The Internet, Worldwide web and Computer Networks

What was the Internet then?

- A network of networks, joining many government, university and private computers together and providing an infrastructure for the use of E-mail, bulletin boards, file archives, hypertext documents, databases and other computational resources

- The vast collection of computer networks which form and act as a single huge network for transport of data and messages across distances which can be anywhere from the same office to anywhere in the world.

What is the Internet now?

- The Internet is a worldwide telecommunications system that provides connectivity for millions of other, smaller networks;

- therefore, the Internet is often referred to as a network of networks.

- It allows computer users to communicate with each other across distance and computer platforms.

The Internet

The **Internet** is a worldwide collection of networks that links millions of businesses, government agencies, educational institutions, and individuals

ORIGIN OF INTERNET

- The Internet began in 1969 as the U.S. Department of Defense's Advanced Research Project Agency (ARPA) to provide immediate communication within the Department in case of war.

- Computers were then installed at U.S. universities with defense related projects. As scholars began to go online, this network changed from military use to scientific use.

- As ARPAnet grew, administration of the system became distributed to a number of organizations, including the National Science Foundation (NSF).

- This shift of responsibility began the transformation of the science oriented ARPAnet into the commercially minded and funded Internet used by millions today

PURPOSE OF THE INTERNET

- The Internet acts as a pipeline to transport electronic messages from one network to another network.

- At the heart of most networks is a server, a fast computer with large amounts of memory and storage space.

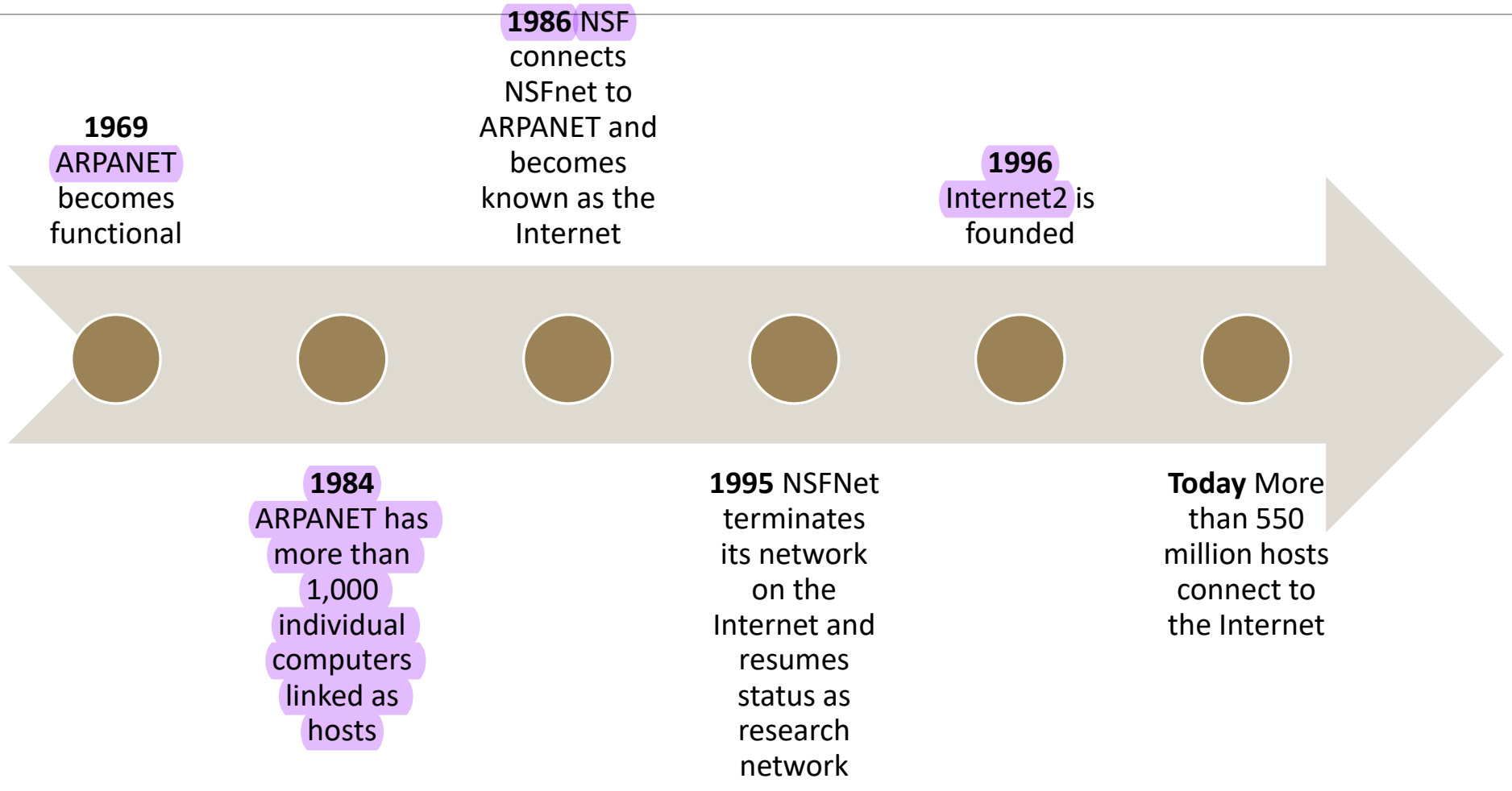
- The server controls the communication of information between the devices attached to a network, such as computers, printers, or other servers.

Evolution of the Internet

The Internet originated as ARPANET in September 1969 and had two main goals:

- Allow scientists at different physical locations to share information and work together
- Function even if part of the network were disabled or destroyed by a disaster

Evolution of the Internet



Evolution of the Internet

Each organization is responsible only for maintaining its own network

- The World Wide Web Consortium (W3C) oversees research and sets guidelines and standards

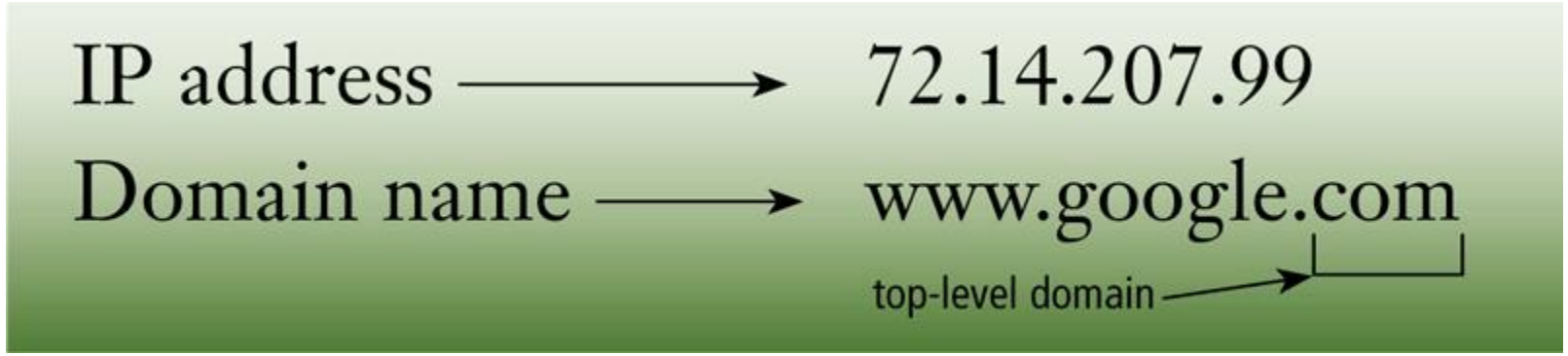
Internet2 connects more than 200 universities and 115 companies via a high-speed private network

Evolution of the Internet

An **IP address** is a number that uniquely identifies each computer or device connected to the Internet

A **domain name** is the text version of an IP address

A **DNS server** translates the domain name into its associated IP address



TOP LEVEL DOMAIN NAME

- Each part of a domain name contains certain information.

- **The first field is the host name, identifying a single computer or organization.**

- The last field is the top-level domain, describing the type of organization and occasionally country of origin associated with the address.

Generic top-level domains

Examples of Generic Top-Level Domains

Generic TLD	Intended Purpose
aero	Aviation community members
biz	Businesses of all sizes
cat	Catalan cultural community
com	Commercial organizations, businesses, and companies
coop	Business cooperatives such as credit unions and rural electric co-ops
edu	Educational institutions
gov	Government agencies
info	Business organizations or individuals providing general information
jobs	Employment or human resource businesses
mil	Military organizations
mobi	Delivery and management of mobile Internet services
museum	Accredited museums
name	Individuals or families
net	Network providers or commercial companies
org	Nonprofit organizations
pro	Certified professionals such as doctors, lawyers, and accountants
tel	Internet communications
travel	Travel industry

WHAT MAKES UP THE WORLD WIDE WEB?

