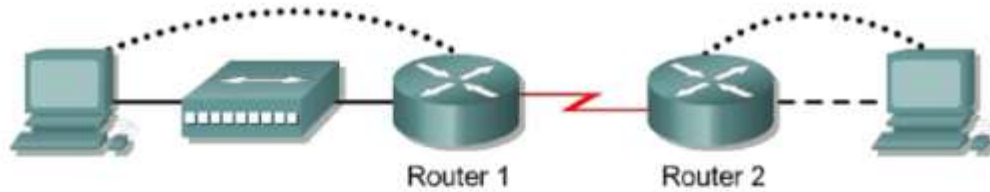


Lab – Topic 9

The **answer sheet URL** is posted on OLE. Please login to your OUHK Google Gmail account (gxxxxxxx@study.ouhk.edu.hk) and submit your answer online. **Due date: Wed, 12 May 2021, 23:59**

Lab 1.2.5 Verifying RIPv2 Configuration



| Router Designation | Router Name | Gigabit Ethernet 0/0 Address | Interface type | Serial 0/0/0 Address | Subnet mask for both interfaces |
|--------------------|-------------|------------------------------|----------------|----------------------|---------------------------------|
| Router 1 | GAD | 172.16.0.1 | DCE | 172.17.0.1 | 255.255.0.0 |
| Router 2 | BHM | 172.18.0.1 | DTE | 172.17.0.2 | 255.255.0.0 |

| | |
|------------------------|------------|
| Straight-through cable | ————— |
| Serial cable | ————— ⚡ |
| Console (Rollover) | |
| Crossover cable | - - - - - |

Objective

- Configure RIPv1 and RIPv2 on routers.
- Use **show** commands to verify RIPv2 operation.

Background/Preparation

Cable a network similar to the one shown in the diagram.

For users of CISCO router:

- **Note:** Go to the “**Erasing and reloading the router**” instructions. Perform those steps on all routers in this lab assignment before continuing.
- Start HyperTerminal session:
 1. Download putty.
 2. Choose “Serial” as the Connection type.
 3. Click “Open” button.

For users of CISCO Packet Tracer:

- Place **two 2901 routes** (with **one HWIC-2T module** installed on each route) as Router 1 and Router 2.

Step 1 Configure the routers

On the routers, configure the hostnames, serial interface IP addresses, clock rate, and ethernet interface IP addresses.

Step 2 Configure the routing protocol on the GAD router

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

Step 3 Configure the routing protocol on the BHM router

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

Step 4 Configure the hosts with the proper IP address, subnet mask, and default gateway

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Step 5 Show the routing tables for each router

- From the enable privileged EXEC mode, examine the routing table entries using **show ip route** command on each router.
- What are the **three** entries in the GAD routing table? (routing entries for codes **C** and **R** only)
 - _____
 - _____
 - _____
- What are the **three** entries in the BHM routing table? (routing entries for codes **C** and **R** only)
 - _____
 - _____
 - _____

Step 6 Enable RIPv2 routing

Enable version 2 of the RIP routing protocol on both of the routers, GAD and BHM.

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

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

Step 7 Show the routing tables

- Show the routing tables on both routers again.
- Have they changed now that RIP v2 is now being used instead of RIP v1? _____
- What is the difference between RIP v2 and RIP v1? _____
- What must be done in order to see a difference between RIP v2 and RIP v1?

Step 8 Change the Ethernet IP subnet mask on the GAD router

- Change the subnet mask on router GAD from a default Class B mask (255.255.0.0) to a default Class C mask (255.255.255.0). Use the same IP address.

```
GAD(config)#interface GigabitEthernet0/0
GAD(config-if)#ip address 172.16.1.1 255.255.255.0
GAD(config-if)#exit
```

- How does this change affect the address for the GigabitEthernet interface?

Step 9 Show the GAD routing table

- Show the GAD routing table.
- Has the output changed with the addition of a subnetted IP address? _____
- How has it changed? _____

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Step 10 Show the BHM routing table

- Show the BHM routing table.
- Has the output changed with the addition of a subnetted IP address? _____

Step 11 Change the network addressing scheme

Change the addressing scheme of the network to a single Class B network with a 255.255.255.0 (default Class C) mask.

