UNIT-III
HANDOVER

Madheswari.K

AP/CSE

Handover

- Cellular systems require handover procedures, as single cells do not cover the whole service area, but, e.g., only up to 35 km around each antenna on the countryside and some hundred meters in cities
- The smaller the cell size and the faster the movement of a mobile station through the cells (up to 250 km/h for GSM), the more handovers of ongoing calls are required.
- However, a handover should not cause a cut-off, also called call drop.
- GSM aims at maximum handover duration of 60 ms.

Handoffs

- **GSM uses mobile assisted hand-off (MAHO). Signal strength measurements are sent to the BS from the mobile.**
- **The MSC decides when to do a handoff and it informs the new BS and the mobile.**
- **When a mobile switches to a new BS it sends a series of shortened bursts to adjust its timing (giving the bS time to calculate it and send it) and allow the new BS to synchronize its receiver to the arrival time of the messages**

Reasons for Handover Techniques

- 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 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 may be due to load balancing.

Types of Handover Techniques

- **Intra-cell handover:**
- **Inter-cell, intra-BSC handover**
- **Inter-BSC, intra-MSC handover**
- **Inter MSC handover:**

Types of Handover Techniques

- **Intra-cell handover:**
- Within a cell, narrow-band interference could make transmission at a certain frequency impossible.
- The BSC could then decide to change the carrier frequency (scenario 1).

Inter-cell, intra-BSC handover

- This is a typical handover scenario. The mobile station moves from one cell to another, but stays within the control of the same BSC.
- The BSC then performs a handover, assigns a new radio channel in the new cell and releases the old one (scenario 2).

Types of Handover Techniques

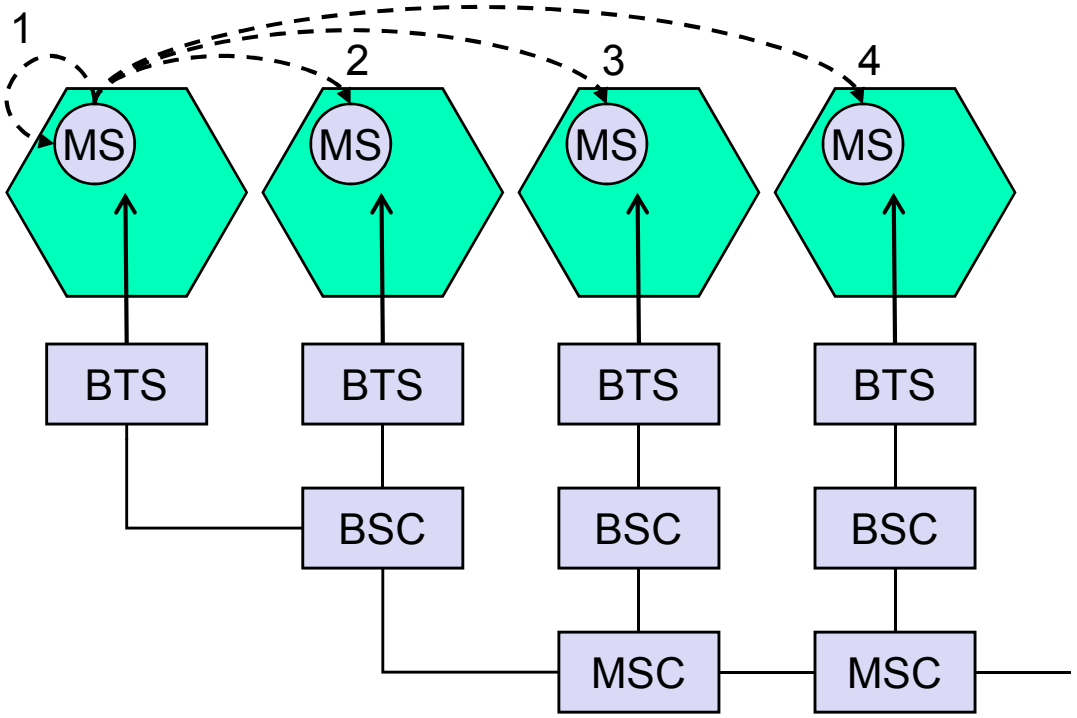
Inter-BSC, intra-MSC handover

- As a BSC only controls a limited number of cells; GSM also has to perform handovers between cells controlled by different BSCs.
- This handover then has to be controlled by the MSC (scenario 3). This situation is also shown in Figure 4.13.

