Layer 2 Local Switching

The Layer 2 Local Switching feature allows you to switch Layer 2 data between two interfaces on the same router, and in some cases to switch Layer 2 data between two circuits on the same interface port. The interface-to-interface switching combinations supported by this feature are:

- ATM to ATM
- ATM to Ethernet
- ATM to Frame-Relay
- Ethernet to Ethernet VLAN
- Frame Relay to Frame Relay (and since 12.0(28)S, also to Multilink Frame Relay)

The same-port switching feature introduced with Release 12.0(30)S supports the following:

- Same-Port Switching for ATM (PVC and PVP)
- Same-Port Switching for Ethernet VLAN
- Same-Port Switching for Frame Relay

Beginning with Cisco IOS Release 12.0(30)S, cell packing is available during ATM VP or VC local switching—on the Cisco Series 12000 router Engine 3 linecards. For information about how to configure cell-packing, see *Any Transport over MPLS*.

### Feature History of Layer 2 Local Switching

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.0(27)S</td>
<td>The feature was introduced on the Cisco 7200 and 7500 series routers.</td>
</tr>
<tr>
<td>12.2(25)S</td>
<td>The feature was integrated into Cisco IOS Release 12.2(25)S.</td>
</tr>
<tr>
<td>12.0(30)S</td>
<td>Same-port switching was added. Support for that and for local switching between interfaces was also added for Cisco 12000 series routers.</td>
</tr>
<tr>
<td>12.2(28)SB</td>
<td>This feature was updated to include NSF/SSO support on the Cisco 7500 series routers for the following local switching types:</td>
</tr>
<tr>
<td></td>
<td>- NSF/SSO—Ethernet to Ethernet VLAN Local Switching Support</td>
</tr>
<tr>
<td></td>
<td>- NSF/SSO—Frame Relay to Frame Relay Local Switching Support</td>
</tr>
</tbody>
</table>
Finding Support Information for Platforms and Cisco IOS Software Images

Use Cisco Feature Navigator to find information about platform support and Cisco IOS software image support. Access Cisco Feature Navigator at http://www.cisco.com/go/fn. You must have an account on Cisco.com. If you do not have an account or have forgotten your username or password, click Cancel at the login dialog box and follow the instructions that appear.

Contents

- Information About Layer 2 Local Switching, page 2
- Prerequisites for Layer 2 Local Switching, page 3
- Restrictions for Layer 2 Local Switching, page 3
- How to Configure Layer 2 Local Switching, page 7
- Configuration Examples for Layer 2 Local Switching, page 31
- Additional References, page 36
- Command Reference, page 38

Information About Layer 2 Local Switching

The following sections provide an introduction to the Layer 2 Local Switching feature:

- Local Switching Overview, page 2
- NSF/SSO—Local Switching Overview, page 2
- When to Use Local Switching, page 3

Local Switching Overview

Local switching allows you to switch Layer 2 data between two interfaces of the same type (for example, ATM to ATM, or Frame Relay to Frame Relay) or between interfaces of different types (for example, Frame Relay to ATM) on the same router. The interfaces can be on the same line card or on two different cards. During these kinds of switching, the Layer 2 address is used, not any Layer 3 address.

Additionally, same-port local switching allows you to switch Layer 2 data between two circuits on the same interface.

NSF/SSO—Local Switching Overview

Nonstop Forwarding (NSF) and Stateful Switchover (SSO) improve the availability of the network by providing redundant route processors and checkpointing of data to ensure minimal packet loss when the primary route processor goes down. NSF/SSO support is available for the following locally switched attachment circuits:

- Ethernet to Ethernet VLAN
- Frame Relay to Frame Relay
When to Use Local Switching

Incumbent local exchange carriers (ILECs) who use an interexchange carrier (IXC) to carry traffic between two local exchange carriers can use Local Switching. Telecom regulations require the ILECs to pay the IXCs to carry that traffic. At times, the ILECs cannot terminate customer connections that are in different local access and transport areas (LATAs). In other cases, customer connections terminate in the same LATA, which may also be on the same router.

For example, company A has more than 50 LATAs across the country and uses three routers for each LATA. Company A uses companies B and C to carry traffic between local exchange carriers. Local switching of Layer 2 frames on the same router might be required.

Similarly, if a router is using, for example, a channelized interface, it might need to switch incoming and outgoing traffic across two logical interfaces that reside on a single physical port. The same-port local switching feature addresses that implementation.

Figure 1 shows a network that using local switching for both Frame Relay to Frame Relay and ATM to Frame Relay local switching.

Prerequisites for Layer 2 Local Switching

- You must enable Cisco Express Forwarding (CEF) for the Cisco 7200 series router. You must use CEF or Distributed CEF for the Cisco 7500 series router. (Distributed CEF is enabled already by default on the Cisco 12000 series routers).
- For Frame Relay local switching, you must globally issue the `frame-relay switching` command.

Restrictions for Layer 2 Local Switching

The following sections list the restrictions for the Layer 2 Local Switching feature:

- General Restrictions, page 4
- Supported Port Adapters on Cisco 7200 and 7500 Series Routers, page 4
- Supported Interface Processors on Cisco 7200 Series Routers, page 5
General Restrictions

- For ATM-to-ATM local switching, the following ATM types are supported for the Layer 2 Local Switching feature:
  - ATM adaptation layer 5 (AAL5)
  - ATM Single Cell Relay adaptation layer 0 (AAL0), VC mode
  - ATM Single Cell Relay VP mode on the Cisco 12000 series routers
  - ATM Packed Cell Relay VC and VP modes on the ISE linecard of Cisco 12000 series routers
- In ATM Single Cell Relay AAL0, the ATM virtual path identifier/virtual channel identifier (VPI/VCI) values must match between the ingress and egress ATM interfaces on the Cisco 7200 series and 7500 series routers. If Layer 2 switching is desired between two ATM VPIs and VCIs whose values do not match and are on two different interfaces, choose ATM AAL5. However, if the ATM AAL5 is using Operation, Administration, and Maintenance (OAM) transparent mode, the VPI and VCI values must match.
- On the Cisco 12000 series routers, VPI/VCI rewrite is supported.
- NSF/SSO for Layer 2 Local Switching is supported on the Cisco 7500 series routers.

Supported Port Adapters on Cisco 7200 and 7500 Series Routers

Layer 2 local switching is supported on the following port adapters in the Cisco 7200 and 7500 series routers:

- PA-FE-TX (single-port Fast Ethernet 100BASE-TX)
- PA-FE-FX (single-port Fast Ethernet 100BASE-FX)
- PA-2FE-TX (dual-port Fast Ethernet 100BASE-TX)
- PA-2FE-FX (dual-port Fast Ethernet 100BASE-FX)
- PA-4E (4-port Ethernet adapter)
- PA-8E (8-port Ethernet adapter)
- PA-4T (4-port synchronous serial port adapter)
- PA-4T+ (enhanced 4-port synchronous serial port adapter)
- PA-8T (8-port synchronous serial port adapter)
- PA-12E/2FE (12-port Ethernet/2-port FE adapter) [Cisco 7200 only]
- PA-GE (Gigabit Ethernet port adapter) [Cisco 7200 only]
- PA-H (single-port HSSI adapter)
- PA-2H (dual-port HSSI adapter)
- PA-MC-8E1 (8-port multichannel E1 G.703/G.704 120-ohm interfaces)
- PA-MC-2EI (2-port multichannel E1 G.703/G.704 120-ohm interfaces)
Layer 2 Local Switching

Restrictions for Layer 2 Local Switching

- PA-MC-8T1 (8-port multichannel T1 with integrated CSUs and DSUs)
- PA-MC-4T1 (4-port multichannel T1 with integrated CSUs and DSUs)
- PA-MC-2T1 (2-port multichannel T1 with integrated CSUs and DSUs)
- PA-MC-8TE1+ (8-port multichannel T1/E1)
- PA-MC-T3 (1-port multichannel T3 interface)
- PA-MC-E3 (1-port multichannel E3 interface)
- PA-MC-2T3+ (2-port enhanced multichannel T3 port adapter)
- PA-MC-STM1 (1-port multichannel STM1 port adapter) [Cisco 7500 only]
- PA-T3 (single-port T3 port adapter)
- PA-E3 (single-port E3 port adapter)
- PA-2E3 (2-port E3 port adapter)
- PA-2T3 (2-port T3 port adapter)
- PA-POS-OC3SML (single-port POS, single-mode, long reach)
- PA-POS-OC3SMI (single-port POS, single-mode, intermediate reach)
- PA-POS-OC3MM (single-port POS, multimode)
- PA-A3-OC3 (1-port ATM OC3/STM1 port adapter, enhanced)
- PA-A3-OC12 (1-port ATM OC12/STM4 port adapter, enhanced) [7500 only]
- PA-A3-T3 (DS3 high-speed interface)
- PA-A3-E3 (E3 medium-speed interface)
- PA-A3-8T1IMA (ATM inverse multiplexer over ATM port adapter with 8 T1 ports)
- PA-A3-8E1IMA (ATM inverse multiplexer over ATM port adapter with 8 E1 ports)

