

UNIT 1---Computer and Information Ethics

Primary Issues with Technology

- Privacy issues: Most importantly today as it relates to cloud computing.
- Privacy in the digital world:
 - Of the person
 - Of behaviour and action
 - Of communication
 - Of data
 - Of thoughts and feelings
 - Of space and time
 - Of association
- Intellectual rights: This is as it relates to context such as cloud computing and deals with issues such as:
 - Patent infringement
 - Copyright infringement
 - Trade secrets
 - Confidential information

What are the primary issues with technology?

- Privacy related issues, most importantly today because it relates to the cloud.
- Privacy in the digital world.

There are 7 different privacy issues:

Privacy of the Person: Embodies the right to keep body functions and body characteristics private (such as genetic codes and biometrics which is statistical analysis to biological data).

Privacy of Behavior and Action: Includes concerns about sensitive issues such as sexual privacy/preferences and habits, political activities and religious practices.

Privacy of Communication: Aims to avoid the interception of communications, including mail interception, the use of bugs, directional microphones, telephone or wireless communication interception or recording or access to email messages.

Privacy of Data and Image: Making sure that individuals data is not automatically available to other individuals and organizations. Also this is for individuals to have more control over data and its issue.

Privacy of Thoughts and Feelings: Refers to the right not to share their thoughts, feelings or to have those thoughts or feelings revealed (individuals should have the right to think whatever they want).

Privacy of Location and Space: individuals have the right to move about in public or semi-public space without being identified, tracked, or monitored.

Privacy of Association: Is concerned with people's right to associate with whomever they wish, without being monitored, this includes group privacy.

*People must ask themselves the following question: Am I sure that I am comfortable with all of my characteristics being exposed in the public domain?

What are some key privacy questions?

→ As big data grows; enterprises need a robust (strong) data privacy solution to help prevent breaches and enforce security in an IT environment.

- Can we trust our sources of big data?
- What information are we collecting without exposing the enterprise to legal and regulatory battles?
- How will we protect our sources, processes, and our decisions from theft and corruption?
- What policies are in place to ensure that employees keep stakeholders information confidential during and after employment?
- What actions are we taking that create trends that can be exploited by our rivals?

→ Many people approve a privacy policy without reading it. The consent to this agreement is mandatory to access the service. Consequently, users have no choice if they want to use it.

Shifting Privacy Standards

→ Many consumers are poorly educated about how their personal data is collected by companies and are unsure about what it is actually used for.

Ex. In December 2012, Instagram said it had the right to sell users photos for advertising purposes without payment or notification.

Cookie Law: A piece of privacy legislation that requires websites to get consent from visitors to store or retrieve any information on a computer, smartphone etc.

Google Glass: A phone in front of your eyes with a front facing camera. There are several tracking devices to collect statistical data. This device can track and recognize numbers very quickly. Must be careful with credit cards, receipts, taxes etc.

Privacy: Intrinsic Right or Social Construct?

→ One way to ensure there are no surprises around privacy is by seeing it not as a right but as an exchange between people and organisations, bound by the same principles of trust that facilitate effective social and business relationships (An approach that is an alternative to "privacy as right").

→ "Privacy as right" instead positions privacy as a social construct to be explicitly negotiated so it is appropriate to the social context in which the exchange occurs.

Primary Risks With Technology

Intellectual Rights- This is as it relates to context such as cloud computing, it deals with issues that will be explained.

Cloud Computing- The delivery of computing as a service rather than a product, typically over the internet. In other words, data is stored and/or processed in the "cloud," which is a broad term generally used to describe infrastructure that is accessed remotely (i.e. the internet). When data and services move to the cloud, there are a number of legal issues, including intellectual property issues, for both cloud computing providers and users to consider.

Examples of cloud computing service models include:

Software-as-a-service (SaaS) → allows users to access and use software over the internet.

Platform-as-a-service (PaaS) → provides access to a computing platform on which applications may be run or developed.

Infrastructure-as-a-service (IAAS) → access to a computer infrastructure on which a computer platform may be run and maintained by the user.

*Main advantages of cloud computing is that individuals or businesses may avoid the costs of buying, installing, and maintaining hardware/software.

1. Patent Infringement- A Canadian patent grants the patentee the exclusive right to make, use, and sell an invention for the term of the patent. A Canadian patent does not grant any rights in any other country (must get an international patent). The multi-jurisdictional nature of cloud computing, and the uncertain nature of the "cloud," give rise to a number of possible complications for patent owners or licensees trying to assert their patents against potential infringers.

→ It may be difficult to predict what activities definitively constitute infringement. For example, if a particular technology is patented in Canada, but a competitor's cloud computing service uses infrastructure that performs some or all of its data outside of Canada, the Canadian patent may not be infringed. The "cloud" may include components in many countries, the law in other countries may also need to be considered.

→ Even if the hardware or processes used in a cloud computing system do infringe patent rights, detecting the infringement may be difficult. Reverse engineering at the user's end to detect information may not be possible.

2. Copyright Infringement- Cloud computing involves the storage of data in the cloud rather than locally. This raises intellectual property issues. For example, the nature of cloud storage may complicate a copyright infringement analysis.

→ Copyright laws vary from jurisdiction to jurisdiction. When data is stored in multiple locations, it is less clear whether copyright has been infringed in a particular jurisdiction.

Another issue relating to copyright is whether cloud storage service providers can be held responsible/liable for this type of infringement.

3. Confidential Info (Trade Secrets)- Another concern relating to cloud storage is the protection of private and confidential data, such as trade secrets.

→ Before uploading confidential data to the cloud, a user should consider what type of duty of confidentiality is owed to the user by the cloud storage server provider. Also, a cloud storage service should consider what would happen to their data in the event that the cloud storage service is terminated.

Computer Abuse→ The use of a computer to do something improper or illegal.

- To expose personally identifiable information (PII)
- Using a computer to modify websites owned by someone else
- Illegally share copyrighted information
- Gaining unauthorized access
- To spy on company information and plans

→ People who commit computer abuse may be violating university, company, and federal policies.

→ Responding to computer abuse involves identifying the offending computers and then identify the individual abusers.

→ The Computer Fraud and Abuse Act of 1984

Examples of Computer Abuse:

- Creating a fake social media account.
- Downloading millions of academic articles to which access was restricted through a subscription service, with intent to freely distribute them.

Morals

- Conforming to established ideas of right and wrong.

Laws

- They are formal standards that apply to all and which are enforced by official agencies such as the government.
 - Laws to cover all possibilities are impossible
 - Consequently, ethics would be used as general guidelines to manage the law and for people to follow.

Ethical Systems

Relativism

- No universal moral truth
- Moral principles are dictated by cultural tastes and customs.

Ex. Topless bathing in Europe is generally banned on public beaches in the United States.

Divine Command

- God is all-knowing. He is the one who sets morals and ethical standards.

- God's law is right, all should conform to it.
- Breaking God's law is wrong.

Ex. The Ten Commandments.

Utilitarianism

- Actions are judged solely by consequences. In other words the outcomes of your actions should be judged.
- Actions that lead to or produce happiness are considered to be superior to those that generate unhappiness.
- The greater good is more important.

Ex. weapons of mass destruction, may end the war sooner. To that effect, it saves lives and misery that would have otherwise been more.

Virtue

- Morals are found internally (within the person).
- Every individual should aim to behave well.

Ex. Volunteers versus court-ordered community service OR donating money without having identity announced.

Duty-Based (Deontology)

- Understanding and adopting a lifestyle in line with moral duties and rights (doing what is morally right).
- Everyone is expected to follow these moral duties and rights.

Ex. Freedom of religion and/or speech.

Unethical and Amoral Behavior

- Unethical does not necessarily mean it is illegal.
- Illegal behavior does not necessarily mean unethical.
- Amoral behavior means no sense of right or wrong and the lack of awareness or interest in consequences.

Sources of Personal Ethics

- Religion
- Family
- Experience
- Teachers
- Friends
- Reflections

Ethics and Society

- Social rules of conduct exist and ignoring them can have an impact.

- Considering these rules and conducts may provide health benefits and rejecting them may produce stress.

Positive Psychology

Causes of happiness.

- Identify personal strengths and values.
- Negative (cheating, stealing, selfishness, lying) versus positive (generosity, honesty, trust).

Technological Challenges

→ Technological advances continue to challenge the boundaries for ethics and moral behaviour.

Examples:

1. Social Injustice → Programming ethics into robots. Who should do it?
2. Intellectual Property → 3D printing misuse. Can regulations be imposed?
3. Privacy → Human implanted data chips. Societal benefits or privacy violation?
4. Property Rights → Who owns outer space?
5. Computer abuse → Is organized hacking a mode of terrorism?
6. Artificial intelligence.

Links:

<https://www.computerweekly.com/opinion/Privacy-concerns-in-the-digital-world>

http://www.smart-bigger.ca/en/articles_detail.cfm?news_id=535

<https://www.investopedia.com/terms/c/computer-abuse.asp>

UNIT 3 (System Software)---Software: Tools for Productivity and Creativity

Unit 3A: System Software: The Power behind the Power

- **Application Software:** software that has been developed to solve a particular problem for users-to perform useful work on specific tasks or to provide entertainment.
- System software: runs at the most basic level of your computer and enables the application software to interact with the computer and helps the computer to manage its internal and external resources, as well as manage the hardware.

There are 3 basic components of system software that you need to know about:

- 1) **Operating system:** the principal component of system software in any computing system.
- 2) **Device Drivers:** help the computer control peripheral devices (peripheral device is a device that is not part of the essential computer (ex: printer and keyboard)). Device drivers control a particular type of device that is attached to your computer.
- 3) **Utility Programs:** generally used to support, enhance, or expand existing programs in a computer system.

