Configuring VCoP Smart SFP

The Virtual Container over Packet (VCoP) smart small form-factor pluggable (SFP) forwards the SONET signal transparently across the packet network. VCoP smart SFP is a special type of transceiver which encapsulates SONET frames on STS-1, STS-3c, or STS-12C channels into a single circuit emulating pseudowire and transports it to a single destination over Packet Switched Network (PSN).

Note The VCoP smart SFP feature is supported only on Cisco ASR-920-24SZ-IM, ASR-920-24SZ-M, ASR-920-12SZ-IM, ASR-920-4SZ-A/D, and ASR-920-12CZ-A/D routers.

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Features of VCoP Smart SFP

VCoP smart SFP provides support for the following features:

Benefits of VCoP Smart SFP

- Supports channelization upto STS1 channel
- Reduces network complexity

Prerequisites

- The Multi-Protocol Label Switching (MPLS) and Interior Gateway Protocol (IGP) endpoints are up and running fine between the PE nodes.
- Ensure that SyncE is configured.
- Use the PTP Telecom profile, G.8265.1 for frequency synchronization, for CEM.
- VCoP smart SFP on OCn mode supports single-mode optical fiber cables.
- Port interface is set as default by using the **default int Gig 0/0/8** command before inserting VCoP smart SFP on GE or 10GE port.
- The GE or 10GE port interface is brought up using the **no shutdown** command.
- In cases where a non-VCoP SFP is to be inserted on any port from which any VCoP smart SFP is removed, then before inserting non-VCoP SFP, the VCoP smart SFP configuration is removed using the below commands:
  - For OC-3

    no platform smart-sfp interface Gig x/y/z type oc3
  - For OC-12

    no platform smart-sfp interface Gig x/y/z type oc12
  - For T1

    no platform smart-sfp interface Gig x/y/z type t1

Note

- Replace GE with 10GE in the above commands to configure VCoP as 10GE port interface when inserted in a 10GE port.
- There is no need to remove **platform smart-sfp interface Gig/TenGig x/y/z type oc3/oc12/ds3** command for OC-3 and OC-12 modes and **platform smart-sfp interface Gig/TenGig x/y/z type T1** for T1 mode if you are replacing one VCoP smart SFP with the same or another VCoP smart SFP.
- Recovered clock configuration needs to be removed before applying the **no platform** command.

- To connect the CE nodes, VCoP smart SFP uses single mode fiber (SMF) over the LC optical interface for OCx mode .

Note Recommended interfacing connector for the T3 VCoP SFP is Compel 1.0/2.3 Coaxial connector P/N 350.064.621.

Restrictions

- The payload size is fixed to STS1 and is 783 bytes.
- VCoP smart SFP *does not* support Stateful Switchover (SSO).
- For QoS, VCoP smart SFP supports only the default MPLS experimental marking.
- At a time, OC-3/OC-12 supports BERT at any one path.
- VCoP smart SFP *does not* support E3 mode.
- The chassis supports up to 12 VCoP smart SFPs.
- The Cisco ASR-920-24SZ-IM, ASR-920-24SZ-M routers support a maximum of 12 VCoP smart SFPs and only on GE ports of the top row, which has odd numbered ports.
- The Cisco ASR-920-12CZ-A/D supports a maximum of four VCoP Smart SFPs on Gigabit Ethernet ports with port numbers of 0, 1, 10, and 11, and maximum ambient temperature of 65°C, or a maximum of 14 VCoP smart SFPs on all the 12 Gigabit Ethernet ports and two 10 Gigabit Ethernet dual rate ports with a maximum temperature of 55°C.
- The Cisco ASR-920-12SZ-IM router supports a maximum of 8 VCoP smart SFPs and on all GE and 10GE ports.
- BERT on OCn VCoP is supported only at STS-1 path level. VCoP hardware does not support BERT at concatenated paths.
- BERT on DS3 VCoP is supported only in the Line direction.
- The VCoP CEM counters do not support L-bit and R-bit counters.
- VCoP is supported *only* on odd number ports and is *not* supported on even number ports.

Alarms on VCoP Smart SFP

VCoP smart SFP supports the following alarms on OC-3 or OC-12 mode:

- Loss of Signal (LOS)
- Loss of Frame (LOF)
- Alarm Indication Signal (MS-AIS, AU-AIS)
- Remote Defect Indication Line (RDI-L)
- Loss of Pointer (AU-LOP)
- Path Unequipped Indication Signal (PUNEQ)

Note In case of RDI-L (remote alarm), SONET controller does not go down as this is not a critical alarm.

