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Configuring MPPP for Multiple BRIs using Rotary Groups

Document ID: 10217

Introduction

Prerequisites

- Requirements
- Components Used
- Conventions

Configure

- Network Diagram
- Configurations
- Tuning and Optional Commands

Verify

- show Commands
- show Command Output
- Sample Debug Output

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- Troubleshooting Commands

Related Information

Introduction

This document describes how to configure a router with multiple BRIs to connect to another device using Multilink PPP (MPPP). In this configuration, we demonstrate the dialer rotary group method to bond the multiple B-channels. However, you can also create a MPPP connection using Dialer Profiles. For more information on that method, refer to [Configuring Multilink PPP with Multiple BRI Interfaces](#).

Prerequisites

Requirements

There are no specific prerequisites for this document.

Components Used

The information in this document is based on these software and hardware versions.

- Cisco 3640 with a four-port BRI module running Cisco IOS® Software Version 12.0(8).
- Two BRI circuits. These BRIs are not configured in a hunt group.
- Cisco AS5300 with MICA modems running Cisco IOS Software Version 12.0(7)T.
- One T1 PRI circuit.

Conventions

For more information on document conventions, refer to the [Cisco Technical Tips Conventions](#).

Configure

In this configuration, the BRI interfaces (3/0 and 3/1) on maui-rtr-12 (the Cisco 3640 client), are configured in a dialer rotary group and are controlled by the corresponding dialer interface. During dialout, the dialer interfaces uses the BRIs sequentially, and establishes a connection with four channels (two BRIs) to maui-nas-01 (the Cisco AS5300 server).

Though this configuration demonstrates dialout, you can modify it to accept incoming multilink calls. This requires you to add an IP address to the dialer interface and configure the appropriate username and password.

Network Diagram

This document uses the network setup shown here.



Configurations

This document uses these configurations.

```
maui-rtr-12 (Cisco 3640)
maui-rtr-12 (Cisco 3640)
maui-rtr-12#show running-config
Building configuration...

Current configuration:
!
version 12.0
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname maui-rtr-12
!
ip subnet-zero
isdn switch-type basic-ni

!--- BRI switch type is basic-ni 1.

!
interface Ethernet0/0
 ip address 10.1.1.1 255.255.255.0
 no ip directed-broadcast
 no keepalive
!

!---Irrelevant output removed.
```

```

!
interface BRI3/0

!--- First physical BRI interface.

no ip address
no ip directed-broadcast
encapsulation ppp
dialer rotary-group 23

!--- BRI 3/0 is a member of rotary group 23.

!--- The rotary group configuration is in interface Dialer 23.

isdn switch-type basic-ni
isdn spid1 51255511110101 5551111
isdn spid2 51255511120101 5551112

!--- Service profile identifier (SPID) information for BRI 3/0.

!
interface BRI3/1

!--- Second physical BRI interface.

no ip address
no ip directed-broadcast
encapsulation ppp
dialer rotary-group 23

!--- BRI 3/1 is a member of rotary group 23.

!--- The rotary group configuration is in interface Dialer 23.

isdn switch-type basic-ni
isdn spid1 51255522220101 5552222
isdn spid2 51255522230101 5552223

!--- SPID information for BRI 3/1

!
interface BRI3/2

!--- Unused BRI.

!--- This interface can be added to the rotary group if BRIs are available.

no ip address
no ip directed-broadcast
shutdown
isdn switch-type basic-ni
!
interface BRI3/3

!--- Unused BRI

!--- This interface can be added to the rotary group if BRIs are available.

```

```

no ip address
no ip directed-broadcast
shutdown
isdn switch-type basic-ni
!
interface Dialer23

!--- Configuration for rotary group 23.

!--- The Dialer interface number must exactly match rotary group number

!--- configured on the physical interface.

    ip address negotiated

!--- This router will obtain an address for this interface from the peer

!--- during IPCP negotiation.

    no ip directed-broadcast
    encapsulation ppp
    dialer in-band
    dialer idle-timeout 900

!--- Sets the idle timeout to 900 seconds.

!--- This can be adjusted depending on your traffic patterns.

    dialer string 5558888 class 56k

!--- Dial 5558888 and use the map-class named "56k" (defined below).

    dialer load-threshold 1 outbound

!--- Load level (in outbound direction) for traffic at which additional

!--- connections will be added to the MPPP bundle.

!--- Load level values range from 1 (unloaded) to 255 (fully loaded).

!--- Refer to Tuning and Optional Commands for more information.

    dialer-group 1

!--- Apply interesting traffic definition from dialer-list 1.

    ppp authentication chap callin

!--- Use one way ppp chap authentication.

    ppp chap hostname rotary_user

!--- Use the chap username rotary_user to authenticate to the other router.