Hardware: computer plus peripheral devices

3.1 The Operating System (What it does)

The operating system manages the entire computer system

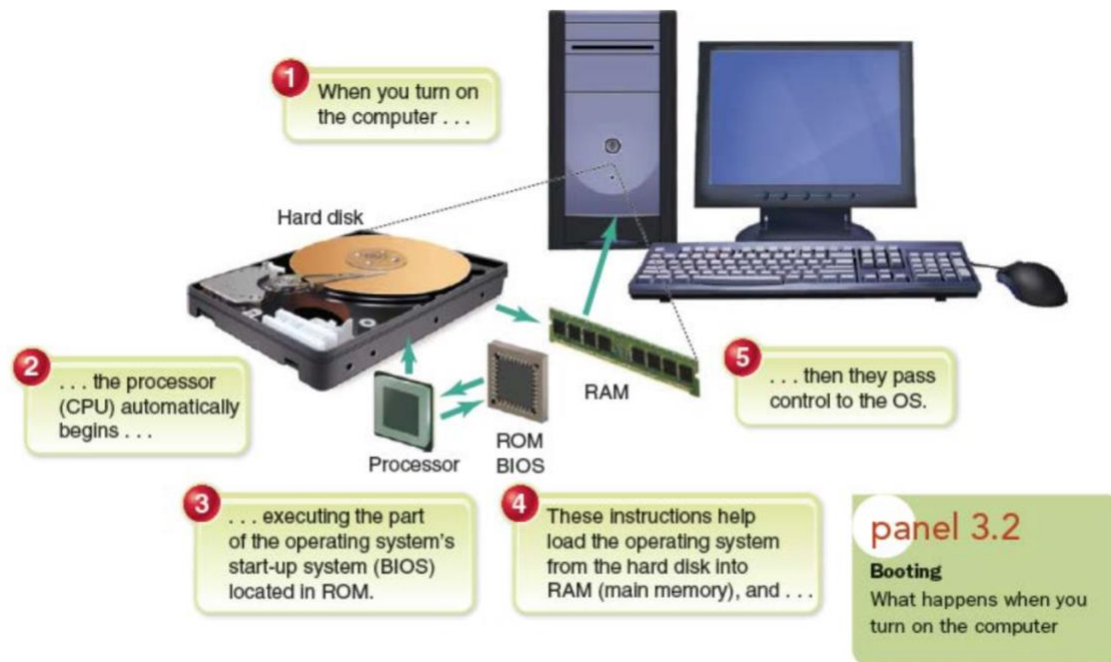
- **The operating system (OS)** consists of the low-level, master system of programs that manage the basic operations of the computer.
 - Every general-purpose computer must have OS to run other programs.
 - OS allows users to concentrate on applications rather than on complexities of the computer.
 - Each application program is written to run on top of a particular OS.

The Operating System manages:

- Booting
- CPU management
- File management
- Task management
- Security management

Booting

- The process of loading an OS into the computer's main memory
- Booting involves 4 steps:
 - 1) Turn on the computer.
 - 2) Diagnostic routines test the main memory CPU, and other hardware.
 - 3) **Basic Input/ Output Systems (BIOS)** programs are copied to main memory.
 - BIOS contains instructions for operating the hardware.
 - The computer needs those instructions to operate the hardware and find a copy of the OS.
 - 4) Boot program obtains the OS and loads it into computer's main memory.\



Types of booting:

- **Cold boot:** turn on computer's "on" system
- **Warm boot:** restart a computer that is already on
- **Boot disk:** use a CD or flash drive containing all files to launch OS
- Boot from cloud

CPU Management

- CPU is the central processing unit.
- **Supervisor (kernel)** is the software that manages the CPU
 - Remains in memory while computer runs
 - Directs other programs not in memory to perform tasks that support application programs

Memory Management

- Operating System keeps track of memory locations to prevent programs and data from overlapping each other.
- Swaps portions of programs and data into the same memory but at different times (to make use that they do not co-inside)
- Keeps track of virtual memory
- Queues, Buffers, Spooling
 - **Queue:** First-in, first-out (FIFO) sequence of data or programs that waits in line for its turn to be processed.
 - **Buffer:** The place where the data or programs sit while they are waiting
 - **To spool:** the act of placing a print job into a buffer (needed because the CPU is faster than printers. The CPU can work on other tasks while the print jobs wait.)

File Management

A file is either a:

- **Data File:** a named collection of data
- **Program File:** a program that exists in a computer's secondary storage

→ Files are located in many places on secondary storage devices; OS locates files and facilitates access to them.

→ The file system arranges files in a hierarchical manner.

- Top level is directories (folders)
- Subdirectories come below folders
- Can find files using their **pathname**

Task Management

- Computers are required to perform many different tasks at once—to do task management.
- **Task:** an operation such as storing, printing, or calculating
- **Multitasking:** handling more than one program concurrently (ex: you doing word processing while playing music on your computer). OS directs processor to alternate time on each program until processing is complete.

Security Management

- Operating system permits users to control access to their computers
- Users gain access using an ID and password
- You set the password the first time you boot up a new computer
- After that, when you boot up, you'll be prepared to type in your username and password

3.2 Other System Software (Device drivers and Utility Programs)

Drivers and utility programs add functionality to your computer and help it perform better.

Device Drivers

- Specialized software programs that allow input and output devices to communicate with the rest of the computer system.
- When you buy a computer, many device drivers come with the system software.
- Device drivers also come with new hardware (on CDs/DVDs) or can be downloaded from the manufacturer's website.

Utilities

- Service programs that perform tasks related to the control and allocation of computer resources (ex: backup, virus protection, data recovery, data compression, file defragmentation...)
- Some come with the OS, others can be bought separately (e.g., Norton SystemWorks, McAfee Utilities).

3.3 Common Features of the User Interface

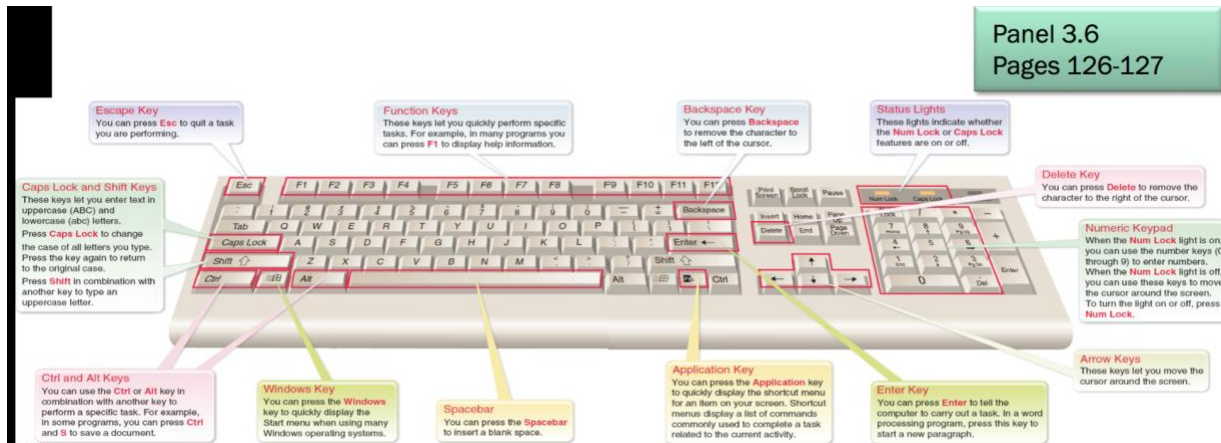
User-interface features use graphics to facilitate a person's interaction with the computer.

User Interface

The user-controllable display screen you use to interact with the computer, using keyboard or mouse.

Keyboard & Mouse

- **Special-purpose keys:** used to enter, delete, edit data, and to execute commands
- **Function keys (F1, F2, etc.):** used to execute commands specific to the software being used.
- **Macros:** keyboard shortcuts to activate series of commands.
- **Mouse pointer:** moved to particular place on screen or to point to little symbol icons.



Graphical User Interface (GUI)

- Allows you to use a mouse or keystrokes to select icons and commands from menus.
- Three main features of GUI are desktop, icons, and menus
 - **Desktop:** The systems main interface screen.
 - **Icons:** Small pictorial figures that represent programs, data files, or procedures.
 - **Rollover:** A small text box that explains the icons when you roll your mouse over it.
 - **Menus:** Lists of built-in commands and/or options from which to choose pull-down, cascading, pull-up, pop-up.

Menus

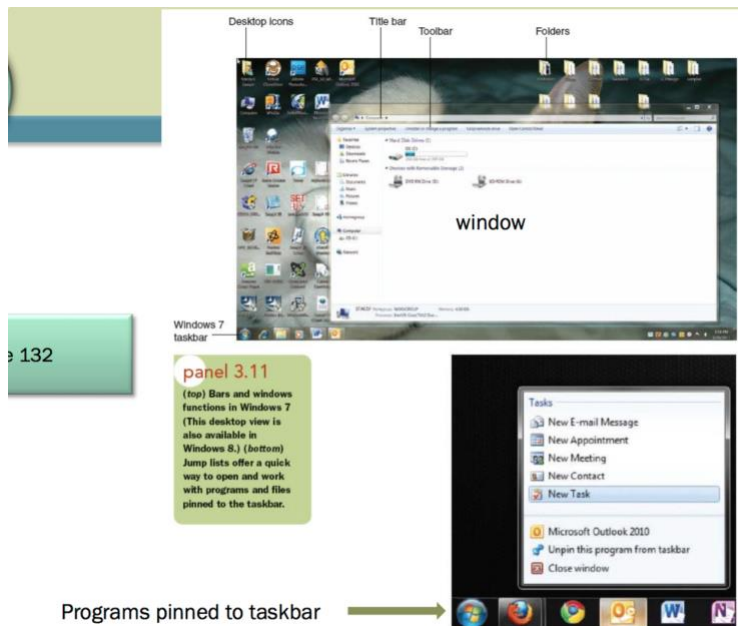


Pull-up menu—When you click the mouse pointer on the Start button at the bottom-left corner of the screen, it produces a pull-up menu offering access to programs and documents.

