



Satellite internet: The next big wave

Market study report

June 2023

About this report

Objectives

- ▶ This report aims to provide an overview and competitive insights into the satellite internet market.
- ▶ It highlights some of the growth drivers and key trends that are shaping this market.
- ▶ The report also examines the pricing policies of major broadband operators and their prospects in India



Foreword



As the economies across the world face the new challenges and opportunities, the need for 24/7 connectivity is at the forefront of this reality, notwithstanding the multitude of conditions that may block the communication and coverage, such as weather or geographic location. Satellite broadband is an alternative with the capacity to provide the required stability and sufficiency for hard-to-reach areas and business domains like logistics which are throwing new scenarios at the communication industry. The lack of dependency on complex ground structures is a boon and at the same time developments in domain of space can provide interesting options.

- Santosh Tiwari
Partner, Strategy and Transactions EY LLP

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SECTION 01



Executive Summary

Executive Summary

GLOBAL

Access to internet

With approximately 63% of the global population having internet access, there is a significant opportunity to expand and bridge the digital divide for the remaining population

Key drivers for industry growth

High demand for instant communication, limited rural internet access, increased adoption of technologies like AI, ML, and cloud computing, increase in government incentives, and the introduction of smart cities and connected cars

Limited players in the industry

SpaceX's Starlink is leading the industry, but the scarcity of providers compared to mobile internet or broadband connections has led to higher costs

Strategies adopted to reach potential

Cost reduction, industry consolidation, service expansion, digitization and innovation, and addressing short-term demand-supply imbalances



Non-internet users in India¹

Out of nearly 1.4 billion people in India, close to 40% do not have internet access, with rural areas making up most of these cases



Potential of Satellite internet customers in India³

The number of satellite internet customers is estimated to increase by almost 6x, reaching ~2 million by 2025, as per ICRA's 2021 report



Government support²

The GoI approved the Indian Space Policy 2023 which helps in providing greater clarity on the regulatory framework and the foreign ownership restrictions for operators of LEO and MEO satellite constellations



Economies of scale

Cost is one of the critical factors in the success of satellite internet in India, the country's potentially vast subscriber base would offer economies of scale



Key drivers for the Indian market

Large population, government initiatives, increased smartphone penetration, and the ability to reach rural and remote areas



Challenges in the Indian market⁴

Challenges may arise in terms of license approvals, high service costs, and the resignation of the company's India chief

SECTION 02



Satellite internet

- ▶ Overview
- ▶ Types of satellite network
- ▶ Growth drivers and challenges
- ▶ Key applications



Satellite internet: an overview



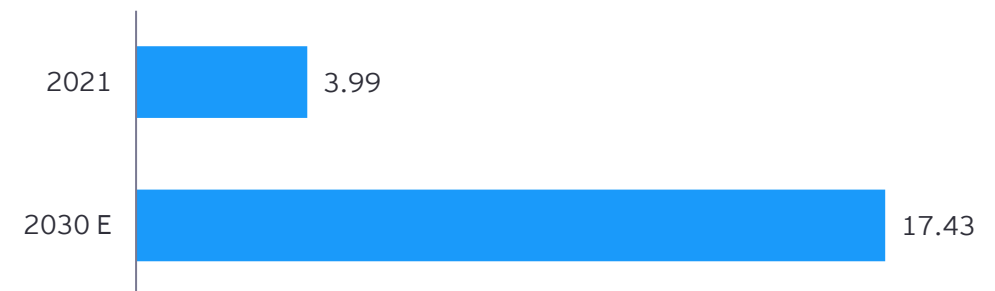
What is satellite internet?

- ▶ Satellite internet or satellite broadband, is a wireless internet connection provided through communication satellites orbiting the Earth.
- ▶ It, being independent of location, can be accessed from anywhere within the range of satellites providing global coverage to its users.
- ▶ It is **emerging as an effective alternative** for communication and broadband services **in remote and rural areas** where other traditional internet mediums like digital subscriber line (DSL) and cable are hard to reach.
- ▶ Thus, satellite internet is gradually gaining popularity in the world and big internet companies are entering this space to offer faster internet network.
- ▶ According to the UN estimates, **roughly 63% of the world's total population has access to internet**. This provides enough scope to tap into this area and cover the remaining world population.

The satellite internet market is on a considerable growth path

- ▶ The satellite internet technology has seen a significant evolution in recent years. However, the industry is still in the nascent stage.
- ▶ Estimates of the industry's market size vary considerably, with one estimate projecting the **overall market to be more than US\$17 billion by 2030**. Another estimate projects the global space-based broadband internet market to surpass US\$50 billion by 2031.
- ▶ Despite considerable variations in the market size, **the industry is on a growth path and has the potential to cause sizable disruptions in traditional industries.**

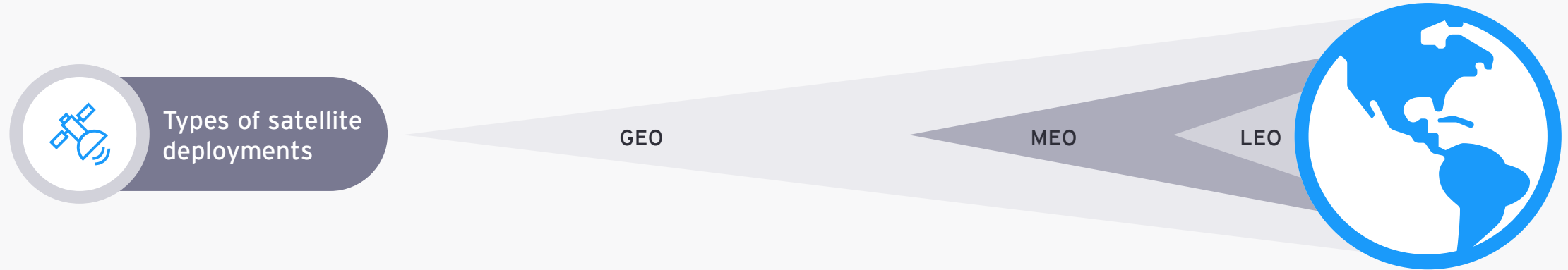
Satellite internet market size estimate (US\$ billion)



Source: Acumen Research and Consulting (Sep 2022)

Starlink uses LEO deployments, while Jio prefers a combination of MEO and GEO

Satellite network and communication work on orbits in space. There are three main types of orbits, based on their distance from the Earth, and each orbit is used for different tasks. A satellite's distance from the Earth impacts its network performance and hence becomes a key criterion when selecting a satellite service provider.



