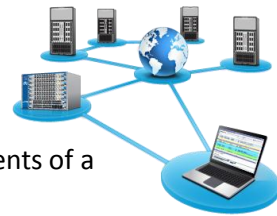


Computer Technology

Lesson 3: Introduction to Internet Technology



Learning Goal:

Students will be able to understand the elements of a network.

Scale Yourself

4	I do understand the elements of a network. I can teach these skills to others.
3	I do understand the elements of a network, without my notes.
2	With help, (my notes, teacher assistance) I do understand the elements of a network.
1	I do not understand the elements of a network.

Learning Targets



- Define networks
- Define the Internet
- Identify Internet connection methods
- Define Internet protocols
- Define the Domain Name System (DNS)
- Define cloud computing

Overview of Networks

- **Network** – two or more computers linked together so they can communicate, share resources and exchange information
- Networks allow users to:
 - Access shared programs and data
 - Transfer data from one computer to another
 - Share peripheral devices such as printers
 - Share storage devices to store data for backup
 - Use programs to communicate with other users
 - Access the Internet



Overview of Networks

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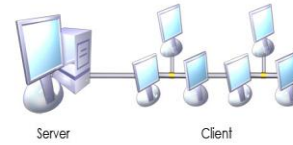


The client/server model

- **Client/server model** – a network structure in which individual computers and devices interact with one another through a central server, to which they are all connected
- The client/server model divides processing and storage tasks between the **client** and the **server**.
 - **Client**-an individual computer connected to a network
 - **Server**-A computer in a network that manages the network resources and provides, or serves, information to clients
 - **Node** – an individual computer or other device connected to a network

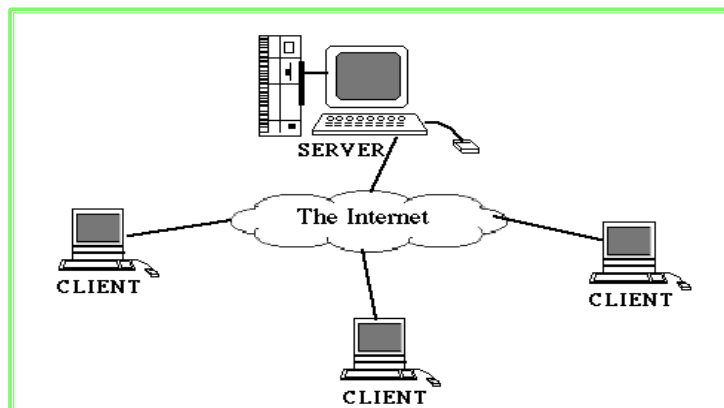


The Client/Server Model



- The server is more powerful than the individual computers, or clients, connected it.
- The **server** is responsible for storing and presenting information.
- Client/server model processes information as follows:
 1. A client requests information from a shared file stored on the server
 2. The server processes the request, locates the requested information and sends the information to the client
 3. The client uses or processes the data as needed

Client/Server Relationship

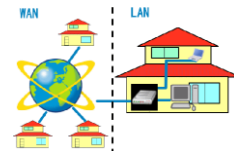




Client/server model example

- Email is a technology that uses the client/server model.
- To use email you must
 - Install and configure an email client/program on your computer
 - You can type an email, edit it repeatedly before sending, and work offline until your ready to access the network connection (Internet) and send
 - When you send the message, the email client computer connects to the network or Internet, transmit the message to an email server, and close the connection,
 - The message recipient can connect to his or her email server through a network or the Internet to retrieve the message

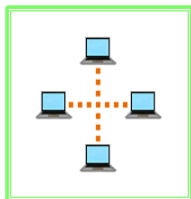
Computer Networks



There are **two** main types of computer networks:

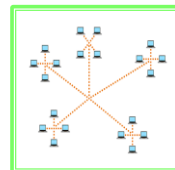
Local Area Network (LAN):

- A LAN is two or more connected computers sharing certain resources in a relatively small geographic location, often in the same building.



Wide Area Network (WAN):

- A WAN typically consists of two or more LANs.
- The computers are farther apart and are linked by telephone lines, dedicated telephone lines, or radio waves.
- The Internet is the largest Wide Area Network (WAN) in existence.



