

mac-address (ATM)

To configure the MAC address on ATM permanent virtual circuits (PVCs) in a broadband access (BBA) group for using a different MAC address for PPP over Ethernet over ATM (PPPoEoA), use the **mac-address** command in BBA group configuration mode. To remove a MAC address, use the **no** form of this command.

```
mac-address { autoselect | mac-address }
```

```
no mac-address { autoselect | mac-address }
```

Syntax Description	Parameter	Description
	autoselect	Automatically selects the MAC address based on the ATM interface.
	<i>mac-address</i>	MAC address (MAC value) to be used on ATM interfaces, entered as a series of three hexadecimal numbers presented in dotted notation. Example: 0100.CCCC.CCCD.

Defaults No MAC address change. Any change in the usage of MAC addresses will not happen unless this command is explicitly configured.

Command Modes BBA group configuration mode

Command History	Release	Modification
	12.3(11)T	This command was introduced.

Usage Guidelines Except for using a different MAC address, this command does not change the way PPPoE works. Use the **mac-address** command to configure the MAC address on ATM PVCs in a BBA group so there will be a different MAC address for PPPoEoA. If a PPP over Ethernet (PPPoE) profile is not specified by using the group option, PPPoE sessions will be established using values from the global PPPoE profile. PPPoE profiles must be configured using the **bba-group pppoe** command.

Examples The following example configures the MAC address on an ATM PVC in a BBA group using values from the global PPPoE profile by specifying the MAC address:

```
Router(config)# bba-group pppoe global
Router(config-bba-group)# virtual-template 1
Router(config-bba-group)# mac-address 1.1.3
```

The following example configures the MAC address automatically on an ATM PVC in a BBA group using group profile by using the **autoselect** option:

```
Router(config)# bba-group pppoe vpn1
Router(config-bba-group)# virtual-template 1
Router(config-bba-group)# mac-address autoselect
```

Related Commands

Command	Description
bba-group pppoe	Creates a PPPoE profile on the BBA group.
protocol pppoe	Establishes PPPoE sessions on PVCs.

map-class atm

This command is no longer supported.

map-class frame-relay

To specify a map class to define quality of service (QoS) values for a switched virtual circuit (SVC), use the **map-class frame-relay** command in global configuration mode.

map-class frame-relay *map-class-name*

Syntax Description	<i>map-class-name</i>	Name of this map class.
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Defaults A map class is not specified.

Command Modes Global configuration

Command History	Release	Modification
	11.2	This command was introduced.

Usage Guidelines After you specify the named map class, you can specify the QoS parameters—such as incoming and outgoing committed information rate (CIR), committed burst rate, excess burst rate, and the idle timer—for the map class.

To specify the protocol-and-address combination to which the QoS parameters are to be applied, associate this map class with the static maps under a map list.

Examples The following example specifies a map class called “hawaii” and defines three QoS parameters for it. The “hawaii” map class is associated with a protocol-and-address static map defined under the **map-list** command.

```
map-list bermuda source-addr E164 123456 dest-addr E164 654321
 ip 10.108.177.100 class hawaii
  appletalk 1000.2 class hawaii

map-class frame-relay hawaii
 frame-relay cir in 2000000
 frame-relay cir out 56000
 frame-relay be out 9000
```

Related Commands	Command	Description
	frame-relay bc	Specifies the incoming or outgoing Bc for a Frame Relay VC.
	frame-relay be	Sets the incoming or outgoing Be for a Frame Relay VC.
	frame-relay cir	Specifies the incoming or outgoing CIR for a Frame Relay VC.
	frame-relay idle-timer	Specifies the idle timeout interval for an SVC.

map-group

To associate a map list with a specific interface, use the **map-group** command in interface configuration mode.

```
map-group group-name
```

Syntax Description

<i>group-name</i>	Name used in a map-list command.
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Defaults

A map list is not associated with an interface.

Command Modes

Interface configuration

Command History

Release	Modification
11.2	This command was introduced.

Usage Guidelines

A map-group association with an interface is required for switched virtual circuit (SVC) operation. In addition, a map list must be configured.

The **map-group** command applies to the interface or subinterface on which it is configured. The associated E.164 or X.121 address is defined by the **map-list** command, and the associated protocol addresses are defined by using the **class** command under the **map-list** command.

Examples

The following example configures a physical interface, applies a map group to the physical interface, and then defines the map group:

```
interface serial 0
 ip address 172.10.8.6
 encapsulation frame-relay
 map-group bermuda
 frame-relay lmi-type q933a
 frame-relay svc

map-list bermuda source-addr E164 123456 dest-addr E164 654321
 ip 10.1.1.1 class hawaii
 appletalk 1000.2 class rainbow
```

Related Commands

Command	Description
class (map-list)	Associates a map class with a protocol-and-address combination.
map-list	Specifies a map group and link it to a local E.164 or X.121 source address and a remote E.164 or X.121 destination address for Frame Relay SVCs.

map-list

To specify a map group and link it to a local E.164 or X.121 source address and a remote E.164 or X.121 destination address for Frame Relay switched virtual circuits (SVCs), use the **map-list** command in global configuration mode. To delete a previous map-group link, use the **no** form of this command.

```
map-list map-group-name source-addr {e164 | x121} source-address dest-addr {e164 | x121}
destination-address
```

```
no map-list map-group-name source-addr {e164 | x121} source-address dest-addr {e164 | x121}
destination-address
```

Syntax Description

<i>map-group-name</i>	Name of the map group. This map group must be associated with a physical interface.
source-addr { e164 x121 }	Type of source address.
<i>source-address</i>	Address of the type specified (E.164 or X.121).
dest-addr { e164 x121 }	Type of destination address.
<i>destination-address</i>	Address of the type specified (E.164 or X.121).

Defaults

A map group is not linked to a source and destination address.

Command Modes

Global configuration

Command History

Release	Modification
11.2	This command was introduced.

Usage Guidelines

Use the **map-class** command and its subcommands to define quality of service (QoS) parameters—such as incoming and outgoing committed information rate (CIR), committed burst rate, excess burst rate, and the idle timer—for the static maps defined under a map list.

Each SVC needs to use a source and destination number, in much the same way that a public telephone network needs to use source and destination numbers. These numbers allow the network to route calls from a specific source to a specific destination. This specification is done through map lists.

Depending on switch configuration, addressing can take either of two forms: E.164 or X.121.

An X.121 address number is 14 digits long and has the following form:

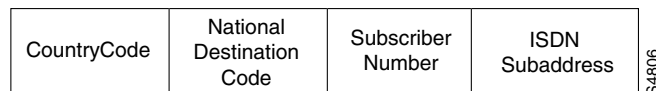
```
Z CC P NNNNNNNNNN
```

[Table 5](#) describes the codes in an X.121 address number form.

Table 5 X.121 Address Numbers

Code	Meaning	Value
Z	Zone code	3 for North America
C	Country code	10–16 for the United States
P	Public data network (PDN) code	Provided by the PDN
N	10-digit number	Set by the network for the specific destination

An E.164 number has a variable length; the maximum length is 15 digits. An E.164 number has the fields shown in [Figure 1](#) and described in [Table 6](#).

Figure 1 E.164 Address Format**Table 6** E.164 Address Field Descriptions

Field	Description
Country code	Can be 1, 2, or 3 digits long. Some current values are the following: <ul style="list-style-type: none"> • Code 1—United States of America • Code 44—United Kingdom • Code 61—Australia
National destination code + subscriber number	Referred to as the National ISDN number; the maximum length is 12, 13, or 14 digits, based on the country code.
ISDN subaddress	Identifies one of many devices at the termination point. An ISDN subaddress is similar to an extension on a PBX.

Examples

In the following SVC example, if IP or AppleTalk triggers the call, the SVC is set up with the QoS parameters defined within the class “hawaii”. An SVC triggered by either protocol results in two SVC maps, one for IP and one for AppleTalk. Two maps are set up because these protocol-and-address combinations are heading for the same destination, as defined by the **dest-addr** keyword and the values following it in the **map-list** command.

```
map-list bermuda source-addr e164 123456 dest-addr e164 654321
 ip 10.1.1.1 class hawaii
 appletalk 1000.2 class hawaii
```

Related Commands	Command	Description
	class (map-list)	Associates a map class with a protocol-and-address combination.
	map-class frame-relay	Specifies a map class to define QoS values for an SVC.

match

To specify whether to use the first three bits in the type of service (ToS) octet or the first six bits of the Differentiated Services Code Point (DSCP) octet of the IP header for mapping packet service levels to Frame Relay permanent virtual circuit (PVC) bundle members, use the **match** command in Frame Relay VC-bundle configuration mode. To change the mapping scheme used, override the current configuration by using the **match** command with the other keyword. This command does not have a **no** form.

```
match {dscp | precedence}
```

Syntax Description

dscp	Specifies that the DSCP octet in the IPv4 header is used to map packet service levels to specific Frame Relay PVC bundle members. Currently the first six bits of the DSCP octet are used for mapping, providing 64 packet service levels numbered 0 through 63.
precedence	Specifies that the precedence field of the ToS octet is used to map packet service levels to specific Frame Relay PVC bundle members. The precedence field consists of the first three bits of the ToS octet, providing eight precedence levels numbered 0 through 7.

Defaults

precedence

Command Modes

Frame Relay VC-bundle configuration

Command History

Release	Modification
12.2(13)T	This command was introduced.

Usage Guidelines

The default PVC bundle match type is **precedence**. To change the match type to DSCP, use the **match dscp** command. When this command is executed, the system displays the message “Resetting vc-bundle configuration” on the console. When the match type is changed, the system removes all level designations that were previously configured.

To return the PVC bundle match type to the default setting of **precedence**, use the **match precedence** command.

A PVC bundle cannot perform precedence matching and DSCP matching at the same time. If the wrong matching scheme is configured for the traffic type, unpredictable behavior will result.

When tag-switching is enabled on the interface by using the **tag-switching ip** command, PVC bundles that are configured for IP precedence mapping are automatically converted to MPLS EXP mapping. The PVC bundle functionality remains the same with respect to priority levels, bumping, and so on, but the **match precedence** command is replaced by “match exp”, and each **precedence** command is replaced by the **exp** command. The result is that a bundle-member PVC previously configured to carry precedence level 1 IP traffic now carries EXP level 1 MPLS traffic.

PVC bundles configured for DSCP mapping go down when tag-switching is enabled. The DSCP configuration for each bundle-member PVC is reset, causing the PVCs to be unmapped and Inverse ARP, bumping, and protection settings to be unconfigured. The **match dscp** command is replaced by “match exp”.

When tag-switching is disabled, the **match precedence** and **match dscp** commands are restored.

Examples

The following example sets the match type to DSCP for the PVC bundle MP-4-dynamic:

```
Router(config)# interface serial 1/4.1 multipoint
Router(config-if)# frame-relay vc-bundle MP-4-dynamic
Router(config-fr-vcb)# match dscp
%Resetting vc-bundle configuration.
```

Related Commands

Command	Description
dscp (Frame Relay VC-bundle-member)	Configures the DSCP value or values for a Frame Relay PVC bundle member.
exp	Configures MPLS EXP levels for a Frame Relay PVC bundle member.
precedence (Frame Relay VC-bundle-member)	Configures the precedence levels for a Frame Relay PVC bundle member.

max bandwidth

To specify the total amount of outgoing bandwidth available to switched virtual circuits (SVCs) in the current configuration, use the **max bandwidth** command in interface-ATM-VC configuration mode. To remove the current bandwidth setting, use the **no** form of this command.

max bandwidth *kbps*

no max bandwidth *kbps*

Syntax Description	<i>kbps</i>	Total amount of outgoing bandwidth in kilobits per second available to all SVCs in the current configuration.
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Defaults	No default behavior or values
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Command Modes	Interface-ATM-VC configuration
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Command History	Release	Modification
	12.1(3)T	This command was introduced.

Usage Guidelines	Only the guaranteed cell rate of an SVC is counted toward the maximum bandwidth.
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Examples In following example, an SVC called “anna” on ATM interface 2/0/0 is configured using the **max bandwidth** command to allow a maximum of 50 Mbps of bandwidth to be used by all of the SVCs in this configuration:

```
interface ATM 2/0/0
  svc anna
  encapsulation aal5auto
  protocol ppp virtual-template 1
  max bandwidth 50000
```

Related Commands	Command	Description
	max vc	Specifies the maximum number of SVCs that can be established using the current configuration.

max vc

To specify the maximum number of switched virtual circuits (SVCs) that can be established using the current configuration, use the **max vc** command in interface-ATM-VC configuration mode. To restore the maximum number of SVCs to the default setting, use the **no** form of this command.

max vc *number*

no max vc *number*

Syntax Description

<i>number</i>	Maximum number of SVCs to be established using the current SVC configuration.
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Defaults

4096 SVCs

Command Modes

Interface-ATM-VC configuration

Command History

Release	Modification
12.1(3)T	This command was introduced.

Examples

In following example, an SVC called “anna” on ATM interface 2/0/0 is configured using the **max vc** command to allow a maximum of 100 SVCs to be established using this configuration:

```
interface ATM 2/0/0
  svc anna
  encapsulation aal5auto
  protocol ppp virtual-template 1
  max vc 100
```

Related Commands

Command	Description
max bandwidth	Specifies the maximum amount of bandwidth available to all SVCs in the current configuration.
svc	Creates an ATM SVC.

mid

To set the range of message identifier (MID) values on a permanent virtual circuit (PVC), use the **mid** interface-ATM-VC configuration command. To remove MID value range settings, use the **no** form of this command.

mid *midlow midhigh*

no mid *midlow midhigh*

Syntax Description		
	<i>midlow</i>	Starting MID number for this PVC. This can be set between 0 and 1023.
	<i>midhigh</i>	Ending MID number for this PVC. This can be set between 0 and 1023.

