Exam
Manual

LearnSmart

CIW v5
Foundations (1D0-510)

This LearnSmart exam manual covers the most important topics with which you must be familiar in order to successfully complete the CIW v5 Foundations exam (1D0-510). Studying this manual will help you better understand a plethora of exam-related topics, including:

- Using e-mail clients to send messages and files to other Internet users
- Defining and using additional network and Internet services
- Performing basic hardware and system maintenance for network-aware systems
- And more!

Give yourself the competitive edge necessary to further your career as an IT professional and purchase this exam manual today!

CIW Foundations (1D0-510) LearnSmart Exam Manual

Product ID: 010656
Production Date: July 18, 2011
Number of Questions: 25

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Abstract

This Exam Manual is intended to help a candidate prepare for, and pass, the CIW Foundations exam (number 1D0-510). Passing this multiple-choice exam is all that is required to become certified at the CIW Associate level, and is a requirement for all upper-level certifications from CIW (CIW Professional, Master CIW Designer, Master CIW Administrator, Master CIW Web Site Manager, or Master CIW Enterprise Developer).

What to Know

The CIW Foundations exam (1D0-510) is intended to demonstrate the test-takers ability to function as an entry-level information technology professional. The exam covers much more information that simply the creation of Web pages. It is important for someone preparing for the exam to be aware of the objectives of the exam and be prepared to answer questions about network hardware, project management, TCP/IP protocols, design concepts, government regulations, and a wide variety of topics specific to the creation of Web sites.

The CIW Foundations exam is also the prerequisite to take other CIW exams that cover a broad spectrum of information technology fields such server administration, programming, security, as well as Web design and as such the topics covered by the CIW Foundations exam are quite varied.

Tips

The exam is a collection of topics from three different categories: Internet Business Foundations, Site Development Foundations, and Network Technology Foundations. There is some overlap between the topics within these three categories which can serve to reinforce your understanding of a topic from several points of view.

Your preparation for the Site Development Foundations portion of the exam will be aided by additional time spent practicing the objectives for that portion of the exam. All that is needed is notepad (or your favorite text editor) and a Web browser to practice the topics in the Site Development Foundations.

Domain 1: Internet Business Foundations – 35%

1.1. Identify job roles in the Information Technology (IT) industry, including the responsibilities, tasks and skills they require.

IT industry job roles

The responsibilities, tasks and common duties of the variety of job roles that exist in the Information Technology industry should be recognized by those who will take the CIW Foundations exam. Often these job roles will be mentioned, by name, in employment postings; just as often you may have to read the details of a job listing to place the position within one of these roles.

Web site designer
The user interface and the overall visual appearance of the site are created by the Web site designer.

Web architect
The Web architect creates the plan for development and support of the Web site and often acts as the project manager in charge of site development, who will pull together the talents of many other individuals to create a finished product.

Web application developer
The Web application developer uses programming languages to create the server-side programming that makes a Web site dynamic. Some of the languages used by the Web application developer include C#, Java, PHP, Perl and Visual Basic Script.

Web site analyst
During the creation of a Web site or after a site has been in use for some time, it is desirable to learn whether or not the site is performing as expected. The role of a Web site analyst is to report on, and make recommendations about, a site's performance through Web analysis tools, surveys and usability evaluations.

Web site manager
The Web site manager is commonly responsible for keeping the Web site running smoothly. By leading a team of Web professionals (sometimes performing all of the roles described above) the Web site manager is able to keep the site up to date, correct style or content errors and generally keep the site functioning as an extension of the business or organization.

Database administrator
Most dynamic Web sites retrieve or store information in a database. Almost any popular Web site that you could name is actually a user interface for a complex database. The database administrator is responsible for the design, maintenance and security of the information kept in the database.

Server administrator
The server administrator is responsible for the Web site infrastructure. If the server computer which runs, stores and manages the Web site crashes or becomes otherwise unavailable, the Web site itself also becomes unavailable. The server administrator is responsible for keeping such "downtime" to a minimum, and ideally to none at all. The server administrator is responsible for configuring the Web server in the most reliable, secure, easily restored way possibly including uninterruptible power, redundant or mirrored servers and tape backup of the Web site and database servers.

Network engineer
Even a well designed Web site running on properly maintained servers is useless unless it is placed on a network with access to the Internet (or a local network in the case of an intranet). The network engineer must design and support the devices and transmission media that allow communication between the Web site and visitors who use it.

Security manager
Often, the information being displayed or gathered by a Web site should be suitably secured from just anyone accessing the site. For example, when a purchase is made from an e-commerce Web site using a credit card, special precautions must be taken to safeguard the credit card number and associated personal information. This and other security requirements are the job of a security manager.

PC technician
Building, configuring, installing and repairing computer hardware is the job performed by a PC technician. The PC technician is often also responsible for installing and maintaining the operating system and other software used on a computer. A PC technician should be knowledgeable about computer components, troubleshooting procedures and software configuration.

Help desk technician
The help desk technician is often the first line of support for a computer user. When a user experiences difficulty in accessing a Web site, they will often communicate with a help desk technician to determine the problem and how it can be corrected.

1.2. Identify the infrastructure required to access the Internet, including hardware and software components.

An IT professional certified as a CIW Associate will need to understand the software and hardware components required to access the Internet.

- Client
- Server
- History of the Internet
- Internet infrastructure
- Connection devices
- Consumer Internet connections

Client and Server

Most information systems make use of the client/server model which describes a process where the server offers a file, application or service which is requested by a workstation (the client). Modern networks commonly include several servers and hundreds or thousands of clients.

Common examples of the client/server model include print servers, file servers, authentication servers, Web servers and e-mail servers to which multiple clients connect in order to make use of the offered services.

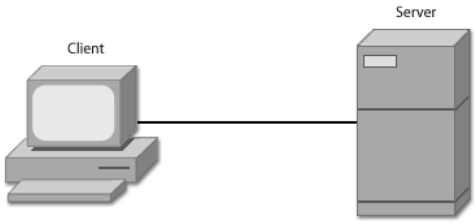


Figure 1

History of the Internet

The Internet, of course, is not a single network, but a vast collection of separate networks that share resources by using common protocols. The origin of the Internet was in 1969 when the Advanced Research Projects Agency Network (ARPANET) was funded by the U.S. Department of Defense. After the U.S. Department of Defense ended ARPANET the National Science Foundation took over the equipment and sites involved and formed NSFnet. Eventually NSFnet was expanded to include sites belonging to businesses, government and military installations, and universities. This large connection of separate networks became our modern Intranet.

All of these separate networks are able to communicate because they use common protocols. Protocols can be best described as rules for communication. The protocol used to communicate on the Internet is the Transmission Control Protocol/Internet Protocol (TCP/IP) which includes the ability to provide an identifier or address for every server or client on the Internet.

The current version of TCP/IP is known as version 4 (IPv4) and uses a 32 bit address format of 4 numbers separated by a period such as 63.146.189.101. A common name for this version of TCP/IP addressing is the "dotted quad".

A newer version of TCP/IP is planned which uses a 128 bit address format allowing for a far greater number of addresses, as well as more sophisticated address management and routing methods. IPv6 will use hexadecimal numbers (using digits of 0 through F rather than 0 through 9) for addressing, like this:

FEBC:A574:382B:23C1:AA49:4592:4E66:9982

Internet infrastructure

The Internet client infrastructure requires 6 elements in order to connect to (or make typical use of) the Internet:

- An access device such as a computer, Internet-enabled mobile phone, or PDA
- An operating system
- TCP/IP for communication on the Internet
- Client software such as a Web browser, chat client, or e-mail application
- A physical Internet connection
- A valid Internet address

The TCP/IP address is typically associated with a name such as www.preplogic.com so that we can use the Internet without memorizing thousands of numeric addresses.

Connection devices

One of the 6 elements needed for an Internet connection is the physical device that provides the connection. Many people access to the Internet using a dialup connection. A dialup connection is created by a modem which is used to translate the digital signals used by the computer to the analog sounds that are carried by regular telephone lines. The need to carry analog sounds – such as speech – on a regular phone line restricts the speed at which digital information can be carried on that kind of connection.

Faster Internet connections are supported by other connection devices that are considered to be "direct" connections. They can communicate using digital techniques that do not require the translation of signals to sound, and are therefore much faster.

Examples of direct connection types include:

Connection Type	Description	Speed
ISDN	A telephone service that provides digital data transmission over existing copper telephone wiring.	264 Kbps (thousands of bits per second) channels
DSL	The Digital Subscriber Loop is a technology for delivering high-bandwidth digital information using ordinary copper telephone lines. There are several variations of DSL. This is a common consumer Internet connection.	512 Kbps to 32 Mbps (million bits per second)
Cable modem	A high-speed digital connection using the coaxial cable and infrastructure provided by cable television providers. This is also a common consumer Internet connection.	512 Kbps to 52 Mbps
T1	Dedicated high-speed telephone connection which can be configured to carry voice or data.	1.544 Mbps
E1	A digital transmission link used in Europe.	2.048 Mbps
E3	A digital transmission link used in Europe.	34.368 Mbps
T3	Recently renamed to DS-3. This is the equivalent of 28 T1 lines.	44.736 Mbps
Wireless	A network connection using radio waves rather than a network cable. Wireless connections are becoming increasingly popular as a method of consumer Internet connection.	Various, from 2 Mbps to
LAN	Local Area Network using the copper or optic fiber connections employed by an organization to connect servers, clients and other network devices. Commonly the LAN is not the connection to the Internet, but makes use of a router to connect to the Internet.	10 Mbps, 100 Mbps to 1000Mbps
Fiber-optic	This network connection uses light rather than electrons to transmit data. Fiber-optic connections are becoming increasingly popular as a method of consumer Internet connection.	Up to 100 Gbps (Gigabit or 1,000 megabits)

1.3. Define important Internet communications protocols and their roles in delivering basic Internet services.

- Remote access protocols
- Internet service protocols

Remote access protocols

You may recall our definition of a protocol as a set of rules for communication. A connection to the Internet is, in part, accomplished by the use of a variety of protocols, for a variety of purposes. Specifically, these protocols are for the establishment and maintenance of a connection to the internet.

These remote access protocols include the Point-to-Point Protocol (PPP), commonly used to connect via a telephone modem to an Internet Service Provider (ISP); and a similar protocol to establish a connection using an existing Ethernet connection, called Point-to-Point Protocol over Ethernet (PPPoE). The PPPoE is often used when you connect to your Internet access device using a network cable instead of a serial or modem cable.

Internet service protocols

The concept of the protocol extends beyond just the connection to the Internet. The activities that you take part in on the Internet have their rules for communication also. For example the way in which a Web server responds to a request for a Web page is called the Hypertext Transfer Protocol or HTTP. You might recognize this as part of the information that is displayed in your browser address bar, such as: http://www.testprep.com.

There are a variety of other such protocols with which you should be familiar – FTP for file transfer, SMTP for simple mail transfer, POP for the post office protocol, IMAP for Internet Message Access and HTTPS for secure Web page requests.

1.4. Identify the basic principles of the Domain Name System (DNS).

Every Web site must have a unique name and address. The Domain Name System (DNS) works to match domain names with Web site addresses.

Domain Name System (DNS)

- Resolves IP addresses into recognizable names
- Inter-changeable information
    - 192.112.12.2 = www.chromezebra.com

Internet domain naming

Domain	Type
.com	commercial or company sites
.edu	educational institutions, typically universities
.org	organizations; originally clubs, associations and nonprofit groups; currently, various types of organizations
.mil	U.S. military
.gov	U.S. civilian government
.net	network sites, including ISPs
.int	international organizations (rarely used)

Hierarchical DNS naming structure

- Domain names
  - Read from right to left
  - General to specific

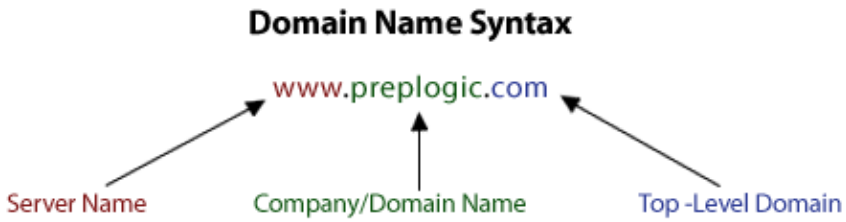


Figure 2

Domain name server

This is a server that resolves domain names into IP addresses.

Shared domains

A shared domain occurs when a company domain name is shared with another company. Example: If preplogic shared its domain name with other companies, you might see *othercompany*.preplogic.com

1.5. Identify the functions of Web browsers, and use them to access the World Wide Web and other computer resources.

Uniform Resource Identifiers (URLs)

- Includes:
  - Protocol
  - Internet resource (server or host name)
  - Domain name
- Absolute URL
  - Example: http://www.chromezebra.com/images/top.gif
- Relative URL
  - Example: images/top.gif

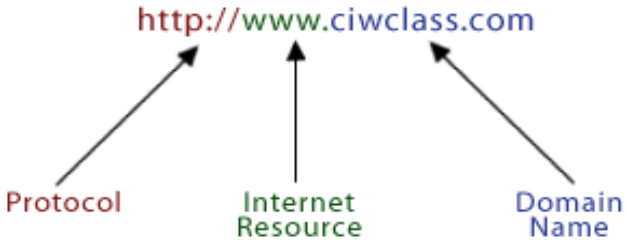


Figure 3

Securing Internet communications

- Configure the browser's security settings
  - Accept, reject or prompt before accepting:
  - ActiveX controls
  - Java applets
- Restrict
  - Set safety levels accordingly

Use a Web browser to download files

- You can use a browser to:
  - Save an entire Web page
  - Save elements of a Web page
  - Download executable files or other types of files from the Internet to a specific location on your hard drive
  - Copy selections to the Clipboard

Intranet, extranet, Internet

- **Intranet -** An internal or in-house Web site used only by employees within a company
- **Extranet -** An internal network designed to provide access to selected external users; these are not available to the Internet public

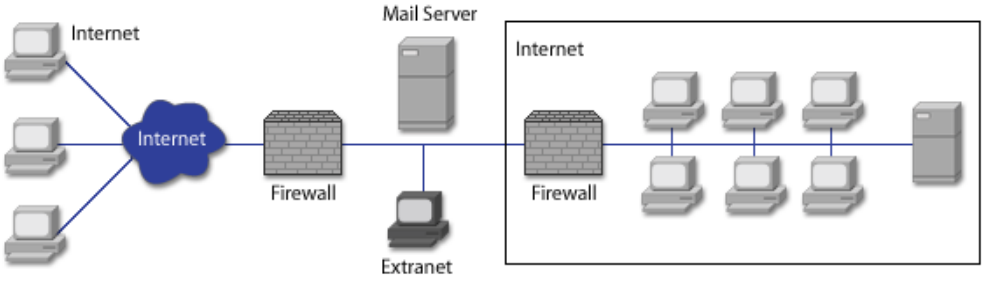


Figure 4

Browser plug-ins

- Programs designed to extend basic browser functionality
  - Helper mini-programs that allow browsers to run various types of files
  - Associated with a specific platform (Windows or Macintosh) and sometimes with a specific browser
  - Provide efficient integration of multimedia formats with the browser and computer

1.6. Use e-mail clients to send simple messages and files to other Internet users.

In order to send and receive e-mail, the following must be in place: a unique IP address, an account name, a password, and a service provider or hosting company.

