Data Compression AIM for the Cisco 2600 Series Routers

The following sections are provided:

Feature Summary

This document describes how to configure, verify, and troubleshoot the data compression features of the Advanced Interface Module (AIM) on the Cisco 2600 series router. The data compression AIM provides hardware-based compression and decompression of packet data transmitted and received on the serial network interfaces of the Cisco 2600 series router without occupying the Port Module Slot which might otherwise be used for additional customer network ports. Supported are the industry standard Limpel Zif Stac (LZS) and Microsoft point-to-point compression (MPPC) compression algorithms over point-to-point protocol (PPP) or frame relay. High-level Data Link Control (HDLC) is not supported. The Data Compression AIM requires Cisco IOS Release 12.0(1)T, or later.

Benefits

The data compression AIM provides a cost effective hardware based compression which yields a higher level of performance than available from the main chassis CPU running the Cisco IOS compression feature. The data compression AIM series cards provide enhanced versatility, network peripheral integration, and performance for the Cisco 2600 series routers. The data compression AIM delivers higher levels of WAN bandwidth optimization by supporting compression ratios of up to 4:1 with 8 Mbps throughput.

List of Terms

AIM—Advanced Interface Module; a hardware module which is designed to plug directly into a header on the Cisco 2600 series router motherboard.

Compression AIM—(CAIM) A hardware module containing a data compression coprocessor device that serves as a compact Compression Port Module similar to those used in larger routers, but is more compact, and does not require a Port Module slot.

CAIM Element—A hardware component such as a HiFn 9711 Compression Coprocessor, which is designed to compress and decompress data.

Context—The history of a session where data is either compressed or decompressed. The session that provides compression is distinct from the session that provides decompression. The history of either session is stored long enough to reference the context so that data is handled correctly.

IDPROM—A PROM mounted on the CAIM daughter-board that provides identification for the system. Often referred to as EEPROM since it uses an electrically erasable PROM.

LZS—Limpel, Zif, and Stac compression algorithm. A widely used, patented compression algorithm, often referred to as STAC.

PPP—Point-to-Point Protocol for WANs. See RFC-1331 for more information.

STAC—The algorithm that includes the Limpel and Zif compression algorithms widely used for data compression.

MPPC—Microsoft Point-to-Point Compression (PPC) compression algorithm, used to exchange compressed information with a Microsoft NT remote access server.

WIC—Wide Area Network Interface Card placed in the network module slot.

Restrictions

The following restrictions apply:

- Install the data compression AIM board in your Cisco 2600.
- Cisco IOS 12.0(1)T must be installed.
- Upgraded the programmable logic device (PLD).

Platform

This feature is supported on these platforms:

- Cisco 2610
- Cisco 2611
- Cisco 2612
- Cisco 2613
- Cisco 2620
- Cisco 2621

Prerequisites

You must have installed the data compression AIM board in your Cisco 2600, and upgraded the programmable logic device (PLD) before you enter any other data compression AIM related commands. See *"Data Compression AIM Configuration Note"* P/N 78-5531-01 for more information about the steps required for the upgrade procedure.

Supported MIBs and RFCs

The required MIB and RFC support is as follows:

- Cisco Chassis MIB
- Cisco Compression MIB

This feature supports the following SNMP version 1 MIBs:

- RFC1213-MIB.my
- RFC1231-MIB.my
- BRIDGE-MIB.my
- ETHERLIKE-MIB.my
- IF-MIB.my

For descriptions of supported MIBs and how to use MIBs, see Cisco's MIB website on CCO at http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml.

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

This feature supports the following RFCs:

- RFC 1967: LZS-DCP Compression Protocol, Internet Engineering Task Force.
- RFC 2118: Microsoft Point-to-Point (mppc) Protocol IETF, March 1997.
- FRF.9: Data Compression Over Frame Relay Implementation Agreement, Frame Relay Forum Technical Committee, January 22, 1996.

Functional Description

The data compression AIM is a daughter-card assembly which attaches directly to the Cisco 2600 motherboard leaving the single network module slot available for other purposes. The data compression AIM supports only serial interfaces using PPP encapsulation with STAC or MPPC compression, or Frame Relay encapsulation with STAC compression. No routing, bridging, or switching performance is impacted by this feature. The data compression AIM module contains a high-performance data compression coprocessor which implements the LZS and MPPC data compression algorithms. The module provides compression support for up to 2 E1 lines. The module contains a PCI Target/Initiator system bus interface for access into Host system memory with minimal Host processor intervention.

Configuration Tasks

To configure the data compression AIM daughter-card assembly, follow the steps provided in the "data compression AIM Configuration Note" P/N: 78-5531-xx, as follows:

- Configuring PPP Compression on page 4
- Configuring Frame-relay Map Compression on page 5
- Configuring Frame-relay payload-compression on page 8
- Configuring Diagnostics on page 9

Configuring PPP Compression

Configure your Cisco 2600 access server to use PPP compression. Specify the following information for each serial interface: encapsulation type, compression algorithm, designate the CAIM daughtercard as the source of this algorithm, and the port. Begin in global configuration mode.

Configure

To configure the PPP form of compression, use the following commands, beginning in global configuration mode:

Step	Command	Purpose
1	`Router# configure terminal` `Enter configuration commands, one per line. End with CNTL/Z.`	Enter global configuration mode.
2	`Router(config)# interface serial` *slot/port*	Enter interface configuration mode to configure serial interface 0 on port 0. If you have installed more than one WAN Interface Card (WIC), you have interfaces 0 and 1. Each WIC has a pair of ports, 0 and 1.
3	`Router(config-if)# encapsulation ppp`	Enter the **encapsulation** type which is **ppp**.[1]
4	`Router(config-if)# compress` {*mppc stac*} `caim` *element-number*	Enter the **compress** command to use one of the algorithms (mppc, predictor, or stac) on the **caim** card for port 0.[2]
5	`Router(config-if)# no fair-queue`	Enter the **no** form of **fair-queue** to ensure correct compression.
6	`Router(config-if)# no shutdown`	Enter the **no** form of the **shutdown** command to bring up this interface.
7	`Router(config-if)# ^Z`	Enter ^Z to return you to EXEC mode.

1. You also have the option of configuring encapsulation for frame-relay, which is the next example.
2. You could also have configured compression for another serial port or another CAIM card, depending upon your configuration.

Verify

- Use the **show interface serial** *slot/port* command. to check that the interface is activated. Focus on **Encapsulation PPP**, CCP Open (if two routers have successfully negotiated compression), output queue, and input queue.

```
Router# show interface serial 0/0
Serial0/0 is up, line protocol is up
  Hardware is PowerQUICC Serial
  Internet address is 1.1.1.2/24
  MTU 1500 bytes, BW 2000 Kbit, DLY 20000 usec,
     reliablility 255/255, txload 3/255, rxload 50/255
  Encapsulation PPP, loopback not set, keepalive not set
  LCP Open
  Open: IPCP, CCP
  Last input 00:00:04, output 00:00:00, output hang never
  Last clearing of "show interface" counters 1w1d
  Queueing strategy: fifo
  Output queue 0/40, 80 drops; input queue 0/75, 0 drops
  30 second input rate 397000 bits/sec, 40 packets/sec
  30 second output rate 30000 bits/sec, 40 packets/sec
     27859655 packets input, 4176659739 bytes, 0 no buffer
     Received 175145 broadcasts, 0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     55309592 packets output, 1044865717 bytes, 0 underruns
```

```
     0 output errors, 0 collisions, 12 interface resets
     0 output buffer failures, 0 output buffers swapped out
     36 carrier transitions
     DCD=up  DSR=up  DTR=up  RTS=up  CTS=up
```

- To indicate if compression is active use the **show compress** command:

  Focus on locating **compression bytes send** and **compression bytes recvd**:

```
Router# show compress
 Serial0/0
     Hardware compression enabled
     CSA in slot 0 in use
     Compressed bytes sent:  317862131 bytes   61 Kbits/sec  ratio: 12.870
     Compressed bytes recv:  221975672 bytes   43 Kbits/sec  ratio: 9.194
     restarts: 1
     last clearing of counters: 41252 seconds
```

Tips

— The interface must report being up.

— No errors should be reported.

— Check this interface again after you are sure traffic is getting to the Cisco 2600 series router to note changes in Compressed bytes recv.

