Chapter 1- Why Computers Matter to You: Becoming Computer Literate

- Information technology: is a field of study focused on managing and processing information and the automatic retrieval of information.
- A study from the National Research Council concludes that by year 2030 computers will displace humans in 60 percent of the current occupations.
- Data Mining: is the process of searching huge amounts of data with the hope of finding a pattern. Allows retailers to respond to consumer buying patterns.
    - Can keep track of purchases customers are making, along with their geographical data, past buying history and list of items they examined but did not buy
- Can be translated into extremely specific marketing that is immediate and customized to your shopping experience. This is the motivation behind discount cards at grocery and drug stores. Take personal information in exchange for better/discounted price.
- United Parcel Service (UPS) handles more than 3.9 billion packages and letters a year… highly efficient package tracking starts when the sender drops off a package and the company creates a "smart label" for the package. In addition to the standard postal bar code and bar code showing UPS customer numbers, this smart label contains something called a Maxicode. The maxicode is a specifically designed, scannable sticker that resembles an inkblot and contains all the important information about the package (class of service/ destination etc). In processing centers, UPS workers scan the maxicode using a portable handheld device, which uses Bluetooth technology, a type of wireless communication, to transmit the scanned data through radio waves to a terminal. This terminal then sends the data across a wireless network, where it is recorded in the UPS database.
- A live dancer can be wired with sensors that are connected to a computer that captures the dancers' movements. Based on the data it collects, the computer generates a virtual dancer on a screen.
- Video games are extremely popular, with sales exceeding the movie industry. Mastering software animation tools, such as 3ds Max, will enable you to create characters and games.
- Schools need computers! Teachers and students both use computers for marking doing quizzes, homework, research etc.
- For Law, there is computer forensics, a specialty that analyzes computer systems with specific techniques to gather potential legal evidence (checking suspect's search engines, pulling up videos, conversations etc)
- Digital home: means to have an appropriate computer and digital devices that are all connected to a home network.
    - **Media computer**… its is the nerve center of any digital home, allowing you to interface with all the different digital devices you have connected to the network. A PC based computer should be equipped with the current version of Microsoft Windows 7 or Windows Vista as its operating system. Windows media center is a part of Windows 7 and functions as a digital video recorder, a video player, and a music player.
        - **TV tuner**: allows your computer to receive television channels from a cable connection and display them on your computer monitor. You can install more than one TV tuner on your computer, allowing you to receive multiple television channels at the same time.
        - **Blu-ray, DVD, and CD players and recorders**: By allowing you to play all kinds of optical media, blu-ray and DVD/CD players make it easier to transfer your audio or video files.
        - **Network Adaptor:** a device that is installed in your computer and allows it to communicate with other devices on a network.
    - **A network:** unless you are going to view digital and audio files only on your computer, you will need a network to transfer files easily to other devices, such as the TV, in your home. Wireless network has an advantage over wired network because you can relocate devices on a wireless network.

Patients Stimulators: life-sized, computer-controlled mannequins that can speak, breathe, and blink (their eyes respond to external stimuli). They have a pulse and respond like humans to procedures such as administration and intravenous drugs. They serve as human substitutes without the controversy of ethics.

The Physiome Project is a global public domain effort in which bioengineers are creating realistic computer stimulators of all systems and features of the human anatomy. The current system models a theoretical human's lungs however, researchers hope to, one day, use computers to stimulate specific person's anatomical systems. This way, an exact copy of one's body can be used to experiment different therapies on before using it on the actual person. This is still far down the road though and computer-literate medical professionals would be needed to make it happen.

Surgeons are using computer-guided robots to perform surgery, as it is difficult for humans to make small, precise incisions.

Medicine:

- Researchers are experimenting with implantable chips to repair nerve damage and restore movement of sensation to parts of the body.

- The MIT eyeball chip is a retinal implant that may restore at least partial vision to certain groups of legally blind patients.

- The VeriChip is a rice-grain sized personal ID chip implanted under the skin which, when exposed to radio waves, shows the name, address and medical conditions of a person. This is helpful for sick patients such as those who suffer from Alzheimer's disease as well as security (credit card could not be used if ID was verified through the chip). The current version of these is nonimplanted chips used in hospitals.

Nature:
Tornado forecasting may be getting more accurate as National Severe Storms Lab and the National Center for Supercomputing Applications have partnered up.

Three-dimensional scanners and imaging software can capture detailed record of the current condition of ruins, something that archaeologists desperately need. The virtual re-creation of the ruins is so life-like that archaeologists can study the ruins on screen instead of at the site. Using the scans as well as satellite imagery, aerial photography and other data, scientist will be able to recreate missing portions of the ruins.

Sports:
Video recordings of athletes in action can be transferred into special motion-analysis software on a computer. Every little detail is taken into consideration by this software and there is room for minor adjustments. An athlete can enhance his or her skills by watching and learning from these videos. For Olympic swimmers, software determines the way water flows around parts of the swimmer's body when in motion. Coaches can use this information to experiment with small changes in the position of the swimmer so that drag and turbulence are reduced.

Nanotechnology:
Nanoscience involves the study of molecules and structures (called nanostructures) that range in size from 1 to 100 nanometers. It will provide numerous career paths and high-tech positions over the next several decades. Nano is one billionth of a meter. Nanostructures represent the smallest human-made structures that can be built. Right now, Nano science is limited to improvising existing products; such as enhancing fibers used in clothing with coatings so that they could repel stains, stop wrinkles etc. However, in the future, scientists hope to use nanostructures to build computing devices that will be too small to be seen by the naked eye.

Psychology:

Psychologists and computer scientists are working together to develop computer systems that respond to human affect and emotional expression, as well as enable computer systems to develop social and emotional skills.

- **Affective Computing** is computing that relates to emotion or deliberately tries to influence emotion.
- **Emotional Social Prosthesis (ESP)** is a project that is to be emerged by a group at the MIT Media Lab. The system is targeted at helping people with autism. Autistic individuals can have extremely high intelligence but do not easily sense nonverbal cues such as facial expressions and tone of voice. ESP is a wearable system that isolates movements and facial expressions of people, interprets what their mood and intention probably are, and communicates this information back to the user.
- Another project at the media lab will help people who have difficulty maintaining focus on specific task.
- Psychologists and computer scientists are also evolving to a more human appearance by making the robots be able to walk on two feet, climb stairs and even hug.

Challenges Facing a Digital Society:

- Since the tragic events of 9/11, surveillance in public areas has been introduced and increased to keep a look out for terrorists however, should this invasion of privacy for the public be allowed in order to make sure the country is secure?
- There is the constant scare that someone may be watching you, as surveillance devices can be hard to spot (technology = smaller devices). One can possibly hack into your laptop webcam and watch your every move. \
- Many employees don't know that employers have the right to monitor email and network traffic on the systems used at work. Due to this, employers may be sending personal emails and going on websites that they do not want their employer to know about (new job search)… Should employers have the right to do this?
- Although VeriChips are meant to benefit the public, there are major privacy issues to the idea.
- There are many other privacy issues associated to the internet and technology.

Chapter 2- Looking at Computers: Understanding the Parts

- A **computer** is a data processing device that performs four major functions:
    1. It *gathers* data, or allows users to input data.
    2. It *processes* that data into information.
    3. It *outputs* data and information.
    4. It *stores* data and information.
- **Data** is a representation of a fact, a figure, or an idea. For example, the number 7135553297 and the names Zoe and Richardson are pieces of data.
- **Information** is data that has been organized or presented in a meaningful fashion. When your computer provides you with a contact listing that indicates Zoe Richardson can be reach by phone at (713) 555-3297, then the previous data suddenly becomes useful- the data becomes information.
- **Binary language** consists of just two digits: 0 and 1. Each 0 and 1 is a **binary digit**, or **bit** for short. Eight binary digits (or bits) combine to create one **byte.**
- In computers, each letter of the alphabet, each number, and each special character consists of a unique combination of eight bits, or a string of eight 0s and 1s. So, for example, in binary (computer) language, the letter K is represented as 01001011.
- Bits and bytes not only are used as the language that tells the computer what to do but also are what the computer uses to represent the data and information that it inputs and outputs. These files and applications can be quite large, containing thousands or millions of bytes.
- How much is a byte?

Name	Abbreviation	Number of Bytes	Relative Size
Byte	B	1 byte	Can hold one character of data

Kilobyte	KB	1,024 bytes (2^10 byte)	Can hold 1,024 characters or about half of a double-spaced typewritten page.
Megabyte	MB	1,048,576 bytes (2^20 bytes)	Can hold approximately 768 pages of typed text.
Gigabyte	GB	1,073,741,824 bytes (2^30 bytes)	Approximately 786,432 pages of text; 500 sheets of paper is approximately 2 inches, so this represents a stack of paper 262 feet high.
Terabyte	TB	1,099,511,627,776 bytes (2^40 bytes)	This represents a stack of typewritten pages almost 51 miles high
Petabyte	PB	1,125,899,906,842, 62 bytes (2^50 bytes)	The stack of pages is now 52,000 miles high, or approximately one-fourth the distance from the Earth to the moon.
Exabyte	EB	1,152,921,504,606, 846,976 bytes (2^60 bytes)	The stack of pages is now 52 million miles high, or just about twice the distance between the Earth and Venus.
Zettabyte	ZB	1,180,591,620,717, 411,303,424 bytes (2^70 bytes)	The stack of pages is now 52 billion miles high. That's some 20 times the distance between the Earth and Pluto.

- **Hardware** is "any part of the computer you can physically touch." However, a computer needs more than just hardware to work: it also needs some form of software (computer programs).
- **Software** is the set of computer programs that enables the hardware to perform different tasks. There are two broad categories of software: application software and system software.
    - **Application Software** is the set of programs you use on a computer to help you carry out tasks such as writing out a research paper.
    - **System Software** is the set of programs that enables your computer's hardware devices and application software to work together. The most common type of system software is the **operating system (OS)-** The program that controls the way in which your computer system functions.

- **A notebook computer (or laptop computer)** is a portable computer that is powered by batteries (or a handy electrical outlet) and has a keyboard, a monitor, and other devices integrated into a single compact case.
- **A netbook** is a small, lightweight notebook computer that is generally 7 to 10 inches wide and has a longer battery life than a notebook computer.
- **A tablet pc** is similar to a notebook but features a touch sensitive screen that can swivel and fold flat. Users input data and commands on a tablet PC via a special pen called a *stylus* or with their fingers.
- **A desktop computer** is intended for use at a single location, and therefore, is stationary. Desktop computers consist of a separate case that houses the main components of the computer plus peripheral devices.
- **A peripheral device** is a component, such as a monitor or keyboard, that is connected to the computer.
- **An all-in-one computer** such as the Apple iMac One houses not just the computer's processor and memory but also its monitor.
- Other types of computers include:
    - **A mainframe** is a large, expensive computer that supports hundreds of users simultaneously
    - **A supercomputer** is a specially designed computer tat can perform complex calculations extremely rapidly.
    - **An embedded computer** is a specially designed computer chip that resides in another device, such as your car or the electronic thermostat in your home.

    - The main difference between a supercomputer and a mainframe is that supercomputers are designed o execute a few programs as quickly as possible, whereas mainframes are designed to handle many programs running at the same time but at a slower place
- **An input device** enables you to enter data (text, images, and sounds) and instructions (user responses and commands) into the computer. The most common input devices are the keyboard and the mouse.
- **A keyboard** is used to enter typed data and commands, and a **mouse** is used to enter user responses and commands.
- **QWERTY keyboard** layout gets its name from the first six letters in the top-left row of alphabetic keys on the keyboard and is the standard English-language keyboard layout. It was originally designed for typewriters and was meant to slow typists down and prevent typewriter keys from jamming.
- **The Dvorak keyboard** is an alternative keyboard layout that puts the most commonly used letters in the English language on "home keys," which are the keys in the middle row of the keyboard. The design reduces the distance your fingers travel for most keystrokes, increasing typing speed.
- **Bluetooth** technology, which is a wireless transmission standard that facilitates the connection of electronic computing devices such as cell phones, smartphones, and computers to peripheral devices such as keyboards and headsets.
- Knowing how to use these special keys will help you improve your efficiency: (See Figure 2.9 in text)
    - The numeric keypad allows you to enter numbers quickly.
    - Function keys act as shortcut keys you press to perform special tasks. They are sometimes referred to as the "F" keys. Each software application has its own set of tasks assigned to various function keys.
    - The control (Ctrl) key is used in combination with other keys to perform shortcuts and special tasks. Eg. Holding down control while pressing the B key adds bold formatting.
    - The Alt key works with other keys to execute additional shortcuts and special tasks(Mac are different).
    - The windows key is specific to the Windows operating system, it is used alone, it opens the start menu, although you use it most often in combination with other keys to perform shortcuts.
    - Cursor control keys.
    - Toggle and other keys.
    - Internet controls
    - Multimedia controls

Keystroke Shortcuts

Text Formatting	**File Management**	**Cut/Copy/Paste**	**Windows Controls**
CTRL+B Applies or removes bold formatting to selected text	**CTRL+O** Opens the Open dialog box	**CTRL+X** Cuts (removes) selected text from document and stores in Clipboard	**Alt+F4** Closes the current window
CTRL+I Applies (or removes) *italic* formatting to selected text	**CTRL+N** Opens a new document	**CTRL+C** Copies selected text to Clipboard	**Windows Key+Tab** Cycles through open programs using Flip 3-D
CTRL+U Applies (or removes) <u>underlining</u> to selected text	**CTRL+S** Saves a document	**CTRL+V** Pastes selected text (previously cut or copied) from Clipboard	**Windows Key+L** Locks the computer
	CTRL+P Opens the Print dialog box		**Windows Key+F** Opens the Search (Find Files) dialog box

- Wireless keyboards are powered by batteries. They send data to the computer using a form of wireless technology that uses radio frequency (RF). RF keyboards used on home computers can be placed as far as 6 feet to 30 feet from the computer, depending on their quality.
- The most familiar mouse is called the **optical mouse** it uses an internal sensor or laser to detect the mouse's movement. The sensor sends signals to the computer, telling it where to move the pointer on the screen. They are preferable to most mice because they have fewer moving parts, which lessens the chances that it will interfere with the mechanisms or that parts will break down.
- A **trackball mouse** has the rollerball on top or on the side of the mouse, and you move the ball with your fingers, allowing the mouse to remain stationary. It's considered better for the wrist than an optical mouse.
- Most notebooks do not have a mouse, instead they have an integrated pointing device such as a **touch pad**, a small, touch sensitive area at the base of the keyboard. Other notebooks incorporate a **track point device**, a small, joystick-like nub that allows you to move the cursor with the tip of your finger.
- Wireless mice are similar to wireless keyboards in that they use batteries and send data to the computer by radio frequency or Bluetooth technologies. If you have an RF wireless keyboard, then your RF wireless mouse and keyboard usually can share the same RF receiver. Wireless mice for notebooks have their own receivers that often clip into the bottom of the mouse for easy storage when not in use.
- Magic Mouse, the first multitouch wireless mouse. The top surface of the mouse, which is virtually the mouse itself, is the button. Use your finger to scroll in any direction, swipe your finger across the mouse to move through Web pages, and tap on the mouse to click and double-click.
- MoGo Mouse are designed for portability and fit into a peripheral slot on the side of a notebook, which serves to store the mouse, protect it, and charge its batteries all at the same time. It uses Bluetooth technology to transmit data to the notebook.
- Mouse models provide features such as the following:
    - Magnifier: enhance viewing of hard-to-read images
    - Customizable buttons: provide extra buttons to perform the functions that you use most often
    - Web search: allows you to quickly highlight a word or phrase and then press the search button
    - File storage: Includes a wireless USB receiver that contains flash memory to store or back up your files
- A **touch screen** is a display screen that responds to commands initiated by a touch with a finger or a stylus.
- Digital cameras, camcorders, and cell phones are common devices for capturing pictures and video, and all of them are considered input devices.
- A **webcam** is a small camera that sits on top of a computer monitor or is built into a notebook computer. They are used mostly for transferring live video directly to a computer.
- Inputting sound to your computer requires equipping it with a **microphone or mic**, a device that allows you to capture sounds waves and transfer them to digital format on your computer.
- Desktop microphones, which have an attached base that allows them to sit on a flat surface, are convenient for recording podcasts or in other situations in which you might need your hands to be free.
- Unidirectional microphones pick up sound from only one direction. These are best used for recording podcasts with a single voice or making phone calls over the Internet.
- Omni directional microphones pick up sounds from all directions at once. These mics are best for recording more than one voice, such as during a conference call.
- Clip-on microphones (also called *lavalier microphones)* are useful in environments such as presentations, where you need to keep your hands free.
- Close-talk microphones, which are usually attached to a headset, facilitate using speech-recognition software, videoconferencing, or making telephone calls.
- **Maltron keyboard** is a type of keyboard designed for individuals who can only use one hand.

