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**DUBAI INTERNATIONAL ACADEMIC CITY, DUBAI**

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**COURSE:** CSF303 (Computer Network)

**COMPONENT:** Tutorial Sheet 2 **DATE:** 15th February 2024

1. A system has an *n*-layer protocol hierarchy. Applications generate messages of length *M* bytes. At each of the layers, an *h*-byte header is added. What fraction of the network bandwidth is filled with headers?

Ans:

With ***n*** layers and ***h*** bytes added per layer, the total number of header bytes per message is ***hn***, so the space wasted on headers is ***hn***. The total message size is ***M + nh***, so the fraction of bandwidth wasted on headers is

***hn*** */ (M +* ***hn****).*

1. When a file is transferred between two computers, two acknowledgement strategies are possible. In the first one, the file is chopped up into packets, which are individually acknowledged by the receiver, but the file transfer as a whole is not acknowledged. In the second one, the packets are not acknowledged individually, but the entire file is acknowledged when it arrives. Discuss these two approaches.

Ans:

If the network tends to lose packets, it is better to acknowledge each one separately, so the lost packets can be retransmitted. On the other hand, if the network is highly reliable, sending one acknowledgement at the end of the entire transfer saves bandwidth in the normal case (but requires the entire file to be retransmitted if even a single packet is lost).

1. Which OSI layer header contains the address of a destination host that is on another network?

Ans: Network Layer

1. Which statements correctly describe steps in the OSI data encapsulation process?
   1. The transport layer divides a data stream into segments and may add reliability and flow control information.
   2. The data link layer adds physical source and destination addresses and an FCS to the segment.
   3. Packets are created when the network layer encapsulates a frame with source and destination host addresses and protocol-related control information.
   4. Packets are created when the network layer adds Layer 3 addresses and control information to a segment.
   5. The presentation layer translates bits into voltages for transmission across the physical link.

Ans: A& D

The transport layer segments data into smaller pieces for transport. Each segment is assigned a sequence number, so that the receiving device can reassemble the data on arrival.

The transport layer also use flow control to maximize the transfer rate while minimizing the requirements to retransmit. For example, in TCP, basic flow control is implemented by acknowledgment by the receiver of the receipt of data; the sender waits for this acknowledgment before sending the next part.

-> A is correct.

The data link layer adds physical source and destination addresses and an Frame Check Sequence (FCS) to the packet (on Layer 3), not segment (on Layer 4) -> B is not correct.

Packets are created when network layer encapsulates a segment (not frame) with source and destination host addresses and protocol-related control information. Notice that the network layer encapsulates messages received from higher layers by placing them into datagrams (also called packets) with a network layer header -> C is not correct.

The Network layer (Layer 3) has two key responsibilities. First, this layer controls the logical addressing of devices. Second, the network layer determines the best path to a particular destination network, and routes the data appropriately.

-> D is correct.

The Physical layer (not presentation layer) translates bits into voltages for transmission across the physical link -> E is not correct.

1. • Which layer in the OSI reference model is responsible for determining the availability of the receiving program and checking to see if enough resources exist for that communication?

Ans: application\*

1. Which of the following is an example of physical layer vulnerability?  
   a)MAC Address Spoofing  
   b) Physical Theft of Data  
   c) Route spoofing  
   d) Weak or non-existent authentication
2. **How Data breaks down on each layer from top to bottom ?**
3. Refer to the exhibit. An administrator pings the default gateway at 10.10.10.1 and sees the output as shown. At which OSI layer is the problem?

|  |
| --- |
| C:\> ping 10.10.10.1 Pinging 10.10.10.1 with 32 bytes of data: Request timed out. Request timed out. Request timed out. Request timed out. Ping statistics for 10.10.10.1: Packets: sent – 4, Received = 0, Lost – 4 (100% loss) |

Ans: The Network layer is responsible for network addressing and routing through the internetwork. So a ping fails, you may have an issue with the Network layer (although lower layers like Data Link & Physical may cause the problem).

The command ping uses ICMP protocol, which is a network layer protocol used to propagate control message between host and router. The command ping is often used to verify the network connectivity, so it works at the network layer.

1. How long does it take to send a file of 640,000 bits from host A to host B over a circuit-switched network?

All links are 1.536 Mb/s

Each link uses TDM with 24 slots/sec (TDM = Time Division Multiplexing)

500 msec to establish end-to-end circuit

For a TDM link, time is divided into frames of fixed duration and each frame is divided into a fixed number of time slots. When the network establish a connection across a link, the network dedicates one time slot in every frame to the connection. These slots are edicated for the sole use of that connection, with a time slot available for use (in every frame) to transmit the connection's data.

Each circuit has a transmission rate of (1.536 Mbps)/24 = 64 Kbps, so it takes (640000bits)/(64 Kbps) = 10 seconds to transmit the file. To this 10 seconds we add the the circuit establishment time, giving 10.5 seconds to send the file. Note that the transmission time is independent of the number links: the transmission time would be 10 seconds if the end-to-end circuit passes through one link or one-hundred links.

10.

