# Computer Concepts and C Programming (06CCP13)

Unit III

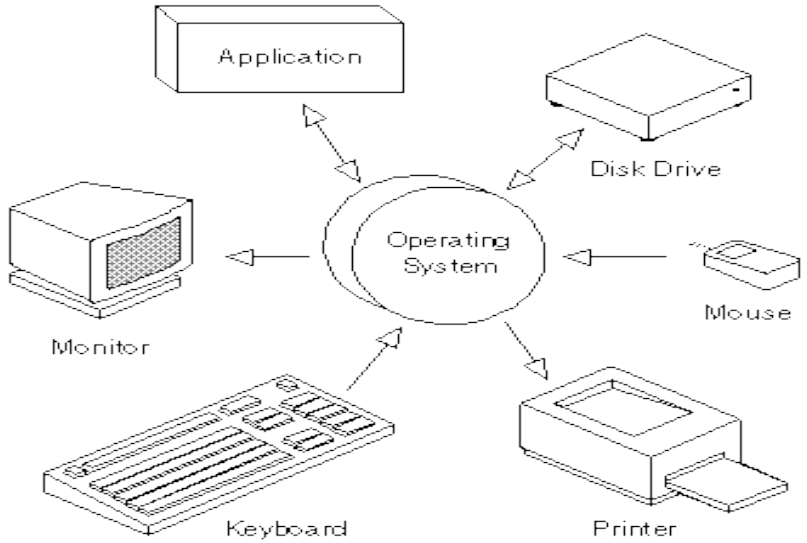
# Contents



- ✓ Operating System (OS) basics
  - ✓ The Purpose of OS
  - ✓ Types of OS
  - ✓ Providing a User Interface
- ✓ PC OS
  - ✓ DOS
  - ✓ Windows – NT Workstation, 9X, 2000 Professional
  - ✓ XP
- ✓ Linux for the Desktop

# Operating System (OS) basics

- An operating system is a layer of software which takes care of technical aspects of a computer's operation. It shields the user of the machine from the low-level details of the machine's operation and provides frequently needed facilities
- Since the operating system (OS) is in charge of a computer, all requests to use its resources and devices need to go through the OS



# Purpose of operating system



- Must communicate with the PC's hardware
- Works with the BIOS to provide access to devices such as hard drives
- Communicates with device drivers
- Provides a user interface

# Roles of the operating system



- **Management of the processor**: the operating system is responsible for managing allocation of the processor between the different programmes using a **scheduling algorithm**. The type of scheduler is totally dependent on the operating system, according to the desired objective.
- **Management of the random access memory**: the operating system is responsible for managing the memory space allocated to each application and, where relevant, to each user. If there is insufficient physical memory, the operating system can create a memory zone on the hard drive, known as "**virtual memory**". The virtual memory lets you run applications requiring more memory than there is available RAM on the system. However, this memory is a great deal slower.
- **Management of input/output**: the operating system allows unification and control of access of programmes to material resources via drivers (also known as peripheral administrators or input/output administrators).

# Components of the OS



The operating system comprises a set of software packages that can be used to manage interactions with the hardware. The following elements are generally included in this set of software:

- The **kernel**, which represents the operating system's basic functions such as management of memory, processes, files, main inputs/outputs and communication functionalities.
- The **shell**, allowing communication with the operating system via a control language, letting the user control the peripherals without knowing the characteristics of the hardware used, management of physical addresses, etc.
- The **file system**, allowing files to be recorded in a tree structure

# Roles of the operating system



- **Management of execution of applications**: the operating system is responsible for smooth execution of applications by allocating the resources required for them to operate. This means an application that is not responding correctly can be "killed".
- **Management of authorizations**: the operating system is responsible for security relating to execution of programmes by guaranteeing that the resources are used only by programmes and users with the relevant authorizations.
- **File management**: the operating system manages reading and writing in the file system and the user and application file access authorizations.
- **Information management**: the operating system provides a certain number of indicators that can be used to diagnose the correct operation of the machine.

# Operating System (OS) basics



- Normally the operating system has a number of key elements:

1. a *technical layer of software* for driving the hardware of the computer, like disk drives, the keyboard and the screen
2. a *file system* which provides a way of organizing files logically
3. a simple *command language* which enables users to run their own programs and to manipulate their files in a simple way. Some operating systems also provide text editors, compilers, debuggers and a variety of other tools
4. *legal entry points* into its code for performing basic operations like writing to devices

# Types of OS



- Operating systems may be classified by both how many tasks they can perform `simultaneously' and by how many users can be using the system `simultaneously'. That is: *single-user* or *multi-user* and *single-task* or *multi-tasking*. A multi-user system must clearly be multi-tasking. The table below shows some examples
    1. The first of these (MS/PC DOS/Windows 3x) are single user, single-task systems which build on a ROM based library of basic functions called the BIOS
    2. Windows 95 replaced the old coroutine approach of quasi-multitasking with a true context switching approach, but only a single user system, without proper memory protection

| OS | Users | Tasks | Processors |
|---|---|---|---|
| MS/PC DOS | S | S | 1 |
| Windows 3x | S | QM | 1 |
| Macintosh System 7.* | S | QM | 1 |
| Windows 9x | S | M* | 1 |
| AmigaDOS | S | M | 1 |
| hline MTS | M | M | 1 |
| UNIX | M | M | *n* |
| VMS | M | M | 1 |
| NT | S/M | M | *n* |
| Windows 2000 | M | M | *n* |
| BeOS (Hamlet?) | S | M | *n* |