- On the BHM router:

```
BHM(config)#interface serial10/0/0
BHM(config-if)#ip address 172.16.2.2 255.255.255.0
BHM(config-if)#exit
BHM(config)#interface GigabitEthernet0/0
BHM(config-if)#ip address 172.16.3.1 255.255.255.0
BHM(config-if)#exit
BHM(config)#exit
```

Note: Please update the changes of RIP routing network.

- On the GAD router:

```
GAD(config)#interface serial10/0/0
GAD(config-if)#ip address 172.16.2.1 255.255.255.0
GAD(config-if)#exit
GAD(config)#exit
```

Note: Please update the changes of RIP routing network.

Step 12 Show the routing table on the GAD router

- Show the GAD routing table.
- Has the output changed with the addition of subnetted IP addresses? _____
- What are the **three** entries in the routing table? (routing entries for codes **C** and **R** only)
 - _____
 - _____
 - _____

Step 13 Show the routing table on the BHM router

- Show the BHM routing table.
- Has the output changed with the addition of a subnetted IP address? _____

Step 14 Change the host configurations

Change the **host configuration** to reflect the new IP addressing scheme of the network.

Step 15 Ping all of the interfaces on the network from each host

- Were all of the interfaces still able to be pinged? _____
- If not, troubleshoot the network and ping again.

Step 16 Show the routing table on both routers

On the GAD router,

- Enter **show ip route connected**.

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b. What networks are displayed?

c. What interfaces are directly connected?

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

e. List the route listed in the routing table? (routing entry for codes **R** only)

f. What is the administrative distance? _____

On the BHM router,

g. Enter **show ip route connected**.

h. What networks are displayed?

i. What interfaces are directly connected?

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

k. List the route listed in the routing table? (routing entry for codes **R** only)

Step 17 Check Point: Send your screen capture to the instructor by email before the lab due date.

a. Take **one** screen capture with the following items. (Sample capture is on next page).

- I. CLI of the routers showing the prompt and the output on **Step 16 (a), (d), (g) and (j)**.
- II. ~~The Computer name and Domain.~~
- III. The date and time of your capture.

b. Save the screen capture to a Word file with filename “your_8_digit_student_number-topic9.docx”. (Eg. **12345678-topic9.docx**).

c. Email your saved file to **thluk@ouhk.edu.hk** (subject: **topic 9**).

Step 18 Use the show ip protocol command

a. Enter **show ip protocols** on the GAD router.

b. When will the routes be flushed? _____

c. What is the default distance listed for RIP? _____

Step 19 Remove the version 2 option

Use the **no version** command to return the routers to the default RIP configuration on both routers.

Step 20 Show the routing table

a. Show the GAD routing table.

b. Has the output changed now that version 2 of RIP was removed? _____

Step 21 Show the routing table

a. Show the BHM routing table

b. Has the output changed now that version 2 of RIP was removed? _____

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PC0

Physical Config **Desktop** Programming Attributes

Terminal

```
C 172.16.1.0/24 is directly connected, GigabitEthernet0/0
L 172.16.1.1/32 is directly connected, GigabitEthernet0/0
C 172.16.2.0/24 is directly connected, Serial0/0/0
L 172.16.2.1/32 is directly connected, Serial0/0/0
R 172.16.3.0/24 [120/1] via 172.16.2.2, 00:00:07, Serial0/0/0

GAD#sh ip route ?
WORD      Network to display information about or hostname
bgp        Border Gateway Protocol (BGP)
connected  Connected
eigrp      Enhanced Interior Routing Protocol (EIGRP)
ospf       Open Shortest Path First (OSPF)
rip        Routing Information Protocol (RIP)
static     Static routes
summary    Summary of all routes
|          Output Modifiers|
<cr>

GAD#sh ip route con
C 172.16.1.0/24 is directly connected, GigabitEthernet0/0
C 172.16.2.0/24 is directly connected, Serial0/0/0

GAD#sh ip route rip
172.16.0.0/16 is variably subnetted, 5 subnets, 2 masks
R 172.16.3.0/24 [120/1] via 172.16.2.2, 00:00:02, Serial0/0/0
GAD#
```

