

Multilink PPP Across Two Serial Physical-layer Async Interfaces

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Introduction

In some environments, it may be necessary to bundle multiple asynchronous links to act as single link with aggregated bandwidth. This document describes how to configure a Cisco 2500 Access Server to bundle two asynchronous interfaces using a virtual template.

This configuration can be used for routers connected by asynchronous lines with external modems or using network modules (built-in modems). You can add additional features to this configuration depending on your needs.

Prerequisites

Requirements

There are no specific prerequisites for this document.

Components Used

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

- Cisco 2511 and Cisco 2503 routers in a lab environment with cleared configurations.
- Cisco IOS® Software Release 12.2(10b) is running on both routers.
- Four external modems.

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.

Related Products

This configuration can be used with any two routers that each have two WAN serial interfaces and are capable of configuring the async interface. WIC-1T, WIC-2A/S, 8 or 16 asynchronous port serial interfaces can be used.

Conventions

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

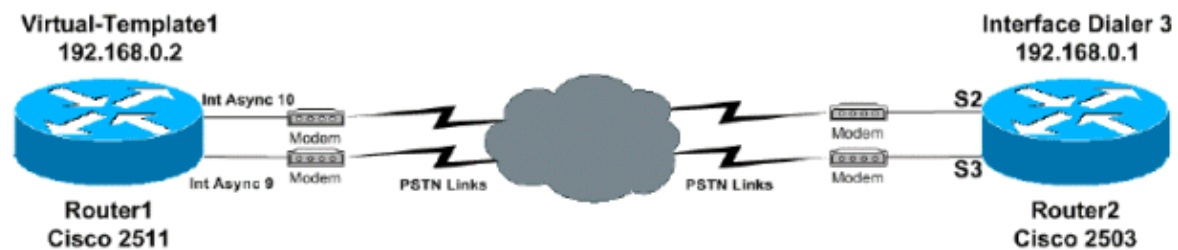
Configure

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 the network setup shown in the diagram below.



Configurations

This document uses the configurations shown below.

Note: This configuration was tested using Cisco IOS Software Release 12.2(10b) on Cisco 2500 series routers. The same configuration applies to a similar router topology running Cisco IOS software releases starting from Release 11.0(3).

```
Router 1 (Cisco 2511)
Current configuration : 1185 bytes
!
version 12.2
service timestamps debug datetime msec
service timestamps log datetime msec
!
hostname Router1
!
username Router2 password 0 xxxxx
ip subnet-zero
!
multilink virtual-template 1
!--- Applies the virtual interface template to the multilink bundle.
!
```

```

interface Loopback0
 ip address 192.168.0.2 255.255.255.0
!
interface Ethernet0
 ip address 10.0.0.1 255.255.255.0
!

!--- Interface virtual-template is a logical interface which creates
!--- virtual access interfaces dynamically and applies them to physical
!--- asynchronous interfaces.

interface Virtual-Templat1
 ip unnumbered Loopback0
 ppp authentication chap

!--- Enables multilink PPP on the virtual template interface.

 ppp multilink
!

!--- The parameters configured in interface group-async are
!--- applied to the group and range reduces the repeated configuration
!--- in asynchronours interfaces.

interface Group-Async0
 ip unnumbered Loopback0
 encapsulation ppp
 async default routing

!--- Permits routing over the async interface.
!--- This is required for a routing protocol to run across the async link.

 async mode dedicated

!--- Places the line into dedicated asynchronous network mode.
!--- This interface is now automatically configured for PPP connections.

 ppp authentication chap
 ppp multilink
 group-range 9 10

!--- Group-range indicates the asynchronous interfaces which comes under
!--- the Group-Async interface.

!
router ospf 1
 redistribute connected subnets
 network 192.168.0.0 0.0.0.255 area 0
!
ip classless
!
dialer-list 1 protocol ip permit
!
!
line con 0
line 1 8
 flush-at-activation
line 9 10
 modem InOut
 modem autoconfigure type default
 transport input all
 autohangup
 speed 115200
line 11 16
 flush-at-activation
line aux 0

```

```
line vty 0 4
 login
!
end
```

Router 2 (Cisco 2503)

```
Current configuration : 1645 bytes
!
version 12.2
service timestamps debug datetime msec
service timestamps log datetime msec
!
hostname Router2
!
username Router1 password 0 xxxxx

!--- Username for remote router (Router1) and shared secret.
!--- Shared secret(used for CHAP authentication) must be the same on both sides.

ip subnet-zero
!
chat-script test "" "ATDT\T" TIMEOUT 120 CONNECT \C

!--- A chat script is a string of text that defines the handshaking that occurs
!--- between the router and the modem to successfully handshake with the destination.
!--- In this chat-script called "test" the expected string "" is
!--- the null from the destination. The send string "ATDT\T" instructs the
!--- modem to dial the telephone number in the dialer string
!--- command. This is 30116 and 30114 in the Interface dialer 3 TIMEOUT 120 CONNECT \C.
!--- It waits up to 120 seconds for the input string "CONNECT". \C is an escape
!--- sequence to end the chat-script.
!--- Refer to the Modem-Router Connection Guide and Chat-script
!--- for more information

!
modemcap entry default

!--- Modemcap named "default" will be applied to the line 2 and line 3 of
!--- Serial interfaces. Refer to the Modem-Router Connection Guide and
!--- modemcap entry for more information.

!
interface Loopback0
 ip address 192.168.0.1 255.255.255.0
!
interface Ethernet0
 ip address 172.16.1.1 255.255.255.0
!
!
interface Serial2
 physical-layer async
 no ip address
 encapsulation ppp
 dialer in-band
 dialer rotary-group 3

!--- Dialer rotary-group applies the the logical interface dialer 3
!--- configuration to physical serial Interfaces 2 and 3. This simplifies the
!--- configuration, else the commands in interface dialer has to be repeatedly
!--- configured in physical interfaces.

 async mode dedicated
!
interface Serial3
```

```

physical-layer async
no ip address
encapsulation ppp
dialer in-band
dialer rotary-group 3
dialer-group 1
async default routing
async mode dedicated
!
interface Dialer3

! -- This is a logical interface applied to dialer rotary-group.

ip unnumbered Loopback0
encapsulation ppp
dialer in-band
dialer idle-timeout 60
dialer map ip 192.168.0.2 name Router1 modem-script test broadcast 30116
dialer map ip 192.168.0.2 name Router1 modem-script test broadcast 30114

!--- dialer map statements for the remote router Router1
!--- The name must match the one used by the remote router to identify itself.
!--- use modem chat script "test" for this connection

dialer hold-queue 15
dialer load-threshold 1 either
dialer-group 1
no cdp enable
ppp authentication chap
ppp multilink
!
router ospf 1
 redistribute connected subnets
 network 192.168.0.0 0.0.0.255 area 0
!
ip classless
!
dialer-list 1 protocol ip permit

!--- All IP traffic is defined interesting.
!--- This is applied to Async interface 2 and 3 using dialer-group 1.

!
!
line con 0
line 2 3
 modem InOut
 modem autoconfigure type default

!--- Apply the modemcap "default" (configured previously) to
!--- initialize the modem. Refer to the link Modem-Router Connection Guide
!--- for more information.

transport input all

!--- Allows all protocols to be passed to the access server
!--- through the line.

autohangup

!--- Disconnects the line automatically after the connection closes.

speed 115200
line aux 0
line vty 0 4
 login

```

```
!  
end
```

To implement this configuration, you have to configure the following:

- Create a multilink virtual-template number on Router 1.
- Configure **ppp multilink** under the interfaces on both routers.
- Configure authentication under the interfaces on both routers.

