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Configuring Multilink PPP with Multiple BRI Interfaces

Document ID: 10308

Introduction

Prerequisites

- Requirements
- Components Used
- Conventions

Configure

- Network Diagram
- Configurations
- Tuning and Optional Commands

Verify

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Troubleshoot

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NetPro Discussion Forums – Featured Conversations

Related Information

Introduction

This document presents a configuration example for a router with multiple BRI interfaces that dials another router with multiple BRI interfaces, and establishes a Multilink PPP (MPPP) connection. The router that dials must identify that no more channels are available on the remote BRI, and then dial the next remote BRI phone number to establish the additional channels.

Both routers use dialer profiles to bond the physical BRI interfaces. You can also configure this setup with a dialer rotary group as depicted in [Configuring MPPP for Multiple BRIs using Rotary Groups](#).

For more information on Dialer Profiles see [Configuring and Troubleshooting Dialer Profiles](#).

Prerequisites

Requirements

There are no specific requirements 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 Release 12.1(4).
- Cisco 4000 with four BRI interfaces running Cisco IOS Software Release 12.1(4).
- Two BRI circuits on each side. These BRIs are not configured in a hunt group.

The information presented in this document was created from devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If you are working in a live network, ensure that you understand the potential impact of any command before using it.

Conventions

For more information on document conventions, see the Cisco Technical Tips Conventions.

Configure

In this section, you are presented with the information to configure the features described in this document.

Note: To find additional information on the commands used in this document, use the Command Lookup Tool (registered customers only)

Network Diagram

This document uses this network setup:



Configurations

This document uses these configurations:

- melanie (Cisco 3640)
- torito (Cisco 4000)

melanie (Cisco 3640)

Current configuration:

```
version 12.1
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname melanie
!
enable password ww
!
username torito password 0 ww

!--- Username for remote router (torito) and shared secret (used for
!--- Challenge Handshake Authentication Protocol (CHAP) authentication).
!--- Shared secret must be the same on both sides.

isdn switch-type basic-net3
```

```

!
interface Loopback0
 ip address 10.10.10.1 255.255.255.0
!
interface BRI0/0
 no ip address
 shutdown
!
interface BRI2/0
 no ip address
 shutdown
!
interface BRI2/1

!--- First BRI interface.

 description ISDN number 6104

!--- Phone number of this BRI.

 no ip address
 encapsulation ppp
 dialer pool-member 1

!--- Member of dialer pool 1.

 isdn switch-type basic-net3
 no cdp enable
 ppp authentication chap

!--- Use CHAP authentication.

 ppp multilink

!--- Enable multilink on the physical interface.

!
interface BRI2/2

!--- Second BRI interface.

 description ISDN number 6103

!--- Phone number of this BRI.

 no ip address
 encapsulation ppp
 dialer pool-member 1

!--- Member of dialer pool 1.

 isdn switch-type basic-net3
 no cdp enable
 ppp authentication chap

!--- Use CHAP authentication.

 ppp multilink

!--- Enable multilink on the physical interface.

!
interface BRI2/3
 no ip address

```

```

shutdown
!
interface Dialer2

!--- Dialer interface used for dialout.

ip unnumbered Loopback0

!--- Use the loopback0 address.
!--- Static route on remote router points to this Loopback0 address.

encapsulation ppp
dialer pool 1

!--- Defines dialer pool 1.
!--- BRI 2/1 and BRI 2/2 are members of this pool.

dialer string 6113

!--- Dial 6113 first
.
dialer string 6114

!--- If 6113 fails, dial 6114 .
!--- Both numbers are required. Otherwise, the third call encounters a busy signal.

dialer load-threshold 1 either

!--- Load level (in either 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).

dialer-group 1

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

no cdp enable
ppp authentication chap

!--- Use CHAP authentication.

ppp multilink

!--- Allow MPPP for the four BRI channels.

!
ip route 10.10.12.1 255.255.255.255 Dialer2

!--- Static route to remote router.
!--- All traffic destined for the remote router must use int Dialer2

!
dialer-list 1 protocol ip permit

!--- All IP traffic is designated as interesting.
!--- This is applied to interface dialer2 with the help of dialer-group 1.

line con 0
transport input none
line 97 114
modem InOut
transport input all
line aux 0
line vty 0 4

```

```
login
!  
end
```

Note these points in the configuration of the Cisco 3640 (melanie):

- The configuration uses dialer profiles. The BRI interfaces are members of a dialer pool. All configuration settings specific to the destination are configured in the interface dialer 2 configuration.
- The dialer interface has two dialer strings. Remember that there are two BRI interfaces on the remote router (torito). Because those BRIs were not configured in a hunt group by the Telco, the router melanie must dial each BRI individually. With multiple dialer strings, the first phone number is always dialed. Only if that call fails does the dialer interface try the second dialer string. We can define as many dialer strings as necessary as they are used in sequential order.
- The dialer load threshold for MPPP is set to one, which is the minimum. This value can be changed based on your traffic patterns and requirements. However, if you define a higher load–threshold, the additional links will only be added when there is a load in excess of that definition. Refer to the section Tuning and Optional Commands for more information on how to control the addition of channels to the multilink bundle.
- The static host route for the remote router points at interface dialer 2. Traffic is then forwarded out the physical members of the pool (BRI 2/1 and BRI 2/2). Create a static route (or use a routing protocol) for the destinations traffic that should use the multilink connection.

