

Chapter 1: Introduction

Operating System

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Components of computer systems

Operating System Concept

- Resource management

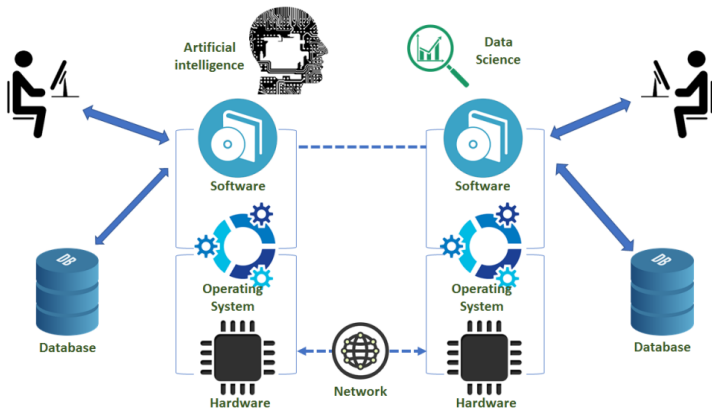
- Manage implementation of programs

Services provided by the Operating System

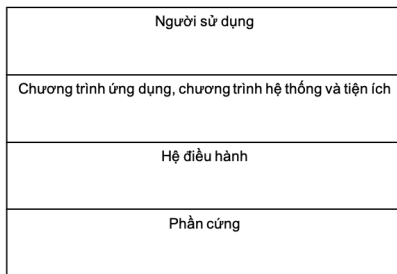
1. Components of computer systems
2. Operating system concept
3. Services provided by the OS
4. Programming interface of the OS
5. Development process and some important concepts
6. Operating system structure
7. Some specific operating systems

Components of computer systems

A computer system is generally divided into **Hardware** và **software**:



- ▶ **Hardware:** Provides the necessary resources for calculation and data processing
- ▶ **software:** specific programs. (softwaresystem and application software)
- ▶ **Operation system:** software Acts as an intermediary between the hardware and the user's application program, making the use of the computer system convenient and efficient.

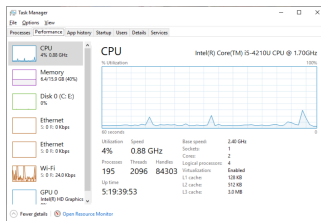


Operating system: is defined through the purpose, role, and function within a computer system

Operating system is a software system that acts as an intermediary between the user and the computer's hardware to perform two basic functions:

- ▶ Resource management
- ▶ Manage implementation of programs

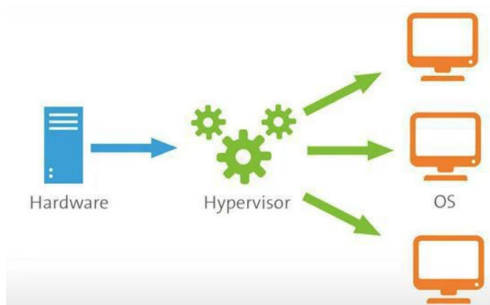
Convenient and effective way!



- ▶ Ensure system resources are used effectively and efficiently
- ▶ Resources: processor (CPU), main memory, external memory (disks), input and output devices
- ▶ Allocating resources to applications efficiently:
 - Resource requests are received by the Operating System and fulfilled by granting the program the corresponding resources
 - The operating system needs to store resource status
- ▶ Make sure not to infringe on resources allocated to other programs
- ▶ **For example :** Store information on disk The operating system needs to know which areas of the disk are unused in order to write information to these areas. Recording information also needs to be calculated so that the access process when needed can be done as quickly as possible.

- ▶ The most important task of a computer is to execute programs, a running program is called a process.(process).
- ▶ The program needs to be managed to execute smoothly, avoid errors, and at the same time ensure an environment for the construction and implementation of the program to be favorable.
- ▶ To run the program, you need to perform certain operations => The operating system makes running the program easier, users do not need to perform operations
- ▶ To create a favorable environment for the program, the Operating System creates virtual machines:
 - Is a logical machine with virtual resources
 - Virtual resources simulate real resources implemented by software
 - Provide basic services such as real resources
 - Easier to use, the number of virtual resources can be larger than the number of real resources.

