Basic Router Configuration

This module provides configuration procedures for Cisco 3900 series, Cisco 2900 series, and Cisco 1900 series integrated services routers (ISRs). It also includes configuration examples and verification steps whenever possible.

Note See Appendix A, "Cisco IOS CLI for Initial Configuration" for information on how to perform the initial configuration using the Cisco Internet Operating System (IOS) command line interface on Cisco 3900 series, Cisco 2900 series, and Cisco 1900 series integrated services routers.

Default Configuration

When you boot up your Cisco router for the first time, you notice some basic configuration has already been performed. Use the **show running-config** command to view the initial configuration, as shown in the following example.

```
Router# show running-config
Building configuration...
Current configuration : 723 bytes
!
version 12.4
no service pad
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname Router
!
boot-start-marker
boot-end-marker
!
logging message-counter syslog
!
no aaa new-model
!
no ipv6 cef
ip source-route
ip cef
!
!
!
!
multilink bundle-name authenticated
!
!
archive
 log config
  hidekeys
!
!
!
!
!
interface GigabitEthernet0/0
 no ip address
 shutdown
 duplex auto
 speed auto
!
interface GigabitEthernet0/1
 no ip address
 shutdown
 duplex auto
 speed auto
!
interface GigabitEthernet0/2
 no ip address
 shutdown
 duplex auto
 speed auto
!
ip forward-protocol nd
```

```
!
no ip http server
!
!
!
!
!
control-plane
!
!
line con 0
line aux 0
line vty 0 3
 login
!
exception data-corruption buffer truncate
scheduler allocate 20000 1000
end
```

Configuring Global Parameters

To configure the global parameters for your router, follow these steps.

SUMMARY STEPS

1. **configure terminal**
2. **hostname** *name*
3. **enable secret** *password*
4. **no ip domain-lookup**

DETAILED STEPS

	Command	Purpose

Step 1	**configure terminal**
	
	Example:
	`Router> enable`
	`Router# configure terminal`
	`Router(config)#`
		Enters global configuration mode, when using the console port.
		
		Use the following to connect to the router with a remote terminal:
		`telnet router name or address`
		`Login: login id`
		`Password: *********`
		`Router> enable`

Step 2	**hostname** *name*
	
	Example:
	`Router(config)# hostname Router`
	`Router(config)#`
		Specifies the name for the router.

	Command	Purpose

Step 3	**enable secret** *password*
	
	Example:
	`Router(config)# enable secret cr1ny5ho`
	`Router(config)#`
		Specifies an encrypted password to prevent unauthorized access to the router.

Step 4	**no ip domain-lookup**
	
	Example:
	`Router(config)# no ip domain-lookup`
	`Router(config)#`
		Disables the router from translating unfamiliar words (typos) into IP addresses.

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 3925E and Cisco 3945E 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/o-memory-percentage	The percentage of DRAM allocated to I/O memory. The values permitted are 5, 10, 15, 20, 25, 30, 40, and 50. A minimum of 201 MB of memory is required for I/O memory.

Tip We recommend that you configure the memory-size iomem below 25%. Any value above 25% should be used only for enhancing IPSec performance.

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

Example

The following example allocates 25% of the DRAM memory to I/O memory and the remaining 75% to processor memory:

```
Router#config t
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 ?
<5-50>  percentage of DRAM to use for I/O memory: 5, 10, 15, 20, 25, 30, 40, 50

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
Current configuration : 6590 bytes
!
! Last configuration change at 16:48:41 UTC Tue Feb 23 2010 !
version 15.1
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
service internal
!
hostname Router1
!
!
no aaa new-model
!
memory-size iomem 25
!
```

Interface Ports

Table 1 lists the interfaces that are supported on Cisco 3900 series, Cisco 2900 series, and Cisco 1900 series integrated services routers.