```

```

ppp chap password 7 <deleted>

!--- Use this chap password to authenticate to the other router.

ppp multilink

!--- Allow multilink for the rotary group.

!--- Without this command multilink will NOT be negotiated.

!
ip classless
ip route 0.0.0.0 0.0.0.0 Dialer23

!--- Set the default route to be interface Dialer 23 (the rotary group).

!--- Traffic sent to int Dialer23 will cause the rotary group members

!--- to be dialed sequentially.

!
map-class dialer 56k

!--- map-class named "56k" that was used with the dialer string in
!--- int Dialer23.

dialer isdn speed 56

!--- Set the speed of the call to be 56k (default is 64k).

!--- This may not be necessary for your connection.

!--- Consult your telco to find out if you need to configure
!--- the dial speed to 56k.

access-list 101 permit ip any any

!--- Define all IP traffic as interesting.

!--- Change this depending on your traffic needs.

dialer-list 1 protocol ip list 101

!--- Interesting traffic is defined by access-list 101.

!--- This is applied to interface Dialer 23 using dialer-group 1.

!
line con 0
  transport input none
line 33 64

line aux 0
line vty 0 4
!
end

```

maui-nas-01 (Cisco AS5300)

```
maui-nas-01#show running-config
Building configuration...

Current configuration:
!
version 12.0
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname maui-nas-01
!
username rotary_user password 0 cisco

!--- Username for remote router and shared secret (used for

!--- Challenge Handshake Authentication Protocol [CHAP] authentication).

!--- Shared secret must be the same on both sides.

!--- The other side must supply this username in the CHAP response.

spe 2/0 2/7
  firmware location system:/ucode/mica_port_firmware
!
resource-pool disable
!
ip subnet-zero
!
isdn switch-type primary-ni
isdn voice-call-failure 0
mta receive maximum-recipients 0
!
controller T1 0

!--- Primary T1 configuration.

  framing esf
  clock source line primary
  linecode b8zs
  pri-group timeslots 1-24
!
controller T1 1
  clock source line secondary 1
!
controller T1 2
!
controller T1 3
!
interface Ethernet0
  ip address 172.22.53.140 255.255.255.0
  no ip directed-broadcast
!
interface Serial0:23

!--- D-channel configuration for T1 0.
```

```

no ip address
no ip directed-broadcast
encapsulation ppp
dialer pool-member 1

!--- D-channel is a member of dialer pool 1.

!--- The dialer pool configuration is defined in interface Dialer 1.

    isdn switch-type primary-ni
    fair-queue 64 256 0
    ppp authentication chap callin
    !
interface FastEthernet0
no ip address
no ip directed-broadcast
shutdown
duplex auto
speed auto
!
interface Dialer1
ip unnumbered Ethernet0
no ip directed-broadcast
encapsulation ppp
dialer pool 1

!--- defines dialer pool 1.

!--- T1 0 is a member of this pool.

    peer default ip address pool DIALIN

!--- assign IP address for incoming calls from pool named DIALIN.

    no fair-queue
    ppp authentication chap callin
    ppp multilink

!--- permit multilink ppp.

!--- This command is required to accept multilink connections.

    !
ip local pool DIALIN 172.22.53.141 172.22.53.148

!--- IP address pool definition.
!--- Incoming calls using int dialer 1 use this pool.

ip classless
no ip http server
!
!
!
line con 0
transport input none
line 1 48
line aux 0
line vty 0 4
!

```

Note: maui-nas-01 is not specially configured to accept calls only from maui-rtr-12 (the client). From the point of view of the Network Access Solutions (NAS) (maui-nas-01), the incoming call is just another dialin client. You can use this configuration for many remote clients to dial the PRI of the central site NAS and connect to the corporate network.

Tuning and Optional Commands

You can use the following commands to adjust the behavior of the MPPP connection. You can help control costs by avoiding wasteful and unnecessary use of data links if you carefully adjust such parameters. Implement these commands on the side that initiates the dial.

- **dialer load-threshold *load* [outbound | inbound | either]** – You can configure MPPP so that additional channels come up immediately after the primary channel is established. In such a case, set the load threshold value in the **dialer load-threshold *load*** command to 1. Therefore, the additional channels are brought up and continue to stay up (that is, they do not flap). If you set the load-threshold to any other value, the multiple channels may flap. This depends on the load across the link. If you want to have additional channels added as necessary, depending on the traffic, set the load-threshold to the appropriate value between 1 and 255. For example, if additional channels are to come up at 50 percent of the total capacity, set the threshold to 128 (0.50*255).
- **ppp timeout multilink link add *seconds*** – Use this command to prevent multiple links from being added to the MP bundle until high traffic is received for a specified interval. This can prevent bursts of traffic from unnecessarily bringing up additional lines.
- **ppp timeout multilink link add *seconds*** – Use this command to prevent multiple links from being added to the MP bundle until high traffic is received for a specified interval. This can prevent bursts of traffic from unnecessarily bringing up additional lines.

Verify

show Commands

This section provides information you can use to confirm your configuration works properly.

The Output Interpreter tool supports certain **show** commands. This tool allows you to view an analysis of **show** command output.

