Overview of Circuit Emulation

Circuit Emulation (CEM) is a technology that provides a protocol-independent transport over IP/MPLS networks. It enables proprietary or legacy applications to be carried transparently to the destination, similar to a leased line.

CEM provides a bridge between a Time-Division Multiplexing (TDM) network and Multiprotocol Label Switching (MPLS) network. The chassis encapsulates the TDM data in the MPLS packets and sends the data over a CEM pseudowire to the remote Provider Edge (PE) chassis. As a result, CEM functions as a physical communication link across the packet network.

The chassis supports the pseudowire type that utilizes CEM transport: Structure-Agnostic TDM over Packet (SAToP).

L2VPN over IP/MPLS is also supported on the interface modules.

The RSP switchover with physical SSO is above 50 ms as follows:

- R0 to R1 is 5 seconds

- R1 to R0 is 10 seconds

- Configuring Pseudowire, on page 1

Configuring Pseudowire

Cisco Pseudowire Emulation Edge-to-Edge (PWE3) allows you to transport traffic by using traditional services such as T1/E1 over a packet-based backhaul technology such as MPLS or IP. A pseudowire (PW) consists of a connection between two provider edge (PE) chassis that connects two attachment circuits (ACs), such as T1/E1 or T3 /E3 links.

Information About Pseudowire

The following sections describe how to configure pseudowire on the interface module of the chassis.

Overview of Pseudowire

Pseudowires manage encapsulation, timing, order, and other operations in order to make it transparent to users. The pseudowire tunnel acts as an unshared link or circuit of the emulated service.

How to Configure Pseudowire

The following sections describe how to configure pseudowire.

Structure-Agnostic TDM over Packet

Structure-Agnostic TDM over Packet (SAToP) encapsulates Time Division Multiplexing (TDM) bit-streams as pseudowires over public switched networks. It disregards any structure that may be imposed on streams, in particular the structure imposed by the standard TDM framing.

The protocol used for emulation of these services does not depend on the method in which attachment circuits are delivered to the Provider Edge (PE) chassis. For example, a T1 attachment circuit is treated the same way for all delivery methods, including copper, multiplex in a T3 circuit, a virtual tributary of a SONET circuit, or unstructured Circuit Emulation Service (CES).

In SAToP mode, the interface is considered as a continuous framed bit stream. The packetization of the stream is done according to IETF RFC 4553. All signaling is carried out transparently as a part of a bit stream.

Configuring CEM for SAToP

This section provides information about how to configure CEM. CEM provides a bridge between a Time Division Multiplexing (TDM) network and a packet network, MPLS. The chassis encapsulates the TDM data in the MPLS packets and sends the data over a CEM pseudowire to the remote Provider Edge (PE) chassis.

The following sections describe how to configure CEM.

Configuring CEM Restriction

- Not all combinations of payload size and dejitter buffer size are supported. If you apply an incompatible payload size or dejitter buffer size configuration, the chassis rejects it and reverts to the previous configuration.

- The dummy-pattern command is *not* supported.

> **Note** CEM interface does *not* support idle-cas parameter.

Configuring CEM Group for SAToP

The following section describes how to configure a CEM group for SAToP.

```
enable
configure terminal
controller t3 0/1/0
cem-group 0 unframed
end
```

Configuring CEM Classes

A CEM class allows you to create a single configuration template for multiple CEM pseudowires. Follow these steps to configure a CEM class:

Note
- The CEM parameters can be configured either by using CEM class or on CEM interface directly.

- The CEM parameters at the local and remote ends of a CEM circuit must match; otherwise, the pseudowire between the local and remote PE chassis does not come up.

```
enable
configure terminal
class cem mycemclass
payload-size 512
dejitter-buffer 12
exit
interface cem 0/0/1
cem 0
cem class mycemclass
xconnect 10.10.10.10 200 encapsulation mpls
exit
```

Configuring CEM Parameters

The following sections describe the parameters you can configure for CEM circuits.

Configuring Payload Size

To specify the number of bytes encapsulated into a single IP packet, use the **payload-size** command. The size argument specifies the number of bytes in the payload of each packet.

