Provisioning Procedures

2.1 Setting Up TL1 Communication

The period during which a user is logged into the Cisco NCS 2002 or Cisco NCS 2006 is called a session. There are three options you can use to open a session (log in):

- Cisco Transport Controller (CTC)
- Telnet
- Craft interface

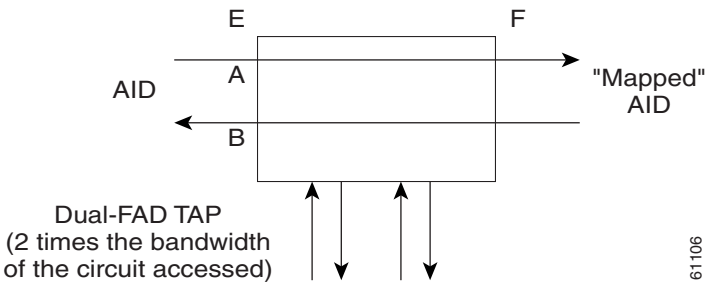
2.2 Test Access

The test access (TACC) feature allows a third-party Broadband Remote Test Unit (BRTU) to create nonintrusive test access points (TAPs) to monitor the circuits on the Cisco NCS 2002 or Cisco NCS 2006 for errors. The test access feature also allows the circuit to be split (intrusive), so that the transmission paths can be tested for bit errors through the use of various bit test patterns. The two BRTUs supported by the Cisco NCS 2002 or Cisco NCS 2006 are the Hekimian/Spirent BRTU-93 (6750) and the TTC/Acterna Centest 650.

The test access functionality provides TL1 commands for creating and deleting TAPs, connecting or disconnecting TAPs to circuit cross-connects and changing the mode of test access on the Cisco NCS 2002 or Cisco NCS 2006. You can view test access information in CTC; in node view click the **Maintenance > Test Access** tabs.

A TAP provides the capability to connect the circuit under test to a BRTU. This connection initially provides in-service monitoring capability to permit the tester to determine that the circuit under test is idle. The monitor connection should not disturb the circuit under test. The access point and remote test unit (RTU) also provide the capability of splitting a circuit under test. A split consists of breaking the transmission path of the circuit under test. This is done out of service. The two sides of the access point are called the Equipment (E) and Facility (F) directions. For a 4-wire or 6-wire circuit, the transmission pairs within the access point are defined as the A and B pairs. The circuit under test should be wired into the access point so the direction of transmission on the A pair is from E to F, and the transmission direction for the B pair is from F to E (Figure 2-1).

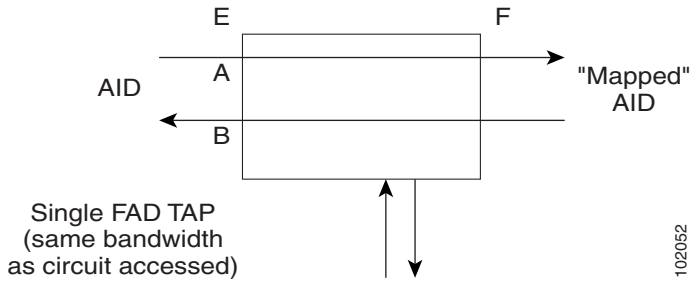
Figure 2-1 Circuit With No Access Dual FAD TAP



A dual facility access digroup (FAD) TAP uses twice the bandwidth of the circuit under test. This can be specified by the TAPTYPE parameter as shown in ED-<MOD2> command syntax in the "2.2.2 TAP Creation and Deletion" section on page 2-3. The values are SINGLE and DUAL. It defaults to DUAL.

A single FAD TAP uses half the bandwidth as that of the dual FAD, for example, it will use the same bandwidth as the circuit accessed for the TAP creation. This can be specified by the TAPTYPE parameter as shown in the "2.2.2 TAP Creation and Deletion" section on page 2-3. The values are SINGLE and DUAL. The MONEF, SPLTEF, and LOOPEF modes are not supported by single FAD TAPs (Figure 2-2).

Figure 2-2 Circuit With No Access (Single FAD TAP)



2.2.1 Test Access Terminology

The terminology in Table 2-1 is used in conjunction with test access.

Table 2-1 Test Access Terminology

Term	Definition
BRTU	Broadband remote test unit
DFAD	Dual facility access digroup
FAD	Facility access digroup
FAP	Facility access path
LOOPE	Split/loop access on A and B paths equipment side
LOOPF	Split/loop access on A and B paths facility side
MONE	Monitor access with signal detector on A path
MONF	Monitor access with signal detector on B path

Table 2-1 Test Access Terminology

Term	Definition
MONEF	Monitor access with signal detector on A and B paths
QRS	Quasi-random signal (bit test pattern)
SPLTA	Split access on A path with signal detector from equipment, QRS on facility side
SPLTB	Split access on B path with signal detector from equipment, QRS on equipment side
SPLTE	Split access on A and B paths with signal detector from equipment, QRS on equipment side
SPLTF	Split access on A and B paths with signal detector from equipment, QRS on facility side
SPLTEF	Split access on A and B paths for testing in both equipment and facility directions
TACC	Test access
TAP	Test access path/point

The following path naming conventions apply to test access:

- E—Equipment test access point direction
- F—Facility test access point direction
- A—Transmission path (the direction of transmission on the A pair is from E to F)
- B—Transmission path (the transmission direction for the B pair is from F to E)

2.2.2 TAP Creation and Deletion

TL1 supports commands to create, delete, connect, change, retrieve, and disconnect TAPs.

2.2.2.1 ED-<rr>

The edit command (ED-<rr>) is used to change an existing port/virtual container (VC) to a TAP.

Note <rr> indicates one of the following parameters: **E1, E3, DS3I, VC12, VC3, VC4, VC42C, VC43C, VC44C, VC48C, VC416C, VC464C.**

Input Format:

ED-(E1, E3, DS3I, VC12, VC3, VC4, VC42C, VC43C, VC44C, VC48C, VC416C, VC464C):[<TID>]:<AID>:<CTAG>[:::TACC=<TACC>],[TAPTYPE=<TAPTYPE>];

Edit an existing port/VC and change it to a TAP so it can be used when requesting TACC connections. This includes an optional parameter TACC=n that defines the port/VC as a test access point with a selected unique TAP number. This TAP number will be used when requesting test access connections to circuit cross-connects under test. The TAP creation will fail if the port/VC already has a cross-connect on it.

The TAPTYPE parameter values are SINGLE and DUAL. The MONEF, SPLTEF, and LOOPEF modes are not supported by single FAD TAPs. It defaults to DUAL.

Note

- This command generates a REPT DBCHG message.

- The alarms and conditions on TACC paths can be retrieved by the RTRV-ALM-ALL or RTRV-ALM-<MOD2> commands.
- The TAP is a persistent object; it will exist even after the user has logged out of the TL1 session.

The following rules apply to TAP numbers:

- A TAP number is an integer in the range of 1 to 999. When TACC=0 is specified, the TAP is deleted (if already present).
- A TAP number is unique across E1, E3, DS3I, VC12, VC3, VC4, VC42C, VC43C, VC44C, VC48C, VC416C, and VC464C TAPs in the system.
- A TAP number is not editable.

2.2.2.2 ED-E1

When an ED-E1 command is executed with a specified TACC value for a given E1 port/facility, a dual facility access digroup (DFAD) is created by using the specified port/facility and the consecutive port/facility.

The command in Example 2-1 creates a DFAD on FAC-1-1 and FAC-1-2.

Example 2-1 Create a DFAD on FAC-1-1 and FAC-1-2

```
    ED-E1::FAC-1-1:12:::TACC=1;

   DV9-99 1970-01-02 03:16:11
M  12 COMPLD
;
```

Note These ports/facilities cannot be used for the creation of cross-connections until the TAP is deleted.

2.2.2.3 ED-E3

When an ED-E3 is executed with a specified TACC value for a given E3 port/facility, a DFAD is created by using the specified port/facility and the consecutive port/facility.

The command in Example 2-2 creates an E3 DFAD on FAC-2-1 and FAC-2-2.

Example 2-2 Create an E3 DFAD on FAC-2-1 and FAC-2-2

```
    ED-E3:: FAC-2-1:12:::TACC=2;

   DV9-99 1970-01-02 03:16:11
M  12 COMPLD
;
```

Note These ports/facilities cannot be used for the creation of cross-connections until the TAP is deleted.

2.2.2.4 ED-DS3I

The ED-DS3I command is used for DS3 access on a DS3i card. When an ED-DS3I is executed with a specified TACC value for a given DS3i card, a DFAD is created by using the specified facility and the consecutive port/facility.

The command in Example 2-3 creates DFAD on FAC-16-1 and FAC-16-1.

Example 2-3 Create a DFAD on FAC-16-1 and FAC-16-1

```
    ED-DS3I::FAC-16-1:12:::TACC=3;

   DV9-99 1970-01-02 03:16:11
M  12 COMPLD
;
```

Note These ports/facilities cannot be used for the creation of cross-connections until the TAP is deleted.

2.2.2.5 ED-VC4n

When an ED-VC4n is executed for a TACC, it assigns the VC path for the first two-way test access connection and VC+1 as the second two-way connection. Similarly, for VC42c, VC43c, VC44c, VC48c, VC416c, the next consecutive VC of the same width is chosen. The TAP creation will fail if either of the consecutive VC's are not available.

The command in Example 2-4 creates a TAP on VC4-5-1-1 and VC4-5-1-2.

Example 2-4 Create a TAP on VC4-5-1-1 and VC4-5-1-2.

```
ED-VC4::VC4-5-1-1:12:::TACC=4;

   DV9-99 1970-01-02 03:16:11
M  12 COMPLD
;
```

Note These VC paths cannot be used for creation of cross-connects until the TAP is deleted.

The command in Example 2-5 creates a VC48C Dual TAP on VC4-6-1-1 and VC4-6-1-25.

Example 2-5 Create a VC48C Dual TAP on VC4-6-1-1 and VC4-6-1-25.

```
ED-VC48C::VC4-6-1-1:12:::TACC=5;

   DV9-99 1970-01-02 03:16:11
M  12 COMPLD
;
```

Note These VC paths cannot be used for creation of cross-connects until the TAP is deleted.

2.2.2.6 ED-VC12

When an ED-VC12 is executed for a TACC, a VC12 TAP is created. The specified VC12 access identifier (AID) is taken as the first VC12 connection, and the consecutive VC12 connection is used as the second path for the TAP.

The command in Example 2-6 creates a VC12 TAP on VC12-1-1-1-1-1 and VC12-1-1-1-2-1.

Example 2-6 Create a VC12 TAP on VC12-1-1-1-1-1 and VC12-1-1-1-2-1

```
    ED-VC12::VC12-1-1-1-1-1:12:::TACC=6;

   DV9-99 1970-01-02 03:16:11
M  12 COMPLD
;
```

Note These VC paths cannot be used for creation of cross-connects until the TAP is deleted.

2.2.2.7 ED-VC3

When an ED-VC3 is executed for a TACC, a VC3 TAP is created. The specified VC3 AID is taken as the first VC3 connection, and the consecutive VC3 connection is used as the second path for the TAP.

The command in Example 2-7 creates a VC3 TAP on VC3-1-1-1 and VC3-1-1-2.

Example 2-7 Create a VC3 TAP on VC3-1-1-1 and VC3-1-1-2

```
    ED-VC3::VC3-1-1-1:12:::TACC=6;

   DV9-99 1970-01-02 03:16:11
M  12 COMPLD
;
```

Note These VC paths cannot be used for creation of cross-connects until the TAP is deleted.

2.2.3 Connect Test Access Points

The connect test access points command (CONN-TACC-<rr>) is used to make a connection between the TAP and the circuit or cross-connect under test.

Note <rr> indicates one of the following parameters: **E1, E3, DS3I, VC12, VC3, VC4, VC42c, VC43c, VC44c, VC48c, VC416c, VC464c.**

Input Format:

CONN-TACC-(E1, E3, DS3I, VC12, VC3, VC4, VC42c, VC43c, VC44c, VC48c, VC416c, VC464c):[<TID>]:<AID>:<CTAG>::<TAP>:MD=<MD>;

Connect the port/VC4n/VC3 defined by <AID> to the port/VC4n/VC3 defined by the <TAP> number. The mode of test access to the circuit/cross-connect is specified by <MD>. The modes can be either of Monitor (nonintrusive), Split, or Loop (intrusive) modes. The various modes are described in the "2.2.9 Test Access Mode Definitions" section on page 2-12.

Note The connection is maintained only for the duration of the TL1 session (nonpersistent).

Note The TAP number is displayed at the output if the CONN-TACC command completes successfully.

The following error codes are supported:

- RTBY—Requested TAP busy
- RTEN—Requested TAP does not exist
- SCAT—Circuit is already connected to another TAP
- SRCN—Requested condition already exists
- IIAC—Invalid access identifier (AID)
- EANS—Access not supported
- SRAC—Requested access configuration is invalid

The command in Example 2-8 creates a connection between TAP number one and the port/facility FAC-1-3 with the access mode defined as MONE. The various modes are described in the "2.2.9 Test Access Mode Definitions" section on page 2-12.

Example 2-8 Create a Connection Between TAP 1 and FAC-1-3

```
CONN-TACC-E1::FAC-1-3:12::1:MD=MONE;

   DV9-99 1970-01-02 02:51:54
M  12 COMPLD
   1
;
```

2.2.4 Change Access Mode

The change access mode command (CHG-ACCMD-<rr>) is used to change the access mode.

Note <rr> indicates one of the following parameters: **E1, E3, DS3I, VC12, VC3, VC4, VC42c, VC43c, VC44c, VC48c, VC416c, VC464c.**

Input Format:

CHG-ACCMD- (E1, E3, DS3I, VC12, VC3, VC4, VC42c, VC43c, VC44c, VC48c, VC416c, VC464c):[<TID>]:<TAP>:<CTAG>::<MD>;

Use this command to change the type of test access. This might be a change from monitoring the data to inserting data into the VC. This command can only be applied to an existing TAP connection. If a TAP connection does not exist, a RTEN error is returned.

The following error codes are supported:

- SRCN—Requested condition already exists
- SRAC—Requested access configuration is invalid
- RTEN—Requested TAP does not exist

The command in Example 2-9 changes the access mode of TAP 1 to LOOPE.

Example 2-9 Change TAP 1 Access Mode to LOOPE

```
CHG-ACCMD-E1::1:12::LOOPE;

   DV9-99 1970-01-02 02:59:43
M  12 COMPLD
;
```

Note The access mode cannot be changed if the TAP is not connected.

Note This command generates a REPT DBCHG message.

2.2.5 Retrieving Test Access Point Information

The following sections retrieve TAP information using the RTRV-<rr> and RTRV-TACC commands.

2.2.5.1 RTRV-<rr>

The RTRV-<rr> command retrieves TAP information.

Note A generic ALL AID would behave similarly to an ALL AID such as, SLOT-ALL or FAC-1-ALL for all the RTRV-<rr> commands that support a generic ALL AID.

Note <rr> indicates one of the following parameters: **E1, E3, DS3I, VC12, VC3, VC4, VC42c, VC43c, VC44c, VC48c, VC416c, VC464c.**

Input Format:

RTRV- (E1, E3, DS3I, VC12, VC3, VC4, VC42c, VC43c, VC44c, VC48c, VC416c, VC464c):[<TID>]:<AID>:<CTAG>;

This command is modified to include the return of a TAP number if the requested <AID> is defined as a TAP. An optional TACC=<TAPNUMBER> will appear in the output list if the requested <AID> is defined as a TAP. The example in Example 2-10 retrieves TAP information for FAC-1-1.

Example 2-10 Retrieve TAP Information for FAC-1-1

```
RTRV-E1::FAC-1-1:D;

   VA454E-96 2003-04-24 20:06:46
M  D COMPLD
"FAC-1-1::LINECDE=HDB3,FMT=E1-MF,TACC=1,TAPTYPE=DUAL,SOAK=32:UNLOCKED,"
;
```

2.2.5.2 RTRV-TACC

The RTRV-TACC command can also be used to retrieve details associated with a TAP.

Input Format:

RTRV-TACC:[<TID>]:<TAP>:<CTAG>;

The TAP is identified by the TAP number. The ALL input TAP value means that the command will return all the configured TACCs in the NE. An example of the RTRV-TACC command is provided in Example 2-11.

Example 2-11 Retrieve Details for TAP 241

```
RTRV-TACC:CISCO:241:CTAG;

   TID-000 1998-06-20 14:30:00
M  001 COMPLD
"241:VC-2-1-1.VC-2-2,MONE,VC-12-1-1,VC-13-1-1"
;
```

2.2.6 Disconnect Test Access Points

TAPs can be disconnected in the following ways:

- Issue the DISC-TACC command.
- Delete or modify the accessed connection.
- Drop the TL1 session for any reason, including logout or a dropped Telnet session.
- Switch or reset a TCC2/TCC2P/TCC3/TSC card.

The disconnect TAP (DISC-TACC) command disconnects the TAP and puts the connection back to its original state (no access).

Input Format:

DISC-TACC:[<TID>]:<TAP>:<CTAG>;

The command in disconnects TAP 1 from the circuit/cross-connect under test.

Example 2-12 Disconnect TAP 1 from the Circuit/Cross-Connect Under Test

```
DISC-TACC::1:12;

   DV9-99 1970-01-02 02:59:43
M 12 COMPLD
;
```

Note This command generates a REPT DBCHG message.

The following error codes are supported:

- SADC—Already disconnected
- SRTN—Unable to release TAP

2.2.7 Delete Test Access Points

To delete a TAP, issue the edit TAP command with the TACC set to zero.

Input Format:

ED-<VC_PATH>:[<[TID>]:<AID>:<CTAG>:::TACC=0:;

Note The TACC number must be set to zero in order to delete a TAP.

Note If a TAP is not removed, the VC bandwidth will be stranded.

2.2.8 Test Access Configurations

This section shows single node and multinode test access configurations. Figure 2-3 shows a single node test access configuration. Figure 2-4 shows a multinode (MONE) test access configuration.

Use the following commands to configure test access:

Step 1 **ED-VC4::VC4-1-1-1:90:::TACC=1;**

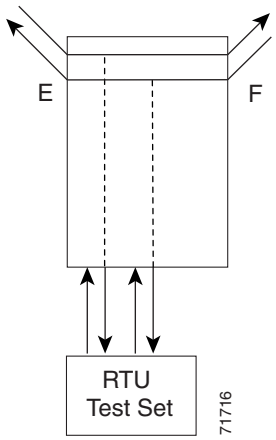
This command changes VC4-1 and VC4-2 on Slot 1 to a TAP. The CTAG is 90. It sets the TACC number to 1.

Step 2 **CONN-TACC-VC4::**<AID for E or F depending on MD>**:91::1:MONE**

This command connects the <AID> to the TACC defined by TAP 1 on the E side. The CTAG is 91.

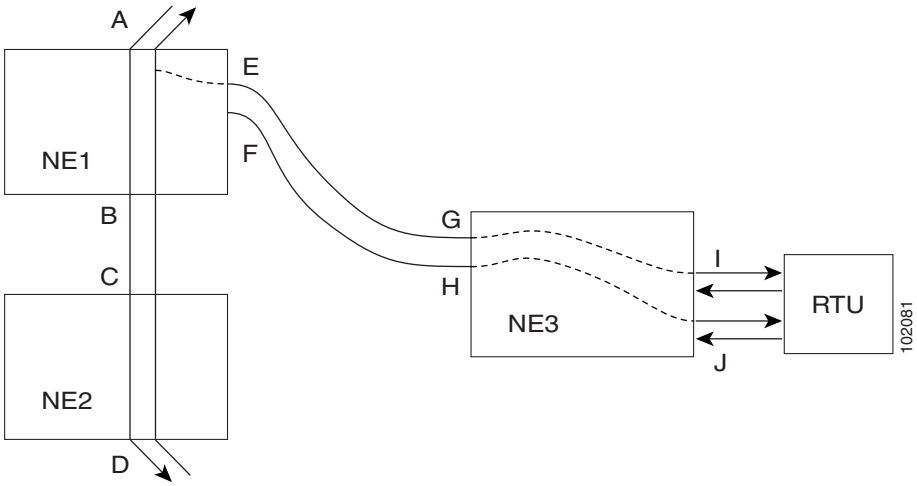
Note The connection made in the CONN-TACC command can use MONE to connect to the F side AID. The AID provided designates the E side and the other automatically becomes the F side. For example, if an <AID F> is supplied to a MONE connection, then the top line would be connected to the other side of the path, or what is shown in Figure 2-3 as the F side. When a CONN-TACC is set up, these designations cannot change until a DISC-TACC or another CONN-TACC command is executed. The connection is based on the AID supplied.

Figure 2-3 Single Node View (Node 1)



In the Figure 2-3 configuration, there might be a single DS-3 port wired up, configured as 14 dual FADs (28 VTs).

Figure 2-4 Multi-Node View (MONE Example)



The following commands are performed on NE3:

ENT-CRS-VC4::<AID I-G>:100::2WAY;

A connection, not a TAP. CTAG is 100.

ENT-CRS-VC4::<AID J-H>:101::2WAY;

Second connection, not a TAP.

The following commands are performed on NE1:

Assuming the path from A to B is already entered, the A and B points in Figure 2-4 refer to entry and exit points on the node or different cards. The E/F designators refer to the two-way connections from NE3.

The following command creates a TAP with VC4-1-1-1 and VC4-1-1-2 through NE1. TAP number assigned is 4.

ED-VC4::VC4-1-1-1:D:::TACC=4;

The following command connects TAP 4 to the circuit:

CONN-TACC-VC4::<AID A or B>:102::4:<MD>

Note The I and J connections above are TAPs in Figure 2-3, but normal connections in Figure 2-4.

2.2.9 Test Access Mode Definitions

The following diagrams show what the different test access modes (<MD>) refer to. Figure 2-5 shows a circuit with no access (dual FAD TAP) and Figure 2-6 shows a circuit with no access (single FAD TAP). The subsections that follow show the circuits in each test access mode. The QRS can be generated by an outside source, for example, the empty connection of the BRTU.

The subsections that follow describe the modes:

- MONE, MONF, and MONEF access modes are non-service effecting and can be applied to a locked (in service) port state.
- LOOPE, LOOPF, SPLTE, SPLTF, SPLTEF, SPLTA, SPLTB, and SPLTAB access modes are intrusive and can only be applied to a circuit/port that is in the Unlocked_Maintenance port state. The NE will change the state of the circuit under test to Unlocked_Maintenance during the period of TACC and restore it to the original state when the connection between the TAP and the circuit is dropped.

