# VP/VC Shaping for PPPoEoA/PPPoA

This feature adds support for ATM VP shaping for VCs with underlying broadband sessions. Per VC and per VP traffic shaping controls or modifies the flow of traffic on an interface. Traffic shaping limits throughput by buffering excess traffic instead of dropping packets. It ensures that traffic from one VC does not adversely impact another VC, thus preventing loss of data. Providing traffic shaping on a per VC and per VP basis allows flexibility and control over every VC and VP configured.

The VP and VC Shaping for PPPoEoA and PPPoA feature is supported for the following ATM traffic service categories:

- Variable bit rate Non-Real-Time (VBR-nRT)
- Unspecified bit rate (UBR)



# Prerequisites for VP/VC Shaping for PPPoEoA/PPPoA

- Dynamic changes to VP shaper rate should be enabled.
- The ATM VC create-on-demand functionality (with the VP shaper configured) should be enabled.
- PPP over Ethernet over ATM (PPPoEoA) sessions must be enabled.

# Restrictions for VP/VC Shaping for PPPoEoA/PPPoA

- All the VCs parented by a given VP with shaping applied must be of the same type. For example, if a VP shaper is applied to virtual path identifier (VPI) 10, all the virtual circuit identifiers (VCIs) with a VP of 10 must be vbr-nrt or all must be ubr+.
- The **atm pvp rate** command cannot be added or removed if any of the VCs on that ATM interface that are in VP are in the active state. This is not supported in a nonbroadband configuration.

- Configuration of Modular QoS CLI (MQC) policy maps on VPs is not supported. Only configuration of the VP rate using the **atm pvp** command is supported.
- Quality of Service (QoS) on the VP and VC session is supported.
- The sum of the VC shaper rates can oversubscribe the VP shaper rate configured.
- The sum of all the VP shaper rates can oversubscribe the physical rate of the ATM interface.
- VP shapers are supported for any combination of VCs with or without broadband sessions. They may or may not have queuing QoS policies attached.
- On a given ATM interface, there may be mixed VPs with and without shapers.
- When there are multiple VCs in a VP, class-of-service change is not allowed.
- When there is only one VC in a VP, class-of-service change is allowed.
- IP sessions and the existing Intelligent Services Gateway (ISG) on ATM functionality are supported.

# Configuring VP/VC Shaping for PPPoEoA/PPPoA

### Before you begin

Before you configure VP/VC shaping for PPoEoA/PPPoA, ensure that you configure the ATM interface and define the attributes for each session. A broadband aggregation group (bba-group) configured on an ATM interface points to the virtual template the router will use to apply QoS policies to the sessions.

To configure VP/VC shaping for PPPoEoA/PPPoA on an ATM interface, perform the following configuration task.

### SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface atm** *slot/module/port*
4. **mac-address** *mac-address*
5. **no ip address**
6. **atm clock internal**
7. **atm oam flush**
8. **no atm ilmi-keepalive**
9. **exit**
10. **bba-group pppoe** {*group-name* | **global**}
11. **virtual-template** *template-number*
12. **sessions per-vc limit** *per-vc-limit* [**threshold** *threshold-value*]
13. **sessions per-mac limit** *per-mac-limit*
14. **sessions per-vlan limit** *per-vlan-limit*
15. **sessions per-vc throttle** *per-vc-throttle*
16. **exit**
17. **interface atm** *slot/subslot/port* [*subinterface*][**point-to-point** | **multipoint**]

18. **atm pvp** *vpi [peak-rate]*
19. **pvc** *vpi/vci*
20. **vbr-nrt** *output-pcr output-scr[output-maxburstsize]*
21. **dbs enable** [**aggregated** | **maximum**]
22. **encapsulation aal5snap**
23. **protocol pppoe group** {*group-name* | **global**}
24. **end**

**DETAILED STEPS**

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **enable**<br>**Example:**<br>`Router> enable` | Enables the privileged EXEC mode.<br>Enter your password if prompted. |
| **Step 2** | **configure terminal**<br>**Example:**<br>`Router# configure terminal` | Enters the global configuration mode. |
| **Step 3** | **interface atm** *slot/module/port*<br>**Example:**<br>`Router(config)# interface atm slot/module/port` | Creates or modifies an ATM interface. Enters the interface configuration mode. Here:<br>*slot/module/port* is the interface number. |
| **Step 4** | **mac-address** *mac-address*<br>**Example:**<br>`Router(config-if)# mac-address mac-address` | Specifies the mac address for an interface. |
| **Step 5** | **no ip address**<br>**Example:**<br>`Router(config-if)# no ip address` | Disables IP processing on the interface by removing its IP address. |
| **Step 6** | **atm clock internal**<br>**Example:**<br>`Router(config-if)#atm clock internal` | Synchronizes the timer between two back-to-back ATM interfaces. |
| **Step 7** | **atm oam flush**<br>**Example:**<br>`Router(config-if)# atm oam flush` | Drops all the current and future Operation, Administration, and Maintenance (OAM) cells received on the ATM interface. |
| **Step 8** | **no atm ilmi-keepalive**<br>**Example:** | Disables the Interim Local Management Interface (ILMI) keepalives. |

