Project Title: ***Infrared Pulse Counter for Energy Meter Monitoring***

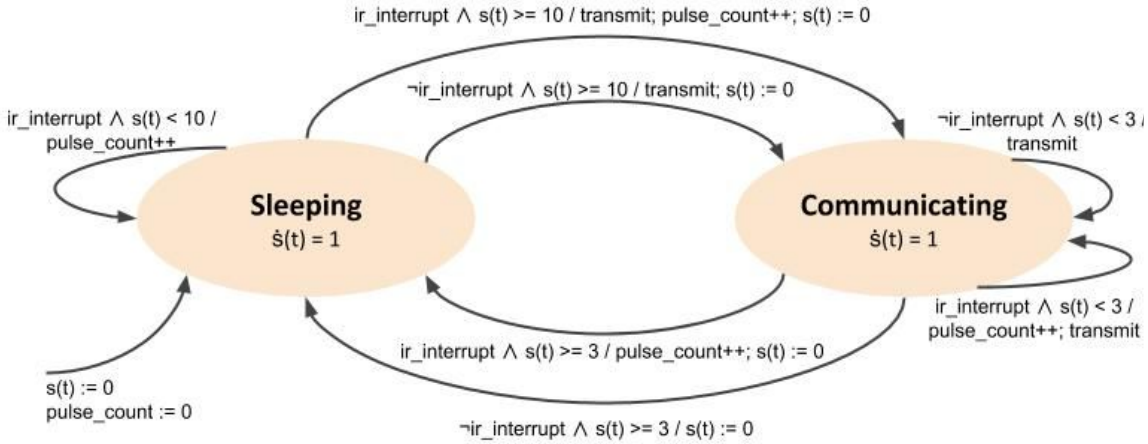
Team: *Damon Anderson, Halley Nathwani, Tim Barat, Megan Kristovich*

EECS 149/249A Project, Fall 2018

Architecture Drawings:

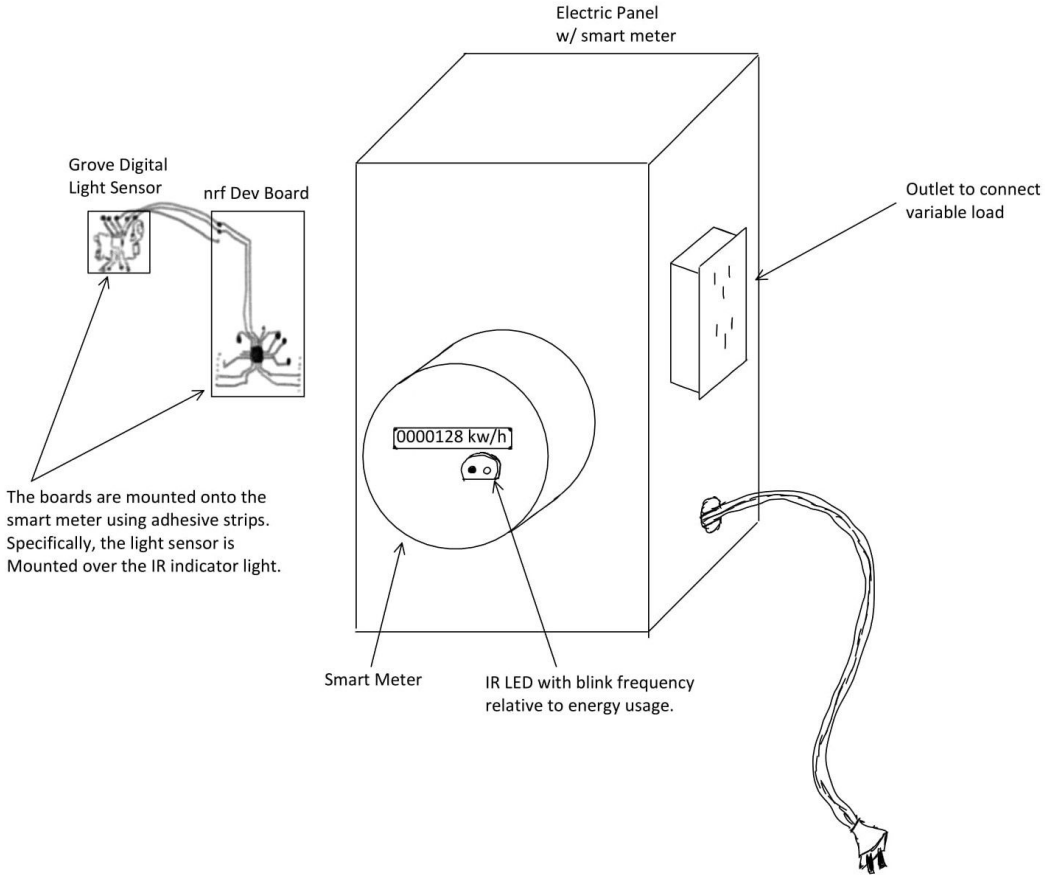
State machine:

Inputs: ir_interrupt, sent: pure
Outputs: pulse_count ∈ $\mathbb{Z}$
transmit: pure
Continuous variables: s ∈ $\Re$

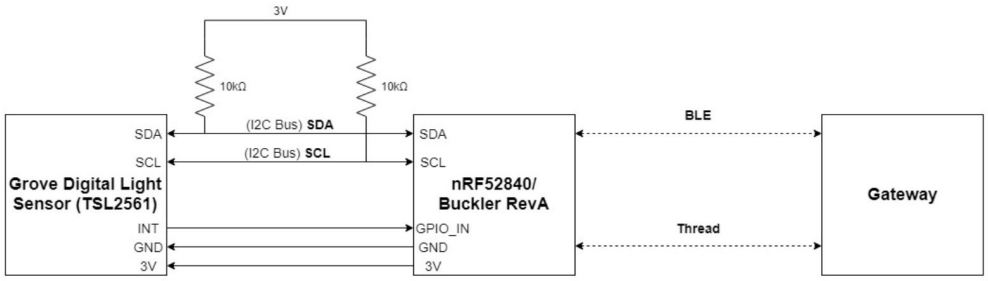


Note that our state machine will be modified based on how often we transmit, which will be adjusted as we progress into implementation. We need to balance frequency of pulses, hardware energy consumption, and transmission accuracy. Additionally, the state machine may be modified as we learn more about Thread.

High level drawing of physical setup:



Low level block diagram:



Progress:

We implemented light (not IR) detection using the Buckler Rev A sensor, to familiarize ourselves with the architecture. Additionally, we implemented light detection with the Grove digital light detector. As a result of exploring RF energy harvesting and aggregating the number of smart meters versus analog meters in the U.S., we now fully understand the bounds of our project setup. Specific modifications are described below. Further, we have a high-level understanding of the gateway functionality and BLE communications. We figured out how to wire a 240V smart meter setup with a 120V power source. Lastly, all necessary parts are ordered.

Github link: https://github.com/Damonan/energy_meter

Modifications:

We determined that analog sensor implementation would not be useful to include in core scope, as there are fewer analog meters than anticipated. Additionally, due to the fact that many meters receive limited light, we decided that solar energy harvesting should be low on our priority list. While exciting, it seems as though RF energy harvesting will not be a viable option either, since the power that would be captured from the smart meter transmissions is not enough to power the system or even recharge a battery.

Resources Needed:

We need BLE/Thread expertise, soldering equipment and access to Jacobs Hall, and a Beagle Bone (gateway).

Schedule:

Person	Deadline	Tasks
Damon	11/4 (milestone 1)	Low level block diagram and Grove light sensor detection
	11/7	Have interrupts configured properly
	11/13 (milestone 2)	Tested and confirmed IR sensor operation
Megan	11/4 (milestone 1)	State Machine
	11/7	Have Grove light sensor detecting properly
	11/13 (milestone 2)	Tested and confirmed IR sensor; Understanding of Thread
Tim	11/4 (milestone 1)	High level smart meter setup drawing
	11/7	Have smart meter setup built; Start getting Gateway setup
	11/13 (milestone 2)	Completed communication to gateway; Understanding of Thread
Halley	11/4 (milestone 1)	Explore BLE communications; email to ask for BLE resources
	11/7	Have BLE code sending packets; Start getting gateway setup
	11/13 (milestone 2)	Completed communication to gateway; Understanding Thread

Other significant dates:

- 12/7 - Successful integration and testing of the whole system
- 12/11 - Submit final demo and project poster
- 12/14 - Submit project report

Identification of Risks:

Filtering out ambient light may be a more difficult problem than anticipated. Also, energy management will be confined to only battery (no energy harvesting), which means that low power operation will be critical.