Chapter 3:
Applications and Systems Software

Introduction

System Types of Software

- Software falls into two categories:
  - Application Software
    - Application software consists of all the programs you can use to perform a task
      - Example: Internet Browser, Word Processor
  - System Software
    - System software includes all programs that help computer function properly
      - Example: Operating System

Application Software

- This is the set of instructions or programs which make the computer performs a particular task which will satisfy a processing requirement of the user. An example is the inventory system.
- Also called a **Software Application** or an **Application**
- Several reasons to use application software
  - To assist with graphics and multimedia projects
  - To serve as a productivity/business tool
  - To facilitate communications
  - To support household activities, for personal business, or for education

Systems Software

- This is the set of instructions or programs which create a computer environment within which the applications software can work.
- Application software determines what processing is done by the computer.
- Systems software determines how that processing will be done by the computer.

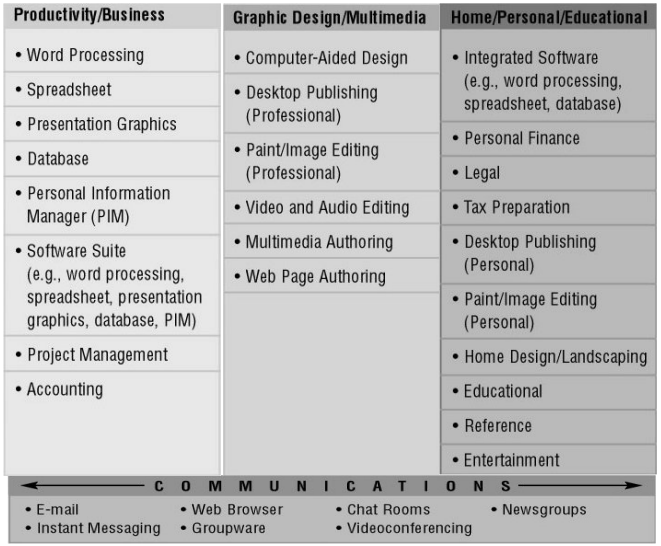
Horizontal & Vertical Application

- **Horizontal Applications** are used across the function divisions of a company. They are general-purpose programs that address the needs of many people, such as writing, working with numbers and keeping track of information.
- **Vertical Applications** are designed for a particular line of business or for a division in a computer. Vertical Applications designed for professional and business use may cost much more than Horizontal Applications.

Applications and Systems Software

Applications Software

Categories of Application Software

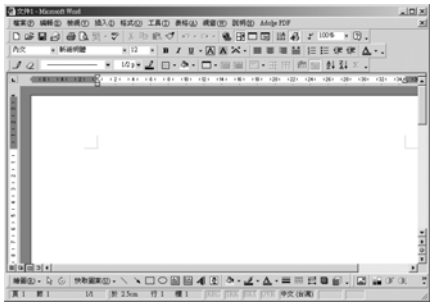


Word Processing

- Allows the user to manipulate text so as to produce documents accurately and efficiently.
- Provide the user with a blank screen page onto which text can be entered.
- Once the text is on the page, it can be altered with the greatest of ease, thereby allowing the correction of errors and perhaps more importantly, allowing the author of the document to change his mind.
- When a document is finally complete, and as the author wants it, then it can be printed and saved.
- Allow multiple copies of the same document to be printed at the touch of a button.
- If a word still turns out to be incorrectly spelt, the document can called up again, the correction made without retyping the whole document and the page printed.

Features of Word Processing

- Page Formatting
- Word Wrap
- Block Functions
- Mail Merge
- Spell Checker
- Thesaurus



Features of Word Processing – Page Formatting

- Some processors will allow the user to select different print fonts, set a variety of tab stops, indent margins on the left or both sides and select single, double or treble spacing.

Features of Word Processing – Word Wrap

- One of the most importantly features of word processor is that of word-wrap.
- With most typewriters, when the end of line is reached, the bell rings to alert the user to the need to press the carriage return to start a new line.
- With the word-wrap facility, the user merely continues to type and the word processor will continue onto a new line when required, without splitting words in the middle of them.
- Similarly , when the end of a page is reached, the software will simply scroll the old page up the screen and a new page will appear automatically at the bottom.

Features of Word Processing – Block Functions

- Most word processors allow the user to identify blocks of text which can be manipulated together.
- Blocks can be moved, copied or deleted.
- This facility is often used to allow transfer of blocks of text from one document (or file) to another, thereby allowing the repeated use of standard paragraphs in several documents.

Features of Word Processing – Mail Merge

- The more sophisticated word processors also allow a function known as mail merge.
- This is where a standard letter or other document can be produced, leaving gaps for details of the recipient's name and address.
- These details, for a number of recipients, can be entered onto another file and the two merged together at the time of printing.
- This process would result in a copy of the document, complete with name and address, for each of the recipients held on the second file.
- Such a facility is nowadays often used in mailshots and circulars.

Features of Word Processing – Spell Checker

- Another feature which is of great use to users is that of the spelling checker.
- This facility allows the user to check the spelling of any, or all, the words in a document prior to printing.
- This software checks the spelling against an internal dictionary and a personal one which would contain entries such as people's names.
- One slight disadvantage is that much of this software is produced in America and results in the spelling checker questioning words which are spelt differently in Britain or America.
- There are, however, spelling checkers available which use the British spellings.

Features of Word Processing – Thesaurus

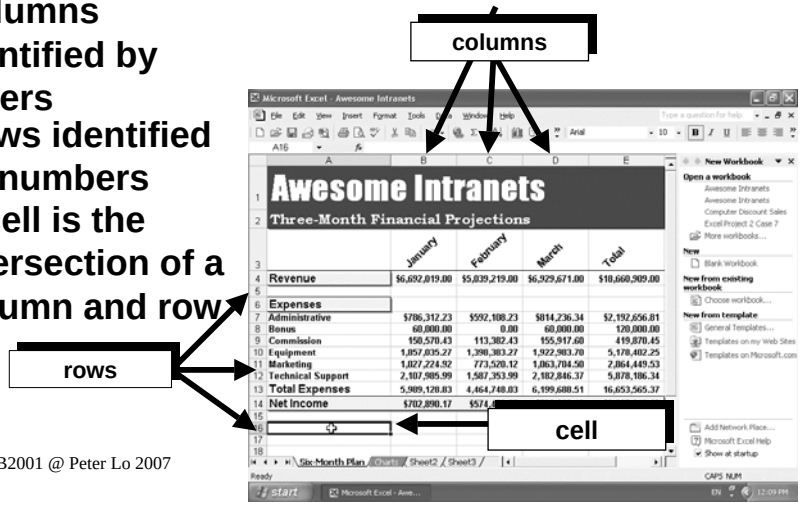
- Finally, and as an extension to the spelling checker, there are now word processors which have the facility to a thesaurus to provide alternative words for the user.
- This again is quite useful tool and avoids having to use a manual method.

