LOCALIZATION AND CALLING

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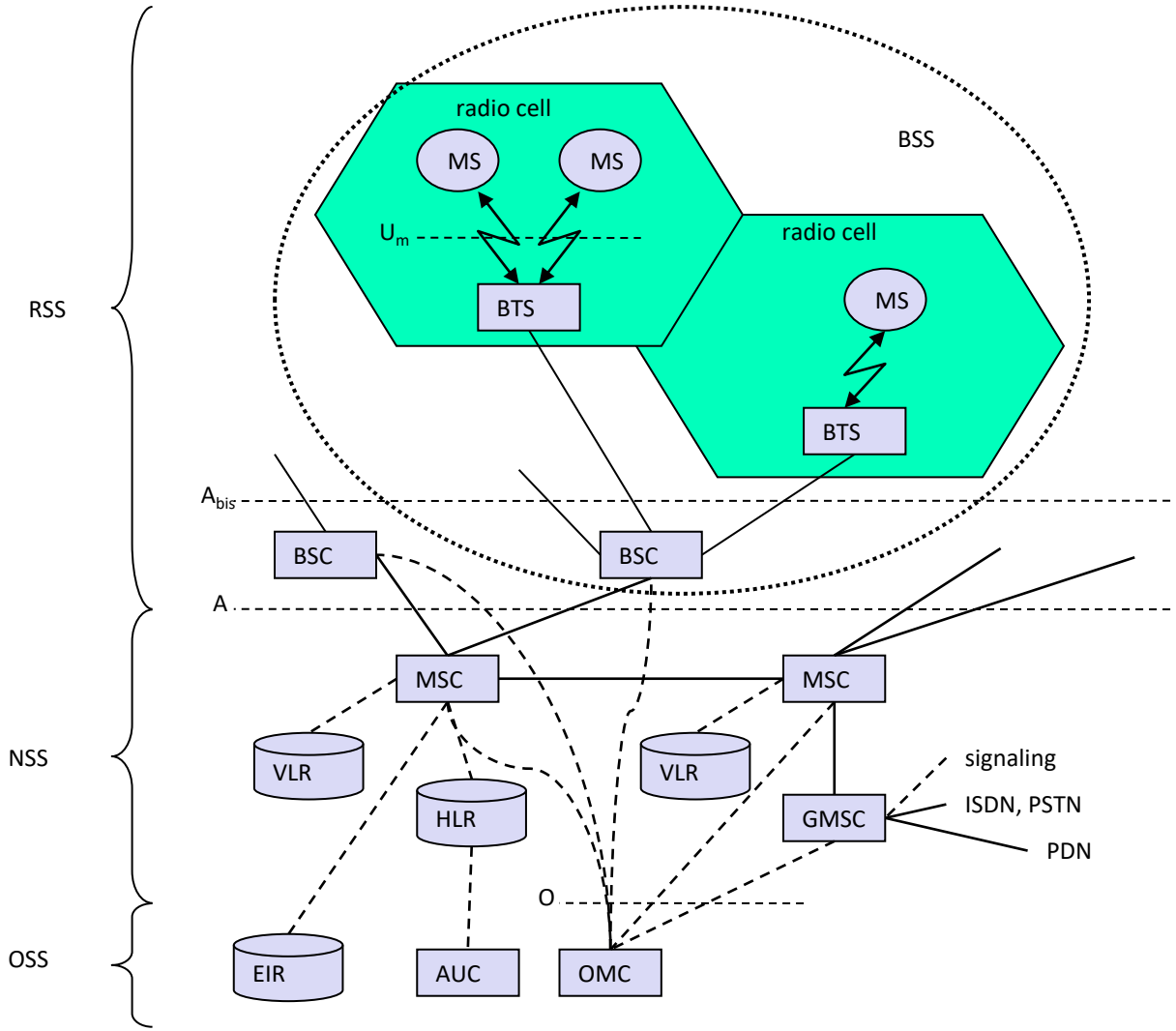
AP/CSE

