



# Basic Router Configuration

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This chapter provides configuration procedures for Cisco 900 series integrated services routers (ISRs). It also includes configuration examples and verification steps whenever possible. This chapter contains the following topics:

## Basic Configuration

- [Default Configuration, page 24](#)
- [Configuring Global Parameters, page 25](#)

## Interface Configuration

- [Interface Ports, page 27](#)
- [Configuring Gigabit Ethernet Interfaces, page 27](#)
- [Configuring a Loopback Interface, page 28](#)

## Routing Configuration

- [Configuring Command-Line Access, page 29](#)
- [Configuring Static Routes, page 29](#)
- [Configuring Dynamic Routes, page 30](#)



```
no ip address
!
interface GigabitEthernet2
no ip address
!
interface GigabitEthernet3
no ip address
!
interface GigabitEthernet4
no ip address
shutdown
duplex auto
speed auto
!
interface GigabitEthernet5
ip address 9.6.12.137 255.255.0.0
duplex auto
speed auto
!
interface Vlan1
no ip address
!
ip forward-protocol nd
no ip http server
no ip http secure-server
!
!
ip route 202.153.144.25 255.255.255.255 9.6.0.1
!
!
!
!
control-plane
!
!
vstack
!
line con 0
line vty 0 4
login
transport input none
!
scheduler allocate 20000 1000
!
end

Router#
```

## Configuring Global Parameters

This example shows how to configure router global parameters. By configuring global parameters, you specify a name for the router, an encrypted password to prevent unauthorized access to the router, and disables the router from translating unfamiliar words (typos) into IP addresses.

```
Router> enable
Router# configure terminal
Router(config)# hostname Router
Router(config)# enable secret pass123
Router(config)# no ip domain-lookup
Router(config)#
```

For complete information on global parameter commands, see the Cisco IOS Release configuration guide documentation set.

## Configuring I/O Memory Allocation

To reallocate the percentage of DRAM in use for I/O memory and processor memory on Cisco 900 series ISR routers, use the **memory-size iomem *i/o-memory-percentage*** command in global configuration mode. To revert to the default memory allocation, use the **no** form of this command. This procedure enables **smartinit**.

Syntax	Description
<i>i/o-memory-percentage</i>	The percentage of DRAM allocated to I/O memory. The values permitted are 5, 10, 15, 20, and 25. A minimum of 50 MB of memory is required for I/O memory.

When you specify the percentage of I/O memory in the command line, the processor memory automatically acquires the remaining percentage of DRAM memory.

This example shows how to allocate 25% of the DRAM memory to I/O memory and the remaining 75% to processor memory:

```
Router#config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# memory-size iomem 5
IO memory size too small:  minimum IO memory size is 201M
Router(config)#
Router(config)# memory-size iomem ?
<5-25>  percentage of DRAM to use for I/O memory: 5, 10, 15, 20, 25

Router(config)# memory-size iomem 25
Smart-init will be disabled and new I/O memory size will take effect upon reload.
Router(config)# end
```

### Verifying IOMEM Setting

```
Router# show run
Building configuration...

Current configuration : 1087 bytes
!
! No configuration change since last restart
! NVRAM config last updated at 06:11:03 UTC Mon Sep 17 2018
!
version 15.8
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname Router
!
boot-start-marker
boot-end-marker
!
memory-size iomem 25
!
```

# Interface Ports

Table 3-1 lists the interfaces that are supported on Cisco 900 series integrated services routers.

**Table 3-1** Interfaces by Cisco Router

Slots, Ports, Logical Interface, Interfaces	C921	C931	c941
Onboard GE Switch ports	Gi0,Gi1,Gi2,Gi3	Gi0,Gi1,Gi2,Gi3	Gi0,Gi1,Gi2,Gi3
Onboard GE WAN ports	Gi4,Gi5	Gi4,Gi5	Gi4,Gi5
USB <sup>1</sup>	usbflash0	usbflash0	usbflash0

1. **usbflash0** is the USB interface for all the Cisco 900 series routers.

