

Smart Home: Remote Energy Monitoring and Automation System

Ted Herman, Paul Haist, Nahid Hassan

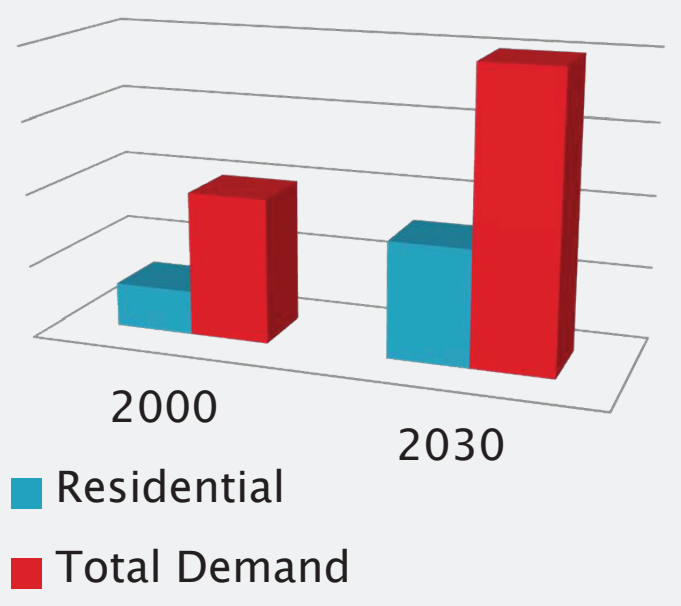
Supervisor: Prof Z. Tate

Administrator: Prof H. Timorabadi

Motivation

➤ Rising Energy Demand

- Demand expected to double over next thirty years [1]
- The single fastest source of growth is **residential demand** [1]



➤ Consumer Perception

- Consumers do not perceive using energy, but rather, using appliances [2]
 - Results in slow adoption of improved efficiency household appliances [2]
 - For example, dishwashers are 95% more efficient than those built 35 years ago [3]

➤ Standby Power

- Many electrical devices draw miniscule amounts of power when the device has been switched off, known as “standby power” [4]
- Standby power accounts for almost 10% of residential electricity use in the United States [4]

Project Goal

Cut home energy usage by:

- Creating awareness of power consumption within the home
- Offering some degree of control over the power consumption

