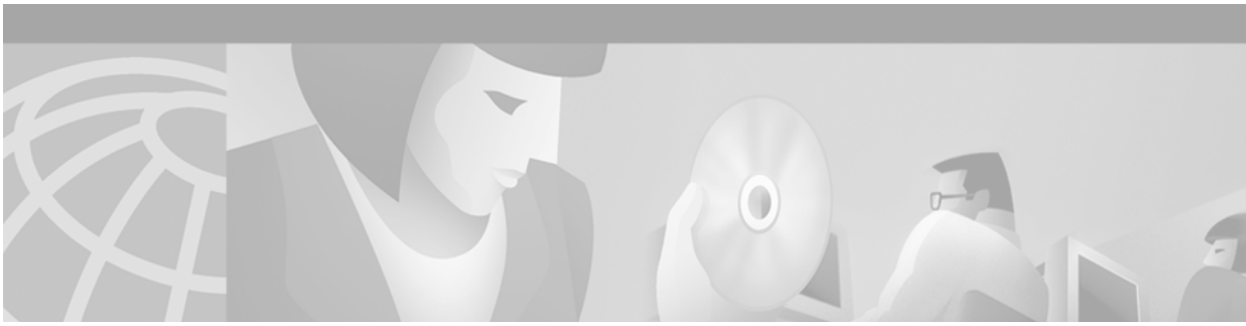


Configuring Peer-to-Peer DDR with Dialer Profiles

This chapter describes how to configure the Cisco IOS software for the Dialer Profiles feature implementation of dial-on-demand routing (DDR). It includes the following main sections:

- Dialer Profiles Overview
- How to Configure Dialer Profiles
- Monitoring and Maintaining Dialer Profile Connections
- Configuration Examples Dialer Profiles

For information about preparations for configuring dialer profiles, see the chapter "Preparing to Configure DDR" in this publication.

The Dialer Profiles feature is contrasted with legacy DDR. For information about legacy DDR, see the other chapters in the "Dial-on-Demand Routing" part of this publication.

For information about dial backup using dialer profiles, see the chapter "Configuring Dial Backup with Dialer Profiles" in this publication.

To identify the hardware platform or software image information associated with a feature, use the Feature Navigator on Cisco.com to search for information about the feature or refer to the software release notes for a specific release. For more information, see the "Identifying Supported Platforms" section in the "Using Cisco IOS Software" chapter.

For a complete description of the commands in this chapter, refer to the *Cisco IOS Dial Technologies Command Reference*. To locate documentation of other commands that appear in this chapter, use the command reference master index or search online.

Dialer Profiles Overview

Dialer profiles allow the configuration of physical interfaces to be separated from the logical configuration required for a call, and they also allow the logical and physical configurations to be bound together dynamically on a per-call basis.

A dialer *profile* consists of the following elements:

- A *dialer interface* (a logical entity) configuration including one or more dial strings (each of which is used to reach one destination subnetwork)
- A *dialer map class* that defines all the characteristics for any call to the specified dial string
- An ordered *dialer pool* of physical interfaces to be used by the dialer interface

Note Dialer profiles support most routed protocols; however, International Organization for Standardization Connectionless Network Service (ISO CLNS) is not supported.

New Dialer Profile Model

In earlier releases of the Cisco IOS software, dialer profiles in the same dialer pool needed encapsulation-specific configuration information entered under both the dialer profile interface and the ISDN interface. If any conflict arose between the logical and the physical interfaces, the dialer profile failed to work.

In the new dialer profile model introduced by the Dynamic Multiple Encapsulations feature in Cisco IOS Release 12.1, the configuration on the ISDN interface is ignored and only the configuration on the profile interface is used, unless PPP name binding is used. Before a successful bind by CLID occurs, no encapsulation type and configuration are assumed or taken from the physical interfaces.

When PPP is used and a caller identification (CLID) bind fails, a dialer profile still can be matched by PPP name authentication. In the new dialer profile model, multiple attempts are made to find a matching profile.

The dialer profile software binds an incoming call on a physical dialer interface according to the following events, and in the order listed:

1. There is only one dialer profile configured to use the pool of which the physical interface is a member; this condition is the default bind. The physical interface must be a member of only this one pool. A default bind is possible only to a dialer profile when there are no **dialer caller** or **dialer called** commands configured on that profile.
2. The CLID matches what is configured in a **dialer caller** command on a dialer profile using a pool of which the physical interface is a member.
3. The DNIS that is presented matches what is configured in a **dialer called** command on a dialer profile using a pool of which the physical interface is a member.
4. If a bind has not yet occurred but the physical interface is configured for PPP encapsulation and CHAP or PAP authentication, and the CHAP or PAP name presented matches a **dialer remote-name** command configuration on a dialer profile using a pool of which the physical interface is a member, then the dialer profile software binds to that dialer profile.

If none of the above events are successful, the call is not answered. The call is also disconnected during any of the first three events when, after the bind occurs and the physical interface is configured for PPP encapsulation and CHAP or PAP authentication, the CHAP or PAP name presented does *not* match what is configured in a **dialer remote-name** command on the dialer profile that was bound to the call.

