Tardiness Bounds for Fixed-Priority Global Scheduling without Intra-Task Precedence Constraints

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The University of North Carolina at Chapel Hill
Department of Computer Science

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Soft Real-Time (SRT)

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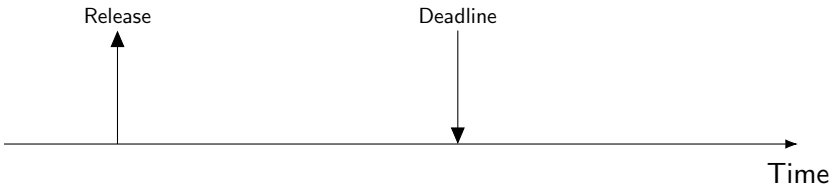

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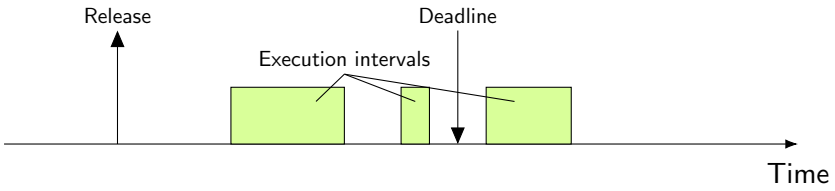

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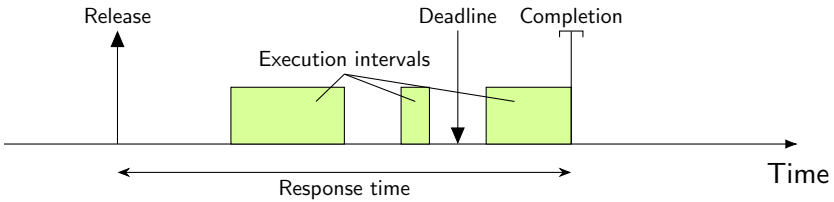

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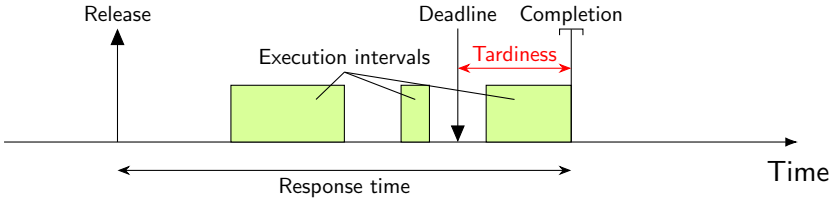

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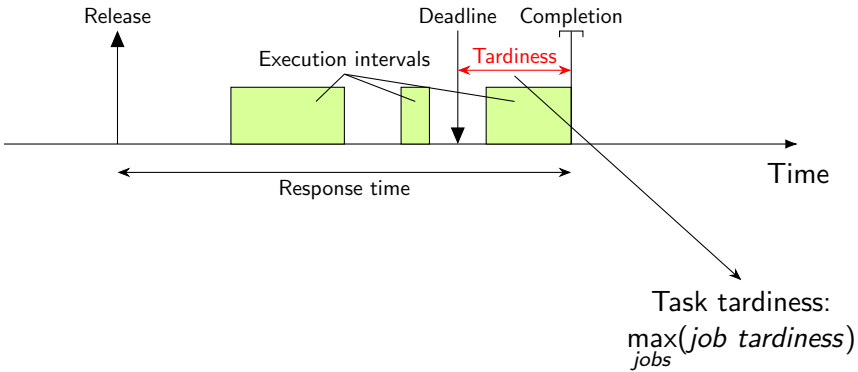

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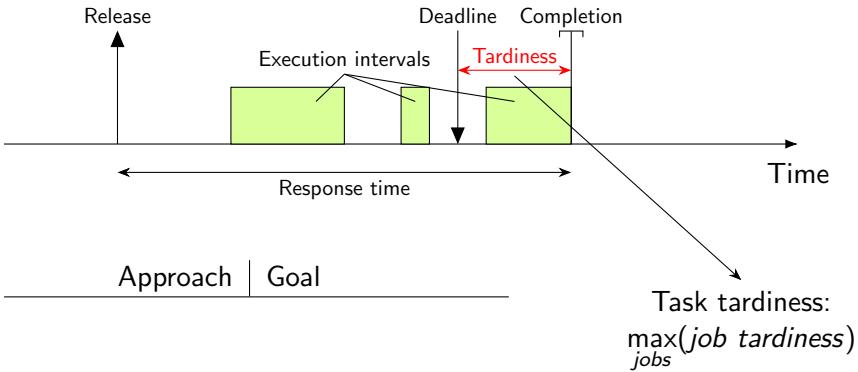

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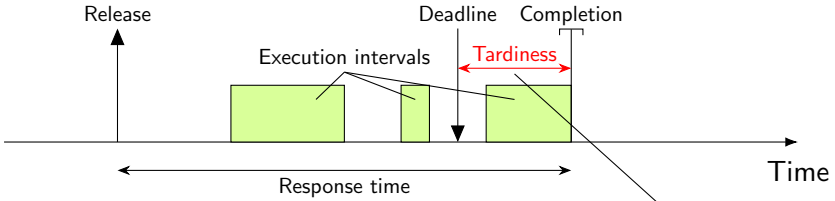

Approach	Goal
Hard Real-Time	no tardiness at all

Task tardiness:
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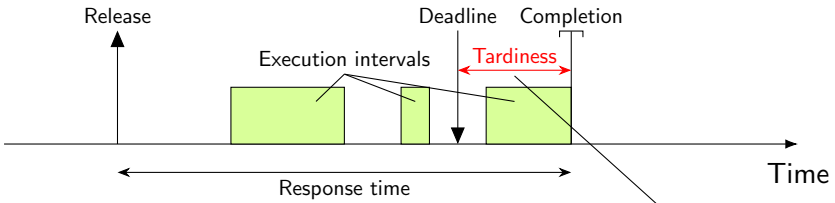


Approach	Goal
Hard Real-Time	no tardiness at all
Soft Real-Time	bounded tardiness for every task

Task tardiness:
$\max_{jobs}(job\ tardiness)$

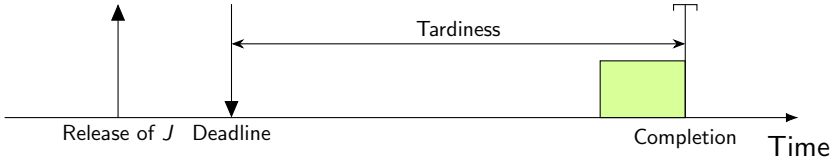
Outline

- Review of G-EDF SRT-optimality proof
- G-FP and SRT-optimality
- Sporadic task model generalization: NPC-sporadic
- Key idea of G-FP-optimality proof under the generalized model

Main result:

Global Fixed Priority scheduling is SRT-optimal under the NPC-sporadic task model.