- **show isdn status**– Ensures that the router is properly communicating with the ISDN switch. In the output, verify that Layer 1 Status is ACTIVE, and that the Layer 2 Status state = MULTIPLE_FRAME_ESTABLISHED appears. This command also displays the number of active calls. Refer to Using the show isdn status Command for BRI Troubleshooting for more information.
- **show ppp multilink** – Displays information on multilink bundles that are active. This command should be used to verify the multilink connection.
- **show dialer [interface *type number*]** – Displays general diagnostic information for interfaces configured for DDR. If the dialer came up properly, the Dialer state is data link layer up message should appear. If physical layer up appears, then the line protocol came up, but the Network Control Protocol (NCP) did not. The source and destination addresses of the packet that initiated the dialing are shown in the Dial reason line. This **show** command also displays the timer's configuration and the time before the connection times out.
- **show caller user *username detail*** – Shows parameters for the particular user such as the IP address assigned, PPP and PPP bundle parameters, and so on. If your version of Cisco IOS does not support

this command, use the **show user** command.

show Command Output

The **show ppp multilink** command shows the members of the multilink bundle on each router after the links have connected. The BRI interfaces and B-channels that belong to the bundle are indicated as well.

```
maui-rtr-12#show ppp multilink

    Bundle maui-nas-01, 4 members, Master link is Virtual-Access1

!--- The bundle name is the remote router name (maui-nas-01).

    !--- The Multilink Bundle is controlled by interface Virtual-Access 1.

Dialer Interface is Dialer23
!--- The dialer interface is Dialer 23.
    0 lost fragments, 3 reordered, 0 unassigned, sequence 0x18/0x16 rcvd/sent
    0 discarded, 0 lost received, 1/255 load

!--- The current load is 1/255.

!--- Adjust the dialer load threshold in the dialer rotary group to

!--- control the load at which additional channels are added.

Member Links: 4 (max not set, min not set)
BRI3/0:1
BRI3/0:2
BRI3/1:1
BRI3/1:2

!--- The individual members of the link are specified.
```

Sample Debug Output

```
maui-rtr-12#debug isdn q931
ISDN Q931 packets debugging is on
maui-rtr-12#debug dialer
Dial on demand events debugging is on
maui-rtr-12#debug ppp negotiation
PPP protocol negotiation debugging is on
maui-rtr-12#debug ppp authentication
PPP authentication debugging is on
maui-rtr-12#
maui-rtr-12#ping 172.22.53.201

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.22.53.201, timeout is 2 seconds:

*Mar  1 01:30:55.295: BRI3/0 DDR: rotor dialout [priority]

!--- Use BRI 3/0 to dial out.
```

```

*Mar 1 01:30:55.295: BRI3/0 DDR: Dialing cause ip (s=10.1.1.1, d=172.22.53.201)

!--- DDR dialing cause is a ping to the remote router.

*Mar 1 01:30:55.295: BRI3/0 DDR: Attempting to dial 5558888

!--- Dial the remote number(specified in the dialer string command).

*Mar 1 01:30:55.295: ISDN BR3/0: TX -> SETUP pd = 8 callref = 0x07
*Mar 1 01:30:55.299: Bearer Capability i = 0x8890218F
*Mar 1 01:30:55.299: Channel ID i = 0x83
*Mar 1 01:30:55.299: Keypad Facility i = '5558888'
*Mar 1 01:30:55.719: ISDN BR3/0: RX <- CALL_PROC pd = 8 callref = 0x87

*Mar 1 01:30:55.719: Channel ID i = 0x89

*Mar 1 01:30:55.739: ISDN BR3/0: RX <- CONNECT pd = 8 callref = 0x87

!--- Call is connected.

*Mar 1 01:30:55.743: %LINK-3-UPDOWN: Interface BRI3/0:1, changed state to up
*Mar 1 01:30:55.743: BR3/0:1 PPP: Treating connection as a callout
*Mar 1 01:30:55.747: BR3/0:1 PPP: Phase is ESTABLISHING, Active Open
*Mar 1 01:30:55.747: BR3/0:1 PPP: No remote authentication for call-out
*Mar 1 01:30:55.747: BR3/0:1 CHAP: Using alternate hostname rotary_user
*Mar 1 01:30:55.747: BR3/0:1 LCP: O CONFREQ [Closed] id 9 len 28
*Mar 1 01:30:55.747: BR3/0:1 LCP: MagicNumber 0x30E772ED (0x050630E772ED)
*Mar 1 01:30:55.747: BR3/0:1 LCP: MRRU 1524 (0x110405F4)
*Mar 1 01:30:55.747: BR3/0:1 LCP: EndpointDisc 1 Local
(0x130E01726F746172795F75736572)
*Mar 1 01:30:55.747: ISDN BR3/0: TX -> CONNECT_ACK pd = 8 callref = 0x07
*Mar 1 01:30:55.771: BR3/0:1 LCP: I CONFREQ [REQsent] id 1 len 33
*Mar 1 01:30:55.771: BR3/0:1 LCP: AuthProto CHAP (0x0305C22305)
*Mar 1 01:30:55.771: BR3/0:1 LCP: MagicNumber 0xE07C5C99 (0x0506E07C5C99)
*Mar 1 01:30:55.771: BR3/0:1 LCP: MRRU 1524 (0x110405F4)
*Mar 1 01:30:55.771: BR3/0:1 LCP: EndpointDisc 1 Local
(0x130E016D6175692D6E61732D3031)
*Mar 1 01:30:55.771: BR3/0:1 LCP: O CONFACK [REQsent] id 1 len 33
*Mar 1 01:30:55.771: BR3/0:1 LCP: AuthProto CHAP (0x0305C22305)
*Mar 1 01:30:55.771: BR3/0:1 LCP: MagicNumber 0xE07C5C99 (0x0506E07C5C99)
*Mar 1 01:30:55.771: BR3/0:1 LCP: MRRU 1524 (0x110405F4)
*Mar 1 01:30:55.775: BR3/0:1 LCP: EndpointDisc 1 Local
(0x130E016D6175692D6E61732D3031)
*Mar 1 01:30:55.775: BR3/0:1 LCP: I CONFACK [ACKsent] id 9 len 28
*Mar 1 01:30:55.775: BR3/0:1 LCP: MagicNumber 0x30E772ED (0x050630E772ED)
*Mar 1 01:30:55.775: BR3/0:1 LCP: MRRU 1524 (0x110405F4)
*Mar 1 01:30:55.775: BR3/0:1 LCP: EndpointDisc 1 Local
(0x130E01726F746172795F75736572)
*Mar 1 01:30:55.779: BR3/0:1 LCP: State is Open
*Mar 1 01:30:55.779: BR3/0:1 PPP: Phase is AUTHENTICATING, by the peer

!--- CHAP authentication begins.

*Mar 1 01:30:55.799: BR3/0:1 CHAP: I CHALLENGE id 1 len 32 from "maui-nas-01"
*Mar 1 01:30:55.799: BR3/0:1 CHAP: Using alternate hostname rotary_user
*Mar 1 01:30:55.799: BR3/0:1 CHAP: Username maui-nas-01 not found
*Mar 1 01:30:55.799: BR3/0:1 CHAP: Using default password
*Mar 1 01:30:55.799: BR3/0:1 CHAP: O RESPONSE id 1 len 32 from "rotary_user"
*Mar 1 01:30:55.819: BR3/0:1 CHAP: I SUCCESS id 1 len 4

!--- Authentication is successful.