PPP encapsulation on an ISDN link is different from other encapsulation types because it runs on the B channel rather than the dialer profile interface. There are two possible configuration sources in a profile bind: the D and the dialer profile interfaces. Hence, a configuration conflict between the sources is possible. If a successful bind is accomplished by name authentication, the configuration used to bring PPP up is the one on the D interface. This is the name used to locate a dialer profile for the bind. The configuration on an ISDN interface goes under the D rather than a B channel, although B channels inherit the configuration from their D interface.

However, the configuration on this found dialer profile could be different from the one on the D interface. For example, the **ppp multilink** command is configured on the D interface, but not on the dialer profile interface. The actual per-user configuration is the one on the dialer profile interface. In this case, per-user configuration is not achieved unless link control protocol (LCP) and authentication are

renegotiated. Because PPP client software often does not accept renegotiation, this workaround is not acceptable. Therefore, the D interface configuration takes precedence over the dialer profile interface configuration. This is the only case where the configuration of the dialer profile is overruled.

Dialer Interface

A dialer interface configuration includes all settings needed to reach a specific destination subnetwork (and any networks reached through it). Multiple dial strings can be specified for the same dialer interface, each dial string being associated with a different dialer map class.

Dialer Map Class

The dialer map class defines all the characteristics for any call to the specified dial string. For example, the map class for one destination might specify a 56-kbps ISDN speed; the map class for a different destination might specify a 64-kbps ISDN speed.

Dialer Pool

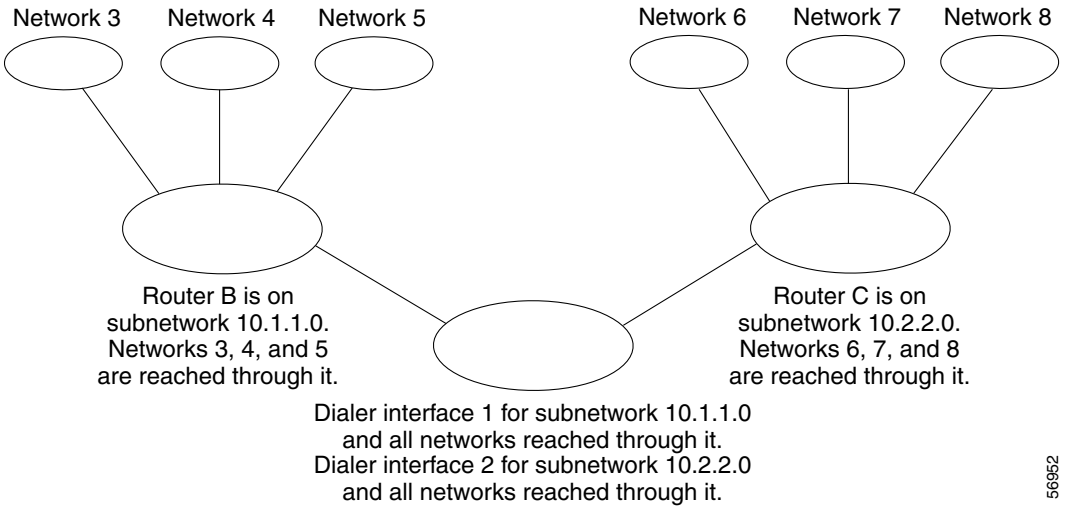
Each dialer interface uses a dialer pool, a pool of physical interfaces ordered on the basis of the priority assigned to each physical interface. A physical interface can belong to multiple dialer pools, contention being resolved by priority. ISDN BRI and PRI interfaces can set a limit on the minimum and maximum number of B channels reserved by any dialer pools. A channel reserved by a dialer pool remains idle until traffic is directed to the pool.

When dialer profiles are used to configure DDR, a physical interface has no configuration settings except encapsulation and the dialer pools with which the interface belongs.

Note The preceding paragraph has one exception: commands that apply before authentication is complete must be configured on the physical (or BRI or PRI) interface and not on the dialer profile. Dialer profiles do not copy PPP authentication commands (or LCP commands) to the physical interface.

Figure 57 shows a typical application of dialer profiles. Router A has dialer interface 1 for DDR with subnetwork 10.1.1.0, and dialer interface 2 for DDR with subnetwork 10.2.2.0. The IP address for dialer interface 1 is its address as a node in network 10.1.1.0; at the same time, that IP address serves as the IP address of the physical interfaces used by the dialer interface 1. Similarly, the IP address for dialer interface 2 is its address as a node in network 10.2.2.0.