G-EDF Soft Real-Time Optimality



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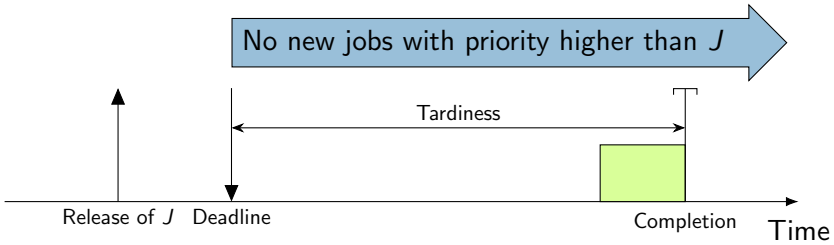

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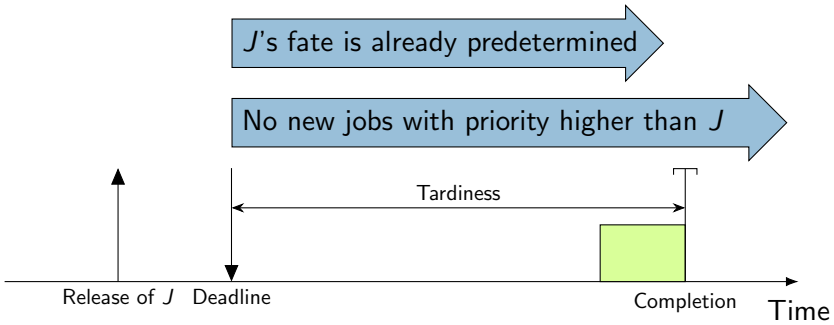

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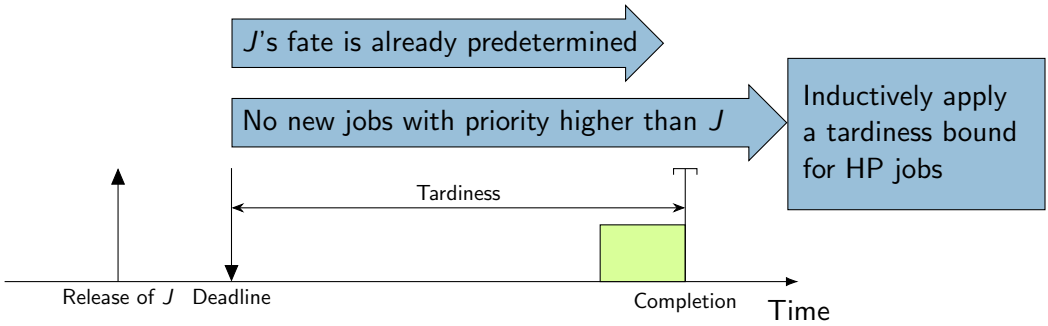

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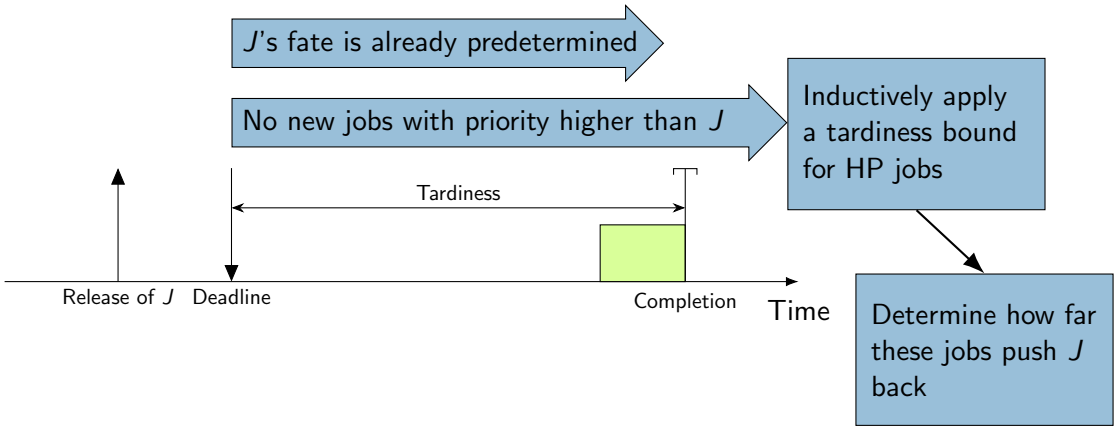

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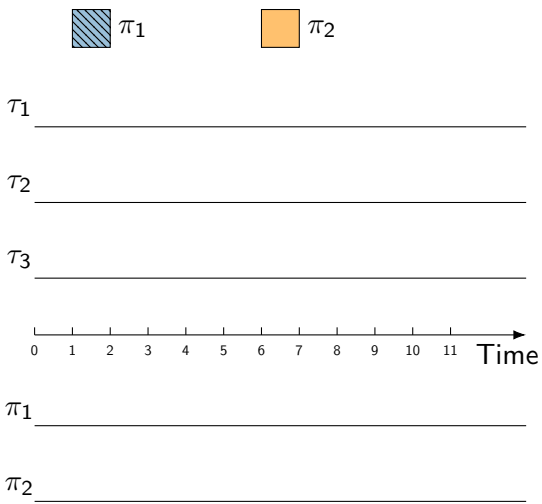

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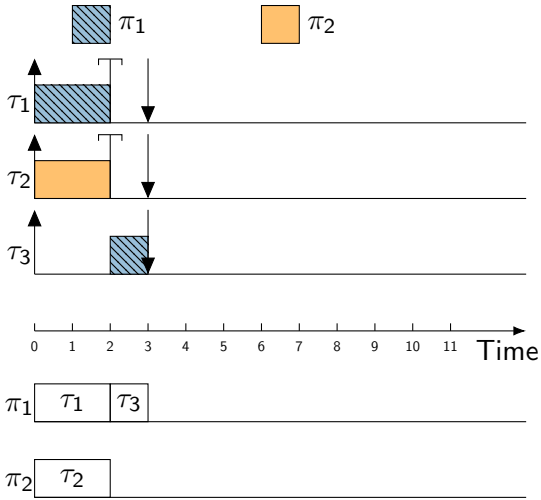

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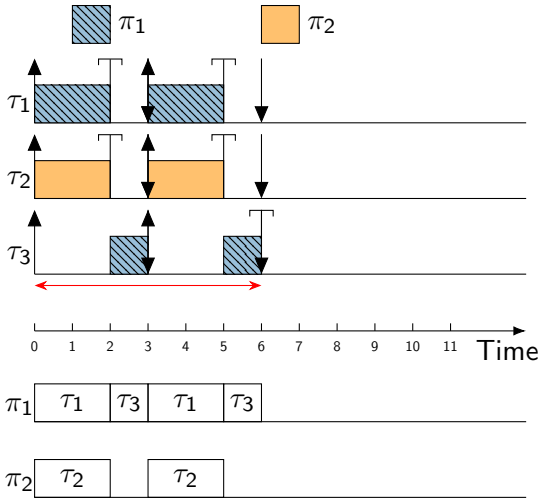

