



# PPPoA/PPPoE Autosense for ATM PVCs

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## History for the PPPoA/PPPoE Autosense for ATM PVCs Feature

Release	Modification
12.1(1)DC	This feature was introduced on the Cisco 6400 UAC.
12.2(4)T	Support for this feature was added to the Cisco 3660 router and the Cisco 7200 series.
12.2(4)T2	Support for the Cisco 7500 series routers was added.
12.2(28)SB	This feature was integrated into Cisco IOS Release 12.2(28)SB.

This feature module describes the PPPoA/PPPoE Autosense for ATM PVCs feature. It includes the following sections:

- [Feature Overview, page 1](#)
- [Supported Platforms, page 2](#)
- [Supported Standards, MIBs, and RFCs, page 3](#)
- [Configuration Tasks, page 3](#)
- [Monitoring and Maintaining PPPoA/PPPoE Autosense for ATM PVCs, page 6](#)
- [Configuration Examples, page 6](#)
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## Feature Overview

The PPPoA/PPPoE Autosense for ATM PVCs feature enables a router to distinguish between incoming PPP over ATM (PPPoA) and PPP over Ethernet (PPPoE) over ATM sessions and to create virtual access based on demand for both PPP types.



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**Note**

The PPPoA/PPPoE Autosense for ATM PVCs feature is supported on SNAP-encapsulated ATM PVCs only. It is not supported on MUX-encapsulated PVCs.

This new feature also adds support for precloning of virtual-access interfaces for PPPoA. Precloning enables virtual-access interfaces to be allocated at system start. This functionality significantly reduces the load on the system during call setup. When precloning is used, the virtual-access interface is attached to the session upon receipt of the first session-initiation packet from the client. The virtual-access interface is detached upon termination of the PPP session.

## Benefits

The PPPoA/PPPoE Autosense for ATM PVCs feature provides resource allocation on demand. For each permanent virtual circuit (PVC) configured for both PPPoA and PPPoE, certain resources (including one virtual-access interface) are allocated upon configuration, regardless of the existence of a PPPoA or PPPoE session on that PVC. With the PPPoA/PPPoE Autosense for ATM PVCs feature, resources are allocated for PPPoA and PPPoE sessions only when a client initiates a session, thus reducing overhead on the network access server (NAS).

## Restrictions

- The PPPoA/PPPoE Autosense for ATM PVCs feature supports only PPPoA sessions that use SNAP encapsulation. It does not support MUX-encapsulated PVCs.
- Do not use this feature on a router that initiates PPPoA sessions.
- This feature supports ATM PVCs. Switched virtual circuits (SVCs) are not supported.
- PPPoA does not support static IP assignments within virtual templates.

## Related Documents

For information on configuring PPPoA and PPPoE, see the following documents:

- The chapter “Configuring Broadband Access: PPP and Routed Bridge Encapsulation” in the *Cisco IOS Wide-Area Networking Configuration Guide*, Release 12.2.
- The chapter “Broadband Access: PPP and Routed Bridge Encapsulation Commands” in the *Cisco IOS Wide-Area Networking Command Reference*, Release 12.2.

## Supported Platforms

The following platforms are supported in Cisco IOS Release 12.2(4)T:

- Cisco 3660 router
- Cisco 7200 series
- Cisco 7500 series (Cisco IOS Release 12.2(4)T2 and later releases)

### Platform Support Through Feature Navigator

Cisco IOS software is packaged in feature sets that support specific platforms. To get updated information regarding platform support for this feature, access Feature Navigator. Feature Navigator dynamically updates the list of supported platforms as new platform support is added for the feature.

Feature Navigator is a web-based tool that enables you to quickly determine which Cisco IOS software images support a specific set of features and which features are supported in a specific Cisco IOS image.

To access Feature Navigator, you must have an account on Cisco.com. If you have forgotten or lost your account information, send a blank e-mail to [cco-locksmith@cisco.com](mailto:cco-locksmith@cisco.com). An automatic check will verify that your e-mail address is registered with Cisco.com. If the check is successful, account details with a new random password will be e-mailed to you. Qualified users can establish an account on Cisco.com by following the directions at <http://www.cisco.com/register>.

Feature Navigator is updated when major Cisco IOS software releases and technology releases occur. As of May 2001, Feature Navigator supports M, T, E, S, and ST releases. You can access Feature Navigator at the following URL:

<http://www.cisco.com/go/fn>

## Supported Standards, MIBs, and RFCs

### Standards

No new or modified standards are supported by this feature.

### MIBs

No new or modified MIBs are supported by this feature.

### RFCs

No new or modified RFCs are supported by this feature.

## Configuration Tasks

See the following sections to configure the PPPoA/PPPoE Autosense for ATM PVCs feature. Each task in the list is identified as required or optional.

- [Configuring PPPoA/PPPoE Autosense for ATM PVCs](#) (required)
- [Verifying PPPoA/PPPoE Autosense Configuration](#) (optional)
- [Precloning Virtual-Access Interfaces](#) (optional)
- [Verifying the Precloned Virtual-Access Interfaces](#) (optional)

## Configuring PPPoA/PPPoE Autosense for ATM PVCs

PPPoA/PPPoE autosense can be configured on a single PVC, or on a VC class that can be applied to all PVCs on an ATM interface.