In the configuration used in this document, Router 1 has been configured to only receive calls, while Router 2 initiates the call and connects to Router 1. Both routers are configured for multilink PPP. When the connection comes up, a master bundle is created and both async links are bundled together under a virtual-access interface.

Interfaces 9 and 10 on Router 1 only receive async calls. It is normal not to see interface 9 and 10 when they are part of group-async 1. Be sure to create a multilink virtual template; otherwise, it is possible to connect on the first channel, but not pass traffic (IP Control Protocol [IPCP] closed). Without a virtual-template and multilink PPP, this configuration would work for one async connection, but not for both.

Interfaces 2 and 3 on Router 2 are configured with the **physical-layer async** command and will accept multilink PPP commands. These interfaces will automatically be removed when they become part of dialer rotary-group. As soon as you enter the **dialer rotary-group 3** command, the **serial ppp multilink** command is deleted from the configuration. Use the **ppp multilink** command under interface dialer 3 instead.

Verify

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

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

```
Router1#show ip route  
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP  
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area  
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2  
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP  
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area  
* - candidate default, U - per-user static route, o - ODR  
P - periodic downloaded static route  
  
Gateway of last resort is not set  
  
172.16.0.0/24 is subnetted, 1 subnets  
O E2 172.16.1.0 [110/20] via 192.168.0.1, 00:32:54, Virtual-Access1  
10.0.0.0/24 is subnetted, 1 subnets  
C 10.0.0.0 is directly connected, Ethernet0  
192.168.0.0/24 is variably subnetted, 2 subnets, 2 masks  
C 192.168.0.0/24 is directly connected, Loopback0  
C 192.168.0.1/32 is directly connected, Virtual-Access1  
  
Router1#show ppp multilink  
  
Virtual-Access1, bundle name is Router2  
  
!--- Virtualized MP bundle. Bundle name is derived from the username used  
!--- during authentication  
  
Bundle up for 00:34:48
```

```
0 lost fragments, 0 reordered, 0 unassigned
0 discarded, 0 lost received, 1/255 load
0xC8 received sequence, 0xC8 sent sequence
Member links: 2 (max not set, min not set)
  Async9, since 00:34:52, last rcvd seq 0000C6
  Async10, since 00:32:11, last rcvd seq 0000C7
```

Router2#show ip route

```
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route
```

Gateway of last resort is not set

```
172.16.0.0/24 is subnetted, 1 subnets
C    172.16.1.0 is directly connected, Ethernet0
10.0.0.0/24 is subnetted, 1 subnets
O E2  10.0.0.0 [110/20] via 192.168.0.2, 00:45:10, Dialer3
      192.168.0.0/24 is variably subnetted, 2 subnets, 2 masks
C    192.168.0.0/24 is directly connected, Loopback0
C    192.168.0.2/32 is directly connected, Dialer3
```

Router2#show ppp multilink

Virtual-Access1, bundle name is Router1

!--- Virtualized MP bundle. Bundle name is derived from the username used during authentication.

```
Bundle up for 00:35:10
Dialer interface is Dialer3
```

!--- This Virtual Access Interface used Interface Dialer3.

```
0 lost fragments, 0 reordered, 0 unassigned
0 discarded, 0 lost received, 1/255 load
0xC9 received sequence, 0xCA sent sequence
Member links: 2 (max not set, min not set)
  Serial3, since 00:35:10, last rcvd seq 0000C8
  Serial2, since 00:32:29, last rcvd seq 0000C7
```

Router1#show caller

Line	User	Service	Active Time	Idle Time
con 0	-	TTY	00:12:03	00:00:00
tty 2	-	TTY	1d08h	00:00:00
tty 4	-	TTY	1d08h	00:00:00
tty 9	Router2	Async	00:43:17	00:00:05
tty 10	Router2	Async	00:40:36	00:00:15

!--- First connection

As9	Router2	PPP	00:43:13	-
-----	---------	-----	----------	---

!--- Second connection

As10	Router2	PPP	00:40:32	-
------	---------	-----	----------	---

!--- MP bundle

!--- Router2 has two async lines, two TTY, and one virtual interface bundle.

```
Vi1 Router2 PPP Bundle 00:43:10 00:00:05
```

```
Router2#show caller
```

Line	User	Service	Active Time	Idle Time
con 0	-	TTY	00:11:36	00:00:00
tty 2	Router1	Async	-	00:00:07
tty 3	Router1	Async	-	00:00:18

```
! --- Second connection
```

Se2	Router1	PPP	00:39:58	-
-----	---------	-----	----------	---

```
! --- First connection
```

Se3	Router1	PPP	00:42:39	-
-----	---------	-----	----------	---

```
! --- MP bundle
```

```
! --- Router1 has two async lines, two TTY, and one virtual interface bundle.
```

```
Vi1 Router1 PPP Bundle 00:42:39 00:00:01
```

```
Router2#show caller user Router1
```

```
User: Router1, line tty 2, service Async  
Idle time 00:00:16
```

Timeouts:	Absolute	Idle Session	Idle Exec
Limits:	-	-	00:10:00
Disconnect in:	-	-	-

```
TTY: Line 2, running PPP on Se2
```

```
Line: Baud rate (TX/RX) is 115200/115200, no parity, 2 stopbits, 8 databits  
Status: Ready, Active, Async Interface Active, Modem Detected  
Capabilities: Modem Callout, Modem RI is CD,  
Line is permanent async interface, Hangup on Last Close  
Modem Autoconfigure  
Modem State: Ready, Modem Configured
```

```
User: Router1, line tty 3, service Async  
Idle time 00:00:08
```

