Introduction to Mobile Computing

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Mobile Computing (IT4267)

1. Introduction to mobile computing
2. Evolution of different generations of wireless technology
3. CDMA
4. Wireless LAN
5. Mobile ad-hoc network
6. Mobile IP
7. Future generation wireless networks

Books:

1. Fundamentals of Mobile Computing by Pattnaik Mall, PHI
2. Mobile Computing, by Talukder Asoke K. Mcgraw Hill
3. Mobile Computing Third Edition, by RAJ KAMAL, Oxford University Press
4. Mobile Communications, by Jochen Schiller, Second Edition, Pearson Education, 2003.

Introduction to Mobility

- Physical entity
  - Small computing units
- Logical entity
  - Running user application (process)
  - Moves between local clusters
- Process migration
  - Flexibility and reliability

Mobile Computing

- Helps in continuous access of remote resource
- Independent of the state of the user
- VLSI technology facilitates the progress of mobile computing

Challenges in Mobility

- Issues in physical mobility
  - Weak connectivity
  - Wireless connectivity
  - Ubiquitous computing

Physical Mobility

- Macro mobility:
  - Mobility through global network
  - Mobile IP is introduced
- Micro mobility
  - Within a local administrative block
  - Cellular IP protocol is introduced
- Ad-hoc mobility
  - MANET architecture
  - Mobile users change topology constantly


Mobile Ad Hoc Network

Mobile Agent

- Acts like a docking station, may work on top of JVM
- A program moving through a network and autonomously executing tasks for users
- Unlike applet, mobile agent carry data and thread of control
- Aids in e-commerce, software distribution, information retrieval, network management

Advantages/Disadvantages

- Very small, compact and light weight mobile computer
- Less power consumption and large battery life
- Higher reliability of data
- The performance highly dependent upon network and wireless channel conditions.

Technical Issues in Mobility

- Security
  - authentication, data integrity, prevention of DoS
- Reliability
  - availability of resource in disconnection
- Naming and location
  - controlling a mobile entity

Wireless medium

- Disconnection
  - Common in radio environments - due to noise.
  - due to moving into dark areas
  - Blocking by servers e.g., due to too many requests to a file server.
- Standalone mobile computer can tolerate this kind of problem better
- Portable terminals will not function
- Pre-fetching / lazy write back decouples communication from data usage/ generation
- Decoupling allows the program to progress even during disconnection

Coda File System

- **Coda -** distributed file system, developed for notebook computers with less frequent disconnections
- It has been developed at Carnegie Mellon University since 1987
- On board cache
- Users' profile is used to keep best selection of files in the cache
- Whole files are cached instead of fixed block of data

