READEX

Runtime Exploitation of Application Dynamism for Energy-efficient eXascale Computing

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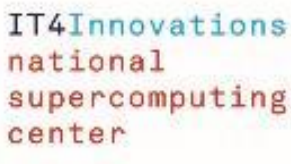
European Commission
Horizon 2020
European Union funding for Research & Innovation

READEX: Overview

- FET-HPC project, launched 09/2015
- www.readex.eu

- Technische Universität Dresden/ZIH (Coordinator)
- Norges Teknisk-Naturvitenskapelige Universitet
- Technische Universität München
- IT4Innovations, VSB-Technical University of Ostrava
- Irish Centre for High-End Computing
- Intel Corporation SAS
- Gesellschaft für numerische Simulation mbH

Motivation

- Energy is critical to current and future systems
- Applications exhibit dynamic behavoir
  - Changing resource requirements
  - Changing load on processors over time

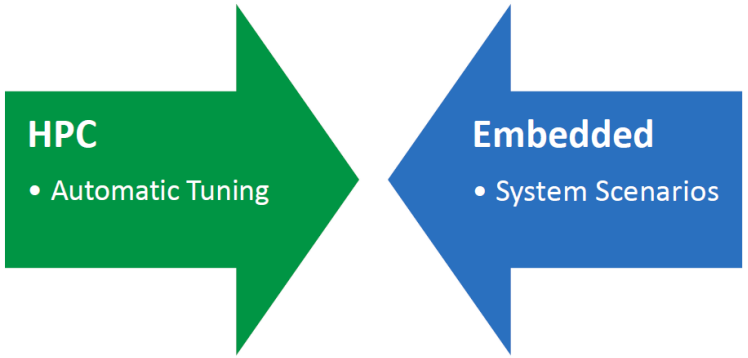
READEX: Overview

Create a tools-aided methodology for automatic tuning for energy efficiency in HPC

- Dynamically adjust system parameters to actual resource requirements

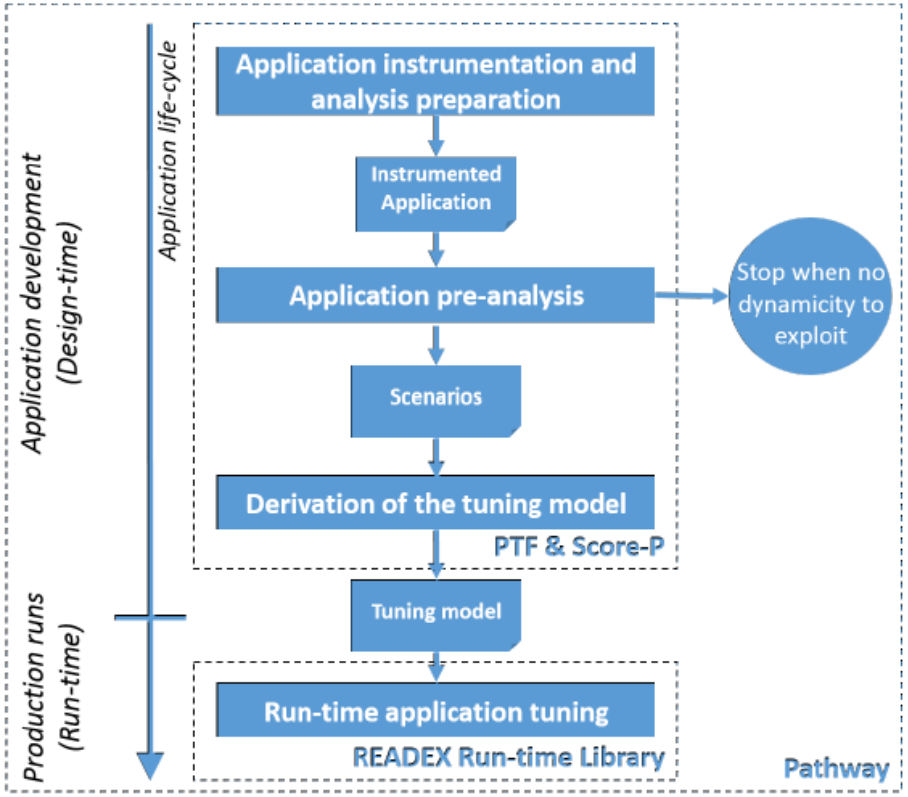
Join technologies from embedded systems and HPC

- HPC: PTF, Score-P, and HDEEM
- ES: System scenario methodology



READEX: Overview

High-level view of READEX tools-aided methodology

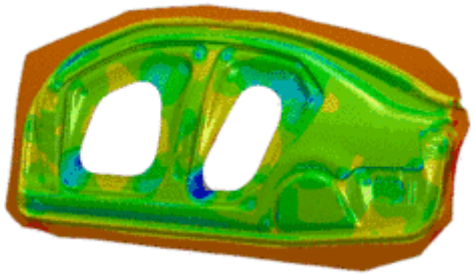


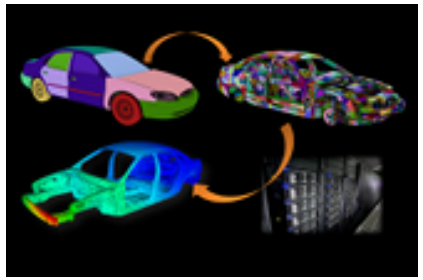
READEX: Overview

Co-design approach

- Manual tuning for energy-efficiency as a baseline
- Automatic tuning for comparison