To configure PPPoA/PPPoE Autosense on a PVC, use the following commands beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config)# <b>interface atm 0/0/0</b> [.subinterface-number] { <b>multipoint</b>   <b>point-to-point</b> }	Specifies the ATM interface and optional subinterface.
Step 2	Router(config-subif)# <b>pvc</b> [name] vpi/vci	Configures a PVC on the ATM interface or subinterface.
Step 3	Router(config-if-atm-vc) # <b>encapsulation aal5autopp</b> <b>virtual-template</b> number	Configures PPPoA/PPPoE autosense on the PVC. Also specifies the virtual template interface to use to clone the new virtual-access interfaces for PPP sessions on this PVC.

To configure PPPoA/PPPoE autosense on a VC class, use the following commands beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config)# <b>vc-class atm</b> vc-class-name	Creates and names a map class.
Step 2	Router(config-vc-class)# <b>encapsulation aal5autopp</b> <b>virtual-template</b> number	Configures PPPoA/PPPoE autosense. Also specifies the virtual template interface to use to clone the new virtual-access interfaces for PPP sessions on this PVC.
Step 3	Router(config-vc-class)# <b>exit</b>	Returns to global configuration mode.
Step 4	Router(config)# <b>interface atm 0/0/0</b> [.subinterface-number] { <b>multipoint</b>   <b>point-to-point</b> }	Specifies the ATM interface and optional subinterface.
Step 5	Router(config-subif)# <b>class-int</b> vc-class-name	Applies the VC class to all VCs on the ATM interface or subinterface.


**Note**

Virtual-access interfaces for PPPoE sessions are cloned from the virtual template interface specified in the VPDN group.

## Verifying PPPoA/PPPoE Autosense Configuration

To verify that you have successfully configured PPPoA/PPPoE autosense, use the **show running-config EXEC** command.

## Precloning Virtual-Access Interfaces

Precloning virtual-access interfaces at the NAS reduces the load on the system during call setup. To preclone a virtual-access interface, use the following command in global configuration mode:

Command	Purpose
Router(config)# <b>virtual-template</b> <i>template-number</i> <b>pre-clone</b> <i>number</i>	Specifies the number of virtual-access interfaces to be created and cloned from a specific virtual template.

## Verifying the Precloned Virtual-Access Interfaces

To check the successful precloning of virtual-access interfaces, use the **show vtemplate** privileged EXEC command.

In the following sample output, precloning is enabled for Virtual-Template1, 250 virtual-access interfaces have been precloned, and 249 virtual-access interfaces are available for new PPPoA and PPPoE sessions. Only one virtual-access interface is in use, and no virtual-access interfaces were cloned during call setup.

```
Router# show vtemplate

Virtual-Template 1, pre-cloning is on
  Pre-clone limit: 250, current number: 249
  Active vaccess number: 1

Generic free vaccess number: 0
```

## Troubleshooting Tips

To troubleshoot PPP sessions establishment, use the following commands:

- **debug ppp authentication**
- **debug ppp negotiation**
- **debug vpdn pppoe-error**
- **debug vpdn pppoe-events**

To troubleshoot the establishment of PPP sessions that are authenticated by a RADIUS or TACACS server, use the following commands:

- **debug aaa authentication**
- **debug aaa authorization**



**Caution**

Use **debug** commands with extreme caution because they are CPU-intensive and can seriously impact your network.

# Monitoring and Maintaining PPPoA/PPPoE Autosense for ATM PVCs

To monitor and maintain PPPoA/PPPoE autosense, use the following commands in EXEC mode:

Command	Purpose
Router# <b>show atm pvc</b> [ppp]	After the client at the other end of the PVC has initiated a PPPoA session, use this command to check that the PVC contains the PPPoA session.
Router# <b>show caller</b>	Use this command to: <ul style="list-style-type: none"> <li>• View individual users and consumed resources on the NAS.</li> <li>• Inspect active call statistics for large pools of connections. (The <b>debug</b> commands produce too much output and tax the CPU too heavily.)</li> <li>• Display the absolute and idle times for each user. The current values for both of these settings are displayed on the tty line and the asynchronous interface. Users that have been idle for unacceptably long periods of time can be easily identified. By using this information, you can define timeout policies and multiple grades of services for different users.</li> </ul>
Router# <b>show interface virtual access</b> <i>number</i>	Displays information about the virtual-access interface, LCP <sup>1</sup> , protocol states, and interface statistics. The status of the virtual-access interface should read:  Virtual-Access3 is up, line protocol is up
Router# <b>show user</b>	Displays information about the active lines on the router.
Router# <b>show vpdn</b>	Displays information about active Level 2 Forwarding (L2F) Protocol tunnel and message identifiers in a VPDN <sup>2</sup> .

1. LCP = link control protocol.

2. VPDN = virtual private dial-up network.

## Configuration Examples

This section provides the following configuration examples:

- [PPPoA/PPPoE Autosense on an ATM PVC Example](#)
- [PPPoA/PPPoE Autosense on a VC Class Example](#)
- [PPPoA/PPPoE Autosense on Multiple VC Classes and Virtual Templates Example](#)

### PPPoA/PPPoE Autosense on an ATM PVC Example

In the following example, the NAS is configured with PPPoA/PPPoE Autosense for ATM PVCs on PVC 30/33:

```
!
! Configure PPP Autosense
```

```

!
interface ATM 0/0/0.33 multipoint
  pvc 30/33
    encapsulation aal5autoppp Virtual-Template1
  !
  ! Configure PPPoE
  !
  vpdn enable
  vpdn-group 1
    accept dialin
    protocol pppoe
    virtual-template 1
  !
  ip cef
  interface virtual-template 1
    ip unnumbered fastethernet 0/0/0
    ip route-cache cef
  !
  interface fastethernet 0/0/0
    ip address 10.1.1.1 255.255.255.0
  !
  ! Enable precloning for virtual-template 1
  !
  virtual-template 1 pre-clone 2000

