

Interactive Scheduling Algorithms

- Usually preemptive
 - Time is **sliced** into quantum (time intervals)
 - Scheduling decision is also made at the beginning of each quantum
- Performance Criteria
 - Min Response time
 - best proportionality
- Representative algorithms:
 - Priority-based
 - Round-robin
 - Multi Queue & Multi-level Feedback
 - Shortest process time
 - Guaranteed Scheduling
 - Lottery Scheduling
 - Fair Sharing Scheduling

Priority Scheduling

- Each job is assigned a priority.
- FCFS within each priority level.
- Select highest priority job over lower ones.
- Rationale: higher priority jobs are more mission-critical
 - Example: DVD movie player vs. send email
- Problems:
 - May not give the best AWT
 - Starvation

Set Priority

- Two approaches
 - Static (for system with well known and regular application behaviors)
 - Dynamic (otherwise)
- Priority may be based on:
 - Cost to user.
 - Importance of user.
 - Aging
 - Percentage of CPU time used in last X hours.

Round-Robin (RR)

- One of the oldest, simple, commonly used scheduling algorithms
- Select process/thread from ready queue in a round-robin fashion (take turns)

- Problems:
 - Do not consider priority
 - More context switch overhead

Round-robin: Example

Process	Duration	Order	Arrival Time
P1	3	1	0
P2	4	2	0
P3	3	3	0

Suppose time quantum is: 1 unit, P1, P2 & P3 never block
Do it yourself

P1 P2 P3 P1 P2 P3 P1 P2 P3 P2



P1 waiting time: 4
P2 waiting time: 6
P3 waiting time: 6

The average waiting time (AWT):
 $(4+6+6)/3 = 5.33$

Time Quantum

- Time slice too large
 - FIFO behavior
 - Poor response time
- Time slice too small
 - Too many context switches (overheads)
 - Inefficient CPU utilization
- Heuristic: (Eliminating preemption)
 - 70-80% of jobs block within time-slice
- Typical time-slice
 - 10 to 100 ms
- Time spent in system depends on size of job

Multi-Queue Scheduling

- Hybrid between priority and round-robin
- Processes assigned to one queue
- Scheduling between queues
 - Fixed Priorities
 - Dynamic priorities based on CPU % spent on queue
- Example
 - System processes
 - Interactive programs
 - Background Processes
- Address the starvation problem

Multi-Queue Scheduling: Example