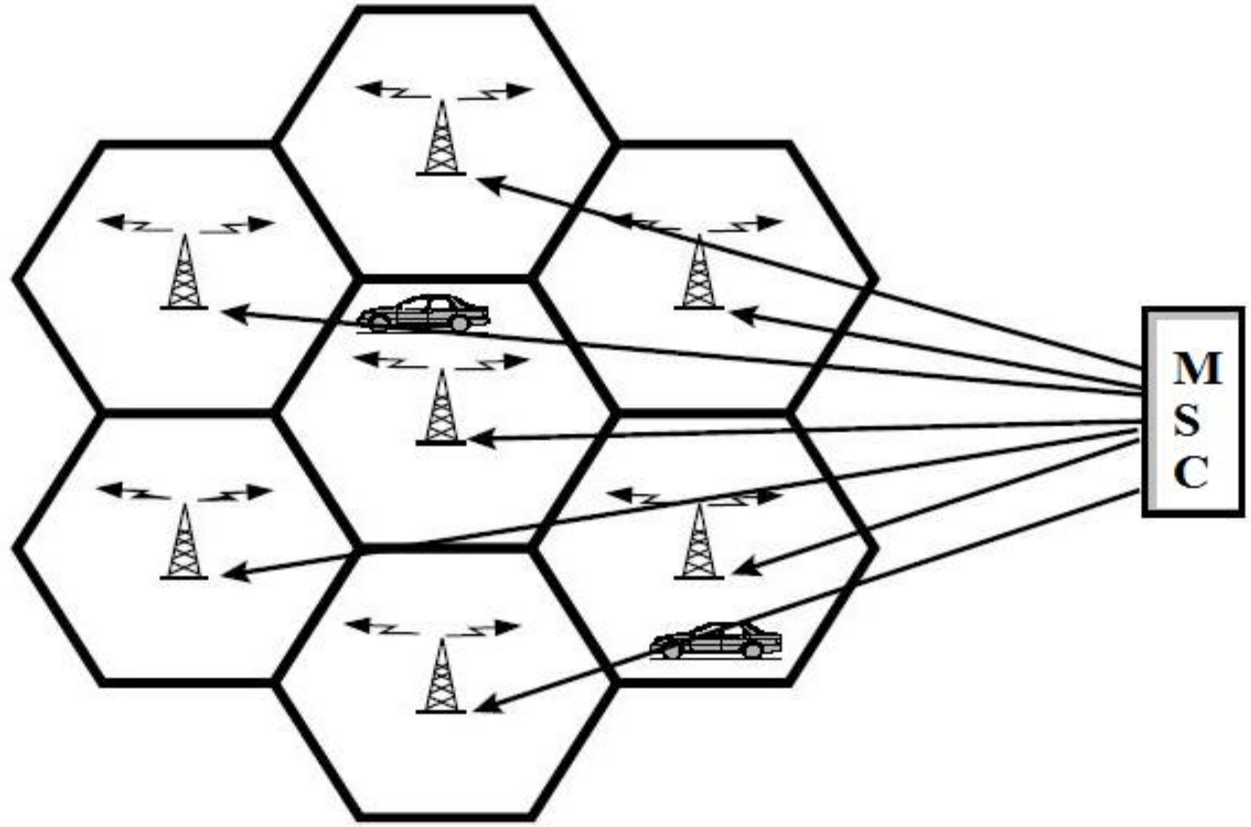
GSM Architecture: Recall



- *BSS* (Base Station Subsystem)
- *BTS* (Base Transceiver Station): sender and receiver
- *BSC* (Base Station Controller): controlling several transceivers
- MSC (Mobile Station Controller)
- HLR (Home Location Register)
- VLR (Visitor Location Register)
- GMSC (Gateway Mobile Station Controller)
- EIR (Equipment Identity Register)
- AuC (Authentication Centre)
- OMC (Operation and Maintenance Centre)
- Interfaces
  - Um : radio interface
  - Abis : standardized, open interface with 16 kbps user channels
  - A: standardized, open interface with 64 kbps user channels

