

# Towards a European Strategy for Cyber-Physical Systems

Concertation Workshop on Mixed-Criticality Systems  
and Multicore

**HARPA**

**HAR**nassing **P**erformance **v**Ariability

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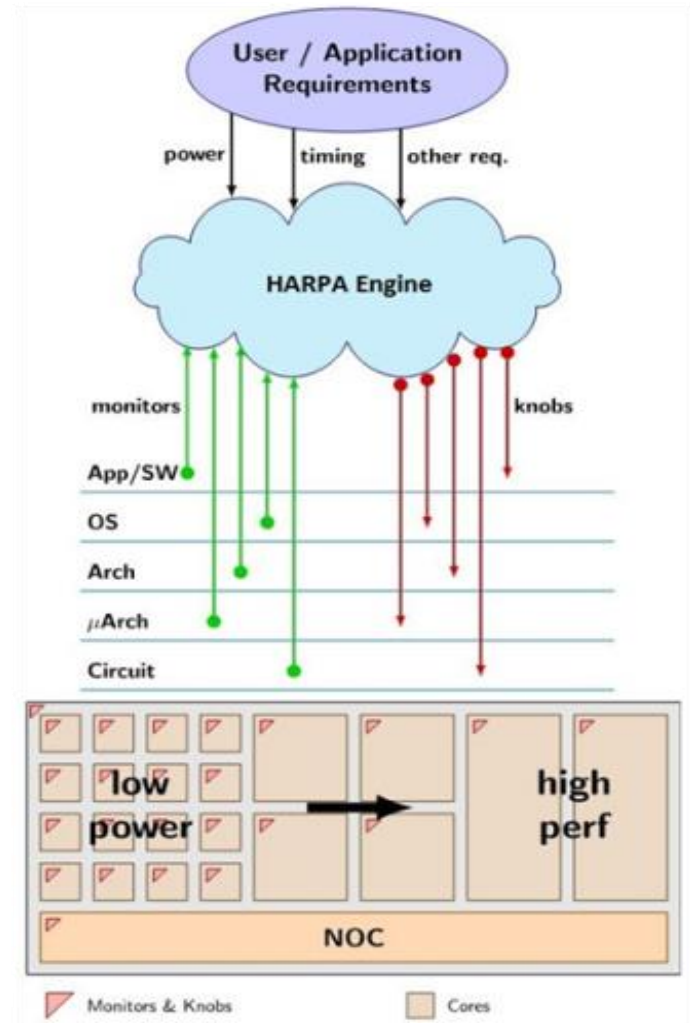
*[home.deib.polimi.it/fornacia](http://home.deib.polimi.it/fornacia)*

- Project full title: **HARPA:**  
**HARnessing Performance vAriability**
- Coordinator: prof. William Fornaciari
- Starting and ending date: 1.09.2013 – 30.08.2016 (36)
- Project major partners: POLIMI - DEIB (coordinator), IMEC, IT4I, ICCS, UCY, THALES, HEN
- Type of project: STREP (FP 7-ICT-2013-10)
- Budget Total: 3.979.620, EC 2.797.000 (394 PM)
- Project Website: <http://www.harpa-project.eu/>
- LinkedIn: [HARPA European Project Group](#)

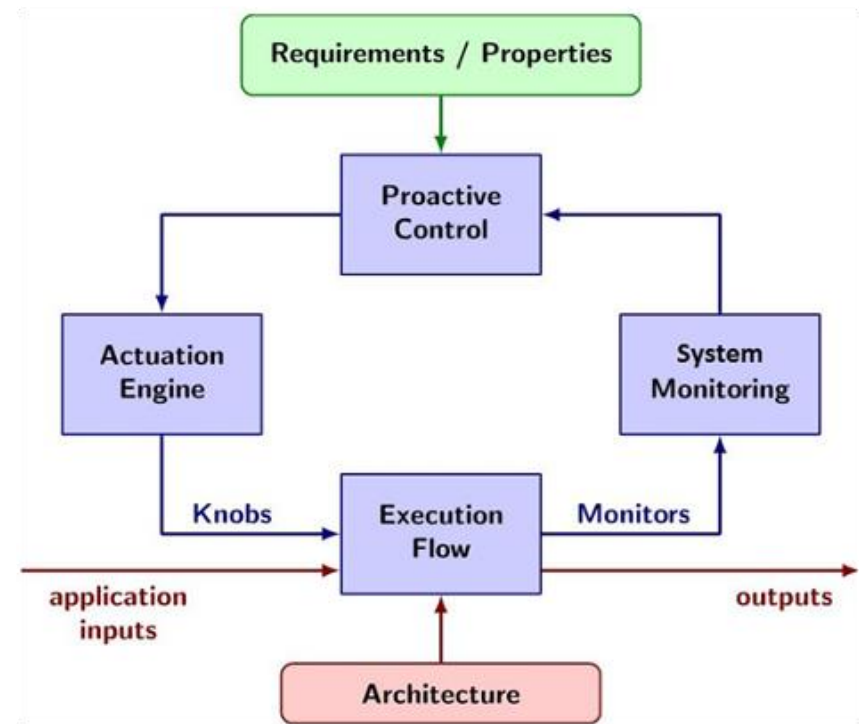


- Motivation
  - ◆ The Challenge: **dependable performance**
    - Critical for embedded applications timing correctness
    - Paramount for HPC load balancing and fast execution
  - ◆ The Vision: **a synergistic approach**
    - Exploit synergies in the EC or the HPC domains
    - Merging concepts, assessing key applications
- Objective: **HARnessing Performance vAriability**
  - ◆ Variable performance confronts new EC/HPC systems
  - ◆ Dependable performance, slack identification, timing

- User Requirements
  - ◆ Quality & Quality Cost
- HARPA Operating System
  - ◆ ~1s responsiveness
- HARPA Run Time Engine
  - ◆ ~1ms responsiveness
- Monitors and Knobs
  - ◆ Cross-Layer Placement
- Hardware System
  - ◆ EC or HPC Platform



- Different metrics are continuously monitored
- The HARPA engine:
  - ◆ Actuates the knobs to bias the execution flow as desired
  - ◆ Implements control strategies
- Manage different slack manifestations to enforce timing guarantees & lifetime
- Combine performance dependability techniques from both the ES and HPC
- Heterogeneous multicore architecture, fitting to emerging computational paradigm



- Dependable Performance **Guarantees**
  - ◆ Engine={ HARPA OS + HARPA RTE + Knobs & Monitors }
  - ◆ Enable reusability, based on the monitor and knob availability of each platform
- System Architectural **Design Principles**
  - ◆ Guidelines for the performance dependability of heterogeneous MPSoCs
  - ◆ Performance guarantees facilitated across many layers
  - ◆ Hints towards a low cost knobs and monitors
- **Demonstrators**
  - ◆ Case studies representing both the EC and HPC worlds
  - ◆ Explore HARPA capabilities using monitors and knobs available in existing and future heterogeneous MPSoCs