Supported Interface Processors on Cisco 7200 Series Routers

- C7200-I/O-2FE
- C7200-I/O-GE+E (Only the Gigabit Ethernet port of this port adapter is supported.)
- C7200-I/O-FE

Supported Interface Processors on Cisco 7500 Series Routers

- GEIP (Gigabit Ethernet interface processor)
- GEIP+ (Enhanced Gigabit Ethernet interface processor)

Supported Interface Processors on Cisco 12000 Series Routers

- Engine-3 linecards support like-to-like and any-to-any local switching
- 8-port OC3 ATM Engine-2 linecards support only like-to-like local switching
- All linecards support FR-to-FR local switching
Unsupported Hardware

The following hardware is not supported:

- Cisco 7200—non-VXR chassis
- Cisco 7500—RSP1 and RSP2
- Cisco 7500—VIP 2-40 and below
- Cisco 12000 series—4-port OC3 ATM Engine-0 linecard
- Cisco 12000 series—4-port OC12 ATM Engine-2 linecard
- Cisco 12000 series—1-port OC12 ATM Engine-0 linecard
- Cisco 12000 series—Ethernet Engine-1, Engine-2, and Engine-4 linecards
How to Configure Layer 2 Local Switching

The following sections explain the tasks you can perform to set up Layer 2 Local Switching:

- Configuring ATM-to-ATM PVC Local Switching, page 8 (required)
- Configuring ATM PVC Same-Port Switching, page 10 (required)
- Configuring ATM-to-ATM PVP Local Switching, page 12 (required)
- Configuring ATM PVP Same-Port Switching, page 14 (required)
- Configuring ATM-to-Ethernet (Port Mode) Local Switching, page 16 (required)
- Configuring ATM-to-Ethernet (VLAN Mode) Local Switching, page 18 (required)
- Configuring Ethernet VLAN Same-Port Switching, page 20 (required)
- Configuring Ethernet (Port Mode) to Ethernet VLAN Local Switching, page 21 (required)
- Configuring ATM-to-Frame-Relay Local Switching, page 23 (required)
- Configuring Frame-Relay-to-Frame-Relay Local Switching, page 25 (required)
- Configuring Frame Relay Same-Port Switching, page 27 (required)
- Verifying Layer 2 Local Switching, page 29 (optional)
- Configuring NSF/SSO—Local Switching Support, page 30 (optional)
- Verifying the SSO/NSF Configuration, page 31 (optional)
Configuring ATM-to-ATM PVC Local Switching

Important points:

- You can configure local switching for both ATM AAL5 and ATM AAL0 encapsulation types.
- Creating the ATM PVC is not required. If you do not create a PVC, one is created for you. For ATM-to-ATM local switching, the autoprovisioned PVC is given the default encapsulation type AAL0 cell relay.
- Starting with Release 12.0(30)S, you can configure same-port switching, as detailed in the section “Configuring ATM PVC Same-Port Switching” section on page 10.

Use the following steps to configure ATM-to-ATM local switching.

**SUMMARY STEPS**

1. enable
2. configure terminal
3. interface atm slot/port
4. pvc vpi/vci l2transport
5. encapsulation layer-type
6. exit
7. exit
8. connect connection-name interface pvc interface pvc

**DETAILED STEPS**

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong> enable</td>
<td>Enables privileged EXEC mode.</td>
</tr>
<tr>
<td><strong>Step 2</strong> configure terminal</td>
<td>Enters global configuration mode.</td>
</tr>
<tr>
<td><strong>Step 3</strong> interface atm slot/port</td>
<td>Specifies an ATM interface and enters interface configuration mode.</td>
</tr>
<tr>
<td><strong>Step 4</strong> pvc vpi/vci l2transport</td>
<td>Assigns a virtual path identifier (VPI) and virtual channel identifier (VCI). The l2transport keyword indicates that the PVC is a switched PVC instead of a terminated PVC. Enters PVC l2transport configuration mode.</td>
</tr>
</tbody>
</table>

**Example:**

Router> enable

Example:

Router# configure terminal

Example:

Router(config)# interface atm 1/0

Example:

Router(config-if)# pvc 1/200 l2transport
### Command or Action

<table>
<thead>
<tr>
<th>Step</th>
<th>Command/Action</th>
<th>Purpose</th>
</tr>
</thead>
</table>
| 5    | `encapsulation layer-type` | Specifies the encapsulation type for the PVC. Both AAL0 and AAL5 are supported.  
- Repeat Steps 3 through 5 for another ATM PVC on the same router. |
| 6    | `exit`         | Exits PVC l2transport configuration mode and returns to interface configuration mode. |
| 7    | `exit`         | Exits interface configuration mode and returns to global configuration mode. |
| 8    | `connect connection-name interface pvc interface pvc` | Creates a local connection between the two specified permanent virtual circuits. |

#### Example:

Step 5:
```
Router(config-if-atm-l2trans-pvc)# encapsulation aal5
```

Step 6:
```
Router(config-if-atm-l2trans-pvc)# exit
```

Step 7:
```
Router(config-if)# exit
```

Step 8:
```
Router(config)# connect atm-con atm1/0/0 0/100 atm 2/0/0 0/100
```
# Configuring ATM PVC Same-Port Switching

Use the following steps to configure local PVC switching on a single ATM interface.

## SUMMARY STEPS

1. enable
2. configure
terminal
3. interface atm\_slot/subslot/port
4. pvc vpi/vci \texttt{l2transport}
5. encapsulation layer-type
6. exit
7. exit
8. connect connection-name interface pvc interface pvc

## DETAILED STEPS

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td>enable</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td>Router&gt; enable</td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td>configure terminal</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td>Router# configure terminal</td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td>interface atm_slot/subslot/port</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td>Router(config)# interface atm1/0/0</td>
</tr>
<tr>
<td><strong>Step 4</strong></td>
<td>pvc vpi/vci \texttt{l2transport}</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td>Router(config-if)# pvc 0/100 l2transport</td>
</tr>
<tr>
<td><strong>Step 5</strong></td>
<td>encapsulation layer-type</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td>Router(config-if-atm-l2trans-pvc)# encapsulation aal5</td>
</tr>
<tr>
<td><strong>Step 6</strong></td>
<td>exit</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td>Router(config-if-atm-l2trans-pvc)# exit</td>
</tr>
</tbody>
</table>
### Step 7

**Command or Action**: `exit`  
**Purpose**: Exits interface configuration mode and returns to global configuration mode.

**Example**:  
`Router(config-if)# exit`

### Step 8

**Command or Action**: `connect connection-name interface pvc interface pvc`  
**Purpose**: In global configuration mode, creates a local connection between the two specified permanent virtual circuits.

**Example**:  
`Router(config)# connect atm-con atml/0/0 0/100 atm1/0/0 0/200`
Configuring ATM-to-ATM PVP Local Switching

Use the following steps to configure ATM-to-ATM PVP local switching.
(Starting with Release 12.0(30)S, you can configure same-port switching, as detailed in the “Configuring ATM PVP Same-Port Switching” section on page 14.)

SUMMARY STEPS

1. enable
2. configure terminal
3. interface atm slot/port
4. atm pvp vpi l2transport
5. exit
6. exit
7. connect connection-name interface pvp interface pvp

DETAILED STEPS

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong> enable</td>
<td>Enables privileged EXEC mode.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td>Router&gt; enable</td>
<td></td>
</tr>
<tr>
<td><strong>Step 2</strong> configure terminal</td>
<td>Enters global configuration mode.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td>Router# configure terminal</td>
<td></td>
</tr>
<tr>
<td><strong>Step 3</strong> interface atm slot/port</td>
<td>Specifies an ATM interface and enters interface configuration mode.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td>Router(config)# interface atm1/0</td>
<td></td>
</tr>
<tr>
<td><strong>Step 4</strong> atm pvp vpi l2transport</td>
<td>Identifies the virtual path and enters PVP l2transport configuration</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td>mode. The l2transport keyword indicates that the PVP is a switched</td>
</tr>
<tr>
<td>Router(config-if)# atm pvp 100 l2transport</td>
<td>PVP instead of a terminated PVP.</td>
</tr>
<tr>
<td><strong>Step 5</strong> exit</td>
<td>Exits PVP l2transport configuration mode and returns to interface</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td>configuration mode.</td>
</tr>
<tr>
<td>Router(config-if-atm-l2trans-pvp)# exit</td>
<td></td>
</tr>
</tbody>
</table>
### How to Configure Layer 2 Local Switching

#### Step 6
**exit**

**Example:**
```
Router(config-if)# exit
```

Exits interface configuration mode and returns to global configuration mode.

#### Step 7
**connect connection-name interface pvp interface pvp**

**Example:**
```
Router(config)# connect atm-con
atml/0 100 atm2/0 200
```

In global configuration mode, creates a local connection between the two specified permanent virtual paths.
Configuring ATM PVP Same-Port Switching

Use the following steps to configure local PVP switching on a single ATM interface.