	Geostationary Earth orbit (GEO)	Medium Earth orbit (MEO)	Low Earth orbit (LEO)
Distance from Earth	~35,786km	~2,000km-35,786km	~160km-2,000km
Latency	Medium latency	Low latency	Very low latency
Deployment cost	Very high cost setup	Mid-high cost setup	Comparatively low cost setup
Earth coverage	Very large	Large	Small
Antenna speed	Stationary antennas (three satellites for global coverage)	1-hour slow tracking (six satellites for coverage)	10-minute fast tracking (100s-1,000s satellites needed for coverage)
Applications	Weather data, broadcast TV, imagery, low-speed data communication	Communications, defense industry applications, navigation systems such as GPS	Remote sensing, human space flight, data communication
Players using this orbit	Jio Space Technology Limited (will use a combination of GEO and MEO satellite constellations)		Starlink, OneWeb, Project Kuiper, Telesat

Satellite providers are driven to reach rural markets ahead of their competitors, which is the primary force driving the industry

Market drivers

Advancements in global communications and increased use of cutting-edge technologies in the satellite space such as **AI, ML and cloud computing**

Limited internet access in rural areas combined with increased smartphone penetration

Increase in government incentives and subsidies is likely to boost the adoption of satellite broadband services

High demand for instant communication between the government and health care institutions, especially during the COVID-19 pandemic

The future of **smart cities and connected cars** likely to augment satellite internet demand

Major growth drivers for satellite internet

Technical challenges



Bad weather conditions, such as heavy rain, wind or snow could impact the signal strength.



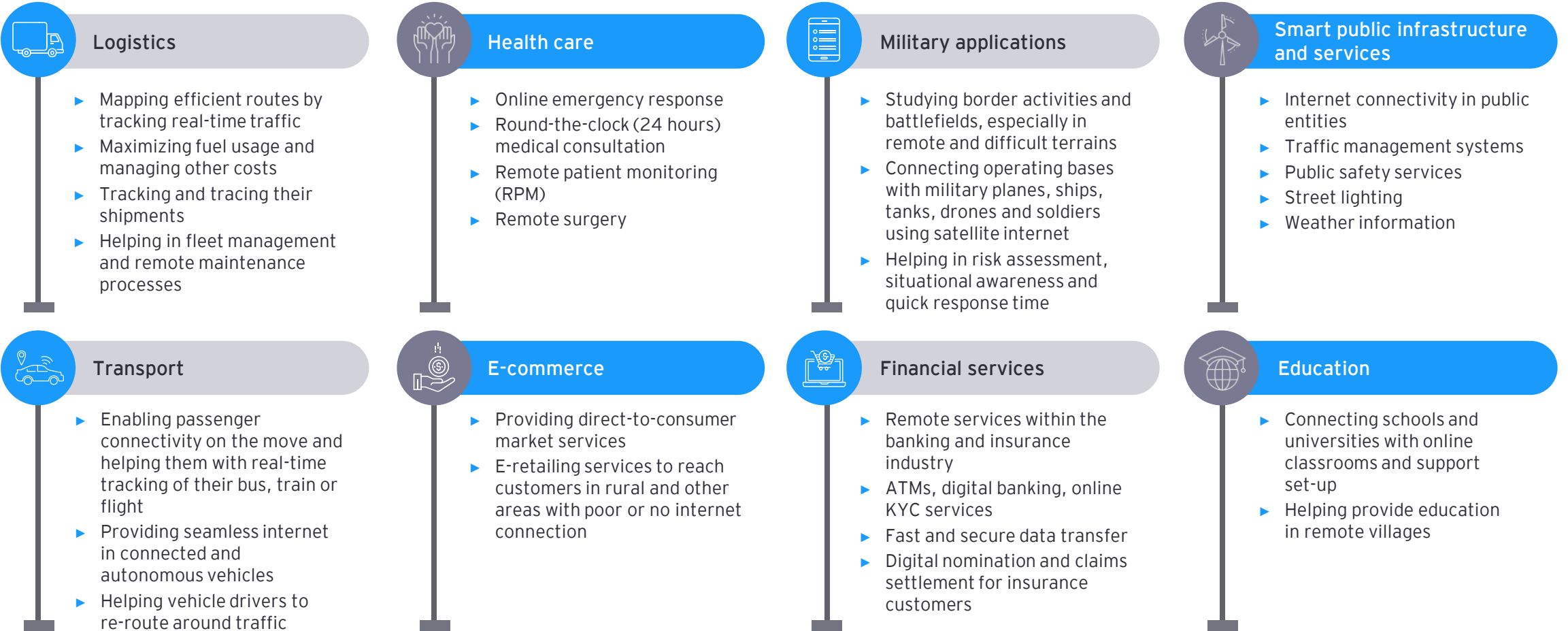
Bright lights emitted by satellites in the night sky could interfere with astronomers' studies and observations.



The lack of **satellite connectivity on smartphones** is a key growth obstacle. However, **Apple's initiative, to introduce this feature** into its newest phones, might prompt other companies to follow the suit.

Key applications of satellite internet

Satellite internet has a multitude of use cases in today's rapidly evolving world and can be beneficial in numerous ways to governments, businesses, schools and individuals, globally. Some of the potential applications of satellite internet are:



SECTION 03



Players emerging in this space

Players emerging in the global and Indian satellite internet space



Key global players

- ▶ Starlink
- ▶ OneWeb
- ▶ Telesat
- ▶ Hughes Communications
- ▶ Viasat
- ▶ SES
- ▶ E-Space
- ▶ Rivada Space Networks
- ▶ Other emerging players and start-ups



- ▶ **Partnerships:** Some of the top companies, including Starlink, OneWeb and Telesat are planning to enter the Indian market through partnerships with existing service providers.
- ▶ **Licenses:** These firms have already **applied for commercial licenses** with the country's Department of Telecommunications (DoT).
- ▶ **Business model:** While these companies have a customer focus, they largely **target a business-to-business (B2B) approach.**



Key Indian players

- ▶ Reliance Jio (Jio Space Technology Limited)
- ▶ Bharti Airtel
- ▶ Tata's Nelco
- ▶ ISRO (Indian Space Research Organisation)
- ▶ Hughes Communications India
- ▶ Bharat Broadband Network Limited (BBNL)



Global satellite players are trying to get their foothold in the Indian market through partnerships:

- ▶ **SES** has entered into a partnership with **Jio Space Technology Limited**
- ▶ **Hughes Communications**, through its Indian arm, has collaborated with **ISRO**
- ▶ **OneWeb** has joined hands with **Bharti Airtel and ISRO**
- ▶ **Telesat** has partnered with **Tata's Nelco**

SECTION 04



Key trends expected to shape
the satellite market

Key trends indicating significant transformations in the satellite space

Some important trends that are expected to shape the satellite internet space in the coming years include:



Decreasing production costs

- ▶ High production costs for launching satellites and installing ground equipment are ultimately passed on to the end-users.
- ▶ Thus, **satellite players are trying to cut production costs** by redesigning their terminals.
- ▶ Starlink's cost to produce each terminal is ~US\$1,500. While the company has succeeded in lowering the costs to US\$1,000, **it is still offering its terminal at a subsidized rate of US\$599¹**.
- ▶ With **continuous efficiencies to lower the terminal cost**, the company has successfully introduced a smaller dish, which is less expensive to produce.