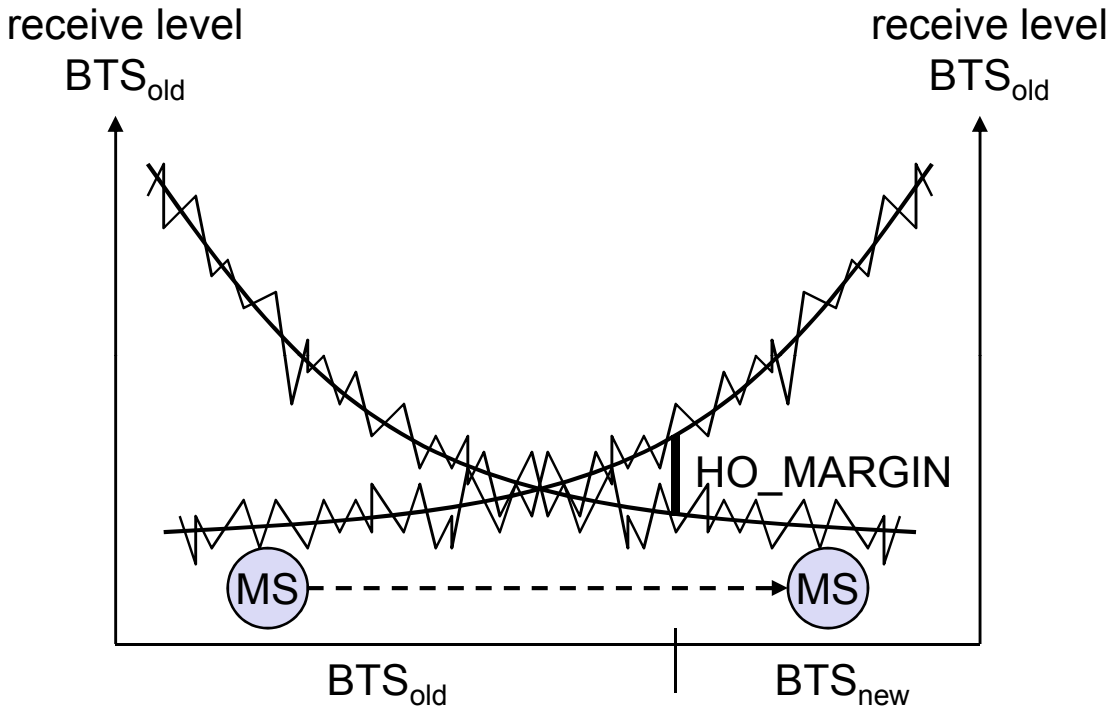
Inter MSC handover:

- A handover could be required between two cells belonging to different MSCs.
- Now both MSCs perform the handover together (scenario 4).

