Computer Skills
IT 110

software and operating system basics

Learning objectives

- Understand the Software system
- Understand the types of operating systems available
- Differentiate among the major desktop operating systems
- Explain how device drivers work
- Explain computer file storage concepts

Understanding System Software

- Software is a broad term for any program that runs on a computer. This can include the operating system and all its helper files, utilities that keep the computer healthy and running well, and applications.

  Another name for software is a program.

- A programmer writes the instructions that become computer programs.

Understanding System Software: cont.

- Application software is software that enables you to perform a useful task on your computer. Some programs are classified as productivity software (is a software that helps a human perform one or more business or personal enrichment tasks) because they allow you to get things done. Other application software is designed to entertain you, or to help you learn something.

Understanding System Software: cont.

- System Software: Software that starts the computer and keeps it running, performing basic system tasks such as running applications, managing files, and correcting errors.
- System software includes BIOS, the operating system, and utility programs.

The System BIOS

- The most basic software is the Basic Input Output System (BIOS).
- It is stored on a read only chip on the motherboard so that it does not accidentally get changed or corrupted.
- It helps the computer start up and performs some basic testing on the hardware.
  - In short, it is the software that initializes and tests the system at start-up.

The System BIOS

- BIOS is the built-in software on the motherboard that starts the computer.
- It performs a power-on self-test (POST) at start-up, which ensures

that all the critical hardware devices are functioning properly,

including the CPU, the RAM, and the motherboard.

The System BIOS: cont.

- If the hardware passes the tests, the BIOS looks for an operating system on one of the available drives, and then passes off control to the operating system to complete the boot process.

- The BIOS has a list of default settings it uses for managing memory and devices, but those settings can be overridden by user settings that you specify.

The Operating System

- The BIOS starts the computer at a basic level, but the operating system does the bulk of work to keep it running and to help the user accomplish tasks.

- the operating system performs these important functions:

1) It provides the user interface that humans use to communicate commands and

receive feedback.

The Operating System: cont.

2) It communicates with the hardware, instructing it to take action to accomplish tasks. For example, it communicates with the keyboard and mouse to accept input, and it communicates with the display screen to show output.

3) It runs applications, and enables humans to interact with them.

4) It controls and manages the file storage system.

The functions performed by an operating system

Operating Systems: examples

- There are many kinds of operating systems, suited for a wide range of devices, from supercomputers to smartphones.
- Each operating system is optimized for the hardware it runs on and the tasks the user is likely to want to perform.

Microsoft Windows, Mac OS and Linux for desktop and notebook PCs;

UNIX for mainframes and servers;(the operating system in a server is designed to give computer professionals many options for managing and configuring the server and supporting users and databases.)

Operating Systems: examples

- Android for tablets and smartphones(For example, the operating system on a tablet computer is designed to be compact (because there is limited storage space in the tablet), easy to operate (because most users are not computer professionals), and fast to respond to simple commands)
- Special versions of Windows (i.e. windows phone) and Mac OS (IOS) also power tablets and smartphones.
- Microsoft Windows is the most popular operating system.

Platform

- Some operating systems are designed to run on just one specific platform.
- Platform: A type of computer hardware that is compatible with certain operating systems.
- Intel platform: A platform that was originally based on CPUs made by Intel.
- The Intel platform can run Windows, UNIX, Linux, and newer versions of Mac OS X operating systems.

Note

- The 32-bit Intel platform is sometimes called x86.
- That name is a nod to the old Intel line of CPUs where the model numbers all ended in 86, such as 286, 386, and 486 .
- The 64-bit Intel platform is sometimes called x64.
- Windows 7 comes in both 32-bit and 64-bit versions, and when purchasing a copy of Windows, you must match the Windows version to the hardware platform you have

User Interfaces

- An operating system can have either a graphical user interface (GUI) or a command-line interface.
- **Graphical User Interface (GUI):** A user interface based on a graphical environment, in which users interact with it using a pointing device or touch screen as the primary input device.
- **Command-line Interface:** A user interface based on typing text at a command prompt.

User Interfaces: cont.

A GUI (left) and a command-line interface (right).

Utility software

- Utility Software: Software that performs some useful service to the operating system, such as optimizing or correcting the file storage system, backing up files, or ensuring security or privacy.
- Microsoft Windows comes with utilities for checking a disk for errors and optimizing the way files are stored on an HDD (hard disk drive).

Utilities

- In addition to the main components of an operating system, utility software may also be available, either provided free with the OS or added on.

- Utility programs assist with a wide range of system maintenance and security functions, such as checking storage disks for errors, blocking security and privacy threats, and backing up important files.

Some Utility Software Types

- Malware: Harmful or maliciously created software, such as a virus or spyware.
- Virus: A type of malware that attaches itself to an executable file and spreads to other files when the program is run.
-

Spyware: A type of malware that spies on the user's activities and reports them back to the spyware's developer.

Some Utility Software Types

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Adware: A type of malware that pops up unwanted ads on the screen.

- Firewall Software: Software that blocks hackers from accessing a computer by closing unnecessary services and ports.
- Anti-Spam Software: Software that rejects junk email messages.
- Disk Checking Program: Software that finds and fixes errors in the disk storage system.