Configuring VCoP Smart SFP

Configuring VCoP Smart SFP on OC-3

Enabling VCoP Smart SFP on OC-3

You can enable VCoP smart SFP for STS1 and STS-3c channels on OC-3.

```
enable
configure terminal
platform smart-sfp interface GigabitEthernet 0/0/8 type OC3
exit
```

Configuring Framing for CEM Circuits for STS-1 on OC-3

```
enable
configure terminal
controller SONET 0/0/8
framing sonet
sts-1 1
mode unframed
cem-group 20 cep
sts-1 2
mode unframed
cem-group21 cep
sts-1 3
mode unframed
cem-group 22 cep
exit
```

Configuring CEM Circuits on VCoP for STS-3c on OC-3

```
enable
configure terminal
controller SONET 0/0/10
framing sonet
sts-1 1-3 mode sts-3c
cem-group 0 cep
overhead c2 0
exit
```

Configuring Cross-Connect for STS-1 on OC-3

Note Ensure that the VC number that is configured in **xconnect** command is the same on both PEs.

```
enable
configure terminal
interface CEM0/0/8
no ip address
cem 20
xconnect 2.2.2.2 3000 encapsulation mpls
cem 21
xconnect 2.2.2.2 3001 encapsulation mpls
```

```
cem 22
xconnect 2.2.2.2 3002 encapsulation mpls
exit
```

Configuring Cross-Connect for STS-3C on OC-3

```
enable
configure terminal
interface GigabitEthernet0/0/10
no ip address
negotiation auto
interface CEM0/0/10
no ip address
cem 0
xconnect 2.2.2.2 1000 encapsulation mpls
exit
```

Verifying VCoP Smart SFP Configuration for STS-1 on OC-3

Use the **show cem circuit** command to verify the VCoP smart SFP configuration.

```
Device# show cem circuit detail

CEM0/0/8, ID: 20, Line: UP, Admin: UP, Ckt: ACTIVE
Controller state: up, CEP state: up
Idle Pattern: 0xFF, Idle CAS: 0x8
Dejitter: 5 (In use: 0)
Payload Size: 783
Framing: Unframed
CEM Defects Set
None

Signalling: No CAS
RTP: No RTP

Ingress Pkts:    24000               Dropped:             0
Egress Pkts:     24000               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


CEM0/0/8, ID: 21, Line: UP, Admin: UP, Ckt: ACTIVE
Controller state: up, CEP state: up
Idle Pattern: 0xFF, Idle CAS: 0x8
Dejitter: 5 (In use: 0)
Payload Size: 783
Framing: Unframed
CEM Defects Set
None

Signalling: No CAS
RTP: No RTP

Ingress Pkts:    24000               Dropped:             0
Egress Pkts:     24000               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


CEM0/0/8, ID: 22, Line: UP, Admin: UP, Ckt: ACTIVE
Controller state: up, CEP state: up
Idle Pattern: 0xFF, Idle CAS: 0x8
Dejitter: 5 (In use: 0)
Payload Size: 783
Framing: Unframed
CEM Defects Set
None

Signalling: No CAS
RTP: No RTP

Ingress Pkts:    24000                Dropped:             0
Egress Pkts:     24000                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
```

```
Device# show cem circuit
CEM Int.       ID   Ctrlr     Admin     Circuit         AC
---------------------------------------------------------------
CEM0/0/8       20   UP        UP        Active           UP
CEM0/0/8       21   UP        UP        Active           UP
CEM0/0/8       22   UP        UP        Active           UP


Device# show mpls l2 vc

Local intf     Local circuit              Dest address    VC ID      Status
-------------  -------------------------- --------------- ---------- ----------
CE0/0/8        CEM 20                     2.2.2.2         3000       UP
CE0/0/8        CEM 21                     2.2.2.2         3001       UP
CE0/0/8        CEM 22                     2.2.2.2         3002       UP
```