Computer Networks

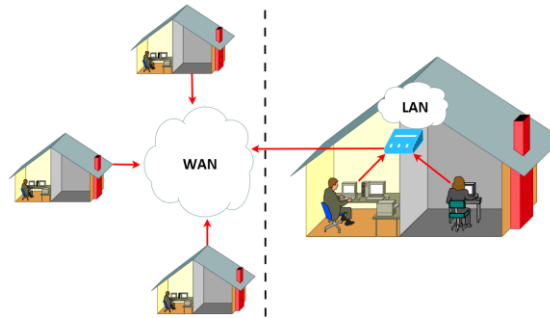
There are **two** main types of computer networks:

Local Area Network (LAN):

- The organization owns all network components
- Examples include home networks and office networks.

Wide Area Network (WAN):

- The organization typically leases some of the components needed to transmit data, such as high-speed telephone lines or wireless transmission equipment

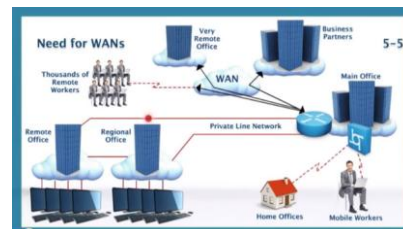


Computer Networks

Video Clips:

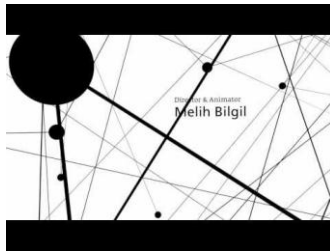
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<https://www.youtube.com/watch?v=fCxfp1iUbqw>



Origin of the Internet

- The Internet is a vast **network** of computers (LANs and WANs) that electronically connects millions of people worldwide.



Creation of the Internet

3 separate inventions created the Internet.

- ARPANET-US
- NPL-Britain
- CYCLADES-French



=



Creation of the Internet

- **ARPANET-US**
 - Focused on time-sharing (how to share data)
- **NPL-Britain**
 - Was a commercial network (money).
 - Came up with the idea of packet switching to avoid congestion on a network
 - breaking information into parts and put it together again when it gets the receiving computer
- **Cyclades-French**
 - focused on direct connection between computers.
 - Came up with the word Internet.



Internet



- The Internet is the largest computer network in the world, connecting millions of computers.
 - A network is a group of two or more computer systems linked together.
- The Internet is now maintained by the major Internet service providers such as MCI Worldcom, Sprint, GTE, ANS, and UUNET.
- Many people think the Internet and the World Wide Web are the same thing. They're not!
 - It is one of the many features of the Internet. E-mail, FTP, and Instant Messaging are also features of the Internet.



The World Wide Web

- **World Wide Web** – a set of software programs that enables users to access resources on the Internet via hypertext documents, or Web pages
- **Web page** – a document created in HTML containing hypertext links that, when clicked, enable users to access a different location or document
- **Web site** – a collection of related Web pages
- **Web browser** – a software application that enables users to easily access, view and navigate Web pages on the Internet

How the Internet Works

- Network protocols and packets:
 - **Protocol** – an agreed-upon format for transmitting data between two devices
 - **Packet** – a fixed piece of information sent across a network
- Every computer connected to the Internet uses Transmission Control Protocol / Internet Protocol (TCP/IP)
 - **TCP/IP** – software that makes Internet communication possible

How the Internet Works (cont' d)

- Computers access information from the Internet as follows:
 - You request data from an Internet server
 - The request is divided into packets
 - The packets are routed from your LAN to the Internet backbone
 - The packets are routed from the Internet backbone to the destination server
 - The destination server sends the requested information using the same process

Connecting to the Internet

IMPORTANT

- Six elements are required to connect to the Internet:
 - **C**omputer
 - **O**perating system
 - **T**CP/IP
 - **C**lient software
 - **I**nternet connection (direct through an ISP)
 - **I**nternet address



How the Internet Works

Six elements

- Computer
- Operating system
- TCP/IP
- Client software
- Internet connection (direct through an ISP)
- Internet address

• Operating system-

- the program that manages all the other programs (software and hardware) in a computer.

