Lab 3 - Routing Protocol

NAME: ABDURRAFIQ BIN ZAKARIA

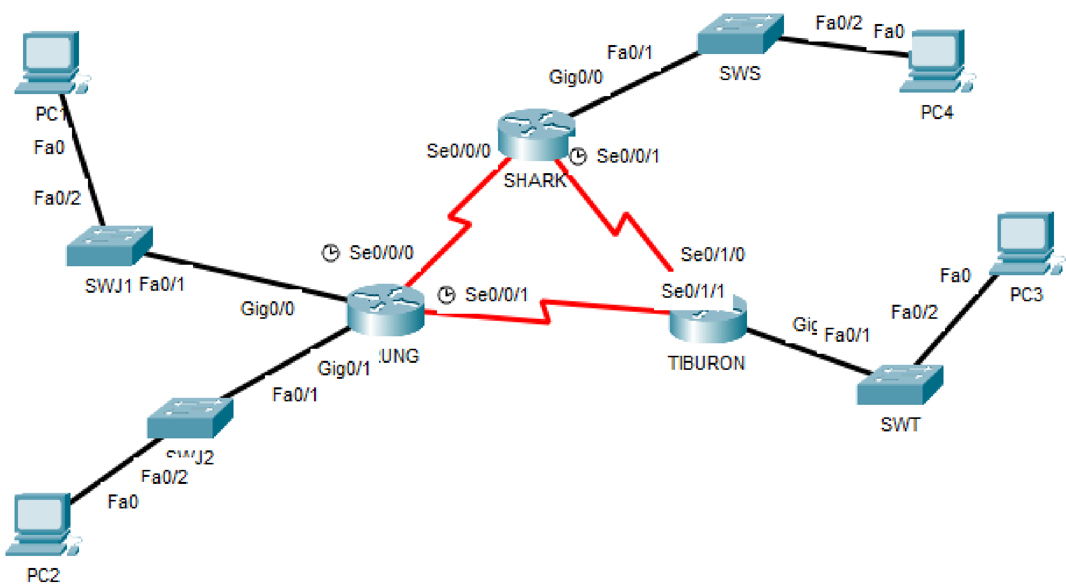
MATRIC NUM.: A24CS0031

SECTION: 05

INTRODUCTION

This lab looks into the network layer, focusing on subnetting and routing.

TOPOLOGY



LAB INFORMATION

Here is some basic information for the lab. The network address given is 172.18.110.0/23.

Table 1

Device	Subnetwork	Usable Hosts
JERUNG	LAN1	20
	LAN2	30
SHARK	LAN	60
TIBURON	LAN	50
Connections	JERUNG-SHARK	2
	JERUNG-TIBURON	2
	SHARK-TIBURON	2

Table 2

#	Device Name	Interface	IP Address	Subnet Mask	Gateway
1	JERUNG	Se0/0/0	172.18.110.193	255.255.255.252	
2		Se0/0/1	172.18.110.197	255.255.255.252	
3		G0/0	172.18.110.161	255.255.255.224	
4		G0/1	172.18.110.129	255.255.255.224	
5	TIBURON	Se0/1/1	172.18.110.198	255.255.255.252	
6		Se0/1/0	172.18.110.201	255.255.255.252	
7		G0/0	172.18.110.65	255.255.255.192	
8	SHARK	Se0/0/0	172.18.110.194	255.255.255.252	
9		Se0/0/1	172.18.110.201	255.255.255.252	
10		G0/0	172.18.110.1	255.255.255.192	
11	PC1	-	172.18.110.190	255.255.255.224	172.18.110.161
12	PC2	-	172.18.110.158	255.255.255.224	172.18.110.129
13	PC3	-	172.18.110.126	255.255.255.192	172.18.110.65
14	PC4	-	172.18.110.62	255.255.255.192	172.18.110.1

Calculation Workflow

1. **Rank by Size:** List all subnets from the largest host requirement to the smallest.
2. **Identify Network Portion:** Use the CIDR (e.g., /20) to identify where the network portion ends and the host portion begins.
3. **Find the Power of 2 (n):** Find $2^n - 2$ that fits the number of devices. This n tells you how many bits to take from the right for the host portion.
4. **Set Boundaries:**
   - **Network Address:** Set all n host bits to **0**.
   - **Broadcast Address:** Set all n host bits to **1**.
   - **Usable Range:** All numbers between the network and broadcast addresses.
5. **Proceed:** Add **1** to the current broadcast address to find the starting point for the next subnet.