SUMMARY STEPS

1. enable
2. configure terminal
3. interface atm slot/subslot/port
4. atm pvp vpi l2transport
5. exit
6. exit
7. connect connection-name interface pvp interface pvp

DETAILED STEPS

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1 enable</td>
<td>Enables privileged EXEC mode.</td>
</tr>
<tr>
<td>Example: Router&gt; enable</td>
<td></td>
</tr>
<tr>
<td>Step 2 configure terminal</td>
<td>Enters global configuration mode.</td>
</tr>
<tr>
<td>Example: Router# configure terminal</td>
<td></td>
</tr>
<tr>
<td>Step 3 interface atm slot/subslot/port</td>
<td>Specifies an ATM interface, subslot (if available), and port.</td>
</tr>
<tr>
<td>Example: Router(config)# interface atm1/0/0</td>
<td></td>
</tr>
<tr>
<td>Step 4 atm pvp vpi l2transport</td>
<td>Specifies one virtual path identifier (VPI) and enters PVP l2transport configuration mode. Repeat this step for the other ATM permanent virtual path on this same port.</td>
</tr>
<tr>
<td>Example: Router(config-if)# atm pvp 100 l2transport</td>
<td></td>
</tr>
<tr>
<td>Step 5 exit</td>
<td>Exits PVP l2transport configuration mode and returns to interface configuration mode.</td>
</tr>
<tr>
<td>Example: Router(config-if-atm-l2trans-pvp)# exit</td>
<td></td>
</tr>
</tbody>
</table>
### Command or Action

<table>
<thead>
<tr>
<th>Step 6</th>
<th>exit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example:</td>
<td>Router(config-if)# exit</td>
</tr>
<tr>
<td>Purpose</td>
<td>Exits interface configuration mode and returns to global configuration mode.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step 7</th>
<th>connect connection-name interface pvp interface pvp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example:</td>
<td>Router(config)# connect atm-con atm1/0/0 100 atm1/0/0 200</td>
</tr>
<tr>
<td>Purpose</td>
<td>In global configuration mode, creates the local connection between the two specified permanent virtual paths.</td>
</tr>
</tbody>
</table>
Configuring ATM-to-Ethernet (Port Mode) Local Switching

Important points:

- Creating the ATM PVC is not required. If you do not create a PVC, one is created for you. For ATM-to-Ethernet local switching, the autoprovisioned PVC is given the default encapsulation type AAL5SNAP.
- ATM-to-Ethernet local switching supports both the IP and Ethernet interworking types.
- ATM-to-Ethernet local switching supports the following encapsulation types:
  - ATM-to-Ethernet with IP interworking: AAL5SNAP, AAL5MUX
  - ATM-to-Ethernet with Ethernet interworking: AAL5SNAP

Use the following steps to configure local switching between ATM and Ethernet port mode.

**SUMMARY STEPS**

1. `enable`
2. `configure terminal`
3. `interface atm slot/port`
4. `pvc vpi/vci l2transport`
5. `encapsulation layer-type`
6. `exit`
7. `exit`
8. `interface fastethernet slot/port`
9. `exit`
10. `connect connection-name interface pvc interface interworking interworking-type`

**DETAILED STEPS**

<table>
<thead>
<tr>
<th>Step</th>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
</table>
| 1.   | enable            | Enables privileged EXEC mode.  
  **Example:**  
  `Router> enable`  
  Enter your password if prompted. |
| 2.   | configure terminal| Enters global configuration mode.  
  **Example:**  
  `Router# configure terminal` |
| 3.   | interface atm slot/port | Specifies an ATM interface and enters interface configuration mode.  
  **Example:**  
  `Router(config)# interface atm 1/0` |
### Step 4
**Command or Action**: `pvc vpi/vci l2transport`  
**Example**: `Router(config-if)# pvc 1/200 l2transport`

Assigns a virtual path identifier (VPI) and virtual channel identifier (VCI), and enters PVC l2transport configuration mode.  
- The `l2transport` keyword indicates that the PVC is a switched PVC instead of a terminated PVC.

### Step 5
**Command or Action**: `encapsulation layer-type`  
**Example**: `Router(config-if-atm-l2trans-pvc)# encapsulation aal5snap`

Specifies the encapsulation type for the PVC.

### Step 6
**Command or Action**: `exit`  
**Example**: `Router(config-if-atm-l2trans-pvc)# exit`

Exits PVC l2transport configuration mode and returns to interface configuration mode.

### Step 7
**Command or Action**: `exit`  
**Example**: `Router(config-if)# exit`

Exits interface configuration mode and returns to global configuration mode.

### Step 8
**Command or Action**: `interface fastethernet slot/port`  
**Example**: `Router(config)# interface fastethernet6/0/0`

Specifies a FastEthernet interface.

### Step 9
**Command or Action**: `exit`  
**Example**: `Router(config)# exit`

Exits interface configuration mode and returns to global configuration mode.

### Step 10
**Command or Action**: `connect connection-name interface pvc interface interworking interworking-type`  
**Example**: `Router(config)# connect atm-eth-con atm1/0 0/100 fastethernet6/0/0 interworking ethernet`

In global configuration mode, creates a local connection between the two interfaces and specifies the interworking type.  
- Both the IP and Ethernet interworking types are supported.
Configuring ATM-to-Ethernet (VLAN Mode) Local Switching

Important points:

- Creating the ATM PVC is not required. If you do not create a PVC, one is created for you. For ATM-to-Ethernet Local Switching, the autoprovisioned PVC is given the default encapsulation type AAL5SNAP.
- ATM-to-Ethernet Local Switching supports both the IP and Ethernet interworking types.
- ATM-to-Ethernet Local Switching supports the following encapsulation types:
  - ATM-to-Ethernet with IP interworking: AAL5SNAP, AAL5MUX
  - ATM-to-Ethernet with Ethernet interworking: AAL5SNAP
- The VLAN header is removed from frames that are received on an Ethernet subinterface.

Use the following steps to configure local switching for ATM to Ethernet in VLAN mode.

**SUMMARY STEPS**

1. `enable`
2. `configure terminal`
3. `interface atm slot/port`
4. `pvc vpi/vci l2transport`
5. `encapsulation layer-type`
6. `exit`
7. `interface fastethernet slot/port/subint`
8. `encapsulation dot1q vlan-id`
9. `exit`
10. `connect connection-name interface pvc interface interworking interworking-type`

**DETAILED STEPS**

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong> enable</td>
<td>Enables privileged EXEC mode.</td>
</tr>
<tr>
<td><strong>Example:</strong> enable</td>
<td></td>
</tr>
<tr>
<td>Router&gt; enable</td>
<td></td>
</tr>
<tr>
<td><strong>Step 2</strong> configure terminal</td>
<td>Enters global configuration mode.</td>
</tr>
<tr>
<td><strong>Example:</strong> configure terminal</td>
<td></td>
</tr>
<tr>
<td>Router# configure terminal</td>
<td></td>
</tr>
<tr>
<td><strong>Step 3</strong> interface atm slot/subslot/port</td>
<td>Specifies an ATM interface and enters interface configuration mode.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td>Router(config)# interface atm1/0/0</td>
<td></td>
</tr>
</tbody>
</table>
### Command or Action | Purpose
--- | ---
**Step 4**
```
pvc vpi/vci l2transport
```
Assigns a virtual path identifier (VPI) and virtual circuit identifier (VCI), and enters PVC l2transport configuration mode.
- The `l2transport` keyword indicates that the PVC is a switched PVC instead of a terminated PVC.

**Example:**
```
Router(config-if)# pvc 1/200 l2transport
```

**Step 5**
```
encapsulation layer-type
```
Specifies the encapsulation type for the PVC.

**Example:**
```
Router(config-if-atm-l2trans-pvc)# encapsulation aal5snap
```

**Step 6**
```
exit
```
Exits PVC l2transport configuration mode and returns to interface configuration mode.

**Example:**
```
Router(config-if-atm-l2trans-pvc)# exit
```

**Step 7**
```
interface fastethernet slot/port/subint
```
Specifies a FastEthernet interface and enters subinterface configuration mode.

**Example:**
```
Router(config-if)# interface fastethernet6/0/0.1
```

**Step 8**
```
encapsulation dot1q vlan-id
```
Enables the interface to accept 802.1Q virtual LAN (VLAN) packets.

**Example:**
```
Router(config-subif)# encapsulation dot1q 100
```

**Step 9**
```
exit
```
Exits subinterface configuration mode and returns to global configuration mode.

**Example:**
```
Router(config-subif)# exit
```

**Step 10**
```
connect connection-name interface pvc interface interworking interworking-type
```
In global configuration mode, creates a local connection between the two interfaces and specifies the interworking type.
- Both the IP and Ethernet interworking types are supported.

**Example:**
```
Router(config)# connect atm-eth-vlan-con atm1/0/0 0/100 fastethernet6/0/0.1 interworking ethernet
```
Configuring Ethernet VLAN Same-Port Switching

Use the following steps to configure switching from one VLAN to another VLAN on the same Ethernet or FastEthernet port.

