Basic Router Configuration - 8 Steps to Success: IP Basics

Step 1: Physical Connections

Connect all of the interfaces including:

- **Console:** Connect your PC/terminal to the console port via HyperTerminal **(9600-8-N-1-no flow)**
- **Ethernet:** Connect Ethernet ports to a hub or a switch using a straight-through cable. Use a crossover cable if going directly between Ethernet ports on two routers.
- **Serial:** If going directly between two routers, don't forget to connect one port via the DTE cable and the other via the DCE cable.

Step 2: Boot up the. router

You may use the setup mode (setup dialogue) but this is to help you with configuring the router using the Cisco IOS commands. The setup mode will only allow you to configure the router with the basic features and not with any advanced features.

Step 3: Host Name and Passwords

It is a good idea to begin your configuration with the hostname and passwords. This will remind you what router you are configuring and it is also a good idea to add the security of passwords right away.

Router(config)# **hostname LabC**

LabC(config)# **enable secret class**

LabC (config)# **line vty 0 4**
(If you are running EFS, you may increase the number of telnet sessions to more than 5.)
LabC (config-line)# **login**
LabC (config-line)# **password cisco**

LabC (config)# **line con 0**
LabC (config-line)# **login**
LabC (config-line)# **password cisco**

Step 4: Adding IP Addresses

Next lets add the IP addresses, as this is a basic function of configuring routers. Below is an example of
configuring both an Ethernet and Serial interface. Don't forget to use the proper subnet mask! For Serial interface with the DCE cable you will need to also add the clocking with the clock rate command.

LabC (config)# **interface ethernet 0**
LabC (config-if)# **ip address 223.8.151.1 255.255.255.0**
LabC (config-if)# **description LAN Network**
LabC (config-if)# **no shutdown**

LabC (config)# **interface serial 0**
LabC (config-if)# **ip address 204.204.7.1 255.255.255.0**
(DCE interface only)
LabC (config-if)# **clock rate 56000**
LabC (config-if)# **no shutdown**
LabC (config-if)# **description Network to Lab D**

LabC (config)# **interface serial 1**
LabC (config-if)# **ip address 199.6.13.2 255.255.255.0**

LabC (config-if)# **no shutdown**
LabC (config-if)# **description Network to Lab B**

Step 5a: Adding Dynamic Routing: RIP

if this router will be participating in a dynamic routing protocol like RIP or IGRP, you will need to enable the routing protocol along with those directly connected networks that will be participating. Only use the classful network address, not the subnet address of the network!

LabC (config)# **router rip**
LabC (config-router)# **network 199.6.13.0** *(NOTSubnet,4ddress)* LabC (config-router)# **network 204.204.7.0** *(NOTSubnet,4ddress)*

Step 5b: Adding Dynamic Routing: EIGRP

EIGRP uses an autonomous system number or process id. This number must be the same on all routers sharing the same EIGRP routing updates.

LabC **(config)# router eigrp 10** **(10** = autonomous-system a.ka. process-id)
LabC (config-router)# **network 199.6.13.0** *(NOT Subnet Address)* LabC (config-router)# **network 204.204.7.0** *(NOT Subnet,4ddress)*

Step 6: Adding Default Routes

Good candidates for default routes are routers which are known as the boundary router. This is a router which is normally part of a stub network. Inside the stub network, the routers may be participating in a dynamic routing protocol like RIP, but only a static default route is needed to connect the stub network to the Internet. Static routes, including default routes, are propagated with dynamic routing updates. Here are two examples. Either one will work.

LabA (config)# **ip route 0.0.0.0 0.0.0.0 201.100.11.2**
(Adding a default route using a static route.)
LabA (config)# **ip default-network 201.100.11.0**
[Adding a default route using a the default-network command..)

Step 7: Adding Static Routes

A static route can be used for various reasons. One reason may be for a router to connect to a stub network.

LabB (config)# **ip route 205.7.5.0 255.255.255.0 201.100.11.1**
LabB (config)# **ip route 192.5.5.0 255.255.255.0 201.100.11.1**

Step 8: Testing and Monitoring

At this point it is a good idea to start testing your network using various commands.