• Examples:

- Linux, Windows, VMS, OS/400



How the Internet Works

Six elements

- Computer
- Operating system
- TCP/IP
- Client software
- Internet connection (direct through an ISP)
- Internet address

TCP/IP- the basic communication language or protocol of the Internet

– TCP (Transmission Control Protocol)-

- manages the assembling of a message or file into smaller packets that are transmitted over the Internet and reassembled into the original message

IP (Internet Protocol)-

- handles the address part of each packet so that it gets to the right destination.



How the Internet Works

Six elements

- Computer
- Operating system
- TCP/IP
- Client software
- Internet connection (direct through an ISP)
- Internet address

Client Software-software that enables users to communicate with and request information from the server.

Examples: Web browser, e-mail or news client program



How the Internet Works

Six elements

- Computer
- Operating system
- TCP/IP
- Client software
- Internet connection (direct through an ISP)
- Internet address

Internet connection-connect through an ISP

- Internet Service Provider (ISP)
 - An organization that maintains a gateway to the Internet and rents access to customers on a per-use or subscription basis.



How the Internet Works

Six elements

- Computer
- Operating system
- TCP/IP
- Client software
- Internet connection (direct through an ISP)
- Internet address

Internet address

- Web address (e.g., www.CIWcertified.com)
- e-mail address (e.g., student1@class.com)
- server address (e.g., ss1.ciwcertified.com)



Packets

- Early creators of the Internet discovered that data moves faster when it is divided into smaller pieces, sent separately, then reassembled. These data pieces are called packets.

Packet-This is a small amount of computer data sent over a network.



How the Internet Works



<https://www.youtube.com/watch?v=6kh5bPupMQM>



Various Types Of Internet Connections

Internet Connection	Description	Notes
dial-up access	The modem attached to the computer uses a standard telephone line to connect to the Internet	A dial-up connection is slow-speed technology
cable	A cable company that provides TV service also provides Internet connection on the cable, instead of using a phone line	This is a type of broadband service and is faster than a dial-up connection
Digital Subscriber Line (DSL)	A high-speed Internet connection using regular copper telephone lines	DSL offers a higher-speed broadband Internet connection
broadband satellite	A high-speed connection to the Internet via satellite	
3G/4G	High-speed wireless connections for smartphones, tablets and other devices	
Wireless Fidelity (Wi-Fi)	A network uses radio signals to provide Internet connections to wireless computers and devices	Wi-Fi hotspots are located in many public places If your computer is in range of a hotspot, your computer finds the connection automatically, giving you free Internet service
FIOS (Fiber-Optic Service) broadband	The newest type of Internet connection It connects to the Internet using light pulses over a fiber-optic network	The advantage of FIOS is that it can provide higher speeds than traditional copper wire connections such as DSL or cable

Various Types Of Internet Connections

Table 3-1: Common speeds for direct Internet connections

Connection Type	Speed
Fiber-optic cable	Up to 100 gigabits per second (Gbps).
T5 and E5 lines	Currently under development. Will offer speeds of 400.352 Mbps (T5) and 565.148 Mbps (E5)
T3 line	44.736 megabits per second (Mbps). Commonly used by North American ISPs to connect to the Internet backbone. Extremely fast and one of the most costly types of access.
E3 line	34.368 Mbps. European equivalent of T3.
T1 line	1.544 Mbps. Commonly used by North American corporate LANs to connect to ISPs.
E1 line	2.048 Mbps. European equivalent of T1.
Cable modem	512 kilobits per second (Kbps) to 52 Mbps.
xDSL modem	512 Kbps to 32 Mbps.
4G mobile hotspot	Potential for 100 Mbps (moving) and 1 Gbps (stationary). Current speeds are 3 Mbps to 12 Mbps.

Dial-up and Direct Internet Connections

- Dial-up Internet connections:
 - Standard telephone lines and analog modem
 - Integrated Services Digital Network (ISDN) line and an ISDN modem
- Direct Internet connections:
 - High-speed data links, including fiber-optic
 - Wireless connections, including 802.11 standards and satellite
 - T and E carriers, including fractional T and E lines
 - LAN connections
 - Cable modems
 - Digital Subscriber Line (DSL)
 - 4G mobile hotspot



Protocols



A specific set of communication rules is called a **protocol**.