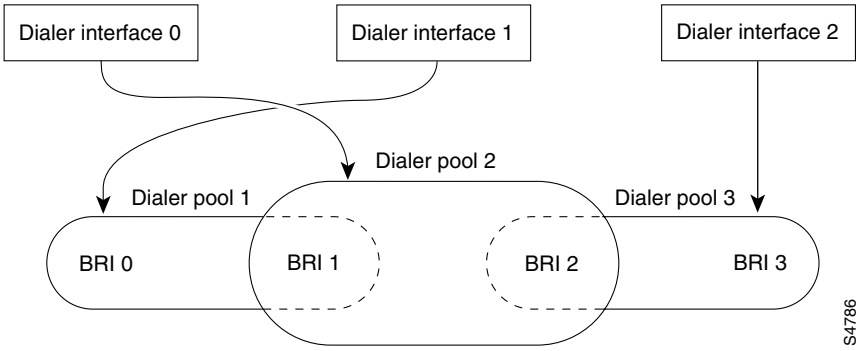
Figure 57 Typical Dialer Profiles Application



A dialer interface uses only one dialer pool. A physical interface, however, can be a member of one or many dialer pools, and a dialer pool can have several physical interfaces as members.

Figure 58 illustrates the relations among the concepts of dialer interface, dialer pool, and physical interfaces. Dialer interface 0 uses dialer pool 2. Physical interface BRI 1 belongs to dialer pool 2 and has a specific priority in the pool. Physical interface BRI 2 also belongs to dialer pool 2. Because contention is resolved on the basis of priority levels of the physical interfaces in the pool, BRI 1 and BRI 2 must be assigned different priorities in the pool. Perhaps BRI 1 is assigned priority 50 and BRI 2 is assigned priority 100 in dialer pool 2 (a priority of 100 is higher than a priority of 50). BRI 2 has a higher priority in the pool, and its calls will be placed first.

Figure 58 Relations Among Dialer Interfaces, Dialer Pools, and Physical Interfaces



How to Configure Dialer Profiles

To configure dialer profiles, perform the task in the following section:

- Configuring a Dialer Profile (Required)

The following tasks can be configured whether you use legacy DDR or dialer profiles. Perform these tasks as needed for your network:

- Configuring Dialer Profiles for Routed Protocols (As required)
- Configuring Dialer Profiles for Transparent Bridging (As required)

See the "Verifying the Dynamic Multiple Encapsulations Feature" section later in this chapter for tips on verifying that the feature is running in your network. See the "Configuration Examples Dialer Profiles" section at the end of this chapter for comprehensive configuration examples.

Configuring a Dialer Profile

To configure a dialer profile, perform the tasks in the following sections as required:

- Configuring a Dialer Interface (Required)
- Fancy Queueing and Traffic Shaping on Dialer Profile Interfaces (Optional)
- Configuring a Map Class (Optional)
- Configuring the Physical Interfaces (Required)

Configuring a Dialer Interface

Any number of dialer interfaces can be created for a router. Each dialer interface is the complete configuration for a destination subnetwork and any networks reached through it. The router on the destination subnetwork sends traffic on to the appropriate shadowed networks.

To configure a dialer interface, use the following commands beginning in global configuration mode:

	Command	Purpose
Step 1	`Router(config)# interface dialer number`	Creates a dialer interface and begins interface configuration mode.
Step 2	`Router(config-if)# ip address address mask`	Specifies the IP address and mask of the dialer interface as a node in the destination network to be called.
Step 3	`Router(config-if)# encapsulation type`	Specifies the encapsulation type.
Step 4	`Router(config-if)# dialer string dial-string class class-name`	Specifies the remote destination to call and the map class that defines characteristics for calls to this destination.
Step 5	`Router(config-if)# dialer pool number`	Specifies the dialing pool to use for calls to this destination.
Step 6	`Router(config-if)# dialer-group group-number`	Assigns the dialer interface to a dialer group.
Step 7	`Router(config-if)# dialer-list dialer-group protocol protocol-name {permit | deny | list access-list-number}`	Specifies an access list by list number or by protocol and list number to define the "interesting" packets that can trigger a call.

Fancy Queueing and Traffic Shaping on Dialer Profile Interfaces

In earlier releases of the Cisco IOS software, fancy queueing and traffic shaping were configured under the physical interfaces, therefore the same queueing or traffic shaping scheme needed to be applied to all users that were sharing the same ISDN link.

Beginning in Cisco IOS Release 12.1, you need only configure the queueing and traffic shaping schemes you desire on the dialer profile interface and the interface will take precedence over those configured on the ISDN B-channel interface. All the per-user encapsulation configuration has been moved to the dialer profile interfaces, separating it from hardware interfaces to make it dynamic and also to make per-user queueing and traffic shaping configuration possible.

Note Per-user fancy queueing and traffic shaping work with both process switching and fast switching in the new dialer profile model. However, Frame Relay Traffic Shaping (FRTS) is not supported on the new dialer profile model.

See the chapter "Policing and Shaping Overview" in the *Cisco IOS Quality of Service Solutions Configuration Guide* for more information about FRTS.

Configuring a Map Class

Map-class configuration is optional but allows you to specify different characteristics for different types of calls on a per-call-destination basis. For example, you can specify higher priority and a lower wait-for-carrier time for an ISDN-calls map class than for a modem-calls map class. You can also specify a different speed for some ISDN calls than for other ISDN calls.

