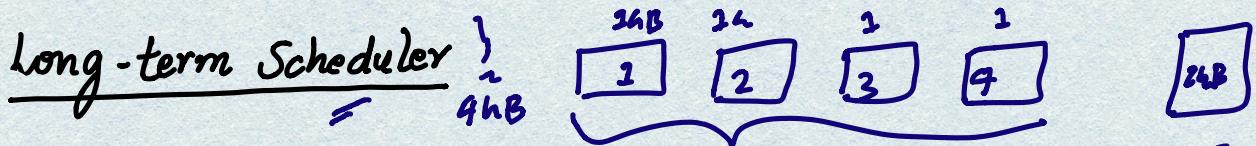


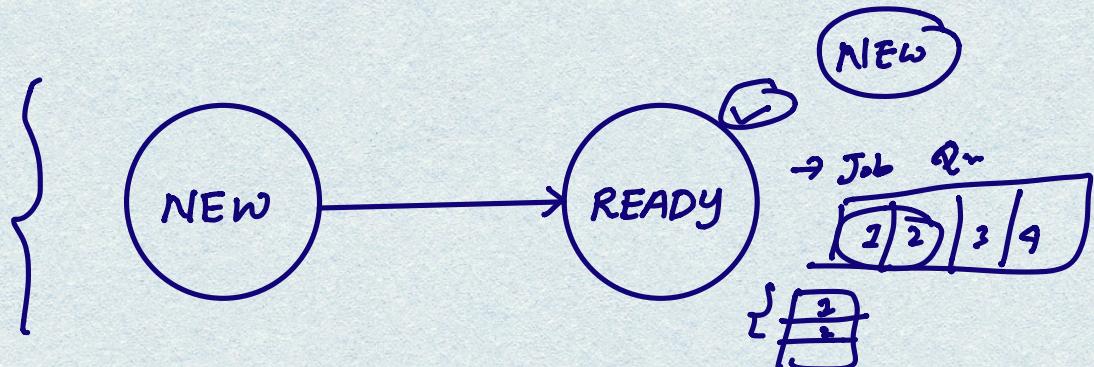
Schedulers in Operating System

1. what is a scheduler? ✓
2. Long-term scheduler ✓
3. Short-term scheduler ✓
4. Medium-term scheduler ✓

-
- Scheduler ✓
- Job → 1, 2, (3, 4)
RQ
- A process migrates among various scheduling queues during its lifetime - job, ready and device queue.
 - Some processes must be selected from these queues and scheduled.
 - This selection process is carried out by the appropriate schedulers. }

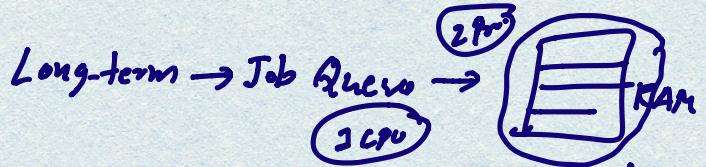


- In a batch operating system, more processes are Submitted than can be executed immediately. [Job Queue]
- What happens when 4GB of batched processes are Submitted to run on 2GB RAM system? 
- All these processes are first stored on a mass-storage device such as disk in job queue.
- The long-term scheduler then selects processes from the disk and loads them into main memory.



- In NEW state, the program resides on the disk itself.
- Long-term scheduler is not used in time sharing operating systems.

