配置电缆上的 GRE 通道

目录

简介

本文包含电缆环境中的通用路由封装 (GRE) 的说明、配置和验证。GRE是Cisco开发的一种隧道协议，能够将广泛的协议信息包类型封装在IP隧道内。

开始使用前

规则

有关文档规则的详细信息，请参阅 Cisco 技术提示规则。

先决条件

本文档没有任何特定的前提条件。

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 12.1(5)T4 的电缆调制解调器 uBR924

注意： 虽然使用不同的思科IOS版本，可以在其他Cisco 有线调制解调器平台（如uBR904平台）上配置GRE通道，但是该功能正式支持的版本是Cisco IOS 12.1(5)T4 for uBR920 和Cisco IOS 12.1(3) for uBR910。

电缆调制解调器平台	Cisco IOS 软件版本

uBR920	12.1(5)T4
uBR910	从 12.1(3) 及更高版本

要运行此配置，两个电缆调制解调器之间需要有 IP 连接。

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。

背景理论

隧道建立提供将外国协议的信息包封装在传输协议内部的一种方式。通道实施作为一个虚拟接口，为配置提供简单接口。隧道接口不依赖于特定的乘客或传输协议，但是它是提供实施任何标准的点到点封装机制所需业务的体系结构。隧道是点对点链路，并且您必须为每条链路配置一个单独隧道。

GRE 创建经由 IP 互联网络连接远程点上 Cisco 路由器的虚拟点对点链接。通过在单协议骨干网环境连接多协议子网络，使用GRE的IP隧道允许网络扩展穿越整个单协议骨干网环境。有线调制解调器终端系统（CMTS）是兼容任意电缆传输数据服务接口规格(DOCSIS）的头端有线路由器，如Cisco UBR7246、uBR7223或uBR7246VXR。

配置

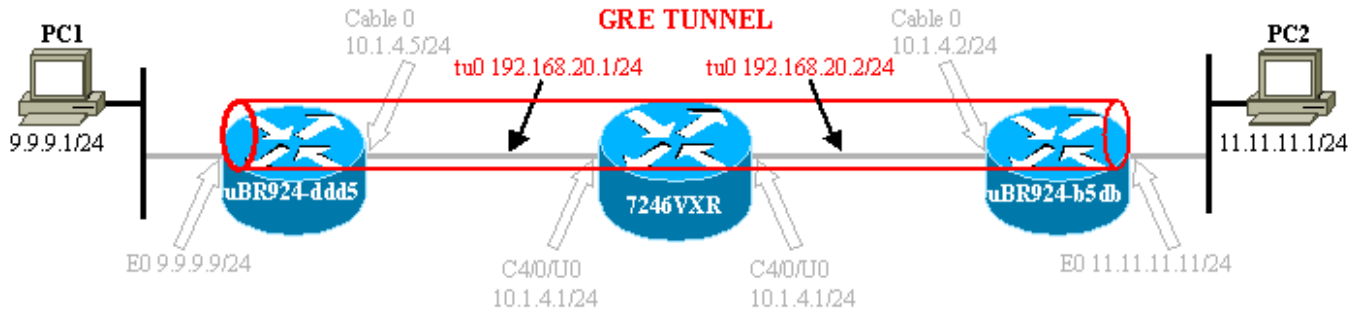
本部分提供有关如何配置本文档所述功能的信息。

网络图

本文档使用下图所示的网络设置。

此设置在两个电缆调制解调器 uBR924-ddd5 和 uBR924-b5db 之间创建一个隧道。以下示例使用两个 uBR924 和一个 uBR7246VXR。在此设置中，有线调制解调器的名称是ubr924-ddd5和ubr924-b5db，它们使用的是Cisco IOS版本12.1(5)T4。此隧道接口通过发出 interface tunnel 0 命令在全局配置模式中动态创建。

