

从 Microsoft Windows 客户端发起的异步多链路 PPP 拨号

目录

[简介](#)

[先决条件](#)

[要求](#)

[使用的组件](#)

[规则](#)

[背景理论](#)

[配置](#)

[网络图](#)

[NAS 配置](#)

[配置 Windows 9x 客户端](#)

[验证](#)

[show 和 debug 输出示例](#)

[故障排除](#)

[故障排除命令](#)

[相关信息](#)

[简介](#)

在此异步多链路PPP配置中，使用Microsoft Windows 95/98 PC的远程拨入用户使用多个调制解调器来提高可用的访问速度。异步多链路PPP也可以与其他客户端（如Linux和Apple Macintosh）配置，并使用相应的客户端PPP软件。多链路PPP的路由器配置独立于客户端PC平台。

[先决条件](#)

[要求](#)

本文档没有任何特定的要求。

[使用的组件](#)

本文档中的信息基于以下软件和硬件版本。

- 运行Cisco IOS®软件版本^本12.07(T)的Cisco AS5300。

本文档中的信息都是基于特定实验室环境中的设备创建的。本文档中使用的所有设备最初均采用原始（默认）配置。如果您是在真实网络上操作，请确保您在使用任何命令前已经了解其潜在影响。

规则

有关文档规则的详细信息，请参阅 [Cisco 技术提示规则](#)。

背景理论

多链路PPP(MPPP)允许设备通过实施虚拟链路通过多个点对点数据链路将数据发送到同一目的地。MPPP连接的最大带宽等于组件链路带宽之和。MPPP可以配置用于多路复用链路（如ISDN和帧中继）或多条异步线路。

异步多链路PPP可用于以比通过单个模拟连接可用的更快速度连接远程客户端。在Async MPPP中，远程客户端使用多个调制解调器，因此使用多条电话线路拨入中央路由器并访问网络。由于多条电话线路通常比ISDN基本速率接口(BRI)服务更便宜，因此Async MPPP提供了一种有效的方法来提高远程用户的连接速度，同时控制成本。异步MPPP也是为无法由ISDN提供服务的远程区域获得更高接入速度的有效方法。

异步MPPP将单独的调制解调器连接捆绑到接入服务器。每个对等体上的PPP软件对数据包进行分段，并通过多个模拟连接将数据段传输到另一端。接收端从独立连接收集数据包，并根据其中嵌入的PPP信息，将数据段重组为有效的数据包，从而提供带宽更高的端到端虚拟链路。异步MPPP可在两台路由器之间或路由器与客户端PC之间配置。

虽然从客户端PC可以使用两个以上的调制解调器进行多链路连接，但PC上数据包的分段和重组所产生的开销可能会抵消任何额外带宽。

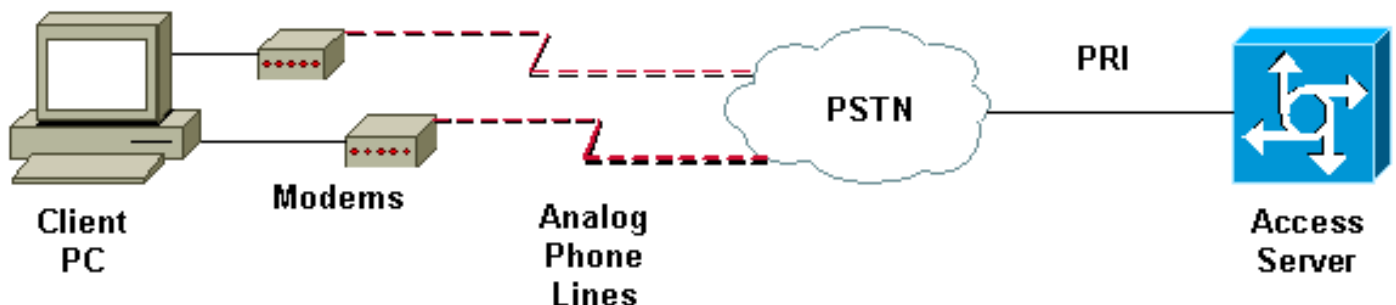
配置

本部分提供有关如何配置本文档所述功能的信息。

注：要查找有关本文档中使用的命令的其他信息，请使用[命令查找工具](#)([仅注册客户](#))。

网络图

本文档使用此图中所示的网络设置：



NAS 配置

在此配置中，具有T1主速率接口(PRI)连接的AS5300服务器用作模拟用户拨入网络接入服务器(NAS)。由于此NAS上没有配置任何其他T1控制器，因此此接入服务器专用于异步拨号。此AS5300配置使用虚拟模板克隆入站呼叫的虚拟接入接口。多链路PPP捆绑包从虚拟模板定义复制其接口参数。

