

S.M.A.C

Smart Mail Automated Center



Group 9

Shane Bramble-Wade
Tyler Rothenberg
Tyler Guerrero
Andre Villaran



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Success Always Belongs For Those
Who Are Prepared

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A summary of our project management plans.

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Administrative

Day-to-day activities that are related to financial planning, record keeping & billing.



● Part 1 ●

Project Overview

A summary of our project management plans.



Motivation

Porch pirates have become public enemy number one.

- In today's world, ordering packages and food from the internet is a way of life.
- Here in America, it turns out, 36% of people have experienced package theft.
- Many of these deliveries are stolen from front porches and building lobbies.



Solution

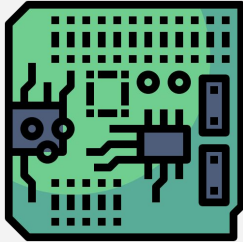
Success Always Belongs For Those Who Are Prepared

- The application will be able to log authorized packages into S.M.A.C.'s database, unlock it from a remote location.
- S.M.A.C is designed to provide peace of mind for homeowners from package thieves.
- When the delivery is made, the delivery driver simply scans the item and places the item in the box, then closes the lid.
- S.M.A.C will integrate a lot of security and smart features to add value to the box.



Team Members

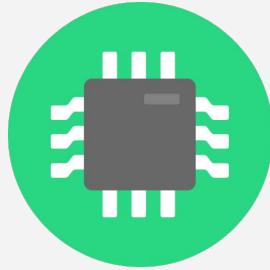
Success Always Belongs For Those Who Are Prepared



Shane Bramble-Wade
(CpE)

PCB, Lock, Barcode Scanner

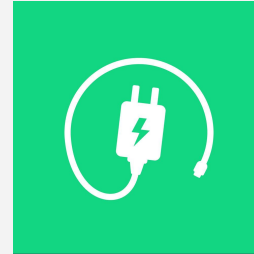
Shane has a strong passion for computer hardware. He will be specializing in creating the PCB.



Ty
Rothenberg
(CpE)

MCU, Camera,
Fingerprint Sensor

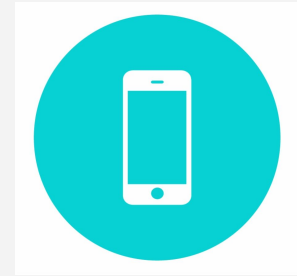
Ty has a passion for embedded systems. He will be working on the microcontroller and sensors.



Andre Villaran
(CpE)

Power Systems, UV Light, Wi-Fi
Module

Andre has a passions for network engineering. He will working on the different power systems and communication module.



Tyler
Guerrero
(CpE)

Mobile Application, RFID
Sensor

Tyler will be creating the Mobile App to interact with our lock box.

Goals and Objectives

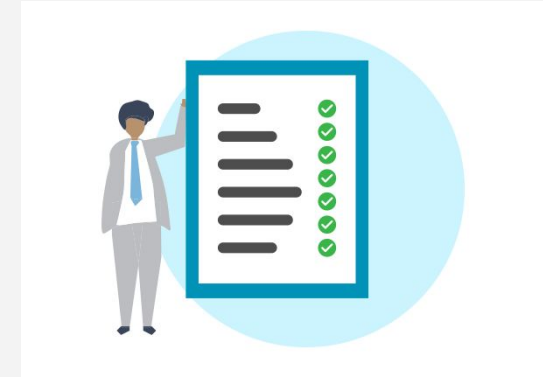
Success Always Belongs For Those Who Are Prepared



Requirements Specifications

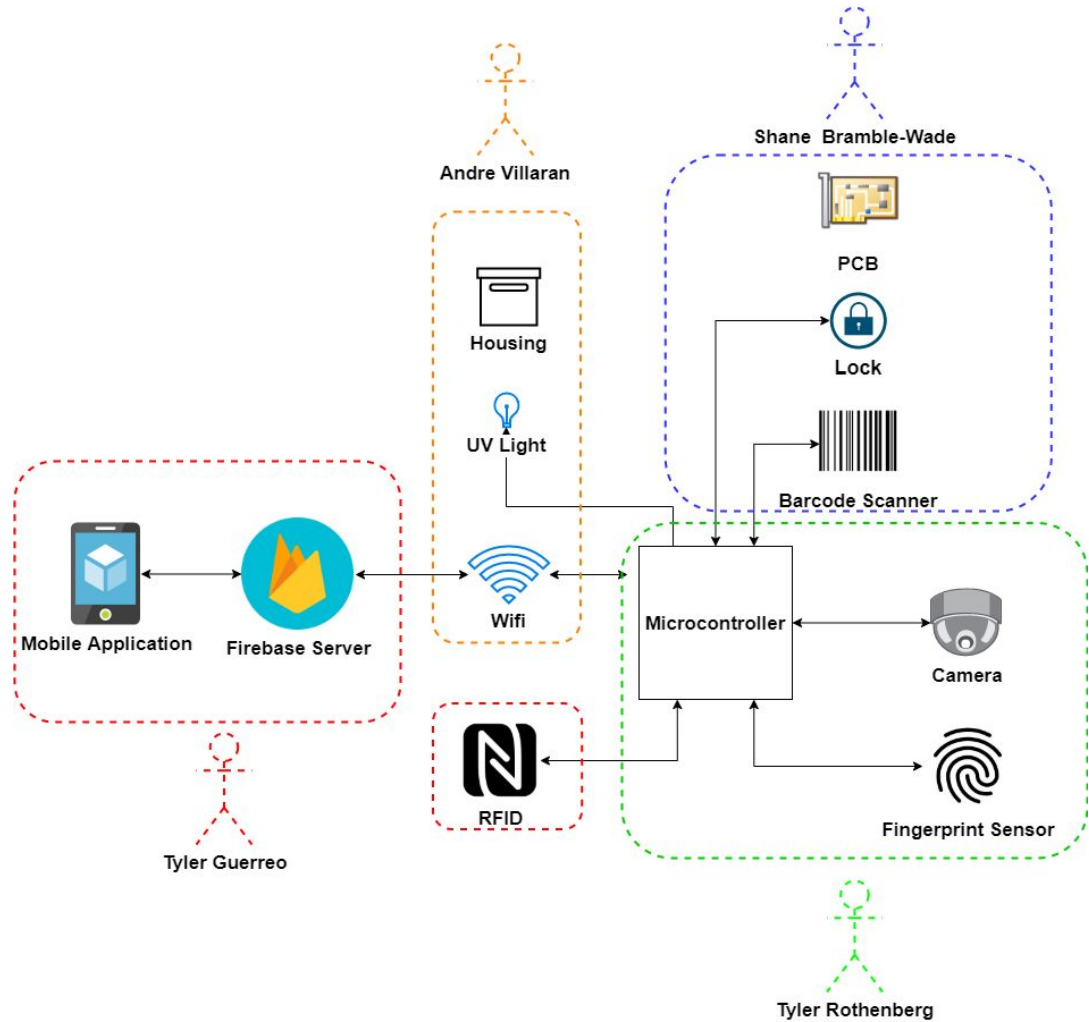
S.M.A.C Project Requirements

1. **Barcode Scanner Unlocks our S.M.A.C. system.**
2. **Unlocking our S.M.A.C. system via a RFID Card.**
3. **Unlock our S.M.A.C. system from a mobile application.**
4. **Enrolling and Unlocking our S.M.A.C. system via a Fingerprint Sensor.**
5. Using mobile application to take snapshot of scenery.



Block Diagram

Group Member	Main Responsibility
Tyler Guerrero	Mobile Application
Andre Villaran	Housing and WiFi
Shane Bramble-Wade	PCB and Lock
Tyler Rothenberg	Microcontroller





● Part 2 ●

Design Choices

Hardware components selected for our design.