| | Command or Action | Purpose |
|---|---|---|
| | `Router(config-if)# no atm ilmi-keepalive` | |
| **Step 9** | **exit**<br>**Example:**<br>`Router(config-if)# exit` | Exits the interface configuration mode. |
| **Step 10** | **bba-group pppoe** {*group-name* \| **global**}<br>**Example:**<br>`Router(config)# bba-group pppoe group-name` | Defines a PPPoE profile, and enters the BBA group configuration mode.<br>The **global** keyword creates a profile that serves as the default profile for any PPPoE port that is not assigned a specific profile. |
| **Step 11** | **virtual-template** *template-number*<br>**Example:**<br>`Router(config-bba-group)# virtual-template template-number` | Specifies which virtual template will be used to clone virtual access interfaces. |
| **Step 12** | **sessions per-vc limit** *per-vc-limit* [**threshold** *threshold-value*]<br>**Example:**<br>`Router(config-bba-group)# sessions per-vc limit per-vc-limit` | Specifies the maximum number of PPPoE sessions that can be established over an ATM permanent virtual circuit (PVC) |
| **Step 13** | **sessions per-mac limit** *per-mac-limit*<br>**Example:**<br>`Router(config-bba-group)# sessions per-mac limit per-mac limit` | Sets the maximum number of PPPoE sessions permitted per MAC address in a PPPoE profile. |
| **Step 14** | **sessions per-vlan limit** *per-vlan-limit*<br>**Example:**<br>`Router(config-bba-group)# sessions per-vlan limit per-vlan-limit` | Specifies the maximum number of PPPoE sessions permitted per VLAN in a PPPoE profile. |
| **Step 15** | **sessions per-vc throttle** *per-vc-throttle*<br>**Example:**<br>`Router(config-bba-group)# sessions per-vc throttle per-vc-throttle` | Configures PPPoE connection throttling, which limits the number of PPPoE session requests that can be made from a VC. |
| **Step 16** | **exit**<br>**Example:**<br>`Router(config-bba-group)# exit` | Exits the BBA group configuration mode and returns to the global configuration mode. |

| | Command or Action | Purpose |
|---|---|---|
| **Step 17** | **interface atm** *slot/subslot/port* [*subinterface*][**point-to-point** \| **multipoint**]<br>**Example:**<br>`Router(config)# interface atm slot/subslot/port multipoint` | Configures the ATM interface and enters the subinterface configuration mode. |
| **Step 18** | **atm pvp** *vpi [peak-rate]*<br>**Example:**<br>`Router(config-subif)# atm pvp vpi[peak-rate]` | Creates a permanent virtual path (PVP) used to multiplex (or bundle) one or more VCs. |
| **Step 19** | **pvc** *vpi/vci*<br>**Example:**<br>`Router(config-subif)# atm pvp vpi[peak-rate]` | Creates or assigns a name to an ATM PVC and enters ATM virtual circuit configuration mode. |
| **Step 20** | **vbr-nrt** *output-pcr output-scr[output-maxburstsize]*<br>**Example:**<br>`Router(config-if-atm-vc)# vbr-nrt output-pcr output-scr [output-maxburstsize]` | Configures the VBR-nRT QoS and specifies output peak cell rate (PCR), output sustainable cell rate (SCR), and output maximum burst cell size for an ATM PVC, PVC range, switched virtual circuit (SVC), VC class, or VC bundle member. |
| **Step 21** | **dbs enable** [**aggregated** \| **maximum**]<br>**Example:**<br>`Router(config-if-atm-vc)# dbs enable` | Applies the Dynamic Subscriber Bandwidth Selection QoS parameters. |
| **Step 22** | **encapsulation aal5snap**<br>**Example:**<br>`Router(config-if-atm-vc)# encapsulation aal5snap` | Configures the ATM adaptation layer (AAL) and encapsulation type for an ATM VC. |
| **Step 23** | **protocol pppoe group** {*group-name* \| **global**}<br>**Example:**<br>`Router(config-if-atm-vc)# protocol pppoe group group-name` | Enables PPPoE sessions to be established on PVCs.<br>**group** specifies a PPPoE profile (bba-group) to be used by the PPPoE sessions on the interface.<br>*group-name* is the name of the PPPoE profile (bba-group) to be used by the PPPoE sessions on the interface.<br>**group** *group-name* points to the bba-group to be used for applying a virtual template interface with QoS policies to sessions. |
| **Step 24** | **end**<br>**Example:**<br>`Router(config-if-atm-vc)# end` | Ends the session and returns to the privileged EXEC mode. |

