



## 5G in India

**For Prelims:** 5G, IoT, big data, AI, edge computing, fourth industrial revolution.

**For Mains:** Uses of 5G, Challenges for 5G Rollout in India, Evolution of telecom technology

### Why in News

Recently, the **Department of Telecommunications (DoT)** has announced that India's major metros will have **5G services next year**.

- Like other global players, **India had, in 2018, planned to start 5G** services as soon as possible, with an aim to **capitalise on the better network speeds and strength that the technology promised**.

### Key Points

- **About 5G Technology:**
  - 5G is the 5<sup>th</sup> generation mobile network. It is a **new global wireless standard after 1G, 2G, 3G, and 4G networks**.
  - It enables a new kind of network that is **designed to connect virtually everyone and everything together including machines, objects, and devices**.
  - Internet speeds in the high-band spectrum of 5G has been tested to be as high as **20 Gbps (gigabits per second)**, while, in most cases, the maximum internet data speed in 4G has been recorded at 1 Gbps.

### Evolution from First Generation to Fifth Generation

- **1G** was launched in the **1980s** and worked on analog radio signals and supported only voice calls.
- **2G** was launched in the **1990s** which uses digital radio signals and supports both voice and data transmission with a bandwidth of 64 Kbps.
- **3G** was launched in the **2000s** with a speed of 1 Mbps to 2 Mbps and it has the ability to transmit telephone signals including digitised voice, video calls and conferencing.
- **4G** was launched in **2009** with a peak speed of 100 Mbps to 1 Gbps and it also enables 3D virtual reality.

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# FROM 1G TO 5G THE EVOLUTION



# 1G

## FIRST GENERATION

YEAR: 1997  
BASIC VOICE SERVICE ONLY  
ANALOG-BASED  
50 KBPS

## SECOND GENERATION

YEAR: 1998  
IMPROVED COVERAGE & CAPACITY  
TEXT AVAILABLE (SMS/MMS)  
DIGITAL (GSM, CDMA)  
250 KBPS

# 2G

## THIRD GENERATION

YEAR: 2001  
VOICE WITH DATA (INTERNET,  
VIDEO CALLS, MOBILE TV)  
DIGITAL (UMTS, HSPA)  
SPEED: 384 KBPS

# 3G

## FOURTH GENERATION

YEAR: 2010  
DESIGNED FOR DATA (INTERNET,  
IM, VIDEO CALLS, MOBILE TV  
HD/3D, CLOUD COMPUTING,  
GAMING)  
DIGITAL (LET, LTE ADVANCED)  
SPEED: 50 MBPS

# 4G

# 5G

## FIFTH GENERATION

YEAR: 2020+  
DESIGNED FOR CONNECTIVITY (INTERNET, IM,  
VIDEO CALLS, MOBILE TV HD/3D, CLOUD  
COMPUTING, GAMING, IOT, INFINITE DATA  
BROADCAST)  
DIGITAL (UBIQUITOUS CONNECTIVITY)  
SPEED: 6,400 MBPS (1,000,000 KBPS)

### ▪ Different Bands of 5G:

- 5G mainly works in **3 bands**, namely low, mid and high frequency spectrum — all of which have their own **uses as well as limitations**.
  - **Low Band Spectrum:** In terms of coverage and speed of Internet and data exchange, **the maximum speed is limited to 100 Mbps** (Megabits per second).
    - This means that **telecom companies can use and install it for commercial cellphone users** who may not have specific demands for very high speed Internet.
    - However, the low band spectrum may not be optimal for specialised needs of the industry.
  - **Mid Band Spectrum:** It offers **higher speeds compared to the low band**, but has limitations in terms of coverage area and penetration of signals.
    - This band may be **used by industries and specialised factory units** for building captive networks that can be moulded into the needs of that particular industry.
  - **High Band Spectrum:** It offers the highest speed of all the three bands, but has extremely limited coverage and signal penetration strength.
    - This band **greatly enhances futuristic 5G technology applications** like [Internet of Things \(IoT\)](#) and smart technology but will require considerable infrastructure.

### ▪ Uses of 5G:

- Broadly speaking, 5G is used across three main types of connected services, including enhanced mobile broadband, mission-critical communications, and the massive IoT.
  - **Enhanced Mobile Broadband:** In addition to making our smartphones better, 5G mobile technology can usher in new immersive experiences such as [Virtual reality \(VR\) and Augmented Reality \(AR\)](#) with faster, more uniform data rates, lower latency, and lower cost-per-bit.
  - **Mission-Critical Communications:** 5G can enable new services that can transform industries with ultra-reliable, available, low-latency links like remote control of critical infrastructure, vehicles, and medical procedures.
  - **Massive Internet of Things :** 5G is meant to seamlessly connect a massive number of embedded sensors in virtually everything through the ability to scale down in data rates, power, and mobility—providing extremely lean and low-cost connectivity solutions.
- Combined with **IoT**, cloud, [big data](#), [Artificial Intelligence](#), and [edge computing](#), 5G could be a critical enabler of the [fourth industrial revolution](#).

### Note:

- [India's National Digital Communications Policy 2018](#) highlights the importance of 5G when it states 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.

### ▪ Challenges for 5G Rollout in India:

- **Low Fiberization Footprint:** There is a need to upgrade fibre connectivity across India, which at present connects only 30% of India's telecom towers.
  - For an efficient 5G India launch and adoption, this number has to double.
- **'Make in India' Hardware Challenge:** The ban on certain **foreign telecom OEMs (original equipment manufacturer)** upon which most of the 5G technology development depends, presents a hurdle in itself.
- **High Spectrum Pricing:** India's 5G [spectrum](#) pricing is several times costlier than the global average.
  - This will be of detriment to India's cash-strapped telcos.

- **Choosing the Optimal 5G Technology Standard:** The tussle between the homegrown 5G standard and the global 3GPP standard needs to be concluded in order to hasten 5G technology implementation.
  - While 5G brings obvious benefits, it also increases 5G India launch costs and interoperability issues for telcos.

## Way Forward

- **Boosting Domestic 5G Production:** The country needs to **encourage and boost its local 5G hardware manufacturing** at an unprecedented rate if it needs to realise the 5G India dream.
- **Pricing Rationalisation:** Rationalisation of this spectrum pricing is needed so that the government generates adequate revenue from the auction without hampering implementation plans for 5G in India.
- **Bridging the Rural-Urban Gap:** 5G can be deployed at different band spectrums and at the low band spectrum, the range is much longer which is helpful for the rural areas.

**Source: IE**

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