



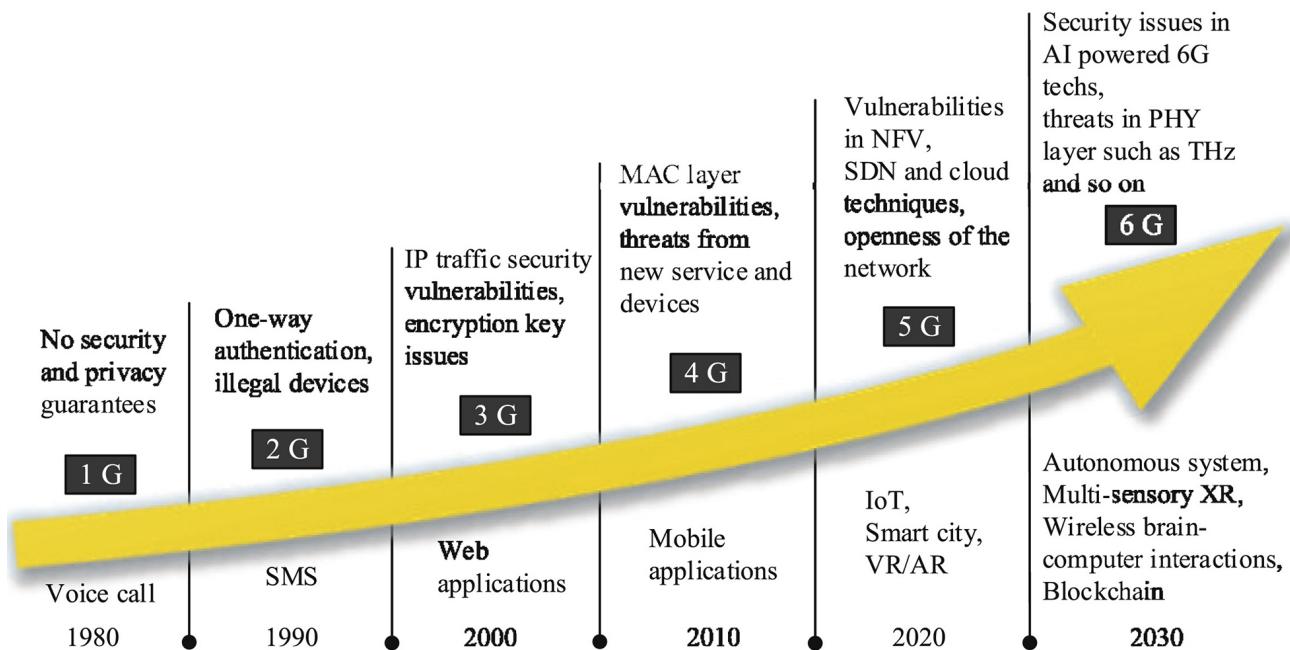
6G Technology

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Why in News

Recently, the government has asked the **Centre for Development of Telematics (C-DOT)** to begin developing 6G and other futuristic technologies to catch up with the global market in time.

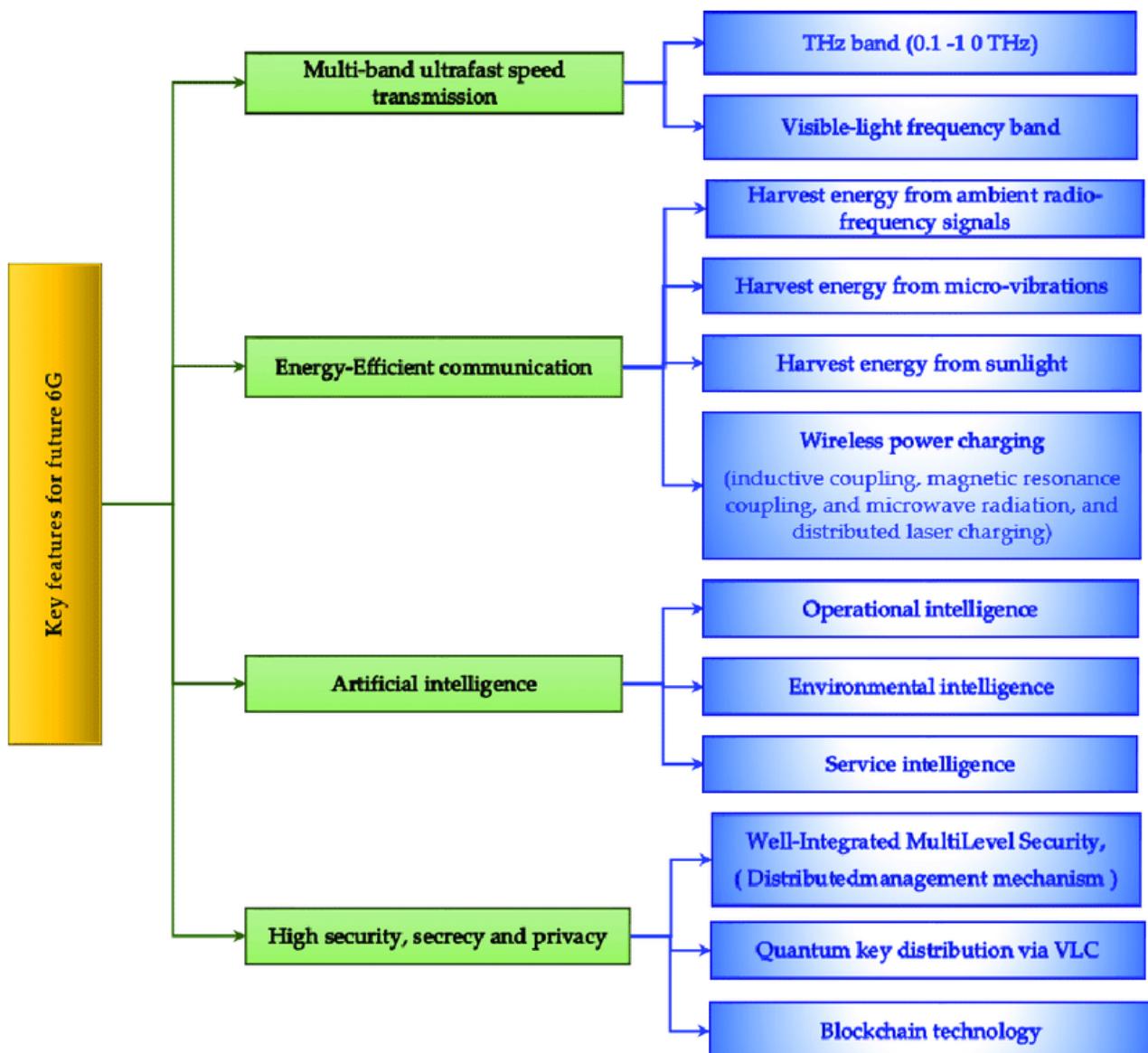
The next generation telecom technology (6G) is said to be **50 times faster than 5G** and is **expected to be commercially launched between 2028-2030**.



