Arduino Based Home energy measurement

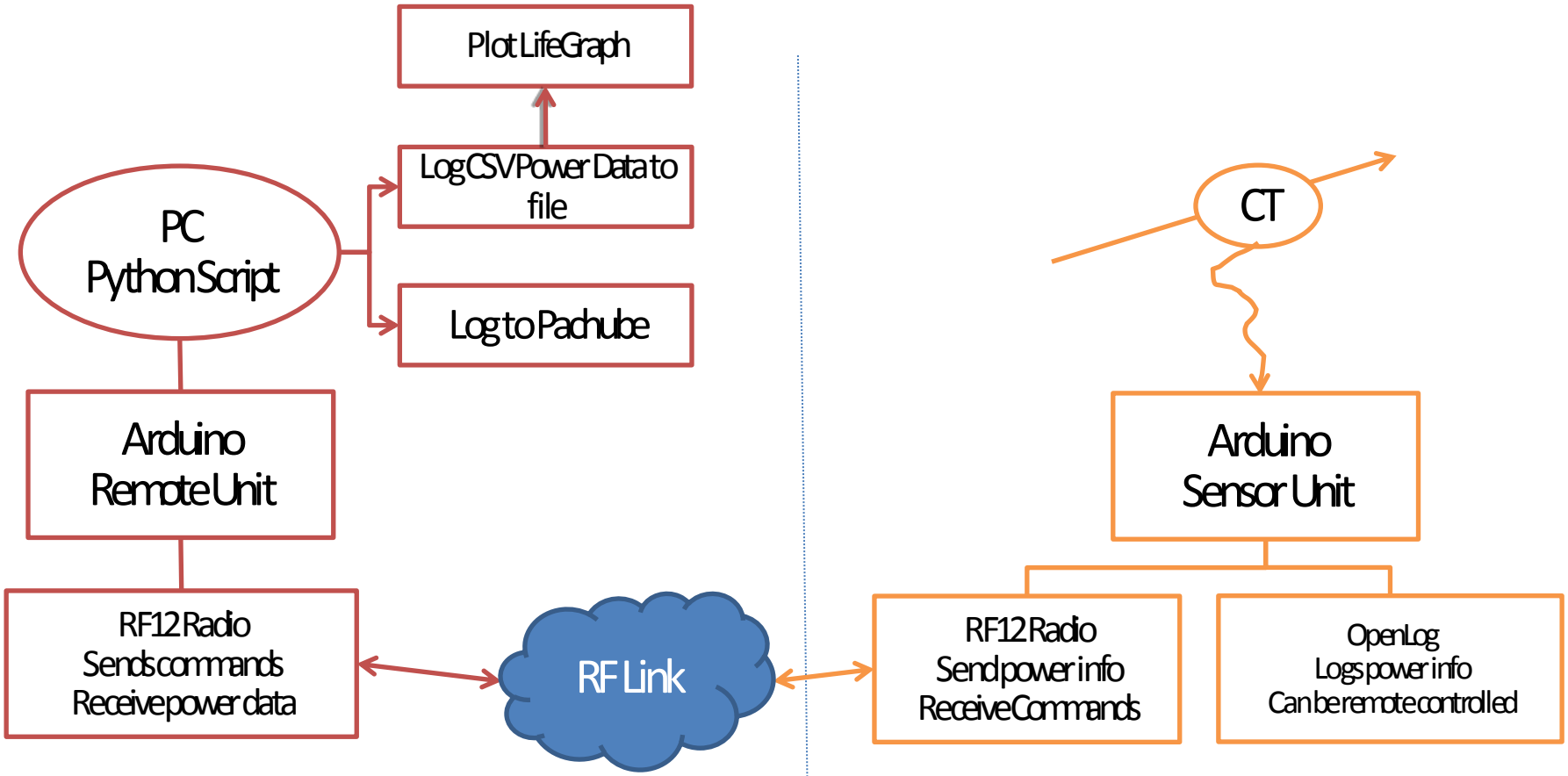
Background

- This is my attempt to build a small home based energy logger.
- It is not unique but has an RF12 on board so it can integrate with other systems, and it logs data to an OpenLog unit
- This makes changing SD cards and logging a breeze
- It is based on OpenEnergyMonitor
- Many of these projects have been done all around the world
- I think what makes this one unique is the fact that the sensor unit (the arduino with the CT) has a RF12 radio built in and also an Openlog unit from Sparkfun
- The OpenLog unit is connected to the UART of the sensor unit. Full control off the Openlog can be obtained via the remote unit connected via RF12 radio
- This means that the sensor unit can keep on logging to the Openlog. You can remotely initiate a session with the Openlog from the base station, and make changes to the settings, before putting it back in logging mode

