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LAB – 3: Network Devices and Basic Configuration

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Network Devices and Basic Configuration

Exercises

Q.1. Repeater: A Repeater is a device that works on layer 1 of the OSI model and has only two ports. It receives packets from one port and forwards it to another port.

Hub: A hub, also a Layer 1 device, receives packets and broadcasts them to all other ports in the network. Hubs cannot separate collision domains, resulting in a high likelihood of collisions.

Bridge: A bridge is a layer 2 device that performs frame filtering. It can separate collision domains, reducing the chances of collisions. When it receives a frame, it checks the destination MAC address and forwards the frame only if the destination is on the other side.

Switch: A switch sends incoming packets to all connected ports and gradually builds a switching table by learning and recording MAC addresses. Once the switching table is established, the switch forwards packets only to the specific port associated with the destination MAC address. **U**sing switches instead of hubs reduced the collisions and ensured that data was only sent to the intended recipient.

Q.2. A router is a device that operates at the network layer and is responsible for connecting multiple networks and facilitating the exchange of packets between them based on IP addresses. Routers analyze the destination IP address of incoming packets and determine the most efficient route to reach the desired network. They play a crucial role in network segmentation, enabling communication between different networks, and ensuring security by enforcing boundaries between networks.

In the lab, configuring a router allowed for successful communication between devices on different subnets. The router facilitated the transfer of data packets by correctly routing them based on IP addresses, demonstrating its essential role in network interconnectivity.

Q. 3. The observations for the activities are described as follows.

A. A Network Topology as shown in the Lab sheet was created.

1. IP addresses and Subnet Mask of all computers were set as given.

2. All pings were successful, with time <1ms to 16ms. Using ping from PC0 to PC1, PC2, PC3 and PC4, the packets were sent to all computers and received back. Same result seen on ping from PC1, PC2 and PC3.

3. In simulation mode, the ip addresses were pinged from the CLI. The packet traveled

to Hub 1 and was then multicasted to PC1 and Repeater. The Repeater multicasted the packet to Hub 2 and finally to PC2 and PC3. The packets were discarded by PC2 and PC3 and accepted only by PC1.

4. Upon initiating the ping command from PC0 and PC2 simultaneously to one another, I observed one packet loss in total. The first packet sent by both the PCs collided and one packet was dropped at the Repeater, because devices connected by a hub are in the same collision domain.

5. The Repeater was replaced by Bridge.

6. Using ping from PC0 to PC1, PC2, PC3 and PC4, the packets were sent to all computers and received back to PC0 and the same was observed when ping was done from PC1, PC2 and PC3 too.

7. At first, the packet was passed by Bridge to Hub1, delivering the packets to PC2 and PC3 too. But after that, the bridge seems to "learn it" and it does not forward the packets to the other side of the bridge unlike the Activity 3 above.

8. On initiating ping command from PC0 to PC2 and from PC2 to PC0 at once in simulation mode, there was no collision at Repeater unlike in Q.4, rather the packets were stored at Bridge and then forwarded to respective Hubs.

9. The hubs were replaced by Switches.

10. Ping command was executed from each PC to another PC turn by turn and the connectivity between the computers was verified.

11. On initiating the ping command from PC0 to PC1, the packet was multicast to Bridge and then to PC2 and PC3 via Switch1. But after that, the packets were forwarded to only PC1 by Switch1. Here, "learning" whom to forward the packet to is done by Switch only, unlike in Q.7 where it was done by Bridge.

12. Initiating the ping command from PC0 and PC2 to each other at the same time, the Bridge seemed to store it and forward the packet to destination at the same time just like in Q.8.

13. The IP addresses of PC2 and PC3 were changed as shown in the Lab sheet.

14. The ping command was successful for packet transmission between PC0 and PC1, or PC2 and PC3, there was no interconnection in between. This can be due to the fact that the PCs on the left and right are on different network addresses.

