Topic I: Priority-Driven Scheduling of Periodic Tasks

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2017 Fall

Outline

- Assumptions
- Fixed-Priority vs. Dynamic-Priority Algorithms
- Maximum Schedulable Utilization
- Optimality of the RM and DM Algorithms
- A Schedulability Test for Fixed-Priority Tasks with Short Response Times
- Schedulability Test for Fixed-Priority Tasks with Arbitrary Response Times
- Sufficient Schedulability Conditions for the RM and DM Algorithms

Assumptions

- The tasks are independent.
  - When tasks are independent, the scheduler can delete any task and add an acceptance task at any time without causing any missed deadline.
  1. Introduce other resources and discuss the effects of resource contention.
  2. Describe resource access-control protocols designed to keep bounded the delay in job completion caused by resource contentions.
- No aperiodic and sporadic tasks
  - Integrate the scheduling of aperiodic and sporadic tasks with periodic tasks.

Task Model Assumptions

- Every job is ready for execution as soon as it is released.
- Every job can be preempted at any time.
- Every job never suspend itself.
- Scheduling decisions are made immediately upon job releases and completions.
- The context switch overhead is negligibly small compared with execution times of the tasks.
- The number of priority levels is unlimited.

➡ We will remove these restrictions and discuss the effects of these and other practical factors!

Terminologies

- We refer to periodic tasks simply as tasks.
- We use the term period to mean *the minimum inter-release time* of jobs in a task.

Let's Start…

1. An application creates a new task.
2. The application requests the scheduler to add the new task by providing the scheduler with relevant parameters of the task, including its period, execution time, and relative deadline.
3. Based on these parameters, the scheduler does an acceptance test on the new periodic task:
   - It accepts and adds the new task to the system only if the new task and all other existing tasks can be feasibly scheduled.
   - Otherwise, the scheduler rejects the new task.

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Priority-Driven Scheduler

- A priority-driven scheduler is an on-line scheduler which assigns priorities to jobs after they are released and places the jobs in a ready job queue in priority order according to some priority-driven algorithm.
- When preemption is allowed at any time, a scheduling decision is made whenever a job is released or completed.