LabC# **show ip route**
LabC # **show ip interface brief**
LabC # **show controller** s *0 (Shows whether or not the serial cable is DCE or DTE.)*
(Remember to turn debug off when done, **undebug all)**
(If using debug from a telnet session, otherwise debug output will
This will cause the debug output to go to all telnet sessions on this

LabC # **terminal no monitor** *(To turn off monitoring during a telnet session.)*
LabC # **show cdp neighbors**
LabC # **show ip protocols**
LabC # **show version**
LabC # **show flash**

Step 9: Finishing up
Once everything is working you may wish to add some commands to make your work easier.
LabC (config)# **ip host LabB 199.6.13.1** *(Mapping names and IP addresses)*
LabC (config)# **ip name-server 223.8.151.10** *(Adding a name server.)*
LabC (config)# **no ip domain-lookup** *(men there is no domain server.)*
LabC (config)# **banner motd # LabC Router, Authorized Access Only!**
LabC (config-router)# **passive-interface e 0**
(When you do no want to advertise routing tables out of a specific interface)

And don't forget to...
LabC # **show running-config**
LabC # **copy running-config startup-config**

Miscellaneous
LabC # ? *I This command can be used by itself or following at the end of any partial command line.)*
LabC > **enable**
LabC # **disable**
LabC # **configure terminal**
LabC (config)# **exit**

LabC (config-if)# **control-z**

LabC # **clock set 15:10:30 27 May 2000**

Editing Commands
Control-A: Moves to the beginning of the command line.
Control-E: Moves to the end of the command line.
Esc-B: Moves back one word.
Control F: Moves forward one character.
Control-B: Move back one character.
Esc F: Moves forward one word.

Command History Commands
Control P or **up arrow key:** Recalls last (previous command.
Control N or **down arrow key:** Recalls most recent command
Tab key: completes the entry.
LabC # **show history**
LabC # **terminal history**
LabC # **terminal editing**
LabC # **no terminal editing**

LabC # ***ping*** ip-address
LabC # ***trace*** ip-address
LabC # **debug** ip rip -
LabC # **terminal monitor**

Testing and other basic commands

The commands listed below are to assist you in setting up your router. **The commands are only examples and do not reflect the configuration of any actual network.** Your actual commands, ip addresses, network addresses, passwords, etc., will depend upon your network design.

More Testing Commands
Here are some connnands which may help you troubleshoot the router. Many of the commands might be used while you are speaking with a Tech Support Engineer.

LabC # **show memory**
LabC # **show stacks**
LabC # **show buffers**
LabC # **show arp**
LabC # **show processes**
LabC # **show processes cpu**
LabC # **show tech-support**

More Copy commands

Backing-up and restoring the router configuration:
LabC # **copy running-config tftp**
LabC # **copy tftp running-config**

Backing-up and restoring the IOS:
LabC # **copy flash tftp**
LabC # **copy tftp flash**

Other Commands

LabC (config)# **config-register Ox2lO2**
LabC (config)# **boot system flash igs-j-1.1 1 1-5**
LabC **(config)# boot system tftp igs-j-1.111-5**

Configuring Standard and Extended IP Access Lists

Sample Network: You may wish to configure the network below. You will first need to configure the network for dynamic or static routing. (Notice that the IP addresses may have changed from the previous example.)

Example: Permitting o-nly a specific host from the 205.7.5.0 network onto the 192.5.5.0 network

LabA (config)# **access-Ust 10 permit host 205.7.5.11**

LabA (config)# **inter e 0**

LabA (config-if)# **ip access-group 10 out**

Example: Denying a specific host from the 205.7.5.0 network onto the 192.5.5.0 network

LabA (config)# **access-list 10 deny 205.7.5.11**

LabA (config)# **access-list 10 permit 0.0.0.0 255.255.255.255**
(Or LabA(config)# access-list 10 permit any)

LabA (config)# **inter e 0**

LabA (config-if)# **ip access-group 10 out**

Example: Permitting only hosts from the 210.93,105.0 network onto the 192.5.5.0 network

LabA (config)# **access-list 10 permit 210.93.105.0**
(Or LabA (config) # access-list IO permit 210.93.105.0 0.0.0.255)

LabA (config)# **inter e 0**
LabA (config-if)# **ip access-group 10 out**

Example: An access list that will permit telnets destined for the host 223.8.151.10 from the 195.5.5.0, but will prohibit all other telnets from the 195.5.5.0 network into the 223.8.151.0 network. All other traffic is allowed to enter the 223.8.151.0 network.