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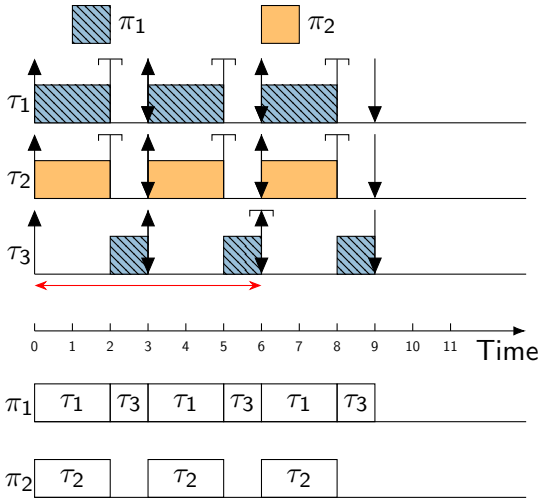

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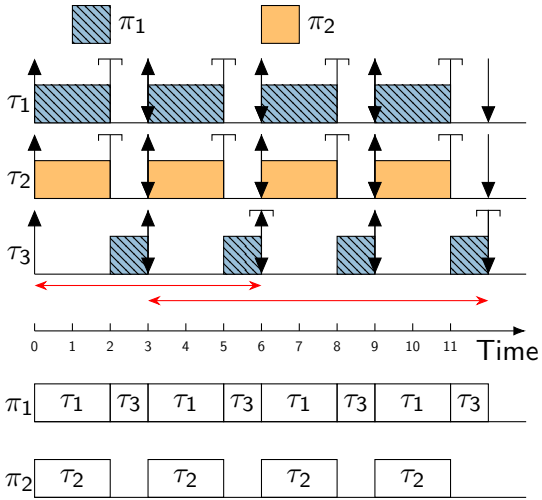

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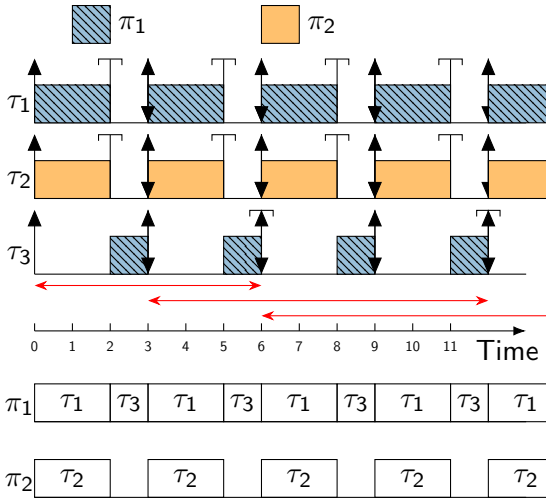

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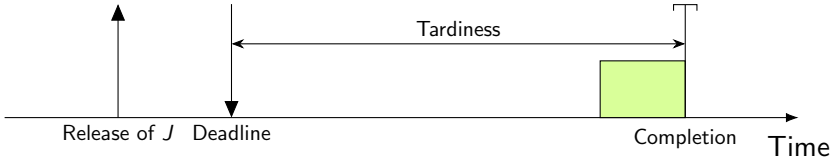

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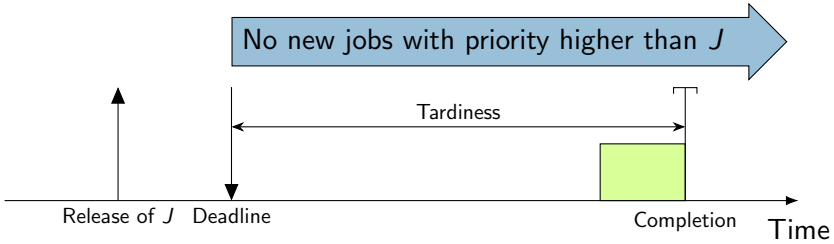

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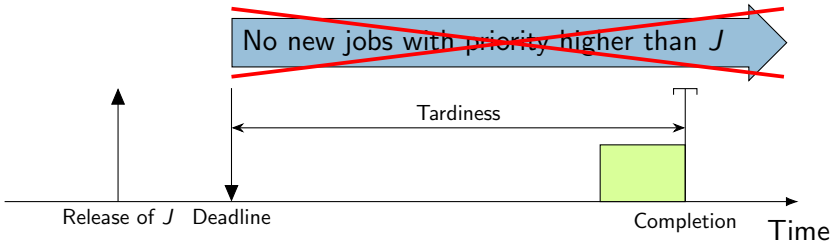

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- Industry interest: Huawei cell base stations

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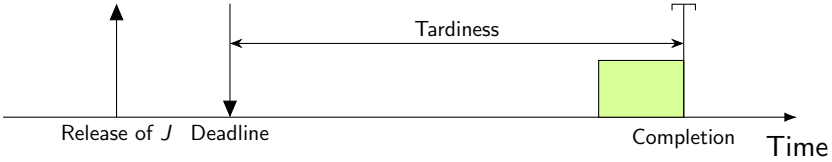

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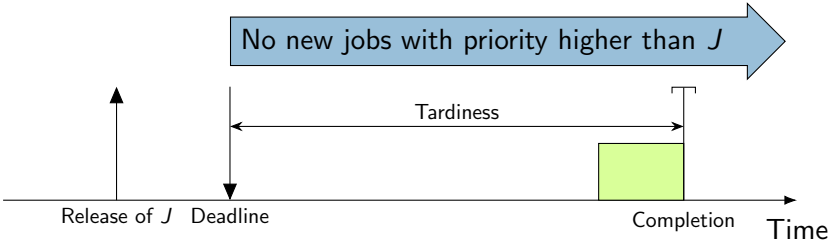

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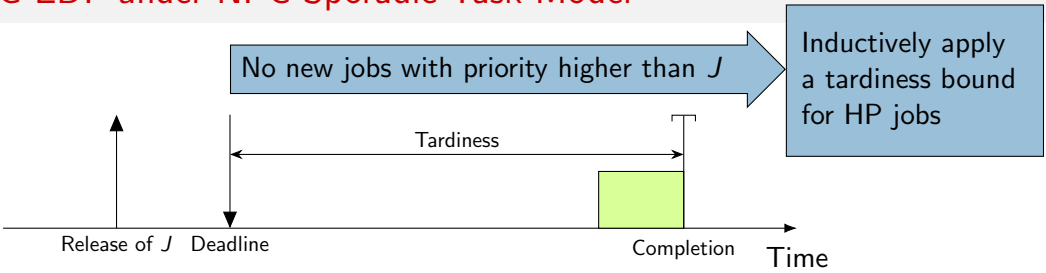