Spreadsheet

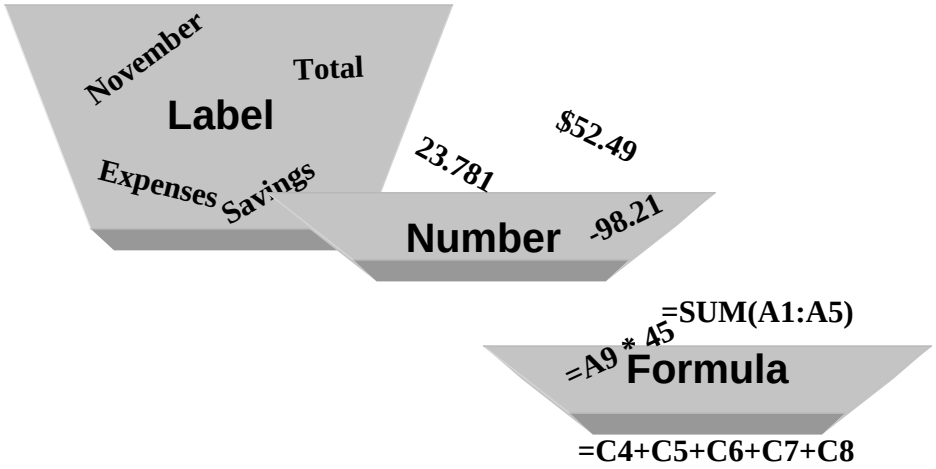
- Allows you to organize data
- Performs calculations
- Called a **Worksheet** or **Spreadsheet**

How is a Spreadsheet Organized?

- Columns identified by letters
- Rows identified by numbers
- A cell is the intersection of a column and row

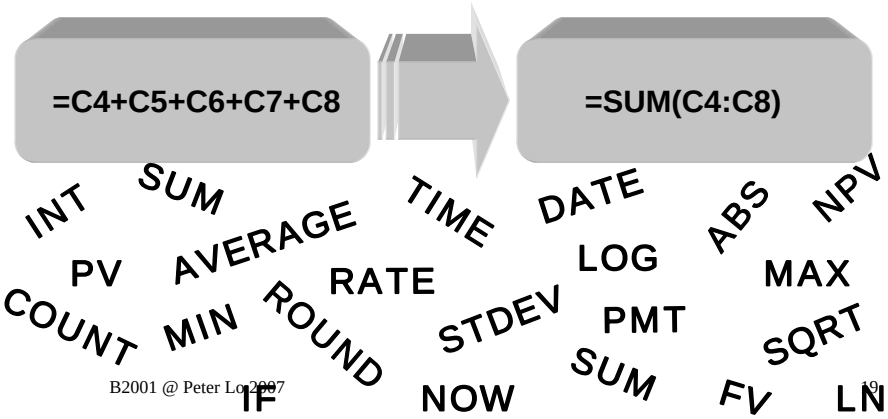


What can a Cell Contain?



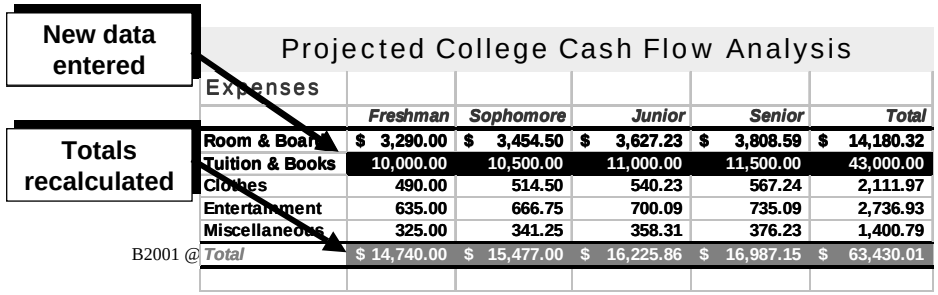
Function

- A predefined formula that performs common calculations



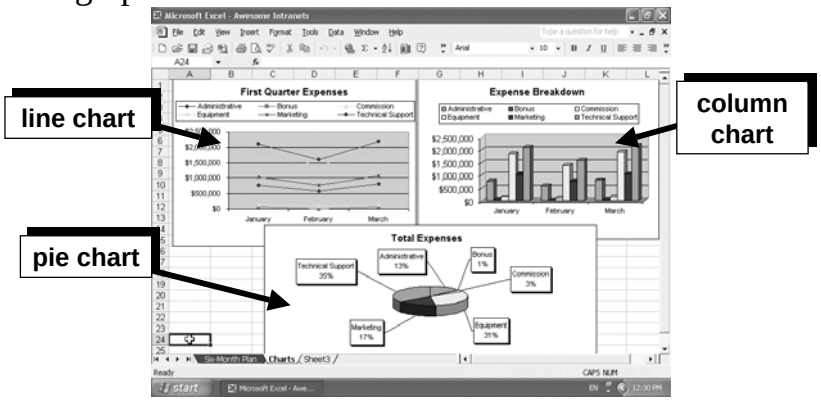
Recalculation

- The capability of recalculating the rest of the worksheet when data in a worksheet changes
- What-if analysis