Timeouts:	Absolute	Idle Session	Idle Exec
Limits:	-	-	00:10:00
Disconnect in:	-	-	-

```
TTY: Line 3, running PPP on Se3
```

```
Line: Baud rate (TX/RX) is 115200/115200, no parity, 2 stopbits, 8 databits  
Status: Ready, Active, Async Interface Active, Modem Detected  
Capabilities: Modem Callout, Modem RI is CD,  
Line is permanent async interface, Hangup on Last Close  
Modem Autoconfigure  
Modem State: Ready, Modem Configured
```

```
User: Router1, line Se2, service PPP
```

```
Active time 23:14:47, Idle time 00:00:00
```

Timeouts:	Absolute	Idle
Limits:	-	-
Disconnect in:	-	-

```
PPP: LCP Open, multilink Open, CHAP (local <--> local)
```

```
Dialer: Connected to 30116, outbound
```

```
Type is IN-BAND ASYNC, group Di3
```

```
Cause: Multilink bundle overloaded
```

```
IP: Local 192.168.0.1
```

```
Bundle: Member of Router1, last input 00:00:01
```

```
Counts: 10194 packets input, 769456 bytes, 0 no buffer  
0 input errors, 0 CRC, 0 frame, 0 overrun
```

10247 packets output, 773761 bytes, 0 underruns
0 output errors, 0 collisions, 31 interface resets

User: Router1, line Se3, service PPP

Active time 23:17:30, Idle time 00:00:01

Timeouts: Absolute Idle

Limits: - -

Disconnect in: - -

PPP: LCP Open, **multilink Open**, CHAP (local <--> local)

Dialer: Connected to 30116, outbound

Type is IN-BAND ASYNC, group Di3

Cause: ip (s=192.168.0.1, d=224.0.0.5)

IP: Local 192.168.0.1

Bundle: Member of Router1, last input 00:00:00

Counts: 10432 packets input, 783562 bytes, 0 no buffer

0 input errors, 0 CRC, 0 frame, 0 overrun

10718 packets output, 799155 bytes, 0 underruns

0 output errors, 0 collisions, 41 interface resets

User: Router1, line Vi1, service PPP Bundle

Active time 23:17:30, Idle time 00:00:05

Timeouts: Absolute Idle

Limits: - 00:01:00

Disconnect in: - 00:00:54

!--- Idle-timeout is 60 seconds(1 Minute).

PPP: LCP Open, **multilink Open**, IPCP

Dialer: Connected to 30116, outbound

Idle timer 60 secs, idle 6 secs

Type is IN-BAND SYNC, group Di3

IP: Local 192.168.0.1, remote 192.168.0.2

!--- IP address assigned to the bundle

!--- and loopback address of the remote router.

Bundle: First link of Router1, 2 links, last input 00:00:07

Counts: 8622 packets input, 623202 bytes, 0 no buffer

0 input errors, 0 CRC, 0 frame, 0 overrun

8776 packets output, 618523 bytes, 0 underruns

0 output errors, 0 collisions, 0 interface resets

Router2#**show dialer**

Di3 - dialer type = IN-BAND SYNC NO-PARITY

Load threshold for dialing additional calls is 1

!--- Load threshold

Idle timer (60 secs), Fast idle timer (20 secs)

Wait for carrier (30 secs), Re-enable (15 secs)

Number of active calls = 2

Dial String	Successes	Failures	Last DNIS	Last status
30114	3	69	00:41:45	successful
30116	4294967293	75	00:44:00	failed

Se2 - dialer type = IN-BAND ASYNC NO-PARITY

Rotary group 3, priority 0

!--- Member of interface dialer 3

Idle timer (60 secs), Fast idle timer (20 secs)

Wait for carrier (30 secs), Re-enable (15 secs)

Dialer state is multilink member

Dial reason: Multilink bundle overloaded

```

!--- Interface was not the first link in the MP bundle

Connected to 30116 (Router1)

!--- Phone number that was dialed

Se3 - dialer type = IN-BAND ASYNC NO-PARITY
Rotary group 3, priority 0

!--- Member of interface dialer 3

Idle timer (60 secs), Fast idle timer (20 secs)
Wait for carrier (30 secs), Re-enable (15 secs)
Dialer state is multilink member
Dial reason: ip (s=192.168.0.1, d=224.0.0.5)

!--- Interface was the first link in the bundle, triggered by OSPF ALL
!--- Routers advt packet.

Connected to 30116 (Router1)

! --- Phone number that was dialed

```

Troubleshoot

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

The following outputs were obtained from the Cisco 2511 and Cisco 2503 routers. They show the Cisco 2503 dialing to PSTN links of the Cisco 2511 router and establishing a MP connection.

```

Router1#debug ppp negotiation
PPP protocol negotiation debugging is on

Router1#debug vtemplate
Virtual Template debugging is on

Router1#show debug
PPP:
  PPP protocol negotiation debugging is on
VTEMPLATE:
  Virtual Template debugging is on

Oct  1 20:15:20.463: As9 LCP: I CONFREQ [Closed] id 81 len 39
Oct  1 20:15:20.463: As9 LCP:   ACCM 0x000A0000 (0x0206000A0000)
Oct  1 20:15:20.467: As9 LCP:   AuthProto CHAP (0x0305C22305)
Oct  1 20:15:20.471: As9 LCP:   MagicNumber 0x57D7985D (0x050657D7985D)
Oct  1 20:15:20.471: As9 LCP:   PFC (0x0702)
Oct  1 20:15:20.475: As9 LCP:   ACFC (0x0802)
Oct  1 20:15:20.479: As9 LCP:   MRRU 1524 (0x110405F4)
Oct  1 20:15:20.479: As9 LCP:   EndpointDisc 1 Router2 (0x130A01526F7574657232)
Oct  1 20:15:20.483: As9 LCP: Lower layer not up, Fast Starting
Oct  1 20:15:20.487: As9 PPP: Treating connection as a dedicated line
Oct  1 20:15:20.487: As9 PPP: Phase is ESTABLISHING, Active Open [0 sess, 0 load]
Oct  1 20:15:20.495: As9 LCP: O CONFREQ [Closed] id 52 len 39
Oct  1 20:15:20.499: As9 LCP:   ACCM 0x000A0000 (0x0206000A0000)
Oct  1 20:15:20.499: As9 LCP:   AuthProto CHAP (0x0305C22305)
Oct  1 20:15:20.503: As9 LCP:   MagicNumber 0x078F2456 (0x0506078F2456)
Oct  1 20:15:20.507: As9 LCP:   PFC (0x0702)
Oct  1 20:15:20.507: As9 LCP:   ACFC (0x0802)
Oct  1 20:15:20.511: As9 LCP:   MRRU 1524 (0x110405F4)
Oct  1 20:15:20.515: As9 LCP:   EndpointDisc 1 Router1 (0x130A01526F7574657231)