**SUMMARY STEPS**

1. `enable`
2. `configure terminal`
3. `interface fastethernet slot/port.subinterface-number`
4. `encapsulation dot1q vlan-id`
5. `exit`
6. `interface fastethernet slot/port.subinterface-number`
7. `encapsulation dot1q vlan-id`
8. `exit`
9. `connect connection-name interface interface`

**DETAILED STEPS**

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td><code>enable</code> Enables privileged EXEC mode.</td>
</tr>
<tr>
<td></td>
<td>- Enter your password if prompted.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td><code>Router&gt; enable</code></td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td><code>configure terminal</code> Enters global configuration mode.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td><code>Router# configure terminal</code></td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td><code>interface fastethernet slot/port.subinterface-number</code> Specifies the first FastEthernet subinterface, and opens subinterface configuration mode.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td><code>Router(config)# interface fastethernet6/0.1</code></td>
</tr>
<tr>
<td><strong>Step 4</strong></td>
<td><code>encapsulation dot1q vlan-id</code> Enables that subinterface to accept 802.1Q VLAN packets and specifies the first VLAN.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td><code>Router(config-subif)# encapsulation dot1q 10</code></td>
</tr>
<tr>
<td><strong>Step 5</strong></td>
<td><code>exit</code> Exits subinterface configuration mode and returns to global configuration mode.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td><code>Router(config-subif)# exit</code></td>
</tr>
</tbody>
</table>
### Step 6
**interface fastethernet slot/port.subinterface-number**

**Example:**
Router(config)# interface fastethernet6/0.2

**Purpose:**
In global configuration mode, specifies the other FastEthernet subinterface and opens subinterface configuration mode.

### Step 7
**encapsulation dot1q vlan-id**

**Example:**
Router(config-subif)# encapsulation dot1q 20

**Purpose:**
Enables this subinterface to accept 802.1Q VLAN packets and specifies the second VLAN.

### Step 8
**exit**

**Example:**
Router(config-subif)# exit

**Purpose:**
Exits subinterface configuration mode and returns to global configuration mode.

### Step 9
**connect connection-name interface interface**

**Example:**
Router(config)# connect fastethernet6/0.1 fastethernet6/0.2

**Purpose:**
In global configuration mode, creates a local connection between the two subinterfaces (and hence their previously specified VLANS) on the same FastEthernet port.

---

## Configuring Ethernet (Port Mode) to Ethernet VLAN Local Switching

This section explains how to configure local switching for Ethernet (port mode) to Ethernet VLAN.

### SUMMARY STEPS

1. enable
2. configure terminal
3. interface fastethernet slot/port
4. interface fastethernet slot/port/subint
5. encapsulation dot1q vlan-id
6. exit
7. **connect connection-name fastethernet interface_1 fastethernet interface_2 interworking interworking-type**
## DETAILED STEPS

<table>
<thead>
<tr>
<th>Step</th>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
</table>
| 1    | `enable`         | Enables privileged EXEC mode.  
  - Enter your password if prompted. |
| 2    | `configure terminal` | Enters global configuration mode. |
| 3    | `interface fastethernet slot/port` | Specifies a FastEthernet interface. This is the interface on one side of the PE router that passes Ethernet packets to and from CE1. |
| 4    | `interface fastethernet slot/port/subint` | Specifies a FastEthernet interface. This is the interface on the other side of the PE router than passes Ethernet VLAN packets to and from CE2. |
| 5    | `encapsulation dot1q vlan-id` | Enables the interface to accept 802.1Q virtual LAN (VLAN) packets. |
| 6    | `exit`           | Exits subinterface configuration mode and returns to global configuration mode. |
| 7    | `connect connection-name fastethernetinterface_1 fastethernetinterface_2 interworking interworking-type` | In global configuration mode, creates a local connection between the two interfaces and specifies the interworking type.  
  - Both the IP and Ethernet interworking types are supported. |
Configuring ATM-to-Frame-Relay Local Switching

ATM-to-Frame-Relay local switching was introduced in an earlier release of Cisco IOS software. Now you use the `interworking ip` keyword for configuring ATM-to-Frame-Relay local switching.

FRF.8 Frame-Relay-to-ATM service interworking functionality is not supported. Frame Relay discard-eligible (DE) bits do not get mapped to ATM cell loss priority (CLP) bits, and forward explicit congestion notification (FECN) bits do not get mapped to ATM explicit forward congestion indication (EFCI) bits.

For additional information about ATM-to-Frame-Relay Local Switching, see the “Configuring Frame Relay-ATM Interworking” section of the Cisco IOS Wide Area Networking Configuration Guide.

Creating the PVC is not required. If you do not create a PVC, one is created for you. For ATM-to-Ethernet local switching, the automatically provisioned PVC is given the default encapsulation type AAL5SNAP.

ATM-to-Frame-Relay Local Switching supports the following encapsulation types:

- AAL5SNAP
- AAL5NLPID (Cisco 12000 series uses AAL5MUX instead, for IP interworking)

**SUMMARY STEPS**

1. `enable`
2. `configure terminal`
3. `interface atm slot/port`
4. `pvc vpi/vci l2transport`
5. `encapsulation layer-type`
6. `exit`
7. `interface serial slot/port`
8. `encapsulation frame-relay [cisco | ietf]`
9. `frame-relay interface-dlci dlci switched`
10. `exit`
11. `connect connection-name interface pvc interface dlci interworking interworking-type`

**DETAILED STEPS**

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td></td>
</tr>
<tr>
<td><code>enable</code></td>
<td>Enables privileged EXEC mode.</td>
</tr>
<tr>
<td><em>Example:</em> Router&gt; enable</td>
<td><em>Enter your password if prompted.</em></td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td></td>
</tr>
<tr>
<td><code>configure terminal</code></td>
<td>Enters global configuration mode.</td>
</tr>
<tr>
<td><em>Example:</em> Router# configure terminal</td>
<td></td>
</tr>
</tbody>
</table>

Cisco IOS Release: Multiple Releases (See the Feature History Table.)
### How to Configure Layer 2 Local Switching

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 3</strong></td>
<td></td>
</tr>
<tr>
<td><code>interface atm slot/port</code></td>
<td>Specifies an ATM interface, and opens interface configuration mode.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td><code>Router(config)# interface atm1/0</code></td>
<td></td>
</tr>
<tr>
<td><strong>Step 4</strong></td>
<td></td>
</tr>
<tr>
<td><code>pvc vpi/vci l2transport</code></td>
<td>Assigns a virtual path identifier (VPI) and virtual circuit identifier (VCI), and enters PVC l2transport configuration mode.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td><code>Router(config-if)# pvc 1/200 l2transport</code></td>
<td></td>
</tr>
<tr>
<td><strong>Step 5</strong></td>
<td></td>
</tr>
<tr>
<td><code>encapsulation layer-type</code></td>
<td>Specifies the encapsulation type for the PVC.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td><code>Router(cfg-if-atm-l2trans-pvc)# encapsulation aal5snap</code></td>
<td></td>
</tr>
<tr>
<td><strong>Step 6</strong></td>
<td></td>
</tr>
<tr>
<td><code>exit</code></td>
<td>Exits PVC l2transport configuration mode and returns to interface configuration mode.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td><code>Router(cfg-if-atm-l2trans-pvc)# exit</code></td>
<td></td>
</tr>
<tr>
<td><strong>Step 7</strong></td>
<td></td>
</tr>
<tr>
<td><code>interface serial slot/port</code></td>
<td>Specifies a serial interface.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td><code>Router(config-if)# interface serial6/0/0</code></td>
<td></td>
</tr>
<tr>
<td><strong>Step 8</strong></td>
<td></td>
</tr>
<tr>
<td>`encapsulation frame-relay [cisco</td>
<td>ietf]`</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td><code>Router(config-if)# encapsulation frame-relay ietf</code></td>
<td></td>
</tr>
<tr>
<td><strong>Step 9</strong></td>
<td></td>
</tr>
<tr>
<td><code>frame-relay interface-dlci dlci switched</code></td>
<td>(Optional) Configures a switched Frame Relay DLCI.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td><code>Router(config-if)# frame-relay interface-dlci 100 switched</code></td>
<td></td>
</tr>
<tr>
<td><strong>Step 10</strong></td>
<td></td>
</tr>
<tr>
<td><code>exit</code></td>
<td>Exits interface configuration mode and returns to global configuration mode.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td><code>Router(config-if)# exit</code></td>
<td></td>
</tr>
<tr>
<td><strong>Step 11</strong></td>
<td></td>
</tr>
<tr>
<td><code>connect connection-name interface pvc interface dlci interworking interworking-type</code></td>
<td>In global configuration mode, creates a local connection between the two interfaces.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td><code>Router(config)# connect atm-fr-con atm 1/0 0/100 serial6/0/0 100 interworking ip</code></td>
<td></td>
</tr>
</tbody>
</table>
Configuring Frame-Relay-to-Frame-Relay Local Switching

For background information about Frame-Relay-to-Frame-Relay Local Switching, see the Distributed Frame Relay Switching feature module.

With Release 12.0(30)S, you can switch between virtual circuits on the same port, as detailed in the “Configuring Frame Relay Same-Port Switching” section on page 27.

