NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

DEPARTMENT OF COMPUTER SCIENCE

COMPUTER NETWORKS LAB

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🌐 Lab – 04

Performing Initial Router Configuration

💡 **Warm-Up Task:**

❓ **1. What is Dynamic Routing?**

- Dynamic routing lets routers automatically discover and update paths.
- Routers talk to each other using protocols to share route info.
- It helps the network adapt to changes like failures or new connections.

✸ **2. Key Features of Dynamic Routing**

- Auto-updates routes when the network changes.
- Scales well in large networks.
- Offers fault tolerance and quick recovery.
- Uses metrics like hop count or bandwidth to choose paths.

⚙ **3. How It Works**

- Routers exchange info using protocols like RIP or OSPF.
- Each router builds a routing table from what it learns.
- Routes are recalculated when the network changes.

📚 **4. Types of Dynamic Routing Protocols**

- **Distance Vector**: Shares full routing tables (e.g., RIP).
- **Link State**: Shares link status and builds a network map (e.g., OSPF).
- **Hybrid**: Mixes both methods (e.g., EIGRP).

♻5. Difference Between Static and Dynamic Routing

- **Static**: Manually set, fixed routes, no auto updates.
- **Dynamic**: Auto-adjusts using protocols.
- Static is simple but rigid; dynamic is flexible and smart.

⬜6. Full Form of RIP & Its Main Purpose

- RIP = **Routing Information Protocol**.
- Its goal is to help routers find the shortest path using hop count.

⬜7. Key Characteristics of RIP

- Uses hop count (max 15 hops).
- Sends updates every 30 seconds.
- Easy to configure.
- Best for small networks.

🔍8. How RIP Works

- Routers send their routing tables to neighbors.
- Each router updates its table based on received info.
- Chooses the path with the fewest hops.

⚖9. Advantages and Disadvantages of RIP

✅ **Advantages:**

- Simple and easy to understand.
- Auto-updates routes.
- Good for small networks.
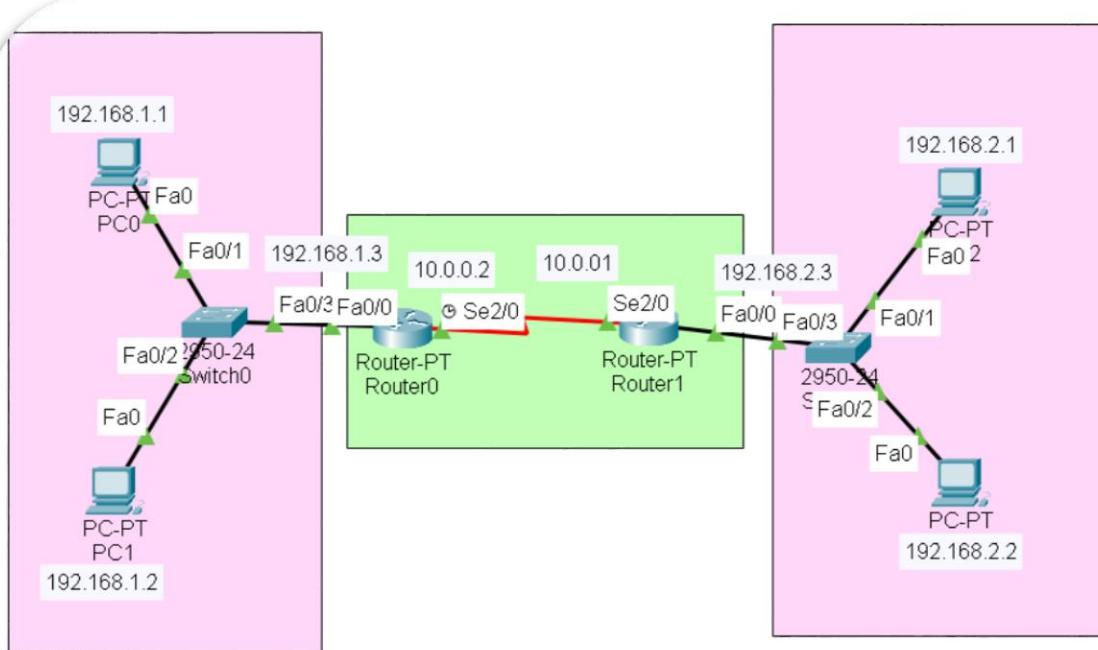
✘ **Disadvantages:**

- Limited to 15 hops.
- Slow to adapt to changes.
- Can cause routing loops without safeguards.

