

## Wireless Networks

### Problem 09 Solutions

#### P9.2

You have temporarily moved to a new area and you would like to use your cell phone. What alternatives do you have if:

- (a) There is no service provider in that area?
- (b) There is no agreement between your wireless phone service provider and the service provider in the new area?
- (c) The area is covered only by a satellite phone service?

#### [Solution]

- (a) It is impossible to use a cell phone where no service provider (including satellite phone service) exists.
- (b) If there is no agreement, there is nothing you can do in the new area. You can register your cell phone to the new service provider in the new area, if that employs the same technology and reprogrammed for new frequency band and/or code.
- (c) Subscribe your cell phone to a satellite phone service provider, if it is capable to use the satellite frequency band.

#### P9.6

Assume that you just got out of the airplane and you switched on your cell phone. If the closest BS is located at a distance of 5 kms, what is the minimum and the maximum delay before a contact is established between your cell phone and the nearest BS, given the BS transmits beacon signals every one second?

#### [Solution]

The registration process including:

$T_1$ : Beacon signal exchange between BS and MS

$T_2$ : MS request for registration

$T_3$ : Visiting BS send authentication request to home BS

$T_4$ : Home BS send authentication response back to the visiting BS

$T_5$ : Visiting BS send the authentication/rejection back to MS

Suppose  $T_3$  and  $T_4$  are fixed, then the minimum delay is

$$T_2 + T_3 + T_4 + T_5 = 2 * \left( \frac{5 \text{ km}}{3 * 10^8} \right) + T_3 + T_4,$$

and the maximum delay is

$$1 + T_1 + T_2 + T_3 + T_4 + T_5 = 1 + 3 * \left( \frac{5 \text{ km}}{3 * 10^8} \right) + T_3 + T_4.$$

#### P9.9

In a wireless network, the radio signal is broadcast through the air. Therefore, what is the significance of multicasting in this context? Explain in detail.

**[Solution]**

When a wireless network use a common channel, only stations in the radio range of the sender can receive the signal. Multicasting implies formation of group members beyond the radio range so that all can receive intended message

**P9.10**

What is meant by bidirectional tunneling? Why do you need HA-FA in addition to HLR-VLR pair? Explain clearly.

**[Solution]**

The bidirectional tunneling approach is that when an MS moves into a foreign network, a binding update is sent to the HA, which then responses with a binding acknowledgement. After that, a bidirectional tunnel is created by HA to the FA that is currently serving the MS and HA encapsulates the packets for the MS