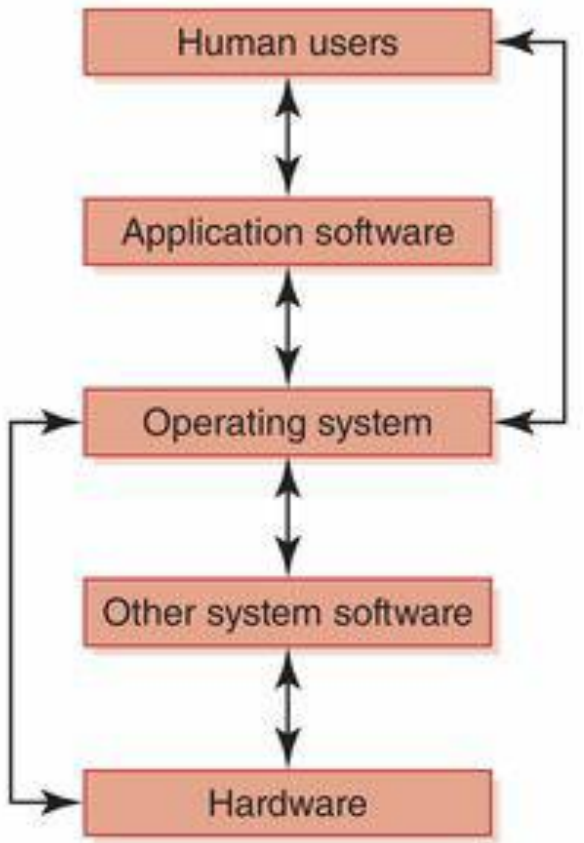
06 – Operating System Layer

Presenter: Phuong Vo

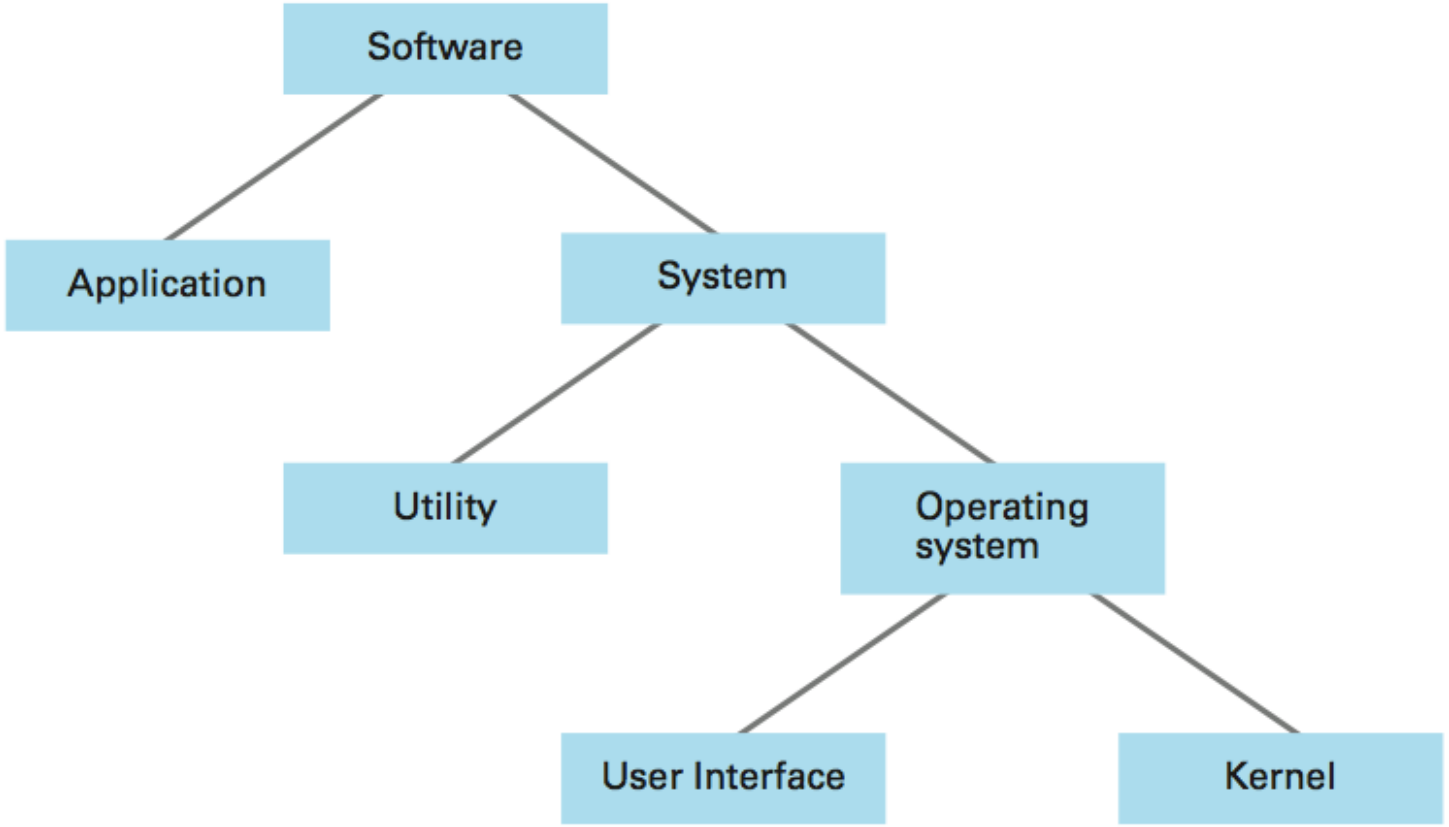
1. Operating system



Roles of an Operating System

- **Application software**: Programs that help us solve real-world problems
- **System software**: Programs that manage a computer system and interact with Hardware
- **Operating system**: *System software that manages computer resources* and *provides an interface for system interaction*

