ALARUM

by

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Submitted to
The Faculty of the School of Information Technology
in Partial Fulfillment of the Requirements for
the Degree of Bachelor of Science
in Information Technology

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March 2019

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April 11, 2019

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

TABLES

FIGURES

ACRONYMS AND ABBREVIATIONS

IoT	Internet of Things

ABSTRACT

Alarum is an Internet of Things (IoT) device that helps convenience stores know when to restock the cans/bottles in their beverage fridges. With an ESP8266 microcontroller and Adafruit VL53LOX laser sensor, Alarum will alert the user the current status of a bottle organizer rack using the laser sensor; which is located at the end of the bottle organizer and constantly calculating the distance between the last item and the sensor. Next, the ESP8266 will send notifications via alert emails containing the current status of the bottle organizer in the fridge, and users can also dictate how frequently they receive them. This process can be further simplified by connecting the notification email with the party responsible for fulfilling orders. Alarum project will be a solution to an inventory management problem of the food retail industry.

PROBLEM STATEMENT

Introduction

In today's world, technological advance has made a huge impact on human life in a lot of different aspects. The "Internet of Things" (IoT) has been one of the hottest topics in the technology world for the past couple of years. All of these devices that have an on/off switch will help connect people-people, people-device, and device-device in a giant network of connected "things". With this being said, "anything that can be connected, will be connected". Imagine if your office equipment knew when it was running low on supplies and automatically re-ordered more. This new technology advance will add a level of digital intelligence to devices and allow them to communicate, analyze, and create an action to help someone with a particular task.

Problem

What if supermarkets and convenience stores have a device that could help alert the store when to restock their beverage fridges as soon as they are about to run out of stock?

Solution

An IoT device that will help convenience stores know when to restock their cans/bottles in their beverage fridges. This project will be a huge addition function for the future food retail industry.

Project Description

Alarum is an IoT device that uses ESP8266 Thing (Wifi-enabled microcontroller) and Adafruit VL53LOX (proximity distance sensor), which will be located at the end of the beverage rack. Alarum can detect and measure the distance between the last item in the rack and the sensor, then it will alert the users of the current status of the rack. Whenever the laser sensor detects a distance that is registered at "Low on stock," it will be read by the ESP8266 with an already set logic that simultaneously connects it with the laser sensor. Following, the ESP8266 will send a notification via an alert email to the user, so that they will in turn know which rack in the fridge is low on stock. This process can be further simplified by connecting the notification email with the party responsible for fulfilling orders. This device will be a huge addition to the inventory management process in the food retail industry.

User Profile

Figure 1: User Profile, illustrates the user profile for the Alarum project.

PROJECT:
Alarum

POTENTIAL USERS:
- Food Retail Industry (Supermarket, Convenience store)

SOFTWARE, INTERFACE, AND RELATED EXPERIENCE:
- This project primary target to the food retail industry or any individual convenience store. The only experience that Alarum's users need to be familiar with is using email on most of the basic technology platforms like mobile device, desktop, laptop.

EXPERIENCE WITH SIMILAR APPLICATIONS:
- There is no other application that I think would share similar experience with the sensor robot that we are creating. Users mostly need to have some experience with email.

TASK EXPERIENCE:
- Alarum will be setting up at the end of the beverage rack and it will detect and measure the distance between the last item and the sensor so that it can alert the user when the rack is low on stock. Then Alarum will convert a signal and automatically sending an email to the user for an immediately response.

FREQUENCY OF USE:
- It can be use whenever user's store beverage organizers ran out of stock. This occurrence can be daily, weekly, monthly.

KEY PROJECT DESIGN REQUIREMENTS THAT THE PROFILE SUGGESTS:
- Faster Response for food retail industry
- Easy Set up/ Usage

Figure 1: User Profile

Use Case Diagram

Figure 2 is the Use Case Diagram for Alarum.