Configuring Frame-relay Map Compression

Configure frame-relay to map compression on this Data-Link Connection Identifier (DLCI) to use the specified AIM hardware compression on the Cisco 2600 access server. You must specify the following information for each serial interface: protocol, protocol-address, DLCI, encapsulation type, the frf.9 stac compression algorithm, designate the CAIM daughtercard as a source of this algorithm, and the CAIM element number.

Configure

To configure the frame-relay map compression command for operation, use the following commands beginning in global configuration mode:

Step	Command	Purpose
1	`Router# configure terminal` `Enter configuration commands, one per line. End with CNTL/Z.`	Enter global configuration mode.
2	`Router(config)# interface serial` *slot/port*	Enter interface configuration mode to configure serial interface. If you have installed more than one WAN Interface Card (WIC), you have interfaces 0 and 1. Each WIC has a pair of ports, 0 and 1.
3	`Router(config-if)# encapsulation frame-relay`	Enter the **encapsulation** type which is **frame-relay**.[1]
4	`Router(config-if)# frame-relay map ip` *ip-address dlci-number* `broadcast payload-compression frf9 stac caim` *element-number*	Enter the **compress stac** command that will use the **stac** algorithm on the **CAIM** card for port 0.[2]
5	`Router(config-controller)# no shutdown`	Enter the **no** form of the **shutdown** command bring up this interface.
6	`Router(config-if)# ^Z`	Enter ^Z to return you to EXEC mode.

1. You also have the option of configuring PPP.
2. You could also have configured compression for another serial port or another CAIM card, depending upon your configuration.

Note The **compress ppp** command applied to the PPP compression configuration example above has no equivalent for compression under frame-relay.

Verify

- Use the **show interface serial** *slot/port* command. to check that the interface is activated with proper compression and encapsulation

  Focus on the serial interface which has Encapsulation FRAME-RELAY, serial 0/1, output queue and input queue.

```
Router# Show interface serial 0/1
Serial0/1 is up, line protocol is up
  Hardware is PowerQUICC Serial
  Internet address is 1.1.1.2/24
  MTU 1500 bytes, BW 2000 Kbit, DLY 20000 usec,
     reliablility 255/255, txload 1/255, rxload 1/255
  Encapsulation FRAME-RELAY, loopback not set, keepalive not set
  FR SVC disabled, LAPF state down
  Broadcast queue 0/64, broadcasts sent/dropped 2743/0, interface broadcasts 2742
  Last input 03:05:57, output 00:00:03, output hang never
  Last clearing of "show interface" counters 1w1d
  Queueing strategy: fifo
  Output queue 0/40, 80 drops; input queue 0/75, 0 drops
  30 second input rate 0 bits/sec, 0 packets/sec
  30 second output rate 0 bits/sec, 0 packets/sec
     30800054 packets input, 3488155802 bytes, 0 no buffer
     Received 199567 broadcasts, 0 runts, 0 giants, 0 throttles
     2 input errors, 0 CRC, 2 frame, 0 overrun, 0 ignored, 0 abort
     58246738 packets output, 1325052697 bytes, 0 underruns
     0 output errors, 0 collisions, 15 interface resets
     0 output buffer failures, 0 output buffers swapped out
     36 carrier transitions
     DCD=up  DSR=up  DTR=up  RTS=up  CTS=up
```

- To indicate if compression is active use the **show controller serial 1/0** command:

  Focus on locating **Using Compression AIM 0**:

```
Router# show controller serial1/0
CD2430 Slot 1, Port 0, Controller 0, Channel 0, Revision 14
Channel mode is synchronous serial
idb 0x811082E8, buffer size 1524, X.21 DTE cable

Global registers
  rpilr 0x2, rir 0x0, risr 0x0, rfoc 0x0, rdr 0x30
  tpilr 0x1, tir 0x0, tisr 0x60, tftc 0x0, tdr 0x41
  mpilr 0x3, mir 0x2, misr 0x60
  bercnt 0xFF, stk 0x0
```

```
Per-channel registers for channel 0
  Option registers
  0x02 0x00 0x42 0xE7 0xE0 0x00 0x00
  Command and status registers
  cmr 0xC0, ccr 0x00, csr 0xAC, msvr-rts 0xF1, msvr-dtr 0xF1
  Clock option registers
  rcor 0x06, rbpr 0x01, tcor 0xC8, tbpr 0x01
  Interrupt registers
  ier 0x89, livr 0x00, licr 0x00
  DMA buffer status 0x27
  DMA receive registers
  arbaddr 0x2549D44, arbcnt 1548, arbsts 0x1
  brbaddr 0x2548344, brbcnt 1548, brbsts 0x1
  rcbaddr 0x2549D94
  DMA transmit registers
  atbaddr 0x257F93E, atbcnt 104, atbsts 0x43
  btbaddr 0x25B25C2, btbcnt 1490, btbsts 0x43
  tcbaddr 0x25B25D2
  Special character registers
  schr1 0x00, schr2 0x00, schr3 0x00, schr4 0x00
  scrl 0x0, scrh 0x0, lnxt 0xF1
Driver context information
  Context structure 0x8110D830, Register table 0x40800400
  Serial Interface Control 5:1 Register (0x40800802) is 0x0
  Adaptor Flags 0x0
  Serial Modem Control Register (0x40800804) is 0x18
  Receive static buffer 0x810E1274
  Receive particle buffers 0x8110DE00, 0x8110DDC0
  Transmit DMA buffers 0x8113E240, 0x810F2808, 0x810D4C00, 0x810EA0DC
  Transmit packet with particles 0x0, first word is 0x0
  Interrupt rates (per second) transmit 25, receive 139, modem 0
  True fast-switched packets    41
  Semi fast-switched packets    13449573
  Transmitter hang count        0
  Residual indication count     0
  Bus error count       0
  Aborted short frames count    0
  CRC short frames count        0
Error counters
  CTS deassertion failures      0
  Nested interrupt errors transmit 0, receive 0, modem 0
```

Using Compression AIM 0

```
CompressionAim0
    ds:0x8113FC04 idb:0x8113A6CC
       5005867 uncomp paks in -->      5005867 comp paks out
      38397501 comp paks in   -->     38397502 uncomp paks out
    2882277146 uncomp bytes in-->    497476655 comp bytes out
    3500965085 comp bytes in  -->   1211331227 uncomp bytes out
            72 uncomp paks/sec in-->        72 comp paks/sec out
           557 comp paks/sec in  -->       557 uncomp paks/sec out
        334959 uncomp bits/sec in-->     57812 comp bits/sec out
        406855 comp bits/sec in  -->    140827 uncomp bits/sec out
    68841 seconds since last clear
    holdq:0  hw_enable:1  src_limited:0  num cnxts:8
    no data:0  drops:0  nobuffers:0  enc adj errs:0  fallbacks:
5322165
    no Replace:0  num seq errs:0  num desc errs:0  cmds complete:
43403738
    Bad reqs:0  Dead cnxts:0  No Paks:0  enq errs:0
    rx pkt drops:0  tx pkt drops:0  dequeues:0  requeues:0
    drops disabled:0  clears:0  ints:41973007  purges:203200
    no cnxts:0  bad algos:0  no crams:0  bad paks:0
    # opens:0  # closes:4  # hangs:0
    # 9711 fatal:0  # poison pkts:0  cmd/res ovruns:0
```

```
# dma fatal:0
Jupiter DMA Controller Registers:(0x40200000
    Cmd Ring:0x025BAE60  Src Ring:0x025BBB60
    Res Ring:0x025BB4E8  Dst Ring:0x025BBDA8
    Status/Cntl:present:0x8080989C  last int:0x9898989C
    Inten:0x30302021  config:0x00080003
    Num DMA ints:41973355
Hifn9711 Data Compression Coprocessor Registers (0x40201000):
    Config:0x000051D4  Inten:0x00000E00
    Status:0x00004000  FIFO status:0x00004000
    FIFO config:0x00000101
```

Tips

- The interface must report being up.
- No errors should be reported.
- Check this interface again after you are sure traffic is getting to the Cisco 2600 series router to note changes in **Compressed bytes recv**.

