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The Low Power Energy Aware Processing (LEAP) Software Applications

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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: etop & Energy-Aware Operating Systems for Microservers

etop: Real-time Per-process Energy Accounting
• Based on “top” Unix utility
  – Real-time display of per-subsystem current/power/energy consumption
  – Real-time display of per-process energy information
• Capabilities
  – Measures energy consumption during system/user time per scheduler tick
  – Provides information in /proc/<pid>/chrg
• Planned extensions
  – Per-process per-subsystem display
  – Asynchronous operation support

Energy-Aware OS for Microservers
• Scheduling
  – Dynamic energy scheduler
• Application design
  – Resource usage: processor, memory, storage, network interfaces
• Automatic energy profiling
  – Selecting the optimal operating points for a particular task

Other LEAP2 Applications

Graphical User Interface – LabVIEW

TinyOS Port
• Sensor-network specific OS
• Tightly coupled I2C interface with PXA
• Capability to power up/down PXA
• Similar abstractions between MP and SMP on ENS Box
• Design energy aware features for TinyOS

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