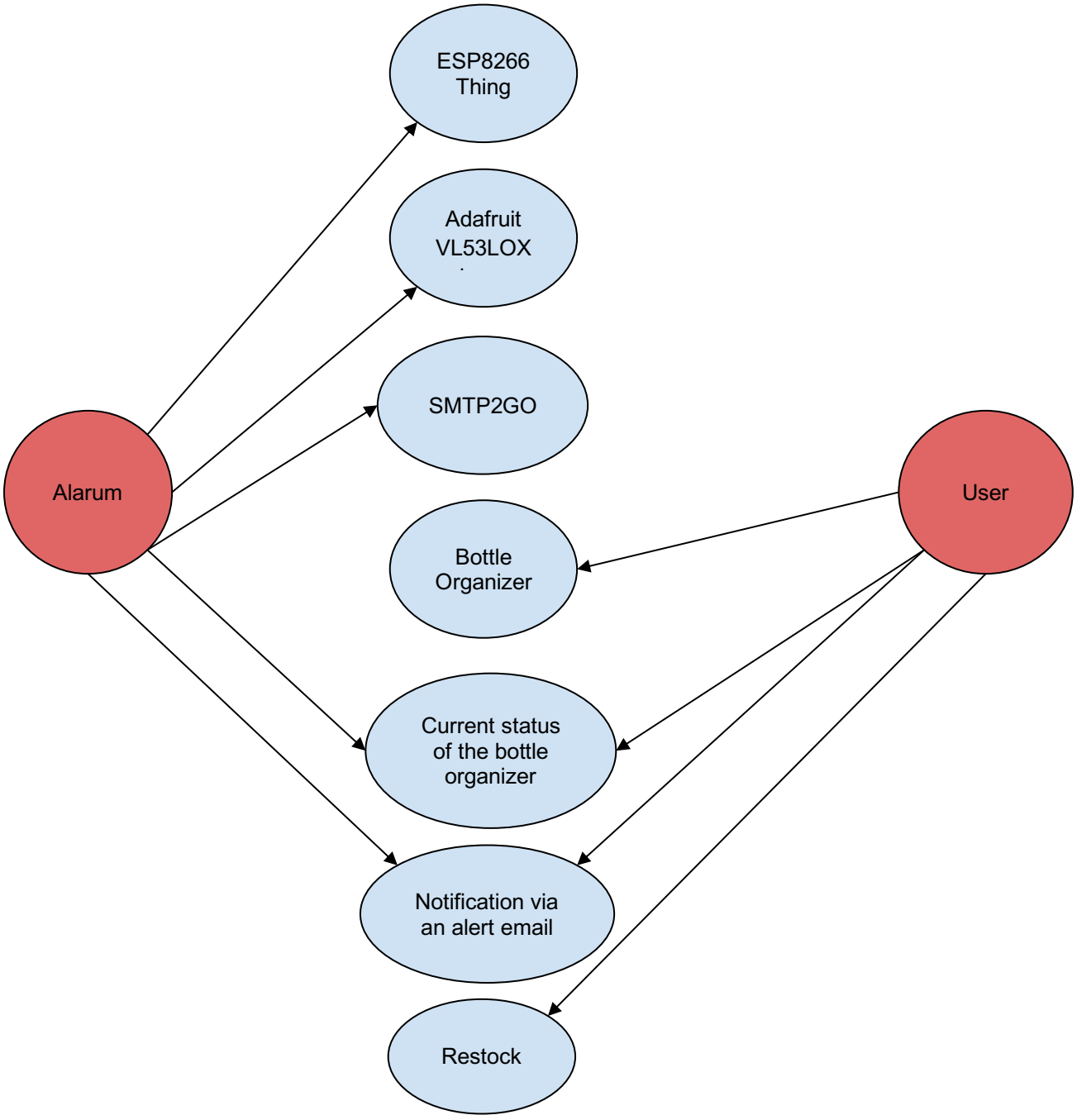


Figure 2: Use Case Diagram

PROJECT MANAGEMENT

Budget

Table 1: Project Budget outlines the budget for this project. This budget reveals the real-world cost of the project for a year in development. We will be utilizing the UC Innovation Hub 1819 building for meetings, as well as using their tools to work on our project so that the budget for our labor will be at no cost. This budget table below will be split into two categories: Hardware and Software.

CATEGORY	ITEM	ACTUAL COST
Software	Arduino IDE	$0
	SMTP2GO	$0
Hardware	Honbay 40pcs Male/Female Pin Header	$7.99
	Iron Solder Wire	$7.90
	Cylewet 10Pcs 3.3V-5V 4 Channels Logic Level Converter	$10.99
	Cyclet 55 Mini Solderless BreadBoard (Pack of 7)	$8.59
	Elegoo EL-CP-004 120pcs Dupont Wire	$6.98
	Elegoo 6pcs Mini Breadboard	$7.86
	Adafruit VL53L0X	$26.62
	SparkFun ESP8266 Thing	$22.85
	Trueflex Bottle Organizer	$56.60
TOTALS		**$156.40**

Table 1: Project Budget

Objective/Deliverables

Alarum is an Internet of Things device that could alert any store when their beverages are low on stock, which will help the store with ordering and restocking their beverages. The sensor robot will be located at the end of each rack in the fridge to detect the distance between the sensor and the last item on the rack.

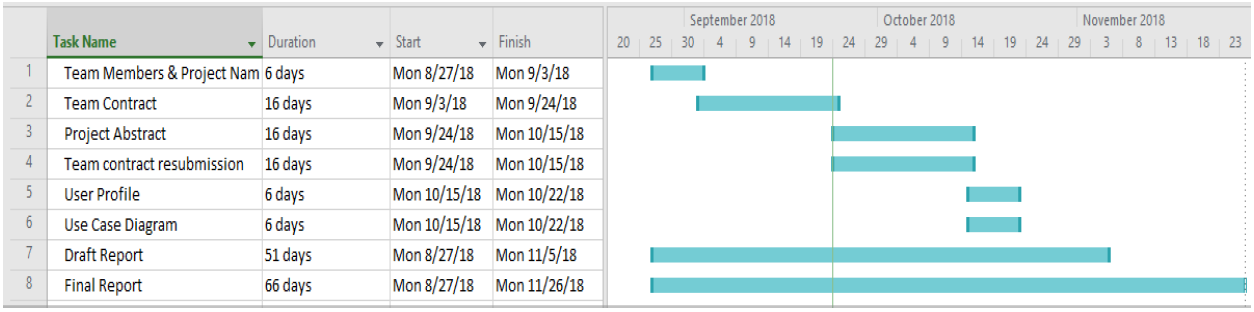
The goals for Alarum is to have a completed prototype of the sensor and the microcontroller, which includes an electronics breadboard that is connecting with the ESP8266, and Adafruit VL53LOX laser sensor. This sensor device can then be tested with the bottle organizer and a dummy item on it for its functionalities. The end goal is to have the device send alerts via emails to the user with the most updated status of the bottle organizer and also a blinking LED as a notifier for the users in the case of when the rack is out of stock, the LED will stop blinking whenever there are items back on the rack.