```

```

Oct  1 20:15:20.519: As9 LCP: O CONFACK [REQsent] id 81 len 39
Oct  1 20:15:20.523: As9 LCP:   ACCM 0x000A0000 (0x0206000A0000)
Oct  1 20:15:20.527: As9 LCP:   AuthProto CHAP (0x0305C22305)
Oct  1 20:15:20.527: As9 LCP:   MagicNumber 0x57D7985D (0x050657D7985D)
Oct  1 20:15:20.531: As9 LCP:   PFC (0x0702)
Oct  1 20:15:20.531: As9 LCP:   ACFC (0x0802)
Oct  1 20:15:20.535: As9 LCP:   MRRU 1524 (0x110405F4)
Oct  1 20:15:20.539: As9 LCP:   EndpointDisc 1 Router2 (0x130A01526F7574657232)
Oct  1 20:15:20.547: %LINK-3-UPDOWN: Interface Async9, changed state to up
Oct  1 20:15:20.695: As9 LCP: I CONFACK [ACKsent] id 52 len 39
Oct  1 20:15:20.699: As9 LCP:   ACCM 0x000A0000 (0x0206000A0000)
Oct  1 20:15:20.703: As9 LCP:   AuthProto CHAP (0x0305C22305)
Oct  1 20:15:20.707: As9 LCP:   MagicNumber 0x078F2456 (0x0506078F2456)
Oct  1 20:15:20.707: As9 LCP:   PFC (0x0702)
Oct  1 20:15:20.711: As9 LCP:   ACFC (0x0802)
Oct  1 20:15:20.711: As9 LCP:   MRRU 1524 (0x110405F4)
Oct  1 20:15:20.715: As9 LCP:   EndpointDisc 1 Router1 (0x130A01526F7574657231)
Oct  1 20:15:20.719: As9 LCP: State is Open
Oct  1 20:15:20.723: As9 PPP: Phase is AUTHENTICATING, by both [0 sess, 0 load]
Oct  1 20:15:20.727: As9 CHAP: O CHALLENGE id 45 len 28 from "Router1"
Oct  1 20:15:20.739: As9 CHAP: I CHALLENGE id 40 len 28 from "Router2"
Oct  1 20:15:20.743: As9 CHAP: O RESPONSE id 40 len 28 from "Router1"
Oct  1 20:15:20.899: As9 CHAP: I RESPONSE id 45 len 28 from "Router2"
Oct  1 20:15:20.903: As9 CHAP: I SUCCESS id 40 len 4
Oct  1 20:15:20.919: As9 CHAP: O SUCCESS id 45 len 4

!--- Call is virtualized after authentication

Oct  1 20:15:20.923: As9 PPP: Phase is VIRTUALIZED [0 sess, 1 load]

!--- creation of Virtual access interface 1

Oct  1 20:15:20.935: Vi1 VTEMPLATE: Reuse Vi1, recycle queue size 0
Oct  1 20:15:20.939: Vi1 VTEMPLATE: Set default settings with ip unnumbered
Oct  1 20:15:21.335: Vi1 VTEMPLATE: Hardware address 0000.0c47.7c6c
Oct  1 20:15:21.335: Vi1 PPP: Phase is DOWN, Setup [0 sess, 1 load]
Oct  1 20:15:21.339: Vi1 VTEMPLATE: Has a new cloneblk vtemplate,
now it has vtemplate

!--- Banner: Cloning is in progress on virtual access interface 1

Oct  1 20:15:21.347: Vi1 VTEMPLATE: ***** CLONE VACCESS1 *****
Oct  1 20:15:21.351: Vi1 VTEMPLATE: Clone from Virtual-Templat1

!--- The following configuration of Virtual-template is cloned to the
!--- Virtual-access interface.

interface Virtual-Access1
default ip address
no ip address
encap ppp
ip unnumbered Loopback0
no ip unnumbered Loopback0
ip addr 192.168.0.2 255.255.255.0
no ip add
ip unnumbered lo 0
ip add 192.168.0.2 255.255.255.0
ip add 192.168.1.2 255.255.255.0
no ip add
ip unnumbered lo 0
end

Oct  1 20:15:21.367: As9 IPCP: Packet buffered while building MLP bundle interface
Oct  1 20:15:22.319: %LINEPROTO-5-UPDOWN: Line protocol on Interface Async9,
changed state to up
Oct  1 20:15:23.267: As9 IPCP: Packet buffered while building MLP bundle interface