Some Utility Software Types

- Registry Cleanup Program: Software that analyzes the Windows registry and deletes unneeded entries.

- Registry: The main system configuration database for Microsoft Windows.

- Uninstaller Utility: Software that removes installed software along with its associated files and registry entries.

Comparing the Major Operating Systems

When you think about operating systems, you probably think first of Microsoft Windows, which is the operating system used on more than 90 percent of all desktop and notebook PCs.

Microsoft Windows: The graphical Microsoft operating system designed for Intel-platform desktop and notebook computers.

Windows 7

Desktop / Notebook OSs: Mac OS X

- Mac OS X: The graphical operating system designed for Apple Macintosh's desktop and notebook computers. Newer versions now run on the Intel platform.
- Mavericks The code name for Mac OS X 10.9.

Mac OS X 10.9 (Mavericks)

Desktop / Notebook OSs: Linux

- Linux: An open-source, cross-platform operating system that runs on desktops, notebooks, tablets, and smartphones.

- The name Linux is a combination of the words Linus and UNIX. Linux is open-source, which means that Mr. Torvalds retains ownership of his original code, but it is free to the public to use in any way they see fit.

Ubuntu Linux

Desktop / Notebook OSs: Linux

- Users are free to modify the code, improve it, and redistribute it.
- Developers are not allowed to charge money for the Linux kernel itself (the main part of the operating system), but they can charge money for distributions (distros for short), which are packaged collections of addons and utility programs for Linux.
- Some of the most popular distros include SUSE Linux, Ubuntu Linux and Red Hat Linux.

Desktop / Notebook OSs: Chrome OS

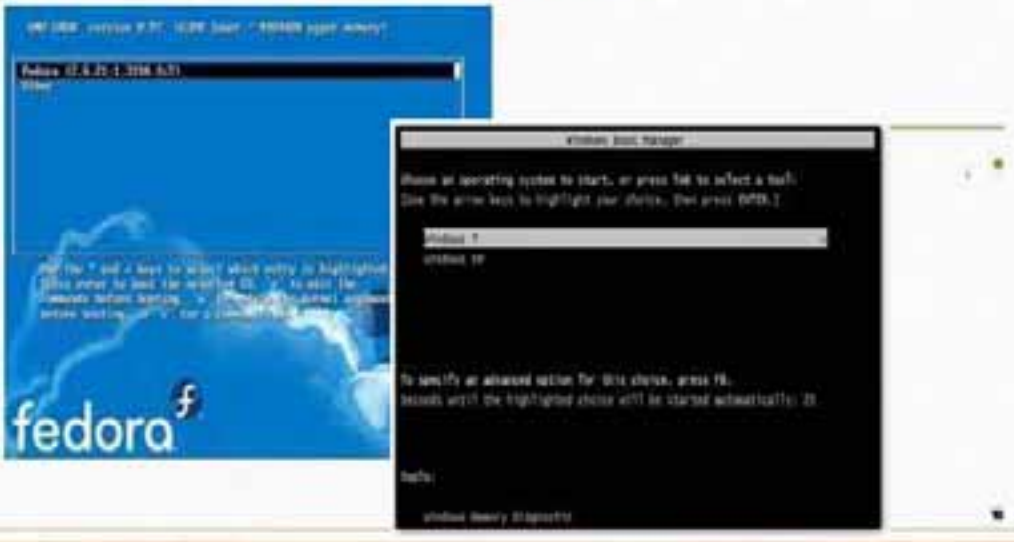
- Thin client: A computer with minimal hardware, designed for a specific task. For example, a thin web client is designed for using the Internet.
- One popular thin client operating system is Chrome OS.
- Chrome OS: A thin client operating system created by Google for small notebook computers (netbooks).

Google Chrome OS.

Running More than One OS using Multi-boot

- Multi-boot (or dual-boot) system is a computer system in which two operating systems are installed on the same hard drive, allowing either operating system to be loaded and given control.
- Each operating system must be on a separate volume in order to multi-boot .
- The drawback to multi-booting is that each time you want to switch operating systems, you have to restart the computer.

Multi-boot



Running More than One OS using Virtual Machine

- Virtual Machine (VM): a self-contained operating environment that behaves as if it is a separate computer, with no access to the host operating system.

Running More than One OS using Virtual Machine

- The drawback is that your computer's runtime resources — RAM, CPU, GPU, etc. — are shared between all running virtual machines.
- This means if you decide to run Linux within Windows, Linux won't be running at 100% and might therefore lag or experience some other kind of performance hit. The more RAM you have, the smoother it will run.

Operating Systems for Servers

- Server: A computer that is dedicated to performing network tasks such as managing files, printers, or email for multiple users.

UNIX: A multi-user, command-line operating system for servers.

Operating Systems for Servers

- Windows Server: The server-optimized version of Microsoft Windows.
- Its GUI is similar to that of the client version of Windows (that is, the version designed for individual PCs), but it has different features and utilities designed to help IT professionals control server activities.

OSs for Tablets & Smartphones

- iOS: The Apple-created operating system for Apple tablets and phones.
- Android: An open-source operating system used on a variety of portable devices, including tablets and smartphones.
- Windows RT: The Windows version designed for system-on-chip tablet computers.
- Windows Phone: The Windows version designed for smartphones.