Calculations:

Step 1: Ranking by Size

1. SHARK LAN: 60 Hosts
2. TIBURON LAN: 50 Hosts
3. JERUNG LAN2: 30 Hosts
4. JERUNG LAN1: 20 Hosts
5. WAN Links: 2 Hosts each

Step 2: Individual Subnet Calculations

1. SHARK LAN (60 Hosts)
   a. **Power:** $2^6 – 2 = 62$ (Fits 60 Hosts)
   b. **Prefix:** 32 – 6 = /26
   c. **Subnet Mask:** 255.255.255.192
   d. **Range:** start at 172.18.110.0
   e. **IP Address:** First usable is 172.18.110.1
   f. **PC4:** Last usable is 172.18.110.62
   g. **Next Subnet Start:** .63 (Broadcast) + 1 = .64

2. TIBURON LAN (50 Hosts)
   a. **Power:** $2^6 – 2 = 62$ (Fits 50 Hosts)
   b. **Prefix:** 32 – 6 = /26
   c. **Subnet Mask:** 255.255.255.192
   d. **Range:** start at 172.18.110.0
   e. **IP Address:** First usable after .64 is 172.18.110.65
   f. **PC3:** Last usable is 172.18.110.126
   g. **Next Subnet Start:** .127 (Broadcast) + 1 = .128

3. JERUNG LAN2 (30 Hosts)
   a. **Power:** $2^5 - 2 = 30$ (Fits 30 Hosts)
   b. **Prefix:** 32 – 5 = /27
   c. **Subnet Mask:** 255.255.255.224
   d. **Range:** start at 172.18.110.0
   e. **IP Address:** First usable after .128 is 172.18.110.129
   f. **PC2:** Last usable is 172.18.110.158
   g. **Next Subnet Start:** .159 (Broadcast) + 1 = .160

4. JERUNG LAN1 (20 Hosts)
   a. **Power:** $2^5 - 2 = 30$ (Fits 20 Hosts)
   b. **Prefix:** 32 – 5 = /27
   c. **Subnet Mask:** 255.255.255.224
   d. **Range:** start at 172.18.110.0
   e. **IP Address:** First usable after .160 is 172.18.110.161
   f. **PC1:** Last usable is 172.18.110.190
   g. **Next Subnet Start:** .191 (Broadcast) + 1 = .192

5. WAN Links (2 Hosts each)
   WAN links use a /30 prefix (255.255.255.252).
   a. **JERUNG-SHARK:**
      i. Subnet .192/30. First IP is .193; second (SHARK) is 172.18.110.194.
   b. **JERUNG-TIBURON:**
      i. Subnet .196/30. First IP is .197; second (TIBURON) is 172.18.110.198.
   c. **SHARK-TIBURON:**
      i. Subnet .200/30. First IP (SHARK) is .201; second (TIBURON) is 172.18.110.201.

LAB TASKS

Task 1 – IP Addressing

1. Given the network address of the organisation and the basic information provided in both Tables 1 and 2. Show your workings here and complete Table 2 with the correct information. PCs will be given the last usable address of the subnetwork.
2. Using the IP addresses calculated, configure the devices with the appropriate information.

Task 2 – Routing Table

1. Paste the current routing table of each router here. There are 2 ways to this – via CLI and via Packet Tracer (PT) tool. Use both ways to show the routing table of all the routers.
   a. CLI
      i. Click on a router. In the prompt, type show ip route. The routing table of the router will be shown, as shown in Figure A.

```
SHARK#show 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

     172.18.0.0/16 is variably subnetted, 2 subnets, 2 masks
C       172.18.110.0/26 is directly connected, GigabitEthernet0/0
L       172.18.110.1/32 is directly connected, GigabitEthernet0/0
```

Figure A

SHARK

```
SHARK>show 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

     172.18.0.0/16 is variably subnetted, 6 subnets, 3 masks
C       172.18.110.0/26 is directly connected, GigabitEthernet0/0
L       172.18.110.1/32 is directly connected, GigabitEthernet0/0
C       172.18.110.192/30 is directly connected, Serial0/0/0
L       172.18.110.194/32 is directly connected, Serial0/0/0
C       172.18.110.200/30 is directly connected, Serial0/0/1
L       172.18.110.201/32 is directly connected, Serial0/0/1
```

TIBURON

```
TIBURON>show 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

     172.18.0.0/16 is variably subnetted, 9 subnets, 4 masks
C       172.18.110.64/26 is directly connected, GigabitEthernet0/0
L       172.18.110.65/32 is directly connected, GigabitEthernet0/0
R       172.18.110.128/27 [120/1] via 172.18.110.197, 00:00:15, Serial0/1/1
R       172.18.110.160/27 [120/1] via 172.18.110.197, 00:00:15, Serial0/1/1
R       172.18.110.192/30 [120/1] via 172.18.110.197, 00:00:15, Serial0/1/1
C       172.18.110.196/30 is directly connected, Serial0/1/1
L       172.18.110.198/32 is directly connected, Serial0/1/1
C       172.18.110.200/30 is directly connected, Serial0/1/0
L       172.18.110.201/32 is directly connected, Serial0/1/0
```