Defaults 0

Command Modes Interface-ATM-VC configuration

Command History	Release	Modification
	11.3(2)T	This command was introduced.

Usage Guidelines This command is only available when SMDS encapsulation is configured on a PVC. Use this command to assign different ranges of message identifiers to different PVCs.

Examples In the following example, the **atm mid-per-vc** command limits the maximum number of message identifiers to 32 for each VC on the ATM interface. Using the **mid** command, the selected range of numbers that are available for the message identifiers on PVC 1/40 is 0 to 31. For PVC 2/50, the range is 32 to 63.

```
interface atm 2/0
 atm mid-per-vc 32
 pvc 1/40 smds
 mid 0 31
 pvc 2/50 smds
 mid 32 63
```

network-clock-select (ATM)

To establish the sources and priorities of the requisite clocking signals for an ATM-CES port adapter, use the **network-clock-select** command in global configuration mode. To remove the clock source, use the **no** form of this command.

```
network-clock-select priority { cbr | atm } slot/port
```

```
no network-clock-select priority { cbr | atm } slot/port
```

Syntax Description

<i>priority</i>	Priority of the clock source. Values are 1 (high priority) to 4 (low priority).
cbr	Specifies a CBR interface to supply the clock source.
atm	Specifies an ATM interface to supply the clock source.
<i>slot</i>	Backplane slot number.
<i>port</i>	Interface port number.

Defaults

No default behavior or values

Command Modes

Global configuration

Command History

Release	Modification
11.1	This command was introduced.

Usage Guidelines

To support synchronous or synchronous residual time stamp (SRTS) clocking modes on the CBR interface, you must specify a primary reference source to synchronize the flow of CBR data from its source to its destination.

You can specify up to four clock priorities. The highest priority active interface in the router supplies primary reference source to all other interfaces that require network clock synchronization services. The fifth priority is the local oscillator on the ATM-CES port adapter.

Use the **show network-locks** command to display currently configured clock priorities on the router.

Examples

The following example defines two clock priorities on the router:

```
network-clock-select 1 cbr 2/0
network-clock-select 2 atm 2/0
```

Related Commands

Command	Description
ces aal1 clock	Configures the AAL1 timing recovery clock for the CBR interface.

Command	Description
ces dsx1 clock source	Configures a transmit clock source for the CBR interface.
show network-clocks	Displays which ports are designated as network clock sources.

oam ais-rdi

To configure an ATM permanent virtual circuit (PVC) to be brought down after a specified number of Operation, Administration, and Maintenance (OAM) alarm indication signal/remote defect indication (AIS/RDI) cells have been received on the PVC or brought up if no OAM AIS/RDI cells have been received in a specified interval, use the **oam ais-rdi** command in ATM VC configuration or VC class configuration mode. To return OAM AIS/RDI behavior to the default, use the **no** form of this command.

oam ais-rdi [*down-count* [*up-count*]]

no oam ais-rdi [*down-count* [*up-count*]]

Syntax Description		
	<i>down-count</i>	(Optional) Number of consecutive OAM AIS/RDI cells received before the PVC is brought down. The range is from 1 to 60. The default is 1.
	<i>up-count</i>	(Optional) Number of seconds after which a PVC will be brought up if no OAM AIS/RDI cells are received. The range is from 3 to 60. The default is 3.

Defaults	
	Down count: 1 Up count: 3

Command Modes	
	ATM VC configuration VC class configuration

Command History	Release	Modification
	12.1(2)T	This command was introduced.

Usage Guidelines	
	The default values for the OAM AIS/RDI down count and up count are used in the following situations: <ul style="list-style-type: none"> • If the oam ais-rdi command has not been entered • If the oam ais-rdi command is entered without the <i>up-count</i> or <i>down-count</i> argument • If the no oam ais-rdi command is entered

If the **oam ais-rdi** command is entered without the *up-count* or *down-count* argument, the command will not appear in the **show running-config** command output.

Examples	
	In the following example, PVC 0/400 will be brought down after 25 consecutive OAM AIS/RDI cells have been received on the PVC. The PVC will be brought up when no OAM AIS/RDI cells have been received for 5 seconds.

```
interface ATM2/0/0
 ip address 172.2.222.20 255.255.255.0
 no ip route-cache cef
 no ip route-cache distributed
 no atm ilmi-keepalive
 pvc 0/400
```

```
protocol ip 172.2.223.21
oam-pvc manage 30
oam ais-rdi 25 5
```

oam retry

To configure parameters related to Operation, Administration, and Maintenance (OAM) management for an ATM permanent virtual circuit (PVC), switched virtual circuit (SVC), VC class, or VC bundle, or label-controlled ATM (LC-ATM) VC, use the **oam retry** command in the appropriate command mode. To remove OAM management parameters, use the **no** form of this command.

oam retry *up-count down-count retry-frequency*

no oam retry

Syntax Description

<i>up-count</i>	Number of consecutive end-to-end F5 OAM loopback cell responses that must be received in order to change a connection state to up. This argument does not apply to SVCs.
<i>down-count</i>	Number of consecutive end-to-end F5 OAM loopback cell responses that are not received in order to change the state to down or tear down an SVC connection.
<i>retry-frequency</i>	The frequency (in seconds) at which end-to-end F5 OAM loopback cells are transmitted when a change in the up/down state is being verified. For example, if a PVC is up and a loopback cell response is not received after the <i>frequency</i> (in seconds) argument is specified using the oam-pvc command, loopback cells are sent at the <i>retry-frequency</i> to verify whether the PVC is down.

Defaults

ATM PVCs and SVCs

up-count: 3
down-count: 5
retry-frequency: 1 second

LC-ATM VCs

up-count: 2
down-count: 2
retry-frequency: 2 seconds

Command Modes

Interface-ATM-VC configuration (for an ATM PVC or SVC)
VC-class configuration (for a VC class)
Bundle configuration mode (for a VC bundle)
PVC range configuration (for an ATM PVC range)
PVC-in-range configuration (for an individual PVC within a PVC range)
Control-VC configuration (for an LC-ATM VC)

Command History

Release	Modification
11.3 T	This command was introduced.
12.0(3)T	This command was modified to allow configuration parameters related to OAM management for ATM VC bundles.

Release	Modification
12.1(5)T	This command was implemented in PVC range and PVC-in-range configuration modes.
12.3(2)T	This command was implemented in control-VC configuration mode.

Usage Guidelines

The following guidelines apply to PVCs, SVCs, and VC classes. They do not apply to LC-ATM VCs.

- For ATM PVCs, SVCs, or VC bundles, if the **oam retry** command is not explicitly configured, the VC inherits the following default configuration (listed in order of precedence):
 - Configuration of the **oam retry** command in a VC class assigned to the PVC or SVC itself.
 - Configuration of the **oam retry** command in a VC class assigned to the PVC's or SVC's ATM subinterface.
 - Configuration of the **oam retry** command in a VC class assigned to the PVC's or SVC's ATM main interface.
 - Global default: *up-count* = 3, *down-count* = 5, *retry-frequency* = 1 second. This set of defaults assumes that OAM management is enabled using the **oam-pvc** or **oam-svc** command. The *up-count* and *retry-frequency* arguments do not apply to SVCs.
- To use this command in bundle configuration mode, enter the bundle command to create the bundle or to specify an existing bundle before you enter this command.
- If you use the **oam retry** command to configure a VC bundle, you configure all VC members of that bundle. VCs in a VC bundle are further subject to the following inheritance rules (listed in order of precedence):
 - VC configuration in bundle-vc mode
 - Bundle configuration in bundle mode (with the effect of assigned VC-class configuration)
 - Subinterface configuration in subinterface mode

Examples

The following example shows how to configure the OAM management parameters with an up count of 3, a down-count of 3, and the retry frequency set at 10 seconds:

```
Router(cfg-mpls-atm-cvc)# oam retry 3 3 10
```

Related Commands

Command	Description
broadcast	Configures broadcast packet duplication and transmission for an ATM VC class, PVC, SVC, or VC bundle.
class-int	Assigns a VC class to an ATM main interface or subinterface.
class-vc	Assigns a VC class to an ATM PVC, SVC, or VC bundle member.
encapsulation	Sets the encapsulation method used by the interface.
inarp	Configures the Inverse ARP time period for an ATM PVC, VC class, or VC bundle.
oam-bundle	Enables end-to-end F5 OAM loopback cell generation and OAM management for a virtual circuit class that can be applied to a virtual circuit bundle.

Command	Description
oam-pvc	Enables end-to-end F5 OAM loopback cell generation and OAM management for an ATM PVC or virtual circuit class.
oam-svc	Enables end-to-end F5 OAM loopback cell generation and OAM management for an ATM SVC or virtual circuit class.
protocol (ATM)	Configures a static map for an ATM PVC, SVC, VC class, or VC bundle. Enables Inverse ARP or Inverse ARP broadcasts on an ATM PVC by either configuring Inverse ARP directly on the PVC, on the VC bundle, or in a VC class (applies to IP and IPX protocols only).
ubr	Configures UBR QoS and specifies the output peak cell rate for an ATM PVC, SVC, VC class, or VC bundle member.
ubr+	Configures UBR QoS and specifies the output peak cell rate and output minimum guaranteed cell rate for an ATM PVC, SVC, VC class, or VC bundle member.
vbr-nrt	Configures the VBR-NRT QoS and specifies output peak cell rate, output sustainable cell rate, and output maximum burst cell size for an ATM PVC, SVC, VC class, or VC bundle member.

oam retry cc

To set the frequency at which ATM Operation, Administration, and Maintenance (OAM) F5 continuity check (CC) activation and deactivation requests are sent to a device at the other end of a segment or permanent virtual circuit (PVC), use the **oam retry cc** command in ATM virtual circuit configuration mode. To remove the retry settings, use the **no** form of this command.

```
oam retry cc {end | segment} [activation-count [deactivation-count [retry-frequency]]]
```

```
no oam retry cc {end | segment} [activation-count [deactivation-count [retry-frequency]]]
```

Syntax Description	end	End-to-end continuity check.
	segment	Segment continuity check.
	<i>activation-count</i>	(Optional) Maximum number of times the activation request will be sent before the receipt of an acknowledgment. The range is from 3 to 600. The default is 3.
	<i>deactivation-count</i>	(Optional) Maximum number of times the deactivation request will be sent before the receipt of an acknowledgment. The range is from 3 to 600. The default is 3.
	<i>retry-frequency</i>	(Optional) Interval between retries, in seconds. The default is 30 seconds.

Defaults	Activation count: 3 Deactivation count: 3 Retry frequency: 30 seconds
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Command Modes	ATM virtual circuit configuration
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Command History	Release	Modification
	12.2(13)T	This command was introduced.

Examples The following example shows how to configure ATM OAM F5 CC support over the segment and configure the router to function as the source. The frequency at which CC activation and deactivation requests will be sent over the segment is also configured.

```
interface atm 0
 ip address 10.0.0.3 255.255.255.0
 pvc 0/40
  oam-pvc manage cc segment direction source
  oam retry cc segment 10 10 30
```

Related Commands

Command	Description
oam-pvc manage cc deny	Configures ATM OAM F5 CC management.
oam-pvc manage cc deny	Disables ATM OAM F5 CC support and configures the PVC to deny CC activation requests.

oam-pvc

To enable end-to-end F5 Operation, Administration, and Maintenance (OAM) loopback cell generation and OAM management for an ATM permanent virtual circuit (PVC), virtual circuit (VC) class, or label-controlled ATM (LC-ATM) VC, use the **oam-pvc** command in the appropriate command mode. To disable generation of OAM loopback cells and OAM management, use the **no** form of this command.

ATM VC or VC Class

oam-pvc [manage] [frequency]

no oam-pvc [manage] [frequency]

LC-ATM VC

oam-pvc manage [frequency]

no oam-pvc manage [frequency]

Syntax Description	
manage	(Optional for ATM VCs or VC classes; required for LC-ATM VCs) Enables OAM management.
<i>frequency</i>	(Optional) Time delay between transmitting OAM loopback cells. For ATM VCs or VC classes, the range of values is from 0 to 600 seconds. The default is 10 seconds. For LC-ATM VCs, the range of values is from 0 to 255 seconds. The default is 5 seconds.

Defaults

ATM VCs or VC Class

10 seconds

LC-ATM VCs

OAM is enabled by default. The default frequency is 5 seconds.

Command Modes

Interface-ATM-VC configuration (for an ATM PVC)
 VC-class configuration (for a VC class)
 PVC-in-range configuration (for an individual PVC within a PVC range)
 Control-VC configuration (for enabling OAM management on an LC-ATM VC)

Command History

Release	Modification
11.3	This command was introduced.
12.1(5)T	This command was implemented in PVC-in-range configuration mode.
12.3(2)T	This command was implemented for LC-ATM VCs.

Usage Guidelines

If OAM management is enabled, further control of OAM management is configured using the **oam retry** command.

ATM VCS or VC Classes

If the **oam-pvc** command is not explicitly configured on an ATM PVC, the PVC inherits the following default configuration (listed in order of precedence):

- Configuration of the **oam-pvc** command in a VC class assigned to the PVC itself.
- Configuration of the **oam-pvc** command in a VC class assigned to the PVC's ATM subinterface.
- Configuration of the **oam-pvc** command in a VC class assigned to the PVC's ATM main interface.
- Global default: End-to-end F5 OAM loopback cell generation and OAM management are disabled, but if OAM cells are received, they are looped back. The default value for the *frequency* argument is 10 seconds.