Default payload sizes for T3/E3 interface are:

- T3/E3 clear channel= 1024 bytes

- T3/E3 channelized = 192 bytes

Default payload sizes for a structured CEM channel depend on the number of time slots that constitute the channel. Payload size (L in bytes), number of time slots (N), and packetization delay (D in milliseconds) have the following relationship: $L = 8*N*D$. The default payload size is selected in such a way that the packetization delay is always 1 millisecond.

Note Both payload-size and dejitter-buffer must be configured simultaneously. When you select a value of payload-size, the acceptable range of dejitter-buffer for that payload size is displayed.

Setting the Dejitter Buffer Size

To specify the size of the dejitter-buffer used to compensate for the network filter, use the **dejitter-buffer** command. The configured dejitter-buffer size is converted from milliseconds to packets and rounded up to the next integral number of packets. Use the size argument to specify the size of the buffer, in milliseconds. The range is from 1 to 32; the default is 5.

Shutting Down a CEM Channel

To shut down a CEM channel, use the **shutdown** command in CEM configuration mode. The **shutdown** command is supported only under CEM mode and not under the CEM class.

Configuring CEM Parameter on CEM Interface

The CEM parameters can be configured directly on CEM interface. Follow these steps to configure CEM parameters:

```
enable
configure terminal
class cem mycemclass
payload-size 1024 dejitter-buffer 10
exit
interface cem 0/0/1
no ip address
cem 0
cem class mycemclass
xconnect 10.10.10.10 200 encapsulation mpls
exit
```

Verifying the Interface Configuration

Use the following commands to verify the pseudowire configuration:

- **show cem circuit**—Displays information about the circuit state, administrative state, the CEM ID of the circuit, and the interface on which it is configured. If **xconnect** is configured under the circuit, the command output also includes information about the attachment circuit status.

```
Router# show cem circuit
 ?

  <0-504>    CEM ID
  detail     Detailed information of cem ckt(s)
  interface  CEM Interface
  summary    Display summary of CEM ckts
  |          Output modifiers
Router# show cem circuit

CEM Int.      ID  Line      Admin     Circuit        AC
-----------------------------------------------------------
CEM0/1/0      1   UP        UP        ACTIVE         --/--
CEM0/1/0      2   UP        UP        ACTIVE         --/--
CEM0/1/0      3   UP        UP        ACTIVE         --/--
CEM0/1/0      4   UP        UP        ACTIVE         --/--
CEM0/1/0      5   UP        UP        ACTIVE         --/--
```

- **show cem circuit** *cem-id* — Displays the detailed information about that particular circuit.

```
Router# show cem circuit 0

CEM0/13/1, ID: 0, Line: UP, Admin: UP, Ckt: ACTIVE
Controller state: down, T3 state: up
Idle Pattern: 0x55, Idle CAS: 0x8
Dejitter: 10 (In use: 0)
Payload Size: 1024
Framing: Unframed
CEM Defects Set
None

Signalling: No CAS
RTP: No RTP

Ingress Pkts:    11060                Dropped:            0
Egress Pkts:     11061                Dropped:            0
```

```
CEM Counter Details
Input Errors:    0                 Output Errors:       0
Pkts Missing:    0                 Pkts Reordered:      0
Misorder Drops:  0                 JitterBuf Underrun:  0
Error Sec:       0                 Severly Errored Sec: 0
Unavailable Sec: 0                 Failure Counts:      0
Pkts Malformed:  0                 JitterBuf Overrun:   0
```

• **show cem circuit summary**—Displays the number of circuits which are up or down for each interface.

```
Router# show cem circuit summary

CEM Int.      Total Active  Inactive
------------------------------------
CEM0/1/0      1     1        0
```

• **show running configuration**—The **show running configuration** command shows detail on each CEM group.

Overview of DS3 CEP

Effective Cisco IOS XE Fuji 16.8.1, DS3 CEP feature is introduced to achieve STS-1 or VC4 CEP configuration on the interface module. Here, T3 or E3 is mapped to STS-1 or VC4 that is emulated on a packet network.