- An **output device** enables you to send processed data out of your computer in the form of text, pictures (graphics), sounds (audio), or video. One common output device is a **monitor** or **display screen,** which displays text, graphics and video as soft copies. Another common output device is the **printer,** which creates hard copies of text and graphics. Speakers and earphones (or earbuds) are the output devices for sound.
- The most common type of monitor is a **liquid crystal display (LCD)** also called a **flat-panel monitor,** is light and energy efficient. LCD monitors have replaced the cathode ray tube (CRT) monitor. CRT monitors are difficult to find or buy because they have become **legacy technology** or computing devices or peripherals that use techniques, parts and methods from an earlier time that are no longer popular.
- Monitor screens are grids made up of millions of tiny dots, each of which is called a **pixel.** Each pixel is actually comprised of three subpixels of red, blue, and green, and some newer TVs on the market have added a fourth color: yellow
- The **aspect ratio** is the width-to-height proportion of a monitor.
- The screen **resolution,** or the clearness or sharpness of the image, reflects the number of pixels on the screen
- Other factors to consider when judging the quality of an LCD monitor:
    - Contrast ratio: Measure of the difference in light intensity between the brightest white and the darkest black that the monitor can produce.
    - Viewing angle: Measured in degrees, tells how far you can move to the side of the monitor before the image quality degrades to unacceptable levels.
    - Brightness: Measured as candelas per square meter (cd/m2) or *nits*, brightness is a measure of the greatest amount of light showing when the monitor is displaying pure white.
    - Response time: This is the measurement (in milliseconds) of the time it takes for a pixel to change color.
- A **projector,** a device that can project images from your computer onto a wall or viewing screen.
- Inkjet and laser printers are both considered nonimpact printers. A **nonimpact printer** sprays ink or uses laser beams to transfer marks onto the paper.
- An **impact printer** has tiny hammer- like keys that strike the paper through an inked ribbon, making marks on the paper.
- An **inkjet printer** is the standard type of printer found in most homes. They are affordable and produce high-quality color printouts quickly and quietly. They work by spraying tiny drops of ink onto paper and are great for printing black-and-white text as well as color images.
- A **laser printer** uses laser beams and static electricity to deliver toner onto the correct areas of the page. Heat is used to fuse the toner to the page, making the image permanent.
- Portable printers are often compact enough to fit in a briefcase, are lightweight, and sometimes run on battery power instead of AC power.
- Wireless printers allow several people to print to the same printer from different places. There are two different types of wireless printers: WiFi and Bluetooth. WiFi sends the data more quickly than Bluetooth.
- An **all-in-one printer** is a device that combines the functions of a printer, scanner, copier, and fax into one machine.
- A **plotter** is another type of printer. Plotters produce oversize pictures that require the drawing of precise and continuous lines, such as maps, detailed images and architectural plans.
- A **thermal printer** is another kind of specialty printer. They work either by melting wax-based ink onto ordinary paper (a process called *thermal wax transfer printing),* or by burning dots onto specially coated paper (a process called *direct thermal printing).* They are used in stores to print receipts and in airports for electronic ticketing, among other places.
- How Inkjet printers work:
    - Step 1: Once the printer receives the command to print, electrical pulses flow through thin resistors in the print head to heat the ink.
    - Step 2: The heated ink forms a bubble. The bubble continues to expand until it is forced out of the nozzle.
    - Step 3: The ink drops onto the paper.

    - Step 4: As the ink leaves the cartridge, the chamber begins to cool and contract, creating a vacuum to draw in the ink for the process to begin again.
- A **speaker** is an output device for sound.
- A **surround-sound speaker** is a system of speakers and audio processing that envelops the listener in a full 360-degree field of sound.
- The **motherboard** is the main circuit board that contains the central electronic components of the computer, including the computer's processor (its brain), its memory, and the many circuit boards that help the computer function. The motherboard on a desktop is located inside the **system unit**, the metal or plastic case that also houses the power source and all the storage devices (CD/DVD drive and hard drive). With a notebook computer, the system unit is combined with the monitor ad the keyboard into a single package.
- The motherboard is the main circuit board that contains the set of chips that powers the system, including the central processing unit (CPU). Also houses ROM, RAM, and cache, the chips that provide the short-term memory for the computer. The motherboard also includes slots for **expansion cards (**or **adapter cards),** which are circuit boards that provide additional functionality.
- A **sound card** provides a connection for the speakers and microphone, whereas a **video card** provides a connection for the monitor.
- The **modem card,** which provides the computer with a connection to the Internet via a traditional phone line, and a **network interface card (NIC),** which enables your computer to connect with other computers or to a cable modem to facilitate a high-speed Internet connection.
- **Random access memory (RAM)** is the place in a computer where the programs and data the computer is currently using are stored. It's much faster to read from and write to than the hard drive and other forms of storage. It's a series of small cards (called *memory cards* or *memory modules)* plugged into slots on the motherboard. RAM is a temporary or **volatile storage** location. Think of RAM as the computer's temporary memory and the hard drive as permanent memory.
- **Read-only memory (ROM)** holds all the instructions the computer needs to start up when the computer is powered on. The instructions stored in ROM are permanent, making ROM a non-volatile storage location, which means the data is not erased when the power is turned off.
- The **central processing unit** is sometimes referred to as the "brains" of the computer because it controls all the functions performed by the computer's other components and processes all the commands issued to it by software instructions.
- Processor speed is measured in units of hertz (Hz). Hertz means "machine cycles per second." A machine cycle is the process of the CPU getting the data or instructions from RAM and decoding the instructions into something the computer can understand.
- Older machines ran at speeds measured in **megahertz (MHz),** or millions of machine cycles per second, whereas current systems run at speeds measured in **gigahertz (GHz),** or billions of machine cycles per second.
- CPU performance is also affected by other factors like the number of *cores,* or processing paths, a processor has. Processors have been designed so that they can have two, four, and even eight different paths, allowing them to process more than one instruction at a time.
- Each permanent storage device is located in your desktop or notebook computer in a space called a **drive bay.** There are two kinds of drive bays- internal and external:
    - Internal drive bays cannot be seen or accessed from outside the system unit. **Internal hard drive** usually holds all permanently stored programs and data.
    - External drive bays can be seen and accessed from outside the system unit. External drive bays house CD and DVD drives.
- *Zip disk drive* resembles a floppy disk drive but has a slightly wider opening. It works just like standard floppy disks but can carry much more data (up to 750 MB)
- The **hard drive** is your computer's primary device for permanent storage of software and documents. The hard drive is a **non-volatile storage** device, meaning it holds the data and instructions your computer needs permanently, even after the computer is turned off. Capacities of as much as 3.5 terabyte (TB), can hold more data than would fit in the books in a school's library.
- An **external hard drive** is essentially like and internal hard drive, however, it has been made portable by making it small and lightweight and enclosing it in a protective case. It is

often used to back up data that is contained on an internal hard drive in case a problem develops with the internal hard drive and data needs to be recovered.

- **Optical drives** can read from and maybe even write to CDs, DVDs, or Blue-ray disc (BD)
- A **flash drive**, sometimes referred to as a **jump drive, USB drive, or thumb drive,** is a way of storing portable data. Flash drives plug into USB ports.
- **Flash memory cards** let you transfer digital data between your computer and devices such as digital cameras and devices such as digital cameras, PDAs, smartphones, video cameras, and printers.

- A **solid state drive (SSD)** does not have any spinning platters or motors, so they are more efficient, run with no noise, emit very little heat, and require very little power.

- A **port** is a place through which a peripheral device attaches to the computer so that data can be exchanged between it and the operating system.

- A **universal serial bus (USB) port** is now the most common port type used to connect input and out put devices to the computer. USB 2.0 ports are the current standard and transfer data at 480 megabits per second.

- A **connectivity port** can give you access to networks and the internet or enable your computer to function as a fax machine.

- **Ethernet ports** transfer data at speeds up to 100 Mbps. You can use and Ethernet port to connect your computer to a digital subscriber line (DSL) or cable modem, or a network.

- A **modem port** uses a traditional telephone signal to connect o the Internet over a phone line.

- **High-definition multimedia interface (HDMI),** a compact audio-video interface that carries both high-definition video and uncompressed digital audio on one cable.

- The **power supply,** which is housed inside the system unit, transforms the wall voltage to the voltages required by computer chips.

- **Hibernate** is another power-saving mode that stores your data in memory and saves it to your computer's hard drive. The big advantage is that if there is a power failure while your computer is conserving power, your information is protected from loss, because it is saved on the hard drive.

- Restarting the system while it's powered on is called a **warm boot.**

- **Ergonomics** is defined as "an applied science concerned with designing and arranging things people use so that the people and things interact most efficiently and safely. It refers to how you set up your computer and other equipment to minimize your risk of injury or discomfort.

Chapter 3 Using the Internet

The Internet

The **Internet** is a network of networks that is the largest computer network in the world, connecting millions of computers around the world. The internet and Web is used to shop, research, communicate, and entertain ourselves.

The internet was invented by 2 men names Vinton Cerf and Robert Kahn.

Communicating through the internet

E-mail (Electronic mail) is a written message that is sent and received over the internet.
E-mail clients such as Microsoft Outlook are software programs running on your computer that access your internet service providers (ISP's) server.
Instant Messaging (IM) services are programs that enable you to communicate in real time with others who are online.
Chat Room is a form of synchronous communication in which online conversations occurs in real time and is visible to everyone in the chat room.

Web 2.0 Technologies

Web 2.0 Tools and web-based services that emphasize online collaboration and sharing among users.
Blog is a personal log or journal posted on the web. They are simple to create, manage and read.
Video Blog is a personal journal that uses video as the primary content. It can also contain text, images and audio
Wikis is a type of web site that allows users to change its content by adding, removing, or editing the content.
Podcast is a clip of audio or video content that is broadcast over the internet using compressed audio and video files such as MP3`s and MP4`s. Podcast use RSS technology. You can find podcast on itunes, podcastalley.com podscope.com
RSS (Really Simple Syndication) is an XML-based format that facilitates the delivery of frequent content updates on web pages.
Webcast is the broadcast of audio or video content over the internet. Webcast are mostly live.
Social Networking is a means by which people use the internet to communicate and share information among their immediate friends and meet and connect with others through common interests, experience and friends. Examples are Facebook, MySpace, LinkedIn, etc.

Web Entertainment

Multimedia is anything that involves one or more forms od media in addition to text such as graphics, audio, and video clips. Sometimes you need a special software program called a plug-in or player to view and hear multimedia files. Plug-ins is often installed in new computers or are offered free of charge at manufactures` websites
Plug-ins a small software program that `plug-ins` to a web browser to enable a specific function-for example, to view and hear certain multimedia files on the web.

Conducting Business over the Internet

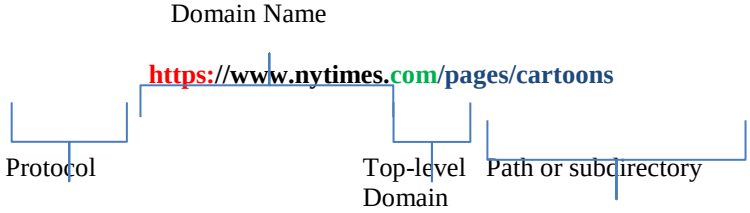
E-commerce is the process of conducting business online, such as through advertising and selling products.
Business-to-Consumer (B2C) exchanges that take place between businesses and consumers- such as the purchases that consumer make at online stores.
Business-to-Business (B2B) consists of business buying and selling goods and services to other businesses.
Consumer-to-Consumer (C2C) portion of e-commerce consists of consumers selling to each other through online auction and exchange sites such as eBay, Kijiji, Craiglist

Accessing the Web

Web Browser is software installed on your computer system that allows you to locate, view and navigate the Web. Examples of web browsers are Firefox, Safari, Google Chrome

Getting Around the Web

URL (Uniform Resource Locator) Website unique address such as Microsoft.com



Protocol Most URLs begin with https, which is short for **hypertext transfer protocol (HTTP).** HTTP is the protocol that allows files to be transferred from a computer that hosts the Website you are requesting so that you can see the web site on your computer by using a browser.
Domain Name identifies the site's host. **Top level Domain** is the suffix in the domain name after the dot such as .com or .ca
Path or Subdirectory is the information after the slash.
Hyperlinks One unique aspect of the Web is that you can jump from place to place by clicking on specially formatted piece of text or images. **Breadcrumb lists** a list of pages within a Web site you've visited.

Searching the Web Effectively

Search Engine is a set of programs that searches the Web using specific keywords you wish to query and then returns a list of the Web sites on which those keywords are found. It can be used to search for images, podcasts, and video in addition to traditional text-based Web content.
Subject Directory is a structured outline of Web sites organized by topic and subtopic.
Metasearch engines search other search engines
Search engines have three parts

1. **Spider** constantly collects data on the web, following links in the websites and reading webpages.
2. Indexer program, organizes the data into a large database.
3. Search engine software searches the indexed data, pulling out relevant information according to your search.

The Internet and How it Works

A computer connected to the internet acts in one of two ways
Client computer that asks for data
Server a computer that receives the request and returns the data to the client

Connecting to the Internet

Dial-up Connection a connection to the internet using a standard telephone line
Broadband often referred to as "high-speed Internet", refers to a type of connection that offers a faster means to connect to the internet. Max data transmission rate of 256 Kbps or greater. Max transmission speed of 56 Kbps.

Types of broadband
Digital Subscriber Line (DSL) which uses a standard phone line to connect your computer to the internet
Cable which uses your television's cable service provider to connect to the internet.
Fiber-optic Service (FiOS) which uses plastic or glass cables to transfer data at the speed of light has just recently become available as a broadband service to the home.
Satellite is a connection option for those who do not have access to faster broadband technologies.
Wi-Fi allows users to connect to the internet wirelessly

The Future of the Internet

The internet of the future will have faster connections and will be able to provide additional services as a result of projects such as the large-scale networking program and Internet2. The internet will become more integrated into our daily lives as Internet-enabled appliances and household systems provide more remote-control features for our home.

Chapter 4 Summary Application software: Programs that let you work and play

The Nuts and Bolts of software
Software – a set of instructions that tells the computer what to do.
Program – (also called instruction set) allows us to use the computer even if we don't have special computer skills.

Two Basic types of software
Application Software: software you use to do tasks at home, work, or school. Examples are editing photos and sending e-mail.
System software: such as Windows and Mac OS X, which help run the computer and regulate instructions between the application software and the hard drive. Examples are operating system and utility programs.
Productivity software for Home and Office
Productivity software – includes programs that help you do different tasks at home, school, or work. Examples are Microsoft word and Personal information manager programs (PIM).
Word Processing software
- considered best software to use to make general documents
    - Easily make corrections, and many templates available.
    - Examples are Microsoft word and Corel WordPerfect

Any alternatives?
Open source software – program code that is publicly available and has very few limitations.
Proprietary Software – not free or open, the code can be copied, distributed or changed without any permission of copyright.
Web-based applications can be accessed from any computer that has internet connection. Limitation is that they do not have formal support.
How to control the way your documents look
word processing software allows for easy change to documents. Web based applications can do this also, but they have their limitations.
What special tools do word processing programs have?
-spell-check, search-and-replace tool, the general and known ones, translate sentences.
Spreadsheet software
Spreadsheet software – such as Microsoft Excel or Openoffice.org Calc lets you do calculations and analyses easily.
- Can use for budgets, expenses, etc.

How do I use spreadsheet software?
- it is a grid made up of columns or rows forming single boxes called cells.
Can enter: text, values, formulas, and functions.
Advantages: ability to recalculate all functions and formulas automatically.
What-if analysis – you can immediately see different options and the effect they have on your total in the same analysis.
Graphs and Charts
- various available such as column charts, pie charts, 3-D effects.
- stock charts for investment analysis and stock charts for statistical analysis
- sparklines fit into one cell.

Other uses
- compute output voltage at a point in an electrical circuit, can sort, filter and group data.

Presentation Software
- such as PowerPoint, Openoffice.org Impress, or Zoho Show.
- make presentations, add videos, change colour, add effects, etc.
How do I create a presentation?
- using basic features, arrange text, pictures, etc.
- variety of layouts, themes, animation effects
Database Software
- Oracle, MySQL, Microsoft Access allow to store and organize data.
    - Organized into fields, records, and tables.

Uses are FedEx, UPS, Amazon.com etc – keep track of package.

Note-taking software
- Microsoft one note – can organize notes and link to Wiki system so that students can quickly link from one note to another document outside of OneNote.
Free note-taking softwares – evernote.com, sticky-notes.net
Personal Information Manager (PIM) Software
Microsoft Outlook, Chandler. – replace management tools such as calendar, notepad, address book. Some contain email features, can organize them into folders, and coordinate them.
Web-based PIM programs are available – such as Yahoo and Google who allow you to make calendars and contacts
Productivity Software Functions – tools to help you increase efficiency
Wizard – systematic guide that walks you through steps to reach your task. Wizard asks questions and then helps you complete that part of the task. Example – installing a software
Template – predesigned form, providing a basic structure of a document, spreadsheet, and presentation. Example – resume template
Macro – small program that groups a series of commands that they will run as a single command. Example, a teacher may write a macro to sort test scores from highest to lowest
Integrated Software Applications
- is a single software program that includes the most commonly used tolls of many productivity softwares into one however they do not include the more complex features.
    - Example is Microsoft Works.