```

```
Oct 1 20:15:24.447: Vi1 VTEMPLATE: Messages from (un)cloning ...
192.168.0.0 overlaps with Loopback0

Oct 1 20:15:24.823: Vi1 VTEMPLATE: Messages from (un)cloning ...
192.168.0.0 overlaps with Loopback0
Oct 1 20:15:24.835: %LINK-3-UPDOWN: Interface Virtual-Access1,
changed state to up
Oct 1 20:15:24.843: Vi1 PPP: Treating connection as a dedicated line
Oct 1 20:15:24.847: Vi1 PPP: Phase is ESTABLISHING, Active Open [0 sess, 1 load]
Oct 1 20:15:24.851: Vi1 LCP: O CONFREQ [Closed] id 1 len 29
Oct 1 20:15:24.855: Vi1 LCP: AuthProto CHAP (0x0305C22305)
Oct 1 20:15:24.859: Vi1 LCP: MagicNumber 0x078F3560 (0x0506078F3560)
Oct 1 20:15:24.859: Vi1 LCP: MRRU 1524 (0x110405F4)
Oct 1 20:15:24.863: Vi1 LCP: EndpointDisc 1 Router1 (0x130A01526F7574657231)

Oct 1 20:15:24.879: Vi1 PPP: Phase is UP [0 sess, 1 load]
Oct 1 20:15:24.883: Vi1 IPCP: O CONFREQ [Closed] id 1 len 10
Oct 1 20:15:24.883: Vi1 IPCP: Address 192.168.0.2 (0x0306C0A80002)

! -- Asynchronous interface 9 is added to the Virtual access interface 1
!-- and the name of the bundle is Router2.

Oct 1 20:15:24.891: Vi1 MLP: Added first link As9 to bundle Router2
Oct 1 20:15:24.891: Vi1 PPP: Pending ncpQ size is 2
Oct 1 20:15:24.895: As9 IPCP: Redirect packet to Vi1
Oct 1 20:15:24.895: Vi1 IPCP: I CONFREQ [REQsent] id 1 len 10
Oct 1 20:15:24.899: Vi1 IPCP: Address 192.168.0.1 (0x0306C0A80001)
Oct 1 20:15:24.903: Vi1 IPCP: O CONFACK [REQsent] id 1 len 10
Oct 1 20:15:24.907: Vi1 IPCP: Address 192.168.0.1 (0x0306C0A80001)
Oct 1 20:15:24.911: As9 IPCP: Redirect packet to Vi1
Oct 1 20:15:24.915: Vi1 IPCP: I CONFREQ [ACKsent] id 2 len 10
Oct 1 20:15:24.919: Vi1 IPCP: Address 192.168.0.1 (0x0306C0A80001)
Oct 1 20:15:24.919: Vi1 IPCP: O CONFACK [ACKsent] id 2 len 10
Oct 1 20:15:24.923: Vi1 IPCP: Address 192.168.0.1 (0x0306C0A80001)
Oct 1 20:15:25.007: Vi1 IPCP: I CONFACK [ACKsent] id 1 len 10

!-- IP address of virtual bundle was previously obtained from the loopback
!-- interface.

Oct 1 20:15:25.011: Vi1 IPCP: Address 192.168.0.2 (0x0306C0A80002)
Oct 1 20:15:25.015: Vi1 IPCP: State is Open

!-- Adds route for virtual bundle to routing table to reach the remote router.

Oct 1 20:15:25.039: Vi1 IPCP: Install route to 192.168.0.1
Oct 1 20:15:25.947: %LINEPROTO-5-UPDOWN: Line protocol on Interface Virtual-Access1,
changed state to up
Oct 1 20:15:31.199: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.0.1 on Virtual-Access1 from
LOADING to FULL, Loading Done

Oct 1 20:18:01.439: As10 LCP: I CONFREQ [Closed] id 61 len 39
Oct 1 20:18:01.443: As10 LCP: ACCM 0x000A0000 (0x0206000A0000)
Oct 1 20:18:01.447: As10 LCP: AuthProto CHAP (0x0305C22305)
Oct 1 20:18:01.451: As10 LCP: MagicNumber 0x57DA0D94 (0x050657DA0D94)
Oct 1 20:18:01.451: As10 LCP: PFC (0x0702)
Oct 1 20:18:01.455: As10 LCP: ACFC (0x0802)
Oct 1 20:18:01.455: As10 LCP: MRRU 1524 (0x110405F4)
Oct 1 20:18:01.459: As10 LCP: EndpointDisc 1 Router2 (0x130A01526F7574657232)
Oct 1 20:18:01.463: As10 LCP: Lower layer not up, Fast Starting
Oct 1 20:18:01.467: As10 PPP: Treating connection as a dedicated line
Oct 1 20:18:01.467: As10 PPP: Phase is ESTABLISHING, Active Open [0 sess, 0 load]
Oct 1 20:18:01.475: As10 LCP: O CONFREQ [Closed] id 30 len 39
Oct 1 20:18:01.475: As10 LCP: ACCM 0x000A0000 (0x0206000A0000)
Oct 1 20:18:01.479: As10 LCP: AuthProto CHAP (0x0305C22305)
Oct 1 20:18:01.483: As10 LCP: MagicNumber 0x0791992D (0x05060791992D)
Oct 1 20:18:01.483: As10 LCP: PFC (0x0702)
```

```
Oct 1 20:18:01.487: As10 LCP: ACFC (0x0802)
Oct 1 20:18:01.491: As10 LCP: MRRU 1524 (0x110405F4)
Oct 1 20:18:01.491: As10 LCP: EndpointDisc 1 Router1 (0x130A01526F7574657231)
Oct 1 20:18:01.499: As10 LCP: O CONFACK [REQsent] id 61 len 39
Oct 1 20:18:01.503: As10 LCP: ACCM 0x000A0000 (0x0206000A0000)
Oct 1 20:18:01.507: As10 LCP: AuthProto CHAP (0x0305C22305)
Oct 1 20:18:01.507: As10 LCP: MagicNumber 0x57DA0D94 (0x050657DA0D94)
Oct 1 20:18:01.511: As10 LCP: PFC (0x0702)
Oct 1 20:18:01.511: As10 LCP: ACFC (0x0802)
Oct 1 20:18:01.515: As10 LCP: MRRU 1524 (0x110405F4)
Oct 1 20:18:01.519: As10 LCP: EndpointDisc 1 Router2 (0x130A01526F7574657232)
Oct 1 20:18:01.531: %LINK-3-UPDOWN: Interface Async10, changed state to up
Oct 1 20:18:01.703: As10 LCP: I CONFACK [ACKsent] id 30 len 39
Oct 1 20:18:01.703: As10 LCP: ACCM 0x000A0000 (0x0206000A0000)
Oct 1 20:18:01.707: As10 LCP: AuthProto CHAP (0x0305C22305)
Oct 1 20:18:01.711: As10 LCP: MagicNumber 0x0791992D (0x05060791992D)
Oct 1 20:18:01.715: As10 LCP: PFC (0x0702)
Oct 1 20:18:01.715: As10 LCP: ACFC (0x0802)
Oct 1 20:18:01.719: As10 LCP: MRRU 1524 (0x110405F4)
Oct 1 20:18:01.723: As10 LCP: EndpointDisc 1 Router1 (0x130A01526F7574657231)
Oct 1 20:18:01.723: As10 LCP: State is Open
Oct 1 20:18:01.727: As10 PPP: Phase is AUTHENTICATING, by both [0 sess, 0 load]
Oct 1 20:18:01.731: As10 CHAP: O CHALLENGE id 25 len 28 from "Router1"
Oct 1 20:18:01.743: As10 CHAP: I CHALLENGE id 30 len 28 from "Router2"
