

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.

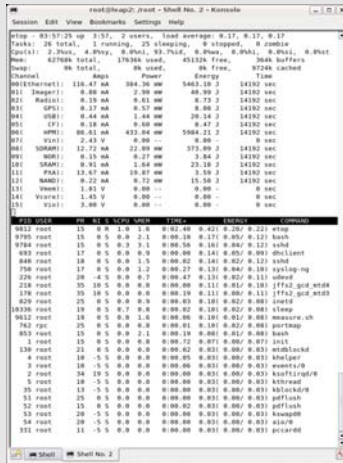
Application Goals

- Distributed sensing in natural and civil environments

Solution: etop & Energy-Aware Operating Systems for Microservers

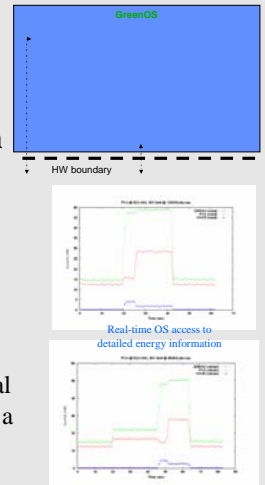
etop: Real-time Per-process Energy Accounting

- 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



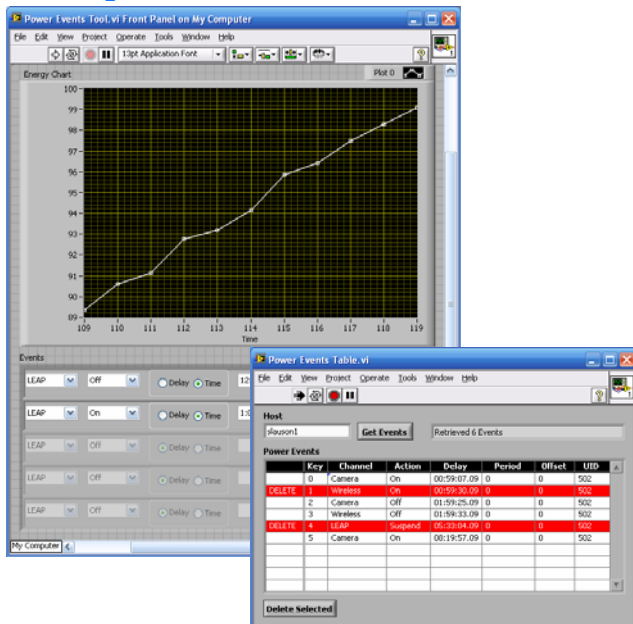
Energy-Aware OS for Microservers

- 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