Verifying VCoP Smart SFP Configuration for STS-3C on OC-3

Use the **show controller** command to verify the VCoP smart SFP configuration.

```
Device#show controller sonet 0/0/10
SONET 0/0/10 is up.
  Hardware is 12xGE-4x10GE-FIXED

 Port configured rate: OC-3
 Applique type is Channelized Sonet/SDH
 Clock Source is Line
Medium info:
  Type: Sonet, Line Coding: NRZ,
 SECTION:
  LOS = 0          LOF = 0                          BIP(B1) = 0

SONET/SDH Section Tables
```

```
  INTERVAL       CV    ES   SES  SEFS
  15:58-16:11     0     0     0     0

LINE:
  AIS = 0          RDI = 0          REI = 0          BIP(B2) = 0
Active Defects: None
Detected Alarms: None
Asserted/Active Alarms: None
Alarm reporting enabled for: SLOS SLOF SF B1-TCA B2-TCA
BER thresholds:  SF = 10e-3  SD = 10e-6
TCA thresholds:  B1 = 10e-6  B2 = 10e-6
Rx: S1S0 = 40
    K1 = 00,   K2 = 00
    J0 = 01
    RX S1 = 00

Tx: S1S0 = 00
    K1 = 00,   K2 = 00
    J0 = 01

SONET/SDH Line Tables
  INTERVAL       CV    ES   SES   UAS
  15:58-16:11     0     0     0     0


High Order Path:

PATH 1:
  AIS = 0          RDI = 0          REI = 0          BIP(B3) = 0
  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: PLOP LOM B3-TCA

TCA threshold:  B3 = 10e-6
Rx: C2 = 00
Tx: C2 = 00

PATH TRACE BUFFER : UNSTABLE

  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     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................

SONET/SDH Path Tables
  INTERVAL       CV    ES   SES   UAS
  16:11-16:11     0     0     0     0


STS-1 1 - 3 mode sts-3c
  cep is configured: TRUE cem_id  :0
Path 2:
 configured as member of a concatenated interface
Path 3:
 configured as member of a concatenated interface
```

Configuring VCoP Smart SFP on OC-12

Enabling VCoP Smart SFP on OC-12

You can enable VCoP smart SFP for STS-1 and STS-12C channels on OC-12.

```
enable
configure terminal
platform smart-sfp interface GigabitEthernet 0/0/8 type OC12
exit
```

Configuring Framing for CEM Circuits for STS-1 on OC-12

```
enable
configure terminal
controller SONET 0/0/8
framing sonet
sts-1 1
mode unframed
cem-group 20 cep
sts-1 2
mode unframed
cem-group21 cep
sts-1 3
mode unframed
cem-group 22 cep
sts-1 4
mode unframed
sts-1 5
mode unframed
sts-1 6
mode unframed
sts-1 7
mode unframed
sts-1 8
mode unframed
sts-1 9
mode unframed
sts-1 10
mode unframed
sts-1 11
mode unframed
sts-1 12
mode unframed
exit
```

Configuring CEM Circuits on VCoP for STS-12C on OC-12

```
enable
configure terminal
controller SONET 0/0/8
framing sonet
sts-1 1-12 mode sts-12c
cem-group0 cep
overhead c2 2
exit
```

Configuring Cross-Connect for STS-1 on OC-12

```
enable
configure terminal
interface CEM 0/0/8
no ip address
cem 20
xconnect 2.2.2.2 3000 encapsulation mpls
cem 21
xconnect 2.2.2.2 3001 encapsulation mpls
cem 22
xconnect 2.2.2.2 3002 encapsulation mpls
cem 23
cem 24
cem 25
cem 26
cem 27
cem 28
cem 29
cem 30
cem 31
exit
```

Configuring Cross-Connect for STS-12C on OC-12

```
enable
configure terminal
interface GigabitEthernet 0/0/8
no ip address
negotiation auto
interface CEM 0/0/8
no ip address
cem 0
xconnect 2.2.2.2 2222 encapsulation mpls
exit
```

