

# Understanding and Configuring the ip unnumbered Command

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## Introduction

This document explains the concept of IP unnumbered, and provides several configuration examples for reference. The **ip unnumbered** configuration command allows you to enable IP processing on a serial interface without assigning it an explicit IP address. The ip unnumbered interface can "borrow" the IP address of another interface already configured on the router, which conserves network and address space.

## Prerequisites

### Requirements

There are no specific requirements for this document.

### Components Used

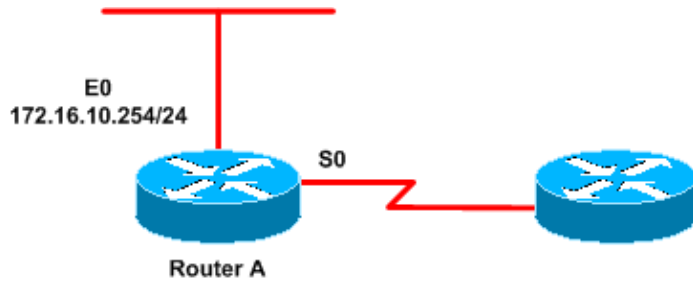
This document is not restricted to specific software and hardware versions.

### Conventions

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

## What is an Unnumbered Interface?

Consider the network shown below. Router A has a serial interface S0 and an Ethernet interface E0.



Router A's Ethernet 0 interface can be configured with an IP address as shown below:

```
interface Ethernet0
ip address 172.16.10.254 255.255.255.0
```

Logically, to enable IP on interface S0, you would need to configure a unique IP address on it. However, it is also possible to enable IP on the Serial interface and bring it up without assigning a unique IP address to it. This is done by borrowing an IP address already configured on one of the router's other interfaces. To do this, the **ip unnumbered** interface mode command is used as shown below.

```
interface Serial 0
ip unnumbered Ethernet 0
```

The **ip unnumbered <type> <number>** interface mode command borrows the IP address from the specified interface to the interface on which the command has been configured. Use of the **ip unnumbered** command results in the IP address being shared by two interfaces. Thus, in our example, the IP address which was configured on the Ethernet interface is also assigned to the Serial interface, and both interfaces involved function normally. This can be verified using the output of the **show ip interface brief** command, as shown below:

```
RouterA# show ip interface brief

Interface      IP-Address      OK?    Method   Status  Protocol
Ethernet0      172.16.10.254  YES    manual   up      up
Serial0        172.16.10.254  YES    manual   up    up
```

As you can see from the output of the **show ip interface brief** command above, the serial interface has an IP address identical to that of the Ethernet interface, and both interfaces are fully functional. The interface that borrows its address from one of the router's other functional interfaces is called the "unnumbered interface". In our example, Serial 0 is the unnumbered interface.

The only real disadvantage that the unnumbered interface suffers from is that it is unavailable for remote testing and management. You should also remember that the unnumbered interface should borrow its address from an interface that is up and running. If the unnumbered interface is pointing to an interface that is not functional (that is, which does not show "Interface status UP", "Protocol UP"), the unnumbered interface does not work. This is precisely why it is recommended that the unnumbered interface point to a loopback interface since loopbacks do not fail. Finally, remember that the **ip unnumbered** command works on point-to-point interfaces only. When you configure the command on the Multiaccess interface (that is, Ethernet) or the loopback interface, the following messages are displayed:

```
RouterA(config)# int e0
RouterA(config-if)# ip unnumbered serial 0
Point-to-point (non-multi-access) interfaces only
RouterA(config-if)# ip unnumbered loopback 0
Point-to-point (non-multi-access) interfaces only
```

# IP and IP Unnumbered

On a Cisco router, every interface connecting to a network segment must belong to a unique subnet. Directly connected routers have interfaces connecting 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 and forwards the packet to the next directly connected hop toward 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.

The IP routing table contains either subnet routes or major network routes. Each route has one or more directly attached next hop address(es). Subnet routes are aggregated or summarized by default at major network boundaries in order to reduce the size of the routing table.

**Note:** The aggregation scheme discussed above assumes a traditional distance–vector routing protocol such as Routing Information Protocol (RIP) or Interior Gateway Routing Protocol (IGRP).

Let's consider assigning IP addresses to the interfaces of a router using a class B network that has been subnetted using eight bits of subnetting. Every interface requires a unique subnet. Although each point–to–point serial connection has only two end points to address, if we assign an entire subnet to each serial interface, we use 254 available addresses for each interface where only two addresses are needed. If we use IP unnumbered on each serial interface, we save address space; the address of a LAN interface is "borrowed" and used as the source address for routing updates and packets sourced from the serial interface. In this way, address space is conserved. IP unnumbered only makes sense for point–to–point links.

