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CMPE 206- Computer Network Design

Homework 1

1. TCP/IP network stack
    a. Purpose of routing protocol?
        i. Protocol is a set of rules and conventions. When the communicating parties stick to a common protocol, communication is possible.
        ii. The routing protocol provides with the information responsible for communication. It provides router with the specific path to use for the exchange of data.
    b. The CSMA/CD (Carrier Sense Multiple Access with collision Detection) and CSMA/CA (Collision Avoidance) would help to allow conversations in the environment as described in the question.
        i. The speakers would wait in the room until it is quiet so they can speak. They would wait for sometime for the other speaker (hoping they would not speak at the same time) and hence providing a delay.
        ii. It would not be efficient but it would provide with clarity of conversation.
        iii. CSMA provides with a multi-point-to-point network. So there are multiple endpoints in the shared medium (just like there are multiple speakers in the classroom as the scenario provided in the question).
    c. Difference between Data Link and Physical Layer
        i. Physical Layer:
            1. Physical Layer provides the foundation on which the other layers a built. It is responsible for providing a good way of transport (a connection) so that exchange of information is possible.
        ii. Data Link Layer
            1. Link Layer is basically responsible for managing the flow of data across the connection which is established by the physical layer. It controls the flow of data and also provides error detection.
    d. Names of units of data transmission at Link Layer, Network, Physical Layer:
        i. Link Layer:
            1. A frame which is series of bits
        ii. Network Layer:
            1. A packet which has the address of source and destination.
        iii. Transport Layer:
            1. A segment which has the TCP header and data.
        iv. Some other units: bps, Kbps, bytes, Kbps, Mbps.
    e. Functionality of Transport layer:
        i. Transport Layer basically provides end-to-end communication over a network. It accepts the data then passes it to the network layer so that the packets arrive correctly at the other end using the message headers and control messages.

ii. Transport Layer provides segmentation which means it divides a message into a segment and each segment contains the sequence number which helps this layer to reassemble the package. They are reassembled when they reach the destination and also takes care of the packages lost in transmission.

iii. In the end to end transmission of data, transport layer also performs error control to make sure that the complete address arrives at the other end through retransmission (the receiving transport layer).

2. Difference between connectionless communication and connection oriented communication:

a. Connection Oriented: Connection oriented communication requires a session prior to exchange of information. It sets up an end to end link through a virtual network. The order of data remains unchanged.

i. Example: TCP protocol, which provides three-way handshake to establish the connection, each endpoint is responsible for the communication as a whole.

ii. Example: In transport layer, A connection is made prior to delivering packets to the destination.

b. Connectionless: Here, no effort is required to establish a connection. The data is transferred from source to destination without checking if the destination exists.

i. Example: IP, SMTP, UDP are some examples as they allow messages to be exchanged without having a continuous flow of conversation.

ii. Example: transport Layer- Here, each segment is an independent package which is sent to the transportation layer of the destination machine.

3. 3.1 coding

a. 3.1.1

i. Remove stop statements from the code. Thus removing clientApps.stop() and serverApps.stop().

b. 3.1.2

i. Server

Pkt size/ Data Rate	512bps	1Kbps	512Kbps	1Mbps
128	4.46975s	3.265s	2.00347s	2.00226s
256	6.46975s	4.289s	2.00547s	2.00329s
1024	18.4698s	10.433s	2.01747s	2.00943s

ii. Client

Pkt size/ Data Rate	512bps	1Kbps	512Kbps	1Mbps
128	6.9395s	4.53	2.00694s	2.00453s

256	10.9395s	6.578s	2.01094s	2.00658s
1024	34.9395s	18.866s	2.03494s	2.01886s

3.2 coding
1. 3.2
   a. 3.2.1
      i. When we set the new server it is 'somewhat' important to pay attention to the port number of the echo server so that it does not conflict with the socket of other echo server application.
   b. 3.2.2
      i. When both the applications are running server receives first message at 2.0078s and the other at 2.0079s, the client receives first message at 2.01761s and second at 2.01929s.
      ii. When one echo client and echo server is running server receives first message at 2.0078s and client receives first message at 2.01761s.

3.3 coding
1. 3.3.1
   a. Throughput:
      i. Client to server: 0.827515 Mbps
      ii. Server to client: 0.75404 Mbps
2. 3.3.2 student id = 009523553 , so 9+3= 12 wifi devices.
   a. Server position: (-2.74339, 3.90652)
   b. Client position: (9.01336, 28.9621)
   c. Throughput from server to client: 1.59167 Mbps
   d. Throughput from client to server: 1.38001 Mbps
   e. Server IP: 10.1.3.1
   f. Client IP: 10.1.3.12