Verifying VCoP Smart SFP Configuration for STS-1 on OC-12

Use the **show cem circuit** and **show mpls l2 vc** commands to verify the VCoP smart SFP configuration.

```
Device# show cem circuit detail

CEM0/0/8, ID: 20, Line: UP, Admin: UP, Ckt: ACTIVE
Controller state: up, CEP state: up
Idle Pattern: 0xFF, Idle CAS: 0x8
Dejitter: 5 (In use: 0)
Payload Size: 783
Framing: Unframed
CEM Defects Set
None

Signalling: No CAS
RTP: No RTP

Ingress Pkts:    24000               Dropped:             0
Egress Pkts:     24000               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


CEM0/0/8, ID: 21, Line: UP, Admin: UP, Ckt: ACTIVE
Controller state: up, CEP state: up
Idle Pattern: 0xFF, Idle CAS: 0x8
Dejitter: 5 (In use: 0)
Payload Size: 783
Framing: Unframed
CEM Defects Set
None

Signalling: No CAS
RTP: No RTP

Ingress Pkts:    24000                Dropped:             0
Egress Pkts:     24000                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


CEM0/0/8, ID: 22, Line: UP, Admin: UP, Ckt: ACTIVE
Controller state: up, CEP state: up
Idle Pattern: 0xFF, Idle CAS: 0x8
Dejitter: 5 (In use: 0)
Payload Size: 783
Framing: Unframed
CEM Defects Set
None

Signalling: No CAS
RTP: No RTP

Ingress Pkts:    24000                Dropped:             0
Egress Pkts:     24000                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
```

```
Device# show cem circuit
CEM Int.       ID   Ctrlr     Admin     Circuit         AC
---------------------------------------------------------------
CEM0/0/8       20   UP        UP        Active          UP
CEM0/0/8       21   UP        UP        Active          UP
CEM0/0/8       22   UP        UP        Active          UP
```

```
Device# show mpls l2 vc

Local intf     Local circuit              Dest address    VC ID      Status
-------------  -------------------------- --------------- ---------- ----------
CE0/0/8        CEM 20                       2.2.2.2         3000       UP
CE0/0/8        CEM 21                       2.2.2.2         3001       UP
CE0/0/8        CEM 22                       2.2.2.2         3002       UP
```

-

Verifying VCoP Smart SFP Configuration for STS-12C on OC-12

Use the **show controller** command to verify the VCoP smart SFP configuration.

```
Device# show controller sonet 0/0/8
SONET 0/0/8 is up.
  Hardware is 12xGE-4x10GE-FIXED

 Port configured rate: OC-3
 Applique type is Channelized Sonet/SDH
 Clock Source is Line
Medium info:
  Type: Sonet, Line Coding: NRZ,
 SECTION:
  LOS = 0          LOF = 0                            BIP(B1) = 0

SONET/SDH Section Tables
  INTERVAL       CV    ES   SES  SEFS
  16:01-16:09     0     0     0     0

LINE:
  AIS = 0          RDI = 0          REI = 0          BIP(B2) = 0
Active Defects: None
Detected Alarms: None
Asserted/Active Alarms: None
Alarm reporting enabled for: SLOS SLOF SF B1-TCA B2-TCA
BER thresholds:  SF = 10e-3  SD = 10e-6
TCA thresholds:  B1 = 10e-6  B2 = 10e-6
Rx: S1S0 = 40
    K1 = 00,   K2 = 00
    J0 = 01
    RX S1 = 00

Tx: S1S0 = 00
    K1 = 00,   K2 = 00
    J0 = 01

SONET/SDH Line Tables
  INTERVAL       CV    ES   SES   UAS
  16:01-16:09     0     0     0     0


High Order Path:

PATH 1:
  AIS = 0          RDI = 0          REI = 0          BIP(B3) = 0
  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: PLOP LOM B3-TCA

TCA threshold:  B3 = 10e-6
Rx: C2 = 00
Tx: C2 = 02

PATH TRACE BUFFER : UNSTABLE

  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     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................

SONET/SDH Path Tables
  INTERVAL       CV    ES   SES   UAS
  16:09-16:09     0     0     0     0


STS-1 1 - 12 mode sts-12c
  cep is configured: TRUE cem_id  :0
Path 2:
 configured as member of a concatenated interface
Path 3:
 configured as member of a concatenated interface
Path 4:
 configured as member of a concatenated interface
Path 5:
 configured as member of a concatenated interface
Path 6:
 configured as member of a concatenated interface
Path 7:
 configured as member of a concatenated interface
Path 8:
 configured as member of a concatenated interface
Path 9:
 configured as member of a concatenated interface
Path 10:
 configured as member of a concatenated interface
Path 11:
 configured as member of a concatenated interface
Path 12:
 configured as member of a concatenated interface
```

Performance Monitoring

Performance Monitoring and Overhead Bytes

The VCoP smart SFP supports the performance monitoring counter to maintain the path quality of the link.