Figure 2-5 Circuit With No Access (Dual FAD TAP)

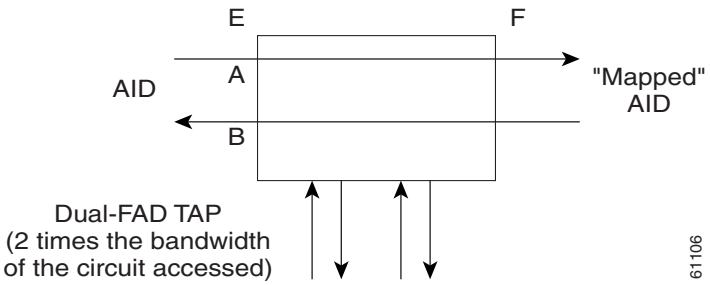
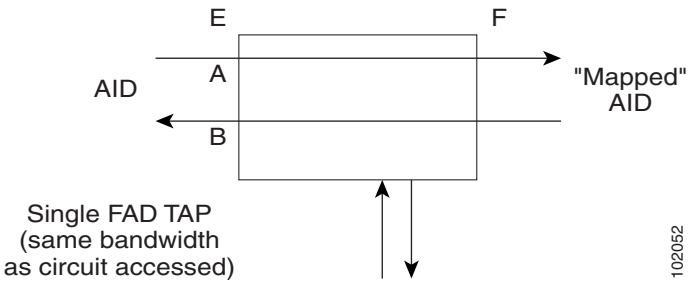


Figure 2-6 Circuit With No Access (Single FAD TAP)



2.2.9.1 MONE

Monitor E (MONE) mode indicates a monitor connection provided from the facility access digroup (FAD) to the A transmission path of the accessed circuit (Figure 2-7 and Figure 2-8). This is a nonintrusive mode.

Figure 2-7 MONE Access Mode Single TAP

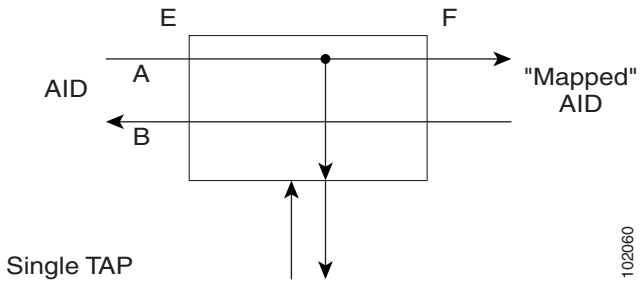
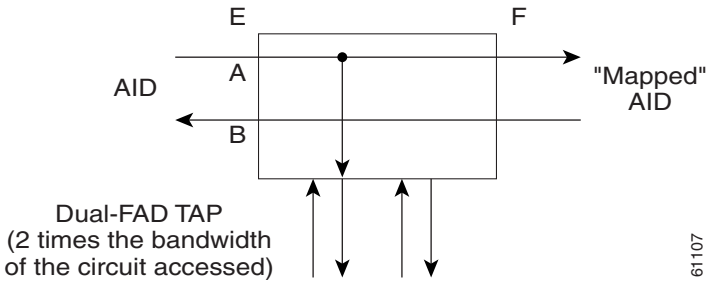


Figure 2-8 MONE Access Mode Dual TAP



2.2.9.2 MONF

Monitor F (MONF) mode indicates that the FAD is providing a monitor connection to the B transmission path of the accessed circuit (Figure 2-9 and Figure 2-10). This is a nonintrusive mode.

Figure 2-9 MONF Access Mode Single TAP

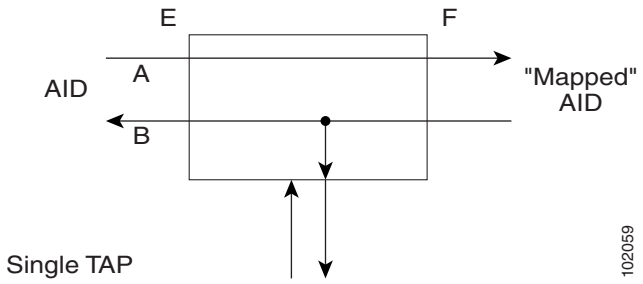
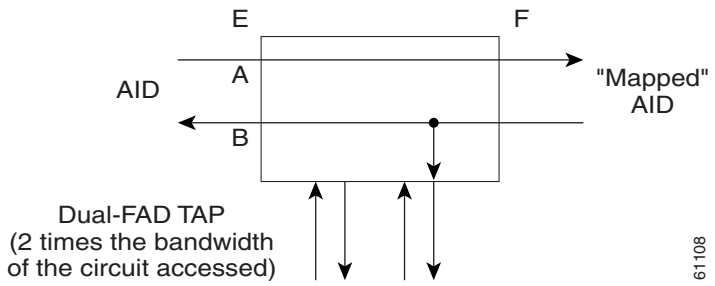


Figure 2-10 MONF Access Mode Dual TAP



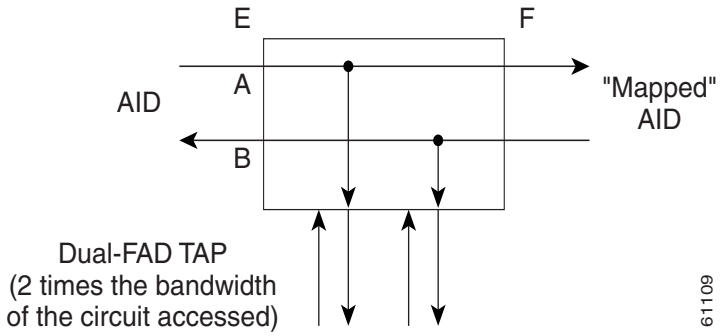
Note The MONE and SPLTA modes are applicable to unidirectional circuits from E to F. The MONF and SPLTB modes are applicable to unidirectional circuits from F to E.

2.2.9.3 MONEF

Monitor EF (MONEF) mode is a monitor connection provided from the FAD1 (odd pair) of a DFAD, to the A transmission path, and from FAD2 (even pair) of the same DFAD, to the B transmission path of the accessed circuit. This is a nonintrusive mode (Figure 2-11).

MONEF for T3 (DS3 HCDS) indicates that the odd pair of a facility access path (FAP) is providing a monitor connection to the A transmission path and from that the even pair of an FAP to the B transmission path of the accessed circuit.

Figure 2-11 MONEF Access Mode Dual TAP



2.2.9.4 SPLTE

Split E (SPLTE) mode splits both the A and B paths and connects the E side of the accessed circuit to the FAD (Figure 2-12 and Figure 2-13).

Note QRS is not supported. The connection will remain as-is.

Figure 2-12 SPLTE Access Mode Single TAP

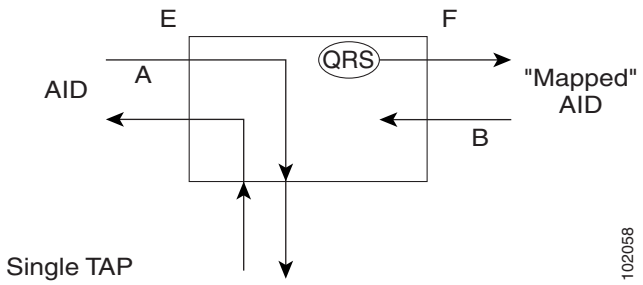
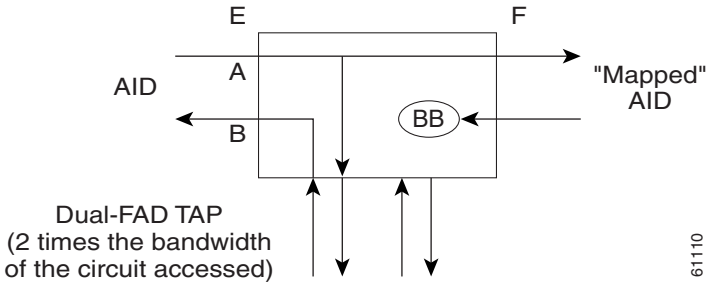


Figure 2-13 SPLTE Access Mode Dual TAP



2.2.9.5 SPLTF

Split F (SPLTF) mode splits both the A and B paths and connects the F side of the accessed circuit to the FAD (Figure 2-14 and Figure 2-15).

Note QRS is not supported. The connection will remain as-is.

Figure 2-14 SPLTF Access Mode Single TAP

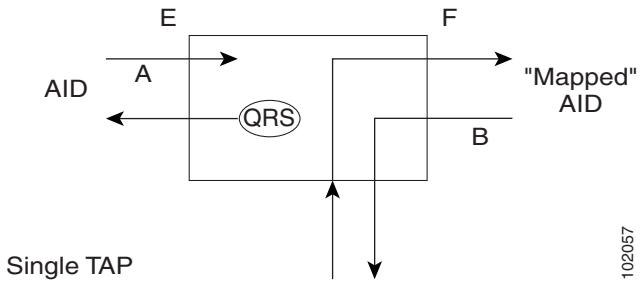
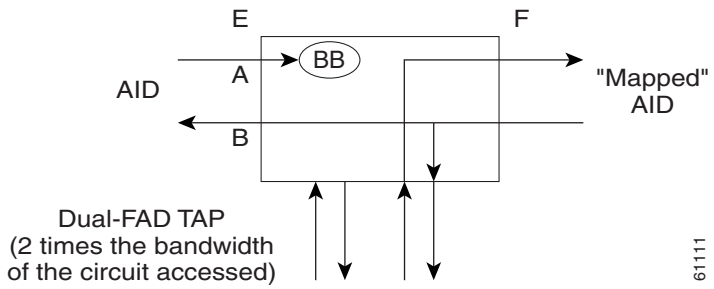


Figure 2-15 SPLTF Access Mode Dual TAP

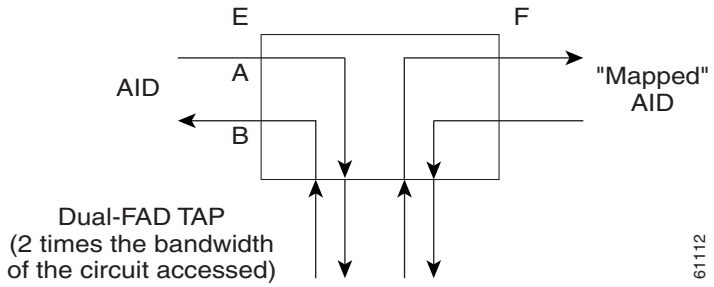


2.2.9.6 SPLTEF

Split EF (SPLTEF) mode for T1 (DS1 HCDS) splits both the A and B paths, connects the E side of the accessed circuit to FAD1 and the DFAD pair, and connects the F side to the FAD2 of the same DFAD pair (Figure 2-16).

SPLTEF for T3 (DS3 HCDS) indicates to split both the A and B paths and connect the E side of the accessed circuit to the odd pair of the FAP and the F side to the even pair of the FAP.

Figure 2-16 SPLTEF Access Mode Dual TAP



2.2.9.7 LOOPE

Loop E (LOOPE) mode splits both the A and B paths, connects the incoming line from the E direction to the outgoing line in the E direction, and connects this looped configuration to the FAD (Figure 2-17 and Figure 2-18). Loop E and F modes are basically identical to the SPLT E and F modes except that the outgoing signal is the incoming signal and not the signal from the remote test unit (RTU).

Note QRS is not supported. The connection will remain as-is.

Figure 2-17 LOOPE Access Mode Single TAP

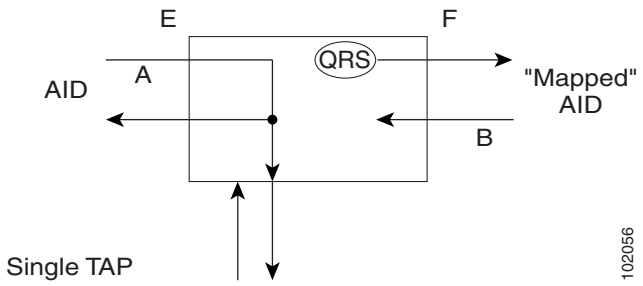
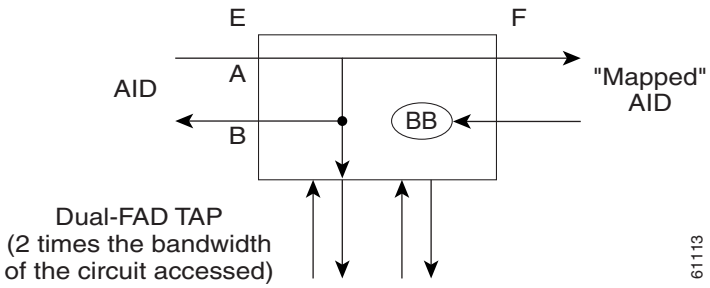


Figure 2-18 LOOPE Access Mode Dual TAP



2.2.9.8 LOOPF

Loop F (LOOPF) mode splits both the A and B paths, connects the incoming line from the F direction to the outgoing line in the F direction and connect this looped configuration to the FAD (Figure 2-19 and Figure 2-20).

Note QRS is not supported. The connection will remain as-is.

Figure 2-19 LOOPF Access Mode Single TAP

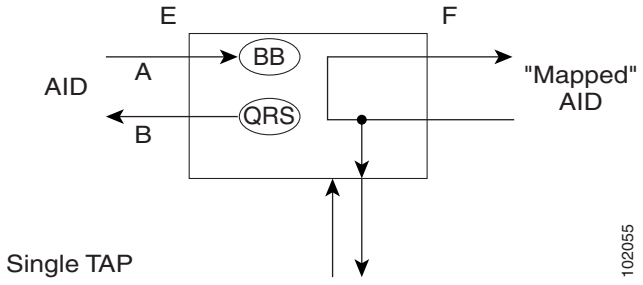
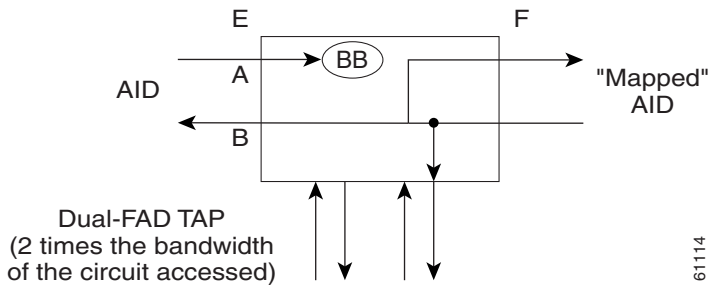


Figure 2-20 LOOPF Access Mode Dual TAP



2.2.9.9 SPLTA

Split A (SPLTA) mode indicates that a connection is provided from both the E and F sides of the A transmission path of the circuit under test to the FAD and splits the A transmission path (Figure 2-21 and Figure 2-22). These modes are similar to the SPLTE and SPLTF modes, except the signals are sent to the RTU, not the NE signal configuration.

Figure 2-21 SPLTA Access Mode Single TAP

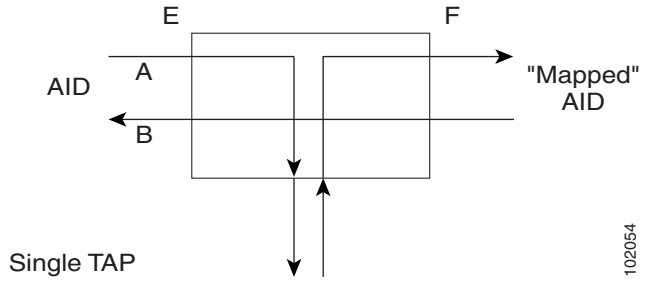
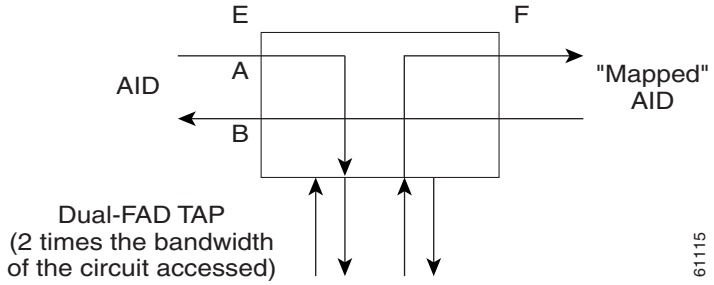


Figure 2-22 SPLTA Access Mode Dual TAP



2.2.9.10 SPLTB

Split B (SPLTB) mode indicates that a connection is provided from both the E and F sides of the B transmission path of the circuit under test to the FAD and splits the B transmission path (Figure 2-23 and Figure 2-24).

Figure 2-23 SPLTB Access Mode Single TAP

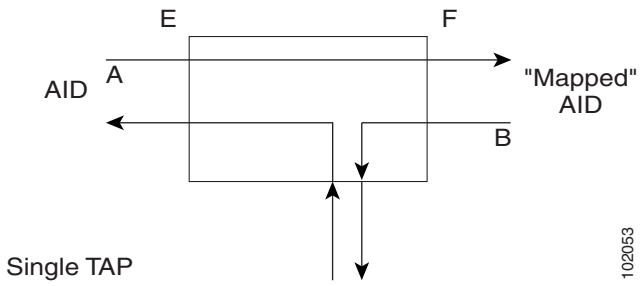
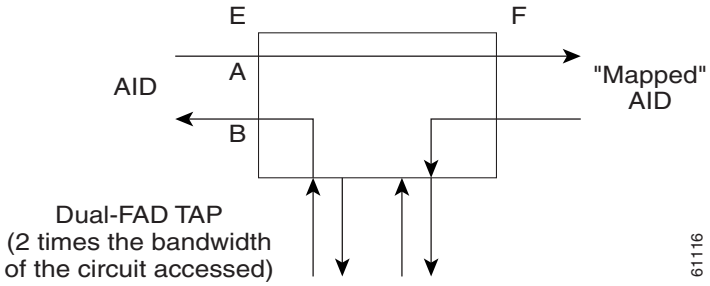


Figure 2-24 SPLTB Access Mode Dual TAP



2.2.10 Unmapped AID Test Access Point Connections

The Cisco NCS 2002 and Cisco NCS 2006 support connections to unmapped AIDs (unmapped circuits). The TAPs can be connected to an unmapped AID, for example, an AID that does not have a cross-connect on it. The access modes supported are: MONE, SPLTE, and LOOPE.

Example 2-13 creates a TAP on VC4-5-1-1.

Example 2-13 Create a TAP on VC4-5-1-1

```
ED-VC4::VC4-5-1-1:12:::TACC=1;

   DV9-99 1970-01-02 03:16:11
M  12 COMPLD
;
```

Example 2-14 creates an unmapped AID connection with a MONE access mode.

Example 2-14 Create an Unmapped AID Connection with a MONE Access Mode

```
CONN-TACC-VC4::VC4-5-1-3:12::1:MD=MONE;

   DV9-99 1970-01-02 02:51:54
M  12 COMPLD
   1
;
```

Note VC4-5-1-3 does not have a cross-connect on it. VC4-5-1-3 becomes unusable until the connection is disconnected by the DISC-TACC command.

Note The AID provided in the CONN-TACC command designates the E side and the other automatically becomes the F side.

Note In the case of all one-way circuits (1-way, SNCP_HEAD, SNCP_DROP, SNCP_DC, SNCP_EN), if the AID specified is the source AID, the direction is designated as From E in Table 2-2 on page 2-21. If the AID specified is the destination AID or the drop side, the direction is designated as From F in Table 2-2 on page 2-21.

2.2.10.1 One-Way Circuit

The examples in this section assume that a VC TAP is already created with a TAP number of 1.

ENT-CRS-VC3::VC-5-1,VC-5-2:12::1WAY;
DV9-99 1970-07-01 20:29:06
M 12 COMPLD;

CONN-TACC-VC3::VC-5-1:12::1:MD=MONF;
DV9-99 1970-01-01 20:29:47
M 12 DENY
EANS
VC-5-1
/*INCORRECT TAP MODE*/

The AID specified in the above CONN-TACC command is the source AID for the one-way circuit. In this case, only MONE and SPLTA modes are allowed because there is no B path in the case of a one-way circuit (see Table 2-2 on page 2-21).

CONN-TACC-VC3::VC-5-1:12::1:MD=MONE;
DV9-99 1970-01-01 20:30:09
M 12 COMPLD

DISC-TACC::1:12;
DV9-99 1970-01-01 20:30:20
M 12 COMPLD
;

However, if the AID specified is the destination AID as shown below, the modes allowed are MONF and SPLTB.

CONN-TACC-VC3::VC-5-2:12::1:MD=MONF;
DV9-99 1970-01-01 20:30:32
M 12 COMPLD

Note
- The same examples apply for SNCP_HEAD, SNCP_DROP, SNCP_DC, and SNCP_EN, which are all one-way circuits.
- The connections are made only to the working path, irrespective of which path is currently active.

2.2.10.2 Two-Way Circuits

For two-way circuits, all the modes are allowed as shown in Table 2-2. The same applies for SNCP_SNCP and SNCP circuit types. In the case of SNCP_SNCP and SNCP circuits, the working path is connected irrespective of which path is currently active.

2.2.10.3 Unmapped AID

As explained in the "2.2.10 Unmapped AID Test Access Point Connections" section on page 2-19, connections can be made to an AID without a cross-connect on it. The modes supported are MONE, SPLTE, and LOOPE as shown in Table 2-2.

Note The AID provided in the CONN-TACC command designates the E side and the other automatically becomes the F side.

Table 2-2 Modes Supported by Circuit Type

Circuit Type (Direction)	MONE	MONF	MONEF	SPLTE	SPLTF	SPLTEF	LOOPE	LOOPF	SPLTA	SPLTB
One-way (from E[1])	X	—	—	—	—	—	—	—	X	—
One-way (from F[2])	—	X	—	—	—	—	—	—	—	X
Two-way	X	X	X	X	X	X	X	X	X	X
SNCP	X	X	X	X	X	X	X	X	X	X
SNCP_HEAD (from E)	X	—	—	—	—	—	—	—	X	—
SNCP_HEAD (from F)	—	X	—	—	—	—	—	—	—	X
SNCP_DROP SNCP_DC SNCP_EN (from E)	X	—	—	—	—	—	—	—	X	—
SNCP_DROP SNCP_DC SNCP_EN (from F)	—	X	—	—	—	—	—	—	—	X
SNCP_SNCP	X	X	X	X	X	X	X	X	X	X
Unmapped AID	X	—	—	X	—	—	X	—	—	—

1. In the case of all one-way circuits (1-way, SNCP_HEAD, SNCP_DROP, SNCP_DC, and SNCP_EN), if the AID specified is the source AID, the direction is designated as "from E" in this table.
2. In the case of all one-way circuits (1-way, SNCP_HEAD, SNCP_DROP, SNCP_DC, and SNCP_EN), if the AID specified is the destination AID or the drop side, the direction is designated as "from F" in this table.

2.3 TL1 Gateway

This section describes the TL1 gateway and provides procedures and examples for implementing TL1 gateway on the Cisco NCS 2002 and Cisco NCS 2006.

