

## Cisco 18400 Space Router

### Product Overview

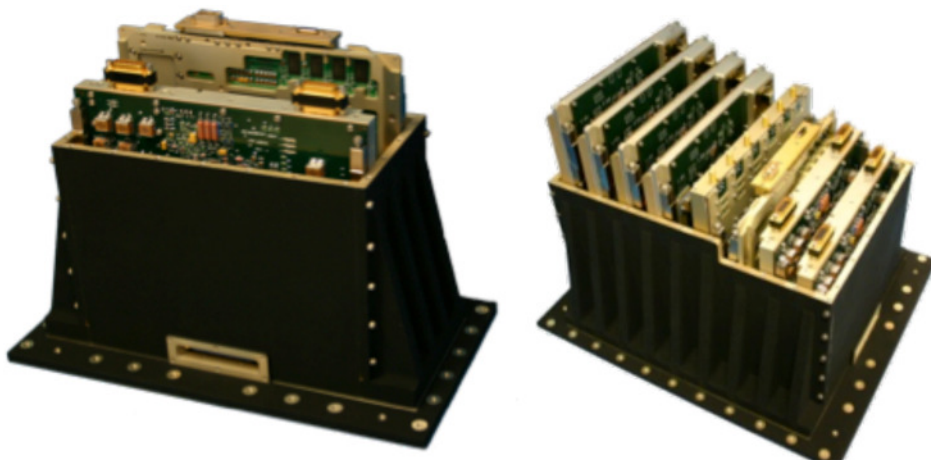
Exploding demand for satellite capacity is accelerated by dynamic and interactive IP applications for voice, video, data, and cloud services. Most applications on very-small-aperture-terminal (VSAT) satellite networks today are open standard, routable IP applications, yet satellite networks have traditionally been deployed as a proprietary circuit-switched network. Internet Routing in Space (IRIS) is a key initiative of Cisco to extend network services to satellite users and to converge space and ground networks.

The Cisco® 18400 Space Router, the primary component of the IRIS initiative, provides the ability to route IP traffic directly on the satellite, eliminating the need to send the data to and from an extra ground station to implement the circuit-switched function. Routing IP traffic natively on the satellite with the Cisco IOS® Software built into the router can increase throughput, reduce latency, and enable flexible bandwidth-on-demand applications between users in different geographic regions without static configuration.

The Cisco 18400 Space Router allows you to implement networking services directly onboard a satellite. The ability for a satellite to participate as an active node on a network allows satellite operators to sell dynamic and differentiated IP services in megabits rather than megahertz. The advantages of selling IP services in megabits include a dramatic reduction in cost by increasing the usage of the RF spectrum while addressing a larger customer base with differentiated services. The Cisco 18400 Space Router allows you to deploy a satellite as an intelligent node and does not require a “bent-pipe” architecture to “double hop” user traffic to and from the teleport. Latency is reduced with the removal of the double hop, enabling quick and effective deployment of real-time applications such as TelePresence and voice over IP (VoIP) over satellite networks.

The Cisco 18400 Space Router also increases the flexibility of the satellite network by being completely upgradable with new software while the router is in orbit. The Cisco 18400 Space Router on Intelsat-14 (IS-14) was recently upgraded with new Cisco IOS Software features, including Cisco Unified Communications Manager Express (CME), which supports a dial tone in space and allows you to implement dynamic VoIP without ground infrastructure at the teleport. The new Cisco IOS Software release for the Cisco 18400 Space Router also includes support for hardware-accelerated IP Security (IPsec) to increase the number of VPN tunnels that can be terminated on the Cisco 18400 Space Router (see figure 1).