torito (Cisco 4000)

```
Current configuration:
!  
version 12.1  
service timestamps debug datetime msec  
service timestamps log datetime msec  
no service password-encryption  
!  
hostname torito  
!  
username melanie password 0 ww  
  
!--- Username for remote router (melanie) and shared secret  
!--- (used for CHAP authentication).  
!--- Shared secret must be the same on both sides.  
  
!  
isdn switch-type basic-net3  
  
interface Loopback0  
 ip address 10.10.12.1 255.255.255.0  
!  
interface BRI0  
 no ip address  
 shutdown  
!  
interface BRI1  
  
!--- Phone number is 6113.  
  
 no ip address  
 encapsulation ppp  
 dialer pool-member 1  
  
!--- Member of dialer pool 1.
```

```

isdn switch-type basic-net3
ppp authentication chap

!--- Use CHAP authentication.

ppp multilink

!--- Enable multilink on the physical interface.
!--- Unless you use CLID/DNIS based binding, this command is required.
!--- See Configuring and Troubleshooting Dialer Profiles for more information.

!
interface BRI2

!--- Phone number is 6114.

no ip address
encapsulation ppp
dialer pool-member 1

!--- Member of dialer pool 1.

isdn switch-type basic-net3
ppp authentication chap

!--- Use CHAP authentication.

ppp multilink

!--- Enable multilink on the physical interface.
!--- Unless you use CLID/DNIS based binding, this command is required.
!--- See Configuring and Troubleshooting Dialer Profiles for more information.

!
interface BRI3
no ip address
shutdown
!
interface Dialer1
ip unnumbered Loopback0

!--- Use the Loopback0 address.
!--- The static route on remote router points to this Loopback0 address.

encapsulation ppp
dialer pool 1

!--- Defines Dialer pool 1.
!--- BRI 1 and BRI 2 are members of this pool.

dialer remote-name melanie

!--- Specifies the name of the remote router.
!--- This name matches the name used by the remote router to authenticate itself.

dialer-group 1

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

ppp authentication chap

!--- Use CHAP authentication.

ppp multilink

```

```

!--- Allow MPPP for the 4 BRI channels.

!
ip route 10.10.10.1 255.255.255.255 Dialer1

!--- Static route to remote router.
!--- All traffic destined for the remote router must use int Dialer1.

dialer-list 1 protocol ip permit

!--- All IP traffic is designated as interesting.
!--- This is applied to interface dialer2 using dialer-group 1.

line con 0
  exec-timeout 0 0
  transport input none
line aux 0
  exec-timeout 0 0
  transport input all
line vty 0 4
  password ww
  login
!
end

```

Tuning and Optional Commands

You can use the commands in this section to adjust the behavior of the MPPP connection. You can control costs through careful adjustment of such parameters, which helps avoid wasteful and unnecessary use of data links. These commands must be implemented 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 they continue to stay up (that is, they do not flap). If the load-threshold is set to a higher value, the multiple channels may flap, based on the load across the link. If you want to have additional channels added as necessary, based 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, the threshold should be set to 128 (0.50×255).
- **ppp timeout multilink link remove *seconds*** Use this command to prevent the multilink connections from flapping when the load varies. For example, when the load threshold is set to 15 (that is, $15/255 = 6$ percent) and the traffic exceeds the threshold, additional lines are brought up. When the traffic falls below the threshold, the additional lines are dropped. In situations where data rates are highly variable, it is advantageous for the multiple channels to stay up for a specified period of time even if the load-threshold falls below the specified value. Assign this multilink timeout to be less than that specified for **dialer idle-timeout** which controls the timeout for all links.
- **ppp timeout multilink link add *seconds*** Use this command to prevent the addition of multiple links 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.
- **dialer max-link *number*** To specify, for a dialer profile, the maximum number of links to a remote destination that can be up at any one time, use the **dialer max-link** command in interface configuration mode. In this example, we have two BRI's (or four B-Channels) on melanie configured for a dialout. Therefore, all four channels, by default, are brought up in a MPPP connection. However, if you want only three B-channels to be brought up, you can use the **dialer max-link** command to restrict the number of links.

Verify

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

show Commands

Use these commands to verify the connection:

Certain **show** commands are supported by the Output Interpreter Tool (registered customers only) , which allows you to view an analysis of **show** command output.