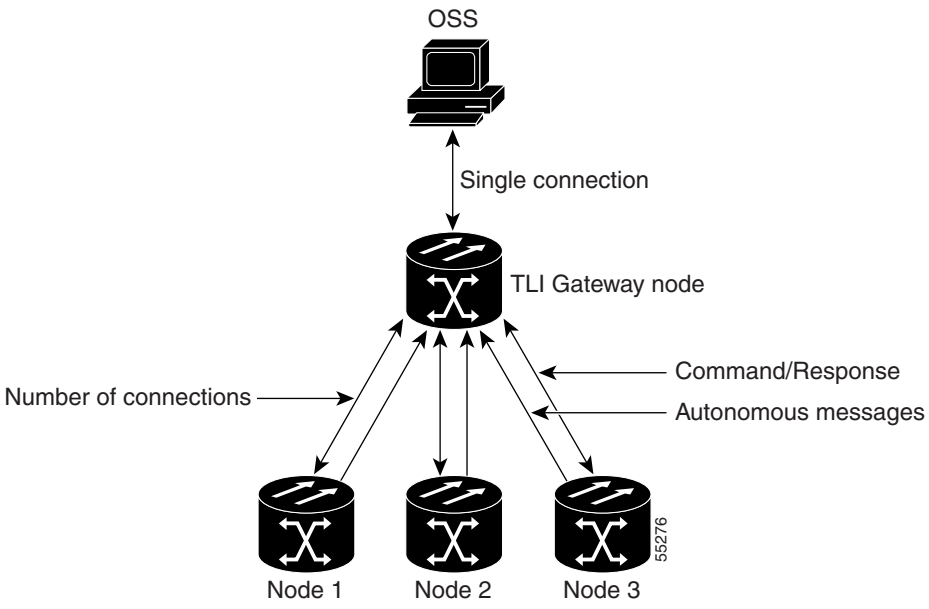
2.3.1 Gateway Network Element Topology

You can issue TL1 commands to multiple nodes through a single connection through the TL1 gateway. Any node can serve as a Gateway Network Element (GNE), End Network Element (ENE), or Intermediate Network Element (INE). A node becomes a GNE when a TL1 user connects to it and enters a command destined for another node. An ENE is an end node because it processes a TL1 command that is passed to it from another node. An INE is an intermediate node because of topology; it has no special hardware, software, or provisioning.

To implement the TL1 gateway, use the desired ENE's TID in the ACT-USER command to initiate a session between the GNE and the ENE. After a session is established, you must enter the ENE's TID in all subsequent commands that are destined for the ENE. From the GNE, you can access several remote nodes, which become the ENEs. The ENEs are the message destinations or origins. The INE handles the data communications channel (DCC) TCP/IP packet exchange. However, if the ENE is directly connected through DCC to the GNE, the INE does not exist.

The GNE session is the connection that multiplexes TL1 messages between the operation support system (OSS)/craftsperson and the GNE. The GNE demulitplexes incoming OSS TL1 commands and forwards them to the remote ENE. The GNE also multiplexes incoming responses and autonomous messages to the GNE session. The ENE session is the connection that exchanges messages between the GNE and the remote ENE. Figure 2-25 shows the GNE topology.

Figure 2-25 Example of a GNE Topology



2.3.2 TL1 Sessions

Each NE can support up to a maximum of 20 concurrent communication sessions (connections from an OS/NE to the GNE). The TL1 connections can be made through telnet sessions from the LAN or from the craft/serial port connection on the NE. One TL1 session is reserved for the active serial port connection. The remaining 19 sessions are used for TL1 sessions through the LAN (wire-wrap, active serial port, or DCC). Table 2-3 shows the number of serial port and LAN connections per platform.

Table 2-3 Number of TL1 Sessions per Platform

Platform	Number of Serial Port Sessions	Number of LAN Sessions	Total Number of TL1 Sessions
Cisco NCS 2002	1	19	20
Cisco NCS 2006	1	19	20

2.3.3 TL1 Gateway and ENE Sessions

Only a limited number of TL1 users logged into an NE at any given time can establish sessions to other ENEs. The active serial port sessions are reserved and can always become a GNE session. The number of ENE sessions is based on the number of gateway communications sessions (GNE sessions).

Each NE can support up to 12 concurrent communication gateway sessions, depending on the NE type. The maximum number of ENE sessions also varies depending on the NE type.

You can dynamically distribute the maximum number of ENE sessions to balance the number of concurrent gateway communication sessions. The GNE treats the concurrent gateway communication sessions and ENE/GNE limit as a resource pool. It continues to allocate resources until the pool is exhausted. When the pool is exhausted, the GNE returns an “All Gateways in Use” message or an “All ENE Connections in Use” message.

Note The speed of the TL1 gateway and the maximum number of connections are limited by shared system resources, such as CTC, CTM, etc. The response time is slow as connections are increased and activity on these connections increases. Alarm storms, additional users, network latency, etc. also increase response time.

The gateway resource pools for each platform are shown in Table 2-4.

Table 2-4 Gateway Resource Pool

Platform	Maximum Number of GNE Sessions	Maximum Number of ENEs over IP DCC	Maximum Number of ENEs over OSI DCC
Cisco NCS 2002	11 (10 + 1)[1]	176	176[2]
Cisco NCS 2006	11 (10 + 1)[3]	176	176[4]

1. If there are any active Socket Over TL1 sessions, the maximum number of GNE sessions that can be established is equal to the number of GNE sessions possible minus the number of Socket Over TL1 sessions. For example, if there are two active Socket Over TL1 sessions, the maximum number of GNE sessions is nine (11-2=9).
2. If there are any active COPY-RFILE command instances, the maximum number of ENE sessions over OSI DCC that can be established is equal to the number of possible ENE sessions over OSI DCC minus the number of COPY-RFILE command instances. For example, if there are 10 active COPY-RFILE command instances, the maximum number of ENE sessions over OSI DCC is 166 (176-10=166).

3. If there are any active Socket Over TL1 sessions, the maximum number of GNE sessions that can be established is equal to the number of GNE sessions possible minus the number of Socket Over TL1 sessions. For example, if there are two active Socket Over TL1 sessions, the maximum number of GNE sessions is nine (11-2=9).
4. If there are any active COPY-RFILE command instances, the maximum number of ENE sessions over OSI DCC that can be established is equal to the number of possible ENE sessions over OSI DCC minus the number of COPY-RFILE command instances. For example, if there are 10 active COPY-RFILE command instances, the maximum number of ENE sessions over OSI DCC is 166 (176-10=166).

2.3.4 Implementing TL1 Gateway

Note Issuing commands to specific nodes in the network is accomplished by entering a unique node name in the TID field in each TL1 message. The TID field is synonymous with the name of the node and is the second token in a TL1 command.

The following procedures demonstrate TL1 gateway on a four-node ring (without TL1 gateway in Figure 2-26 and with TL1 gateway in Figure 2-27), where:

- Node 0 is the GNE.
- Node 1 is the ENE 1.
- Node 2 is the INE 2.
- Node 3 is the ENE 3.

Figure 2-26 Four-Node Ring Without TL1 Gateway

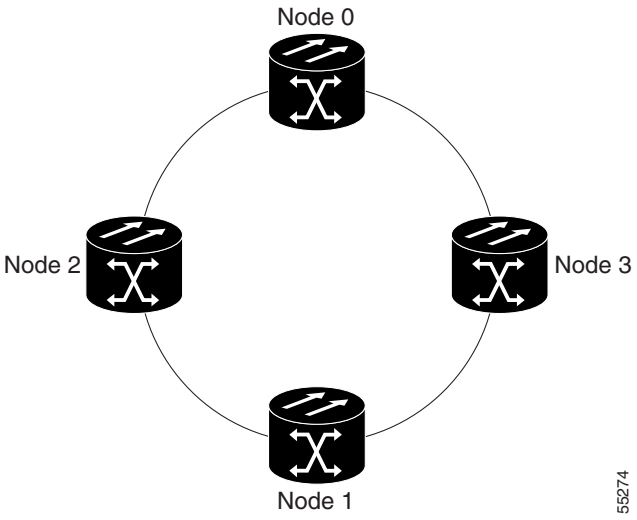
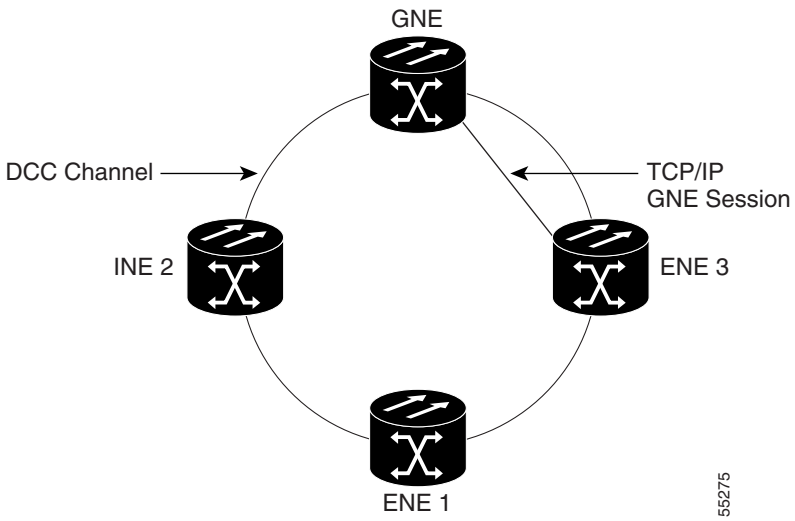


Figure 2-27 Four-Node Ring With TL1 Gateway



Log Into a Remote ENE

Step 1 Telnet or connect through the serial port to Node 0, which will become the GNE.

Step 2 To connect to the ENE 1 node, enter the TL1 login command using the following input example:

ACT-USER:NODE1:<USERNAME>:1234:<PASSWORD>;

The GNE forwards the login to ENE 1. After successful login, ENE 1 sends a COMPLD response.

Step 3 When you are logged into ENE 1, enter the following TL1 login command to connect to ENE 3:

ACT-USER:NODE3:<USERNAME>:1234:<PASSWORD>;

The GNE forwards the login to ENE 3. After successful login, the ENE 3 sends a COMPLD response.

Forward Commands by Specifying the ENE TID (Node 1 or Node 3)

To forward commands when you are logged into ENE 1 and ENE 3, enter a command and designate a specific TID, as shown in the following examples.

Enter the following command to retrieve the header of Node 1:

RTRV-HDR:NODE1::1;

Enter the following command to retrieve the header of Node 3:

RTRV-HDR:NODE3::3;

Receive Autonomous Messages from the Remote ENE

To receive autonomous messages from the remote ENE, you must log into the remote ENE. When you are logged in, you will begin to receive autonomous messages. The source of the message is identified in the header of the message.

Log Out of a Remote ENE

To disconnect from a remote ENE, you must use the CANC-USER command. To disconnect ENE1, enter the following command:

CANC-USER:NODE1:<USERNAME>:1;

To disconnect ENE2, enter the following command:

CANC-USER:NODE3:<USERNAME>:3;

The GNE forwards the logout to the remote ENEs. The GNE/ENE TCP session is closed.

2.4 Ring Provisioning

This section provides information and sample procedures for setting up VC circuits over existing subnetwork connection protection (SNCP) ring and multiplex section-shared protection ring (MS-SPRing) configurations using TL1, including:

- SNCP topology
- SNCP cross-connections
- Ring-to-ring interconnection
- One-way drop and continue

In Sections 2.4.4 through 2.4.10, the form “5/1/1” (for example) represents “Slot 5, Port 1, VC 1.” For VCs, add the normal VC Group and VC ID extensions. These examples also assume that the slots/ports have been autoprovisioned (through a plug-in event) and that the ports involved have been placed into the in-service (IS) state using a port configuration command, for example, ED-STMn.

2.4.1 SNCP Topology

No special configuration of the physical SNCP topology is required other than connecting the fibers to the desired ports on the desired nodes. The east and west paths must exit a node at different ports (to ensure link diversity), but there are no other physical topology restrictions.

Cisco NCS 2002 and Cisco NCS 2006 networks give you the option to set up path-protected mesh networks (PPMNs). PPMNs extend the protection scheme of an SNCP from the basic ring configuration to the meshed architecture of several interconnected rings.

2.4.2 SNCP Cross-Connections

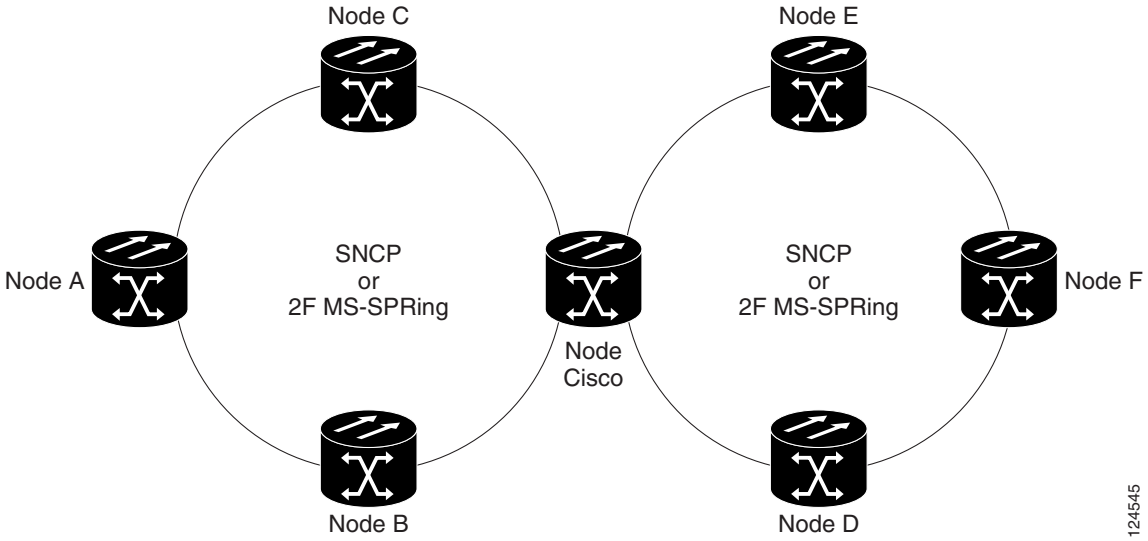
To create an SNCP cross-connection using TL1, you only need to designate it as a one-way or two-way cross-connect. The AID must be more explicit. For example, to create a one-way SNCP circuit over the network with Nodes A, B, C, and D and Segments A-B, B-D, A-C, C-D, enter the following commands (Node A is the source node and Node D is the destination node):

ENT-CRS-VC1:A:FROM,TO1&TO2:CTAG1::1WAY;
ENT-CRS-VC1:B:FROM,TO:CTAG2::1WAY;
ENT-CRS-VC1:C:FROM,TO:CTAG3::1WAY;
ENT-CRS-VC1:D:FROM1&FROM2,TO:CTAG4::1WAY;

2.4.3 Ring-to-Ring Interconnection

In this section, both rings traverse the same node; therefore, only a single cross-connection is required to create the ring-to-ring connection. This is shown in Figure 2-28. The node named "Cisco" is in the nexus.

Figure 2-28 Network Map With Cisco Node Showing Ring-to-Ring Interconnection

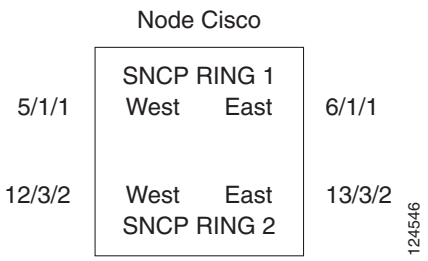


2.4.4 SNCP-to-SNCP Connection Example

This example, illustrated in Figure 2-29, uses an STM-3-4 to feed Ring 2. Ring 1 can have any STM-N trunk card, but the trunk card is most likely a single-port STM-16 or STM-4.

Note The VC calculation formula is: (((Port # – 1) * Number of VC per port) + VC#).
VC 12/3/2 maps to VC-12-8 (((3 – 1) * 3) + 2).

Figure 2-29 SNCP-to-SNCP Connection Specifications Through The Cisco Node

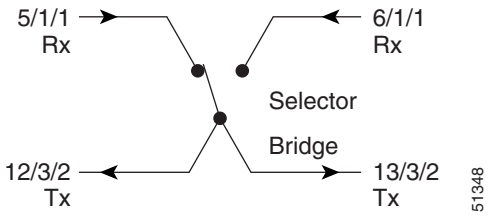


Use the following command to create a selector between 5/1/1 and 6/1/1, which is bridged to Ring 2 (12/3/2 and 13/3/2):

ENT-CRS-VC1:CISCO:VC-5-1&VC-6-1,VC-12-8&VC-13-8:CTAG1::2WAY;

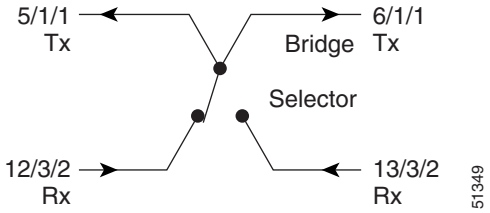
This is illustrated in Figure 2-30.

Figure 2-30 Selector Between 5/1/1 and 6/1/1



The command also creates a selector between 12/3/2 and 13/3/2 to a bridge to Ring 1 (5/1/1 and 6/1/1), as shown in Figure 2-31.

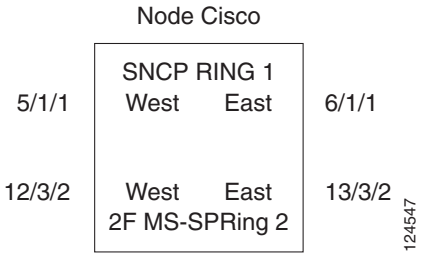
Figure 2-31 Selector Between 12/3/2 and 13/3/2



2.4.5 SNCP to Two-Fiber MS-SPRing Connection Example

This example, illustrated in Figure 2-32, uses a SNCP endpoint with a drop on a two-fiber MS-SPRing and the west span of the two-fiber MS-SPRing (Ring 2) for the active path of the circuit. The example also uses multiport addressing for Ring 2 and is based on a multiport STM-4 card, where 13/3/2 = VC-13-26 and where 26 = (((3 – 1) * 12) + 2). (This is only important for computing the VC AID for multiport cards.)

Figure 2-32 SNCP to Two-Fiber MS-SPRing

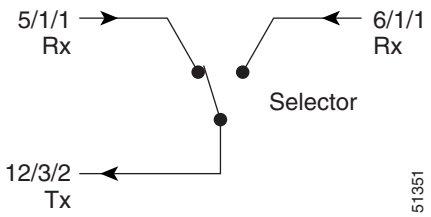


Use the following command to create a selector between 5/1/1 and 6/1/1, which connects to 12/3/2 on Ring 2:

ENT-CRS-VC1:CISCO:VC-5-1&VC-6-1,VC12-26:CTAG2::2WAY;

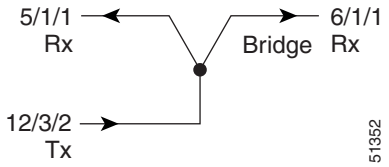
This is shown in Figure 2-33.

Figure 2-33 Selector Between 5/1/1 and 6/1/1



The command also creates a bridge from 12/3/2 to Ring 1 (5/1/1 and 6/1/1), as shown in Figure 2-34.

Figure 2-34 Bridge From 12/3/2 to Ring 1

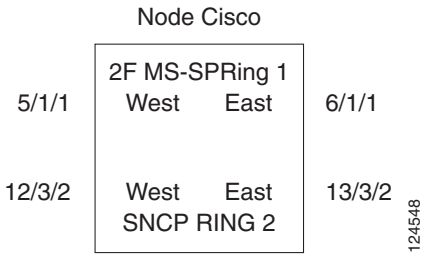


In this configuration, a two-fiber MS-SPRing switch can automatically reconnect the selector output to the protection path on the east port (12/3/2 assuming STM-4) if necessary.

2.4.6 Two-Fiber MS-SPRing to SNCP Connection Example

This example, illustrated in Figure 2-35, uses a SNCP endpoint with a drop on a two-fiber MS-SPRing and uses the east span of the two-fiber MS-SPRing (Ring 1) for the active path of the circuit. For VC addressing, the SNCP is an STM-1 (for example, VC-13-8).

Figure 2-35 Two-Fiber MS-SPRing to SNCP

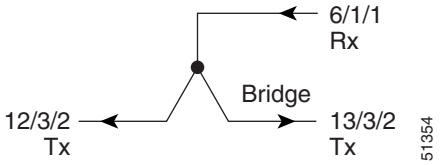


Use the following command to create a bridge from 6/1/1 to Ring 2 (12/3/2 and 13/3/2):

ENT-CRS-VC1:CISCO:VC-6-1,VC-12-8&VC-13-8:CTAG3::2WAY;

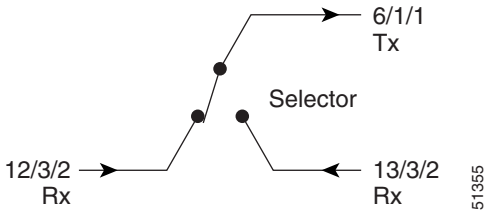
This is shown in Figure 2-36.

Figure 2-36 Bridge From 6/1/1 to Ring 2



The command also creates a selector between 12/3/2 and 13/3/2 to Ring 1 (6/1/1) as shown in Figure 2-37.

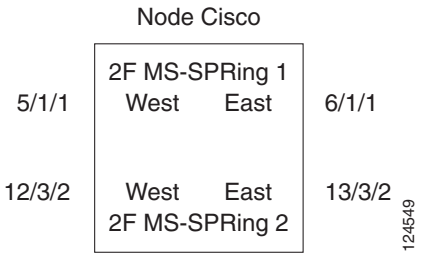
Figure 2-37 Selector Between 12/3/2 and 13/3/2 to Ring 1



2.4.7 Two-Fiber MS-SPRing to Two-Fiber MS-SPRing Connection Example

All protection for a two-fiber MS-SPRing interconnecting to a two-fiber MS-SPRing is performed at the line level. You can make the connection with a two-way cross-connect from a VC on the working side of the two-fiber MS-SPRing span of Ring 1 to a VC on the working side of a two-fiber MS-SPRing span on Ring 2. The connections can be east-to-east, east-to-west, west-to-east, and west-to-west. This example, illustrated in Figure 2-38, uses Ring 1 west to Ring 2 east and assumes an STM-12-4 in Slots 12 and 13 for subtending to a two-fiber MS-SPRing (Ring 2).

Figure 2-38 Two-Fiber MS-SPRing to Two-Fiber MS-SPRing

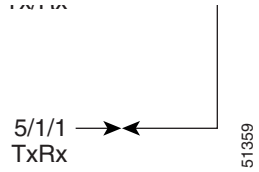


Use the following command to create a two-way connection from 5/1/1 to 13/3/2:

ENT-CRS-VC1:CISCO:VC-5-1,VC-13-26:CTAG4::2WAY;

This is shown in Figure 2-39.

