5G Technology In India

[UPSC Notes]

5G Technology: The Concept

5G 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 make 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 will bring more dependability, extremely low latency, a massive network, and increased availability with a fast data speed. 5G 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

Before 5G, we had four more networks, which are used extensively for various things, but the introduction of 5G 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 Spectrum Bands

5G operates on three different spectrum bands.

1. Low-band spectrum – offering exceptional coverage area and wall penetration
2. Mid-band spectrum – provides faster speed and lower latency. However, building penetration is lower than the Low-band spectrum.
3. 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 network in India:

- Faster data processing- 5G has a latency rate of 1 millisecond and a speed range of 20Gbps and more. Thus data collected by various source 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 will boost up development in the field of IoT.
- Artificial intelligence- 5G has added advantage 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 can help in faster connectivity and better learning experience. It'll also open new avenues for learning.
- Health sector- 5G 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 sector like the I.T. sector, construction sector and Cyber sector. According to an estimate, it can lead to employment opportunity for almost 5 crore youth in India.
- Government Services- 5G 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 in government services.
- Global competitiveness- India can boost it's Make in India programme and also compete with China in terms of 5G rollout. To meet the pace with global technology India needs to speed up its 5G research.

Difference Between 5G Vs 4G Network

Both are so different from each other in many factors. 4G is the one which we are using in the present and 5G we will going to use in the coming time.

4G Network

- 4G uses low frequencies of 700 to 2500 MHZ
- It has low speed and might get interrupted by other signals
- Less capacity to transfer and process data
- It supports lesser devices

5G Network

- It uses the highest frequency of 28 GHz
- It has the highest speed with less interruption
- Provides very easy and quick transfer and process data easily
- It can support many devices within the same geographical area.

Uses of 5G Technology

The multiple benefits of 5G Technology include -

- Enhanced Mobile Connectivity: With smartphones and new devices supporting 5G technology, which helps make smartphones a lot more efficient.
- Mission Critical Communications: Being ultra-reliable and having faster speeds, 5G is ideal for communication, including video calling, which requires high-speed internet.
- Internet of Things: In the future, smart devices will be in vogue and can use 5G technology to seamlessly connect a massive number of embedded sensors used to make everyday electronic appliances and devices' smart'. The interconnected devices enable users to easily make decisions, automate processes and even get things done a lot more efficiently.
- Enabler of the fourth industrial revolution combines the power of Cloud, Big Data, Artificial Intelligence, Edge Computing, Automation, IoT, and others.

Challenges for Rolling Out 5G Technology

Before establishing the 5G spectrum, there are huge challenges that India has to face and has to tackle. Let's talk about some major challenges.

- **Spectrum Cost:** India faced a huge challenge during the auction of the 5G band, but somehow India took a pragmatic approach and tackled this issue by providing benefits like payment of spectrum in instalments, which reduced the cost and burden on the telecom company. Although India tried a lot, the cost of the spectrum is going high, and the companies are now facing financial issues, which cause problems in the allocation of the spectrum.
- **Digital Infrastructure:** Before establishing 5G, it is important to build suitable digital infrastructure for the 5G network, just like in the U.K., South Korea, or the U.S. India should also do this before installing the 5G network. In South Korea, they fiberized all the towers and networks and build infrastructure for a new network with the help of the government and companies to make a suitable environment for 5G technology. India needs to do such things before instalment, and the whole process is very costly, so India should also be prepared according to that.

India's 5G adoption is late compared to other countries where services are available to More than 50 cities. This can affect India's revenue in the country. Many telecom companies have to bear the dual cost, as they have to manage 4G with 5G both together, and maintaining and managing the tower of both will be very costly for companies planning for 5G.

- **Affect Navigation:** Another challenge many are saying is that the 5G spectrum could add a lot of interference in the aircraft navigation system. In the U.S., around 7 planes are cancelled due to navigation problems, which might be due to 5G. 5G network will also create electromagnetic fields, which can cause hams to many species, humans, and wildlife species, animal, it can affect their livelihood and life extensively.
- **5G Hardware:** India's ban on the import of foreign hardware manufacturing products will become a major challenge for India in this 5G era, as mostly 5G hardware is bought from foreign and If India does not import this hardware, then they have to set up their manufacturing plant for the production of equipment suitable for 5G which can again add the cost to 5G spectrum. This all cost can add liabilities to the consumer and will make it costly for the consumer.

Government's Initiatives for 5G Technology

In India, after government deploys 5G, they also have to take some other actions that are necessary before serving services to customers.

- The First step of the government is to find suitable customers for service. Initially, the government must find to whom they are providing their services too with what frequency, as it can help them discover their user requirement of services or their purpose.
- As we discussed above that, how much it costs to deploy 5G services in India, and which cannot be funded by Indian investors alone, so the government of India has to open doors for foreign direct investment by encouraging them to invest in the telecom sector, through fulfilling their interest, This will help to reduce the cost services and reduce the liability from the consumer, so that they can enjoy the services freely.
- As the initial cost of deploying the 5G spectrum is high, which will increase the cost of the services for 2 to 3 years, the government should cut taxes on the spectrum for better consumption.
- At present, government and telecom companies need to provide service at a lower cost to convince the customer to switch from 4G to 5G; once they got switch then, it will become easy to increase the price, as it leads to increase consumption of content due to high speed and no latency, which are attracting feature of the network.

Today government has complete control over the spectrum, without any intervention by anyone, so the government can provide support to telecom companies to roll out the services at an affordable price, which can improve the consumption and the likeability of 5G.

5G Technology in India

The Indian government recognises the importance of 5G technology for the nation's future and has outlined it in India's National Digital Communications Policy 2018.

It highlights the importance of 5G for the convergence of a cluster of revolutionary technologies, including Cloud Computing, the Internet of Things (IoT), Big Data, Artificial Intelligence and Data Analytics.

However, the key impediments to 5G rollout in India are:

- Lower Fiber Connectivity, which currently stands at only 30% telecom towers. The nation needs to double this number to make the 5G rollout smoother.
- The ban on foreign telecom OEMs presents a hurdle as it creates a high dependence on 'Make in India' hardware.
- 5G spectrum pricing is costlier than the global average and will need a more efficient setup to decrease overall pricing.
- A huge gap in the rural and urban networks needs to be bridged by deploying different band spectrums.

5G networks have the power to change the way we live and think. It's a great opportunity for India to boost its telecom sector and ensure global competitiveness. For wider and equal deployment of 5G India needs to ensure that it overcomes the challenges related to infrastructure and spectrum sale. This will help in taking the benefits of 5G as soon as possible.