CSC369 Week 1 Notes

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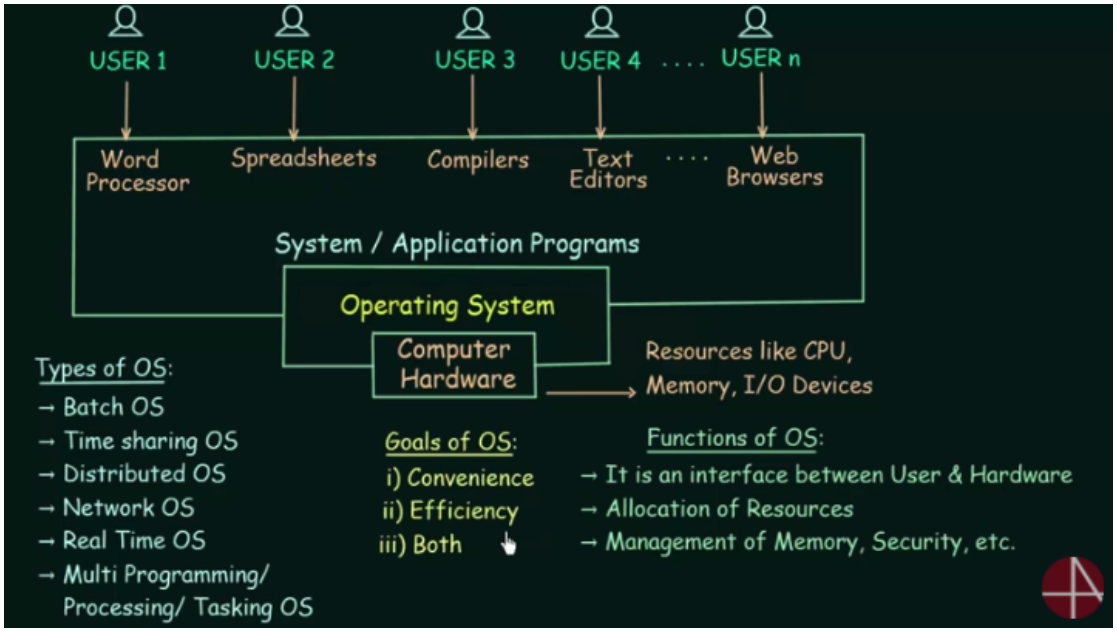
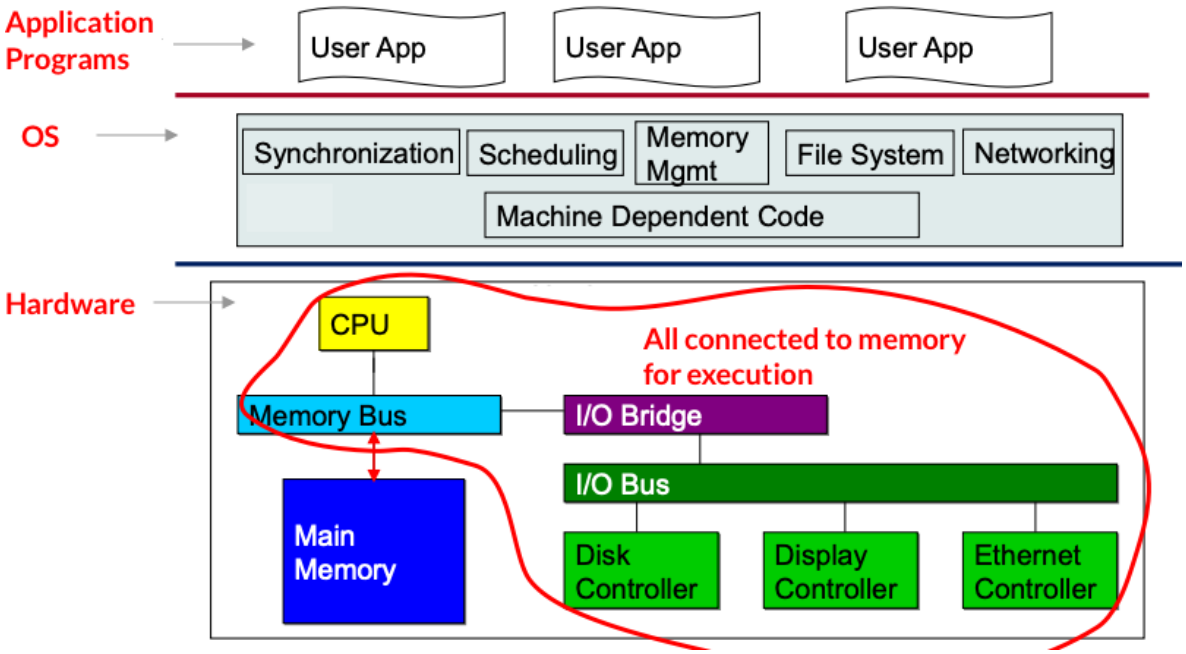
May 19, 2020