Why use this instead of actual software?
- good if you don't need the complex features, less expensive, provides templates for frequently developed documents (resume, etc).

Software Suits – group of software programs that have been bundled as a package. You can buy these for productivity, virus protection, and graphics. Primary developers are Microsoft, Apple, and Corel.
- Most productivity software suites have similar basic components such as word processing, spreadsheets, presentation and PIM software. Some may contain database and estop publishing software. Research your options before buying a bundle as per your needs.

Advantages
- cheaper, share common features (toolbars, themes, menus), easier to import documents such as from excel to word or to access.
Personal Financial Software
Tax preparations software such as Intuit TurboTax help you prepare state and federal taxes. Both contain a set of tax forms and videos tohelp you fill in the forms. TurboTax is also able to check for audit alerts, file your taxes online, and then plan and manage your finances. Tax code changes every year so you have to buy an updates version each year.
Financial planning software helps manage daily finances. Intuit Quicken and Microsoft Money are examples. These have online billing and can print cheques. Records all transactions m and can set up a budget.
Web-based programs like Mint.com analyze your spending and offer advice on how to spend your money. You can monitor and change your information from any computer privately and securely.
Some applications also coordinate with tax applications so that it helps you fill in your tax forms as well as go through your tax related income and expenses.
Media Software for Home
Multimedia software – image, video, and audio editing software, animation software, and other software needed to make computer games, animations, and movies.
Digital Image Editing Software
Once the image is converted to digital form, you can use Google Picasa or Microsoft Photo Story to add audio to make a slide show of your images.
You can edit using image editing software which has certain basic features like red eye removal, cropping, sharpness, brightness, etc. There are more advanced applications such as Photoshop which are fully featured in terms of photo editing. They have features like layering images, making images that designers use. However, they can also be used by nonprofessional home users.

Digital Audio Software
A lot of novels, newspapers, radio shows can be bought from audible.com
podcasting – the distribution of audio files such as radio shows and music videos
MAGIX Music Maker or Apple Garage Band , you can compose your own songs with virtual instruments, voice recorders, etc.
Why are MP3 files so popular?

- Short for MPEG-1 Audio Layer 3, is a type of audio compression format that reduces the file size so that they will take less space on your device.

Other programs have many capabilities:
MP3 recording, CD ripping, CD burning, Encoding and decoding and format conversion.
Audio editing software includes tools that can help you edit audio files. Examples are audacity.com.
Digital Video Editing Software

- Adobe Premiere Pro has complex features , has widest range of video editing, but it is expensive.
- Microsoft Live Movie Maker helps with video editing and is a free download.

Videos come in different formats such as flash video, MPEG-1, 2, and 4, VCD, etc. Normally you watch videos in MP4 form which compresses the audio and video content to a smaller size. Apple created other MP4 extensions to identify specific content such as .m4b (audio book and podcast) and .m4r (ringtone files for iPhone).
Media management software
How to manage media on your system
Windows Media Player and iTunes helps to organize, sort, search music.
You can burn these songs to a cd or transfer to a device.
There are a lot of photo sharing sites such as Kodak.com. Flickr.com is one of the best photo management and photo sharing applications. Google Picasa also allows to store and share photos with friends and family.
Software Fun for Home
Entertainment software is designed to provide users with fun. Virtual reality programs turn artificial environments into a realistic experience.

Gaming software
- system has to have enough processing power, memory (RAM), hard drive capacity. Some games might require a controller.
- The entertainment software rating board (ESRB) is a self-regulatory body made in 1994 which helps customers choose the computer and video games that is right for their families. They also come up with the rating symbol for games.
- You can create your own video games through Adobe Flash , RPG Maker VX. Some websites help you make a game without any programming. (yoyogames.com)

Educational Software
Many softwares such as MCAT Prep, cooking, typing, languages, work-outs, etc.

Simulation programs allow users to experience or control the software as it were the actual software or an actual event. Examples are military flight training, surgical instrument training.
These courses can be taken online if you have the compatible web browser. Many of these courses are run through course management software such as Blackboard, Moodle, and Angel.

Drawing software (illustration software) allows you to make 2-d, line based drawings. Tools are available such as pencils, pens, and paintbrushes, geometric shapes, etc.
Different types of drawing software – Adobe illustrator has tools that are used by professionals. (human muscles, and special sketches)

- Warping tool allows to bend, stretch, and twist portions.

Microsoft Visio helps with building planning such as maps, block diagrams, etc.

Home Business Software

Accounting software helps manage small business owners finances. Tools for tracking accounts, inventory management, payroll, and billing tools. Intuit QuickBooks is an example.

Desktop publishing software (DTP) helps you add pictures to your documents in a creative way. Examples are QuarkXpress and Adobe InDesign which allow for complex features.

- Tools are arranging text in different columns, shapes, patterns, import documents, and manipulate the pictures.

Web-page authoring software allows you to make websites without having HTML knowledge or using the HTML code.

- Tools are templates, wizards, and reference materials. Microsoft Expression Web is an example.

If you just want a simple web page and not a separate authoring program, then Microsoft Applications also let you publish your document online.

Palo Alto Software's Business Plan Pro helps users make strategic and development plans for business and marketing needs.

Project Management software (Microsoft Project) helps create scheduling charts.

Customer Relationship management Software (CRM) stores sales and client contact info in one central database.

Enterprise resource planning software (ERP) helps a business coordinate multiple departments of a business in terms of billing, production, inventory management , etc.

Mapping programs such as DeLorme Street Atlas USA is an example that helps employees who have to travel frequently.

Online mapping programs are Google Maps, MapQuest, etc but they require internet connection.

Many companies use GIS (geographic information system) to help with managing, analyzing, and displaying data, mostly in a map or spatial form.

For companies who have an online store, they can use IBM'S WebSphere and ProStores. These products offer web site creation, hosting services, and credit card processing.

Vertical market software – designed for specific industry. For example, the construction industry uses Sage Master Builder.

Computer-aided design (CAD) programs are a form of 3D modelling that engineers use to create automated designs, technical drawings, and model visualizations.

- Helps with costly building errors
- Works in coordination with GPS devices to see where fiber-optic networks can be places
- Many graphics, animation, use applications from Autodesk t create 3D models with complex textures lighting models.

Programs offer help right in the application you are using. Some applications allow you to talk to help and support people online.

Integrated help means you can just search your question without having to go through manuals.

For training and help learning, the product's developer may offer online tutorials. Malektips.com has a lot of helpful videos for various applications.

Buying Software

- When you buy software, you do not own it, you only have the license to be the only user for that software
- Software license is an agreement between the user and the company. It outlines the rules and actions that could violate the license to use the software.
- You mostly buy a single license but they can come in multiuser packages as well.
- Concurrent licenses limit the number of user accesing the software at any given time
- Open source software has access to the program's code so anyone can use it and distribute it. A free software license is required and grants the user the right to modify and distribute the software. (called copyleft)

Pre-Installed Software

- Every computer comes with an operating system, as well as some form of application software (such as Microsoft Works)
- Usually, there is no storage problem with pre-installed software.
- Other softwares, such as virus protection, comes with a trial version andonce over but still installed, you have to buy the license and reinstate the software. If you don't, it stays there useless, and this is called bloatware. The best thing to do is delete the programs.
- Normally, computer manufacturers let you delete or choose which software you want pre-installed on your computer.
- Most manufactures do not gve you a restore disc, so if your computer crashes, it is hard to get your pre installed software back. So, the first thing you should do, is create a restore disc.

Web-based applications

- Mostly, software has to be bought and installed on your computer
- Software as a Service (SaaS) allows you to buy the software online and have it installed all online. These are refered to as web based applications
- Some web based applications available are Microsoft Office Web Apps (same as word, excel, etc, but with fewer options)
- Google Docs is also a web based suite of productivity software.
- As long as you have a web browser, you can access your files which are stored online.
- Even though they are not as complex with their features, you can change the document formats and export them. You can invite others to share your work and work on it in real time.
- Most web based apps are free but some like TurboTax , you have to buy.

Discounted software

- Available for students and educators because they need certain softwares for a short amount of time. Campus bookstores, etc, have such discounts.
- You can buy used software online but make sure it is a legal copy.
- You can buy software directly on the internet however if it is possible, as for a CD or DVD in case you have problems with installation or your computer crashes.

Freeware and Shareware

Freeware- any copyrighted software that you can use for free (screen savers, games, etc)
Some softwares have a beta version, which is when an application is under development but it is tested by users for bugs, errors, and their opinion on the software.
Shareware is software distributed free but with conditions. Such as a limited time. After a while, the software will not work (after free trial period).
There are risks assoiated with freeware, shareware, and beta versions, so you need to be careful. You can install a restore point on your system in case your computer does crash.
Software Versions and system requirements

- Software is updated and repaired periodically and that's why there are different versions of software
- Theres no rush to get the latest version of the software, but it depends on the usage of the software
- Normally, you can use and see the files created by different versions of the same software but sometimes, older versions cannot recognize the document created by the newer version.
- Every software has system requirements so you need to check those befoe you buy the software

Installing, Uninstalling, and Starting software

- When you buy software, it comes with a CD or DVD which opens up an installation wizrd which helps you install the software.
- If you buy a software online, it will come in a compressed folder which will automatically decompress and start the installation. You can decide where you want to save the file.

- If the installation doesn't begin right away, find the file (so remember the location!) and click on the .exe extention. This the application whereas the rest are data or help files.
- A full installation will copy all the files and programs from the distribution disc to the computer's hard drive where as a custom installation, you can decide which files you want on your system.
- When you delete a file, you aren't removing it from storage..you must uninstall it.
- The best way to start an application is to click on the icon in the All programs.
- You can put the icon in your taskbar as well as on your desktop if it is easier for you.

See pages 196-197 for chapter summary.

Chapter 5- Using System Software: The Operating System, Utility Programs, and File Management

What software is included in system software?
System software is the set of software programs the helps run the computer coordinates instructions between application software and hardware devices. It consists of the operating system, and utility programs. The OS controls how your computer system functions. Utility programs are programs that perform general housekeeping tasks for the computer, such as system maintenance and file compression.
What are the different kinds of operating systems?
Operating systems can be classified into 4 categories. Real-time operating systems (RTOs) require no user intervention. They are designed for systems with a specific purpose and response time. Smartphones have their own specific operating systems, the latest of which allow the user to multitask. Current operating systems for desktops, notebooks, and netbooks have multitasking capabilities, as well as networking capabilities.
What are the most common operating sysems?
Microsoft Windows is the most populare OS. It has evolved into a powerful multiuser operating system. The most recent releas is Windows 7. Another popular OS is the Mac OS, which is designed to work on Apple computers. Apple's most recent release, Mac OS X Snow Leopard, is based on the UNIX operating system. There are various versions of the UNIX on the market, although UNIX is most often used on networks. Linux is an open source OX based on UNIX and designed primarily for use on personal computers, although it is often found as the operating system on servers.
How does the operating system provide a means for users to interact with the computer?
The operating system provides a user interface that enables users to interact with the computer. Most Oss today us a geographical interface (GUI). Unlike the command menu-driven interfaces used earlier, GUIs display graphics and use the point and click technology of the mouse and cursor, making the OS more user friendly. Common features of GUIs include windows, menus, and icons.

How does the operating system help manage resources such as the processor, memory, storage, hardware, and peripheral devices?
When the OS allows you to perform more than one task at a time, it is multitasking. To provide for seamless multitasking, the OS controls the timing of events the processor works on. As the OS coordinates the activities of the processor, it uses RAM as a temporary storage area for instructions and data the processor needs. The OS is therefore responsible for coordinating the space allocations in RAM to ensure that there is enough space for the waiting instructions and data. If there isn't sufficient space in RAM for all the data and instructions, then the OS allocates the least necessary files to temporary storage on the hard drive, called *virtual memory* . The OS manages storage by providing a file-management system that keeps track of the names and locations of files and programs. Programs called *device drivers* facilitate communication between devices attached to the computer and the OS. Device drivers translate the specialized commands of devices to commands that the OS can understand and vice versa, enabling the OS to communicate with every device in the computer system. Device drivers for common devices are included in the OS software, whereas other devices come with a device driver that you must install or download off the Web.
How does the operating system interact with application software?

All software applications need to interact with the CPU. For programs to work with the CPU, they must contain code that the CPU recognizes. Rather than having the same blocks of code appear in each application, the OS includes the blocks of code to which software applications refer. These blocks of code are called *application programming interfaces* (APIs)

How does the operating system help the computer stat up?

When you start your computer, it runs through a special process called the *boot process.* The boot process consists of 4 basic steps

- The basic input/output system (BIOS) is activated when the user powers on the CPU
- IN the POST check, the BIOS verifies that all attached devices are in place
- The operating system is loaded into RAM
- Configuration and customization settings are checked

What are the main desktop and windows features?

The desktop provides your first interaction with the OS and is the first image you see on your monitor once the system had booted up. It provides you with access to your computers files, folders, and commonly used tools and applications. Windows are the rectangular panes on your screen that display applications running on your system. Common features of windows include toolbars, scrollbars, and minimize, maximize and restore and close buttons

- Note CPU – central processing unit

How does the operating system help me keep my computer organized?

The OS allows you to organize the contents of your computer in a hierarchical structure of directories that includes files, folders, libraries, and drives. Windows Explorer helps you mange your files and folders by showing the location and contents of every drive, folder, and file on your computer. Creating folders is the key to organizing files because folders keep related documents together. Following naming conventions and using proper file extensions are also important aspects of file management

What utility programs are included in system software, and what do they do?

Some utility programs are incorporated into the OS; others are sold as stand alone off the shelf programs. Common Windows utilities include those that enable you to adjust your display, add or remove programs, compress files, defragment your hard drive, clean unnecessary files off your system, check for lost files and errors, restore your system to an earlier setting, back up your files, schedule automatic tasks, and check on programs that have stopped running.

Definitions:

Disk Defragmenter: A utility that regroups related pieces of files on the hard drive, enabling faster retrieval of the data

Error Checking: A Windows itility that checks for lost files and fragments as well as physical errors on a hard drive

File Compression: A program that takes out redundancies in a file to reduce the file size

File Management: The process by which humans or computer software provide organizational structure to a computers contents

File: A collection of related pieces of information stored together for easy reference; in database terminology, a file or *table* is a group of related records

Folders: A collection of files stored on a computer

Linux: An open source operating system based on UNIX. Because of the stable nature of this operating system, it is often used on Web servers

Mac OS: The first commercially available operating system to incorporate a graphical user interface (GUI) with user-friendly point-and-click technology

Platform: The combination of a computers operating system and processor. The two most common platform types are the PC and the Apple Macintosh

System Files: Any of the main files of an operating system

System Software: The set of programs that enables a computers hardware devices and application software to work together it includes the operating system and utility programs

Task Manager: A Windows utility that shows programs currently running and permits you to exit nonresponsive programs when you click End Task

Task Scheduler: A Windows utility that enables you to schedule tasks to run automatically at predetermined times with no interaction necessary on your part

Track: a concentric circle that serves as a storage area on a hard drive platter
Utility programs: A small program that preforms many of the general housekeeping tasks for the computer, such as system maintenance and file compression
Windows: An operating system by Microsoft that incorporates a user-friendly graphical interface
Windows Explorer: The main tool for finding, viewing, and managing the contents of your computer b showing the location and contents of every drive, folder, and file
Windows 7: Microsoft operating system that builds upon the security and user interface upgrades that the Windows Vista release provided, and gives users with touch-screen monitors that ability to use touch commands to scroll, resize windows, pan and zoom

Chapter 6: Understanding and Assessing your Hardware: Evaluating your System

- Moore's law dictates that CPU speed will double every 18 months
- External hard drives can drastically increase the memory of a notebook

The CPU is located on the *motherboard* (motherboard: primary circuit board of a computer)
CPU is comprised of two units:

- The control unit that coordinates all other parts of the computer
- The arithmetic logic unit preforms all math calculations and makes logical decisions (this larger than, less than, equal to that, etc)

A machine cycle in a computer proceeds as: CPU retrieves instruction from the RAM, decodes instruction into computer language, executes the instruction, stores result in RAM
Factors that distinguish CPU's:

- Core: complete processing section from the CPU embedded into one chip (multiple cores allow the CPU to execute multiple instructions at once as opposed to ***hyperthreading*** that allows another instruction to begin execution before the original instruction has finished)
- Clock speed: how fast it can process information
- Cache memory: memory more accessible to the CPU than RAM is (immediate access memory)
    - Level 1 cache: stores data/commands that have just been used
    - Level 2 cache: contains more storage area than level 1 (slightly further away than level one, therefore it takes longer to access)
    - Level 3 cache: even more storage, even slower access
- Front Side Bus (FSB): connects CPU with computer memory (RAM), speed of FSB directly affects productivity of CPU