Figure 1: Network Reference Model and Protocol Layers for TDM-MPLS User Plane Interworking
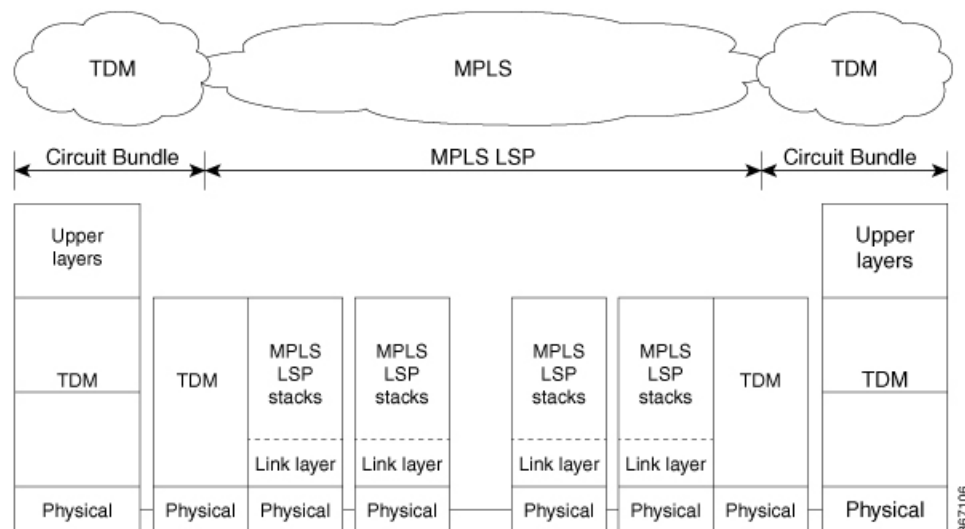

Asynchronous Mapping for DS3 CEP

An asynchronous mapping for a DS3 in the payload capacity of an STS-1 signal is defined for clear-channel transport of DS3 signals that meet the DS3 requirements in GR-499-CORE. The asynchronous DS3 mapping consists of nine subframes each of 125 µs. Each subframe contains 621 information (I) bits, a set of five stuff control (C) bits, one stuff opportunity (S) bit, and two overhead communication channel (O) bits. The remaining bits of the STS-1 payload capacity are fixed stuff (R) bits. The O-bits are reserved for future overhead communication purposes. The values of the R and O bits are undefined. In each subframe, the set of five C-bits are used to control the S-bit. CCCCC = 00000 is used to indicate that the S-bit is an information bit, while CCCCC = 11111 is used to indicate that the S-bit is a stuff bit. The value of the S-bit (if it is stuff bit) is undefined.

Figure 2: Asynchronous Mapping for DS3 CEP
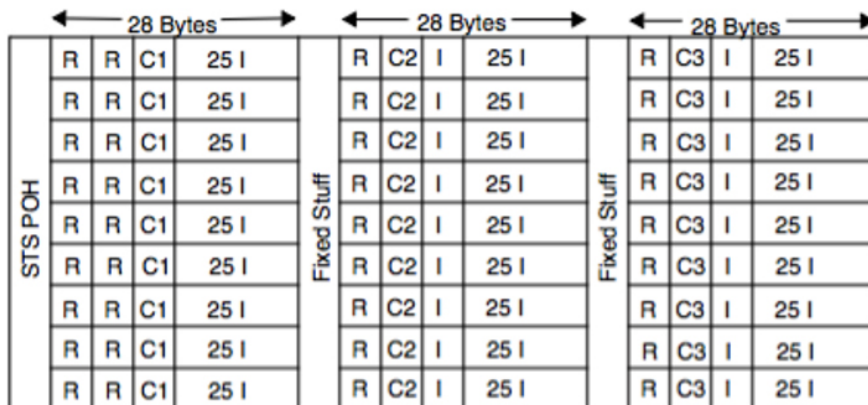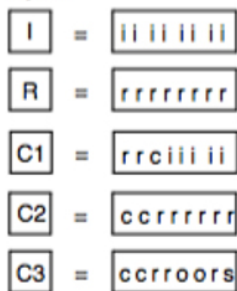

Restrictions

- BERT for both line and system directions is *not* supported.

- Card Protection is *not* supported.

- E3 CEP is not supported on optical or SDH controller.