Industry consolidation

- ▶ Starlink's emergence as a dominant player in the industry is pressurizing its competitors to consider merger options.
- ▶ Satellite and space are fixed and high-cost industries, thus **market consolidation or partnerships can ensure financial benefits and constant capital flow**.



Possibility of disruption in the telecom market

- ▶ The increasing number of satellites in the orbit will help satellite operators grow and gradually expand their service offerings.
- ▶ **Starlink and Apple**, along with their current offerings, are also said **to provide a 'voice-based telephony' service**, which will enable users to make satellite-based calls.
- ▶ This may give direct competition and pose a threat to existing telecoms.



Potential breakthroughs this decade

- ▶ There is **ongoing rapid digitization and an increase in innovations** in the satellite and space industry.
- ▶ Many governments and companies worldwide have begun investing and experimenting in the satellite networks market.
- ▶ With new and large players entering the competition, a **global transformation is likely to be expected in the coming years**.



Short-term demand-supply imbalance

- ▶ With satellite internet on a growing path, **supply may exceed demand** for the next few years.
- ▶ This is majorly on account of traditional internet operators offering reliable high-speed internet at fairly lower prices than satellite internet.
- ▶ However, the demand for such service is likely to increase, with various **governments trying to reduce the digital divide in rural areas** and with technological advancements in other sectors.

SECTION 05



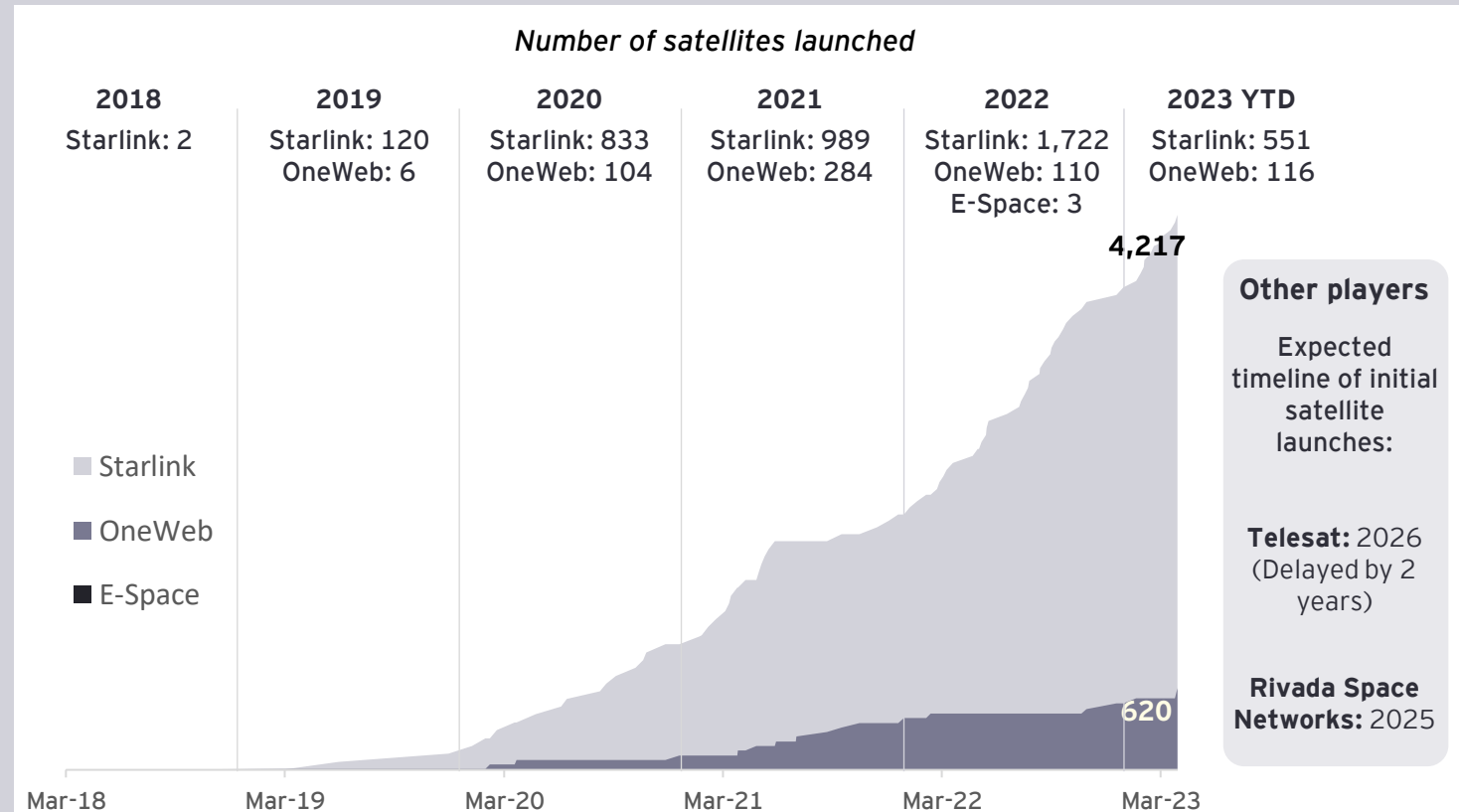
How Starlink fares against the competition

Starlink way ahead of its competition

Starlink's first mover advantage

- ▶ SpaceX's internet venture Starlink was among the first players in the satellite internet market and **has launched over 4,200 satellites till date** (~3,900 currently operating in orbit)¹.
- ▶ With **more than 1 million subscribers² in over 50 countries globally**, it is by far the biggest player in the satellite internet market.
- ▶ US Federal Communications Commission (FCC) has already approved Starlink for **12,000 satellites**.³
- ▶ While Starlink's primary focus would be rural connectivity, it has also received FCC authorization to **provide satellite internet services to trucks, planes and boats**.⁴
- ▶ It is also **partnering with tech majors like Microsoft and Google** to link their respective cloud services to its own satellite network.⁵
- ▶ In August last year, it **partnered with T-Mobile** to provide direct-to-mobile satellite communication.⁶

The satellite launch race: how the competition is shaping up



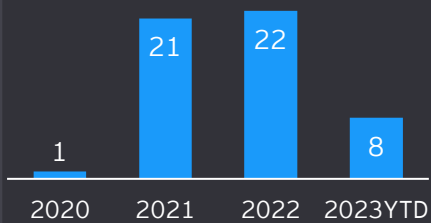
Source: Jonathan's Space Pages (Satellite statistics for Starlink, OneWeb, and E-Space)

