CSE 6392 Mobile Computer Systems

Lecture 1 : Introduction

With Dr. Mohan Kumar
Introduction

Definitions

Mobile host and base station

Disconnected operation

Mobility – Issues and challenges

Middleware/Infrastructure support

Internet and Internet protocols
Definitions

Wireless Computing

  Access to computer networks and computing resources through a wireless media.
Definitions

Wireless Computing
Access to computer networks and computing resources through a wireless media.

Nomadic Computing
Access to computer networks and computing resources while on the move.
Definitions (Contd.)

Wireless Computing
Access to computer networks and computing resources through a wireless media.

Nomadic Computing
Access to computer networks and computing resources while on the move.

Mobile Computing
Distributed Computing + Mobility
Definitions (Contd.)

Wireless Computing

Nomadic Computing

Mobile Computing
  Distributed Computing + Mobility

Pervasive Computing
  Access to computer networks, and computing and information resources everywhere all the time.
Why Mobile Computing?

Small and Flexible

laptops, PDAs, cell phones, sensors
Why Mobile Computing?

Small and Flexible
- laptops, PDAs, cell phones, sensors

Technological advances
- CPU power
- Memory
- Wireless communication
Why Mobile Computing?

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Technological advances
- CPU power
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- Wireless communication

Application areas
- Health
- Industry control
- Commerce
Growth in Mobile Users and Wireless Internet

Growth in Wireless subscribers (Millions)
Forecast by IDC (International Data Corp)

- Mobile Users
- Wired internet access
- Wireless internet access

1999 2000 2001 2002 2003 2004
Mobile Environment

MH ---- Mobile Host
BS ---- Base Station
GW ---- Gateway
CH ---- Correspondent Host
HA ---- Home Agent
What is a Mobile Host?

Features

Any laptop computer, handheld device equipped with wireless communication hardware
What is a Mobile Host?

Features

Any laptop computer, handheld device equipped with wireless communication hardware

Functions

similar to the functions of a personal computer
What is a Base Station?

The point of contact for the MH
A gateway that connects a mobile host to the rest of the Internet

Requirements
- Computing power, connection to wired network, wireless communication hardware

Services
- Infrastructure support to the MH
What’s different about a mobile computing environment?

**Mobility**

location changes
What’s different about a mobile computing environment?

Mobility

Disconnection
- Disconnect
- Sleep
- Reconnect
- Handoff
What’s so different about a mobile computing environment?

- Mobility
- Disconnection
- Low Bandwidth
  - 802.11 – 11 Mbps
What’s so different about a mobile computing environment?

Mobility

Disconnection

Low Bandwidth

Limited Resources on the MH

Battery, CPU, memory, cache
Issues in Mobile Systems

Network Configuration
Devices
Bandwidth and Frequency of Operation
Handoffs
QoS management
Mobility management
Location Tracking
Applications and Middleware
Security
Fault-tolerance
Challenges

Reliable wireless communications

Support for disconnected operation

Mobile applications development

Support seamless movement

Bandwidth, Limited Resources, Battery power
Challenges

- Reliable wireless communications
- Support for disconnected operation
- Mobile applications development
- Support seamless movement
- **Mobile users and applications**
  - Transparently access files, personal data, email,

- Bandwidth
- Limited Resources
- Battery power
Infrastructure support

Mobile service stations
TCP/IP
Security
Databases
Proxy services
Fault-tolerance
Location management
Caching
Prefetching
Middleware services

In mobile networking,

“computer applications are likely to involve interactions between machines without human intervention” Perkins ’98.

Provide completely automatic, non-interactive reconnections

Web applications – adjust their graphical data presentations depending on available bandwidth.

Act on dynamic changes in network parameters – link bandwidth, error rate, RTT, QoS and Security requirements
Internet and Internet protocols

IP addresses and fixed network location
Transparent mobility
Internet and Internet protocols

IP addresses and fixed network location

Transparent mobility

**Hourglass architecture**

  Narrow waist – basic network services
  Wider regions – applications and communication technologies

**End-to-end architecture**

  Network – data transport
  Edge - Intelligence, information processing
Internet and Internet protocols

IP addresses and fixed network location

Transparent mobility

Hourglass architecture
  Narrow waist – basic network services
  Wider regions – applications and communication technologies

End-to-end architecture
  Network – data transport
  Best effort service
  Edge - Intelligence, information processing
Support for Disconnected operation

CODA
A distributed file system for networks with variable connectivity.
Application transparent adaptation.

Odyssey
A platform for mobile data access.
Application aware adaptation – suitable for multimedia applications
Mobile-Aware Adaptation

Application-awareness

(Collaboration)

No system support  Application-transparent

Application-Transparent Adaptation

Applications work with no modifications
  Hide differences between static and mobile environments
    File system proxy, e.g., Coda
    Web Proxy, e.g. WebExpress
Application-aware adaptation

React to mobile resource changes
  Client-based application adaptation
  Client-server application adaptation
  Proxy-based application adaptation
Summary

Case for Mobile computing
Mobility – issues and challenges
Infrastructure for mobile computing