注意： 只要二个有线调制解调器之间有IP连接，那么uBR900 有线调制解调器就无需连接到同一个uBR7200 CMTS或同一个服务提供商网络上。



配置

本文档使用如下所示的配置。

注意： 粗体文本指 GRE 相关命令。注释为蓝色，指上一行。

ubr924-ddd5

```
version 12.1
no service single-slot-reload-enable
no service pad
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname ubr924-ddd5
!
logging rate-limit console 10 except errors
!
clock timezone - -80
ip subnet-zero
no ip finger
!
call rsvp-sync
!
!
!
!
!
!
!
!
!
!
interface Tunnel0
!--- Tunnel interface 0. ip address 192.168.20.1
255.255.255.0 !--- IP address of the GRE tunnel
interface 0. tunnel source Ethernet0 !--- IP source of
the tunnel. It is best to make this an !--- interface
with a public, routable IP address so that !--- it is
reachable from the other endpoint of the tunnel. tunnel
destination 11.11.11.11 !--- IP destination of the
tunnel. Make sure this is !--- reachable via the ping
command !--- Otherwise, the tunnel will not be created
properly.

!
interface Ethernet0
 ip address 9.9.9.9 255.255.255.0
 ip rip send version 2
!--- Send RIP version 2 packets. ip rip receive version
2 !--- Receive RIP version 2 packets. ! interface cable-
modem0 ip rip send version 2 !--- Send RIP version 2
packets. ip rip receive version 2 !--- Receive RIP
version 2 packets. cable-modem downstream saved channel
525000000 40 1 cable-modem mac-timer t2 40000 no cable-
modem compliant bridge ! router rip version 2 passive-
interface Tunnel0 !--- This command is used to avoid
recursive routing. network 10.0.0.0 network 9.0.0.0 no
auto-summary ! ip default-gateway 10.1.4.1 ip classless
no ip http server no ip http cable-monitor ! snmp-server
packetsize 4096 snmp-server manager ! voice-port 0 input
gain -2 ! voice-port 1 input gain -2 ! ! line con 0
transport input none line vty 0 4 login ! end ubr924-
ddd5#
```

ubr924-b5db

```
version 12.1
no service single-slot-reload-enable
no service pad
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname ubr924-b5db
!
logging rate-limit console 10 except errors
enable password ww
!
clock timezone - -80
ip subnet-zero
no ip finger
!
mgcp
call rsvp-sync
!
!
!
!
!
!
!
!
!
!

interface Tunnel0
!--- Tunnel interface 0 ip address 192.168.20.2
255.255.255.0
!--- IP address of the gre tunnel interface 0 tunnel
source Ethernet0
!--- IP source of the tunnel. It is best to make this an
!--- interface with a public, routable IP address so
that !--- it is reachable from the other endpoint of the
tunnel. tunnel destination 9.9.9.9
!--- IP destination of the tunnel. Make sure this is !--
- reachable via the ping command !--- Otherwise, the
tunnel will not be created properly.

!
interface Ethernet0
 ip address 11.11.11.11 255.255.255.0
 ip rip send version 2
!--- Send RIP version 2 packets. ip rip receive version
2 !--- Receive RIP version 2 packets. ! no ip route-
cache no ip mroute-cache ! interface cable-modem0 ip rip
send version 2 !--- Send RIP version 2 packets. ip rip
receive version 2 !--- Receive RIP version 2 packets. no
ip route-cache no ip mroute-cache no cable-modem
compliant bridge ! router rip
 version 2
 passive-interface Tunnel0
!--- This command is used to avoid recursive routing.
network 10.0.0.0 network 11.0.0.0
 no auto-summary
!
ip default-gateway 10.1.4.1
ip classless
no ip http server
no ip http cable-monitor
!
```

```
snmp-server packetsize 4096
snmp-server manager
!
voice-port 0
 input gain -2
!
voice-port 1
 input gain -2
!
!
line con 0
 exec-timeout 0 0
 transport input none
line vty 0 4
 password ww
 login
!
end

ubr924-b5db#
```