***Alarum Objectives*:**

- Connect the ESP8266 with VL53L0X sensor
- Connecting the ESP8266 with the laser sensor so it could receive data from the sensor.
- VL53L0X sensor is able to detect the distance of items on the rack.
- Connect ESP8266 with the Wifi.
- With Wifi connection, ESP8266 can send the alert notifications to the user (store manager) via emails.
- Develop code for the ESP8266 to send an email whenever a “marked distance” is being read from the sensor.

***Base Cases*:**

- In case no object is in front of sensor. How it is going to notify the store manager.
- What if a customer picks the items and sensor detects the threshold, but customer put that item back. How a system going to respond?

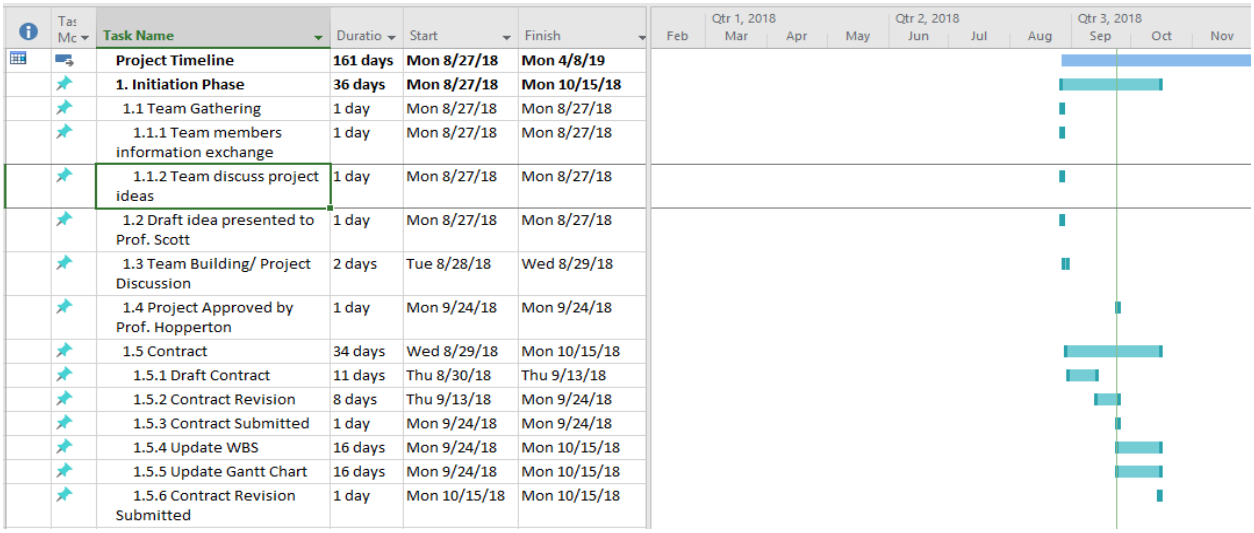


	Task Name	Duration	Start	Finish
1	Team Members & Project Nam	6 days	Mon 8/27/18	Mon 9/3/18
2	Team Contract	16 days	Mon 9/3/18	Mon 9/24/18
3	Project Abstract	16 days	Mon 9/24/18	Mon 10/15/18
4	Team contract resubmission	16 days	Mon 9/24/18	Mon 10/15/18
5	User Profile	6 days	Mon 10/15/18	Mon 10/22/18
6	Use Case Diagram	6 days	Mon 10/15/18	Mon 10/22/18
7	Draft Report	51 days	Mon 8/27/18	Mon 11/5/18
8	Final Report	66 days	Mon 8/27/18	Mon 11/26/18

Figure 3: Course Deliverable

Project Schedule

Figure 4: Fall 2018 Project Schedule and Gantt Chart is our Fall project schedule with the major milestones listed.



	Tas Mc	Task Name	Duratio	Start	Finish
		Project Timeline	**161 days**	**Mon 8/27/18**	**Mon 4/8/19**
		1. Initiation Phase	**36 days**	**Mon 8/27/18**	**Mon 10/15/18**
		1.1 Team Gathering	1 day	Mon 8/27/18	Mon 8/27/18
		1.1.1 Team members information exchange	1 day	Mon 8/27/18	Mon 8/27/18
		1.1.2 Team discuss project ideas	1 day	Mon 8/27/18	Mon 8/27/18
		1.2 Draft idea presented to Prof. Scott	1 day	Mon 8/27/18	Mon 8/27/18
		1.3 Team Building/ Project Discussion	2 days	Tue 8/28/18	Wed 8/29/18
		1.4 Project Approved by Prof. Hopperton	1 day	Mon 9/24/18	Mon 9/24/18
		1.5 Contract	34 days	Wed 8/29/18	Mon 10/15/18
		1.5.1 Draft Contract	11 days	Thu 8/30/18	Thu 9/13/18
		1.5.2 Contract Revision	8 days	Thu 9/13/18	Mon 9/24/18
		1.5.3 Contract Submitted	1 day	Mon 9/24/18	Mon 9/24/18
		1.5.4 Update WBS	16 days	Mon 9/24/18	Mon 10/15/18
		1.5.5 Update Gantt Chart	16 days	Mon 9/24/18	Mon 10/15/18
		1.5.6 Contract Revision Submitted	1 day	Mon 10/15/18	Mon 10/15/18

