Overview

This chapter describes the SA-Comp/1 and SA-Comp/4 service adapters (CSA) and contains the following sections:

CSA Overview

The CSA provides high performance, hardware-based, data compression capabilities for Cisco 7200 series routers and VIP2 in the Cisco 7000 series and Cisco 7500 series routers. Following are the two CSA models:

- SA-Comp/1(=)—A 768-KB memory configuration, which supports up to 64 compression contexts (see Figure 1-1)
- SA-Comp/4(=)—A 3-MB memory configuration, which supports up to 256 compression contexts (see Figure 1-2)

Note There is one compression context for each PPP link and one compression context for each virtual circuit in a Frame Relay link.

Figure 1-1 SA-Comp/1—Faceplate View

Figure 1-2 SA-Comp/4—Faceplate View

There are no media interfaces on the CSA faceplate. The CSA off-loads all compression and decompression-related packet handling from host processors by compressing and decompressing packets passing through interfaces on serial port adapters installed in the host chassis.

Note See the "Software and Hardware Requirements" section on page 2-1 for the serial port adapters supported by the CSA.

The CSA supports simultaneous Stacker data compression algorithms, with independent full-duplex compression and decompression capabilities. The CSA supports only PPP and Frame Relay encapsulation.

Note While the VIP2 supports online insertion and removal (OIR), individual port adapters and service adapters do not. To replace a port adapter or service adapter, you must first remove the VIP2 from the router, and then replace adapters as required.

Cisco 7200 series routers support the OIR of all port adapter and service adapter types.

Data Compression Overview

The basic function of data compression is to reduce the size of a data frame transmitted over a network link. Reducing the size of the frame reduces the time required to transmit the frame across the network. Data compression works by providing a coding scheme at each end of a transmission link. This coding scheme allows characters to be removed from the frames of data at the sending side of the link and then replaced correctly at the receiving side. Because the condensed frames take up less bandwidth, greater numbers of them can be transmitted per unit of time.

Data compression schemes used in internetworking devices are referred to as lossless compression algorithms. These schemes reproduce the original bit streams exactly, with no degradation or loss, a feature required by routers and other devices to transport data across the network. The two most commonly used compression algorithms on internetworking devices are the Stacker compression and the Predictor data compression algorithms.

Stacker compression was developed by STAC Electronics and is based on the Lempel-Ziv compression algorithm. The Stacker algorithm uses an encoded dictionary that replaces a continuous stream of characters with codes. The symbols represented by the codes are stored in memory in a dictionary-style list. Because the relationship between a code and the original symbol varies as the data varies, this approach is more responsive to the variations in the data. This flexibility is particularly important for LAN data, because many different applications can be transmitting over the WAN at any one time. In addition, as the data varies, the dictionary changes to accommodate and adapt to the varying needs of the traffic.

Predictor compression was developed by Novell. The Predictor compression algorithm tries to predict the next sequence of characters in a data stream by using an index to look up a sequence in the compression dictionary. It then examines the next sequence in the data stream to see if it matches. If it

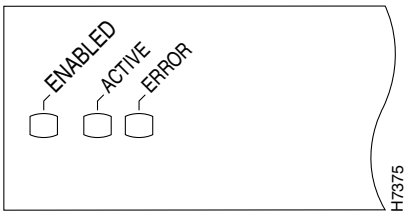
does, that sequence replaces the looked-up sequence in the dictionary. If there is no match, the algorithm locates the next character sequence in the index and the process begins again. The index updates itself by hashing a few of the most recent character sequences from the input stream.

Cisco internetworking devices use the Stacker and Predictor data compression algorithms. The CSA supports only the Stacker algorithm.

LEDs

The CSA has an enabled LED, standard on all service adapters, plus active and error LEDs. After system initialization, the enabled LED goes on to indicate that the CSA has been enabled for operation. (The LEDs are shown in Figure 1-3.)

Figure 1-3 LEDs on the CSA (Partial Faceplate View)



The following conditions must be met before the enabled LED goes on:

- The data compression interface is correctly connected to the backplane and receiving power.
- The CSA-equipped VIP2 contains a valid microcode version that has been downloaded successfully and the bus recognizes the CSA-equipped VIP2.

If either of these conditions is not met, or if the router initialization fails for other reasons, the enabled LED does not go on.

The CSA has the following LEDs and indications:

Table 1-1 CSA LEDs

LED Label	Color	State	Function
Enabled	Green	On	Compression service adapter is enabled for operation.
Active	Green	On	Indicates the CSA is active and ready to process data. This LED goes on when the service adapter's boot process is complete and remains off during normal system operation.
Error	Amber	On	Indicates an error was found, and if it remains on, it indicates the error might prevent accurate compression. Error codes are generated by software. This LED remains off during normal system operation.