Netbook CPUs are different than Desktop CPUs because they must use low power to increase battery life and have increased flexibility in connectivity options
CPU usage is referred to as the percentage of time that your CPU is working, to view information on this usage, open the task manager
Upgrading a CPU does not directly upgrade your computer's performance—it will only upgrade the processing portion of the CPU, not how fast data moves to or from the CPU
RAM (random access memory): a computers temporary memory space (considered volatile memory because when the power is off the RAM is wiped)
ROMs and harddrives are non-volatile memory space, areas that are not wiped when the power is off
It is faster for the CPU to retrieve information from the RAM than a harddrive – the faster the retrieval the more expensive the equipment is
Types of RAM: DDR2, DDR3, DRAM, SDRAM, SRAM, better modules often work at lower temperatures which are more reliable
Memory modules are small circuit boards that hold series of RAM chips (referred to as dual inline memory modules DIMM)
The kernel memory is the memory that your operating system uses
RAM contains the memory of all programs being used while a system is on… so you need a lot
The more RAM you have the faster/more efficient your computer will work… but every computer has a limit of how much RAM it can handle
RAM is relatively easy to add to a system and is not expensive compared to other upgrades however prices fluxuate a lot
LONG TERM (non-volatile) STORAGE:

- Harddrive: largest storage capacity, cheapest to purchase, the access time to retrieve information stored on the harddrive is very quick
  - Information is stored on the harddrive on 'platters', when info is stored to these platters small magnetized bits appear, and their orientation denotes whether they represent a 1 or a 0
    - Solid state drives are very fast versions of harddrives that are expensive but gaining popularity
- Optical storage use lasers to store and read data, such as CDs, DVDs and Blu-ray disks (optical media)
  - ROM versions of these optical medias are read only and no information can be stored to them
  - -R versions (recordable) of these optical medias allow information to be saved or burned on to them
  - DVDs and Blu-rays can not be played on a CD player, but a blu-ray player can play everything
  - DVD drives are faster than CD drives
- A video card/adaptor translates binary data into images to view on your monitor
  - Contain their own RAM referred to as video memory
  - Contain graphic processing unit (GPU) which the CPU with direct information to
    - A GPU works in the same way as a CPU but it handles 3D images and videos, allowing the CPU to work more efficiently
    - GPUs exist on video cards
    - Video card memory can be found in a computer's advanced settings
    - A new video card is needed if your computer is loading pictures/the web/videos very slowly
- Sound cards are chips that can be added to the motherboard that enables a computer to produce sounds
  - Many computers have a 3D soundcard:
    - good at convincing the human ear that the sounds perceived are omnidirectional (without a detectable location)
    - surround sound on the other hand convinces the ears that the sound is originating from all directions
  - a standard sound card allows you to attach a microphone, put a line in (headphones) and speaker out – any additional sound requirements need an updated sound card

If your computer is freezing/crashing/restarting:

- check that you have enough RAM
- run a restore program
- if you have an error code in windows visit the online Microsoft knowledge base for help
- upgrade software when updates are available

Chapter 7: Networking Connection Computer Devices

Objectives

- What is a network, advantages/disadvantages of setting up one?
- What is the difference between a client/server network and a peer-to-peer network?
- Main components of every network
- What type of network most commonly found in the home?
- What equipment and software do I need to build a network in my home?
- Besides computers, what other devices would I connect to a home network?
- Why are wireless networks more vulnerable than wired networks, and what special precautions are required to ensure my wireless network is secure?
- How do I configure the software on my computer and set up other devices to get my network up and running?
- What problems might I encounter when setting up a wireless network?

Networking Fundamentals

- Computer network: two or more computers that are connected via software and hardware so they can communicate (ATM, get gas, internet)
- Node: each device connected to a network (computer, peripheral(printer), game console)
- Main function- facilitate information sharing

Benefits

- Share internet connections, peripheral device (printer), files (music, videos)
- Computers running different operating systems (windows or OS X) can communicate on same network

Disadvantages

- Purchase of additional equipment
- Network administration
    1) Installing new computer and devices
    2) Monitoring the network to ensure performance
    3) Updating/installing software
    4) Configuring proper security

Network Architecture: design of a network, classified by how they are controlled and distance between nodes

- Local administration: configuration/maintenance must be performed on each individual computer
- peer-to-peer network: each node can communicate directly with every other node on the network, all node are peers (equal), most common in homes)
- Central administration: tasks can be preformed from one computer
- client/server network: computer acts as a client making requests or a server providing resources (internet)
- home network server: store media, share media and back up files on computers connected to the network

Network Based on distance

- local area network (LAN): nodes located in small geographic area (lab at school, fast-food restaurant)
- wide area network (WAD): made up of LANs connected over long distance (east and west campus)
- home area network (HAN): network located at home, connect all digital devices
- metropolitan area network (MAN): internet access to residents and visitors

Network components

1) means of connecting nodes
2) special devices allowing nodes to communicate
3) software that allows network to run

Transmission Media

- transmission media: establishes a communication channel between nodes
- wireless: use radio waves
- wired: various cables
- Twisted-pair cable: copper wires that are twisted together and surrounded by plastic jacket (telephone cable)
- Coaxial cable: single copper wire surrounded by plastic (cable TV)
- Fiber-optic cable: plastic or glass fibers that transmit data, not usually used inside the home

- Data transfer rate (bandwidth): maximum speed data can be transmitted
- Throughput: actual speed of data, always less or equal to data transfer rate
- Both measured in megabits per second

Network Adapters

- Network adapters: devices connected to nodes to allow communication and access to networks
- Network interface card (NIC): network adapter that is installed inside a computer
- Why use wired
    - Wireless susceptible to interference from magnetic or electrical sources
    - Other wireless networks can interfere

        - Building materials can decrease throughput
        - Throughput varies depending on distance from network equipment

Networking navigation devices: facilitate and control the flow of data
- Packet: bundled data
- Router: transfers packets of data between two or more networks
- Switch: "traffic cop", receive data packets and send them to their intended node (intergraded in routers)

Network software
- Home networks need operating system (OS) software that support P3P networking
- Network operating system (NOS):for client/server networks (windows server 2008 R2 and SUSE Linux Enterprise Server)

Home Ethernet Networks

Ethernet home networks
- Ethernet network: uses Ethernet protocol (developed by institute of Electrical and Electronic engineers (IEEE)) for nodes to communicate
    - 802.11= wireless
    - 802.3 = wired
- Current standard that governs wireless networking is the 802.11n standard (Wi-Fi)
    - 802.11a, 802.11b, 802.11g, 802.11n (fastest data transfer, most desirable)
- Backward compatibility: current devices able to use previously issues standards
- Transceiver: device that translates the electronic data into radio waves, send and receive signals
- Multiple input multiple output (MIMO): use multiple antennas for transmitting/receiving data

Throughput speeds
- Install utilities to measure throughput such as net meter
- Ideal throughput 50 to 200 Mbps with wireless
- Up to 1000 Mbps with wired (gigabit Ethernet standard used for wired)

Networking cabling
- Unshielded twisted-pair (UTP) cable: most popular wired Ethernet , 4 pairs of wires that are twisted to reduce electrical interference, most have RJ-45 connectors (resemble phone connectors)
- 3 types of UTP: Cat 5E (cheapest, 100Mbps, Cat 6 (support gigabit Ethernet, best choice), Cat 6a (ultra fast Ethernet, 10 gigabit Ethernet)
- UTP cable can't exceed 100 meters (328 feet)

Wired and Wireless on One Network: can have both in on network
- Non-Ethernet networks rare because Ethernet networks
    1) Based on well established standard
    2) Feature easy set-up
    3) Provide good throughput
    4) Cost effective

Home Ethernet Equipment

Routers and Switches: moving data around your network
- Need a router, a switch (usually built into router)

Connecting devices to Routers
- Most home routers can support up to 253 wireless connections
- More devices, smaller bandwidth each node receives
- Router should be connected directly to broadband modem
- Setting up router: basic info such as logon info, type of IP

Connecting Network Nodes
- Need a wireless network interface card (NICs), most computers have them install inside

Connecting Other devices to the Network

Network-ready devices (internet ready): connected directly to router instead to a computer

- Network attached storage (NAS) devices: store and manage data
    - Automatically back up all computers connected to the network
    - Act as a repository for files to be shared across the network
    - Function as an access gateway to allow any computer on the network to be accessed from a remote location via the internet
- Apple computers, time capsule is a wireless router combined with hard drive, works in conjunction with time machine backup feature of OS X

Digital Entertainment Devices on a Network

- Main reason to access and share digital content
- When connected to internet; enjoy movies, videos, music, gaming devices, Netflix
    - Through streaming: sent directly to device without being saved, requires lots of bandwidth
    - Downloaded(saved): saved to a hard rive
- Many digital entertainment drives are network-ready with direct connection to network
- Companies developing applications that enable handheld devices to act as controls (BD remote)

Specialized home Networking Devices

- Internet appliances: easy access to the internet, social networking sites, emails, video etc
    - First marketed towards older computer users, but now very age group
- Digital picture frames now incorporate wireless adapters
- Enhance home security; cameras (Logitech Digital Video Security System)

Securing wireless Networks

- Wireless more vulnerable to hackers(breaks into system) cause of wide range
- Piggybacking: connecting to a wireless network (other than your own) without permission
- Packets of info on a wireless network are broadcast through the airwaves, hackers can incept/decode info, should take additional precautions described in the Sound Byte "Securing Wireless Networks";
    1. Change your network name (SSID: service set identifier)
    2. Disable SSID broadcast
    3. Change the default password on your router
    4. Turn on security protocols: when connecting a new node recurred to enter password
    5. Implement media access control: each network adapter has unique number (media access control (MAC) address)
    6. Limit your signal range
    7. Apply firmware upgrades: router has read-only memory

Configuring software for Your Home Network

Window Configuration

1. Make sure each node has a network adapter
2. Wired connections are all plugged
3. Broadband modem is connected to router and internet
4. Turn equipment on in this order, broadband modem, router, computers and peripherals

- Computer with various versions of windows can coexist
- Windows 7 created Homegroup, need password to join, option to decide what you share
- Connecting a Mac is much easier, connect router same, need to know SSID and passphrase
- Networks with SSID broadcast turned will not appear on available networks, have to enter name and password

Wireless node configuration

- Wired connection, simply plug cable in
- Wireless, set of steps, need to know SSID and security passphrase

Troubleshooting network problems

- Maximum range of wireless devices: 350 feet
- Wireless range extender: device that amplifies wireless signals

Chapter 8: Digital Lifestyle, Managing Digital Data and Devices

- Everything used to be in analog, now it is in digital: movies, music, tv, radio, stock prices
- Any kind of information can be digitized (measured and converted into numeric values)
    - Digital formats describe signals as long strings of numbers, opposed to long continuous lines (waves) of analog, gives us a way to simplistically and perfectly describe light and sound waves exactly
    - Easy ways of communicating digital information: cds, dvds, email
- Long, complex shapes can be duplicated in a sequence of numbers by analog-to-digital conversion
    - Incoming analog signal is measured many times each second, strength of the signal at each measurement is recorded as simple number; series of numbers produced by analog-to-digital process gives us the digital form of a wave
- When switched to digital standard, new capabilities, could hold huge collections of information, can now interact any way we'd like with our information

Digital Telephony: Communicating with Bits

- Telephony is the use of equipment to provide voice communications over a distance
- Cell phones have evolved from big chunky devices to compact and fully featured communication and information storage device; have all tradition phone features in addition to internet access, text messaging, personal information management, voice recording, GPS, digital image and video
    - The fullest featured phones are smartphones that require data plans to fully access its abilities, have enough computing power to run programs like Microsoft excel and powerpoint
- When you speak into a cell phone, it goes through a microphone as a sound wave thus the phone needs an analog-to-digital converter chip and converts the voice into a digital sound wave
- Digital data must be compressed into the smallest space possible so that it will transmit more quickly to another phone
    - The processor cannot perform the math quick enough, so a special chip, digital signal processor, is included to handle the compression work; when a call comes in it decompresses the incoming message
    - The digital data is transmitted as radio wave to the other phone on the cellular network
- Set of connected 'cells' make a cellular network, each cell is geographic area centered on a base transceiver station (a large communications tower with antennas, amplifiers, receivers, and transmitters)
    - On a call, a base stations picks up the request for service and passes it along to a central location called a mobile switching center (reverse for incoming)
    - A wireless network makes money by constructing series of cells that overlap in attempt to guarantee service no matter where you are
    - If you are moving during the call, the signal is changed when it is no longer strong enough and asks the next station to take care of your call, when a call drops out it is because the distance between base stations was too great to provide signal
- Smart/Cell phones have many of the same features as computers; a processor (CPU), memory, input/output devices, also have their own operating system (OS) software, own application software
- The processor is not as powerful as a computer obviously, but is responsible for a great number of tasks, coordinates sending all data among the other electronic components inside the phone
    - Runs the OS (changes phone settings, store information, play games, etc),
    - Popular processors include Qualcomm Snapdragon, Texas Instrument OMAP, Marvell XScale

- When shopping for a smartphone, use published benchmarking for performance, can be found online
- Each manufacturer makes own changes to OS and designs user interface, thus different set of commands and icons
    - Common smartphones use Windows mobile, Windows 7, OS X, or webOS; the most common is the android OS which was developed by Google
    - OS translates users commands into instructions for processo
- The OS and saved info (contacts) need to be stored in memory; OS stored in read-only memory (ROM), other phone data is stored in separate internal memory chips (ring tones)
    - Full-featured phones have about 200 MB of internal memory and additional support through micro SD flash cards that can store up to 32 GB and are easy to install (not available in iPhones)
    - This storage can be used for contacts, ring tones, pictures, songs, videos, and software applications
- Primary input devices include keypad and microphone; most smartphones feature touch-sensitive screens or hidden keyboards
- Often include digital cameras, quality level catching up to standalone point-and-shoot cameras
- Output devices include a speaker and liquid crystal display; new on the market are organic light-emitting didoe (OLED) which have excellent images and draw less power from the phone
    - Cell phone and cable providers are teaming up to deliver broadcast TV to smartphones
- Files can easily be transferred from your phone and computer with the flash cards; some can be directly slipped into the computers SD slot, or most phones are now have USB ports
    - Connecting with the USB cable, phone appears like an additional flash drive on computer and you can drag and drop files into it
- The connection also allows you to synchronize your phone and your computer data (calendar, files) all it takes is pushing the sync button when your phone is connected to your computer and the data transfer updates both device to have the most up-to-date files
- Bluetooth technology uses radio waves to transmit data signals over short distances; most cell phones are Bluetooth enabled, you can transmit data to a computer this way, and it also works with earpieces, mice, keyboards and headphones
- 'Cloud computing' allows users to have all updated files and new additions to be pushed out from one device to others that are connected to them (from iPhone to iPad to desktop)
    - Apple has MobileMe for a surcharge to users, Google has Google Sync for free working with most devices
- Text messaging or short message service allows you to send short messages up to 160 characters across mobile networks
    - can send them to other mobile devices and email addresses, you can also send them from your home computer to a friend's cell
    - uses cell network to transmit message, SMS sends and a SMS calling centre receives it and delivers it to the mobile phone using store-and-forward technology, allows it to send SMS device in the world
    - texting algorithms allows text programs such as T9 to help speed up the process of sending a message with pulling up the most common words used by the owner with just a single letter typed in
- An extension of SMS, multimedia message service allows you to send messages that include text, sound, images and videos to cell and email addresses
    - They arrive has a series of messages, you view the text, then the image, then the sound, you can then choose to save one part of the message (the image) all of it, or none of it
- Must have a wireless internet service provider to get internet on phone, most providers of phone calling plans also integrate wireless and texting plans for phones combined into data plans
- A smartphone connection is much slower than what you'd receive at home, data providers have started initiatives such as EDGE and 3G which provide a much faster data transfer
    - This is also helped if you are within range of a wireless network, however EDGE and 3G provide a much more reliable and less susceptible to interference; wireless providers are beginning to roll out 4G which will promise the same quality as home networks

- Mobile WiFi devices are revolutionizing where you can get wireless, MiFi devices are small and portable that provide up to four hours of connection through a single charge
    - Connects through the 3G wireless phone network and then distributes a WiFi signal up to 30 ft. can be used by up to five wireless devices
    - An iPhone can do this with a notebook computer through its Bluetooth network
- Smartphones have a limited amount of screen space, difficult to view webpages since designed for computers
    - Special microbrowser technology is installed in most smartphones which is software that allows web pages to be optimally displayed on the smaller screen
    - Software includes internet explorer mobile, safari and opera mobile; uses small-screen rendering technology to reform web images to fit one the phone's screen and can zoom in with a single tap
    - More websites are designing pages with wireless markup language, having the content being already smaller in size for mobile devices
- BlackBerrys were the first mobile devices optimized to check email, pioneered the push technology that delivers email to your phone automatically, now available on a wide range of phones; still can use internet to access accounts
- Voice over internete protocol (VoIP) is a form of voice-based internet communitcation, turns standard internet connection into a means that can support phone calls including long distance
    - Uses technology similar to that used in e-mail to send voice data digitally across the internet
    - You need speakers, a microphone, internet connection, and a provider (of VoIP), this may also require some software
    - Creating an account with Skype is similar to creating an IM account, requiring both parties to have the software installed, you can also change your online status, choose who you want to talk to and look at your contact list; Vonage is another company but is more complicated and requires a fee
- Advantages is that it is low-cost or free to make long distance calls and only requires an internet connection in order to get in touch with someone, can call from almost anywhere; disadvantages can be seen in the voice quality and reliability issues, another can be loss of service and dropped calls, security is also an issue, similar to email spam and fraud
- Viruses can already infect cell phones, manufacturers are bracing themselves for a tidal wave of viruses that can infect smartphones, they are the next realm to be targeted by criminals, as so much private info (emails, banking) is accessed from phones now
    - Symantec, McAfee and F-Secure are currently companies offering protection for mobile devices, if one is not offered for your phone updating it to keep security intact is the best step
- Keeping your phone number private to avoid unwanted calls can be done using a virtual phone number which is made up and design to ring at an already existing phone number like your cell, set hours calls are allowed and disable at any time if too many calls come in