	2. Research Phase	**15 days**	**Wed 8/29/18**	**Tue 9/18/18**
	2.1 Listing the require hardware and software	1 day	Wed 8/29/18	Wed 8/29/18
	2.2 How to set up an Andruino project using an electronics breadboard	3 days	Thu 8/30/18	Mon 9/3/18
	2.3 How to connect the Andruino with the sensor	4 days	Tue 9/4/18	Fri 9/7/18
	2.4 How to pair the Arduino with the WifiShield	4 days	Sat 9/8/18	Wed 9/12/18
	2.5 How to connect to the wifi with security implementation	3 days	Wed 9/12/18	Fri 9/14/18
	2.6 How to send out notifications via emails from the Arduino	3 days	Fri 9/14/18	Tue 9/18/18
	3. Design Phase	**10 days**	**Wed 9/19/18**	**Tue 10/2/18**
	3.1 Rack prototype Functionality	5 days	Wed 9/19/18	Tue 9/25/18
	3.2 Robot prototype Orientation	5 days	Wed 9/26/18	Tue 10/2/18
	4. Implementation Phase	**34 days**	**Tue 10/2/18**	**Fri 11/16/18**
	4.1 Purchase equipments for the prototype	7 days	Tue 10/2/18	Wed 10/10/18
	4.2 Set up the Ardruino project using an electronics breadboard	7 days	Thu 10/11/18	Fri 10/19/18
	4.3 Connect the Ardruino with the sensor	5 days	Sat 10/20/18	Thu 10/25/18
	4.4 Pair the Ardruino with the WifiShield	5 days	Fri 10/26/18	Thu 11/1/18
	4.5 Connect to the wifi with security implenmentation	5 days	Fri 11/2/18	Thu 11/8/18
	4.6 Send out email from the Ardruino using wifi	6 days	Fri 11/9/18	Fri 11/16/18
	5. Test Phase	**8 days**	**Fri 11/16/18**	**Tue 11/27/18**
	5.1 Sensor Functionality	2 days	Fri 11/16/18	Mon 11/19/18
	5.2 Ardruino Functionality	2 days	Tue 11/20/18	Wed 11/21/18
	5.3 Wifi connectivity	2 days	Thu 11/22/18	Fri 11/23/18
	5.4 Send out email to the users	3 days	Sat 11/24/18	Tue 11/27/18
	6. Deployment Phase	**8 days**	**Tue 11/27/18**	**Thu 12/6/18**
	6.1 Install product prototype	4 days	Tue 11/27/18	Fri 11/30/18
	6.2 Test/Validate the prototype	5 days	Sat 12/1/18	Thu 12/6/18
	7. Documentation Phase	**21 days**	**Mon 9/24/18**	**Mon 10/22/18**
	7.1 Abstract and Team Contract Submission	16 days	Mon 9/24/18	Mon 10/15/18
	7.2 User Profile Submission	21 days	Mon 9/24/18	Mon 10/22/18
	7.3 Use Case Submission	21 days	Mon 9/24/18	Mon 10/22/18
	7.4 Weekly reports	21 days	Mon 9/24/18	Mon 10/22/18
	7.5 Project Timeline Updated	21 days	Mon 9/24/18	Mon 10/22/18
	8. Demonstration of Deliverables	**141 days**	**Mon 9/24/18**	**Mon 4/8/19**
	8.1 Elevator Speech	11 days	Mon 10/15/18	Mon 10/29/18
	8.2 Presentation	8 days	Thu 11/22/18	Mon 12/3/18
	8.3 Final reports	1 day	Mon 11/26/18	Mon 11/26/18
	8.4 Tech Expo	1 day	Tue 4/9/19	Tue 4/9/19