Table listing different OS and their user handling capabilities

| Unix | Manufacturer | Mainly BSD / Sys 5 |
|---|---|---|
| BSD | Berkeley | BSD |
| SunOS (solaris 1) | Sun Microsystems | BSD/sys 5 |
| Solaris 2 | Sun Microsystems | Sys 5 |
| Ultrix | DEC/Compaq | BSD |
| OSF 1/Digital Unix | DEC/Compaq | BSD/sys 5 |
| HPUX | Hewlett-Packard | Sys 5 |
| AIX | IBM | Sys 5 / BSD |
| IRIX | Silicon Graphics | Sys 5 |
| GNU/Linux | Public Domain | Posix (Sys V/BSD) |
| SCO unix | Novell | Sys 5 |

Common version of Unix

| System | Programming | Single user | Multi-user | Single task | Multi-task |
|---|---|---|---|---|---|
| DOS | 16 bits | X | | X | |
| Windows3.1 | 16/32 bits | X | | | not pre-emptive |
| Windows95/98/Me | 32 bits | X | | | cooperative |
| WindowsNT/2000 | 32 bits | | X | | pre-emptive |
| WindowsXP | 32/64 bits | | X | | pre-emptive |
| Unix / Linux | 32/64 bits | | X | | pre-emptive |
| MAC/OS X | 32 bits | | X | | pre-emptive |
| VMS | 32 bits | | X | | pre-emptive |

# RTOS



**Real time systems**, used mainly in industry, are systems designed to operate in a time-constrained environment. A real time system must also operate reliably according to specific time constraints; in other words, it must be able to properly process information received at clearly-defined intervals (regular or otherwise).

- Here are some examples of real time operating systems:
- OS-9;
- RTLinux (RealTime Linux);
- QNX;
- VxWorks

# RTOS



A well-designed RTOS provides a number of tangible benefits to the developer. It

- abstracts away the complexities of the processor,
- provides a solid infrastructure constructed of rules and policies that provide consistency and repeatability
- simplifies development and improves developer productivity by utilizing high level kernel objects to easily handle complex functions
- integrates and manages resources needed by communications stacks and middleware (TCP/IP, USB, SDIO, CAN, FAT and Flash file systems, etc.)
- optimizes use of **system** resources and improves product reliability, maintainability and quality

An RTOS can bring all those elements together into a platform that allows the application developer to begin development at a much higher point, enabling a shorter **time**-to-market with higher reliability and lower risk

# Embedded systems

Embedded systems are operating systems designed to operate on small machines, such as PDAs (*personal digital assistants*) or autonomous electronic devices (spatial probes, robot, on-board vehicle computer, etc.) with reduced autonomy. Thus an essential feature of embedded systems is their advanced energy management and ability to operate with limited resources. The main "general use" embedded systems for PDAs are as follows:

- PalmOS
- Windows CE / Windows Mobile / Window Smartphone

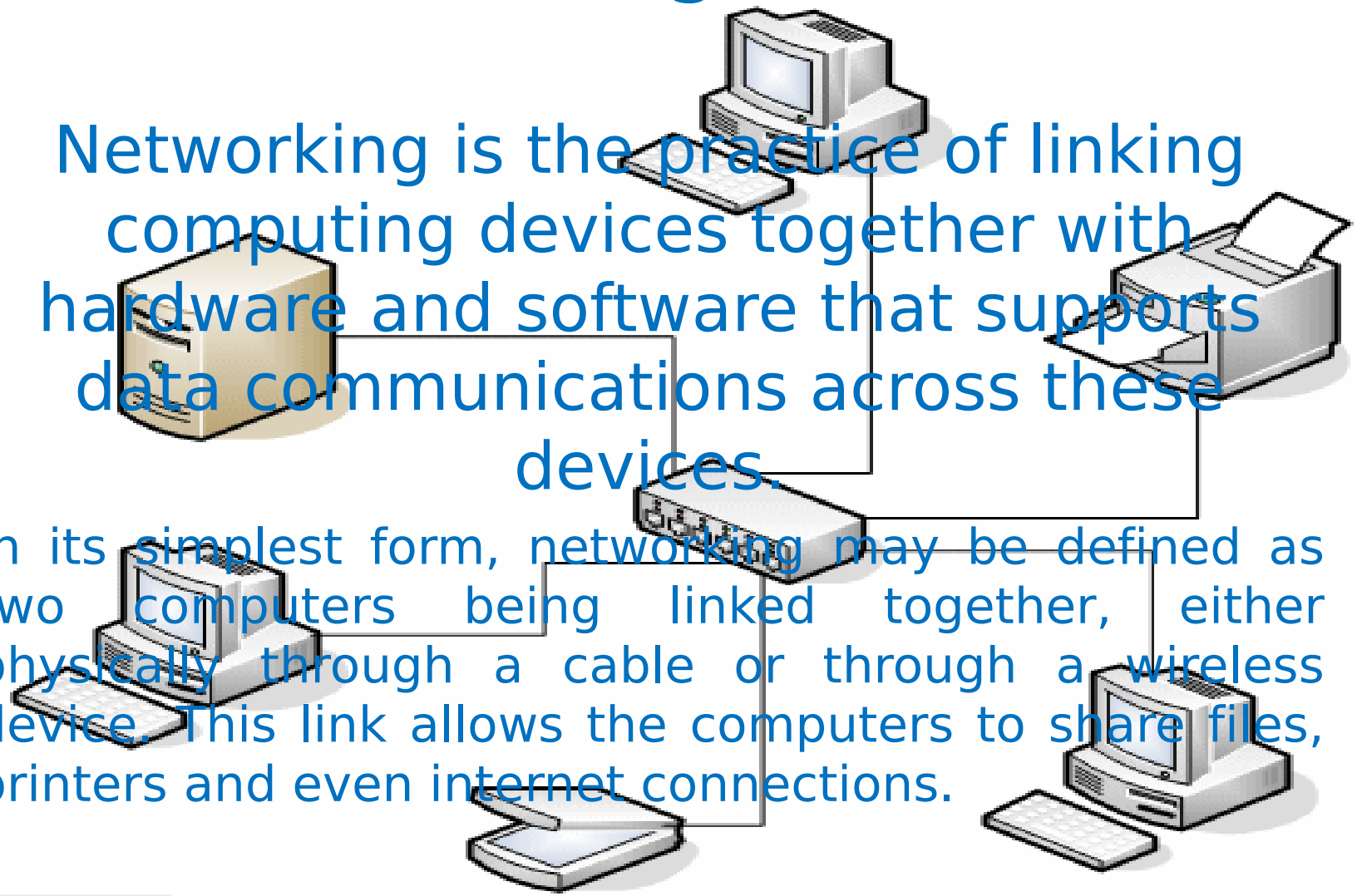
# Networks and Internet

## Unit III Section 2

# Content

- Networking Basics
  - The Uses of a Network
  - Common types of Networks
  - Network Topologies and Protocols
- Internet
  - What is Internet ?
  - Internet's Major Services
  - Understanding WWW
  - Using E-Mail

# Networking Basics



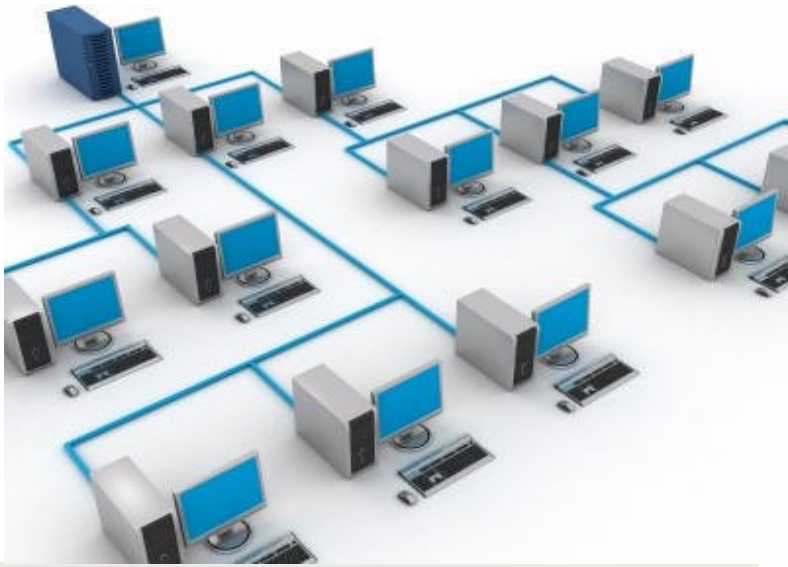
Networking is the practice of linking computing devices together with hardware and software that supports data communications across these devices.

In its simplest form, networking may be defined as two computers being linked together, either physically through a cable or through a wireless device. This link allows the computers to share files, printers and even internet connections.

