SNS COLLEGE OF TECHNOLOGY

Coimbatore – 35

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Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A++' Grade

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

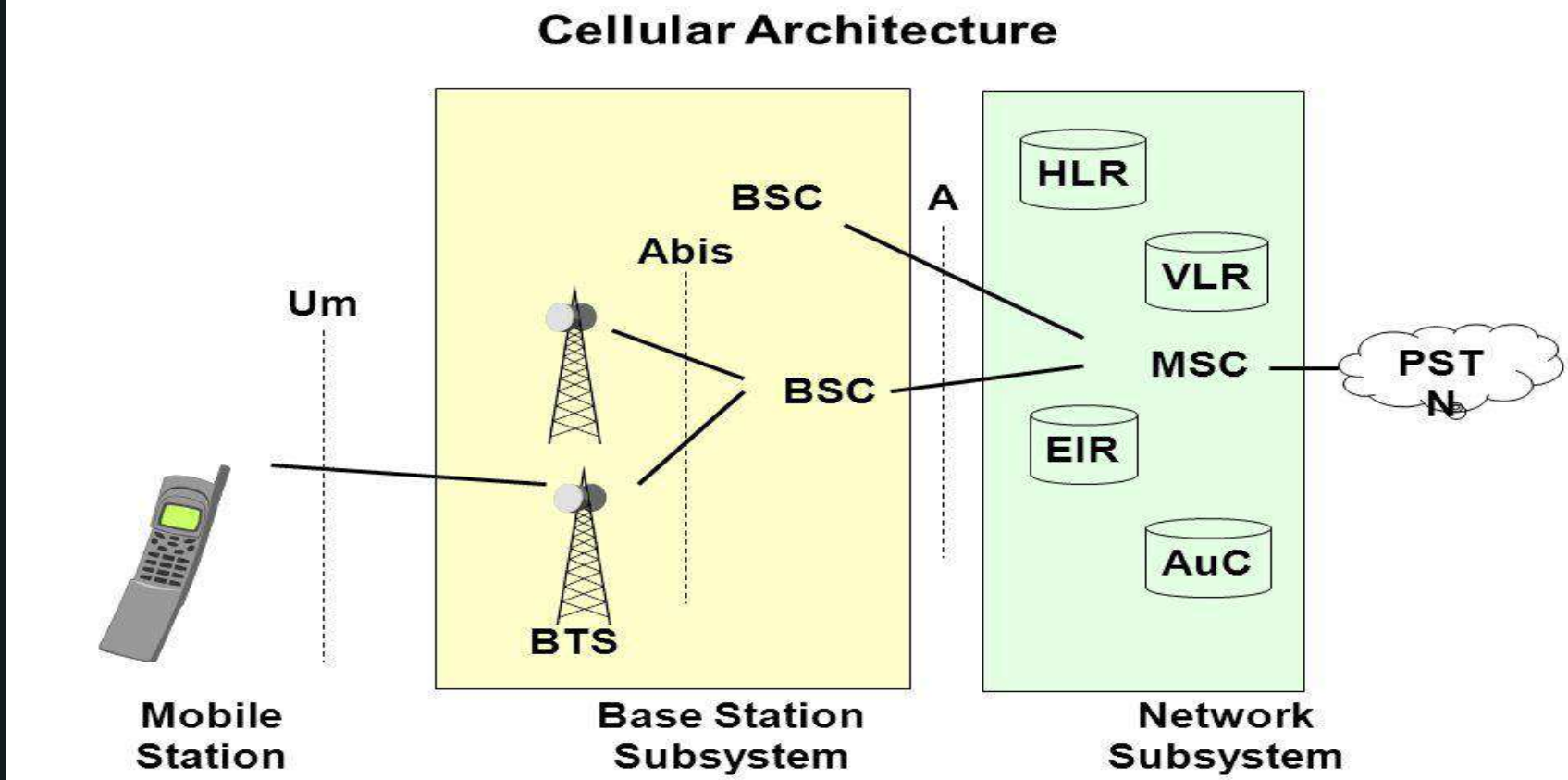
16EC401 / Wireless Communication

IV ECE/ VII SEMESTER

Unit II - **CELLULAR ARCHITECTURE**

Topic 5 : Channel Assignment

Cellular Architecture



Channel Assignment Strategies

- Channel assignment strategy
  - fixed channel assignment
  - dynamic channel assignment

