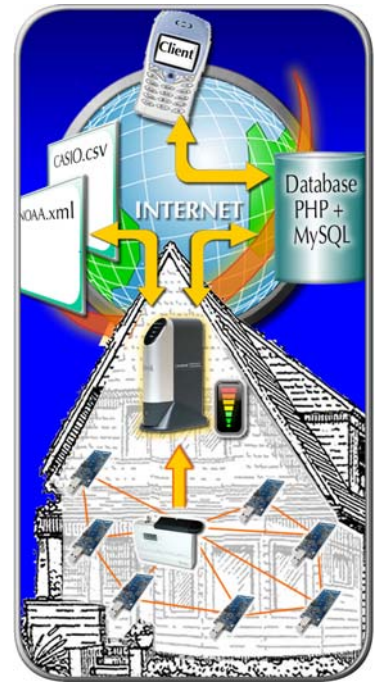
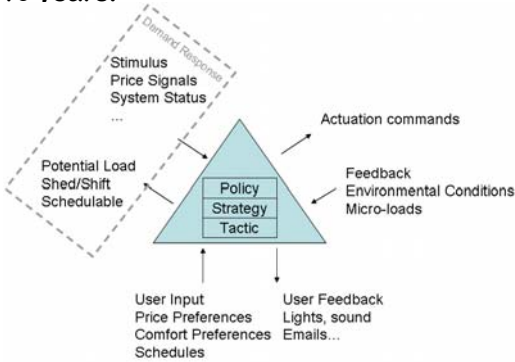


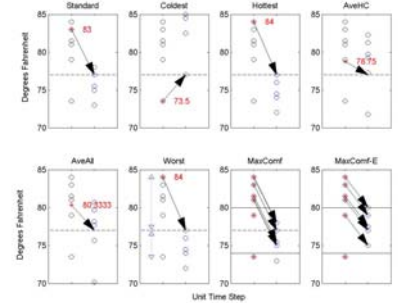
Vision

Design and implement a wireless sensor network enabled residential energy management system that reliably balances occupant satisfaction and energy savings preferences with automatic, reactive short-term load shedding and long-term energy reduction without changing sensor node batteries for 10 years.



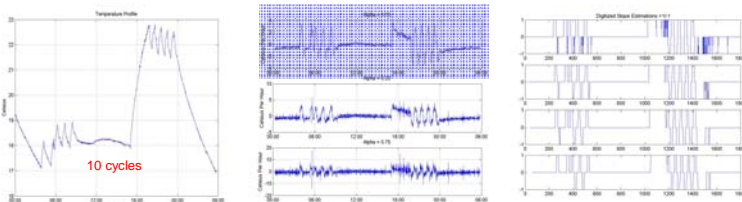
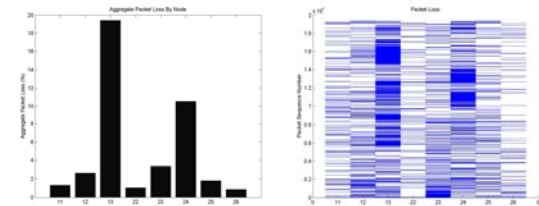
Research Questions

- How can a HVAC react differently given environmental conditions from all rooms?
- How reliable is 2.4GHz communication in houses?
- How much ambient energy is available in a residential environment? Is it needed?
- How can energy consumption be cost-effective monitored?



Methods

- 64 simulations to evaluate HVAC control with distributed sensing for 4 house designs, 4 control deadbands, 2 operational modes, and 2 weather profiles.
- 5 wireless communication performance site surveys to characterize packet-level communication.
- Development of autonomous embedded Java software for in-situ system pilot tests. In-situ pilot tests of HVAC control with distributed sensing occurring during Summer 2006.



Findings

- Aggregated packet loss < 10%, short bursty events.
- +/- 10% HVAC energy estimate using distributed temperature sensing (using from measured data).
- HVAC Control with distributed environmental sensing can reduce energy consumption by more than 30%.