Configuring Frame-relay payload-compression

Configure frame-relay frf.9 stac payload-compression on a specified port for the Cisco 2600 access server. You must specify the following information for each serial interface: payload-compression, encapsulation type, compression algorithm, designate the CAIM daughtercard as a source of this algorithm, and the specific port.

Configure

To configure the frame-relay to map for compression, use the following commands beginning in global configuration mode:

Step	Command	Purpose
1	`Router# configure terminal` `Enter configuration commands, one per line. End with CNTL/Z.`	Enter global configuration mode.
2	`Router(config)# interface serial` *slot/port*	Enter the interface configuration mode to configure serial interface 0 on port 0.
3	`Router(config-if)# encapsulation frame-relay`	Enter the **encapsulation** type which is **ppp**.[1]
4	`Router(config-if)# frame-relay payload-compression frf9 stac caim` *element-number*	Enter the **compress stac** command that will use the **stac** algorithm on the **CAIM** card for port 0.[2]
5	`Router(config-controller)# no shutdown`	Enter the **no** form of the **shutdown** command bring up this interface.
6	`Router(config-if)# ^Z`	Enter ^Z to return you to EXEC mode.

1. You also have the option of configuring
2. You could also have configured compression for another serial port or another CAIM card, depending upon your configuration.

Verify

- Use the **show interface serial** *slot/port* command. to check that the interface is activated with proper compression and encapsulation

  Focus on the serial interface which has Encapsulation frame-relay, serial 0/0, output queue and input queue.

```
Router# Show interface serial 0/0
Serial0/0 is up, line protocol is up
  Hardware is PowerQUICC Serial
  Internet address is 1.1.1.2/24
  MTU 1500 bytes, BW 2000 Kbit, DLY 20000 usec,
     reliablility 255/255, txload 1/255, rxload 1/255
  Encapsulation FRAME-RELAY, loopback not set, keepalive not set
  FR SVC disabled, LAPF state down
  Broadcast queue 0/64, broadcasts sent/dropped 2743/0, interface broadcasts 2742
  Last input 03:05:57, output 00:00:03, output hang never
  Last clearing of "show interface" counters 1w1d
  Queueing strategy: fifo
  Output queue 0/40, 80 drops; input queue 0/75, 0 drops
  30 second input rate 0 bits/sec, 0 packets/sec
  30 second output rate 0 bits/sec, 0 packets/sec
     30800054 packets input, 3488155802 bytes, 0 no buffer
     Received 199567 broadcasts, 0 runts, 0 giants, 0 throttles
     2 input errors, 0 CRC, 2 frame, 0 overrun, 0 ignored, 0 abort
     58246738 packets output, 1325052697 bytes, 0 underruns
     0 output errors, 0 collisions, 15 interface resets
     0 output buffer failures, 0 output buffers swapped out
     36 carrier transitions
     DCD=up  DSR=up  DTR=up  RTS=up  CTS=up
```

Warning Frame-relay is not displayed using **show compress.** Use the **debug compress** command.

Tips

- The interface must report being up.
- No errors should be reported.

Configuring Diagnostics

Configure the AIM daughtercard to provide compression for the Cisco 2600 series router. You must specify the following information for each daughtercard installed.

Configure

To configure the ppp for compression, use the following commands beginning in global configuration mode:

Step	Command	Purpose
1	Router> **enable**	Enter global configuration mode.
1	Router# **show pas caim stats** *element-number*	Enter the global configuration command that displays compression statistics for your CAIM.
2	Router# **show compress**	Enter the global configuration mode command that displays the current configuration for compression on your Cisco 2600.

Step	Command	Purpose
3	Router# **clear compress**	Enter the global configuration command that clears all the counters and resets the CAIM hardware.
4	Router# **show pas caim stats** *element-number*	Enter the global configuration command that displays compression statistics for your CAIM.
5	Router(config-if)# **^Z**	Enter ^Z to return you to EXEC mode.

Verify

- Use the **show pas caim** *element-number* command. to check that the data compression Advanced Interface Module (AIM) is collecting statistics that represent proper compression:

```
Router# Show pas caim stats 0
CompressionAim0
      ds:0x80F56A44 idb:0x80F50DB8
          422074 uncomp paks in -->       422076 comp paks out
          422071 comp paks in   -->       422075 uncomp paks out
       633912308 uncomp bytes in-->     22791798 comp bytes out
        27433911 comp bytes in  -->    633911762 uncomp bytes out
             974 uncomp paks/sec in-->       974 comp paks/sec out
             974 comp paks/sec in  -->       974 uncomp paks/sec out
        11739116 uncomp bits/sec in-->    422070 comp bits/sec out
          508035 comp bits/sec in  -->  11739106 uncomp bits/sec out
      433 seconds since last clear
      holdq: 0  hw_enable: 1  src_limited: 0  num cnxts: 4
      no data: 0  drops: 0  nobuffers: 0  enc adj errs: 0  fallbacks: 0
      no Replace: 0  num seq errs: 0  num desc errs: 0  cmds complete: 844151
      Bad reqs: 0  Dead cnxts: 0  No Paks: 0  enq errs: 0
      rx pkt drops: 0  tx pkt drops: 0  dequeues: 0  requeues: 0
      drops disabled: 0  clears: 0  ints: 844314  purges: 0
      no cnxts: 0  bad algos: 0  no crams: 0  bad paks: 0
      # opens: 0  # closes: 0 # hangs: 0
```

- Use the show compress command to identify compression characteristics for each port:

```
Router# show compress
 Serial0/0
     Hardware compression enabled
     CSA in slot 0 in use
     Compressed bytes sent:  317862131 bytes   61 Kbits/sec  ratio: 12.870
     Compressed bytes recv:  221975672 bytes   43 Kbits/sec  ratio: 9.194
     restarts: 1
     last clearing of counters: 41252 seconds
 Serial0/1
     Hardware compression enabled
     CSA in slot 0 in use
     Compressed bytes sent:    249720 bytes   0 Kbits/sec  ratio: 5.923
     Compressed bytes recv:  465843659 bytes   43 Kbits/sec  ratio: 9.128
     restarts: 1
     last clearing of counters: 85525 seconds
```

- Use the clear compress command to reset the CAIM hardware to 0. (There is no output for this command, instead check show compress to see what took place):

```
Serial0/0
     Hardware compression enabled
     CSA in slot 0 in use
     Compressed bytes sent:  0 bytes   61 Kbits/sec  ratio: 0
     Compressed bytes recv:  0 bytes   43 Kbits/sec  ratio: 0
     restarts: 0
     last clearing of counters: 0 seconds
```

Tips

— The interface must report being up.

— No errors should be reported.

Configuration Example

Configuring your Cisco 2600 series router for compression over serial interfaces involves specifying many steps, regardless of your choice of compression algorithm, whether the compression you specify is software or hardware based, or whether you are configuring for just one port or to interface with a network protocol address associated with a Data-Link Connection Identifier (DLCI). The choices of functionality allow you to configure for frame-relay over a wide area network using a wide area network interface card (WIC) in your Cisco 2600 series router or for point-to-point protocol (even the Microsoft PPC compression algorithm for Microsoft NT networks) including the Stacker (LZS) compression algorithm that can be used on LAPB, HDLC, and PPP encapsulations. An entire configuration for ppp includes the following steps:

Step	Command	Purpose
1	`Router# configure terminal` `Enter configuration commands, one per line. End with CNTL/Z.`	Enter global configuration mode.
2	`Router(config)# interface serial` *slot/port*	Enter interface configuration mode to configure serial interface 0 on port 0.
3	`Router(config-if)# ip address` *ip-address*	Enter the IP address of this interface if one is desired.
4	`Router(config-if)# encapsulation ppp`	Enter the **encapsulation** type which is **ppp**.
5	`Router(config-if)# compress mppc caim` *element-number*	Enter the **compress** command to use the **mppc** algorithm on the **caim** card for port 0.
6	`Router(config-if)# no fair-queue`	Enter the **no** form of **fair-queue** to ensure correct compression.
7	`Router(config-if)# no shutdown`	Enter the **no** form of the **shutdown** command bring up this interface.
8	`Router(config-if)# ^Z`	Enter ^Z to return you to EXEC mode.

