SATELLITE COMMUNICATION

IRIDIUM Globalstar inmarsat THURAYA

IRIDIUM

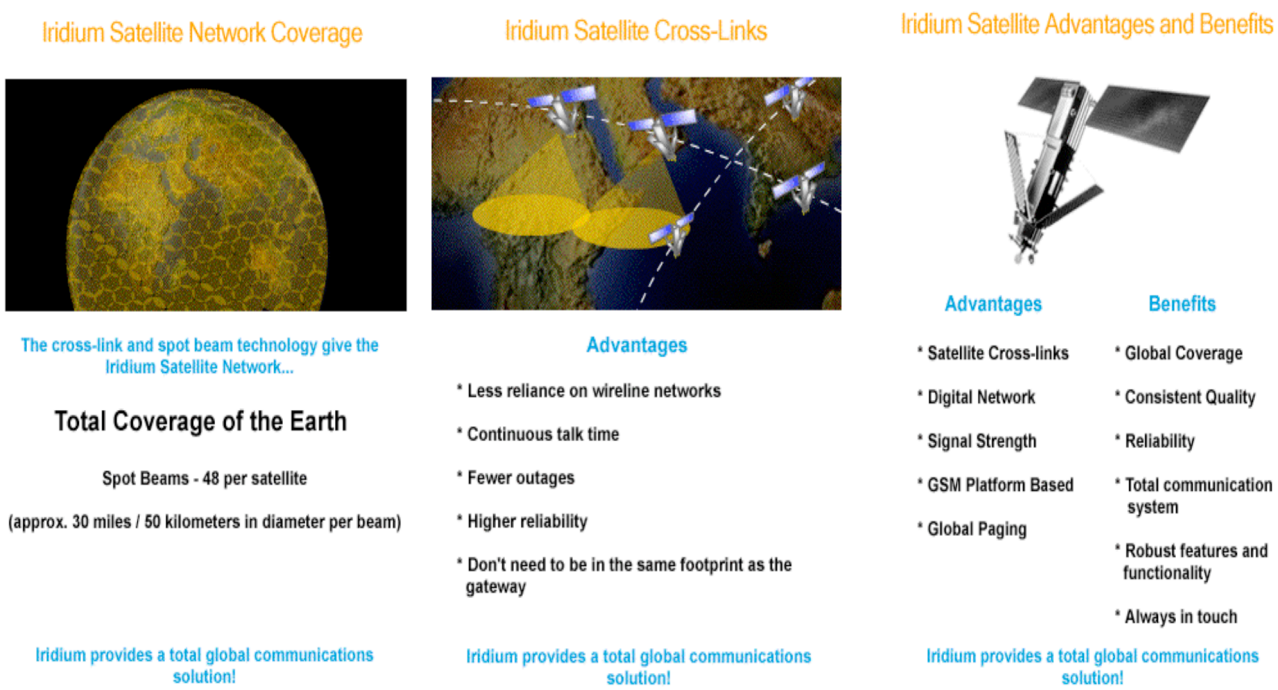
System Architecture

The Iridium Satellite System is the only provider of truly global, truly mobile satellite voice and data solutions with complete coverage of the Earth (including oceans, airways and Polar regions). Through a constellation of 66 low-earth orbiting (LEO) satellites operated by Boeing, Iridium delivers essential communications services to and from remote areas where terrestrial communications are not available. The service is ideally suited for industrial applications such as heavy construction, defense/military, emergency services, maritime, mining, forestry, oil and gas and aviation. Iridium currently provides services to the United States Department of Defense and launched commercial service in March 2001.

The IRIDIUM system is a satellite-based Personal Communication Services (PCS), or Mobile Satellite Services (MSS) system, supporting global, wireless digital communications. IRIDIUM provides voice, messaging and data services to mobile subscribers using handheld user terminals.