**Figure 1.** Cisco 18400 Space Router with Modem Interface Chassis



## Features and Benefits

The Cisco 18400 Space Router is composed of two chassis: the Cisco 18400 Router Processing Engine (RPE) and the Cisco 18400 Modem Interface Chassis (MIC). The MIC is a software-defined radio (SDR) that can support multiple RF waveforms. The Cisco 18400 MIC removes the need for a ground-based modem hub, and allows you to deploy smaller satellite antenna dishes, increasing the attractiveness, revenue per user, and adoptability of satellite network services. The Cisco 18400 Space Router also supports space-qualified Gigabit Ethernet and can provide all of the services provided by a traditional Cisco Integrated Services Router (ISR) to other SDRs and hosted payloads with the Gigabit Ethernet interface.

The Cisco 18400 Space Router allows you to implement routed services on the satellite using the same Cisco IOS Software IP routing used on ground networks. The entire suite of Cisco IOS Software services is supported on the Cisco 18400 Space Router, improving the security, manageability, and upgradability of a satellite network:

- Cisco IOS Software Security and onboard termination of the uplink and downlink help protect transmissions from spoofing and other attacks.
- Dynamic IP routing allows secure peer-to-peer communication between users without cumbersome static configuration.
- Zero-touch deployment (ZTD) allows automated configuration of routers that are deployed on the ground behind the satellite antenna.
- Quality-of-service (QoS) capabilities enable cost-effective support of bursty applications such as Cisco TelePresence™ conferencing over satellites.
- The router and the MIC are upgradable to new waveforms and Cisco IOS Software services, making it easy to add new billable services.
- The Cisco 18400 Space Router uses the common protocols, configuration policies, and management tools used by IPv6 and IPv4 ground infrastructures.

The Cisco 18400 Space Router integrates transparently with traditional Cisco routers on the ground to create the IRIS Next-Generation Global Services (NGGS) network. The router ushers in a new era in satellite networking by providing the following benefits:

- Extends access to IP applications into areas not covered by traditional ground networks or third-generation (3G) networks, delivering consistent and pervasive IP capabilities regardless of geographic location
- Extends Cisco IOS Software to spacecraft, thus integrating the IP services and capabilities already present in Cisco IOS Software ground networks and moves IP services closer to the satellite user
- Provides business continuity by helping ensure access to IP applications if ground or 3G networks are unavailable

The Cisco 18400 Space Router introduces several innovative features to the satellite networking industry, including:

- Onboard routing between transponders removes the need to “double hop” network traffic from the satellite to a ground gateway hub.
- Onboard routing between terminals using different waveforms reduces latency by shortening the end-to-end path compared to switching at ground gateways.
- Onboard demodulation of satellite signals separates the uplink and downlink to enable support of smaller satellite antennas.
- Dynamically routing between users on different transponder bands.

- Support for next-generation protocols and upgradability help ensure a long useful life and better return on investment.

Table 1 lists additional features and benefits of the Cisco 18400 Space Router.