JERUNG

```
JERUNG>show 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

     172.18.0.0/16 is variably subnetted, 10 subnets, 4 masks
R       172.18.110.64/26 [120/1] via 172.18.110.198, 00:00:01, Serial0/0/1
C       172.18.110.128/27 is directly connected, GigabitEthernet0/1
L       172.18.110.129/32 is directly connected, GigabitEthernet0/1
C       172.18.110.160/27 is directly connected, GigabitEthernet0/0
L       172.18.110.161/32 is directly connected, GigabitEthernet0/0
C       172.18.110.192/30 is directly connected, Serial0/0/0
L       172.18.110.193/32 is directly connected, Serial0/0/0
C       172.18.110.196/30 is directly connected, Serial0/0/1
L       172.18.110.197/32 is directly connected, Serial0/0/1
R       172.18.110.200/30 [120/1] via 172.18.110.198, 00:00:01, Serial0/0/1
```

b. PT tool

  i. Click on the magnifying glass (shown in Figure B), then click on a router, then choose Routing Table. A sample of the result is shown in Figure C.

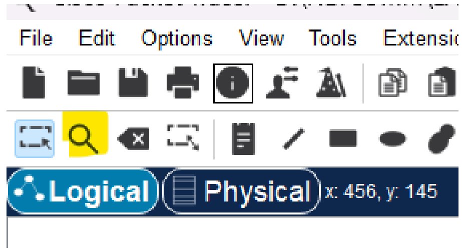


Figure B

Routing Table for SHARK

Type	Network	Port	Next Hop IP	Metric
C	172.18.110.0/26	GigabitEthernet0/0	---	0/0
L	172.18.110.1/32	GigabitEthernet0/0	---	0/0

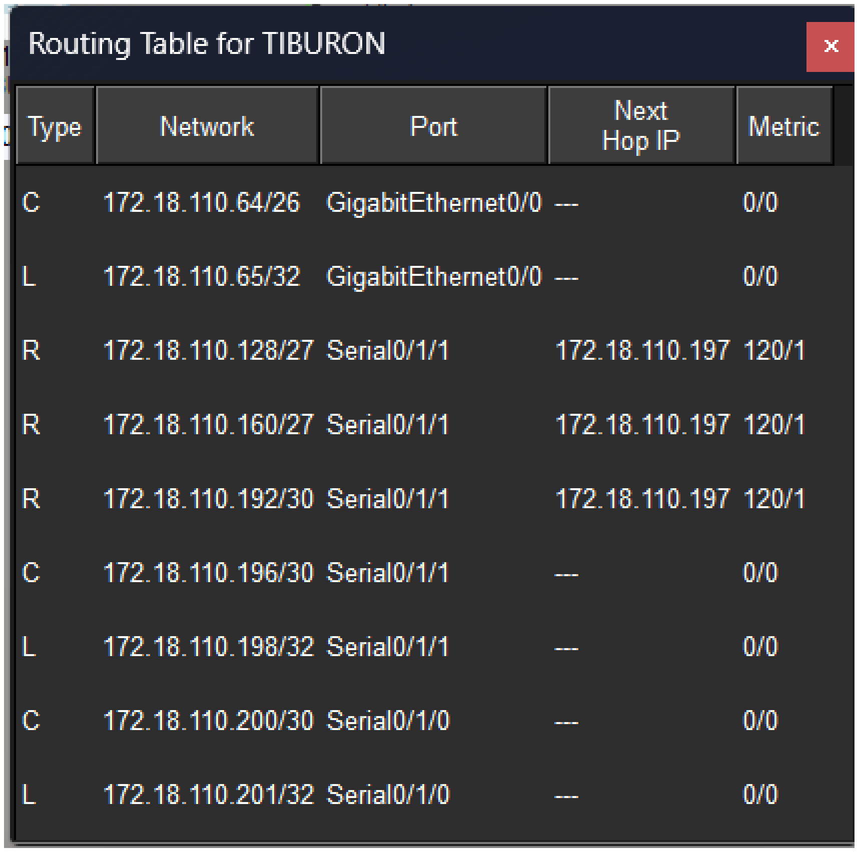
Figure C

SHARK

Routing Table for SHARK

Type	Network	Port	Next Hop IP	Metric
C	172.18.110.0/26	GigabitEthernet0/0	---	0/0
L	172.18.110.1/32	GigabitEthernet0/0	---	0/0
C	172.18.110.192/30	Serial0/0/0	---	0/0
L	172.18.110.194/32	Serial0/0/0	---	0/0
C	172.18.110.200/30	Serial0/0/1	---	0/0
L	172.18.110.201/32	Serial0/0/1	---	0/0

