CHAPTER 6

Cabling the Line Ports and Completing the Installation

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Introduction

This chapter provides instructions for cabling the Gigabit Ethernet ports for both one and two Cisco SCE 2000 topologies, and for configuring Gigabit Ethernet (GBE) interface parameters. In a topology utilizing two Cisco SCE 2000 s (cascade), this includes the cascade ports as well as the line ports.

Note When installing a cascaded system, it is extremely important to follow the sequence of procedures outlined in the section How to Install a Cascaded System, page 6-12.

Note When installing an External Optical Bypass module, the Cisco SCE 2000 line ports are connected to the module. Refer to How to Cable the External Optical Bypass Module, page A-6 for complete instructions.

Connecting the Line Ports to the Network

Cabling Diagrams

Before beginning, find the appropriate cabling diagram for the topology in your installation:

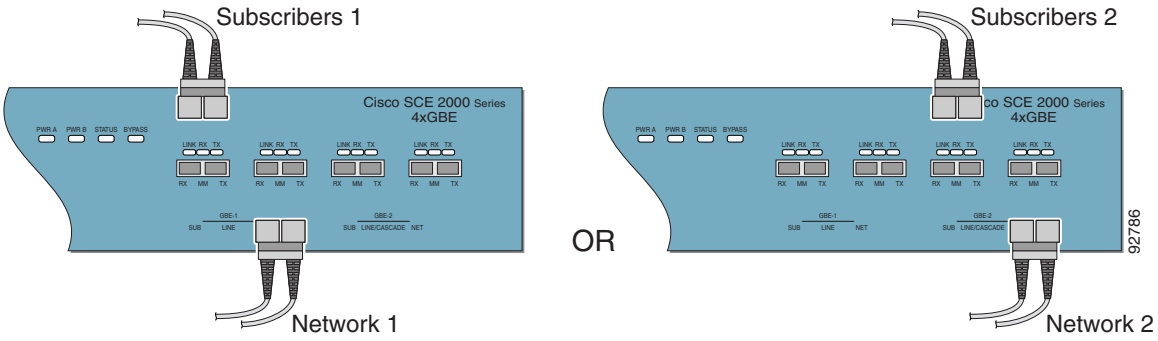
- Single Cisco SCE 2000 topologies
  - Single Link: Inline Topology, page 6-2
  - Single Link: Receive-only Topology, page 6-3
  - Dual Link: Single SCE 2000 Topologies, page 6-3
- Dual Cisco SCE 2000 topologies (cascaded)
  - Dual Link: Two Cisco SCE 2000s Topology, page 6-5

Note When installing a cascaded system, it is extremely important to follow the sequence of procedures outlined in the section How to Install a Cascaded System, page 6-12.

Single Link: Inline Topology

In the inline topology, the Cisco SCE 2000 resides physically on the GBE (Gigabit Ethernet) link between the subscribers, which are usually connected through either a BRAS (in DSL access), a PDSN (in wireless access), a CMTS (in the Cable access), or a switch or router aggregator (in other topologies), and the network, where the Cisco SCE 2000 usually connects to a router or layer 3 switch network element.

Figure 6-1 Cabling Diagram for Single Link Inline Topology



In the single link inline topology, either the first GBE link (first two ports) of the Cisco SCE 2000 or the second GBE link (third and fourth ports) can be used, as illustrated in the diagram above. The remaining pair of ports is unused.

Either port 1 or port 3 is used for connecting to the network element that is deployed on the subscriber side of the Cisco SCE 2000 while port 2 or port 4 is used for connecting to the network element that is deployed on the network side of the Cisco SCE 2000 .

Inline topology requires both Receive and Transmit fibers.

