



EVERYWHERE

## The Global Network: Satellite Constellation

***Snapshot - Iridium's cross-linked LEO constellation architecture provides multiple layers of resiliency and redundancy to provide industry-leading network reliability.***

Most of us are familiar with the way mobile phone networks work, with multiple interconnected cellular towers. As you move from one cell to another, the system automatically hands off your call seamlessly to the next tower. Iridium's satellite network functions in much the same way. The satellites are the towers, orbiting the Earth and handing off calls to each other as they pass overhead.

Iridium's constellation consists of 66 cross-linked operational satellites, plus six in-orbit spares. The satellites operate in near-circular low-Earth orbits (LEO) about 780 km (483 miles) above the Earth's surface. There are 11 satellites in each of six orbital planes and their orbits "crisscross" roughly over the north and south poles. The low-flying satellites travel at approximately 17,000 miles per hour, completing an orbit of the Earth in about 100 minutes. It is a function of latitude/longitude and beam coverage, but it typically takes about ten minutes for a satellite to cross the sky from horizon to horizon.

Each satellite can project 48 spot beams on the Earth's surface. The size of each spot beam is approximately 250 miles in diameter and the satellite's full 48-beam footprint is approximately 2,800 miles in diameter. All spot beams and satellite footprints overlap.

The network is considered a meshed constellation of interconnected, cross-linked satellites so that each satellite "talks" with the other nearby satellites in front, behind and in adjacent orbits. Thus, the satellite network - much like a cellular network - hands off voice or data communications automatically from one spot beam to another within the satellite footprint, and from one satellite to the next as they pass overhead. The call is relayed from satellite to satellite around the constellation without touching ground until it is downlinked at an Iridium gateway and subsequently patched into the public switched telecommunication network (PSTN) for transmission to its destination. And this all happens in fractions of seconds and is completely seamless to the end user.

This architecture is unique to Iridium, and it provides inherent advantages in performance and reliability over other mobile satellite services providers:

- **The large number of fast-moving satellites with multiple overlapping spot beams minimizes missed connections and dropped calls**, since more than one satellite is usually visible from any place on Earth. The LEO satellite constellation also makes it possible for changing and multiple view angles to the satellite so that line of sight issues will be temporary as long as you have a view of the sky.



- **If a single satellite is temporarily unavailable due to technical issues or planned maintenance:**
  - a) The outage will be localized to the user or region.
  - b) Inter Satellite Link (ISL) traffic can be routed within the constellation until a spare is moved into place.
  - c) Back-up Earth Terminals at other locations within the teleport network architecture can allow traffic to be grounded in multiple locations.
- **The cross-linked satellite architecture permits Iridium to operate with increased reliability due to the inherent meshed architecture involving both celestial and terrestrial infrastructure.** Similarly, should one link in this network fail, the system can recognize and quickly respond by providing alternative routing paths for the communication to reach the end users.
- **The Iridium satellites have multiple layers of on-board subsystem resiliency for critical components,** and an on-board fault detection system allowing for safe and quick mitigation of anomalies that may occur.
- **The satellites are programmable,** enabling ground engineers to upload instructions and software as needed to keep the satellites functioning at high level performance and reliability levels.
- **The in-orbit spares can be quickly repositioned** and activated, as needed.
- **The low-Earth orbit provides a shorter transmission path with less signal attenuation.** This permits truly mobile user equipment with smaller antennas that require no mechanical stabilization or repointing to keep lock on the satellite signals. In other words, Iridium's devices are more like cell phones in their size and mobility.

In summary, one of the keys to Iridium's enviable record of network reliability is the design of the satellites themselves and the unique cross-linked constellation that provides a constantly moving canopy of low-flying satellites with visibility over the entire face of the planet.

In our next Network Reliability Report, we will turn our eyes from the skies to the ground infrastructure.

## Only one communications company connects the entire globe

Iridium is the world's only truly global mobile communications company, with coverage of the entire Earth, including oceans, airways and Polar Regions. Iridium voice and data products provide communications solutions that allow global companies, government agencies and individuals to stay connected, everywhere. The unique Iridium constellation of 66 Low Earth Orbiting (LEO) cross-linked satellites routes communications traffic through space and around the world, creating highly efficient and reliable connections.

**[www.iridium.com](http://www.iridium.com)**

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