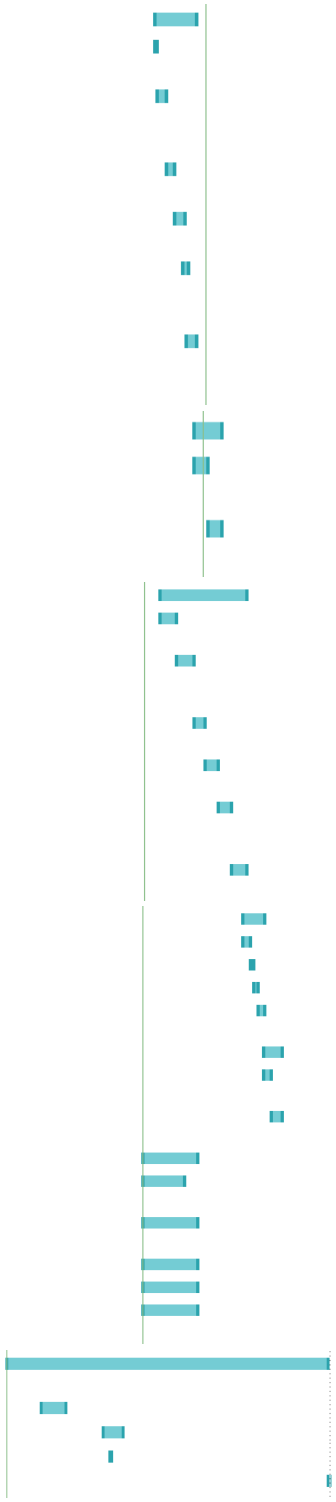
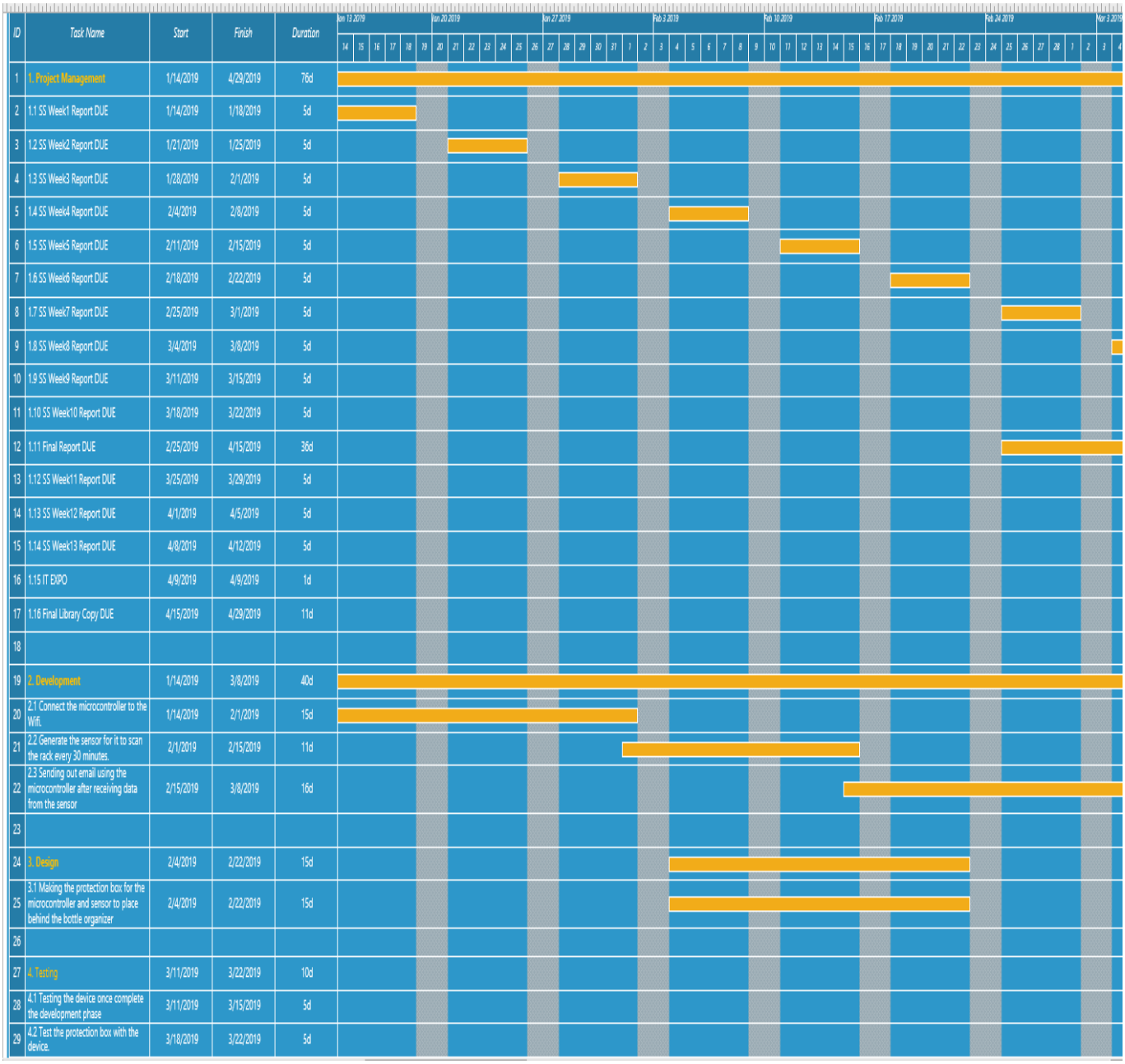


Figure 5: Spring 2019 Project Schedule and Gantt Chart is our Fall project schedule with the major milestones listed.



ID	Task Name	Start	Finish	Duration
1	1. Project Management	1/14/2019	4/29/2019	76d
2	1.1 SS Week1 Report DUE	1/14/2019	1/18/2019	5d
3	1.2 SS Week2 Report DUE	1/21/2019	1/25/2019	5d
4	1.3 SS Week3 Report DUE	1/28/2019	2/1/2019	5d
5	1.4 SS Week4 Report DUE	2/4/2019	2/8/2019	5d
6	1.5 SS Week5 Report DUE	2/11/2019	2/15/2019	5d
7	1.6 SS Week6 Report DUE	2/18/2019	2/22/2019	5d
8	1.7 SS Week7 Report DUE	2/25/2019	3/1/2019	5d
9	1.8 SS Week8 Report DUE	3/4/2019	3/8/2019	5d
10	1.9 SS Week9 Report DUE	3/11/2019	3/15/2019	5d
11	1.10 SS Week10 Report DUE	3/18/2019	3/22/2019	5d
12	1.11 Final Report DUE	2/25/2019	4/15/2019	36d
13	1.12 SS Week11 Report DUE	3/25/2019	3/29/2019	5d
14	1.13 SS Week12 Report DUE	4/1/2019	4/5/2019	5d
15	1.14 SS Week13 Report DUE	4/8/2019	4/12/2019	5d
16	1.15 IT EXPO	4/9/2019	4/9/2019	1d
17	1.16 Final Library Copy DUE	4/15/2019	4/29/2019	11d
18				
19	2. Development	1/14/2019	3/8/2019	40d
20	2.1 Connect the microcontroller to the Wifi.	1/14/2019	2/1/2019	15d
21	2.2 Generate the sensor for it to scan the rack every 30 minutes.	2/1/2019	2/15/2019	11d
22	2.3 Sending out email using the microcontroller after receiving data from the sensor	2/15/2019	3/8/2019	16d
23				
24	3. Design	2/4/2019	2/22/2019	15d
25	3.1 Making the protection box for the microcontroller and sensor to place behind the bottle organizer	2/4/2019	2/22/2019	15d
26				
27	4. Testing	3/11/2019	3/22/2019	10d
28	4.1 Testing the device once complete the development phase	3/11/2019	3/15/2019	5d
29	4.2 Test the protection box with the device.	3/18/2019	3/22/2019	5d