Key Points

About:

- 6G (sixth-generation wireless) is the successor to 5G cellular technology.
- It will be able to **use higher frequencies than 5G networks** and provide substantially higher capacity and **much lower latency (delay)**.
- One of the goals of 6G internet will be to support **one microsecond-latency communication** (delay of one-microsecond in communication).
This is **1,000 times faster** - or 1/1000th the latency - than one millisecond throughput.
- It seeks to **utilize the terahertz band of frequency** which is currently unutilized.
 - Terahertz waves fall between infrared waves and microwaves on the electromagnetic **spectrum**.
 - These waves are extremely **tiny and fragile**, but there's a huge amount of free spectrum up there that would allow for spectacular data rates.



- **Significance:**

- **More facilitation:**

- The 6G technology market is expected to facilitate **large improvements** in imaging, presence technology and location awareness.
 - 6G's higher frequencies will **enable much faster sampling rates**, in addition to providing significantly better throughput and higher data rates.

- **Advancement in Wireless sensing technology:**

- The combination of sub-mm waves (e.g., wavelengths smaller than one millimeter) and frequency selectivity to determine relative electromagnetic absorption rates could **potentially lead to significant advances in wireless sensing technology**.

- **Emergence of Digital Capabilities:**

- It will see the **emergence of simple, easy-to-wear-and-carry devices with a huge set of digital capabilities**.
 - This will help the paramedics, educators and agro-technicians to jumpstart the village ecosystems with little or limited need for on-site presence of doctors, professors and agro-experts.

- **Optimising mass public transportation:**

- For India, such an enabling set of technologies will **bring manifold utilisation of scarce rail, air and road networks and make mass transportation far more efficient**; **Artificial Intelligence (AI)** and massively parallel computing architectures will help solve transportation and scheduling operations research problems.

- **Challenges:**

- **Maintaining Protection Mechanisms:**

- The key technical challenges are energy efficiency, avoiding signal attenuation due to obstructions and water droplets in the air, and, of course, maintaining end-to-end trust through robust cyber security and data protection mechanisms.

- **Adoption of New Models:**

- Need **innovations in antenna design, miniaturisation, edge cloud and distributed AI models**. In addition, we need to ensure end-to-end security and privacy by design, instead of as an afterthought.

- **Availability of Semiconductor:**

- We don't have **semiconducting materials that can use multi-THz frequencies**. Getting any kind of range out of those frequencies may require enormous arrays of extremely tiny antennas.

- **Complex Design for Carrier Wave:**

- Water vapor in the atmosphere blocks and reflects THz waves, so mathematicians will have to **design models that allow data to take very complex routes** to its destination.

- It was established in **1984**. It is an **autonomous Telecom R&D (Research and Development) centre** of DoT (Department of Telecom), Ministry of Communications.
- It is a registered society under the **Societies Registration Act, 1860**.
- It is a registered public-funded research institution with the **Department of Scientific and Industrial Research (DSIR)**, Ministry of Science & Technology.
- Currently, C-DOT is working towards realising the objective of various flagship programmes of Govt. of India which include **Digital India**, **BharatNet**, Smart Cities etc.

Way Forward

- Government should indicate the intention for pursuit of 6G by announcing a **long-term vision, a multi-year (multi-decade) plan, strong investments, and minimal bureaucracy**.
- Government needs to **execute the new electronics manufacturing policy** as stated in the **India Trillion Dollar Digital Opportunity document (2019)** of the Ministry of Electronics and IT.
- Not just providing leadership for the Googles and Microsofts of the world, but creating them in our own Indian innovation eco system based on the strong foundation of **'Talent, Technology and Trust'**, is imperative.
- India needs to replicate the space and nuclear technologies mission experience which achieved self-reliance and self-confidence or **Atmanirbharta**. Technology leadership for a better world should be our gift to the world and to ourselves. **Leadership in 6G may be the best way to celebrate 2047, our centenary of Independence.**

Source: ET