TIBURON



Routing Table for TIBURON

Type	Network	Port	Next Hop IP	Metric
C	172.18.110.64/26	GigabitEthernet0/0	---	0/0
L	172.18.110.65/32	GigabitEthernet0/0	---	0/0
R	172.18.110.128/27	Serial0/1/1	172.18.110.197	120/1
R	172.18.110.160/27	Serial0/1/1	172.18.110.197	120/1
R	172.18.110.192/30	Serial0/1/1	172.18.110.197	120/1
C	172.18.110.196/30	Serial0/1/1	---	0/0
L	172.18.110.198/32	Serial0/1/1	---	0/0
C	172.18.110.200/30	Serial0/1/0	---	0/0
L	172.18.110.201/32	Serial0/1/0	---	0/0

JERUNG

Routing Table for JERUNG

Type	Network	Port	Next Hop IP	Metric
R	172.18.110.64/26	Serial0/0/1	172.18.110.198	120/1
C	172.18.110.128/27	GigabitEthernet0/1	---	0/0
L	172.18.110.129/32	GigabitEthernet0/1	---	0/0
C	172.18.110.160/27	GigabitEthernet0/0	---	0/0
L	172.18.110.161/32	GigabitEthernet0/0	---	0/0
C	172.18.110.192/30	Serial0/0/0	---	0/0
L	172.18.110.193/32	Serial0/0/0	---	0/0
C	172.18.110.196/30	Serial0/0/1	---	0/0
L	172.18.110.197/32	Serial0/0/1	---	0/0
R	172.18.110.200/30	Serial0/0/1	172.18.110.198	120/1

2. Try to ping PC2 from PC1, paste the results here.

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 172.18.110.158

Pinging 172.18.110.158 with 32 bytes of data:

Request timed out.
Reply from 172.18.110.158: bytes=32 time<1ms TTL=127
Reply from 172.18.110.158: bytes=32 time=1ms TTL=127
Reply from 172.18.110.158: bytes=32 time=1ms TTL=127

Ping statistics for 172.18.110.158:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>
```

3. Try to ping PC4 from PC1, paste the results here.

```
C:\>ping 172.18.110.62

Pinging 172.18.110.62 with 32 bytes of data:

Reply from 172.18.110.161: Destination host unreachable.
Reply from 172.18.110.161: Destination host unreachable.
Reply from 172.18.110.161: Destination host unreachable.
Reply from 172.18.110.161: Destination host unreachable.

Ping statistics for 172.18.110.62:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

4. Explain the reason(s) behind the results.
    a. The pings are failing because the **routers do not have a full "map" of the network**. Currently, each router only knows about the networks it is physically plugged into. It doesn't know where to send data meant for the other side of the lab.

5. What needs to be done to ensure all PCs can ping each other successfully?
    a. You need to configure **Routing** (specifically the **RIP protocol** shown in Task 2). This allows the routers to "talk" to each other and share information about their connected networks so they can find the correct path to every PC.

Task 2 – Routing Configuration

1. Let's start by opening the routing table (using the PT tool) for TIBURON and JERUNG. This is done to show changes to the routing table as configurations are made.

Routing Table for TIBURON

Type	Network	Port	Next Hop IP	Metric
C	172.18.110.64/26	GigabitEthernet0/0	---	0/0
L	172.18.110.65/32	GigabitEthernet0/0	---	0/0
C	172.18.110.196/30	Serial0/1/1	---	0/0
L	172.18.110.198/32	Serial0/1/1	---	0/0

Routing Table for JERUNG

Type	Network	Port	Next Hop IP	Metric
C	172.18.110.128/27	GigabitEthernet0/1	---	0/0
L	172.18.110.129/32	GigabitEthernet0/1	---	0/0
C	172.18.110.160/27	GigabitEthernet0/0	---	0/0
L	172.18.110.161/32	GigabitEthernet0/0	---	0/0