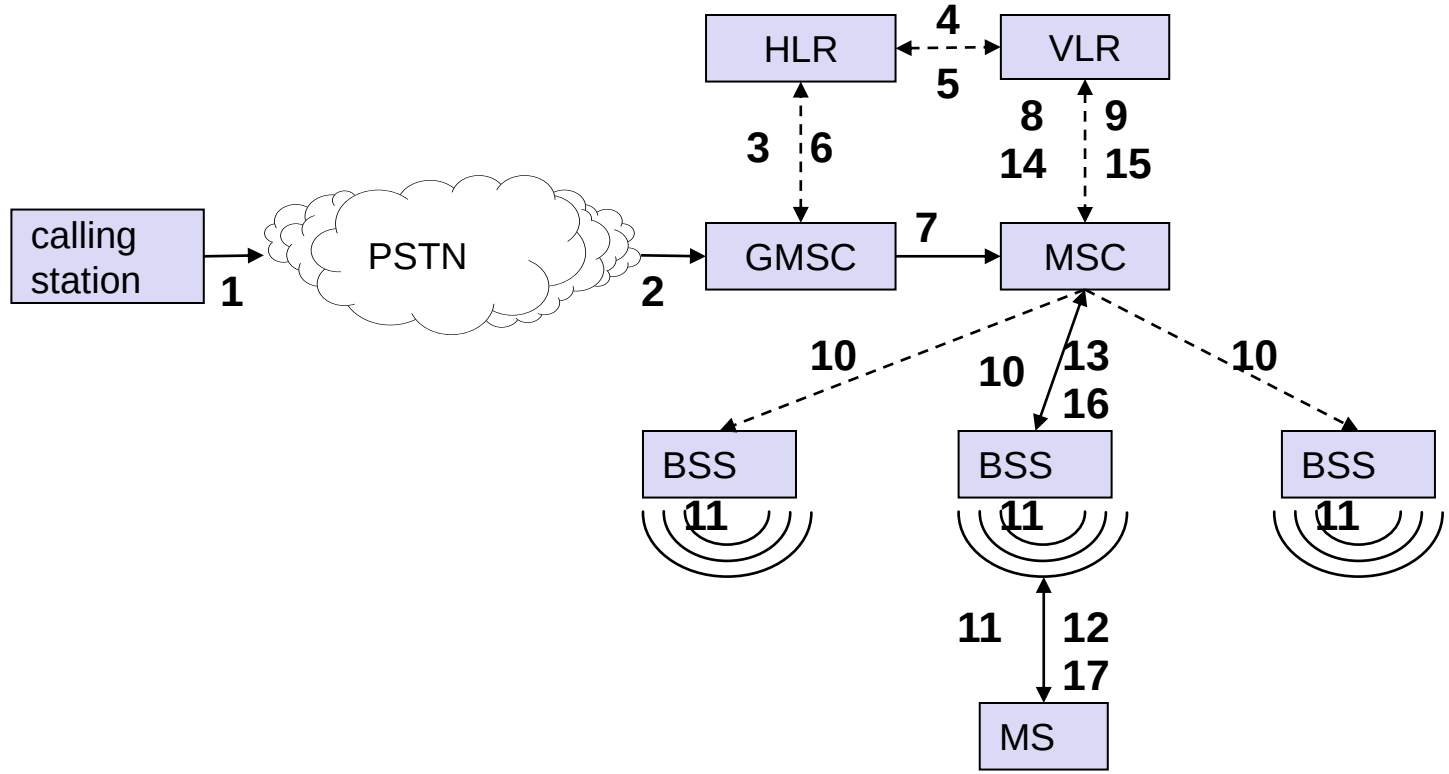
Types of Calls

- 2 types of calls
  - Mobile Terminated Call (MTC)
  - Mobile Originated Call (MOC)
- Paging
  - Broadcasting a message in a cell or group of cells to get a response from the MS for which a call or message is incoming.



