Operating Systems

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> This note is a reading note of the book: Operating Systems: Three Easy Pieces (OSTEP) by Prof. Remzi Arpaci-Dusseau and Prof. Andrea Arpaci-Dusseau. Figures included in this note are from this book unless otherwise stated.

Introduction to OS

An **Operating System** (*OS*) is a body of software sitting in between *software applications* and a Von Neumann computer architecture. An OS connects applications to physical hardware. It makes **abstractions** of underlying hardware and provides an easy-to-use *interface* for running portable software on physical hardware.

An OS does this through three general techniques:

1. **Virtualization**: taking a physical resource (processor, memory, storage, ...) and transforms it into a more general, portable, and easy-to-use virtual interface for user applications to use
2. **Concurrency**: acting as a resource manager which supports multiple user applications to run concurrently and coordinates among running applications, ensuring fair and efficient sharing of resources
3. **Persistence**: data can be easily lost on volatile devices such as DRAM. An OS allows users to talk to peripheral devices - including persistent storage drives - through *Input/Output* (I/O)

> Abstraction is a great idea in both computer architecture and operating systems. It hides implementation complexity about the underlying layer and exposes a unified model of how to use the underlying layer to the upper layer. Check out the first section of this note.

A modern operating system also pursues some other goals apart from the above three. These are:

- *Performance*: minimize the overheads brought by the OS
- *Security*: protect against bad behavior; provide *isolation*
- *Reliability*: properly recover on fail-stops
- *Connectivity*: networking support; connect with the Internet
- *Energy-efficiency*, *Mobility*, ...

> I've made a brief OS history tree in XMind which is available HERE.

Virtualizing the Processor: Processes

TODO

Virtualizing Memory: Memory Management

TODO

Concurrency: Multi-Tasking & Synchronization

TODO

Persistence: Storage Device & File System

TODO

Advanced Topics

TODO a list