Examples

The following example shows how to enable end-to-end F5 OAM loopback cell transmission and OAM management on an ATM PVC with a transmission frequency of 3 seconds:

```
Router(cfg-mpls-atm-cvc)# oam-pvc manage 3
```

The following example shows how to enable end-to-end F5 OAM loopback cell transmission and OAM management on an LC-ATM interface with a transmission frequency of 2 seconds:

```
Router(config)# interface Switch1.10 mpls
Router(config-subif)# ip unnumbered Loopback0
Router(config-subif)# mpls atm control-vc 0 32
Router(cfg-mpls-atm-cvc)# oam-pvc manage 2
```

Related Commands

Command	Description
ilmi manage	Enables ILMI management on an ATM PVC.
oam retry	Configures parameters related to OAM management for an ATM PVC, SVC, VC class or LC-ATM VC.

oam-pvc manage cc

To configure ATM Operation, Administration, and Maintenance (OAM) F5 continuity check (CC) management, use the **oam-pvc manage cc** command in ATM virtual circuit configuration mode. To disable OAM F5 continuity checking, use the **no** form of this command.

```
oam-pvc manage cc {end | segment} [direction {both | sink | source}] [keep-vc-up [end aistrdi failure | seg aistrdi failure]]
```

```
no oam-pvc manage cc {end | segment} [deactivate-down-vc] [direction {both | sink | source}] [keep-vc-up [end aistrdi failure | seg aistrdi failure]]
```

Syntax Description

end	End-to-end continuity checking. Monitoring occurs on the entire VC between two ATM end stations.
segment	Segment continuity checking. Monitoring occurs on a VC segment between a router and a first-hop ATM switch.
direction	(Optional) Direction of CC cell transmission.
both	(Optional) Specifies that CC cells transmit toward and away from the activator.
sink	(Optional) Specifies that CC cells transmit toward the activator. This is the default direction.
source	(Optional) Specifies that CC cells transmit away from the activator.
keep-vc-up	(Optional) Specifies that VC will be kept in the UP state when CC cells detect connectivity failure.
end aistrdi failure	(Optional) Specifies that if end alarm indication signals/remote defect indications (AIS/RDI) cells are received, the VC will not be brought down because of segment CC failure.
seg aistrdi failure	(Optional) Specifies that if segment AIS/RDI cells are received, the VC will not be brought down because of end CC failure or loopback failure.
deactivate-down-vc	(Optional) Specifies that an OAM F5 CC deactivation message will be sent when the VC is operationally down and in the CC active state. This keyword is available only when the no form of this command is used.

Defaults

The default direction is **sink**.

Command Modes

ATM virtual circuit configuration

Command History

Release	Modification
12.2(13)T	This command was introduced.

Usage Guidelines

ATM OAM F5 continuity checking enables OAM to support the use of F5 segment and end-to-end CC cells to detect connectivity failures.

It is not necessary to enter a CC configuration on the router at the other end of a segment. The router on which CC management has been configured sends a CC activation request to the router at the other end of the segment, directing it to act as either a source or a sink.

Use the **oam-pvc manage cc deny** command to configure a permanent virtual circuit (PVC) to respond to activation requests from a peer device with “activation denied” messages. The **oam-pvc manage cc deny** command prevents ATM OAM F5 CC management from being activated on the PVC.

Use the **no oam-pvc manage cc** command to send a deactivation request to the peer device. The **no oam-pvc manage cc** command will disable ATM OAM F5 CC management on the PVC until the PVC receives an activation request. When the PVC receives an activation request, ATM OAM F5 CC management will be reenabled.

The **no oam-pvc manage cc {end | segment} deactivate-down-vc** command does not disable ATM OAM F5 CC support. This command causes OAM F5 CC deactivation messages to be sent over the VC when the VC goes down.

To enable the SNMP notifications that support ATM OAM F5 continuity checking, use the **snmp-server enable traps atm pvc extension** command.

Examples

ATM OAM F5 CC Support on a PVC Configuration Example

The following example shows how to configure ATM OAM F5 CC support over the segment and configure the router to function as the source. The frequency at which CC activation and deactivation requests will be sent over the segment is also configured.

```
interface atm 0
 ip address 10.0.0.3 255.255.255.0
 pvc 0/40
  oam-pvc manage cc segment direction source
  oam retry cc segment 10 10 30
```

Deactivation of ATM OAM F5 CC upon VC Failure Example

The following example shows how to configure OAM to send a CC deactivation request across the segment when PVC 0/1 goes down:

```
interface atm 0
 ip address 10.0.0.3 255.255.255.0
 pvc 0/40
  no oam-pvc manage cc segment deactivate-down-vc
```

Related Commands

Command	Description
debug atm oam cc	Displays ATM OAM F5 CC management activity.
oam-pvc manage cc deny	Disables ATM OAM F5 CC support and configures the PVC to deny CC activation requests.
oam retry cc	Sets the frequency at which ATM OAM F5 CC activation and deactivation requests are sent to the device at the other end of a segment or PVC.
show atm pvc	Displays all ATM PVCs and traffic information.

Command	Description
vpn service	Enables the sending of extended ATM PVC SNMP notifications and SNMP notifications for ATM OAM F5 CC, ATM OAM F5 AIS/RDI, and loopback failures.
snmp-server enable traps atm pvc extension mibversion	Specifies the MIB that supports extended ATM PVC SNMP notifications or the MIB that supports SNMP notifications for ATM OAM F5 CC management, ATM OAM F5 AIS/RDI management, and F5 loopback failure management.

oam-pvc manage cc deny

To disable ATM Operation, Administration, and Maintenance (OAM) F5 continuity check (CC) support and configure a permanent virtual circuit (PVC) to deny CC activation requests, use the **oam-pvc manage cc deny** command in ATM virtual circuit configuration mode. To reenable OAM F5 CC support and allow CC activation requests, use the **no** form of this command.

oam-pvc manage cc {end | segment} deny

no oam-pvc manage cc {end | segment} deny

Syntax Description

end	End-to-end continuity checking.
segment	Segment continuity checking.

Defaults

If the peer device sends the activation message, F5 CC management will be enabled on the PVC.

Command Modes

ATM virtual circuit configuration

Command History

Release	Modification
12.2(13)T	This command was introduced.

Usage Guidelines

Use the **oam-pvc manage cc deny** command to configure a permanent virtual circuit (PVC) to respond to activation requests from a peer device with “activation denied” messages. The **oam-pvc manage cc deny** command prevents ATM OAM F5 CC management from being activated on the PVC.

Use the **no oam-pvc manage cc** command to send a deactivation request to the peer device. The **no oam-pvc manage cc** command will disable ATM OAM F5 CC management on the PVC until the PVC receives an activation request. When the PVC receives an activation request, ATM OAM F5 CC management will be reenabled.

Examples

The following example shows how to disable ATM OAM F5 CC support and configure the VC to deny CC activation requests:

```
interface atm 0
 ip address 10.0.0.3 255.255.255.0
 pvc 0/40
  oam-pvc manage cc segment deny
```

Related Commands

Command	Description
oam-pvc manage cc deny	Configures ATM OAM F5 CC management.
oam retry cc	Sets the frequency at which ATM OAM F5 CC activation and deactivation requests are sent to the device at the other end of a segment or PVC.

oam-range

To enable end-to-end F5 Operation, Administration, and Maintenance (OAM) loopback cell generation and OAM management for an ATM permanent virtual circuit (PVC) range, use the **oam-range** command in PVC range configuration mode. To disable generation of OAM loopback cells and OAM management, use the **no** form of this command.

oam-range [**manage**] [*frequency*]

no oam-range [**manage**] [*frequency*]

Syntax Description

manage	(Optional) Enables OAM management.
<i>frequency</i>	(Optional) Time delay (0 to 600 seconds) between transmissions of OAM loopback cells.

Defaults

10 seconds

Command Modes

PVC range configuration

Command History

Release	Modification
12.1(5)T	This command was introduced.

Usage Guidelines

If OAM management is enabled, further control of OAM management is configured using the **oam retry** command.

If the **oam-range** command is not explicitly configured for an ATM PVC range, the range inherits the following default configuration (listed in order of precedence):

- Configuration of the **oam-range** command in a VC class assigned to the range.
- Configuration of the **oam-range** command in a VC class assigned to the ATM subinterface for the range.
- Configuration of the **oam-range** command in a VC class assigned to the ATM main interface for the range.
- Global default: End-to-end F5 OAM loopback cell generation and OAM management are disabled, but if OAM cells are received, they are looped back. The default value for the *frequency* argument is 10 seconds.

Examples

The following example enables end-to-end F5 OAM loopback cell transmission and OAM management on an ATM PVC range called "range1" with a transmission frequency of 11 seconds:

```
interface atm 6/0.1
 range range1 pvc 7/101 7/103
  oam-range manage 11
  oam retry 8 9 10
```

Related Commands	Command	Description
	ilmi manage	Enables ILMI management on an ATM PVC.
	oam-pvc	Enables end-to-end F5 OAM loopback cell generation and OAM management for an ATM PVC or VC class.
	oam retry	Configures parameters related to OAM management for ATM PVC, SVC, or VC class.

oam-svc

To enable end-to-end F5 Operation, Administration, and Maintenance (OAM) loopback cell generation and OAM management for an ATM switched virtual circuit (SVC) or virtual circuit (VC) class, use the **oam-svc** command in the appropriate command mode. To disable generation of OAM loopback cells and OAM management, use the **no** form of this command.

oam-svc [**manage**] [*frequency*]

no oam-svc [**manage**] [*frequency*]

Syntax Description

manage (Optional) Enable OAM management.

frequency (Optional) Time delay (0 to 600 seconds) between transmitting OAM loopback cells.

Defaults

10 seconds

Command Modes

Interface-ATM-VC configuration (for an ATM SVC)
VC-class configuration (for a VC class)

Command History

Release	Modification
11.3	This command was introduced.

Usage Guidelines

If OAM management is enabled, further control of OAM management is configured using the **oam retry** command.



Note

Generally, ATM signalling manages ATM SVCs. Configuring the **oam-svc** command on an SVC verifies the inband integrity of the SVC.

If the **oam-svc** command is not explicitly configured on an ATM SVC, the SVC inherits the following default configuration (listed in order of precedence):

- Configuration of the **oam-svc** command in a VC class assigned to the SVC itself.
- Configuration of the **oam-svc** command in a VC class assigned to the SVC's ATM subinterface.
- Configuration of the **oam-svc** command in a VC class assigned to the SVC's ATM main interface.
- Global default: End-to-end F5 OAM loopback cell generation and OAM management are disabled, but if OAM cells are received, they are looped back. The default value for *frequency* is 10 seconds.

Examples

The following example enables end-to-end F5 OAM loopback cell transmission and OAM management on an ATM SVC with a transmission frequency of 3 seconds:

```
oam-svc manage 3
```

Related Commands

Command	Description
oam retry	Configures parameters related to OAM management for an ATM PVC, SVC, or VC class.

packet drop during-authorization

To specify that packets received from the user during authorization will be dropped, use the **packet drop during-authorization** command in transparent auto-logon configuration mode. To remove the configuration, use the **no** form of this command.

packet drop during-authorization

no packet drop during-authorization

Syntax Description This command has no arguments or keywords.

Defaults Packet drop during authorization is disabled, and packets from the authorizing user are forwarded.

Command Modes Transparent auto-logon configuration

Command History	Release	Modification
	12.3(1a)BW	This command was introduced.
	12.3(3)B	This command was integrated into Cisco IOS Release 12.3(3)B.
	12.3(7)T	This command was integrated into Cisco IOS Release 12.3(7)T.

Usage Guidelines Use this command for configuring data traffic packet drop for users that are waiting for authorization (WA).

Examples The following example specifies that packets received from the user during authorization will be dropped:

```
Router(config-login-transparent)# packet drop during-authorization
```

Related Commands	Command	Description
	ssg login transparent	Enables the SSG Transparent Autologon feature.

partial-fill

To configure the number of AAL1 user octets per cell for the ATM circuit emulation service (CES) on the OC-3/STM-1 Circuit Emulation Service network module, use the **partial-fill** command in interface-CES-VC mode. To delete the CES partial-fill value, use the **no** form of this command.

partial-fill *octet*

no partial-fill *octet*

Syntax Description

<i>octet</i>	Number of user octets per cell for the CES. Possible values of octet range from 1 to 47.
--------------	--

Defaults

No partial-fill

Command Modes

Interface-CES-VC configuration

Command History

Release	Modification
12.1(2)T	This command was introduced.

Usage Guidelines

The **partial-fill** command applies to CES switched virtual circuits (SVCs) and permanent virtual circuits (PVCs) configured on Cisco 2600 series and Cisco 3600 series routers that have OC-3/STM-1 ATM CES network modules.

Examples

The following example sets the CES partial cell fill to 50 octets per cell for SVC “ces1”:

```
interface atm 1/0
  svc ces1 nsap 47.00.00.....01.01.00 ces
  partial fill 40
```

Related Commands

Command	Description
svc	Creates an ATM SVC and specifies the destination NSAP address on a main interface or subinterface.

password (L2TP)

To configure the password used by a provider edge (PE) router for Layer 2 authentication, use the **password** command in L2TP class configuration mode. To disable a configured password, use the **no** form of this command.

password [*encryption-type*] *password*

no password [*encryption-type*] *password*

Syntax Description

<i>encryption-type</i>	(Optional) Specifies the type of encryption to use. The valid values are from 0 to 7. Currently defined encryption types are 0 (no encryption) and 7 (text is encrypted using an algorithm defined by Cisco).
<i>password</i>	Specifies the password used for L2TPv3 authentication.

Defaults

If a password is not configured for the L2TP class with the **password** command, the password configured with the **username** command in global configuration mode is used.

Command Modes

L2TP class configuration

Command History

Release	Modification
12.0(23)S	This command was introduced.
12.3(2)T	This command was integrated into Cisco IOS Release 12.3(2)T.