```

```
*Mar 1 01:30:55.819: BR3/0:1 PPP: Phase is VIRTUALIZED
*Mar 1 01:30:55.823: Vi1 PPP: Phase is DOWN, Setup
*Mar 1 01:30:55.827: BR3/0:1 IPCP: Packet buffered while building MLP bundle
interface
*Mar 1 01:30:55.827: BR3/0:1 CDPCP: Packet buffered while building MLP bundle
interface
*Mar 1 01:30:55.827: %LINK-3-UPDOWN:
Interface Virtual-Access1, changed state to up
```

!--- The router creates a virtual-access interface for the multilink bundle.

```
*Mar 1 01:30:55.831: Vi1 PPP: Treating connection as a callout
*Mar 1 01:30:55.831: Vi1 PPP: Phase is ESTABLISHING, Active Open
*Mar 1 01:30:55.831: Vi1 PPP: No remote authentication for call-out
*Mar 1 01:30:55.831: Vi1 CHAP: Using alternate hostname rotary_user
*Mar 1 01:30:55.831: Vi1 LCP: O CONFREQ [Closed] id 1 len 28
*Mar 1 01:30:55.831: Vi1 LCP: MagicNumber 0x30E77342 (0x050630E77342)
*Mar 1 01:30:55.831: Vi1 LCP: MRRU 1524 (0x110405F4)
*Mar 1 01:30:55.831: Vi1 LCP: EndpointDisc 1 Local
(0x130E01726F746172795F75736572)
*Mar 1 01:30:55.831: Vi1 PPP: Phase is UP
```

