

INTRODUCTION to COMPUTER AND ICT

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For BS Computer Science, BS (IT),
BS Geology, BS Mathematics,
BS Commerce, BS Statistics

MANAGEMENT Information System **1st Edition** Dr. Rahman Ali



MANAGEMENT Information System

1st Edition

In accordance with approved curriculum
for BS Commerce, Master of Commerce,
BBA and MBA program of the HEC
and University of Peshawar.



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Chapter 4:

Computer Software

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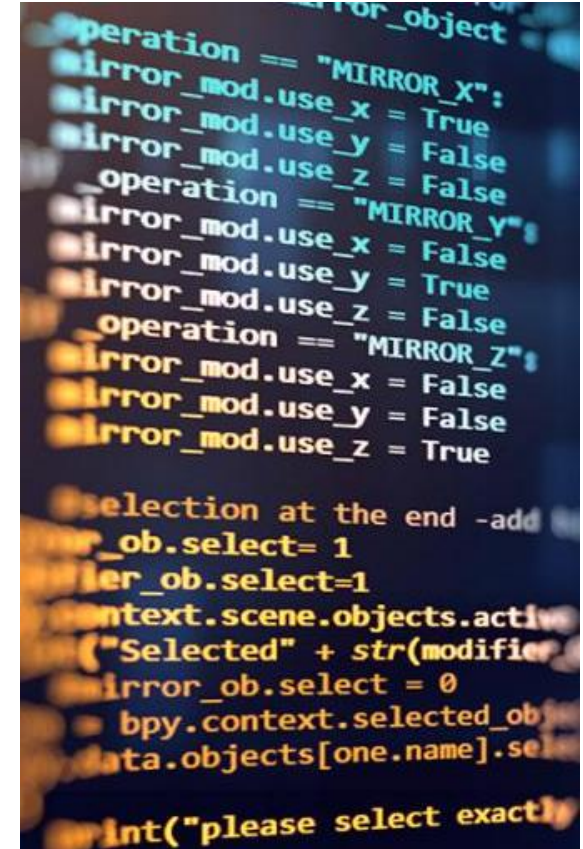
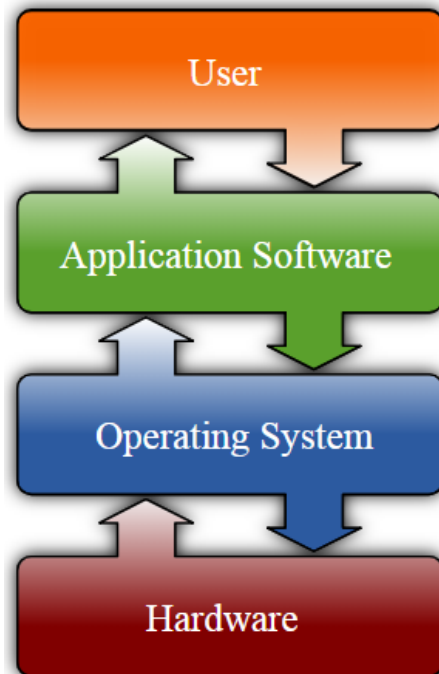
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Outlines

- ✓ Software
- ✓ History
- ✓ Types
 - Classification based on purpose
 - System & Application Software
 - Classification based on availability/copyright Status
 - Shareware, Freeware, Open source
- ✓ Programming Languages
 - Machine, Assembly & high level languages
 - Compilation and interpretation
 - Algorithm
 - Pseudocode
 - Flowchart
 - Graphical Programming
- ✓ Artificial Intelligence
- ✓ Information System

Software

- Computer program.
- A set of instructions that tells the computer what to do and how to do.
- Enable user to interact with hardware.
- A piece of hardware is useless without software.