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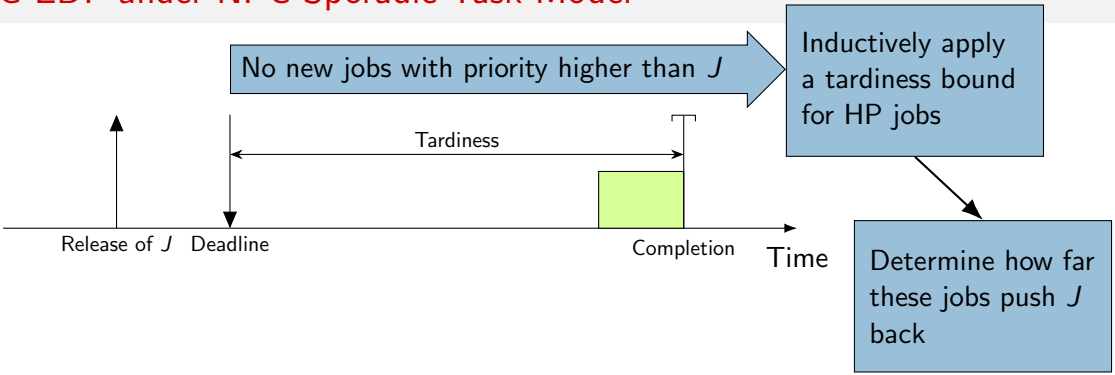

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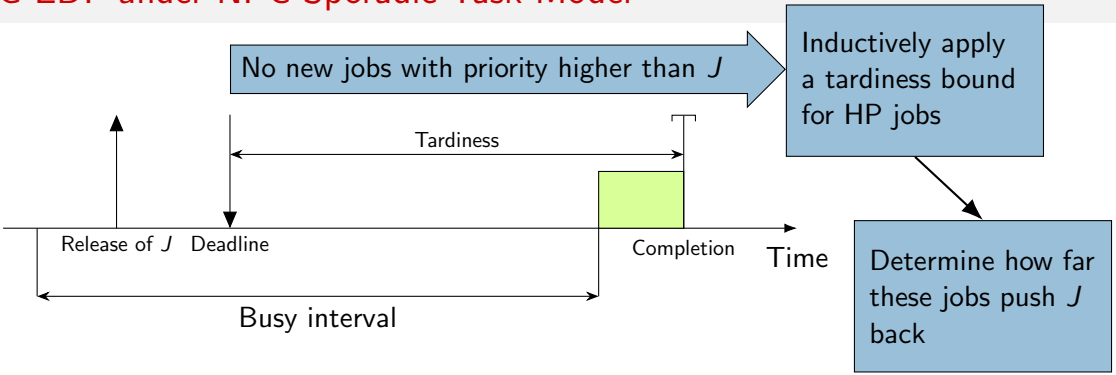

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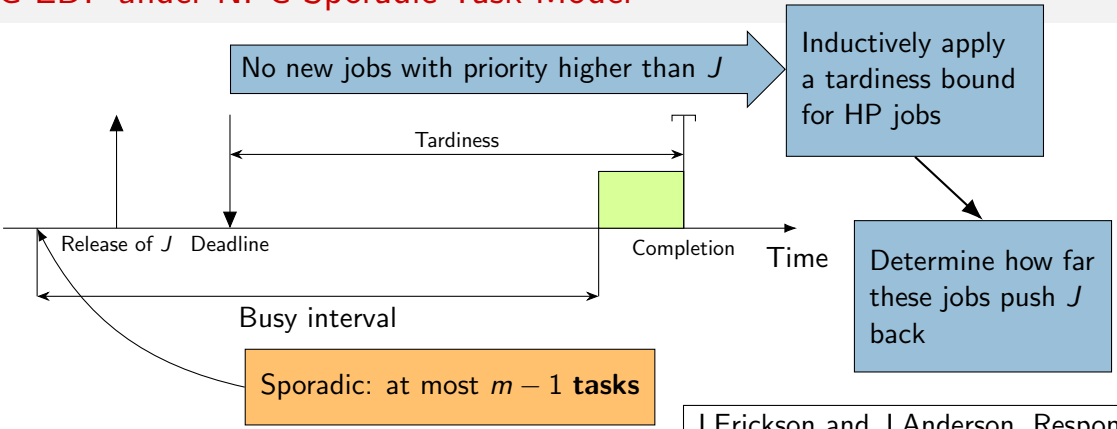

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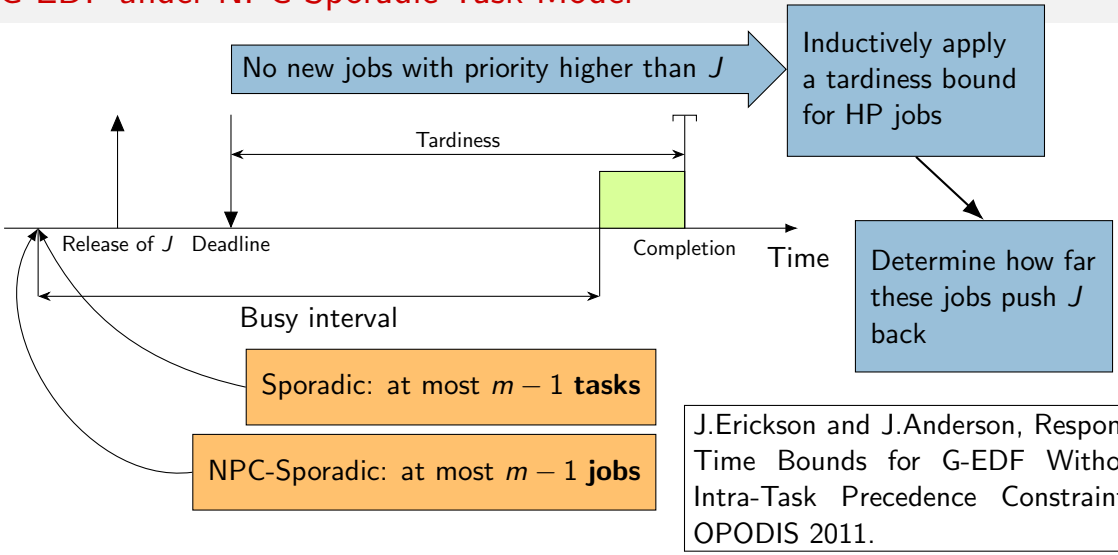

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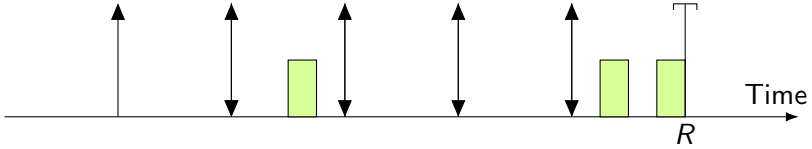