Usage Guidelines

The password that you define with the **password** command is also used for attribute-value pair (AVP) hiding.

The password hierarchy sequence used for a local and remote peer PE for L2TPv3 authentication is as follows:

- The L2TPv3 password (configured with the **password** command) is used first.
- If no L2TPv3 password exists, the globally configured password (configured with the **username password** command) for the router is used.

Examples

The following example sets the password named “tunnel2” to be used to authenticate an L2TPv3 session between the local and remote peers in L2TPv3 pseudowires that has been configured with the L2TP class configuration named “l2tp-class1”:

```
Router(config)# l2tp-class l2tp-class1
Router(config-l2tp-class)# password tunnel2
```

Related Commands	Command	Description
	l2tp-class	Creates a template of L2TP control plane configuration settings that can be inherited by different pseudowire classes and enters L2TP class configuration mode.
	username	Establishes a username-based authentication system.

ping atm interface atm

To perform an ATM Operation, Administration, and Maintenance (OAM) ping to confirm connectivity for a specific permanent virtual circuit (PVC), use the **ping atm interface atm** command in privileged EXEC mode.

```
ping atm interface atm interface vpi vci [seg-loopback | end-loopback] [repeat [timeout]]
```

Syntax Description

<i>interface</i>	ATM interface.
<i>vpi</i>	Virtual path identifier.
<i>vci</i>	Virtual channel identifier.
seg-loopback	(Optional) Sends ATM ping to segment loopback.
end-loopback	(Optional) Sends ATM ping to end loopback. This is the default.
<i>repeat</i>	(Optional) Number of ping packets that are sent to the destination address. Default is 5.
<i>timeout</i>	(Optional) Timeout interval. Default is 2 seconds.

Defaults

Send ping to end loopback.
5 repeat pings.
2-second timeout interval.

Command Modes

Privileged EXEC

Command History

Release	Modification
11.4	This command was introduced on the LightStream 1010.
12.0(21)S	This command was integrated into Cisco IOS Release 12.0(21)S.
12.2(13)T	This command was integrated into Cisco IOS Release 12.2(13)T.

Usage Guidelines

The **ping atm interface atm** command sends an OAM packet and indicates when a response is received. You can choose one of two ping options:

- End loopback—Verifies end-to-end PVC integrity.
- Segment loopback—Verifies PVC integrity to the neighboring ATM device.

Examples

In the following example, an ATM OAM ping with a 5-second timeout verifies end-to-end connectivity for PVC 0/5:

```
Router# ping atm interface atm 0/0/0 0 5 end-loopback 5 5
```

Type escape sequence to abort.

```
Sending 5, 53-byte end-to-end OAM echoes, timeout is 5 seconds:  
!!!!!
```

```
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/4 ms
```

In the following example, an ATM OAM ping verifies connectivity to the first-hop ATM switch on PVC 1/100:

```
Router# ping atm interface atm 0/0/0 1 100 seg-loopback
```

```
Type escape sequence to abort.
```

```
Sending 5, 53-byte segment OAM echoes, timeout is 2 seconds:
```

```
!!!!
```

```
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
```

Related Commands

Command	Description
debug atm oam	Displays information about ATM OAM events.
ping (privileged)	Checks host reachability and network connectivity.

pppoe enable

To enable PPP over Ethernet (PPPoE) sessions on an Ethernet interface or subinterface, use the **pppoe enable** command in the appropriate configuration mode. To disable PPPoE, use the **no** form of this command.

pppoe enable [**group** *group-name*]

no pppoe enable

Syntax Description

group	(Optional) Specifies that a PPPoE profile will be used by PPPoE sessions on the interface.
<i>group-name</i>	(Optional) Name of the PPPoE profile to be used by PPPoE sessions on the interface.

Defaults

PPPoE is disabled by default.

Command Modes

Interface configuration
VLAN configuration
VLAN range configuration

Command History

Release	Modification
12.1(2)T	This command was introduced.
12.1(5)T	This command was modified to enable PPPoE on IEEE 802.1Q encapsulated VLAN interfaces.
12.2(15)T	The group option was added.
12.3(2)T	This command was implemented in VLAN configuration mode and VLAN range configuration mode.

Usage Guidelines

If a PPPoE profile is not specified by using the **group** option, PPPoE sessions will be established using values from the global PPPoE profile. PPPoE profiles must be configured using the **bba-group pppoe** command.

Examples

PPPoE on an Ethernet Interface: Example

The following example enables PPPoE sessions on Ethernet interface 1/0. PPPoE sessions will be established using the PPPoE parameters in the global PPPoE profile.

```
Router(config)# interface ethernet 1/0
Router(config-if)# pppoe enable
!
Router(config)# bba-group pppoe global
Router(config-bba-group)# virtual-template 1
Router(config-bba-group)# sessions max limit 8000
```

```
Router(config-bba-group)# sessions per-vc limit 8
Router(config-bba-group)# sessions per-mac limit 2
```

PPPoE on an 802.1Q VLAN Subinterface: Example

The following example shows how to enable PPPoE on an 802.1Q VLAN subinterface. PPPoE sessions will be established using the PPPoE parameters in PPPoE profile “vpn1”.

```
Router(config)# interface ethernet 2/3.1
Router(config-if)# encapsulation dot1q 1
Router(config-if)# pppoe enable group vpn1
!
Router(config)# bba-group pppoe vpn1
Router(config-bba-group)# virtual-template 1
Router(config-bba-group)# sessions per-vc limit 2
Router(config-bba-group)# sessions per-mac limit 1
```

PPPoE on an 802.1Q VLAN Main Interface: Example

The following example shows how to configure PPPoE over a range of 802.1Q VLANs on Fast Ethernet interface 0/0. The VLAN range is configured on the main interface, and therefore each VLAN will not use up a separate subinterface.

```
Router(config)# interface fastethernet 0/0
Router(config-if)# no ip address
Router(config-if)# no ip mroute-cache
Router(config-if)# duplex half
Router(config-if)# vlan-range dot1q 20 30
Router(config-if-vlan-range)# pppoe enable group PPPOE
Router(config-if-vlan-range)# exit-vlan-config
```

Related Commands

Command	Description
bba-group pppoe	Creates a PPPoE profile.
debug pppoe	Displays debugging information for PPPoE sessions.
sessions max limit	Configures a PPPoE global profile with the maximum number of PPPoE sessions permitted on a router and sets the PPPoE session-count threshold.
sessions per-vlan limit	Specifies the maximum number of PPPoE sessions under each VLAN.

pppoe limit max-sessions

To specify the maximum number of PPP over Ethernet (PPPoE) sessions that will be permitted on a router, use the **pppoe limit max-sessions** command in VPDN group configuration mode. To remove this specification, use the **no** form of this command.

pppoe limit max-sessions *number-of-sessions*

no pppoe limit max-sessions

Syntax Description

<i>number-of-sessions</i>	Maximum number of PPPoE sessions that will be permitted on the router. The range is from 0 to the maximum number of interfaces on the router.
---------------------------	---

Defaults

Maximum *number-of-sessions* is not set.

Command Modes

VPDN group configuration

Command History

Release	Modification
12.2(1)DX	This command was introduced.
12.2(2)DD	This command was integrated into Cisco IOS Release 12.2(2)DD.
12.2(4)B	This command was integrated into Cisco IOS Release 12.2(4)B.
12.2(13)T	This command was integrated into Cisco IOS Release 12.2(13)T.

Usage Guidelines

PPPoE session limits configured using the **pppoe limit per-vc**, **pppoe limit per-vlan**, **pppoe max-sessions**, **pppoe max-sessions (VC)**, and **pppoe max-sessions (subinterface)** commands take precedence over limits configured for the router using the **pppoe limit max-sessions** command.

Examples

The following example shows a limit of 100 PPPoE sessions configured for the router.

```
vpdn enable

vpdn-group 1
  accept dialin
  protocol pppoe
  virtual-template 1
  pppoe limit max-sessions 100
```

Related Commands

Command	Description
debug vpdn pppoe-errors	Displays PPPoE protocol errors that prevent a session from being established or errors that cause an established session to be closed.
pppoe limit per-mac	Specifies the maximum number of PPPoE sessions to be sourced from a MAC address.

Command	Description
pppoe limit per-vc	Specifies the maximum number of PPPoE sessions permitted on all VCs.
pppoe limit per-vlan	Specifies the maximum number of PPPoE sessions permitted on a VLAN.
pppoe max-sessions	Specifies the maximum number of PPPoE sessions permitted on an ATM PVC, PVC range, VC class, or Ethernet subinterface.

pppoe limit per-mac

To specify the maximum number of PPPoE sessions to be sourced from a MAC address, use the **pppoe limit per-mac** command in VPDN configuration mode.

pppoe limit per-mac *number*

Syntax Description

<i>number</i>	Maximum number of PPPoE sessions that can be sourced from a MAC address.
---------------	--

Defaults

100 sessions

Command Modes

VPDN configuration

Command History

Release	Modification
12.1(1)T	This command was introduced.

Examples

The following example sets a limit of 10 sessions to be sourced from a MAC address:

```
pppoe limit per-mac 10
```

Related Commands

Command	Description
pppoe limit per-vc	Specifies the maximum number of PPPoE sessions to be established over a VC.
pppoe limit per-vlan	Specifies the maximum number of PPPoE sessions under each VLAN.

pppoe limit per-vc

To specify the maximum number of PPPoE sessions to be established over a VC, use the **pppoe limit per-vc** command in VPDN configuration mode.

pppoe limit per-vc *number*

Syntax Description	<i>number</i>	Maximum number of PPPoE sessions that can be established over an ATM PVC.
---------------------------	---------------	---

Defaults	100 sessions
-----------------	--------------

Command Modes	VPDN configuration
----------------------	--------------------

Command History	Release	Modification
	12.1(1)T	This command was introduced.

Examples The following example sets a limit of 10 sessions to be established over a VC:

```
pppoe limit per-vc 10
```

Related Commands	Command	Description
	pppoe limit max-sessions	Specifies the maximum number of PPPoE sessions to be sourced from a MAC address.
	pppoe limit per-vlan	Specifies the maximum number of PPPoE sessions under each VLAN.

pppoe limit per-vlan

To specify the maximum number of PPP over Ethernet (PPPoE) sessions permitted under each virtual LAN (VLAN), use the **pppoe limit per-vlan** command in VPDN configuration mode. To remove this specification, use the **no** form of this command.

pppoe limit per-vlan *number*

no pppoe limit per-vlan

Syntax Description	<i>number</i>	Maximum number of PPP over Ethernet sessions permitted under each VLAN.
--------------------	---------------	---

Defaults	100 PPPoE sessions per VLAN
----------	-----------------------------

Command Modes	VPDN configuration
---------------	--------------------

Command History	Release	Modification
	12.1(5)T	This command was introduced.

Usage Guidelines

If the **pppoe max-session** command is configured on a VLAN, that command will take precedence over the **pppoe limit per-vlan** command. The **pppoe limit per-vlan** command applies to all VLANs on which the **pppoe max-session** command has not been configured.

The **pppoe limit per-vlan** command must be configured after the accept dial-in VPDN group has been configured using the **accept-dialin** VPDN configuration command.

Examples

The following example shows a maximum of 200 PPPoE sessions configured for an 802.1Q VLAN subinterface:

```
interface FastEthernet0/0.10
  encapsulation dot1Q 10
  pppoe enable
!
vpdn enable
vpdn-group 1
  accept dialin
  protocol pppoe
  virtual-template 1
  pppoe limit per-vlan 200
```

Related Commands	Command	Description
	accept dial-in	Creates an accept dial-in VPDN subgroup.
	debug vpdn pppoe-data	Displays data packets of PPPoE sessions.

Command	Description
debug vpdn pppoe-error	Displays PPPoE protocol errors that prevent a session from being established or errors that cause an established session to be closed.
debug vpdn pppoe-events	Displays PPPoE protocol messages about events that are part of normal session establishment or shutdown.
debug vpdn pppoe-packet	Displays each PPPoE protocol packet exchanged.
pppoe enable	Enables PPPoE sessions on an Ethernet interface.
pppoe limit max-sessions	Specifies the maximum number of PPPoE sessions to be sourced from a MAC address.
pppoe limit per-vc	Specifies the maximum number of PPPoE sessions to be established over a VC.
pppoe max-sessions	Specifies the maximum number of PPPoE sessions permitted under a VLAN.

pppoe max-sessions

To specify the maximum number of PPP over Ethernet (PPPoE) sessions that will be permitted on an ATM permanent virtual circuit (PVC), PVC range, virtual circuit (VC) class, or Ethernet subinterface, use the **pppoe max-sessions** command in the appropriate mode. To remove this specification, use the **no** form of this command.

pppoe max-sessions *number-of-sessions*

no pppoe max-sessions

Syntax Description

number-of-sessions

Maximum number of PPPoE sessions that will be permitted.

Note The PPPoE session limit in the case of a PVC range applies to *each* PVC in the range. This limit is not cumulative on *all* PVCs belonging to the range.

Defaults

Maximum number of sessions is not set.

Command Modes

Ethernet subinterface configuration
Interface-ATM-VC configuration
VC-class configuration
ATM PVC range configuration
PVC-in-range configuration

Command History

Release	Modification
12.1(5)T	This command was introduced.
12.2(4)T	This command was modified to limit PPPoE sessions on ATM PVCs, PVC ranges, and VC classes.

Usage Guidelines

PPPoE sessions can be limited in the following ways:

- The **pppoe limit max-sessions** command limits the total number of PPPoE sessions on the router, regardless of the type of medium the sessions are using.
- The **pppoe limit per-mac** command limits the number of PPPoE sessions that can be sourced from a single MAC address. This limit also applies to all PPPoE sessions on the router.
- The **pppoe limit per-vc** and **pppoe limit per-vlan** commands limit the number of PPPoE sessions on all PVCs or VLANs on the router. The **pppoe max-sessions** command limits the number of PPPoE sessions on a specific PVC or VLAN. Limits created for a specific PVC or VLAN using the **pppoe max-session** command take precedence over the global limits created with the **pppoe limit per-vc** and **pppoe limit per-vlan** commands.