Software

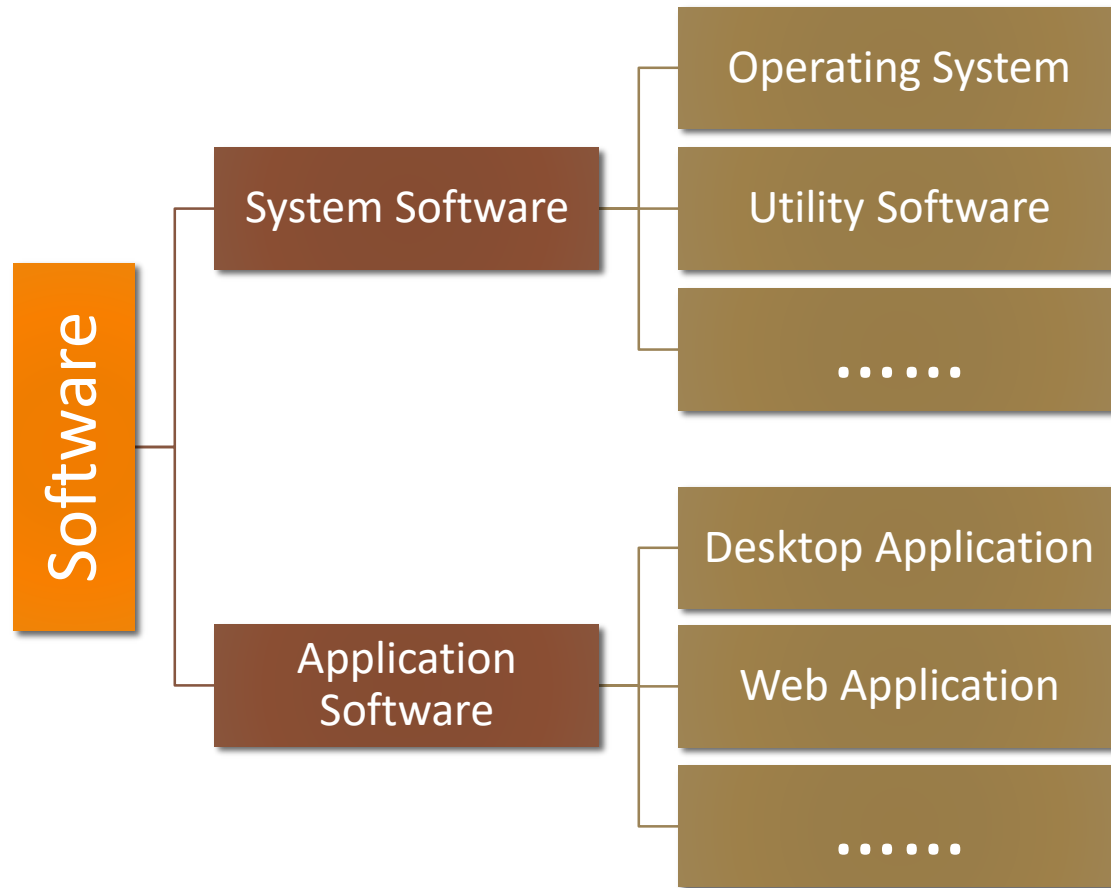
➤ History

- Alan Turing was the first man who introduced the theory of software.
- Claude Shannon explained how binary logic can be used to program a computer. The computer programs in the 1940's were written directly in machine language.
- 1957: The first programming language FORTRAN was introduced by IBM.
- 1962: COBOL.
- Other programming languages like Pascal, C and C++.
- 1970's: Unix OS and the Unix-based Mac OS X were introduced.
- 1980: Bill Gates and his co-workers introduced DOS OS.
- 1980's: Richard Stallman worked on the open source GNU project which led to the development of Linux OS.
- 1985: The first Windows OS was developed which was evolved over time from Windows 1.0 to Windows 10.

Types of Software

1. Classification Based on Purpose

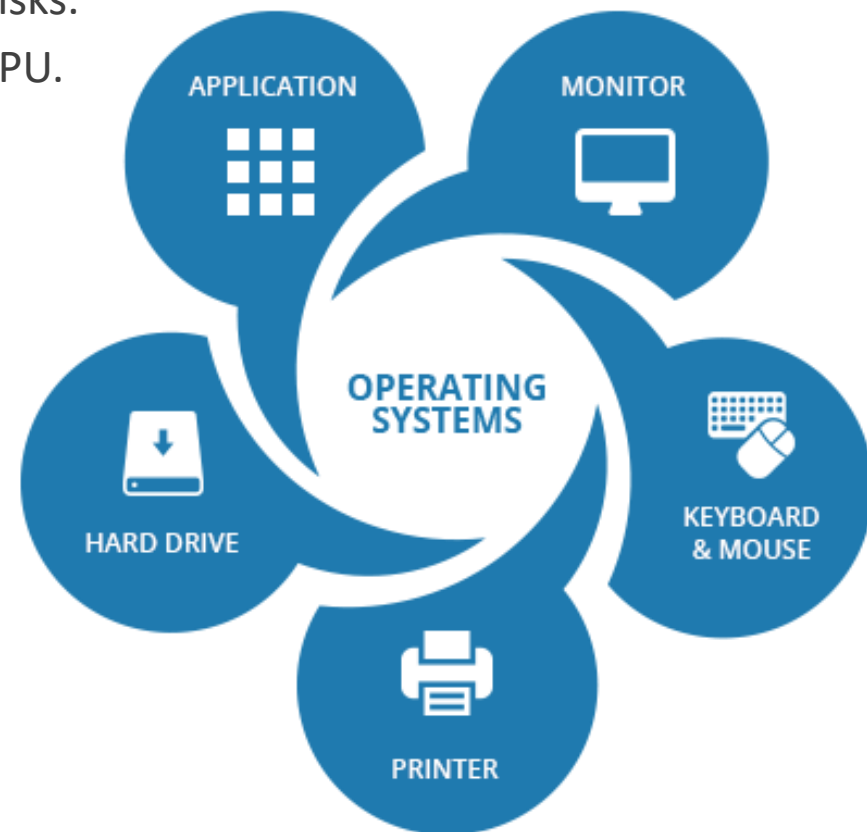
- Two broad categories based on Purpose, System Software and Application Software.



Types of Software

a. System Software

- Provides platform to other software programs.
- Controls and works with hardware.
- Enables the hardware tools to work together:
 - Transferring data between memory and disks.
 - Transferring data between memory and CPU.
 - Rendering output to output devices.
 - Receiving input from input devices.
- Examples:
 - Operating system
 - System development programs
 - Device drivers



System Software

➤ Types of System S/W

• Operating System

- **Functions:** Booting, Interfacing, Resource, Memory and process Management, Security
- **Types:** Batch, Timesharing, Distributed, Network, Real-time, Embedded
- **Others OS:** Windows, OS X, UNIX, Linux and Chrome OS, Mobile category contains Google Android, Apple iOS

• BIOS

- Basic input/output system.
- Stored on an EPROM.
- A program that gets computer started when we turn it on.

• Firmware

- A piece of software embedded in a hardware.
- Directly controls any single hardware.

• Networking software

- It is the software that facilitates and interacts with a computer network.

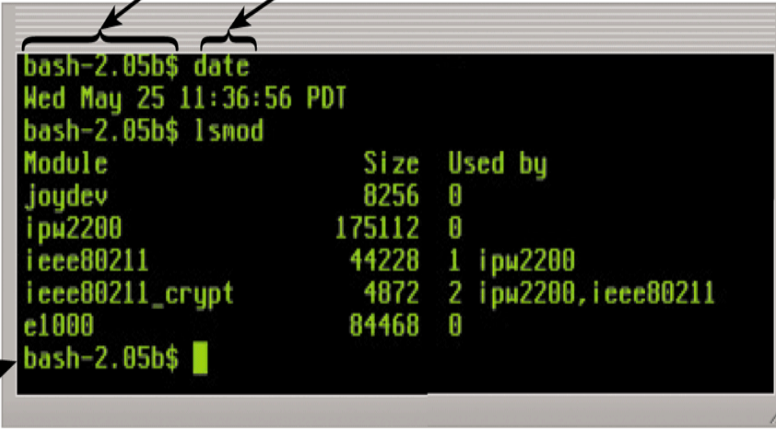


BIOS Chip

System Software

• Shell

- Interface between user and the OS.
- MS DOS, Ubuntu terminal and graphical user interface etc.
- Types
 - CLI
 - GUI