- **show isdn status** indicates whether the router communicates properly with the ISDN switch. In the output, you need to verify that Layer 1 Status is ACTIVE, and that Layer 2 Status state = MULTIPLE_FRAME_ESTABLISHED appears. This command also displays the number of active calls. For more information, see Using the **show isdn status** Command for BRI Troubleshooting.
- **show ppp multilink** displays information on multilink bundles that are active. Use this command 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 must appear. If physical layer up appears, it means 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 configuration of the timer, 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. Observe that on router melanie, the bundle name is torito while on router torito the bundle name is melanie. The BRI interfaces and B-channels that belong to the bundle are also indicated.

```
melanie#show ppp multilink

Dialer2, bundle name is torito
0 lost fragments, 0 reordered, 0 unassigned
0 discarded, 0 lost received, 1/255 load
0x8 received sequence, 0x8 sent sequence
Member links: 4 (max not set, min not set)
BRI2/1:1
BRI2/1:2
BRI2/2:1
BRI2/2:2

torito#show ppp multilink
Dialer1, bundle name is melanie
0 lost fragments, 0 reordered, 0 unassigned
0 discarded, 0 lost received, 1/255 load
0x8 received sequence, 0x8 sent sequence
Member links: 4 (max not set, min not set)
BRI1:1
BRI1:2
BRI2:1
```

Troubleshoot

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

Troubleshooting Commands

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 that 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 it negotiates 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 when LCP negotiation is in progress.
- **debug ppp authentication** displays PPP authentication protocol messages, and includes 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.

debug Command Output

For information on how to troubleshoot multilink on per-BRI basis, see Troubleshooting Second B-channel Call Failures on ISDN BRI Links. When you have got multilink functional on 1 BRI (2 b-channels), you can add BRIs to the bundle.

Enable the debugs described in the Troubleshooting Commands section, and then **ping** the address of the remote router. The ping must initiate the dial, and connect to the remote router. As each additional link is brought up, it is added to the MPPP bundle.

```
melanie#show debug
Dial on demand:
Dial on demand events debugging is on
PPP:
PPP authentication debugging is on
PPP protocol negotiation debugging is on
ISDN:
ISDN Q931 packets debugging is on
ISDN Q931 packets debug DSLs. (On/Off/No DSL:1/0/-)

melanie#ping 10.10.12.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.10.12.1, timeout is 2 seconds:
*Mar 1 05:30:45.502: BR2/1 DDR: rotor dialout [priority]

!--- Use BRI 2/1 to dial out.

*Mar 1 05:30:45.502: BR2/1 DDR: Dialing cause ip (s=10.10.10.1, d=10.10.12.1)

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

*Mar 1 05:30:45.502: BR2/1 DDR: Attempting to dial 6113
```

*!--- Dial the first number (6113) configured with dialer string command.
!--- This number corresponds to the first BRI on torito.*

```
*Mar 1 05:30:45.506: ISDN BR2/1: TX -> SETUP pd = 8 callref = 0x77
*Mar 1 05:30:45.506: Bearer Capability i = 0x8890
*Mar 1 05:30:45.506: Channel ID i = 0x83
*Mar 1 05:30:45.506: Called Party Number i = 0x80, '6113', Plan:Unknown,
Type:Unknown
*Mar 1 05:30:45.574: ISDN BR2/1: RX <- CALL_PROC pd = 8 callref = 0xF7
*Mar 1 05:30:45.574: Channel ID i = 0x89
*Mar 1 05:30:46.026: ISDN BR2/1: RX <- CONNECT pd = 8 callref = 0xF7
*Mar 1 05:30:46.030: ISDN BR2/1: TX -> CONNECT_ACK pd = 8 callref = 0x77
```

!--- Call connects.

```
*Mar 1 05:30:46.030: %LINK-3-UPDOWN: Interface BRI2/1:1, changed state to up
*Mar 1 05:30:46.034: BR2/1:1: interface must be fifo queue, force fifo
*Mar 1 05:30:46.034: %DIALER-6-BIND: Interface BR2/1:1 bound to profile Di2
```

!--- Call is bound to interface Dialer 2.

```
*Mar 1 05:30:46.034: BR2/1:1 PPP: Treating connection as a callout
*Mar 1 05:30:46.034: BR2/1:1 PPP: Phase is ESTABLISHING, Active Open
```

!--- LCP negotiation begins.

```
*Mar 1 05:30:46.034: BR2/1:1 LCP: O CONFREQ [Closed] id 116 len 29
*Mar 1 05:30:46.034: BR2/1:1 LCP: AuthProto CHAP (0x0305C22305)
*Mar 1 05:30:46.034: BR2/1:1 LCP: MagicNumber 0x513DE606 (0x0506513DE606)
*Mar 1 05:30:46.034: BR2/1:1 LCP: MRRU 1524 (0x110405F4)
*Mar 1 05:30:46.034: BR2/1:1 LCP: EndpointDisc 1 Local (0x130A016D656C616E6965)
*Mar 1 05:30:46.074: BR2/1:1 LCP: I CONFREQ [REQsent] id 11 len 28
*Mar 1 05:30:46.074: BR2/1:1 LCP: AuthProto CHAP (0x0305C22305)
*Mar 1 05:30:46.074: BR2/1:1 LCP: MagicNumber 0x00B3729B (0x050600B3729B)
*Mar 1 05:30:46.074: BR2/1:1 LCP: MRRU 1524 (0x110405F4)
*Mar 1 05:30:46.074: BR2/1:1 LCP: EndpointDisc 1 Local (0x130901746F7269746F)
*Mar 1 05:30:46.074: BR2/1:1 LCP: O CONFACK [REQsent] id 11 len 28
*Mar 1 05:30:46.074: BR2/1:1 LCP: AuthProto CHAP (0x0305C22305)
*Mar 1 05:30:46.074: BR2/1:1 LCP: MagicNumber 0x00B3729B (0x050600B3729B)
*Mar 1 05:30:46.074: BR2/1:1 LCP: MRRU 1524 (0x110405F4)
*Mar 1 05:30:46.074: BR2/1:1 LCP: EndpointDisc 1 Local (0x130901746F7269746F)
*Mar 1 05:30:46.086: BR2/1:1 LCP: I CONFACK [ACKsent] id 116 len 29
*Mar 1 05:30:46.086: BR2/1:1 LCP: AuthProto CHAP (0x0305C22305)
*Mar 1 05:30:46.086: BR2/1:1 LCP: MagicNumber 0x513DE606 (0x0506513DE606)
*Mar 1 05:30:46.086: BR2/1:1 LCP: MRRU 1524 (0x110405F4)
*Mar 1 05:30:46.086: BR2/1:1 LCP: EndpointDisc 1 Local (0x130A016D656C616E6965)
*Mar 1 05:30:46.086: BR2/1:1 LCP: State is Open
```