SUMMARY STEPS

1. enable
2. configure terminal
3. ip cef [distributed]
4. frame-relay switching
5. interface type number
6. encapsulation frame-relay [cisco | ietf]
7. frame-relay interface-dlci dlci switched
8. exit
9. connect connection-name interface dlci interface dlci

DETAILED STEPS

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1 enable</strong></td>
<td>Enables privileged EXEC mode.</td>
</tr>
<tr>
<td>Example: Router&gt; enable</td>
<td></td>
</tr>
<tr>
<td><strong>Step 2 configure terminal</strong></td>
<td>Enters global configuration mode.</td>
</tr>
<tr>
<td>Example: Router# configure terminal</td>
<td></td>
</tr>
<tr>
<td><strong>Step 3 ip cef [distributed]</strong></td>
<td>Enables CEF operation.</td>
</tr>
<tr>
<td>Example: Router(config)# ip cef</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• For the Cisco 7500 series router, use the <strong>ip cef distributed</strong> command. (On the Cisco 12000 series router, this command is already enabled by default).</td>
</tr>
<tr>
<td></td>
<td>• For the Cisco 7200 series router, use the <strong>ip cef</strong> command.</td>
</tr>
<tr>
<td>This command is not required by the FR-FR local switching feature.</td>
<td></td>
</tr>
<tr>
<td><strong>Step 4 frame-relay switching</strong></td>
<td>Enables PVC switching on a Frame Relay data communications equipment (DCE) device or a Network-to-Network Interface (NNI).</td>
</tr>
<tr>
<td>Example: Router(config)# frame-relay switching</td>
<td></td>
</tr>
</tbody>
</table>
### Command or Action

<table>
<thead>
<tr>
<th>Step</th>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 5</td>
<td><code>interface type number</code></td>
<td>Specifies an interface and enters interface configuration mode.</td>
</tr>
<tr>
<td></td>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><code>Router(config)# interface serial 0</code></td>
<td></td>
</tr>
<tr>
<td>Step 6</td>
<td>`encapsulation frame-relay [cisco</td>
<td>ietf]`</td>
</tr>
<tr>
<td></td>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><code>Router(config-if)# encapsulation frame-relay</code></td>
<td>The default is cisco encapsulation.</td>
</tr>
<tr>
<td></td>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><code>Router(config-if)# encapsulation frame-relay</code></td>
<td>You do not need to specify an encapsulation type.</td>
</tr>
<tr>
<td>Step 7</td>
<td><code>frame-relay interface-dlci dlci switched</code></td>
<td>(Optional) Creates a switched PVC and enters Frame Relay DLCI configuration mode.</td>
</tr>
<tr>
<td></td>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><code>Router(config-if)# frame-relay interface-dlci 100 switched</code></td>
<td>Repeat steps 5 through 7 for each switched PVC.</td>
</tr>
<tr>
<td></td>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><code>Router(config-if)# frame-relay interface-dlci 100 switched</code></td>
<td>If you do not create a Frame Relay PVC in this step, it will automatically be created in the next step by the <code>connect</code> command.</td>
</tr>
<tr>
<td>Step 8</td>
<td><code>exit</code></td>
<td>Exits interface configuration mode and returns to global configuration mode.</td>
</tr>
<tr>
<td></td>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><code>Router(config-if)# exit</code></td>
<td></td>
</tr>
<tr>
<td>Step 9</td>
<td><code>connect connection-name interface dlci interface dlci</code></td>
<td>In global configuration mode, defines a connection between Frame Relay PVCs.</td>
</tr>
<tr>
<td></td>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><code>Router(config)# connect connection1 serial0 100 serial1 101</code></td>
<td></td>
</tr>
</tbody>
</table>
# Configuring Frame Relay Same-Port Switching

Use the following steps to configure local Frame Relay switching on a single interface.

## SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ip cef [distributed]**
4. **frame-relay switching**
5. **interface type number**
6. **encapsulation frame-relay [cisco | ietf]**
7. **frame-relay intf-type [dte | dce | nni]**
8. **frame-relay interface-dlci dlci switched**
9. **exit**
10. **connect connection-name interface dlci interface dlci**

## DETAILED STEPS

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong> enable</td>
<td>Enables privileged EXEC mode.</td>
</tr>
<tr>
<td><strong>Example:</strong> Router&gt; enable</td>
<td>Enter your password if prompted.</td>
</tr>
<tr>
<td><strong>Step 2</strong> configure terminal</td>
<td>Enters global configuration mode.</td>
</tr>
<tr>
<td><strong>Example:</strong> Router# configure terminal</td>
<td></td>
</tr>
<tr>
<td><strong>Step 3</strong> ip cef [distributed]</td>
<td>Enables CEF operation.</td>
</tr>
<tr>
<td><strong>Example:</strong> Router# ip cef</td>
<td>• For the Cisco 7500 series router, use the <strong>ip cef distributed</strong> command. (On the Cisco 12000 series router, this command is already enabled by default).</td>
</tr>
<tr>
<td></td>
<td>• For the Cisco 7200 series router, use the <strong>ip cef</strong> command.</td>
</tr>
<tr>
<td></td>
<td>This command is not required by the FR-FR local switching feature.</td>
</tr>
<tr>
<td><strong>Step 4</strong> frame-relay switching</td>
<td>Enables PVC switching on a Frame Relay data communications equipment (DCE) device or a Network-to-Network Interface (NNI).</td>
</tr>
<tr>
<td><strong>Example:</strong> Router(config)# frame-relay switching</td>
<td></td>
</tr>
</tbody>
</table>
### Command or Action

<table>
<thead>
<tr>
<th>Step</th>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td><strong>interface</strong> type number</td>
<td>Specifies the interface and enters interface configuration mode.</td>
</tr>
<tr>
<td>6</td>
<td><strong>encapsulation</strong> frame-relay [cisco</td>
<td>ietf]</td>
</tr>
<tr>
<td></td>
<td>Example: Router(config-if)# encapsulation frame-relay</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td><strong>frame-relay</strong> intf-type {dce</td>
<td>dte</td>
</tr>
<tr>
<td></td>
<td>Example: Router(config-if)# frame-relay intf-type nni</td>
<td>- Data Communications Equipment (DCE)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Data Terminal Equipment (DTE)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Network-to-Network Interface (NNI)</td>
</tr>
<tr>
<td>8</td>
<td><strong>frame-relay</strong> interface-dlci dlci switched</td>
<td>(Optional) Creates a switched PVC and enters Frame Relay DLCI configuration mode.</td>
</tr>
<tr>
<td></td>
<td>Example: Router(config-if)# frame-relay interface-dlci 100 switched</td>
<td>- If you do not create a Frame Relay PVC in this step, it will automatically be created in the next step by the <code>connect</code> command.</td>
</tr>
<tr>
<td>9</td>
<td><strong>exit</strong></td>
<td>Exits Frame Relay DLCI configuration mode and returns to interface configuration mode.</td>
</tr>
<tr>
<td></td>
<td>Example: Router(config-fr-dlci)# exit</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td><strong>exit</strong></td>
<td>Exits interface configuration mode and returns to global configuration mode.</td>
</tr>
<tr>
<td></td>
<td>Example: Router(config-if)# exit</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td><strong>connect</strong> connection-name interface dlci</td>
<td>In global configuration mode, defines a connection between the two data links.</td>
</tr>
<tr>
<td></td>
<td>Example: Router(config)# connect connection1 serial1/0 100 serial1/0 200</td>
<td></td>
</tr>
</tbody>
</table>
Verifying Layer 2 Local Switching

To verify configuration of the Layer 2 Local Switching feature, use the following commands on the provider edge (PE) router.

**SUMMARY STEPS**

1. `show connection`
2. `show atm pvc`
3. `show frame-relay pvc`

**Step 1  show connection**

The `show connection` command displays the local connection between an ATM interface and a Fast Ethernet interface.

```
Router# show connection name atm-eth-con
```

```
ID  Name  Segment 1   Segment 2   State
--------------------------------------------
1   atm-eth-con  ATM0/0/0  AAL5 0/100  FastEthernet6/0/0  UP
```

This example displays the local connection between an ATM interface and a serial interface.

```
Router# show connection name atm-fr-con
```

```
ID  Name  Segment 1   Segment 2   State
--------------------------------------------
1   atm-fr-con  ATM0/0/0  AAL5 0/100  Serial1/0/0  16  UP
```

This example displays a same-port connection on a serial interface.

```
Router# show connection name same-port
```

```
ID  Name  Segment 1   Segment 2   State
--------------------------------------------
1   same-port  Serial1/1/1  101  Serial1/1/1  102  UP
```

**Step 2  show atm pvc**

The `show atm pvc` command shows that interface ATM3/0 is UP.

```
Router# show atm pvc
```

```
Interface  VCD/  Name  VPI  VCI  Type  Encaps  Peak  Avg/Min  Burst
----------  ----  ----  ---  ---  ----  ------  ----  -------  -------
3/0         10    1    32  PVC  FRATMSRV  155000
```

