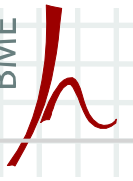


Mobilitás menedzsment alapok (angolul)

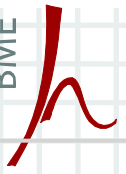
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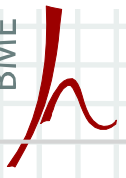
Cellular network basics

- mobile phone is physically connected to a base station, through the transceiver that covers a cell
- radio cells:
 - no fixed and strict borders, not regular shapes
 - rather probabilities of having a given signal quality in certain locations
 - due to the random nature of the radio channel
- in every cell a certain amount of frequency channels can be used -> a given capacity, according to Shannon
- cells using the same frequency channels cause interference to each others
- why cells? why not a single big cell over a big area?
 - propagation loss issues, power is not enough to reach very big distances
 - protocol issues: radio signal formats may limit the maximum cell size (see later)
 - but the main reason is: to **provide more capacity**
 - the idea of frequency –reuse
 - more smaller cells in an area -> higher capacity over the area -> higher number of customers and higher total traffic over the area
 - do not increase, or even decrease the maximum bitrate of a single user!



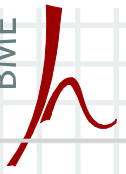
Mobility management

- mobile phone is physically connected to a base station, through the transceiver that covers a cell (-> mobile is in a cell)
 - the mobile has an active connection or data flow
 - while moving, the mobile may arrive to a place where the serving signal quality becomes bad (-> the mobile reaches the cell edge, mobile is going out of the cell)
 - the call/flow has to be switched to another cell, whose signal quality is better
 - without interrupting the call
 - this process is **handover**
- handover
 - handover at radio level: the call to be switched to another transceiver
 - handover in the network: the data flow to be routed to the new cell or new base station
 - handover is handled in the network
 - HOW?
 - mobile constantly measures the quality of serving cell and neighboring cells (yes, meanwhile having a conversation)
 - reports the measurements
 - the network decides and order the mobile to attach to another cell
 - the network handles the re-routing of the data flow to the new place



Mobility management

- Location management
 - when a mobile is turned on, but there's no connection
 - a mobile terminated call/data arrives to the network
 - the data should be routed to the mobile
 - to the base station, to the cell where the mobile currently is
- How does the system know it?
 - option 0: mobile reports its position using e.g. GPS
 - wrong, due to multiple reasons, I'll ask in the exam
 - option 1: the mobile constantly measures the qualities of all cells, selects the best one and reports the Id. of this cell to the network very often. The network keeps a database containing the Id. of best cell for all mobiles. Problems:
 - this reporting needs network capacity and signalling, setting up of signalling communication
 - too often, too much signalling especially for fast mobiles in small-cell area
 - due to the random nature of radio channel, best cell can change very often -> reporting should be done very often
 - option 2: don't report and don't store mobile positions at all, but operate a broadcast channel (paging channel) in the network. This should be listened to by all mobiles. In case of incoming data, send a notification to the paging broadcast channel in the whole network -> mobile will answer through its best cell. Problem:
 - paging channel should be so huge, to contain all the incoming notifications of all mobiles



Mobility management

- Location management
 - solution: Location Areas (later: Routing Areas, Tracking Areas)
 - a group of cells (say 20-30)
 - has a unique Id. as well LAC Location Area Code
 - the mobile constantly reads the LAC of its best cell
 - if there is a new LAC -> then sends the new LAC to the network
 - the network stores the current LAC for the mobile
 - upon arrival of a call the notification is sent to the paging channel of all the cells within the location area