Table 1 Interfaces by Cisco Router

Slots, Ports, Logical Interface, Interfaces	1941	2901[1]	2911 & 2921	2951 & 3925 & 3945	3925E & 3945E
Onboard GE ports	Gi0/0,Gi0/1	Gi0/0,Gi0/1	Gi0/0,Gi0/1,GI0/2	Gi0/0,Gi0/1,GI0/2	Gi0/0,Gi0/1,GI0/2, GI0/3
Onboard WLAN	Wlan-ap0	not supported	not supported	not supported	not supported
Onboard WLAN GE connection to MGF[2]	Wlan-Gi0/0	not supported	not supported	not supported	not supported
Onboard ISM GE interface on the PCIe	*service-module-name*-ISM 0/0	*service-module-name*-ISM 0/0	*service-module-name*-ISM 0/0	*service-module-name*-ISM 0/0	not supported
Onboard ISM GE connection to MGF	*service-module-name*-ISM 0/1	*service-module-name*-ISM 0/1	*service-module-name*-ISM 0/1	*service-module-name*-ISM 0/1	not supported
USB	*usbflash0, usbflash1* *usbtoken0, usbtoken1*	*usbflash0, usbflash1* *usbtoken0, usbtoken1*	*usbflash0, usbflash1* *usbtoken0, usbtoken1*	*usbflash0, usbflash1* *usbtoken0, usbtoken1*	*usbflash0, usbflash1* *usbtoken0, usbtoken1*
Interfaces on HWIC and VWIC	*interface*0/0/*port* *interface*0/1/*port*	*interface*0/0/*port* *interface*0/1/*port* *interface*0/2/*port* *interface* 0/3/*port*	*interface*0/0/*port* *interface*0/1/*port* *interface*0/2/*port* *interface* 0/3/*port*	*interface*0/0/*port* *interface*0/1/*port* *interface*0/2/*port* *interface* 0/3/*port*	<int>0/0/<port> <int>0/1/<port> <int>0/2/<port>
Interfaces on Double Wide-HWIC	*interface*0/1 *port*	*interface*0/1/*port* *interface*0/3/*port*	*interface*0/1/*port* *interface*0/3/*port*	*interface*0/1/*port* *interface*0/3/*port*	<int>0/1/<port>
Interfaces on SM	not supported	not supported	*interface*1/*port*	*interface1-2/port*[3] *interface1-4/port*[4]	*interface*1-2/*port* *interface*1-4/*port*

Table 1 Interfaces by Cisco Router (continued)

Slots, Ports, Logical Interface, Interfaces	1941	2901[1]	2911 & 2921	2951 & 3925 & 3945	3925E & 3945E
Interfaces on Double Wide-SM	not supported	not supported	not supported	*interface 2/port*[5] *interface4/port*[6]	*interface* 2/*port* *interface* 4/*port*
Interfaces HWIC on SM Interfaces VWIC on SM	not supported	not supported	*interface1wic-slot/ port*	*interface1-2/wic-slot/port*[7] *interface1-4/wic-slot/port*[8]	*interface1-2/wic-slot/port* *interface1-4/wic-slot/port*

1. On the Cisco 2901 router, the numbering format for configuring an asynchronous interface is 0/slot/port. To configure the line associated with an asynchronous interface, simply use the interface number to specify the asynchronous line. For example, line 0/1/0 specifies the line associated with interface serial 0/1/0 on a WIC-2A/S in slot 1. Similarly, line 0/2/1 specifies the line associated with interface async 0/2/1 on a WIC-2AM in slot 2.
2. MGF = multi-gigabit fabric
3. Applies only to Cisco 2951, Cisco 3925, and Cisco 3925E routers.
4. Applies only to Cisco 3945 and Cisco 3945E routers.
5. Applies only to Cisco 2951, Cisco 3925, and Cisco 3925E routers.
6. Applies only to Cisco 3945 and Cisco 3945E routers.
7. Applies only to Cisco 2951, Cisco 3925, and Cisco 3925E routers.
8. Applies only to Cisco 3945 and Cisco 3945E routers.

Configuring Gigabit Ethernet Interfaces

To manually define onboard Gigabit Ethernet (GE) interfaces, follow these steps, beginning in global configuration mode.

SUMMARY STEPS

1. **interface gigabitethernet** *slot/port*
2. **ip address** *ip-address mask*
3. **no shutdown**
4. **exit**

DETAILED STEPS

	Command	Purpose

Step 1	**interface gigabitethernet** *slot/port*
	Example:
	`Router(config)# interface gigabitethernet 0/1`
	`Router(config-if)#`
		Enters the configuration mode for a Gigabit Ethernet interface on the router.