Understanding Device Drivers

- Device driver: A file that translates instructions and messages between the operating system and a hardware device.
- You can update a device driver to solve some performance problems you may have with the device, and roll back the driver if the new driver does not work as well as the previous one.

- Each device driver is designed for one specific device and one specific operating system, although it may work, fully or partially, with other similar devices or operating systems.

Understanding Device Drivers: cont.

- When you install a new piece of hardware, Windows uses a technology called Plug and Play to identify the device and locate a driver for it if possible.
- Plug and Play: A standard that enables the BIOS and operating system to identify a hardware device and install a driver for it automatically if one is available.

Understanding Digital Storage

- To prepare a hard drive for use, it must first be partitioned.
- Partitioning creates the logical divisions of the available space on a storage medium such as an HDD; or, a logical division of space on a storage medium.

- A drive is a physical storage unit.
- Each drive has one or more volumes.
- Volumes are represented by letters, such as C:, D: … etc.

Digital Storage: cont.

- Each volume must then be formatted.

- Formatting a volume organizes the available space by creating a file system on it.
- File system is a set of rules for storing and managing the files on a volume, such as NTFS or FAT32.

- New Technology File System (NTFS) is the proprietary Microsoft file system used in modern versions of Windows.

Digital Storage: cont.

- System volume is the volume on which the operating system files are stored.
- FAT32 is a file system used in Windows 95, Windows 98, and Windows Millennium Edition. FAT stands for File Allocation Table.
- Hierarchical File System Plus (HFS+) is the file system used with Mac OS X.
- ISO 9660 is a file system used on optical media such as CDs; also called CD File System, or CDFS.

How Files Are Organized in Folders

- The top level of a storage volume is its root directory.
- A file's path is the complete descriptor of its location, including the volume and any folders you pass through to get to it (e.g. **E:\Personal\Budget.txt**)
- A folder tree is a graphical representation of a volume's storage hierarchy, with subordinate branches for folders and subfolders.

The Budget.txt file's complete path is illustrated in the navigation pane.

File Extensions and File Types

- A file extension is a code following the name of the file that indicates its type.
- Extensions are separated from the filename by a period, like this: **Myfile.docx**. In this example, **docx** is the extension, and it indicates the Microsoft Word format.
- Almost all files have file extensions in Windows, not just data files.
- You can configure the OS to associate a file type with any of the applications you have installed on your computer.

Understanding Application Software

Learning objectives

- Business Productivity Software
- Understand the basics of business productivity applications
  - ✓ Word Processing and Desktop Publishing
  - ✓ Spreadsheets
  - ✓ Databases
  - ✓ Graphics Software
- Managing Your Applications

Business Productivity Software

Some software are classified as productivity software because they allow you to get things done. Other application software is designed to entertain you, or to help you learn something.

- Business Productivity Software

Business people typically use a collection of applications known as an office suite to perform the most common tasks involved in their jobs, such as writing reports and correspondence, calculating numbers, giving presentations, and maintaining databases of information.

- Microsoft Office is the most popular suite of business applications in the world. Its core products—Word, Excel, and PowerPoint—are considered the standard tools in millions of offices.

Understanding Word Processing and Desktop Publishing

- word processor A program used to create or view text-based documents.

- A word processor contains many features designed to help improve text, such as spell-checking, grammar correction, and formatting tools.

- Microsoft Word is the world's most widely used word processor and one of the most advanced examples of this type of program.

Desktop Publishing

Desktop publishing software provides more control over page layout than a word processor, sometimes called page layout software.

Desktop publishing software enables users to precisely position the text and other elements on a page or across a double-page spread (facing pages) to create an attractive design.

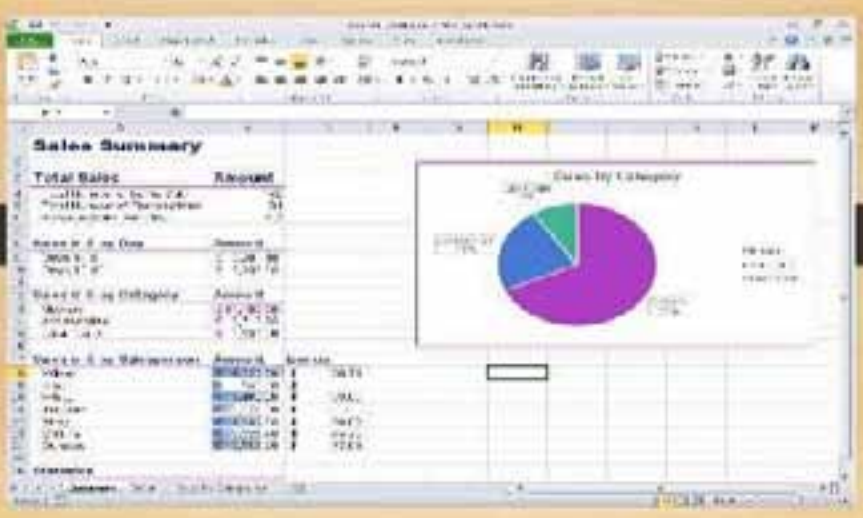
The main difference operationally between word processing and desktop publishing is that a word-processing program typically enables you to type directly on the page onscreen, and it flows the text automatically based on the margins, indents, and number of columns you specify.

