Arrays At One

Research & Requirement Document: Maple Leaf Foods

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Research Summary

The current research conducted by the team primarily includes hands-on IoT hardware construction and communication. The team has acquired a set of Arduino UNO microprocessor boards to experiment with live temperature gathering and voltage management.

Current learning focus' include understanding sensor functionality, data gathering & standardization, data communication, and iOS & Android mobile application development.

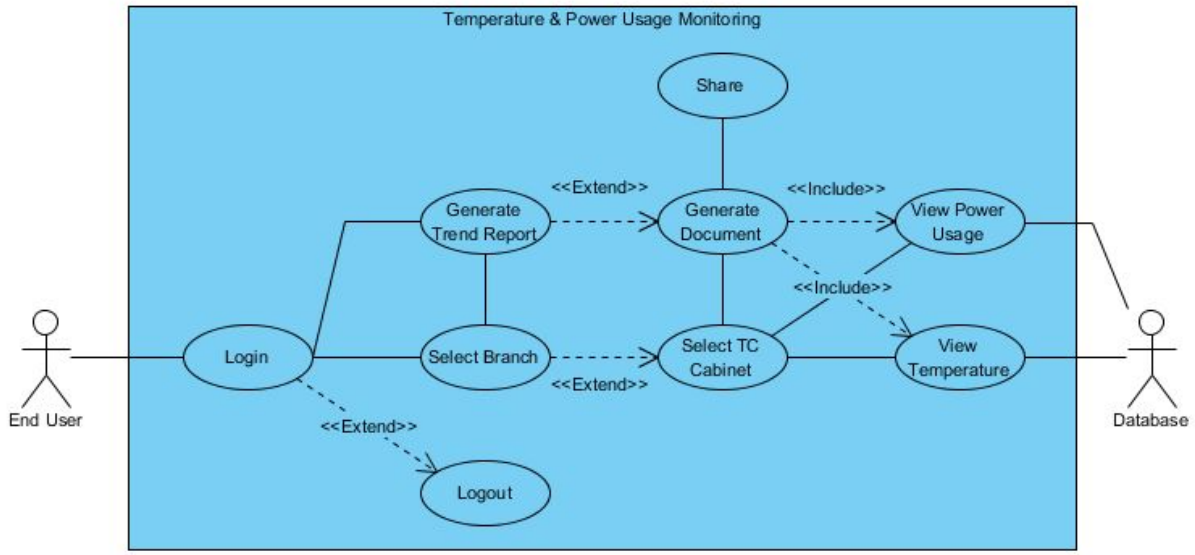
The team is currently working with the technical services team at Maple Leaf Foods and external vendors to further understand how the live projected data will be gathered and transferred. Once a reliable data communication method is determined and the team is more familiarized with the to-be-implemented sensors, focus will be targeted towards data standardization, transfer, storage, and representation.

