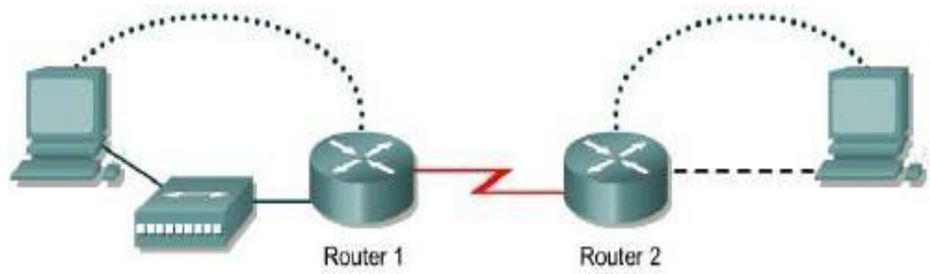
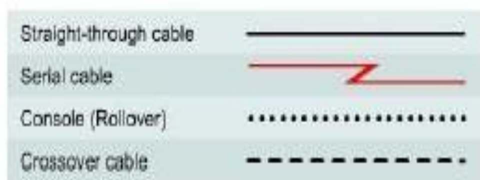
Experiment 7
Using Show IP Route to Examine Routing Tables



Router Designation	Router Name	Fast Ethernet 0 Address	Interface type	Serial 0 Address	Subnet mask for both interfaces	Enable secret password	Enable, VTY and console password
Router 1	GAD	192.168.1.1	DCE	192.168.2.1	255.255.255.0	class	cisco
Router 2	BHM	192.168.3.1	DTE	192.168.2.2	255.255.255.0	class	cisco



Objective

- Use the `show ip route` and `show ip protocol` commands to diagnose a routing configuration problem.

Background/Preparation

Cable a network similar to the one in the diagram. Any router that meets the interface requirements displayed on the above diagram, such as 800, 1600, 1700, 2500, 2600 routers, or a combination, may be used. Please refer to the chart at the end of the lab to correctly identify the interface identifiers to be used based on the equipment in the lab. The configuration output used in this lab is produced from 1721 series routers. Any other router used may produce a slightly different output. The following steps are intended to be executed on each router unless specifically instructed otherwise.

Start a HyperTerminal session as performed in the Establishing a HyperTerminal session lab.

Note: Go to the erase and reload instructions at the end of this lab. Perform those steps on all routers in this lab assignment before continuing.

Step 1 Configure the routers

a. On the routers, enter the global configuration mode and configure the hostname as shown in the chart. Then configure the console, virtual terminal, and enable passwords. If there is a problem doing this, refer to the Configuring Router Passwords lab. Next configure the interfaces according to the chart. If there is a problem doing this, refer to the Configuring Host Tables lab. Finally, configure RIP routing. This is covered in the Configuring RIP lab if help is needed. Do not forget to save the configurations to the startup configuration file.

Step 2 Configure the hosts with the proper IP address, subnet mask and default gateway

Step 3 Verify that the internetwork is functioning by pinging the ~~Fast~~Ethernet interface of the other router

a. From the host attached to GAD, is it possible to ping the BHM router ~~Fast~~Ethernet interface?

Yes

b. From the host attached to BHM, is it possible to ping the GAD router ~~Fast~~Ethernet interface?

Yes

c. If the answer is no for either question, troubleshoot the router configurations to find the error. Then do the pings again until the answer to both questions is yes.

Step 4 Make sure that routing updates are being sent

a. Type the command **`debug ip rip`** at the privileged EXEC mode prompt. Wait for at least 45 seconds.

b. Was there any output from the debug command? Yes

c. What did the output display? Routing updates

d. Stop the debug with **`no debug ip rip`**.

Step 5 Show the routing tables for each router

a. Examine the routing table entries, using command **`show ip route`** command on each router.

b. What are the entries in the GAD routing table?

```
C    172.16.0.0/16 is directly connected, Ethernet0
C    172.17.0.0/16 is directly connected, Serial0
R    172.18.0.0/16 [120/1] via 172.17.0.2, 00:00:00, Serial0
```

c. What are the entries in the BHM routing table?

```
R    172.16.0.0/16 [120/1] via 172.17.0.1, 00:00:25, Serial0
C    172.17.0.0/16 is directly connected, Serial0
C    172.18.0.0/16 is directly connected, Ethernet0
```

Step 6 Enable IGRP routing on both routers

a. Leave RIP enabled but enter router igrp 25 on both routers at the configuration prompt. Enter the appropriate network statements for each router.

```
GAD(config-router)#network 172.16.0.0
GAD(config-router)#network 172.17.0.0
BHM(config-router)#network 172.18.0.0
BHM(config-router)#network 172.17.0.0
```

b. On the same router used in Step 4, issue the **debug ip rip** was entered, now enter **debug ip igrp events**. Then wait at least two minutes.

c. What type of routing updates are being sent? IGRP and RIP updates

d. Why are both protocols sending updates? Because both protocols are enabled

e. Stop the debugwith the undebug all command.

Step 7 Show the routing tables for each router again

a. Examine the routing table entries, using command **show ip route** command on each router.

b. What are the entries in the GAD routing table?

```
C    172.16.0.0/16 is directly connected, Ethernet0
C    172.17.0.0/16 is directly connected, Serial0
I    172.18.0.0/16 [100/8576] via 172.17.0.2, 00:00:33, Serial0
```

c. What are the entries in the BHM routing table?

```
I    172.16.0.0/16 [100/8576] via 172.17.0.1, 00:00:11, Serial0
C    172.17.0.0/16 is directly connected, Serial0
C    172.18.0.0/16 is directly connected, Ethernet0
```

d. Why are the RIP routes not in the tables?

Because RIP has a higher Administrative Distance than IGRP

e. What should be done in order for this network to be more efficient? Turn off RIP.

Step 8 Add a second serial cable between routers

a. Add a second serial cable between interface S1 on GAD to serial S1 on BHM. GAD is the DCE.

b. Configure the GAD router with the additional statements.

```
GAD(config)#interface Serial1
GAD(config-if)#ip address 172.22.0.1 255.255.0.0
GAD(config-if)#clockrate 56000
GAD(config-if)#no shutdown
```

c. Configure the BHM router with the additional statements.

```
BHM(config)#interface Serial1
BHM(config-if)#ip address 172.22.0.2 255.255.0.0
BHM(config-if)#no shutdown
```

d. On the BHM router remove the IGRP network statement **network 172.18.0.0** so the **router IGRP 25** should only contain the **network 172.17.0.0** statement.

Step 9 Clear the routing tables on both routers

a. Type the command **clear ip route *** at the privileged EXEC prompt on both routers. Wait at least 90 seconds. Then type the command **show ip route** on both routers.

b. What types of routes are shown on GAD? RIP, and Connected

c. What types of routes are shown on BHM? IGRP and Connected

d. Why is this? BHM is only advertising attached networks using RIP. GAD is advertising attached networks using RIP and IGRP. The IGRP routes are preferred over the RIP routes as they have a lower administrative distance.

Step 10 Use show ip route to see different routes by type

a. Enter **show ip route** while connected to the GAD router.

b. What networks are displayed?

```
C    172.22.0.0/16 is directly connected, Serial1
C    172.16.0.0/16 is directly connected, Ethernet0
C    172.17.0.0/16 is directly connected, Serial0
```

c. What interface is directly connected? Serial 0, Serial 1, and Ethernet 0

d. Enter **show ip route rip**.

e. List the routes listed in the routing table:

```
R    172.18.0.0/16 [120/1] via 172.17.0.2, 00:00:14, Serial0
```

f. What is the administrative distance? 120

g. Enter **show ip route** while connected to the BHM router.

h. What networks are displayed?

```
C    172.22.0.0/16 is directly connected, Serial1
C    172.17.0.0/16 is directly connected, Serial0
C    172.18.0.0/16 is directly connected, Ethernet0
```

i. What interface is directly connected? Serial 0, Serial 1, and Ethernet 0

j. Enter **show ip route rip**.

k. List the routes listed in the routing table: None

l. If you saw none then that is correct, why?

Because IGRP has a lower Administrative Distance than RIP

m. Enter **show ip route igrp**

n. List the routes listed in the routing table:

```
I    172.16.0.0/16 [100/8576] via 172.17.0.1, 00:00:59, Serial0
```

o. What is the administrative distance? 100

Upon completion of the previous steps, log off by typing **exit** and turn the router off.

Erasing and reloading the router

Enter into the privileged exec mode by typing **enable**.

If prompted for a password, enter **class**. If "class" does not work, ask the instructor for assistance.

```
Router>enable
```

At the privileged exec mode, enter the command `erase startup-config`.

```
Router#erase startup-config
```

The responding line prompt will be:

```
Erasing the nvram filesystem will remove all files! Continue?
[confirm]
```

Press **Enter** to confirm.

The response should be:

```
Erase of nvram: complete
```

Now at the privileged exec mode, enter the command `reload`.

```
Router(config)#reload
```

The responding line prompt will be:

```
System configuration has been modified. Save? [yes/no]:
```

Type **n** and then press **Enter**.

The responding line prompt will be:

```
Proceed with reload? [confirm]
```

Press **Enter** to confirm.

In the first line of the response will be:

```
Reload requested by console.
```

After the router has reloaded the line prompt will be:

```
Would you like to enter the initial configuration dialog? [yes/no]:
```

Type **n** and then press **Enter**.

The responding line prompt will be:

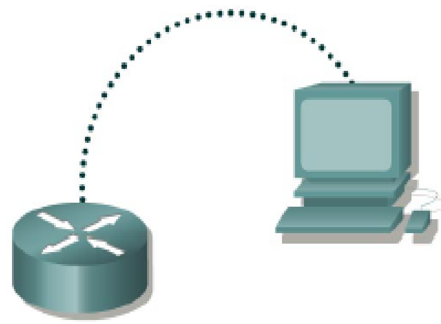
```
Press RETURN to get started!
```

Press **Enter**.

The router is ready for the assigned lab to be performed.

Router Interface Summary					
Router Model	Ethernet Interface #1	Ethernet Interface #2	Serial Interface #1	Serial Interface #2	Interface #5
800 (806)	Ethernet 0 (E0)	Ethernet 1 (E1)			
1600	Ethernet 0 (E0)	Ethernet 1 (E1)	Serial 0 (S0)	Serial 1 (S1)	
1700	FastEthernet 0 (FA0)	FastEthernet 1 (FA1)	Serial 0 (S0)	Serial 1 (S1)	
2500	Ethernet 0 (E0)	Ethernet 1 (E1)	Serial 0 (S0)	Serial 1 (S1)	
2600	FastEthernet 0/0 (FA0/0)	FastEthernet 0/1 (FA0/1)	Serial 0/0 (S0/0)	Serial 0/1 (S0/1)	
In order to find out exactly how the router is configured, look at the interfaces. This will identify the type of router as well as how many interfaces the router has. There is no way to effectively list all of the combinations of configurations for each router class. What is provided are the identifiers for the possible combinations of interfaces in the device. This interface chart does not include any other type of interface even though a specific router may contain one. An example of this might be an ISDN BRI interface. The string in parenthesis is the legal abbreviation that can be used in IOS command to represent the interface.					

