



Satellite Internet

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Why in News

According to an estimate, 1,250 satellites will be launched annually this decade, with 70% of them for commercial purposes.

- Various private companies are **aiming to deliver broadband satellite Internet** around the world **through** their fleet of **Low Earth Orbit (LEO) satellites**.
- The idea of a **space internet** system is not new. It is being used through **Geostationary Satellite** for selective users.

Key Points

- **Satellite Internet and LEO Technology:**
 - **Positioning of Satellites:** LEO satellites are **positioned around 500km-2000km from earth, compared to stationary orbit satellites** which are approximately **36,000km away**.
 - **Latency:** Latency, or the time needed for data to be sent and received, is contingent on proximity.
 - As LEO satellites orbit closer to the earth, they are able to **provide stronger signals and faster speeds** than traditional fixed-satellite systems.
 - Additionally, because signals travel faster through space than through fibre-optic cables, they also have the potential to rival if not exceed existing ground-based networks.
 - **Higher Investment:** LEO satellites **travel at a speed of 27,000 kph** and complete a full circuit of the planet in 90-120 minutes.
 - As a result, individual satellites can only make direct contact with a land transmitter for a short period of time thus requiring massive LEO satellite fleets and consequently, a **significant capital investment**.
 - Due to these costs, of the three mediums of Internet – fibre, spectrum and satellite – the latter is the most expensive.

- **Geostationary Satellite Internet:**

- **Positioning of Satellites:** Geostationary orbit is **located at a height of 35,786 km over the Earth's surface, directly above the Equator.**

- Most of the existing space-based Internet systems use satellites in geostationary orbit.
- 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.

- **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.
- **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 in greater latency.

- **Related Initiatives:**

- **'Five to 50' service (OneWeb):** OneWeb, a private company, has successfully launched constellations of 218 satellites in LEO.
 - The company only has one more launch to complete before it obtains the capacity to enable its **'Five to 50' service** of offering internet connectivity to all regions **north of 50 degrees latitude.**
 - The Five to 50 service is expected to be switched on by June 2021 with global services powered by 648 satellites available in 2022.
- **Starlink:** It is a venture of SpaceX.
 - **Starlink** currently has 1,385 satellites in orbit and has already started beta testing in North America and initiating pre-orders in countries like India.
 - However, Starlink's satellites fly closer to the earth and therefore, the company requires a larger fleet to provide global connectivity than OneWeb.
- **Project Kuiper:** It is a **project of Amazon** announced in 2019.
- **Loon Project:** Google launched its 'Loon' project in 2013, using high-altitude balloons to create an aerial wireless network.

After testing the service in rural Kenya, Google's parent company, Alphabet, abandoned the project in 2021.

- **Issues in LEO Satellites Launch:**

- **Regulation Issues:** During the days of the Sputnik and Apollo missions, governments dominated and regulated space-based activities.
 - However, today, the balance of power has shifted from countries to companies.
 - As a result, there are questions related to who regulates these companies, especially given the large number of nations that contribute to individual projects.
 - It makes the regulatory framework complicated.
- **Logistic Challenge:** There are logistical challenges with launching thousands of satellites into space as well.
- **Difficulty in Space Observation:** Satellites can sometimes be seen in the night skies which creates difficulties for astronomers as the satellites reflect sunlight to earth, leaving streaks across images.
- **Interruptions:** Satellites travelling at a lower orbit can also **interrupt the frequency** of those orbiting above them.
- **Space Junk:** There are already almost 1 million objects larger than 1cm in diameter in orbit, a byproduct of decades of space activities.

Those objects, colloquially referred to as 'space junk,' have the **potential to damage spacecraft** or collide with other satellites.

Source: IE