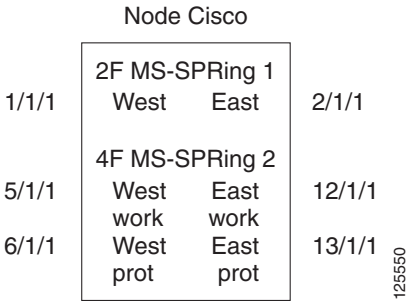
Figure 2-39 Two-Way Connection from 5/1/1 to 13/3/2



2.4.8 Two-Fiber MS-SPRing to Four-Fiber MS-SPRing Connection Example

All protection for a two-fiber MS-SPRing interconnecting to a four-fiber MS-SPRing is performed at the line level. You can make the connection with a simple two-way cross-connect from the appropriate side, east or west, of the two-fiber MS-SPRing to the working fiber of the appropriate side, east or west, of the four-fiber MS-SPRing, as shown in Figure 2-40.

Figure 2-40 Two-Fiber MS-SPRing to Four-Fiber MS-SPRing

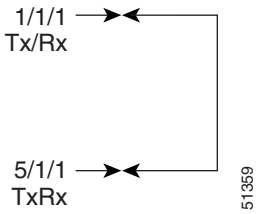


Use the following command to create a two-way connection from 1/1/1 to 5/1/1:

ENT-CRS-VC1:CISCO:**VC-1-1,VC-5-1**:CTAG5::2WAY;

This is shown in Figure 2-41.

Figure 2-41 Two-Way Connection from 1/1/1 to 5/1/1

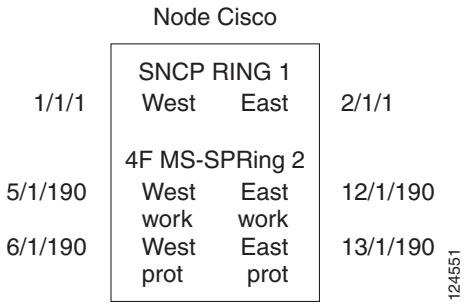


In the event of a failure, the software will automatically switch the traffic to the appropriate line and path.

2.4.9 SNCP to Four-Fiber MS-SPRing Connection Example

This example uses the west span of the four-fiber MS-SPRing (Ring 2) for the active path of the circuit. The example also assumes that the four-fiber MS-SPRing travels over STM-64 spans, as shown in Figure 2-42.

Figure 2-42 SNCP to Four-Fiber MS-SPRing

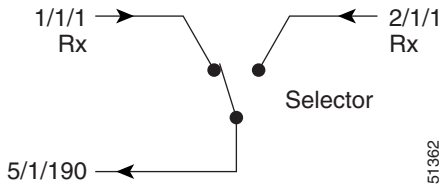


Use the following command to create a selector between 1/1/1 and 2/1/1 to Ring 2 (5/1/190):

ENT-CRS-VC1:CISCO:VC-1-1&VC-2-1&VC-5-190:CTAG6::2WAY;

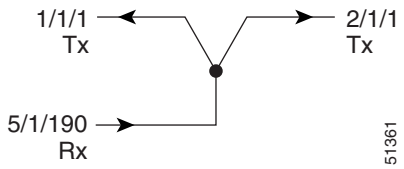
This is shown in Figure 2-43.

Figure 2-43 Selector Between 1/1/1 and 2/1/1 to Ring 2 (5/1/190)



The command also creates a bridge from 5/1/190 to Ring 1 (1/1/1 and 2/1/1), as shown in Figure 2-44 on page 2-32.

Figure 2-44 Bridge from 5/1/190 to Ring 1 (1/1/1 and 2/1/1)



2.4.10 One-Way Drop and Continue

The following examples show how to create a one-way drop and continue cross-connect. The examples use three nodes (Node 1, Node 2, and Node 3) in a ring configuration (Figure 2-45). Node 1 is the source node, Node 2 has the drop and continue, and Node 3 is the destination.

Figure 2-45 One-Way Drop and Continue

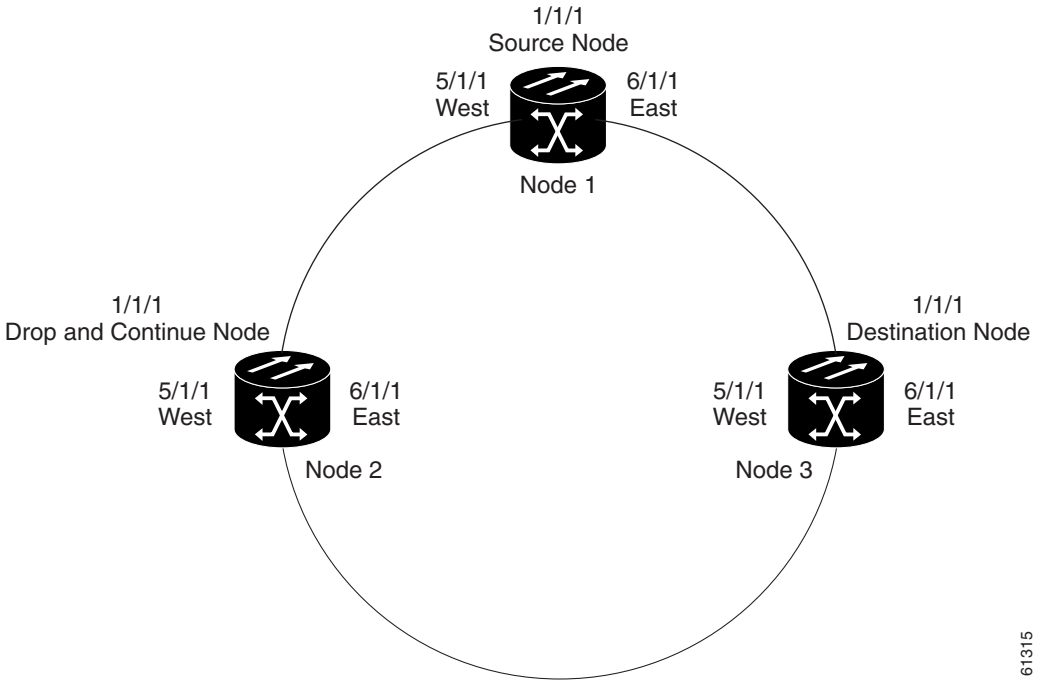
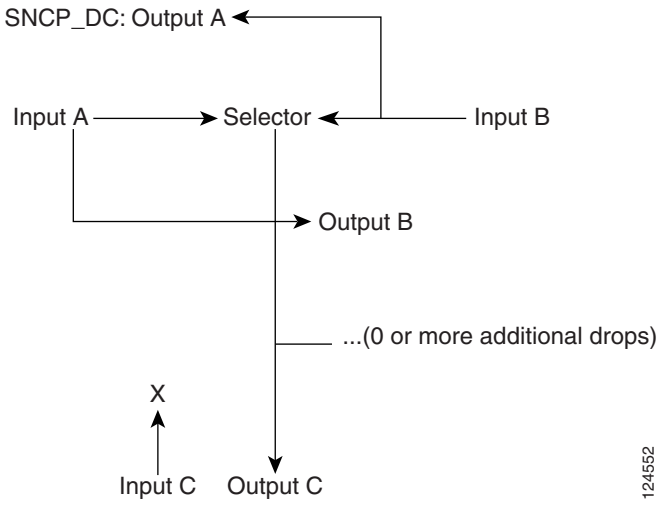


Figure 2-46 shows a circuit diagram example of the orientation of AIDs associated with the ENT-CRS command used to establish drop and continue connections.

Figure 2-46 Orientation of AIDs Used to Establish Drop and Continue Connections

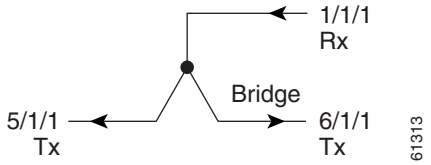


2.4.10.1 Node 1 Configuration Example (Source Node)

To configure Node 1 in the one-way drop-and-continue example, issue the following command on Node 1 (see Figure 2-47):

ENT-CRS-VCn::VC-1-1,VC-5-1&VC-6-1:CTAG::1WAY;

Figure 2-47 Bridge from 1/1/1 to 5/1/1 and 6/1/1

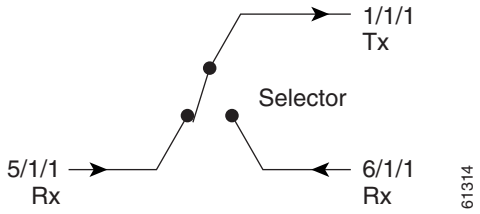


2.4.10.2 Node 2 Configuration Example (Drop and Continue Node)

To configure Node 2 in the one-way drop-and-continue example, issue the following command on Node 2 (see Figure 2-48):

ENT-CRS-VCn::VC-5-1&VC-6-1,VC-1-1:CTAG::1WAYDC;

Figure 2-48 Selector Between 5/1/1 and 6/1/1 to 1/1/1

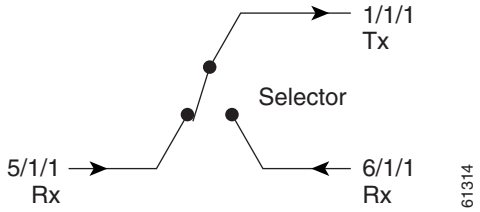


2.4.10.3 Node 3 Configuration Example (Destination Node)

To configure Node 3 in the one-way drop-and-continue example, issue the following command on Node 3 (see Figure 2-49):

ENT-CRS-VCn::VC-5-1&VC-6-1,VC-1-1:CTAG::1WAY;

Figure 2-49 Selector Between 5/1/1 and 6/1/1 to 1/1/1



2.5 PCA Provisioning

You can provision or retrieve protection channel access (PCA) cross-connections on two-fiber and four-fiber MS-SPRing topologies at these supported VC rates: STM-4 (two-fiber only), STM-16, and STM-64. The traffic on the protection channel is referred to as extra traffic and has the lowest priority level. Extra traffic will be preempted by any working traffic that requires the use of the protection channel.

In a two-fiber MS-SPRing, the extra traffic is provisioned on the upper half of the bandwidth path. In a four-fiber MS-SPRing, the extra traffic is provisioned on the protect fiber. The PCA provisioning feature allows you to establish the PCA cross-connection on the protection path of the two-fiber MS-SPRing and the protection channel of the four-fiber MS-SPRing only when the query is an explicit request.

There are two PCA connection types: 1WAYPCA and 2WAYPCA. The PCA cross-connection is provisioned only when the user provides an explicit request using the ENT-CRS-VCp/VC12 commands. If the cross-connection is a PCA cross-connection, either 1WAYPCA or 2WAYPCA is shown in the cross-connect type field of the RTRV-CRS-VCp/VC12 command output.

1WAYPCA and 2WAYPCA are only used in the TL1 user interface to provide usability and visibility for the user to specify a PCA cross-connection type in the TL1 cross-connection commands.

Note The network must be configured as either a two-fiber or four-fiber STM-4, STM-16, or STM-64 MS-SPRing.

Note The VC path cross-connection can be established with TL1 commands (ENT-CRS-xxx).

Note Because the RTRV-CSR-xxx command does not include the optional CTYPE field to specify a connection type, the output result reports the matched cross-connections based on the queried AID(s); therefore, the retrieved cross-connection inventory can contain both PCA and non-PCA cross-connections.

2.5.1 Provision a PCA Cross-Connection

Example 2-12 shows the input format for provisioning a PCA cross-connection.

Example 2-15 Provision a PCA Cross-Connect: Input Format

```
ENT-CRS-<PATH>:[<TID>]:<FROM>,<TO>:<CTAG>::[<CCT>][::];
<PATH>::={VC_PATH, VC12}
[<CCT>]::={1WAY, 1WAYDC, 1WAYEN, 2WAY, 1WAYPCA, 2WAYPCA},
{VC_PATH}::={VC3, VC4, VC42C, VC43C, VC44C, VC48C, VC416C, VC464C}
```

where:

- VC represents all of the VC bandwidth cross-connections.
- VC12 represents the VC12_5 cross-connection.
- CCT defaults to 2WAY.

Example 2-16 shows an input example of provisioning a VC4 PCA cross-connection.

Example 2-16 Provision a PCA Cross-Connect: Example

```
ENT-CRS-VC4::VC4-1-1,VC4-2-1:123::2WAYPCA;
```

Note If the cross-connect type (CCT) of this cross-connection provisioning command is either 1WAYPCA or 2WAYPCA, and the NONE value of both <FROM> and <TO> AID is PCA AID, an IIAC (Input, Invalid PCA AIDs) error message is returned.

Note If sending this command with a non-PCA CCT, and one or two AIDs are the PCA AIDs, an IIAC (The PCA AID Is Not Allowed for the Queried CCT Type) error message is returned.

2.5.2 Retrieve a PCA Cross-Connection

Use the input format in Example 2-17 to retrieve a PCA cross-connection.

Example 2-17 Retrieve a PCA Cross-Connect: Input Format

```
RTRV-CRS-[<PATH>]:[<TID>]:<AID>:<CTAG>[::::];<PATH>::={VC_PATH, VC12, VC}
```

If PATH is VC, it will retrieve all of the VC cross-connections based on the queried AIDs:

<AID>={FacilityAIDs, VCAIDs, VC12AIDs, ALL}

Example 2-18 shows the output format of the PCA VCp cross-connection retrieval command.

Example 2-18 Output Format of PCA STSp Cross-Connect Retrieve Command

```
"<FROM>,<TO>:2WAYPCA,VC4"
```

Example 2-19 shows the output format of the PCA VC cross-connection retrieval command.

Example 2-19 Output Format of PCA VT Cross-Connect Retrieve Command

```
"<FROM>,<TO>:2WAYPCA"
```

2.6 FTP Software Download

Note FTP timeout is 30 seconds and is not user-configurable.

The file transfer protocol (FTP) software download feature downloads a software package to the inactive flash partition residing on the TCC2/TCC2P/TCC3/TSC/CTX-MA card. FTP software download provides for simplex and duplex TCC2/TCC2P/TCC3/TSC/CTX-MA card downloads, success and failure status, and in-progress status at 20 percent increments.

2.6.1 COPY-RFILE

The COPY-RFILE command downloads a new software package from the location specified by the FTP URL into the inactive flash partition residing on the TCC2/TCC2P/TCC3/TSC/ CTX-MA card. COPY-RFILE can also be used to back up and restore the database file.

Note Since Software Release 5.0, PACKAGE_PATH is relative to your home directory, instead of being an absolute path from the root directory of the NE. If you want to specify an absolute path, start the path with the string '%2F'.

The input format of the COPY-RFILE command is:

COPY-RFILE:[<TID>]:<SRC>:<CTAG>::TYPE=<XFERTYPE>,[SRC=<SRC1>], [DEST=<DEST>],[OVWRT=<OVWRT>],[FTTD=<FTTD>];

where:

- <SRC> is the type of file being transferred.
- <XFERTYPE> is the file transfer protocol.
- <SRC1> specifies the source of the file to be transferred. <SRC1> is a string. Only the FTP URL is supported. In a nonfirewall environment, the format for the URL is:

  "FTP://FTP_USER[:FTP_PASSWORD]]@FTP_HOST_IP[:FTP_PORT] /PACKAGE_PATH[:TYPE=I]"

  where:

  - FTP_USER is the user ID to connect to the computer with the package file.
  - FTP_PASSWORD is the password used to connect to the computer with the package file.
  - FTP_HOST_IP is the IP address of the computer with the package file. Domain name server (DNS) lookup of hostnames is not supported.
  - <FTP_PORT> defaults to 21.
  - PACKAGE_PATH is the long path name to the package file starting from the home directory of the logged-in user.

    In a firewall environment, the hostname should be replaced with a list of IP addresses each separated by an ampersand (@) character. The first IP address should be for the computer where the package file is stored. Subsequent IP addresses are for firewall computers moving outward toward the edge of the network until the final IP address listed is the computer that outside users use to first access the network.

    For example, if your topology is:

    "FTPHOST <-> GNE3 <->GNE2 <-> GNE1 <-> ENE"

    the FTP URL is:

    FTP://FTP_USER:FTP_PASSWORD@FTP_HOST_IP@GNE3@GNE2@GNE1/ PACKAGE_PATH
- <DEST> specifies the destination of the file to be transferred. The comments for the SRC parameter are also valid here. <DEST> is a string.
- If <OVWRT> is YES, then files are overwritten. Currently only YES is supported. Using a NO value for <OVWRT> will result in an error message.

- <FTTD> is the format of the URL should be
  “FTTD://[FTTD_USER][:FTTD_PASSWORD]] @FTTD_HOST_TID”
  where:
  - FTTD_USER is the used to connect to the FTTD host.
  - FTTD_PASSWORD is the password used to connect to FTTD host.
  - FTTD_HOST_IP is the TID of the FTTD host. DNS and network service access point (NSAP) names are not supported.

Note
- FTP is the only allowed file transfer method.
- The use of the SWDL and the extended FTP URL syntax are required by the COPY-RFILE syntax.

2.6.2 APPLY

The APPLY command can activate or revert software depending on the version of software loaded on the active and protect flash. An error is returned if you attempt to activate to an older software load or try to revert to a newer software load. If this command is successful, the appropriate flash is selected and the TCC2/TCC2P2/TCC3/TSC/CTX-MA card will reboot.

The input format for the APPLY command is as follows:

APPLY:[<TID>]::<CTAG>[::<MEM_SW_TYPE>];

where <MEM_SW_TYPE> indicates memory switch action during the software upgrade.

2.6.3 REPT EVT FXFR

REPT EVT FXFR is an autonomous message used to report the start, completion, and completed percentage status of the FTP software download. REPT EVT FXFR also reports any failure during the software upgrade including invalid package, invalid path, invalid user ID/password, and loss of network connection.

Note The “FXFR_RSLT” is only sent when the “FXFR_STATUS” is COMPLD.

The “BYTES_XFRD” is only sent when the “FXFR_STATUS” is IP or COMPLD.

The output format of the REPT EVT FXFR message is as follows:

```
  SID DATE TIME
A  ATAG REPT EVT FXFR
  “<FILENAME>,<FXFR_STATUS>,[<FXFR_RSLT>],[<BYTES_XFRD>]”
;
```

where:

- <FILENAME> indicates the transferred file path name and is a string. When a package is being transferred between the FTP server and the controller cards, the filename field will contain the string “active”. Following this transfer, if there is a second controller card on the node, the file will be copied over to the second card. While this is happening, REPT EVT FXFR messages will be generated with a filename of “standby”.
- <FXFR_STATUS> indicates the file transferred status: Start, IP (in progress), or COMPLD.
- <FXFR_RSLT> indicates the file transferred result: success or failure. <FXFR_RSLT> is optional.
- <BYTES_XFRD> indicates the transferred byte count. <BYTES_XFRD> is a string and is optional.

2.6.4 Downloading New Software

The following procedure downloads new software to the TCC2/TCC2P/TCC3/TSC/CTX-MA card using TL1.

Download New Software

Note Only Superusers can download and activate software.

Step 1 Copy the new software package (for example, 15XXXSDH-0340-X02E-2804.pkg) to an FTP host.

Step 2 Establish a TL1 session with the target NE.

Step 3 Log in with the ACT-USER command.

Step 4 Check the working and protect software on the NE by issuing the RTRV-NE-GEN command, for example:

RTRV-NE-GEN:::1;

The output should be similar to the following:

VA454-94 1970-01-06 22:22:12
M 1 COMPLD
“IPADDR=10.76.44.112,IPMASK=255.255.255.128,DEFRTR=10.76.44.1,IPV6ENABLE=N,
IIOPPORT=57790,NAME=\"454-SDH-112\",SWVER=9.00.00,LOAD=09.00-008G-19.05,
PROTSWVER=9.00.00,PROTLOAD=09.00-008F-06.23,DEFDESC=\"Factory Defaults\",
PLATFORM=NCS 2002,SECUMODE=NORMAL,SUPPRESSIP=NO,
MODE=SINGLESHELF,AUTOPM=NO,SERIALPORTECHO=Y,OSIROUTINGMODE=ES,
NET=39840F80000000000000000000000059B12DB3000”
;

Step 5 Issue the COPY-RFILE command. This command will initiate the download process. See the “2.6.1 COPY-RFILE” section on page 2-37 for command syntax.

In Example 2-20, the package is located in “/%2FUSR/CET/VINTARA” in the host 10.77.22.199. The user ID and passwords are TL1 and CISCO454SDH. The directory path of the package is similar to what you will see during an FTP session.

Example 2-20 Issue the COPY-RFILE Command

```
COPY-RFILE::RFILE-
PKG:CTAG::TYPE=SWDL,SRC=”FTP://TL1:CISCO454SDH@10.77.29.199
/%2FUSR/CET/VINTARA/NCS-0340-X02E-2804.PKG”;
```

```
   DEV208 1970-01-10 11:51:57
M   CTAG  COMPLD
;
```

Step 6 If any of the parameters are wrong or if the host is not accessible, a REPT EVT FXFR message will report errors. A download failure might be due to one or more of the following:

- Directory path of the package is invalid or not found.
- Package is invalid
- Package not found on specified path.
- User ID/password or hostname is invalid.
- Host is not accessible.
- Firewall user ID/password or host is invalid.
- Node rebooted or lost connection during download.
- Software download is already in progress.
- The node or the host timed out during FTP protocol (see Example 2-21).

Example 2-21 REPT EVT FXFR when Node or Host Timed Out During FTP Protocol

```
   DEV208 1970-01-10 11:52:02
A  2816.2816 REPT EVT FXFR
   "SLOT-11:SFTWDOWN-FAIL,TC,,,,,,,:\"SOFTWARE DOWNLOAD FAILED\",TCC
;
```

Step 7 If the download is successful, the REPT EVT FXFR message will report an active start, as shown in Example 2-22.

Example 2-22 REPT EVT FXFR Message Reporting an Active Start

```
   DEV208 1970-01-10 11:52:15
A  2818,2818 REPT EVT FXFR
   "ACTIVE START"
;
```

Step 8 A SFTDOWN minor alarm is raised to indicate that the software download is in progress (Example 2-23). The SFTDOWN alarm will clear when the download is complete.

Example 2-23 SFTDOWN Minor Alarm

```
DEV208 1970-01--10 11:52:15
*  2817.2817 REPT ALM EQPT
   "SLOT-7:MN,SFTWDOWN,NSA,,,,:\"SOFTWARE DOWNLOAD IN PROGRESS\",TCC"
;
```

Use the in-progress status at any time during the software download to verify the RTRV-NE-GEN command (Example 2-24).

Example 2-24 RTRV-NE-GEN Command

```
RTRV-NE-GEN

VA454-94 1970-01-06 22:22;12
M  1  COMPLD
   "IPADDR=10.76.44.112,IPMASK=255.255.255.128,DEFRTR=10.76.44.1,IPV6ENABLE=N,II
OPPORT=57790,NAME=\"454-SDH-112\",SWVER=9.00.00,LOAD=09.00-008G-19.05,PROTSWV
ER=9.00.00,PROTLOAD=09.00-008F-06.23,DEFDESC=\"Factory Defaults\",PLATFORM=NCS
2002,SECUMODE=NORMAL,SUPPRESSIP=NO,MODE=SINGLESHELF,AUTOPM=NO,SERIALPORTECHO=Y,
OSIROUTINGMODE=ES,NET=39840F8000000000000000000000059B12DB3000"
;
```

Step 9 The download progress is reported by the REPT EVT FXFR message, which will report a message after every 20 percent of download is complete as shown (Example 2-25).