Digital Media and Information

- All digital media follows the same process: playing music (media) creates analog waves, microphone feeds sound waves into chip (analog-to-digital converter) inside recording device, ADC digitizes the waves into series of numbers, series recorded onto CD or DVD or sent electronically, the process is then reverse on the playing device with a digital-to-analog converter, the waves then tell speakers how to move cones to play sounds
- Portable media players (PMPs) small devices that enable you to carry MP3s,can handle videos, music and images; many smartphones are also able to handle this, but the optimal choice would be the player offering more storage and features; also some cameras and game systems
    - Music and video files compete on sound quality and video quality, the file names relate to how small a file can be and still get good quality playback
    - The number of songs or hours of video that can be stored and played depends on storage space of device; most have built in flash memory (non-volatile), those that are more expensive have built in hard drives; it also depends on the quality of MP3s that you put

    - on, the higher the quality the larger the file (if you are ripping a CD yourself, you can select the sampling size, the higher it is the better quality)
    - Some PMP allow you to add extra removable flash memory cards which can constantly be erased and rewritten upon your command
- PMPs come with software that allows you to transfer music and video files from the computer to the player, most connect through USB 2.0 port, are extremely fast at syncing
- Many PMPs have docks that can be purchased to plug the device into the speakers and share music or movies with others
- Digital music became popular when MP3s were downloaded with permission online for easy access to the song (mp3.com), then came Napster which used peer-to-peer (P2P) sharing and always had access to popular songs where you could search for specific songs, it became too good at what it set out to do and had the music industry sue for copyright infringement and the site was closed in June 2002, reopened and now rightfully sells music
- DRM-free music is currently the most popular source of digital music (iTunes), once bought the music can be moved from system to system
- Current P2P sites operate claiming that they do not have a central server as Napster did, and are a true P2P network, having no control over what users trade
- Radio stations often had advantages like access to new music, personalities, conversations, however the internet now allows easier access to fans for artists to post new material online, many stations are now available to listen online
- Podcasting is another new way to broadcast, as they can be downloaded and listened to at any time, software now allows anyone to create their own and distribute them
- GPS systems have become relatively cheap and small, and widespread in vehicles and mobile devices; also at work in airplanes and boats
    - Is a network of 21 satellite (plus 3 working spares) which constantly orbit Earth, uses an antenna to pick up signals from these satellites, use special software to transform signals into latitude and longitude
    - Can determine geographical locations within 3 ft., accuracy depends on atmospheric conditions and interference from objects like mountains
- In 2005 all phones were to be equipped with GPS chip for 911, it can also be used to track the cell phone, which many parents subscribe to, to know where their children are which cannot be turned off
- Digital cameras beat out analog ones, since they do not require any film, capturing pictures instead by electronic sensors (charged-couple device) which converts the image into digital data, or series of numbers, corresponding to colours and brightness of millions of points in image
    - When purchasing need to determine if point and shoot or if single-lens reflex where multiple lens can be bought, then the features, image quality, ease of use and value for the cost
    - Many phones include digital cameras but they are much lower-resolution than a standalone camera and inferior lenses
    - Overall image determined by quality of lens, file format, compression used, colour management software and the camera resolution (number of data points it records for each image, measured in megapixels)
- Cameras allow you to choose file types to fit more onto memory, choosing to compress some files will cause you to lose some detail; most files are raw uncompressed data and joint photographic experts group
    - RAW files have different formats and extensions, record all of the original image information and is larger than the compressed JPEG file
    - Printing photos can be done be a photo printer that attaches to camera, or machines are available to print photos from memory card in stores, and can also use USB to connect to computer and save and print photos
    - Digital scanners can be used to create digital images from paper, text and old images (traditional photos), taking the old photo and scanning it turning it into a JPEG file to be saved

    - Printing photos with a photo service provides you with better quality photos due to paper and ink; you can use online services like Flickr to organize and create albums if you don't want to print them, or use mobile devices to store them as well
- People can now create their own digital videos, with digital camcorders, cell phones; the internet is now a wealth of digital media with devoted websites to digital videos like YouTube, as well as websites like Hulu that offer digital videos of TV(all TV is now digital), movies
    - Video editing allows you to add titles, animation, sound effects, background music, and narration; a DVD menu can also be implemented by using DVD software
    - In the end you can use which type of file you'd like to save it as, depending on what you'd like to play it on
    - Flip cameras are one of the best ways to capture video and quickly upload it to where you want and get your video out on the web, websites like YouTube offer a mobile upload app that allows for fast downloading to the site
- HD TV is different from digital TV by providing high definition and guarantee a specific level of resolution and aspect ratio (the rectangle shape of the image)
    - A 1080 HD displays 1920 vertical lines and 1080 horizontal lines of video on the screen, 6 times more than standard definition, uses 16:9 making the screen wider making it the same dimensions as a movie screen
    - Have HDMI cable connections for game consoles, cable boxes and blu-ray players, built-in SD card readers for slide shows of photos, some even have internet video links
- Digital TV has the advantages of being paused or renowned in real time, other services can be integrated with it, such as phone calls can appear on service, digital video recorders allow you to record shows to watch at a later date
    - some TV's have internet links and widgets, in the future you'll more integration which will allow online chats to take place on-air and real-time polls; on-demand services are readily available with providers, also services like Netflicks provide on demand
    - many DVRs allow you to get access on mobile devices, can transfer shows from PC to device, also can control how your TV operates from device

Digital Mobility and Access

- netbook runs fully featured operating system, weighs 2 pounds or less, internet tablet very light and portable but do not offer full keyboards; both can carry files, music, videos and provide specialized services
    - some mobile tablets do not have any cell service but only have services like Skype to make voice calls depending on WiFi
    - if you require a larger screen and keyboard emerging netbooks are the best choice for you, pack in computing power but lack battery life, full size keyboard and cd drive; can also include iPads as they have integrated onscreen keyboard, large screen and lightweight but does not have a full OS
    - if you are keen on taking multiple books with you systems like the Kindle and Kobo are best, having long battery life and supports more memory; iPads are also an excellent choice for this
- digital life will be integrated into everyday life until it is synonymous with it, being used in appliances, cars, clothing, era of 'smart things' beginning
- shopping is now beginning with online comparison, also many online deals and coupons can be found and used on mobile devices
    - this is also changing how we examine products, special bar codes are now being attached to products that will take the scanner to an informative sites about the product they are interested in

Chapter 9 Securing Your System

Cybercrime: any criminal action perpetrated primarily through the use of a computer

Cybercriminals: individuals who use computers, networks, and the internet to perpetrate crime

IC3: Internet Crime Complaint Center

- processed 336,000 complaints of cybercrime in 2009 → ~~up from~~ A 22% increase from 2008

Virus: a computer program that attaches itself to another program (known as the host program)
- attempts to spread to other computers when files are exchanged
- if you never expose your computer to new files you'll never get a virus

How are viruses spread? → An Example ←

① An individual writes a program and disguises it as a music file or another popular downloaded file

② Unsuspecting individual downloads the file onto his/her computer → computer becomes infected.

③ Unsuspecting individual sends an email with the infected file as an attachment to his/her friend another computer is infected.

④ The file gets saved to a flash-drive and then gets copied to another computer → another computer is affected.

Types of Viruses

1) Boot Sector
   - replicates itself onto a hard-drive's master boot record

2) Logic Bombs / Time Bombs
   - triggered when certain logical conditions are met ie. starting a program or opening a file
   - or triggered when a certain amount of time has past or on a certain date

3) Worm
   - attempts to travel between systems through network connection to spread the infection

4) Script/Macro Infections
   - hidden on websites
   - script: a series of commands (mini program)
     - run without your knowledge
   - macro virus: a virus that attaches itself to a document that uses a short series of commands that automates repetitive tasks (a macro)

5) Encryption Viruses
- they run a program that searches your computer for files & then encrypts them so that they are unreadable and useless
- then you will receive an email that asks you if you want your files unencrypted but you have to pay for the service.

Virus Classifications

1) Polymorphic
changes its own code to avoid detection

2) Multipartite
designed to infect multiple file types
- this fools antivirus software

3) Stealth
temporarily erase their code from the infected files and hide in the active memory of the computer

Antivirus Software
- should be run at least once a week
- looks for virus signatures in files

Virus Signature: portion of the virus code that is unique to a particular computer virus

- if a virus is found then it is moved to a secure area on the hard drive to prevent it from spreading
  - called quarantining
- Sometimes the software will try to prevent files from viruses by inoculating them

Software Updates

- Windows can update software automatically using Windows Update

If you don't want to install updates automatically there are 4 other options

1. Download updates, but choose when to install them yourself
2. Check for updates but choose when to download and install them yourself
3. Get reccommended updates only
4. Microsoft Update

Hackers

Hackers anyone who unlawfully breaks into a computer system

White-Hat Hackers - hackers that hack systems just for the challenge
- discover vulnerabilities in corporate systems

Black-Hat Hackers: hackers who hack to cause damage, destroy information, or for illegal gain.

Script-Kiddies: amateur hackers

Packets - data travelling through the internet in small pieces
- identified with an IP address
- can be found by hackers using Packet Sniffers

Trojan Horses

Trojan Horse: a program that appears to be something useful or desirable, but while it runs does something harmful in the background

- hackers can use it to install a backdoor program
- they can access, use, delete, or modify your files
- a computer that is controlled by a hacker like this is called a zombie

Denial of Service (DoS) Attack: legitimate users of a computer can't use it anymore because a hacker is controlling it

- Hackers gain access into computers using logical ports

logical ports: virtual communications gateways or paths that allow a computer to organize requests for information
- numbered & assigned to specific services
- protect yourself using a firewall

firewall: protects computers from hackers closes open logical ports

Passwords

How to create a strong Password

a) 14 characters long with numbers, symbols, upper/lowercase
b) Should not be a single word found in the dictionary
c) Should be a combination of several words
d) Should not be easily associated with you
e) Use different passwords for each system / Website
f) Never tell anyone your password or write it down
g) change your password regularly

Malware: - software that has malicious intents
- 3 different kinds

① Adware
- software that displays sponsored advertisements as a pop-up
- you can disable them in your internet browser

② Spyware
- unwanted piggy-back program that downloads with other software you want to install
- runs in the background of your system
- transmits info about your activities that can be used for marketing purposes

③ Viruses
see earlier pages in notes

Spam

Spam: - unwanted/junk email
- avoid it by creating an email account for when your filling in web-based forms
- then the spam will collect in this account and leave your main personal account alone

Cookies

Cookies: small text files that some web sites automatically store on your harddrive when you visit them

- makes your return to the website more efficient because it can remember your interests etc.

Protect Yourself... From Yourself

- don't reveal personal information over the internet
- Never share your 1) Social Security Number 2) Phone Number 3) Street Address
  - Using those 3 pieces of information your identity can be stolen

Backing Up Data

Two Types of files need to be backed-up

1. Program File: - used to install software
   - ie. Microsoft Office
2. Data File: - a file you have created or purchased
   - ie. music file or spreadsheet

Two ways of backing up files

1. Incremental or Partial: backing up only the files that have been created or changed since the last back-up

② Image or System ° all the system, application, and data files are backed up → not just the ones that have changed

3 main places where back-ups reside

① Online Sites - data is available anywhere you are
- less vulnerable to potential disasters (ie flood)

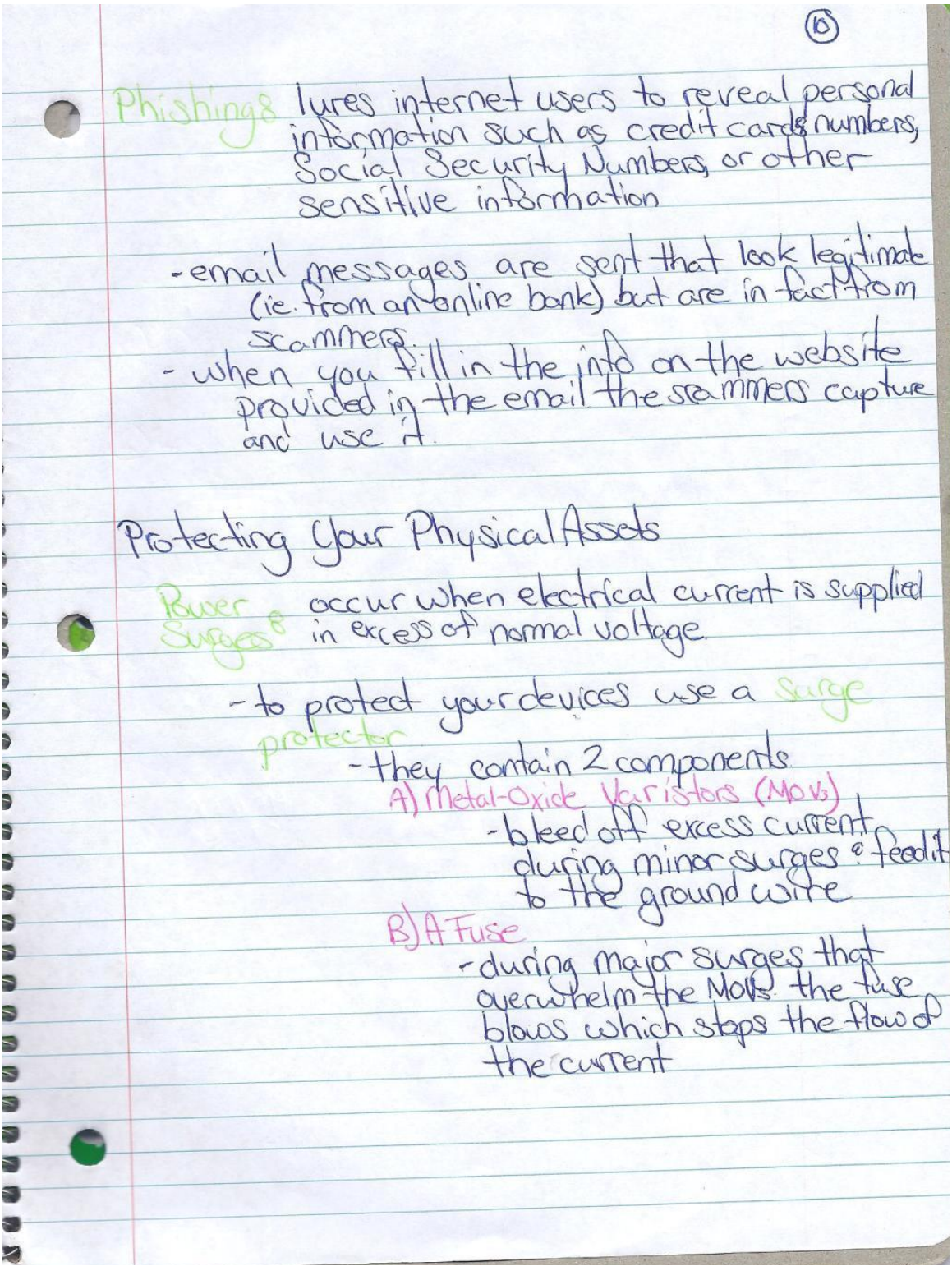
② Local Drives - ie. External hard drives
- must be kept in a safe location
- best if used with an online backup site.

③ Network-attached Storage devices & home servers
- easy to configure and very useful if you have multiple computers within a single household that needs backup

Social Engineering

- any technique that uses social skills to generate human interaction that entices individuals to reveal sensitive information.
- usually start with pre-texting

Pre-texting: involves creating a situation that seems legitimate enough that someone will trust you
- most common form is phishing



Chapter 10- Behind the Scenes: Building Applications

Information system – a system that includes data, people, procedures, hardware, and software that is used to gather and analyze information.

System development life cycle (SDLC) – An organized process (or set of steps) for developing an information system.