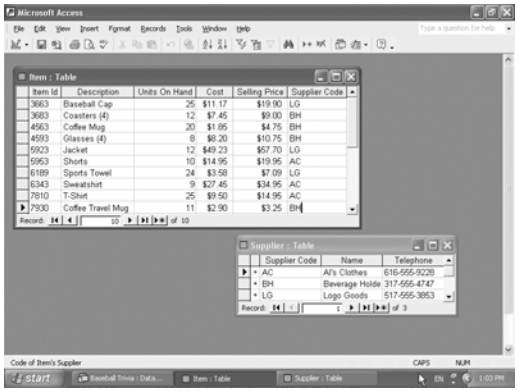
Charting

- Allows you to display spreadsheet data in graphical form



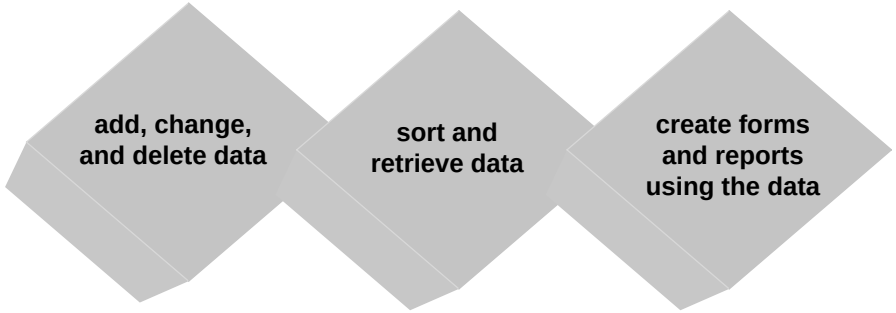
Database

- Database is a collection of data organized in a manner that allows access, retrieval, and use of that data



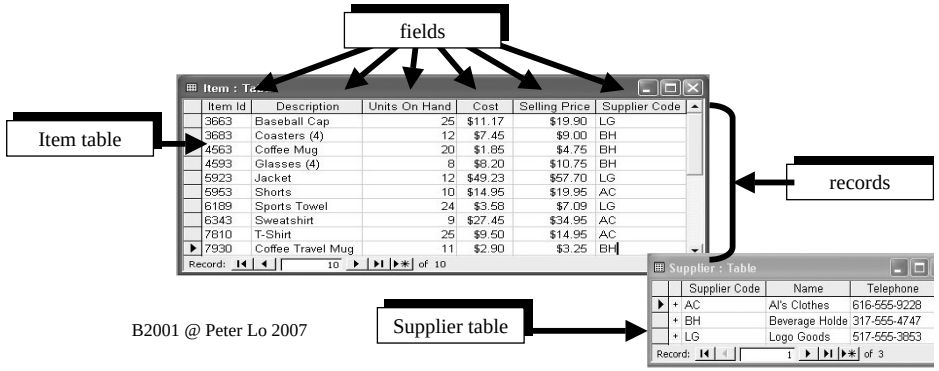
Database Software

- Allows you to create, access, and manage a database
- Also called a database management system (DBMS)



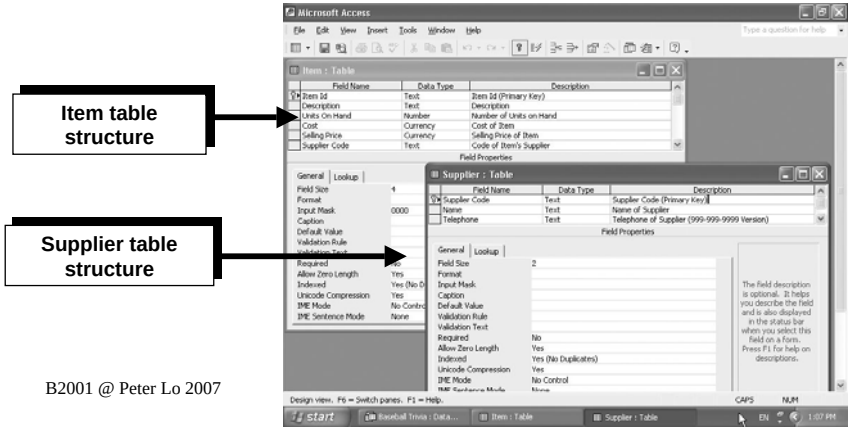
What are the Parts of a Database?

- A table contains records
- A record is a row in a table that contains information about a given person, product, or event
- A field is a column in a table that contains a specific piece of information within a record



How is a database organized?

- Records and fields in a table are described by the table structure



Extract information from a Database

- Sort records in a particular order
- Query database

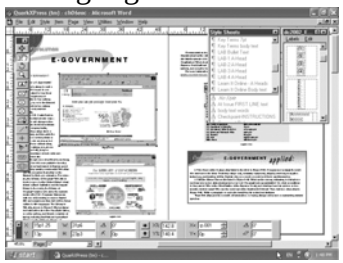
Item Query : Select Query

Item Id	Description	Units On Hand	Cost	Selling Price	Supplier Code
4563	Coffee Mug	20	$1.85	$4.75	BH
6189	Sports Towel	24	$3.58	$7.09	LG
7810	T-Shirt	25	$9.50	$14.95	AC
3663	Baseball Cap	25	$11.17	$19.90	LG

Record: 4 of 4 (Filtered)

Desk Top Publishing (DTP) Software

- Enables you to design and produce sophisticated documents that contain text, graphics, and brilliant colors
- Users can combine word-processed text with such elements as artwork, photos, and a variety of style fonts.
- Allow users to combine a variety of graphical fonts onto a page, use pre-stored art images (such as clip art) on pages, and draw lines and boxed to highlight text or art.

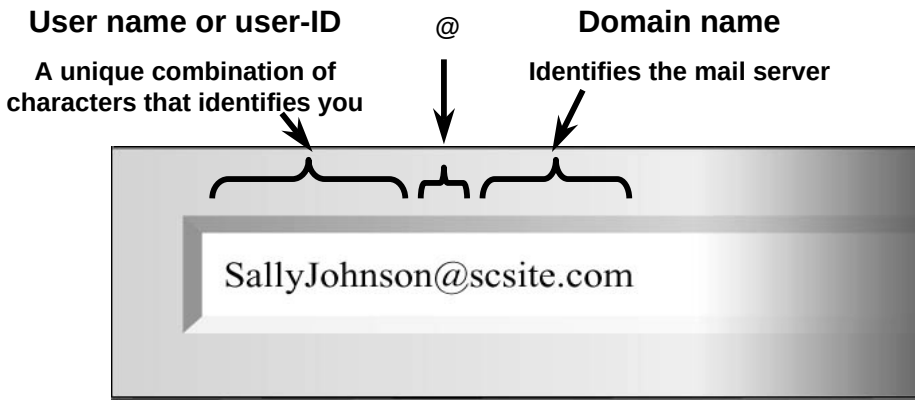


Electronic Mail

- It refers to the technology used to send messages or documents from one electronic workstation to another.
- For instance, employees within a large organization may have electronic mailboxes that are managed by a mainframe, minicomputer, or local area network.
- When these employees access a workstation, they can send a message to place in someone else's mailbox.
- These types of E-mail systems are typically standard components in integrated office packages.