TECHNICAL ELEMENT

Application

Alarum is a combination of the Sparkfun ESP8266 Thing Dev microcontroller and the Adafruit VL53LOX proximity laser sensor that are used for our prototype. A set of codes will run to determine the distance of the last item on the bottle organizer from the Adafruit VL53LOX laser sensor. The laser sensor will be scanning and calculating the distance of the last item on the rack from the back of the rack, then it will send that data of the current distance with a prompt indicating the current status of the rack to the Sparkfun ESP8266 Thing Dev. If the rack is out of stock, the microcontroller will have a blinking LED indicating that the rack needs to be refilled and it will return to normal state when there are items back on the rack. Then, the ESP8266 Thing Dev microcontroller will take that data from the sensor and send notifications via emails to the party that is in charge of fulfilling the orders, approximately every 2 hours, and let them know to restock the beverage fridges when they are low.

Programming

The coding language for Alarum is the Arduino language, while the logic control code will be developed using Arduino IDE for this prototype sensor. The logic control codes, (one for the microcontroller and one for the sensor) which are merely sets of C/C++ functions, will be called from the computer, then they will be uploaded to the sensor (Adafruit VL53L0X) and the microcontroller (Sparkfun ESP8266 Thing Dev). There are 3 parts that go into the code that is responsible for the functionality of Alarum: The Wifi connection part, the sensor reading part, and lastly the SMTP email server part that connects and sends emails.

The microcontroller will first need to reference the libraries of the ESP8266 and VL53L0X libraries. Then it will create some variables and enums for the functions in the code.

Next, the microcontroller will need to be connected with the Wifi using a function that requires authentication information from the administrator, like Wifi ssid and password, which were defined at the beginning.

The code for the sensor part contains one function to read and receive data of the current distance from the sensor with the closest item to it. In that function, there is a “checking loop” that has some “if else” conditions that check the current distance and compare them with some “const unsigned int” that was predefined from above. It will create some status prompts according to the current distance of the rack to the closet detected item using the data that it got from the above (For example, “High on stock,” “Medium on stock,” “Low on stock,” or “Out of stock”). After that, each status from the “checking loop” will be assigned with their according enum numbers which will only be recorded by the current distance in the specific time that it’s being read. These “enums” will then be stored and used with the sending email code.

For sending emails, a function will ask for username and password for authorization to connect to the SMTP Server from the administrator. Then, there is another function that requires the administrator to put in the information of the sender and recipient email addresses. After that, a loop function will be calling those enums from the sensor’s function and checking them with “if else” conditions to make sure that it is receiving the correct data from the sensor before using the data from the enums to send emails to the recipient email address with a prompt indicating what is the current status of the bottle organizer.

SMTP Service

Alarum is using a free SMTP Service for the notification alert emails, specifically, SMTP2GO is being used for this project. Alarum has a free account on STMP2GO.com and the

account is able to record all the emails that has been sent, it also has all the information of the sender email addresses as well as recipient email addresses.

Security

Alarum uses a 3D printed container box only for the proximity sensor, but a bigger container box could be made to be able to contain the whole device, including all the wires and microcontroller. This box will have a physical lock to make sure that no one would have access to it without the key to increase the security of the whole device.

With SMTP2GO, Alarum needs to provide username and password to log in to the server and they need to be in base64, ASCII encoded format. Alarum is also able to track all the emails that have been sent via the SMTP2GO Service, with the information of what email is sent to and from which email address, as well as an “Email Activity” report stating the specific time of when each email was sent. The report could even be exported from SMTP2GO in case we need to take a look at them.

TESTING

Overview

This portion of the report will be operating as a guidebook to give more details on the testing phase of the Alarum project. All team members will be working on testing together to ensure the final prototype is functioning. The individuals that need to use this section are:

- Project Manager
- Developer
- Team Member

Scope

The testing scope is to verify that Alarum project is operating properly, which means that the microcontroller is sending out email notifications with the data information that it is receiving from the sensor to users' emails. The test will be following procedures that are required to install and set up the Adafruit VL53LOX sensor, the SparkFun ESP8266 Thing Dev microcontroller, and SMTP Service from SMTP2GO.

Objective

The objective of testing for Alarum will be clarifying if it has all the proper codes that are needed for the ESP8266 to connect to the wifi and SMTP server. It will also receive data from the sensor and then send that data via email to the users. Information that will be provided in this part is mainly testing information on three main categories, which are: ensuring the SparkFun ESP8266 microcontroller is connected to the Wifi/Hotspot, the functionality of the Adafruit VL53LOX sensor, and sending email notifications to the user with the collected data from the sensor.

Entry and Exit Criteria

Entry Criteria:

- Developing the code for the ultrasonic proximity sensor
- Developing the code for Wifi and SMTP Server Connection

- Developing the code for sending emails using the data from the sensor
- Testing environment setting up

Exit Criteria:

- All tests are run properly
- Errors and documented are patches

Logging Test and Reporting

After each test, the developer will document the test and describe the outcome of each test. If the test fails, the developers will fix the issue. If there is an error found in the project, the developers will also document the error or issues in the testing reports in the appendix section.

System Testing

The complete system testing for Alarum project will be included the time of flight sensor and distance measuring working effectively. That way if any errors or failures appear during the test, it can be taking care of right away. The final product will be a complete microcontroller/sensor prototype that can measure distance between cans/bottles in the rack and sending out notifications via emails.