一些基本的身份验证、授权和记帐(AAA)命令作为最佳实践方法的示例。在路由器上配置拨入用户的用户名和密码。分配给拨入用户的IP地址从地址池提供。

Cisco AS5300

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

Current configuration:
!
! Last configuration change at 16:01:01 UTC Wed Jun 28
2000
! NVRAM config last updated at 15:30:28 UTC Wed Jun 28
2000
!
version 12.0
service timestamps debug datetime msec localtime show-
timezone
service timestamps log datetime msec localtime show-
timezone
service password-encryption
service tcp-small-servers
!
hostname bobslake-nas-01
!
logging buffered 10000 debugging
aaa new-model
aaa authentication login default local
aaa authentication ppp default if-needed local
!--- authenticate for PPP if not authenticated during
login !--- allows users with Terminal Window after Dial
to initiate PPP! username admin password <deleted>
username charlie password <deleted> spe 1/0 1/7 firmware
location system:/ucode/mica_port_firmware ! resource-
pool disable ! ip subnet-zero no ip source-route ip
domain-name the.net ! multilink virtual-template 1
!--- use virtual-template 1 for multilink connections
async-bootp dns-server 172.22.53.210 isdn switch-type
primary-5ess isdn voice-call-failure 0 ! controller T1 0
framing esf clock source line primary linecode b8zs pri-
group timeslots 1-24 ! controller T1 1 framing esf
linecode b8zs pri-group timeslots 1-24 ! controller T1 2
framing esf linecode b8zs pri-group timeslots 1-24 !
controller T1 3 framing esf clock source line secondary
3 linecode b8zs pri-group timeslots 1-24 ! interface
Loopback0 ip address 172.21.10.10 255.255.255.255 no ip
directed-broadcast ! interface Loopback1
ip address 172.21.104.254 255.255.255.0
!--- summarizes addresses in address pool !--- Loopback
1 is in the same subnet as the address pool no ip
directed-broadcast ! interface Ethernet0 no ip address
no ip directed-broadcast shutdown ! interface Virtual-
Template1
description Template for Multilink Users
ip unnumbered Loopback0
no ip directed-broadcast
peer default ip address pool addr-pool
!--- use IP pool called addr-pool !--- for incoming
calls

ppp authentication chap
!--- authenticate using Challenge Handshake
```

```

Authentication Protocol (CHAP) ppp multilink
!
!--- configure D channel on PRI interface Serial0:23
description Headquarters 324-1939 active PRI line no ip
address no ip directed-broadcast isdn switch-type
primary-5ess isdn incoming-voice modem fair-queue 64 256
0 no cdp enable ! interface Serial1:23 no ip address no
ip directed-broadcast no logging event link-status no
snmp trap link-status isdn switch-type primary-5ess isdn
incoming-voice modem fair-queue 64 256 0 no cdp enable !
interface Serial2:23 no ip address no ip directed-
broadcast no logging event link-status no snmp trap
link-status isdn switch-type primary-5ess isdn incoming-
voice modem fair-queue 64 256 0 no cdp enable !
interface Serial3:23 no ip address no ip directed-
broadcast no logging event link-status no snmp trap
link-status isdn switch-type primary-5ess isdn incoming-
voice modem fair-queue 64 256 0 no cdp enable !
interface FastEthernet0 ip address 172.21.101.23
255.255.255.0 no ip directed-broadcast duplex auto speed
auto ! interface Group-Async1
!--- template to control all async interface
configuration ip unnumbered Loopback0 no ip directed-
broadcast encapsulation ppp
!--- use PPP encapsulation dialer in-band dialer-group 5
async mode interactive peer default ip address pool
addr-pool
!--- use IP pool called addr-pool !--- for incoming
calls

no fair-queue
no cdp enable
ppp authentication chap callin
!--- CHAP authenticate for dialin users only ppp
multilink
group-range 1 48
!--- assign modems 1-48 to the Group-Async 1
configuration template router eigrp 1 network 172.21.0.0
! ip local pool addr-pool 172.21.104.1 172.21.104.48
!--- define IP address pool range for dialin clients ip
classless no ip http server ! access-list 105 permit ip
any any dialer-list 5 protocol ip list 105 ! line con 0
exec-timeout 0 0 transport input none line 1 48
autoselect during-login
!--- permits user login prompts after dialin autoselect
ppp
!--- automatically launch PPP on the line modem InOut
!--- modems can be used to dialin and dialout !--- InOut
may be replaced by Dialin !--- if NAS handles only
incoming calls