15. The connections could be made successful using a Router which can make communication between two different networks.

B. 1. Command: ping <IP-address>

The PCs on the same network connected through the switch could ping each other, but not through the router. PC0 pinged PC1 successfully, but couldn't ping PC2 and PC3, request timed out. It is because P1 is in the same subnet whereas P2 and P3 are in different subnets from P0.

2. Command: ping <IP-address>

PC2 successfully pinged PC3, and couldn't ping PC0 and PC1. The request timed out, because P2 and P3 are in the same subnet but P0 and P1 are in different one.

3. To configure the router0 to change it's hostname as "roshni":

I clicked on the router0 to open it's cli and then enabled the router. It took me to the privileged EXEC mode. Then I entered the configuration terminal using the

configure terminal command.

Command: hostname roshni

Then, the cli showed this:

roshni(config)#

4. Configuring the console password as: poudel

roshni(config)#line console 0

roshni(config-line)#password poudel

roshni(config-line)#login

roshni(config)#exit

User Access Verification

Password:

On typing 'poudel', I was prompted to the User EXEC mode

5. Configuring the enable password as: cisco

roshni(config)#enable password cisco

roshni(config)#exit

roshni#disable

roshni>enable

Password: *on typing the password cisco, I entered the privileged EXEC mode.*

6. Configuring the telnet password as: class

roshni(config)#line vty 0 4

roshni(config-line)#password class

roshni(config-line)#login

7. Configuring the ethernet Interface, using IP address of the Router and with subnet address of 255.255.255.0

roshni(config)#interface gigabitEthernet 0/0

roshni(config-if)#ip address 200.10.8.1 255.255.255.0

roshni(config-if)#no shutdown

roshni#write memory

8. In Command Prompt of PC0, the following command was executed to connect to the router using telnet:

C:\>telnet 200.10.8.1

Password: *upon entering the password: class, User access was allowed.*

9. Other interface of the Router was also configured as:

roshni(config)#interface gigabitEthernet 0/1

roshni(config-if)#ip address 200.10.9.1 255.255.255.0

roshni(config-if)#no shutdown

roshni#write memory

10. On using ping command to test the connectivity from PC0 to PC1 and IP address of router Ethernet0 (200.10.8.1), the packet transfer was successful. Ping from PC0 to other hosts and IP address of router Ethernet1(200.10.9.1) were unsuccessful.

11. On using ping command to test the connectivity from PC3 to PC2 and IP address of router Ethernet1 (200.10.9.1), the packet transfer was successful. Ping from PC3 to hosts PC1 and PC0 and IP address of router Ethernet1(200.10.8.1) were unsuccessful due to the absence of a configured default gateway.

12. On using ping command to test the connectivity from Router to other PCs, all the packet transfer to all hosts were successful. No packet loss was detected.

13. Default gateway of PC0 and PC2 were set to 200.10.8.1 and 200.10.9.1.

14. From PC0, all pings were successful, except the ping to PC3. It is because the default gateway for PC3 was not configured. From PC3, only the pings to PC2 and router Ethernet1 were successful, but not PC0, PC1 and GigabitEthernet0/0 just like in qn. 11.

15. Default gateway of PC1, PC3 were set to 200.10.8.1 and 200.10.9.1 respectively.

16. All pings from each PC to other PCs and IP addresses of Router were successful.

17. All pings from the Router to all PCs were successful.

18. Almost all activities were exhibited in simulation modes, with an unusual behavior observed: switch was sending packets to all PCs and the router, which were discarded.

Conclusion:

In this lab session, we used the CISCO Packet Tracer simulation tool to visualize the movement of packets. We created networks using hubs, bridges, switches, and routers to understand their respective functionalities. Hubs distributed received packets to all ports, bridges filtered frames, and switches maintained a switching table to learn MAC addresses. Additionally, we configured the network using routers and conducted connectivity tests, including establishing a telnet connection. Overall, we gained practical insights into the operation of networking components and performed various network-related tasks during the lab.