



Department of Computer Science and Engineering
Islamic University of Technology (IUT)
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Laboratory Report

CSE 4412: Data Communication and Networking Lab

Name: Tahsin Islam

Student ID: 210042137

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Title: Configuring and Verifying of RIP and OSPF in a network topology.

Objective:

1. Describe the concept of dynamic routing.
2. Explain disadvantages of RIPv1 and improvement in RIPv2.
3. Configure Routing Information Protocol (RIP) in a network topology following given specifications.
4. Describe the concept of OSPF and related terminologies.
5. Explain the advantages of OSPF over RIP.
6. Configure OSPF in a network topology following the given specifications.

Devices/ software Used:

1. Laptop
2. Cisco Packet Tracer

Theory:

(Explain in brief the listed keywords)

1. Routing Information Protocol (RIP)

Ans: RIP is one of the oldest dynamic routing protocols used in computer networks. It's designed to allow routers to exchange routing information periodically within a network. RIP uses hop count as its metric to determine the best route to a destination network. Despite being obsolete in many modern network environments due to its limitations, RIP is still taught and understood because it provides a foundational understanding of dynamic routing protocols.

2. Forwarding Table used in RIP

Ans: In RIP, routers maintain a routing table, also known as a forwarding table, which contains information about reachable destinations in the network. This table includes entries for various networks along with associated metrics (typically hop counts in RIP) that indicate the cost of reaching those destinations. The router consults this table to determine the next hop for forwarding packets towards their destination.

3. Hop Count as cost

Ans: In RIP, the metric used to evaluate the "cost" of reaching a destination network is the hop count. Hop count refers to the number of routers (or hops) that a packet must traverse to reach the destination network. Each hop between routers typically incurs a certain amount of delay and resource consumption, so minimizing hop count generally leads to more efficient routing paths.

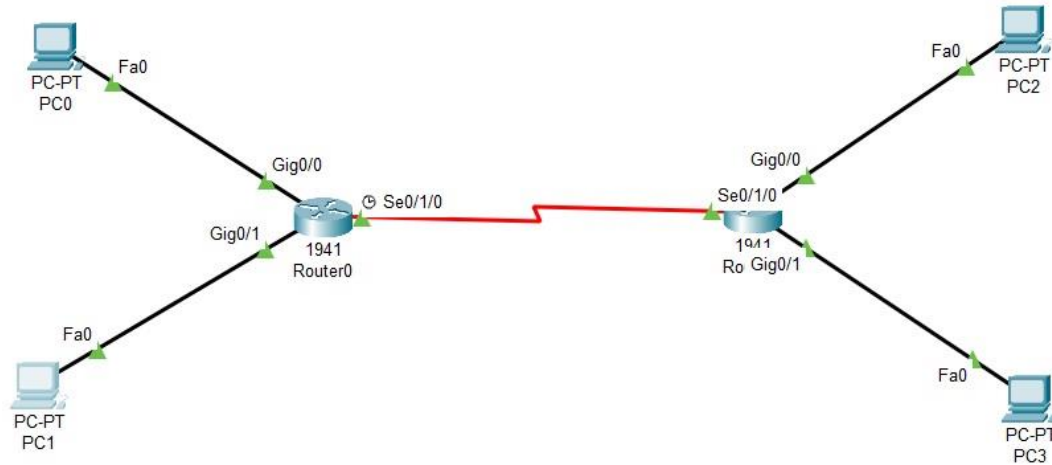
4. Timers in RIP

Ans: RIP employs several timers to manage the exchange of routing information and to detect network topology changes. The key timers in RIP include:

- **Update Timer:** This timer determines how frequently routers send routing table updates to their neighbors. In RIP, updates are sent every 30 seconds by default.
- **Invalid Timer:** When a router stops receiving updates about a particular route, it starts the invalid timer. If no updates are received for a route within a certain period (typically three times the update timer), the route is considered invalid.
- **Hold-down Timer:** After marking a route as invalid, the router starts the hold-down timer. During this time, the router suppresses any route updates received for the invalid route, preventing potentially incorrect information from being propagated.
- **Flush Timer:** Once the hold-down timer expires, indicating that the route is likely stable again, the router starts the flush timer. After the flush timer expires, the route is removed from the routing table if no updates confirming the route's validity are received.