Desktop publishing, on the other hand, uses movable and resizable frames for everything, including text.

Understanding Spreadsheets

- A **spreadsheet** is a grid used to analyze and present numeric data in **cells**.
- Spreadsheets use **formulas** to perform calculations.
- Microsoft Excel is the most commonly used application for creating and managing spreadsheets.
- An Excel data file is a **workbook** and can contain multiple **worksheets**. You can switch between worksheets with the tabs at the bottom of the window. A worksheet is organized in rows and columns; the intersection of a row and column is a **cell**.

Spreadsheets Software



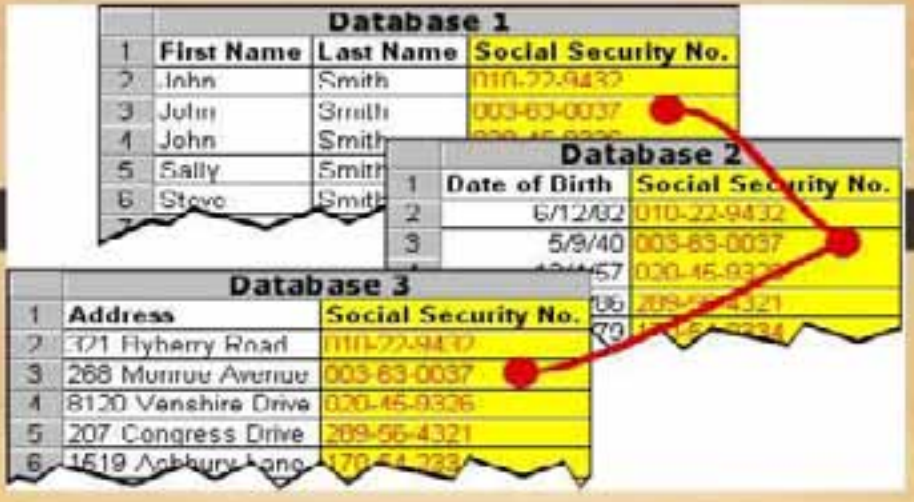
Understanding Databases

- A **database** is a structured collection of data. The data resides in **tables**, each of which contains **records** and **fields**.
- The software used to create and control a database is a **database management system (DBMS)**.
- **Data mining** is the process of extracting useful information from a database.
- The most common type of database is a **relational database**, which has multiple tables with relationships between them , another type is a **hierarchical database**, which uses a tree structure made up of **nodes**.

Hierarchical Database

- It works by narrowing down a search starting with the entire set of records and successively excluding any that the search doesn't apply to.
- **Family historians** would use a hierarchical view to see all the descendants of a single ancestor.
- A **suite** is a group of related applications, such as the applications in Microsoft Office. For small, use Microsoft Access, for large-scale databases, use an enterprise level database system like Oracle or Adobe Creative Suite.

Hierarchical Database



Database 1

	First Name	Last Name	Social Security No.
2	John	Smith	010-22-9432
3	John	Smith	003-63-0037
4	John	Smith	
5	Sally	Smith	
6	Steve	Smith	

Database 2

	Date of Birth	Social Security No.
2	6/12/82	010-22-9432
3	5/9/40	003-63-0037
4		020-45-9326
5		269-55-4321
6		170-64-2234

Database 3

	Address	Social Security No.
2	321 Ryberry Road	010-22-9432
3	268 Munroe Avenue	003-63-0037
4	8120 Vanshire Drive	020-45-9326
5	207 Congress Drive	269-55-4321
6	1519 Ashbury Lane	170-64-2234

Accounting and Personal Finance Software

Accounting software : Software that enables a small business to manage and track its financial health and transactions.

Personal finance software: Software that enables individuals and families to track and manage their bank accounts and investments.

- Tax software: Software that enables individuals and small businesses to calculate the taxes they owe and file the needed forms with the government.

Understanding Graphics Software

- Graphics software is software that enables you to create and manipulate visual images.
- There are two main categories of graphic images: vector and raster.

1-Vector graphics are lines and shapes drawn mathematically, like in geometry. Vector graphics are small and easily resizable but not realistic.

2-Raster graphic, or bitmap, A graphic that consists of a grid of colored pixels that collectively form an image.

Presentation Graphics Software

- Presentation graphics software A program that combines charts, graphics, and bulleted lists of information as a series of slides that summarize a report or verbal presentation.
- Microsoft PowerPoint is the most widely used program.
- Presentation graphics software enables you to create slides to use as visual aids in presentations.
- slide A screen of information that is displayed in a static fashion while a presenter elaborates on its contents. Often, the slide will be part of an electronic presentation file and the presenter can move through successive files on demand.

Computer-Aided Design Software

- **Computer-aided design (CAD)** software is used to design 3D objects using vector-based drawings.
- An object drawing starts out as a **wireframe** and then is **rendered** by having surface textures and colors applied to it.
- **Wireframe** A 3D vector drawing that consists only of drawn lines, without any surface textures Applied.
- **Render** To apply a surface texture and fill to a wireframe image to give it a solid appearance.

