Thesis Research

Presentation for Huawei Technologies

Application of State-Transition Graphs for Optimized Heterogeneous Scheduling

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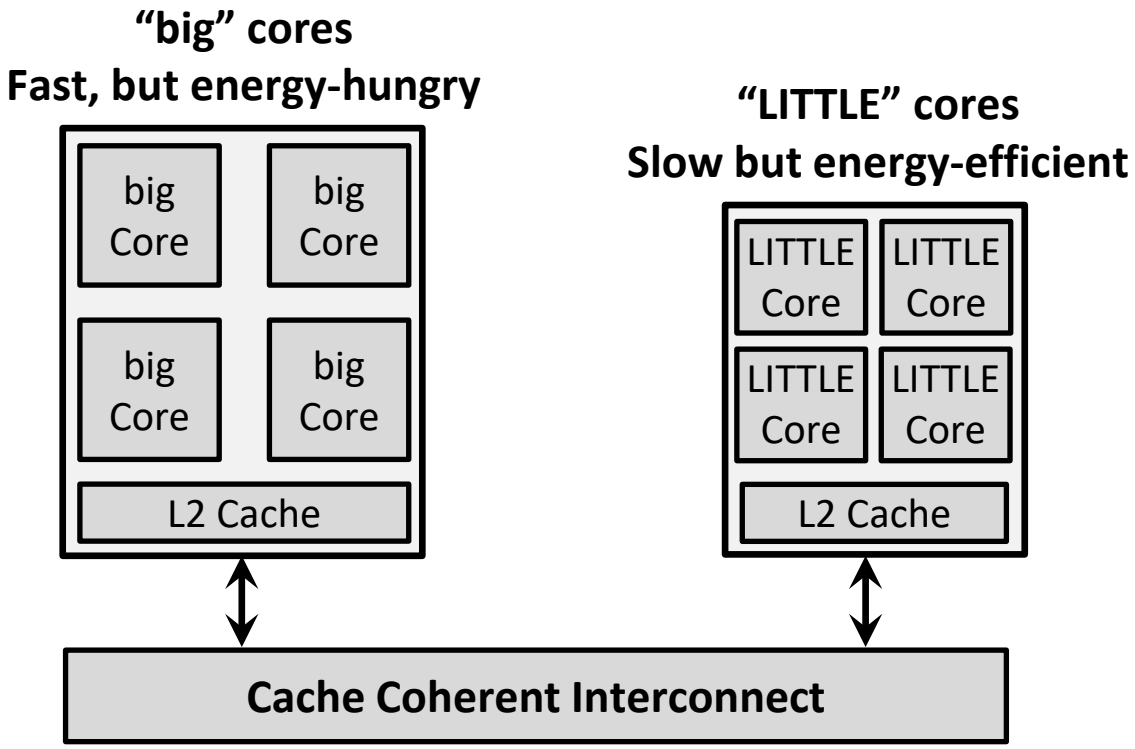
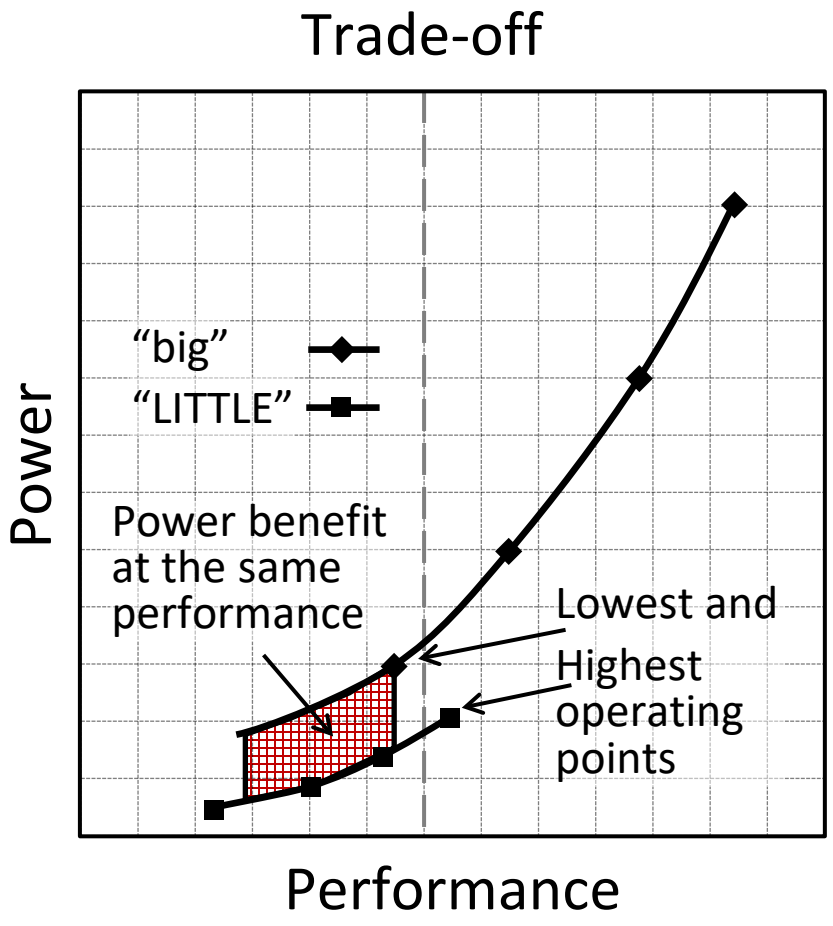
Heterogeneous Platform Example: ARM big.LITTLE

