



## Space Internet

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### Why in News

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Recently, the world's leading private company in space technology **SpaceX** has launched the **Starlink Network** in **Lower Earth Orbit (LEO)** aimed at **providing low-cost and reliable space-based internet services to the world.**

- Currently, **fibre optic cables or wireless networks** through mobile towers provide **internet services.**
- It can be noted that the idea of space internet system is **not new.** It is being used **through Geostationary Satellite** for selective users.

### Starlinks

- **Starlink** is a **SpaceX project** to build a broadband **network with a cluster of orbiting spacecraft** that could eventually number thousands.
- The Starlink satellites carry **Hall thrusters**, which **use electricity and krypton gas** to generate an **impulse**, to manoeuvre in orbit, maintain altitude and guide the spacecraft back into the atmosphere at the end of their mission.
- The **Starlink network** is one of several ongoing efforts **to start beaming data signals from space.**

### Space Internet with Geostationary Satellite

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- Most of the **existing** space-based Internet systems use **satellites in geostationary orbit**.
  - **Geostationary orbit** is located at a height of **35,786 km over** the Earth's surface, **directly above the Equator**.
  - Satellites in this orbit move at **speeds of about 11,000 km per hour**, and complete one revolution of the Earth at the same time that the earth rotates once on its axis.
  - To the observer on the ground, therefore, a **satellite in a geostationary orbit appears stationary**.
- **Advantages:**
  - **Coverage:** The signals from one geostationary satellite can cover roughly a third of the planet — and three to four satellites would be enough to cover the entire Earth.
  - **Easier Connectivity:** As satellites appear to be stationary, it is easier to link to them.
- **Disadvantages:**
  - **Latency Issues:** The transmission from a satellite in geostationary orbit has a **latency of about 600 milliseconds**. The geostationary satellites are located at higher altitudes compared to LEO, thus **the longer the distance that needs to be covered results into greater latency**.
    - The latency is the time lag between a user seeking data, and the server sending that data.

## Space Internet with Low Earth Orbit

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- The LEO extends up to **2,000 km above the Earth's surface**.
- **Advantages:**
  - **Reduced Latency:** The presence of satellite at a lower height from the Earth's surface, will help to **bring the lag down to 20-30 milliseconds**, roughly the time it takes for terrestrial systems to transfer data.
  - **More Viable:** The signals from satellites in space can **overcome obstacles** faced by fibre-optic cables or wireless networks **easily**.
    - The **traditional ways** to deliver the internet — fibre-optic **cables or wireless networks** are **not feasible** in remote areas or places with difficult terrain.
    - Setting up **cables or mobile towers** in these areas is **not viable**.

- **Disadvantages:**

- **Coverage:** Due to its **lower height**, its signals cover a **relatively small area**. As a result, **many more satellites are needed** in order to reach signals to every part of the planet.

The satellites in these orbits travel at more than double the speed of satellites in geostationary orbit to balance the effects of gravity. Thus, many more satellites are needed in the network to eliminate breaks in transmission of data.

- **Space Debris:** It will generate **more space debris**.
- **Difficulty in Space Studies:** The constellations of space internet satellites will make it difficult **to observe other space objects, and to detect their signals**.
- **Light Pollution:** There will be an **increased** risk of **light pollution**.  
Light reflected from the man-made satellites can interfere with — and be mistaken for — light coming from other space bodies.

**Source: IE**