

Configuring PPP over Ethernet with NAT

This chapter provides an overview of Point-to-Point Protocol over Ethernet (PPPoE) clients and network address translation (NAT) that can be configured on the Cisco 819, Cisco 860, Cisco 880, and Cisco 890 series Integrated Services Routers (ISRs).

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Overview

Multiple PCs can be connected to the LAN behind the router. Before the traffic from these PCs is sent to the PPPoE session, it can be encrypted, filtered, and so forth. Figure 1: PPP over Ethernet with NAT shows a typical deployment scenario with a PPPoE client and NAT configured on the Cisco router.





1	Multiple networked devices—Desktops, laptop PCs, switches
2	Fast Ethernet LAN interface (inside interface for NAT)
3	PPPoE client—Cisco 860, Cisco 880, or Cisco 890 ISRs
4	Point at which NAT occurs
5	Fast Ethernet WAN interface (outside interface for NAT)
6	Cable modem or other server that is connected to the Internet
7	PPPoE session between the client and a PPPoE server

PPPoE

The PPPoE client feature on the router provides PPPoE client support on Ethernet interfaces. A dialer interface must be used for cloning virtual access. Multiple PPPoE client sessions can be configured on an Ethernet interface, but each session must use a separate dialer interface and a separate dialer pool.

NAT

- By entering the clear vpdn tunnel pppoe command. The PPPoE client session is terminated, and the PPPoE client immediately tries to reestablish the session. This also occurs if the session has a timeout.
- By entering the **no pppoe-client dial-pool** *number* command to clear the session. The PPPoE client does not attempt to reestablish the session.

NAT

NAT (represented as the dashed line at the edge of the Cisco router) signifies two addressing domains and the inside source address. The source list defines how the packet travels through the network.

Configuration Tasks

Perform the following tasks to configure this network scenario:

PPPoE client session can be terminated in one of two ways:

An example showing the results of these configuration tasks is shown in the Configuration Example, on page 10.

Configure the Virtual Private Dialup Network Group Number

Configuring a virtual private dialup network (VPDN) enables multiple clients to communicate through the router by way of a single IP address.

To configure a VPDN, perform the following steps, starting in global configuration mode:

SUMMARY STEPS

- 1. vpdn enable
- **2.** vpdn-group name
- 3. request-dialin
- 4. protocol {l2tp | pppoe}
- 5. exit
- 6. exit

DETAILED STEPS

	Command or Action	Purpose
Step 1	vpdn enable	Enables VPDN on the router.
	Example:	
	Router(config)# vpdn enable	

	Command or Action	Purpose
Step 2	vpdn-group name	Creates and associates a VPDN group with a customer or VPDN profile.
	Example:	
	Router(config)# vpdn-group 1	
Step 3	request-dialin	Creates a request-dialin VPDN subgroup, indicating the dialing direction, and initiates the tunnel.
	Example:	
	Router(config-vpdn)# request-dialin	
Step 4	protocol {l2tp pppoe}	Specifies the type of sessions the VPDN subgroup can establish.
	Example:	
	Router(config-vpdn-req-in)# protocol pppoe	
Step 5	exit	Exits request-dialin VPDN group configuration mode.
	Example:	
	Router(config-vpdn-req-in)# exit	
Step 6	exit	Exits VPDN configuration mode and returns to global configuration mode.
	Example:	
	Router(config-vpdn)# exit	

Configure Ethernet WAN Interfaces

In this scenario, the PPPoE client (your Cisco router) communicates over a 10/100 Mbps-Ethernet interface on both the inside and the outside.

To configure the Fast Ethernet WAN interfaces, perform these steps, starting in global configuration mode:

SUMMARY STEPS

- **1.** interface type number
- 2. pppoe-client dial-pool-number number
- 3. no shutdown
- 4. exit

DETAILED STEPS

	Command or Action	Purpose
Step 1	interface type number	Enters interface configuration mode for WAN interface.
	Example:	
	Router(config)# interface fastethernet 4 or	
	Example: Router(config)# interface gigabitethernet 4	
Step 2	pppoe-client dial-pool-number number	Configures the PPPoE client and specifies the dialer interface to use for cloning.
	Example:	
	Router(config-if)# pppoe-client dial-pool-number 1	
Step 3	no shutdown	Enables the Fast Ethernet interface and the configuration changes just made to it.
	Example:	
	Router(config-if)# no shutdown	
Step 4	exit	Exits configuration mode for the Fast Ethernet interface and returns to global configuration mode.
	Example:	
	Router(config-if)# exit	

What to Do Next

Ethernet Operations, Administration, and Maintenance

Ethernet Operations, Administration, and Maintenance (OAM) is a protocol for installing, monitoring, and troubleshooting Ethernet metropolitan-area networks (MANs) and Ethernet WANs. It relies on a new, optional sublayer in the data link layer of the Open Systems Interconnection (OSI) model. The OAM features covered by this protocol are Discovery, Link Monitoring, Remote Fault Detection, Remote Loopback, and Cisco Proprietary Extensions.

