Cisco IP VSAT Satellite WAN Network Module (NM-1VSAT-GILAT)

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The NM-1VSAT-GILAT network module provides Cisco modular access routers with two-way satellite WAN connectivity in Gilat© SkyEdge© or compatible satellite communications networks. The NM-1VSAT-GILAT network module functions as the indoor unit (IDU) of a very small aperture terminal (VSAT), or earthbound station of a satellite communications network. A “very small” dish antenna is called the outdoor unit (ODU) of a VSAT. As the IDU, the NM-1VSAT-GILAT network module serves as the interface between the ODU and the VSAT LAN. The ODU receives and sends signals to a satellite, and the satellite sends and receives signals from an earthbound central hub, which controls the entire operation of the satellite network.

Finding Feature Information in This Module

Your Cisco IOS software release may not support all of the features documented in this module. To reach links to specific feature documentation in this module and to see a list of the releases in which each feature is supported, use the “Feature Information for the Cisco IP VSAT Satellite WAN Network Module” section on page 185.

Finding Support Information for Platforms and Cisco IOS Software Images

Use Cisco Feature Navigator to find information about platform support and Cisco IOS and Catalyst OS software image support. To access Cisco Feature Navigator, go to http://www.cisco.com/go/cfn. An account on Cisco.com is not required.

Contents

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Prerequisites for the Cisco IP VSAT Satellite WAN Network Module (NM-1VSAT-GILAT)

- The firmware version on the NM-1VSAT-GILAT network module must be compatible with the Cisco IOS software release and feature set on the router:
  - For software compatibility information, see the *Cisco IP VSAT Satellite WAN Network Module (NM-1VSAT-GILAT) Data Sheet*.
  - To view the Cisco IOS release and feature set on the router, enter the **show version** command in privileged EXEC mode.
  - To view the firmware version on the NM-1VSAT-GILAT network module, enter the **service-module satellite** *slot*/**0 status** command in privileged EXEC mode.
- The NM-1VSAT-GILAT network module requires an associated central hub, which monitors and controls the satellite network. You must therefore take one of the following actions:
  - Subscribe to a service from a Gilat SkyEdge satellite service provider, who will operate the hub and install an ODU.
  - Purchase and operate your own Gilat SkyEdge hub equipment, obtain and install an ODU, and acquire the appropriate satellite bandwidth to operate a satellite communications network.
- The NM-1VSAT-GILAT network module can be used in one-way mode with SkyEdge-compatible equipment with the following configuration:
  - IPE: SkyStream SMR Series (SMR-24/25/26)
  - Modulator: A DVB-S compliant modulator, registered at www.dvb.org. DVB-S compliant modulators are Newtec, EF-DATA 2020M, and Sencore ASM 988A. Any other modulator must be approved by Gilat.
  - For the DVB-S (QPSK) OB symbol rate: maximum = 30 Msps or 48.38 Mbps
  - Coding rate: 1/2, 2/3, 3/4, 5/6, 7/8

  See the "Configuring the Initial VSAT Parameters for the NM-1VSAT-GILAT Network Module" section on page 13 for more details.
- Install the NM-1VSAT-GILAT network module in the router chassis, connect the network module to the ODU, and connect the network module to the external power supply. See the "Connecting Cisco IP VSAT Satellite WAN Network Modules" chapter of the *Cisco Network Modules Hardware Installation Guide*.
- The hub must be configured to connect to the NM-1VSAT-GILAT network module.

- If you plan to use Protocol Independent Multicast (PIM), Open Shortest Path First (OSPF), or Enhanced Interior Gateway Routing Protocol (EIGRP) on the router satellite interface, then the hub must be configured to enable transparent tunneling of the protocol packets.

Note For hardware-related prerequisites, see the "Connecting Cisco IP VSAT Satellite WAN Network Modules" chapter of the *Cisco Network Modules Hardware Installation Guide*.

Restrictions for the Cisco IP VSAT Satellite WAN Network Module (NM-1VSAT-GILAT)

- The NM-1VSAT-GILAT network module is supported only in Gilat SkyEdge–compatible satellite communications networks. For more information, go to http://www.gilat.com/.

Note In one-way mode, the NM-1VSAT-GILAT network module can operate with SkyEdge-compatible equipment. See the section Prerequisites for the Cisco IP VSAT Satellite WAN Network Module (NM-1VSAT-GILAT), page 2, for more information about the non-SkyEdge hub requirements for one-way mode.

- The NM-1VSAT-GILAT network module is designed for Ku-band and C-band satellite networks using the Gilat SkyEdge Frequency and Time Division Multiple Access (FTDMA) technology. The NM-1VSAT-GILAT network module is *not* compatible with these items:
  - Other frequency bands, such as Ka-band
  - Other satellite TDMA systems, including Digital Video Broadcasting–Return Channel by Satellite (DVB-RCS), and Data Over Cable Service Interface Specification (DOCSIS)
  - Other media access methods, such as Single Channel Per Carrier (SCPC)
- If you use IP routing protocols other than Routing Information Protocol Version 2 (RIPv2), then one of the following actions is required:
  - On the VSAT router, enable VSAT route update messages to the hub. See the "Enabling or Disabling VSAT Route Update Messages to the Hub from the NM-1VSAT-GILAT Network Module" section on page 35.
  - On the hub router, configure static routes to the VSAT router networks.
- If you enable Network Address Translation (NAT) on the VSAT router, then you must disable route update messages to the hub. See the "Enabling or Disabling VSAT Route Update Messages to the Hub from the NM-1VSAT-GILAT Network Module" section on page 35.
- PIM and RIP are not compatible on the satellite interface. Also, a specific configuration is required for the satellite link to support IP multicast routing. See the "Configuring IP Multicast Routing for the NM-1VSAT-GILAT Network Module" section on page 80.
- If a large number of VSATs send PIM, OSPF, or EIGRP protocol packets to the hub, then the inbound channel may become saturated. Extremely large satellite networks may be required to use only the RIPv2 routing protocol, because the VSAT software on the NM-1VSAT-GILAT network module automatically optimizes RIPv2 packets for inbound channel bandwidth. To reduce inbound channel saturation caused by PIM, OSPF, or EIGRP, increase the hello intervals on the VSAT router satellite interface:
  - For PIM, use the **ip pim query-interval** command.

  - For OSPF, use the **ip ospf hello-interval** command.
  - For EIGRP, use the **ip hello-interval eigrp** command.
- When using encryption over the satellite network, one of the following methods should be used to enable TCP acceleration:
  - Integrated Acceleration and Encryption (ITAE) Mode to perform TCP acceleration on the VSAT module and encryption with Cisco IOS software. See Configuring Integrated TCP Acceleration and Encryption, page 86.
  - Rate Based Satellite Control Protocol (RBSCP), a Cisco IOS software feature
  - An external Performance Enhancement Proxy (PEP) device to perform TCP acceleration before encryption on Cisco IOS software. Contact your satellite service provider for information.
- Voice over IP (VoIP) calls are extremely sensitive to jitter and delay, both of which are inherent in typical satellite links. The NM-1VSAT-GILAT network module can use dedicated access (DA) bandwidth over the satellite link to ensure that VoIP calls receive the highest quality of service. To enable the use of DA bandwidth during VoIP calls, you must set up an integrated VoIP gateway by taking one of the following actions on the router in which the NM-1VSAT-GILAT network module is installed:
  - Configure a VoIP gateway solution, such as Cisco Unified CallManager Express (Cisco Unified CME).
  - Install a hardware VoIP gateway, such as one of the following voice-enabled modules: NM-HDV, NM-HDA, NM-HD-1V, NM-HD-2V, NM-HD-2VE, or EVM-HD.
  - Enable the Cisco Multiservice IP-to-IP Gateway feature.

  For information about these voice applications, see the Cisco IOS Voice Configuration Library.
- Do not enable Cisco Discovery Protocol on the satellite interface. By default, Cisco Discovery Protocol is disabled on the satellite interface to avoid unnecessary traffic.
- Both the Cisco IOS software on the router and the VSAT software on the NM-1VSAT-GILAT network module apply QoS features to satellite traffic. These QoS features are applied separately and sequentially. For outbound traffic (that is, traffic sent by the hub and received by the VSAT), the VSAT software QoS features are applied first, followed by the Cisco IOS QoS features. The sequence is reversed for inbound traffic.
- Because of delays that are inherent to satellite links, using TFTP results in long file-download times. Therefore, do not use TFTP to download a new Cisco IOS image over the satellite link. Instead, use FTP, which performs faster downloads by leveraging the NM-1VSAT-GILAT network module's TCP acceleration feature.

  For more information about using FTP, see the "Copying an Image from an FTP Server to a Flash Memory File System" section of the "Loading and Maintaining System Images" chapter of the *Cisco IOS Configuration Fundamentals Configuration Guide*.
- Booting the router from a network server over the satellite link is not supported, because the bootup process may time out before the satellite link comes up. Therefore, if you use the following commands, make sure that you do not specify the satellite network or interfaces:
  - **boot system** command in global configuration mode
  - **boot** command in ROM monitor mode

Note For hardware-related restrictions, see the "Connecting Cisco IP VSAT Satellite WAN Network Modules" chapter of the *Cisco Network Modules Hardware Installation Guide*.

Information About the Cisco IP VSAT Satellite WAN Network Module (NM-1VSAT-GILAT)

To configure the Cisco IP VSAT Satellite WAN Network Module (NM-1VSAT-GILAT) feature, you should understand the following concepts:

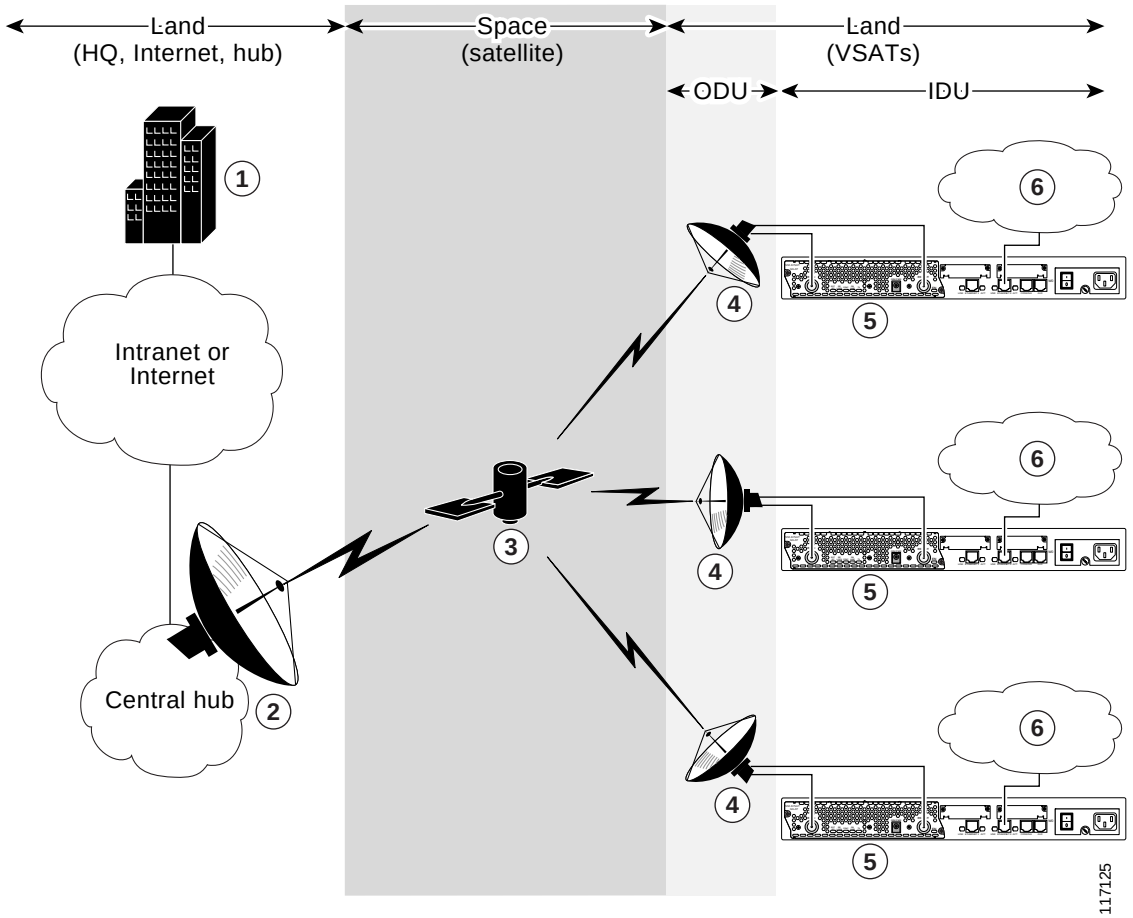
Note For NM-1VSAT-GILAT network module features and benefits, supported hardware and software, and other product information, see the *Cisco IP VSAT Satellite WAN Network Module (NM-1VSAT-GILAT) Data Sheet*.

General Satellite Network Components

Figure 1 shows a satellite communications network that includes NM-1VSAT-GILAT network modules.

Note Not shown in Figure 1 are the terrestrial WAN connections that are also commonly used to connect VSAT routers to the Internet or an intranet. A terrestrial WAN connection can be used to back up a satellite link or can serve as a primary link that is backed up by a satellite link.

Figure 1 Satellite Communications Network Using the NM-1VSAT-GILAT Network Module



1	Corporate headquarters/campus	**4**	Dish antenna (ODU) at VSAT
2	Dish antenna at hub	**5**	NM-1VSAT-GILAT network module at VSAT
3	Satellite in space	**6**	Local network at VSAT; for example, a branch office network connected to an Ethernet port on the router

At a high level, the many components of an enterprise satellite communications network can be divided into three categories:

- Satellite, page 6
- Hub, page 7
- VSATs, page 7

Satellite

Placed in orbit around the earth, a satellite is a specialized repeater that receives radio-frequency signals from earth stations and retransmits them to other earth stations. The satellite also amplifies the signals and switches the frequencies between the uplink and the downlink carriers. Gilat SkyEdge systems use geostationary satellites with a fixed satellite-to-earth delay of about 250 ms.

Hub

The central hub—sometimes referred to as the "master earth station" but most often simply called the "hub"—contains many components, including:

- Large dish antenna (15 to 36 feet [4.5 to 11 meters] in diameter)
- Satellite network management system (NMS) and provisioning stations, from which a network operator can monitor and control all components of the enterprise satellite communications network
- Baseband equipment that handles satellite access, routing between the hub and remote earth stations, dial backup, quality of service (QoS), TCP acceleration, and HTTP acceleration
- Optional components: web caches, MPEG transport coder/decoder, application server farms, and audio/video broadcast programming devices

Note Throughout this document, the "hub" refers specifically to a Gilat SkyEdge hub, unless otherwise stated.

VSATs

A very small aperture terminal (VSAT) is an earth station that can be divided into two areas:

- Indoor unit (IDU), which generally serves to connect the local network to the hub through the satellite link. The IDU components vary, depending on the functions required, but the components typically include these items:
  - Integrated receiver decoder (IRD) for the tuning
  - Demodulation and decoding of L-band or other type of intermediate frequency (IF) passed from the dish
  - End-user input/output
- Outdoor unit (ODU), which includes a "very small" dish antenna (2 to 6 feet [0.5 to 2 meters] in diameter) and its components, shown in Figure 2. The ODU is typically mounted on a building roof or outer wall, or placed on the ground.

The NM-1VSAT-GILAT network module functions as the IDU of a VSAT and is connected to the ODU through coaxial cables. A power supply is connected to the NM-1VSAT-GILAT network module to provide power over the coaxial cables to the ODU.

Figure 2 ODU Components

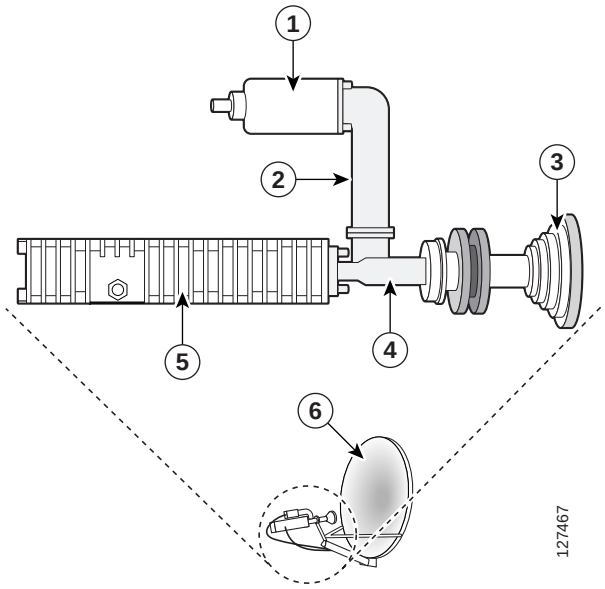


Figure Callout	ODU Component	Function
1	Low noise block converter (LNB)	Amplifies and converts high-frequency satellite signals into lower-frequency signals.
2	Transmit reject filter	Filters out transmitted signals so that only signals received from the satellite enter the LNB.
3	Feed horn	Captures signals from and transmits energy to the reflector.
4	Orthomode transducer (OMT)	Separates transmitted signals from received signals, which have different polarization and frequency.
5	Solid state block converter and power amplifier (SSPA)	Amplifies and converts the low-frequency signals from the IDU to high-frequency signals for transmission across the satellite link.
6	Reflector	Concave dish surface that focuses the energy received from the satellite to the feed horn and that transfers the energy transmitted by the feed horn to the satellite.

Satellite Network Management and Provisioning

The satellite network is provisioned and managed primarily from the central hub, where the network management system (NMS) is used to manage satellite access, configure the VSAT software on the NM-1VSAT-GILAT network module, and monitor and control all components of the satellite network.

From the VSAT, the Cisco IOS software on the router is used to perform the initial configuration of the NM-1VSAT-GILAT network module to establish the backbone link to the hub. The Cisco IOS software is also used to configure VSAT IP addresses and Cisco IOS software features. Some features require configuration from both the hub NMS and the VSAT router Cisco IOS software.

You can use the following tools to monitor your NM-1VSAT-GILAT network module from the VSAT:

- CiscoView
- Network-based Simple Network Management Protocol (SNMP)—CiscoWorks and MIB browsers
- Cisco IOS CLI—**service-module satellite** *slot*/**0 status** command and various **show** and **debug** commands

Outbound and Inbound Directions in a Satellite Communications Network

The *outbound* direction applies to signals transmitted from the hub to the VSAT. Within a VSAT network, the outbound direction applies to RF communication from the dish antenna (ODU) to the NM-1VSAT-GILAT network module (IDU). From the VSAT perspective, the outbound direction is the *receive* path. Gilat SkyEdge outbound signals include user data and timing data that are compatible with the Digital Video Broadcasting–Satellite (DVB-S) standard.

The *inbound* direction applies to signals transmitted from the VSAT to the hub. Within a VSAT network, the inbound direction applies to RF communication from the NM-1VSAT-GILAT network module to the dish antenna. From the VSAT perspective, the inbound direction is the *transmit* path. Inbound signals include user data and retransmission requests.

NM-1VSAT-GILAT Network Module LEDs

The NM-1VSAT-GILAT network module has six LEDs, shown in Figure 3 and described in Table 1.

Figure 3 NM-1VSAT-GILAT Network Module LEDs

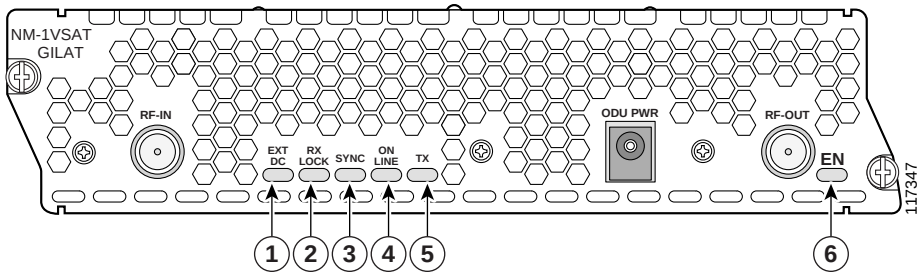


Table 1 NM-1VSAT-GILAT Network Module LED Descriptions

Figure Ref.	LED	State	Meaning	Possible Causes and Corrective Actions
1	EXT DC	Blinking	ODU power DC level is correct, and the VSAT[1] software on the network module is running.	Normal indication. No action required.
		Steady on	ODU power supply is connected properly, but the VSAT software on the network module is not running.	Wait until the VSAT software completes the boot process.
		Off	ODU power supply is not connected or is outside the specified DC range.	Check ODU power supply connections. See the "Connecting Cisco IP VSAT Satellite WAN Network Modules" chapter of the *Cisco Network Modules Hardware Installation Guide*.

Table 1 NM-1VSAT-GILAT Network Module LED Descriptions (continued)

Figure Ref.	LED	State	Meaning	Possible Causes and Corrective Actions
2	RX LOCK	On	DVB[2] (outbound[3]) receiver is locked.	Normal indication. No action required.
		Off	NM-1VSAT-GILAT network module does not see or recognize the DVB carrier signal from the hub.	The VSAT parameters are configured incorrectly. See the "Configuring the Initial VSAT Parameters for the NM-1VSAT-GILAT Network Module" section on page 13. The network module is not properly connected to the LNB.[4] Check the RF[5] cables or contact your satellite service provider. The dish antenna is misaligned. Contact your satellite service provider. There is a hub failure, or the hub is configured incorrectly. Contact your satellite service provider.
3	SYNC	On	NM-1VSAT-GILAT network module is synchronized with the hub timing.	Normal indication. No action required.
		Off	NM-1VSAT-GILAT network module is not synchronized with the hub timing.	If the RX LOCK LED is also off, then see the corrective actions for RX LOCK. If the RX LOCK LED is on while the SYNC LED is off, then the following apply: • The VSAT parameters are configured incorrectly. See the "Configuring the Initial VSAT Parameters for the NM-1VSAT-GILAT Network Module" section on page 13. • There is a hub failure, or the hub is configured incorrectly. Contact your satellite service provider.

Table 1 NM-1VSAT-GILAT Network Module LED Descriptions (continued)

Figure Ref.	LED	State	Meaning	Possible Causes and Corrective Actions
4	ON LINE	On	IP connectivity to the hub is fully established.	Normal indication. No action required.
		Off	IP connectivity to the hub was unsuccessful.	If the SYNC LED is also off, then see the corrective actions for SYNC. If the SYNC LED is on while the ON LINE LED is off, then the following apply: • There is a problem somewhere in the return path from the network module to the hub. Check the cabling between the RF-OUT connector and the SSPA.[6] • The SSPA may not be working. Contact your satellite service provider. • The dish antenna is misaligned. Contact your satellite service provider. • There is a hub failure, or the hub is configured incorrectly. Contact your satellite service provider.
5	TX	Flickering	Inbound[7] transmission is in progress.	Normal indication. No action required.
		Off	No inbound transmission is in progress.	If you are concerned about the TX LED being off, then try to ping the hub or another destination on the other side of the satellite link. If the TX LED does not flicker during the ping, then the network module is not attempting to send data to the hub. • Wait until the VSAT software completes the boot process. • Verify that your Cisco IOS software configuration is correct. • The VSAT software has failed. Contact your satellite service provider.

Table 1 NM-1VSAT-GILAT Network Module LED Descriptions (continued)

Figure Ref.	LED	State	Meaning	Possible Causes and Corrective Actions
6	EN	On	The router Cisco IOS software recognizes the network module.	Normal indication. No action required.
		Off	The router Cisco IOS software does not recognize the network module.	Verify that the network module is properly installed in the router chassis. See the "Installing Cisco Network Modules in Cisco Access Routers" chapter of the *Cisco Network Modules Hardware Installation Guide*.

1. VSAT = very small aperture terminal
2. DVB = Digital Video Broadcasting
3. The *receive* direction at the remote VSAT is called the *outbound* direction from the hub. See the "Outbound and Inbound Directions in a Satellite Communications Network" section on page 9.
4. LNB = low noise block converter
5. RF = radio frequency
6. SSPA = solid state block converter and power amplifier
7. The *transmit* direction at the remote VSAT is called the *inbound* direction to the hub. See the "Outbound and Inbound Directions in a Satellite Communications Network" section on page 9.

How to Configure the Cisco IP VSAT Satellite WAN Network Module (NM-1VSAT-GILAT)

This section contains the following procedures:

- Configuring NM-1VSAT-GILAT Network Module Satellite Backup for a Terrestrial Link, page 54 (optional)
- Verifying NM-1VSAT-GILAT Network Module Satellite Backup for a Terrestrial Link—Floating Static Route, page 57 (optional)
- Verifying NM-1VSAT-GILAT Network Module Satellite Backup for a Terrestrial Link—Backup Interface, page 61 (optional)
- Configuring HSRP Redundancy for the NM-1VSAT-GILAT Network Module, page 66 (optional)
- Verifying HSRP Redundancy for the NM-1VSAT-GILAT Network Module, page 74 (optional)
- Troubleshooting HSRP Redundancy for the NM-1VSAT-GILAT Network Module, page 76 (optional)
- Configuring IP Multicast Routing for the NM-1VSAT-GILAT Network Module, page 80 (optional)
- Troubleshooting Voice over IP for the NM-1VSAT-GILAT Network Module, page 83 (optional)
- Configuring Integrated TCP Acceleration and Encryption, page 86 (optional)
- Upgrading VSAT Firmware, page 95 (optional)

Configuring the Initial VSAT Parameters for the NM-1VSAT-GILAT Network Module

This section describes how to perform the initial configuration of VSAT parameters that are required for the NM-1VSAT-GILAT network module to establish a satellite backbone link to the hub. Typically, this task is performed only once by an installation technician.

After the NM-1VSAT-GILAT network module establishes a link to the hub, the satellite network management system at the hub is used to configure the VSAT software on the NM-1VSAT-GILAT network module.

The initial VSAT parameters are saved directly to the nonvolatile memory on the NM-1VSAT-GILAT network module. The commands do not appear in the router configuration, even though you configure the parameters through the Cisco IOS CLI.

Note The parameter values are provided by your satellite service provider and are typically configured by an installation technician. If this task was already performed by an installation technician, then do not attempt to further modify any of the parameters, and proceed directly to the "Configuring IP Addresses for the Router Satellite Interface and the NM-1VSAT-GILAT Network Module" section on page 20.

Prerequisites

- Read the "Outbound and Inbound Directions in a Satellite Communications Network" section on page 9.
- Obtain the following items from your satellite service provider:
  - The password required to enter satellite initial configuration mode. Each NM-1VSAT-GILAT network module has a unique, factory-installed default password. After the initial configuration mode is accessed, a user-defined password of up to 32 alpha-numeric characters can be set for future access.

– Initial VSAT parameter values. You must configure the exact parameter values that are provided by your satellite service provider.

Restrictions

If an installation technician performs this configuration task, then do not attempt to further modify the parameters, and proceed directly to the "Configuring IP Addresses for the Router Satellite Interface and the NM-1VSAT-GILAT Network Module" section on page 20.

SUMMARY STEPS

1. **enable**
2. **service-module satellite** *slot*/**0 configuration**
3. Enter the password.
4. **id aa-group** *number*
5. **id software group** *number*
6. **id vsat** *number*
7. **mode download**
   or
   no mode download
8. **mode two-way**
   or
   no mode two-way
9. **outbound pid management** *number*
10. **outbound data-rate** *rate*
11. **outbound frequency** *frequency*
12. **outbound id** *number*
13. **outbound modulation-type** {**DVB** | **TURBO_QPSK** | **8PSK**}
14. **outbound sync ip address** *address*
15. **outbound viterbi-rate** {**1/2** | **1/4** | **2/3** | **3/4** | **3/4(2.05)** | **3/4(2.1)** | **3/4(2.6)** | **5/6** | **6/7** | **7/8** | **8/9**}
16. **password** <*new password*>
17. **show**
18. **apply**
19. **exit**
    or
    end
20. **service-module satellite** *slot*/**0 status**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	(Optional) Enables privileged EXEC mode. • Enter your password if prompted. **Note** You can perform this entire task in user EXEC mode; therefore, this step is optional.
Step 2	**service-module satellite** *slot*/**0 configuration** **Example:** `Router# service-module satellite 1/0 configuration`	Enters satellite initial configuration mode.

Step 3	Enter the password.
	
	Example:
	`Password: <mypassword>`
	`Reminder: changing any parameters will result in a software reset of the module.`
		If this is the first time you are accessing this mode, enter the VSAT initial configuration mode password supplied by the service provider. Otherwise, enter the user-defined password.

Step 4	**id aa-group** *number* **Example:** `Router(sat-init-config)# id aa-group 336`	Configures the asynchronous acknowledgement group ID. • The *number* argument is in the range from 256 to 511.
Step 5	**id software group** *number* **Example:** `Router(sat-init-config)# id software group 598`	Configures the operational software group ID. • The *number* argument is in the range from 512 to 767.
Step 6	**id vsat** *number* **Example:** `Router(sat-init-config)# id vsat 1284`	Configures the component physical address (CPA). • The CPA uniquely identifies the VSAT endpoint in the satellite network. • The *number* argument is in the range from 1280 to 8100. **Note** Even in homogeneous HSRP setups, each NM-1VSAT-GILAT network module must have a unique CPA.
Step 7	**mode download** or **no mode download** **Example:** `Router(sat-init-config)# mode download`	Enables operational code download mode for the NM-1VSAT-GILAT network module. or Disables operational code download mode for the NM-1VSAT-GILAT network module.

	Command or Action	Purpose
Step 8	**mode two-way** or **no mode two-way** **Example:** `Router(sat-init-config)# mode two-way`	Specifies two-way operational mode. or Specifies one-way operational mode. This mode is used with third-party hubs. The NM-1 VSAT-GILAT network module is able to operate only outbound (from hub to VSAT) for user traffic when third-party hubs are used.
Step 9	**outbound pid management** *number* **Example:** `Router(sat-init-config)# pid management 3000`	Specifies the outbound packet identifier (PID). • The *number* argument is in the range from 1 to 8190.
Step 10	**outbound data-rate** *rate* **Example:** `Router(sat-init-config)# outbound data-rate 450000`	Specifies the outbound data rate. • The *rate* argument is in the range from 250000 to 73000000 bits per second.
Step 11	**outbound frequency** *frequency* **Example:** `Router(sat-init-config)# outbound frequency 950000`	Specifies the outbound frequency. • The *frequency* argument is in the range from 950000 to 2150000 kilohertz.
Step 12	**outbound id** *number* **Example:** `Router(sat-init-config)# outbound id 95`	Specifies the outbound VSAT ID. • The *number* argument is in the range from 0 to 255.
Step 13	**outbound modulation-type** {**DVB** | **TURBO_QPSK** | **8PSK**} **Example:** `Router(sat-init-config)# outbound modulation-type DVB`	Specifies the outbound modulation type.
Step 14	**outbound sync ip address** *address* **Example:** `Router(sat-init-config)# outbound sync ip address 10.2.2.2`	Specifies the outbound synchronization IP address.
Step 15	**outbound viterbi-rate** {**1/2** | **1/4** | **2/3** | **3/4** | **3/4(2.05)** | **3/4(2.1)** | **3/4(2.6)** | **5/6** | **6/7** | **7/8** | **8/9**} **Example:** `Router(sat-init-config)# outbound viterbi-rate 3/4(2.6)`	Specifies the outbound Viterbi code rate.
Step 16	**password** <*new password*> **Example:** `Router(sat-init-config)# password vsatuser`	(Optional) Sets the user-defined password for VSAT initial configuration mode. The command is used the first time this mode is accessed to replace the factory-installed default password with your user-defined password.

	Command or Action	Purpose
Step 17	**show** **Example:** `Router(sat-init-config)# show`	Displays the initial configuration parameters for the NM-1VSAT-GILAT network module. • Verify that you configured the satellite parameters correctly.

Step 18	**apply**
	
	Example:
	`Router(sat-init-config)# apply`
	`Applying changed parameters to the satellite module.`
	`Parameter update succeeded. Module is now resetting.`
	
	Example:
	`Router(sat-init-config)# apply`
	`% No new or changed parameters to apply.`
		(Optional) Saves any changed parameters to the NM-1VSAT-GILAT network module nonvolatile memory, and resets the NM-1VSAT-GILAT network module.
		• This step automatically occurs when you enter the **exit** or **end** command in Step 19.

Step 19	**exit** or **end** **Example:** `Router(sat-init-config)# exit`	Exits satellite initial configuration mode, saves any changed parameters to the NM-1VSAT-GILAT network module nonvolatile memory, and resets the NM-1VSAT-GILAT network module. • If no parameters are changed, then the NM-1VSAT-GILAT network module is not reset.
Step 20	**service-module satellite** *slot*/**0 status** **Example:** `Router# service-module satellite 1/0 status`	Displays status information related to the hardware and software on the NM-1VSAT-GILAT network module. • Verify that the link to the hub (BackBone Status) is UP. • You may need to wait a minute for the system to complete the reset process. The process is complete when the operational mode (Oper Mode) is OPERATIONAL instead of BOOT.

Examples

This section provides the following examples:

apply Command: Sample Output

The following example shows what appears when you enter the **apply** command after changing some initial configuration parameters:

```
Router(sat-init-config)# apply
Applying changed parameters to the satellite module.
Parameter update succeeded. Module is now resetting.
```

```
Router(sat-init-config)#
```

The following example shows what appears when you enter the **apply** command when no parameters have been changed:

```
Router(sat-init-config)# apply
% No new or changed parameters to apply.
Router(sat-init-config)#
```

show (satellite initial configuration) Command: Sample Output

The following example shows the satellite initial configuration parameters:

```
Router(sat-init-config)# show
!
! Initial Configuration Parameters:
!
id aa-group 298
id software group 598
id vsat 6201
mode download
mode two-way
outbound data-pid 514
outbound data-rate 15000000
outbound frequency 1201000
outbound id 2
outbound modulation-type DVB
outbound sync ip address 172.16.0.3
outbound viterbi-rate 1/2
!
!
Router(sat-init-config)#
```

end or exit Command in Satellite Initial Configuration Mode: Sample Output

The following example shows what appears when you enter the **end** or **exit** command after changing one or more initial configuration parameters:

```
Router(sat-init-config)# end

Applying changed parameters to the satellite module.
Parameter update succeeded. Module is now resetting.
Router#
```

The following example shows what appears when you enter the **end** or **exit** command when no parameters have been changed:

```
Router(sat-init-config)# end
Router#
```

service-module satellite status Command—Normal Operational Mode: Sample Output

The following example shows that the link to the hub (BackBone Status) is up, indicating that you correctly configured the initial VSAT parameters:

```
Router# service-module satellite 2/0 status
Getting status from the satellite module, please wait..

Software Versions, OS:15.4.5.12, RSP:3.4.5.5, MBC:2.0.4.3
HW Version:00008000
CPA Number:6101, DPS CPA:5
Workgroup: 257, SW Group: 512, Download: YES
```

```
Service Module Uptime:00:06:40, Router Uptime:1 day, 20 hours, 26 minutes
Current router clocktime:*03:11:22.641 UTC Tue Dec 2 2003
Oper Mode:OPERATIONAL, In Dial Backup:NO, Standby:NO, One-Way:NO
RBCP Received Packets:44, RBCP Sent Packets:41
Bit Error Rate:0e-0, Signal to Noise Ratio:12.4453
IP Address/Mask:10.22.1.1/255.255.255.252
Service Module MAC:00:A0:AC:00:20:60
RX Lock:LOCKED, Sync Lock:LOCKED
BackBone Status:UP, Two-Way Mode:YES, DA/RA Mode:RA
Outbound Modulation Type:DVB, OB Code Rate:3/4
Outbound Unicast Packets:61, OB Multicast Packets:23547
Outbound ID:2, OB PID:514, OB Freq:1201000, OB Bit Rate:30000000
Outbound Sync IP address: 172.22.0.3
Inbound Start Freq:1201176, IB Stop Freq:1209336
Inbound Data Rate:307200, IB Freq Offset:0
Inbound Packets:3553
BackBone Hub Link Status:UP
BackBone Received Packets:1, BB Sent:3552
BackBone Received Retransmitted:0, BB Sent Retrans:0
Service Module Eth RX:3550, TX:47110
Service Module Eth Multicast RX:1, Multicast TX:23563
Bufs Configured:5000, Bufs Free:4951
Internal Software State parameters:
   Service Module SW State Var:3
   General IOS FSM:LINK_UP, HSRP FSM:ACTIVE, HSRP VSAT Mode:ACTIVE
   Lost Beats Total:0, Lost Beats This Retry:0
VOIP DA calls:
 NONE

Router#
```

service-module satellite status Command—During Reset Process: Sample Output

The following examples show what would appear if the NM-1VSAT-GILAT network module was still resetting itself when you entered the **service-module satellite status** command:

```
Router# service-module satellite 1/0 status
   Getting status from the satellite module, please wait..

% Satellite1/0 card is busy. Status is not available. Try later.

Router# service-module satellite 1/0 status
Getting status from the satellite module, please wait..

Software Versions, OS: 15.4.5.12, RSP: 0.0.0.0, MBC: 2.0.4.3
HW Version: 00008000
CPA Number: 6103, DPS CPA: 0
Workgroup: 257, SW Group: 513, Download: YES
Service Module Uptime: 00:00:20, Router Uptime: 4 days, 4 hours, 29 minutes
Current router clocktime: *19:07:35.935 UTC Tue Jul 11 2006
Oper Mode: BOOT, In Dial Backup: NO, Standby: NO
RBCP Received Packets: 0, RBCP Sent Packets: 0
Eb/No: 10.9283, Flags: 0xEEEE
IP Address/Mask: 0.0.0.0/0.0.0.0
Service Module MAC: 00:A0:AC:06:15:00
RX Lock: LOCKED, Sync Lock: NOT LOCKED
BackBone Status: DOWN, Two-Way Mode: YES, Access Mode: INVALID
Outbound Modulation Type: DVB, OB Code Rate: 3/4
Outbound Unicast Packets: 0, OB Multicast Packets: 0
Outbound ID: 2, OB PID: 514, OB Freq: 1201000, OB Bit Rate: 30000000
Outbound Sync IP address: 172.2.0.3
Inbound Start Freq: 1190140, IB Stop Freq: 1193710
Inbound D
```

```
ata Rate: 768000, IB Freq Offset: 0

COUNTERS OMITTED. Not available at this time.
Internal Software State parameters:
   Service Module SW State Var: 0
   General IOS FSM: LINK_DOWN, HSRP FSM: N/A, HSRP VSAT Mode: N/A
   Lost Beats Total: 176, Lost Beats This Retry: 0
VOIP DA calls:
  NONE
```

Troubleshooting Tips

Make sure that you configure the exact satellite initial configuration parameters that are provided by your satellite service provider. To view the configured parameter values, use one of the following commands:

- **service-module satellite** *slot*/**0 status** command in privileged EXEC mode
- **show** command in satellite initial configuration mode

What to Do Next

Proceed to the "Configuring IP Addresses for the Router Satellite Interface and the NM-1VSAT-GILAT Network Module" section on page 20.

Configuring IP Addresses for the Router Satellite Interface and the NM-1VSAT-GILAT Network Module

This section describes how to configure the two IP addresses that are required to use the NM-1VSAT-GILAT network module. The two required IP addresses are:

- One IP address for the router satellite interface, which is the internal interface that connects the router to the installed NM-1VSAT-GILAT network module
- One IP address for the NM-1VSAT-GILAT network module

The two methodologies that perform this configuration are:

- Configuring IP Addresses Locally, page 20
- Configuring IP Addresses from the Hub, page 26

Either methodology may be used. See the "Compatibility Between Local Configuration and Configuration from the Hub" section on page 28.

Configuring IP Addresses Locally

This section describes how to implement configuration of the IP addresses locally. The IP address for the router satellite interface is configured with the **ip address** command. The IP address for the NM-1VSAT-GILAT network module is configured with the **service-module ip address** command.

Both the **ip address** command and the **service-module ip address** command are entered in satellite interface configuration mode.

Note Your satellite service provider may assign one or both of the required IP addresses.

Automatically Configured IP Address and Mask for the NM-1VSAT-GILAT Network Module

If you configure the router satellite interface with an IP address and subnet mask with these conditions:

- The IP address leaves a remainder of 2 when the last octet is divided by 4
- The subnet mask has /30 or fewer masking bits

then the system automatically configures the IP address and subnet mask on the NM-1VSAT-GILAT network module with these results:

- The IP address is 1 less than the IP address you configured for the router satellite interface.
- The subnet mask is /30.

You can override the automatically configured IP address and mask by manually entering the **service-module ip address** command.

Note The automatically configured IP address does not appear in the router configuration because the **service-module ip address** command is considered to be set to its default value. Similarly, if you manually configure an IP address and subnet mask that is identical to the automatically configured IP address and subnet mask, the **service-module ip address** command does *not* appear in the router configuration.

IP Address Requirements for IP Multicast and Non-RIPv2 Routing Protocols

If you use Protocol Independent Multicast (PIM) or any unicast routing protocols *other* than Routing Information Protocol Version 2 (RIPv2) on the satellite interface, then you must configure IP addresses and subnet masks as follows:

- To the VSAT router, the hub router and all VSATs in the satellite network appear to be on the same subnet.
- To the NM-1VSAT-GILAT network module, all VSATs in the satellite network appear to be on separate subnets.