- Use the show run command to display information about the configuration on your Cisco 2600. Your information should be displayed as follows:

```
Router# show run

----cut----
!
version 12.0
service timestamps debug uptime
service timestamps log uptime
!
----cut----
!
interface Serial0/1
 ip address 1.1.1.1 255.255.255.0
 no ip directed-broadcast
 encapsulation ppp
 no ip mroute-cache
 load-interval 30
 no keepalive
 no fair-queue
 clockrate 2000000
 compress stac
 no cdp enable
!
----cut----
```

Use a show compress command to display information about compression

```
Router# show compress
 Serial0/0
     Hardware compression enabled
     CSA in slot 0 in use
     Compressed bytes sent:  317862131 bytes   61 Kbits/sec  ratio: 12.870
     Compressed bytes recv:  221975672 bytes   43 Kbits/sec  ratio: 9.194
     restarts: 1
     last clearing of counters: 41252 seconds
----cut----
```

Use the **show pas caim stats** command to display statistics of traffic as it is handled by the CAIM hardware algorithm:

```
Router# show pas caim stats 0
CompressionAim0
    ds:0x81110644 idb:0x8110B190
      34734673 uncomp paks in -->     34734673 comp paks out
      34733339 comp paks in   -->     34733339 uncomp paks out
    4075117517 uncomp bytes in-->   3117657645 comp bytes out
     168220657 comp bytes in  -->   4073901654 uncomp bytes out
            80 uncomp paks/sec in-->        80 comp paks/sec out
            80 comp paks/sec in  -->        80 uncomp paks/sec out
         75509 uncomp bits/sec in-->     57768 comp bits/sec out
          3117 comp bits/sec in  -->     75487 uncomp bits/sec out
    431744 seconds since last clear
    holdq: 0  hw_enable: 1  src_limited: 0  num cnxts: 4
    no data: 0  drops: 0  nobuffers: 0  enc adj errs: 0  fallbacks: 0
    no Replace: 0  num seq errs: 0  num desc errs: 0  cmds complete: 69468106
    Bad reqs: 0  Dead cnxts: 0  No Paks: 0  enq errs: 0
    rx pkt drops: 0  tx pkt drops: 0  dequeues: 0  requeues: 0
    drops disabled: 0  clears: 0  ints: 70566468  purges: 4
    no cnxts: 0  bad algos: 0  no crams: 0  bad paks: 0
    # opens: 4  # closes: 4  # hangs: 0
    # 9711 fatal: 0  # poison pkts: 0  cmd/res ovruns: 0
    # dma fatal: 0
----cut----
```

Command Reference

This section defines new and modified Cisco IOS commands that support the data compression AIM daughter-board when it is installed in the Cisco 2600 series router. These commands configure and debug CAIM operation. Some commands support PPP STAC configuration, while others support frame-relay on a per port basis. A few additional commands (where noted) already exist in the Cisco IOS command reference, but are modified to display CAIM related information, or to include configuration characteristics unique to the CAIM. Such commands have similar syntax to commands already described in the Cisco IOS command reference, and are only referenced as useful for CAIM operation. All other commands used with the CAIM feature are documented by the Cisco IOS Release 12.0 command references.

- clear aim
- compress mppc
- compress stac caim
- frame-relay map payload-compression frf9 stac caim
- frame-relay payload-compression frf9 stac caim
- show pas caim
- show pas caim stats
- show pci aim
- test aim eeprom

clear aim

To clear data compression AIM daughter-board registers and reset the hardware, enter the **clear aim** interface configuration command.

clear aim *element-number*

Syntax Description

element-number	Enables compression for this AIM slot. AIM slots begin with 0.

Default

Disabled

Command Mode

Interface configuration mode

Usage Guidelines

This command first appeared in Cisco I OS Release 12.0(1)T.

The **clear aim** command is used to reset the data compression AIM hardware. This command is used if the CAIM hardware becomes “stuck” or hangs for some reason. The CAIM registers are cleared, and the hardware is reset upon execution. All compression history is lost when the CAM is reset.

Example

The following example shows how to use the interface configuration mode **clear aim** command. This command will reset the hardware, flushing the buffers and history for all compression tasks currently under operation:

```
Router# clear aim 0
Router#
1w0d: %CAIM-6-SHUTDOWN: CompressionAim0 shutting down
1w0d: %CAIM-6-STARTUP: CompressionAim0 starting up
```

Related Commands

debug compress
show controller
show pci aim
test aim eeprom

compress mppc

To configure compression using the mppc compression algorithm on your data compression Advanced Interface Module (AIM) for the Cisco 2600 series router, enter the **compress mppc** interface configuration mode command. The Microsoft PPC compression algorithm (mppc) is used to exchange compressed information with a Microsoft NT remote access server.

compress mppc
no compress

Syntax Description

mppc	The Microsoft PPC compression algorithm (mppc) is used to exchange compressed information with a Microsoft NT remote access server.

Default

Disabled.

Command Mode

Interface configuration mode.

Usage Guidelines

This command first appeared in Cisco IOS Release 12.0(1)T.

When configuring point-to-point protocol (PPP) on a serial interface, you can use hardware compression on the data compression AIM daughtercard for mppc is one is installed, otherwise you can use software compression.

Example

The following example shows how to configure the data compression AIM daughtercard for mppc:

```
Router(config-if)# encapsulate ppp
Router(config-if)# compress mppc
```

Related Commands

compress stac caim
clear aim
debug compress
encapsulation ppp
show pas caim stats
show compress
show processes

compress stac caim

To specify the exact hardware compression resource preferred, enter the **compress stac caim** interface configuration mode command.

compress stac caim *element-number*
no compress stac *element-number*

Syntax Description

stac	Specifies that a Stacker (LZS) compression algorithm will be used on LAPB, HDLC, and PPP encapsulation. Compression is implemented in the hardware Advanced Interface Module installed in the router.
element-number	Enables compression for this interface. AIM interfaces begin with 0.

Default

Disabled

Command Mode

Interface configuration mode

Usage Guidelines

This command first appeared in Cisco IOS Release 12.0(1)T.

Specifying the **compress stac** command with no options causes the router to use the fastest available compression method:

- If the router contains a data compression Advanced Interface Module (CAIM), compression is performed in the CAIM hardware (hardware compression).
- If the CAIM is not available, compression is performed in the is performed in the router's main processor (software compression).

Using hardware compression in the AIM frees the router's main processor for other tasks. You can also configure the router to use the Compression Port Module to perform compression by using the distributed option, or to use the router's main processor by using the software option. If the Compression Port Module is compression is performed in the router's main processor.

When compression is performed in software installed in the router's main memory, it might significantly affect system performance. It is recommended 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.

Specifying the **compress stac** command with no options causes the router to use the fastest available compression method.

Example

The following example specifies that hardware compression should be activated for CAIM element 0:

```
Router(config-if)# encapsulation ppp
Router(config-if)# compress stac caim 0
Router(config)# ^Z
Router# show compress

 interface serial 3/1
 encapsulate ppp
 compress stac
----cut----
```

Related Commands

encapsulation ppp
compress stac came
clear aim
debug compress
show pas caim stats
show compress
show processes

frame-relay map payload-compression frf9 stac caim

To enable frame-relay compression on a DLC basis, enter the **frame-relay** interface configuration command. Enter the **no** form of this command to deactivate frame-relay compression.

frame-relay map {*protocol protocol-address dlci***}** **payload-compression frf9 stac caim** *element-number*
no frame-relay map

Syntax Description

map	Define mapping between a destination protocol address and the DLCI used to connect to the destination address.
protocol	Supported protocol, bridging, or logical link control keywords: appletalk, decnet, dlsw, ip, ipx, llc2, rsrb, vines and xns.
protocol-address	Destination protocol address.
dlci	DLCI number used to connect to the specified protocol address on the interface.
payload-compression	Packet-by-packet payload compression, using the Stacker method.
frf9	data compression over Frame-relay.
stac	Specifies that a Stacker (LZS) compression algorithm will be used on **LAPB, HDLC**, and **PPP** encapsulation. Compression is implemented in the hardware Advanced Interface Module installed in the router.
caim	Enable the data compression AIM hardware compression daughtercard to do compression.
element-number	(Optional) The compression element number, beginning with 0 and including all possible elements.

Default

Disabled

Command Mode

Interface configuration mode

Usage Guidelines

This command first appeared in Cisco IOS Release 12.0(2)T.