Microcontroller - Ty

Microcontroller Selection

	MSP430FR6989	ATmega2560
I/O Pins	83	54
UART	2	4
I2C	2	1
SPI	4	5
Program Memory (KB)	128	256
SRAM (KB)	2	8
Architecture	RISC	RISC
Speed	16 MIPS	16 MIPS
Timers	5 16-bit	4 16-bit, 2 8-bit
Size	14 mm × 14 mm	16 mm × 16 mm
Manufacturer	Texas Instruments	Microchip
Cost	\$3.61	\$11.85



MSPFR6989



ATmega2560

Microcontroller - Ty

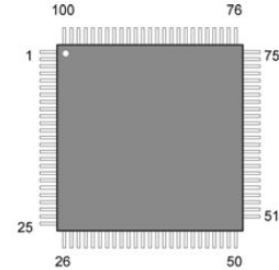
Microcontroller Selection



ATmega2560 QFP Package

Device	Flash	RAM	I/O	UART	ADC
ATmega640	64KB	8KB	86	4	16
ATmega1280	128KB	8KB	86	4	16
ATmega2560	256KB	8KB	86	4	16

ATmega2560 Model Options



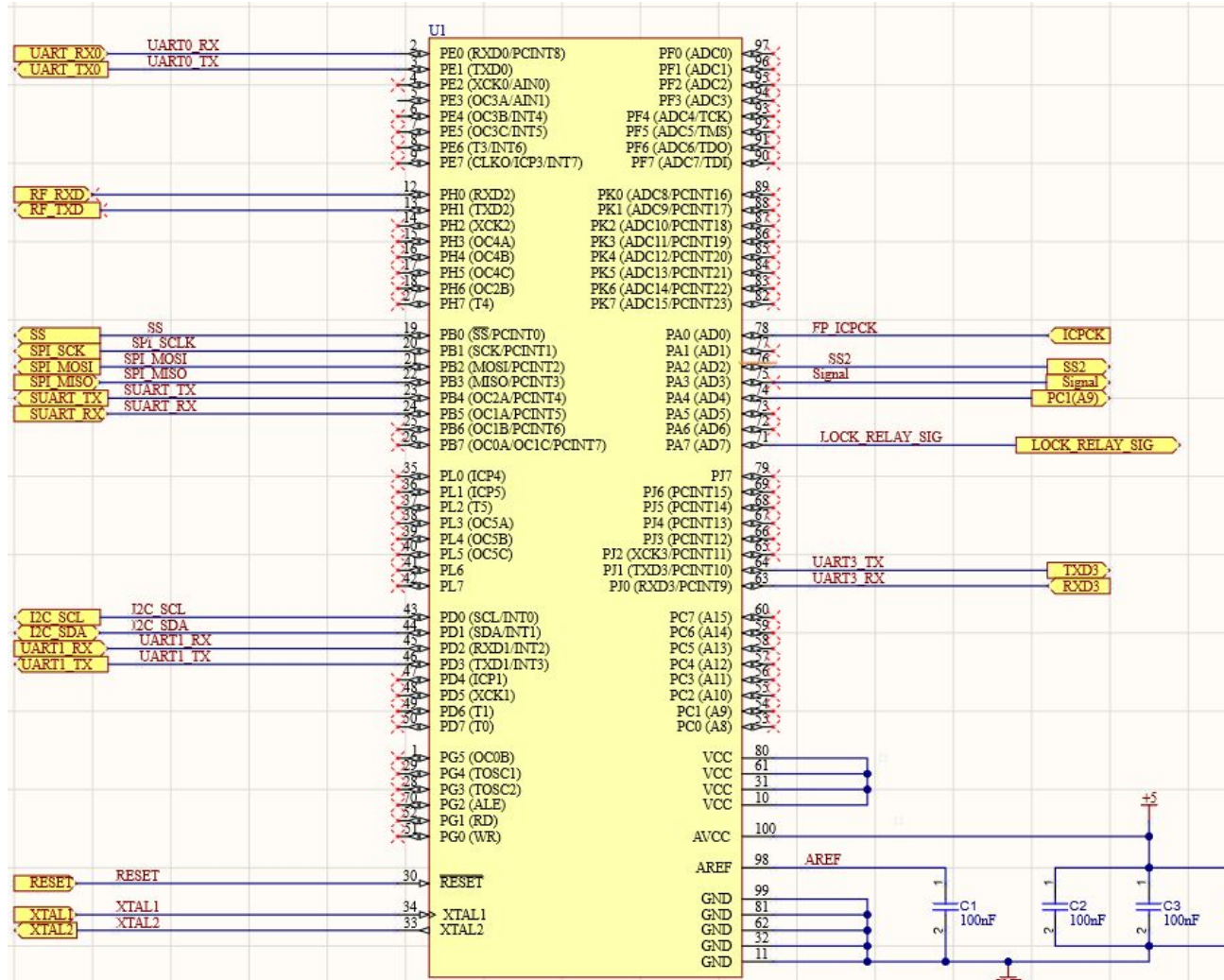
ATmega2560-16AU Specifications

Operating Voltage	1.8-5.5V
Max Current	20-50mA
Communication Interfaces	4 UART, 1 I2C, 5 SPI
Program Memory Size	256KB
Ram Size	8KB
Chip Size	16 mm x 16 mm
Manufacturer	Microchip
Price	\$11.85

ATmega2560 QFP Specifications

Microcontroller Schematic

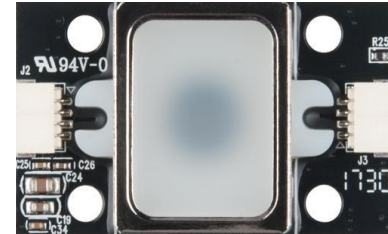
Main Microcontroller Schematic



Fingerprint Sensor - Ty

Box will unlock when a valid fingerprint is scanned.

	Adafruit 751	Sparkfun SEN-14518
Baud Rate	57600	9600
File Size	512B	512B
Communication Protocol	UART	UART
Accuracy	99.999%	99.999%
Identification Time	<1 second	< 1.5 second
Operating Voltage	3.6-5V	3.3-6V
Operating Current	<120mA	<130mA
Cost	\$49.95	\$35.95
Size	56 x 20 x 21.5mm	36 x 21 x 4.38 mm
Manufacturer	Adafruit Industries LLC	SparkFun



Fingerprint Sensor - Ty

Box will unlock when a valid fingerprint is scanned.

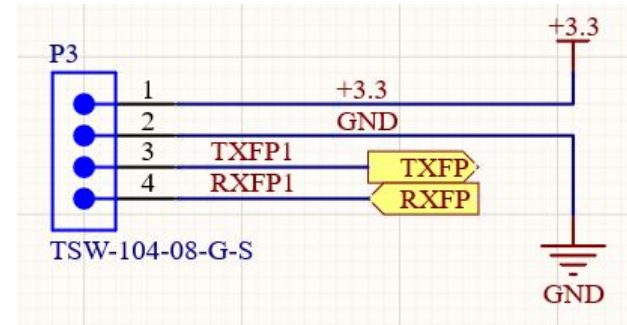
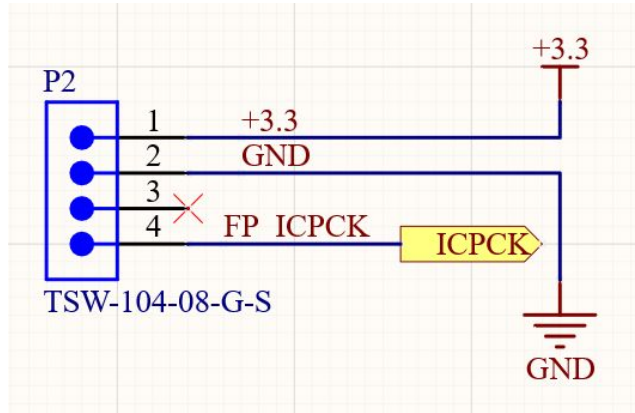


GT-521F32 Fingerprint Module

Specifications	
Supply Voltage	3.3-6V
Operating Current	<130mA
Communication Interfaces	UART
False Acceptance Rate	<0.001%
Identification Time	<1.5 Second
Baud Rate	9600
Board Size	36 x 21 x 4.38 mm
Manufacturer	SparkFun

Fingerprint Sensor Schematic - Ty

Box will unlock when a valid fingerprint is scanned.