Experiment 8
Managing IOS Images with TFTP



Router designation	Router name	Fast Ethernet 0 address	Subnet mask all addresses
Router 1	GAD	192.168.14.1	255.255.255.0

Straight-through cable	
Serial cable	
Console (Rollover)	
Crossover cable	

Objective

- Backup a copy of a router IOS from flash to a TFTP server.
- Reload the backup IOS software image from a TFTP server into flash on a router.

Background/Preparation

For recovery purposes it is important to keep backup copies of router IOS images. These can be stored in a central location such as a TFTP server and retrieved if necessary.

Cable a network similar to the one in the previous diagram. Any router that meets the interface requirements may be used. Possible routers include 800, 1600, 1700, 2500, 2600 routers, or a combination. Refer to the chart at the end of the lab to correctly identify the interface identifiers to be used based on the equipment in the lab. The configuration output used in this lab is produced from 1721 series routers. Any other router used may produce slightly different output. The following steps are intended to be executed on each router unless specifically instructed otherwise.

Start a HyperTerminal session as performed in the Establishing a HyperTerminal session lab.

Step 1 Configure the Gadsden router

a. If there are any difficulties configuring hostname, refer to the Configuring router passwords lab. If there are any difficulties configuring interfaces, refer to the Configuring host tables lab.

b. Verify the routers configurations by performing a `show running-config` on each router. If not correct, fix any configuration errors and verify.

Step 2 Configure the workstation

A workstation with the TFTP server software must be available for this lab. There are a number of good freeware and shareware TFTP servers available by searching the Internet for "TFTP server". This Lab uses the Cisco TFTP server. Verify that the software is available. If not, ask your instructor for assistance.

Configure the TFTP Host as follows:

IP Address	192.168.14.2
IP subnet mask	255.255.255.0
Default gateway	192.168.14.1

Confirm that the host has accepted the new IP settings with the **winipcfg** command (Windows 9x) or the **ipconfig** command (Windows NT/2000/XP).

Step 3 Collect information to document the router

The answers may vary.

a. Issue the **show version** command.

b. What is the current value of the config-register? 0x 2102

c. How much flash memory does this router have? 16MB

d. Is there at least 4mb (4096K) of flash? Yes (This lab requires at least 4Mb flash!)

e. What is the version number of boot ROM? 11.0(10c)

f. Is the boot ROM version 5.2 or later? Yes (This lab requires 5.2 or later)

Step 4 Collect more information to document the router

The answers may vary.

a. Issue the **show flash** command.

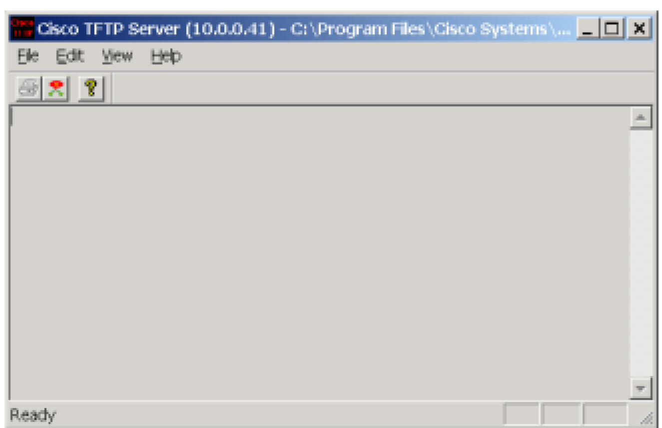
b. Is there a file already stored in flash? Yes

c. If so, what is the exact name of that file? c2500-i-l.121-18.bin

d. How much of flash is available or unused? 8753692 available

Step 5 Start and configure the Cisco TFTP Server

Start the TFTP server.



Step 6 Verify connectivity

Ping the TFTP server from the Gadsden router.

If the ping fails, review host and router configurations to resolve the problem.

Step 7 Copy IOS to TFTP server

a. Before copying the files, verify that the TFTP server is running.

b. What is the IP address of the TFTP server? 192.168.14.2

c. From the console session, enter **show flash**.

d. What is the name and length of the Cisco IOS image stored in flash?

c2500-i-l.121-18.bin and 8023460

e. What attributes can be identified from codes in the Cisco IOS filename?

Hardware platform, feature set, file format, and version number

Step 8 Copy the IOS image to the TFTP server

a. From the console session in the privileged EXEC mode, enter the **copy flash tftp** command. At the prompt enter the IP address of the TFTP server. Filenames will vary based on IOS and platform. The filename for your system was reported in Step 4:

```
GAD#copy flash tftp
Source filename []? flash:c1700-y-mz.122-11.T.bin
Address or name of remote host []? 192.168.14.2
Destination filename [c1700-y-mz.122-11.T.bin]? y
```

After entering this command and answering the process requests, the student should see the following output on the console. The process may take a few minutes depending on the size of the image. Do not interrupt this process.

```
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
4284648 bytes copied in 34.012 secs (125975 bytes/sec)
```

Step 9 Verify the transfer to the TFTP server

a. Check the TFTP server log file by clicking **View** > **Log File**. The output should resemble the following output:

```
Mon Sep 16 14:10:08 2003: Receiving 'c1700-y-mz.122-11.T.bin' in binary
mode
Mon Sep 16 14:11:14 2003: Successful.
```

b. Verify the flash image size in the TFTP server directory. To locate it, click on **View** > **Options**. This will show the TFTP server root directory. It should be similar to the following, unless the default directories were changed:

```
C:\Program Files\Cisco Systems\Cisco TFTP Server
```

If not using the Cisco TFTP server consult the supplied documentation for default TFTP server root directory.

c. Locate this directory using Windows Explorer or My Computer. Look at the detail listing of the file. The file length in the **show flash** command should be the same file size as the file stored on the TFTP server. If the file sizes are not identical, check with the instructor.

Step 10 Copy the IOS image from the TFTP server

a. Now that the IOS is backed up, the image must be tested and the IOS restored to the router. Ping the TFTP server IP address. When prompted for "Destination filename" use the file name from Step 7.

b. Record the IP address of the TFTP server. 192.168.14.2

c. Copy from the privileged EXEC prompt.

```
GAD#copy tftp flash
Address or name of remote host []?192.168.14.2
Source filename []?c1700-y-mz.122-11.T.bin
Destination filename [c1700-y-mz.122-11.T.bin]? [Enter]
%Warning:There is a file already existing with this name
Do you want to over write? [confirm]
Accessing tftp://192.168.14.2/c1700-y-mz.122-11.T.bin...
Erase flash: before copying? [confirm] [Enter]
Erasing the flash filesystem will remove all files! Continue?
[confirm] [Enter]
Erasing device...
eeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeee
eeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeee
...erased
Erase of flash: complete
Loading c1700-y-mz.122-11.T.bin from 192.168.14.2 (via
FastEthernet0):!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
[OK - 4284648 bytes]

Verifying checksum... OK (0x9C8A)
4284648 bytes copied in 26.584 secs (555739 bytes/sec)
```

d. The router may prompt to erase flash. Will the image fit in available flash? Yes

e. If the flash is erased, what happened on the router console screen as it was doing so?

Lines of "e"s will popup as the flash module is being erased.

f. What is the size of the file being loaded? 4284648 bytes (results may vary)

g. What happened on the router console screen as the file was being downloaded?

Lines of "!"s will popup as the file is being downloaded.

h. Was the verification successful? Yes

i. Was the whole operation successful? Yes

Step 11 Test the restored IOS image

a. Verify that the router Image is correct. Cycle the router power and observe the startup process to confirm that there were no flash errors. If there are none, then the router IOS should have started correctly.

b. Further verify IOS image in flash by issuing the **show version** command which will show output similar to:

```
System image file is "flash:c1700-y-mz.122-11.T.bin"
```

Upon completion of the previous steps, logoff by typing **exit**. Turn the router off.

Step 13 Test the restored IOS image

a. Verify that the router Image is correct. Cycle the router power and observe the startup process to confirm that there were no flash errors. If there are none, then the router IOS should have started correctly.

b. Further verify IOS image in flash by issuing the `show version` command which will show output similar to:

```
System image file is "flash:c1700-y-mz.122-11.T.bin"
```

Upon completion of the previous steps, logoff by typing **exit**. Turn the router off.

Erasing and reloading the router

Enter into the privileged EXEC mode by typing **enable**.

If prompted for a password, enter **class**. If "class" does not work, ask the instructor for assistance.

```
Router>enable
```

At the privileged EXEC mode, enter the command `erase startup-config`.

```
Router#erase startup-config
```

The responding line prompt will be:

```
Erasing the nvram filesystem will remove all files! Continue?
[confirm]
```

Press **Enter** to confirm.

The response should be:

```
Erase of nvram: complete
```

Now at the privileged EXEC mode, enter the command `reload`.

```
Router(config)#reload
```

The responding line prompt will be:

```
System configuration has been modified. Save? [yes/no]:
```

Type **n** and then press **Enter**.

The responding line prompt will be:

```
Proceed with reload? [confirm]
```

Press **Enter** to confirm.

In the first line of the response will be:

```
Reload requested by console.
```

After the router has reloaded the line prompt will be:

```
Would you like to enter the initial configuration dialog? [yes/no]:
```

Type **n** and then press **Enter**.

The responding line prompt will be:

```
Press RETURN to get started!
```

Press **Enter**.

The router is ready for the assigned lab to be performed.

Experiment 9
Calculating VLSM Subnets

Objective

Use variable-length subnet mask (VLSM) to support more efficient use of the assigned IP addresses and to reduce the amount of routing information at the top level.

Background/Preparation

A class C address of 192.168.10.0/24 has been allocated.

Perth, Sydney, and Singapore have a WAN connection to Kuala Lumpur.

- Perth requires 60 hosts.
- Kuala Lumpur requires 28 hosts.
- Sydney and Singapore each require 12 hosts.

To calculate VLSM subnets and the respective hosts allocate the largest requirements first from the address range. Requirements levels should be listed from the largest to the smallest.

In this example Perth requires 60 hosts. Use 6 bits since $2^6 - 2 = 62$ usable host addresses. Thus 2 bits will be used from the 4th Octet to represent the extended-network-prefix of /26 and the remaining 6 bits will be used for host addresses.

Step 1

The first step in the subnetting process is to divide the allocated address of 192.168.10.0/24 into four equal size address blocks. Since $4 = 2^2$, 2 bits are required to identify each of the 4 subnets.

Next, take subnet #0 (192.168.10.0/26) and identify each of its hosts.

Allocated Address	**Sub-networks**	**62 usable hosts/ sub-network (subnet #0)**
192.168.10.0/24	192.168.10.0/26	**192.168.10.0/26 (Network Address)**
	192.168.10.64/26	192.168.10.1/26
	192.168.10.128/26	192.168.10.2/26
	192.168.10.192/26	192.168.10.3/26
		thru
		192.168.10.61/26
		192.168.10.62/26
		192.168.10.63/26 (Broadcast Address)

Here is the range for the /26 mask.

Perth	**Range of addresses in the last octet**
192.168.10.0/26	From 0 to 63, 60 hosts required. Hosts 0 and 63 cannot be used because they are the network and broadcast addresses for their subnet

Step 2

Allocate the next level after all the requirements are met for the higher level or levels.