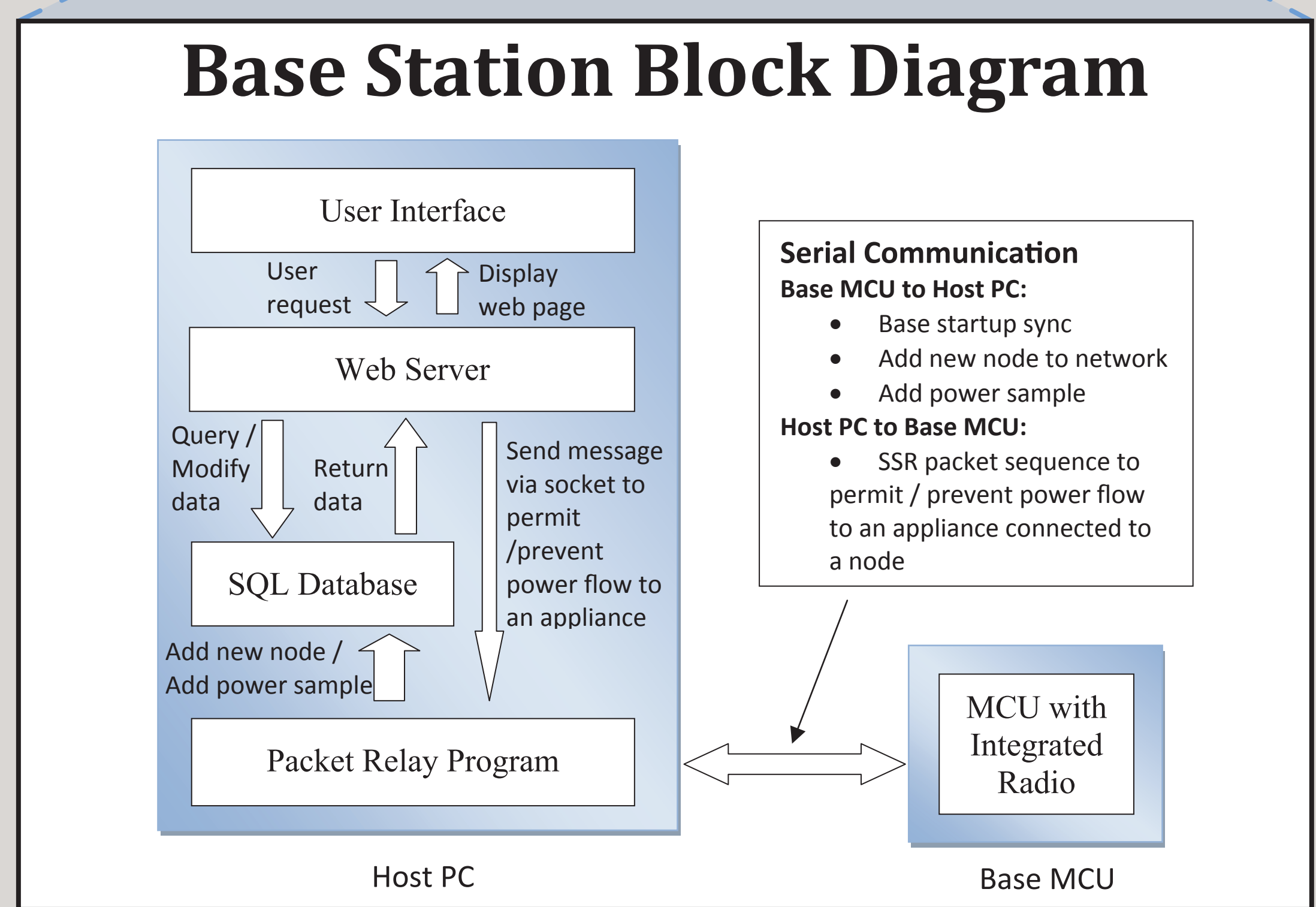
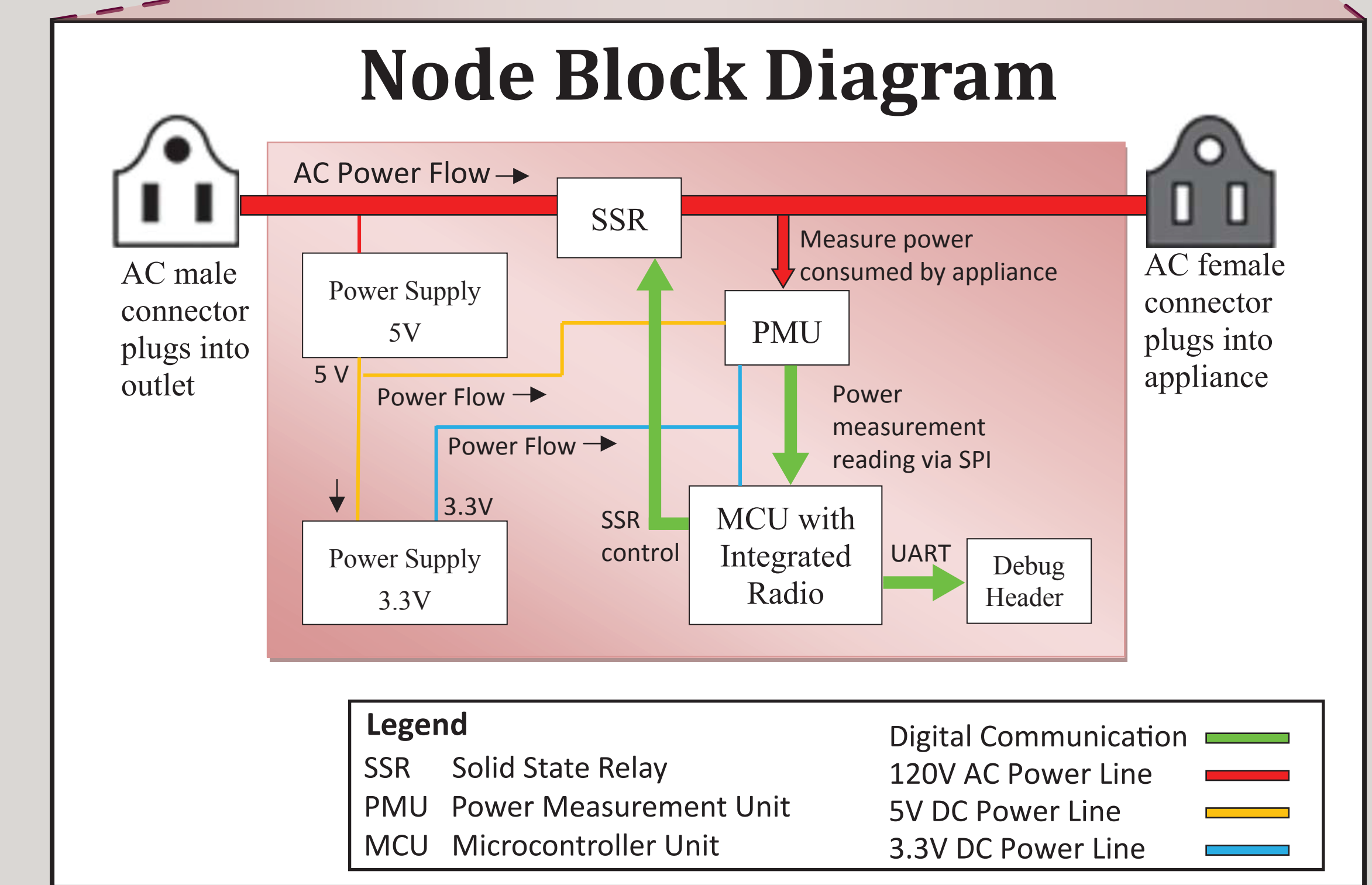
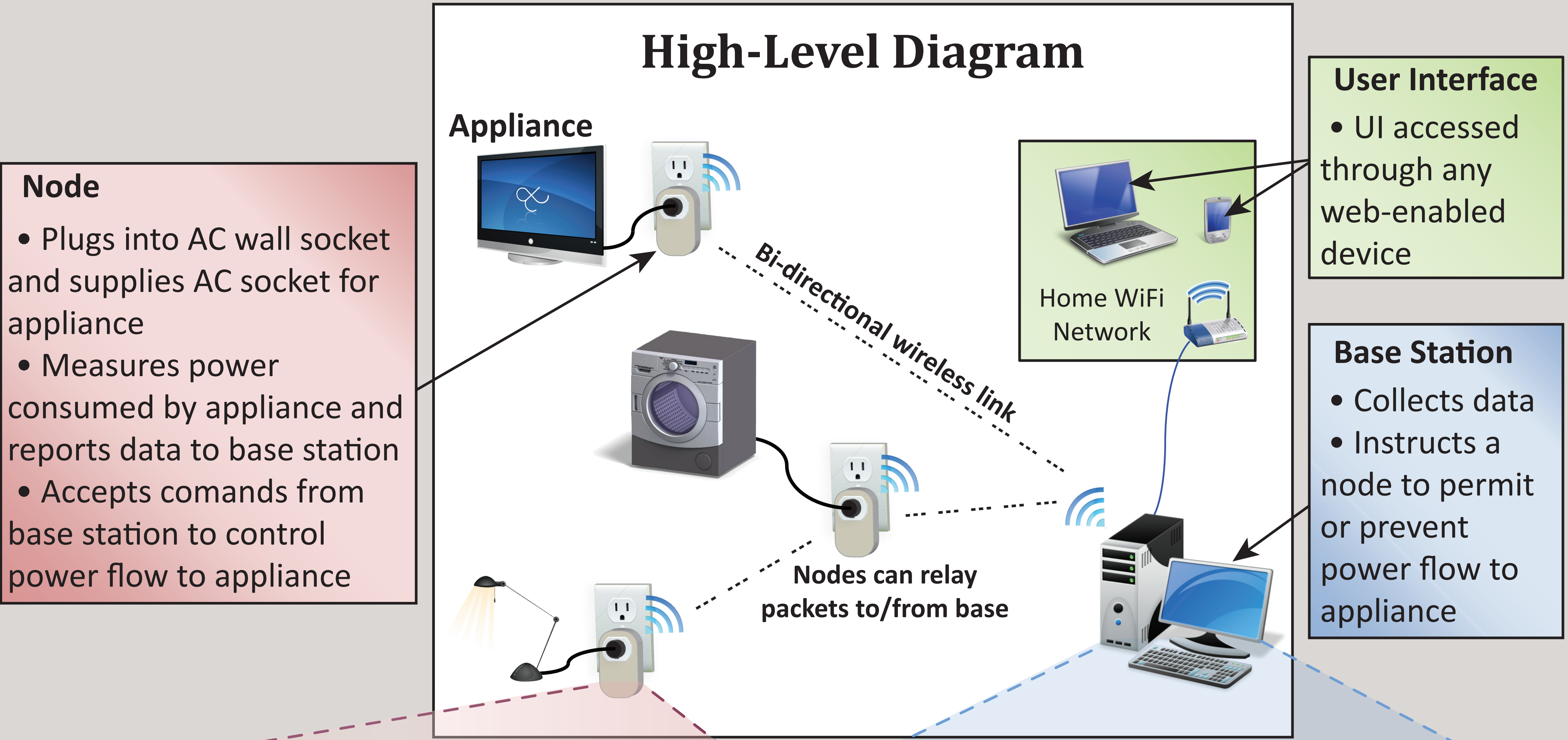
By combining awareness of how power is consumed and providing users with a mechanism by which to save power, we hope to encourage and facilitate power saving habits.