You can view the statistics or error count that is generated on the VCoP smart SFP, if you have the configuration that is described:

```
enable
configure terminal
controller SONET 0/0/8
threshold b1-tca 8
threshold  b2-tca 8
framing  sonet
overhead j0 6
overhead s1s0 2
!
sts-1  1
overhead  c2 2
threshold b3-ber_sd 8
threshold b3-ber_sf 8
overhead  1 message PATH_TRACEj
threshold  b3-tca 8
mode unframed
```

```
cem-group0 cep
!
```

The following parameters affect SONET configuration:

- Overhead - Sets the SONET overhead bytes in the frame header to a specific standards requirement, or to ensure interoperability with equipment from another vendors.
  - J0 - Sets the J0/C1 byte value in the SONET section overhead.

Note 1 byte, 16 bytes, and 64 bytes are the supported values for J0.

  - J1 - Path Trace Byte
  - C2- Path Signal label
  - S1S0 - Sets the SS bits value of the H1 byte in the SONET line overhead
- Alarm Reporting - Enables reporting for all or selected alarms.
  - B1 - Section BIP Error (SF/SD)
  - B2 - Line BIP Error (SF/SD)
  - B3 (SF/SD) - STS Path BIP Error
  - sd-ber - Sets Signal Degrade BER threshold
  - sf-ber - Sets Signal failure BER threshold

The performance monitoring result is displayed using the **show controller** command. The following snippets are the performance monitoring details when the **show controller** command is executed.

```
Router# show controller sonet 0/0/8
SONET 0/0/8 is up.
  Hardware is 12xGE-4x10GE-FIXED

 Port configured rate: OC3
 Applique type is Channelized Sonet/SDH
 Clock Source is Line
Medium info:
  Type: Sonet, Line Coding: NRZ,
 SECTION:
  LOS = 0          LOF = 0                          BIP(B1) = 0

SONET/SDH Section Tables
  INTERVAL       CV    ES   SES  SEFS
  12:25-12:25     0     0     0     0

LINE:
  AIS = 0          RDI = 0          REI = 0          BIP(B2) = 0
Active Defects: None
Detected Alarms: None
Asserted/Active Alarms: None
Alarm reporting enabled for: SLOS SLOF SF B1-TCA B2-TCA
BER thresholds:  SF = 10e-3  SD = 10e-6
TCA thresholds:  B1 = 10e-8  B2 = 10e-8
Rx: S1S0 = 40
```

```
    K1 = 00,   K2 = 00
    J0 = 01
    RX S1 = 00

Tx: S1S0 = 02
    K1 = 00,   K2 = 00
    J0 = 06

SONET/SDH Line Tables
  INTERVAL       CV    ES   SES   UAS
  12:25-12:25     0     0     0     0


High Order Path:

PATH 1:
  AIS = 0          RDI = 0          REI = 0          BIP(B3) = 0
  LOP = 0          PSE = 0          NSE = 0          NEWPTR = 0
  LOM = 0          PLM = 0          UNEQ = 0

Active Defects: None
Detected Alarms: PAIS
Asserted/Active Alarms: PAIS
Alarm reporting enabled for: PLOP LOM B3-TCA

TCA threshold:  B3 = 10e-6
Rx: C2 = 00
Tx: C2 = 02

PATH TRACE BUFFER : UNSTABLE

  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     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................

SONET/SDH Path Tables
  INTERVAL       CV    ES   SES   UAS
  12:25-12:25     0     0     0     0

PATH 2:
  AIS = 0          RDI = 0          REI = 0          BIP(B3) = 0
  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: PLOP LOM B3-TCA

TCA threshold:  B3 = 10e-6
Rx: C2 = 00
Tx: C2 = 02

PATH TRACE BUFFER : UNSTABLE

  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     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................

SONET/SDH Path Tables
  INTERVAL       CV    ES   SES   UAS
  12:25-12:25     0     0     0     0
```

```
PATH 3:
  AIS = 0          RDI = 0          REI = 0          BIP(B3) = 0
  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: PLOP LOM B3-TCA

TCA threshold:  B3 = 10e-6
Rx: C2 = 00
Tx: C2 = 02

PATH TRACE BUFFER : UNSTABLE

  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     ................
  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00     ................

SONET/SDH Path Tables
  INTERVAL       CV    ES   SES   UAS
  12:25-12:25     0     0     0     0


STS-1 1 mode UNFRAMED
  cep is configured: TRUE cem_id  :0

STS-1 2 mode UNFRAMED
  cep is configured: FALSE cem_id  :0

STS-1 3 mode UNFRAMED
  cep is configured: FALSE cem_id  :0
```