```

## PPPoA/PPPoE Autosense on a VC Class Example

In the following example, the NAS is configured with PPPoA/PPPoE autosense on the VC class called “MyClass.” “MyClass” applies PPPoA/PPPoE autosense to all PVCs on the ATM 0/0/0.99 interface.

```

!
! Configure PPP Autosense
!
vc-class ATM MyClass
  encapsulation aal5autoppp Virtual-Template1
  !
interface ATM 0/0/0.99 multipoint
  class-int MyClass
  no ip directed-broadcast
  pvc 20/40
  pvc 30/33
  !
  ! Configure PPPoE
  !
  vpdn enable
  vpdn-group 1
    accept dialin
    protocol pppoe
    virtual-template 1
  !
  ip cef
  interface virtual-template 1
    ip unnumbered fastethernet 0/0/0
    ip route-cache cef
  !
  interface fastethernet 0/0/0
    ip address 10.1.1.1 255.255.255.0
  !
  ! Enable precloning for virtual-template 1
  !
  virtual-template 1 pre-clone 2000
  !

```

## PPPoA/PPPoE Autosense on Multiple VC Classes and Virtual Templates Example

In the following example, PPPoA and PPPoE sessions are handled separately by two virtual templates.

```
ip cef
vpdn enable
!
vpdn-group 1
  accept-dialin
  protocol pppoe
  virtual-template 1
pppoe limit per-mac 1
pppoe limit per-vc 1
!
virtual-template 1 pre-clone 1500
virtual-template 2 pre-clone 1000
!
interface ATM0/0/0.3 multipoint
  no ip directed-broadcast
  class-int pppauto
!
interface ATM0/0/0.9 multipoint
  ip address 10.16.40.1 255.255.0.0
  no ip directed-broadcast
!
interface Virtual-Template1
  ip unnumbered ATM0/0/0.9
  ip route-cache cef
  no ip directed-broadcast
  peer default ip address pool pool-1
  ppp authentication pap
!
interface Virtual-Template2
  ip unnumbered ATM0/0/0.9
  ip route-cache cef
  no ip directed-broadcast
  peer default ip address pool pool-2
  ppp authentication chap
!
interface fastethernet 0/0/0
  ip address 10.1.1.1 255.255.255.0
!
vc-class atm pppauto
  encapsulation aal5autopp Virtual-Template2
!
```



### Note

Whenever possible, it is preferable to configure PPPoA and PPPoE to use the same virtual template. Using separate virtual templates leads to the inefficient use of virtual access because the maximum number of virtual-access interfaces will have to be precloned twice: once for PPPoE and once for PPPoA. If PPPoA and PPPoE use the same virtual template, the maximum number of virtual-access interfaces can be precloned once and used for PPPoA and PPPoE as needed.

# Command Reference

This section documents modified commands.

- [encapsulation aal5autopp virtual-template](#)
- [show atm pvc](#)
- [virtual-template pre-clone](#)

# encapsulation aal5autopp virtual-template

To enable PPPoA/PPPoE autosense, which enables a router to distinguish between incoming PPP over ATM (PPPoA) and PPP over Ethernet (PPPoE) sessions and create virtual access for both PPP types based on demand, use the **encapsulation aal5autopp virtual-template** command in Interface-ATM-VC configuration or VC class configuration mode. To terminate the PPPoA or PPPoE session and to detach the virtual-access interface from the permanent virtual circuit (PVC), use the **no** form of this command.

**encapsulation aal5autopp virtual-template** *template-number*

**no encapsulation aal5autopp virtual-template** *template-number*

<b>Syntax Description</b>	<i>template-number</i> Number of the virtual template that will be used to clone virtual-access interfaces for PPPoA sessions. The range is from 1 to 25.
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<b>Defaults</b>	PPPoA/PPPoE autosense is not enabled.
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<b>Command Modes</b>	Interface-ATM-VC configuration VC class configuration
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<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	12.1(1)DC1	This command was introduced on the node route processor (NRP) of the Cisco 6400 Universal Access Concentrator.
	12.2(4)T	This command was integrated into Cisco IOS Release 12.2(4)T.
	12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.

<b>Usage Guidelines</b>	This command functions only when the PPPoA sessions are LLC-encapsulated.
-------------------------	---



**Note** Do not use this command on a router that initiates PPPoA sessions.

Entering the **no encapsulation aal5autopp virtual-template** command will terminate the PPPoA or PPPoE session and detach the virtual-access interface from the PVC.

Precloning is recommended for use with PPPoA/PPPoE autosense to improve router performance. If precloned virtual-access interfaces are not available when an incoming PPPoA or PPPoE session is identified, then a virtual-access interface will be created.

Whenever possible, it is preferable to configure PPPoA and PPPoE to use the same virtual template. Using separate virtual templates leads to the inefficient use of virtual access because the maximum number of virtual-access interfaces will have to be precloned twice: once for PPPoE and once for PPPoA. If PPPoA and PPPoE use the same virtual template, the maximum number of virtual-access interfaces can be precloned once and used for PPPoA and PPPoE as needed.