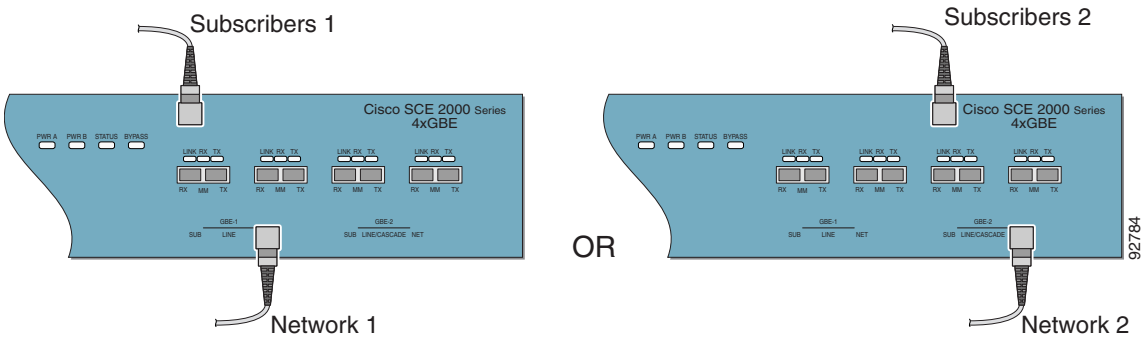
Single Link: Receive-only Topology

In this topology, an optical splitter resides physically on the GBE link that the Cisco SCE 2000 should monitor. The optical splitter is connected to the Cisco SCE 2000 via Rx links only.

In this topology, the traffic passes through the optical splitter, which splits traffic to the Cisco SCE 2000.

Note Receive-only topologies can also be implemented using a switch. Such a switch must support SPAN functionality that includes separation between ingress and egress traffic and multiple SPAN-ports destinations.

Figure 6-2 Cabling Diagram for Single SCE Platform Single Link Receive-only Topology



The single link receive-only topology cabling is similar to that for single link inline, in that either the first GBE link (first two ports) or the second GBE link (third and fourth ports) can be used, as illustrated in the diagram above. The remaining pair of ports is unused.

Either port 1 or port 3 is used for connecting to the network element that is deployed on the subscriber side of the SCE 2000 while port 2 or port 4 is used for connecting to the network element that is deployed on the network side of the SCE 2000.

Dual Link: Single SCE 2000 Topologies

In this topology, one Cisco SCE 2000 is connected to two full duplex, GBE links. The Cisco SCE 2000 may be either inline, to support both monitoring and traffic control functionality, or receive-only for traffic monitoring functionality only.

When one Cisco SCE 2000 supports two links, the first two ports are connected to one link, while ports 3 and 4 are connected to the second link as follows;

- Port 1: Link 1, Subscriber side
- Port 2: Link 1, Network side
- Port 3: Link 2, Subscriber side
- Port 4: Link 2, Network side

As with the single link cabling, inline topologies require both Receive and Transmit fibers, while Receive-only systems use only Receive fibers.

Note Receive-only topologies can be implemented using either an optical splitter or a switch. If a switch is used, it must support SPAN functionality that includes separation between ingress and egress traffic and multiple SPAN-ports destinations.

The following two diagrams illustrate the connections for dual links, with a single Cisco SCE 2000 deployed for both inline and receive-only topologies.

