COMP4097 Mobile Computing

Additional Written Assignment for COMP4097, Semester 1, 2019

Submit to Moodle by December 21st before 5pm

1.a) In terms of location dependency, use an example to show how the correctness of mobile computing is different from traditional computing. (5 marks)

1.b) Referring to the WiFi and Mobile Networks, both of these networks are providing wireless connectivity to the users. Use examples to show the differences in their usages. (5 marks)

1.c) Describe how the CSMA/CA protocol can provide wireless communication services within a WLAN. (5 marks)

2. Code Division Multiple Access

Given the following Chipping Code for user A, B, and C.

Chipping Code (k = 4)	1	2	3	4
UserA	1	-1	-1	1
UserB	1	-1	1	-1
UserC	1	1	-1	-1

a) Show that they are orthogonal to each other. (6 marks)

b) If User A is sending "101", User B is sending "100", and User C is sending "011" at the same time, what will the Sending Signal (namely Signal D) looks like? (4 marks)

c) If User C is communicating with User A, and Received Signal (Signal D from part b), show how User C can decode Signal D and get what User A had sent to User C. (5 marks)

3. The following THREE technologies: QR-Code, iBeacon, and RFID Tag can all be used to provide location-based services based on proximity detection or location identification. Use mobile advertisement as a sample location based services, i.e., after the application identify where the user is, an eCoupon will be downloaded from a specific website to the mobile application.

a) Compare and contrast among the three technologies for the above application. (12 marks)

b) Which technology will you pick and give your reasons. (3 marks)

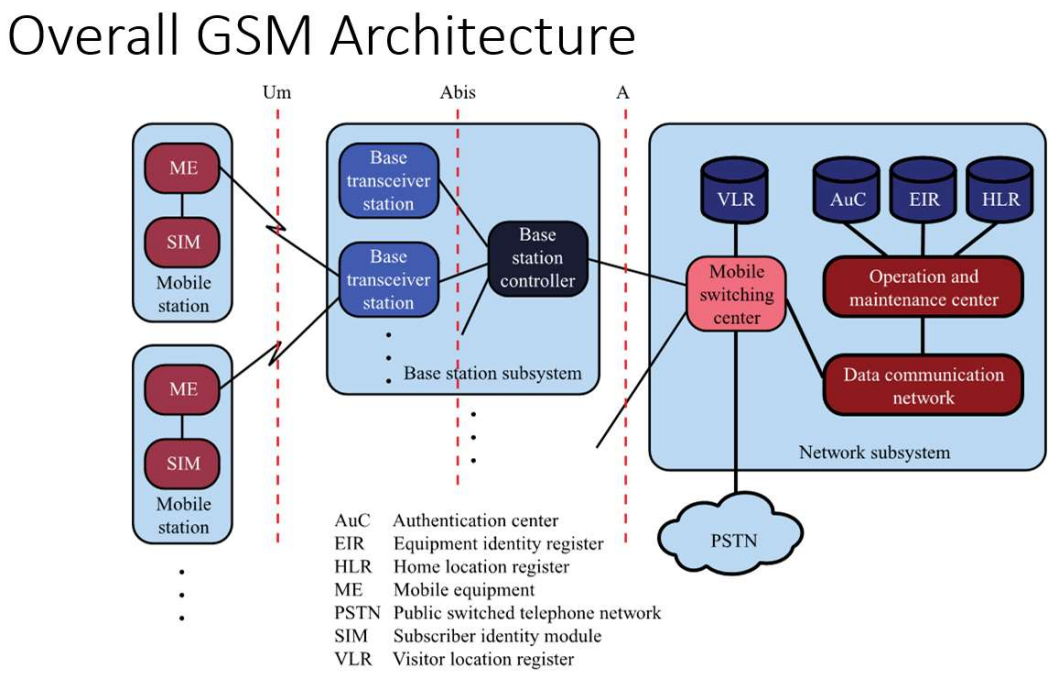
Method	QR-Code	iBeacon	RFID Tag
Basic Technology Being Used			
Reading Distance			
Subject to damage			
Power needed			
Information updates			
Cost of device			
Cost for installation and maintenance			
Availability to all users			

Table 1. Compare and contrast among QR-Code, iBeacon, and RFID Tag for mobile advertisement.

4.a) What is the aim of the Bluetooth protocol? Describe how Bluetooth is used in Personal Area Networks. What are some of the unique and useful applications? (10 marks)

4.b) Describe how Bluetooth devices are connected among each other to form a bigger network. Is this network efficient and scalable? List out your reasons. (10 marks)

5.a) Referring to the diagram below that shows the system architecture of a GSM Network.



Use a diagram to show the Network Architecture for the 4G (LTE-Advanced) Mobile Network. Indicate the similarities and the differences between the 2G GSM and the 4G mobile communication networks. (9 marks)

5.b) Describe the Steps that the MTSO of the mobile network system have to go through for finding the mobile phone according to its number, setup a connection and make a call between two mobile phones. (5 marks)

5.c) There are THREE advanced solutions in order to increase the capacity to serve crowded users within a cell. What are they? Briefly describe the approach of each of the solution. (6 marks)

6.a) Describe the basic concept of the Fingerprint approach for signal strength based location estimation. (6 marks)

6.b) List out the difficulties and problems of the Fingerprint approach for each of the following venues: (9 marks)

i) Ordinary venue in general (e.g., A shopping mall with atrium, corridors, and shops);

ii) Large venues (e.g., An exhibition hall in the Hong Kong Convention and Exhibition Centre);

iii) Venues that has frequent and dynamic changes (e.g., Supermarket, Art Gallery, Large Bookstore);

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