Operating System: Introduction

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Contents

1 Common Operating Systems

- Unix Family
- BSD Family
- Linux Family
- Windows NT Family
- Real-time OS
- Micro-kernel OS

2 Four Components of a Computer System

```
Computer Hardware
   (overlays)
 Operating System
```

```
          (overlays)
System and Application Programs
          (overlays)
         User Programs
          (overlays)
             Users
```

Hardware provides basic computing resources. e.g. CPU, I/O Devices, Storage, Memory.

Operating System controls and coordinates use of hardware among various applications and users.

System and Application Programs manipulate directly on physical devices. From my perspective, they run in kernel space and read or write registers in devices through MMIO or other protocol. They include drivers, BIOS (or UEFI on `x86_64` devices, Bootloader on other platforms)

User Programs include browser, compiler, database systems, etc.

Users can be the one physically using the computer, or other users, devices or computers connecting to the server using the Internet.

3 What is an Operating System?

It leverages hardware resources and provides abstractions for underlying software.

The one program running at all times on the computer is the kernel, not an operating system.

$\Longrightarrow$ Operating system is shipped with many system programs, such as drivers, desktop environments, shell, etc. In fact, Linux kernel standalone can not be used directly be end users. Some distributions today, such as Ubuntu, ships many things with the Linux kernel.

Wikipedia: An operating system (OS) is software, consisting of programs and data, that runs on computers, manages computer hardware resources, and provides common services for execution of various application software.

4 Operating System Structures

- Process management
- Memory management

- Storage management

Here I would like to introduce concepts in *Operating Systems: Three Easy Pieces*, aka. OSTEP. OS manages 3 things: Virtualization, Concurrency, Persistence. "Process Management" and "Memory Management" above is indeed a kind of virtualization provided by OS. OS leverages concept of "process" and virtual memory technology to let the process think itself have full control to the computer. And for storage management, OS provides persistence abstractions such as file and directory to make life easier.