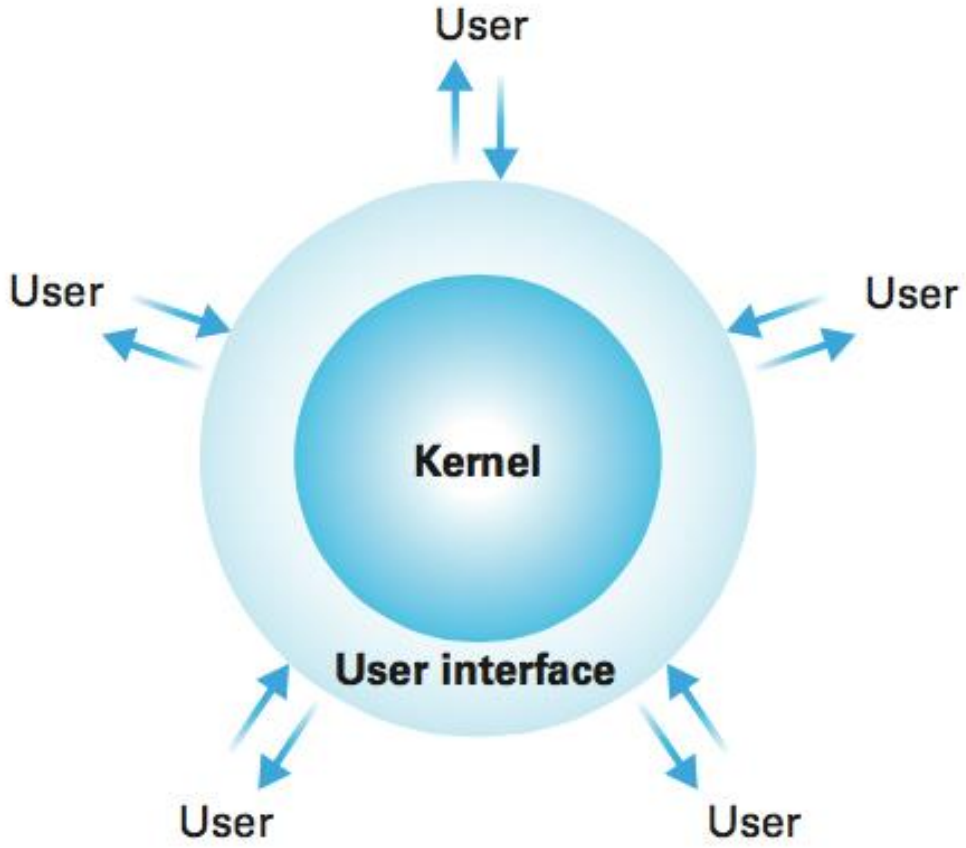
Software clasification



This figure is from "CS: An overview".

Operating System Components

- **User Interface:** Communicates with users
  - Text based (Shell), e.g. Bourne shell, Bash shell, C shell, and Korn shell
  - Graphical user interface (GUI), e.g. GNOME, KDE , Unity, etc.
- **Kernel:** Performs basic functions
  - File manager
  - Device drivers
  - Memory manager
  - Scheduler and dispatcher