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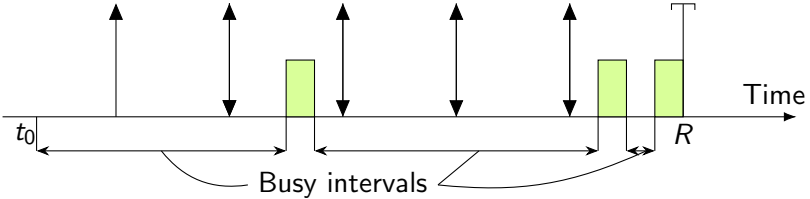

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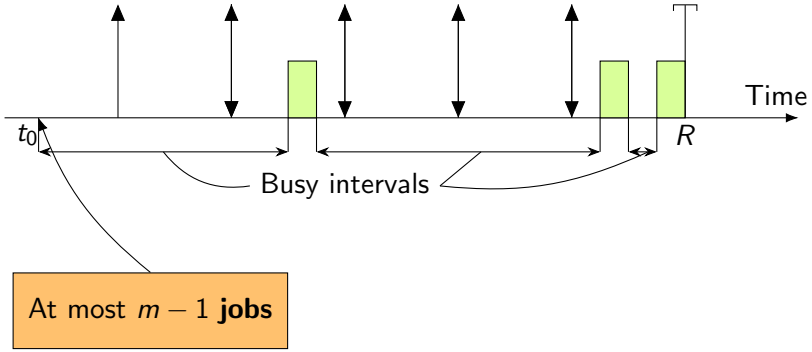

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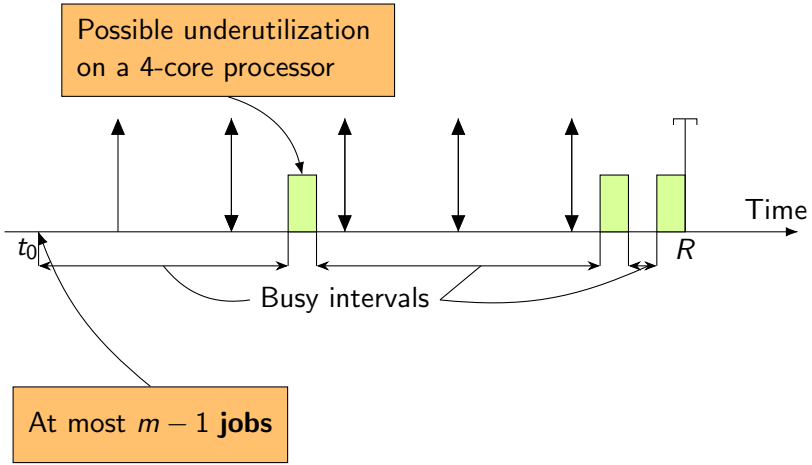

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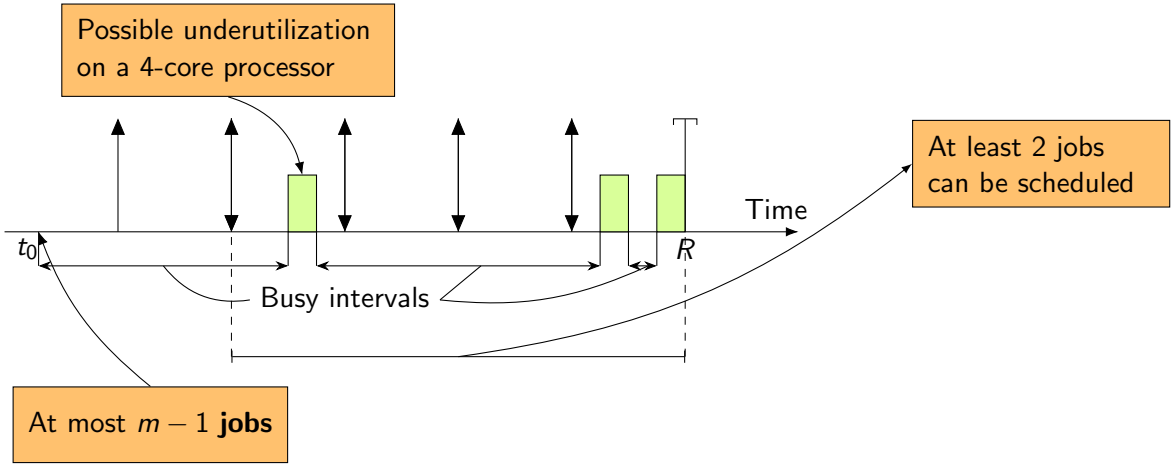

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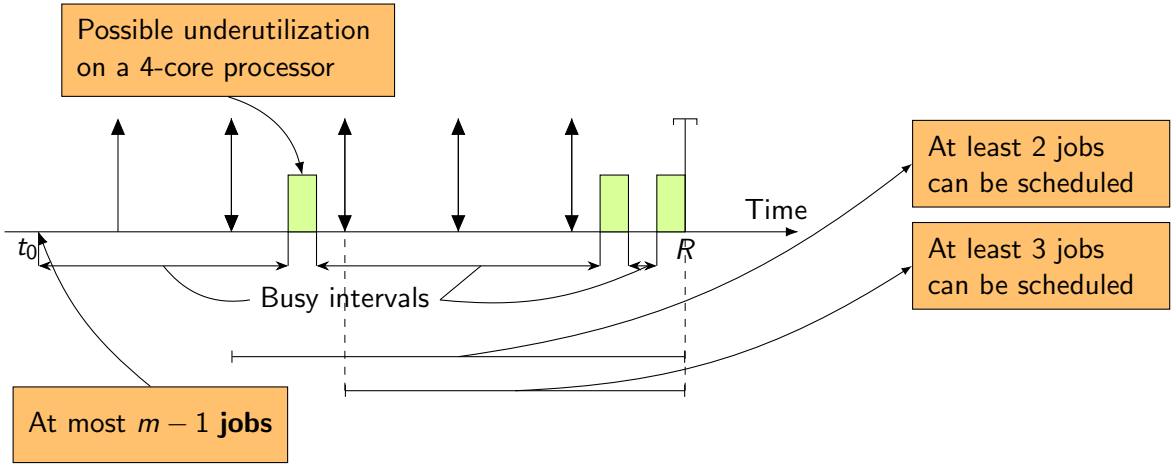

