CS3212 計算機網路概論 期中考 (4/20/2007, 10:10-11:50)

Solution

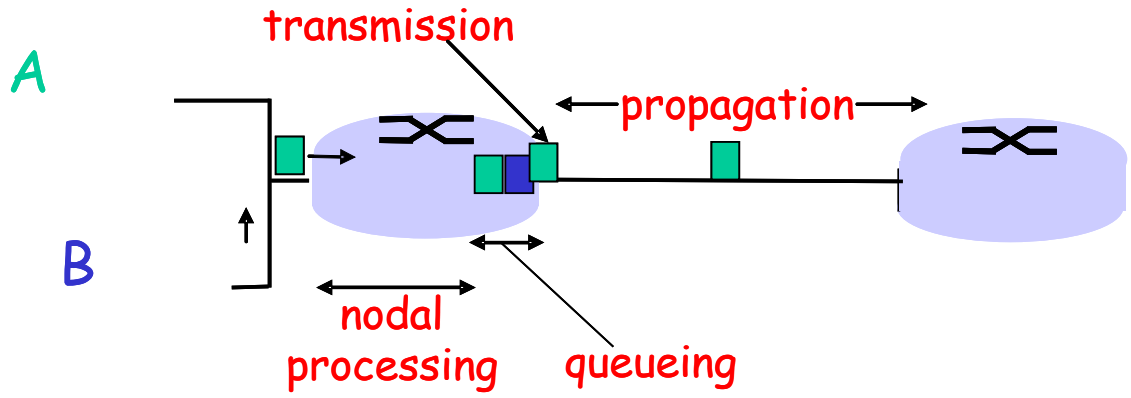
1.

	Advantages	Disadvantages
Circuit Switching	❑ dedicated resources, no sharing with others ❑ performance guaranteed	❑ call setup required ❑ low utilization of links
Packet Switching	❑ simpler and less costly than circuit switching ❑ better sharing of bandwidth ❑ more efficient (high utilization of links)	❑ packet delay ❑ packet loss ❑ not guarantee performance

2.

Flow control	❑ Allow a receiving TCP to regulate the rate at which data arrives from a sending TCP. ❑ The rate of segment transmission should be retrained because a lack of receiver buffer space.
Congestion control	❑ Senders sends data as fast as they can, and then slow down sending rate when detecting the network is congested

3.



processing delay	time required to examine the packet's header and determine where to direct the packet
queuing delay	the time that the packet waits to be transmitted onto the link while it is at the queue
transmission delay	also called the store-and forward delay, the amount of time required to push all of the packet's bit into the link
propagation delay	the time required to propagate a bit from the beginning of the link to the end of the link

4.

a) (10^7)/(2.5*10^8)=0.04, 0.04*10^6=40,000 bits

b) 40,000 bits

c) the bandwidth-delay product of a link is the maximum number of bits that can be in the link

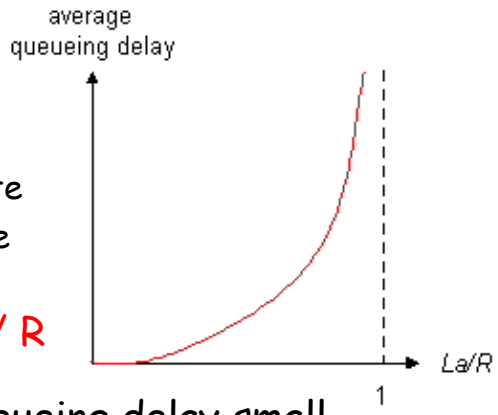
d) 10^7/40,000=250, 1 bit is 250 meters long

e) $\frac{m}{\frac{m}{s} * R} = s/R$

5.

- R = link bandwidth (bps)
- L = packet length (bits)
- a = average packet arrival rate
- L · a = average bit arrival rate

traffic intensity = (L · a) / R



- (L · a)/R ~ 0: average queueing delay small
- (L · a)/R -> 1: delays become large
- (L · a)/R > 1: more "work" arriving than can be serviced, average delay infinite! (infinite queue length) -- or packet loss! (finite queue length)

6.

