
Many suspensions, many problems: A review of self-suspending tasks in real-time systems

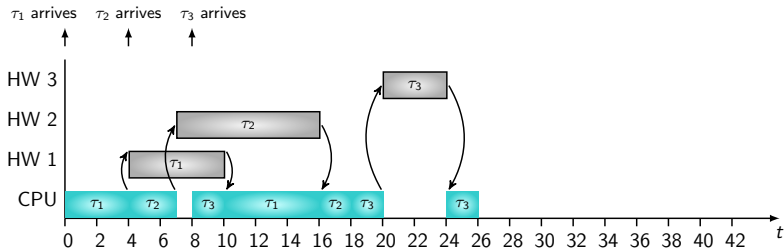
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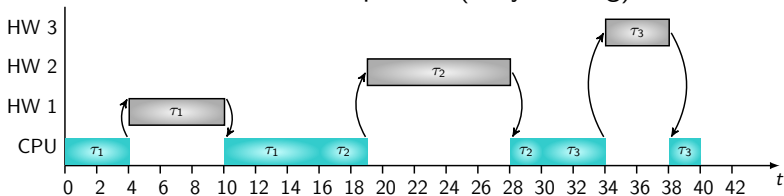
12,12,2018 at RTSS

Reasons for Suspension: Hardware Acceleration

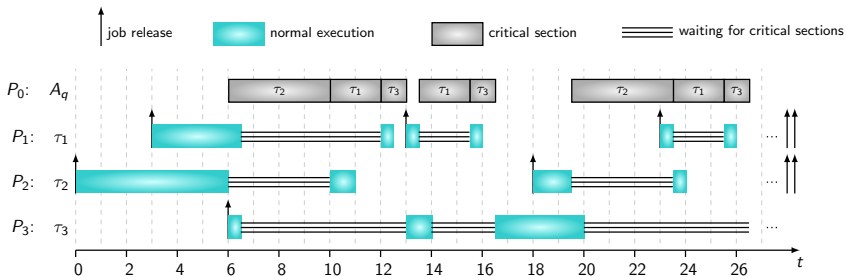
Use FPGA in parallel (suspension aware).



Not use FPGA in parallel (busy waiting).



Reasons for Self-Suspensions: Locking Protocols



- Distributed PCP in the above example
- Semaphores in multiprocessor systems: remote blocking due to mutual exclusion

Purpose of the paper

Motivation: Several errors were discovered:

- Incorrect quantification of jitter for self-suspending task systems
- Incorrect assumptions on the critical instant
- Incorrectly counting highest-priority self-suspension time to reduce the interference on the lower-priority tasks
- Incorrect fixed-priority scheduling with period enforcement
- Incorrect conversion of higher-priority self-suspending tasks into sporadic tasks with release jitter

Purpose of the paper

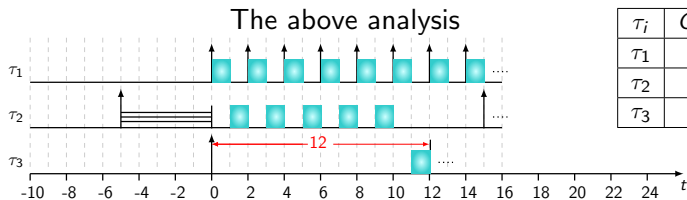
Our Mission:

- summarize the existing self-suspending task models
- provide the general methodologies to handle self-suspension
- explain the misconceptions in the literature, their consequences, and potential solutions to fix those flaws
- examine the inherited flaws in multiprocessor synchronization, due to a flawed analysis in self-suspending task models
- provide the summary of the computational complexity classes of different self-suspending task models and systems

Suspension Induces Jitter under Fixed-Priority

Schedulability test of task τ_k :

$$\exists t | 0 < t \leq D_k \quad \text{s.t.} \quad C_k + S_k + \sum_{j=1}^{k-1} \left\lceil \frac{t + S_j}{T_j} \right\rceil C_j \leq t.$$



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