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The Low Power Energy Aware Processing (LEAP) Embedded Networked Sensor System

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The Low Power Energy Aware Processing (LEAP) Embedded Networked Sensor System

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Introduction: Adaptive Sensing with Energy Agile Platforms

New Requirements

- Measurement and detection in complex environments
- Requires high performance sensing, computing, networking
- Requires on demand actuation

Fundamental Challenges

- Must maintain low energy operation
- Must enable adaptation to environmental change

Research Goals

- Harness highest energy efficiency components
- Introduce new multiprocessor platform
- Hardware/software support for new scheduling methods
- Autonomous adaptation to maximize sensing fidelity.

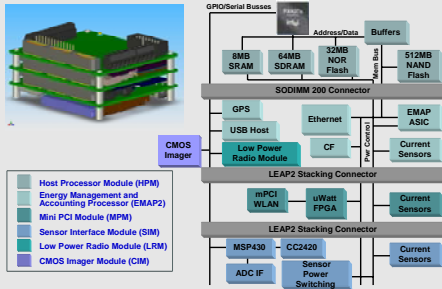
Application Goals

- Distributed sensing in natural and civil environments

Solution: LEAP2 Architecture

LEAP2 System

- Exploit high energy efficiency components
- Integrate energy management and accounting
- Enable on-demand and/or proactive scheduling
- Match instantaneous sensing requirements with components in multiple *power domains*



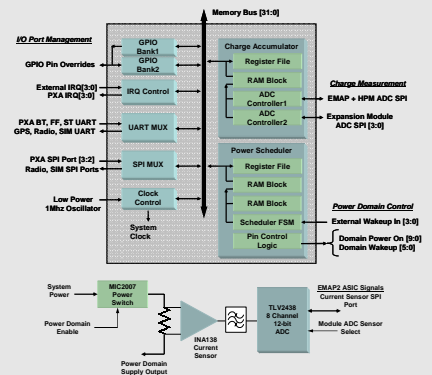
LEAP2 Imaging

3M pixel CMOS imager with pan/tilt controls



EMAP2 ASIC

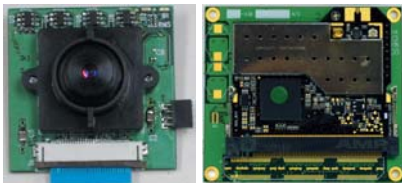
Dedicated ASIC for energy measurement and power scheduling



Results: Hardware Platforms

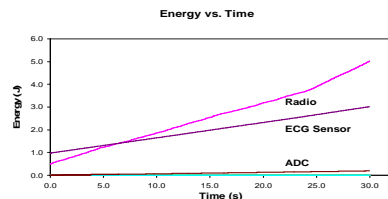
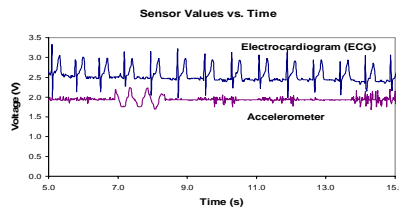
LEAP2 Modules

- Stacking-connector design allows rapid peripheral development
- Single-point energy management unit (EMAP2)



μLEAP

μController-based LEAP system



ENSBox

- Dual MSP430 microcontroller, one for system management, one for sensor management
- Applications include outdoor environmental sensing and seismic sensing