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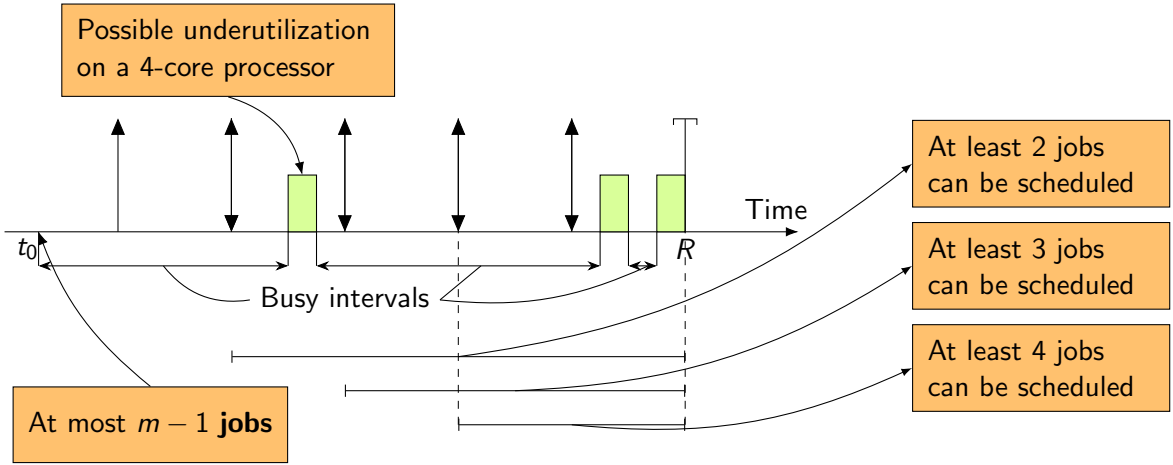

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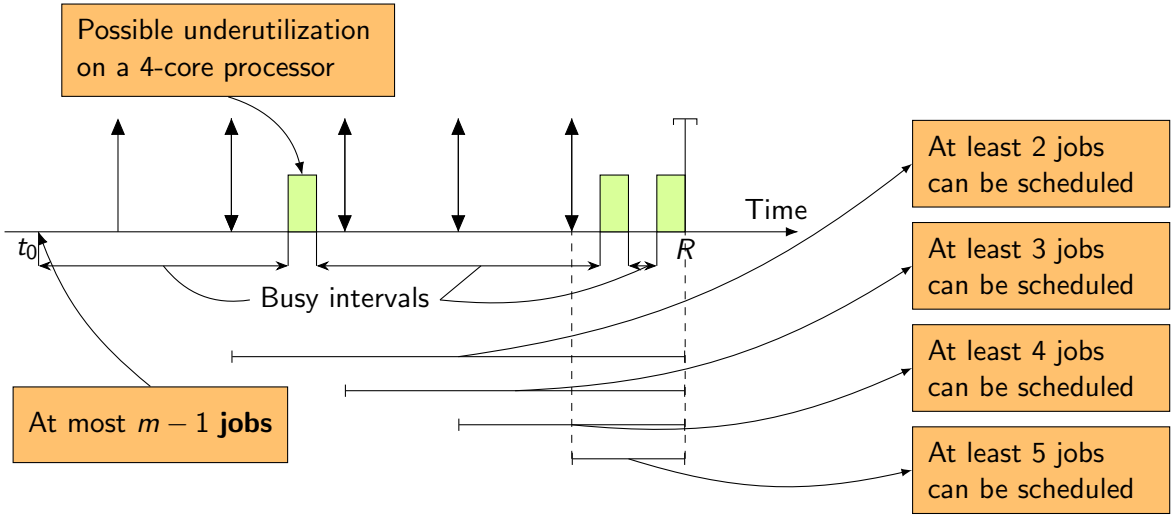

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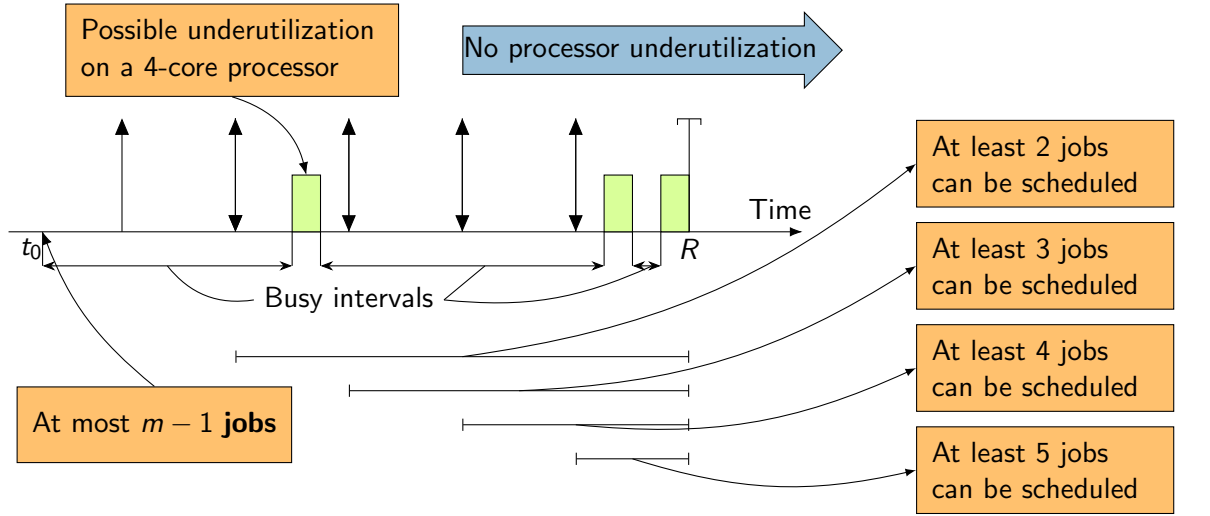

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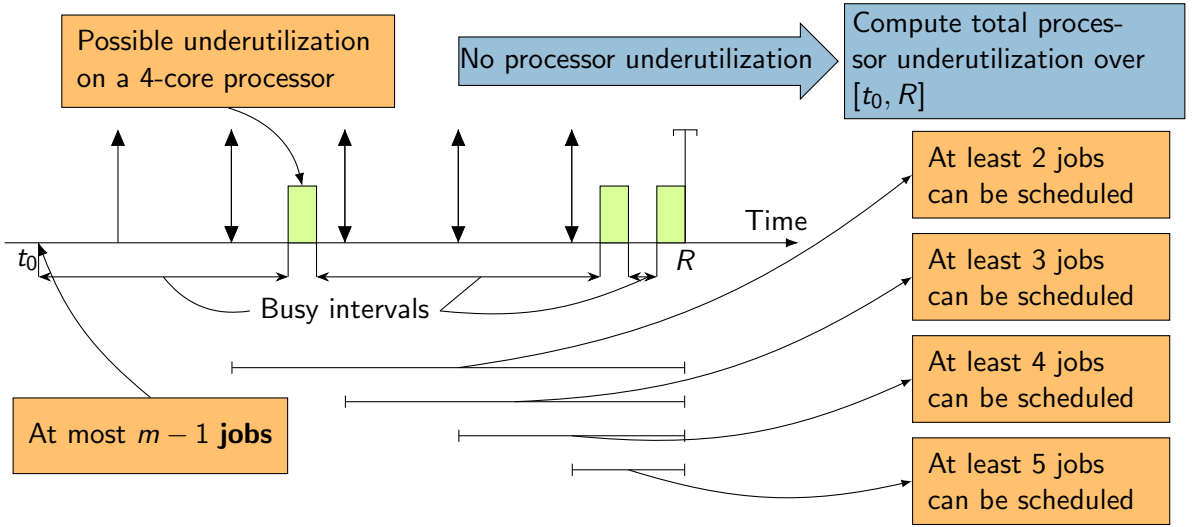