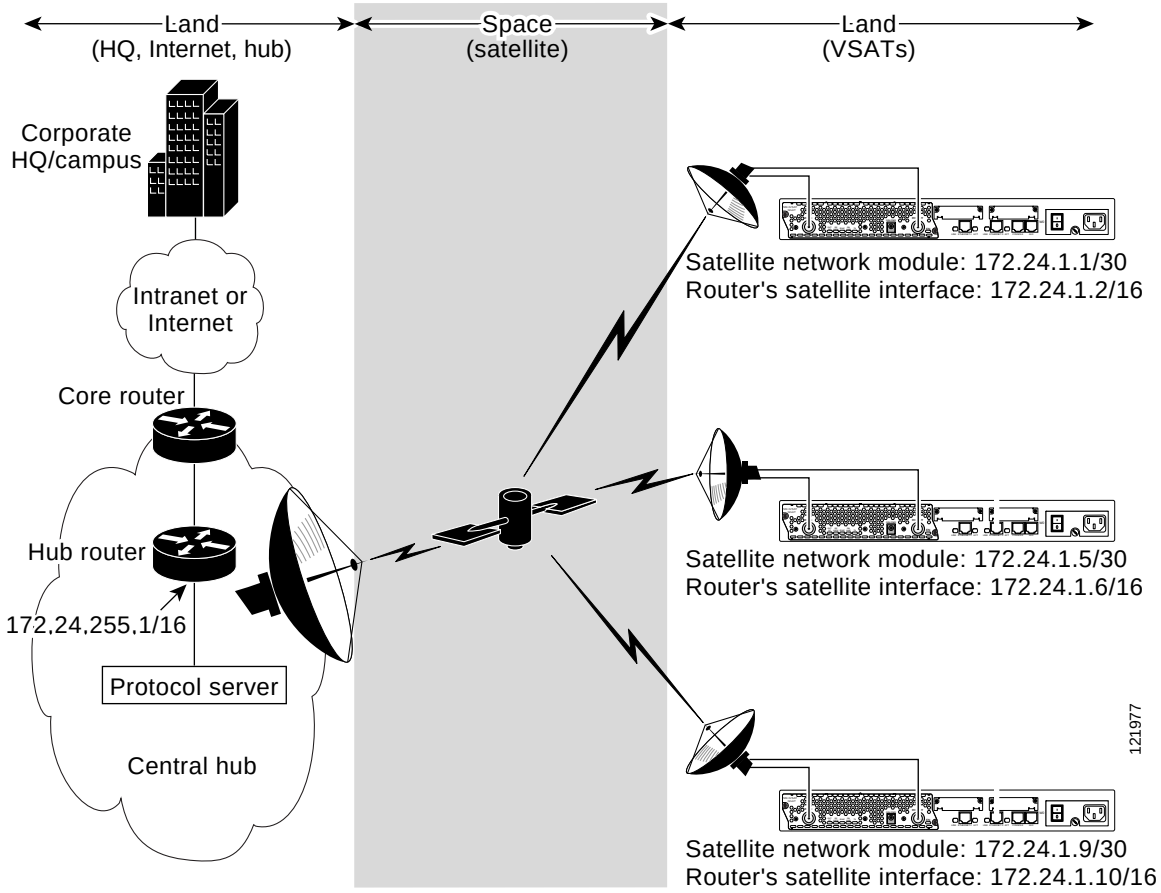
To satisfy the above requirements, use the following rules to configure IP addresses:

- The VSAT router satellite interface must have a subnet mask with equal or fewer masking bits than the subnet mask configured for the NM-1VSAT-GILAT network module.
- Regardless of the actual subnet masks you configure, both IP addresses must belong in the same subnet that you assign to the NM-1VSAT-GILAT network module.

Tip The automatically configured IP address and mask on the NM-1VSAT-GILAT network module comply with the requirements for supporting PIM and non-RIPv2 routing protocols on the VSAT router satellite interface. See the "Automatically Configured IP Address and Mask for the NM-1VSAT-GILAT Network Module" section on page 21.

See Figure 4 for sample IP address assignments that enable support of PIM and non-RIPv2 routing protocols on the satellite network.

Figure 4 Sample IP Addresses for PIM or Unicast Routing Protocols Other Than RIPv2



Restrictions

- If your satellite service provider assigns one or both of the required IP addresses, then you must configure those exact IP addresses.
- If you use Protocol Independent Multicast (PIM) or any unicast routing protocols *other* than Routing Information Protocol Version 2 (RIPv2), such as OSPF, on the satellite interface, then you must assign IP addresses according to the rules stated in the "IP Address Requirements for IP Multicast and Non-RIPv2 Routing Protocols" section on page 21.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface satellite** *slot*/**0**
4. **ip address** *address mask*
5. **service-module ip address** *address mask*
6. **end**
7. **show running-config | begin Satellite**

8. **ping** *router-sat-int-address*
9. **ping** *satellite-nm-address*

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**interface satellite** *slot*/**0** **Example:** `Router(config)# interface satellite 1/0`	Enters satellite interface configuration mode.
Step 4	**ip address** *address mask* **Example:** `Router(config-if)# ip address 10.0.0.6 255.255.255.0`	Sets the IP address for the router satellite interface, which is the internal interface that connects the router to the installed NM-1VSAT-GILAT network module.
Step 5	**service-module ip address** *address mask* **Example:** `Router(config-if)# service-module ip address 10.0.0.1 255.255.255.252`	(Optional) Sets the IP address for the NM-1VSAT-GILAT network module. • This step is required when the following message appears after you perform Step 4: `%VSAT-6-PIMINCOMPADDR:The IP address configured on Satellite1/0 requires a manually configured IP address for the satellite module` • If the previous message does not appear, then this step is optional, because the NM-1VSAT-GILAT network module IP address was automatically configured. See the "Automatically Configured IP Address and Mask for the NM-1VSAT-GILAT Network Module" section on page 21. • Perform this step if you want to override the automatically configured IP address.
Step 6	**end** **Example:** `Router(config-if)# end`	Returns to privileged EXEC mode.

	Command or Action	Purpose
Step 7	**show running-config | begin Satellite** **Example:** `Router# show running-config | begin Satellite`	Displays the running configuration, beginning with the first line that contains the text string "Satellite". • Verify that the router satellite interface and NM-1VSAT-GILAT network module IP addresses are configured properly. • Note that the command is case-sensitive.
Step 8	**ping** *router-sat-int-address* **Example:** `Router# ping 10.0.0.6`	Assesses basic network connectivity. • Verify that you can ping the IP address configured on the *router* satellite interface, which is the internal interface that connects the router to the NM-1VSAT-GILAT network module.
Step 9	**ping** *satellite-nm-address* **Example:** `Router# ping 10.0.0.1`	Assesses basic network connectivity. • Verify that you can ping the IP address configured on the NM-1VSAT-GILAT network module.

Examples

This section provides the following examples:

- Configuring IP Addresses for the Router Satellite Interface and the NM-1VSAT-GILAT Network Module: Using the Automatically Configured IP Address for the NM-1VSAT-GILAT Network Module: Example, page 24
- Configuring IP Addresses for the Router Satellite Interface and the NM-1VSAT-GILAT Network Module: Overriding the Automatically Configured IP Address for the NM-1VSAT-GILAT Network Module: Example, page 25
- Configuring IP Addresses for the Router Satellite Interface and the NM-1VSAT-GILAT Network Module: Manually Configuring Both IP Addresses: Example, page 25

Configuring IP Addresses for the Router Satellite Interface and the NM-1VSAT-GILAT Network Module: Using the Automatically Configured IP Address for the NM-1VSAT-GILAT Network Module: Example

In the following example, the router satellite interface IP address is configured as 10.0.0.6. Because the last octet of the IP address leaves a remainder of 2 when divided by 4, the system automatically configures the IP address for the NM-1VSAT-GILAT network module.

Although the NM-1VSAT-GILAT network module IP address and mask do not appear in the router configuration, you know that the IP address is 1 less than the IP address of the router satellite interface and has a subnet mask of /30. In this case, the NM-1VSAT-GILAT network module is automatically configured with the following IP address and mask: 10.0.0.5 255.255.255.252.

```
!
interface Satellite 1/0
 ip address 10.0.0.6 255.255.255.0
!
```

Configuring IP Addresses for the Router Satellite Interface and the NM-1VSAT-GILAT Network Module: Overriding the Automatically Configured IP Address for the NM-1VSAT-GILAT Network Module: Example

In the following example, the router satellite interface IP address is configured as 10.0.0.6. Because the last octet of the IP address leaves a remainder of 2 when divided by 4, the system automatically configures the IP address and mask for the NM-1VSAT-GILAT network module as 10.0.0.5 255.255.255.252.

Nevertheless, the NM-1VSAT-GILAT network module IP address and mask are manually configured as 10.0.0.1 255.255.255.0 to override the automatically derived IP address and mask. Notice that the IP addresses for both the router satellite interface and the NM-1VSAT-GILAT network module appear in the running configuration.

```
!
interface Satellite 1/0
 ip address 10.0.0.6 255.255.255.0
 service-module ip address 10.0.0.1 255.255.255.0
!
```

Configuring IP Addresses for the Router Satellite Interface and the NM-1VSAT-GILAT Network Module: Manually Configuring Both IP Addresses: Example

In the following example, the router satellite interface is assigned an IP address (10.0.0.7), the last octet of which does *not* leave a remainder of 2 when divided by 4. The system displays a message to manually configure the IP address for the NM-1VSAT-GILAT network module. Notice that the IP addresses for both the router satellite interface and the NM-1VSAT-GILAT network module appear in the running configuration.

```
Router(config)# interface satellite 1/0
Router(config-if)# ip address 10.0.0.7 255.255.255.0

%VSAT-6-PIMINCOMPADDR:The IP address configured on Satellite1/0
      requires a manually configured IP address for the satellite module

Router(config-if)# service-module ip address 10.0.0.6 255.255.255.0
Router(config-if)# end
Router# show running-config | begin Satellite

interface Satellite 1/0
   ip address 10.0.0.7 255.255.255.0
   service-module ip address 10.0.0.6 255.255.255.0
.
.
.
```

Troubleshooting Tips

- If you cannot ping either IP address, then enter the **show interfaces satellite** command in privileged EXEC mode to verify that the satellite interface is up. If the satellite interface is down, then bring up the interface by entering the **no shutdown** command in satellite interface configuration mode.
- If you cannot ping the NM-1VSAT-GILAT network module IP address, then enter the **service-module satellite** *slot*/**0 status** command in privileged EXEC mode to display the operational mode (Oper Mode), which should be OPERATIONAL. If the operational mode is

BOOT, then you need to wait for the NM-1VSAT-GILAT network module to complete a boot process. If the operational mode is not OPERATIONAL or BOOT, then one of the following has occurred:

- The initial VSAT parameters were not configured properly. Notify the installation technician or see the "Configuring the Initial VSAT Parameters for the NM-1VSAT-GILAT Network Module" section on page 13.
- A problem at the hub is preventing the NM-1VSAT-GILAT network module from connecting to the hub. Contact your satellite service provider for help.

What to Do Next

Proceed to the "Verifying Satellite Network Connectivity for the NM-1VSAT-GILAT Network Module" section on page 28.

Configuring IP Addresses from the Hub

This section describes how to implement centralized configuration of the VSAT module IP addresses from the hub. The IP address is configured at the hub NMS by the satellite service provider. The satellite interface is configured with DHCP to obtain the IP address from the VSAT module. A DHCP server is part of the VSAT firmware, and has to be enabled by the service provider.

Because the IP address for the NM-1VSAT-Gilat network module is configured remotely from the hub, the **service-module ip address** command, which is used to configure the network module locally, is disabled in centralized IP address configuration.

Prerequisites

Your service provider must do the following:

- Configure the VSAT IP address at the hub NMS and push it to the VSAT.
- Enable the DHCP server in the VSAT firmware.

To verify that all of this is done, examine the value of the Flags parameter in the service module status output.

```
Router# service-module satellite 1/0 status
Getting status from the satellite module, please wait..

Software Versions, OS: 15.4.5.12, RSP: 3.4.5.5, MBC: 2.0.4.3
HW Version: 00008000
CPA Number: 6101, DPS CPA: 5
Workgroup: 257, SW Group: 513, Download: YES
Service Module Uptime: 00:01:16, Router Uptime: 2 days, 22 hours, 58 minutes
Current router clocktime: *04:08:44.310 UTC Mon Mar 4 2002
Oper Mode: OPERATIONAL, In Dial Backup: NO, Standby: NO
RBCP Received Packets: 33, RBCP Sent Packets: 38
Eb/No: 10.9324, Flags: 0x0007
IP Address/Mask: 10.0.0.1/255.255.255.252
Service Module MAC: 00:A0:AC:06:14:ED
RX Lock: LOCKED, Sync Lock: LOCKED
BackBone Status: UP, Two-Way Mode: YES, Access Mode: RA
. . .
```

Table 2 gives the values and interpretations of the Flag bits.

When all of these bits are on (giving the Flags parameter a cumulative value of 0x0007), the NM-1VSAT-GILAT network module can assign the IP address to the satellite interface.

Table 2 Flag Bits for Hub Configuration of IP Addresses

Bit Number	Hexadecimal Flag Value	Meaning
00	0x0001	VSAT has received the configuration table from the hub.
01	0x0002	VSAT has its IP address as configured from the hub.
02	0x0004	The DHCP server in the VSAT firmware is enabled.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface satellite** *slot*/**0**
4. **ip address dhcp** [**client-id** *interface-name*] [**hostname** *host-name*]
5. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**interface satellite** *slot*/**0** **Example:** `Router(config)# interface satellite 1/0`	Enters satellite interface configuration mode.
Step 4	**ip address dhcp** [**client-id** *interface-name*] [**hostname** *host-name*] **Example:** `Router(config-if)# ip address dhcp`	Obtains the IP address of the interface from the VSAT module using DHCP.
Step 5	**end** **Example:** `Router(config-if)# end`	Returns to privileged EXEC mode.

What to Do Next

Proceed to the "Verifying Satellite Network Connectivity for the NM-1VSAT-GILAT Network Module" section on page 28.

Compatibility Between Local Configuration and Configuration from the Hub

If you attempt to configure the satellite interface locally with an address that does not match the address that has already been configured at the hub, the hub address will take precedence, and an error message describing the condition will be generated. To confiure the IP address locally, the VSAT IP address at the hub should be configured to 0.0.0.0.

Verifying Satellite Network Connectivity for the NM-1VSAT-GILAT Network Module

This section describes how to verify that your router can connect to the satellite communications network using the NM-1VSAT-GILAT network module.

Prerequisites

Complete the tasks in these sections:

- Configuring the Initial VSAT Parameters for the NM-1VSAT-GILAT Network Module, page 13
- Configuring IP Addresses Locally, page 20, or Configuring IP Addresses from the Hub, page 26

SUMMARY STEPS

1. **enable**
2. **service-module satellite** *slot*/**0 status**
3. **ping** {*host-name* | *ip-address*} **source** *lan-ip-address*
   or
   telnet {*host-name* | *ip-address*}
   or
   traceroute

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**service-module satellite** *slot*/**0 status** **Example:** `Router# service-module satellite 1/0 status`	Displays status information related to the hardware and software on the NM-1VSAT-GILAT network module. • Verify that the output says: – In Dial Backup: NO – Standby: NO – BackBone Status: Up
Step 3	**ping** {*host-name* | *ip-address*} **source** *lan-ip-address* or **telnet** {*host-name* | *ip-address*} or **traceroute** **Example:** `Router# ping 172.16.0.4 source 10.2.0.1`	Assesses basic network connectivity. or Logs in to a host that supports Telnet. or Displays the routes that packets take through a network to their destinations. • These commands attempt to reach a destination on the other side of the satellite link to verify that the satellite link is up. **Note** If you use the **ping** or **traceroute** command, you must specify the source IP address as the IP address of a LAN interface on your router.[1]

1. Use the IP address of any interface on your router *except* for the IP addresses assigned to the NM-1VSAT-GILAT network module and to the router satellite interface.

Examples

This section provides the following examples:

- service-module satellite status Command: Sample Output, page 29
- ping Command: Sample Output, page 30
- traceroute Command: Sample Output, page 31

service-module satellite status Command: Sample Output

The following example shows that the backbone link to the hub is up, and that the NM-1VSAT-GILAT network module is not in hub dial backup mode or in Hot Standby Router Protocol (HSRP) standby mode. This means that the NM-1VSAT-GILAT network module has, in fact, established a connection to the hub over the satellite link (air).

```
Router# service-module satellite 1/0 status

Getting status from the satellite module, please wait..
```

```
Software Versions, OS: 15.4.5.12, RSP: 3.4.5.5, MBC: 2.0.4.3
HW Version: 00008000
CPA Number: 6101, DPS CPA: 5
Workgroup: 257, SW Group: 513, Download: YES
Service Module Uptime: 00:00:55, Router Uptime: 3 days, 22 hours, 3 minutes
Current router clocktime: *03:13:01.924 UTC Tue Mar 5 2002
Oper Mode: OPERATIONAL, In Dial Backup: NO, Standby: NO
RBCP Received Packets: 14, RBCP Sent Packets: 13
Eb/No: 10.9483, Flags: 0x0007
IP Address/Mask: 9.0.0.1/255.255.255.252
Service Module MAC: 00:A0:AC:06:14:ED
RX Lock: LOCKED, Sync Lock: LOCKED
BackBone Status: UP, Two-Way Mode: YES, Access Mode: RA
Outbound Modulation Type: DVB, OB Code Rate: 3/4
Outbound Unicast Packets: 0, OB Multicast Packets: 0
Outbound ID: 2, OB PID: 514, OB Freq: 1201000, OB Bit Rate: 30000000
Outbound Sync IP address: 172.2.0.3
Inbound Start Freq: 1190140, IB Stop Freq: 1193710
Inbound Data Rate: 768000, IB Freq Offset: 0
Inbound Packets: 0
BackBone Received Packets: 0, BB Sent: 2
BackBone Received Retransmitted: 0, BB Sent Retrans: 0
Service Module Eth RX: 3, TX: 0
Service Module Eth Multicast RX: 3, Multicast TX: 0
Bufs Configured: 1500, Bufs Free: 1449
Internal Software State parameters:
   Service Module SW State Var: 3
   General IOS FSM: LINK_UP, HSRP FSM: N/A, HSRP VSAT Mode: N/A
   Lost Beats Total: 53, Lost Beats This Retry: 0
VOIP DA calls:
 NONE
```

ping Command: Sample Output

The following example shows the outcome of a successful **ping** command to a destination on the other side of the satellite link. The specified source IP address belongs to the router LAN interface.

```
Router# show running-config interface fastethernet0/0

Building configuration...

Current configuration:110 bytes
!
interface FastEthernet0/0
 ip address 10.2.0.1 255.255.255.0
 load-interval 30
 speed 100
 full-duplex
end

Router# ping 172.16.0.4 source 10.2.0.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.16.0.4, timeout is 2 seconds:
Packet sent with a source address of 10.2.0.1
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 136/147/160 ms
Router#
```

traceroute Command: Sample Output

The following example shows the outcome of a successful **traceroute** command to a destination on the other side of the satellite link or hub dial backup link. The source IP address belongs to the router LAN interface.

```
Router# traceroute

Protocol [ip]:
Target IP address: 172.16.0.4
Source address: 10.2.0.1
Numeric display [n]:
Timeout in seconds [3]:
Probe count [3]:
Minimum Time to Live [1]:
Maximum Time to Live [30]:
Port Number [33434]:
Loose, Strict, Record, Timestamp, Verbose[none]:
Type escape sequence to abort.
Tracing the route to 172.16.0.4

  1  *  *  *
  2  *  *  *
  3 192.168.1.5 148 msec 140 msec 160 msec
  4 172.17.5 140 msec 160 msec 140 msec
  5 172.16.0.4 160 msec *  152 msec
```

Troubleshooting Tips

- If the **ping** and **traceroute** commands fail to reach a destination on the other side of the satellite link, make sure that you specify a source IP address that is *not* configured on the satellite interface. We recommend using the IP address of a LAN interface on your router, such as a Fast Ethernet interface, as the source IP address for the **ping** and **traceroute** commands.
- Check the LEDs on the NM-1VSAT-GILAT network module faceplate. See the "NM-1VSAT-GILAT Network Module LEDs" section on page 9.
- See the "Troubleshooting Satellite Network Connectivity for the NM-1VSAT-GILAT Network Module" section on page 31.

What to Do Next

Proceed to the "Enabling or Disabling VSAT Route Update Messages to the Hub from the NM-1VSAT-GILAT Network Module" section on page 35.

Troubleshooting Satellite Network Connectivity for the NM-1VSAT-GILAT Network Module

This section describes how to use the Cisco IOS CLI to troubleshoot failure of the router to connect to the satellite communications network using the NM-1VSAT-GILAT network module.

You can also check the LEDs on the NM-1VSAT-GILAT network module faceplate to troubleshoot satellite network connectivity. See the "NM-1VSAT-GILAT Network Module LEDs" section on page 9.

Prerequisites

Before using **debug** commands, read and understand the *Important Information on Debug Commands* document.

SUMMARY STEPS

1. **enable**
2. **service-module satellite** *slot*/**0 status**
3. **show**
4. **debug satellite rbcp**
5. **debug satellite errors**
6. **debug satellite events**
7. **debug scp** {**data** | **async** | **errors** | **timeouts** | **packets** | **all**}

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**service-module satellite** *slot*/**0 status** **Example:** `Router# service-module satellite 1/0 status`	Displays status information related to the hardware and software on the NM-1VSAT-GILAT network module. • Determine whether the link to the hub (BackBone Status) is UP or DOWN. You may need to wait a minute for the system to complete the reset process. The process is complete when the operational mode (Oper Mode) is OPERATIONAL instead of BOOT. • If the BackBone Status remains DOWN, then proceed to Step 3.
Step 3	**show** **Example:** `Router(sat-init-config)# show`	Displays the initial configuration parameters for the NM-1VSAT-GILAT network module. • Verify that you configured the initial VSAT parameters correctly. See the "Configuring the Initial VSAT Parameters for the NM-1VSAT-GILAT Network Module" section on page 13. • If the initial VSAT parameters are correctly configured, then proceed to Step 4.
Step 4	**debug satellite rbcp** **Example:** `Router# debug satellite rbcp`	Displays Router Blade Configuration Protocol (RBCP) management messages between Cisco IOS software and the network module. • Verify communication between the router and the NM-1VSAT-GILAT network module. • If messages are being sent between the router and the NM-1VSAT-GILAT network module, then continue.

	Command or Action	Purpose
Step 5	**debug satellite errors** **Example:** `Router# debug satellite errors`	(Optional) Displays satellite link error conditions. • This command is useful for detecting unusual conditions when troubleshooting unexpected behavior. • Because this command typically generates very little output, you can enter the command every time you troubleshoot satellite network connectivity.
Step 6	**debug satellite events** **Example:** `Router# debug satellite events`	(Optional) Displays debug information for software events, such as the periodic heartbeats from the NM-1VSAT-GILAT network module to the Cisco IOS software on the router.
Step 7	**debug scp** {**data** | **async** | **errors** | **timeouts** | **packets** | **all**} **Example:** `Router# debug scp all`	(Optional) Displays management messages between Cisco IOS software and the network module that are more detailed than the **debug satellite rbcp** command output. **Note** If a content engine (CE) network module is installed in the same router, the **debug scp** command displays management messages for both the Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT) and the CE network module (NM-CE-BP).

Examples

This section provides the following examples:

- service-module satellite status Command: Sample Output, page 33
- show (satellite initial configuration) Command: Sample Output, page 34
- debug satellite rbcp Command: Sample Output, page 34
- debug satellite events Command: Sample Output, page 35
- debug satellite scp Command: Sample Output, page 35

service-module satellite status Command: Sample Output

The following example shows that the NM-1VSAT-GILAT network module is in boot mode after a reset, so that the link to the hub (BackBone Status) is down. In this situation, you need to wait until the NM-1VSAT-GILAT network module completes the boot process.

```
Router# service-module satellite 1/0 status

Getting status from the satellite module, please wait..

Software Versions, OS: 15.4.5.12, RSP: 0.0.0.0, MBC: 2.0.4.3
HW Version: 00008000
CPA Number: 6103, DPS CPA: 0
Workgroup: 257, SW Group: 513, Download: YES
Service Module Uptime: 00:00:20, Router Uptime: 4 days, 4 hours, 29 minutes
Current router clocktime: *19:07:35.935 UTC Tue Jul 11 2006
Oper Mode: BOOT, In Dial Backup: NO, Standby: NO
RBCP Received Packets: 0, RBCP Sent Packets: 0
Eb/No: 10.9283, Flags: 0xEEEE
IP Address/Mask: 0.0.0.0/0.0.0.0
Service Module MAC: 00:A0:AC:06:15:00
```

```
RX Lock: LOCKED, Sync Lock: NOT LOCKED
BackBone Status: DOWN, Two-Way Mode: YES, Access Mode: INVALID
Outbound Modulation Type: DVB, OB Code Rate: 3/4
Outbound Unicast Packets: 0, OB Multicast Packets: 0
Outbound ID: 2, OB PID: 514, OB Freq: 1201000, OB Bit Rate: 30000000
.
.
.
```

show (satellite initial configuration) Command: Sample Output

The following example shows the satellite initial configuration parameters:

```
Router(sat-init-config)# show
!
! Initial Configuration Parameters:
!
id aa-group 298
id software group 598
id vsat 6201
mode download
mode two-way
outbound data-pid 514
outbound data-rate 15000000
outbound frequency 1201000
outbound id 2
outbound modulation-type DVB
outbound sync ip address 172.22.0.3
outbound viterbi-rate 1/2
!
!
Router(sat-init-config)#
```

debug satellite rbcp Command: Sample Output

With the **debug satellite rbcp** command enabled, you can verify communication between the router and the NM-1VSAT-GILAT network module by monitoring RBCP messages between the Cisco IOS software and the NM-1VSAT-GILAT network module. In the following example, the NM-1VSAT-GILAT network module requests updates to the routing table, and the router responds to the request.

```
Router# debug satellite rbcp
...
```

The NM-1VSAT-GILAT network module requests IP route information:

```
*May 16 09:18:54.475:Satellite1/0 RBCP Request msg Recd:IPROUTE_REQ(0x22)
```

The Cisco IOS software acknowledges that it received the message from the NM-1VSAT-GILAT network module:

```
*May 16 09:18:54.475:Satellite1/0 RBCP Response msg Sent:IPROUTE_REQ(0x22)
```

The Cisco IOS software sends the IP route information to the NM-1VSAT-GILAT network module:

```
*May 16 09:18:54.475:Satellite1/0 RBCP Request msg Sent:IPROUTE_UPD(0x23)
```

The NM-1VSAT-GILAT network module acknowledges that it received the routing update from the Cisco IOS software:

```
*May 16 09:18:54.475:Satellite1/0 RBCP Response msg Recd:IPROUTE_UPD(0x23)
```

debug satellite events Command: Sample Output

The following example shows how to monitor the periodic heartbeats that the NM-1VSAT-GILAT network module sends to the Cisco IOS software:

```
Router# debug satellite events

satellite major software events debugging is on
*May 16 09:32:15.575:Satellite1/0 FSM transition LINK_UP-->LINK_UP, ev=got_heartbeat
*May 16 09:32:32.363:Satellite1/0 FSM transition LINK_UP-->LINK_UP, ev=got_heartbeat
```

debug satellite scp Command: Sample Output

The following example shows management messages between the Cisco IOS software on the router and the NM-1VSAT-GILAT network module.

```
Router# debug scp all

*Aug 31 09:26:19.221:scp-rx:SA:01/02 DA:0F/02 Op:0071 Sq:0D15 Ln:0014 I:00
*Aug 31 09:26:19.221:000:10 00 00 03 00 00 00 02 00 0E 0D 08 00 0E 0D 08 ................
*Aug 31 09:26:19.225:010:00 00 00 01                                     ....
*Aug 31 09:26:19.229:scp-tx:SA:0F/02 DA:01/02 Op:0071 Sq:0D15 Ln:0014 I:01
*Aug 31 09:26:19.229:000:00 00 9C 40 00 00 00 02 00 0E 0D 08 00 0E 0D 08 ...@............
*Aug 31 09:26:19.233:010:00 00 00 01                                     ....
*Aug 31 09:26:30.492:scp-rx:SA:01/02 DA:0F/02 Op:0022 Sq:0D17 Ln:0000 I:00
*Aug 31 09:26:30.492:scp-rx:SA:01/02 DA:0F/02 Op:0026 Sq:0D18 Ln:0000 I:00
*Aug 31 09:26:30.492:scp-tx:SA:0F/02 DA:01/02 Op:0022 Sq:0D17 Ln:0000 I:01
*Aug 31 09:26:30.504:scp-tx:SA:0F/02 DA:01/02 Op:0023 Sq:9DC1 Ln:0018 I:00
*Aug 31 09:26:30.504:000:00 00 00 01 00 00 00 01 08 7B 60 00 FF FF FF 00 .........{`.....
*Aug 31 09:26:30.508:010:3E 01 00 06 00 00 00 01                        >.......
*Aug 31 09:26:30.508:scp-rx:SA:01/02 DA:0F/02 Op:0023 Sq:9DC1 Ln:0018 I:01
*Aug 31 09:26:30.508:000:00 00 00 01 00 00 00 01 08 7B 60 00 FF FF FF 00 .........{`.....
*Aug 31 09:26:30.512:010:3E 01 00 06 00 00 00 01                        >.......
*Aug 31 09:26:30.508:scp-tx:SA:0F/02 DA:01/02 Op:0026 Sq:0D18 Ln:0000 I:01
*Aug 31 09:26:30.516:scp-tx:SA:0F/02 DA:01/02 Op:0027 Sq:9DC2 Ln:0008 I:00
*Aug 31 09:26:30.516:000:00 00 00 00 00 00 00 00                         ........
*Aug 31 09:26:30.520:scp-rx:SA:01/02 DA:0F/02 Op:0027 Sq:9DC2 Ln:0008 I:01
*Aug 31 09:26:30.524:000:00 00 00 00 00 00 00 00                         ........
*Aug 31 09:26:36.009:scp-rx:SA:01/02 DA:0F/02 Op:0071 Sq:0D1A Ln:0014 I:00
*Aug 31 09:26:36.009:000:10 00 00 03 00 00 00 02 00 0E 0D 0D 00 0E 0D 0D ................
*Aug 31 09:26:36.009:010:00 00 00 01                                     ....
*Aug 31 09:26:36.013:scp-tx:SA:0F/02 DA:01/02 Op:0071 Sq:0D1A Ln:0014 I:01
*Aug 31 09:26:36.013:000:00 00 9C 40 00 00 00 02 00 0E 0D 0D 00 0E 0D 0D ...@............
```

Enabling or Disabling VSAT Route Update Messages to the Hub from the NM-1VSAT-GILAT Network Module

By default, when a change occurs in the routing table, the router sends RBCP messages to the NM-1VSAT-GILAT network module. In turn, the NM-1VSAT-GILAT network module sends the route updates to the hub, which has a routing database that includes the routing table of every VSAT router in the satellite network.

This section describes how to disable or, if already disabled, how to enable the route update messages to the hub. Disabling the route update messages conserves satellite link bandwidth when the hub does not need to know the entire routing table of the VSAT router. For example, if you enable Network Address Translation (NAT) on the VSAT router, the hub should not learn the NAT local addresses.

Prerequisites

Complete the tasks in these sections:

- Configuring the Initial VSAT Parameters for the NM-1VSAT-GILAT Network Module, page 13
- Configuring IP Addresses for the Router Satellite Interface and the NM-1VSAT-GILAT Network Module, page 20

Restrictions

- If you enable NAT on the VSAT router, then you must disable route update messages to the hub.
- If you disable route update messages to the hub, then the hub must learn the remote VSAT routing database through one of the following methods:
  - You use RIPv2 as the only routing protocol on your VSAT router. The hub can understand and track RIPv2 route updates.
  - On the hub router, configure static routes to the VSAT router networks.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface satellite** *slot*/**0**
4. **no service-module routing redistribute**
   or
   service-module routing redistribute
5. **end**
6. **show running-config**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**interface satellite** *slot*/**0** **Example:** `Router(config)# interface satellite 1/0`	Enters satellite interface configuration mode.

	Command or Action	Purpose
Step 4	**no service-module routing redistribute** or **service-module routing redistribute** **Example:** `Router(config-if)# no service-module routing redistribute`	Disables VSAT route update messages to the hub. or Enables VSAT route update messages to the hub.
Step 5	**end** **Example:** `Router(config-if)# end`	Returns to privileged EXEC mode.
Step 6	**show running-config** **Example:** `Router# show running-config`	Displays the running configuration. • Verify your configuration. • If you disabled VSAT route update messages, then the **no service-module routing redistribute** command appears in the satellite interface configuration. • If you enabled VSAT route update messages, then the command does not appear in the configuration because that is the default setting.

Examples

A configuration example follows.

Disabling VSAT Route Update Messages to the Hub: Example

In the following example, the VSAT router does not send route update messages to the hub:

```
!
interface Satellite 1/0
 ip address 10.0.0.6 255.255.255.0
 service-module ip address 10.0.0.1 255.255.255.0
 no service-module routing redistribute
!
```

Configuring Hub Dial Backup for the NM-1VSAT-GILAT Network Module Satellite Link

When you use the NM-1VSAT-GILAT network module to provide your primary network connectivity over the satellite link, you can set up a backup terrestrial link in either *hub* dial backup mode or *router* dial backup mode. This section describes how to configure *hub* dial backup mode.

For information about router dial backup mode, see the "Configuring Router Dial Backup for the NM-1VSAT-GILAT Network Module Satellite Link" section on page 46.

Hub Dial Backup Mode

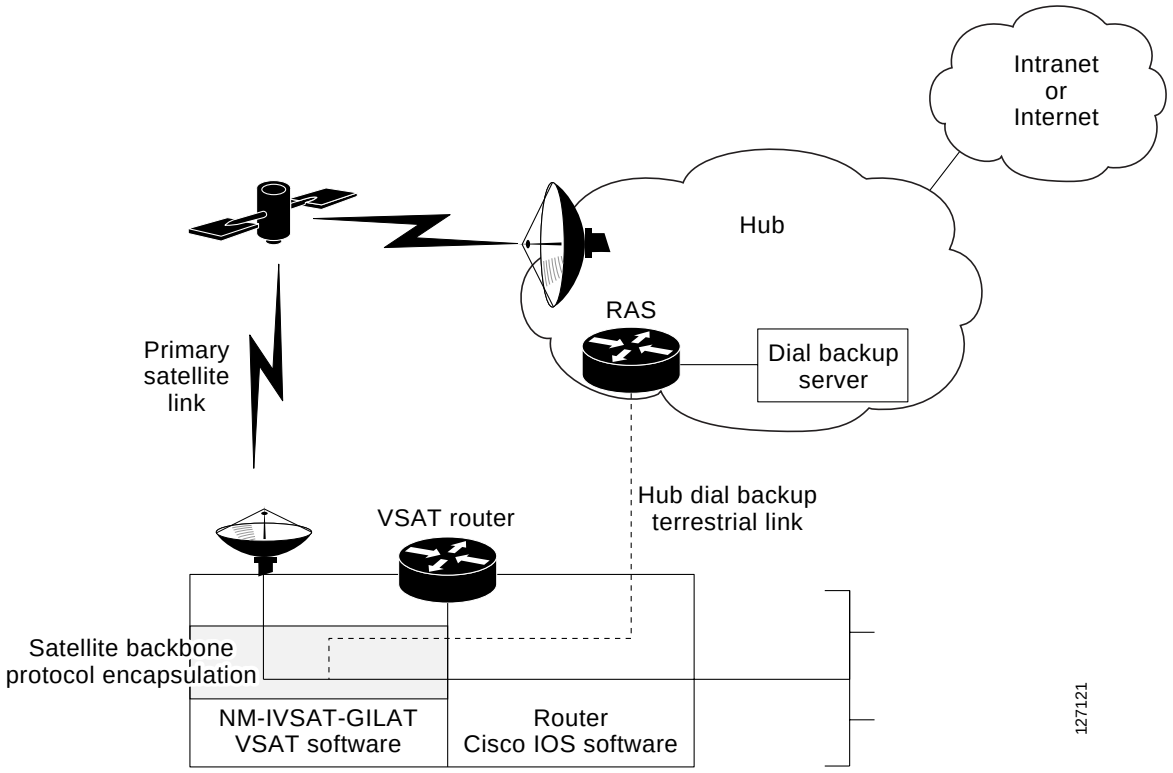
Hub dial backup mode maintains TCP connections during transitions between primary and backup links. Note, however, that hub dial backup mode provides backup for the satellite *link*, but not for the NM-1VSAT-GILAT network module hardware, the router satellite interface, or other router interfaces.

If the satellite link goes down (for example, because of rain fade) in hub dial backup mode, the NM-1VSAT-GILAT network module connects to the hub using dial-on-demand routing (DDR). Common DDR backup links use ISDN BRIs, modems on auxiliary ports, and T1/E1 lines.

The NM-1VSAT-GILAT network module always encapsulates packets using a satellite backbone protocol before sending the packets over the satellite link. In hub dial backup mode, the NM-1VSAT-GILAT network module continues to encapsulate the packets using the satellite backbone protocol before sending the packets over the dial backup link to the hub; this is how hub dial backup mode maintains TCP connections during transitions between the primary satellite link and the dial backup link. Therefore, hub dial backup mode works only when the NM-1VSAT-GILAT network module itself is functioning properly.

Figure 5 shows a sample network topology for hub dial backup mode.

Figure 5 Hub Dial Backup for the NM-1VSAT-GILAT Network Module Satellite Link—Sample Network Topology



Prerequisites

- Configure the WAN interface or dial-up modem for the backup link. See the *Cisco IOS Dial Technologies Configuration Guide*, the *Cisco IOS Interface and Hardware Component Configuration Guide*, or the *Cisco IOS Wide-Area Networking Configuration Guide*.
- Configure the remote access server (RAS) at the hub to accept calls from the VSAT router in which the NM-1VSAT-GILAT network module is installed.
- Configure the IP addresses for the router satellite interface and the NM-1VSAT-GILAT network module. See the "Configuring IP Addresses for the Router Satellite Interface and the NM-1VSAT-GILAT Network Module" section on page 20.
- On the VSAT router, configure a static route to the hub network that contains the dial backup server. Typically, an installation technician configures hub dial backup mode, including the static route to the dial backup server. If you need to configure hub dial backup mode yourself, then get the dial backup server network address from your satellite service provider.

Restrictions

- Hub dial backup mode works only when the NM-1VSAT-GILAT network module itself is functioning properly. Therefore, hub dial backup mode provides backup for the satellite link, but not for the satellite interface or the NM-1VSAT-GILAT network module hardware.
- Do not configure hub dial backup if you are using a homogeneous HSRP setup. Hub dial backup mode is not compatible with homogeneous HSRP, which is described in the "Configuring HSRP Redundancy for the NM-1VSAT-GILAT Network Module" section on page 66.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface satellite** *slot*/**0**
4. **service-module backup interface** *interface-type interface-number*
5. **service-module backup mode hub**
6. **exit**
7. **ip route** *backup-server-prefix mask backup-interface-type backup-interface-number*
8. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**interface satellite** *slot*/**0** **Example:** `Router(config)# interface satellite 1/0`	Enters satellite interface configuration mode.
Step 4	**service-module backup interface** *interface-type interface-number* **Example:** `Router(config-if)# service-module backup interface bri 0/0`	Defines the interface to use as backup to the satellite link.
Step 5	**service-module backup mode hub** **Example:** `Router(config-if)# service-module backup mode hub`	Specifies hub dial backup mode.

	Command or Action	Purpose
Step 6	**exit** **Example:** `Router(config-if)# exit`	Exits satellite interface configuration mode.
Step 7	**ip route** *backup-server-prefix mask backup-interface-type backup-interface-number* **Example:** `Router(config)# ip route 192.168.255.0 255.255.255.0 bri 0/0`	Establishes a static route through the backup interface to the hub dial backup server network.
Step 8	**end** **Example:** `Router(config)# end`	Returns to privileged EXEC mode.

What to Do Next

Proceed to the "Verifying Hub Dial Backup for the NM-1VSAT-GILAT Network Module Satellite Link" section on page 41.

Verifying Hub Dial Backup for the NM-1VSAT-GILAT Network Module Satellite Link

This section describes how to verify successful configuration of a backup terrestrial link in *hub* dial backup mode when you use the NM-1VSAT-GILAT network module to provide your primary network connectivity over the satellite link.

Prerequisites

Complete the task described in the "Configuring Hub Dial Backup for the NM-1VSAT-GILAT Network Module Satellite Link" section on page 38.

SUMMARY STEPS

1. **enable**
2. **ping** {*host-name* | *ip-address*} **source** *lan-ip-address*
   or
   telnet {*host-name* | *ip-address*}
   or
   traceroute
3. **service-module satellite** *slot*/**0 backup initiate**
   or
   Disconnect the external power supply from the ODU PWR connector on the NM-1VSAT-GILAT network module.
4. **service-module satellite** *slot*/**0 status**

5. **ping** {*host-name* | *ip-address*} **source** *lan-ip-address*
   or
   telnet {*host-name* | *ip-address*}
   or
   traceroute
6. **service-module satellite** *slot*/**0 backup terminate**
   or
   Reconnect the external power supply to the ODU PWR connector on the NM-1VSAT-GILAT network module.
7. **service-module satellite** *slot*/**0 status**
8. **ping** {*host-name* | *ip-address*} **source** *lan-ip-address*
   or
   telnet {*host-name* | *ip-address*}
   or
   traceroute

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**ping** {*host-name* | *ip-address*} **source** *lan-ip-address* or **telnet** {*host-name* | *ip-address*} or **traceroute** **Example:** `Router# ping 172.16.0.4 source 10.2.0.1`	Assesses basic network connectivity. or Logs in to a host that supports Telnet. or Displays the routes that packets take through a network to their destinations. • Attempt to reach a destination on the other side of the satellite link to verify that the satellite link is up. **Note** If you use the **ping** or **traceroute** command, you must specify the source IP address as the IP address of a LAN interface on your router.[1]
Step 3	**service-module satellite** *slot*/**0 backup initiate** or Disconnect the external power supply from the ODU PWR connector on the NM-1VSAT-GILAT network module. **Example:** `Router# service-module satellite 1/0 backup initiate`	Initiates a test of the hub dial backup link for the NM-1VSAT-GILAT network module. or Brings down the satellite link by cutting off power to the dish antenna.

	Command or Action	Purpose
Step 4	**service-module satellite** *slot*/**0 status** **Example:** `Router# service-module satellite 1/0 status`	Displays status information related to the hardware and software on the NM-1VSAT-GILAT network module. • Verify that the output says, "In Dial Backup: YES" and "BackBone Status: Up."
Step 5	**ping** {*host-name* | *ip-address*} **source** *lan-ip-address* or **telnet** {*host-name* | *ip-address*} or **traceroute** **Example:** `Router# ping 172.16.0.4 source 10.2.0.1`	Assesses basic network connectivity. or Logs in to a host that supports Telnet. or Displays the routes that packets take through a network to their destinations. • Attempt to reach a destination on the other side of the satellite link to verify that the dial backup link is up. **Note** If you use the **ping** or **traceroute** command, you must specify the source IP address as the IP address of a LAN interface on your router.[1]
Step 6	**service-module satellite** *slot*/**0 backup terminate** or Reconnect the external power supply to the ODU PWR connector on the NM-1VSAT-GILAT network module. **Example:** `Router# service-module satellite 1/0 backup terminate`	Terminates the test of the hub dial backup link for the NM-1VSAT-GILAT network module. or Brings up the satellite link by reconnecting power to the dish antenna.
Step 7	**service-module satellite** *slot*/**0 status** **Example:** `Router# service-module satellite 1/0 status`	Displays status information related to the hardware and software on the NM-1VSAT-GILAT network module. • Verify that the output says, "In Dial Backup: NO" and "BackBone Status: Up."
Step 8	**ping** {*host-name* | *ip-address*} **source** *lan-ip-address* or **telnet** {*host-name* | *ip-address*} or **traceroute** **Example:** `Router# ping 172.16.0.4 source 10.2.0.1`	Assesses basic network connectivity. or Logs in to a host that supports Telnet. or Displays the routes that packets take through a network to their destinations. • Attempt to reach a destination on the other side of the satellite link to verify that the satellite link is up. **Note** If you use the **ping** or **traceroute** command, you must specify the source IP address as the IP address of a LAN interface on your router.[1]

1. Use the IP address of any interface on your router *except* for the IP addresses assigned to the NM-1VSAT-GILAT network module and to the router satellite interface.

