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LAB 2: THE HOMEWORK FILE #2

Objectives

To record and do the class activity. In this case is for Class Activity #1

Scenario

After the exercise in class (Class Activity #1 and your Homework Lab 1), you should have a basic idea of connections and packet forwarding within a network topology.

Previously, in Homework Lab 1, you created a topology, with the 5 routers and configured the basic NOS in Packet Tracer. You will use it for this Homework Lab 2. For this particular activity, name the PT file as YOURNAME_ACT2 (of YOURNAME means your own name). This is individual work.

As you do the activity, and have your answers, compare them with your partner. Then compare your answers with, at least, one other group from the class.

Tasks

Task 1 – Subnet matters

- ***Please note**: In this Task, you will use the IP addressing information given here and not the ones given in Activity#1. You are just using the topology from Activity#1 and adding these LANs to it.*
- You applied to the ISP for IP addressing for your topology, and you were given the network address 172.16.224.0/21. You decided to first divided them variably according to LAN groups (Group A,B,C,D and E). Subsequently, you will take the subnet (say Subnet group A) and divide further for each LAN in group A (A1, A2 and A3) following its need, as shown in Table 1. **Note: A1,A2 and A3 are LANs connected to Router A; B1 and B2 are LANs connected to Router B and so on.*

Table 1

LAN	Host needed
A1	100
A2	100
A3	75
B1	120
B2	60
C1	120
C2	60
D1	120
D2	60
E1	50

Task 1a – Create subnet for groups

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- Using the information provided. Show how you will divide the Network address to each group. Clearly show your workings here.
- Put the final results into a table like Figure 1. **Note: The info in red is just an example.*

SUBNET	NETWORK ADDRESS	BROADCAST ADDRESS	USABLE ADD. RANGE	SUBNET MASK
0 [A]	192.168.1.0	192.168.1.63	192.168.1.1 – 192.168.1.62	/26 OR 255.255.255.192
1				
2				
3				

Figure 1

Group	LANs	Hosts Needed	Total
A	A1, A2, A3	100, 100, 75	275
B	B1, B2	120, 60	180
C	C1, C2	120, 60	180
D	D1, D2	120, 60	180
E	E1	50	50

Group A: needs 275 → 29=5122^9 = 51229=512 → **/23** (512 IPs)

Group B: needs 180 → 28=2562^8 = 25628=256 → **/24**

Group C: needs 180 → **/24**

Group D: needs 180 → **/24**

Group E: needs 50 → 26=642^6 = 6426=64 → **/26**

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Group	Subnet Address	Subnet Mask	CIDR	Usable Host IP Range	Broadcast Address
A	172.16.224.0	255.255.254.0	/23	172.16.224.1 – 172.16.225.254	172.16.225.255
B	172.16.226.0	255.255.255.0	/24	172.16.226.1 – 172.16.226.254	172.16.226.255
C	172.16.227.0	255.255.255.0	/24	172.16.227.1 – 172.16.227.254	172.16.227.255
D	172.16.228.0	255.255.255.0	/24	172.16.228.1 – 172.16.228.254	172.16.228.255
E	172.16.229.0	255.255.255.192	/26	172.16.229.1 – 172.16.229.62	172.16.229.63

Task 1b – Create subnet for groups

- Using the information provided. Show how you will divide the group Network address to each LAN. Clearly show your workings here.
- Put the final results into a table like Figure 1.

Group	LAN	Subnet Address	Subnet Mask	CIDR	Usable IP Range	Broadcast
A	A1	172.16.224.0	255.255.255.128	/25	172.16.224.1 – 172.16.224.126	172.16.224.127
A	A2	172.16.224.128	255.255.255.128	/25	172.16.224.129 – 172.16.224.254	172.16.224.255
A	A3	172.16.225.0	255.255.255.128	/25	172.16.225.1 – 172.16.225.126	172.16.225.127
B	B1	172.16.226.0	255.255.255.128	/25	172.16.226.1 – 172.16.226.126	172.16.226.127
B	B2	172.16.226.128	255.255.255.192	/26	172.16.226.129 – 172.16.226.190	172.16.226.191
C	C1	172.16.227.0	255.255.255.128	/25	172.16.227.1 – 172.16.227.126	172.16.227.127
C	C2	172.16.227.128	255.255.255.192	/26	172.16.227.129 – 172.16.227.190	172.16.227.191
D	D1	172.16.228.0	255.255.255.128	/25	172.16.228.1 – 172.16.228.126	172.16.228.127
D	D2	172.16.228.128	255.255.255.192	/26	172.16.228.129 – 172.16.228.190	172.16.228.191
E	E1	172.16.229.0	255.255.255.192	/26	172.16.229.1 – 172.16.229.62	172.16.229.63

Task 2 – Updating your topology

- In your HOMEWORK topology in Packet Tracer, update it with the LANs.
- Add two PCs attached to the LAN A1 via a switch. Name the PCs **PA1A** and **PA1B**.
- Using any of the usable address for the LAN, assign the PCs with the appropriate IP address, subnet mask and default gateway. List these information in a form of a table here.