Diagram of the experiment

Task #01:



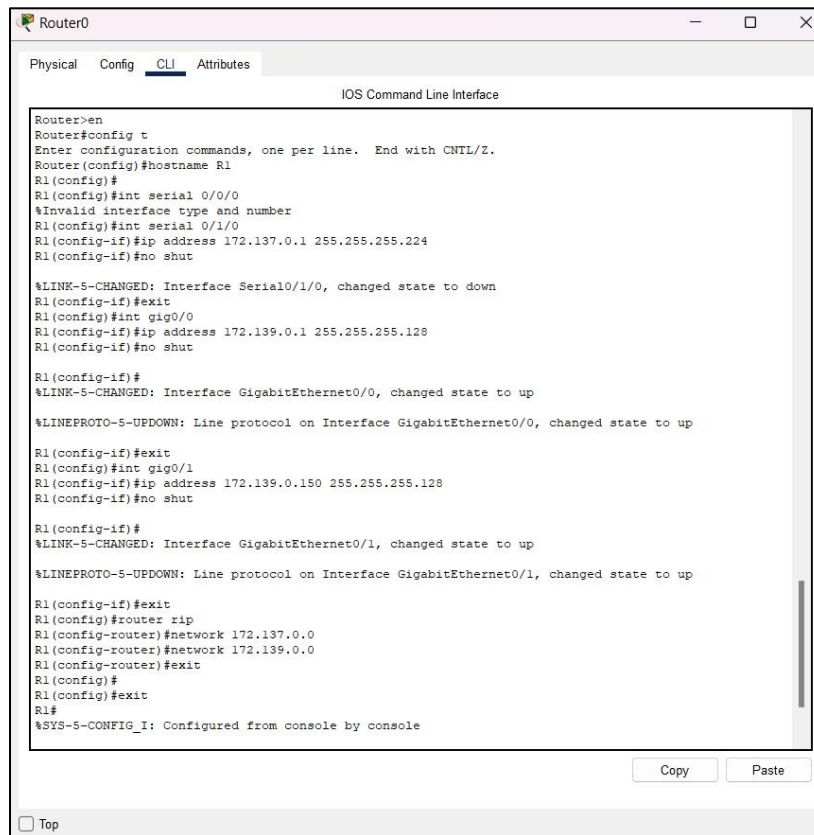
Working Procedure:

Step 1: Configuring Routers

At first I changed the host name of the routers. Here I am providing codes for R1, then I configured the router. The process for router-2 is similar. To do this, I have used the following commands:

```
En
Config t
Hostname R1
Serial 0/1/0
Ip address 172.137.0.2 255.255.255.224
No shut
exit
Int gig 0/0
Ip address 172.140.0.1 255.255.255.192
No shut
Exit
Int gig 0/1
Ip address 172.140.0.150 255.255.255.192
No shut
Exit
Router rip
Network 172.137.0.0
Network 172.140.0.0
Exit
```

Here are the screenshots:



The screenshot shows the CLI window for Router0. The window has tabs for Physical, Config, CLI (selected), and Attributes. The title bar says "Router0". The main area is titled "IOS Command Line Interface" and contains the following text:

```
Router>en
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname R1
R1(config)#
R1(config)#int serial 0/0/0
%Invalid interface type and number
R1(config)#int serial 0/1/0
R1(config-if)#ip address 172.137.0.1 255.255.255.224
R1(config-if)#no shut

%LINK-5-CHANGED: Interface Serial0/1/0, changed state to down
R1(config-if)#exit
R1(config)#int gig0/0
R1(config-if)#ip address 172.139.0.1 255.255.255.128
R1(config-if)#no shut

R1(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0, changed state to up

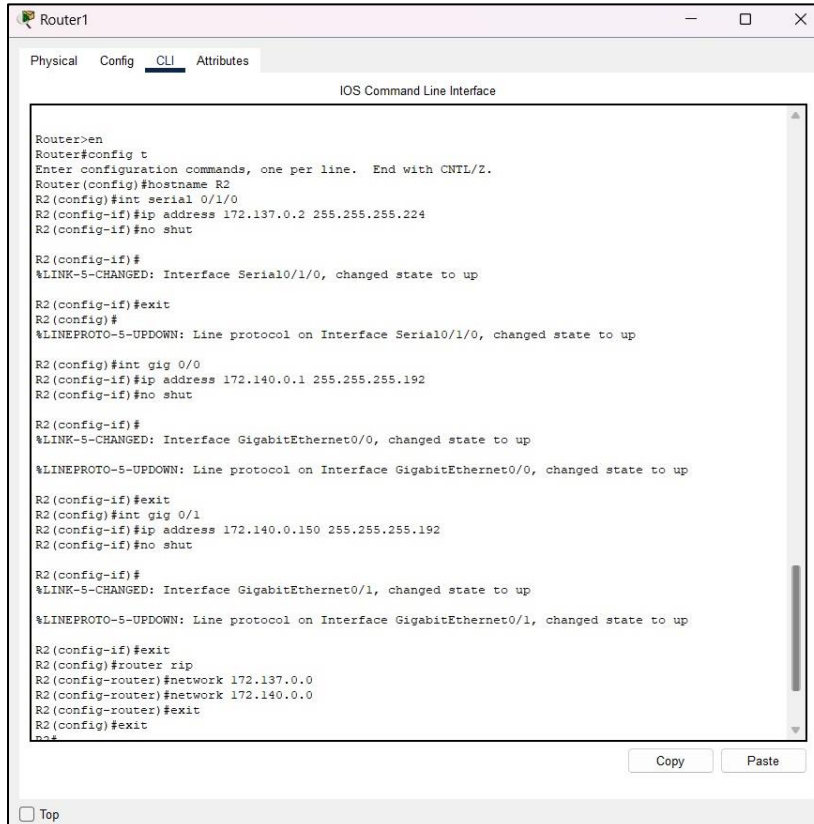
R1(config-if)#exit
R1(config)#int gig0/1
R1(config-if)#ip address 172.139.0.150 255.255.255.128
R1(config-if)#no shut

R1(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1, changed state to up

R1(config-if)#exit
R1(config)#router rip
R1(config-router)#network 172.137.0.0
R1(config-router)#network 172.139.0.0
R1(config-router)#exit
R1(config)#
R1#
%SYS-5-CONFIG_I: Configured from console by console
```

