Demo Abstract: Intel Mote 2: An Advanced Platform for Demanding Sensor Network Applications

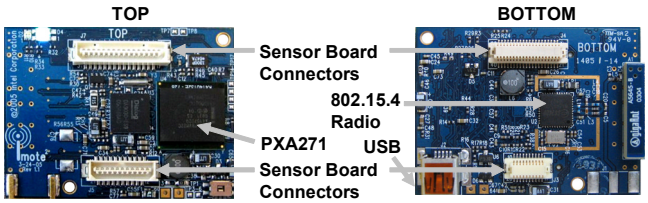
Robert Adler, Mick Flanigan, Jonathan Huang, Ralph Kling,
Nandakishore Kushalnagar, Lama Nachman, Chieh-Yih Wan, Mark Yarvis [1]
Intel Corporation
2200 Mission College Blvd., Santa Clara, CA 95052, USA

Categories and Subject Descriptors
C.3 [**Special-Purpose and Application-Based Systems**]: *real-time and embedded systems, microprocessor/microcomputer applications, signal processing systems.*

General Terms
Performance, Design, Economics, Experimentation.

Keywords
Industrial sensor network applications, embedded hardware design.

1. INTRODUCTION
The Intel Mote 2 is an advanced wireless sensing platform. Intel Mote 2 includes a 32-bit microprocessor, an 802.15.4 radio, and a wide variety of I/O interfaces, making it ideal for high-performance sensing applications.



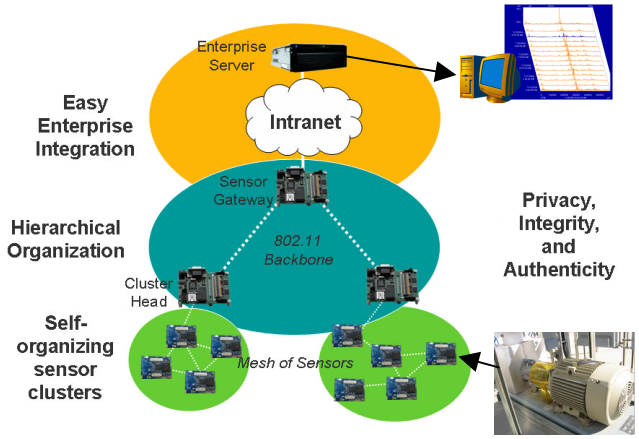
Intel Mote 2 is based on the PXA271 microprocessor featuring the Intel XScale® core[2]. This multi-die package includes a high performance processor, 32 MB of flash and 32 MB of SDRAM. The processor integrates a DSP coprocessor, a security coprocessor and an expanded set of I/O interfaces (including UART, I2C, SPI, USB, CIF, I2S, and AC97) to ease sensor integration. The platform also provides an on-board 802.15.4 radio and the option to add other wireless interfaces via an SDIO interface. We have ported the TinyOS and Linux operating systems to this platform.

The processor's Dynamic Voltage Scaling feature enables applications to dynamically trade off performance and power consumption. The lowest active power is obtained at low voltage (0.85V) and low frequency (13 MHz). The frequency can be dynamically scaled to 416 MHz, to satisfy demanding real-time constraints.

The I/O interfaces are accessible through stackable connectors on the top and bottom sides, allowing for easy integration of various sensor and power boards. The mote also includes a mini USB connector to simplify PC connectivity. In addition to the integrated 2.4 GHz surface mount antenna, an external Antenna option is provided for enhanced range.

SenSys'05, November 2–4, 2005, San Diego, California, USA.
ACM 1-59593-054-X/05/0011.

2. DEMONSTRATION
Condition-based maintenance: The Intel Mote 2 is well suited for industrial applications, which can take advantage of the increased capabilities of the platform. We will demonstrate application of wireless sensor networks to condition based maintenance. We have deployed such a network in an Intel fabrication facility and on board a BP oil tanker, to predict the health of equipment using vibration monitoring. We will demonstrate the complete application using hardware from our deployments, starting from vibration sensors connected to the Intel Motes via custom sensor boards. These motes form clusters, collect data from the vibration sensors, perform data processing, and relay the data to a backend server using intermediate gateway nodes. The Rockwell Enshare[*] backend server is used to analyze and trend the data, and generate alerts to schedule equipment maintenance, as required.



Real-time data collection: We will demonstrate a collection of Intel Mote 2 nodes connected to various sensors (3 dimensional accelerometers, temperature, humidity) in an 802.15.4 mesh network, streaming live data to a PC.

[1] Authors may be contacted at {robert.p.adler, mick.j.flanigan, jonathan.huang, ralph.kling, nandakishore.kushalnagar, lama.nachman, chieh-yih.wan, mark.d.yarvis} @intel.com

[2] *Intel XScale is a trademark or registered trademark of Intel Corporation or its subsidiaries in the United States and other countries.*

[*] Other names and brands may be claimed as the property of others.