arm

OSPM 2020
OEM scheduler changes

Changes made to the Linux kernel scheduler to meet the phones requirements for performance and battery saving.

1. CPU Isolation

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2. Migration margins for CPU asym capacity

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3. Packing task on active CPU

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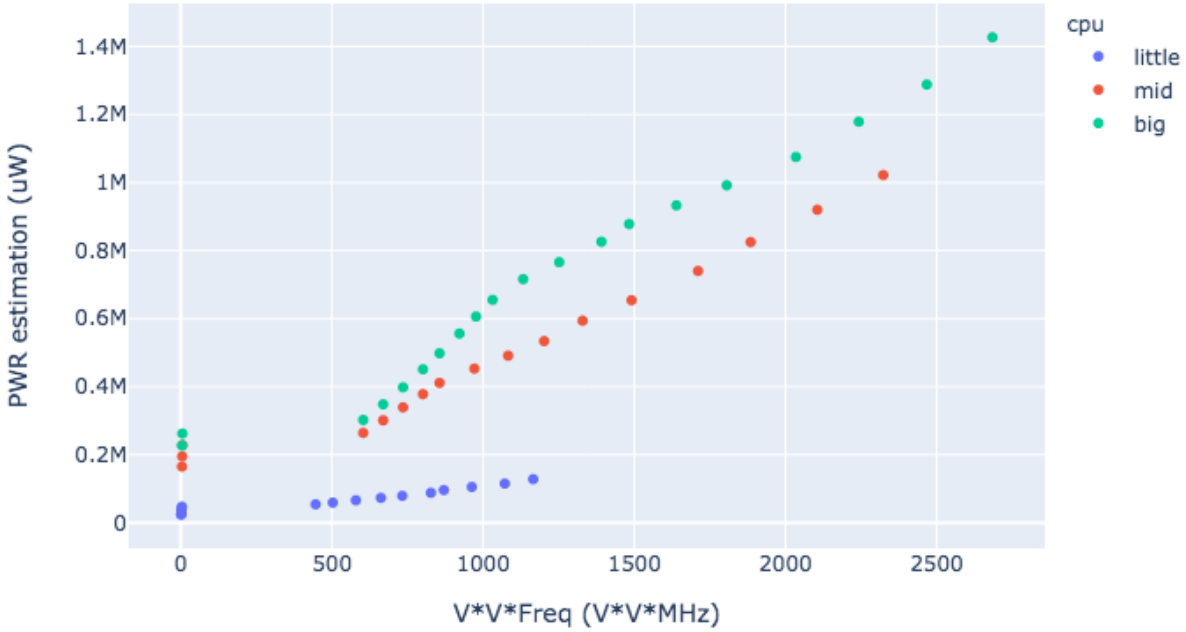
Setup

Setup

Google Pixel4

Setup

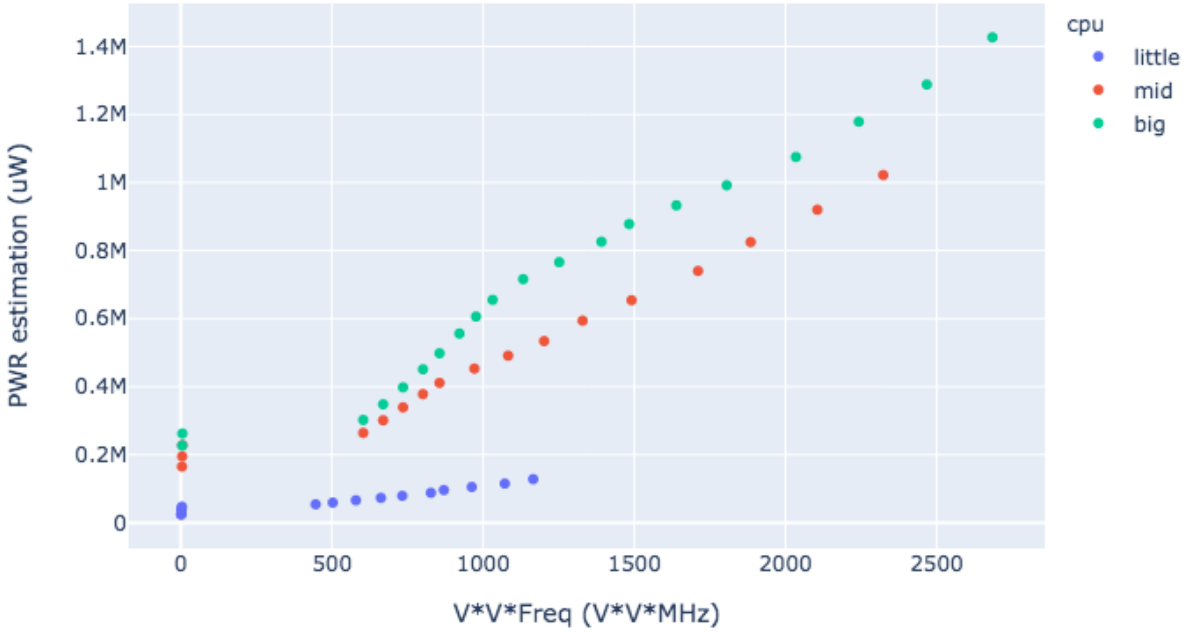
Google Pixel4



Setup

Google Pixel4

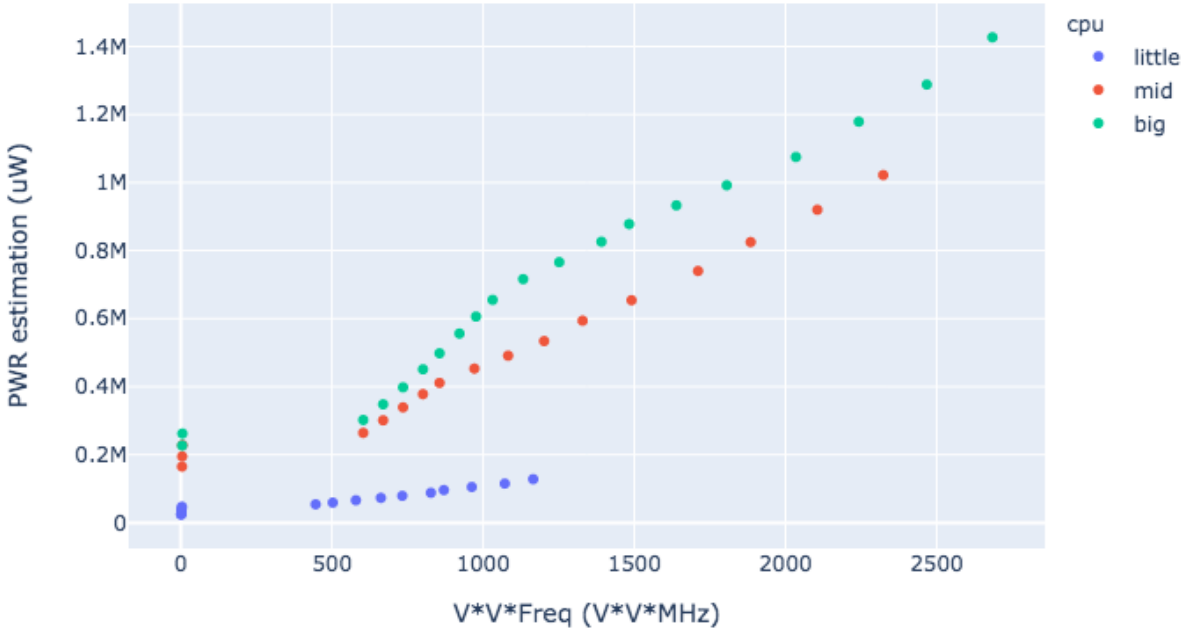
- Performance results:
  - **PCMark Benchmark**.
  - 100 runs.



Setup

Google Pixel4

- Performance results:
  - **PCMark Benchmark**.
  - 100 runs.
- Energy results:
  - Power measurement made on the PMIC CPU rails.
  - 10 runs.



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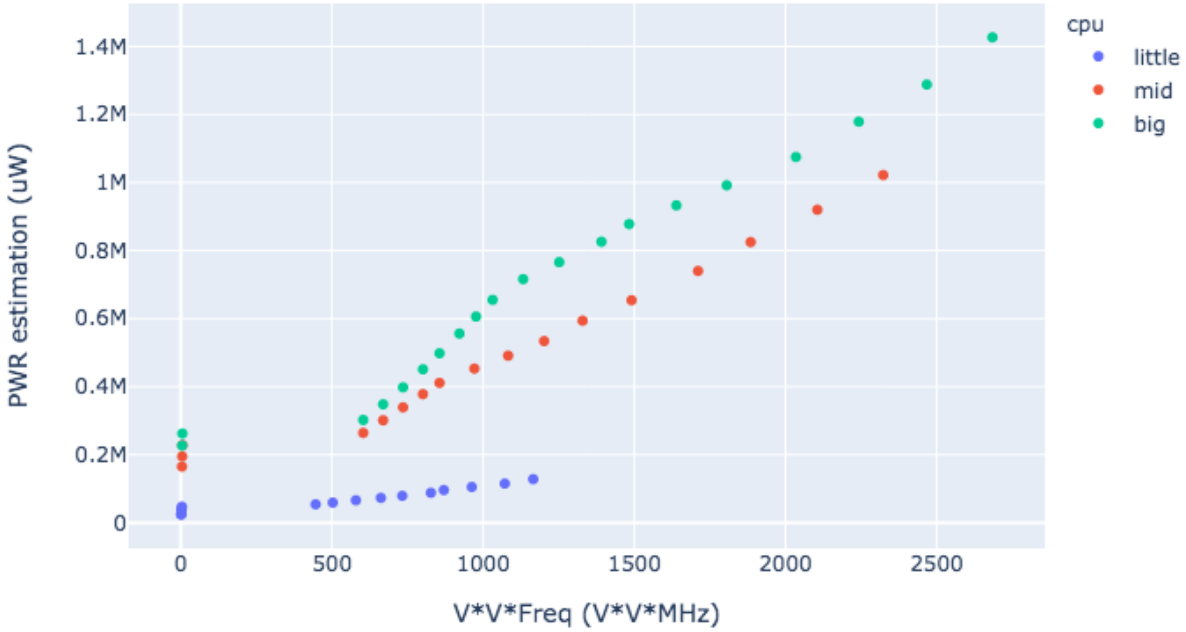