transport preferred none
transport output telnet
line aux 0
line vty 0 4
transport preferred none
transport input telnet
transport output telnet
!
ntp clock-period 17180374
ntp update-calendar
ntp server 172.22.255.1 prefer
end

```

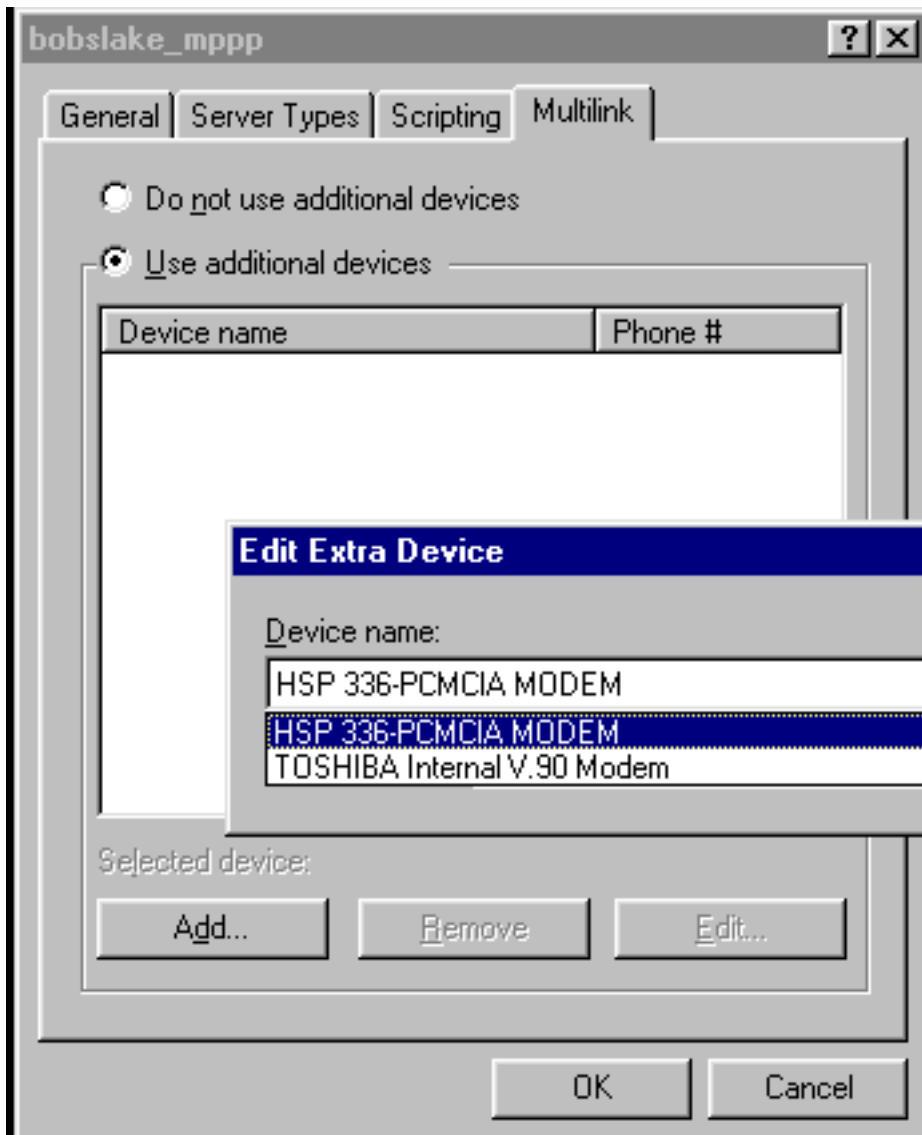
配置 Windows 9x 客户端

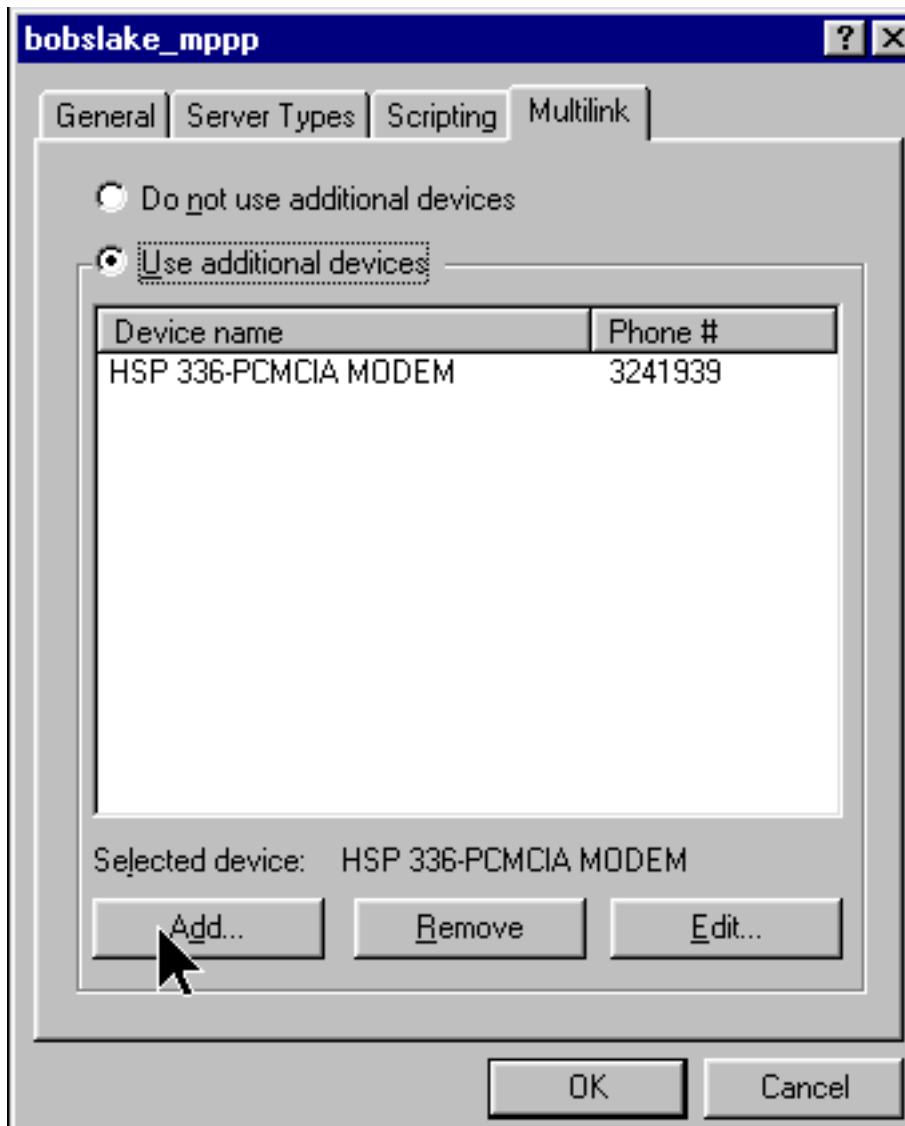
以下步骤是有关为MPP配置Windows 9x客户端的快速概述。如果遇到[困难](#)，请 参阅Microsoft网站。

要为MPP配置Microsoft Windows 9x客户端，请确保已安装拨号网络版本1.3或更高版本。

请访问Microsoft[网站](#)，以获取详细信息并下载最新版本的拨号网络(DUN)。

1. 分别连接和配置每个调制解调器。在Windows控制面板中，使用“添加新硬件”实用程序将调制解调器添加到客户端。如果添加调制解调器时遇到问题，请联系PC供应商或Microsoft以了解故障排除步骤。验证每个调制解调器是否连接正确且操作系统能识别。您可能希望使用终端仿真程序来验证调制解调器是否正常工作。
2. 创建新的拨号连接。在Windows中，双击“My Computer (我的电脑)”图标并导航至“Dialup Networking (拨号网络)”。然后，双击“建立新连接”。按照指示使用主调制解调器创建拨号连接。多链路功能稍后配置。通过拨入您的服务提供商来测试连接。
3. 向拨号连接添加多链路功能。双击“My Computer (我的电脑)”图标并导航至“Dialup Networking (拨号网络)”。右键单击刚设置的连接图标。从显示的菜单中，选择“属性”。单击“Multilink”选项卡，选择“Use additional devices”，然后单击“Add”按钮。从下拉菜单中选择其他调制解调器，并仅输入接入服务器的七位数电话号码，或接受显示的号码。配置其他设备时，即使是长途呼叫，也不要包含区号。连接会自动使用为第一个调制解调器配置的区号。单击两次“确定”完成设置。以下是Windows多链路配置的一些屏幕截图