Types of Email

- Types of Email
  - Browser-based
  - Outlook Express, Netscape Mail
- Online Service
  - AOL, CompuServe
- Web-based (IMAP)
  - Yahoo, Hotmail, etc.

Sending and Receiving Email

- Requirements
  - Email program
  - Incoming mail server and protocol (POP)
    - POP3 account name (user name)
    - POP3 account password
  - Need outgoing mail server and protocol
    - SMTP

E-mail signatures

- Display at the bottom of an email message
- Identifies the sender and provides contact information
- Can be added automatically to outgoing messages
- Some companies require signatures to follow specific guidelines for content and structure
- Default Signature
  - Only one can be the default signature at any given time

E-mail attachments

- Attaching Files
  - Any kind of file can be attached to an email message
  - Use attachments for sharing files and documents
- Receiving an attachment
  - The email clients uses MIME to identify attached files by their file type
  - Some attachments are blocked or removed by the browser security or antivirus program
- Company servers scan email attachments
  - Company servers may block certain types of attachments, or all attachments, depending on the company security policy

E-mail for Business

- Choose the response to email
  - Reply
  - Reply All
  - Forward
- Communicate professionally
  - Use proper grammar
  - Check spelling

    - Keep messages clear and concise
- Remember e-mail is permanent
- Include e-mail threads
    - Add information about what you are addressing from the original email
- Out-of-office messages
    - Automatic feature to tell senders that you are gone

E-mail Issues

- Sexual harassment
- Offensive language
- Disclosure of confidential information
- Combating spam
    - Use spam filters
    - Block mail from IP addresses
    - Use a blackhole list
    - Require SMTP authentication
    - Set up rules
- Storing email messages
    - Make local copies
    - Remove messages from the server

1.7. Define and use additional networking and Internet services.

The Internet allows you to collect information in many ways. The following tools allow you to do a myriad of things online:

- Newsgroups
    - Also called UseNet
    - Allow posting of questions and information
    - Broken into many categories and subcategories
    - Postings are for those who have used a product, not for manufacturer sales pitch
    - Tree Structure
        - Uses dot notation to separate categories
        - Read left (broad category) to right (more specific category)
        - Example: comp.lang.java
        - Computer language java

- FTP
  - Used to transfer files between two computers
  - Upload or download files through the internet
  - Public FTP servers allow anonymous logon and downloading of files only
  - Corporate FTP servers usually require a user name and password
  - Types
    - Command-line FTP
    - Built-in FTP browser client
    - Specialized FTP client
  - Downloading Files
    - Taking a file from a server and putting it on the user's computer
    - Use the get command
  - Uploading Files
    - Transferring a file from the user's computer to another computer
    - Use the put command
  - Secure versions of FTP
    - Secure Copy (SCP)
    - SSH File Transfer Protocol (S/FTP)
    - SSL/TLS-enabled FTP (FTPS)
- Telnet – before the Internet
  - Remote host connection
    - Logs on to a server and access information as if you were sitting in front of the server
  - Provides a login shell (an environment that allows you to issue commands)
  - Similar to a dial-up shell account
  - Establishes a text-based connection with another computer
  - Requires a username and password
    - Uses a generic user name and password to access public servers
  - SSH (Secure Shell)
    - Secure form of Telnet
- Virtual Network Connection (VNC)
  - Allows you to control a computer at a remote location as if you were sitting in front of it
  - Consists of two components: the server and the viewer
  - Provides a full GUI display and allows authenticated users to log on and see the same display they would see if they were sitting in front of the computer
  - The viewer and server do not need to be running the same operating system

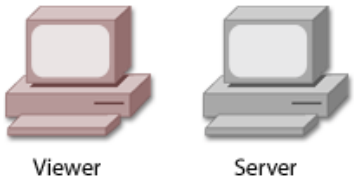


Figure 5

- Instant Messaging
  - Computer-based method of communication in which users can type and view messages sent to one or more recipients and view the responses immediately
  - Contacts must be online to receive messages
  - Can send files, view photos, send Web links and talk to contacts
  - Becoming very popular in the workplace
  - Requires an instant messaging client and an account for instant messaging service
  - IM Programs
    - AOL, ICQ, Trillian, MSN

- Peer-to-Peer *(figure 6)*
  - Each computer has both client and server capabilities
  - On the Internet, a P2P network allows a group of users to connect with each other and directly share files among their hard drives
  - P2P networks are inexpensive and allow users to share bandwidth
  - Examples:
    - Kazaa
    - ITunes

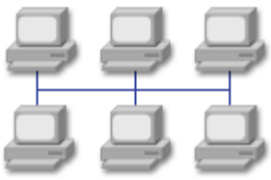


Figure 6

- Lightweight Directory Access Protocol (LDAP)
  - Directories contain contact information
  - Used by corporations to organize names, addresses, etc.
  - Simplified version of X.500 standard
  - Supports TCP/IP
  - Makes global directory service available to everyone
  - Modern e-mail clients are capable of searching an LDAP directory
- Concurrent Versioning System (CVS) *(figure 7)*
  - Development tools for programmers
  - Used on Linux or other UNIX-based systems
  - Controls different versions of the pieces of a program, as those pieces are developed
  - Allows programmers to use the latest (debugged) versions of their co-workers' code while developing their own portions
  - Allows a large program to be developed in a much shorter time frame

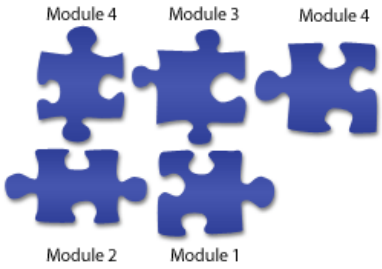


Figure 7

- Blog
  - Collection of personal thoughts on a Web site

1.8. Demonstrate ways to communicate effectively using Internet technology.

- Netiquette
  - Don't type in all caps
  - Check spelling
  - Be careful about using acronyms
- Ethical issues
  - These issues are the same as if you were communicating face-to-face.
  - Remember that IM and chats are not secure
  - Do not ask for personal info
  - Do not send credit card or password info
  - Do not represent yourself as someone else
  - Adhere to copyright laws
  - Pay for shareware if you keep it
  - Do not plagiarize
  - Do not libel others
- Avoid harassment
  - Sending instant messages to those who do not want them
  - Jokes in bad taste
  - Forwarding everything

1.9. Identify and configure user customization features in Web browsers, including: preferences, caching, cookies.

- Configuring browser preferences
  - Fonts
  - Home page URL
  - History folder cache time
  - Controlling pop-up and pop-under windows
  - Image loading
    - Disabled: text only, reduces page load time
  - Cookies and Privacy
    - Text file that collects visitor information
    - Helps to customize return visits
    - Privacy levels are modified to block or allow cookies

- What is and is not allowed to be executed
- Cookie warnings

Security

Security from unauthorized breaches can be provided through a variety of methods. The following addresses some of those methods:

- Browser security
  - Accept, reject or prompt before accepting:
    - ActiveX controls
    - Java applets
  - Restrict
    - Set safety levels accordingly
- Proxy servers – provide added security
  - Placed between corporate networks and the Internet
  - Provide:
    - Web document caching: speeds up access
    - Corporate firewall access
  - Configure Browsers for use with Proxy
    - Netscape Navigator: manually configure to work with a proxy server, or can use a proxy server's URL to automatically configure itself
    - Internet Explorer: automatically scans the network for a proxy server; or uses a configuration script; or can be configured manually

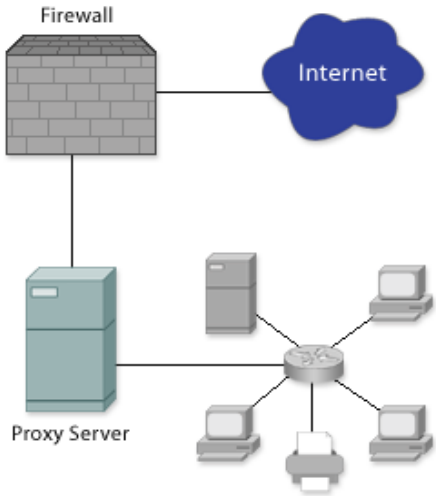


Figure 8

Troubleshooting connection problems

- Client problems
  - Poor rendering
  - Slow connection
  - No connection
  - Inability to render images
  - Slow browser and other system functions
- TCP/IP troubleshooting tools
  - Ipconfig
    - Displays system IP configurations
  - Ping
    - Tests connectivity between a source system and a destination system
  - Tracert
    - Determines the path between a source system and a destination system

1.10. Identify security issues related to Internet clients (e.g., Web browsers, e-mail, instant messaging) in the workplace, including: certificates, malware, illicit servers and viruses.

Authentication

Authentication verifies the identity of the person logging into a computer, web site, etc. The most common forms of authentication are usernames, passwords and digital certificates.

- User names and passwords
  - Use to log on to private and public networks, including the Internet
- Digital certificates
  - Attachments to electronic transmissions that supply a verifiable signature
  - Digital signatures – electronic signatures that verify the identity of the message sender
    - Non-repudiation – digital signatures prove that a transaction or transmission took place; such that neither the sender nor the receiver can later deny the action

Encryption

Encryption is the scrambling of data using a mathematical algorithm (when you see algorithm, think calculation). There are three types of encryption: symmetric-key, asymmetric-key and hash function. Note: the standard is 128-bit symmetric-key encryption.

- Symmetric-key (secret-key) encryption
  - The same key is used to encrypt and decrypt messages
- Asymmetric-key (public-key) encryption
  - Two keys are used to encrypt and decrypt messages: a public key and a private key
  - Uses an RSA algorithm
- Hash (one-way) encryption
  - Uses hashes to verify the integrity of transmitted messages
  - Also called a message digest
  - Uses the MD5 or SHA (160-bit – more secure than MD5) algorithm

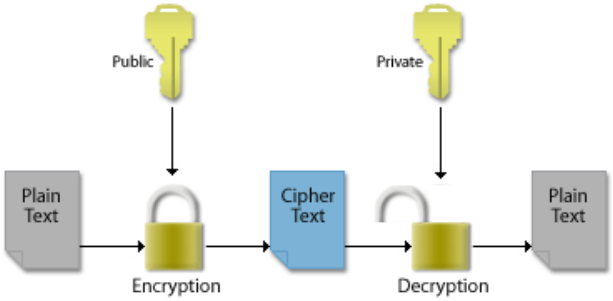


Figure 9

Firewall

Firewalls are collections of hardware, software and corporate policies that prevent unauthorized access to, or from, private networks.

- Prevent unauthorized Internet users from accessing private networks
- Retain control of proprietary information
- Prevent unauthorized export of proprietary information
- Prevent access to external e-mail providers or external servers

Malware

- **Virus -** Damages computers and networks, often alters files to damage or destroy data
- **Worm** - Resides in active memory and replicates itself until an entire disk is full
- **Trojan horse -** Appears to be harmless (such as a computer game) but produces harmful results
- **Illicit server -** Installs hidden services on systems. Client code: allows remote access to a computer by an attacker. Server code: infects destination computers and enables the attacker to control it
- **Spyware (adware) -** An application secretly placed on a user's system to covertly gather information and relay it to outside parties, usually for advertising purposes. Cookies are not spyware because:
  - The user is aware of their presence
  - The user has the option to disable outside access to cookie information
    - Use spyware detection applications to detect and eliminate spyware

Protection

- Do not open e-mail or attachments from unknown senders
- Configure browser and e-mail security to highest levels
- Use antivirus software
- Keep antivirus software current
- Install system patches and updates
- Stay informed about the latest virus threats
- Make backup copies of important files
- Use a password-protected screen saver to eliminate prying eyes

1.11. Use different types of Web search engines effectively.

- Search Engine
  - A powerful software program that makes it easy to find information on the Internet
  - Large database that allows you to query indices
- Index
  - An enormous catalog that is compiled by the search engine
  - Many engines use "robots" or "spiders" to automatically search the Web and index Web sites
- Types of searches
  - Directory search
    - Search engine displays a list of categories and subcategories that you can browse to find information or websites
  - Keyword search
    - Enter keywords in a search engine to find information about any subject you want to investigate

- Register with search engines
  - May be manual or automatic submission
  - Once submitted:
    - Robots search your site for relevant keywords found in the <meta> tag
    - Search engines that scan Web pages for <meta> tags are called meta search engines
  - Information portal
    - Only finds Web sites based on manual submissions
    - Information portals are more likely to contain high-quality content matches to any given query
  - Search engines
    - Uses a robot or spider program to browse the Web, following hyperlinks, and indexes the content that the robot finds

Popular Searches

- Yahoo
  - One of the oldest and most basic information portals
  - Yahoo was not intended to be a search engine; it was intended to provide multiple links relating to each topic
- AltaVista
  - Originally designed to index the entire Internet
  - Two search options are offered: general and advanced
  - Ranks relevance to a site based on keywords entered by the user
- Google
  - Ranks relevance to a site based on keywords entered by the user
  - Also determines relevance based upon how many hyperlinks are made to a particular site
- Lycos
  - One of the largest and most complete databases on the Internet
  - Offers both directory and keyword searches
- Webcrawler
  - A much smaller database than Lycos
  - It is fast, simple and reliable
  - Good for general searches
- Excite
  - Allows keyword searches
  - Also contains cross-referencing fields for conceptual searches

Boolean operators

Symbols or words used to narrow Internet search results by including or excluding certain words or phrases from the results