Starlink is expanding its global footprint rapidly

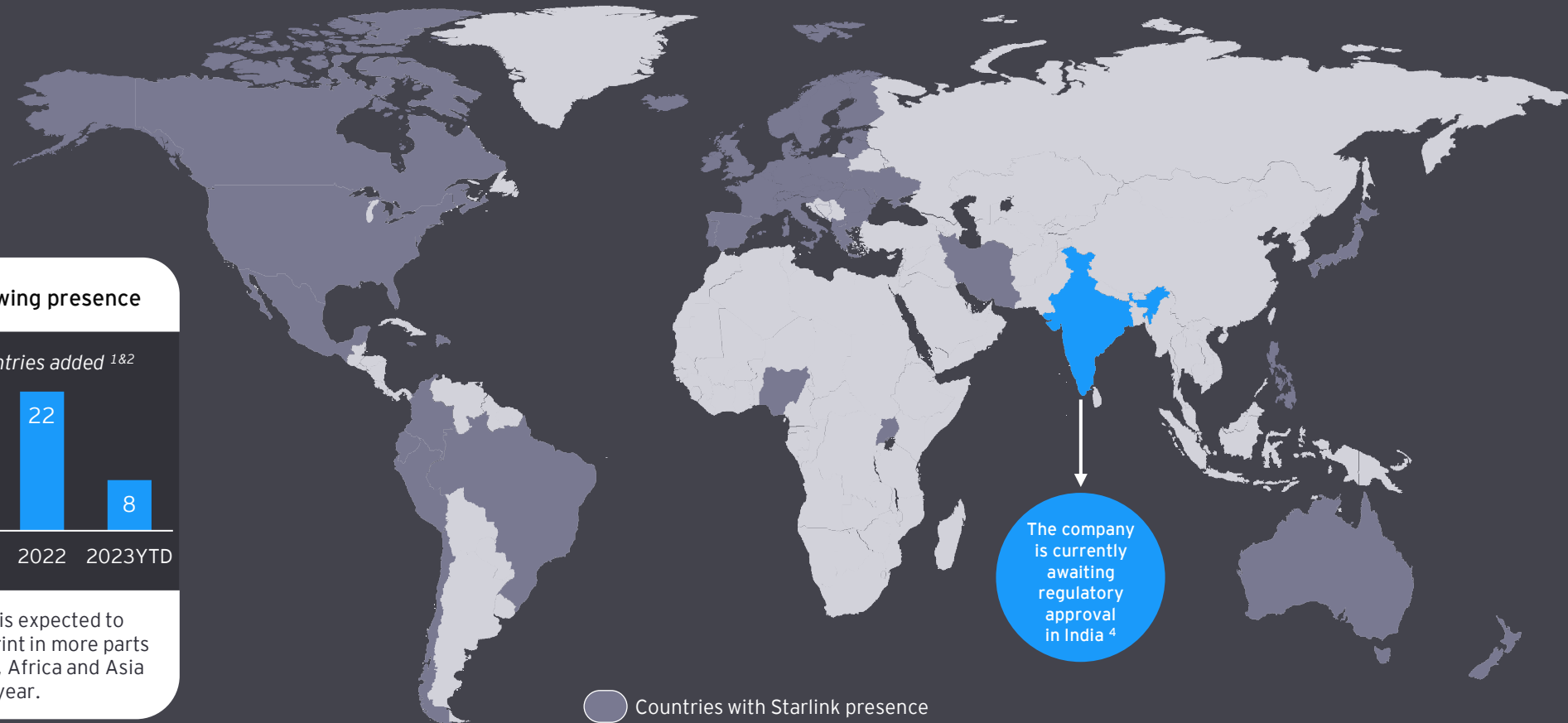
Starlink is now present on all seven continents and serves more than **1 million subscribers globally**. Moreover, through its space laser network, it can also reach remote locations across the world such as Antarctica³.

Starlink's growing presence

Number of countries added ^{1&2}



The company is expected to expand its footprint in more parts of the Americas, Africa and Asia this year.



With Starlink leading the satellite internet space, competitors are also firming their market foothold (1/2)

OneWeb

- ▶ Backed by the **Bharti Airtel Group**, OneWeb is the **second largest player** after Starlink, in the satellite internet space.¹
- ▶ Unlike Starlink, it does not offer broadband connections to individual users, but primarily caters to telecom firms that offer internet service.²
- ▶ The company has signed a **six-year contract with Hughes Network Systems**.¹
- ▶ OneWeb anticipates having all necessary regulatory permits, including **the essential landing rights and market access clearances, by July 2023**, to launch its high-speed satellite internet services in India.¹⁰
- ▶ It has received a letter of intent for offering NLD services and a license for GMPCS services from India's DoT*.
- ▶ In March this year, it **completed its 18th launch, bringing the total satellite launches to 620** (618 in orbit, after 2 satellites failed or were retired).²
- ▶ OneWeb has now launched ~95% of its **planned 648 LEO satellites**, enough for providing global coverage. However, it plans to launch additional satellites for resiliency and redundancy.³

Telesat and Nelco

- ▶ Canadian firm Telesat aims to launch its global satellite internet services through its LEO network, **"Lightspeed"**, targeting enterprises and governments.⁴
- ▶ Amid inflation and supply chain constraints, **Telesat was forced to downsize its initially planned 298 satellites to 198 satellites**⁶. This also pushed its planned debut to 2026 (from 2024).⁴
- ▶ Despite downsizing, the project cost is estimated at **~US\$5 billion**, of which Telesat has secured ~US\$3.3 billion from the Canadian government and existing financial resources.⁵
- ▶ **Tata Group's Nelco and Telesat entered into a partnership** and applied for the GMPCS license to launch their satellite internet services in India.⁶
- ▶ **Nelco became the fourth player to apply for a satellite internet license**, after presenting a trial for its satellite broadband to government agencies and telecom firms in May 2022.⁶

Bharat Broadband Network Ltd. (BBNL)

- ▶ The Indian government is also entering the satellite internet space with **BBNL, a state-owned** agency, in charge of implementing the **BharatNet project**.⁷
- ▶ Under this project, BBNL aims to connect 7,000-gram panchayats all over India through satellite internet.⁸
- ▶ BBNL **finished its pilot testing** in India's Arunachal Pradesh in 2022 and aimed to roll out its satellite services in other north-eastern states.⁷
- ▶ While the actual pricing and details regarding a commercial rollout would be determined after testing in some more states, it is expected that the **costs would be fairly reasonable**.⁷
- ▶ Recently, BBNL collaborated with the Indian army to provide satellite-based Internet services to the soldiers deployed at the Siachen Glacier. The communication satellites were launched by ISRO under the BharatNet project.⁹

Reliance Jio has also entered the market by partnering with SES, creating a potential threat to competitors. It has already received DoT approvals.