1 Intro to OS

- What is Operating System
  - is the program that manages the computer hardware
  - is the software layer between user applications and hardware
  - is used for
    - Allication of resources
    - Management of memory, security, etc.

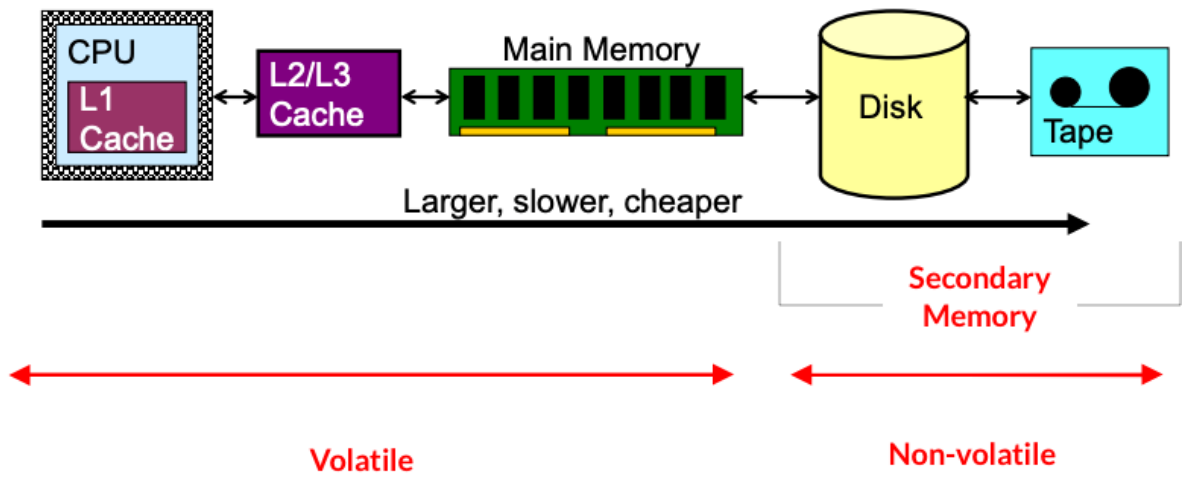


- Overview of Computer System



  - All hardware devices are connected through common **bus** and are loaded to memory for execution.
  - **Synchronization:** to ensure orderly acces to the shared memory

