CS 168
Spring 2026

Wireless and Cellular

Discussion 13

1 True or False

1.1 Wireless is a fundamentally shared medium.

1.2 The path loss of a wireless transmission is always the same in all directions.

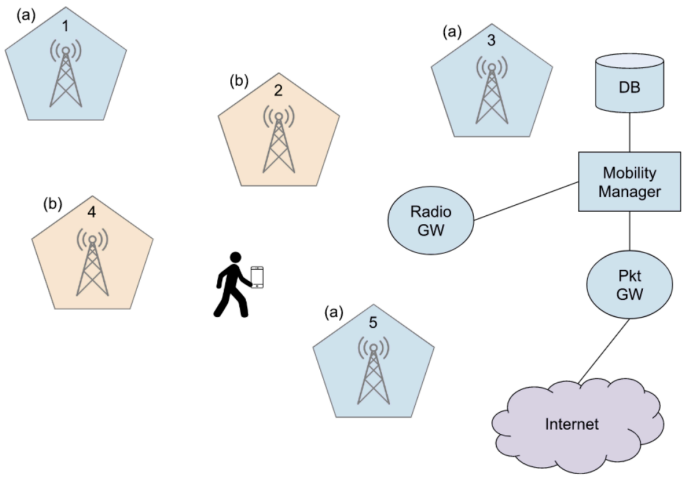
1.3 In cellular networks, the nearest tower to the user configures the specific routers to establish a path from the user to the Internet.

1.4 When picking a tower to configure with, the user picks the tower (belonging to its operator) that is closest to the user in terms of distance.

1.5 When towers periodically broadcast hello messages in order to be discovered, they include their network operator in these broadcast messages.

2 Cellular

In the following cellular architecture, the user is registered with the cellular operator (a) shown in blue and labeled with (a). As the user moves around the area, they discover and transfer data using different cellular towers.



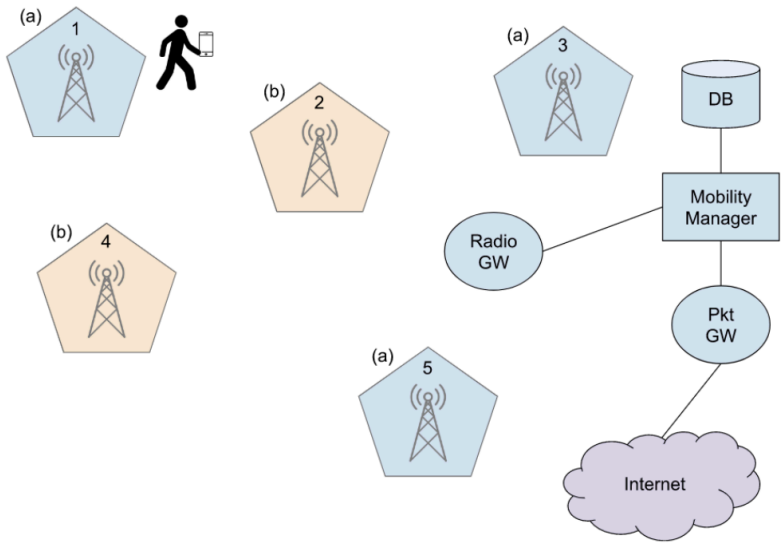
The user device is registered with operator (a), and gets the following beacons from the different towers with different received signal strength indicators (RSSI).

Tower	RSSI	Operator
1	−75dBm	(a)
2	−23dBm	(b)
3	−84dBm	(a)
4	−32dBm	(b)
5	−42dBm	(a)

2.1 Which tower should the user device connect to?

2.2 What entity in the cellular core processes the attach request from the user device?

Now the user moves as shown below and a handoff to tower 1 must occur.



2.3 Who participates in the handoff? Select all that apply.

- ☐ User Device
- ☐ Tower 1
- ☐ Tower 4
- ☐ Packet Gateway
- ☐ Old Tower (from part 1)
- ☐ Mobility Manager

2.4 Who initiates the handoff?

- ○ User Device
- ○ Tower 1
- ○ Tower 4
- ○ Packet Gateway
- ○ Old Tower (from part 1)
- ○ Mobility Manager

3 Wireless

Consider the following hosts attempting to talk with each other using the Multiple Access Collision Avoidance (MACA) protocol from class. You may assume that when a host transmits a message, the message travels radially outward from that host at a uniform velocity.

Notably, if Host D transmits a message, then after one second, both Host C and Host E hear the message, and after two seconds, both Host B and Host F hear the message, and so on. All hosts are equidistant from each other.

Suppose after not hearing any messages being transmitted for a while, Host E wants to start the process for transmitting a message to Host G at time $t = 0$.

3.1 What is the first thing that Host E transmits, and why does this first step help reduce collisions?

3.2 How does this first step differ from what would happen through the Carrier Sense Multiple Access (CSMA) approach?

Suppose Host G has received Host E's message from the "first step" of the previous part.

3.3 What packet does Host G now transmit to Host E, and what is the significance of this packet?

3.4 Suppose Host A wants to transmit data to Host H at the same time that Host G receives E's "first step" message. By MACA rules, is Host A able to do this?

3.5 Suppose Host E has now received the packet from Host G. Why can Host E now transmit the data and be assured that collisions at Host G are unlikely to occur?