E-mail address

- Combination of user name and domain name that identifies user so he or she can receive e-mail



How can you get e-mail?

- Obtain e-mail address from school or ISP
- Some Web sites, such as hotmail.com, provide e-mail services free of charge
- Basic components include:

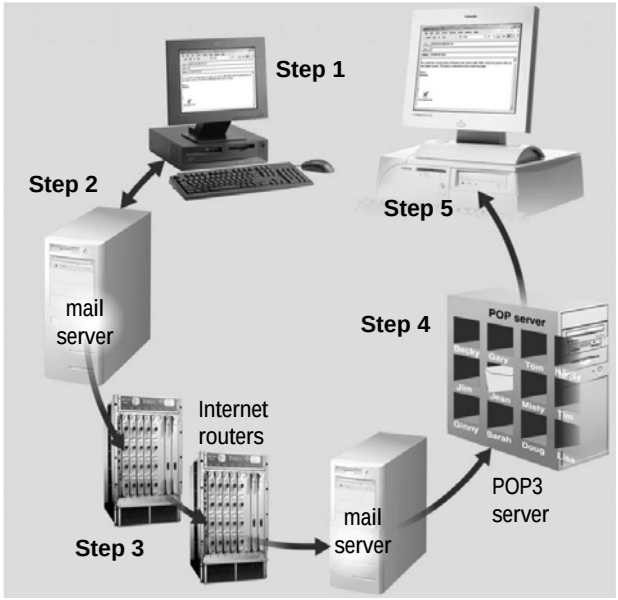
Mailbox
Storage location usually residing on computer that connects you to Internet

Mail Server
Server that contains mailboxes

Address Book
Allows you to store list of names and e-mail addresses

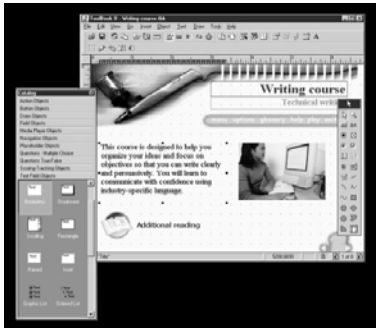
How does an e-mail message travel?

1 Create & send message
2 Your software contacts ISP mail server
3 Mail server determines best route
4 Mail server transfers message to POP3 server
5 When e-mail software checks for e-mail messages, message transfers from POP3 server to recipient's computer



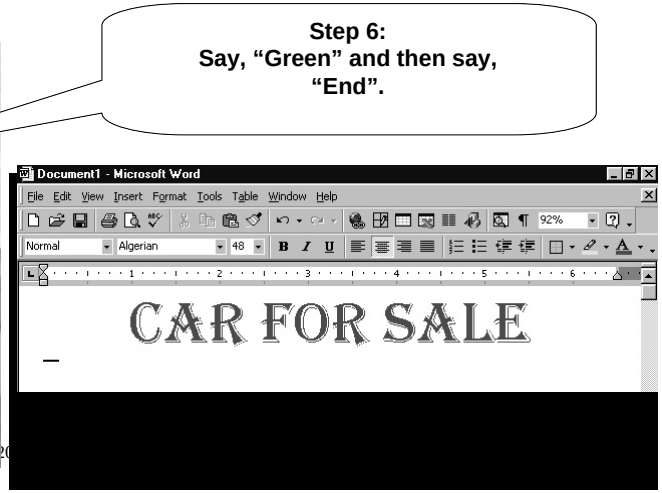
Digital Image Processing

- Digital image processing is the use of computer algorithms to perform image processing on digital images.
- It allows a much wider range of algorithms to be applied to the input data, and can avoid problems such as the build-up of noise and signal distortion during processing.



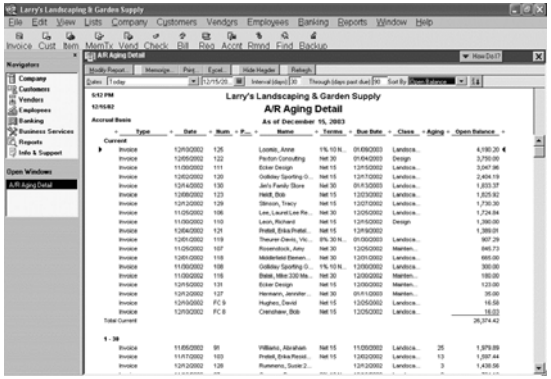
Voice Recognition

- The computer's capability of distinguishing spoken words



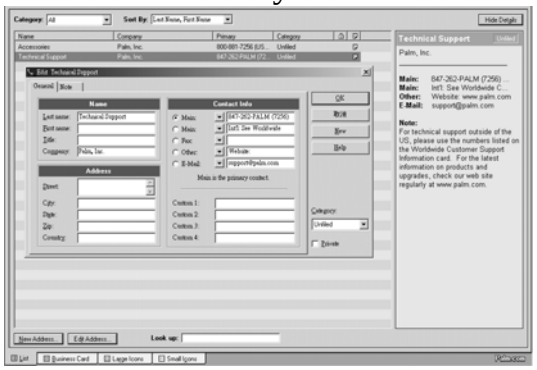
Bookkeeping Software

- Helps companies record and report their financial transactions



Contact Managers

- Built around a database customized to track information about your contact.



Resume Manager

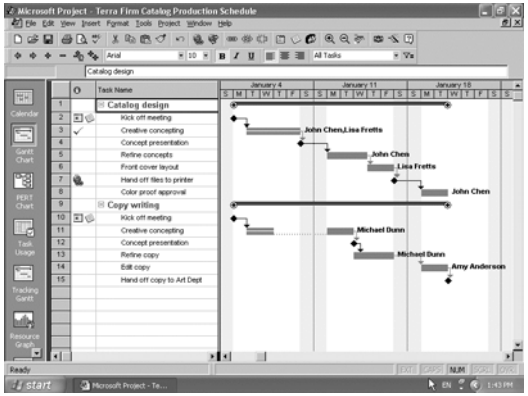
- Provide expert guideline in resume preparation, including suggestion for how to write the best resume for different occupations

Decision Support System

- Help decision-makers work through the decision process so that they can make decision more intelligent and rationally.