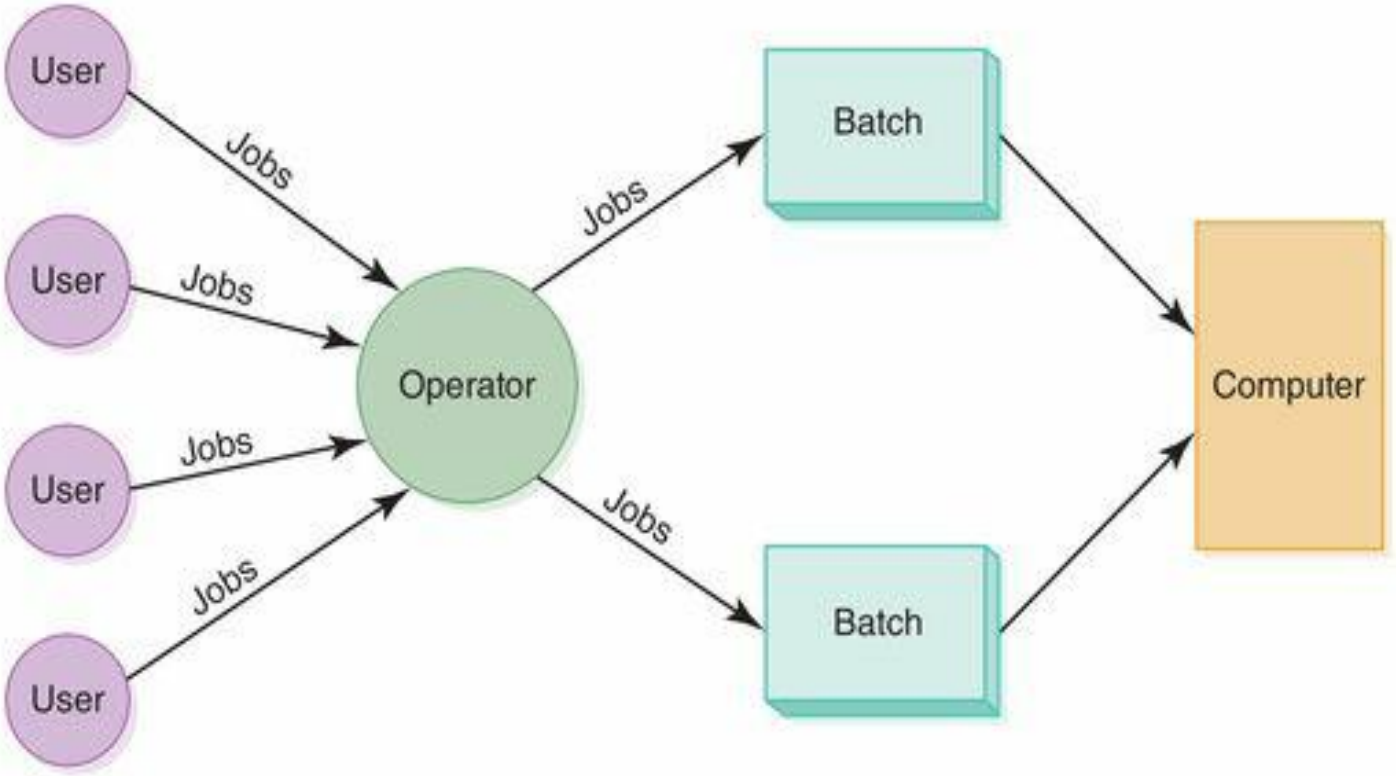


This slide is from "CS: An overview".

Memory, Process, and CPU Management

- **Multiprogramming** The technique of keeping multiple programs in main memory at the same time, competing for the CPU
- **Memory management** The act of keeping track of how and where programs are loaded in main memory.
- **Process** The dynamic representation of a program during execution
- **Process management** The act of keeping track of information for active processes
- **CPU scheduling** The act of determining which process in memory is given access to the CPU so that it may execute

