

# **Introduction to Computer Networks**

# Definition

- ✧ ***Computer Networks*** mean a collection of *autonomous* computers *interconnected* by a single technology
- ✧ Group of interconnected computers

# Definition

- ✧ Computers are *autonomous* if they are independent entities and are **not** in a *master-slave* configuration
- ✧ Computers are said to be *interconnected* if they are able to exchange information

# Definition

## ✧ Computer Networks

- User is aware of the presence of multiple computers
- User explicitly connects or disconnects to another computer
- User explicitly assign a job to a certain computer

# Definition

- ✧ ***Distributed System:*** A non centralised system consisting of numerous computers that can communicate with one another and appears to the user as single, large, storehouse of hardware, software and data
- ✧ It is a software system built on top of a network

Example: World Wide Web, cloud computing

# Definition

## ✧ Distributed Systems

- Existence of multiple autonomous computers is *transparent* to the user
- User is unaware of existence of multiple processors (computers)-virtual uniprocessor
- Operating System or Application Software (*Middleware*) selects the processor to execute the task

# Use of Computer Networks

- Business Applications
- Home Applications
- Mobile Users
- Social Issues

# Business Applications

- Resource sharing
- Data sharing
- Intranet applications
  - Notices, Work flow management
- E-commerce
- Video-Conferencing
- Voice Communication, etc.



