

SA-Comp/1 and SA-Comp/4 Data Compression Service Adapters

Description

The SA-Comp/1 and SA-Comp/4 data compression service adapters (CSAs) are available on Cisco 7200 series routers, on second-generation Versatile Interface Processors (VIP2s) in Cisco 7500 series routers, and on Cisco 7000 series routers with the 7000 Series Route Switch Processor (RSP7000) and 7000 Series Chassis Interface (RSP7000CI). (CSAs require VIP2 model VIP2-40.)

These service adapters provide high-performance, hardware-based data compression capabilities via simultaneous Stacker compression data compression algorithms with independent full-duplex compression and decompression capabilities on point-to-point (PPP) encapsulated packets.

The SA-Comp/1 supports up to 64 compression contexts and the SA-Comp/4 supports up to 256 compression contexts. There is one compression context per PPP link.

The CSA supports the compression and decompression of data passing through synchronous serial interfaces that are configured for a peak line rate of 16 Mbps or lower. You can use the CSA to compress and decompress data passing through any synchronous serial interface; however, the serial interface must be configured to send and receive data at a rate no greater than 16 Mbps. For example, the CSA supports high-speed serial interfaces (such as HSSI interfaces) if the interfaces are configured for a peak line rate of 16 Mbps or lower.

On the Cisco 7200 series routers you can optionally specify which CSA the interface uses to perform hardware compression.

Platforms

This feature is supported on these platforms:

- Cisco 7200 series
- Cisco 7500 series
- Cisco 7000 series with the RSP7000 and RSP7000CI

Configuration Task

You can configure point-to-point compression on serial interfaces that use PPP encapsulation. Compression reduces the size of a PPP frame via lossless data compression. PPP encapsulations support both predictor and Stacker compression algorithms.

If the majority of your traffic is already compressed files, do not use compression.

When you configure Stacker compression on Cisco 7000 series routers with RSP7000, on Cisco 7200 series routers, and on Cisco 7500 series routers, there are three methods of compression: hardware compression, distributed compression, and software compression. Specifying the **compress stac** command with no options causes the router to use the fastest available compression method:

- If the router contains a compression service adapter (CSA), compression is performed in the CSA hardware (hardware compression).
- If the CSA is not available, compression is performed in the software installed on the VIP2 (distributed compression).
- If the VIP2 is not available, compression is performed in the router's main processor (software compression).

Using hardware compression in the CSA frees the router's main processor for other tasks. You can also configure the router to use the VIP2 to perform compression by using the **distributed** option, or to use the router's main processor by using the **software** option. If the VIP2 is not available, compression is performed in the router's main processor.

When compression is performed in software installed in the router's main processor, it might significantly affect system performance. We recommend that you disable compression in the router's main processor if the router CPU load exceeds 40 percent. To display the CPU load, use the **show process cpu EXEC** command.

To configure compression over PPP, perform the following tasks in interface configuration mode:

Task	Command
Step 1 Enable encapsulation of a single protocol on the serial line.	encapsulation ppp
Step 2 Enable compression.	compress {predictor stac} or compress {predictor stac [distributed software]} (Cisco 7000 series with RSP7000 and Cisco 7500 series) or compress {predictor stac [csa slot software]} (Cisco 7200 series)

Configuration Example

The following example enables hardware compression and PPP encapsulation on serial interface 3/1/0:

```
router(config)# interface serial 3/1/0
router(config-if)# encapsulate ppp
router(config-if)# compress stac
router(config-if)# exit
router(config)#
```

Command Reference

This section documents new or modified commands. All other commands used with this feature are documented in the Cisco IOS Release 11.2 command references.