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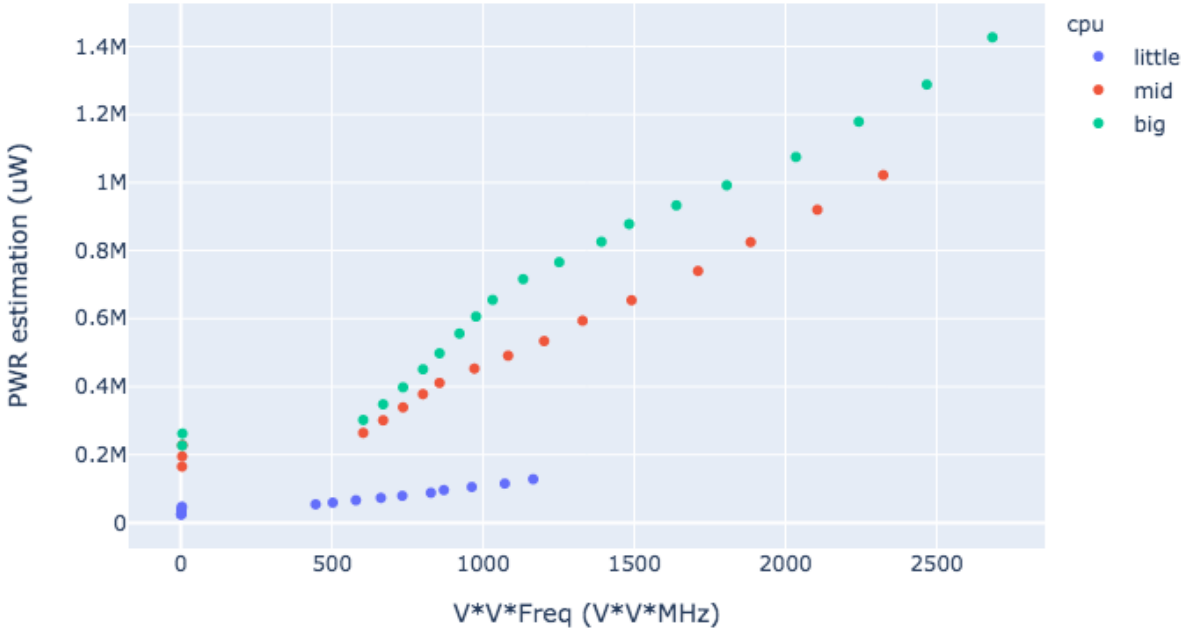
Setup

Google Pixel4

- Performance results:
  - **PCMark Benchmark**.
  - 100 runs.
- Energy results:
  - Power measurement made on the PMIC CPU rails.
  - 10 runs.
- Statistics:
  - Wilcoxon signed rank test p-value
  - P-value > 0.01 excluded



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1. CPU Isolation - Implementation

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… Lightweight but fast hotplug

1. CPU Isolation - Usage

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- Number of running tasks

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- Current CPU utilisation

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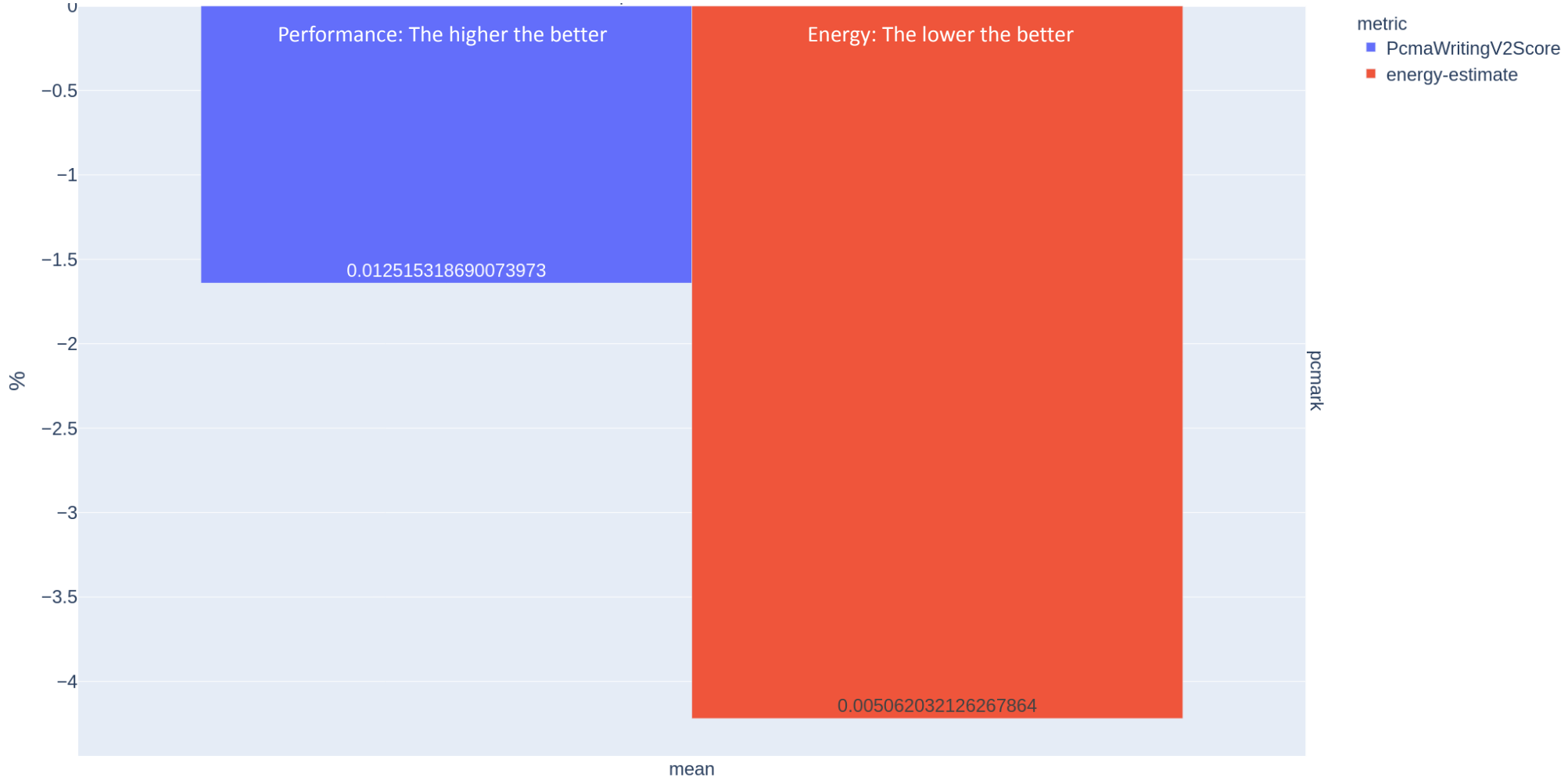
#CPUs to isolate per cluster