Step 2	**ip address** *ip-address mask*
	Example:
	`Router(config-if)# ip address 192.168.12.2 255.255.255.0`
	`Router(config-if)#`
		Sets the IP address and subnet mask for the specified GE interface.

	Command	Purpose

Step 3	**no shutdown**
	
	Example:
	`Router(config-if)# no shutdown`
	`Router(config-if)#`
		Enables the GE interface, changing its state from administratively down to administratively up.

Step 4	**exit**
	
	Example:
	`Router(config-if)# exit`
	`Router(config)#`
		Exits configuration mode for the GE interface and returns to global configuration mode.

Configuring Wireless LAN Interfaces

The wireless LAN interface on the Cisco 1941W router enables connection to the router through **interface wlan-ap0**. For more information about configuring a wireless connection, see the "Configuring the Wireless Device" section on page 247.

Configuring Interface Card and Module Interfaces

To configure interface cards and modules inserted in internal services module (ISM), enhanced high-speed WAN interface card (EHWIC), Ethernet WAN interface card (EWIC), and service module (SM) slots, see the appropriate interface card or module configuration documents on Cisco.com.

Configuring a Loopback Interface

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

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

To configure a loopback interface, follow these steps, beginning in global configuration mode.

SUMMARY STEPS

1. **interface** *type number*
2. **ip address** *ip-address mask*
3. **exit**

DETAILED STEPS

	Command	Purpose

Step 1	**interface** *type number*
	
	Example:
	`Router(config)# interface Loopback 0`
	`Router(config-if)#`
		Enters configuration mode for the loopback interface.

Step 2	**ip address** *ip-address mask*
	
	Example:
	`Router(config-if)# ip address 10.108.1.1 255.255.255.0`
	`Router(config-if)#`
		Sets the IP address and subnet mask for the loopback interface.

Step 3	**exit**
	
	Example:
	`Router(config-if)# exit`
	`Router(config)#`
		Exits configuration mode for the loopback interface and returns to global configuration mode.

Example

The loopback interface in this sample configuration 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
!
```

Verifying Configuration

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

To configure parameters to control access to the router, follow these steps, beginning in global configuration mode.

Note 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 ISR G2 series routers, the TTY lines are incremented by 1 and start with line number3 instead of line number 2 in Cisco ISR G1 series routers. In ISR G2 series routers, line number 2 cannot be accessed since it has been used for the second core feature.TTY lines are not static and line numbers can be changed in future when more features are added similar to the second core.

SUMMARY STEPS

1. **line** [**aux** | **console** | **tty** | **vty**] *line-number*
2. **password** *password*
3. **login**
4. **exec-timeout** *minutes* [*seconds*]
5. **line** [**aux** | **console** | **tty** | **vty**] *line-number*
6. **password** *password*
7. **login**
8. **end**

DETAILED STEPS

	Command	Purpose

Step 1	**line** [**aux** | **console** | **tty** | **vty**] *line-number*
	
	Example:
	`Router(config)# line console 0`
	`Router(config-line)#`
		Enters line configuration mode, and specifies the type of line.
		
		This example specifies a console terminal for access.

Step 2	**password** *password*
	
	Example:
	`Router(config-line)# password 5dr4Hepw3`
	`Router(config-line)#`
		Specifies a unique password for the console terminal line.

Step 3	**login**
	
	Example:
	`Router(config-line)# login`
	`Router(config-line)#`
		Enables password checking at terminal session login.

Step 4	**exec-timeout** *minutes* [*seconds*]
	
	Example:
	`Router(config-line)# exec-timeout 5 30`
	`Router(config-line)#`
		Sets the interval that the EXEC command interpreter waits until user input is detected. The default is 10 minutes. Optionally, add seconds to the interval value.
		
		This example shows a timeout of 5 minutes and 30 seconds. Entering a timeout of 0 0 specifies never to time out.

Step 5	**line** [**aux** | **console** | **tty** | **vty**] *line-number*
	
	Example:
	`Router(config-line)# line vty 0 4`
	`Router(config-line)#`
		Specifies a virtual terminal for remote console access.

Step 6	**password** *password*
	
	Example:
	`Router(config-line)# password aldf2ad1`
	`Router(config-line)#`
		Specifies a unique password for the virtual terminal line.

Step 7	**login**
	
	Example:
	`Router(config-line)# login`
	`Router(config-line)#`
		Enables password checking at the virtual terminal session login.

Step 8	**end**
	
	Example:
	`Router(config-line)# end`
	`Router#`
		Exits line configuration mode, and returns to privileged EXEC mode.

Example

The following configuration 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.

To configure static routes, follow these steps, beginning in global configuration mode.

SUMMARY STEPS

1. **ip route** *prefix mask* {*ip-address* | *interface-type interface-number* [*ip-address*]}
2. **end**

DETAILED STEPS

	Command	Purpose

Step 1	**ip route** *prefix mask* {*ip-address* | *interface-type interface-number* [*ip-address*]}
	
	Example:
	`Router(config)# ip route 192.168.1.0 255.255.0.0 10.10.10.2`
	`Router(config)#`
		Specifies the static route for the IP packets.
		
		For details about this command and about additional parameters that can be set, see *Cisco IOS IP Command Reference, Volume 2 of 4: Routing Protocols, Release 12.3*

Step 2	**end**
	
	Example:
	`Router(config)# end`
	`Router#`
		Exits router configuration mode, and enters privileged EXEC mode.

Example

In the following 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!
```

