

**CPET 565/CPET 499**  
**Mobile Computing Systems**

**Lecture 4**

**Mobility Management**

1 of 2

Based on the Text used in the course: **Fundamentals of Mobile & Pervasive Computing, 2005**, by Frank Adelstein, et. al, from McGraw-Hill

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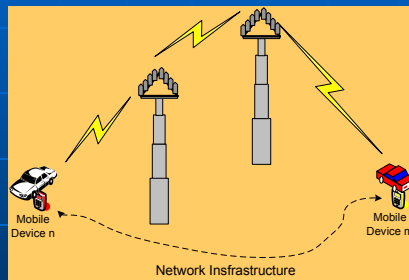
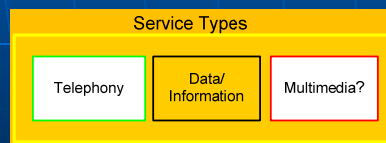
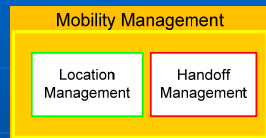
**Mobility Management**

- Mobility Management
  - Mobility management related tasks
  - Location management
  - Handoff management
- Location Management Principles & techniques
  - Location Registrars (databases)
  - Operations
    - Search operation
    - Update operation
- Location Management Case Studies
- Summary

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## Mobility Management



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## Mobility Management Tasks (cont.)

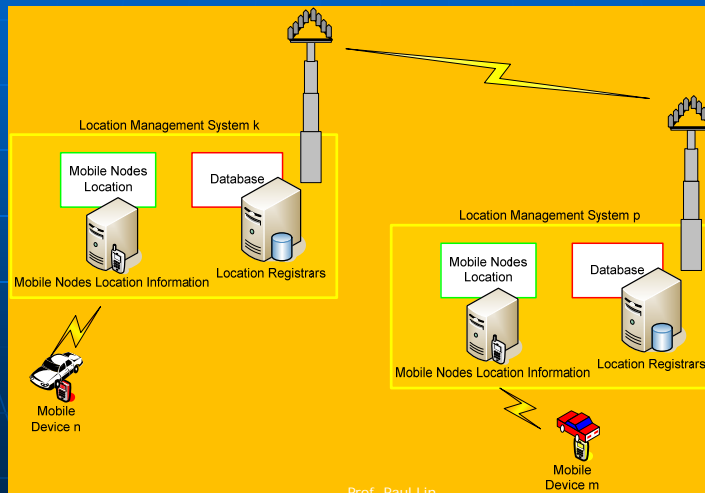
- Mobile device m ↔ Mobile device n
- Task 1. Determine Device m's Location and Establish a Route
  - Its access point (AP) in the wireless network
  - Base stations in cellular networks
- Task 2. Handoff - when m device move out of the range of current AP, it established a connection with another AP
- Task 3. The connection/data packets are routed correctly to new AP

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## Mobility Management Tasks (cont.)

### ■ Task 1: Location Management System & Operations



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## Mobility Management Tasks (cont.)

### ■ Task 1: Location Management System & Operations

- Location Registrars – databases
- Two Operations
  - Search
    - Mobile Node m – Invoke the search operation
    - Mobile Node n – Current Location Unknown
    - Cost of Search: Finest Granularity, Coarser Granularity
  - Update (Registration)
    - Mobile Node n – Informs the system of its current location
    - Frequency of update (never performed?, too frequent?)

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## Mobility Management Tasks (cont.)

- Task 1: Location Management System & Operations
- Cost of Search Operations
  - The granularity and currency of location information
    - Finest granularity
      - Maintained in a Cell
      - Requires a mobile node to update its location whenever it move from one cell to another
    - Coarser granularity
      - In an area consisting of certain number of contiguous cells
      - Search cost  $\uparrow$ , because a large number of cells need to be paged to obtain the exact location (cell) of the mobile node each time a call needs to be established

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## Mobility Management Tasks (cont.)

- Task 2 Handoff
  - Ensure the mobile node remains connected while moving from one cell to another
  - Or In-transit packets can be routed correctly
- Subtasks
  1. Deciding when to handoff to a new AP
  2. Selecting a new AP from several APs in the vicinity
  3. Acquiring resources: channels
  4. Informing Old AP to reroute data packets; and send state information

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## Mobility Management Tasks (cont.)

- Handoff Management Subtasks
  1. Deciding when to handoff (switch) to a new AP  
Handoff Decision can be initiated/controlled:
    - Mobile-controlled Handoff
    - Network-controlled HandoffDecision Factors:
    - Signal quality or quality of wireless communication (Signal-to-Noise ratio)
    - The Load of current AP is high → Switch to a lightly loaded APSmooth Operation:
    - Code Division Multiple Access – permit smooth handoffs
    - Multiple base stations can be in communication before selecting a base station

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## Mobility Management Tasks (cont.)

- Handoff Management Subtasks
  2. Selecting a new AP from several APs in the vicinity  
Deciding Factors
    - The SNR of the beacon signals from these APs
    - The anticipated region the mobile node is expected to move to
    - The availability of resource at the AP:
      - Uplink & downlink channels of connection-oriented circuit-switched network
      - Address (such as IP) in a packet switched network

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## Mobility Management Tasks (cont.)

- Handoff Management Subtasks
  3. Acquiring resources: channels
    - Channel Allocation Schemes
  4. Informing old AP to reroute data packets; and send state information
    - Route several in-transit packets:
    - Connection-less traffic (UDP/IP data grams): the IP address of the new AP as the destination address
    - Connection-oriented traffic
      - TCP/IP on the Internet: Quad-tuple(source IP address, source port, destination IP address, destination port)
      - Asynchronous Transfer Mode (ATM)
      - Public Switched Telephone Networks (PSTN)