Service and Port Adapter Slot Locations on the Supported Platforms

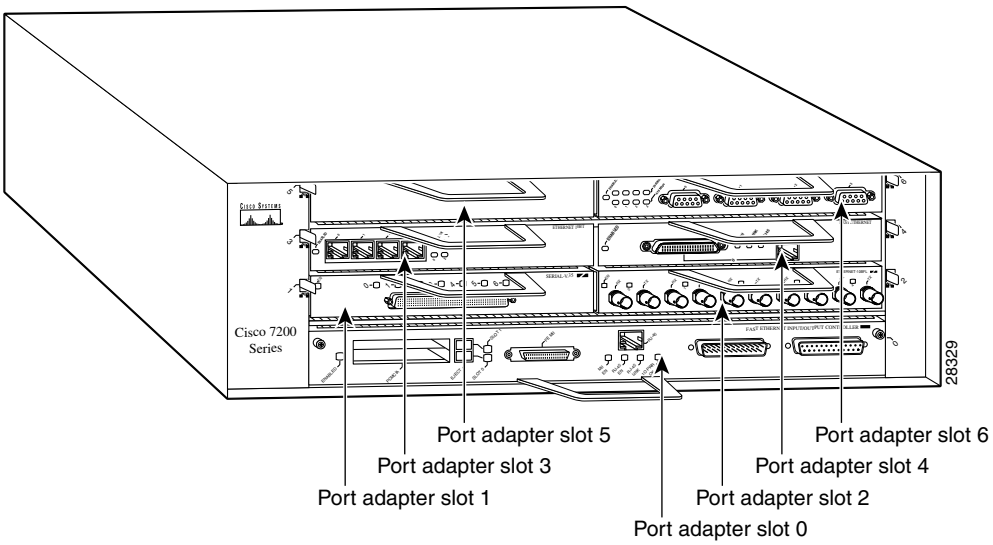
Cisco 7200 Series Routers Slot Numbering

Figure 1-4 shows a Cisco 7206 with port adapters installed. In the Cisco 7206 (including the Cisco 7206 as a router shelf in a Cisco AS5800 Universal Access Server), port adapter slot 1 is in the lower left position, and port adapter slot 6 is in the upper right position. (The Cisco 7204 is not shown; however, the SA-Comp/1 and SA/Comp/4 can be installed in any available port adapter slot.)

Note The I/O controller is available with or without a Fast Ethernet port. You can install both I/O controller types in the Cisco 7204 and the Cisco 7206.

Note The Cisco 7202, Cisco 7204VXR, and Cisco 7206VXR do not support the CSA. See the "Software and Hardware Requirements" section on page 2-1 for information CSA requirements.

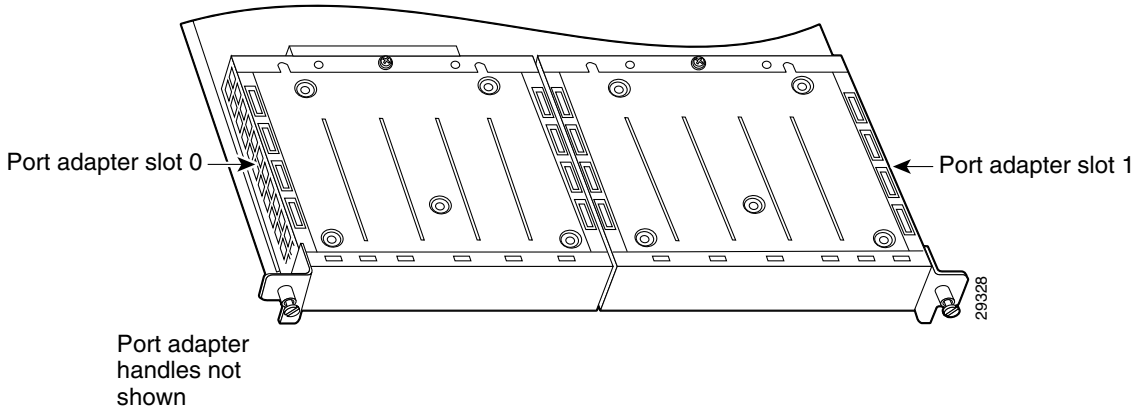
Figure 1-4 Port Adapter Slots in the Cisco 7206



VIP2 Slot Numbering

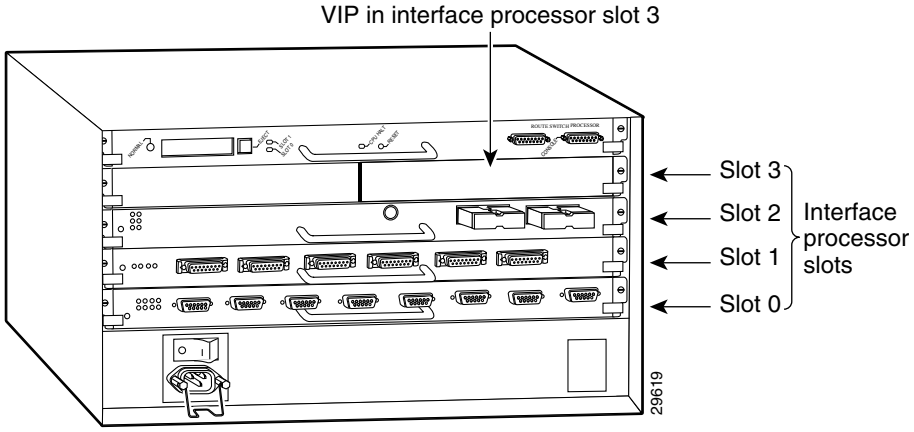
Figure 1-5 shows a partial view of a VIP motherboard with installed port or service adapters. With the motherboard oriented as shown in Figure 1-5, the left port adapter is in port adapter slot 0, and the right port adapter is in port adapter slot 1. The slots are always numbered 0 and 1.