4. 启动与接入服务器的调制解调器连接。双击刚创建的拨号连接图标。输入在路由器上配置的用户名和密码，然后单击“Connect”按钮。拨号网络将拨打为连接指定的主调制解调器配置的号码。建立第一个连接后，拨号网络使用Additional Devices列表中指定的其他调制解调器拨号。建立所有连接后，您可以双击任务栏中显示的“通信计算机”图标来查看有关链接的状态信息，也可以断开连接。单击“详细信息”以验证连接是否使用多台设备。在列表框中选择设备时，系统将显示Suspend或Resume按钮。如果出现“暂停”按钮，则设备现在正在使用中并“捆绑”到多链路连接中。单击“暂停”按钮将断开该线路，并从捆绑连接中删除该线路。如果显示“恢复”按钮，请单击该按钮拨打该连接，然后将该线路添加到捆绑包。您可以动态暂停和恢复多链路，而不会断开连接。

验证

当前没有可用于此配置的验证过程。

本部分所提供的信息可用于确认您的配置是否正常工作。

输出解释器工具支持某些 show 命令（只限于注册用户），通过它可以查看 show 命令输出的分析。

- **show ppp multilink** - 显示处于启用状态下的多链路捆绑的信息。应使用本命令来检查多链路连接。

- **show caller** - 显示NAS上的个人用户以及所消耗的资源的信息。本命令显示大量连接池中的Active的呼叫统计信息，并显示各用户的绝对时间以及空闲时间。
- **show caller user** - 显示特定用户（例如使用TTY线路的用户）的参数、异步接口（机架/插槽/端口）、DS0信道编号、调制解调器编号、所分配的IP地址、PPP与PPP捆绑参数等等。

要帮助检验MPPP连接并排除故障，请参阅以下建议：

- 确保在客户端PC上正确配置前缀，例如在拨打外线之前使用9。如果未正确配置，当号码开始拨号时，您会听到忙音。
- 为每个调制解调器创建单独的DUN客户端，并验证您与服务提供商的完全连接。在继续排除多链路连接故障之前，请分别使用每个调制解调器。
- 使用终端仿真器连接到调制解调器。使用atdt命令拨打NAS的号码。例如，在超级终端中输入 **atdt 55511111**。验证调制解调器拨号是否正确并连接到NAS。如果调制解调器未连接，请排除调制解调器故障。有关排除客户端[调制解调器故障的详细信息](#)，请参阅Microsoft网站上的“使用基本AT调制解调器命令”文档。
- 如果主连接连接正确连接，但第二个拨号连接发出忙信号，请验证DUN中是否正确配置了附加调制解调器的电话号码。请记住，不应将区号添加到其他设备的配置中。请参阅上面“配置Windows 9x客户端”部分中的配置步骤。

[show 和 debug 输出示例](#)

以下是AS5300的show和debug输出。为简单起见，已删除部分调试。注意在输出和备注中的粗体部分。

请注意，主叫方在Async5和Async6上连接，直到身份验证完成。临时IP地址从地址池提供给主叫方。然后，呼叫将虚拟化或绑定到现有虚拟捆绑包。这是因为接入服务器需要知道呼叫方是否属于已建立的虚拟捆绑包。一旦呼叫方与捆绑包绑定，临时IP地址即被删除，并且呼叫方使用虚拟捆绑包的IP地址。

