Internet Searches and Network Connections

Unit: Science, Technology, Engineering, and Mathematics (STEM) Skills

Problem Area: Computer Skills

Lesson: Internet Searches and Network Connections

Student Learning Objectives.

Instruction in this lesson should result in students achieving the following objectives:

1. **Distinguish among network connection types.**
2. **Demonstrate Internet search strategies and tools.**

Resources.

The following resources may be useful in teaching this lesson:

E-units corresponding to this lesson plan. CAERT, Inc. http://www.mycaert.com.

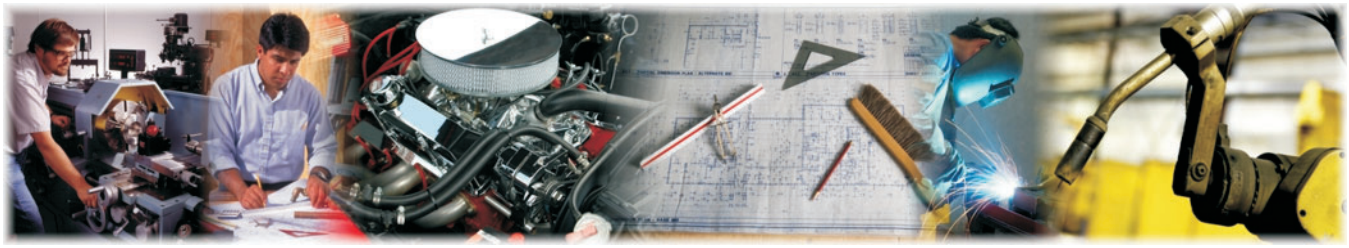
"Different Types of Networks in Computer Systems," *Network Wire*. Accessed Oct. 19, 2014. http://networkwire.org/different-types-of-networks-in-computer-system.html.

Mitchell, Bradley. "Introduction to Network Types," *About.com*. Accessed Oct. 19, 2014. http://compnetworking.about.com/od/basicnetworkingconcepts/a/network_types.htm.

"Networking Basics: Key Concepts in Computer Networking," *About.com*. Accessed Oct. 19, 2014. and http://compnetworking.about.com/od/basicnetworkingconcepts/.

The Search Engine List. Accessed Oct. 19, 2014. http://www.thesearchenginelist.com/.

Search Engine Watch. Accessed Oct. 19, 2014. http://searchenginewatch.com/industry.



Equipment, Tools, Supplies, and Facilities

- ✓ Overhead or PowerPoint projector
- ✓ Visual(s) from accompanying master(s)
- ✓ Copies of sample test, lab sheet(s), and/or other items designed for duplication
- ✓ Materials listed on duplicated items
- ✓ Computers with printers and Internet access
- ✓ Classroom resource and reference materials

Key Terms.

The following terms are presented in this lesson (shown in bold italics):

- coaxial cable
- communications protocol
- computer networks
- digital cellular system
- DNS
- Ethernet
- firewall
- HTML
- HTTP
- hypertext
- Internet search engine
- IP
- ISP
- LAN
- metasearch engine
- microwave
- network bridge
- network link
- NIC
- optical fiber
- radio waves
- router
- satellite communication
- spiders
- TCP
- twisted pair wiring
- WAN
- Web servers
- Wi-Fi™

Interest Approach. Use an interest approach that will prepare the students for the lesson. Teachers often develop approaches for their unique class and student situations. A possible approach is included here.

> *Tell your students the Internet and World Wide Web have revolutionized how we work and access data. Ask them to demonstrate how quickly they can search for manufacturing-specific material information and production technology using Internet search protocols and various networking connections. To begin the conversation, ask students to list the search engines and metasearch engines they are currently using to conduct research. Tally the list, and review it at the end of the lesson. To what degree have students' search engine and networking connection worlds expanded as a result of this introductory lesson?*

CONTENT SUMMARY AND TEACHING STRATEGIES

Objective 1: Distinguish among network connection types.

Anticipated Problem: What are some types of network connections?

I. Network connections

A. ***Computer networks*** are telecommunication systems that allow multiple computers to exchange data. Computers rely on networks to exchange or send and receive information and data. Data connections require network links to transfer information. A ***network link*** is the communication media (means) used to connect devices that form a digital network. Computer networks include wired and wireless connections, communication hardware, and communication standards or protocols.

1. A local area network (***LAN***) is a system that connects computers and other devices in close proximity to each other (e.g., in a single building or a school or work campus). It connects workstations and personal computers and allows users to access data and share other devices (e.g., printers and modems), files, and applications available on the network.
2. A wide area network (***WAN***) is a system that consists of two or more interconnected LANs. A WAN includes a larger geographic area than a LAN. Also, a WAN may be privately owned or rented, and it is often a public (shared use) network.

B. Wired and wireless connection technology

1. Wired and wireless connection technology consists of materials and transmission technology that transfer digital data.

a. Wired networks use inexpensive Ethernet cables and network adapters as well as Ethernet crossover cables. They may require central devices—hubs, switches, or routers—to accommodate more computers. Wired connections are faster, more secure, and more dependable than wireless connections (Wi-Fi™) and are preferred for the transmission of sensitive or personal data. Broadband routers make it easier to share cable modems or DSL Internet connections, plus they often have built-in firewall support. The main security tool for a LAN is firewall software. In general, wired connections are faster and less expensive than wireless connections.

b. ***Wi-Fi™*** is a wireless networking technology that allows electronic devices to communicate over a wireless signal. Wireless connections occur when users connect computers or other devices to the network. Most electronic devices have built-in chips that allow users to find and connect to wireless routers. Data is sent and received using radio waves rather than Ethernet cables. Users can connect to the network from anywhere within range of the wireless router. Wireless connections are shared resources among network users. Wireless speeds degrade as more users connect to an access point. Also, more loss of security exists with wireless connections. There is, however, greater flexibility and ease of use with a wireless connection compared to a wired connection.

2. Materials and communication tools

a. ***Twisted pair wiring*** is the ordinary copper wire that connects home and many business computers through traditional telephone wires. This cabling consists of four pairs of copper wires used for voice and data transmission. This technology is becoming obsolete and is primarily used in small home networks.

b. ***Coaxial cable*** is copper or aluminum wire surrounded by an insulating layer (typically a flexible material). Cable television systems, office networks, and other business facilities on local area networks (LAN) use coaxial cable.

c. ***Optical fiber*** is a thin and flexible glass or plastic strand that carries data through pulses of light that are not subject to interference. It transmits large amounts of data at the "speed of light" over long distances. Fiber optics or optical fiber is used in network connections.

d. A ***microwave*** is a short wavelength electromagnetic transmission. It can be used for land-based communication and for satellite communications. The small frequencies allow for small antenna and small energy transmitters. Wireless connections primarily rely on microwaves or radio waves.

e. ***Satellite communication*** is a route that uses microwave radio waves, in part, because they are not deflected by the earth's atmosphere. Microwave connections are used to communicate data through large and small computer devices via satellite communication.

f. ***Radio waves*** are electromagnetic waves in a large spectrum. Spread spectrum technology uses electromagnetic waves, too. A high-frequency radio wave is used for wireless (LAN). Radio waves are used in digital

cellular applications and in low-frequency radio technology. Local wireless connections use spread spectrum technology that allows for communication between multiple devices in a small area. The local wireless technology is also known as Wi-Fi™.

g. ***Digital cellular system*** (personal computer system) is an upbanded—a wireless service operating at a higher frequency than it normally does—version of Global System for Mobile (GSM) communications, which is an international standard for the transmission of voice and data between cellphones and other mobile devices. It uses several radio communication technologies to transmit digital data. A digital cellular system uses a low-power transmitter or radio relay antenna device to relay data from one local area to the next area.

