SATELLITE INTERNET - ECONOMY

NEWS: Recently, India's Department of Telecommunications (DoT) issued new amendments to satellite internet service rules, tightening national security and compliance norms.

WHAT'S IN THE NEWS?

Definition and Overview

- Satellite Internet refers to broadband internet access provided via satellites, especially useful in remote or underserved regions.
- It typically involves two types of satellites:
    - Low Earth Orbit (LEO) satellites, positioned between 500–2,000 km from Earth, offer low latency and high speed.
    - Geostationary Orbit (GEO) satellites, located at ~35,786 km above the equator, remain fixed over one location and are ideal for continuous coverage.

Characteristics of Geostationary Satellites

- These satellites orbit at the same rotational speed as the Earth, appearing stationary from the ground.
- Widely used in telecommunications, broadcasting, and weather forecasting due to their constant coverage over a specific area.

Major Satellite Internet Providers in India

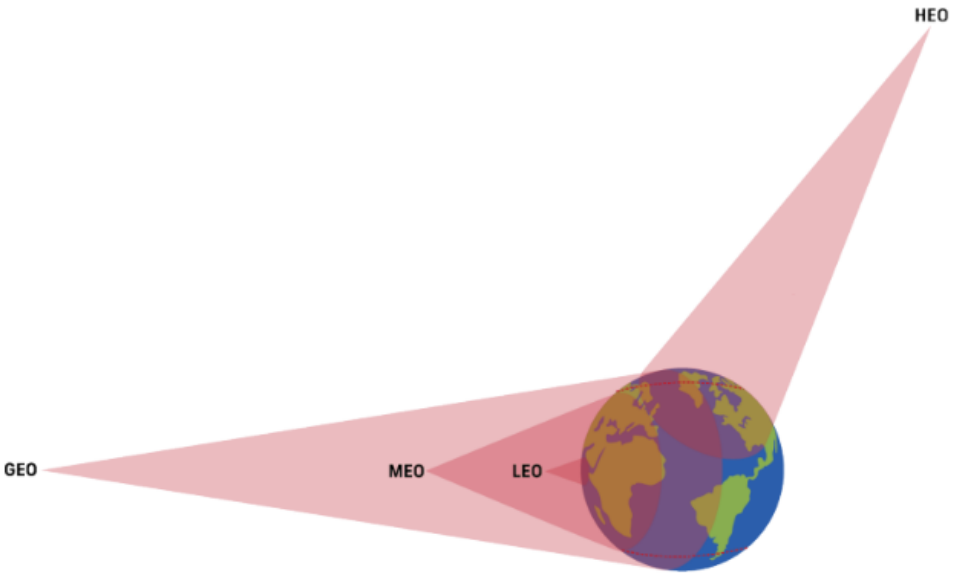
- Key companies exploring or operating in the Indian market include:
    - SpaceX's Starlink
    - Amazon's Project Kuiper
    - Eutelsat OneWeb
    - Reliance Jio Satellite Communications

Regulatory Licensing Framework in India

- Satellite internet services in India require a Global Mobile Personal Communications by Satellite (GMPCS) license.
- These are now brought under the Unified License (UL) regime to ensure uniform regulatory treatment for all operators.
- Starlink's operations are currently on hold, pending GMPCS approval and satellite spectrum allocation.

Satellite Based Communication

- ## About:
    - A communications satellite is a type of artificial satellite placed in Earth's orbit to send and receive communication data between a source and a destination.
    - With over three thousand communication satellites in multiple orbits today, millions worldwide rely on satellite communications to deliver radio, television, and military applications.
    - Satellite communications have opened access to voice and data communication services across the globe in places where terrestrial cellular and broadband connectivity is not available or network coverage is patchy.
- ## Types:
    - Based on the orbit, communication satellites fall into one of four categories:
        - Geostationary Earth orbit (GEO)
        - Medium Earth orbit (MEO)
        - Low Earth orbit (LEO)
        - Highly elliptical orbit (HEO)



The 4 different satellite orbit paths. LEO, MEO, GEO & HEO. All providing coverage to different areas of the earth for various applications.

