

# Configuring Peer-to-Peer DDR with Dialer Profiles

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This chapter describes how to configure the Cisco IOS software for the Dialer Profiles implementation of dial-on-demand routing (DDR).

For information about preparations for configuring Dialer Profiles, see the “Deciding and Preparing to Configure DDR” chapter of this manual.

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 manual.

For information about dial backup using Dialer Profiles, see the “Configuring Backup with Dialer Profiles” chapter of this manual.

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

## Restrictions

Dialer Profiles supports most routed protocols. However, Frame Relay, ISO CLNS, and LAPB are not supported.

## Background about Dialer Interfaces and Dialer Profiles

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

All calls going to or from the same destination subnetwork use the same dialer profile.

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. 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.

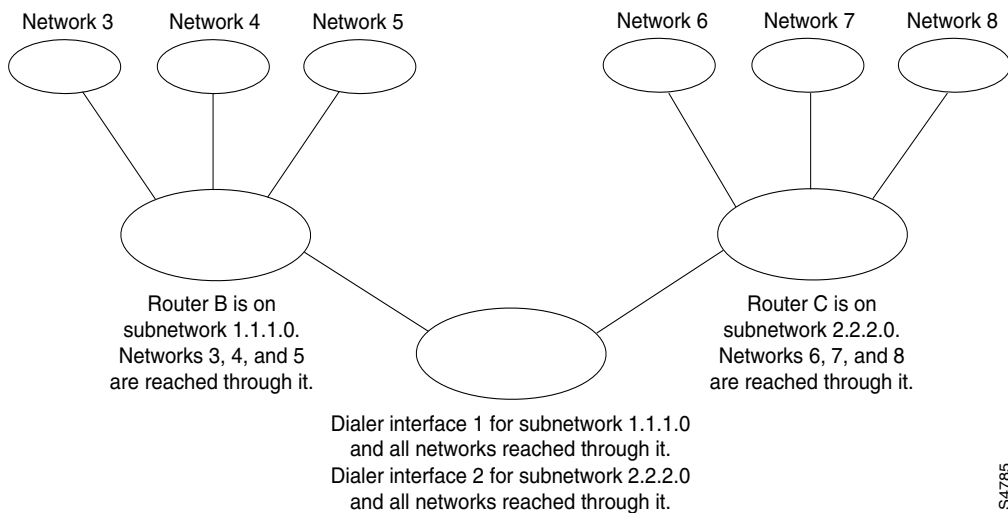
Each dialer interface uses a dialer pool, a pool of physical interfaces ordered on the basis of the priority assigned to each physical interface. A physical interface can belong to multiple dialer pools, contention being resolved by priority. ISDN BRI and PRI interfaces can set a limit on the minimum 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 the interface belongs to.

**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.

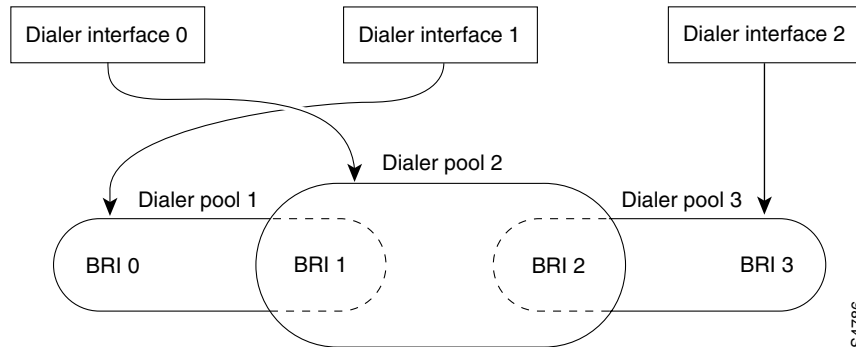
Figure 299 shows a typical application of dialer profiles. Router A has dialer interface 1 for dial-on-demand routing with subnetwork 1.1.1.0, and dialer interface 2 for dial-on-demand routing with subnetwork 2.2.2.0. The IP address for dialer interface 1 is its address as a node in network 1.1.1.0; 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 2.2.2.0.