!--- LCP negotiation is complete.

```
*Mar 1 05:30:46.090: BR2/1:1 PPP: Phase is AUTHENTICATING, by both
```

!--- PPP authentication by both sides begins.

```
*Mar 1 05:30:46.090: BR2/1:1 CHAP: O CHALLENGE id 39 len 28 from "melanie"
*Mar 1 05:30:46.110: BR2/1:1 CHAP: I CHALLENGE id 7 len 27 from "torito"
*Mar 1 05:30:46.110: BR2/1:1 CHAP: O RESPONSE id 7 len 28 from "melanie"
*Mar 1 05:30:46.126: BR2/1:1 CHAP: I SUCCESS id 7 len 4
*Mar 1 05:30:46.134: BR2/1:1 CHAP: I RESPONSE id 39 len 27 from "torito"
*Mar 1 05:30:46.138: BR2/1:1 CHAP: O SUCCESS id 39 len 4
```

!--- CHAP authentication is successful

```
*Mar 1 05:30:46.138: BR2/1:1 PPP: Phase is VIRTUALIZED
```

```

*Mar 1 05:30:46.138: Di2 PPP: Phase is UP
*Mar 1 05:30:46.138: Di2 IPCP: O CONFREQ [Closed] id 14 len 10
*Mar 1 05:30:46.138: Di2 IPCP: Address 10.10.10.1 (0x03060A0A0A01)
*Mar 1 05:30:46.142: BR2/1:1 MLP: torito, multilink up, first link
*Mar 1 05:30:46.162: Di2 IPCP: I CONFREQ [REQsent] id 7 len 10
*Mar 1 05:30:46.162: Di2 IPCP: Address 10.10.12.1 (0x03060A0A0C01)
*Mar 1 05:30:46.162: Di2 IPCP: O CONFACK [REQsent] id 7 len 10
*Mar 1 05:30:46.162: Di2 IPCP: Address 10.10.12.1 (0x03060A0A0C01)
*Mar 1 05:30:46.166: Di2 CDPCP: I CONFREQ [Not negotiated] id 7 len 4
*Mar 1 05:30:46.166: Di2 LCP: O PROTREJ [Open] id 14 len 10 protocol CDPCP
(0x820701070004)
*Mar 1 05:30:46.182: Di2 IPCP: I CONFACK [ACKsent] id 14 len 10
*Mar 1 05:30:46.182: Di2 IPCP: Address 10.10.10.1 (0x03060A0A0A01)
*Mar 1 05:30:46.182: Di2 IPCP: State is Open
*Mar 1 05:30:46.182: Di2 DDR: dialer protocol up
*Mar 1 05:30:46.182: Di2 IPCP: Install route to 10.10.12.1
*Mar 1 05:30:46.186: BR2/1 DDR: rotor dialout [priority]
*Mar 1 05:30:46.186: BR2/1 DDR: Attempting to dial 6113

```

```

!--- Dial the first number (6113) configured with dialer string command.
!--- This number corresponds to the first BRI on torito.
!--- Remember there is one B-channel available on the remote BRI.

```

```

*Mar 1 05:30:46.186: ISDN BR2/1: TX -> SETUP pd = 8 callref = 0x78
*Mar 1 05:30:46.186: Bearer Capability i = 0x8890
*Mar 1 05:30:46.190: Channel ID i = 0x83
*Mar 1 05:30:46.190: Called Party Number i = 0x80, '6113', Plan:Unknown,
Type:Unknown
*Mar 1 05:30:46.274: ISDN BR2/1: RX <- CALL_PROC pd = 8 callref = 0xF8
*Mar 1 05:30:46.274: Channel ID i = 0x8A
*Mar 1 05:30:46.726: ISDN BR2/1: RX <- CONNECT pd = 8 callref = 0xF8
*Mar 1 05:30:46.730: ISDN BR2/1: TX -> CONNECT_ACK pd = 8 callref = 0x78
*Mar 1 05:30:46.730: %LINK-3-UPDOWN: Interface BRI2/1:2, changed state to up

```

```

!--- Second B-channel is connected.