**Table 1.** Cisco 18400 Space Router Features and Benefits

Feature	Benefit
<b>Full suite of Cisco IOS Software 12.4T(24) services</b>	All the services of Cisco IOS Software are onboard the spacecraft, increasing the use and flexibility of the satellite network. All Cisco IOS Software Release 12.4T(24) services are supported, including routing (IPv4 and IPv6), QoS, Security, VPN, Multicast, etc.
<b>MIC</b>	The MIC reduces capital expense at the teleport because hub-modem functions are implemented in the space router. It reduces operational expense by creating an any-to-any mesh network between all users on routed transponders.
<b>Linkway S2/2100 waveform</b>	This waveform offers transparent interoperability with existing deployments of a leading defense Time Division Multiple Access (TDMA) modem.
<b>Dynamic onboard IP routing</b>	Dynamic onboard IP routing allows for increased transponder use and reduced latency by establishing new user-to-user sessions without double hopping user traffic.
<b>Dynamic QoS</b>	You can bill users according to flexible QoS profiles rather than requiring dedicated bandwidth for circuit-switched users.
<b>Bandwidth-on-demand</b>	You can quickly change and configure committed and peak information rates for customers. Bandwidth on demand helps ensure that all RF spectrum can be allocated to active users as billable services.
<b>Cisco Unified Communications Manager Express 7.1</b>	A "dial tone in the sky" simplifies the process to provision and deliver voice services over satellite. You have increased flexibility because Cisco IP phones and soft phones with Cisco Unified Video Advantage can talk directly with call routing onboard the satellite. You also have increased network resilience because Cisco Unified Communications Manager Express or Cisco CallManager servers at the teleport can use the Cisco Unified Communications Manager Express function in the space router onboard the satellite as a backup with Survivable Remote Site Telephony (SRST).
<b>Multiple concurrent waveforms</b>	The SDR is upgradable and can support multiple concurrent waveforms for enhanced flexibility. For example, a user of an single-channel-per-carrier (SCPC) waveform could directly communicate with a user on a TDMA waveform without hub infrastructure at the teleport. Currently, only the Linkway TDMA waveform is supported for user traffic, but the SDR is upgradable in space to future waveforms.
<b>Hardware encryption engine</b>	Security is increased with additional IPsec VPN tunnels terminated directly onboard the Cisco 18400 Space Router.
<b>SEU, OBMI, and HWDIAG MIBs</b>	Manageability is increased with new Single Event Upset (SEU), Out-of-Band Management Interface (OBMI), and Hardware Diagnostics (HWDIAG) MIBs
<b>Public key infrastructure and authentication, authorization, and accounting (AAA) services</b>	You can use existing and off-the-shelf authentication and billing components that integrate with other ground networks.
<b>ZTD</b>	The automated, template-based user terminal deployed with the Cisco Next-Generation Global Services model allows bootstrap and offline configuration of the Cisco ground router before delivery to users.

## Product Specifications

Table 2 provides the specifications of the Cisco 18400 Space Router, and Table 3 describes the specifications of the optional onboard modem interface chassis for the Cisco 18400 Space Router.

**Table 2.** Specifications of Cisco 18400 Space Router Route Processing Engine (RPE)

<b>Protocols</b>	Full suite of Cisco IOS Software Release 12.4T(24) services, including IPv4, IPv6, OSPF, Border Gateway Protocol (BGP), Simple Network Management Protocol (SNMP), TCP, User Datagram Protocol (UDP), Session Initiation Protocol (SIP), IPsec, RADIUS, Cisco Unified Communications Express (CME), etc.
<b>Throughput</b>	250 Mbps (506-byte packets)
<b>Memory</b>	<ul style="list-style-type: none"> <li>• 1-GB synchronous dynamic RAM (SDRAM)</li> <li>• 1-GB Flash NVRAM</li> <li>• 128-KB electrically erasable programmable read-only memory (EEPROM)</li> </ul>
<b>Software</b>	Cisco IOS Software Release 12.4T(24)
<b>MIBs</b>	More than 100 Cisco IOS Software MIBs, including support for SNMPv3
<b>Network management</b>	<ul style="list-style-type: none"> <li>• In-band management through Cisco IOS Software</li> <li>• Out-of-band management through satellite spacecraft management bus for command and telemetry</li> </ul>
<b>Interfaces</b>	Serialized Gigabit Ethernet (2 ports with embedded MAC)

<b>Language support</b>	English
<b>Embedded CompactPCI (cPCI) controller</b>	Yes (33 MHz/32 bit)
<b>Physical dimensions (H x W x D)</b>	9 x 14 x 8 inches (23 x 36 x 20 cm)
<b>Weight (inclusive of 300-mil chassis enclosure)</b>	22 pounds (10 kg)
<b>Power dissipation</b>	32W
<b>Input voltage</b>	100 VDC +/-5%
<b>Radiation tolerance</b>	<ul style="list-style-type: none"> <li>• Total dose: &gt;100 Krad (Si)</li> <li>• SEU: 6.67 E-4 errors/card-day (nonsolar)</li> <li>• Latchup-immune</li> </ul>
<b>Temperature</b>	(-40 to 90°C) rating, conductive cooling to chassis or enclosure
<b>Reliability</b>	90% worst-case geosynchronous orbit (GEO)
<b>Orbit</b>	GEO