- Common operators:
  - AND, OR, NOT, NEAR, FAR, BEFORE, ADJ (adjacent)
  - Plus sign (+)
  - Minus sign (-)
  - Brackets ([ ])
  - Quotation marks (" ")
  - Asterisk (*)
  - Period (.)
- Boolean Operators Results:
  - keyword1 AND keyword2
    - results must include both keywords
  - keyword1 OR keyword2
    - results must include at least one of the keywords
  - keyword1 NOT keyword2
    - results must exclude keyword2
  - keyword1 + keyword2
    - results must include both keywords
  - keyword1 - keyword2
    - results must exclude keyword2

Search Strategies

- Check the default settings for each search engine
- Use keywords that are specific, and try to use nouns rather than verbs
- Combine keywords into phrases by using quotation marks to indicate exact wording
- Use all uppercase letters when typing Boolean operators
- Use all lowercase letters when typing keywords

1.12. Identify and use principles of Personal Information Management (PIM), including: common applications.

PIM software is used for a variety of organizational tasks:

- Keeping track of appointments
- Storing contact information
- Providing email capabilities (some programs)
- Providing a centralized electronic calendar (some programs)
- Setting reminders and alarms
- Use with PDAs - Synchronize data between PDA and desktop computer

Wireless Application Protocol (WAP)

- Protocol used for wireless communication of hand-held devices
- Views Wireless Markup Language (WML)
- Advantages: Allows access to the Internet from anywhere
- Disadvantages: Device screens difficult to read, no e-mail attachment support

1.13. Efficiently transmit text and binary files using popular Internet services.

- Compression
    - Downloaded files are usually compressed
    - You must decompress to use the file
- File Types
    - MIME types may need to be defined
    - Some files may be blocked
- Common compression utilities include:
    - Zip/unzip
    - Bzip2/bunzip2
    - Bzip/bunzip
    - Gzip/gunzip
    - Compress/uncompress
    - RAR/WinRAR

1.14. Identify security-related ethical and legal issues faced by IT professionals.

Privacy Issues

- Your computer activities are no longer private
- You may receive malware and spam
- Organizations may monitor employee e-mail and restrict access to Internet sites
- Network administrators may audit the contents of employee hard drives
- Protect Yourself
    - Do not click banner ads
    - Do not sign up for unwanted mailing lists (sweepstakes, etc.)
    - Conduct secure transactions
    - Send only emails that anyone can read
    - Be selective before posting to a message board/Usenet
    - Use home computer for personal communications and Internet searches

Copyright Issues

Copyright is defined by expression and originality. You need to know the laws governing copyright.

- Copyright laws extend to works of authorship on the Internet
- There is no international copyright
- You must obtain copyrights from the appropriate agency in your home country
- Court cases have set precedents that copyright-protected material cannot be used or distributed on the Internet without permission

Other Issues

- Licensing:
    - To license copyright-protected material, you must obtain permission from the author
- Trademarks:
    - To register a trademark, you must contact the appropriate agency in your home country
- Encryption policies:
    - Determine the risk of transmitting or emailing unencrypted proprietary or sensitive data

1.15. Relate project management concepts and terms to the IT profession.

Term	Definition
Project Management	Applying knowledge, skills and processes to specific activities in order to meet deadlines and achieve a desired result
Project	A sequence of tasks that must be accomplished within a certain time frame to achieve a desired result
Task	A unit of work during a project
Resource	A person, department or device needed to accomplish a task
Assignment	The appointment of a specific resource to a specific task
Scope	The goals and tasks of a project and the work required to complete them
Scope creep	Gradual increases in project scope that occur in small increments over time

Project Management Skills

The following are skills that are essential for all project managers:

- Planning skills
  - Identify project stakeholders
  - Acquire the right staff for the project
  - Develop and manage project teams
- Organizational skills
  - Control how and when tasks are completed
  - Prioritize tasks
- Communication skills
  - Gather information
  - Evaluate and communicate project condition
- Problem-solving skills
  - Identify problems
  - Propose solutions
  - Make decisions in a timely manner

Project Management Phases

- Initiating phase
  - Conduct needs analysis
  - Determine objectives, assumptions and constraints
  - Create Statement Of Work (SOW)
- Planning phase
  - Develop project schedule
  - Assemble project team
- Executing phase
  - Perform project tasks
- Controlling phase (concurrent with executing phase)
  - Monitor progress and take corrective action as needed
- During the executing and controlling phases:
  - Schedule meetings with team members to monitor progress
  - Schedule meetings with stakeholders and management around milestones to review project status
  - Avoid scope creep by managing requests and changes at regular intervals
- Closing phase
  - Evaluate schedule, budget, scope, resources and assignments
  - Formal acceptance of project deliverable
- During the closing phase:
  - Test the product
    - Client evaluates and accepts/rejects project deliverable
  - Evaluate performances
    - Review performances of team members
  - Document lessons learned
    - Review what went well, what did not and what could be done differently to improve team performance

1.16. Recognize essential database concepts.

Search engines use large databases that contain information that can be searched. Before continuing it is important that you understand basic database concepts.

Database Terminology

Term	Definition
Database	An organized collection of information that pertains to a particular subject} or purpose
Table	A collection of data about a specific topic, organized into columns and rows
Field	A category of information in a table (column)
Record	A collection of information consisting of one or more related fields about a specific entity (row)
Relational Database	A database that contains multiple tables related through common fields
Common field	A field, contained in two or more tables, that forms a relationship between the tables
Relationship	A connection between two or more tables based on a common field
Primary key	A field containing a value that uniquely identifies each record in a table
Foreign key	A field in a related table that refers to the primary key in another table
Query	Ask a question of the database
SQL	Standard interactive and programming language for accessing information from, and updating information in, relational databases

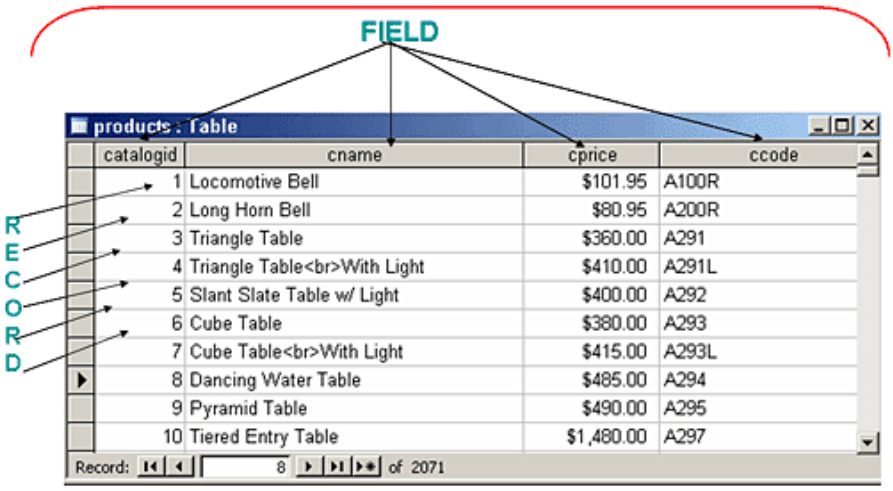


Figure 10

Relational Databases

- Relating tables eliminates the duplication of data
- Tables are related through their common fields
- The common field is the primary key in one table and the foreign key in another table

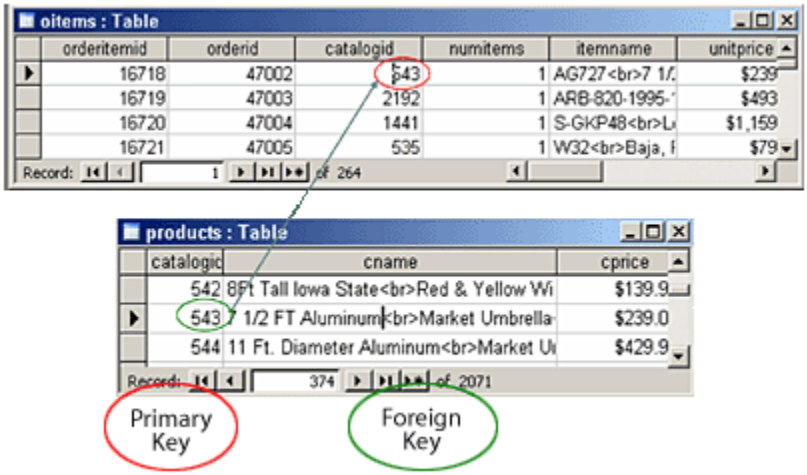


Figure 11

Relationships

- One-to-one relationship
  - Each record in Table A can have only one matching record in Table B
- One-to-many relationship
  - A record in Table A can have many matching records in Table B, but a record in Table B has only one matching record in Table A (the most common table relationship)
- Many-to-many relationship
  - One record in either Table A or B can relate to many matching records in the other table
  - Established by creating multiple one-to-many relationships with a third table (junction table)

Connecting Databases to Internet Servers

- Database Management System (DBMS)
  - Program used to store, access and manipulate information
    - IBM
    - Oracle
    - SQL Server
    - Microsoft Access
    - Sybase
- Open Database Connectivity (ODBC)
  - Standard that allows an operating system to access databases.
- Alternative standards
  - Java Database Connectivity (JDBC)
  - Common Interface Gateway (CGI)
  - Connects the server to the database

Domain 2: Site Development Foundations – 35%

2.1. Demonstrate knowledge required to create a Web page.

History of markup languages

SGML, or Standard Generalized Markup Language, was created by IBM and became a standard recognized by the International Organization for Standardization in 1986. SGML is a very capable yet very complex language used to describe the information within a document.

HTML was designed by Tim Berners-Lee as a method of distributing documents across a computer network. HTML is similar to SGML in many ways, but it uses a much simpler set of elements than SGML, and as a result has become the standard for transferring information in Web documents.

It is important to note that markup languages are quite different from programming languages. Markup languages define what information is for, and how information should be presented. Markup languages are not used to perform calculations or any of the other duties of a programming language.

Over time, HTML has been extended and modified so that it is now commonly used to provide formatting information for a web page and not just content or data. The way in which HTML changes the information in a document is by embedding special codes or elements called tags within a document.

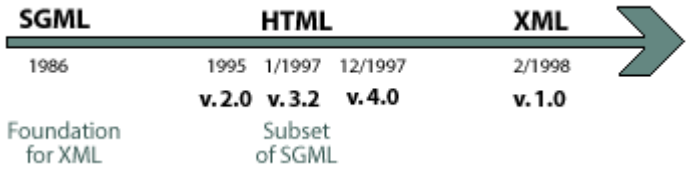


Figure 12

Versions of HTML

The type of Web design that is tested by the CIW v5 Foundations Exam 1D0-510 is very different from the type of Web pages that were created when HTML was first created. The first Web pages were scientific documents following a standardized layout with little need for colors, animations, sound or support of accessibility requirements. The primary purpose of these early Web documents was to provide built-in links to other documents of a similar nature.

This use of HTML was not satisfying to the Internet using public, who demanded a much more colorful, dynamic and entertaining kind of Web document. Many enhancements were made to HTML by individual interpreters – the programs that display Web pages – in an effort to appeal to a wider audience. Web browsers and e-mail client software are the most common interpreters, and these programs are written by several companies with competing ideas of what HTML should do.

HTML

- Hypertext Markup Language (HTML)
(*figure 13*)
    - Allows hyperlinks and describes visual layout
    - HTML versions include HTML 3.2 and HTML 4.01

```
<div align="center">
      <table border="1" cellpadding="2">
        <tr>
          <td bgcolor="#008080">
          <p align="center"><font
color="#FFFFFF" size="2">
</div>
```

Figure 13

- HTML 4.0 "Flavors"
    - 4.01 Transitional -- allows deprecated tags and html formatting
    - 4.01 Strict -- requires all tags be container tags, does not allow deprecated tags, and requires CSS for formatting
    - 4.01 Frameset -- for use with frames

Document Structure Tags

Every XHTML document must have the following document structure components so that the appropriate interpreter can render the document as expected and validate its contents:

<!DOCTYPE> - determines how the markup will be rendered.

<html> </html> - identifies that the document is written in HTML. This tag sets boundaries by marking the beginning and end of pages.

<head> </head> - contains the document title, and sets the global settings which effect the entire document. Used by search engines to determine whether it meets the required criteria.

<link> - references a style sheet.

<title> </title> - created within the <head>, and is displayed at the top of the browser window.

<body> </body> - contains the bulk of the document, text, headings, links, graphics, etc. What you see on the screen resides here.

Document Type Declaration (DTD)

Every XHTML page must contain this declaration.

- <!DOCTYPE>
  - An SGML statement that describes the nature of your code
  - Placed at the top of the document
- No DOCTYPE
  - Two problems may arise:
    - Unable control how the code renders in the future
    - Unable to use a markup validator
- Each version and flavor of XHTML has its own DOCTYPE

Error!

```
<!DOCTYPE html
  PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN"
  "http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
```

Figure 14

Text and paragraph formatting tags

- Block-level markup elements
  - <p/> creates a blank line below text
  -
 moves to next line
- Text-level markup elements
  - <bold> or
  - <i> or
- Heading tags
  - Automatically places formatting on text
  - Levels 1 (large) through 6 (small)
    - <h1> </h1>, <h2> </h2>, <h3> </h3>, <h4> </h4>, <h5> </h5>, <h6> </h6>
  - Used in Transitional HTML/XHTML
- Indenting and centering text
  -
  - <p align="center" /> <p align="right" />
  - <blockquote />

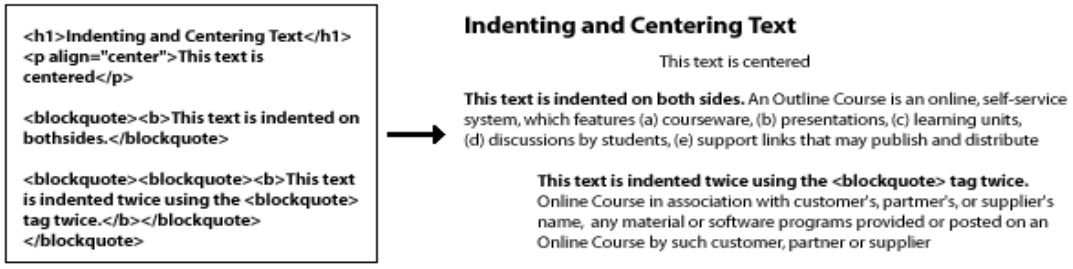


Figure 15

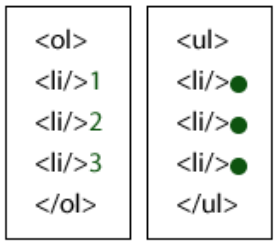


Figure 16

Lists

- Ordered
  - A numbered list
  - Uses the <ol> element and requires a closing tag
- Unordered
  - A bulleted list
  - Uses the <ul> element and requires a closing tag

Hyperlink Tags

Hyperlinks connect pages to other pages and files on the Internet. Clicking on a text or image link will take you to a new Web page.