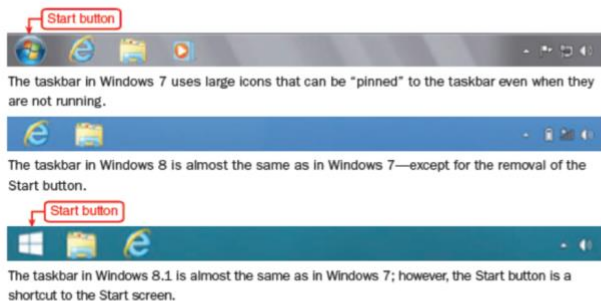


Cascading menu—Moving the mouse pointer to an option on the pull-up menu in some versions of Windows produces flyout (cascading) menus with more options.

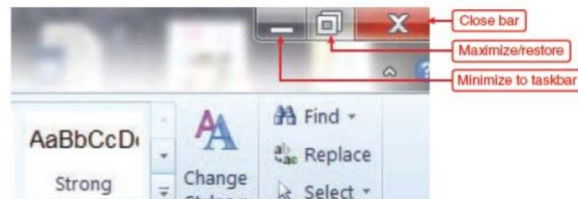
- Most operating systems use GUIs with the following:
 - **Title Bar:** runs across the top of the display window and shows the name of the folder you are in.
 - **Menu Bar:** shows the names of the pull-down menus available.
 - **Toolbar:** displays menus and icons representing frequently used options or commands.
 - **Taskbar:** the bar across the bottom of the Windows screen that contains the Start button and icons that show open files/programs.
 - **Windows:** rectangular portion of the display screen through which you can view a file of data or an application program.



Windows 7 and Windows 8 taskbars



Minimize, Maximize, Restore Down, and Close



3.4 Common Operating Systems

The main operating systems for general computer users are Windows, Mac OS, and Unix/Linux.
Platform

- The particular processor model and operating system on which a computer system is based.
- Three principle categories of operating systems:
 - 1) Stand-alone**
 - 2) Network**
 - 3) Embedded**

1) Stand-alone operating systems

- Often called a desktop operating system, an operating system that works on a single desktop or notebook (laptop) computer.
- Two principal stand-alone systems
 - Mac platforms –run Apple Macintosh
 - PC platforms–run Microsoft Windows
- Some legacy systems still used—outdated but still functional.
 - DOS (Disk Operating System) (original Microsoft OS)—hard-to-use command-driven user interface

Mac OS X (“Ten”)

OS that runs on Apple Macintosh computers; is popular for desktop publishing , graphics, and educational settings.

- Pioneered the easy-to-use GUI (based on work done at Xerox)
- Proprietary OS
- Mac OS X from 2000 is based on Unix • Mac OS 10.8 = Mountain Lion (2011) • Mac OS 10.9 = Mavericks (2013)
- Apple iOS runs mobile devices

Microsoft Windows

- Most common operating system for desktop and portable PC's.
- Windows early version: 95, 98, 2000, Vista
- Windows 7: still most commonly used OS
- Windows 8: had both desktop (“classic”) and tile views
 - Tile view gesture manipulation of on-screen items (touch screens).

2) Network operating systems

Novell’s Open Enterprise Server (OES)

- Used for coordinating microcomputer-based local area networks (LANs) throughout a company or campus
- Network OS usually located on a main server

Windows Server

- Designed to run on network servers in businesses of all sizes
- Multiple users share resources, such as data, programs, printers

Unix, Solaris, BSD

- **Unix** is a multitasking operating system with multiple users that has built-in networking capability and versions for all kinds of computers
- Is particularly stable—used to run backbone of Internet
- Used by large organizations—for airplane design, currency trading
- Versions include Solaris, BSD
- Unix interface is command-line interface

Linux

- Free (nonproprietary) version of Unix
- Continual improvements from thousands of volunteer programmers
- Linux is open-source software—anyone may make suggested improvements
 - May legally be downloaded and used for free
 - May legally be modified for free, as long as modifications aren't copyrighted
 - Uses command-line-interface or GUI
 - Linux vendors give away software but sell services, products
 - Is the basis of Google's Chrome OS

3) Embedded Operating Systems

- Embedded OS—resides on CPU chip
- Specialized system that is part of larger system or machine
- Used in mobile devices: Google Android, BlackBerry, Windows Phone, iOS, Embedded Linux

UNIT 4 (Application Software) ---Software: Tools for Productivity & Creativity

3.5 Application Software: Where to get it, how to use it

- Availability of software depends on how it is licensed or copyrighted by its creators or owners.
- Different types of software: custom software, packaged software (copyrighted software), public-domain software, freeware, shareware, rentalware and web application.
- **Copyright** → users must get license from owner and sign a contract in which they agree not to make copies of the software to give away or resell.

Software licenses types:

- 1) Site licenses allow software to be used on all computers at a specific location
 - 2) Concurrent-user licenses—allow a number of copies to be used at one time
 - 3) Multiple-user license—specifies number of people who may use the software
 - 4) Single-user license—limits software to one user at a time
- **Pirated software:** Software obtained illegally in violation of copyright
 - **Abandonware:** Software that is no longer being sold or supported by its publisher (but may still not be legally copied)
 - **Tutorial:** Instruction book or program that helps you learn to use the product by taking you through a series of steps.
 - **Documentation:** All information that describes a product to users, including a user guide or reference manual that provides a narrative and graphical description of the program
 - Types of application software can be classified as entertainment, personal, education/references, productivity, and specialized users.
 - **Productivity software:** Purpose is to make users more productive at particular tasks. Example: word processing, spreadsheets, database managers • May be bundled in office suite

3.6 Data Files & Program Files

- **Data files:** Data files contain data, such as words, number, picture, and sounds (example: extensions).
- **Program files:** program files contain software instructions that execute, or run, when the program is opened. Two types:
 - 1) Source program files: Source program files contain high-level computer instructions in the original form written by the computer programmer.
 - 2) Executable files: To be made useful to the computer for processing, a source program file must be translated into an executable file, which contains the instructions that tell the computer how to perform a particular task. You use an executable file by running it, as when you select the spreadsheet program Microsoft Excel from your on-screen menu and open it.

Exchanging files:

- **Importing:** getting data from another source and then converting it into a format compatible with the program in which you are currently working

- **Exporting:** transforming data into a format that can be used in another program and then transmitting it.
- **Data compression:** a method of removing repetitive elements from a data file so that it requires less storage space and therefore less time to transmit. Later the data is decompressed—the repeated patterns are restored. Types of compressions:
 - 1) Lossless compression uses mathematical techniques to replace repetitive patterns of bits with a kind of coded summary. During decompression, the coded summaries are replaced with the original patterns of bits -- the data that comes out is exactly the same as what went in. Lossless techniques are used when it's important that nothing be lost—for instance, for computer data, database records, spreadsheets, and word processing files.
 - 2) Lossy compression techniques permanently discard some data during compression. Lossy data compression involves a certain loss of accuracy in exchange for a high degree of compression. Examples of two lossy compression file formats are .jpeg and .mpeg, used for graphics files and sound files.

3.7 Word Processing Software

- **Word processing:** uses computers to create, edit, format, print, and store text.
 - Microsoft Word best known
 - Others: Corel WordPerfect, Apple iWork Pages, Google Apps, Zoho Writer
 - Word processing allows you to delete, insert, and replace text
 - Additional features: creating, formatting, printing, saving
- **Cursor:** a movable symbol to show where to enter text
- **Scrolling:** moving quickly up, down, or sideways
- **Word wrap:** automatically continues text to next line
- **Head hierarchy:** Outline views puts tags on headings within a document to organize it according to head level
- **Footnote numbering:** can be done automatically
- **Editing:** making alterations in content
- **Inserting:** adding text to documents
- **Deleting:** removing text from documents
- **Find and replace:**
 - **Find:** lets you go straight to any text in your document
 - **Replace:** let's you automatically replace it with something else
- **Cut, Copy, and Paste**
 - Select the text you want to move
 - Copy (or cut) to clipboard, then paste in new location
- **Spelling Checker:** tests for incorrectly spelled words (not always 100% accurate)
- **Grammar checker:** highlights poor grammar, wordiness, incomplete sentences, and awkward phrases.
- **Thesaurus:** offers alternative words with the same meaning.

Formatting documents with the help of templates

- **Formatting:** determining the appearance of a document.

- **Template:** a preformatted “form” that provides basic tools for structuring a final document (ex: text, layout page design, brochures...). Every word processing program comes with standard templates (for letters, memos...).

Aspects of Formatting

- **Font:** the typeface and size of the text you use (underlined, italic, or bold and color).
- **Spacing & Columns:** line spacing (single or double-spaced, or other). Single column or multi-columned text.
- **Margins & Justification:** indicate width of left, right, top, and bottom margins. Justifies text left, right or center.

Headers, footers, page numbers

- **Header:** text printed at the very top of the page.
- **Footer:** text (like page number) at bottom of page.

Other formatting

- Borders, shading, tables, and footnotes.
- Graphics (ex: clip art).

Default Settings

- These are the settings automatically used by the programs unless you change them.