1. CPU Isolation



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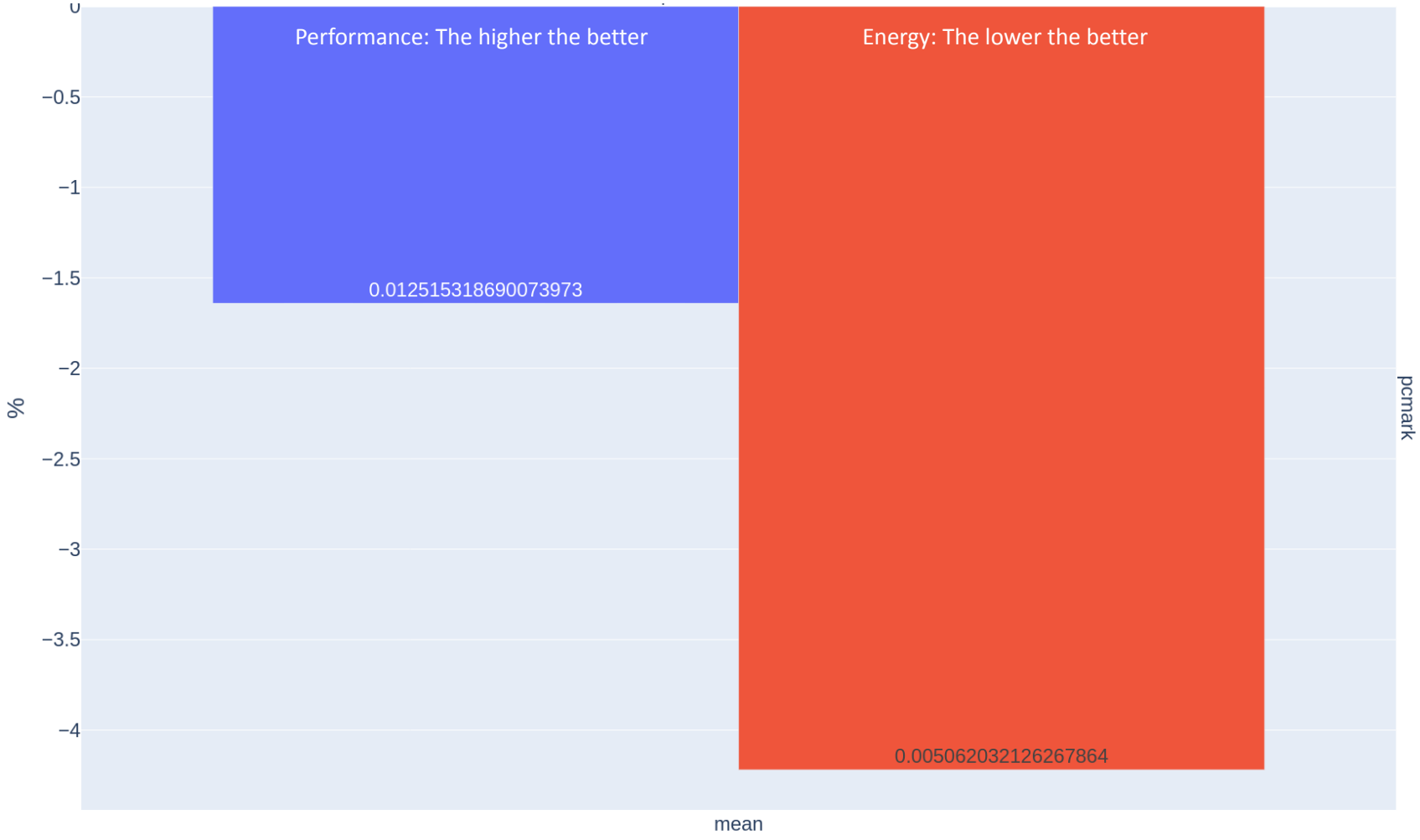

Based on:

- CPU Frequencies
- CPU Idle states

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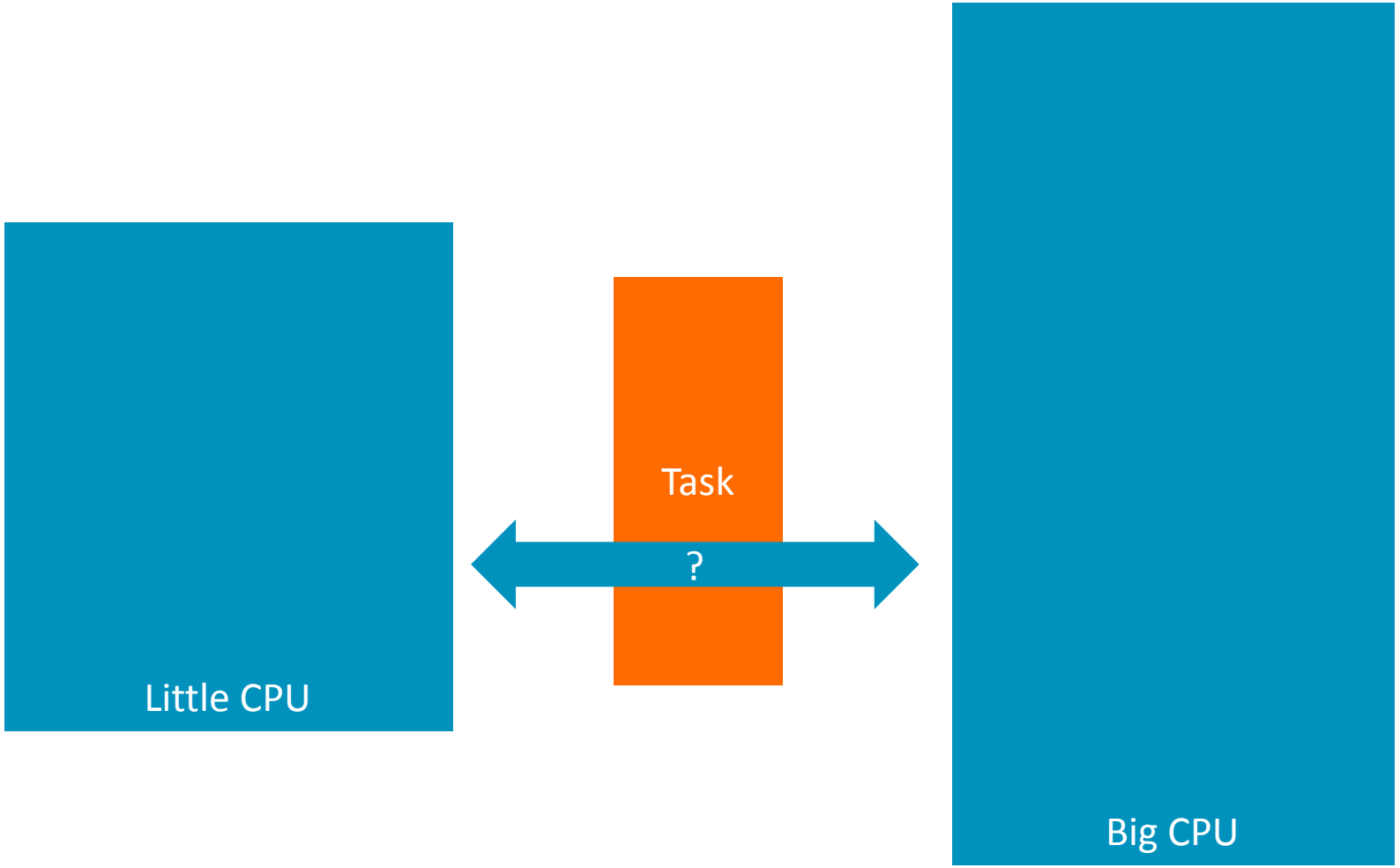
2. Migration margins for asym CPU capacities



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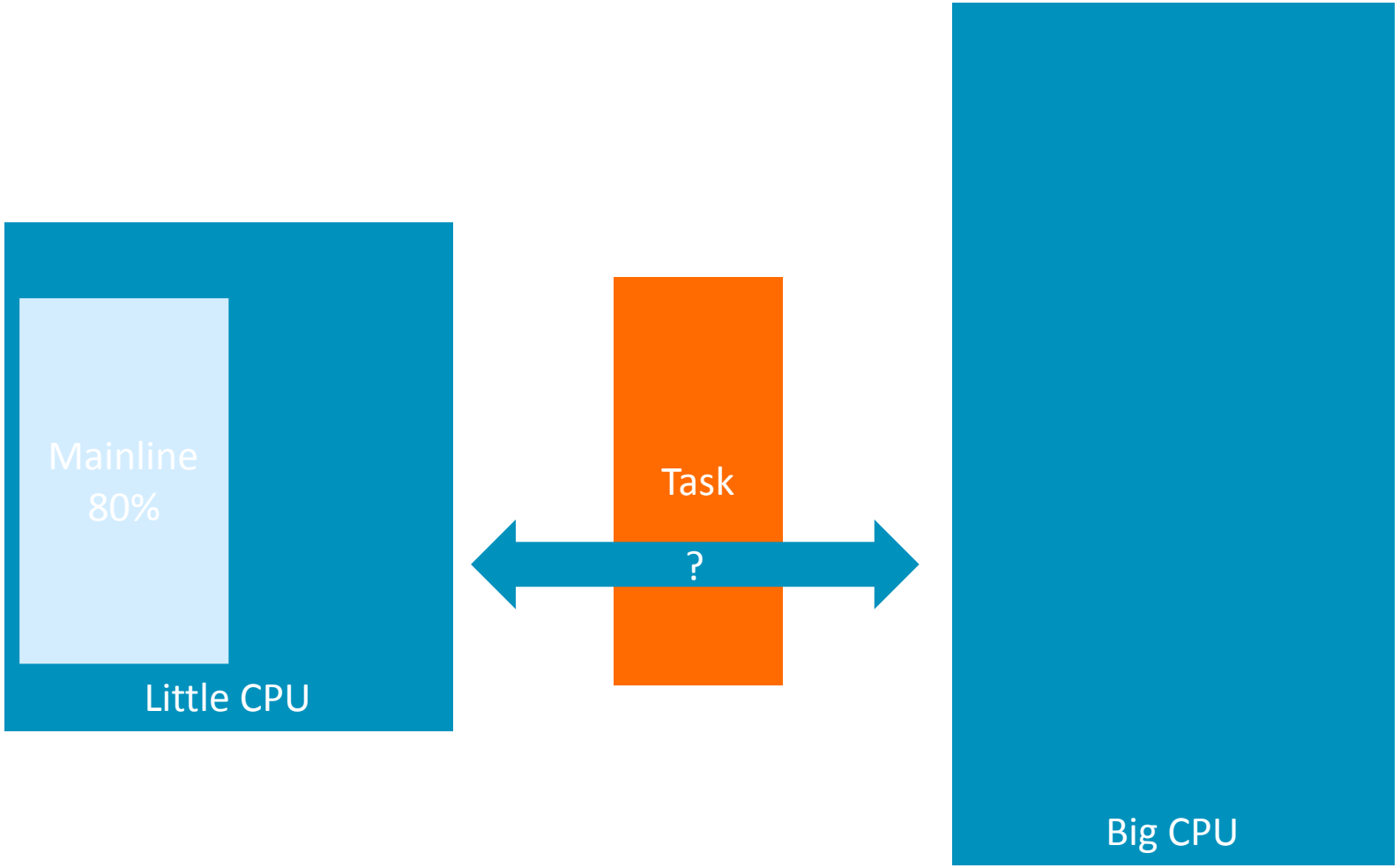