Figure D

Routing Table for TIBURON

Type	Network	Port	Next Hop IP	Metric
C	172.18.110.64/26	GigabitEthernet0/0	---	0/0
L	172.18.110.65/32	GigabitEthernet0/0	---	0/0
R	172.18.110.128/27	Serial0/1/1	172.18.110.197	120/1
R	172.18.110.160/27	Serial0/1/1	172.18.110.197	120/1
R	172.18.110.192/30	Serial0/1/1	172.18.110.197	120/1
C	172.18.110.196/30	Serial0/1/1	---	0/0
L	172.18.110.198/32	Serial0/1/1	---	0/0
C	172.18.110.200/30	Serial0/1/0	---	0/0
L	172.18.110.201/32	Serial0/1/0	---	0/0

Routing Table for JERUNG

Type	Network	Port	Next Hop IP	Metric
R	172.18.110.64/26	Serial0/0/1	172.18.110.198	120/1
C	172.18.110.128/27	GigabitEthernet0/1	---	0/0
L	172.18.110.129/32	GigabitEthernet0/1	---	0/0
C	172.18.110.160/27	GigabitEthernet0/0	---	0/0
L	172.18.110.161/32	GigabitEthernet0/0	---	0/0
C	172.18.110.192/30	Serial0/0/0	---	0/0
L	172.18.110.193/32	Serial0/0/0	---	0/0
C	172.18.110.196/30	Serial0/0/1	---	0/0
L	172.18.110.197/32	Serial0/0/1	---	0/0
R	172.18.110.200/30	Serial0/0/1	172.18.110.198	120/1

2. In router JERUNG, configure the RIP routing protocol as shown in Figure E.

```
JERUNG#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
JERUNG(config)#router rip
JERUNG(config-router)#version 2
JERUNG(config-router)#network 172.18.110.128
JERUNG(config-router)#network 172.18.110.160
JERUNG(config-router)#network 172.18.110.192
JERUNG(config-router)#network 172.18.110.196
JERUNG(config-router)#no auto-summary
JERUNG(config-router)#
```

Figure E

a. What can you say about the addresses used in the ‘network’ instructions in Figure E?

The addresses in Figure E are **specific subnet addresses** rather than the standard "major" classful addresses usually seen in RIP. Since they all belong to the same **Class B family (172.18.0.0)**, you can list them individually like this because you’ve enabled **Version 2** and used the **no auto-summary** command. This tells the router to treat each small segment as its own unique path instead of bunching them all together, which is exactly what’s needed for the different groups of usable hosts in your topology to communicate.

3. Then configure RIP in TIBURON. All are similar except use the network address. Use the instructions as shown below.

```
TIBURON (config-router) #network 172.18.110.64

TIBURON (config-router) #network 172.18.110.196

TIBURON (config-router) #network 172.18.110.200
```

```
TIBURON>enable
TIBURON#enable
TIBURON#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
TIBURON(config)#router rip
TIBURON(config-router)#version 2
TIBURON(config-router)#network 172.18.110.64
TIBURON(config-router)#network 172.18.110.196
TIBURON(config-router)#network 172.18.110.200
TIBURON(config-router)#no atuo-summary
                           ^
% Invalid input detected at '^' marker.

TIBURON(config-router)#no auto-summary
TIBURON(config-router)#
```

4. As you may have seen, there are changes in the routing tables of both TIBURON and JERUNG. Paste a copy of these routing tables here.

Routing Table for TIBURON

Type	Network	Port	Next Hop IP	Metric
C	172.18.110.64/26	GigabitEthernet0/0	---	0/0
L	172.18.110.65/32	GigabitEthernet0/0	---	0/0
R	172.18.110.128/27	Serial0/1/1	172.18.110.197	120/1
R	172.18.110.160/27	Serial0/1/1	172.18.110.197	120/1
R	172.18.110.192/30	Serial0/1/1	172.18.110.197	120/1
C	172.18.110.196/30	Serial0/1/1	---	0/0
L	172.18.110.198/32	Serial0/1/1	---	0/0
C	172.18.110.200/30	Serial0/1/0	---	0/0
L	172.18.110.201/32	Serial0/1/0	---	0/0

Routing Table for JERUNG

Type	Network	Port	Next Hop IP	Metric
R	172.18.110.64/26	Serial0/0/1	172.18.110.198	120/1
C	172.18.110.128/27	GigabitEthernet0/1	---	0/0
L	172.18.110.129/32	GigabitEthernet0/1	---	0/0
C	172.18.110.160/27	GigabitEthernet0/0	---	0/0
L	172.18.110.161/32	GigabitEthernet0/0	---	0/0
C	172.18.110.192/30	Serial0/0/0	---	0/0
L	172.18.110.193/32	Serial0/0/0	---	0/0
C	172.18.110.196/30	Serial0/0/1	---	0/0
L	172.18.110.197/32	Serial0/0/1	---	0/0
R	172.18.110.200/30	Serial0/0/1	172.18.110.198	120/1

a. What are the changes seen in TIBURON?