Example 2-25 REPT EVT FXFR Messages During Software Download

```
   DEV208 1970-01-10 11:53:12
A  2820,2820 REPT EVT FXFR
   "ACTIVE,IP,,20"
;

DEV208 1970-01-10 11:53:12
A  2820,2820 REPT EVT FXFR
   "ACTIVE,IP,,40"
;

DEV208 1970-01-10 11:53:12
A  2820,2820 REPT EVT FXFR
   "ACTIVE,IP,,60"
;

DEV208 1970-01-10 11:53:12
A  2820,2820 REPT EVT FXFR
   "ACTIVE,IP,,80"
;
```

Step 10 If the TL1 session times out during download or if the user terminates the TL1 session, the download will continue. The download completion can be confirmed by issuing the RTRV-NE-GEN command and verifying the PROTLOAD (Example 2-26).

Example 2-26 Verifying the PROTLOAD

```
RTRV-NE-GEN:::1;

VA454-94 1970-01-06 22:22:12
M  1  COMPLD
   "IPADDR=10.76.44.112,IPMASK=255.255.255.128,DEFRTR=10.76.44.1,IPV6ENABLE=N,II
OPPORT=57790,NAME=\"454-SDH-112\",SWVER=9.00.00,LOAD=09.00-008G-19.05,PROTSWV
ER=9.00.00,PROTLOAD=09.00-008F-06.23,DEFDESC=\"Factory Defaults\",PLATFORM=NCS 2002,
SECUMODE=NORMAL,SUPPRESSIP=NO,MODE=SINGLESHELF,AUTOPM=NO,SERIALPORTECHO=Y,
OSIROUTINGMODE=ES,NET=39840F8000000000000000000000059B12DB3000"
;
```

Step 11 REPT EVT FXFR confirms the completion of the software download (Example 2-27).

Example 2-27 Confirm Download Completion

```
 DEV208 1970-01-10 12:01:16
A  2825,2825 REPT EVT FXFR
   "ACTIVE,COMPLD,SUCCESS"
;
```

Step 12 The SFTDOWN alarm clears when the download is complete (Example 2-28).

Example 2-28 Download is Complete

```
  DEV208 1970-01-10 11:52:15
*  2826,2817 REPT ALM EQPT
   "SLOT-7:CL,SFTWDOWN,NSA,,,,:\"SOFTWARE DOWNLOAD IN PROGRESS\",TCC"
;
```

2.6.5 Activating New Software

After the software is successfully downloaded, the new software that resides in the protect load must be activated to run on the NE. The APPLY command can be used to activate and revert depending on the version of the protect software and the newly downloaded software (see the "2.6.2 APPLY" section on page 2-38 for correct APPLY syntax).

Activate New Software

Step 1 If the protect software is newer than the working software, activate it as shown:

APPLY::1::ACT;

```
  DEV208 1970-01-10 13:40:53
M  1 COMPLD
;
```

An error is reported if a revert is attempted with a newer protect software.

Step 2 If the APPLY command is successful, log out of the TL1 session using the CANC-USER command:

CANC-USER::CISCO15:1;

```
 VA454-94 1970-01-07 01:18:18
M  1  COMPLD
;
```

Step 3 After a successful completion of the APPLY command, the NE will reboot and the TL1 session will disconnect. When the NE comes up after the reboot, it will be running the new software. Traffic switches are possible during activation.

2.6.6 Remote Software Download/Activation Using the GNE

In a network with regenerator section data communications channel (RS-DCC)-connected Cisco NCS 2002 and Cisco NCS 2006s remote download and activation are possible using the GNE/ENE feature supported in TL1. The GNE must be connected by a LAN and the remaining ENEs can download the new software package through fiber from the GNE.

For remote software downloading, complete the steps in the "Download New Software" procedure on page 2-39 and the "Activate New Software" procedure on page 2-42, but ensure that the TID in each command is filled with the ENE node name.

Each GNE can support 11 (TCC2/TCC2P/TCC3) concurrent communication gateway sessions and up to a maximum of 176 (TCC2/TCC2P/TCC3) ENEs/GNE. For more information on TL1 gateway, see the"2.3 TL1 Gateway" section on page 2-22.

After activating the nodes (Example 2-29), five simultaneous software downloads can be initiated using the COPY-RFILE command with appropriate TIDs, as shown in Example 2-30. All downloads will be independent of each other and download speeds might differ.

Example 2-29 Activating the Nodes for Simultaneous Software Downloads

```
ACT-USER:NODE1:CISCO15:1;
ACT-USER:NODE2:CISCO15:1;
ACT-USER:NODE3:CISCO15:1;
ACT-USER:NODE4:CISCO15:1;
ACT-USER:NODE5:CISCO15:1;
```

Example 2-30 Downloading Software on Multiple Nodes Simultaneously

```
COPY-RFILE:NODE1:RFILE-PKG:CTAG::TYPE=SWDL,SRC="FTP://TL1:
CISCO454@10.77.29.199/USR/CET/VINTARA/NCS 2002-0340-X02E-2804.PKG";

COPY-RFILE:NODE2:RFILE-PKG...
COPY-RFILE:NODE3:RFILE-PKG...
COPY-RFILE:NODE4:RFILE-PKG...
COPY-RFILE:NODE5:RFILE-PKG...
```

To download software to an ENE through a GNE, the FTTD URL in the COPY-RFILE command must be used as shown in Example 2-31. The FTTD parameter has the following format: "FTTD://USERID:PASSWORD@TL1 GNE NODENAME:21". Prior to Release 6.0, Port 21 is mandatory. In Release 6.0 and later, Port 21 is optional.

Example 2-31 Downloading Software to an ENE through a GNE

```
GNE = NODE1
ENE = NODE2

COPY-RFILE:NODE2:RFILE-PKG:1::TYPE=SWDL,SRC=FTP://USER-ID:PASSWORD@HOST-IP//USERS/JDOE/
NCS 2002-XXXX-XXXX-XXXX.PKG,OVWRT=YES,FTTD="FTTD://USERID:PASSWORD@NODE1:21"
```

Individual REPT EVT FXFR messages can be isolated using the node names. RTRV-NE-GEN also requires the individual node names to be entered in the TID in order to see a specific download status.

Activate the software using the APPLY command (Example 2-32) on all of the nodes using the GNE node.

Note Activate the GNE last, after activating all of the ENEs, or else ENE connectivity will be lost when the GNE starts to reboot for activation.

Example 2-32 Activate the Software Load

```
APPLY:NODE1::1::ACT;
APPLY:NODE2::1::ACT;
APPLY:NODE3::1::ACT;
APPLY:NODE4::1::ACT;
APPLY:NODE5::1::ACT;
```

2.7 Scheduled PM Report

Scheduled performance monitoring (PM) reporting is a feature that extends the capability of PM reporting for the Cisco NCS 2002 and Cisco NCS 2006. With scheduled PM reports, the system automatically and periodically generates the PM report of any specified facility or cross-connection.

The following rules apply to the creation of scheduled PM reports:

- The current maximum number of schedules allowed to be created for an NE is 1000. If you try to create more schedules in the NE when the maximum number of schedules has been created, an error message “Reach Limits Of MAX Schedules Allowed. Can Not Add More” is returned.
- Identical schedules are not allowed for one NE. Two schedules are considered identical if they have the same AID, MOD2 type, performance monitor type, performance monitor level, location, direction, and time period.
- The error message “Duplicate Schedule” is returned if you create a schedule that is a duplicate of an existing schedule. However, if the existing schedule expires (with the parameter <NUMINVL> equal to zero when retrieved by the RTRV-PMSCHED command, which means that there is no more performance monitoring report to be sent), then the new schedule with the identical parameter will replace the existing schedule.
- When you create a PM schedule, the minimum report interval should not be less than five minutes.

Use the following commands to schedule and manage PM reports:

- SCHED-PMREPT-<MOD2>
- ALW-PMREPT-ALL
- RTRV-PMSCHED-<MOD2>
- RTRV-PMSCHED-ALL
- INH-PMREPT-ALL
- REPT PM <MOD2>

2.7.1 Create a PM Schedule and Receive an Autonomous PM Report

Issue the SCHED-PMREPT-<MOD2> command to create a PM schedule.

Note The minimum interval for the PM schedule cannot be set to less than five minutes.

Issue the ALW-PMREPT-ALL command to allow the current TL1 session to be able to receive the autonomous PM report.

2.7.2 Manage PM Schedules

Use the following commands to manage PM schedules:

- Create a PM schedule by issuing the SCHED-PMREPT-<MOD2> command.
- Delete a PM schedule by issuing the SCHED-PMREPT-<MOD2> command with the <NUMREPT> parameter equal to zero.

Note The PM schedules created on a facility or a cross-connect will be automatically deleted if the card or the cross-connect are unprovisioned.

- Retrieve all the PM schedules created on the node by issuing the RTRV-PMSCHED-ALL command. Retrieve a particular MOD2 type of PM schedule by issuing the RTRV-PMSCHED-<MOD2> command.

Note The system will not automatically delete the schedules that are expired. For example, assume that a schedule is created to report PM ten times. After ten PM reports are sent, the schedule is expired. The expired schedule can be identified by its <NUMINVL> field (equal to zero) in the response of the RTRV-PMSCHED command.

2.7.3 Enable or Disable a TL1 Session to Receive Autonomous PM Reports

Enable a TL1 session to receive a scheduled PM report by issuing the ALW-PMREPT-ALL command.

Note By default, a TL1 session is disabled to receive PM reports. The ALW-PMREPT-ALL command enables a TL1 user to receive all the scheduled PM and automatic autonomous performance monitoring (AutoPM) reports from the system, regardless of whether or not the schedule is created by this TL1 user or by any other TL1 user.

Disable a TL1 session to receive any scheduled PM report by issuing the INH-PMREPT-ALL command.

2.8 Automatic Autonomous PM

The automatic autonomous performance monitoring (AutoPM) report is a feature that extends the capability of PM reporting for the Cisco NCS 2002 and Cisco NCS 2006. With this feature enabled, the system automatically generates the PM report for all cross-connections. AutoPM is disabled by default. When enabled, an automatic report is generated every 15 minutes, which is the default interval. AutoPM can be enabled or disabled only through CTC.

Issue the RTRV-NE-GEN TL1 command on the node to retrieve the AutoPM configuration.

To enable or disable a TL1 session to receive AutoPM reports see the "2.7.3 Enable or Disable a TL1 Session to Receive Autonomous PM Reports" section on page 2-45.

2.9 Bridge and Roll

Bridge and roll functionality allows live traffic to be moved (rolled) from one entity to another. This section provides information and sample procedures for single-rolling, dual-rolling, and protection rolling for one-way or two-way circuits using TL1 commands, including:

- Path Level Rolling—Rolls cross-connections at the VC11, VC12, VC3, and VCNc rate for all supported time-division multiplexing (TDM) drops (STM1, STM4, STM16, and STM64). Individual rolls are done at the Path level.
- Line Level Rolling—Rolls all cross-connections from one port/facility to another port/facility.
- Bulk Rolling—Rolls a subset of cross-connections from one port/facility to another port/facility.

There are two roll modes:

- In automatic mode, the leg to be rolled is automatically dropped upon detection of a valid input signal on the new path.
- In manual mode, the leg to be rolled is retained upon detection of a valid signal on the new path. The leg must be dropped manually.

Caution If you have created a roll on the circuit and it has detected a valid signal, do not cancel it. Cancelling a valid roll will cause a traffic hit of more than 1300 ms. If you want to revert back from a valid roll, complete the roll and use bridge and roll again to roll it back.

Caution Performing bridge and roll on a VC4-64c (STM64c circuit) might cause a traffic hit of 50 ms.

Note The path width rules for creating circuits apply when rolling circuits. For example, if you roll a VC4 starting at VC#1, you cannot roll it to another port and start it at VC#2. You have to start it at VC#1.

2.9.1 Restrictions

The following restrictions apply for bridge and roll using TL1 in this release:

- Rolling is not allowed on electrical cards or Ethernet cards.
- Rolling is not allowed on hairpin circuits.
- Rolling is not allowed on monitor circuits.
- Rolling is not allowed on any cross-connection that is involved in test access.
- Rolling is not allowed on any cross-connection that is involved in cross-connect loopbacks.
- Rolling is not allowed on any port that is involved in facility or equipment loopbacks. This restriction applies to both “roll from” and “roll to.”
- When rolling on a 1+1 protected circuit, the “roll to” cannot be on the protect port of the protection group.
- Rolling on a MS-SPRing protected circuit cannot violate the rules governing MS-SPRing circuits: a circuit that traverses a MS-SPRing must use the same STS number on the ring between source and destination.

- Rolling on an MS-SPRing protected circuit will be denied if there is an existing protection switch on the ring. If the protection switch happens after the roll is initiated, the system will not monitor valid signals on the “roll to” path until the protection switching is cleared.
- Rolling on an SNCP protected circuit cannot violate the rules governing SNCP circuits: SNCP circuits must have one bridge and one selector.
- The bridge and selector of an SNCP protected circuit cannot be rolled away.
- In the case of a dual roll on an SNCP protected circuit, both roll points have to be on either the working or protect path of the circuit. For example, you cannot specify one roll point on the working path and the other roll point on the protect path of the circuit being rolled.
- When rolling on a SNCP protected circuit, the “roll to” cannot be line protected (1+1 or MS-SPRing protected). TL1 can only ensure this on the bridge and selector node, not on the intermediate node.
- When rolling on a mixed protection circuit, the roll points have to be within the same protection domain.
- Rolling using TL1 can be performed on a CTC-created cross-connection.

Note If a roll is created using TL1, it cannot be edited or deleted by CTC.

- Rolling using TL1 can be performed on a TL1 cross-connection.

Note If a roll is created using CTC, it cannot be edited or deleted by TL1.

- If the intermediate path of a circuit is being rolled away to another circuit, the second circuit cannot carry any live traffic.

Note After a roll is completed, the second circuit will form the new intermediate path of the original circuit.

- Rolling cannot be performed on low order path tunnel or VC low order path aggregation point (VAP) circuits passing through less than four nodes.

The following restrictions apply for bridge and roll using TL1 virtual concatenation (VCAT) in this release:

- For non-open-ended VCAT circuits, you cannot change the source or destination of the circuit.
- For open-ended VCAT circuits, you can change the source or destination of the circuit, but only on the open end.

The following restrictions apply for bridge and roll using TL1 common fiber-routed VCAT circuits in this release:

- Rolling cannot change the common fiber property of a common fiber-routed VCAT circuit.
- When rolling on a VCAT member circuit, in order not to change the common fiber property of a common fiber-routed VCAT circuit, you can roll the member from one time slot to a different time slot within the same fiber.

2.9.2 Bridge and Roll TL1 Commands

The following commands are used for bridge and roll:

- DLT-BULKROLL-<STM_TYPE>

  This command deletes an attempted rolling operation or completes an attempted rolling operation. This command supports Line level and bulk rolling, but cannot be used for Path level rolling. The rolls that are created using the ENT-BULKROLL-<STM_TYPE> command can be deleted using the DLT-BULKROLL-<STM_TYPE> command.

- DLT-ROLL-<MOD_PATH>

  This command deletes an attempted rolling operation or completes an attempted rolling operation.

- ED-BULKROLL-<STM_TYPE>

  This command edits information about rolling traffic from one endpoint to another without interrupting service. This command can use the CMDMDE option to force a valid signal. The only parameter that can be edited is CMDMDE. The time slots cannot be edited. This commands supports Line level and bulk rolling, but cannot be used for Path level rolling.

- ED-ROLL-<MOD_PATH>

  This command edits information about rolling traffic from one endpoint to another without interrupting service. This command can use the CMDMDE option to force a valid signal. The only parameter that can be edited is CMDMDE. The time slots cannot be edited.

- ENT-BULKROLL-<STM_TYPE>

  This command enters information about rolling traffic from one endpoint to another without interrupting service. This commands supports Line level and bulk rolling, but cannot be used for single Path level rolling.

- ENT-ROLL-<MOD_PATH>

  This command enters information about rolling traffic from one endpoint to another without interrupting service. This command supports VC Path-level rolling only.

- RTRV-BULKROLL-<STM_TYPE>

  This command retrieves roll data parameters. This command supports Line level and bulk rolling, but cannot be used for Path level rolling.

- RTRV-ROLL-<MOD_PATH>

  This command retrieves roll data parameters.

2.9.3 Two-Way Circuit Single Roll and Dual Roll Procedures

Single roll operation moves either the source or destination of a circuit to a new endpoint on the same node or on a different node. In single roll operation, you only choose one roll point during the process.

Dual roll operation reroutes a segment between two roll points of a circuit. In dual roll operation, you choose two roll points during the process.The new route can be one of the following:

- A new link (no circuit is required)
- Another circuit (created before or during the bridge and roll process)

Create a Two-Way Circuit Single Roll or Dual Roll

To create a two-way circuit single roll or dual roll, enter the ENT-ROLL-<MOD_PATH> command or the ENT-BULKROLL-<STM_TYPE> command depending on the type of roll you want to perform.

The input formats are as follows:

- ENT-ROLL-<MOD_PATH>:[<TID>]:<FROM>,<TO>:<CTAG>:::RFROM=<RFROM>, RTO=<RTO>,RMODE=<RMODE>,[CMDMDE=<CMDMDE>];
- ENT-BULKROLL-<STM_TYPE>:[<TID>]:<FROM>:<CTAG>:::RTOSTART=<RTOSTART>, [RFROMSTART=<RFROMSTART>],[RFROMEND=<RFROMEND>],RMODE=<RMODE>, [CMDMDE=<CMDMDE>];

Step 1 Choose the type of roll you want to perform and enter the corresponding command:

- For automatic rolling onto the same facility, but different STS (path roll), use the ENT-ROLL-<MOD_PATH> command as shown in the following example:

  ENT-ROLL-VC3:CISCO:VC4-1-1-1,VC4-2-1-1:1:::RFROM=VC4-2-1-1,RTO=VC4-3-1-1, RMODE=MAN,CMDMDE=FRCD;

- For manual rolling onto the same facility, but different VC (path roll), use the ENT-ROLL-<MOD_PATH> command as shown in the following example:

  ENT-ROLL-VC3:CISCO:VC4-1-1-1,VC4-2-1-1:1:::RFROM=VC4-2-1-1,RTO=VC4-3-1-1, RMODE=MAN,CMDMDE=FRCD;

- For rolling onto a different facility with the same or different VC (line roll), use the ENT-BULKROLL-<STM_TYPE> command as shown in the following example:

  ENT-BULKROLL-STM16:CISCO:FAC-5-1:123:::RTOSTART=VC4-6-1-1, RFROMSTART=VC4-5-1-1,RFROMEND=VC4-5-1-4,RMODE=AUTO,CMDMDE=FRCD;

  This command will roll all the VC paths to a facility on Slot 6 with the same VC as shown in Table 2-5.

Table 2-5 Two-Way Circuit Single or Dual Line Roll with ENT-BULKROLL

Path	Before Roll	After Roll
VC4#1	VC4-5-1-1	VC4-6-1-1
VC4#2	VC4-5-1-2	VC4-6-1-2
VC11#1 on VC4#3	VC11-5-1-3-1-1	VC11-6-1-3-1-1
VC11#2 on VC4#3	VC11-5-1-3-2-4	VC11-6-1-3-2-4
VC4#4	VC4-5-1-4	VC4-6-1-4
VC4#5	VC4-5-1-5	VC4-6-1-5
VC11#3 on VC4#6	VC11-5-1-6-1-1	VC11-6-1-6-1-1

- For rolling a set of circuits onto a different facility (bulk roll), use the ENT-BULKROLL-<STM_TYPE> command as shown in the following example:

  ENT-BULKROLL-STM16:CISCO:FAC-5-1:123:::RTOSTART=VC4-6-1-1, RFROMSTART=VC4-5-1-1,RFROMEND=VC4-5-1-4,RMODE=AUTO,CMDMDE=FRCD;

  This command will roll the paths shown in Table 2-6.

Table 2-6 Two-Way Circuit Single or Dual Bulk Roll with ENT-BULKROLL

Path	Before Roll	After Roll
VC4#1	VC4-5-1-1	VC4-6-1-1
VC4#2	VC4-5-1-2	VC4-6-1-2

Table 2-6 Two-Way Circuit Single or Dual Bulk Roll with ENT-BULKROLL (continued)

Path	Before Roll	After Roll
VC11#1 on VC4#3	VC11-5-1-3-1-1	VC11-6-1-3-1-1
VC11#2 on VC4#3	VC11-5-1-3-2-4	VC11-6-1-3-2-4
VC4#4	VC4-5-1-4	VC4-6-1-4

Step 2 If you performed a manual roll, you must confirm the circuit is valid by issuing the RTRV-BULKROLL-<STM_TYPE> command. The input format of the command is as follows:

RTRV-BULKROLL-<STM_TYPE>:[<TID>]:<SRC>:<CTAG>;

The following is an example of the command input:

RTRV-BULKROLL-STM4:CISCO:FAC-3-1:1;

2.9.4 One-Way Circuit Single Roll and Dual Roll Procedures

Single roll operation moves either the source or destination of a circuit to a new endpoint, either onto the same node or onto a different node. In single roll operation you only choose one roll point during the process.

Dual roll operation reroutes a segment between two roll points of a circuit. In dual roll operation, you choose two roll points during the process. The new route can be one of the following:

- A new link (no circuit is required)
- Another circuit (created before or during the bridge and roll process)

Create a One-Way Circuit Single Roll

To create a one-way circuit single roll, enter the ENT-ROLL-<MOD_PATH> command or the ENT-BULKROLL-<STM_TYPE> command, depending on the type of roll you want to perform. The input formats for these commands are as follows:

- ENT-ROLL-<MOD_PATH>:[<TID>]:<FROM>,<TO>:<CTAG>:::RFROM=<RFROM>, RTO=<RTO>,RMODE=<RMODE>,[CMDMDE=<CMDMDE>];

  Note For a one-way destination roll, the roll mode (RMODE) must be manual (MAN).

- ENT-BULKROLL-<STM_TYPE>:[<TID>]:<FROM>:<CTAG>:::RTOSTART=<RTOSTART>, [RFROMSTART=<RFROMSTART>],[RFROMEND=<RFROMEND>],RMODE=<RMODE>, [CMDMDE=<CMDMDE>];

Step 1 Choose the type of roll that you want to perform and enter the corresponding command:

- For automatic rolling onto the same facility, but different VC (path roll), use the ENT-ROLL-<MOD_PATH> command as shown in the following example:

  ENT-ROLL-VC3:CISCO:VC4-1-1-1,VC4-2-1-1:1:::RFROM=VC4-2-1-1,RTO=VC4-3-1-1, RMODE=MAN,CMDMDE=FRCD;

- For manual rolling onto the same facility, but different VC (path roll), use the ENT-ROLL-<MOD_PATH> command as shown in the following example:

  ENT-ROLL-VC3:CISCO:VC4-1-1-1,VC4-2-1-1:1:::RFROM=VC4-2-1-1,RTO=VC4-3-1-1, RMODE=MAN,CMDMDE=FRCD;

- For rolling onto a different facility with the same or different VC (line roll), use the ENT-ROLL-<MOD_PATH> command as shown in the following example:

  ENT-ROLL-VC3:CISCO:VC4-1-1-1,VC4-2-1-1:1:::RFROM=VC4-2-1-1,RTO=VC4-3-1-1, RMODE=MAN,CMDMDE=FRCD;

  This command will roll all the VC paths to a facility on Slot 6 with the same STS as shown in Table 2-7.