验证

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。

验证CMTS (7246VXR)配置正确，并且调制解调器处于联机状态。CMTS 的配置如下所示。

```
7246VXR#show run
Building configuration...

Current configuration : 4579 bytes
!
! Last configuration change at 13:22:17 PDT Mon Feb 26 2001
! NVRAM config last updated at 13:22:46 PDT Mon Feb 26 2001
!
version 12.1
no service single-slot-reload-enable
no service pad
service timestamps debug datetime msec localtime
service timestamps log datetime localtime
no service password-encryption
service linenumber
service udp-small-servers max-servers no-limit
!
hostname 7246VXR
!
logging buffered 1000000 debugging
logging rate-limit console 10 except errors
enable password cable
!
cable qos profile 8
cable qos profile 10
cable qos profile 10 grant-size 1500
cable qos profile 12 guaranteed-upstream 100000
no cable qos permission create
no cable qos permission update
```

```
cable qos permission modems
cable time-server
clock timezone PDT -8
clock summer-time PDT recurring
clock calendar-valid
ip subnet-zero
no ip finger
!
interface Ethernet2/0
 ip address 172.16.30.4 255.255.255.192
 no ip mroute-cache
 half-duplex
!

interface Cable4/0
 ip address 172.16.29.1 255.255.255.224 secondary
 ip address 10.1.4.1 255.255.255.0
 no keepalive
 cable downstream rate-limit token-bucket shaping
 cable downstream annex B
 cable downstream modulation 64qam
 cable downstream interleave-depth 32
 cable downstream frequency 555000000
 cable upstream 0 frequency 40000000
 cable upstream 0 power-level 0
 no cable upstream 0 shutdown
 cable upstream 1 shutdown
 cable upstream 2 shutdown
 cable upstream 3 shutdown
 cable upstream 4 shutdown
 cable upstream 5 shutdown
 cable dhcp-giaddr policy
 cable helper-address 172.16.30.2
!
interface Cable5/0
 ip address 172.16.29.225 255.255.255.224 secondary
 ip address 10.1.5.1 255.255.255.0
 load-interval 30
 no keepalive
 cable downstream rate-limit token-bucket shaping
 cable downstream annex B
 cable downstream modulation 64qam
 cable downstream interleave-depth 32
 cable downstream frequency 620000000
 cable upstream 0 frequency 25008000
 cable upstream 0 power-level 0
 no cable upstream 0 shutdown
 no cable upstream 1 shutdown
 cable dhcp-giaddr policy
!
router eigrp 202
 redistribute connected
 redistribute static
 network 10.0.0.0
 network 172.16.0.0
 no auto-summary
 no eigrp log-neighbor-changes
!
router rip
 version 2
 redistribute connected
 redistribute static
 network 10.0.0.0
 network 172.16.0.0
```

```
 no auto-summary
!
ip default-gateway 172.16.30.1
ip classless
ip route 0.0.0.0 0.0.0.0 172.16.30.1
ip route 172.16.30.0 255.255.255.0 Ethernet2/0
ip http server
ip http authentication local
!
access-list 188 permit tcp any any eq www log
access-list 188 permit ip any any
route-map docsis permit 10
!
snmp-server engineID local 00000009020000E01ED77E40
snmp-server community public RO
snmp-server community private RW

line con 0
 exec-timeout 0 0
 transport input none
line aux 0
 speed 19200
line vty 0 4
 session-timeout 60
 exec-timeout 0 0
!
ntp clock-period 17179973
end
```

```
7246VXR#show cable modem
Interface   Prim Online     Timing Rec    QoS CPE IP address      MAC address
            Sid  State      Offset Power
Cable4/0/U0 69   online     2812    0.25  5   0   10.1.4.3        0002.1685.b5db
Cable4/0/U0 70   online     2288    0.00  5   0   10.1.4.6        0010.7bed.9b23
Cable4/0/U0 71   online     2289    0.50  5   0   10.1.4.2        0010.7bed.9b45
Cable4/0/U0 72   online     2812    0.00  5   0   10.1.4.4        0002.fdfa.0a63
Cable4/0/U0 73   online     2812   -0.75  5   0   10.1.4.5        0004.2752.ddd5
Cable4/0/U0 74   online     2813    0.25  5   0   10.1.4.7        0001.64ff.e47d
```

如果电缆调制解调器在线状态不显示 online，请参阅针对 uBR 电缆调制解调器不在线进行故障排除文档。

```
7246VXR#show ip interface brief
Interface                  IP-Address      OK? Method Status                Protocol
FastEthernet0/0            192.168.7.253   YES NVRAM  up                    down
Ethernet2/0                172.16.30.4     YES manual up                    up
Ethernet2/1                unassigned      YES NVRAM  administratively down down
Ethernet2/2                unassigned      YES NVRAM  administratively down down
Ethernet2/3                unassigned      YES NVRAM  administratively down down
Cable3/0                   10.1.3.1        YES manual up                    up
Cable4/0                   10.1.4.1        YES manual up                    up
Cable5/0                   10.1.5.1        YES manual up                    up
```

```
7246VXR#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 172.16.30.1 to network 0.0.0.0
```

```
     172.16.0.0/16 is variably subnetted, 4 subnets, 3 masks
C       172.16.29.224/27 is directly connected, Cable5/0
C       172.16.29.0/27 is directly connected, Cable4/0
S       172.16.30.0/24 is directly connected, Ethernet2/0
C       172.16.30.0/26 is directly connected, Ethernet2/0
     9.0.0.0/24 is subnetted, 1 subnets
R       9.9.9.0 [120/1] via 10.1.4.5, 00:00:09, Cable4/0
R    192.168.20.0/24 [120/1] via 10.1.4.5, 00:00:09, Cable4/0
     10.0.0.0/8 is variably subnetted, 5 subnets, 2 masks
C       10.1.3.0/24 is directly connected, Cable3/0
R       10.5.5.0/24 [120/1] via 10.1.4.4, 00:00:01, Cable4/0
R       10.0.0.0/8 [120/1] via 172.16.30.10, 00:00:24, Ethernet2/0
C       10.1.5.0/24 is directly connected, Cable5/0
C       10.1.4.0/24 is directly connected, Cable4/0
     11.0.0.0/24 is subnetted, 1 subnets
R       11.11.11.0 [120/1] via 10.1.4.3, 00:00:15, Cable4/0
S*   0.0.0.0/0 is directly connected
```