- **compress**
- **show compress**

compress

To configure compression for Link Access Procedure, Balanced (LAPB), Point-to-Point Protocol (PPP), and High-Level Data Link Control (HDLC) encapsulations, use the **compress** interface configuration command. On Cisco 7000 series routers with RSP7000, Cisco 7200 series routers, and Cisco 7500 series routers, hardware compression on the compression service adapter (CSA) is supported for PPP links. To disable compression, use the **no** form of this command.

```
compress {predictor | stac}
no compress {predictor | stac}
```

```
compress {predictor | stac [distributed | software]}
```

 (Cisco 7500 series and Cisco 7000 series with RSP7000)

```
compress {predictor | stac [csa slot | software]}
```

 (Cisco 7200 series)

Syntax Description

predictor	Specifies that a predictor (RAND) compression algorithm will be used on LAPB and PPP encapsulation. Compression is implemented in the software installed in the router's main processor.
stac	<p>Specifies that a Stacker (LZS) compression algorithm will be used on LAPB, HDLC, and PPP encapsulation. For all platforms except Cisco 7200 series and platforms that support the VIP2, compression is implemented in the software installed in the router's main processor.</p> <p>On Cisco 7200 series, on VIP2s in Cisco 7500 series, and on Cisco 7000 series with RSP7000, specifying the compress stac command with no options causes the router to use the fastest available compression method for PPP encapsulation only:</p> <ul style="list-style-type: none"> • If the router contains a compression service adapter (CSA), compression is performed in the CSA hardware (hardware compression). • If the CSA is not available, compression is performed in the software installed on the VIP2 (distributed compression). • If the VIP2 is not available, compression is performed in the router's main processor (software compression).
distributed	(Optional) Specifies that compression is implemented in the software that is installed in a VIP2. If the VIP2 is not available, compression is performed in the router's main processor (software compression).

- software** (Optional) Specifies that compression is implemented in the Cisco IOS software installed in the router's main processor.
- csa slot** (Optional) Specifies the CSA to use for a particular interface. This option applies only to Cisco 7200 series routers.

Default

Compression is disabled.

Command Mode

Interface configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 10.0 (as **compress predictor**). The command **compress {predictor | stac}** first appeared in Cisco IOS Release 10.3.

This command was modified in Cisco IOS Release 11.2 P and 11.1 CA to include the **distributed**, **software**, and **csa** keywords.

Using CSA hardware compression on Cisco 7000 series routers with RSP7000, Cisco 7200 series routers, and Cisco 7500 series routers removes the compression and decompression responsibilities from the VIP2 or the main processor installed in the router. By using the **compress stac** command, the router determines the fastest compression method available on the router.

When using hardware compression on Cisco 7200 series routers with multiple CSAs, you can optionally specify which CSA is used by the interface to perform compression. If no CSA is specified, the router determines which CSA is used. On Cisco 7000 series routers with RSP700 and on Cisco 7500 series routers, the router uses the CSA on the same VIP2 as the interface.

You can configure point-to-point software compression for all LAPB, PPP, and HDLC encapsulations. Compression reduces the size of frames via lossless data compression. HDLC encapsulations supports the Stacker compression algorithm. PPP and LAPB encapsulations support both predictor and Stacker compression algorithms.

When compression is performed in software installed in the router's main processor, it might significantly affect system performance. We recommend that you disable compression if the CPU load exceeds 40 percent. To display the CPU load, use the **show process cpu EXEC** command.

Compression requires that both ends of the serial link be configured to use compression.

If the majority of your traffic is already compressed files, we recommend that you not use compression. If the files are already compressed, the additional processing time spent in attempting unsuccessfully to compress them again will slow system performance.

Table 55 provides general guidelines for deciding which compression type to select.

Table 55 Compression Guidelines

Situation	Compression Type to Use
The bottleneck is caused by the load on the router.	Predictor
The bottleneck is the result of line bandwidth or hardware compression on the CSA is available.	Stacker
Most files are already compressed.	None

Software compression makes heavy demands on the router's processor. The maximum compressed serial line rate depends on the type of Cisco router you are using and which compression algorithm you specify. Table 56 shows a summary of the compressed serial line rates for software compression. The maximums shown in Table 56 apply to the "combined" serial compressed load on the router. For example, a Cisco 4000 series router could handle four 64-kbps lines using Stacker or one 256-kbps line. These maximums also assume there is very little processor load on the router aside from compression. Lower these numbers when the router is required to do other processor-intensive tasks.

