

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 acts 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 |