   i. After configuring RIP, the TIBURON routing table expanded from showing only directly connected networks to including remote networks learned from its neighbors, marked with the code "R". Specifically, it added routes for the 172.18.110.128/27, 172.18.110.160/27, and 172.18.110.192/30 subnets, all pointing to 172.18.110.197 as the next-hop address. This indicates that TIBURON now has full reachability to the networks attached to the JERUNG router, with a hop count (metric) of 1.

b. What are the Networks with type R in TIBURON and JERUNG?

   i. TIBURON:
      1. 172.18.110.128/27 (via 172.18.110.197)
      2. 172.18.110.160/27 (via 172.18.110.197)
      3. 172.18.110.192/30 (via 172.18.110.197)

   ii. JERUNG:
      1. 172.18.110.64/26 (via 172.18.110.198)
      2. 172.18.110.200/30 (via 172.18.110.198)

c. Ping PC3 from PC1. Was it successful?

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 172.18.110.126

Pinging 172.18.110.126 with 32 bytes of data:

Request timed out.
Reply from 172.18.110.126: bytes=32 time=22ms TTL=126
Reply from 172.18.110.126: bytes=32 time=1ms TTL=126
Reply from 172.18.110.126: bytes=32 time=1ms TTL=126

Ping statistics for 172.18.110.126:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 22ms, Average = 8ms

C:\>
```

Successfull but still have 25% loss of packets

d. Ping PC4 from PC1. Was it successful?

```
C:\>ping 172.18.110.62

Pinging 172.18.110.62 with 32 bytes of data:

Reply from 172.18.110.161: Destination host unreachable.
Request timed out.
Reply from 172.18.110.161: Destination host unreachable.
Request timed out.

Ping statistics for 172.18.110.62:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>
```

Unsuccessful

e. Explain the reasons for your answer.

The ping from PC1 to PC3 is successful (with 25% loss) because RIP is configured on both JERUNG and TIBURON, allowing them to share the necessary route information. However, the ping to PC4 is unsuccessful (100% loss) because the SHARK router has not yet been configured with RIP. Without this configuration, the other routers lack a path to PC4's network in their routing tables, leaving the destination unreachable.

f. Continue with configuration of RIP in SHARK. Paste your configurations here.