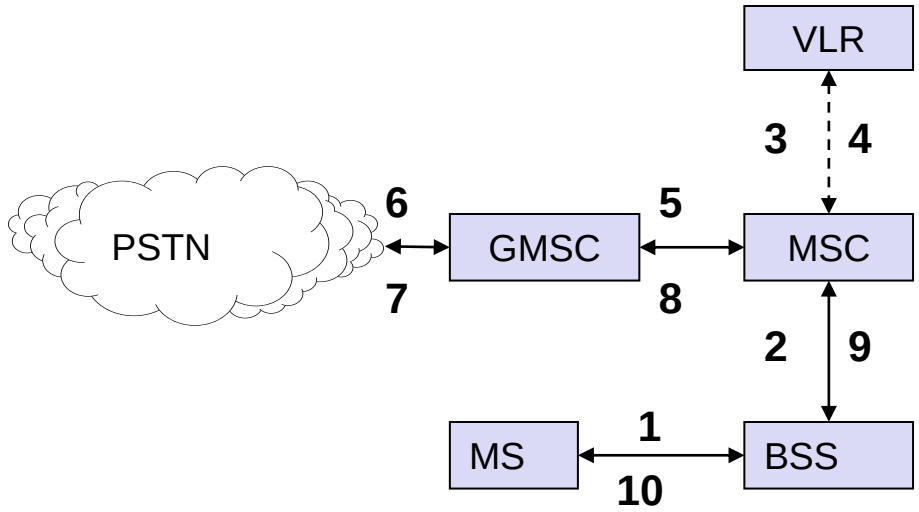
Mobile Terminated Call

- 1: calling a GSM subscriber
- 2: forwarding call to GMSC
- 3: signal call setup to HLR
- 4, 5: request MSRN from VLR
- 6: forward responsible MSC to GMSC
- 7: forward call to current MSC
- 8, 9: get current status of MS
- 10, 11: paging of MS
- 12, 13: MS answers
- 14, 15: security checks
- 16, 17: set up connection



Mobile Originated Call

- 1, 2: connection request
- 3, 4: security check
- 5-8: check resources
- 9-10: set up call



HANDOVER

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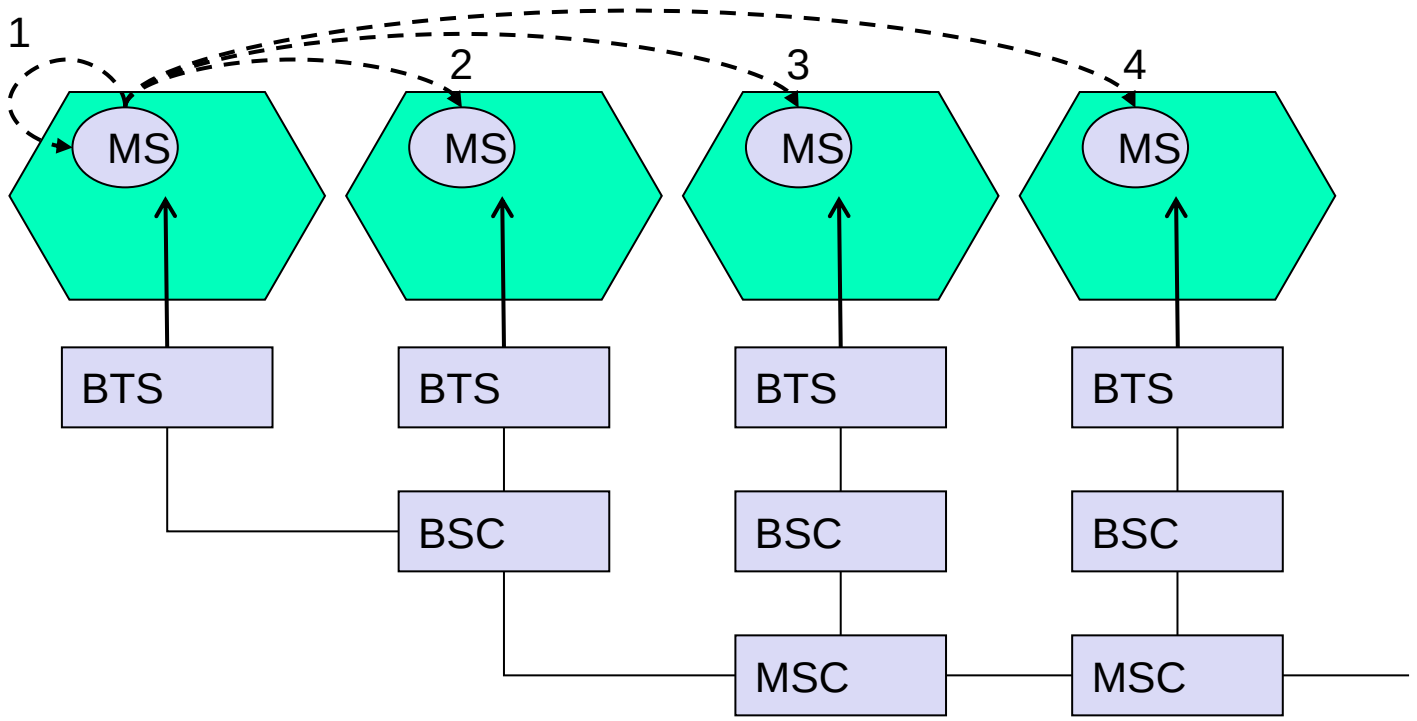
Introduction

- Single cell do not cover the whole service area.
- Therefore handover procedure is required in GSM
- More handover for ongoing call are needed when the cell size is small and the movement of the mobile station is fast (Upto 250 km/h)
- A handover should not cause a cut-off or call drop.
- Maximum handover duration is about 60ms.