A terminal window showing a command prompt and the execution of two commands. The first command is 'date', which outputs the current date and time. The second command is 'lsmod', which outputs a table of loaded kernel modules.

```
bash-2.05b$ date
Wed May 25 11:36:56 PDT
bash-2.05b$ lsmod
Module                Size  Used by
joydev                 8256  0
ipw2200                175112 0
ieee80211              44228  1 ipw2200
ieee80211_crypt        4872   2 ipw2200, ieee80211
e1000                  84468  0
bash-2.05b$
```

Annotations:

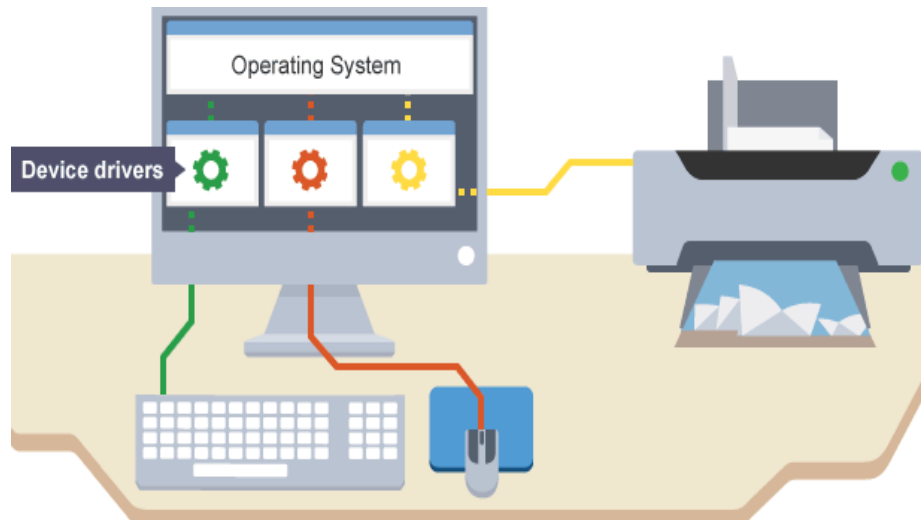
- command prompt (points to 'bash-2.05b\$')
- command entered by user (points to 'date' and 'lsmod')
- command prompt (points to the prompt after the second command)



System Software

- Device Drivers

- A program that operates and controls a particular device.



System Software

➤ Types of System S/W (continued...)

• Translator

- Translates a program from high level language to machine language.
 - Assembler.
 - Interpreter.
 - Compiler.

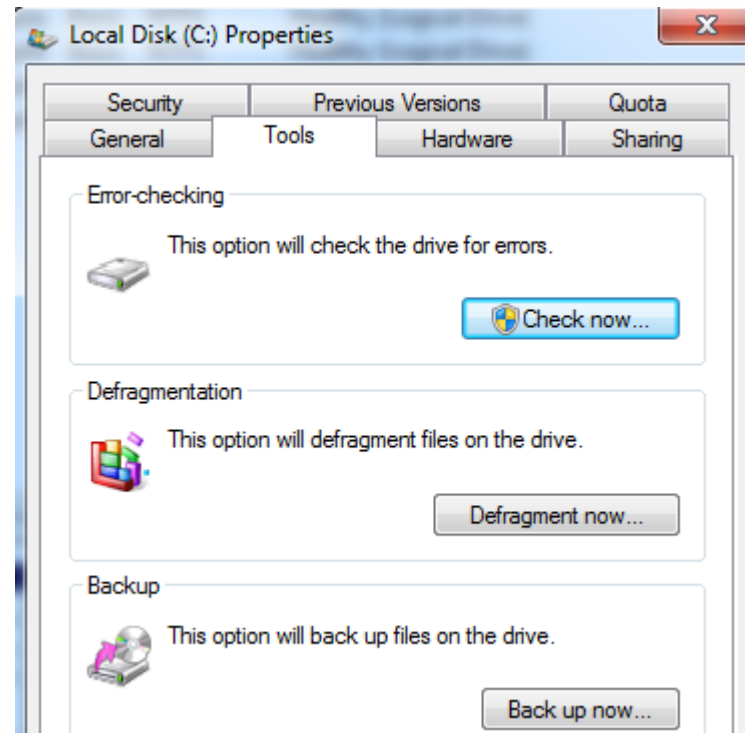
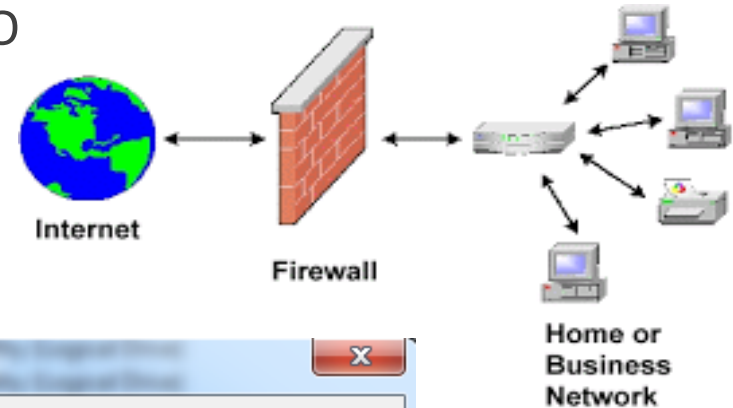
• Networking Software

- Facilitates and interacts with computer network.
- Supports the creation and operation of network.

System Software

➤ Utility Software

- Programs distributed with OS but not a part of O
 - Firewall
 - Backup utility
 - Data Compression Tools
 - Archive Managers
 - Disk Defragmenters
 - ScanDisk
 - Disk utilities and more.



System Development Software

- System development software are tools that are used to write new software and ensure it is working correctly.
- Tools that are classified as following:
 - **Editor:**
 - These are text editors where we write the program.
 - **Compiler:**
 - These are tools that transform the code we write in programming language into machine language that the processor can understand.
 - **Interpreter:**
 - It works like compiler but translates one statement of the source code at a time and directly executes the program.
 - **Debugger:**
 - It is a software tool that is used to test and find errors (bugs) in a program. Software developers use debuggers to debug the code they write. A debugger provides a higher level of control over the program execution so that it can be stopped according to specific conditions. Debugger tries to point out the error in a program when it crashes.
- **IDE:**
 - It stands for “Integrated Development Environment”. It is a software suite (a collection of related programs) that provides a complete development environment to the developers.

