5G Technology

What is the issue?

The transition to fifth-generation cellular networks (known as 5G for short) is soon to happen.

What is the change in the making?

- The transition to 5G is an upgrade to wireless systems that will start reaching mobile phone users in a matter of months from now (Aug, 2019).
- But this is not just about faster smartphones.
- This will affect many other kinds of devices, including industrial robots, security cameras, drones and cars that send traffic data to one another.
- This new era will leap ahead of current wireless technology, known as 4G.
- This would offer mobile internet speeds that will let people download movies within seconds and bring big changes to video games, sports and shopping.
- To get the benefits of 5G, users will have to buy new phones, while carriers will need to install new transmission equipment to offer the faster service.

Where 5G technology can be applied

Healthcare
- Reduce pharmaceutical R&D costs
- Video/3D video appointments for non-life-threatening ailments
- Development of robotics in surgery
- More efficient health and fitness monitors

Smart cities and homes
- 3D video calls and holograms
- Innovative augmented and virtual reality applications
- Improved public safety with more efficient trackers
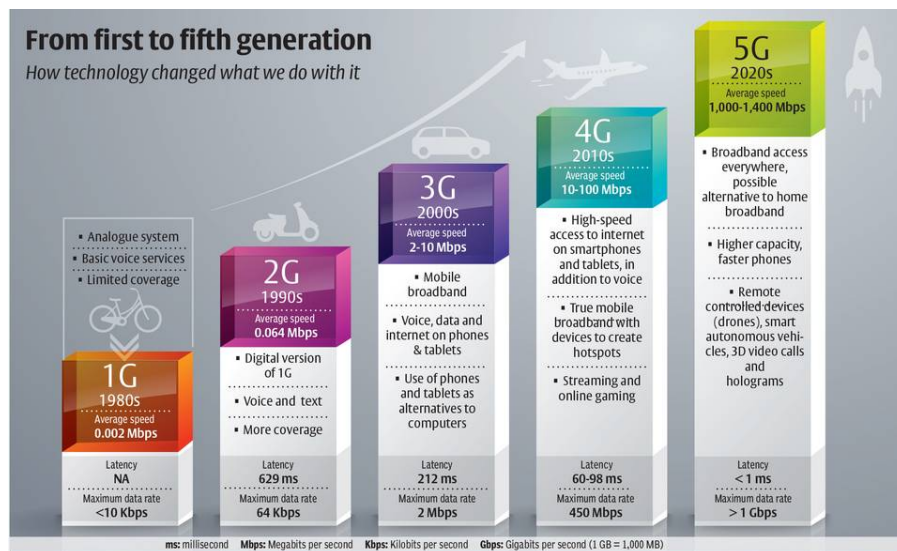- Remote device control

Transport
Connected vehicles which allow data collection from traffic signals and road-side sensors will lead to
- Reduced congestion
- Intelligent fleet and logistics management

Autonomous cars with little or no help from humans can
- Improve road safety
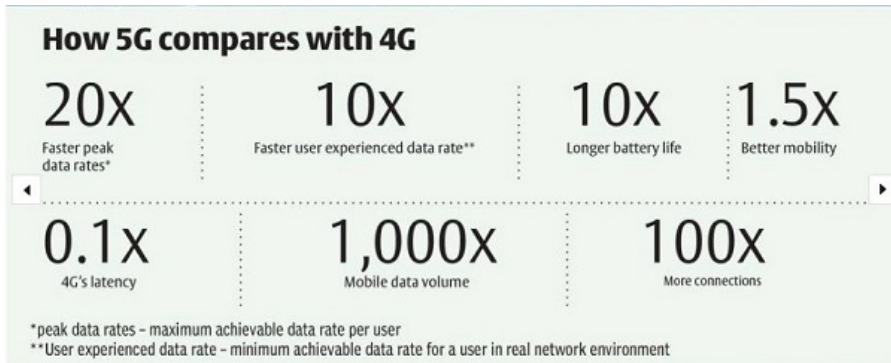- Increase mobility

What exactly is 5G?

- Essentially, 5G is a set of technical ground rules.
- They define the workings of a cellular network, including the radio frequencies used and how various components like computer chips and antennas handle radio signals and exchange data.

From first to fifth generation
How technology changed what we do with it

1G — 1980s — Average speed 0.002 Mbps
- Analogue system
- Basic voice services
- Limited coverage

Latency NA
Maximum data rate <10 Kbps

2G — 1990s — Average speed 0.064 Mbps
- Digital version of 1G
- Voice and text
- More coverage

Latency 629 ms
Maximum data rate 64 Kbps

3G — 2000s — Average speed 2-10 Mbps
- Mobile broadband
- Voice, data and internet on phones & tablets
- Use of phones and tablets as alternatives to computers

Latency 212 ms
Maximum data rate 2 Mbps

4G — 2010s — Average speed 10-100 Mbps
- High-speed access to internet on smartphones and tablets, in addition to voice
- True mobile broadband with devices to create hotspots
- Streaming and online gaming

Latency 60-98 ms
Maximum data rate 450 Mbps

5G — 2020s — Average speed 1,000-1,400 Mbps
- Broadband access everywhere, possible alternative to home broadband
- Higher capacity, faster phones
- Remote controlled devices (drones), smart autonomous vehicles, 3D video calls and holograms

Latency <1 ms
Maximum data rate >1 Gbps

ms: millisecond Mbps: Megabits per second Kbps: Kilobits per second Gbps: Gigabits per second (1 GB = 1,000 MB)

What are the key benefits?

- **Speed** - The speed depends on where one is, and which wireless services is used.
- Qualcomm, the wireless chipmaker, said it had demonstrated peak 5G download speeds of 4.5 gigabits a second.

- However, it predicts initial median speeds of about 1.4 gigabits.
- In other words, it would be roughly 20 times faster than the current 4G experience.
- E.g. downloading a typical movie at the median speeds cited by Qualcomm would take 17 seconds with 5G, compared with 6 minutes for 4G
- The speeds will be particularly noticeable in higher-quality streaming video.

How 5G compares with 4G

20x	10x	10x	1.5x
Faster peak data rates*	Faster user experienced data rate**	Longer battery life	Better mobility

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0.1x	1,000x	100x
4G's latency	Mobile data volume	More connections

*peak data rates – maximum achievable data rate per user
**User experienced data rate – minimum achievable data rate for a user in real network environment

- **Latency** - There is another kind of speed, a lag known as latency, that may become even more important with 5G.
- The response is not exactly immediate when issuing a command now on a smartphone, such as starting a web search.
- A lag of 50 to several hundred milliseconds is common, partly because signals often must pass between different carrier switching centers.
- 5G, which uses newer networking technology, was designed to reduce this latency down to a few milliseconds.
- **Reliability** - 5G is also designed to deliver signals more reliably than earlier cellular networks.
- [Networks now frequently drop bits of data that are not essential for tasks like watching movies on a phone.]
- This change could bring many benefits, notably in fields such as virtual reality.
- The highest-quality VR applications now typically require bulky headsets that are connected by wire to nearby personal computers that generate 3-D images.
- With 5G, that would be off-loaded wirelessly to other machines, freeing users to move and making it easier to develop goggles the size of eyeglasses.
- In the related field of augmented reality, a smartphone camera could be pointed at a football game to see both live video on the display and superimposed player statistics or other data.
- **Besides** these, 5G's impact extends to medicine and other fields that increasingly rely on high-speed connections.
- Officials in the United States and China see 5G networks as a competitive edge.

- The faster networks could help spread the use of artificial intelligence and other cutting-edge technologies too.

Source: Business Line