Kuala Lumpur requires 28 hosts. The next available address after 192.168.10.63/26 is 192.168.10.64/26. Note from the above table that this is subnet number 1. Since 28 hosts are required, 5 bits will be needed for the host addresses, $2^5 - 2$ = 30 usable host addresses. Thus 5 bits will be required to represent the hosts and 3 bits will be used to represent the extended-network-prefix of /27. Applying VLSM on address 192.168.10.64/27 gives:

Sub-network #1	**Sub-sub-networks**	**30 usable hosts**
		192.168.10.64/27 (Network Address)
192.168.10.64/26	192.168.10.64/27	192.168.10.65/27
	192.168.10.96/27	192.168.10.66/27
	192.168.10.128/27	192.168.10.67/26
	192.168.10.192/27	thru
		192.168.10.93/27
		192.168.10.94/27
		192.168.10.95/27 (Broadcast Address)

Here is the range for the /27 mask.

Kuala Lumpur	**Range of addresses in the last octet**
192.168.10.64/27	From 64 to 95, 28 hosts required. Hosts 64 and 95 cannot be used because they are the network and broadcast addresses for their subnet. Thirty usable addresses are available in this range for the hosts.

Step 3

Now Sydney and Singapore require 12 hosts each. The next available address starts from 192.168.10.96/27. Note from Table 2 that this is the next subnet available. Since 12 hosts are required, 4 bits will be needed for the host addresses, $2^4 = 16$, $16 – 2 = 14$ usable addresses. Thus 4 bits are required to represent the hosts and 4 bits for the extended-network-prefix of /28. Applying VLSM on address 192.168.10.96/27 gives:

Sub-network	**Sub-sub-networks**	**14 usable hosts**
192.168.10.96/27	192.168.10.96/28	**192.168.10.96/28 (Network Address)**
	192.168.10.112/28	192.168.10.97/28
	192.168.10.128/28	192.168.10.98/28
	192.168.10.224/28	192.168.10.99/28
	192.168.10.240/28	thru
		192.168.10.109/28
		192.168.10.110/28
		192.168.10.111/28 (Broadcast Address)

Here is the range for the /28 mask.

Sydney	**Range of addresses in the last octet**
192.168.10.96/28	From 96 to 111,12 hosts required. Hosts 96 and 111 cannot be used because they are network and broadcast addresses for their subnet. Fourteen useable addresses are available in this range for the hosts.

Step 4

Since Singapore also requires 12 hosts, the next set of host addresses can be derived from the next available subnet (192.168.10.112/28).

Sub-sub-networks	**14 usable hosts**
192.168.10.96/28	**192.168.10.112/28 (Network Address)**
192.168.10.112/28	192.168.10.113/28
192.168.10.128/28	192.168.10.114/28
192.168.10.224/28	192.168.10.115/28
	Thru
192.168.10.240/28	192.168.10.125/28
	192.168.10.126/28
	192.168.10.127/28 (Broadcast Address)

Here is the range for the /28 mask.

Singapore	**Range of addresses in the last octet**
192.168.10.112/28	From 112 to 127, 12 hosts required. Hosts 112 and 127 cannot be used because they are network and broadcast addresses for their subnet. Fourteen usable addresses are available in this range for the hosts

Step 5

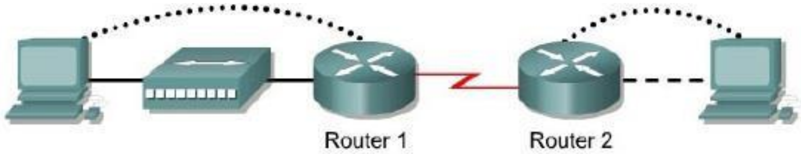
Now allocate addresses for the WAN links. Remember that each WAN link will require two IP addresses. The next available subnet is 192.168.10.128/28. Since 2 network addresses are required for each WAN link, 2 bits will be needed for host addresses, $2^2 - 2 = 2$ usable addresses. Thus 2 bits are required to represent the links and 6 bits for the extended-network-prefix of /30. Applying VLSM on 192.168.10.128/28 gives:

Sub-sub-networks	**14 usable hosts**
192.168.10.128/30	**192.168.10.128/30(Network Address)**
	192.168.10.129/30
	192.168.10.130/30
	192.168.10.131/30 (Broadcast Address)
192.168.10.132/30	**192.168.10.132/30(Network Address)**
	192.168.10.133/30
	192.168.10.134/30
	192.168.10.135/30 (Broadcast Address)
192.168.10.136/30	**192.168.10.136/30 (Network Address)**
	192.168.10.137/30
	192.168.10.138/30
	192.168.10.139/30 (Broadcast Address)

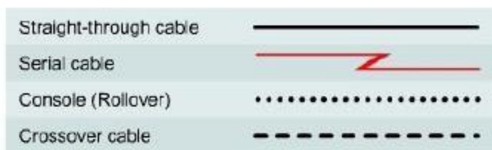
The available addresses for the WAN links can be taken from the available addresses in each of the /30 subnets.

Router Interface Summary					
Router Model	Ethernet Interface #1	Ethernet Interface #2	Serial Interface #1	Serial Interface #2	Interface #5
800 (806)	Ethernet 0 (E0)	Ethernet 1 (E1)			
1600	Ethernet 0 (E0)	Ethernet 1 (E1)	Serial 0 (S0)	Serial 1 (S1)	
1700	FastEthernet 0 (FA0)	FastEthernet 1 (FA1)	Serial 0 (S0)	Serial 1 (S1)	
2500	Ethernet 0 (E0)	Ethernet 1 (E1)	Serial 0 (S0)	Serial 1 (S1)	
2600	FastEthernet 0/0 (FA0/0)	FastEthernet 0/1 (FA0/1)	Serial 0/0 (S0/0)	Serial 0/1 (S0/1)	
In order to find out exactly how the router is configured, look at the interfaces. This will identify the type of router as well as how many interfaces the router has. There is no way to effectively list all of the combinations of configurations for each router class. What is provided are the identifiers for the possible combinations of interfaces in the device. This interface chart does not include any other type of interface even though a specific router may contain one. An example of this might be an ISDN BRI interface. The string in parenthesis is the legal abbreviation that can be used in IOS command to represent the interface.					

Experiment 10
Configuring RIP



Router Designation	Router Name	FastEthernet 0 Address	Interface Type	Serial 0 Address	Subnet Mask for Both Interfaces	Enable Secret Password	Enable, VTY, and Console Passwords
Router 1	GAD	172.16.0.1	DCE	172.17.0.1	255.255.0.0	class	cisco
Router 2	BHM	172.18.0.1	DTE	172.17.0.2	255.255.0.0	class	cisco



Objective

- Cable and configure workstations and routers
- Setup IP addressing scheme using Class B networks
- Configure Routing Information Protocol (RIP) on routers

Background / Preparation

Cable a network similar to the one shown in the diagram. Any router that meets the interface requirements displayed on the above diagram may be used. For example, router series 800, 1600, 1700, 2500 and 2600 or any such combination can be used. Please refer to the chart at the end of the lab to correctly identify the interface identifiers to be used based on the equipment in the lab. The configuration output used in this lab is produced from 1721 series routers. Any other router used may produce slightly different output. Perform the following steps on each router unless specifically instructed otherwise.

Note: Go to the erase and reload instructions at the end of this lab. Perform those steps on all routers in this lab assignment before continuing.

General Configuration Tips

a. Use the question mark (**?**) and arrow keys help to enter commands.

b. Each command mode restricts the set of available commands. If there is difficulty entering a command, check the prompt and then enter the question mark (**?**) for a list of available commands. The problem might be a wrong command mode or using the wrong syntax.

c. To disable a feature, enter the keyword **`no`** before the command; for example, **`no ip routing`**.

d. Save the configuration changes to NVRAM so that the changes are not lost if there is a system reload or power outage.

Router Command Modes			
Command Mode	**Access Method**	**Router Prompt Displayed**	**Exit Method**
User EXEC	Log in.	`Router>`	Use the **`logout`** command.
Privileged EXEC	From user EXEC mode, enter the **`enable`** command.	`Router#`	To exit to user EXEC mode, use the **`disable`**, **`exit`**, or **`logout`** command.
Global configuration	From the privileged EXEC mode, enter the **`configure terminal`** command.	`Router(config)#`	To exit to privileged EXEC mode, use the **`exit`** or **`end`** command, or press **Ctrl-z**.
Interface configuration	From the global configuration mode, enter the **`interface`** ***`type number`*** command, such as **`interface serial 0`**.	`Router(config-if)#`	To exit to global configuration mode, use the **`exit`** command.

Step 1 Basic router configuration

Connect a rollover cable to the console port on the router and the other end to the PC with a DB9 or DB25 adapter to a COM port. This should be completed prior to powering on of any devices.

Step 2 Start HyperTerminal program

a. Turn on the computer and router.

b. From the Windows taskbar, locate the HyperTerminal program:

Start > **Programs** > **Accessories** > **Communications** > **HyperTerminal**

Step 3 Name the HyperTerminal Session

a. At the "Connection Description" popup, enter a name in the connection *Name:* field and select **OK**.

Step 4 Specify the computer connecting interface

a. At the "Connect To" popup, use the drop down arrow in the *Connect using:* field to select **COM1** and select **OK**.

Step 5 Specify the interface connection properties

a. At the "COM1 Properties" popup, use the drop down arrows to select:

   Bits per second: **9600**

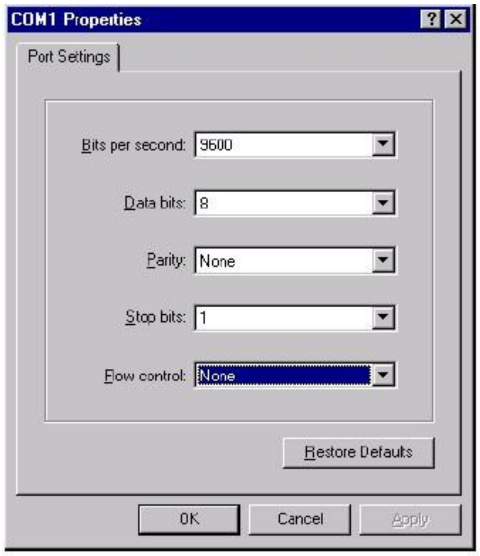
   Data bits: **8**

   Parity: **None**

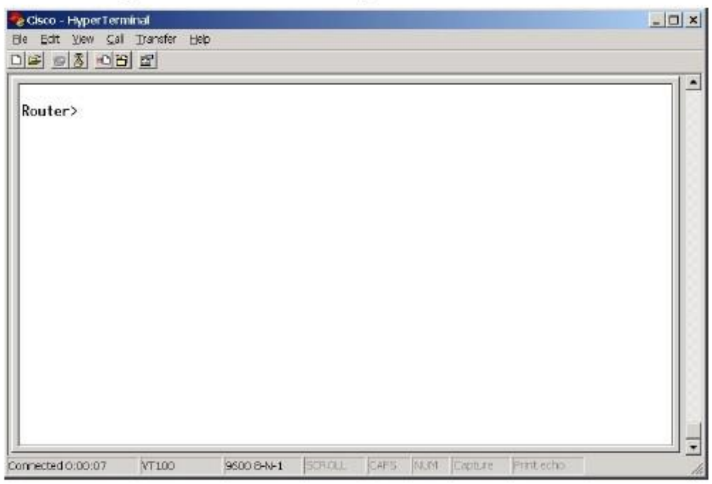
   Stop bits: **1**

   Flow control: **none**

b. Then select **OK**.



c. When the HyperTerminal session window comes up, turn on the router or if router is already on and press the **Enter** key. There should be a response from the router.