- Create a hyperlink
  - The <a> anchor tag creates hyperlinks
  - A container tag that encompasses the text or image (or both) to be used as a link
  - linked text or image (or both)
- Image links
  -
- Uniform Resource Locator (URL)

URL	Description	Examples
Fully Qualified (Absolute)	A URL that contains a full path to a resource, including the protocol. Also known as a hard link.	http://www.someserver.com/somepage.html http://someserver.com/pub/~james/somefile.ext c:\intetpub\wwwroot\ccyp\syb\syb.html
Partial	A URL that assumes the current document's path. All references are made from the document's current directory.	syb.html Specifies a file in the current directory ../css/stylesheet.css Specifies a file one directory up from the current page pub/images/mybullet.gif Specifies a file in a subdirectory

Internal Hyperlinks (Bookmarks)

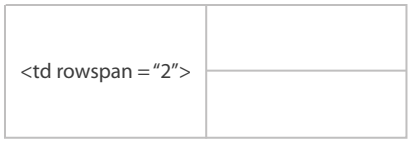
- Target links within the page
- Attribute
  - name
- Form
  - <a name="top">
  - Defines the internal bookmark (place it where you want it to go)
  - <a href = "#top">
    - Defines the link
    - Note the # sign

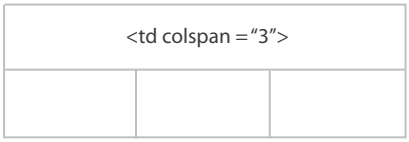
HTML tables

- Control content placement
- Aligns images and text
- Organizes information
- Presents data that lends itself to tabular format
- Offers many formatting options
- In XHTML, do not use to structure entire pages

Element	Tag	Description
Table	<table>...</table>	Required to create a table; contains all other table elements.
Caption	<caption>...</caption>	Optional; adds a caption or title, which appear above the table by default.
Table Row	<tr>...</tr>	Required; contains all data for a table row.
Table Header Cell	<th>...</th>	Optional; typically designates the top row or left column. By default, text in a header cell will appear bold and centered.
Table Data Cell	<td>...</td>	Required, unless <th> is being used; designates table cell contents.

- Column and Row Spanning
  - Allows rows or columns to span the table





Comment Tags

Add hidden comments by using the comment tag: <!—comments here -->

Document Object Model

- Vendor-neutral, cross-platform application programming interface (API)
- Specifies objects in a document that can be referred to and manipulated through scripting languages
- Describes the elements or objects, within a document
- A W3C standard
- Accessing a browser's DOM
  - Must use a scripting language
  - JavaScript or VBScriptFactors when choosing a DOM Compliant browserStability and security
  - Authentication features
  - Availability

2.2. Add images and graphical formatting to HTML files.

Adding images to Web pages

- Image tag
  -
- Aligning images relative to text
  - <img src="image.jpg" align="top"></img>
  - Values = top, middle, bottom
- Text description of image (ALT)
  - <img src="image.jpg" alt="pigs">
  - Include the *alt* attribute with a corresponding value
  - Required to validate as XHTML
  - Allows browsers and screen-readers to read the image description to the viewer

Image maps

These images contain clickable regions that are defined as "hot spot" that hyperlink to other pages or page sections. Two types: client or server side.

Image map tags

- <map> </map>
  - <map name="mymap" id="mymap">
  - Names the image map
  - Id is required to validate as XHTML
- <area>
  - Defines regions in the image
  - Attributes
    - Shape -- defines the shape of the regions
    - Rect, circle, polygon
    - Coords --specifies the coordinates of the map
    - Href -- specifies the hyperlink
- <usemap>
  - Can be placed before or after MAP coding
  - Indicates that the image placed in the Web page will use a map
- #mapname
  - Indicates that the map resides within the same page

```
<map name="mymap"  id="mymap">
<area shape="rect"coords="100,20,200,14" href="mypage.html"/>
</map>
<img src="mymap.jpg"usemap="#mymap"/>
```

Figure 17

<body> backgrounds and color

- Background color
  - <body bgcolor="#FF0000" >
- Background image
  - <body background="pigs.jpg" >
- Text color
  - <body text="colorNameOrCode">
- Unvisited link color
  - <body alink="colorNameOrCode">
- Visited link color
  - <body vlink="colorNameOrCode">

Image file formats

- GIF (Graphics Interchange Format)
  - GIF 87a and GIF 89a
  - Supports transparency, interlacing and animation
  - Line art, images with 256 colors or less
- JPEG (Joint Experts Group)
  - Supports 16+ million colors
  - Photographs
- PNG (Portable Network Graphics)
  - New format
  - Quick loading, supports all colors
  - Supports transparency (not supported in IE)

2.3 Identify and use design and color principles for Web pages.

Figure 18

Design Considerations

- Popular color combinations
  - Consider existing sites
  - Cultural and audience concerns
- Culture and Audience
  - Colors
  - Professionalism
- Page layout
  - Layout guidelines
  - Document structure, the tag and style sheets
  - Relative path names
  - White space, the <img> tag and XHTML

2.4 Create a basic HTML form that accepts user input.

Web forms are used to obtain information from users. Input can include the user's name, address or credit card number.

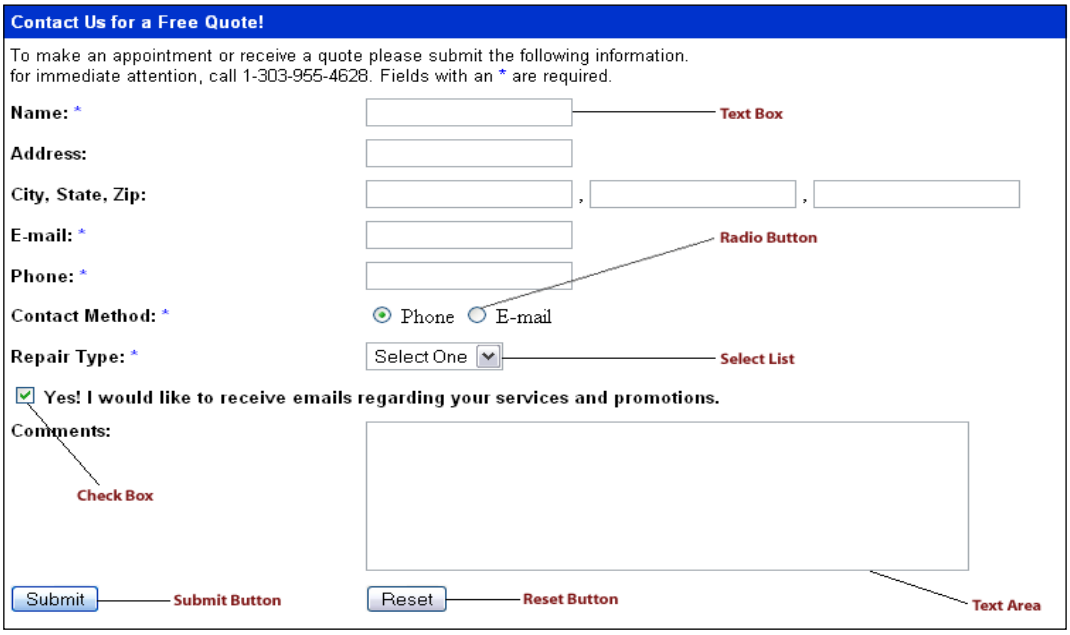


Figure 19

Form Elements

- Text box – single line of text
- Text area – specify columns and rows of input area
- Check box – allows users to choose more than one item
- Radio button – forces users to choose only one item
- Select list – drop down menu of items
- Submit button – submits the form to the server for processing
- Reset button – clears the form

Form Processing

- Scripts
  - Sends, receives and processes data from a browser
- Common Gateway Interface (CGI)
  - Server-side script
  - Resides on the server
  - Receives and processes the data
- Other types of scripting
  - Client-side script
  - Resides on the client
  - Sends and formats the data

2.5 Create HTML frames

What are HTML frames

Frames are often used to contain items that visitors should always see (copyright notices navigation information, and so on). By placing this information in a static frame, it can always be there as the user scrolls through other information in another (dynamic) frame.

The <FRAMESET> tag is used to define frames in the browser. Using it, you can define the number of columns and rows the frames will occupy. Beneath this, you add the <FRAME> tag to define the content in each frame.

- Frames are separate panes
  - Each has its own URL
- Frameset Document
  - Contains: <frameset>, <frame>, <noframes>
- Combines Static and Dynamic Information
  - Static Frames
    - Frames content remains the same
  - Dynamic Frames
    - Changes in response to choices made in the static frame
    - Non-printable frame
    - Provides security
- Noframes tag
  - Used to display text or images in browsers that do not support frames
  - Place right before the ending frameset tag

- Base Targets
  - Automatically sets a default target for all links
  - <base href="url" target="one">
  - Placed into the <head> section
- Inline Frame (floating frame)
  - Inserts an HTML or XHTML document inside another
  - <iframe>
  - Browser reads the <iframe> tag
  - Then requests the embedded file from the server

2.6. Define Extensible Markup Language (XML), and identify its features and appropriate use.

```
<catalog>
        <book>
                <title>My stuff</title>
                <author>me</author>
                <year-published>1874
                <year-published>
        </book>
</catalog>
```

Figure 20

Extensible Markup Language (XML)

- XML documents have a tree structure
- Describes the function and context of the information
- Contains a Document Type Definition (DTD)
  - Defines the syntax, structure and vocabulary
- Must be well-formed
  - Contains a DTD *and* a root element
- Must be valid
  - Must declare a DTD

Server-side Languages

- Code is executed by the Web server, not the Web browser
- Code executes because an interpreter has been installed and activated on the Web server
- Server-side Scripts
    - Browser detection
    - Database connectivity
    - Cookie creation and identification
    - Logon scripts
    - Hit counters
    - File uploading and downloading

2.7. Identify essential Web site navigation issues, and ensure page/site accessibility.

Web page accessibility

An accessible Web page has user-friendly, and accessible, front-end and back-end server resources that process and store user input. The World Wide Web Consortium (WC3) estimates that up to 10 percent of people have disabilities, and as such companies with a web presence should give some consideration to accessibility issues.

Addressing accessibility

- Visual challenges
    - Ensure text readability
    - Text support for images
    - Screen reader support
- Audio challenges
    - Provide alternative audio support
    - Provide alternative speech input
    - Text support for audio elements
- Cognitive and technical challenges
    - No flashing images or strobes
    - Provide alternative navigation
    - Provide audio support
    - Provide low resolution alternatives
- Site maps
    - Text map of the site
    - Improves accessibility

2.8. Define and apply essential aspects of the Cascading Style Sheets (CSS) standard.

```
h1          {color: #000080; font-size: 14pt}
a:link      {text-decoration: none; color: #000080}
p           {font-family: Arial; font-size: 10pt}
h4          {margin-top: 0; margin-bottom: 0}
```

Figure 21

- CSS
  - Adds formatting and structure to your pages
  - Simple text file that contains instructions
  - Benefits
    - The site pages are linked to the same style sheet
    - Changes to the sheet affect all pages across the site
  - Strict flavors of HTML and XHTML require that you use style sheets
- CSS Versions
  - CSS1: Addresses format
  - CSS2: Addresses multimedia objects
- Style Types
  - Linked style
    - The <style> and <font> tags in the HTML/XHTML file will override style sheets
    - <link rel="stylesheet" type="text/css" href="mysheet.css"/>
  - Inline style
    - The tag
    - Can span multiple elements:
    - CIW Associate
  - Embedded style
    - Uses the <style> tag within the <head> section
    - The style will remain in force until overridden
    - <style> h1 {color: magenta; font-size: 20pt} </style>
  - Imported style
    - Like a linked style sheet, refers to a separate file
    - Created using the *@import*
    - <style type="text/css"> @import url(import.css); </style>

2.9. Use Extensible Hypertext Markup Language (XHTML) to create Web pages.

```
<div align="center />
      <table border="1"cellpadding="2">
       <tr />
        <td bgcolor="#008080"/>
        <p align="center"/>
```

Figure 22

Extensible HTML (XHTML)

- Latest formulation of HTML
- Allows HTML to become XML compliant
- Extends HTML by allowing HTML to converge with XML
- Used to organize data on the page
- More flexible than HTML
- XHTML flavors
  - Transitional -- allows formatting to be specified within the document and deprecated tags
  - Strict -- requires CSS for formatting, and does not allow deprecated tags
  - Frameset -- for use with frames
- XHTML Rules *(figure 23)*
  - Requires the use of container or non-empty tags
  - Empty tags will not validate
  - Uses an alternative non-empty tag
    - Alternative notation for stand-alone non-empty tags
    - Place the slash (/) after the element name (before the closing wicket), rather than before the element name, as in a standard closing tag

```
HTML
<title>My Page</title>

XHTML
<title/>My Page
```

Figure 23

- All tags are in lowercase
- Requires a DTD at the top of every page

2.10. Identify technologies for enhancing the user's Web experience, including: programming languages, multimedia technologies.