Types of Software

b. Application Software

- A computer program designed to perform a specific task or a group of coordinated tasks.
- Not necessary for the basic functionality of computer.
- General purpose or special purpose.
- Broad category with thousands of different software tools.



Application Software

➤ Types of Application S/W

- Desktop Application

- Runs stand-alone on a desktop or laptop computer.

- Application Suite

- More than one different but relevant applications bundled together.
- E.g. MS Office (Word, Excel, Access and PowerPoint etc.)

- Mobile Application

- Designed for use on mobile devices, e.g. android and iPhone.
- May be native app or hybrid app.

- Web Application

- Designed to be delivered over the web through a web browser.
- Stored on a remote server.



Application Software

➤ Types of Application S/W (continued...)

- Enterprise Software

- Designed to address the needs of a large organization.
- Often runs in a distributed environment.

- Content Access Software

- Designed to access content without editing it.
- Media players, web browsers.

- Educational Software

- Designed for use by educators and students, e.g. for delivering tests.

- Simulation Software

- Simulate physical or abstract systems.
- Used in education and research.

Application Software

➤ Types of Application S/W (continued...)

- Media Development Software

- Graphic art tools, video composers etc.
- Generates electronic media.

- Product Engineering Software

- Tools used to develop software programs.
- IDE, editor, compiler and more.

- General Purpose Software

- Programs used for multiple purposes.
- Spreadsheet applications, word processors, communication software and more.

- Special Purpose Software

- Customized software.
- Designed to meet a person or organization's unique demands.

Types of Software

2. Classification by Copyright Status

- Availability or copyright status.
- Four main categories, shareware, freeware, free software and open source software.

❖ Shareware

- Trial software.
- Full functionality for a short period of time or limited functionality unless a license is purchased.

❖ Freeware

- Freely available without any payment.
- Copyrighted, i.e. can't be illegally distributed.

Types of Software

2. Classification by Copyright Status (continued...)

❖ Free Software

- Freely available.
- Free to use, copy and distribute.
- Should be redistributed with original terms of use.

❖ Open Source Software

- Similar to freeware.
- Source code made available to view and analyze how it was created.
- Can be modified and extended by adding additional modules.

Software Copyrights and Piracy

➤ Software Copyrights:

• Copyrights:

- Protection of any piece of work to protect it from being used, reproduced and distributed illegally.
- Software developers use copyrights to prevent unauthorized copying of their software.
- Each user needs to be licensed for each computer using the program.



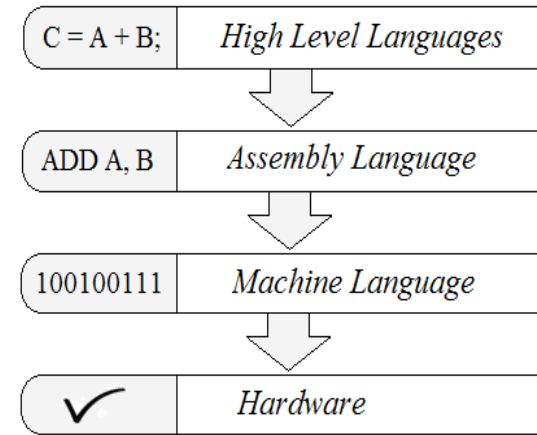
➤ Software Piracy

- Illegal use of software
 - Copying
 - Distributing to unlicensed users.
 - Selling copyrighted software.
 - Installing on more devices than the user is licensed for.
 - Sharing login credentials of a web application.



Programming Languages

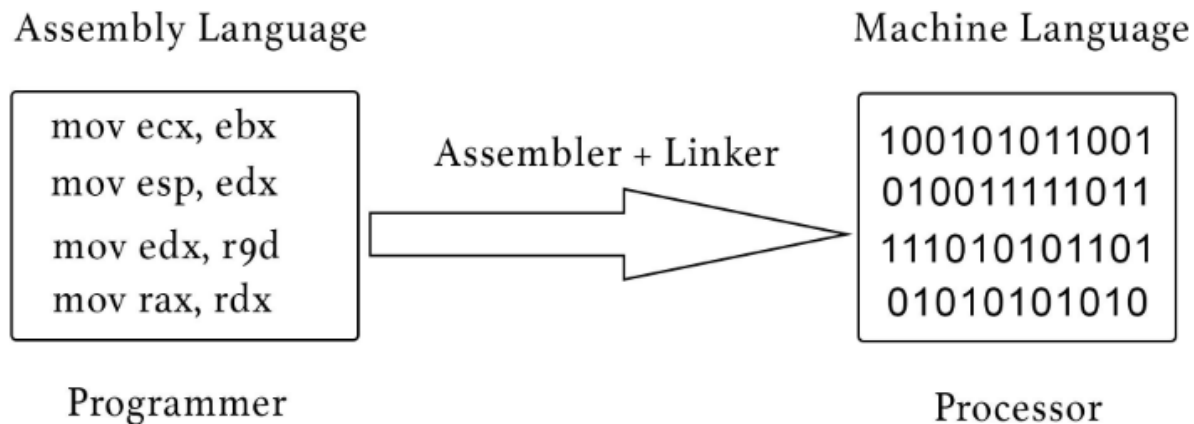
- A language used to write computer programs.
- Allows the programmer to instruct the computer.
 - Machine language
 - Low level languages
 - High level languages
- Desktop and other applications development:
 - C/C++
 - Java
 - C#
 - Visual Basic
 - Python and more.
- Web designing and development:
 - HTML and CSS
 - Java Script
 - PHP
 - ASP.NET
 - JSP