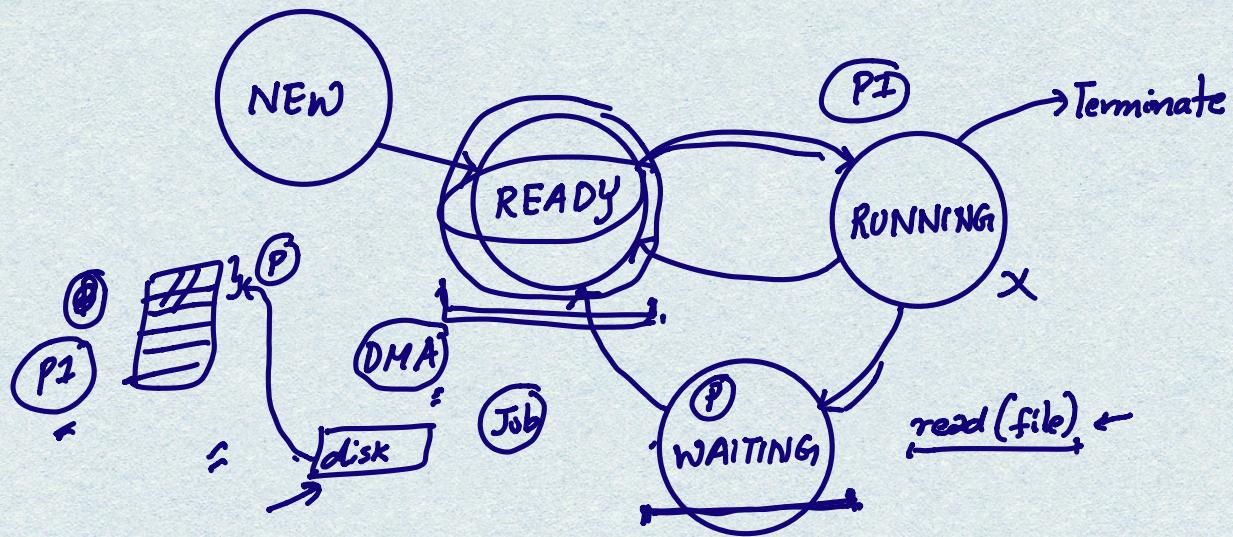
Short-term Scheduler



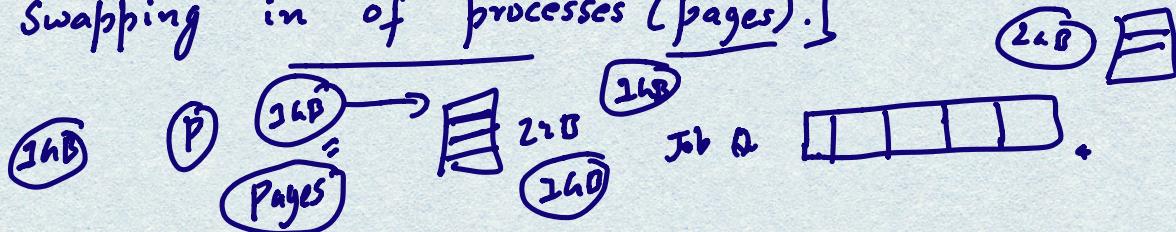
- Short-term scheduler selects from the processes that are ready to execute and allocates them a processor.
- It is also known as the CPU scheduler.
- In other words, it picks one of the process from the ready queue and schedules it.
- A state transition diagram showing the progression of processes. It starts with a 'NEW' state, which has arrows pointing to both a 'READY' state and a 'RUNNING' state. The 'READY' state has an arrow pointing to the 'RUNNING' state. Labels below the diagram indicate 'Job queue' points to 'READY', and 'Ready Queue' points to 'RUNNING'.
- In batch operating systems, long-term schedulers bring processes to main memory. Then, short-term scheduler schedules these processes on the CPU.
- In Time sharing operating systems, the PCB of all the processes are always kept in main memory. The concept of virtual memory and demand paging makes it possible to have more processes than RAM's capacity.

Medium - Term Scheduler

- Used in time sharing operating systems.

