Homework #2	CS 372	Rhea Mae Edwards

Review Questions

94/100

5/5

R5) Processes in different hosts communicate by exchanging messages. In order to recieve messages, a process must have an identifier. An identifier is the information that is used by a process running on one host to identify a process running on another host, which includes both the IP address and port numbers associated with the process on the host.

5/5

R6) You would want to use UDP to do a transaction from a remote client to a server as fast as possible, because it is just a single transaction you don't need to setup up an initial "connection" between the client and server; there wouldn't need to be any handshaking before sending any data which would take up more time to do

5/5

R11) HTTP, FTP, SMTP, and POP3 run on top of TCP rather than on UDP primarily because TCP provides reliable data transfer, guaranteeing that all data will eventually get to its destination.

8/10

R13) Well overall when Web caching, there can be a reduction in the delay in receiving a requested object explained by the following process. When a Web server receives the identifier of the requested object, it can cache the mapping/any information contained in the reply in its local memory. So when that same object is requested, the Web server can provide the desired information for that object, even if it is not authoritative for the object, which in turn can reduce the delay in receiving that requested object.

access delay is also decreased, though

-2

Web caching will only reduce the delay for some of the objects, because objects that have not previously been requested won't experience a reduction in its delay because the Web server has yet to get a hold of that information needed of that reply of the requested object. In other words, the needed information in order to experience a reduction of the delay for receiving that requested object, has not yet been stored in the Web server's local memory.

Problems

P9) Figure 2.12 : An Institutional Network Connected to the Internet

11/15

Average Object Size = 850,000 bits
Average Request Rate = 16 requests/second
(Institutions Browsers → Original Servers)
Average Response Time = 3 seconds
(Internet Side → Forward HTTP Request)

β = Arrival Rate of objects to the Access Link

Total Average Response Time = Average Access Delay + Average Internet Delay
+
Delay From Internet router to Institution router

Average Access Delay = $\Delta / (1 - \Delta\beta)$ Δ = Average Time Required to Send Object over Access Link

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a) Total Average Response Time = ?

$\Delta = \frac{850,000}{15,000,000} = 0.0567$ seconds

$\Delta\beta = (0.0567)(3) = 0.17$ seconds

Average Access Delay $= \frac{0.0567}{(1-0.17)} = 0.0683$ seconds

Average Internet Delay = 3 seconds

$\boxed{\text{Total Average Response Time} = 3.068 \text{ seconds}}$ ✓

b) Cache Installed Miss Rate = 0.4 Total Response Time = ?

60% Reduction of Delay 40% Miss Rate

$\beta = (16)(1-0.4) = 9.6$ requests/second

$\Delta\beta = (0.0567)(9.6) = 0.544$

Average Access Delay $= \frac{(0.0567)}{(1-0.544)} = 0.124$ seconds

Average Internet Delay = 3 seconds

(3)(0.4) + 0.124

$\boxed{\text{Total Average Response Time} = 3.\cancel{124} \text{ seconds}}$ -4

P20) A way to roughly determine the Web servers that are most popular among the users in your department when you have acces to the caches in the local DNS servers of your department is to see how often certian Web servers are requested among the users. And possibly not only how often, but also how many times certian frequent Web servers are requested, and then somehow document such a way to support this determination being explored. ✓

10/10

P22) F = 15 Gbits
N peers
server upload rate = u_s = 30 Mbps
download rate = d_i = 2 Mbps
peer upload rate = u

N = 10, 100, and 1000
u = 300 Kbps, 700 Kbps, and 2 Mbps

20/20

A chart giving minimum distribution time for each combination N and u for both client-server distribution and P2P distribution.