## Configuring Gigabit Ethernet Interfaces

This example shows how to configure the onboard Gigabit Ethernet (GE) interfaces:

```
Router# configure terminal
Router(config)# interface gigabitethernet 4
Router(config-if)# ip address 192.168.12.2 255.255.255.0
Router(config-if)# no shutdown
Router(config-if)# exit
```



### Note

Switch ports support Auto, Full, and Half Duplex. WAN ports support only Full Duplex.

Use **show interface** command to verify the interface configuration. The following example shows the output for the switch port:

```
Router#show interfaces gig0
GigabitEthernet0 is up, line protocol is up
  Hardware is Gigabit Ethernet, address is 7872.5dab.fe73 (bia 7872.5dab.fe73)
  MTU 1500 bytes, BW 1000000 Kbit/sec, DLY 10 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive set (10 sec)
  Full-duplex, 1000Mb/s
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input never, output never, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: fifo
  Output queue: 0/40 (size/max)
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
    0 packets input, 0 bytes, 0 no buffer
    Received 0 broadcasts (0 multicasts)
    0 runs, 0 giants, 0 throttles
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
    0 watchdog, 0 multicast, 0 pause input
    0 input packets with dribble condition detected
  86738 packets output, 9316451 bytes, 0 underruns
    0 output errors, 0 collisions, 2 interface resets
    0 unknown protocol drops
```

```

0 babbles, 0 late collision, 0 deferred
0 lost carrier, 0 no carrier, 0 pause output
0 output buffer failures, 0 output buffers swapped out

```

The following example shows the output for the WAN port:

```

Router#show interfaces gig5
GigabitEthernet5 is administratively down, line protocol is down
Hardware is iGbE, address is 7872.5dab.fe75 (bia 7872.5dab.fe75)
MTU 1500 bytes, BW 1000000 Kbit/sec, DLY 10 usec,
    reliability 255/255, txload 1/255, rxload 1/255
Encapsulation ARPA, loopback not set
Keepalive set (10 sec)
Auto Duplex, Auto Speed, media type is RJ45
output flow-control is XON, input flow-control is XON
ARP type: ARPA, ARP Timeout 04:00:00
Last input never, output never, output hang never
Last clearing of "show interface" counters never
Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
Queueing strategy: fifo
Output queue: 0/40 (size/max)
5 minute input rate 0 bits/sec, 0 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
    0 packets input, 0 bytes, 0 no buffer
    Received 0 broadcasts (0 IP multicasts)
    0 runts, 0 giants, 0 throttles
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
    0 watchdog, 0 multicast, 0 pause input
    0 packets output, 0 bytes, 0 underruns
    0 output errors, 0 collisions, 0 interface resets
    0 unknown protocol drops
    0 babbles, 0 late collision, 0 deferred
    1 lost carrier, 0 no carrier, 0 pause output
    0 output buffer failures, 0 output buffers swapped out
Router#

```

## Configuring a Loopback Interface

The loopback interface acts as a placeholder for the static IP address and provides default routing information.

This example shows how loopback interface is used to support Network Address Translation (NAT) on the virtual-template interface. This configuration example shows the loopback interface configured on the gigabit ethernet interface with an IP address of 200.200.100.1/24, which acts as a static IP address. The loopback interface points back to virtual-template1, which has a negotiated IP address.

```

!
interface loopback 0
ip address 200.200.100.1 255.255.255.0 (static IP address)
ip nat outside
!
interface Virtual-Template1
ip unnumbered loopback0
no ip directed-broadcast
ip nat outside
!

```

To verify that you have properly configured the loopback interface, enter the **show interface loopback** command. You should see verification output similar to the following example.

```

Router# show interface loopback 0
Loopback0 is up, line protocol is up

```

```

Hardware is Loopback
Internet address is 200.200.100.1/24
MTU 1514 bytes, BW 8000000 Kbit, DLY 5000 usec,
    reliability 255/255, txload 1/255, rxload 1/255
Encapsulation LOOPBACK, loopback not set
Last input never, output never, output hang never
Last clearing of "show interface" counters never
Queueing strategy: fifo
Output queue 0/0, 0 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
    0 packets input, 0 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
    0 packets output, 0 bytes, 0 underruns
    0 output errors, 0 collisions, 0 interface resets
    0 output buffer failures, 0 output buffers swapped out

```

Another way to verify the loopback interface is to ping it:

```

Router# ping 200.200.100.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 200.200.100.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/4 ms

```

## Configuring Command-Line Access

The TTY lines are asynchronous lines used for inbound or outbound modem and terminal connections and can be seen in a router or access server configuration as line *x*. The specific line numbers are a function of the hardware built into or installed on the router or access server. In Cisco 900 series routers, the TTY lines are incremented by 1 and start with line number 3.