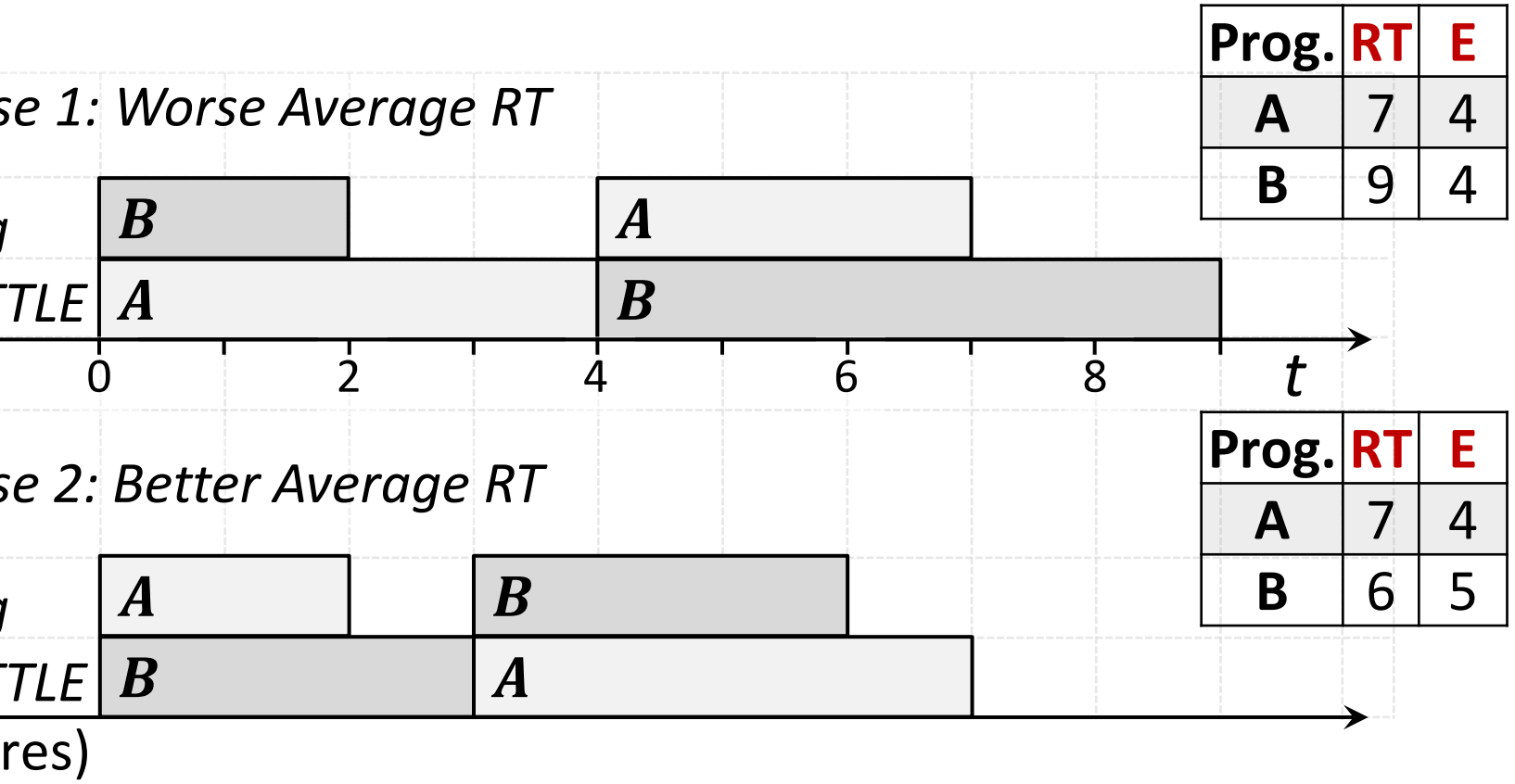




- A chosen scheduling policy significantly affects the runtime and energy efficiency;
- Essential for mobile devices with autonomous power supply.

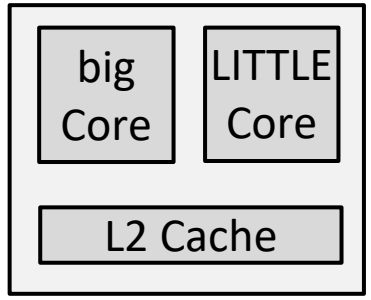
Examples of Heterogeneous Schedules for Programs A, B