!--- IPCP negotiation begins.

```
*Mar 1 01:30:55.831: Vi1 IPCP: O CONFREQ [Closed] id 1 len 10
*Mar 1 01:30:55.831: Vi1 IPCP: Address 0.0.0.0 (0x030600000000)
*Mar 1 01:30:55.835: Vi1 CDPCP: O CONFREQ [Closed] id 1 len 4
*Mar 1 01:30:55.835: Vi1 PPP: Pending ncpQ size is 2
*Mar 1 01:30:55.835: BR3/0:1 IPCP: Redirect packet to Vi1
*Mar 1 01:30:55.835: Vi1 IPCP: I CONFREQ [REQsent] id 2 len 10
*Mar 1 01:30:55.835: Vi1 IPCP: Address 172.22.53.140 (0x0306AC16358C)
*Mar 1 01:30:55.835: Vi1 IPCP: O CONFACK [REQsent] id 2 len 10
*Mar 1 01:30:55.835: Vi1 IPCP: Address 172.22.53.140 (0x0306AC16358C)
*Mar 1 01:30:55.835: BR3/0:1 CDPCP: Redirect packet to Vi1
*Mar 1 01:30:55.835: Vi1 CDPCP: I CONFREQ [REQsent] id 2 len 4
*Mar 1 01:30:55.835: Vi1 CDPCP: O CONFACK [REQsent] id 2 len 4
*Mar 1 01:30:55.851: Vi1 IPCP: I CONFNAK [ACKsent] id 1 len 10
*Mar 1 01:30:55.851: Vi1 IPCP: Address 172.22.53.141 (0x0306AC16358D)
*Mar 1 01:30:55.851: Vi1 IPCP: O CONFREQ [ACKsent] id 2 len 10
*Mar 1 01:30:55.851: Vi1 IPCP: Address 172.22.53.141 (0x0306AC16358D)
*Mar 1 01:30:55.855: Vi1 CDPCP: I CONFACK [ACKsent] id 1 len 4
*Mar 1 01:30:55.855: Vi1 CDPCP: State is Open
*Mar 1 01:30:55.871: Vi1 IPCP: I CONFACK [ACKsent] id 2 len 10
*Mar 1 01:30:55.871: Vi1 IPCP: Address 172.22.53.141 (0x0306AC16358D)
*Mar 1 01:30:55.871: Vi1 IPCP: State is Open
*Mar 1 01:30:55.871: Di23 IPCP: Install negotiated IP interface address
172.22.53.141
*Mar 1 01:30:55.879: Virtual-Access1 DDR: dialer protocol up
*Mar 1 01:30:55.883: Di23 IPCP: Install route to 172.22.53.140
```

!--- Route to the peer is installed.

```
*Mar 1 01:30:56.819: %LINEPROTO-5-UPDOWN: Line protocol on Interface BRI3/0:1,
changed state to up
*Mar 1 01:30:56.831: %LINEPROTO-5-UPDOWN: Line protocol on Interface
Virtual-Access1, changed state to up
```

!--- First Call is up and connected.

```
*Mar 1 01:30:58.727: BRI3/0 DDR: rotor dialout [priority]
```

!--- The router dials out using the second B-channel on BRI 3/0.

```
*Mar 1 01:30:58.727: BRI3/0 DDR: Attempting to dial 5558888
```

```

*Mar 1 01:30:58.727: ISDN BR3/0: TX -> SETUP pd = 8 callref = 0x08
*Mar 1 01:30:58.727: Bearer Capability i = 0x8890218F
*Mar 1 01:30:58.727: Channel ID i = 0x83
*Mar 1 01:30:58.727: Keypad Facility i = '5558888'
*Mar 1 01:30:59.119: ISDN BR3/0: RX <- CALL_PROC pd = 8 callref = 0x88
*Mar 1 01:30:59.119: Channel ID i = 0x8A
*Mar 1 01:30:59.139: ISDN BR3/0: RX <- CONNECT pd = 8 callref = 0x88
*Mar 1 01:30:59.143: %LINK-3-UPDOWN: Interface BRI3/0:2, changed state to up

