Fall 2017 Computer Networks (IT3007)
Quiz #1
2017/10/23 17:30-18:00

/ 100

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1. (20%) List at at least two advantages of packet switching compared with circuit switching.
2. (25%) Consider sending a packet from a source host to a destination host over a fixed route. List the delay components in the end-to-end delay, and briefly explain each of them. Which of these delays are constant and which are variable? Note that the network may be congested.
3. (35%) List the seven layers of the OSI model and describe the basic functions of each layer.
4. (20%) Explain the following terms:
   a. botnet
   b. denial-of-service attacks
   c. IP spoofing
   d. forwarding table

1. ① 共享頻寬 (bandwidth) ② simple, no call setup (不需要先建立好路線) ↙較不浪費資源

2. ① (延遲原因)
   d_{proc} : nodel processing → 檢查資料有無錯誤
   d_{queu} : queuing delay → 資料在 router 中佇列
   d_{trans} : transmission delay → 將資料放至傳輸位置; $\frac{L}{R}$
   d_{prop} : propagation delay → 在 links 上傳輸的時間; $\frac{d}{s}$

   ③ constant: d_{proc}, d_{prop}, d_{trans}
   variable: d_{queu}

3.

Application	提供 Network application
Presentation	資料處理 (eg. 壓縮, 加密)
Session	同步, checkpointing, recovery of data exchange
Transport	process-process data transfer
Network	network graphic from source to destination
Links	data transfer between neighboring links
Physical	資料傳輸的實體物件

4. (a) botnet: 殭屍網路, 用途: email spam, DDoS attack
   許多被攻擊的裝置所組成的網路
   (b) denial-of service attacks: 攻擊目標, 使其服務、連線中斷
   (c) IP spoofing: 偽造信息, 使接收端以為其是可信任的網路來源
   (d) forwarding table: 列出在此 router 中, 可以連接的 links
   再利用 routing 找出最短路徑

Fall 2017 Computer Networks (IT3007)

Quiz #2

2017/12/25 17:40-18:00

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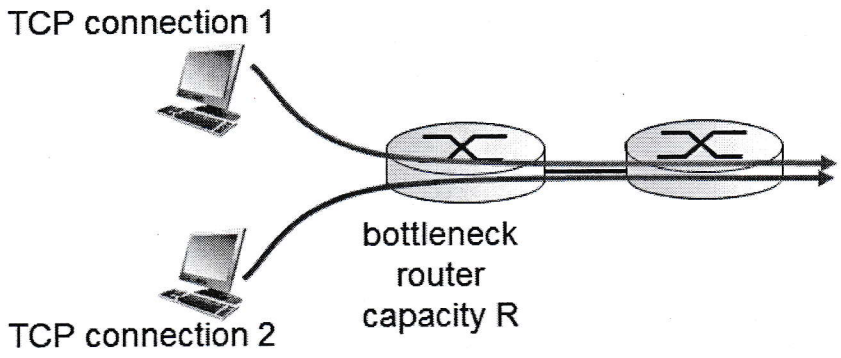
/100

1. (25%) Explain how TCP flow control works.
2. (40%) Explain how TCP fast retransmit works. What is the benefit of TCP fast retransmit?
3. (35%) Suppose that there are two TCP connections sharing a single link with transmission rate R, as shown in the following figure. Assume that the two connections have the same MSS and RTT and have a large amount of data to send. Also, ignore the slow-start phase of TCP and assume the TCP connections are operating in CA (Congestion Avoidance) mode at all times. Explain why TCP congestion control converges to provide an equal share of a bottleneck link's bandwidth among competing TCP connections.



1. Receiver 在收到 packet 後，會回傳可用 (free) 的 buffer size 給 sender.

若 free buffer size ≠ 0，sender 繼續送 packet.

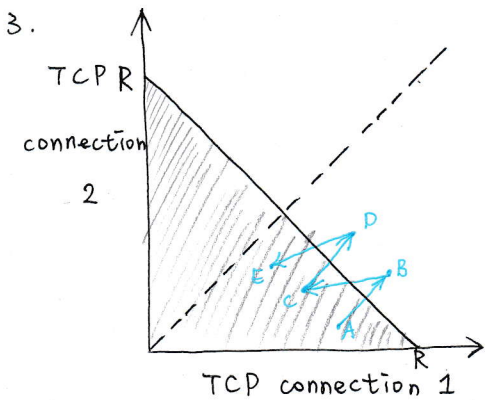
若 free buffer size = 0，sender 暫停送 packet 的工作，並持續送一個 buffer 給 receiver，直到 receiver 可接收這個 buffer (代表有空間)，再繼續傳送 packets

2. ① 當偵測到3個相同ACK時，令門檻為封包遺失前 cwnd 的 $\frac{1}{2}$，並令 cwnd = 1，重新開始 start slow

(代表封包遺失)

② 不必等到超過時間 / timer 計時完，只要收到3個相同 ACK 即是 packet loss 比較有效率、不浪費時間。

3.



一開始，2個 connection 在 A.

接著兩者 transmission 增加 (A ---→ B) (C → D)

然後偵測到可能發生 congestion，兩者減少 transmission (B → C) (D → E)

不斷重複後，隨著時間增長，會逐漸靠近平均分配的斜線 (圖中虛線)

超過斜線區域