Basic Reasons for handover

1. The mobile station moves out of the range of a BTS.
   - The signal strength decreased continuously until it falls below the minimum requirement.
   - The error rate is high due to interference. (BTS may be too high max 35km)
2. MSC or BSC may decide that the traffic in one cell is too high and shift some MS to other cells with a lower load ie load balancing

Types of Handover



Types of Handover

- Intra cell handover
  - Within a cell.
  - Narrow band interference could make transmission with error at a certain frequency
  - BSC then decides to change the carrier frequency
- Inter cell, Intra BSC handover
  - Mobile station moves from one cell to another, but stays within the control of the same BSC.
  - BSC performs a handover, assigns a new channel in the new cell and releases the old one.

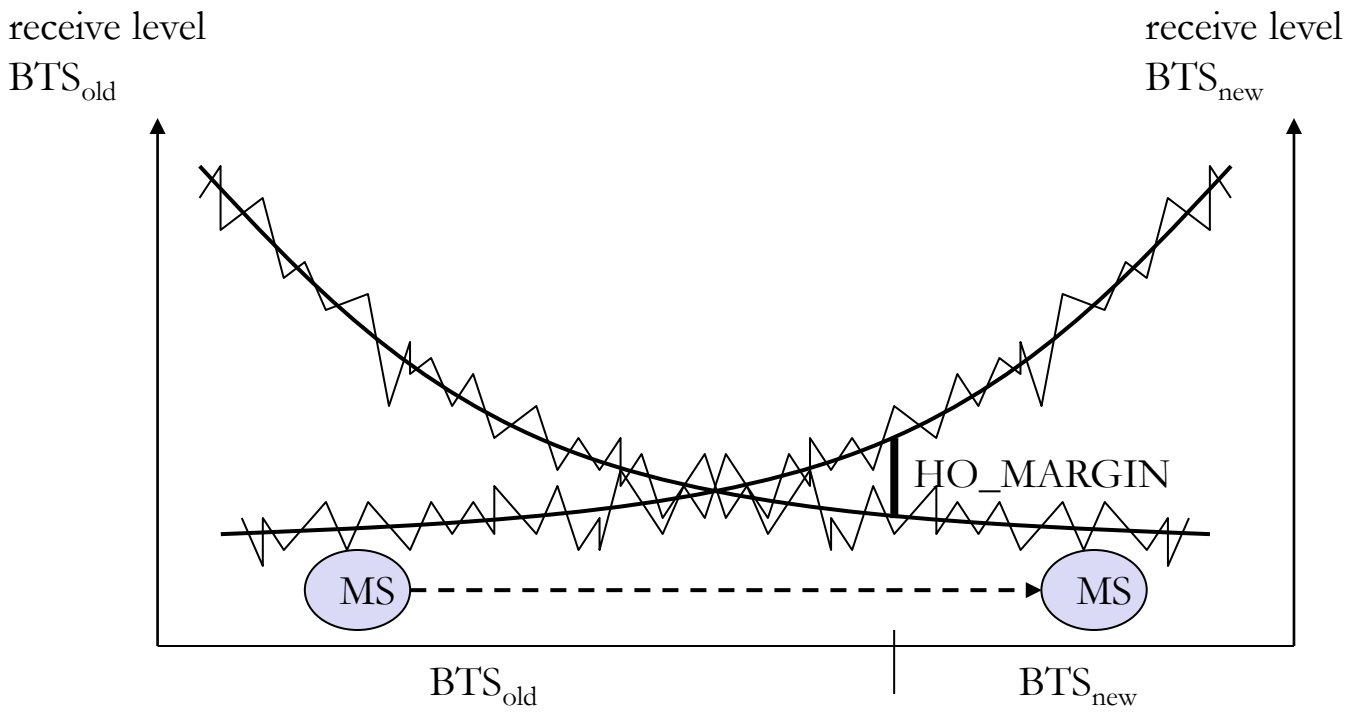
Types of Handover

- Inter BSC, Intra MSC handover
  - BSC controls only limited number of cells.
  - GSM has to perform handovers between cells controlled by different BSCs.
  - This handover is then controlled by MSC.
- Inter MSC handover
  - A handover could be required between two cells belonging to different MSCs.
  - Both MSCs perform the handover together.

