

## Uses of Computer Networks

- 1) Business Applications
- 2) Home Applications
- 3) Mobile Users
- 4) Social Issues

### 1) Business Applications

- Enable Resource Sharing ①
- Make all programs, equipment, data available to anyone on the network without regard to physical location of the resource & user

Ex: having Common printer

- More important is Sharing information  
Ex: Bank, small office in single building

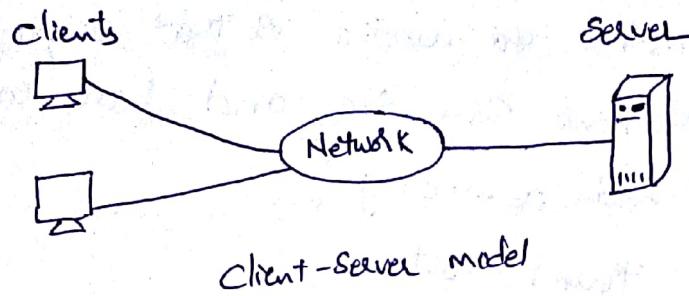
all employees need to share information

- Company Information Systems may consist of one or more databases with company information & some no. of employees need to access them remotely

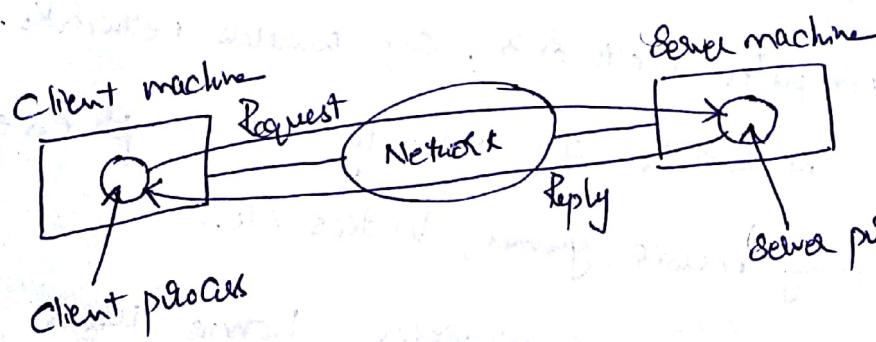
- Data is stored in powerful computers called servers, employees have simpler machines called clients

client and server machines are connected by a network.

This model is called Client-Server model



- Ex of client-Server model : web application . Server generates web pages based on its database in response to Client requests that may update the database.
- 2 processes run , one on client and one on server Communication takes the form of Client process sending a message over the network to Server process
- The client process then waits for a reply message When the server process gets the request , it performs the requested work or looks up the requested data and sends back a reply



- Computer Network provide powerful Communication medium among employees
- Email for daily communication  
Telephone Calls between employees  
L IP Telephony & VOICE over IP.

- video can be added to audio so that employees at distant locations can see and hear each other as they hold a meeting.

Reduces the travel cost.

- Desktop Sharing:

Allows remote workers see and interact with graphical computer screen.

- Many companies are doing business electronically

This model is called e-commerce.

Ex: using computers, manufacturers can place orders electronically as needed.

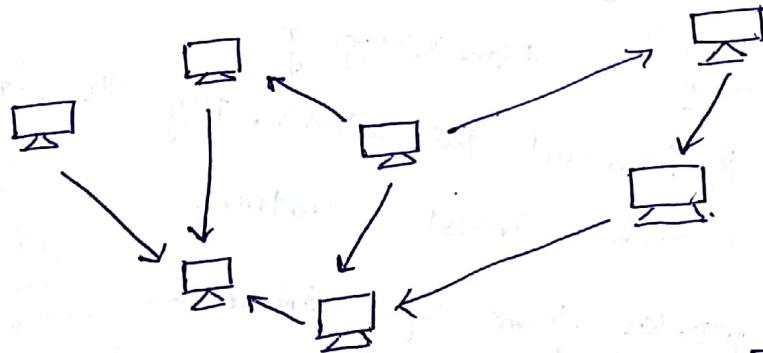
## 2) Home Applications

Many electronic devices come with embedded computers and computer networks, esp wireless networks. Home networks are broadly used for entertainment including music, games, videos etc..

Internet access provides home users with ① Connectivity to remote computers

As like companies, home users can access information, communicate with other people, and buy products and services with e-commerce.

- Access to remote information Comes in many forms
  - Surfing www, arts, business, health, travel.
- Newspapers have gone online & can be personalized; beyond that is online digital library ex: IEEE, ACM, Springer
- Popular model is peer-to-peer communication
- Much of the information is accessed using client/server
- In peer-to-peer, individuals form a loose group Can communicate with others in the group
- Every person can communicate with one or more other people; there is no fixed division into clients & servers.



