

EE/CprE/SE 492 BIWEEKLY REPORT 1

1/8/18 – 1/22/18

SDMay18-41

Free Market P2P Energy Trading and Analytics

Client: Sodima Solutions

Adviser: Goce Trajcevski

Team Members/Role:

Arun Sondhi: Embedded Engineer/Hardware-Software Interface Lead

Alec Dorenkamp: Software Engineer (back end)

Noah Eigenfeld: Software Engineer (front end)

Brendon Geils: Software Engineer/Technical Lead

Jack Myers : Hardware Engineer/Project Manager

Joe Staudacher: Hardware/Power Engineer

Weekly Summary

This reporting period was primarily focused on organization and planning for the semester. We reconvened as a group to update one another on what progress had been made since we last met. We discussed the feedback that we had received from the faculty panel at the end of EE 491 and how we can use that information to guide the progress of our project and fix any weaknesses that may have arisen. During this period, we created a general outline for what specific tasks and deliverables we expect to have done by the end of the semester. We have divided this up into subtasks with deadlines and task owners to hold each other and ourselves accountable to make sure we stay on track to complete the project.

Accomplishments in past two weeks:

Arun:

- Embedded platform investigation
 - Weighed benefits of switching to a different platform from existing prototype (Raspberry Pi)
- Will assist in forming a complete high-level hardware design to follow for the semester

Alec:

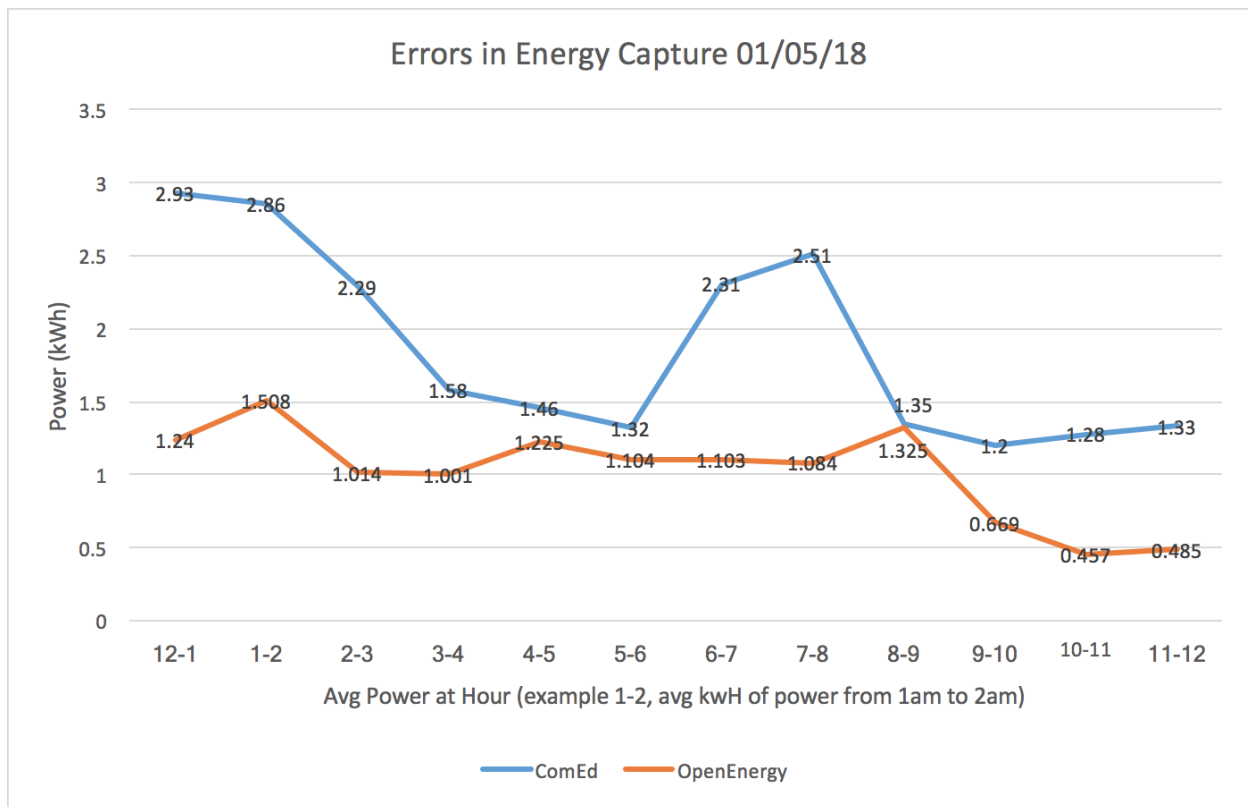
- Data analytics preliminary survey
 - Surveyed meaningful energy parameters to measure
 - Researched potential implementations of this analytics that would be informative for the consumer

Noah:

- Researched online marketplace vulnerabilities
 - Discussed potential solutions with adviser
 - It will be main priority in the coming weeks to determine which of these vulnerabilities we can realistically hope to combat
- Explored analytics opportunities from data we are acquiring

Brendon:

- Presenting as one of eight finalists for the 2018 Cleantech University Prize, a \$50,000 grant awarded to the most innovative and promising clean energy projects at Midwest universities
- Tested hardware and software integration
 - Compared our hardware's data acquisition capabilities with an actual smart meter
 - Data is shown below



- Definitely outside of acceptable range for final implementation of the smart meter, will be one of our primary goals to fix this in the coming weeks

Jack:

- Lead meeting to plan out the semester
 - Force ourselves to follow specific deadlines
 - Split up into smaller sub-teams and reconvene/check in with each other when deemed necessary
- Reviewed feedback from faculty review panel with Dr Daniels (who was a member of the panel)
 - Gained suggestions and developed a plan for responding to feedback, planning to implement a solution to some of the problems and address other limitations of our project
 - Researched implementations of competitors and how they solved some major issues relating to security, privacy, and legislative/economic feasibility of the project
- Researched pros and cons of comparable hardware platforms like Arduino
 - Weighed advantages and disadvantages versus our current solution (i.e. Arduino is faster and lower power consumption but not necessarily substantially more effective than current solution relative to the additional effort required)

- Also developed a prototype for data acquisition on Arduino, server connectivity still pending
- Researched subcomponents of standard smart meter and compared them to what we currently have
 - Looked into possibility of creating an additional board that can carry some of the components that the PI (processing unit) does not have built in
 - Exploring possibility of having our system powered by the line instead of requiring an additional external power supply

Joe:

- Hardware modifications research
 - Explored comparable solutions on the market for hardware/software
- Researched subcomponents of smart meters and determined which would be useful/necessary for our implementation

Pending Issues

- Current data acquisition is not nearly as accurate as smart meters that are currently on the market, we need to get it to an acceptable level (maybe around 1% difference)
 - Possible issues:
 - Transducer doesn't have the accuracy necessary
 - We think this is unlikely based on the specs given by the manufacturer but we will do further testing
 - It is also possible that the sensor was configured/installed improperly
 - Our algorithm for converting data from the raw analog reading from the sensor may have been incorrect
 - We will review the code for mathematical errors
 - Also will test/research to make sure that all assumptions that we are making are reasonable and accurate
- Make sure team website and documents from last semester are cleaned up and updated to our current progress
- Develop concrete plan that we will commit to for the duration of semester (addressed in other sections of this report)

Individual Contributions

Team Member	Contribution summary	Biweekly Hours	Total Hours (Semester)
Arun Sondhi	Investigated advantages/disadvantages of various hardware platforms and how they would interface with software	10	10
Alec Dorenkamp	Surveyed relevant parameters for energy analytics, researched complications of implementing marketplace	10	10
Noah Eigenfeld	Researched concerns related to implementing a marketplace and potential analytics opportunities that our data provides	10	10
Brendon Geils	Explored the feasibility of our project and met with individuals with industry knowledge, tested current hardware prototype on home	15	15
Jack Myers	Led organizational tasks for the semester, researched and started implemented some changes to the meter	12	12
Joe Staudacher	Researched potential hardware modifications	10	10

Summary of advisor meeting

With our advisor, we ended up deciding that it would make the most sense to meet with our adviser every two weeks, meeting more often when necessary. We put together a road map for the semester to try to plan what we want to get done by the end of the course and how the tasks will be delegated. Continuing from where we left off last semester, we debriefed our faculty panel review and gained feedback on how we can respond to some of the constructive criticism that we received.

Plan for coming weeks

Hardware team

- Come up with specific plan for deliverables by the end of the semester, create list with task owners and deadlines
 - This will require us to break up final tasks into subtasks
 - We will most likely create some kind of Gantt chart

Software team

- Create similar plan, potentially using specific development cycle TBD

Arun:

- Investigate security concerns related to various hardware modules and communications methods
- Develop a final decision for what we will implement by the end of the week
- Assist in assessing feasibility of new hardware components

Brendon:

- Discuss security concerns with Dr. Daniels
- Determine exactly what aspects of the marketplace we will implement and which we will just address and propose a solution to
- Continue development of front end software

Alec:

- Research/begin to implement back end of data analytics
- Explore possibilities for a marketplace solution and start planning a development cycle/timeline

Noah:

- Begin to develop more detailed and complete front-end software
 - Determine what data analytics capabilities we will provide to the user
 - Determine what data will be available to what users (keeping in mind privacy concerns)
 - Potentially solving via obscurity

Jack:

- Further develop/explore Arduino prototype
- Help debug existing hardware prototype to retrieve more accurate data
- Make final list of components that would go into additional customized board

Joe:

- Research smart meter components
- Start to research what components we would need to make and how we could design a board for fabrication within a reasonable price range/amount of time