

Holistic Energy Harvesting Workshop and Showcase

Introduction

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holistic

energy harvesting

UNIVERSITY OF
Southampton

Newcastle
University

Imperial College
London

University of
BRISTOL

Welcome!

- Next Generation Energy-Harvesting Electronics:
A Holistic Approach

EPSRC-funded research project

October 2009 – March 2013

Consortium of 4 UK universities and 4 industrial partners

EPSRC

Engineering and Physical Sciences
Research Council

dialog
SEMICONDUCTOR

Mentor
Graphics

ARM

DIODES
INCORPORATED

Who are we?

- 12 Investigators



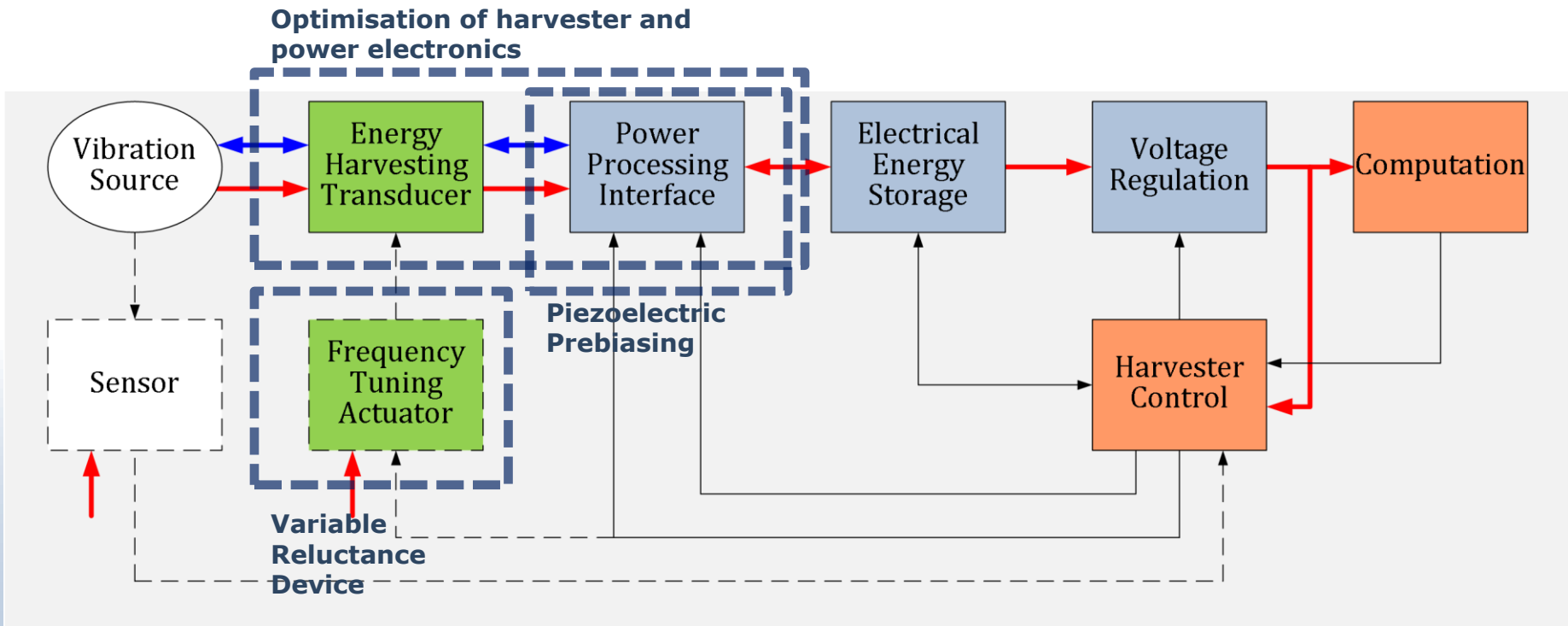
- 14 Researchers



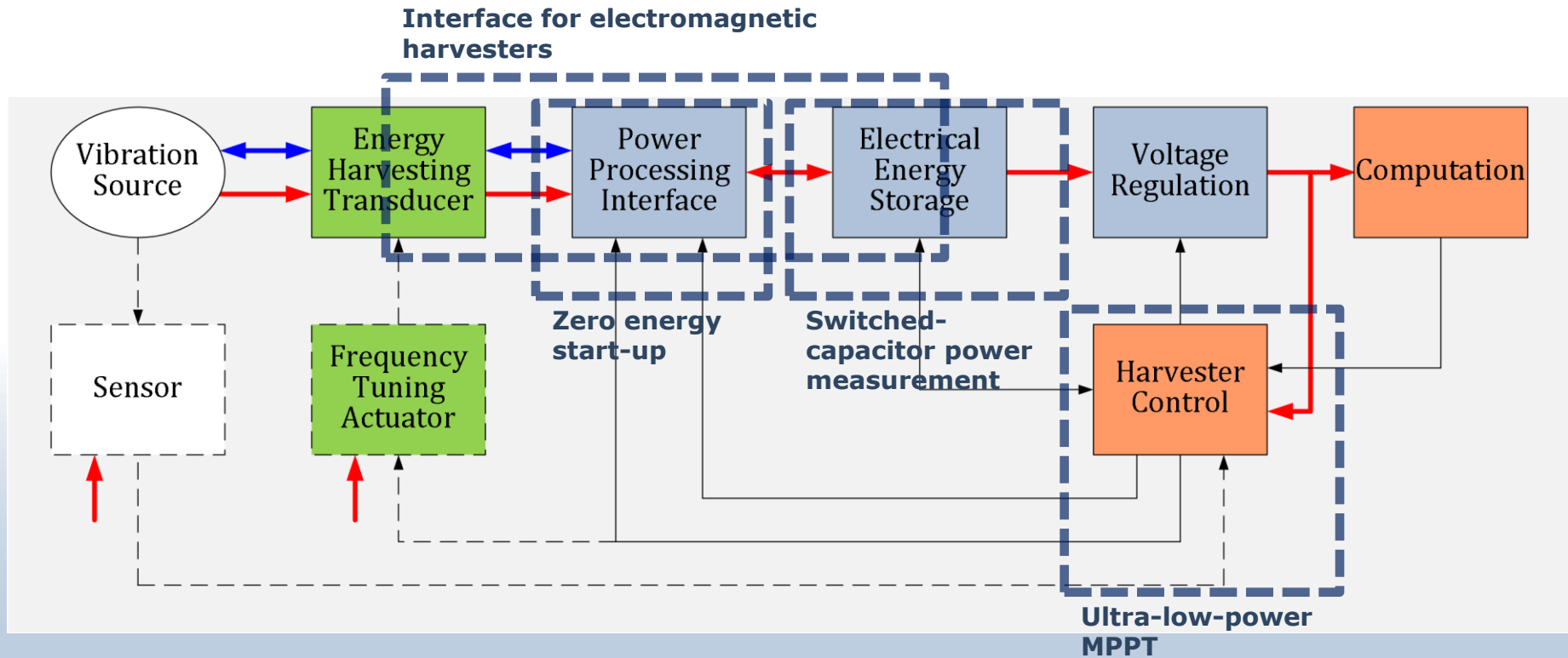
Where did we start?

- Microelectronics grand challenge
- This project joins three communities:
 - *energy harvesting and MEMS processing*
 - *low-power embedded computing systems*
 - *electronic design automation*
- Aims
 - *Adaptive micro-generators*
 - *EH-aware design methods for computational logic*
 - *Integrated modelling & optimisation methodology/design toolkit*
 - *A self-powered, autonomous wireless system demonstrator*

