COMPUTER COMMUNICATION AND NETWORKING LAB (IT 205)

LAB 5

Name: Sachin Prasanna

Roll no. : 211IT058

Q1.

ICMP Packet:

An ICMP (Internet Control Message Protocol) packet is a type of network packet that is used to communicate information about the status of a network connection. It forms a key part of the Internet Protocol suite, which is the set of protocols that are used to manage network communications on the Internet.

ICMP packets are typically used to diagnose and troubleshoot network problems. They can also be used for other purposes such to identify the path that data takes from one device to another on a network.

ARP Packet:

ARP Packet is a network packet that is used to get the MAC address of a device from its corresponding IP address.
When a device on a network needs to send data to another device, it first needs to determine the MAC address of the destination device. The device sends an ARP packet to the network, requesting for the MAC address of the destination device with a given IP address. The destination device then responds with its MAC address, which the sending device can then use to send the data directly to the destination. This is the main use of the ARP packet.

Scenario 1: Set ICMP packet transfer/Ping between PC0 and PC2 and record the result.

Answer: An ICMP packet is sent from PC0 to the Hub. The Hub then sends an ICMP packet to both PC1 and PC2. Since the packet was intended for PC2, PC1 rejects the packet and PC2 accepts the packet. PC2 then sends an acknowledgement back to the Hub signifying that the ICMP Packet has been received. The Hub then broadcasts the acknowledgement to both PC0 and PC1. Since the acknowledgement was meant for PC0, PC0 accepts the acknowledgement and PC1 rejects it and the transmission is complete. Here, Packets are BROADCASTED.

Scenario 2: Set ICMP packet transfer /Ping between PC3 and PC5 and record the results.

Answer: An ICMP and ARP packet is to be sent by PC3. Initially, it sends an ARP packet to the switch so that it can find out PC5s (receiver) MAC address. This ARP packet is broadcasted by the switch to PC4 and PC5. Since the IP address of PC5 (the receiver) matches with the IP address

mentioned in the ARP packet, PC5 sends back an ARP packet to the switch specifying it is receiver. The switch then forwards this packet to PC3.

Now, PC3 sends the ICMP packet to the switch, the switch knows which is the exact receiver now, so it does not have to broadcast the ICMP packet. It sends the ICMP packet to PC5, which then sends an acknowledgement back to the switch. The switch sends this acknowledgement to PC3 and the transmission is complete.

Difference between HUB and SWITCH:

The major difference between Hub and Switch is that Hub functions in half duplex mode and Switch functions in full duplex mode. Hub always broadcasts any packet but Switch can multicast, unicast or broadcast packets, it can do any of the 3. Finally, Hub functions in the Physical layer and Switch functions in the Data Link layer.

Q2.

a) ICMP packets and ARP packets are transferred. They are broadcasted by the Hub. Yes, the packets get transferred to hub1. Yes, packets get transferred to PC3, PC4 and PC5.

b) Both ARP and ICMP packets are transferred. They are broadcasted by the Hub. Yes, the packets get transferred to hub1. Yes, the packets get transferred to PC3, PC4 and PC5.

c) Both ARP and ICMP packets are transferred. PC0 sends ICMP packet. PC3 sends ICMP and ARP packets. They are broadcasted by the hubs. Yes, the packets get transferred to hub1. Collision occurs at both the hubs, therefore the packet sent from PC0 cannot be successfully received by Hub1 and packet sent from PC3 cannot be received by Hub0. But as PC2 is directly connected to Hub0 and PC5 to Hub1, the packet may be successfully received. Finally, only one of the two packets is received successfully.

d) Both ARP and ICMP packets are transferred. They are broadcasted by both the hubs. Yes, packets are transferred to PC3, PC4 and PC5. Since the ARP packets sent collide with each other, the MAC address cannot be resolved. Hence, the packets are not accepted by the destination (They do not reach the destination).

e) ICMP packet is not sent anywhere and fails immediately. So, the packet is not received at the destination.