A router receiving 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 we use IP unnumbered because each serial interface "borrows" their IP address from a different LAN interface, each in a different subnet and possibly in a different major network. When IP unnumbered is configured, routes learned through the IP unnumbered interface have the interface as the next hop instead of the source address of the routing update. Thus we avoid an invalid next hop address problem due to the source of the routing update coming from a next hop that is not directly connected.

## Configuration Examples

**Note:** The information in these configuration examples is based on Cisco IOS® Software version 12.2(10b) and was tested on Cisco 2500 series routers.

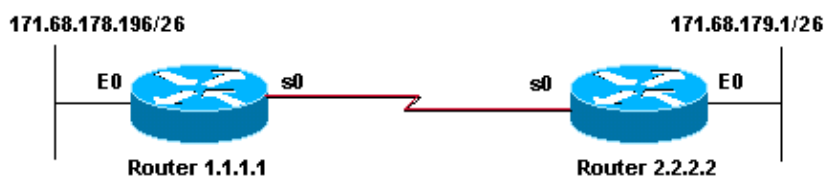
Let us look at four different sample configurations for IP unnumbered.

**Note:** We could have used loopback interfaces instead of ethernet interfaces.

### Same Major Net, Different Subnets

Figure 1 shows that on either side of the serial link we have the same major net with different subnets.

**Figure 1 Network Diagram**



Router 1.1.1.1	Router 2.2.2.2
<pre> Current configuration:  interface Ethernet0  ip address 171.68.178.196 255.255.255.192  interface Serial0  ip unnumbered Ethernet0  router igrp 10  network 171.68.0.0 </pre>	<pre> Current configuration:  interface Ethernet 0  ip address 171.68.179.1 255.255.255.192  interface Serial 0  ip unnumbered Ethernet0 </pre>

Router 1.1.1.1# **show ip route**

```

171.68.0.0/26 is subnetted, 3 subnets
I    171.68.179.0 [100/8976] via 171.68.179.1, 00:00:02, Serial0
C    171.68.178.192 is directly connected, Ethernet0
I    171.68.0.0 [100/8976] via 171.68.179.1, 00:00:02, Serial0

```

Router 1.1.1.1# **ping 171.68.179.1**

```

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 171.68.179.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 28/30/32 ms

```

Router 2.2.2.2# **show ip route**

```

171.68.0.0/26 is subnetted, 3 subnets
C    171.68.179.0 is directly connected, Ethernet0
I    171.68.178.192 [100/8976] via 171.68.178.196, 00:00:02, Serial0
I    171.68.0.0 [100/8976] via 171.68.178.196, 00:00:02, Serial0

```

Router 2.2.2.2# **ping 171.68.178.196**

```

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 171.68.178.196, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 32/32/32 ms

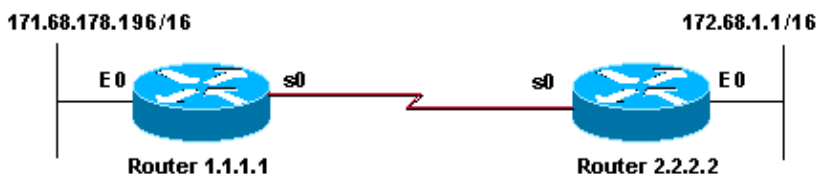
```

The route information about subnets is correctly maintained in this scenario.

## Different Major Nets, No Subnets

Figure 2 shows that on either side of the serial link we have different major nets and no subnets.

Figure 2 – Network Diagram



Router 1.1.1.1	Router 2.2.2.2
----------------	----------------

<pre> Current configuration:  interface Ethernet0  ip address 171.68.178.196 255.255.0.0  interface Serial0  ip unnumbered Ethernet0  router igrp 10  network 171.68.0.0 </pre>	<pre> Current configuration:  interface Ethernet 0  ip address 172.68.1.1 255.255.0.0 </pre>
---	--

```

Router 1.1.1.1# show ip route
C    171.68.0.0/16 is directly connected, Ethernet0
I    172.68.0.0/16 [100/8976] via 172.68.1.1, 00:01:26, Serial0

Router 1.1.1.1# ping 172.68.1.1

Sending 5, 100-byte ICMP Echos to 172.68.1.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 28/28/28 ms

Router 2.2.2.2# show ip route

I    171.68.0.0/16 [100/8976] via 171.68.178.196, 00:00:21, Serial0
C    172.68.0.0/16 is directly connected, Ethernet0

Router 2.2.2.2# ping 171.68.178.196

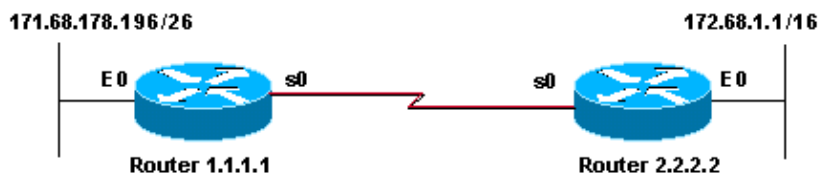
Sending 5, 100-byte ICMP Echos to 171.68.178.196, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 28/29/32 ms

```

## Major Net with Subnet, Major Net with No Subnet

Figure 3 shows that on one side of the serial link we have a major net with a subnet, and on the other side a major net with no subnet.