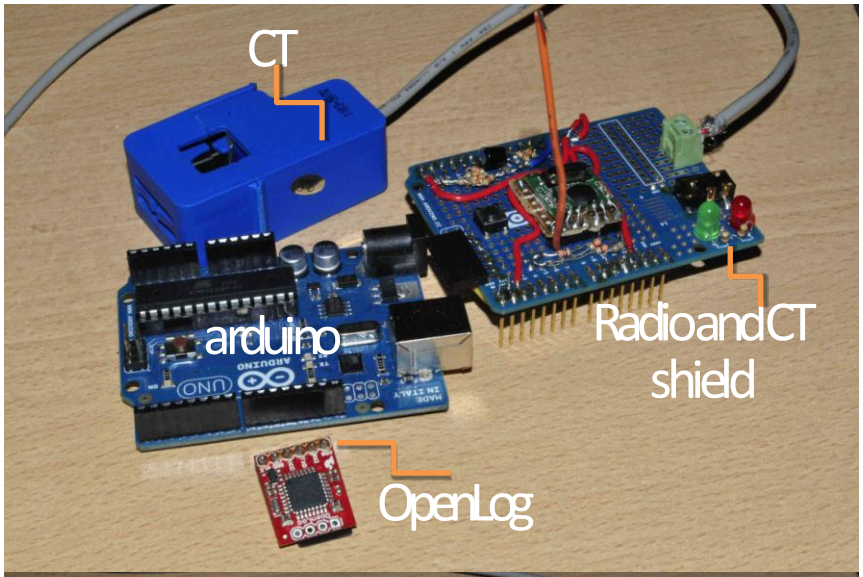
Some facts

- Small home built energy logger
- Based on Atmel ATMega 328 chip and arduino compatible
- Based on the OpenEnergyMonitor project
- Measure current only, Voltage assumed constant
- RF12 radio installed, this makes the system very expandable
- OpenLog from sparkfun installed
- Voltage assumed constant and only RMS current measured using Emon.cc library from the OpenEnergyLogger project