Programming Languages

➤ Machine Language

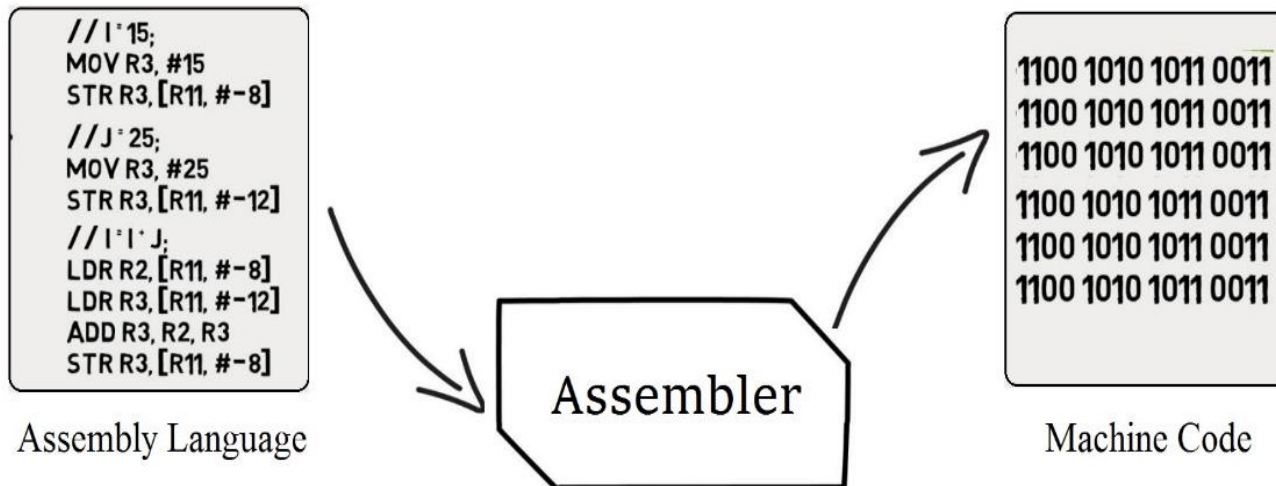
- Collection of binary digits (bits).
- Directly executed by CPU without compilation.
- Only language computer understands; programs written in any other language must first be transformed into machine code.



Programming Languages

➤ Low Level Language

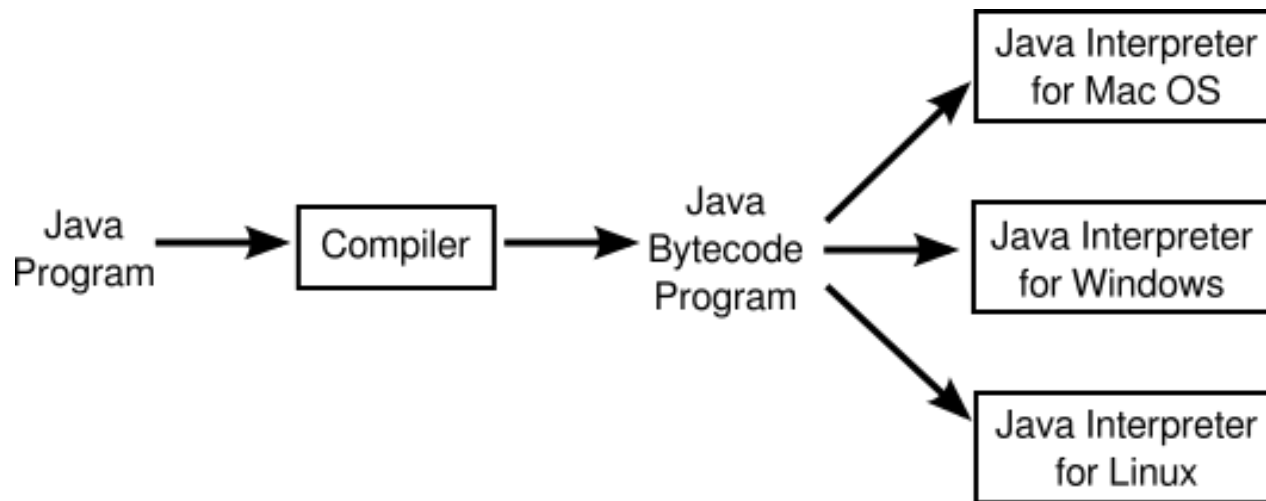
- Close to machine language.
- Little or no abstraction of programming concepts.
- Human readable and understandable form.
- Easier to write programs.
- Example:
 - Assembly language, transformed to machine code by an assembler.



Programming Languages

➤ High Level Language

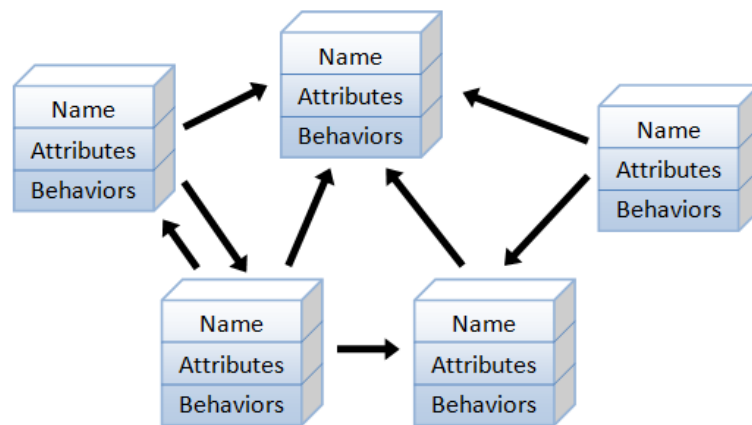
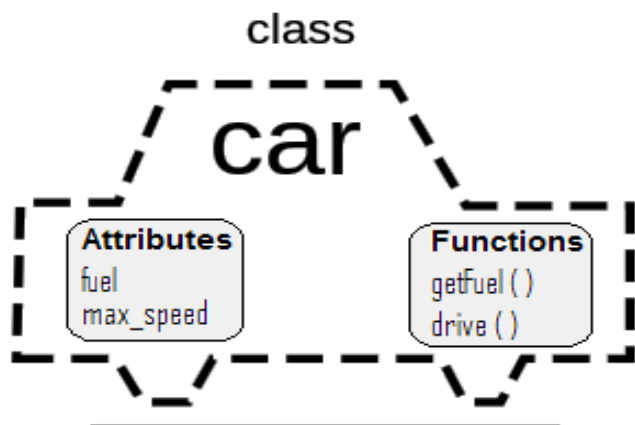
- Provides strong abstraction from the details of the computer.
- Generally independent of the underlying architecture of computer.
- Automates and hides some aspects, e.g. memory management.
- Natural language elements; easier to understand and program.
- Compiled to machine code before execution.