Figure 6-3 Cabling Diagram: Dual Link One SCE Platform Inline

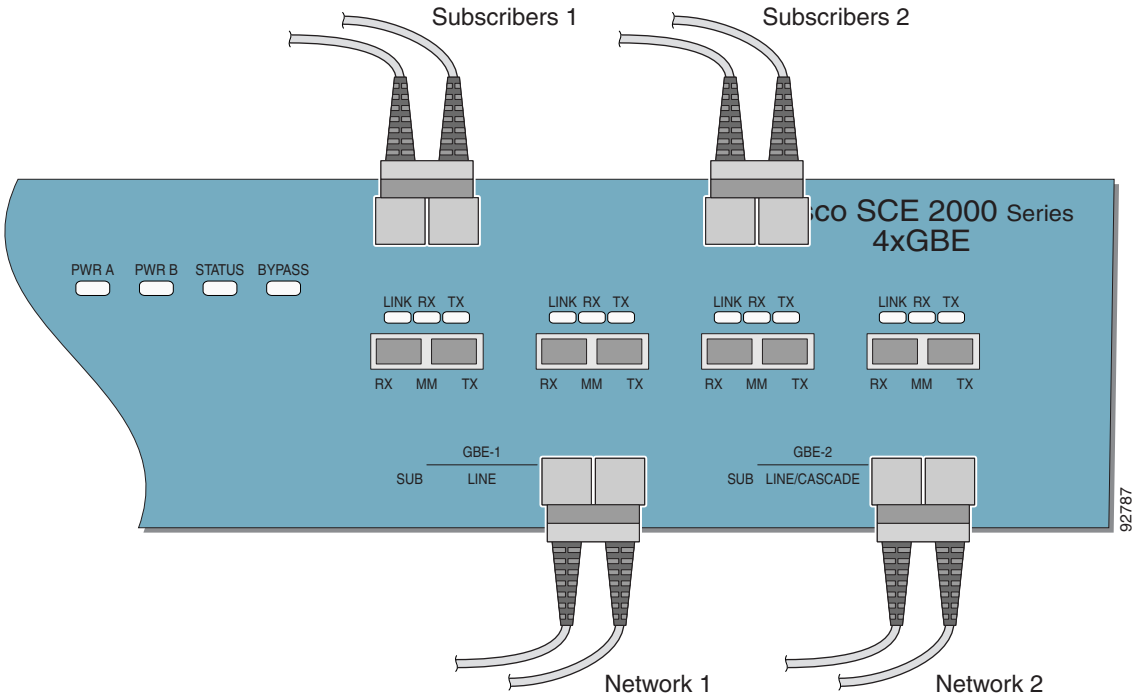
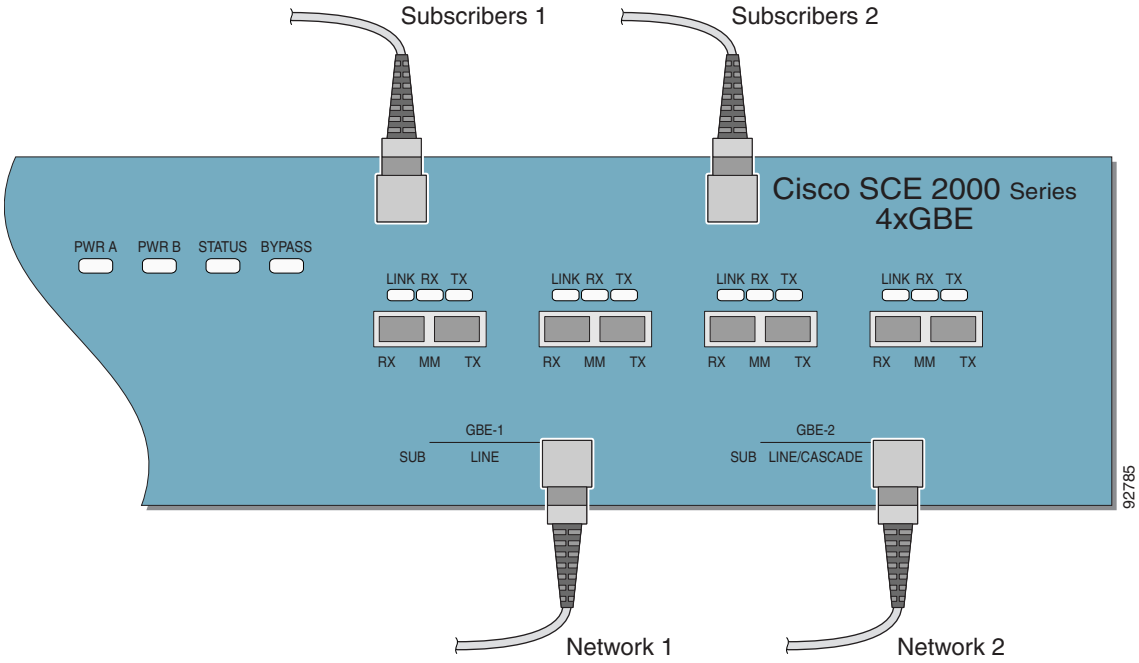


Figure 6-4 Cabling Diagram: Dual Link One SCE Platform Receive-only



Dual Link: Two Cisco SCE 2000s Topology

In this topology, two Cisco SCE 2000s are connected to two full duplex, GBE links, providing full redundancy through cascading the two Cisco SCE 2000s. The Cisco SCE 2000s may be either inline, to support both monitoring and traffic control functionality, or receive-only for traffic monitoring functionality only.

Note When installing a cascaded system, it is extremely important to follow the sequence of procedures outlined in the section How to Install a Cascaded System, page 6-12.