从电缆调制解调器侧，验证两个设备的 sh version，如下所示。

```
ubr924-ddd5#sh ver
Cisco Internetwork Operating System Software
IOS (tm) 920 Software (UBR920-K1V4Y556I-M), Version 12.1(5)T4,  RELEASE SOFTWARE (fc1)
TAC Support: http://www.cisco.com/pcgi-bin/ibld/view.pl?i=support
Copyright (c) 1986-2001 by cisco Systems, Inc.
Compiled Fri 02-Feb-01 10:55 by ccai
Image text-base: 0x800100A0, data-base: 0x806DB770

ROM: System Bootstrap, Version 12.0(6r)T3, RELEASE SOFTWARE (fc1)
ROM: 920 Software (UBR920-K1V4Y556I-M), Version 12.1(5)T4,  RELEASE SOFTWARE (fc1)

ubr924-ddd5 uptime is 2 hours, 1 minute
System returned to ROM by reload at 12:45:25 - Fri Feb 23 2001
System restarted at 12:46:07 - Fri Feb 23 2001
System image file is "flash:ubr920-k1v4y556i-mz.121-5.T4"

cisco uBR920 CM (MPC850) processor (revision 4.d) with 15872K/1024K bytes of memory.
Processor board ID FAA0444Q14Z
Bridging software.
1 Ethernet/IEEE 802.3 interface(s)
1 Cable Modem network interface(s)
3968K bytes of processor board System flash (Read/Write)
1536K bytes of processor board Boot flash (Read/Write)

Configuration register is 0x2102

ubr924-b5db#show ver
Cisco Internetwork Operating System Software
IOS (tm) 920 Software (UBR920-K1V4Y556I-M), Version 12.1(5)T4,  RELEASE SOFTWARE (fc1)
TAC Support: http://www.cisco.com/pcgi-bin/ibld/view.pl?i=support
Copyright (c) 1986-2001 by cisco Systems, Inc.
Compiled Fri 02-Feb-01 10:55 by ccai
Image text-base: 0x800100A0, data-base: 0x806DB770

ROM: System Bootstrap, Version 12.0(6r)T3, RELEASE SOFTWARE (fc1)
ROM: 920 Software (UBR920-K1V4Y556I-M), Version 12.1(5)T4,  RELEASE SOFTWARE (fc1)

ubr924-b5db uptime is 1 hour, 53 minutes
System returned to ROM by reload at 12:55:34 - Fri Feb 23 2001
System restarted at 12:56:15 - Fri Feb 23 2001
System image file is "flash:ubr920-k1v4y556i-mz.121-5.T4"

cisco uBR920 CM (MPC850) processor (revision 3.e) with 15872K/1024K bytes of memory.
```

```
Processor board ID FAA0422Q04F
Bridging software.
1 Ethernet/IEEE 802.3 interface(s)
1 Cable Modem network interface(s)
3968K bytes of processor board System flash (Read/Write)
1536K bytes of processor board Boot flash (Read/Write)

Configuration register is 0x2102
```