Iridium Satellite launched commercial global satellite communications services on March 28, 2001 with enhanced products and services. Service enhancements include improved voice quality and simplified pricing plans. Soon after launch, Iridium expanded the service portfolio to include data services. Please see the Product & Services pages for details. Iridium Satellite LLC is focused on providing affordable, dependable, long-term global communications solutions

Coverage – Totally Global



Product Listing

ECI Iridium Marine Satellite Telephone 	The Scansat-7701 Iridium satellite telephone from SKANTI is designed for the harsh sea environments with professional mariners and serious yachtsmen in mind.	**Motorola 9505 Portable Phone** 	Now smaller, lighter and more resistant to water, dust and shock than Motorola's previous offering, this newest addition to the Motorola Satellite Series (TM) portfolio is ideal for industrial or rugged conditions, yet appealing to the traveling professional.
Passive Iridium Antenna 	The AD510-1 is a rugged passive Iridium antenna designed to operate in harsh environments. The antenna's radome is 4 mm thick GRP, whilst the base is milled from aluminum and hard anodised giving an attractive green finish, which is mechanically resilient and resistant to corrosion.	**Motorola 9501 Pager** 	A lightweight and wearable one-way messaging device that keeps you in touch wherever you are in the world. Combined with an Iridium Satellite phone, the pager offers one of the world's most extensive global wireless personal communications networks.
Icarus 	SatTalk provides you with clear telephone communications and internet access in your aircraft cockpit and cabin	**Motorola 9522 L-Band Transceiver (Sebring)** 	The Iridium Short Burst Data service is designed for applications that send and receive short data messages ranging from one to 1960 bytes in size, ideal for situations such as asset tracking, remote telemetry, or pipeline monitoring. Multi-Interface Connector

Globalstar

System Architecture

Globalstar phones look and act like mobile or fixed phones with which you're familiar. The difference is that they can operate virtually anywhere, carrying your call / data over an exceptionally clear, secure Code Division Multiple Access (CDMA) satellite signal.

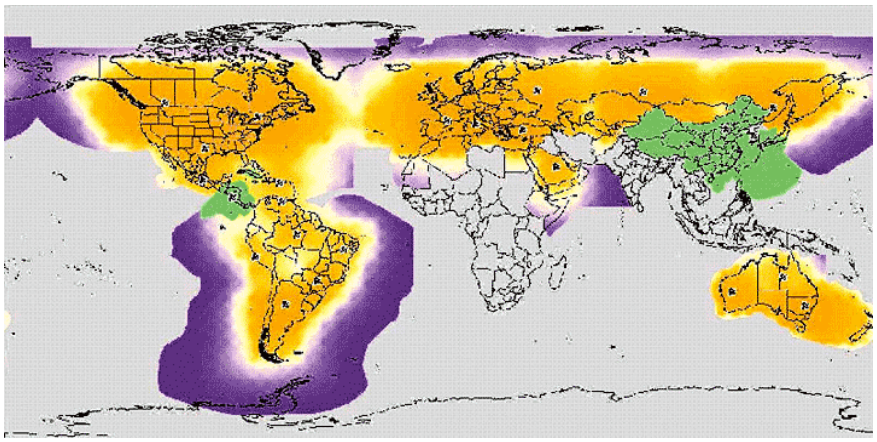
Like "bent-pipes", or mirrors in the sky, the Globalstar constellation of 48 Low Earth Orbiting (LEO) satellites picks up signals from over 80% of the Earth's surface, everywhere outside the extreme polar regions and some mid-ocean regions. Several satellites pick up a call, and this "path diversity" assures that the call does not get dropped even if a phone moves out of sight of one of the satellites.

As soon as a second satellite picks up the signal and is able to contact the same terrestrial gateway, it begins to simultaneously transmit. If buildings or terrain block your phone signal, this "soft-handoff" prevents call interruption. The second satellite now maintains transmission of the original signal to the terrestrial "gateway".

Additional advantages of using Low Earth Orbiting (LEO) satellites within the Globalstar system include no perceptible voice delay and lighter / smaller all-in-one phones.

Gateways process calls, then distribute them to existing fixed and cellular local networks. Terrestrial gateways are an important part of Globalstar's strategy to keep key technology and equipment easily accessible and to integrate our services as closely as possible with existing local telephony networks. This makes the Globalstar system and its services simple to manage, expand and improve.

Coverage – Regional



Primary Globalstar Service Area

Extended Globalstar Service Area (Customer may occasionally experience lower signal availability)

Fringe Globalstar Service Area (Customers may experience intermittent signals)

Globalstar Service Area currently unavailable to Globalstar Europe roamers

Product Listing

Telit SAT-550
The SAT-550 is a rugged dual-mode phone that provides callers with GSM 900 and Globalstar satellite modes. Voice and data ready, this phone is ideal to keep you in contact whether at sea or on the road. Dual mode Satellite/GSM 900 MHz Phase II

Telit SAT-600
The dual-mode SAT-600 combines the functionality of GSM 900 and the advantages of satellite. Voice and data ready, this is one of the most sophisticated and advanced mobile satellite phones ever produced. Dual mode Satellite/GSM 900 MHz Phase II

System Architecture

Inmarsat's primary satellite constellation consists of four Inmarsat-3 satellites in geostationary orbit. Between them, the main ("global") beams of the satellites provide overlapping coverage of the whole surface of the Earth apart from the poles. So, thanks to Inmarsat, it has become possible to extend the reach of terrestrial wired and cellular networks to almost anywhere on Earth.