At the bottom right of the window are "Copy" and "Paste" buttons. At the bottom left is a "Top" button.



The screenshot shows the CLI window for Router1. The window has tabs for Physical, Config, CLI (selected), and Attributes. The title bar says "Router1". The main area is titled "IOS Command Line Interface" and contains the following text:

```
Router>en
Router#config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname R2
R2(config)#int serial 0/1/0
R2(config-if)#ip address 172.137.0.2 255.255.255.224
R2(config-if)#no shut

R2(config-if)#
%LINK-5-CHANGED: Interface Serial0/1/0, changed state to up

R2(config-if)#exit
R2(config)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1/0, changed state to up

R2(config)#int gig 0/0
R2(config-if)#ip address 172.140.0.1 255.255.255.192
R2(config-if)#no shut

R2(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0, changed state to up

R2(config-if)#exit
R2(config)#int gig 0/1
R2(config-if)#ip address 172.140.0.150 255.255.255.192
R2(config-if)#no shut

R2(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1, changed state to up

R2(config-if)#exit
R2(config)#router rip
R2(config-router)#network 172.137.0.0
R2(config-router)#network 172.140.0.0
R2(config-router)#exit
R2(config)#exit
***
```

At the bottom right of the window are "Copy" and "Paste" buttons. At the bottom left is a "Top" button.

Step 1: Setting Up IPs

As my ID's last 2 digits are 37, IP addresses are:

Here are the screenshots:

The image displays two screenshots of a network configuration interface, likely from a Packet Tracer simulation. Both windows are titled 'PC0' and 'PC1' respectively, and show the 'Config' tab with the 'Desktop' sub-tab selected. The 'Interface' dropdown is set to 'FastEthernet0'.

PC0 Configuration:

- IP Configuration:** Static IP is selected. IPv4 Address: 172.139.0.2, Subnet Mask: 255.255.255.128, Default Gateway: 172.139.0.1, DNS Server: 0.0.0.0.
- IPv6 Configuration:** Static is selected. IPv6 Address: (empty), Link Local Address: FE80::201:42FF:FE80:5C60, Default Gateway: (empty), DNS Server: (empty).
- 802.1X:** Use 802.1X Security is unchecked. Authentication: MD5, Username: (empty), Password: (empty).

PC1 Configuration:

- IP Configuration:** Static IP is selected. IPv4 Address: 172.139.0.151, Subnet Mask: 255.255.255.128, Default Gateway: 172.139.0.150, DNS Server: 0.0.0.0.
- IPv6 Configuration:** Static is selected. IPv6 Address: (empty), Link Local Address: FE80::20B:8EFF:FE80:B765, Default Gateway: (empty), DNS Server: (empty).
- 802.1X:** Use 802.1X Security is unchecked. Authentication: MD5, Username: (empty), Password: (empty).