只要以下条件存在，此隧道就会显示 up/up：

- 它使用有效 IP 地址配置。
- 路由表中具有到达隧道目的地的IP地址的路由，没有分配到隧道远端的IP地址的路由。

不论您是否可以 ping 目的地地址，都应如此。不正确的静态路由或指向错误方向的默认路由将调动隧道，但隧道不会工作。

验证隧道运行的第一步是验证隧道是否开通。在两个电缆调制解调器上发出 **show ip interface brief** 和 **show interface tunnel 0** 命令。示例命令输出如下所示。

```
ubr924-ddd5#show ip interface brief
Interface                  IP-Address      OK? Method Status                Protocol
Ethernet0                  9.9.9.9         YES manual up                    up
Tunnel0                    192.168.20.1    YES manual up                    up
cable-modem0               10.1.4.5        YES unset  up                    up

ubr924-ddd5#show interface tunnel 0
Tunnel0 is up, line protocol is up
  Hardware is Tunnel
  Internet address is 192.168.20.1/24
  MTU 1514 bytes, BW 9 Kbit, DLY 500000 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation TUNNEL, loopback not set
  Keepalive set (10 sec)
  Tunnel source 9.9.9.9 (Ethernet0), destination 11.11.11.11
  Tunnel protocol/transport GRE/IP, key disabled, sequencing disabled
  Checksumming of packets disabled
  Last input 00:15:25, output 00:14:27, output hang never
  Last clearing of "show interface" counters never
  Queueing strategy: fifo
  Output queue 0/0, 2 drops; input queue 0/75, 0 drops
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     146 packets input, 21024 bytes, 0 no buffer
     Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     172 packets output, 57392 bytes, 0 underruns
     0 output errors, 0 collisions, 0 interface resets
     0 output buffer failures, 0 output buffers swapped out


ubr924-b5db#show ip interface brief
Interface                  IP-Address      OK? Method Status                Protocol
Ethernet0                  11.11.11.11     YES manual up                    up
Tunnel0                    192.168.20.2    YES manual up                    up
cable-modem0               10.1.4.3        YES NVRAM  up                    up

ubr924-b5db#show interface tunnel 0
Tunnel0 is up, line protocol is up
  Hardware is Tunnel
  Internet address is 192.168.20.2/24
  MTU 1514 bytes, BW 9 Kbit, DLY 500000 usec,
```

```
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation TUNNEL, loopback not set
  Keepalive set (10 sec)
  Tunnel source 11.11.11.11 (Ethernet0), destination 9.9.9.9
  Tunnel protocol/transport GRE/IP, key disabled, sequencing disabled
  Checksumming of packets disabled
  Last input 00:16:42, output 00:17:40, output hang never
  Last clearing of "show interface" counters never
  Queueing strategy: fifo
  Output queue 0/0, 5 drops; input queue 0/75, 0 drops
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     118 packets input, 19144 bytes, 0 no buffer
     Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     164 packets output, 49624 bytes, 0 underruns
     0 output errors, 0 collisions, 0 interface resets
     0 output buffer failures, 0 output buffers swapped out
```

验证此隧道的工作是 ping 隧道目标 IP 地址。这只会验证 IP 连接，而不会验证通道的实际运行情况。

```
From ubr924-ddd5 we ping 11.11.11.11
ubr924-ddd5#ping 11.11.11.11

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 11.11.11.11, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 12/14/17 ms
ubr924-ddd5#
```

从 ubr924-b5db 目标地址 9.9.9.9 Ping。

```
ubr924-b5db#ping 9.9.9.9

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 9.9.9.9, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 12/14/16 ms
ubr924-b5db#
```

要验证此隧道是否能工作，请发出 **show ip route x.x.x.x 命令**，其中 x.x.x.x *是*分配给此隧道远端的 IP 地址。在这种情况下，它是远端路由器的环回地址。如果显示的唯一路由是对隧道接口，那么到该地址的ping将证明此隧道会工作。

如果有IP编制机制，反向穿过网络通告路由回通道分段，则应该是有一个以上的路由到达通道接口的远端如果那是实际情形，则很难检验隧道是够正在运行。通常，在这种情况下，您不会想将路由复制到隧道网络。应当由网络的路由协议采取措施，防止路由通告。如果隧道被用来传输来自IP的不同协议的数据流，则应使用同一个基本验证方法。

```
From ubr924-ddd5 we get
ubr924-ddd5#show ip route 192.168.20.2
Routing entry for 192.168.20.0/24
  Known via "connected", distance 0, metric 0 (connected, via interface)
  Routing Descriptor Blocks:
  * directly connected, via Tunnel0
      Route metric is 0, traffic share count is 1

From ubr924-b5db we get
ubr924-b5db#show ip route 192.168.20.1
Routing entry for 192.168.20.0/24
  Known via "connected", distance 0, metric 0 (connected, via interface)
```

```
  Routing Descriptor Blocks:
  * directly connected, via Tunnel0
      Route metric is 0, traffic share count is 1
```

