CS 638 Mobile Phone Programming   **Spring 2010**

Mid-term Exam I

Open book and notes; Take home   *Due: Tuesday, March 23, 2010 in class*

⊕ *Do not forget to write your name on the first page.*
⊕ *Be* **neat** *and* **precise**.
⊕ *You should draw simple figures if you think it will make your answers clearer.*
⊕ *Remember to cite all your sources, and also to paraphrase the text you find elsewhere in your own words.*
⊕ *While you can discuss your thoughts and sources with your peers, the thoughts and written content has to be entirely your own.*
⊕ *Good luck and remember, brevity is the soul of wit.*

- All problems are mandatory

- I cannot stress this point enough: **Be precise**. If you have written something incorrect along with the correct answer, you should **not** expect to get all the points. I will grade based upon what you **wrote**, not what you **meant**.

- Maximum possible points: 30.

1. **Voice over WiFi:** Over the years, there is a large move for converting the phone network in enterprises from the regular PSTN system (regular telephones) to Voice-over-IP (VoIP) phones. VoIP systems are ones where voice data are carried over the Internet instead of the phone network. Most VoIP systems today are wired, i.e., the phones connect directly to the IP network, over Ethernet or equivalent.

   Now consider that the phones used in the enterprise are not wired (Ethernet), but instead wireless (WiFi). For example, the handset in the office sends the voice data using the WiFi (802.11) protocol that we discussed in class. At a high level, the idea is that a phone handset acts as a 802.11 client to Access Points (APs) that are located in the building. When a user talks to another user, the traffic from the handsets carrying voice content travels over the WiFi link, into the wired backbone and then back down another WiFi link.

   Traditional enterprise WiFi systems are not all effective at dealing with a completely VoIP phone system. They expect that there will be infrequent disconnections, especially if a user is walking through the building and is handing off its connection from one AP to another.

   Your task is to read up the literature on Voice-over-WiFi solutions for enterprises from at least three of the following four vendors: Cisco, Aruba Networks, Meru Networks, and Extricom Networks. Each of them are WiFi enterprise vendors and have small differences in the way they structure their WiFi networks. Each of them try to target the VoIP market in an enterprise setting. You have to understand the solutions offered by each of the selected three vendors from a technical standpoint and explain the differences. If needed, you should read up on the 802.11 protocol in more detail and understand how it works and how it might or might not be able to support VoIP traffic.

   Which of these four vendor solutions for structuring an enterprise WLAN do you think works best for VoIP application over WiFi networks.

   Answer this question in as much detail as possible. Use diagrams to make your point. Take data liberally from any source on the web, but do make sure you cite them and paraphrase them. (20 points)

2. **Femto cells:** There is a new product in the horizon for cellular users, called Femto cells. Read up on their structure, business model, etc. Who do you think benefits from Femto cells — the end customers, the cellular operator, the home ISP?

   Should a home based user consider using a femto cell or a WiFi Access Point and their home Internet service if they have the choice of both? What in your opinion determines this choice?

   Answer this question in as much detail as possible. Use diagrams to make your point. Take data liberally from any source on the web, but do make sure you cite them and paraphrase them. (10 points)