Seminar questions and problems

Module 3
CPU scheduling

Computer systems with project work (1DT003)

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Different types of scheduling

1. What is the overall purpose of the the short-term scheduler (aka CPU scheduler)?

2. What is the overall purpose of the long-term scheduler?

3. What is the overall purpose of the medium-term scheduler?

Scheduling criteria

4. Define the following scheduling criteria: CPU utilization, throughput, turnaround time, waiting time and response time. For each metric, state whether the goal is to minimize or maximize the metric.

Classification of processes

5. What is meant by CPU burst? What is meant by I/O burst?

6. What characterizes a CPU bound process? What characterizes an I/O bound process?

7. What would happen if there was a large majority of CPU bound processes in the ready queue?

8. What would happen if there was a large majority of I/O bound processes in the ready queue?

9. How can a good balance between CPU bound processes and I/O bound processes in the ready queue be maintained?

10. What characterizes an interactive process?

11. What requirements on CPU scheduling does interactive processes impose?

12. What characterizes a batch process?

Scheduling dispatch

13. What is meant by scheduler dispatch?

14. What actions are taken during a scheduler dispatch?

15. Define dispatch latency.

16. Scheduler dispatch can be preemptive and nonpreemptive, define these terms.

17. Draw a diagram showing which process state transitions causes a preemptive respectively a nonpreemptive scheduler dispatch.

Scheduling algorithms

18. Explain the FCFS scheduling algorithm.

19. Explain the convoy effect.

20. Explain the SJF scheduling algorithm.

21. In what way is SJF optimal?

22. Explain the PSJF scheduling algorithm.

23. Explain the RR scheduling algorithm.

24. In general, what can be said about turnaround time and response time when comparing RR and SJF?

25. In CPU scheduling, what is meant by starvation and ageing?

Multilevel queue scheduling

26. What is the overall purpose of multilevel queue scheduling?

27. In a ready queue for foreground processes, which algorithm of FCFS, SJF and RR would you choose. Justify your answer.

28. What are the design objective of multilevel feedback queue scheduling?

29. Explain how multilevel feedback queue scheduling works and how this relates to the design objectives.

Solaris and Linux

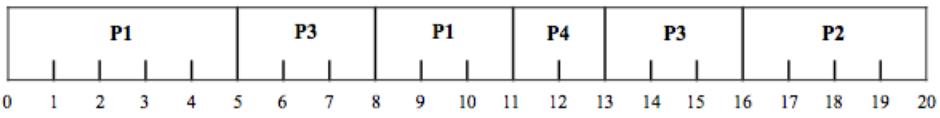
30. Explain how the Solaris dispatch table is used to dynamically change a the priority and time quantum (time slice) for a process.

31. Explain how a bitmap makes it possible for the Linux O(1) scheduler to find the highest priority process in constant time, independent of the the number of active tasks.

32. The Linux Completely Fair Scheduler uses a red-black tree to keep track the processes in the ready queue. What is the time complexity of selecting the next process to run? What is the time complexity of inserting process (task) into the red-black-tree?

Problems

33. A tuple (PID, A) denotes a process with process ID PID that arrives to the ready queue at time A. In a system the ready queue holds the following processes: (P1, 0), (P2, 4), (P3, 5) and (P4, 11). An unknown scheduling algorithm results in the following Gantt chart.



From the above Gantt chart, calculate the average waiting time and the average response time.

34. A triple (PID, A, B) denotes a process with process ID PID that arrives to the ready queue at time A with CPU burst B. In a system the ready queue holds the following processes: (P1, 0, 9), (P2, 4, 4), (P3, 5, 2) and (P4, 11, 5). Draw Gantt charts for SJF, PSJF and RR with q=3.

- If a process is preempted at the same time as a process arrives to the ready queue, the arriving processes should be placed ahead of the preempted process in the ready queue.
- For PSJ, a process is only preempted by a process with a strictly smaller remaining burst time.