```
bobslake-nas-01#
bobslake-nas-01#show ppp multilink
```

```
Virtual-Access1, bundle name is charlie
 0 lost fragments, 0 reordered, 0 unassigned, sequence 0x29/0x17 rcvd/sent
 0 discarded, 0 lost received, 1/255 load
Member links: 2 (max not set, min not set)
  Async5
  Async6
```

```
!--- Note that the bundle is using Async line 5 and 6 for multilink. bobslake-nas-01#show caller
```

Line	User	Service	Active Time	Idle Time
con 0	admin	Host connect	1w4d	16:50:19
tty 5	charlie	Async	00:04:34	00:01:54
tty 6	charlie	Async	00:02:00	00:00:57
vty 1	admin	VTY	00:13:43	00:00:00
As5	charlie	PPP	00:04:25	00:00:00
As6	charlie	PPP	00:01:53	00:00:00
vi1	charlie	PPP Bundle	00:04:25	00:00:57

```
!--- User charlie has two async lines, two tty, !--- and one virtual interface bundle. bobslake-nas-01#show caller user charlie
```

```
User: charlie, line tty 5, service Async
```

```
!--- shows hardware level settings for user charlie (first connection) Active time 00:04:43,
```


Idle time 00:00:06 Timeouts: Absolute Idle Idle Session Exec Limits: - - 00:10:00 Disconnect in:
- - - **TTY: Line 5, running PPP on As5**

!--- user charlie is using tty 5 DS0: (slot/unit/channel)=0/0/0 Line: Baud rate (TX/RX) is 115200/115200, no parity, 1 stopbits, 8 databits Status: Ready, Active, No Exit Banner, Async Interface Active HW PPP Support Active Capabilities: Hardware Flowcontrol In, Hardware Flowcontrol Out Modem Callout, Modem RI is CD, Line usable as async interface, Integrated Modem Modem State: Ready **User: charlie, line tty 6, service Async**

!--- shows hardware level settings for user charlie (second connection) Active time 00:02:09, Idle time 00:01:06 Timeouts: Absolute Idle Idle Session Exec Limits: - - 00:10:00 Disconnect in:
- - - **TTY: Line 6, running PPP on As6**

!--- user charlie is using tty 6 DS0: (slot/unit/channel)=0/0/1
Line: Baud rate (TX/RX) is 115200/115200, no parity, 1 stopbits, 8 databits
Status: Ready, Active, No Exit Banner, Async Interface Active
HW PPP Support Active
Capabilities: Hardware Flowcontrol In, Hardware Flowcontrol Out
Modem Callout, Modem RI is CD,
Line usable as async interface, Integrated Modem
Modem State: Ready

User: charlie, line As5, service PPP

!--- PPP setting for user charlie (first connection). Active time 00:04:34, Idle time 00:00:00 Timeouts: Absolute Idle Limits: - - Disconnect in: - - **PPP: LCP Open, multilink Open, CHAP (<-AAA)**

!--- MPPP state is open. Dialer: Connected, inbound Type is IN-BAND ASYNC, group Async5 IP: Local 172.21.10.10 Bundle: Member of charlie, last input 00:00:00 Counts: 54 packets input, 4110 bytes, 0 no buffer 1 input errors, 1 CRC, 0 frame, 0 overrun 73 packets output, 4150 bytes, 0 underruns 0 output errors, 0 collisions, 0 interface resets *!--- Packets are passing through the connection.* **User: charlie, line As6, service PPP**

!--- PPP setting for user charlie (second connection). Active time 00:02:02, Idle time 00:00:00 Timeouts: Absolute Idle Limits: - - Disconnect in: - - **PPP: LCP Open, multilink Open, CHAP (<-AAA)**

!--- MPPP state is Open. Dialer: Connected, inbound Type is IN-BAND ASYNC, group Async6 IP: Local 172.21.10.10 Bundle: Member of charlie, last input 00:00:00 Counts: 6 packets input, 462 bytes, 0 no buffer 1 input errors, 1 CRC, 0 frame, 0 overrun 20 packets output, 1129 bytes, 0 underruns 0 output errors, 0 collisions, 0 interface resets *!--- Packets are passing through the connection.* **User: charlie, line Vi1, service PPP Bundle**

!--- Bundle information for user charlie Active time 00:04:34, Idle time 00:00:06 Timeouts: Absolute Idle Limits: - - Disconnect in: - - **PPP: LCP Open, multilink Open, IPCP**

IP: Local 172.21.104.254, remote 172.21.104.2

!--- Remote IP address is obtained from IP pool. Counts: 50 packets input, 4034 bytes, 0 no buffer 0 input errors, 0 CRC, 0 frame, 0 overrun 80 packets output, 8750 bytes, 0 underruns 0 output errors, 0 collisions, 0 interface resets **bobslake-nas-01#debug vtemplate**

Virtual Template debugging is on

bobslake-nas-01#debug ppp multilink events

Multilink events debugging is on

bobslake-nas-01#debug ppp negotiation

PPP protocol negotiation debugging is on

bobslake-nas-01#debug ppp authentication

PPP authentication debugging is on

bobslake-nas-01#debug ppp error

PPP protocol errors debugging is on

bobslake-nas-01#debug modem

Modem control/process activation debugging is on

bobslake-nas-01#show debug

General OS:

Modem control/process activation debugging is on

PPP:

PPP authentication debugging is on

PPP protocol errors debugging is on

PPP protocol negotiation debugging is on

Multilink events debugging is on

VTEMPLATE:

Virtual Template debugging is on

bobslake-nas-01#

Jun 28 15:41:46.281 UTC: TTY5: **DSR came up**

Jun 28 15:41:46.281 UTC: tty5: Modem: IDLE->(unknown)

!--- Modem responds to first dialin connection. Jun 28 15:41:46.281 UTC: TTY5: EXEC creation