C. Communication hardware is a range of devices that allow data to be transferred from one computer to another through network nodes—devices (e.g., data communication equipment)—that transfer data. A modem, a network interface card (NIC), a bridge, and a router are examples of communication hardware. A network of nodes used to transfer data or media used in a local area network (LAN) is known as Ethernet.

1. ***Ethernet*** is the most common standard for cabling computers together in a network. An Ethernet port looks much like a regular phone jack, but it is slightly wider. This port can be used to connect a computer to another computer, to a LAN, or to an external DSL or cable modem. Two common forms of Ethernet are 10BaseT and 100BaseT. The 10BaseT Ethernet transfers data at a rate up to 10 megabits per second (mbps) through a copper cable. The 100BaseT can transfer data at a rate up to 100 mbps. The newer form is GigaBit Ethernet at a data transfer rate peak of 1,000 mbps. GigaBit Ethernet is an Ethernet standard that transmits at 1 gbps (gigabits per second; a gigabit is one billion bits). It connects computers and servers in local networks.
2. A network interface controller (***NIC***) is a computer hardware component that connects a computer to a computer network. This common node also is called a network interface card, a network adapter, and a LAN adapter. A NIC provides a computer with the ability to transmit and access media or data. For example, a NIC typically has a connection for a cable/wire or an aerial for wireless transmission and reception to send and receive digital data.
3. A ***network bridge*** is a device that connects two or more local area networks. It is capable of networking devices across multiple networks.
4. A ***router*** (a gateway) is a device that records the address information of everything connected to it and then forwards data packets from one network to another. It reads more of the information in the address of a packet and makes an intelligent decision about what to do with the data based on the address.
   a. A router packet must be formatted in a routable protocol, and the global standard routable protocol is TCP/IP or IP.
   b. A wireless router for home and small business directs traffic to and from the Internet. It moves data (e.g., Web pages, email, and video) between

computers and the Internet and may include a cable or DSL router that connects to the Internet through an ISP.

c. An advanced router or enterprise router connects corporations along ISP networks with powerful core routers that transmit data at high speeds along fiber optics.

5. An ***ISP*** is an Internet service provider, which is a company that supplies Internet connectivity to homes and businesses.
   a. Examples of cellular ISPs are AT&T, Cricket, NetZero, T-Mobile, U.S. Cellular, and Verizon.
   b. Examples of computer ISPs are AOL, AT&T, Comcast, EarthLink, Yahoo!, and MSN.
6. A ***firewall*** is a network device that controls (allows or blocks) access to a private network or to a user's computer. It is used to provide secure access to the Internet as well as to separate a company's public Web server from its internal network. A firewall is programmed to reject access from unrecognized sources and only allow data transfer from recognized sources.

D. Communication protocols

1. A ***communications protocol*** is a set of rules for exchanging information over a network link.
2. ***Hypertext*** is structured text that uses logical links (hyperlinks) between wide ranges of nodes containing text. Hypertext transfer protocol is used to exchange or transfer hypertext.
3. Hypertext transfer protocol (***HTTP***) is a communications protocol that connects to Web servers on the Internet or on an Intranet. It is an application protocol for distributed, collaborative, hypermedia information systems. HTTP is the beginning of most Web site addresses; it signals a request to receive or transmit files over the Internet. Its primary function is to establish a connection with the server and send HTML pages back to the user's browser. It is used to download files from a server to a browser or to any other requesting application that uses HTTP. It is the foundation of data communication for the World Wide Web (www).
4. Transmission control protocol (***TCP***) is one of the core procedures of the Internet. TCP is a standard sequence of procedures for the exchange of most digital communication in and among networks. It is typically called *TCP/IP*. Web browsing software used for Internet searches utilizes TCP when connecting to a server on the World Wide Web.
5. The Internet protocol (***IP***) is the principal communications protocol used for the Internet. It is used for relaying data and communications across network boundaries. Its routing capability enables computers to network together, and establishes the basis for the method in which the Internet connects computers and servers.

Teaching Strategy: *Many techniques can be used to help students master this objective. Students may study the computer network at school and determine its*

Internet search capabilities and its networking connections. Use VM–A through VM–H to illustrate and review.

Objective 2: Demonstrate Internet search strategies and tools.

Anticipated Problem: What are some Internet search strategies and tools?

II. Internet search strategies and tools

A. An ***Internet search engine*** is a software system that indexes millions of Web sites and collects and organizes content from those sites on the World Wide Web. Indexes are large databases of Web sites that people can search by title, keyword, or by text found in the pages. Most all-purpose search engines begin a search by visiting heavily used servers and popular pages.

1. All-purpose search engines are the most common type, including:
   a. Google
   b. Yahoo!
   c. Bing
   d. AltaVista
   e. HotBot
   f. Infoseek
   g. LiveSearch
2. A ***metasearch engine*** is a system that submits a query to several other search engines and returns a summary of the results of the wide-scope search.
   a. Clusty
   b. Ithaki
   c. Dogpile
   d. MetaCrawler
   e. Kartoo
3. Search engines are tailored to specific topics, including:
   a. Accounting
   b. International Web sites
   c. Jobs
   d. Legal
   e. Manufacturing industry
   f. Maps
   g. Medicine
   h. News
   i. Open source
   j. Real-estate

k. Schools, colleges, and universities
l. Shopping

B. ***Spiders*** (crawlers or bots) are special software robots that visit Web sites, read pages, and index the Web sites for a search engine's database.
   1. Spiders build lists; the list-building task is also called Web crawling. Spiders search for the particular words typed in the "search box" and are designed to crawl through a Web site in different ways, including following all the hypertext links in each page until all the pages have been read. "Scooter" is a popular search engine spider. Typically, spiders do not breach firewalls. Software spiders can keep hundreds of Web page connections open at one time noting the HTML page, words on the page, and where in the page they are located.
   2. Hypertext markup language (***HTML***) is the computer language in which Web pages are written; it is the software used to format a page. Web pages must follow the rules of HTML to be displayed properly in a Web browser. The HTML syntax (grammar) is based on a list of tags that define the page's format and what is presented on the page.