Oct 1 20:18:01.755: As10 CHAP: O RESPONSE id 30 len 28 from "Router1"
Oct 1 20:18:01.851: As10 CHAP: I RESPONSE id 25 len 28 from "Router2"
Oct 1 20:18:01.867: As10 CHAP: O SUCCESS id 25 len 4
Oct 1 20:18:01.879: As10 CHAP: I SUCCESS id 30 len 4
Oct 1 20:18:01.879: As10 PPP: Phase is VIRTUALIZED [0 sess, 0 load]
Oct 1 20:18:01.891: Vi1 MLP: Added link As10 to bundle Router2
Oct 1 20:18:02.899: %LINEPROTO-5-UPDOWN: Line protocol on Interface Async10,
changed state to up
Router1#
```

```
Router2#debug ppp negotiation
PPP protocol negotiation debugging is on
```

```
Router2#debug ppp multilink events
Multilink events debugging is on
```

```
Router2#debug dialer
Dial on demand events debugging is on
```

```
Router2#show debug
  Dial on demand:
  Dial on demand events debugging is on
  PPP:
  PPP protocol negotiation debugging is on
  Multilink events debugging is on
```

```
Oct 2 20:15:07.442: %SYS-5-CONFIG_I: Configured from console by console
Oct 2 20:15:08.038: %LINK-3-UPDOWN: Interface Dialer3, changed state to up
Oct 2 20:15:08.046: Se3 DDR: rotor dialout [priority]
```

```
!--- Dialing Reason
```

```
Oct 2 20:15:08.050: Se3 DDR: Dialing cause ip (s=192.168.0.1, d=224.0.0.5)
```

```
!--- Number being dialed
```

```
Oct 2 20:15:08.054: Se3 DDR: Attempting to dial 30116
Oct 2 20:15:08.058: CHAT3: Attempting async line dialer script
```

```
!--- Using chat script "test" for dialout
```

```
Oct  2 20:15:08.058: CHAT3: Dialing using Modem script:
test & System script: none
Oct  2 20:15:08.066: CHAT3: process started
Oct  2 20:15:08.070: CHAT3: Asserting DTR
Oct  2 20:15:08.070: CHAT3: Chat script test started

!--- Call being established; note the time elapsed for call setup.

Oct  2 20:15:35.814: CHAT3: Chat script test finished, status = Success
Oct  2 20:15:35.830: Di3 IPCP: Install route to 192.168.0.2

! -- Physical Layer (Serial Interface) is up.
!--- Only now can PPP negotiation begin.

Oct  2 20:15:37.818: %LINK-3-UPDOWN: Interface Serial3, changed state to up
Oct  2 20:15:37.822: Se3 DDR: Dialer statechange to up
Oct  2 20:15:37.822: Se3 DDR: Dialer call has been placed

!--- PPP negotiation begins

Oct  2 20:15:37.826: Se3 PPP: Treating connection as a callout

!--- PPP Phase is ESTABLISHING. LCP negotiation will now occur

Oct  2 20:15:37.826: Se3 PPP: Phase is ESTABLISHING, Active Open
[0 sess, 0 load]

!--- Outgoing CONFREQ with Field ID 81

Oct  2 20:15:37.834: Se3 LCP: O CONFREQ [Closed] id 81 len 39
Oct  2 20:15:37.838: Se3 LCP:   ACCM 0x000A0000 (0x0206000A0000)

!--- This router is requesting:
! -- Option: Authentication Protocol, Value: CHAP
! -- Option: MagicNumber (used to detect loopbacks and is always sent)

Oct  2 20:15:37.838: Se3 LCP:   AuthProto CHAP (0x0305C22305)
Oct  2 20:15:37.842: Se3 LCP:   MagicNumber 0x57D7985D (0x050657D7985D)
Oct  2 20:15:37.846: Se3 LCP:   PFC (0x0702)
Oct  2 20:15:37.846: Se3 LCP:   ACFC (0x0802)

! -- Negotiate Maximum Receive Reconstructed Unit (MRRU)
! -- MRRU is the maximum packet size this end will reconstruct

Oct  2 20:15:37.850: Se3 LCP:   MRRU 1524 (0x110405F4)
Oct  2 20:15:37.854: Se3 LCP:   EndpointDisc 1 Router2
(0x130A01526F7574657232)

! -- Incoming CONFREQ. ID field is 52

Oct  2 20:15:38.162: Se3 LCP: I CONFREQ [REQsent] id 52 len 39
Oct  2 20:15:38.166: Se3 LCP:   ACCM 0x000A0000 (0x0206000A0000)

! -- The peer has requested:
! -- Option: Authentication Protocol, Value: CHAP
! -- Option: MagicNumber (used to detect loopbacks and is always sent)

Oct  2 20:15:38.166: Se3 LCP:   AuthProto CHAP (0x0305C22305)
Oct  2 20:15:38.170: Se3 LCP:   MagicNumber 0x078F2456 (0x0506078F2456)
Oct  2 20:15:38.174: Se3 LCP:   PFC (0x0702)
Oct  2 20:15:38.174: Se3 LCP:   ACFC (0x0802)
Oct  2 20:15:38.178: Se3 LCP:   MRRU 1524 (0x110405F4)
Oct  2 20:15:38.182: Se3 LCP:   EndpointDisc 1 Router1
(0x130A01526F7574657231)

! -- Outgoing CONFACK for message with Field ID 52
```

```
Oct  2 20:15:38.186: Se3 LCP: O CONFACK [REQsent] id 52 len 39
Oct  2 20:15:38.190: Se3 LCP:   ACCM 0x000A0000 (0x0206000A0000)
Oct  2 20:15:38.194: Se3 LCP:   AuthProto CHAP (0x0305C22305)
Oct  2 20:15:38.198: Se3 LCP:   MagicNumber 0x078F2456 (0x0506078F2456)
Oct  2 20:15:38.198: Se3 LCP:   PFC (0x0702)
Oct  2 20:15:38.202: Se3 LCP:   ACFC (0x0802)
Oct  2 20:15:38.202: Se3 LCP:   MRRU 1524 (0x110405F4)
Oct  2 20:15:38.206: Se3 LCP:   EndpointDisc 1 Router1
(0x130A01526F7574657231)

! -- Incoming CONFACK for message with Field ID 81

Oct  2 20:15:38.214: Se3 LCP: I CONFACK [ACKsent] id 81 len 39
Oct  2 20:15:38.214: Se3 LCP:   ACCM 0x000A0000 (0x0206000A0000)
Oct  2 20:15:38.218: Se3 LCP:   AuthProto CHAP (0x0305C22305)
Oct  2 20:15:38.222: Se3 LCP:   MagicNumber 0x57D7985D (0x050657D7985D)
Oct  2 20:15:38.222: Se3 LCP:   PFC (0x0702)
Oct  2 20:15:38.226: Se3 LCP:   ACFC (0x0802)

! -- Both sides have CONFACKed the parameters