Output: Printing, Faxing, or Emailing Documents

- Print either individual pages, whole documents, or several pages. You can fax or email finished documents.
- **Previewing:** gives you a look at how documents will look when printed, before you print.
- When saving documents → store a document as an electronic file (ex: hard disk, CD or flash drive)
- Word processing allows formatting of documents in HTML (for web).

3.8 Spreadsheet Programs

A spreadsheet program uses rectangular grids for laying out linked (usually financial) data in a very organised fashion.

- **Spreadsheets:** used to create tables and financial schedules.
 - enter data and formulas into rows and columns on screen (ex: Microsoft Excel, Apple iWork numbers).
- Organized into columns and rows on a worksheet.
 - **Labels:** descriptive text, identify cell contents
 - **Cells:** where a row and column meet
 - **Cell address:** position of the cell
 - **Range:** a group of adjacent cells
 - **Values:** numbers or dates entered into a cell
 - **Cell pointer:** shows where the data is to be entered

In Excel, row headings are identified by numbers and column headings are identified by letters.

Formulas, Functions, Recalculations, What-If Analysis

- **Formulas:** instructions for calculations. Defines mathematically how one cell relates to another. Ex: @SUM(A5:A15) sums the values of the cells A5, A6, A7, and so forth up through cell A15.
- **Functions:** built-in formulas, such as SUM(A1, A2, A3)
- **Recalculation:** process of re-computing values.
- **What-If Analysis:** allows users to see what happens to totals when one or more numbers change in the cell.
 - **worksheet templates:** custom-designed for a particular work
 - **multidimensional spreadsheets:** link one to another
- **Analytical Graphics:** worksheet and workbook data can be displayed in graphic form.
 - spreadsheet programs allow you to automatically create graphics
 - graphs make numeric data easier to analyse
 - examples of analytical graphics: column charts, line graphs, pie charts, scatter charts

3.9 Database Software

A database is a collection of data that is organized so that its contents can easily be accessed, managed, and updated.

- **Database:** structured collection interrelated files in a computer system.
 - Data base software sets up and controls the structure of a database and access to data.
 - Principal microcomputer databases: Microsoft Access, FileMaker Pro
 - Benefits of databases: data redundancy is minimized, data is integrated and stored in a structured way, data in databases has more integrity, data may include text, numbers, and graphics.

****The main type of microcomputer database program is the relational database.****

- **Relational database:** data organized into related tables. Each containing rows (records) and column (fields).
- **Status bar:** shows document details
- **Key is field used to store data**
 - most frequent key field is social security number
 - tables with same key are linked together
- **Querying and displaying records** → database software offers a quick way to locate records.
- **Saving, Formatting, Printing, Copying, Transmitting**
 - can save results, format them in different ways, print as reports, copy to other documents, & transmit as email

3.10 Software suites & Integrated Packages

Software suite: collection of individual programs bundled together in a single package (ex: under Microsoft office you have power point, word, and excel).

- most popular software suite is productivity suites (office suites), frequently used in business (usually word processing, spreadsheet, database management and presentation programs).
- best known productivity suite is Microsoft word. Others include Apple iWork, StartOffice...

→ cloud suites (or online suites) include Microsoft Web Apps

- **Integrated package:** single program for microcomputers that combines the function of word processing, spreadsheet and database management (combines several applications in one program).
- **Personal information manager:** software that helps you keep track of and manage information used on a daily basis, such as addresses, telephone numbers, appointments, to-do lists, and miscellaneous notes (ex: Microsoft outlook).

3.11 Specialty Application Software

Some Special Application Software

- Presentation graphics
- Financial
- Desktop publishing
- Drawing & painting
- Video/audio editing
- Animation
- Multimedia authoring
- Web page design/authoring
- Project management
- Portable Document Format (PDF)
- Computer-aided design

Presentation Graphics Software

- Uses graphics, animation, sound, data, and information to make visual presentations. Example: Microsoft PowerPoint and Coral presentations.
- Includes design and content templates (allows presentations to be dressed up with special visual effects, animation, and video clips).

Financial software

- Ranges from personal finance managers to entry-level accounting programs to business financial-management packages. Personal finance programs include Quicken, Moneydance...
- Common features of financial software: track income and expenses, allow checkbox management, do financial reporting, offer tax categories to assist with tax recordkeeping, may offer financial planning & portfolio management. Tax, accounting, investment software are also available.

Desktop Publishing

- Involves mixing text and graphics to produce high quality output for commercial printing.
- Uses mouse, scanner, printer, and DTP software.
- Professional DTP programs: QuarkXPress, Adobe InDesign
- Features include: mix of text with graphics, offers varied type & layout styles, and allows import of files from other programs.
- Requires training

Desktop publishing overview



Drawing Programs

- Graphics software used to design and illustrate objects and products. Create vector images (created from geometrical formulas) example adobe illustrator.

Painting Programs

- Graphic programs that allow users to simulate painting on-screen. Produces bit-mapped or raster images (tiny dots).
- Common graphics File Formats include:

.bmp (BitMaP) – used on PCs (Native to MS Windows)

.gif (Graphic Interchange Format) – format used in web pages

.jpeg (Joint Photographic Experts Group) – used in high-resolution images, especially photos

.tiff (Tagged Image File Formats) – used on PCs & Macs for high-resolution images to print

.png (Portable Network Graphics) – used as alternative to .gif

Video Editing Software

- Allows import to and editing of videos footage on computer, example of video editing packages: coral video studio , apple final cut express...

Audio Editing software

- Allows import to and editing sound files on computer, example of sound editing packages include windows sound recorder, GoldWave...

Animation Software

- Stimulates movement by rapidly displaying a series of still pictures
- **Computer animation:** creation of moving images by means of computer.
- GIF animation: First format to be widely used web pages. Packages include 3D GIF designer, Easy GIF Animator...

Multimedia Authoring Software

- Combines text, graphics, video, animation, and sound in an integrated way to create stand-alone multimedia applications.

- Can content can be put on CDs or delivered via the web.

Web Page Design/Authoring Software

- Used to create web pages with sophisticated multimedia features.

Project Management Software

- Program used to plan and schedule the people, costs, and resources required to complete a project on time. Ex: Microsoft Project.

Portable Document Format (PDF)

- Multiplatform file format adopted by Adobe Systems that allows documents to be used with any operating system.
- Captures text, graphic, and formatting information from a variety of apps of different platforms, making it possible to send documents and have them appear on the recipient's monitor as they were intended to be viewed.
- Today it is used for virtually any data that needs to be exchanged among applications and users.

Computer-Aided Design (CAD)

- Programs intended for 2D and 3D design of products, structures, civil engineering drawings, and maps. Ex: TurboCAD, AutoCAD
- CAD programs help design buildings, cars, planes, electronic devices, roadways, bridges and subdivisions.
- CAD/CAM programs allow CAD programs to be input into computer-aided manufacturing systems that make products.

UNIT 7 (Security)---The Challenges of the Digital Age: Society & Information Technology Today Security, Privacy, and Surveillance Concerns

Technology is now used to develop predictive search apps that know what you want before you do. Some people see new technology as just the latest intrusion into our private lives, learning personal information about us that we cannot always foresee.

9.1 Security Issues (Threats to computers and communication systems)

Errors, Accidents, and Natural Hazards

Human Errors

- Humans often are not good at assessing their own information.
- Human emotions affect performance (ex: people get frustrated)
- Human perceptions are slower than the equipment (meaning that computers work at a faster speed).
- Information overload (too much info) may also be a problem.

Procedural Errors

- When people fail to follow established procedures, errors can occur.

Software Errors

- **Software bug:** an error in a program that causes it not to work properly.

“Dirty data” Problems

- Incomplete, outdated, or otherwise inaccurate data.

Electromechanical Problems

- Occurs when mechanical systems wear out or become damaged.
- They can also be badly designed/constructed.
- Power failures and surges can damage equipment.

Natural Hazards

- Can lead to disasters

Computer Crimes

There are 2 types of computer crimes:

- 1) Illegal act that is perpetrated against computers or telecommunications (computer is the target)
- 2) Use of computers or telecommunication to accomplish an illegal act (computers is the tool)

Theft of hardware

Theft of software

Theft of intellectual property (piracy) privacy of another person’s work

Theft of time and services

Theft of information (ex: credit card information)

Internet-related fraud (ex: Wi-Fi phishing). Phishing: the fraudulent practice of sending emails purporting to be from reputable companies in order to induce individuals to reveal personal information, such as passwords and credit card numbers.

Crimes of malice: crashing entire systems (attacks on power-control systems and attacks on the Internet.

9.2 Security Safeguards (Protecting Computers & Communications)

Security: a system of safeguards for protecting information technology against disasters, system failures, and unauthorized access that can result in damage or loss.

- Computer security's five components:
 - 1) Deterrents to computer crime
 - 2) Identification and access
 - 3) Encryption
 - 4) Protection of software and data
 - 5) Disaster recovery plans

Deterrents to computer crime

- Enforcing laws
- CERT (The Computer Emergency Response Team): provides round-clock info on international computer security threats.
- Tools to fight fraudulent and unauthorized online uses include: rule-based detection software, predictive-statistical-model software, employee Internet management software, and Internet filtering software (filtering out unsafe content, used for families with younger children).

Identification and access

- Verify legitimate right if access by what you have (cards, keys, signatures, badges), what you know (PIN's and password; callback provision), and who you are (biometrics, such as fingerprint scans, face recognition, voice recognition).