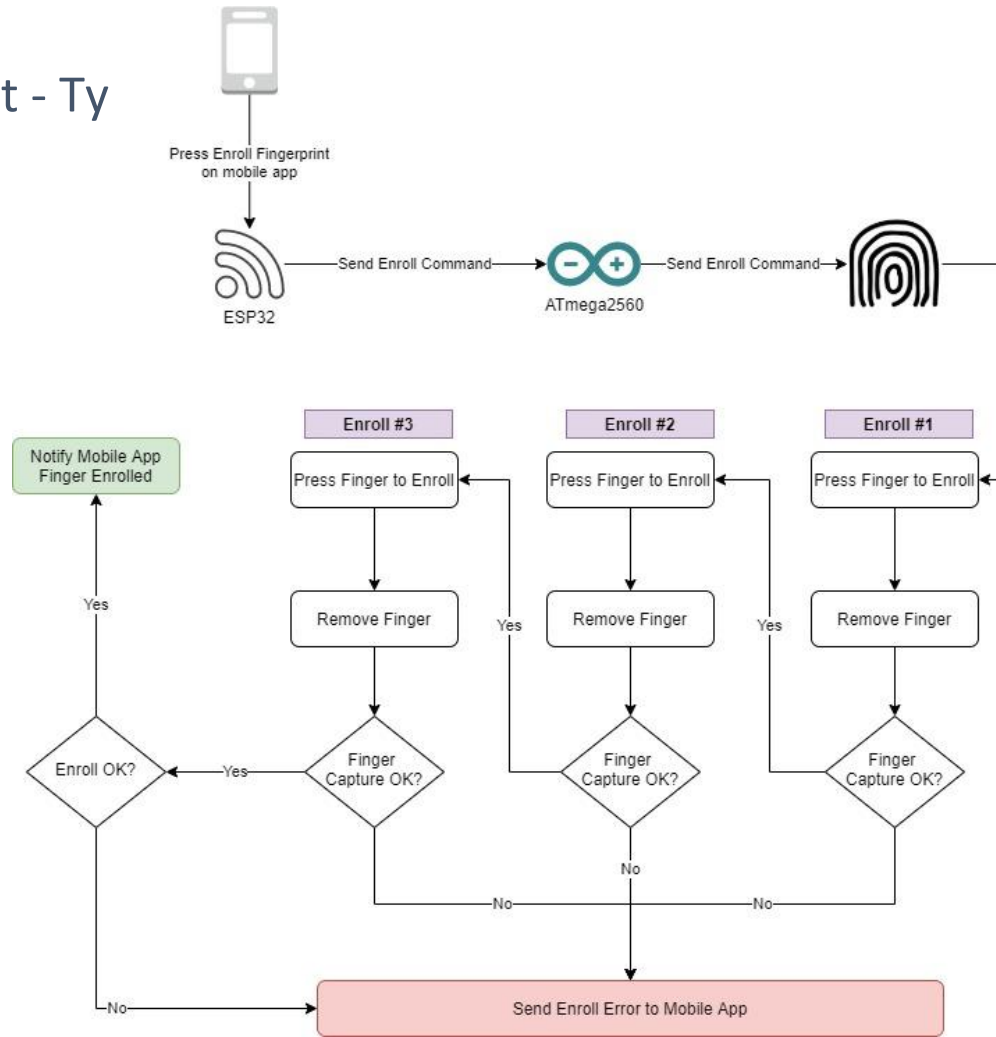


Pin	Label	Type	Description
1	VCC	POWER	3.3V Power Supply
2	GND	Ground	Power Ground
3	x	x	x
4	FP_ICPCK	Output	Hi / Lo output

Pin	Label	Type	Description
1	VCC	POWER	3.3V Power Supply
2	GND	Ground	Power Ground
3	TX	Output	Transmission Line
4	RX	Input	Reception Line

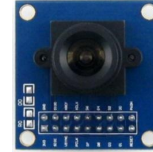
Enrolling New Fingerprint - Ty

General logic for enrolling a new fingerprint



Camera Selection - Ty

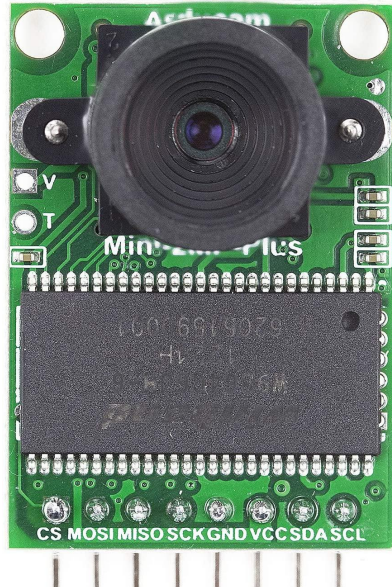
Camera will take a photo upon any unlock attempt



	Waveshare OV5640	ArduCAM	OV7670 Camera
Communication Protocol	I2C	I2C	I2C
Max Resolution	640x480	1600 x 1200	2592x1944
Picture Format	RAW RGB, RGB, YUV, YCbCr	RAW, YUV, RGB, JPEG	RAW, RGB, YUV
Supply Voltage	3.3V	5V	3.3V
Size	23.9 x 35.7 x 3 mm	34 x 24 x 3 mm	35.16 x 34.29 mm
Manufacturer	Waveshare	ArduCam	Waveshare
Cost	\$31.88	\$39.99	\$7.69

Camera Selection - Ty

Camera will take a photo upon any unlock attempt



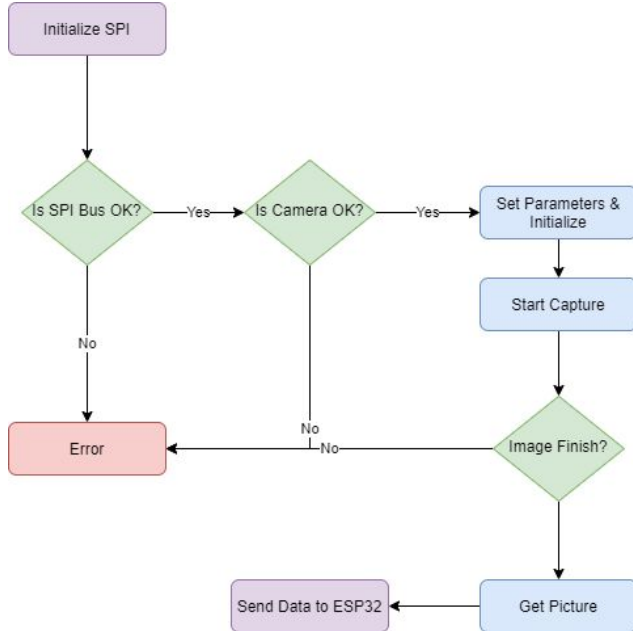
ArduCAM OV2640 Plus

Specifications

Supply Voltage	5V
Operating Current	<140mA
Communication Interfaces	I2C & SPI
Max Resolution	1600 x 1200
Lens Size	¼"
Board Size	34 x 24 x 3 mm
Manufacturer	ArduCam
Output Format	•RAW •YUV •RGB •JPEG