Wireframe and Render Images

Managing Your Applications

- Software License Agreements
- Application System Requirements
- Installing and Removing Applications
- Updating Applications

Software License Agreements

- Software is licensed in different ways.
- Most applications are commercial software, owned and distributed by someone who wants to make a profit on them.
- Shareware allows you to try it first and then pay only if you keep it. Freeware is totally free. With public domain software, the owner gives up the copyright.
- When the author makes the source code available, it is called open-source software.
- The End User License Agreement (EULA) spells out the terms of the license.
- Software piracy means stealing software by using it without abiding by the license agreement.

Application System Requirements

The system requirements of an application explain the minimum hardware configuration required to run the application successfully. It may include specs for CPU, memory, graphics, and hard drive space.

Installing and Removing Applications

To install an application, insert its CD/DVD or run its Setup file. To remove an application, use the Uninstall a Program feature in the Control Panel in Windows.

Updating Applications

Some applications update themselves automatically; with others, you must locate and run a Check for Updates command in the software interface or visit the manufacturer’s website to see if updates are available.

Computer Viruses

Learning objectives

- What is a virus
- The anatomy of a virus
- Viruses VS. worms
- Different types of viruses
- Who writes viruses and why ?

What is a virus

A virus is computer program that spreads or replicates by copying itself.

The main parts of a virus' code are :-

- The replication routine.
- The payload routine.

The virus waits until user transmits the infected object to another computer

↓

User transmits an infected object to another computer

↓

The virus locates and infects suitable objects on the new computer

A typical lifecycle of a computer virus

The anatomy of a virus

1. The replication routine:-

This mechanism is the most important part of the virus. This part of the virus code locates suitable objects to attach the virus to and copies the virus to these objects.

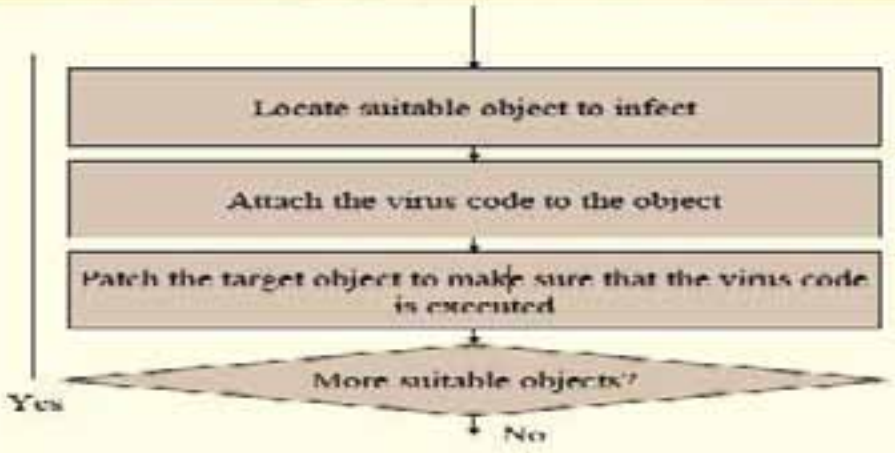
A large number of various techniques have been used for this purpose.

The problems of work the replication routine :-

- The first problem the replication routine must solve is how to find suitable objects.

- A virus is always written so as to work attached to a certain type of carrier object, such as a program file or text document.
- This can be done by searching through the computer, file by file.

A more elegant approach is for the virus to remain in memory and monitor system activity. This enables the virus to infect files when they are used.



Functions performed by a typical replication mechanism

The second problem that the replication mechanism must solve is how to attach the virus to the carrier object.

This step is done using totally different techniques for different types of viruses. However, one common requirement is that the virus' code be executed when the object is used.

2. The payload routine:-

payload routine is not a mandatory part of a virus. It does not take part in the replication of the virus in any way. Some viruses also lack a payload routine altogether.

The payload routines can be divided into **two** groups, malicious and non-malicious.

1-Malicious payloads can, for example, delete files, modify data, plant backdoors in the system or reveal confidential data.

2-Non-malicious payloads may play music, show pictures or animations, promote the author's favorite heavy-metal band etc.

Viruses VS. worms

The difference between these two groups may not be obvious to the computer user who encounters a virus or worm, but the difference is significant from a technical point of view.

- **A worm**, is able to use services provided by a modern networked environment much more efficiently than a virus. This results in an advantage that enables worms to spread much faster than viruses.

- **viruses** attach to a carrier object and wait for the object to be transmitted to another computer. Once transmitted, they activate and start looking for other objects to infect.

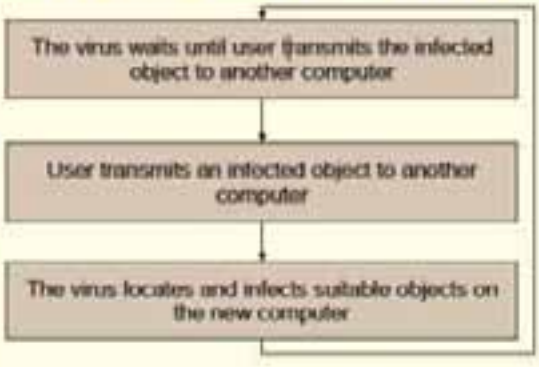
Viruses VS. worms

- A pure worm is more independent than a virus. A pure worm works by itself as an independent object. It does not need a carrier object to attach itself to.