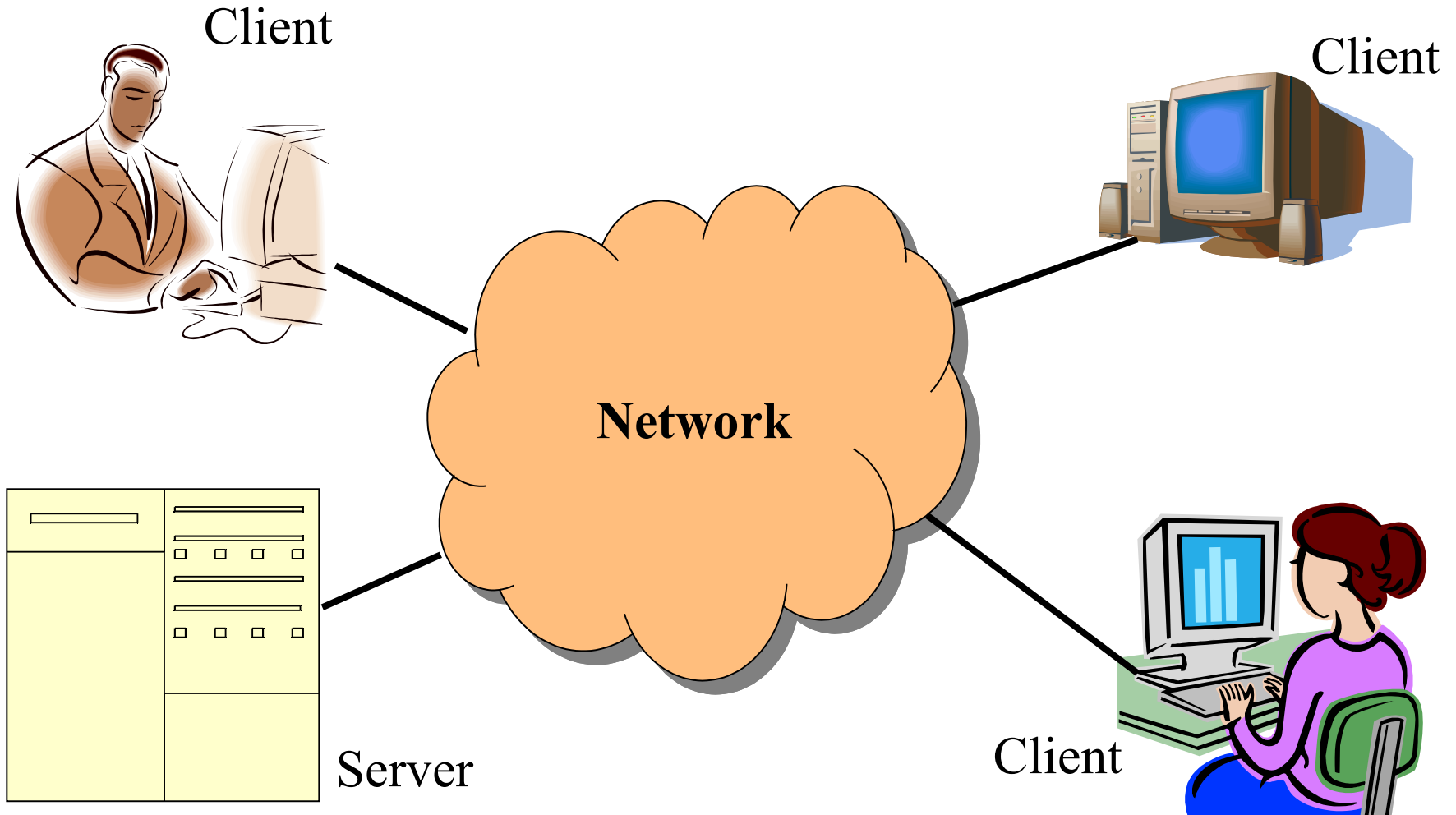
# Home Users

- Access to remote information
- Personal communication
  - E-mail, voice/video chats
- E-Commerce
- Education
- Entertainment
  - Video on demand
  - TV Channels

# Mobile Users

- Notebook computers
  - Business travellers, students
- PDAs & Smart Phones
  - Health workers, Courier Services
- Mobile phones
  - Internet, SMS, MMS
- Wireless handsets
  - Security agencies, site engineers, utilities

# Computer Network



# Social Issues

- Moral issues
- Privacy issues
- Employee-Employer rights
- Legal problems

Computer networks and distributed systems  
have a major impact on the society at large

# Some More Terminologies

# Communication Terminology

- Transmission Modes
  - Serial
  - Parallel
  - Simplex
  - Half-Duplex
  - Full-Duplex

# Transmission Mode

- Serial Communication
  - One bit at a time
  - Unidirectional/bidirectional
  - Simpler physical media
  - Cheaper
  - Longer distance

# Transmission Mode

- Parallel Communication
  - More than one bit simultaneously
  - Bi-directional
  - Bulkier media
  - Costlier
  - Short distance



# Transmission Mode

- Simplex Communication
  - Unidirectional
  - Open loop
  - Unreliable for data communication

Example: TV Broadcast, Fiber

# Transmission Mode

- Half duplex communication
  - Bi-directional
  - One direction at a time

Example: Ethernet (IEEE 802.3)

# Transmission Mode

- Full-Duplex
  - Bi-directional
  - Both directions simultaneously
  - Use bi-directional lines or multiple unidirectional lines

Example: Telephone

# Communication Terminology

- Data Speed
  - Baud
  - BPS
- Asynchronous Transmission
- Synchronous Transmission

# Data Speed

- Baud
  - Measure of speed for analog signaling
  - Electronic state change per second
    - ❖ Symbol rate
  - Related to modulation rate in digital circuits
  - Named after French engineer Jean Mourice Emile Baudot
  - Less relevant in practice, only used by telecom h/w designers

# Data Speed

- BPS
  - Bits per second
  - Number of bits transmitted per second
  - Depends on coding technique used
    - ❖ BPSK, QPSK, FSK
  - Direct indicator of the channel speed

# Synchronisation

- Asynchronous Communication
  - Not coordinated in time
  - Independent transmitter and receiver
  - Prior agreement on data rate and character length
  - Use of start bit, stop bit, etc.
  - Simpler
  - Cheaper

# Synchronisation

- Synchronous Communication
  - Coordinated in time
  - Bound by a common (reference) clock
  - No use of start and stop bits
  - Less overheads
  - Costlier



# Communication Terminology

- Type of Services
  - Connection-Oriented
  - Connectionless
  - Unreliable
  - Reliable

# Types of Services

- Connection oriented
  - Similar to telephone network
  - Connection Set-up
  - Use it
  - Disconnect
  - Both ends to be alive

# Types of Services

- Connectionless
  - Similar to postal system
  - No connection set-up
  - Receiver may be off
  - Resources are not dedicated

# Types of Services

- Unreliable
  - Information sent is not acknowledged
  - Sender is left guessing
  - Used when an unreported data loss is acceptable
  - Not related to the 'quality' of communication

# Types of Services

- **Reliable**

- Information sent is acknowledged
- Sender is certain about the delivery of the information
- Used in typical data centric applications
- Does not indicate the 'quality' of communication media

# Home Task

# Self Study Task

- Understand your computer
  - Identify all interfaces/ports of your computer
  - Find out whether they are serial or parallel ports
  - Find out if they are simplex / half-duplex / full-duplex

# Thank you!

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