Advanced Computer Network Final (104/06/24)

1. (a) List three characteristics of CDMA (4%) (b) Draw a figure to show the CDMA encoding and decoding processes for two senders and receivers if the CDMA code of sender 1 and receiver 1 is (-1, 1, 1, 1, -1, -1, -1, -1) and that of sender 2 and receiver 2 is (1, -1, 1, 1, -1, -1, 1, 1). Please note source bits of sender 1 are (1, 1) and those of sender 2 are (-1, 1). (計算過程要寫出來，encoding 時不能只寫相加的結果，decoding 時只寫出來 receiver 1 10%) (14% total)

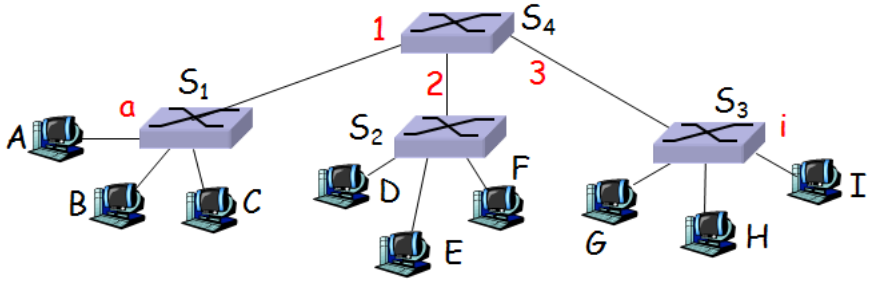
2. (a) Describe and draw two topologies of Ethernet. (列出其名稱且畫圖，4%) (b) What does 100BaseTX mean? (4%) (c) 雙絞線 Ethernet 網路線的插頭是一種只能沿固定方向插入並自動防止脫落的塑料接頭，這種接頭的專有名詞是？(2%) (d) 我們做接頭時用 568B 的標準，這幾根線排列順序為何？(由 pin 1 至 8, 8%) (18% total)

3. (a) What is mobility? (2%) (b) What kind of routing is used by Mobile IP? (2%) (c) Describe its registration and routing operation by drawing a figure. (12%) (d) What problem will happen using this kind of routing? (2%) (18% total)

4. (a) Draw a figure to describe Components of 2G and 3G cellular network architecture (12%) (要寫出 6 項) (b) Components of 3G cellular network architecture (8%) (要寫出 4 項) (20% total)

5. (a) Explain why IEEE 802.11 cannot detect collision. (4%) (b) How IEEE 802.11 uses CSMA/CA with RTS/CTS packets to avoid collision?畫圖並加以說明(8 %) (c) Draw a figure to explain the Hidden terminal problem. (4%, 16% total)

6. Describe the filtering/forwarding operations of four switches when (a) node I sends a frame to A (8%) (b) node A sends back a frame to I (6%) (說明時要提到 frame 經過每個 switch 時的詳細動作與列出 switch table 的內容) (14% total)



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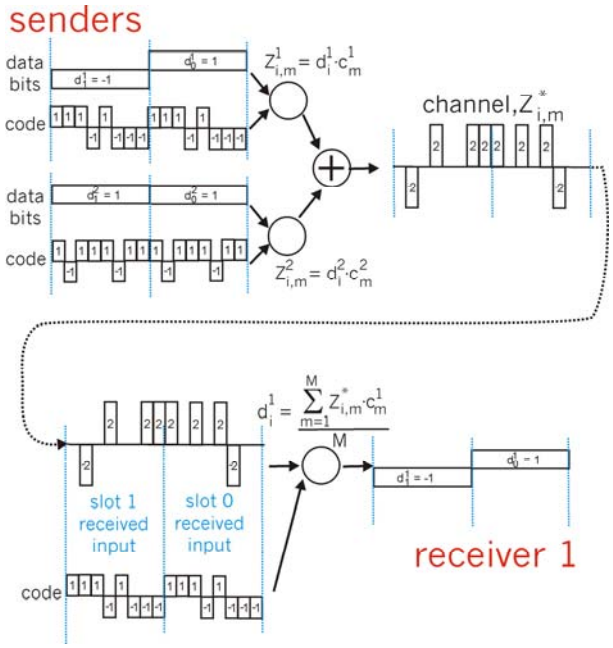
Ans:

(a) CDMA (Code Division Multiple Access)

- unique "code" assigned to each user; (2%)
- all users share same frequency, but each user has own "chipping" sequence (i.e., code) to encode data
- allows multiple users to "coexist" and transmit simultaneously with minimal interference (if codes are "orthogonal") (2%)

(b) (10%) （類似以下過程，必要部分要改）



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Ans:

(a) bus topology (1%, 圖 1%)

all nodes in same collision domain (can collide with each other)

star topology (1%, 圖 1%)

active *switch* in center

each "spoke" runs a (separate) Ethernet protocol (nodes do not collide with each other)

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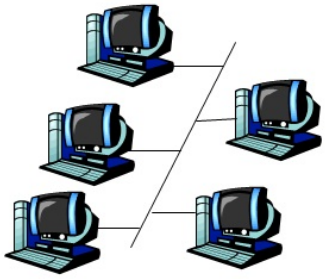
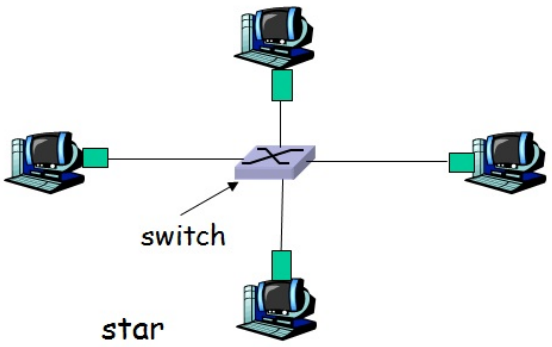




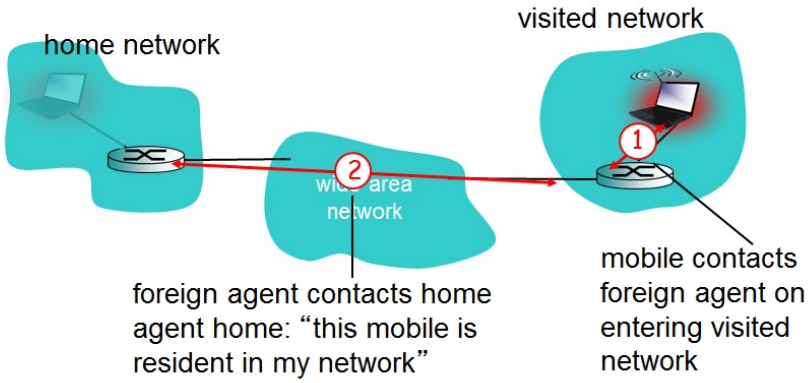
(b) 100Mbps, Twisted Pair (4%)
(c) RJ-45 (2%) (d) 1、白橙 2、橙 3、白綠 4、藍 5、白藍 6、綠 7、白棕 8、棕 (8%)

3. (a) What is mobility? (2%) (b) What kind of routing is used by Mobile IP? (2%) (c) Describe its registration and routing operation by drawing a figure. (12%) (d) What problem will happen using this kind of routing? (2%) (18% total)

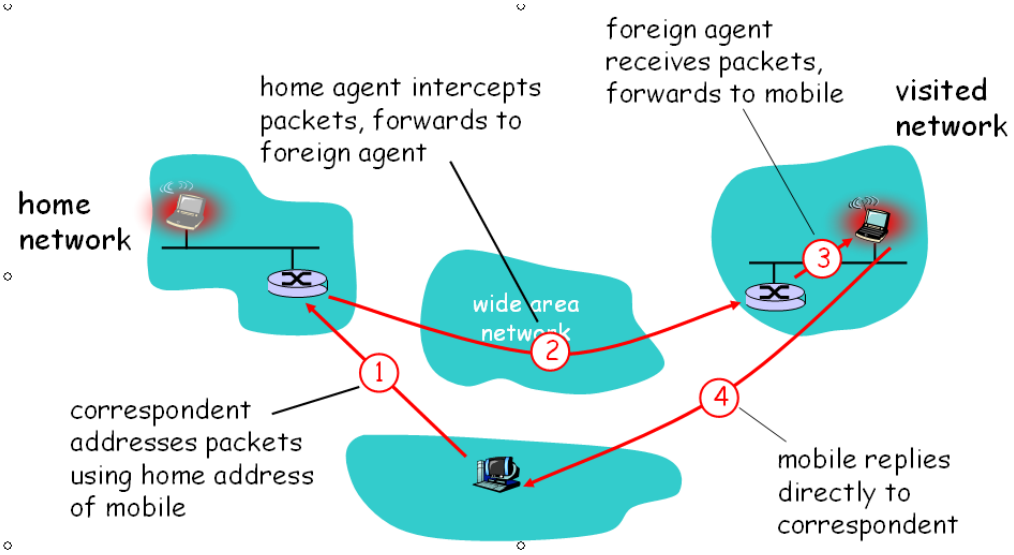
Ans:

(a) mobility: handling the mobile user who changes point of attachment to network (2%)
(b) indirect routing (2%)
(c)