Examples

This section provides the following examples:

ping Command: Sample Output

The following example shows the outcome of a successful **ping** command to a destination on the other side of the satellite link or hub dial backup link. The source IP address belongs to the router LAN interface.

```
Router# show running-config interface fastethernet0/0
Building configuration...

Current configuration:110 bytes
!
interface FastEthernet0/0
 ip address 10.2.0.1 255.255.255.0
 load-interval 30
 speed 100
 full-duplex
end

Router# ping 172.16.0.4 source 10.2.0.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.16.0.4, timeout is 2 seconds:
Packet sent with a source address of 10.2.0.1
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 136/147/160 ms
```

traceroute Command: Sample Output

The following example shows the outcome of a successful **traceroute** command to a destination on the other side of the satellite link or hub dial backup link. The source IP address belongs to the router LAN interface.

```
Router# traceroute
Protocol [ip]:
Target IP address: 172.16.0.4
Source address: 10.2.0.1
Numeric display [n]:
Timeout in seconds [3]:
Probe count [3]:
Minimum Time to Live [1]:
Maximum Time to Live [30]:
Port Number [33434]:
Loose, Strict, Record, Timestamp, Verbose[none]:
Type escape sequence to abort.
Tracing the route to 172.16.0.4

  1  *  *  *
  2  *  *  *
  3 192.168.1.5 148 msec 140 msec 160 msec
  4 172.17.5 140 msec 160 msec 140 msec
  5 172.16.0.4 160 msec *  152 msec
```

service-module satellite status Command: Sample Output

The following example shows that the NM-1VSAT-GILAT network module is using dial backup to connect to the hub:

```
Router# service-module satellite 1/0 status
Getting status from the satellite module, please wait..

Software Versions, OS: 15.4.5.12, RSP: 3.4.5.5, MBC: 2.0.4.3
HW Version: 00008000
CPA Number: 6101, DPS CPA: 5
Workgroup: 257, SW Group: 513, Download: YES
Service Module Uptime: 00:00:55, Router Uptime: 3 days, 22 hours, 3 minutes
Current router clocktime: *03:13:01.924 UTC Tue Mar 5 2002
Oper Mode: OPERATIONAL, In Dial Backup: YES, Standby: NO
RBCP Received Packets: 14, RBCP Sent Packets: 13
Eb/No: 10.9483, Flags: 0x0007
IP Address/Mask: 9.0.0.1/255.255.255.252
Service Module MAC: 00:A0:AC:06:14:ED
RX Lock: LOCKED, Sync Lock: LOCKED
BackBone Status: UP, Two-Way Mode: YES, Access Mode: RA
Outbound Modulation Type: DVB, OB Code Rate: 3/4
Outbound Unicast Packets: 0, OB Multicast Packets: 0
Outbound ID: 2, OB PID: 514, OB Freq: 1201000, OB Bit Rate: 30000000
Outbound Sync IP address: 172.2.0.3
Inbound Start Freq: 1190140, IB Stop Freq: 1193710
Inbound Data Rate: 768000, IB Freq Offset: 0
Inbound Packets: 0
BackBone Received Packets: 0, BB Sent: 2
BackBone Received Retransmitted: 0, BB Sent Retrans: 0
Service Module Eth RX: 3, TX: 0
Service Module Eth Multicast RX: 3, Multicast TX: 0
Bufs Configured: 1500, Bufs Free: 1449
Internal Software State parameters:
   Service Module SW State Var: 3
   General IOS FSM: LINK_UP, HSRP FSM: N/A, HSRP VSAT Mode: N/A
   Lost Beats Total: 53, Lost Beats This Retry: 0
VOIP DA calls:
  NONE
```

show interfaces summary Command: Sample Output

The following example shows interface packet counters while the hub dial backup link is in use and working properly. Notice that the number of packets that pass through the satellite interface is twice the number of packets that pass through the dial backup interface.

The NM-1VSAT-GILAT network module always encapsulates packets using a satellite backbone protocol before sending the packets over the satellite link. In hub dial backup mode, the NM-1VSAT-GILAT network module continues to encapsulate the packets using the satellite backbone protocol before sending the packets over the dial backup link to the hub; this is how hub dial backup mode maintains TCP connections during transitions between the primary satellite link and the dial backup link. Therefore, all packets from the VSAT to the hub over the dial backup link still need to enter and exit the NM-1VSAT-GILAT network module, even when the satellite link is down because of a rain-fade event.

```
Router# show interfaces summary

 *:interface is up
 IHQ:pkts in input hold queue     IQD:pkts dropped from input queue
 OHQ:pkts in output hold queue    OQD:pkts dropped from output queue
 RXBS:rx rate (bits/sec)          RXPS:rx rate (pkts/sec)
 TXBS:tx rate (bits/sec)          TXPS:tx rate (pkts/sec)
```

```
 TRTL:throttle count

  Interface              IHQ   IQD  OHQ   OQD  RXBS RXPS  TXBS TXPS TRTL
------------------------------------------------------------------------
  Async1                   0     0    0     0     0    0     0    0    0
* FastEthernet0/0          0     0    0     0  1000    1  1000    1    0
* BRI0/0                   0     0    0     0     0    0     0    0    0
* BRI0/0:1                 0     0    0     0  1000    1  1000    1    0
  BRI0/0:2                 0     0    0     0     0    0     0    0    0
  Async2                   0     0    0     0     0    0     0    0    0
  FastEthernet0/1          0     0    0     0     0    0     0    0    0
  Serial0/2                0     0    0     0     0    0     0    0    0
  Serial0/3                0     0    0     0     0    0     0    0    0
* Satellite1/0             0     0    0     0  2000    2  2000    2    0
* Virtual-Access1          0     0    0     0  1000    1  1000    1    0
NOTE:No separate counters are maintained for subinterfaces
     Hence details of subinterface are not shown
```

Troubleshooting Tips

- If the **ping** and **traceroute** commands fail to reach a destination on the other side of the satellite link, make sure that you specify a source IP address that is *not* configured on the satellite interface. We recommend using the IP address of a LAN interface on your router, such as a Fast Ethernet interface, as the source IP address for the **ping** and **traceroute** commands.
- If you view interface packet counters, such as those that appear in **show interfaces summary** command output, the satellite interface displays twice as many packets as the dial backup interface while the hub dial backup link is in use and working properly. See the "show interfaces summary Command: Sample Output" section on page 45.
- Make sure that your backup terrestrial link is working properly. See the *Cisco IOS Dial Technologies Configuration Guide*, the *Cisco IOS Interface and Hardware Component Configuration Guide*, or the *Cisco IOS Wide-Area Networking Configuration Guide*.

Configuring Router Dial Backup for the NM-1VSAT-GILAT Network Module Satellite Link

When you use the NM-1VSAT-GILAT network module to provide your primary network connectivity over the satellite link, you can set up a backup terrestrial link in either *hub* dial backup mode or *router* dial backup mode. This section describes how to configure *router* dial backup mode.

For information about hub dial backup mode, see the "Configuring Hub Dial Backup for the NM-1VSAT-GILAT Network Module Satellite Link" section on page 38.

Router Dial Backup Mode

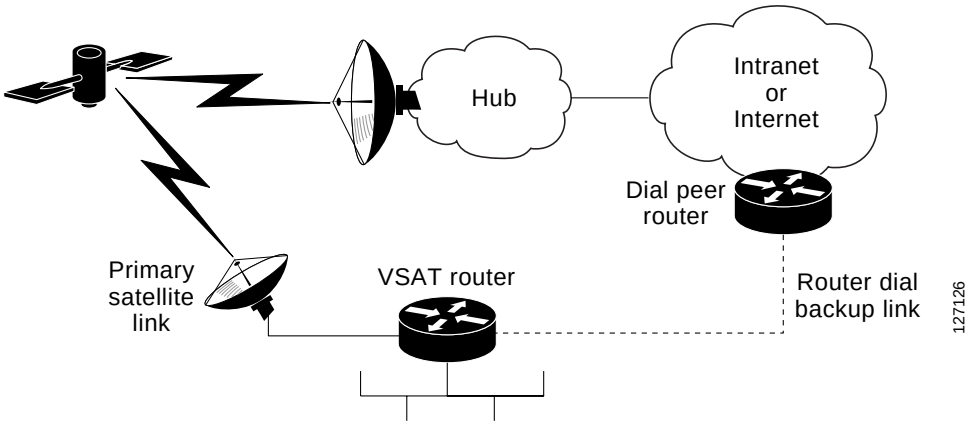
If the satellite link goes down in router dial backup mode, the router uses dial-on-demand routing (DDR) to send data out a different interface. Common DDR backup links use ISDN BRIs, modems on auxiliary ports, and T1/E1 lines.

Unlike hub dial backup mode, router dial backup mode does these things:

- Tears down and reestablishes TCP connections during transitions between primary and backup links
- Does not require that the NM-1VSAT-GILAT network module work properly while the backup link is in use

Figure 6 shows a sample network topology for router dial backup mode.

Figure 6 Router Dial Backup for the NM-1VSAT-GILAT Network Module Satellite Link—Sample Network Topology



Prerequisites

- Configure the WAN interface or dial-up modem for the backup link. See the *Cisco IOS Dial Technologies Configuration Guide*, the *Cisco IOS Interface and Hardware Component Configuration Guide*, or the *Cisco IOS Wide-Area Networking Configuration Guide*.
- Configure the dial peer router (that connects to an intranet or the Internet) to accept calls from the VSAT router in which the NM-1VSAT-GILAT network module is installed.
- Configure the IP addresses for the router satellite interface and the NM-1VSAT-GILAT network module. See the "Configuring IP Addresses for the Router Satellite Interface and the NM-1VSAT-GILAT Network Module" section on page 20.

Perform one of the following tasks in this section, depending on your preferred method of configuration:

- Configuring Router Dial Backup by Using a Floating Static Route, page 47
- Configuring Router Dial Backup by Using a Backup Interface, page 49

Configuring Router Dial Backup by Using a Floating Static Route

This section describes how to use a floating static route to configure a selected interface as the backup to the satellite interface.

In general, floating static routes are static routes that are used to back up other static routes or dynamic routes learned through configured routing protocols. A floating static route is configured with a less efficient administrative distance than the routing protocol or static route it is backing up. As a result, the preferred static route or dynamic route learned through the routing protocol is always used in preference to the floating static route. If the preferred static route or dynamic route is lost, the floating static route will be used in its place.

For more general information about floating static routes, see these tech notes:

- *Sample Configuration: Using Floating Static Routes and Dial-on-Demand Routing*
- *Evaluating Backup Interfaces, Floating Static Routes, and Dialer Watch for DDR Backup*

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface satellite** *slot*/**0**
4. **service-module backup mode router**
5. **exit**
6. **ip route** *prefix mask* {*ip-address* | *interface-type interface-number*} *distance*
7. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**interface satellite** *slot*/**0** **Example:** `Router(config)# interface satellite 1/0`	Enters satellite interface configuration mode.
Step 4	**service-module backup mode router** **Example:** `Router(config-if)# service-module backup mode router`	Specifies router dial backup mode. **Note** Because *router* dial backup mode is the default setting for this command, this command does not appear in the router configuration.
Step 5	**exit** **Example:** `Router(config-if)# exit`	Exits satellite interface configuration mode.
Step 6	**ip route** *prefix mask* {*ip-address* | *interface-type interface-number*} *distance* **Example:** `Router(config)# ip route 0.0.0.0 0.0.0.0 BRI0/0 200`	Establishes a static route and defines the next hop. • By specifying an administrative distance, you flag the static route as one that can be overridden by a static or dynamic route with a lower administrative distance. • Enter an administrative distance that is greater than the administrative distance of the satellite link.
Step 7	**end** **Example:** `Router(config)# end`	Returns to privileged EXEC mode.

What to Do Next

Proceed to the "Verifying Router Dial Backup for the NM-1VSAT-GILAT Network Module Satellite Link" section on page 50.

Configuring Router Dial Backup by Using a Backup Interface

This section describes how to configure a selected interface as the backup interface for the primary satellite interface. A backup interface is an interface that stays idle until the primary line goes down; then it is activated.

For more general information about backup interfaces, see the *Evaluating Backup Interfaces, Floating Static Routes, and Dialer Watch for DDR Backup* tech note.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface satellite** *slot*/**0**
4. **service-module backup mode router**
5. **backup interface** *interface-type interface-number*
6. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**interface satellite** *slot*/**0** **Example:** `Router(config)# interface satellite 1/0`	Enters satellite interface configuration mode.
Step 4	**service-module backup mode router** **Example:** `Router(config-if)# service-module backup mode router`	Specifies router dial backup mode.

	Command or Action	Purpose
Step 5	**backup interface** *interface-type interface-number* **Example:** `Router(config-if)# backup interface bri 0/0`	Defines the interface to use as backup to the satellite link.
Step 6	**end** **Example:** `Router(config)# end`	Returns to privileged EXEC mode.

What to Do Next

Proceed to the "Verifying Router Dial Backup for the NM-1VSAT-GILAT Network Module Satellite Link" section on page 50.

Verifying Router Dial Backup for the NM-1VSAT-GILAT Network Module Satellite Link

This section describes how to verify successful configuration of a backup terrestrial link in *router* dial backup mode when you use the NM-1VSAT-GILAT network module to provide your primary network connectivity over the satellite link.

Prerequisites

Complete one of the tasks in the "Configuring Router Dial Backup for the NM-1VSAT-GILAT Network Module Satellite Link" section on page 46.

SUMMARY STEPS

1. **enable**
2. **ping** {*host-name* | *ip-address*} **source** *lan-ip-address*
   or
   telnet {*host-name* | *ip-address*}
   or
   traceroute
3. Disconnect the external power supply from the ODU PWR connector on the NM-1VSAT-GILAT network module.
4. **show interfaces satellite** *slot*/**0**
5. **ping** {*host-name* | *ip-address*}
   or
   telnet {*host-name* | *ip-address*}
   or
   traceroute {*host-name* | *ip-address*}
6. Reconnect the external power supply to the ODU PWR connector on the NM-1VSAT-GILAT network module.

7. **show interfaces satellite** *slot*/**0**
8. **ping** {*host-name* | *ip-address*} **source** *lan-ip-address*
   or
   telnet {*host-name* | *ip-address*}
   or
   traceroute

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**ping** {*host-name* | *ip-address*} **source** *lan-ip-address* or **telnet** {*host-name* | *ip-address*} or **traceroute** **Example:** `Router# ping 172.16.0.4 source 10.2.0.1`	Assesses basic network connectivity. or Logs in to a host that supports Telnet. or Displays the routes that packets take through a network to their destinations. • Attempt to reach a destination on the other side of the satellite link to verify that the satellite link is up. **Note** If you use the **ping** or **traceroute** command, you must specify the source IP address as the IP address of a LAN interface on your router.[1]
Step 3	Disconnect the external power supply from the ODU PWR connector on the NM-1VSAT-GILAT network module.	Brings down the satellite link by cutting off power to the dish antenna.
Step 4	**show interfaces satellite** *slot*/**0** **Example:** `Router# show interfaces satellite 1/0`	Displays general interface settings and traffic rates for the router satellite interface, which is the internal interface that connects the router to the installed NM-1VSAT-GILAT network module. • Verify that the output says, "Line protocol is down." • If the output says "Line protocol is up," then repeat this step until the output says, "Line protocol is down."
Step 5	**ping** {*host-name* | *ip-address*} or **telnet** {*host-name* | *ip-address*} or **traceroute** {*host-name* | *ip-address*} **Example:** `Router# ping 172.16.0.4`	Assesses basic network connectivity. or Logs in to a host that supports Telnet. or Displays the routes that packets take through a network to their destinations. • Attempt to reach a destination on the other side of the satellite link to verify that the dial backup link is up.

	Command or Action	Purpose
Step 6	Reconnect the external power supply to the ODU PWR connector on the NM-1VSAT-GILAT network module.	Brings up the satellite link by reconnecting power to the dish antenna.
Step 7	**show interfaces satellite** *slot*/**0** **Example:** `Router# show interfaces satellite 1/0`	Displays general interface settings and traffic rates for the router satellite interface, which is the internal interface that connects the router to the installed NM-1VSAT-GILAT network module. • Verify that the output says, "Line protocol is up." • If the output says "Line protocol is down," then repeat this step until the output says, "Line protocol is up."
Step 8	**ping** {*host-name* | *ip-address*} **source** *lan-ip-address* or **telnet** {*host-name* | *ip-address*} or **traceroute** **Example:** `Router# ping 172.16.0.4 source 10.2.0.1`	Assesses basic network connectivity. or Logs in to a host that supports Telnet. or Displays the routes that packets take through a network to their destinations. • These commands attempt to reach a destination on the other side of the satellite link to verify that the satellite link is up. **Note** If you use the **ping** or **traceroute** command, you must specify the source IP address as the IP address of a LAN interface on your router.[1]

1. Use the IP address of any interface on your router *except* for the IP addresses assigned to the NM-1VSAT-GILAT network module and to the router satellite interface.

Examples

This section provides the following examples:

- ping Command: Sample Output, page 52
- traceroute Command: Sample Output, page 53
- show interfaces satellite Command: Sample Output, page 53

ping Command: Sample Output

The following example shows the outcome of a successful **ping** command to a destination on the other side of the satellite link. The source IP address belongs to the router LAN interface.

```
Router# show running-config interface fastethernet0/0

Building configuration...

Current configuration :110 bytes
!
interface FastEthernet0/0
 ip address 10.2.0.1 255.255.255.0
 load-interval 30
 speed 100
 full-duplex
end
```

```
Router# ping 172.16.0.4 source 10.2.0.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.16.0.4, timeout is 2 seconds:
Packet sent with a source address of 10.2.0.1
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 136/147/160 ms
Router#
```

traceroute Command: Sample Output

The following example shows the outcome of a successful **traceroute** command to a destination on the other side of the satellite link. The source IP address belongs to the router LAN interface.

```
Router# traceroute

Protocol [ip]:
Target IP address: 172.16.0.4
Source address: 10.2.0.1
Numeric display [n]:
Timeout in seconds [3]:
Probe count [3]:
Minimum Time to Live [1]:
Maximum Time to Live [30]:
Port Number [33434]:
Loose, Strict, Record, Timestamp, Verbose[none]:
Type escape sequence to abort.
Tracing the route to 172.16.0.4

  1  *  *  *
  2  *  *  *
  3 192.168.1.5 148 msec 140 msec 160 msec
  4 172.17.5 140 msec 160 msec 140 msec
  5 172.16.0.4 160 msec *  152 msec
```

show interfaces satellite Command: Sample Output

The following example shows that the satellite link is up.

```
Router# show interfaces satellite 2/0

Satellite1/0 is up, line protocol is up
  Hardware is I82559FE, address is 0008.e35f.7370 (bia 0008.e35f.7370)
  Internet address is 10.0.0.6/24
.
.
.
```

Troubleshooting Tips

Make sure that your backup terrestrial link is working properly. See the *Cisco IOS Dial Technologies Configuration Guide*, the *Cisco IOS Interface and Hardware Component Configuration Guide*, or the *Cisco IOS Wide-Area Networking Configuration Guide*.

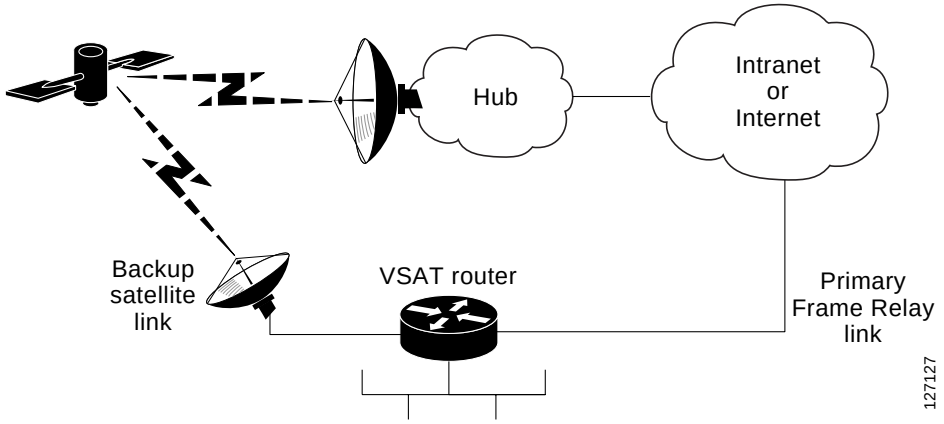
Configuring NM-1VSAT-GILAT Network Module Satellite Backup for a Terrestrial Link

This section describes how to configure the satellite link as a backup to a primary terrestrial link such as Frame Relay or DSL.

A backup satellite link provides a higher level of resiliency than modem or ISDN BRI backup links. If the cables of a primary link are severed in a "backhoe" event, then it is likely that *all* terrestrial circuits from the building are out of service. A satellite communications network provides total path diversity without the need to provide a second cable entrance facility.

Figure 7 shows a sample network topology for NM-1VSAT-GILAT network module satellite backup for a terrestrial link.

Figure 7 NM-1VSAT-GILAT Network Module Satellite Backup for a Terrestrial Link—Sample Network Topology



Prerequisites

- Configure the terrestrial link and verify network connectivity over that link.
- Configure the IP addresses for router satellite interface and the NM-1VSAT-GILAT network module. See the "Configuring IP Addresses for the Router Satellite Interface and the NM-1VSAT-GILAT Network Module" section on page 20.
- If Cisco Express Forwarding is enabled on your router, then you must also enter the **ip cef table adjacency-prefix validate** command in global configuration mode.

Perform *one* of the following tasks in this section, depending on your preferred method of configuration:

- Configuring Satellite Backup by Using a Floating Static Route, page 55
- Configuring Satellite Backup by Using a Backup Interface, page 56

Configuring Satellite Backup by Using a Floating Static Route

This section describes how to use a floating static route to configure the satellite interface as a backup to another interface.

In general, floating static routes are static routes that are used to back up other static routes or dynamic routes learned through configured routing protocols. A floating static route is configured with a less efficient administrative distance than the routing protocol or static route it is backing up. As a result, the preferred static route or dynamic route learned through the routing protocol is always used in preference to the floating static route. If the preferred static route or dynamic route is lost, the floating static route will be used in its place.

For more general information about floating static routes, see the *Evaluating Backup Interfaces, Floating Static Routes, and Dialer Watch for DDR Backup* tech note.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ip route** *prefix mask* **satellite** *slot*/**0** *distance*
4. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**ip route** *prefix mask* **satellite** *slot*/**0** *distance* **Example:** `Router(config)# ip route 0.0.0.0 0.0.0.0 satellite 1/0 200`	Establishes a static route and defines the next hop. • By specifying an administrative distance (such as 200 in the example), you flag the static route as one that can be overridden by a static or dynamic route with a lower administrative distance. • Enter an administrative distance that is greater than the administrative distance of the primary link.
Step 4	**end** **Example:** `Router(config)# end`	Returns to privileged EXEC mode.

What to Do Next

Proceed to the "Verifying NM-1VSAT-GILAT Network Module Satellite Backup for a Terrestrial Link—Floating Static Route" section on page 57.

Configuring Satellite Backup by Using a Backup Interface

This section describes how to configure the satellite interface as the backup interface for a selected primary interface. A backup interface is an interface that stays idle until the primary line goes down; then it is activated.

For more general information about backup interfaces, see the *Evaluating Backup Interfaces, Floating Static Routes, and Dialer Watch for DDR Backup* tech note.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. **backup interface satellite** *slot*/**0**
5. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**interface** *type number* **Example:** `Router(config)# interface serial 0/2`	Enters interface configuration mode. • Specify the primary interface that you want to back up with the satellite interface. **Note** You can back up a subinterface, such as when you want to back up a Frame Relay link.
Step 4	**backup interface satellite** *slot*/**0** **Example:** `Router(config-if)# backup interface satellite 1/0`	Configures the satellite interface as a backup interface.
Step 5	**end** **Example:** `Router(config-if)# end`	Returns to privileged EXEC mode.

What to Do Next

Proceed to the "Verifying NM-1VSAT-GILAT Network Module Satellite Backup for a Terrestrial Link—Backup Interface" section on page 61.

Verifying NM-1VSAT-GILAT Network Module Satellite Backup for a Terrestrial Link—Floating Static Route

This section describes how to verify successful configuration of satellite backup for a terrestrial link by using a floating static route.

Prerequisites

Complete the task in the "Configuring NM-1VSAT-GILAT Network Module Satellite Backup for a Terrestrial Link" section on page 54.

SUMMARY STEPS

1. **enable**
2. **ping** {*host-name* | *ip-address*}
   or
   telnet {*host-name* | *ip-address*}
   or
   traceroute {*host-name* | *ip-address*}
3. Disconnect the cables attached to the primary interface, and proceed to Step 8.
   or
   If you do not have physical access to the router, proceed to Step 4.
4. **configure terminal**
5. **interface** *type number*
6. **shutdown**
7. **end**
8. **show interfaces satellite** *slot*/**0**
9. **ping** {*host-name* | *ip-address*} **source** *lan-ip-address*
   or
   telnet {*host-name* | *ip-address*}
   or
   traceroute
10. Reconnect the cables attached to the primary interface, and proceed to Step 15.
    or
    If you do not have physical access to the router, proceed to Step 11.
11. **configure terminal**
12. **interface** *type number*
13. **no shutdown**
14. **end**
15. **ping** {*host-name* | *ip-address*}
    or
    telnet {*host-name* | *ip-address*}
    or
    traceroute {*host-name* | *ip-address*}

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**ping** {*host-name* | *ip-address*} or **telnet** {*host-name* | *ip-address*} or **traceroute** {*host-name* | *ip-address*} **Example:** `Router# ping 172.16.0.4`	Assesses basic network connectivity. or Logs in to a host that supports Telnet. or Displays the routes that packets take through a network to their destinations. • These commands attempt to reach a destination on the other side of the terrestrial link to verify that your primary link is up.
Step 3	Disconnect the cables attached to the primary interface, and proceed to Step 8. or If you do not have physical access to the router, proceed to Step 4.	Physically brings down the terrestrial link. or Proceeds to instructions for disabling the interface.
Step 4	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 5	**interface** *type number* **Example:** `Router(config)# interface serial 0/2`	Enters interface configuration mode. • Specify the primary interface or subinterface that you backed up with the satellite interface.
Step 6	**shutdown** **Example:** `Router(config-if)# shutdown`	Disables the interface.
Step 7	**end** **Example:** `Router(config-if)# end`	Returns to privileged EXEC mode.
Step 8	**show interfaces satellite** *slot*/**0** **Example:** `Router# show interfaces satellite 1/0`	Displays general interface settings and traffic rates for the router satellite interface, which is the internal interface that connects the router to the installed NM-1VSAT-GILAT network module. • Verify that the output says, “Line protocol is up.” • If the output says “Line protocol is down,” then repeat this step until the output says, “Line protocol is up.”

	Command or Action	Purpose
Step 9	**ping** {*host-name* | *ip-address*} **source** *lan-ip-address* or **telnet** {*host-name* | *ip-address*} or **traceroute** **Example:** `Router# ping 172.16.0.4 source 10.2.0.1`	Assesses basic network connectivity. or Logs in to a host that supports Telnet. or Displays the routes that packets take through a network to their destinations. • These commands attempt to reach a destination on the other side of the satellite link to verify that the satellite link is up. **Note** If you use the **ping** or **traceroute** command, you must specify the source IP address as the IP address of a LAN interface on your router.[1]
Step 10	Reconnect the cables attached to the primary interface, and proceed to Step 15. or If you do not have physical access to the router, proceed to Step 11.	Physically brings up the terrestrial link. or Proceeds to instructions for enabling the interface.
Step 11	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 12	**interface** *type number* **Example:** `Router(config)# interface serial 0/2`	Enters interface configuration mode. • Specify the primary interface or subinterface that you backed up with the satellite interface.
Step 13	**no shutdown** **Example:** `Router(config-if)# no shutdown`	Enables the interface.
Step 14	**end** **Example:** `Router(config-if)# end`	Returns to privileged EXEC mode.
Step 15	**ping** {*host-name* | *ip-address*} or **telnet** {*host-name* | *ip-address*} or **traceroute** {*host-name* | *ip-address*} **Example:** `Router# ping 172.16.0.4`	Assesses basic network connectivity. or Logs in to a host that supports Telnet. or Displays the routes that packets take through a network to their destinations. • Attempt to reach a destination on the other side of the terrestrial link to verify that your primary link is up.

1. You can use the IP address of any interface on your router *except* for the IP addresses assigned to the NM-1VSAT-GILAT network module and to the router satellite interface.

Examples

This section provides the following examples:

- ping Command: Sample Output, page 60
- traceroute Command: Sample Output, page 60

ping Command: Sample Output

The following example shows the outcome of a successful **ping** command to a destination on the other side of the satellite link. The specified source IP address belongs to the router LAN interface.

```
Router# show running-config interface fastethernet0/0

Building configuration...

Current configuration:110 bytes
!
interface FastEthernet0/0
 ip address 10.2.0.1 255.255.255.0
 load-interval 30
 speed 100
 full-duplex
end

Router# ping 172.16.0.4 source 10.2.0.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.16.0.4, timeout is 2 seconds:
Packet sent with a source address of 10.2.0.1
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 136/147/160 ms
Router#
```

traceroute Command: Sample Output

The following example shows the outcome of a successful **traceroute** command to a destination on the other side of the satellite link or hub dial backup link. The source IP address belongs to the router LAN interface.

```
Router# traceroute

Protocol [ip]:
Target IP address: 172.16.0.4
Source address: 10.2.0.1
Numeric display [n]:
Timeout in seconds [3]:
Probe count [3]:
Minimum Time to Live [1]:
Maximum Time to Live [30]:
Port Number [33434]:
Loose, Strict, Record, Timestamp, Verbose[none]:
Type escape sequence to abort.
Tracing the route to 172.16.0.4

  1  *  *  *
  2  *  *  *
  3 192.168.1.5 148 msec 140 msec 160 msec
```

```
4 172.17.5 140 msec 160 msec 140 msec
5 172.16.0.4 160 msec *  152 msec
```

Troubleshooting Tips

If the **ping** and **traceroute** commands fail to reach a destination on the other side of the satellite link, make sure that you specify a source IP address that is *not* assigned to the router satellite interface or to the NM-1VSAT-GILAT network module. We recommend using the IP address of a LAN interface on your router, such as a Fast Ethernet interface, as the source IP address for the **ping** and **traceroute** commands.

Verifying NM-1VSAT-GILAT Network Module Satellite Backup for a Terrestrial Link—Backup Interface

This section describes how to verify successful configuration of satellite backup for a terrestrial link by using a backup interface.

Prerequisites

Complete the task in the "Configuring NM-1VSAT-GILAT Network Module Satellite Backup for a Terrestrial Link" section on page 54.

Restrictions

Do not enter the **shutdown** command to bring down the primary interface. The primary interface must be administratively up for the specified backup interface to work.

SUMMARY STEPS

1. **enable**
2. **ping** {*host-name* | *ip-address*}
   or
   telnet {*host-name* | *ip-address*}
   or
   traceroute {*host-name* | *ip-address*}
3. Disconnect the cables attached to the primary interface and proceed to Step 9.
   or
   If you do not have physical access to the router, then access the Cisco IOS CLI of the router on the other end of the primary terrestrial link and proceed to Step 4.
4. **configure terminal**
5. **interface** *type number*
6. **shutdown**
7. **end**
8. Access the Cisco IOS CLI of the router in which the NM-1VSAT-GILAT network module is installed.
9. **show interfaces satellite** *slot*/**0**

10. **ping** {*host-name* | *ip-address*} **source** *lan-ip-address*
    or
    telnet {*host-name* | *ip-address*}
    or
    traceroute
11. Reconnect the cables attached to the primary interface, and proceed to Step 17.
    or
    If you do not have physical access to the router, then access the Cisco IOS CLI of the router on the other end of the primary terrestrial link and proceed to Step 12.
12. **configure terminal**
13. **interface** *type number*
14. **no shutdown**
15. **end**
16. Access the Cisco IOS CLI of the router in which the NM-1VSAT-GILAT network module is installed.
17. **ping** {*host-name* | *ip-address*}
    or
    telnet {*host-name* | *ip-address*}
    or
    traceroute {*host-name* | *ip-address*}

DETAILED STEPS

	Command or Action	Purpose

Step 1	`enable`
	
	Example:
	`Router> enable`
		Enables privileged EXEC mode.
		• Enter your password if prompted.

Step 2	`ping {host-name | ip-address}`
	or
	`telnet {host-name | ip-address}`
	or
	`traceroute {host-name | ip-address}`
	
	Example:
	`Router# ping 172.16.0.4`
		Assesses basic network connectivity.
		or
		Logs in to a host that supports Telnet.
		or
		Displays the routes that packets take through a network to their destinations.
		• These commands attempt to reach a destination on the other side of the terrestrial link to verify that your primary link is up.

Step 3	Disconnect the cables attached to the primary interface and proceed to Step 9. or If you do not have physical access to the router, then access the Cisco IOS CLI of the router on the other end of the primary terrestrial link and proceed to Step 4.	Physically brings down the terrestrial link. or Proceeds to instructions for disabling the terrestrial link by disabling the interface on the neighboring router that connects to the primary interface on which the **backup interface** command is entered.

	Command or Action	Purpose
Step 4	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 5	**interface** *type number* **Example:** `Router(config)# interface serial 0/2`	Enters interface configuration mode. • Specify the primary interface or subinterface that you backed up with the satellite interface.
Step 6	**shutdown** **Example:** `Router(config-if)# shutdown`	Disables the interface.
Step 7	**end** **Example:** `Router(config-if)# end`	Returns to privileged EXEC mode.
Step 8	Access the Cisco IOS CLI of the router in which the NM-1VSAT-GILAT network module is installed.	—
Step 9	**show interfaces satellite** *slot*/**0** **Example:** `Router# show interfaces satellite 1/0`	Displays general interface settings and traffic rates for the router satellite interface, which is the internal interface that connects the router to the installed NM-1VSAT-GILAT network module. • Verify that the output says, "Line protocol is up." • If the output says "Line protocol is down," then repeat this step until the output says, "Line protocol is up."
Step 10	**ping** {*host-name* | *ip-address*} **source** *lan-ip-address* or **telnet** {*host-name* | *ip-address*} or **traceroute** **Example:** `Router# ping 172.16.0.4 source 10.2.0.1`	Assesses basic network connectivity. or Logs in to a host that supports Telnet. or Displays the routes that packets take through a network to their destinations. • Attempt to reach a destination on the other side of the satellite link to verify that the satellite link is up. **Note** If you use the **ping** or **traceroute** command, you must specify the source IP address as the IP address of a LAN interface on your router.[1]
Step 11	Reconnect the cables attached to the primary interface, and proceed to Step 17. or If you do not have physical access to the router, then access the Cisco IOS CLI of the router on the other end of the primary terrestrial link and proceed to Step 12.	Physically brings up the terrestrial link. or Proceeds to instructions for reenabling the terrestrial link by enabling the interface on the neighboring router that connects to the primary interface on which the **backup interface** command is entered.

	Command or Action	Purpose
Step 12	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 13	**interface** *type number* **Example:** `Router(config)# interface serial 0/2`	Enters interface configuration mode. • Specify the primary interface or subinterface that you backed up with the satellite interface.
Step 14	**no shutdown** **Example:** `Router(config-if)# no shutdown`	Enables the interface.
Step 15	**end** **Example:** `Router(config-if)# end`	Returns to privileged EXEC mode.
Step 16	Access the Cisco IOS CLI of the router in which the NM-1VSAT-GILAT network module is installed.	—
Step 17	**ping** {*host-name* | *ip-address*} or **telnet** {*host-name* | *ip-address*} or **traceroute** {*host-name* | *ip-address*} **Example:** `Router# ping 172.16.0.4`	Assesses basic network connectivity. or Logs in to a host that supports Telnet. or Displays the routes that packets take through a network to their destinations. • Attempt to reach a destination on the other side of the terrestrial link to verify that your primary link is up.

1. You can use the IP address of any interface on your router *except* for the IP addresses assigned to the NM-1VSAT-GILAT network module and to the router satellite interface.

Examples

This section provides the following examples:

- ping Command: Sample Output, page 65
- traceroute Command: Sample Output, page 65

ping Command: Sample Output

The following example shows the outcome of a successful **ping** command to a destination on the other side of the satellite link. The specified source IP address belongs to the router LAN interface.

```
Router# show running-config interface fastethernet0/0
Building configuration...

Current configuration:110 bytes
!
interface FastEthernet0/0
 ip address 10.2.0.1 255.255.255.0
 load-interval 30
 speed 100
 full-duplex
end

Router# ping 172.16.0.4 source 10.2.0.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.16.0.4, timeout is 2 seconds:
Packet sent with a source address of 10.2.0.1
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 136/147/160 ms
Router#
```

traceroute Command: Sample Output

The following example shows the outcome of a successful **traceroute** command to a destination on the other side of the satellite link or hub dial backup link. The source IP address belongs to the router LAN interface.

```
Router# traceroute

Protocol [ip]:
Target IP address: 172.16.0.4
Source address: 10.2.0.1
Numeric display [n]:
Timeout in seconds [3]:
Probe count [3]:
Minimum Time to Live [1]:
Maximum Time to Live [30]:
Port Number [33434]:
Loose, Strict, Record, Timestamp, Verbose[none]:
Type escape sequence to abort.
Tracing the route to 172.16.0.4

  1  *  *  *
  2  *  *  *
  3 192.168.1.5 148 msec 140 msec 160 msec
  4 172.17.5 140 msec 160 msec 140 msec
  5 172.16.0.4 160 msec *  152 msec
```

Troubleshooting Tips

If the **ping** and **traceroute** commands fail to reach a destination on the other side of the satellite link, make sure that you specify a source IP address that is *not* assigned to the router satellite interface or to the NM-1VSAT-GILAT network module. We recommend using the IP address of a LAN interface on your router, such as a Fast Ethernet interface, as the source IP address for the **ping** and **traceroute** commands.

Configuring HSRP Redundancy for the NM-1VSAT-GILAT Network Module

This section describes how to configure homogeneous and heterogeneous HSRP redundancy when you use the NM-1VSAT-GILAT network module. To configure HSRP redundancy for the NM-1VSAT-GILAT network module, you should understand the following concepts:

HSRP

The Hot Standby Router Protocol (HSRP) provides high network availability because it routes IP traffic from hosts on LANs without relying on the availability of any single router. HSRP is used in a group of routers for selecting an active router and a standby router. An active router is the router of choice for routing packets; a standby router is a router that takes over the routing duties when an active router fails, or when preset conditions are met.

For more information about HSRP, see the "Configuring IP Services" chapter of the *Cisco IOS IP Configuration Guide, Release 12.3*.

Preemption, Priority, and Tracking

HSRP uses priority and preemption to determine which router is active and which routers are in standby mode. How you configure priority and preemption sets one of the following behaviors:

- Once a secondary router takes over as the active router, it remains active until the next event occurs.
- A secondary router is active only when the primary router is down. When the primary router becomes available, the primary router becomes active while the secondary router returns to standby mode.

Preemption allows a router to become the active router when its priority is higher than that of all other routers in the hot standby group. If preemption is disabled on a router, the router assumes control as the active router only if it receives information indicating that no router is in the active state.

Tracking allows you to specify an interface that the HSRP process should monitor to alter the priority for a given hot standby router. If the specified interface line protocol goes down, the HSRP priority is reduced. This means that another HSRP router with higher priority can become the active router. The amount by which the hot standby priority for the router is decreased (or increased) when the tracked interface goes down (or comes back up) can be configured, but the amount is 10 by default.

For more information on HSRP tracking, preemption, and priority settings, see the *How to Use the standby preempt and standby track Commands* tech note.

Homogeneous HSRP Redundancy for the NM-1VSAT-GILAT Network Module

Homogeneous HSRP redundancy refers to a setup in which each router in the hot standby group is equipped with an NM-1VSAT-GILAT network module.

If you have only two routers in your hot standby group, then one outdoor unit (ODU) can be shared by two HSRP-redundant NM-1VSAT-GILAT network modules. Note that a Gilat SkyEdge–equipment certified installer must set up this hardware configuration, including connecting the power supply and the NM-1VSAT-GILAT network modules to the ODU.

Figure 8 and Figure 9 show homogeneous HSRP setups for the NM-1VSAT-GILAT network module.