Batch Processing

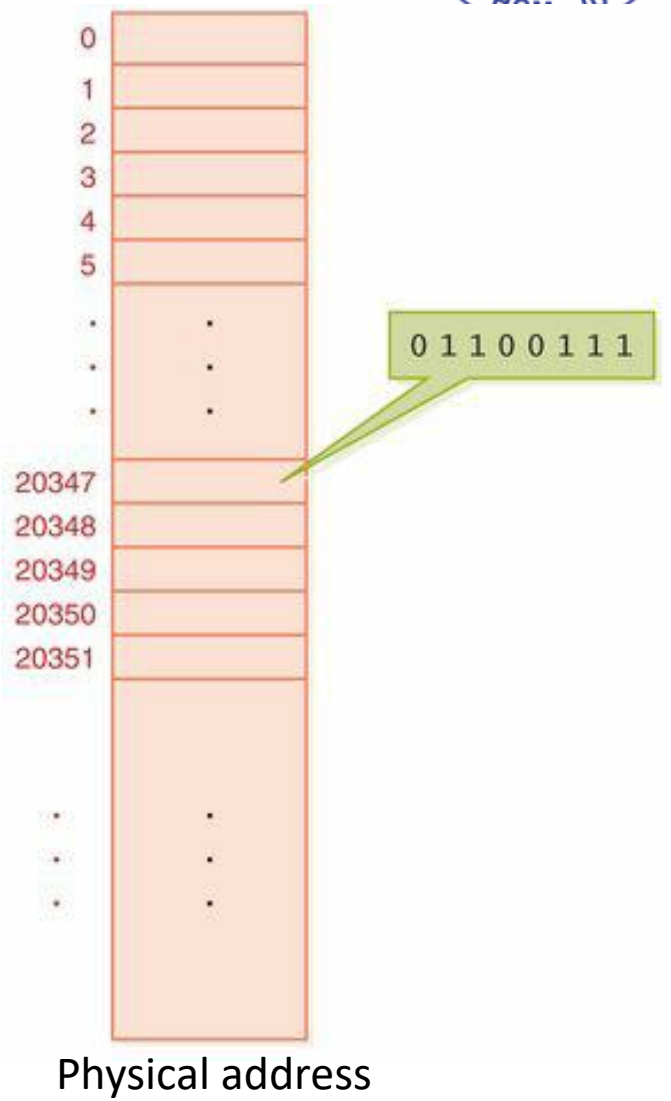


- .bat in Microsoft Windows

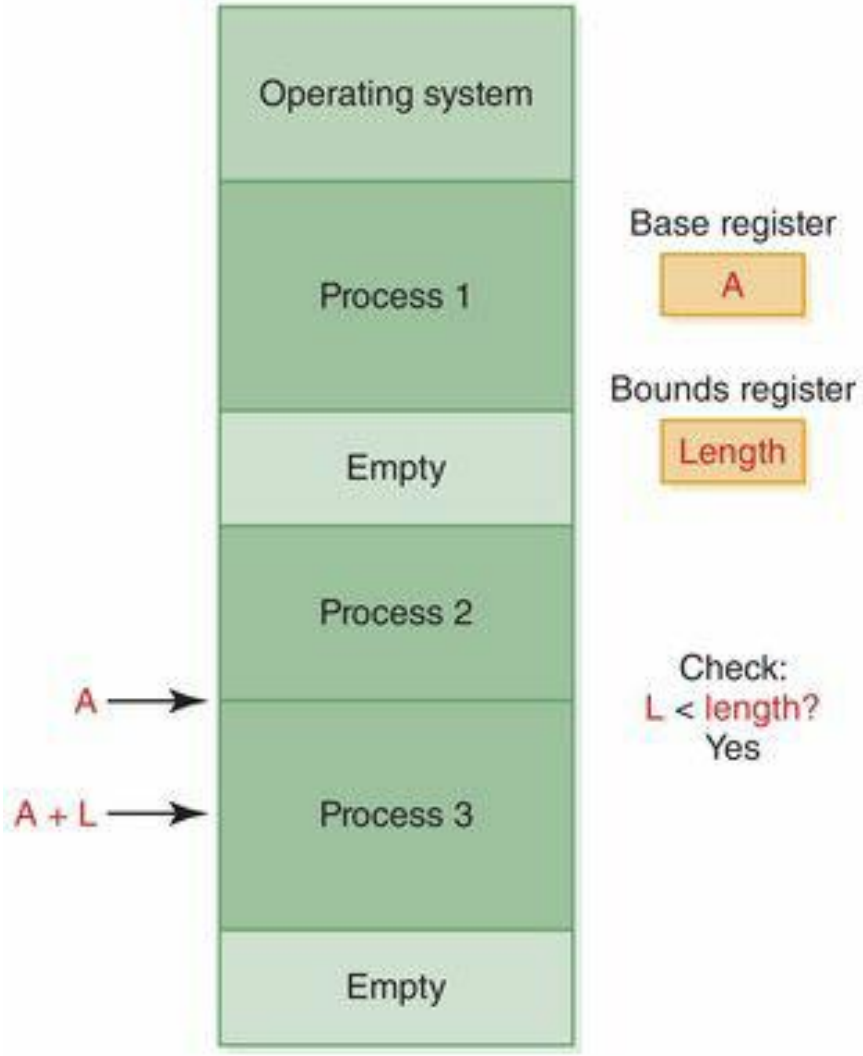
In early systems, human operators would organize jobs into batches