A specific map class is tied to a specific call destination by the use of the map-class name in the **dialer-string** command with the **class** keyword.

To specify a map class and define its characteristics, use the following commands beginning in global configuration mode:

	Command	Purpose
Step 1	`Router(config)# map-class dialer classname`	Specifies a map class and begins map-class configuration mode.
Step 2	`Router(config-map-class)# dialer fast-idle seconds`	Specifies the fast idle timer value.
Step 3	`Router(config-map-class)# dialer idle-timeout seconds [inbound | either]`	Specifies the duration of idle time in seconds after which a line will be disconnected. By default, outbound traffic will reset the dialer idle timer. Adding the **either** keyword causes both inbound and outbound traffic to reset the timer; adding the **inbound** keyword causes only inbound traffic to reset the timer.
Step 4	`Router(config-map-class)# dialer wait-for-carrier-time seconds`	Specifies the length of time to wait for a carrier when dialing out to the dial string associated with the map class.
Step 5	`Router(config-map-class)# dialer isdn [speed speed] [spc]`	For ISDN only, specifies the bit rate used on the B channel associated with a specified map class or specifies that an ISDN semipermanent connection is to be used for calls associated with this map.

Note The **dialer idle-timeout** interface configuration command specifies the duration of time before an idle connection is disconnected. Previously, both inbound and outbound traffic would reset the dialer idle timer; now you can specify that only inbound traffic will reset the dialer idle timer.

Configuring the Physical Interfaces

To configure a physical interface, use the following commands beginning in global configuration mode:

	Command	Purpose
Step 1	`Router(config)# interface type number`	Specifies the physical interface and begins interface configuration mode.
Step 2	`Router(config-if)# encapsulation ppp`	Enables PPP encapsulation.
Step 3	`Router(config-if)# ppp authentication chap`	Specifies PPP Challenge Handshake Authentication Protocol (CHAP) authentication, if you also want to receive calls on this interface.

Step 4	`dialer pool-member number [priority priority]`
	
	`dialer pool-member number [priority priority] [min-link minimum] [max-link maximum]`
		Places the interface in a dialing pool and, optionally, assigns the interface a priority.
		
		For ISDN interfaces, you may also specify the minimum number of channels reserved and maximum number of channels used on this interface.
		
		The *minimum* value applies to outgoing calls only, and specifies the number of channels or interfaces reserved for dial out in that dialer pool; the channels remain idle when no calls are active. The *maximum* value applies to both incoming and outgoing calls and sets the total number of connections for a particular dialer pool member.

Step 5	`Router(config-if)# dialer pool-member number [priority priority]`
	or
	`Router(config-if)# dialer pool-member number [priority priority] [min-link minimum] [max-link maximum]`
		(Optional) Repeat Step 4 if you want to put the interface in additional dialing pools.

Repeat this procedure for additional physical interfaces that you want to use with dialer profiles.

Configuring Dialer Profiles for Routed Protocols

Both legacy DDR and dialer profiles support the following routed protocols: AppleTalk, Banyan VINES, DECnet, IP, Novell Internet Protocol Exchange (IPX), and Xerox Network System (XNS). To configure dialer profiles for a routed protocol, perform the tasks in the relevant section:

- Configuring Dialer Profiles for AppleTalk (As required)
- Configuring Dialer Profiles for Banyan VINES (As required)
- Configuring Dialer Profiles for DECnet (As required)

- Configuring Dialer Profiles for IP (As required)
- Configuring Dialer Profiles for Novell IPX (As required)
- Configuring XNS over DDR (As required)

Configuring Dialer Profiles for AppleTalk

To configure dialer profiles for AppleTalk, you specify AppleTalk access lists and then configure the dialer interface for dialer profiles, defining the dialer list to be used. Use the **dialer-list protocol** command to define permit or deny conditions for the entire protocol; for a finer granularity, use the **dialer-list protocol** command with the **list** keyword. See the section "Configuring a Dialer Interface" earlier in this chapter for more information about defining dialer lists.

Configuring Dialer Profiles for Banyan VINES

To configure DDR for Banyan VINES, use one of the following commands in global configuration mode:

Command	Purpose
`Router(config)# vines access-list access-list-number {permit | deny} source source-mask1`	Specifies a VINES standard access list.
or	
`Router(config)# vines access-list access-list-number {permit | deny} source source-mask [destination] [destination-mask]`	Specifies a VINES extended access list.

After you specify VINES standard or extended access lists, configure the dialer interface for dialer profiles, defining the dialer list to be used. Use the **dialer-list protocol** command to define permit or deny conditions for the entire protocol; for a finer granularity, use the **dialer-list protocol** command with the **list** keyword. See the section "Configuring a Dialer Interface" earlier in this chapter for more information about defining dialer lists.

Note The Banyan VINES **neighbor** command is not supported for Link Access Procedure, Balanced (LAPB) and X.25 encapsulations.

