Space Internet

What is the issue?

- The SpaceX, the world's leading private company in space technology, recently fired a spray of 60 satellites into orbit.
- This is the first operational batch of what is intended to evolve into a constellation of 12,000 satellites aimed at providing low-cost and reliable space-based Internet services.

What is the Starlink network?

- The project "Starlink network" of SpaceX is one of the ongoing efforts to start beaming data signals from space, and also the most ambitious.
- The first batch of Starlink satellites went up on May 24, 2019 will not be part of the network.
- These are similar in configuration to the ones launched on November 11.
- In 2015, SpaceX announced the satellite Internet constellation and later in 2018, it launched two test satellites.
- Following the recent launch, it has now deployed 122 satellites in orbit.
- In October 2019, SpaceX told the International Telecommunication Union (ITU) that it intends to deploy another 30,000 Starlink satellites in Low Earth Orbit (LEO) in coming years.

Why is it necessary to launch satellites in order to provide Internet services?

- This is mainly to ensure that **reliable and uninterrupted Internet services** are universally available in every part of the globe.
- Currently, more than half the world's population do not have access to reliable Internet networks.
- That is because the traditional ways to deliver the Internet (fibre-optic cables or wireless networks) cannot take it everywhere on Earth.
- In many remote areas, or places with difficult terrain, it is not feasible or viable to set up cables or mobile towers.
- Signals from satellites in space can overcome this obstacle easily.

How old is this idea of Space Internet?

- Space-based Internet systems have been in use for several years now but

only for a small number of users.
- Also, most of the existing systems use satellites in geostationary orbit.
- This 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 in the same time that the earth rotates once on its axis.
- To the observer on the ground, therefore, a satellite in geostationary orbit appears stationary.

How will placing satellites in lower orbits help?

- One big advantage of beaming signals from geostationary orbit is that the **satellite can cover a very large part of the Earth**.
- Signals from one satellite can cover roughly a third of the planet and 3 to 4 satellites would be enough to cover the entire Earth.
- As they appear to be stationary, it is easier to link to them.
- A satellite in the lower orbit, 200-2,000 km from the Earth's surface, can bring the lag down to 20-30 milliseconds, roughly the time it takes for terrestrial systems to transfer data.
- The LEO extends up to 2,000 km above the Earth's surface.
- The **12,000 Starlink satellites** for which SpaceX has permission and the **other 30,000** that it wants to launch will be deployed in the altitude band of 350 km to 1,200 km.

What are the problems with the lower orbits?

- Owing to their lower height, their 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.
- Additionally, satellites in these orbits travel at more than double the speed of satellites in geostationary orbit about 27,000 kmph to balance the effects of gravity.
- Typically, they go around the Earth once every few hours.
- To compensate for the fact that they cannot be seen from a terrestrial location for more than a few minutes, many more satellites are needed in the networks, so that there are no breaks in the transmission of data.
- That is the reason why the Starlink network is talking about 42,000 satellites.

When will Starlink provide its space-based Internet service?

- Starlink aims to start service in the northern United States and Canada in

2020, and expand to cover the whole world by 2021.

- The current plan is to deploy satellites in two constellations of around 4,400 and 7,500.
- Launches will take place at frequent intervals now onward.
- SpaceX says it can start services on a small scale once 400 satellites join the network.
- Several other private companies too, have plans for space-based Internet services. But these projects are very small compared to Starlink.
- Once operational, space-based Internet networks are expected to change the face of the Internet.
- Services such as autonomous car driving are expected to be revolutionised, and the Internet of Things (IoT) can be integrated into virtually every household, whether urban or rural.

Is there a downside to this projection?

- **Three issues** have been flagged -
    1. Increased space debris,
    2. Increased risk of collisions, and
    3. The concern of astronomers that these constellations of space Internet satellites will make it difficult to observe other space objects, and to detect their signals.
- To put things in perspective, fewer than 9,000 satellites have been launched into space since the beginning of the Space Age in 1957.
- Most of the operational satellites are located in the lower orbits.
- On September 2019, the European Space Agency (ESA) had to perform, for the first time ever, a collision avoidance manoeuvre to protect one of its live satellites from colliding with a mega constellation.
- Astronomers and scientists have also complained about **increased light-pollution**.
- They referred to light reflected from the man-made satellites that can interfere with and be mistaken for light coming from other heavenly bodies.

Source: The Indian Express

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