Project Management Software

- Allows you to plan, schedule, track, and analyze the events, resources, and costs of a project



Fax Software

- Help you project a professional image to your clients and customers. When image clarity is vital, you can generate photo-quality faxes. You can even send or forward faxes via email to people who don't have fax hardware or software

Personal Finance Program

- Also called Checkbook program
- Help you track credit card debts, set up budgets, establish savings and investment plans, develop strategies for retirement and college tuition expenses.

Tax Software

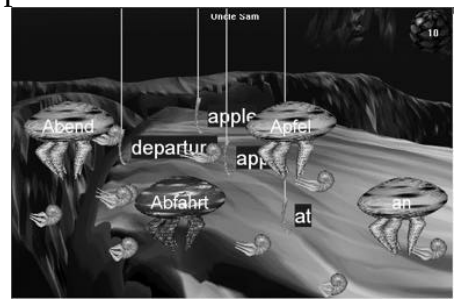
- Guides you step-by-step and is packed with more advice, guidance and tips to help you save on your taxes to make you benefit from smart tax strategies, expert guidance and a comprehensive tax library.

Genealogy Software

- helps you track, organize, print, and share your family history

Education Software

- Most of these program blend learning with multimedia-based entertainment, so the term edutainment is often used to describe these product.

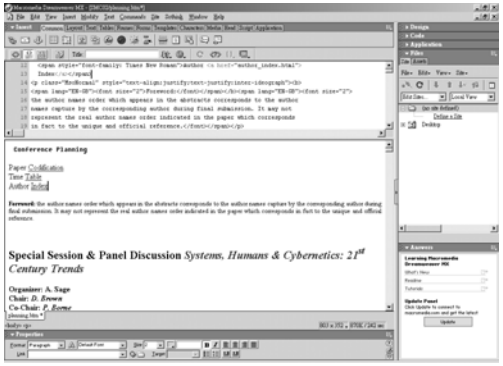


Video and Audio Editing Software

- Video editing software allows you to modify a segment of a video, called a clip
- Audio editing software allows you to modify audio clips

Web Page Authoring Software

- Allows you to create Web pages

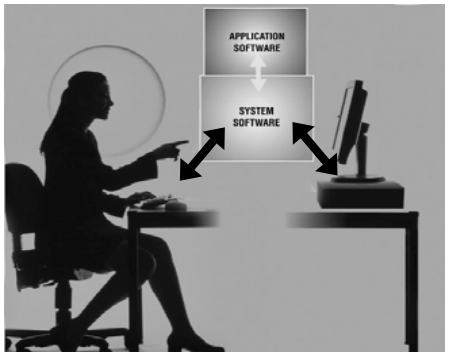


Applications and Systems Software

System Software

System Software

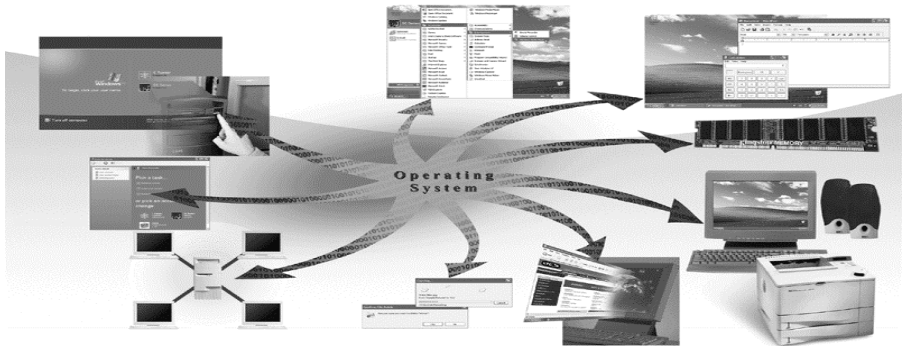
- Programs that control the operations of the computer
- Serves as the interface between the user, the application software, and the computer's hardware



Operating Systems

- The operating system can be defined as a set of programs which supervise and control the whole computer configuration.
- This includes control of the input and output of data from the computer and control of the peripherals.
- It also handles error routines and communication with the operator.
- One aim of the operating system is to ensure the efficient use of the CPU and other devices.

Functions of an Operating System

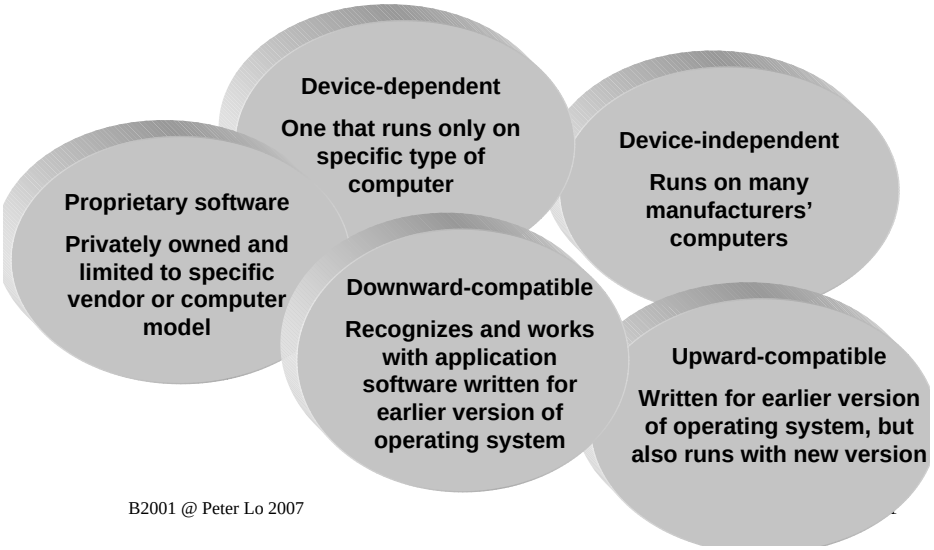


❑ start up the computer	❑ monitor performance and provide housekeeping services	❑ manage memory
❑ administer security		❑ manage programs
❑ control a network	❑schedule jobs and configure devices	❑ provide user interface
❑ access the Web		

Functions of an Operating System

- Loading Into Memory
  - When a program needs to be executed, it must first be transferred from storage device to main memory as required. Similarly, when data is to be processed, it must be read into memory first.
- Queuing of processing Tasks
  - The scheduling of processing tasks, or jobs, so as to attempt to keep the central processing unit constantly active.
- Control of Peripheral Devices
  - The selection of input and output devices and the control of their operations.