PPPoE session limits created on an ATM PVC take precedence over limits created in a VC class or ATM PVC range.

PPPoE session limits created in an ATM PVC range take precedence over limits created in a VC class.

Examples**Ethernet Subinterface Example**

The following example shows a limit of 200 PPPoE sessions configured for the subinterface:

```
interface FastEthernet 0/0.10
 encapsulation dot1Q 10
 pppoe enable
 pppoe max-sessions 200
```

ATM PVC Example

The following example shows a limit of 10 PPPoE sessions configured for the PVC:

```
interface ATM1/0.102 multipoint
 pvc 3/304
 encapsulation aal5snap
 protocol pppoe
 pppoe max-sessions 10
```

VC Class Example

The following example shows a limit of 20 PPPoE sessions that will be permitted per PVC in the VC class called “main”:

```
vc-class atm main
 pppoe max-sessions 20
```

ATM PVC Range Example

The following example shows a limit of 30 PPPoE sessions that will be permitted per PVC in the PVC range called “range-1”:

```
interface atm 6/0.110 multipoint
 range range-1 pvc 100 4/199
 encapsulation aal5snap
 protocol ppp virtual-template 2
 pppoe max-sessions 30
```

Individual PVC Within a PVC Range Example

The following example shows a limit of 10 PPPoE sessions configured for “pvc1”, which is part of the ATM PVC range called “range1”:

```
interface atm 6/0.110 multipoint
 range range1 pvc 100 4/199
 pvc-in-range pvc1 3/104
 pppoe max-sessions 10
```

Related Commands

Command	Description
debug vpdn pppoe-errors	Displays PPPoE protocol errors that prevent a session from being established or errors that cause an established session to be closed.
pppoe limit max-sessions	Specifies the maximum number of PPPoE sessions that will be permitted on a router.
pppoe limit per-mac	Specifies the maximum number of PPPoE sessions to be sourced from a MAC address.
pppoe limit per-vc	Specifies the maximum number of PPPoE sessions permitted on all VCs.
pppoe limit per-vlan	Specifies the maximum number of PPPoE sessions permitted on a VLAN.

pppoe service

To add a PPP over Ethernet (PPPoE) service name to a local subscriber profile, use the **pppoe service** command in subscriber profile configuration mode. To remove a PPPoE service name from a subscriber profile, use the **no** form of this command.

pppoe service *service-name*

no pppoe service *service-name*

Syntax Description

<i>service-name</i>	Name of the PPPoE service to be added to the subscriber profile.
---------------------	--

Defaults

A PPPoE service name is not part of a subscriber profile.

Command Modes

Subscriber profile configuration

Command History

Release	Modification
12.3(4)T	This command was introduced.

Usage Guidelines

A subscriber profile contains a list of PPPoE service names. Use the **pppoe service** command to add PPPoE service names to a local subscriber profile.

When you configure PPPoE service selection, you define a RADIUS service profile for each service name, list the service names that you want to advertise in a subscriber profile, and then assign the subscriber profile to a PPPoE profile. The PPPoE server will advertise the service names that are listed in the subscriber profile to each PPPoE client connection that uses the configured PPPoE profile.

Examples

The following example shows PPPoE service names being added to the subscriber profile called “listA”:

```
!
! Configure the AAA default authorization method
aaa new-model
aaa authorization network default local
!
! Configure the subscriber profile
subscriber profile listA
  pppoe service gold_isp_A
  pppoe service silver_isp_A
  pppoe service isp_xyz
!
! Configure the PPPoE profile
bba-group pppoe group_A
  virtual-template 1
  sessions per-vc 5
  service profile listA
!
! Attach the PPPoE profile to a PVC
```

```
interface atm1/0.1
 pvc 2/200
  protocol PPPoE group group_A
!
```

Related Commands

Command	Description
clear pppoe derived	Clears the cached PPPoE configuration of a PPPoE profile and forces the PPPoE profile to reread the configuration from the assigned subscriber profile.
service profile	Assigns a subscriber profile to a PPPoE profile.
show pppoe derived	Displays the cached PPPoE configuration that is derived from the subscriber profile for a specified PPPoE profile.
subscriber profile	Defines Subscriber Service Switch policy for searches of a subscriber profile database.

pppoe-client dial-pool-number

To configure a PPP over Ethernet (PPPoE) client and to specify dial-on-demand routing (DDR) functionality, use the **pppoe-client dial-pool-number** command in either interface configuration mode or ATM virtual circuit configuration mode. To disable any configured functionality, use the **no** form of this command.

pppoe-client dial-pool-number *number* [**dial-on-demand**]

no pppoe-client dial-pool-number *number* [**dial-on-demand**]

Syntax Description

<i>number</i>	Unique number of a dial group configured with the dialer-group dialer interface command.
dial-on-demand	(Optional) Enables DDR functionality for the PPPoE connection.

Defaults

A PPPoE client is not configured, and DDR functionality is disabled.

Command Modes

Interface configuration
ATM virtual circuit configuration

Command History

Release	Modification
12.1(3)XG	This command was introduced.
12.2(2)T	This command was integrated into Cisco IOS Release 12.2(2)T.
12.2(13)T	The dial-on-demand keyword was added to allow the configuration of DDR interesting traffic control list functionality.

Usage Guidelines

One permanent virtual circuit (PVC) will support only one PPPoE client. Multiple PPPoE clients can run concurrently on different permanent virtual circuits (PVCs), but each PPPoE client must use a separate dialer interface and a separate dialer pool.

Use this command to configure dial-on-demand routing (DDR) interesting traffic control list functionality of the dialer interface with a PPP over Ethernet (PPPoE) client. When the DDR functionality is configured for this command, the following DDR commands must also be configured: **dialer-group**, **dialer hold-queue**, **dialer idle-timeout**, and **dialer-list**.

Tips for Configuring the Dialer Interface

If you are configuring a hard-coded IP address under the dialer interface, you can configure a default IP route using the **ip route** command as follows:

```
ip route 0.0.0.0 0.0.0.0 dialer1
```

But if you are configuring a negotiated IP address using the **ip address negotiated** command under the dialer interface, you must configure a default IP route using the **ip route** command as follows:

```
ip route 0.0.0.0 0.0.0.0 dialer1 permanent
```

The reason is that the dialer interface will lose its IP address when a PPPoE session is brought down (even if the dialer does not go down), and hence the route removal routine will take effect and remove all IP routes pointed at the dialer interface, even the default IP route. Although the default IP route will be added back about one minute later by IP background processes, you may risk losing incoming packets during the interval.

Examples

PPPoE Client DDR Idle-Timer on an Ethernet Interface

The following example shows how to configure the PPPoE client DDR idle-timer on an Ethernet interface and includes the required DDR commands:

```
!
vpdn enable
no vpdn logging
!
vpdn-group 1
 request-dialin
 protocol pppoe
!
interface Ethernet1
 pppoe enable
 pppoe-client dial-pool-number 1 dial-on-demand
!
interface Dialer1
 ip address negotiated
 ip mtu 1492
 encapsulation ppp
 dialer pool 1
 dialer idle-timeout 180 either
 dialer hold-queue 100
 dialer-group 1
!
dialer-list 1 protocol ip permit
!
ip route 0.0.0.0 0.0.0.0 Dialer1
```

PPPoE client DDR Idle-Timer on an ATM PVC

The following example shows how to configure the PPPoE client DDR idle-timer on an ATM PVC interface and includes the required DDR commands:

```
!
vpdn enable
no vpdn logging
!
vpdn-group 1
 request-dialin
 protocol pppoe
!
interface ATM2/0
 pvc 2/100
 pppoe-client dial-pool-number 1 dial-on-demand
!
interface Dialer1
 ip address negotiated
 ip mtu 1492
 encapsulation ppp
 dialer pool 1
 dialer idle-timeout 180 either
 dialer hold-queue 100
 dialer-group 1
!
```

pppoe-client dial-pool-number

```
dialer-list 1 protocol ip permit
!
ip route 0.0.0.0 0.0.0.0 Dialer1
```

Related Commands

Command	Description
debug vpdn pppoe-data	Displays PPPoE session data packets.
debug vpdn pppoe-errors	Displays PPPoE protocol errors that prevent a session from being established or errors that cause an established session to be terminated.
debug vpdn pppoe-events	Displays PPPoE protocol messages about events that are part of normal session establishment or shutdown.
debug vpdn pppoe-packets	Displays each PPPoE protocol packet exchanged.
dialer-group	Controls access by configuring a virtual access interface to belong to a specific dialing group.
dialer hold-queue	Allows interesting outgoing packets to be queued until a modem connection is established.
dialer idle-timeout	Specifies the idle time before the line is disconnected.
dialer-list	Defines a DDR dialer list to control dialing by protocol or by a combination of protocol and an access list.

precedence (Frame Relay VC-bundle-member)

To configure the precedence levels for a Frame Relay permanent virtual circuit (PVC) bundle member, use the **precedence** command in Frame Relay VC-bundle-member configuration mode. To remove the precedence level configuration from the PVC, use the **no** form of this command.

precedence {*level* | **other**}

no precedence

Syntax Description		
	<i>level</i>	Specifies the precedence level or levels for this Frame Relay PVC bundle member. The range is from 0 to 7. A PVC bundle member can be configured with a single precedence level, multiple individual precedence levels, a range of precedence levels, multiple ranges of precedence levels, or a combination of individual levels and level ranges. Examples are as follows: <ul style="list-style-type: none"> • 0 • 0,2,3 • 0-2,4-5 • 0,1,2-4,7
	other	Specifies that this Frame Relay PVC bundle member will handle all of the remaining precedence levels that are not explicitly configured on any other bundle member PVCs.

Defaults Precedence levels are not configured.

Command Modes Frame Relay VC-bundle-member configuration

Command History	Release	Modification
	12.2(13)T	This command was introduced.

Usage Guidelines Assignment of precedence levels to PVC bundle members allows you to create differentiated service because you can distribute the IP precedence levels over the various PVC bundle members. You can map a single precedence level or a range of levels to each discrete PVC in the bundle, thereby enabling PVCs in the bundle to carry packets marked with different precedence levels. Use the **precedence other** command to indicate that a PVC can carry traffic marked with precedence levels not specifically configured for other PVCs. Only one PVC in the bundle can be configured using the **precedence other** command.

This command is available only when the match type for the PVC bundle is set to precedence using the **match precedence** command in Frame Relay VC-bundle configuration mode.

You can overwrite the precedence level configuration on a PVC by reentering the **precedence** command with a new level value.

All precedence levels must be accounted for in the PVC bundle configuration, or the bundle will not come up. Note, however, that a PVC may be a bundle member but have no precedence level associated with it. As long as all valid precedence levels are handled by other PVCs in the bundle, the bundle can come up, but the PVC that has no precedence level configured will not participate in it.

A precedence level can be configured on one PVC bundle member per bundle. If you configure the same precedence level on more than one PVC within a bundle, the following error warning appears on the console:

```
%Overlapping precedence levels
```

When tag-switching is enabled on the interface by using the **tag-switching ip** command, MPLS and IP packets can flow across the interface, and PVC bundles that are configured for IP precedence mapping are converted to MPLS EXP mapping. The PVC bundle functionality remains the same with respect to priority levels, bumping, and so on, but the **match precedence** command is replaced by “match exp”, and each **precedence** command is replaced by the **exp** command. The result is that a bundle-member PVC previously configured to carry precedence level 1 IP traffic now carries EXP level 1 MPLS traffic.

When tag-switching is disabled, the **match precedence** and **match dscp** commands are restored, and the **exp** commands are replaced by **precedence** commands.

When tag-switching is enabled or disabled, PVC bundles configured for IP precedence mapping or MPLS EXP mapping will stay up, and traffic will be transmitted over the appropriate bundle-member PVCs.

Examples

The following example configures Frame Relay PVC bundle member 101 to carry traffic with IP precedence level 5:

```
frame-relay vc-bundle new-york
 match precedence
 pvc 101
  precedence 5
```

Related Commands

Command	Description
bump	Configures the bumping rules for a specific PVC member of a bundle.
class	Associates a map class with a specified DLCI.
dscp (Frame Relay VC-bundle-member)	Configures the DSCP value or values for a Frame Relay PVC bundle member.
exp	Configures MPLS EXP levels for a Frame Relay PVC bundle member.
match	Specifies which bits of the IP header to use for mapping packet service levels to Frame Relay PVC bundle members.
protect (Frame Relay VC-bundle-member)	Configures a Frame Relay PVC bundle member with protected group or protected PVC status.

protect (Frame Relay VC-bundle-member)

To configure a Frame Relay protected permanent virtual circuit (PVC) bundle member with protected group or protected PVC status, use the **protect** command in Frame Relay VC-bundle-member configuration mode. To remove the protected status from the PVC, use the **no** form of this command.

```
protect {group | vc}
```

```
no protect {group | vc}
```

Syntax Description

group	Configures the PVC bundle member as part of a collection of protected PVCs within the PVC bundle.
vc	Configures the PVC member as individually protected.

Defaults

The PVC neither belongs to the protected group nor is an individually protected PVC.

Command Modes

Frame Relay VC-bundle-member configuration

Command History

Release	Modification
12.2(13)T	This command was introduced.

Usage Guidelines

When an individually protected PVC goes down, it takes the bundle down. When all members of a protected group go down, the bundle goes down.

