National University of Computer and Emerging Sciences, Lahore Campus

Introduction to Internet of Things (Code: IO4041)

Quiz 3 [BSCS-8A] Spring 2022

Date: May12, 2022 Weighatge: 2.5% Marks: 10 Duration: 20 Minutes

Name: ---------- Roll # ----------

Question 1: Suppose an IPv6 datagram is exactly 870 bytes wide which consists of IPv6 base header and an unfragmentable 30-byte hop-by-hop option header. Suppose we need to send this over a link with an MTU of only 158 bytes and this is possible only by performing fragmentation. Unfragmentable part in each fragment is followed by an 8-byte fragment header. Keeping in view this scenario, answer the following questions by showing necessary calculations in support of your answers: **[3+1.5+2+2 = 8.5 Marks]**

I. How many fragments will be needed? Show necessary calculations in support of your answer:
II. how many bytes of data including upper layer header are present in this original IPv6 datagram?
III. How many bytes of data will be carried by the first and last fragment?
IV. Now, suppose that there is one 40 byte fragmentable destination option header (i.e., soon after 30-byte hop-by-hop option header). In this case, how many fragments will be needed? Moreover, how many bytes of data will be carried by the first and last fragment?

Question 2: A. Write down the names of 3 main services of 6LoWPAN. [3* 0.5 = 1.5 Marks]

Question 1: Answer:

I. 10 fragments

Calculations:

original datagram size= 870 bytes

Unfragmentable part to be present in each fragment: IPv6 base header + hop-by-hop options header = 40 + 30 = 70 bytes

Fragmentable part in the datagram: 870 – 70 = 800 bytes

Fragment header in each fragment = 8 bytes

Thus, each fragment will have 78 necessary bytes and only 80 bytes are left for carrying fragmentable data of 800 bytes.

So, we need 800/80 = 10 segments

II. Calculations: total datagram size = 870 bytes

Size of headers = base header of 40 bytes + 1 option header of 30 bytes= 40 + 30 = 70 bytes

So, data bytes in this datagram = 870 – 70 = 800 bytes

III. 80 bytes, 80 bytes

IV. 11 fragments, 40 bytes, 40 bytes (if fragmentable destination option header is considered in addition to 870 bytes datagrams i.e., making datagram size as 910 bytes),
Else 10 fragments, 40 bytes, 80 bytes (if fragmentable destination option header is considered as part of 870 bytes datagrams)

Question 2: Answer

I. Packet fragmentation and reassembly

II. Header compression

III. Link layer (layer 2) forwarding when multi-hop is used by the link layer