Channel Assignment Strategies

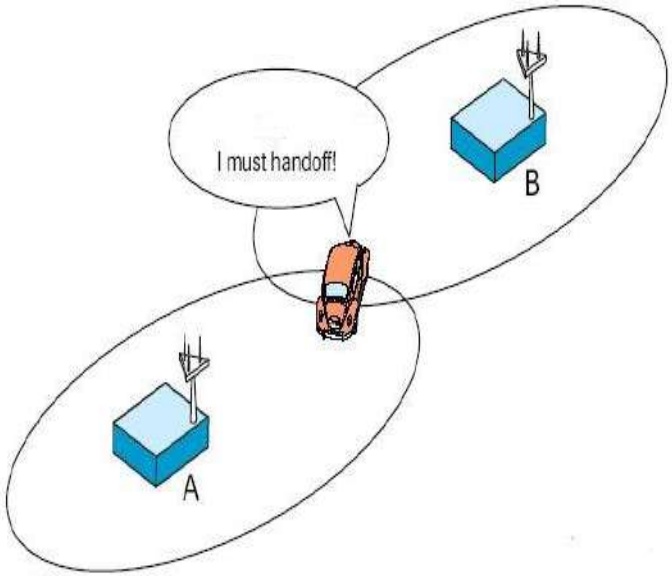
- Fixed channel assignment
  - Each cell is allocated a predetermined set of voice channel
  - Any new call attempt can only be served by the unused channels
  - The call will be *blocked* if all channels in that cell are occupied
- Dynamic channel assignment
  - Channels are not allocated to cells permanently
  - Allocate channels based on request
  - Reduce the likelihood of blocking, increase capacity

Handoff Strategies

- When a mobile moves into a different cell while a conversation is in progress
- The MSC automatically transfers the call to a new channel belonging to the new base station

- Handoff operation
  - Identifying a new base station
  - Re-allocating the voice and control channels with the new base station

Handoff Strategies



- Handoff Threshold
  - Minimum usable signal for acceptable voice quality (-90dBm to -100dBm)

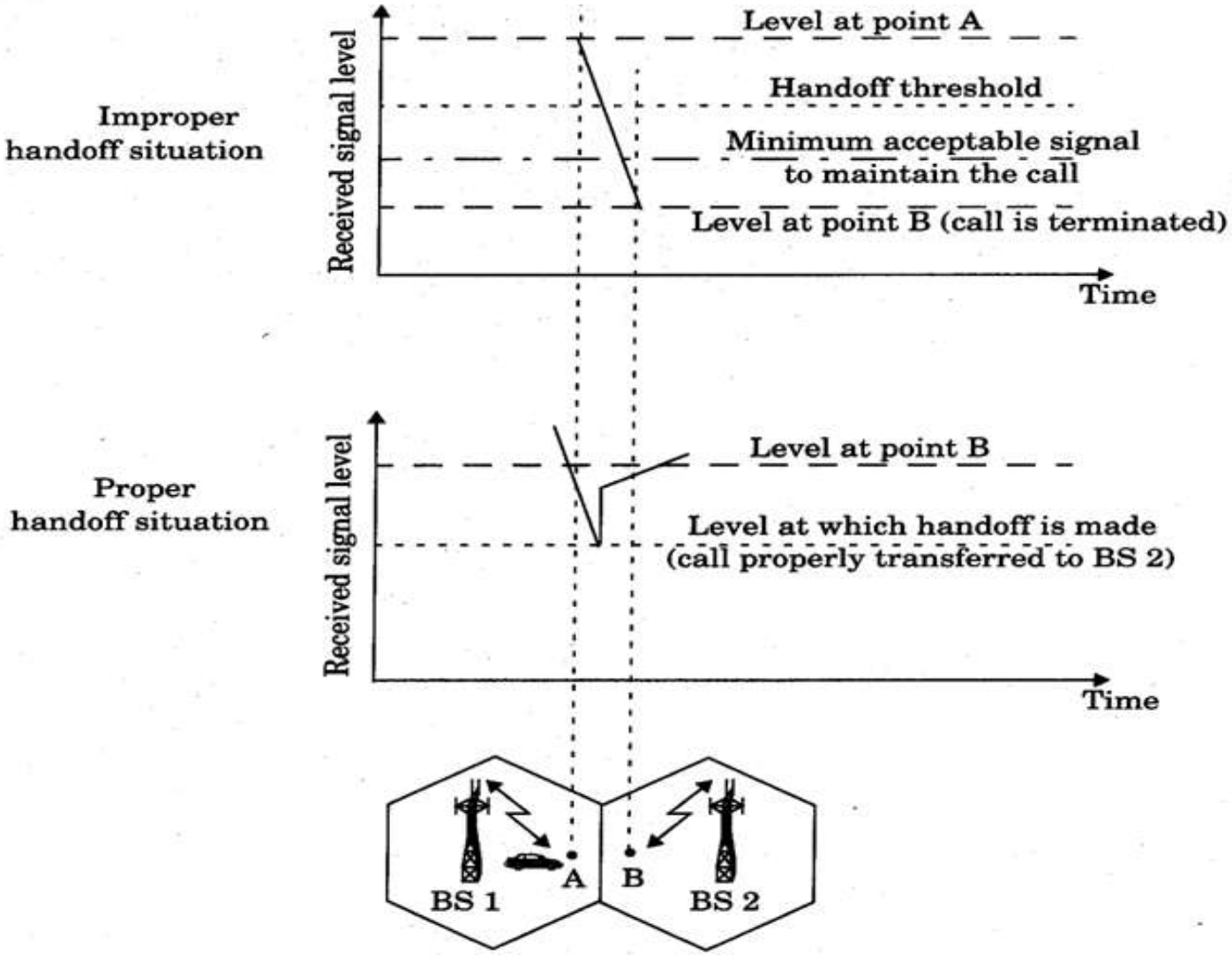
$$\Delta = P_{r,handoff} - P_{r,minimum\ usable}$$

