ENTRA: Whole-Systems Energy Transparency

(01 Oct. 2012 - 30 Sept. 2015)

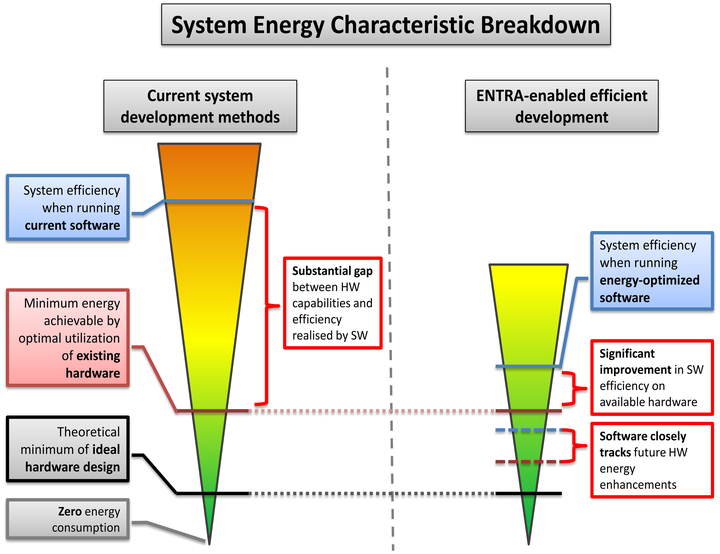
EU 7th Framework Programme Future and Emerging Technologies (FET)

Background

- Today's software engineering approaches produce systems that are far from energy-optimal.
- Energy consumption is a major concern, especially in embedded systems and HPC.
- Traditionally, researchers and engineers work within one or perhaps two layers of the system stack with very limited overlap.
- Energy-efficient computing requires considering the entire system stack vertically.

Question: Is it possible to facilitate energy consumption to be made available early in the software design phase (energy transparency)?

ENTRA Vision of Energy Optimization



Summary and Objectives

The project seeks to make energy usage transparent throughout a system, promoting energy efficiency to a first-class goal in design and system management.
The project will aim to:

- Establish energy modeling and analysis techniques that support energy transparency through the system layers.
- Develop prototype tools enabling engineers to understand and quantify the impact of design decisions on energy.
- Enable software engineers to express and verify properties of the system.
- Develop optimization techniques both at design and run-time.
- Develop energy benchmarking techniques.

Is Energy Transparency Possible?

The project will facilitate predictions of energy consumption to be made early in the software design phase, thus enabling the development of greener IT products.

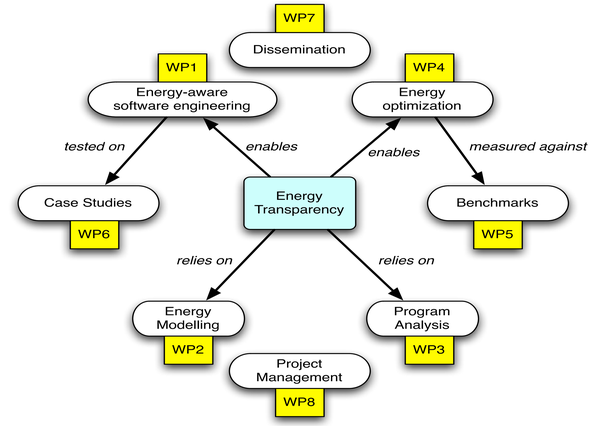
The following components of a potential solution enables the energy consumption at hardware level to be immediately visible at source code level:

- analysis of programs with respect to energy usage, performance and precision;
- energy modeling at low and high level;
- a common assertion language as an integrating framework.

Further Research Beyond the Project

- Hardware design for energy transparency;
- Deeper program transformations and optimizations;
- Real Energy Programming Languages.

ENTRA Work Packages



Impact on S&T and Society

- Understanding of theoretical limits of energy efficiency in computation.
- Foundations for computing technologies with negligible energy consumption.
- Reduction of the environmental impact caused by the energy consumption of ICT.

Project Partners

The following partners take part in the ENTRA project:

- Roskilde University, Denmark (RUC)
- University of Bristol, UK (UNIVBRIS)
- IMDEA Software Institute, Spain (IMDEA)
- XMOS Limited, UK (XMOS)

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- **Project Webpage**: www.entraproject.eu