Objective: optimize trade-off between **R**esponse **T**ime and **E**nergy



Prog.	RT	E
A	7	4
B	9	4

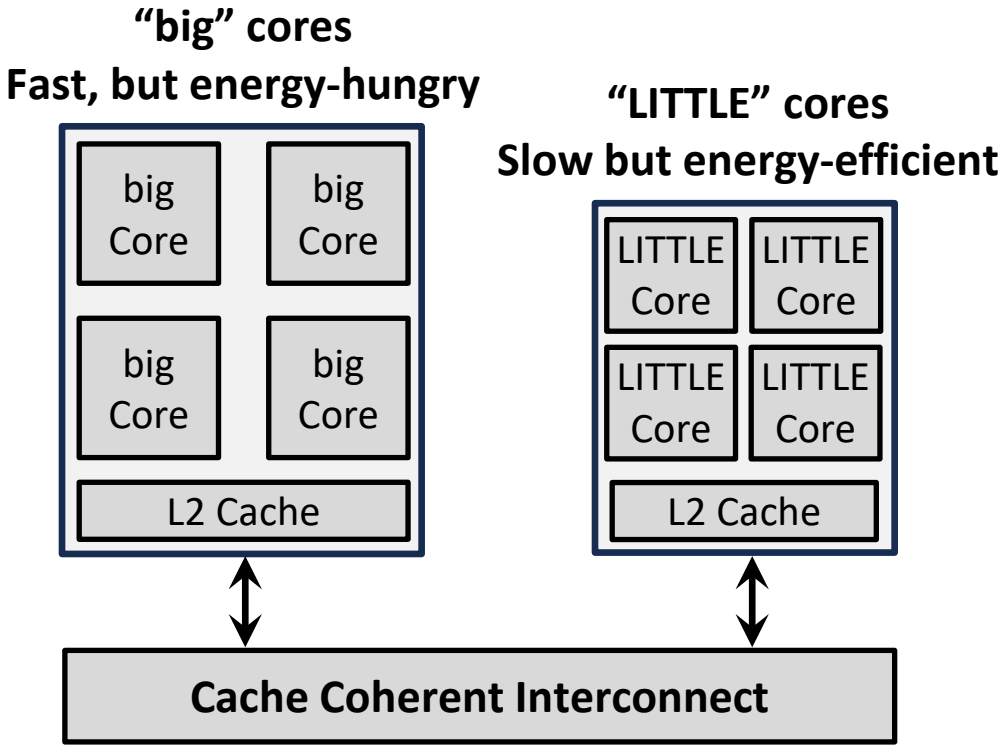
Prog.	RT	E
A	7	4
B	6	5



Oversimplified ARM big.LITTLE

Schedulers affect the efficiency of hardware utilization

Existing Heterogeneous Schedulers



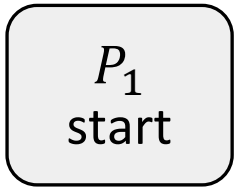
Schedulers:

- HEFT: Heterogeneous Earliest Finish Time;

- HASS: Heterogeneity-Aware Signature-Supported.

Property	Description
Objective	to minimize programs response times;
Principle	heuristic and greedy based
Key limitations	suboptimal scheduling decisions; no optimization of energy consumption.

State-Transition Graph for a Solo Program P_1



P_1 requirements

Block	Param	Core 1	Core 2
Block 1	Time	5	4
	Energy	6	10
Block 2	Time	3	2
	Energy	3	7
Block 3	Time	2	2
	Energy	3	6

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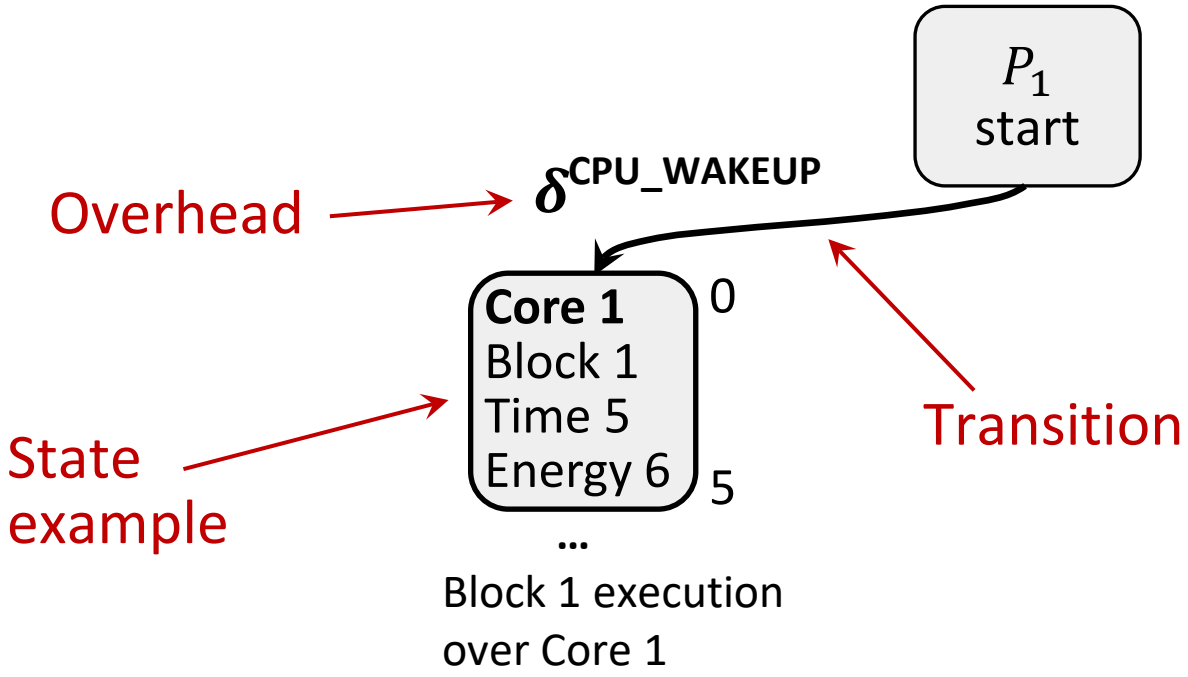

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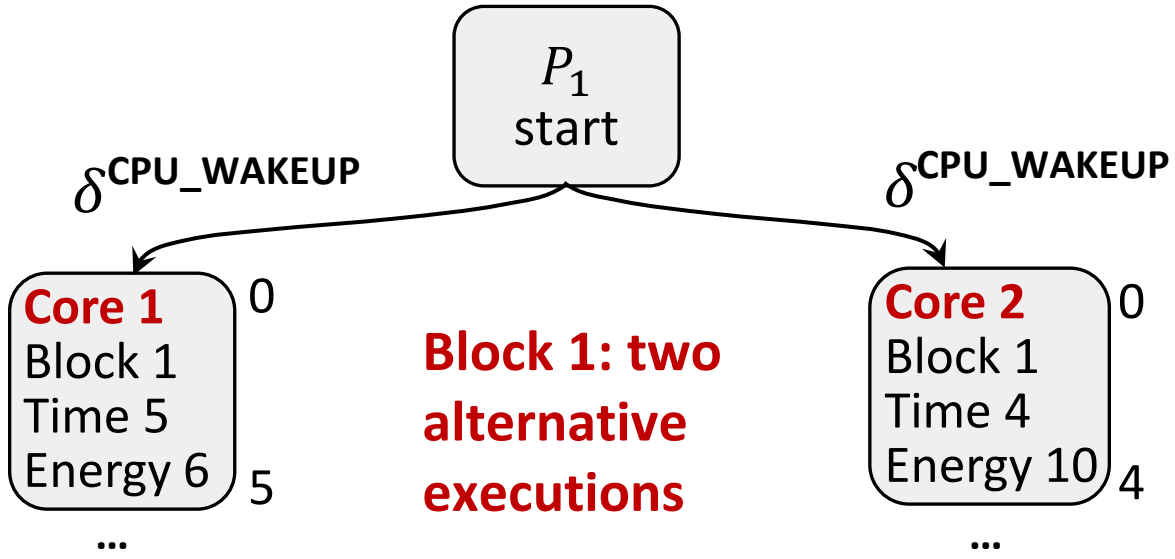

