國 立 臺 北 科 技 大 學

九十八學年第一學期電機系博士班資格考試

網際網路工程試題

注意事項：

1. 本試題共【7】題，配分共 100 分。
2. 請按順序標明題號作答，不必抄題。
3. 全部答案均須答在試卷答案欄內，否則不予計分。
4. 考試時間:二小時。

1. (15 points) Explain the following items.

(a) Consider an e-commerce site that wants to keep a purchase record for each of its customers. Describe how this can be done.

(b) Describe how Web caching can reduce the delay in receiving a requested object. Will Web caching reduce the delay for all objects requested by a user or for only some of the objects? Why?.

(c) If the TCP server were to support *n* simultaneous connection, each from a different client host, how many sockets would the TCP server need? If the UDP server were to support *n* simultaneous different client hosts, how many sockets would the UDP server need?

2. (15 points) As shown in Figure 1, the server and the peers are connected to the Internet with access links. Denote the upload rate of the server's access link by u_s, the upload rate of the *i*th peer's access link by u_i, and the download rate of the *i*th peer's access link by d_i. Denote the size of the file to be distributed by *F* bits and the number of peers that want to obtain a copy of the file by *N*. Please derive the minimum distribution time for P2P. (The distribution time is the time it takes to get a copy of the file to all *N* peers)

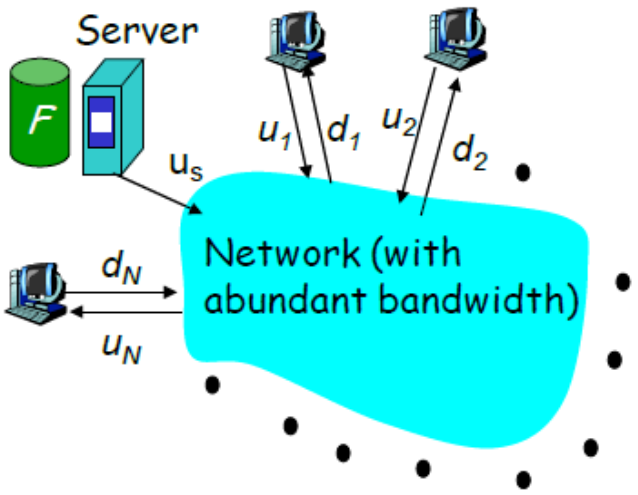


Figure 1.

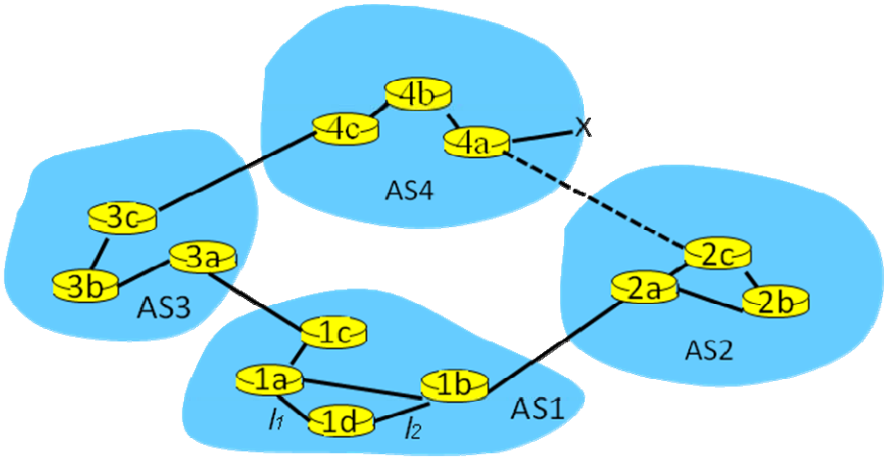
3. (15 points) Consider a TCP connection with 1500-byte segment and a 100 *ms RTT*, and suppose we want to achieve a throughput of 10 *Gbps*, please derive the segment loss probability that TCP could only tolerate.

4. (15 points) Consider the network shown in Figure 2. Suppose AS3 and AS2 are running OSPF for their intra-AS routing protocol. Suppose AS1 and AS4 are running RIP for their intra-AS routing protocol. Suppose eBGP and iBGP are used for the inter-AS routing protocol. Initially suppose there is ***no*** physical link between AS2 and AS4.

(a) Once router 1d learns about x will put an entry (x,l) in its forwarding table. Will l be equal to l_1 or l_2 for this entry? Explain why.

(b) Now suppose that there is a physical link between AS2 and AS4, shown by the dotted line. Suppose router 1d learns that x is accessible via AS2 and viaAS3. Will l be set to l_1 or l_2? Explain why.

(c) Now suppose that there is another AS, called AS5, which lies on the path between AS2 and AS4 (not shown in Figure). Suppose router 1d learns that x is accessible via AS2 AS5 AS4 and via AS3 AS4. Will l be set to l_1 or l_2? Explain why.



Figure

5. (15 points) Show that the maximum efficiency of pure ALOHA is 1/(2e).

6. (10 points) What are three approaches that can be taken to avoid having a single wireless link degrade the performance of an end-to-end transport-layer TCP connection?

7. (15 points) Consider the client buffer shown in Figure 3. Suppose that the streaming system use the third option; that is, the server pushes the media into the socket as quickly as possible. Suppose the available TCP bandwidth >> d most of the time. Also suppose that the client buffer can hold only about one-third of the media. Describe how x(t) and content of the client buffer will evolve over time.

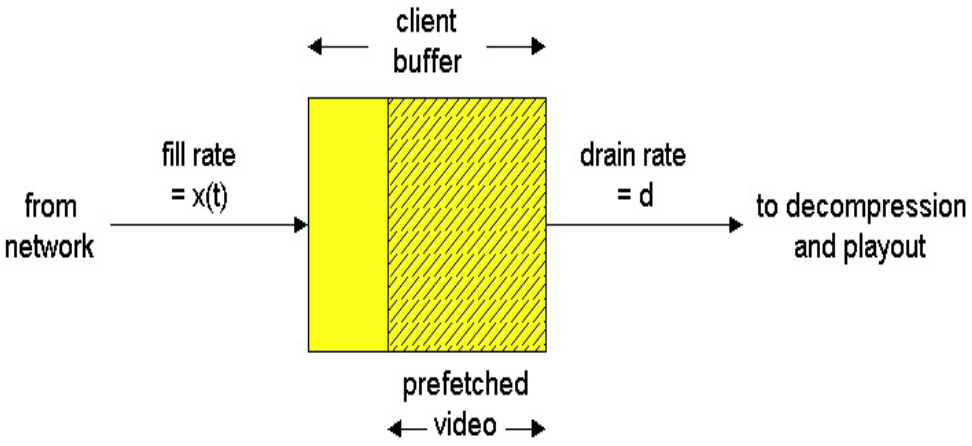


Figure 3