... Jun 28 15:41:48.537 UTC: TTY5 **Autoselect cmd: ppp negotiate**

Jun 28 15:41:48.537 UTC: TTY5: EXEC creation

...

Jun 28 15:41:48.545 UTC: As5 IPCP: **Install route to 172.21.104.4**

!--- IP address for first link obtained from address pool. !--- Route will be removed when link is virtualized later. Jun 28 15:41:50.541 UTC: As5 PPP: Treating connection as a callin Jun 28

15:41:50.541 UTC: As5 PPP: Phase is ESTABLISHING, Passive Open Jun 28 15:41:50.541 UTC: **As5 LCP: State is Listen**

!--- LCP negotiation begins. Jun 28 15:41:51.549 UTC: As5 LCP: I CONFREQ [Listen] id 3 len 46

... Jun 28 15:41:51.549 UTC: Unthrottle 5 Jun 28 15:41:51.549 UTC: As5 LCP: O CONFREQ [Listen]

id 1 len 47 ... Jun 28 15:41:51.549 UTC: As5 LCP: O CONFREQ [Listen] id 3 len 7 ... Jun 28

15:41:53.549 UTC: As5 LCP: O CONFREQ [REQsent] id 2 len 47 Jun 28 15:41:53.549 UTC: As5 LCP:

ACCM 0x000A0000 (0x0206000A0000) Jun 28 15:41:53.549 UTC: As5 LCP: AuthProto CHAP (0x0305C22305)

Jun 28 15:41:53.549 UTC: As5 LCP: MagicNumber 0x56E3C73E (0x050656E3C73E) Jun 28 15:41:53.549

UTC: As5 LCP: PFC (0x0702) Jun 28 15:41:53.549 UTC: As5 LCP: ACFC (0x0802) **Jun 28 15:41:53.549**

UTC: As5 LCP: MRRU 1524 (0x110405F4)

!--- Max-Receive-Reconstructed-Unit:Maximum packet size !--- that the peer will reconstruct. !---

- Both sides must agree on the packet size (MRRU). Jun 28 15:41:53.549 UTC: As5 LCP:

EndpointDisc 1 Local Jun 28 15:41:53.549 UTC: As5 LCP: (0x131201626F62736C616B652D6E61732D) Jun

28 15:41:53.549 UTC: As5 LCP: (0x3031) Jun 28 15:41:53.789 UTC: As5 LCP: I CONFACK [REQsent] id

2 len 47 Jun 28 15:41:53.789 UTC: As5 LCP: ACCM 0x000A0000 (0x0206000A0000) Jun 28 15:41:53.789

UTC: As5 LCP: AuthProto CHAP (0x0305C22305) Jun 28 15:41:53.789 UTC: As5 LCP: MagicNumber

0x56E3C73E (0x050656E3C73E) Jun 28 15:41:53.789 UTC: As5 LCP: PFC (0x0702) Jun 28 15:41:53.789

UTC: As5 LCP: ACFC (0x0802) **Jun 28 15:41:53.789 UTC: As5 LCP: MRRU 1524** (0x110405F4)

!--- Max-Receive-Reconstructed-Unit:Maximum packet size that !--- the peer will reconstruct. Jun

28 15:41:53.789 UTC: As5 LCP: EndpointDisc 1 Local Jun 28 15:41:53.789 UTC: As5 LCP:

(0x131201626F62736C616B652D6E61732D) Jun 28 15:41:53.789 UTC: As5 LCP: (0x3031)Jun 28

15:41:54.541 UTC: As5 LCP: I CONFREQ [ACKrcvd] id 4 len 46 ... Jun 28 15:41:54.541 UTC: As5 LCP:

O CONFREQ [ACKrcvd] id 4 len 7 ... Jun 28 15:41:54.717 UTC: As5 LCP: I CONFREQ [ACKrcvd] id 5

len 43 ... Jun 28 15:41:54.717 UTC: As5 LCP: O CONFACK [ACKrcvd] id 5 len 43 ... Jun 28

15:41:54.721 UTC: As5 **LCP: State is Open**

!--- LCP negotiation is complete. Jun 28 15:41:54.721 UTC: As5 PPP: Phase is AUTHENTICATING, by

this end *!--- CHAP authentication begins.* Jun 28 15:41:54.721 UTC: As5 CHAP: O CHALLENGE id 1

len 36 from "bobslake-nas-01" Jun 28 15:41:54.909 UTC: As5 CHAP: I RESPONSE id 1 len 27 from

"charlie" Jun 28 15:41:54.909 UTC: As5 **CHAP: O SUCCESS** id 1 len 4

!--- CHAP authentication is successful. Jun 28 15:41:54.909 UTC: As5 MLP: Multilink up event

pending Jun 28 15:41:54.913 UTC: As5 PPP: **Phase is VIRTUALIZED**

!--- Call is virtualized after authentication. Jun 28 15:41:54.913 UTC: Vi1 VTEMPLATE: Reuse

Vi1, recycle queue size 0 Jun 28 15:41:54.913 UTC: Vi1 VTEMPLATE: Hardware address

0010.7b4d.7046 Jun 28 15:41:54.913 UTC: Vi1 PPP: Phase is DOWN, Setup Jun 28 15:41:54.913 UTC:

Vi1 MLP: VP: Clone from Vtemplate 1 block=1 Jun 28 15:41:54.913 UTC: Vi1 VTEMPLATE: Has a new

cloneblk vtemplate Jun 28 15:41:54.913 UTC: Vi1 VTEMPLATE: ***** CLONE VACCESS1

***** Jun 28 15:41:54.913 UTC: **Vi1 VTEMPLATE: Clone from Virtual-Templatel**

!--- Cloning from Virtual-Template. interface Virtual-Access1 default ip address no ip address

encap ppp description Template for Multilink Users ip unnumbered Loopback0 no ip directed-

broadcast no logging event link-status no snmp trap link-status peer default ip address pool

addr-pool ppp authentication chap ppp multilink ip unnum loop 1 end Jun 28 15:41:55.005 UTC: Vi1

PPP: Treating connection as a dedicated line Jun 28 15:41:55.005 UTC: Vi1 PPP: Phase is

ESTABLISHING, Active Open Jun 28 15:41:55.005 UTC: Vi1 LCP: O CONFREQ [Closed] id 1 len 37 ...

Jun 28 15:41:55.009 UTC: Vi1 PPP: Phase is UP Jun 28 15:41:55.009 UTC: Vi1 IPCP: O CONFREQ

[Closed] id 1 len 10 Jun 28 15:41:55.009 UTC: Vi1 IPCP: Address 172.21.104.254 (0x0306AC1568FE)

Jun 28 15:41:55.009 UTC: **As5 MLP: charlie, multilink up, first link**

!--- First link in multilink bundle for user charlie is up. Jun 28 15:41:55.009 UTC: As5 IPCP:

Remove route to 172.21.104.4

!--- Temporary route to first link removed since link is virtualized. Jun 28 15:41:55.069 UTC:

Vi1 IPCP: I CONFREQ [REQsent] id 1 len 40 ... Jun 28 15:41:55.069 UTC: Vi1 IPCP: **Pool returned**

172.21.104.2

!--- IP address for virtual bundle obtained from address pool. Jun 28 15:41:55.069 UTC: Vi1

