IoT Waste Management Project

IoT (Internet Of Things)

The Internet of Things (IoT) is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers and have the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction.

Sustainability

- In 2014, MacEwan University diverted 65% of their trash from the landfill and by 2020, they hope to reach a 90% diversion rate from the landfill.
- Maximizing waste management efficiency and increased sustainability has become a primary focus of many educational institutions and businesses all across North America.
- At the forefront of this trend, is the implementation of information technology and intelligent automated systems, such as IoT, into the waste management process.
- Patterns and trends can be tracked to utilize waste management resources more effectively and efficiently.

Potential Benefits

- Enevo is a Finnish company that makes sensors for municipal waste management systems.
- Raised $15.8 million in new funding.
- Using ultrasonic sensors to measure the fill levels of dumpsters and other waste receptacles, Enevo lets waste managers create dynamic, need-based trash pickup schedules.
- A web dashboard collects, analyzes the data, generates routes and schedules that make sure well-used locations get a pickup before becoming overfull, while avoiding unnecessary pickups at locations that don't fill as quickly.
- Enevo claims that cities can experience **direct cost savings of up to 50 percent on trash collection**.

Project Description

- The MacEwan University Waste Management System is a working demonstration of resource management and sustainability featuring IoT(The Internet Of Things) connectivity.
- Utilizing low cost infrared proximity sensors and Raspberry Pi hardware, capacity data of waste bins is detected, encrypted and sent through client nodes to a central server. This server inputs the data into a database and provides an administrative view of all the connected client nodes via a web interface.
- Along with data logs and statistical information, the MacEwan University Waste Management System provides the information required to efficiently and effectively manage waste collection resources.