☐ Top

```
172.16.0.0/16 is variably subnetted, 4 subnets, 2 masks
C 172.16.2.0/24 is directly connected, Serial0/0/0
L 172.16.2.2/32 is directly connected, Serial0/0/0
C 172.16.3.0/24 is directly connected, GigabitEthernet0/0
L 172.16.3.1/32 is directly connected, GigabitEthernet0/0

BHM# sh ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

172.16.0.0/16 is variably subnetted, 5 subnets, 2 masks
R 172.16.1.0/24 [120/1] via 172.16.2.1, 00:00:10, Serial0/0/0
C 172.16.2.0/24 is directly connected, Serial0/0/0
L 172.16.2.2/32 is directly connected, Serial0/0/0
C 172.16.3.0/24 is directly connected, GigabitEthernet0/0
L 172.16.3.1/32 is directly connected, GigabitEthernet0/0

BHM# sh ip route con
C 172.16.2.0/24 is directly connected, Serial0/0/0
C 172.16.3.0/24 is directly connected, GigabitEthernet0/0

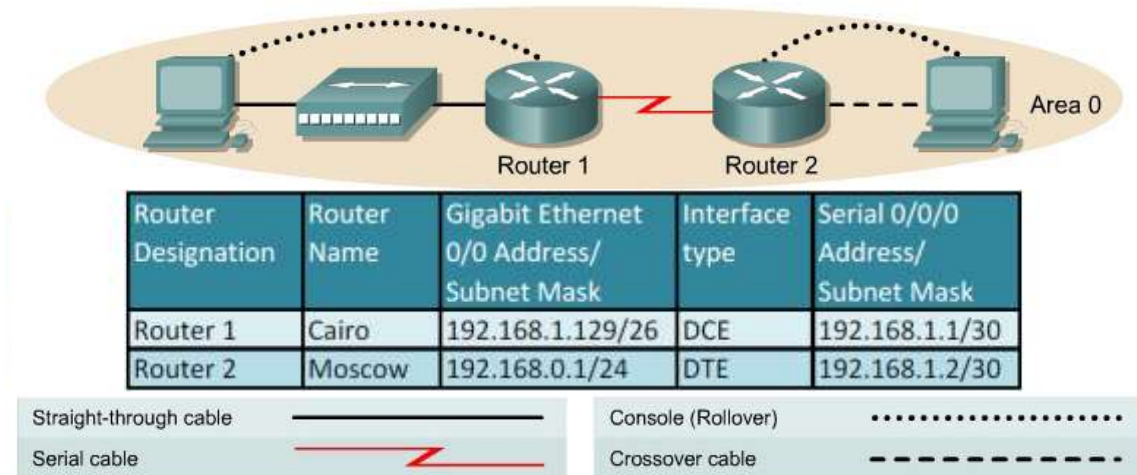
BHM# sh ip route rip
172.16.0.0/16 is variably subnetted, 5 subnets, 2 masks
R 172.16.1.0/24 [120/1] via 172.16.2.1, 00:00:10, Serial0/0/0
BHM#
```

☐ Top

5:47 PM
30/3/2020

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Lab 2.3.3 Modifying OSPF Cost Metric



Objective

- Setup an IP addressing scheme for Open Shortest Path First (OSPF) area.
- Configure and Verify OSPF routing.
- Modify OSPF cost metric on an interface.

Background/Preparation

Cable a network similar to the one shown in the diagram.

Step 1 Configure the routers

Configure the routers according to the chart. **Do not configure the routing protocol** until specifically told to.

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

Step 4 Verify the serial link connection

- On each router, ping the serial interface of the other router.
- Was the ping successful? _____
- If the ping was not successful, troubleshoot the router configuration until the ping is successful.

