

SCHEDULABILITY ANALYSIS OF THE LINUX PUSH & PULL SCHEDULER WITH **ARBITRARY PROCESSOR AFFINITIES***

Arpan Gujarati, Felipe Cerqueira, Björn Brandenburg
Max Planck Institute for Software Systems, Germany (Kaiserslautern - Saarbrücken)

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Multiprocessor Real-Time Scheduling THEORY

Schedulability analysis

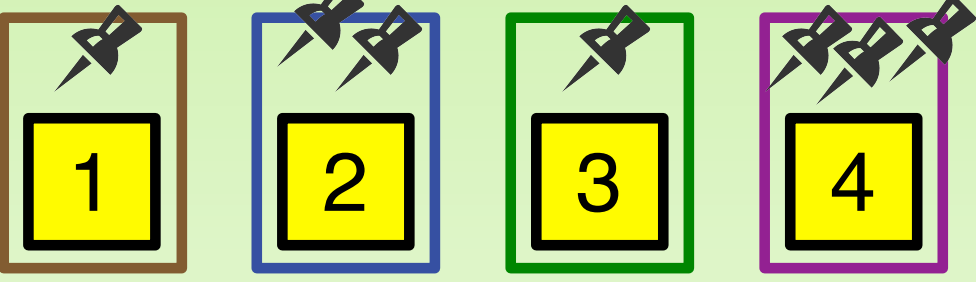
No deadline misses!

State-of-the-art analyses exist for the following scheduling algorithms:

Global scheduling (**unrestricted** migrations)

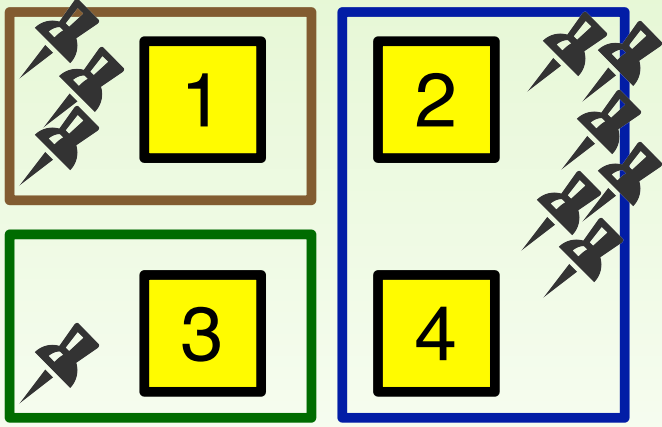


Partitioned scheduling (**no** migration)



Clustered scheduling (**restricted** migrations)

~ **generalizes** global and partitioned scheduling



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 CPU  Task Permissions

4

New Approach to Schedulability ANALYSIS

Schedulability guarantees for APA schedulers:

APA scheduling problem

reduction

"global-like" subproblems

At least one subproblem should be schedulable using **any global schedulability analysis**

Exponential number of subproblems — we also propose a fast and accurate **heuristic**

Theoretical implications:

APA scheduling **strictly dominates** global, partitioned, and clustered scheduling for job-level fixed priority (JLFP) policies

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Meanwhile Real-Time Systems in PRACTICE...

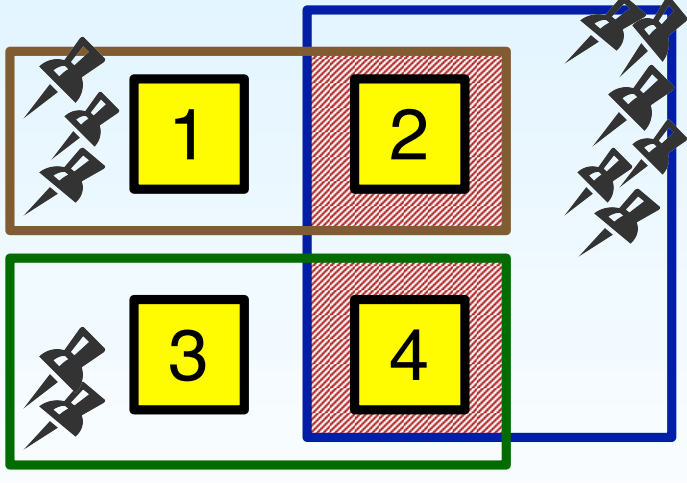
CPU affinity interface in Linux

```
int sched_setaffinity(pid_t pid, size_t cpusetsize, cpu_set_t *mask);  
  
int sched_getaffinity(pid_t pid, size_t cpusetsize, cpu_set_t *mask);
```