Verifying Configuration

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, FastEthernet0
```

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" section on page 25
- "Configuring Enhanced Interior Gateway Routing Protocol" section on page 27

Configuring Routing Information Protocol

To configure the RIP routing protocol on the router, follow these steps, beginning in global configuration mode.

SUMMARY STEPS

1. **router rip**
2. **version** {**1** | **2**}
3. **network** *ip-address*
4. **no auto-summary**
5. **end**

DETAILED STEPS

	Command	Task

Step 1	**router rip**
	
	Example:
	`Router> configure terminal`
	`Router(config)# router rip`
	`Router(config-router)#`
		Enters router configuration mode, and enables RIP on the router.

Step 2	**version** {**1** | **2**}
	
	Example:
	`Router(config-router)# version 2`
	`Router(config-router)#`
		Specifies use of RIP version 1 or 2.

Step 3	**network** *ip-address*
	
	Example:
	`Router(config-router)# network 192.168.1.1`
	`Router(config-router)# network 10.10.7.1`
	`Router(config-router)#`
		Specifies a list of networks on which RIP is to be applied, using the address of the network of each directly connected network.

Step 4	**no auto-summary**
	
	Example:
	`Router(config-router)# no auto-summary`
	`Router(config-router)#`
		Disables automatic summarization of subnet routes into network-level routes. This allows subprefix routing information to pass across classful network boundaries.

Step 5	**end**
	
	Example:
	`Router(config-router)# end`
	`Router#`
		Exits router configuration mode, and enters privileged EXEC mode.

Example

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

To see this configuration, use the **show running-config** command from privileged EXEC mode.

```
!
Router# show running-config
router rip
 version 2
 network 10.0.0.0
 network 192.168.1.0
 no auto-summary
!
```

Verifying Configuration

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

To configure Enhanced Interior Gateway Routing Protocol GRP (EGRP), follow these steps, beginning in global configuration mode.

SUMMARY STEPS

1. **router eigrp** *as-number*
2. **network** *ip-address*
3. **end**

DETAILED STEPS

	Command	Purpose

Step 1	**router eigrp** *as-number*
	
	Example:
	`Router(config)# router eigrp 109`
	`Router(config)#`
		Enters router configuration mode, and enables EIGRP on the router. The autonomous-system number identifies the route to other EIGRP routers and is used to tag the EIGRP information.

Step 2	**network** *ip-address*
	
	Example:
	`Router(config)# network 192.145.1.0`
	`Router(config)# network 10.10.12.115`
	`Router(config)#`
		Specifies a list of networks on which EIGRP is to be applied, using the IP address of the network of directly connected networks.

Step 3	**end**
	
	Example:
	`Router(config-router)# end`
	`Router#`
		Exits router configuration mode, and enters privileged EXEC mode.

Example

The following 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.

To see this configuration use the **show running-config** command, beginning in privileged EXEC mode.

```
Router# show running-config
...
!
router eigrp 109
    network 192.145.1.0
        network 10.10.12.115
!
...
```

Verifying Configuration

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
```