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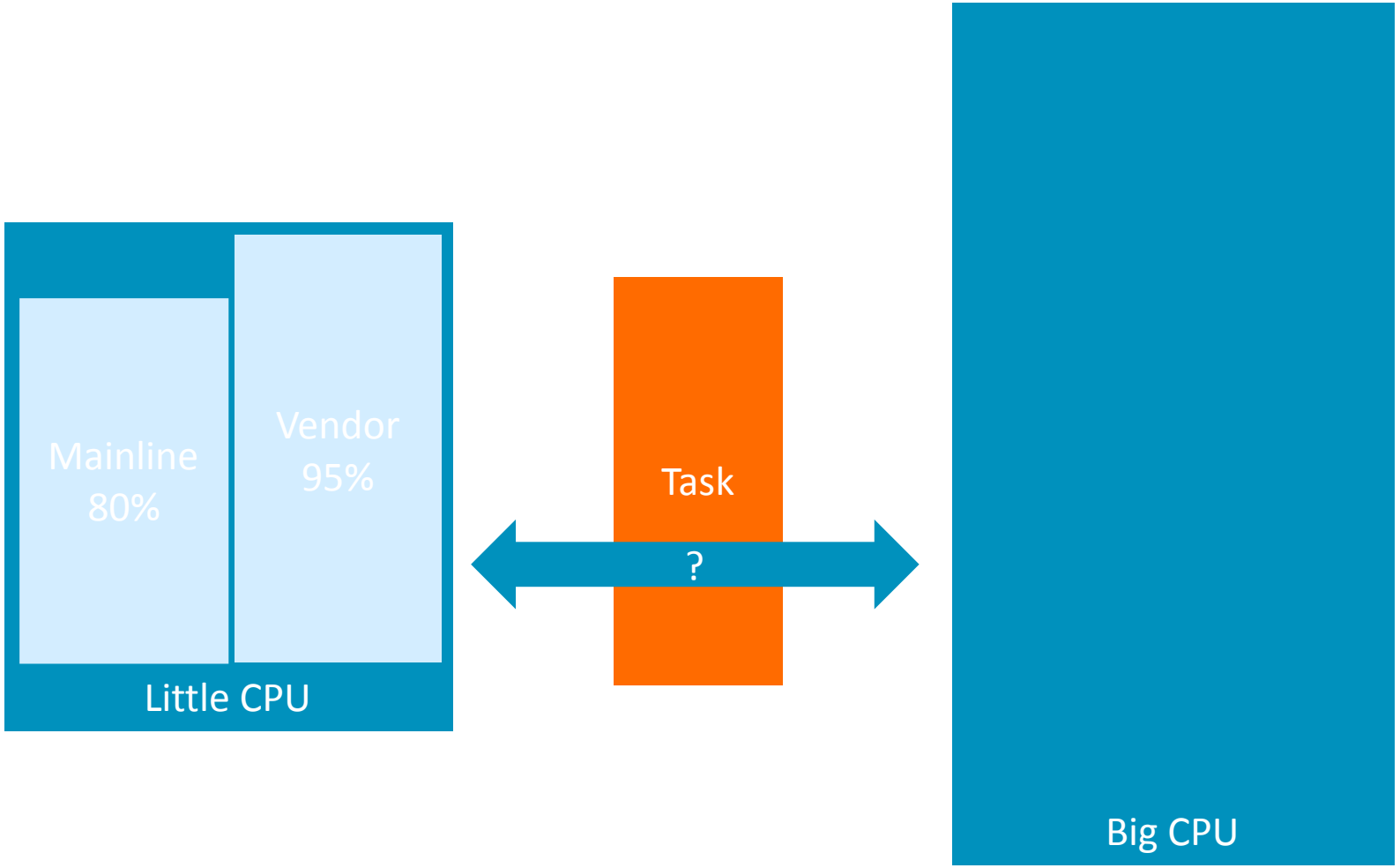

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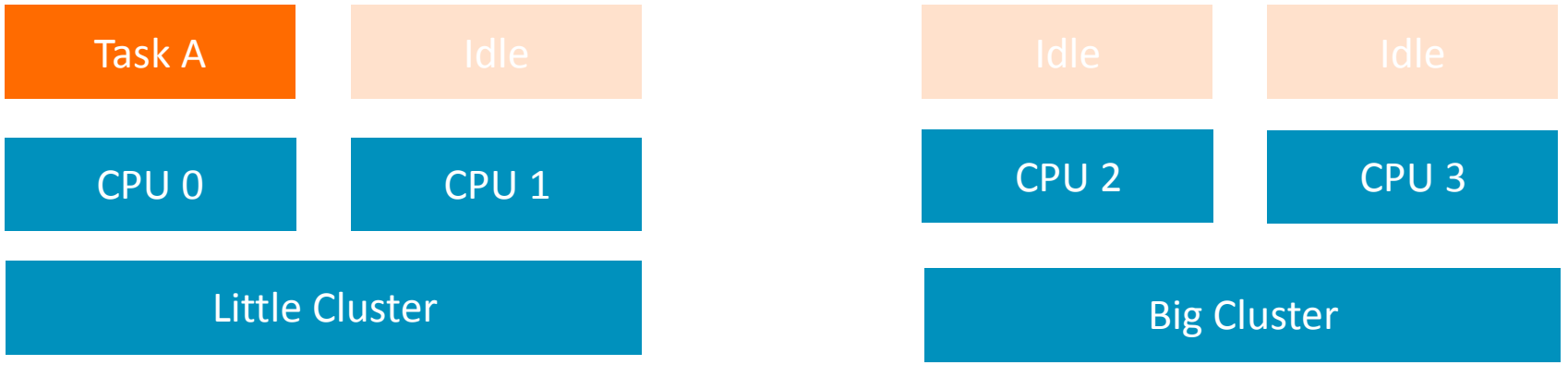

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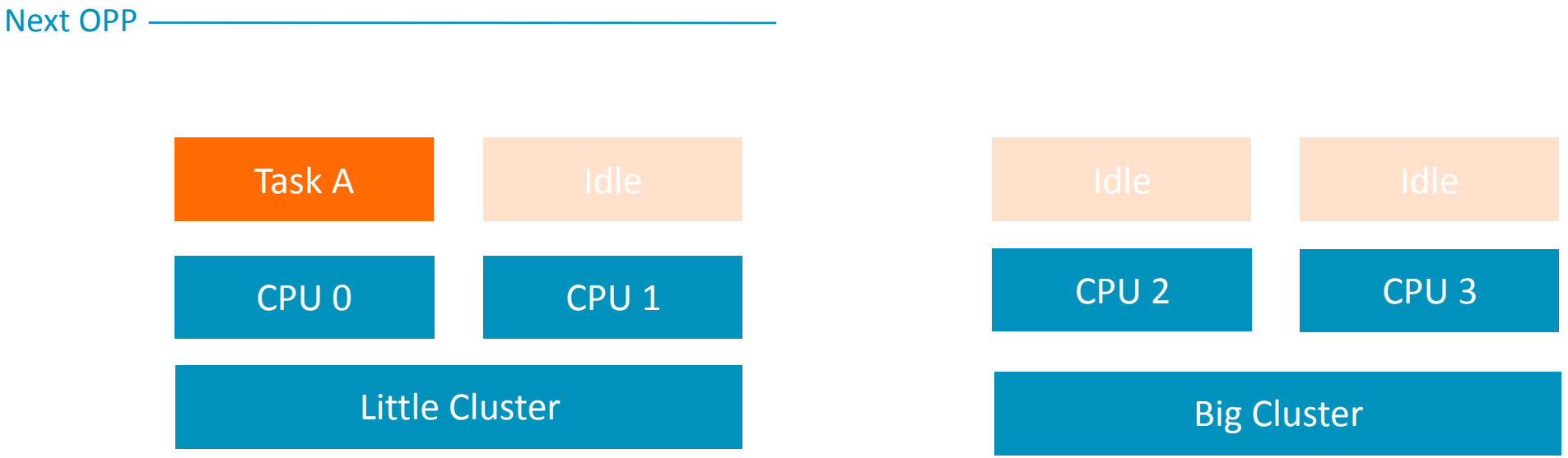