Despite any protection configurations, the PVC bundle will go down if a downed PVC has no PVC to which to bump its traffic or if the last PVC that is up in a PVC bundle goes down.

Examples

The following example configures Frame Relay PVC bundle member 101 as an individually protected PVC:

```
frame-relay vc-bundle new york
pvc 101
protect vc
```

Related Commands

Command	Description
bump	Configures the bumping rules for a specific PVC member of a bundle.
bundle	Creates a bundle or modifies an existing bundle to enter bundle configuration mode.
dscp (Frame Relay VC-bundle-member)	Configures the DSCP value or values for a Frame Relay PVC bundle member.

protect (Frame Relay VC-bundle-member)

Command	Description
exp	Configures MPLS EXP levels for a Frame Relay PVC bundle member.
precedence (Frame Relay VC-bundle-member)	Configures the precedence levels for a Frame Relay PVC bundle member.

protocol (ATM)

To configure a static map for an ATM permanent virtual circuit (PVC), switched virtual circuit (SVC), or virtual circuit (VC) class or to enable Inverse Address Resolution Protocol (ARP) or Inverse ARP broadcasts on an ATM PVC, use the **protocol** command in the appropriate mode. To remove a static map or disable Inverse ARP, use the **no** form of this command.

```
protocol protocol [protocol-address [virtual-template] | inarp] [[no] broadcast]
```

```
no protocol protocol [protocol-address [virtual-template] | inarp] [[no] broadcast]
```

Syntax Description	
<i>protocol</i>	Choose one of the following values: aarp —AppleTalk ARP appletalk —AppleTalk arp —IP ARP bridge —bridging bstun —block serial tunnel cdp —Cisco Discovery Protocol clns —ISO Connectionless Network Service (CLNS) clns_es —ISO CLNS end system clns_is —ISO CLNS intermediate system cmns —ISO CMNS compressedtcp —Compressed TCP decnet —DECnet decnet_node —DECnet node decnet_prime_router —DECnet prime router decnet_router-11 —DECnet router L1 decnet_router-12 —DECnet router L2 dlsw —data link switching ip —IP ipx —Novell IPX llc2 —llc2 pad —packet assembler/disassembler (PAD) links ppp —Point-to-Point Protocol carried on the VC pppoe —PPP over Ethernet qllc —Qualified Logical Link Control protocol rsrb —remote source-route bridging snapshot —snapshot routing support stun —serial tunnel
<i>protocol-address</i>	Destination address that is being mapped to a PVC.
virtual-template	(Optional) Specifies parameters that the point-to-point protocol over ATM (PPoA) sessions will use.
	Note This keyword is valid only for the ppp protocol.

inarp	(Valid only for IP and IPX protocols on PVCs) Enables Inverse ARP on an ATM PVC. If you specify a <i>protocol-address</i> instead of inarp , Inverse ARP is automatically disabled for that protocol.
[no] broadcast	(Optional) broadcast indicates that this map entry is used when the corresponding protocol sends broadcast packets to the interface. Pseudobroadcasting is supported. The broadcast keyword of the protocol command takes precedence if you previously configured the broadcast command on the ATM PVC or SVC.

Defaults

Inverse ARP is enabled for IP and IPX if the protocol is running on the interface and no static map is configured.

Command Modes

Interface-ATM-VC configuration (for an ATM PVC or SVC)
 VC-class configuration (for a VC class)
 PVC range configuration (for an ATM PVC range)
 PVC-in-range configuration (for an individual PVC within a PVC range)

Command History

Release	Modification
11.3	This command was introduced.
12.1	The ppp and virtual-template keywords were added.
12.1(5)T	The ip and ipx options were made available in PVC range and PVC-in-range configuration modes.
12.2(13)T	The apollo , vines , and xns arguments were removed because Apollo Domain, Banyan VINES, and Xerox Network Systems are no longer supported in the Cisco IOS software.

Usage Guidelines**Command Application**

Use this command to perform either of the following tasks:

- Configure a static map for an ATM PVC, SVC, or VC class.
- Enable Inverse ARP or Inverse ARP broadcasts on an ATM PVC or PVC range by configuring Inverse ARP directly on the PVC, in the PVC range, or in a VC class (applies to IP and IPX protocols only).

PVC range and PVC-in-range configuration modes support only the protocols that do not require static map configuration. Those protocol options are **ip** and **ipx**.

Default Configurations

If the **protocol** command is not explicitly configured on an ATM PVC or SVC, the VC inherits the following default configuration (listed in order of precedence):

- Configuration of the **protocol ip inarp** or **protocol ipx inarp** command in a VC class assigned to the PVC or SVC itself.
- Configuration of the **protocol ip inarp** or **protocol ipx inarp** command in a VC class assigned to the ATM subinterface of the PVC or SVC.

- Configuration of the **protocol ip inarp** or **protocol ipx inarp** command in a VC class assigned to the ATM main interface of the PVC or SVC.
- Global default: Inverse ARP is enabled for IP and IPX if the protocol is running on the interface and no static map is configured.

Examples

The following example creates a static map on a VC, indicates that 10.68.34.237 is connected to this VC, and sends ATM pseudobroadcasts:

```
protocol ip 10.68.34.237 broadcast
```

The following example enables Inverse ARP for IPX and does not send ATM pseudobroadcasts:

```
protocol ipx inarp no broadcast
```

The following example removes a static map from a VC and restores the default behavior for Inverse ARP (Refer to the “Default” section described above):

```
no protocol ip 10.68.34.237
```

In the following example, the VC carries PPP traffic and its associated parameters.

```
protocol ppp 10.68.34.237 virtual-template
```

protocol (L2TP)

To specify the signaling protocol to be used to manage the pseudowires created from a pseudowire class for a Layer 2 session and to cause control plane configuration settings to be taken from a specified L2TP class, use the **protocol** command in pseudowire class configuration mode. To remove the signaling protocol (and the control plane configuration to be used) from a pseudowire class, use the **no** form of this command.

```
protocol {l2tpv2 | l2tpv3 | none} [l2tp-class-name]
```

```
no protocol {l2tpv2 | l2tpv3 | none} [l2tp-class-name]
```

Syntax Description		
	l2tpv2	Specifies that the Layer 2 Tunnel Protocol (L2TP) signaling protocol will be used.
	l2tpv3	Specifies that the L2TPv3 signaling protocol will be used. This is the default.
	none	Specifies that no signaling protocol will be used in L2TPv3 sessions.
	<i>l2tp-class-name</i>	(Optional) The name of the L2TP class whose control plane configuration is to be used for pseudowires set up from a specified pseudowire class.

Defaults

The default protocol option is **l2tpv3**.

If you do not enter a value for the *l2tp-class-name* argument, the default control plane configuration settings in the L2TP signaling protocol are used.

Command Modes

Pseudowire class configuration

Command History

Release	Modification
12.0(23)S	This command was introduced.
12.3(2)T	This command was integrated into Cisco IOS Release 12.3(2)T.

Usage Guidelines

Use the **protocol** (L2TP) command to configure the signaling protocol to use in sessions created from the specified pseudowire class. In addition, you can use this command to specify the L2TP class from which the control plane configuration settings are to be taken.

Use the **protocol none** command to specify that no signaling will be used in L2TPv3 sessions created from the specified pseudowire class. This configuration is required for interoperability with a remote peer running the Universal Tunnel Interface (UTI).

Do not use this command if you want to configure a pseudowire class that will be used to create manual L2TPv3 sessions.

Examples

The following example shows how to enter pseudowire class configuration mode and how to configure L2TPv3 as the signaling protocol. The control plane configuration used in the L2TP class named “class1” will be used to create dynamic L2TPv3 sessions for a VLAN xconnect interface.

```
Router(config)# pseudowire-class vlan-xconnect
Router(config-pw)# protocol l2tpv3 class1
```

Related Commands

Command	Description
pseudowire-class	Specifies the name of an L2TP pseudowire class and enters pseudowire class configuration mode.

protocol pppoe (ATM VC)

To enable PPP over Ethernet (PPPoE) sessions to be established on permanent virtual circuits (PVCs), use the **protocol pppoe** command in the appropriate configuration mode. To disable PPPoE, use the **no** form of this command.

```
protocol pppoe [group group-name]
```

```
no protocol pppoe [group group-name]
```

Syntax Description

group	(Optional) Specifies a PPPoE profile to be used by PPPoE sessions on the interface.
<i>group-name</i>	(Optional) Name of the PPPoE profile to be used by PPPoE sessions on the interface.

Defaults

PPPoE is not enabled.

Command Modes

ATM VC configuration
 ATM VC class configuration
 ATM PVC range configuration
 ATM PVC-in-range configuration

Command History

Release	Modification
12.2(15)T	This command was introduced.

Usage Guidelines

If a PPPoE profile is not specified by using the **group** option, PPPoE sessions will be established using values from the global PPPoE profile. PPPoE profiles must be configured using the **bba-group pppoe** command.

Examples

The following example shows PPPoE configured in virtual circuit (VC) class “class-pppoe-global” and on the range of PVCs from 100 to 109. PVCs that use VC class “class-pppoe-global” will establish PPPoE sessions using the parameters configured in the global PPPoE profile. PVCs in the PVC range will use PPPoE parameters defined in PPPoE profile “vpn1”.

```
bba-group pppoe global
  virtual-template 1
  sessions max limit 8000
  sessions per-vc limit 8
  sessions per-mac limit 2
!
bba-group pppoe vpn1
  virtual-template 1
  sessions per-vc limit 2
  sessions per-mac limit 1
!
```

```

vc-class atm class-pppoe-global
  protocol pppoe
  !
interface ATM1/0.10 multipoint
  range range-pppoe-1 pvc 100 109
  protocol pppoe group vpn1
  !
interface ATM1/0.20 multipoint
  class-int class-pppoe-global
  pvc 0/200
  !
  pvc 0/201
  !

```

Related Commands

Command	Description
bba-group pppoe	Creates a PPPoE profile.
debug pppoe	Displays debugging information for PPPoE sessions.
sessions max limit	Configures a PPPoE global profile with the maximum number of PPPoE sessions permitted on a router and sets the PPPoE session-count threshold.
sessions per-mac limit	Sets the maximum number of PPPoE sessions allowed per MAC address in a PPPoE profile.
sessions per-vc limit	Sets the maximum number of PPPoE sessions to be established over a VC and sets the PPPoE session-count threshold.

protocol pppovlan dot1q

To configure an ATM PVC to support PPPoE over a specific IEEE 802.1Q VLAN or range of VLANs, use the **protocol pppovlan dot1q** command in ATM VC configuration or VC class configuration mode. To disable ATM PVC support for PPPoE for a specific IEEE 802.1Q VLAN or a range of VLANs, use the **no** form of this command.

protocol pppovlan dot1q {*vlan-id* | *start-vlan-id end-vlan-id*} [**group** *group-name*]

no protocol pppovlan dot1q {*vlan-id* | *start-vlan-id end-vlan-id*} [**group** *group-name*]

Syntax Description		
<i>vlan-id</i>	VLAN identifier. Valid values range from 1 to 4095.	
<i>start-vlan-id</i>	VLAN identifier of the first VLAN in the range. Valid values range from 1 to 4095.	
<i>end-vlan-id</i>	VLAN identifier of the last VLAN in the range. Valid values range from 1 to 4095.	
group	(Optional) Specifies that a PPPoE profile will be used by PPPoE sessions on the interface.	
<i>group-name</i>	(Optional) Name of the PPPoE profile to be used by PPPoE sessions on the interface.	

Defaults ATM PVC support for PPPoE over 802.1Q VLAN encapsulation is not enabled.

Command Modes ATM VC configuration
VC class configuration

Command History	Release	Modification
	12.3(2)T	This command was introduced.

Usage Guidelines The **protocol pppovlan dot1q** command enables an ATM PVC to support PPPoE over 802.1Q VLAN traffic that uses bridged RFC 1483 encapsulation.

An ATM PVC will drop 802.1Q traffic that is configured for non-PPPoE VLANs.

PPPoE over 802.1Q VLANs over ATM is supported on the PPPoE server only.

Examples The following example shows how to configure an ATM PVC to support PPPoE over a range of 802.1Q VLANs:

```
bba-group pppoe PPPOEOA
  virtual-template 1
  sessions per-mac limit 1

interface virtual-template 1
  ip address 10.10.10.10 255.255.255.0
```

```
mtu 1492

interface atm 4/0.10 multipoint
 pvc 10/100
  protocol pppovlan dot1q range 10 30 group PPPOEOA
```

Related Commands

Command	Description
debug pppoe	Displays debugging information for PPPoE sessions.

pseudowire

To bind an attachment circuit to a Layer 2 pseudowire for xconnect service, use the **pseudowire** command in interface configuration mode.

```
pseudowire peer-ip-address vcid pw-class pw-class-name [sequencing { transmit | receive | both }]
```

Syntax Description

<i>peer-ip-address</i>	The IP address of the remote peer.
<i>vcid</i>	The 32-bit identifier of the virtual circuit between the routers at each end of the Layer 2 control channel.
pw-class <i>pw-class-name</i>	The pseudowire class configuration from which the data encapsulation type will be taken.
sequencing { transmit receive both }	(Optional) Sets the sequencing method to be used for packets received or sent in L2TP sessions: <ul style="list-style-type: none"> • transmit—Sequencing of Layer 2 Tunnel Protocol (L2TP) data packets received from the session. • receive—Sequencing of L2TP data packets sent into the session. • both—Sequencing of L2TP data packets that are both sent and received from the session.

Defaults

No default behavior or values

Command Modes

Interface configuration

Command History

Release	Modification
12.3(2)T	This command was introduced.

Usage Guidelines

The combination of the *peer-ip-address* and *vcid* arguments must be unique on the router. Each pseudowire configuration must have a unique combination of *peer-ip-address* and *vcid* configuration.