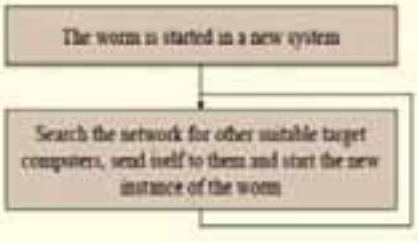
- A computer environment must naturally meet some requirements to make worms possible. A worm's method of replication cannot work unless computers are networked in some way.

This is the main reason for the fact that viruses were the most common form of malware in PC environments for a long time.

Viruses VS. worms



A typical lifecycle of a computer virus



The lifecycle of a typical pure worm

Different types of viruses

1. Boot sector viruses

A boot sector virus infects the boot sector of floppy disks or hard drives. These blocks contain a small computer program that participates in starting the computer. A virus can infect the system by replacing or attaching itself to these blocks.

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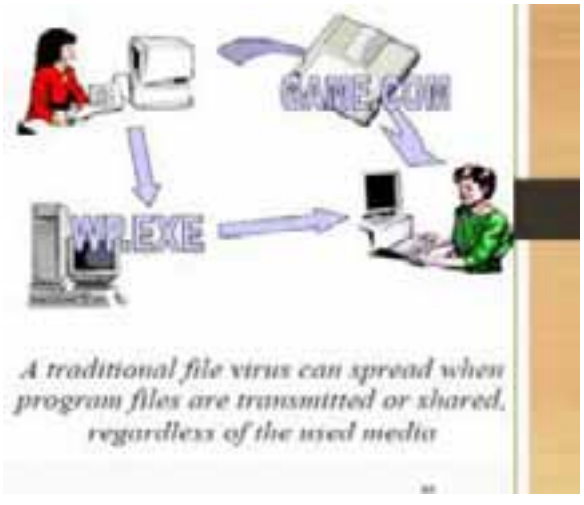
Different types of viruses

2. Traditional file viruses

This group of viruses replicates when attached to MS-DOS program files with the EXE or COM extensions.



They cannot infect 32-bit EXE files used by newer versions of MS Windows. The Traditional file viruses were made for 16bit program files used by MS-DOS.

Different types of viruses

3. Document or macro viruses

written in a macro language, Such languages are usually included in advanced applications such as word processing and spreadsheet programs.

The vast majority of known macro viruses replicate using the MS Office program suite, mainly MS Word and MS Excel.

A document or macro virus spreads when documents are exchanged, regardless of the media used

Different types of viruses

4. 32-bit file viruses

The 32-bit versions of Windows, such as Windows 95, 98 and NT, use a different and more complex format for the program files. Traditional files viruses cannot infect these files.

5. Worms → Mail worms

→ Pure worms

Different types of viruses

A. mail worm

is carried by an email message, usually as an attachment but there have been some cases where the worm is located in the message body.
The recipient must open or execute the attachment before the worm can activate.

An e-mail worm sends a large number of messages automatically when the user has activated the worm

Different types of viruses

B.Pure worms

A worm is a replicating program that works independently without a host file and without user intervention. Pure worms have the potential to spread very quickly because they are not dependent on any human actions.

A pure worm locates and infects other machines on the same network without user interventions

Different types of viruses

6. Other kinds of malware

A. Trojan horses

In the computer world the term refers to a program that contains hidden malicious functions. The program may look like something funny or useful such as a game or utility, but harms the system when executed.

B. Backdoor Trojans

are a special kind of Trojan that grant unauthorized access to computer systems. This type of Trojan is rather common and can pose a significant threat to business users.

Different types of viruses

C. Jokes

A joke program does something funny or tasteless, but does not harm the computer environment. The effect may be music

or sounds, video or animations, interactive functions etc.

D. Hoaxes

A hoax is a chain letter that is usually circulated as an email message. These chain letters may have any content and are actually not related to computer viruses in any way.

Who writes viruses and why?

- **Challenge and curiosity**: There are no courses or good books about how to write viruses. Many programmers want to see if they can do it.
- **Protest and anarchy**: A virus is quite a powerful way to cause intentional damage.
- **Proof of concept**: Someone may for example want to prove that a certain replication technique works.
- **Political motives**: A virus may be used to spread a political message. This may, for example, be protests against totalitarian
- **Fame and power** : The virus, and possibly the damage it has caused makes other people work and react in some way.

Networking and Internet Basics

Learning objectives

- What is network
- What is protocol
- Identify communications networks in daily life
- Distinguish between types of networks
- Wireless Networking Technologies
- Network hardware

what is network

- **Network concepts** :-A collection of computers that communicate with one another over transmission lines.
- The first worldwide network ever created was the telephone network, predating computers by many decades. This network is an example of a **circuit-switched network**.

Circuit-Switched and Public Telephone Networks

- circuit-switched network A network that creates a point-topoint connection between locations that remains open for the duration of the communication.