```

```

*Mar 1 05:30:46.730: BR2/1:2: interface must be fifo queue, force fifo
*Mar 1 05:30:46.734: %DIALER-6-BIND: Interface BR2/1:2 bound to profile Di2
*Mar 1 05:30:46.734: %ISDN-6-CONNECT: Interface BRI2/1:1 is now connected to
6113 torito
*Mar 1 05:30:46.734: BR2/1:2 PPP: Treating connection as a callout
*Mar 1 05:30:46.734: BR2/1:2 PPP: Phase is ESTABLISHING, Active Open
*Mar 1 05:30:46.734: BR2/1:2 LCP: O CONFREQ [Closed] id 31 len 29
*Mar 1 05:30:46.734: BR2/1:2 LCP: AuthProto CHAP (0x0305C22305)
*Mar 1 05:30:46.734: BR2/1:2 LCP: MagicNumber 0x513DE8C4 (0x0506513DE8C4)
*Mar 1 05:30:46.734: BR2/1:2 LCP: MRRU 1524 (0x110405F4)
*Mar 1 05:30:46.734: BR2/1:2 LCP: EndpointDisc 1 Local (0x130A016D656C616E6965)
*Mar 1 05:30:46.774: BR2/1:2 LCP: I CONFREQ [REQsent] id 12 len 28
*Mar 1 05:30:46.774: BR2/1:2 LCP: AuthProto CHAP (0x0305C22305)
*Mar 1 05:30:46.774: BR2/1:2 LCP: MagicNumber 0x00B37556 (0x050600B37556)
*Mar 1 05:30:46.774: BR2/1:2 LCP: MRRU 1524 (0x110405F4)
*Mar 1 05:30:46.774: BR2/1:2 LCP: EndpointDisc 1 Local (0x130901746F7269746F)
*Mar 1 05:30:46.774: BR2/1:2 LCP: O CONFACK [REQsent] id 12 len 28
*Mar 1 05:30:46.774: BR2/1:2 LCP: AuthProto CHAP (0x0305C22305)
*Mar 1 05:30:46.774: BR2/1:2 LCP: MagicNumber 0x00B37556 (0x050600B37556)
*Mar 1 05:30:46.774: BR2/1:2 LCP: MRRU 1524 (0x110405F4)
*Mar 1 05:30:46.774: BR2/1:2 LCP: EndpointDisc 1 Local (0x130901746F7269746F)
*Mar 1 05:30:46.786: BR2/1:2 LCP: I CONFACK [ACKsent] id 31 len 29
*Mar 1 05:30:46.786: BR2/1:2 LCP: AuthProto CHAP (0x0305C22305)
*Mar 1 05:30:46.786: BR2/1:2 LCP: MagicNumber 0x513DE8C4 (0x0506513DE8C4)
*Mar 1 05:30:46.786: BR2/1:2 LCP: MRRU 1524 (0x110405F4)
*Mar 1 05:30:46.786: BR2/1:2 LCP: EndpointDisc 1 Local (0x130A016D656C616E6965)
*Mar 1 05:30:46.786: BR2/1:2 LCP: State is Open
*Mar 1 05:30:46.786: BR2/1:2 PPP: Phase is AUTHENTICATING, by both