Scientific Contributions

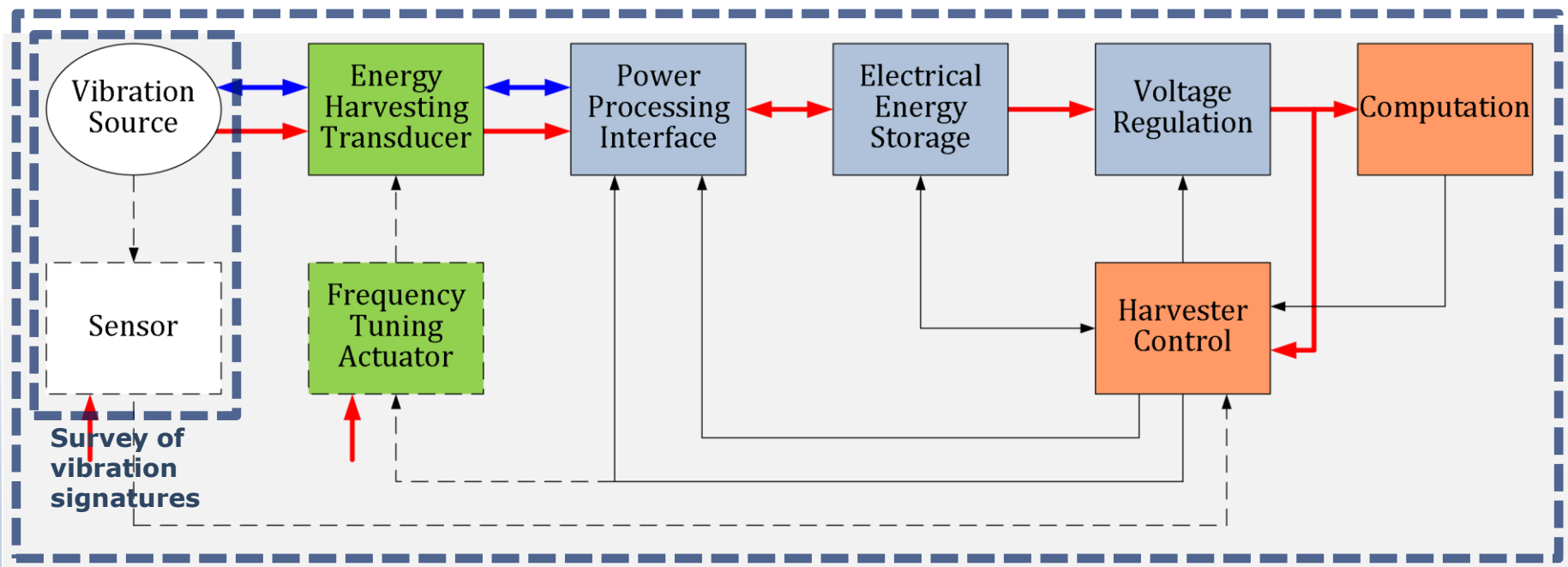


Scientific Contributions



Scientific Contributions

Fast simulation, design space exploration and optimisation of EH systems



Project Outputs

- **Publications**

- Over 50 academic papers (>30% journals), more in preparation
- Three book chapter, downloadable tools etc

- **Invited talks**

- 6 academic conferences and industrial events
- Sub clock featured in Mike Muller's (CTO, ARM) keynote, DAC'12

- **3 fabricated chips, >8 demonstrators, patents**

- **Training and Employment**

- 9 PhD students (2 EPSRC, others self/externally funded)
- 6 post doctoral researchers
- Many have now already gone on to new roles in academia and industry

- **Follow-on research projects**

- **Industrially-sponsored research and consultancy**

What's happening today?

Morning Session - Overview

- 11:00 Welcome and Project Overview
- 11:15 Summaries of Project Outputs
- 12:00 Demonstrations

Lunch

- 13:00 A light lunch for those who registered

Afternoon Session – Technical Seminars

- 13:30 Seminar 1: Building a Holistic System Demonstrator
- 13:50 Seminar 2: Adaptive Electronics for EH Systems
- 14:10 Seminar 3: Accelerating Simulation & Design Exploration
- 14:30 Seminar 4: Energy Modulated Computing
- 14:50 Seminar 5: Adaptive and Tunable Microgenerators



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I want to know more!

- Good – that’s what today is all about!
- *But...* visit www.holistic.ecs.soton.ac.uk for:
 - Videos explaining our research and demonstrators
 - Open-source data on energy availability
 - Our dissemination activities
 - Open-source tools
 - Publications
 - ...

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Next Generation Energy-Harvesting Electronics: A Holistic Approach

The project is now nearing completion, and the consortium is holding a workshop at Imperial College London on 11 February 2013 to showcase the project's demonstrators and research findings. Registration is free, details here.

There is now a consensus that we are entering the era of electronics powered, or at least augmented by, energy harvesters. Future self-powered applications will require electronic systems that are more complex and more compact but also intelligent, adaptive and able to perform more computation with less energy.

The EPSRC has provided £1.6M of funding to this project, which is developing ultra energy-efficient electronic systems for emerging applications including mobile digital health, and autonomous wireless monitoring in environmental and industrial settings. The project involves four universities (the University of Southampton, Newcastle University, Imperial College, and the University of Bristol) which are undertaking the three-year collaborative research project in partnership with four industrial companies: Dialog Semiconductor, Diodes Incorporated, ARM, and Mentor Graphics.

This research joins up three different research fields, including energy harvesting and MEMS processing methods, low-power embedded computing systems, and electronic design automation. The new design methodology will be incorporated into a novel mixed-technology domain modeling and performance optimization design toolkit. This design approach is fundamental to ultra energy-efficient design and to the miniaturisation of next-generation wireless electronics.

The project was focussed on three interlinked themes (microgenerator design, computation circuits, and system optimisation), involved over 25 people at the four academic institutions, and produced over 50 publications. Members of the project and the advisory board may access the members' area of the site. The advisory board meets annually and is chaired by Prof. Steve Furber.

Latest News

Showcase and Workshop: The project is now nearing completion, and the consortium is holding a workshop at Imperial College London on 11 February 2013 to showcase the project's demonstrators and research findings. Registration is free, details here.

Follow-on Project: EPSRC have funded a follow-on project by the University of Bristol and Newcastle University on power-conditioning and computational electronics that will be able to survive in power-deficient modes.

Innovator of the Year Award: Alex Yakovlev's team at Newcastle University won the Innovator of the Year 2012 award for their work on the Holistic project.

DIODES **ARM** **Mentor Graphics** **dialog**

A Holistic Approach to Energy Harvesting Electronics | Public Website
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