Alarms

If an alarm is detected in the DS3 end, the C2 bytes are used to inform the remote Provider Edge (PE). For this, the alarm mapping table has to be followed as shown in the figure below.

Figure 3: Alarm Mapping Table
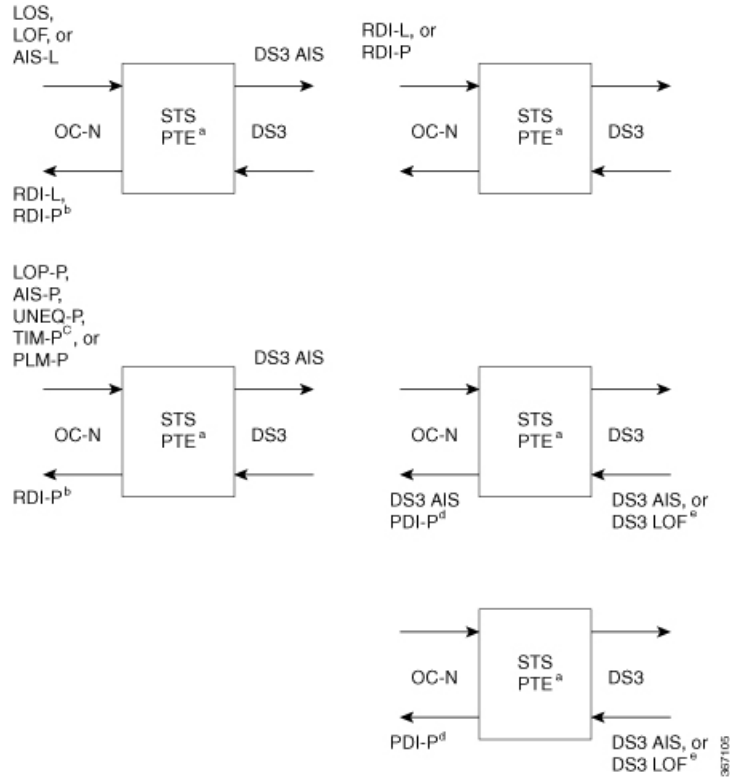
Configuring DS3 CEP

Pre-requisites:

The default mode is channelized mode. Use **no channelized** command to change to non-channelized mode.

To configure DS3 CEP for mode T3:

```
enable
controller MediaType 0/3/0
mode t3
controller t3 0/3/0
no channelized
cem-group 0 cep
```

To configure DS3 CEP for mode E3:

```
enable
controller MediaType 0/3/0
mode e3
controller e3 0/3/0
no channelized
cem-group 0 cep
```

Configuration of Overhead C2 and J1 Bytes:

You can configure overhead C2 and J1 bytes after you configure DS3 CEP.

```
enable
controller MediaType 0/14/44
mode e3
```

```
controller e3 0/14/44
threshold sd-ber 6
threshold sf-ber 3
no channelized
framing g751
cablelength short
cem group 0 cep
overhead j1 tx length 16
overhead j1 expected length 16
```

For loopback configuration, see *Loopback on T3/E3 Interfaces* section.

Verification of DS3 CEP Configuration

Use **show controller t3** *0/1/20 path* to verify DS3 CEP configuration:

```
rtr2#show controller t3 0/1/20 path

T3 0/1/20 PATH 1.

Asynchronous Mapping for DS3 into STS-1

TX : TDM to PSN direction
RX : PSN to TDM direction

Clock Source is internal

  AIS = 0          RDI = 0          REI = 349        BIP(B3) = 22
  LOP = 0          PSE = 0          NSE = 0          NEWPTR = 0
  LOM = 0          PLM = 0          UNEQ = 0
Active Defects: None
Detected Alarms: None
Asserted/Active Alarms: None
Alarm reporting enabled for: None

TCA threshold:  B3 = 10e-6
Rx: C2 = FF
Tx: C2 = 01

Tx J1 Length : 64
Tx J1 Trace

  72 74 72 32 20 30 2F 31 2F 32 30 2E 31 00 00 00    rtr2 0/1/20.1...
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00    ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00    ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00    ................

Expected J1 Length : 64
Expected J1 Trace

  72 74 72 32 20 30 2F 31 2F 32 30 2E 31 00 00 00    rtr2 0/1/20.1...
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00    ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00    ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00    ................

PATH TRACE BUFFER : UNSTABLE

Rx J1 Length : 64
Rx J1 Trace

  72 73 70 32 20 30 2F 35 2F 31 32 2E 31 00 00 00    rsp2 0/5/12.1...
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00    ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00    ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00    ................
```

```
rtr2#
```

> **Note** The verification output does not provide the alarm details.