Figure 8 Homogeneous HSRP Redundancy Setup Using Separate ODUs

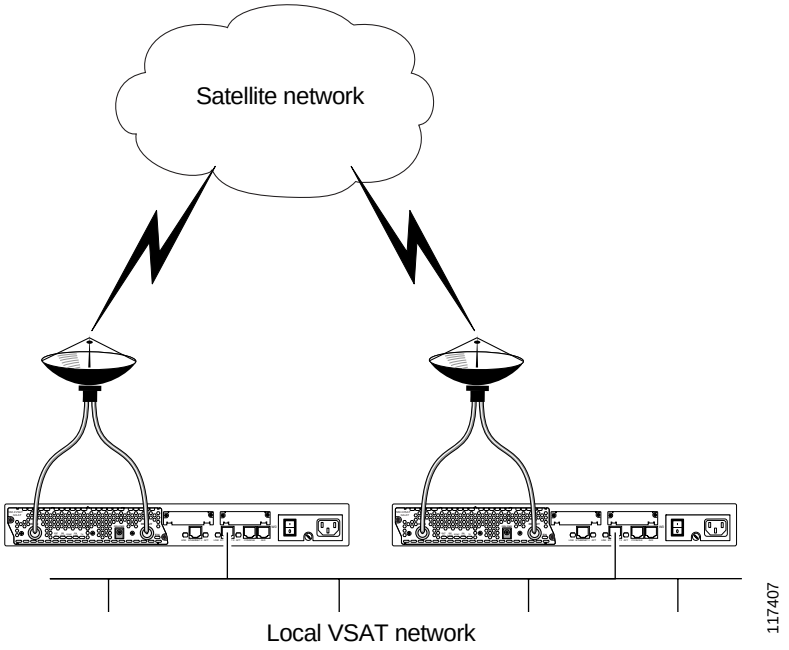
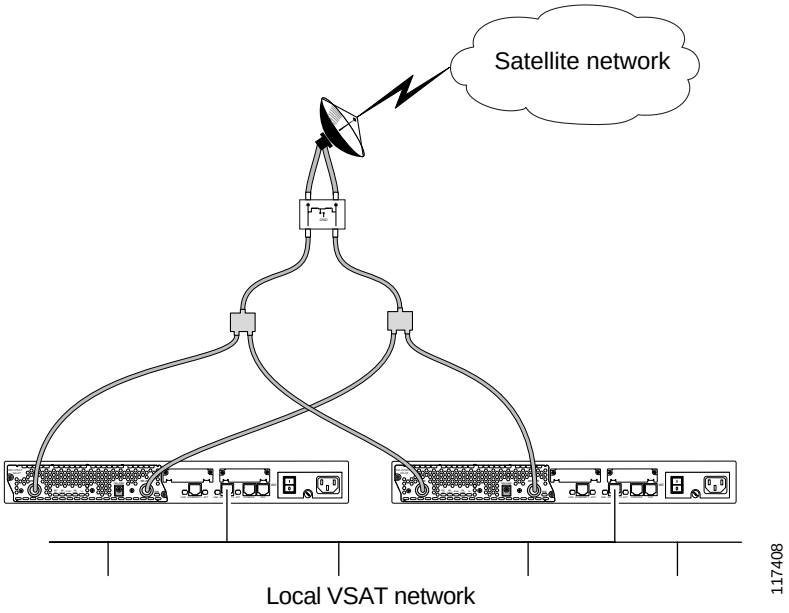


Figure 9 Homogeneous HSRP Redundancy Setup Using a Shared ODU



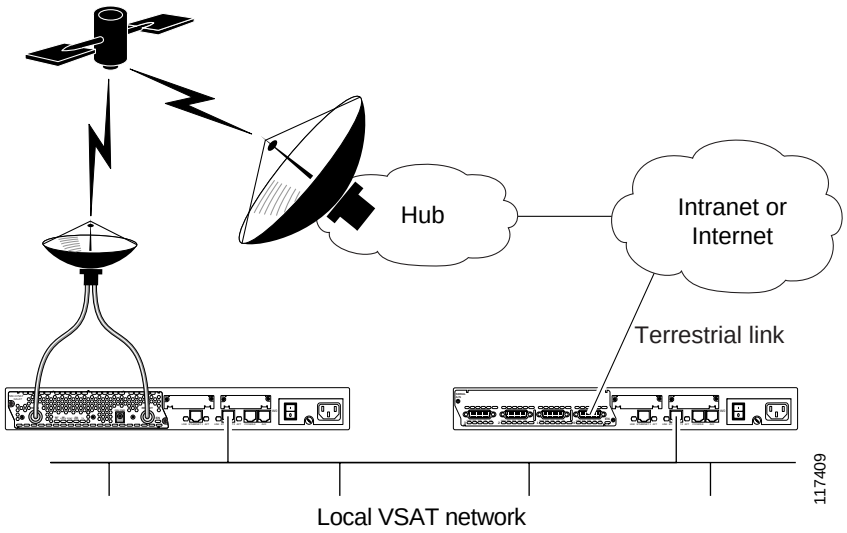
Heterogeneous HSRP Redundancy for the NM-1VSAT-GILAT Network Module

Heterogeneous HSRP redundancy refers to a setup in which not all routers in the hot standby group are equipped with an NM-1VSAT-GILAT network module. For example, in a two-router heterogeneous HSRP setup, you can choose one of the following scenarios:

- The primary router uses a terrestrial link, whereas the secondary router uses a satellite link.
- The primary router uses a satellite link, whereas the secondary router uses a terrestrial link.

Figure 10 shows a heterogeneous HSRP setup for the NM-1VSAT-GILAT network module.

Figure 10 Heterogeneous HSRP Redundancy Setup



Perform one of the following tasks, dependi ng on whether or not you have an NM-1VSAT-GILAT network module installed in each router in the hot standby group.

- Configuring Homogeneous HSRP Redundancy with the NM-1VSAT-GILAT Network Module, page 68
- Configuring Heterogeneous HSRP Redundancy with the NM-1VSAT-GILAT Network Module, page 71

Configuring Homogeneous HSRP Redundancy with the NM-1VSAT-GILAT Network Module

This section describes how to configure HSRP redundancy for the satellite link when you have an NM-1VSAT-GILAT network module in each router in the hot standby group.

If you instead want to configure HSRP redundancy for the satellite link when not all routers in the hot standby group are equipped with an NM-1VSAT-GILAT network module, then go to the "Configuring Heterogeneous HSRP Redundancy with the NM-1VSAT-GILAT Network Module" section on page 71.

Prerequisites

- For the routers in the hot standby group, connect a LAN interface (typically the lowest-numbered Ethernet interface) of each router to the same network.
- An NM-1VSAT-GILAT network module must be installed in each router in the hot standby group.
- If two HSRP-redundant NM-1VSAT-GILAT network modules share one ODU, a Gilat SkyEdge–equipment certified installer must set up the hardware configuration, including connecting the power supply and the NM-1VSAT-GILAT network modules to the ODU.

- With the one exception of the component physical address (CPA), which must be unique for each NM-1VSAT-GILAT network module, the initial VSAT configuration parameters must be identical for all NM-1VSAT-GILAT network modules in the homogeneous HSRP setup. See the "Configuring the Initial VSAT Parameters for the NM-1VSAT-GILAT Network Module" section on page 13.
- Configure the same IP address on the satellite interface for all routers in the hot standby group. Similarly, configure the same IP address on the NM-1VSAT-GILAT network module for all routers in the hot standby group. See the "Configuring IP Addresses for the Router Satellite Interface and the NM-1VSAT-GILAT Network Module" section on page 20.

Restrictions

- If you have a separate account with your satellite service provider for each NM-1VSAT-GILAT network module in your homogeneous HSRP setup, then do not perform this task. Instead, see the "Configuring IP Services" chapter of the *Cisco IOS IP Configuration Guide* for normal HSRP configuration.
- Do not use more than two routers in the hot standby group if one ODU is connected to two HSRP-redundant NM-1VSAT-GILAT network modules.
- All routers in the hot standby group must have the same configured HSRP priority.
- Do not configure homogeneous HSRP if you are using hub dial backup. Homogeneous HSRP is not compatible with hub dial backup mode, which is described in the "Configuring Hub Dial Backup for the NM-1VSAT-GILAT Network Module Satellite Link" section on page 38.
- When an HSRP transition occurs, the NM-1VSAT-GILAT network modules in both the active router and the standby routers automatically reset. Therefore, it takes about 2 minutes for the satellite interface to come up and pass traffic after an HSRP transition.

SUMMARY STEPS

1. Access the Cisco IOS CLI of the primary router.
2. **enable**
3. **configure terminal**
4. **interface** *interface*
5. **ip address** *ip-address mask*
6. **standby** [*group-number*] **ip** [*virtual-ip-address*]
7. **standby** [*group-number*] **name** *group-name*
8. **standby** [*group-number*] **track satellite** *slot*/**0** [**decrement** *priority*]
9. **standby** [*group-number*] **preempt** [**delay** {**minimum** *seconds* | **reload** *seconds* | **sync** *seconds*}]
10. **exit**
11. **interface satellite** *slot*/**0**
12. **service-module ip redundancy** *group-name*
13. **end**
14. Access the Cisco IOS CLI of the secondary router.
15. Complete Step 2 to Step 13 on the secondary router.
16. Repeat Step 14 and Step 15 for any additional secondary routers.

DETAILED STEPS

	Command or Action	Purpose
Step 1	Access the Cisco IOS CLI of the primary router.	—
Step 2	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 3	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 4	**interface** *interface* **Example:** `Router(config)# interface fastethernet 0/0`	Enters interface configuration mode for the primary LAN interface on which you want to enable HSRP for the router.
Step 5	**ip address** *ip-address mask* **Example:** `Router(config-if)# ip address 10.123.96.3 255.255.255.0`	Sets the IP address for the LAN interface. • For all routers in the hot standby group, the HSRP-enabled LAN interfaces must belong to the same IP subnet.
Step 6	**standby** [*group-number*] **ip** [*virtual-ip-address*] **Example:** `Router(config-if)# standby 1 ip 10.0.0.100`	Activates HSRP and optionally sets the virtual IP address for the hot standby group.
Step 7	**standby** [*group-number*] **name** *group-name* **Example:** `Router(config-if)# standby 1 name grp-hsrp`	Configures the name of the hot standby group. • The *group-name* argument that you enter in this step must match the *group-name* argument that you enter in Step 12.
Step 8	**standby** [*group-number*] **track satellite** *slot*/**0** [**decrement** *priority*] **Example:** `Router(config-if)# standby 1 track satellite 1/0`	Monitors the satellite interface and alters the priority of the hot standby router if the satellite interface line protocol goes down. • The *priority* is the amount by which the hot standby priority for the router is decreased (or increased) when the tracked interface goes down (or comes back up). The default value is 10.

Step 9	**standby** [*group-number*] **preempt** [**delay** {**minimum** *seconds* | **reload** *seconds* | **sync** *seconds*}]
	
	Example:
	`Router(config-if)# standby 1 preempt`
	
	Example:
	`Router(config-if)# standby 1 preempt delay minimum 90`
		Enables preemption on the router and optionally configures a preemption delay.
		• A minimum preemption delay is useful for avoiding HSRP transitions during rain-fade or other transient events that bring down the satellite link for a short time.

	Command or Action	Purpose
Step 10	**exit** **Example:** `Router(config-if)# exit`	Exits interface configuration mode.
Step 11	**interface satellite** *slot*/**0** **Example:** `Router(config)# interface satellite 1/0`	Enters satellite interface configuration mode.
Step 12	**service-module ip redundancy** *group-name* **Example:** `Router(config-if)# service-module ip redundancy grp-x`	(Optional) Links the primary HSRP interface status to the satellite interface. • Do not perform this step if each hot standby router and NM-1VSAT-GILAT network module is equipped with an ODU. • Perform this step if one ODU is shared by two HSRP-redundant NM-1VSAT-GILAT network modules. • The *group-name* argument that you enter in this step must match the *group-name* argument entered in Step 7.
Step 13	**end** **Example:** `Router(config-if)# end`	Returns to privileged EXEC mode.
Step 14	Access the Cisco IOS CLI of the secondary router.	—
Step 15	Complete Step 2 to Step 13 on the secondary router.	—
Step 16	Repeat Step 14 and Step 15 for any additional secondary routers.	—

Configuring Heterogeneous HSRP Redundancy with the NM-1VSAT-GILAT Network Module

This section describes how to configure HSRP redundancy when not all routers in the hot standby group are equipped with an NM-1VSAT-GILAT network module.

If you instead want to configure HSRP redundancy for the satellite link when you have an NM-1VSAT-GILAT network module in each router in the hot standby group, then go to the "Configuring Homogeneous HSRP Redundancy with the NM-1VSAT-GILAT Network Module" section on page 68.

For heterogeneous HSRP redundancy, choose one of the following scenarios:

- The primary router uses a terrestrial link, whereas the secondary router uses a satellite link.
- The primary router uses a satellite link, whereas the secondary router uses a terrestrial link.

In both cases of heterogeneous HSRP redundancy, you need to configure the HSRP priority on the primary router to be higher than the HSRP priority of the secondary router. The difference in priority numbers must be small enough that tracking the WAN link (satellite or terrestrial) of the primary router determines which router becomes active, and which router goes to standby. For more information about priority and tracking, see the "Preemption, Priority, and Tracking" section on page 66.

Prerequisites

- For the routers in the hot standby group, connect a LAN interface (typically the lowest-numbered Ethernet interface) of each router to the same network.
- If multiple routers in the hot standby group contain an NM-1VSAT-GILAT network module, then each NM-1VSAT-GILAT network module requires a separate ODU.
- Configure the IP addresses for the router satellite interface and the NM-1VSAT-GILAT network module. See the "Configuring IP Addresses for the Router Satellite Interface and the NM-1VSAT-GILAT Network Module" section on page 20.
- Configure the terrestrial link on the secondary router. See the *Cisco IOS Dial Technologies Configuration Guide*, the *Cisco IOS Interface and Hardware Component Configuration Guide*, or the *Cisco IOS Wide-Area Networking Configuration Guide*.

SUMMARY STEPS

1. Access the Cisco IOS CLI of the primary router.
2. **enable**
3. **configure terminal**
4. **interface** *type number*
5. **ip address** *ip-address mask*
6. **standby** [*group-number*] **ip** [*virtual-ip-address*]
7. **standby** [*group-number*] **name** *group-name*
8. **standby** [*group-number*] **priority** *priority*
9. **standby** [*group-number*] **track satellite** *slot*/**0** [**decrement** *priority*]
   or
   standby [*group-number*] **track** *type number* [*interface-priority*]
10. **standby** [*group-number*] **preempt** [**delay** {**minimum** *seconds* | **reload** *seconds* | **sync** *seconds*}]
11. **end**
12. Access the Cisco IOS CLI of the secondary router.
13. Complete Step 2 to Step 11 on the secondary router.
14. Repeat Step 12 and Step 13 for each additional secondary router.

DETAILED STEPS

	Command or Action	Purpose
Step 1	Access the Cisco IOS CLI of the primary router.	—
Step 2	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 3	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.

	Command or Action	Purpose
Step 4	**interface** *type number* **Example:** `Router(config)# interface fastethernet 0/0`	Enters interface configuration mode for the primary LAN interface on which you want to enable HSRP for the router.
Step 5	**ip address** *ip-address mask* **Example:** `Router(config-if)# ip address 10.123.96.3 255.255.255.0`	Sets the IP address for the LAN interface. • For all routers in the hot standby group, the HSRP-enabled LAN interfaces must belong to the same IP subnet.
Step 6	**standby** [*group-number*] **ip** [*virtual-ip-address*] **Example:** `Router(config-if)# standby 1 ip 10.0.0.100`	Activates HSRP and optionally sets the virtual IP address for the hot standby group.
Step 7	**standby** [*group-number*] **name** *group-name* **Example:** `Router(config-if)# standby 1 name grp-x`	Configures the name of the hot standby group.
Step 8	**standby** [*group-number*] **priority** *priority* **Example:** `Router(config-if)# standby 1 priority 105`	(Optional) Configures HSRP priority. • The *priority* argument is a number in the range from 1 (lowest priority) to 255 (highest priority). • The default priority is 100.

Step 9	**standby** [*group-number*] **track satellite** *slot*/**0** [**decrement** *priority*]
	
	or
	
	standby [*group-number*] **track** *type number* [*interface-priority*]
	
	Example:
	`Router(config-if)# standby 1 track satellite 1/0`
	
	Example:
	`Router(config-if)# standby 1 track serial 1/0`
		Monitors the satellite interface and alters the priority of the hot standby group if the satellite interface line protocol goes down.
		
		or
		
		Monitors the terrestrial link and alters the priority of the hot standby group if the tracked interface line protocol goes down.
		• We recommend performing this step when you want the status of the satellite link or terrestrial link to determine which router becomes active.
		• The *priority* argument is the amount by which the hot standby priority for the router is decreased (or increased) when the tracked interface goes down (or comes back up). The default value is 10.

Step 10	**standby** [*group-number*] **preempt** [**delay** {**minimum** *seconds* | **reload** *seconds* | **sync** *seconds*}]
	
	Example:
	`Router(config-if)# standby 1 preempt`
	
	Example:
	`Router(config-if)# standby 1 preempt delay minimum 90`
		Enables preemption on the router and optionally configures a preemption delay.
		• On a router with an HSRP-tracked satellite interface, you can use a minimum preemption delay to avoid HSRP transitions during rain-fade or other transient events that bring down the satellite link for a short time.

	Command or Action	Purpose
Step 11	**end** **Example:** `Router(config-if)# end`	Returns to privileged EXEC mode.
Step 12	Access the Cisco IOS CLI of the secondary router.	—
Step 13	Complete Step 2 to Step 11 on the secondary router.	—
Step 14	Repeat Step 12 and Step 13 for each additional secondary router.	—

What to Do Next

Proceed to the "Verifying HSRP Redundancy for the NM-1VSAT-GILAT Network Module" section on page 74.

Verifying HSRP Redundancy for the NM-1VSAT-GILAT Network Module

This section describes how to verify successful HSRP configuration for the NM-1VSAT-GILAT network module.

Prerequisites

Configure HSRP. See the "Configuring HSRP Redundancy for the NM-1VSAT-GILAT Network Module" section on page 66.

SUMMARY STEPS

1. **enable**
2. **show standby**
3. **service-module satellite** *slot*/**0 status**
4. Repeat this procedure for all routers in the hot standby group.

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**show standby** **Example:** `Router# show standby`	Displays HSRP information. • Verify that the router is in the intended HSRP state, either active or standby. • Verify that preemption is enabled. • Verify that the correct standby routers are listed. • Verify that the correct interfaces are being tracked on the router. • Verify that the HSRP group name in the "IP redundancy name" field is correct.
Step 3	**service-module satellite** *slot*/**0 status** **Example:** `Router# service-module satellite 1/0 status`	Displays status information related to the hardware and software on the NM-1VSAT-GILAT network module. • For a router in standby state, verify that the output says, "Standby: YES." • For the router in active state, verify that the output says, "Standby: NO."
Step 4	Repeat this procedure for all routers in the hot standby group.	—

Examples

This section provides the following examples:

- show standby Command: Sample Output, page 75
- service-module satellite status Command: Sample Output, page 76

show standby Command: Sample Output

The following example shows the output of the **show standby** command when entered on a hot standby router in the active state. The router is equipped with an NM-1VSAT-GILAT network module, and the satellite interface is tracked by the HSRP process.

```
Router# show standby

FastEthernet0/0 - Group 1
  State is Active
    2 state changes, last state change 00:53:09
  Virtual IP address is 10.123.96.100
  Active virtual MAC address is 0000.0c07.ac01
    Local virtual MAC address is 0000.0c07.ac01 (v1 default)
  Hello time 3 sec, hold time 10 sec
    Next hello sent in 2.556 secs
```

```
  Preemption enabled
  Active router is local
  Standby router is 10.123.96.3, priority 100 (expires in 8.168 sec)
  Priority 100 (default 100)
    Track interface Satellite2/0 state Up decrement 10
  IP redundancy name is "grp-x" (cfgd)
```

service-module satellite status Command: Sample Output

The following example shows the status of a hot standby router and NM-1VSAT-GILAT network module in the active state. If the hot standby router was in the standby state, then the “Standby” field would say “YES.”

```
Router# service-module satellite 2/0 status

Getting status from the satellite module, please wait..

Software Versions, OS: 15.4.5.12, RSP: 3.4.5.5, MBC: 2.0.4.3
HW Version: 00008000
CPA Number: 6101, DPS CPA: 5
Workgroup: 257, SW Group: 513, Download: YES
Service Module Uptime: 00:00:55, Router Uptime: 3 days, 22 hours, 3 minutes
Current router clocktime: *03:13:01.924 UTC Tue Mar 5 2002
Oper Mode: OPERATIONAL, In Dial Backup: NO, Standby: NO
RBCP Received Packets: 14, RBCP Sent Packets: 13
Eb/No: 10.9483, Flags: 0x0007
IP Address/Mask: 9.0.0.1/255.255.255.252
.
.
.
```

Troubleshooting HSRP Redundancy for the NM-1VSAT-GILAT Network Module

This section describes how to troubleshoot the HSRP configuration for the NM-1VSAT-GILAT network module.

Prerequisites

Before using **debug** commands, read and understand the *Important Information on Debug Commands* tech note.

SUMMARY STEPS

1. **enable**
2. **debug standby**
3. **debug satellite hsrp**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**debug standby** **Example:** `Router# debug standby`	(Optional) Displays HSRP state changes and debugging information regarding transmission and receipt of HSRP packets. • Use this command to determine whether or not hot standby routers recognize one another and take the proper actions.
Step 3	**debug satellite hsrp** **Example:** `Router# debug satellite hsrp`	(Optional) Displays debug information for HSRP events on the NM-1VSAT-GILAT network module.

Examples

This section provides the following examples:

- debug standby Command: Sample Output, page 77
- debug satellite hsrp Command: Sample Output, page 78
- Combined Sample Output for the debug satellite hsrp and debug standby Commands, page 79

debug standby Command: Sample Output

The following example shows how to display HSRP state changes and debugging information about the transmission and receipt of HSRP packets:

```
Router# debug standby
HSRP debugging is on
Router#
```

Two routers, one active and one standby, recognize each other as members of hot standby group 1:

```
*Dec  6 02:08:46.032:HSRP:Fa0/0 Grp 1 Hello  in  10.123.96.3 Standby pri 100 vIP
10.123.96.100
*Dec  6 02:08:46.648:HSRP:Fa0/0 REDIRECT adv in, Passive, active 0, passive 1, from
10.123.96.15
*Dec  6 02:08:47.364:HSRP:Fa0/0 Grp 1 Hello  out 10.123.96.2 Active  pri 100 vIP
10.123.96.100
*Dec  6 02:08:49.028:HSRP:Fa0/0 Grp 1 Hello  in 10.123.96.3 Standby pri 100 vIP
10.123.96.100
*Dec  6 02:08:50.365:HSRP:Fa0/0 Grp 1 Hello  out 10.123.96.2 Active  pri 100 vIP
10.123.96.100
*Dec  6 02:08:52.089:HSRP:Fa0/0 Grp 1 Hello  in 10.123.96.3 Standby pri 100 vIP
10.123.96.100
*Dec  6 02:08:53.365:HSRP:Fa0/0 Grp 1 Hello  out 10.123.96.2 Active  pri 100 vIP
10.123.96.100
*Dec  6 02:08:55.085:HSRP:Fa0/0 Grp 1 Hello  in 10.123.96.3 Standby pri 100 vI
```

The active router is forced to standby status by disabling the primary HSRP interface, Fast Ethernet 0/0:

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# interface fastethernet 0/0
Router(config-if)# shutdown
Router(config-if)# exit

*Dec 6 02:09:05.365:HSRP:Fa0/0 Grp 1 Hello out 10.123.96.2 Active pri 100 vIP
10.123.96.100
*Dec 6 02:09:05.617:HSRP:Fa0/0 REDIRECT adv in, Passive, active 0, passive 2, from
10.123.96.3
*Dec 6 02:09:07.085:HSRP:Fa0/0 Grp 1 Hello in 10.123.96.3 Standby pri 100 vIP
10.123.96.100
*Dec 6 02:09:07.317:HSRP:Fa0/0 API Software interface going down
*Dec 6 02:09:07.317:HSRP:Fa0/0 API Software interface going down
*Dec 6 02:09:07.317:HSRP:Fa0/0 Interface down
*Dec 6 02:09:07.317:HSRP:Fa0/0 Grp 1 Active:b/HSRP disabled
*Dec 6 02:09:07.317:HSRP:Fa0/0 Grp 1 Active router is unknown, was local
*Dec 6 02:09:07.317:HSRP:Fa0/0 Grp 1 Standby router is unknown, was 10.123.96.3
*Dec 6 02:09:07.317:HSRP:Fa0/0 Grp 1 Resign out 10.123.96.2 Active pri 100 vIP
10.123.96.100
*Dec 6 02:09:07.317:HSRP:Fa0/0 Grp 1 Active -> Init
*Dec 6 02:09:07.317:%HSRP-6-STATECHANGE:FastEthernet0/0 Grp 1 state Active -> Init
Router#
*Dec 6 02:09:07.317:HSRP:Fa0/0 Grp 1 Redundancy "grp-x" state Active -> Init
*Dec 6 02:09:07.317:HSRP:Fa0/0 Redirect adv out, Passive, active 0 passive 2
*Dec 6 02:09:07.317:HSRP:Fa0/0 Grp 1 Resign out 10.123.96.2 Init    pri 100 vIP
10.123.96.100
*Dec 6 02:09:07.325:HSRP:Fa0/0 API MAC address update
*Dec 6 02:09:07.325:HSRP:Fa0/0 API Add active HSRP addresses to ARP table
*Dec 6 02:09:07.817:%SYS-5-CONFIG_I:Configured from console by console
*Dec 6 02:09:09.317:%LINK-5-CHANGED:Interface FastEthernet0/0, changed state to
administratively down
*Dec 6 02:09:09.317:HSRP:API Hardware state change
*Dec 6 02:09:10.318:%LINEPROTO-5-UPDOWN:Line protocol on Interface FastEthernet0/0,
changed state to down
*Dec 6 02:09:35.743:HSRP:Fa0/0 Redirect adv out, Passive, active 0 passive 2
*Dec 6 02:10:04.924:HSRP:Fa0/0 Redirect adv out, Passive, active 0 passive 2
*Dec 6 02:10:31.834:HSRP:Fa0/0 Redirect adv out, Passive, active 0 passive 2
*Dec 6 02:10:59.571:HSRP:Fa0/0 Redirect adv out, Passive, active 0 passive 2
*Dec 6 02:11:29.329:HSRP:Fa0/0 Redirect adv out, Passive, active 0 passive 2
*Dec 6 02:11:56.034:HSRP:Fa0/0 Redirect adv out, Passive, active 0 passive 1
```

debug satellite hsrp Command: Sample Output

The following example shows the **debug satellite hsrp** messages that appear when the active router is forced to standby status because the HSRP-tracked satellite interface is shut down:

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# interface satellite 1/0
Router(config-if)# shutdown
Router(config-if)# end
Router#
01:03:48:%SYS-5-CONFIG_I:Configured from console by console
01:03:49:%LINK-5-CHANGED:Interface Satellite1/0, changed state to administratively down
01:03:50:%LINEPROTO-5-UPDOWN:Line protocol on Interface Satellite1/0, changed state to
down
01:04:22:%HSRP-6-STATECHANGE:FastEthernet0/0 Grp 1 state Active -> Speak
01:04:22:HSRP-sat:IPred group grp-x update state ACTIVE --> SPEAK
01:04:22:Satellite1/0 HSRP-sat:fsm crank ACTIVE-->STANDBY
```

```
01:04:22:Satellite1/0 HSRP-sat:send standby msg STANDBY
01:04:32:HSRP-sat:IPred group grp-x update state SPEAK --> STANDBY
01:04:32:Satellite1/0 HSRP-sat:fsm crank STANDBY-->STANDBY
01:04:32:Satellite1/0 HSRP-sat:send standby msg STANDBY
01:04:42:Satellite1/0 HSRP-sat:send standby msg STANDBY
01:04:52:Satellite1/0 HSRP-sat:standby msg STANDBY deferred, not in operational state
01:05:02:Satellite1/0 HSRP-sat:standby msg STANDBY deferred, not in operational state
01:05:12:Satellite1/0 HSRP-sat:standby msg STANDBY deferred, not in operational state
01:05:22:Satellite1/0 HSRP-sat:standby msg STANDBY deferred, not in operational state
01:05:32:Satellite1/0 HSRP-sat:standby msg STANDBY not sent, already in state
01:06:47:%VSAT-5-STANDBY_MODE:Satellite1/0 module configured for standby mode
01:09:32:Satellite1/0 HSRP-sat:fsm crank STANDBY-->STANDBY-UP
```

Combined Sample Output for the debug satellite hsrp and debug standby Commands

The following example shows HSRP-related debug output for both the router and the NM-1VSAT-GILAT network module when the router goes from the standby to active state because the HSRP-tracked satellite interface is reenabled:

```
Router# show debugging

SATCOM:
  satellite HSRP events debugging is on

HSRP:
  HSRP Errors debugging is on
  HSRP Events debugging is on
  HSRP Packets debugging is on
```

The satellite interface is reenabled:

```
Router# configure terminal
Router(config)# interface satellite 1/0
Router(config-if)# no shutdown
Router(config-if)# end
Router#
```

The effective HSRP priority of the router changes as the tracked satellite interface comes up:

```
02:14:37:HSRP:Fa0/0 Grp 1 Hello in 10.123.96.2 Active pri 90 vIP 10.123.96.100
02:14:39:HSRP:Fa0/0 API 62.1.0.6 is not an HSRP address
02:14:39:HSRP:Fa0/0 Grp 1 Hello out 10.123.96.3 Standby pri 90 vIP 10.123.96.100
02:14:39:HSRP:Fa0/0 Grp 1 Track 1 object changed, state Down -> Up
02:14:39:HSRP:Fa0/0 Grp 1 Priority 90 -> 100
Router#
```

The router changes from standby to active state because its priority is now highest in the hot standby group, and preemption is enabled:

```
02:14:40:HSRP:Fa0/0 Grp 1 Hello in 10.123.96.2 Active pri 90 vIP 10.123.96.100
02:14:40:HSRP:Fa0/0 Grp 1 Standby:h/Hello rcvd from lower pri Active router
(90/10.123.96.2)
02:14:40:HSRP:Fa0/0 Grp 1 Active router is local, was 10.123.96.2
02:14:40:HSRP:Fa0/0 Grp 1 Standby router is unknown, was local
02:14:40:HSRP:Fa0/0 Redirect adv out, Active, active 1 passive 3
02:14:40:HSRP:Fa0/0 Grp 1 Coup   out 10.123.96.3 Standby pri 100 vIP 10.123.96.100
02:14:40:HSRP:Fa0/0 Grp 1 Standby -> Active
02:14:40:%HSRP-6-STATECHANGE:FastEthernet0/0 Grp 1 state Standby -> Active
```

The HSRP status of the satellite interface is linked to the primary HSRP interface, Fast Ethernet 0/0, by the **service-module ip redundancy** command:

```
02:14:40:HSRP:Fa0/0 Grp 1 Redundancy "grp-x" state Standby -> Active
02:14:40:HSRP-sat:IPred group grp-x update state STANDBY --> ACTIVE
02:14:40:Satellite1/0 HSRP-sat:fsm crank STANDBY-UP-->ACTIVE-COND
02:14:40:HSRP:Fa0/0 Redirect adv out, Active, active 1 passive 2
02:14:40:HSRP:Fa0/0 Grp 1 Hello out 10.123.96.3 Active pri 100 vIP 10.123.96.100
02:14:40:HSRP:Fa0/0 REDIRECT adv in, Passive, active 0, passive 2, from 10.123.96.2
02:14:40:HSRP:Fa0/0 REDIRECT adv in, Passive, active 0, passive 1, from 10.123.96.15
02:14:40:HSRP:Fa0/0 Grp 1 Hello in 10.123.96.2 Speak   pri 90 vIP 10.123.96.100
```

Line protocols come up, and HSRP states become fully active:

```
02:14:41:%LINK-3-UPDOWN:Interface Satellite1/0, changed state to up
02:14:42:%LINEPROTO-5-UPDOWN:Line protocol on Interface Satellite1/0, changed state to up

02:14:43:HSRP:Fa0/0 Grp 1 Hello out 10.123.96.3 Active pri 100 vIP 10.123.96.100
02:14:43:HSRP:Fa0/0 Grp 1 Redundancy group grp-x state Active -> Active
02:14:43:HSRP-sat:IPred group grp-x update state ACTIVE --> ACTIVE
02:14:43:Satellite1/0 HSRP-sat:fsm crank ACTIVE-COND-->ACTIVE-COND
02:14:43:HSRP:Fa0/0 Grp 1 Hello in 10.123.96.2 Speak   pri 90 vIP 10.123.96.100
02:14:46:HSRP:Fa0/0 Grp 1 Hello out 10.123.96.3 Active pri 100 vIP 10.123.96.100
02:14:46:HSRP:Fa0/0 Grp 1 Redundancy group grp-x state Active -> Active
02:14:46:HSRP-sat:IPred group grp-x update state ACTIVE --> ACTIVE
02:14:46:Satellite1/0 HSRP-sat:fsm crank ACTIVE-COND-->ACTIVE-COND
02:14:46:HSRP:Fa0/0 Grp 1 Hello in 10.123.96.2 Speak   pri 90 vIP 10.123.96.100
02:14:49:HSRP:Fa0/0 Grp 1 Hello out 10.123.96.3 Active pri 100 vIP 10.123.96.100
02:14:49:HSRP:Fa0/0 Grp 1 Hello in 10.123.96.2 Speak   pri 90 vIP 10.123.96.100
02:14:50:HSRP:Fa0/0 Grp 1 Hello in 10.123.96.2 Standby pri 90 vIP 10.123.96.100
02:14:50:HSRP:Fa0/0 Grp 1 Standby router is 10.123.96.2
02:14:51:Satellite1/0 HSRP-sat:send standby msg ACTIVE
02:14:52:HSRP:Fa0/0 Grp 1 Hello out 10.123.96.3 Active pri 100 vIP 10.123.96.100
02:14:53:HSRP:Fa0/0 Grp 1 Hello in 10.123.96.2 Standby pri 90 vIP 10.123.96.100
02:14:55:HSRP:Fa0/0 Grp 1 Hello out 10.123.96.3 Active pri 100 vIP 10.123.96.100
```

Configuring IP Multicast Routing for the NM-1VSAT-GILAT Network Module

This section describes how to configure IP multicast routing over the satellite link.

For general information about IP multicast, see the "IP Multicast" part of the *Cisco IOS IP Configuration Guide, Release 12.3*.

Prerequisites

- Configure the IP addresses for the router satellite interface and the NM-1VSAT-GILAT network module. See the "Configuring IP Addresses for the Router Satellite Interface and the NM-1VSAT-GILAT Network Module" section on page 20.
- Your satellite service provider must configure the hub to support IP multicast.
- Obtain the IP address of the Protocol Independent Multicast (PIM) rendezvous point (RP) from your satellite service provider. The IP address should be that of the hub router interface that connects to the hub protocol server.

Restrictions

- You must implement IP multicast as described in this section. Otherwise, the satellite link cannot support IP multicast.
- Because PIM and Routing Information Protocol (RIP) are not compatible on the satellite link, do not use RIP on the satellite interface. Instead, take one of the following actions:
  - Use another routing protocol on the satellite interface. See the *Cisco IOS IP Configuration Guide, Release 12.3*.
  - Configure a default route, or gateway of last resort, to the PIM RP. See the *Configuring a Gateway of Last Resort Using IP Commands* tech note.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ip multicast-routing**
4. **ip pim rp-address** *rp-address* [*access-list*]
5. **interface satellite** *slot*/**0**
6. **ip pim dr-priority 0**
7. **ip pim sparse-dense-mode**
8. **exit**
9. **interface** *type number*
10. **ip pim sparse-dense-mode**
11. Repeat Step 9 and Step 10 for all other interfaces that will perform IP multicast routing.
12. **end**
13. **show ip pim neighbor**

DETAILED STEPS

	Command or Action	Purpose

Step 1	`enable`
	
	Example:
	`Router> enable`
		Enables privileged EXEC mode.
		• Enter your password if prompted.

Step 2	`configure terminal`
	
	Example:
	`Router# configure terminal`
		Enters global configuration mode.

Step 3	`ip multicast-routing`
	
	Example:
	`Router(config)# ip multicast-routing`
		Enables IP multicast routing on the router.

	Command or Action	Purpose
Step 4	**ip pim rp-address** *rp-address* [*access-list*] **Example:** `Router(config)# ip pim rp-address 192.168.1.5`	Configures the IP address of a Protocol Independent Multicast (PIM) rendezvous point (RP) for a particular multicast group. • Provided by your satellite service provider, the PIM RP IP address should be that of the hub router interface that connects to the hub protocol server.
Step 5	**interface satellite** *slot*/**0** **Example:** `Router(config)# interface satellite 1/0`	Enters satellite interface configuration mode.
Step 6	**ip pim dr-priority 0** **Example:** `Router (config-if)# ip pim dr-priority 0`	Ensures that the VSAT router is never the designated router (DR).
Step 7	**ip pim sparse-dense-mode** **Example:** `Router(config-if)# ip pim sparse-dense-mode`	Enables PIM on an interface and specifies the sparse-dense mode.
Step 8	**exit** **Example:** `Router(config-if)# exit`	Exits satellite interface configuration mode.
Step 9	**interface** *type number* **Example:** `Router(config)# interface fastethernet 0/1`	Specifies a router interface that is connected to hosts.
Step 10	**ip pim sparse-dense-mode** **Example:** `Router(config-if)# ip pim sparse-dense-mode`	Enables PIM on an interface and specifies the sparse-dense mode.
Step 11	Repeat Step 9 and Step 10 for all other interfaces that will perform IP multicast routing.	—
Step 12	**end** **Example:** `Router(config-if)# end`	Returns to privileged EXEC mode.
Step 13	**show ip pim neighbor** **Example:** `Router# show ip pim neighbor`	Lists the PIM neighbors discovered by the Cisco IOS software. • Verify that the PIM RP IP address appears to be reachable through the satellite interface.

Examples

A sample of command output follows.

Sample Output for the show ip pim neighbor Command

The following example shows that the PIM RP (192.168.1.5) appears to be reachable through the satellite interface:

```
Router# show ip pim neighbor
PIM Neighbor Table
Neighbor          Interface               Uptime/Expires    Ver   DR
Address                                                           Prio/Mode
192.168.1.5       Satellite1/0            00:24:27/00:01:18 v2    1 / DR S
```

Troubleshooting Tips

- Make sure that the satellite interface network is not associated with a RIP routing process while PIM is enabled on the satellite interface. For more information about RIP, see the *Cisco IOS IP Configuration Guide, Release 12.3*.
- For general multicast troubleshooting information, see the following tech notes:
  - *Basic Multicast Troubleshooting Tools*
  - *IP Multicast Troubleshooting Guide*

Troubleshooting Voice over IP for the NM-1VSAT-GILAT Network Module

This section describes how to troubleshoot Voice over IP (VoIP) when you have problems making calls over the satellite link. You do not need to perform any special configuration tasks for VoIP to work over the satellite link; however, understanding the following concepts can help you troubleshoot problems.

Dedicated Access (DA) and Random Access (RA) Modes

VoIP calls are extremely sensitive to jitter and delay, both of which are inherent to typical satellite links. Therefore, the NM-1VSAT-GILAT network module provides two modes to connect to the hub:

- Random access (RA) mode—Provides a typical, shared-bandwidth satellite link which is highly efficient and suitable for most data and streaming media transmissions, but which has inherent delays, jitter, and collisions.
- Dedicated access (DA) mode—Provides a special channel, or slice of satellite time, that is dedicated to delay-sensitive applications such as VoIP. DA mode is a limited resource that is provisioned by your satellite service provider. Your satellite service provider can tell you how much DA bandwidth you can use.

Requirements for Automatic Activation and Deactivation of DA Mode

Automatic activation and deactivation of DA mode is available when you set up a VoIP gateway on the router in which the NM-1VSAT-GILAT network module is installed. The integrated VoIP gateway enables the NM-1VSAT-GILAT network module to use RA mode to connect to the hub, except when a VoIP call is placed over the satellite link; then the integrated VoIP gateway automatically activates DA mode. When all calls are terminated, the integrated VoIP gateway automatically deactivates DA mode.

To set up an integrated VoIP gateway that enables automatic activation and deactivation of DA mode, complete one of the following actions on the router in which the NM-1VSAT-GILAT network module is installed:

- Configure a VoIP gateway solution, such as Cisco CallManager Express (Cisco CME).
- Install a hardware VoIP gateway, such as one of the following voice-enabled modules: NM-HDV, NM-HDA, NM-HD-1V, NM-HD-2V, NM-HD-2VE, or EVM-HD.
- Enable the Cisco Multiservice IP-to-IP Gateway feature.

For information about these voice applications, see the Cisco IOS Voice Configuration Library.

Configuration of Optimum Codec Payload Size in DA Mode

The satellite bandwidth allocation algorithm employed by Gilat SkyEdge satellite service providers uses parameters for bandwidth and packet rate to configure PDA time slot allocations for VoIP calls placed over the satellite link. This results in bandwidth savings or, alternately, in the ability to have more calls in a given bandwidth.

Consult with the service provider on configuration of optimum codec payload size for the NM-1VSAT-Gilat network module. The service provider determines time slot allocations and available bandwidth. The user then determines the optimum payload size, and configures the codecs accordingly in the VoIP gateway solution being used.

For information on optimizing payload size, see the tech note *Voice Over IP - Per Call Bandwidth Consumption*.

When DA Mode Is Not Available

If you hear a fast busy signal when you try to initiate a VoIP call, or when the call quality is extremely poor, then DA mode is probably not being used for the call. DA mode may be unavailable for one or more of the following reasons:

- You have not set up a VoIP gateway on the router in which the NM-1VSAT-GILAT network module is installed. See the "Requirements for Automatic Activation and Deactivation of DA Mode" section on page 84.
- You have exceeded the DA bandwidth that was provisioned by your satellite service provider. Wait until some calls are terminated or request more DA bandwidth from your satellite service provider.
- The hub is not configured to support your DA mode connection. Contact your satellite service provider.

Restrictions

This section describes how to perform basic VoIP troubleshooting for the NM-1VSAT-GILAT network module. For more general VoIP troubleshooting information, see the Cisco IOS Voice Configuration Library.

SUMMARY STEPS

1. **enable**
2. **service-module satellite** *slot*/**0 status**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**service-module satellite** *slot*/**0 status** **Example:** `Router# service-module satellite 1/0 status`	(Optional) Displays status information related to the hardware and software on the NM-1VSAT-GILAT network module. • Determine whether or not any VoIP calls are active. • Determine whether or not DA mode is activated. • Determine how much DA bandwidth is in use. • Compare the DA bandwidth in use with the DA bandwidth your satellite service provider provisioned for you.