Encryption

- Encryption is the process of altering readable data into unreadable form to prevent unauthorized access.
- Advantage: encrypting data that is available over the Internet keeps thieves and hackers from reading it.
- Disadvantage: encrypting data may prevent law-enforcement officials from reading the data criminals are sending to one another

Protection of software and data

- Restrict access to online files; use transaction logs
- Use audit controls to track who used what programs and servers, which files were opened, and so on...
- Use people controls (screen applicants; to background checks; monitor internet, email, and computer usage; use shredders for discarded documents and materials.

Disaster-Recovery Plans

- Method of restoring information-processing operations that have been halted by destruction or accident
- Must back up everything (put mainframes in different locations)
- Plans to backup range in price and complexity
- Automatically store data redundantly in two or more places
- Have an off-site computer-based data storage centre with independent power supply

9.3 Privacy and Surveillance

The rise of Big Data has led to continuing threats to privacy from three giant sources:

- 1) From business organizations
- 2) From governments, local to federal
- 3) From foreign governments and criminal groups

Business & Cyberspying

- Almost all that we do online is being scooped up and used by marketers, therefore, it is difficult to know which part of our lives still belong to us.
- No matter the impact on your personal privacy, it is unlikely that you can claim ownership of a lot of the data that is being collected about you (ex: at work you basically have no rights)

Government and Cyberspying

- Governments at all levels spy on their citizens, sometimes encouraged by the law, sometimes in spite of the law, often unknown to us (ex: local police, national ID cards, National Security Agency (NSA), FBI drones, and so on...

Spying, Hacking, & Cyberwarfare by Foreign Governments & Groups

- The world is so interconnected that it is a constant struggle for technology managers to keep us secure against cyberinvasions of all sorts.
- Governments get involved in **cyberwarfare**--warfare involving computers and the Internet in which one nation attacks another's information systems.

Cryptocurrency and Blockchain

A cryptocurrency refers to a digital coin that runs on a blockchain.

UNIT 5---Communications, Networks, & Cyber threats

Unit 6A: Networks and Wired and Wireless Data

- **Digital Convergence:** the gradual merger of computing and communications into a new information environment, in which the same information is exchanged among many kinds of equipment, using the language of computers.
 - At the same time, there has been a convergence of several important industries- computers, telecommunications, consumer electronics, entertainment, mass media- producing new electronic products that perform multiple functions.

6.1 From the Analog to the Digital Age

Digital

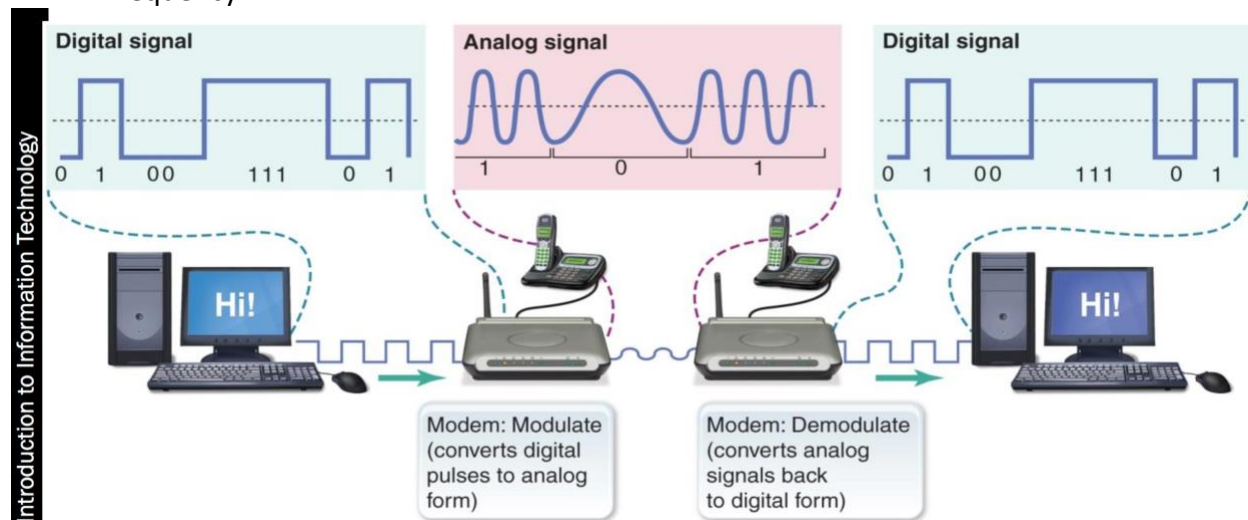
- Computers use digital signals (0's and 1's) off and on.
- All the data that computer processes is a series of 0's and 1's.
- Each signal is a bit.

Analog

- But most phenomena in life are analog.
- Analog signals use wave variations, continuously changing.
- Sound, light, and temperature are analog forms.
- Traditional TV and radio use analog signals.
- Humans' vision operates in analog mode.

Analog data can be converted into digital form. Even though digital data is not as exact as analog data, it is easier to manipulate.

- For data transmission over telephone lines and cables, modems are needed to convert analog data into digital data that computers can use.
- **Modem:** a short for modulate/demodulate. Modems modulate (convert) a computer's digital data to analog data, transmit it, then demodulate (reconvert) it back to digital data for the receiving computer.
- Modems can convert data by modulating either analog wave's amplitude or its frequency.

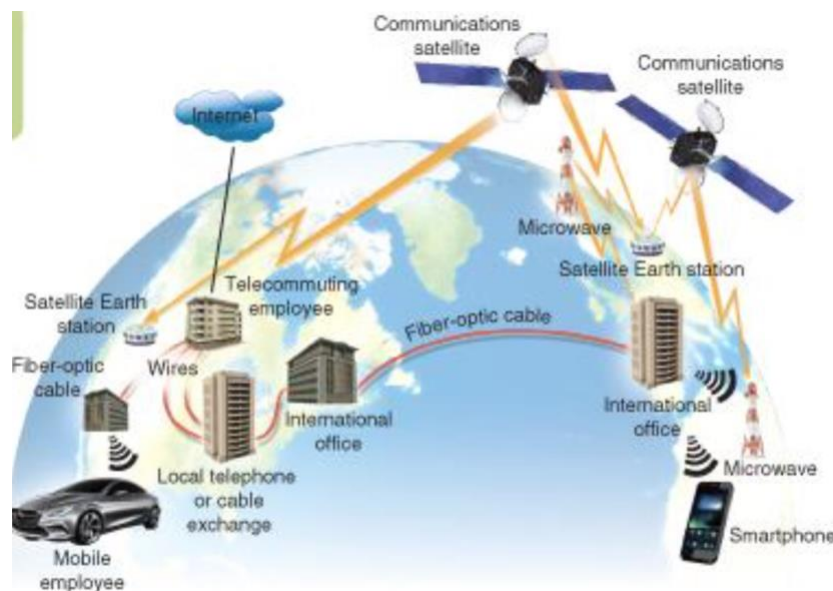


6.2 Networks

- **Network:** system of interconnected computers, telephones, and/or other communications devices that can communicate with one another and share applications and data.
- Benefits of Networks
 - Share peripheral devices, such as printers, scanners, disk drives
 - Share software
 - Share data and information
 - Better communications
 - Accessing databases
 - Centralized communications
 - Security of information, because of improved backup systems.

Types of networks: WANs, MANs, & Others

- **Wide area network (WAN):** communications network that covers a wide geographic area, such as a country or the world. Most long-distance and regional telephone companies are WANs. WANs are used to connect local area networks. The best example of a WAN is the Internet.
- **Metropolitan area network (MAN):** Communications network covering a city or a suburb. Many cellphone systems are MANs.
- **Local area network (LAN):** Connects computers and devices in a limited geographic area, such as one office, one building, or a group of buildings close together. LANs are the basis for most office networks, and the organization that runs the LAN owns it. WANs and MANs generally use a common carrier—a telecommunications company that hires itself out to the public to provide communications transmission services—for at least part of its connections (A **home area network** is LAN).



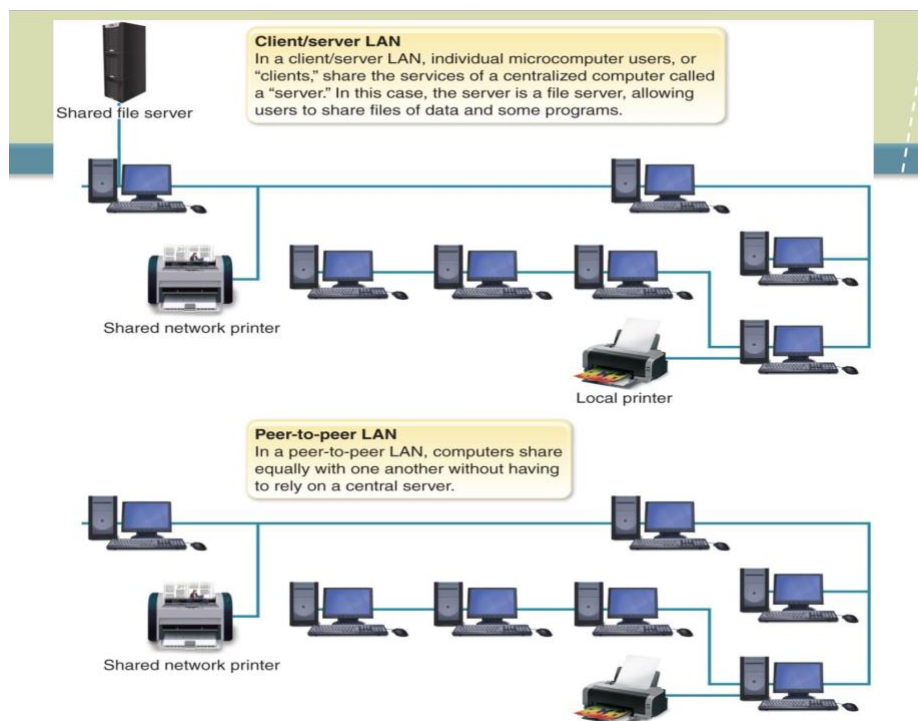
Network Architecture: How Networks Are Structured

1. Client/Server

- Consists of clients, which are computers that request data, and servers, which are computers that supply data (has a shared central server).
 - File servers act like a network-based shared disk drive.
 - Database servers store data but don't store programs.
 - Print servers connect one or more printers and schedule and control print jobs.
 - Mail servers manage email.