C. Data collection
   1. ***Web servers*** are computers that run a Web site. Web servers deliver Web pages to browsers as well as other data files to Web-based applications. They include the hardware, operating system, software, TCP/IP protocols, and site content that allow the Web content to be accessed from the Internet and displayed on a personal computer.
   2. A domain name system (***DNS***) is a naming system used to search or access a specific Web site by its name. DNS is a system that manages Web site names, computers, services, and other Internet domains. The DNS is sometimes explained as the "phone book" for the Internet by translating human-friendly computer hostnames into IP addresses. The system uses a domain name server, consisting of a computer that uses software to convert the Web site name into a numerical Internet protocol (IP) address. This address is the location of the actual computer that "serves up" the Web page. Once a search engine has this address, it can locate and upload the Web page.

Teaching Strategy: *Many techniques can be used to help students master this objective. Use VM–I through VM–L to review. Additional search engine spider information is found at http://www.siteware.ch/webresources/useragents/spiders/. Assign LS–A.*

Review/Summary. Use the student learning objectives to summarize the lesson. Have students explain the content associated with each objective. Student responses can be used in determining which objectives need to be reviewed or taught from a different angle. Questions at the ends of chapters in the textbook may be used in the Review/Summary.

Application. Use the included visual master(s) and lab sheet(s) to apply the information presented in the lesson.

Evaluation. Evaluation should focus on student achievement of the objectives for the lesson. Various techniques can be used, such as student performance on the application activities. A sample written test is provided.

Answers to Sample Test:

Part One: Matching

1. d
2. f
3. e
4. b
5. a
6. c
7. g
8. h

Part Two: Completion

1. hypertext transfer protocol (HTTP)
2. hypertext
3. HTML
4. Web servers
5. optical fibers
6. microwave
7. firewall
8. computer networks

Part Three: Short Answer

1. A metasearch engine submits a query to several other search engines and returns a summary of the results of the wide-scope search.
2. Web servers are computers that run a Web site. Web servers deliver Web pages to browsers as well as other data files to Web-based applications. They include the hardware, operating system, software, TCP/IP protocols, and site content that allow the Web content to be accessed from the Internet and displayed on a personal computer.

Sample Test

Name _____

Internet Searches and Network Connections

Part One: Matching

Instructions: **Match the term with the correct definition.**

a. communications protocol
b. network bridge
c. router
d. network link
e. network interface controller (NIC)
f. Ethernet
g. spiders
h. Wi-Fi™

_____1. The communication media used to connect devices that form a digital network

_____2. The most common standard for cabling computers together in a network

_____3. A computer hardware component that connects a computer to a computer network

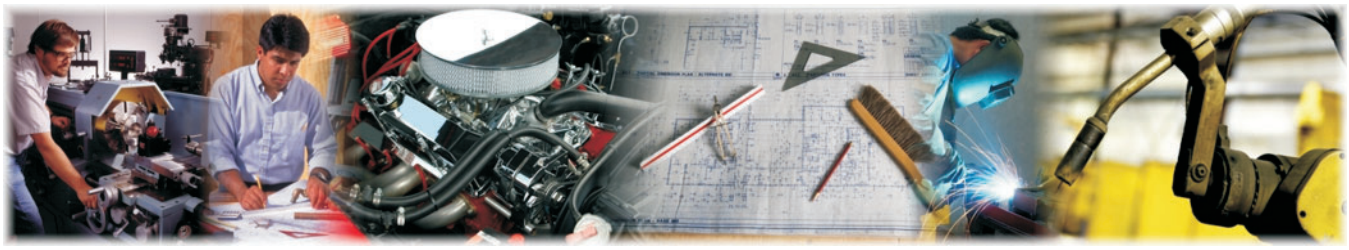
_____4. A device that connects two or more local area networks

_____5. A set of rules for exchanging information over a network link

_____6. A device that records the address information of everything connected to it and then forwards data packets from one network to another

_____7. Special software robots that visit Web sites, read pages, and index the Web sites for a search engine's database

_____8. A wireless networking technology that allows electronic devices to communicate over a wireless signal



Part Two: Completion

Instructions: **Provide the word or words to complete the following statements.**

1. A communications protocol that connects to Web servers on the Internet or on an Intranet is _____.
2. The structured text that uses logical links (hyperlinks) between wide ranges of nodes containing text is _____.
3. The computer language in which Web pages are written is _____.
4. Computers that run a Web site are _____.
5. Glass fibers that carry data through pulses of light that are not subject to interference are _____.
6. A short wavelength electromagnetic transmission is a/an _____.
7. A network device that controls (allows or blocks) access to a private network or to a user's computer is a/an _____.
8. Telecommunication systems that allow multiple computers to exchange data are called _____.

Part Three: Short Answer

Instructions: **Answer the following.**

1. Describe the way a metasearch engine works.

2. Describe how Web servers work.

COMPUTER PORTS

IES Power Connectors

Cloverleaf

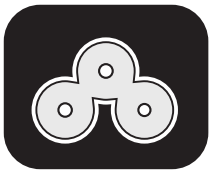
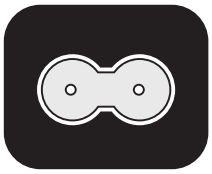
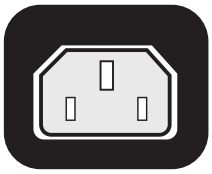