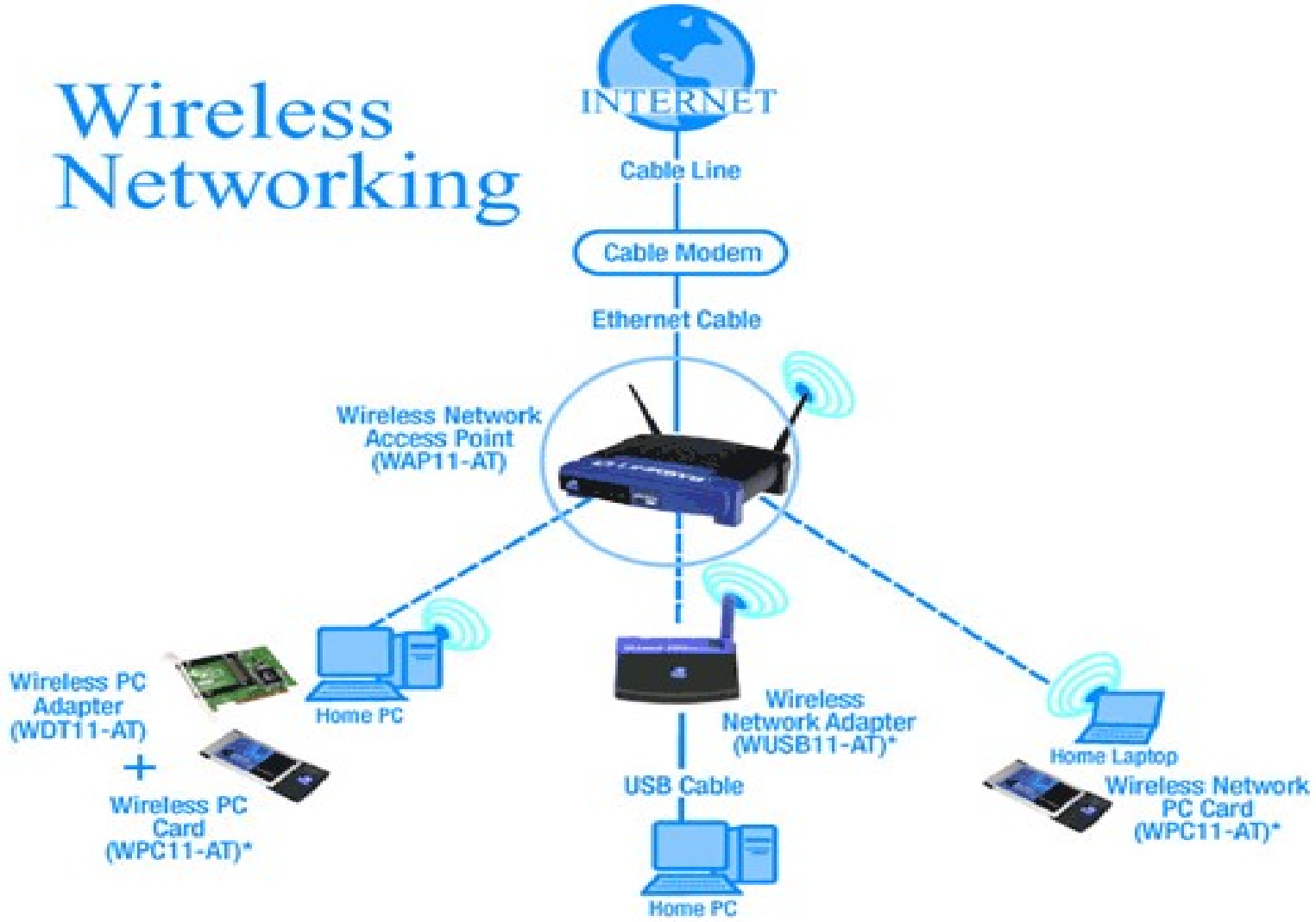
# Networking Basics



- Within small organizations, the two most prevalent types of networks are “peer-to-peer” networks and “client/server” networks.



# Wireless Networking




Depending on your desktop or laptop configuration, you can choose any of these three network adapter options

*All PCs must also have an IP Address in order to share the Internet

# Peer-to-Peer

Peer-to-peer networks are the simplest and least expensive type of networks available and are most suitable for organizations with less than 5 computers. A peer-to-peer network will allow an organization to share files, printers and even modems and Internet connections. In general, a peer-to-peer network does not have a central server and consists of 2 or more computers connecting through a device called a “Hub.” The hub allows multiple computers and devices to connect via network cable. While simpler and less expensive, peer-to-peer networks do not offer many of the benefits of client/server networks.

# Client/server networks

Client/server networks are networks that connect individual computers, known as “clients,” and one or more central computers, called “servers.” There are many types of servers, the most common being a file server. In a client/server network, the file server acts as a shared resource – a repository for files, such as documents, spreadsheets, databases, etc. Instead of storing these files on each individual machine, the file server permits storage on one central computer.

# Networking Basics



## What Are the Benefits of a Network?

- Centralize Storage
- Sharing the resources
- Reduced Capital Investments
- Email, Sharing Files etc.,

# Networking Basics



## What Are the Components of a Network?

- Network Interface Card (NIC)
- Servers
- Bridges, Hubs and Routers
- Firewalls
- Network Operating Systems