Jio's entry (covered ahead)

*DoT - Department of Telecommunications, India ; NLD - National long distance ; GMPCS - Global mobile personal communications by satellite services

With Starlink leading the satellite internet space, competitors are also firming their market foothold (2/2)

E-Space

- ▶ E-space is a new **satellite start-up**, that recently launched its **first three test satellites in May 2022**, by developing a satellite **mesh network in LEO** and using a peer-to-peer communications setup.¹
- ▶ It aims to help customers **communicate securely** through its custom network based on a “zero trust” security topology, by also **reducing the cost**.¹
- ▶ The company’s satellites would additionally be able to capture and **clean some space debris**.¹
- ▶ The company’s **target markets are majorly commercial, which include defense, governments, connected vehicles, forestry, critical infrastructure, and earth observation**.²
- ▶ In March 2023, E-space stated its **plans to collaborate with ‘e&’,** to leverage digital and IoT solutions across land, sea and sky.³
- ▶ E-space announced the **acquisition of CommAgility** from the Wireless Telecom Group in December 2022, to integrate CommAgility’s **5G and 6G network, air-to-ground, and related applications, thereby speeding up its satellite payload and connectivity solutions**.⁴

Rivada Space Networks (RSN)

- ▶ **Founded in 2022** and based in Germany, RSN is a subsidiary of **the US-based Rivada Networks, Inc.**⁵
- ▶ It aims to create **end-to-end secure communications** by transmitting data through peer-to-peer orbital laser communications without using terrestrial infrastructure, hence **eliminating the risk of ground-based interference from malicious parties**.⁵
- ▶ It plans to build a constellation of **600 LEO satellites**, through **24 orbital planes**, linked together by **2,400 laser inter-satellite links**, forming a mesh network.²
- ▶ The **estimated cost** of this constellation is nearly **US\$3 billion to US\$4 billion**, and **target markets** include **businesses and governments**.²
- ▶ The company recently entered into a **contract to manufacture 300 LEO satellites with Terran Orbital’s** wholly owned subsidiary Tyvak Nano-Satellite Systems, Inc.²
- ▶ RSN targets to **initiate the deployment of satellites in 2025**, with **300 satellites** (288 plus 12 spares) **launched by mid-2026 and full deployment** expected to be completed **by mid-2028**.⁶

Other major player

- ▶ Another major satellite player is aiming to launch **~3,000 LEO satellites**², thereby giving direct competition to Starlink with respect to its goal, scale, and target users.
- ▶ The company received the US FCC approval to launch almost **50% of its planned satellites by 2026 and the remaining by 2029**.
- ▶ In order to comply with the regulatory mandate of the FCC, **it would require to produce nearly 1 to 3 satellites per day to reach half of its planned satellites by mid 2026**.²

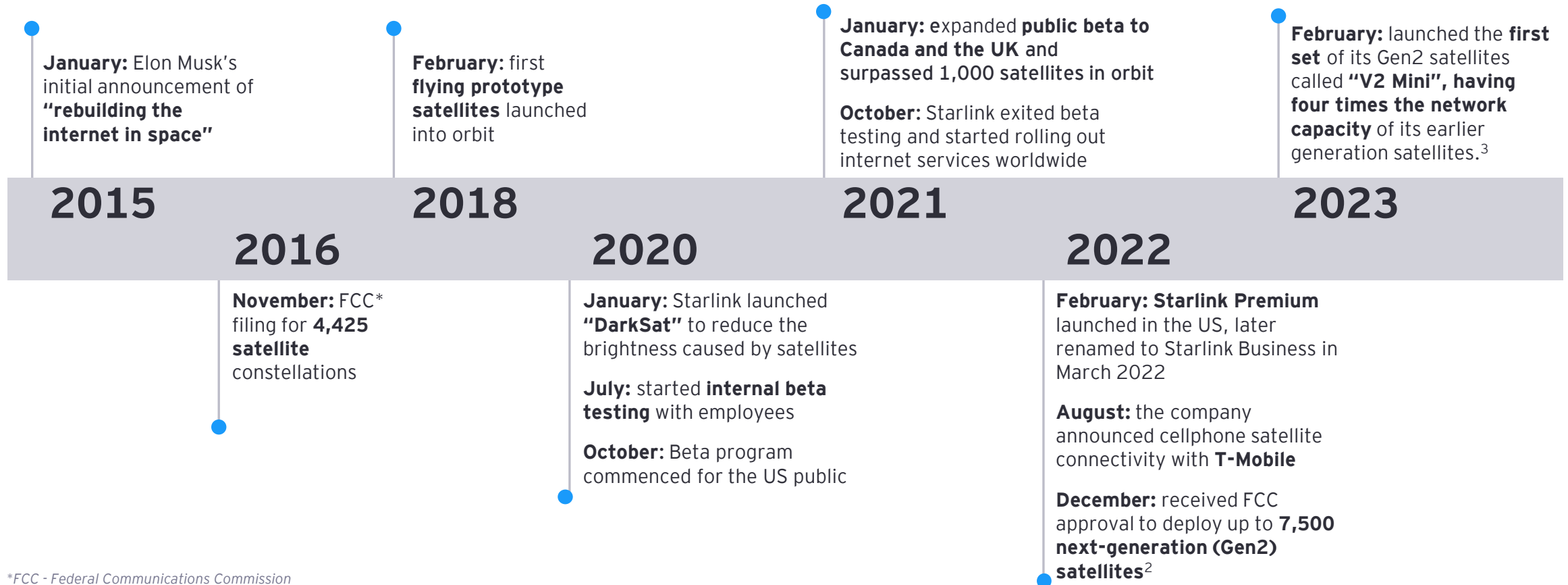
Reliance Jio has also entered the market by partnering with SES, creating a potential threat to competitors. It has already received DoT approvals.