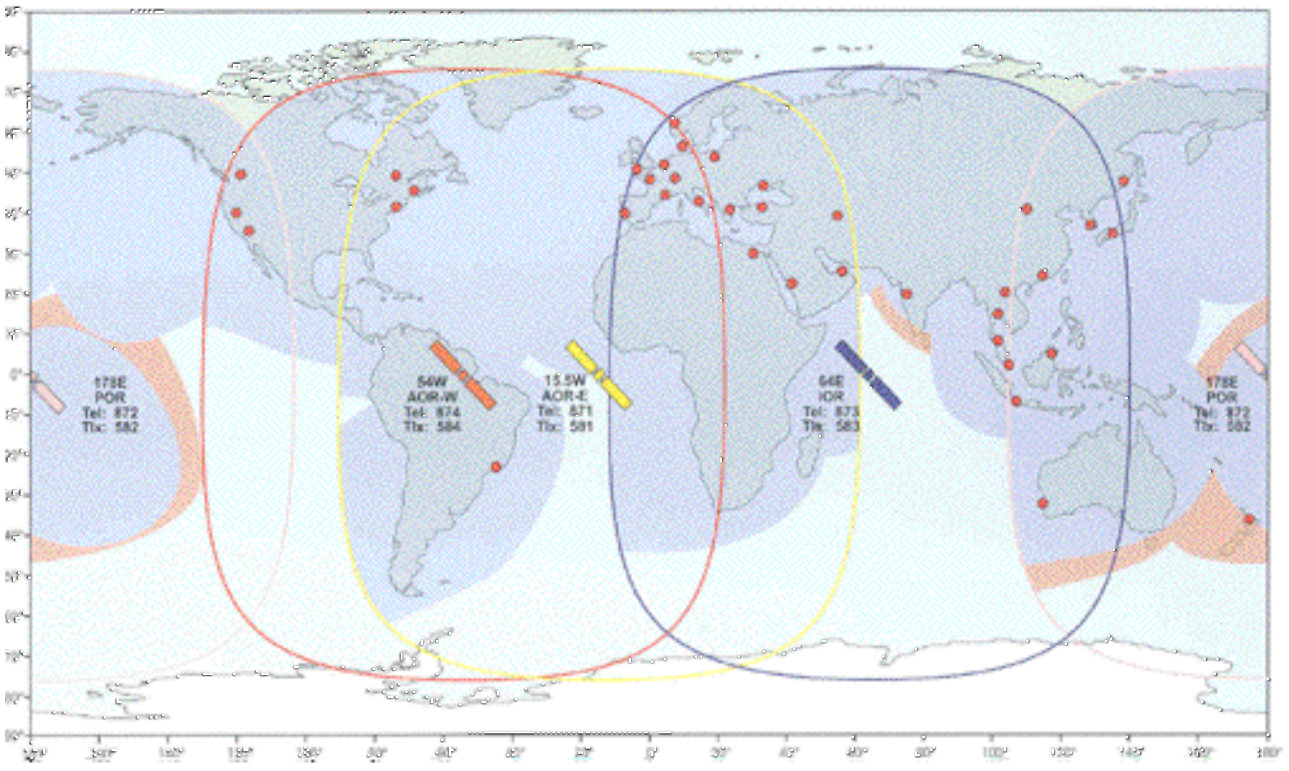
A geostationary satellite follows a circular orbit in the plane of the Equator at a height of 35,600km, so that it appears to hover over a chosen point on the Earth's surface. Three such satellites are enough to cover most of the globe, and mobile users rarely have to switch from one satellite to another. Other mobile satellite systems use larger numbers of satellites in lower, non-geostationary orbits. From the user's point of view, they move across the sky at a comparatively high speed, often requiring a switch from one satellite to another in mid-communication and risking the possibility of an interrupted call.