```
IPCP: O CONFREQ [REQsent] id 1 len 22 ... Jun 28 15:41:55.085 UTC: Vi1 CCP: I CONFREQ [Not negotiated] id 1 len 15 Jun 28 15:41:55.085 UTC: Vi1 CCP: MS-PPC supported bits 0x00000001 (0x120600) ... Jun 28 15:41:55.181 UTC: Vi1 IPCP: I CONFACK [REQsent] id 1 len 10 Jun 28 15:41:55.181 UTC: Vi1 IPCP: Address 172.21.104.254 (0x0306AC1568FE) Jun 28 15:41:57.009 UTC: Vi1 IPCP: TIMEOUT: State ACKrcvd Jun 28 15:41:57.009 UTC: Vi1 IPCP: O CONFREQ [ACKrcvd] id 2 len 10 Jun 28 15:41:57.009 UTC: Vi1 IPCP: Address 172.21.104.254 (0x0306AC1568FE) Jun 28 15:41:59.009 UTC: Vi1 IPCP: TIMEOUT: State REQsent Jun 28 15:41:59.009 UTC: Vi1 IPCP: O CONFREQ [REQsent] id 3 len 10 Jun 28 15:41:59.009 UTC: Vi1 IPCP: Address 172.21.104.254 (0x0306AC1568FE) Jun 28 15:41:59.617 UTC: Vi1 IPCP: I CONFREQ [REQsent] id 2 len 34 ... Jun 28 15:41:59.617 UTC: Vi1 IPCP: O CONFREQ [REQsent] id 2 len 16 ... Jun 28 15:41:59.633 UTC: Vi1 PPP: Replace IPCP code 2 id 3 with id 3 Jun 28 15:41:59.633 UTC: Vi1 IPCP: I CONFACK [REQsent] id 3 len 10 Jun 28 15:41:59.633 UTC: Vi1 IPCP: Address 172.21.104.254 (0x0306AC1568FE) Jun 28 15:41:59.777 UTC: Vi1 IPCP: I CONFREQ [ACKrcvd] id 3 len 22 ... Jun 28 15:41:59.777 UTC: Vi1 IPCP: O CONFNAK [ACKrcvd] id 3 len 22 ... Jun 28 15:41:59.937 UTC: Vi1 IPCP: I CONFREQ [ACKrcvd] id 4 len 22 Jun 28 15:41:59.937 UTC: Vi1 IPCP: Address 172.21.104.2 (0x0306AC156802)
!--- IP address of virtual bundle was previously obtained from !--- address pool. Jun 28 15:41:59.937 UTC: Vi1 IPCP: PrimaryDNS 172.22.53.210 (0x8106AC1635D2) Jun 28 15:41:59.937 UTC: Vi1 IPCP: SecondaryDNS 171.68.10.70 (0x8306AB440A46) Jun 28 15:41:59.937 UTC: Vi1 IPCP: O CONFACK [ACKrcvd] id 4 len 22 Jun 28 15:41:59.937 UTC: Vi1 IPCP: Address 172.21.104.2 (0x0306AC156802) Jun 28 15:41:59.937 UTC: Vi1 IPCP: PrimaryDNS 172.22.53.210 (0x8106AC1635D2) Jun 28 15:41:59.937 UTC: Vi1 IPCP: SecondaryDNS 171.68.10.70 (0x8306AB440A46) Jun 28 15:41:59.937 UTC: Vi1 IPCP: State is Open Jun 28 15:41:59.941 UTC: Vi1 IPCP: Install route to 172.21.104.2 !--- Add route for virtual bundle to routing table. Jun 28 15:42:44.383 UTC: TTY51: timer type 1 expired Jun 28 15:42:44.383 UTC: TTY51: Exec timer (continued) !--- Modem comes up for multilink connection. Jun 28 15:44:20.385 UTC: TTY6: DSR came up
!--- Async 6 is used for second connection. Jun 28 15:44:20.385 UTC: tty6: Modem: IDLE->(unknown) Jun 28 15:44:20.385 UTC: TTY6: EXEC creation ... Jun 28 15:44:20.529 UTC: TTY6 Autoselect cmd: ppp negotiate Jun 28 15:44:20.529 UTC: TTY6: EXEC creation ...Jun 28 15:44:20.661 UTC: As6 IPCP: Install route to 172.21.104.5