Many DLCIs known by an access server can be used to send data to many different places, but they are all multiplexed over one physical link. The Frame Relay map tells the Cisco IOS software how to get from a specific protocol and address pair to the correct DLCI.

Note Although you did not specified the IETF keyword during configuration, the map inherits the attributes set with the encapsulation frame-relay command so that all interfaces use IETF encapsulation.

Use the frame-relay map command to enable or disable payload compression on multipoint interfaces. Use the **frame-relay payload-compress packet-by-packet** command to enable or disable payload compression on point-to-point interfaces.

The broadcast keyword provides two functions: It forwards broadcasts when multicasting is not enabled, and it simplifies the configuration of OSPF for nonbroadcast networks that will use Frame Relay.

The broadcast keyword might also be required for some routing protocols--for example, AppleTalk--that depend on regular routing table updates, especially when the router at the remote site is waiting for a routing update packet to arrive before adding the route. Network broadcasts are necessary if you intend to use routing protocols such as RIP or OSPF running across the frame relay link.

The **payload-compression FRF9 stac caim 0** enables compression on the frame relay link, but requires the **caim 0** portion of the command.

Warning Frame-relay output is not displayed using **show compress.** Use the **show controller serial 0/0** command.

Example

The following example shows configuration of frame-relay map payload-compression using the data compression AIM daughtercard for compression mapping the destination address 1.1.1.2 to DLCI 16:

```
Router(config-if)# frame-relay map ip 1.1.1.2 16 broadcast payload-compression
                   frf9 stac caim 0
```

Related Commands

debug compress
encapsulation frame-relay
compress frame-relay
frame-relay payload-compress packet-by-packet
frame-relay interface-dlci

frame-relay payload-compression frf9 stac

To configure frame-relay payload-compression for each frame-relay port, enter the **frame-relay payload-compression** interface configuration command. Enter the **no** form of this command to terminate this form of payload-compression over frame relay.

frame-relay payload-compression frf9 stac caim *element-number*
no frame-relay payload-compression

Syntax Description

payload-compression	Packet-by-packet payload compression, using the Stacker method.
frf9 stac	Enables FRF.9 compression using the Stacker method. • If the router contains a data compression Advanced Interface Module (AIM) for the Cisco 2600 series router, compression is performed in the hardware (hardware compression). • If the CAIM is not available, compression is performed in the software installed on the router's main processor (software compression).
software	Perform compression from software running in Cisco IOS.
caim *element-number*	(Optional) Enable the data compression AIM hardware compression daughtercard to do compression, at the element numbered beginning with 0 and incrementing to include all possible elements.

Default

Disabled

Command Mode

Interface configuration mode

Usage Guidelines

The frame-relay payload-compress command first appeared in Cisco IOS Release 11.0. The packet-by-packet keyword first appeared in Cisco IOS Release 11.2. The frf9 stac keyword first appeared in Cisco IOS Release 11.3. The **frame-relay payload-compression frf9 stac caim** command first appeared in Cisco IOS Release 12.0(2)T.

Use the frame-relay payload-compress command to enable or disable payload compression on a point-to-point interface or subinterface. Use the frame-relay map command to enable or disable payload compression on a multipoint interface or subinterface.

Note Shut down the interface prior to changing encapsulation types. Although this is not required, shutting down the interface ensures the interface is reset for the new encapsulation.

Example

The following example shows configuration of frame-relay payload-compression using the data compression AIM daughtercard for compression:

```
Router(config-if)# frame-relay payload-compression frf9 stac caim 0
```

Using this command, frame relay has been configured to use payload-compression with the frf9 stac algorithm for CAIM hardware compression using the installed data compression Advanced Interface Module (AIM) as the source.

Related Commands

debug compress
encapsulation frame-relay
compress frame-relay
show compress
frame-relay interface-dlci

show pci aim

To show the IDPROM contents for each AIM board in the Cisco 2600, enter the **show pic aim** global configuration command.

show pci aim

Syntax Description

There are no optional or required keywords or variables for this command.

Default

Disabled

Command Mode

Global configuration mode

Usage Guidelines

This command first appeared in Cisco IOS Release 12.0(1)T.

This command shows the IDPROM contents for each AIM board present in the system, by AIM slot number (currently 0, since that is the only daughter board installed for version 12.0(1)T). The IDPROM is a small PROM built into the AIM board used to identify it to the system. It is sometimes referred to as an EEPROM because it is implemented using electrically erasable PROM.

Example

The following example shows the IDPROM output for the installed AIM daughtercard:

```
Router# show pic aim 0
AIM Slot 0: ID 0x012D
        Hardware Revision        : 1.0
        EEPROM format version 4
        EEPROM contents (hex):
          0x00: 04 FF 40 01 2D 41 01 00 FF FF FF FF FF FF FF FF
          0x10: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
          0x20: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
          0x30: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
          0x40: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
          0x50: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
          0x60: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
          0x70: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
```

Related Commands

test aim eeprom
clear aim

show pas caim

To show debug information about data compression Advanced Interface Module (AIM) daughter-card, enter the **show pas caim** global configuration command.

show pas caim {rings | **dma** | **coprocessor** | **stats** | **cnxt_table** | **page_table}** *element-number*

Syntax Description

rings *element-number*	Display current content of the Direct Memory Access (DMA) ring buffer.
dma *element-number*	Display registers of the Jupiter DMA controller.
coprocessor *element-number*	Display registers of the Hifn 9711 compression coprocessor.
stats *element-number*	Display statistics describing operation of the data compression AIM.
cnxt_table *element-number*	Display the context of the specific data compression AIM element.
page_table *element-number*	Displays the page table for each CAIM element.

Default

Disabled

Command Mode

Global configuration mode

Usage Guidelines

This command first appeared in Cisco IOS Release 12.0(2)T.

This command displays performance statistics describing the operation of the CAIM. This command is primarily intended for engineering debug, but it can also be useful to Cisco support personnel and to Cisco customers in troubleshooting network problems. The output of this command consists of a number of fields as follows:

Value	Description
uncomp paks in	Number of packets containing uncompressed data input to the CAIME for compression.
comp paks out	Number of packets containing uncompressed data which were successfully compressed.
comp paks in	Number of packets containing compressed data input to the CAIM for compression.
uncomp paks out	Number of packets containing compressed data which were successfully decompressed.
uncomp bytes in / comp bytes out	Summarizes the compression performance of the CAIM. The “uncomp bytes in” statistic gives the total number of uncompressed bytes submitted to the CAIM for compression. The “Comp bytes out” statistic gives the resulting number of compressed bytes output by the CAIM. If one forms the ratio of “uncomp bytes in” to “comp bytes out”, one obtains the average compression ratio achieved by the CAIM.

Value	Description
comp bytes in / uncomp bytes out	Summarizes the decompression performance of the CAIM. The “comp bytes in” statistic gives the total number of compressed bytes submitted to the CAIM for decompression. The “uncomp bytes out” statistic gives the resulting number of uncompressed bytes output by the CAIM. The average decompression ratio achieved can be computed as the ratio of “uncomp bytes out” to “comp bytes in”. Note that each packet submitted for compression or decompression has a small header at the front which is always clear data and hence never compressed nor decompressed. The “comp bytes in / uncomp bytes out” and “uncomp bytes in / comp bytes out” statistics do not include this header.
uncomp paks/sec in	A time average of the number of packets per second containing uncompressed data submitted as input to the CAIM for compression. It is computed as the ratio of the “uncomp paks in” statistic to the “seconds since last clear” statistic.
comp paks/sec out	A time average of the number of packets per second containing uncompressed data which were successfully compressed by the CAIM. It is computed as the ratio of the “comp paks out” statistic to the “seconds since last clear” compressed by the CAIM. It is computed as the ratio of the “comp paks out” statistic to the “seconds since last clear” statistic.
comp paks/sec in	A time average of the number of packets per second containing compressed data submitted as input to the CAIM for decompression. It is computed as the ratio of the “comp paks in” statistic to the “seconds since last clear” statistic.
uncomp paks/sec out	A time average of the number of packets per second containing compressed data which were successfully decompressed by the CAIM. It is computed as the ratio of the “uncomp paks out” statistic to the “seconds since last clear” statistic. Note that the “uncomp paks/sec in”, “comp paks/sec out”, “comp paks/sec in”, and “uncomp paks/sec out” statistics are averages over the entire time since the last “clear count” command was issued. This means that as time progresses, these statistics become averages over an ever larger time interval. As time progresses, these statistics become ever less sensitive to current prevailing conditions. Note also that the “uncomp paks in”, “comp paks out”, “comp paks in”, and “uncomp paks out” statistics are 32-bit counters and can roll over from 0xffff ffff to 0. When they do so, the “uncomp paks/sec in”, “comp paks/sec out”, “comp paks/sec in”, and “uncomp paks/sec out” statistics can be rendered meaningless. It is therefore recommend that one issue a “clear count” command before sampling these statistics.
uncomp bits/sec in	A time average of the number of bits per second of uncompressed data which were submitted to the CAIM for compression. It is computed as the ratio of the “uncomp bytes in” statistic, times 8, to the “seconds since last clear” statistic.
comp bits/sec out	A time average of the number of bits per second of uncompressed data which were successfully compressed by the CAIM. It is computed as the raio of the “comp bytes out” statistic, times 8, to the “seconds since last clear” statistic.
comp bits/sec in	A time average of the number of bits per second of compressed data which were submitted to the CAIM for decompression. It is computed as the ratio of the “comp bytes in” statistic, times 8, to the “seconds since last clear” statistic.