Configuring Dialer Profiles for DECnet

To configure dial-on-demand routing (DDR) for DECnet, use one of the following commands in global configuration mode:

Command	Purpose
`Router(config)# access-list access-list-number {permit | deny} source source-mask1`	Specifies a DECnet standard access list.
or	
`Router(config)# access-list access-list-number {permit | deny} source source-mask [destination] [destination-mask]`	Specifies a DECnet extended access list.

After you specify DECnet standard or extended access lists, configure the dialer interface for dialer profiles, defining the dialer list to be used. Use the **dialer-list protocol** command to define permit or deny conditions for the entire protocol; for a finer granularity, use the **dialer-list protocol** command with the **list** keyword. See the section "Configuring a Dialer Interface" earlier in this chapter for more information about defining dialer lists.

You classify DECnet control packets, including hello packets and routing updates, using one or more of the following commands: **dialer-list protocol decnet_router-L1 permit**, **dialer-list protocol decnet_router-L2 permit**, and **dialer-list protocol decnet_node permit**.

Configuring Dialer Profiles for IP

To configure DDR for IP, use one of the following commands in global configuration mode:

Command	Purpose
`Router(config)# access-list access-list-number {deny | permit} source [source-mask]`	Specifies an IP standard access list.
or	
`Router(config)# access-list access-list-number {deny | permit} protocol source source-mask destination destination-mask [operator operand]`	Specifies an IP extended access list.

You can now also use simplified IP access lists that use the **any** keyword instead of the numeric forms of source and destination addresses and masks. Other forms of IP access lists are also available. For more information, see the chapter "IP Services Commands" in the *Cisco IOS IP Command Reference.*

To use dynamic routing where multiple remote sites communicate with each other through a central site, you might need to disable the IP split horizon feature. Split horizon applies to Routing Information Protocol (RIP), Interior Gateway Routing Protocol (IGRP), and Enhanced IGRP. Depending on which routing protocol is configured, see the chapter "Configuring RIP," "Configuring IGRP," or "Configuring Enhanced IGRP" in this publication. Refer to the chapter "Configuring IP Routing Protocols" in the *Cisco IOS IP Configuration Guide* for more information.

Configuring Dialer Profiles for Novell IPX

On DDR links for Novell IPX, the link may come up often even when all client sessions are idle because the server sends watchdog or keepalive packets to all the clients approximately every 5 minutes. You can configure a local router or access server to idle out the DDR link and respond to the watchdog packets on behalf of the clients.

To modify the dialer profiles dialer interface configuration for Novell IPX, use the following commands in interface configuration mode:

	Command	Purpose
Step 1	`Router(config-if)# no ipx route-cache`	Disables fast switching for IPX.

Step 2	`Router(config-if)# ipx watchdog-spoof`
	or
	`Router(config-if)# ipx spx-spoof`
		Enables IPX watchdog spoofing.
		Enables Sequenced Packet Exchange (SPX) keepalive spoofing.

Step 3	`Router(config-if)# ipx spx-idle-time delay-in-seconds`	Sets the idle time after which SPX keepalive spoofing begins.

Configuring XNS over DDR

To configure XNS for DDR, use one of the following commands in global configuration mode:

Command	Purpose

`Router(config)# access-list access-list-number {deny | permit} source-network[.source-address [source-address-mask]] [destination-network[.destination-address [destination-address-mask]]]`
or
`Router(config)# access-list access-list-number {deny | permit} protocol [source-network[.source-host [source-network-mask.]source-host-mask] source-socket [destination-network [.destination-host [destination-network-mask.destination-host-mask] destination-socket[/pep]]]`
	Specifies a standard XNS access list.
	Specifies an extended XNS access list.

After you specify an XNS access list, configure the dialer interface for dialer profiles, defining the dialer list to be used. Use the **dialer-list protocol** command to define permit or deny conditions for the entire protocol; for a finer granularity, use the **dialer-list protocol** command with the **list** keyword. See the section "Configuring a Dialer Interface" earlier in this chapter for more information about defining dialer lists.

Configuring Dialer Profiles for Transparent Bridging

The Cisco IOS software supports transparent bridging over both legacy DDR and dialer profiles, and it provides you some flexibility in controlling access and configuring the interface.

To configure dialer profiles for bridging, perform the tasks in the following sections:

- Defining the Protocols to Bridge (Required)
- Specifying the Bridging Protocol (Required)
- Controlling Access for Bridging (Required)
- Configuring an Interface for Bridging (Required)

Defining the Protocols to Bridge

IP packets are routed by default unless they are explicitly bridged; all others are bridged by default unless they are explicitly routed. To bridge IP packets, use the following command in global configuration mode:

Command	Purpose
`Router(config)# no ip routing`	Disables IP routing.

If you choose *not* to bridge another protocol, use the relevant command to enable routing of that protocol. For more information about tasks and commands, refer to the relevant chapter in the appropriate network protocol configuration guide, such as the *Cisco IOS AppleTalk and Novell IPX Configuration Guide*.

Specifying the Bridging Protocol

You must specify the type of spanning-tree bridging protocol to use and also identify a bridge group. To specify the spanning-tree protocol and a bridge group number, use the following command in global configuration mode:

Command	Purpose
`Router(config)# bridge` *bridge-group* `protocol {ieee | dec}`	Defines the type of spanning-tree protocol and identifies a bridge group.