This example shows the command-line access commands. You do not need to input the commands marked “default.” These commands appear automatically in the configuration file generated when you use the **show running-config** command.

```

!
line con 0
exec-timeout 10 0
password 4youreyesonly
login
transport input none (default)
stopbits 1 (default)
line vty 0 4
password secret
login
!

```

## Configuring Static Routes

Static routes provide fixed routing paths through the network. They are manually configured on the router. If the network topology changes, the static route must be updated with a new route. Static routes are private routes unless they are redistributed by a routing protocol.

In this configuration example, the static route sends out all IP packets with a destination IP address of 192.168.1.0 and a subnet mask of 255.255.255.0 on the Gigabit Ethernet interface to another device with an IP address of 10.10.10.2. Specifically, the packets are sent to the configured PVC.

You do not need to enter the command marked “(default).” This command appears automatically in the configuration file generated when you use the **show running-config** command.

```
!
ip classless (default)
ip route 192.168.1.0 255.255.255.0 10.10.10.2
!
```

To verify that you have properly configured static routing, enter the **show ip route** command and look for static routes signified by the “S.”

You should see verification output similar to the following:

```
Router# show ip route
Codes: C - connected, S - static, 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
       i - IS-IS, su - IS-IS summary, 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

    10.0.0.0/24 is subnetted, 1 subnets
C       10.108.1.0 is directly connected, Loopback0
S* 0.0.0.0/0 is directly connected, gigabitethernet0
```

## Configuring Dynamic Routes

In dynamic routing, the network protocol adjusts the path automatically, based on network traffic or topology. Changes in dynamic routes are shared with other routers in the network.

The Cisco routers can use IP routing protocols, such as Routing Information Protocol (RIP) or Enhanced Interior Gateway Routing Protocol (EIGRP), to learn routes dynamically. You can configure either of these routing protocols on your router.

- [Configuring Routing Information Protocol, page 30](#)
- [Configuring Enhanced Interior Gateway Routing Protocol, page 31](#)

## Configuring Routing Information Protocol

This configuration example shows RIP version 2 enabled in IP network 10.0.0.0 and 192.168.1.0.

```
Router> configure terminal
Router(config)# router rip
Router(config-router)# version 2
Router(config-router)# network 192.168.1.1
Router(config-router)# network 10.10.7.1
Router(config-router)# no auto-summary
Router(config-router)# end
```

To verify that you have properly configured RIP, enter the **show ip route** command and look for RIP routes signified by “R”. You should see a verification output like the example shown below.

```
Router# show ip route
```



```

Codes: C - connected, S - static, 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
       i - IS-IS, su - IS-IS summary, 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
 10.0.0.0/24 is subnetted, 1 subnets
C 10.108.1.0 is directly connected, Loopback0
R 3.0.0.0/8 [120/1] via 2.2.2.1, 00:00:02, Ethernet0/0

```

## Configuring Enhanced Interior Gateway Routing Protocol

This configuration example shows the EIGRP routing protocol enabled in IP networks 192.145.1.0 and 10.10.12.115. The EIGRP autonomous system number is 109.

```

Router> configure terminal
Router(config)# router eigrp 109
Router(config)# network 192.145.1.0
Router(config)# network 10.10.12.115
Router(config-router)# end

```

To verify that you have properly configured IP EIGRP, enter the **show ip route** command, and look for EIGRP routes indicated by “D”. You should see verification output similar to the following:

```

Router# show ip route
Codes: C - connected, S - static, 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
       i - IS-IS, su - IS-IS summary, 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
 10.0.0.0/24 is subnetted, 1 subnets
C 10.108.1.0 is directly connected, Loopback0
D 3.0.0.0/8 [90/409600] via 2.2.2.1, 00:00:02, Ethernet0/0

```