- Because of the many ways computers can communicate with each other, there are many different protocols -- too many for the average person to remember.
- Examples:
 - PPP (Point to Point)
 - TCP/IP
 - HTTP (Hypertext Transfer Protocol)
 - FTP (File Transfer Protocol)

Internet Protocols

- **Internet Protocol version 4 (IPv4)** – supports 32-bit dotted quad IP address format
 - Most widely used version of IP
 - Approximately 4 billion possible IP addresses
- **Internet Protocol version 6 (IPv6)** – supports 128-bit hexadecimal address format
 - Also known as Internet Protocol Next Generation (IPng)
 - Included as part of IP support in many products
 - Approximately 340 undecillion (340 times 10^{36}) possible IP addresses

Internet Protocols (cont' d)

- Remote access protocols:
 - **Point-to-Point Protocol (PPP)** – allows a computer to connect to the Internet over a phone line
 - **Point-to-Point Protocol over Ethernet (PPPoE)** – implements PPP over Ethernet (Ethernet is a LAN network standard that allows computers in a network to communicate)
 - PPPoE connects an entire network to the Internet

Internet Protocols (cont' d)

- **Hypertext Transfer Protocol (HTTP)** – used to transfer Web pages from a Web server to a Web client (Web browser)
- **Hypertext Transfer Protocol Secure (HTTPS)** – used to access a secure Web server
- **File Transfer Protocol (FTP)** – used to transfer files between computers on the Internet

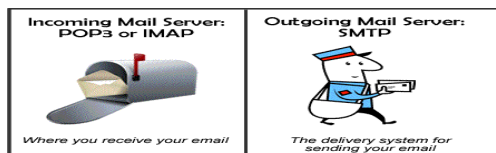
Internet Protocols (cont' d)

- Electronic mail (e-mail) protocols:
 - **Simple Mail Transfer Protocol (SMTP)** – used to transfer e-mail messages to others with an outgoing mail server
 - **Post Office Protocol (POP)** – used to receive e-mail from an incoming mail server
 - Forces you to download e-mail messages before reading and managing them
 - Current version is POP3
 - **Internet Message Access Protocol (IMAP)** – used to receive e-mail from an incoming mail server
 - Allows you to manage e-mail messages while they reside on the server
 - Current version is IMAP4

Internet Protocols (cont'd)



- Electronic mail (e-mail) protocols: *there are 4
 - **Simple Mail Transfer Protocol (SMTP)** – used to transfer e-mail messages to others with an outgoing mail server
 - Internet Standard
 - **Post Office Protocol (POP)** – used to receive e-mail from an incoming mail server
 - Forces you to download e-mail messages before reading and managing them
 - Current version is POP3

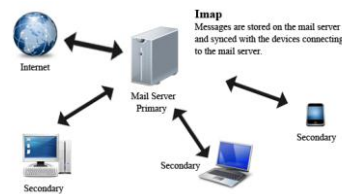


Internet Protocols (cont'd)



- **Internet Message Access Protocol (IMAP)** – used to receive e-mail from an incoming mail server

- Allows you to manage e-mail messages while they reside on the server
- Current version is IMAP4



Internet Protocols (cont'd)



- **Network News Transfer Protocol (NNTP)** – used by news servers to exchange newsgroup articles

- **Newsgroup** – a group of messages about a particular subject that is posted to a central Internet site (news server) and redistributed through Usenet

- Usenet – a public-access worldwide network to which users can submit messages or notes about any subject
 - Many ISPs no longer support newsgroup access

Internet Protocols (cont' d)

- **Network News Transfer Protocol (NNTP)** – used by news servers to exchange newsgroup articles
 - Newsgroup – a group of messages about a particular subject that is posted to a central Internet site (news server) and redistributed through Usenet
 - **Usenet** – a public-access worldwide network

Domain Name System (DNS)

