

Lec 5: Operating Systems, Programming Languages, and Software Development

Dr. Sedeeq Al-khazraji

2024-2025

OS: An operating system (OS) is system software that manages computer hardware and software resources, and provides common services for computer programs.

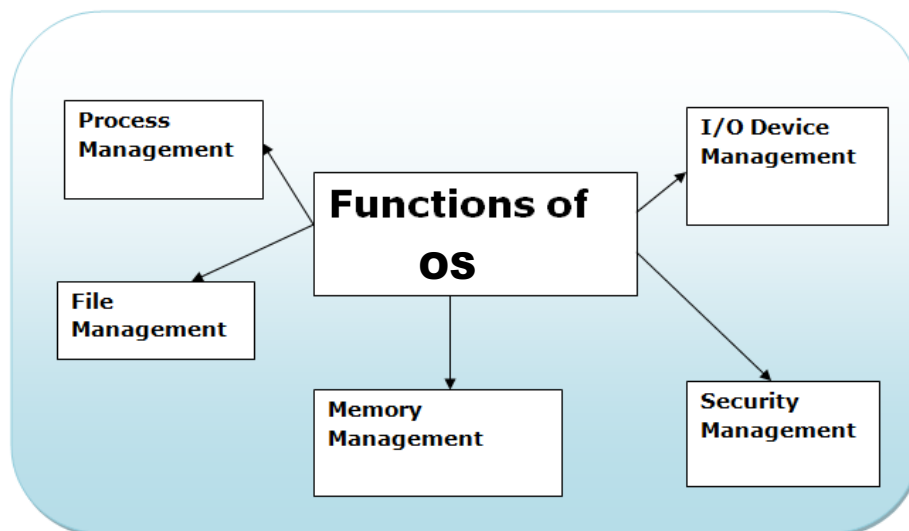
Important services that an operating system provides:

- Security: prevent unauthorized users from accessing the system.
- Commands to manipulate the file system.
- Input and output on a variety of devices.
- Windows management.

Operating system goals:

- Execute user programs and make solving user problems easier.
- Make the computer system convenient to use.
- Use the computer hardware in an efficient manner.

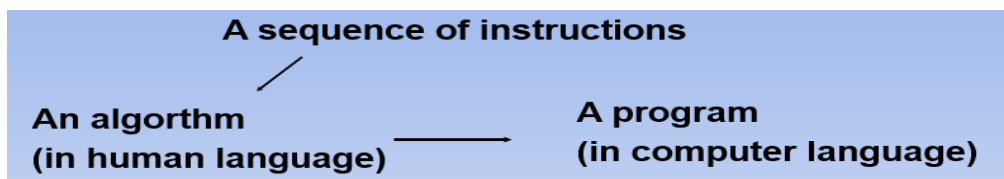
Functions of Operating System



Operating System Mode

- The **User Mode** is concerned with the actual interface between the user and the system; it controls things like running applications and accessing files.
- The **Kernel Mode** is concerned with everything running in the background. It controls things like accessing system resources, controlling hardware functions, and processing program instructions.

What is a (programming) language?



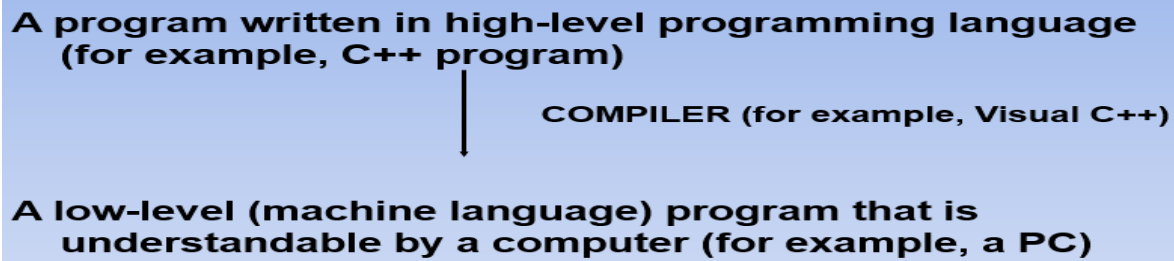
A program needs to be written in a programming language, **there are many programming languages.**

Low-Level Languages	High-Level Languages
Unreadable	Readable
Not understandable by a human	Understandable by a human
Defined at the hardware level	Not Defined at the hardware level
Low Portable	Highly Portable
Machine-dependent (run only on one hardware)	Machine-independent (can run on another hardware)
Example: Assembly language and machine binary language	Example: C++, Java, C#

An example:

Machine binary language	Low-level assembly	High-level
<pre> 00001001001011100110011001101001101100011001010000100100100X 01010111001001100101001100010010111001100011001000100000101001 0110000110111101101101011100000110100010110110001100101011001 00110110010101100011011101000110100101101110110110000010010X 01101000010001000001010000010010010110011000010110110001101X 101000001001001011100110011011011000110111011000100110000101 0110111000001010000010010010111001110100011100001100001001 10010101110001011000010001011001100111010101101100110001101 00001001001011100111000001110010011011101100011000010010110X 100101101110001110100000101000001001001000110101000001 01010110100010100100011001000000110000000101000001001110X 0101011100110111000000101100001010100110001001100001110000X 00001010000010010010000100100011010100000101001001111010011 0011000100000001100010000101000001001011011011110111001100X 0011000000001010000100101110011011101000010000001001010111 0110011100000010110100110010001100000101101000010100000100101 001011000010010101101110011000000010100000100101110011011101 11000101101100100101011001100111000000101101001100100011010001 0010000001011011001001010110011001110000001011010011001000110X 000000010100000100101101100011001000010010110110010010101 010111010010110000100101011100110001000010100000100101100X 1111001100000010110000100101011011100110001001011000010010101 0111010000100000010010101101110011000100101100001001010101 100001011101000010100000100101101101101110110110001000000X 000010100000100101100010001000000010110010011000100110000110X 0000000010100010111001001100010011000011000100111010000010100X 0000100101110010011001010111001101110100011011101110010011001 0110011001010011000101110100000101000001001001011100111001101 01101101011000010110100101101110001011000010110010011000110001 110101100001011010001011011100000101000001001001011100110100101 00100010010001110100001010000100110100010000000101000110100110100101001001000000011 0010001011100011100000101110001100010010001000001010 </pre>	<pre> main: !#PROLOGUE# 0 save %sp,-128,%sp !#PROLOGUE# 1 mov 1,%o0 st %o0,[%fp-20] mov 2,%o0 st %o0,[%fp-24] ld [%fp-20],%o0 ld [%fp-24],%o1 add %o0,%o1,%o0 st %o0,[%fp-28] mov 0,%i0 nop </pre>	<pre> int main() { int x, y, z; x = 1; y = 2; z = x+y; return 0; } </pre>

How to Translate?



Translation System: A special translator/processor system software used to convert programming languages to machine language (binary code). Compilers and Interpreters are used to convert High-Level Language into machine language.

Major Activities of Software Development

- Editing (writing the program)
- Compiling (creates .obj file)
- Linking with compiled files (creates .exe file)
 - Object files
 - Library modules
- Loading and executing
- Testing the program