Note Receive-only topologies can be implemented using either an optical splitter or a switch. If a switch is used, it must support SPAN functionality that includes separation between ingress and egress traffic and multiple SPAN-ports destinations.

When two Cisco SCE 2000s are used, the first two ports in each Cisco SCE 2000 are connected to the links, while ports 3 and 4 are the cascade ports that are used for communicating between the two Cisco SCE 2000s as follows:

Cisco SCE 2000 #1

- Port 1: Link 1, Subscribers side
- Port 2: Link 1, Network side
- Port 3: Cascade, connect to Port 4 in Cisco SCE 2000 #2
- Port 4: Cascade, connect to Port 3 in Cisco SCE 2000 #2

Cisco SCE 2000 #2

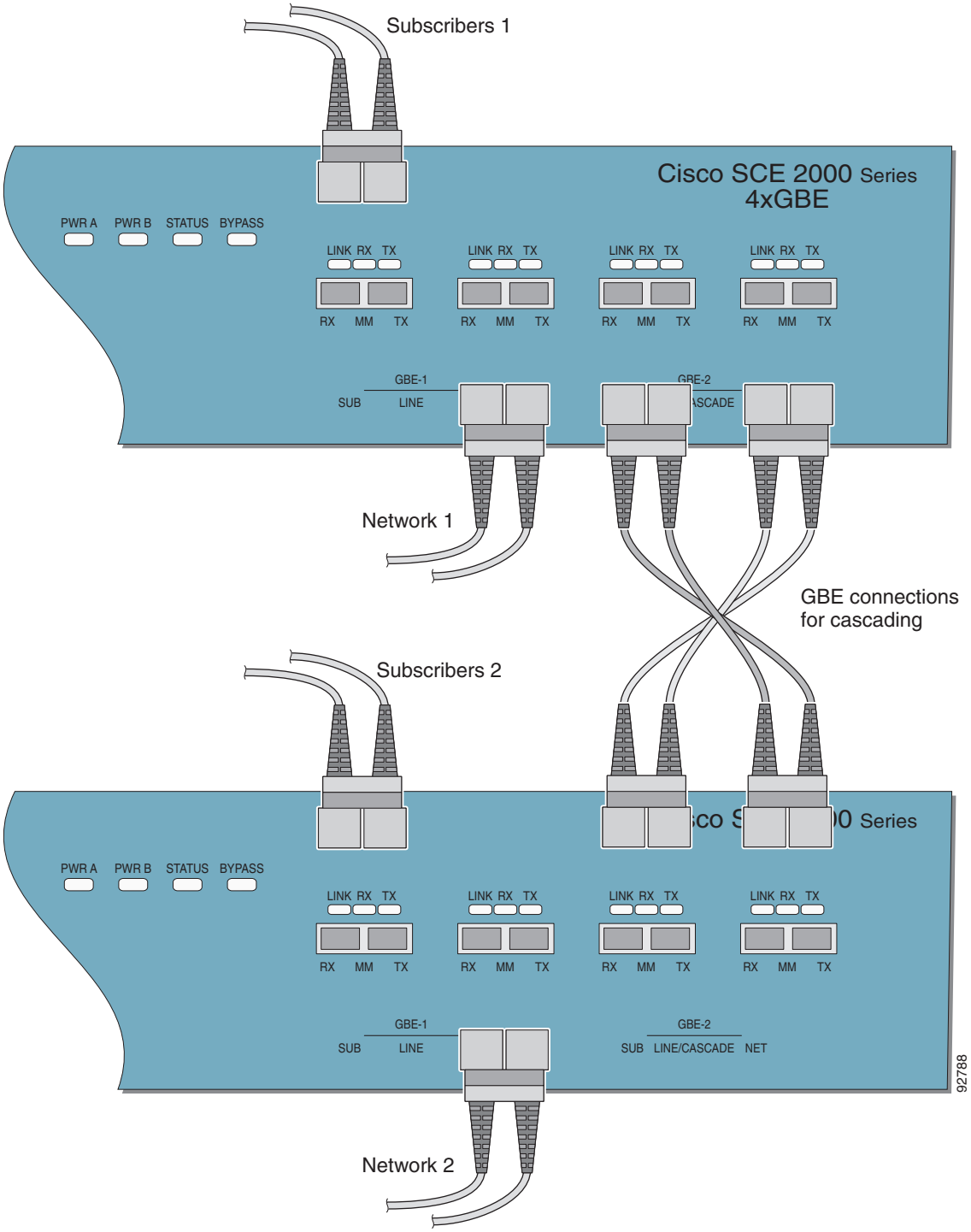
- Port 1: Link 2, Subscribers side
- Port 2: Link 2, Network side
- Port 3: Cascade, connect to Port 4 in Cisco SCE 2000 #1
- Port 4: Cascade, connect to Port 3 in Cisco SCE 2000 #1

Note Cascade ports must be connected directly in Layer 1 (dark fibers).