Programming Languages

➤ Object Oriented Language

- An object oriented language is a high level language that implements objects and their associated procedures to create software.
- Object oriented programming introduces the concept of class. For each entity under consideration, we create a class which includes the data and the functions related to the entity.



Programming Languages

➤ Fourth Generation Language

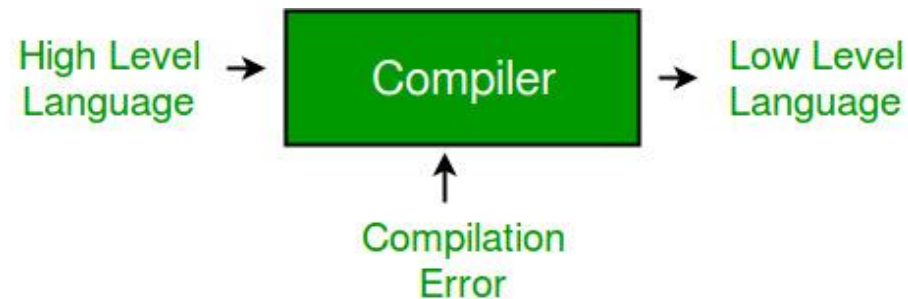
- 4th generation languages (4GLs) are considered to have support for database management, report generation, mathematical optimization, GUI creation and web development.
- These languages designed to reduce the time, effort and cost of software development.
- They are closer to human language than the earlier generation languages like Java, C++ and C# etc. which are third generation languages.
- For example a 4GL command may look something like “FIND ALL RECORDS WHERE NAME IS ‘ALI’”.

Programming Languages

➤ Compilation and Interpretation

• Compilation

- Converts program in high level language into machine language.
- The whole program is converted to machine code as a whole.
- Produces a list of errors and warnings if any.
- Doesn't run the program.



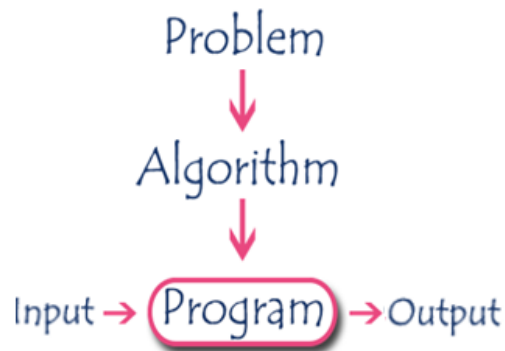
• Interpretation

- Converts program into machine code.
- Reads the programs line by line, transforms and executes.
- Stops if any error found.
- Slower than compilation.



Algorithm

- Step by step method to solve a particular problem.
- Series of instructions to carry out an operation.
- The step by step solution is transformed to computer program by programmers.



Algorithm: Find solution of a quadratic equation $(x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a})$

- Step 1: Start
- Step 2: Read a, b, c
- Step 3: $d \leftarrow \text{sqrt}(b \times b - 4 \times a \times c)$
- Step 4: $x1 \leftarrow (-b + d) / (2 \times a)$
- Step 5: $x2 \leftarrow (-b - d) / (2 \times a)$
- Step 6: Print x1, x2
- Step 7: Stop

Pseudocode







- The detailed, human readable description of a program.
- Described in natural language.
- Provides a template for what the programmers have to program.
- Ensures to meet the clients requirements.
- No standard, the style varies from designer to designer.

- Example:

```
Begin
  enter two numbers x, y
  add x and y
  assign the sum to z
  print z
End
```

Flow Chart

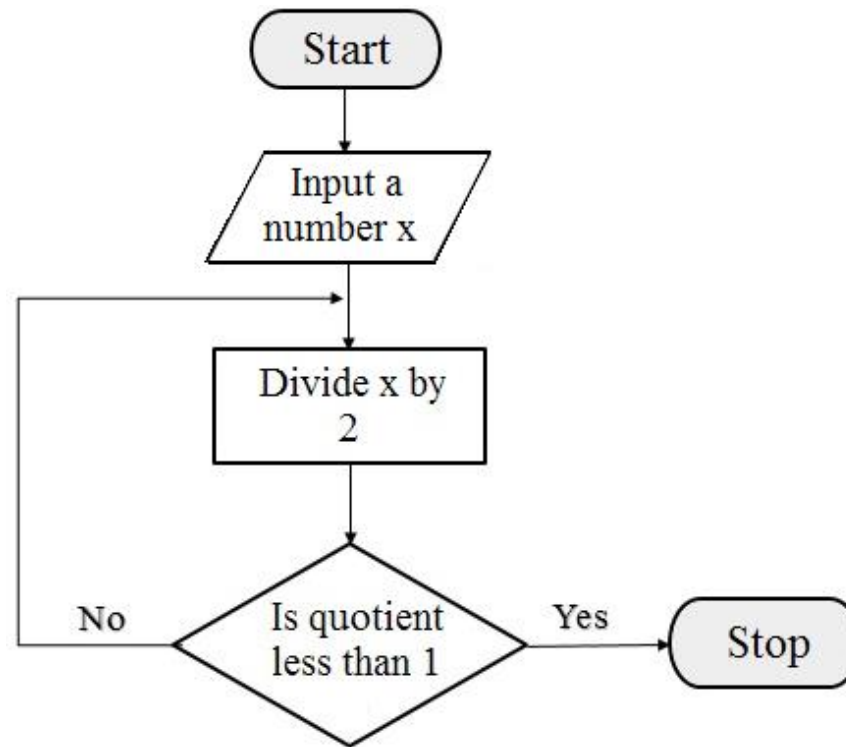
- The diagrammatic representation of an algorithm or a process.
- Represents the sequence of activities involved in the process.
- Comprised of different elements:
 - Different type of boxes, interconnected by arrows.