Arbitrary Processor Affinities (APA) → Overlapping clusters

~ **Flexible** task migrations

~ Example APA scheduler: Linux push & pull scheduler



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This work addresses the following QUESTIONS

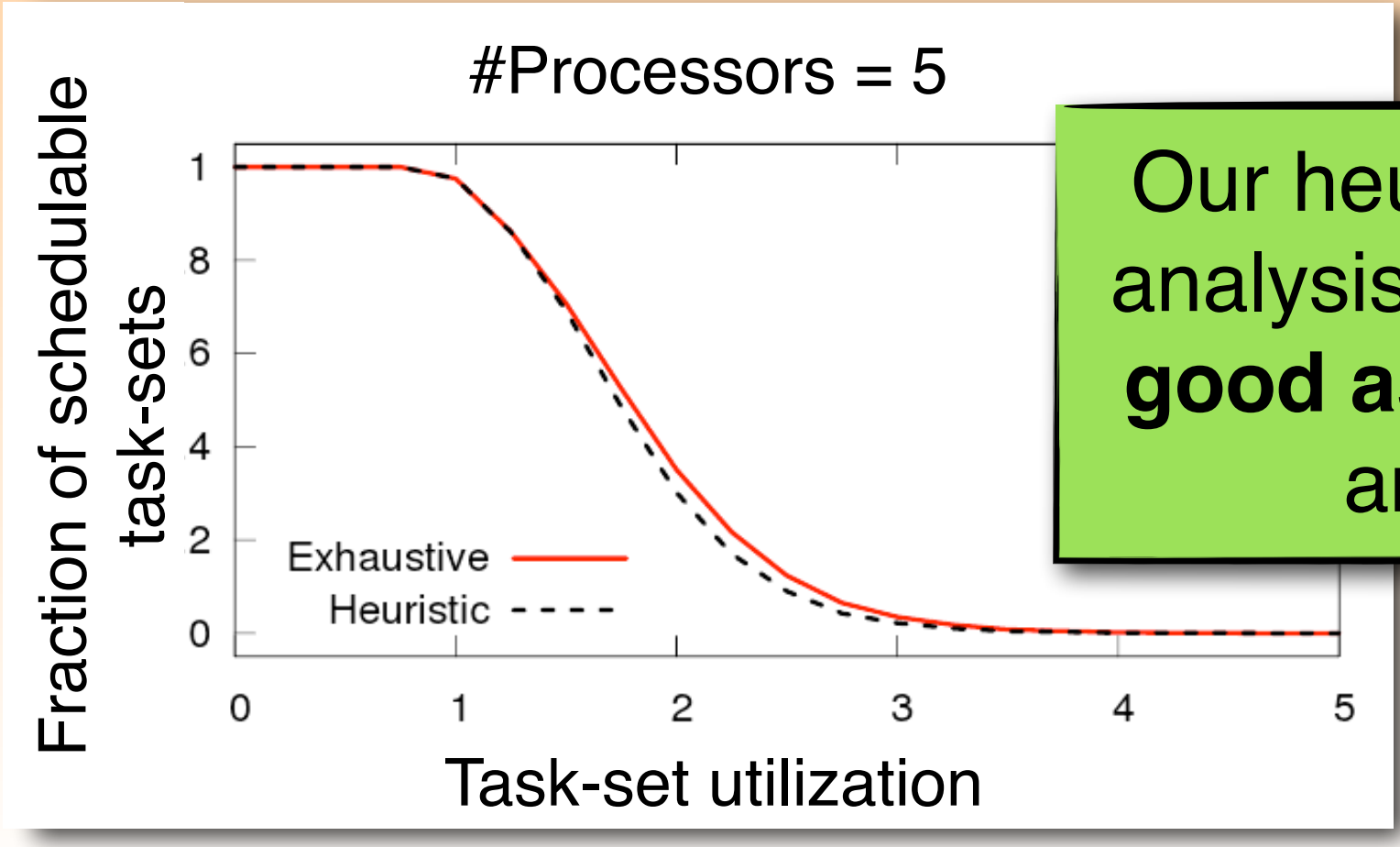
How can we derive **schedulability guarantees** for APA schedulers?

Does APA scheduling have interesting **theoretical implications**?

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CONTRIBUTIONS

We are the **first** to propose an analysis for the APA scheduling problem



Our heuristic-based analysis is almost **as good as** exhaustive analysis

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