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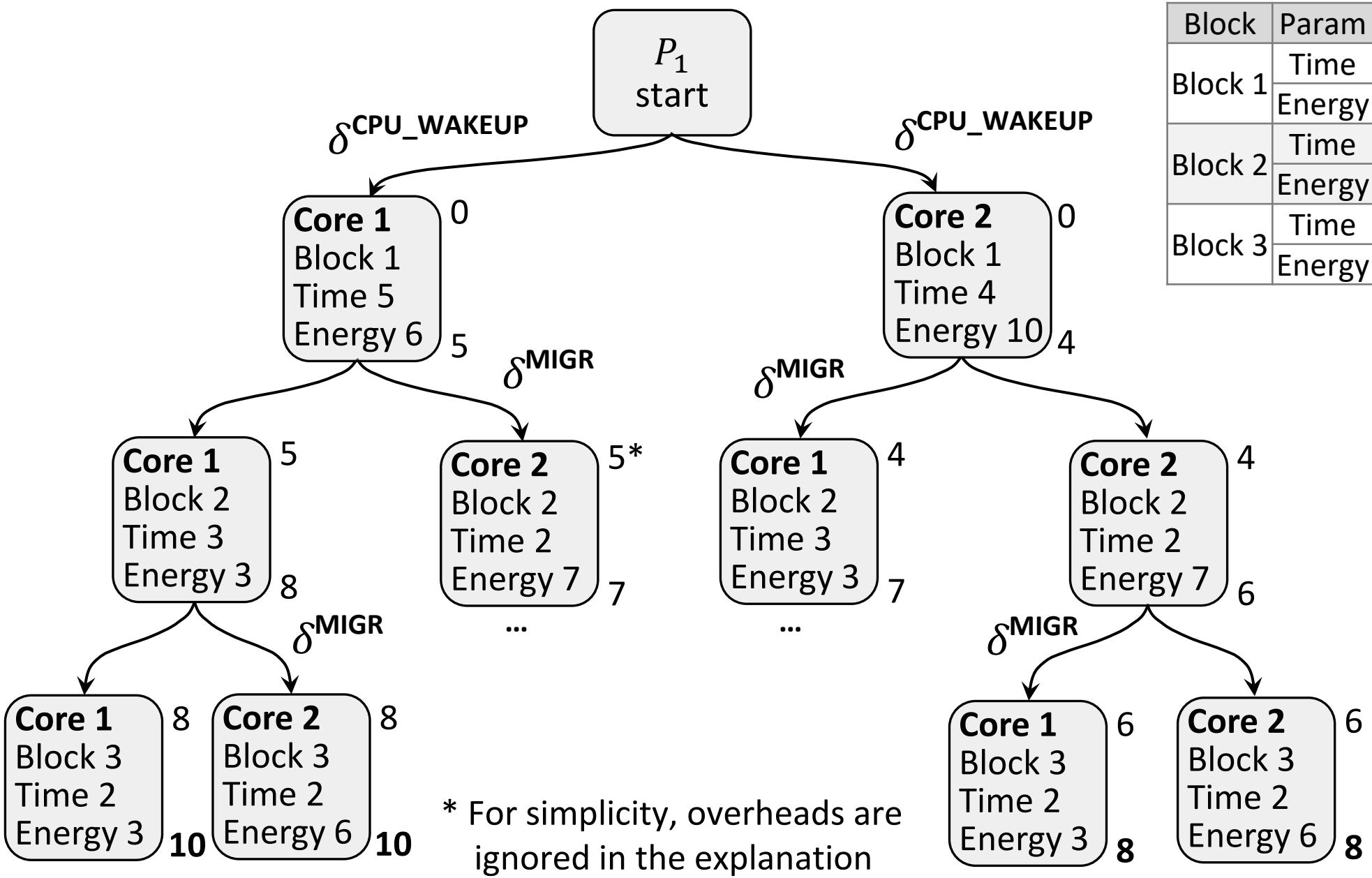