Characteristics of OS



Types of Operating Systems

Stand-alone	• DOS • Windows 3.x • Windows 95 • Windows NT Workstation • Windows 98 • Windows 2000 Professional • Windows Millennium Edition • Windows XP Home Edition • Windows XP Professional Edition • Mac OS X • OS/2 Warp Client • UNIX • Linux
Network	• NetWare • Windows NT Server • Windows 2000 Server • Windows .NET Server • OS/2 Warp Server for E-business • UNIX • Linux • Solaris
Embedded	• Windows CE • Pocket PC 2002 • Palm OS

DOS (Disk Operating System)

- Refers to several single user operating systems developed in the early 1980s for personal computers

```
C:\My Documents>DIR *.XLS

 Volume in drive C has no label
 Volume Serial Number is 3331-12D5
 Directory of C:\My Documents

CUSTOMER XLS         5,632  05-23-02  9:36a Customer.xls
STOCKS   XLS        15,360  11-15-02  1:46p Stocks.xls
BILLPH~1 XLS        14,848  03-01-02  2:04p bill physics graph.xls
HAINES~1 XLS        95,744  09-09-02  3:44p Haines Volunteers.xls
        4 file(s)        131,584 bytes
        0 dir(s)       9,255.94 MB free

C:\My Documents>COPY STOCKS.XLS STOCKS2.XLS
        1 file(s) copied

C:\My Documents>
C:\My Documents>RENAME STOCKS2.XLS STOCKSBK.XLS

C:\My Documents>
C:\My Documents>CD..

C:\>
C:\>
```

commands entered by user

Where is the Operating System Located?

operating system resides on ROM in handhelds

operating system resides on hard disk in most cases

Booting

- Booting is a process of starting or restarting a computer
  - **Cold Boot** – Process of turning on a computer after it has been powered off completely
  - **Warm Boot** – Process of restarting a computer that is already powered on

What messages display on the screen when you boot up?

BIOS version and copyright notice

total amount of memory

devices detected and tested

Windows message

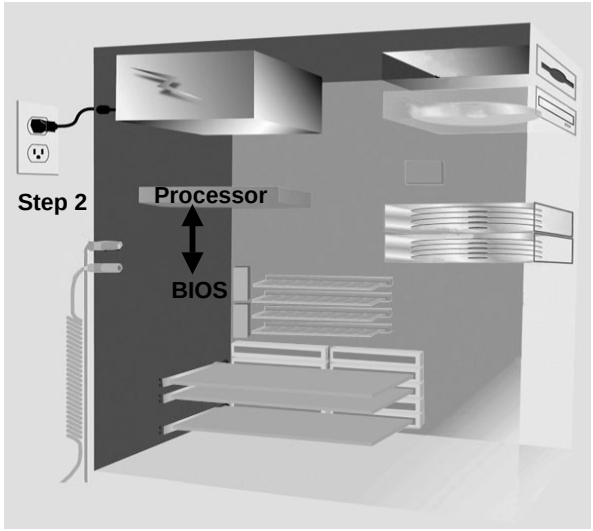
sound card and CD-ROM drivers loaded

```
ROM BIOS Version 2.10 A05
Copyright BIOSTech Inc. 2003
All rights reserved

0065536 KB

Keyboard.....Detected
Mouse.......Detected

Hard Disk Installed WCW AC41600H

Floppy A: Installed

Starting Windows

SoundUTIL TSR Version 1.20
Copyright SoundCard Technology 2002-03

IDE CD-RW Device Driver Version V2.33 (4/20/03)
Copyright Gaijin Electric Co.
1 drive(s) selected
```

How does a computer boot up?

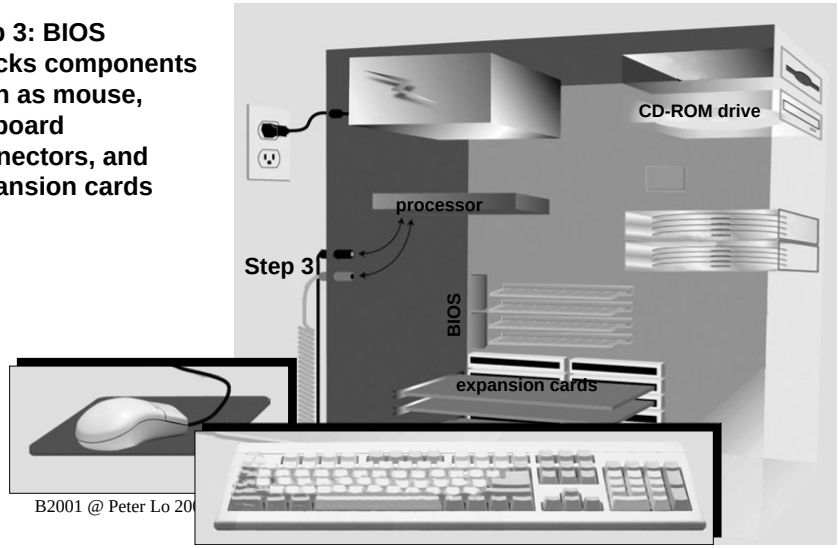
1: Power supply sends signal to components in system unit

2: The processor accesses BIOS to start computer



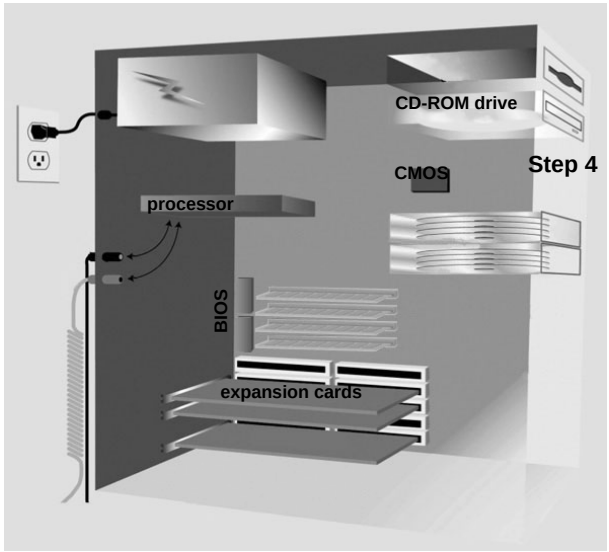
How does a computer boot up?