  - Handoff margin cannot be too large or too small

– If Δ is too large, unnecessary handoffs burden the MSC

– If Δ is too small, there may be insufficient time to complete handoff before a call is lost

Handoff Consideration

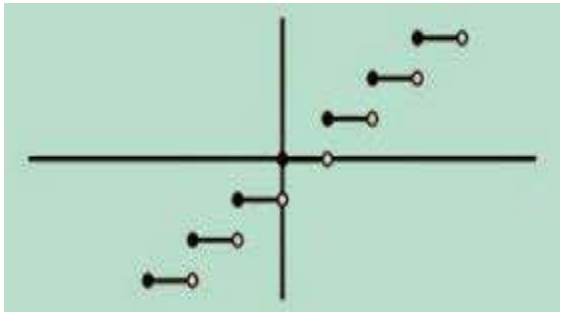


ACITIVITY

Activity : Brain teaser

1.Find the name of the movie for the below picture

$9.80665\ m/s^2$

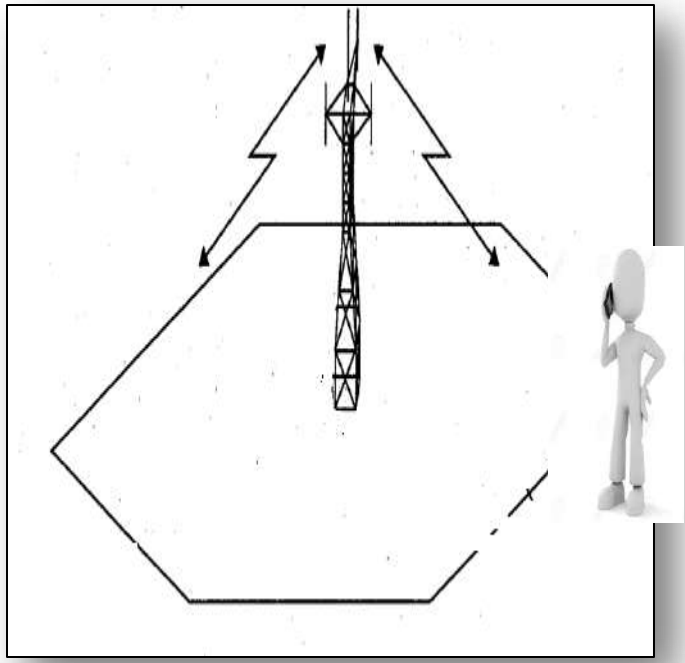


Practical Handoff Consideration

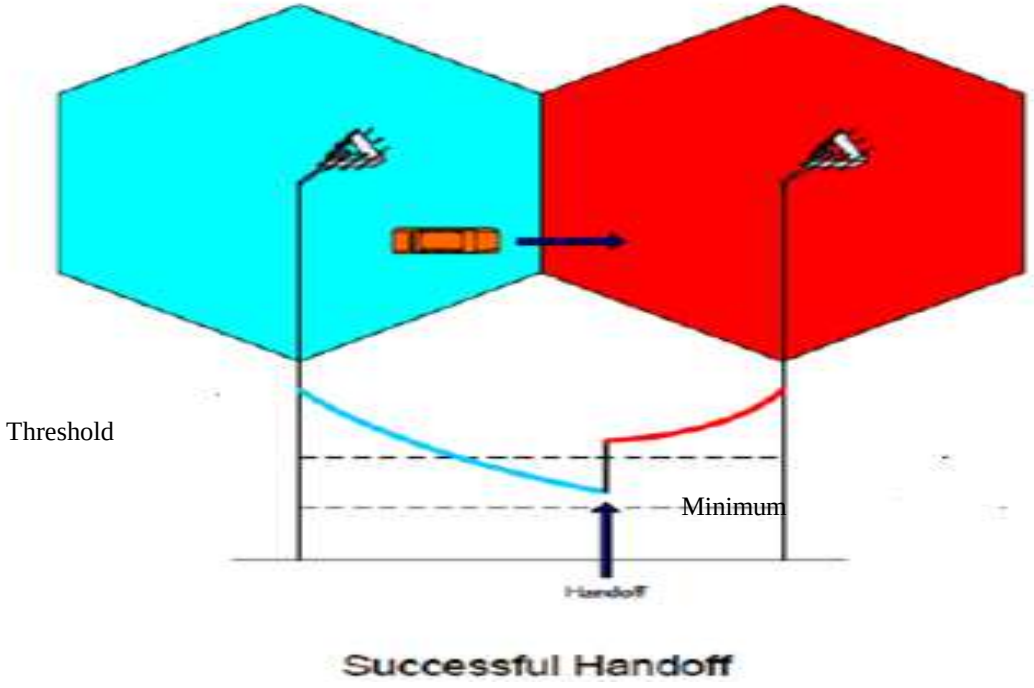
- Handoff must ensure that the drop in the measured signal is not due to momentary fading
- The mobile is actually moving away from the serving base station
- Running average measurement of signal strength should be optimized so that unnecessary handoffs are avoided
