Operating System Theory

- Operating System
  - Is a set of basic programming instructions to the lowest level of computer hardware, forming a basic layer of programming code on which most other functions of the computer are built.
  - Tasks
    - Handle input from the keyboard
    - Handle output to the screen and printer
    - Handle communications to the modem
    - Control input/output with all bus interfaces, example NIC
    - Control information storage and retrieval using various types of disk drives
- Device driver
  - Program that exchanges information with specific hardware(chips) inside the computer to get things done
    - Floppy disks
    - Hard disks
    - CD_ROM drive
    - Scanners
    - Printers
    - Digital cameras
- Application programs
  - Communicate to operating system to get input, produce output
  - Saves programmer from learning how to communicate with different devices
- BIOS
  - Basic input output system
  - Stored in ROM(read only memory)
    - Does not lose contents when power is removed from the computer
- API
  - Application Programming Interface
    - Software designed to communicate with the application software and with the user
    - API translates requests from application program into code that operating system Kernel can understand and pass on to the hardware device drivers and translates data from the kernel and device drivers into so the application can use it.
- Resource manager
  - Programs that manage computer memory and central processor use
- Operating System Concepts
  - Time- sharing
    - Each job on a computer given a slice of time to run, jobs(programs) share memory
  - Batch processing
    - Large amounts of data are processed. Run in background

        - Not interactive like most PC programs
    - Real-Time systems
        - Interact with external entities: people devices(scales, heart monitors, Programmable controllers)
    - Multi-user
        - More than one user using a machine
    - Client/server
        - Server holds files, database
        - Application program on client accesses data files, databases on server
- History of Operating Systems
    - Early OS rudimentary
        - Read punch cards, write output to teletype
        - Single program controlled all resources, one program ran at a time
    - 1960's & 1970's
        - More devices
        - Faster processors, large disks
        - Multi user system
    - Next step
        - Share resources, more that one user active
            - Digital Equipment PDP line – DEC Operating System
                - Good book – Soul of a New Machine
                    - Development of Data General Computer to compete with DEC
                - Originally UNIX was developed for PDP at AT&T Labs
                    - Dennis Ritchie and Kenneth Thompson
            - IBM
                - CICS
                - OS/VM
                    - Both aimed at batch processing and time-sharing systems
    - Development of application oriented languages
        - BASIC
            - Beginner's All Purpose Symbolic Instruction Code
    - Micro-computers
        - Developed in mid 1970's
        - CP/M one of the first PC OS
            - Control Program/Microcomputer
        - IBM adopted MS-DOS
            - Microsoft Disk Operating System
                - Provides basic operating system function
                    - Keyboard, disk, printer/IO
        - PC Operating Systems
            - MS-DOS - 1980
            - Windows 3.0 - 1990

        - First widely distributed OS with User Interface
    - Windows for Workgroups - 1993
        - Peer to peer networking
    - Windows NT - 1993
        - 32 bit preemptive multitasking OS
        - integrated networking
    - Windows 95 - 1995
        - Mostly 32 bit code, networking
    - Windows 2000
- Multitasking
    - Technique that allows a program to run two or more program in memory at the same time
        - CPU Switches between them
        - Slicing processor time between applications
    - Cooperative multitasking
        - The program hands control back to the OS
        - Windows 3.0
    - Preemptive multitasking
        - OS forces the program to relinquish control
        - Windows NT & Windows 2000, UNIX