2. Peer-to-Peer (P2P)

- All computers on the network are "equal" and communicate directly with one another, without relying on servers (no central server).



Intranets, Extranets, & VPNs: Use the Internet as their base

- **Intranets:** use infrastructure and standards of the Internet and then web, but for an organization's internal use only.
- **Extranets:** similar to intranets but allows use by selected outside entities, such as suppliers.
- **VPNs (virtual private networks):** use a public network (usually the Internet) plus intranets and extranets to connect an organization's various sites, but on a private basis, via encryption and authentication; regular Internet users do not have access to the VPN's data information.

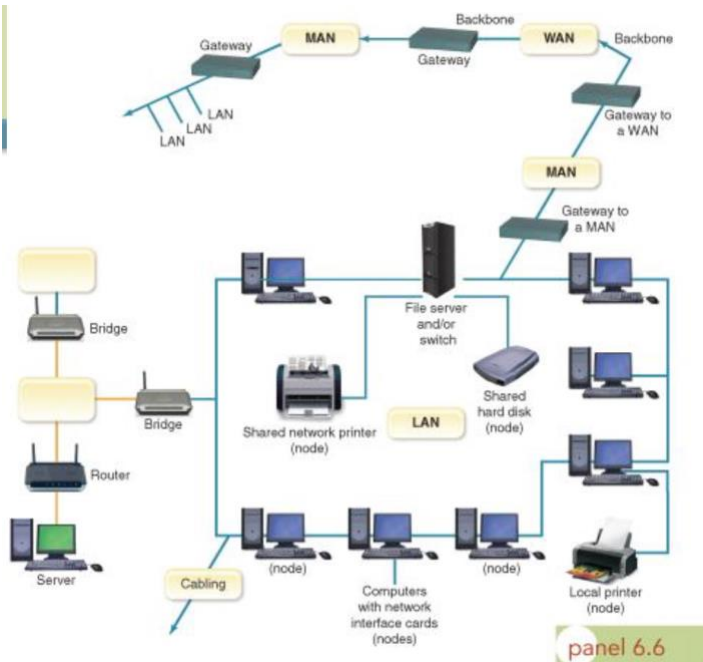
**All 2 use firewalls for security, a system of hardware and/or software that protects the system from intruders.

Network Components- all networks have several things in common:

- **Wired:** twisted pair, coaxial cable, fiber-optic cable (consists of dozens or hundreds of thin strands of glass or plastic).
- **Wireless:** infrared, microwave, radio, Wi-Fi, satellite
- **Hosts and Nodes:** client/server network has a host computer, which controls the network; a node is any device attached to the network.
- **Packets:** fixed-length blocks of data for transmission, reassembled after transmission.
- **Protocols:** set of conventions, or rules, governing the exchange of data between hardware and/or software components in the network; built into the hardware or software you are using.
- The protocol in your communications software specifies how receiver devices will acknowledge sending devices, a matter called **handshaking**. Handshaking establishes the fact that the circuit is available and operational. It also establishes the level of device compatibility and the speed of transmission.
- In addition, protocols specify the type of electronic connections used, the timing of message exchanges, and error-detection techniques.
- Each packet, or electronic message, carries four types of information that will help it get to its destination.
 1. The sender's address (IP)
 2. The intended receiver's address
 3. How many packets the complete message has been broken into
 4. The number of this particular packet. The packets carry the data in the protocols that the Internet uses—that is TCP/IP.

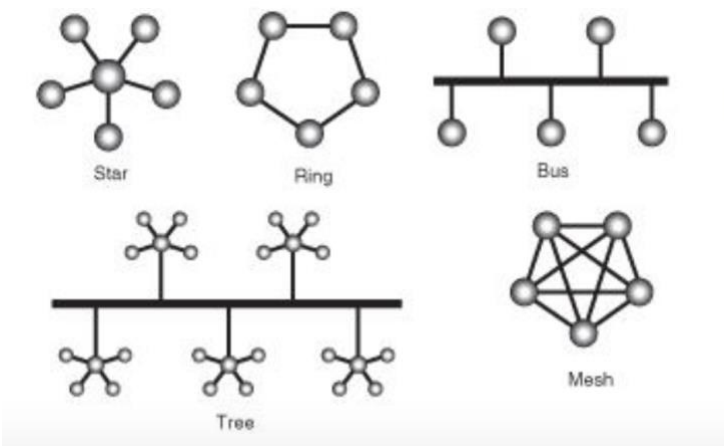
Networking linking devices:

- **Switch:** device that connects computers to a network (sends only to intended recipients; operates back and forth at the same time).
- **Bridge:** interface device that connects same type of networks.
- **Gateway:** interface device that connects dissimilar networks.
- **Router:** device that directs messages among several networks, wired or and/or wireless.
- **Backbone:** main internet highway that connects all networks in an organization; includes switches, gateways, routers, etc....
- **NIC (Network Interface card):** inserted in a slot on the motherboard, enables computer to operate as part of a network.
- **NOS (Network Operating System):** the system software that manages network activity.

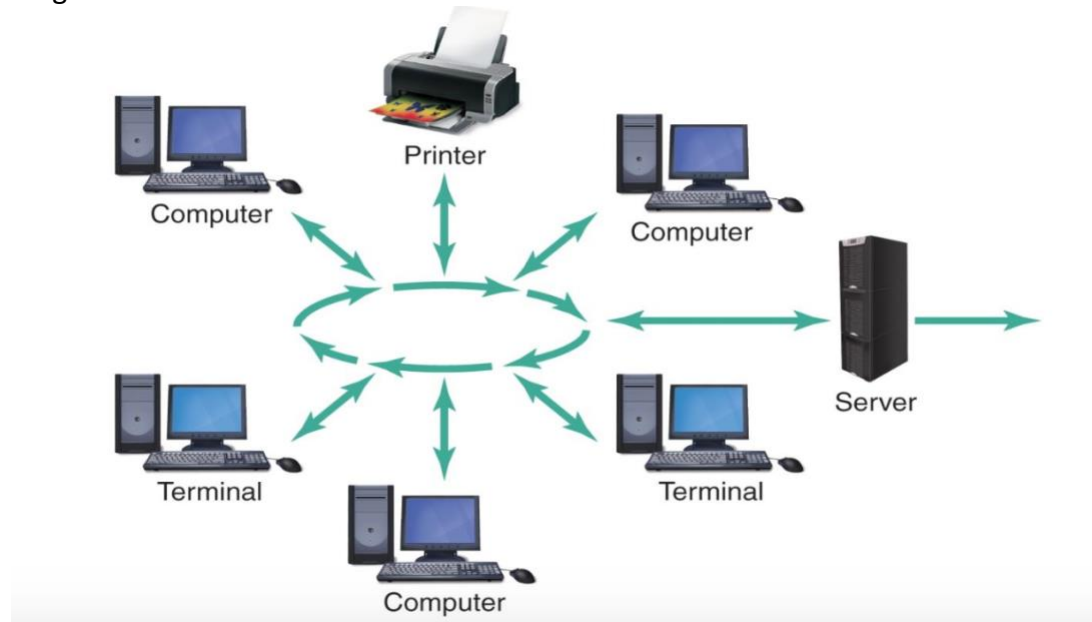


Network Topology: The layout (shape) of a network

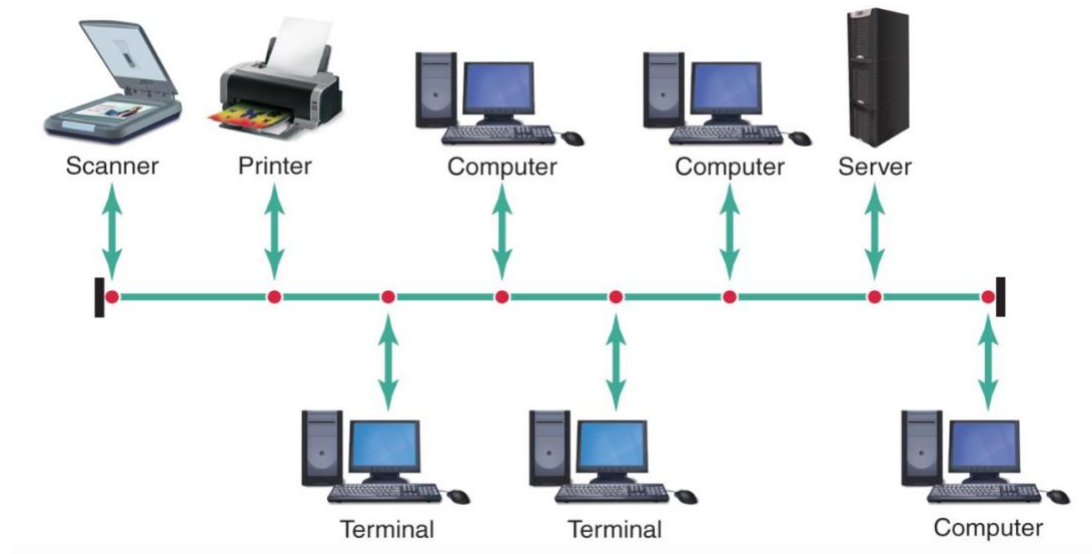
- **Star:** all nodes are connected through a central network switch
- **Ring:** all nodes are connected in a continuous loop
- **Bus:** all nodes are connected to a single wire or cable
- **Tree:** a bus network of star networks
- **Mesh:** messages sent to the destination can take any possible shortest, easier route to reach its destination. There must be at least two paths to any individual computer to create a mesh network. (wireless networks are often implemented as a mesh, and the Internet is a mesh).