**Examples**

The following example enables PPPoA/PPPoE autosense on PVC 30/33 and specifies virtual-template 1 to be used for PPPoA sessions:

```
interface ATM 0/0/0.33 multipoint
 pvc 30/33
 encapsulation aal5autopp Virtual-Template1
```

**Related Commands**

Command	Description
<b>virtual-template pre-clone</b>	Specifies the number of virtual-access interfaces to be created and cloned from a specific virtual template.

# show atm pvc

To display all ATM permanent virtual connections (PVCs) and traffic information, use the **show atm pvc** command in privileged EXEC mode.

```
show atm pvc [vpi/vci | name | interface atm interface-number[.subinterface-number multipoint]]
[ppp]
```

## Syntax Description

<i>vpi/vci</i>	(Optional) ATM virtual path identifier (VPI) and virtual channel identifier (VCI) numbers. The absence of the slash character (/) and a <i>vpi</i> value causes the <i>vpi</i> value to default to 0.
<i>name</i>	(Optional) Name of the PVC.
<b>interface atm</b> <i>interface-number</i>	(Optional) Displays all PVCs on the specified ATM interface. To determine the appropriate form of the <i>interface-number</i> argument, consult your ATM network module, port adapter, or router documentation.
<i>.subinterface-number</i>	(Optional) Subinterface number in the range from 1 to 4294967293. The dot (.) is required as a separator between <i>interface-number</i> and <i>subinterface-number</i> .
<b>multipoint</b>	(Optional) Multipoint subinterface.
<b>ppp</b>	(Optional) Displays each PVC configured for PPP over ATM.

## Command Modes

Privileged EXEC

## Command History

Release	Modification
11.3T	This command was introduced.
12.1(1)T	This command was modified to display PPPoE status.
12.2(4)T	This command was modified to display only PVCs that are attached to a virtual access interface. Before this modification, all PVCs that were configured with PPPoA or PPPoE were displayed.
12.0(23)S	This command was modified to display OAM cell emulation status for Any Transport over MPLS (AToM).
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.
12.2(15)T	This command was integrated into Cisco IOS Release 12.2(15)T.
12.3(7)T	This command was modified to display information about multilink PPP over ATM link fragmentation and interleaving for ATM PVCs.
12.0(30)S	This command was modified to display information about OAM loopback detection.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.

## Usage Guidelines

If the *vpi/vci* or *name* argument is not specified, the output of this command is the same as that of the **show atm vc** command, but only the configured PVCs are displayed.

If the *vpi/vci* or *name* argument is specified, the output of this command is the same as that of the **show atm vc vcd** command, with extra information related to PVC management, including connection name, detailed states, and Operation, Administration, and Maintenance (OAM) counters.

If the **interface atm interface-number** option is included in the command, all PVCs under that interface or subinterface are displayed.

**Examples**

The following is sample output from the **show atm pvc** command. The output is the same as that of the **show atm vc** command, but only the configured PVCs are displayed.

Router# **show atm pvc**

Interface	VCD/ Name	VPI	VCI	Type	Encaps	Peak Kbps	Avg/Min Kbps	Burst Cells	Sts
2/0	1	0	5	PVC	SAAL	155000	155000		UP
2/0	2	0	16	PVC	ILMI	155000	155000		UP
2/0.2	101	0	50	PVC	SNAP	155000	155000		UP
2/0.2	102	0	60	PVC	SNAP	155000	155000		DOWN
2/0.2	104	0	80	PVC	SNAP	155000	155000		UP
2/0	hello	0	99	PVC	SNAP	1000			UP

The following is sample output from the **show atm pvc** command with the *vpi/vci* argument specified:

Router# **show atm pvc 0/41**

```

ATM2/0: VCD: 3, VPI: 0, VCI: 41
UBR, PeakRate: 155000
AAL5-LLC/SNAP, etype:0x0, Flags: 0xC20, VCmode: 0x0
OAM frequency: 0 second(s), OAM retry frequency: 1 second(s), OAM retry frequency: 1
second(s)
OAM up retry count: 3, OAM down retry count: 5
OAM Loopback status: OAM Disabled
OAM VC state: Not Managed
OAM Loop detection: Disabled
ILMI VC state: Not Managed
InARP frequency: 15 minutes(s)
InPkts: 31759, OutPkts: 26497, InBytes: 2356434, OutBytes: 1589743
InPRoc: 15785, OutPRoc: 26472, Broadcasts: 0
InFast: 20, OutFast: 20, InAS: 15954, OutAS: 6
OAM cells received: 0
F5 InEndloop: 0, F5 InSegloop: 0, F5 InAIS: 0, F5 InRDI: 0
F4 InEndloop: 0, F4 InSegloop: 0, F4 InAIS: 0, F4 InRDI: 0
OAM cells sent: 0
F5 OutEndloop: 0, F5 OutSegloop: 0, F5 OutRDI: 0
F4 OutEndloop: 0, F4 OutSegloop: 0, F4 OutRDI: 0
OAM cell drops: 0
Status: UP
PPPOE enabled.
    
```

The following sample output from the **show atm pvc** command displays OAM cell emulation statistics, which are marked in this example by exclamation points:

Router# **show atm pvc 5/500**

```

ATM4/1/0.200: VCD: 6, VPI: 5, VCI: 500
UBR, PeakRate: 1
AAL5-LLC/SNAP, etype:0x0, Flags: 0x3400C20, VCmode: 0x0
OAM Cell Emulation: enabled, F5 End2end AIS Xmit frequency: 1 second(s) !!!
OAM frequency: 0 second(s), OAM retry frequency: 1 second(s)
OAM up retry count: 3, OAM down retry count: 5
OAM Loopback status: OAM Disabled
OAM VC state: Not ManagedVerified
    
```

```

OAM Loop detection: Disabled
ILMI VC state: Not Managed
InPkts: 564, OutPkts: 560, InBytes: 19792, OutBytes: 19680
InProc: 0, OutProc: 0
InFast: 4, OutFast: 0, InAS: 560, OutAS: 560
InPktDrops: 0, OutPktDrops: 0
CrcErrors: 0, SarTimeOuts: 0, OverSizedSDUs: 0
Out CLP=1 Pkts: 0
OAM cells received: 26
F5 InEndloop: 0, F5 InSegloop: 0, F5 InAIS: 0, F5 InRDI: 26
OAM cells sent: 77
F5 OutEndloop: 0, F5 OutSegloop: 0, F5 OutAIS: 77, F5 OutRDI: 0 !!!
OAM cell drops: 0
Status: UP

```

The following is sample output from the **show atm pvc** command with the ATM subinterface specified:

```
Router# show atm pvc interface atm 2/0.2
```

Interface	VCD/ Name	VPI	VCI	Type	Encaps	Peak Kbps	Avg/Min Kbps	Burst Cells	Sts
2/0.2	101	0	50	PVC	SNAP	155000	155000		UP
2/0.2	102	0	60	PVC	SNAP	155000	155000		DOWN
2/0.2	104	0	80	PVC	SNAP	155000	155000		UP

The following is sample output for the **show atm pvc** command for a PVC that is a member of a multilink PPP bundle:

```
Router# show atm pvc 15/200
```

```

ATM4/0.10000:VCD:16, VPI:15, VCI:200
UBR, PeakRate:149760 (353208 cps)
AAL5-LLC/SNAP, etype:0x0, Flags:0xC20, VCmode:0x0, Encaps:12
OAM frequency:0 second(s), OAM retry frequency:1 second(s)
OAM up retry count:3, OAM down retry count:5
OAM Loopback status:OAM Disabled
OAM VC State:Not Managed
OAM Loop detection: Disabled
ILMI VC status:Not Managed
VC TxRingLimit:40 particles
VC Rx Limit:800 particles
InARP frequency:15 minutes(s)
Transmit priority 6
InPkts:347, OutPkts:399, InBytes:6268, OutBytes:7728
InCells:347, OutCells:399
InProc:7, OutProc:228
InFast:338, OutFast:169, InAS:0, OutAS:0
InPktDrops:0, OutPktDrops:0/0/0 (holdq/outputq/total)
InCellDrops:0, OutCellDrops:0
InByteDrops:0, OutByteDrops:0
CrcErrors:0, SarTimeOuts:0, OverSizedSDUs:0, LengthViolation:0, CPIErrors:0
Out CLP=1 Pkts:0, Cells:0
OAM cells received:0
F5 InEndloop:0, F5 InSegloop:0, F5 InAIS:0, F5 InRDI:0
F4 InEndloop:0, F4 InSegloop:0, F4 InAIS:0, F4 InRDI:0
OAM cells sent:0
F5 OutEndloop:0, F5 OutSegloop:0, F5 OutRDI:0
F4 OutEndloop:0, F4 OutSegloop:0, F4 OutRDI:0
OAM cell drops:0
Status:UP
PPP:Virtual-Access3 from Virtual-Template1
PPPoA Current State = LOCALLY_TERMINATED
PPPoA Latest Event = Vaccess Up

```

```

PPPoA Latest Error = None
PPPoA Session ID = 7
PPPoA Handle = 0x4D000006, SSS Handle = 0x00000000
Switch Handle = 0xB5000006, PPP Handle = 0xD700000A
AAA Unique ID = 0x00000007, AIE Handle = 0xE7000006
PVC belongs to Multilink PPP Bundle Virtual-Access4 as a PPPoA member link
Packets in VC Holdq:0 , Particles in VC Tx Ring:0
    
```

The following is sample output from the **show atm pvc** command with loopback detection mode through OAM enabled:

```
Router# show atm pvc 4/100
```

```

ATM1/0: VCD: 4, VPI: 4, VCI: 100
UBR, PeakRate: 149760
AAL5-LLC/SNAP, etype:0x0, Flags: 0xC20, VCmode: 0x0
!
OAM frequency: 10 second(s), OAM retry frequency: 1 second(s)
OAM up retry count: 3, OAM down retry count: 5
OAM Loopback status: OAM Received
OAM VC state: Verified
OAM Loop detection: Enabled ! Indicates that loopback mode detection is enabled.
!
ILMI VC state: Not Managed
VC is managed by OAM.
InARP frequency: 15 minutes(s)
Transmit priority 4
InPkts: 0, OutPkts: 0, InBytes: 0, OutBytes: 0
InPRoc: 0, OutPRoc: 0, Broadcasts: 0
InFast: 0, OutFast: 0, InAS: 0, OutAS: 0
InPktDrops: 0, OutPktDrops: 0
CrcErrors: 0, SarTimeOuts: 0, OverSizedSDUs: 0
Out CLP=1 Pkts: 0
OAM cells received: 27
F5 InEndloop: 27, F5 InSegloop: 0, F5 InAIS: 0, F5 InRDI: 0
OAM cells sent: 27
F5 OutEndloop: 27, F5 OutSegloop: 0, F5 OutAIS: 0, F5 OutRDI: 0
OAM cell drops: 3
Status: UP
    
```