```

```

*Mar 1 05:30:46.786: BR2/1:2 CHAP: O CHALLENGE id 14 len 28 from "melanie"
*Mar 1 05:30:46.806: BR2/1:2 CHAP: I CHALLENGE id 7 len 27 from "torito"
*Mar 1 05:30:46.806: BR2/1:2 CHAP: O RESPONSE id 7 len 28 from "melanie"
*Mar 1 05:30:46.822: BR2/1:2 CHAP: I SUCCESS id 7 len 4
*Mar 1 05:30:46.834: BR2/1:2 CHAP: I RESPONSE id 14 len 27 from "torito"
*Mar 1 05:30:46.834: BR2/1:2 CHAP: O SUCCESS id 14 len 4

!--- PPP authentication is complete.

*Mar 1 05:30:46.834: BR2/1:2 PPP: Phase is VIRTUALIZED
*Mar 1 05:30:46.834: BR2/1:2 MLP: torito, multilink up
*Mar 1 05:30:47.138: %LINEPROTO-5-UPDOWN: Line protocol on Interface BRI2/1:1,
changed state to up
*Mar 1 05:30:47.834: %LINEPROTO-5-UPDOWN: Line protocol on Interface BRI2/1:2,
changed state to up
*Mar 1 05:30:52.734: %ISDN-6-CONNECT: Interface BRI2/1:2 is now connected to
6113 torito

!--- Both B-channels are up.

melanie#
*Mar 1 05:31:16.186: BR2/2 DDR: rotor dialout [priority]

!--- Dialout using BRI 2/2.

*Mar 1 05:31:16.186: BR2/2 DDR: Attempting to dial 6113

!--- Dial the first number (6113) configured with dialer string command.
!--- This number corresponds to the first BRI on torito.
!--- Remember there are no B-channels available on the remote BRI.

*Mar 1 05:31:16.186: ISDN BR2/2: TX -> SETUP pd = 8 callref = 0x79
*Mar 1 05:31:16.186: Bearer Capability i = 0x8890
*Mar 1 05:31:16.186: Channel ID i = 0x83
*Mar 1 05:31:16.190: Called Party Number i = 0x80, '6113', Plan:Unknown,
Type:Unknown
*Mar 1 05:31:16.274: ISDN BR2/2: RX <- CALL_PROC pd = 8 callref = 0xF9
*Mar 1 05:31:16.274: Channel ID i = 0x89
*Mar 1 05:31:16.298: ISDN BR2/2: RX <- PROGRESS pd = 8 callref = 0xF9
*Mar 1 05:31:16.302: Progress Ind i = 0x8188 - In-band info or appropriate
now available
*Mar 1 05:31:16.318: ISDN BR2/2: RX <- DISCONNECT pd = 8 callref = 0xF9
*Mar 1 05:31:16.318: Cause i = 0x8191 - User busy

!--- We receive a user busy signal, because there are no available
!--- B-channels on that BRI, and melanie must dial the next BRI on torito.

*Mar 1 05:31:16.322: BRI2/2: wait for isdn carrier timeout, call id=0x8079
*Mar 1 05:31:16.322: BR2/2 DDR: Attempting to dial 6114

!--- Dial the second number (6114) configured with dialer string command.
!--- This number corresponds to the second BRI on torito.
!--- Remember both B-channels are available on that remote BRI.

*Mar 1 05:31:16.326: ISDN BR2/2: TX -> RELEASE pd = 8 callref = 0x79
*Mar 1 05:31:16.326: Cause i = 0x8091 - User busy

!--- Release message from the previous failed call.

*Mar 1 05:31:16.346: ISDN BR2/2: TX -> SETUP pd = 8 callref = 0x7A

!--- Setup message for next call.

*Mar 1 05:31:16.346: Bearer Capability i = 0x8890

```

```
*Mar 1 05:31:16.346: Channel ID i = 0x83
*Mar 1 05:31:16.346: Called Party Number i = 0x80, '6114', Plan:Unknown,
Type:Unknown
*Mar 1 05:31:16.362: ISDN BR2/2: RX <- RELEASE_COMP pd = 8 callref = 0xF9
```

!--- Release acknowledgement for previous failed call.

```
*Mar 1 05:31:16.422: ISDN BR2/2: RX <- CALL_PROC pd = 8 callref = 0xFA
```

!--- ISDN call progress message.

```
*Mar 1 05:31:16.426: Channel ID i = 0x89
*Mar 1 05:31:16.878: ISDN BR2/2: RX <- CONNECT pd = 8 callref = 0xFA
*Mar 1 05:31:16.882: ISDN BR2/2: TX -> CONNECT_ACK pd = 8 callref = 0x7A
*Mar 1 05:31:16.882: %LINK-3-UPDOWN: Interface BRI2/2:1, changed state to up
```

!--- Call is connected on BRI 2/2 B-channel 1.

```
*Mar 1 05:31:16.882: BR2/2:1: interface must be fifo queue, force fifo
*Mar 1 05:31:16.882: %DIALER-6-BIND: Interface BR2/2:1 bound to profile Di2
```