Value	Description
uncomp bits/sec out	A time average of the number of bits per second of compressed data which were successfully decompressed by the CAIM. It is computed as the ratio of the "uncomp bytes in" statistic, times 8, to the "seconds since last clear" statistic. Note again that these "bits/sec" statistics are time averages over the "seconds since last clear" statistics, and therefore become less and less sensitive to current conditions as time progresses. Also, these "bits/sec" statistics are computed from 32-bit counters, and when the counters roll over from the maximum 32-bit value to 0, the "bits/sec" statistics become inaccurate. It is again recommended that one issue the "clear count" command before sampling the "bits/sec" statistics.
The remaining statistics summarize operational state and error conditions encountered by the CAIM, and have the following interpretations:	
holdq	gives the number of packets occupying the "hold queue" of the CAIM. The hold queue is a holding area, or "overflow" area, for packets to be processed by the CAIM. Normally, the CAIM is fast enough that no overflow into the hold queue occurs, and so normally this statistic should show zero.
hw_enable	This a flag indicating if the CAIM is disabled or not. Zero implies disabled, one implies enabled. The CAIM can become disabled if certain fatal hardware error conditions are detected. It can be re-enabled by issuing the "clear aim <aim-slot>" command.
src_limited	This is a flag indicating if the CAIM is in "source limited" mode. In source limited mode, the CAIM can only process a single command at a time. In non source limited mode, the CAIM can process several commands at a time using a pipeline built into the 9711 coprocessor. Note that the normal mode of operation is "non-source limited", and there is no command to place the CAIM in "source limited" mode. Hence, this statistic should always read zero.
num cnxts	This statistics gives the number of "contexts" which are currently open on the CAIM. Each interface configured for compression opens two contexts, one for each direction of data transfer.
no data	This statistic counts the number of times in which the CAIM performed either a compress or decompression operation, and the output data length was reported with a length of zero. In normal operation, this statistic should always read zero. A non-zero value is an indication of a malfunctioning CAIM.
drops	This statistic counts the total number of times in which the CAIM was forced to drop a packet it was asked to compress or decompress. This can happen for a number of reasons, and the remaining statistics summarize these reasons. This statistic indicates that the CAIM is being overloaded with requests for compression/decompression.
nobuffers	This statistic counts the total number of times the CAIM needed to allocate memory for buffers but could not obtain memory. The CAIM allocates memory for buffers for holding the results of compression or decompression operations. In normal operation, there is plenty of memory available for holding CAIM results. This statistic, if non-zero, indicates that there is a significant backup in memory, or perhaps a memory leak.

Value	Description
enc adj errs	Each packet compressed or decompressed involves an adjustment of the encapsulation of the packet between the LZS-DCP, FRF9, or MPPC encapsulation used to transport compressed packets to the standard encapsulation used to transport clear data. This statistic counts the number of times this encapsulation adjustment failed. In normal operation, this statistic should be zero. A non-zero value indicates that we are short in a specific memory resource referred to as “paktypes”, and that packets are being dropped due to this shortage.
fallbacks	Number of times the data compression AIM card could not use its pre-allocated buffers to store compression results and had to “fallback” to using a common buffer pool.
no replace	Each time a compression or decompression operation is completed and the resultant data fill up a buffer, the CAIM software allocates a new buffer to replace the buffer filled. If no buffers are available, then the packet involved in this operation is dropped and the old buffer reused. This statistic thus represents the number of times such an allocation failure occurred. In normal operation there is plenty of memory available for these buffers. A non-zero value for this statistic is thus a serious indication of a memory leak or other backup in buffer usage somewhere in the system. num seq errs - This statistic is incremented when the CAIM produces results in a different order than that in which the requests were submitted. Packets involved in such errors are dropped. A non-zero value in this statistic indicates a serious malfunction in the CAIM.
num desc errs	This statistic is incremented when the CAIM reports error in a compression or decompression operation. Such errors are most likely bus errors, and they indicate a serious malfunction in the CAIM.
cmds complete	This statistic reports the number of compression/decompression commands completed. This statistic should steadily increase in normal operation (assuming that the CAIM is continuously being asked to perform compression or decompression). If this statistic is not steadily increasing or decreasing when a steady stream of compression/decompression is expected, then this is an indication of a malfunctioning CAIM.
bad reqs	This statistic reports the number of compression/decompression requests that the CAIM software determined it could not possibly handle. This occurs only if a severely scattered packet (with more than 64 “particles”, or separate buffers of data) is handed to the CAIM to compress or decompress. This statistic should not increment during normal operation. A non-zero value indicates a software bug.
dead cntxts	The number of times a packet was successfully compressed or decompressed, only to find that the software “context”, or stream sourcing the packet, was no longer around. In such a case the packet is dropped. This statistic can be incremented at times when a serial interface is administratively disabled. If the timing is right, the CAIM may be right in the middle of operating on a packet from that interface when the disable takes effect. When the CAIM operation completes, it finds that the interface has been disabled and all “compression contexts” pertaining to that interface have been deleted. Another situation in which this can occur is when a Frame Relay DLC goes down. This is a normal and tolerable. If this statistic is incrementing when no such situations exist, it is an indication of a software bug.

Value	Description
no paks	If a packet to be compressed or decompressed overflows into the hold queue, then it must undergo an operation called “reparenting”. This involves the allocation of a “paktype” structure for the packet. If no paktype structures are available, then the packet is dropped and this statistic is incremented. A non-zero value of this statistic indicates that the CAIM is being overtaxed, i.e, it’s being asked to compress/decompress at a rate exceeding its capabilities.
enq errors	This statistic is closely related to the “no paks” statistic. The hold queue for the CAIM is limited in length, and if the hold queue grows to this length, no further packets may be placed on it. A non-zero value of this statistic therefore also indicates that the CAIM is being overtaxed.
rx pkt drops	This statistic contains the total number of packets dropped due to “no paks” or “enq errors”, which were destined to be decompressed.
tx pkt drops	This statistic contains the total number of packets dropped due to “no paks” or “enq errors”, which were destined to be compressed
dequeues	This statistic indicates the total number of packets which were removed from the CAIM hold queue when the CAIM became available for servicing its hold queue.
requeues	This statistic indicates the total number of packets which were removed from the hold queue, only to find that the necessary CAIM resources were not available (it is not possible to determine whether CAIM resources are available until the packet is dequeued). Such packets are requeued onto the hold queue, with order in the queue preserved.
drops disabled	This statistic indicates the total number of packets which were submitted for compression or decompression, but which were dropped because the CAIM was disabled.
clears	This statistic indicates the number of times the CAIM was reset using the “clear aim <aim-slot>” command.
# ints	This statistic indicates the number of interrupts serviced by the CAIM software. This statistic should steadily increase (assuming the CAIM workload is steady). If this statistic is not incremented when expected, it indicates a severe CAIM malfunction.
# purges	This statistic indicates the total number of times the compression history for a session had to be purged. This statistic is incremented a couple of times at startup. Thereafter, any increase in this statistic is an indication that the other side of the serial link detected bad data or gaps in the compressed packets being passed to it, and hence signalled a request to purge compression history in order to get back in synchronization. This can indicate that the CAIM is being overtaxed, or that the serial interface is overtaxed and being forced to drop output packets.
no cnxts	This statistic indicates the total number of times a request was issued to open a context, but the CAIM could not support any more contexts. Recall that two contexts are required for each interface configured for compression. bad algos - This statistic indicates the total number of times a request was issued to open a context for a compression algorithm not supported by the CAIM. Recall that the CAIM supports the LZS and MPPC algorithms only.
no crams	This statistic indicates the total number of times a request was issued to open a context but there was insufficient compression DRAM to open another context. The CAIM software is set up to run out of contexts before it runs out of compression DRAM, so this statistic should always be zero.