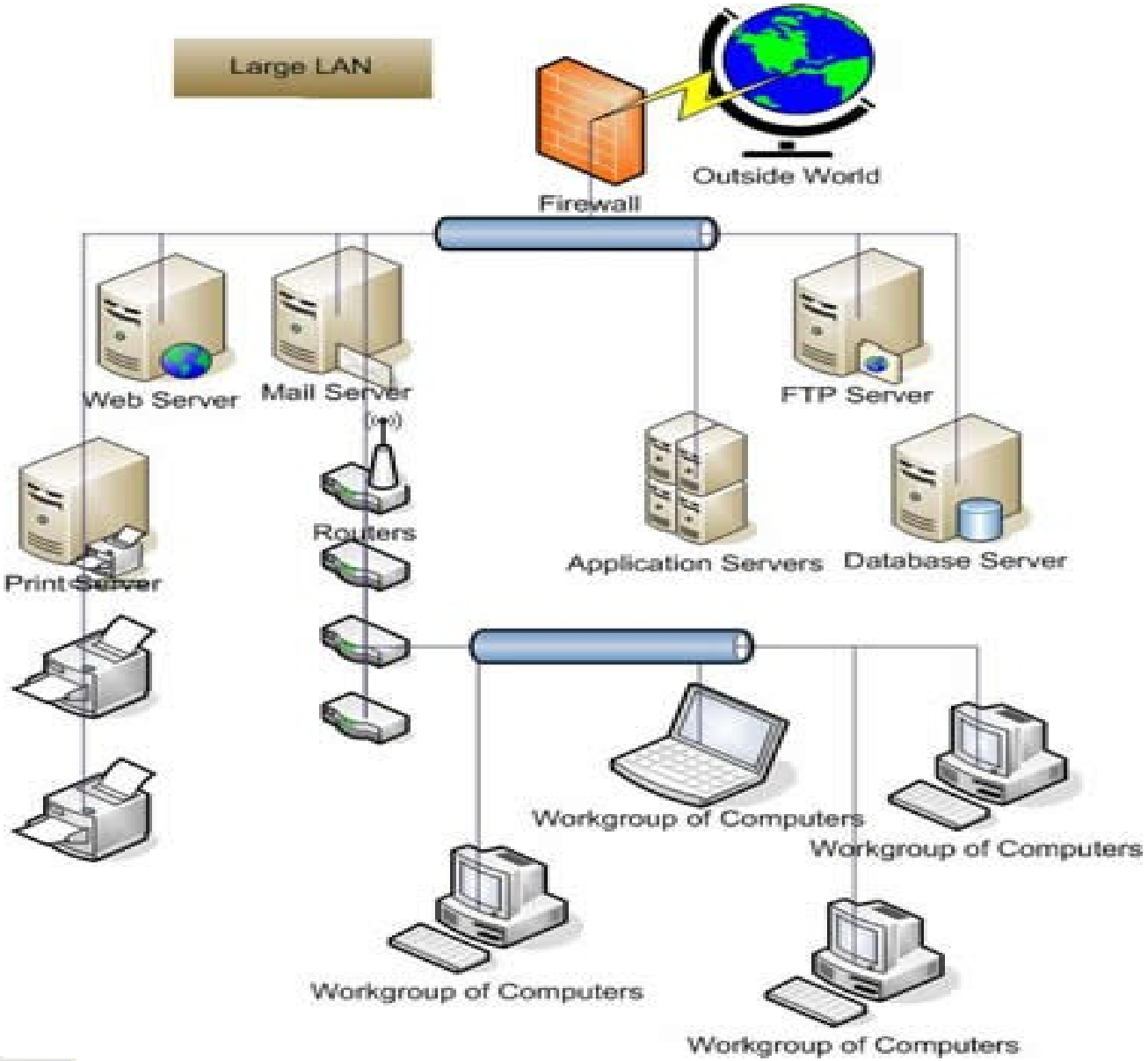
# Uses of Computer Networks



- Simultaneous Access
- Personal Communication
- Video Conferencing
- Easier Backup
- Bootable Backup

# Common Type of N/Ws

- Local Area Networks
- Wide Area Networks
- Metropolitan Area Networks.
- Home area Networks.
- Campus Area networks
- Intranets and extranets


Large LAN
Outside World
Firewall
Web Server
Mail Server
FTP Server
Routers
Application Servers
Database Server
Print Server
Workgroup of Computers
Workgroup of Computers
Workgroup of Computers
Workgroup of Computers