2. Memory Management

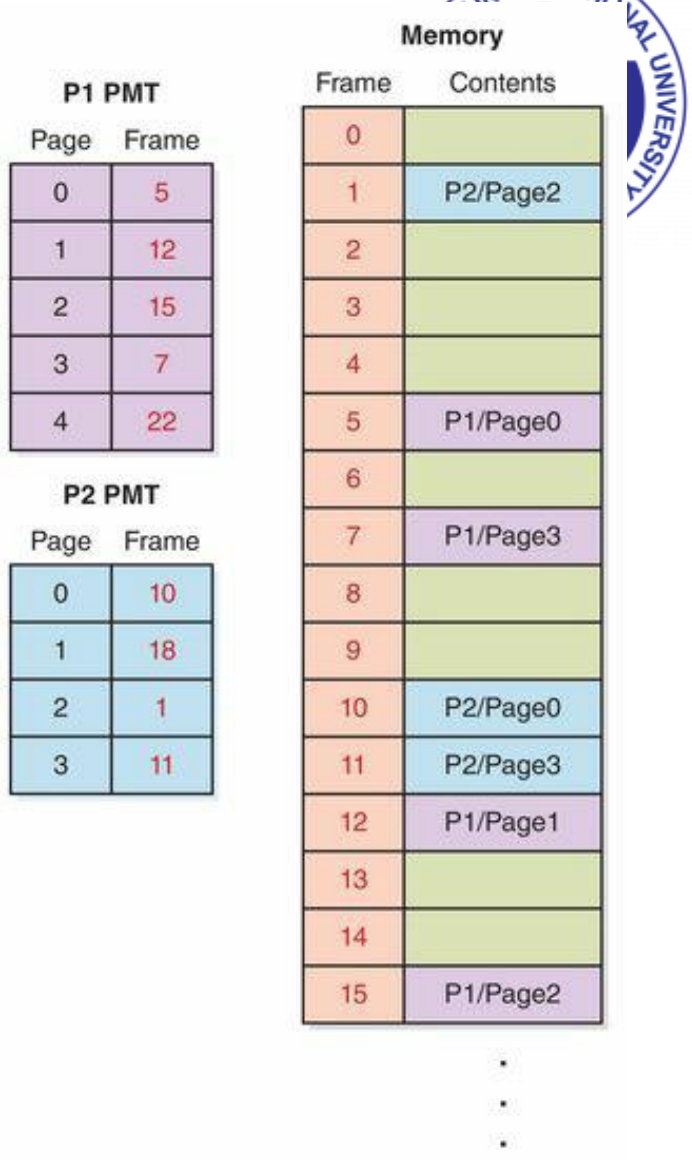
- **Logical address**: A reference to a stored value relative to the program making the reference
- **Physical address** An actual address in the main memory device