Step 5 Configure OSPF routing on Router Cairo

- Configure OSPF routing on Router Cairo. Use OSPF process number 1 and ensure all networks are in area 0.

```
Cairo(config)#router ospf 1
Cairo(config-router)#network 192.168.1.128 0.0.0.63 area 0
Cairo(config-router)#network 192.168.1.0 0.0.0.3 area 0
Cairo(config-router)#end
```

- Examine the running configuration file.
- Show the routing table for the Cairo router.

```
Cairo#show ip route
```

- Are there any OSPF entries in the routing table? _____
- Why? _____

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Step 6 Configure OSPF routing on Router Moscow

- Configure OSPF routing on Router Moscow. Use OSPF process number 1 and ensure all networks are in area 0.

```
Moscow(config)#router ospf 1  
Moscow(config-router)#network 192.168.0.0 0.0.0.255 area 0  
Moscow(config-router)#network 192.168.1.0 0.0.0.3 area 0  
Moscow(config-router)#end
```

Step 7 Show the routing table entries

- Show the routing table entries for the Cairo router.

```
Cairo#show ip route
```

- Are there any OSPF entries in the routing table now? _____
- What is the metric (distance) value of the OSPF route? _____
- What is the VIA address in the OSPF route? _____
- Are routes to all networks shown in the routing table? _____
- What does the O mean in the first column of the routing table? _____

Step 8 Test network connectivity

- Ping the Cairo host from the Moscow host. Was it successful? _____
- If not, troubleshoot as necessary.

Step 9 Look at the OSPF cost on the Cairo router interfaces

| Link Bandwidth | Default OSPF Cost |
|-----------------------------------|-------------------|
| 56 Kbps | 1785 |
| T1 | 64 |
| 10-Mbps | 10 |
| 16-Mbps Token-ring | 6 |
| FDDI/FastEthernet/GigabitEthernet | 1 |

- Show the properties of the Cairo router serial and ethernet interfaces using the **show interfaces** command.
- What is the default bandwidth of the interfaces?
 - Serial0/0/0 Interface: _____
 - GigabitEthernet0/0 Interface: _____
- Calculate the OSPF cost. (Refer to notes Part III – Module 2 – 2.3.3 for more information.)
 - Serial0/0/0 Interface: _____
 - GigabitEthernet0/0 Interface: _____

Note: OSPF cost = $(10^8) / (\text{bandwidth in bit})$.

Step 10 Record the OSPF cost of the serial and ethernet interfaces

- Using the **show ip ospf interface** command, record the OSPF cost of the serial and Fast Ethernet interfaces.
- OSPF cost of Serial0/0/0 Interface: _____
- OSPF cost of GigabitEthernet0/0 Interface: _____
- Do these agree with the calculations in Step 9 (c)? _____

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- e. The clock rate set for the interface should have been 56000. This is what has been used as a default to this point. To calculate the cost of this actual bandwidth, divide 10^8 by 56000.

Step 11 Manually set the cost on the serial interface

On the **Serial0/0/0** interface of the Cairo router, set the OSPF cost to 1785 by typing **ip ospf cost 1785** at the serial interface configuration mode prompt.

Step 12 Verify cost

- a. Note that it is essential that all connected links agree about the cost for consistent calculation of the shortest path first algorithm (SPF) in an area.
- b. Verify that the interface OSPF cost was successfully modified.
- c. Reverse the effect of this command by entering in interface configuration mode the command **no ip ospf cost**.
- d. Verify that the default cost for the interface has returned.
- e. Enter the command **bandwidth 2000** at the Serial 0/0/0 interface under configuration mode.
- f. Record the new OSPF cost of the Serial 0/0/0 interface. _____
- g. Can the OSPF cost of the GigabitEthernet0/0 interface be modified in this way? _____
- h. The speed can be set on the GigabitEthernet0/0 interface by enter the command **bandwidth 2000**. Will this affect the OSPF cost of that interface?

- i. Verify the result by entering the command **show ip ospf interface**. What is the OSPF cost of GigabitEthernet0/0 Interface?

- j. Reset the bandwidth on the serial interface using the **no bandwidth 2000** at the serial 0/0/0 interface configuration mode.

~~ End ~~