- The Internet is often confused with the World Wide Web. The misperception is that these two terms are synonymous.

- The Internet is the collection of the many different systems and protocols.

- **The World Wide Web, developed in 1989, as one of those different protocols. As the name implies, it allows resources to be linked with great ease in an almost seamless fashion.**

- The World Wide Web contains a vast collection of linked multimedia pages that is ever-changing

INTERNET ENABLERS

TCP/IP :In order for a computer to communicate on the Internet, a set of rules or protocols computers must follow to exchange messages was developed. The two most important protocols allowing computers to transmit data on the Internet are Transmission Control Protocol (TCP) and Internet Protocol (IP).

Domain name system

An Internet address has four fields with numbers that are separated by periods or dots. This type of address is known as an IP address. Rather than have the user remember long strings of numbers, the Domain Name System (DNS) was developed to translate the numerical addresses into words. For example, the address fcit.usf.edu is really 131.247.120.10.

URLs

Addresses for web sites are called URLs (Uniform Resource Locators). Most of them begin with http (Hypertext Transfer Protocol), followed by a colon and two slashes. For example, the URL for KNUST is https://www.knust.edu.gh/

.

The World Wide Web

- The **World Wide Web**, or **Web**, consists of a worldwide collection of electronic documents (**Web pages**)
- A **Web site** is a collection of related Web pages and associated items
- A **Web server** is a computer that delivers requested Web pages to your computer

WEB 2.0

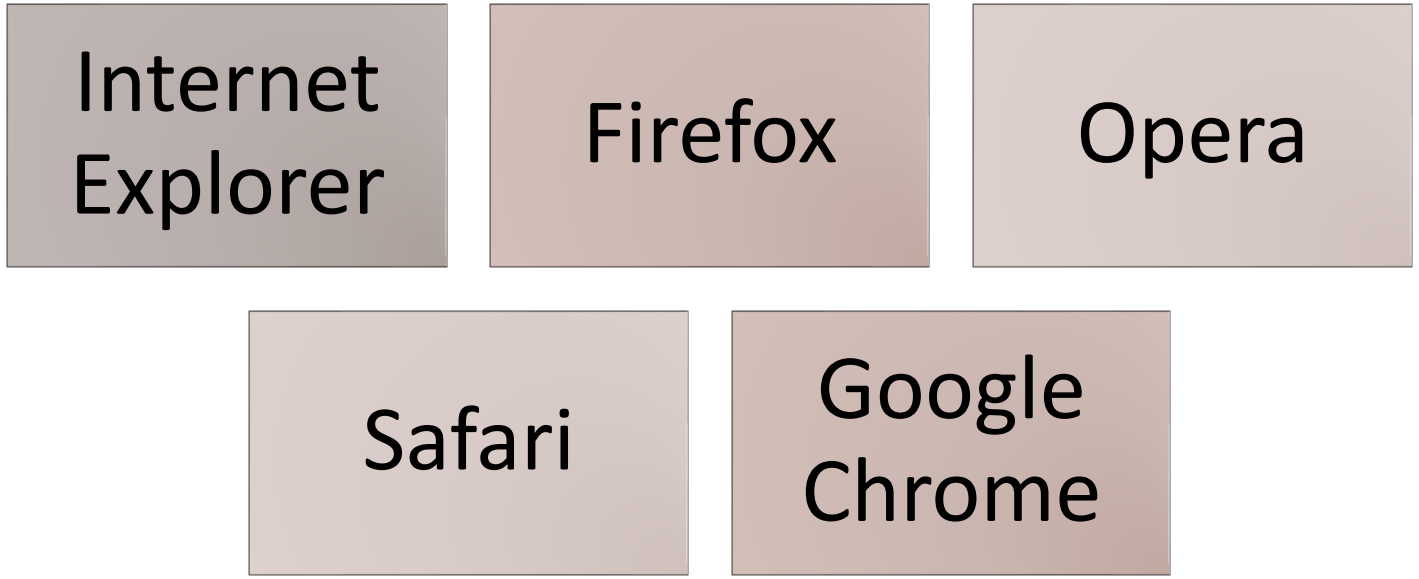
- Web 2.0 describes the current state of the web, which has more user-generated content and usability for end-users compared to its earlier incarnation, Web 1.0
- **Web 2.0** refers to Web sites that provide a means for users to interact
- Web 2.0 does not refer to any specific technical upgrades to the internet; it refers to a shift in how the Internet is used.
- In the new age of the Internet, there is a higher level of information sharing and interconnectedness among participants.

Assignment

Discuss the Advantages and Disadvantages of Web 2.0

The World Wide Web

A **Web browser**, or **browser**, allows users to access Web pages and Web 2.0 programs



WHY DO YOU NEED A BROWSER?

- Once you have an account with an Internet service provider, you can access the Web through a browser, such as Safari or Microsoft Internet Explorer.

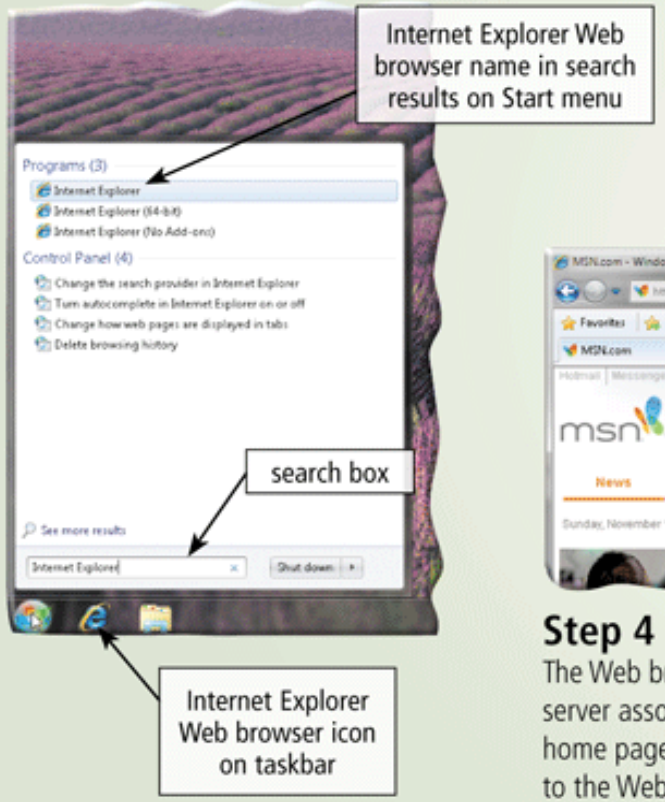
- The browser is the application responsible for allowing a user's computer to read and display web documents.

The World Wide Web

How a Web Browser Displays a Home Page

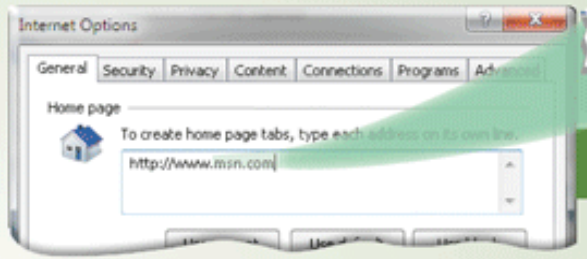
Step 1

Start the Web browser software by clicking the Web browser icon on the taskbar or typing the Web browser name in the search box on the Start menu.



Step 2

Behind the scenes, the Web browser looks up its home page setting. For illustration purposes only, the screen on the right shows the home page setting is msn.com.

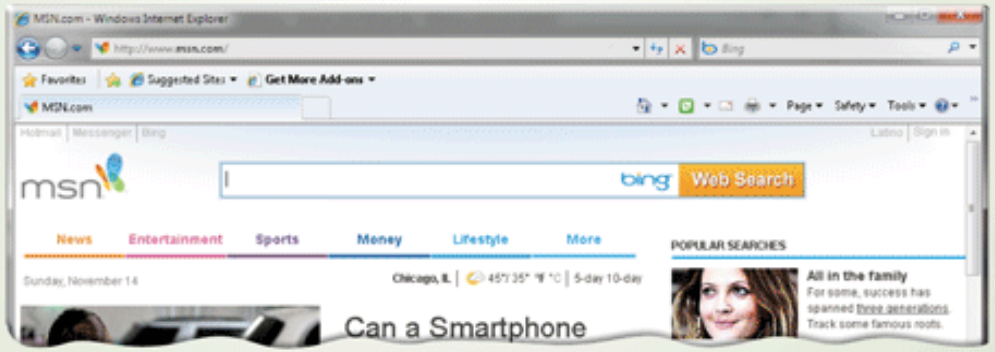


msn.com

msn.com

Step 3

The Web browser communicates with a server maintained by your Internet access provider. The server translates the domain name of the home page to an IP address and then sends the IP address to your computer.