Enhance the user's Web experience by building the following into the Web site:

- Audience development techniques
  - Flash, Java
  - Company logos
  - Strategies developed by sales and marketing
  - Push and pull technologies
  - Visitor tracking
- Portal
  - A Web site that acts as a centralized access point for other Web sites
  - Portal types:
    - Vertical: dedicated to a specific interest
    - Horizontal: links to various sites
  - Portal benefits:
    - Direct users to the best sites
    - Attract users to products
    - Improve brand name
- Wiki site
  - Allows all visitors to collaborate in its construction
  - Wiki software is installed on a Web server
  - You can lock down certain pages and leave others open to editing

Active Content and Formats

- Common file formats and MIME types
  - HTML: text/html
  - JPEG: image/jpeg
  - Cascading Style Sheets (CSS): text/css
  - MPEG: audio/mpeg
  - MP3: audio/mp3
- Evaluating proprietary formats
  - Difficulty/inconvenience
    - Difficult for end users to obtain or use
  - Cost
    - Some require purchasing software
  - Audience limitation
    - Limits disabled person's access

2.11. Use GUI-based HTML editing software to create Web pages.

Web site publishing

- GUI HTML editors have built-in publishing tools
- FTP is the standard protocol for Web page publishing
  - Stand-alone FTP clients
  - FTP client provided by GUI HTML editor
  - Post to test server (staging server)
    - Verify that pages work and render as expected
    - Verify that CGI script works as expected
    - Locate and repair dead links
    - Allow stakeholders to preview the site
- Test server configuration
  - Identical to production server
  - Use the identical Web server software and CGI scripts

2.12. Test and analyze Web site performance issues.

Verify accessibility

- Use the following tools:
  - Bobby (*www.cast.org/bobby*)
  - STEP508 (*www.section508.gov*)
  - RetroAccess (*www.retroaccess.com*)
- Improve accessibility
  - Adhere to the XHTML 1.0 standard
  - Use cascading style sheets

Calculate download times

- Check the size of the HTML file and all associated images, files or programs
- Determine the speed of your network connection
- Convert the connection speed and file size to common units of measure (e.g., bytes or bits)
- Divide file size by connection speed
- Calculate download time
  - (File Size in bytes x 8) / by connection speed
  - 65KB file = 65x1000 = 65000bytes x 8 = 520000 bits
  - Modem speed = 56Kbps = 56000bps
  - Time = 520000/56000=9.3seconds

2.13. Identify steps in the Web site planning and development process.

- The Web site development cycle
- Development team members
- Web site requirements
- Determining the audience for the Web site
- Web site plan documentation
- Presenting the Web site plan
- Improving the Web site

The Web site development cycle

- Create and document an initial Web site plan
  - Create a site plan (rough outline of planned development)
  - Determine audience and message
  - Validate design issues
- Obtain relevant input from stakeholders
  - Relevant organization, employees or contributors
  - The purpose of the Web site
  - The services that the audience requires from the site
  - Development timelines
- Communicate the Web site plan
  - Documenting
    - Create a storyboard
    - Document decisions in meetings and follow up
  - Communicating
    - Calling relevant parties to ensure that everyone is satisfied
    - Present the plan
    - Lead discussions
    - Address technical and non-technical issues
- Develop the site
  - Create Markup code
  - Test code with browsers
  - Approve the site
    - Ensure that everyone is in agreement
    - Obtain written approval
- Publish the site
  - Requirements
    - The IP address and/or DNS name of the site
    - User name and authentication information
    - The destination directory (i.e., folder) on the Web server
  - Space requirements
    - The protocol for uploading the site
- Manage the site
  - Create new content
  - Update dead links
  - Remove old sites

- Remove unused pages
- Ensure connectivity
- Report access troubles
- Process feedback from customers and stakeholders

2.14. Identify essential issues in developing and maintaining a Web site, including: project management, testing, legal issues.

- Intellectual Property
  - A unique product or idea created by an individual or organization
  - Your responsibilities
    - Never "borrow" content without express, written consent
    - Review copyright and trademark issues (e.g., trade secrets, licensing, infringement, plagiarism)
    - Understand copyright scope, reach and time limits
    - Consider ethical issues of copyright, trademark and plagiarism
  - Avoid copyright infringement, trademark infringement and plagiarism by:
    - Reviewing content
    - Obtaining express, written consent
    - Creating reasonable deadlines
- Manage Hyperlinks
  - Periodically check internal and external links
  - Use automated link-checking software

2.15. Plan and deliver oral presentations of your Web site, during and after site development.

Obtain feedback on your site design

- Comes from various sources
- Ways to obtain quality feedback
  - Providing Web forms on the site that ask for customer input
  - Conducting surveys in person
  - Conducting surveys via e-mail

Communication forms

- Presentations
  - Use oral presentations and presentation aids
    - Presentation software
    - Overhead projection
    - Whiteboards
    - Easel and poster paper
    - Charts
    - Published handouts
- Leading Discussions
  - Make introductions
  - Recall past business
  - Create a list of action items, including timelines
  - Monitor time
  - Ensure proper discussion focus
  - Handle heated discussions
  - Distribute minutes
- Addressing technical and non-technical issues
  - Regularly asking if anyone has questions
  - Asking team members to summarize their understanding of decisions
  - Asking a third party to deliver a summary of progress
  - Writing regular updates about the project

2.16. Define electronic commerce (e-commerce) and related technologies and concepts necessary to develop a secure, useful interface (i.e., storefront).

Traditional vs. Electronic Commerce

- Similarities
  - Both aim to deliver a valued product or service
  - Both want to serve a large audience
  - Both strive to quickly deliver products and services
- Differences
  - E-commerce customers expect shorter fulfillment time
  - E-commerce customers must understand Web-based technologies
  - E-commerce provides a global audience

- E-commerce orders are processed without human interaction or travel to a store location
- E-commerce relies upon encryption for security

Methods of e-commerce

- Business to consumer (B2C)
  - Targets consumers or end users, and sells products and/or services
    - Amazon.com, small business sites
- Business to business (B2B)
  - Helps organizations to manage relationships and transactions with other businesses
    - B2BExchange
- Consumer to consumer
  - Not a traditional B2C model
    - eBay

E-commerce technologies

- EFT (wire transfer)
  - Ability to transfer funds using computers rather than paper
  - Ensures:
    - Confidentiality of payment information
    - Integrity of payment information
    - Merchant authentication
    - Interoperability
- Automated Clearing House (ACH)
  - Governed in the United States by the National Automated Clearing House Association
  - Used in EFT
- Secure Electronic Transactions (SET)
  - Uses digital certificates to secure financial transactions
  - Public and private keys ensure encryption, data confidentiality and non-repudiation
  - Designed to allow both simple and complex transactions
- Open Trading Protocol (OTP)
  - Alternative to SET
    - An open standard
    - Used for B2C and B2B
    - Often used with XML

- Features
  - Provides trading protocol options to control the way that the trade occurs
  - Provides a record of a particular trade
  - Supports real and virtual delivery of goods and services (payment tracking)

Secure transactions

- SSL/TSL
  - Not a transaction method
  - Used to secure transactions
  - Services
    - Authentication
    - Data confidentiality
    - Data integrity
- Digital certificates
  - Enable host authentication before an SSL session begins
- Public Key Infrastructure (PKI)
  - A collection of individuals, networks and machines
  - Authoritatively confirm the identity of a person, host or organization
- The SSL/TLS handshake
  - Negotiation between the client and server
    - Negotiates the encryption key
    - Server authenticates client
    - Symmetric key is shared between the client and server
- Beginning an SSL/TLS session
  - Encryption begins after authentication
  - Issues:
    - Different host name
    - Certificate expired
    - Certificate date not yet valid
    - Invalid certificate format
    - Certificate presented by the server not signed by a recognized CA
    - Incompatible encryption settings

Global Environment

The Internet opens up avenues to potential international customers. As the global market continues to expand, the following issues must be addressed:

- Currency and Trade
  - Countries and Economic Blocks (European Union)
    - Uses its own currency
  - Businesses and Organizations
    - Automatically calculate exchange rates for the day of the transaction
    - Calculate taxes and tariffs on goods
- International Shipping
  - Issues
    - Customs searches
    - Costs incurred by customs
    - Delays caused by customs
  - All tariffs
  - Legal and regulatory issues
- Language Concerns
  - Considerations
    - The language(s) used by the target audience
    - The characters necessary (e.g., alphanumeric, mathematical or currency symbols)
  - Character sets and languages
    - Computers can use different character sets
    - Unicode

2.17. Demonstrate knowledge of languages commonly used to provide database connectivity to Web sites.

Server-side languages

PHP	An interpreted server-side scripting language for creating dynamic Web pages, embedded in HTML pages but usually executed on a Web server
Perl	Server-interpreted language
ASP	Microsoft's original server-side scripting solution
C	A procedural language usually used to create stand-alone applications and operating systems (e.g., UNIX/Linux). Can also be used for CGI
C++	Object-oriented language, not procedural, links data to the processes that manipulate it, creates reusable objects that can then be manipulated throughout the program, platform dependent: Must be compiled to a specific architecture
Java	Object-oriented, platform-independent Can run on any operating system that has the Java interpreter installed
VB	A compiled programming language developed by Microsoft Corporation Used for stand-alone applications and server-side Web applications Easier to use than C++ and Java
C#	Object-oriented, compiled, platform-dependent Used for Microsoft .NET program
SSI	An instruction inside of an XHTML/HTML page, directs the Web server to perform an action. An alternative to CGI

Client-side languages

- JavaScript
  - Object-based
  - Adds interactivity to Web pages
  - Can also be used on the server side (Server-Side JavaScript, SSJS)
- Function
  - Detect browsers
  - Create cookies
  - Create mouse rollovers

- VBScript
  - Microsoft's answer to JavaScript
  - Can be used on the client side or the server side
  - If used on the client side, only Internet Explorer can render the script

Common Gateway Interface (CGI)

- Helps Web pages pass information to and from databases
- Provides active content (e.g., hit counters)
- Provides dynamic content

The role of Structured Query Language in Web sites

SQL is used to create and maintain databases. SQL retrieves the data in the form requested by the web page.

- Structured Query Language (SQL)
  - Advanced powerful language for accessing databases
- Commands
  - SELECT -- requests data from a particular table or table row
  - FROM -- delimits the beginning search point in a table or table row
  - WHERE -- delimits the ending search point in a table or table row
  - JOIN -- creates a new table from selected data
  - SUM -- adds numerical information within records

Database connectivity technologies

- Connecting to a Database
  - Requires that web server and database recognize each other
    - Microsoft systems can use ODBC
    - Other methods include PHP scripts
  - Provide read and/or write permissions to the database
  - Provide scripts that have the correct permissions and execute privileges

Multiple tier applications

- Database Elements
  - Data
    - The database file, or multiple database files
  - Business logic
    - The SQL coding necessary to create relationships with the data stored in the database
  - Presentation
    - The way that data and business logic are presented on the user screen
- In n-tier, all three database elements are separated
  - Tier 1 -- the Web browser is responsible for presenting information
  - Tier 2 -- the Web server is responsible for the programming logic
  - Tier 3 -- the database server is responsible for housing data and transferring it to the Web server

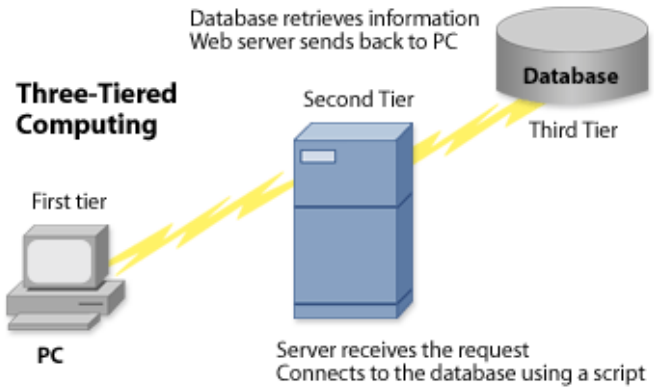


Figure 24

2.18. Identify the benefits and drawbacks of running your own Web server versus using a service provider.

Configuring your own hosting solution

- Benefits
  - Control over services
  - More choices
- Drawbacks
  - Purchase and house all hardware/software
  - Configure and manage all

Using an ISP

- Benefits
  - No hardware or software purchase
  - ISP configures server
- Drawbacks
  - Fewer configuration choices
  - Only given basic services

Using an ASP

- Benefits
  - No hardware or software purchase
  - Provides complete services
  - Creates custom solutions
- Drawbacks
  - More costly than ISP
  - Dependent on ASP's management and security

2.19. Identify common strategies for managing an end user's experience and improving site creativity.

Branding

A Web page is often part of a larger marketing and sales strategy. It aids in creating and ensuring brand recognition (name recognition) and presenting a strong company message. A Web site allows a company to create a market, a mind share and a brand.

2.20. Consider copyright and ethical issues when creating Web pages.

Ethical issues occur when outsourcing work. Ensure that when you provide Web development work to workers in remote locations that you require Non-Disclosure Agreements (NDAs) from each worker and get legal advice.

Domain 3: Network Technology Foundations – 30%

3.1. Demonstrate knowledge of basic data communications components, and demonstrate technical knowledge of the Internet.

- Basic network topologies
- OSI Reference Model
- TCP/IP essentials
- LAN and WAN definitions
- Internet infrastructure components
- Network Operations Center

Basic network topologies

- Bus Networks *(figure 25)*
    - All components use the same cable
    - Data is sent to everyone on the cable
    - Advantages: relatively simple and inexpensive
    - Disadvantages: a broken cable effects the entire network, when one node fails, all fail, and isolating problems can be difficult

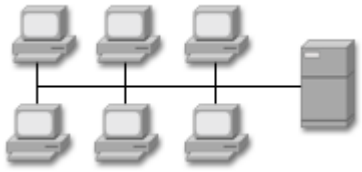


Figure 25

- Star Network *(figure 26)*
  - Network nodes are connected through a central device
  - When one node fails, the rest still function
  - Advantages: network expansion and reconfiguration is simple, and management and monitoring are centralized
  - Disadvantage: if the central device (hub) fails, the network fails

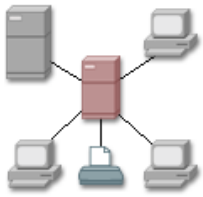


Figure 26

- Ring Network *(figure 27)*
  - No central connection point
  - Nodes connected to each other through ring
  - Connect through a Multistation Access Unit (MAU) on the ring
  - Advantages: All computers have access to data and perform well with heavy traffic
  - Disadvantages: Network expansion affects network operation

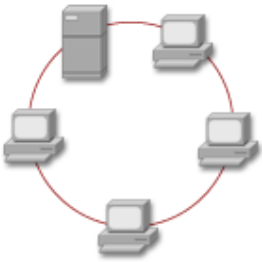


Figure 27

- Mesh Network *(figure 28)*
  - The Internet is an example of mesh topology
  - Devices are connected with multiple paths
  - The best path can be chosen
  - Advantages: if one connection fails, another connection sends the data
  - Disadvantage: hardware requirements increase costs

Figure 28

OSI Reference Model

The ISO (International Standards Organization) created the OSI (Open Systems Interconnection) model to outline networking. They defined the functions that must take place between machines in order to have a network, and broke them into seven distinct parts, or layers.