Future Work

- **Power Triggers:** Turning appliances on/off based on power readings from other appliances
 - A computer powering down turns off its peripherals
- **Power States:** A set of grouped actions
 - A vacation state where all non-essential appliances are turned off
- **Additional Node Models:** Greater coverage of appliances
 - 240V appliances, fixed lighting systems, power bars
- **Reduce System Power:** Modify base station to use a low-power plug computer instead of a PC

System Design

A wireless network of nodes monitors and controls power consumption of appliances in the home. The user interface is accessible through any web-enabled device.



References:

- [1] C. Harvilla, "Green Power: An Electrifying Choice," Center for Resource Solutions, Worldwatch Institute, 2004. [Online]. Available: <http://www.worldwatch.org/system/files/GS0012.pdf>. [Accessed: Sept. 18, 2009].
- [2] G. Fitzpatrick and G. Smith, "Technology-enabled feedback on domestic energy consumption: articulating a set of design concerns," IEEE Pervasive Computing, vol. 8, no. 1, pp. 37-44, Jan.-Mar. 2009.
- [3] A. Meier, "Standby Power," Lawrence Berkeley National Laboratory, Energy Analysis Department, 2009. [Online]. Available: <http://standby.lbl.gov/standby.html>. [Accessed: Sept 18, 2009].
- [4] J. Porter, "Compiled List of Quick Facts," Environment Canada, Dec. 5, 2007. [Online]. Available: <http://www.ec.gc.ca/cleanair-airpur/default.asp?lang=En&n=2309FEF9-1&meta=1>. [Accessed: Sept 18, 2009].