Examples

An example of command output follows.

service-module satellite status Command: Sample Output

The following example shows the status of an active VoIP call. Note that dedicated access (DA) mode is in use, and you can see the bandwidth (26 kilobits per second) being used on the DA channels.

```
Router# service-module satellite 1/0 status

Getting status from the satellite module, please wait..

Software Versions, OS: 15.4.5.12, RSP: 3.4.5.5, MBC: 2.0.4.3
HW Version: 00008000
CPA Number: 6101, DPS CPA: 5
Workgroup: 257, SW Group: 513, Download: YES
Service Module Uptime: 00:00:55, Router Uptime: 3 days, 22 hours, 3 minutes
Current router clocktime: *03:13:01.924 UTC Tue Mar 5 2002
Oper Mode: OPERATIONAL, In Dial Backup: NO, Standby: NO
RBCP Received Packets: 14, RBCP Sent Packets: 13
Eb/No: 10.9483, Flags: 0x0007
IP Address/Mask: 10.0.0.1/255.255.255.252
Service Module MAC: 00:A0:AC:06:14:ED
RX Lock: LOCKED, Sync Lock: LOCKED
BackBone Status: UP, Two-Way Mode: YES, Access Mode: DA
Outbound Modulation Type: DVB, OB Code Rate: 3/4
Outbound Unicast Packets: 0, OB Multicast Packets: 0
Outbound ID: 2, OB PID: 514, OB Freq: 1201000, OB Bit Rate: 30000000
Outbound Sync IP address: 172.2.0.3
Inbound Start Freq: 1190140, IB Stop Freq: 1193710
```

```
Inbound Data Rate: 768000, IB Freq Offset: 0
Inbound Packets: 0
BackBone Received Packets: 0, BB Sent: 2
BackBone Received Retransmitted: 0, BB Sent Retrans: 0
Service Module Eth RX: 3, TX: 0
Service Module Eth Multicast RX: 3, Multicast TX: 0
Bufs Configured: 1500, Bufs Free: 1449
Internal Software State parameters:
   Service Module SW State Var: 3
   General IOS FSM: LINK_UP, HSRP FSM: N/A, HSRP VSAT Mode: N/A
   Lost Beats Total: 53, Lost Beats This Retry: 0
VOIP DA calls:
VOIP DA calls:
   Call ID BW (kb)  Dst Port  Src Port  Dest Addr
  ======== =======  ========  ======== ==============
     16075     26      18310     16866  162.0.0.2
```

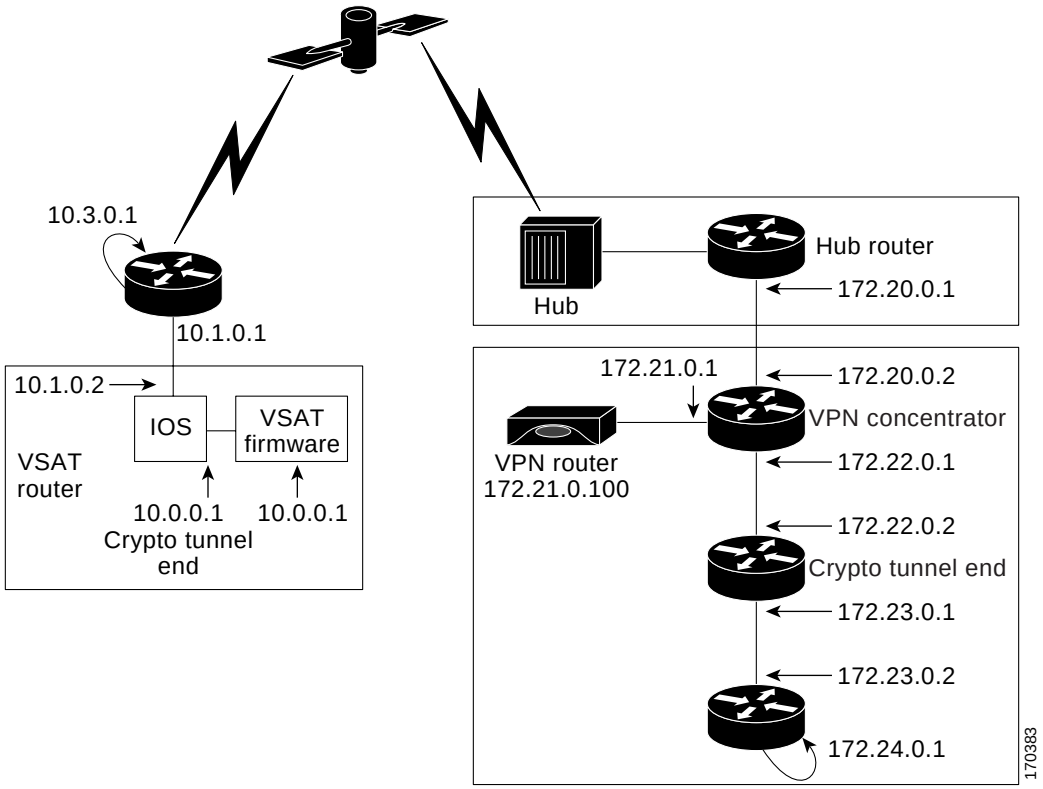
What to Do Next

If you continue to encounter VoIP problems while you have sufficient available DA bandwidth, and the **service-module satellite** *slot*/**0 status** command shows that your NM-1VSAT-GILAT network module uses DA mode for the VoIP calls, then troubleshoot your general VoIP setup. See the Cisco IOS Voice Configuration Library.

Configuring Integrated TCP Acceleration and Encryption

Integrated TCP Accelertion and Encryption (ITAE) is used to provide site-to-site VPN connections. An end-to-end VPN tunnel is created between the remote VSAT router and the VPN concentrator. Accelerated traffic is encrypted by Cisco IOS software before being sent over the satellite link. This traffic is first decrypted, and then TCP spoofing information is recovered at the VPN concentrator. Figure 11 shows the topology of such a setup.

Figure 11 Integrated TCP Acceleration and Encryption Setup



The configuration of this setup is done in three parts:

- Configuring the VSAT router to set up the crypto tunnel from the VSAT router to the VPN concentrator
- Configuring the hub to enable ITAE and set a pre-built access list of traffic to be encrypted (done by the service provider)
- Configuring the VPN router to set up the VPN backbone tunnel between VSAT and VPN router (done by the service provider)

Prerequisites

Do the following before configuring the VSAT router.

- Provide information to the service provider about which network needs to be secured and which cryptographic algorithm will be used. The service provider will need this information in order to configure the hub and VPN router. Have the service provider set up these configurations before continuing.
- Make sure that the satellite interface line protocol is up and that there is IP connectivity between the VSAT router and the VPN concentrator.
- Make sure that SkyEdge version 4.0 or later, required for ITAE, is being used.
- The user can verify that ITAE is enabled and configured properly on the VSAT from the hub by issuing a **service-module status** command. Examine the output for the Flags parameter and for the Integrated TCP Acceleration and Encapsulation Statistic.

```
Router# service-module satellite 1/0 status
Getting status from the satellite module, please wait..
```

```
Software Versions, OS: 15.4.5.12, RSP: 3.4.5.5, MBC: 2.0.4.3
HW Version: 00008000
CPA Number: 6103, DPS CPA: 5
Workgroup: 257, SW Group: 513, Download: YES
Service Module Uptime: 18:52:37, Router Uptime: 4 days, 1 hour, 41 minutes
Current router clocktime: *16:19:52.691 UTC Tue Jul 11 2006
Oper Mode: OPERATIONAL, In Dial Backup: NO, Standby: NO
RBCP Received Packets: 7714, RBCP Sent Packets: 7746
Eb/No: 10.8640, Flags: 0x000F
IP Address/Mask: 10.0.0.1/255.255.255.252
Service Module MAC: 00:A0:AC:06:15:00
RX Lock: LOCKED, Sync Lock: LOCKED

.....................
.....................

      Integrated TCP Acceleration and Encapsulation Statistic
ITAE mode: ENABLED, VPN BB: DOWN, ACL name: Satellite1/0_ITAE_ACL
Backbone Link Number: 10, BB Bypass packet sent: 10
Accelerated Packet: Source 10.0.0.1, Destination 172.21.0.100
                    Protocol ID: 254

Local classifier:
Network          Mask               Packet Sent
10.1.0.0          255.255.255.0      0

Remote classifier:
Network          Mask               Packet Sent
172.24.0.0         255.255.255.0      0
```

The Accelerated Packet IP address pair shows the service module IP address as the source and the VPN router address as the destination.

Table 3 gives the values and interpretations of the Flag bits.

Table 3 Flag Bits for Enabling of ITAE

Bit Number	Hexadecimal Flag Value	Meaning
00-02	0x0007	Remote IP address configuration. See Table 2 on page 27.
03	0x0008	The VPN feature is enabled.
04	0x0010	The VPN backbone is up (there is connection to the VPNA).

Configuring the VSAT Router for ITAE

To configure the VSAT router for ITAE, perform the following procedures:

- Configuring the IPsec Tunnel Between the VSAT and the VPN Concentrator, page 89
- Configuring the Satellite Interface for ITAE, page 90
- Configuring the VSAT Access List, page 90

Configuring the IPsec Tunnel Between the VSAT and the VPN Concentrator

To configure the IPsec tunnel between the VSAT and the VPN concentrator, perform the following steps.

SUMMARY STEPS

1. **crypto map** *map-name seq-num* [**ipsec-isakmp**] [**dynamic** *dynamic-map-name*] [**discover**] [**profile** *profile-name*]
2. **set peer** {*host-name* [**dynamic**] [**default**] | *ip-address* [**default**]}
3. **set transform-set** *transform-set-name [transform-set-name2...transform-set-name6]*
4. **match address** [*access-list-id* | *name*]

DETAILED STEPS

	Command or Action	Purpose
Step 1	**crypto map** *map-name seq-num* [**ipsec-isakmp**] [**dynamic** *dynamic-map-name*] [**discover**] [**profile** *profile-name*] **Example:** `Router> crypto map mymap 1 ipsec-isakmp`	Enters crypto map configuration mode and creates a crypto map entry. • **ipsec-isakmp** indicates that IKE will be used to establish the IPsec security associations.
Step 2	**set peer** {*host-name* [**dynamic**] [**default**] | *ip-address* [**default**]} **Example:** `Router# set peer 172.20.0.2`	Specifies the IPsec peer in a crypto map entry.
Step 3	**set transform-set** *transform-set-name [transform-set-name2...transform-set-name6]* **Example:** `Router# set transform-set rtr_trans`	Specifies which transform sets are used with the crypto map entry. For an **ipsec-isakmp** crypto map entry, you can specify up to six transform sets.
Step 4	**match address** [*access-list-id* | *name*] **Example:** `Router# match address Satellite1/0_ITAE_ACL`	Specifies an extended access list for a crypto map entry.

Configuring the Satellite Interface for ITAE

To configure the satellite interface for ITAE, perform the following steps.

SUMMARY STEPS

1. **interface satellite** *slot*/**0**
2. **service-module itae** {**auto-acl**}
3. **crypto map** *map-name* [**redundancy** *standby-group-name*[**stateful**]]

DETAILED STEPS

	Command or Action	Purpose
Step 1	**interface satellite** *slot*/**0** **Example:** `Router> interface Satellite1/0`	Enters satellite interface configuration mode.
Step 2	**service-module itae** {**auto-acl**} **Example:** `Router(sat-init-config)# service-module itae auto-acl`	Automatically configures the pre-built access list for packet acceleration.
Step 3	**crypto map** *map-name* [**redundancy** *standby-group-name*[**stateful**]] **Example:** `Router(sat-init-config)# crypto map mymap`	Applies the previously defined crypto map set to the interface.

Configuring the VSAT Access List

The VSAT access list specifies the traffic that needs to be directed to the satellite interface after acceleration. There are two ways to specify an access list: manually and automatically.

Automatic Configuration

Perform the following steps to enable automatic configuration of the ITAE access list.

Summary Steps

1. **interface satellite** *slot*/**0**
2. **service-module itae** {**auto-acl**}

Detailed Steps

	Command or Action	Purpose
Step 1	**interface satellite** *slot*/**0** **Example:** `Router> interface Satellite1/0`	Enters satellite configuration mode.
Step 2	**service-module itae** {**auto-acl**} **Example:** `Router(sat-init-config)# service-module itae auto-acl`	Enables automatic configuration of the pre-built ITAE access list.

Manual Configuration

Perform the following steps to manually configure the ITAE access list.

SUMMARY STEPS

1. **ip access-list** {**standard** | **extended**} *access-list-name*
2. **permit** *protocol* [**source-network**][[[**.source-node**] **source-node-mask**] | [**.source-node source-network-mask.source-node-mask**]] [**source-socket**] [**destination-network**][[[**.destination-node**] *destination-node-mask*] | [**.destination-node destination-network-mask.destination-node-mask**]] [**destination-socket**] [**log**] [**time-range** *time-range-name*]

DETAILED STEPS

	Command or Action	Purpose
Step 1	**ip access-list** {**standard**	**extended**} *access-list-name* **Example:** `Router> ip access-list extended Satellite1/0_ITAE_ACL`	Defines the extended IP access list by name.
Step 2	**permit** *protocol* [**source-network**][[[**.source-node**] **source-node-mask**]	[**.source-node source-network-mask.source-node-mask**]] [**source-socket**] [**destination-network**][[[**.destination-node**] *destination-node-mask*]	[**.destination-node destination-network-mask.destination-node-mask**]] [**destination-socket**] [**log**] [**time-range** *time-range-name*] **Example:** `Router# permit ip host 10.0.0.1 host 172.21.0.100`	Sets the source and destination IP addresses for the access list. The VSAT router is the source and the VPNA router is the destination.

Note The VPN concentrator will have its access list configured similarly, but with its own name for the list, and with the VPN router as the source and the VSAT as the destination.

Examples

This section provides examples for the following:

- service-module status Command: Sample Output, page 92
- ITAE Configuration for VSAT Router: Example, page 93
- ITAE Configuration of VPN Concentrator: Example, page 94

service-module status Command: Sample Output

The following example gives the output of the **service-module status** command when ITAE is enabled.

```
Router#service-module sat 1/0 status
Getting status from the satellite module, please wait..

Software Versions, OS: 15.4.5.12, RSP: 3.4.5.5, MBC: 2.0.4.3
HW Version: 00008000
CPA Number: 6103, DPS CPA: 5
Workgroup: 257, SW Group: 513, Download: YES
Service Module Uptime: 02:07:06, Router Uptime: 4 days, 4 hours, 19 minutes
Current router clocktime: *18:58:23.455 UTC Tue Jul 11 2006
Oper Mode: OPERATIONAL, In Dial Backup: NO, Standby: NO
RBCP Received Packets: 923, RBCP Sent Packets: 932
Eb/No: 10.8586, Flags: 0x001F
IP Address/Mask: 10.0.0.1/255.255.255.252
Service Module MAC: 00:A0:AC:06:15:00
RX Lock: LOCKED, Sync Lock: LOCKED
BackBone Status: UP, Two-Way Mode: YES, Access Mode: RA
Outbound Modulation Type: DVB, OB Code Rate: 3/4
Outbound Unicast Packets: 173, OB Multicast Packets: 0
Outbound ID: 2, OB PID: 514, OB Freq: 1201000, OB Bit Rate: 30000000
Outbound Sync IP address: 172.2.0.3
Inbound Start Freq: 1190140, IB Stop Freq: 1193710
Inbound Data Rate: 768000, IB Freq Offset: 0
Inbound Packets: 0
BackBone Received Packets: 173, BB Sent: 2
BackBone Received Retransmitted: 0, BB Sent Retrans: 0
Service Module Eth RX: 786, TX: 724
Service Module Eth Multicast RX: 282, Multicast TX: 0
Bufs Configured: 1500, Bufs Free: 1436
Internal Software State parameters:
   Service Module SW State Var: 3
   General IOS FSM: LINK_UP, HSRP FSM: N/A, HSRP VSAT Mode: N/A
   Lost Beats Total: 176, Lost Beats This Retry: 0
VOIP DA calls:
  NONE

Integrated TCP Acceleration and Encapsulation Statistic
ITAE mode: ENABLED, VPN BB: UP, ACL name: Satellite1/0_ITAE_ACL
Backbone Link Number: 10, BB Bypass packet sent: 166
Accelerated Packet: Source 10.0.0.1, Destination 172.21.0.100
                    Protocol ID: 254

Local classifier:
Network          Mask              Packet Sent
10.1.0.0          255.255.255.0      5
```

```
Remote classifier:
Network          Mask               Packet Sent
172.24.0.0         255.255.255.0      5
```

ITAE Configuration for VSAT Router: Example

```
Current configuration: 1599 bytes
!
version 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname Router
!
boot-start-marker
boot-end-marker
!
logging buffered 50000000 debugging
!
no aaa new-model
!
resource policy
!
!
!
ip cef
!
!
ip multicast-routing
!
!
!
!
crypto isakmp policy 1
 hash md5
 authentication pre-share
crypto isakmp key rtrkey address 172.20.0.2
crypto isakmp keepalive 12 3
!
!
crypto ipsec transform-set rtr_trans esp-3des
!
crypto map mymap 1 ipsec-isakmp
 set peer 172.20.0.2
 set transform-set rtr_trans
 match address Satellite1/0_ITAE_ACL
!
!
interface GigabitEthernet0/0
 no ip address
 shutdown
!
interface GigabitEthernet0/1
 ip address 10.1.0.1 255.255.255.0
!
interface Satellite1/0
 ip address dhcp
 service-module itae auto-acl
```

```
 crypto map mymap
!
router rip
 version 2
 network 8.0.0.0
!
!
no ip http server
no ip http secure-server
!
!
control-plane
!
!
line con 0
 exec-timeout 0 0
line aux 0
line vty 0 4
 password
 login
 transport input all
!
scheduler allocate 20000 1000
!
End
```

ITAE Configuration of VPN Concentrator: Example

```
Current configuration: 1989 bytes
!
! Last configuration change at 12:20:00 EDT Thu Jul 6 2006
! NVRAM config last updated at 10:13:48 EDT Fri Jul 7 2006
!
version 12.4
no service pad
service timestamps debug datetime msec localtime
service timestamps log datetime msec localtime
no service password-encryption
!
!
boot-start-marker
boot-end-marker
!
!
no aaa new-model
clock timezone EST -5
clock summer-time EDT recurring
ip cef
!
!
ip multicast-routing
!
!
crypto isakmp policy 1
 hash md5
 authentication pre-share
crypto isakmp key rtrkey address 10.0.0.2
crypto isakmp keepalive 12 3
!
!
crypto ipsec transform-set rtr_trans esp-3des
```

```
!
crypto map mymap 1 ipsec-isakmp
 set peer 10.0.0.2
 set transform-set rtr_trans
 match address itae_acl
!
!
interface FastEthernet0/0
 ip address 172.20.0.2 255.255.255.0
 crypto map mymap
!
interface FastEthernet1/0
 ip address 172.21.0.1 255.255.255.0
!
interface FastEthernet2/0
 ip address 172.22.0.2 255.255.255.0
 crypto map mymap2
!
router rip
 version 2
 network 172.20.0.0
!
no ip http server
no ip http secure-server
!
!
ip access-list extended itae_acl
 permit ip host 172.21.0.100 host 10.0.0.1
!
logging alarm informational
!
!
control-plane
!
!
line con 0
 exec-timeout 0 0
 stopbits 1
line aux 0
 stopbits 1
line vty 0 4
 exec-timeout 0 0
 password lab
 login
!
no scheduler max-task-time
!
end
```

Upgrading VSAT Firmware

This section describes an alternate method of upgrading NM-1VSAT-GILAT firmware.

In the standard method, the VSAT compares the firmware image at the hub with its own firmware image every time it goes online. If the image at the hub is newer, the VSAT will download the newer version.

The alternate method provides a firmware upgrade of VSATs locally at remote sites through TFTP. This method reduces dependency on a central hub, and allows for ease of update when connected to a service provider who uses third-party hubs that operate in one-way mode only.

When the VSAT firmware is sent to the router flash memory, the TFTP server is configured on the router so that when the upgrade command is issued from the VSAT, the VSAT is able to find the file on the router flash memory. The TFTP server configuration would be as follows:

```
tftp-server flash:< <firmware filename>
```

This configuration would be within the overall router configuration.

When this configuration is done, the upgrade is accomplished by pointing the VSAT to the router IP address in the upgrade command.

The upgrade is accomplished by using the following command in privileged EXEC mode.

Command	Purpose
upgrade satellite satellite *slot/unit* <*tftp server address*> <*firmware filename*> **Example:** `Router# upgrade satellite satellite 1/0 10.1.0.1 VSAT_99.06.01.26_Bin.bin`	Specifies the TFTP server that contains the upgraded firmware and the firmware filename.

Caution When the **upgrade satellite satellite** command is executed, the firmware already existing on the VSAT will be erased. If the upgrade fails for any reason (for example, the TFTP server is unreachable, or an incorrect filename is entered in the command), the upgrade command must be executed again, successfully, to make the VSAT operational. Simply resetting the VSAT will not make it operational.

Examples

Examples of responses to the upgrade command and verification of upgrade follow.

upgrade satellite satellite Command: Sample Output

The following example shows the response of the VSAT to a firmware upgrade command.

```
Router# upgrade satellite satellite 1/0 10.1.0.1 VSAT_99.06.01.26_Bin.bin
Download of new firmware will proceed after a reboot of
 the satellite network module. This could take up to two minutes.
 Please wait...


*Mar 4 03:18:15.006: %LINEPROTO-5-UPDOWN: Line protocol on Interface Satellite1/0, changed
state to up
The upgrade process will complete in several minutes.
 It will take place in the background.
 Please monitor the console for errors.

*Mar 4 03:21:16.006: %LINEPROTO-5-UPDOWN: Line protocol on Interface Satellite1/0, changed
state to down
*Mar 4 03:27:20.842: %LINEPROTO-5-UPDOWN: Line protocol on Interface Satellite1/0, changed
state to up
```

service-module satellite status Command: Sample Output

After a successful firmware upgrade, the user can use the **service-module status** command to verify the downloaded image version.

```
Router# service-module sat 1/0 status
Getting status from the satellite module, please wait..

Software Versions, OS: 99.6.282, RSP: 3.4.0.6, MBC: 2.0.4.3
HW Version: 00008000
...
```

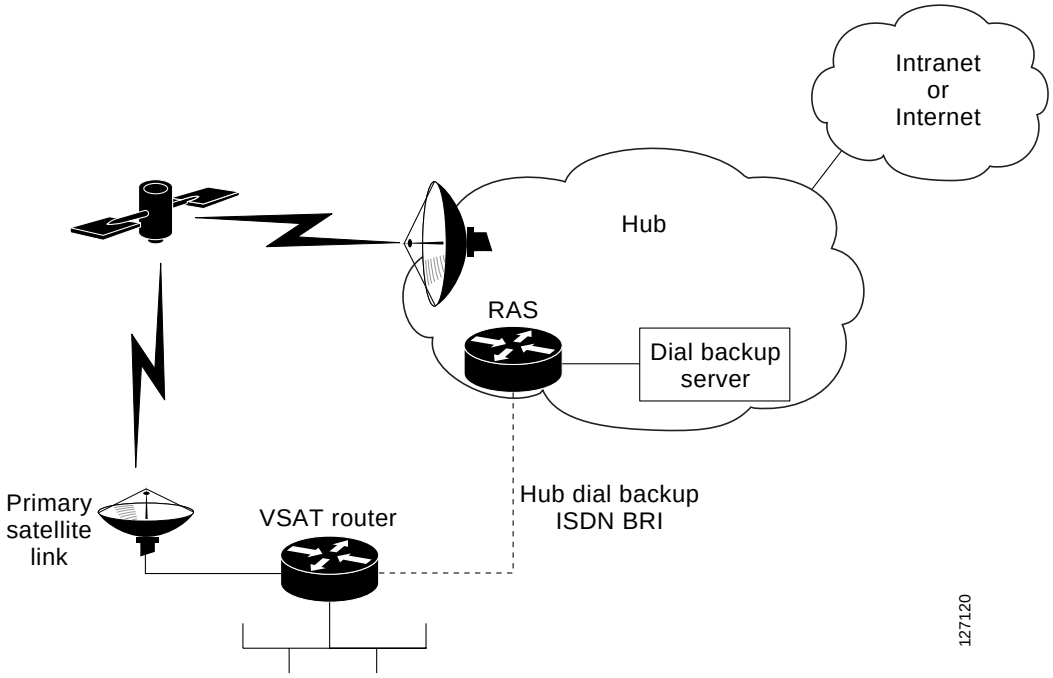
Configuration Examples for the Cisco IP VSAT Satellite WAN Network Module (NM-1VSAT-GILAT)

This section provides the following configuration examples:

Configuring Hub Dial Backup for the NM-1VSAT-GILAT Network Module—Primary Satellite Link with a Backup ISDN BRI Link: Example

In the following example, hub dial backup is configured. If the primary satellite link goes down, then the VSAT router connects directly to the remote access server (RAS) at the hub using an ISDN BRI backup link. Figure 12 shows the network topology for this setup.

Figure 12 Hub Dial Backup—ISDN BRI Backup Link: Sample Network Topology



See the following sample configurations:

- Router1—VSAT Router with NM-1VSAT-GILAT Network Module
- Router2—RAS at the Hub

Router1—VSAT Router with NM-1VSAT-GILAT Network Module

```
!---Backup interface configuration
interface BRI0/0
 ip address 192.168.3.1 255.255.255.0
 encapsulation ppp
 load-interval 30
 dialer string 5550150
 dialer-group 1
 isdn switch-type basic-5ess
.
.
.
```

```
!---Primary satellite link configuration
!---Notice that hub dial backup mode is configured.
interface Satellite2/0
 ip address 172.24.1.3 255.255.0.0
 service-module backup interface BRI0/0
 service-module backup mode hub
 service-module ip address 172.24.1.1 255.255.0.0
.
.
.
!---RIPv2 configuration
!---The 172.24.0.0 network connects to the hub over the primary satellite link.
!---The 192.168.3.0 network connects to the hub over the backup ISDN BRI link
router rip
 version 2
 network 172.24.0.0
 network 192.168.3.0
 no auto-summary
.
.
.
!---Static route over the BRI link to the hub dial backup server.
ip route 192.168.255.0 255.255.255.255 BRI0/0
.
.
.
!---Dial-on-Demand Routing (DDR) Dialer List Definition
dialer-list 1 protocol ip permit
!
```

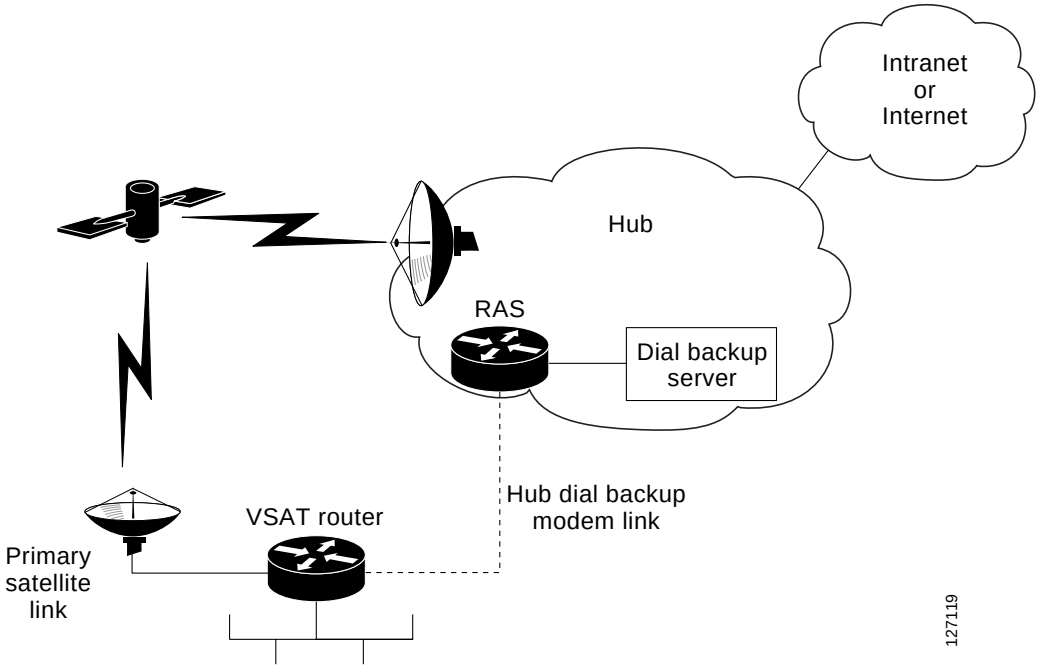
Router2—RAS at the Hub

```
!---LAN interface that connects to the hub dial backup server
interface FastEthernet0/0
 ip address 192.168.255.222 255.255.255.0
 speed 10
 full-duplex
.
.
.
!---BRI interface that connects to the VSAT router with the NM-1VSAT-GILAT network module
interface BRI0/0
 ip address 192.168.3.2 255.255.255.0
 encapsulation ppp
 isdn switch-type basic-5ess
.
.
.
!---RIPv2 configuration
!---The 192.168.3.0 network connects to the VSAT router with the NM-1VSAT-GILAT
!---network module.
router rip
 version 2
 network 192.168.3.0
.
.
.
!---Dial-on-Demand Routing (DDR) Dialer List Definition
dialer-list 1 protocol ip permit
!
```

Configuring Hub Dial Backup for the NM-1VSAT-GILAT Network Module—Primary Satellite Link with a Backup Modem Link: Example

In the following example, hub dial backup is configured. If the primary satellite link goes down, then the VSAT router uses a modem to connect directly to the remote access server (RAS) at the hub. Figure 13 shows the network topology for this setup.

Figure 13 Hub Dial Backup—Backup Modem Link: Sample Network Topology



See the following sample configurations:

- Router1—VSAT Router with NM-1VSAT-GILAT Network Module
- Router2—RAS at the Hub

Router1—VSAT Router with NM-1VSAT-GILAT Network Module

```
!---Create a script that will place a call over a modem.
chat-script dial ABORT ERROR "" "ATDT \T" TIMEOUT 60 CONNECT
.
.
.
!---Primary satellite link configuration
!---Notice that hub dial backup mode is configured.
interface Satellite2/0
 ip address 172.24.1.3 255.255.0.0
 service-module backup interface Async3
 service-module backup mode hub
 service-module ip address 172.24.1.1 255.255.0.0
.
.
.
```

```
!---Backup interface configuration
interface Async3
 ip address 10.3.0.1 255.255.255.0
 encapsulation ppp
 dialer in-band
 dialer enable-timeout 20
 dialer wait-for-carrier-time 60
 dialer map ip 192.168.255.99 broadcast 102
 dialer-group 1
 async mode dedicated
 no peer default ip address
 ppp authentication chap callin
 ppp chap hostname myhostname
 ppp chap password 0 mypassword
 routing dynamic
.
.
.
!---RIPv2 configuration
!---The 10.0.0.0 network connects to the hub over the backup modem link.
!---The 172.24.0.0 network connects to the hub over the primary satellite link.
router rip
 version 2
 network 10.0.0.0
 network 172.24.0.0
.
.
.
!---Static route over the modem link to the hub dial backup server
ip route 192.168.255.99 255.255.255.255 Async3
!
!---Dial-on-demand routing (DDR) dialer list definition
dialer-list 1 protocol ip permit
.
.
.
!---Modem line configuration
line 3
 exec-timeout 0 0
 script dialer dial
 modem InOut
 transport input all
 stopbits 1
 speed 115200
 flowcontrol hardware
!
```

Router2—RAS at the Hub

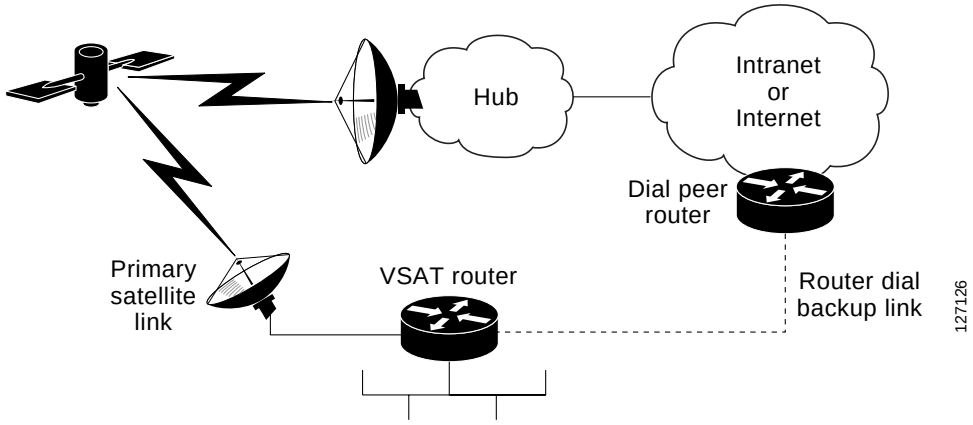
```
!---Define username and password for Challenge Handshake Authentication Protocol (CHAP).
username myhostname password 0 mypassword
.
.
.
!---LAN interface that connects to the dial backup server
interface FastEthernet0/0
 ip address 192.168.255.222 255.255.255.0
 speed 10
 full-duplex
.
.
.
```

```
!---Backup interface configuration
!---The async interface and dialer interface configurations are linked together.
interface Group-Async0
 no ip address
 encapsulation ppp
 dialer in-band
 dialer pool-member 1
 async default routing
 async mode dedicated
 no peer default ip address
 ppp authentication chap
 group-range 3 4
!
interface Dialer1
 ip address 10.3.0.2 255.255.255.0
 encapsulation ppp
 dialer pool 1
 dialer remote-name myhostname
 dialer-group 1
 no cdp enable
 ppp authentication chap callin
.
.
.
!---RIPv2 configuration
!---The 10.0.0.0 network connects to the VSAT router over the modem link
router rip
 version 2
 network 10.0.0.0
.
.
.
!---Dial-on-demand routing (DDR) dialer list definition
dialer-list 1 protocol ip permit
.
.
.
!---Modem line configuration
line 3 4
 exec-timeout 0 0
 flush-at-activation
 modem InOut
 transport input all
 stopbits 1
 speed 115200
 flowcontrol hardware
!
```

Configuring Router Dial Backup for the NM-1VSAT-GILAT Network Module Satellite Link—Floating Static Route: Example

In the following example, a floating static route is used to configure router dial backup for the NM-1VSAT-GILAT network module satellite link. If the primary satellite link goes down, then the VSAT router connects to the Internet or an intranet through an ISDN BRI link. Figure 14 shows the network topology for this setup.

Figure 14 Router Dial Backup: Sample Network Topology



See the following sample configurations:

- Router1—VSAT Router with NM-1VSAT-GILAT Network Module
- Router2—Dial Peer Router That Connects to an Intranet or the Internet

Router1—VSAT Router with NM-1VSAT-GILAT Network Module

```
!---Backup interface configuration
interface BRI0/0
 ip address 192.168.3.1 255.255.255.0
 ip rip v2-broadcast
 encapsulation ppp
 dialer string 5550100
 dialer-group 1
 isdn switch-type basic-5ess
.
.
.
!---Primary satellite link configuration:
!---Notice that the service-module backup mode router command
!---does not appear because router dial backup mode is the default setting.
interface Satellite2/0
 ip address 172.24.1.3 255.255.0.0
 ip rip v2-broadcast
 service-module ip address 172.24.1.1 255.255.0.0
.
.
.
!---RIPv2 configuration:
!---Redistribute static routes to RIPv2.
!---The 172.24.0.0 network connects to the hub over the primary satellite link.
!---The 192.168.3.0 network connects to the Internet or an intranet
!---over the backup ISDN BRI link.
router rip
 version 2
 redistribute static
 network 172.24.0.0
 network 192.168.3.0
 no auto-summary
.
.
.
```

```
!---Floating static route configuration:
!---Enter an administrative distance that is greater than
!---the administrative distance of the satellite link.
ip route 0.0.0.0 0.0.0.0 BRI0/0 200
.
.
.
!---Access list and dial-on-demand routing (DDR) dialer list definitions
access-list 100 deny   ip any host 255.255.255.255
access-list 100 permit ip any any
dialer-list 1 protocol ip list 100
!
```

Router2—Dial Peer Router That Connects to an Intranet or the Internet

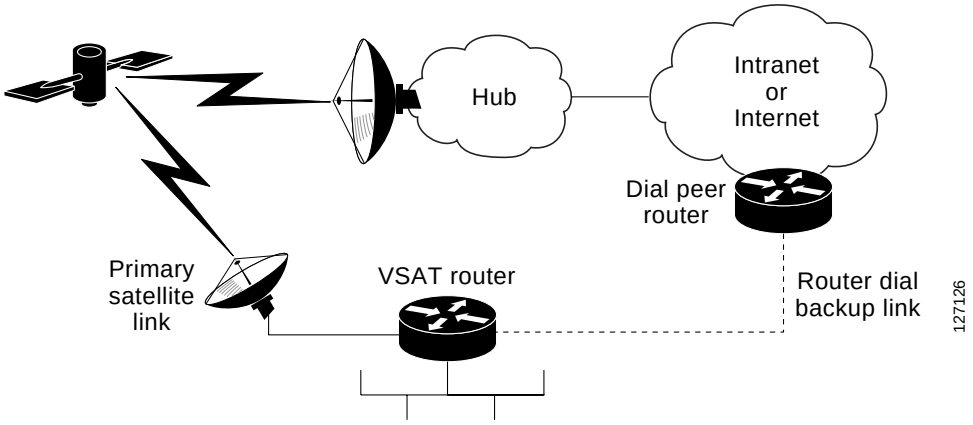
```
!---BRI interface that connects to the VSAT router with the NM-1VSAT-GILAT network module
interface BRI0/0
 ip address 192.168.3.2 255.255.255.0
 encapsulation ppp
 isdn switch-type basic-5ess
.
.
.
!---RIPv2 configuration:
!---The 192.168.3.0 network connects to the VSAT router with the NM-1VSAT-GILAT
!---network module.
router rip
 version 2
 network 192.168.3.0
 no auto-summary
!
```

Configuring Router Dial Backup for the NM-1VSAT-GILAT Network Module Satellite Link—Backup Interface: Example

In the following example, the **backup interface** command is used to configure router dial backup for the NM-1VSAT-GILAT network module satellite link. If the primary satellite link goes down, then the VSAT router connects to the Internet or an intranet through an ISDN BRI link.

Figure 15 shows the network topology for this setup.

Figure 15 Router Dial Backup: Sample Network Topology



See the following sample configurations:

- Router1—VSAT Router With NM-1VSAT-GILAT Network Module
- Router2—Dial Peer Router That Connects to an Intranet or the Internet

Router1—VSAT Router With NM-1VSAT-GILAT Network Module

```
!---Backup interface configuration
interface BRI0/0
 ip address 192.168.3.1 255.255.255.0
 encapsulation ppp
 dialer string 5550100
 dialer-group 1
 isdn switch-type basic-5ess
.
.
.
!---Primary satellite link configuration:
!---Notice that the service-module backup mode router command
!---does not appear because router dial backup mode is the default setting.
interface Satellite2/0
 ip address 172.24.1.3 255.255.0.0
 backup interface BRI0/0
 service-module ip address 172.24.1.1 255.255.0.0
.
.
.
!---RIPv2 configuration:
!---The 172.24.0.0 network connects to the hub over the primary satellite link.
!---The 192.168.3.0 network connects to an intranet or Internet
!---over the backup ISDN BRI link.
router rip
 version 2
 network 172.24.0.0
 network 192.168.3.0
 no auto-summary
.
.
.
!---Dial-on-Demand Routing (DDR) Dialer List Definition
dialer-list 1 protocol ip permit
```

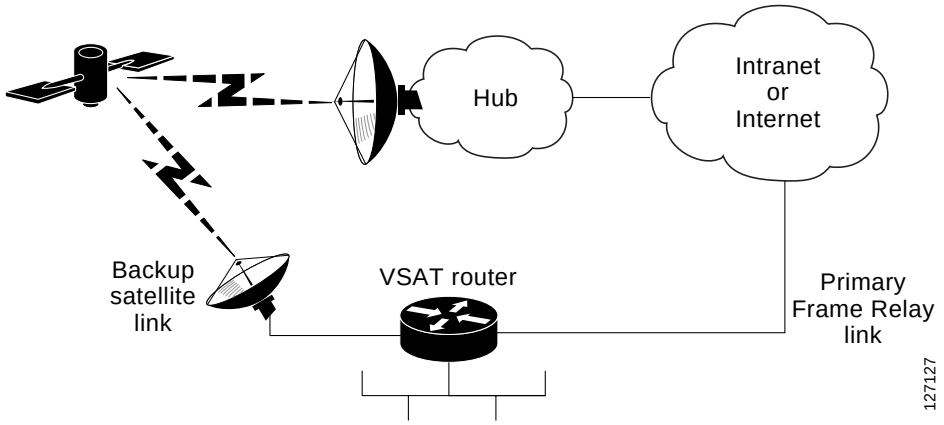
Router2—Dial Peer Router That Connects to an Intranet or the Internet

```
!---BRI interface that connects to the VSAT router with the NM-1VSAT-GILAT network module
interface BRI0/0
 ip address 192.168.3.2 255.255.255.0
 encapsulation ppp
 isdn switch-type basic-5ess
.
.
.
!---RIPv2 configuration:
!---The 192.168.3.0 network connects to the VSAT router with the NM-1VSAT-GILAT
!---network module.
router rip
 version 2
 network 192.168.3.0
 no auto-summary
!
```

Configuring NM-1VSAT-GILAT Network Module Satellite Backup for a Terrestrial Link—Floating Static Route: Example

In the following example, the satellite link backs up a Frame Relay link. Both links are configured as static routes, but the satellite link has a higher administrative distance. Figure 16 shows the network topology for this setup.

Figure 16 NM-1VSAT-GILAT Network Module Satellite Backup for a Terrestrial Link: Sample Network Topology



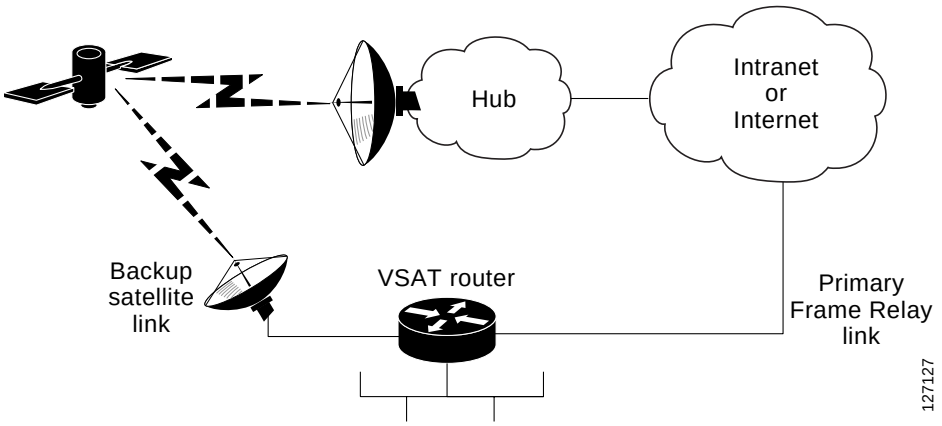

```
!---Because Cisco Express Forwarding (CEF) is enabled,
!---the ip cef table adjacency-prefix validate command is required.
ip cef table adjacency-prefix validate
ip cef
.
.
.
!---Primary link configuration:
!---Frame Relay requires a subinterface configuration
interface Serial0/2
 no ip address
 encapsulation frame-relay
```

```
!
interface Serial0/2.1 point-to-point
 ip address 192.168.3.1 255.255.255.0
 frame-relay interface-dlci 200
.
.
.
!---Backup link configuration
interface Satellite1/0
 ip address 172.24.1.3 255.255.0.0
 service-module ip address 172.24.1.1 255.255.0.0
.
.
.
!---RIPv2 configuration:
!---Redistribute static routes to RIPv2.
!---The 192.168.3.0 network is the primary Frame Relay link.
!---The 172.24.0.0 network is the backup satellite link.
router rip
 version 2
 redistribute static
 network 192.168.3.0
 network 172.24.0.0
 no auto-summary
.
.
.
!---Static route configuration:
!---Notice that the satellite link has a higher administrative distance.
ip route 0.0.0.0 0.0.0.0 Serial0/2.1
ip route 0.0.0.0 0.0.0.0 Satellite1/0 200
!
```

Configuring NM-1VSAT-GILAT Network Module Satellite Backup for a Terrestrial Link—Backup Interface: Example

In the following example, the satellite interface backs up the subinterface on which the Frame Relay link is configured. Figure 17 shows the network topology for this setup.