!--- IP address for second link is obtained from the pool. !--- Route will be removed when link is added to the MPPP bundle. Jun 28 15:44:22.661 UTC: As6 PPP: Treating connection as a callin Jun 28 15:44:22.661 UTC: As6 PPP: Phase is ESTABLISHING, Passive Open !--- LCP negotiation begins. Jun 28 15:44:22.661 UTC: As6 LCP: State is Listen Jun 28 15:44:23.521 UTC: As6 LCP: I CONFREQ [Listen] id 2 len 46 ... Jun 28 15:44:23.525 UTC: Unthrottle 6 Jun 28 15:44:23.525 UTC: As6 LCP: O CONFREQ [Listen] id 1 len 47 ... Jun 28 15:44:23.525 UTC: As6 LCP: O CONFREQ [Listen] id 2 len 7 Jun 28 15:44:23.525 UTC: As6 LCP: Callback 6 (0x0D0306) Jun 28 15:44:25.525 UTC: As6 LCP: TIMEOUT: State REQsent Jun 28 15:44:25.525 UTC: As6 LCP: O CONFREQ [REQsent] id 2 len 47 ... Jun 28 15:44:25.765 UTC: As6 LCP: I CONFACK [REQsent] id 2 len 47 ... Jun 28 15:44:26.533 UTC: As6 LCP: I CONFREQ [ACKrcvd] id 3 len 46 ... Jun 28 15:44:26.533 UTC: As6 LCP: O CONFREQ [ACKrcvd] id 3 len 7 Jun 28 15:44:26.533 UTC: As6 LCP: Callback 6 (0x0D0306) Jun 28 15:44:26.741 UTC: As6 LCP: I CONFREQ [ACKrcvd] id 4 len 43 ... Jun 28 15:44:26.741 UTC: As6 LCP: O CONFACK [ACKrcvd] id 4 len 43 ... Jun 28 15:44:26.741 UTC: As6 LCP: State is Open !--- LCP negotiation is complete. !--- CHAP authentication begins. Jun 28 15:44:26.745 UTC: As6 PPP: Phase is AUTHENTICATING, by this end Jun 28 15:44:26.745 UTC: As6 CHAP: O CHALLENGE id 1 len 36 from "bobslake-nas-01" Jun 28 15:44:26.981 UTC: As6 CHAP: I RESPONSE id 1 len 27 from "charlie" Jun 28 15:44:26.981 UTC: As6 CHAP: O SUCCESS id 1 len 4
!--- CHAP authentication is successful. Jun 28 15:44:26.981 UTC: As6 MLP: Multilink up event pending Jun 28 15:44:26.981 UTC: As6 PPP: Phase is VIRTUALIZED
!--- Link is virtualized. Jun 28 15:44:26.985 UTC: As6 MLP: charlie, multilink up
!--- Multilink connection is up. Jun 28 15:44:26.985 UTC: As6 IPCP: Remove route to 172.21.104.5
!--- Use IP address previously assigned to the bundle !--- (in this case, 172.21.104.2).
bobslake-nas-01#
```

故障排除

本部分提供的信息可用于对配置进行故障排除。

故障排除命令

输出解释器工具支持某些 show 命令 (只限于注册用户) , 通过它可以查看 show 命令输出的分析

。

注意：在发出debug命令之前，[请参阅有关Debug命令的重要信息](#)。

- **debug vtemplate** — 显示从从虚拟模板克隆到虚拟模板关闭时的虚拟访问接口的克隆信息。
- **debug ppp multilink events** - 显示关于影响多链路捆绑的事件的信息。
- **debug ppp negotiation** -显示协商链路控制协议(LCP)、认证和网络控制协议(NCP)时的 PPP数据流量和交换的信息。成功的PPP协商将首先开放LCP状态，然后进行验证，最后进行NCP协商。
- **debug ppp authentication** — 显示PPP身份验证协议消息，包括质询握手身份验证协议(CHAP)数据包交换和密码身份验证协议(PAP)交换。
- **debug ppp error** -显示与PPP连接协商和运行有关的协议错误和错误统计数据。
- **debug modem** - 显示接入服务器上的调制解调器线路活动情况。

[相关信息](#)

- [配置虚拟配置文件](#)
- [配置虚拟模板接口](#)
- [对基本拨号接入进行NAS配置](#)
- [显示呼叫方统计信息](#)
- [多链路 PPP RFC 1717](#)
- [拨号和接入技术支持](#)
- [技术支持和文档 - Cisco Systems](#)