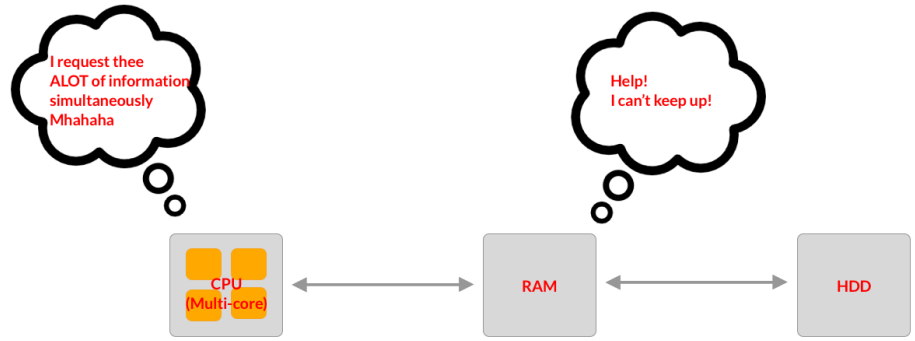
- Storge Hierarchy / Storage Structure

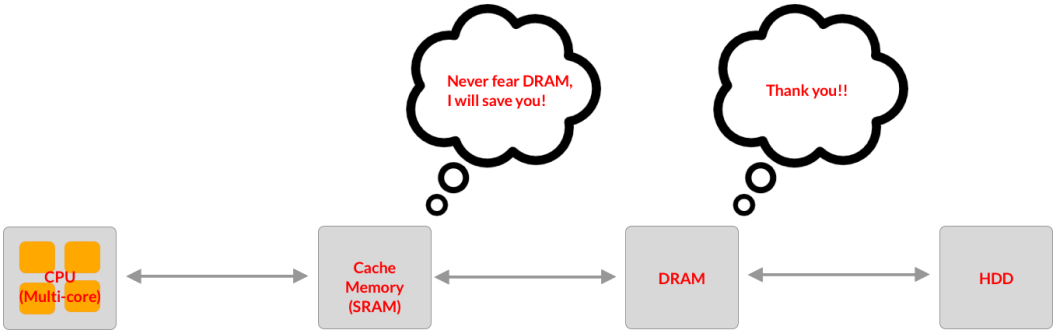


  - **Volatile** → Loses contents when power is removed
  - **Non-volatile** → Retains contents even when power is removed

- Caching / Cache Memory

  - Is also called **Static Random Access Memory (SRAM)**
  - Is more costly
  - Hides performance differences when large access-time gap exsists between two levels
    * Quad-quare requesting RAM for information





  - More can be found here

- Concurrency
  - Is execution of several instruction sequences at same time
    * i.e, CPU and device controllers
  - **Interrupt:** are signals sent to the CPU by external devices, (usually I/O devices)
    * It's like telling 'Hey CPU, please stop this process, and do y instead, since this is more important'
    * i.e. Network Packet has arrived, Disk I/O comeplete occured
  - **System Call:** are interrupt signals sent by software
    * Is a programmatic way of a program requesting for service to kernel of operating system
    * i.e. Accessing a hard-disk drive
  - IMPORTANT: An operating system is an event-driven program.

2 Process Threads

- Part 1: The Process Concept
  - **Process:** is a program in execution
  - **Threads:** is the unit of execution within a process.

$$\text{Thread} = \frac{\text{Job}}{\text{Unit of Work}} \tag{1}$$

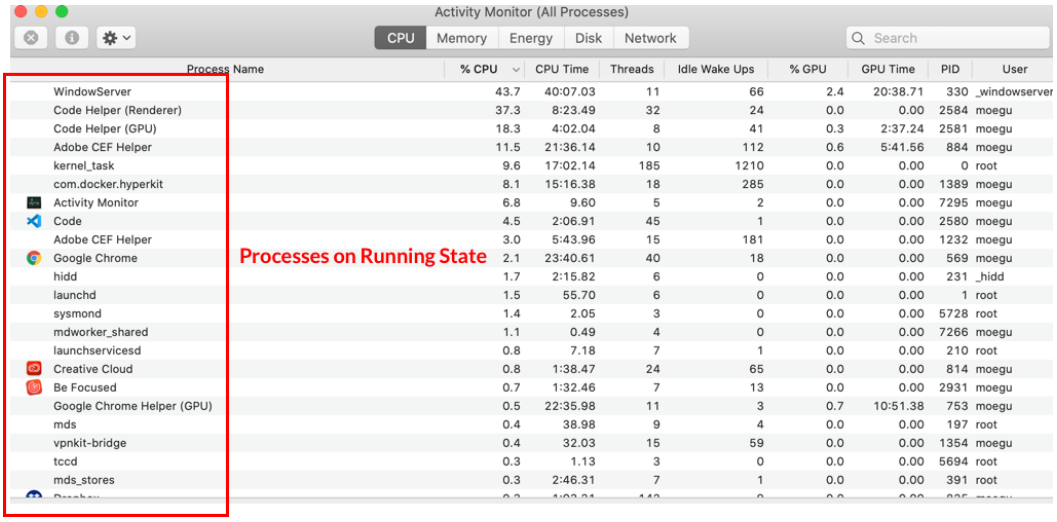
    - A process can have anywhere from one thread to many threads