PC2

Physical Config Desktop Programming Attributes

IP Configuration X

Interface FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IPv4 Address 172.140.0.2

Subnet Mask 255.255.255.128

Default Gateway 172.140.0.1

DNS Server 0.0.0.0

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address /

Link Local Address FE80::2E0:F7FF:FED3:92B4

Default Gateway

DNS Server

802.1X

☐ Use 802.1X Security

Authentication MD5

Username

Password

Top

PC3

Physical Config Desktop Programming Attributes

IP Configuration X

Interface FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IPv4 Address 172.140.0.151

Subnet Mask 255.255.255.128

Default Gateway 172.140.0.150

DNS Server 0.0.0.0

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address /

Link Local Address FE80::240:BFF:FE68:E7C9

Default Gateway

DNS Server

802.1X

☐ Use 802.1X Security

Authentication MD5

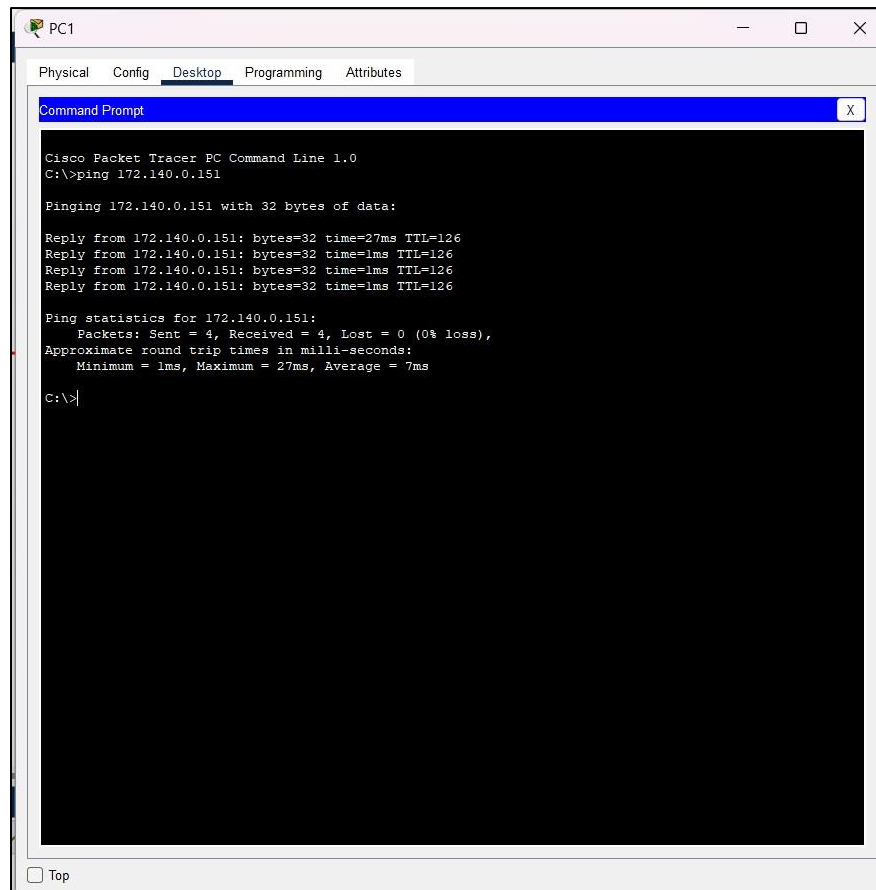
Username

Password

Top

Step 3: Using the ping command from the Terminal

Here are the screenshot of sending packets to another PC:



The screenshot shows a Cisco Packet Tracer PC Command Line window for PC1. The window has tabs for Physical, Config, Desktop, Programming, and Attributes. The Desktop tab is active, showing a Command Prompt window. The Command Prompt displays the output of the command 'ping 172.140.0.151'. The output shows four successful replies from 172.140.0.151 with 32 bytes of data, a time of 1ms, and a TTL of 126. The ping statistics show 4 packets sent, 4 received, 0% loss, and approximate round trip times of 1ms, 27ms, and 7ms.

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 172.140.0.151

Pinging 172.140.0.151 with 32 bytes of data:

Reply from 172.140.0.151: bytes=32 time=27ms TTL=126
Reply from 172.140.0.151: bytes=32 time=1ms TTL=126
Reply from 172.140.0.151: bytes=32 time=1ms TTL=126
Reply from 172.140.0.151: bytes=32 time=1ms TTL=126

Ping statistics for 172.140.0.151:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 27ms, Average = 7ms

C:\>
```

Challenges (if any):

No challenges faced.