For setup and configuration information about Ethernet OAM, see Using Ethernet Operations, Administration, and Maintenance at: Carrier Ethernet Configuration Guide.

Configure the Dialer Interface

The dialer interface indicates how to handle traffic from the clients, including, for example, default routing information, the encapsulation protocol, and the dialer pool to use. The dialer interface is also used for cloning virtual access. Multiple PPPoE client sessions can be configured on a Fast Ethernet interface, but each session must use a separate dialer interface and a separate dialer pool.

To configure a dialer interface for one of the Fast Ethernet LAN interfaces on the router, complete the following steps, starting in global configuration mode:

SUMMARY STEPS

- 1. interface dialer dialer-rotary-group-number
- 2. ip address negotiated
- 3. ip mtu bytes
- 4. encapsulation encapsulation-type
- **5. ppp authentication** {*protocol1* [*protocol2*...]}
- 6. dialer pool number
- 7. dialer-group group-number
- 8. exit
- 9. dialer-list*dialer-group* protocol*protocol-name* {permit | deny | list *access-list-number* | access-group}
- **10.** ip routeprefix mask {interface-type interface-number}

DETAILED STEPS

	Command or Action	Purpose
Step 1	interface dialer dialer-rotary-group-number	Creates a dialer interface and enters interface configuration mode.
	Example:	• Range is from 0 to 255.
	Router(config)# interface dialer 0	
Step 2	ip address negotiated	Specifies that the IP address for the interface is obtained through PPP/IPCP (IP Control Protocol) address negotiation.
	Example:	
	Router(config-if)# ip address negotiated	
Step 3	ip mtu bytes	Sets the size of the IP maximum transmission unit (MTU).
	Example:	• The default minimum is 128 bytes. The maximum for Ethernet is 1492 bytes.
	Router(config-if)# ip mtu 1492	
Step 4	encapsulation encapsulation-type	Sets the encapsulation type to PPP for the data packets being transmitted and received.
	Example:	
	Router(config-if)# encapsulation ppp	
Step 5	<pre>ppp authentication {protocol1 [protocol2]}</pre>	Sets the PPP authentication method to Challenge Handshake Authentication Protocol (CHAP).
	<pre>Example: Router(config-if)# ppp authentication chap</pre>	For details about this command and additional parameters that can be set, see Cisco IOS Security Command Reference.

	Command or Action	Purpose
Step 6	dialer pool number	Specifies the dialer pool that is used to connect to a specific destination subnetwork.
	Example:	
	Router(config-if)# dialer pool 1	
Step 7	dialer-group group-number	Assigns the dialer interface to a dialer group.
	Example:	• Range is from 1 to 10.
	Router(config-if)# dialer-group 1	TipUsing a dialer group controls access to your router.
Step 8	exit	Exits the dialer 0 interface configuration mode and returns to global configuration mode.
	Example:	
	Router(config-if)# exit	
Step 9	dialer-listdialer-group protocolprotocol-name {permit deny list access-list-number	Creates a dialer list and associates a dial group with it. Packets are then forwarded through the specified interface dialer group.
	access-group}	For details about this command and additional parameters that can be set, see Cisco IOS Dial Technologies Command Reference.
	Example:	
	Router(config)# dialer-list 1 protocol ip permit	
Step 10	ip route prefix mask {interface-type interface-number}	Sets the IP route for the default gateway for the dialer 0 interface.
	Example:	
	Router(config)# ip route 10.10.25.2 255.255.255.255 dialer 0	

Configure Network Address Translation

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Network Address Translation (NAT) translates packets from addresses that match a standard access list, using global addresses allocated by the dialer interface. Packets that enter the router through the inside interface, packets sourced from the router, or both are checked against the access list for possible address translation. You can configure NAT for either static or dynamic address translations.