- public switched telephone network (PSTN) The worldwide network of circuit-switched telephone lines.


Circuit-switched network
Communication channel remains open
during the entire duration of the conversation
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packet-switched network

- packet-switched network A network that transfers data by breaking it up into separately transferred packets.
- A communication channel does not remain open between two points for an entire

conversation; instead, the data is broken up at the sending end into small packets, each with an electronic envelope around it that states the source and the destination, and sent individually to the receiver. Depending on the network traffic, each packet may take a different route to the destination, but when they arrive they are unpacked and reassembled into the original message.

The Internet

- Internet A global packet-switched network created cooperatively by multiple companies, governments, and standards organizations. The Internet is the world's largest network.

- The Internet uses various protocols (rules) that all participating computers have standardized on, so that services like the web, email, and instant messaging work the same everywhere

What is protocol ?

- protocol A rule or custom that governs how something is done. In computer context, it refers to a standard for transferring data.
- Internet service provider (ISP) A company that maintains a direct connection to the Internet and leases access to it to individuals and companies.
- The Internet is based on a protocol stack (a set of protocols or A related group of protocols for example TCP/IP called Transmission Control Protocol/Internet Protocol (TCP/IP).

TCP/IP

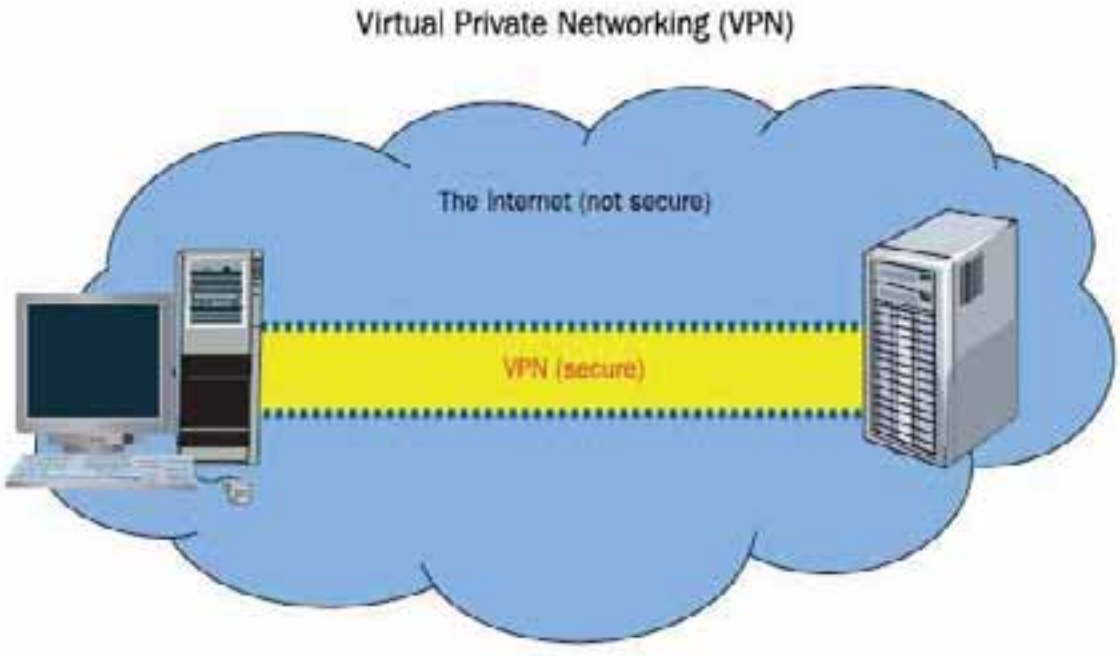
TCP/IP :-The protocol suite (set of rules) that defines how data will move on the Internet and on most other modern networks.

- It is used not only on the Internet, but in most private networks today as well. One of the key features of TCP/IP is IP addressing, which is a means of uniquely identifying each connected computer on the network by a numeric value.

