Final Review

R1. Listed are four strategies that can be used to provide a transport user with the address of the destination transport user. For each one, describe an analogy with the Postal Service user.

a. Know the address ahead of time.

Addressing a letter or package

b. Make use of a “well-known address”

The post office is a well known address

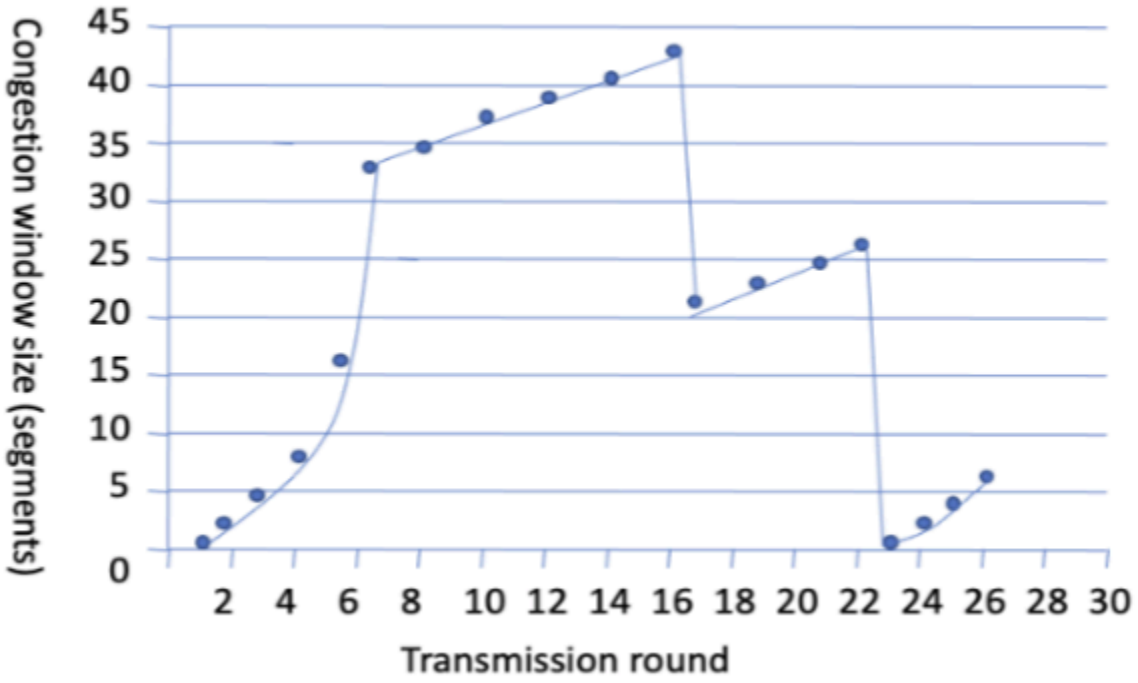
c. Use a name server.

A letter addressed to a company by title

d. Addressee is spawned at request time.

Hire a firm to forward mail to all addresses on a mailing list

R2. Consider the following plot of the TCP window size as a function of time. Assuming TCP Reno is the protocol experiencing the behavior shown above, answer the following questions. In all cases, you should provide a short discussion justifying your answer.



a). Identify the intervals of time when TCP slow start is operating.

[1,6] and [23,26], as the congestion is growing exponentially

b). Identify the intervals of time when TCP congestion avoidance is operating.

[7,16] and [17,22], as the congestion is growing linearly

c). After the 16th transmission round, is segment loss detected by a triple duplicate ACK or by a timeout?

Triple Duplicate ACK, the widow was only cut in half

d). After the 22nd transmission round, is segment loss detected by a triple duplicate ACK or by a timeout?

Timeout, traffic was linearly increasing but then shot to zero

e). What is the initial value of Threshold at the first transmission round?

32, as after that point slow start stopped and congestion avoidance began

f). What is the value of Threshold at the 18th transmission round?

21, the window reached a size of 42 and then lost packets thus dividing the threshold by 2

g). What is the value of Threshold at the 24th transmission round?

13, the window reached a size of 26 and then lost packets thus dividing the threshold by 2

h). During what transmission round is the 70th segment sent?

During the 7th transmission round, as during the 7th round the 64th through 127th segments are sent

i). Assuming a packet loss is detected after the 26th round by the receipt of a triple duplicate ACK, what will be the values of the congestion window size and of Threshold?

The congestion window and threshold will be a size of 4 as they will be set to half the size of the current congestion window (8)

R3. TCP and UDP.

UDP is a simple datagram based connection protocol, if data is lost you just try to send again, although it is not a very secure system.

TCP is connection oriented, congestion must be established before a connection is made (3-way handshake). Very secure and stable system is very good at minimizing errors in transmission.

R4. Describe why an application developer might choose to run an application over UDP rather than TCP.

UDP has minimal delay, supports multi broadcast communication, and is much simpler to use than TCP, especially when security is not required.

R5. Why is it that voice and video traffic is often sent over TCP rather than UDP in today's Internet.

TCP provides a stable and protected system due to firewalls that block UDP connection.

R6. TCP throughput

TCP Throughput <= (TCP Window Size)/(Round Trip Time (RTT))

TCP throughput represents the effective data rate achieved by TCP connections, balancing reliability with efficiency.

R7. TCP congestion control.

TCP congestion control dynamically adjusts sending rate based on network conditions, ensuring efficient data transfer while preventing congestion related issues

Slow Start

Additive Increase

Chapter 6 slides

1. *When congestion window is under threshold, sender is in slow start phase (exponential increase)*
2. *When congestion window is above threshold, sender is in congestion avoidance phase (linear increase)*
3. *Duplicate ACK occurs threshold is set to half of congestion window size and the window size is set to the new threshold*
4. *Timeout detected threshold is set to half maximum window size and the window is set to 1 Segment Size*