The *bridge-group* number is used when you configure the interface and assign it to a bridge group. Packets are bridged only among members of the same bridge group.

Controlling Access for Bridging

You can control access by defining any transparent bridge packet as *interesting*, or you can use the finer granularity of controlling access by Ethernet type codes. To control access for DDR bridging, perform *one* of the following tasks:

- Permitting All Bridge Packets
- Controlling Bridging Access by Ethernet Type Codes

Note Spanning-tree bridge protocol data units (BPDUs) are always treated as *uninteresting*.

Permitting All Bridge Packets

To identify all transparent bridge packets as interesting, use the following command in global configuration mode:

Command	Purpose
`Router(config)# dialer-list` *dialer-group* `protocol bridge permit`	Defines a dialer list that treats all transparent bridge packets as interesting.

Controlling Bridging Access by Ethernet Type Codes

To control access by Ethernet type codes, use the following commands in global configuration mode:

	Command	Purpose
Step 1	`Router(config)# access-list access-list-number {permit | deny} type-code [mask]`	Identifies interesting packets by Ethernet type codes (access list numbers must be in the range 200 to 299).
Step 2	`Router(config)# dialer-list dialer-group protocol bridge list access-list-number`	Defines a dialer list for the specified access list.

For a table of some common Ethernet type codes, see the "Ethernet Type Codes" appendix in the *Cisco IOS Bridging and IBM Networking Command Reference*.

Configuring an Interface for Bridging

You can perform serial interfaces or ISDN interfaces for DDR bridging. To configure an interface for DDR bridging, complete all the tasks in the following sections:

- Specifying the Interface (Required)
- Configuring the Destination (Required)
- Assigning the Interface to a Bridge Group (Required)

Specifying the Interface

To specify the interface and enter interface configuration mode, use the following command in global configuration mode:

Command	Purpose
`Router(config)# interface type number`	Specifies the serial or ISDN interface and enters interface configuration mode.

Configuring the Destination

You can configure the destination by specifying either of the following:

- A dial string—for unauthenticated calls to a single site
- A dialer bridge map—when you want to use authentication

To configure the destination for bridging over a specified interface, use the following command in interface configuration mode:

Command	Purpose
`Router(config-if)# dialer string dial-string`	Configures the dial string to call.

Note You can define only one dialer bridge map for the interface. If you enter a different bridge map, the previous one is replaced immediately.

Assigning the Interface to a Bridge Group

Packets are bridged only among interfaces that belong to the same bridge group. To assign an interface to a bridge group, use the following command in interface configuration mode:

Command	Purpose
`Router(config-if)# bridge-group bridge-group`	Assigns the specified interface to a bridge group.

Monitoring and Maintaining Dialer Profile Connections

To monitor DDR dialer profile connections, use any of the following commands in privileged EXEC mode:

Command	Purpose
`Router# show dialer interface`	Displays information for the interfaces configured for DDR dialer profiles.
`Router# show interfaces type number`	Displays statistics for configured interfaces. The output varies, depending on the network for which an interface has been configured.
`Router# show ipx interface [type number]`	Displays status about the IPX interface.
`Router# show ipx traffic`	Displays information about the IPX packets sent by the router or access server, including watchdog counters.
`Router# show appletalk traffic`	Displays information about the AppleTalk packets sent by the router or access server.
`Router# show vines traffic`	Displays information about the Banyan VINES packets sent by the router or access server.
`Router# show decnet traffic`	Displays information about the DECnet packets sent by the router or access server.
`Router# show xns traffic`	Displays information about the XNS packets sent by the router or access server.
`Router# clear dialer`	Clears the values of the general diagnostic statistics.

Configuration Examples Dialer Profiles

The following sections provide three comprehensive configuration examples:

- Dialer Profile with Inbound Traffic Filter Example
- Dialer Profile for Central Site with Multiple Remote Sites Example
- Dialer Profile for ISDN BRI Backing Up Two Leased Lines Example
- Dynamic Multiple Encapsulations over ISDN Example

Dialer Profile with Inbound Traffic Filter Example

The following example shows a Cisco 5200 series router that has enabled the **dialer idle-timeout** command with the **inbound** keyword. This command allows only inbound traffic that conforms to the dialer list to establish a connection and reset the dialer idle timer.

```
interface Serial0:23
 no ip address
 no ip directed-broadcast
 encapsulation ppp
 dialer pool-member 1 max-link 2
 isdn switch-type primary-5ess
 no cdp enable
 ppp authentication chap
!
interface Dialer0
 ip address 10.1.1.2 255.255.255.0
 no ip directed-broadcast
 encapsulation ppp
 dialer remote-name 2610-2
 dialer idle-timeout 30 inbound
 dialer string 2481301
 dialer pool 1
 dialer-group 1
 no cdp enable
 ppp authentication chap
 ppp multilink
!
access-list 101 permit icmp any any
access-list 101 deny   ip any any
dialer-list 1 protocol ip list 101
```