* For simplicity, overheads are ignored in the explanation

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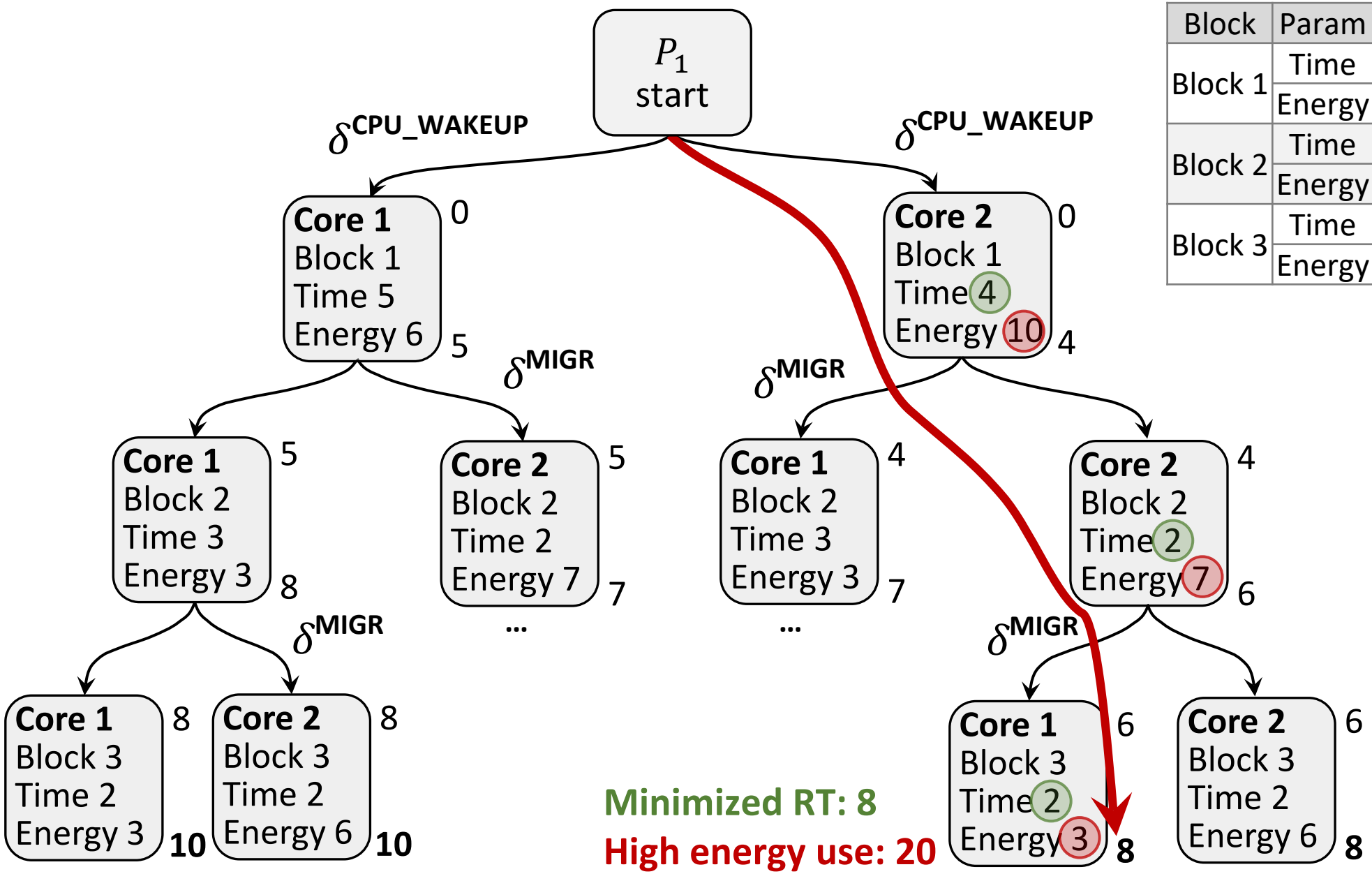