!--- Call is bound to interface Dialer 2.

```
*Mar 1 05:31:16.886: BR2/2:1 PPP: Treating connection as a callout
*Mar 1 05:31:16.886: BR2/2:1 PPP: Phase is ESTABLISHING, Active Open
*Mar 1 05:31:16.886: BR2/2:1 LCP: O CONFREQ [Closed] id 31 len 29
*Mar 1 05:31:16.886: BR2/2:1 LCP: AuthProto CHAP (0x0305C22305)
*Mar 1 05:31:16.886: BR2/2:1 LCP: MagicNumber 0x513E5E8D (0x0506513E5E8D)
*Mar 1 05:31:16.886: BR2/2:1 LCP: MRRU 1524 (0x110405F4)
*Mar 1 05:31:16.886: BR2/2:1 LCP: EndpointDisc 1 Local (0x130A016D656C616E6965)
*Mar 1 05:31:16.926: BR2/2:1 LCP: I CONFREQ [REQsent] id 11 len 28
*Mar 1 05:31:16.926: BR2/2:1 LCP: AuthProto CHAP (0x0305C22305)
*Mar 1 05:31:16.926: BR2/2:1 LCP: MagicNumber 0x00B3EB20 (0x050600B3EB20)
*Mar 1 05:31:16.926: BR2/2:1 LCP: MRRU 1524 (0x110405F4)
*Mar 1 05:31:16.926: BR2/2:1 LCP: EndpointDisc 1 Local (0x130901746F7269746F)
*Mar 1 05:31:16.926: BR2/2:1 LCP: O CONFACK [REQsent] id 11 len 28
*Mar 1 05:31:16.926: BR2/2:1 LCP: AuthProto CHAP (0x0305C22305)
*Mar 1 05:31:16.926: BR2/2:1 LCP: MagicNumber 0x00B3EB20 (0x050600B3EB20)
*Mar 1 05:31:16.926: BR2/2:1 LCP: MRRU 1524 (0x110405F4)
*Mar 1 05:31:16.926: BR2/2:1 LCP: EndpointDisc 1 Local (0x130901746F7269746F)
*Mar 1 05:31:16.938: BR2/2:1 LCP: I CONFACK [ACKsent] id 31 len 29
*Mar 1 05:31:16.938: BR2/2:1 LCP: AuthProto CHAP (0x0305C22305)
*Mar 1 05:31:16.938: BR2/2:1 LCP: MagicNumber 0x513E5E8D (0x0506513E5E8D)
*Mar 1 05:31:16.938: BR2/2:1 LCP: MRRU 1524 (0x110405F4)
*Mar 1 05:31:16.938: BR2/2:1 LCP: EndpointDisc 1 Local (0x130A016D656C616E6965)
*Mar 1 05:31:16.938: BR2/2:1 LCP: State is Open
*Mar 1 05:31:16.938: BR2/2:1 PPP: Phase is AUTHENTICATING, by both
*Mar 1 05:31:16.938: BR2/2:1 CHAP: O CHALLENGE id 14 len 28 from "melanie"
*Mar 1 05:31:16.958: BR2/2:1 CHAP: I CHALLENGE id 6 len 27 from "torito"
*Mar 1 05:31:16.958: BR2/2:1 CHAP: O RESPONSE id 6 len 28 from "melanie"
*Mar 1 05:31:16.974: BR2/2:1 CHAP: I SUCCESS id 6 len 4
*Mar 1 05:31:16.986: BR2/2:1 CHAP: I RESPONSE id 14 len 27 from "torito"
*Mar 1 05:31:16.986: BR2/2:1 CHAP: O SUCCESS id 14 len 4
```

!--- CHAP authentication is successful.

```
*Mar 1 05:31:16.986: BR2/2:1 PPP: Phase is VIRTUALIZED
*Mar 1 05:31:16.990: BR2/2:1 MLP: torito, multilink up
*Mar 1 05:31:17.986: %LINEPROTO-5-UPDOWN: Line protocol on Interface BRI2/2:1,
changed state to up
*Mar 1 05:31:22.886: %ISDN-6-CONNECT: Interface BRI2/2:1 is now connected to
6114 torito
```

!--- Call connection is complete.

```

melanie#
*Mar 1 05:31:46.186: BR2/2 DDR: rotor dialout [priority]
*Mar 1 05:31:46.186: BR2/2 DDR: Attempting to dial 6113

!--- Dial the first number (6113) configured with dialer string command.
!--- This number corresponds to the first BRI on torito.
!--- Remember there are no B-channels available on the remote BRI.

*Mar 1 05:31:46.186: ISDN BR2/2: TX -> SETUP pd = 8 callref = 0x7B
*Mar 1 05:31:46.186: Bearer Capability i = 0x8890
*Mar 1 05:31:46.186: Channel ID i = 0x83
*Mar 1 05:31:46.190: Called Party Number i = 0x80, '6113', Plan:Unknown,
Type:Unknown
*Mar 1 05:31:46.274: Channel ID i = 0x8A
*Mar 1 05:31:46.302: ISDN BR2/2: RX <- PROGRESS pd = 8 callref = 0xFB
*Mar 1 05:31:46.302: Progress Ind i = 0x8188 - In-band info or appropriate
now available
*Mar 1 05:31:46.318: ISDN BR2/2: RX <- DISCONNECT pd = 8 callref = 0xFB
*Mar 1 05:31:46.322: Cause i = 0x8191 - User busy

!--- We receive a user busy signal, since there are no available B-channels.
!--- on that BRI melanie must dial the next BRI on torito.

*Mar 1 05:31:46.322: BRI2/2: wait for isdn carrier timeout, call id=0x807B
*Mar 1 05:31:46.326: BR2/2 DDR: Attempting to dial 6114

!--- Dial the second number (6114) configured with dialer string command.
!--- This number corresponds to the second BRI on torito.
!--- Remember there is one B-channels available on that remote BRI.

*Mar 1 05:31:46.326: ISDN BR2/2: TX -> RELEASE pd = 8 callref = 0x7B
*Mar 1 05:31:46.326: Cause i = 0x8091 - User busy

!--- Release message from the previous failed call.

*Mar 1 05:31:46.346: ISDN BR2/2: TX -> SETUP pd = 8 callref = 0x7C

!--- Setup message for next call.

*Mar 1 05:31:46.346: Bearer Capability i = 0x8890
*Mar 1 05:31:46.346: Channel ID i = 0x83
*Mar 1 05:31:46.346: Called Party Number i = 0x80, '6114', Plan:Unknown,
Type:Unknown
*Mar 1 05:31:46.362: ISDN BR2/2: RX <- RELEASE_COMP pd = 8 callref = 0xFB

!--- Release acknowledgement for previous failed call.

*Mar 1 05:31:46.422: ISDN BR2/2: RX <- CALL_PROC pd = 8 callref = 0xFC
*Mar 1 05:31:46.426: Channel ID i = 0x8A
*Mar 1 05:31:46.878: ISDN BR2/2: RX <- CONNECT pd = 8 callref = 0xFC
*Mar 1 05:31:46.882: ISDN BR2/2: TX -> CONNECT_ACK pd = 8 callref = 0x7C
*Mar 1 05:31:46.882: %LINK-3-UPDOWN: Interface BRI2/2:2, changed state to up

!--- Call is connected on BRI 2/2 B-channel 2.

*Mar 1 05:31:46.882: BR2/2:2: interface must be fifo queue, force fifo
*Mar 1 05:31:46.882: %DIALER-6-BIND: Interface BR2/2:2 bound to profile Di2

!--- Call is bound to interface Dialer 2.

*Mar 1 05:31:46.886: BR2/2:2 PPP: Treating connection as a callout
*Mar 1 05:31:46.886: BR2/2:2 PPP: Phase is ESTABLISHING, Active Open
*Mar 1 05:31:46.886: BR2/2:2 LCP: O CONFREQ [Closed] id 24 len 29