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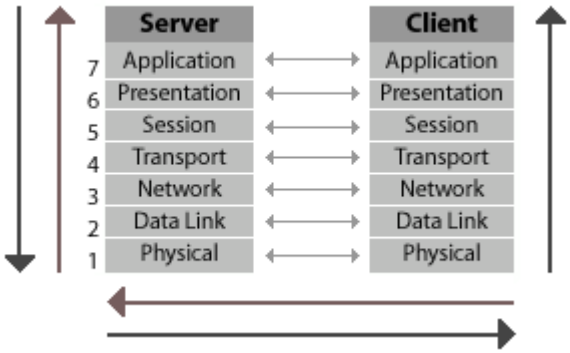


Figure 29

- Purpose
  - Reduces complexity
  - Standardizes interfaces
  - Facilitates modular engineering
  - Ensures interoperability
  - Accelerates evolution
  - Simplifies teaching and learning

Memorize this table

OSI Layer Name	Description	Protocols	Devices
7. Application	The Applications interface for networked communications.	SMB, HTTP, SMTP FTP, SNMP, WWW Telnet, AppleTalk	
6. Presentation	Responsible for encryption and data presentation.	HTTP, FTP, Telnet, SMTP, AFP, TDI, GIF, MPEG, JPG	
5. Session	Creates a connection between two endpoints and establishes an "end-to-end" bidirectional channel of communication.	NetBEUI, SPX, RPC, TCP, UDP (Port Numbering)	
4. Transport	Ensures the integrity of data sent between two locations.	IPX, UDP, NWLink, TCP, SPX, NetBEUI	
3. Network	Addresses logical locations.	IP, IPX, NWLink, NetBEUI	
2. Data Link	Encapsulates data into frames.	Ethernet, PPP, HDLC	
1. Physical	Physically moves the data over a hard wired line.	Ethernet, Token Ring, FDDI	

Networking Protocols

The following protocols address the OSI/RM architecture protocols. Note: TCP/IP uses more protocols than the OSI/RM.

Protocol terms

- Connection-Oriented (stateful)
  - Requires a connection at both ends before sending a packet across the network
- Connectionless (stateless)
  - Packet is sent without establishing a connection first

- Routable
  - TCP/IP and IPX/SPX
  - Travels through a router
- Non-routable
  - NetBEUI, NetBIOS, SNA, LAT, DLC
  - Uses predefined routes (static)

Protocols

- Transmission Control Protocol/Internet Protocol (TCP/IP) -- routable
  - Default collection of protocols for the Internet
  - TCP
    - Connection-oriented (stateful)
    - Ensures reliable communication
  - IP
    - Connectionless (stateless)
    - Provides addresses
  - User Datagram Protocol (UDP)
    - Connectionless (stateless)
- IPX/SPX -- routable
  - Created by Novell
  - IPX
    - Connectionless protocol
    - Responsible for addressing and forwarding packets
    - Operates at the network layer
  - SPX
    - Connection-oriented protocol
    - Provides reliability
    - Operates at the transport layer
- NetBEUI – non-routable protocol
  - Used for Microsoft peer-to-peer networks
- NetBIOS
  - Mainly used as a programming interface
- AppleTalk
  - Macintosh protocol divides networks into zones

TCP/IP essentials

TCP/IP (Internet Protocol Suite) came before an OSI model. All of the functions of networking are performed, but in a 4-layer model and not the 7 layers of OSI. To a great degree, the layers match up as shown below:

Memorize this table

OSI	TCP/IP	Protocols
Application	Application	HTTP, FTP, TFTP, TELNET, NNTP, SMTP, SNMP, DNS, BOOTP, DHCP
Presentation		
Session		
Transport	Transport	TCP, UDP
Network	Internet	IP, ICMP, IGMP, ARP, RARP
Data Link	Network Access	Ethernet, WAN, LAN
Physical		

TCP/UDP Ports

Some applications require a connection to be established between two computers before they can communicate, while others do not. For example, to retrieve a file from a server, a connection must be established. To send email that arrives several minutes later, a connection need not be established.

Applications requiring a connection use TCP (Transport Control Protocol), while those that do no use its counterpart, UDP (User Datagram Protocol). Port numbers are used by TCP/UDP to listen for and respond to requests for communications. Common port assignments are as follows:

- Ports
    - Contained in packet information
    - Used to direct the information to the correct destination
    - FTP = 21
    - HTTP = 80
    - DNS = 53
    - SMTP = 25
    - Well-known ports
        - 0 – 1023

    - Registered Ports
        - 1024 – 49151
    - Dynamic
        - 49152 - 65535

Protocol States

Before a protocol becomes a standard, it must go through four states.

- Experimental – not intended for operation except in experiment
- Proposed – testing and research stage
- Draft – test results are analyzed, feedback is requested
- Standard – becomes a standard
- Other states
    - Historic – protocols replaced by more recent ones
    - Informational – protocols developed outside of the IETF (usually by vendors)

Networks

Collections of computers designed for communication.

- Local Area Network (LAN)
    - A group of computers connected within a confined geographic area
    - Commonly used for intraoffice communication
- Wide Area Network (WAN)
    - A group of computers connected over an expansive geographic area
- Network Access Points (NAP)
    - Junction between high speed networks
    - Joins LANs and WANs together
    - Uses routers or switches
    - Internet backbones

3.2. Identify the role of networking hardware, and configure common hardware for operation.

Network Components

These are the hardware components required to connect the network.

- Network Interface Card (NIC)
  - Interface between the computer and the network
- Repeaters
  - Low level devices that amplify a signal, allowing it to travel farther
  - Operate at the physical layer
- Hub
  - Central component in a star network
  - Operates at the physical layer
- Bridge
  - Device that filters frames based on physical addresses (MAC)
  - Reduces network traffic by dividing the LAN into segments
  - Operates at the data link layer
- Routers
  - Forwards messages based on logical addresses(IP)
  - Used to connect LAN segments to WANs
  - Uses routing tables to track routes to other networks
  - Operates at the network layer
- Switches
  - Direct the flow of information from one node to another
  - Operates at layer 2, data link layer
  - Benefits:
    - Simple installation
    - Higher speeds
    - Bandwidth control
    - Creates logical computer groupings (VLAN)
    - More default security
- Gateways (protocol converters)
  - Operates at any layer
  - Connects networks running different protocols
- Channel Service/Data Service Unit (CSU/DSU)
  - Terminates physical connections
  - Used with T1 lines

- Modems
  - Device that translates analog (phone) signals into digital (computer) signals
- Patch Panels
  - Centralized connection point between cables from other locations can be connected to each other
- Firewall
  - Secure computer placed between a trusted and untrusted network
  - Acts as a barrier against malicious activity

Transmission Media

Media	Speed	Max. Distance	Types	Miscellaneous
Twisted Pair	10-100 Mbps	100 meters	STU UTP	Harder to install Prone to electromagnetic interference
Coaxial Cable	10 Mbps	500 meters 185 meters	Thicknet Thinnet	Not easily bendable
Fiber-optic Cable	100-1000 Mbps	1000 meters 3000 meters	Single mode Multi mode	Uses light signals No electromagnetic interference issues
Wireless	11-54 Mbps	No limit	Single mode Multi mode	Used in cell phones, pagers, computers

LAN Standards

IEEE 802.2	Divides the OSI Data Link layer into two sublayers: LLC and MAC
Ethernet/IEEE 802.3	All Ethernet LANs
IEEE 802.3u	Fast Ethernet
IEEE 802.3z and 802.3ab	Gigabit Ethernet
IEEE 802.5	Token Ring
IEEE 802.12	100VG-AnyLAN, Supports access method called demand priority

WAN Standards

X.25	Original packet-switching from ARPANET. Uses fast packet switching on the Internet.
Frame relay	Uses fiber-optic and digital cabling, variable length packets, Permanent Virtual Circuits (PVC) and logical end-to-end connections. Operates at 64Kbps – 1.544 Mbps
ATM	Use both LAN and WAN, fixed-length packets, and operates at 155 – 622 Mbps

T and E-Carrier System

The T-carrier system is the digital transmission format for North America and the E-carrier system is the European equivalent.

T-Carrier	Data Transfer Rate
T1	1.544 Mbps
T2	6.312 Mbps
T3	44.736 Mbps
T4	274.176 Mbps

E-Carrier	Data Transfer Rate
E1	2.048 Mbps
E2	8.448 Mbps
E3	34.368 Mbps
E4	139.264 Mbps
E5	565.148 Mbps

Routing

IP requires routing. This is when a path is chosen by a router to move packets between networks. There are two types of routing and several protocols *(figure 30)*.

- Direct Routing
  - Sends information to hosts within the same physical network
- Indirect Routing
  - Packets move between outside networks, requiring a router

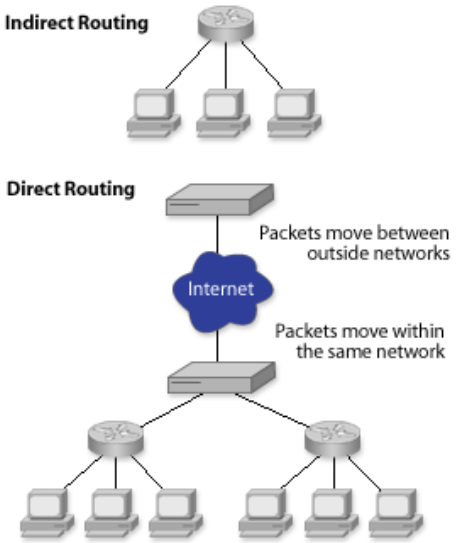


Figure 30

Routing Protocols

- Interior Protocols
  - Used within a company network
    - RIP
  - Protocol that maintains the best closest route to a destination
    - OSPF
  - Protocol that uses bandwidth, connections and security to determine the best route to a destination
- Exterior Protocols
  - Used outside a company network
  - EGP, BGP

3.3. Identify the relationship between IP addresses and domain names, including: assignment of IP addresses within a subnet.

- IP addressing
- Valid IP addresses
- Public and private IP addresses
- Subnet masking
- Classless Interdomain Routing (CIDR)
- Ipv6

IP Addressing

IPv4 addresses are 32-bit binary numbers. Because numbers of such magnitude are difficult to work with, they are divided into four octets (eight bits) and converted to digital. Thus, the binary string "01010101" becomes 85. This is important because the limits on the size of the digital number are placed there by the reality that it is just a representation of a binary number. The range must be from 0 (00000000) to 255 (11111111) per octet, making the lowest possible IP address:

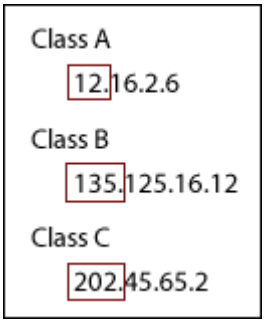


Figure 31

Address Form

- Contains the network portion (N) and host portion (h)
- Consists of four 8-bit fields (octets) – total 32 bits
- Uses dot notation
    - 125.25.2.0
    - First value (octet) determines the address class

Class	Form/Purpose	Range
A	N.h.h.h	1–126
B	N.N.h.h	128–191
C	N.N.N.h	192–223
D	multicasting	224 – 239
E	future use	240 – 247
Loopback	troubleshooting	127
Broadcast	broadcasts to all	255
Reserved	private networks	10, 172, and 192

Public and Private Networks

Public networks use public IP addresses assigned to them. You are required to have a public address to communicate on the Internet. Private addresses are used within a network.

Subnetting

Subnetting *(figure 32)* your network is the process of taking the total number of hosts available to you, and dividing it into smaller networks. When you configure TCP/IP on a host, you must use the following:

- A unique IP address
- A default gateway (router) address
- A subnet mask

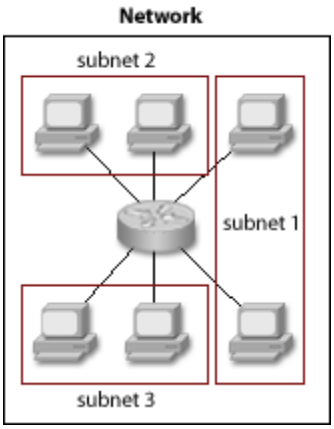


Figure 32

Subnet Masks (net mask)

- 32 bit address similar to IP
- Distinguishes network and host portion of IP address
- 255 placed into the network portion of the address
- Class A 255.0.0.0
- Class B 255.255.0.0
- Class C 255.255.255.0

$$\frac{1}{128}\ \frac{1}{64}\ \frac{1}{32}\ \frac{1}{16}\ \frac{1}{8}\ \frac{1}{4}\ \frac{1}{2}\ \frac{1}{1}$$

Internet Addressing

- Decimal Form: 125.25.2.0
  - Contains the network portion (N) and host portion (h)
  - Composed of 4 decimal values divided by dot notation
- Binary Form: 01111101.00011001.00000010.00000000
  - Consists of four 8-bit fields (octets) = total 32 bits
  - Each field represents a value
- ANDing
  - Adding the subnet mask to the IP address in binary form

IP Address: 11011011.11000101.00000011.11110001 = 219.197.3.241
Subnet Mask: 11111111.11111111.11111111.00000000 = 255.255.255.0
Result: 11011011.11000101.00000011.00000000 = 219.197.3.0

IPv4 vs. IPv6

Internet growth has produced a shortage of IPv4 addresses which has prompted a change in the addressing schema. This change, called Internet Protocol v6, is contrasted with IPv4 below:

- Shortcomings of IPv4 201.156.14.2
  - Limited address space
  - Lack of security
  - Speed problems
  - Configuration problems
- Strengths of IPv6 2E22:4D00:001E:00D0:A267:97FF:RE6B:FE34
  - More efficient and requires less administrative overhead than IPv4
  - Provides a practically unlimited number of IP addresses
  - Less dependent on routers

3.4. Identify the functions and components of servers commonly used on the Internet.

Internetworking Server Types

Server	Description
File and Print	File: stores data files and programs that can be shared by network users. Print: allows multiple users to send print jobs to the same physical printer.
DNS	A distributed database used on the Internet to translate host computer names into IP addresses and matches the IP address to the Internet URL.
Proxy	An intermediary between a network host and other hosts outside the network. Provides enhanced security, manages TCP/IP addresses, speeds Internet access by caching Web documents and replaces network IP address with another, contingent address.
FTP	Uploads and downloads files. It is faster than email and HTTP. Files of 2 MB or greater should be transferred by FTP.
HTTP	Acts as delivery system by requesting documents from web servers. Uses the MIME (Multipurpose Internet Mail Extensions) protocol to identify files types, and encodes and decodes the files.
Database	Presents relational databases and makes it possible for remote individuals to access the data. Uses SQL to create, maintain and query databases.
News	Uses Network News Transfer Protocol (NNTP) to post information online in a hierarchical form. Creates secure newsgroups by enabling user-specific password protection or by using an SSL session.
Certificate	Validates or certifies keys (calculated text strings used for security).
Directory	Identifies all resources on a network, and then makes them available to authenticated users. Enables a company to reuse information in its directory. Protocols: X.500: used to manage user and resource directories. Provides scalability, synchronization and replication. LDAP: TCP/IP protocol that allows communication on both intranets and the Internet.
Media	Provides streaming audio and video over a network. Uses UDP (connectionless protocol) ports and buffers to achieve the effect of a real-time connection.
Transaction	Guarantees that all required databases are updated when a transaction takes place.
Mail	Stores/forwards e-mail messages using protocols: SMTP – sends email; POP – receives email; IMAP – stores and forwards email.
Mailing list	Forwards an e-mail message to every member on a distribution list.
Catalog	Indexes databases, files and information and allow keyword, Boolean and other searches.

