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Configuring ISDN BRI Using the ip unnumbered Command

Document ID: 6504

Introduction

Prerequisites

- Requirements
- Components Used
- Conventions

Background Information

- IP Unnumbered

Configure

- Network Diagram
- Configurations
- Use Static Routes

Verify

- show Commands
- Sample show Output

Troubleshoot

- debug Commands
- Sample debug Output

NetPro Discussion Forums – Featured Conversations

Related Information

Introduction

This document explains the concept of IP unnumbered functionality, and provides sample configurations of ISDN BRI. This document uses the **ip unnumbered** command for reference.

The **ip unnumbered** configuration command allows you to enable IP processing on a BRI interface even if you do not assign an explicit IP address for the interface. This ip unnumbered interface can borrow the IP address of another interface already configured on the router, and thereby conserve network and address space.

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:

- **Router1** A Cisco 2503 with one Ethernet and one BRI interface running Cisco IOS® Software Release 12.2(1a).
- **Router2** A Cisco 2503 with one Ethernet and one BRI interface running Cisco IOS Software Release 12.0(7)T).

The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, make sure that you understand the potential impact of any command.

Conventions

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

Background Information

IP Unnumbered

On a Cisco router, every interface that connects to a network segment must belong to a unique subnet. Directly connected routers have interfaces that connect to the same network segment, and are assigned IP addresses from the same subnet. If a router needs to send data to a network that is not directly connected, it looks in its routing table. The router then forwards the packet to the next directly connected hop towards the destination. If there is no route in the routing table, the router forwards the packet to its gateway of last resort. When a router that is directly connected to the final destination receives the packet, it delivers the packet directly to the end host.

A router that receives a routing update installs the source address of the update as the next hop in its routing table. Normally, the next hop is a directly connected network node. This is no longer the case if you use IP unnumbered. This is because the BRI interface borrows the IP address from a different interface, each in a different subnet, and possibly in a different major network. When you configure IP unnumbered, routes learned through the IP unnumbered interface have the interface as the next hop instead of the source address of the routing update. Therefore, the router avoids the problem of an invalid next hop address, which is caused when the source of the routing update comes from a next hop that is not directly connected.

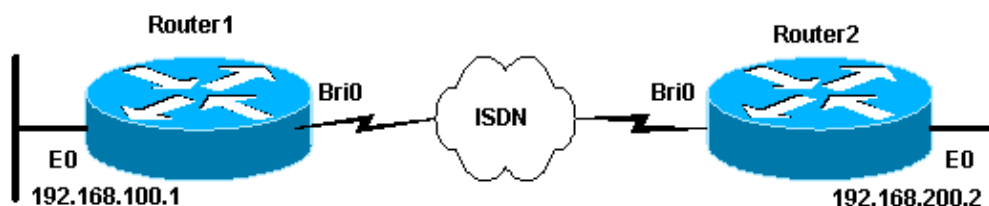
Note: Use IP unnumbered only for point-to-point links.

Configure

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

Network Diagram

This document uses this network setup:



Configurations

Perform the IP unnumbered configuration in the interface configuration mode. You must define an interface from which the IP address is borrowed. This configuration uses the Interior Gateway Routing Protocol (IGRP) routing protocol between the two routers, although you can also use static routes instead.

The configuration of IP unnumbered in a Dial-on-Demand Routing (DDR) environment involves a single interface configuration command:

ip unnumbered <*interface_type number*>

Notes:

1. You cannot use the **ping** command to determine whether the interface is up, because the interface has no address.
2. You can use Simple Network Management Protocol (SNMP) to remotely monitor interface status.
3. You cannot netboot an executable image over an unnumbered interface.
4. The argument type and number must be another interface in the network server that has an IP address, not another unnumbered interface.

```
Router1
router1#show running-config
Building configuration...

Current configuration : 1095 bytes
!
version 12.2
no service single-slot-reload-enable
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname router1
!
logging rate-limit console 10 except errors
!
username router2 password 0 ipunnumb

!--- Username for remote router (router2) and shared secret.
!--- Shared secret(used for CHAP) must be the same on both sides.

ip subnet-zero
no ip finger
!
no ip dhcp-client network-discovery
isdn switch-type basic-5ess
!
interface Loopback0
 ip address 10.1.1.1 255.0.0.0
!
interface Ethernet0
 ip address 192.168.100.1 255.255.255.0

!--- IP address for the Ethernet interface.

!
interface Serial0
 no ip address
 no ip mroute-cache
 shutdown
 no fair-queue
!
interface Serial1
 no ip address
 shutdown
!
```

```

interface BRI0
 ip unnumbered Ethernet0

!--- ip unnumbered is configured in such a way that the BRI interface
!--- uses the IP address of the Ethernet 0 interface.

encapsulation ppp
dialer idle-timeout 60

!--- Idle timeout(in seconds)for this BRI interface.

dialer map ip 192.168.200.2 name router2 broadcast 96665700

!--- Dialer map for the BRI interface of the remote router uses the
!--- ethernet interface IP address of the remote router. The remote router BRI
!--- interface is also unnumbered to its ethernet interface. Therefore,
!--- the dialer map IP address points to the remote ethernet interface address.

dialer hold-queue 10
dialer-group 1

!--- Apply interesting traffic defined in dialer-list 1.

isdn switch-type basic-5ess
cdapi buffers regular 0
cdapi buffers raw 0
cdapi buffers large 0
ppp authentication chap

!--- Use CHAP authentication.

!
router igrp 100
 network 10.0.0.0
 network 192.168.100.0
!
ip classless
ip http server
!
dialer-list 1 protocol ip permit

!--- Interesting traffic is defined by dialer-list1.
!--- This is applied to BRI0 though the dialer-group 1 command.

!
line con 0
 transport input none
line aux 0
line vty 0 4
 login
!
end