Step 3: BIOS checks components such as mouse, keyboard connectors, and expansion cards



How does a computer boot up?

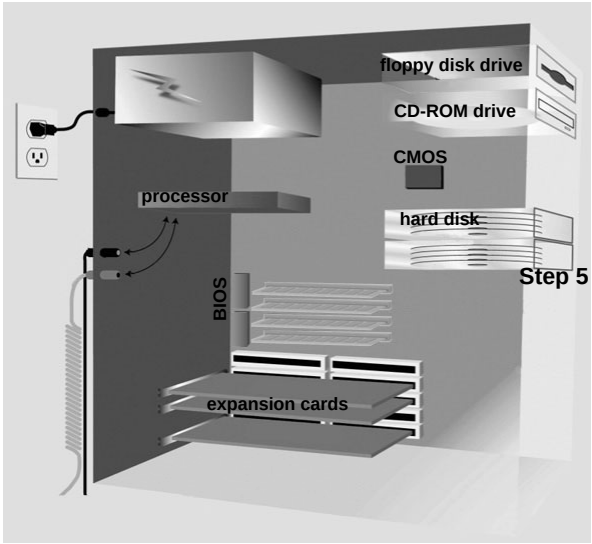
Step 4: Results of POST are compared to data in the CMOS chip



How does a computer boot up?

Step 5: BIOS looks for system files in drive A (floppy disk drive) and then drive C (hard disk)

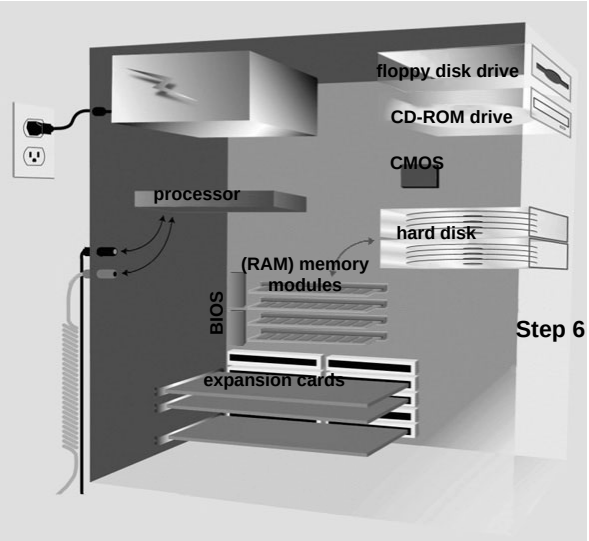
Drive that contains operating system is called boot drive



How does a computer boot up?

Step 6: Boot program loads kernel of operating system into RAM from boot drive

Operating system in memory takes control of computer

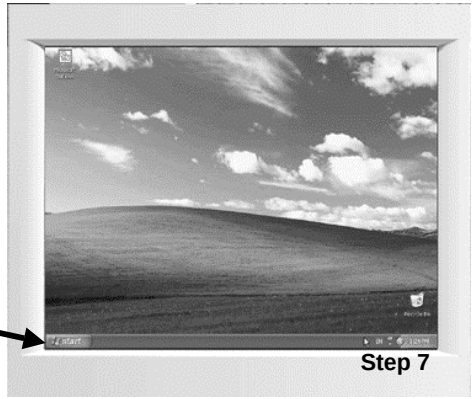


How does a computer boot up?

Step 7: Operating system loads configuration information and displays desktop on screen

Operating system executes programs in Startup folder

click Start to display list of applications you can run



Utilities

- Utilities are programs which perform tasks that are often required by end-users, or other programs.
- Many of them, especially for microcomputers, come as part of the operating system.
- With larger systems, some of the utilities are separate.
- Most of these are file handling utilities such as copying and moving files which allow the user to perform housekeeping activities.

What is a Utility Program

- System software that performs a specific task
- Examples include:
  - File viewer
  - File compression
  - Diagnostic utility
  - Uninstaller
  - Disk scanner
  - Backup utility
  - Screen saver

Applications and Systems Software

Computer Languages

Computer Languages

- Computer languages can be categorized into:
  - **First-generation Language**: Machine languages
  - **Second-generation Language**: Assembly Languages (Low level)
  - **Third-generation Languages** (High level Languages)
  - **Fourth-generation Languages** (Very high level Languages)

Machine Language

- Machine code or machine language is the lowest level of computer language and is in binary notation.
- This is the actual “language” that the computer can understand and execute.
- However, it is very difficult to code using nothing but binary notation.

```
                                        00090
000090  50E0   30B2                     010B4
000094  1B44
000096  1B77
000098  1B55
00009A  F273   30D6   2C81   010D8   00C83
0000A0  4F50   30D6                    010D8
0000A4  F275   30D6   2C7B   010D8   00C7D
0000AA  4F70   30D6                    010D8
0000AE  5070   304A                    0104C
0000B2  1C47
0000B4  5050   304E                    01050
0000B8  58E0   30B2                    010B4
0000BC  07FE
```


Advantages and Disadvantages of Machine Language

- Advantage
  - Most efficient in terms of storage area use and execution speed.
  - Allows programmer to utilize the computer's potential for processing data.
- Disadvantage
  - Extremely difficult to program, remember and use.

Assembly Language

- Assembly Languages are also called **Symbolic Languages** or **Low-level Languages**.
- They must be translated into machine language by an assembler program.
- The assembly language is not written in binary notation. Instead, mnemonics or abbreviations are used to represent operations (e.g SUB for Subtract).
- This makes the language much easier to write in than machine code but it is still relatively tedious for a programmer who has to code in very detailed steps.

```
*        THIS MODULE CALCULATES THE REGULAR TIME PAY
CALCSTPY EQU   *
         ST    14,SAVERTPY
         SR    4,4
         SR    7,7
         SR    5,5
         PACK  DOUBLE,RTHRSIN
         CVB   4,DOUBLE
         PACK  DOUBLE,RATEIN
         CVB   7,DOUBLE
         ST    7,RATE
         MR    4,7
         ST    5,RTPAY
         L     14,SAVERTPY
         BR    14
```


Advantages and Disadvantages of Assembly Language

- Advantage
  - Can be used to develop programs highly efficient in terms of storage space use and processing time.
- Disadvantage
  - Cumbersome to use, as one assembly-language instruction is translated into one machine-language instruction.
  - Difficult to program effectively.
  - Machine-dependent, i.e. programs written on one computer generally cannot work on another.