	Flowline, shows the order of processes		Decision, shows a conditional Operation
	Terminal, indicates the begin or end of a process		Process, represents a set of operations
	Input/Output		Predefined Process, shows a process defined elsewhere

Flow Chart

➤ Example:

- Divide a given number by 2 repeatedly until the quotient is less than 1.



Graphical User Interface

- The interface between user and electronic devices comprised of visual elements.
- Introduced by Xerox Palo Alto research lab in the 1970's.
- Faster way to interact with computer.

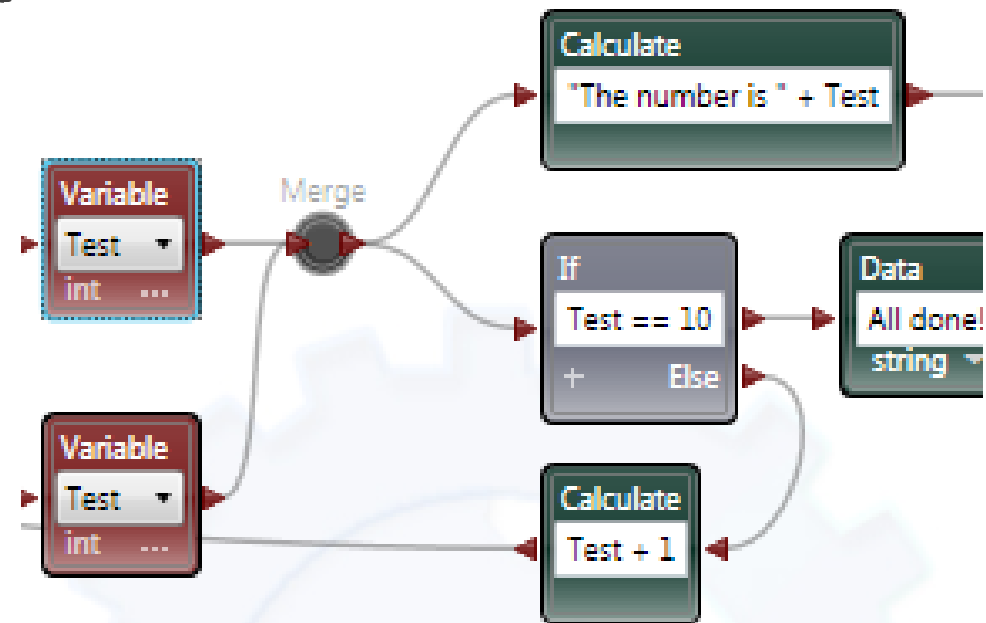
- Elements

- Widget, for displaying a collection.
- Tabs, to switch between windows.
- Interaction elements like cursor, pointer etc.
- Button
- Window
- Menu
- Icon
- Checkbox and radio button
- Labels
- Dropdown list
- Textbox and text area.



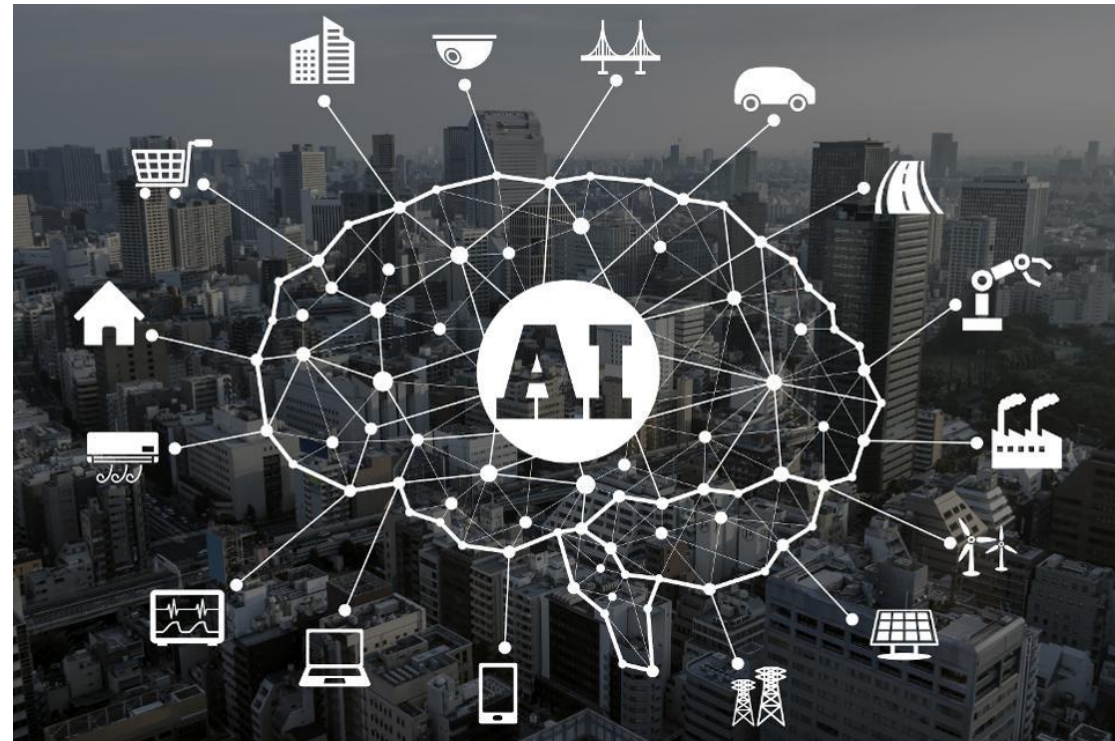
Graphical Programming

- Uses visual blocks to code instead of text.
- Easier for non-programmers to implement algorithms.
- A flow of the app describing:
 - Entities.
 - Relations.
 - User interactions.
 - What happens to data at each stage
- This flow is converted to a working software by the programming tool.
- Example:
 - Scratch (scratch.mit.edu), online programming tool for children to create projects using a block like interface.



Artificial Intelligence

- The creation of machines and programs that intelligently work and react like humans.
- Imitate the intelligence and decision making capabilities of humans.
- Understand the environment and take actions to maximize the chances to reach a solution.
- Address various problems like:
 - Knowledge engineering
 - Problem solving
 - Machine learning
 - Reasoning
 - Speech recognition
 - Machine translation.

