

# 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.

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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

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## Technological advances

CPU power

Memory

Wireless communication



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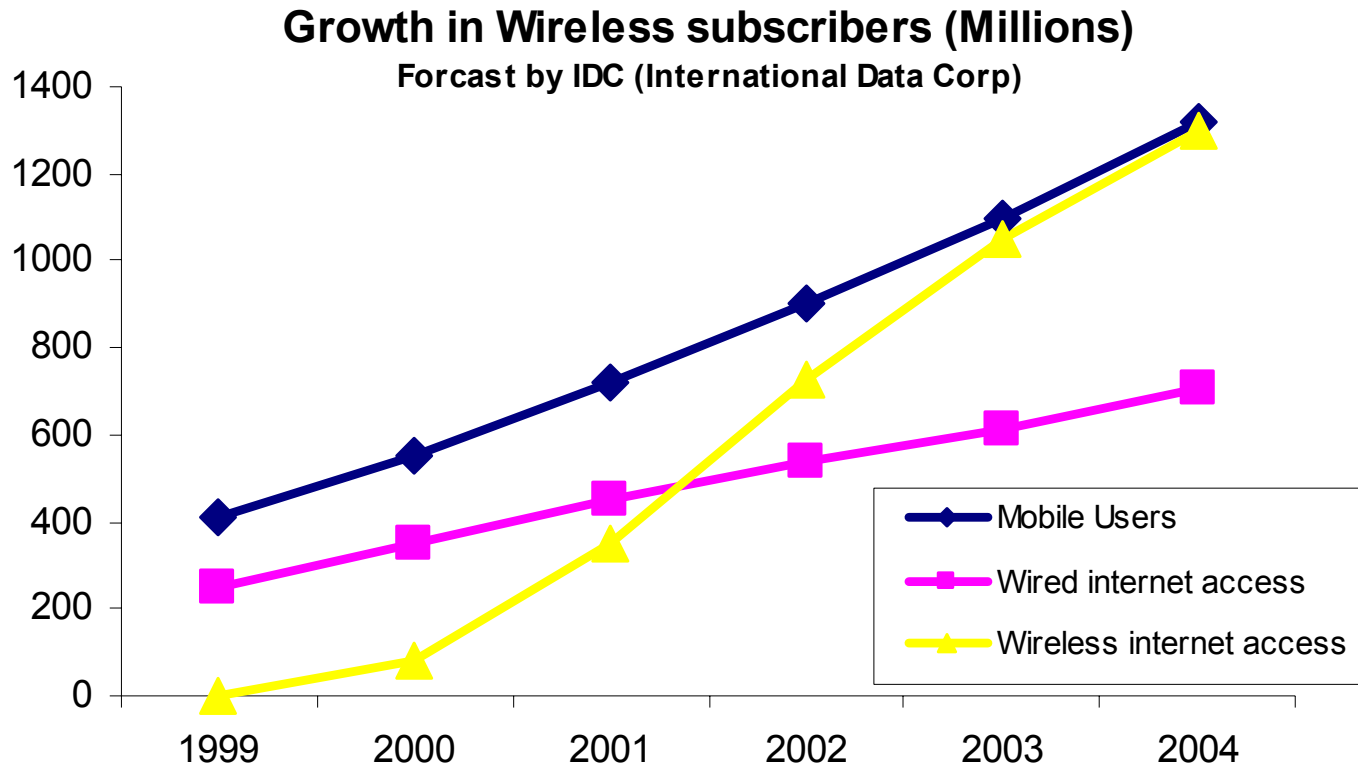
## Application areas

