

Operating System

CSC3123

1. Introduction

- The Computer systems can be divided into two main categories:
 - Software
 - Hardware
- The Software was classified
 - Application Software
 - System Software
- The full of hardware computer is **functionless** with out software.
- Therefore the system software **manages** the operation of the computer itself; application software solves users' problems
- The most fundamental unit of the System software is **Operating system**

- An operating system is software that **manages a computer's hardware**
- It also provides a **basis for application programs** and **acts as an intermediary** between the computer user and the computer hardware
- An amazing aspect of operating systems is how they vary in accomplishing these tasks in a wide **variety of computing environments.**

1.1. Role of Operating System

- **User View**

- The way a computer user interacts with a computer depends on the **interface** they're using. Traditional setups, like laptops or desktop PCs, are designed for **single-user** use and **prioritize ease of use**, with less focus on resource sharing and optimization

- **System View**

- The operating system is the key program that manages a computer's hardware and resources. It as a **resource allocator**, deciding how to distribute resources like CPU time, memory, and I/O devices among different programs and users. Additionally, the operating system functions as a **control program**, overseeing the execution of user programs to prevent errors and ensure proper computer acts usage. It pays particular attention to the operation and control of I/O devices

1.2. History of OS

- The earliest computer was designed by Charles Babbage (1792). It was an analytical engine that purely consists mechanical devices such as wheels, gears, and cogs. It **did not have an OS**.
1. First generation - 1945 – Vacuum tubes and Plug-boards
 - A calculated engine was invented using **vacuum tubes**.
 - **Machine language** is the programming language.
 - This was **very large in size** and filling up entire rooms with 10000 of vacuum tubes. A group of people designed, built, programmed, operated and maintained each machine.

2. Second Generation – 1955 – Transistors and Batch System

- The IBM 1401 and IBM 7094 were introduced to perform the **I/O operation** and **processing** respectively.
- **Batch processing** is the simple single stream OS uses in the IBM machines.

3. Third Generation – 1965 – IC and Multiprogramming

- The **system/360** is newer OS introduced by the IBM.
- It can handle both **scientific** and **commercial computing**.
- **Multiprogramming** is the most important feature in the 3rd generation computers, when a current job was paused to do I/O event, the CPU will be idle until it finishes I/O operations. Multiprogramming avoids this waste of CPU time.

4. Fourth Generation – 1980 – LSI and VLSI

- The major development in the 4th generation was the growth of personal computers running **network OS** and **distributed OS**.

1.3. Operating System Structures

1. Simple/Monolithic Structure (MS-DOS)

- Such operating systems do not have well-defined structures and are **small**, **simple**, and **limited**.
- The interfaces and levels of functionality are not well separated.
- Application programs are able to access the basic I/O routines.

Refer

2. Micro-Kernel Structure(Mac OS)

3. Hybrid-Kernel Structure

4. Exo-Kernel Structure

5. Layered Structure

6. Modular Structure

7. Virtual Machines

Operating System Components

- There are various components of an Operating System to perform well defined tasks.
- There are following 8-components of an Operating System:
 1. Process Management
 2. I/O Device Management
 3. File Management
 4. Network Management
 5. Main Memory Management
 6. Secondary Storage Management
 7. Security Management
 8. Command Interpreter System

Comparison of Different Operating Systems.

Feature	Windows	Unix	Linux	OS X
Developer	Microsoft	AT&T Bell Labs (and others)	Linus Torvalds (and community)	Apple Inc.
Architecture	Proprietary	Multi-user, multitasking	Multi-user, multitasking	BSD Unix-based
Target Audience	Home users, businesses	System administrators, developers, scientists	System administrators, developers, scientists, home users	Apple hardware users, creative professionals
Key Features	User-friendly interface, extensive software ecosystem, wide hardware compatibility	Stability, security, flexibility, modular design	Free and open- source, highly customizable, security-focused	Tight integration with Apple hardware, elegant interface, focus on design and user experience
Philosophy	Closed-source, proprietary software, emphasis on ease of use	Open-source, modular design, emphasis on efficiency and power	Open-source, community- driven development, emphasis on freedom and customization	Closed-source, proprietary software, emphasis on user experience and aesthetics