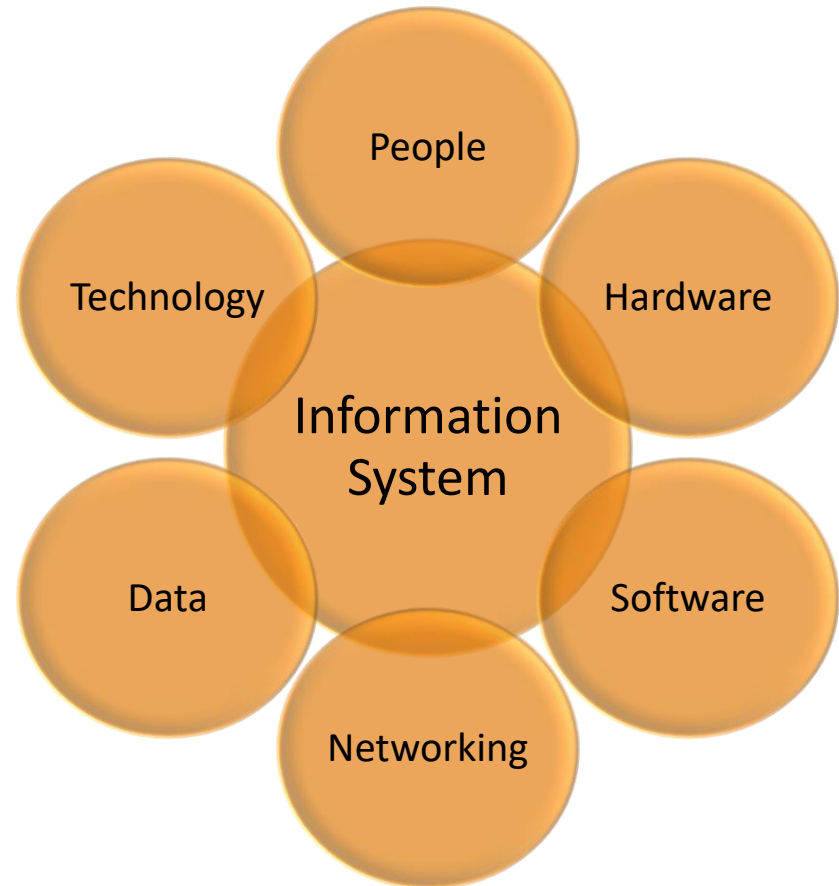


Information System

- An organized combination of hardware, software, people, data resources, infrastructure, policies and procedures to facilitate control, decision making and planning in an organization.
- A software that helps an organization in various aspects related to the organization.

➤ Basic Components

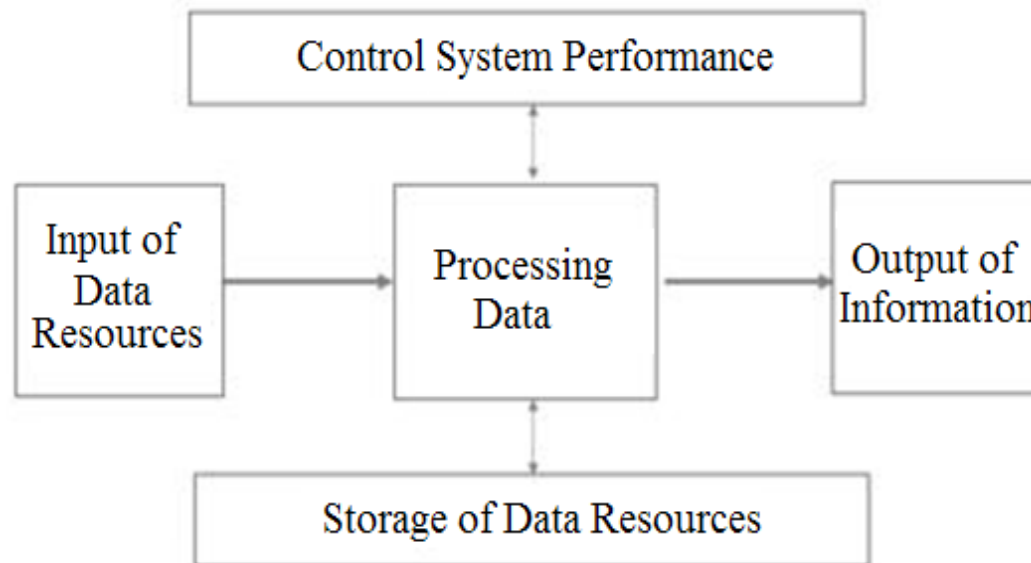
- People
- Software
- Hardware
- Network
- Data resources.



Information System

➤ Basic Activities

- Input of data
- Processing of data
- Output of data
- Storage of data
- Control of system performance.



The Need for Programming

- Only hardware is of no use

- Need an operating system and some application programs to make use of hardware.

- Machine language is tedious

- The early computers were operated this way. It is very tedious, almost a non-practical way to interact with computers.

- Interface

- Programming languages are an interface between humans and machines.

- Problem solving

- Health
- Business
- Governance
- Education
- Scientific research and more.

Social and Legal Issues

- The software engineer needs to understand and deal with a number of issues, such as:
 - The impact of software
 - A program may have adverse effects e.g.
 - Malware
 - A social network, not well managed.
 - Reliance on software
 - A vast majority of modern day machines rely on software.
 - The solutions developed should be reliable, virus-free and efficient.
 - Acknowledging the property of others
 - Use work of others only if allowed.
 - Acknowledge the original creator.

Social and Legal Issues

- Copyrights

- Illegal use of software.
- Distribution for financial gain.

- Use of Networks

- Licenses allow use of software on a single device.
- Purchase network license to use it on several machines over a network.

- Software market

- Determine and fulfill the needs of customers.
- Understand and consider social, legal and ethical issues while developing marketing strategies.

References

- Ali, R. & Ali, A. (2018). Chapter 4: Computer Software. *Management Information System (MIS) – 1st Edition* (pp. 61-84). Muhalla Jangi, Qissa Khawani, Peshawar, Pakistan: Al-ilum Publications.

Thanks!

Any Questions

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