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Satellite internet: connected from  
space

# SATELLITE INTERNET: CONNECTED FROM SPACE

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## SUMMARY

## Approximately 65% (5.16 billion people) of the world's population are connected to the internet.

And the most common method is through land-based fibre, cable or mobile broadband connections - either underground or via deep-sea cables. However, that leaves over three billion people without access to any connectivity, which is partly because there are certain areas on the planet that are inaccessible or too remote for cables to reach.

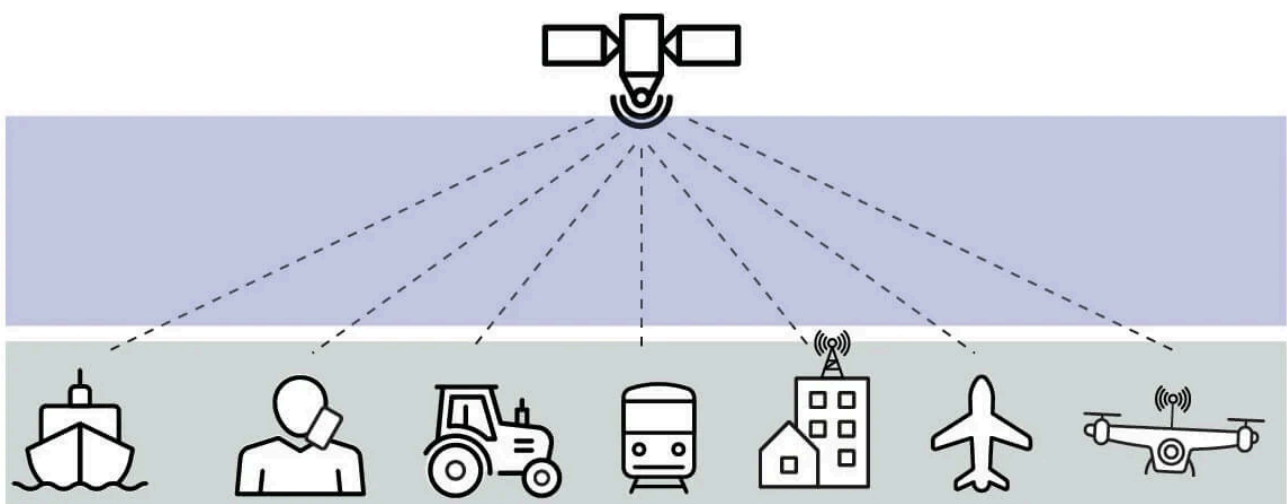
One solution to this problem is satellite internet.

### WHAT IS SATELLITE INTERNET?

Exactly as it sounds, satellite internet is simply internet from an orbiting satellite.

The global standard for internet connectivity is land based. Whether through fibre, cable, LTE (Long Term Evolution) or DSL (Digital Subscriber Line), it is all part of a terrestrial cable network, connecting cities, countries and continents.

Satellite internet on the other hand offers internet connectivity by wirelessly transmitting information through a satellite network in space.



Various applications satellite internet can enable

You can use satellite internet much in the same way as terrestrial Wi-Fi or mobile broadband by simply connecting your device to the satellite hardware that supplies the internet.

The stages that data travels through for you to connect to, however, are a little more complex with satellite internet. When you are connected to the internet via land-based infrastructure, the information is sent from your device via your Wi-Fi router or modem, which is then sent to your internet service provider.

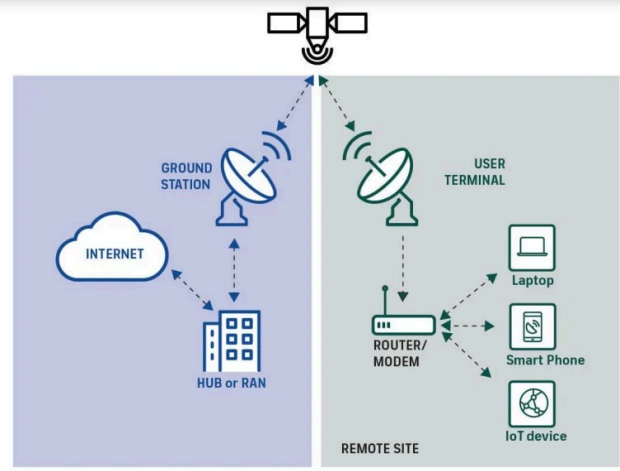
With satellite internet, there are six main components that data travels through:

1. Internet-enabled device
2. Modem/router
3. Satellite dish
4. Orbiting satellite
5. Ground station
6. Internet

Similar to a terrestrial connection, information starts with an internet-enabled device (smartphone, laptop, console, etc) which passes through a Wi-Fi router or modem.

The router is then connected to a user terminal (usually a mini satellite dish) where the information is sent up to an orbiting satellite in the form of radio waves. The information is then amplified and beamed back down to the relevant ground station on Earth, which is connected to the backbone of the internet.

Two-way communication satellites are needed for satellite internet to provide point-to-point connectivity, meaning information can be relayed back and forth through the same network.



A simplified diagram of how satellite internet works

There are many advantages to satellite internet:

**Speed:** The latest advancements to satellite communications, with both Very High-Throughput Satellites (VHTS), such as our Global Xpress network in geostationary orbit, as well as expanding low Earth orbit (LEO) constellations have seen major improvements to satellite internet speeds, reaching between 25Mbps to 150Mbps.