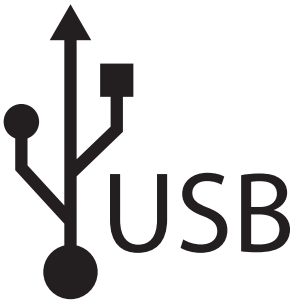
Figure of 8



IEC Cord

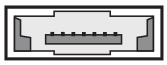


USB



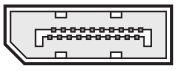
eSata

External Hard Drive Port



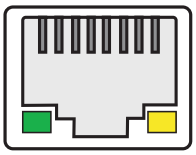
DisplayPort

Video and Audio Port for Home Theater Systems

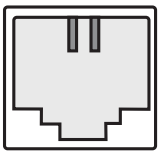


MiniDP

Ethernet / Rj45



Modem / Rj11



PCMCIA / Cardbus

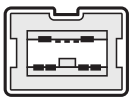
WiFi, Networking and Expansion Cards

Firewire

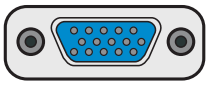
Video camera (DV) and Hard Drives

Firewire 400 Mb/s

Firewire 800 Mb/s



VGA Port

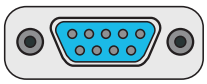


S - Video

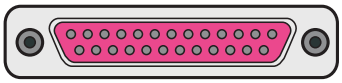
HDMI

Digital Video Interface

Serial Port

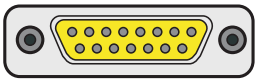


Parallel Port



PS/2 Port

Games Port



Audio Mini - Jacks Sockets

Microphone

Stereo Line-In

Stereo Line-Out

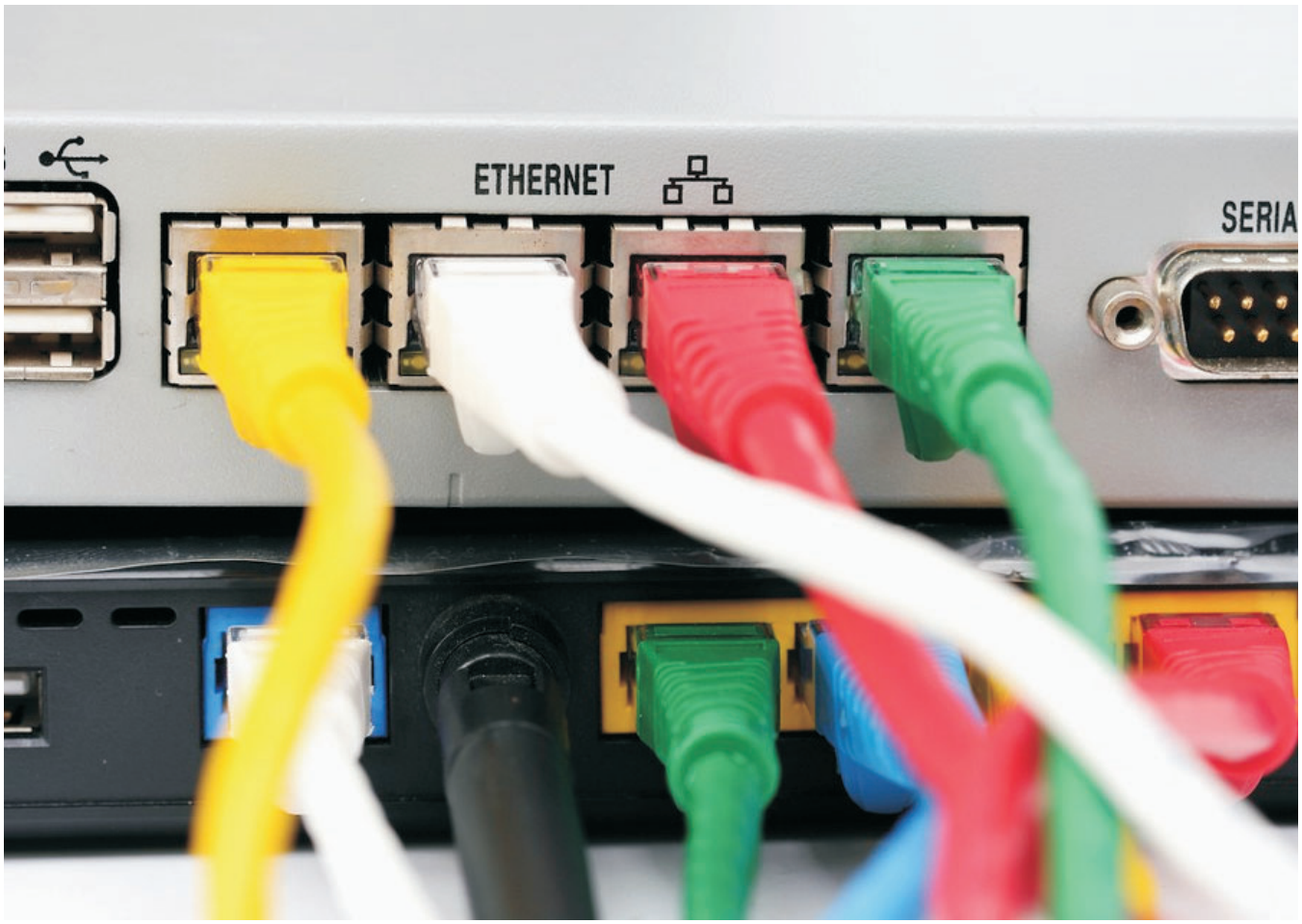
Right-to Left

Center / Subwoofer

S/PDIF

Digital Audio

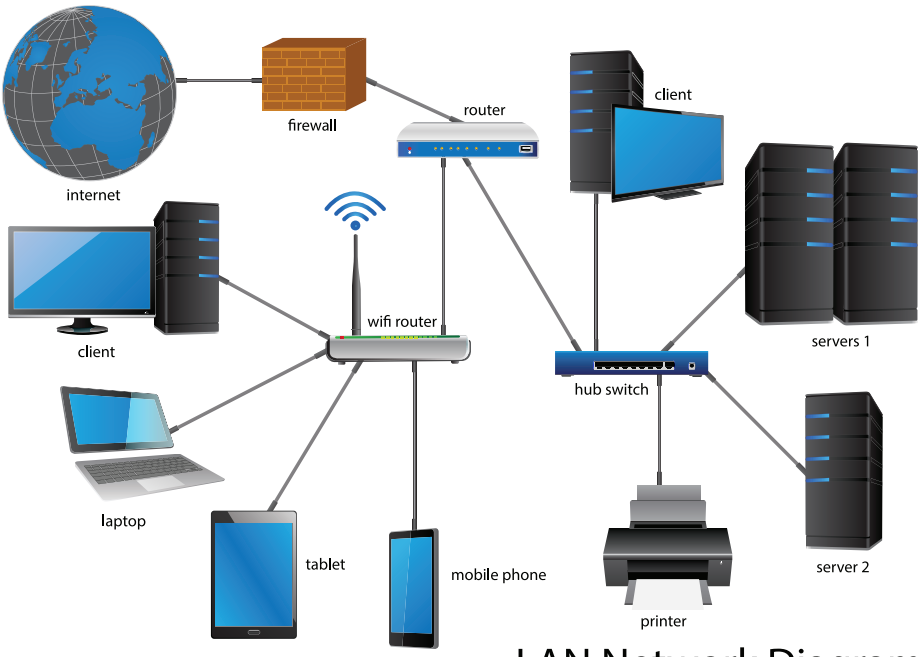
ETHERNET



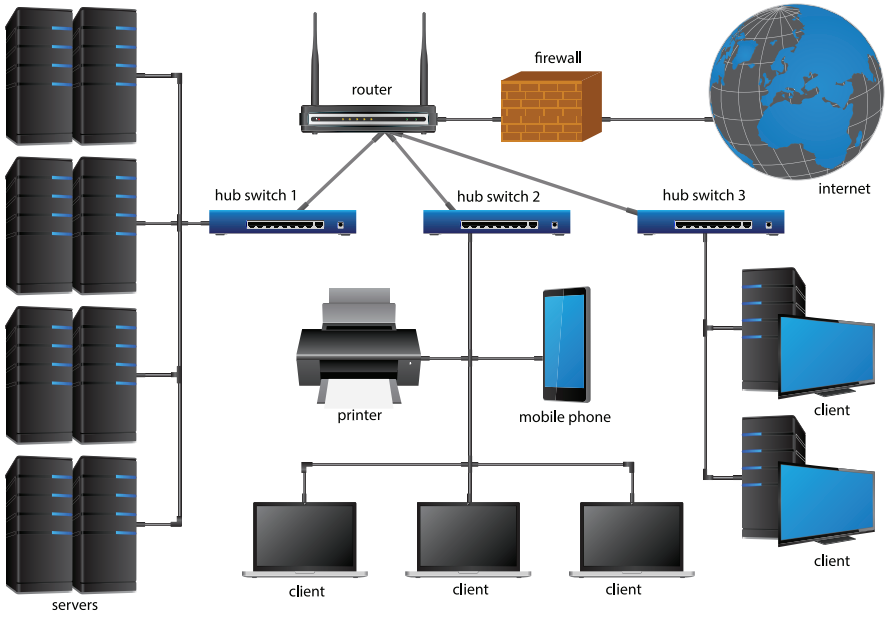
This is an image of an unshielded twisted pair (UTP) LAN Ethernet port on the back of a router. Ethernet is the most common standard for cabling computers together in a network. An Ethernet port looks much like a regular phone jack, but it is slightly wider. This port can be used to connect a computer to another computer, to a LAN, or to an external DSL or cable modem.