Figure 1-5 VIP Motherboard with Two Port Adapters Installed—Horizontal Orientation



Note In the Cisco 7000, Cisco 7507, and Cisco 7513 chassis, the VIP motherboard is installed vertically. In the Cisco 7010 and Cisco 7505 chassis, the VIP motherboard is installed horizontally.

Figure 1-6 Interface Slot Numbers—Cisco 7505 shown



Identifying Interface Addresses

This section describes how to identify interface addresses for the SA-Comp/1 and SA-Comp/4 in supported platforms. Interface addresses specify the actual physical location of each interface on a router or switch.

Interfaces on the SA-Comp/1 and SA-Comp/4 installed in a router maintain the same address regardless of whether other port adapters are installed or removed. However, when you move a port adapter to a different slot, the first number in the interface address changes to reflect the new port adapter slot number.

Interfaces on an SA-Comp/1 and SA-Comp/4 installed in a VIP2 maintain the same address regardless of whether other interface processors are installed or removed. However, when you move a VIP2 to a different slot, the interface processor slot number changes to reflect the new interface processor slot.

Note Interface ports are numbered from left to right starting with 0.

Table 1-2 explains how to identify interface addresses.

Table 1-2 Identifying Interface Addresses

Platform	Interface Address Format	Numbers	Syntax
Cisco 7200 series routers	Port-adapter-slot-number/interface-port-number	Port adapter slot—0 through 6 (depends on the number of slots in the router)[1] Interface port—0 through 7	`1/0`
VIP2 in Cisco 7000 series or Cisco 7500 series routers	Interface-processor-slot-number/port-adapter-slot-number/interface-port-number	Interface processor slot—0 through 12 (depends on the number of slots in the router) Port adapter slot—always 0 or 1 Interface port—0 through 7	`3/1/0`

1. Port adapter slot 0 is reserved for the Fast Ethernet port on the I/O controller (if present).

Cisco 7200 Series and Routers Interface Addresses

This section describes how to identify the interface addresses used for the SA-Comp/1 and SA-Comp/4 in Cisco 7200 series routers. The interface address is composed of a two-part number in the format *port-adapter-slot-number/interface-port-number*. See Table 1-2 for the interface address format.

In Cisco 7200 series routers, port adapter slots are numbered from the lower left to the upper right, beginning with port adapter slot 1 and continuing through port adapter slot 2 for the Cisco 7202, slot 4 for the Cisco 7204, and slot 6 for the Cisco 7206. (Port adapter slot 0 is reserved for the optional Fast Ethernet port on the I/O controller—if present.)

The interface addresses of the interfaces on the SA-Comp/1 or SA-Comp/4 in port adapter slot 1 are 1/0 through 1/7 (port adapter slot 1 and interfaces 0 through 7). If the SA-Comp/1 or SA-Comp/4 was in port adapter slot 4, these same interfaces would be numbered 4/0 through 4/7 (port adapter slot 4 and interfaces 0 through 7).

VIP2 Interface Addresses

This section describes how to identify the interface addresses used for the SA-Comp/1 and SA-Comp/4 on a VIP2 in Cisco 7000 series and Cisco 7500 series routers.

Note The Cisco 7202, Cisco 7204VXR, and Cisco 7206VXR do not support the CSA. See the "Software and Hardware Requirements" section on page 2-1 for information CSA requirements.

Note Although the processor slots in the 7-slot Cisco 7000 and Cisco 7507 and the 13-slot Cisco 7513 and Cisco 7576 are vertically oriented and those in the 5-slot Cisco 7010 and Cisco 7505 are horizontally oriented, all Cisco 7000 series and Cisco 7500 series routers use the same method for slot and port numbering.

Note The I/O controller is available with or without a Fast Ethernet port. You can install both I/O controller types in all Cisco 7200 series routers; however, when you install an I/O controller with a Fast Ethernet port in a Cisco 7202, the system software automatically disables the port.

See Table 1-2 for the interface address format. The interface address is composed of a three-part number in the format *interface-processor-slot number/port-adapter-slot-number/interface-port- number.*

If the VIP2 is inserted in interface processor slot 3, then the interface addresses of the *SA-Comp/1 and SA-Comp/4* are 3/1/0 through 3/1/7 (interface processor slot 3, port adapter slot 1, and interfaces 0 through 7). If the port adapter was in port adapter slot 0 on the VIP2, these same interface addresses would be numbered 3/0/0 through 3/0/7.

Note If you remove the VIP2 with the *SA-Comp/1 and SA/Comp/4* (shown in Figure 1-6) from interface processor slot 3 and install it in interface processor slot 2, the interface addresses become 2/1/0 through 2/1/7.