To configure the outside Fast Ethernet WAN interface with dynamic NAT, perform these steps, beginning in global configuration mode:

SUMMARY STEPS

- **1.** ip nat pool name start-ip end-ip {netmask netmask | prefix-length prefix-length}
- **2.** Do one of the following:
 - ip nat inside source {list access-list-number} {interface type number | pool name} [overload]
 - Router(config) # ip nat inside source list 1 interface dialer 0 overload
 - Router(config) # ip nat inside source list acl1 pool pool1
- **3.** interface type number
- 4. ip nat {inside | outside}
- 5. no shutdown
- 6. exit
- 7. interface type number
- 8. ip nat {inside | outside}
- 9. no shutdown
- 10. exit
- **11.** access-list access-list-number {deny | permit} source [source-wildcard]

	Command or Action	Purpose
Step 1	ip nat pool <i>name start-ip end-ip</i> { netmask <i>netmask</i> prefix-length <i>prefix-length</i> }	Creates pool of global IP addresses for NAT.
	Example:	
	Router(config)# ip nat pool pooll 192.168.1.0 192.168.2.0 netmask 255.255.252.0	
Step 2	Do one of the following:	Enables dynamic translation of addresses on the inside interface.
	 (interface type number pool name) [overload] Router(config) # ip nat inside source list 1 interface dialer 0 overload Router(config) # ip nat inside source list 	The first example shows the addresses permitted by the access list <i>I</i> to be translated to one of the addresses specified in the dialer interface θ . The second example shows the addresses permitted by access list <i>acl1</i> to be translated to one of the addresses specified in the NAT pool <i>pagl1</i>
Step 3	interface type number	Enters configuration mode for the VLAN (on which the Fast Ethernet LAN interfaces [FE0–FE3] reside) to be the inside interface for NAT.
	Router(config)# interface vlan 1	

DETAILED STEPS

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	Command or Action	Purpose
Step 4	ip nat {inside outside}	Identifies the specified VLAN interface as the NAT inside interface.
	Example:	
	Router(config-if)# ip nat inside	
Step 5	no shutdown	Enables the configuration changes just made to the Ethernet interface.
	Example:	
	Router(config-if)# no shutdown	
Step 6	exit	Exits configuration mode for the Fast Ethernet interface and returns to global configuration mode.
	Example:	
	Router(config-if)# exit	
Step 7	interface type number	Enters configuration mode for the Fast Ethernet WAN interface (FE4) to be the outside interface for NAT.
	Example:	
	Router(config)# interface fastethernet 4	
Step 8	ip nat {inside outside}	Identifies the specified WAN interface as the NAT outside interface.
	Example:	
	Router(config-if)# ip nat outside	
Step 9	no shutdown	Enables the configuration changes just made to the Ethernet interface.
	Example:	
	Router(config-if)# no shutdown	
Step 10	exit	Exits configuration mode for the Fast Ethernet interface and returns to global configuration mode.
	Example:	
	Router(config-if) # exit	
Step 11	access-list access-list-number {deny permit} source [source-wildcard]	Defines a standard access list indicating which addresses need translation.
	Example:	Note All other addresses are implicitly denied.
	Router(config)# access-list 1 permit 192.168.1.0 255.255.255.0	

What to Do Next

Note

To use NAT with a virtual-template interface, you must configure a loopback interface. See Chapter 3, "Basic Router Configuration," for information on configuring a loopback interface.

For complete information on the NAT commands, see the Cisco NX-OS Release 4.1 documentation set. For more general information on NAT concepts, see Appendix A, "Cisco IOS Software Basic Skills".

Configuration Example

The following configuration example shows a portion of the configuration file for the PPPoE scenario described in this chapter.

The VLAN interface has an IP address of 192.168.1.1 with a subnet mask of 255.255.255.0. NAT is configured for inside and outside

Note

Commands marked by "(default)" are generated automatically when you run the **show running-config** command.

```
vpdn enable
vpdn-group 1
request-dialin
protocol pppoe
interface vlan 1
ip address 192.168.1.1 255.255.255.0
no ip directed-broadcast (default)
ip nat inside
interface FastEthernet 4
no ip address
no ip directed-broadcast (default)
ip nat outside
pppoe enable group global
pppoe-client dial-pool-number 1
no sh
interface dialer 0
ip address negotiated
ip mtu 1492
encapsulation ppp
ppp authentication chap
dialer pool 1
dialer-group 1
dialer-list 1 protocol ip permit
ip nat inside source list 1 interface dialer 0 overload
ip classless (default)
ip route 10.10.25.2 255.255.255.255 dialer 0
ip nat pool pool1 192.168.1.0 192.168.2.0 netmask 255.255.252.0
ip nat inside source list acl1 pool pool1
```

Verifying Your Configuration

Use the show ip nat statistics command in privileged EXEC mode to verify the PPPoE with NAT configuration. You should see verification output similar to the following example:

```
Router# show ip nat statistics

Total active translations: 0 (0 static, 0 dynamic; 0 extended)

Outside interfaces:

FastEthernet4

Inside interfaces:

Vlan1

Hits: 0 Misses: 0

CEF Translated packets: 0, CEF Punted packets: 0

Expired translations: 0

Dynamic mappings:

-- Inside Source

[Id: 1] access-list 1 interface Dialer0 refcount 0

Queued Packets: 0
```



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