Troubleshooting

Troubleshooting VCoP Smart SFP Configuration on OC-3

Problem Checking the MAC address of the VCoP smart SFP from database

Possible Cause None

Solution Use the **show platform software ssfpd** and **show inventory** commands to troubleshoot issues with the VCoP smart SFP configuration.

```
Device# show platform software ssfpd db

=== Redundancy role ===
RF role: Active


=== Smart SFP info ===
dpidx: 15
mac : 00:19:3a:00:79:58
port: 8
bay: 0
ssfp upgrade data store id: -1
ssfp is device upgrade safe: -1
```

```
upgrade percentage complete: 0
ssfp upgrade in progress: 0

fpga version of the VCoP
#############

Device# show platform software ssfpd slot 0 bay 0 port 8 version
sdid: 15
rma timestamp: 160209-09:21
rma version: 00060000
firmware: 03002400
ppactive: 00060000
ppstored: 00060000
--CN Information--
cnid: 0
mbid: 271
hwid: 1274
nabc: 0
sabc: 0
nmbc: 0
ReleaseType: OFFICIAL

Device# show inventory |
beg VCoPNAME: "subslot 0/0 transceiver 8", DESCR: "VCoP OC-3/OC-12" PID: ONS-SI-OC-VCOP
   , VID: 01.0, SN: OEA19430007
```

Troubleshooting VCoP Smart SFP Configuration on OC-12

Problem Checking the MAC address of the VCoP smart SFP from database

Possible Cause None

Solution Use the **show platform software ssfpd** and **show inventory** commands to troubleshoot issues with the VCoP smart SFP configuration.

```
Device#show platform software ssfpd db

=== Redundancy role ===
RF role: Active


=== Smart SFP info ===
dpidx: 15
mac : 00:19:3a:00:79:58
port: 8
bay: 0
ssfp upgrade data store id: -1
ssfp is device upgrade safe: -1
upgrade percentage complete: 0
ssfp upgrade in progress: 0

fpga version of the VCoP
#############

Device#show platform software ssfpd slot 0 bay 0 port 8 version
sdid: 15
rma timestamp: 160209-09:21
rma version: 00060000
firmware: 03002400
ppactive: 00060000
ppstored: 00060000
--CN Information--
cnid: 0
mbid: 271
```

```
hwid: 1274
nabc: 0
sabc: 0
nmbc: 0
ReleaseType: OFFICIAL

Device#show inventory
 | beg VCoPNAME: "subslot 0/0 transceiver 8", DESCR: "VCoP OC-3/OC-12"PID: ONS-SI-OC-VCOP
     , VID: 01.0, SN: OEA19430007
```

Running Bit Error Rate Testing

Bit Error Rate Testing (BERT) is supported on VCoP smart SFP at the STS-1 path level. The OCn VCoP hardware does not support BERT at the concatenated level paths like STS-3c or STS-12c. The interfaces contain onboard BERT circuitry to send and detect a pattern.

When running a BERT test, your system expects to receive the same pattern that it is transmitting. To help ensure that the two common options are available:

- Use a loopback somewhere in the link or network.
- Configure remote testing equipment to transmit the same BERT test pattern at the same time.

VCoP smart SFP supports Pseudo Random Binary Sequence (PRBS) pattern.

Both the total number of error bits received and the total number of error bits received are available for analysis. You can select the testing period to be from 1 minute to 24 hours, and you can also retrieve the error statistics anytime during the BERT test.

BERT is supported in two directions:

- Line - supports BERT in TDM direction.
- System - supports BERT in PSN direction.

Note When the BERT is configured towards system direction, it internally loopbacks the TDM side locally.

Note DS3 VCoP supports BERT only in the Line direction.

Note Running BERT on DS3 VCoP triggers LOF alarm and it is cleared when BERT is over.

Configuring BERT on OC-3/OC-12 VCoP Smart SFP

Follow these steps to configure BERT on VCoP STS-1 path for direction as line.

```
enable
configure terminal
```

```
controller SONET 0/0/9
sts-1 1
bert pattern pRBS  interval 5 direction line
exit
```

Note To terminate a BERT test during the specified test period, use the **no bert** command.

You can view the results of a BERT test at the following times:

- After you terminate the test using the **no bert** command.
- After the test runs completely.
- Anytime during the test (in real time).