Registration: Each step 2%, 4% total



Routing: 8% total



(d) triangle routing (2%): correspondent->home-network->mobile => is inefficient when correspondent, mobile are in same network

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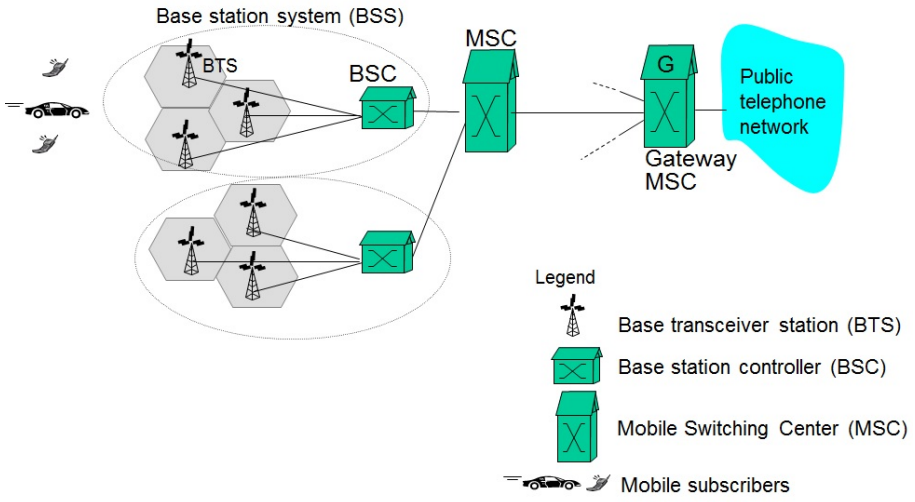
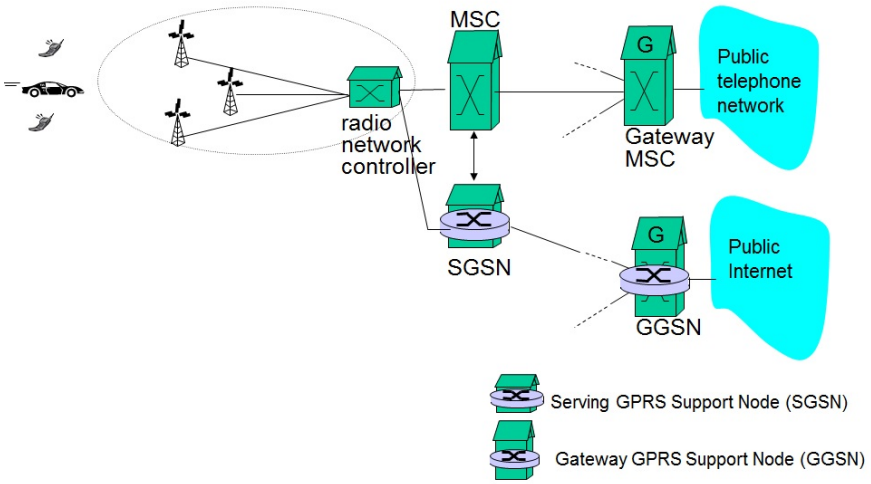
Ans:

(a) 2G: MS, BTS; BSC; MSC; GMSC, Public Telephone network (2%)



(b) 3G: RNC, SGSN, GGSN, Public Internet (2% each)



5. (a) Explain why IEEE 802.11 cannot detect collision. (4%) (b) How IEEE 802.11 uses CSMA/CA with RTS/CTS packets to avoid collision?畫圖並加以說明(8 %) (c) Draw a figure to explain the Hidden terminal problem. (4%, 16% total)

Ans:

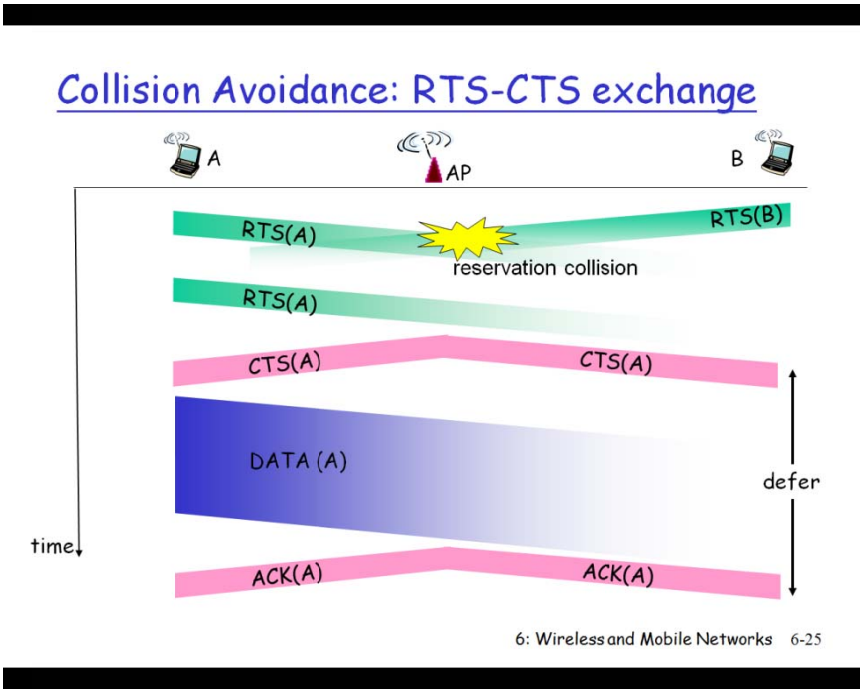
(a)

