

CSC9006: Real-Time Systems

Lecture 3: Real-Time Scheduling (1)

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Definitions

- Real-time scheduling is a study of some proper allocation of resources in order to meet the tasks' timing requirements.
 - Computational resources
 - Data resources
 - I/O resources
- Static vs. Dynamic scheduling
- Preemptive vs. Non-preemptive scheduling

Task model for real-time scheduling

- Task request time (a.k.a. task release time): the instant when a request for a task execution is made
- Periodic tasks
 - Period: p_i
 - Deadline interval: d_i
 - Execution time: c_i
 - Response time
 - Laxity: $l_i = d_i - c_i$
- Sporadic tasks

Schedulability test

- To determine whether or not a set of ready tasks can be scheduled in a way so that all the tasks can meet their deadline.
- Types of schedulability test:

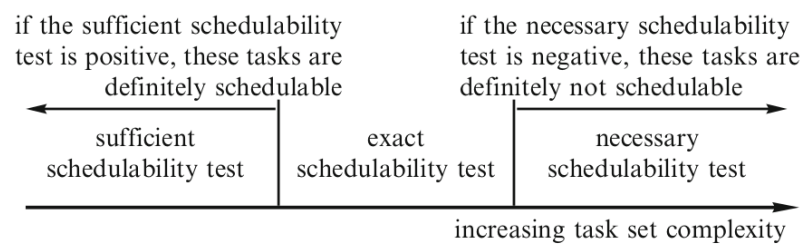


Fig. 10.2 Necessary and sufficient schedulability test

- Optimal scheduler

The adversary argument

- If there are mutual exclusion constraints between a periodic and a sporadic task, there is no guarantee to construct an optimal totally on-line dynamic scheduler.

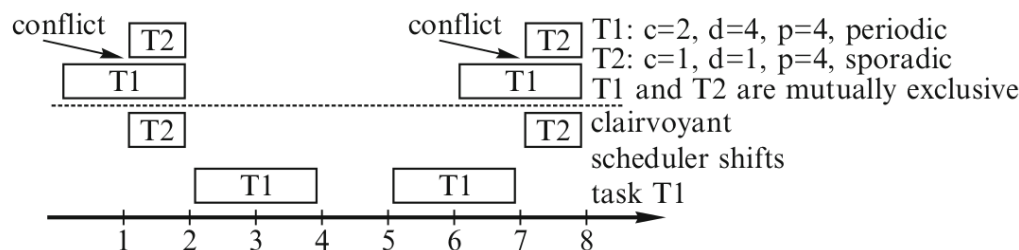


Fig. 10.3 The adversary argument

Response time of a task

- WCET: worst-case execution time
- WCAO: worst-case administrative overhead
- WCET of simple tasks (S-tasks)
- WCET of complex tasks (C-tasks)
- Anytime algorithms



Static scheduling

- May be viewed as a search problem:

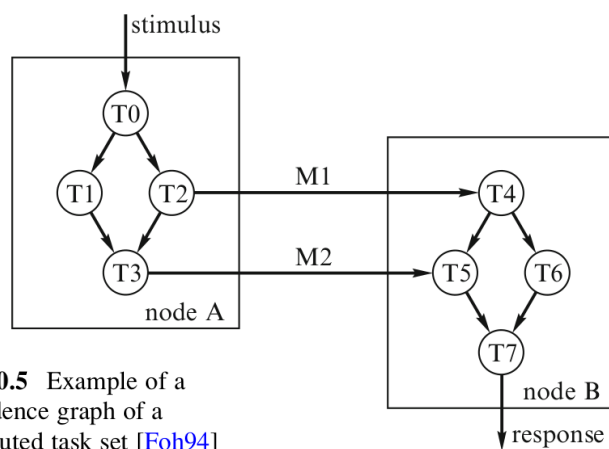


Fig. 10.5 Example of a precedence graph of a distributed task set [Foh94]