Task 1 : Draw given topology diagrams and attach screen shots of Pcs communication

By using Drag and drop draw the topology diagram as shown below and attach a screenshot of each step.

1. Pc

2. Switch (2950-24)

3.Router (Generic-PT)

Basic Router configuration on R1:

1. Continue with configuration dialog? [yes/no]: no

2. Press RETURN to get started! Press enter button

3. Router>en (enable)

4. Router#config t (configure terminal)

5. Router(config)#int fa0/0 (interface FastEthernet0/0)

6. Router(config-if)#ip address 192.168.1.3 255.255.255.0

7. no shut (no shutdown)

8. Router(config-if)#exit

9. Router(config)#

10. Router#config t

11. Router(config)#int se2/0 (Interface Serial2/0)

12. Router(config-if)#ip address 10.0.0.2 255.0.0.0

13. no shut (no shutdown)

14. exit

15. exit

ROUTER 1:

```
Router>enable
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface fa0/0
Router(config-if)#ip address 192.168.1.3 255.255.255.0
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
exit
Router(config)#interface Se2/0
Router(config-if)#ip address 10.0.0.2 255.0.0.0
Router(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial2/0, changed state to down
Router(config-if)#exit
Router(config)#
%LINK-5-CHANGED: Interface Serial2/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to up
```

2. Basic Router configuration on R2 Side:

1. Continue with configuration dialog? [yes/no]: no

2. Press RETURN to get started! Press enter button

3. Router>en (enable)

4. Router#config t (configure terminal)

5. Router(config)#int fa0/0 (interface FastEthernet0/0)

6. Router(config-if)#ip address 192.168.2.3 255.255.255.0

7. no shut (no shutdown)

8. Router(config-if)#exit

9. Router(config)#

10. Router#config t

11. Router(config)#int se2/0 (Interface Serial2/0)

12. Router(config-if)#ip address 10.0.0.1 255.0.0.0

13. no shut (no shutdown)

14. exit

15. exit

ROUTER 2:

```
Router>enable
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface fa0/0
Router(config-if)#ip address 192.168.2.3 255.255.255.0
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
exit
Router(config)#interface Se2/0
Router(config-if)#ip address 10.0.0.1 255.0.0.0
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface Serial2/0, changed state to up
exit
Router(config)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to up
```

RIP Implementation on Router 1 Side:

(After implementation all above 15 command)

Router> enable

Router# configure terminal

Router(config)# router rip

Router(config-router)# version 2

Router(config-router)# network 192.168.1.0

Router(config-router)# network 10.0.0.0

Router(config-router)# exit

Router# write memory

Router 1:

```
Router(config)#router rip
Router(config-router)#network 10.0.0.0
Router(config-router)#network 192.168.1.0
Router(config-router)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
write memory
Building configuration...
[OK]
```

RIP Implementation on Router 2 Side:

Router> enable

Router# configure terminal

Router(config)# router rip

Router(config-router)# version 2

Router(config-router)# network 192.168.2.0

Router(config-router)# network 10.0.0.0

Router(config-router)# exit

Router# write memory

```
Enter Configuration Commands, one per line.  End with
Router(config)#router rip
Router(config-router)#Network 10.0.0.0
Router(config-router)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
```

PACKET TRANSFER:

REAL TIME:

						Realtime	**Simulati**			
Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
●	Successful	PC1	PC3	ICMP	■	0.000	N	2	(edit)	(delete)
●	Successful	PC2	PC0	ICMP	■	0.000	N	3	(edit)	(delete)
●	Successful	PC1	PC2	ICMP	■	0.000	N	4	(edit)	(delete)
●	Successful	PC2	PC1	ICMP	■	0.000	N	5	(edit)	(delete)