  - Depends on the speed at which the vehicle is moving
  - Steep short term average -> the hand off should be made quickly
  - The speed can be estimated from the statistics of the received short-term fading signal at the base station

Practical Handoff Consideration

- Dwell time: the time over which a call may be maintained within a cell without handoff
- Dwell time depends on
  - propagation
  - interference
  - distance
  - speed



Practical Handoff Consideration



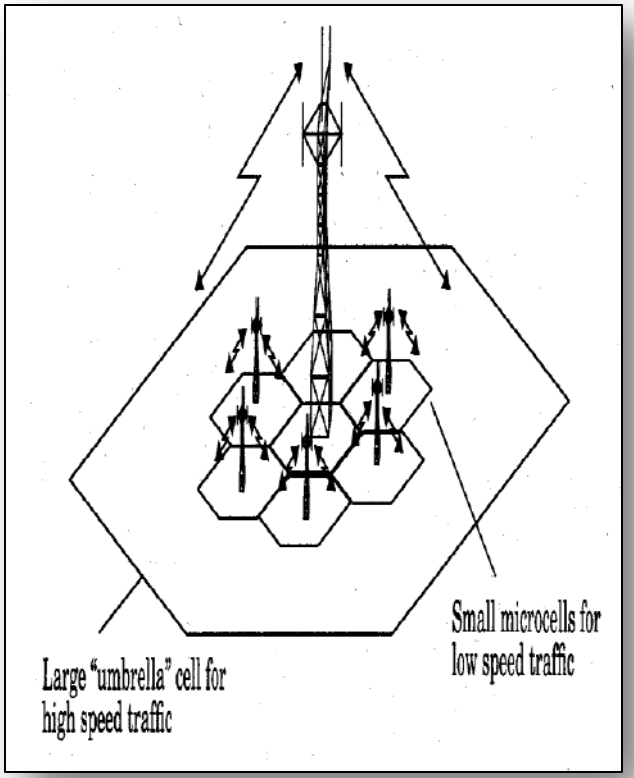
- Handoff measurement
  - In 1G systems, signal strength measurements are made by the base station and supervised by the MSC
  - In 2G TDMA, handoff decisions are mobile assisted, called mobile assisted handoff (MAHO)