Step 4

The Web browser uses the IP address to contact the Web server associated with the home page and then requests the home page from the server. The Web server sends the home page to the Web browser, which formats the page for display on your screen.

207.68.172.234

The World Wide Web

A **home page** is the first page that a Web site displays

Web pages provide **links** to other related Web pages

Discussion: What is the difference between uploading and downloading

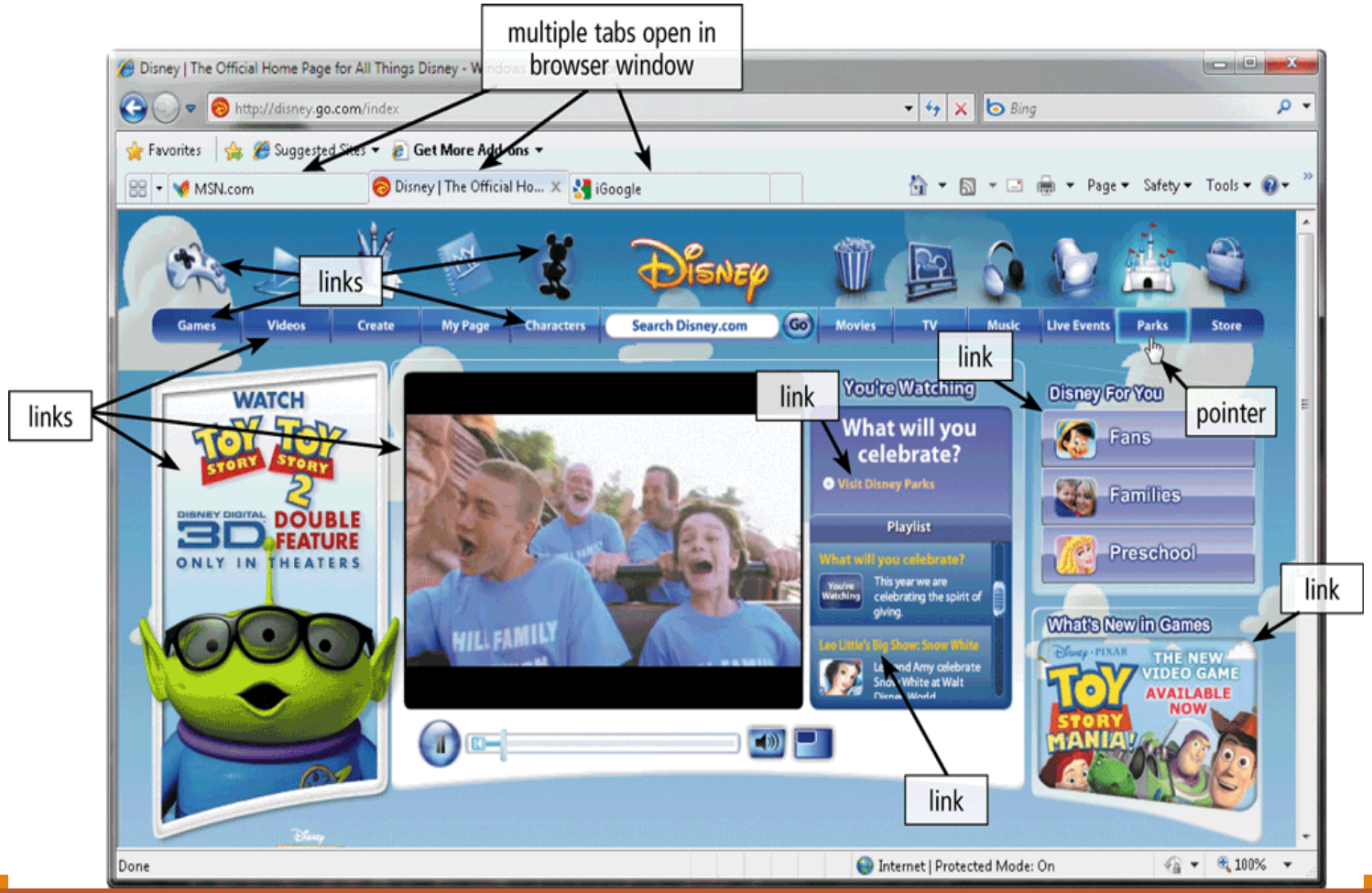
Some Web pages are designed specifically for microbrowsers

The World Wide Web

A Web page has a unique address called a **URL** or **Web address**

The World Wide Web

Tabbed browsing allows you to open and view multiple Web pages in a single Web browser window



The World Wide Web

Search operators can help to refine your search

Search Engine Operators

Operator	Description	Examples	Explanation
Space or +	Display hits that include specific words.	art + music art music	Results have both words art and music — in any order.
OR	Display hits that include only one word from a list.	dog OR puppy dog OR puppy OR canine	Results have either the word dog or puppy. Results have the word dog or puppy or canine.
( )	Combine hits that include specific words with those that include only one word from a list.	Kalamazoo Michigan (pizza OR subs)	Results have both words Kalamazoo Michigan and either the word, pizza, or the word, subs.
-	Exclude a word from the search results.	automobile -convertible	Results include automobile but do not include convertible.
" "	Search for an exact phrase in a certain order.	"19th century literature"	Results have the exact phrase, 19th century literature.
*	Substitute characters in place of the asterisk.	writer*	Results include any word that begins with writer (e.g., writer, writers, writer's).

The World Wide Web

- Information presented on the Web must be evaluated for accuracy
- No one oversees the content of Web pages

Criteria for Evaluating a Web Site's Content

Evaluation Criteria	Reliable Web Sites
Affiliation	A reputable institution should support the Web site without bias in the information.
Audience	The Web site should be written at an appropriate level.
Authority	The Web site should list the author and the appropriate credentials.
Content	The Web site should be well organized and the links should work.
Currency	The information on the Web page should be current.
Design	The pages at the Web site should download quickly, be visually pleasing, and easy to navigate.
Objectivity	The Web site should contain little advertising and be free of preconceptions.

The World Wide Web

Multimedia refers to any application that combines text with:

The World Wide Web

- A **graphic** is a digital representation of non-text information

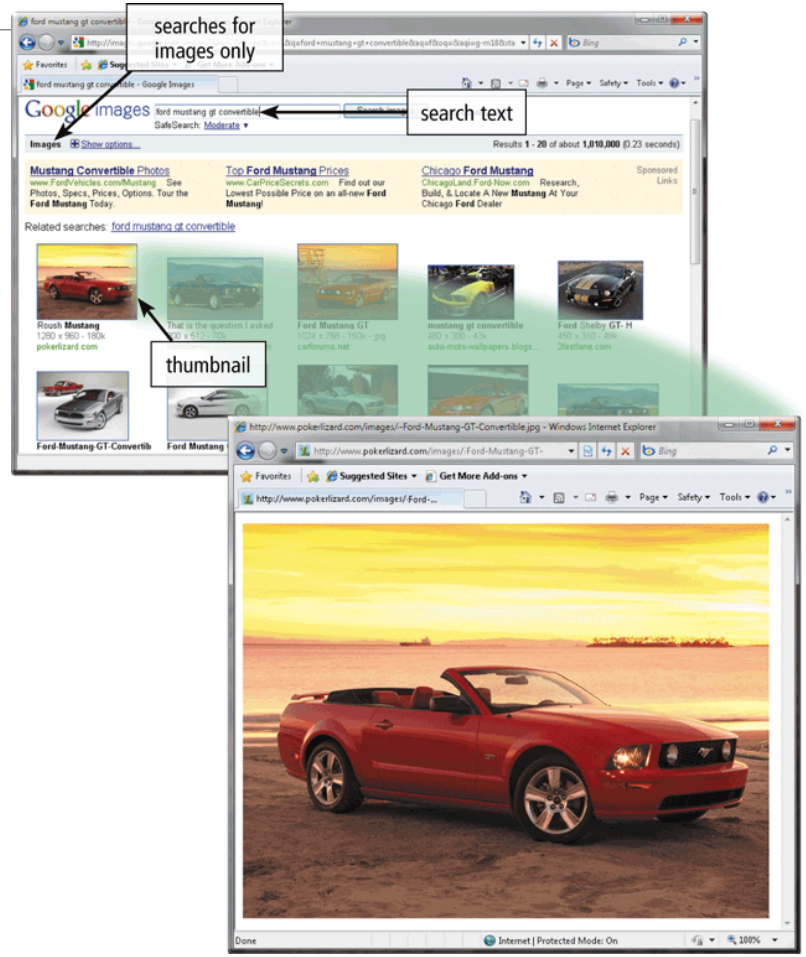
- Graphic formats include
  - BMP - Bitmap Image file,
  - GIF - Graphics Interchange Format,
  - JPEG - Joint Photographic Experts Group,
  - PNG - Portable Graphics Format, and TIFF - Tagged Image File Format