Inline topologies require connecting both Receive and Transmit fibers to the Cisco SCE 2000 . Cascade ports always require both Receive and Transmit fibers to be connected.

The following diagram illustrates the connections for a dual link, two Cisco SCE 2000 inline topology.

Figure 6-5 Cabling Diagram: Dual Link Inline Topology Two Cascaded SCE Platforms



How to Configure the GBE Interface Parameters

By default, the Cisco SCE 2000 GBE line interface ports are configured with auto-negotiation disabled. The procedure for enabling auto-negotiation for the GBE line interface ports is explained in the following section.

Note Auto-negotiation must be disabled when the Cisco SCE 2000 is deployed via an external optical splitter (receive-only topology)

Note If you change any parameters, you must save the new configuration settings. Type **copy running-config startup-config** and press **Enter**.

Note The maximum packet size supported by the Cisco SCE platform is 1600 bytes

Step 1 To enter the Global Configuration Mode, at the SCE# prompt, type **configure** and press **Enter**.

Step 2 To enter the desired GBE port interface, type **interfaceGigabitEthernet 0/** *portnumber*, and press **Enter**, where *portnumber* is the number of the selected port (1-4).

Step 3 Type **auto-negotiate** and press **Enter**.

Step 4 To return to Global Configuration Mode, type **exit** and press **Enter**.

How to Cable the GBE Line Interface Ports

The following sections present the general procedure for cabling the GBE interface ports. Refer to Cabling Diagrams, page 6-2 to find the appropriate cabling diagram for the topology of your system for the specific connections required.

Note When installing an External Optical Bypass module, the SCE 2000 line ports are connected to the module. See The External Optical Bypass Module, page A-1 for complete instructions.

Warning **Class 1 laser. Avoid exposure to radiation and do not stare into open aperture.**

Fiber Specifications

The following table presents the fiber specifications. The Cisco SCE 2000 may be ordered with either Multimode or Single Mode transceivers. The transceiver type is indicated on the front panel under the ports. Note that both transceivers on any individual Cisco SCE 2000 are the same, either 850nm Multimode OR 1310nm Single Mode.

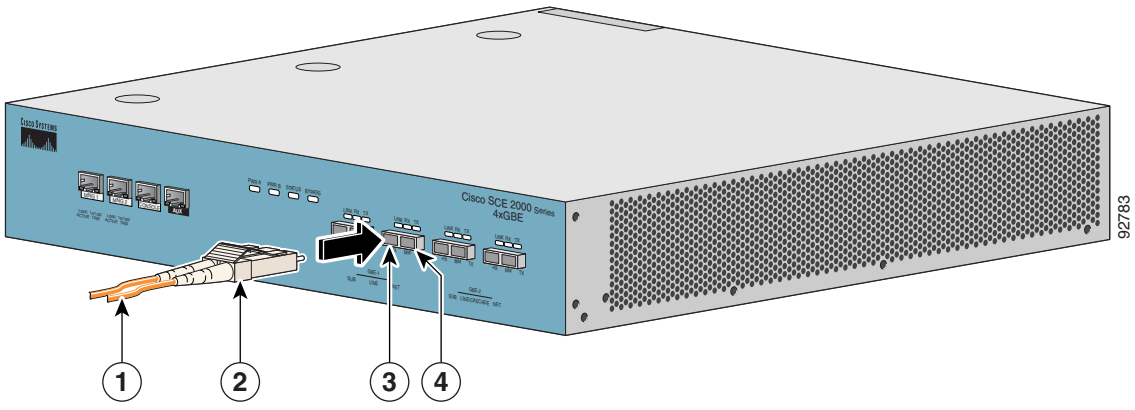
Table 6-1 Fiber Specifications

SCE Model	Transceiver	Transmit Power (dBm)	Receive Power (dBm)	Typical (Max.) Distance
SCE 2000 4xGBE MM	850nm Multimode	–9.5 to –4.0	–17.0 to 0.0	• 750m for 50µm Core Diameter MMF • 400m for 62.5µm Core Diameter MMF
SCE 2000 4xGBE SM	1310nm FRP laser Single Mode	–9.5 to –3.0	–20.0 to 3.0	10 km for 9.0µm Core Diameter SMF