Health

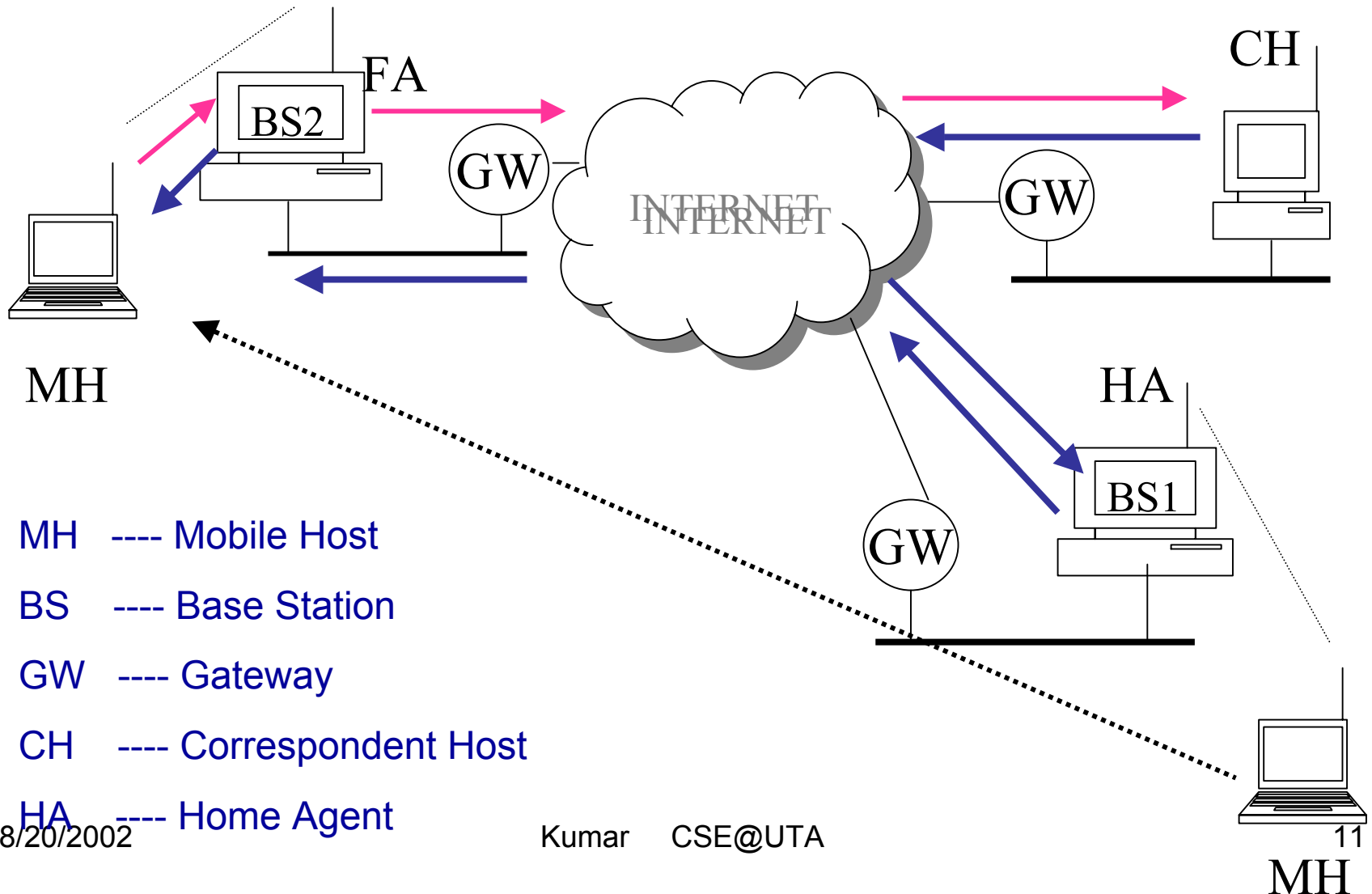
Industry control

Commerce

# Growth in Mobile Users and Wireless Internet



# Mobile Environment



# 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

Mobility environment?

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.

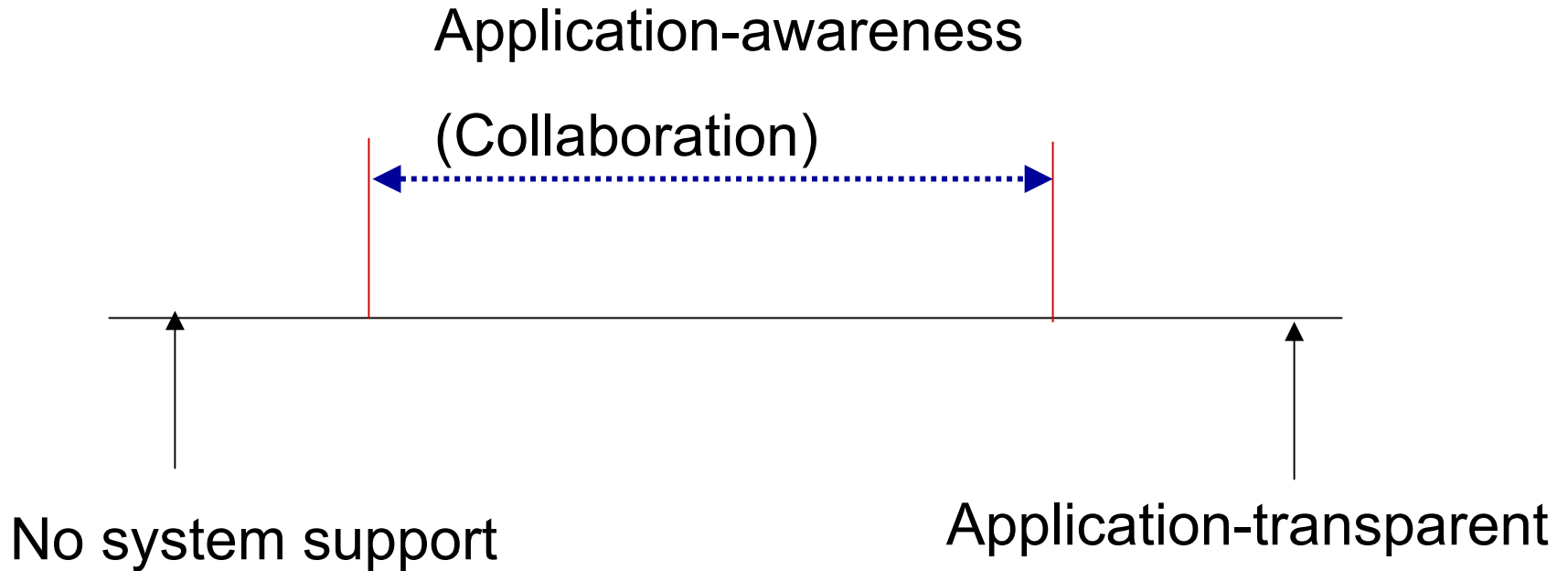
Application transparent adaptation.

## Odyssey

A platform for mobile data access.

Application aware adaptation – suitable for multimedia applications

# Mobile-Aware Adaptation



**M. Satyanarayanan, Accessing Information on demand at any location, IEEE Personal Communications, Vol. 3, No. 1, pgs. 26-33.**

# 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 application adaptation**

# Summary

Case for Mobile computing

Mobility – issues and challenges

Infrastructure for mobile computing