The following is sample output from the **show atm pvc** command when loopback mode has been detected:

```
Router# show atm pvc 4/100
```

```

ATM1/0: VCD: 4, VPI: 4, VCI: 100
UBR, PeakRate: 149760
AAL5-LLC/SNAP, etype:0x0, Flags: 0xC20, VCmode: 0x0
!
OAM frequency: 10 second(s), OAM retry frequency: 1 second(s)
OAM up retry count: 3, OAM down retry count: 5
OAM Loopback status: OAM Sent
OAM VC state: Not Verified
OAM Loop detection: Enabled, Detected ! Indicates that loopback mode has been detected on
this interface.
!
ILMI VC state: Not Managed
VC is managed by OAM.
InARP frequency: 15 minutes(s)
Transmit priority 4
InPkts: 0, OutPkts: 0, InBytes: 0, OutBytes: 0
InPRoc: 0, OutPRoc: 0, Broadcasts: 0
InFast: 0, OutFast: 0, InAS: 0, OutAS: 0
InPktDrops: 0, OutPktDrops: 0
    
```

```

CrcErrors: 0, SarTimeOuts: 0, OverSizedSDUs: 0
Out CLP=1 Pkts: 0
OAM cells received: 20
F5 InEndloop: 20, F5 InSegloop: 0, F5 InAIS: 0, F5 InRDI: 0
OAM cells sent: 20
F5 OutEndloop: 20, F5 OutSegloop: 0, F5 OutAIS: 0, F5 OutRDI: 0
OAM cell drops: 1
Status: DOWN, State: NOT_VERIFIED
    
```

Table 1 describes significant fields shown in the displays.

**Table 1 show atm pvc Field Descriptions**

Field	Description
Interface	Interface and subinterface slot and port.
VCD/Name	Virtual connection descriptor (virtual connection number). The connection name is displayed if a name for the VC was configured using the <b>pvc</b> command.
VPI	Virtual path identifier.
VCI	Virtual channel identifier.
Type	Type of PVC detected from PVC discovery, either PVC-D, PVC-L, or PVC-M: <ul style="list-style-type: none"> <li>• PVC-D—PVC created as a result of PVC discovery.</li> <li>• PVC-L—The corresponding peer of this PVC could not be found on the switch.</li> <li>• PVC-M—Some or all of the QoS<sup>1</sup> parameters of this PVC fail to match those of the corresponding peer on the switch.</li> </ul>
Encaps	Type of ATM adaptation layer (AAL) and encapsulation.
Peak or PeakRate	Kilobits per second sent at the peak rate.
Avg/Min or Average Rate	Kilobits per second sent at the average rate.
Burst Cells	Maximum number of ATM cells that the VC can send at peak rate.
Sts or Status	Status of the VC connection: <ul style="list-style-type: none"> <li>• UP—The connection is enabled for data traffic.</li> <li>• DOWN—The connection is not ready for data traffic. When the Status field is DOWN, a State field is shown. See a description of the different values for the State field later in this table.</li> <li>• INACTIVE—The interface is down.</li> </ul>
Connection Name	Name of the PVC.

**Table 1** show atm pvc Field Descriptions (continued)

Field	Description
UBR, UBR+, or VBR-NRT	<ul style="list-style-type: none"> <li>• UBR—Unspecified bit rate QoS is specified for this PVC. See the <b>ubr</b> command for further information.</li> <li>• UBR+—Unspecified bit rate QoS is specified for this PVC. See the <b>ubr+</b> command for further information.</li> <li>• VBR-NRT—Variable bit rate–non-real-time QoS rates are specified for this PVC. See the <b>vbr-nrt</b> command for further information.</li> </ul>
etype	Encapsulation type.
Flags	<p>Bit mask describing VC information. The flag values are summed to result in the displayed value:</p> <ul style="list-style-type: none"> <li>• 0x40—SVC</li> <li>• 0x20—PVC</li> <li>• 0x10—ACTIVE</li> <li>• 0x0—AAL5-SNAP</li> <li>• 0x1—AAL5-NLPID</li> <li>• 0x2—AAL5-FRNLPID</li> <li>• 0x3—AAL5-MUX</li> <li>• 0x4—AAL3/4-SMDS</li> <li>• 0x5—QSAAL</li> <li>• 0x6—ILMI</li> <li>• 0x7—AAL5-LANE</li> <li>• 0x9—AAL5-CISCOPPP</li> </ul>
virtual-access	Virtual-access interface identifier.
virtual-template	Virtual template identifier.
VCmode	AIP-specific or NPM-specific register describing the usage of the VC. This register contains values such as rate queue, peak rate, and AAL mode, which are also displayed in other fields.
OAM Cell emulation	The status of the OAM cell emulation functionality. It is either enabled or disabled.
F5 end2end AIS xmit frequency	Number of seconds between transmission of AIS cells.
OAM frequency	Number of seconds between transmission of OAM loopback cells.
OAM retry frequency	Frequency (in seconds) at which end-to-end F5 loopback cells should be sent when a change in state (up or down) is being verified. For example, if a PVC is up and a loopback cell response is not received after the value of the <i>frequency</i> argument (in seconds) specified using the <b>oam-pvc</b> command, loopback cells are sent at the value of the <i>retry-frequency</i> argument to determine whether the PVC is down.
OAM up retry count	Number of consecutive end-to-end F5 OAM loopback cell responses that must be received in order to change a PVC state to up. Does not apply to SVCs.