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- Any NPC-sporadic task, regardless of other tasks in system
- Any work-conserving scheduler (preemptive or not)
- Asymptotically optimal

Prior work: J.Erickson and J.Anderson,
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Strategy:

- Apply partitioned scheduling
- Use only bin packing heuristics
- Get smaller tardiness bounds

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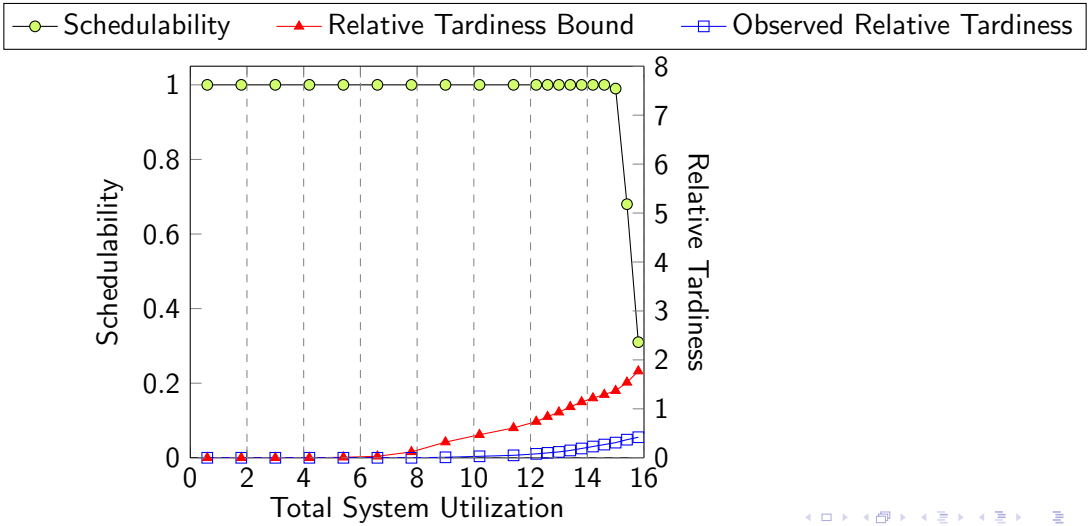

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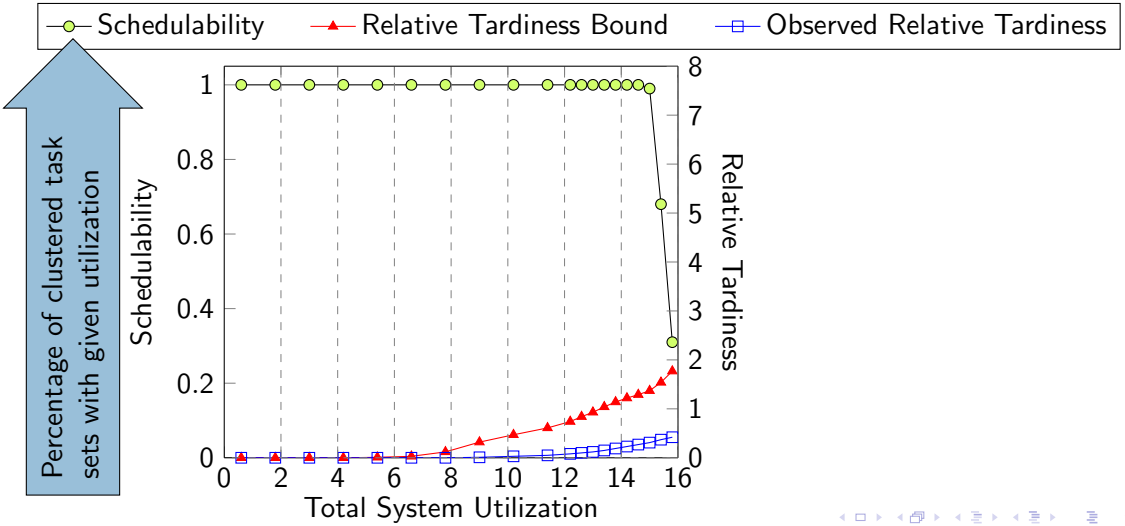

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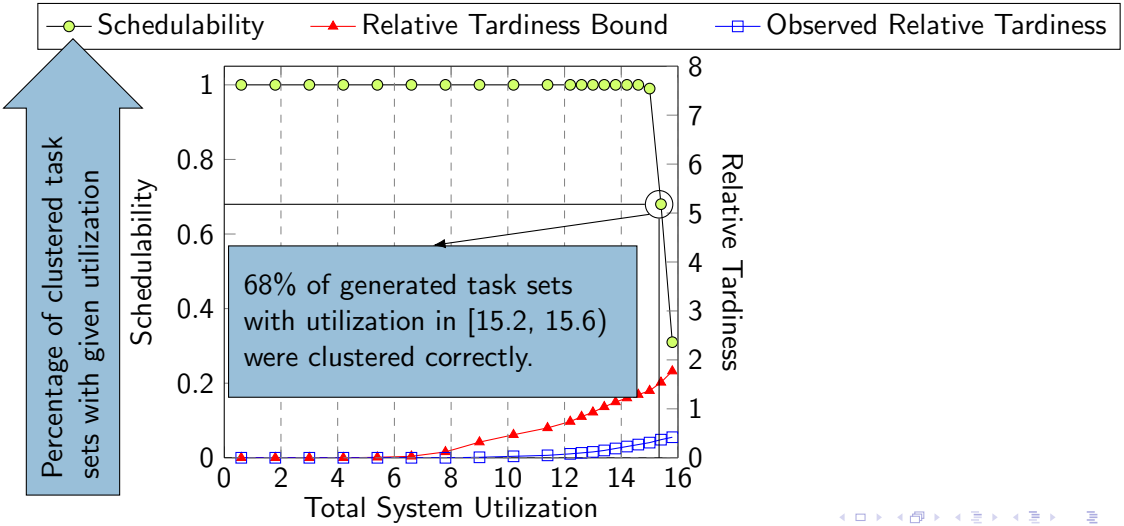