LAN: LOCAL AREA NETWORK DIAGRAMS

LANs connect computers and other devices in close proximity to each other. They connect workstations and personal computers and allow users to access data and share other devices, files, and applications available on the network.

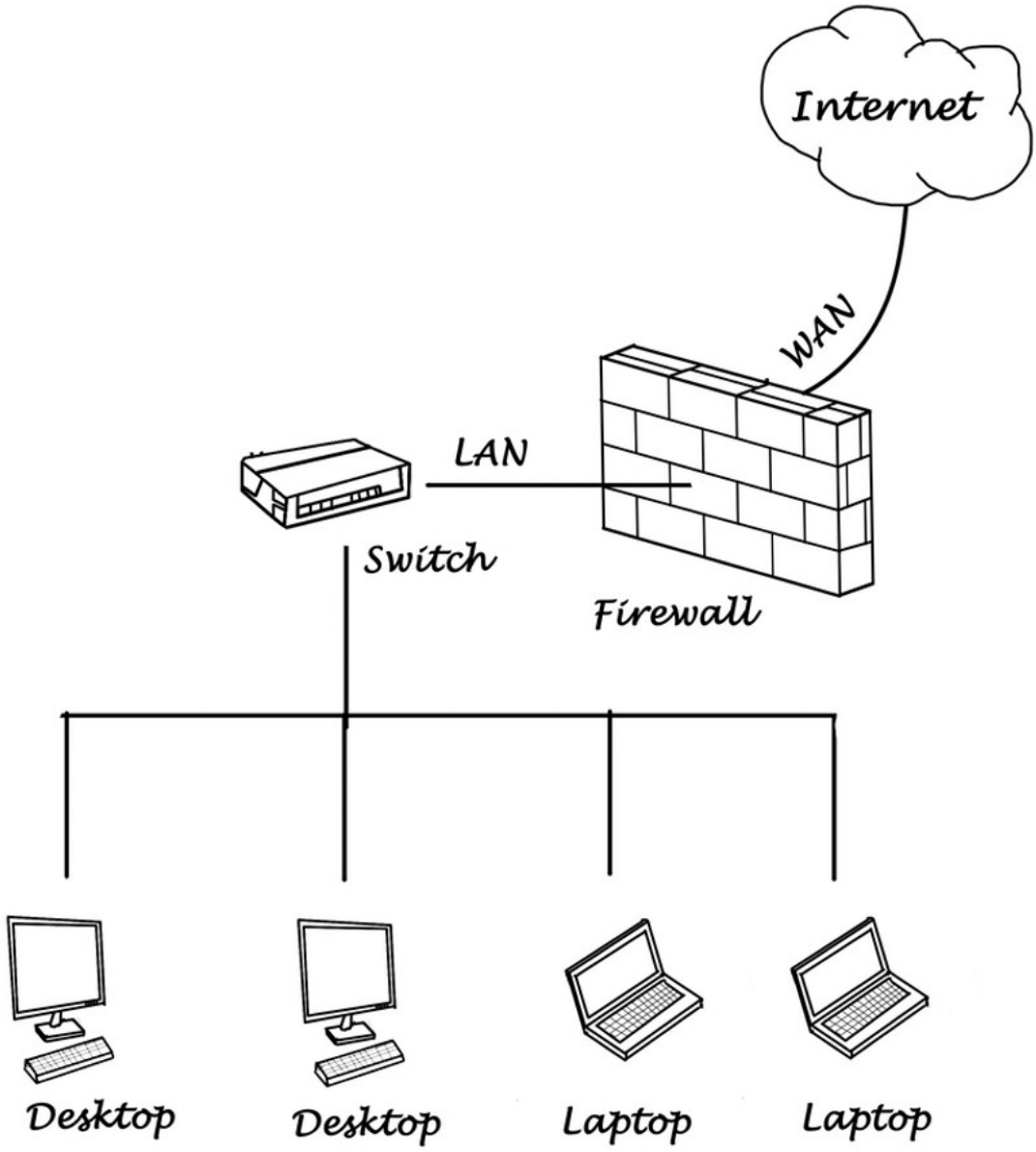


LAN Network Diagram



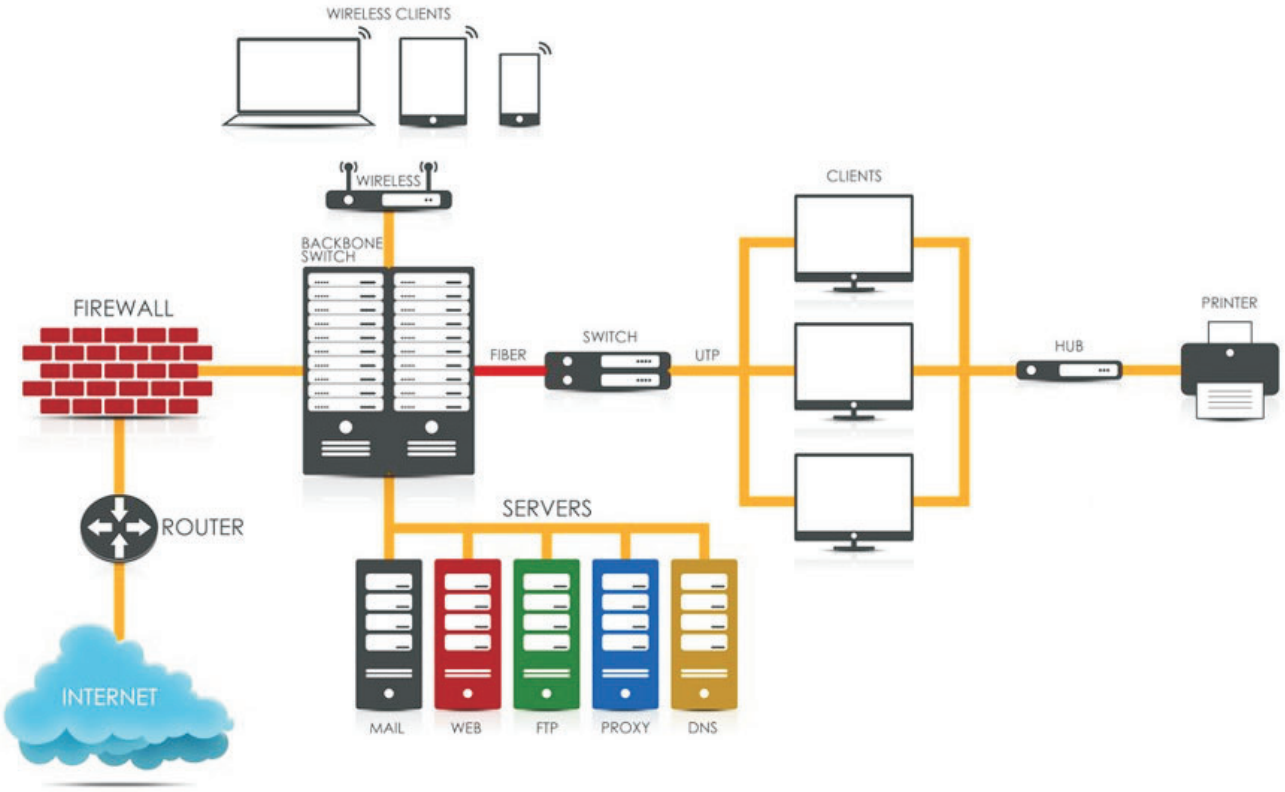
LAN Network Diagram

WAN: WIDE AREA NETWORK



WANs consist of two or more interconnected LANs. WANs include a larger