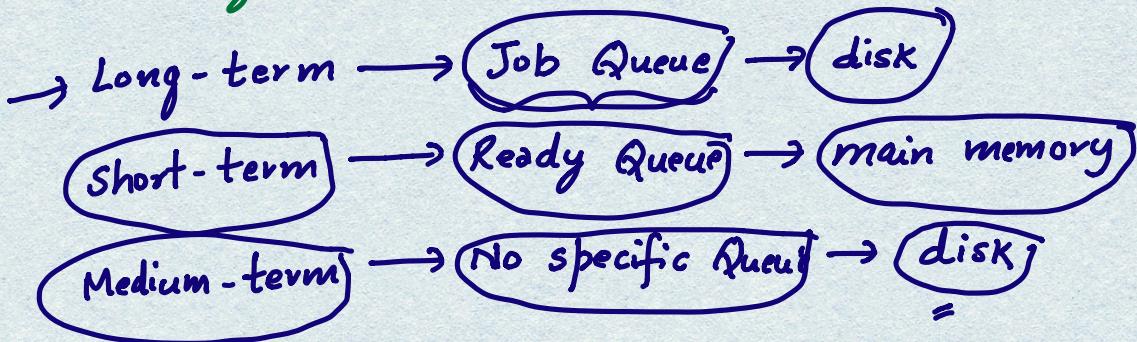


- when the main memory becomes full, some processes (pages) is swapped out to the disk.
- These pages gets swapped in when required.
- The medium - term scheduler or the memory manager is responsible for swapping out and Swapping in of processes (pages).



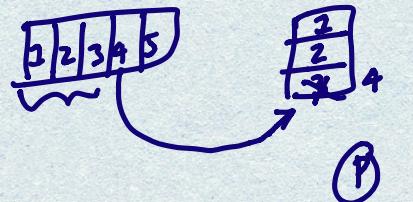
Comparing long, short and medium schedulers

1. Scheduling Queues ✓



2. Frequency of Execution ✓

short-term > long-term

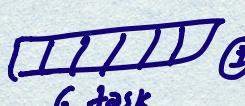


- A process may execute only for a few milliseconds before waiting for an I/O.
- The long-term scheduler is mostly invoked when a process leaves the main memory (terminates).
- Not fair to compare long-term scheduler with medium-term as both are suited for different operating systems.

- Short-term \Rightarrow Medium-term in most cases.
- If the system is thrashing, then the calls to medium-term scheduler will increase a lot.

3. Degree of Multiprogramming

4 processes ④

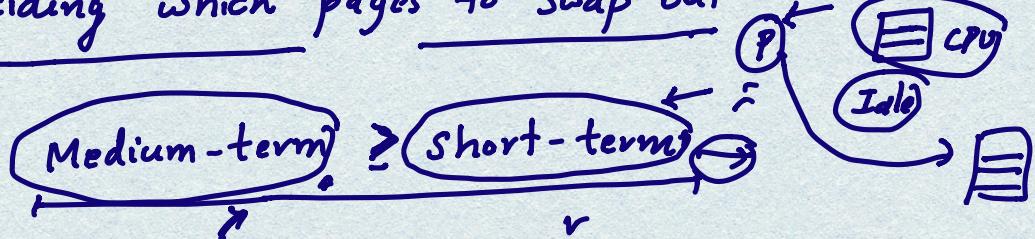
- Degree of multiprogramming is the number of processes present in main memory for execution.
- Long-term scheduler controls the degree of multiprogramming. Job  ⑤
- Medium-term scheduler decreases the degree of multiprogramming since it removes processes from the main memory.
- Short-term scheduler doesn't have to do anything with degree of multiprogramming.

/

4. Scheduling Speed



- If the short-term scheduler takes more time, it will keep the CPU idle for more time.
- Also, short-term scheduler gets called often. If it spends more time in just selecting processes, more CPU time will just be spent on this.
- Long-term schedulers are called less frequently. So, they can take more time.
- Medium-term schedulers should also be fast in deciding which pages to swap out.



CPU-Bound vs I/O-Bound

- Long-term scheduler should make a careful selection between CPU-Bound and I/O-Bound processes.
- If all processes selected are I/O-Bound, ready queue will be empty.
- If all processes selected are CPU-Bound, I/O queues will be empty.
- Select combination of I/O-bound & CPU-bound processes.