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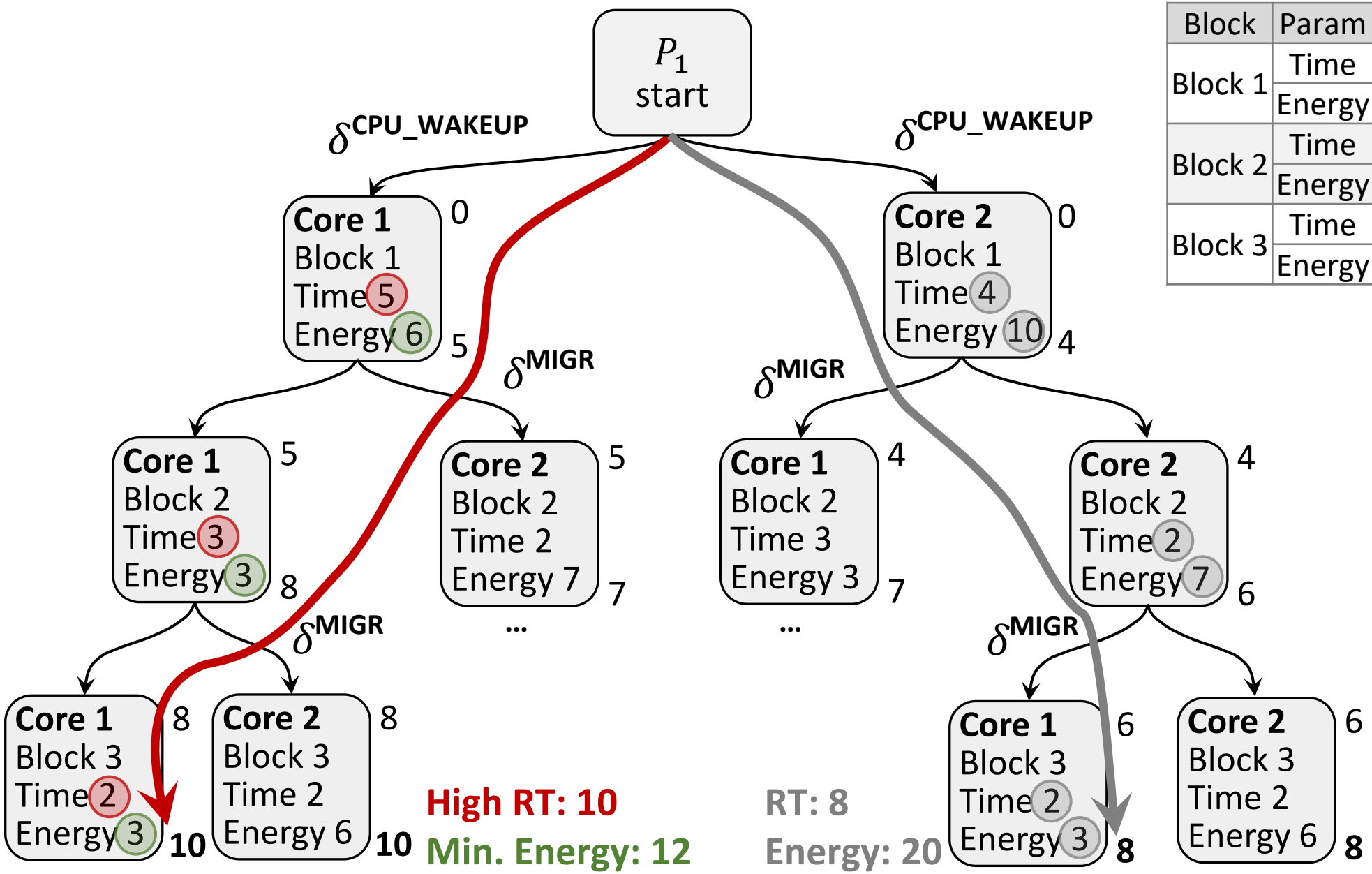
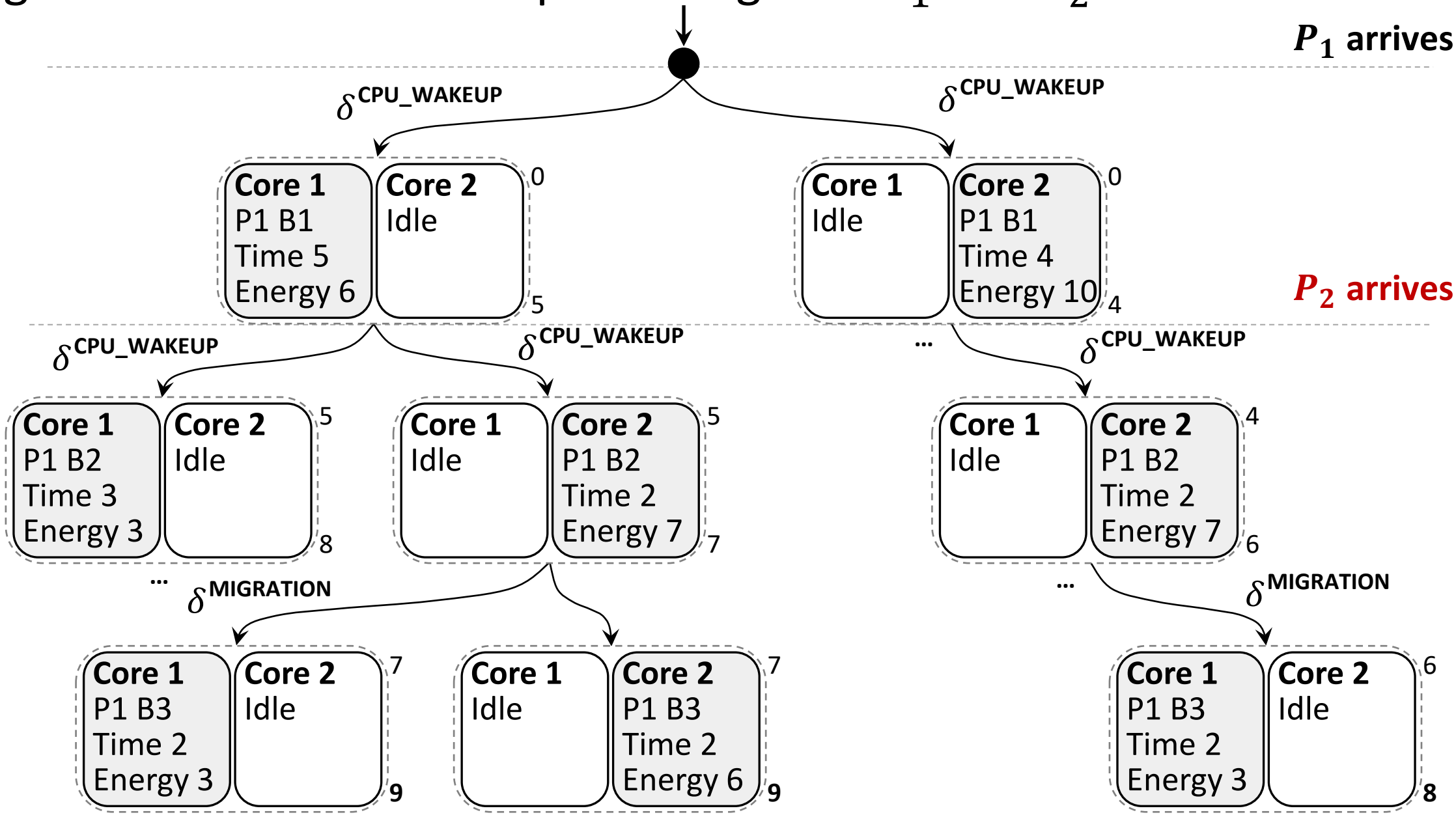