If the router responds, then the connection has been successfully completed.

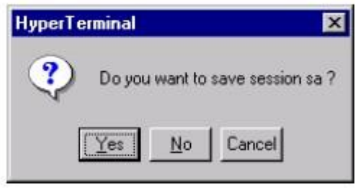
Step 6 Closing the Session

a. To end the console session from a HyperTerminal session, select:

File > **Exit**

b. When the HyperTerminal disconnect warning popup appears. Select **Yes**.

c. The computer will then ask if the session is to be saved. Select **Yes**.



Step 7 Reopen the HyperTerminal connection, as shown in Step 2

a. At the "Connection Description" popup, select **Cancel**.

b. To open the saved console session from HyperTerminal, select:

File > **Open**

c. The saved session will now appear and by double-clicking on the name, the connection will open without reconfiguring it each time.

Step 8 Configure the hostname and passwords on the router Gadsden

a. Enter **`enable`** at the user mode prompt.

```
Router>enable
Router#configure terminal
Router(config)#hostname GAD
GAD(config)#enable password cisco
GAD(config)#enable secret class
GAD(config)#line console 0
GAD(config-line)#password cisco
GAD(config-line)#login
GAD(config-line)#line vty 0 4
```

```
GAD(config-line)#password cisco
GAD(config-line)#login
GAD(config-line)#exit
GAD(config)#
```

Step 9 Configure serial interface Serial 0 on router GAD

a. From the global configuration mode, configure interface Serial 0 on router GAD. Refer to the interface chart.

```
GAD(config)#interface serial 0
GAD(config-if)#ip address 172.17.0.1 255.255.0.0
GAD(config-if)#clock rate 64000
GAD(config-if)#no shutdown
GAD(config-if)#exit
```

Step 10 Configure the fastethernet 0 interface on router GAD

```
GAD(config)#interface fastethernet 0
GAD(config-if)#ip address 172.16.0.1 255.255.0.0
GAD(config-if)#no shutdown
GAD(config-if)#exit
```

Step 11 Configure the IP host statements on router GAD

```
GAD(config)#ip host BMH 172.18.0.1 172.17.0.1
```

Step 12 Configure RIP routing on router GAD

```
GAD(config)#router rip
GAD(config-router)#network 172.16.0.0
GAD(config-router)#network 172.17.0.0
GAD(config-router)#exit
GAD(config)#exit
```

Step 13 Save the Gadsden router configuration

```
GAD#copy running-config startup-config
Destination filename [startup-config]?[Enter]
```

Step 14 Configure hostname and passwords on the router Birmingham

a. Enter **enable** at the user mode prompt.

```
Router>enable
Router#configure terminal
Router(config)#hostname BHM
BHM(config)#enable password cisco
BHM(config)#enable secret class
BHM(config)#line console 0
```

```
BHM(config-line)#password cisco
BHM(config-line)#login
BHM(config-line)#line vty 0 4
BHM(config-line)#password cisco
BHM(config-line)#login
BHM(config-line)#exit
BHM(config)#
```

Step 15 Configure serial interface Serial 0 on router BHM

a. From the global configuration mode, configure interface Serial 0 on router BHM. Refer to interface chart.

```
BHM(config)#interface serial 0
BHM(config-if)#ip address 172.17.0.2 255.255.0.0
BHM(config-if)#no shutdown
BHM(config-if)#exit
```

Step 16 Configure the fastethernet 0 interface on router BHM

```
BHM(config)#interface fastethernet 0
BHM(config-if)#ip address 172.18.0.1 255.255.0.0
BHM(config-if)#no shutdown
BHM(config-if)#exit
```

Step 17 Configure the IP host statements on router BHM

```
BHM(config)#ip host GAD 172.16.0.1 172.17.0.1
```

Step 18 Configure RIP routing on router BHM

```
BHM(config)#router rip
BHM(config-router)#network 172.18.0.0
BHM(config-router)#network 172.17.0.0
BHM(config-router)#exit
BHM(config)#exit
```

Step 19 Save the Birmingham router configuration

```
BHM#copy running-config startup-config
Destination filename [startup-config]?[Enter]
```

Step 20 Configure the hosts with the proper IP address, subnet mask, and default gateway

a. Host connected to router GAD

IP Address:	172.16.0.2
Subnet mask:	255.255.0.0
Default gateway:	172.16.0.1

b. Host connected to router BHM

IP Address:	172.18.0.2
Subnet mask:	255.255.0.0
Default gateway:	172.18.0.1

Step 21 Verify that the internetwork is functioning by pinging the Fast Ethernet interface of the other router

a. From the host attached to GAD, ping the BHM router Fast Ethernet interface. Was the ping successful? __Yes__________

b. From the host attached to BHM, ping the GAD router Fast Ethernet interface. Was the ping successful? __Yes__________

c. If the answer is no for either question, troubleshoot the router configurations to find the error. Then do the pings again until the answer to both questions is yes. Then ping all interfaces in the network.

Step 22 Show the routing tables for each router

a. From the enable privileged EXEC mode:

Examine the routing table entries, using the **show ip route** command on each router.

b. What are the entries in the GAD routing table?

```
C     172.16.0.0/16 is directly connected, Ethernet0
C     172.17.0.0/16 is directly connected, Serial0
R     172.18.0.0/16 [120/1] via 172.17.0.2, 00:00:25, Serial
```

c. What are the entries in the BHM routing table?

```
R     172.16.0.0/16 [120/1] via 172.17.0.1, 00:00:04, Serial0
C     172.17.0.0/16 is directly connected, Serial0
C     172.18.0.0/16 is directly connected, Ethernet0
```

Once the previous steps are completed, logoff by typing **exit**, and turn the router off. Then remove and store the cables and adapter.

Erasing and reloading the router

Enter into the privileged EXEC mode by typing **enable**.

If prompted for a password, enter **class**. If that does not work, ask the instructor for assistance.

```
Router>enable
```

At the privileged EXEC mode, enter the command **erase startup-config**.

```
Router#erase startup-config
```

The responding line prompt will be:

```
Erasing the nvram filesystem will remove all files! Continue?
[confirm]
```

Press **Enter** to confirm.

The response should be:

```
Erase of nvram: complete
```

Now at the privileged EXEC mode, enter the command **reload**.

```
Router(config)#reload
```

The responding line prompt will be:

```
System configuration has been modified. Save? [yes/no]:
```

Type **n** and then press **Enter**.

The responding line prompt will be:

```
Proceed with reload? [confirm]
```

Press **Enter** to confirm.

In the first line of the response will be:

```
Reload requested by console.
```

After the router has reloaded the line prompt will be:

```
Would you like to enter the initial configuration dialog? [yes/no]:
```

Type **n** and then press **Enter**.

The responding line prompt will be:

```
Press RETURN to get started!
```

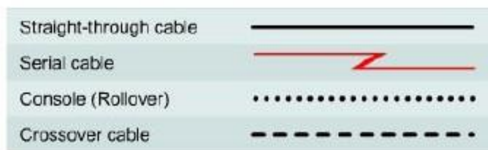
Press **Enter**.

Now the router is ready for the assigned lab to be performed.

Router Interface Summary				
Router Model	Ethernet Interface #1	Ethernet Interface #2	Serial Interface #1	Serial Interface #2
800 (806)	Ethernet 0 (E0)	Ethernet 1 (E1)		
1600	Ethernet 0 (E0)	Ethernet 1 (E1)	Serial 0 (S0)	Serial 1 (S1)
1700	FastEthernet 0 (FA0)	FastEthernet 1 (FA1)	Serial 0 (S0)	Serial 1 (S1)
2500	Ethernet 0 (E0)	Ethernet 1 (E1)	Serial 0 (S0)	Serial 1 (S1)
2600	FastEthernet 0/0 (FA0/0)	FastEthernet 0/1 (FA0/1)	Serial 0/0 (S0/0)	Serial 0/1 (S0/1)
In order to find out exactly how the router is configured, look at the interfaces. This will identify what type and how many interfaces the router has. There is no way to effectively list all of the combinations of configurations for each router class. What is provided are the identifiers for the possible combinations of interfaces in the device. This interface chart does not include any other type of interface even though a specific router may contain one. An example of this might be an ISDN BRI interface. The string in parenthesis is the legal abbreviation that can be used in IOS command to represent the interface.				

Experiment 11
Troubleshooting RIP v2 using Debug

Router Designation	Router Name	FastEthernet 0 Address	Interface Type	Serial 0 Address	Subnet Mask for Both Interfaces	Enable Secret Password	Enable, VTY, and Console Passwords
Router 1	GAD	172.16.0.1	DCE	172.17.1.1	255.255.0.0	class	cisco
Router 2	BHM	172.18.0.1	DTE	172.17.1.2	255.255.0.0	class	cisco



Objective

- Configure RIP v2 on both routers
- Use debug commands to verify proper RIP operation and analyze data transmitted between routers.

Background/Preparation

Cable a network similar to the one shown in the diagram. Any router that meets the interface requirements displayed on the above diagram may be used. For example, router series 800, 1600, 1700, 2500, and 2600 or any such combination can be used. Please refer to the chart at the end of the lab to correctly identify the interface identifiers to be used based on the equipment in the lab. The configuration output used in this lab is produced from 1721 series routers. Any other router used may produce slightly different output. Perform the following steps on each router unless specifically instructed otherwise.

Start a HyperTerminal session as performed in the Establishing a HyperTerminal session lab.

> **Note:** Go to the erase and reload instructions at the end of this lab. Perform those steps on all routers in this lab assignment before continuing.

Step 1 Configure the routers

On the routers, configure the hostnames as well as the console, virtual terminal, and enable passwords. Next configure the serial interface IP address and clock rate and the Fast Ethernet interface IP address. Finally configure IP host names. If there are problems performing the basic configuration, refer to the Review of Basic Configuration including RIP lab. Optional interface descriptions and message of the day banners may also be configured. Be sure to save the configurations just created.

```
Router1
Router>enable
Router#configure terminal
Router(config)#hostname GAD

GAD(config)#enable secret class
GAD(config)#line console 0
GAD(config-line)#password cisco
GAD(config-line)#login
GAD(config-line)#line vty 0 4
GAD(config-line)#password cisco
GAD(config-line)#login
GAD(config-line)#exit
GAD(config)#interface serial 0
GAD(config-if)#ip address 172.17.1.1 255.255.0.0
GAD(config-if)#clock rate 64000
GAD(config-if)#no shutdown
GAD(config-if)#exit
GAD(config)#interface ethernet 0
GAD(config-if)#ip address 172.16.0.1 255.255.0.0
GAD(config-if)#no shutdown
GAD(config-if)#exit
GAD(config)#ip host BMH 172.18.0.1 172.17.1.2

Router2
Router>enable
Router#configure terminal
Router(config)#hostname BHM

BHM(config)#enable secret class
BHM(config)#line console 0
BHM(config-line)#password cisco
BHM(config-line)#login
BHM(config-line)#line vty 0 4
BHM(config-line)#password cisco
BHM(config-line)#login
BHM(config-line)#exit
BHM(config)#interface serial 0
BHM(config-if)#ip address 172.17.1.2 255.255.0.0
BHM(config-if)#no shutdown
BHM(config-if)#exit
BHM(config)#interface ethernet 0
BHM(config-if)#ip address 172.18.0.1 255.255.0.0
BHM(config-if)#no shutdown
BHM(config-if)#exit
BHM(config)#ip host GAD 172.16.0.1 172.17.1.1
```