```

```

*Mar 1 05:31:46.886: BR2/2:2 LCP: AuthProto CHAP (0x0305C22305)
*Mar 1 05:31:46.886: BR2/2:2 LCP: MagicNumber 0x513ED3BF (0x0506513ED3BF)
*Mar 1 05:31:46.886: BR2/2:2 LCP: MRRU 1524 (0x110405F4)
*Mar 1 05:31:46.886: BR2/2:2 LCP: EndpointDisc 1 Local (0x130A016D656C616E6965)
*Mar 1 05:31:46.922: BR2/2:2 LCP: I CONFREQ [REQsent] id 10 len 28
*Mar 1 05:31:46.922: BR2/2:2 LCP: AuthProto CHAP (0x0305C22305)
*Mar 1 05:31:46.926: BR2/2:2 LCP: MagicNumber 0x00B46053 (0x050600B46053)
*Mar 1 05:31:46.926: BR2/2:2 LCP: MRRU 1524 (0x110405F4)
*Mar 1 05:31:46.926: BR2/2:2 LCP: EndpointDisc 1 Local (0x130901746F7269746F)
*Mar 1 05:31:46.926: BR2/2:2 LCP: O CONFACK [REQsent] id 10 len 28
*Mar 1 05:31:46.926: BR2/2:2 LCP: AuthProto CHAP (0x0305C22305)
*Mar 1 05:31:46.926: BR2/2:2 LCP: MagicNumber 0x00B46053 (0x050600B46053)
*Mar 1 05:31:46.926: BR2/2:2 LCP: MRRU 1524 (0x110405F4)
*Mar 1 05:31:46.926: BR2/2:2 LCP: EndpointDisc 1 Local (0x130901746F7269746F)
*Mar 1 05:31:46.938: BR2/2:2 LCP: I CONFACK [ACKsent] id 24 len 29
*Mar 1 05:31:46.938: BR2/2:2 LCP: AuthProto CHAP (0x0305C22305)
*Mar 1 05:31:46.938: BR2/2:2 LCP: MagicNumber 0x513ED3BF (0x0506513ED3BF)
*Mar 1 05:31:46.938: BR2/2:2 LCP: MRRU 1524 (0x110405F4)
*Mar 1 05:31:46.938: BR2/2:2 LCP: EndpointDisc 1 Local (0x130A016D656C616E6965)
*Mar 1 05:31:46.938: BR2/2:2 LCP: State is Open
*Mar 1 05:31:46.938: BR2/2:2 PPP: Phase is AUTHENTICATING, by both
*Mar 1 05:31:46.938: BR2/2:2 CHAP: O CHALLENGE id 11 len 28 from "melanie"
*Mar 1 05:31:46.958: BR2/2:2 CHAP: I CHALLENGE id 6 len 27 from "torito"
*Mar 1 05:31:46.958: BR2/2:2 CHAP: O RESPONSE id 6 len 28 from "melanie"
*Mar 1 05:31:46.974: BR2/2:2 CHAP: I SUCCESS id 6 len 4
*Mar 1 05:31:46.982: BR2/2:2 CHAP: I RESPONSE id 11 len 27 from "torito"
*Mar 1 05:31:46.986: BR2/2:2 CHAP: O SUCCESS id 11 len 4

```

!--- CHAP authentication is successful.

```

*Mar 1 05:31:46.986: BR2/2:2 PPP: Phase is VIRTUALIZED
*Mar 1 05:31:46.986: BR2/2:2 MLP: torito, multilink up
*Mar 1 05:31:47.986: %LINEPROTO-5-UPDOWN: Line protocol on Interface BRI2/2:2,
changed state to up
*Mar 1 05:31:52.886: %ISDN-6-CONNECT: Interface BRI2/2:2 is now connected to
6114 torito

```

!--- Call connection is complete.

```
melanie#ping 10.10.12.1
```

```

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.10.12.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 24/24/24 ms

```

!--- Successful ping.

```
melanie#
```

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