# LAN

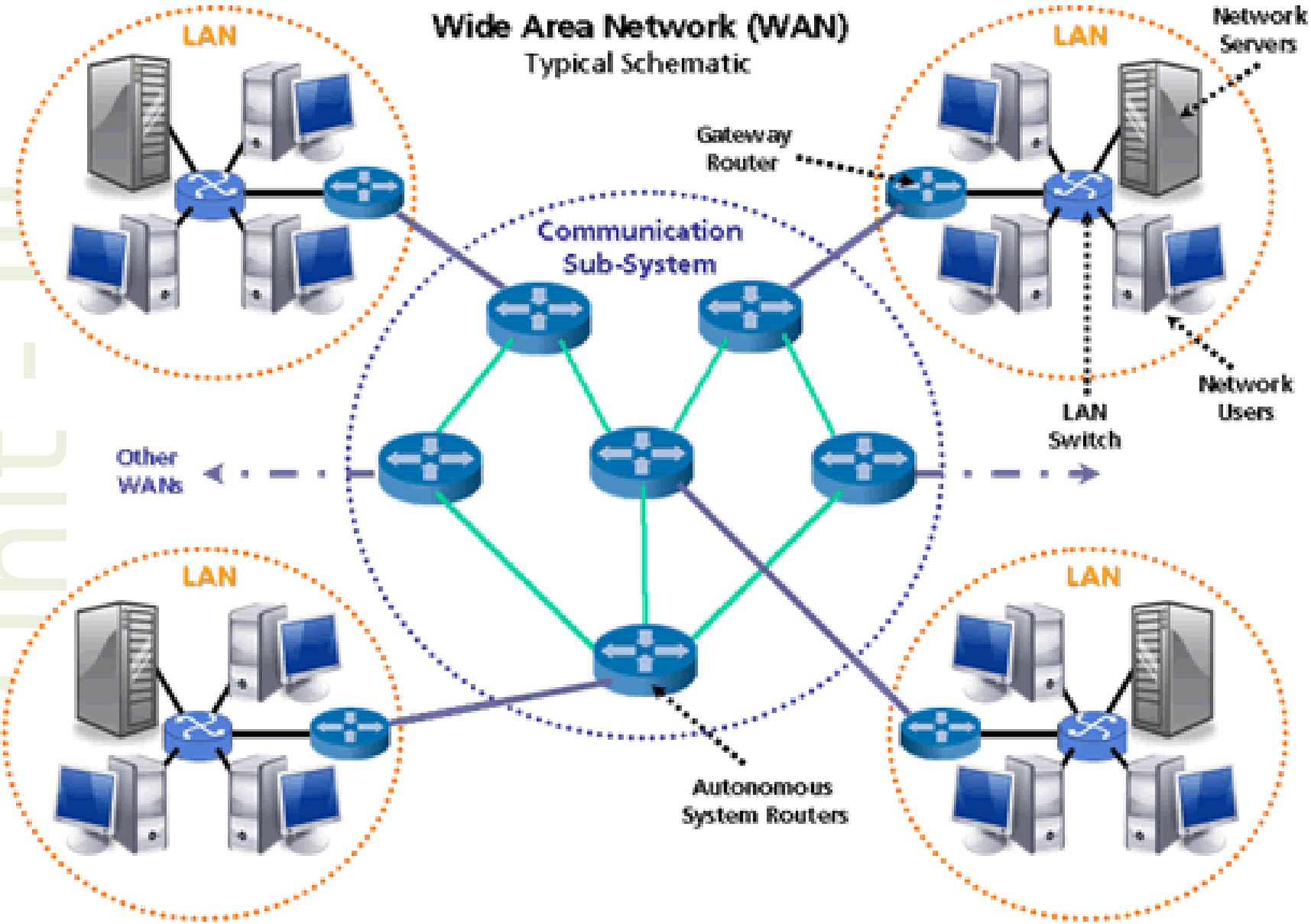
A **local area network (LAN)** supplies networking capability to a group of computers in close proximity to each other such as in an office building, a school, or a home. A LAN is useful for sharing resources like files, printers, games or other applications.

**Examples:** Ethernet LAN. The smallest home LAN can have exactly two computers; a large LAN can accommodate many thousands of computers. Many LANs are divided into logical groups called subnets.

# WAN

A **WAN** spans a large geographic area, such as a state, province or country. WANs often connect multiple smaller networks, such as local area networks (LANs) or metro area networks (MANs).

The world's most popular WAN is the Internet. Some segments of the Internet, like VPN-based extranets, are also WANs in themselves

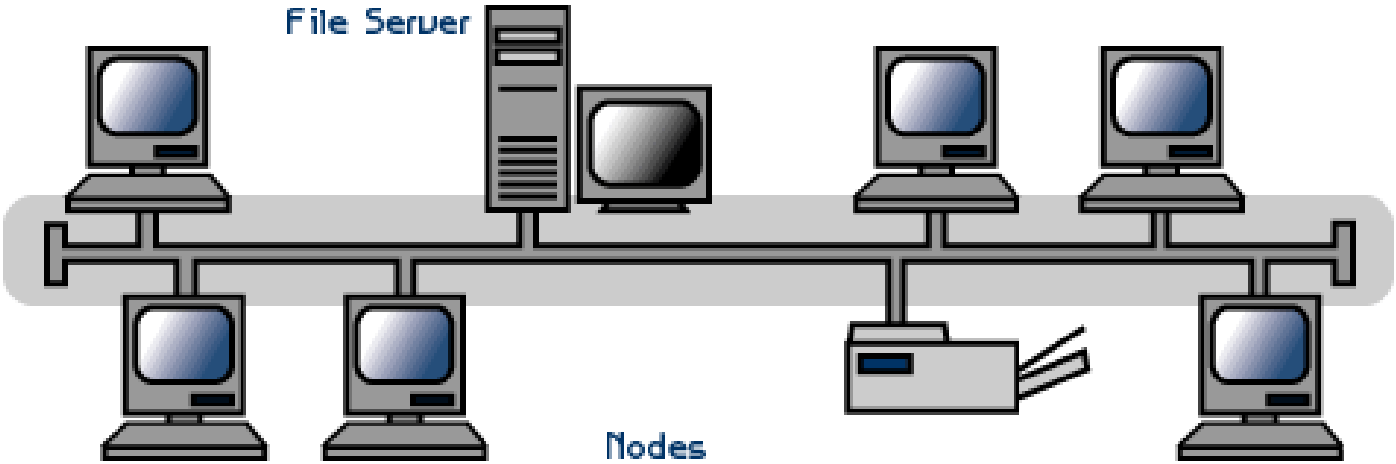

Wide Area Network (WAN)
Typical Schematic
LAN
LAN
LAN
LAN
Network Servers
Gateway Router
Communication Sub-System
Network Users
LAN Switch
Other WANs
Autonomous System Routers