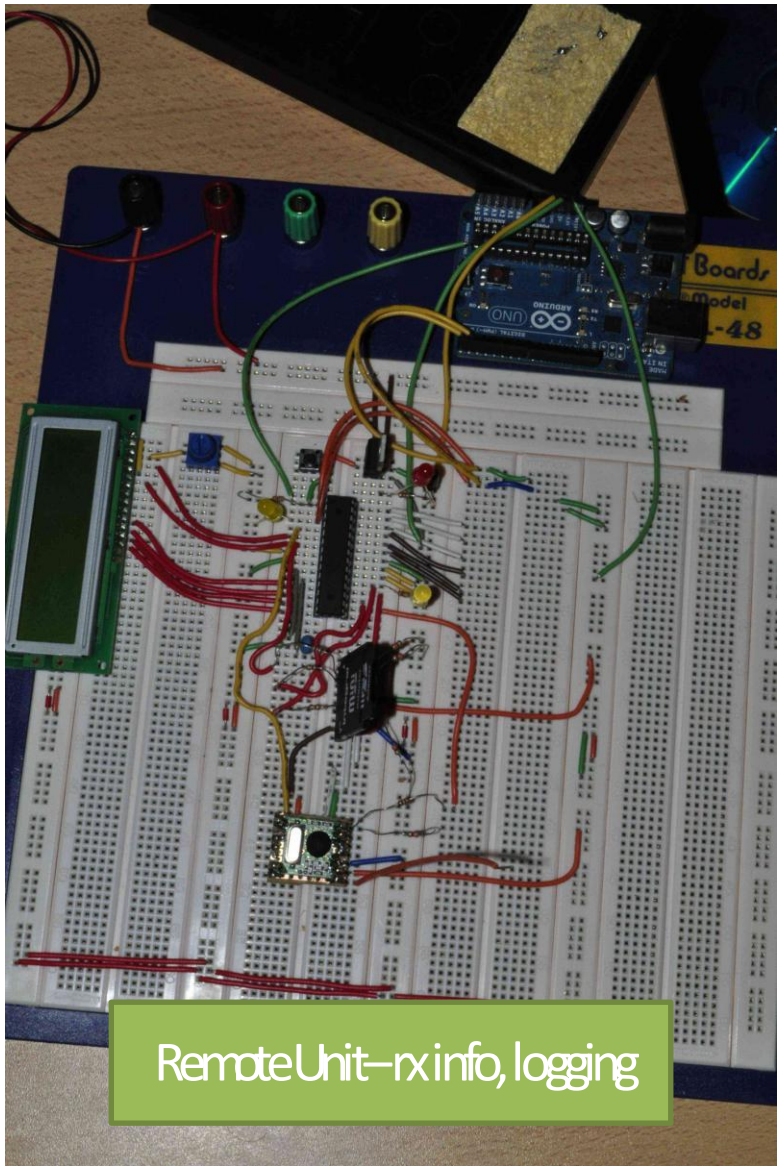
Device Setup



Some photos


CT
arduino
Radio and CT shield
OpenLog


Sensor Unit – CT and logging


Remote Unit – rx info, logging

Connecting the CT

- Use bias resistors to bias CT voltage around 2.5V, since the controller cannot read the negative portion of the current wave
- We would have to filter out this DC voltage later on with a digital high pass filter – refer to code in emon.cc

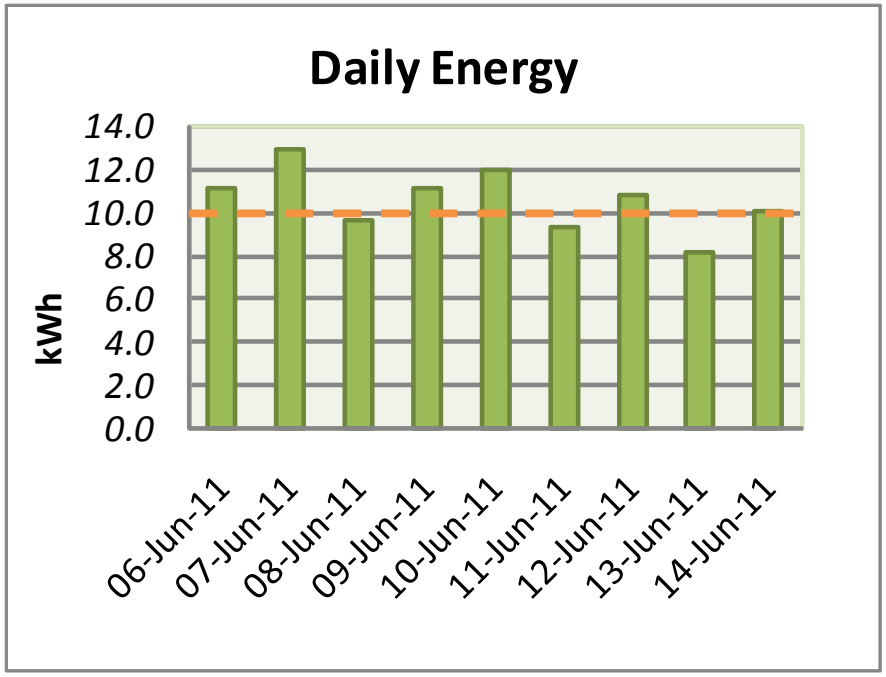
- Source - http://openenergymonitor.org/emon/

Measuring Power

- http://openenergymonitor.org/emon/

Measurement of home hot water energy

Row Labels	Sum of Energy
06-Jun-11	11.1
07-Jun-11	12.9
08-Jun-11	9.6
09-Jun-11	11.2
10-Jun-11	12.0
11-Jun-11	9.4
12-Jun-11	10.8
13-Jun-11	8.2
14-Jun-11	10.0
Grand Total	**95.0**



Average(kWh)	***10.56***	*Average kWh for a day*
Approx Losses	***1.50***	*Lets remove losses, to see how much we used*
Q(joules)	***32614785.61***	*We used this many joules for water heating*
T1(degreesC)	***65.00***	*Geyser Setting*
T2(degreesC)	***10.00***	*Lets guess the input water temperature*
Mass of water use(litres)	***141.19***	*Approximate water use for the house (Q=mc delta T)*
Number of people (n)	***2.50***	*How many people in the house....baby = 0.5*
Litres of water used per person	***56.48***	*Average water use per person per day*

