SMART BUILDINGS INITIATIVE

UNIVERSITY OF TEXAS AT AUSTIN
What Starts Here Changes The World
To develop, prioritize and execute energy related sustainability initiatives for UT’s buildings we must answer three questions:

- **What is the building’s total energy consumption?**

- **How is energy consumed inside the building?**

- **How is the building used by students, faculty and staff?**
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  - Building-Level Energy Meters

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  - Indoor Localization System
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GOAL: Implement and environment and energy monitoring system which would monitor temp., light levels, relative humidity, and electricity usage throughout a building.

- **System Basics: ZibBee System**
  - Does not interfere with UT Wi-Fi network
  - Secured using 128-bit AEX encryption
  - Can be expanded with GPS and Cellular

- **Benefits:**
  - Application of energy and environment data can result in an initial reduction of energy usage by 10-20% per building.
SYSTEM INFO: Works by creating wireless mesh networks between a base station or gateway, and an array of deployed sensors.

- **Battery-powered & wall-mounted**

- **Single sensor monitors & transmits:**
  - Temperature
  - Relative Humidity
  - Light Level Data
  - Connects to a CO2 sensor

- **Network is automatically created**

- **Gateway connects to 3rd party sensor**

- **Sensor acts as wireless bridge**
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DEMO
By tracking mobile devices such as cellphones and laptops it is possible to map how a building is used by people, while protecting personal privacy [1,4].
Indoor Localization

There are many well researched methods for tracking the movement of people inside a building [2,5,6].

- Infrared
- Ultrasound
- Bluetooth
- Wi-Fi
- Cellular
Bluetooth, Wi-Fi, Cellular localization are attractive methods for the following reasons [1]:

- Wi-Fi and Cellular networks are ubiquitous.
- Mobile phones and laptops come enabled.
- Room-level accuracy (1-3 meters).
- Relatively inexpensive to setup and operate.
Wi-Fi localization opens up many exciting new frontiers. Here are just a few of the possible benefits and applications:

- **Sustainability**
- **Security**
- **Public Health**
- **Navigation**
- **Communication**
- **Basic Research**
We propose a pilot project that will accomplish the following:

- Develop the technology to track mobile devices to a room-level specificity.

- Deploy Environment and Energy Monitoring System in 4 test buildings.

- Conduct a study with voluntary beta testers to understand how students, faculty and staff are using several test buildings.

- Compare the test buildings’ usage with their energy consumption to help identify potential energy savings.


COSTS:

- *LabView Software* = $1,250 ea.
- *XBee Sensors* = $138 ea.
- *Dedicated-Client Gateways* = $378 ea.
- *Network Extenders* = $69 ea.
- *XBee Adapters* = $69 ea.

**EXAMPLE PILOT PROJECT:**

- 4 Buildings W/ Zero-Client Gateways
- 20 Room Each
- Average of 2 sensors per room
- 8 Network Extenders
- LabView Software

Total Cost = $25,394