Step 1 Take the appropriate fiber optic cable (see Fiber Specifications, page 6-9) and plug it into the appropriate GBE port on the front panel of the Cisco SCE 2000.

Make sure to push on the connector until you hear a click, which indicates that the connector is fully inserted and secured in the receptacle. Always make sure that you insert the connector completely into the socket.

Figure 6-6 Cabling the GBE Interface



Step 2 Verify that the link LED is green.

If the link LED does not light, try removing the network cable plug and reinserting it firmly into the module socket.

Testing Connectivity: Examining Link LEDs and Counters to Verify that the Network Traffic is Reaching the Device

If the Cisco SCE 2000 platform has been powered up, test now to verify that connectivity has been established on all links. If the Cisco SCE 2000 platform is not powered up, perform this step after starting the Cisco SCE 2000 platform.

Examining the LEDs

The GBE Link LED must be green in order to verify that an active connection exists.

The GBE Rx and Tx LEDs (if flashing green) indicate that traffic is being received or transmitted by the Cisco SCE 2000 platform, respectively.

Note that in an inline topology, the Rx and Tx LEDs indicate that packets are being received/transmitted by the Cisco SCE 2000 platform.

In optical splitter topologies, the Rx LEDs are the sole indicators. The Tx LEDs do not “blink”, since the Tx is not connected to the port in this topology.

How to View the Gigabit Ethernet Port Status

Step 1 At the SCE# prompt, type **show interfaceGigabitEthernet 0/** *interface-number*.

This displays the port link and auto-negotiation status.

The following example displays a system response.

EXAMPLE:

```
SCE# show interface GigabitEthernet 0/1

Auto negotiation configured: Enabled
Actual Status:
Link is on
Autonegotiation: Enabled
Bandwidth: 100000Kbps
Burst-size: 50000bytes
```

Again, auto-negotiation for bump-in-the-wire topology may be enabled or disabled. For receive-only topologies, using an external splitter, auto-negotiation must be disabled.

How to View the Gigabit Ethernet Counters

In an inline topology, you can monitor traffic via the platform counters for both the Rx and Tx connections. The counters increase, together with the increased number of packets that flow through the Cisco SCE 2000 for both Rx and Tx.

However, in external switch topologies, the counters for the Tx do not increment, that is, Tx does not have a function in monitoring traffic, as it is disconnected.

Step 1 At the SCE# prompt, type **show interfaceGigabitEthernet 0/** *interface-number* **counters**.

This displays the GigabitEthernet counters. This command enables you to verify that traffic is taking place. You can see that the counters increase, together with the increased number of packets that flow through the SCE 2000.

Again, in bump-in-the-wire topology, both the Rx and Tx counters apply as traffic monitors. For receive-only topologies, using an external splitter, only the Rx counters apply.

The following example shows the counters of the first Gigabit Ethernet interface.

```
SCE# show interface GigabitEthernet 0/1 counters

In total octets: 100
In good unicast packets: 90
In good multicast packets: 0
In good broadcast packets: 10
In packets discarded: 0
In packets with CRC/Alignment error: 0
In undersized packets: 0
In oversized packets: 0
Out total octets: 93*2^32+1022342538
Out unicast packets: 858086051
Out non unicast packets: 0
Out packets discarded: 0
```

What to Do Next

You are now ready to continue to the next stage, How to Install a Service Control Application, page 6-17.

Information About Cascaded Systems

How to Install a Cascaded System

This section outlines the installation procedures for a redundant solution with two cascaded Cisco SCE 2000 platforms. Refer to the Cisco Service Control Engine (SCE) CLI Command Reference for details of the CLI commands.

When working with two Cisco SCE 2000 platforms with split-flow and redundancy, it is extremely important to follow this installation procedure.