**Figure 299 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 300 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 have to 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 300 Relations Among Dialer Interfaces, Dialer Pools, and Physical Interfaces**

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## Dialer Profiles Configuration Task List

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

- Configure a Dialer Profile

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

- Configure Dialer Profiles for Routed Protocols
- Configure Dialer Profiles for Transparent Bridging

See the “Dialer Profiles Configuration Examples” section for comprehensive configuration examples.

## Configure a Dialer Profile

To configure a dialer profile, perform the tasks in the following sections. The first and last are required. Map-class configuration is optional.

- Configure a Dialer Interface
- Configure a Map Class
- Configure the Physical Interfaces

## Configure 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:

Step	Command	Purpose
1	<b>interface dialer</b> <i>number</i>	Create a dialer interface.
2	<b>ip address</b> <i>address mask</i>	Specify the IP address and mask of the dialer interface as a node in the destination network to be called.

Step	Command	Purpose
3	<b>encapsulation ppp</b>	Specify PPP encapsulation.
4	<b>dialer remote-name</b> <i>username</i>	Specify the remote router CHAP authentication name.
5	<b>dialer string</b> <i>dial-string</i> <b>class</b> <i>class-name</i>	Specify the remote destination to call and the map class that defines characteristics for calls to this destination.
6	<b>dialer pool</b> <i>number</i>	Specify the dialing pool to use for calls to this destination.
7	<b>dialer-group</b> <i>group-number</i>	Assign the dialer interface to a dialer group.
8	<b>dialer-list</b> <i>dialer-group</i> <b>protocol</b> <i>protocol-name</i> { <b>permit</b>   <b>deny</b>   <b>list</b> <i>access-list-number</i> }	Specify an access list by list number or by protocol and list number to define the “interesting” packets that can trigger a call.

## Configure 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
<b>map-class dialer</b> <i>classname</i>	Specify a map class and enter map-class configuration mode.
<b>dialer fast-idle</b> <i>seconds</i>	Specify the fast idle timer value.
<b>dialer idle-timeout</b> <i>seconds</i>	Specify the idle time before the calls in this map class are disconnected.
<b>dialer wait-for-carrier-time</b> <i>seconds</i>	Specify the length of time to wait for a carrier when dialing out to the dial string associated with the map class.
<b>dialer isdn</b> [ <b>speed</b> <i>speed</i> ] [ <b>spc</b> ]	For ISDN only, specify the bit rate used on the B channel associated with a specified map class or specify that an ISDN semipermanent connection is to be used for calls associated with this map.

## Configure the Physical Interfaces

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

Step	Command	Purpose
1	<b>interface</b> <i>type number</i>	Specify the physical interface.
2	<b>encapsulation ppp</b>	Enable PPP encapsulation.

Step	Command	Purpose
3	<b>ppp authentication chap</b>	Specify PPP CHAP authentication, if you also want to receive calls on this interface.
4	<b>dialer pool-member</b> <i>number</i> [ <b>priority</b> <i>priority</i> ]  <b>dialer pool-member</b> <i>number</i> [ <b>priority</b> <i>priority</i> ] [ <b>min-link</b> <i>minimum</i> ] [ <b>max-link</b> <i>maximum</i> ] <sup>1</sup>	Put the interface in a dialing pool and, optionally, assign the interface a priority.  For ISDN interfaces, you can also optionally specify the minimum number of channels reserved and maximum number of channels that can be for this dialing pool.
5	<b>dialer pool-member</b> <i>number</i> [ <b>priority</b> <i>priority</i> ] or <b>dialer pool-member</b> <i>number</i> [ <b>priority</b> <i>priority</i> ] [ <b>min-link</b> <i>minimum</i> ] [ <b>max-link</b> <i>maximum</i> ]	(Optional) Repeat if you want to put the interface in additional dialing pools.

1 When you specify a min-link number, that number of channels is reserved for that dialer pool; the channels remain idle when no calls are active.