Taking a Picture - Ty

Picture logic



```
0255 216 255 224 0 16 74 70 73 70 0 1 1 1 0 0 0 0 0 0 0 255 219 0 67 0 12 8 9 11 9 8 12 11 10 11 14 13 12 14 18 30 20 18 17 17 18 37 26 28 22
30 44 38 46 45 43 38 42 41 48 54 69 59 48 51 65 52 41 42 60 82 61 65 71 74 77 78 77 47 58 85 91 84 75 90 69 76 77 74 255 219 0 67 1 13 14 14
18 16 18 35 20 20 35 74 50 42 50 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74
74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74 74
0 22 23 24 25 26 37 38 39 40 41 42 52 53 54 55 56 57 58 67 68 69 70 71 72 73 74 83 84 85 86 87 88 89 90 99 100 101 102 103 104 105 106 115
116 117 118 119 120 121 122 131 132 133 134 135 136 137 138 146 147 148 149 150 151 152 153 154 162 163 164 165 166 167 168 169 170 178 179
180 181 182 183 184 185 186 194 195 196 197 198 199 200 201 202 210 211 212 213 214 215 216 217 218 225 226 227 228 229 230 231 232 233 234
241 242 243 244 245 246 247 248 249 250 255 196 0 31 1 8 3 1 1 1 1 1 1 1 1 1 0 0 0 0 0 1 2 3 4 5 6 7 8 9 10 11 255 196 0 181 17 0 2 1 2 4
4 3 4 7 5 4 4 0 1 2 119 0 1 2 3 17 4 5 33 49 6 18 65 81 7 97 113 19 34 50 129 8 20 6 145 161 177 193 9 35 51 82 240 21 98 114 209 10 22 36
52 225 37 241 23 24 25 26 38 39 40 41 42 53 54 55 56 57 58 67 68 69 70 71 72 73 74 83 84 85 86 87 88 89 90 99 100 101 102 103 104 105 106
115 116 117 118 119 120 121 122 130 131 132 133 134 135 136 137 138 146 147 148 149 150 151 152 153 154 162 163 164 165 166 167 168 169 170
178 179 180 181 182 183 184 185 186 194 195 196 197 198 199 200 201 202 210 211 212 213 214 215 216 217 218 225 226 227 228 229 230 231 232 233
234 242 243 244 245 246 247 248 249 250 255 192 0 17 8 0 120 0 160 3 1 33 0 2 17 1 3 17 1 255 218 0 12 3 1 0 2 17 3 17 0 63 0 282 252 210
102 144 131 52 80 1 75 64 5 20 192 40 160 2 151 20 0 152 163 20 0 98 147 20 0 98 140 82 1 41 40 17 38 218 54 208 33 118 209 182 129 134 218
49 64 11 182 140 80 2 226 140 80 1 138 49 64 9 69 0 37 37 0 20 148 0 148 148 1 38 105 51 64 135 102 140 208 1 154 76 208 48 221 70 205 140
50 81 186 144 131 52 153 166 48 205 38 104 16 102 155 154 6 25 162 129 9 73 72 99 169 41 128 234 90 4 33 162 128 10 40 24 81 64 5 20 0 148
80 1 73 64 5 20 0 148 82 1 212 148 196 61 23 52 242 132 80 34 58 41 20 20 83 0 162 128 10 40 0 164 160 2 138 0 74 41 0 148 83 1 212 80 34
229 186 229 186 71 94 41 16 81 61 105 40 52 22 138 0 74 41 128 81 64 5 20 128 74 41 128 148 80 2 81 72 7 82 175 38 152 139 73 148 166 203 41
34 145 37 122 41 148 20 180 134 20 148 0 81 76 2 146 128 10 40 1 40 160 2 146 144 14 169 96 25 166 75 38 124 129 85 152 210 4 54 138 101 5
45 0 20 82 0 162 152 9 69 0 20 80 2 81 64 9 69 32 31 90 54 177 208 200 100 215 16 229 9 172 131 214 146 26 18 138 162 130 138 6 45 20 8 40
160 4 162 128 10 40 1 40 160 4 162 144 22 224 139 123 86 213 168 88 215 238 131 83 35 54 64 167 256 205 38 20 98 177 182 85 34 133 9 75 229
211 1 187 41 222 93 3 19 101 40 142 128 20 199 77 217 64 18 172 20 199 139 20 128 143 109 59 203 166 3 10 210 98 144 6 218 77 180 1 126 223
59 184 173 68 60 116 92 153 155 34 150 38 146 152 44 115 214 132 4 139 167 45 33 211 199 175 48 184 207 176 123 212 82 90 236 160 119 43 149
167 170 211 1 196 113 76 84 25 160 101 128 160 10 138 85 21 34 32 217 78 217 64 200 221 42 61 148 198 63 101 49 146 164 69 152 95 203 60 213
228 185 92 117 170 34 196 171 114 190 181 40 184 95 90 145 15 89 199 173 63 206 6 144 13 243 5 84 185 215 213 72 97 167 180 195 117 50