Circuit Emulation Service over Packet-Switched Network

CESoPSN is a method for encapsulating structured (NxDS0) TDM signals as pseudowires over packet switching networks.

Restrictions for CESoPSN on T3 Interface

- The maximum sacle is 1344 cem interface.

- Changing framing from C-bit to M13 not supported where as Changing framing from g751 to g832 is supported.

- CT3-E1 and CE3-T1 is not supported (only CT3-T1 and CE3-E1 is supported).

- DS0 loopback is not supported.

- The alarm forwarding is not supported on the T1 interface.

- The card protection is not supported on the T1 interface.

Configuring CEM Group for CESoPSN on T3 Interface

The following section describes how to configure a CEM group for CESoPSN on the T3 interface:

```
controller MediaType 0/5/1
 mode t3
channelized
controller T3 0/5/1
 framing c-bit
 cablelength short
 t1 1 cem-group 1 timeslots 1-10
```

Verifying CEM for CESoPSN on T3 Interface

Use the following commands to verify the pseudowire configuration for CESoPSN:

- **show cem circuit**—Displays information about the circuit state, administrative state, the CEM ID of the circuit, and the interface on which it is configured. If cross connect is configured under the circuit, the command output also includes information about the attachment circuit status.

- **show mpls l2 vc**—Displays information about the MPLS VC.