- Process Data Structure (PCB)
  - Is called Process Control Block
  - Is OS data structur representing each process
  - Generally includes
    1. Process State
       - (Ready, running, blocked)
    2. Program Counter
       - Is an address that indicates the line of code that has to be executed next
       - i.e. the next line of code i need to execute is line 2 :)

```
print("Hello World");
print("Hi World!") //<- Line 2
```

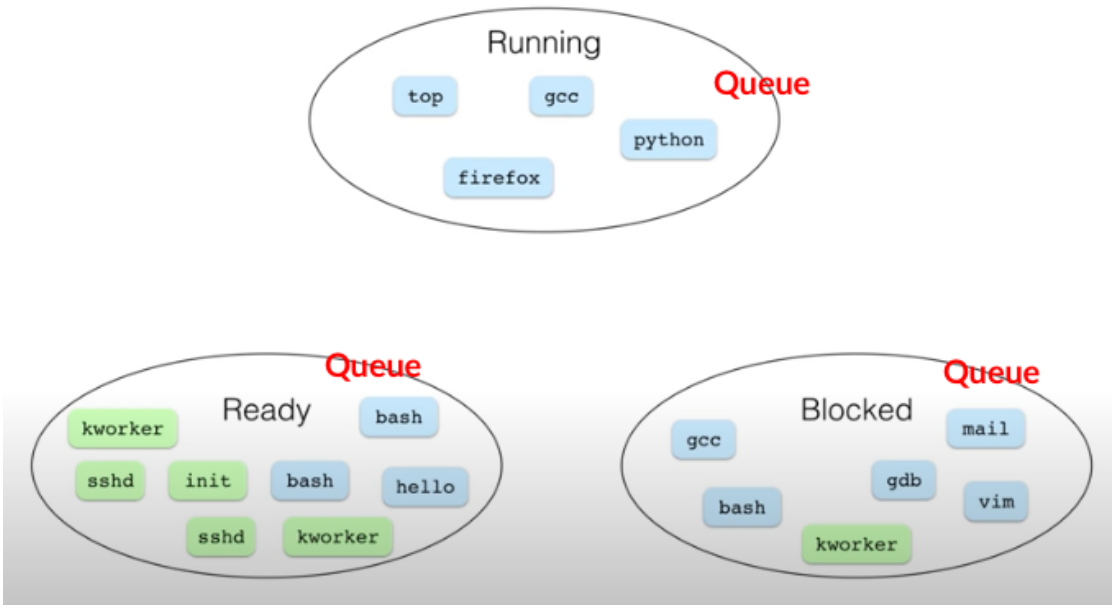
    3. CPU Register ***Need to come back*
    4. CPU Scheduling Information
       - Priority of process
       - Higher the priority → executed first
    5. Memory Management ***Need to come back*
    6. I/O Status Information
       - Is list of input output devices assigned to this process
       - Is used during execution
       - i.e. Sound, Mouse, Keyboard

- State Queues
  - Is a part of **process scheduling**
    - keeps CPU busy at all times to deliver minimum response time for all programs