242 215 236 212 92 101 38 124 212 176 219 187 243 84 202 38 104 93 69 84 99 206 41 18 36 99 113 197 91 251 47 203 154 67 35 22 196 208 108
217 185 8 103 146 106 57 90 219 64 18 136 131 115 81 208 155 106 169 140 26 112 52 12 120 38 151 115 122 210 16 190 99 250 208 28 228 49 76
183 73 163 202 157 61 106 109 102 211 206 128 226 178 234 73 203 11 119 143 168 169 163 188 72 248 53 93 102 142 146 253 90 168 187 228 211
26 65 20 187 90 175 253 176 189 165 97 52 58 11 164 207 53 123 206 137 214 165 162 25 93 60 188 213 91 242 129 105 1 155 20 248 169 152 239
90 212 208 175 156 26 120 106 0 153 24 84 188 82 16 194 69 54 129 151 52 251 159 46 64 43 171 183 152 66 51 81 34 12 109 105 22 44 145
222 185 103 229 141 92 77 16 222 105 217 52 198 25 165 221 64 9 186 164 23 46 180 137 57 110 216 84 114 206 100 164 77 136 42 72 228 193 170
85 146 144 26 163 206 40 16 229 122 210 182 179 51 14 258 65 186 183 107 83 205 48 32 243 49 93 6 145 122 193
115 218 166 66 101 109 110 240 77 242 214 48 166 138 180 163 105 52 0 175 19 40 166 10 144 63 255 217
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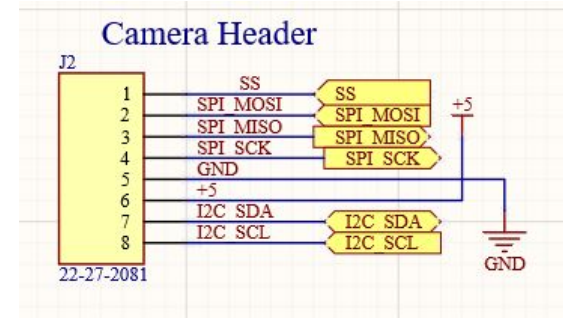
Picture Sample Data

Camera Schematic - Ty

Camera Pin header

Pin	Label	Type	Description
1	CS	Input	Slave select
2	MOSI	Input	Data output from master
3	MISO	Output	Data output from slave
4	SCK	Input	Serial Clock from master
5	GND	Ground	Power Ground
6	VCC	POWER	5V Power Supply
7	SDA	Bi-directional	Serial Interface Data I/O
8	SCL	Input	Serial Interface Clock

Detailed Pinout



Camera Pin Header

Barcode Scanner - Shane

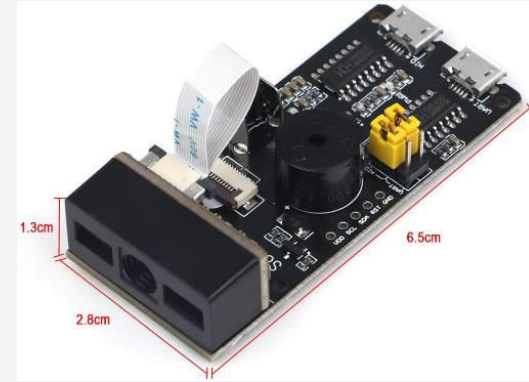
Box will unlock when a valid package is scanned.



DYScan DE2120



Waveshare Barcode Scanner



MG65 1D 2D Code Scanner

Device	Voltage	Interface	Current	DOF	Price
DYScan	3.3V	UART	190mA	400mm	29.95
Waveshare	5V	UART	135mA	400mm	39.99
MG65	5V	UART	120mA	250mm	29.99



Left: 1D | Right: 2D

Solenoid Lock - Shane

An electronic lock used to open or close our box.



Smartphone-controlled,
Deadbolt Actuator



Smock



Morning Industry RF-01SN

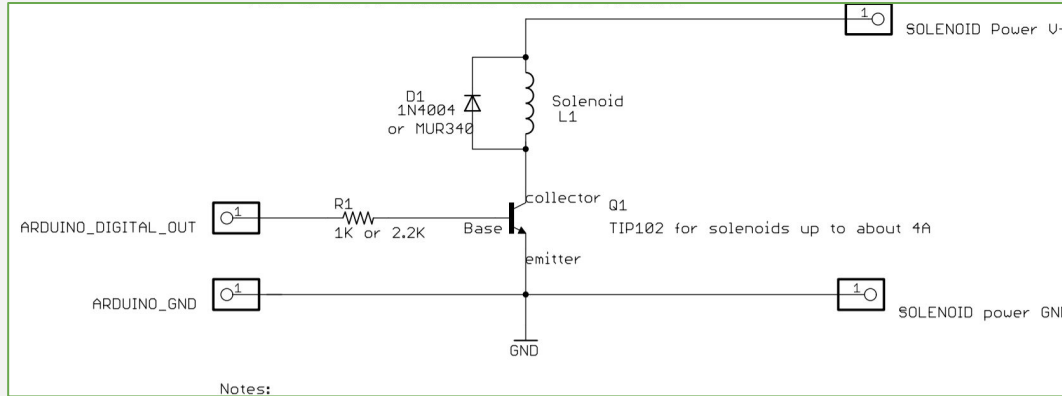


AdaFruit Solenoid Lock

- A supply voltage of 12V will be needed to energize our solenoid lock.
- A solenoid lock is commonly used in the tech field as an electronic lock, which provides a bunch of versatility and usability.

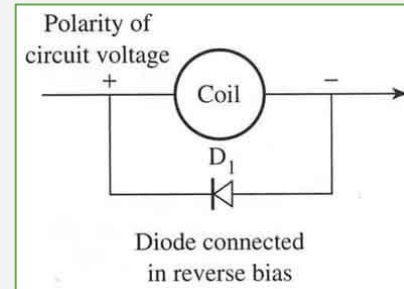
Solenoid Lock - Shane

An electronic lock used to open or close our box.



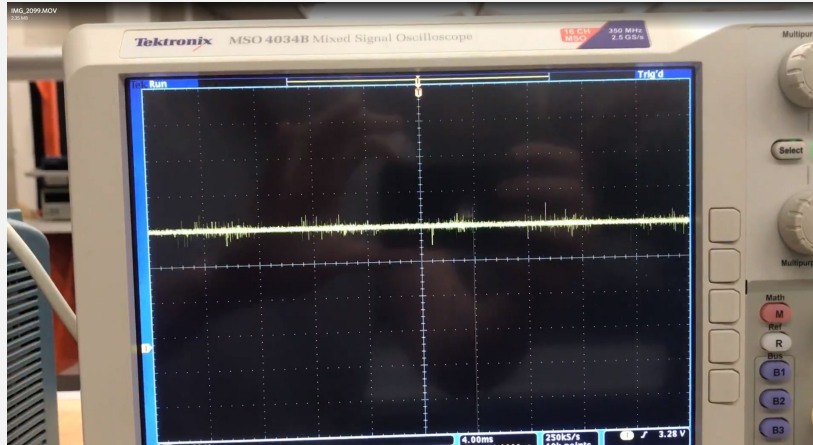
Mechanism of Solenoid Lock

- The lock solenoid draws 650 mA at 12V.
- For protection of the solenoid and other electrical components in our design, a Schottky diode is used.

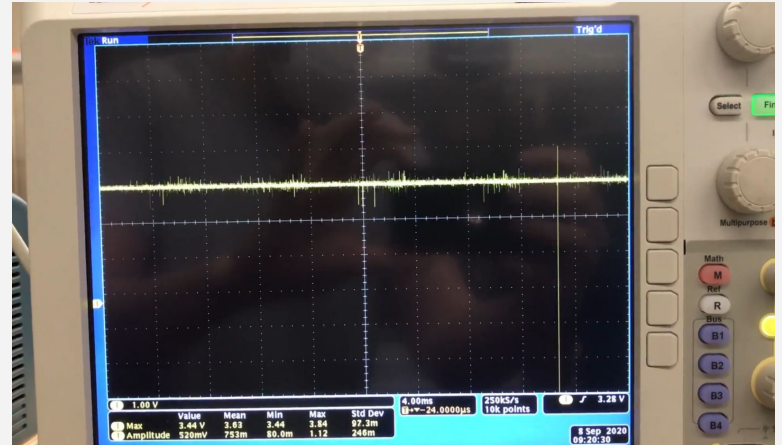


Solenoid Lock - Shane

An electronic lock used to open or close our box.



3.3V Power Line



Spike generated after unlock on 3.3V power line

Power System Requirements - Andre

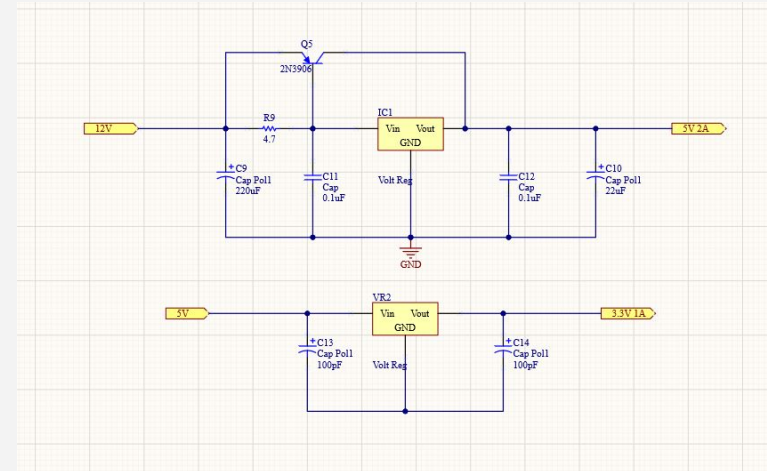
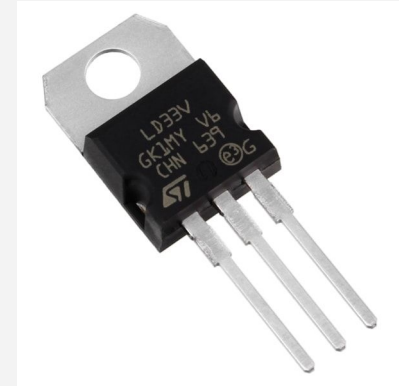
S.M.A.C. requires multiple components to work in harmony with a constant and steady voltage and current source to operate efficiently and securely. It also required a mix of multiple voltages to operate its plethora of devices. S.M.A.C. required the following voltages and currents to operate:

- 110-120V Power
- 12V
- 5V
- 3.3V
- Total of about 2A



Power System Design -Andre

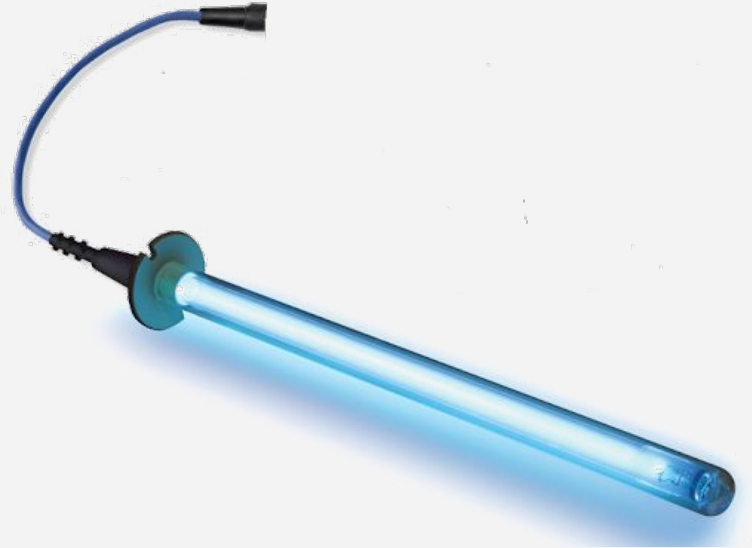
- With the many different voltages and extensive constant power requirement. It was decided to use an AC power source and convert the voltage to a DC source accordingly. satisfying our reliable and constant inflow of power.