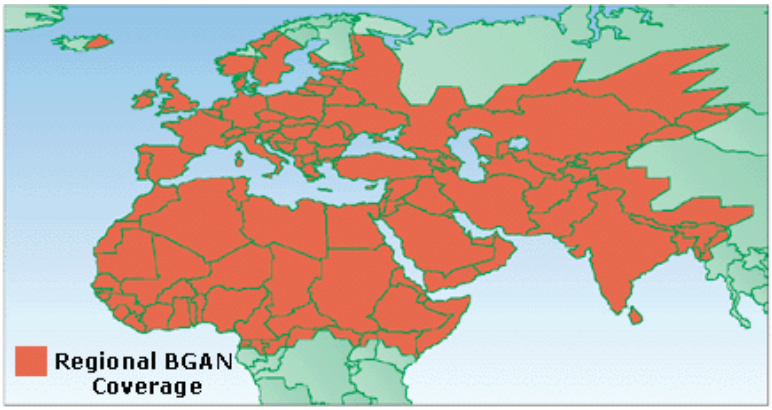
A call from an Inmarsat mobile terminal goes directly to the satellite overhead, which routes it back down to a gateway on the ground called a land earth station (LES). From there the call is passed into the public phone network.

The Inmarsat-3 satellites are backed up by a fifth Inmarsat-3 and four previous-generation Inmarsat-2s, also in geostationary orbit.

A key advantage of the Inmarsat-3s over their predecessors is their ability to generate a number of spot-beams as well as single large global beams. Spot-beams concentrate extra power in areas of high demand as well as making it possible to supply standard services to smaller, simpler terminals.

Coverage – Regional





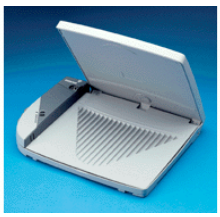
Inmarsat Regional BGAN, is based on GPRS technology and extends the reach of the corporate office to allow business to operate where there is no reliable high-speed data network available. It enables remote access to corporate networks, to the Internet, to email, to set up a Virtual Private Networks and manage file transfers.

Delivers cost-effective, reliable, high-speed wireless data services via satellite which enables businesses to operate without the constraints of terrestrial networks, if available."

Product Listing

The Capsat Fleet33 provides a constant two-way link to the Inmarsat satellites offering all Fleet33 services. The Capsat Fleet33 terminal enables the vessel to be connected to voice, fax, e-mail and Internet 24 hours a day. Connected to an Ethernet IP router several PC's may be connected to the Internet. The TT-3088A Capsat@ Fleet33 offers cost effective, 9.6 kbps fax/data, 4.8 kbps Mini-M voice and 64/28 kbps MPDS data communication. With MPDS you are always online but only charged for the amount of data sent making it the most economic and convenient solution for e-mail, small and medium size transfer, LAN, VPN and Internet MPDS offers a shared 64 kbps downstream/28 kbps upstream data channel .

The data services, charged per minute, provide a 9.6 kbps fax channel and a 9.6kbps channel with a constant data stream usually preferable for up- or downloading large files Data compression will offer data speed up to 40 kbps. The system is accompanied by user-friendly software, which enables simple configuration from a standard PC. The compact antenna is 35 cm high, has a diameter of just 35 cm and weighs less 4.5 kg The small sized transceiver unit weighs only 1.9 kg A single cable connects the system units making system installation and service very simple.



The technology operates via a lightweight, A4 sized portable satellite IP modem, and uses standard interfaces for ease of use. Continuous coverage within the satellite footprint. 'Always on' access to IP-based networks, including the Internet and corporate data networks. Value for money, with users being charged only for the amount of data sent and received rather than time spent online. Secure 144kbit/s shared channel. Bluetooth, USB and ethernet ports. Its low-cost and lightweight satellite modem, offers users in the satellite footprint what many network providers have promised all along - anytime, anywhere connectivity on the extended Internet."

Regional BGAN represents the first evolution with the 144kbit/s IP connection, and paves the way to Inmarsat's Broadband Global Area Network (BGAN), utilising the I-4 satellites to offer voice and data services at speeds up to 432kbit/s, and currently due for launch in 2004. Inmarsat Regional BGAN will provide users with all the functionality of GPRS networks, at faster speeds, and will be available across Western and Eastern Europe, the Middle East, northern half of Africa, large parts of the Commonweath of Independent States (CIS) and the Indian sub-continent, at a time when most GPRS networks are still largely metropolitan based.