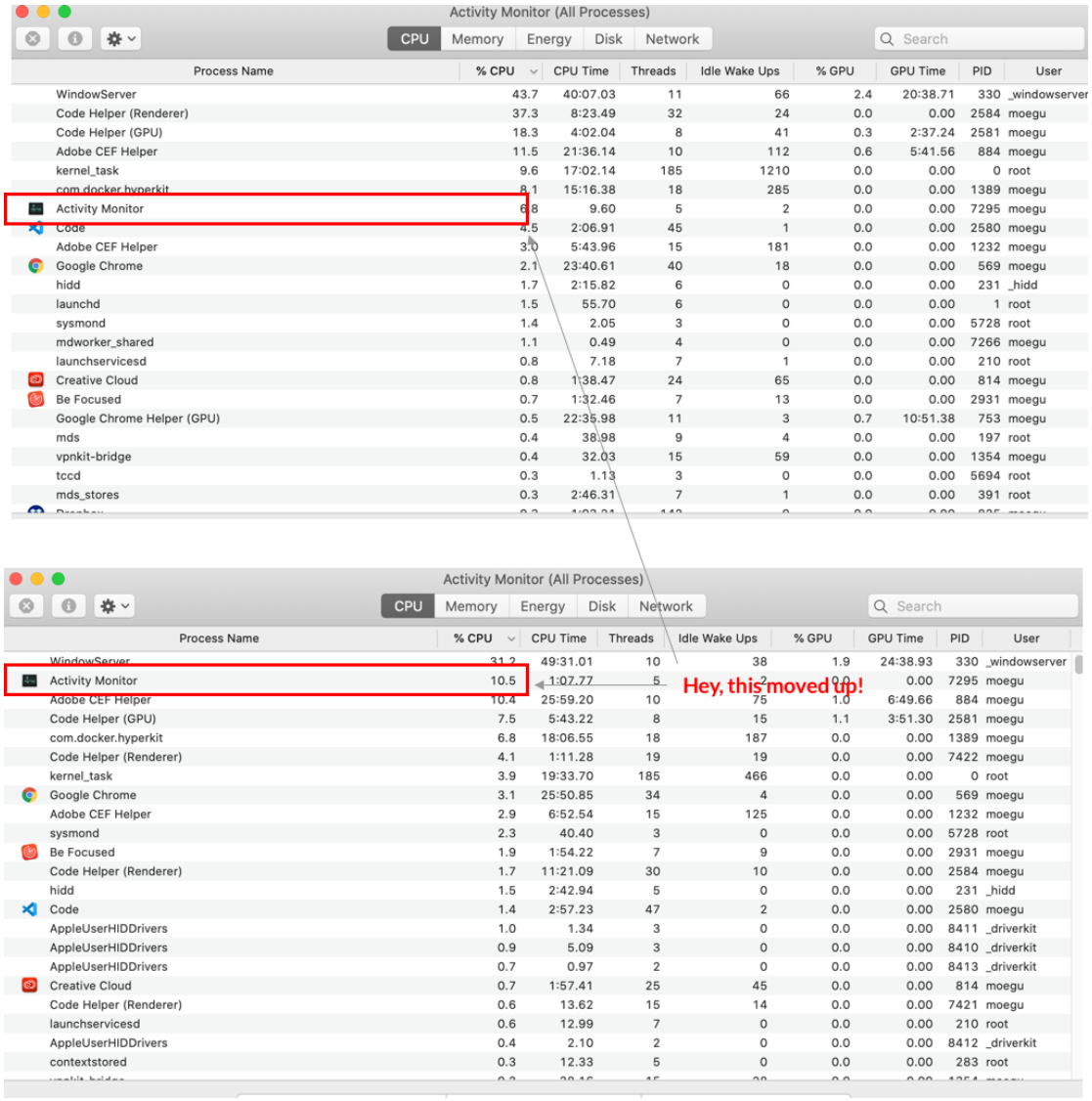
* Here, processes in queue are switched so frequently that user can interact with each program simultaneously while running
  - i.e, listening to music, typing and downloading a picture of a cute puppy all at the same time

– Has one state queue for each process state
  * Job Queue, Ready Queue, Waiting Queue, Blocking Queue