```

!--- The second B-Channel (indicated by BRI3/0:2) is brought up.

```

*Mar 1 01:30:59.143: %ISDN-6-CONNECT: Interface BRI3/0:1 is now connected to
5558888 maui-nas-01
*Mar 1 01:30:59.147: BR3/0:2 PPP: Treating connection as a callout
*Mar 1 01:30:59.147: BR3/0:2 PPP: Phase is ESTABLISHING, Active Open
*Mar 1 01:30:59.147: BR3/0:2 PPP: No remote authentication for call-out
*Mar 1 01:30:59.147: BR3/0:2 CHAP: Using alternate hostname rotary_user
*Mar 1 01:30:59.147: BR3/0:2 LCP: O CONFREQ [Closed] id 3 len 28
*Mar 1 01:30:59.147: BR3/0:2 LCP: MagicNumber 0x30E78037 (0x050630E78037)
*Mar 1 01:30:59.147: BR3/0:2 LCP: MRRU 1524 (0x110405F4)
*Mar 1 01:30:59.147: BR3/0:2 LCP: EndpointDisc 1 Local
(0x130E01726F746172795F75736572)
*Mar 1 01:30:59.147: ISDN BR3/0: TX -> CONNECT_ACK pd = 8 callref = 0x08
*Mar 1 01:30:59.171: BR3/0:2 LCP: I CONFREQ [REQsent] id 1 len 33
*Mar 1 01:30:59.171: BR3/0:2 LCP: AuthProto CHAP (0x0305C22305)
*Mar 1 01:30:59.171: BR3/0:2 LCP: MagicNumber 0xE07C69E4 (0x0506E07C69E4)
*Mar 1 01:30:59.171: BR3/0:2 LCP: MRRU 1524 (0x110405F4)
*Mar 1 01:30:59.171: BR3/0:2 LCP: EndpointDisc 1 Local
(0x130E016D6175692D6E61732D3031)
*Mar 1 01:30:59.175: BR3/0:2 LCP: O CONFACK [REQsent] id 1 len 33
*Mar 1 01:30:59.175: BR3/0:2 LCP: AuthProto CHAP (0x0305C22305)
*Mar 1 01:30:59.175: BR3/0:2 LCP: MagicNumber 0xE07C69E4 (0x0506E07C69E4)
*Mar 1 01:30:59.175: BR3/0:2 LCP: MRRU 1524 (0x110405F4)
*Mar 1 01:30:59.175: BR3/0:2 LCP: EndpointDisc 1 Local
(0x130E016D6175692D6E61732D3031)
*Mar 1 01:30:59.179: BR3/0:2 LCP: I CONFACK [ACKsent] id 3 len 28
*Mar 1 01:30:59.179: BR3/0:2 LCP: MagicNumber 0x30E78037 (0x050630E78037)
*Mar 1 01:30:59.179: BR3/0:2 LCP: MRRU 1524 (0x110405F4)
*Mar 1 01:30:59.179: BR3/0:2 LCP: EndpointDisc 1 Local
(0x130E01726F746172795F75736572)
*Mar 1 01:30:59.179: BR3/0:2 LCP: State is Open
!--- LCP negotiation is complete.
*Mar 1 01:30:59.179: BR3/0:2 PPP: Phase is AUTHENTICATING, by the peer
*Mar 1 01:30:59.199: BR3/0:2 CHAP: I CHALLENGE id 1 len 32 from "maui-nas-01"
*Mar 1 01:30:59.199: BR3/0:2 CHAP: Using alternate hostname rotary_user
*Mar 1 01:30:59.199: BR3/0:2 CHAP: Username maui-nas-01 not found
*Mar 1 01:30:59.199: BR3/0:2 CHAP: User using default password
*Mar 1 01:30:59.199: BR3/0:2 CHAP: O RESPONSE id 1 len 32 from "rotary_user"
*Mar 1 01:30:59.219: BR3/0:2 CHAP: I SUCCESS id 1 len 4
*Mar 1 01:30:59.223: BR3/0:2 PPP: Phase is VIRTUALIZED
*Mar 1 01:31:00.219: %LINEPROTO-5-UPDOWN: Line protocol on Interface BRI3/0:2,
changed state to up
*Mar 1 01:31:05.147: %ISDN-6-CONNECT: Interface BRI3/0:2 is now connected
to 5558888 maui-nas-01
!--- Second B-channel is connected.
maui-rtr-12#
maui-rtr-12#ping 172.22.53.201

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.22.53.201, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 28/302/1372 ms

```

!--- This ping generates enough traffic to make the additional links dial.

maui-rtr-12#

*Mar 1 01:31:28.727: **BRI3/1 DDR: rotor dialout** [priority]