Table 2-7 One-Way Circuit Single Line Roll with ENT-BULKROLL

Path	Before Roll	After Roll
VC4#1	VC4-5-1-1	VC4-6-1-1
VC4#2	VC4-5-1-2	VC4-6-1-2
VC11#1 on VC4#3	VC11-5-1-3-1-1	VC11-6-1-3-1-1
VC11#2 on VC4#3	VC11-5-1-3-2-4	VC11-6-1-3-2-4
VC4#4	VC4-5-1-4	VC4-6-1-4
VC4#5	VC4-5-1-5	VC4-6-1-5
VC11#3 on VC4#6	VC11-5-1-6-1-1	VC11-6-1-6-1-1

- For rolling a set of circuits onto a different facility (bulk roll), use the ENT-BULKROLL-<STM_TYPE> command as shown in the following example:

  ENT-BULKROLL-STM16:CISCO:FAC-5-1:123:::RTOSTART=VC4-6-1-1, RFROMSTART=VC4-5-1-1,RFROMEND=VC4-5-1-4,RMODE=AUTO,CMDMDE=FRCD;

  This command will roll the paths shown in Table 2-8.

Table 2-8 One-Way Circuit Single Bulk Roll with ENT-BULKROLL

Path	Before Roll	After Roll
VC4#1	VC4-5-1-1	VC4-6-1-1
VC4#2	VC4-5-1-2	VC4-6-1-2
VC11#1 on VC4#3	VC11-5-1-3-1-1	VC11-6-1-3-1-1
VC11#2 on VC4#3	VC11-5-1-3-2-4	VC11-6-1-3-2-4
VC4#4	VC4-5-1-4	VC4-6-1-4

Step 2 If you performed a manual roll, you must confirm that the circuit is valid by issuing the RTRV-BULKROLL-<STM_TYPE> command using the following format:

RTRV-BULKROLL-<STM_TYPE>:[<TID>]:<SRC>:<CTAG>;

An example of the RTRV-BULKROLL-<STM_TYPE> input follows:

RTRV-BULKROLL-STM4:CISCO:FAC-3-1:1;

Create a One-Way Circuit Dual Roll

In this procedure, both the source and destination nodes are rolled. There are two types of dual rolls:

- Dual roll for a single circuit within the same facilities but to a different time slot.
- Dual roll for a single circuit from one span card to another span card.

Step 1 Determine the type of roll that you want to perform on the source node and follow the steps in the "Create a One-Way Circuit Single Roll" section on page 2-50.

Step 2 Determine the type of roll that you want to perform on the destination node and follow the steps in the "Create a One-Way Circuit Single Roll" section on page 2-50.

2.9.5 Protection Rolling Procedures

To perform protection rolls, follow the procedures in the "2.9.3 Two-Way Circuit Single Roll and Dual Roll Procedures" section on page 2-48 and the "2.9.4 One-Way Circuit Single Roll and Dual Roll Procedures" section on page 2-50.

Note Before performing a protection roll, either from one protection group to another or within the same protection group, the protection group must already be provisioned.

Table 2-9 shows the kind of protection rolls that are supported from one domain to another. In the table, an X indicates that the roll is allowed and a dash indicates that the roll is not allowed.

Table 2-9 Supported Protection Rolls

	Roll To Domain				
Roll From Domain	**MS-SPRing**	**PCA**	**1+1**	**SNCP**	**Unprotected**
MS-SPRing	X	X	X	—	X
PCA	X	X	X	—	X
1+1	X	X	X	—	X
SNCP	—	—	—	X	—
Unprotected	X	X	X	—	X

2.10 Remote Monitoring-Managed PMs

This section describes the retrieval, threshold setting, threshold crossing alerts (TCAs), and scheduled PM reporting for all remote monitoring (RMON)-managed PM data.

The cards that support RMON PMs include: G1K-4, CE-1000-4, ML1000-2/ML100T-12, FC_MR-4, MXP_MR_2.5G/MXPP_MR_2.5G, and ML-100T-8/CE-100T-8. The PM types for these cards include Ethernet statistic types defined in the standard SNMP/RMON MIB, and also include other statistic types managed by RMON, for example, the Fibre Channel statistical types.

When creating an RMON threshold, there are two threshold values that need to be specified. The first threshold is the rising threshold and the other is the falling threshold. There are other parameters that need to be specified when creating the RMON threshold, for example, the startup type and the sample type.

Note There can be more than one threshold defined for each RMON statistic type.

The current bucket is not defined by the RMON. RMON-managed PM only shows the history data of the PMs and the data accumulated since the last time the counters are cleared (RAW-DATA).

In the RMON TCA, the accumulation time period is not the predefined PM bucket accumulation time, such as 15-MIN or 1-DAY. It can be any integer (any time greater than 10 seconds) that is defined when creating the RMON threshold.

2.10.1 RTRV-PM-<MOD2>

The RTRV-PM-<MOD2> command retrieves the RMON-managed PMs.

The TL1 modifiers FSTE, GIGE, and POS are used to retrieve the RMON-managed Ethernet PM, if the Ethernet port is an FSTE, GIGE, or POS port type. The FC modifier retrieves the RMON-managed Fibre Channel PM.

There are three accumulation time periods for RMON statistics: 1-MIN, 1-HR, and RAW-DATA. For RMON-managed PMs, only history PM buckets and RAW-DATA are supported and there is no current bucket defined for RMON-managed PMs. When RAW-DATA is specified in the input of RTRV-PM, the date and time specified in the input will be ignored. The MONDAT and MONTM in the output will be the last time the counters were cleared. RAW-DATA is the default TMPER value for RMON-managed PM retrieval.

Because RMON PM only supports the history data if the accumulation time period is 1-MIN, 15-MIN, 1-HR, or 1-DAY, you must specify the correct history PM bucket for the RTRV-PM command to succeed.

When retrieving PM, if an unsupported MONTYPE is specified, an error message is returned.

Currently there is no support of LOCN (location) and DIRN (direction) for RMON-managed data statistics.

Input Format

RTRV-PM-<MOD2>:[<TID>]:<AID>:<CTAG>::[<MONTYPE>],[<MONLEV>],[<LOCN>],[<DIRECTION>],[<TMPER>],[<DATE>],[<TIME>];

Input Example

RTRV-PM-GIGE:TID:FAC-2-1:123::ETHERSTATSOCTETS,,,,1-MIN,04-11,12-45;

RTRV-PM-GIGE:TID:FAC-2-1:123::,,,,RAW-DATA;

Output Format

SID DATE TIME
M CTAG COMPLD
""<AID>,[<AIDTYPE>]:<MONTYPE>,<MONVAL>,[<VLDTY>],[<LOCN>],[<DIRECTION>],[<TMPER>],[<MONDAT>],[<MONTM>]"

;

Output Example

```
   TID-000 1998-06-20 14:30:00
M  001  COMPLD
   "FAC-2-1,GIGE:etherStatsOctets,21,COMPL,,,1-MIN,04-11,12-45"
;
```

Table 2-10 shows the error messages associated with the RTRV-PM-<MOD2> command.

Table 2-10 Error Messages for RTRV-PM-<MOD2>

Error Code	Description	Scenario When the Error Message is Sent
IDNV	TMPER Type Not Supported	The TMPER parameter specified is not applicable for the MOD2 type. For example, 1-MIN is not applicable for STM16 PM types.
IDNV	Current Interval Not Supported For RMON PMs	The current interval is specified by default, or is explicitly specified by MONDAT/MONTM, when the TMPER is 1-MIN, 15-MIN, 1-HR, or 1-DAY.

2.10.2 ENT-RMONTH-<MOD2_RMON>

The ENT-RMONTH-<MOD2_RMON> command creates a threshold type (an entry in the RMON alarm table) for an RMON statistic, for the RMON-managed PMs. An event (TCA) is generated and reported when the threshold is crossed in the appropriate direction during the sampled time period. More than one threshold can be created by using different parameters (rising/falling threshold), for each MONTYPE.

This command applies to G1000, GIGE, FSTE, POS, and FC data objects.

Input Format

```
ENT-RMONTH-<MOD2_RMON>:[<TID>]:<SRC>:<CTAG>::<MONTYPE>,,,,<INTVL>:
RISE=<RISE>,FALL=<FALL>,[SAMPLE=<SAMPLE>],[STARTUP=<STARTUP>][:];
```

Input Example

The following example creates an entry in the RMON threshold table for the etherStatsOctets statistic type with an interval equal to 100 seconds, rising threshold of 1000, falling threshold of 100, DELTA sampling type and the startup type of RISING-OR-LTING.

```
ENT-RMONTH-GIGE:CISCO:FAC-2-1:123::ETHERSTATSOCTETS,,,,100:RISE=1000,
FALL=100,SAMPLE=DELTA,STARTUP=RISING-OR-LTING;
```

Table 2-11 shows the error messages associated with the ENT-RMONTH-<MOD2_RMON> command.

Table 2-11 Error Messages for ENT-RMONTH-<MOD2_RMON>

Error Code	Description	Scenario When the Error Message is Sent
IDNV	Invalid Interval	The input interval value is less than 10.
IDRG	Invalid Threshold Value	The rising or falling threshold is less than 0, or the falling threshold is greater than or equal to the rising threshold.
IDNV	Invalid MONTYPE value	The MONTYPE is not applicable to the data type (represented by the MOD2).

Table 2-11 Error Messages for ENT-RMONTH-<MOD2_RMON> (continued)

Error Code	Description	Scenario When the Error Message is Sent
IIDT	Cannot Create More RMON Threshold	The number of RMON threshold created reached the maximum (256).
IIDT	Duplicate RMON Threshold	There is already a threshold created with the exact parameters.

2.10.3 DLT-RMONTH-<MOD2_RMON>

The DLT-RMONTH-<MOD2_RMON> command deletes a threshold type (an entry in the RMON alarm table) created for a MONTYPE (RMON statistic type). Because there can be multiple thresholds created for a particular MONTYPE, you must specify all the necessary parameters for the threshold in order to identify the particular threshold to be deleted.

This command applies to G1000, GIGE, FSTE, POS, and FC data objects.

Input Format

DLT-RMONTH-<MOD2>:[<TID>]:<AID>:<CTAG>::<MONTYPE>,,,,<INTVL>:RISE=<RISE>,FALL=<FALL>,[SAMPLE=<SAMPLE>,][STARTUP=<STARTUP>][:];

Input Example

The following example deletes an entry in the RMON threshold table for the etherStatsOctets statistic type, with an interval equal to 100 seconds, rising threshold of 1000, falling threshold of 100, DELTA sampling type, and the startup type of BOTH.

DLT-RMONTH-GIGE:CISCO:FAC-2-1:123::ETHERSTATSOCTETS,,,,100:RISE=1000,FALL=100,SAMPLE=DELTA,STARTUP=BOTH;

Table 2-12 shows the error messages associated with the DLT-RMONTH-<MOD2_RMON> command.

Table 2-12 Error Messages for DLT-RMONTH-<MOD2_RMON>

Error Code	Description	Scenario When the Error Message is Sent
IDNV	Invalid Interval	The input interval value is less than 10.
IDRG	Invalid Threshold Value	The rising or falling threshold is less than 0, or the falling threshold is greater than or equal to the rising threshold.
IDNV	Invalid MONTYPE value	The MONTYPE is not applicable to the data type (represented by the MOD2).
SROF	RMON Threshold Does Not Exist	The RMON threshold you are trying to delete does not exist.

2.10.4 RTRV-RMONTH-<MOD2_RMON>

The RTRV-RMONTH-<MOD2_RMON> command retrieves the thresholds defined in the RMON alarm table.

Input Format

RTRV-RMONTH-<MOD2>:[<TID>]:<AID>:<CTAG>::[<MONTYPE>]>,,,,[<INTVL>]:[RISE=<RISE>,][FALL=<FALL>,][SAMPLE=<SAMPLE>,][STARTUP=<STARTUP>];

Input Example

The following example retrieves all the thresholds defined in the RMON threshold table for the etherStatsOctets statistics type.

RTRV-RMONTH-GIGE:TID:FAC-2-1:123::ETHERSTATSOCTETS;

The following example retrieves all the thresholds with the DELTA sampling type, RISING startup type, and etherStatsOctets statistics type, defined in the RMON threshold table.

RTRV-RMONTH-GIGE:CISCO:FAC-2-1:123::ETHERSTATSOCTETS:SAMPLE=DELTA, STARTUP=RISING;

Output Format

SID DATE TIME
M CTAG COMPLD
"<AID>,[<AIDTYPE>]:<MONTYPE>,,,,[<INTVL>]:INDEX=<INDEX>,RISE=<RISE>,
FALL=<FALL>,SAMPLE=<SAMPLE>,STARTUP=<STARTUP>"
;

Output Example

TID-000 1998-06-20 14:30:00
M 001 COMPLD
"FAC-2-1,GIGE:ETHERSTATSOCTETS,,,,100:INDEX=2,RISE=1000,FALL=100,
SAMPLE=DELTA,STARTUP=RISING"
;

Table 2-13 shows the error messages associated with the RTRV-RMONTH-<MOD2_RMON> command.

Table 2-13 Error Messages for RTRV-RMONTH-<MOD2_RMON>

Error Code	Description	Scenario When the Error Message is Sent
IDNV	Invalid Interval	The input interval value is less than 10.
IDRG	Invalid Threshold Value	The rising or falling threshold is less than 0, or the falling threshold is greater than or equal to the rising threshold.
IDNV	Invalid MONTYPE value	The MONTYPE is not applicable to the data type (represented by the MOD2).
SROF	RMON Threshold Does Not Exist	The RMON threshold that you are trying to delete does not exist.

2.10.5 REPT EVT <MOD2ALM> for Threshold Crossing Events

The REPT EVT <MOD2ALM> autonomous message reports the threshold crossing event for the RMON statistics.

The HT or LT is appended to the CONDTYPE when crossing the rising or falling threshold.

The table index for the threshold in the RMON alarm table is enclosed in the text of the TCA description. This table index is displayed in the output of the RTRV-RMONTH command also. You can retrieve additional information regarding the threshold that generates the TCA by issuing the RTRV-RMONTH command and comparing the output with corresponding table index.

Output Format

```
   SID DATE TIME
M  CTAG COMPLD
"<AID>:<CONDTYPE>,[<CONDEFF>],[<OCRDAT>],[<OCRTM>],[<LOCN>],[<DIRN>],
[<MONVAL>], [<THLEV>],[<TMPER>]:[<DESC>],[<AIDDET>]"
;
```

Output Example

```
   VA454-23 2000-02-20 08:47:03
A  512.512 REPT EVT G1000
   "FAC-2-1,G1000:T-ETHERSTATSOCTETS-HT,TC,09-30,23-59-59,,,1003,
   1000,:\"RMON THRESHOLD CROSSING ALARM # 1 \",G1000-4"
;
```

2.10.6 INIT-REG-<MOD2>

This command initializes the PM registers. This command applies to G1K-4, GIGE, FSTE, and FC data objects.

Only RAW-DATA is allowed to be specified for TMPER because no history data will be cleared for RMON-managed PMs by INIT-REG-<MOD2>.

2.10.7 SCHED-PMREPT-<MOD2>

This command schedules or reschedules the NE to report the PM data. The three accumulation time periods for RMON statistics are: 1-MIN, 1-HR, and RAW-DATA.

2.10.8 RTRV-PMSCHED-<MOD2>

This command retrieves the RMON statistics reporting schedule that was set for the NE by the SCHED-PMREPT-<MOD2> command.

The LOCN parameter is optional in the output of RTRV-PMSCHED-<MOD2>, and no LOCN information will be given in the output of RTRV-PMSCHED for RMON PM schedule.

2.10.9 REPT PM <MOD2>

This message reports autonomous monitoring statistics as a result of the schedule created by SCHED-PMREPT-<MOD2>.

The LOCN parameter is optional in the output of REPT PM <MOD2> message, and no LOCN information will be given in the output of REPT PM <MOD2>.

2.10.10 REPT DBCHG

Reports any changes to the NE that result from issuing the following commands:

- ENT-RMONTH-<MOD2>
- DLT-RMONTH-<MOD2>

Also reports when an RMON PM schedule is created or deleted through the SCHED-PMREPT-<MO2> command.

2.10.11 MONTYPE Defined for Ethernet Statistics and Condition Type for TCA

The names of Ethernet and Fibre Channel MONTYPEs are defined exactly as they are defined in the corresponding SNMP MIB statistics group. For example, etherStatsUndersizePkts will be used as the name for the same RMON statistics defined in RFC 1757.

Unlike the PM of other SDH entities (such as VC path, STM), there are two condition types defined for the TCAs of each RMON-managed statistics type (Ethernet or Fibre Channel MONTYPE). One condition type is for the rising threshold, and the other is for the falling threshold. For example, there are two condition types for the etherStatsUndersizePkts statistics type: T-etherStatsUndersizePkts-HT for the rising threshold, and T-etherStatsUndersizePkts-LT for the falling threshold.

Note For platform-specific PM information, refer to the Procedure Guide and Reference Manual of that platform.

2.10.12 Enumerated Types

2.10.12.1 TMPER

Table 2-14 shows the possible TMPER values.

Table 2-14 TMPER Type

Value	Description
1-DAY	Performance Parameter Accumulation Interval Length - Every 24 Hours. For RMON managed data statistics, 7 days of history data are available.
15-MIN	Performance Parameter Accumulation Interval Length - Every 15 Minutes. 32 days of history data are available.
1-MIN	Performance Parameter Accumulation Interval Length - Every 1 minute. Only applicable to RMON statistics. 60 days of history data are available.
1-HR	Performance Parameter Accumulation Interval Length - Every 1 Hours. Only applicable to RMON statistics. 24 days of history data are available.
RAW-DATA	The data shown is accumulated starting from the last time that the counters are cleared. This is only applicable to RMON managed PMs.

2.10.12.2 SAMPLE_TYPE

SAMPLE_TYPE (Table 2-15) describes how the data will be calculated during the sampling period.

Table 2-15 SAMPLE_TYPE

Value	Description
ABSOLUTE	Comparing directly
DELTA	Comparing with the current value of the selected variable subtracted by the last sample.

2.10.12.3 STARTUP_TYPE

STARTUP_TYPE (Table 2-16) indicates whether an event will be generated when the first valid sample is crossing the rising or falling threshold.

Table 2-16 STARTUP_TYPE

Value	Description
RISING	Generate the event when the sample is greater than or equal to the rising threshold.
FALLING	Generate the event when the sample is smaller than or equal to the falling threshold.
RISING-OR-FALLING	Generate the event when the sample is crossing either the rising threshold or it the falling threshold.

2.10.13 Notes for Card Types

The PM for the client port and/or chunk port (OCH) can include both the RMON-managed PM and the SDH PM when the client payload is provisioned as 1GFC, 2GFC, 10GFC, 1GFICON, 2GFICON, GIGE, or 10GIGE for the following cards:

- MXP_2.5G_10G
- TXP_MR_10G
- TXP_MR_2.5G
- TXP_MR_10E
- MXP_MR_2.5G

2.10.13.1 Client Port of Cards

When the client port of a card is provisioned as 1GFC, 2GFC, 10GFC, 1GFICON, 2GFICON, GIGE, or 10GIGE, the applicable PM for the client port includes both the RMON-managed PM and the SDH PM. Therefore, the behavior of the RTRV-PM-MMOD2>, INIT-REG-<MOD2>, and SCHED-PMREPT-<MOD2> commands is different from the Ethernet or Fibre Channel port of the other cards where only RMON PM is applicable. The differences include:

- LOCN and DIRN parameters are applicable to the RTRV-PM-<MOD2>, INIT-REG-<MOD2>, and SCHED-PMREPT-<MOD2> commands because they are applicable to the SDH PM. When the LOCN or DIRN parameter is specified, it only applies to the SDH PM.

- Because 1-MIN, 1-HR, and RAW-DATA are not applicable to SDH PM, no SDH PM would be returned in the output of the RTRV-PM command. If RAW-DATA is specified in the input of the INIT-REG command, no SDH PM counter will be cleared.
- When the accumulation time period is specified as 15-MIN or 1-DAY and the PM history bucket is specified as 0 (current bucket), only SDH PM will be returned in the output of the RTRV-PM command. No RMON-managed PM will be included in the output of the RTRV-PM command because RMON PM does not have current bucket.
- An SDH PM MONTYPE cannot be specified in the input of the INIT-REG command. Only the SDH PM counters are cleared. When the ALL MONTYPE is specified, both the RMON and the SDH PM counters are cleared.
- The commands used to manage RMON thresholds (ENT-RMONTH, DLT-RMONTH, and RTRV-RMONTH) are only applicable to the RMON PM of the client port. The SDH PM thresholds of the client port are still managed by the SET-TH and RTRV-TH commands. For example, if the client port type of an MXP_MR_2.5G card is provisioned as GIGE, the following commands would be used to create an RMON threshold:

  ENT-RMONTH-GIGE::FAC-2-1-1:1::IFINOTETS,,,,1000:RISE=1000,FALL=900;

  and the following command would be used to set the SDH PM threshold:

  SET-TH-GIGE::FAC-2-1-1:1LBCL-MIN,0.2;

2.10.13.2 OCH Port of Cards

The optical channel (OCH) port of the TXP_MR_10G and TXP_MR_10E cards include the RMON-managed 8B10B PM as well as the other SDH PM when their client port is provisioned as GIGE, 10GIGE, 1GFC, 2GFC, or 10GFC.

The RTRV-PM-OCH, INIT-REG-OCH, SCHED-PMREPT-OCH, and REPT PM OCH commands have similar behaviors as mentioned in the "2.10.13.1 Client Port of Cards" section on page 2-59.

2.11 Rules for Framing Type Autoprovisioning in CTC Versus TL1

The E1, E3, and DS3i cards can autosense framing and set the format accordingly; however, this framing autosense feature can only be set using CTC. Use CTC to set the frame format (FMT) attribute on E1, E3, and DS3i cards to autoprovision. The FMT field will blank out for a few seconds while the card determines the framing mode received by that particular port. The FMT field is set accordingly to unframed, M23, or CBit. If the card is not present (preprovisioned), setting the FMT field to autoprovision will result in the FMT field defaulting to unframed.