```

Router2

```

router2#show running-config
Building configuration...

Current configuration:
!
version 12.0
service timestamps debug uptime
service timestamps log uptime

```

```

no service password-encryption
!
hostname router2
!
username router1 password 0 ipunnumb

!--- Username for remote router (router1) and shared secret.
!--- Shared secret(used for CHAP) must be the same on both sides.

ip subnet-zero
no ip finger
no ip domain-lookup
!
isdn switch-type basic-5ess
isdn voice-call-failure 0
!
interface Loopback0
 ip address 20.2.2.2 255.0.0.0
 no ip directed-broadcast
!
interface Ethernet0
 ip address 192.168.200.2 255.255.255.0

!--- IP address for the Ethernet interface.

 no ip directed-broadcast
!
interface Serial0
 no ip address
 no ip directed-broadcast
 no ip mroute-cache
 shutdown
 no fair-queue
!
interface Serial1
 no ip address
 no ip directed-broadcast
 shutdown
!
interface BRI0
 ip unnumbered Ethernet0

!--- IP unnumbered is configured in such a way that BRI interface
!--- uses the IP address of the Ethernet 0 interface.

 no ip directed-broadcast
 encapsulation ppp
 dialer idle-timeout 60

!--- Idle timeout(in seconds)for this BRI interface.

 dialer map ip 192.168.100.1 name router1 broadcast 96666600

!--- Dialer map for the BRI interface of the remote router uses the
!--- ethernet interface IP address of the remote router. The remote router BRI
!--- interface is also unnumbered to its ethernet interface, and the dialer
!--- map IP address points to the remote ethernet interface address.

 dialer hold-queue 10
 dialer-group 1

!--- Apply interesting traffic defined in dialer-list 1.

 isdn switch-type basic-5ess

```

```

ppp authentication chap

!--- Use CHAP authentication.

!
router igrp 100
 network 20.0.0.0
 network 192.168.200.0
!
ip classless
ip http server
!
dialer-list 1 protocol ip permit

!--- Interesting traffic is defined by dialer-list1.
!--- This is applied to BRI0 through the dialer-group 1 command.

!
line con 0
 transport input none
line aux 0
line vty 0 4
 login
!
end

```

Use Static Routes

If you do not use a routing protocol on the link, you can use static routes in conjunction with ip unnumbered. To allow the router to call the peer you need two static routes: one for the network that needs to be reached, and one for the IP address of the remote router BRI interface (which is unnumbered to its Ethernet interface). In this example you need these commands on router 1:

```

ip route 20.0.0.0 255.0.0.0 192.168.200.2

!--- Route statement for the remote network.
!--- Note: The next hop is the IP address in the dialer map statement.
!--- You can add additional static routes for every network you need to reach.

ip route 192.168.200.2 255.255.255.255 BRI 0

!--- Specify how the router can use interface BRI 0 to get to host IP 192.168.200.2.
!--- Remember that the next hop for static routes is the same address.

```

The first command creates a static default route. If the router receives a packet destined to a network specified in the static route, the router forwards the packet to 192.168.200.2. In this case, 192.168.200.2 is the address of the BRI interface of the opposite router, and is also configured in the dialer map statement on router 1.

The BRI interface is unnumbered. Therefore, a second static route is needed to tell the local router which interface to use to reach 192.168.200.2. A mask of 255.255.255.255 is used to specify this route as a host address. The next hop is the BRI interface, where the dialer map is configured.

Verify

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

show 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.

- **show isdn status** displays the status of each ISDN layer. This command verifies whether ISDN Layer 1 and 2 function. Refer to Using the **show isdn status** Command for BRI Troubleshooting for further information.
- **show ip interface brief** displays the interface status and the IP address configured on the interface.
- **show ip route** displays the information about the routing table.