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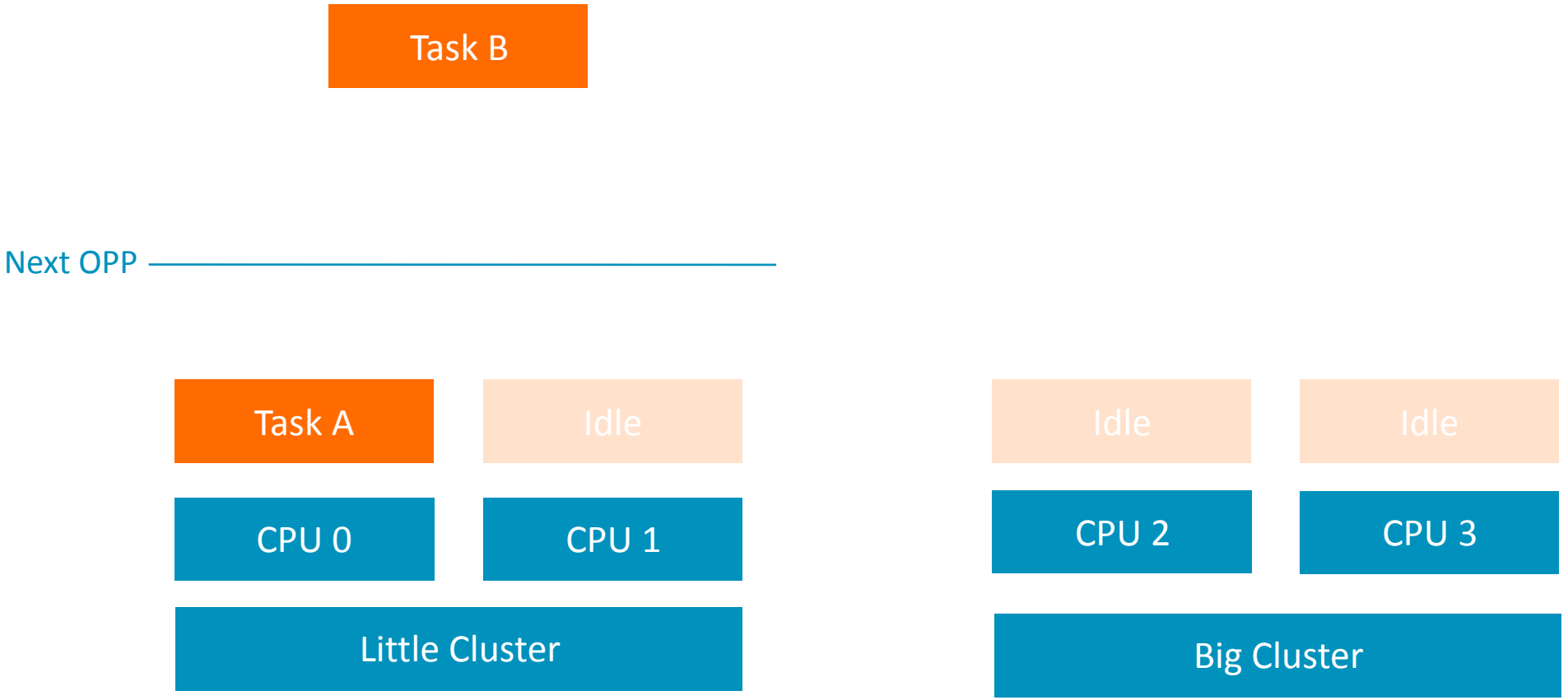

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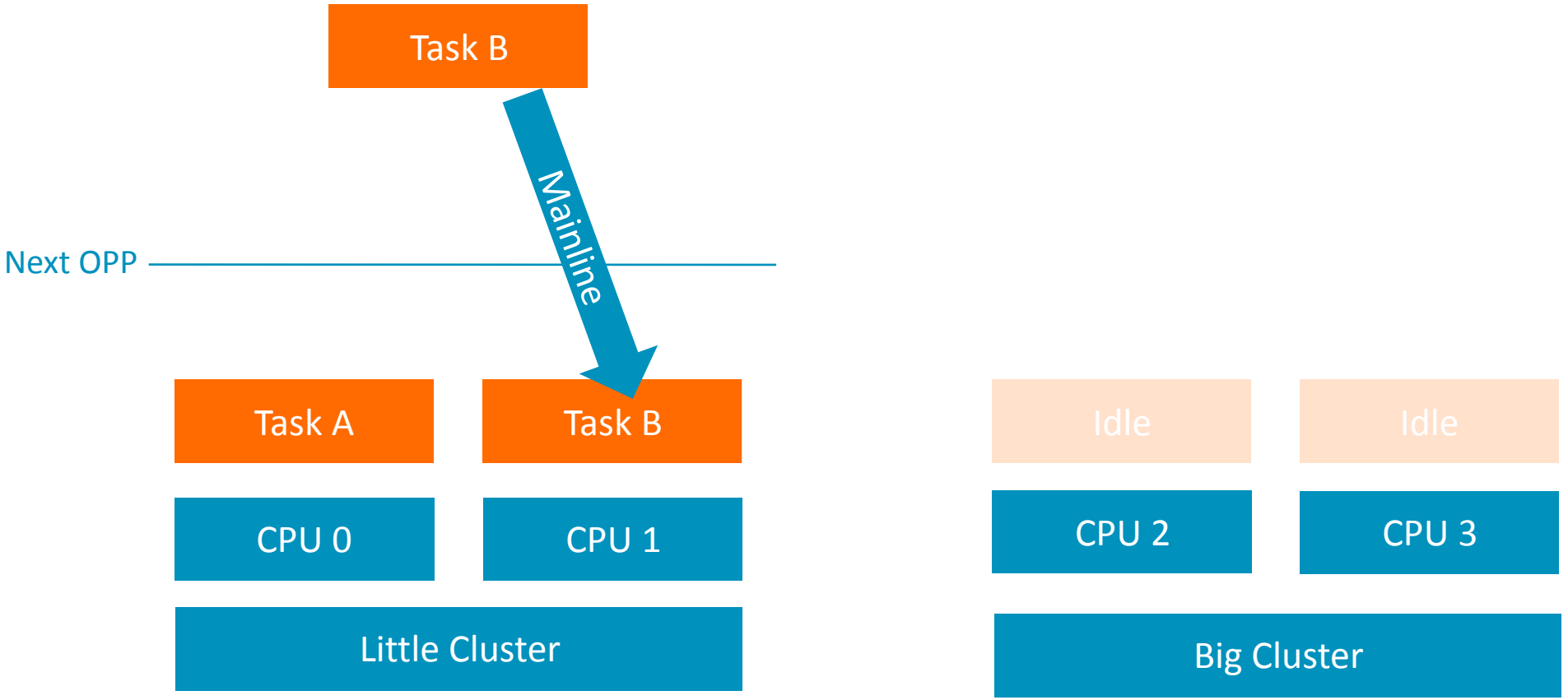

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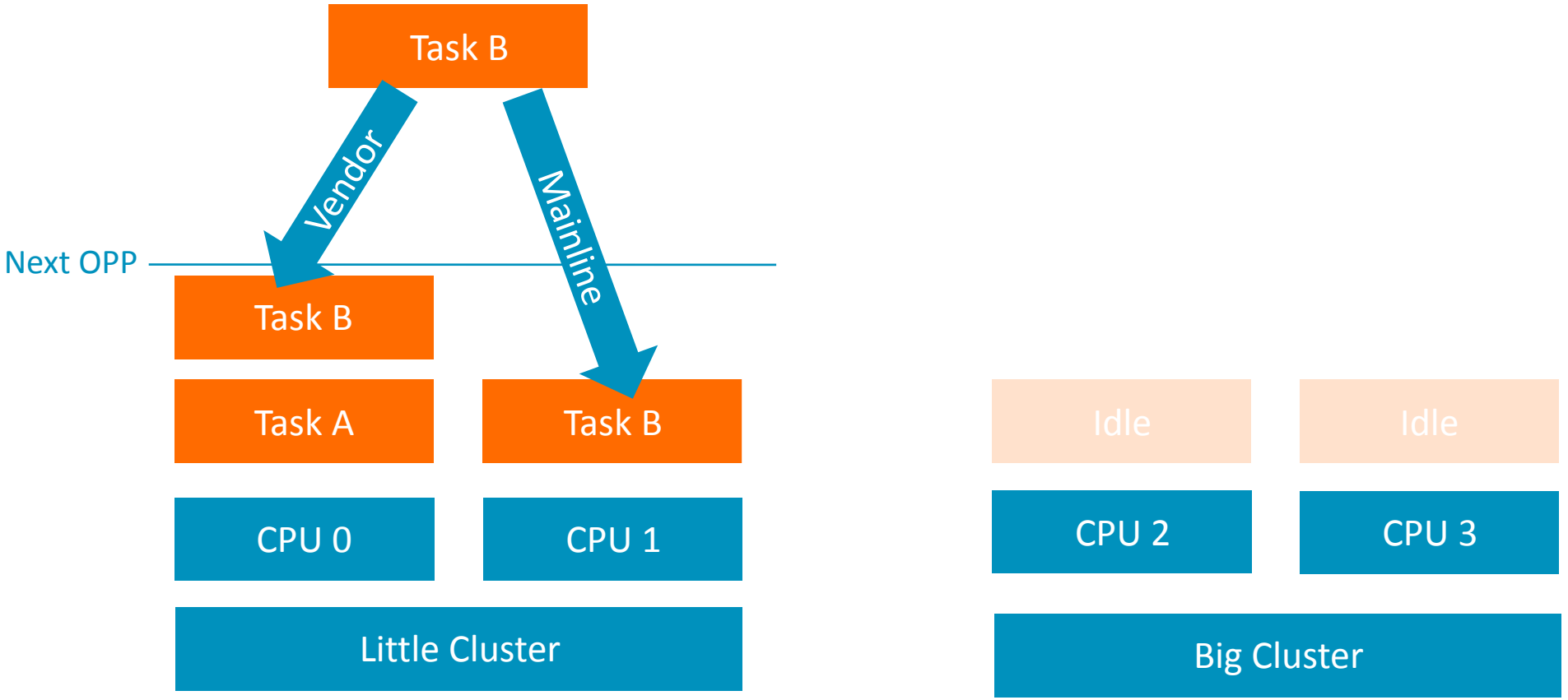