PC Name	IP Address	Subnet Mask	Default Gateway	Group
PCA1	172.16.224.10	255.255.254.0 (/23)	172.16.224.1	A
PC7	172.16.224.20	255.255.254.0 (/23)	172.16.224.1	A
PCA2	172.16.224.30	255.255.254.0 (/23)	172.16.224.1	A
PCC	172.16.227.10	255.255.255.0 (/24)	172.16.227.1	C
PCB	172.16.226.10	255.255.255.0 (/24)	172.16.226.1	B
PCE2	172.16.229.10	255.255.255.192 (/26)	172.16.229.1	E
PCE1	172.16.229.20	255.255.255.192 (/26)	172.16.229.1	E
PCD	172.16.228.10	255.255.255.0 (/24)	172.16.228.1	D

- On **PA1A**, go to *Desktop* , then choose *Command Prompt*. Ping **PA1B** from here.
  - You can use the command ***ping* PA1B *_IPaddress*** (example: ping 192.168.2.10).
- Capture the screen shot (like Figure 2) and paste it here.

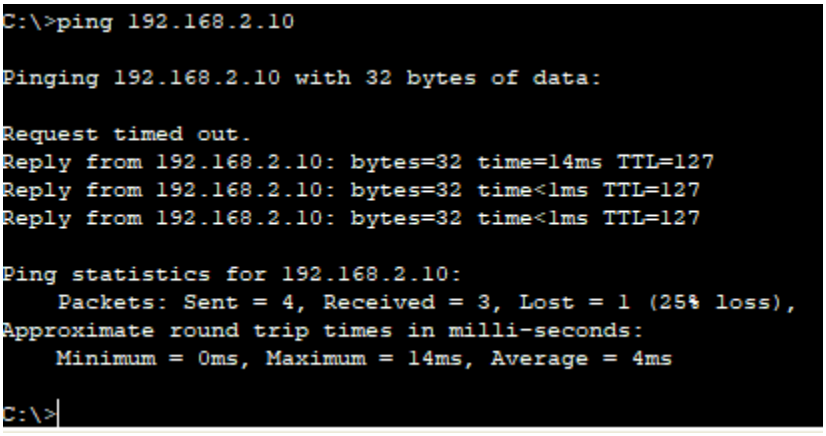

Figure 2 (example)

- Was the ping successful?

  Yes

```
C:\>ping 172.16.224.20

Pinging 172.16.224.20 with 32 bytes of data:

Reply from 172.16.224.20: bytes=32 time<1ms TTL=128
Reply from 172.16.224.20: bytes=32 time<1ms TTL=128
Reply from 172.16.224.20: bytes=32 time<1ms TTL=128
Reply from 172.16.224.20: bytes=32 time<1ms TTL=128

Ping statistics for 172.16.224.20:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>
```

- If the ping was NOT successful, can you identify and rectify the problem? Explain your solution here.
- Add 1 PC to each of the remaining LAN and give each an appropriate IP address, subnet mask and default gateway. In a table, list all the PCs name and addressing information.

New PC Name	IP Address	Subnet Mask	Default Gateway	LAN
PCA1-2	172.16.224.11	255.255.254.0	172.16.224.1	A1
PC7-2	172.16.224.21	255.255.254.0	172.16.224.1	A2
PCA2-2	172.16.224.31	255.255.254.0	172.16.224.1	A3
PCB-2	172.16.226.11	255.255.255.0	172.16.226.1	B1
PCC-2	172.16.227.11	255.255.255.0	172.16.227.1	C1
PCD-2	172.16.228.11	255.255.255.0	172.16.228.1	D1
PCE2-2	172.16.229.11	255.255.255.192	172.16.229.1	E1
PCE1-2	172.16.229.21	255.255.255.192	172.16.229.1	E1

- Try to ping the PC on LAN A2 from **PA1A**. Capture the screen shot (like Figure 2) and paste it here. Is it successful? Explain why it was successful (or not).