geographic area than LANs. WANs may be privately owned or rented, and they are often public (shared use) networks.

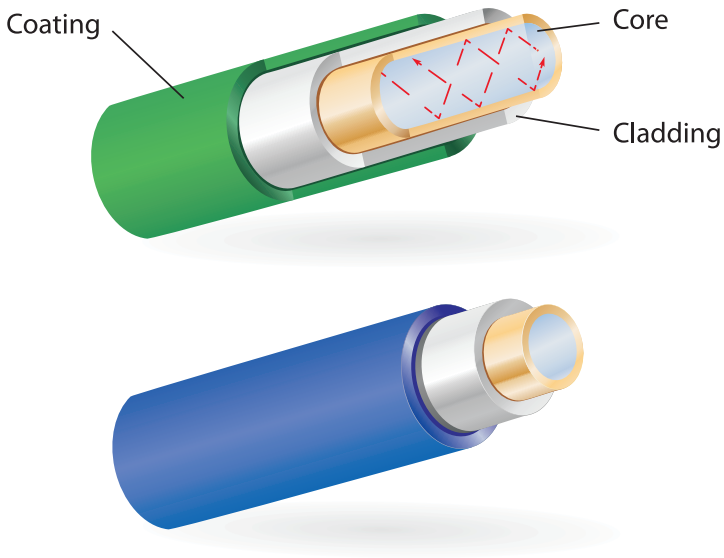
COMPUTER NETWORK DIAGRAM

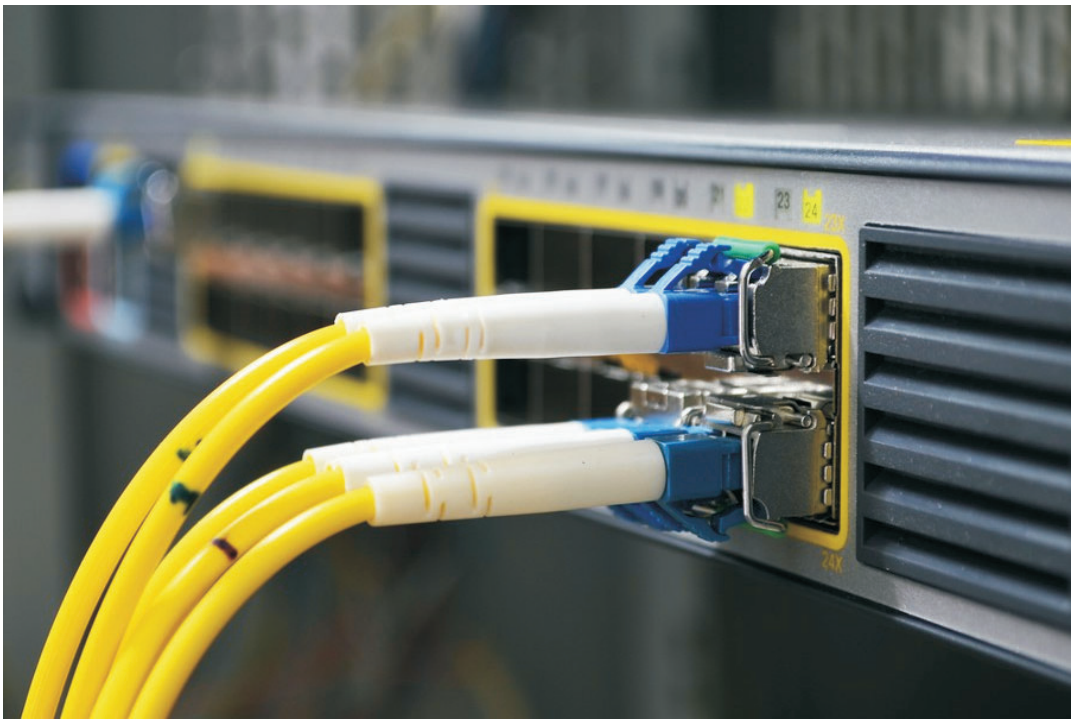


OPTIC FIBERS

Optical fiber is glass fiber that carries data through pulses of light that are not subject to interference. Optical fibers transmit large amounts of data at the "speed of light" over long distances. These optic fiber cables are connected to a data center.