Figure 17 NM-1VSAT-GILAT Network Module Satellite Backup for a Terrestrial Link: Sample Network Topology



```
!---Primary link configuration:
!---Frame Relay requires a subinterface configuration
interface Serial0/2
 no ip address
 encapsulation frame-relay
!
interface Serial0/2.1 point-to-point
 ip address 192.168.3.1 255.255.255.0
 backup interface Satellite1/0
 frame-relay interface-dlci 200
.
.
.
!---Backup link configuration
interface Satellite1/0
 ip address 172.24.1.3 255.255.0.0
 service-module ip address 172.24.1.1 255.255.0.0
.
.
.
!---RIPv2 configuration:
!---Redistribute static routes to RIPv2
!---The 192.168.3.0 network is the primary Frame Relay link.
!---The 172.24.0.0 network is the backup satellite link.
router rip
 version 2
 redistribute static
 network 192.168.3.0
 network 172.24.0.0
 no auto-summary
!
```

Configuring Homogeneous HSRP Redundancy with the NM-1VSAT-GILAT Network Module—Shared ODU: Example

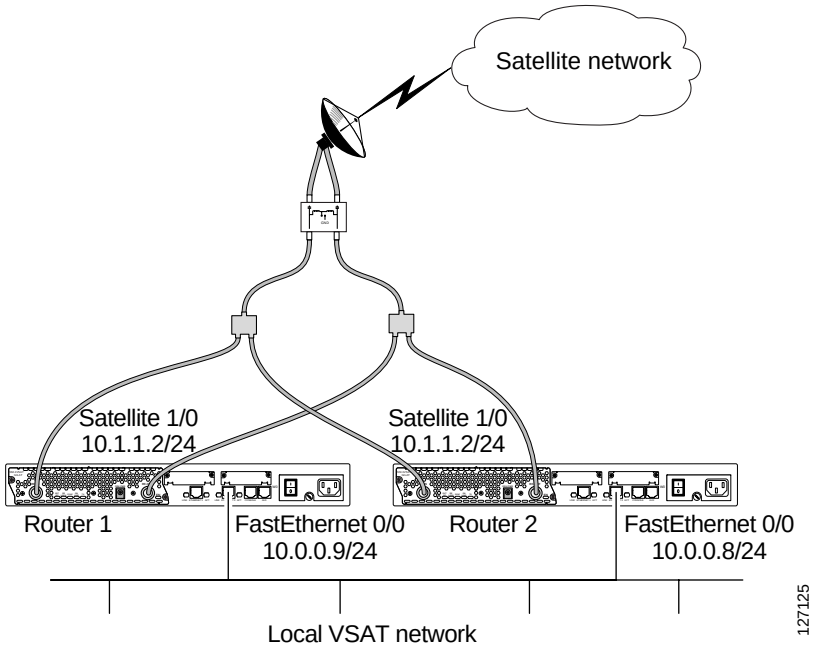
In the following example, the hot standby group consists of two routers, each equipped with an NM-1VSAT-GILAT network module. Both NM-1VSAT-GILAT network modules are connected to the same ODU.

The routers are each connected through interface Fast Ethernet 0/0 to the same subnet to establish the hot standby group, named “grp-hsrp.” Although the routers have unique IP addresses, the designated IP address for the hot standby group is 10.0.0.100.

Because preemption is enabled on both routers, the router with the higher priority takes over as the active router. Both routers have the default priority value of 100, and they each track the installed satellite interface. If a satellite link goes down, that router’s HSRP priority drops to 90, and the other router, which still has a priority of 100, becomes the active router.

Figure 18 shows the network topology for this setup.

Figure 18 Homogeneous HSRP Redundancy: Sample Network Topology



See the following sample router configurations:

- Router1
- Router2

Router1

```
!---For both routers, preemption and tracking are enabled.
!---Also, both routers have the same priority (default 100).
!
interface FastEthernet0/0
  ip address 10.0.0.9 255.255.255.0
  standby 1 ip 10.0.0.100
  standby 1 preempt
  standby 1 name grp-hsrp
  standby 1 track Satellite1/0
!
!---Note that the hot standby group name (in this example,
!---“grp-hsrp”) must match exactly on the primary HSRP interface
!---(Fast Ethernet 0/0) and on the satellite interface.
!
interface Satellite1/0
  ip address 10.1.1.2 255.255.255.0
  service-module ip redundancy grp-hsrp
!
!---The last command is required because two NM-1VSAT-GILAT network modules
!---on separate routers are connected to the same ODU.
```

Router2

```
!---Aside from the IP address of the Fast Ethernet interface,
!---the Router1 and Router2 configurations are identical.
interface FastEthernet0/0
  ip address 10.0.0.8 255.255.255.0
  standby 1 ip 10.0.0.100
  standby 1 preempt
  standby 1 name grp-hsrp
  standby 1 track Satellite1/0
.
.
.
interface Satellite1/0
  ip address 10.1.1.2 255.255.255.0
  service-module ip redundancy grp-hsrp
!
```

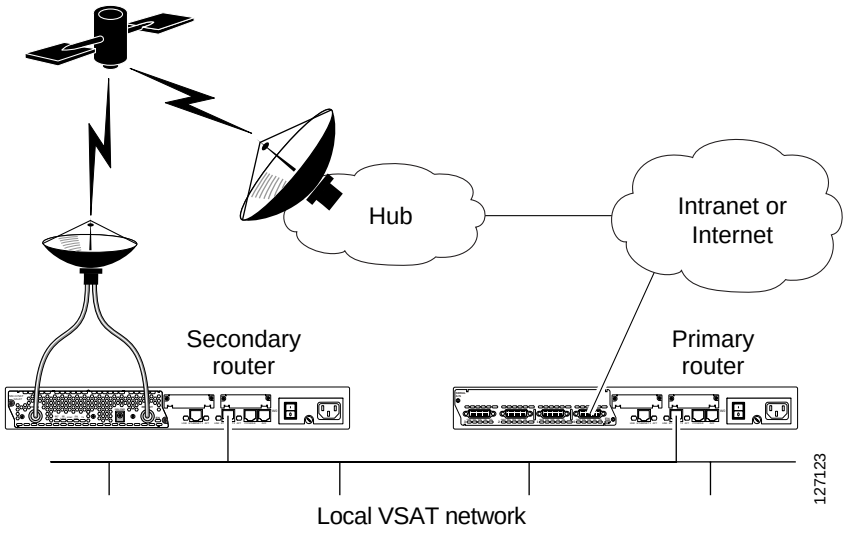
Configuring Heterogeneous HSRP Redundancy with the NM-1VSAT-GILAT Network Module—Primary Satellite Link with a Backup Terrestrial Link: Example

In the following example, the primary router (Router1) uses a satellite link, whereas the secondary router (Router2) uses a serial link. This setup provides terrestrial network connectivity when the satellite link fails.

Because preemption is enabled on both routers, the router with the higher priority takes over as the active router. Router1 tracks its satellite interface and has a higher configured priority (105) than Router2, which has a configured priority of 100. In normal working conditions, Router1 is the active router. If the tracked satellite interface goes down, the Router1 priority drops to 95. Because Router2 now has a higher priority (100), Router2 takes over as the active router. When the tracked satellite interface comes up again, the Router1 priority returns to 105, and Router1 becomes the active router.

Figure 19 shows the network topology for this setup.

Figure 19 Heterogeneous HSRP Redundancy: Sample Network Topology



See the following sample router configurations:

- Router1 (Primary—Satellite Link)
- Router2 (Secondary—Serial Link)

Router1 (Primary—Satellite Link)

```
!---For both routers, preemption is enabled.
!---Note, however, that the HSRP priority value of Router1 (105)
!---is higher than the HSRP priority value of Router2 (100).
!
interface FastEthernet0/0
  ip address 10.0.0.9 255.255.255.0
  standby 1 ip 10.0.0.100
  standby 1 priority 105
  standby 1 preempt
  standby 1 track Satellite1/0
!
!---Router1 tracks the satellite interface. If the satellite
!---link goes down, the Router1 priority falls below the Router2
!---priority, so Router2 takes over as the active router.
!---Because preemption is enabled, Router1 takes over as the active
!---router as soon as the satellite link comes back up.
!
interface Satellite1/0
  ip address 10.1.1.2 255.255.255.0
!
```

Router2 (Secondary—Serial Link)

```
!---For both routers, preemption is enabled.
!---Note, however, that the HSRP priority value of Router1 (105)
!---is higher than the HSRP priority value of Router2 (100).
!
interface FastEthernet0/0
  ip address 10.0.0.8 255.255.255.0
  standby 1 ip 10.0.0.100
  standby 1 priority 100
  standby 1 preempt
!
!---Because preemption is enabled, Router2 takes over as the active
!---router if the Router1 tracked satellite link goes down
!---and reduces the Router1 priority to 95.
!---When the satellite link comes back up, Router1 becomes the
!---active router because Router1 has preemption enabled and
!---has a higher priority (105).
!
interface Serial 1/0
  ip address 10.1.1.3 255.255.255.0
!
```

Configuring Heterogeneous HSRP Redundancy with the NM-1VSAT-GILAT Network Module—Backup Satellite Link for a Primary Terrestrial Link: Example

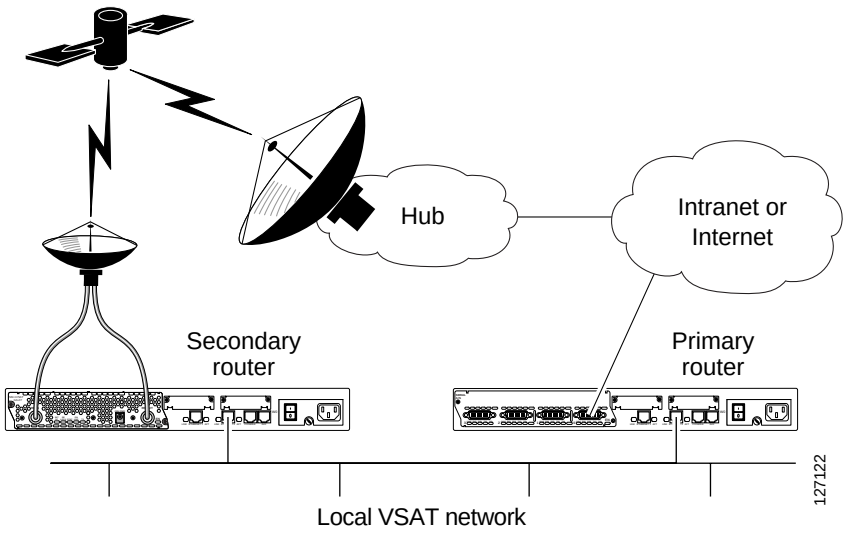
In the following example, the primary router (Router1) uses a serial link, whereas the secondary router (Router2) uses a satellite link. This setup preserves network connectivity when there is a problem at the terrestrial Internet service provider (ISP) or when the terrestrial network cables fail because of a backhoe event.

Because preemption is enabled on both routers, the router with the higher priority takes over as the active router. Router1 tracks its serial interface and has a higher configured priority (105) than Router2, which has a configured priority of 100 and tracks its satellite interface. Under normal working conditions, Router1 is the active router. If the tracked serial interface goes down, the Router1 priority drops to 95. Because Router2 now has a higher priority (100), Router2 takes over as the active router. When the tracked serial interface comes up again, Router1 once again becomes the active router.

If the tracked satellite link goes down, the Router2 priority drops to 90, which is always lower than that of Router1. Therefore, Router2 is always in standby mode when the satellite link is down.

Figure 20 shows the network topology for this setup.

Figure 20 Heterogeneous HSRP Redundancy: Sample Network Topology



See the following sample router configurations:

- Router1 (Primary—Serial Link)
- Router2 (Secondary—Satellite Link)

Router1 (Primary—Serial Link)

```
!---For both routers, preemption and tracking are enabled.
!---Note, however, that the HSRP priority value of Router1 (105)
!---is higher than the HSRP priority value of Router2 (100).
interface FastEthernet0/0
  ip address 10.0.0.8 255.255.255.0
  standby 1 ip 10.0.0.100
  standby 1 priority 105
  standby 1 preempt
  standby 1 track Serial 1/0
!
!---Router1 tracks the serial interface. If the serial
!---link goes down, the Router1 priority falls below the Router2
!---priority, so Router2 takes over as the active router.
!---Because preemption is enabled, Router1 takes over as the active
!---router as soon as the serial link comes back up.
!
interface Serial 1/0
  ip address 10.1.1.3 255.255.255.0
!
```

Router2 (Secondary—Satellite Link)

```
!
interface FastEthernet0/0
  ip address 10.0.0.9 255.255.255.0
  standby 1 ip 10.0.0.100
  standby 1 preempt
  standby 1 track Satellite1/0
!
!---Because Router2 tracks the satellite interface,
!---Router2 cannot become the active router
!---if the satellite link is down, because the
!---effective priority of Router2 is still lower
!---than that of Router1.
!
interface Satellite1/0
  ip address 10.1.1.2 255.255.255.0
!
```

Configuring IP Multicast Routing for the NM-1VSAT-GILAT Network Module: Example

In the following example, IP multicast routing is configured on the satellite and Fast Ethernet links. Note that certain IP address requirements apply when you use IP multicast routing over the satellite network. See the "IP Address Requirements for IP Multicast and Non-RIPv2 Routing Protocols" section on page 21.

```
!---Enable IP multicast routing
ip multicast-routing
.
.
.
!---LAN with hosts that can join the multicast group
interface FastEthernet0/0
 ip address 10.1.0.1 255.255.255.0
 ip pim sparse-dense-mode
```

```
 duplex auto
 speed auto
.
.
.
!---Satellite link configuration:
!---Notice that the NM-1VSAT-GILAT network module IP address
!---does not appear in the configuration because it is
!---automatically configured to 192.168.1.137 255.255.255.252.
interface Satellite1/0
 ip address 192.168.1.138 255.255.255.0
 ip pim dr-priority 0
 ip pim sparse-dense-mode
.
.
.
!---The PIM RP is the hub router interface that connects to the hub protocol server.
ip pim rp-address 192.168.1.5
```

Additional References

The following sections provide references related to the Cisco IP VSAT Satellite WAN Network Module (NM-1VSAT-GILAT) feature.

Related Documents

Related Topic	Document Title
Installing and connecting the NM-1VSAT-GILAT network module	*Cisco Network Modules Hardware Installation Guide*
Regulatory compliance and safety information	*Cisco Network Modules and Interface Cards Regulatory Compliance and Safety Information*
IP multicast routing	*Cisco IOS IP Configuration Guide*
Configuring terrestrial links	*Cisco IOS Dial Technologies Configuration Guide* *Cisco IOS Interface and Hardware Component Configuration Guide* *Cisco IOS Wide-Area Networking Configuration Guide*
Routing Information Protocol (RIP), RIP version 2 (RIPv2), and other routing protocols	*Cisco IOS IP Configuration Guide*
Configuring backup links using backup interfaces or floating static routes	*Evaluating Backup Interfaces, Floating Static Routes, and Dialer Watch for DDR Backup*
Hot Standby Router Protocol (HSRP)	*Cisco IOS IP Configuration Guide* *How to Use the standby preempt and standby track Commands*
Voice over IP	Voice Configuration Library
Rate Based Satellite Control Protocol (RBSCP)	*Rate Based Satellite Control Protocol*, Cisco IOS software feature module

Standards

Standards	Title
No new or modified standards are supported by this feature, and support for existing standards has not been modified by this feature.	—

MIBs

MIBs	MIBs Link
• CISCO-ENTITY-ASSET-MIB • ENTITY-MIB • RFC1213-MIB Your satellite service provider can use the following MIBs: • Skystar Advantage Proxy Agent MIB • Gilat SkyEdge–compatible Enterprise MIB	To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

RFCs

RFCs	Title
No new or modified RFCs are supported by this feature, and support for existing RFCs has not been modified by this feature.	—

Technical Assistance

Description	Link
The Cisco Technical Support & Documentation website contains thousands of pages of searchable technical content, including links to products, technologies, solutions, technical tips, and tools. Registered Cisco.com users can log in from this page to access even more content.	http://www.cisco.com/techsupport

Command Reference

This section documents new and modified commands. All other commands used with this feature are documented in the Cisco IOS Release 12.3 and Cisco IOS Release 12.3T command reference publications.

The following commands in Cisco IOS Release 12.3(14)T apply to the setup and operation of the Cisco IP VSAT Satellite WAN Network Module (NM-1VSAT-Gilat).

The following cammands in Cisco IOS Release 12.4(6th)T apply to the security and QoS feature enhancements for the Cisco IP VSAT Satellite WAN Network Module (NM-1VSAT-Gilat).

apply (satellite initial configuration)

To save new or changed satellite initial configuration parameters and to reset the Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT), use the **apply** command in satellite initial configuration mode.

apply

Syntax Description

This command has no arguments or keywords.

Defaults

No default behavior or values

Command Modes

Satellite initial configuration mode

Command History

Release	Modification
12.3(14)T	This command was introduced.

Usage Guidelines

The **apply** command saves any new or changed satellite initial configuration parameters to the nonvolatile memory of the Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT) and initiates a network module software reset. Commands entered in satellite initial configuration mode do not appear in the router configuration.

When you enter the **exit** or **end** command to exit satellite initial configuration mode, the system automatically saves any changed parameters to the NM-1VSAT-GILAT network module's nonvolatile memory and resets the NM-1VSAT-GILAT network module.

Note This command is typically used by an installation technician. Do not use this command unless your satellite service provider instructs you to perform the satellite initial configuration and provides all necessary parameter values.

Examples

The following example shows what appears when you enter the **apply** command after changing some initial configuration parameters:

```
Router(sat-init-config)# apply

Applying changed parameters to the satellite module.
Parameter update succeeded.  Module is now resetting.
Router(sat-init-config)#
```

The following example shows what appears when you enter the **apply** command when no parameters have been changed:

```
Router(sat-init-config)# apply

% No new or changed parameters to apply.
Router(sat-init-config)#
```

Related Commands

Command	Description
end (satellite initial configuration)	Exits satellite initial configuration mode, saves any new or changed parameters, and resets the Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT).
exit (satellite initial configuration)	Exits satellite initial configuration mode, saves any new or changed parameters, and resets the Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT).

debug satellite firmware

To enable debugging output for the Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT) firmware, use the **debug satellite firmware** command in privileged EXEC mode. To disable debugging output, use the **no** form of this command.

debug satellite firmware {**all** | **level** *number* | *option*}

no debug satellite firmware

Syntax Description

all	Displays all satellite firmware events.
level *number*	Satellite debug level. The debug level affects what information is displayed for subsequently entered **debug satellite firmware** commands. See Table 4.
option	One of the following options. See Table 1. • **bb**—Satellite backbone events • **buf**—Satellite buffer events • **en**—Satellite firmware encryption events • **ip**—Satellite IP events • **rbcp**—Satellite RBCP events • **rpa**—Satellite Remote Page Acceleration (RPA) events • **sat**—Satellite inbound and outbound packet statistics • **tcp**—Satellite TCP events • **trc**—Satellite backbone traces

Defaults

No default behavior or values.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.3(14)T	This command was introduced.

Usage Guidelines

The output from this command is generally useful for diagnostic tasks performed by technical support.

The level number affects which debug messages the system displays for subsequently entered **debug satellite firmware** commands. Table 4 describes what each command option displays at each debug level.

Note Level 3 debugging produces significant amounts of output that may negatively impact the performance of both the NM-1VSAT-GILAT network module and the router. When you enter debug level 3, a warning message and confirmation prompt appear.

Table 4 debug satellite firmware Command Level Options

Option	Level 1 Output	Level 2 Output	Level 3 Output
bb	Backbone link information	Frame statistics for the backbone link to the hub	—
buf	Buffer information	Buffer owners	—
en	Satellite firmware-based encryption events	—	—
ip	IP statistics	—	Driver transmission statistics
rbcp	Number of transmitted and received RBCP messages	—	Satellite Control Protocol (SCP) message summaries
rpa	RPA statistics	Tunnel connect and disconnect events	—
tcp	TCP statistics	TCP connection information	TCP statistics and TCP connection information
sat	Inbound and outbound packet statistics	Inbound and outbound packet statistics	Inbound and outbound packet statistics
trc	—	—	Backbone receive and transmit traces

Examples

This section provides the following sample output for the **debug satellite firmware** command:

Sample Output for the debug satellite firmware all Command

The following example shows all satellite firmware events and statistics:

```
Router# debug satellite firmware all

2d06h: Satellite2/0
buffers 4856 min 4486 list_str 683798 list_end 6885c8
emp 686030 fil 685de0 start 6885c8 end fb4fe8

2d06h: Satellite2/0
TCP stats: NetRXBytes=223 NetTXBytes=4775126 NetRxPkts=104213 ToIOSPkts=104166

2d06h: Satellite2/0
SAT stats: OUTbound_pkts=114131, INbound_pkts=182347

2d06h: Satellite2/0
RBCP statistics: TXcount=975 RXCount=975

2d06h: Satellite2/0
RPA stats: ToTunnel=0 FromTunnel=0
TunnelGets=0 TunnelNotGets=0
BlksUsed=0 BlksIn-Use=0 Max=300

2d06h: Satellite2/0
EN:
RX encrypted bytes received = 0
RX: compressed=0 -> Uncompressed=0
TX: compressed=0 -> Uncompressed=0

2d06h: Satellite2/0
BB 6 LINK state=INFO_STATE
     Status = 0x79,  LOW NOT READY,  HI PRI READY
     RSP Q free=230, Max HI=228, Max LOW=224, Max DG=232
     IN RA mode
     Curr DG BW=50000, HighDG BW=100000, Curr BW=98094
    MaxDG BW=1250000, Max BW=2500000
     PD Queue lengths:
        q_wtog=0, q_wtos=57,  q_wtos_high=0, q_defrag=d
     DG Queue lengths:
        q_dg_wtos=0, q_dg_wtos_hi=0, q_dg_defrag=0
     Congestion Levels:        TX LOCAL = 7, TX NET = 0

2d06h: Satellite2/0
IP stats: ToIOS_Pkts=234193, ToIOS_Bytes=183444492 FromIOS_Pkts=143 From_IOS_Bytes=12204

2d06h: Satellite2/0 NO Trace at levels 1 or 2

2d06h: Satellite2/0 NO Trace at levels 1 or 2
```

Sample Output for the bb Option at Level 1

The following example shows backbone link information:

```
Router# debug satellite firmware level 1
Router# debug satellite firmware bb

satellite BackBone events debugging is on
Router#
2d06h: Satellite2/0
BB 6 LINK state=INFO_STATE
     Status = 0x79,  LOW NOT READY,  HI PRI READY
     RSP Q free=240, Max HI=228, Max LOW=224, Max DG=232
     IN RA mode
     Curr DG BW=50000, HighDG BW=100000, Curr BW=96188
```

```
    MaxDG BW=1250000, Max BW=2500000
     PD Queue lengths:
        q_wtog=0, q_wtos=95,  q_wtos_high=0, q_defrag=d
     DG Queue lengths:
        q_dg_wtos=0, q_dg_wtos_hi=0, q_dg_defrag=0
     Congestion Levels:        TX LOCAL = 7, TX NET = 0

2d06h: Satellite2/0
BB 6 LINK state=INFO_STATE
     Status = 0x7b,  LOW READY,  HI PRI READY
     RSP Q free=27, Max HI=228, Max LOW=224, Max DG=232
     IN RA mode
     Curr DG BW=50000, HighDG BW=100000, Curr BW=92376
    MaxDG BW=1250000, Max BW=2500000
     PD Queue lengths:
        q_wtog=0, q_wtos=24,  q_wtos_high=0, q_defrag=d
     DG Queue lengths:
        q_dg_wtos=0, q_dg_wtos_hi=0, q_dg_defrag=0
     Congestion Levels:        TX LOCAL = 4, TX NET = 0
```

Sample Output for the bb Option at Level 2

The following example shows frame statistics for the backbone link to the hub:

```
Router# debug satellite firmware level 2
Router# debug satellite firmware bb

satellite BackBone events debugging is on
Router#
2d06h: Satellite2/0 BB link statistics
    Frame Type          # Received      # Transmitted
  ------------          ----------      -------------
   INFORMATION           00096238          00184811
   UNNUMBERED            00000000          00000067
   RETRANSMITTED         00000000          00000000
   POLLS                 00000000          00000000
   ACKS                  00006640          00000455
   NAKS                  00000000          00000000
   PACKS                 00000000          00000000
   UA                    00000001          00000000
   SABME                 00000000          00000001
   DISC                  00000000          00000000
```

Sample Output for the buf Option at Level 1

The following example shows buffer information:

```
Router# debug satellite firmware level 1
Router# debug satellite firmware buf

*May 13 15:58:54.498:Satellite1/0
buffers 4951 min 4945 list_str 681858 list_end 686688
emp 683abc fil 6839e8 start 686688 end fb30a8
```

Sample Output for the buf Option at Level 2

The following example shows buffer owners:

```
Router# debug satellite firmware level 2
Router# debug satellite firmware buf

*May 13 15:59:13.438:Satellite1/0 inuse 49 free 4951
Trace byte  1
Trace byte = 0x169    Count =   49
Trace byte  2
```

```
Trace byte = 0x  0    Count =   49
   0 buffers with BB Rel only
   0 buffers with in lower layer set
   0 buffers with do not transmit set
   0 buffers on BB retransmit queues
```

Sample Output for the ip Option at Level 1

The following example shows IP statistics:

```
Router# debug satellite firmware level 1
Router# debug satellite firmware ip

*Nov  7 08:27:56.440: Satellite3/0
IP stats: ToIOS_Pkts=0, ToIOS_Bytes=0 FromIOS_Pkts=84751 From_IOS_Bytes=5941124
```

Sample Output for the rbcp Option at Level 1

The following example shows the number of RBCP messages transmitted and received since the most recent reset of the Cisco IOS software on the router or the VSAT software on the NM-1VSAT-GILAT network module:

```
Router# debug satellite firmware level 1
Router# debug satellite firmware rbcp

RBCP statistics:TXcount=301154 RXCount=301155
```

Sample Output for the rpa Option at Level 1

The following example shows RPA statistics:

```
Router# debug satellite firmware level 1
Router# debug satellite firmware rpa

  *Nov  7 08:27:13.488:Satellite3/0
  RPA stats:ToTunnel=0 FromTunnel=0
  TunnelGets=0 TunnelNotGets=0
  BlksUsed=0 BlksIn-Use=0 Max=400
```

Sample Output for the rpa Option at Level 2

The following example shows a tunnel being disconnected:

```
Router# debug satellite firmware level 2
Router# debug satellite firmware rpa

*May 13 18:27:59.779:Satellite1/0 RPA Tunnel DOWN
RPA:InitTunnelConn Successful locIP e000006 locPort 1090, RemIP c0a80186,
RemPort 9876
RPA Tunnel DOWN
RPA:InitTunnelConn Successful locIP e000006 locPort 1091, RemIP c0a80186,
RemPort 9876
RPA Tunnel DOWN
RPA:InitTunnelConn Successful locIP e000006 locPort 1092, RemIP c0a80186,
RemPort 9876
RPA Tunnel DOWN
RPA:InitTunnelConn Successful locIP e000006 locPort 1093, RemIP c0a80186,
RemPort 9876
RPA Tunnel DOWN
RPA:InitTunnelConn Successful locIP e000006 locPort 1094, RemIP c0a80186,
RemPort 9876
```

Sample Output for the sat Option at All Levels

The following example shows inbound and outbound packet statistics. Note that for all levels, the debug output is the same for the **sat** option.

```
Router# debug satellite firmware level 1
Router# debug satellite firmware sat

satellite related trace events debugging is on
Router#
1d16h: Satellite2/0
SAT stats: OUTbound_pkts=25660796, INbound_pkts=3235932

1d16h: Satellite2/0
SAT stats: OUTbound_pkts=25660800, INbound_pkts=3235934

1d16h: Satellite2/0
SAT stats: OUTbound_pkts=25660803, INbound_pkts=3235934

1d16h: Satellite2/0
SAT stats: OUTbound_pkts=25660803, INbound_pkts=3235934
```

Sample Output for the tcp Option at Level 1

The following example shows TCP statistics:

```
Router# debug satellite firmware level 1
Router# debug satellite firmware tcp

satellite tcp events debugging is on
Router#
2d06h: Satellite2/0
TCP stats: NetRXBytes=631292 NetTXBytes=4009436 NetRxPkts=49244 ToIOSPkts=49246

2d06h: Satellite2/0
TCP stats: NetRXBytes=1154356 NetTXBytes=4086106 NetRxPkts=49621 ToIOSPkts=49629
```

Sample Output for the tcp Option at Level 2

The following example shows the TCP connections:

```
Router# debug satellite firmware level 2
Router# debug satellite firmware tcp

satellite tcp events debugging is on
Router#
2d06h: Satellite2/0 TCP connections:
ID=48, locIP=192.168.107.2 remIP=172.25.1.2, locP=2962, remP=21 state=17 iosQ=0
ID=49, locIP=192.168.107.2 remIP=172.25.1.2, locP=2963, remP=20 state=17 iosQ=0
ID=58, locIP=192.168.107.2 remIP=172.25.1.28, locP=2972, remP=21 state=17 iosQ=0
ID=59, locIP=192.168.107.2 remIP=172.25.1.28, locP=2973, remP=20 state=17 iosQ=7

2d06h: Satellite2/0 TCP connections:
ID=48, locIP=192.168.107.2 remIP=172.25.1.2, locP=2962, remP=21 state=17 iosQ=0
ID=49, locIP=192.168.107.2 remIP=172.25.1.2, locP=2963, remP=20 state=7 iosQ=0
ID=60, locIP=192.168.107.2 remIP=172.25.1.28, locP=2974, remP=21 state=3 iosQ=0
```

Sample Output for the tcp Option at Level 3

The following example shows TCP statistics and connections:

```
Router# debug satellite firmware level 3
Output may be extensive and affect performance. Continue? [yes]: yes
Router# debug satellite firmware tcp

satellite tcp events debugging is on
Router#
2d06h: Satellite2/0
TCP stats: NetRXBytes=279 NetTXBytes=9436111 NetRxPkts=64991 ToIOSPkts=64999

2d06h: Satellite2/0 TCP connections:
ID=48, locIP=192.168.107.2 remIP=172.25.1.2, locP=2962, remP=21 state=7 iosQ=0
ID=49, locIP=192.168.107.2 remIP=172.25.1.2, locP=2963, remP=20 state=7 iosQ=0
ID=62, locIP=192.168.107.2 remIP=172.25.1.28, locP=2976, remP=21 state=7 iosQ=0

2d06h: Satellite2/0
TCP stats: NetRXBytes=382 NetTXBytes=9582924 NetRxPkts=64993 ToIOSPkts=65001

2d06h: Satellite2/0 TCP connections:
ID=48, locIP=192.168.107.2 remIP=172.25.1.2, locP=2962, remP=21 state=17 iosQ=0
ID=49, locIP=192.168.107.2 remIP=172.25.1.2, locP=2963, remP=20 state=17 iosQ=0
ID=62, locIP=192.168.107.2 remIP=172.25.1.28, locP=2976, remP=21 state=7 iosQ=0
```

Sample Output for the trc Option at Level 3

The following example shows detailed receive and transmit traces for the backbone link:

```
Router# debug satellite firmware level 3
Output may be extensive and affect performance. Continue? [yes]: yes
Router# debug satellite firmware trc

satellite BackBone trace debugging is on
Router#
2d06h: Satellite2/0 strrec 0, rec 0, count 256, trc 1a6dd78, str 1a5c600, end 1a
74600
count 4096, emp 1a6dd78, fil 1a6d8b0, lnknum=6
   0 xmt  6 len  951  9 pd    con 0 PF  3 ns  169 nr   15  a c12 0   0.000
   1 xmt  6 len  951  9 pd    con 0 PF  3 ns  170 nr   15  a c12 0   0.010
   2 xmt  6 len  951  9 pd    con 0 PF  3 ns  171 nr   15  a c12 0   0.010
   3 xmt  6 len  951  9 pd    con 0 PF  3 ns  172 nr   15  a c12 0   0.010
   4 xmt  6 len  951  9 pd    con 0 PF  3 ns  173 nr   15  a c12 0   0.030
   5 xmt  6 len
2d06h: Satellite2/0  951
2d06h: Satellite2/0  9 pd    con 0 PF  3 ns  174 nr   15  a c12 0   0.010
   6 xmt  6 len  951  9 pd    con 0 PF  3 ns  175 nr   15  a c12 0   0.010
   7 xmt  6 len  951  9 pd    con 0 PF  3 ns  176 nr   15  a c12 0   0.010
   8 xmt  6 len  951  9 pd    con 0 PF  3 ns  177 nr   15  a c12 0   0.010
   9 xmt  6 len  951  9 pd    con 0 PF  3 ns  178 nr   15  a c12 0   0.010
  10 xmt  6 len  951  9 pd    con 0 PF  3 ns  179 nr   15  a c12 0   0.010
  11 xmt  6 len  951  9 pd    con 0 PF  3 ns  180 nr   15  a c12 0   0.010
```

Related Commands

Command	Description
debug satellite	Enables debugging output for the Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT).

debug satellite

To enable debugging output for the Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT), use the **debug satellite** command in privileged EXEC mode. To disable debugging output, use the **no** form of this command.

debug satellite {**all** | **errors** | **events** | **hsrp** | **rbcp**}

no debug satellite {**all** | **errors** | **events** | **hsrp** | **rbcp**}

Syntax Description

all	Displays all types of satellite debug information.
errors	Displays debug information for satellite error events.
events	Displays debug information for software events.
hsrp	Displays debug information for satellite Hot Standby Router Protocol (HSRP) events.
rbcp	Displays debug information for satellite Router Blade Control Protocol (RBCP) messages.

Defaults

No default behavior or values

Command Modes

Privileged EXEC

Command History

Release	Modification
12.3(14)T	This command was introduced.

Usage Guidelines

The **debug satellite errors** command is useful for catching unusual conditions when troubleshooting unexpected behavior. Because this command typically generates very little output, you can enter the **debug satellite errors** command every time you troubleshoot satellite network connectivity.

Examples

This section provides the following examples:

- Sample Output for the debug satellite rbcp Command, page 128
- Sample Output for the debug satellite events Command, page 128
- Sample Output for the debug satellite hsrp Command, page 128
- Combined Sample Output for the debug satellite hsrp and debug standby Commands, page 129

Sample Output for the debug satellite rbcp Command

Every 2 minutes, the NM-1VSAT-GILAT network module sends the router an RBCP message requesting any updates to the routing table. The following example shows how to monitor the route-update messages:

```
Router# debug satellite rbcp
...
```

The NM-1VSAT-GILAT network module requests IP route information:

```
*May 16 09:18:54.475:Satellite1/0 RBCP Request  msg Recd:IPROUTE_REQ(0x22)
```

The Cisco IOS software acknowledges that it received the message from the NM-1VSAT-GILAT network module:

```
*May 16 09:18:54.475:Satellite1/0 RBCP Response msg Sent:IPROUTE_REQ(0x22)
```

The Cisco IOS software sends the IP route information to the NM-1VSAT-GILAT network module:

```
*May 16 09:18:54.475:Satellite1/0 RBCP Request  msg Sent:IPROUTE_UPD(0x23)
```

The NM-1VSAT-GILAT network module acknowledges that it received the routing update from the Cisco IOS software:

```
*May 16 09:18:54.475:Satellite1/0 RBCP Response msg Recd:IPROUTE_UPD(0x23)
```

Sample Output for the debug satellite events Command

The following example shows how to monitor the periodic heartbeats that the NM-1VSAT-GILAT network module sends to the Cisco IOS software:

```
Router# debug satellite events

satellite major software events debugging is on
.Dec 16 12:57:52.108:Satellite1/0 FSM transition LINK_UP-->LINK_UP, ev=got_heartbeat
.Dec 16 12:58:08.888:Satellite1/0 FSM transition LINK_UP-->LINK_UP, ev=got_heartbeat
.Dec 16 12:58:25.664:Satellite1/0 FSM transition LINK_UP-->LINK_UP, ev=got_heartbeat
.Dec 16 12:58:42.440:Satellite1/0 FSM transition LINK_UP-->LINK_UP, ev=got_heartbeat
```

Sample Output for the debug satellite hsrp Command

The following example shows the **debug satellite hsrp** command messages that appear when the active router is forced to standby status because the HSRP-tracked satellite interface is shut down:

```
Router# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.

Router(config)# interface satellite 1/0
Router(config-if)# shutdown
Router(config-if)# end
Router#
01:03:48:%SYS-5-CONFIG_I:Configured from console by console
01:03:49:%LINK-5-CHANGED:Interface Satellite1/0, changed state to administratively down
01:03:50:%LINEPROTO-5-UPDOWN:Line protocol on Interface Satellite1/0, changed state to
down
01:04:22:%HSRP-6-STATECHANGE:FastEthernet0/0 Grp 1 state Active -> Speak
01:04:22:HSRP-sat:IPred group grp-x update state ACTIVE --> SPEAK
01:04:22:Satellite1/0 HSRP-sat:fsm crank ACTIVE-->STANDBY
01:04:22:Satellite1/0 HSRP-sat:send standby msg STANDBY
01:04:32:HSRP-sat:IPred group grp-x update state SPEAK --> STANDBY
01:04:32:Satellite1/0 HSRP-sat:fsm crank STANDBY-->STANDBY
01:04:32:Satellite1/0 HSRP-sat:send standby msg STANDBY
01:04:42:Satellite1/0 HSRP-sat:send standby msg STANDBY
01:04:52:Satellite1/0 HSRP-sat:standby msg STANDBY deferred, not in operational state
01:05:02:Satellite1/0 HSRP-sat:standby msg STANDBY deferred, not in operational state
```

```
01:05:12:Satellite1/0 HSRP-sat:standby msg STANDBY deferred, not in operational state
01:05:22:Satellite1/0 HSRP-sat:standby msg STANDBY deferred, not in operational state
01:05:32:Satellite1/0 HSRP-sat:standby msg STANDBY not sent, already in state
01:06:47:%VSAT-5-STANDBY_MODE:Satellite1/0 module configured for standby mode
01:09:32:Satellite1/0 HSRP-sat:fsm crank STANDBY-->STANDBY-UP
```

Combined Sample Output for the debug satellite hsrp and debug standby Commands

The following example shows HSRP-related debug output for both the router and the NM-1VSAT-GILAT network module when the router goes from standby to active state because the HSRP-tracked satellite interface is reenabled:

```
Router# show debugging

SATCOM:
  satellite HSRP events debugging is on

HSRP:
  HSRP Errors debugging is on
  HSRP Events debugging is on
  HSRP Packets debugging is on
```

The satellite interface is reenabled:

```
Router# configure terminal
Router(config)# interface satellite 1/0
Router(config-if)# no shutdown
Router(config-if)# end
Router#
```

The effective HSRP priority of the router changes as the tracked satellite interface comes up:

```
02:14:37:HSRP:Fa0/0 Grp 1 Hello  in  10.123.96.2 Active  pri 90 vIP 10.123.96.100
02:14:39:HSRP:Fa0/0 API 10.1.0.6 is not an HSRP address
02:14:39:HSRP:Fa0/0 Grp 1 Hello  out 10.123.96.3 Standby pri 90 vIP 10.123.96.100
02:14:39:HSRP:Fa0/0 Grp 1 Track 1 object changed, state Down -> Up
02:14:39:HSRP:Fa0/0 Grp 1 Priority 90 -> 100
Router#
```

The router changes from standby to active state because its priority is now highest in the hot standby group, and preemption is enabled:

```
02:14:40:HSRP:Fa0/0 Grp 1 Hello  in  10.123.96.2 Active  pri 90 vIP 10.123.96.100
02:14:40:HSRP:Fa0/0 Grp 1 Standby:h/Hello rcvd from lower pri Active router
(90/10.123.96.2)
02:14:40:HSRP:Fa0/0 Grp 1 Active router is local, was 10.123.96.2
02:14:40:HSRP:Fa0/0 Grp 1 Standby router is unknown, was local
02:14:40:HSRP:Fa0/0 Redirect adv out, Active, active 1 passive 3
02:14:40:HSRP:Fa0/0 Grp 1 Coup   out 10.123.96.3 Standby pri 100 vIP 10.123.96.100
02:14:40:HSRP:Fa0/0 Grp 1 Standby -> Active
02:14:40:%HSRP-6-STATECHANGE:FastEthernet0/0 Grp 1 state Standby -> Active
```

The HSRP status of the satellite interface also changes from standby to active state because the **service-module ip redundancy** command was previously entered to link the HSRP status of the satellite interface to the primary HSRP interface, Fast Ethernet 0/0.

```
02:14:40:HSRP:Fa0/0 Grp 1 Redundancy "grp-x" state Standby -> Active
02:14:40:HSRP-sat:IPred group grp-x update state STANDBY --> ACTIVE
02:14:40:Satellite1/0 HSRP-sat:fsm crank STANDBY-UP-->ACTIVE-COND
02:14:40:HSRP:Fa0/0 Redirect adv out, Active, active 1 passive 2
02:14:40:HSRP:Fa0/0 Grp 1 Hello  out 10.123.96.3 Active  pri 100 vIP 10.123.96.100
02:14:40:HSRP:Fa0/0 REDIRECT adv in, Passive, active 0, passive 2, from 10.123.96.2
02:14:40:HSRP:Fa0/0 REDIRECT adv in, Passive, active 0, passive 1, from 10.123.96.15
02:14:40:HSRP:Fa0/0 Grp 1 Hello  in  10.123.96.2 Speak   pri 90 vIP 10.123.96.100
```

Line protocols come up, and HSRP states become fully active:

```
02:14:41:%LINK-3-UPDOWN:Interface Satellite1/0, changed state to up
02:14:42:%LINEPROTO-5-UPDOWN:Line protocol on Interface Satellite1/0, changed state to up

02:14:43:HSRP:Fa0/0 Grp 1 Hello  out 10.123.96.3 Active  pri 100 vIP 10.123.96.100
02:14:43:HSRP:Fa0/0 Grp 1 Redundancy group grp-x state Active -> Active
02:14:43:HSRP-sat:IPred group grp-x update state ACTIVE --> ACTIVE
02:14:43:Satellite1/0 HSRP-sat:fsm crank ACTIVE-COND-->ACTIVE-COND
02:14:43:HSRP:Fa0/0 Grp 1 Hello  in  10.123.96.2 Speak   pri 90 vIP 10.123.96.100
02:14:46:HSRP:Fa0/0 Grp 1 Hello  out 10.123.96.3 Active  pri 100 vIP 10.123.96.100
02:14:46:HSRP:Fa0/0 Grp 1 Redundancy group grp-x state Active -> Active
02:14:46:HSRP-sat:IPred group grp-x update state ACTIVE --> ACTIVE
02:14:46:Satellite1/0 HSRP-sat:fsm crank ACTIVE-COND-->ACTIVE-COND
02:14:46:HSRP:Fa0/0 Grp 1 Hello  in  10.123.96.2 Speak   pri 90 vIP 10.123.96.100
02:14:49:HSRP:Fa0/0 Grp 1 Hello  out 10.123.96.3 Active  pri 100 vIP 10.123.96.100
02:14:49:HSRP:Fa0/0 Grp 1 Hello  in  10.123.96.2 Speak   pri 90 vIP 10.123.96.100
02:14:50:HSRP:Fa0/0 Grp 1 Hello  in  10.123.96.2 Standby pri 90 vIP 10.123.96.100
02:14:50:HSRP:Fa0/0 Grp 1 Standby router is 10.123.96.2
02:14:51:Satellite1/0 HSRP-sat:send standby msg ACTIVE
02:14:52:HSRP:Fa0/0 Grp 1 Hello  out 10.123.96.3 Active  pri 100 vIP 10.123.96.100
02:14:53:HSRP:Fa0/0 Grp 1 Hello  in  10.123.96.2 Standby pri 90 vIP 10.123.96.100
02:14:55:HSRP:Fa0/0 Grp 1 Hello  out 10.123.96.3 Active  pri 100 vIP 10.123.96.100
```

Related Commands

Command	Description
debug satellite firmware	Enables debugging output for the Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT) firmware.
debug standby	Displays all HSRP errors, events, and packets.

end (satellite initial configuration)

To exit satellite initial configuration mode, save any new or changed parameters, and reset the Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT), use the **end** command in satellite initial configuration mode.

end

Syntax Description

This command has no arguments or keywords.