```
SHARK>enable
SHARK#
SHARK#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
SHARK(config)#router rip
SHARK(config-router)#router rip
SHARK(config-router)#version 2
SHARK(config-router)#network 172.18.110.192
SHARK(config-router)#network 172.18.110.200
SHARK(config-router)#network 172.18.110.0
SHARK(config-router)#no auto-summary
SHARK(config-router)#
```

g. Open router SHARK's routing table and paste here.

Routing Table for SHARK

Type	Network	Port	Next Hop IP	Metric
C	172.18.110.0/26	GigabitEthernet0/0	---	0/0
L	172.18.110.1/32	GigabitEthernet0/0	---	0/0
R	172.18.110.64/26	Serial0/0/0	172.18.110.193	120/2
R	172.18.110.128/27	Serial0/0/0	172.18.110.193	120/1
R	172.18.110.160/27	Serial0/0/0	172.18.110.193	120/1
C	172.18.110.192/30	Serial0/0/0	---	0/0
L	172.18.110.194/32	Serial0/0/0	---	0/0
R	172.18.110.196/30	Serial0/0/0	172.18.110.193	120/1
C	172.18.110.200/30	Serial0/0/1	---	0/0
L	172.18.110.201/32	Serial0/0/1	---	0/0

h. Try to ping from PC4 to all other PCs in the topology. *Note: Try to ping at least twice to get best results.

PC	Ping result

1	C:\>ping 172.18.110.190
	
	Pinging 172.18.110.190 with 32 bytes of data:
	
	Reply from 172.18.110.190: bytes=32 time=1ms TTL=126
	Reply from 172.18.110.190: bytes=32 time=5ms TTL=126
	Reply from 172.18.110.190: bytes=32 time=1ms TTL=126
	Reply from 172.18.110.190: bytes=32 time=1ms TTL=126
	
	Ping statistics for 172.18.110.190:
	    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
	Approximate round trip times in milli-seconds:
	    Minimum = 1ms, Maximum = 5ms, Average = 2ms
	
	C:\>ping 172.18.110.190
	
	Pinging 172.18.110.190 with 32 bytes of data:
	
	Reply from 172.18.110.190: bytes=32 time=9ms TTL=126
	Reply from 172.18.110.190: bytes=32 time=1ms TTL=126
	Reply from 172.18.110.190: bytes=32 time=2ms TTL=126
	Reply from 172.18.110.190: bytes=32 time=1ms TTL=126
	
	Ping statistics for 172.18.110.190:
	    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
	Approximate round trip times in milli-seconds:
	    Minimum = 1ms, Maximum = 9ms, Average = 3ms
	
	C:\>

<table>
<tr>
<td>2</td>
<td><pre>
C:\>ping 172.18.110.158

Pinging 172.18.110.158 with 32 bytes of data:

Reply from 172.18.110.158: bytes=32 time=10ms TTL=126
Reply from 172.18.110.158: bytes=32 time=5ms TTL=126
Reply from 172.18.110.158: bytes=32 time=5ms TTL=126
Reply from 172.18.110.158: bytes=32 time=3ms TTL=126

Ping statistics for 172.18.110.158:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 3ms, Maximum = 10ms, Average = 5ms

C:\>ping 172.18.110.158

Pinging 172.18.110.158 with 32 bytes of data:

Reply from 172.18.110.158: bytes=32 time=10ms TTL=126
Reply from 172.18.110.158: bytes=32 time=1ms TTL=126
Reply from 172.18.110.158: bytes=32 time=1ms TTL=126
Reply from 172.18.110.158: bytes=32 time=1ms TTL=126

Ping statistics for 172.18.110.158:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 10ms, Average = 3ms

C:\>
</pre></td>
</tr>
</table>

3		C:\>ping 172.18.110.126 Pinging 172.18.110.126 with 32 bytes of data: Reply from 172.18.110.126: bytes=32 time=2ms TTL=125 Reply from 172.18.110.126: bytes=32 time=3ms TTL=125 Reply from 172.18.110.126: bytes=32 time=2ms TTL=125 Reply from 172.18.110.126: bytes=32 time=2ms TTL=125 Ping statistics for 172.18.110.126: Packets: Sent = 4, Received = 4, Lost = 0 (0% loss), Approximate round trip times in milli-seconds: Minimum = 2ms, Maximum = 3ms, Average = 2ms C:\>ping 172.18.110.126 Pinging 172.18.110.126 with 32 bytes of data: Reply from 172.18.110.126: bytes=32 time=9ms TTL=125 Reply from 172.18.110.126: bytes=32 time=2ms TTL=125 Reply from 172.18.110.126: bytes=32 time=11ms TTL=125 Reply from 172.18.110.126: bytes=32 time=7ms TTL=125 Ping statistics for 172.18.110.126: Packets: Sent = 4, Received = 4, Lost = 0 (0% loss), Approximate round trip times in milli-seconds: Minimum = 2ms, Maximum = 11ms, Average = 7ms C:\>

Task 3 – Routing Update

1. Let's try a little experiment. Change the IP addresses of router TIBURON interface G0/0 to 192.168.1.1/24.
   a. This means that the subnet has changed. Find the new Network address of this subnet. Network Address is: 192.168.1.1
   b. As this change happens, PC3 must also have different IP address, subnet mask and gateway address. What will it be?

PC3	Info
IP address	192.168.1.3
Subnet Mask	255.255.255.0
Gateway Address	192.168.1.1

   c. After this change, can PC4 and PC1 ping PC3?
   No, PC4 and PC1 can not ping to PC3 because router SHARK and JERUNG can not know the route to ping to PC3 because of different routing information with router TIBURON.
   d. Copy and paste the routing tables for both SHARK and TIBURON here.

Routing Table for SHARK ×

Type	Network	Port	Next Hop IP	Metric
C	172.18.110.0/26	GigabitEthernet0/0	---	0/0
L	172.18.110.1/32	GigabitEthernet0/0	---	0/0
