操作系统原理

第六章：CPU调度

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目录

Outline

Basic concepts

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- Operating systems supporting threads at the kernel level must schedule threads (NOT processes) for execution.

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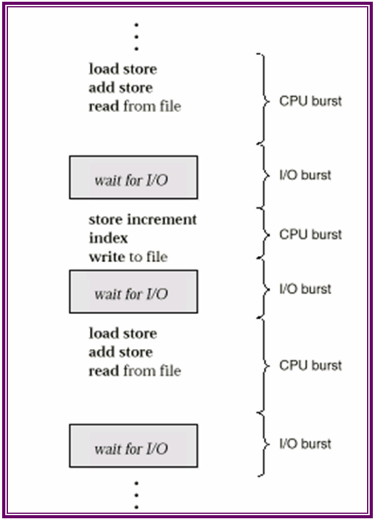

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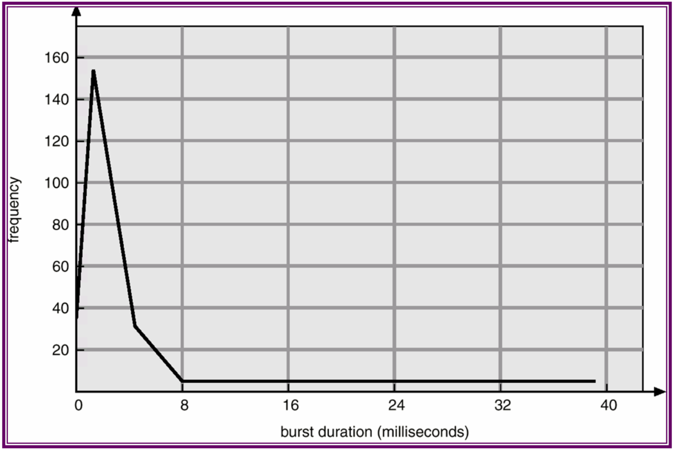

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- Scheduling under 1 and 4 is **non-preemptive**. All other scheduling is **preemptive**.

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- Response time –amount of time it takes from when a request was submitted until the first response is produced

Outline

1. CPU scheduling
   - Basic concepts
   - CPU or I/O burst
   - CPU scheduler
   - Dispatcher
   - Scheduling criteria
2. Scheduling algorithms
   - First-come, first-served
   - Shortest Job First
   - Priority scheduling
   - Round-Robin scheduling
   - Multilevel queue
   - Multilevel feedback queue
   - Conclusion

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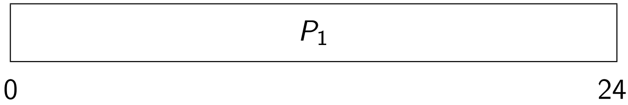

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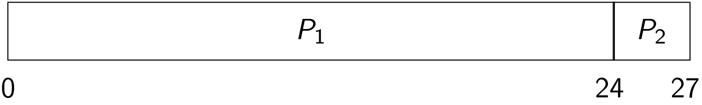

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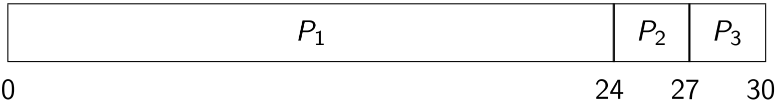

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0 – 24	24 – 27	27 – 30

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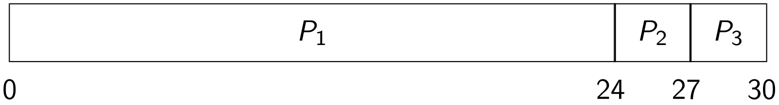

- Waiting time for P1 = 0; P2 = 24; P3 = 27
- Average waiting time: $(0 + 24 + 27)/3 = 17$

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- SJF is optimal gives minimum average waiting time for a given set of processes.

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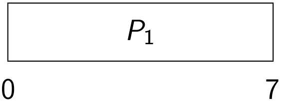

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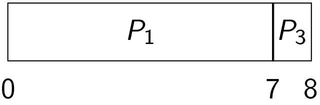

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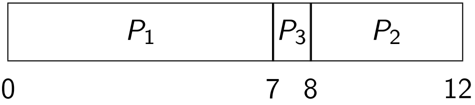

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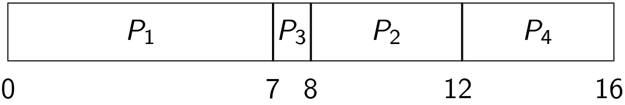

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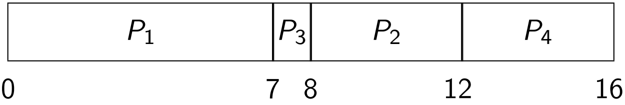

- Average waiting time $= (0 + 6 + 3 + 7)/4 = 4.$

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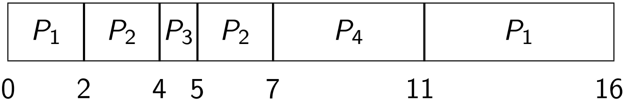

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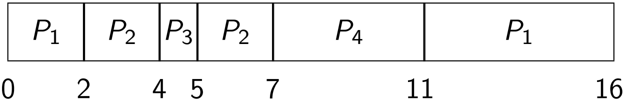

- Average waiting time $= (9 + 1 + 0 + 2)/4 = 3$.