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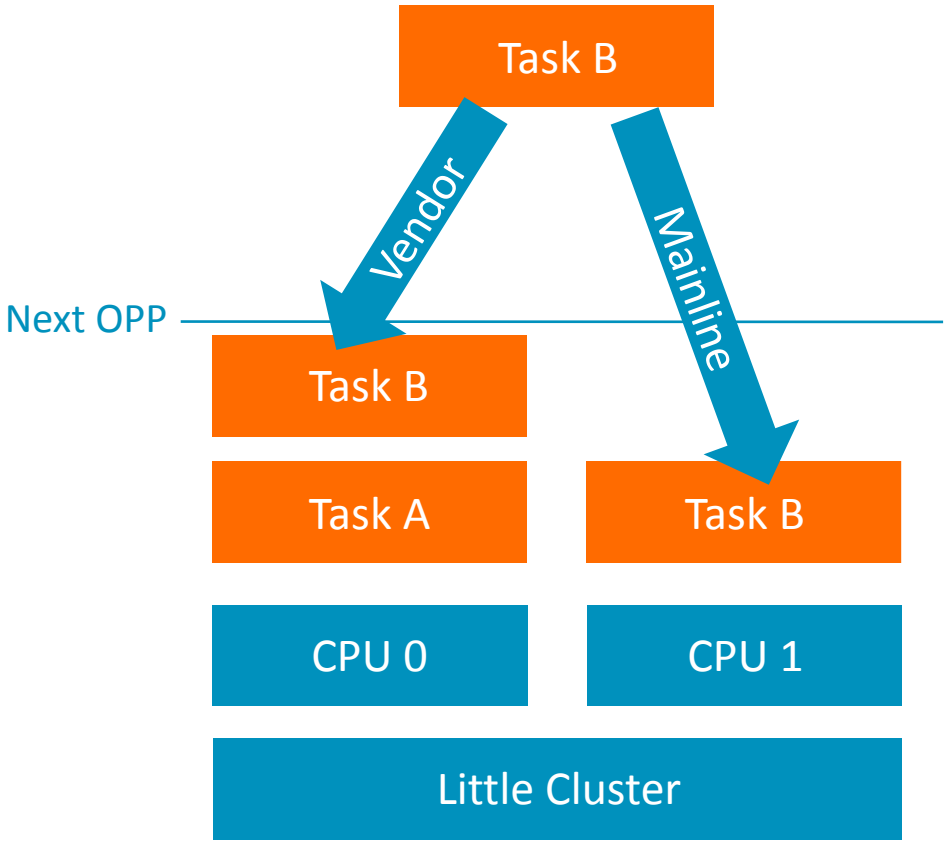
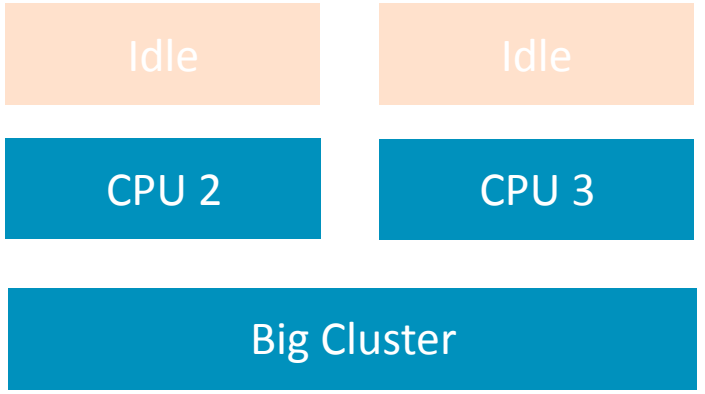


Triggered 16k*+/- 900* per PCMark run



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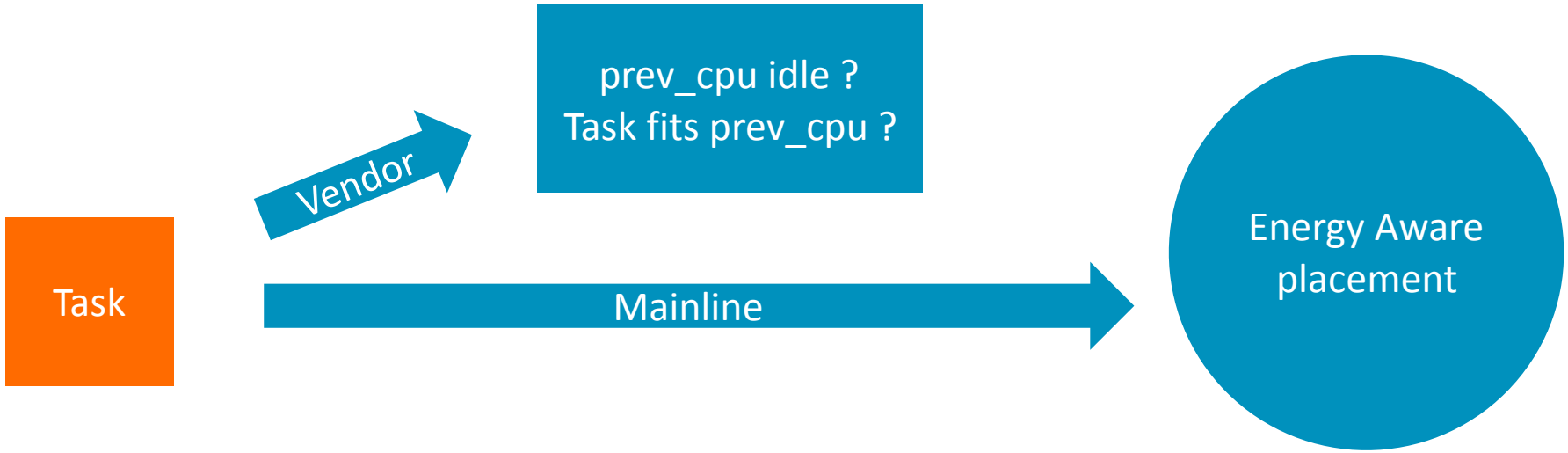

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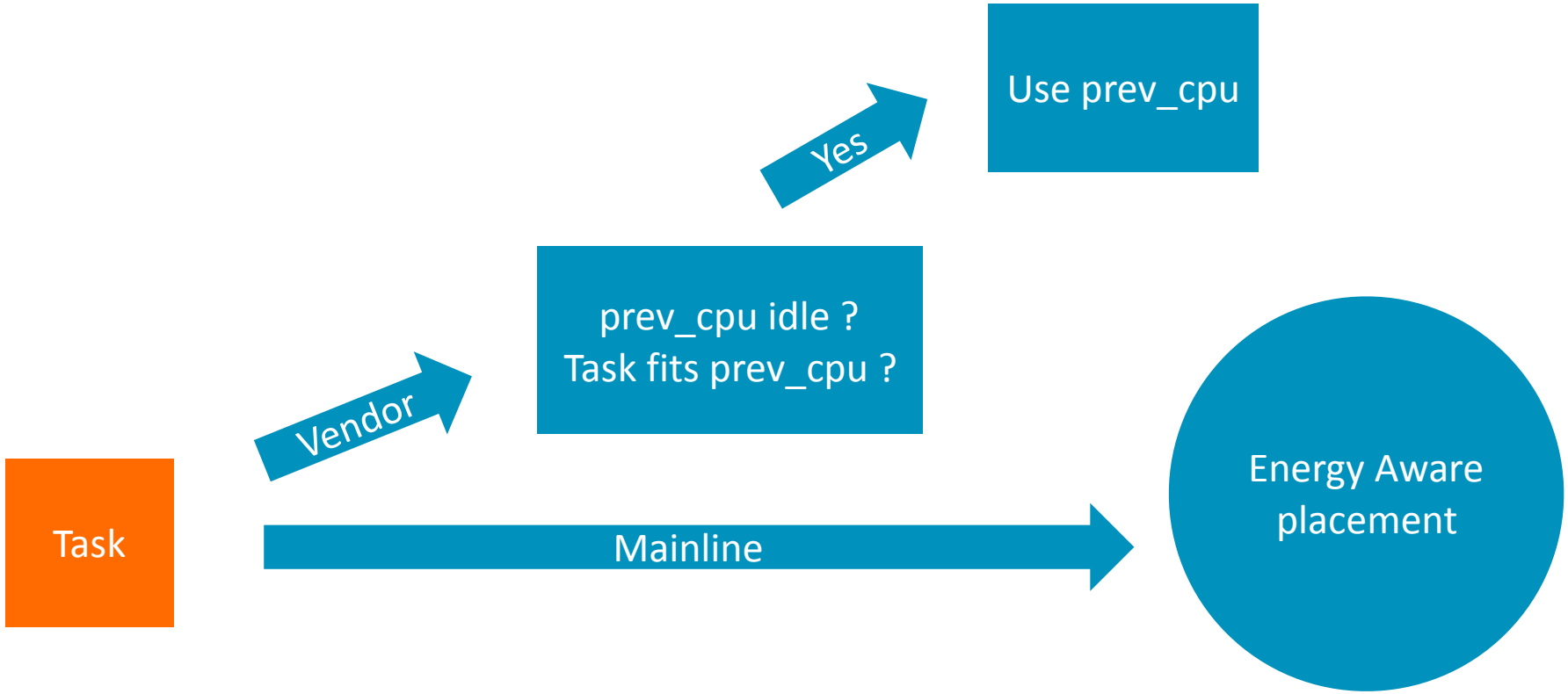