- The design was simple 120V AC source would be turned into 12V 2A power source then stepped down to a 5V 2A power source and from the 5V we would use a step down converter to 3.3V.
- This design will give ease of use and constant security for the box. Which would accomplish its main goal.



UV light - Andre

UV light's functionality comes from the programming of the relay. The light was going to be controlled by a relay module attached to the power source making it a "smart" light. The UV light itself still needed to meet some criterias as there are ranges of UV lights that work for different uses. The following were the requirements:

- 184-254 nm wavelength
- UVC
- Cold cathode
- long lifespan



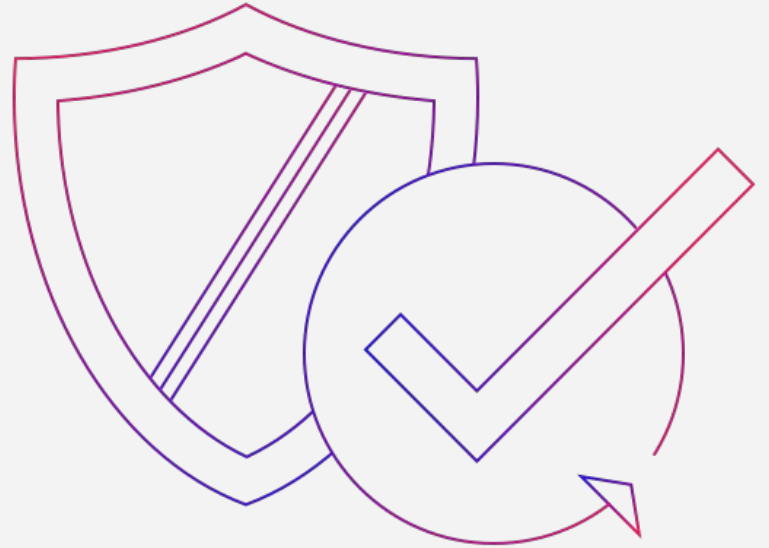
Housing Inspiration - Andre



Housing Goals - Andre

Housing was one of the most important aspects of the project. It would not only protect the boxes it would receive but also protect all its components that made it work. The following is a short list of goals the box needed to accomplish:

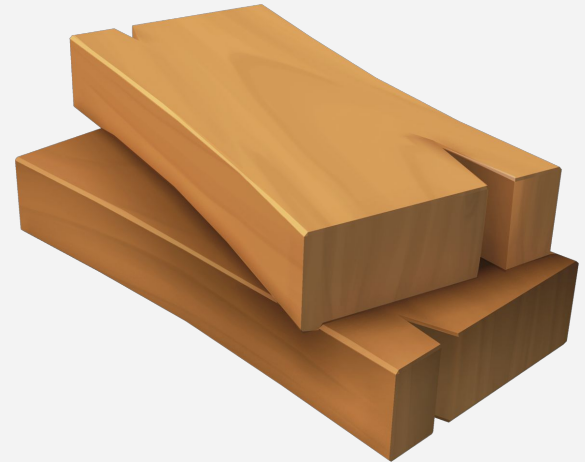
- Fit most boxes
- Secure
- Malleability
- Weatherproof
- Long lasting



Housing Choices - Andre

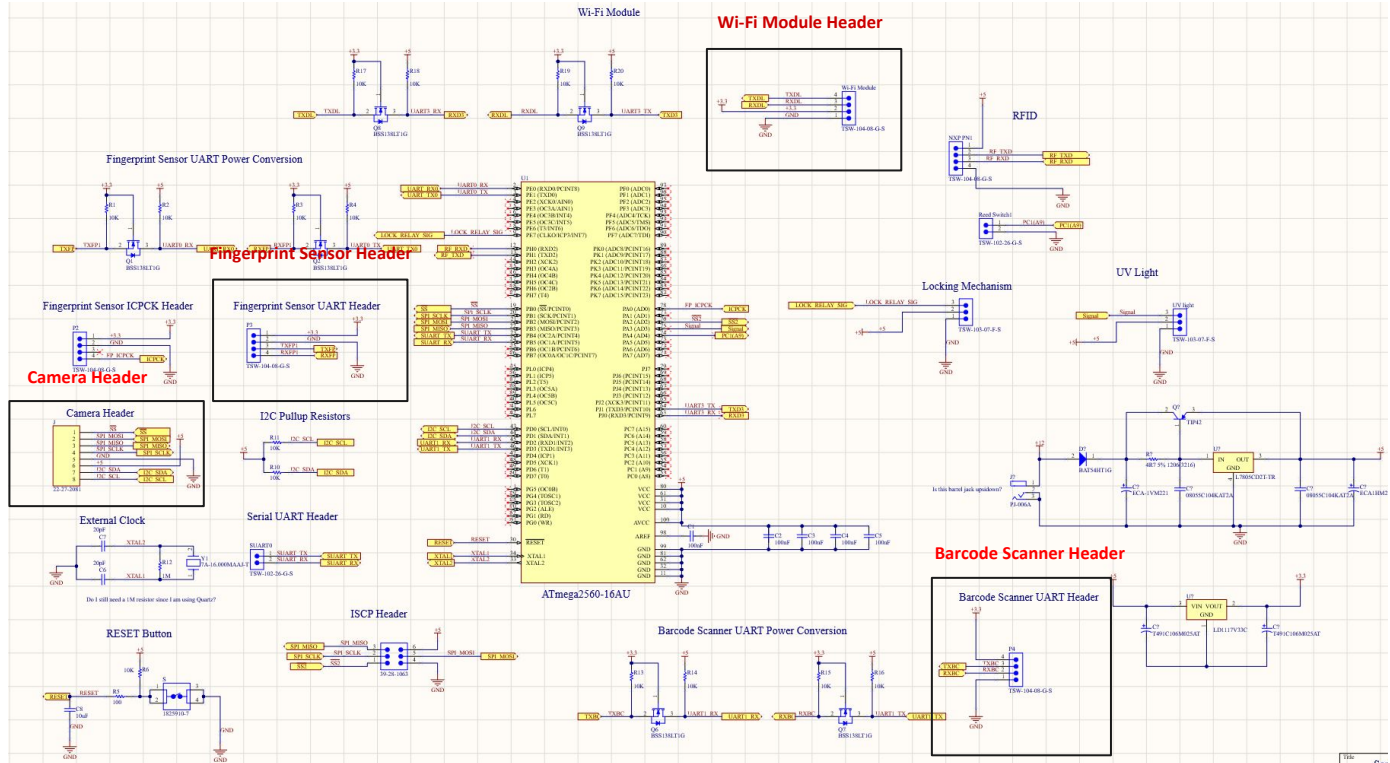
To accomplish all our goals extensive research had to be done to get the right dimensions and material to make the box. Research narrowed on a dimensions that would accommodate most boxes in the shipping industry. The material choice came down to how easy it would be to incorporate into the environment and malleability to work with. The narrowed specifications were as followed:

- Material: Wood
- Dimensions: 28 x 18 x 15



Altium PCB Schematic

Overall PCB Schematic of our Design Choices.

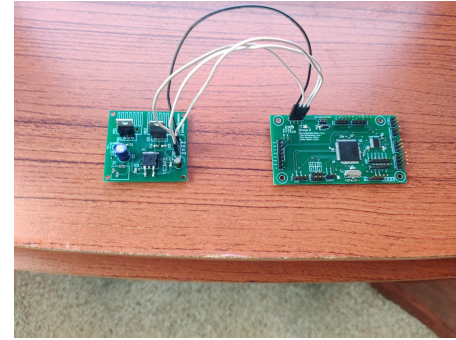


Custom PCB

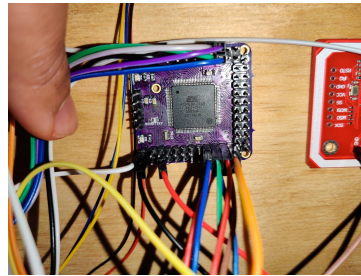
Overall PCB Schematic of our Design Choices.



First PCB



Second PCB



Final PCB

Android Operating System

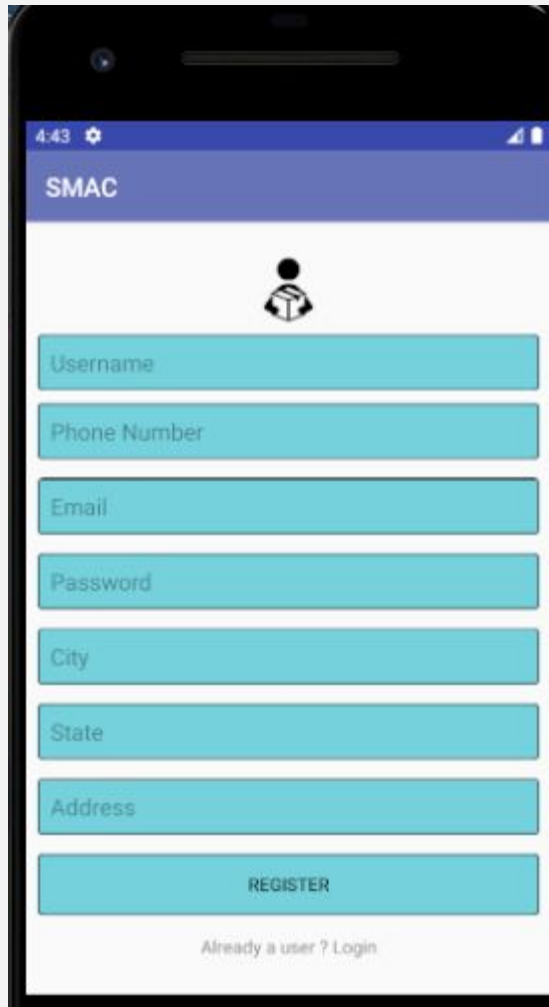
- An open source Linux-based operating system that was released on November 5, 2007
- With Android you can either choose kotlin or java, we chose java.
- Java is one of the most used programming languages, so the resources to develop with Java are immense, which makes the process to develop smooth.
- With android development it provides a multitude of reasons to use it, some of the following below are the reasons we valued the most.
 - Zero/negligible development cost
 - Open Source
 - Multi-Platform Support



Login Graphic User Interface




Register Graphic User Interface



The image shows a mobile application registration screen for 'SMAC'. The screen features a blue header with the app name 'SMAC'. Below the header is a user icon. The registration form consists of several text input fields: Username, Phone Number, Email, Password, City, State, and Address. A large blue button labeled 'REGISTER' is positioned below the input fields. At the bottom of the screen, there is a link that says 'Already a user ? Login'. The status bar at the top shows the time as 4:43 and various system icons.

4:43

SMAC



Username

Phone Number

Email

Password

City

State

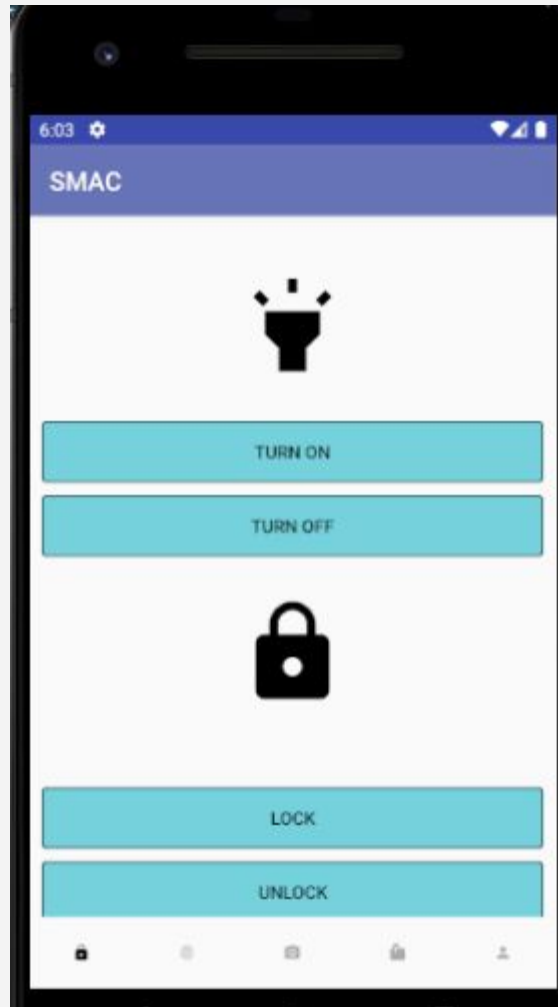
Address

REGISTER

Already a user ? Login

Mobile Application Features

- Delivery Log
- Profile
- Lock/Unlock your SMAC
- See a Photo capture after the box was unlocked
- UV Light



FireBase Real-Time Database