Jio’s entry (covered ahead)

Starlink has taken considerable strides in a short time span

Starlink's transformative journey¹

Key events that have led Starlink to become a pioneer in the satellite internet space

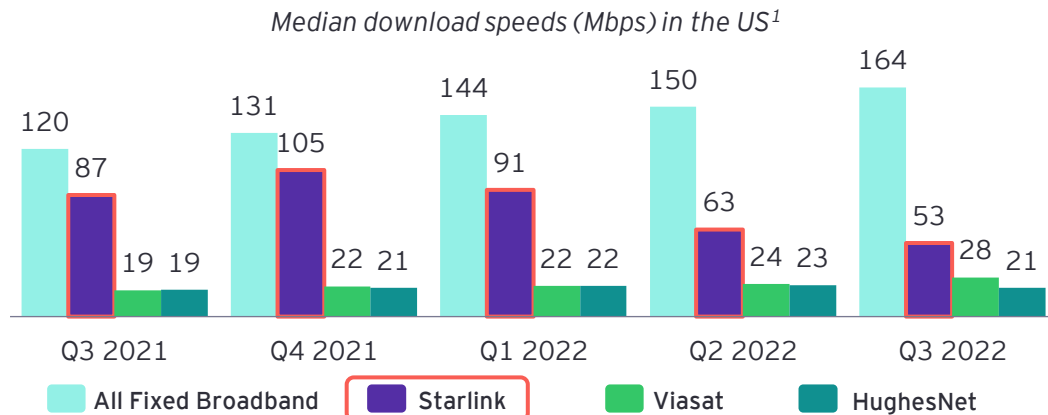


*FCC - Federal Communications Commission

Starlink delivers faster speeds than competitors and fixed internet in major economies, but witnesses a steady decline in speeds as its user base grows

Satellite internet speed: country-wise comparison

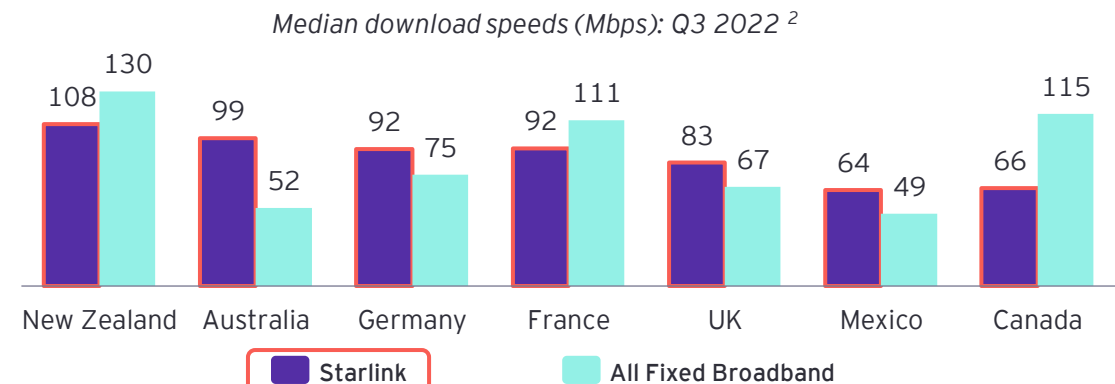
Starlink's speeds continue to dip in the US but still outpace competitor offerings



- ▶ Starlink's speed, the fastest among its competitors, is witnessing a gradual decline in the last few quarters, on account of its growing user base.
- ▶ It was, till very recently the only satellite internet company in the US to **meet the minimum broadband speed limit of 25Mbps**. However, Viasat and HughesNet are also catching up in the space race.
- ▶ Targeting businesses and high-demand users, Starlink introduced a new **"Premium" plan, promising higher speeds of 150Mbps to 500Mbps. It is 5 times costlier than its regular service**, with US\$2,500 for the antenna and a monthly fee of US\$500.

- ▶ Starlink is the only major player marking its presence in several developed countries, apart from the US.
- ▶ When assessing **European markets**, Starlink saw **median download speed in excess of 100Mbps** in Q3 2022, in various countries in such as Switzerland, Portugal, Ireland, Sweden, and Netherlands.
- ▶ According to Speedtest Intelligence, **the company raced ahead of fixed broadband in several countries**. Moreover, its median download speed in **Australia was almost double** the speed of fixed broadband in Q3 2022.

Starlink faster than fixed broadband in some of the key economies



SECTION 06



India overview

- ▶ Starlink in India: roadmap, pricing and use cases
- ▶ Jio's entry: the potential of a possible disruption?

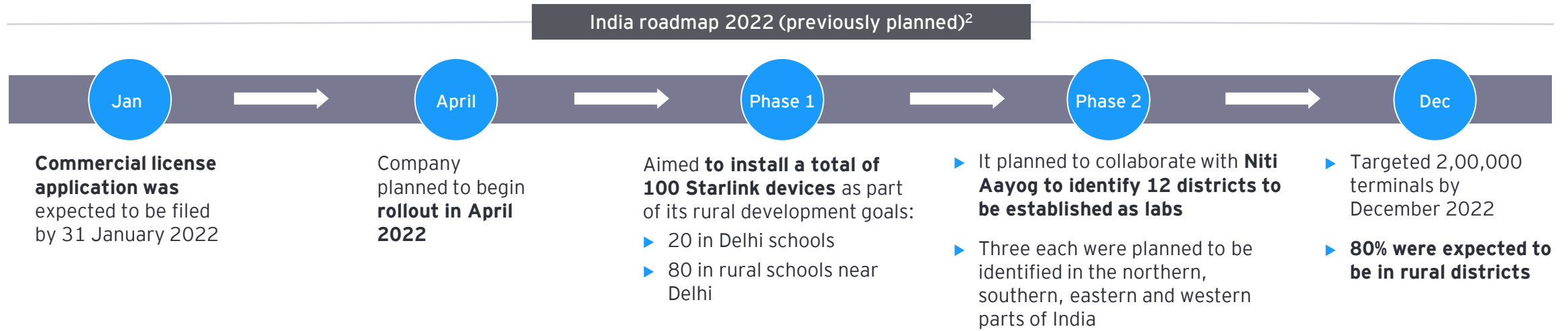
SECTION 6.1



Starlink in India: roadmap,
pricing and use cases

Starlink awaiting approval in India amid regulatory challenges. However, it has the potential to disrupt the market

India being an emerging market for satellite internet, Starlink briefly entered the country toward the end of 2021 through its wholly owned subsidiary. However, it had to withdraw its pre-booked orders later following regulatory hurdles. It had applied for a commercial license, but is yet to receive approvals to ship its terminals in the country.



 Lucrative opportunities	 Roadblocks
--	---

- ▶ **Vast population:** Out of India's ~1.4 billion people (as of April 2023)³, close to 40% do not have internet access⁴, with rural areas making up most of these cases
- ▶ Rural areas are largely disconnected due to **infrastructure challenges**
- ▶ **Government initiatives:** "BharatNet Scheme" to provide internet connectivity in rural areas at affordable prices
- ▶ Increasing **smartphone penetration** in India

- ▶ **License approval:** Starlink is yet to get a commercial license and is still awaiting regulatory approval in India.⁵ The company had to refund ~5,000 pre-booked Indian orders amid government mandates¹
- ▶ **High costs:** Despite potential government subsidies, higher costs could make it difficult for Starlink to compete with traditional players
- ▶ **India chief quitting:** Starlink's India head exited the company following the firm's brief entry into India, possibly impacting the company's entry in India.