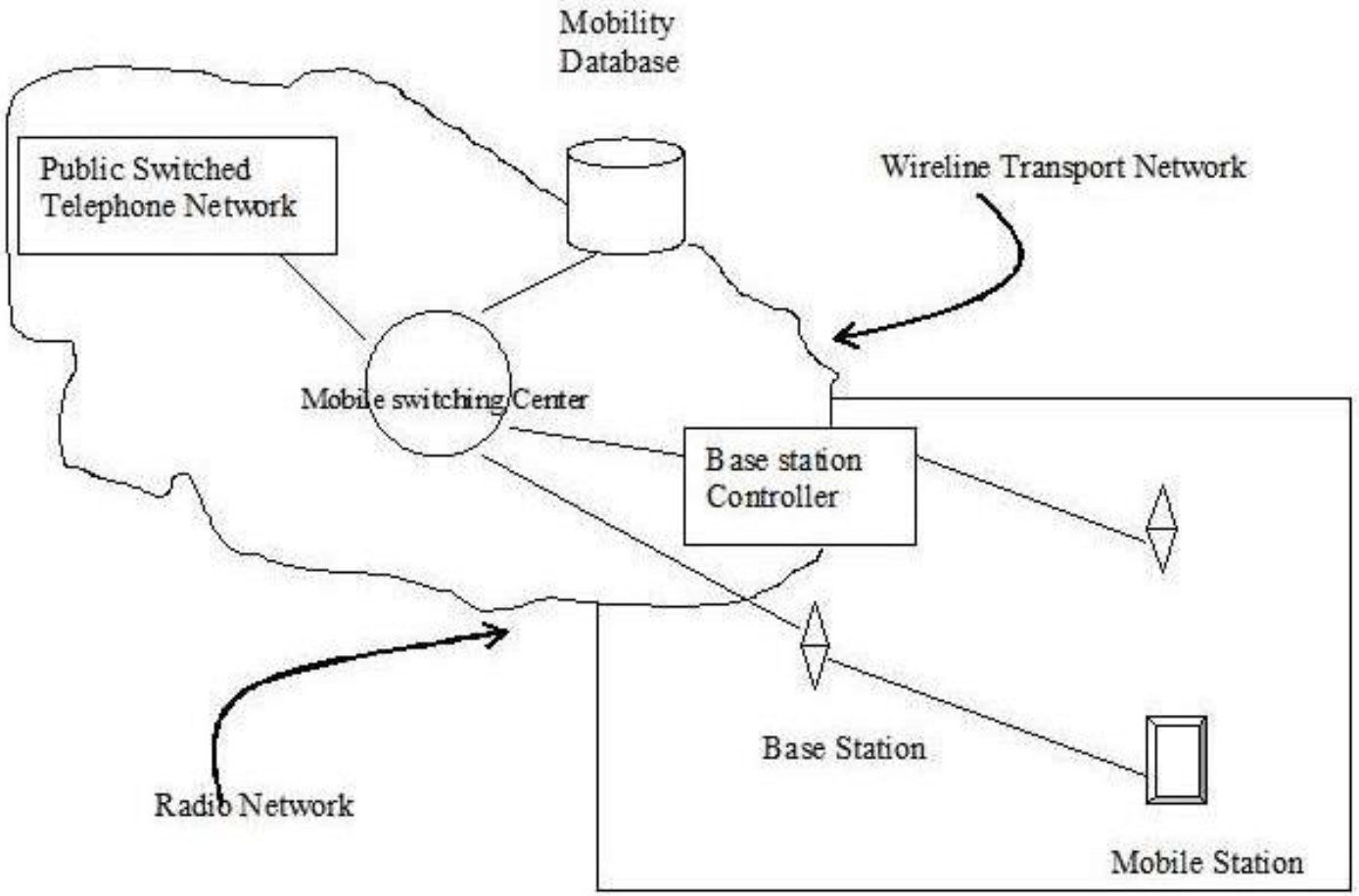
Coda File System

- After disconnection, the cache is automatically synchronized with file server
- File modification are allowed even during disconnection
- Bandwidth adaptation
- Scalability and security

Personal Communication Systems (PCS)

- Objective is to enable communication with a person at any time, at any place and in any form
- A singe personal telecommunication number (PTN)
- Based on second generation technology like GSM (Global System for Mobile Communication); according to the definition given by the US Federal Communications Commission (FCC)
- Key factors of PCS are:
  - Reachability with respect to Location (Home, office, in public, in transit)
  - Accessibility with respect to Device (Cellular phone, wired phone, fax)
  - Management of Service
- Architecture:
  - Radio network
  - Wireline transport network

