

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

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1 Multiprocessor Real-Time Scheduling THEORY

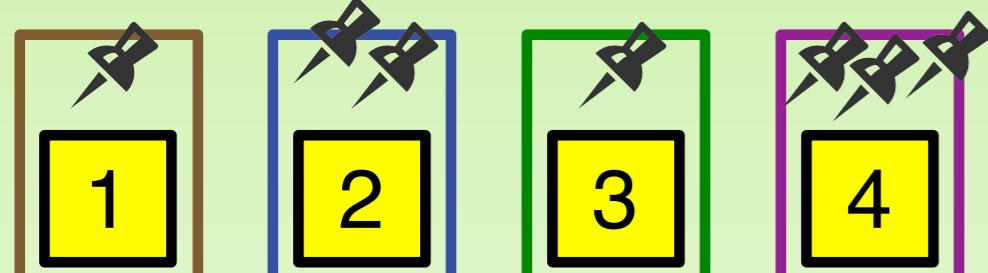


State-of-the-art analyses exist for the following scheduling algorithms:

Global scheduling (**unrestricted** migrations)

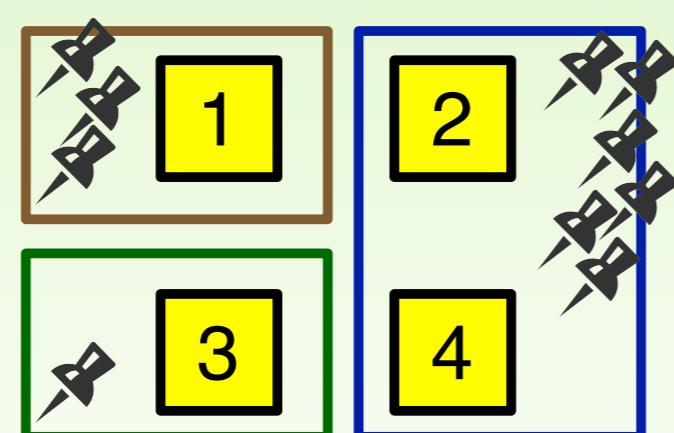


Partitioned scheduling (**no** migration)



Clustered scheduling (**restricted** migrations)

- ~ **generalizes** global and partitioned scheduling



■ CPU

↗ Task

□ Permissions

4 New Approach to Schedulability ANALYSIS

Schedulability guarantees for APA schedulers:



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

2 Meanwhile Real-Time Systems in PRACTICE...

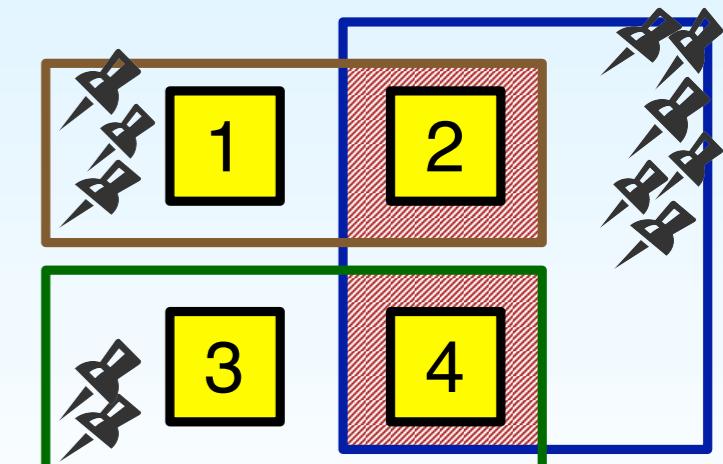
CPU affinity interface in Linux

```
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



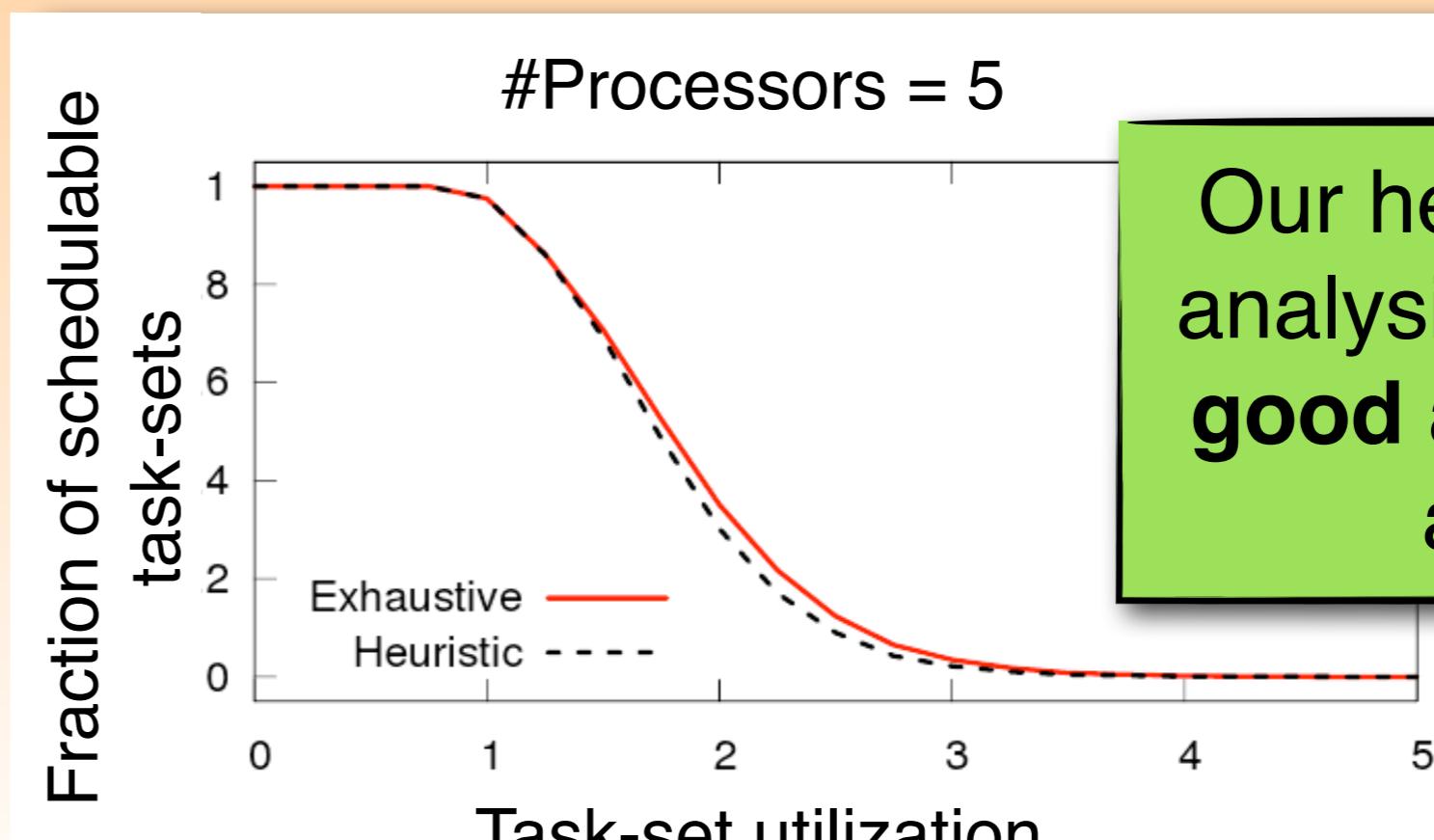
3 This work addresses the following QUESTIONS

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

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

5 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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