Practical Handoff Consideration

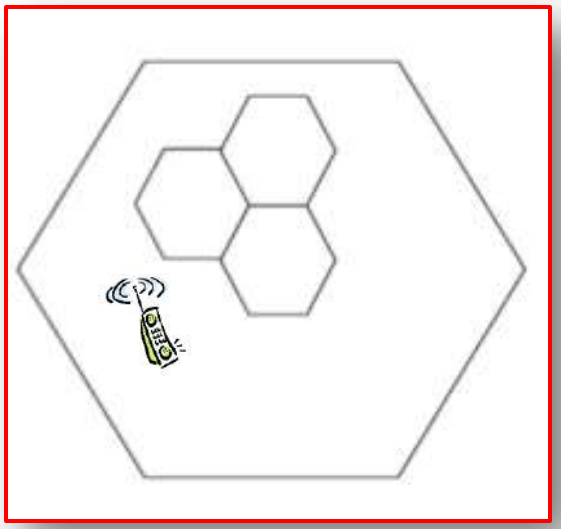
- Intersystem handoff: If a mobile moves from one cellular system to a different cellular system controlled by a different MSC
- Handoff requests is much important than handling a new call
- Different type of users
  - High speed users need frequent handoff during a call
  - Low speed users may never need a handoff during a call

Practical Handoff Consideration

- Microcells to provide capacity, the MSC can become burdened if high speed users are constantly being passed between very small cells
- Minimize handoff intervention
  - handle the simultaneous traffic of high speed and low speed users



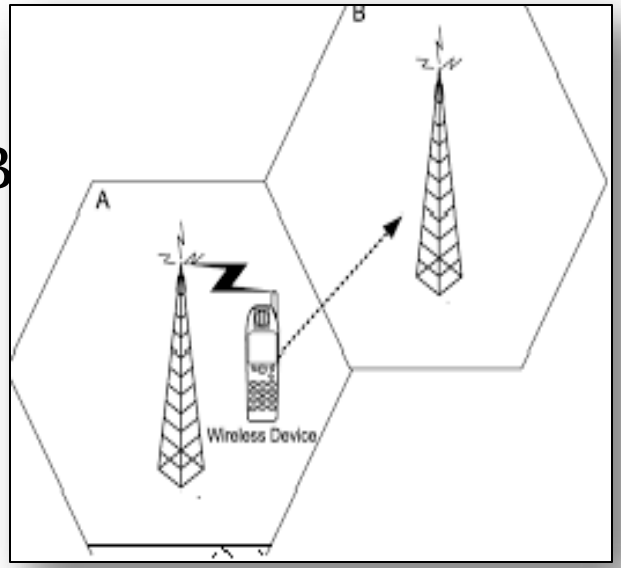
Practical Handoff Consideration



- Large and small cells can be located at a single location (umbrella cell)
  - different antenna height
  - different power level
- Cell dragging problem: pedestrian users provide a very strong signal to the base station
  - The user may travel deep within a neighboring cell

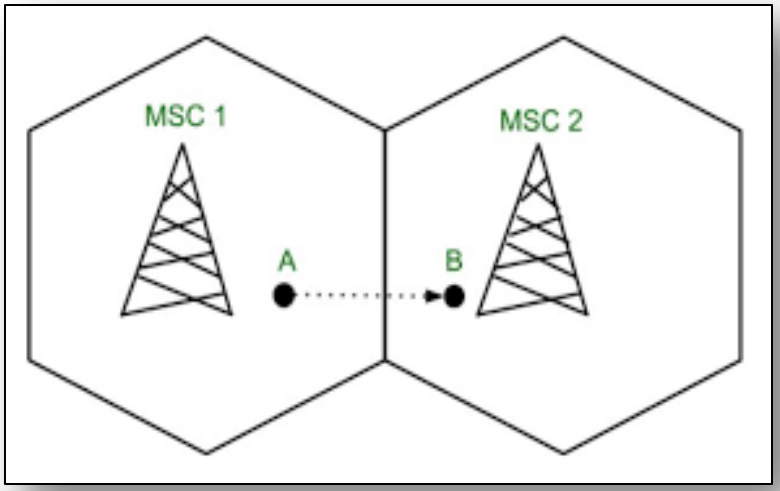
Practical Handoff Consideration

- Handoff for first generation analog cellular systems
  - 10 secs handoff time
  - Δ is in the order of 6 dB to 12 dB
- Handoff for second generation cellular systems, e.g., GSM
  - 1 to 2 seconds handoff time
  - Mobile assists handoff
  - Δ is in the order of 0 dB to 6 dB
    - Handoff decisions based on signal strength, co-channel interference, and adjacent channel interference



Practical Handoff Consideration

- IS-95 CDMA spread spectrum cellular system
  - Mobiles share the channel in every cell
  - No physical change of channel during handoff
  - MSC decides the base station with the best receiving signal as the service station



Assessment

1.Illustrate a handoff scenario at cell boundary.