Private Digital Networks

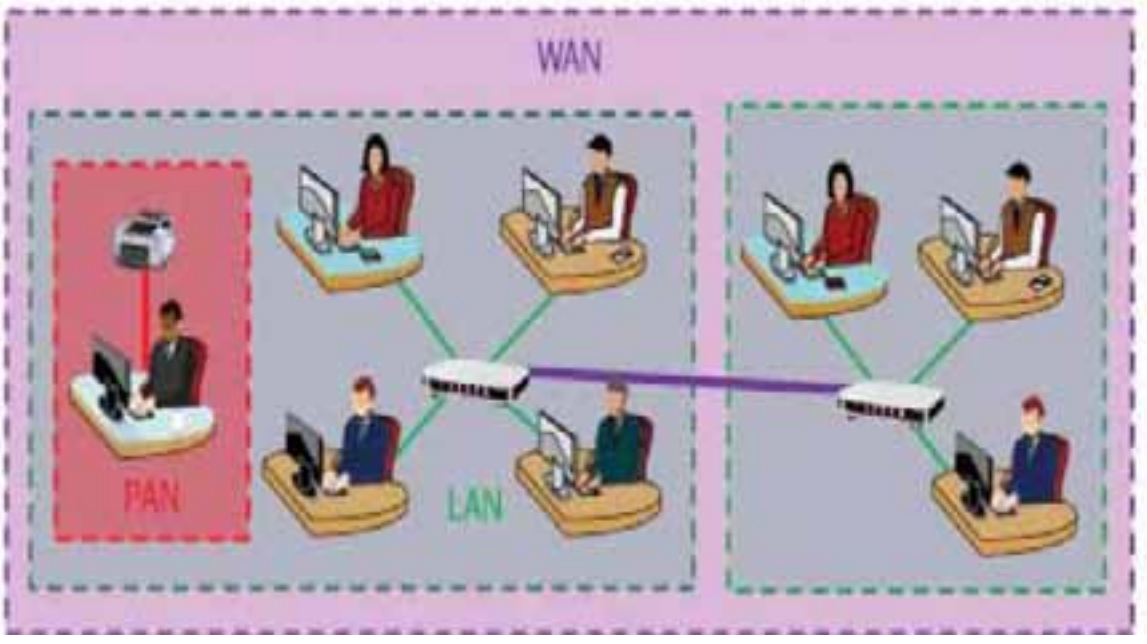
- Many companies maintain high-speed connections between their locations. Using the Internet is also not very secure; it's an open system, and data being sent and received can easily be snooped. To tighten the security when using the Internet as a conduit, many companies use a software technology called virtual private networking (VPN).

virtual private networking (VPN) A method of creating a secure, private communication tunnel using a public communications channel such as the Internet.



Ways Of Classifying Networks(Network Types)

- There are several ways to classify computer networks. 1-One way is according to the geographical range that they cover:
- personal area network (PAN):-A network formed when devices are connected to an individual computer.
- local area network (LAN):-local area network (LAN) A network that connects devices housed in the same physical location.
- metropolitan area network (MAN):-A network that connects devices within the area of a city or town.
- wide area network (WAN):-A network that spans at least two geographical locations; a business with two or more offices may have a LAN at each site but use a WAN to connect them all to the same network.



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Other types of networks

2-Another way to classify networks is to look at whether or not a server is involved in their management.

A-peer-to-peer (P2P) also called a **workgroup** network A network that consists only of clients (no servers). Very small networks (10 computers or fewer) can get by without a server by operating.

B-client/server network A network that contains one or more servers. For larger networks, a client/server model is more effective and it can be any size, and can have multiple servers.

Other types of networks

Some organizations have a part of the network that can only be accessed from within the organization.

- **intranet** A special network that only staff within the company network can access. For security reasons, an intranet can only be accessed onsite and not remotely.
- **extranet** A special network set up by a business for its customers, staff, and business partners to access from outside the office network; may be used to share marketing assets and other non sensitive items.
- **Ethernet** The current dominant standard for local area networking devices. Ethernet can technically be either wired or wireless.

Wireless Networking Technologies

- A network can connect devices using either wired or wireless connections. A wired connection runs a cable between the points, whereas wireless connects the two points via radio frequency (RF) or infrared.

- Wireless communications have two main uses:

- The first use is at the endpoints of network connectivity, where a device such as a smartphone or laptop computer connects wirelessly to a router or other device that provides network and/or Internet access.
- The second use is as a source of transferring data between locations when using cables is not practical, such as with satellite and microwave systems.

Wireless Networking Technologies

1 Wi-Fi is short for wireless fidelity. Wi-Fi Wireless Ethernet. A means of connecting computers and other devices wirelessly. Another name for it is IEEE 802.11, its technical standard.

2 Bluetooth is a wireless technology used to connect individual devices to one another in close proximity. Bluetooth An inexpensive short-range networking technology used for computer-to-device connections such as computer-to-printer or phone-to-headset.

3 infrared Older type of wireless communication that used light waves to pass simple information between nearby devices.

Network Hardware

- Network connectivity requires both hardware and software. The software portion is handled by the operating system; all modern operating systems include network

support. Network hardware may also be known as network equipment or computer networking devices.

1-network adapter:-A hardware component that enables a computer to connect to a network. Each network adapter has a hardware address, called a media access control (MAC) address, that is unique in all the world.

Network Hardware

2-switch :- A gathering point for the computers in a LAN to connect with to participate in the network.

3-hub:- A primitive version of a switch that lacks the capability to read packet addresses and route them to the appropriate port.

4-router:- A connection box for Ethernet networks that physically joins the devices in the network (wired) or provides wireless connectivity (wireless), and enables a connection to an outside network such as the Internet.

Network Hardware

Network Cables

Wired communication media consists mainly of various types of cables:-

1-twisted-pair cable:- Cable that transfers data via pairs of copper wires that are twisted around each other to reduce electromagnetic interference

twisted-pair cable

A. unshielded twisted pair (UTP) :-A type of twisted-pair cable that does not have an outer sheath that protects against external EMI.

B. shielded twisted pair (STP):- A type of twisted-pair cable that has an outer sheath that protects against external EMI.

Network Cables

2- Coaxial Cable :- Cable that consists of a solid copper core with an insulated sleeve around it.

3- Fiber Optic Cable :- Cable that carries data using light pulses through a bundle of glass fibers.

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