Step 2 Configure the routing protocol on the GAD router

Go to the proper command mode and configure RIP routing on the GAD router according to the chart.

```
GAD(config)#router rip
GAD(config-router)#network 172.16.0.0
GAD(config-router)#network 172.17.0.0
GAD(config-router)#exit
GAD(config)#exit
```

Step 3 Save the GAD router configuration

Any time that changes are correctly made to the running configuration, they should be saved to the startup configuration. Otherwise if the router is reloaded or power cycled, the changes that are not in the startup configuration will be lost.

```
GAD#copy running-config startup-config
Destination filename [startup-config]?[Enter]
```

Step 4 Configure the routing protocol on the BHM router

Go to the proper command mode and configure RIP routing on the BHM router according to the chart.

```
BHM(config)#router rip
BHM(config-router)#network 172.18.0.0
BHM(config-router)#network 172.17.0.0
BHM(config-router)#exit
BHM(config)#exit
```

Step 5 Save the BHM router configuration

```
BHM#copy running-config startup-config
Destination filename [startup-config]?[Enter]
```

Step 6 Configure the hosts with the proper IP address, subnet mask, and default gateway

```
Host connected to router GAD
IP Address:       172.16.0.2
Subnet mask:      255.255.0.0
Default gateway:  172.16.0.1

Host connected to router BHM
IP Address:       172.18.0.2
Subnet mask:      255.255.0.0
Default gateway:  172.18.0.1
```

Step 7 Verify that the internetwork is functioning by pinging the FastEthernet interface of the other router

a. From the host attached to the GAD, ping the other host attached to the BHM router. Was the ping successful? Yes

b. From the host attached to the BHM, ping the other host attached to the GAD router. Was the ping successful? Yes

c. If the answer is no for either question, troubleshoot the router configurations to find the error. Then do the pings again until the answer to both questions is yes.

Step 8 Show the debug IP options

a. At the privileged EXEC mode type **debug ip ?**.

```
cache      IP cache operations
dhcp       Dynamic Host Configuration Protocol
eigrp      IP-EIGRP information
error      IP error debugging
ftp        FTP dialogue
html       HTML connections
http       HTTP connections
icmp       ICMP transactions
igrp       IGRP information
interface  IP interface configuration changes
```

```
mpacket     IP multicast packet debugging
nat         NAT events
ospf        OSPF information
packet      General IP debugging and IPSO security transactions
peer        IP peer address activity
policy      Policy routing
rip         RIP protocol transactions
routing     Routing table events
rtp         RTP information
security    IP security options
socket      Socket event
tcp         TCP information
tempacl     IP temporary ACL
udp         UDP based transactions
```

b. Which routing protocols can use debug commands? `eigrp, igrp, ospf, rip`

Step 9 Show the debug IP RIP options

a. At the privileged EXEC mode type **`debug ip rip ?`**.

```
database   RIP database events
events     RIP protocol events
trigger    RIP trigger extension
```

b. How many options are available for **`debug ip rip ?`**? 3

Step 10 Show the RIP routing updates

a. From the enable privileged EXEC mode, examine the routing table entries using command **`debug ip rip`** command on each router.

b. What are the three operations that take place listed in the rip debug statements?

Receive routing update Send an update Build update entries

c. Turn off debugging by typing either **`no debug ip rip`** or **`undebug all`**.

Step 11 Enable RIP Version 2 Routing

Enable version 2 of the RIP routing protocol on the GAD router only.

```
GAD(config)#router rip
GAD(config-router)#version 2
```

Step 12 Start the debug function again on the GAD router

a. Does a problem occur now that we have RIP v2 on the GAD router? Yes

b. What is the problem? ____

Step 13 Clear the routing table

a. Instead of waiting for the routes to time out, type **`clear ip route *`**. Then type **`show ip route`**.

b. What has happened to the routing table? The route to 172.18.0.1 is no longer there

b. Will it be updated to include RIP routes if the debug output says the update is ignored? No

Step 14 Start the debug RIP function

a. Start the debug RIP function on the BHM router again by typing **`debug ip rip`**.

b. Does a problem occur now that RIP v2 is on the GAD router? Yes

c. What is the problem? It is rejecting updates from GAD because of the version difference.

Step 15 Clear the routing table

a. Instead of waiting for the routes to time out, type **`clear ip route *`**. Then type **`show ip route`**.

b. What has happened to the routing table? Route to 172.16.0.0/24 is no longer there.

c. Does a problem occur now that RIP v2 is on the GAD router? No

d. Turn off debugging by typing either **`no debug ip rip`** or **`undebug all`**.

Step 16 Enable RIP version 2 routing

Enable version 2 of the RIP routing protocol on the BHM router.

```
BHM(config)#router rip
BHM(config-router)#version 2
```

Step 17 Use the debug function to see packet traffic on a router

a. Use the **`debug`** function to see packet traffic on the GAD router by typing **`debug ip packet`** at the privileged EXEC mode.

b. When an RIP update is sent how many source addresses are used? 2

c. Why are multiple source addresses used? One for each network the router will send and receive updates with.

d. What is the source address used? 172.16.0.1 and 172.17.1.1

e. Why is this address used? It is the originating interface from which the packet is sent.

Step 18 Start the debug RIP database function again on the BHM router

a. Start the RIP database debugging by typing **`debug ip rip database`**, then clear the routing table by typing **`clear ip route *`**.

b. Are the old routes in the table deleted? Yes

c. Are new routes added back into the table? Yes

d. What does the last entry in the **`debug`** output say? RIP-DB: Adding new rndb entry 172.18.0.0/16

e. Turn off debugging by typing either **`no debug ip rip`** or **`undebug all`**.

Step 19 Use the debug events function to see routing updates

a. Use the **`debug`** function to see routing updates by typing **`debug ip rip events`** in privileged EXEC mode on the BHM router.

b. What interfaces are the routing updates sent on? Ethernet 0 and Serial 0

c. How many routes are in the routing updates being sent? 2

Once the previous steps are completed, log off by typing **`exit`**, and turn the router off. Then remove and store the cables and adapter.

Erasing and reloading the router

Enter into the privileged EXEC mode by typing **enable**.

If prompted for a password, enter **class**. If that does not work, ask the instructor for assistance.

```
Router>enable
```

At the privileged EXEC mode, enter the command **erase startup-config**.

```
Router#erase startup-config
```

The responding line prompt will be:

```
Erasing the nvram filesystem will remove all files! Continue?
[confirm]
```

Press **Enter** to confirm.

The response should be:

```
Erase of nvram: complete
```

Now at the privileged EXEC mode, enter the command **reload**.

```
Router(config)#reload
```

The responding line prompt will be:

```
System configuration has been modified. Save? [yes/no]:
```

Type **n** and then press **Enter**.

The responding line prompt will be:

```
Proceed with reload? [confirm]
```

Press **Enter** to confirm.

In the first line of the response will be:

```
Reload requested by console.
```

After the router has reloaded the line prompt will be:

```
Would you like to enter the initial configuration dialog? [yes/no]:
```

Type **n** and then press **Enter**.

The responding line prompt will be:

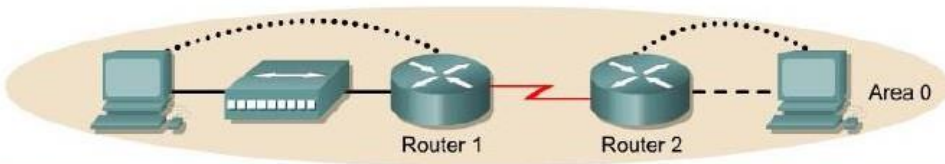
```
Press RETURN to get started!
```

Press **Enter**.

Now the router is ready for the assigned lab to be performed.

Router Interface Summary				
Router Model	Ethernet Interface #1	Ethernet Interface #2	Serial Interface #1	Serial Interface #2
800 (806)	Ethernet 0 (E0)	Ethernet 1 (E1)		
1600	Ethernet 0 (E0)	Ethernet 1 (E1)	Serial 0 (S0)	Serial 1 (S1)
1700	FastEthernet 0 (FA0)	FastEthernet 1 (FA1)	Serial 0 (S0)	Serial 1 (S1)
2500	Ethernet 0 (E0)	Ethernet 1 (E1)	Serial 0 (S0)	Serial 1 (S1)
2600	FastEthernet 0/0 (FA0/0)	FastEthernet 0/1 (FA0/1)	Serial 0/0 (S0/0)	Serial 0/1 (S0/1)
In order to find out exactly how the router is configured, look at the interfaces. This will identify what type and how many interfaces the router has. There is no way to effectively list all of the combinations of configurations for each router class. What is provided are the identifiers for the possible combinations of interfaces in the device. This interface chart does not include any other type of interface even though a specific router may contain one. An example of this might be an ISDN BRI interface. The string in parenthesis is the legal abbreviation that can be used in IOS command to represent the interface.				

<u>Experiment 12</u>
Configuring the OSPF Routing Process



Router Designation	Router Name	Enable Secret Password	Enable, VTY, and Console Passwords	Routing Protocol	Network Statements
Router 1	Berlin	class	cisco	OSPF	192.168.1.0 192.168.15.0
Router 2	Rome	class	cisco	OSPF	192.168.15.0 192.168.0.0

Router Designation	IP Host Table Entry	FastEthernet 0 Address/ Subnet Mask	Interface Type Serial 0	Serial 0 Address/Subnet Mask	Interface Type Serial 1	Serial 1 Address/Subnet Mask
Router 1	Rome	192.168.1.129/26	DCE	192.168.15.1/30	NA	No address
Router 2	Berlin	192.168.0.1/24	DTE	192.168.15.2/30	NA	No address

Note: The IP Host Table Entry column contents indicate the name(s) of the other router(s) in the IP host table.

Straight-through cable	————	Console (Rollover)	•••••••••
Serial cable	—Z—	Crossover cable	– – – – –

Objective

- Setup an IP addressing scheme for OSPF area 0.
- Configure and verify Open Shortest Path First (OSPF) routing.

Background/Preparation

Cable a network similar to the one shown in the diagram. Any router that meets the interface requirements displayed on the above diagram may be used. For example, router series 800, 1600, 1700, 2500, and 2600 or any such combination can be used. Please refer to the chart at the end of the lab to correctly identify the interface identifiers to be used based on the equipment in the lab. The configuration output used in this lab is produced from 1721 series routers. Any other router used may produce slightly different output. Perform the following steps on each router unless specifically instructed otherwise.

Start a HyperTerminal session.

Note: Go to the erase and reload instructions at the end of this lab. Perform those steps on all routers in this lab assignment before continuing.

Step 1 Configure the routers

On the routers, enter the global configuration mode and configure the hostname as shown in the chart. Then configure the console, virtual terminal and enable passwords. Next configure the interfaces according to the chart. Finally, configure the IP hostnames. Do not configure the routing protocol until specifically told to. If there are any problems configuring the router basics, refer to prior lab "Review of Basic Router Configuring with RIP".