SDLC (waterfall) – there are six common steps each dependent on the next.
1. Problem and Opportunity Identification
- break new markets and developing new sources of customers
2. Analysis
- analysts explore in depth the problem to be solved and develop a program specification.
3. Design
-a plan to follow
-ultimate goal is to design a system that details the software inputs and outputs, backups and controls, and processing requirements of the problem
Flowcharts – visual diagrams of a process, including decisions
Data-flow diagrams trace all data in an information system from the point at which data enters the system to its final resting place.
4. Development & Documentation
-actual programming takes place/first step of program development
5. Testing & Installation
-installing the program so it can be used
6. Maintenance & Evaluation
-monitoring the system to ensure performance

Therac-25 between June 1985 – January 1987 is an example of a product being defective. Over radiated Americans and Canadians. The software did not catch the machine's status and accepted inputs.
The Association for Computing Machinery (ACM) and the IEEE have established eight priciples for ethical software engineering practices:
1. Public – Software engineers shall act consistently with the public interest.
2. Client Employer – Software engineers shall act in a manner that is in the best interests of their client and employer consistent with the public interest.
3. Product – Software engineers shall ensure that their product related modifications meet the highest professional standards possible.
4. Judgment = Software engineers shall maintain integrity and independence in their professional judgment
5. Management – Software engineering managers and leaders shall subscribe to and promote an ethical approach to the management of software development and maintenance.
6. Profession – Software engineers shall advance the integrity and reputation of the profession consistent with the public interest.
7. Colleagues – Software engineers shall be fair to and supportive of their colleagues.
8. Self – Software engineers shall participate in lifelong learning regarding the practice of their profession and shall promote an ethical approach to the practice of the profession.

Programming – the process of translating a task into a series of commands a computer will use to perform that task.
Program development life cycle (PDLC):
1. Describing the Problem
2. Making a plan
- Algorithm – a set of specific, sequential steps that describe in natural language exactly what a computer program must do to complete its task.
3. Coding
-translated into 1's and 0's
4. Debugging
-find and decode any repairs or errors
5. Finishing the project
Problem Statement – a clear description of which tasks the computer program must accomplish and how the program will execute these tasks and respond to unusual situations. It is the starting point of the programming work.
Three things relative to creating a useful program: data, information, and method.
Error Handling – in programming , the instructions that a program runs if the input data is incorrect or another error is encountered.

Test Planning – a plan that lists specific input numbers that the program would typically expect the user to enter. It then lists the prescise output values that a perfect program would return for those input values.
Programmers have several visual tools at their disposal to help them document points and flow of their algorithms. For example flowcharts and psdedocode (a text-based approach to documenting an algorithm).
Decision Points – a point at which a computer program must choose from a set of different actions based on the value of its current inputs.
Two main types of decisions change the flow of an algorithm. One decision point that appears often in algorithms is like a: "fork in the road" or a branch. These are called binary decisions.
Loop – in algorithm that performs a repeating set of actions. A logical yes/no expression is evaluated. As long as the expression evaluates to TRUE (yes) , the algorithm will perform the same set of actions, and continue to loop around. When the answer to the question is FALSE (no), the algorithm breaks free of the looping structure and moves on to the next step.
Test Condition (for loops) – see whether the loop is completed
Control structures – the general term used for keywords in a programming language that allow the programmer to control the flow of the program based on a decision.
Top-down design – a systematic approach in which a problem is broken into a series of high-level tasks.
Object-oriented analysis – an approach to software design that differs from the tradition "top-down" design. In object-oriented (OO) analysis programmers first identify all the classes (collections of data and methods that are required to describe completely the problem the program is trying to solve.
Object – A variable in a program that is an example of a class. Each object in a specific class is constructed from similar data and methods.
Object vs. Top down :
-object oriented analysis forces programmers to think in general terms about their problem.
- object oriented leads to reusability
-object oriented reuses existing classes
Base class – the original class
Derived class – the new modified class
Coding – the process of translating an algorithm into a programming language
First-generation language (1GL) – the actual machine language of a central processing unit (CPU); the sequence of bits-1s and 0s- that the CPU understands
Machine Language – a set of instructions executed directly by the central processing unit (CPU)
Second-generation Language (2GL) – also known as assembly language. 2GL languages deal directly with system hardware but provide acronyms that are easier for human programmers to work with
Third-generation Language (3GL) – a computer language that uses symbols and commands to help programmers tell the computer what to do. EX. BASIC, FORTRAN, COBOL, C/C++ and Java
Structured Query Language – the most popular database query language today
Fourth-generation language (4GL) – a sophisticated level of programming language such as a report generator or database query language
Fifth-generation language (5GL) – a computer language that uses natural language processing or expert systems to make the programming experience better matched to human thinking process. EX is PROLOG
Portability – the capability to move a completed solution easily from one type of computer to another
Syntax – an agreed-upon set of rules defining how a programming language must be structured.
Statements – a sentence in programming code
If else – in the programming language C++, keywords for a binary decision within an algorithm
Variable – a name or symbol that stands for a value
Variable declaration – a line of programming code that alerts code the code operating system that the program needs to allocate storage space in RAM for the variable
Data type – an attribute of a data field that determines what type of data can be stored in the database or memory location
Each language has its own data types for example C++ includes data types that represent integers, real numbers, characters and Boolean values.
Operator – any of the coding symbols that represent the fundamental actions of a computer language
Compilation – the process by which code is converted into machine language or the language the CPU can understand
Source Code – the instructions programmers write in a higher-level language
Executable program – the binary sequence (code) that instructs the CPU to perform certain calculations

Interpreter – a software program that translates source code into an intermediate form line by line. Each line is then executed as it is translated
Integrated development environment (IDE) – a development tool that helps programmers write, compile, and test their programs
Editor – a tool that helps programmers as they enter code, highlighting keywords and alerting the programmers to typos
Debugging – the process of repeatedly running a program to find errors and to make sure the program behaves in the way it should
Logical error – a mistake in the design and planning of the algorithm itself rather than in the use of syntax in the coding
Runtime error – an error in the problem logic that is only caught when the program executes
Beta versions are used to find mistakes programmers may have missed as well as get input from others. They are generally cheap or no price.
Software update (service pack) a downloadable software module that repairs errors identified in commercial program code
Langpop.com is an example of a site that uses a number of different techniques to get a feel for which languages are popular in the software industry
Pascal – the only modern computer language that was specifically designed as a teaching language; it is seldom taught now at the college level
Visual programming – a technique for automatically writing code when the programmer says the layout is complete. It helps programmers produce a final application much more quickly
Prototype – a small model of a computer program, often built at the beginning of a large project
Rapid application development (RAD) – a method of system development in which developers create a prototype first, generating system documents as they use and remodel the product
Visual Basic (VB) – a programming language used to build a wide range of windows applications quickly
VB is a very simple, quick, interface, which is easy for a programmer to learn and use.
Web service – a program used by a web site to make information available to other web sites
Languages such as C/C++ are good for uses of small amounts of memory and quick processing
Hypertext Markup Language (HTML) – a set of rules for making up blocks of text so that a web browser knows how to display them. It uses a series of tags that defines the display of text on a Web page
Extensible Hypertext Markup Language (XHTML) – a standard established by the World Wide Web Consortium (W3C) that combines elements from both Extensible Markup Language (XML) and HyperText Markup Language. XHTML has much more stringent rules that HTML does regarding tagging.
VBScript – a subset of Visual Basic; also used to introduce interactivity to Web pages
Dynamic decision making – a mechanism allows a Web page to decide how to display itself, based on the choices the reader makes as he or she looks at the page
To build a web site with interactive capability programmers use :
Active Server Pages (ASP) – a scripting environment in which users combine HyperText Markup Language, scripts, andreusable Microsoft ActiveX server components to create dynamically generated Web pages
Java Server Pages (JSP) – an extension of the Java servlet technology with dynamic scripting capability
PHP (Hypertexting Preprocessor) – a scripting language used to produce dynamic web pages
The most advanced web pages interact with the user, collecting information and then customizing the content displayed based on the users feedback
Action Script – a programming language included in Flash; similar to javascript in its keywords, operators, and classes
Extensible Markup Language (XML) – a language that enables designers to define their own tags, making it much easier to transfer data between web sites and web servers

Chapter 11: Behind the Scenes: Databases and Information Systems

Life Without Databases

- Database
    - A database is a collection of related data that can be easily stored, sorted, organized and queried.

Should I use databases for managing all types of data?

- Not every situation is which related data needs to be turned into organized information demands the complexity of a database
- For simple tasks, lists are adequate

When is a list not appropriate?

- If complex information needs to be organized or more than one person needs to access it, a list is not an efficient solution

What's the problem with having two lists?

- There is a great deal of duplicated information between two lists **(Data Redundancy)**
    - This data redundancy can be problematic when a college or university has 10, 000 students
- Each time information in the list changes, multiple lists have to be updated
    - It would be easy to overlook one or more lists or even one or more rows in the same list
    - This would lead to a state of **Data Inconsistency**

Are there any other problems with using lists instead of databases?

- Duplicate data may be entered (ex. student enrolled in college twice- will be sent two student bills)
- With a list, anything can be entered into a row or column, even if that information is incorrect
- Information can be organized in many ways- reorganizing multiple lists is labour intensive (residence wants sorted by residence halls while accounting clerk wants sorted by last name)
- Lists cannot handle incomplete data

How can I solve the problems associated with lists?

- For single topics, a list is sufficient
- For complex data that needs to be organized or shared, using a database is the most practical and efficient way to avoid the pitfalls associated with lists

Database Building Blocks

- Almost any kind of data that needs organization and analysis can be put into a database
- Ex. Yahoo! People Search and Netflix

Advantages of Using Databases

How do databases make our lives easier?

- Without databases you could not store and retrieve large quantities of information easily
- Although you can look up information quickly in a list, even extremely large electronic databases can provide the information you request in seconds
- Provide three main advantages:
    - Enable information sharing
    - They promote data integrity
    - They allow the flexible use of data

How do databases make information sharing possible?

- With a database, only one file is maintained, which reduces the possibility of errors when data is entered or updates
- It increases efficiency, because there are no files to reconcile with each other
- A database provides for data centralization- there is no need for multiple lists
- Ex. each department in a school that needs to use student information can accesses it from the same set of data

How do databases promote integrity?

- **Data Integrity** means that the data contained in the database in accurate and reliable
- **Data Centralization** ensures data integrity
- Instead of being in multiple lists that have to be maintained, your name and address information is maintained in only one place

How do databases provide flexibility?

- Databases are flexibly organized, enabling you to reorganize the information they contain in a variety of ways to suit the needs of the moment
- Data flexibility also makes information dissemination easier
- Databases can manage larger amounts of data and process that data more efficiently

Are there any disadvantages associated with databases?

- Databases are more complex to construct and administer than lists
- They can be time- consuming and expensive to set up
- Great care must be taken to ensure they will function as intended
- **Database administrator (database designer)** is an individual trained in the design and building of databases, to assist with the construction of large databases
- Data privacy concerns arise when using databases
- The advantages of databases far outweigh the administrative disadvantages

Database Terminology

How is data stored in a database?

- Databases have three main components:
    - Fields
    - Records
    - Tables (files)

Fields

What is a field?

- A database stores each category of information in a **Field**
- Fields are displayed in columns
- Each field is identified by a **Field Name** which is a way of describing the field
- In a database, fields have other characteristics to describe them, including field data types and field size

What are data types?

- When fields are created in the database, the user assigns those fields a **Data Type** or (**Field Type)**
    - the data type indicated what type of data can be stored in the field
    - common data types are listed below

Figure 11.6 | COMMON DATA TYPES AND ILLUSTRATIVE DATA

Data Type	Used to Store	Examples
Text	Alphabetic or alphanumeric data	Mirabel CIS 110
Numeric	Numbers	256 1.347 $5,600
Computational	Computational formulas	Credit hours × per-credit tuition charges
Date	Dates in standard date notation	4/15/2014
Memo	Long blocks of text	Four score and seven years ago, our fathers brought forth on this continent a new nation, conceived in liberty, and dedicated to the proposition that all men are created equal.
Object	Multimedia files or documents	MP3 file AVI file
Hyperlink	A hyperlink to a Web page	pearsonhighered.com/techinaction

What is meant by field size?

- **Field Size** defines the maximum number of characters or numbers that field can hold
- If a numeric field has a size of 5, it can hold a number as high as 99999
- As a rule, you should tailor the field size to the length of the data it contains
- If you define a field size of 50, space is reserved for 50 characters in that field

Records and Tables

What are records and tables in databases?

- A group of related fields is called a **record**
- A group of related records is a **Table or (file)**
- Tables are usually organized by a common subject

Primary Keys

Can fields have the same values in the same table?

- Yes they can- it may be possible that two students may live in the same town or have the same last name
- However, each record must have one field that has a value unique to that record, this unique field is called a **Primary Key or a Key Field**
- Establishing a primary key and ensuring that it is unique make it impossible to duplicate records

What makes a good primary key?

- Drivers license numbers are unique within a particular state, as are the license plate numbers, government agencies often use these numbers to track individuals and their transactions
- Primary keys don't have to be numbers that already represent something- ex. amazon creates their own primary key

Database Types

- The three major types of databases currently in use are:
    - Relational
    - Object- oriented
    - Multidimensional
- Relational databases have the largest market share

Relational Databases

What is a relational database?

- A **Relational Database** organizes data in table format by logically grouping similar data into a **relation** (a table that contains related data)
- In relational databases, tables are logically linked to each other by including their primary keys in other tables with related information
- Data types common in relational databases are text, numeric, and data

Object- Oriented Databases

What is an object- oriented database?

- An **Object- Oriented Database** stores data in objects rather than in tables
- Objects contain not only data, but also methods for processing or manipulating data
- This allows these types of databases to store more types of data than relational databases and to access that data faster
- Because object- orientated databases store the instructions for doing computations in the same place as they store the data, they can usually process requests for information faster than can relational databases

What would I use an object- orientated database?

- Whereas relational databases excel in the storage of **Structured (analytic) Data** (such as "Bill" or "345"), object- oriented databases are more adept at handling unstructured data
- **Unstructured Data** includes non-traditional data such as audio clips, video clips, pictures, and large documents
- Data of this type is known as a **Binary Large Object (BLOB)** because it is actually encoded in binary form
- Object- oriented databases are based on complex models for manipulating data
    - These models are much more complex than relational database models
- They also need to use a query language to access and manage data
- Many object- orientated databases use **Object Query Language (OQL)** which is similar to SQL (Structured query language), a standard language used to construct queries to extract data from databases

Multidimensional Databases

What is a multidimensional database?

- A **Multidimensional Database** stores data in more than two dimensions which distinguishes it from a relational database, which stores data in two- dimensional tables
- Multidimensional databases organize data in a cube format
    - Each data cube has a *measure attribute*, which is the main type of data that the cube is tracking
    - Other elements of the cube are known as *feature attributes*, which all describe the measure attribute in some meaningful way

What are the advantages of multidimensional databases?

- The two main advantages of multidimensional databases are that they can easily be customized to provide information to a variety of users, and they can process data much faster than pure relational databases can
- The need for processing speed is especially critical when deploying a large database that will be accessed via the Internet

Database Management Systems: Basic Operations

- Databases are created and managed using a **Database Management System (DBMS)**

- A DBMS is a designed application software that interacts with the user, other applications, and the database to capture and analyze data
- The four main operations of a DBMS are:
  - Creating databases and entering data
  - Viewing (or browsing) and sorting data
  - Querying (extracting) data
  - Outputting data

Creating Databases and Entering Data

- To create a database with DBMS, you must first define the data to be captured, therefore, you must create a description of the data
  - This description is contained in the databases files and is referred to as the **Data Dictionary** or the **Database Schema**
  - The data dictionary defines the name, data type and length of each field in the database

How do I know what fields are needed in my database?

- Each field should describe a unique piece if data and should never combine two separate pieces of data

What should a data dictionary look like, and how do I create one?

- In Microsoft Access, the data dictionary is called the Field Properties Box
- The first step in creating an entry is to create a field name
- Field names should be unique within a table
- You must define a data type for each field
- You should set a maximum field size for the field
- The caption value allows you to display a name of your choice on forms and reports
- You then can set a **Default Value** for a field
  - A default value is the value that database uses for the field unless the user enters another value
- **Metadata** is data that describes other data and is an integral part of the data dictionary
- You need to build the data dictionary for each table you will use in a database before you enter data into the database

What happens if I forget to define a field in the data dictionary or if I want to add another one later?

- You can add additional fields as needed but this does not negate the need for proper planning and design of the database
- You will need to populate (enter data into) any fields that are added to your database

Inputting Data

How do I get data into the database?

- After you create a data dictionary for each table (or file) in the database, and establish the fields you want the database to contain, you can begin creating individual records in the database
- Most databases can import data electronically from other application files
- When importing data, most databases usually apply filters to the data to determine that it is in the correct format as defined by the data dictionary
- Nonconforming data is flagged so that you can modify the data to fit the databases format

How can I make manual entry into a database more convenient?

- For small databases, or databases in which no electronic information is to be imported, you can create an input form to speed data entry

- An **Input Form** provides a view of the data fields to be filled, with appropriate labels to assist the database users in populating the database
- Each field has a label that indicates the data to be placed in the field, the data is represented by blank boxes

Data Validation

How can I ensure that only valid data is entered into the database?

- One feature of most DBMNs is the capability to perform data validation
- **Validation** is the process of ensuring that data entered into the database is correct
- A **Validation Rule** is set up in the student database to alert the user if a clearly wrong entry is entered in the phone number field instead of a valid 10- digit phone number
    - Validation rules are generally defined as part of the data dictionary
    - Violations usually result in an error message
    - Common validation checks include range, completeness, consistency, and alphabetic and numeric checks

How does a range check work?

- A **Range Check** ensures that the data entered into the database falls within a certain range of numbers
- You can set a **Field Constraint** (a property that must be satisfied for an entry to be accepted into the field

What does a completeness check accomplish?