Dialer Profile for Central Site with Multiple Remote Sites Example

The following example shows a central site that can place or receive calls from three remote sites over four ISDN BRI lines. Each remote site is on a different IP subnet and has different bandwidth requirements; therefore, three dialer interfaces and three dialer pools are defined.

```
! This is a dialer profile for reaching remote subnetwork 10.1.1.1.
interface Dialer1
 ip address 10.1.1.1 255.255.255.0
 encapsulation ppp
 dialer remote-name Smalluser
 dialer string 4540
 dialer pool 3
 dialer-group 1

! This is a dialer profile for reaching remote subnetwork 10.2.2.2.
interface Dialer2
 ip address 10.2.2.2 255.255.255.0
 encapsulation ppp
 dialer remote-name Mediumuser
 dialer string 5264540 class Eng
 dialer load-threshold 50 either
 dialer pool 1
 dialer-group 2

! This is a dialer profile for reaching remote subnetwork 10.3.3.3.
interface Dialer3
 ip address 10.3.3.3 255.255.255.0
```

```
 encapsulation ppp
 dialer remote-name Poweruser
 dialer string 4156884540 class Eng
 dialer hold-queue 10
 dialer load-threshold 80
 dialer pool 2
 dialer-group 2

! This map class ensures that these calls use an ISDN speed of 56 kbps.
map-class dialer Eng
 isdn speed 56

interface BRI0
 encapsulation PPP
! BRI 0 has a higher priority than BRI 1 in dialer pool 1.
 dialer pool-member 1 priority 100
 ppp authentication chap

interface BRI1
 encapsulation ppp
 dialer pool-member 1 priority 50
 dialer pool-member 2 priority 50
! BRI 1 has a reserved channel in dialer pool 3; the channel remains inactive
! until BRI 1 uses it to place calls.
 dialer pool-member 3 min-link 1
 ppp authentication chap

interface BRI2
 encapsulation ppp
! BRI 2 has a higher priority than BRI 1 in dialer pool 2.
 dialer pool-member 2 priority 100
 ppp authentication chap

interface BRI3
 encapsulation ppp
! BRI 3 has the highest priority in dialer pool 2.
 dialer pool-member 2 priority 150
 ppp authentication chap
```

Dialer Profile for ISDN BRI Backing Up Two Leased Lines Example

The following example shows the configuration of a site that backs up two leased lines using one BRI. Two dialer interfaces are defined. Each serial (leased line) interface is configured to use one of the dialer interfaces as a backup. Both of the dialer interfaces use BRI 0, and BRI 0 is a member of the two dialer pools. Thus, BRI 0 can back up two different serial interfaces and can make calls to two different sites.

```
interface dialer0
 ip unnumbered loopback0
 encapsulation ppp
 dialer remote-name Remote0
 dialer pool 1
 dialer string 5551212
 dialer-group 1

interface dialer1
 ip unnumbered loopback0
 encapsulation ppp
 dialer remote-name Remote1
 dialer pool 2
 dialer string 5551234
 dialer-group 1
```

```
interface bri 0
 encapsulation PPP
 dialer pool-member 1
 dialer pool-member 2
 ppp authentication chap

interface serial 0
 ip unnumbered loopback0
 backup interface dialer0
 backup delay 5 10

interface serial 1
 ip unnumbered loopback0
 backup interface dialer1
 backup delay 5 10
```

Dynamic Multiple Encapsulations over ISDN Example

The following example shows a network access server named NAS1 with dialer profiles and LAPB, X.25, and PPP encapsulations configured. Although the BRI0 D interface uses X.25 encapsulation, the actual encapsulations running over the ISDN B channels are determined by the encapsulations configured on the profile interfaces bound to them.

When an ISDN B channel connects to remote user RU2 using CLID 60043, Dialer1 is bound to this ISDN B channel by CLID binding. The protocol used is PPP; the X.25 configuration on the D interface has no effect. Because the **ppp authentication chap** command is configured, even though the binding is done by CLID, PPP authentication is still performed over the name RU2 before the protocol is allowed to proceed.

The Dialer2 interface uses DNIS-plus-ISDN-subaddress binding and is bound to a B channel with an incoming call with DNIS 60045 and ISDN subaddress 12345. Also note that the High-Level Data Link Control (HDLC) encapsulation has no username associated. It is no longer necessary to configure the **dialer remote-name** command, as in the previous dialer profile model.