Step 1 Install both Cisco SCE 2000 platforms, power them up, and perform the initial system configuration. (See Installation and Maintenance, page 4-1 and Connecting the Management Interfaces and Performing Initial System Configuration, page 5-1)

Step 2 Connect both Cisco SCE 2000 platforms to the management station. (See Connecting the Management Interfaces and Performing Initial System Configuration, page 5-1.)

Step 3 Connect the cascade ports. The cascade ports must be connected directly in Layer 1 (dark fibers), not through switches. (See Dual Link: Two Cisco SCE 2000s Topology, page 6-5.)

Step 4 Set topology configurations for each Cisco SCE 2000 platform via the connection-mode options. (See Topology-Related Parameters, page 3-12.)

Step 5 Make sure that the Cisco SCE 2000 platforms have synchronized and active Cisco SCE 2000 platform was selected.

Use the **show interface linecard 0 connection-mode** command.

Step 6 If you want to start with bypass/sniffing, change the link mode to your required mode in both Cisco SCE 2000 platforms on both links. The bypass mode will be applied only to the active SCE 2000 platform. (See How to Set the Link Mode, page 6-14.)

Step 7 Make sure that the link mode is as you required. (See How to Install a Service Control Application, page 6-17.)

Use the **show interface linecard 0 link mode** command.

Step 8 Connect the traffic port of Cisco SCE 2000 platform #1. This will cause a momentary down time until the network elements from both sides of the SCE 2000 platform auto-negotiate with it and start working (when working inline). (See Dual Link: Two Cisco SCE 2000s Topology, page 6-5.)

Step 9 Connect the traffic port of Cisco SCE 2000 platform #2. This will cause a momentary down time until the network elements from both sides of the Cisco SCE 2000 platform auto-negotiate with it and start working (when working inline). (See Dual Link: Two Cisco SCE 2000s Topology, page 6-5.)

Step 10 When full control is needed, change the link mode on both Cisco SCE 2000 platforms on both links to ‘forwarding’. It is recommended to first configure the active Cisco SCE 2000 platform and then the standby. (See How to Set the Link Mode, page 6-14.)

Step 11 You can now start working with the Cisco Service Control Subscriber Manager.

CLI Commands for Cascaded Systems

This section presents CLI commands relevant to the configuration and monitoring of a redundant system.

Topology-Related Parameters for Redundant Topologies

All four of the topology-related parameters are required when configuring a redundant topology.

- **Connection mode** — Redundancy is achieved by cascading two Cisco SCE platforms. Therefore the connection mode for both SCE platforms may be either:
  - Inline-cascade
  - Receive-only-cascade
- **sce-id** — In cascaded topologies, defines which link is connected to this Cisco SCE platform.

  The sce-id parameter, which identifies the Cisco SCE platform, replaces the physically-connected-link parameter, which identified the link. This change was required with the introduction of the Cisco SCE 8000 GBE platform, which supports multiple links.

  In the Cisco SCE 2000, the number assigned to the sce-id parameter (0 or 1) will be defined as the of number of the physically connected link.

Note For backwards compatibility, the physically-connected-links parameter is currently still recognized.

- **Priority** — For each of the cascaded Cisco SCE platforms, this parameter defines whether it is the primary or secondary device.
- **On-failure** — For each of the cascaded Cisco SCE platforms, this parameter determines whether the system cuts the traffic or bypasses it when the Cisco SCE platform either has failed or is booting.

How to Configure the Connection Mode

Use the following command to configure the connection mode, including the following parameters:

- inline/receive only
- sce-id
- behavior upon failure of the Cisco SCE platform
- primary/secondary

Step 1 From the SCE(config if)# prompt, type **connection-mode inline-cascade/receive-only-cascade [sce-id (link-0/link-1)] [priority (primary/secondary)] [on-failure (bypass/cutoff)]** and press **Enter**.

