Problem 1 Solution

If we need to send a burst of packets that an IP that we do not know the MAC address yet, then we will send an ARP request for each packet. These duplicate ARP requests will waste network resources.

To solve this problem, we can keep track of IP address that we sent an ARP request and waiting for a reply. Then, if we need to resolve an IP address that we recently sent out an ARP request, we can just wait for the reply to that request instead of sending a new ARP request.

Problem 2 Solution

a)

Let P(A) denote the probability that A succeeds in a slot. We have:

$$P(A) = p(1-p)(1-p)(1-p) = p(1-p)^3$$

Hence the probability for A succeeds in slot 3 for the first time is:

$$(1-P(A))^2 P(A) = (1- p(1-p)^3)^2 p (1-p)^3$$

b)

The probability that node A succeeds in slot 4 is $P(A)= p(1-p)^3$

The probability that node B succeeds in slot 4 is $P(B) = p(1-p)^3$

The probability that node C succeeds in slot 4 is $P(C) = p(1-p)^3$

The probability that node D succeeds in slot 4 is $P(D) = p(1-p)^3$

The probability that some node succeeds in slot 4 is:

$$P_{success} = P(A)+P(B)+P(C)+P(D) = 4p(1-p)^3$$

because the events are mutually exclusive.

c)

We know $P_{success} = 4p(1-p)^3$ from (b).

Hence the probability that the first success occurs in slot 5 is:

$$(1-P_{success})^4. P_{success} = (1-4p(1-p)^3)^4 4p(1-p)^3$$

Problem 3 Solution

IP-Source: 218.1.2.4

IP-Destination: 218.1.3.5

Frame-Source: 42-94-B3-FF-F6-2C

Frame-Destination: 13-24-B3-FF-F6-2C

Problem 4 Solution

a) We know that each row's parity can detect odd number of errors in that row. The 3 errors can occur in either one, two, or three rows. If they occur in two or three rows, then one of those rows has only one error, and its parity will detect the error. If all three errors occur in the same row, then the parity of that row will detect it.

b)

i) Adapter waits for 25600 bit times. For the 10-Mbps channel, this wait is $25600/(10*10^6)$ = 2.56 milliseconds.

ii) Adapter waits for 51200 bit times. For the 10-Mbps channel, this wait is $51200/(10*10^6)$ = 5.12 milliseconds.

c) These Ethernet stations spend N/3 time slots to select which one can send next, and then that station will send a packet which will last for 15 time slots. So only 15 times slots out of every N/3 + 15 time slots is used to send data, and the utilization will be 15/(N/3+15)=45(N+45).

Problem 5 Solution

Action	**Switch Table State**	**Link(s) packet is forwarded to**	**Explanation**
B sends a frame to E	Switch learns interface corresponding to MAC address of B	A, C, D, E, and F	Since switch table is empty, so switch does not know the interface corresponding to MAC address of E
E replies with a frame to B	Switch learns interface corresponding to MAC address of E	B	Since switch already knows interface corresponding to MAC address of B
A sends a frame to B	Switch learns the interface corresponding to MAC address of A	B	Since switch already knows the interface corresponding to MAC address of B
B replies with a frame to A	Switch table state remains the same as before	A	Since switch already knows the interface corresponding to MAC address of A