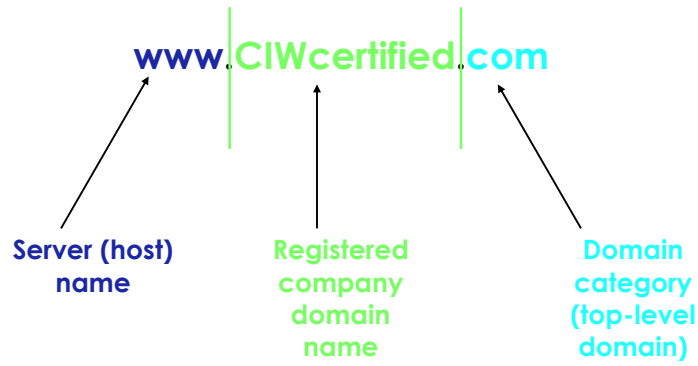


- **Domain Name System (DNS)** – resolves (translates) IP addresses into easily recognizable names
- For example:

72.44.192.233 = www.CIWcertified.com

Domain name and IP address refer to the same Web server

Typical Domain Name



Domain Name Syntax

- **Domain names** are read right to left, signifying general, then specific locations
- For example, `www.CIWcertified.com` can be interpreted as follows:
 - `com` – commercial site
 - `CIWcertified` – registered company domain name
 - `www` – Web server name at company

Domain Name Servers



- **Domain name server** – a server on the Internet that resolves domain names into IP addresses
- **Reverse DNS** – the process of resolving (translating) IP addresses into domain names

Fully qualified domain name (FQDN)

- **Fully qualified domain name (FQDN)**- the complete domain name of an Internet computer.
 - Provides enough information to convert the domain name to an IP address.



Top-Level Domain Categories



Virtual and Shared Domains

- **Virtual domain** – a hosting service that allows a company to host its domain name on a third-party ISP server
 - Example: If you register your domain name *yourcompany.com*, users can enter *www.yourcompany.com* to access your site, even if its hosted by a 3RD party ISP.
 - If you use a nonvirtual domain users would enter *www.websserver.com/yourcompany*.
- **Shared domain** – a hosting service that allows multiple entities to share portions of the same domain name
 - You could sell the domain name *company1.yourcompany.com* to Company1, the domain *name company2.yourcompany.com* to company2, and so forth

Class Exercise

- Break down the following web addresses
 - Identify the internet protocol, domain category, server name, registered company domain names.
- <http://www.facebook.com>
- <https://www.readaloud.org>
- <ftp://www.redbook2000.edu>
- <http://www.onestep.mil>



CIW Video Clip

Lesson 3: What's in a Name? A closer look at DNS



Cloud Computing

- The network of servers and connections that make up the Internet is known as **“the cloud”**.
- **Cloud computing** – a system in which users access software and services remotely over the Internet



Cloud Computing

Common cloud computing services include:

- Document creation and conversion
- File storage and management services
- Instant Messaging (IM)
- Customer relationship management (CRM)



Cloud Computing

- **Crowdsourcing** – outsourcing a task to an undefined group of people or community to obtain and analyze large amounts of data
- **Example:** Pandora (www.pandora.com) uses crowdsourcing. Selections are determined by other Pandora users who selected similar stations and liked similar songs.



Cloud Computing (cont'd)



Advantages to cloud computing:

- Flexibility
- Scalability
- Cost reduction

Problems with cloud computing:

- Connectivity
- Speed
- Lockout

Cloud Computing

- Cloud computing characteristics:
 - **Reliance on only a Web browser to access services**
 - **No browser preference**- most cloud computing services work with any browser
 - **No operating system preference**- because clouds only require a browser, many services do not favor a particular operating system



Cloud Computing (cont'd)



- **Software as a Service (SaaS)** – another name for cloud computing
- **Grid computing** – a cluster of multiple, remote systems that are used to create a single solution
 - Usually relates to the use of multiple systems dedicated to processing a vast amount of data or solving a math or science problem.
 - **Examples:** Economic forecasting or analyzing data

Classwork

Exercise 3-5: Cloud computing concepts



CIW Video Clip

Lesson 3: Looking to the Clouds





Lesson 3 Summary

- ✓ Define networks
- ✓ Define the Internet
- ✓ Identify Internet connection methods
- ✓ Define Internet protocols
- ✓ Define the Domain Name System (DNS)
- ✓ Define cloud computing