验证PC1能访问PC2并且反之亦然，请在有线调制解调器上执行扩展的ping，同时也从PC执行ping。

将ping从ubr924-b5db以太网接口(11.11.11.11)扩展到ubr924-ddd5以太网接口(9.9.9.9)。

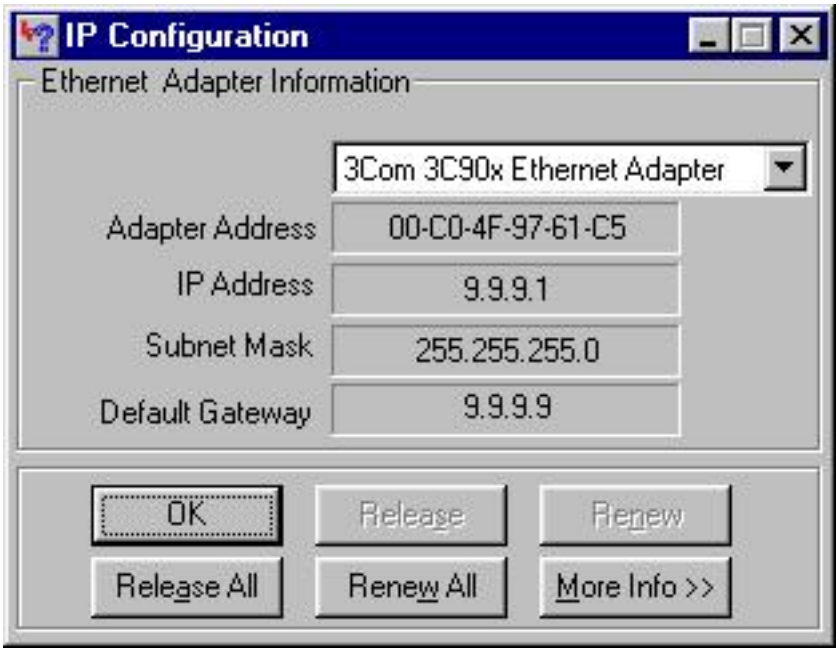
```
ubr924-b5db#ping ip
Target IP address: 9.9.9.9
!--- ubr924-ddd5 Ethernet's IP address. Repeat count [5]: Datagram size [100]: Timeout in
seconds [2]: Extended commands [n]: y Source address or interface: 11.11.11.11
!--- ubr924-b5db Ethernet's IP address. Type of service [0]: Set DF bit in IP header? [no]:
Validate reply data? [no]: Data pattern [0xABCD]: Loose, Strict, Record, Timestamp,
Verbose[none]: Sweep range of sizes [n]: Type escape sequence to abort. Sending 5, 100-byte ICMP
Echos to 9.9.9.9, timeout is 2 seconds: !!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 12/16/28 ms
ubr924-b5db#
```

执行相反步骤测试另一侧的连接。

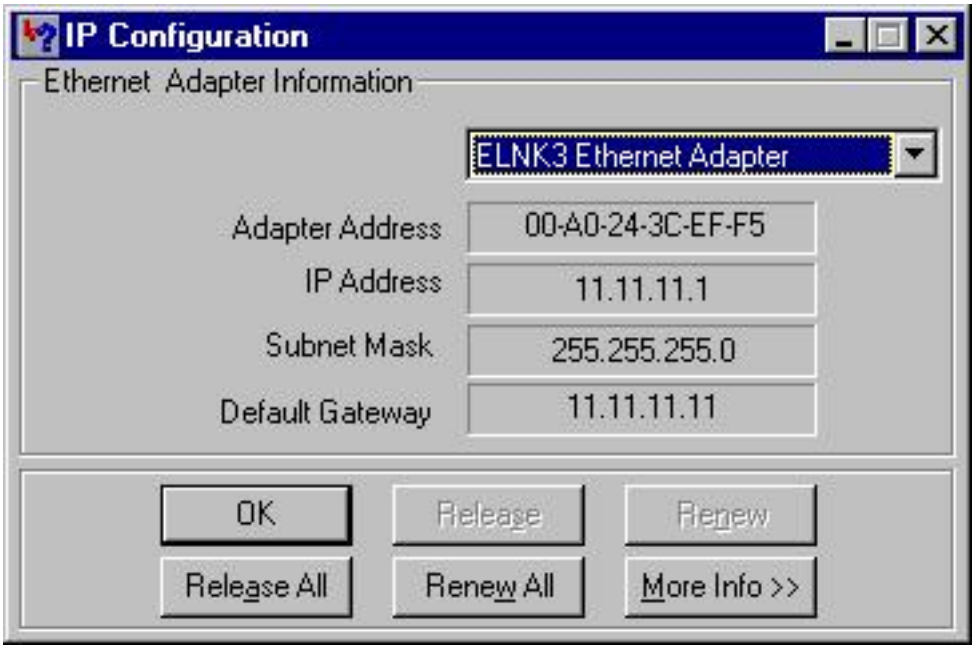
```
ubr924-ddd5#ping ip
Target IP address: 11.11.11.11
!--- ubr924-b5db Ethernet's IP address. Repeat count [5]: Datagram size [100]: Timeout in
seconds [2]: Extended commands [n]: y Source address or interface: 9.9.9.9
!--- ubr924-ddd5 Ethernet's IP address. Type of service [0]: Set DF bit in IP header? [no]:
Validate reply data? [no]: Data pattern [0xABCD]: Loose, Strict, Record, Timestamp,
Verbose[none]: Sweep range of sizes [n]: Type escape sequence to abort. Sending 5, 100-byte ICMP
Echos to 11.11.11.11, timeout is 2 seconds: !!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 12/14/16 ms
ubr924-ddd5#
```