Router1

```
Router>enable
Router#configure terminal
Router(config)#hostname BERLIN

BERLIN(config)#enable secret class
BERLIN(config)#line console 0
BERLIN(config-line)#password cisco
BERLIN(config-line)#login
BERLIN(config-line)#line vty 0 4
BERLIN(config-line)#password cisco
BERLIN(config-line)#login
BERLIN(config-line)#exit
BERLIN(config)#interface serial 0
BERLIN(config-if)#ip address 192.168.15.1 255.255.255.252
BERLIN(config-if)#clock rate 64000
BERLIN(config-if)#no shutdown
BERLIN(config-if)#exit
BERLIN(config)#interface ethernet 0
BERLIN(config-if)#ip address 192.168.1.129 255.255.255.192
BERLIN(config-if)#no shutdown
BERLIN(config-if)#exit
BERLIN(config)#ip host ROME 192.168.0.1 192.168.15.2
```

Router2

```
Router>enable
Router#configure terminal
Router(config)#hostname ROME

ROME(config)#enable secret class
ROME(config)#line console 0
ROME(config-line)#password cisco
ROME(config-line)#login
ROME(config-line)#line vty 0 4
ROME(config-line)#password cisco
ROME(config-line)#login
ROME(config-line)#exit
ROME(config)#interface serial 0
ROME(config-if)#ip address 192.168.15.2 255.255.255.252
ROME(config-if)#no shutdown
ROME(config-if)#exit
ROME(config)#interface ethernet 0
ROME(config-if)#ip address 192.168.0.1 255.255.255.0
ROME(config-if)#no shutdown
ROME(config-if)#exit
ROME(config)#ip host BERLIN 192.168.1.129 192.168.15.1
```

Step 2 Save the configuration information from the privileged EXEC command mode

```
BERLIN#copy running-config startup-config
Destination filename [startup-config]? [Enter]
```

a. Why save the running configuration to the startup configuration?

So that the router will keep the configuration when it is reset

Step 3 Configure the hosts with the proper IP address, subnet mask, and default gateway

a. Each workstation should be able to ping the attached router. Troubleshoot as necessary. Remember to assign a specific IP address and default gateway to the workstation. If running Windows 98, check by using **Start** >**Run** > `winipcfg`. If running Windows 2000, check by using the `ipconfig` command in a DOS window.

b. At this point the workstations will not be able to communicate with each other. The following steps will demonstrate the process required to get communication working using OSPF as the routing protocol.

```
Host connected to router Rome
IP Address:             192.168.0.2
Subnet mask:            255.255.255.0
Default gateway:        192.168.0.1

Host connected to router Berlin
IP Address:             192.168.1.130
Subnet mask:            255.255.255.128
Default gateway:        192.168.1.129
```

Step 4 View the routers configuration and interface information

a. At the privileged EXEC mode prompt type:

```
Berlin#show running-config
```

b. Using the `show ip interface brief` command, check the status of each interface.

c. What is the state of the interfaces on each router?

Berlin:

Ethernet 0: Up

Serial 0: Up

Serial 1: Down

Rome:

Ethernet 0: Up

Serial 0: Up

Serial 1: Down

d. Ping from one of the connected serial interfaces to the other.

Was the ping successful? Yes

e. If the ping was not successful, troubleshoot the router configuration, until the ping is successful.

Step 5 Configure OSPF routing on router Berlin

a. Configure an OSPF routing process on router Berlin. Use OSPF process number 1 and ensure all networks are in area 0.

```
Berlin(config)#router ospf 1
Berlin(config-router)#network 192.168.1.128 0.0.0.63 area 0
Berlin(config-router)#network 192.168.15.0 0.0.0.3 area 0
Berlin(config-router)#end
```

b. Examine the routers running configurations files.

c. Did the IOS version automatically add any lines under router OSPF 1? Yes

d. If so, what did it add? log-adjacency-changes

e. If there were no changes to the running configuration, type the following commands:

```
Berlin(config)#router ospf 1
Berlin(config-router)#log-adjacency-changes
Berlin(config-router)#end
```

f. Show the routing table for the Berlin router.

```
Berlin#show ip route
```

g. Are there any entries in the routing table? No

h. Why? OSPF is not configured on Rome

Step 6 Configure OSPF routing on router Rome

a. Configure an OSPF routing process on router Rome. Use OSPF process number 1 and ensure all networks are in area 0.

```
Rome(config)#router ospf 1
Rome(config-router)#network 192.168.0.0 0.0.0.255 area 0
Rome(config-router)#network 192.168.15.0 0.0.0.3 area 0
Rome(config-router)#end
```

b. Examine the Rome running configuration files.

c. Did the IOS version automatically add any lines under router OSPF 1? Yes

d. If so, what did it add? log-adjacency-changes

e. If there were no changes to the running configuration, type the following commands:

```
Rome(config)#router ospf 1
Rome(config-router)#log-adjacency-changes
Rome(config-router)#end
```

f. Show the routing table for the Rome router:

```
Rome#show ip route
```

g. Are there any OSPF entries in the routing table now? Yes

h. What is the metric value of the OSPF route?

It varies, the default with bandwidth on serial set to 128kb gives a net cost of 782.

i. What is the VIA address in the OSPF route? 192.168.15.1

j. Are routes to all networks shown in the routing table? Yes

k. What does the O mean in the first column of the routing table?

The route was learned by OSPF.

Step 7 Test network connectivity

a. Ping the Berlin host from the Rome host. Was it successful? Yes

Erasing and reloading the router

Enter into the privileged EXEC mode by typing **enable**.

If prompted for a password, enter **class**. If that does not work, ask the instructor for assistance.

```
Router>enable
```

At the privileged EXEC mode, enter the command **erase startup-config**.

```
Router#erase startup-config
```

The responding line prompt will be:

```
Erasing the nvram filesystem will remove all files! Continue?
[confirm]
```

Press **Enter** to confirm.

The response should be:

```
Erase of nvram: complete
```

Now at the privileged EXEC mode, enter the command **reload**.

```
Router(config)#reload
```

The responding line prompt will be:

```
System configuration has been modified. Save? [yes/no]:
```

Type **n** and then press **Enter**.

The responding line prompt will be:

```
Proceed with reload? [confirm]
```

Press **Enter** to confirm.

In the first line of the response will be:

```
Reload requested by console.
```

After the router has reloaded the line prompt will be:

```
Would you like to enter the initial configuration dialog? [yes/no]:
```

Type **n** and then press **Enter**.

The responding line prompt will be:

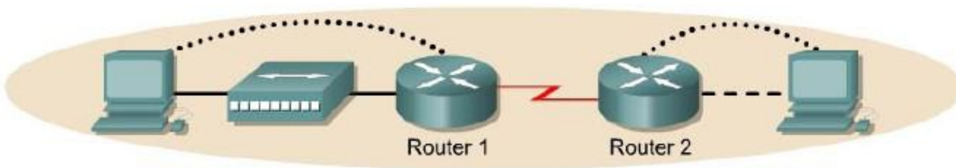
```
Press RETURN to get started!
```

Press **Enter**.

Now the router is ready for the assigned lab to be performed.

Router Interface Summary				
Router Model	Ethernet Interface #1	Ethernet Interface #2	Serial Interface #1	Serial Interface #2
800 (806)	Ethernet 0 (E0)	Ethernet 1 (E1)		
1600	Ethernet 0 (E0)	Ethernet 1 (E1)	Serial 0 (S0)	Serial 1 (S1)
1700	FastEthernet 0 (FA0)	FastEthernet 1 (FA1)	Serial 0 (S0)	Serial 1 (S1)
2500	Ethernet 0 (E0)	Ethernet 1 (E1)	Serial 0 (S0)	Serial 1 (S1)
2600	FastEthernet 0/0 (FA0/0)	FastEthernet 0/1 (FA0/1)	Serial 0/0 (S0/0)	Serial 0/1 (S0/1)
In order to find out exactly how the router is configured, look at the interfaces. This will identify what type and how many interfaces the router has. There is no way to effectively list all of the combinations of configurations for each router class. What is provided are the identifiers for the possible combinations of interfaces in the device. This interface chart does not include any other type of interface even though a specific router may contain one. An example of this might be an ISDN BRI interface. The string in parenthesis is the legal abbreviation that can be used in IOS command to represent the interface.				

Experiment 13
Configuring EIGRP Routes



Router Designation	Router Name	Enable Secret Password	Enable, VTY, and Console Passwords	Routing Protocol	Network Statements
Router 1	Paris	class	cisco	EIGRP	192.168.3.0 192.168.2.0
Router 2	Warsaw	class	cisco	EIGRP	192.168.1.0 192.168.2.0

Router Designation	IP Host Table Entry	FastEthernet 0 Address/ Subnet Mask	Interface Type Serial 0	Serial 0 Address/Subnet Mask	Loopback 0 Address/Subnet Mask
Router 1	Warsaw	192.168.3.1/24	DCE	192.168.2.1/30	192.168.0.2/24
Router 2	Paris	192.168.1.1/24	DTE	192.168.2.2/30	No address

Note: The IP Host Table Entry column contents indicate the name(s) of the other router(s) in the IP host table.

Straight-through cable	Console (Rollover)
Serial cable	Crossover cable

Objective

- Setup an IP addressing scheme for the network.
- Configure and verify Enhanced Interior Gateway Routing Protocol (EIGRP) routing.

Background/Preparation

Cable a network similar to the one shown in the diagram. Any router that meets the interface requirements displayed on the above diagram may be used. For example, router series 800, 1600, 1700, 2500, and 2600 or any such combination can be used. Please refer to the chart at the end of the lab to correctly identify the interface identifiers to be used based on the equipment in the lab. The configuration output used in this lab is produced from 1721 series routers. Any other router used may produce slightly different output. Perform the following steps on each router unless specifically instructed otherwise.

Start a HyperTerminal session.

> **Note:** Go to the erase and reload instructions at the end of this lab. Perform those steps on all routers in this lab assignment before continuing.

Step 1 Configure the routers

On the routers, enter the global configuration mode and configure the hostname as shown in the chart. Then configure the console, virtual terminal and enable passwords. Next configure the interfaces according to the chart. Finally, configure the IP hostnames. Do not configure the routing

Step 2 Save the configuration information from the privileged EXEC command mode

```
Paris#copy running-config startup-config
Destination filename [startup-config]? [Enter]
```

Step 3 Configure the hosts with the proper IP address, subnet mask and default gateway

a. Each workstation should be able to ping the attached router. Troubleshoot as necessary. Remember to assign a specific IP address and default gateway to the workstation. If running Windows 98, check by using **Start** > **Run** > `winipcfg`. If running Windows 2000, check by using the `ipconfig` command in a DOS window.

b. At this point the workstations will not be able to communicate with each other. The following steps will demonstrate the process required to get communication working using EIGRP as the routing protocol.

```
Host connected to router Paris
IP Address:          192.168.3.2
Subnet mask:         255.255.255.0
Default gateway:     192.168.3.1

Host connected to router Warsaw
IP Address:          192.168.1.2
Subnet mask:         255.255.255.0
Default gateway:     192.168.1.1
```

Step 4 View the routers configuration and interface information

a. At the privileged EXEC mode prompt type:

```
Paris#show running-config
```

b. Using the `show ip interface brief` command, check the status of each interface.

c. What is the state of the interfaces on each router?

Paris:

Ethernet 0: Up

Serial 0: Up

Warsaw:

Ethernet 0: Up

Serial 0: Up

d. `Ping` from one of the connected serial interfaces to the other.

e. Was the ping successful? Yes

f. If the `ping` was not successful, troubleshoot the routers configuration, until the `ping` is successful.