Verifying BERT on OC3/OC12

Use the **show controller** command to verify the BERT configuration on VCoP smart SFP.

```
BERT test result (running)
     Test Pattern : All 0's, Status : Not Sync, Sync Detected : 0
     Interval : 5 minute(s), Time Remain : 4 minute(s)
     Bit Errors (since BERT started): 0 bits,
     Bits Received (since BERT started): 0 Kbits
     Bit Errors (since last sync): 0 bits
     Bits Received (since last sync): 0 Kbits
     Direction : Line
```

Loopback on VCoP Smart SFP

VCoP smart SFP supports two types of loopback configurations:

- Local loopback - In local loopback, the transmitting signal is looped back to the receiver signal.
- Network loopback - In network loopback, the receiving signal is looped back to the transmitting signal.

You can configure loopback on VCoP smart SFP at two levels:

- Controller level
- Path Level

Configuring Loopback on VCoP STS1 Channel

Configuring Network Loopback

Follow these steps to configure network loopback on VCoP STS1 channel.

```
enable
configure terminal
controller SONET 0/0/8
sts-1 1
```

```
loopback network
exit
```

Configuring Local Loopback

Follow these steps to configure local loopback on VCoP STS1 channel.

```
enable
configure terminal
controller SONET 0/0/8
sts-1 1
loopback local
exit
```

Verifying Loopback at Path Level

Use the **show run controller sonet 0/0/8** command to verify the configuration with loopback on VCoP smart SFP.

```
Controller SONET 0/0/11
no TU-AIS
threshold sf-ber 3
threshold b1-tca 8
threshold b2-tca 8
framing sonet
overhead j0 6
overhead s1s0 2
!
sts-1 1 - 12 mode sts-12c
cem-group 0 cep
loopback local
overhead c2 2
threshold b3-ber_sd 8
threshold b3-ber_sf 8
overhead j1 message PATH_T
threshold b3-tca 8
```

Use the **show controller sonet 0/0/8** command to verify the path level local loopback configuration on VCoP smart SFP.

```
SONET 0/0/8 is up.
  Hardware is A900-IMA8S

 Port configured rate: OC3
 Applique type is Channelized Sonet/SDH
....
......
.........
SONET/SDH Path Tables
  INTERVAL       CV    ES   SES   UAS
  02:32-02:32     0     0     0     0


STS-1 1 mode UNFRAMED
  cep is configured: TRUE cem_id  :10
  Configured Loopback :  Locally Looped
```

Use the **show controller sonet 0/0/8** command to verify the path level network loopback configuration on VCoP smart SFP.

```
SONET 0/0/8 is up.
  Hardware is A900-IMA8S

 Port configured rate: OC3
 Applique type is Channelized Sonet/SDH
 Clock Source is Line
....
......
.........
SONET/SDH Path Tables
  INTERVAL       CV    ES   SES   UAS
  02:35-02:35     0     0     0     0


STS-1 1 mode UNFRAMED
  cep is configured: TRUE cem_id  :10
  Configured Loopback :  Network Looped
```

Configuring Loopback on SONET Controller

Configuring Network Loopback

Follow these steps to configure network loopback on SONET controller.

```
enable
configure terminal
controller SONET 0/0/8
loopback network
exit
```

Configuring Local Loopback

Follow these steps to configure local loopback on SONET controller.

```
enable
configure terminal
controller SONET 0/0/8
loopback local
exit
```

Verifying Loopback at Controller Level

Use the **show controller sonet 0/0/8** command to verify the controller level local loopback configuration on VCoP smart SFP.

```
SONET 0/0/8 is up.(Configured for Locally Looped)
  Hardware is A900-IMA8S

 Port configured rate: OC3
 Applique type is Channelized Sonet/SDH
.....
......
```

Use the **show controller sonet 0/0/8** command to verify the BERT configuration on VCoP Smart SFP.

```
SONET 0/0/8 is up.(Configured for Network Looped)
  Hardware is A900-IMA8S
```

```
 Port configured rate: OC3
 Applique type is Channelized Sonet/SDH
......
........
```