Group presentations

Presentations on the various file formats

The World Wide Web

A thumbnail is a small version of a larger graphic



The World Wide Web

A **plug-in** is a program that extends the capability of a Web browser

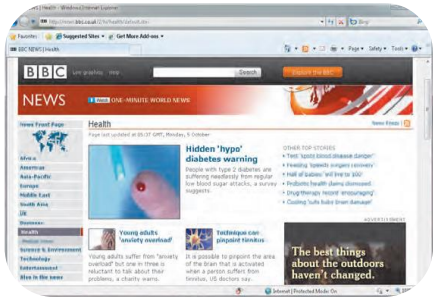
Popular Plug-Ins

Plug-In Application	Description	Web Address
Acrobat Reader	View, navigate, and print Portable Document Format (PDF) files — documents formatted to look just as they look in print	adobe.com
Flash Player	View dazzling graphics and animation, hear outstanding sound and music, display Web pages across an entire screen	adobe.com
Java	Enable Web browser to run programs written in Java, which add interactivity to Web pages	java.com
QuickTime	View animation, music, audio, video, and VR panoramas and objects directly on a Web page	apple.com
RealPlayer	Listen to live and on-demand near-CD-quality audio and newscast-quality video, stream audio and video content for faster viewing, play MP3 files, create music CDs	real.com
Shockwave Player	Experience dynamic interactive multimedia, 3-D graphics, and streaming audio	adobe.com
Silverlight	Experience high-definition video, high-resolution interactive multimedia, and streaming audio and video	microsoft.com
Windows Media Player	Listen to live and on-demand audio, play or edit WMA and MP3 files, burn CDs, and watch DVD movies	microsoft.com

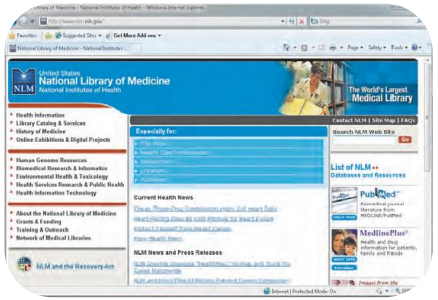
The World Wide Web

There are different types of Web sites

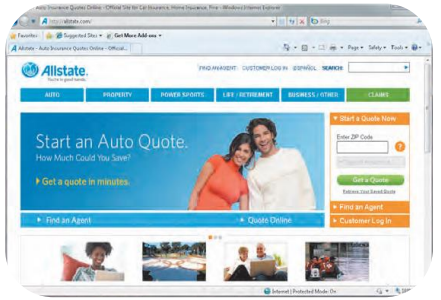
Portal



News



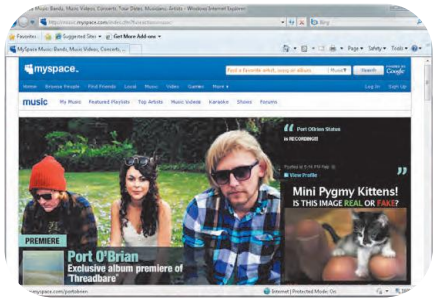
Informational



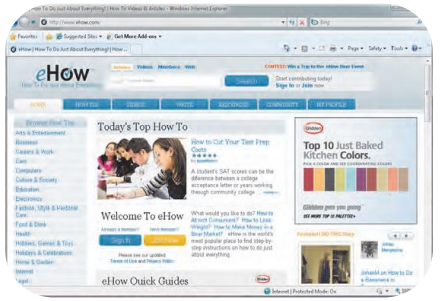
Business/Marketing

Blog

Wiki



Online Social Network

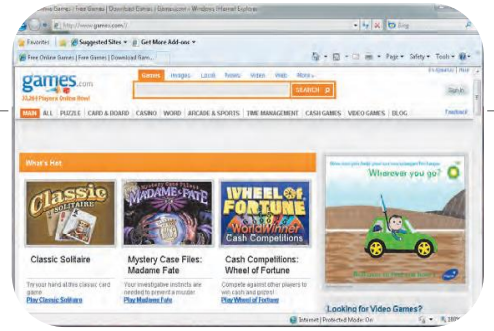


Educational

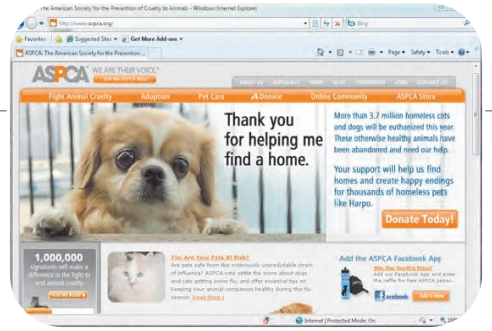
Pages 88 – 91

Figure 2-15

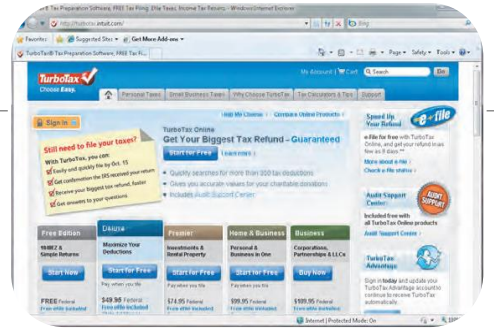
The World Wide Web



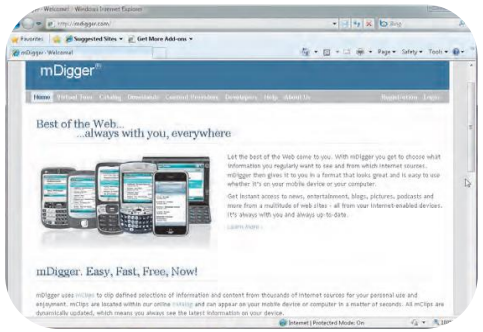
Entertainment



Advocacy



Web Application



Content Aggregator

Personal

Netiquette

Netiquette is the code of acceptable Internet behaviour

NETIQUETTE — Golden Rule: Treat others as you would like them to treat you.

1. In e-mail, chat rooms, and newsgroups:
   - Keep messages brief. Use proper grammar, spelling, and punctuation.
   - Be careful when using sarcasm and humor, as it might be misinterpreted.
   - Be polite. Avoid offensive language.
   - Read the message before you send it.
   - Use meaningful subject lines.
   - Avoid sending or posting *flames*, which are abusive or insulting messages. Do not participate in *flame wars*, which are exchanges of flames.
   - Avoid sending spam, which is the Internet's version of junk mail. *Spam* is an unsolicited e-mail message or newsgroup posting sent to many recipients or newsgroups at once.
   - Do not use all capital letters, which is the equivalent of SHOUTING!
   - Use **emoticons** to express emotion. Popular emoticons include

     :) Smile :| Indifference :o Surprised
     :(Frown :\ Undecided

   - Use abbreviations and acronyms for phrases:

     btw by the way
     imho in my humble opinion
     fyi for your information
     ttfn ta ta for now
     fwiw for what it's worth
     tyvm thank you very much

   - Clearly identify a *spoiler*, which is a message that reveals a solution to a game or ending to a movie or program.
2. Read the *FAQ* (frequently asked questions), if one exists. Many newsgroups and Web pages have an FAQ.
3. Do not assume material is accurate or up-to-date. Be forgiving of other's mistakes.
4. Never read someone's private e-mail.

COMPUTER NETWORKS

- A network is basically a combination of hardware and software that send data from one computer to another.
- It can also be defined as two or more computers that are connected to each other to share and exchange data.
- The hardware consist of the physical components that carries data or signals from one point to the other while the software are the instructions that make the services expected from a network possible.

APPLICATIONS OF COMPUTER NETWORKS

1. **Sharing of resources such as printers**
2. **Sharing of expensive software's and database**
3. **Communication from one computer to another computer**
4. **Exchange of data and information among users via network**
5. **Sharing of information over geographically wide areas.**

Benefits of Computer Networks

1. **Increased speed**
2. **Reduced cost**
3. **Improved security**
4. **Centralized software managements**
5. **Electronic mail**
6. **Flexible access**

Disadvantages of Computer Networks

1. **High cost of installation**
2. **Requires time for administration**
3. **Failure of server**
4. **Cable faults**

COMPUTER NETWORKS

- A computer network must meet a number of criteria, notable among these are **performance, security and reliability**.