Sample show Output

```
router1#show isdn status
Global ISDN Switchtype = basic-5ess
ISDN BRI0 interface
    dsl 0, interface ISDN Switchtype = basic-5ess
Layer 1 Status:
    ACTIVE
Layer 2 Status:
    TEI = 64, Ces = 1, SAPI = 0, State = MULTIPLE_FRAME_ESTABLISHED
Layer 3 Status:
    1 Active Layer 3 Call(s)
    CCB:callid=8010, sapi=0, ces=1, B-chan=1, calltype=DATA
    Active dsl 0 CCBs = 1
    The Free Channel Mask: 0x80000002
    Total Allocated ISDN CCBs = 1
router1#
```

The **show isdn status** output displays the current status of each ISDN layer. If you do not see these states, refer to Using the **show isdn status** Command for BRI Troubleshooting.

```
router1#
show ip interface brief
Interface                IP-Address      OK? Method Status      Protocol
BRI0                     192.168.100.1  YES unset  up          up
BRI0:1                   unassigned      YES unset  up          up
BRI0:2                   unassigned      YES unset  down        down
Ethernet0                192.168.100.1  YES manual up          up
Loopback0                10.1.1.1       YES manual up          up
Serial0                  unassigned      YES manual administratively down down
Serial1                  unassigned      YES manual administratively down down

router2#
show ip interface brief
Interface                IP-Address      OK? Method Status      Protocol
BRI0                     192.168.200.2  YES unset  up          up
BRI0:1                   unassigned      YES unset  up          up
BRI0:2                   unassigned      YES unset  down        down
Ethernet0                192.168.200.2  YES manual up          up
Loopback0                20.2.2.2       YES manual up          up
Serial0                  unassigned      YES manual administratively down down
Serial1                  unassigned      YES manual administratively down down

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

```
I 20.0.0.0/8 [100/158750] via 192.168.200.2, 00:02:11, BRI0
  192.168.200.0/24 is variably subnetted, 2 subnets, 2 masks
I 192.168.200.0/24 [100/158350] via 192.168.200.2, 00:02:37, BRI0
C 192.168.200.2/32 is directly connected, BRI0
C 10.0.0.0/8 is directly connected, Loopback0
C 192.168.100.0/24 is directly connected, Ethernet0
```

router1#

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

```
C 20.0.0.0/8 is directly connected, Loopback0
C 192.168.200.0/24 is directly connected, Ethernet0
I 10.0.0.0/8 [100/158750] via 192.168.100.1, 00:00:51, BRI0
  192.168.100.0/24 is variably subnetted, 2 subnets, 2 masks
I 192.168.100.0/24 [100/158350] via 192.168.100.1, 00:00:51, BRI0
C 192.168.100.1/32 is directly connected, BRI0
```

router2#

router1#**ping 20.2.2.2**

```
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 20.2.2.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 36/37/40 ms
router1#
```

router2#

ping 10.1.1.1

```
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.1.1.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 36/37/40 ms
router2#
```

Troubleshoot

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

debug Commands

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

- **debug ip packet** provides details about the source and destination IP address of the packets exchanged between the routers.



Caution: Be extremely careful when you use this command. It produces a large volume of

output, and can cause a busy router to crash. Do not use this command on a busy router. Refer to Important Information on Debug Commands to minimize the impact of this **debug** command.

- **debug isdn q921** provides data-link layer debugging of q.921 messages.
- **debug isdn q931** provides network-layer debugging of q.931 messages..
- **debug dialer** provides DDR information for the outbound call.

Sample debug Output

```
router1#debug ip packet

!--- Do not use this debug on a busy router, because this command can
!--- cause the router to crash.

IP packet debugging is on

router1#ping 20.2.2.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 20.2.2.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 44/45/48 ms

router1#
00:55:23: IP: s=192.168.100.1 (local), d=20.2.2.2 (BRI0), len 100, sending
00:55:23: IP: s=20.2.2.2 (BRI0), d=192.168.100.1, len 100, rcvd 4
00:55:23: IP: s=192.168.100.1 (local), d=20.2.2.2 (BRI0), len 100, sending
00:55:23: IP: s=20.2.2.2 (BRI0), d=192.168.100.1, len 100, rcvd 4
00:55:23: IP: s=192.168.100.1 (local), d=20.2.2.2 (BRI0), len 100, sending
00:55:23: IP: s=20.2.2.2 (BRI0), d=192.168.100.1, len 100, rcvd 4
00:55:23: IP: s=192.168.100.1 (local), d=20.2.2.2 (BRI0), len 100, sending
00:55:23: IP: s=20.2.2.2 (BRI0), d=192.168.100.1, len 100, rcvd 4
00:55:23: IP: s=192.168.100.1 (local), d=20.2.2.2 (BRI0), len 100, sending
00:55:23: IP: s=20.2.2.2 (BRI0), d=192.168.100.1, len 100, rcvd 4
00:55:40: IP: s=192.168.200.2 (BRI0), d=255.255.255.255, len 74, rcvd 2
00:55:40: IP: s=192.168.200.2 (Ethernet0), d=255.255.255.255, len 74, rcvd 2

router1#undebug all
All possible debugging has been turned off
```

The **debug ip packet** output indicates that the source interface (BRI0) address is 192.168.100.1, which is borrowed from the Ethernet 0 interface.

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Network Infrastructure: Remote Access

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