Configuration Examples for VCoP Smart SFP

Example: VCoP Smart SFP Configuration on OC-3

```
Enabling the VCoP SSFP.
#########################
platform smart-sfp interface GigabitEthernet0/0/8 type OC3

configuring the sonet controller.
============================
controller SONET 0/0/8
 framing sonet
 !
 sts-1 1
  mode unframed
  cem-group 20 cep
 !
 sts-1 2
  mode unframed
  cem-group 21 cep
 !
 sts-1 3
  mode unframed
  cem-group 22 cep
 !
 configuring the cem interface
##########################
interface CEM0/0/8
 no ip address
 cem 20
  xconnect 2.2.2.2 3000 encapsulation mpls
 !
 cem 21
  xconnect 2.2.2.2 3001 encapsulation mpls
 !
 cem 22
  xconnect 2.2.2.2 3002 encapsulation mpls
 !
```

Example: VCoP Smart SFP Configuration on OC-12

```
Enabling the VCoP SSFP.
#########################
platform smart-sfp interface GigabitEthernet0/0/8 type OC12

configuring the sonet controller.
============================
controller SONET 0/0/8
 framing sonet
 !
 sts-1 1
```

```
 mode unframed
 cem-group 20 cep
!
sts-1 2
 mode unframed
 cem-group 21 cep
!
sts-1 3
 mode unframed
 cem-group 22 cep
!
sts-1 4
 mode unframed

!
sts-1 5
 mode unframed

!
sts-1 6
 mode unframed

!
sts-1 7
 mode unframed

!
sts-1 8
 mode unframed

!
sts-1 9
 mode unframed

!
sts-1 10
 mode unframed

!
sts-1 11
 mode unframed

!
sts-1 12
 mode unframed

!

configuring the cem interface
############################
interface CEM0/0/8
 no ip address
 cem 20
  xconnect 2.2.2.2 3000 encapsulation mpls
 !
 cem 21
  xconnect 2.2.2.2 3001 encapsulation mpls
 !
 cem 22
  xconnect 2.2.2.2 3002 encapsulation mpls
 !
 cem 23
 !
 cem 24
```

```
 !
 cem 25

 !
 cem 26

 !
 cem 27

 !
 cem 28

 !
 cem 29

 !
 cem 30
  !
 cem 31

 !
!
```

Associated Commands

The commands used to configure VCoP Smart SFP.

Commands	URL
platform smart-sfp	https://www.cisco.com/c/en/us/td/docs/ios-xml/ios/interface/command/ir-cr-book/ir-o1.html#wp2283539401
controller sonet	http://www.cisco.com/c/en/us/td/docs/ios-xml/ios/interface/command/ir-cr-book/ir-c2.html#wp2020468554
framing sonet	http://www.cisco.com/c/en/us/td/docs/ios-xml/ios/interface/command/ir-cr-book/ir-f1.html#wp6807068490
controller t3	http://www.cisco.com/c/en/us/td/docs/ios-xml/ios/interface/command/ir-cr-book/ir-c2.html#wp1921350260
sts-1	http://www.cisco.com/c/en/us/td/docs/ios-xml/ios/interface/command/ir-cr-book/ir-s6.html#wp2423232697
cem-group	http://www.cisco.com/c/en/us/td/docs/ios-xml/ios/interface/command/ir-cr-book/ir-c1.html#wp2440628600

Commands	URL
xconnect	http://www.cisco.com/c/en/us/td/docs/ios-xml/ios/interface/command/ir-cr-book/ir-t2.html#wp8578094790
overhead	http://www.cisco.com/c/en/us/td/docs/ios-xml/ios/interface/command/ir-cr-book/ir-o1.html#wp1973678817
bert pattern	http://www.cisco.com/c/en/us/td/docs/ios-xml/ios/interface/command/ir-cr-book/ir-a1.html#wp3620978929
show cem circuit	http://www.cisco.com/c/en/us/td/docs/ios-xml/ios/interface/command/ir-cr-book/ir-c1.html#wp7026926390
loopback	http://www.cisco.com/c/en/us/td/docs/ios-xml/ios/interface/command/ir-cr-book/ir-l1.html#wp1033903426
show controller sonet	http://www.cisco.com/c/en/us/td/docs/ios-xml/ios/interface/command/ir-cr-book/ir-s3.html#wp1341372847

Additional References for VCoP Smart SFP

Related Documents

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

Standards and RFCs

Standard/RFC	Title
IETF RFC: 4842	*Synchronous Optical Network/Synchronous Digital Hierarchy (SONET/SDH) - Circuit Emulation over Packet (CEP)*

MIBs

MIB	MIBs Link
• CISCO-MIB	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