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Time to Distribute F to N Clients using Client-Server Approach:

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

Time to Distribute F to N Clients using P2P Approach:

$D_{P2P} \geq \max\{F/u_s, F/d_{min}, NF/(u_s + \Sigma_i u_i)\}$

<u>Client Server Distribution</u>

$F = 15 \text{ Gbits} = 15(1024) \text{ Mbits}$

$\text{Kbps} = \frac{\text{Kbps}}{1024} \text{ Mbps}$

N

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

✓

$D_{cs} \geq \max\{(10 \cdot 15 \cdot 1024)/30, (15 \cdot 1024)/2\} =$
$\max\{5120, 7680\} = 7680 s$

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$\max\{5120, 7680\} = 7680 s$

$D_{cs} \geq \max\{(100 \cdot 15 \cdot 1024)/30, (15 \cdot 1024)/2\} =$
$\max\{51200, 7680\} = 51200 s$

$D_{cs} \geq \max\{(100 \cdot 15 \cdot 1024)/30, (15 \cdot 1024)/2\} =$
$\max\{51200, 7680\} = 51200 s$

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P2P Distribution

		N: 10	100	1000
u	300 Kbps	7680 s	25904 s	47559 s
	700 Kbps	7680 s	15616 s	21525 s
	2 Mbps	7680 s	7680 s	7680 s

✓

$D_{P2P} \geq \max\{(15\cdot1024)/30, (15\cdot1024)/2, (10\cdot15\cdot1024)/(30+(300/1024))\} =$
$\max\{512, 7680, 5070\} = 7680s$

$D_{P2P} \geq \max\{(15\cdot1024)/30, (15\cdot1024)/2, (10\cdot15\cdot1024)/(30+(700/1024))\} =$
$\max\{512, 7680, 5005\} = 7680s$

$D_{P2P} \geq \max\{(15\cdot1024)/30, (15\cdot1024)/2, (10\cdot15\cdot1024)/(30+2)\} =$
$\max\{512, 7680, 4800\} = 7680s$

$D_{P2P} \geq \max\{(15\cdot1024)/30, (15\cdot1024)/2, (100\cdot15\cdot1024)/(30+(300/1024))\} =$
$\max\{512, 7680, 25904\} = 25904s$

$D_{P2P} \geq \max\{(15\cdot1024)/30, (15\cdot1024)/2, (100\cdot15\cdot1024)/(30+(700/1024))\} =$
$\max\{512, 7680, 15616\} = 15616s$

$D_{P2P} \geq \max\{(15\cdot1024)/30, (15\cdot1024)/2, (100\cdot15\cdot1024)/(30+2)\} =$
$\max\{512, 7680, 4800\} = 7680s$

$D_{P2P} \geq \max\{(15\cdot1024)/30, (15\cdot1024)/2, (1000\cdot15\cdot1024)/(30+(300/1024))\} =$
$\max\{512, 7680, 47559\} = 47559s$

$D_{P2P} \geq \max\{(15\cdot1024)/30, (15\cdot1024)/2, (1000\cdot15\cdot1024)/(30+(700/1024))\} =$
$\max\{512, 7680, 21525\} = 21525s$

$D_{P2P} \geq \max\{(15\cdot1024)/30, (15\cdot1024)/2, (1000\cdot15\cdot1024)/(30+2)\} =$
$\max\{512, 7680, 4800\} = 7680s$

P26) Bob joins BitTorrent torrent
- Doesn't want to upload any data to any other peers (free-riding)

10/10

a) Yes, it is possible for Bob to claim that he can receive a complete copy of the file that is shared by the swarm, because if Bob waits around long enough, all the parts of the file can have been download and shared throughout the swarm, later giving Bob a complete file. ✓

b) Being a true claim, Bob can combine different parts of the file from each client of each computer into a single complete file. ✓

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Additional Questions

20/20

Client sends HTTP GET message to Web Server
- Requesting Basic HTML object
  - References 3 JPEG objects

Size = 5×10^6 bits
Round-Trip = 0.75 s
Transmission Rate = 2 Mbps
= 2×10^6 bps

a.) Time Request and Receive Entire Page = ? s
(Connection Non-Persistent)

Total Non-Persistent HTTP Response Time PER OBJECT:
2RTT + file transmission time

$4(2(0.75) + (5 \times 10^6)/(2 \times 10^6)) = \boxed{16s}$ ✓

b.) RTT + 4 (RTT + Transmission Time)
$0.75 + 4(0.75 + (5 \times 10^6)/(2 \times 10^6)) = \boxed{13.75s}$ ✓

→ Establishing connection

(Persistent and No Pipelining)

c.) RTT + 2(RTT + Transmission Time)
$0.75 + 2(0.75 + (5 \times 10^6)/(2 \times 10^6)) = \boxed{2.75s}$ ✓

(Persistent and Pipelining)