

Abstract

New technology finding its way into the home has opened up a gateway to collect power statistics and other information in a fast and efficient way. To keep up with demand from consumers, some electric companies provide primitive visualizations of their power usage and quality of power. A problem arises from hosting all this data on a centralized network, introducing problems such as low sample rates and extremely high latency.

Introduction

Our goal is to extend the capability of home power systems such as the UPS (Uninterruptible Power Supply) by Schneider Electric. This can be accomplished by taking advantage of the preexisting sensors on such devices and allowing the data to be stored and viewed remotely and in real time.

Methods & Materials

- Raspberry Pi – Hosts the server code and web client
- Web Client – PHP, JavaScript, WebSockets, CSS, jQuery
- Multithreading – Our multithreaded python server samples and collects data from a UPS via USB in one thread, while other threads are opened to communicate with clients accessing the web interface and serving data.
- WebSockets (RFC 6455) – These are used to maintain an open channel of communication between server and client while accessing the web interface. Communication is used to request sets of data and stream live data.

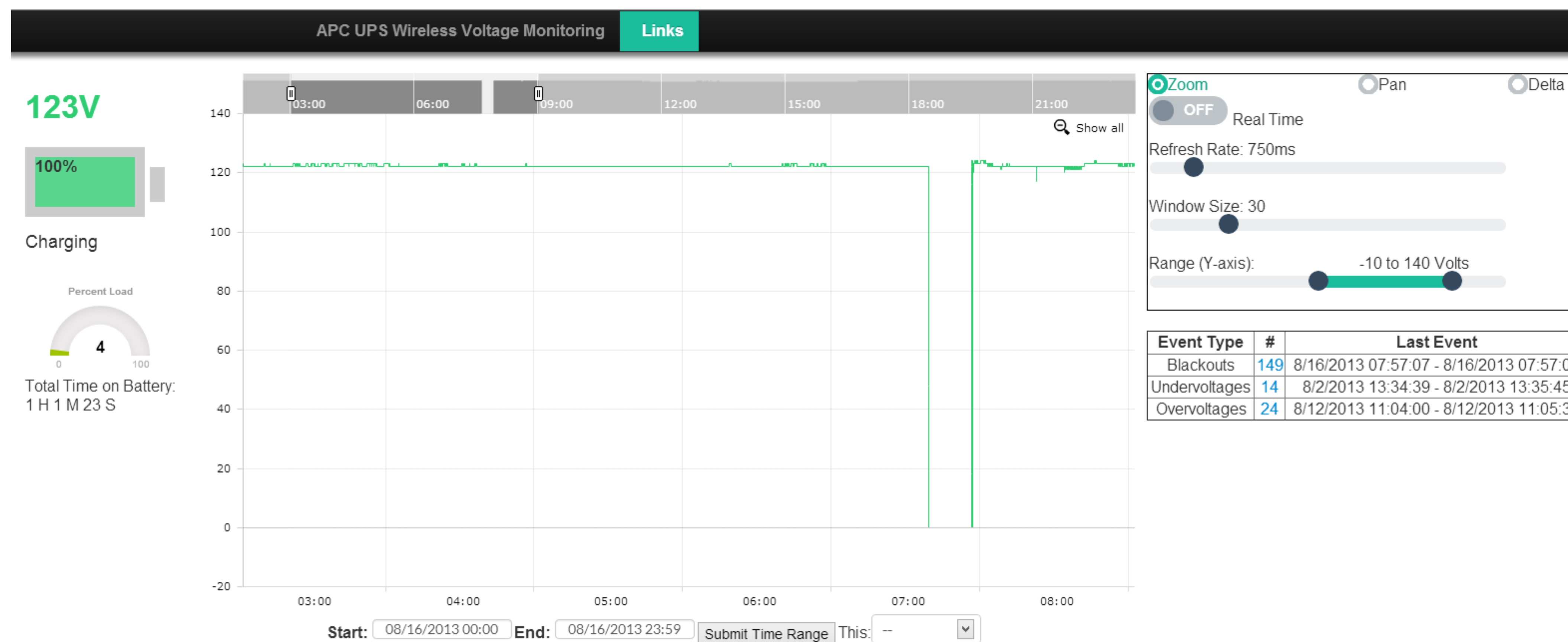


Fig. 1. Screenshot of blackout data from 3-9am on 8/16/2013.