When there is an ISDN B-channel connection to remote user RU1 using CLID 60036, LAPB encapsulation will run on this connection once CLID binding to Dialer0 takes place. This connection will operate as a standalone link independent of other activities over other ISDN B channels.

```
version xx.x
service timestamps debug datetime msec
service timestamps log datetime msec
service password-encryption
service udp-small-servers
service tcp-small-servers
!
virtual-profile virtual-template 1
virtual-profile aaa
!
hostname NAS1
!
aaa new-model
aaa authentication ppp default radius
aaa authorization network radius
enable secret 5 $1$0Ced$YYJJ12p8f94lc/.JSgw8n1
enable password 7 153D19270D2E
!
username RU1 password 7 11260B2E1E16
username RU2 password 7 09635C221001
no ip domain-lookup
```

```
ip domain-name cisco.com
ip name-server 192.168.30.32
ip name-server 172.16.2.132
isdn switch-type basic-5ess
!
interface Virtual-Template 1
encapsulation ppp
ppp authentication chap
!
interface Ethernet0
 ip address 172.21.17.11 255.255.255.0
 no ip mroute-cache
 no cdp enable
!
interface Serial0
 ip address 10.2.2.1 255.0.0.0
 shutdown
 clock rate 56000
 ppp authentication chap
!
interface Serial1
 ip address 10.0.0.1 255.0.0.0
 shutdown
!
interface BRI0
 description PBX 60035
 no ip address
 encapsulation x25
 no ip mroute-cache
 no keepalive
 dialer pool-member 1
 dialer pool-member 2
!
interface Dialer0
 ip address 10.1.1.1 255.0.0.0
 encapsulation lapb dce multi
 no ip route-cache
 no ip mroute-cache
 no keepalive
 dialer remote-name RU1
 dialer idle-timeout 300
 dialer string 60036
 dialer caller 60036
 dialer pool 1
 dialer-group 1
 no fair-queue
!
interface Dialer1
 ip address 10.1.1.1 255.0.0.0
 encapsulation ppp
 no ip route-cache
 no ip mroute-cache
 dialer remote-name RU2
 dialer string 60043
 dialer caller 60043
 dialer pool 2
 dialer-group 1
 no fair-queue
 no cdp enable
 ppp authentication chap
!
interface Dialer2
 ip address 10.1.1.1 255.0.0.0
 encapsulation hdlc
```

```
 dialer called 60045:12345
 dialer pool 1
 dialer-group 1
 fair-queue
 !
radius-server host 172.19.61.87
radius-server key foobar
snmp-server community public RO
!
line con 0
 exec-timeout 0 0
line aux 0
 transport input all
line vty 0 4
 password 7 10611B320C13
 login
!
end
```

Verifying the Dynamic Multiple Encapsulations Feature

To see statistics on each physical interface bound to the dialer interface, and to verify dialer interfaces configured for binding, use the **show interfaces** EXEC command. Look for the reports "Bound to:" and "Interface is bound to..." while remembering that this feature applies only to ISDN.

```
Router# show interfaces dialer0

Dialer0 is up, line protocol is up
  Hardware is Unknown
  Internet address is 10.1.1.2/8
  MTU 1500 bytes, BW 64 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation PPP, loopback not set
  DTR is pulsed for 1 seconds on reset
  Interface is bound to BRI0:1
  Last input 00:00:38, output never, output hang never
  Last clearing of "show interface" counters 00:05:36
  Queueing strategy: fifo
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     38 packets input, 4659 bytes
     34 packets output, 9952 bytes
Bound to:
BRI0:1 is up, line protocol is up
  Hardware is BRI
  MTU 1500 bytes, BW 64 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation PPP, loopback not set, keepalive not set
  Interface is bound to Dialer0 (Encapsulation PPP)
  LCP Open, multilink Open
  Last input 00:00:39, output 00:00:11, output hang never
  Last clearing of "show interface" counters never
  Queueing strategy: fifo
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     78 packets input, 9317 bytes, 0 no buffer
     Received 65 broadcasts, 0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     93 packets output, 9864 bytes, 0 underruns
     0 output errors, 0 collisions, 7 interface resets
     0 output buffer failures, 0 output buffers swapped out
     4 carrier transitions
```

At the end of the Dialer0 display, the **show interfaces** command is executed on each physical interface bound to it.

In the next example, the physical interface is the B1 channel of the BRI0 link. This example also illustrates that the output under the B channel keeps all hardware counts that are not displayed under any logical or virtual access interface. The line in the report that states "Interface is bound to Dialer0 (Encapsulation LAPB)" indicates that this B interface is bound to the dialer 0 interface and that the encapsulation running over this connection is LAPB, not PPP, which is the encapsulation configured on the D interface and inherited by the B channel.

```
Router# show interfaces bri0:1

BRI0:1 is up, line protocol is up
  Hardware is BRI
  MTU 1500 bytes, BW 64 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation PPP, loopback not set, keepalive not set
  Interface is bound to Dialer0 (Encapsulation LAPB)
  LCP Open, multilink Open
  Last input 00:00:31, output 00:00:03, output hang never
  Last clearing of "show interface" counters never
  Queueing strategy: fifo
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 0 bits/sec, 1 packets/sec
  5 minute output rate 0 bits/sec, 1 packets/sec
     110 packets input, 13994 bytes, 0 no buffer
     Received 91 broadcasts, 0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     135 packets output, 14175 bytes, 0 underruns
     0 output errors, 0 collisions, 12 interface resets
     0 output buffer failures, 0 output buffers swapped out
     8 carrier transitions
```

Any protocol configuration and states should be displayed from the dialer 0 interface.