Step 5 Configure EIGRP routing on router Paris

a. Enable the EIGRP routing process on Paris, and configure the networks it will advertise. Use EIGRP autonomous system number 101.

```
Paris(config)#router eigrp 101
Paris(config-router)#network 192.168.3.0
```

```
Paris(config-router)#network 192.168.2.0
Paris(config-router)#network 192.168.0.0
Paris(config-router)#end
```

b. Show the routing table for the Paris router.

```
Paris#show ip route
```

c. Are there any EIGRP entries in the routing table? No

d. Why? EIGRP is not configured on Warsaw.

Step 6 Configure EIGRP routing on router Warsaw

a. Enable the EIGRP routing process on Warsaw, and configure the networks it will advertise. Use EIGRP autonomous system number 101.

```
Warsaw(config)#router eigrp 101
Warsaw(config-router)#network 192.168.2.0
Warsaw(config-router)#network 192.168.1.0
Warsaw(config-router)#end
```

b. Show the routing table for the Warsaw router.

```
Warsaw#show ip route
```

Step 7 Test network connectivity

Ping the Paris host from the Warsaw host. Was it successful? Yes

If not troubleshoot as necessary.

Once the previous steps are completed, log off by typing `exit`, and turn the router off. Then remove and store the cables and adapter.

Erasing and reloading the router

Enter into the privileged EXEC mode by typing **enable**.

If prompted for a password, enter **class**. If that does not work, ask the instructor for assistance.

```
Router>enable
```

At the privileged EXEC mode, enter the command **erase startup-config**.

```
Router#erase startup-config
```

The responding line prompt will be:

```
Erasing the nvram filesystem will remove all files! Continue?
[confirm]
```

Press **Enter** to confirm.

The response should be:

```
Erase of nvram: complete
```

Now at the privileged EXEC mode, enter the command **reload**.

```
Router(config)#reload
```

The responding line prompt will be:

```
System configuration has been modified. Save? [yes/no]:
```

Type **n** and then press **Enter**.

The responding line prompt will be:

```
Proceed with reload? [confirm]
```

Press **Enter** to confirm.

In the first line of the response will be:

```
Reload requested by console.
```

After the router has reloaded the line prompt will be:

```
Would you like to enter the initial configuration dialog? [yes/no]:
```

Type **n** and then press **Enter**.

The responding line prompt will be:

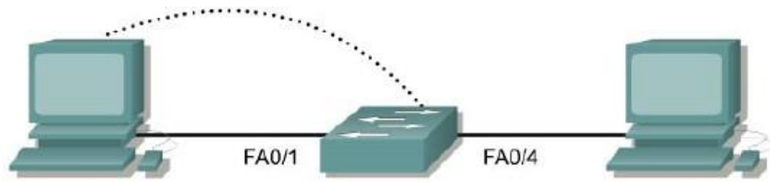
```
Press RETURN to get started!
```

Press **Enter**.

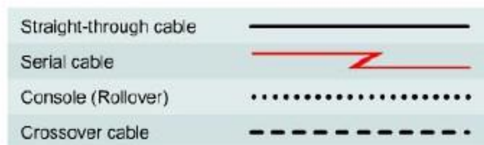
Now the router is ready for the assigned lab to be performed.

Router Interface Summary				
Router Model	Ethernet Interface #1	Ethernet Interface #2	Serial Interface #1	Serial Interface #2
800 (806)	Ethernet 0 (E0)	Ethernet 1 (E1)		
1600	Ethernet 0 (E0)	Ethernet 1 (E1)	Serial 0 (S0)	Serial 1 (S1)
1700	FastEthernet 0 (FA0)	FastEthernet 1 (FA1)	Serial 0 (S0)	Serial 1 (S1)
2500	Ethernet 0 (E0)	Ethernet 1 (E1)	Serial 0 (S0)	Serial 1 (S1)
2600	FastEthernet 0/0 (FA0/0)	FastEthernet 0/1 (FA0/1)	Serial 0/0 (S0/0)	Serial 0/1 (S0/1)
In order to find out exactly how the router is configured, look at the interfaces. This will identify what type and how many interfaces the router has. There is no way to effectively list all of the combinations of configurations for each router class. What is provided are the identifiers for the possible combinations of interfaces in the device. This interface chart does not include any other type of interface even though a specific router may contain one. An example of this might be an ISDN BRI interface. The string in parenthesis is the legal abbreviation that can be used in IOS command to represent the interface.				

Experiment 14
Basic Switch Configuration



Switch Designation	Switch Name	Enable Secret Password	Enable, VTY, and Console Passwords
Switch 1	AL Switch	class	cisco



Objective

- Configure a switch with a name and an IP address.
- Configure passwords to ensure that access to the CLI is secured.
- Configure switch port speed and duplex properties for an interface.
- Save the active configuration.
- View the switch browser interface.

Background/Preparation

Cable a network similar to the one in the diagram. The configuration output used in this lab is produced from a 2950 series switch. Any other switch used may produce different output. The following steps are to be executed on each switch unless specifically instructed otherwise. Instructions are also provided for the 1900 Series switch, which initially displays a User Interface Menu. Select the “Command Line” option from the menu to perform the steps for this lab.

Start a HyperTerminal session.

> **Note:** Go to the erase and reload instructions at the end of this lab. Perform those steps on all switches in this lab assignment before continuing.

Step 1 Enter privileged mode

a. Privileged mode gives access to all the switch commands. Many of the privileged commands configure operating parameters. Therefore, privileged access should be password-protected to prevent unauthorized use. The privileged command set includes those commands contained in user EXEC mode, as well as the `configure` command through which access to the remaining command modes is gained.

```
Switch>enable
Switch#
```

1900:

```
>enable
#
```

b. Notice the prompt changed in the configuration to reflect privileged EXEC mode.

Step 2 Examine the current switch configuration

a. Examine the following current running configuration file:

```
Switch#show running-config
```

b. How many Ethernet or Fast Ethernet interfaces does the switch have? 24

c. What is the range of values shown for the VTY lines? 5 – 15 (Note: 1900 will not display VTY lines).

d. Examine the current contents of NVRAM as follows:

```
Switch#show startup-config
%% Non-volatile configuration memory is not present
```

e. Why does the switch give this response?

Nothing is saved into NVRAM.

Step 3 Assign a name to the switch

a. Enter **enable** and then the configuration mode. The configuration mode allows the management of the switch. Enter **ALSwitch**, the name this switch will be referred to in the following:

```
Switch#configure terminal
```

Enter the configuration commands, one for each line. End by pressing **Ctrl-Z**.

```
Switch(config)#hostname ALSwitch
ALSwitch(config)#exit
```

b. Notice the prompt changed in the configuration to reflect its new name. Type `exit or press Ctrl-Z` to go back into privileged mode.

Step 4 Examine the current running configuration

a. Exam the current configuration that follows to verify that there is no configuration except for the hostname:

```
ALSwitch#show running-config
```

b. Are there any passwords set on the lines? No (Note: There are no VTY **lines** on the 1900.)

c. What does the configuration show as the hostname of this switch? ALSwitch

Step 5 Set the access passwords (1900: Skip to Step 6)

Enter config-line mode for the console. Set the password on this line as **cisco** for login. Configure the vty lines 0 to 15 with the password cisco as follows:

```
ALSwitch#configure terminal
```

Enter the configuration commands, one for each line. End by pressing **Ctrl-Z**.

```
ALSwitch(config)#line con 0
ALSwitch(config-line)#password cisco
ALSwitch(config-line)#login

ALSwitch(config-line)#line vty 0 15
ALSwitch(config-line)#password cisco
ALSwitch(config-line)#login

ALSwitch(config-line)#exit
```

Step 6 Set the command mode passwords

a. Set the **enable password** to **cisco** and the **enable secret password** to **class** as follows:

```
2950:
ALSwitch(config)#enable password cisco
ALSwitch(config)#enable secret class

1900:
ALSwitch(config)#enable password level 15 cisco
ALSwitch(config)#enable secret class
```

b. Which password takes precedence, the enable password or enable secret password? secret

Step 7 Configure the layer 3 access to the switch

a. Set the IP address of the switch to 192.168.1.2 with a subnet mask of 255.255.255.0 as follows:

Note: This is done on the internal virtual interface VLAN 1.

```
ALSwitch(config)#interface VLAN 1
ALSwitch(config-if)#ip address 192.168.1.2 255.255.255.0
ALSwitch(config-if)#exit

1900:
ALSwitch(config)#ip address 192.168.1.2 255.255.255.0
```

```
ALSwitch(config)#exit
```

b. Set the default gateway for the switch and the default management VLAN to 192.168.1.1 as follows:

```
ALSwitch(config)#ip default-gateway 192.168.1.1
ALSwitch(config)#exit

1900:
ALSwitch(config)#ip default-gateway 192.168.1.1
ALSwitch(config)#exit
```

Step 8 Verify the management LANs settings (1900: Skip to Step 10)

Note to instructor: if 1900 is used, please skip to step 9.

a. Verify the interface settings on VLAN 1 as follows:

```
ALSwitch#show interface VLAN 1
```

b. What is the bandwidth on this interface? 10000 Kbit

c. What are the VLAN states: VLAN1 is up, Line protocol is up

d. Enable the virtual interface using the `no shutdown` command

```
ALSwitch(config)#interface VLAN 1
ALSwitch(config-if)#no shutdown
ALSwitch(config-if)#exit
```

e. What is the queuing strategy? fifo

Step 9 Save the configuration

a. The basic configuration of the switch has just been completed. Back up the running configuration file to NVRAM as follows:

Note: This will ensure that the changes made will not be lost if the system is rebooted or loses power.

```
ALSwitch#copy running-config startup-config
Destination filename [startup-config]?[Enter]
Building configuration...
[OK]
ALSwitch#
```

1900:

b. The configuration is automatically saved to NVRAM within approximately one minute of entering a command. To save the configuration to a TFTP server, enter the following:

```
ALSwitch#copy nvram tftp://tftp server ip add/destination_filename
```

c. Configuration upload is successfully completed.

Step 11 Exit the switch

Leave the switch welcome screen by typing **`exit`** as follows:

```
ALSwitch#exit
```

Once these steps are completed, logoff by typing **`exit`**, and turn all the devices off. Then remove and store the cables and adapter

Erasing and Reloading the Switch

For the majority of the labs in CCNA 3 and CCNA 4 it is necessary to start with an unconfigured switch. Use of a switch with an existing configuration may produce unpredictable results. These instructions allow preparation of the switch prior to performing the lab so previous configuration options do not interfere. The following is the procedure for clearing out previous configurations and starting with an unconfigured switch. Instructions are provided for the 2900, 2950, and 1900 Series switches.

2900 and 2950 Series Switches

1. Enter into the privileged EXEC mode by typing **enable**.

   If prompted for a password, enter **class** (if that does not work, ask the instructor).

   ```
   Switch>enable
   ```

2. Remove the VLAN database information file.

   ```
   Switch#delete flash:vlan.dat
   Delete filename [vlan.dat]?[Enter]
   Delete flash:vlan.dat? [confirm] [Enter]
   ```

   If there was no VLAN file, this message is displayed.