- **show mpls l2 vc detail**—Displays detailed information about the MPLS VC.

```
Router# show controllers e3 0/14/2
E3 0/14/2 is up.
  Hardware is -48T3E3-CE
```

```
     Applique type is Channelized E3
     No alarms detected.
     Framing is E3 G751, Line Code is HDB3, Cablelength Short less than 225ft
     BER thresholds:  SF = 10e-10  SD = 10e-10
     Clock Source is internal, National Bit 0
     Equipment customer loopback
  Data in current interval (240 seconds elapsed):
    Near End
       0 Line Code Violations, 0 P-bit Coding Violations
       0 C-bit Coding Violations, 0 P-bit Err Secs
       0 P-bit Severely Err Secs, 0 Severely Err Framing Secs
       0 Unavailable Secs, 0 Line Errored Secs
       0 C-bit Errored Secs, 0 C-bit Severely Errored Secs
       0 Severely Errored Line Secs, 0 Path Failures
       0 AIS Defect Secs, 0 LOS Defect Secs
    Far End
       0 Errored Secs, 0 Severely Errored Secs
       0 C-bit Unavailable Secs, 0 Path Failures
       0 Code Violations, 0 Service Affecting Secs
  Data in Interval 1:
    Near End
       0 Line Code Violations, 0 P-bit Coding Violations
       0 C-bit Coding Violations, 0 P-bit Err Secs
       0 P-bit Severely Err Secs, 0 Severely Err Framing Secs
      20 Unavailable Secs, 20 Line Errored Secs
       0 C-bit Errored Secs, 0 C-bit Severely Errored Secs
      20 Severely Errored Line Secs, 1 Path Failures
       0 AIS Defect Secs, 20 LOS Defect Secs
    Far End
       0 Errored Secs, 0 Severely Errored Secs
       0 C-bit Unavailable Secs, 0 Path Failures
       0 Code Violations, 0 Service Affecting Secs
  Total Data (last 1 15 minute intervals):
    Near End
       0 Line Code Violations, 0 P-bit Coding Violations,
       0 C-bit Coding Violations, 0 P-bit Err Secs,
       0 P-bit Severely Err Secs, 0 Severely Err Framing Secs,
      20 Unavailable Secs, 20 Line Errored Secs,
       0 C-bit Errored Secs, 0 C-bit Severely Errored Secs
      20 Severely Errored Line Secs, 1 path failures
       0 AIS Defect Secs, 20 LOS Defect Secs
    Far End
       0 Errored Secs, 0 Severely Errored Secs
       0 C-bit Unavailable Secs, 0 Path Failures
       0 Code Violations, 0 Service Affecting Secs

E1 1 is up
  timeslots: 1-20
  No alarms detected.
  Framing is crc4, Clock Source is Internal, National bits are 0x1F.
  Data in current interval (250 seconds elapsed):
    Near End
       0 Line Code Violations, 0 Path Code Violations
       0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
       0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
       0 Unavailable Secs, 0 Stuffed Secs
       0 Path Failures, 0 SEF/AIS Secs
    Far End
       0 Line Code Violations, 0 Path Code Violations
       0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
       0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
       0 Unavailable Secs 0 Path Failures
  Data in Interval 1:
    Near End
```

```
       0 Line Code Violations, 0 Path Code Violations
       0 Slip Secs, 2 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
       2 Errored Secs, 0 Bursty Err Secs, 2 Severely Err Secs
       0 Unavailable Secs, 0 Stuffed Secs
       1 Path Failures, 2 SEF/AIS Secs
    Far End
       0 Line Code Violations, 0 Path Code Violations
       0 Slip Secs, 2 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
       3 Errored Secs, 0 Bursty Err Secs, 3 Severely Err Secs
       0 Unavailable Secs 0 Path Failures
  Total Data (last 1 15 minute intervals):
    Near End
       0 Line Code Violations,0 Path Code Violations,
       0 Slip Secs, 2 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins,
       2 Errored Secs, 0 Bursty Err Secs, 2 Severely Err Secs
       0 Unavailable Secs, 0 Stuffed Secs
       1 Path Failures, 2 SEF/AIS Secs
    Far End
       0 Line Code Violations,0 Path Code Violations
       0 Slip Secs, 2 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins,
       3 Errored Secs, 0 Bursty Err Secs, 3 Severely Err Secs
       0 Unavailable Secs, 0 Path Failures



router# sh mpls l2 vc  interface cem 0/14/0 0

Local intf      Local circuit              Dest address     VC ID      Status
-------------   --------------------------  ---------------  ----------  ----------
CE0/14/0        CESoPSN Basic 0            1.1.1.1          9999        UP


Router# sh mpls l2transport  vc 9090 detail
Local interface: CE0/14/2 up, line protocol up, CESoPSN Basic 0 up
  Destination address: 1.1.1.1, VC ID: 9090, VC status: up
    Output interface: Te0/12/0, imposed label stack {130}
    Preferred path: not configured
    Default path: active
    Next hop: 123.123.123.1
  Create time: 00:18:44, last status change time: 00:18:30
    Last label FSM state change time: 00:18:30
  Signaling protocol: LDP, peer 1.1.1.1:0 up
    Targeted Hello: 2.2.2.2(LDP Id) -> 1.1.1.1, LDP is UP
    Graceful restart: not configured and not enabled
    Non stop routing: configured and not enabled
    Status TLV support (local/remote)   : enabled/supported
      LDP route watch                   : enabled
      Label/status state machine        : established, LruRru
      Last local dataplane   status rcvd: No fault
      Last BFD dataplane     status rcvd: Not sent
      Last BFD peer monitor  status rcvd: No fault
      Last local AC  circuit status rcvd: No fault
      Last local AC  circuit status sent: No fault
      Last local PW i/f circ status rcvd: No fault
      Last local LDP TLV     status sent: No fault
      Last remote LDP TLV    status rcvd: No fault
      Last remote LDP ADJ    status rcvd: No fault
    MPLS VC labels: local 130, remote 130
    Group ID: local 207, remote 220
    MTU: local 0, remote 0
    Remote interface description:
  Sequencing: receive disabled, send disabled
  Control Word: On (configured: autosense)
  SSO Descriptor: 1.1.1.1/9090, local label: 130
```

```
  Dataplane:
    SSM segment/switch IDs: 1237749/557811 (used), PWID: 114
  VC statistics:
    transit packet totals: receive 0, send 0
    transit byte totals:   receive 0, send 0
    transit packet drops:  receive 0, seq error 0, send 0

Router# sh cem circuit interface cem 0/14/2 0

CEM0/14/2, ID: 0, Line: UP, Admin: UP, Ckt: ACTIVE
Mode :Channelized-E1, E1: 1, CEM Mode: E1-CESoP
Controller state: up, T1 state: up
Idle Pattern: 0xFF, Idle CAS: 0x8
Dejitter: 5 (In use: 0)
Payload Size: 160
Framing: Framed (DS0 channels: 1-20)
CEM Defects Set
None

Signalling: No CAS
RTP: No RTP

Ingress Pkts:    24005              Dropped:             0
Egress Pkts:     24005              Dropped:             0

CEM Counter Details
Input Errors:    0                  Output Errors:       0
Pkts Missing:    0                  Pkts Reordered:      0
Misorder Drops:  0                  JitterBuf Underrun:  0
Error Sec:       0                  Severly Errored Sec: 0
Unavailable Sec: 0                  Failure Counts:      0
Pkts Malformed:  0                  JitterBuf Overrun:   0
Generated Lbits: 0                  Received Lbits:      0
Generated Rbits: 0                  Received Rbits:      0
Generated Mbits: 0                  Received Mbits:      0
```