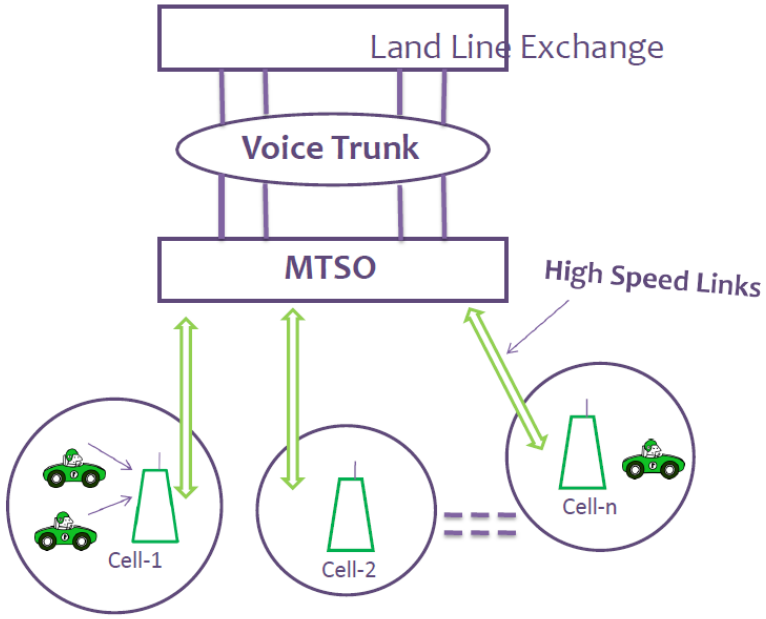
PCS Network Architecture



Cellular Communication

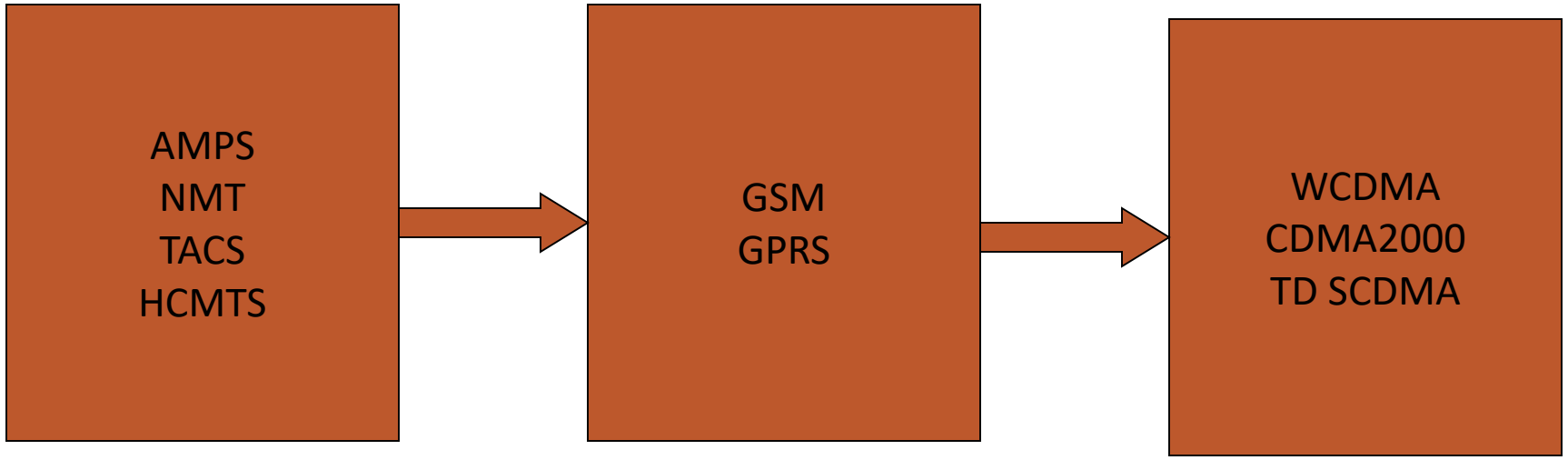
A Basic Cellular network has following components:

1. Mobile Unit
2. Cell Site (Base Station)
3. MTSO (Mobile Telephone Switching Office)
4. System interconnects
5. Communication protocol