Q3.

a) ICMP and ARP packets are transferred. ICMP is unicasted by Switch0, ARP is broadcasted by the Switches. Yes, ARP packet gets transferred to Switch1. ARP packets are sent to PC3, PC4 and PC5. But, ICMP packets are NOT transferred to Switch1 and hence not transferred to PC3, PC4 and PC5.

b) ICMP and ARP packets are transferred. ICMP is unicasted by both Switches, ARP is broadcasted by the Switches. Yes, ICMP and ARP gets transferred to Switch1. Yes, ARP packets are transferred to PC3, PC4, PC5. ICMP packet is transferred ONLY to PC4.

c) ICMP and ARP packets are transferred. PC3 sends both ARP and ICMP packets. PC0 sends ICMP packet. ICMP is unicasted, ARP is broadcasted by the Switches. ICMP packet from PC0 is transferred to Switch0 and then unicasted to PC2 and ICMP packet from PC3 is transferred to Switch1 and unicasted to PC5. Yes, the packet is received by the destination properly.

d) ICMP and ARP packets are transferred. PC0 sends ICMP packet. PC5 sends ARP and ICMP packets. ICMP is unicasted, ARP is broadcasted. Yes, packets are transferred between the switches. PC0 sends the ICMP packet to Switch0 which unicasts it to Switch1 which then unicasts it PC4. PC5 sends the ICMP packet to Switch1 which unicasts it to Switch0 which then unicasts it PC2. Yes, packet is accepted by the destination as a switch operates in full duplex mode and no collision occurs while transferring of packets.

e) The packet does not get transferred anywhere. So, the packet is not received by the destination.

Q4.

a) ICMP and ARP packets are sent. ARP packets are broadcasted from the Hub0 to PC1 and PC2 and Switch2 and further to all other PCs to resolve the MAC address. The ICMP packet gets transferred to

Switch2 as it is broadcasted by Hub0. No, the ICMP packet is not transferred to PC3, PC4 and PC5 as the Switch2 does not transfer it to Hub1.

b) ICMP and ARP packets are sent. They are broadcasted by the Hubs and Unicasted by Switch2. Yes, both ICMP and ARP packets are transferred to Switch2. Switch2 unicasts the packet to Hub1. Hub1 broadcasts the packets to PC3, PC4 and PC5. Hence, packets are transferred to PC3, PC4 and PC5.

c) ICMP and ARP packets are sent. ICMP packet is sent from PC0 and ICMP and ARP packets are sent from PC5. ICMP packet is transferred from PC0 to Hub0, and PC3 to Hub1 simultaneously. Hub0 broadcasts the ICMP packet to PC1, PC2, and Switch2 whereas Hub1 broadcasts the packet to PC4, PC5, and Switch2. Switch2 then unicasts the ICMP packets to Hub0 and Hub1 which is then broadcasted by the hubs to reach the required destination. Clearly, the packet is transferred to Switch2. Yes, the packet is received successfully by the destination.

d) ICMP and ARP packets are sent. ICMP packet is sent from PC0 and ICMP and ARP packets are sent from PC5. They are broadcasted from the Hubs and unicast from Switch2. The ICMP packet is initially transferred from PC0 to Hub0 and from PC5 to Hub1. The hubs broadcast the received packet to all connected devices. Switch2 receives packets from both Hub0 and Hub1. Those packets are then unicast to the corresponding Hubs. Hub0 and Hub1 broadcast the received packets to all devices connected to them. Hence, PC4 and PC2 receive the packets successfully. The switch has a pool of buffer space which is used to control congestion in the network. Also, the

switch is full duplex which allows communication in both directions at the same time. Due to these reasons, the switch is able to handle multiple packets at the same time and send the packets to the destination correctly.

e) The packet does not get transferred anywhere. So, the packet is not received by the destination.

Working Principle of Hub:

A hub is a device that allows multiple devices to be connected to a single network. The working principle of a hub is like that of a switch, that it allows devices to communicate with each other by routing data packets between them. However, unlike a switch, a hub does not have the ability to read the destination address of a data packet and route it accordingly. Instead, a hub simply broadcasts all data packets it receives to all connected devices, regardless of their destination.

Thus, it is less efficient than using a switch because all devices must process every data packet, even if it is not intended for them.

Working Principle of Switch:

A switch is also a networking device that is used to connect multiple devices together on a network. It is similar to the hub in that it allows devices on a network to communicate with each other, but it uses a

different approach than the hub to manage the flow of data in a particular network.

Unlike a hub, which broadcasts data to all devices on the network, a switch only sends data to the specific device that it is intended for. This is done using a process called MAC address learning, in which the switch maintains a table of the MAC (Media Access Control) addresses of all of the devices on the network.

This improves the network performance, as only the intended receiver receives the data, rather than all devices on the network like in the case of the hub.