SIMULATION:
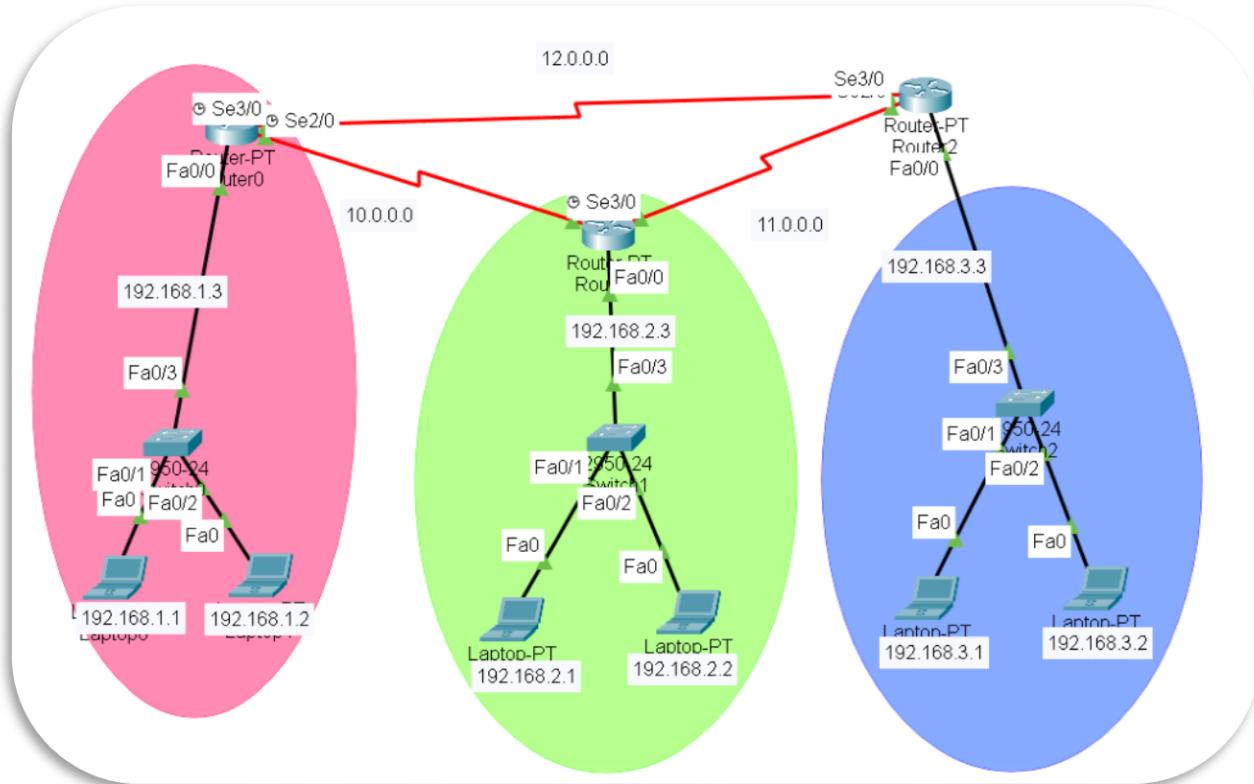
				Event List	**Realtime**	**Simulation**				
Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
●	Successful	PC0	PC2	ICMP	■	0.000	N	0	(edit)	(delete)
●	Successful	PC3	PC1	ICMP	■	0.000	N	1	(edit)	(delete)
●	Successful	PC1	PC2	ICMP	■	0.000	N	2	(edit)	(delete)
●	Successful	PC3	PC0	ICMP	■	0.000	N	3	(edit)	(delete)

Task 2: Draw given topology diagrams and attach screen shots of Pcs communication

1) Label each device with a unique ip address.

2) Highlight different sections

3) Divide given topology in three different networks

4) Ping one laptop to other network laptops.

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.168.2.1

Pinging 192.168.2.1 with 32 bytes of data:

Request timed out.
Reply from 192.168.2.1: bytes=32 time=1ms TTL=126
Reply from 192.168.2.1: bytes=32 time=1ms TTL=126
Reply from 192.168.2.1: bytes=32 time=1ms TTL=126

Ping statistics for 192.168.2.1:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 1ms, Average = 1ms

C:\>ping 192.168.3.1

Pinging 192.168.3.1 with 32 bytes of data:

Request timed out.
Reply from 192.168.3.1: bytes=32 time=29ms TTL=126
Reply from 192.168.3.1: bytes=32 time=1ms TTL=126
Reply from 192.168.3.1: bytes=32 time=1ms TTL=126

