Question: 10.7.2 4E

Given the maximum size of an Ethernet packet (Figure 10.16), calculate the packet efficiency.

Solution:

Formula to calculate packet efficiency:

$$\text{Packet Efficiency} = \frac{\text{Size of the data field in bits}}{\text{Total packet size in bits}}$$

The maximum possible size of an Ethernet packet is 1618 bytes (Figure 10.16)

Data field – 1600
Destination MAC address – 6 bytes
Source MAC address – 6 bytes
Packet type – 2 bytes
CRC – 4bytes

Total – 1618 bytes

Size of the data field in bits = 1600×8

Total packet size in bits = 1600×8

$$\text{Packet Efficiency} = \frac{1600 \times 8}{1618 \times 8}$$

$$= \frac{12800}{12944}$$

$$= 0.9889$$

$$\text{Packet Efficiency in percentage} = 0.9889 \times 100$$

$$= 98.89\ \%$$

Note:

* 1 byte equals to 8 bits
* If the length of the packet is bigger, the packet efficiency increases.

Question: 10.7.2 5E

Many early timesharing computers provided connections across LANs and other networks. Many of these computers accepted data typed at a keyboard one character at a time. Thus, many of the messages sent to these systems contained no more than 1 byte's worth of actual data, after all headers were removed. If we transmit the smallest possible Ethernet packet, and it only contains 1 byte of data, what is the packet efficiency?

Solution:

Formula to calculate packet efficiency:

$$\text{Packet Efficiency} = \frac{\text{Size of the data field in bits}}{\text{Total packet size in bits}}$$

The smallest possible size of an Ethernet packet to transmit 1 byte of data is 64 bytes (Figure 10.16)

Data field – 46 bytes (to transmit 1 byte of data the minimum required data filed)
Destination MAC address – 6 bytes
Source MAC address – 6 bytes
Packet type – 2 bytes
CRC – 4bytes

Total – 64 bytes

Size of the data field in bits = 46×8

Total packet size in bits = 64×8

$$\text{Packet Efficiency} = \frac{46 \times 8}{64 \times 8}$$

$$= \frac{368}{512}$$

$$= 0.71875$$

$$\text{Packet Efficiency in percentage} = 0.71875 \times 100$$

$$= 71.875\ \%$$

Note:

* 1 byte equals to 8 bits
* If the length of the packet is smaller, the packet efficiency decreases.

137206