**Step 3  show frame-relay pvc**

The `show frame-relay pvc` command shows a switched Frame Relay PVC:

```
Router# show frame-relay pvc 16
```

```
PVC Statistics for interface POS5/0 (Frame Relay NNI)
DLCI = 16, DLCI USAGE = SWITCHED, PVC STATUS = UP, INTERFACE = POS5/0
LOCAL PVC STATUS = UP, NNI PVC STATUS = ACTIVE
input pkts 0  output pkts 0  in bytes 0
out bytes 0  dropped pkts 100 in FECN pkts 0
in DE pkts 0  out DE pkts 0
out bcast pkts 0  out bcast bytes 0
```
How to Configure Layer 2 Local Switching

30
Cisco IOS Release: Multiple Releases (See the Feature History Table.)

Layer 2 Local Switching

Troubleshooting Tips

You can troubleshoot Layer 2 local switching using the following commands on the PE router:

- show connection
- show atm pvc
- show frame-relay pvc
- debug conn
- debug atm l2transport
- debug frame-relay pseudowire

Configuring NSF/SSO—Local Switching Support

This feature provides SSO/NSF support for Local Switching of the following attachment circuits on the same router:

- Ethernet (port mode) to Ethernet VLAN
- Frame Relay to Frame Relay

For information about configuring SSO/NSF on the route processors, see the Stateful Switchover feature module.
Verifying the SSO/NSF Configuration

To verify that the NSF/SSO—Layer 2 Local Switching Support is working correctly, use the following procedure:

**Step 1** Issue the `ping` command or initiate traffic between the two CE routers.

**Step 2** Force the switchover from the active RP to the standby RP by using the `redundancy force-switchover` command. This manual procedure allows for a “graceful” or controlled shutdown of the active RP and switchover to the standby RP. This graceful shutdown allows critical cleanup to occur.

**Step 3** Issue the `show connect all` command to ensure that the Layer 2 Local Switching connection on the dual RP is operating.

```
Router # show connect all

ID  Name  Segment 1  Segment 2  State
2  Eth-Vlan1  Fa1/1/1  Fa6/0/0.1  UP
```

**Step 4** Check the ping buffer from the CE router to verify that the contiguous packet outage was minimal during the switchover.

Configuration Examples for Layer 2 Local Switching

This section provides the following configuration examples:

- ATM-to-ATM Local Switching: Example, page 31
- ATM PVC Same-Port Switching: Example, page 32
- ATM PVP Same-Port Switching: Example, page 32
- ATM-to-Ethernet Local Switching: Examples, page 32
- Ethernet VLAN Same-Port Switching: Example, page 33
- ATM-to-Frame-Relay Local Switching: Example, page 33
- Frame-Relay-to-Frame-Relay Local Switching: Example, page 33
- Frame Relay DLCI Same-Port Switching: Example, page 33
- NSF/SSO—Ethernet (Port Mode) to Ethernet VLAN Local Switching: Example, page 34

ATM-to-ATM Local Switching: Example

The following example shows local switching on ATM interfaces configured for AAL5:

```
interface atm 1/0/0
  pvc 0/100 12transport
  encapsulation aal5

interface atm 2/0/0
  pvc 0/100 12transport
  encapsulation aal5

connect aal5_conn atm 1/0/0 0/100 atm 2/0/0 0/100
```
ATM PVC Same-Port Switching: Example

The following example shows same-port switching between two PVCs on one ATM interface:

```cisco
interface atm 1/0/0
pvc 0/100 l2transport
encapsulation aal5
pvc 0/200 l2transport
encapsulation aal5

connect conn atm 1/0/0 0/100 atm 1/0/0 0/200
```

ATM PVP Same-Port Switching: Example

The following example shows same-port switching between two PVPs on one ATM interface:

```cisco
interface atm 1/0/0
atm pvp 100 l2transport
atm pvp 200 l2transport

connect conn atm 1/0/0 100 atm 1/0/0 200
```

ATM-to-Ethernet Local Switching: Examples

ATM-to-Ethernet local switching terminates an ATM frame to an Ethernet/VLAN frame over the same PE router. Two interworking models are used: Ethernet mode and IP mode.

ATM to Ethernet VLAN: Example

The following example shows an Ethernet interface configured for Ethernet VLAN, and an ATM PVC interface configured for AAL5 encapsulation. The `connect` command allows local switching between these two interfaces and specifies the interworking type as Ethernet mode.

```cisco
interface fastethernet6/0/0.1
encapsulation dot1q 10

interface atm 2/0/0
pvc 0/400 l2transport
encapsulation aal5

connect atm_ethvlan_con atm 2/0/0 0/400 fastethernet6/0/0.1 interworking ethernet
```

ATM to Ethernet (Port Mode): Example

The following example shows an Ethernet interface configured for Ethernet and an ATM interface configured for AAL5SNAP encapsulation. The `connect` command allows local switching between these two interfaces and specifies the interworking type as IP mode.

```cisco
interface atm0/0/0
pvc 0/100 l2transport
encapsulation aal5snap

interface fastethernet6/0/0

connect atm_eth_con atm0/0/0 0/100 fastethernet6/0/0 interworking ip
```
Ethernet VLAN Same-Port Switching: Example

The following example shows same-port switching between two VLANs on one Ethernet interface:

```
interface fastethernet0/0.1
   encapsulation dot1q 1
interface fastethernet0/0.2
   encapsulation dot1q 2

connect conn FastEthernet0/0.1 FastEthernet0/0.2
```

ATM-to-Frame-Relay Local Switching: Example

The following example shows a serial interface configured for Frame Relay and an ATM interface configured for AAL5SNAP encapsulation. The `connect` command allows local switching between these two interfaces.

```
interface serial1/0
   encapsulation frame-relay

interface atm1/0
   pvc 7/100 l2transport
   encapsulation aal5snap

connect atm_fr_conn atm1/0 7/100 serial1/0 100 interworking ip
```

Frame-Relay-to-Frame-Relay Local Switching: Example

The following example shows serial interfaces configured for Frame Relay. The `connect` command allows local switching between these two interfaces.

```
frame-relay switching
ip cef distributed

interface serial3/0/0
   encapsulation frame-relay
   frame-relay interface-dlci 100 switched
   frame-relay intf-type dce

interface serial3/1/0
   encapsulation frame-relay ietf
   frame-relay interface-dlci 200 switched
   frame-relay intf-type dce

connect fr_con serial3/0/0 100 serial 3/1/0 200
```

Frame Relay DLCI Same-Port Switching: Example

The following example shows same-port switching between two data links on one Frame Relay interface:

```
interface serial1/0
   encapsulation frame-relay
   frame-relay int-type nni

connect conn serial1/0 100 serial1/0 200
```
NSF/SSO—Ethernet (Port Mode) to Ethernet VLAN Local Switching: Example

The following configuration uses the network topology shown in Figure 2.

**Figure 2  NSF/SSO—Layer 2 Local Switching Support: Ethernet to Ethernet VLAN**

![Network Topology Diagram]

### Configuring the CE Interfaces to Connect to the PE1 Router: Example

<table>
<thead>
<tr>
<th><strong>CE1</strong></th>
<th><strong>CE2</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>ip routing</td>
<td>ip routing</td>
</tr>
<tr>
<td>!</td>
<td>!</td>
</tr>
<tr>
<td>interface fa3/1/0</td>
<td>interface fa4/0</td>
</tr>
<tr>
<td>description: connection to PE fa1/1/1</td>
<td>no shutdown</td>
</tr>
<tr>
<td>no shutdown</td>
<td>!</td>
</tr>
<tr>
<td>ip address 10.1.1.1 255.255.255.0</td>
<td>!</td>
</tr>
<tr>
<td></td>
<td>interface fa4/0.1</td>
</tr>
<tr>
<td></td>
<td>description: connection to PE1 fa6/0/0.1</td>
</tr>
<tr>
<td></td>
<td>encapsulation dot1Q 10</td>
</tr>
<tr>
<td></td>
<td>ip address 10.1.1.2 255.255.255.0</td>
</tr>
<tr>
<td></td>
<td>!</td>
</tr>
<tr>
<td></td>
<td>interface fa4/0.2</td>
</tr>
<tr>
<td></td>
<td>description - connection to PE1 fa6/0/0.2</td>
</tr>
<tr>
<td></td>
<td>encapsulation dot1Q 20</td>
</tr>
<tr>
<td></td>
<td>ip address 10.1.1.2 255.255.255.0</td>
</tr>
</tbody>
</table>
Configuring the PE1 Router with NSF/SSO and PE Interfaces to the CE Routers

**PE1**

```plaintext
redundancy
   no keepalive-enable
   mode sso
!
hw-module slot 2 image disk0:rsp-pv-mz.shaft.111004
hw-module slot 3 image disk0:rsp-pv-mz.shaft.111004
!
ip routing
ip cef distributed
!
interface fa1/1/1
description - connection to CE1 fa3/1/0
no shutdown
no ip address
!
interface fa4/0/0
description - connection to CE3 fa6/0
no shutdown
no ip address
!
interface fa6/0/0
no shutdown
no ip address
!
interface fa6/0/0.1
description - connection to CE2 fa4/0.1
encapsulation dot1Q 10
no ip address
!
interface fa6/0/0.2
description - connection to CE2 fa4/0.2
encapsulation dot1Q 20
no ip address
```

Configuring ICMP Router Discovery Protocol on the CE Routers: Example

This example configures ICMP router discovery protocol (IRDP) on the CE router for Interworking IP for ARP mediation.

