

Chapter - 21

- The delivery of a packet to a host or a router requires two levels of addressing:- logical & physical.
We need to map a logical address to its corresponding physical address. This can be done by using either static or dynamic mapping.
- Static mapping involves in the creation of a table that associates a logical address with a physical address. This table is stored in each machine on the network.
Each machine that knows IP address of another machine but not its physical address, can look it up in table.
This has some limitations because physical addresses may change in following ways:-
 - a machine could change its NIC, resulting in a new physical address.
 - a mobile computer can move from one physical ^{network} to another, resulting in a change in physical address.

1. ARP stands for Address Resolution protocol. It helps to find the IP address of the destination host on next hop. Whenever we send a packet from source to destination host, it requires to identify the way to deliver this packet to the next hop first. For this, IP packet refers its routing table. Since, data link layer services are used by IP to get physical address of the next hop which is done by a protocol called ARP.

→ Hence, data link layer services are used by IP. Size of ARP packet is not fixed because it is variable & depends on the length of physical & logical address used.

$$\begin{aligned}\text{2) ARP Packet Size} &= 2 + 2 + 1 + 1 + 2 + 1 + 9 + 6 + 4 \\ &= 28 \text{ bytes}\end{aligned}$$

3) Size of ARP packet in question 2 is 28 bytes. We need to pad the data to have minimum size of 46. The size of the packet in the Ethernet frame is then calculated as $6 + 6 + 2 + 46 + 4 = 64$ bytes.

- ④ The broadcast for Ethernet is all 1s or $0 \times \text{FFFFFFFFFFFF}$.
- ⑤ This restriction prevents ICMP packets from flooding the network. Without this, restriction an endless flow of ICMP packets could be created.
- ⑥ The IP header is included because it contains IP address of the original source. The first 8 bytes of data are included because they contain first section of TCP or UDP header which contains info about port numbers (TCP & UDP) & sequence no (TCP). This information allows the source to direct the ICMP message to the correct application.
- ⑦ A host would never receive a redirection message if there is only one router that connects local network to outside world.
- ⑧ The min size of an ICMP packet is 8 bytes (router solicitation packet). The largest of the ICMP packets is the router advertisement packets.
The max size :-

$$255 \times 8 + 8 = 2048 \text{ bytes}$$

(9) The min size of an IP packet that carries an ICMP packet would be 28 bytes (20 byte IP header + 8 byte router solicitation packet).
The max size would be 2060 bytes (20 byte IP header + a 2040 byte router advertisement packet).

(10) The value of the protocol field of an IP packet carrying an ICMP packet is 1.

(11) The min size would be 64 bytes if we do not consider the preamble & SFD fields, which are added at physical layer. The max size would be 1518 bytes, again not considering the preamble & SFD fields.

(12) There is no need for a report message to travel outside of its own network because (i) its only purpose is to inform the next router in spanning tree of group membership.

(ii) to poll the local network for membership in any groups.

(13)

0 x 0001	0 x 0000
0 x 06 0 x 04	0 x 0001
0 x 2345A B4F	
0 x 67CD	0 x 78D (125.95)
0 x 170C (23.12)	0 x 0000
0 x 00000000	
0 x 7B0 @ F0A (125.11.78.10)	

(14)

Same as above que (13) concept
0 x 0000 to 0 x AABB

(15)

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of os padding

0 x 2345A B4F67CD	0 x AABBA2F6A	0 x 0006	CR0
destination addr.	source addr.	Type	Data

(16)

Same as above (15)

(17)

It could happen that host B is unreachable, for some reason. The error message generated by an intermediate router could then be lost on its way back to host A.

(18) The checksum is 0x D399 or 1101 0011 1001 1001 or calculated:-

	1	2	1	2
8 and 0	→	0	8	0 0
0	→	0	0	0 0
123	→	0	0	7 B
25	→	0	0	1 9
Hand e	→	4	8	6 5
1 & I	→	6	C	6 C
0 & pad	→	6	F	0 0
Partial sum		2	C	6 5
Carry from last column				1
Sum		2	3	6 6
Checksum		D	3	9 9

(19) The appropriate ICMP message is destination unreachable message. In the case, the code is 0, which means network is unreachable.

(20) The appropriate ICMP message is destination unreachable message. In the case, the code is 3, which means port is unreachable.

IP	11100111	0
ethernet → 00000001	00000000	01011110

4 $0 \times 01005 \in 20309$

- (22) A router should send only 1 query message no matter, how many entries it has in its group table. The message will be broadcast to all of the local nodes that are below in its spanning tree.

(23) The host must send as many as five different report messages at random times in order to preserve membership in five different groups.

Q9) The router will not need the service of ARP because the frame is broadcast at the physical address level.

②c) No action should be taken

② It should set the state of 2 entries to Delaying & start a timer for each within a random time.

(27)

Ethernet

supported no of groups using 23 bits = 2^{23}
IP

supported no of groups using 28 bits = 2^{28}
Address space lost

$$2^{28} - 2^{23} = 260, 046, 048$$

(28)

- a) IP : 234.18.72.0 → Ethernet : 0x01005E124 008
b) IP : 235.18.72.0 → Ethernet : 0x01005E124 008
c) IP : 237.18.6.00 → " : _____
d) IP : 224.00.12.0 → " : _____