3.5. Identify common Internet security and availability issues, including: user-level and enterprise-level concerns.

Network Attack Types

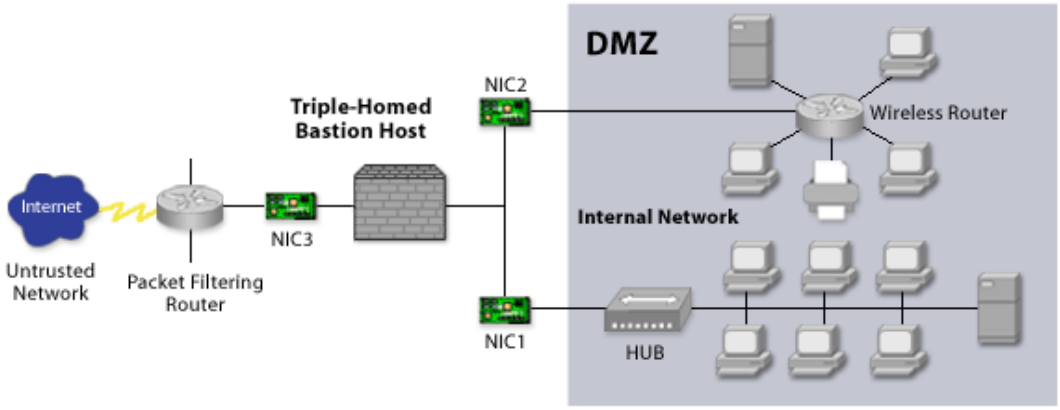
- Spoofing (masquerade)
  - Host or program assumes an identity of a network device
  - Victims assume they are communicating with legitimate source
- Man-in-the-middle (hijacking)
  - Packet sniffing – intercepts data
  - Connection hijacking – completes a connection
  - Replay – modifies a message to resend it to someone else
- Denial-of-service (DOS)
  - A system is flooded with packets
  - Result: system shuts down
- Distributed Denial-of-service (DDOS)
  - Use multiple applications to flood the system
  - Result: system server data connection down
- Brute force
  - Attempts to break the authentication code to access the system (logon and passwords)
  - Uses random values
- Dictionary
  - Repeated attempts to guess a password
  - Uses a file of words
- Back door
  - Commands allow access to system
- Buffer overflow
  - Occurs when a legitimate application exceeds the memory buffer allocated to the OS
- Trojan horse
  - Hides a command within a common function to cause a breach in security
- Social engineering
  - Convinces people to reveal sensitive information
- Virus
  - Malicious program designed to damage computers, networks
  - Types
    - Macros/script – in Microsoft Word or Excel
    - File infecting – attaches to executable files

        - Boot sector – copies to boot sector, resides in memory
        - Stealth – redirects hard drive requests from anti-virus software
        - Polymorphic – executes differently every time it runs
        - Retro – specifically attacks anti-virus software
- Worm
    - Similar to virus
    - Replicates in order to use up system resources

OSI/RM security services

- Authentication
    - Methods
    - What you know – using passwords
        - Strong passwords: upper, lower case letters, numbers, non-alphanumeric characters, etc.
        - No nicknames or personal info, no repeated letters or digits
    - What you have – using a physical key
    - What you are – using fingerprints, signatures, etc.
- Encryption (see Domain 1)
    - Symmetric
    - Asymmetric
    - Hash function
- Virtual Private Network (VPN)
    - Allows secure communication across long distances, usually for a company extranet
    - Transmits data using encapsulation (tunneling)
        - Encryption occurs at the source and decryption occurs at the destination
- Remote Access Server (RAS)
    - Uses dial-up modems to dial up, connect and log on to RAS
    - Offers security through a callback feature
- Digital Certificates
    - Provide authoritative identification
    - Verify the sender's identity
    - Generated and authenticated by a certificate server
    - A third party verifies the legitimacy of the certificate
- PKI Certificate Authority servers
    - Are repositories for managing digital certificates
    - Enable the secure creation and management of digital certificates

    - Provide the ability to revoke an invalid key
- Firewalls – acts as a choke point
    - Secure computer system placed between a trusted and untrusted network (Internet)
    - Filters packets, detects intrusions, provides enhanced password authentication
    - Types
        - Packet filtering – inspects each packet for predefined content
        - Internal firewall – resides inside your company's internal network
        - Proxy – replaces the network IP address with a single IP address
        - Circuit-level gateway – Acts as a proxy between the Internet and your internal systems
        - Application-level gateway – Same as a circuit-level gateway but at the application level
- Network Access Translation
    - The practice of hiding internal IP addresses from the external network
- Security Zones
    - DMZ
        - A mini-network that resides between a company's internal network and the external network
    - Intranet
        - A security zone available only to authorized organization employees
    - Extranet
        - A private network that allows selected access to outsiders only after they provide authentication information
    - VLAN
        - A logical grouping of hosts, generally not implemented by a firewall
- Firewall topologies
    - Packet filter
    - Dual-homed bastion host
        - Computer with two NICs with IP forwarding disabled
    - Triple-homed bastion host
        - Separates the Internet, intranet with the demilitarized zone



- Screened subnet (back-to-back firewalls)
  - Uses external and internal routers

3.6. Identify common performance issues affecting Internet clients, including: analysis, diagnosis.

TCP/IP workstation configuration

- Requirements
  - IP address, subnet mask, default gateway, the router's address
- TCP/IP Services
  - Domain Name System (DNS)
    - Resolves names to IP addresses
  - Windows Internet Naming Service (WINS)
    - Legacy name resolution
    - Provides a NETBIOS name and receives an IP address
- Dynamic Host Configuration Protocol (DHCP)
  - Automated IP address assignment from a server
- Automatic Private IP Addressing (APIPA)
  - Creates a private address when an address from a DHCP server is unavailable

Diagnostic tools

- Ping: determines connectivity between source and destination
- Tracert or Traceroute: determines the path between source and destination
- Netstat: displays the contents of network data structures

- Ipconfig (WinNT, 2K or XP) winipcfg (Win 95, 98, Me)
  - Displays the physical address, the IP address, subnet mask and default gateway
- Network Analyzers: Captures data as it moves through the network

3.7. Perform basic hardware and system maintenance for network-aware systems.

Computer system maintenance

- Fix hardware problems
  - Components are plugged in
  - Components are turned on
  - Components are connected properly in order to operate (such as connecting the keyboard to the computer)
- Periodically clean hardware components
  - CD-ROMs
    - Keep the drives closed when they are not in use
    - Check all media for foreign matter before inserting into the drive
    - Handle disks only by the edges
    - Avoid scratching the disc surface
    - Never directly touch or try to manually clean the laser
    - Brush away and vacuum accumulated dust
    - Manually eject a stuck disc by inserting a wire into the small hole on the face of the drive, then pressing hard until the disc is ejected
- Establish a preventive maintenance plan

Computer system components

- Mainboard
  - Main circuit board in a computer
  - Must be securely fastened to system chassis
  - Should never touch anything metal, except through proper connections
- Interrupt Requests (IRQs)
  - Hardware lines used to identify when a device wants to communicate with the processor
- I/O address
  - Memory location that allows the system processor and system devices to communicate
- Direct Memory Access (DMA)
  - Allows a device to access system memory directly, bypassing the processor

- Common Interfaces – used to communicate between storage devices and mainboard
  - IDE/EIDE
    - IDE is also known as Advanced Technology Attachment (ATA)
    - IDE/EIDE interface cables are long, thin and gray in appearance
    - EIDE (ATA-2) is an enhanced version of IDE that provides higher drive capacities
  - SATA
    - Provides faster speeds than standard ATA
  - SCSI
    - Multiple devices can be connected to a single controller in a daisy chain configuration
    - SCSI daisy chain must be terminated at both ends, and only at the ends
- NIC (transceiver) (*figure 33*)
  - Network devices must have a network interface card (or network adapter card)
  - Makes the physical connection between the device and the network cabling
  - Converts the data from the computer into a format appropriate for transmission over the network

Figure 33

- Peripheral Ports
  - PS/2-style ports
    - Mouse and keyboard
  - Serial ports:
    - Communicate using serial asynchronous communication
    - Used for serial communication devices
  - Parallel ports:
    - Communicate using parallel communication
    - Used for parallel communication devices
  - USB ports:
    - Communicate using serial communication
    - Support as many as 127 peripheral devices in a daisy chain configuration

    - FireWire (IEEE 1394):
        - A high-speed serial interface to which you can daisy chain as many as 63 peripheral devices
        - Good for devices that need to transfer large amounts of data
- CD-ROM
    - An optical storage device from which data can be read only
- Writable CD-ROM
    - Creates, or "burns," data and audio CDs
- DVD
    - Optical storage device from which data can be read only
    - Similar to CD-ROMs but have higher storage capacity

3.8. Manage fundamental elements of modern network-based client operating systems.

Software Licensing

Purchasing software provides the rights to use the software, not the ownership. Read the license carefully to ensure that you are not infringing on copyright. In addition, if the software is unlicensed you will not have documentation, warranties, product support and may open system to viruses.

Partitions and logical drives

Recovering from a disk failure or installing new operating system software, you will have to partition your disk and identify logical drives. (See *figure 34*)

- Disk Partition
    - Divide the disk storage space
    - Primary partition
        - The system's boot drive, used for system startup
    - Extended partition
        - The remaining drive space after you create the primary partition
- Logical Drives
    - Each partition must be assigned a logical drive identifier
    - A primary partition is treated as a single logical drive
    - An extended partition can be divided into multiple logical drives (drives D and E in figure)

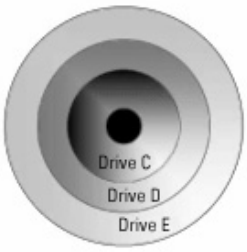


Figure 34

- File system Types
  - FAT, FAT32
    - Not a secure format
  - NTFS (Windows)
    - Allows permission bits to be set on system resources
    - Protects files so that only certain users or groups of users can read them
  - Ext3 and ReiserFS (Linux)

File system management tools

These tools will help maintain the hard drives. Maintaining your hard drive will result in more efficient performance.

- Disk Defragmenter
  - Recombines the files in a contiguous cluster
    - As files are created and deleted, a partition can become severely fragmented
    - Fragmented files are no longer located in contiguous clusters
- Chkdsk Utility
  - Create and display a status report for a disk based on its file system
  - List and correct errors on the disk
  - Display the status of the disk in the current drive
- Disk Cleanup Utility
  - Recovers disk space by removing temporary files, unused applications, files in the Recycle Bin, files downloaded as part of Web pages or files created when Chkdsk attempted to recover lost file fragments
  - Compresses files
- Backup and Restore
  - Stores copies of folders and files to a source other than the computer's hard
  - Ensure that data can be recovered if a hard drive fails

Remote management and troubleshooting

- Telnet
  - TCP/IP command that establishes a remote connection with a server
- Secure Shell (SSH)
  - Protocol and command interface that can gain secure access to a remote computer
- Virtual Network Computing (VNC)
  - Program that controls a remote computer
  - Two components
  - A server that listens to a specific port
  - The viewer, which shows the remote system's logon environment
- Remote Desktop
  - Windows XP service used to gain access to a Windows session that is running on another computer
    - Allows multiple users to have active sessions on a single computer
    - Allows you to switch from one user to another on the same computer
- Remote Assistance
  - Windows XP service used to seek help from a remote user

3.9. Configure and troubleshoot wireless networks.

Wireless Network Technologies

Note: the difference between cabled and wireless networks is the medium.

- Wireless Access Point (WAP)
  - Central access point
  - Acts like a hub or switch

- WAP security features
  - Wired Equivalency Privacy (WEP)
  - Encryption in 64 – 256bit keys
  - MAC address filtering
  - Allows only certain MAC addresses to access the network

Transmission Types

- Synchronous Transmission
  - Devices share a transmission clock and rate
- Asynchronous Transmission
  - No clock, not synchronized with another device
- Data transmission flow (*figure 35*)
  - Simplex – data travels in one direction only
  - Half duplex (modems, walkie-talkies, Ethernet) – travels in 2 directions, one direction at a time
  - Full Duplex (Fast Ethernet) – travels in 2 directions at the same time
- Baseband Transmission
  - Uses the entire bandwidth for a single channel (digital)
- Broadband Transmission
  - Divides the media into multiple channels (analog)
- Logical Topologies
  - Signal's actual path over a network (think signal)
- Physical Topologies
  - The layout of the network's device connections (think media)

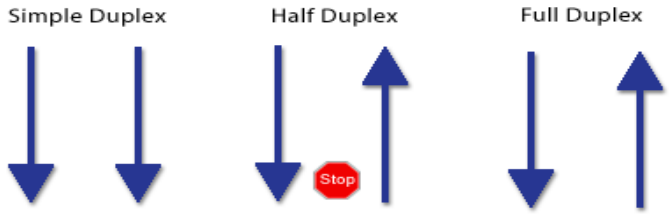


Figure 35

3.10. Manage career opportunities in the IT industry.

Prepare for your career

- Conduct job searches
- Use usenets
- Create an electronic resume
- Research career types

Practice Questions

Chapter 1 Internet Business Foundations

1. Martin is charged with getting the hospital's new Imaging Center online. He needs to decide the type of Internet connection will work best. He must have connection speeds of at least 512Kbps and not require new wiring. What is the best choice for this environment?

   Select the best answer.