!--- BRI 3/1 is used for the dialout.

```
*Mar 1 01:31:28.727: BRI3/1 DDR: Attempting to dial 5558888
*Mar 1 01:31:28.727: ISDN BR3/1: TX -> SETUP pd = 8 callref = 0x09
*Mar 1 01:31:28.727: Bearer Capability i = 0x8890218F
*Mar 1 01:31:28.727: Channel ID i = 0x83
*Mar 1 01:31:28.727: Keypad Facility i = '5558888'
*Mar 1 01:31:29.103: ISDN BR3/1: RX <- CALL_PROC pd = 8 callref = 0x89
*Mar 1 01:31:29.103: Channel ID i = 0x89
*Mar 1 01:31:29.123: ISDN BR3/1: RX <- CONNECT pd = 8 callref = 0x89
*Mar 1 01:31:29.123: %LINK-3-UPDOWN: Interface BRI3/1:1, changed state to up
*Mar 1 01:31:29.127: BR3/1:1 PPP: Treating connection as a callout
*Mar 1 01:31:29.127: BR3/1:1 PPP: Phase is ESTABLISHING, Active Open
*Mar 1 01:31:29.127: BR3/1:1 PPP: No remote authentication for call-out
*Mar 1 01:31:29.127: BR3/1:1 CHAP: Using alternate hostname rotary_user
*Mar 1 01:31:29.131: BR3/1:1 LCP: O CONFREQ [Closed] id 3 len 28
*Mar 1 01:31:29.131: BR3/1:1 LCP: MagicNumber 0x30E7F554 (0x050630E7F554)
*Mar 1 01:31:29.131: BR3/1:1 LCP: MRRU 1524 (0x110405F4)
*Mar 1 01:31:29.131: BR3/1:1 LCP: EndpointDisc 1 Local
(0x130E01726F746172795F75736572)
*Mar 1 01:31:29.131: ISDN BR3/1: TX -> CONNECT_ACK pd = 8 callref = 0x09
*Mar 1 01:31:29.159: BR3/1:1 LCP: I CONFREQ [REQsent] id 1 len 33
*Mar 1 01:31:29.159: BR3/1:1 LCP: AuthProto CHAP (0x0305C22305)
*Mar 1 01:31:29.159: BR3/1:1 LCP: MagicNumber 0xE07CDF06 (0x0506E07CDF06)
*Mar 1 01:31:29.159: BR3/1:1 LCP: MRRU 1524 (0x110405F4)
*Mar 1 01:31:29.159: BR3/1:1 LCP: EndpointDisc 1 Local
(0x130E016D6175692D6E61732D3031)
*Mar 1 01:31:29.159: BR3/1:1 LCP: O CONFACK [REQsent] id 1 len 33
*Mar 1 01:31:29.159: BR3/1:1 LCP: AuthProto CHAP (0x0305C22305)
*Mar 1 01:31:29.159: BR3/1:1 LCP: MagicNumber 0xE07CDF06 (0x0506E07CDF06)
*Mar 1 01:31:29.159: BR3/1:1 LCP: MRRU 1524 (0x110405F4)
*Mar 1 01:31:29.159: BR3/1:1 LCP: EndpointDisc 1 Local
(0x130E016D6175692D6E61732D3031)
*Mar 1 01:31:29.163: BR3/1:1 LCP: I CONFACK [ACKsent] id 3 len 28
*Mar 1 01:31:29.163: BR3/1:1 LCP: MagicNumber 0x30E7F554 (0x050630E7F554)
*Mar 1 01:31:29.163: BR3/1:1 LCP: MRRU 1524 (0x110405F4)
*Mar 1 01:31:29.163: BR3/1:1 LCP: EndpointDisc 1 Local
(0x130E01726F746172795F75736572)
*Mar 1 01:31:29.163: BR3/1:1 LCP: State is Open
*Mar 1 01:31:29.163: BR3/1:1 PPP: Phase is AUTHENTICATING, by the peer
*Mar 1 01:31:29.187: BR3/1:1 CHAP: I CHALLENGE id 1 len 32 from "maui-nas-01"
*Mar 1 01:31:29.187: BR3/1:1 CHAP: Using alternate hostname rotary_user
*Mar 1 01:31:29.187: BR3/1:1 CHAP: Username maui-nas-01 not found
*Mar 1 01:31:29.187: BR3/1:1 CHAP: Using default password
*Mar 1 01:31:29.187: BR3/1:1 CHAP: O RESPONSE id 1 len 32 from "rotary_user"
*Mar 1 01:31:29.207: BR3/1:1 CHAP: I SUCCESS id 1 len 4
*Mar 1 01:31:29.207: BR3/1:1 PPP: Phase is VIRTUALIZED
*Mar 1 01:31:30.207: %LINEPROTO-5-UPDOWN: Line protocol on Interface BRI3/1:1,
changed state to up
*Mar 1 01:31:35.127: %ISDN-6-CONNECT: Interface BRI3/1:1 is now connected
to 5558888 maui-nas-01
```

!--- B-channel 1 on BRI 3/1 is now connected to the peer.

maui-rtr-12#

maui-rtr-12#ping 172.22.53.201

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 172.22.53.201, timeout is 2 seconds:

!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 28/36/56 ms
maui-rtr-12#

*Mar 1 01:31:58.727: **BRI3/1 DDR: rotor dialout [priority]**

!--- Second B-channel on BRI 3/1 is used for the dialout.

```
*Mar 1 01:31:58.727: BRI3/1 DDR: Attempting to dial 5558888
*Mar 1 01:31:58.727: ISDN BR3/1: TX -> SETUP pd = 8 callref = 0x0A
*Mar 1 01:31:58.727: Bearer Capability i = 0x8890218F
*Mar 1 01:31:58.727: Channel ID i = 0x83
*Mar 1 01:31:58.727: Keypad Facility i = '5558888'
*Mar 1 01:31:59.099: ISDN BR3/1: RX <- CALL_PROC pd = 8 callref = 0x8A

*Mar 1 01:31:59.099: Channel ID i = 0x8A
*Mar 1 01:31:59.135: ISDN BR3/1: RX <- CONNECT pd = 8 callref = 0x8A
*Mar 1 01:31:59.135: %LINK-3-UPDOWN: Interface BRI3/1:2, changed state to up
*Mar 1 01:31:59.139: %ISDN-6-CONNECT: Interface BRI3/1:1 is now connected to
5558888 maui-nas-01
*Mar 1 01:31:59.139: BR3/1:2 PPP: Treating connection as a callout
*Mar 1 01:31:59.139: BR3/1:2 PPP: Phase is ESTABLISHING, Active Open
*Mar 1 01:31:59.139: BR3/1:2 PPP: No remote authentication for call-out
*Mar 1 01:31:59.139: BR3/1:2 CHAP: Using alternate hostname rotary_user
*Mar 1 01:31:59.139: BR3/1:2 LCP: O CONFREQ [Closed] id 3 len 28
*Mar 1 01:31:59.139: BR3/1:2 LCP: MagicNumber 0x30E86A91 (0x050630E86A91)
*Mar 1 01:31:59.139: BR3/1:2 LCP: MRRU 1524 (0x110405F4)
*Mar 1 01:31:59.139: BR3/1:2 LCP: EndpointDisc 1 Local
(0x130E01726F746172795F75736572)
*Mar 1 01:31:59.143: ISDN BR3/1: TX -> CONNECT_ACK pd = 8 callref = 0x0A
*Mar 1 01:31:59.167: BR3/1:2 LCP: I CONFREQ [REQsent] id 1 len 33
*Mar 1 01:31:59.167: BR3/1:2 LCP: AuthProto CHAP (0x0305C22305)
*Mar 1 01:31:59.167: BR3/1:2 LCP: MagicNumber 0xE07D5441 (0x0506E07D5441)
*Mar 1 01:31:59.167: BR3/1:2 LCP: MRRU 1524 (0x110405F4)
*Mar 1 01:31:59.167: BR3/1:2 LCP: EndpointDisc 1 Local
(0x130E016D6175692D6E61732D3031)
*Mar 1 01:31:59.167: BR3/1:2 LCP: O CONFACK [REQsent] id 1 len 33
*Mar 1 01:31:59.167: BR3/1:2 LCP: AuthProto CHAP (0x0305C22305)
*Mar 1 01:31:59.167: BR3/1:2 LCP: MagicNumber 0xE07D5441 (0x0506E07D5441)
*Mar 1 01:31:59.167: BR3/1:2 LCP: MRRU 1524 (0x110405F4)
*Mar 1 01:31:59.167: BR3/1:2 LCP: EndpointDisc 1 Local
(0x130E016D6175692D6E61732D3031)
*Mar 1 01:31:59.171: BR3/1:2 LCP: I CONFACK [ACKsent] id 3 len 28
*Mar 1 01:31:59.171: BR3/1:2 LCP: MagicNumber 0x30E86A91 (0x050630E86A91)
*Mar 1 01:31:59.171: BR3/1:2 LCP: MRRU 1524 (0x110405F4)
*Mar 1 01:31:59.171: BR3/1:2 LCP: EndpointDisc 1 Local
(0x130E01726F746172795F75736572)
*Mar 1 01:31:59.171: BR3/1:2 LCP: State is Open
*Mar 1 01:31:59.171: BR3/1:2 PPP: Phase is AUTHENTICATING, by the peer
*Mar 1 01:31:59.195: BR3/1:2 CHAP: I CHALLENGE id 1 len 32 from "maui-nas-01"
*Mar 1 01:31:59.195: BR3/1:2 CHAP: Using alternate hostname rotary_user
*Mar 1 01:31:59.195: BR3/1:2 CHAP: Username maui-nas-01 not found
*Mar 1 01:31:59.195: BR3/1:2 CHAP: Using default password
*Mar 1 01:31:59.195: BR3/1:2 CHAP: O RESPONSE id 1 len 32 from "rotary_user"
*Mar 1 01:31:59.215: BR3/1:2 CHAP: I SUCCESS id 1 len 4
*Mar 1 01:31:59.215: BR3/1:2 PPP: Phase is VIRTUALIZED
*Mar 1 01:32:00.215: %LINEPROTO-5-UPDOWN: Line protocol on Interface BRI3/1:2,
changed state to up
*Mar 1 01:32:05.139: %ISDN-6-CONNECT: Interface BRI3/1:2 is now connected
to 5558888 maui-nas-01
```

!--- Both BRIs (four channels) are connected to the peer.

Troubleshoot

This section provides information you can use to troubleshoot your configuration.

Troubleshooting Commands

Certain **show** commands are supported by the Output Interpreter tool, which allows you to view an analysis of **show** command output.

Note: Before issuing **debug** commands, please see Important Information on Debug Commands.

- **debug dialer** – Displays DDR debugging information about the packets received on a dialer interface. This information can help to ensure there is interesting traffic that can use the dialer interface.
- **debug isdn q931** – Shows call setup and tear down of the ISDN network connection (Layer 3).
- **debug ppp negotiation** – Displays information on the PPP traffic and exchanges while negotiating Link Control Protocol (LCP), Authentication, and Network Control Protocol (NCP). A successful PPP negotiation will first open the LCP state, then Authenticate, and finally negotiate NCP. Multilink Parameters such as Maximum Receive Reconstructed Unit (MRRU) are established during LCP negotiation.
- **debug ppp authentication** – Displays PPP authentication protocol messages, including CHAP packet exchanges and Password Authentication Protocol (PAP) exchanges.
- **debug ppp error** – Displays protocol errors and error statistics associated with PPP connection negotiation and operation.

Related Information

- [Configuring Multilink PPP with Multiple BRI Interfaces](#)
- [Technical Support – Cisco Systems](#)

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Updated: Nov 22, 2004

Document ID: 10217
