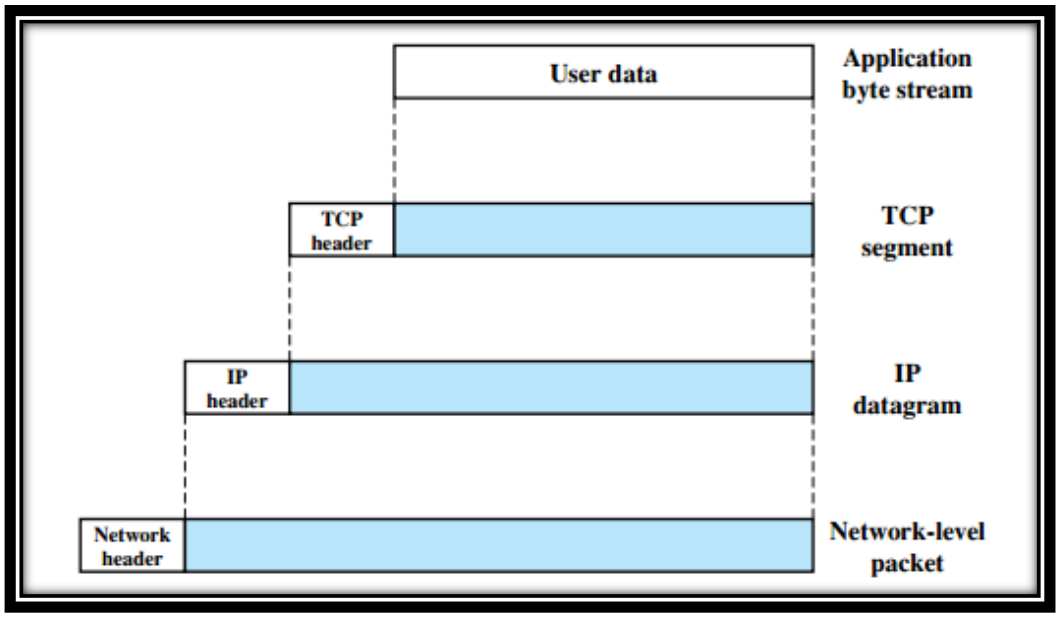
CPEG 572 Data and Computer Communications

ASSIGNMENT #6

Q.1

In Figure below exactly one protocol data unit (PDU) in layer *N* is encapsulated in a PDU at layer (*N* – 1). It is also possible to break one *N*-level PDU into multiple (*N* – 1)-level PDUs (segmentation) or to group multiple *N*-level PDUs into one (*N* – 1)-level PDU (blocking).



a. In the case of segmentation, is it necessary that each (*N* – 1)-level segment contain a copy of the *N*-level header?
No this is not necessary. This will violate the principle of separation of layers. The N level protocol data unit is simply data. The N-1 level doesn't know about N format of the N level protocol data unit. It just breaks the protocol data unit in fragments and reassembles them in proper order.

b. In the case of blocking, is it necessary that each *N*-level PDU retain its own header, or can the data be consolidated into a single *N*-level PDU with a single *N*-level header?
No it is not necessary that each N level protocol data unit to retain its own header. This will also violate the principle of separation of layers.

Q.2

A TCP segment consisting of 1500 bits of data and 160 bits of header is sent to the IP layer, which appends another 160 bits of header. This is then transmitted through two networks, each of which uses a 24-bit packet header. The destination network has a maximum packet size of 800 bits. How many bits, including headers, are delivered to the network layer protocol at the destination?

Total data = Internet header + data + transport header

Total data = 160 + 1500 + 160 = 1820

Since the data is delivered as sequence of packets. Each of which contains 24 bits of packet header and up to 776 bits of higher-layer headers and/or data. So three 2^{nd} layers packets are needed.

Total bits delivered at 2^{nd} layer = Total Data + No. of packets * header size

= 1820 + 3 * 24 = 1892 bits

Q.3

Why is UDP needed? Why can't a user program directly access IP?

UDP provides the source and destination port addresses and a checksum that covers the data field. Application can't access the IP directly because of the lack of application level addressing i.e. Port. Whereas, UDP will add the application level addressing.

Q.4

A broadcast network is one in which a transmission from any one attached station is received by all other attached stations over a shared medium. Examples are a bus-topology local area network, such as Ethernet, and a wireless radio network. Discuss the need or lack of need for a network layer (OSI layer 3) in a broadcast network

The network layer is responsible for routing data through the network, but with a broadcast network, routing is not needed. Sequencing, flow control, error control between end systems, can be accomplished at layer 2, because the link layer will be a protocol directly between the two end systems, with no intervening switches. So it would seem that a network layer is not needed.

The upper layer sees itself attached to an access point into a network supporting communication with multiple devices. The layer for assuring that data sent across a network is delivered to one of a number of other end systems is the network layer. This argues for inclusion of a network layer.

In fact, the OSI layer 2 is split into two sub layers. The lower sub layer is concerned with medium access control, assuring that only one end system at a time transmits, the MAC sub layer is also responsible for addressing other end systems across the LAN.

The upper sub layer is called Logical Link Control. LLC performs traditional link control functions. With the MAC/LLC combination, no network layer is needed.

Q.5

In order to be able retransmit lost packets, TFTP must keep a copy of the data it sends. How many packets of data must TFTP keep at a time to implement this retransmission mechanism?

In TFTP, when a sender has transmitted the packet, it starts a timer. If the timer expires before the acknowledgment is received from receiver, sender retransmits the same packet. If in fact the original packet was lost, then the retransmission will be the first copy of this packet received by receiver. If the original packet was not lost but the acknowledgment from receiver was lost, then receiver will receive two copies of the same packet from sender and simply acknowledges both copies.