Configuring DS1 Local Connect on T3/E3 Interface

The following section describes how to configure the first segment for DS1 local connection:

```
enable
configure terminal
controller MediaType 0/5/7
 mode e3
channelized mode e1
controller E3 0/5/7
 e1 2 cem-group 1 timeslots 1-10
```

The following section describes how to configure the second segment for DS1 local connection:

```
enable
configure terminal
controller MediaType 0/5/2
 mode e3
channelized mode e1
controller E3 0/5/2
 e1 2 cem-group 1 timeslots 1-10
```

The following section describes how to create a DS1 local connection:

```
enable
```

```
configure terminal
connect ds1_connect CEM0/5/7 1 CEM CEM0/5/2  1
```

Verifying DS1 Local Connect on T3 Interface

Use the following commands to verify the DS1 local connection:

- **show connection name**—Displays information about the connection state and segment state.

```
ASR907# sh xconnect all | i 0/14/7
 UP pri   ac CE0/14/2:2(CESoPSN Basic)    UP  ac CE0/14/7:2(CESoPSN Basic)    UP

ASR907# sh connection all | i 0/14/7
 38   local_t3       CE0/14/2 CESP 2       CE0/14/7 CESP 2            UP
```

Associated Commands

The following commands are used to configure pseudowire:

Commands	URL
cem-group	http://www.cisco.com/c/en/us/td/docs/ios-xml/ios/interface/command/ir-cr-book/ir-c1.html#wp2440628600
payload-size dejitter-buffer	https://www.cisco.com/c/en/us/td/docs/ios-xml/ios/interface/command/ir-cr-book/ir-o1.html#wp3946673156
class cem	https://www.cisco.com/c/en/us/td/docs/ios-xml/ios/interface/command/ir-cr-book/ir-c1.html#wp2169323859
controller t1	https://www.cisco.com/c/en/us/td/docs/ios-xml/ios/interface/command/ir-cr-book/ir-c2.html#wp1472647421
xconnect	http://www.cisco.com/c/en/us/td/docs/ios-xml/ios/interface/command/ir-cr-book/ir-t2.html#wp8578094790
show controllers t3	https://www.cisco.com/c/en/us/td/docs/ios-xml/ios/interface/command/ir-cr-book/ir-s3.html#wp1987423547

Additional References for Configuring Pseudowire

Related Documents

Related Topic	Document Title
Cisco IOS commands	Cisco IOS Master Commands List, All Releases

Standards and RFCs

Standard/RFC	Title
—	*There are no standards and RFCs for this feature.*

MIBs

MIB	MIBs Link
—	To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

Technical Assistance

Description	Link
The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies. To receive security and technical information about your products, you can subscribe to various services, such as the Product Alert Tool (accessed from Field Notices), the Cisco Technical Services Newsletter, and Really Simple Syndication (RSS) Feeds. Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.	http://www.cisco.com/cisco/web/support/index.html