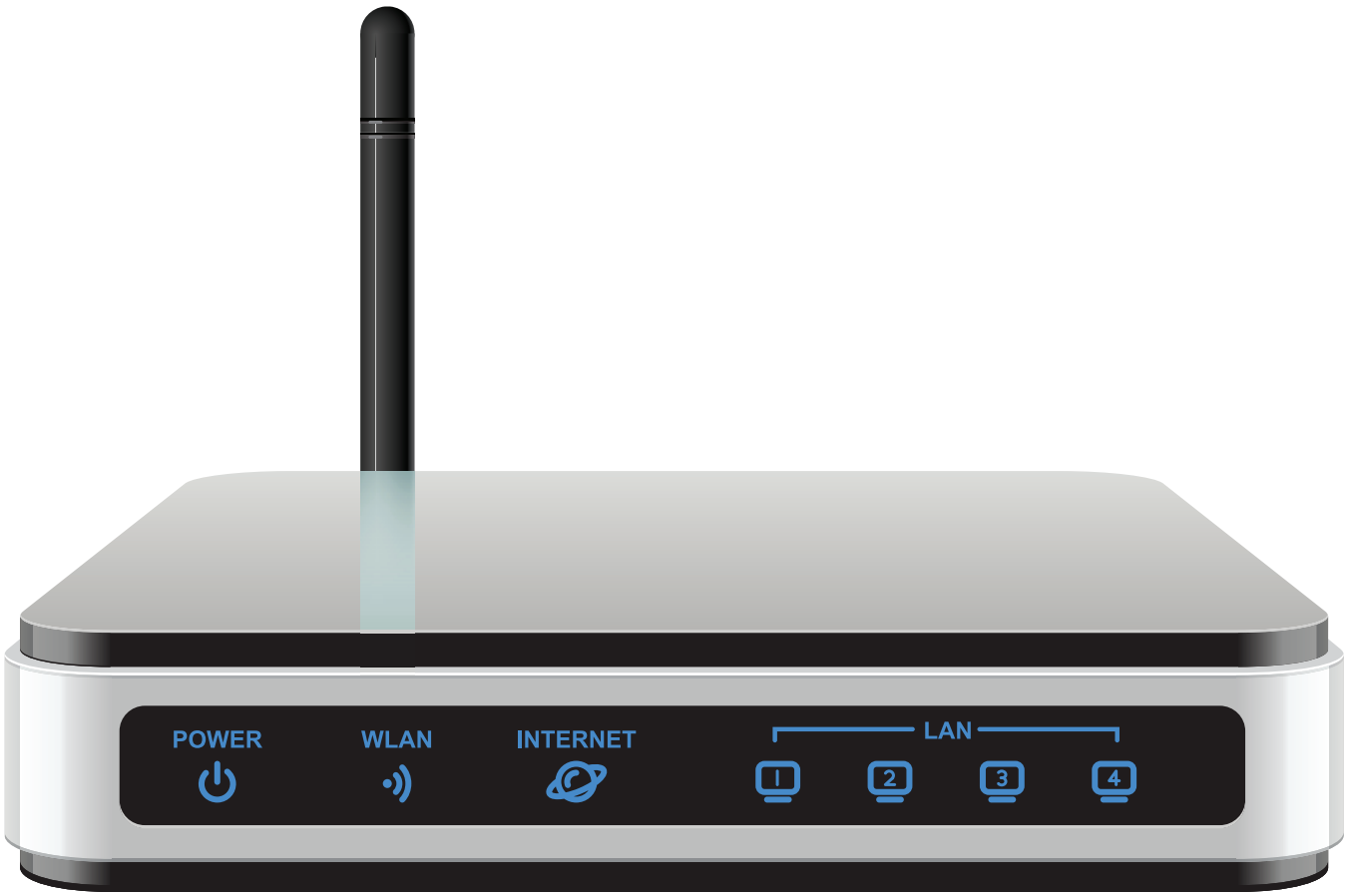
OPTICAL FIBER





WIRELESS ROUTER

A router is a device that records the address information of everything connected to it and then forwards data packets from one network to another. Router packets must be formatted in a routable protocol, and the global standard routable protocol is TCP/IP or IP. Home and small business wireless routers direct traffic to and from the Internet.



ROUTER NETWORK HUB WITH CABLE INSERT RJ45 PORT

A hub is a connection point for devices in a network. It is often used to connect segments of a LAN. A hub contains multiple ports. When a packet arrives at one of the ports, the hub forwards the packet to all the other connected devices.

INTERNET SEARCH ENGINE

Internet search engines are software systems that index millions of Web sites and collect and organize content from those sites on the World Wide Web. Indexes are large databases of Web sites that one can search by title, keyword, or by text found in the pages.

All-purpose search engines include:

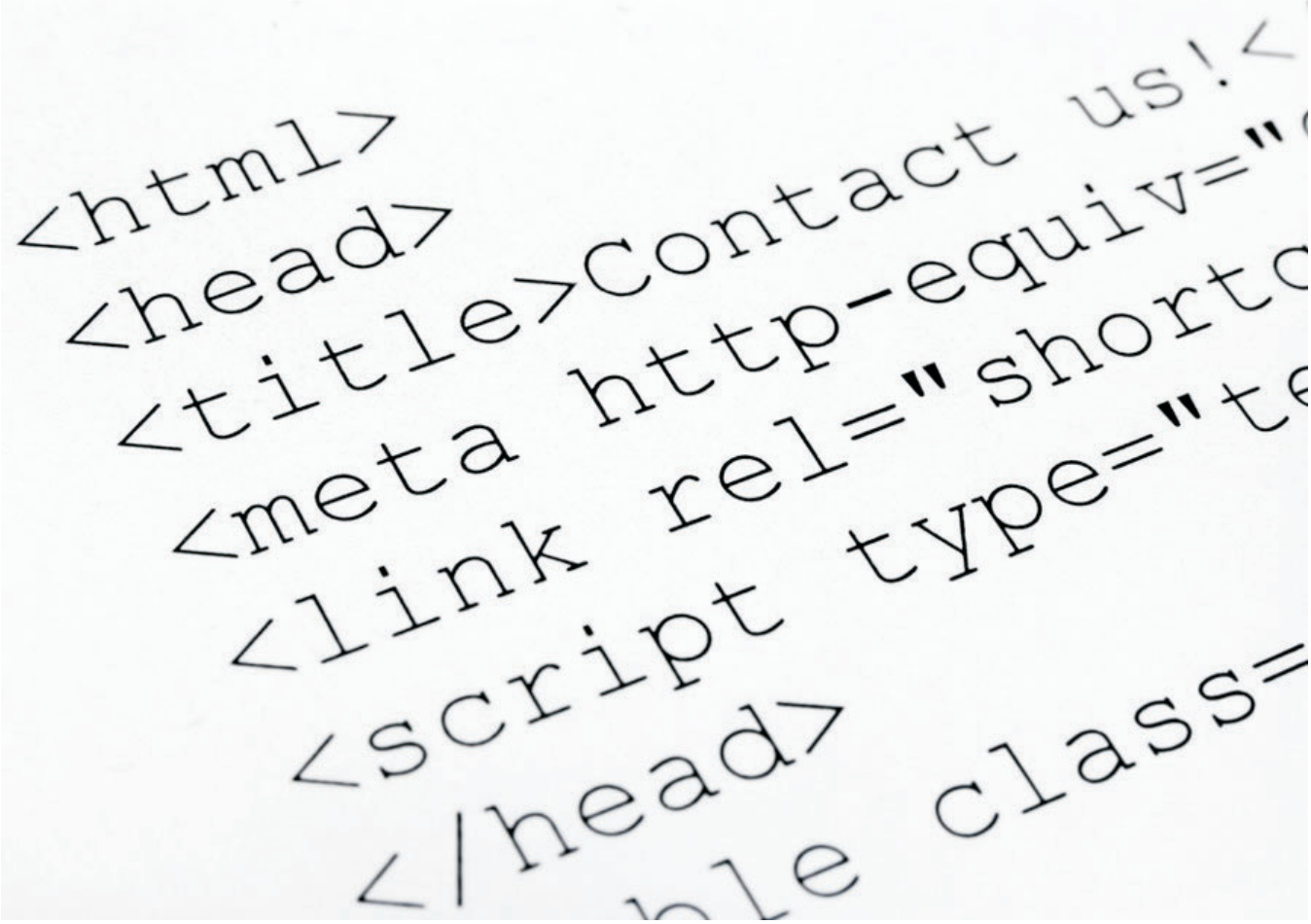
- Google
- Yahoo!
- Bing
- AltaVista
- HotBot
- Infoseek
- LiveSearch

Metasearch engines include:

- Clusty
- Ithaki
- Dogpile
- MetaCrawler
- Kartoo

HTML CODE

Hypertext markup language (HTML) is the computer language in which Web pages are written; it is the software used to format a page. Web pages must follow the rules of HTML to be displayed properly in a Web browser. The HTML syntax (grammar) is based on a list of tags that define the page's format and what is presented on the page.

