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Lab02

**Question 1) R9.** Recall that TCP can be enhanced with SSL to provide process-to-process security services, including encryption. Does SSL operate at the transport layer or the application layer? If the application developer wants TCP to be enhanced with SSL, what does the developer have to do? (10 marks)

**Question 2) R18.** From a user’s perspective, what is the difference between the download-and-delete mode and the download-and-keep mode in POP3? (10 marks)

**Question 3) R26.** In Section 2.7, the UDP server described needed only one socket, whereas the TCP server needed two sockets. Why? If the TCP server were to support n simultaneous connections, each from a different client host, how many sockets would the TCP server need? (10 marks)

**Question 4) P9.** Consider Figure 2.12, for which there is an institutional network connected to the Internet. Suppose that the average object size is 850,000 bits and that the average request rate from the institution’s browsers to the origin servers is 16 requests per second. Also suppose that the amount of time it takes from when the router on the Internet side of the access link forwards an HTTP request until it receives the response is three seconds on average (see Section 2.2.5).

Model the total average response time as the sum of the average access delay (that is, the delay from Internet router to institution router) and the average Internet delay. For the average access delay, use Δ/(1 – Δ𝛽), where Δ is the average time required to send an object over the access link and 𝛽 is the

arrival rate of objects to the access link. (15 marks)

1. Find the total average response time.

Δ = 850,000/(15\*10^6) = .056 seconds

𝛽 = 16 rps

Total average response time = 3 + 0.056/(1- 0.056 \* 16)=**3.53846**

1. Now suppose a cache is installed in the institutional LAN. Suppose the miss rate is 0.4. Find the total response time.

Total response time = (0.6\*0)+(0.4\*(3+.056/(1-0.4\*.056\*16)))= **3.087281**

**Question 5) P22.** Consider distributing a file of F = 15 Gbits to N peers. The server has an upload rate of us = 30 Mbps, and each peer has a download rate of di = 2 Mbps and an upload rate of u. For N = 10 and 1,000 and u = 300 Kbps and 2 Mbps, prepare a chart giving the minimum distribution time for each of the combinations of N and u for both client-server distribution and P2P distribution. (15 marks)

F = 15 Gbits

us = 30 Mbps

di = 2 Mbps

Dcs=max{NF/us, F/di}

DP2P=max{F/us, F/di, NF/(us +∑i=1Nui)}

|  |  |  |
| --- | --- | --- |
| Client-Server Distribution | N=10 | N=1,000 |
|  | max{10\*(15E9/30E6),15E9/2E6} =max{500, 7,500}  =**7,500s** | max{1000\*(15E9/30E6),15E9/2E6}= **500,000s** |
|  | U value unapplicable | U value unapplicable |

|  |  |  |
| --- | --- | --- |
| P2P Distribution | N=10 | N=1,000 |
| u=300kbps | max{15E9/30E6,15E9/2E6,10\*(15E9/(30E6+300E3+3E6))}=**7,500s** | max{15E9/30E6, 15E9/2E6, 1,000\*(15E9/(30E6+300E3+2E6))}=**464,396.3s** |
| u=2Mbps | Same | Same |

***TCP vs UDP (12 marks)***

**Question 6)** Indicate if TCP, UDP, or neither should be used given the following transmission requirements:

1. Reliable data transfer
2. Minimum transmission overhead
3. Guaranteed transmission rate
4. Bounded limits on packet delay
5. Guarantee in-order delivery of data
6. No transmission setup time

***HTTP Request and Response (8 marks)***

**Question 7)** Given the following HTTP request, answer the following questions:

GET /index.html HTTP/1.1

Accept: \*/\*

Accept-Language: en-ca

User-Agent: Mozilla/5.0 (Windows NT 6.1; rv:2.0.1) Gecko/20100101 Firefox/4.0.1

CLR 2.0.50727; InfoPath.1)

Host: localhost:6789

Connection: Keep-Alive

1. What is the full URL of the requested page?
2. Is the browser requesting a persistent or non-persistent connection? How do you know?