Main memory divided into two sections in Single contiguous memory management



Address resolution in partition memory management

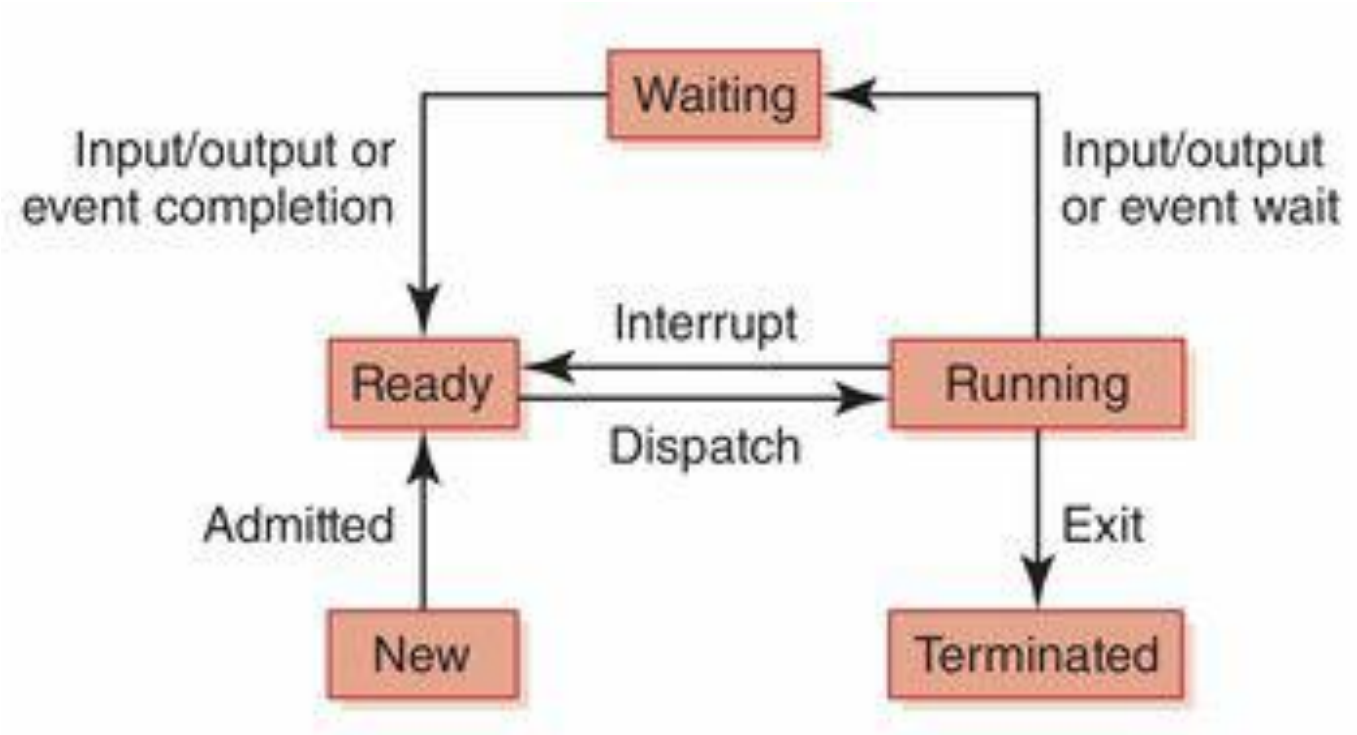


A paged memory management approach

Process management - Process states

- In the new state, a process is being created.
- A process that has no barriers to its execution is in the ready state.
- A process in the running state is currently being executed by the CPU. Its instructions are being processed in the fetch–execute cycle.
- A process in the waiting state is currently waiting for resources (other than the CPU).
- A process in the terminated state has completed its execution and is no
- longer active.

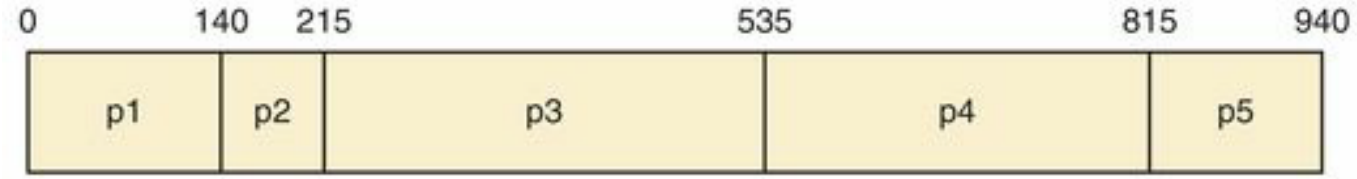
Process Management



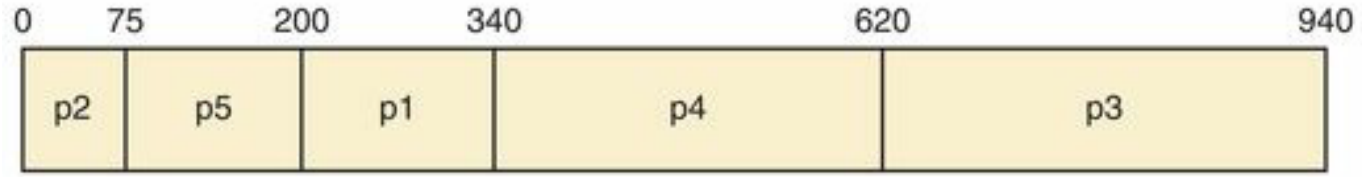
The process life cycle

CPU Scheduling

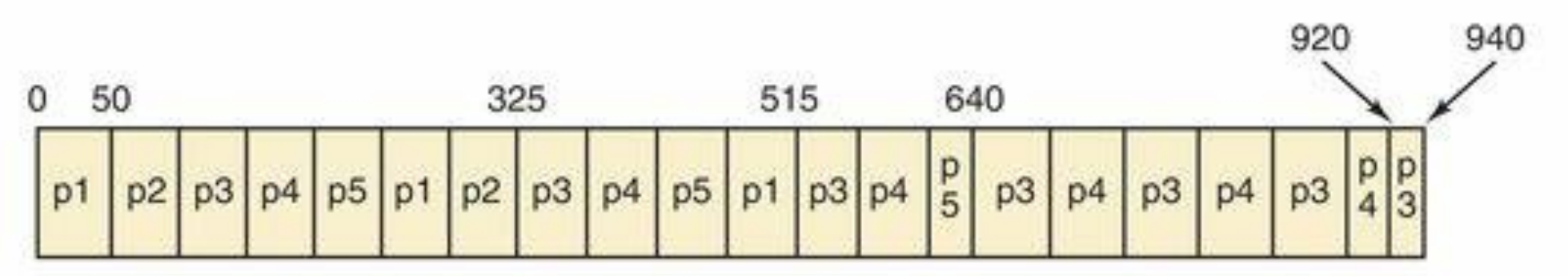
- CPU scheduling is the act of determining which process in the ready state should be moved to the running state.
- First Come, First Served (FCFS): non-preemptive



- Shortest Job Next: non-preemptive



❖Round Robin: time slice, preemptive scheduling



2. File system directory

File Systems

- main memory is where active programs and data are held while in use. A volatile memory.
- Secondary memory is nonvolatile—the data stored on it is maintained even when power is not on.
- **File** A named collection of data, used for organizing secondary memory.
- **File system** The operating system's logical view of the files it manages.
- **Directory** A named group of files.