**CE1**

```plaintext
interface FastEthernet3/1/0
ip irdp
ip irdp maxadvertinterval 0
```

**CE2**

```plaintext
interface FastEthernet4/0.1
ip irdp
ip irdp maxadvertinterval 0
```
Configuring OSPF on the CE Routers

<table>
<thead>
<tr>
<th>CE1</th>
<th>CE2</th>
</tr>
</thead>
<tbody>
<tr>
<td>interface loopback 1</td>
<td>interface loopback 1</td>
</tr>
<tr>
<td></td>
<td>ip address 10.11.11.11 255.255.255.255</td>
</tr>
<tr>
<td></td>
<td>network 10.11.11.1 0.0.0.0 area 0</td>
</tr>
<tr>
<td></td>
<td>network 10.1.1.1 0.0.0.0 area 0</td>
</tr>
<tr>
<td>!</td>
<td>!</td>
</tr>
<tr>
<td>router ospf 10</td>
<td>router ospf 10</td>
</tr>
<tr>
<td>network 10.11.11 0.0.0.0 area 0</td>
<td>network 10.12.12 0.0.0.0 area 0</td>
</tr>
<tr>
<td>network 10.1.1.1 0.0.0.0 area 0</td>
<td>network 10.1.1.2 0.0.0.0 area 0</td>
</tr>
</tbody>
</table>

Configuring Local Switching on the PE1 Router

PE1

For interworking Ethernet:

connect eth-vlan1 fa1/1/1 fa6/0/0.1 interworking ethernet
connect eth-vlan2 fa4/0/0 fa6/0/0.2 interworking ethernet

For interworking IP:

connect eth-vlan1 fa1/1/1 fa6/0/0.1 interworking ip
connect eth-vlan2 fa4/0/0 fa6/0/0.2 interworking ip

Additional References

The following sections provide references related to the Layer 2 Local Switching feature.

Related Documents

<table>
<thead>
<tr>
<th>Related Topic</th>
<th>Document Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stateful Switchover</td>
<td>Stateful Switchover</td>
</tr>
<tr>
<td>Nonstop Forwarding</td>
<td>Cisco Nonstop Forwarding</td>
</tr>
<tr>
<td>High Availability for Any Transport over MPLS</td>
<td>NSF/SSO-Any Transport over MPLS and AToM Graceful Restart</td>
</tr>
<tr>
<td>Layer 2 Local Switching</td>
<td>Layer 2 Local Switching</td>
</tr>
<tr>
<td>L2VPN Interworking</td>
<td>L2VPN Interworking</td>
</tr>
<tr>
<td>Frame-Relay-to-ATM Interworking</td>
<td>Configuring Frame Relay-ATM Interworking</td>
</tr>
<tr>
<td>Frame-Relay-to-Frame-Relay local switching</td>
<td>Distributed Frame Relay Switching</td>
</tr>
<tr>
<td>Layer 2 Tunnel Protocol Version 3</td>
<td>Layer 2 Tunnel Protocol Version 3</td>
</tr>
<tr>
<td>Any Transport over MPLS</td>
<td>Any Transport over MPLS</td>
</tr>
</tbody>
</table>
## Standards

<table>
<thead>
<tr>
<th>Standard</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>draft-ietf-l2tpext-l2tp-base-03.txt</td>
<td>Layer Two Tunneling Protocol (Version 3) 'L2TPv3'</td>
</tr>
<tr>
<td>draft-martini-12circuit-trans-mpls-09.txt</td>
<td>Transport of Layer 2 Frames Over MPLS</td>
</tr>
<tr>
<td>draft-martini-12circuit-encap-mpls-04.txt</td>
<td>Encapsulation Methods for Transport of Layer 2 Frames Over IP and MPLS Networks</td>
</tr>
<tr>
<td>draft-ietf-ppvpn-l2vpn-00.txt</td>
<td>An Architecture for L2VPNs</td>
</tr>
</tbody>
</table>

## MIBs

<table>
<thead>
<tr>
<th>MIB</th>
<th>MIBs Link</th>
</tr>
</thead>
<tbody>
<tr>
<td>• CISCO-IETF-PW-MIB (PW-MIB)</td>
<td>To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL: <a href="http://www.cisco.com/go/mibs">http://www.cisco.com/go/mibs</a></td>
</tr>
<tr>
<td>• CISCO-IETF-PW-MPLS-MIB (PW-MPLS-MIB)</td>
<td></td>
</tr>
<tr>
<td>• CISCO-IETF-PW-ENET-MIB (PW-ENET-MIB)</td>
<td></td>
</tr>
<tr>
<td>• CISCO-IETF-PW-FR-MIB (PW-FR-MIB)</td>
<td></td>
</tr>
</tbody>
</table>

## RFCs

<table>
<thead>
<tr>
<th>RFC</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>—</td>
</tr>
</tbody>
</table>

## Technical Assistance

<table>
<thead>
<tr>
<th>Description</th>
<th>Link</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Cisco Technical Support website contains thousands of pages of searchable technical content, including links to products, technologies, solutions, technical tips, and tools. Registered Cisco.com users can log in from this page to access even more content.</td>
<td><a href="http://www.cisco.com/techsupport">http://www.cisco.com/techsupport</a></td>
</tr>
</tbody>
</table>
Command Reference

This section documents new and modified commands only.

- connect (L2VPN local switching)
- encapsulation (Layer 2 Local Switching)
- show connection
connect (L2VPN local switching)

To create Layer 2 data connections between two ports on the same router, use the connect command in global configuration mode. To remove such connections, use the no form of this command.

```
connect connection-name interface [dlci | pvc | pvp] [interface [dlci | pvc | pvp]] [interworking interworking-type]
```

```
no connect connection-name interface [dlci | pvc | pvp] [interface [dlci | pvc | pvp]] [interworking interworking-type]
```

**Syntax Description**

<table>
<thead>
<tr>
<th>Syntax</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>connection-name</code></td>
<td>A name for this local switching connection.</td>
</tr>
<tr>
<td><code>interface</code></td>
<td>The interface type and number used to create a local switching connection;</td>
</tr>
<tr>
<td></td>
<td>for example serial1/0 or atm1/0/1.</td>
</tr>
<tr>
<td><code>dlci</code></td>
<td>(Optional) The data-link connection identifier (DLCI) assigned to the</td>
</tr>
<tr>
<td></td>
<td>interface.</td>
</tr>
<tr>
<td><code>pvc</code></td>
<td>(Optional) The permanent virtual circuit (PVC) assigned to the interface,</td>
</tr>
<tr>
<td></td>
<td>expressed by its vpi/vci (Virtual Path and Virtual Channel identifiers).</td>
</tr>
<tr>
<td><code>pvp</code></td>
<td>(Optional) The permanent virtual path (PVP) assigned to the interface.</td>
</tr>
<tr>
<td><code>interworking</code></td>
<td>(Optional) Specifies that this local connection enables different transport</td>
</tr>
<tr>
<td></td>
<td>types to be switched locally. This keyword is not necessary for</td>
</tr>
<tr>
<td></td>
<td>configurations that locally switch the same transport type, such as</td>
</tr>
<tr>
<td></td>
<td>ATM to ATM, or FR to FR.</td>
</tr>
<tr>
<td><code>interworking-type</code></td>
<td>(Optional) Specifies one of the following types of L2VPN Interworking to</td>
</tr>
<tr>
<td></td>
<td>use to transport the data:</td>
</tr>
<tr>
<td></td>
<td>• <code>ip</code>—Causes IP packets to be extracted from the attachment circuit and</td>
</tr>
<tr>
<td></td>
<td>sent over the pseudowire. Attachment circuit frames that do not contain</td>
</tr>
<tr>
<td></td>
<td>IPv4 packets are dropped.</td>
</tr>
<tr>
<td></td>
<td>• <code>ethernet</code>—Causes Ethernet frames to be extracted from the attachment</td>
</tr>
<tr>
<td></td>
<td>circuit and sent over the pseudowire. Ethernet end-to-end transmission</td>
</tr>
<tr>
<td></td>
<td>is assumed. Attachment circuit frames that do not contain Ethernet</td>
</tr>
<tr>
<td></td>
<td>frames are dropped. In the case of VLAN, the VLAN tag is removed,</td>
</tr>
<tr>
<td></td>
<td>leaving a pure Ethernet frame.</td>
</tr>
</tbody>
</table>

**Defaults**

No default behavior or values

**Command Modes**

Global configuration

**Command History**

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.0(27)S</td>
<td>This command was introduced for local switching.</td>
</tr>
<tr>
<td>12.2(25)S</td>
<td>This command was integrated into Cisco IOS Release 12.2(25)S.</td>
</tr>
<tr>
<td>12.0(30)S</td>
<td>This command was integrated into Cisco IOS Release 12.0(30)S.</td>
</tr>
<tr>
<td>12.2(28)SB</td>
<td>This command was integrated into Cisco IOS Release 12.2(28)SB.</td>
</tr>
</tbody>
</table>
**Examples**