# Network topologies & protocols



- Linear Bus
- Star
- Star-Wired Ring
- Tree

- Linear Bus

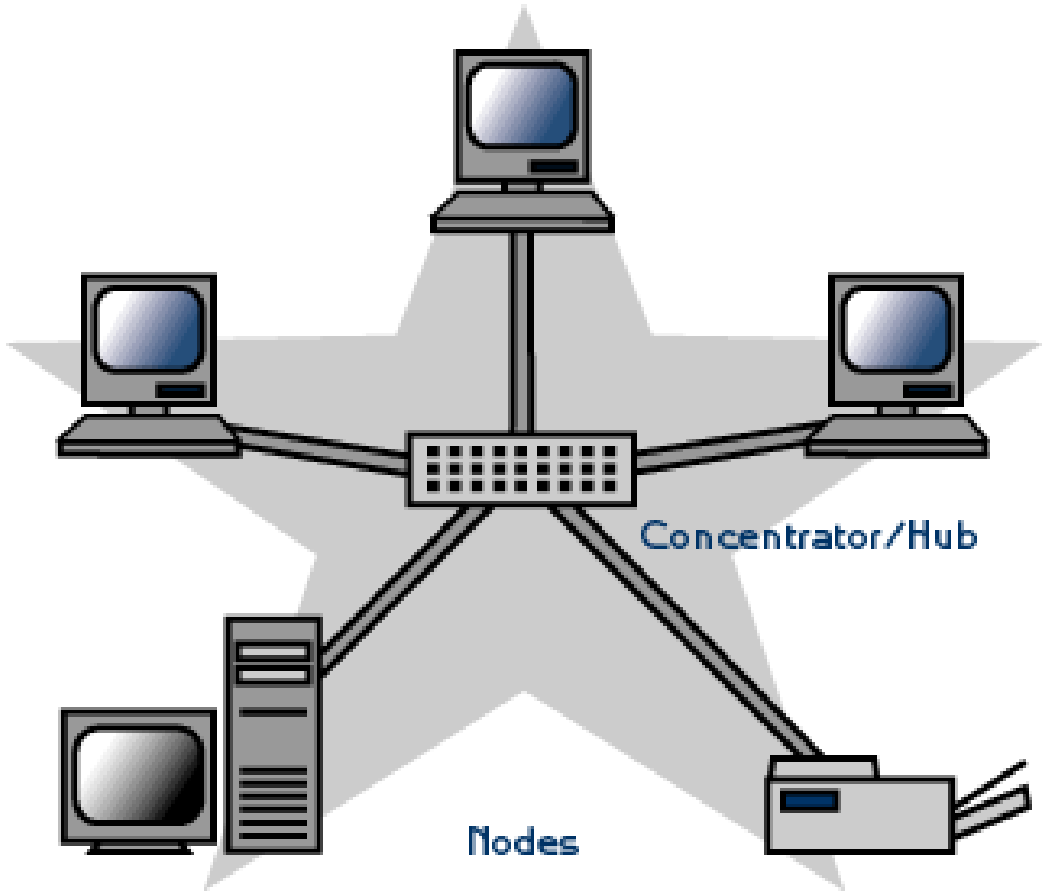


# Linear Bus



- **Advantages of a Linear Bus Topology**
  - Easy to connect a computer or peripheral to a linear bus.
  - Requires less cable length than a star topology.
- **Disadvantages of a Linear Bus Topology**
  - Entire network shuts down if there is a break in the main cable.
  - Terminators are required at both ends of the backbone cable.
  - Difficult to identify the problem if the entire network shuts down.
  - Not meant to be used as a stand-alone solution in a large building.

