Mobile Communication

Exercise Sheet # 4

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Exercise 1: Mobility management in GSM networks

1. Why is it necessary at all to know about the location of the mobile stations? Give examples of situations where the location of the mobile station is needed to ensure correct network operation.
   When a calling station dials a number it doesn't know the current location of the desired MS. It just dials the number and this request is going to home network of the desired MS's GMSC (through PSTN). Then the GMSC sends request to HLR (Home Location Register) and the HLR gets the information from VLR (Visitor Location Register) which can be far away from the home network. After the GMSC gets current location of the MS it forwards the call request to the MSC which is the MSC of the MS at the current location. For example, let's say someone from Bonn (a calling station) calls a friend (MS) which has the number of +49 171 ******* and that friend is in the Turkey at that time. First, the callers' request arrives to the GMSC and it contacts to HLR in order to get the information about corresponding MSC of the desired MS. And HLR gets this data from the VLR. So GMSC (of home network) should be able of obtaining the location of the MSs any time which is done through HLR.

2. The MoCo lecture introduced two different methods of location management: Handover and Location update. What is the difference between these methods? When and how often are these methods used?
   The location update is done when the mobile station is switched on but it is "idle" ("idle" means there is no active communication is going on = no phone call going on). In handover step, the mobile station is switched on but it has an active phone call going on (or circuit switched data).
   When the MS is moving and in "idle" state, it frequently measures reception quality of BTSs. If there is a BTS with a better receive quality the MS decides to "camp on a cell" which means selecting the best BTS in the vicinity. If the MS decides to change to another BTS, it analyses location area identity (LAI) which is broadcasted from the BTS and initiates the location update as LAI changes.
   Handover happens when the MS has active phone call going on. During the call the MS sends "measurement reports" to BTS (receive quality from current + alternative BTSs) and the BTS forwards measurement report to BSC. If there is a new BTS with a better receive quality BSC decides when to carry out the handover and to which new BTS.

3. What is the role of Paging in this context? Assume a mobile network operator does not want to have paging in his network. Is there any way to refrain from using paging without changing the GSM protocol? If yes, how could this work and what would be the consequences?
   The MSC does not exactly know the location of the MS. MSC uses paging procedure to find out the MS's location before actual call establishment.When the MS is switched on and is in idle state it listens to paging channel of the currents BTS. If there is a request from the corresponding paging channel the MS notices it answers and this goes back to MSC.