C	172.18.110.192/30	Serial0/0/0	---	0/0
L	172.18.110.194/32	Serial0/0/0	---	0/0
C	172.18.110.200/30	Serial0/0/1	---	0/0
L	172.18.110.201/32	Serial0/0/1	---	0/0

Routing Table for TIBURON ×

Type	Network	Port	Next Hop IP	Metric
R	172.18.110.128/27	Serial0/1/1	172.18.110.197	120/1
R	172.18.110.160/27	Serial0/1/1	172.18.110.197	120/1
R	172.18.110.192/30	Serial0/1/1	172.18.110.197	120/1
C	172.18.110.196/30	Serial0/1/1	---	0/0
L	172.18.110.198/32	Serial0/1/1	---	0/0
C	172.18.110.200/30	Serial0/1/0	---	0/0
L	172.18.110.201/32	Serial0/1/0	---	0/0
C	192.168.1.0/24	GigabitEthernet0/0	---	0/0
L	192.168.1.1/32	GigabitEthernet0/0	---	0/0

   e. Referring to the routing table, explain your findings.
   The new address was set up inside router TIBURON which is 192.168.1.0/24 and 192.168.1.1 both use GigabitEthernet0/0 which is not been set up in router SHARK. So, when pinging the PC 1 and PC 4 to PC3, it says "Destination host unreachable" because router SHARK did not know the way to go to PC 3 yet.

f. What is your next move to ensure end-to-end connectivity (i.e. all PCs can ping each other successfully)?
I will update the routing tables of router SHARK and router JERUNG by adding static route for new network 192.168.1.0/24 on these routers so they know to forward traffic towards router TIBURON.

g. Show your configurations in TIBURON to ensure end-to-end connectivity.

Routing Table for TIBURON

Type	Network	Port	Next Hop IP	Metric
R	172.18.110.0/26	Serial0/1/1	172.18.110.197	120/2
R	172.18.110.128/27	Serial0/1/1	172.18.110.197	120/1
R	172.18.110.160/27	Serial0/1/1	172.18.110.197	120/1
R	172.18.110.192/30	Serial0/1/1	172.18.110.197	120/1
C	172.18.110.196/30	Serial0/1/1	---	0/0
L	172.18.110.198/32	Serial0/1/1	---	0/0
C	172.18.110.200/30	Serial0/1/0	---	0/0
L	172.18.110.201/32	Serial0/1/0	---	0/0
C	192.168.1.0/24	GigabitEthernet0/0	---	0/0
L	192.168.1.1/32	GigabitEthernet0/0	---	0/0

h. To ensure end-to-end connectivity, ping to all the PCs from PC3.

PC	Ping result
1	C:\>ping 172.18.110.190 Pinging 172.18.110.190 with 32 bytes of data: Reply from 172.18.110.190: bytes=32 time=1ms TTL=126 Reply from 172.18.110.190: bytes=32 time=2ms TTL=126 Reply from 172.18.110.190: bytes=32 time=1ms TTL=126 Reply from 172.18.110.190: bytes=32 time=1ms TTL=126 Ping statistics for 172.18.110.190: Packets: Sent = 4, Received = 4, Lost = 0 (0% loss), Approximate round trip times in milli-seconds: Minimum = 1ms, Maximum = 2ms, Average = 1ms
2	C:\>ping 172.18.110.158 Pinging 172.18.110.158 with 32 bytes of data: Reply from 172.18.110.158: bytes=32 time=10ms TTL=126 Reply from 172.18.110.158: bytes=32 time=1ms TTL=126 Reply from 172.18.110.158: bytes=32 time=10ms TTL=126 Reply from 172.18.110.158: bytes=32 time=1ms TTL=126 Ping statistics for 172.18.110.158: Packets: Sent = 4, Received = 4, Lost = 0 (0% loss), Approximate round trip times in milli-seconds: Minimum = 1ms, Maximum = 10ms, Average = 5ms
4	C:\>ping 172.18.110.62 Pinging 172.18.110.62 with 32 bytes of data: Reply from 172.18.110.62: bytes=32 time=16ms TTL=125 Reply from 172.18.110.62: bytes=32 time=10ms TTL=125 Reply from 172.18.110.62: bytes=32 time=10ms TTL=125 Reply from 172.18.110.62: bytes=32 time=10ms TTL=125 Ping statistics for 172.18.110.62: Packets: Sent = 4, Received = 4, Lost = 0 (0% loss), Approximate round trip times in milli-seconds: Minimum = 10ms, Maximum = 16ms, Average = 11ms C:\>

REFLECTION

What have you learned in this task?

Precision in Subnetting and Planning Lab 3 has significantly enhanced my technical understanding of IP addressing and network planning. One of the most important skills I acquired was learning how to identify precise network addresses by calculating "magic numbers" or multiples based on specific subnet masks like .192, .224, and .252. This method was essential for configuring the RIP network commands correctly, as it ensured each interface was mapped to its rightful subnet. Mastering this mathematical logic allowed me to build a more organized and efficient network structure, ensuring that all routers were synchronized within the correct boundaries.

Troubleshooting and Critical Thinking Beyond the initial configuration, this lab truly challenged my critical thinking through troubleshooting and error resolution. Encountering connectivity issues forced me to go beyond the lab manual; I had to conduct extensive research and systematically analyze routing tables to identify the root cause of failures. This process of fixing errors was demanding, yet it taught me how to be a more resilient and resourceful network administrator. Ultimately, successfully resolving these challenges and achieving a successful ping test across the entire topology solidified my confidence in managing real-world network applications.