Table 56 Combined Compressed Serial Line Rates (Software Compression)

Compression Method	Cisco 1000 Series	Cisco 3000 Series	Cisco 4000 Series	Cisco 4500	Cisco 4700	Cisco 7000 Family
Stacker (kbps)	128	128	256	500	T1	256
Predictor (kbps)	256	256	500	T1	2xT1	500

We recommend that you do not adjust the maximum transmission unit (MTU) for the serial interface and the LAPB maximum bits per frame (N1) parameter.

Note For information on configuring Frame Relay compression, refer to the "Configuring Frame Relay" chapter in the *Wide-Area Networking Configuration Guide*.

Examples

The following example enables hardware compression and PPP encapsulation on serial interface 3/1/0:

```
interface serial 3/1/0
  encapsulate ppp
  compress stac
```

The following example enables predictor compression on serial interface 0 for a LAPB link:

```
interface serial 0
  encapsulation lapb
  compress predictor
```

Related Commands

encapsulation lapb
encapsulation ppp
encapsulation x25
ppp compress
show compress
show processes

show compress

To display compression statistics, use the **show compress** EXEC command.

show compress

Syntax Description

This command has no arguments or keywords.

Command Mode

EXEC

Usage Guidelines

This command first appeared in Cisco IOS Release 10.0.

This information was modified in Cisco IOS Release 11.2 P and 11.1 CA to include sample output for hardware compression (implemented in the CSA hardware).

Sample Displays

The following is sample output from the **show compress** command when software compression is used on the router:

```
Router# show compress
Serial0
uncompressed bytes xmt/rcv 10710562/11376835
 1 min avg ratio xmt/rcv 2.773/2.474
 5 min avg ratio xmt/rcv 4.084/3.793
10 min avg ratio xmt/rcv 4.125/3.873
no bufs xmt 0 no bufs rcv 0
resets 0
```

Table 57 describes the fields shown in the display.

Table 57 Show Compress Field Descriptions—Software Compression

Field	Description
Serial0	Name and number of the interface.
uncompressed bytes xmt/rcv	Total number of uncompressed bytes sent and received.
1 min avg ratio xmt/rcv	Static compression ratio for bytes sent and received, averaged over 1, 5, and 10 minutes.
5 min avg ratio xmt/rcv	
10 min avg ratio xmt/rcv	
no bufs xmt	Number of times buffers were not available to compress data being sent.
no bufs rcv	Number of times buffers were not available to uncompress data being received.
resets	Number of resets (for example, line errors could cause resets).

The following is sample output from the **show compress** command when hardware compression is enabled (that is, compression is implemented in the CSA hardware):

```
Router# show compress
Serial6/1
  Hardware compression enabled
  Compressed bytes sent:    402 bytes      0 Kbits/sec   ratio: 4.092
  Compressed bytes rcv:    390 bytes      0 Kbits/sec   ratio: 3.476
  restarts:1
  last clearing of counters: 1278 seconds
```

Table 58 describes the fields shown in the display. The information displayed by the **show compress** command is the same for hardware and distributed compression. For Cisco 7200 series routers with multiple CSAs, an additional line is displayed indicating the CSA in use.

Table 58 Show Compress Field Descriptions—Hardware or Distributed Compression

Field	Description
Serial6/1	Name and number of the interface.
Compressed bytes sent	Total number of compressed bytes sent including the kilobits per second.
Compressed bytes rcv	Total number of compressed bytes received including the kilobits per second.
ratio	Compression ratio for bytes sent and received since the link last came up or since the counters were last cleared.
restarts	Number of times the compression process restarted or reset.
last clearing of counters	Duration since the last time the counters were cleared with the clear counters command.

Related Command

compress

Supported MIB

The compression service adapters can be monitored with the Cisco Compression Service Adapter (CSA) MIB (CISCO-COMPRESSON-SERVICE-ADAPTER-MIB.my). For information on accessing Cisco MIB files, refer to the *Cisco MIB User Quick Reference*.

What to Do Next

For more information on the CSA service adapters, refer to the *SA-Comp/1 and SA-Comp/4 Data Compression Service Adapter Installation and Configuration* publication.

