SPECTR

Formal Supervisory Control and Coordination for Many-core Systems Resource Management

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23rd ACM International Conference on Architectural Support for Programming Languages and Operating Systems
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Motivation

- Formal supervisory control theory (SCT) can combine the strengths of classical control theory and heuristics to
  - meet changing runtime goals (Autonomy)
  - offer a systematic design flow for hierarchical control (Scalability)

	Methods	Robustness	Formalism	Efficiency	Coordination	Scalability	Autonomy
A	Machine learning		✓	✓	✓		
B	Estimation/Model based heuristics			✓	✓		
C	SISO Control Theory	✓	✓	✓		✹	
D	MIMO Control Theory	✓	✓	✓	✓		
E	Supervisory Control Theory [SPECTR]	✓	✓	✓	✓	✓	✓

Major on-chip resource management approaches and the key questions they address (∗ = partially addressed)

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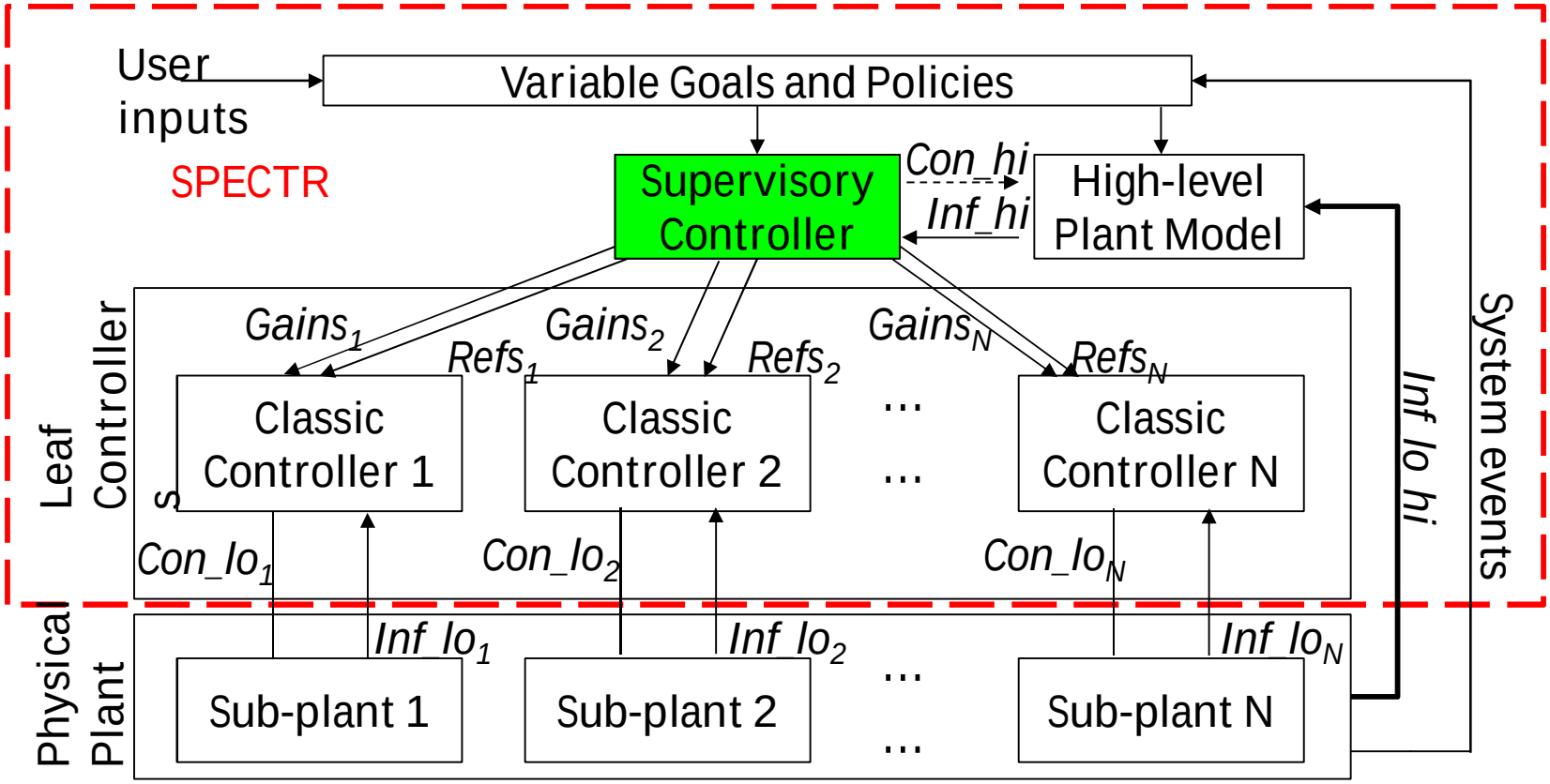
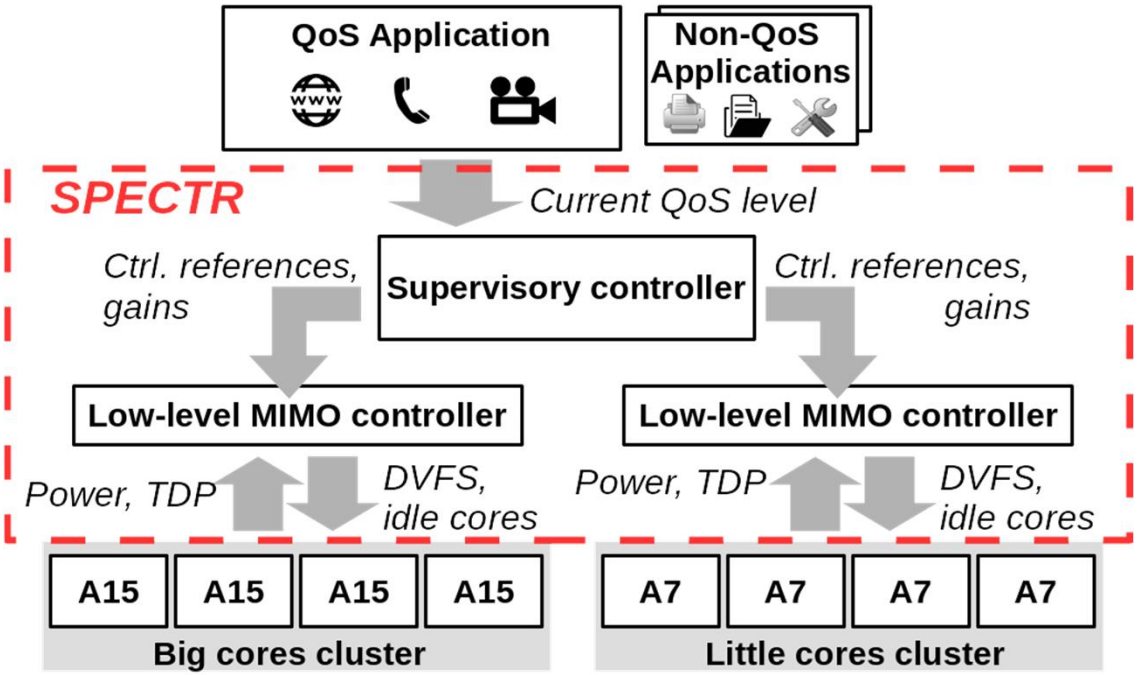
SPECTR overview