LabA (config)# **access-list 101 permit tcp 192.5.5.0 0.0.0.255 223.8.151.10 0.0.0.0 eq 23**
LabA (config)# **access-list 101 deny tcp 192.5.5.0 0.0.0.255 223.8.151.0 0.0.0.255 eq 23**
LabA (config)# **access-list 101 permit ip 0.0.0.0 255.255.255.255 0.0.0.0 255.255.255.255**

LabA (config)# **interface e 0**
LabA (config-if)# **ip access-group 101 in**

Listing the host keyword same as the wildcard mask 0.0.0.0:

LabA (config)# access-list 101 permit tcp 192.5.5.0 0.0.0.255 **223.8.151.10 0.0.0.0** eq 23 *replaced by*
LabA(config)# access-list 101 permit tep 192.5.5.0 0.0.0.255 **host 223.8.151.10** eq23
Using the any keyfford is the same as the using 0.0.0.0 255.255.255.255
LabA (config)# access-list 101 permit ip 0.0.0.0 **255.255.255.255 0.0.0.0 255.255.255.255**
replaced by
LabA (config)# access-list 101 permit ip **any any**
Note: Remember there is an implicit deny any (everything) at the end of an access list.

PPP Encapsulation with PAP and CHAP

The commands listed below are to assist you in setting up your router. **The commands are only examples and do not reflect the configuration of any actual network.** Your actual commands, ip addresses, network addresses, passwords, etc., will depend upon your network design.

PPP Encapsulation between **LabB and LabC routers**

PPP encapsulation

Note: The default encapsulation on serial interfaces on Cisco Routers is HDLC.
LabB (config)# **interface Serial 0**
LabB (config-if)# **encapsulation ppp**
LabB # **show inter s 0**
LabC (config)# **interface Serial 1**
LabC (config-if)# **encapsulation ppp**
LabC # **show inter s 1**

PPP with PAP authentication

LabB # **username LabC password class**
LabB (config)# **interface Serial 0**
LabB (config-if)# **encapsulation ppp**
LabB (config-if)# **ppp authentication pap**
LabB (config-if)# **ppp pap sent-username LabB password class**
LabC # **username LabB password class**
LabC (config)# **interface Serial 0**
LabC (config-if)# **encapsulation ppp**
LabC (config-if)# **ppp authentication pap**
LabC (config-if)# **ppp pap sent-username LabC password class**

PPP with CHAP authentication

LabB # **username LabC password class**

LabB (config)# **interface Serial 0**
LabB (config-if)# **encapsulation ppp**
LabB (config-if)# **ppp authentication chap**
LabC # **username LabB password class**
LabC (config)# **interface Serial I**
LabC (config-if)# **encapsulation ppp**
LabC (config-io# **ppp authentication chap**

Frame Relay - Simple Configuration

PIRI
PlRl(config)# **interface s 1**
PlRl(config-if)# **ipadd 10.16.0.1 255.255.255.0**
PlRl(config-if)# **encapsulation frame-relay**
PIRI(config-if)# **bandwidth frame-relay**
PlRl(config-if)# **frame-relay map 10.16.0.2 110 broadcast ietf**
PlRl(config-if)# **frame-relay Imi-type ansi**
INeedforpre-ll.OIOS. 11.01OSsupportsautomaticLMIsensing.)

PI Rl(config)# **router rip**
PlRl(config-router)# **network 10.0.0.0**

PIR3
PlR3(config)# **interface s 1**
PlR3(config-if)# **ip add 10.16.0.2 255.255.255.0**
PIR3(config-if)# **encapsulation frame-relay**
PlR3(config-if)# **bandwidth frame-relay**
PlR3(config-if)# **frame-relay map 10.16.0.2 100 broadcast ietf**
PlR3(config-if)# **frame-relay Imi-type ansi**

PlR3(config)# **router rip**
PIR3(config-router)# **network 10.0.0.0**

V. B. Frame Relay - Multipoint Subinterfaces Configuration

(Same network/subnet: Multi point-to-points with subinterfaces)
S2.2 DLCI = 200; 10.17.0.2/24
S2.2 DLCI = 3 00; 1 0. 1 7.0.3/24
S2.2 DLCI = 400; 10.17.0.4/24