Ping statistics for 192.168.3.1:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 29ms, Average = 10ms

C:\>
C:\>
```

5) Send packets (Real time).

6) Send packets(Simulation).

7) Take screen shots of routing table of each router

Router 1	Router 2	Router 3
Network Address 10.0.0.0 12.0.0.0 192.168.1.0	Network Address 10.0.0.0 11.0.0.0 192.168.2.0	Network Address 11.0.0.0 12.0.0.0 192.168.3.0

8) Take screen shots of routers configurations

Router 1	Router 2
Rip configuration: ``` Router(config)#router rip Router(config-router)#no network 10.0.0.0 Router(config-router)#no network 12.0.0.0 Router(config-router)#network 10.0.0.0 Router(config-router)#network 12.0.0.0 ```	**Rip configuration:** ``` Router(config-router)#network 10.0.0.0 Router(config-router)#network 11.0.0.0 Router(config-router)#network 192.168.2.0 Router(config-router)# ```
Serial2/0: ``` Router(config-if)#ip address 10.0.0.1 255.0.0.0 Router(config-if)#ip address 10.0.0.1 255.0.0.0 ```	**Serial2/0** ``` Router(config)#interface Serial2/0 Router(config-if)#ip address 10.0.0.2 255.0.0.0 ```
Serial 3/0: ``` Router(config-if)#ip address 12.0.0.2 255.0.0.0 Router(config-if)#ip address 12.0.0.2 255.0.0.0 Router(config-if)# Router(config-if)#exit Router(config)#interface Serial3/0 ```	**Serial 3/0:** ``` Router(config)#interface Serial3/0 Router(config-if)#ip address 11.0.0.1 255.0.0.0 Router(config-if)#ip address 11.0.0.1 255.0.0.0 ```

Show ip route:
 	
``
Router# show ip route
Codes: C - connected, S - static, I - IGRP, 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 - BGP
       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
``
	Show ip route:
	
	``
	show ip route
	Codes: C - connected, S - static, I - IGRP, 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
	``

Router 3:

Fa0/0:

```
Router(config)#interface FastEthernet0/0
Router(config-if)#ip address 192.168.3.3 255.255.255.0
```

Se2/0:

```
Router(config)#interface Serial2/0
Router(config-if)#ip address 11.0.0.2 255.0.0.0
Router(config-if)#ip address 11.0.0.2 255.0.0.0
Router(config-if)#
```

Se3/0:

```
Router(config)#interface Serial3/0
Router(config-if)#ip address 12.0.0.1 255.0.0.0
Router(config-if)#ip address 12.0.0.1 255.0.0.0
Router(config-if)#
```

Rip Configuration:

```
Router#
%SYS-5-CONFIG_I: Configured from console by console
show ip route
Codes: C - connected, S - static, I - IGRP, 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

R    10.0.0.0/8 [120/1] via 12.0.0.2, 00:00:00, Serial3/0
                [120/1] via 11.0.0.1, 00:00:07, Serial2/0
C    11.0.0.0/8 is directly connected, Serial2/0
C    12.0.0.0/8 is directly connected, Serial3/0
R    192.168.1.0/24 [120/1] via 12.0.0.2, 00:00:00, Serial3/0
R    192.168.2.0/24 [120/1] via 11.0.0.1, 00:00:07, Serial2/0
C    192.168.3.0/24 is directly connected, FastEthernet0/0
```

Show ip protocol:

```
Router# show ip protocol
Routing Protocol is "rip"
Sending updates every 30 seconds, next due in 24 seconds
Invalid after 180 seconds, hold down 180, flushed after 24
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Redistributing: rip
Default version control: send version 1, receive any versi
  Interface              Send  Recv  Triggered RIP  Key-cha
  FastEthernet0/0        12 1
  Serial2/0              12 1
  Serial3/0              12 1
Automatic network summarization is in effect
Maximum path: 4
Routing for Networks:
        11.0.0.0
        12.0.0.0
        192.168.3.0
Passive Interface(s):
Routing Information Sources:
        Gateway         Distance      Last Update
        12.0.0.2            120       00:00:24
        11.0.0.1            120       00:00:04
```