Starlink's pricing appears steep for a cost-conscious Indian market

Corporate internet tariff plans of Starlink (expected) vs. traditional broadband providers in India

	Starlink ¹	Airtel ²		Jio ³	
Speed #	50mbps to 200mbps (expected in beta stage)	100mbps	200mbps	100mbps	150mbps
Initial upfront fees	INR37,400 (US\$499)*	INR1,000	INR1,000	INR1,000	INR1,000
Per month fees	INR7,425 (US\$99)**	INR799	INR999	INR901	INR1,201
Taxes and levies	~30% (Starlink estimates)	18%	18%	18%	18%
Total price (annual)	INR1,58,000	~INR12,494	~INR15,326	~INR13,938	~INR18,186

Note: comparison based on internet speed similar to Starlink's expected offering in India; actual pricing may differ due to company offers and discounts



- ▶ Based on current expectations, **Starlink's price is considerably higher (almost 10x)** than India's major broadband providers.
- ▶ Even though the company is trying to cut costs by redesigning its satellites, the **price charged currently is fairly high for developing countries like India**, especially for the rural market.
- ▶ Unless the Indian government offers subsidies to LEO players such as Starlink, the latter could have a **tough time competing against the economical alternatives** in the country.

*Note 1: Starlink has increased its one-time upfront equipment fee from US\$499 to US\$599.⁶

**Note 2: Starlink has raised the monthly membership cost of satellite internet from US\$99 to US\$110 per month, and even more for select subscribers in "limited capacity" areas, raising it to US\$120 per month.^{4,5}

Starlink's planned use cases in India

Potential applications of Starlink's satellite internet in various sectors

School	Health care	Financial inclusion	E-commerce	Tele-medicine	Non-agri and rural jobs	Multi-purpose center (MPC)
Smart classrooms <ul style="list-style-type: none"> ▶ Projection capabilities ▶ Wi-Fi modem ▶ Content ▶ Trained teachers 	Health data on every individual	Peer-to-Peer (P2P) lending	E-commerce sites enable and encourage businesses to employ rural workers	Online prescription for common ailments	Plug-and-play Internet-enabled manufacturing facilities	MPCs that can be flexibly designed for multiple uses and are always available
Computer labs	Diagnostic tests with immediate results and providing an action plan based on results	P2P insurance		Tele-consults for complex ailments	Rural BPO and tourism	To be franchised by a few chains making it more widespread, like PVR and other chains in urban areas
		Zero net interest margin		Movement to district or super-speciality hospitals for serious conditions	Infrastructure and affordable housing	
		Modest platform fee			Attract foreign and domestic private investments	

100% broadband strategy



Starlink's India strategy is based on the belief that a 100% broadband scenario is crucial for rural connectivity, which can be achieved with the help of government initiatives and an ecosystem where all satellite and terrestrial broadband providers agree to collaborate and operate together.

SECTION 6.2



Jio's entry: the potential of a possible disruption?

Can Jio's entry in the satellite internet space disrupt the market?

Reliance Jio's partnership with SES

- ▶ In February 2022, Jio Platforms Ltd. and SES, a Luxembourg-based satellite solutions provider, announced a joint venture with a **51% and 49% stake respectively**, under the name of **Jio Space Technology Limited**.
- ▶ It has **received DoT approvals for a 20-year license** to set up a mobile satellite network for voice and internet services, becoming the second company in India to receive the DoT nod after OneWeb.

Target audience	Purpose and intent	Expected speed	Investment plan	Strategy	How is it different from the competition?
The partnership's major focus would be to provide satellite services to Indian customers, alongside some of the international maritime and aeronautical clients whom SES will offer its services.	<p>The multi-orbit space networks would help Jio to provide multi-gigabit links and offer mobile backhaul connectivity services to telecom companies in rural areas.</p> <p>The firm will leverage satellite technology to enter the next generation of affordable and scalable broadband services.</p>	The internet infrastructure from SES would be capable of offering up to 100gbps capacity .	With an investment of US\$100 million , Jio has signed a multi-year capacity purchase agreement, which includes equipment purchases and gateways.	<p>Using SES's satellite capacity and Jio's market coverage in India, this partnership aims to tap a potentially large opportunity.</p> <p>Along with rural areas, it would have the capacity to power retail customers and enterprises across India.</p>	The new venture aims to use a combination of GEO and MEO satellites , while other satellite providers such as Starlink and OneWeb operate in the LEO orbits.



- ▶ Reliance Jio's entry into the satellite internet space is heating up the market, providing internet users in India with additional options to choose from.
- ▶ Jio, India's largest telecom player, **enjoys huge economies of scale and already has the infrastructure in place**.
- ▶ While the company has not revealed any pricing details, **an aggressive pricing strategy that would undercut the competition is expected**, similar to how it captured the telecom market during its initial foray into the space.

Other competitors

SECTION 07



Recent news highlights

News highlights in the satellite internet space over the past year

Hughes-ISRO partnership¹

- ▶ With Starlink continuing to be plagued by regulatory hurdles in India, other players are capitalizing on the untapped opportunity.
- ▶ In late 2022, Hughes Communications India announced the launch of the country's first high-throughput satellite (HTS) broadband service in collaboration with ISRO.



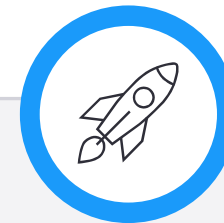
Telstra-OneWeb partnership²

- ▶ The Australian telecommunications company signed a memorandum of understanding with OneWeb last year, aiming to **expand its network coverage across Australia**.
- ▶ Using LEO satellite connectivity, it plans to cater to its small business and enterprise customers in the broader Asia-Pacific region.



Starlink's efforts in Ukraine^{3,4}

- ▶ **Starlink activated its internet services in Ukraine soon after Russia's invasion in February 2022**, helping to bring up the country's communication networks and internet services.³
- ▶ Recently, the company announced that it is taking steps to prevent Ukraine's military from using its satellite services as war weapons and controlling combat drones.⁴



Mobile satellite connectivity may pave the way for a massive transformation in the telecom industry

Apple launches satellite connectivity feature in its latest iPhone 14 ¹

- ▶ Apple recently announced its move to add a **satellite connectivity feature, initially only available to customers in the US and Canada.**
- ▶ It introduced this feature as a type of **alert or messaging service (emergency SOS) via satellite**, allowing users to send a text message in a situation where there is no mobile network around. However, **satellite voice service is not yet allowed.**
- ▶ The company is reported to have **invested US\$450 million** toward satellite infrastructure, with most of the funding going to LEO satellite maker **Globalstar.**

Starlink has partnered with T-Mobile for direct-to-mobile satellite connectivity ^{2, 3}

