Study Guide to Accompany *Operating Systems Concepts 9ᵗʰ Ed* by Silberschatz, Galvin and Gagne
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Ch.1 - Introduction

- An OS is a program that acts as an intermediary between a user of a computer and the computer hardware
- Goals: Execute user programs, make the comp. system easy to use, utilize hardware efficiently
- Computer system: Hardware ↔ OS ↔ Applications ↔ Users (↔ = 'uses')
- OS is:
  - Resource allocator: decides between conflicting requests for efficient and fair resource use
  - Control program: controls execution of programs to prevent errors and improper use of computer
- Kernel: the one program running at all times on the computer
- Bootstrap program: loaded at power-up or reboot
  - Stored in ROM or EPROM (known as firmware), Initializes all aspects of system, loads OS kernel and starts execution
- I/O and CPU can execute concurrently
- Device controllers inform CPU that it is finished w/ operation by causing an interrupt
  - Interrupt transfers control to the interrupt service routine generally, through the interrupt vector, which contains the addresses of all the service routines
  - Incoming interrupts are disabled while another interrupt is being processed
  - Trap is a software generated interrupt caused by error or user request
  - OS determines which type of interrupt has occurred by polling or the vectored interrupt system
- System call: request to the operating system to allow user to wait for I/O completion
- Device-status table: contains entry for each I/O device indicating its type, address, and state
  - OS indexes into the I/O device table to determine device status and to modify the table entry to include interrupt
- Storage structure:
  - Main memory – random access, volatile
  - Secondary storage – extension of main memory That provides large non-volatile storage
  - Disk – divided into tracks which are subdivided into sectors. Disk controller determines logical interaction between the device and the computer.
- Caching – copying information into faster storage system
- Multiprocessor Systems: Increased throughput, economy of scale, increased reliability
  - Can be asymmetric or symmetric
  - Clustered systems – Linked multiprocessor systems
- Multiprogramming – Provides efficiency via job scheduling
  - When OS has to wait (ex: for I/O), switches to another job
- Timesharing – CPU switches jobs so frequently that each user can interact with each job while it is running (interactive computing)
- Dual-mode operation allows OS to protect itself and other system components – User mode and kernel mode
  - Some instructions are only executable in kernel mode, these are privileged
- Single-threaded processes have one program counter, multi-threaded processes have one PC per thread
- Protection – mechanism for controlling access of processes or users to resources defined by the OS
- Security – defense of a system against attacks
- User IDs (UID), one per user, and Group IDs, determine which users and groups of users have which privileges