References

Arduino UNO Microprocessor
Arduino Thermistor Implementation Guide

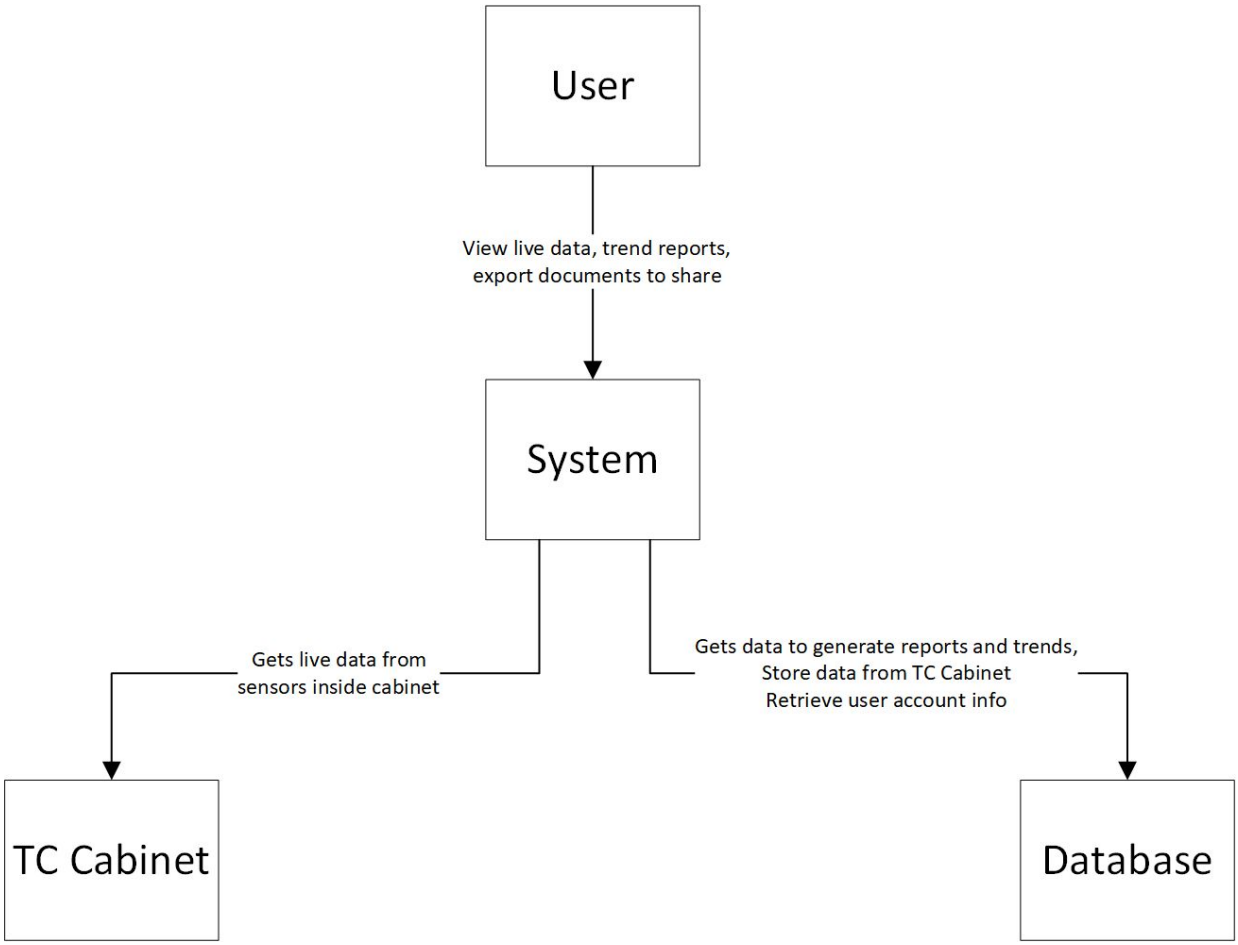
Use Cases

Temperature & Power Usage - Application Use Case:

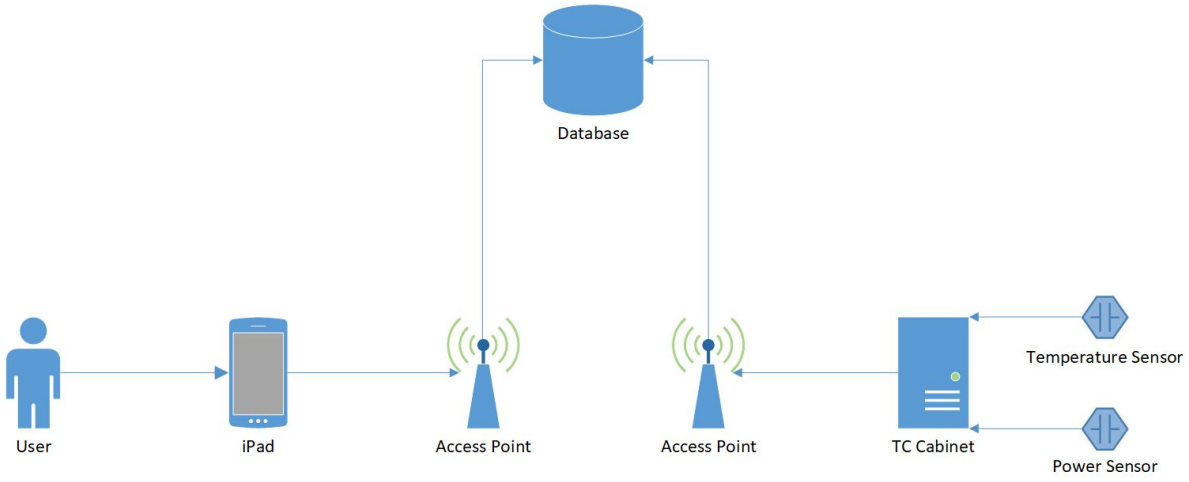


Proposed System Architecture

Context Diagram:



System Architecture Diagram:



Description of Proposed System:

In its initial form, the proposed system will start with collection of temperature and power information from Thin Client Cabinets located across the country in Maple Leaf Offices and Plants.

The information will be collected using sensors installed within the cabinets themselves. These sensors will connect to the nearest wireless access point to transmit the data to our database. This data is then transmitted to the mobile application.

The mobile application will be built on iOS, primarily for the iPad. It will consist of two main views, Live Data and Trends/Reports. The Live Data view will allow the user to have a real time look at how the TC Cabinets are doing. The user will be able to drill down from a country wide view, all the way down to a specific thin client cabinet. The application will visually flag any cabinet that is having issues (i.e. overheating, loss of power etc.). This will allow the user to quickly identify an issue from anywhere in the world, and notify the plant or office where the cabinet is located to investigate. The Trends/Reports view will collect data over a set period of time (hours, days, weeks etc.) and present graphs and charts to communicate information that might not be otherwise obvious when viewing the data on a moment by moment basis. For example, the trend report could show that a specific TC Cabinet is continually overheating. This could hint to any number of issues that could be further investigated.

Design Requirements & Constraints

The design requirements for this project are the ability to monitor temperature and power to reduce the electrical footprint. The project needs to have a 95-100% uptime so that accurate results can be calculated as often as possible. The sensors need to be able to withstand varied temperatures as they will be going both inside ovens and cooling units. On top of that, the sensors need to be able to be interchangeable, so that one sensor can be switched out for another, depending on the scenario. The app itself needs to run on all mobile OS's used by Maple Leaf so that there isn't any compatibility issues, this includes iOS and Android. It will need to also generate charts based on temperature and power recorded to show trends and areas of improvement. The logistical attaining of information needs to be cost-effective so that it can be implemented in as many places as possible. The deadline for completing the project is the end of December, and needs to be completed using the agile development method.

Some constraints are that we cannot test on live devices without a developer license, and without sensors, we cannot see how information is transmitted to a database or how to get that information if we need to do something specific to get it.

Project Risks

There are some risks that need to be considered with this capstone project. A technical risk is that there might be branch downtime for the application. If the network goes down in certain plants, the application will no longer be able to output data on the temperature and power of the TC cabinets. Since the application is being created on IOS, there is another technical risk that needs to be considered. When an update is pushed to IOS, there is a possibility that the application might break. Functionalities implemented in the current version could become deprecated, thus preventing the application from performing its key functionalities.

A risk with resources would be the sensors somehow breaking. If the sensors are battery powered, the sensors will eventually start to die. The application must be able to detect this issue. If the sensors are powered by cable, there is also the risk of the sensors being damaged due to a power surge, therefore there must be protection for them, such as a surge protector. No matter how the sensors are powered, overtime they will become less effective, and even stop working as they age, and therefore must be replaced.

Since the capstone project must be finished in December, there is a risk of the project not being finished before the due date. This could be because of factors within or out of our control. There is also a risk with scheduling. Since we will be working on the capstone during our school terms, there might be issues with scheduling as we would have to schedule around assignments and exams.

Since this is an application that Maple Foods is asking us to make for them, there is no competitive risk involved with this project.