Advanced Computer Network Final (103/06/18)

1. Classify the following wireless network standards into (a) wireless LAN, (b) wireless personal area network. (c) 2G cellular network. (d) 2.5G cellular network. (e) 3G cellular network. (f) 3.5G cellular network. (g) 4G cellular network (14%)
   LTE, UMTS, GPRS, Bluetooth, HSDPA, GSM, 802.11

2. (a) Router, hub and switch 分別是第幾層的網路設備？(6%) (b)Which two important information of the AP is given to the wireless host through the beacon frame? (4%) (10% total)

3. Draw a figure to show the CDMA encoding and decoding processes for two senders and receivers if the CDMA code of sender1 and receiver1 is (-1, 1, 1, 1, -1, -1, -1, -1) and that of sender2 and receiver2 is (1, -1, 1, 1, -1, -1, 1, 1). Please note source bits of sender1 are (-1, 1) and those of sender2 are (-1, -1). (計算過程要寫出來，encoding 時<u>不能只寫相加的結果</u>，decoding 時 <u>receiver1 and 2 分別寫出來</u>, 10%)

4. 平時我們用的雙絞線 Ethernet 網路線是由(a)幾根不同顏色的線?分成幾對絞合在一起? (2%) 列出所有顏色。(4%) (b) 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%) (c) 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%) (16% total)

5. (a) What is mobility? (2%) (b) What kind of routing is used by Mobile IP? (2%) (c) Describe its routing operation by drawing a figure. (8%) (d) What problem will happen using this kind of routing? (2%) (total 14%)

6. Draw a figure to describe <u>Components of cellular network architecture (12%)</u> (要寫出 6 項，並說明其功能)

7. How IEEE 802.11 uses CSMA/CA with RTS/CTS packets to avoid collision? 畫圖並加以說明(8 %)

8. Describe how Ethernet uses <u>CSMA/CD</u> with <u>exponential backoff</u> (要寫出碰撞後如何動作) in detail (9%)

9. Draw figures to describe the infrastructure mode of wireless networks. (畫圖加說明，7%)

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1. Classify the following wireless network standards into (a) wireless LAN, (b) wireless personal area network. (c) 2G cellular network. (d) 2.5G cellular network. (e) 3G cellular network. (f) 3.5G cellular network. (g) 4G cellular network (14%)

   LTE, UMTS, GPRS, Bluetooth, HSDPA, GSM, 802.11

Ans: (2% each)

    (a) wireless LAN : *802.11,*

    (b) personal area network: *Bluetooth,*

    (c) 2G cellular network: *GSM*

    (d) 2.5G cellular network: *GPRS*

    (e) 3G cellular network: UMTS

    (f) 3.5G cellular network: *HSDPA*

    (g) 4G cellular network: *LTE*

2. (a) Router, hub and switch 分別是第幾層的網路設備？(6%) (b)Which two important information of the AP is given to the wireless host through the beacon frame? (4%) (10% total)

Ans: (a) <u>Router: layer 3, hub: layer 1,　switch: layer 2</u> (2% each)

    (b) <u>AP's name (SSID) and MAC address</u> (4%)

3. Draw a figure to show the CDMA encoding and decoding processes for two senders and receivers if the CDMA code of sender1 and receiver1 is (-1, 1, 1, 1, -1, -1, -1, -1) and that of sender2 and receiver2 is (1, -1, 1, 1, -1, -1, 1, 1). Please note source bits of sender1 are (-1, 1) and those of sender2 are (-1, -1). (計算過程要寫出來，encoding 時不能只寫相加的結果，decoding 時 receiver1 and 2 分別寫出來, 10%)

Ans:

(10%) （類似以下過程，必要部分要改）
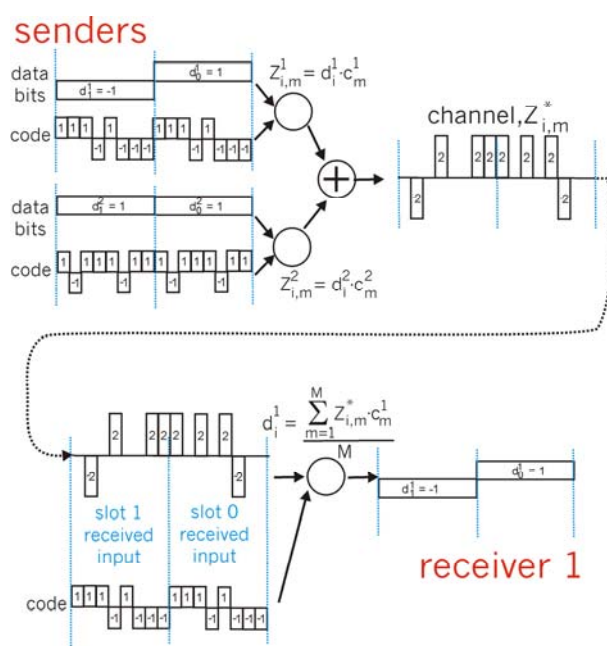
4. 平時我們用的雙絞線 Ethernet 網路線是由(a)幾根不同顏色的線?分成幾對絞合在一起?(2%) 列出

所有顏色。(4%) (b) 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%) (c) 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%) (16% total)

Ans (a) 8 根不同顏色的線，分成 4 對絞合在一起 (2%) 橙、藍、綠、棕 (4%)

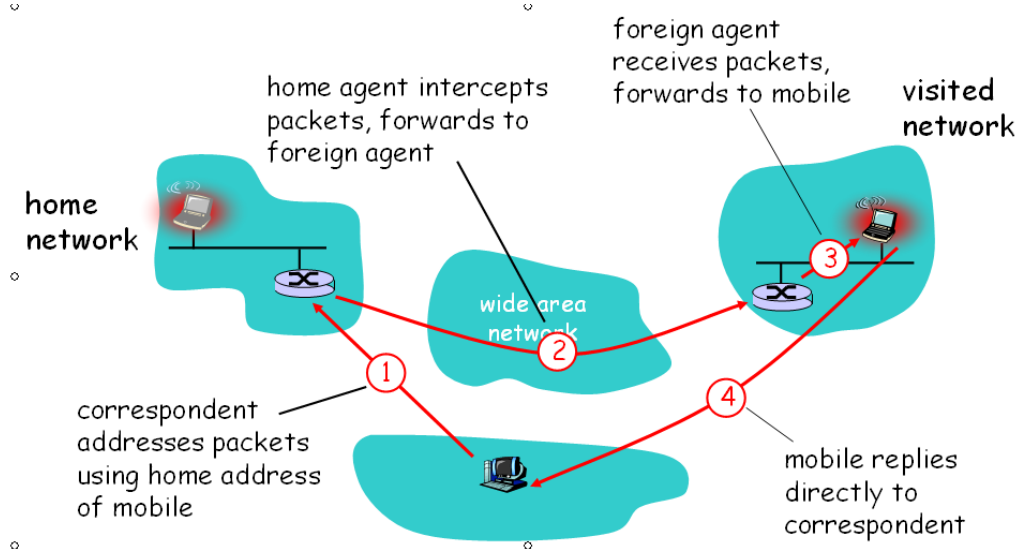(b) RJ-45 (2%) (c) 1、白橙　2、橙　　3、白綠 4、藍　　5、白藍 6、綠　　7、白棕 8、棕 (8%)

5. (a) What is mobility? (2%) (b) What kind of routing is used by Mobile IP? (2%) (c) Describe its routing operation by drawing a figure. (8%) (d) What problem will happen using this kind of routing? (2%) (total 14%)

Ans:

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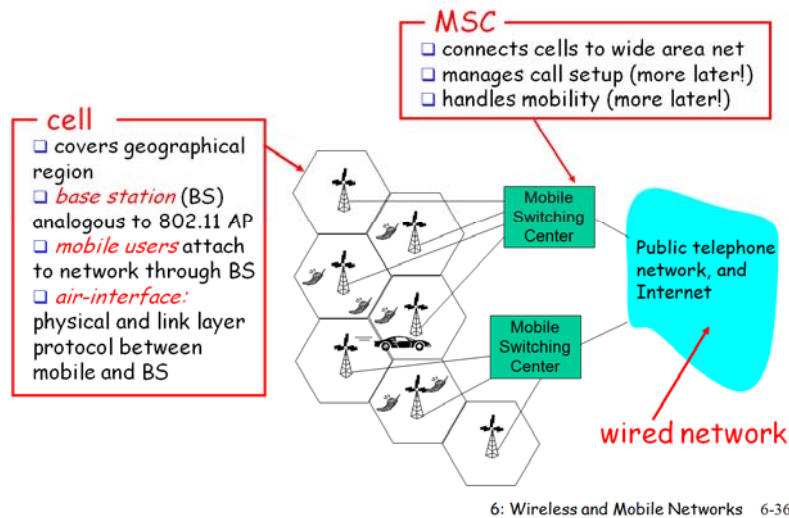
(b) indirect routing (2%)

(c) Each step 2%, total 8%

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

6. Draw a figure to describe Components of cellular network architecture (12%) (要寫出 6 項，並說明其功能)

Ans: MSC (2%); Cell (2%); BS (2%); Mobile user (2%); air interface (2%), wired core network (2%)

Components of cellular network architecture

MSC
- connects cells to wide area net
- manages call setup (more later!)
- handles mobility (more later!)

cell
- covers geographical region
- *base station* (BS) analogous to 802.11 AP
- *mobile users* attach to network through BS
- *air-interface:* physical and link layer protocol between mobile and BS

Mobile Switching Center

Mobile Switching Center

Public telephone network, and Internet

wired network

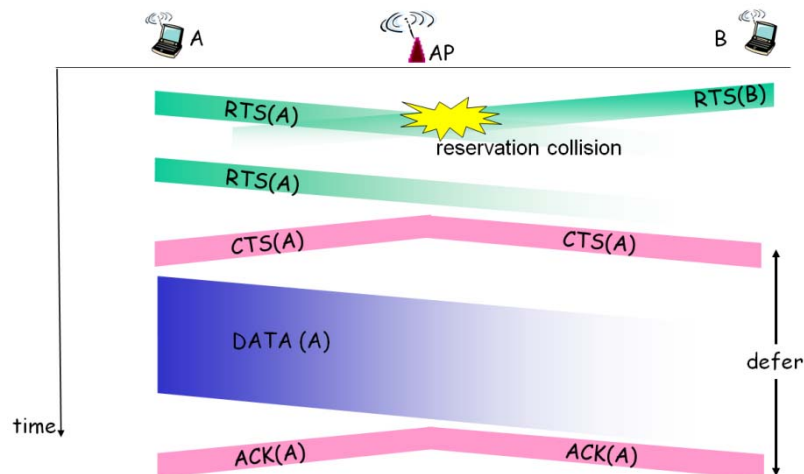6: Wireless and Mobile Networks   6-36

7. How IEEE 802.11 uses CSMA/CA with RTS/CTS packets to avoid collision? 畫圖並加以說明(8 %)

 Ans:

- 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%)

Collision Avoidance: RTS-CTS exchange

A   AP   B

RTS(A)   RTS(B)

reservation collision

RTS(A)

CTS(A)   CTS(A)

DATA (A)   defer

time

ACK(A)   ACK(A)

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8. Describe how Ethernet uses <u>CSMA/CD</u> with <u>exponential backoff</u> (要寫出碰撞後如何動作) in detail (9%)

Ans:

- adapter doesn't transmit if it senses that some other adapter is transmitting, that is, carrier sense (2%)
- transmitting adapter aborts when it senses that another adapter is transmitting, that is, collision detection (2%)
- Before attempting a retransmission, adapter waits a random time, that is, random access with Exponential Backoff. (2%)
  - first collision: choose K from {0,1}; delay is K· 512 bit transmission times (1%)
    after second collision: choose K from {0,1,2,3}…(1%)
    after ten collisions, choose K from {0,1,2,3,4,…,1023}   (1%)

9.   Draw figures to describe the infrastructure mode of wireless networks. (畫圖加說明，7%)

Ans:

   infrastructure mode:

   - cell (2%)
   - base station connects mobiles into wired network (2%)
   - mobile (2%)
   - 圖(1%)