Holistic Energy Harvesting Workshop and Showcase

Introduction

Prof Bashir Al-Hashimi, Project Director
Welcome!


*EPSRC-funded research project*

*October 2009 – March 2013*

*Consortium of 4 UK universities and 4 industrial partners*
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

Optimisation of harvester and power electronics

Vibration Source

Energy Harvesting Transducer

Power Processing Interface

Electrical Energy Storage

Voltage Regulation

Computation

Sensor

Frequency Tuning Actuator

Piezoelectric Prebiasing

Variable Reluctance Device

Harvester Control
Scientific Contributions
Scientific Contributions

Energy-modulated computing & Vdd-robust electronics

- Vibration Source
- Energy Harvesting Transducer
- Power Processing Interface
- Electrical Energy Storage
- Voltage Regulation
- Computation

Sensor
Frequency Tuning Actuator
Harvester Control
Scientific Contributions

Fast simulation, design space exploration and optimisation of EH systems

- Vibration Source
- Energy Harvesting Transducer
- Power Processing Interface
- Electrical Energy Storage
- Voltage Regulation
- Computation
- Frequency Tuning Actuator
- Survey of vibration signatures
- Harvester Control
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
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
  – ...