CECS 474 - Homework 2

Solution

Created by: Haixia Peng

Problem 1

Note that each downloaded object can be completely put into one data packet. Let Tp denote the one-way propagation delay between the client and the server.

First consider parallel downloads using non-persistent connections. Parallel downloads would allow 10 connections to share the 150 bits/sec bandwidth, giving each just 15 bits/sec. Thus, the total time needed to receive all objects is given by:

(200/150 + Tp + 200/150 + Tp + 200/150 + Tp + 100,000/150 + Tp) + (200/(150/10) + Tp + 200/(150/10) + Tp + 200/(150/10) + Tp + 100,000/(150/10) + Tp) = 7377 + 8*Tp (seconds)

Now consider a persistent HTTP connection. The total time needed is given by:

(200/150+Tp + 200/150 +Tp + 200/150 + Tp + 100,000/150+ Tp) + 10*(200/150 + Tp + 100,000/150 + Tp) = 7351 + 24*Tp (seconds)

Assuming the speed of light is 300*10^6 m/sec, then Tp=10/(300*10^6)=0.03 microsec. Tp is therefore negligible compared with transmission delay.

Thus, we see that persistent HTTP is not significantly faster (less than 1 percent) than the non-persistent case with parallel download.

Problem 2

For calculating the minimum distribution time for client-server distribution, we use the following formula:

$$D_{cs} = \max \{NF/u_s, F/d_{min}\}$$

Similarly, for calculating the minimum distribution time for P2P distribution, we use the following formula:

$$D_{P2P} = max\{F/u_s, F/d_{min}, NF/(u_s + \sum_{i=1}^{N} u_i)\}$$

Where, F = 15 Gbits = 15 * 1024 Mbits

u_s = 30 Mbps

$d_{min} = d_i$ = 2 Mbps

Note, 300Kbps = 300/1024 Mbps, 700Kbps = 700/1024 Mbps.

Thus, for Client Server:

	N=10	N=100	N=1000
u = 300 Kbps	7680	51200	512000
u = 700 Kbps	7680	51200	512000
u = 2 Mbps	7680	51200	512000

For Peer to Peer:

	N=10	N=100	N=1000
u = 300 Kbps	7680	25904	47558.60
u = 700 Kbps	7680	15616.10	21524.97
u = 2 Mbps	7680	7680	7680