### Example

The following example shows how to configure VP/VC shaping for PPPoEoA/PPPoA:

```
Router(config)#interface ATM1/0/0
Router(config-if)#mac-address 0000.b001.0001
Router(config-if)#no ip address
Router(config-if)#atm clock INTERNAL
Router(config-if)#atm oam flush
Router(config-if)#no atm ilmi-keepalive
Router(config-if)#exit
Router(config)#bba-group pppoe group_basic
Router(config-bba-group)#virtual-template 2
Router(config-bba-group)#sessions per-vc limit 1
Router(config-bba-group)#sessions per-mac limit 1
Router(config-bba-group)#sessions per-vlan limit 1
Router(config-bba-group)#sessions per-vc throttle 1 2 3
Router(config-bba-group)#exit
Router(config)#interface ATM1/0/0.64001 multipoint
Router(config-subif)#atm pvp 1 50000
Router(config-subif)#pvc 1/32
Router(config-if-atm-vc)#vbr-nrt 40000 40000 1
Router(config-if-atm-vc)#dbs enable
Router(config-if-atm-vc)#encapsulation aal5snap
Router(config-if-atm-vc)#protocol pppoe group group_1
Router(config-if-atm-vc)#end
```

# Configuration Examples for VP/VC Shaping for PPPoEoA/PPPoA

## Example: Configuring VP/VC Shaping for PPPoEoA/PPPoA

The following example shows how to configure VP/VC shaping for PPPoEoA/PPPoA:

```
interface ATM1/0/0
mac-address 0000.b001.0001
no ip address
atm clock INTERNAL
atm oam flush
no atm ilmi-keepalive
!
bba-group pppoe group_basic
virtual-template 2
sessions per-vc limit 1
sessions per-mac limit 1
sessions per-vlan limit 1
sessions per-vc throttle 1 2 3
!
interface ATM1/0/0.1 multipoint
atm pvp 1 1000
pvc 1/10000
 vbr-nrt 500 500 1
 dbs enable
 encapsulation aal5snap
 protocol pppoe group group_basic
```

# Example: Verifying VP/VC Shaping for PPPoEoA/PPPoA

The following example shows how to display configuration of a particular PVC.

```
Router# Show ATM pvc
Keys:  A = ATM1/0/0, B = ATM1/0/1, C = ATM1/0/2,
          VCD /                                          Peak Av/Min Burst
Interface  Name          VPI   VCI Type    Encaps     SC     Kbps   Kbps Cells St
A.64001    1             1     3 PVC     F4-OAM     UBR   50000              UP
A.64001    2             1     4 PVC     F4-OAM     UBR   50000              UP
A.64001    11            1    32 PVC     SNAP       VBR   40000  40000     1 UP
A.64001    12            1    33 PVC     SNAP       VBR   40000  40000     1 UP
A.64001    13            1    34 PVC     SNAP       VBR   40000  40000     1 UP
A.64001    14            1    35 PVC     SNAP       VBR   40000  40000     1 UP
A.64001    15            1    36 PVC     SNAP       VBR   40000  40000     1 UP
A.64001    16            1    37 PVC     SNAP       VBR   40000  40000     1 UP
A.64001    17            1    38 PVC     SNAP       VBR   40000  40000     1 UP
A.64001    18            1    39 PVC     SNAP       VBR   40000  40000     1 UP
A.64001    19            1    40 PVC     SNAP       VBR   40000  40000     1 UP
A.64001    20            1    41 PVC     SNAP       VBR   40000  40000     1 UP
A.64001    3             2     3 PVC     F4-OAM     UBR   50000              UP
A.64001    4             2     4 PVC     F4-OAM     UBR   50000              UP
A.64001    21            2    32 PVC     SNAP       VBR   40000  40000     1 UP
A.64001    22            2    33 PVC     SNAP       VBR   40000  40000     1 UP
A.64001    23            2    34 PVC     SNAP       VBR   40000  40000     1 UP
A.64001    24            2    35 PVC     SNAP       VBR   40000  40000     1 UP
```