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

## Configure Dialer Profiles for Routed Protocols

Both legacy DDR and Dialer Profiles support the following routed protocols: AppleTalk, Banyan VINES, DECnet, IP, Novell IPX, and XNS.

To configure Dialer Profiles for a routed protocol, perform the tasks in the relevant section:

- Configure Dialer Profiles for AppleTalk
- Configure Dialer Profiles for Banyan VINES
- Configure Dialer Profiles for DECnet
- Configure Dialer Profiles for IP
- Configure Dialer Profiles for Novell IPX
- Configure XNS over DDR

## Configure 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 “Configure a Dialer Interface” section earlier in this chapter for more information about defining dialer lists.

## Configure Dialer Profiles for Banyan VINES

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

Command	Purpose
<b>vines access-list</b> <i>access-list-number</i> { <b>permit</b>   <b>deny</b> } <i>source source-mask</i>	Specify a VINES standard access list.
or	
<b>vines access-list</b> <i>access-list-number</i> { <b>permit</b>   <b>deny</b> } <i>source source-mask [destination] [destination-mask]</i>	Specify 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 “Configure a Dialer Interface” section earlier in this chapter for more information about defining dialer lists.

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**Note** The Banyan VINES **neighbor** command is not supported for LAPB and X.25 encapsulations.

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## Configure Dialer Profiles for DECnet

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

Command	Purpose
<b>access-list</b> <i>access-list-number</i> { <b>permit</b>   <b>deny</b> } <i>source source-mask</i>	Specify a DECnet standard access list.
or	
<b>access-list</b> <i>access-list-number</i> { <b>permit</b>   <b>deny</b> } <i>source source-mask [destination] [destination-mask]</i>	Specify 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 “Configure a Dialer Interface” section 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**.

## Configure Dialer Profiles for IP

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

Command	Purpose
<b>access-list</b> <i>access-list-number</i> { <b>deny</b>   <b>permit</b> } <i>source</i> [ <i>source-mask</i> ]	Specify an IP standard access list.
or	
<b>access-list</b> <i>access-list-number</i> { <b>deny</b>   <b>permit</b> } <i>protocol source source-mask destination destination-mask</i> [ <i>operator operand</i> ]	Specify an IP extended access list.

You can now also use simplified IP access lists that use the abbreviation *any* 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 “IP Services Commands” chapter in the *Network Protocols Command Reference, Part 1*.

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 RIP, IGRP, and Enhanced IGRP. Depending on which routing protocol is configured, see the chapter “Configuring RIP,” “Configuring IGRP,” or “Configuring Enhanced IGRP.” See the “Configuring IP Routing Protocols” chapter in the *Network Protocols Configuration Guide, Part 1* for more information.

## Configure 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
<b>no ipx route-cache</b>	Disable fast switching for IPX.
<b>ipx watchdog-spoof</b>	Enable IPX watchdog spoofing.
or	
<b>ipx spx-spoof</b>	Enable SPX keepalive spoofing.
<b>ipx spx-idle-time</b> <i>delay-in-seconds</i>	Set the idle time after which SPX keepalive spoofing begins.

## Configure XNS over DDR

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

Command	Purpose
<b>access-list</b> <i>access-list-number</i> { <b>deny</b>   <b>permit</b> } <i>source-network</i> [, <i>source-address</i> [ <i>source-address-mask</i> ]] [ <i>destination-network</i> [, <i>destination-address</i> [ <i>destination-address-mask</i> ]]]	Specify a standard XNS access list.
or	
<b>access-list</b> <i>access-list-number</i> { <b>deny</b>   <b>permit</b> } <i>protocol</i> [ <i>source-network</i> [, <i>source-host</i> [ <i>source-network-mask</i> ,] <i>source-host-mask</i> ] <i>source-socket</i> [ <i>destination-network</i> [ <i>destination-host</i> [ <i>destination-network-mask</i> . <i>destination-host-mask</i> ] <i>destination-socket</i> [/ <b>pep</b> ]]]	Specify 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 “Configure a Dialer Interface” section earlier in this chapter for more information about defining dialer lists.