# Star

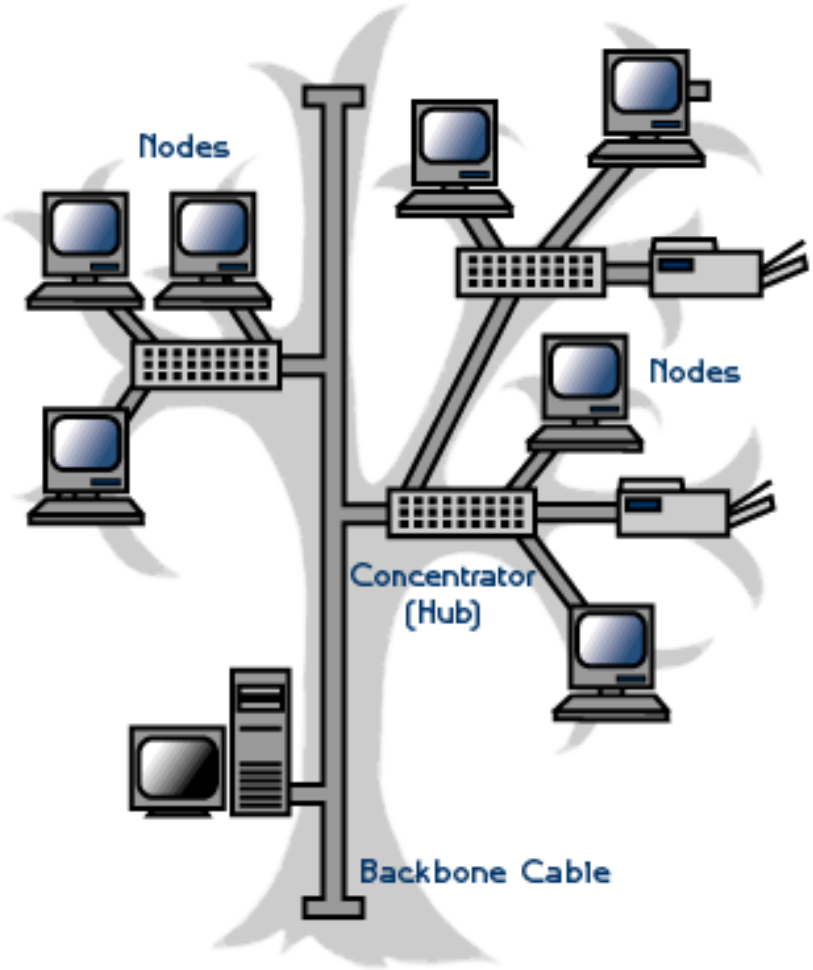


# Star



- **Advantages of a Star Topology**
  - Easy to install and wire.
  - No disruptions to the network then connecting or removing devices.
  - Easy to detect faults and to remove parts.
- **Disadvantages of a Star Topology**
  - Requires more cable length than a linear topology.
  - If the hub or concentrator fails, nodes attached are disabled.
  - More expensive than linear bus topologies because of the cost of the concentrators.

# Tree



# Tree



- **Advantages of a Tree Topology**
  - Point-to-point wiring for individual segments.
  - Supported by several hardware and software venders.
- **Disadvantages of a Tree Topology**
  - Overall length of each segment is limited by the type of cabling used.
  - If the backbone line breaks, the entire segment goes down.
  - More difficult to configure and wire than other topologies.

# Networks

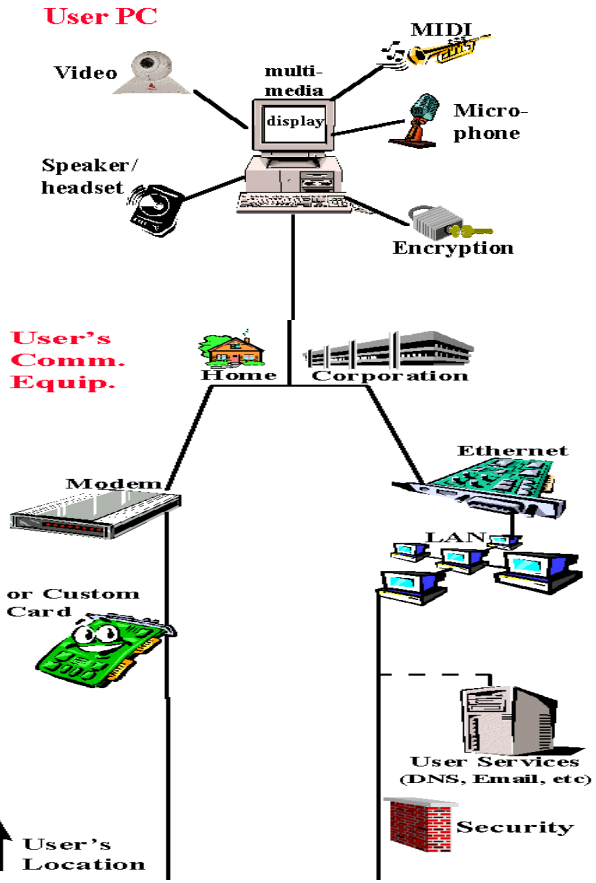


- Network Repeater
- Bridge
- Hub
- Router
- Gateway
- Firewall

- Protocol
- Protocol Suite
- TCP /IP
- SMTP
- FTP

# Internet

## Internet is “Network of Networks”



# Scope of Internet



- connect easily through ordinary personal computers and local phone numbers;
- exchange electronic mail (E-mail) with friends and colleagues with accounts on the Internet;
- post information for others to access, and update it frequently;
- access multimedia information that includes sound, photographic images and even video; and
- access diverse perspectives from around the world.

# Use of Internet



- Sharing research and business data among colleagues and like-minded individuals.
- Communicating with others and transmitting files via E-mail.
- Requesting and providing assistance with problems and questions.
- Marketing and publicizing products and services.
- Gathering valuable feedback and suggestions from customers and business partners.

# Major Services

- Search engines
- Online courses, schools, business etc
- Entrainment ( Games, quiz, survey, music, movie etc)
- Media for advertising and news telecasts
- Chatting textual, audio and video
- E-commerce and Shopping
- Online Libraries and dictionaries
- Web hosting
- Training
- News and Discussion

# WWW



The World Wide Web is the combination of four basic ideas:

- Hypertext: a format of information which allows, in a computer environment, one to move from one part of a document to another or from one document to another through internal connections among these documents (called "hyperlinks");
- Resource Identifiers: unique identifiers used to locate a particular resource (computer file, document or other resource) on the network - this is commonly known as a URL or URI, although the two have subtle technical differences;

# WWW



- The Client-server model of computing: a system in which client software or a client computer makes requests of server software or a server computer that provides the client with resources or services, such as data or files; and
- Markup language: characters or codes embedded in text which indicate structure, semantic meaning, or advice on presentation.

World Wide Web Consortium [W3C]

# Using E-mail



- Electronic mail is a unique medium of communication. Messages can be replied to or forwarded with speed and ease, and email has the potential to reach a wide audience.