**Table 3.** Specifications of Cisco 18400 Space Router Modem Interface Card

<b>Transponders</b>	Supports up to three per MIC
<b>Throughput</b>	<ul style="list-style-type: none"> <li>• Up to three channels of 70-MHz intermediate frequency (IF) per card, with 36-MHz bandwidth each</li> <li>• 50 Mbps (506 byte packets) per card</li> </ul>
<b>Memory</b>	1-GB SDRAM
<b>Performance</b>	Up to 5 Mega symbols per second (Msps) (Linkway 2100 and Linkway S2)
<b>Network management</b>	Out-of-band management through satellite spacecraft management bus for command and telemetry
<b>Language support</b>	English
<b>Physical dimensions (H x W x D)</b>	9 x 14 x 17 inches (23 x 36 x 43 cm)
<b>Weight (inclusive of 300-mil chassis enclosure)</b>	55 pounds (25 kg)
<b>Power dissipation</b>	177W
<b>Input voltage</b>	100 VDC +/-5%
<b>Radiation tolerance</b>	<ul style="list-style-type: none"> <li>• Total dose: &gt;100 Krad (Si)</li> <li>• SEU: 1.06 E-2 errors/card-day (nonsolar)</li> <li>• Latchup-immune</li> </ul>
<b>Temperature</b>	(-40 to 90°C) rating, conductive cooling to chassis or enclosure
<b>Reliability</b>	90% worst-case GEO
<b>Orbit</b>	GEO
<b>Modem carrier symbol rates downlink</b>	Multichannel: 5 and 2.5 Msps
<b>Modem carrier symbol rates uplink</b>	Multichannel: 5, 2.5, and 1.25 Msps
<b>Modem maximum carriers per transponder</b>	Downlink: Five 5-Msps + One 2.5-Msps Uplink: Four 5-Msps + Two 2.5-Msps + Two 1.25-Msps
<b>Modem modulation</b>	QPSK
<b>Modem FEC (uplink/downlink)</b>	Viterbi + Reed-Solomon
<b>Modem uplink access</b>	Multifrequency TDMA
<b>Modem downlink access</b>	Multifrequency TDMA
<b>Modem uplink timing, frequency, and power control</b>	Performed by terminals

## Trial Information

The Cisco 18400 Space Router is deployed in space on the Intelsat-14 (IS-14) GEO satellite with coverage in North America, South America, Europe, and Africa. It is the cornerstone of the IRIS NGGS network with IS-14. The best way to see how the Cisco 18400 Space Router can add value to your next satellite, hosted payload, or service is to experience a proof-of-concept trial with the Cisco 18400 Space Router in live orbit. For information about how to participate in a trial with the Cisco 18400 Space Router and IRIS NGGS network, please contact your local Cisco account representative, or send an email request to [c18000-space-routers@cisco.com](mailto:c18000-space-routers@cisco.com).

## Cisco Services

Cisco Advanced Services can help you deliver IRIS Next-Generation Global Services, meeting aggressive deployment schedules and increasing your business advantage. Cisco's portfolio of services uses proven methodologies for unifying voice, video, data, and mobile applications on fixed and mobile networks.

Cisco Services programs are delivered through a unique combination of people, processes, tools, and partners, resulting in high levels of customer satisfaction. Cisco Services help you protect your network investment, optimize network operations, and prepare your network for new applications to extend network intelligence and the power of your business. For more information about Cisco Services, refer to Cisco Technical Support Services, Cisco Advanced Services, or contact a Cisco Services expert at to [c18000-space-routers@cisco.com](mailto:c18000-space-routers@cisco.com).

### For More Information

For more information about the Cisco 184000 Space Router, visit <http://www.cisco.com/go/iris>, contact your local Cisco account representative, or send an email request to [c18000-space-routers@cisco.com](mailto:c18000-space-routers@cisco.com).



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