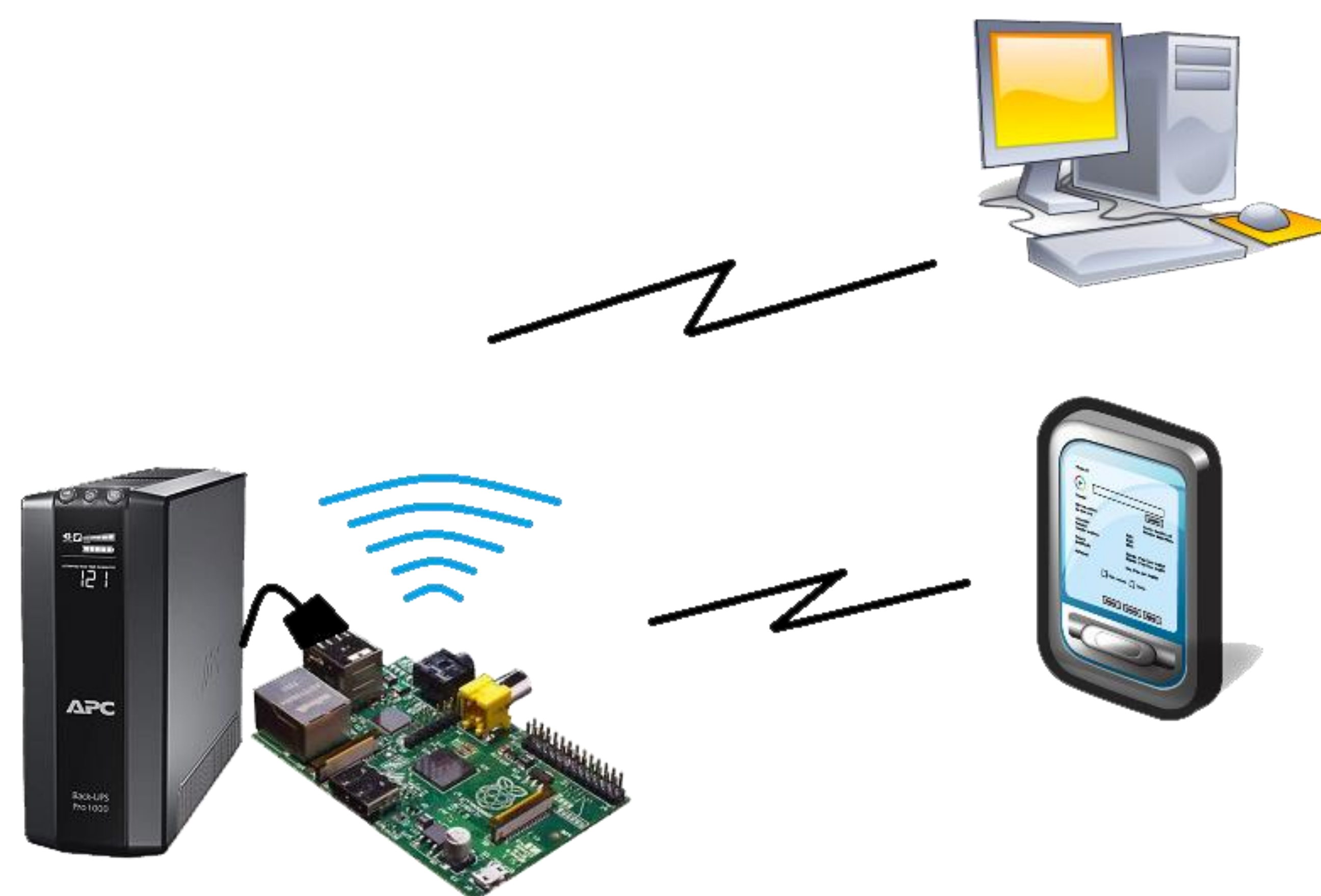


Fig. 2. Model of our project showing how the UPS becomes connected with PC's and mobile devices.

Future Plans

- Generalize database to accept a wide variety of sensors.
- Communicate with database server to report different kinds of data.
- Integrate with other power monitoring research groups to combine data visualization interfaces and techniques.
- Tap into the analog signals on the board to get faster sampling.

Limitations/Caveats

- APC Software only provides 6Hz sample rate.
- Sampling is done over USB.
- Voltage samples only have integer resolution.

Results

Our web interface provides a clean user-friendly window into visualizing power statistics. Users can view their power usage and voltage in real time, or browse through past data. Given more frequently sampled data, the interface has the power to catch the cause of a blackout by interpreting the voltage between the 8 cycles from breaker to fault.