

Satellite Internet in India

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Satellite Internet in India : Technology, Applications, and Strategic Significance

Context:

Starlink, the **satellite internet service** by Elon Musk, is preparing to enter India. This development could significantly enhance **digital connectivity** and strengthen **strategic communication networks** across the country, especially in regions with limited or no access to conventional internet infrastructure.

Introduction

Satellite internet is a **wireless communication technology** that delivers internet access via satellites in space instead of traditional cables or fiber-optic lines. It consists of satellites in orbit, ground stations, and user terminals. The technology enables internet access across remote, rural, and hard-to-reach locations where terrestrial networks are not viable.

Need for Satellite Internet

- **Bridging the Digital Divide** - Extends internet connectivity to remote, rural, and island communities where building terrestrial networks is costly and slow.
- **Disaster Resilience** - Quickly restores communication after natural disasters such as floods, cyclones, or earthquakes disrupt ground-based systems.
- **On-the-Move Connectivity** - Provides stable internet access to moving ships, aircraft, and defence convoys across challenging terrains.
- **Strategic Security** - Maintains secure links in high-altitude and sensitive areas like **Siachen**, enhancing military preparedness.

- **Economic Inclusion** – Boosts **e-governance**, **e-commerce**, **telemedicine**, and financial services for underserved populations.
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Key Features

- **Global Coverage** – Operates effectively over oceans, deserts, mountains, and polar regions.
 - **Dual-Use Technology** – Supports both civilian and military applications.
 - **Rapid Deployment** – Can be activated within hours to address urgent connectivity needs.
 - **High Resilience** – Works independently of local cables and towers, avoiding risks of physical damage.
 - **Mega-Constellations** – Utilises thousands of satellites for **low latency** and redundancy in network performance.
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How It Works

- **Space Segment** – Satellites equipped with antennas, transponders, and onboard processors capture and relay signals between users and the internet backbone.
 - **Ground Segment** – User terminals, antennas, and ground stations connect directly to satellites. Terminals can be fixed or portable.
 - **Data Flow** – Requests from the user travel to satellites, which relay them to ground stations connected to the internet backbone, and return the response through the same route.
 - **Seamless Handover** – In Low Earth Orbit (LEO), satellites remain over a location for only a few minutes. As one satellite moves out of range, the system automatically transfers the connection to the next satellite, ensuring uninterrupted service.
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Applications

- **Civilian** – Extends broadband to rural areas, supports smart agriculture, and assists in

environmental monitoring.

- **Disaster Management** - Facilitates coordination in rescue and relief efforts during natural disasters.
- **Defence** - Enables secure communications, drone control, and intelligence sharing.
- **Transport** - Improves safety and navigation in aviation, shipping, and autonomous vehicles.
- **Healthcare** - Supports telemedicine and remote diagnostics in isolated areas.
- **Space Economy** - Enhances global trade, space tourism, and exploration initiatives.

Conclusion

Satellite internet represents not only a **technological advancement** but also a **strategic asset** for enhancing **national security**, **economic growth**, and **digital equity**. For India, it is essential to integrate satellite internet into national infrastructure planning while simultaneously developing **indigenous capabilities** to ensure self-reliance and security in this emerging sector.