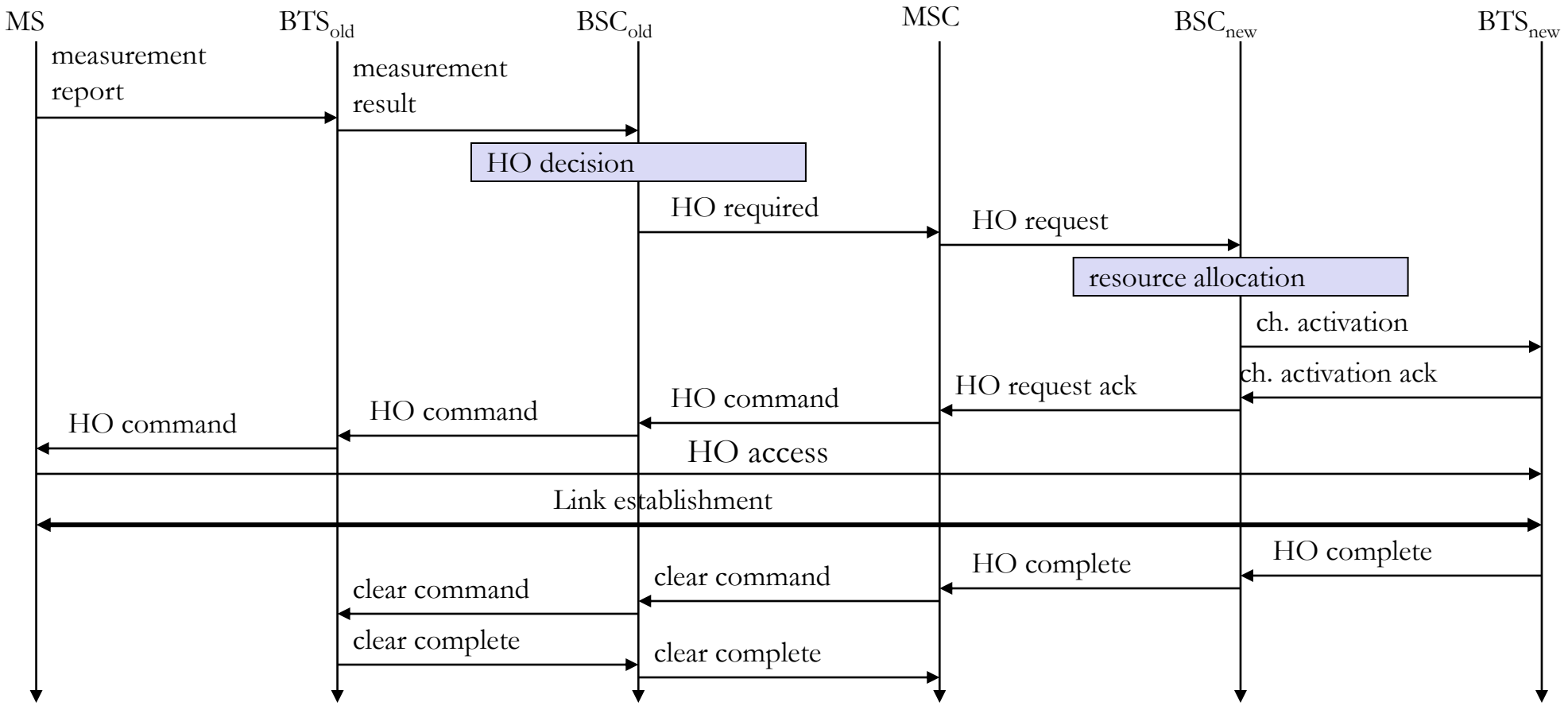
Handover Decision

- To identify a weak link
  - MS and BTS perform periodic measurements of the downlink and uplink quality respectively.
  - For every half second MS sent information about the quality of the current link used for transmission and the quality of certain channels in neighboring cells.
- Handover value does not depends on the actual value, but it depends on the average value.

Handover Decision



Intra MSC Handover



Summary

- Localization
  - Paging
- Calling
  - Mobile Terminated Call
  - Mobile Originated Call
- Handover
  - Different types
  - Handover margin
  - Handover Decision

Test your understanding

- How a call connection is established between 2 mobile phones.

References

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