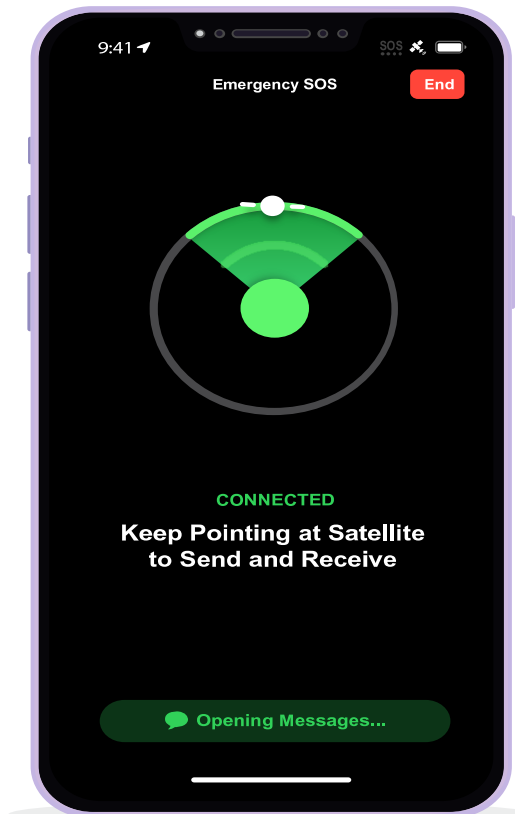
- ▶ This partnership will allow a **direct Starlink connection to current phones** that will deliver cellular access, **allowing MMS and SMS text messages to be sent anywhere in the world**, and eventually allowing voice services and transfer of tiny quantities of data in the future.²
- ▶ SpaceX has announced plans to begin testing its satellite-to-cell service with T-Mobile this year.³

Satellite phones in India: regulations and legal issues ⁴

- ▶ **Satellite phones from other countries are not permitted** to be carried into the country.
- ▶ However, importing a satellite phone may be permitted with **official consent from the DoT.**
- ▶ A person who requires the use of a satellite phone within India must **buy it from an authorized dealer.**

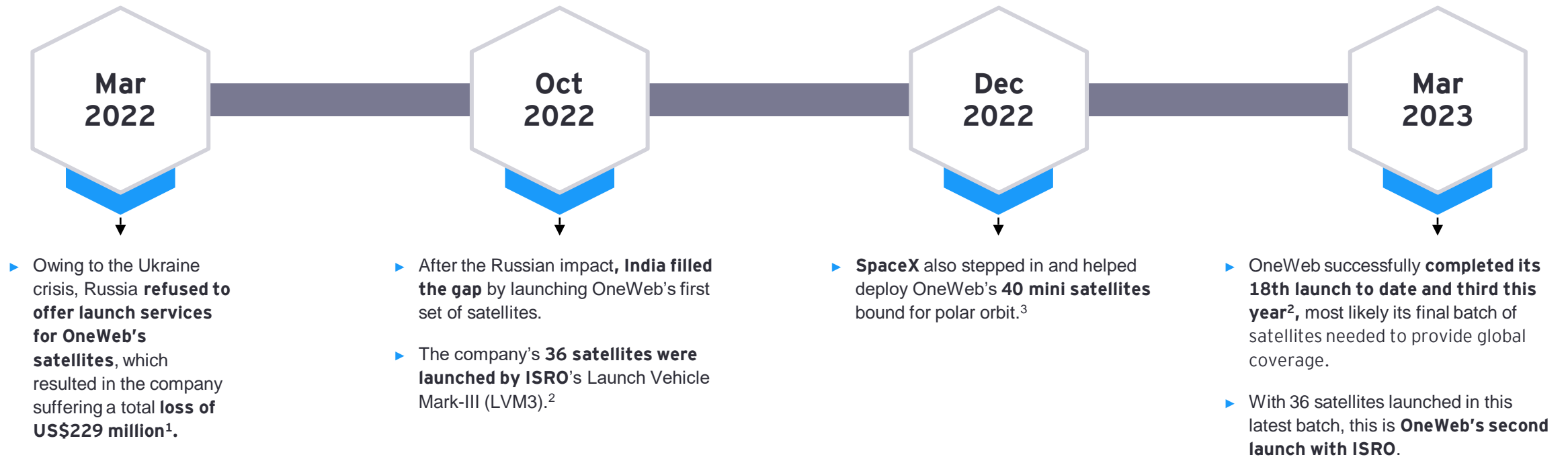
Other telecom or tech players following lead

- ▶ Industry majors such as **Google and Samsung are also expected to join the “fight for space”**, thereby resulting in large-scale infrastructure investments and boosting the market.



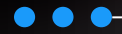
Impact of the Russia-Ukraine crisis on OneWeb and how it successfully completed its targeted launches

OneWeb's recent timeline



- ▶ OneWeb's senior executive highlighted the enormous growth of the satellite internet service industry which, creates opportunities for various players to thrive.³
- ▶ The company also indicated that despite the availability of other launch options, SpaceX and India provided the quickest and most effective combination.³

SECTION 08



India outlook

Promising outlook for the Indian satellite internet market



~850 million

India's total internet user base, as of September 2022 (~60% of the population)¹



US\$1 billion+

India's near-term annual revenue opportunity for satellite internet²



Indian Space Policy 2023⁴

The Government recently approved this policy which seeks to regulate and enhance private sector involvement in the space sector.

The policy is expected to clarify the foreign ownership restrictions for operators of LEO and MEO satellite constellations.

It may also help in providing greater clarity on the regulatory framework, addressing some of the previous hurdles around commercial satellite broadband services in India.

- ▶ Considering India's large population and the **Government's digital push**, the satellite internet market has enormous potential.
- ▶ With a large section of the rural populace still devoid of internet access, **satellite services can help bridge the digital divide in India**. These services can provide connectivity in tough terrains where fiber or traditional infrastructure is difficult to install.
- ▶ The number of **satellite internet customers is estimated to increase by almost 6x, reaching ~2 million by 2025**, as per ICRA's 2021 report.³
- ▶ **Cost being one of the critical factors in the success** of satellite internet in India, the country's potentially vast subscriber base would offer economies of scale.
- ▶ The above factors point to **a favorable phase for satellite internet in the country**, and it will be interesting to see how satellite players roll out offerings to compete with traditional broadband providers.

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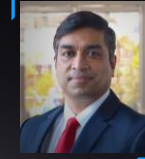
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CONTACTS



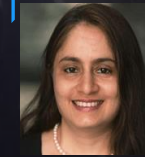
Santosh Tiwari

Partner, Strategy and Transactions
EY LLP
santosh.tiwari2@parthenon.ey.com



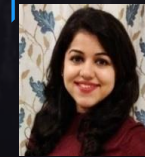
Sriram Dharmarajan

Senior Manager, Strategy and
Transactions
EY LLP
Sriram.dharmarajan@parthenon.ey.com



Kamal Suri

Associate Director, Strategy and
Transactions Research
kamal.suri@in.ey.com



Deepali Sharma

Assistant Manager
Strategy and Transactions Research
deepali.sharma@in.ey.com