Indian Institute of Technology, Guwahati
CS341 - Computer Networks
ASSIGNMENT 3

Answer all questions

1. Consider that only a single TCP (Reno) connection uses one 10Mbps link which does not buffer any data. Suppose that this link is the only congested link between the sending and receiving hosts. Assume that the TCP sender has a huge file to send to the receiver, and the receiver's receive buffer is much larger than the congestion window. We also make the following assumptions: each TCP segment size is 1,500 bytes; the two-way propagation delay of this connection is 150 msec; and this TCP connection is always in congestion avoidance phase, that is, ignore slow start.
   (a) What is the maximum window size (in segments) that this TCP connection can achieve?
   (b) What is the average window size (in segments) and average throughput (in bps) of this TCP connection?
   (c) How long would it take for this TCP connection to reach its maximum window again after recovering from a packet loss?

2. Suppose the network layer provides the following service. The network layer in the source host accepts a segment of maximum size 1,200 bytes and a destination host address from the transport layer. The network layer then guarantees to deliver the segment to the transport layer at the destination host. Suppose many network application processes can be running at the destination host.
   (a) Design the simplest possible transport-layer protocol that will get application data to the desired process at the destination host. Assume the operating system in the destination host has assigned a 4-byte port number to each running application process.?
   (b) Modify this protocol so that it provides a "return address" to the destination process.
   (c) In your protocols, does the transport layer "have to do anything" in the core of the computer network?

3. The set of IP addresses from 29.18.0.0 to 19.18.128.255 has been aggregated to 29.18.0.0/17. However, there is a gap of 1024 unassigned addresses from 29.18.60.0 to 29.18.63.255 that are now suddenly assigned to a host using a different outgoing line. Is it now necessary to split up the aggregate address into its constituent blocks, add the new block to the table, and then see if any reaggregation is possible? If not, what can be done instead?

   A router has the following (CIDR) entries in its routing table:

Address/Mask	**Next Hop**
135.46.56.0/22	Interface 0
135.46.60.0/22	Interface 1
192.53.40.0/23	Router 1
Default	Router 2

   For each of the following IP addresses, what does the router do if a packet with that address arrives?

   (a) 135.46.63.10

   (b) 135.46.57.14

   (c) 135.46.52.2

   (d) 192.53.40.7

   (e) 192.53.56.7

4. Consider sending a 2400-byte datagram into a link that has an MTU of 700 bytes. Suppose the original datagram is stamped with the identification number 422. How many fragments are generated? What are the values in the various fields in the IP datagram(s) generated related to fragmentation?

5. What is DHCP? Why it is used? How DHCP client-server communication on same subnet differs form DHCP client-server communication on different subnets?

6. How many IPv6 addresses are there in one IPv6 enabled network interface and mention their purposes? What are the services of IPv4 which are discontinued in IPv6 and why?

7. What is traffic shaping and why it is required? Describe Leaky Bucket and Token bucket tecniques for traffic shaping and mention their differences. Which one is prefarable from the perspective of hosts/users and ISPs? Give reasons.

8. Why Network Address translation (NAT) is used? What are the different methods of network translation used in NAT? How a host behind a NAT can host a web service? What is STUN method and when it is used?

Best wishes