- *Performance* is normally measured in terms of **transit time** and **response time.**

- The performance of a network can be affected by
  - the number of people on the network at a time,
  - the transmission medium,
  - What else?

COMPUTER NETWORKS

- *Security* basically deals with preventing unauthorized users to access, update or damage data.

It also deals with the policies needed for implementation and procedures needed for recovery from breaches and data loses.

COMPUTER NETWORKS

- ***Reliability*** is usually measured by the frequency at which failure occurs, the time it takes the network to recover from a failure and the network‘s robustness in an emergency or disaster.

TYPES OF COMPUTER NETWORKS

- As mentioned earlier, a network consists of two or more devices that have been connected through links to send and receive data.
- **A link is simply a communication pathway for transferring data from one device to another.**
- There are basically two types of connections namely point-to-point and multipoint connections.

TYPES OF COMPUTER NETWORKS

- **For a point-to-point connection**, there is a dedicated link between two devices and the entire capacity of the link is set aside for transmission between these two devices.

- **A multipoint connection** on the other hand is one in which more than two devices share a common link.

NETWORK TOPOLOGY

- **A network topology refers to the way in which the network devices are connected to each other.**

- When two or more devices are connected they form a link, and one or more links form a topology.

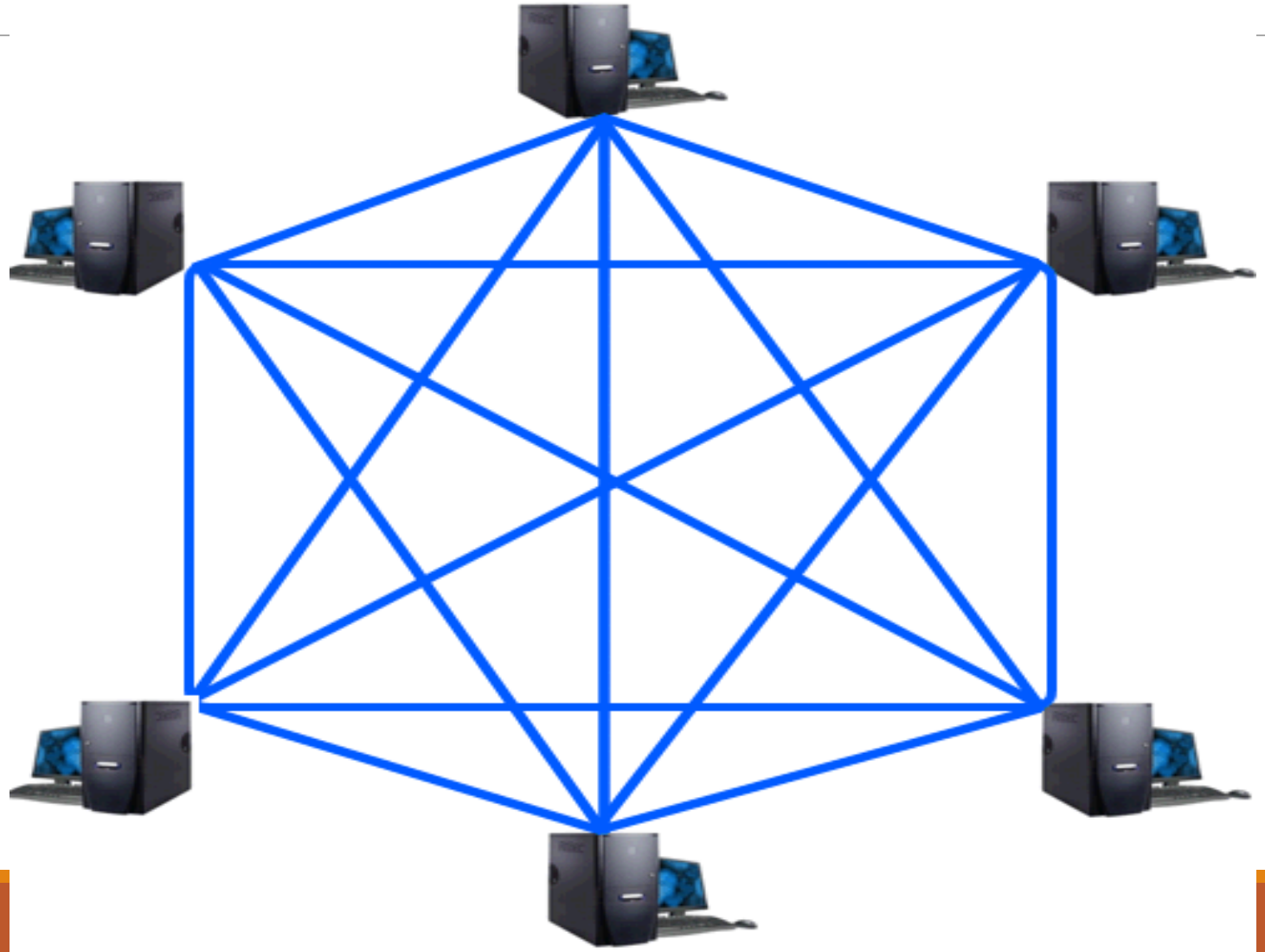
- In a network the devices are normally referred to as **nodes**.

- There are basically four main types of networking and these are the *mesh, star, bus* and *ring*.

MESH TOPOLOGY

- In a mesh topology each device has a dedicated point-to-point link to all other devices in the network.
- In other words, there is a direct connection between every two devices on the network.
- A typical mesh topology is as shown below:

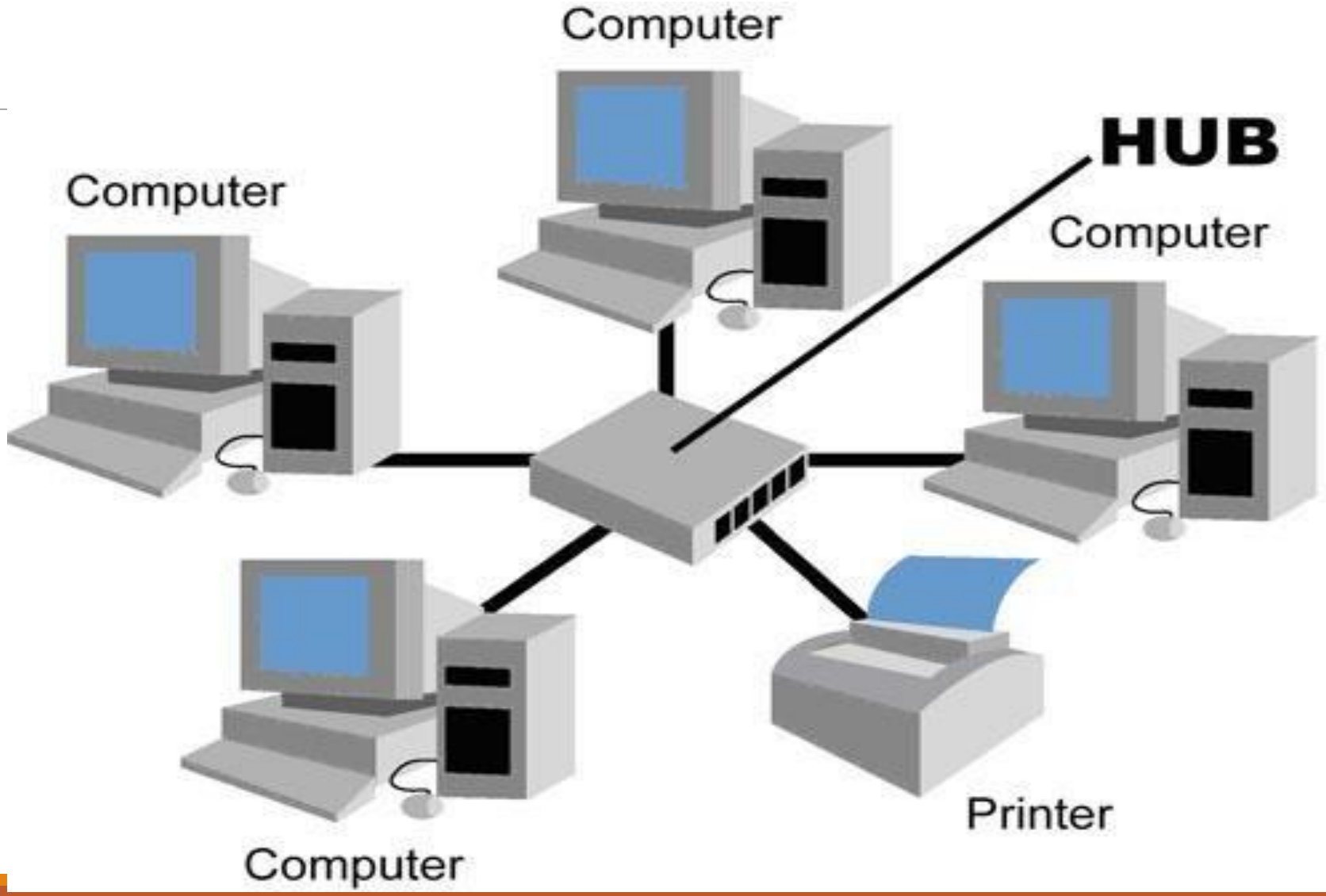
MESH TOPOLOGY



STAR TOPOLOGY

- In a star topology, each device has a dedicated point-to-point link only to a hub; a central controller.
- In other words, there is no direct link between any two devices.
- A typical star topology is as shown below:

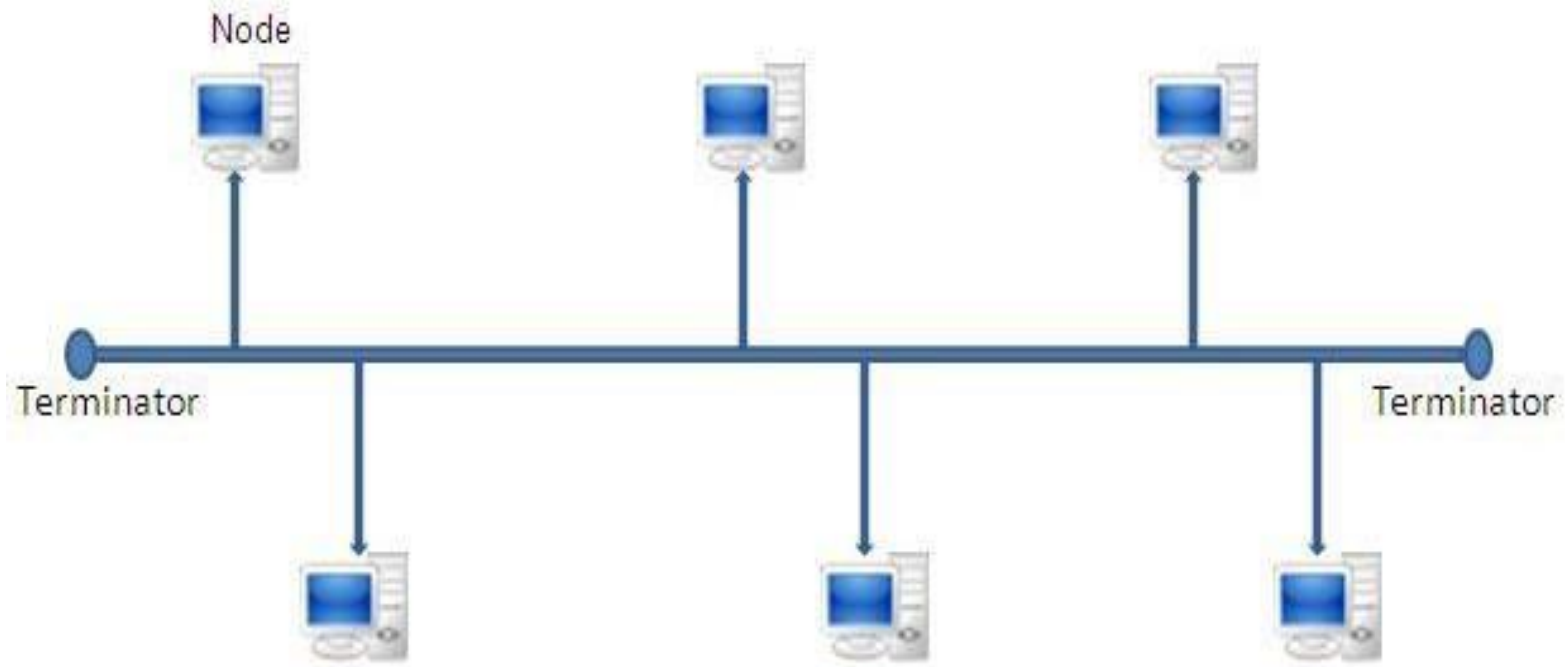
STAR TOPOLOGY

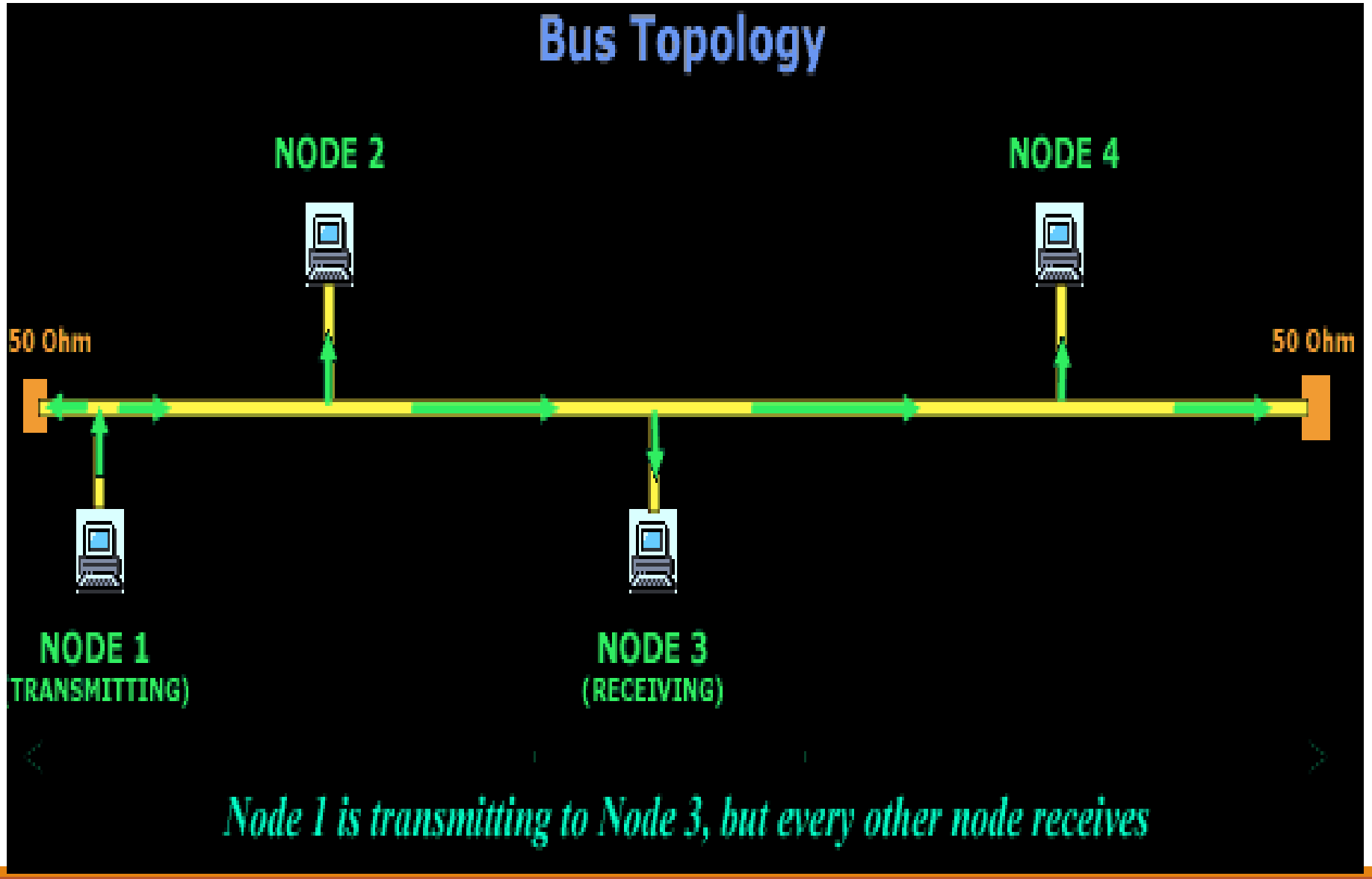


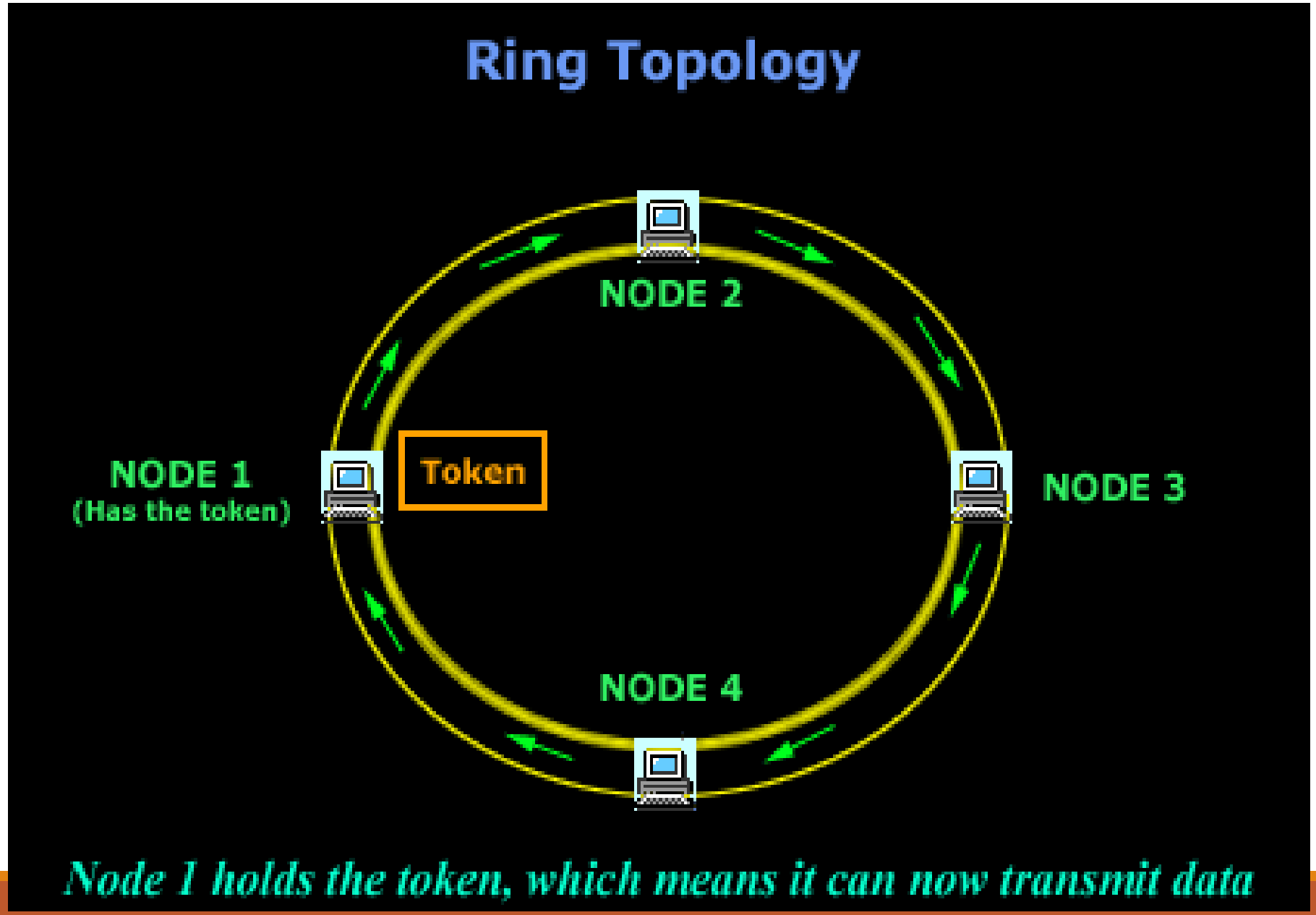
BUS TOPOLOGY

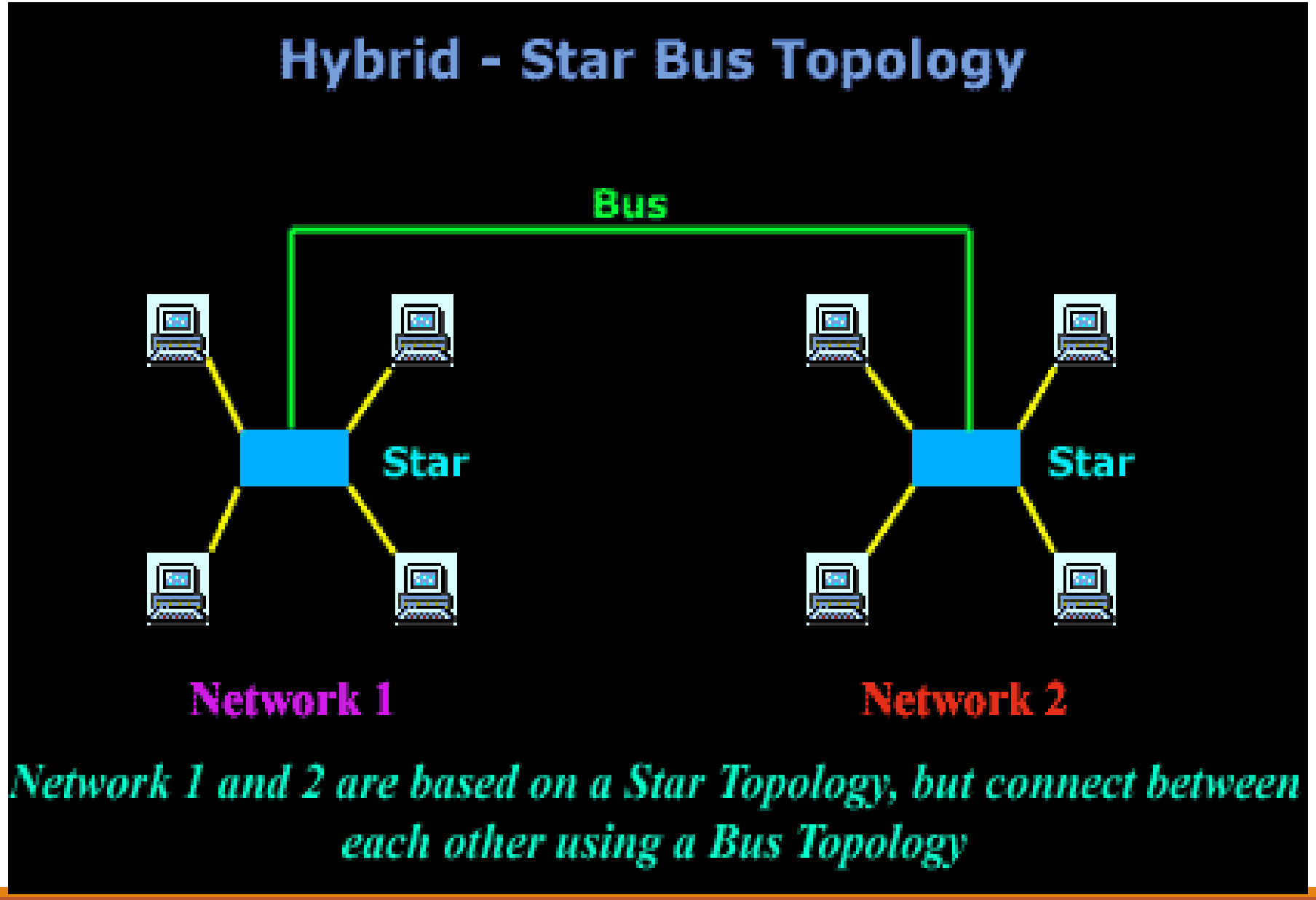
- **In a bus topology one long cable called the bus cable is used to link all the devices in a link.**