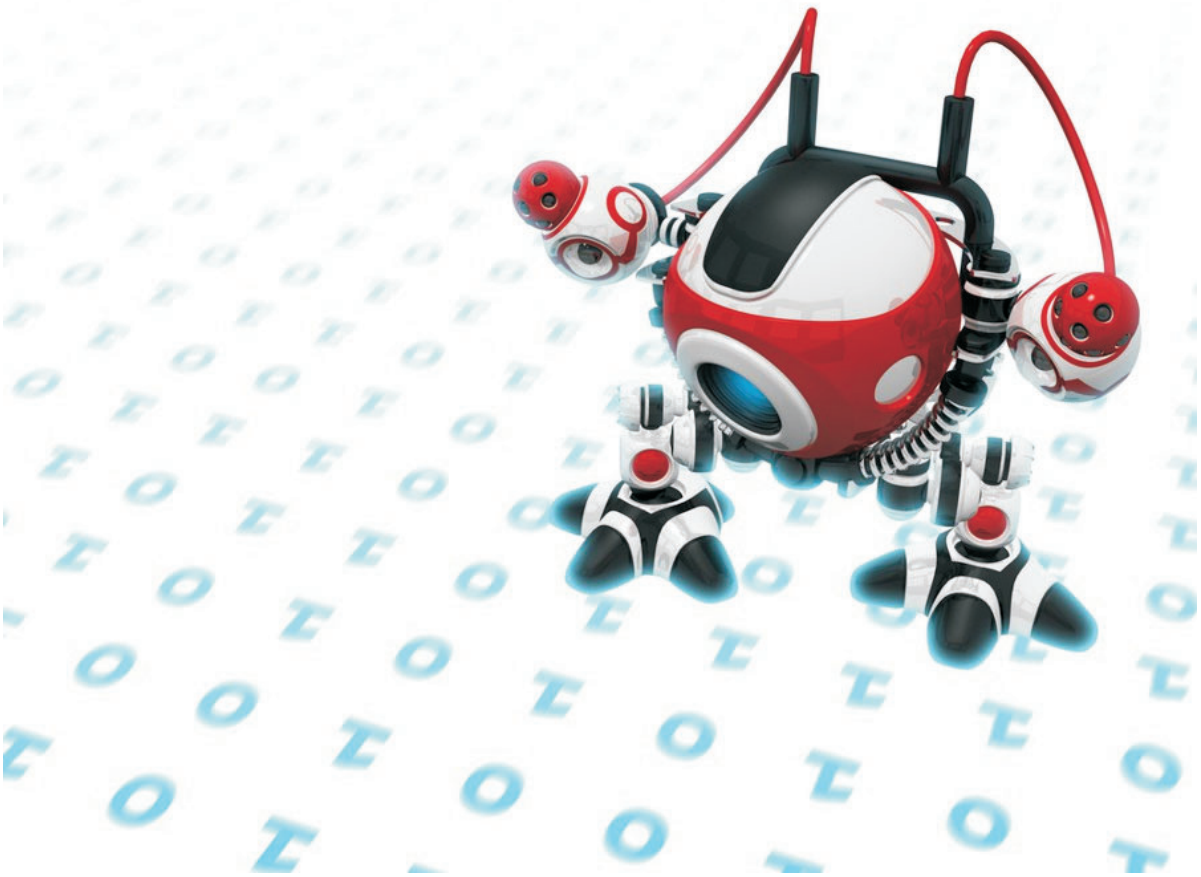


WEB SERVER

Web servers are computers that run a Web site. Web servers deliver Web pages to browsers as well as other data files to Web-based applications. Network engineers work in the server room.

SPIDERS

Spiders (crawlers or bots) are special software robots that visit Web sites, read pages, and index the Web sites for a search engine's database. Spiders crawl through a Web site in different ways, including following all the hypertext links in each page until all the pages have been read. This stylized Web Crawler, Index Web Spider, or Internet Bot was launched by a search engine and is walking on binary code seeking out new information to gather.



LS–A

Name _____

Use an Industry Search Engine

Purpose

The purpose of this activity is to demonstrate use of an industry search engine.

Objectives

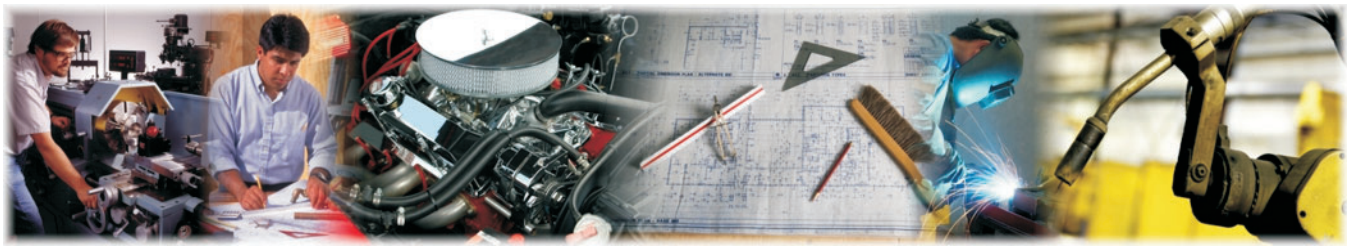
1. Access an industry search engine.
2. Research a specific manufacturing material, part, supply, or product.
3. Record data about the material, part, supply, or product.
4. Summarize the research data you collected.
5. Participate in a class discussion of the search engine process.

Materials

- writing utensil
- paper
- device with Internet access
- printer

Procedure

1. Work independently.
2. Your task is to research a specific material, part, supply, or product used in the manufacturing industry. Begin your research by accessing a manufacturing-specific industry search engine.
3. Select your research topic (e.g., a material, part, supply, or product that you used in one of your recent projects or will use in a new project). Then open your Web browsing software (e.g., Mozilla Firefox, Google Chrome, Internet Explorer, or Safari), and type the



following URL into the Web page window (usually located at the top left of the page): http://www.industrynet.com. This URL takes you directly to the search engine.

4. At the IndustryNet search engine homepage, type your material or product into the search box. Then click "search." Your search will result in a list of companies that sell the material or product you are researching. Also, you will receive a list of related categories that may help to refine your search. Review your search options.

5. Begin by choosing a company and clicking on its name. You will receive information about the company and its Web page address. Record the following manufacturer or company information:

   a. Company name:

   b. Address:

   c. Web site URL:

   d. Product(s) sold:

6. Next, click on the company's Web link, and research your product or material from the data. Take notes on the following:

   a. Material/product specifications:

   b. Description:

   c. Type or model:

   d. Sizes available:

   e. Colors available:

   f. Other: _____

7. Summarize the information about your product or material in the space provided. If possible, print and attach a copy of the product information details.

8. Participate in a class discussion of the search engine process.
9. Participate in a class discussion to summarize the research data you collected.
10. Turn in your completed lab sheet to your instructor.