High Level Languages

- High level languages are a group of languages which closely resemble the structure of English and are the easiest in which to program.
- There is less requirement on the programmer to specify so many details.
- One high level language command can represent several machine code instructions which means that the same can be achieved with fewer instructions in a high level language.
- High level languages are more complex to translate into machine code and the language processors which perform this task are called **Compliers**.

```
*   COMPUTE REGULAR TIME PAY
    MULTIPLY REGULAR-TIME-HOURS BY HOURLY-PAY-RATE
        GIVING REGULAR-TIME-PAY.

*   COMPUTE OVERTIME PAY
    IF OVERTIME-HOURS > 0
        COMPUTE OVERTIME-PAY = OVERTIME-HOURS * 1.5 * HOURLY-PAY-RATE
    ELSE
        MOVE 0 TO OVERTIME-PAY.

*   COMPUTE GROSS PAY
    ADD REGULAR-TIME-PAY TO OVERTIME-PAY
        GIVING GROSS-PAY.

*   PRINT GROSS PAY
    MOVE GROSS-PAY TO GROSS-PAY-OUT.
    WRITE REPORT-LINE-OUT FROM DETAIL-LINE
        AFTER ADVANCING 2 LINES.
```


Fourth Generation Languages

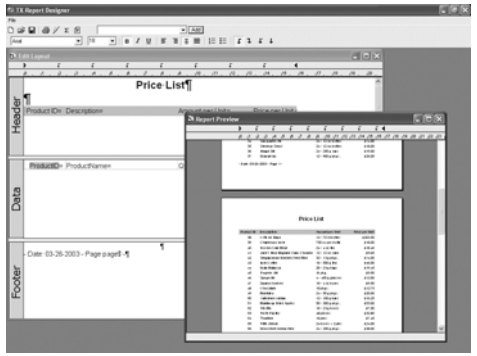
- Very High Level Languages are also known as **Fourth Generation Languages** (4GL).
- This name is given to a group of languages that allow users to specify what the output should be without describing all the details of how the data should be manipulated to produce that result.

Functionalities of 4GL

- Each individual 4GL product may perform one or more of the following functions :
  - Report Generation
  - Retrieval and Update (Query)
  - Graphics Generation
  - Application Generators

Report Generation

- This enables a user or a programmer to produce reports quickly.
- Facilities are provided to allow data to be extracted from files or databases easily, and then classified or summarized in a report format.



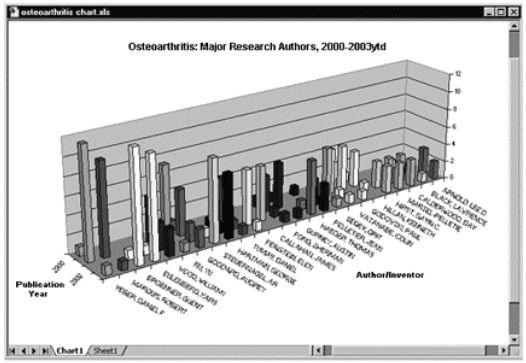
Retrieval and Update

- A typical 4GL will also be capable of performing online queries.
- This enables a user to make a quick inquiry and if necessary, to perform an update as well.

```
SELECT LAST_NAME, FIRST_NAME, GROSS_PAY
FROM EMPLOYEE
WHERE OVERTIME_HOURS > 0
ORDER BY LAST_NAME;

LAST_NAME    FIRST_NAME    GROSS_PAY

Antiqua      Martin          780.00
Charles      Leslie          715.00
Guillan      Anita           847.50
.
.
.
```

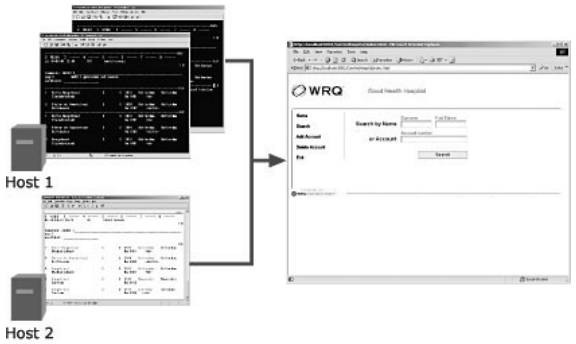

Graphics Generation

- A user will use this function to extract data from the database and present it in graphical format, e.g. line charts, bar charts, pie charts, etc.



Application Generators

- 4GL with this capability enables the user or programmer to develop a set of programs that comprise an entire application system.

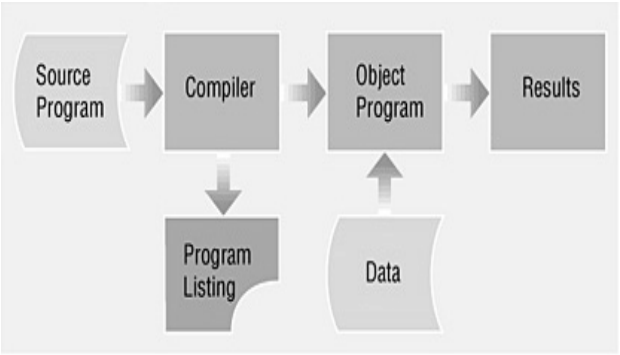


Language Translators

- All computer languages must be converted to machine language which can be executed by a computer.
- The software used to convert source programs to object programs is called a **Program Translator** or **Language Processor**.
- The complier translates a high level program into machine code. In a high level language, fairly complex concepts can be expressed with the use of single commands.
- Consequently, each high level statement can be translated into several (sometimes several hundred) machine code statements.

What is a Compiler?

- Program that converts entire source program into machine language before executing it



What is an Interpreter?

- Program that translates and executes one program code statement at a time
- Does not produce an object program