Architecture

Sensor Calibration

Sharp GP2Y0A60SZLF Sensor Measurements Graph
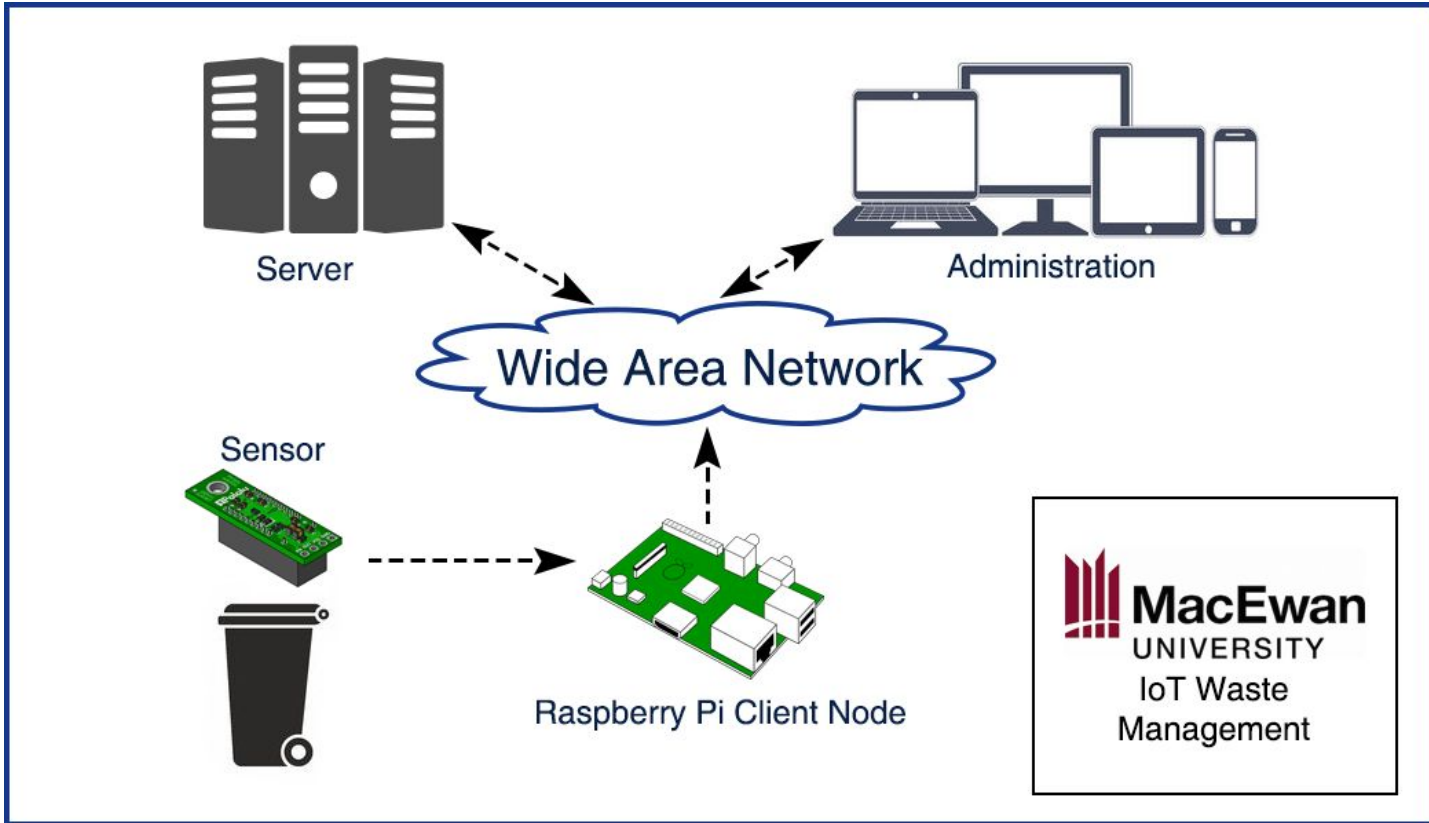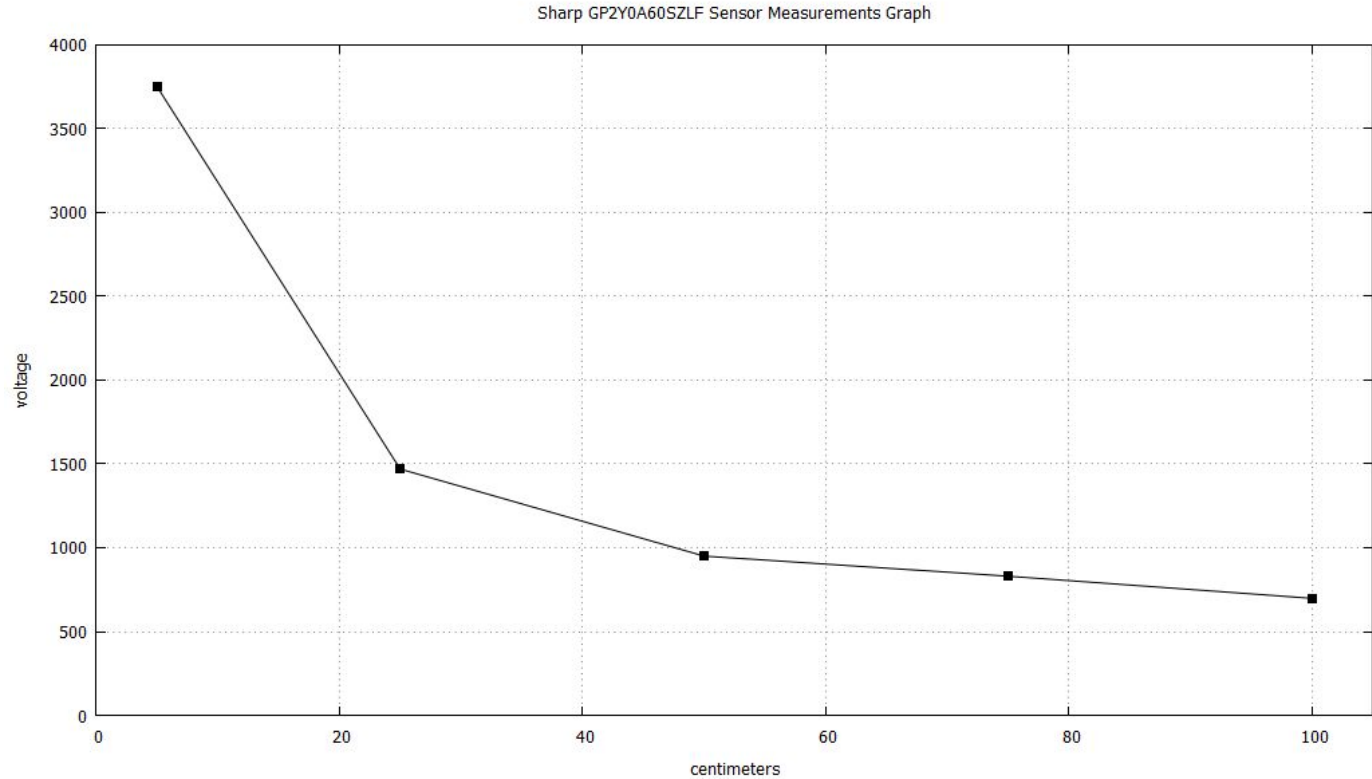
Future Work

- Additional client nodes could be implemented, each with its own cluster of sensors deployed to garbage bins in an assigned area. This would extend the garbage bin monitoring exponentially utilizing minimal resources as the same client scripts, network and server would still be in place.
- Implementing battery power for nodes in outside or remote locations that could operate with minimal maintenance required. Measurements only need to occur a few times daily to effectively monitor garbage capacity so the client nodes, analog-digital converter and sensors could be powered off between cycles.
- Client node hardware could be minimized further by utilizing smaller Arduino Feathers with embedded LoRaWAN (Long Range Wide Area Network) radios. These Arduino Feathers are lower cost and require less energy to run than Raspberry Pi Model 2B's. The addition of LoRaWAN radios permit these client nodes to communicate over a radio frequency that allows for communication for many kilometres without the need of a wireless network.