! -- MRRU of 1524 bytes and the Endpoint Discriminator have been negotiated

Oct  2 20:15:38.230: Se3 LCP:   MRRU 1524 (0x110405F4)
Oct  2 20:15:38.230: Se3 LCP:   EndpointDisc 1 Router2 (0x130A01526F7574657232)

!-- LCP negotiation complete and LCP state goes to Open

Oct  2 20:15:38.234: Se3 LCP: State is Open

! -- PPP Phase is AUTHENTICATING. PPP Authentication occurs now
! -- Two-way authentication will be performed (indicated by the both keyword)

Oct  2 20:15:38.238: Se3 PPP: Phase is AUTHENTICATING, by both [0 sess, 0 load]

! -- Outgoing CHAP Challenge.
! -- In LCP we had agreed upon CHAP as the authentication protocol

Oct  2 20:15:38.238: Se3 CHAP: O CHALLENGE id 40 len 28 from "Router2"

! -- Incoming Challenge from peer

Oct  2 20:15:38.398: Se3 CHAP: I CHALLENGE id 45 len 28 from "Router1"

! -- Incoming response from peer

Oct  2 20:15:38.402: Se3 CHAP: I RESPONSE id 40 len 28 from "Router1"

! -- Outgoing Response

Oct  2 20:15:38.410: Se3 CHAP: O RESPONSE id 45 len 28 from "Router2"

! -- CHAP authentication successful

Oct  2 20:15:38.418: Se3 CHAP: O SUCCESS id 40 len 4
Oct  2 20:15:38.538: Se3 CHAP: I SUCCESS id 45 len 4
Oct  2 20:15:38.542: Se3 MLP: Request add link to bundle

! -- Virtualize Se3
! -- Virtual Access interface will represent the MP bundle

Oct  2 20:15:38.542: Se3 PPP: Phase is VIRTUALIZED [0 sess, 1 load]
Oct  2 20:15:38.546: Se3 MLP: Adding link to bundle
Oct  2 20:15:38.550: Vi1 PPP: Phase is DOWN, Setup [0 sess, 0 load]
Oct  2 20:15:38.558: Vi1 PPP: No remote authentication for call-out
Oct  2 20:15:38.566: Vi1 MLP: Added to huntgroup Di3
```

```

Oct  2 20:15:38.570: Vi1 MLP: Clone from Di3
Oct  2 20:15:38.574: %LINK-3-UPDOWN: Interface Virtual-Access1,
changed state to up
Oct  2 20:15:38.578: Vi1 DDR: Dialer statechange to up

! -- Virtual Access Interface is up
! -- Negotiate LCP and PPP parameters for Virtual-Access Interface

Oct  2 20:15:38.582: Vi1 DDR: Dialer call has been placed
Oct  2 20:15:38.586: Vi1 PPP: Treating connection as a callout
Oct  2 20:15:38.586: Vi1 PPP: Phase is ESTABLISHING, Active Open
[0 sess, 0 load]
Oct  2 20:15:38.594: Vi1 LCP: O CONFREQ [Closed] id 1 len 29
Oct  2 20:15:38.594: Vi1 LCP:   AuthProto CHAP (0x0305C22305)
Oct  2 20:15:38.598: Vi1 LCP:   MagicNumber 0x57D79B57 (0x050657D79B57)
Oct  2 20:15:38.602: Vi1 LCP:   MRRU 1524 (0x110405F4)
Oct  2 20:15:38.606: Vi1 LCP:   EndpointDisc 1 Router2
(0x130A01526F7574657232
Oct  2 20:15:38.614: Vi1 PPP: Phase is UP [0 sess, 0 load]
Oct  2 20:15:38.618: Vi1 IPCP: O CONFREQ [Closed] id 1 len 10
Oct  2 20:15:38.622: Vi1 IPCP:   Address 192.168.0.1 (0x0306C0A80001)

! -- First multilink connection is brought up in the virtual access interface

Oct  2 20:15:38.626: Vi1 MLP: Added first link Se3 to bundle Router1
Oct  2 20:15:38.630: Di3 IPCP: Remove route to 192.168.0.2
Oct  2 20:15:39.542: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial3,
changed state to up
Oct  2 20:15:39.614: %LINEPROTO-5-UPDOWN: Line protocol on Interface
Virtual-Access1, changed state to up
Oct  2 20:15:40.614: Vi1 IPCP: TIMEout: State REQsent
Oct  2 20:15:40.618: Vi1 IPCP: O CONFREQ [REQsent] id 2 len 10
Oct  2 20:15:40.618: Vi1 IPCP:   Address 192.168.0.1 (0x0306C0A80001)
Oct  2 20:15:41.046: Vi1 MLP: Load (1) above threshold in bundle Router1
Oct  2 20:15:41.046: Se2 DDR: rotor dialout [priority]
Oct  2 20:15:41.050: Se2 DDR: Attempting to dial 30116
Oct  2 20:15:41.054: CHAT2: Attempting async line dialer script
Oct  2 20:15:41.054: CHAT2: Dialing using Modem script:
test & System script: none
Oct  2 20:15:41.062: CHAT2: process started
Oct  2 20:15:41.066: CHAT2: Asserting DTR
Oct  2 20:15:41.066: CHAT2: Chat script test started
Oct  2 20:15:42.506: Vi1 IPCP: I CONFREQ [REQsent] id 1 len 10
Oct  2 20:15:42.510: Vi1 IPCP:   Address 192.168.0.2 (0x0306C0A80002)
Oct  2 20:15:42.514: Vi1 IPCP: O CONFACK [REQsent] id 1 len 10
Oct  2 20:15:42.518: Vi1 IPCP:   Address 192.168.0.2 (0x0306C0A80002)
Oct  2 20:15:42.530: Vi1 IPCP: I CONFACK [ACKsent] id 1 len 10
Oct  2 20:15:42.534: Vi1 IPCP:   Address 192.168.0.1 (0x0306C0A80001)
Oct  2 20:15:42.538: Vi1 IPCP: ID 1 didn't match 2, discarding packet
Oct  2 20:15:42.546: Vi1 IPCP: I CONFACK [ACKsent] id 2 len 10
Oct  2 20:15:42.550: Vi1 IPCP:   Address 192.168.0.1 (0x0306C0A80001)
Oct  2 20:15:42.554: Vi1 IPCP: State is Open
Oct  2 20:15:42.562: Vi1 DDR: dialer protocol up
Oct  2 20:15:42.570: Vi1 DDR: Call connected, 4 packets unqueued,
4 transmitted 0 discarded

! -- Adds route for virtual bundle to routing table to reach the remote router

Oct  2 20:15:42.582: Di3 IPCP: Install route to 192.168.0.2

Oct  2 20:15:48.714: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.0.2 on Dialer3
from LOADING to FULL, Loading Done

Oct  2 20:17:41.070: CHAT2: Chat script test finished, status = Connection timed
out; remote host not responding
Oct  2 20:17:41.074: Se2 DDR: disconnecting call