- In database systems, fields can be defined as required, meaning that data must be entered into them
- A **Completeness check**, ensures that all fields defined as required have data entered into them
- When this occurs, an error message then displays to alert the user of the omission

What is the function of a consistency check?

- A **Consistency Check** compares the values of data in two or more fields to see if these values are reasonable

How are alphabetic and numeric check used?

- You may want to restrict fields to only alphabetic or numerical data
- An **Alphabetical Check** confirms that only textual characters are entered into the field
- A **Numeric Check** confirms that only numbers are entered in the field

Viewing and Sorting Data

How can I view the data in a database?

- Displaying the tables on- screen and **Browsing** through the data (viewing records) is an option with most databases
- In many instances, you will only want to view the data, not display the entire table
- Browsing large databases is time consuming unless the records are in an order that makes your task easy

How can I reorder records in a database?

- You can easily **Sort** a database into the order that you need
- Sorting a database involves organizing I in a new fashion
- By highlighting a column, and then clicking the Sort Ascending button, the database displays the records in alphabetical order by last name

What is I want to find a particular piece of data in a database?

- To find data in a large database quickly and efficiently, you need to be able to request only the data you are seeking, therefore, database management systems let you query the data to enable you to find what you are looking for

Extracting or Querying Data

What is a query?

- A **Query** is a question or inquiry
- A **Database Query** is a question you ask the database so that is provides you with the records you with to view
- When you query a dataset, you instruct it to search for a particular piece of data
- They enable you to have the databases select and display records that match certain criteria

In querying a database as simple as just asking the proper question?

- All modern DBMNs contain a **Query Language** that the software uses to retrieve and display records
- A query language consists of its own vocabulary and sentence structure, which you use to frame the requests
    - They are similar to full-blown programming languages but are usually much easier to learn
    - The most popular query language today is structured query language (SQL)

Do I have to learn a query language to develop queries for my database?

- Modern database systems provide wizards to guide you through the process of creating queries

Outputting Data

How do I get data out of a database?

- The most common form of output for any database is a viewable (printable) electronic report
- Businesses routinely summarize the data within their databases and compile summary data reports

Can I transfer data from a database file to another software application?

- Database systems also can be used to **Export** data to other applications
- Exporting data involves putting it into an electronic file in a format that another application can understand

Relational Database Operations

- Relational databases operate by organizing data in various tables based on logical groupings
- Because not all of the data in a relational database is stored in the same table, a methodology must be implemented to link data between tables
- In a relational database, a link between tables that defines how the data is related is referred to as a **Relationships**
    - To establish a relationship between two tables, both tables must have a common field
- Relationships in databases can take three forms
    - A **One to One Relationship** indicates that for each record in a table there is only one corresponding record in a related table
        - Occur most frequently in relational databases
    - A **One to Many Relationship** is a relationships in which one record in a data table can have many related records in another data table
    - A **Many to Many Relationship** is characterized by records in one table being related to multiple records in a second table and vice versa

Normalization of Data

How do I decide which tables I need and what data to put in them?

- In databases, the goal is to reduce data redundancy by recording data only once, this process is called **Normalization** of the data
- The tables must still work well enough together to enable you to retrieve the data when you need it. Tables should be grouped using logical data that can be identified uniquely

How do I get the data in the tables to work together now that it is split up?

- The entire premise behind relational databases is that relationships are established among the tables to allow the data to be shared
- To establish a relationship between two tables, the tables must have a common field (column)- this usually involves the primary keys of the table
- A **Foreign Key** is the primary key of another table that is included for purposes of establishing relationships with the other table
- Because relationships are vital to the operation of the database, it is important to ensure that there are no inconsistencies in the data entered in the common fields of the two tables

How do I ensure that a foreign key field contains a valid primary key from the related table?

- To apply this restraint, when defining a relationship in a database, you have the option of enforcing referential integrity for that relationship
- **Referential Integrity** means that for each value in the foreign key on the table, there is a corresponding value in the primary key of the related table
- Establishing referential integrity between two tables helps prevent inconsistent data from being entered

Who manages the data in a database?

- All of the data that is collected in databases needs to be stored and managed
- Database administrators review and manage data on an ongoing basis to ensure data is flowing smoothly in and out of the database

Data Storage

- At the simplest level, data is stored in a single database on a database server and you retrieve the data as needed
- Problems can arise when the data you need is in multiple places
- Large storage repositories called *data warehouses* and *data marts* help to solve this problem

Data Warehouses

What is a data warehouse?

- A **Data Warehouse** is a large- scale electronic repository of data that contains and organizes all the data related to an organization in one place
- Data warehouses consolidate information from disparate sources to present an enterprise- wide view of business operations

Is data in a data warehouse organized the same way as in a normal database?

- Data is organized by subject
- Most databases focus on one specific operational aspect of business operations

Are data warehouses much larger than conventional databases?

- Data warehouses, lie conventional warehouses, are vast repositories of information
- The data contained within them is not operational in nature, but rather archival
- Data warehouse data is **Time- Variant Data**, meaning it does not all pertain to one period in time

- The warehouse contains current values, such as amounts due from customers
- Having time- variant data in the warehouse enables you to analyze the past, examine the present and make projections about the future

Populating Data Warehouses

How are data warehouses populated with data?

- Source data for data warehouses can come from three places:
    - Internal sources
        - Ex. Company databases, sales, billing, inventory
        - Is not contained exclusively in databases, spreadsheets and other analysis tools may contain data that needs to be loaded into the warehouse
    - External sources
        - Ex. Suppliers, vendors
        - Provide data regarding product specifications, shipment methods and dates, etc.
    - Customers or visitors to a company's web site

What is a clickstream and why is it important?

- Companies can use software on their web sites to capture information about each click that users make as they navigate through the site
- This information is called **Clickstream Data**
- Monitoring the clickstream helps managers assess the effectiveness of a website

Data Staging

Does all source data fit into the warehouse?

- No two source databases are the same
- Source data must be `staged` before entering the data warehouse
- **Data Staging** consists of three steps:
    - Extraction of the data from source databases
    - Transformation (reformatting) of the data
    - Storage of the data in the warehouse

Data Marts

Is finding the right data in a huge data warehouse difficult?

- Small slices of the data warehouse, each called a **Data Mart** are created
- The information in data marts pertains to a single department
- Data staging is vital because different data must be extracted and then reformatted to fit the data structure defined in the data warehouses DBMN

Managing Data: Information Systems

- An **Information System** is a software- based solution used to gather and analyze information
- Databases, data warehouses, and data marts are integral parts of information systems because they store the information that makes information systems functional
- All information systems perform similar functions such as, acquiring data, processing that data into information, storing the data, and providing the user with a number of output options with which to make the information meaningful ad useful
- Most information systems fall into one of five categories:
    - Office support systems
    - Transaction- processing systems
    - Management information systems
    - Decision support systems

- Enterprise resource planning systems

Office Support Systems
What does an office support system accomplish?
- An **Office Support System (OSS)** is designed to improve communications and assist employees in accomplishing their daily tasks
- Ex. Microsoft office

Transaction- Processing Systems
What is a transaction- processing system?
- A **Transaction- Processing System (TPS)** keeps track of everyday business activities

How do transactions enter a TPS?
- Transactions can be entered manually or electronically
- Transactions are processed either in batches or in real time
- Various departments in an organization then access the TPSs to extract the information they need to process additional transactions

What is batch processing?
- **Batch processing** means that transaction data is accumulated until a certain point is reaches and then several transactions are processed all at once
- This is appropriate for activities that are not time sensitive

How does real- time processing work?
- **Real- Time Processing** means that the database is queried and updated while the transaction is taking place

Management Information Systems
What is a management information system?
- A **Management Information System (MIS)** provides timely and accurate information that enables managers to make critical business decisions

What does an MIS provide that a TPS does not?
- The original TPSs were usually designed to output detail reports
- **Detail Report** provides a list of the transactions that occurred during a certain time period
- Going beyond detail reports provided by TPSs, MISs provide summary reports and exception reports
- A **Summary Report** provides a consolidated picture of detailed data
    - These reports usually include some calculation (totals) or visual displays of information
- An **Exception Report** shows conditions that are unusual or that need attention by users of the system

Decision Support Systems
What is a decision support system?
- A **Decision Support System (DSS)** is designed to help managers develop solutions for specific problems

What does a decision support system look like?
- The major components of a DSS are internal and external data sources, model management systems, and knowledge based systems

Internal and External Data Sources

What are internal and external data sources for decision support systems?

- Internal data sources are maintained by the same company that operates the DSS
- An **External Data Source** is any course not owned by the company that owns the DSS
- These both provide a stream of data that is integrated into the DSS for analysis

Model Management Systems

What function does a model management system perform?

- A **Model Management System** is software that assists in building management models in DSSs
- A management model is an analysis tool that, through the use of internal and external data, provides a view of a particular business situation for the purposes of decision making
- Internal models, such as spreadsheets are developed inside an organization
- External models, such as statistics are purchased from third parties

Knowledge- Based Systems

What is a knowledge- based system, and how is it used in decision support systems?

- A **Knowledge Based System** provides additional intelligence that supplements the users own intellect and makes the DSS more effective
- It can be an **Expert System** that tries to replicate the decision making process of human experts to solve specific problems
- Another type of knowledge based system is a **Natural Language Processing System** which enables users to communicate with computer systems using a natural spoken or written language instead of using a computer programming languages

How does a knowledge based system help in the decision making process?

- Databases and the models provided tend to be analytical and mathematical in language
- Knowledge bases system provides an opportunity to introduce experience into the mix and supports the concept of fuzzy logic
- **Fuzzy Logic** enables the interjection of experiential learning into the equation by considering probabilities

Enterprise Resource Planning Systems

What is an enterprise?

- Any business entity, large or small

What does an enterprise resource planning system do?

- **Enterprise Resource Planning (ERP) System** is a broad- based software system that integrates multiple days sources and ties together the various processes of an enterprise to enable information to flow more smoothly
- Use a common database to store and integrate information and this enables the information to be used across multiple areas of enterprise

Data Mining

- **Data Mining** is the process by which great amounts of data are analyzed and investigated
- The objective is to spot significant patterns or trends within the data that would otherwise not be obvious

Why do businesses mine their data?

- To understand their customers better

How do businesses mine their data?

- Enables managers to sift through data in several ways
- Each method produced different information that managers can then base their decisions on
- Make their data meaningful in the following activities:
    - *Classification*
        - To analyse data, managers need to classify it
        - Before mining, managers define data classes that they think will be helpful in spotting trends
        - They then apply these class definitions to all unclassified data to prepare it for analysis
    - *Estimation*
        - When mangers classify data, the record either fits the classification criteria or it doesn't
        - Estimation enables managers to assign a value to data based on some criteria
    - *Affinity grouping (association rules)*
        - When mining data, managers can determine which data goes together
        - They can apply affinity grouping to the data
    - *Clustering*
        - Involves organizing data into similar subgroups or clusters
        - No predefined classes
        - Software makes the decision about what to group and the managers have to determine whether the clusters are meaningful
    - *Description and visualization*
        - The purpose of mining is merely to describe data so that mangers can visualize it
        - Having a clear picture helps to interpret it in different ways

Chapter #12 - Behind the Scenes: Networking and Security in the Business World

Networking Advantages

- **Network**: a group of two or more computers (or nodes) that are configured to share information and resources such as printers, files and databases
- Large business networks provide advantages similar to home networks:
    - Networks increase productivity because people can share information and communicate efficiently
    - Networks enable expensive resources to be shared, reducing costs
    - Networks facilitate knowledge sharing
    - Networks enable software sharing as all employees can access a program from the server, saving the hassle of installation on each computer
    - Networks facilitate Internet connectivity as many computers can share one Internet connection
    - Networks enable enhances communication with tools such as social networking, e-mail and instant messaging
- There are a few disadvantages to using business networks, including:
    - A **network administrator** is required to maintain the network
    - Special equipment and software may be required
    - However, the benefits generally outweigh these costs
- Small networks in homes and small businesses are usually peer-to-peer
- Most business networks are based on the client/server model

Client/Server Networks

- **Server**: a computer that stores and shares resources on a network
- **Client**: a computer that requests the resources of the server

- Main advantage is that data can flow more efficiently as servers can respond to requests from a large number of clients at a time
- Servers can be configured to perform specific tasks (e.g. e-mail or database requests) efficiently
- A P2P network does not need a server
- P2P networks become difficult to administer when they have a large number (10+) users; this is when a client/server network should be used
- **Scalability**: more users can be added easily to a network without affecting the performance of other network nodes (computers or peripherals)
- The main difference other than having a centralized server is that client/server networks have increased scalability than P2P networks
- Additional users can be managed by adding more servers to manage the workload
- Client/server networks are **centralized** because all clients connect to a server that performs tasks for them

Classifications of Client/Server Networks: LANs, WANs and MANs
- Networks are classified according to their size and the distance between the physical parts of the networks
- **Local area network (LAN)**: a generally small group of computers and peripherals linked over a relatively small geographic area (e.g. computer lab at school or network serving a floor of an office building)
- **Wide area network (WAN)**: a large number of users over a wider physical area (e.g. a large college campus, or geographically distant branches of a corporation)
- **Metropolitan area network (MAN)**: government organization or civic group users linked in a specific geographic area, such as within a city or country (e.g. San Diego's Traffic Management Center)
- **Personal area network (PAN)**: connects wireless devices in close proximity to each other (e.g. Bluetooth-enables devices or smartphones); wireless networks that connect through the personal operating space of an individual (30 feet or 10 metres)
- **Intranet**: a private network set up by an entity that is used exclusively by a select group of individuals (employees, customers, suppliers, volunteers, supports, etc.) that facilitates information sharing, database access, group scheduling, videoconferencing and other collaborations
    - Usually deployed using Transmission Control Protocol/Internet Protocol (TCP/IP)
    - Generally include links to the Internet
    - Not accessible to unauthorized individuals by firewall protection
    - First main uses was to run groupware (group collaborating software)
- **Extranet**: an area of an intranet that only certain corporations of individuals can access
    - Useful for enabling electronic data interchange (EDI)
    - Provide access to catalogs and inventory databases
- **Virtual private network (VPN)**: used by intranets and extranets to use the public Internet communications infrastructure to build a secure, private network among various locations
    - Use special security technologies and enhanced protocols to increase security
    - Requires VPN-optimized routers and firewalls
    - VPN software must be installed on users' PCs
- **Tunneling**: the main technology for achieving a VPN in which data packets are placed inside other data packets; the format of these external data packets is encrypted and only understood by the sending and receiving hardware
- **Tunnel interface**: the sending and receiving hardware optimized to seek efficient routes of transmission through the Internet

Constructing Client/Server Networks
- Have many of the same components of P2P networks
- **Server**: must have at least one computer that functions solely as the server
- **Network topology**: because client/server networks are more complex than P2P networks, the structure of the network must be carefully planned
- **Transmission media**: data needs a way to flow between clients and servers; an appropriate cable or wireless media technology is required
- **Network operating system (NOS) software**: specialized software that is installed on servers and client computers and enables the network to function (included on many modern operating systems

- **Network adaptor**: all nodes must contain adaptors that enable a computer or peripheral to communicate with the network using common data communication language or protocol

Servers
- **Dedicated server**: a server used to fulfill one specific function (e.g. handling e-mail)
- **Authentication server**: a server that keeps track of who is logging onto the network and which services are available to each user; acts as overseers for the network
- **File server**: stores and manages files for network users
- **Print servers**: manage all client-requested printing jobs for all printers on a network
- **Print queue**: a software holding area for print jobs to organize them
- **Application server**: acts as a repository for the application software utilized by many of the client computers
- **Database server**: provides client computers with access to information stored in databases so that many people can access the database at the same time
- **E-mail server**: processes and delivers incoming and outgoing e-mail to manage large volumes of e-mail on a large network
- **Communications server**: handles all communication between the network and other networks, including managing Internet connectivity; often the only device on the network connected to the Internet
- **Web server**: used to host a Web site so it will be available through the Internet by running specialized software

Network Topologies
- **Network topology**: the physical or logical arrangement of computers, transmission media and other network components
- **Physical topology**: refers to the layout of the "real" components of the network
- **Logical topology**: refers to the virtual connections among network nodes
- **Data collisions**: a problem for all networks when two computers send data at the same time and sets of data collide and are irreparably damaged or lost
- Because two signals transmitted at the same time may cause a data collision, an **access method** must be established to control which computer is allowed to use the transmission media at a certain time
- **Bus topology**: all computers are connected in sequence on a single cable
    - Most often found in P2P networks
    - Not designed to easily support wireless connections
    - Every computer can communicate directly with every other computer on the network
    - When it is safe to sent data, the sending computer broadcasts data onto the media and the data is sent throughout the network to all devices on the network
    - When a device "hears" data addressed to it, it takes the data off the media and processes it
    - A **passive topology** since the devices do nothing to move data along the network
    - **Terminator**: a device that absorbs a signal so it is not reflected back onto parts of the network that have already received it
    - Simple and low cost, but if there is a break in the cable, the network is disrupted
    - Only one computer can communicate at a time
- **Ring topology**: the computers and peripherals are laid out resembling a circle
    - Data flows around the circle between devices in one direction only
    - Data is passed using a special data packet called a **token**
    - Can deliver **data transfer rates** of up to 100 Mbps
    - When the receiving node received a complete transmission of the data, it transmits an acknowledgement to the sending node
    - Is an **active topology** because the nodes participate in moving data through the network
    - Provides fairer allocation of network resources than the bus topology as all nodes have an equal chance to send data
    - However, if one computer fails it can bring the whole network to a halt
    - Problems in the ring can also be hard to find
- **Star topology**: widely deployed client/server network in which the nodes connect to a central communications device called a **switch** in a pattern resembling a star
    - Each network node only picks up the transmissions attached to it