Yes, the ping was successful because the IP configuration and RIP routing were correctly set up.

```
C:\>ping 172.16.224.21

Pinging 172.16.224.21 with 32 bytes of data:

Reply from 172.16.224.21: bytes=32 time<1ms TTL=128
Reply from 172.16.224.21: bytes=32 time<1ms TTL=128
Reply from 172.16.224.21: bytes=32 time<1ms TTL=128
Reply from 172.16.224.21: bytes=32 time<1ms TTL=128

Ping statistics for 172.16.224.21:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>
```

- Try to ping the PC on LAN B2 from **PA1A**. Capture the screen shot (like Figure 2) and paste it here. Is it successful? Explain why it was successful (or not).

```
C:\>ping 172.16.226.130

Pinging 172.16.226.130 with 32 bytes of data:

Reply from 10.0.0.2: Destination host unreachable.
Reply from 10.0.0.2: Destination host unreachable.
Reply from 10.0.0.2: Destination host unreachable.
Reply from 10.0.0.2: Destination host unreachable.

Ping statistics for 172.16.226.130:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>
```

No, the ping failed. The routers don't know where 172.16.226.130 is because the network is missing in routing.

Task 2a – Record the routing table of all routers.

- In the privilege Exec mode type ***`show ip route`*** to display the routing table for the router.
- Paste the routing table for each router here.

RTA

```
RTA#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

     10.0.0.0/8 is variably subnetted, 8 subnets, 2 masks
C       10.0.0.0/30 is directly connected, Serial0/0/0
L       10.0.0.1/32 is directly connected, Serial0/0/0
C       10.0.0.4/30 is directly connected, Serial0/0/1
L       10.0.0.5/32 is directly connected, Serial0/0/1
R       10.0.0.8/30 [120/1] via 10.0.0.2, 00:00:27, Serial0/0/0
R       10.0.0.12/30 [120/1] via 10.0.0.6, 00:00:14, Serial0/0/1
C       10.0.0.20/30 is directly connected, Serial0/1/0
L       10.0.0.21/32 is directly connected, Serial0/1/0
     172.16.0.0/16 is variably subnetted, 7 subnets, 3 masks
C       172.16.224.0/25 is directly connected, GigabitEthernet0/0
L       172.16.224.1/32 is directly connected, GigabitEthernet0/0
C       172.16.224.128/25 is directly connected, GigabitEthernet0/1
L       172.16.224.129/32 is directly connected, GigabitEthernet0/1
R       172.16.226.0/25 [120/1] via 10.0.0.2, 00:00:27, Serial0/0/0
R       172.16.226.128/26 [120/1] via 10.0.0.2, 00:00:27, Serial0/0/0
R       172.16.227.0/25 [120/1] via 10.0.0.6, 00:00:14, Serial0/0/1

RTA#
```

RTC

```
RTC>enable
RTC#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

     10.0.0.0/8 is variably subnetted, 7 subnets, 2 masks
R       10.0.0.0/30 [120/1] via 10.0.0.5, 00:00:23, Serial0/0/0
C       10.0.0.4/30 is directly connected, Serial0/0/0
L       10.0.0.6/32 is directly connected, Serial0/0/0
R       10.0.0.8/30 [120/2] via 10.0.0.5, 00:00:23, Serial0/0/0
C       10.0.0.12/30 is directly connected, Serial0/0/1
L       10.0.0.13/32 is directly connected, Serial0/0/1
R       10.0.0.20/30 [120/1] via 10.0.0.5, 00:00:23, Serial0/0/0
     172.16.0.0/16 is variably subnetted, 6 subnets, 3 masks
R       172.16.224.0/25 [120/1] via 10.0.0.5, 00:00:23, Serial0/0/0
R       172.16.224.128/25 [120/1] via 10.0.0.5, 00:00:23, Serial0/0/0
R       172.16.226.0/25 [120/2] via 10.0.0.5, 00:00:23, Serial0/0/0
R       172.16.226.128/26 [120/2] via 10.0.0.5, 00:00:23, Serial0/0/0
C       172.16.227.0/25 is directly connected, GigabitEthernet0/0
L       172.16.227.1/32 is directly connected, GigabitEthernet0/0
```

RTD

```
RTD>enable
RTD#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

     10.0.0.0/8 is variably subnetted, 4 subnets, 2 masks
C       10.0.0.8/30 is directly connected, Serial0/0/1
L       10.0.0.10/32 is directly connected, Serial0/0/1
C       10.0.0.20/30 is directly connected, Serial0/0/0
L       10.0.0.22/32 is directly connected, Serial0/0/0
     172.16.0.0/16 is variably subnetted, 2 subnets, 2 masks
C       172.16.228.0/25 is directly connected, GigabitEthernet0/0
L       172.16.228.1/32 is directly connected, GigabitEthernet0/0

RTD#
```