   ```
   %Error deleting flash:vlan.dat (No such file or directory)
   ```

3. Remove the switch startup configuration file from NVRAM.

   ```
   Switch#erase startup-config
   ```

   The responding line prompt will be:

   ```
   Erasing the nvram filesystem will remove all files! Continue? [confirm]
   ```

   Press **Enter** to confirm.

   The response should be:

   ```
   Erase of nvram: complete
   ```

4. Check that VLAN information was deleted.

   Verify that the VLAN configuration was deleted in Step 2 using the **show vlan** command. If previous VLAN configuration information (other than the default management VLAN 1) is still present it will be necessary to power cycle the switch (hardware restart) instead of issuing the **reload** command. To power cycle the switch, remove the power cord from the back of the switch or unplug it. Then plug it back in.

   If the VLAN information was successfully deleted in Step 2, go to Step 5 and restart the switch using the **reload** command.

5. Software restart (using the **reload** command)

Note: This step is not necessary if the switch was restarted using the power cycle method.

a. At the privileged EXEC mode enter the command **`reload`**.

```
Switch(config)#reload
```

The responding line prompt will be:

```
System configuration has been modified. Save? [yes/no]:
```

b. Type **n** and then press **Enter**.

The responding line prompt will be:

```
Proceed with reload? [confirm] [Enter]
```

The first line of the response will be:

```
Reload requested by console.
```

After the switch has reloaded, the line prompt will be:

```
Would you like to enter the initial configuration dialog? [yes/no]:
```

c. Type **n** and then press **Enter**.

The responding line prompt will be:

```
Press RETURN to get started! [Enter]
```

1900 Series Switches

1. Remove VLAN Trunking Protocol (VTP) information

```
#delete vtp
This command resets the switch with VTP parameters set to factory
defaults.
All other parameters will be unchanged.

Reset system with VTP parameters set to factory defaults, [Y]es or
[N]o?
```

Enter **y** and press **Enter**.

2. Remove the switch startup configuration from NVRAM.

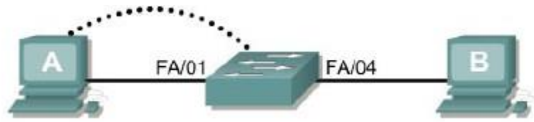
```
#delete nvram
```

This command resets the switch with factory defaults. All system parameters will revert to their default factory settings. All static and dynamic addresses will be removed.

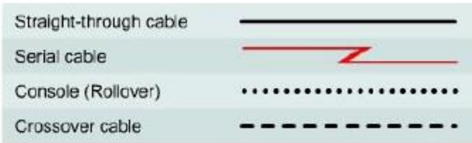
Reset system with factory defaults, [**Y**]es or [**N**]o?

Enter **y** and press **Enter**.

Experiment 15 (Open Ended Lab)
Configuring Static VLANS



Switch Designation	Switch Name	Enable Secret Password	Enable, VTY, and Console Passwords	VLAN 1 IP Address	Default Gateway IP Address	Subnet Mask
Switch 1	Switch_A	class	cisco	192.168.1.2	192.168.1.1	255.255.255.0



Objective

- Create a basic switch configuration and verify it.
- Determine the switch firmware version.
- Create two VLANs, name them and assign member ports to them.

Background/Preparation

When managing a switch, the Management Domain is always VLAN 1. The Network Administrator's workstation must have access to a port in the VLAN 1 Management Domain. All ports are assigned to VLAN 1 by default. This lab will also help demonstrate how VLANs can be used to separate traffic and reduce broadcast domains.

Cable a network similar to the one in the diagram. The configuration output used in this lab is produced from a 2950 series switch. Any other switch used may produce different output. The following steps are to be executed on each switch unless specifically instructed otherwise. Instructions are also provided for the 1900 Series switch, which initially displays a User Interface Menu. Select the "Command Line" option from the menu to perform the steps for this lab.

Start a HyperTerminal session.

> **Note:** Go to the erase and reload instructions at the end of this lab. Perform those steps on all switches in this lab assignment before continuing.

Step 1 Configure the switch

Configure the hostname, access and command mode passwords, as well as the management LAN settings. These values are shown in the chart. If problems occur while performing this configuration, refer to the Basic Switch Configuration lab.

Step 2 Configure the hosts attached to the switch

Configure the host to use the same subnet for the address, mask, and default gateway as on the switch.

Step 3 Verify connectivity

a. To verify that the host and switch are correctly configured, ping the switch from the host.

b. Was the ping successful? Yes

c. If the answer is no, troubleshoot the host and switch configurations.

Step 4 Show the IOS version

a. It is very important to know the version of the operating system. Differences between versions may change how commands are entered. Type the **show version** command at the User EXEC or Privileged EXEC mode prompt as follows:

```
Switch_A#show version
```

b. What version of the switch IOS is displayed? 12.0(5)WC7

c. Does this switch have standard edition or Enterprise edition software? Enterprise

d. What is the Firmware or IOS Version running on this switch? N/A

Step 5 Display the VLAN interface information

a. On Switch_A, type the command **show vlan** at the Privileged EXEC prompt as follows:

```
Switch_A#show vlan
```

1900:

```
Switch_A#show vlan-membership
```

b. Which ports belong to the default VLAN? All

c. How many VLANs are set up by default on the switch? 5

d. What does the VLAN 1003 represent? default token ring vlan

e. How many ports are in the 1003 VLAN? 0

Step 6 Create and name two VLANs

Enter the following commands to create and name two VLANs:

```
Switch_A#vlan database
Switch_A(vlan)#vlan 2 name VLAN2
Switch_A(vlan)#vlan 3 name VLAN3
Switch_A(vlan)#exit
```

1900:

```
Switch_A#configure terminal
Switch_A(config)#vlan 2 name VLAN2
Switch_A(config)#vlan 3 name VLAN3
```

Step 7 Display the VLAN interface information

a. On Switch_A, type the command **show vlan** at the Privileged EXEC prompt as follows:

```
Switch_A#show vlan
```

b. Are there new VLANs in the listing? Yes, 2 and 3

1900:

```
Switch_A#show vlan-membership
```

c. Do they have any ports assigned to them yet? No

Step 8 Assign ports to VLAN 2

Assigning ports to VLANs must be done from the interface mode. Enter the following commands to add port 2 to VLAN 2:

```
Switch_A#configure terminal
Switch_A(config)#interface fastethernet 0/2
Switch_A(config-if)#switchport mode access
Switch_A(config-if)#switchport access vlan 2
Switch_A(config-if)#end
```

1900:

```
Switch_A#config terminal
Switch_A(config)#interface Ethernet 0/2
Switch_A(config-if)#vlan static 2
Switch_A(config)#end
```

Step 9 Display the VLAN interface information

a. On Switch_A, type the command **show vlan** at the Privileged EXEC prompt as follows:

```
Switch_A#show vlan
```

1900:

```
Switch_A#show vlan-membership
```

b. Is port 2 assigned to VLAN 2? Yes

c. Is the port still listed in the default VLAN? No

Step 10 Assign a port to VLAN 3

Assigning ports to VLANs must be done from the interface mode. Enter the following commands to add port 3 to VLAN3

```
Switch_A#configure terminal
Switch_A(config)#interface fastethernet 0/3
Switch_A(config-if)#switchport mode access
Switch_A(config-if)#switchport access vlan 3
Switch_A(config-if)#end
```

1900:

```
Switch_A#config terminal
Switch_A(config)#interface Ethernet 0/3
Switch_A(config)#vlan static 3
Switch_A(config)#end
```

Step 11 Look at the VLAN interface information

a. On Switch_A, type the command **show vlan** at the Privileged EXEC prompt as follows:

```
Switch_A#show vlan
```

1900:

```
Switch_A#show vlan-membership
```

b. Is port 3 assigned to VLAN 3? Yes

c. Is the port still listed in the default VLAN? No

Step 12 Look at only VLAN2 information

a. Instead of displaying all of the VLANs type the **show vlan id 2** command at the Privileged EXEC mode prompt as follows:

```
Switch_A#show vlan id 2
```

1900:

```
Switch_A#show vlan 2
```

b. Does this command supply any more information than the show VLAN command? Yes

Step 13 Look at only VLAN2 information with a different command (1900: Omit this step)

a. Instead of displaying all of the VLANs type the **show vlan name VLAN2** command at the Privileged EXEC mode prompt.

```
Switch_A#show vlan name VLAN2
```

b. Does this command supply any more information than the show VLAN command? No

Once the steps are completed, log off by typing **exit**, and turn all the devices off. Then remove and store the cables and adapter.

Erasing and Reloading the Switch

For the majority of the labs in CCNA 3 and CCNA 4 it is necessary to start with an unconfigured switch. Use of a switch with an existing configuration may produce unpredictable results. These instructions allow preparation of the switch prior to performing the lab so previous configuration options do not interfere. The following is the procedure for clearing out previous configurations and starting with an unconfigured switch. Instructions are provided for the 2900, 2950, and 1900 Series switches.

2900 and 2950 Series Switches

1. Enter into the privileged EXEC mode by typing **enable**.

If prompted for a password, enter **class** (if that does not work, ask the instructor).

```
Switch>enable
```

2. Remove the VLAN database information file.

```
Switch#delete flash:vlan.dat
Delete filename [vlan.dat]?[Enter]
Delete flash:vlan.dat? [confirm] [Enter]
```

If there was no VLAN file, this message is displayed.

```
%Error deleting flash:vlan.dat (No such file or directory)
```

3. Remove the switch startup configuration file from NVRAM.

```
Switch#erase startup-config
```

The responding line prompt will be:

```
Erasing the nvram filesystem will remove all files! Continue? [confirm]
```

Press **Enter** to confirm.

The response should be:

```
Erase of nvram: complete
```

4. Check that VLAN information was deleted.

Verify that the VLAN configuration was deleted in Step 2 using the **show vlan** command. If previous VLAN configuration information (other than the default management VLAN 1) is still present it will be necessary to power cycle the switch (hardware restart) instead of issuing the **reload** command. To power cycle the switch, remove the power cord from the back of the switch or unplug it. Then plug it back in.

If the VLAN information was successfully deleted in Step 2, go to Step 5 and restart the switch using the **reload** command.

5. Software restart (using the **reload** command)

Note: This step is not necessary if the switch was restarted using the power cycle method.

a. At the privileged EXEC mode enter the command **`reload`**.

```
Switch(config)#reload
```

The responding line prompt will be:

```
System configuration has been modified. Save? [yes/no]:
```

b. Type **n** and then press **Enter**.

The responding line prompt will be:

```
Proceed with reload? [confirm] [Enter]
```

The first line of the response will be:

```
Reload requested by console.
```

After the switch has reloaded, the line prompt will be:

```
Would you like to enter the initial configuration dialog? [yes/no]:
```

c. Type **n** and then press **Enter**.

The responding line prompt will be:

```
Press RETURN to get started! [Enter]
```

1900 Series Switches

1. Remove VLAN Trunking Protocol (VTP) information.

```
#delete vtp
This command resets the switch with VTP parameters set to factory
defaults.
All other parameters will be unchanged.

Reset system with VTP parameters set to factory defaults, [Y]es or
[N]o?
```

Enter **y** and press **Enter**.

2. Remove the switch startup configuration from NVRAM.

```
#delete nvram
```

This command resets the switch with factory defaults. All system parameters will revert to their default factory settings. All static and dynamic addresses will be removed.

Reset system with factory defaults, **[Y]**es or **[N]**o?

Enter **y** and press **Enter.**