The same *vcid* value that identifies the attachment circuit must be configured using the **pseudowire** command on the local and remote router at each end of a Layer 2 session. The virtual circuit identifier creates the binding between a pseudowire and an attachment circuit.

The **pw-class** *pw-class-name* value binds the pseudowire configuration of an attachment circuit to a specific pseudowire class. In this way, the pseudowire class configuration serves as a template that contains settings used by all attachment circuits bound to it with the **pseudowire** command.

Examples

The following example creates a virtual-PPP interface with the number 1, configures PPP on the virtual-PPP interface, and binds the attachment circuit to a Layer 2 pseudowire for xconnect service for the pseudowire class named pwclass1:

```
interface virtual-ppp 1
  ppp authentication chap
  ppp chap hostname peer1
  pseudowire 172.24.13.196 10 pw-class pwclass1
```

Related Commands

Command	Description
l2tp-class	Creates a template of L2TP control plane configuration settings that can be inherited by different pseudowire classes and enters L2TP class configuration mode.
pseudowire-class	Specifies the name of an L2TP pseudowire class and enters pseudowire class configuration mode.

pseudowire-class

To specify the name of a Layer 2 pseudowire class and enter pseudowire class configuration mode, use the **pseudowire-class** command in global configuration mode.

```
pseudowire-class [pw-class-name]
```

Syntax Description	<i>pw-class-name</i>	(Optional) The name of a Layer 2 pseudowire class. If you want to configure more than one pseudowire class, you must enter a value for the <i>pw-class-name</i> argument.
---------------------------	----------------------	---

Defaults	No pseudowire class is defined.
-----------------	---------------------------------

Command Modes	Global configuration
----------------------	----------------------

Command History	Release	Modification
	12.0(23)S	This command was introduced.
	12.3(2)T	This command was integrated into Cisco IOS Release 12.3(2)T.

Usage Guidelines	<p>The pseudowire-class command allows you to configure a pseudowire class template that consists of configuration settings used by all attachment circuits bound to the class. A pseudowire class includes the following configuration settings:</p>
-------------------------	--

- Data encapsulation type
- Control protocol
- Sequencing
- IP address of the local Layer 2 interface
- Type of service (ToS) value in IP headers

After you enter the **pseudowire-class** command, the router switches to pseudowire class configuration mode, where pseudowire settings may be configured.

Examples	<p>The following example shows how to enter pseudowire class configuration mode to configure a pseudowire configuration template named “ether-pw”:</p>
-----------------	--

```
Router(config)# pseudowire-class ether-pw
Router(config-pw)#
```

Related Commands	Command	Description
	l2tp-class	Creates a template of L2TP control plane configuration settings that can be inherited by different pseudowire classes and enters L2TP class configuration mode.
	pseudowire	Binds an attachment circuit to a Layer 2 pseudowire for xconnect service.
	xconnect	Binds an attachment circuit to an L2TPv3 pseudowire for xconnect service and enters xconnect configuration mode.

pvc

To create or assign a name to an ATM permanent virtual circuit (PVC), to specify the encapsulation type on an ATM PVC, and to enter ATM virtual circuit configuration mode, use the **pvc** command in interface configuration mode or subinterface configuration mode. To remove an ATM PVC from an interface, use the **no** form of this command.

```
pvc [name] vpi/vci [ces | ilmi | qsaal | smds | l2transport]
```

```
no pvc [name] vpi/vci [ces | ilmi | qsaal | smds | l2transport]
```

Syntax Description	
<i>name</i>	(Optional) The name of the PVC or map. The name can be up to 15 characters long.
<i>vpi</i>	<p>ATM network virtual path identifier (VPI) for this PVC. The absence of the “/” and a <i>vpi</i> value causes the <i>vpi</i> value to default to 0.</p> <p>Valid value ranges are as follows:</p> <ul style="list-style-type: none"> • Cisco 7200 and 7500 series routers: 0 to 255 . • Cisco 4500 and 4700 routers: 0 to 1 less than the quotient of 8192 divided by the value set by the atm vc-per-vc command. • Cisco 2600 and 3600 series routers using Inverse Multiplexing for ATM (IMA): 0 to 15, 64 to 79, 128 to 143, and 192 to 207. • A value that is out of range is interpreted as a string and is treated as the connection ID. • The arguments <i>vpi</i> and <i>vci</i> cannot both be set to 0; if one is 0, the other cannot be 0.
<i>vci</i>	<p>ATM network virtual channel identifier (VCI) for this PVC. This value ranges from 0 to 1 less than the maximum value set for this interface by the atm vc-per-vc command. Typically, lower values from 0 to 31 are reserved for specific traffic (for example, F4 OAM, SVC signaling, ILMI, and so on) and should not be used.</p> <p>The VCI is a 16-bit field in the header of the ATM cell. The VCI value is unique only on a single link, not throughout the ATM network, because it has local significance only.</p> <p>A value that is out of range causes an “unrecognized command” error message.</p> <p>The arguments <i>vpi</i> and <i>vci</i> cannot both be set to 0; if one is 0, the other cannot be 0.</p>
ces	(Optional) Circuit Emulation Service encapsulation. This keyword is available on the OC-3/STM-1 ATM Circuit Emulation Service network module and on AIM-ATM and AIM-ATM-VOICE-30 network modules only.
ilmi	(Optional) Sets up communication with the Interim Local Management Interface (ILMI); the associated <i>vpi</i> and <i>vci</i> values ordinarily are 0 and 16, respectively.

qsaal	(Optional) A signaling-type PVC used for setting up or tearing down SVCs; the associated <i>vpi</i> and <i>vci</i> values ordinarily are 0 and 5, respectively.
smds	(Optional) Encapsulation for SMDS networks. If you are configuring an ATM PVC on the ATM Interface Processor (AIP), you must configure AAL3/4SMDS using the atm aal aal3/4 command before specifying smds encapsulation. If you are configuring an ATM network processor module (NPM), the atm aal aal3/4 command is not required. SMDS encapsulation is not supported on the ATM port adapter.
l2transport	(Optional) Specifies that the PVC is switched and not terminated.

Defaults

No PVC is defined. When a PVC is defined, the global default of the **encapsulation** command applies (**aal5snap**).

Command Modes

Interface configuration
Subinterface configuration

Command History

Release	Modification
11.3 T	This command was introduced.
12.1(2)T	The ranges for the VPI were increased for Cisco 2600 and Cisco 3600 series routers using Inverse Multiplexing for ATM (IMA). The ces keyword was added for configuring CES encapsulation when using the OC-3/STM-1 ATM Circuit Emulation Service network module on Cisco 2600 and Cisco 3600 series routers.
12.1(5)XM	This command was extended to the merged Simple Gateway Control Protocol (SGCP)/Media Gateway Control Protocol (MGCP) software.
12.2(2)T	This command was integrated into Cisco IOS Release 12.2(2)T.
12.0(23)S	The l2transport keyword was added.
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(8)T	The ces keyword was added to AIM-ATM and AIM-ATM-VOICE-30 network modules.

Usage Guidelines**Creating and Configuring PVCs**

The **pvc** command replaces the **atm pvc** command. Use the **pvc** command to configure a single ATM VC only, not a VC that is a bundle member. We recommend that you use the **pvc** command in conjunction with the **encapsulation** and **random-detect attach** commands instead of the **atm pvc** command.

The **pvc** command creates a PVC and attaches it to the VPI and VCI specified. Both the *vpi* and *vci* arguments cannot be simultaneously specified as 0; if one is 0, the other cannot be 0.

When configuring an SVC, use the **pvc** command to configure the PVC that handles SVC call setup and termination. In this case, specify the **qsaal** keyword. See the second example that follows.

ATM PVC Names

Once you specify a name for a PVC, you can reenter ATM virtual circuit configuration mode by simply entering the **pvc name** command. You can remove a PVC and any associated parameters by entering **no pvc name** or **no pvc vpi/vci**.



Note

After configuring the parameters for an ATM PVC, you must exit the ATM virtual circuit configuration mode in order to create the PVC and enable the settings.

Encapsulation Types on ATM PVCs

Specify CES, ILMI, QSAAL, or SMDS as the encapsulation type on an ATM PVC. (To configure other encapsulations types, see the **encapsulation** command.)

Configuring CES encapsulation on a PVC is equivalent to creating a constant bit rate (CBR) class of service.

Rate Queues

The Cisco IOS software dynamically creates rate queues as necessary to satisfy the requests of the **pvc** commands.

Default Configurations

If **ilmi**, **qsaal**, or **smds** encapsulation is not explicitly configured on the ATM PVC, the PVC inherits the following default configuration (listed in order of precedence):

- Configuration of the **encapsulation** command in a VC class assigned to the PVC itself.
- Configuration of the **encapsulation** command in a VC class assigned to the ATM subinterface of the PVC.
- Configuration of the **encapsulation** command in a VC class assigned to the ATM main interface of the PVC.
- Global default: The global default value of the **encapsulation** command applies (**aal5snap**).

Examples

The following example creates a PVC with VPI 0 and VCI 16, and communication is set up with the ILMI:

```
pvc cisco 0/16 ilmi
exit
```

The following example creates a PVC used for ATM signaling for an SVC. It specifies VPI 0 and VCI 5:

```
pvc cisco 0/5 qsaal
exit
```

The following example configures the PVC called “cisco” to use class-based weighted fair queueing (CBWFQ). It attaches a policy map called “policy1” to the PVC. The classes that make up “policy1” determine the service policy for the PVC:

```
pvc cisco 0/5
service-policy output policy1
vbr-nrt 2000 2000
encap aal5snap
```

Related Commands

Command	Description
atm vc-per-vp	Sets the maximum number of VCIs to support per VPI.
pvc-bundle	Adds a PVC to a bundle as a member of the bundle.

pvc (Frame Relay VC-bundle)

To create a permanent virtual circuit (PVC) that is a Frame Relay PVC bundle member, and to enter Frame Relay VC-bundle-member configuration mode, use the **pvc** command in Frame Relay VC-bundle configuration mode. To delete the PVC from the Frame Relay PVC bundle, use the **no** form of this command.

```
pvc dcli [vc-name]
```

```
no pvc dcli [vc-name]
```

Syntax Description

<i>dcli</i>	Data-link connection identifier (DLCI) number used to identify the PVC.
<i>vc-name</i>	(Optional) An alphanumeric name for the PVC.

Defaults

No PVC is defined.

Command Modes

Frame Relay VC-bundle configuration

Command History

Release	Modification
12.2(13)T	This command was introduced.

Usage Guidelines

To use this command, you must first create a Frame Relay PVC bundle and enter Frame Relay VC-bundle configuration mode.

A PVC bundle must have at least one PVC for the bundle to come up. A PVC bundle cannot have more than eight PVCs. If you try to configure more than eight PVCs in a bundle, the following message will appear on the console:

```
%FR vc-bundle contains 8 members. Cannot add another.
```

Dynamic PVCs can be specified as PVC bundle members; however, if a PVC has already been created by using some other configuration command, you will not be able to add it to a PVC bundle. If you try to add it to a bundle, the following message will appear on the console:

```
%DLCI 200 is not a dynamic PVC. Cannot add to VC-Bundle.
```

If a PVC is already a member of a PVC bundle, any attempt to reuse that same PVC in a command that creates a PVC (e.g. **frame-relay interface-dcli**, **frame-relay local-dcli**) will result in the following error message:

```
%Command is inapplicable to vc-bundle PVCs.
```

Examples

The following example creates PVC 101 belonging to the Frame Relay PVC bundle named “new_york”:

```
frame-relay vc-bundle new_york
pvc 101
```

Related Commands

Command	Description
dscp (frame-relay vc-bundle-member)	Configures the DSCP value or values for a Frame Relay PVC bundle member.
exp	Configures MPLS EXP levels for a Frame Relay PVC bundle member.
frame-relay vc-bundle	Creates a Frame Relay PVC bundle and enters Frame Relay VC-bundle configuration mode.
match	Specifies which bits of the IP header to use for mapping packet service levels to Frame Relay PVC bundle members
precedence (Frame Relay VC-bundle-member)	Configures the precedence levels for a Frame Relay PVC bundle member.

pvc-in-range

To configure an individual permanent virtual circuit (PVC) within a PVC range, use the **pvc-in-range** command in PVC range configuration mode. To delete the individual PVC configuration, use the **no** form of this command.

```
pvc-in-range [pvc-name] [vpi/vci]
```

```
no pvc-in-range [pvc-name] [vpi/vci]
```

Syntax Description

<i>pvc-name</i>	(Optional) Name given to the PVC. The PVC name can have a maximum of 15 characters.
<i>vpi</i>	(Optional) ATM network virtual path identifier (VPI) for this PVC. In the absence of the “/” and a <i>vpi</i> value, the <i>vpi</i> value defaults to 0. The <i>vpi</i> value ranges from 0 to 255.
<i>vci</i>	(Optional) ATM network virtual channel identifier (VCI) for this PVC. The <i>vci</i> value ranges from 32 to 2047.

Defaults

No default behavior or values

Command Modes

PVC range configuration

Command History

Release	Modification
12.1(5)T	This command was introduced.

Usage Guidelines

The **pvc-in-range** command defines an individual PVC within a PVC range and enables PVC-in-range configuration mode.