Testing Procedures

Below are tests that we will perform:

1. Stability Test - This test is focused on setting up the environment for the prototype using the Adafruit VL53L0X and the ESP8266 microcontroller onto the breadboard.

2. Launch Test - This test is focused on using the sensor to measure the distance from the end of the rack to the last bottle.

3. Functionality Test - This test will be focused on sending out email notifications by using the microcontroller that connect to the Wifi and send out notifications to users' emails (via platform like iPhone, Android and Laptops).

Pass/Fails Conditions

All tests that will be conducting mostly expected to be pass. If there is any errors or fails during the testing phase, developers will records and documents the problems and resolve them.

Schedule of Team Member Testing

Following is the Team Member Testing schedule table

Team Member	Timeline to be Completed	When
Developer	10/16/2018 - 04/14/2019	Weekly

Table 2: Team Member Testing

Schedule of Round Table Testing

Below is the round table testing schedule for the project.

Round Table	TimeLine	Time
Participants	02/11/2019 - 04/15/2019	Once per 1 weeks (4 times)
Volunteers	02/11/2019 - 04/15/2019	Once per 1 weeks (4 times)

Table 3: Round Table Testing

IT EXPO

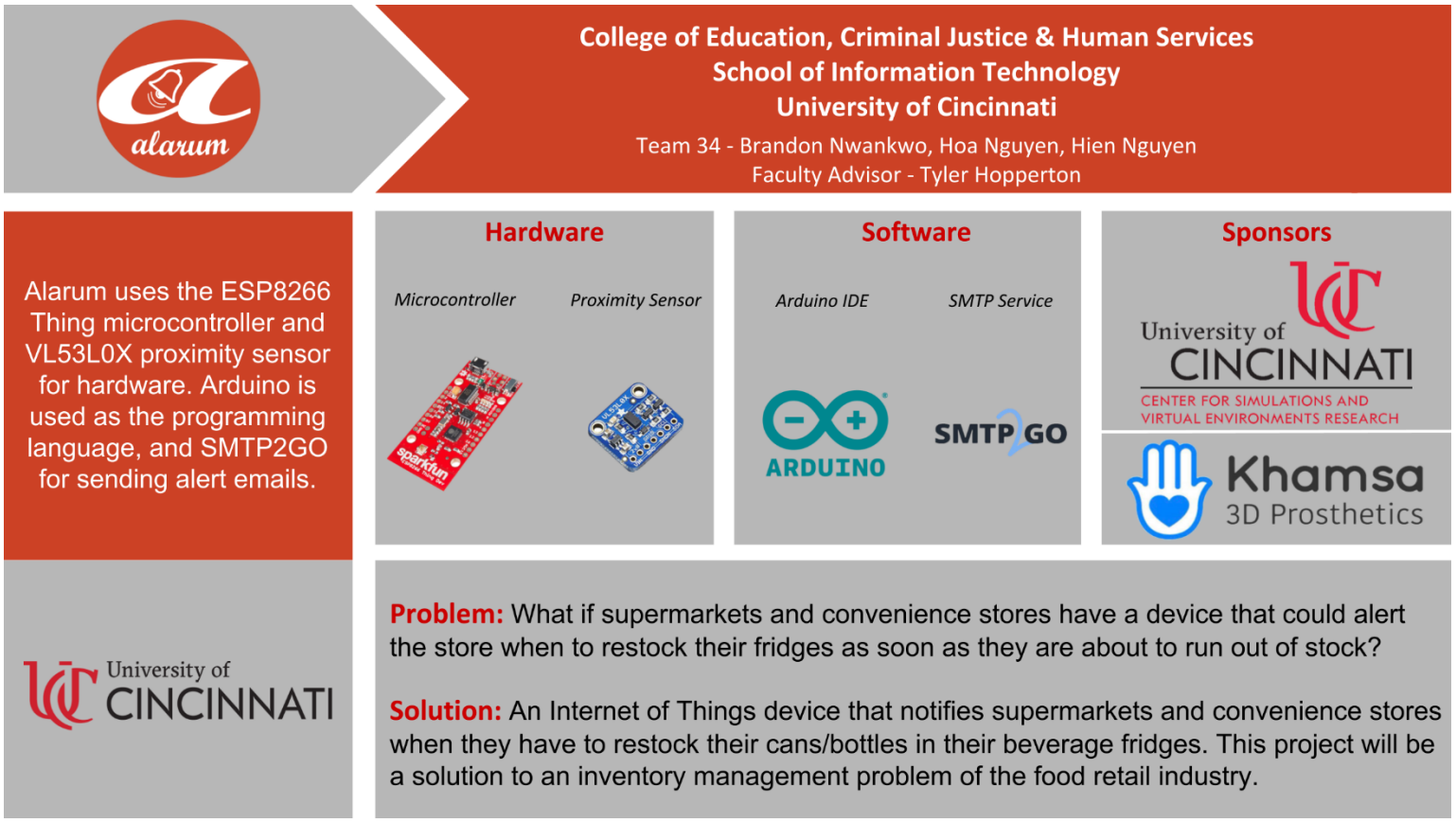


Figure 4: Alarum - IT Expo Poster

CONCLUSION

FALL 2018 - August to December 2018

Alarum has accomplished its objectives of Fall semester 2018 of purchasing and wiring up all of the hardware parts; having the sensor able to run and read the distance of a nearby object with the prototype bottle organizer; as well as having all the paperwork finished by the beginning of December before Winter break.