- Some of the best virtual machines today: VirtualBox (Windows/-Mac/Linux); Parallels (Windows/Mac/Linux) ; VMware (Windows/Linux, Basic) ; QEMU (Linux) ; Boot Camp (Windows/macOS) ; Windows Virtual PC (Windows).



- ▶ One of the main tasks of the Operating System is to create a favorable environment for other programs to execute and make it easy for users of the system.
- ▶ Services may vary by Operating System. Some Operating Systems may provide many services while others may provide fewer services. *For example, MS-DOS does not provide security services, while Windows NT pays great attention to this service.*
- ▶ **Some common operating system services:**
- ▶ **Download and run the program:**
 - To execute, the program is loaded from disk into memory, and then empowered to execute commands. When done, memory and resources need to be freed
 - This entire process is relatively complicated but happens regularly. *The operating system will perform this complex and repetitive work*

- Since the Operating System is the first program executed at system startup, the Operating System loads itself into memory
 - Thanks to the operating system and programmers, users do not need to pay attention to the details of downloading and running programs.
- **User interface:** Enables communication between the operating system and the user:
- Command-line: allows users to instruct the operating system by typing commands as text. For example: Windows `chtr cmd.exe`.
 - Graphical User Interface (GUI): uses a system of windows, menus and mouse pointing devices, combined with the keyboard to communicate with the system.

► Perform data input/output operations:

- Users and programs during execution may have data I/O needs with disks and peripherals. To avoid the program having to work with hardware, I/O requests are left to the operating system to execute.

► Working with file systems:

- Need to read, write, create, delete, copy files or work with directories
- Manage access rights and backups.

► Error detection and handling:

- Detect and promptly handle errors that appear in hardware as well as software => *Ensure the system operates stably and safely*
- **example:** Hardware errors such as running out of memory, power outage, printer running out of ink, running out of paper, etc.

► The media:

- Provides a service that allows establishing communication and transmitting information in the form of messages or via a shared patient.

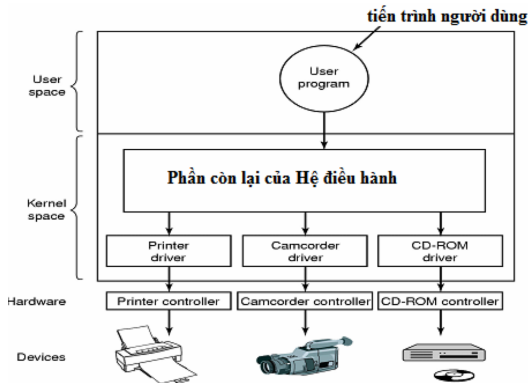
► Resource allocation:

- In systems that allow multiple programs to execute simultaneously, there needs to be a reasonable resource allocation and distribution mechanism
- Users and applications do not have to allocate resources themselves, but still ensure fair and efficient allocation

► Security and privacy services:

- Resource allocation:
- For multi-user systems, there is often a requirement for information security, meaning that one user cannot access another's information without permission.

- It is necessary to ensure that processes do not illegally access resources (such as memory areas, open files) of other processes or the operating system itself will do so by controlling access to resources.



Chapter 1

- ▶ Components of Computer Systems
- ▶ Operating System Concept
- ▶ Services provided by the Operating System

Next

- ▶ Operating System programming interface
- ▶ Operating System Development Process

1. **Questions 1:** What are the main functions of an Operating System?
2. **Questions 2:** Based on the operating system definition, can a Web browser be a component of an operating system?
3. **Questions 3:** Does any computer system have an operating system? Why? Here, a computer system is broadly understood as any system with a processor and memory.
4. **Questions 4:** One of the requirements for computing systems is safety, which means ensuring that processes do not violate resources without permission. Can a system achieve security requirements without distinguishing between user mode and privileged mode (kernel mode)? Please explain your answer by giving an example.