Jio to establish Wi-Fi in rural areas as part of the second phase of the BharatNetproject.The government is working on creating a corpus of Rs 500 crore to fund 5G activity, India's National Digital Communications Policy 2018 emphasizes the importance of 5G when it mentions that the convergence of a cluster of revolutionary technologies including 5G, the cloud, Internet of Things (IoT) and data analytics, along with a growing start-up community, promise to accelerate and deepen its digital engagement, opening up a new horizon of opportunities.

Way forward: Increasing domestic 5G manufacturing: Government should encourage and boost its local 5G hardware production at an exceptional rate if it needs to achieve the 5G India dream. PricingRationalisation: Rationalisation of this spectrum pricing is required so that the government generates sufficient revenue from the auction without affecting the roll-out plans for 5G in India.
Filling the Rural-Urban Gap: 5G can be launched at different band spectrums and at the low band spectrum, the range is much longer which is useful for the rural areas

CONCLUSION
Earlier deployment of 5G technology in India will help companies design and manufacture 5G products and solutions in India, thus creating some essential Intellectual Property Rights (IPR) in the 5G standard. It is high time that India strengthens the domestic telecommunication manufacturing market to enable local industries to capture both domestic as well as global market. particularly on research and product development.

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