Examples

In the following example, a PVC called “pppoa” is deactivated. The PVC “pppoa” is an individual PVC within a configured PVC range.

```
pvc-in-range pppoa 0/130
  shutdown
```

Related Commands

Command	Description
range pvc	Defines a range of ATM PVCs.

range pvc

To define a range of ATM permanent virtual circuits (PVCs), use the **range pvc** command in subinterface configuration mode. To delete the range of ATM PVCs, use the **no** form of this command.

```
range [range-name] pvc start-vpilstart-vci end-vpilend-vci
```

```
no range [range-name] pvc
```

Syntax Description

<i>range-name</i>	(Optional) Name of the range. The range name can be a maximum of 15 characters.
<i>start-vpil</i>	Beginning value for a range of virtual path identifiers (VPIs). In the absence of the “ <i>f</i> ” and a <i>vpi</i> value, the <i>vpi</i> value defaults to 0. The <i>vpi</i> value ranges from 0 to 255.
<i>start-vcil</i>	Beginning value for a range of virtual channel identifiers (VCIs). The <i>vci</i> value ranges from 32 to 65535.
<i>end-vpil</i>	End value for a range of virtual path identifiers (VPIs). In the absence of an <i>end-vpi</i> value, the <i>end-vpi</i> value defaults to the <i>start-vpi</i> value. The <i>vpi</i> value ranges from 0 to 255.
<i>end-vci</i>	End value for a range of virtual channel identifiers (VCIs). The <i>vci</i> value ranges from 32 to 65535.

Defaults

An ATM PVC range is not configured.

Command Modes

Subinterface configuration

Command History

Release	Modification
12.1(5)T	This command was introduced.

Usage Guidelines

The **range pvc** command defines a range of PVCs and enables PVC range configuration mode.

The number of PVCs in a range can be calculated using the following formula:

$$\text{number of PVCs} = (\text{end-vpi} - \text{start-vpi} + 1) \times (\text{end-vci} - \text{start-vci} + 1).$$

The *start-vpi* argument may be omitted if it is zero. The *end-vpi* argument may be omitted, but if it is omitted, it is assigned the value of *start-vpi*. The *end-vpi* and *end-vci* arguments are always greater than or equal to *start-vpi* and *start-vci* respectively.

When applied to multipoint subinterfaces, the **range pvc** command creates a range of ATM PVCs. When applied to point-to-point subinterfaces, the **range pvc** command creates range of PVCs and a corresponding range of point-to-point subinterfaces.

For point-to-point subinterfaces, subinterface numbering begins with the subinterface on which the PVC range is configured and increases sequentially through the range.

Examples**ATM PVC Range Example**

In the following example, 100 PVCs with VCI values from 100 to 199 for each VPI value from 0 to 4 are created for a PVC range called “range-pppoa-1”. This configuration creates a total of 500 PVCs in the range. PVC parameters are then configured for the range.

```
interface atm 6/0.110 multipoint
 range range-pppoa-1 pvc 100 4/199
  class-range class-pppoa-1
 ubr 1000
 encapsulation aal5snap
 protocol ppp virtual-Template 2
```

Subinterface Grouping by PVC Range for Routed Bridge Encapsulation Example

In the following example, a PVC range called “range1” is created with a total of 100 PVCs in the range. A point-to-point subinterface will be created for each PVC in the range. ATM routed bridge encapsulation is also configured.

```
interface atm 6/0.200 point-to-point
 ip unnumbered loopback 1
 atm route-bridged ip
 range range1 pvc 1/200 1/299
 # end
```

Related Commands

Command	Description
pvc-in-range	Configures an individual PVC within a PVC range.

rbe nasip

To specify the IP address of an interface on the Dynamic Host Configuration Protocol (DHCP) relay agent that will be sent to the DHCP server via the agent remote ID option, use the **rbe nasip** command in global configuration mode. To remove this specification, use the **no** form of this command.

rbe nasip *source-interface*

no rbe nasip *source-interface*

Syntax Description

<i>source-interface</i>	The type and number of one of the interfaces on the router. The IP address for this interface will be forwarded in the agent remote ID option and can be used by the DHCP server to uniquely identify the DHCP relay agent.
-------------------------	---

Defaults

No IP address is specified.

Command Modes

Global configuration

Command History

Release	Modification
12.2(2)T	This command was introduced.

Usage Guidelines

The **rbe nasip** command is used to configure support for the DHCP relay agent information option (option 82) for ATM routed bridge encapsulation (RBE).

Support for the DHCP relay agent information option must be configured on the DHCP relay agent using the **ip dhcp relay information option** command in order for the **rbe nasip** command to be effective.

Examples

In the following example, support for DHCP option 82 is enabled on the DHCP relay agent by the use of the **ip dhcp relay agent information option** command. The **rbe nasip** command configures the router to forward the IP address for Loopback0 to the DHCP server. ATM routed bridge encapsulation is configured on ATM subinterface 4/0.1.

```
ip dhcp-server 10.1.1.1
!
ip dhcp relay information option
!
interface Loopback0
 ip address 10.5.1.1 255.255.255.0
!
interface ATM4/0
 no ip address
!
interface ATM4/0.1 point-to-point
 ip unnumbered Loopback0
 ip helper-address 10.1.1.1
 atm route-bridged ip
 pvc 88/800
```

```
    encapsulation aal5snap
!
router eigrp 100
  network 10.0.0.0
!
rbe nasip loopback0
```

Related Commands

Command	Description
ip dhcp relay information option	Enables the system to insert the DHCP relay agent information option in forwarded BOOT REQUEST messages to a Cisco IOS DHCP server.

receive-window

To configure the packet size of the receive window on the remote provider edge router at the other end of a Layer 2 control channel, use the **receive-window** command in L2TP class configuration mode. To disable the configured value, use the **no** form of this command.

receive-window *number*

no receive-window *number*

Syntax Description

<i>number</i>	The number of packets that can be received by the remote peer before backoff queuing occurs. The valid values range from 1 to the upper limit the peer has for receiving packets. The default value is the upper limit.
---------------	---

Defaults

The default value is the upper limit that the remote peer has for receiving packets.

Command Modes

L2TP class configuration

Command History

Release	Modification
12.0(23)S	This command was introduced.
12.3(2)T	This command was integrated into Cisco IOS Release 12.3(2)T.

Usage Guidelines

To determine the upper limit for the *number* argument, refer to the platform-specific documentation for the peer router.

Examples

The following example sets a receive window of 30 packets to the remote peer in Layer 2 pseudowires that have been configured with the L2TP class named "l2tp-class1":

```
Router(config)# l2tp-class l2tp-class1
Router(config-l2tp-class)# receive-window 30
```

Related Commands

Command	Description
l2tp-class	Creates a template of L2TP control plane configuration settings that can be inherited by different pseudowire classes and enters L2TP class configuration mode.

relay pppoe bba-group

To configure the PPP over Ethernet (PPPoE) broadband access (BBA) group that responds to PPPoE Active Discovery (PAD) messages, use the **relay pppoe bba-group** command in VPDN group or VPDN template configuration mode. To unconfigure the group, use the **no** form of this command.

```
relay pppoe bba-group pppoe-bba-group-name
```

```
no relay pppoe bba-group pppoe-bba-group-name
```

Syntax Description

pppoe-bba-group-name Name of the PPPoE BBA group.

Command Default

No PPPoE BBA group is configured to respond to PAD messages.

Command Modes

VPDN group configuration
VPDN template configuration

Command History

Release	Modification
12.3(4)T	This command was introduced.

Usage Guidelines

On the router that responds to relayed PAD messages, this command configures a PPPoE group and attaches it to a virtual private dialup network (VPDN) group or VPDN template that accepts dial-in calls for Layer 2 Tunnel Protocol (L2TP). The relayed PAD messages will be passed from the VPDN L2TP tunnel or session to the PPPoE broadband group for receiving the PAD response.

Examples

The following partial example shows how to configure a tunnel switch or L2TP tunnel server to respond to PAD messages. The **relay pppoe bba-group** command configures PPPoE “group-1”, which is attached to accept dial-in VPDN group “Group-A”.

```
.
.
.
vpdn-group Group-A
! Configure an L2TP tunnel for PPPoE Relay
accept-dialin
  protocol l2tp
.
.
.
  terminate-from hostname LAC-1
  relay pppoe bba-group group-1
.
.
! Configure the PPPoE group to respond to the relayed PAD messages
bba-group pppoe group-1
  service profile profile-1
```

Related Commands

Command	Description
bba-group pppoe	Creates a PPPoE profile.
vpdn-group	Creates a VPDN group and enters VPDN group configuration mode.
vpdn-template	Enters VPDN template configuration mode, where a template for VPDN groups can be configured.

retransmit

To configure the retransmission settings of control packets, use the **retransmit** command in L2TP class configuration mode. To disable the configured values, use the **no** form of this command.

retransmit {**initial retries** *initial-retries* | **retries** *retries* | **timeout** {**max** | **min**} *seconds*}

no retransmit {**initial retries** *initial-retries* | **retries** *retries* | **timeout** {**max** | **min**} *seconds*}

Syntax Description

initial retries <i>initial-retries</i>	Specifies how many start control channel requests (SCCRQs) are re-sent before giving up on the session. Valid values for the <i>initial-retries</i> argument range from 1 to 1000. The default value is 2.
retries <i>retries</i>	Specifies how many retransmission cycles occur before determining that the peer provider edge (PE) router does not respond. Valid values for the <i>retries</i> argument range from 1 to 1000. The default value is 15.
timeout { max min } <i>seconds</i>	Specifies maximum and minimum retransmission intervals (in seconds) for resending control packets. Valid values for the <i>timeout</i> argument range from 1 to 8. The default maximum interval is 8; the default minimum interval is 1.

Defaults

initial retries: 2
retries: 15
timeout max *seconds*: 8 seconds
timeout min *seconds*: 1 second

Command Modes

L2TP class configuration

Command History

Release	Modification
12.0(23)S	This command was introduced.
12.3(2)T	This command was integrated into Cisco IOS Release 12.3(2)T.

Usage Guidelines

Use this command to configure the amount of time spent trying to establish or maintain a control channel.

Examples

The following example configures ten retries for sending tunneled packets to a remote peer in Layer 2 pseudowires that have been configured with the Layer 2 Tunnel Protocol (L2TP) class named "l2tp-class1":

```
Router(config)# l2tp-class l2tp-class1
Router(config-l2tp-class)# retransmit retries 10
```

Related Commands

Command	Description
l2tp-class	Creates a template of L2TP control plane configuration settings that can be inherited by different pseudowire classes and enters L2TP class configuration mode.

retry (SVC)

To configure a router to periodically attempt to bring up an active switched virtual circuit (SVC) connection after the initial call setup failed, use the **retry** command in interface-CES-VC configuration mode. To disable the retry mechanism, use the **no** form of this command.

retry *timeout-value* [*retry-limit*] [*first-retry-interval*]

no **retry**

Syntax Description

<i>timeout-value</i>	Number of seconds between attempts to bring up the connection. The range is from 1 to 86400 seconds.
<i>retry-limit</i>	(Optional) Number of attempts the router will make to bring up the connection. The range is from 0 to 65535. The default value of 0 indicates no limit.
<i>first-retry-interval</i>	(Optional) Number of seconds the router will wait after the first call attempt failed before trying the call again. The default is 10 seconds.

Defaults

There is no default *timeout-value*.
retry-limit: 0
first-retry-interval: 10 seconds

Command Modes

Interface-CES-VC configuration

Command History

Release	Modification
12.1(2)T	This command was introduced.

Usage Guidelines

This command is used on Cisco 2600 series and 3600 series routers that have OC-3/STM-1 ATM CES network modules.

The **retry** command applies only to active SVCs.

Examples

In the following example, the router is configured to make up to 20 attempts to bring up a connection on SVC "ces1". The interval between attempts is set at 10 seconds.

```
interface atm 1/0
 svc ces1 nsap 47.0091.81.000000.0040.0B0A.2501.ABC1.3333.3333.05 ces
  retry 10 20
```

Related Commands

Command	Description
ces	Configures CES on a router port and enters CES configuration mode.
svc	Creates an ATM SVC and specifies the destination NSAP address on a main interface or subinterface.

rx-speed

To configure the required speed on the ATM virtual circuit (VC) carrying the PPPoX session, and to transfer this information into attribute-value pair 38 (AVP 38) from the Layer 2 Tunnel Protocol (L2TP) Access Concentrator (LAC) to the L2TP network server (LNS) for asymmetric digital subscriber line (DSL) sessions, use the **rx-speed** command in PVC, PVC-in-range, or range configuration mode. To reset the variable to have the same value as that passed in AVP 24, use the **no** form of this command.

rx-speed *incoming-cell-rate*

no rx-speed

Syntax Description	<i>incoming-cell-rate</i>	Incoming cell rate for L2TP AVP 38, in Kbps.
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Defaults The same value as that passed in AVP 24.

Command Modes PVC
PVC-in-range
Range

Command History	Release	Modification
	12.3(11)T	This command was introduced.

Usage Guidelines To allow L2TP to send AVP 38 with the required value from LAC to LNS for DSL services, use the **rx-speed** command in PVC, PVC-in-range, or range configuration mode.

The configured speed is transported to the LNS, which validates the session within AVP 24 and AVP 38.

Examples The following examples show how L2TP sends AVP38 with the required value to LNS in the PVC, range PVC and PVC-in-range modes.

PVC

```
Router(config)# interface atm 6/0.110 multipoint
Router(config-if)# pvc 0/600
Router(config-if-atm-vc)# rx-speed 128
Router(config-if-atm-vc)# encapsulation aal5snap
Router(config-if-atm-vc)# exit
```

Range PVC

```
Router(config)# interface atm 6/0.110 multipoint
Router(config-subif)# range range-pppoa-1 pvc 100 4/199
Router(config-if-atm-range-pvc)# rx-speed 400
Router(config-if-atm-range-pvc)# exit
```

PVC-in-Range

```
Router(config)# interface atm 6/0.110 multipoint  
Router(config-subif)# range range1 pvc 100 4/199  
Router(config-if-atm-range)# pvc-in-range 0/300  
Router(config-if-atm-range-pvc)# rx-speed 200  
Router(config-if-atm-range-pvc)# shutdown
```