**Table 1** show atm pvc Field Descriptions (continued)

Field	Description
OAM down retry count	Number of consecutive end-to-end F5 OAM loopback cell responses that are not received in order to change a PVC state to down or tear down an SVC.
OAM Loopback status	Status of end-to-end F5 OAM loopback cell generation for this VC. This field will have one of the following values: <ul style="list-style-type: none"> <li>• OAM Disabled—End-to-end F5 OAM loopback cell generation is disabled.</li> <li>• OAM Sent—OAM cell was sent.</li> <li>• OAM Received—OAM cell was received.</li> <li>• OAM Failed—OAM reply was not received within the frequency period or contained a bad correlation tag.</li> </ul>
OAM VC state	This field will have one of the following states for this VC: <ul style="list-style-type: none"> <li>• AIS<sup>2</sup>/RDI<sup>3</sup>—The VC received AIS/RDI cells. End-to-end F5 OAM loopback cells are not sent in this state.</li> <li>• Down Retry—An OAM loopback failed. End-to-end F5 OAM loopback cells are sent at retry frequency to verify that the VC is really down. After down-count unsuccessful retries, the VC goes to the Not Verified state.</li> <li>• Not Managed—VC is not being managed by OAM.</li> <li>• Not Verified—VC has not been verified by end-to-end F5 OAM loopback cells. AIS and RDI conditions are cleared.</li> <li>• Up Retry—An OAM loopback was successful. End-to-end F5 OAM loopback cells are sent at retry frequency to verify that the VC is really up. After up-count successive and successful loopback retries, the VC goes to the Verified state.</li> <li>• Verified—Loopbacks are successful. AIS/RDI cell was not received.</li> </ul>
OAM Loop detection	Status of loopback detection mode through OAM: <ul style="list-style-type: none"> <li>• Disabled—Automatic loopback detection is disabled.</li> <li>• Enabled—Automatic loopback detection is enabled.</li> <li>• Detected—Loopback mode is detected on an ATM interface.</li> </ul>
ILMI VC state	This field will have one of the following states for this VC: <ul style="list-style-type: none"> <li>• Not Managed—VC is not being managed by ILMI<sup>4</sup>.</li> <li>• Not Verified—VC has not been verified by ILMI.</li> <li>• Verified—VC has been verified by ILMI.</li> </ul>
VC is managed by OAM/ILMI	VC is managed by OAM or ILMI.
InARP frequency	Number of minutes for the Inverse Address Resolution Protocol (ARP) time period.
InPkts	Total number of packets received on this VC. This number includes all fast-switched and process-switched packets.
OutPkts	Total number of packets sent on this VC. This number includes all fast-switched and process-switched packets.

**Table 1** *show atm pvc Field Descriptions (continued)*

<b>Field</b>	<b>Description</b>
InBytes	Total number of bytes received on this VC. This number includes all fast-switched and process-switched bytes.
OutBytes	Total number of bytes sent on this VC. This number includes all fast-switched and process-switched bytes.
InPRoc	Number of process-switched input packets.
OutPRoc	Number of process-switched output packets.
Broadcasts	Number of process-switched broadcast packets.
InFast	Number of fast-switched input packets.
OutFast	Number of fast-switched output packets.
InAS	Number of autonomous-switched or silicon-switched input packets.
OutAS	Number of autonomous-switched or silicon-switched output packets.
OAM cells received	Total number of OAM cells received on this VC.
F5 InEndloop	Number of end-to-end F5 OAM loopback cells received.
F5 InSegloop	Number of segment F5 OAM loopback cells received.
F5 InAIS	Number of F5 OAM AIS cells received.
F5 InRDI	Number of F5 OAM RDI cells received.
F4 InEndloop	Number of end-to-end F4 OAM loopback cells received.
F4 InSegloop	Number of segment F4 OAM loopback cells received.
F4 InAIS	Number of F4 OAM AIS cells received.
F4 InRDI	Number of F4 OAM RDI cells received.
OAM cells sent	Total number of OAM cells sent on this VC.
F5 OutEndloop	Number of end-to-end F5 OAM loopback cells sent.
F5 OutSegloop	Number of segment F5 OAM loopback cells sent.
F5 OutRDI	Number of F5 OAM RDI cells sent.
OAM cell drops	Number of OAM cells dropped (or flushed).