The following example shows how to display configuration of the traffic parameters for a PVC.

```
Router# Show ATM vc
Keys:  A = ATM1/0/0, B = ATM1/0/1, C = ATM1/0/2,
Codes: DN - DOWN, IN - INACTIVE

          VCD /                                          Peak Av/Min Burst
Interface  Name          VPI   VCI Type    Encaps     SC     Kbps   Kbps Cells St
A.64001    1             1     3 PVC     F4-OAM     UBR   50000              UP
A.64001    2             1     4 PVC     F4-OAM     UBR   50000              UP
A.64001    11            1    32 PVC     SNAP       VBR   40000  40000     1 UP
A.64001    12            1    33 PVC     SNAP       VBR   40000  40000     1 UP
A.64001    13            1    34 PVC     SNAP       VBR   40000  40000     1 UP
A.64001    14            1    35 PVC     SNAP       VBR   40000  40000     1 UP
A.64001    15            1    36 PVC     SNAP       VBR   40000  40000     1 UP
A.64001    16            1    37 PVC     SNAP       VBR   40000  40000     1 UP
A.64001    17            1    38 PVC     SNAP       VBR   40000  40000     1 UP
A.64001    18            1    39 PVC     SNAP       VBR   40000  40000     1 UP
A.64001    19            1    40 PVC     SNAP       VBR   40000  40000     1 UP
A.64001    20            1    41 PVC     SNAP       VBR   40000  40000     1 UP
A.64001    3             2     3 PVC     F4-OAM     UBR   50000              UP
A.64001    4             2     4 PVC     F4-OAM     UBR   50000              UP
A.64001    21            2    32 PVC     SNAP       VBR   40000  40000     1 UP
A.64001    22            2    33 PVC     SNAP       VBR   40000  40000     1 UP
A.64001    23            2    34 PVC     SNAP       VBR   40000  40000     1 UP
A.64001    24            2    35 PVC     SNAP       VBR   40000  40000     1 UP
A.64001    25            2    36 PVC     SNAP       VBR   40000  40000     1 UP
A.64001    26            2    37 PVC     SNAP       VBR   40000  40000     1 UP
A.64001    27            2    38 PVC     SNAP       VBR   40000  40000     1 UP
A.64001    28            2    39 PVC     SNAP       VBR   40000  40000     1 UP
```

The following example shows how to display configuration for VP mode cell relay.

```
Router# Show ATM vp
Keys:  A = ATM1/0/0, B = ATM1/0/1, C = ATM1/0/2,
```

```
                                Data  CES    Peak     CES Avg/Min Burst     MCR
Interface     VPI SC            VCs  VCs    Kbps     Kbps    Kbps Cells    Kbps    CDVT  Status
A.64001         1 VBR-NRT        10    0   50000        0     N/A   N/A     N/A     N/A  ACTIVE

A.64001         2 VBR-NRT        10    0   50000        0     N/A   N/A     N/A     N/A  ACTIVE

A.64001         3 VBR-NRT        10    0   50000        0     N/A   N/A     N/A     N/A  ACTIVE

A.64001         4 VBR-NRT        10    0   50000        0     N/A   N/A     N/A     N/A  ACTIVE

A.64001         5 VBR-NRT        10    0   50000        0     N/A   N/A     N/A     N/A  ACTIVE

B.64001         6 VBR-NRT        10    0   40000        0     N/A   N/A     N/A     N/A  ACTIVE

B.64001         7 VBR-NRT        10    0   40000        0     N/A   N/A     N/A     N/A  ACTIVE

B.64001         8 VBR-NRT        10    0   40000        0     N/A   N/A     N/A     N/A  ACTIVE

B.64001         9 VBR-NRT        10    0   40000        0     N/A   N/A     N/A     N/A  ACTIVE

B.64001        10 VBR-NRT        10    0   40000        0     N/A   N/A     N/A     N/A  ACTIVE

C.64001        11 VBR-NRT        10    0   30000        0     N/A   N/A     N/A     N/A  ACTIVE

C.64001        12 VBR-NRT        10    0   30000        0     N/A   N/A     N/A     N/A  ACTIVE

C.64001        13 VBR-NRT        10    0   30000        0     N/A   N/A     N/A     N/A  ACTIVE

C.64001        14 VBR-NRT        10    0   30000        0     N/A   N/A     N/A     N/A  ACTIVE

C.64001        15 VBR-NRT        10    0   30000        0     N/A   N/A     N/A     N/A  ACTIVE
```

# Additional References

### Related Documents

| Related Topic | Document Title |
|---|---|
| Cisco IOS commands | Cisco IOS Master Commands List, All Releases |
| QoS commands | *Cisco IOS QoS Command Reference* |

### Technical Assistance

| Description | Link |
|---|---|
| The Cisco Support and Documentation website provides online resources to download documentation, software, and tools. Use these resources to install and configure the software and to troubleshoot and resolve technical issues with Cisco products and technologies. Access to most tools on the Cisco Support and Documentation website requires a Cisco.com user ID and password. | http://www.cisco.com/cisco/web/support/index.html |

# Feature Information for VP/VC Shaping for PPPoEoA/PPPoA

*Table 1: Feature Information for VP/VC Shaping for PPPoEoA/PPPoA*