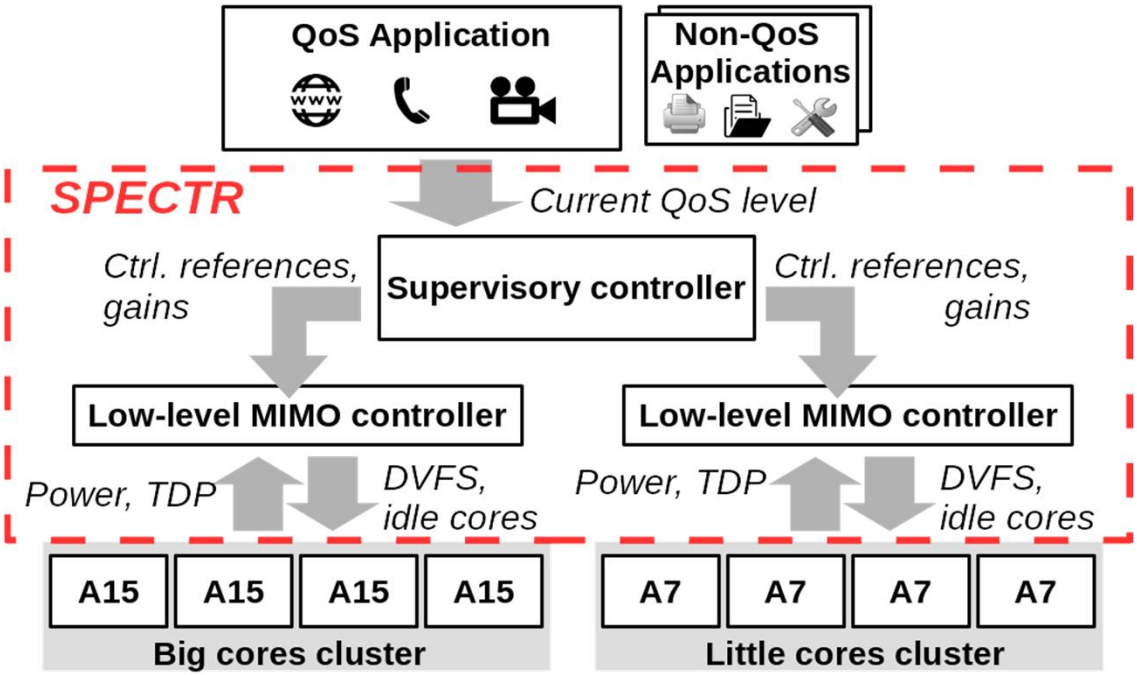
Case Study



ODROID-XU3 platform contains an Exynos 5422 Octa-core SoC

- System goals:
  - Meet the QoS requirement of the foreground application
  - Ensure the total system power always remains below the Thermal Design Power (TDP)
  - Minimize energy consumption

Case Study



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SPECTR achieves up to 8x and 6x better target QoS and power tracking over state-of-the-art, respectively (in our case study)

SPECTR

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