SPRING 2019 - January to April 2019

The goals for Spring semester will be to focus on enhancing the code for the sensor and to have the sensor be able to send emails through the microcontroller. Also, creating a protection box for the prototype, as well as finding a solution to stabilize the sensor at the back of the rack.

FUTURE RECOMMENDATION

Alarum is potentially looking into using a more secure microcontroller in the future if the project becomes commercialized. We could also look for a better solution to item detection, such as using a sensor distance camera instead of a proximity sensor, so it could actually see the current state of the bottle organizer.

A new paid Sender Domain will be utilized instead of the current free SMTP2GO Service. With the paid SMTP Sender Domain, all emails will be properly authenticated with DKIM and SPF, which means they won't show as being sent 'via smtp2go.com' in Gmail. Alarum will also look into adding Webhooks and API Keys for more control over the traffic of the sent emails and be able to implement more security procedures on the server.

WORK CITED

Hardware:

Adafruit. "Adafruit VL53L0X Time of Flight Distance Sensor - ~30 to 1000mm". https://www.adafruit.com/product/3317. n.d.

SparkFun Electronics. “SparkFun ESP8266 Thing - Dev Board (with Headers)”. https://www.sparkfun.com/products/13804. n.d.

Software:

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3D Printed Model:

NotLikeALeafOnTheWind. “8020 mount VL6180x Adafruit Time of Flight Distance Sensor 90 deg”. https://www.thingiverse.com/thing:3367437. January 20, 2019.

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Rosenblum. Paula. “Walmart's Out of Stock Problem: Only Half the Story?”. https://www.forbes.com/sites/paularosenblum/2014/04/15/walmarts-out-of-stock-problem-only-half-the-story/#3659e4487369. April 15, 2014.

APPENDIX

Testing Reports

Stability Test - This test is focused on setting up the environment for the prototype using the Adafruit VL53L0X and the ESP8266 microcontroller.

Tester	Date	Item #	Expected	Actual	Pass/Fail	Error
Developer	10/20/18	1.1	Wire up the VL53L0X sensor and the ESP8266 microcontroller together with a breadboard	Attachment stabilized with the breadboard and wires	Pass	
Developer	11/05/18	1.2	Connect the device to the computer via micro USB cable	Connection established with the computer	Pass	
Developer	12/15/19	1.3	Placing the sensor at the back of the rack to read distance	Receiving inconsistent data from the sensor	Fail	Receive inconsistent outcome data
Developer	02/15/19	1.4	Tape the sensor to the back of the rack to dictate its scanning direction	Not much improvement as the sensor still not completely stable	Fail	Still receive inconsistent outcome data
Developer	03/07/19	1.5	Using a 3D printed container box for the sensor and place it at the back of the rack	The device was able to detect the correct distance of the closet item on the rack from the sensor	Pass	

Table 4: Stability Test

Launch Test - This test is focused on using the sensor to measure the distance from the end of the rack to the last bottle.

Tester	Date	Item #	Expected	Actual	Pass/Fail	Error
Developer	11/15/18	1.1	Testing the sensor by connecting it with the microcontroller to see if it is functioning.	The sensor works fine with the microcontroller after powered on.	Pass	
Developer	12/03/18	1.2	Use example code from the Adafruit_VL53L0X library to test if the sensor is able to read and send data.	The sensor was able to measure the distance of the cans from the back of the rack.	Pass	
Developer	01/12/19	1.3	Code Developing #1 - Alter the example code to make it fit with Alarum Project's goals.	Wasn't able to compile and upload the code changes.	Fail	There are some errors within the new codes
Developer	02/02/19	1.4	Code Developing #2 - Fix the errors of the code and create some loop to check on current status of the stack.	Being able to compile and upload the new code with some changes to its.	Pass	
Developer	02/18/19	1.5	Code Developing #3 - Improve the current "loop code" using multiple void functions.	The device is able to send prompt of current status from the sensor's data	Pass	
Developer	03/08/19	1.6	Code Developing #4 - Final improve on the "loop code" using if else conditions and combine everything in one function	The code is a lot cleaner and work better with the email sending now.	Pass	

Table 5: Launch Test

Functionality Test - This test will be focused on sending out email notifications by using the microcontroller that connect to the Wifi and send out notifications to users' email (via platforms like iPhone, Android and Laptops).

Tester	Date	Item #	Expected	Actual	Pass/Fail	Error
Developer	02/8/19	1.1	Microcontroller to join the Wifi network using the Wifi example code.	Does not join the Wifi network using the example code.	Fail	The Wifi was the 5.0 GHz, and it can only use the 2.4 GHz one
Developer	02/13/19	1.2	Microcontroller able to join Wifi network after switching it to 2.4 GHz network	Microcontroller is able to joins the Wifi Network.	Pass	
Developer	02/20/19	1.3	Create a SMTP2GO account for Alarum Project and try to connect it with the microcontroller	Microcontroller is able to connect with the SMTP Server.	Pass	
Developer	02/24/19	1.4	Try to send a test email to a recipient email address using SMTP2GO Service.	Couldn't send email due to the account is blocked by SMTP2GO.	Fail	"Error: 550 that SMTP username's account is not allowed to send"
Developer	02/26/19	1.5	Contact SMTP2GO and ask them to remove the restriction as Alarum is just a school project.	Accepted - Alarum is able to send emails to the recipient via SMTP2GO.	Pass	
Developer	03/08/19	1.6	Send emails with the data of the current status that is receiving from the sensor	Successfully deployed.	Pass	

Table 6: Functionality Test