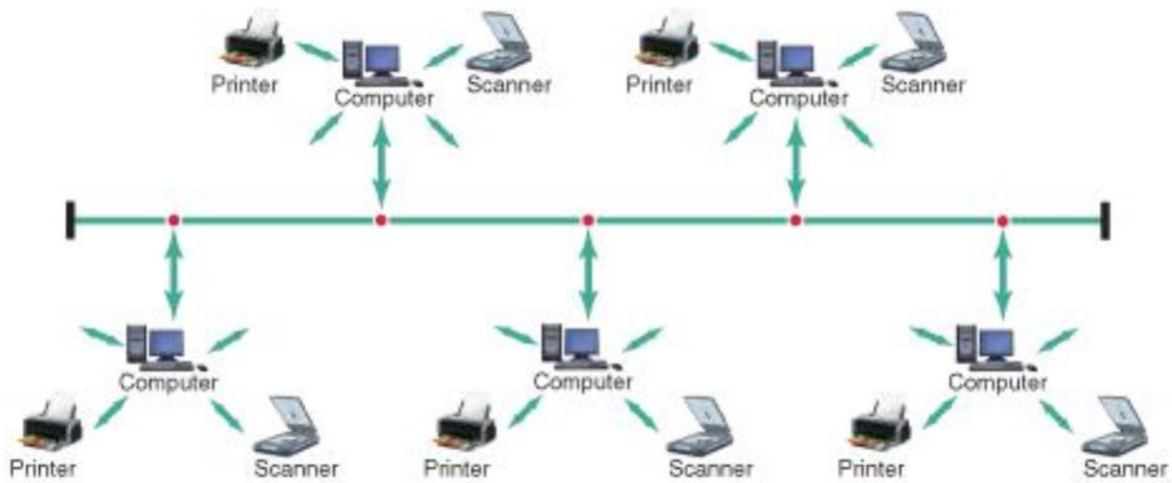
Ring Network



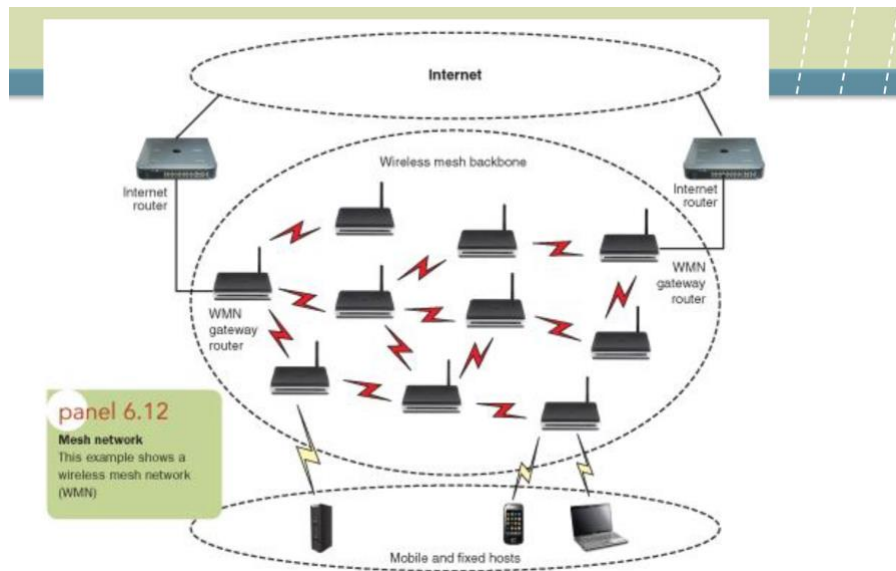
Bus Network



Tree Network



Mesh Network



Ethernet

- Network standard for linking all devices in a local area network that describes how data can be sent between computers and other networked devices usually in close proximity.
- Ethernet deals with LAN (Local Area Network) collisions; Ethernet is a LAN technology that can be used with almost any kind of computer and that describes how data can be sent between computers and other networked devices usually in close proximity.
- Ethernet communications protocol is embedded in software and hardware devices intended for building a local area network (LAN), and it is commonly used in star topologies.

6.3 Wired Communications Media

Communications media: the means of interchanging or transmitting and receiving information.

- Twisted-Pair Wire (dial-up connections)
 - 2 strands of insulated copper wire twisted around each other
 - Twisting reduces interference (crosstalk) from electrical signals.
 - Data rates are 1-128 megabits per second (slow)
- Coaxial Cable
 - Insulated copper wire wrapped in a metal shield and then in an external plastic cover.
 - Used for cable TV and cable Internet electric signals
 - Carries voice and data up to 200 megabits per second
- Fibre-optic cable
 - Dozens or hundreds of thin strands of glass or plastic that transmit pulses of light, not electricity.
 - Can transmit up to 2 gigabits per second (very fast)
 - Have lower error rate than twisted-pair or coax but more expensive
 - Lighter and more durable, and more difficult to tap than twisted-pair or coax

Wired connections media for the home:

- Ethernet
 - Connects to PC's Ethernet network interface card (NIC)
 - For several PCs, get a switch to connect all of them
 - 10 or 100 megabits per second
- HomePNA
 - Uses existing telephone wiring and jacks
 - Requires HomePNA NIC in your PC
 - Speeds of 200 megabits per second
- Homeplug
 - Uses existing home electrical lines
 - Speeds of 200 megabits per second

6.4 Wireless Communications Media

- **Electromagnetic spectrum** of radiation is the basis of all telecommunications signals, wired and wireless.
- **Radio-frequency (RF)** spectrum is the part of the electromagnetic spectrum that carries most communications signals.

Bandwidth: range (band) of frequencies that a transmission medium can carry in a given period of time.

- Analog bandwidth → expressed in hertz
- Digital bandwidth → usually expressed in bits per second (bps).
- **Narrowband** (voiceband): used for regular telephone communications (transmission rate 1.5 megabits per second or less)

- **Broadband:** For high-speed data and high-quality audio and videos; wide band of frequencies. (Transmission rate 1.5 megabits per second to 1 gigabit per second or more)
- **TC/IP (Ch.2)** is the protocol for getting wired devices connected to the Internet.
- **WAP (Wireless Application Protocol):** Wireless handheld devices such as cellphones use the Wireless Application Protocol for connecting wireless users to the Web.
 - WAP is a standard designed to link nearly all mobile devices telecommunications carriers' wireless networks and content providers.

Five Types of Wireless Communications Media

- **Infrared Transmission**
 - Sends signals using infrared light (TV remotes)
 - Frequencies are too low to see (1-16 megabits per second)
- **Broadcast Radio**
 - AM/FM, CB, ham, cellphones, police radio
 - Sends data over long distances using a transmitter and a receiver (up to 2 megabits per second).
- **Cellular Radio**
 - Form of broadcast radio
 - Widely used in cellphones and wireless modems
 - Transmits voice and digital messages
- **Microwave Radio**
 - Super high-frequency radio transmits voice and data at 45 megabits per second
 - Requires line-of-sight transmitters and receivers.
 - More than ½ of today's telephones systems use microwave
- **Communications Satellites**
 - Microwave relay stations in orbit around the earth
 - Basis for Global Positioning Systems (GPS)
 - Cover broad service area
 - Can be placed at different heights: GEO, MEO, LEO
- ❖ **GEO**---Geostationary earth orbit (HIGHEST LEVEL THAT A SATELLITE CAN OCCUPY IN SPACE)
 - 22,300 miles above earth, travels at the same speed as the earth and so appear to us to be stationary
 - Always above equator
 - Transmission delay (latency) can make conversations difficult; not good for applications requiring real-time user input.
- ❖ **MEO**---Medium-earth orbit
 - 5,000-10,000 miles up
- ❖ **LEO**---Low-earth orbit
 - 200-1,000 miles up
 - Has no signal delay

Long-Distance Wireless: One-Way Communication

- **GPS (Global Positioning System)**
 - 24 to 32 MEO satellites continuously transmitting timed radio signals to identify Earth
 - Each satellite circled earth twice each day at 11,000 miles' up
 - GPS receivers pick up transmissions from up to 4 satellites and pinpoint the receiver's location
 - Accurate within 3-50 feet, with a norm of 10 feet accuracy
 - Not all services based on GPS technology are reliable
- **One-way Pagers:** radio receivers that receive data sent from a special radio transmitter.
 - Radio transmitter sends out signals over the special frequency; pagers are tuned to that frequency.
 - When a particular pagers hears its own code, it receives and displays the message
 - Often used in hospitals and areas where smartphones are not allowed

Long-Distance Wireless: Two-Way Communication

- **1G:** First-Generation Cellular Service
 - Analog cellphones
 - Designed for voice communication using a system of hexagonal ground-area cells around transmitter-receiver cell towers
 - Good for voice—less effective for data because of handing off
- **2G:** Second-Generation Cellular Service
 - Uses digital signals
 - First digital voice cellular network
- **3G:** Third-Generation Cellular Service
 - Broadband technology
 - Carries data at high speeds: 144 kilobits per second up to 3.1 megabits per second
 - Accepts e-mail with attachments
 - Displays color video and still pictures
 - Plays music
- **4G:** Fourth-Generation Cellular Service
 - A nationwide 4G network is in development; up to 100 megabits/second
 - Enables faster Internet surfing

Includes LTE (Long Term Evolution), an international standard widely adopted in the United States and several countries in Europe and Asia. LTE supports data transfer rates of up to 100 megabits per second over cellular networks.