EXAMPLE 1

Use the following command to configure the primary Cisco SCE platform in a two-Cisco SCE platform inline topology. Link 1 is connected to this Cisco SCE platform and the behavior of the Cisco SCE platform if a failure occurs is bypass.

```
SCE(config if)# connection-mode inline-cascade sce-id 1 priority primary on-failure bypass
```

EXAMPLE 2

Use the following command to configure the Cisco SCE platform that might be cascaded with the Cisco SCE platform in Example 1. This Cisco SCE platform would have to be the secondary SCE platform, and Link 0 would be connected to this Cisco SCE platform, since Link 1 was connected to the primary. The connection mode would be the same as the first, and the behavior of the Cisco SCE platform if a failure occurs is also bypass.

```
SCE(config if)# connection-mode inline-cascade sce-id 0 priority secondary on-failure
bypass
```

How to Set the Link Mode

The Cisco SCE platform has an internal hardware card used to maintain the links even when the SCE platform fails. This hardware card has four possible modes of operation:

- bypass
- forwarding
- cutoff
- sniffing

Normally, the link mode is selected by the Cisco SCE platform software according to the configured connection-mode. However, the **link mode** command can be used to enforce a specific desired mode. This may be useful when debugging the network, or in cases where we would like the Cisco SCE platform just to forward the traffic. (Note that this is only relevant to inline topologies even though the configuration is available also when in receive-only mode.)

The following link mode options are available:

- **Forwarding** — forwards traffic on the specified link to the Cisco SCE platform for processing.
- **Bypass** — stops all forwarding of traffic on the specified link to the Cisco SCE platform. Traffic still flows on the link, but is not processed in any way by the Cisco SCE platform.

  This does not affect the redundancy states.
- **Sniffing** — allows the Cisco SCE platform to forward traffic on the specified link through the bypass mechanism while still analyzing the traffic passively.

  Sniffing is permitted to be configured for all links, only (use the all-links option).
- **Cutoff** — completely cuts off flow of traffic through the specified link.

Note the following recommendations and restrictions:

- Since the Cisco SCE 2000 platforms have more than one link, it is required to specify the link. The link designations are as follows:
  - GBE1-GBE2/GBE3-GBE4
- Use the ' **all-links**' option to configure the link mode for all links.
- It is recommended that both links be configured together. Use the **all-links** option.
- Link mode is relevant only to inline topologies.
- It is recommended that in cascaded topologies, both SCE platforms be configured for the same link mode, otherwise the service will be unpredictable.

- Sniffing can only be configured for all links, therefore, to configure sniffing, the **all-links** option is required, not just recommended.
- The default link mode is forwarding. When other link modes are selected, active service control is not available and any service control configuration will not be applicable.

Step 1 From the SCE(config if)# prompt, type **link mode [<link>|all-links] [forwarding|bypass|sniffing|cutoff]** and press **Enter**.

Monitoring a Cascaded System

Use the following commands to monitor a cascaded system. They provide information regarding the connection status and link configuration.

How to View the Current Connection Mode

Step 1 From the SCE> prompt, type **show interface linecard 0 connection-mode** and press **Enter**.

How to View the SCE-ID

Step 1 From the SCE> prompt, type **show interface linecard 0 sce-id** and press **Enter**.

How to View the Current Link Mode

Step 1 From the SCE> prompt, type **show interface linecard 0 link mode** and press **Enter**.

How to View the Current Redundancy Status of the SCE Platform

Step 1 From the SCE> prompt, type **show interface linecard 0 cascade redundancy-status** and press **Enter**.

How to View Information about the Peer SCE Platform

Step 1 From the SCE> prompt, type **show interface linecard 0 cascade peer-sce-information** and press **Enter**.

How to View Information about the Cascade Connections

Step 1 From the SCE> prompt, type **show interface linecard 0 cascade connection-status** and press **Enter**.

How to View the Current Link Mappings

Step 1 From the SCE> prompt, type **show interface linecard 0 physically-connected-links** and press **Enter**.

How to Install a Service Control Application

The Cisco Service Control solution requires that the Cisco Service Control application be installed on the Cisco SCE platform. This is a pqi file that is installed and configured using the Cisco Service Control Application for Broadband (Cisco SCA BB) console.

For an explanation of how to install the pqi file, see the "Installing the Application and Protocol Pack on the SCE Platform" section in the *Cisco Service Control Product Installation Guide*.

For information on initial configuration of the application, see the "Initial SCA BB Configuration" section in the *Cisco Service Control Product Installation Guide*.

For complete instructions on how to install and configure the SCA BB application, see the *Cisco Service Control Application for Broadband User Guide*.