Extensions	File type
txt	text data file
mp3, au, wav	audio file
gif, tiff, jpg	image file
doc, wp3	word processing document
java, c, cpp	program source files

File Operations

- Create a file
- Delete a file
- Open a file
- Close a file
- Read data from a file
- Write data to a file
- Reposition the current file pointer in a file
- Append data to the end of a file
- Truncate a file (delete its contents)
- Rename a file
- Copy a file

How to create / delete / open / close / write data / append data ... to a file in **Python**?

File protection

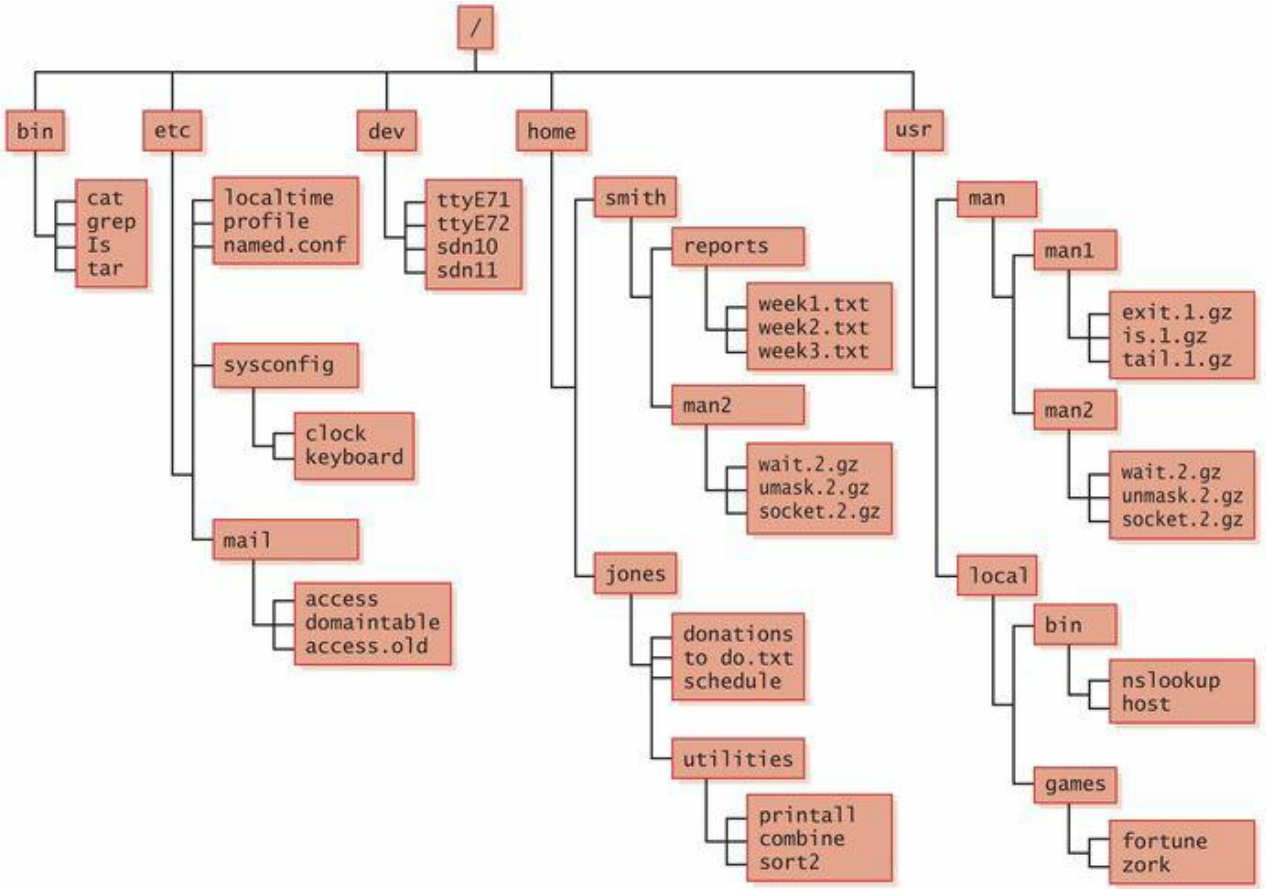
	Read	Write/Delete	Execute
Owner	Yes	Yes	No
Group	Yes	No	No
World	No	No	No