```
https://smac-7a161.firebaseio.com/Users

smac-7a161 > Users

Users
├── 3onK8dMraeaU0ivr5n1Tzey0aRw2
│   ├── bio: ""
│   ├── email: "test@gmail.com"
│   ├── id: "3onK8dMraeaU0ivr5n1Tzey0aRw2"
│   ├── imgurl: "default"
│   ├── name: "Tyler"
│   └── username: "test"
```




firebase

FireBase Authentication

Authentication

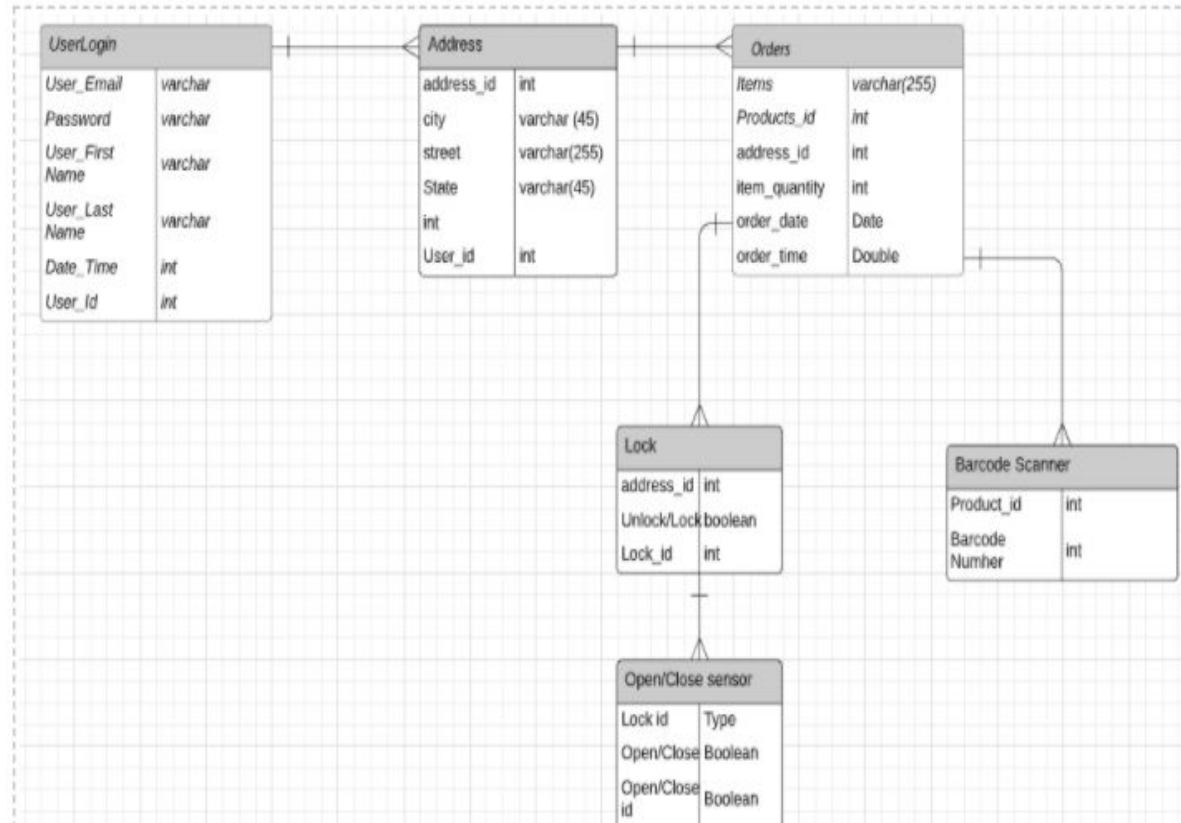
[Users](#) [Sign-in method](#) [Templates](#) [Usage](#)

Search by email address, phone number, or user UID Add user ↺ ⋮

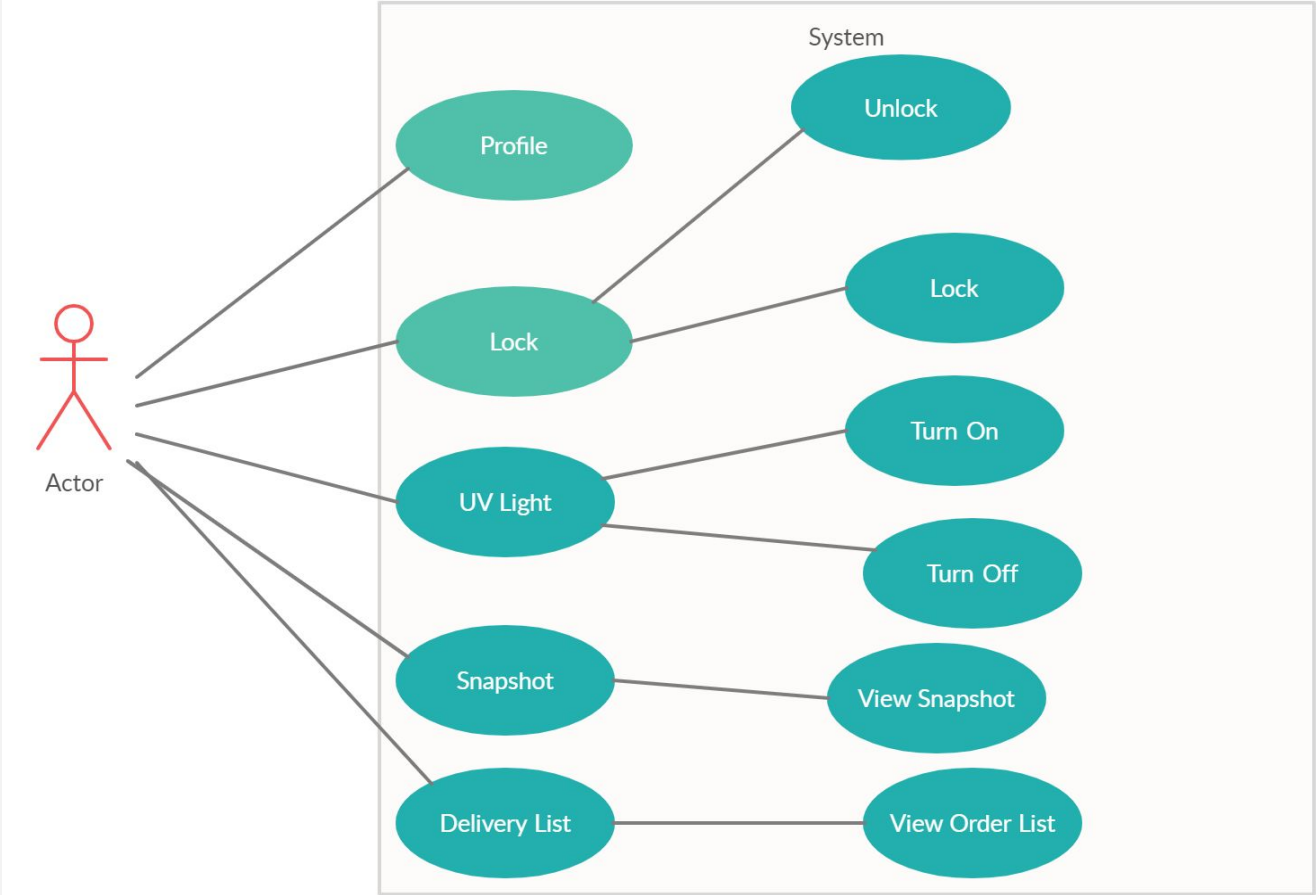
Identifier	Providers	Created	Signed In	User UID ↑
test@gmail.com		Sep 13, 2020	Sep 13, 2020	3onK8dMraeaUOivr5nITzey0aRw2

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DataBase Diagram



Use Case Diagram



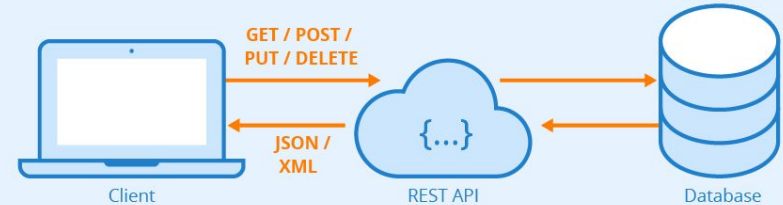
FireBase Cloud Functions

- A serverless framework that lets you run your backend code with responses from your databases and HTTPS request.
- In SMAC we used this framework to mainly communicate when a user would send request to our ESP32 or when we would want to send a response to our user.
- Our javascript server side code was stored in google cloud servers and was maintained and ran by google. We just used the platform to use their services

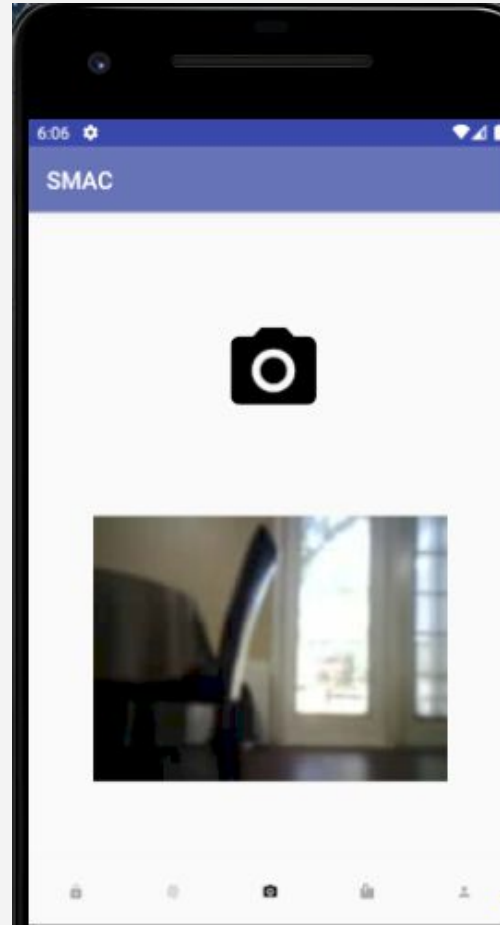
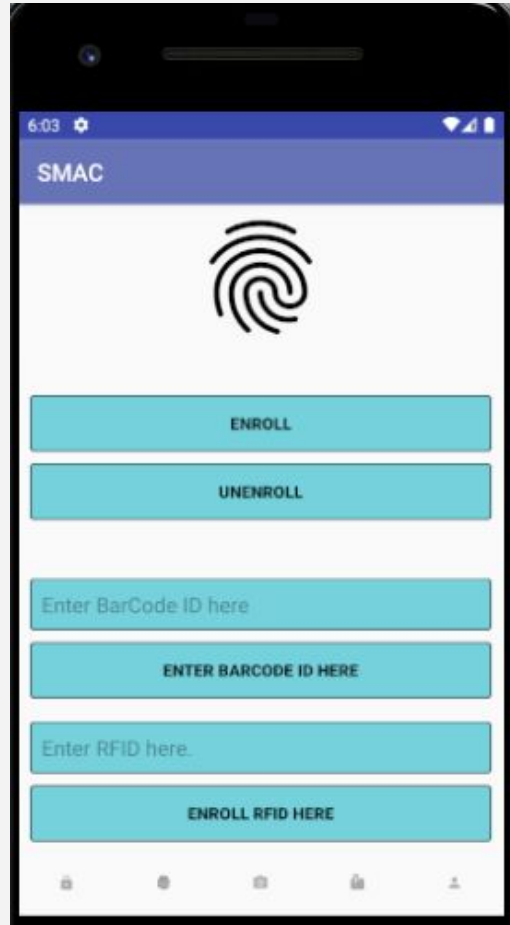


Rest API

- For our project we create REST API's for all our features to properly communicate with our ESP32 to our app.
- With doing a REST API it provided us powerful functionality that made it possible to do the features we did.
- For example we used HTTP request to send our image byte array to upload it to firebase storage to display it on our app.
- For our Unlock/Lock, BarCode Scanner, RFID, and our camera they all had individual REST API's for proper communication between the app and the ESP32.



App Features





● Part 3 ●

Administrative

Day-to-day activities that are related to
financial planning, record keeping & billing.



Project Expenses - Ty

Current Project Expenses

Tyler Rothenberg Current Expenditure			
Item	Amount	Supplier Link	Cost
ESP32	1	https://www.ama	\$10.99
Arduino Mega	1	https://www.banc	\$13.31
Waveshare Camera	1	https://www.banc	\$31.05
Sparkfun Fingerprint Sensor	1	https://www.spar	\$43.04
ArduCAM	1	https://www.ebay	\$33.04
Quic Cable Breadboard Jumper	2	https://www.spar	\$3.00
Sparkfun Logic Level Converter	1	https://www.spar	\$2.95
Breadboard Jumper Cables	2	https://www.ama	\$11.58
Solder Practice Kit	1	https://www.ama	\$9.99
Flux	1	ip.com/amtech-n	\$8.99
PCB Board Tester	1	tps://oshpark.co	\$30.29
PCB Components	1	s://www.digikey.c	\$9.16
SMD Practice Kit	1	YJTM/ref=ppx_v	\$6.98