Defaults

No default behavior or values

Command Modes

Satellite initial configuration

Command History

Release	Modification
12.3(14)T	This command was introduced.

Usage Guidelines

The **end** command is identical to the **exit** command in satellite initial configuration mode.

When you enter the **exit** or **end** command to exit satellite initial configuration mode, the system automatically saves any changed parameters to the NM-1VSAT-GILAT network module nonvolatile memory and resets the NM-1VSAT-GILAT network module.

Examples

The following example shows what appears when you enter the **end** or **exit** command after changing one or more initial configuration parameters:

```
Router(sat-init-config)# end
Applying changed parameters to the satellite module.
Parameter update succeeded.  Module is now resetting.
Router#
```

The following example shows what appears when you enter the **end** or **exit** command when no parameters have been changed:

```
Router(sat-init-config)# end
Router#
```

Related Commands

Command	Description
apply	Saves new or changed satellite initial configuration parameters and resets the Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT).
exit (satellite initial configuration)	Exits satellite initial configuration mode, saves any new or changed parameters, and resets the Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT).

exit (satellite initial configuration)

To exit satellite initial configuration mode, save any new or changed parameters, and reset the Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT), use the **exit** command in satellite initial configuration mode.

exit

Syntax Description

This command has no arguments or keywords.

Defaults

No default behavior or values

Command Modes

Satellite initial configuration

Command History

Release	Modification
12.3(14)T	This command was introduced.

Usage Guidelines

The **exit** command is identical to the **end** command in satellite initial configuration mode.

When you enter the **exit** or **end** command to exit satellite initial configuration mode, the system automatically saves any changed parameters to the NM-1VSAT-GILAT network module nonvolatile memory and resets the NM-1VSAT-GILAT network module.

Examples

The following example shows what appears when you enter the **exit** or **end** command after changing one or more initial configuration parameters:

```
Router(sat-init-config)# exit
Applying changed parameters to the satellite module.
Parameter update succeeded.  Module is now resetting.
Router#
```

The following example shows what appears when you enter the **exit** or **end** command when no parameters have been changed:

```
Router(sat-init-config)# exit
Router#
```

Related Commands

Command	Description
apply	Saves new or changed satellite initial configuration parameters and resets the Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT).
end (satellite initial configuration)	Exits satellite initial configuration mode, saves any new or changed parameters, and resets the Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT).

id aa-group

To configure the asynchronous acknowledgement group ID, use the **id aa-group** command in satellite initial configuration mode. To remove the ID configuration, use the **no** form of this command.

id aa-group *number*

no id aa-group

Syntax Description

aa-group	Asynchronous acknowledgement group ID.
number	ID number in the range from 256 to 511.

Defaults

No default behavior or values

Command Modes

Satellite initial configuration

Command History

Release	Modification
12.3(14)T	This command was introduced.

Usage Guidelines

This command is typically used by an installation technician. Do not use this command unless your satellite service provider instructs you to perform the satellite initial configuration and provides all necessary parameter values.

Examples

The following example shows how to configure the asynchronous acknowledgement group identification number:

```
Router(sat-init-config)# id aa-group 336
```

id software group

To configure the operational software group identification number, use the **id software group** command in satellite initial configuration mode. To remove the ID configuration, use the **no** form of this command.

id software group *number*

no id software group

Syntax Description

number	ID number in the range from 512 to 767.

Defaults

No default behavior or values

Command Modes

Satellite initial configuration

Command History

Release	Modification
12.3(14)T	This command was introduced.

Usage Guidelines

This command is typically used by an installation technician. Do not use this command unless your satellite service provider instructs you to perform the satellite initial configuration and provides all necessary parameter values.

Examples

The following example shows how to configure the operational software group identification number:

```
Router(sat-init-config)# id software group 598
```

id vsat

To configure the component physical address (CPA), use the **id vsat** command in satellite initial configuration mode. To remove the CPA configuration, use the **no** form of this command.

id vsat *number*

no id vsat *number*

Syntax Description

number	CPA number in the range from 1280 to 8100.

Defaults

No default behavior or values

Command Modes

Satellite initial configuration

Command History

Release	Modification
12.3(14)T	This command was introduced.

Usage Guidelines

The CPA uniquely identifies the VSAT endpoint in the satellite network.

Note This command is typically used by an installation technician. Do not use this command unless your satellite service provider instructs you to perform the satellite initial configuration and provides all necessary parameter values.

Examples

The following example shows how to configure the CPA number:

```
Router(sat-init-config)# id vsat 1284
```

interface satellite

To enter satellite interface configuration mode, use the **interface satellite** command in global configuration mode.

interface satellite *slot/unit*

Syntax Description

slot	Router chassis slot in which the network module is installed.
unit	Interface number. For NM-1VSAT-GILAT network modules, always use 0.

Defaults

No default behavior or values

Command Modes

Global configuration

Command History

Release	Modification
12.3(14)T	This command was introduced.

Examples

The following example shows how to enter satellite interface configuration mode:

```
Router(config)# interface satellite 1/0
Router(config-if)#
```

Related Commands

Command	Description
service-module satellite status	Displays status information related to the hardware and software on the Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT), including the initial configuration parameters.
show controllers satellite	Displays controller information about the internal router interface that connects to an installed Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT).
show interface satellite	Displays general interface settings and traffic rates for the internal router interface that connects to an installed Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT).

mode download

To enable operational code download mode for the Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT), use the **mode download** command in satellite initial configuration mode. To disable operational code download mode, use the **no** form of this command.

mode download

no mode download

Syntax Description

This command has no arguments or keywords.

Defaults

Operational code download mode is enabled.

Command Modes

Satellite initial configuration

Command History

Release	Modification
12.3(14)T	This command was introduced.

Usage Guidelines

This command is typically used by an installation technician. Do not use this command unless your satellite service provider instructs you to perform the satellite initial configuration and provides all necessary parameter values.

Examples

The following example shows how to disable operational code download mode:

```
Router(sat-init-config)# no mode download
```

mode two-way

To enable two-way operational mode for the Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT), use the **mode two-way** command in satellite initial configuration mode. To revert to one-way operational mode, use the **no** form of this command.

mode two-way

no mode two-way

Syntax Description

This command has no arguments or keywords.

Defaults

Two-way mode is enabled.

Command Modes

Satellite initial configuration

Command History

Release	Modification
12.3(14)T	This command was introduced.

Usage Guidelines

This command is typically used by an installation technician. Do not use this command unless your satellite service provider instructs you to perform the satellite initial configuration and provides all necessary parameter values.

Examples

The following example shows how to specify two-way operational mode:

```
Router(sat-init-config)# mode two-way
```

The following example shows how to specify one-way operational mode:

```
Router(sat-init-config)# no mode two-way
```

outbound data-pid

Note Effective with Cisco IOS Release 12.4(2)T, this command is superseded by the **outbound pid management** command. The **outbound data-pid** command is still available, but use of the **outbound pid management** command is recommended.

To specify the outbound data packet identification (PID) number, use the **outbound data-pid** command in satellite initial configuration mode. To remove the PID number configuration, use the **no** form of this command.

outbound data-pid *number*

no outbound data-pid

Syntax Description

number	Packet identification (PID) number in the range from 1 to 8190.

Defaults

No default behavior or values

Command Modes

Satellite initial configuration

Command History

Release	Modification
12.3(14)T	This command was introduced.
12.4(2)T	This command was superseded by the **outbound pid management** command.

Usage Guidelines

This command is typically used by an installation technician. Do not use this command unless your satellite service provider instructs you to perform the satellite initial configuration and provides all necessary parameter values.

Examples

The following example shows how to specify the outbound data PID number:

```
Router(sat-init-config)# outbound data-pid 3000
```

outbound data-rate

To specify the VSAT data rate, use the **outbound data-rate** command in satellite initial configuration mode. To remove the data rate configuration, use the **no** form of this command.

outbound data-rate *rate*

no outbound data-rate

Syntax Description

rate	VSAT data rate in the range from 250000 to 73000000 bits per second.

Defaults

No default behavior or values

Command Modes

Satellite initial configuration

Command History

Release	Modification
12.3(14)T	This command was introduced.

Usage Guidelines

This command is typically used by an installation technician. Do not use this command unless your satellite service provider instructs you to perform the satellite initial configuration and provides all necessary parameter values.

Examples

The following example shows how to specify the VSAT data rate:

```
Router(sat-init-config)# outbound data-rate 450000
```

outbound frequency

To specify the VSAT outbound frequency, use the **outbound frequency** command in satellite initial configuration mode. To remove the outbound frequency configuration, use the **no** form of this command.

outbound frequency *frequency*

no outbound frequency

Syntax Description

frequency	VSAT outbound frequency in the range from 950000 to 2150000 kilohertz.

Defaults

No default behavior or values

Command Modes

Satellite initial configuration

Command History

Release	Modification
12.3(14)T	This command was introduced.

Usage Guidelines

This command is typically used by an installation technician. Do not use this command unless your satellite service provider instructs you to perform the satellite initial configuration and provides all necessary parameter values.

Examples

The following example shows how to configure the VSAT outbound frequency:

```
Router(sat-init-config)# outbound frequency 950000
```

outbound id

To specify the VSAT outbound ID, use the **outbound id** command in satellite initial configuration mode. To remove the outbound ID configuration, use the **no** form of this command.

outbound id *number*

no outbound id

Syntax Description

number	ID number in the range from 0 to 255.

Defaults

No default behavior or values

Command Modes

Satellite initial configuration

Command History

Release	Modification
12.3(14)T	This command was introduced.

Usage Guidelines

This command is typically used by an installation technician. Do not use this command unless your satellite service provider instructs you to perform the satellite initial configuration and provides all necessary parameter values.

Examples

The following example shows how to configure the VSAT outbound ID:

```
Router(sat-init-config)# outbound id 95
```

outbound modulation-type

To specify the VSAT modulation type, use the **outbound modulation-type** command in satellite initial configuration mode. To remove the VSAT modulation type configuration, use the **no** form of this command.

outbound modulation-type {**DVB** | **TURBO_QPSK** | **8PSK**}

no outbound modulation-type

Syntax Description

DVB	Digital Video Broadcasting for satellite.
TURBO_QPSK	Turbo-coded quadrature Phase Shift Keying.
8PSK	Phase Shift Keying.

Defaults

No default behavior or values

Command Modes

Satellite initial configuration

Command History

Release	Modification
12.3(14)T	This command was introduced.

Usage Guidelines

This command is typically used by an installation technician. Do not use this command unless your satellite service provider instructs you to perform the satellite initial configuration and provides all necessary parameter values.

Examples

The following example shows how to configure the VSAT modulation type:

```
Router(sat-init-config)# outbound modulation-type DVB
```

outbound sync ip address

To specify the outbound synchronization IP address, use the **outbound sync ip address** command in satellite initial configuration mode. To remove the outbound synchronization IP address configuration, use the **no** form of this command.

outbound sync ip address *address*

no outbound sync ip address

Syntax Description

address	Outbound synchronization IP address.

Defaults

No default behavior or values

Command Modes

Satellite initial configuration

Command History

Release	Modification
12.3(14)T	This command was introduced.

Usage Guidelines

This command is typically used by an installation technician. Do not use this command unless your satellite service provider instructs you to perform the satellite initial configuration and provides all necessary parameter values.

Examples

The following example shows how to configure the outbound synchronization IP address:

```
Router(sat-init-config)# outbound sync ip address 10.2.2.2
```

outbound viterbi-rate

To specify the VSAT Viterbi code rate, use the **outbound viterbi-rate** command in satellite initial configuration mode. To return to the default rate, use the **no** form of this command.

outbound viterbi-rate *rate*

no outbound viterbi-rate

Syntax Description

rate	Viterbi code rate. It can be one of the following values: • **1/2** • **1/4** • **2/3** • **3/4** • **3/4(2.05)** • **3/4(2.1)** • **3/4(2.6)** • **5/6** • **6/7** • **7/8** • **8/9**

Defaults

No default behavior or values

Command Modes

Satellite initial configuration

Command History

Release	Modification
12.3(14)T	This command was introduced.

Usage Guidelines

This command is typically used by an installation technician. Do not use this command unless your satellite service provider instructs you to perform the satellite initial configuration and provides all necessary parameter values.

Examples

The following example shows how to configure the VSAT Viterbi code rate:

```
Router(sat-init-config)# outbound viterbi-rate 3/4(2.6)
```

password (satellite initial configuration)

To define or to change the password of the NM-1VSAT-GILAT network module required to enter satellite initial configuration mode, use the **password** command in the satellite initial configuration mode.

password *password*

Syntax Description

password	A string of up to 32 alphanumeric characters.

Command Default

The factory-supplied default password is active.

Command Modes

Satellite initial configuration.

Command History

Release	Modification
12.4(11)XJ2	This command was introduced.

Usage Guidelines

The NM-1VSAT-GILAT network module has a factory-supplied unique default password to enter satellite initial configuration mode for initial configuration. During this configuration, the **password** command is used to set a user-defined password for subsequent entries to satellite initial configuration mode. The user-defined password consists of up to 32 alphanumeric characters.

Examples

The following example shows how to enter a user-defined password:

```
Router(sat-init-config)# password vsatuser
```

service-module backup interface

To configure an interface as a secondary or dial backup to the satellite interface, use the **service module backup interface** command in satellite interface configuration mode. To remove the backup interface configuration, use the **no** form of this command.

service module backup interface *interface*

no service module backup interface *interface*

Syntax Description

interface	Interface type and number.

Defaults

No default behavior or values

Command Modes

Satellite interface configuration

Command History

Release	Modification
12.3(14)T	This command was introduced.

Examples

The following example shows how to set interface async 1 as the backup to the satellite link:

```
Router(config-if)# service-module backup interface async1
```

Related Commands

Command	Description
service-module backup mode	Sets the terrestrial backup mode for the Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT).

service-module backup mode

To set the terrestrial dial backup mode for the Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT), use the **service-module backup mode** command in satellite interface configuration mode. To return to the router (default) dial backup mode, use the **no** form of this command.

service-module backup mode [**hub** | **router**]

no service-module backup mode

Syntax Description

hub	Hub dial backup mode.
router	Router dial backup mode.

Defaults

Router dial backup mode

Command Modes

Satellite interface configuration

Command History

Release	Modification
12.3(14)T	This command was introduced.

Usage Guidelines

Hub Dial Backup Mode

Hub dial backup mode maintains TCP connections during transitions between primary and backup links. Note, however, that hub dial backup mode provides backup for the satellite *link*, but not for the NM-1VSAT-GILAT network module hardware, the router satellite interface, or other router interfaces. If the satellite link goes down (for example, because of rain fade) in hub dial backup mode, the NM-1VSAT-GILAT network module connects to the hub using dial-on-demand routing (DDR). Common DDR backup links use ISDN BRIs, modems on auxiliary ports, and T1/E1 lines.

The NM-1VSAT-GILAT network module always encapsulates packets using a satellite backbone protocol before sending the packets over the satellite link. In hub dial backup mode, the NM-1VSAT-GILAT network module continues to encapsulate the packets using the satellite backbone protocol before sending the packets over the dial backup link to the hub; this is how hub dial backup mode maintains TCP connections during transitions between the primary satellite link and the dial backup link. Therefore, hub dial backup mode works only when the NM-1VSAT-GILAT network module itself is functioning properly.

Router Dial Backup Mode

If the satellite link goes down in router dial backup mode, the router uses DDR to send data out a different interface. Unlike hub dial backup mode, router dial backup mode does these things:

- Tears down and reestablishes TCP connections during transitions between primary and backup links
- Does not require that the NM-1VSAT-GILAT network module work properly while the backup link is in use

Examples

The following example shows how to specify hub backup mode:

```
Router(config-if)# service-module backup mode hub
```

The following example shows how to specify router backup mode:

```
Router(config-if)# service-module backup mode router
```

Related Commands

Command	Description
service-module backup interface	Specifies the interface to use to back up the satellite interface.

service-module ip address

To define the IP address for the internal network-module-side interface on a content engine network module (NM-CE-BP) or Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT), use the **service-module ip address** command in content-engine interface configuration mode or satellite interface configuration mode. To delete the IP address associated with this interface, use the **no** form of this command.

service-module ip address *nm-side-ip-addr subnet-mask*

no service-module ip address

Syntax Description

nm-side-ip-addr	IP address of the internal network-module-side interface on a CE network module (NM-CE-BP) or Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT).
subnet-mask	Subnet mask to append to the IP address.

Defaults

No default behavior or values

Command Modes

Content-engine interface configuration
Satellite interface configuration

Command History

Release	Modification
12.2(11)YT	This command was introduced for the CE network module.
12.2(13)T	This command was integrated into Cisco IOS Release 12.2(13)T.
12.3(14)T	This command was implemented for the Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT).

Usage Guidelines

Content Engine Network Module (NM-CE-BP)

There are no usage guidelines for this command.

Cisco IP VSAT Satellite WAN Network Module (NM-1VSAT-GILAT)

For the NM-1VSAT-GILAT network module, the **service-module ip address** command is typically not used. The NM-1VSAT-GILAT network module IP address is automatically configured when you enter the **ip address** command in satellite interface configuration mode to configure the IP address and subnet mask of the router satellite interface with these conditions:

- The IP address leaves a remainder of 2 when the last octet is divided by 4.
- The subnet mask has /30 or fewer masking bits.

If you use this method to configure the IP address for the router satellite interface, the system automatically configures the IP address and subnet mask on the NM-1VSAT-GILAT network module with these results:

- The IP address is 1 less than the IP address you configured for the router satellite interface.
- The subnet mask is /30.

You can override the automatically configured IP address and mask by manually entering the **service-module ip address** command.

Note The automatically configured IP address does not appear in the router configuration, because the **service-module ip address** command is considered to be set to its default value. Similarly, if you manually configure an IP address and subnet mask that are identical to the automatically configured IP address and subnet mask, the **service-module ip address** command does *not* appear in the router configuration.

Examples

This section provides the following examples:

- Content Engine Network Module (NM-CE-BP) Example, page 151
- Cisco IP VSAT Satellite WAN Network Module (NM-1VSAT-GILAT) Example—Manually Configuring the IP Address, page 151
- Cisco IP VSAT Satellite WAN Network Module (NM-1VSAT-GILAT) Example—Using the Automatically Configured IP Address, page 152
- Cisco IP VSAT Satellite WAN Network Module (NM-1VSAT-GILAT) Example—Overriding the Automatically Configured IP Address, page 152

Content Engine Network Module (NM-CE-BP) Example

The following example shows how to define an IP address for the internal network-module-side interface on the CE network module in slot 1:

```
Router(config)# interface content-engine 1/0
Router(config-if)# service-module ip address 172.18.12.26 255.255.255.0
Router(config-if)# exit
```

Cisco IP VSAT Satellite WAN Network Module (NM-1VSAT-GILAT) Example—Manually Configuring the IP Address

In the following example, the router satellite interface is assigned an IP address (10.0.0.7), the last octet of which does *not* leave a remainder of 2 when divided by 4. The system displays a message to manually configure the IP address for the NM-1VSAT-GILAT network module. Notice that the IP addresses for both the router satellite interface and the NM-1VSAT-GILAT network module appear in the running configuration.

```
Router(config)# interface satellite 1/0
Router(config-if)# ip address 10.0.0.7 255.255.255.0

%VSAT-6-PIMINCOMPADDR:The IP address configured on Satellite1/0
      requires a manually configured IP address for the satellite module

Router(config-if)# service-module ip address 10.0.0.6 255.255.255.0
Router(config-if)# end
```

```
Router# show running-config | begin Satellite

interface Satellite 1/0
   ip address 10.0.0.7 255.255.255.0
   service-module ip address 10.0.0.6 255.255.255.0
.
.
.
```

Cisco IP VSAT Satellite WAN Network Module (NM-1VSAT-GILAT) Example—Using the Automatically Configured IP Address

In the following example, the router satellite interface IP address is configured as 10.0.0.6. Because the last octet of the IP address leaves a remainder of 2 when divided by 4, the system automatically configures the IP address for the NM-1VSAT-GILAT network module.

Although the NM-1VSAT-GILAT network module IP address and mask do not appear in the router configuration, you know that the IP address is 1 less than the IP address of the router satellite interface and has a subnet mask of /30. In this case, the NM-1VSAT-GILAT network module is automatically configured with the following IP address and mask: 10.0.0.5 255.255.255.252.

```
!
interface Satellite 1/0
 ip address 10.0.0.6 255.255.255.0
!
```

Cisco IP VSAT Satellite WAN Network Module (NM-1VSAT-GILAT) Example—Overriding the Automatically Configured IP Address

In the following example, the router satellite interface IP address is configured as 10.0.0.6. Because the last octet of the IP address leaves a remainder of 2 when divided by 4, the system automatically configures the IP address and mask for the NM-1VSAT-GILAT network module as 10.0.0.5 255.255.255.252.

Nevertheless, the NM-1VSAT-GILAT network module IP address and mask are manually configured as 10.0.0.1 255.255.255.0 to override the automatically derived IP address and mask. Notice that the IP addresses for both the router satellite interface and the NM-1VSAT-GILAT network module appear in the running configuration.

```
!
interface Satellite 1/0
 ip address 10.0.0.6 255.255.255.0
 service-module ip address 10.0.0.1 255.255.255.0
!
```

Related Commands

Command	Description
show controllers content-engine	Displays controller information for CE network modules.
show controllers satellite	Displays controller information about the internal router interface that connects to an installed Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT).

Command	Description
show interfaces satellite	Displays general interface settings and traffic rates for the internal router interface that connects to an installed Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT).
show interfaces content-engine	Displays basic interface configuration information for a CE network module.

service-module ip redundancy

To link the primary HSRP interface status to that of the satellite interface, use the **service-module ip redundancy** command in satellite interface configuration mode. To remove the link between the primary HSRP interface status and the satellite interface status, use the **no** form of this command.

service-module ip redundancy *group-name*

no service-module ip redundancy *group-name*

Syntax Description

group-name	Name of the hot standby group. This name must match the hot standby group name configured for the primary HSRP interface, which is typically an Ethernet interface.

Defaults

HSRP is disabled.

Command Modes

Satellite interface configuration

Command History

Release	Modification
12.3(14)T	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

Usage Guidelines

Use the **service-module ip redundancy** command only when you have two Cisco IP VSAT satellite WAN network modules (NM-1VSAT-GILAT) on separate HSRP-redundant routers that connect to the same outdoor unit (ODU).

This command enables the satellite interface to spoof the line protocol UP state.

Examples

The following example shows how to link the primary HSRP interface status to that of the satellite interface:

```
service-module ip redundancy grp-hsrp
```

Related Commands

Command	Description
standby ip	Activates HSRP.
standby name	Configures the name of the hot standby group.
standby preempt	Enables preemption on the router and optionally configures a preemption delay.
standby track	Configures an interface so that the hot standby priority changes based on the availability of other interfaces.

service-module itae

To configure a pre-built access list for integrated TCP acceleration and encryption (ITAE) in the NM-1VSAT-GILAT network module, use the **service-module itae** command in the satellite initial configuration mode. To disable the packet acceleration configuration, use the **no** form of this command.

service-module itae {**auto-acl**}

no service-module itae

Syntax Description

auto-acl	Enables automatic configuration of the service provider-supplied pre-built access list for packet acceleration and encryption.

Command Default

Packet acceleration and encryption is not enabled for traffic between the hub and the NM-1VSAT-GILAT network module.

Command Modes

Satellite initial configuration.

Command History

Release	Modification
12.4(11)XJ2	This command was introduced.

Examples

The following example shows how to enter satellite configuration mode and configure the pre-built access list for ITAE:

```
Router> interface Satellite1/0
Router(sat-init-config)# service module itae auto-acl
```

Related Commands

Command	Description
service-module status	Verifies that ITAE is enabled and configured properly on the VSAT from the hub.

service-module routing redistribute

To enable the router to send its routing database to the satellite network central hub, use the **service-module routing redistribute** command in satellite interface configuration mode. To prevent the router from sending its routing database over the satellite network, use the **no** form of this command.

service-module routing redistribute

no service-module routing redistribute

Syntax Description

This command has no arguments or keywords.

Defaults

The router is enabled to send its routing database to the hub.

Command Modes

Satellite interface configuration

Command History

Release	Modification
12.3(14)T	This command was introduced.

Usage Guidelines

The **service-module routing redistribute** command is used on a VSAT router, that is, an earthbound modular access router equipped with a Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT) that connects to a satellite network. When VSAT route updates are enabled, the NM-1VSAT-GILAT network module uses Router Blade Configuration Protocol (RBCP) messages to communicate VSAT routing table changes to the hub.

Entering the **no service-module routing redistribute** command is useful when you do not want the hub to be aware of all the routes known by the VSAT router, such as when Network Address Translation (NAT) is configured on the router.

The hub must learn the remote VSAT routing database for the satellite network to function properly. Therefore, if you enter the **no service-module routing redistribute** command, then one of the following actions is required:

- You use RIPv2 as the only routing protocol on your VSAT router. The hub can understand and track RIPv2 route updates.
- On the hub router, configure static routes to the VSAT router networks.

Examples

The following example shows how to prevent the VSAT router from sending its routing database to the satellite network central hub:

```
Router(config-if)# no service-module routing redistribute
```

service-module satellite backup

To test the hub dial backup connection for the Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT), use the **service-module satellite backup** command in privileged EXEC mode.

service module satellite *slot*/*unit* **backup** {**initiate** | **terminate**}

Syntax Description

slot	Router chassis slot in which the network module is installed.
unit	Interface number. For NM-1VSAT-GILAT network modules, always use 0.
initiate	Initiates a hub dial backup connection.
terminate	Terminates a hub dial backup connection.

Defaults

No default behavior or values.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.3(14)T	This command was introduced.

Usage Guidelines

The **service-module satellite backup** command is used only when you configure *hub* dial backup for the Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT).

Normally, the hub dial backup connection comes up only when the satellite link goes down (for example, because of a rain-fade event). The **service-module satellite backup** command allows you to artificially bring down the satellite link to test the hub dial backup connection.

Examples

The following example shows how to initiate a satellite backup test:

```
Router# service-module satellite 1/0 backup initiate
```

The following example shows how to terminate a running satellite backup test:

```
Router# service-module satellite 1/0 backup terminate
```

Related Commands

Command	Description
service-module backup interface	Specifies the interface to use to back up the satellite interface on the Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT).
service-module backup mode	Sets the terrestrial backup mode for the Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT).

service-module satellite configuration

To enter satellite initial configuration mode, use the **service-module satellite configuration** command in user EXEC or privileged EXEC mode.

service-module satellite *slot*/*unit* **configuration**

Syntax Description

slot	Router chassis slot in which the network module is installed.
unit	Interface number. For NM-1VSAT-GILAT network modules, always use 0.

Defaults

No default behavior or values.

Command Modes

User EXEC
Privileged EXEC

Command History

Release	Modification
12.3(14)T	This command was introduced.

Usage Guidelines

You need a password from your satellite service provider to enter satellite initial configuration mode.

The parameters that you configure in satellite initial configuration mode are saved directly to the network module and do not appear in the router configuration, even though you configure the parameters through the Cisco IOS CLI.

To view the parameter values that were configured in satellite initial configuration mode, use one of the following commands:

- **show** command in satellite initial configuration mode
- **service-module satellite** *slot*/**0 status** command in privileged EXEC mode

Note This command is typically used by an installation technician. Do not use this command unless your satellite service provider instructs you to perform the satellite initial configuration and provides all necessary parameter values.

Examples

The following example shows how to enter satellite initial configuration mode:

```
Router> service-module satellite 1/0 configuration
Password: <mypassword>
Reminder:changing any parameters will result in a software reset of the module.
Router(sat-init-config)>
```

Related Commands

Command	Description
end (satellite initial configuration)	Exits satellite initial configuration mode, saves any new or changed parameters, and resets the Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT).
exit (satellite initial configuration)	Exits satellite initial configuration mode, saves any new or changed parameters, and resets the Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT).
service-module satellite status	Displays status information related to the hardware and software on the Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT), including the initial configuration parameters.
show (satellite initial configuration)	Displays the initial configuration parameters for the Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT).

service-module satellite cw-mode

To enable or disable continuous wave mode, use the **service-module satellite cw-mode** command in satellite interface configuration mode.

service-module satellite *slot/unit* **cw-mode** {**off** | **on frequency** *frequency* [**time** *time*]}

Syntax Description

slot	Router chassis slot in which the network module is installed.
unit	Interface number. For NM-1VSAT-GILAT network modules, always use 0.
off	Disables continuous wave mode.
on	Enables continuous wave mode.
frequency *frequency*	Frequency, in kilohertz, in the range from 900000 to 1650000.
time *time*	Length of time, in seconds, that continuous wave mode is enabled. The *time* argument is a number in the range from 60 to 1800.

Defaults

Continuous wave mode is disabled.

If the time is not specified, continuous wave mode continues until turned off.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.3(14)T	This command was introduced.
12.4(2)T	A password challenge was added to the command-line interface when continuous wave mode is enabled.

Usage Guidelines

Continuous wave mode can be enabled only when the Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT) is in boot mode.

When continuous wave mode is enabled, the NM-1VSAT-GILAT network module transmits unmodulated carrier waves that can be used for dish antenna orientation adjustments and for signal quality measurements.

Note This command is typically used by an installation technician. Do not use this command unless your satellite service provider instructs you to do so.

Note You need a password from your satellite service provider to enable continuous wave mode.

Examples

The following example shows how to enable continuous wave mode for 2 minutes, at 900000 kilohertz:

```
Router# service-module satellite 1/0 cw-mode on frequency 900000 time 120
Password: <mypassword>
CW mode obtained.
```

The following example shows how to disable continuous wave mode:

```
Router# service-module satellite 1/0 cw-mode off
CW mode released.
```

The following example shows the message that appears when you try to enable continuous wave mode while the NM-1VSAT-GILAT network module is *not* in boot mode:

```
Router# service-module satellite 1/0 cw-mode on frequency 900000 time 120
Password <mypassword>
% CW mode NOT obtained!  Valid during boot mode only.
```

service-module satellite status

To display status information related to the hardware and software on the Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT), including the initial configuration parameters, use the **service-module satellite status** command in privileged EXEC mode.

service-module satellite *slot*/*unit* **status** [**log**]

Syntax Description

slot	Router chassis slot in which the network module is installed.
unit	Interface number. For NM-1VSAT-GILAT network modules, always use 0.
log	Extends the output to include the last ring of messages from the firmware and the last crash dump available from the NM-1VSAT-GILAT network module.

Defaults

No default behavior or values.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.3(14)T	This command was introduced.

Usage Guidelines

Use the **service-module satellite status** command to troubleshoot the Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT).

Examples

See Table 5 for **service-module satellite status** command output field descriptions.

This section provides the following examples:

Normal Operation Example

The following example shows that the link to the hub (backbone status) is up, as is expected in normal working conditions:

```
Router# service-module satellite 2/0 status

Getting status from the satellite module, please wait..

Software Versions, OS:14.2.2, RSP:1.5.1.3, MBC:1.0.0.5
HW Version:00008100
CPA Number:6204, HPS CPA:1, HSP Link:2
AA Group: 258, SW Group: 512, Download: YES
Service Module Uptime:00:06:40, Router Uptime:1 day, 20 hours, 26 minutes
Current router clocktime:*03:11:22.641 UTC Tue Dec 2 2003
Oper Mode:OPERATIONAL, In Dial Backup:NO, Standby:NO, One-Way:NO
RBCP Received Packets:44, RBCP Sent Packets:41
Bit Error Rate:0e-0, Signal to Noise Ratio:12.4453
IP Address/Mask:10.22.1.1/255.255.255.252
Service Module MAC:00:A0:AC:00:20:60
RX Lock:LOCKED, Sync Lock:LOCKED
BackBone Status:UP, Two-Way Mode:YES, DA/RA Mode:RA
Outbound Modulation Type:DVB, OB Code Rate:3/4
Outbound Unicast Packets:61, OB Multicast Packets:23547
Outbound ID:2, OB PID:514, OB Freq:1201000, OB Bit Rate:30000000
Outbound Sync IP address: 172.22.0.3
Inbound Start Freq:1201176, IB Stop Freq:1209336
Inbound Data Rate:307200, IB Freq Offset:0
Inbound Packets:3553
BackBone Hub Link Status:UP
BackBone Received Packets:1, BB Sent:3552
BackBone Received Retransmitted:0, BB Sent Retrans:0
Service Module Eth RX:3550, TX:47110
Service Module Eth Multicast RX:1, Multicast TX:23563
Bufs Configured:5000, Bufs Free:4951
Internal Software State parameters:
   Service Module SW State Var:3
   General IOS FSM:LINK_UP, HSRP FSM:ACTIVE, HSRP VSAT Mode:ACTIVE
   Lost Beats Total:0, Lost Beats This Retry:0
VOIP DA calls:
  NONE
```

Boot Mode Example

The following example shows that the NM-1VSAT-GILAT network module is in boot mode after a software reset, so that the link to the hub (backbone status) is down:

```
Router# service-module satellite 1/0 status

Getting status from the satellite module, please wait..

Software Versions, OS:0.0.0, RSP:1.0.0.5, MBC:0.0.0.0
HW Version:001D1757
CPA Number:6204, HPS CPA:0, HSP Link:2
AA Group: 258, SW Group: 512, Download: YES
Service Module Uptime:00:00:14, Router Uptime:1 day, 20 hours, 19 minutes
Current router clocktime:*03:04:38.017 UTC Tue Dec 2 2003
Oper Mode:BOOT, In Dial Backup:NO, Standby:NO, One-Way:NO
RBCP Received Packets:1, RBCP Sent Packets:8
Bit Error Rate:0e-0, Signal to Noise Ratio:12.4453
IP Address/Mask:172.27.1.54/255.255.255.252
Service Module MAC:00:A0:AC:00:20:60
RX Lock:LOCKED, Sync Lock:NOT LOCKED
BackBone Status:DOWN, Two-Way Mode:YES, DA/RA Mode:RA
```

```
Outbound Modulation Type:DVB, OB Code Rate:3/4
Outbound Unicast Packets:0, OB Multicast Packets:0
Outbound ID:2, OB PID:514, OB Freq:1201000, OB Bit Rate:30000000
Outbound Sync IP address: 172.22.0.3
Inbound Start Freq:1201176, IB Stop Freq:1209336
Inbound Data Rate:307200, IB Freq Offset:0

COUNTERS OMITTED.  Not available at this time.

Internal Software State parameters:
   Service Module SW State Var:3
   General IOS FSM:LINK_DOWN, HSRP FSM:ACTIVE, HSRP VSAT Mode:ACTIVE
   Lost Beats Total:0, Lost Beats This Retry:0
VOIP DA calls:
  NONE
```

Software Reset Example

The following example shows what appears during the beginning stages of a software reset:

```
Router# service-module satellite 2/0 status

   Getting status from the satellite module, please wait..

   % Satellite2/0 card is busy.  Status is not available.  Try later.
```

Hub Dial Backup Example

The following example shows that the hub dial backup link is being used instead of the satellite link. Note, however, that hub dial backup keeps the backbone status up. In hub dial backup mode, the NM-1VSAT-GILAT network module connects to the hub over a specified dial backup link and maintains TCP connections.

```
Router# service-module satellite 1/0 status

Getting status from the satellite module, please wait..

Software Versions, OS:14.2.3, RSP:1.5.1.3, MBC:1.0.0.5
HW Version:00008100
CPA Number:3201, HPS CPA:1, HSP Link:2
AA Group: 258, SW Group: 512, Download: YES
Service Module Uptime:02:09:38, Router Uptime:2 hours, 10 minutes
Current router clocktime:*19:28:20.195 UTC Wed Apr 7 2004
Oper Mode:OPERATIONAL, In Dial Backup:YES, Standby:NO, One-Way:NO
RBCP Received Packets:31511, RBCP Sent Packets:31358
Bit Error Rate:0e-0, Signal to Noise Ratio:12.4453
IP Address/Mask:10.0.0.100/255.255.255.0
Service Module MAC:00:A0:AC:00:20:66
RX Lock:LOCKED, Sync Lock:NOT LOCKED
BackBone Status:UP, Two-Way Mode:YES, DA/RA Mode:RA
Outbound Modulation Type:DVB, OB Code Rate:3/4
Outbound Unicast Packets:39944, OB Multicast Packets:45612
Outbound ID:2, OB PID:514, OB Freq:1201000, OB Bit Rate:30000000
Outbound Sync IP address: 172.22.0.3
Inbound Start Freq:1201176, IB Stop Freq:1209336
Inbound Data Rate:307200, IB Freq Offset:0
Inbound Packets:8281
BackBone Hub Link Status:UP
BackBone Received Packets:37894, BB Sent:39162
BackBone Received Retransmitted:1, BB Sent Retrans:12
Service Module Eth RX:37840, TX:129000
Service Module Eth Multicast RX:202, Multicast TX:45970
```

```
Bufs Configured:5000, Bufs Free:4949
Internal Software State parameters:
   Service Module SW State Var:3
   General IOS FSM:LINK_UP, HSRP FSM:N/A, HSRP VSAT Mode:N/A
   Lost Beats Total:0, Lost Beats This Retry:0
```

VoIP Example

The following example shows the status of VoIP calls. Note that dedicated access (DA) mode is in use, and you can see the bandwidth (26 kilobits per second) being used on the DA channels.

```
Router# service-module satellite 1/0 status

Getting status from the satellite module, please wait..

Software Versions, OS:14.2.3, RSP:1.5.1.3, MBC:1.0.0.5
HW Version:00008100
CPA Number:6202, HPS CPA:1, HSP Link:2
AA Group: 258, SW Group: 512, Download: YES
Service Module Uptime:00:34:53, Router Uptime:2 days, 21 hours, 23 minutes
Current router clocktime:*08:33:51.301 UTC Mon Feb 16 2004
Oper Mode:OPERATIONAL, In Dial Backup:NO, Standby:NO, One-Way:NO
RBCP Received Packets:335, RBCP Sent Packets:332
Bit Error Rate:0e-0, Signal to Noise Ratio:12.4453
IP Address/Mask:10.2.0.2/255.255.0.0
Service Module MAC:00:A0:AC:00:20:67
RX Lock:LOCKED, Sync Lock:LOCKED
BackBone Status:UP, Two-Way Mode:YES, DA/RA Mode:DA
Outbound Modulation Type:DVB, OB Code Rate:3/4
Outbound Unicast Packets:758, OB Multicast Packets:139823
Outbound ID:2, OB PID:514, OB Freq:1201000, OB Bit Rate:30000000
Outbound Sync IP address: 172.22.0.3
Inbound Start Freq:1201176, IB Stop Freq:1209336
Inbound Data Rate:307200, IB Freq Offset:0
Inbound Packets:346
BackBone Hub Link Status:UP
BackBone Received Packets:335, BB Sent:288
BackBone Received Retransmitted:0, BB Sent Retrans:0
Service Module Eth RX:356, TX:280163
Service Module Eth Multicast RX:1, Multicast TX:139918
Bufs Configured:5000, Bufs Free:4951
Internal Software State parameters:
   Service Module SW State Var:3
   General IOS FSM:LINK_UP, HSRP FSM:N/A, HSRP VSAT Mode:N/A
   Lost Beats Total:0, Lost Beats This Retry:0
VOIP DA calls:
   Call ID  BW (kb)  Dst Port  Src Port  Dest Addr
  ========  ======= ========  ========  ==============
     16075      26     18310     16866  162.0.0.2
```

Firmware Debug Log Example

The following example includes the firmware debug message log:

```
Router# service-module satellite 1/0 status log

Getting status from the satellite module, please wait..

Software Versions, OS:14.2.3, RSP:1.5.1.3, MBC:1.0.0.5
HW Version:00008100
CPA Number:1203, HPS CPA:1, HSP Link:2
AA Group: 258, SW Group: 512, Download: YES
Service Module Uptime:19:01:32, Router Uptime:1 week, 4 days, 16 hours,
```

```
15 minutes
Current router clocktime:*15:12:45.310 UTC Mon May 13 2002
Oper Mode:OPERATIONAL, In Dial Backup:NO, Standby:NO, One-Way:NO
RBCP Received Packets:9279, RBCP Sent Packets:9276
Bit Error Rate:0e-0, Signal to Noise Ratio:12.4453
IP Address/Mask:14.0.0.6/255.255.255.0
Service Module MAC:00:A0:AC:00:20:72
RX Lock:LOCKED, Sync Lock:LOCKED
BackBone Status:UP, Two-Way Mode:YES, DA/RA Mode:RA
Outbound Modulation Type:DVB, OB Code Rate:3/4
Outbound Unicast Packets:11099797, OB Multicast Packets:429401
Outbound ID:2, OB PID:514, OB Freq:1201000, OB Bit Rate:30000000
Outbound Sync IP address: 172.22.0.3
Inbound Start Freq:1201176, IB Stop Freq:1209336
Inbound Data Rate:307200, IB Freq Offset:0
Inbound Packets:674619
BackBone Hub Link Status:UP
BackBone Received Packets:11084921, BB Sent:93899
BackBone Received Retransmitted:352, BB Sent Retrans:2
Service Module Eth RX:10001424, TX:18532485
Service Module Eth Multicast RX:2615, Multicast TX:431486
Bufs Configured:5000, Bufs Free:1240
Internal Software State parameters:
   Service Module SW State Var:3
   General IOS FSM:LINK_UP, HSRP FSM:N/A, HSRP VSAT Mode:N/A
   Lost Beats Total:4, Lost Beats This Retry:0
VOIP DA calls:
  NONE

Last forced reset log from card
==============================
bb 01 e3 a3 28 00 00 10 00 01 ff 6f f0 00 00 10
00 00 2a aa 00 4f f9 5f c4 00 00 01 2a ff ff ff
ff 00 00 80 00 01 ff 6f f0 00 00 00 00 01 ff 76
b0 01 e3 a3 28 00 00 90 02 00 00 00 00 00 00 00
13 00 18 84 1c 00 00 00 00 01 e3 a3 28 00 2b 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 2b 00 00 01 ff 76 b0 00 2a a2 80 00 00 88
88 00 00 90 02 00 0a 7f 58 00 00 00 00 00 00 00
00 40 00 00 43 20 00 00 00 00 00 00 00 01 ff 76
b0 00 00 00 00 01 ff 70 20 ff ff ff
```

Table 5 describes the significant fields shown in the displays.