The TL1 interface does not support the autoprovision option for the E1, E3, and DS3i cards; it only supports unframed, M23, or CBit. If autoprovision is selected from CTC and at the same time the TL1 command RTRV-E3 is issued, the TL1 output will indicate the FMT field as unframed during the time period that the card (if present) is autosensing the frame format. If the card is not present (preprovisioned), the response of the RTRV-E3 command (after CTC sets the FMT to autoprovision) will indicate the FMT field as unframed.

2.12 Provisioning Rules for Transponder and Muxponder Cards

This section provides provisioning rules associated with the following cards and their pluggable port modules (PPMs):

- MXP_2.5G_10G
- TXP_MR_10G
- TXP_MR_2.5G
- TXPP_MR_2.5G
- MXP_2.5G_10E
- TXP_MR_10E
- MXP_MR_2.5G
- MXPP_MR_2.5G
- GE_XP
- 10GE_XP
- GE_XPE
- 10GE_XPE
- OTU2_XP
- ADM_10G

2.12.1 PPM Provisioning Rules

To provision PPMs, use the **ENT-EQPT** command.

Example 2-33 provisions the first PPM.

Example 2-33 Provision the first PPM on Slot 2

ENT-EQPT::PPM-2-1:100::PPM-1PORT;

To delete PPM provisioning, use the DLT-EQPT command.

2.12.2 Payload Provisioning Rules

Use the following rules when provisioning payload:

- PPM must first be provisioned.
- When changing the payload data type:
  - All ports being edited must be in the OutOfServiceandManagement,Disabled state because this change is traffic affecting.
  - All ports being edited must not have any DCC terminations.
  - All ports being edited must not be part of any timing source.
  - The section trace mode of all ports being edited must be OFF.

  - For all regeneration and retiming (2R) payload types, trunk ports must not have generic communications channel (GCC) termination or optical transport network/forward error correction (OTN/FEC) enabled.
  - Payload cannot be changed if any ports being edited are part of a Y-cable protection group.
  - The payload cannot be changed if any of the ADM-10G and OTU2_XP ports being edited are part of the APS (Automatic Protection Switching) protection group.
  - Only the TXP, GE_XP, 10GE_XP, GE_XPE, 10GE_XPE, and OTU2_XP cards can be used for the 10GIGE payload. Termination mode must be set to TRANSPARENT-ALARM INDICATION SIGNAL (AIS) or TRANSPARENT-SQUELCH (TRANSPARENT-SQUELCH is only supported on TXP_MR_10E).
- To set the payload to other than STM1, STM4, STM16, or STM64, the termination mode must be set to TRANSPARENT-AIS or TRANSPARENT-SQUELCH (TRANSPARENT-SQUELCH is only supported on TXP_MR_10E). For Fibre Channel cards and all 2R payload types, the termination mode is not applicable and must be set to TRANSPARENT-AIS or TRANSPARENT-SQUELCH.
- Changing the payload while in a regeneration group requires unprovisioning the regeneration group, unprovisioning the payload, reprovisioning the payload, and reprovisioning the regeneration group.

To provision the payload, use the following commands:

- **ENT-(OCn, nGIGE, nGFC, 2R)**
- **DLT-(OCn, nGIGE, nGFC, 2R)**
- **ED-(OCn, nGIGE, nGFC, 2R)**

Examples of provisioning payload commands include:

- ENT-STM4
- ENT-10GIGE
- ED-2GFC

2.12.3 STM Payload Provisioning Parameters

SDH payloads are supported by NCS cards according to Table 2-17. These payloads are configurable only for the Section and Line layers. STM layers cannot be provisioned or retrieved.

Table 2-17 Payload/Card Mode Support

Card Type	Payload	Card Mode
TXP_MR_10G	STM64	NCS-LINE
	10GIGE	NCS-SECTION NCS-TRANS-AIS With REGEN group: NCS-TRANS-AIS
MXP_2.5G_10G	STM16	NCS-LINE NCS-SECTION NCS-TRANS-AIS

Table 2-17 Payload/Card Mode Support (continued)

Card Type	Payload	Card Mode
TXP_MR_2.5G and TXPP_MR_2.5G	1GIGE, 1GF, 1GFICON, 2GFICON, ESCON, ISC1, ISC3, ETRCLO, DV6000, HDTV, D1VIDEO	With REGEN group: NCS-TRANS-AIS Must be NCS-TRANS-AIS. Requires the DWRAP and FEC disabled on the network/OCH ports.
	STM1, STM4, STM16	NCS-LINE NCS-SECTION NCS-TRANS-AIS
TXP_MR_10E	STM64	NCS-LINE NCS-SECTION NCS-TRANS-AIS NCS-TRANS-SSQUELCH
	10GIGE, 10GFC	NCS-TRANS-AIS NCS-TRANS-SQUELCH With REGEN group: NCS-TRANS-AIS NCS-TRANS-SQUELCH
MXP_2.5G_10E	STM16	NCS-SECTION NCS-TRANS-AIS NCS-TRANS-SQUELCH
MXP_MR_2.5G AND MXPP_MR_2.5G	Port 1: 1GFC, 1GFICON, GIGE Port 2: 1GFC, 2GFC, 1GFICON, 2GFICON, GIGE[1]	FCGE[2]
GE_XP and GE_XPE	GIGE, 10GIGE	GEXP-10x1Gx2-MXP GEXP-20x1G-MXP GEXP-L2ETH
10GE_XP and 10GE_XPE	GIGE, 10GIGE	10GEXP-TXP 10GEXP-L2ETH
OTU2_XP	OC192, 10GIGE	NCS-TRANS-AIS NCS-TRANS-SQUELCH NCS-SECTION NCS-LINE
ADM_10G	OC3, OC12, OC48, GIGE	—

1. If 2GFC or 2GFICON is on Port 2, then Port 1 must be unprovisioned. If Port 1 is provisioned then Port 2 cannot contain 2GFC or 2GFICON because of bandwidth limitations. Ports 3 through 8 are not available. ESCON payload is not supported.
2. ESCON and mixed card modes are not supported.

The configuration parameters for STM ports can be edited and retrieved using the ED-<STM_TYPE> and RTRV-<STM_TYPE> commands. The following conditions apply when using the parameters for these commands:

- Regenerator Section DCC (RS-DCC) and Multiplex Section DCC (MS-DCC) parameters are used to enable and disable RS-DCC and MS-DCC functionality, respectively.

- SYNMSG and SENDDUS synchronization parameters are applicable only to cards supporting synchronization: MXP-2.5G-10G, TXP-MR-10E, and MXP-2.5G-10E, OTU2_XP, and ADM-10G.
- Signal fail and signal degrade can be provisioned using SFBER and SDBER parameters, respectively.
- Soak time and administrative/service state parameters can be provisioned using SOAK, SOAKLEFT, PST, SST, and CMDMDE parameters.
- The SONET/SDH selection can be provisioned using the MODE parameter.
- The name of the facility can be provisioned using the NAME parameter.
- The J0 Section Trace parameters can be provisioned using the EXPTRC, TRC, INCTRC, TRCMODE, and TRCFORMAT parameters.

2.12.4 Termination Mode Provisioning Rules

The following rules apply when provisioning the termination mode:

- It is a card-level operation.
- Termination mode provisioning is only applicable to the STM1, STM4, STM16, and STM64 payload types.
- Changing termination mode requires:
  a. All ports must be in OutOfService state because this change is traffic-affecting.
  b. All ports must not have DCC termination (GCC is not applicable).
  c. The J0 Section Trace Mode on all ports must be <OFF>.
  d. The trunk port must not be part of any timing source.
  e. If any port is Y-cable protected, these rules also apply to the peer slot.
- Section and Line termination mode is supported for the STM1, STM4, STM16, and STM64 payloads.
- You cannot change the termination mode if the port is part of a Y-cable protection or regeneration group.
- Termination mode provisioning does not apply to MXP_MR_2.5G, MXPP_MR_2.5G, and ADM-10G cards.

To set the termination mode, use the following commands:

- ENT-EQPT
- ED-EQPT

Example 2-34 sets the termination mode of the card in Slot 1 to NCS-LINE.

Example 2-34 Set the Termination Mode

```
ED-EQPT::SLOT-1:116:::CARDMODE=NCS-LINE;
```

2.12.5 Wavelength Provisioning Rules

The following rules apply when provisioning the wavelength:

- Change the trunk wavelength of all the trunk ports to be in the Locked-Disabled state, because this change is traffic-affecting.
- Setting the wavelength to the first tunable wavelength will cause the first wavelength from the card manufacturing data to be used as the operational wavelength.
- If the provisioned wavelength is set to the first tunable wavelength, any removal of an operational card and subsequent replacement with a card for a different wavelength will not cause a mismatch alarm to be raised.
- To receive the mismatch alarm notification, you need to explicitly provision the wavelength and not use the first tunable wavelength.

To set the card-level wavelength, use the following commands:

- **ENT-EQPT**
- **ED-EQPT**

Example 2-35 sets the card-level wavelength of the card in Slot 1 to 150.33.

Example 2-35 Set the Card-Level Wavelength

```
ED-EQPT:VA454-22:SLOT-1:116:::PWL=1530.33;
```

2.12.6 Regeneration Group Provisioning Rules

The following rules apply when provisioning the regeneration group:

- The TXPP and TXP versions of the transponder card can be used in a regeneration group.
- When the TXPP card is used as a regeneration group, the LOCKOUT_OF_PROTECTION, inhibit switching command is issued on the working trunk port.
- The inhibit switching command cannot be unlocked until the regeneration group is unprovisioned for the TXPP.
- Regeneration group provisioning is denied if there is a FORCE or MANUAL switching command already provisioned on the trunk ports for the TXPP.
- A regeneration group enables the continuation of the client signal across multiple spans.
- Peer slot must not be itself.
- Peer slot must at least be preprovisioned.
- Peer slot must not be part of another regeneration group.
- Peer slot must not be part of a Y-cable protection group.
- Same card type.
- Same payload type and data rate.
- Same ITU-T G.709 OTN status.
- Same FEC status.
- Termination mode has to be set to TRANSPARENT-AIS or TRANSPARENT-SQUELCH mode.

To set the card-level regeneration group, use the following commands:

- **ED-EQPT**
- **ENT-EQPT**

Example 2-36 sets a card-level regeneration group for Slot 2.

Example 2-36 Set Card-Level Regeneration Group

ED-EQPT::SLOT-2:CTAG:::PROTID=SLOT-2,NAME=REGENGROUPNAME;

2.12.7 DCC/GCC Provisioning Rules

The following rules apply when provisioning DCC and GCC:

- The DCC can be provisioned on the client port of a TXP or MXP card.
- No 2R payload types support GCC.
- Provisioning a DCC requires:
  - Payload data type is set to STM1, STM4, STM16, or STM64.
  - Termination mode is set to Line or Section terminated if the card supports provisionable termination mode.
- The DCC can be provisioned on the trunk line provided that ITU-T G.709 is provisionable and ITU-T G.709 OTN status is turned off:
  - To provision a GCC on the trunk port, the ITU-T G.709 should be enabled.
  - To provision a DCC on the trunk port, the ITU-T G.709 should be disabled.
- Only the working client port in a Y-cable protection scheme is allowed to be provisioned with DCC.
- Only the working trunk port in a splitter protection scheme can be provisioned with DCC or GCC.

To provision DCC, use the **ED-(OCn, nGIGE, NGFC)** command.

Example 2-37 provisions DCC.

Example 2-37 Provision DCC

```
ED-STM64::FAC-1-1-1:100:::COMM=DCC:OutOfService,AutomaticInService;
```

To provision GCC, use the **ED-OCH** command.

Example 2-38 provisions GCC.

Example 2-38 Provision GCC

```
ED-OCH::CHAN-6-2:114::COMM=GCC:OutOfService,AutomaticInService;
```

2.12.8 ITU-T G.709 OTN, FEC, and OTN SDBER/SFBER Provisioning Rules

The following rules apply when provisioning ITU-T G.709 OTN, FEC, and OTN SDBER/SFBER:

- The ITU-T G.709 OTN, FEC, and OTN SDBER/SFBER can only be provisioned on the trunk port.
- 2R (transparent) payload types (HDTV and passthrough) do not support ITU-T G.709 OTN or FEC.
- To enable ITU-T G.709 OTN:

  - All trunk ports must be in the OutOfService state.
  - All trunk ports must not have any RS-DCC provisioned.
- To disable ITU-T G.709 OTN:
  - All trunk ports must be in the OutOfService state.
  - All trunk ports must not have any GCC or active trail trace identification (TTI) mode provisioned.
- FEC status can be enabled only if ITU-T G.709 is enabled.
- To change FEC status, all trunk ports must be in the OutOfService state.
- Only ITU-T G.709 OTN, FEC status, and SDBER/SFBER settings on the working trunk port can be changed in the protected version of the TXP card. The value provisioned on the working trunk port is reflected on the protect trunk port.
- The ITU-T G.709 OTN is only provisionable in non-2R (or unframed) payload type.
- When ITU-T G.709 is turned on, the OTN SFBER value is always set to 1E-5 and no other bit error rate (BER) values are provisionable.

To provision ITU-T G.709, FEC, and OTN SDBER/SFBER, use the **ED-OCH** command.

Example 2-39 provisions ITU-T G.709, FEC, and OTN SDBER/SFBER.

Example 2-39 Provision ITU-T G.709, FEC, and OTN SDBER/SFBER

```
ED-OCH::CHAN-6-2:114:::OSDBER=1E-6,DWRAP=Y,FEC=Y,:
OutOfService,AutomaticInService;
```

2.12.9 Synchronization Provisioning Rules

The following rules apply when provisioning synchronization:

- The TXP_MR_10G, TXP_MR_2.5G, and TXPP_MR_2.5G cards are through-timed (passthrough) and cannot be used as a timing source. The GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards do not support synchronization provisioning.
- The TXP_MR_10E card can be used as a timing reference (only on the client port, not the trunk port).
- A MXP_MR_2.5G, MXPP_MR_2.5G, OTU2_XP, or ADM-10G card trunk port can be used as a timing source.
- Only MXP ports can be used for a timing source. A trunk port is only allowed as a timing reference if ITU-T G.709 is off and the termination mode is Line or Section.
- All client ports of the ADM-10G cards are available for timing source when configured as SDH. GIGE payload cannot be used for timing source. Interlink port cannot be used for synchronization.
- All client ports of the MXP cards are available for timing source irrespective of termination mode.

To set port-level synchronization attributes, use the following commands:

- **ENT-OCn**
- **ED-OCn**
- **ED-OCH**

Example 2-40 sets port-level synchronization attributes.

Example 2-40 Set Port-Level Synchronization Attributes

```
ED-OC48::FAC-1-1-1:CTAG:::SYNCMSG=Y,SENDDUS=N:;
ED-OCH::CHAN-6-2:114:::SYNCMSG=N,SENDDUS=Y;:
```

2.12.10 Section Trace Provisioning (J0) Rules

The following rules apply when provisioning section trace (J0):

- The client and trunk ports support section trace only if the payload is STM1, STM4, STM16, or STM64.
- The client and the trunk ports support the section trace only in Line or Section termination mode.
- In Line termination mode, the supported trace modes are MANUAL and MANUAL_NO_AIS trace modes.
- In Section termination mode, the supported trace mode is only the MANUAL_NO_AIS trace mode.
- The section trace supports a 1- or 16-byte length trace format.
- The trace mode of AUTO and AUTO-NO-AIS are not supported.
- No trace is applicable for 2R (unframed) payload types, for example, DV-6000, HDTV, and ESCON.
- The section trace received string should appear when the card is in TRANSPARENT-AIS or TRANSPARENT-SQUELCH termination mode and the payload is STM1, STM4, STM16, or STM64.
- When the client port is configured in a Y-cable or APS protection group, the received string is always retrieved from the active client port.
- If the line is Y-cable or APS protected, section trace can only be provisioned on the working port. However, the provisioning is duplicated between the two ports. Both ports contain the same values. This rule applies to the following parameters: Mode, Format, Send String, and Expected String.
- The MXP_2.5G_10E card is used for client test connection on client ports. For the trunk port, the trail trace identification (TTI) is used.
- The TXP_MR_10E card is used to test connections on client trunk ports.
- On MXP_MR_2.5G/MXPP_MR_2.5G cards, the trunk port section trace can be provisioned following the rules for line terminated SDH.
- Section trace provisioning is not supported on GE_XP, 10GE_XP, GE_XPE, 10GE_XPE cards.

For section trace provisioning of client ports provisioned for OCn payload, use the ED-OCn command.

Example 2-41 provisions section trace for client ports.

Example 2-41 Section trace provisioning of client ports

```
ED-OC48::FAC-6-1-1:10:::EXPTRC="AAA",TRC="AAA",TRCMODE=MAN,
TRCFORMAT=16-BYTE;
```

For section trace provisioning of trunk/OCH NCS ports, use the ED-TRC-OCH command.

Example 2-42 provisions section trace for client ports.

Example 2-42 Section Trace Provisioning of Trunk/OCH NCS Ports

```
ED-TRC-OCH::CHAN-6-2:10:::EXPTRC="AAA",TRC="AAA",TRCMODE=MAN,
TRCLEVEL-J0,TRCFORMAT=64-BYTE;
```

2.12.11 Trail Trace Identification Provisioning Rules

The following rules apply when provisioning trail trace identification (TTI):

- For the TXPP_MR_2.5G card, TTI can be provisioned only on the working trunk port. However, the provisioning will be duplicated between the two ports. Both ports will contain the same values. This rule applies to the following parameters: Mode, Format, Send String, and Expected String.
- The TTI level trace supports only 64-byte length trace format.
- The TTI level trace supports only the MANUAL and MANUAL_NO_AIS trace modes.
- The TTI received string is always retrieved from the active trunk port.
- The TTI level trace can be provisioned for the section and path monitoring.
- MXP_MR_2.5G and MXPP_MR_2.5G cards do not support TTI.

To provision port-level trace, use the **ED-TRC-OCH** command.

Example 2-43provisions port-level trace.

Example 2-43 Provision Port-Level Trace

```
ED-TRC-OCH::CHAN-6-2:10:::EXPTRC="AAA",TRC="AAA",TRCMODE=MAN,
TRCLEVEL=TTI-PM,TRCFORMAT=64-BYTE;
```

2.12.12 PM (Performance Monitoring) and Alarm Threshold Provisioning Rules

The following rules apply when provisioning PM parameters and alarm thresholds:

- When framing type is unframed, for example, HDTV or DV6000, only optics threshold provisioning and PM are applicable. Support for optics threshold provisioning and PM depends on the ESCON SFP type.
- Optics PM supports only Near End, 15MIN, and 1DAY interval buckets.
- When framing type is Fibre Channel or Ethernet (for example, 1GFC or 1G Ethernet):
  - (TXP_MR_2.5G/TXPP_MR_2.5G, MXP_2.5G_10G, and TXP_MR_10G only) Only 8B10B threshold provisioning and PM are available.
  - 2G Fibre Channel does not support 8B10B threshold provisioning and PM.
- When the framing type is GIGE/10GIGE, all monitored PM parameter terminology will follow the current chassis type.
- (TXP_MR_2.5G/TXPP_MR_2.5G, MXP_2.5G_10G, and TXP_MR_10G only) 8B10B applies to both transmit (Tx) and receive (Rx) directions.
- 8B10B PM supports only Near End, 15MIN, and 1DAY interval buckets.
- The 8B10B layer is not used for MXP_2.5G_10E and TXP_MR_10E cards.
- When the framing type is SONET/SDH, all monitored PM parameter terminology follows the current chassis type.
- The OTN thresholds are only applicable if the ITU-T G.709 OTN status is enabled.

- The FEC thresholds are only applicable if the ITU-T G.709 and FEC are enabled.
- If the line is configured in a Y-cable, APS protection, or splitter protection group, only the working line thresholds can be provisioned. The working line thresholds will be reflected on the protect line thresholds. This rule applies for all threshold types including ITU-T G.709 OTN and FEC thresholds.
- Payload PM can be independently retrieved for both the working and protect port.

To set port-level thresholds, use the **SET-TH-(OCn, nGIGE, nGFC, OCH)** command.

Example 2-44 sets port-level thresholds.

Example 2-44 Set Port-Level Thresholds

```
SET-TH-OC48::FAC-1-1-1:123::CVL,12,NEND,,15-MIN;
SET-TH-OCH::CHAN-6-1:123::ES-PM,12,NEND,,15-MIN;
```

To retrieve port-level thresholds, use the **RTRV-PM-(OCn, nGIGE, nGFC, OCH)** command.

Example 2-45 retrieves port-level thresholds.

Example 2-45 Retrieve Port-Level Thresholds

```
RTRV-PM-OC48::FAC-1-1-1:123::CVL,10-UP,NEND,BTH,15-MIN,04-11,12-45;
RTRV-PM-OCH::CHAN-6-1:123::ES-PM,10-UP,NEND, BTH,15-MIN,04-11,12-45:
```

2.12.13 Y-Cable Protection Group Provisioning Rules

The following rules apply when provisioning a Y-cable protection group:

- A Y-cable protection group can be created between the client ports of two unprotected TXPs and OTU2_XP cards.
- While in Y-cable protection, a TXP card cannot be part of a regeneration group.
- Only the working client port can be provisioned with RS-DCC.
- Y-cable cannot be provisioned for a protect version of the TXP_MR_2.5G card.
- Y-cable protection group is not supported on the ADM-10G card.
- Only the working ports (not the protect) can be provisioned with DCC and timing reference.

To provision Y-cable protection groups, use the following commands:

- ENT-FFP-(OCn, nGIGE, nGFC)
- DLT-FFP-(OCn, nGIGE, nGFC)
- ED-FFP-(OCn, nGIGE, nGFC)

Example 2-46 provisions Y-Cable Protection Groups.

Example 2-46 Provision Y-Cable Protection Groups

```
ENT-FFP-OC48::FAC-1-1-1,FAC-2-1-1:100:::PROTTYPE=Y-CABLE,
PROTID=DC-METRO-1,RVRTV=Y,RVTM=1.0,PSDIRN=BI:
ENT-FFP-10GIGE::FAC-1-1-1,FAC-2-1-1:100:::PROTTYPE=Y-CABLE,
PROTID=DC-METRO-2,RVRTV=Y,RVTM-1.0,PSDIRN=BI;
```

2.12.14 Splitter Protection Group Provisioning Rules

The following rules apply when provisioning a splitter protection group:

Note Splitter protection group provisioning rules apply only to the protect version of the TXP and OTU2_XP cards.

- Splitter protection groups cannot be created or deleted.
- Splitter protection groups are created automatically when a protect TXP card is provisioned.
- The only editable attributes for a splitter protection group are Revertive, Revertivetime, and Transponder mode.

To provision a splitter protection group, use the **ED-FFP-OCH** command.