Short-Range Wireless: Two-Way Communication

- **Local Area Networks**
 - Range 100-228 feet
 - Include Wi-Fi (802.11) type networks
 - Wi-Fi is the latest and fastest Wi-Fi technology
- **Personal Area Networks**

- Range 30-33 feet
- Us Bluetooth, ultra wideband, and wireless USB
- **Home Automation Networks**
 - Range 100-150 feet
 - Use Insteon, ZigBee, and Z-Wave standards
- **Personal Area Wireless**
 - **Bluetooth**
 - Short-range wireless standard to link cellphones, computers, and peripherals at distances usually up to 33 ft.
 - Often used with headsets
 - Transmits up to 24 Mbps per second
 - When Bluetooth devices come into range of each other, they negotiate. If they have information to exchange, they form a temporary wireless network.
 - **Ultra Wideband (UWB)**
 - Operates in 480 megabits-1.6 gigabits per second, range up to 30 ft.
 - Uses a low power source to send out millions of bursts of radio waves each second.
 - **Wireless USB**
 - USB is the most used interface of PCs
 - Range of 32 ft. and maximum data of 110-480 megabits per second; used in game controllers, printers,, scanners, digital cameras, MP3 players, hard disks, and flash drives.
- **Short-Range Wireless for Home**
 - Insteon
 - Combines electronic power line and wireless technology
 - Can send data at 13.1 kilobits per second with 150 ft. range
 - ZigBee
 - Entirely wireless sensor technology
 - Can send data at 128 kilobits per second with 250 ft. range
 - Z-Wave
 - Entirely wireless power-efficient technology
 - Can send data at 127 kilobits per second to range of 100 ft.

UNIT 6B: Cyber threats: Trolls, Spices, & Hackers & Thieves

The ongoing dilemma of the Digital Age is balancing convenience against security.

- **Security:** consists of safeguards for protecting information technology against unauthorized access, system failures, and disasters that can result in damage or loss.

6.5 Cyberintruders (Trolls, Spies, Hackers, & Thieves)

- Trolls aren't necessarily destructive, but they can be disruptive on online comment boards. A troll is a person who posts intentionally offensive, incendiary, or off-topic comments online, to upset people.

- Many companies have extensive data-collection efforts that constantly track (spy on) our personal activities.
- **Malicious hackers:** break into computers for malicious purposes.
- **Script kiddies:** technically unsophisticated teenagers who use downloadable software for perform break-ins.
- **Hacktivists:** hacker activists who break into systems for a political or a socially motivated purpose.
- **Black-hat hackers:** break into computers to steal or destroy information or to use it for illegal profit.
- **Cyberterrorists:** attack computer systems so as to bring physical, political or financial harm to groups, companies, or nations.
- **Benign hackers (thrill-seeker hackers):** illegally access computer system simply for the challenge of it, not to damage or steal anything; their reward is the achievement of breaking in.
- **Benevolent hackers (ethical hackers or white-hat hackers):** usually computer professionals who break into computer systems and networks with the knowledge of their owners to expose security flaws that can then be fixed.
- **Thieves:** may be a company's employees or suppliers or professionals.
 - Employees
 - Outside partners & suppliers
 - Hardware thieves
 - Con artists, scammers, & counterfeiters

6.6 Cyberattacks & Malware

- Networks and computer systems are susceptible to attacks by all kinds of **malware**.
- Some common cyber threats are denial-of-service attacks; viruses; worms; Trojan horses; rootkits and backdoors; blended threats; zombies; ransomware; and time, logic, and email bombs.

Cyberthreats:

- **Denial of Service Attack**
 - Consists of making repeated requests of a computer or network device, thereby overloading it and denying access to legitimate users.
 - Used to target particular companies or individuals.
- **Virus**
 - Deviant program that hides in a file or a program on a disk, flash memory drive, in an e-mail, or in a web link and that causes unexpected effects such as destroying or corrupting data.
 - Usually attached to an executable file that you must run or open (to activate the virus)
- **Worms**
 - A program that copies itself repeatedly into a computer's memory or disk drive.
 - May copy itself so much it crashes the infected computer

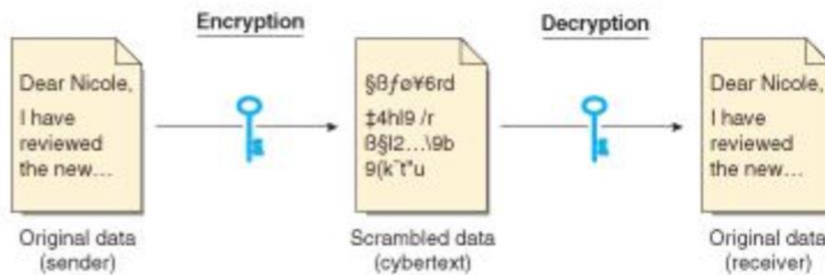
- **Trojan Horses**
 - Programs that pretend to be a useful program such as a free game or a screensaver but that carry viruses or malicious instructions that damage your computer or install a backdoor or spyware.
 - Backdoors and spyware allow others to access your computer without your knowledge.
- **Rootkits**
 - In many computer operating systems, the “root” is an account for system administration. A “kit” is the malware secretly introduced into the computer. A rootkit gives an attacker “super powers” over computers—for example, the ability to steal sensitive personal information.
- **Blended Threats**
 - A blended threat is a more sophisticated attack that bundles some of the worst aspects of viruses, worms, Trojan horses, and other malware into one single threat. Blended threats can use server and internet vulnerabilities to initiate, then transmit and also spread an attack. Blended threats are designed to use multiple modes of transport—email, flash drives, networks, and so on.
- **Zombies & Bots**
 - A botmaster uses malware to hijack hundreds to many thousands of computers and is able to remotely control them all, including the ability to update the malware and to introduce other programs such as spyware. Hijacked computers are called **zombies**.
 - A **botnet** (robot network) is a network of computers in which each computer has been implanted with instructions to wait for commands from the person controlling the botnet.
- **Ransomware**
 - A botnet may be used to install ransomware, which holds the data on a computer or the use of the computer hostage until a payment is made. Ransomware encrypts the target’s files, and the attacker tells the victim to make a payment of a specified amount to a special account to receive the decryption key.
- **Time, Logic, & Email Bombs:** A time bomb is malware programmed to “go off” at a particular time or date. A logic bomb is “detonated” when a specific event occurs—for example, all personnel records are erased when an electronic notation is made that a particular person was fired. *Email bombs* overwhelm a person’s email account a person’s email account by surreptitiously subscribing it to dozens or even hundreds of mailing lists.
- **Phone Malware:** Worms and viruses and other malware are attacking smartphones. The most common type of cellphone infection occurs when a cellphone downloads an infected file from a PC or the Internet, but phone-to-phone viruses are also on the rise.
 - Infected files usually show up disguised as applications such as games, security patches, add-on functionalities, and free stuff. Future possibilities include cellphone spyware—so someone can see every number you call and listen to your conversations—and viruses that steal financial information, which will become more serious as smartphones are used as common payment devices.

- **Cellphone Malware**
 - Spread via Internet downloads, MMS attachments, and Bluetooth transfers.
 - Usually show up disguised as applications such as games, security patches, add-on functionalities, erotica, and free programs.
 - Protect your phone:
 - turn off Bluetooth discoverable mode
 - check security updates to learn about filenames to watch out for
 - Install security software
- **How do cyberthreats spread?**
 - Via e-mail attachments
 - By infected disks and flash drives
 - By clicking on infiltrated websites
 - By downloading infected files from websites
 - Through infiltrated Wi-Fi hotspots
 - From one infected PC on a LAN to another
- **What can you do about it?**
 - Install antivirus and firewall software and subscribe to the manufacturer's automatic antivirus update service.

Online Safety

- Use antivirus software, and keep it current.
- Install a firewall to monitor network traffic and filter out undesirable types of traffic and undesirable sites.
- Don't use the same password for multiple sites
- Don't give out any password information
- Use robust passwords:
 - Minimum 8 characters with letters, numbers, characters
 - 4 cats is not a good password, complicated password is better
 - Use biometric identification
 - Use encryption
- Install antispyware software
- Encrypt financial and personal records so only you can read them
- Back up your data, so if your PC is attacked and must be reformatted, you can restore your data.
- Never download from a website you don't trust.
- Consider biometric authentication
- **Encryption:** Process of altering readable data into unreadable form to prevent unauthorized access.
 - Uses powerful mathematical ciphers to create coded messages that are difficult to break.
 - Unencrypted messages are known as plain text
 - Encrypted text is known as cybertext
 - You use an encryption key to encrypt and decrypt coded messages

Basic encryption. Both the sender and the receiver have the appropriate encryption key.



6.7 Concerns about Privacy and Identity Theft

- The proliferation of networks and databases have put privacy under great pressure.
- **Privacy** is the right of people not to reveal information about themselves.
- Some threats to privacy: name migration, resume rustling & online snooping, government prying & spying.
- Identity (ID) theft, or theft of identity (TOI), is a crime in which thieves hijack you name and identity and use your information and credit rating to get cash or buy things.
 - Wallet or purse theft
 - Mail theft
 - Mining the trash
 - Telephone solicitation
 - Insider access to database
 - Outsider access to database
- If ID theft happens, contact:
 - Credit card companies
 - Your bank
 - Department of Automotive Vehicles
 - Utility companies
 - Phone companies
 - Local police
 - Federal Trade Commission
 - Other organizations you belong to
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