Directory Trees

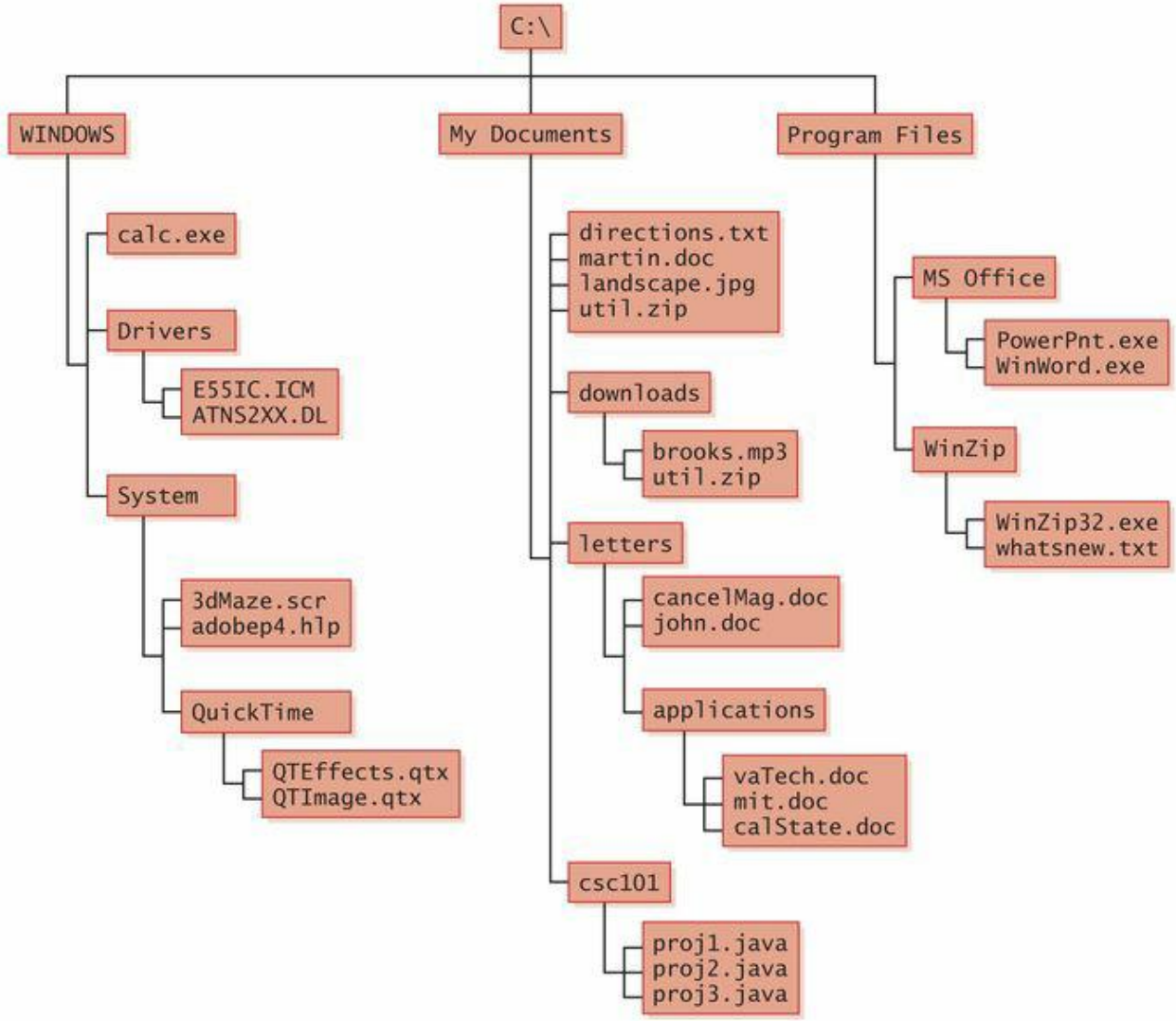
- **Directory tree** A structure showing the nested directory organization of the file system
- **Root directory** The topmost directory, in which all others are contained
- Path Names: absolute vs. relative

```
C:\Program Files\MS Office\WinWord.exe
C:\My Documents\letters\applications\vaTech.doc
C:\Windows\System\QuickTime
```

```
..\landscape.jpg
..\csc111\proj2.java
..\..\WINDOWS\Drivers\E55IC.ICM
..\..\Program Files\WinZip
```



A **Unix** directory tree



A **Windows** directory tree

Thank you <3