**Reliability:** Unlike traditional cable, fibre cable and DSL internet, satellite internet negates many of the physical obstacles. According to research by Uswitch, 11 million customers experienced broadband outages of three hours or more between 2021 and 2022, with some customers experiencing outages for up to 70 hours due to storms damaging 650+ cell towers across the country.

**Back-up connectivity:** When a primary ground-based connection suffers an outage for whatever reason, a satellite backup on standby can kick in immediately to maintain connectivity.

Equally, there are a few obstacles that satellite internet faces at the moment:

**Latency:** The main obstacle satellite internet faces is latency, or the time it takes information to do a round trip through the satellite network. Information from satellites travels at around 180,000 mph (or the speed of light) and up to 22,300 miles above the Earth, so there can be a slight delay of about 0.6 seconds for data transmission from the orbiting satellite.

The common misconception is that latency refers to a delay in the speed information is transferred. Latency refers to the time in which the data transfer starts. In theory, a two megabyte file sent through satellite internet with 25Mbps can transfer at the same speed as terrestrial internet at 25Mbps, however, the small delay that satellite internet users experience refers to the time in which the transfer begins.

**Data caps:** Satellite internet is not truly commercial yet, meaning there is not enough infrastructure to support similar usage as terrestrial broadband. Because of this, many providers currently have data caps which can be costly.

**Cost:** Satellite internet is a growing technology and is starting to gain serious adoption from commercial entities and individual consumers. For the average consumer, the highest cost incurred is usually in purchasing a satellite dish and installation, on top of which there is a subscription-based service.

For commercial satellite internet use, the cost can vary due to a number of factors, for example, is the terminal stationary or on a moving vehicle? what is the required capacity and bandwidth? How many users need to connect and what reason do they need to get connected?

Despite these limitations, satellite internet has enormous potential for industries that rely on consistent and seamless connectivity for operational efficiencies, safety, asset tracking and improving crew welfare or simply getting online mid-flight.

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Our goal is to build the world's first unique, global, multi-dimensional, dynamic mesh network that will redefine connectivity at scale with the highest capacity for mobility worldwide and at hot spots, as well as the fastest average speeds and the lowest average latency of any network, planned or in existence. This network is called ORCHESTRA.



Here are just a few ways in which Inmarsat's satellite internet network is helping shape the Aviation, Enterprise, and Maritime industries as well as governments across the globe:

## High-speed internet without restriction

Some services that transfer substantial amounts of data like remote working, accessing critical information, video conferencing and training, are now possible where terrestrial internet is unavailable.

What does this mean? Well, you can hold a virtual business meeting at 35,000 feet in the air, stream films in 4K out at sea, or get clear communication and real-time data in an emergency response scenario.

Many airlines now offer inflight Wi-Fi from providers such as Inmarsat, to make airline travel more enjoyable and productive for all passengers. Our GX Aviation high-speed broadband service for passengers is the service of choice for many leading airlines including Qatar Airways, Lufthansa, Singapore Airlines, Air New Zealand, Virgin Atlantic, AirAsia and many more.

In the Maritime industry, crew are often out at sea for months at a time. Satellite internet has made it possible to keep seafarers connected to life on land, contact family and friends, provide streaming services and access to social media, entertainment and news site, ensuring crew welfare remains positive. Inmarsat's dedicated crew internet services include Fleet Hotspot and Fleet ChatCard.

## Remote monitoring, tracking, and data collection

With the emergence of Internet of Things (IoT) devices, satellite internet is enabling industries to improve operational efficiencies through remote tracking and monitoring of both data and assets in the field in areas where terrestrial coverage does not reach. Not only does this reduce costly site visits, but it also enables constant access to data, improving efficiency.

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can be remotely done between the aircraft and air traffic control on the ground with seamless satellite connectivity.

In the cockpit of an aircraft, satellite internet also provides a huge amount of data for pilots who need to monitor weather data and flight plans to chart optimal routes and rising altitudes for example.

Satellite internet allows governments to better provide public services, connect communities, improve emergency response times, and monitor natural disasters. When there is a disaster or emergency, satellite internet not only helps coordinate and improve response times but also improves the safety of emergency response teams through real-time data and voice/video communication.

## Maritime fleet monitoring

For maritime organisations with medium to large fleets, monitoring and maintaining vessels can be time-consuming and assessing the status of each vessel can be inaccurate.

As satellite internet provides global coverage on both land and seas, services like Inmarsat Fleet Data for the Maritime industry allows the remote tracking of a vessel's data sensors to monitor and analyse data to ensure voyage optimisation, fuel efficiency and even predicting when faults may occur on fleets.

## Yield optimisation

In the agriculture industry, satellite internet can be used to improve crop yields and reduce waste. Farmers can use satellite internet to monitor weather patterns, soil moisture levels and crop growth through satellite-enabled IoT devices and sensors, powered by Inmarsat's 99.9% reliable narrowband ELERA network. This allows farmers to make informed decisions about irrigation, fertilisation, and other farming practices and can lead to increased productivity and reduced environmental impact.

In conclusion, satellite internet is having a profound effect on our world and is set to provide enormous potential and capabilities for future endeavours, such as digitalisation, sustainability and operational efficiencies.

With high-speed internet access to even the most remote locations improving communication, productivity and safety, the benefits of this technology make it a valuable investment for many individuals and businesses for years to come.

Why not explore how Inmarsat is already providing satellite internet for our clients and building new space infrastructure to prepare for the technological revolution that is upon us already.

A straightforward introduction  
to satellite communications

Roadmap

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