The total amount of time to get the IP address is

$$RTT_1 + RTT_2 + \cdots + RTT_n .$$

Once the IP address is known, RTT_O elapses to set up the TCP connection and another RTT_O elapses to request and receive the small object. The total response time is

$$2RTT_o + RTT_1 + RTT_2 + \cdots + RTT_n$$

7.

a)

$$RTT_1 + \cdots + RTT_n + 2RTT_o + 3 \cdot 2RTT_o$$
$$= 8RTT_o + RTT_1 + \cdots + RTT_n .$$

b)

$$RTT_1 + \cdots + RTT_n + 2RTT_o + 2RTT_o$$
$$= 4RTT_o + RTT_1 + \cdots + RTT_n .$$

c)

$$RTT_1 + \cdots + RTT_n + 2RTT_o + RTT_o$$
$$= 3RTT_o + RTT_1 + \cdots + RTT_n .$$

8.

a)

1) When peer connects, it informs central server about his IP address and contents.
2) Peer X queries "Hey Jude" from centralized directory server and knows that Peer Y has the file.
3) Peer X requests file from Peer Y.

b)

1) Query messages of Peer X sends over his existing TCP connections (flooding)
2) Other peers forward Query messages
3) Peer Y sends QueryHit over reverse path
4) Peer X requests file from Peer Y

c)

1) Each file has a hash and a descriptor
2) Client sends keyword query to its group leader
3) Group leader responds with matches:
   - For each match: metadata, hash, IP address
4) If group leader forwards query to other group leaders, they respond with matches
5) Client then selects files for downloading
   - HTTP requests using hash as identifier sent to peers holding desired file

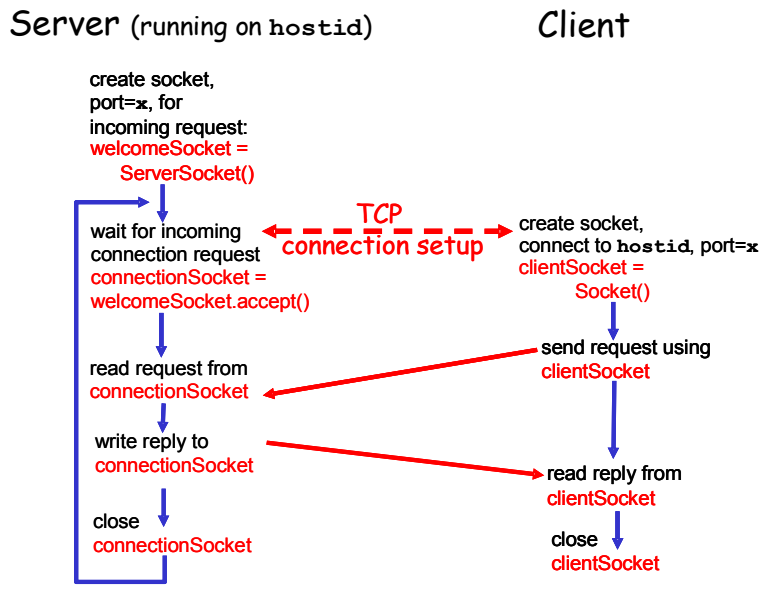
9.

a) Request queuing
   Limitation on the number of simultaneous uploads.
b) Incentive priorities
   Give priority to users who have uploaded more files than they have downloaded.
c) Parallel downloading
   Use the byte-range header of HTTP to request different portion of the file from different peers.

10.

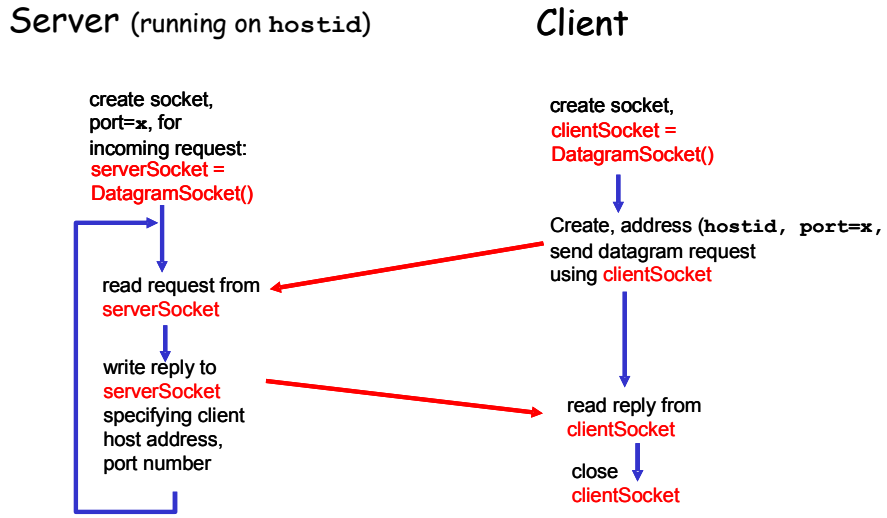
1)

Client/server socket interaction: TCP



OR

Client/server socket interaction: UDP



2)

a) Client uses “Client socket” to connect to server.
b) Server uses “Welcoming socket” to wait for “Client socket” connecting.
c) After “Welcoming socket” accepting “Client socket”, it creates a new socket that is called “Connection socket”. Communication between Server and Client goes through “Connection socket” and “Client socket”.