- Many peer-to-peer systems, such BitTorrent do not have any central database of content
- Each user maintains his own database locally
- Each user provides a list of other nearby people who are members of the system.
- A new user can then go to any existing member to see what he has and get the names of other members to inspect for more content & names

- This backup process can be repeated indefinitely to build up a large local database of what is out there.
- Peer-to-peer communication is often used to share music and videos.
- inherently email is peer-to-peer
- Instant messaging (2)
  - multi-person message services : Twitter
  - Applications carrying audio : YouTube
  - Social Networks : facebook
- people work together to create content
  - Ex: Collaborative website that the members of a community edit : Wikipedia.
- E-commerce (3) : home shopping
  - access to financial institutions, pay bills, manage bank accounts, invest, auctions

Most popular forms of e-commerce

Tag	Full Name	Example
B2C	Business-to-Consumer	online books order
B2B	Business-to-Business	Car manufacturers order from suppliers
G2C	Government-to-Consumer	Govt. distributing forms electronically
C2C	Consumer-to-Consumer	Auction 2nd hand products
P2P	Peer-to-peer	Music sharing

## Entertainment

- Distribution of music, radio, TV programs, movies over internet.
- Users can buy, download, add them to personal collections.
- Users can search movie, video or TV programs which can be displayed on your screen.
- Game playing, multi person real time simulation games, shooting.
- Computing is embedded into everyday life:

Ubiquitous Computing - Many homes are fitted with Security Systems that include door and window sensors, electricity, gas & water meters report usage over network.

Smoke detectors call fire department instead of making noise.

As cost of sensing and communication drops, more and more measurement and reporting will be done with networks.

Consumer electronic devices are networked. High end cameras have n/w capability to send photos.

Devices such as tv's that plug into the wall can use powerline networks to send information throughout the house over wires that carry electricity.

- These objects communicate through network  
ex: shower may detect water usage, give visual feedback & report to a home environmental monitoring application.
- Radio Frequency Identification (RFID) is future  
RFID chips don't have battery, can be applied to books, credit cards etc.  
RFID readers locate & communicate with the items

### 3) Mobile Users

- Mobile computers such as laptops are one of the fastest growing segments of computer industry
- Connectivity to the internet enables many of these mobile uses.
- As cars can't use wired connection, wireless networks are used a lot.
  - Cellular nets operated by telephone companies are kind of wireless networks
  - Wireless hotspots based on 802.11 are another kind of wireless networks for mobile computers
  - Wireless Networks are used in taxi booking important in military.

- wireless Networks & mobile Computing are related

but not identical

Wireless vs networking vs mobile Networking

Wireless	Mobile	Typical Applications
No	No	Desktops in office
No	Yes	Notebook in hotel
Yes	No	W/L's installed buildings
Yes	Yes	Phone in handheld device

- Key driver of mobile, wireless applications is mobile phone. Text messaging is popular. SMS is very profitable since it cost the carrier but a tiny fraction of one cent to relay a text message, a service for which they charge for more.
- Smart phones combine aspects of mobile phones & mobile computers. Cellular networks provide fast data services, focusing internet & phone calls. phones can connect to hotSpot & switch between networks.
- Mobile phones know their location using Global positioning system.
- Mobile phones are also used in e-commerce. Short messages from mobile are used to authenticate payments for food in vending machines, movie tickets & others instead of cash & credit card.

- Sensor Networks are made up of nodes that gather and wirelessly relay information they sense about the state of the physical world.
- Wearable Computers
  - Smart watches
  - pacemakers
  - insulin pumps

#### 4) Social Issues

- Some network operators block content for their own reasons
- Some users of peer-to-peer applications had their network service cut off because the network operators did not find it profitable to carry the large amounts of traffic sent by these applications.
- The argument for communications that are not differentiated by their content & source or who is providing the content is known as network neutrality.
- Many other parties are involved in the issue over content. Pirated music and movies fueled the massive growth of peer-to-peer networks, which did not please the copyright holders, who have threatened legal action.

- There are automated systems that search peer-to-peer networks and fire off warnings to network operators and users who are suspected of copyright.
- Digital Millennium Copyright Act. It states that it sends warning messages to the operators and the users who are suspect of infringing copyrights.
- Computer Networks make it very easy to communicate. They also make it easy for the people who own the network to snoop on the traffic.
- This sets up conflicts over issues such as employee rights versus employer rights, government versus citizen's rights.
- FBI has installed systems at many internet service providers to snoop on all incoming and outgoing email for nuggets of interest. The goal of such systems is to spy on millions of people with the hope of perhaps finding information about illegal activities.

- government does not have a monopoly on threatening people's privacy.
- private sectors does its bit too by plotting users.
- Example: small files called Cookies that web browser stores on users' computers allow companies to track user's activities in cyberspace and may also allow Credit Card numbers, Social Security no's & other confidential information to leak all over the Internet.
- Mobile devices don't have location privacy.
- Computer Networks offer potential increase privacy by sending anonymous messages.
- Spam mails - became part of life, spammers are collecting huge email addresses & sending spam mails.
- phishing messages masquerade as legitimate from a trustworthy party. Ex: Bank trick to get sensitive information.
- This led to development of CAPTCHA's
- Encryption can solve the problem, if not, makes it significantly harder to commit activities that are illegal