- The bus topology is a multipoint.
- Each device is connected to the bus cable by drop lines and connectors (taps)

BUS TOPOLOGY

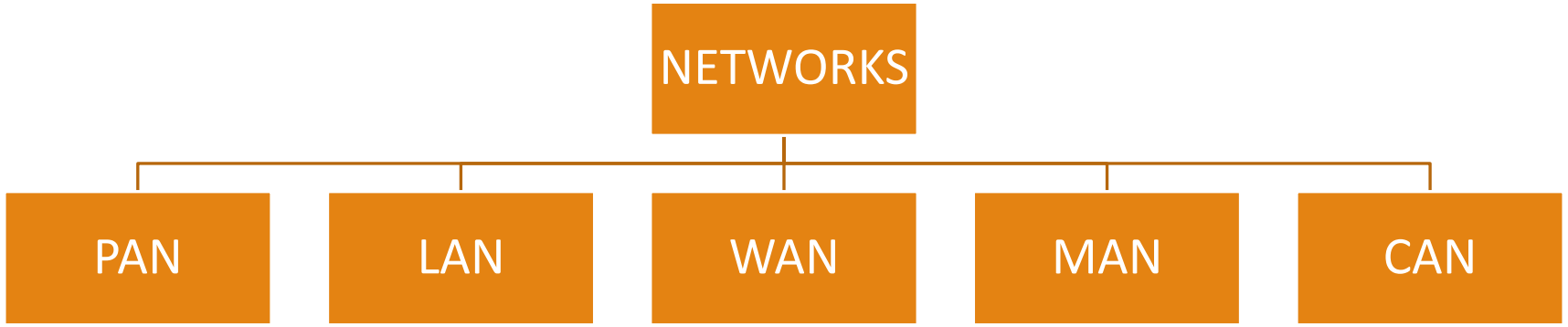



Bus Topology
NODE 2
NODE 4
50 Ohm
50 Ohm
NODE 1
(TRANSMITTING)
NODE 3
(RECEIVING)
Node 1 is transmitting to Node 3, but every other node receives


