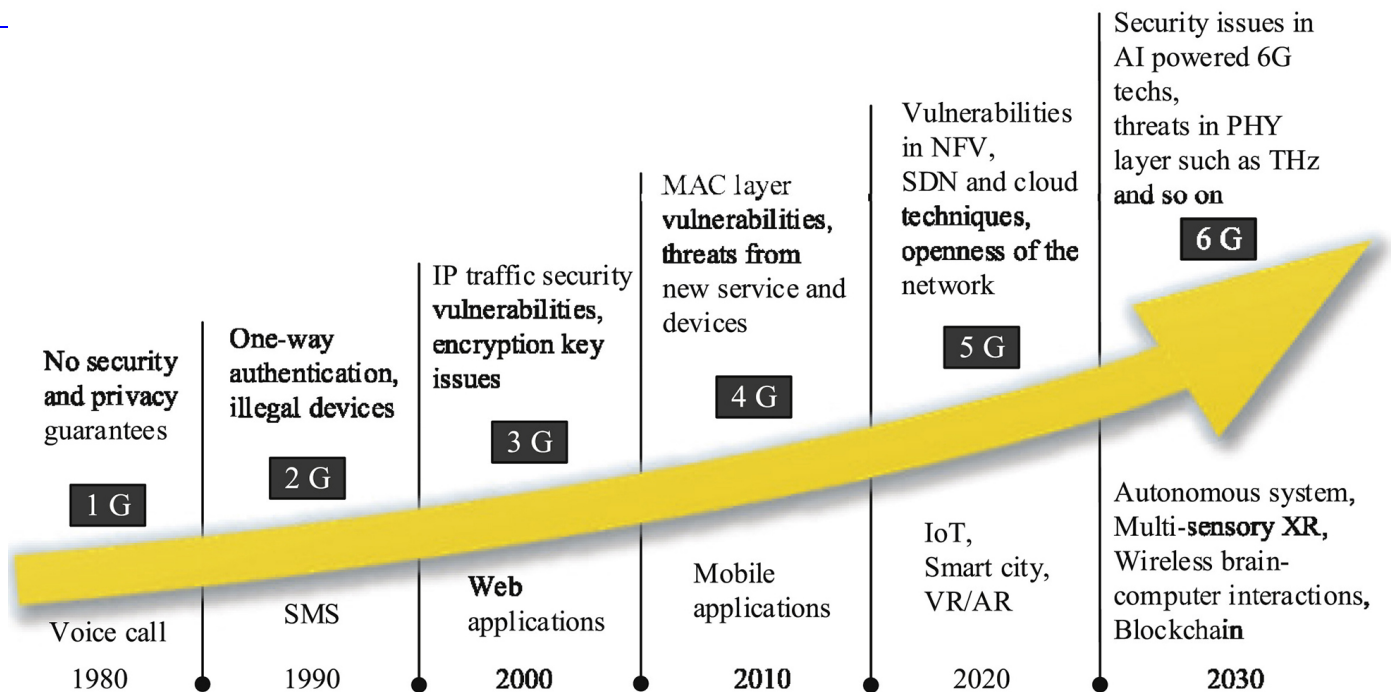# 6G Technology

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.**
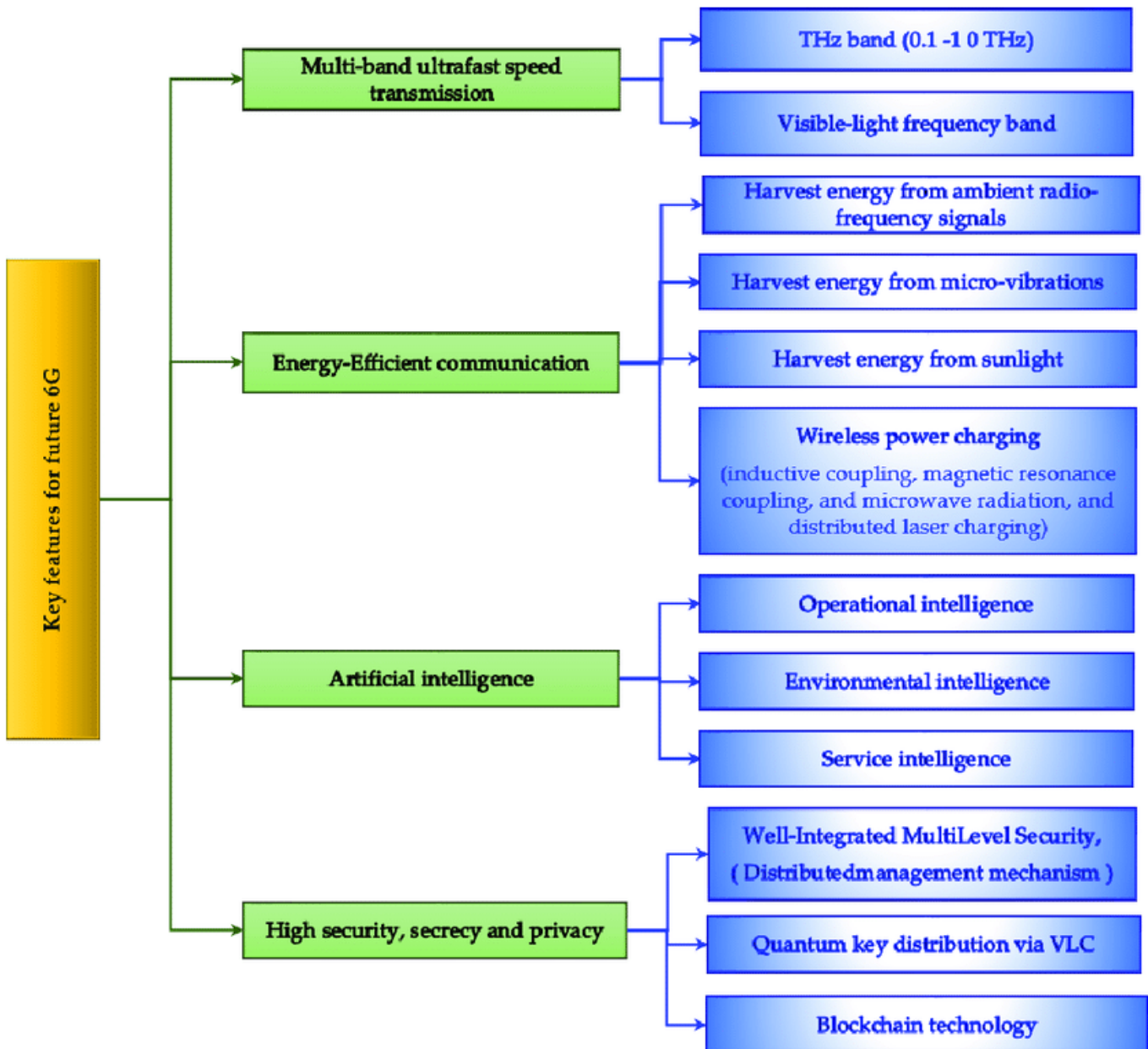
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Key Points

- **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.

Key features for future 6G

- Multi-band ultrafast speed transmission
  - THz band (0.1 -1 0 THz)
  - Visible-light frequency band
- Energy-Efficient communication
  - Harvest energy from ambient radio-frequency signals
  - Harvest energy from micro-vibrations
  - Harvest energy from sunlight
  - Wireless power charging (inductive coupling, magnetic resonance coupling, and microwave radiation, and distributed laser charging)
- Artificial intelligence
  - Operational intelligence
  - Environmental intelligence
  - Service intelligence
- High security, secrecy and privacy
  - Well-Integrated MultiLevel Security, (Distributedm anagement mechanism)
  - Quantum key distribution via VLC
  - Blockchain technology

- **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.

Centre for Development of Telematics (C-DOT)

- 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

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