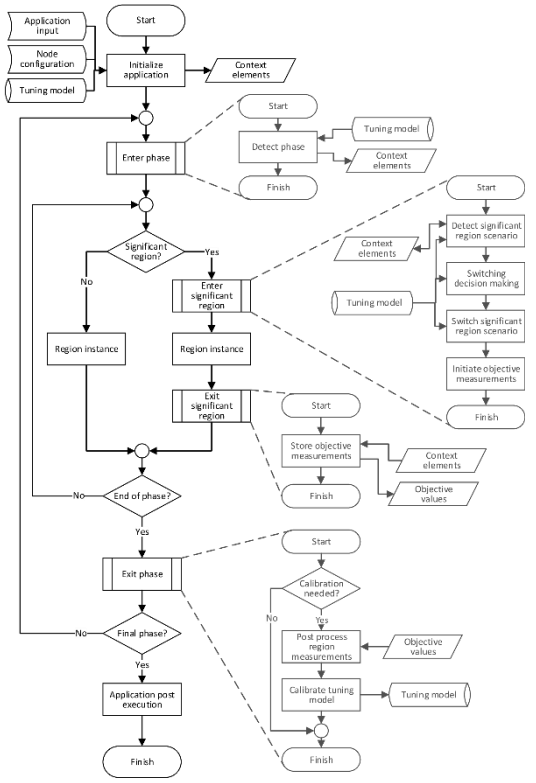
- Applications
  - PERMON and ESPRESO (FETI tools from IT4Innovations)
  - Indeed (GNS)
  - CORAL benchmark suite

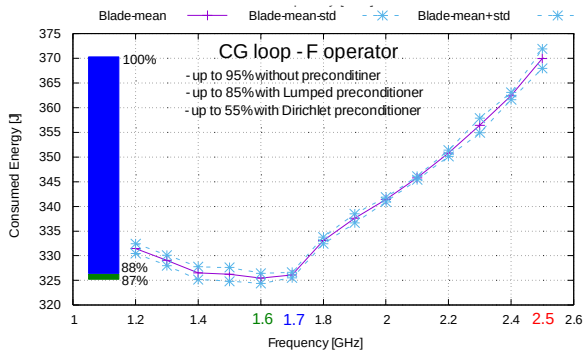


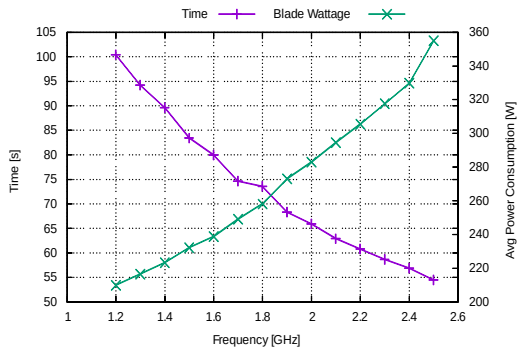


Current Status

- First Milestones achieved
  - Dissemination Strategy
  - System Parameters
- Formalised methodology
- READEX tool-suite design and implementation
- Manual tuning efforts

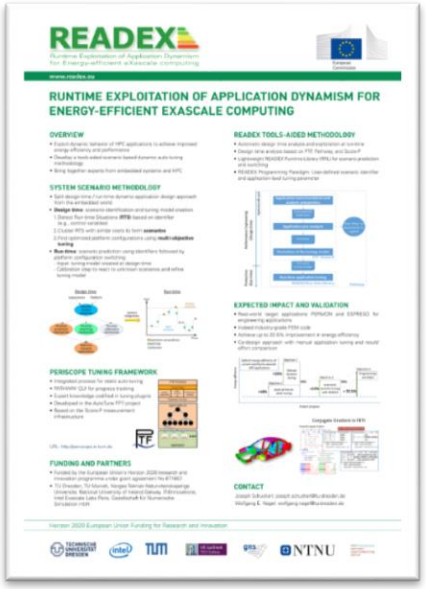






Dissemination

- International Workshop on Code Auto-Tuning (DCAT) workshop @ CGO'16
  - Invited speakers, ~20 participants
- Dissemination material (SC'15)
- Presentations
  - Keynote on READEX at ICGHPC 2016
  - GAMM DMV yearly meeting
- Posters
  - CSE 2015, Porto
  - HiPEAC conference 2016, Prague
- Publications
- Outreach into HiPEAC, PRACE, EE-HPC-WG, System Scenario SIG



Integration with the Ecosystem

- International Workshop on Code Auto-Tuning (DCAT)
- Extensions to Score-P
- ESPRESO/PERMON tuning efforts
- Automatic energy-efficiency tuning

- HDEEM system Taurus open to all interested projects
  - High definition energy-measurement system (1000 Sa/s, accuracy validated)

International Cooperation

Activities:

- External Advisory Board
  - UTK, VA Tech, LLNL, Skoda, imec, JSC
- International Workshop on Code Auto-Tuning (DCAT) @ CGO'16
- Visiting researcher from St Xaviers Catholic College in India at TUM

Support by EXDCI?

- Cross-border call for proposals
- Organization of workshops
- Funding for visiting researchers

Role in Extreme Scale Demonstrator

- Willing to provide input to ESD proposal
- Provide product quality performance and energy-efficiency tools
- Energy-efficiency crucial for ESD
    - READEX will contribute to energy-efficiency tuning

- What will the role of software be in the ESD?

Contact and Funding

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TECHNISCHE UNIVERSITÄT DRESDEN

Questions?

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