Ring Topology
NODE 2
NODE 1
(Has the token)
Token
NODE 3
NODE 4
Node 1 holds the token, which means it can now transmit data


Hybrid - Star Bus Topology
Bus
Star
Star
Network 1
Network 2
Network 1 and 2 are based on a Star Topology, but connect between each other using a Bus Topology

CLASSIFICATION OF NETWORKS BY THEIR GEOGRAPHY



LOCAL AREA NETWORK (LAN)

- LAN is a network which is designed to operate over a small physical area such as an office, factory or a group of buildings.
- LAN's are easy to design and troubleshoot
- Exchange of information and sharing of resources becomes easy because of LAN.
- In LAN all machines are connected to a single cable or sometimes wireless.
- Different types of topologies such as star, tree, bus, ring, etc can be used
- It is usually a privately owned network.

Wide Area Network (WAN)

- When network spans over a large distance or when the computers to be connected to each other are at widely separated locations a local area network cannot be used.

- A wide area network(WAN) is installed.

- The communication between different users of WAN is established using leased telephone lines, satellite links and similar channels.

- It is cheaper and more efficient to use the phone network for the link.

- Most WAN networks are used to transfer large blocks of data between its users.

Personal Area network (PAN)

- **A** personal area network is a computer network organized around an individual person.
- It generally consists of a mobile computer, a cell phone or personal digital assistant. PAN enables the communication among these devices.
- It can also be used for communication among personal devices themselves for connecting to a digital level network and internet.
- The PANs can be constructed using wireless or cables.

CAMPUS AREA NETWORK (CAN)

- The campus area network is made up of an interconnection of LAN with limited geographical area.

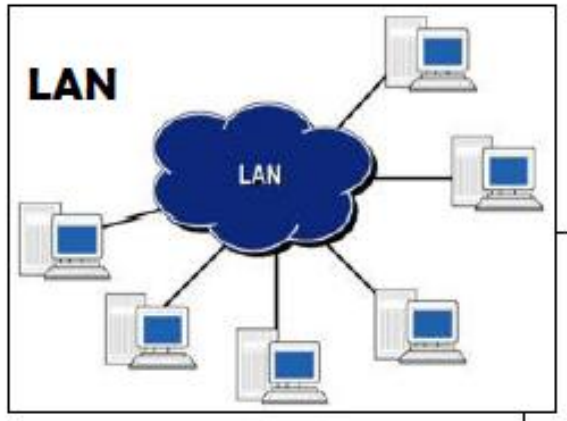
- Network equipment such as switches, routers and the transmission media i.e. optical fibre etc are almost entirely owned by the campus owner.

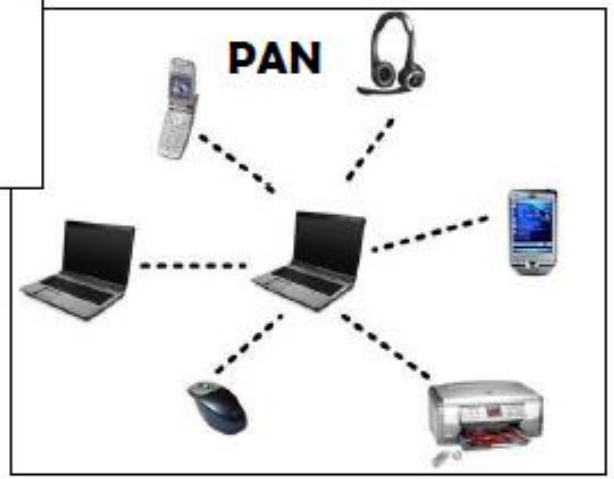
METROPOLITAN AREA NETWORK (MAN)

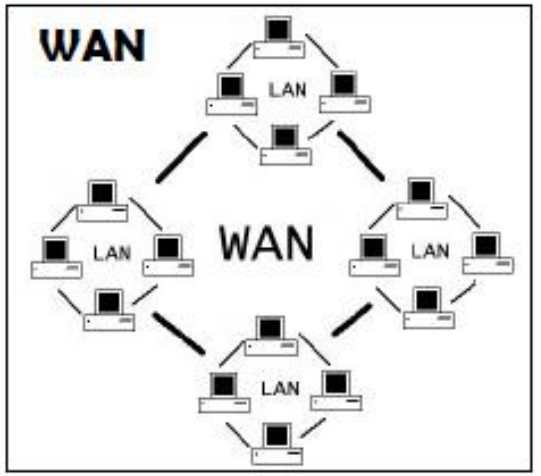
- It is in between LAN & WAN technology that covers the entire city.

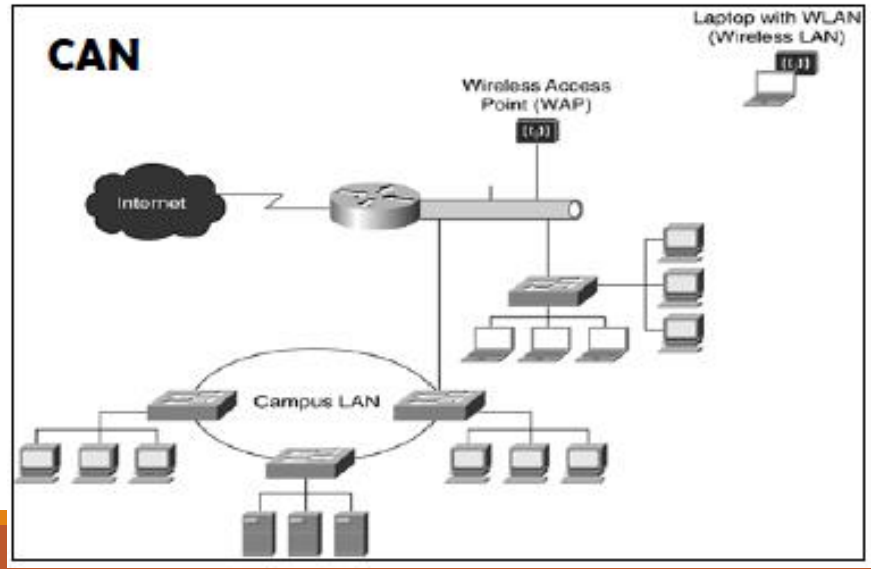
- It uses similar technology as LAN.

- It can be a single network such as cable TV network, or a measure of connecting a number of LAN's on a large network so that resources can be shared LAN to LAN as well as device to device.









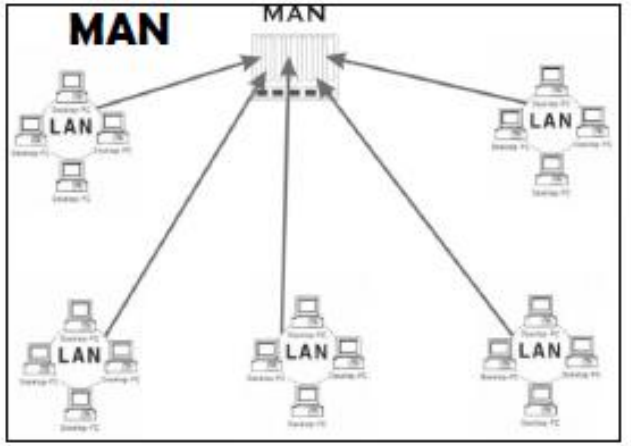


Figure taken from: CN1047 INTRODUCTION TO COMPUTER NETWORKINGCHAPTER 1BASIC CONCEPTS OF NETWORK

DISTINGUISH BETWEEN LAN, MAN AND WAN

PARAMETERS	LAN	WAN	MAN
Ownership of network	Private	Private or public	Private or public
Geographical area covered	Small	Very large	Moderate
Design and maintenance	Easy	Not easy	Not easy
Communication medium	Coaxial cable	PSTN or satellite links	Coaxial cables, PSTN, optical fibre, cables, wireless
Bandwidth	Low	High	moderate
Data rates(speed)	High	Low	moderate

Figure taken from: CN1047 INTRODUCTION TO COMPUTER NETWORKINGCHAPTER 1BASIC CONCEPTS OF NETWORK