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  - After this time has elapsed, the process is preempted and added to the end of the ready queue.
- If there are n processes in the ready queue and the time quantum is q,
  - then each process gets $1/n$ of the CPU time in chunks of at most q time units at once.
  - No process waits more than $(n\text{-}1)q$ time units.
- Performance
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  - q large - FCFS
  - q small - q must be large with respect to context switch, otherwise overhead is too high.

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Multilevel queue (2/2)

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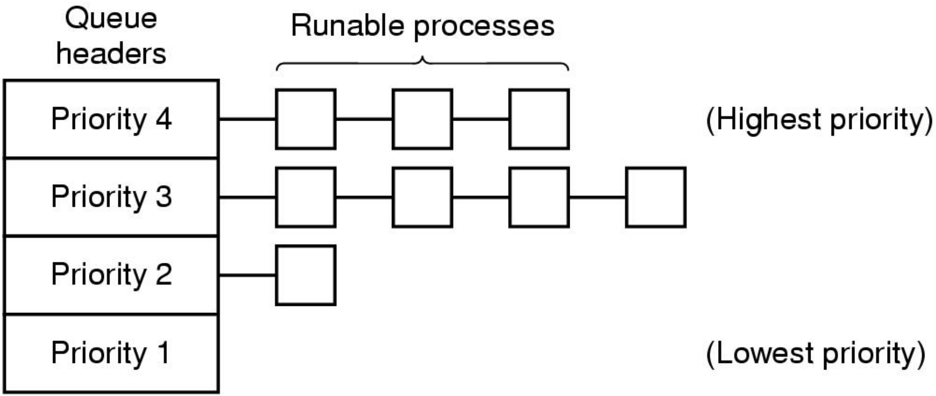

Multilevel feedback queue scheduling

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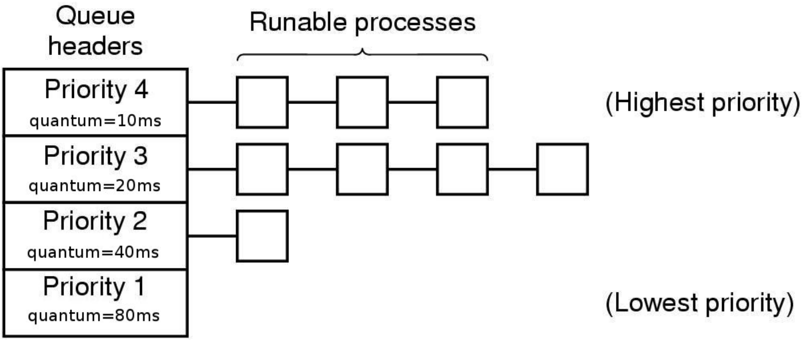
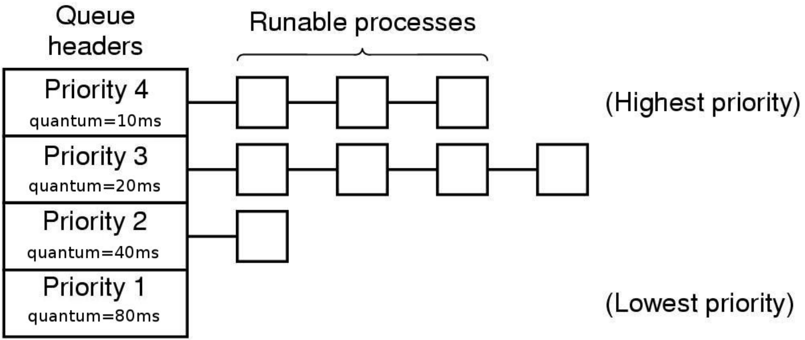


Multilevel feedback queue scheduling



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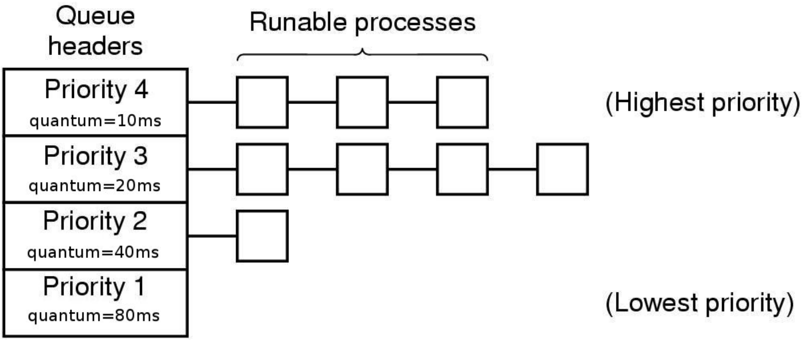

- A process can move between the various queues.
  - For example, whenever a process used up the quantum allocated to it, it sank into a lower priority queue.

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  - As a result, the scheduler rarely makes the best choice.
  - The solution: separation of scheduling policy and scheduling mechanism.
    - That is, the scheduling algorithm is parameterized in some way, but the parameters can be filled in by the user.

Questions

- Any questions?