RTR1
RTR1(config)# **interface s2**

RTR1(config-if)# **no ip address**

RTR1(config-if)# **encapsulation frame-relay**
RTRI(config-if)# **exit**
RTRI(config)# **interfaces2.2 multipoint**
RTR1(config-if)# **ip add 10.17.0.1 255.255.255.0**
RTRI(config-if)# **bandwidth 64**
RTRI(config-if)# **frame-relay map ip 10.17.0.2 200 broadcast ietf**
RTR1(config-if)# **frame-relay map ip 10.17.0.3 300 broadcast ietf**
RTR1(config-if)# **frame-relay map ip 10.17.0.4 400 broadcast ietf**

RTRI(config)# **router rip**

RTR1(config)# **network 10.0.0.0**

Frame Relay - Point-to-Point Sub interfaces Configuration

(Different Networks or Subnets: Point-to-point connections using sub interfaces otherwise need multiple serial interfaces.)

S2.2 DLCI =

S2.3 DLCI =

S2.4 DLCI 400

RTRI
RTR1(config)# **interface s2**
RTRI(config-if)# **no ip address**
RTR1(config-if)# **encapsulation frame-relay**
RTR1(config-if)# **exit**
RTRI(config)# **interfaces2.2 point-to-point**
RTRI(config-if)# **ip add 10.17.0.2 255.255.255.0**
RTR1(config-if)# **bandwidth 64**
RTR1(config-if)# **frame-relay interface-dlci 200 broadcast cisco**
RTR1(config-if)# **exit**
RTRI(config)# **interfaces2.3 point-to-point**
RTR1(config-if)# **ip add 10.18.0.3 255.255.255.0**
RTR1(config-if)# **bandwidth 64**
RTR1(config-if)# **frame-relay interface-dlci 300 broadcast cisco**
RTRI(config-if)# **exit**
RTRI(config)# **interfaces2.4 point-to-point**
RTR1(config-if)# **ip add 10.20.0.3 255.255.255.0**
RTR1(config-if)# **bandwidth 64**
RTR1(config-if)# **frame-relay interface-dlci 400 broadcast cisco**
RTRI(config)# **router rip**
RTRI(config)# **network 10.0.0.0**

S2.2 DLCI = **200; 10.17.0**
S2.2 DLCI = **300; 10.17.0.3/24**
S2.2 DLCI = **400; 10.17.0.4/24**

RTR1
RTRI(config)# **interface s2**
RTR1(config-if)# **no ip address**
RTR1(config-if)# **encapsulation frame-relay**
RTR1(config-if)# **exit**

RTRI(config)# **interfaces2.2 multipoint**
RTRI(config-if)# **ip** add 10.17.0.1 255.255.255.0
RTRI(config-if)# bandwidth 64
RTRI(config-if)# **frame-relay map ip 10.17.0.2** 200 **broadcast ietf**
RTRI(config-if)# **frame-relay map ip 10.17.0.3 300 broadcast ietf**
RTRI(config-if)# **frame-relay map ip 10.17.0.4 400 broadcast ietf**

RTRI(config)# **router rip**
RTR1(config)# **network 10.0.0.0**

Summary: Booting up the Router

Cisco routers boot **Cisco IOS software** from: • **Flash**
• TFTP server
ROM (not full Cisco IOS)

Multiple source options provide **flexibility and fallback alternatives**

Locating the Cisco IOS Software

Default source for **Cisco IOS** software: • Flash (sequential) **•** TFTP server (netboot) **•** ROM (partial IOS)

Note: boot system commands can be used to specify the primary IOS source and fallback sequences.

Booting up the router and locating the Cisco IOS.

ROM
I .POST
2. Bootstrap code executed
3. Check Configuration Register value (NVRAM) which can be modified using the configregister command
0 = ROM Monitor mode
I = ROM IOS
2 - *15* = startup-config in NVRAM

4. **Startup-conflg file:** Check for **boot system** commands (NVRAM)

If **boot system** commands in **startup-conflg**

a. Run **boot system** commands in **order** they appear in **startup-config** to locate the ios
b. [If boot system commands fail, use default fallback sequence to locate the **IOS** (Flash, TFTP, ROM)?]

If **no** boot system commands in **startup-config** use the default fallback sequence in locating the IOS:

a. Flash (sequential)
b. TFTP server (netboot)
c. ROM (partial IOS) or keep retrying TFTP depending upon router model

5. a) If IOS is loaded, but there is **no** startup-config file, the router will use the default fallback sequence for locating the IOS and then it will enter **setup mode** or the **setup dialogue.**

b) If no IOS can be loaded, the router will get the partial IOS version from ROM