    - An **active topology** because the switch retransmits data signals
    - If the switch fails, the network no longer functions
    - Most use the Ethernet protocol
    - A **protocol** is a set of rules for exchanging communication
    - Main advantage is that if one node fails, the network still functions
    - It is easy to add nodes
    - Can accommodate a large number of users
    - Disadvantage was cost, as their require more cable (but prices are lower)
- **CSMA/CD**: the method used on all Ethernet networks to avoid data collisions
    - A node connected to the network uses carrier sense to verify that no other nodes are currently transmitting signals
    - When two signals collide, a node on the network detects the collision
    - That node sends a **jam signal** to all network nodes, alerting them that a collision has occurred
    - The original nodes wait a random amount of time before retransmitting their data signals
- Topologies are often combined into a **hybrid topology**

Transmission Media
- **Transmission media**: comprise the routes data takes to flow between devices on the network
- Most home networks use twisted-pair cable as wires transmission media
- Important factors in choosing a cable type include:
    - Maximum run length over which signals can be sent and "heard"
    - **Bandwidth**: the amount of data that can be transmitted in a certain amount of time
    - Bend radius (flexibility)
    - Cable cost
    - Installation costs
    - Susceptibility to interference
    - Signal transmission methods (electrical impulses vs pulses of light)
- **Twisted-pair cable**: consists of copper wires twisted around each other and covered by a protective sheath
    - **Shielded twist-pair (STP) cable**: contains a layer of foil shielding to reduce interference
    - **Unshielded twisted-pair (UTP) cable**: does not contain foil shielding
- **Coaxial cable**: consists of a copper core for transmitting the signal, a solid layer of nonconductive insulation, a layer of braided metal shielding to reduce interference and an external jacket of plastic
- **Fiber-optic cable**: comprised of a glass fiber that transmits data, a protective layer of glass or plastic, and an outer jacket of durable material
    - Signals are converted to light pulses
- **Wireless media**: add ons that extend of improve access to a wired network
    - Wireless communications must use the **802.11 standard** (**WiFi**) in the US, as established by the Institute of Electrical and Electronics Engineers (IEEE)
- Network engineers determine the transmission media a network will use

Network Operating Systems
- **Network operating system (NOS)** needs to be installed on each client and server computer to provide the services necessary for communication
- Many modern operating systems include NOS client software as a part of the basic installation
- The software P2P networks require is built into Windows and Mac operating systems
- NOS software is specifically designed to provide server services, network communications, management of network peripherals and storage
- Each NOS has its own proprietary communications language, file-management structure and device-management structure
- The NOS also sets protocols for all devices wishing to communicate on the network
- Many large networks use several different NOSs at the same time that provide different features for different situations

Network Adaptors

- **Network adaptors**: devices that perform specific tasks to enable computers to communicate on a network
- Most are installed inside computers and peripherals (**Network interface cards**)
- Perform three critical functions:

1. Generate high-powered signals from low power signals generated inside the computer that enable network transmissions

2. They are responsible for breaking the data into packets and preparing packets for transmission across the network

3. They act as gatekeepers to information flowing to and from the client computer

- Ethernet is the standard communications protocol, so adaptor cards for most computers are Ethernet compliant
- A computer that connects to the network using wireless access needs to have a special network adaptor card called a **wireless network interface card** (**wireless NIC**) installed in the system unit
- A **wireless access point (WAP)** gives wireless devices a sending and receiving connection to the network
- When a wireless device is powered on near a WAP, it establishes a connection with the access point using radio waves
- The network adaptor needs to speak the same language as the network's operating system software
- **Device driver**: special communications software installed on all client computers that enable communication with the operating system of the server

Network Navigation Devices

- **Media access control (MAC) address**: a physical address (similar to a serial number on an appliance) that every network adaptor has
    - Made up of six two-position characters
    - The first three sets of characters specify the manufacturer
    - The second three sets make up the unique address
    - A MAC address is used for identification purposes internally on a network, as opposed to an IP address that external entities use
    - Groups of data packets are sent in groups called **frames**, and the NOS software assigns the appropriate MAC address to the frame
    - MAC addresses can also be used to enhance network security on networks with wireless capabilities by filtering which MAC addresses have access
- A **switch** makes decisions, based on the MAC address of the data, as to where the data is to be sent and directs it to the appropriate node
- Switches are needed on Ethernet networks
- A **bridge** is a device that is used to send data between different segments of a network or **collision domains**
- A **router** sends information between two networks by looking at higher-level network address (such as IP addresses)

Network Security for Client/Server Networks

- Client/server networks offer a higher level of security than P2P networks
- The security can be centrally controlled by network administrators
- Security threats that administrators need to watch for include:
    - Human errors and mistakes (e.g. accidental deletions)
    - Malicious human activity (e.g. disgruntled employees)
    - Natural events and disasters that could destroy data
- **Authentication**: the process whereby users prove they have authorization to access a computer network, such as an ID and password
- **Possessed object**: an object that a user carries to identify himself and that grants him access to a computer system or facility, such as a badge or key card
- **Brute force attack**: attempting to hack an account by repeatedly trying different passwords
- Certain individuals or computers have certain access privileges that control what they can access on the network
- Physical measures can also be taken to protect a network, such as **access card readers** that only admit authorized personnel

- **Biometric authentication device**: uses some unique characteristic of human biology to identify authorized users, such as fingerprint readers or eye scanners
- Large client/server networks use firewalls as part of security measures
- Most firewalls contain **packet screeners** that examine incoming data packets to ensure they originated from or are authorized by valid users
- Packet screening is performed by the router
- Packet screening can also be configured to ensure that outgoing packet requests are from legitimate users
- To increase security further, large networks add a **bastion host**, which is a heavily secured server located on a special perimeter network between the company's secure internal network and the firewall
    - To external computers, the bastion host gives the appearance of being the internal network server
    - Hackers will attempt to attack the bastion host, leaving the internal server protected
- Bastion servers are often configured as **proxy servers** that connect computers on the internal network to those on the external network (Internet)
    - All incoming and outgoing requests must pass through the proxy server

Chapter 13: Behind the Scenes: How the Internet Works

- The Internet is the largest network that you use and to keep it functioning at peak efficiency, it must be governed and regulated. No one really owns the internet
- Several nonprofit organizations and user groups, each with a specialized purpose, are responsible for its management. Some of these organizations include: *Internet Society (ISOC), Internet Engineering Task Force (IETF), Internet Architecture Board (IAB), Internet Corporation for Assigned Names and Numbers (ICANN), and World Wide Web Consortium (W3C)*
- National Science Foundation (NSF) pays a large portion of the Internet's infrastructure and funds and R&D. Primary source of their funding is tax dollars

Internet Networking

- **Internet backbone:** the main paths of the Internet, along which data travels the fastest. It is a collection of large and international networks, most of which are owned by commercial, educations, or government organizations (such as NASA)
- **T line:** carried digital data over twisted-pair wires. Backbone ISPs initially connected with T lines
- **Optical carrier (OC) line:** a backbone is typically a high-speed fiber-optic line, designated as an optical carrier line
- **Internet exchange point (IXP):** a device that allows different Internet service providers to exchange information between networks
- **Switches:** devices that send data on a specific route through a network
- **Point of presence (POP):** a bank of modems, servers, routers, and switches through which many users can connect to an ISP simultaneously
- **Client/server model:** majority of Internet communications, which we defined as in earlier chapters as one in which client computers request services and other computers, known as servers, provide those services to the clients. The networks that make up the Internet include:
    - **Web server:** computer that runs specialized operating systems, enabling it to host (provide Web space for) Web pages and other information and provide requested Web pages to clients
    - **Commerce server:** computer that hosts software that enables users to purchase goods and services over the Web
    - **File server:** computer that is deployed to provide remote storage space or to act as a storehouse for files that users can download
- **Bittorrent.com:** a popular file-sharing service through which Internet users can exchange files

Data Transmission and Protocols

- **Computer protocol:** a set of rules for exchanging electronic information
- **Open system:** each protocol has to be an open system, meaning its design would be made public for access by any interested party

- **Proprietary system:** private system model
- **Circuit switching:** used since the early days of the telephone for establishing communication. A dedicated connection is formed between two points and the connection remains active for the duration of the transmission
- **Packet switching:** the communications methodology that makes computer communication efficient. Data is broken into smaller chunks (each one called a packet or a data packet) that are sent over various routes at the same time
    - At a minimum, all packets must contain: (1) an address to which the packet is being sent; (2) the address from where the packet originated; (3) reassembling instructions, if the original data was split between packets; and (4) the data that is being transmitted
- **TCIP/IP:** the main suite of protocols, named after the two protocols that were developed for the internet, the **Transmission Control Protocol (TCP)** and the **Internet Protocol (IP)**

IP Addresses and Domain Names

- **IP address:** a unique identification number that defines each computer, service, or other device that connects to the Internet
- **Internet Corporation for Assigned Names and Numbers (ICANN):** IP addresses must be registered with this to ensure that they are unique and have not been assigned to other users. It is responsible for allocating IP addresses to network administrators
    - **Dotted decimal number:** (also known as a dotted quad) a typical IP address is expressed as follows: 197.169.73.63
    - **Octet:** each 4 numbers in a dotted decimal number
- **Internet Protocol version 4 (IPv4):** the original IP addressing scheme
- **Classless interdomain routing (CIDR):** a different addressing scheme, allows a single IP access to represent several unique IP addresses by adding a network prefix to the end of the last octect.
- **Internet Protocol version 6 (IPv6):** an IP addressing scheme developed by the Internet Engineering Task Force (IETF) to make IP addresses longer, thereby providing more available IP addresses
- IPv6 uses 8 groups of 16-bit numbers, referred to as **hexadecimal notation**
- **Static addressing:** means that the IP address for a computer never changes and is most likely assigned manually by a network administrator or ISP
- **Dynamic addressing:** when your computer is assigned an address from an available pool of IP addresses
- **Dynamic host configuration protocol (DHCP):** this normally handles dynamic addressing, which belongs to the TCP/IP protocol suite. DHCP takes a pool of IP addresses and shares them with hosts on the network on an as-needed basis
- **Domain name:** a name that takes the place of an IP address (e.g., yahoo.com)
    - Top-level domain (TLD)→ the portion of the domain name after the dot (e.g., Google)
    - **Second-level domain name:** needs to be unique within its own top-level domain but not necessarily unique to all top-level domains (.com vs. .org)
- **DNS (domain name system) server:** a server that contains location information for domains on the Internet and functions like a phone book for the Internet. Translates a URL to an IP address
- **Root DNS server:** knows the location of all the DNS servers that contain the master listings for an entire top-level domain

Other Protocols: FTP and Telnet

- **File transfer protocol:** enables users to share files that reside on local computers with remote computers
- **Telnet:** is both a protocol for connecting to a remote computer and a TCP/IP service that runs on a remote computer to make it accessible to other computers. Enables you to take control of a remote computer (the server) with your computer (the client) and manipulate files and data on the server as if the server were on your own computer

HTTP, HTML, and Other Web Jargon

- World Wide Web (Web) is not the same as the Internet- Web is actually a grouping of protocols and software that resides on the Internet. Uses HTMAL and protocols such as HTTP, which facilitate communication between computers using different system and application software
- **HyperText Transfer Protocol (HTTP):** created especially for the transfer of hypertext documents across the Internet. It's the internet protocol a browser uses to send requests
- **Hypertext:** documents in which text is linked to other documents or media (such as video clips, pictures, and so on) E.g., hyperlink
- **HyperText Transfer Protocol Secure (HTTPS):** is actually a combination of the HTTP protocol and a network security protocol (usually SSL or ELS). Ensures data is sent securely over the Web
- **Transport layer security (TLS)** and the **secure sockets layer (SSL)-** two protocols that provide data integrity and security for transmissions over the Internet
- HTML and XHTML→ set of rules for marking up blocks of texts so that a browser knows how to display them
    - **HTML tags:** blocks of texts in HTML/XHTML documents are surrounded by pairs of HTML tags (such as and , which indicate bolding)
    - **Element:** each pair of tags and the text between them are collectively referred to as an element. The elements are interpreted by the browser, and appropriate effects are applied to the text
- XML (extensible markup language)→ describes the content in terms of what data is being described rather than how it is to be displayed. Users can build their own markup languages to accommodate particular data formats and needs as they are not locked into standard tags and formats for data
- **Common gateway interface:** provides a methodology by which your browser can request that a program file be executed (run) instead of just being delivered to the browser. Enables functionality beyond the simple display of information
    - **CGI scripts:** CGI files can be created in almost any programming language, and the programs created are often referred to as CGI scripts. Common languages used to create CGI scripts are Perl, C, and C++
    - **CGI-bin:** a directory that is created by the network administrator who configures the Web server. All CGI scripts are placed in this directory
    - **Server-side program:** a program that is run on a Web server as opposed to inside a Web browser
- **Dynamic HTML (DHTML):** a combination of Web development technologies including HTML, cascading style sheets, and a scripting language that are used to add interactivity to a Web site after the Web site has been loaded onto the client computer
    - **AJAX:** the acronym for a newer group of technologies that facilitates the creation of Web applications. Can update information on the page without requiring the user to do a page refresh or leave the page
    - JavaScript→ the most common scripting language used for creating DHTML effects
    - **Cascading style sheet (CSS):** a list of statements (also known as rules) that defines in one single location how to display HTML/XHTML elements
    - **Document object model (DOM):** defines every item on a Web page- including graphics, tables and headers- as objects. Then with DOM, similar to CSS, Web developers can easily change the look and feel of these objects. Used by DHTML to organize the objects and page elements
- **Client-side program:** a computer program that runs on the client computer and requires no interaction with a Web server. Two main types of client-side methods:
    - **HTML/XHTML embedded scripting language:** embedding programming language code directly within the HTML or XHTML code of a web page using this
    - **Applet:** a small application that resides on a server. When requested, a compiled version of the program is downloaded to the client computer and run there. Once the applet has arrived, it can execute all its functions without further communication with the server

Communications over the Internet

- Email→ **simple mail transfer protocol (SMTP):** responsible for sending e-mail along the Internet to its destination. E-mail is a client/server application

    - **E-mail server:** a specialized computer who's sole function is to store, process, and send e-mail
    - **Multi-purpose Internet mail extensions (MIME):** introduced in 1991 to simplify attachments to e-mail messages. All e-mail client software now uses this protocol to attach files (e-mails are still sent as text)
    - Email is highly susceptible to being read by unintended parties because it's sent in plain text, so encryption is used for sensitive e-mail messages
    - **Encryption:** refers to the process of coding your e-mail so that only the person with the key to the code (the intended recipient) can decode (or decipher) and read the message. Two basic types of encryption:
        - **Private-key encryption:** only the two parties involved in sending the message have the code, which can be as simple as a shift code (shifting letters of alphabet to a new position) or as complex as a substitution code (a=h)
        - **Public-key encryption:** two keys, known as a key pair, are created. You use only one key for coding and the other for decoding. The key for coding is generally distributed as a public key. Most commonly used encryption on the Internet, such as **Pretty Good Privacy (PGP)** public-key package
        - A key is a binary number and varies in length
- Instant messaging→ the act of communicating over the Internet with one or more people in real time. Conversations are able to happen at the same time rather than lagging by minutes or hours, which is the case for e-mail
    - Steps: *step 1*- contact chat server to see who is online; *step 2*- IP addresses of your buddies sent to your computer; *step 3*- chat with your buddy commences via his IP address
    - Most instant messaging services do not use a high level of encryption for their messages. In addition to viruses, worms, and hacking threats, instant messaging systems are vulnerable to eavesdropping, in which someone using a packet sniffer "listens in" on IM conversations
- Voice over Internet Protocol (VoIP)→ turns a standard Internet connection into a way to make free long-distance phone calls. It is a method of taking analog voice signals that normally travel telephone wires and turning them into digital data that can be transmitted over the Internet
    - Uses packet-switching as a method of transferring data

Using the Internet to Deliver Computer Services

- **Cloud computing:** refers to using the Internet to deliver business services online that were previously delivered locally by company-owned IT departments. Many Web 2.0 applications (such as blogs, wikis, and social networks) and Web-based email (such as Yahoo! Or Gmail) are provided to you via cloud computing
    - Needed by companies to manage the millions of products the company has to offer and handle the tens of thousands of orders it receives and delivers each day

Businesses that process large amounts of data every once in a while can significantly reduce costs by usin