Value	Description
bad paks	This statistic indicates the total number of times a packet was submitted for compression or decompression to the CAIM, but the packet had an invalid size.
# opens	Indicates the total number of times a context was opened.
# closes	Indicates the total number of times a context was closed.
# hangs	Indicates the total number of times a CAIM appeared hung up, necessitating a clear of the CAIM.

The **show pas caim rings** *element-number* form of this command displays the current state of the DMA ring buffers maintained by the CAIM software. These rings feed the CAIM with data and commands. It is intended for Engineering debug of the compression AIM. It produces the following output:

```
CAIM Command Ring: 0x01A2BC00  Stack: 0x01A2BE40  Shadow: 0x80F88BAC
 Head: 0021  Tail: 0021  Count: 0000
CAIM Source Ring:  0x01A2C900  Shadow: 0x80F88BAC
 Head: 0021  Tail: 0021  Num: 0000
CAIM Results Ring: 0x01A2C280  Stack: 0x01A2C4C0
 Head=021  Tail=021
CAIM Dest Ring:    0x01A2CB40  Shadow: 0x80F892D8  Head=021  Tail=000
  Desc: 0x01A2CBE8  flags: 0x8000060C  dptr: 0x019E7EB8  part: 0x80F84BE0
  Desc: 0x01A2CBF0  flags: 0x8000060C  dptr: 0x019FC63C  part: 0x80F85240
----cut----
```

The CAIM Command Ring feeds commands to the CAIM. The Address of the command ring is displayed first. The Stack is a ring which feeds additional commands to the CAIM, and its address is displayed next. The Shadow is a software ring which stores additional information about each command. The Head field is an index into the Source Ring, specifying where the next entry will be extracted from. The Tail field is an index into the Source Ring which specifies where the next entry will be inserted. Refer to the Jupiter DMA specification and the Hifn 9711 Data Sheet for more information.

The CAIM Source Ring feeds information about input data to the CAIM. The address of the Source Ring is displayed first. The Source Ring Shadow is a ring which contains additional information about each source buffer. The Head field specifies where the next entry will be extracted, and the Tail field specifies where the next entry will be inserted. Refer to the Jupiter DMA specification and the Hifn 9711 Data Sheet for more information.

The CAIM Results Ring receives information about each CAIM command as it is completed. The address of the ring is displayed first. The Stack is a ring which receives additional information about each completed command, and its address is next displayed. The Head field specifies where the next entry will be extracted, and the Tail field specifies where the next entry will be inserted. Refer to the Jupiter DMA specification and the Hifn 9711 Data Sheet for more information.

The CAIM Dest Ring holds information about the buffers available to the CAIM for output data. The address of the Dest Ring is displayed first. The Dest Shadow is a ring which holds additional information about each output buffer. The Head field specifies where the next entry will be extracted, and the Tail field specifies where the next entry will be inserted. Refer to the Jupiter DMA specification and the hifn 9711 Data Sheet for more information.

There now follows a line of information about each output data buffer. The desc field is the address of a so-called descriptor, used by the Jupiter DMA engine. The flags field contains flags describing attributes of the buffer. The dptr field displays the actual address of the output buffer. The part field

displays the address of the corresponding particletype structure, a software defined structure which describes a buffer when its a component of a network data buffer. Refer to the Jupiter DMA specification and the hifn 9711 Data Sheet for more information.

The **show pas caim dma** *element-number form of this command d*isplays the registers of the Jupiter DMA Controller. These registers control the operation of the Jupiter DMA Controller. This command is intended for Engineering debug of the CAIM. Detailed descriptions of the various fields may be found in the Jupiter DMA Controller specification. The output of this command consists of:

```
Jupiter DMA Controller Registers: (0x40200000
        Cmd Ring: 0x01A2BCA8  Src Ring: 0x01A2C9A8
        Res Ring: 0x01A2C328  Dst Ring: 0x01A2CBE8
        Status/Cntl: present: 0x80808084  last int: 0x80808084
        Inten: 0x10100000  config: 0x00100003
        Num DMA ints: 143330469
```

The **show pas caim compressor** *element-number* form of this command displays the registers of the Hifn 9711 compression coprocessor. These registers control the operation of the Hifn 9711 part. This command is intended for Engineering debug of the CAIM. Detailed descriptions of the various fields may be found in the Hifn 9711 data book. The output of this command consists of:

```
Hifn9711 Data Compression Coprocessor Registers (0x40201000):
        Config: 0x000051D4  Inten: 0x00000E00
        Status: 0x00004000  FIFO status: 0x00004000
        FIFO config: 0x00000101
```

The address of the registers in the address space of the processor is displayed first. The Config field displays the current contents of the 9711 configuration register. The Inten field displays the contents of the 9711 interrupt enable register. The Status field displays the contents of the 9711 status register. The FIFO status field displays the contents of the 9711 FIFO Status register.

The **show pas caim cnxt_table** *element-number* form of this command displays the context table for the specified CAIM element. The context is a table of information concerning each compression context. The display has the following appearance:

```
CAIM0 Context Table
Context: 0x8104F320  Type: Compr   Algo: Stac
    Hdrlen: 0006  History: 0x0000
    Callback: 0x8011D68C  Shutdown: x8011EBE4  Purge: N
    Comp_db: 0x81034BC0  idb: 0x81038084  ds: 0x8104E514
Context: 0x8104F340  Type: Decomp  Algo: Stac
    Hdrlen: 0002  History: 0x0000
    Callback: 0x8011E700  Shutdown: x8011EBE4  Purge: N
    Comp_db: 0x81034BC0  idb: 0x81038084  ds: 0x8104E514
```

The Context field is a numeric internal reference for the compression context. The Type field gives the type of context, either “Compr” for a compression context or “Decomp” for a decompression context. The Algo field gives the compression algorithm used, either “Stac” or “Mppc”. The Hdrlen field gives the number of bytes in the compression header for each compressed packet. The History field gives the 16 Kbyte page number in compression RAM for the context. The Callback, Shutdown, Comp_db, idb, and ds fields give internal numeric references for various control structures and procedures to facilitate debugging. The Purge field indicates whether the compression context has been flagged to have its history purged.

The **show pas caim page_table** *element-number* form of this command displays the page table for the selected CAIM element. The page table is a table of entries describing each page in compression RAM. The display appears as follows:

```
CAIM0 Page Table
    Page  0x0000 Comp cnxt: 8104F320  Decmp cnxt: 8104F340  Algo: Stac
```

The Page field is the 16 Kbyte page number of the page. The Comp cnxt and Decmp cnxt fields contain internal numeric references to the context structures using this page. The Algo field gives the compression algorithm used, either “Stac” or “Mppc”.

Example

The following example shows stats of an active data compression AIM session:

```
Router# show pas caim stats 0

CompressionAim0
    ds:0x80F56A44 idb:0x80F50DB8
        422074 uncomp paks in -->       422076 comp paks out
        422071 comp paks in   -->       422075 uncomp paks out
     633912308 uncomp bytes in-->     22791798 comp bytes out
      27433911 comp bytes in  -->    633911762 uncomp bytes out
           974 uncomp paks/sec in-->       974 comp paks/sec out
           974 comp paks/sec in  -->       974 uncomp paks/sec out
      11739116 uncomp bits/sec in-->    422070 comp bits/sec out
         508035 comp bits/sec in  -->  11739106 uncomp bits/sec out
    433 seconds since last clear
    holdq: 0  hw_enable: 1  src_limited: 0  num cnxts: 4
    no data: 0  drops: 0  nobuffers: 0  enc adj errs: 0  fallbacks: 0
    no Replace: 0  num seq errs: 0  num desc errs: 0  cmds complete: 844151
    Bad reqs: 0  Dead cnxts: 0  No Paks: 0  enq errs: 0
    rx pkt drops: 0  tx pkt drops: 0  dequeues: 0  requeues: 0
    drops disabled: 0  clears: 0  ints: 844314  purges: 0
    no cnxts: 0  bad algos: 0  no crams: 0  bad paks: 0
    # opens: 0  # closes: 0 # hangs: 0
```

Related Commands

show compress
debug compress

test aim eeprom

To test the data compression Advanced Interface Module (AIM) after it is installed in your Cisco 2600, enter the **test aim eeprom** global configuration command. Using this command can erase all locations in EEPROM memory.

test aim eeprom

Syntax Description

There are no optional or required keywords or variables for this command.

