**MOBILE COMPUTING – ASSIGNMENT PRESENTATION**

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**HANDOFFS AND ITS TYPES**

The mobile station moves out of the range of a BTS or a certain antenna of a BTS respectively. The received signal level decreases continuously until it falls below the minimal requirements for communication. The error rate may grow due to interference, the distance to the BTS maybe too high (max.35km) etc –all these effects may diminish the quality of the radio link and make radio transmission impossible in the near future.

The wired infrastructure (MSC, BSC) may decide that the traffic in one cell is too high and shift some MS to other cells with a lower load (if possible) . Handover maybe due to load balancing.

**HANDOFFS**

Handoffs, also known as handovers, are a crucial aspect of mobile computing and telecommunications. They are the process by which a mobile device transitions its communication connection from one cell in a cellular network to another without interrupting the ongoing communication session.

When a mobile device moves out of the coverage area of one cell and into the coverage area of another cell, the connection needs to be transferred seamlessly to the new cell to avoid interruption of the communication session. The process of transferring the connection from one cell to another is known as a handoff.

Cellular systems require handover procedures, as single cells do not cover the whole service area, but ,e.g. ,only upto 35km around each antenna on the countryside and some hundred meters in cities (Tripathi,1998). The smaller the cell size and the faster the movement of a mobile station through the cells (upto250km/h for GSM), the more handovers of on going calls are required. However ,a handover should not cause a cut-off, also called call drop. GSM aims at maximum handover duration of 60ms.

**WHY HANDOFFS?**

**To maintain continuous connectivity**: As a mobile device moves, the signal strength of the original cell decreases, while the signal strength of the new cell increases. To ensure uninterrupted communication, the mobile device must transfer the connection from the original cell to the new cell.

**To optimize network performance**: By dynamically adjusting the handover threshold based on the signal strength of nearby cells, the network can allocate network resources more efficiently and optimize network performance.

**To increase network capacity**: By balancing the load across multiple cells, the network can increase its capacity and accommodate more mobile devices.

**TYPES OF HANDOFFS**

**Intra-cell handover:** In this type of handover, a mobile device is handed over from one channel to another within the same cell. This type of handover is used when the signal strength of a channel within a cell becomes too weak and the mobile device needs to switch to another channel with stronger signal strength.

**Inter-cell handover:** In this type of handover, a mobile device is handed over from one cell to another. This type of handover is used when the mobile device moves from one cell to another, and the signal strength of the current cell becomes too weak while the signal strength of a neighboring cell becomes stronger. The inter-cell handover is typically initiated by the base station, which detects the decreasing signal strength of the current cell and instructs the mobile device to switch to a new cell.

**Hard handover**: In this type of handover, the mobile device completely breaks its connection with the current cell before establishing a connection with the new cell. This type of handover is generally used in older cellular networks, where the handover process takes longer and can result in a brief interruption of the communication session.

**Soft handover**: In this type of handover, the mobile device establishes a connection with the new cell before breaking its connection with the current cell. This type of handover is used in modern cellular networks, where the handover process is faster and more seamless, resulting in minimal or no interruption of the communication session.

Here is an overview of the general handover procedure:

**Measurement and Detection:** The first step in the handover procedure involves measuring the signal strength and quality of the current cell and neighboring cells. The base station continuously measures the signal strength of the mobile device and detects when the signal strength falls below a certain threshold.

**Decision Making:** Once the signal strength of the current cell falls below a threshold, the base station decides whether to initiate a handover. This decision is based on various factors such as the signal strength of the neighboring cells, the traffic load on the current cell and neighboring cells, and the type of handover to be performed.

**Handover Preparation:** If a handover is deemed necessary, the base station prepares the mobile device for handover. The base station sends a handover command message to the mobile device, indicating the identity of the new cell and the type of handover to be performed.

**Handover Execution:** The mobile device receives the handover command message and initiates the handover process. In a hard handover, the mobile device completely breaks its connection with the current cell before establishing a connection with the new cell. In a soft handover, the mobile device establishes a connection with the new cell before breaking its connection with the current cell.

**Handover Completion:** Once the handover is complete, the mobile device is fully connected to the new cell, and the communication session resumes. The base station sends a handover complete message to the mobile device, indicating that the handover process is complete.

**Handover Optimization:** Once the handover is complete, the network may perform additional optimization steps to ensure optimal network performance. This may include adjusting the handover threshold, allocating network resources, and balancing the load across multiple cells.