System Architecture

Thuraya-1 satellite was launched on 21st October 2000; on board a Sea Launch Zenit-3SL rocket from the equator in the middle of the Pacific Ocean .It was the heaviest commercial payload ever launched and the first commercial satellite to employ digital beam forming. Thuraya's commercial services have begun in a gradual roll out in a number of countries in 2001.

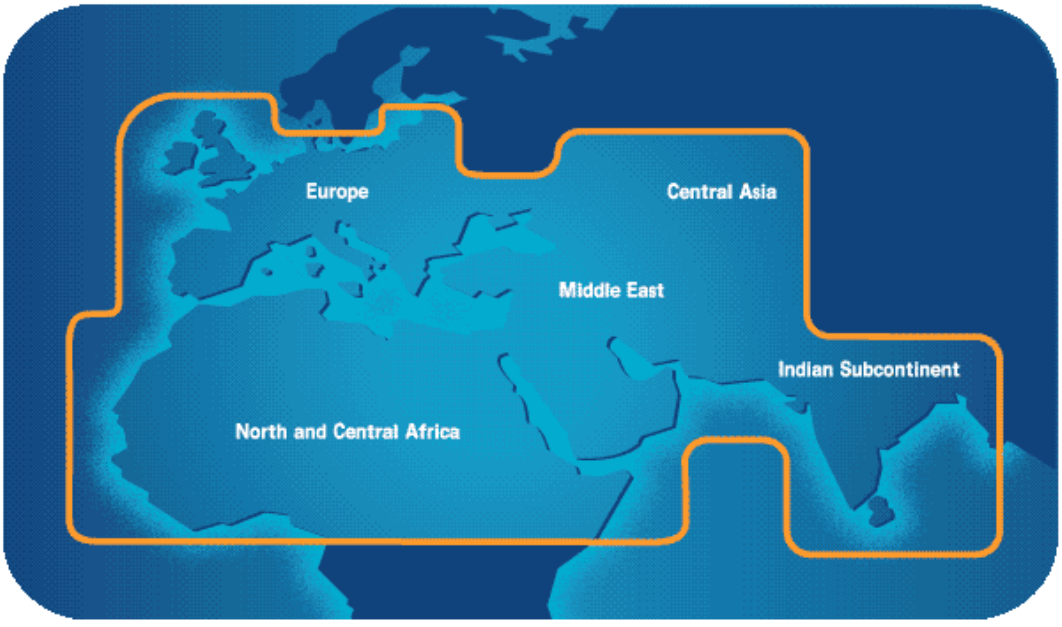
The Thuraya mobile satellite system is a turnkey project built by Boeing Satellite Systems, formerly Hughes Space and Communications International, Inc. (HSCI), at the cost of US$ 1 billion. Designed for a lifespan of 12 to 15 years, Thuraya's satellite will maintain geo-synchronous orbit at 44° East. The contract includes manufacture of two high power geo-synchronous satellites, the launch of the first satellite, manufacture and installation of the ground network equipment, the manufacture of nearly a quarter of a million mobile handsets and the project insurance.

Thuraya's system has been adapted for efficient operation in both satellite and GSM environments. It provides high flexibility in managing network resources through a re-programmable satellite payload. This supports modifications to the system's coverage area even in the post-launch period and optimizes performance over high demand areas.

Thuraya's satellites have been specially designed to achieve network capacity of about 13,750 telephone channels. Thuraya's hand held mobile terminals are comparable to GSM handsets in terms of size and appearance, as well as in voice quality.

Coverage – Regional

Thuraya's geo-synchronous satellite will provide border-to-border coverage to a footprint area of 99 nations. Our coverage will span Europe, North and Central Africa, the Middle East, Central Asia and the Indian Subcontinent. Thuraya's services will extend beyond boundaries of terrestrial networks and reach remote areas not accessible by conventional modes of mobile telecommunications.



Product Listing

Thuraya offers quality dual-mode terminals that offer satellite and GSM connectivity. This flexibility ensures continuous and cost-effective roaming for users. Essentially, Thuraya subscribers would continue using their national land-based mobile network, but will be able to automatically switch to Thuraya satellite mode in areas that are outside the terrestrial system.

Another advantage is that outside Thuraya's coverage area, subscribers would still have the convenience of roaming in other GSM networks areas. This combination of advanced and flexible system designs ensures reliable, global mobile services to subscribers.

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