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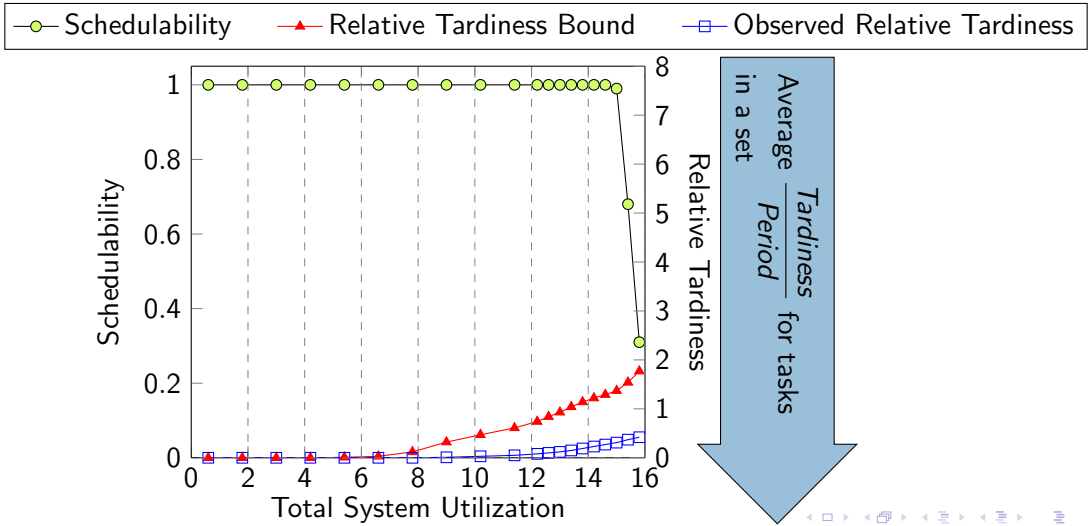

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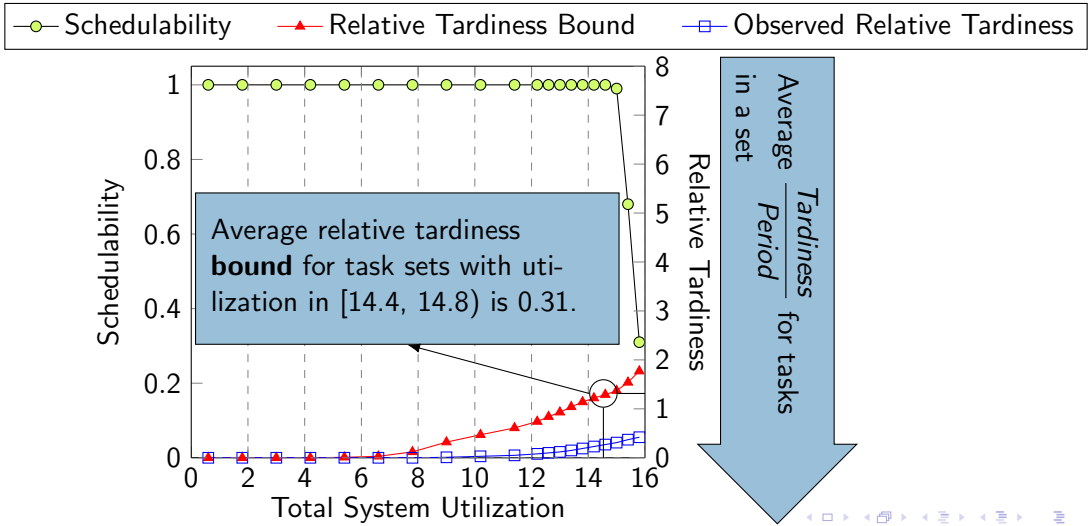

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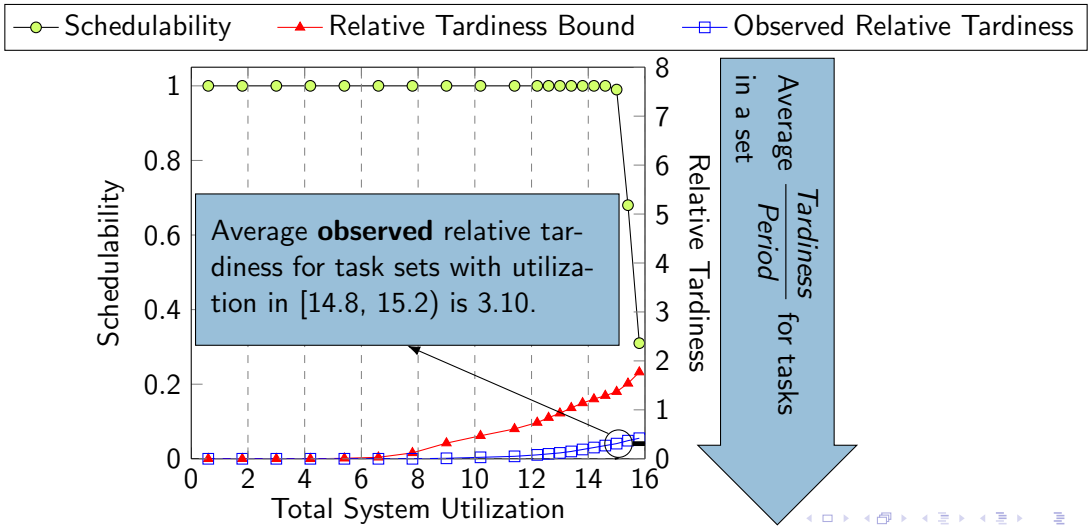
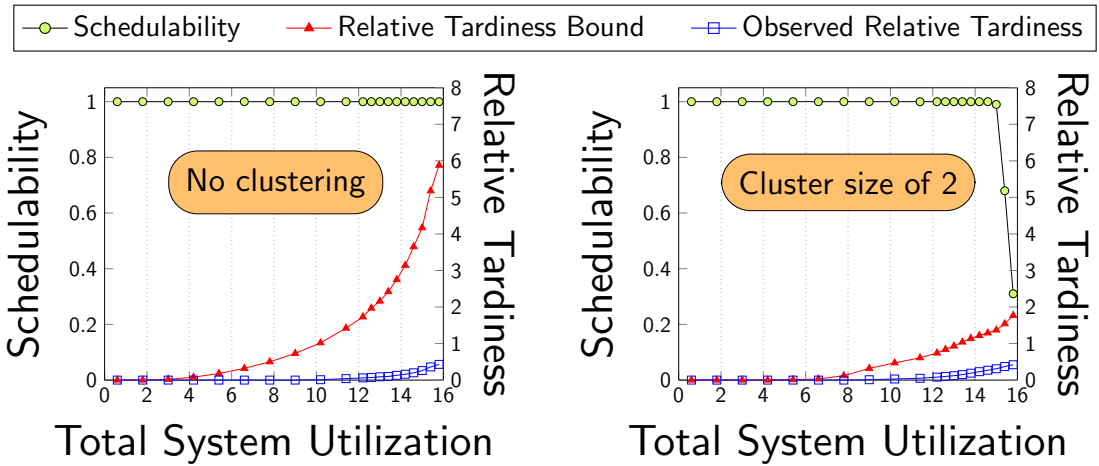


Experiments



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Thank you for listening.