**Figure 3 Network Diagram**



Router 1.1.1.1	Router 2.2.2.2
<pre> Current configuration:  interface Ethernet0  ip address 171.68.178.196 255.255.255.192  interface Serial0  ip unnumbered Ethernet0  router igrp 10  network 171.68.0.0 </pre>	<pre> Current configuration:  interface Ethernet 0  ip address 172.68.1.1 255.255.0.0 </pre>

```

interface Serial 0
 ip unnumbered Ethernet0

```

```

router igrp 10

```

```

Router 1.1.1.1# show ip route

    171.68.0.0/26 is subnetted, 1 subnets
C       171.68.178.192 is directly connected, Ethernet0
I       172.68.0.0/16 [100/8976] via 172.68.1.1, 00:00:03, Serial0

Router 1.1.1.1# ping 172.68.1.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.68.1.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 28/31/32 ms

Router 2.2.2.2# show ip route

    171.68.0.0/16 is variably subnetted, 2 subnets, 2 masks
I       171.68.178.192/32 [100/8976] via 171.68.178.196, 00:00:48, Serial0
I       171.68.0.0/16 [100/8976] via 171.68.178.196, 00:00:48, Serial0
C       172.68.0.0/16 is directly connected, Ethernet0

Router 2.2.2.2# ping 171.68.178.196

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 171.68.178.196, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 28/29/32 ms

```

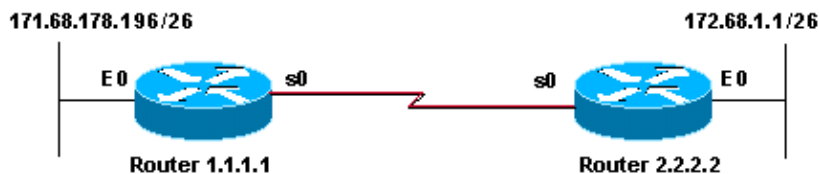
**Note:** Prior to Cisco IOS software version 11.0(2), you are required to put a static route for the major net 171.68.0.0/16 in Router 2.2.2.2.

In this scenario, the subnet information gets lost since it's treated as a host route. In Cisco IOS software version 11.0(2) and higher, Interior Gateway Routing Protocol (IGRP) and Routing Information Protocol (RIP) fix this problem by sending the summary route for the major net across the unnumbered point-to-point links.

## Two Different Major Nets and Their Respective Subnets

Figure 4 shows that on both sides of the serial link we have two different major nets with respective subnets.

**Figure 4 Network Diagram**



Router 1.1.1.1	Router 2.2.2.2
<pre> Current configuration:  interface Ethernet0  ip address 171.68.178.196 255.255.255.192  interface Serial0  ip unnumbered Ethernet0  router igrp 10 </pre>	<pre> Current configuration:  interface Ethernet 0  ip address 172.68.1.1 255.255.255.192  interface Serial 0  ip unnumbered Ethernet0  router igrp 10 </pre>

```
Router 1.1.1.1# show ip route
```

```
    171.68.0.0/26 is subnetted, 1 subnets
C       171.68.178.192 is directly connected, Ethernet0
    172.68.0.0/16 is variably subnetted, 2 subnets, 2 masks
I       172.68.0.0/16 [100/8976] via 172.68.1.1, 00:00:02, Serial0
I       172.68.1.0/32 [100/8976] via 172.68.1.1, 00:00:02, Serial0
```

```
Router 1.1.1.1# ping 172.68.1.1
```

```
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.68.1.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 32/81/280 ms
```

```
Router 2.2.2.2# show ip route
```

```
    171.68.0.0/16 is variably subnetted, 2 subnets, 2 masks
I       171.68.178.192/32 [100/8976] via 171.68.178.196, 00:00:22, Serial0
I       171.68.0.0/16 [100/8976] via 171.68.178.196, 00:00:22, Serial0
    172.68.0.0/26 is subnetted, 1 subnets
C       172.68.1.0 is directly connected, Ethernet0
```

```
Router 2.2.2.2# ping 171.68.178.196
```

```
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 171.68.178.196, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 28/31/32 ms
```

**Note:** In Cisco IOS software versions earlier than 11.0(2), you are required to put a static route for the major net 171.68.0.0/16 in Router 2.2.2.2 and 172.68.0.0/16 in Router 1.1.1.1.

In this scenario, the subnet information gets lost since it's treated as a host route. In Cisco IOS software version 11.0(2) and later, IGRP and RIP fix this problem by sending the summary route for the major net across the unnumbered point-to-point links.

## Related Information

- [IP Routed Protocols Support Page](#)
- [IP Routing Support Page](#)
- [Technical Support – Cisco Systems](#)