- Working:
  - Satellite communications use orbiting satellites and ground stations to transmit and relay information via microwaves between points on Earth.
  - There are three stages in the process:
    - Uplink
    - Transponder
    - Downlink
  - For example, in live television, a broadcaster sends a signal to a satellite (uplink), which then boosts and changes the frequency of the signal (transponder), before sending it back to Earth stations (downlink).

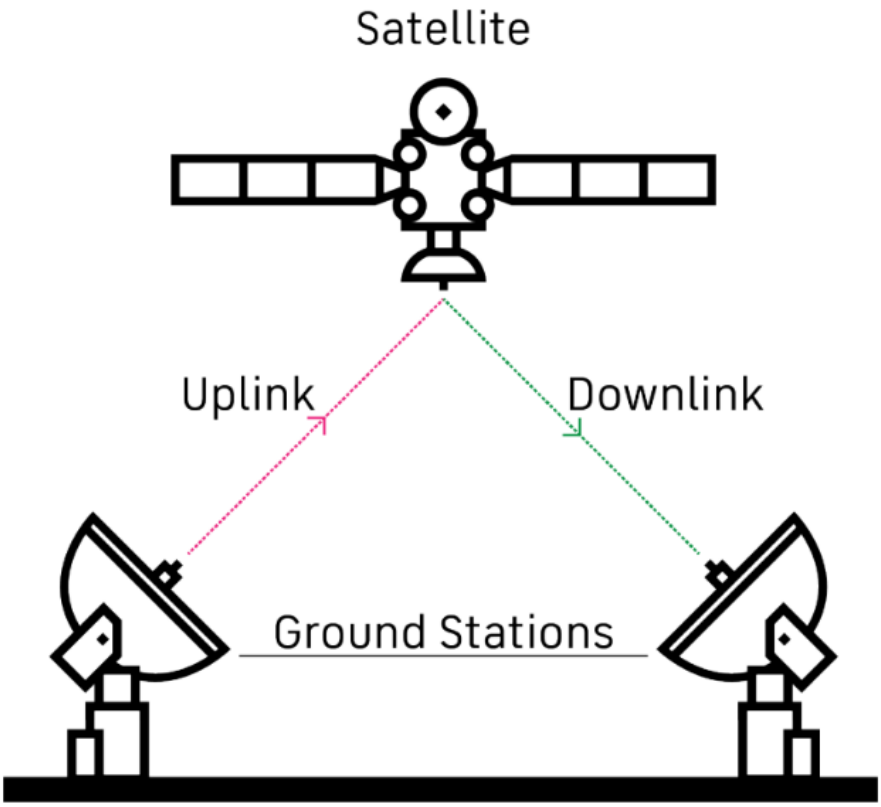
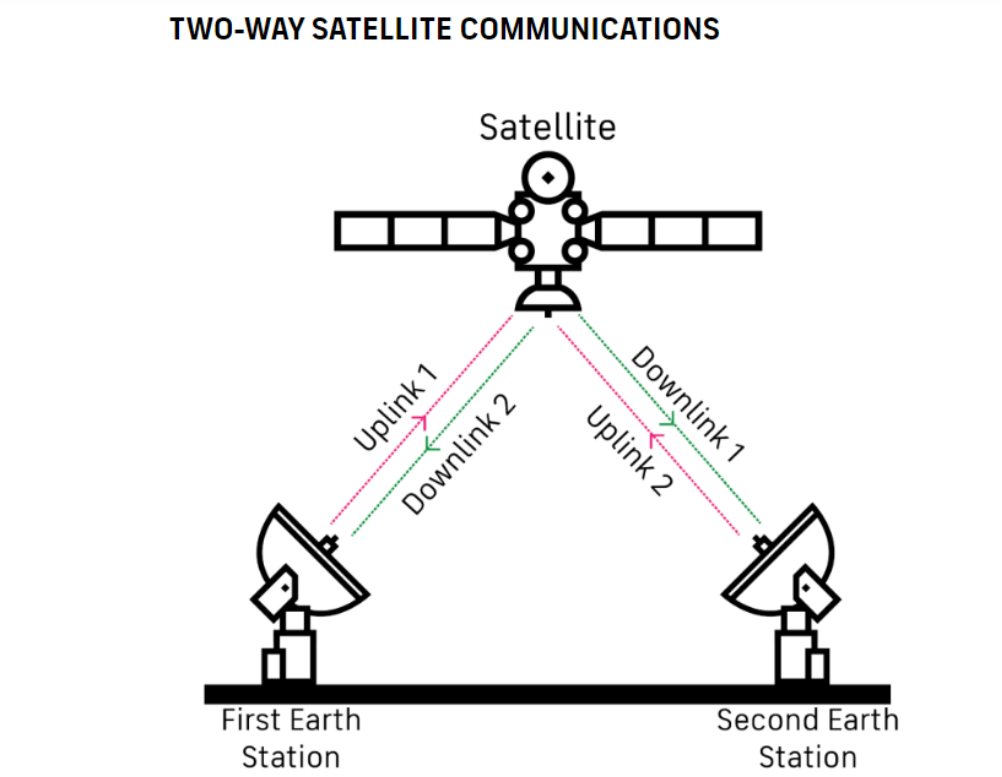