- difficult to receive (sense collisions) when transmitting due to weak received signals (fading) (2%)
- can't sense all collisions in any case: hidden terminal (2%)

(b)

- sender first transmits small *request-to-send (RTS)* packets to BS using CSMA; RTSs may still collide with each other (but they're short) (2%)
- BS broadcasts *clear-to-send (CTS)* in response to RTS; CTS heard by all nodes (2%)

- sender transmits data frame, other stations defer transmissions (2%)
- BS replies ACK to sender (2%)



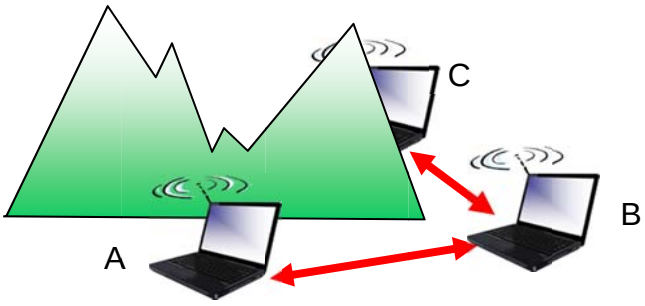
(c) Hidden terminal problem

B, A hear each other (1%)

B, C hear each other (1%)

A, C can not hear each other (1%)

It means A, C unaware of their interference at B (1%)



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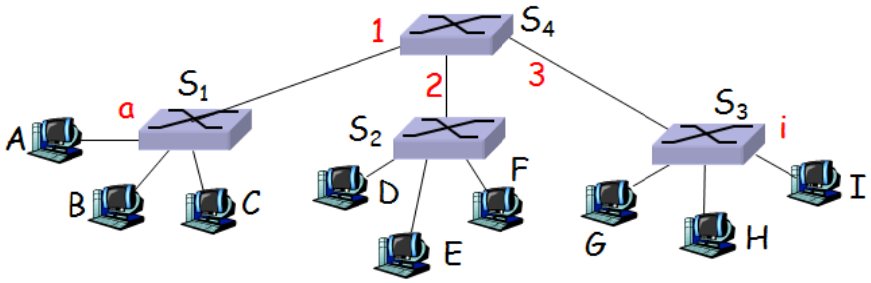

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Ans:

(a) When the frame received, S3 records link associated with sending host I in S3's table (1%)

MAC address	Interface	TTL
I	i	XX

index switch table using MAC dest address **A**
entry not found for destination, then flood to G, H and interface 3! (1%)

When the frame received, S4 records link associated with sending host **I** in S4's table (1%)

MAC address	Interface	TTL
I	3	XX

index switch table using MAC dest address **A**
entry not found for destination, then flood to interfaces 1 and 2! (1%)

When the frame received, S2 records link associated with sending host I in S2's table (1%)

MAC address	Interface	TTL
I	2	XX

index switch table using MAC dest address **A**
entry not found for destination, then D, E and F! (1%)

When the frame received, S1 records link associated with sending host I in S1's table (1%)

MAC address	Interface	TTL
I	1	XX

index switch table using MAC dest address **A**
entry not found for destination, then flood to A, B and C! (1%)

(b) When the frame received, S1 records link associated with sending host A in S1's table (1%)

MAC address	Interface	TTL
I	1	XX
A	a	XX

index switch table using MAC dest address **I**
entry found for destination, then forward the frame on interface 1 (1%)

When the frame received, S4 records link associated with sending host A in S4's table (1%)

MAC address	Interface	TTL
I	3	XX
A	1	XX

index switch table using MAC dest address **I**
entry found for destination, then forward the frame on interface 3 (1%)

When the frame received, S3 records link associated with sending host A in S3's table (1%)

MAC address	Interface	TTL
I	i	XX
A	3	XX

index switch table using MAC dest address **I**
entry found for destination, then forward the frame on interface i and I receives the frame (1%)