**Table 1** show atm pvc Field Descriptions (continued)

Field	Description
PVC Discovery	<ul style="list-style-type: none"> <li>• NOT_VERIFIED—This PVC is manually configured on the router and not yet verified with the attached adjacent switch.</li> <li>• WELL_KNOWN—This PVC has a VCI value of 0 through 31.</li> <li>• DISCOVERED—This PVC is learned from the attached adjacent switch via ILMI.</li> <li>• MIXED—Some of the traffic parameters for this PVC were learned from the switch via ILMI.</li> <li>• MATCHED—This PVC is manually configured on the router, and the local traffic-shaping parameters match the parameters learned from the switch.</li> <li>• MISMATCHED—This PVC is manually configured on the router, and the local traffic-shaping parameters do not match the parameters learned from the switch.</li> <li>• LOCAL_ONLY—This PVC is configured locally on the router and not on the remote switch.</li> </ul>
Status	When the Status field indicates UP, the VC is established. When the Status field indicates DOWN, refer to the State field for further information about the VC state.
State	When the Status field is UP, this field does not appear. When the Status field is DOWN or INACTIVE, the State field will appear with one of the following values: <ul style="list-style-type: none"> <li>• NOT_VERIFIED—The VC has been established successfully; waiting for OAM (if enabled) and ILMI (if enabled) to verify that the VC is up.</li> <li>• NOT_EXIST—VC has not been created.</li> <li>• HASHING_IN—VC has been hashed into a hash table.</li> <li>• ESTABLISHING—Ready to establish VC connection.</li> <li>• MODIFYING—VC parameters have been modified.</li> <li>• DELETING—VC is being deleted.</li> <li>• DELETED—VC has been deleted.</li> <li>• NOT_IN_SERVICE—ATM interface is shut down.</li> </ul>
PPP	For PPP over ATM, indicates the virtual access interface number and virtual template number being used.
PPPoA Current State	State of the PPPoA session associated with the VC.
PPPoA Latest Event	The latest event that occurred on the PPPoA session associated with the VC.
PPPoA Latest Error	The latest error that occurred on the PPPoA session associated with the VC.
PPPoA Session ID	PPPoA session identifier of the PPPoA session associated with the VC.
PPPoA Handle	PPPoA context handle.
SSS Handle	SSS handle for PPPoA session associated with the VC.
Switch Handle	SSS handle for switch management.
PPP Handle	Handle associated with the PPP context.

**Table 1** *show atm pvc Field Descriptions (continued)*

<b>Field</b>	<b>Description</b>
AAA Unique ID	Unique identifier associated with the AAA session.
AIE Handle	Access IE handle for the PPPoA session.
Packets in VC Holdq	Number of packets in the hold queue of the VC.
Particles in VC Tx Ring	Number of particles in the Tx ring of the VC.

1. QoS = quality of service
2. AIS = alarm indication signal
3. RDI = remote defect identification
4. ILMI = Interim Local Management Interface

# virtual-template pre-clone

To specify the number of virtual-access interfaces to be created and cloned from a specific virtual template, use the **virtual-template pre-clone** command in global configuration mode. To disable precloning, use the **no** form of this command.

**virtual-template** *template-number* **pre-clone** *number*

**no virtual-template** *template-number* **pre-clone** *number*

## Syntax Description

<i>template-number</i>	The number of the virtual template interfaces from which the new virtual-access interfaces are created.
<i>number</i>	The number of virtual-access interfaces to be created.

## Defaults

Precloning is disabled.

## Command Modes

Global configuration

## Command History

Release	Modification
12.0(3)DC	This command was introduced on the Cisco 6400 node route processor.
12.2(4)T	This command was integrated into Cisco IOS Release 12.2(4)T.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.

## Usage Guidelines

The number of precloned virtual-access interfaces should be set to the number of expected PPPoA and PPPoE sessions.

The precloned virtual-access interfaces will be attached to the PVC upon receipt of the first PPP packet from the client on the PVC. The virtual-access interface will be detached from the PVC upon termination of the PPP session.

When a PPP session is terminated, the virtual-access interface will remain in the router and will be reused. When precloning is disabled, any virtual-access interfaces that were already precloned but have not yet been used will remain in the router for future use.

## Examples

The following example shows how to create 1200 precloned virtual-access interfaces on virtual template 1:

```
virtual-template 1 pre-clone 1200
```

Related Commands	Command	Description
	<b>encapsulation (ATM)</b>	Configures the AAL and encapsulation type for an ATM VC, VC class, VC, bundle, or PVC range.
	<b>show vtemplate</b>	Displays a list of all configured virtual templates.

# Glossary

**cloning**—Creating and configuring a virtual-access interface by applying a specific virtual template interface. The template is the source of the generic user information and router-dependent information. The result of cloning is a virtual-access interface configured with all the commands in the template.

**LCP**—link control protocol. Protocol that establishes, configures, and tests data-link connections for use by PPP.

**LLC**—logical link control. Higher of the two data link layer sublayers defined by the IEEE. The LLC sublayer handles error control, flow control, framing, and MAC-sublayer addressing. The most prevalent LLC protocol is IEEE 802.2, which includes both connectionless and connection-oriented variants.

**NAS**—network access server. A device providing local network access to users across a remote access network such as the Public Switched Telephone Network (PSTN).

**PPP**—Point-to-Point Protocol. A protocol that encapsulates network layer protocol information over point-to-point links. PPP is defined in RFC 1661.

**PPPoA**—PPP over ATM.

**PPPoE**—PPP over Ethernet.

**precloning**—Cloning a specified number of virtual-access interfaces from a virtual template at system startup or when the command is configured.

**PVC**—permanent virtual circuit (or connection). Virtual circuit that is permanently established. PVCs save bandwidth associated with circuit establishment and teardown in situations where certain virtual circuits must exist all the time. In ATM terminology, called a permanent virtual connection.

**VC**—virtual channel. Logical circuit created to ensure reliable communication between two network devices. A VC is defined by a VPI/VCI pair and can be either permanent (PVC) or switched (SVC).

**virtual-access interface**—Instance of a unique virtual interface that is created dynamically and exists temporarily. Virtual-access interfaces can be created and configured differently by different applications, such as virtual profiles and virtual private dialup networks. Virtual-access interfaces are cloned from virtual template interfaces.

**virtual template interface**—A logical interface configured with generic configuration information for a specific purpose or configuration common to specific users, plus router-dependent information. The template takes the form of a list of Cisco IOS interface commands that are applied to virtual-access interfaces, as needed.

**VPDN**—virtual private dialup network. A system that permits dial-in networks to exist remotely from home networks, while giving the appearance of being directly connected.

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