## Configure 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, complete the tasks in the following sections:

- Define the Protocols to Bridge
- Specify the Bridging Protocol
- Control Access for Bridging
- Configure an Interface for Bridging

### Define 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, complete the following task in global configuration mode:

Command	Purpose
<b>no ip routing</b>	Disable 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 protocol chapter in either the *Network Protocols Configuration Guide, Part 1* or the *Network Protocols Configuration Guide, Part 2*.

## Specify 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 commands in global configuration mode:

Command	Purpose
<b>bridge</b> <i>bridge-group</i> <b>protocol</b> { <b>ieee</b>   <b>dec</b> }	Define the type of spanning tree protocol and identify 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.

## Control 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, complete *one* of the following tasks in global configuration mode:

- Permit All Bridge Packets
- Control Bridging Access by Ethernet Type Codes

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

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### Permit All Bridge Packets

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

Command	Purpose
<b>dialer-list</b> <i>dialer-group</i> <b>protocol bridge permit</b>	Define a dialer list that treats all transparent bridge packets as interesting.

### Control Bridging Access by Ethernet Type Codes

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

Command	Purpose
<b>access-list</b> <i>access-list-number</i> { <b>permit</b>   <b>deny</b> } <i>type-code</i> [ <i>mask</i> ]	Identify interesting packets by Ethernet type codes (access list numbers must be in the range 200–299).
<b>dialer-list</b> <i>dialer-group</i> <b>protocol bridge list</b> <i>access-list-number</i>	Define a dialer list for the specified access list.

For a table of some common Ethernet types codes, see the “Ethernet Types Codes” appendix in the *Bridging and IBM Networking Command Reference*.

### Configure an Interface for Bridging

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

- Specify the Interface
- Configure the Destination
- Assign the Interface to a Bridge Group

#### Specify the Interface

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

Command	Purpose
<b>interface</b> <i>type number</i>	Specify the serial or ISDN interface and enter interface configuration mode.

#### Configure 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
<b>dialer string</b> <i>dial-string</i>	Configure 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.

#### Assign 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
<b>bridge-group</b> <i>bridge-group</i>	Assign the specified interface to a bridge group.

## Monitor and Maintain Dialer Profiles Connections

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

Command	Purpose
<b>show dialer interface</b>	Display information for the interfaces configured for DDR dialer profiles.
<b>show interfaces bri 0</b>	Display information about the ISDN interface.
<b>show ipx interface</b> <i>[type number]</i>	Display status about the IPX interface.
<b>show ipx traffic</b>	Display information about the IPX packets transmitted by the router or access server, including watchdog counters.
<b>show appletalk traffic</b>	Display information about the AppleTalk packets transmitted by the router or access server.
<b>show vines traffic</b>	Display information about the Banyan VINES packets transmitted by the router or access server.
<b>show decnet traffic</b>	Display information about the DECnet packets transmitted by the router or access server.
<b>show xns traffic</b>	Display information about the XNS packets transmitted by the router or access server.
<b>clear dialer</b>	Clear the values of the general diagnostic statistics

## Dialer Profiles Configuration Examples

This section provides two comprehensive configuration examples:

- Dialer Profile for Central Site with Multiple Remote Sites
- Dialer Profile for ISDN BRI Backing Up Two Leased Lines Example

### Dialer Profile for Central Site with Multiple Remote Sites

This central site 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 1.1.1.1.
interface Dialer1
 ip address 1.1.1.1 255.255.255.0
 encapsulation ppp
 dialer remote-name Smalluser
 dialer string 4540
 dialer pool 3
 dialer-group 1

! This is a Dialer Profile for reaching remote subnetwork 2.2.2.2.
interface Dialer2
 ip address 2.2.2.2 255.255.255.0
 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 3.3.3.3.
interface Dialer3
 ip address 3.3.3.3 255.255.255.0
 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
```