Merged State-Transition Graph of Programs P_1 and P_2



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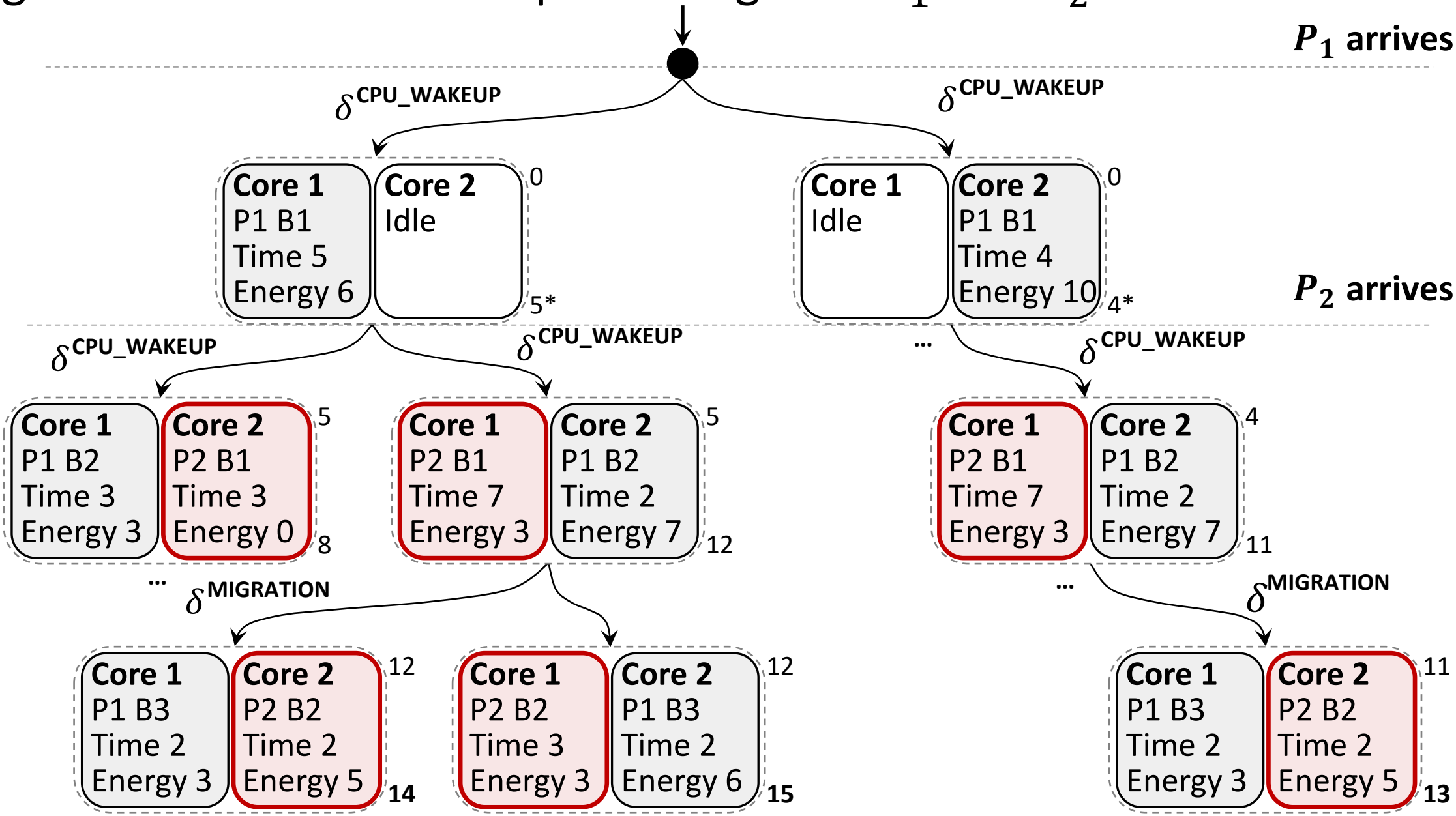

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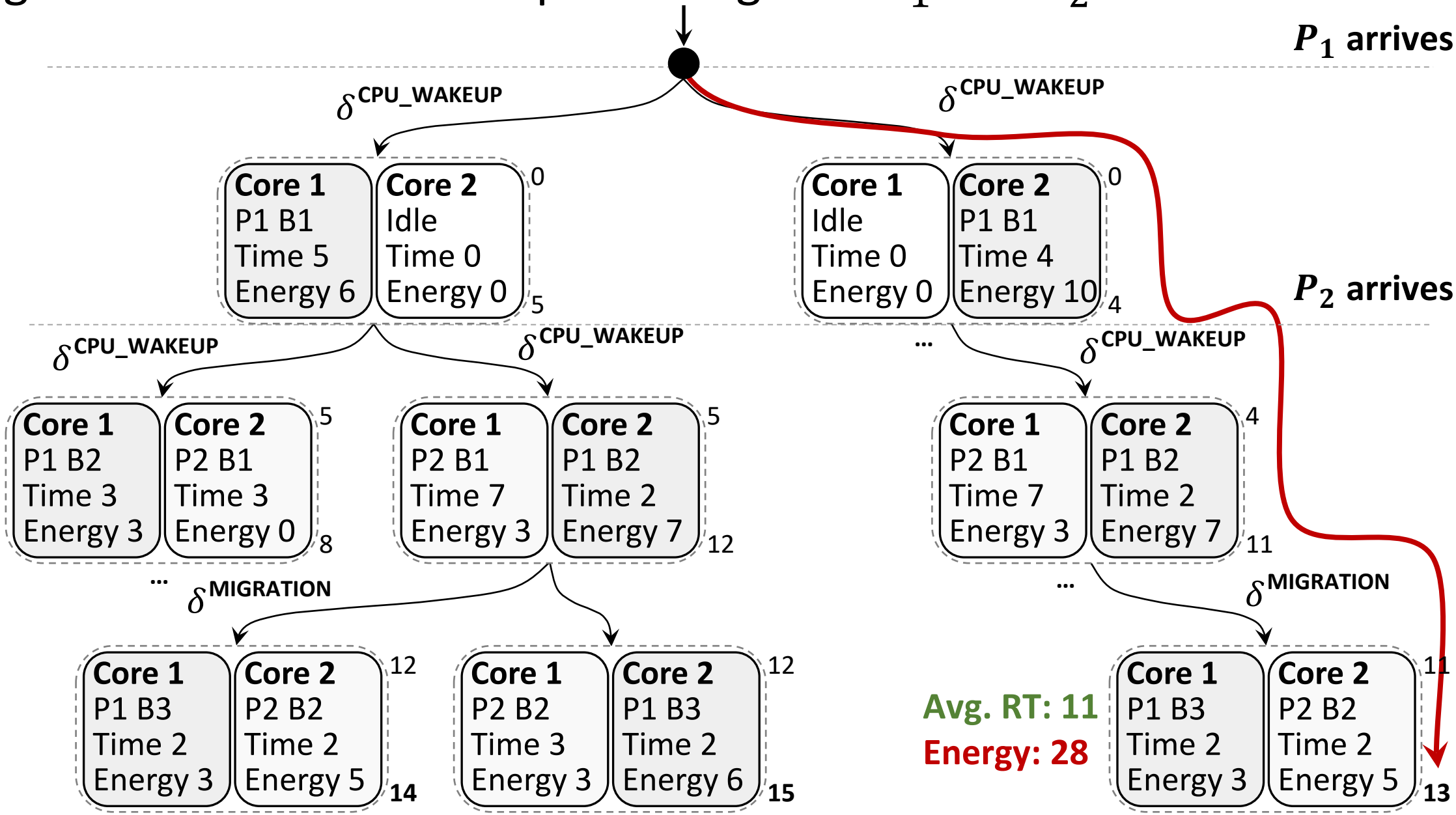