Default

Disabled

Command Mode

Global configuration mode

Usage Guidelines

This command first appeared in Cisco IOS Release 12.0(2)T.

This command is the AIM counterpart of the “test pas eeprom” command which performs similar tasks for port modules. The following lines are displayed:

Note There is a danger that you can erase all bytes in the entire EEPROM. Though it is good to have a diagnostic tool that allows you to read and write data, there is a danger that lost data will make the AIM card fail.

Questions	Description
AIM Slot [0]:	The user responds by entering the slot number of the AIM whose EEPROM is to be modified. If the user presses ENTER, then the default slot 0 is used.
Use NMC93C46 ID EEPROM [y]:	The user responds with “y” if the AIM contains a NMC93C46 type EEPROM, and “n” if the AIM contains a X2444 EEPROM. The CAIM contains a NMC93C46 EEPROM and this is the default if the user just pressed ENTER.
AIM Slot %d eeprom (? for help)[%c]	This is the general command prompt for the “test aim eeprom” dialog. The AIM slot number chosen is displayed, and the default command is the last command entered. The user has the following options:
Address within slot %d eeprom, [0x%02x]	Enter the desired address within the EEPROM to modify. The default is the next address beyond the byte last modified. If the user wishes to enter a hexadecimal number, it must be preceded by “0x”.
Read or Write access to slot %d at 0x%02x [%c]?	Respond with a W to write to the addressed byte, or with a R to read from the addressed byte. The default value is selected by just pressing ENTER, and is the same as the value specified in the last primitive access.

Questions	Description
Write data (hex 8 bits) [%02x]?:	If you respond to prompt B with "W", then prompt C is issued, requested the user to enter the data to write to the addressed byte. The user enters the desired value. Note that if the user desires to enter a hex value, then the hex value entered must be preceded by "0x". Otherwise, the value entered is assumed to be in decimal radix.

At any time you can use these commands:

Dump EEPROM Contents	This command results in the display of the contents of the EEPROM in hex.
Erase EEPROM	This command results in the erasure of the entire EEPROM (all bytes set to 0xff).
Primitive Access	This command allows you to erase the EEPROM.
Exit EEPROM Test	This command causes the "test aim eepromp" command dialog to exit back to the CLI.
Zero EEPROM	This command causes the entire EEPROM to be zeroed out.

During your session with the test dialog, you have access to the following commands:

H or h - Help - A summary of the available commands is displayed.
d - dump eeprom contents
e - erase all locations
p - primitive access
q - exit eeprom test
z - zero eeprom
'c' rules of radix type-in and display apply

Example

The following example displays the test aim eeprom command's user dialog

```
Router# test aim eeprom
 AIM Slot [0]: 0
 Use NMC93C46 ID EEPROM [y]: y
 AIM Slot 0 eeprom (? for help)[?]:  ?
  d - dump eeprom contents
  e - erase all locations (to 1)
  p - primitive access
  q - exit eeprom test
  z - zero eeprom

  'c' rules of radix type-in and display apply.

 AIM Slot 0 eeprom (? for help)[?]:
```

Debug Commands

The following modified debug commands are provided for the data compression AIM:

- **debug compress on page 34**

debug compress

To debug compression, enter the **debug compress** global configuration command. To disable debugging output, use the **no** form of this command.

[**no**] **debug compress**

Syntax Description

There are no optional or required keywords or variables for this command.

Default

Disabled.

Usage Guidelines

This command first appeared in Cisco IOS Release 10.0.

Use this command to display output from the compression and decompression configuration you made. Live traffic must be configured through the Cisco 2600 with a data compression Advanced Interface Module (AIM) installed for this command to work.

Sample Display

The following example is output from the debug compress command, which shows that compression is taking place on a Cisco 2600 Access Router using data compression Advanced Interface Module (AIM) hardware compression is configured correctly.

For a description of the debug output, see Table 1.

```
Router# debug compress
COMPRESS debugging is on
Router#compr-in:pak:0x810C6B10 npart:0 size:103
pak:0x810C6B10 start:0x02406BD4 size:103 npart:0
compr-out:pak:0x8118C8B8 stat:0x00000000 npart:1 size:71 lcb:0xED
pak:0x8118C8B8 start:0x0259CD3E size:71 npart:1
    mp:0x8118A980 start:0x0259CD3E size:71

decmp-in:pak:0x81128B78 start:0x0255AF44 size:42 npart:1 hdr:0xC035
pak:0x81128B78 start:0x0255AF44 size:42 npart:1
    mp:0x81174480 start:0x0255AF44 size:42
decmp-out:pak:0x8118C8B8 start:0x025B2C42 size:55 npart:1 stat:0
pak:0x8118C8B8 start:0x025B2C42 size:55 npart:1
    mp:0x8118B700 start:0x025B2C42 size:55
```

Table 1 Debug Compress Field Descriptions

Field	Description
compr-in	Indicates that a packet needs to be compressed.
compr-out	Indicates completion of compression of packet.
decmp-in	Indicates receipt of a compressed packet which needs to be decompressed.
decmp-out	Indicates completion of decompression of packet.

Table 1 Debug Compress Field Descriptions

Field	Description
pak:0x810c6b10	Provides the address in memory of a software structure which describes the compressed packet.
start:0x02406bd4 size:103 npart:0	The 'npart:0' indicates that the packet is contained in a single, contiguous area of memory. The start address of the packet is0x02406bd4 and the size of the packet is 103.
start:0x0259cd3E size:71 npart:1	The npart:1 indicates that the packet is contained in 1 or more regions of memory. The start address of the packet is 0x0259cd3e and the size of the packet is 71.
mp:0x8118a980 start:0x0259cd3e size:71	Describes one of these regions of memory.
mp:0x8118a980	Provides the address of a structure describing this region.
start 0x0259cd3e	Provides the address of the start of this region.

Related Commands

debug frame-relay
debug ppp
show compress
show diag

What to Do Next

For additional software configuration information, see the following publications:

- Cisco IOS Command Reference Version 12.0 for the following commands:
  - frame-relay map ip compress command
  - frame-relay payload-compress command
  - frame-relay payload-compress packet-by-packet command
  - compress command
- data compression AIM Configuration Note
- Cisco IOS Interface Command Reference, Release 12.0
  http://www.cisco.com/univercd/cc/td/doc/product/software/ios120/12cgcr/inter_r/index.htm
- Cisco 2600 Series Routers
  http://www.cisco.com/univercd/cc/td/doc/product/access/acs_mod/cis2600/index.htm
  - Quick Start Guide Cisco 2600 Series Cabling and Setup
  - Cisco 2600 Series Hardware Installation Guide
  - Network Module Hardware Installation Guide
  - Update to Network Module Hardware and Software Guides
  - Cisco WAN Interface Cards Hardware Installation Guide
  - Update to WAN Interface Cards Hardware Installation Guide
  - Software Configuration Guide for Cisco 3600 and Cisco 2600 Series Routers
  - Cisco 2600 - Release Notes for Release 11.3 XA1
  - Cisco 2600 - Release Notes for Release 11.3(6)T
  - New and Changed Show Commands for the Cisco 2600 Series Routers
- How to download a Software Image to a Cisco 2600 via TFTP Using the tftpdnld ROMMON Command *http://www.cisco.com/warp/public/471/76.html*
- How to Download a Software Image to a Cisco 2600 via the Console Port Using the xmodem ROMMON Command *http://www.cisco.com/warp/public/471/77.html*

Note These URLs can change without notice.