The following example shows an Ethernet interface configured for Ethernet, plus an ATM interface configured for AAL5SNAP encapsulation. The `connect` command allows local switching between these two interfaces and specifies the interworking type as IP mode.

```
Router(config)# interface atm0/0/0
Router(config-if)# pvc 0/100 12transport
Router(config-if-atm-l2trans-pvc)# encapsulation aal5snap

Router(config)# interface fastethernet6/0/0.1
Router(config-subif)# encapsulation dot1q 100

Router(config)# connect atm_eth_con atm0/0/0 0/100 fastethernet6/0/0.1 interworking ip
```

**Related Commands**

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>frame-relay switching</td>
<td>Enables PVC switching on a Frame Relay DCE or NNI.</td>
</tr>
</tbody>
</table>
encapsulation (Layer 2 Local Switching)

To configure the ATM adaptation layer (AAL) for a Layer 2 local switching ATM permanent virtual circuit (PVC), use the `encapsulation` command in ATM PVC L2transport configuration mode. To remove an encapsulation from a PVC, use the `no` form of this command.

```
encapsulation layer-type

no encapsulation layer-type
```

### Syntax Description

- **layer-type**  
  Adaptation layer type. Possible values are:  
  - aal5  
  - aal0  
  - aal5snap  
  - aal5mux  
  - aal5nlpid (not on Cisco 12000 series)

### Defaults

If you do not create a PVC, one is created for you. The default encapsulation types for autoprovisioned PVCs are as follows:

- For ATM-to-ATM local switching, the default encapsulation type for the PVC is AAL0.
- For ATM-to-Ethernet or ATM-to-Frame-Relay, the default encapsulation type for the PVC is AAL5SNAP.

### Command Modes

ATM PVC L2transport configuration

### Command History

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.0(27)S</td>
<td>This command was introduced for Layer 2 local switching.</td>
</tr>
<tr>
<td>12.2(25)S</td>
<td>This command was integrated into Cisco IOS Release 12.2(25)S.</td>
</tr>
<tr>
<td>12.0(30)S</td>
<td>This command was integrated into Cisco IOS Release 12.0(30)S.</td>
</tr>
<tr>
<td>12.2(28)SBC</td>
<td>This command was integrated into Cisco IOS Release 12.2(28)SBC.</td>
</tr>
</tbody>
</table>

### Usage Guidelines

The `pvc` command and the `encapsulation` command work together. The use of these commands with Layer 2 local switching is slightly different from the use of these commands with other applications. The following list highlights the differences:

- For Layer 2 local switching, you must add the `l2transport` keyword to the `pvc` command. The `l2transport` keyword enables the PVC to transport Layer 2 packets.
- The Layer 2 local switching `encapsulation` command works only with the `pvc` command. You cannot create switched virtual circuits or VC bundles to transport Layer 2 packets. You can only use PVCs to transport Layer 2 packets.

The following table shows the encapsulation types supported for each transport type:
Layer 2 Local Switching

Encapsulation (Layer 2 Local Switching)

Cisco IOS Release: Multiple Releases (See the Feature History Table.)

Examples

The following example shows how to configure a PVC to transport AAL0 packets for Layer 2 local switching:

```
pvc 1/100 l2transport
encapsulation aal0
```

Related Commands

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>pvc</td>
<td>Creates or assigns a name to an ATM PVC.</td>
</tr>
</tbody>
</table>

### Interworking Type

<table>
<thead>
<tr>
<th>Interworking Type</th>
<th>Encapsulation Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATM to ATM</td>
<td>AAL0, AAL5</td>
</tr>
<tr>
<td>ATM to Ethernet with IP interworking</td>
<td>AAL5SNAP, AAL5MUX</td>
</tr>
<tr>
<td>ATM to Ethernet with Ethernet interworking</td>
<td>AAL5SNAP</td>
</tr>
<tr>
<td>ATM to Frame-Relay</td>
<td>AAL5SNAP, AAL5NLPID</td>
</tr>
</tbody>
</table>
**show connection**

To display the status of interworking connections, use the `show connection` command in EXEC mode.

```
show connection [all | element | id ID | name name | port port]
```

**Syntax Description**

- **all** (Optional) Displays information about all interworking connections.
- **element** (Optional) Displays information about the specified connection element.
- **id ID** (Optional) Displays information about the specified connection identifier.
- **name name** (Optional) Displays information about the specified connection name.
- **port port** (Optional) Displays information about all connections on an interface. (In the 12.0S train, only ATM, Serial, and Fast Ethernet are shown.)

**Command Modes**

EXEC

**Command History**

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.1(2)T</td>
<td>This command was introduced as <code>show connect</code> (FR-ATM).</td>
</tr>
<tr>
<td>12.0(27)S</td>
<td>This command was integrated into Cisco IOS Release 12.0(27)S and updated to show all ATM, Serial, and Fast Ethernet interworking connections.</td>
</tr>
<tr>
<td>12.2(25)S</td>
<td>This command was integrated into Cisco IOS Release 12.2(25)S.</td>
</tr>
<tr>
<td>12.4(2)T</td>
<td>Segment state and channel ID added output of Segment 1 and Segment 2 fields.</td>
</tr>
<tr>
<td>12.0(30)S</td>
<td>This command was integrated into Cisco IOS Release 12.0(30)S.</td>
</tr>
<tr>
<td>12.2(28)SB</td>
<td>This command was integrated into Cisco IOS Release 12.2(28)SB.</td>
</tr>
</tbody>
</table>

**Examples**

The following example shows the local interworking connections on a router:

```
Router# show connection
```

<table>
<thead>
<tr>
<th>ID</th>
<th>Name</th>
<th>Segment 1</th>
<th>Segment 2</th>
<th>State</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>conn1</td>
<td>ATM 1/0/0 AAL5 0/100</td>
<td>ATM 2/0/0 AAL5 0/100</td>
<td>UP</td>
</tr>
<tr>
<td>2</td>
<td>conn2</td>
<td>ATM 2/0/0 AAL5 0/300</td>
<td>Serial0/1 16</td>
<td>UP</td>
</tr>
<tr>
<td>3</td>
<td>conn3</td>
<td>ATM 2/0/0 AAL5 0/400</td>
<td>FA 0/0.1 10</td>
<td>UP</td>
</tr>
<tr>
<td>4</td>
<td>conn4</td>
<td>ATM 1/0/0 CELL 0/500</td>
<td>ATM 2/0/0 CELL 0/500</td>
<td>UP</td>
</tr>
<tr>
<td>5</td>
<td>conn5</td>
<td>ATM 1/0/0 CELL 100</td>
<td>ATM 2/0/0 CELL 100</td>
<td>UP</td>
</tr>
</tbody>
</table>

**Table 1** describes the significant fields shown in the display.

**Table 1** **show connection Field Descriptions**

<table>
<thead>
<tr>
<th>Display</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID</td>
<td>Arbitrary connection identifier assigned by the operating system.</td>
</tr>
<tr>
<td>Name</td>
<td>Name of the connection.</td>
</tr>
</tbody>
</table>
Table 1  show connection Field Descriptions (continued)

<table>
<thead>
<tr>
<th>Display</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Segment 1</td>
<td>Information about the interworking segments, including:</td>
</tr>
<tr>
<td>Segment 2</td>
<td>• Interface name and number.</td>
</tr>
<tr>
<td></td>
<td>• Segment state, interface name and number, and channel ID.</td>
</tr>
<tr>
<td></td>
<td>Segment state will displays nothing if the segment state is UP,</td>
</tr>
<tr>
<td></td>
<td>“-” if the segment state is DOWN, and “<em><strong>Card Removed</strong></em>” if the</td>
</tr>
<tr>
<td></td>
<td>segment state is DETACHED.</td>
</tr>
<tr>
<td></td>
<td>• Type of encapsulation (if any) assigned to the interface.</td>
</tr>
<tr>
<td></td>
<td>• PVC assigned to the ATM interface, DLCI assigned to the serial interface,</td>
</tr>
<tr>
<td></td>
<td>or VLAN ID assigned to the Ethernet interface.</td>
</tr>
<tr>
<td>State or Status</td>
<td>Status of the connection, including the following states: INVALID,</td>
</tr>
<tr>
<td></td>
<td>UP, ADMIN UP, ADMIN DOWN, OPER DOWN, COMING UP, NOT VERIFIED, ERR.</td>
</tr>
</tbody>
</table>

Related Commands

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>connect (L2VPN local switching)</td>
<td>Connects two different or like interfaces on a router.</td>
</tr>
<tr>
<td>show atm pvc</td>
<td>Displays the status of ATM PVCs and SVCs.</td>
</tr>
<tr>
<td>show frame-relay pvc</td>
<td>Displays the status of Frame Relay interfaces.</td>
</tr>
</tbody>
</table>