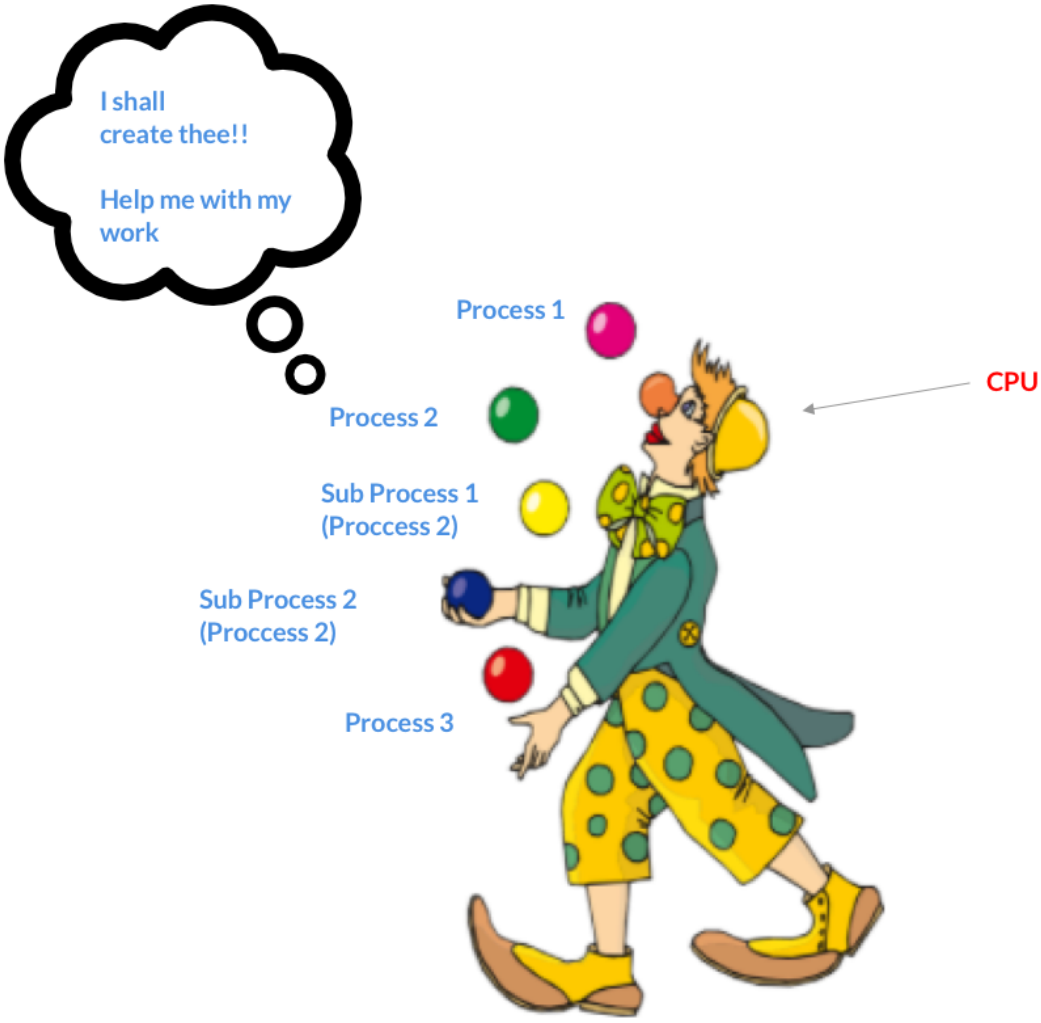


- PCBs And State Queues
  – Process created → OS allocates PCB → Initializes it → Places it on Ready Queue
  – Process terminated → PCB deallocated
- Context Switch

- Switches the CPU to another process on interrupt, saving the state of the old process and loading the saved state of the new process until done
  - i.e. Loading a music in Google Music Player
- Previous process resumes executing when done



- Operations on Processes
  - Process can have multiple new processes during the course of execution, or alone
  - Process execute concurrently and must be created and deleted dynamically
    - Wow, CPU is a master juggler



  - Has two types of operations
    - Process Creation
    - Process Termination

- Process Creation
  - Is an operation that creates new processes by another process
    - Child process → New Process
    - Parent Process → Creating Process
  - Is achieved through **fork()** system call
  - Occurs in
    1. System Initialization
    2. A running process
    3. A user request
    4. Initialization of a bath job
  - Two possibilities exist on creation:

1. Parent executes with children in parallel
2. Parent waits until some or all of its children are terminated

- More can be found here

- fork()
- Duplicating Address Processes
- Divergence
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