```

```
Oct 2 20:17:56.074: Se2 DDR: re-enable timeout
Oct 2 20:17:56.074: Se2 DDR: Attempting to dial 30114
Oct 2 20:17:56.078: CHAT2: Attempting async line dialer script
Oct 2 20:17:56.078: CHAT2: Dialing using Modem script: test & System script:
none
Oct 2 20:17:56.086: CHAT2: process started
Oct 2 20:17:56.090: CHAT2: Asserting DTR
Oct 2 20:17:56.090: CHAT2: Chat script test started
```

! -- Call is being established; note the time elapsed for call setup

```
Oct 2 20:18:16.890: CHAT2: Chat script test finished, status = Success
Oct 2 20:18:18.894: %LINK-3-UPDOWN: Interface Serial2, changed state to up
Oct 2 20:18:18.898: Se2 DDR: Dialer statechange to up
Oct 2 20:18:18.898: Se2 DDR: Dialer call has been placed
```

! -- PPP negotiation begins

```
Oct 2 20:18:18.902: Se2 PPP: Treating connection as a callout
Oct 2 20:18:18.906: Se2 PPP: Phase is ESTABLISHING, Active Open
[0 sess, 0 load]
```

! -- LCP negotiation begins; Multilink parameters are also negotiated

```
Oct 2 20:18:18.910: Se2 LCP: O CONFREQ [Closed] id 61 len 39
Oct 2 20:18:18.914: Se2 LCP: ACCM 0x000A0000 (0x0206000A0000)
Oct 2 20:18:18.918: Se2 LCP: AuthProto CHAP(0x0305C22305)
Oct 2 20:18:18.918: Se2 LCP: MagicNumber 0x57DA0D94 (0x050657DA0D94)
Oct 2 20:18:18.922: Se2 LCP: PFC (0x0702)
Oct 2 20:18:18.926: Se2 LCP: ACFC (0x0802)
```

! -- Negotiate Maximum Receive Reconstructed Unit (MRRU)

! -- MRRU is the maximum packet size this end will reconstruct

```
Oct 2 20:18:18.926: Se2 LCP: MRRU 1524 (0x110405F4)
Oct 2 20:18:18.930: Se2 LCP: EndpointDisc 1 Router2
(0x130A01526F7574657232)
Oct 2 20:18:19.142: Se2 LCP: I CONFREQ [REQsent] id 30 len 39
Oct 2 20:18:19.146: Se2 LCP: ACCM 0x000A0000 (0x0206000A0000)
Oct 2 20:18:19.146: Se2 LCP: AuthProto CHAP (0x0305C22305)
Oct 2 20:18:19.150: Se2 LCP: MagicNumber 0x0791992D (0x05060791992D)
Oct 2 20:18:19.154: Se2 LCP: PFC (0x0702)
Oct 2 20:18:19.154: Se2 LCP: ACFC (0x0802)
Oct 2 20:18:19.158: Se2 LCP: MRRU 1524 (0x110405F4)
Oct 2 20:18:19.162: Se2 LCP: EndpointDisc 1 Router1
(0x130A01526F7574657231)
Oct 2 20:18:19.166: Se2 LCP: O CONFACK [REQsent] id 30 len 39
Oct 2 20:18:19.170: Se2 LCP: ACCM 0x000A0000 (0x0206000A0000)
Oct 2 20:18:19.174: Se2 LCP: AuthProto CHAP (0x0305C22305)
Oct 2 20:18:19.174: Se2 LCP: MagicNumber 0x0791992D (0x05060791992D)
Oct 2 20:18:19.178: Se2 LCP: PFC (0x0702)
Oct 2 20:18:19.178: Se2 LCP: ACFC (0x0802)
Oct 2 20:18:19.182: Se2 LCP: MRRU 1524 (0x110405F4)
Oct 2 20:18:19.186: Se2 LCP: EndpointDisc 1 Router1
(0x130A01526F7574657231)
Oct 2 20:18:19.194: Se2 LCP: I CONFACK [ACKsent] id 61 len 39
Oct 2 20:18:19.198: Se2 LCP: ACCM 0x000A0000 (0x0206000A0000)
Oct 2 20:18:19.198: Se2 LCP: AuthProto CHAP (0x0305C22305)
Oct 2 20:18:19.202: Se2 LCP: MagicNumber 0x57DA0D94 (0x050657DA0D94)
Oct 2 20:18:19.206: Se2 LCP: PFC (0x0702)
Oct 2 20:18:19.206: Se2 LCP: ACFC (0x0802)
Oct 2 20:18:19.210: Se2 LCP: MRRU 1524 (0x110405F4)
Oct 2 20:18:19.214: Se2 LCP: EndpointDisc 1 Router2
(0x130A01526F7574657232)
Oct 2 20:18:19.214: Se2 LCP: State is Open
Oct 2 20:18:19.218: Se2 PPP: Phase is AUTHENTICATING, by both [0 sess, 0 load]
```

```

Oct  2 20:18:19.222: Se2 CHAP: O CHALLENGE id 30 len 28 from "Router2"
Oct  2 20:18:19.358: Se2 CHAP: I CHALLENGE id 25 len 28 from "Router1"
Oct  2 20:18:19.362: Se2 CHAP: O RESPONSE id 25 len 28 from "Router2"
Oct  2 20:18:19.382: Se2 CHAP: I RESPONSE id 30 len 28 from "Router1"
Oct  2 20:18:19.390: Se2 CHAP: O SUCCESS id 30 len 4
Oct  2 20:18:19.482: Se2 CHAP: I SUCCESS id 25 len 4
Oct  2 20:18:19.486: Se2 MLP: Request add link to bundle
Oct  2 20:18:19.486: Se2 PPP: Phase is VIRTUALIZED [0 sess, 0 load]

!--- Virtualize Se2
!--- Virtual Access interface will represent the MP bundle

Oct  2 20:18:19.490: Se2 MLP: Adding link to bundle

!--- Second multilink connection is virtualized and added to Virtual
!--- access interface.

Oct  2 20:18:19.494: Se2 IPCP: Route to 192.168.0.2 still needed by Vi1
Oct  2 20:18:19.498: DDR: MLP bundle, 0 packets unqueued and discarded
Oct  2 20:18:19.498: Vi1 MLP: Added link Se2 to bundle Router1
Oct  2 20:18:20.482: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2,
changed state to up

```


Troubleshooting Commands

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

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

- **debug ppp negotiation** – To see if a client is passing PPP negotiation; this commnad is used to check for address negotiation.
- **debug ppp authentication** – To see if a client is passing authentication. If you are using a Cisco IOS Software Release prior to 11.2, use the debug ppp chap command instead.
- **debug ppp error** – To display protocol errors and error statistics associated with PPP connection negotiation and operation.
- **debug vtemplate** – To display the Virtual Template cloning to form a Virtual Access interface.
- **debug ppp multilink events** – To see PPP multilink events debugging. Displays information about events affecting multilink groups.
- **debug dialer** – To display debugging information about the packets received on a dialer interface.
- **show caller** – Displays statistics or debug information for connections.
- **show dialer** – Displays general diagnostic information for interfaces configured for DDR.
- **show caller user** – Displays List of which user is using which modem port.
- **show ppp multilink** – To see the members of the multilink bundle.

Related Information

- [Virtual Profiles](#)
- [Virtual Interface Template Service](#)
- [Configuring PPP and Authentication](#)
- [Configuring the NAS for Basic Dial Access](#)
- [Configuring Legacy DDR Hubs](#)
- [Displaying Caller Statistics](#)
- [Multilink PPP RFC 1717 Multilink PPP RFC 1717](#) 
- [Configuring Peer to Peer DDR with Dialer Profiles](#)
- [Access Technology Support Pages](#)
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