4 types of handover



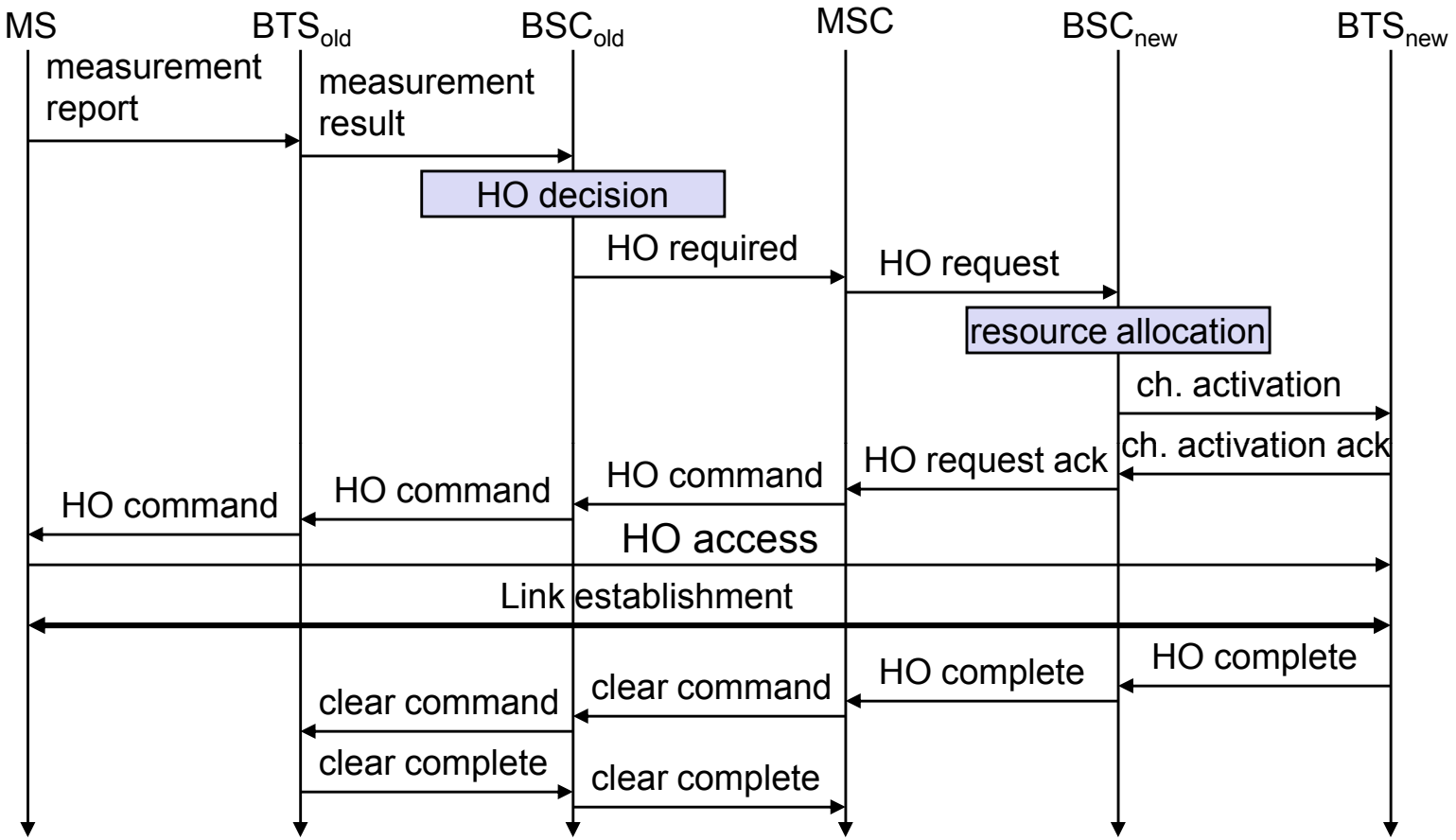
Handover decision



Handover decision

- Figure shows the typical behavior of the received signal level while an MS moves away from one BTS (BTSold) closer to another one (BTSnew).
- In this case, the handover decision does not depend on the actual value of the received signal level, but on the average value.
- Therefore, the BSC collects all values (bit error rate and signal levels from uplink and downlink) from BTS and MS and calculates average values. These values are then compared to thresholds, i.e., the handover margin (HO_MARGIN),

Handover procedure



Handover procedure

- Figure shows the typical signal flow during an inter-BSC, intra-MSC handover.
- The MS sends its periodic measurements reports, the BTSold forwards these reports to the BSCold together with its own measurements.
- Based on these values and, e.g., on current traffic conditions, the BSCold may decide to perform a handover and sends the message HO_required to the MSC.
- The task of the MSC then comprises the request of the resources needed for the handover from the new BSC, BSC new.
- This BSC checks if enough resources (typically frequencies or time slots) are available and activates a physical channel at the BTSnew to prepare for the arrival of the MS.

Test Your Knowledge

- Do you know the current situation of mobile phone networks in Europe, Japan, China, and North America.
- What are the main differences, what are efforts to find a common system or at least interoperable systems?

Reference

- Jochen H. Schller, “Mobile Communications”, Second Edition, Pearson Education, New Delhi, 2007.