RTE

```
RTE>enable
RTE#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

     10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       10.0.0.16/30 is directly connected, Serial0/0/0
L       10.0.0.18/32 is directly connected, Serial0/0/0
     172.16.0.0/16 is variably subnetted, 4 subnets, 3 masks
C       172.16.229.0/26 is directly connected, GigabitEthernet0/0
L       172.16.229.1/32 is directly connected, GigabitEthernet0/0
C       172.16.231.0/24 is directly connected, GigabitEthernet0/1
L       172.16.231.1/32 is directly connected, GigabitEthernet0/1

RTE#
```

RTB

```
RTB>enable
RTB#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

     10.0.0.0/8 is variably subnetted, 7 subnets, 2 masks
C       10.0.0.0/30 is directly connected, Serial0/0/0
L       10.0.0.2/32 is directly connected, Serial0/0/0
R       10.0.0.4/30 [120/1] via 10.0.0.1, 00:00:21, Serial0/0/0
C       10.0.0.8/30 is directly connected, Serial0/0/1
L       10.0.0.9/32 is directly connected, Serial0/0/1
R       10.0.0.12/30 [120/2] via 10.0.0.1, 00:00:21, Serial0/0/0
R       10.0.0.20/30 [120/1] via 10.0.0.1, 00:00:21, Serial0/0/0
     172.16.0.0/16 is variably subnetted, 5 subnets, 2 masks
R       172.16.224.0/25 [120/1] via 10.0.0.1, 00:00:21, Serial0/0/0
R       172.16.224.128/25 [120/1] via 10.0.0.1, 00:00:21, Serial0/0/0
C       172.16.226.0/25 is directly connected, GigabitEthernet0/0
L       172.16.226.1/32 is directly connected, GigabitEthernet0/0
R       172.16.227.0/25 [120/2] via 10.0.0.1, 00:00:21, Serial0/0/0

---
```

Task 3 – Experimenting.

- Move PA1B and connect it to the switch in LAN B1.
- Ping PA1B from PA1A. Do you think it will be successful? Capture the screen shot (like Figure 2) and paste it here. Is it successful? Explain why it was successful (or not).
- Change the IP address, subnet mask and Default gateway of PA1B to reflect its new LAN location. List the newly assigned IP address, subnet mask and Default gateway of PA1B here.

```
C:\>ping 172.16.224.20

Pinging 172.16.224.20 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 172.16.224.20:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>
```

No, the ping failed. The routers don't know where 172.16.226.130 is because the network is missing in routing.

- Ping PA1B from PA1A. Do you think it will be successful? Capture the screen shot (like Figure 2) and paste it here. Is it successful? Explain why it was successful (or not).

```
C:\>ping 172.16.226.12

Pinging 172.16.226.12 with 32 bytes of data:

Reply from 172.16.226.12: bytes=32 time=17ms TTL=126
Reply from 172.16.226.12: bytes=32 time=22ms TTL=126
Reply from 172.16.226.12: bytes=32 time=3ms TTL=126
Reply from 172.16.226.12: bytes=32 time=14ms TTL=126

Ping statistics for 172.16.226.12:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 3ms, Maximum = 22ms, Average = 14ms

C:\>
```

Yes, the ping was successful because the IP configuration and RIP routing were correctly set up.

- You can continue to experiment with the rest of the PCs in the topology.

Reflection *(*note: reflection is not a yes or no answer – it needs elaboration and explanation)*

1. Is being in the same subnet a requirement for the devices to successfully ping each other in Task 2?

   No, it's not required. Devices in different subnets can ping each other if routers are properly set up and know the routes.

2. What can you say about the content of the routing table of the router?

   The routing table shows all the networks the router can reach. It tells the router where to send packets.

3. What is the significance of changing the IP addressing info in PA1B in Task 3?

   Because when PA1B moved to LAN B1, it needed an IP that matches the new network. Without changing it, the router wouldn't know how to deliver packets.

4. Reflect upon the connectivity of 2 PCs in these situations:

   i) 2 PCs in same subnet.

   They can ping each other directly without a router because they are in the same network.

   ii) 2 PCs in different subnet, but both subnets connected to same router.

   They can ping each other, but the router must route the packets between the subnets.

   iii) 2 PCs in different subnets, and both subnets are connected to different routers.

   They can ping if the routers are connected and have proper routing (like RIP or static routes).

   iv) 2 PCs not belonging to any subnets.

   They cannot ping because without an IP and subnet, the devices don’t know where to send data.