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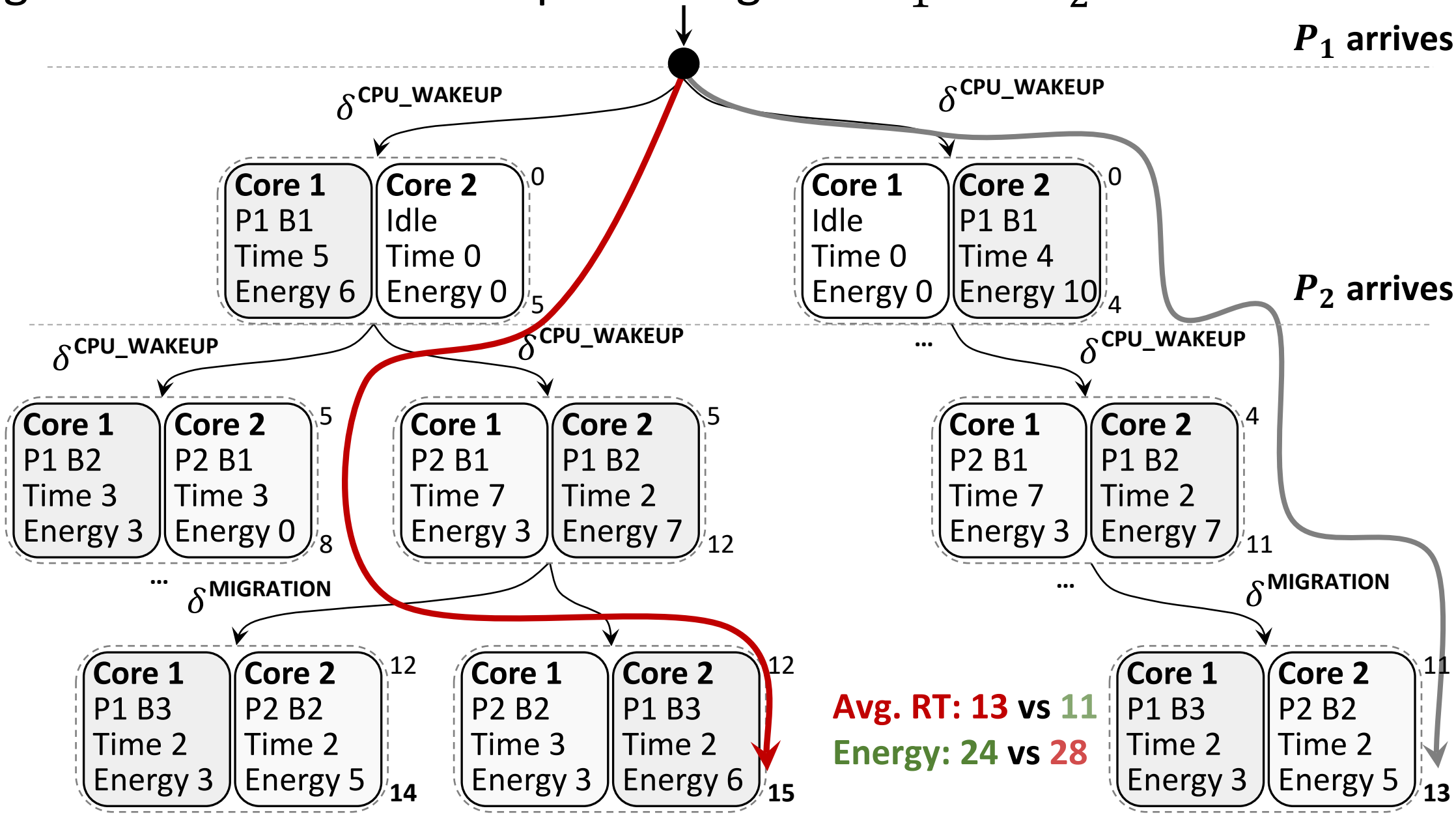

Status: Ongoing Thesis Work

- State-Transition Graph is an appropriate starting point for deriving optimal and suboptimal scheduling techniques;
- Potential pruning rules allow to control the analysis runtime making it more tractable for large systems;
- This methodology triggered a potential collaboration with Huawei but for now the submitted research proposal to the CSTT grant committee was not approved.