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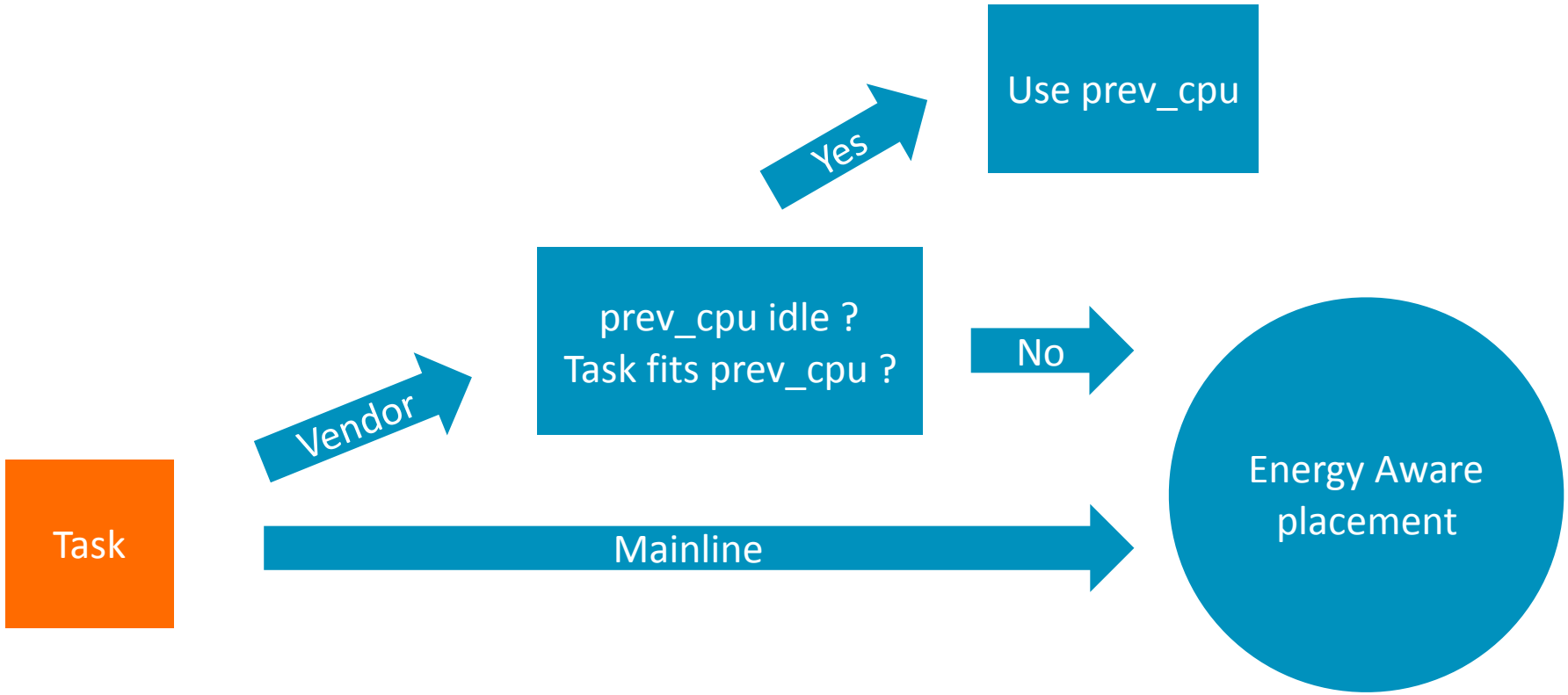

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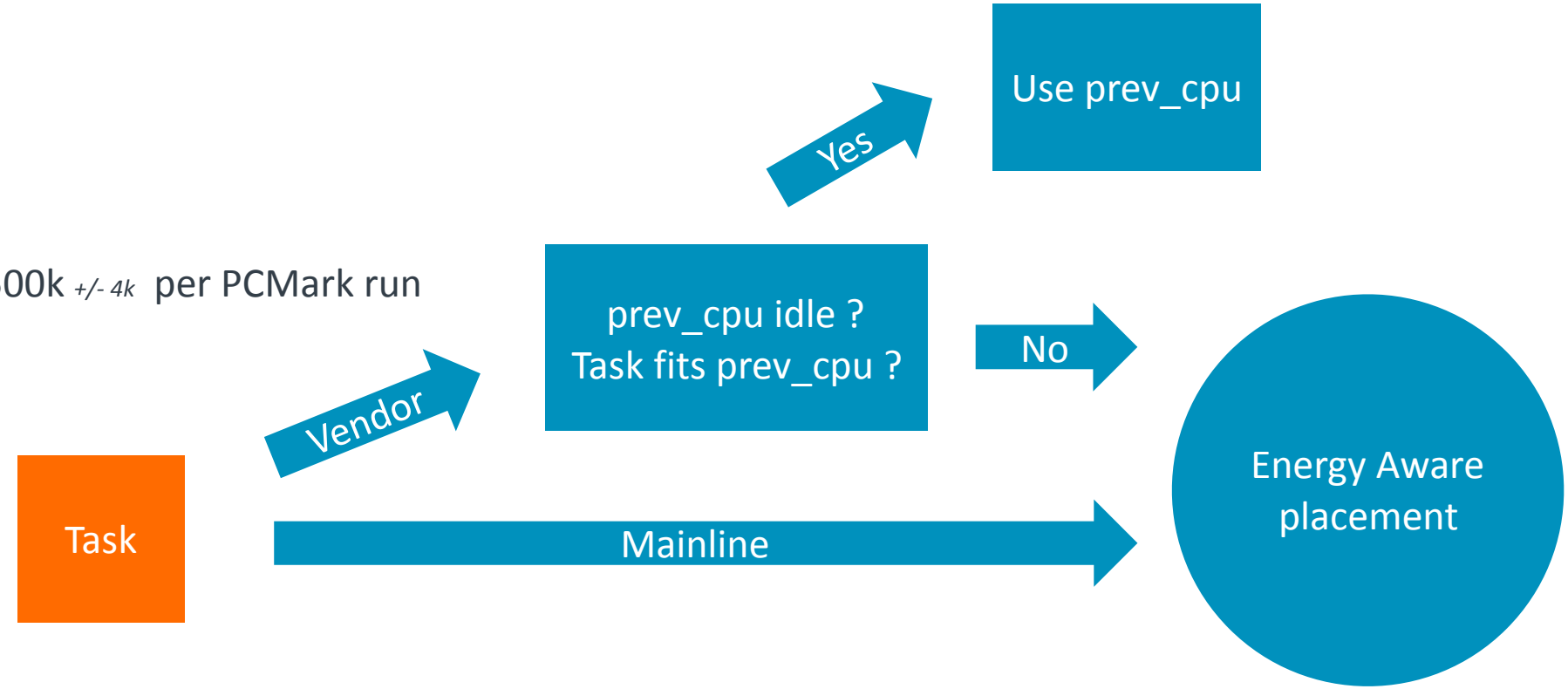
4. Fastpath for prev_cpu

Triggered 500k *+/- 4k* per PCMark run



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4.14 lowest_mask

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4.14	lowest_mask
Vendor	lowest_mask > ↓ CPU utilisation > ↑ Idle state > ↓ CPU capacity