Example 2-47 provisions a splitter protection group:

Example 2-47 Provisioning Splitter Protection Group Attributes:

```
ED-FFP-OCH::CHAN-2-1:100:::PROTID=DC-METRO3,RVRTV=Y,
RVTM=5.0,PSDIRN=BI;
```

2.12.15 Loopback Provisioning Rules

The following rules apply when provisioning loopbacks:

- Loopbacks can be provisioned on the client and trunk ports.
- Both terminal and facility loopback types can be provisioned.
- Loopbacks are not applicable when the framing type is UNFRAMED (HDTV or DV6000).
- For the protect TXP card, the following loopback rules apply to the trunk ports:
  - Only one loopback is allowed to be provisioned at the trunk ports at any given time.
  - Loopback is allowed only if the sibling trunk port is in the OutOfService-Maintenance state.
  - Provisioning a loopback on a trunk port will trigger the LOCKOUT_OF_PROTECTION or LOCKOUT_OF_WORKING inhibit switching command, depending on whether the working or the protect port is placed in the loopback.
  - When a loopback is provisioned on a trunk port, both trunk ports will transmit the signal of the loopback port.
  - A loopback is denied if there is a FORCE or MANUAL switching command in place on the trunk ports.
  - You cannot remove the inhibit switching command issued as a result of the loopback. This inhibit switching command will be removed only when the loopback is removed.

  Use the **OPR-LPBK-OCH** command to provision loopbacks.

  Example 2-48 is an example of operating a loopback.

Example 2-48 Operating a Loopback

```
OPR-LPBK-OCH::CHAN-2-1:1::,,,TERMINAL;
```

2.12.16 Automatic Laser Shutdown Provisioning Rules

The following rules apply when provisioning automatic laser shutdown (ALS):

- ALS can be provisioned on the client and trunk ports. For an ADM-10G card, ALS can be provisioned on interlink ports as well.
- If the trunk port is configured in a splitter protection group, only the working trunk can be provisioned for ALS. However, provisioning on the working trunk port is reflected on the protect port.
- For an OTU2-XP card, ALS can be provisioned on the trunk ports. If the trunk port is configured in an APS protection group, only the working trunk port can be provisioned for ALS. However, provisioning on the working trunk port is reflected on the protect port.
- For the protected TXP card, ALS mode will only take effect when both ports receive a loss of signal (LOS).

To provision ALS, use the following commands:

- **ED-ALS**
- **ED-ALS-(OCn, nGIGE, nGFC, OTS, OMS, OCH)**

Example 2-49 provisions ALS.

Example 2-49 Provision ALS

```
ED-ALS::FAC-1-1-1:100:::ALSMODE=Y,ALSRCINT=130,ALSRCPW=35.1,RLASER=Y;
ED-ALS-OC192::FAC-1-1-1:100:::ALSMODE=Y,ALSRCINT=130,ALSRCPW=35.1,
RLASER=Y;
```

2.12.17 Ethernet Provisioning Rules

Ethernet provisioning is applicable only when the card is configured in the GEXP-L2ETH or 10GEXP-L2ETH mode.

2.12.17.1 Bandwidth Profile Provisioning Rules

The following rules apply when provisioning Bandwidth profile:

- Bandwidth Profile (BWP) database (DB) is applicable to the entire node.
- Any row of the BWP represents a set of VLAN profile attributes.
- Each BWP is identified by a unique number in the range of 1 to 10000.
- BWP 0 is reserved for default profile. Since it contains the default manufacturing data, only retrieve (RTRV) command is applicable.
- NAME, CIR, CBS, PBS, PIR, and CFMSTATE parameters can be configured.

To provision BWP, use the following commands:

- **ENT-BWP-ETH**
- **DLT-BWP-ETH**
- **ED-BWP-ETH**
- **RTRV-BWP-ETH**

Example 2-50 provisions BWP.

Example 2-50 Provision BWP

```
ENT-BWP-ETH:ROCKS:BWP-75:123:::NAME="MyBWP75",CIR=10,CBS=1M,PBS=1M,PIR=20,CFMSTATE=Y;
DLT-BWP-ETH:ROCKS:BWP-75:123;
ED-BWP-ETH:ROCKS:BWP-75:123:::NAME="MyBWP75",CIR=10,CBS=1M,PBS=1M,PIR=25,CFMSTATE=N;
RTRV-BWP-ETH:ROCKS:BWP-75:123;
```

When a BWP is created using the ENT-BWP-ETH command, it can be used in the ED-VLAN-ETH command to set up a relationship between the ETH port, VLAN, and BWP parameters.
If BWP field is omitted the first time the ENT-VLAN-ETH command is executed, then BWP-0 default value is assumed. When a BWP is already associated with the ETH Port-VLAN couple, to detach the Profile and restore the default value, a BWP=0 is requested using the ED-VLAN-ETH command.

TL1 examples of BWP attach, retrieve, or detach are:

```
ED-VLAN-ETH:ROCKS:ETH-1-1-1:123::100:BWP=34;
RTRV-VLAN-ETH:ROCKS:ETH-1-1-1:123::100:;
ED-VLAN-ETH:ROCKS:ETH-1-1-1:123::100:BWP=0;
```

2.12.17.2 VLAN Provisioning Rules

The following rules apply when provisioning the VLAN:

- The VLAN database (DB) is applicable to the entire node.
- Any row of the database represents a VLAN.
- The VLAN DB can be in the range of 1 to 4069. VLAN 0 is reserved for untagged VLAN.
- Name and Protected parameters can be configured.
- There is a hardware limitation on the maximum number of VLANs on which the CIR (Committed Information Rate), CBS (Committed Burst Size), EBS (Excess Burst Size), EIR (Excess Information Rate), and Ingress rate limit is set:
  - For GE_XP and 10GE_XP cards, Ingress rate limit is set on 128 (maximum) VLANs per board.
  - For GE_XPE and 10GE_XPE cards, Ingress rate limit is set on 256 (maximum) VLANs per board.
- A VLAN can be created (ENT), deleted (DLT), modified (ED), and retrieved (RTRV).

To provision VLAN, use the following commands:

- **ENT-VLAN**
- **DLT-VLAN**
- **ED-VLAN**
- **RTRV-VLAN**

Example 2-51 provisions VLAN.

Example 2-51 Provision VLAN

```
ENT-VLAN::VLAN-100:123::NAME="My VLAN",PROTN=N;
DLT-VLAN::VLAN-100:123;
ENT-VLAN::VLAN-100:123::NAME="Your VLAN",PROTN=Y;
RTRV-VLAN::VLAN-100:123
```

2.12.17.3 Link Integrity Rule

Link Integrity must be provisioned on a specific VLAN setting, that is, CFMSTATE=Y, in the bandwidth profile used by the VLAN.

To activate link integrity, use the **ED-BWP-ETH** command.

Example 2-52 activates link integrity.

Example 2-52 Activate Link Integrity

```
ED-BWP-ETH:ROCKS:BWP-56:1:::NAME="MyBWP56",CIR=10,CBS=1M,PBS=1M,PIR=20,CFMSTATE=Y
```

The VLAN-AIS action depends on the AISACTION parameter set on the ETH port. The possible values are AIS-SQUELCH and AIS-NONE.

To set and retrieve the AISACTION value use the following commands:

- **ED-L2-ETH**
- **RTRV-L2-ETH**

Example 2-53 sets and retrieves AISACTION parameter

Example 2-53 Set and Retrieve AISACTION Parameter

```
ED-L2-ETH::ETH-5-3-2-1:502:::AISACTION=AIS-SQUELCH;
RTRV-L2-ETH:TID:ETH-5-3-2-1:CTAG;
```

Since VLAN-AIS alarm on a ETH port is a summarization of multiple possible VLAN-X-AIS, the RTRV-VLAN-ETH command can be used to retrieve specific VLAN-X-AIS status on a single port as shown in the following examples:

```
RTRV-VLAN-ETH:TID:ETH-1-1-1:CTAG::110;
RTRV-VLAN-ETH:TID:ETH-1-1-1:CTAG;
```

Link Integrity can be activated on a limited number of VLANs per board:

- For GE_XP and 10GE_XP cards, link integrity is enabled on 128 (maximum) VLANs.
- For GE_XPE and 10GE_XPE cards, the link integrity feature is enabled on 256 (maximum) VLANs.

2.12.17.4 L2 Provisioning Rules

An L2 Ethernet port is present for every 22 ports of the GE-XP card, and for every 4 ports of the 10GE-XP card.

The following rules apply when provisioning L2:

- An L2 Ethernet port is accessed by the ETH modifier.
- The access identifier (AID) of an L2 Ethernet port is same as the supporting facility, with ETH prefix instead of FAC.
- The following parameters can be edited:
  - PST, SST, CMDMDE, and so on—administrative or service state parameters.
  - NIMODE (UNI,NNI)—client ports default to UNI and trunk ports default to NNI.

- MACLEARNING, INGRESSCOS, ETHERCETYPE (CE type), ETHERSTYPE (Service Provider Type), BPDU, and BRIDGESTATE.
- ALWMACADDR and INHMACADDR—mutually exclusive parameters.
- QNQMODE and TRNSPSVLAN—when QNQMODE is SELECTIVE the QNQ-ETH table should be referred for detailed VLAN association; when QNQMODE is TRANSPARENT, TRANSPSVLAN contains VLAN ID of the only service provider's VLAN configured for the port.
- NAME—name of the facility.

To provision L2, use the following commands:

- **ED-L2-ETH**
- **RTRV-L2-ETH**

Example 2-54 provisions L2.

Example 2-54 Provision L2

```
ED-L2-ETH:CISCO:ETH-1-1-1:123:::NIMODE=NNI,MACLEARNING=Y,INGRESSCOS=7,
ETHERCETYPE=8100,ETHERSTYPE=8100,
ALWMACADDR=[aa-bb-cc-dd-ee-ff&zz-yy-ww-tt-ss-rr],BPDU=Y,BRIDGESTATE=DISABLED,
QNQMODE=TRANSPARENT,TRNSPSVLAN=4096,NAME="Ethernet",IGMPROUTER=STATIC,
AISACTION=AIS-SQUELCH
RTRV-L2-ETH:PETALUMA:FAC-1-1:CTAG;
```

2.12.17.4.1 L2 Queue In Queue (QinQ) Provisioning Rules

The following rules apply when provisioning L2 Queue In Queue (QinQ):

- L2 QinQ associates a customer-end VLAN to a service provider VLAN.
- L2 QinQ is valid on port basis only when QNQMODE is SELECTIVE.
- The following association rules apply between the two VLAN types:
  - Add (ADD) the service provider VLAN when the customer-end VLAN (or a range of customer-end VLAN) matches, *or*
  - Translate (XLTE) the customer-end VLAN (or a range of customer-end VLAN) with service provider VLAN when it matches.

  The default rule is ADD.
- The XLTE-ADD and DOUBLE-ADD rules for QinQ settings are not supported by the GE_XP and 10GE_XP cards.
- DOUBLE-ADD and XLTE-ADD are the newly introduced L2 QinQ rules. INTERNALVLAN and INGRESSCOS are the newly added parameters.
- When the DOUBLE-ADD and XLTE-ADD rules are activated, INTERNALVLAN parameter has to be provided.
- When DOUBLE-ADD rule is activated, the C-VLANs identified by FIRSTCEVLANID and LASTCEVLANID parameters will be added by the INTERNALVLAN parameter first and then added by the SVLANID parameter.
- When XLTE-ADD rule is activated, the C-VLANs identified by FIRSTCEVLANID and LASTCEVLANID parameters will be first translated to the INTERNALVLAN parameter and then will be added by the SVLANID parameter.

- The INGRESSCOS parameter is requested only if the INGRESSCOS parameter on the ETH port is set to VLAN operating mode. This this means the INGRESSCOS parameter applied to this port may be different depending on the VLAN and its QinQ setting.
- Only when the Ethernet port Ingress COS value is set to CVLAN, the ENT-QNQ-ETH command can set the ingress value for QinQ.
- Ingress values for QinQ cannot be set when VLAN ranges are configured for QinQ.
- In retrieve command, the VLAN IDs can be optionally specified to filter CVLAN ID (or a range of them) and SVLAN ID. When the VLAN ID is not specified, all the VLAN IDs associated to the Ethernet port are returned.

To provision QinQ, use the following commands:

- **ENT-QNQ-ETH**
- **ED-QNQ-ETH**
- **RTRV-QNQ-ETH**
- **DLT-QNQ-ETH**

Example 2-55 provisions QinQ.

Example 2-55 Provision QinQ

```
ENT-QNQ-ETH::ETH-2-10-1:123::10,10,100:RULE=XLTE;
RTRV-QNQ-ETH::ETH-2-10-1:123;
```

2.12.17.4.2 L2 Selective NNI Provisioning Rules

The L2 Selective NNI Provisioning applies to an L2 Ethernet port configured as NNI. The following rules apply when provisioning L2 Selective NNI:

- Any entry associates a SVLAN to the Ethernet port.
- User can add (ENT), remove (DLT), and retrieve (RTRV) a VLAN associated to the Ethernet port.
- In the RTRV command, the VLAN ID can be optionally specified in order to filter the SVLAN ID. If the VLAN ID is not specified, then all the VLAN IDs associated to the Ethernet port are returned.

To provision NNI, use the following commands:

- ENT-NNI-ETH
- ED-QNQ-ETH
- RTRV-NNI-ETH

Example 2-56 provisions NNI

Example 2-56 Provision NNI

```
ENT-NNI-ETH::ETH-2-10-1:123::10;
RTRV-NNI-ETH::ETH-2-10-1:123::10;
```

2.12.17.5 Internet Group Management Protocol Rules

The Internet Group Management Protocol (IGMP) can be activated on a specific VLAN by setting IGMPENABLE=Y in the ED-VLAN command. Also, IGMPFASTLEAVE=Y can be set in the ED-VLAN command to decrease the delay for forwarding multicast.

To activate IGMP, use the ED-VLAN command.

Example 2-57 Activate IGMP

```
ED-VLAN:ROCKS:VLAN-1-2-84:1:::NAME="VLAN84",PROTN=N,MACLEARNING=N,IGMPENABLE=Y,IGMPFASTLEA
VE=Y,IGMPSUPP=N
```

To indicate which port is connected to the router, set the parameter IGMPROUTER=STATIC in the ED-L2-ETH command.

To set and retrieve IGMP router, use the following commands:

- ED-L2-ETH
- RTRV-L2-ETH

Example 2-58 sets and retrieves IGMP Router.

Example 2-58 Set and Retrieve IGMP Router

```
ED-L2-ETH:CISCO:ETH-1-1-1:123:::IGMPROUTER=STATIC;
RTRV-L2-ETH:TID:ETH-1-1-1:CTAG;
```

The IGMP Snooping feature can be activated on a limited number of VLANs per board:

- For GE_XP and 10GE_XP cards, the IGMP snooping feature is enabled on 256 (maximum) VLANs.
- For GE_XPE and 10GE_XPE cards, the IGMP snooping feature is enabled on 512 (maximum) VLANs.

2.12.17.6 Multicast VLAN Registration Rule

Multicast VLAN Registration (MVR) can be activated using ED-MCAST command.

To set and retrieve MVR, use the following commands:

- ED-MCAST
- RTRV-MCAST

Example 2-59 sets and retrieves MVR.

Example 2-59 Set and Retrieve MVR

```
ED-MCAST:CISCO:SLOT-1-4:321:::MVRSTATE=Y,MVRSVLAN=46,MVRSTARTIP=230.64.72.57,MVRIPRANGE=20
:;
RTRV-MCAST:CISCO:SLOT-1-4:33;
```

2.12.17.7 1+1 Protection Rule

The 1+1 Protection in L2-over-NCS mode can be activated using the ENT-FFP-GIGE command with a new ONEPLUSONEL2 protection type. The cards must be set in the L2 mode and a double link must be established between the trunk ports.

To establish double link between the trunk ports, use the **ENT-LNK** command.

Example 2-60 establishes double link between trunk ports.

Example 2-60 Establish Double Link between Trunk Ports

```
ENT-LNK::CHAN-4-12-21-1,CHAN-4-14-21-1:1482;
ENT-LNK::CHAN-4-14-21-1,CHAN-4-12-21-1:1486;
```

To create 1+1 L2 protection, use the **ENT-FFP-GIGE** command.

Example 2-61 creates 1+1 L2 Protection.

Example 2-61 Create 1+1 L2 Protection

```
ENT-FFP-GIGE::FAC-4-12-1-1,FAC-4-14-1-1:1487:::PROTTYPE=ONEPLUSONEL2;
```

To operate on switch protection, use the OPR-PROTNSW and RLS-PROTNSW-GIGE commands.

The laser status of the standby port in the protection unit can be decided using the PROTACTION parameter set on the ETH port. PROT-SQUELCH and PROT-NONE are the possible values.

To set and retrieve the PROTACTION value, use the following commands:

- **ED-L2-ETH**
- **RTRV-L2-ETH**

Example 2-62 sets and retrieves the PROTACTION value.

Example 2-62 Set and Retrieve the PROTACTION value

```
ED-L2-ETH::ETH-5-3-2-1:506:::PROTACTION=PROT-SQUELCH;
RTRV-L2-ETH:TID:ETH-5-3-2-1:CTAG;
```

2.12.18 Resilient Ethernet Protocol Provisioning Rule

The Resilient Ethernet Protocol (REP) can be configured on the ethernet port of GE_XP or 10GE_XP card. The following rules apply when provisioning the REP:

- You can configure REP only if the card is in ETH-L2 card mode.
- When REP is enabled, the interface is a regular segment port unless it is configured as an edge port.
- If only one port on the card is configured in a segment, the port should be an edge port.
- If two ports on the card belong to the same segment, both ports must be an edge ports or both ports must be a regular segment ports.

Note If one of the port is an Edge with No Neighbor, the other port can be a Regular segment port.

- Each card can have a maximum of 3 segments.
- Each segment can have a maximum of 2 ports (in the same card).

2.12.19 Connectivity Fault Management Provisioning Rules

The following rules apply when provisioning the Connectivity Fault Management (CFM):

- MAC security and CFM is mutually exclusive per card. You can enable CFM only if the MAC security is not enabled and vice versa.
- You cannot disable CFM when Maintenance End Point (MEP) or Maintenance Intermediate Point (MIP) is configured on the interface.
- Maintenance domain profile name length should not exceed more than 43 characters.

- The level of the maintenance domain should be in the range of 0 to 7.
- No two domains can have the same name.
- You cannot modify or delete the maintenance domain profile when the domain is associated with maintenance association (MA) profile.
- You cannot modify or delete the maintenance domain if the domain is associated with the MEP.
- A maximum of 1000 profiles can be created.
- There should not be a duplicate entry for VLAN and MA name on the profile table.
- You cannot delete the MA if it is associated with any domain.
- You can crate MEP or MIP only on the CFM enabled interfaces.
- You cannot detach the VLAN from the interface if the MEP is configured on the port for the VLAN.
- You cannot modify MEP.
- You cannot configure MIP if MEP with higher or same level is already configured on the port with the same VLAN ID.
- You cannot detach the VLAN from the interface if it is associated with any of the MIPs on the interface.
- A maximum of 1000 MEPs can be created per card.
- A maximum of 1500 MIPs can be created per card.

2.12.20 Ethernet in the First Mile Rules

The following rules apply when provisioning the Ethernet in the First Mile (EFM:

- The EFMSTATE parameter should be “enabled” for the facility by ED-FSTE to edit the EFM parameters.
- You cannot enable or disable the remote loopback through the local interface on the remote OAM peer entity if any other type of loopback (facility/terminal) is already configured on the local interface.
- CFM, REP, link integrity, LACP, FAPS, IGMP on SVLAN and L2 1+1 protection are not supported with EFM.

2.12.21 Link Aggregation Control Protocol Rules

The following rules apply when provisioning the Link Aggregation Control Protocol (LACP):

- When the GE_XP card is provisioned in the switch mode (L2 Mode), you can configure the channel group interfaces as follows:
  - MXP: Up to 11 channel group with a maximum of 8 port for each channel group.
  - TXP: Up to 2 Channel group with a maximum of 3 ports for each channel group.

2.12.22 LEX Provisioning Rules

The following rules apply when provisioning the LEX:

- You can provision LEX only on ADM-10G card.

- You can provision LEX provisioning on any of the 8 GigE Ports.
- LEX framing supports 16-bit or 32-bit CRC configuration. The default CRC for LEX framing is CRC-32 bit.

2.12.23 Port State Model Provisioning Rules

The following rules apply when provisioning the port state model:

- The OutOfService,AutomaticInService state is not supported for the 1GigE and 2GigE payload types.
- The working and protect port can be put in InService and OutOfService independently.
- For the protect TXP card:
  - Setting the protect trunk port to OutOfService enables the suppression of alarms on that port and enables the card to be used like an unprotected card, but the card still cannot be used in a Y-cable protection group.
  - Setting the protect trunk port to OutOfService does not switch off the transmit laser unless both trunk ports are OutOfService.
  - The protect trunk port cannot be InService if a loopback or a regeneration group is provisioned.

To edit the port state, use the **ED-(OCn, nGIGE, nGFC, OCH**) command.

Example 2-63 edits port state.

Example 2-63 Edit Port State

```
ED-STM16::FAC-6-1-1:114::::OutOfService,AutomaticInService;
ED-10GIGE::FAC-6-1:114::::OutOfService,AutomaticInService;
ED-OCH::CHAN-6-1:114::::IS;
```

2.12.24 SDH-Related Provisioning Rules

Use the following rule when editing SDH trunk port attributes:

When provisioning SDH-related parameters, the SDBER and SFBER can only be provisioned on the working trunk port (OCH) for the protect TXP card. Values set at the working port will be reflected on the trunk port.

To edit SDH trunk port attributes, use the **ED-OCH** command.

Example 2-64 edits SDH Trunk port attributes.

Example 2-64 Edit SDH Trunk Port Attributes

```
ED-OCH::CHAN-6-2:114:::RDIRN=W-E,EXPWLEN=1530.32,VOAATTN=2.5,VOAPWR=7.5,
CALOPWR=0,CHPOWER=2.0,NAME="NYLINE",SFBER=1E-5,SDBER=1E-6,
ALSMODE=MAN,ALSRCINT=60,ALSRCPW=35.1,COMM=DCC,GCCRATE=192K,
OSDBER=1E-6,DWRAP=Y,FEC=Y,MACADDR=OO-OE-AA-BB-CC-DD,SYNCMSG=N,
SENDDUS=Y,RLASER=Y,SOAK=10,OSPF=Y:OutOfService,AutomaticInService;
```

2.12.25 Overhead (OH) Circuit Provisioning Rules

Use the following rules when provisioning overhead circuits:

- Local orderwire/express orderwire (LOW/EOW) is possible between the AIC-I, STM, and TXP/TXPP cards in any combination in line-terminated mode.
- Creating a F1/D4-D12 user data channel (UDC) is:
  - Not possible between TXP/TXPP and AIC-I cards in line-terminated mode.
  - Not possible between TXP/TXPP and STM cards in line-terminated mode.
  - Possible between STM ports.
- All overhead (OH) bytes are passed across client and NCS ports in transparent mode.
- RS-DCC and MS-DCC tunneling is not possible in line-terminated mode.
- No end-to-end OH circuit provisioning is allowed.
- For MXP_MR_2.5G and MXPP_MR_2.5G cards, these rules apply to the trunk port only.