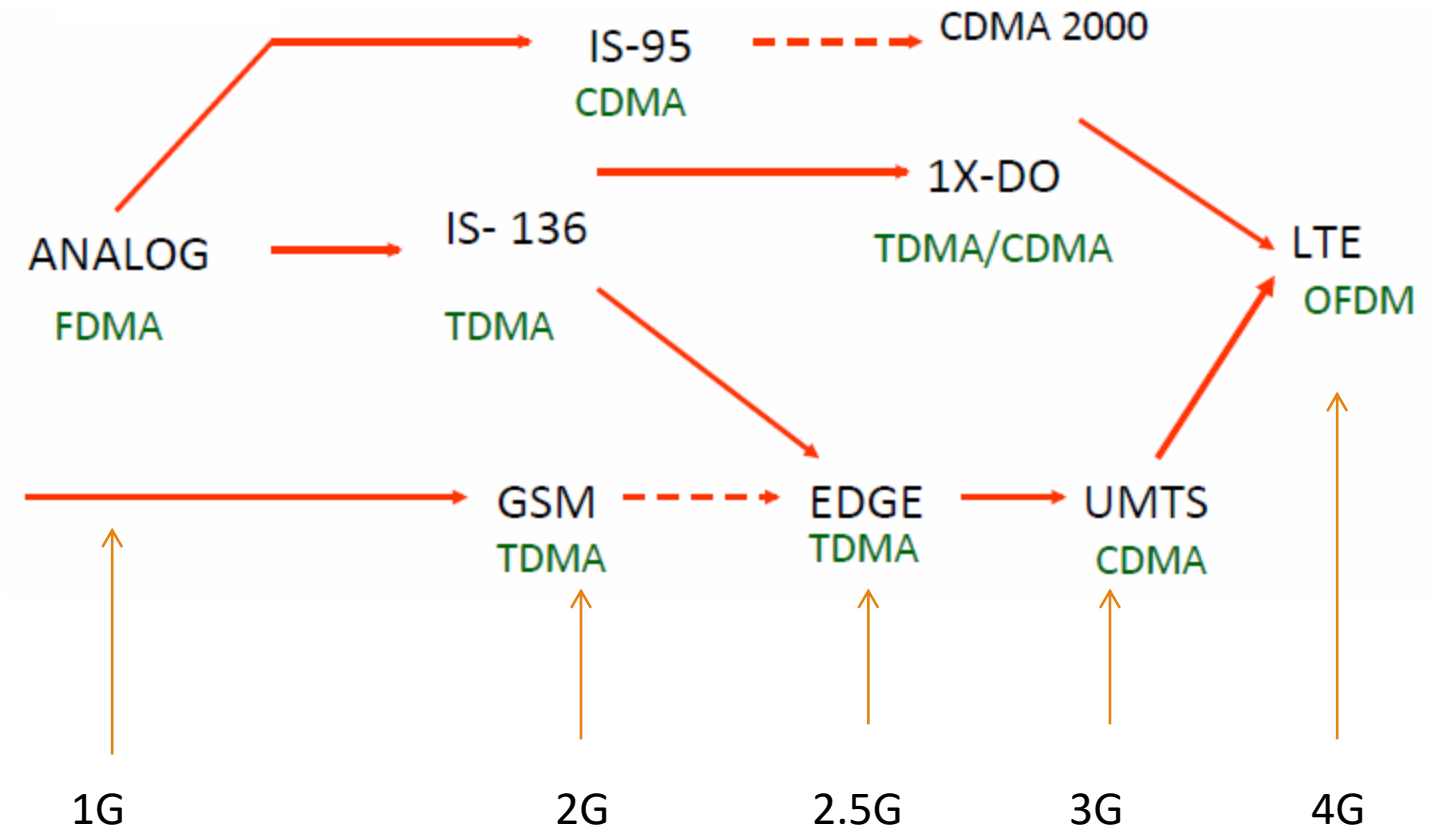
A Basic Cellular System

Generation of Cellular Communication



PCS is classified as a 2.5 generation

Evolution of Cellular Networks



Future generation Cellular Communication

- To carry mobile multimedia communication
- Some of the proposed features of 4G systems include
  - High bandwidth, ubiquity (connectivity everywhere)
  - Seamless integration with wired networks (especially IP)
  - Adaptive resource and spectrum management
  - Software radio, besides high quality of multimedia service
- **5G** is the fifth generation technology giving higher download speeds, eventually up to 10 gigabits per second

LTE Key Features

- Uses Multi-input Multi-output (MIMO) for enhanced throughput
- Reduced power consumption
- Higher RF power amplifier efficiency (less battery power used by handsets)
- Lower latency to get access to the medium
- Performance sometimes better than WiFi

Thank You