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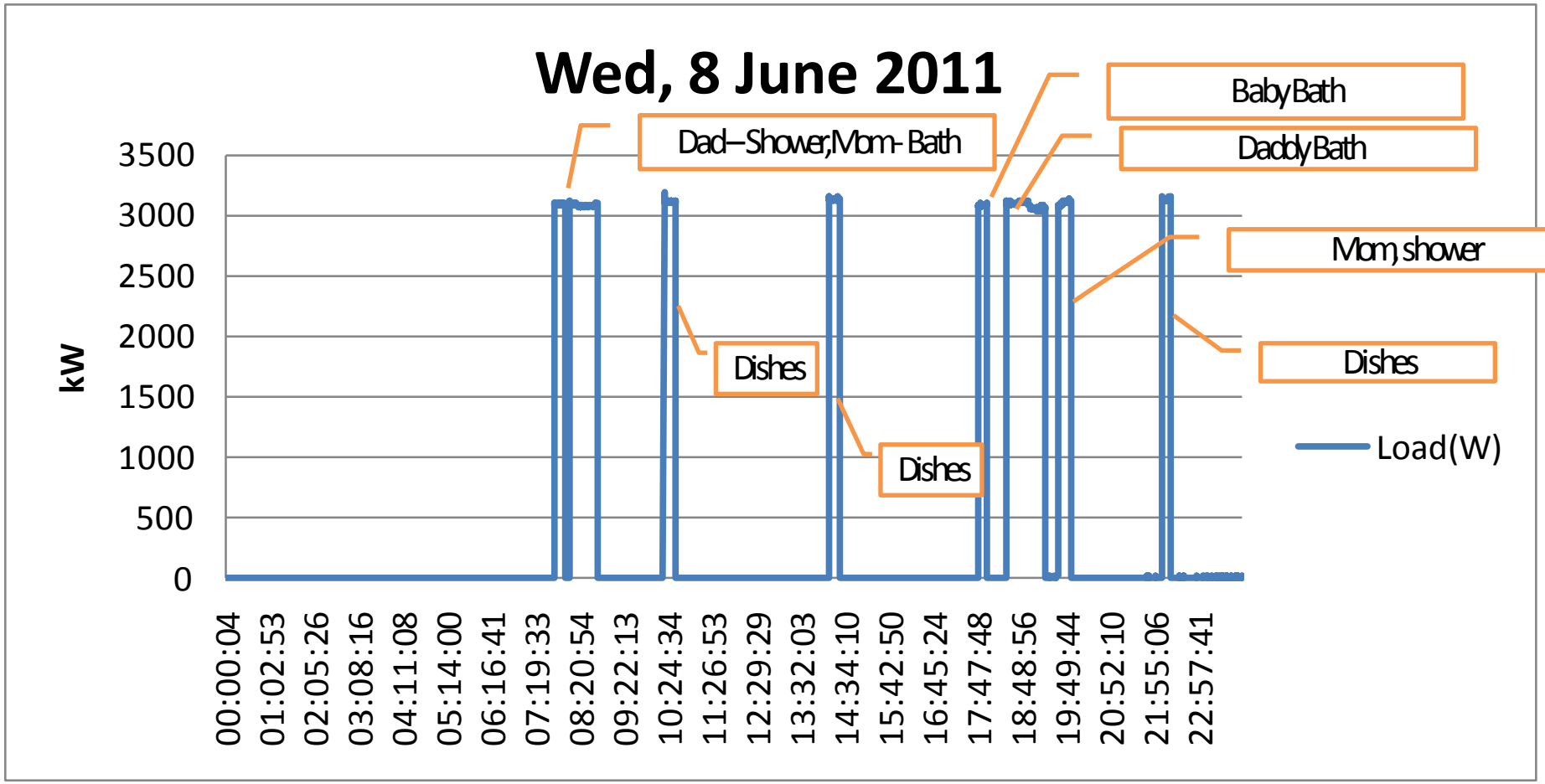
Day measurement



Project Info

- GIT - https://github.com/Toolslippe/Energy_Logger
- GIT Wiki - https://github.com/Toolslippe/Energy_Logger#readme
- Sparkfun – www.sparkfun.com
- Arduino – www.arduino.cc
- OpenEnergyMonitor - http://openenergymonitor.org/emon/
- My RF12 data hub -

More about me

- www.navitas.co.za/tobienortje

Project licence

- Free as in really free... give us a mention and we are happy, but you don't have to.