最终测试是从 PC1 ping 到 PC2，以及从 PC2 ping 到 PC1。

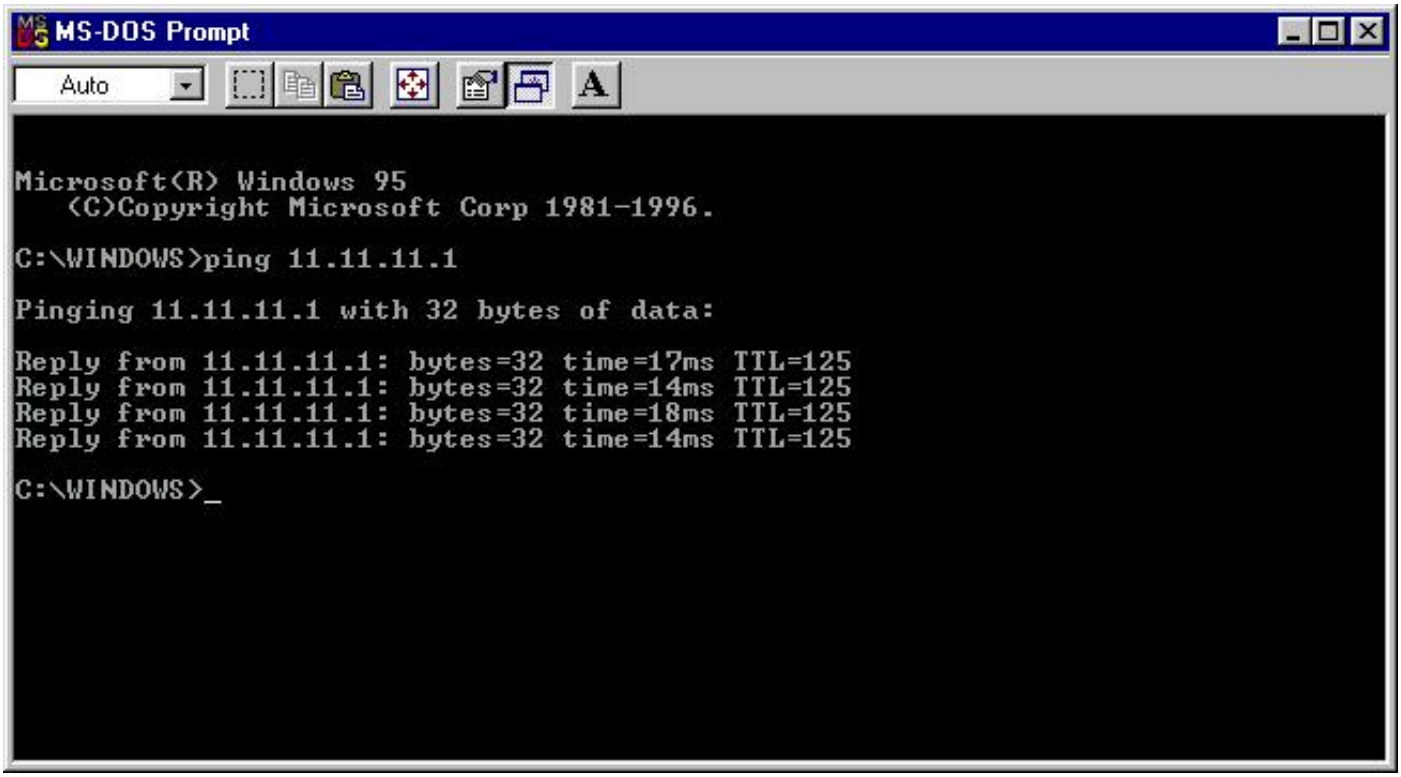
PC1 的 IP 地址为 9.9.9.1。



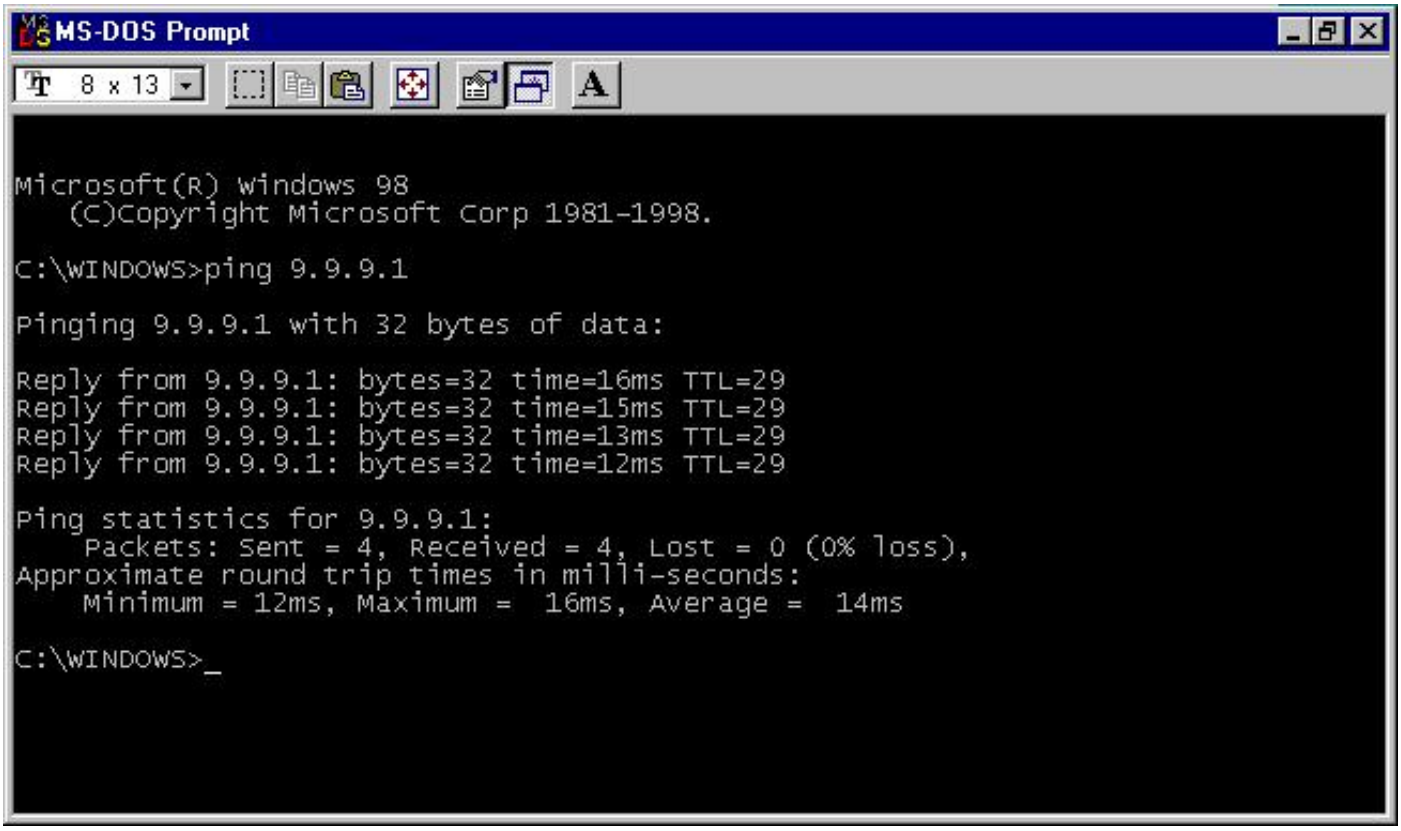
PC2 的 IP 地址是 11.11.11.1。



从 PC1 ping PC2。



从 PC2 ping PC1。



故障排除

目前没有针对此配置的故障排除信息。

相关信息

- 故障排除 UBR 电缆调制解调器不上线的问题
- 技术支持 - Cisco Systems