   - ❍ A. Cable modem
   - ❍ B. Wireless
   - ❍ C. DSL
   - ❍ D. T1

2. Diane is trying to connect to a site on the Internet by using the address: http://www.mysite.com. When she types it into the address bar, a page comes up telling her that the Web site can not be found. What could be wrong?

   Select the best answer.

   - ❍ A. The domain name server cannot resolve the address
   - ❍ B. The address is a relative URL.
   - ❍ C. The default home page is missing.
   - ❍ D. The top level domain is unavailable.

3. When would a web designer create a site that operates in an intranet?

   Select the best answer.

   - ❍ A. When the employees need to access a Web site designed only for employees that resides within the company.
   - ❍ B. When employees need to access the company website from home.
   - ❍ C. When employees need to print documents.
   - ❍ D. When employees need to do research online.

4. Genna needs to troubleshoot a software issue on a client's computer that is located in another state. What is the best way to do this?

   Select the best answer.

   - ❍ A. Use an FTP server.
   - ❍ B. Use a VNC server.
   - ❍ C. Use an LDAP server.
   - ❍ D. Use an Instant Messaging client.

5. Mary is setting up a phone directory of all the company employees. What should she use to launch the directory?

Select the best answer.

- ❍ A. LDAP
- ❍ B. CVS
- ❍ C. P2P
- ❍ D. VNC

6. What could be done to speed up internet access for company employees?

Select the best answer.

- ❍ A. Install a firewall.
- ❍ B. Configure the browser to accept ActiveX controls.
- ❍ C. Install a proxy server.
- ❍ D. Disable history caching.

7. What encryption method uses a 160-bit key?

Select the best answer.

- ❍ A. Asymmetric key
- ❍ B. Message digest
- ❍ C. Digital certificate
- ❍ D. Symmetric key

8. XYZ's network administrator has noticed a marked decrease in memory and hard drive space. What could be happening?

Select the best answer.

- ❍ A. The system is under attack by a virus.
- ❍ B. The system is inundated by spyware.
- ❍ C. The system's cookie files are corrupted.
- ❍ D. The system contains a worm.

9. Mary is searching for purple shoes. She types purple And shoes in the search box. The results are not what she expected. What should she do to get the correct results?

Select the best answer.

- ❍ A. Capitalize "and."
- ❍ B. Capitalize purple.
- ❍ C. Use NOT as the Boolean Operator.
- ❍ D. Use OR as the Boolean Operator.

Chapter 2 Site Development Foundations

1. Why is it necessary to place the <!DOCTYPE> tag at the top of an XHTML document?
Select the best answer.

- ❍ A. Because it is the current web requirement.
- ❍ B. Because it supports the non-HTML in the page.
- ❍ C. Because it allows the use of a markup validator.
- ❍ D. Because it makes the page accessible to all.

2. Which of the following is the correct code for specifying a triangle hot spot?
Select the best answer.

- ❍ A. < area shape="rect" coords ="12,52,45,60" href="mine.htm">
- ❍ B. < area shape ="rect" coords="12,52,45,60,15,75" href ="mine.htm">
- ❍ C. < area shape ="poly" coords ="12,52,45,60,15,75" href ="mine.htm">
- ❍ D. < area shape ="poly" coords ="12,52,45,60" href ="mine.htm">

3. Marty created an informational web page that is 12 pages long. He wants his readers to be able to read different sections without scrolling up and down the page. How can he best accomplish this?
Select the best answer.

- ❍ A. Make each section heading a link.
- ❍ B. Make each section heading a bookmark and create navigation links at the top of the page.
- ❍ C. Make each section heading a bookmark.
- ❍ D. Make each section heading a link and create navigation links at the top of the page.

4. Which table attribute was used in creating the image in the exhibit?
Select the best answer.

- ❍ A. colspan
- ❍ B. rowspan
- ❍ C. alt
- ❍ D. frameset

Exhibit(s):

5. Zana wants to create a one-question exit survey. She needs to find out if her Web site has been helpful. She also wants to insure that the survey-taker has only four choices and can only choose one. What form element will offer the most control over the responses?

   Select the best answer.

   - ❍ A. Checkbox
   - ❍ B. Radio button
   - ❍ C. Text box
   - ❍ D. Text area box

6. The base target frame is placed...
   Select the best answer.

   - ❍ A. Between the beginning and ending head tags.
   - ❍ B. Between the beginning and ending body tags.
   - ❍ C. Between the beginning and ending frame source tags.
   - ❍ D. Between the beginning and ending frameset tags.

7. What is required to be XML compliant?
   Select the best answer.

   - ❍ A. The document must be valid, transitional and contain a DTD statement.
   - ❍ B. The document must be valid, transitional and contain a root statement.
   - ❍ C. The document must be valid, well-formed and contain a DTD statement.
   - ❍ D. The document must be valid, well-formed and contain a function statement.

8. Which tags will override linked style sheets?
   Select the best answer.

   - ❍ A. style and doctype
   - ❍ B. Style and font
   - ❍ C. style and format
   - ❍ D. style and list

9. Bob is a network administrator who wants to determine the network's connection speed. How can he determine this?

   Select the best answer.

   - ❍ A. Divide the download time by the network speed.
   - ❍ B. Divide the file size by the download time.
   - ❍ C. Divide the file size by the modem speed.
   - ❍ D. Divide the download time by the modem speed.

Chapter 3 Networking Technology Foundations

1. Jerry is setting up a network at home. He has five computers and wants to share a printer. Which type of network design will work best?

   Select the best answer.

   - ❍ A. Star
   - ❍ B. Bus
   - ❍ C. Mesh
   - ❍ D. Hybrid

2. Which layer of the OSI/RM ensures that data is error-free when it reaches its destination?

   Select the best answer.

   - ❍ A. Layer 7
   - ❍ B. Layer 6
   - ❍ C. Layer 5
   - ❍ D. Layer 4

3. A router operates at the _____ layer of the OSI/RM.

   Select the best answer.

   - ❍ A. Network
   - ❍ B. Data link
   - ❍ C. Transport
   - ❍ D. Physical

4. What is a packet?
   Select the best answer.

   - ❍ A. A protocol that enables information to be sent across a network.
   - ❍ B. Another name for an e-mail message.
   - ❍ C. A fixed piece of information sent across a network.
   - ❍ D. A protocol that sends e-mail messages.

5. What is a subnet mask?

   Select the best answer.

   - ❍ A. A 28-bit address that translates IP addresses.
   - ❍ B. An IP address containing 255 in the host portion.
   - ❍ C. A 32-bit address that translates MAC addresses.
   - ❍ D. A 32-bit address that translates IP addresses.

6. Which of the following is a Class B address?

Select the best answer.

- ❍ A. NNNNNNNN.NNNNNNNN.NNNNNNNN.NNNNNNNN
- ❍ B. NNNNNNNN.NNNNNNNN.hhhhhhhh.hhhhhhhh
- ❍ C. NNNNNNNN.hhhhhhhh.hhhhhhhh..hhhhhhhh
- ❍ D. NNNNNNNN.NNNNNNNN.NNNNNNNN.hhhhhhhh

7. Jerome is setting up a firewall for the company. The computer that connects to the firewall contains two NICs. Which type of firewall will work best with the existing equipment?
Select the best answer.

- ❍ A. Dual-homed bastion
- ❍ B. Packet filter
- ❍ C. Triple-homed bastion
- ❍ D. Secured subnet

Answers and Explanations

Chapter 1

1. Answer: C

Explanation A. Incorrect. Although this reaches the correct speed, cable would have to be put in to accommodate everyone.

Explanation B. Incorrect. Wireless connections interfere with hospital equipment.

Explanation C. Correct. This provides the bandwidth and can be run through existing phone lines.

Explanation D. Incorrect. Although this would work with existing telephone lines, it is more than is required.

2. Answer: A

Explanation A. Correct. A domain server must resolve the written name into an IP address in order to connect.

Explanation B. Incorrect. The address is an absolute URL containing the entire address.

Explanation C. Incorrect. The error that would be occur would be a 404 error code, saying the page is not available.

Explanation D. Incorrect. Top level domains are always available.

3. Answer: A

Explanation A. Correct. Intranets serve up web pages behind the company firewall.

Explanation B. Incorrect. An extranet would accomplish this.

Explanation C. Incorrect. This is handled by the company network.

Explanation D. Incorrect. An Internet connection is all that is needed.

4. Answer: B

Explanation A. Incorrect. That is only useful for transferring files.

Explanation B. Correct. This allows Genna to control and work with the other computer regardless of the distance.

Explanation C. Incorrect. This serves up contact information.

Explanation D. Incorrect. This allows her to converse but not fix.

5. Answer: A

Explanation A. Correct. This is the Lightweight Directory Access Protocol that companies use to organize employee contact information.

Explanation B. Incorrect. This controls versions in software development.

Explanation C. Incorrect. This is a shared network type.

Explanation D. Incorrect. That allows connection to another computer.

6. Answer: C

Explanation A. Incorrect. Firewalls must evaluate each packet and results in slowing.

Explanation B. Incorrect. This is not a good idea from the standpoint of security.

Explanation C. Correct. A proxy server will cache documents allowing quicker access to Web pages.

Explanation D. Incorrect. This will not effect performance, only limit the amount of history information available.

7. Answer: B

Explanation A. Incorrect. This one uses an RSA algorithm that does not support 160-bit keys.

Explanation B. Correct. Yes this is the hash function and when using the SHA algorithm, it encrypts with 160-bits.

Explanation C. Incorrect. This authenticates, not encrypts.

Explanation D. Incorrect. This one uses the same key to encrypt and decrypt.

8. Answer: D

Explanation A. Incorrect. A virus infection would not impact memory allocation.

Explanation B. Incorrect. Spyware would not fill up a hard disk.

Explanation C. Incorrect. Cookie files are text files that collect information.

Explanation D. Correct. Worms use up system resources.

9. Answer: A

Explanation A. Correct. Boolean operators should always be capitalized.

Explanation B. Incorrect. That will produce poorer results. Search terms should be in lowercase only.

Explanation C. Incorrect. This will exclude one criteria of the search.

Explanation D. Incorrect. This will exclude one criteria of the search.

Chapter 2

1. Answer: C

Explanation A. Incorrect. This is not the case at this time.

Explanation B. Incorrect. That is not the purpose of the doctype tag.

Explanation C. Correct.

Explanation D. Incorrect. Accessibility requires more than this tag.

2. Answer: C

Explanation A. Incorrect: This code contains a code for a rectangle.

Explanation B. Incorrect. This code contains the code for a rectangle and too many coordinates.

Explanation C. Correct. Shape is poly with 3 sets of coordinates.

Explanation D. Incorrect. The correct shape is specified but the number of coordinates is wrong.

3. Answer: B

Explanation A. Incorrect: That only creates the link.

Explanation B. Correct. This will allow the navigation to link to the bookmark.

Explanation C. Incorrect. There needs to be a link to the bookmark.

Explanation D. Incorrect. Links are not used to reference other links within a page

4. Answer: A

Explanation A. Correct. This table contains a row that spans 3 columns.

Explanation B. Incorrect. This attribute spans rows, not columns.

Explanation C. Incorrect. This tag gives images names for screen readers.

Explanation D. Incorrect: This tag is used to create a frame.

5. Answer: B

Explanation A. Incorrect. This allows multiple choices.

Explanation B. Correct. This forces the reader into only one choice.

Explanation C. Incorrect. She cannot control what is placed into the text box.

Explanation D. Incorrect. This does not afford sufficient control over the information.

6. Answer: A

Explanation A. Correct. This tag resides in the head region of the document.

Explanation B. Incorrect. The base target frame is placed in the head region of the document.

Explanation C. Incorrect. The base target frame is placed in the head region of the document.

Explanation D. Incorrect. The base target frame is placed in the head region of the document.

7. Answer: C

Explanation A. Incorrect. Transitional is a flavor of XHTML.

Explanation B. Incorrect. Form is imparted through the root statement, transitional is a flavor.

Explanation C. Correct. All these must be in place to be compliant.

Explanation D. Incorrect. The tree structure is not necessary.

8. Answer: B

Explanation A. Incorrect.

Explanation B. Correct. Yes, placed in the body, they will override style sheet specifications.

Explanation C. Incorrect. Format is not a tag.

Explanation D. Incorrect.

9. Answer: C

Explanation A. Incorrect. This is a wrong calculation.

Explanation B. Incorrect. This is a wrong calculation.

Explanation C. Correct. This calculation will provide the speed of the network.

Explanation D. Incorrect. This is a wrong calculation.

Chapter 3

1. Answer: B

Explanation A. Incorrect. This type of network requires a central hub.

Explanation B. Correct. A bus network is limited to 10 devices and is easy to set up.

Explanation C. Incorrect. This is designed for redundancy. It is not needed on a small network.

Explanation D. Incorrect. Hybrids exist when adding to an existing network.

2. Answer: D

Explanation A. Incorrect. This is the application layer which provides services to applications outside the OSI model.

Explanation B. Incorrect. This is the presentation layer that provides transformationson data so that it is presentable.

Explanation C. Incorrect. This is the session layer that establishes, manages, and terminates sessions.

Explanation D. Correct. The data link layer is responsible for error checking.

3. Answer: A

Explanation A. Correct. Routers operate at layer 3 in OSI/RM.

Explanation B. Incorrect. This works with Layer 2 switches.

Explanation C. Incorrect. The transport layer does not support devices.

Explanation D. Incorrect. Hubs operate at this layer.

4. Answer: C

Explanation A. Incorrect. A packet is not a protocol.

Explanation B. Incorrect.

Explanation C. Correct. Packets are moved across the network and transferred between devices.

Explanation D. Incorrect. A packet is not a protocol.

5. Answer: D

Explanation A. Incorrect. IP addresses are 32-bit.

Explanation B. Incorrect. The 255 is placed in the network portion.

Explanation C. Incorrect. Translates IP addresses not MAC.

Explanation D. Correct.

6. Answer: B

Explanation A. Incorrect. This class does not exist.

Explanation B. Correct. A class B has the form N.N.h.h Each value represents 8 bits.

Explanation C. Incorrect. This is class A.

Explanation D. Incorrect. This is class C.

7. Answer: A

Explanation A. Correct. With IP forwarding disabled this makes the firewall setup of choice.

Explanation B. Incorrect. This is a basic firewall configuration.

Explanation C. Incorrect. This type requires three NICs on separate devices.

Explanation D. Incorrect. Would require external and internal routers.