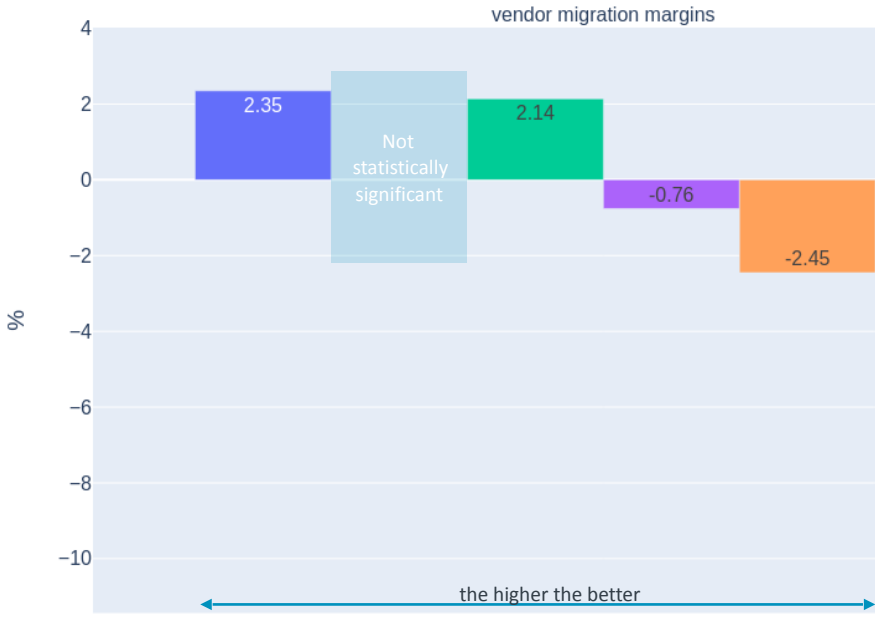
5. RT Capacity Awareness

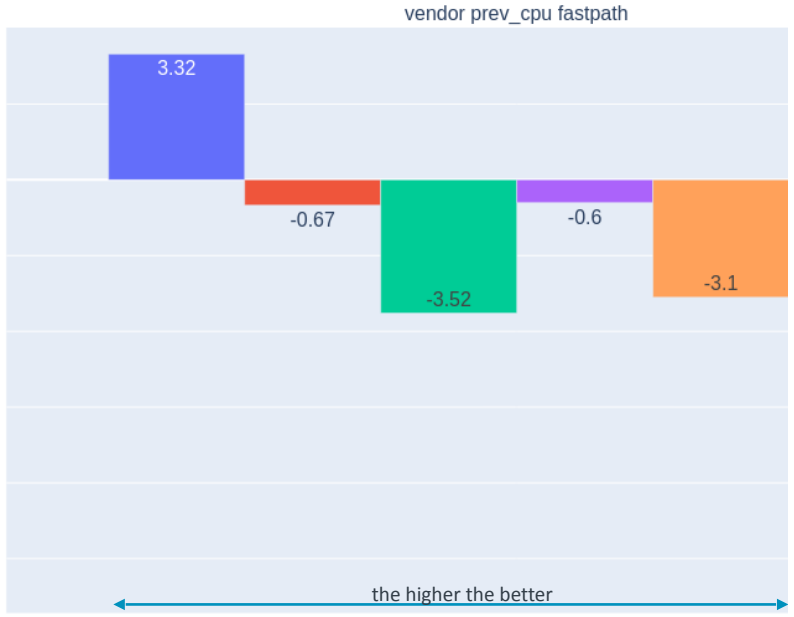
4.14 — lowest_mask

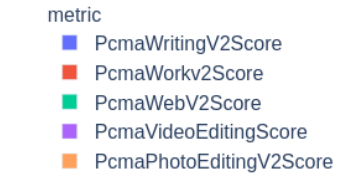
Vendor — lowest_mask > ↓ CPU utilisation > ↑ Idle state > ↓ CPU capacity

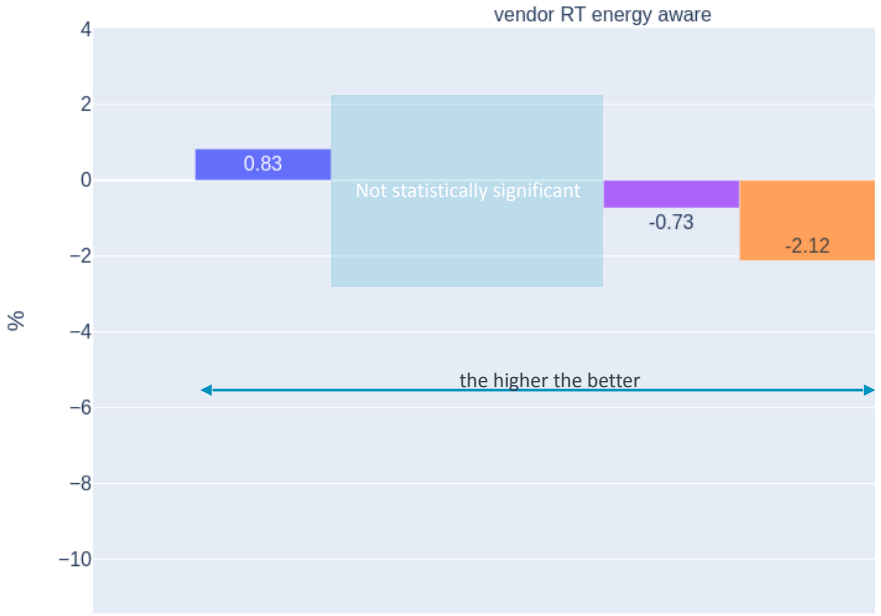
Mainline — lowest_mask > Uclamp values

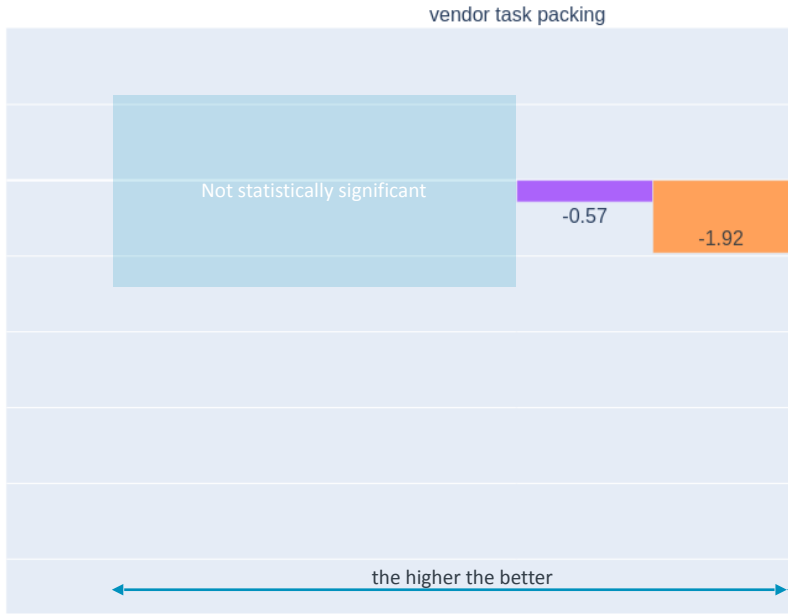
arm

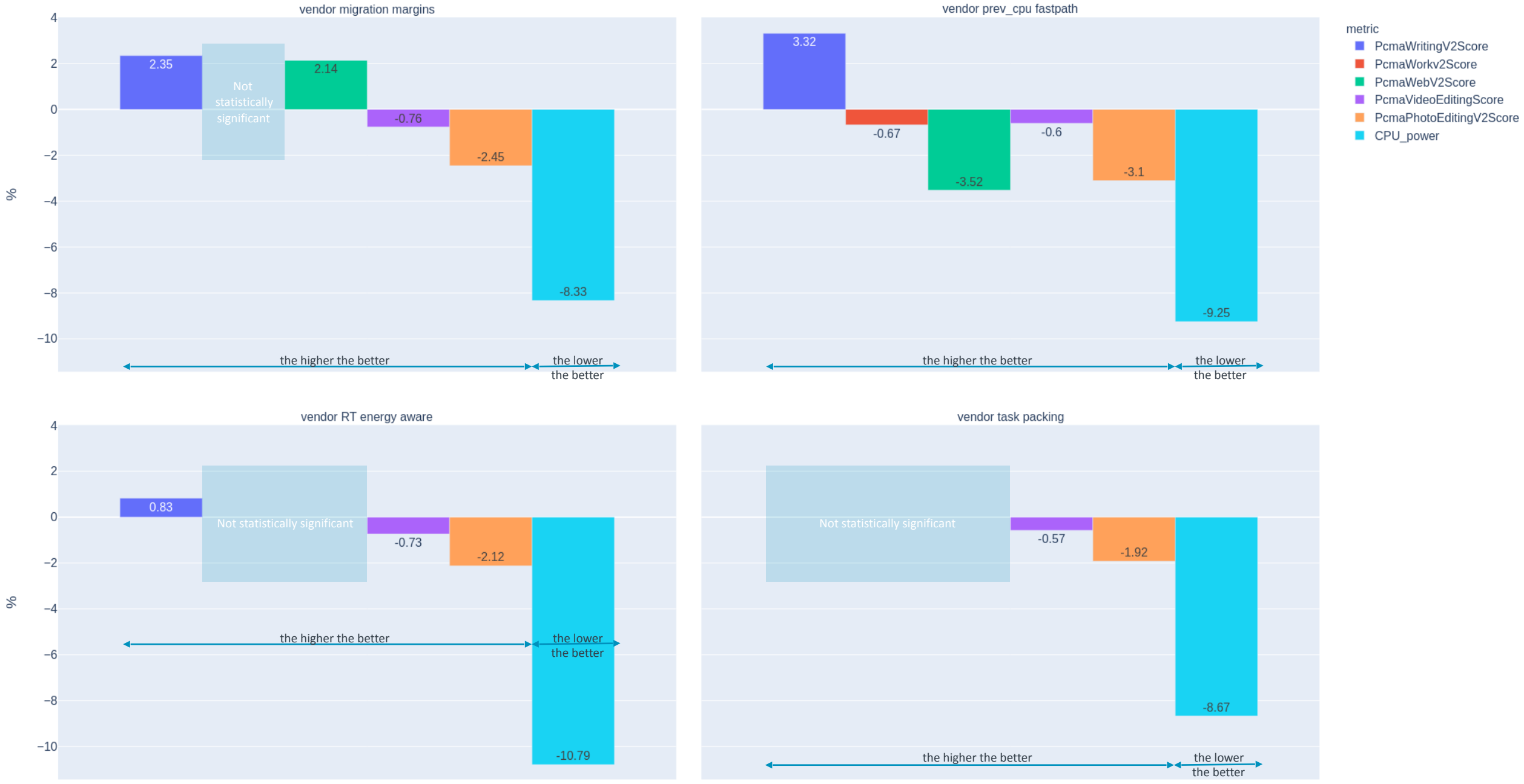












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Thank You
Danke
Merci
谢谢
ありがとう
Gracias
Kiitos
감사합니다
धन्यवाद
شكرًا
ধন্যবাদ
תודה