Diagram of a one way communication satellite network consisting of three stages: uplink, transponder and downlink..



Two way communication satellite network displaying information relayed between the same ground stations via the same satellite.

Key Changes in Satellite Internet Rules

a. Licensing and Uniformity

- All satellite internet service providers—existing and new—must now operate under the Unified License framework, ensuring regulatory consistency.

b. Geo-Fencing of Terminals

- Terminals within India cannot function when taken abroad.
- Any foreign-purchased terminal must be disabled inside India to prevent cross-border misuse.

c. Mandatory Local Manufacturing

- Companies must submit a 5-year phased manufacturing plan.
- The plan must ensure at least 20% indigenisation of the ground segment to promote local production.

Data Localisation and Infrastructure Requirements

- All user data must be stored within Indian territory.
- Indian user traffic cannot be routed or mirrored through foreign servers or gateways.
- Critical infrastructure such as:
    - Data centers
    - Domain Name Systems (DNS)
    - Lawful interception systems
      must be physically located in India.

NavIC Integration Mandate

- All user terminals must integrate India's NavIC navigation system.
- Initially on a best-effort basis, but full compliance is mandated by 2029.

Operational and Surveillance Obligations

- Providers must support:
    - Website blocking based on government directives.
    - Real-time tracking of both fixed and mobile user terminals.
    - Metadata sharing with law enforcement agencies when demanded.
- Operators must be capable of restricting services during:
    - Emergencies
    - Hostile situations
    - In sensitive zones like international borders and the Exclusive Economic Zone (EEZ).

Significance of the New Regulations

a. Strengthening National Security

- These rules are framed in light of concerns following incidents like the Pahalgam terror attack, ensuring satcom networks are not misused.

b. Ensuring Digital Sovereignty

- India is asserting full control over digital infrastructure and data, ensuring no foreign dependency for data handling.

c. Boosting Indigenous Innovation

- Mandatory NavIC integration and local manufacturing requirements promote the Make in India initiative and enhance technological self-reliance.

d. Addressing Operational Challenges

- Geo-fencing restrictions may complicate global roaming, affecting sectors like:
    - Aviation
    - Maritime connectivity
- For example, Starlink's global roaming terminals are not viable for Indian users traveling abroad due to these restrictions.

e. Creating Regulatory Clarity

- By integrating satellite services into the Unified License system, India is ensuring a clear, consistent, and enforceable legal framework for all stakeholders.

Overall Impact

- These comprehensive rules strike a balance between technological innovation, connectivity expansion, and strategic national interests.

- The framework prioritizes security, sovereignty, and self-reliance while ensuring operational accountability for private and global satellite operators.

Source: https://www.thehindu.com/news/national/trai-recommends-fees-framework-for-satellite-internet-services/article69557372.ece