Table 5 service-module satellite status Field Descriptions

Field	Description
Software Versions HW Version	Software (not Cisco IOS) and hardware versions on the NM-1VSAT-GILAT network module. Useful for technical support.
CPA Number HPS CPA HSP Link AA Group SW Group Download	VSAT-to-hub link parameters.

Table 5 service-module satellite status Field Descriptions (continued)

Field	Description
Oper Mode	Operational mode; one of the following values: • OPERATIONAL—Boot complete and running operational code. • BOOT HOLD—Held in boot mode. • BOOT—In boot mode after a reset. • IDLE—Transitional state. • UNKNOWN—Indicates an error.
In Dial Backup	YES indicates that the satellite link is down and that the hub dial backup connection is in use. NO means that the hub dial backup connection is not in use or not configured. **Note** This field does not indicate whether *router* dial backup mode is in use.
Standby	YES indicates that the router in which the NM-1VSAT-GILAT network module is installed is in standby mode for Hot Standby Router Protocol (HSRP). NO indicates that the router in which the NM-1VSAT-GILAT network module is installed is either in active mode for HSRP, or HSRP is not configured.
One-Way	YES indicates one-way operational mode. NO indicates two-way operational mode.
RBCP Received Packets RBCP Sent Packets	Number of sent and received Router Blade Configuration Protocol (RBCP) packets.
IP Address/Mask	IP address and subnet mask of the NM-1VSAT-GILAT network module.

Table 5 service-module satellite status Field Descriptions (continued)

Field	Description
RX Lock Sync Lock	Corresponds to the following LEDs on the NM-1VSAT-GILAT network module faceplate: • RX LOCK—Indicates whether or not the DVB (outbound) receiver is locked. • SYNC—Indicates whether or not the NM-1VSAT-GILAT network module is synchronized with the hub timing. For both fields: • LOCKED indicates that the initial connection to the hub was successful. This means that the dish antenna is positioned correctly and the satellite initial configuration parameters are valid. • NOT LOCKED indicates that the NM-1VSAT-GILAT network module is in a transitional state during the boot process. If NOT LOCKED does not eventually become LOCKED, then the satellite initial configuration parameters are incorrect, there is a hardware problem, or the satellite signal has faded because of rain-fade or obstruction.
BackBone Status	Backbone link to the hub, either fully established (UP) or not fully established (DOWN). Corresponds to the ON LINE LED on the NM-1VSAT-GILAT network module faceplate.
Two-Way Mode	YES indicates two-way operational mode. NO indicates one-way operational mode.
DA/RA Mode	Indicates whether the satellite link is operating in random access (RA) or dedicated access (DA) mode. DA mode is required for VoIP calls.
Outbound Modulation Type OB Code Rate Outbound ID OB PID OB Freq OB Bit Rate Outbound Sync IP address	Satellite initial configuration parameters: • Outbound modulation type • Outbound Viterbi code rate • Outbound VSAT ID • Outbound packet identifier (PID) • Outbound frequency • Outbound data rate • Outbound synchronization IP address
Internal Software State parameters	Internal states that are useful for technical support.
VOIP DA calls	Information about VoIP calls, which use DA mode. **Note** This field appears only on routers that run VoIP-enabled Cisco IOS software images.
Last forced reset log from card	Debug information used by technical support.

Related Commands

Command	Description
show (satellite initial configuration)	Displays the initial configuration parameters for the Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT).
show controllers satellite	Displays controller information about the internal router interface that connects to an installed Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT).
show interfaces satellite	Displays general interface settings and traffic rates for the internal router interface that connects to an installed Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT).

show (satellite initial configuration)

To display the initial configuration parameters for the Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT), use the **show** command in satellite initial configuration mode.

show

Syntax Description

This command has no arguments or keywords.

Defaults

No default behavior or values

Command Modes

Satellite initial configuration

Command History

Release	Modification
12.3(14)T	This command was introduced.

Usage Guidelines

This command is typically used by an installation technician. Do not use this command unless your satellite service provider instructs you to perform the satellite initial configuration and provides all necessary parameter values.

You can view the satellite initial configuration parameters by entering the **service-module satellite** *slot*/**0 status** command in privileged EXEC mode.

Examples

The following example shows the satellite initial configuration parameters for the Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT):

```
Router(sat-init-config)# show
!
! Initial Configuration Parameters:
!
id aa-group 298
id software group 598
id vsat 6201
mode download
mode two-way
outbound data-pid 514
outbound data-rate 15000000
outbound frequency 1201000
outbound id 2
outbound modulation-type DVB
outbound sync ip address 172.16.0.3
outbound viterbi-rate 1/2
!
!
Router(sat-init-config)#
```

Related Commands

Command	Description
service-module satellite status	Displays status information related to the hardware and software on the Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT), including the initial configuration parameters.

show controllers satellite

To display controller information about the internal router interface that connects to an installed Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT), use the **show controllers satellite** command in user EXEC or privileged EXEC mode.

show controllers satellite *slot*/*unit*

Syntax Description

slot	Router chassis slot in which the network module is installed.
unit	Interface number. For NM-1VSAT-GILAT network modules, always use 0.

Defaults

No default behavior or values.

Command Modes

User EXEC
Privileged EXEC

Command History

Release	Modification
12.3(14)T	This command was introduced.

Usage Guidelines

The output from this command is generally useful for diagnostic tasks performed by technical support.

The **show controllers satellite** command displays information about initialization block, transmit ring, receive ring, and errors for the Fast Ethernet controller chip in the internal router interface that connects to an installed Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT).

Examples

The following example shows how to display controller information about the internal router interface that connects to an installed NM-1VSAT-GILAT network module:

```
Router# show controllers satellite 2/0

Interface Satellite2/0
Hardware is Intel 82559 FastEthernet
IDB:640B6584, FASTSEND:60A585E0, MCI_INDEX:0

INSTANCE=0x640B7D84
  Rx Ring entries = 64
  Rx Shadow = 0x640B8054
  Rx Ring = 0x 70FEE80
  Rx Ring Head = 51
  Rx Ring Last = 50
  Rx Buffer Descr = 0x 70FF2C0
  Rx Buffer Descr Head = 51
  Rx Buffer Descr Last = 50
  Rx Shadow (malloc) = 0x640B8054
  Rx Ring (malloc) = 0x 70FEE80
  Rx Buffer Descr (malloc) = 0x 70FF2C0
  Tx Ring entries = 128
```

```
  Tx Shadow = 0x640B8184
  Tx Shadow Head = 78
  Tx Shadow Tail = 78
  Tx Shadow Free = 128
  Tx Ring = 0x 70FF700
  Tx Head = 80
  Tx Last = 79
  Tx Tail = 80
  Tx Count = 0
  Tx Buffer Descr = 0x 7100740
  Tx Buffer Descr Head = 0
  Tx Buffer Descr Tail = 0
  Tx Shadow (malloc) = 0x640B8184
  Tx Ring (malloc) = 0x 70FF700
  Tx Buffer Descr (malloc) = 0x 7100740

CONTROL AND STATUS REGISTERS (CSR)=0x3E000000
  SCB Intr Mask    = 00
  SCB CU/RU Cmd    = 00
  SCB Intr Status  = 00
  SCB CU Status    = 01
  SCB RU Status    = 04
  SCB General Ptr  = 00000000
  PORT             = 00000000
  EEPROM           = 0008
  FLASH            = 0002
  MDI              = 1821780D
  Rx Byte Count    = 00000608
  PMDR             = 80
  FC Cmd           = 00
  FC Threshold     = 03
  Early Rx         = 00
  General Status   = 03
  General Control  = 00

PHY REGISTERS
  Register 0x00:  2000  780D  02A8  0154  0081  0000  0000  0000
  Register 0x08:  0000  0000  0000  0000  0000  0000  0000  0000
  Register 0x10:  0202  0000  0001  0005  0000  0000  0000  0000
  Register 0x18:  0000  0000  8B10  0000  0010  0000  0000  0000

HARDWARE STATISTICS
  Rx good frames:        420979
  Rx CRC:                0
  Rx alignment:          0
  Rx resource:           0
  Rx overrun:            0
  Rx collision detects:  0
  Rx short:              0
  Tx good frames:        653125
  Tx maximum collisions: 0
  Tx late collisions:    0
  Tx underruns:          0
  Tx lost carrier sense: 9
  Tx deferred:           86
  Tx single collisions:  1
  Tx multiple collisions:1
  Tx total collisions:   3
  FC Tx pause:           0
  FC Rx pause:           0
  FC Rx unsupported:     0
```

```
INTERRUPT STATISTICS
  CX  = 653136
  FR  = 420979
  CNA = 0
  RNR = 0
  MDI = 0
  SWI = 0
  FCP = 0

Receive All Multicasts = enabled
Receive Promiscuous = disabled
Loopback Mode = disabled
```

Table 6 describes the significant fields shown in the display.

Table 6 show controllers satellite Field Descriptions

Field	Description
Hardware	Description of the chip being used.
IDB	Address in router memory of the Interface Descriptor Block (IDB).
FASTSEND	Fastsend routine.
INSTANCE	Device-specific data stored in router memory that lists the memory locations and current indices of receive (Rx) and transmit (Tx) rings in router I/O memory.
CONTROL AND STATUS REGISTERS (CSR)	Control and status registers that are physically located on the chip itself and that are accessed by the CPU over the protocol control information (PCI) bus.
PHY REGISTERS	Contents of the physical layer (PHY) registers of the PHY module, which is an internal device that interfaces between the internal physical Ethernet line and the external physical line.
HARDWARE STATISTICS	Receive (Rx) and transmit (Tx) traffic statistics collected by the chip.
INTERRUPT STATISTICS	Receive (Rx), transmit (Tx), control, software, and flow control interrupt statistics collected by the chip.

Related Commands

Command	Description
service-module satellite status	Displays status information related to the hardware and software on the Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT), including the initial configuration parameters.
show interfaces satellite	Displays general interface settings and traffic rates for the internal router interface that connects to an installed Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT).

show interfaces satellite

To display general interface settings and traffic rates for the internal router interface that connects to an installed Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT), use the **show interfaces satellite** command in user EXEC or privileged EXEC mode.

show interfaces satellite *slot/unit*

Syntax Description

slot	Router chassis slot in which the network module is installed.
unit	Interface number. For NM-1VSAT-GILAT network modules, always use 0.

Defaults

No default behavior or values.

Command Modes

User EXEC
Privileged EXEC

Command History

Release	Modification
12.3(14)T	This command was introduced.

Usage Guidelines

The **show interfaces satellite** command shows these items:

- Basic configuration information for the internal router interface that connects to an installed Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT)
- Traffic statistics, including the number of packets transmitted, input and output rate, and errors
- Interface and line protocol status (up or down), with the following exceptions:
  - Line Protocol Status Exception—Hub Dial Backup Mode
  - Line Protocol Status Exception—Hot Standby Router Protocol (HSRP) Standby Mode

Line Protocol Status Exception—Hub Dial Backup Mode

If you configure hub dial backup mode on the satellite interface, then the **show interfaces satellite** command always displays Line Protocol Up status, even when the line protocol is down. To view the actual line protocol status, enter the **show controllers satellite** command or the **service-module satellite** *slot*/**0 status** command in privileged EXEC mode.

Line Protocol Status Exception—Hot Standby Router Protocol (HSRP) Standby Mode

If the router is in a hot standby group and is in standby mode, then the **show interfaces satellite** command displays “line protocol is up (standby)”, even though a link to the hub is not established from the standby router. To view the actual line protocol status, enter the **show controllers satellite** command or the **service-module satellite** *slot*/**0 status** command in privileged EXEC mode.

Examples

For output field descriptions, see Table 7 on page 178.

This section provides the following examples:

Normal Operation or Hub Dial Backup Mode Example

In the following example, the satellite interface is up and the line protocol is up.

If you configure hub dial backup for the NM-1VSAT-GILAT network module, the line protocol appears to be up even if the satellite link is actually down. To view the actual line protocol status while hub dial backup mode is configured, use the **show controllers satellite** command or the **service-module satellite** *slot*/**0 status** command instead.

```
Router# show interfaces satellite 2/0

Satellite2/0 is up, line protocol is up
  Hardware is I82559FE, address is 0008.e35f.7370 (bia 0008.e35f.7370)
  Internet address is 10.22.1.2/24
  MTU 1500 bytes, BW 100000 Kbit, DLY 100 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive not set
  ARP type:ARPA, ARP Timeout 04:00:00
  Last input 00:00:02, output 00:00:00, output hang never
  Last clearing of "show interface" counters never
  Input queue:0/75/0/0 (size/max/drops/flushes); Total output drops:0
  Queueing strategy:fifo
  Output queue:0/40 (size/max)
  5 minute input rate 13000 bits/sec, 6 packets/sec
  5 minute output rate 8000 bits/sec, 9 packets/sec
     419433 packets input, 108329352 bytes, 0 no buffer
     Received 11792 broadcasts, 0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
     0 input packets with dribble condition detected
     650568 packets output, 73969720 bytes, 0 underruns
     0 output errors, 0 collisions, 0 interface resets
     0 babbles, 0 late collision, 0 deferred
     0 lost carrier, 0 no carrier
     0 output buffer failures, 0 output buffers swapped out
```

Satellite Backup for a Terrestrial Link—Standby Mode Example

In the following example, the satellite interface is in standby mode because the primary terrestrial link is up:

```
Router# show interfaces satellite 1/0

Satellite1/0 is standby mode, line protocol is down
  Hardware is I82559FE, address is 00e0.f7ff.f310 (bia 00e0.f7ff.f310)
  Internet address is 10.0.0.1/24
  MTU 1500 bytes, BW 100000 Kbit, DLY 100 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive not set
  ARP type:ARPA, ARP Timeout 04:00:00
  Last input 00:00:00, output 00:00:03, output hang never
  Last clearing of "show interface" counters 00:00:04
  Input queue:0/75/0/0 (size/max/drops/flushes); Total output drops:0
```

```
  Queueing strategy:fifo
  Output queue:0/40 (size/max)
  30 second input rate 13000 bits/sec, 6 packets/sec
  30 second output rate 0 bits/sec, 0 packets/sec
     30 packets input, 7474 bytes, 0 no buffer
     Received 1 broadcasts, 0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
     0 input packets with dribble condition detected
     1 packets output, 82 bytes, 0 underruns
     0 output errors, 0 collisions, 0 interface resets
     0 babbles, 0 late collision, 0 deferred
     0 lost carrier, 0 no carrier
     0 output buffer failures, 0 output buffers swapped out
```

Hot Standby Router Protocol (HSRP)—Standby Mode Example

In the following example, homogeneous HSRP is configured on two routers, each of which contains an NM-1VSAT-GILAT network module that connects to the same dish antenna (ODU). The following output from the standby router shows that the line protocol is "up (standby)," even though the satellite link on the standby router is actually down. To view the actual line protocol status, use the **show controllers satellite** command or the **service-module satellite** *slot*/**0 status** command.

```
Router# show interfaces satellite 2/0

Satellite2/0 is up, line protocol is up (standby)
  Hardware is I82559FE, address is 0008.e35f.7370 (bia 0008.e35f.7370)
  Internet address is 10.22.1.2/24
  MTU 1500 bytes, BW 100000 Kbit, DLY 100 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive not set
  ARP type:ARPA, ARP Timeout 04:00:00
  Last input 00:00:02, output 00:00:00, output hang never
  Last clearing of "show interface" counters never
  Input queue:0/75/0/0 (size/max/drops/flushes); Total output drops:0
  Queueing strategy:fifo
  Output queue:0/40 (size/max)
  5 minute input rate 13000 bits/sec, 6 packets/sec
  5 minute output rate 8000 bits/sec, 9 packets/sec
     419433 packets input, 108329352 bytes, 0 no buffer
     Received 11792 broadcasts, 0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
     0 input packets with dribble condition detected
     650568 packets output, 73969720 bytes, 0 underruns
     0 output errors, 0 collisions, 0 interface resets
     0 babbles, 0 late collision, 0 deferred
     0 lost carrier, 0 no carrier
     0 output buffer failures, 0 output buffers swapped out
```

Table 7 describes the significant fields shown in the display.

Table 7 show interfaces satellite Field Descriptions

Field	Description
Satellite2/0 is... • up • down • standby mode	State of the interface hardware: • Currently active. • Has been taken down by an administrator. • In HSRP standby mode when two HSRP-redundant NM-1VSAT-GILAT network modules (in separate routers) connect to one dish antenna (ODU).
line protocol is	State of the backbone link to the hub: up or down. See the following exceptions: • Line Protocol Status Exception—Hub Dial Backup Mode, page 175 • Line Protocol Status Exception—Hot Standby Router Protocol (HSRP) Standby Mode, page 175
Hardware is	Hardware type (for example, Fast Ethernet) and address.
Internet address	Internet address followed by subnet mask.
MTU	Maximum transmission unit of the interface.
BW	Bandwidth of the interface, in kilobits per second.
DLY	Delay of the interface, in microseconds.
reliability	Reliability of the interface as a fraction of 255 (255/255 is 100 percent reliability), calculated as an exponential average over 5 minutes.
txload and rxload	Transmitted and received load on the interface as a fraction of 255 (255/255 is completely saturated), calculated as an exponential average over 5 minutes.
Encapsulation	Encapsulation method assigned to the interface.
loopback	Indicates whether loopback is set or not.
keepalive	Indicates whether keepalives are set or not.
ARP type	Type of Address Resolution Protocol assigned.
Last input	Number of hours, minutes, and seconds since the last packet was successfully received by an interface and processed locally on the router. Useful for knowing when a dead interface failed. This counter is updated only when packets are process-switched, not when packets are fast-switched.
output	Number of hours, minutes, and seconds since the last packet was successfully transmitted by the interface. Useful for knowing when a dead interface failed. This counter is updated only when packets are process-switched, not when packets are fast-switched.

Table 7 show interfaces satellite Field Descriptions (continued)

Field	Description
output hang	Number of hours, minutes, and seconds (or never) since the interface was last reset because of a transmission that took too long. When the number of hours in any of the "last" fields exceeds 24 hours, the number of days and hours is printed. If that field overflows, asterisks are printed.
Last clearing	Time at which the counters that measure cumulative statistics (such as number of bytes transmitted and received) shown in this report were last reset to zero. Note that variables that might affect routing (for example, load and reliability) are not cleared when the counters are cleared. *** indicates the elapsed time is too large to be displayed. 0:00:00 indicates the counters were cleared more than 2^{31} ms (and less than 2^{32} ms) ago.
Input queue	Input queue information: • Size—Number of packets in the input queue • Max—Maximum size of the queue • Drops—Number of packets discarded because of a full queue • Flushes—Number of times data on queue has been discarded
Total output drops	Total number of output packets dropped.
Queueing strategy	First-in, first-out queueing strategy (other queueing strategies you might see are priority-list, custom-list, and weighted fair).
Output queue	Number of packets in the output queue and the maximum size of the queue,
5 minute input rate 5 minute output rate	Average number of bits and packets transmitted per second in the last 5 minutes. The 5-minute input and output rates should be used only as an approximation of traffic per second during a given 5-minute period. These rates are exponentially weighted averages with a time constant of 5 minutes. A period of four time constants must pass before the average will be within two percent of the instantaneous rate of a uniform stream of traffic over that period.
packets input	Total number of error-free packets received by the system.
bytes	Total number of bytes, including data and MAC encapsulation, in the error-free packets received by the system.

Table 7 show interfaces satellite Field Descriptions (continued)

Field	Description
no buffer	Number of received packets discarded because there was no buffer space in the main system. Compare with ignored count. Broadcast storms on Ethernet networks and bursts of noise on serial lines are often responsible for no input buffer events.
broadcasts	Total number of broadcast or multicast packets received by the interface.
runts	Number of packets that are discarded because they are smaller than the minimum packet size of the media.
giants	Number of packets that are discarded because they exceed the maximum packet size of the media.
throttles	Number of times that the interface requested another interface within the router to slow down.
input errors	Includes runts, giants, no buffer, CRC, frame, overrun, and ignored counts. Other input-related errors can also cause the input errors count to be increased, and some datagrams may have more than one error; therefore, this sum may not balance with the sum of enumerated input error counts.
CRC	Cyclic redundancy checksum generated by the originating LAN station or far-end device does not match the checksum calculated from the data received. On a LAN, this usually indicates noise or transmission problems on the LAN interface or the LAN bus itself. A high number of CRCs is usually the result of collisions or a station transmitting bad data.
frame	Number of packets received incorrectly having a CRC error and a noninteger number of octets. On a LAN, this is usually the result of collisions or a malfunctioning Ethernet device.
overrun	Number of times the receiver hardware was unable to hand received data to a hardware buffer because the input rate exceeded the receiver's ability to handle the data.
ignored	Number of received packets ignored by the interface because the interface hardware ran low on internal buffers. These buffers are different from the system buffers mentioned previously in the buffer description. Broadcast storms and bursts of noise can increase the ignored count.
input packets with dribble condition detected	Dribble bit error indicates that a frame is slightly too long. This frame error counter is incremented just for informational purposes; the router accepts the frame.
packets output	Total number of messages transmitted by the system.
bytes	Total number of bytes, including data and MAC encapsulation, transmitted by the system.
underruns	Number of times that the transmitter has been running faster than the router can handle. This may never be reported on some interfaces.

Table 7 show interfaces satellite Field Descriptions (continued)

Field	Description
output errors	Sum of all errors that prevented the final transmission of datagrams out of the interface being examined. Note that this may not balance with the sum of the enumerated output errors, because some datagrams may have more than one error, and others may have errors that do not fall into any of the specifically tabulated categories.
collisions	Number of messages retransmitted because of an Ethernet collision. A packet that collides is counted only once in output packets.
interface resets	Number of times an interface has been completely reset. This can happen if packets queued for transmission were not sent within several seconds. On a serial line, this can be caused by a malfunctioning modem that is not supplying the transmit clock signal, or by a cable problem. If the system notices that the carrier detect line of a serial interface is up, but the line protocol is down, it periodically resets the interface in an effort to restart it. Interface resets can also occur when an interface is looped back or shut down.
babbles[1]	Indicates that the transmit jabber timer expired.
late collision[1]	Number of late collisions. Late collision happens when a collision occurs after the preamble has been transmitted. The most common cause of late collisions is that your Ethernet cable segments are too long for the speed at which you are transmitting.
deferred[1]	Deferred indicates that the chip had to defer transmission while ready to transmit a frame, because the carrier was asserted.
lost carrier[1]	Number of times the carrier was lost during transmission.
no carrier[1]	Number of times the carrier was not present during the transmission.
output buffer failures	Number of failed buffers.
output buffers swapped out	Number of buffers swapped out.

1. This field applies to the router internal interface that connects to the installed Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT). This field typically does not apply to the external satellite interface.

Related Commands

Command	Description
service-module satellite status	Displays status information related to the hardware and software on the Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT), including the initial configuration parameters.
show controllers satellite	Displays controller information about the internal router interface that connects to an installed Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT).

test satellite satellite mfg link

To force the Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT) to show that the backbone link to the hub is up, even when the link is actually down, use the **test satellite satellite mfg link** command in privileged EXEC mode.

test satellite satellite *slot*/*unit* **mfg link** {**force** | **normal**}

Syntax Description

slot	Router chassis slot in which the network module is installed.
unit	Interface number. For NM-1VSAT-GILAT network modules, always use 0.
force	Forces the satellite link to appear to be UP.
normal	Allows the satellite link to display the actual status, UP or DOWN.

Defaults

The actual status (UP or DOWN) of the satellite link is displayed.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.3(14)T	This command was introduced.

Usage Guidelines

Use the **test satellite satellite mfg link** command only when instructed by your satellite service provider or a technical support representative.

Examples

The following example shows how to force the NM-1VSAT-GILAT network module to show that the backbone link to the hub is up, even if the link is actually down:

```
Router# test satellite satellite 1/0 mfg link force
```

The following example shows how to allow the NM-1VSAT-GILAT network module to show the actual status (UP or DOWN) of the satellite link:

```
Router# test satellite satellite 1/0 mfg link normal
```

upgrade satellite satellite

To upgrade the firmware of an NM-1VSAT-GILAT network module through TFTP, use the **upgrade satellite satellite** command in privileged EXEC mode.

upgrade satellite satellite *slot/unit <tftp server address> <firmware filename>*

Syntax Description

slot	Router chassis slot in which the network module is installed.
unit	Interface number. For NM-1VSAT-GILAT network modules, always use 0.
tftp server address	The IP address of the TFTP server that contains the firmware upgrade.
firmware filename	The name of the file with the upgraded firmware.

Command Default

Firmware will not be upgraded through TFTP.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.4(11)XJ2	This command was introduced.

Usage Guidelines

The **upgrade satellite satellite** command is used to provide a firmware upgrade of VSATs locally at remote sites through TFTP. This method reduces dependency on a central hub, and allows for ease of update when connected to a service provider who uses third-party hubs.

When the TFTP server is configured on the router, the VSAT firmware is copied to the router flash memory. The TFTP server configuration would be as follows:

```
tftp-server flash:< <firmware filename>
```

This configuration would be within the overall router configuration.

When this configuration is done, the upgrade is accomplished by pointing the VSAT to the router IP address in the **upgrade satellite satellite** command. The upgrade process will take several minutes.

Examples

The following example shows the response of the NM-1VSAT-GILAT network module to a firmware upgrade command.

```
Router# upgrade satellite satellite 1/0 9.1.0.1 VSAT_99.06.01.26_Bin.bin
Download of new firmware will proceed after a reboot of
 the satellite network module. This could take up to two minutes.
 Please wait...


*Mar 4 03:18:15.006: %LINEPROTO-5-UPDOWN: Line protocol on Interface Satellite1/0, changed
state to up
The upgrade process will complete in several minutes.
 It will take place in the background.
 Please monitor the console for errors.
```

```
*Mar 4 03:21:16.006: %LINEPROTO-5-UPDOWN: Line protocol on Interface Satellite1/0, changed
state to down
*Mar 4 03:27:20.842: %LINEPROTO-5-UPDOWN: Line protocol on Interface Satellite1/0, changed
state to up
```

Related Commands

Command	Description
service-module satellite status	Verifies the image version of the downloaded firmware.

Feature Information for the Cisco IP VSAT Satellite WAN Network Module

Table 8 lists the release history for this feature.

Not all commands may be available in your Cisco IOS software release. For release information about a specific command, see the command reference documentation.

Use Cisco Feature Navigator to find information about platform support and software image support. Cisco Feature Navigator enables you to determine which Cisco IOS and Catalyst OS software images support a specific software release, feature set, or platform. To access Cisco Feature Navigator, go to http://www.cisco.com/go/cfn. An account on Cisco.com is not required.

Note Table 8 lists only the Cisco IOS software release that introduced support for a given feature in a given Cisco IOS software release train. Unless noted otherwise, subsequent releases of that Cisco IOS software release train also support that feature.

Table 8 Feature Information for Cisco IP VSAT Satellite WAN Network Module (NM-1VSAT-Gilat)

Feature Name	Releases	Feature Information
Cisco IP VSAT Satellite WAN Network Module (NM-1VSAT-Gilat)	12.3(14)T	Provides Cisco modular access routers with satellite WAN connectivity in Gilat© SkyEdge© or compatible satellite communications networks.
Security and QoS Feature Enhancements for the Cisco IP VSAT Satellite WAN Network Module	12.4(11)XJ2	Security and QoS feature enhancements have been introduced to provide user-configurable VSAT passwords, centralized IP address management, support for GA mode, support for integrated TCP acceleration and encryption (ITAE), and local firmware upgrade for the Cisco IP VSAT Satellite WAN network module. The following section provides information about user-configurable VSAT passwords: • Configuring the Initial VSAT Parameters for the NM-1VSAT-GILAT Network Module, page 13 The following section provides information about centralized IP address management: • Configuring IP Addresses from the Hub, page 26 The following section provides information about support for GA mode: • Configuration of Optimum Codec Payload Size in DA Mode, page 84 The following section provides information about support for ITAE: • Configuring Integrated TCP Acceleration and Encryption, page 86 The following section provides information about local firmware upgrade: • Upgrading VSAT Firmware, page 95 The following commands were introduced by these enhancements: **password (satellite initial configuration)**, **service-module itae**, and **upgrade satellite satellite**.

Glossary

access list—A list kept by routers to control access to or from the router for a number of services (for example, to prevent packets with a certain IP address from leaving a particular interface on the router). Also called access control list (ACL).

BRI—Basic Rate Interface. ISDN interface composed of two B channels and one D channel for circuit-switched communication of voice, video, and data.

CDP— Cisco Discovery Protocol. Media- and protocol-independent device-discovery protocol that runs on all equipment manufactured by Cisco, including routers, access servers, bridges, and switches. Using CDP, a device can advertise its existence to other devices and receive information about other devices on the same LAN or on the remote side of a WAN. Runs on all media that support SNAP, including LANs, Frame Relay, and ATM media.

DDR—dial-on-demand routing. Technique whereby a router can automatically initiate and close a circuit-switched session as transmitting stations demand. The router spoofs keepalives so that end stations treat the session as active. DDR permits routing over ISDN or telephone lines using an external ISDN terminal adapter or modem.

DVB—Digital Video Broadcasting. Consortium of around 300 companies in the fields of broadcasting, manufacturing, network operation, and regulatory matters, working to establish common international standards for the move from analog to digital broadcasting. The DVB Project Office is based in Geneva, Switzerland. There are many standards within the DVB family, including subspecifications for satellite (DVB-S), cable (DVB-C), and terrestrial (DVB-T) transmission and reception.

feed horn—A device mounted at the focal point of a dish antenna that captures the signals reflected from the dish surface and channels them into an amplifier. The feed horn also transmits energy to the dish antenna reflector, which then transfers the energy to a satellite.

FTDMA—Frequency and Time Division Multiple Access. Transmission technology that divides an allocated radio-frequency (RF) band into multiple RF channels and then further divides each RF channel into multiple time slots. These divisions enable the RF band to support multiple, simultaneous users by allocating unique time slots to each user.

HSRP—Hot Standby Router Protocol. Provides high network availability and transparent network topology changes. HSRP creates a hot standby router group with a lead router that services all packets sent to the hot standby address. The lead router is monitored by other routers in the group, and if it fails, one of these standby routers inherits the lead position and the hot standby group address.

HTTP acceleration—Sometimes called Internet page acceleration (IPA). Feature that improves the performance of web browsing over a satellite link. In a typical HTTP exchange, the web browser requests a web page, and the web server responds with the HTML text of the requested page. The HTML text also contains requests for objects (such as images, embedded media, or scripts), each of which requires a separate HTTP request from the web browser and an HTTP response from the web server. The resulting traffic from HTTP requests and responses can cause delays in satellite communications networks. With HTTP acceleration, most of the HTTP requests are handled locally by software at the central hub and VSAT IDUs. For example, the central hub intercepts the web server's initial response, which is the HTML text of the requested page. The hub immediately initiates HTTP requests for all the page objects using a high-speed, low-latency terrestrial link between the hub and the Internet. As the objects are received by the hub, they are immediately forwarded over the satellite link to the web browser. This results in the web browser receiving the HTML text and the pre-fetched page objects in rapid, uninterrupted succession. When the web browser sends requests for the objects in the HTML text, the VSAT IDU terminates the requests locally without sending them over the satellite link.

hub—Central hub for a satellite communications network; sometimes referred to as the "master earth station" but most often simply called the "hub." The hub contains many components, including a large dish antenna (15 to 36 feet [4.5 to 11 m] in diameter), provisioning stations, and the satellite network

management system (NMS), from which a network operator can monitor and control all components of the satellite network. The hub also contains baseband equipment that handles satellite access, routing between the hub and remote earth stations, dial backup, quality of service (QoS), TCP acceleration, and HTTP acceleration. Depending on the satellite network usage, the hub may also contain web caches, MPEG transport coder/decoders, application server farms, and audio/video broadcast programming devices.

IDU—indoor unit. Part of the earthbound VSAT in a satellite communications network, the IDU generally serves to connect the local network to the hub through the satellite link.

IF—intermediate frequency. A frequency to which a carrier frequency is shifted as an intermediate step in transmission or reception. The IF is typically lower than the RF in frequency, which facilitates further amplification and processing.

inbound—Direction of satellite network traffic from the VSAT to the hub.

IRD—Integrated Receiver Decoder. A satellite receiver with a built-in decoder for unscrambling subscription channels.

ISDN—Integrated Services Digital Network. Communication protocol offered by telephone companies that permits telephone networks to carry data, voice, and other source traffic.

ISP—Internet service provider. Company that provides Internet access to other companies and individuals.

L-band—The 1- to 2-GHz frequency range of the electromagnetic spectrum that is used for satellite transmission.

LNB—low noise block converter. Mounted at the focal point of a dish antenna, this small device amplifies and converts high-frequency satellite signals into lower-frequency signals. Satellite service providers have satellites in multiple orbital positions, and a separate LNB is needed to access each satellite position.

MII—media-independent interface. Standard specification for the interface between network controller chips and their associated media interface chips. The MII automatically senses 10- and 100-Mbps Ethernet speeds.

MPEG—Moving Picture Experts Group, a joint committee of ISO and the International Electrotechnical Commission. MPEG is more commonly known as the series of hardware and software standards involving the reduction of storage requirements (compression schemes) for full-motion video.

multicast—A routing technique that allows IP traffic to be sent from one source or multiple sources and delivered to multiple destinations. Instead of sending individual packets to each destination, a single packet is sent to a group of destinations known as a multicast group, which is identified by a single IP destination group address. Multicast addressing supports the transmission of a single IP datagram to multiple hosts.

NMS—network management system. System responsible for managing at least part of a network. An NMS is generally a reasonably powerful and well-equipped computer, such as an engineering workstation. The NMS communicates with agents to help keep track of network statistics and resources.

NTSC—National Television Standards Committee. A United States TV technical standard, named after the organization that created the standard in 1941. Specifies a 6 MHz-wide modulated signal.

ODU—outdoor unit. Mounted outdoors in direct line of sight to the satellite, the ODU is part of the earthbound VSAT in a satellite communications network. The ODU includes a small dish antenna (2 to 6 feet [0.5 to 2 m] in diameter) and its parts, such as the low noise block converter (LNB), solid state block converter and power amplifier (SSPA), orthomode transducer (OMT), and the feed horn. The ODU is connected to the indoor unit (IDU) by a coaxial RF cable similar to a cable TV connection.

orthomode transducer—Antenna feed component that separates transmitted signals from received signals, which have different polarization and frequency.

outbound—Direction of satellite network traffic from the hub to the VSAT.

PIM— Protocol Independent Multicast. Multicast routing architecture that allows the addition of IP multicast routing on existing IP networks. PIM is unicast routing protocol independent and can be operated in two modes: dense and sparse. See also PIM dense mode and PIM sparse mode.

PIM dense mode—One of the two PIM operational modes. PIM dense mode is data-driven and resembles typical multicast routing protocols. Packets are forwarded on all outgoing interfaces until pruning and truncation occur. In dense mode, receivers are densely populated, and it is assumed that the downstream networks want to receive and will probably use the datagrams that are forwarded to them. The cost of using dense mode is its default flooding behavior. Sometimes called dense mode PIM or PIM DM. Contrast with PIM sparse mode. See also PIM.

PIM sparse mode—One of the two PIM operational modes. PIM sparse mode tries to constrain data distribution so that a minimal number of routers in the network receive it. Packets are sent only if they are explicitly requested at the rendezvous point (RP). In sparse mode, receivers are widely distributed, and the assumption is that downstream networks will not necessarily use the datagrams that are sent to them. The cost of using sparse mode is its reliance on the periodic refreshing of explicit join messages and its need for RPs. Sometimes called sparse mode PIM or PIM SM. Contrast with PIM dense mode. See also PIM and rendezvous point.

POTS—Plain old telephone service. Basic telephone service supplying standard single-line telephones, telephone lines, and access to the public switched telephone network.

QoS—quality of service. QoS refers to the capability of a network to provide better service to selected network traffic over various technologies, including Frame Relay, Asynchronous Transfer Mode (ATM), Ethernet and 802.1 networks, SONET, and IP-routed networks that may use any or all of these underlying technologies.

rendezvous point—Router specified in PIM sparse mode implementations to track membership in multicast groups and to forward messages to known multicast group addresses. See also PIM sparse mode.

RF—radio frequency. Generic term referring to frequencies that correspond to radio transmissions, that is, wireless communications with frequencies below 300 GHz. Cable TV and broadband networks use RF technology. In a satellite communications network, the term RF is often used to distinguish signals that are transmitted to and from the satellite from signals that are processed at other frequencies within the same communication system, such as intermediate frequencies (IFs).

RIP—Routing Information Protocol. Interior Gateway Protocol (IGP) supplied with UNIX BSD systems. The most common IGP in the Internet. RIP uses hop count as a routing metric.

SIP—Session Initiation Protocol. An application-layer protocol originally developed by the Multiparty Multimedia Session Control (MMUSIC) working group of the Internet Engineering Task Force (IETF). Their goal was to equip platforms to signal the setup of voice and multimedia calls over IP networks. SIP features are compliant with IETF RFC 2543, published in March 1999.

spoofing—A method of fooling network end stations into believing that keepalive signals have come from and return to the host. Spoofing maintains network connectivity, such as TCP connections, during periods of inactivity that would otherwise result in network connections being torn down and reestablished unnecessarily.

SSPA—Solid state block converter and power amplifier. Outdoor unit (ODU) device which amplifies the signal from the indoor unit (IDU) and which converts the low-frequency signal to a high-frequency signal for transmission across the satellite link.

TCP— Transmission Control Protocol. Connection-oriented transport layer protocol that provides reliable full-duplex data transmission. TCP is part of the TCP/IP protocol stack.

TCP acceleration—Feature that improves the utilization efficiency of a satellite link by minimizing the number of TCP acknowledgement packets that are sent over the satellite link. In a typical terrestrial network, TCP provides reliable network connectivity by requiring a receiving host to send an acknowledgement for each packet (or set of packets) received before the transmitting host sends the next packet (or set of packets). In a satellite communications network, the satellite backbone protocol provides reliable delivery of data, so the TCP acknowledgements are unnecessary. With TCP acceleration, most of the TCP acknowledgements are handled locally by software at the central hub and VSAT IDUs, so that only the application data and the data required to establish TCP sessions are transmitted over the satellite link. For example, the central hub sends acknowledgements to the transmitting host while forwarding all content packets (as they are received) over the satellite link to the receiving host. At the remote side of the satellite link, the VSAT IDU locally terminates the TCP acknowledgements sent by the receiving host. Only in the case of delivery problems are any TCP acknowledgement packets sent over the satellite link.

TDMA—Time Division Multiple Access. Transmission technology that enables a single radio-frequency (RF) channel to support multiple, simultaneous users by dividing a radio frequency into time slots and then allocating unique time slots to each user.

UDLR—Unidirectional Link Routing Protocol. A routing protocol that provides a way to forward multicast packets over a physical unidirectional interface (such as a satellite link of high bandwidth) to stub networks that have a back channel.

VoIP—Voice over IP. The capability to carry normal telephony-style voice over an IP-based internetwork with POTS-like functionality, reliability, and voice quality. VoIP enables a router to carry voice traffic (for example, telephone calls and faxes) over an IP network. In VoIP, the digital signal processor (DSP) segments the voice signal into frames, which then are coupled in groups of two and stored in voice packets. These voice packets are transported using IP in compliance with ITU-T specification H.323.

VSAT—very small aperture terminal. An earthbound station of a satellite communications network. A VSAT consists of two parts, an outdoor unit (ODU) and an indoor unit (IDU). The ODU is a “very small” transceiver dish antenna (2 to 6 feet [0.5 to 2 m] in diameter) that is placed outdoors in direct line of sight to the satellite. The IDU generally serves to connect the local network to the dish antenna and satellite network. The ODU receives and sends signals to a satellite. The satellite sends and receives signals from an earthbound central hub, which controls the entire operation of the satellite network.

Note See *Internetworking Terms and Acronyms* for terms not included in this glossary.