Solder Wick	1	VWJ8/ref=ppx_v	\$6.88
Bluetooth Serial	1	W4FSI/ref=ppx_v	\$7.39
USB to TTL Adapter	1	32CDL/ref=ppx_v	\$11.99
ESP32 CAM	1	HYNM/ref=ppx_v	\$10.99
Laser Infrared Thermometer	1	I632G/ref=ppx_v	\$23.11
Lowe's Supplies	1		\$11.39
Walmart Supplies	1		\$7.62
TOTAL:			\$293.74

Tyler G Current Expenditure			
Item	Amount	Supplier Link	Cost
ELEGOO MEGA 2560 R3	1	https://www.ama	\$15.99
REED Switch	2	https://www.ama	\$14.58
RFID Module	2	https://www.ama	\$19.38
Heatsink	1		\$9.80
TIP42	1		\$6.99
PCB Printing	2		\$185.96
PCB Components	1		\$108.56
TIP42	1		\$4.99
ESP32	1		\$10.29
Random Components for Andre	1		\$22.00
TOTAL:			\$398.54

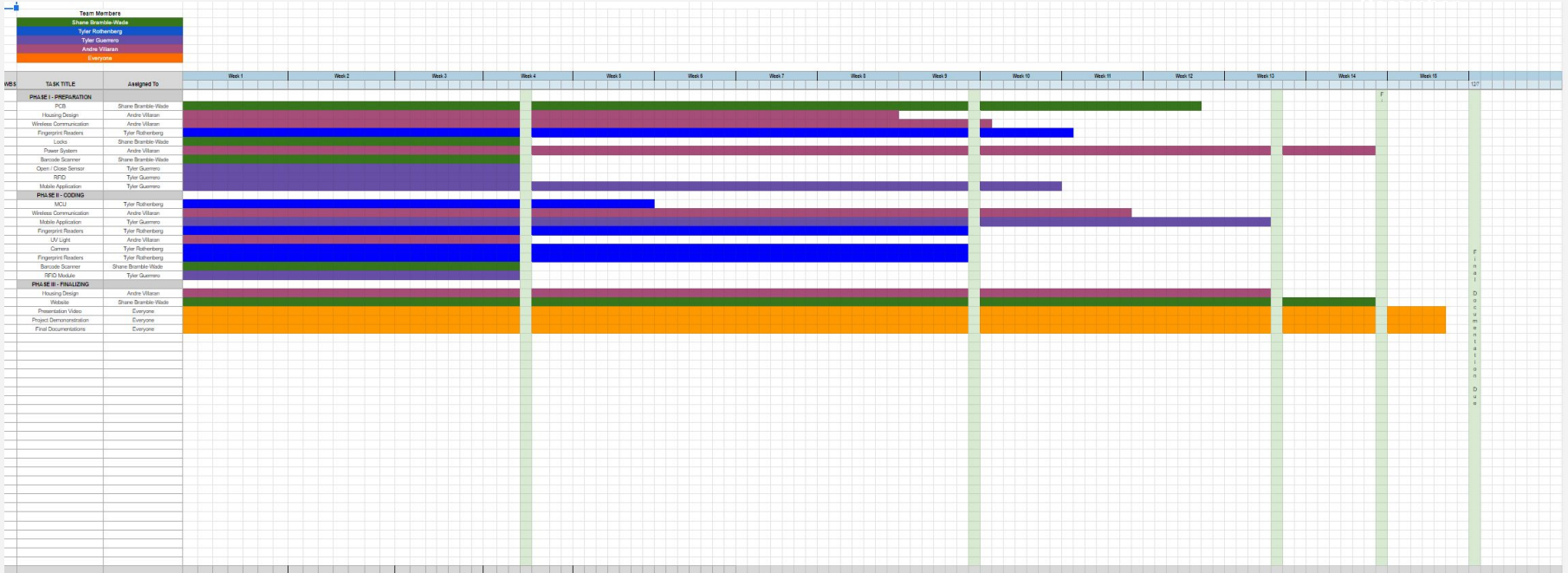
Shane Current Expenditure			
Item	Amount	Supplier Link	Cost
Sparkfun Barcode Scanner V1	1	https://www.spar	\$29.95
Sparkfun Barcode Scanner Module	3	https://www.spar	\$134.85
Lock-style Solenoid - 12VDC	1	v.adafruit.com/pr	\$14.95
ELEGOO MEGA 2560 R3	1	https://www.ama	\$15.99
Mega +WiFi R3 Module ATmega2560	1	https://www.banc	\$15.74
Youngneer 5v Relay Board Relay Mox	1	https://www.ama	\$11.99
PCB Manufacturing	1	https://www.4pct	\$77.07
BNTECHGO 22 Gauge PVC 1007 So	1	https://www.ama	\$12.98
NTE Electronics SW02-10 No-Clean S	1	https://www.ama	\$6.88
PCB Board Kit Jumper Wires Sold	1	https://www.ama	\$49.87
Digi-Key Mounting Components	1	https://www.digikey	\$26.74
PCB Mounting Components	1	https://www.arro	\$101.00
0-2A 0-15V DC Power Supply	1	https://www.ama	\$31.99
Carpet Flooring	1	https://www.waln	\$12.59
5.1 Zener Diode (Through hole)	1	https://www.digikey	\$2.25
RES SMD 4.7 OHM 1% 1W 0805	1	https://www.digikey	\$6.50
Neiko 01902 Adjustable Helping Hand	1	https://www.ama	\$8.15
PCB Power System Design	1	https://www.4pct	40.51
TOTAL:			\$600.00

Total Cost: \$1,505.46

Andre Current Expenditure			
Item	Amount	Supplier Link	Cost
ESP32	1	https://www.ebay	\$10.29
3.3V Voltage regulator	3	https://www.ebay	\$5.99
TIP42 PNP power transistor	4	https://www.ebay	\$3.01
DC Power Jack 2.1mm	5	https://www.ebay	\$5.44
Tolako 5V relay module	1	https://www.ama	\$5.50
9V 1A power supply	1	https://www.ama	\$6.79
Breadboard power supply	5	https://www.ama	\$7.49
ATMega2560	1	https://www.ama	\$15.99
Digital Multimeter	1	https://www.ama	\$10.30
Logic Level Converter	10	https://www.ama	\$7.49
Home Depot	1		\$94.58
Fans	1		\$16.54
UVC Ozone lamp	1	https://www.ama	\$23.77
TOTAL:			\$213.18

Project Progress

Success Always Belongs For Those Who Are Prepared



Project Timeline

Success Always Belongs For Those Who Are Prepared

NAME	June	July	August	September	October	November	December
PCB	■				■		
Fingerprint			■				
App	■			■			
Housing			■				
Coding					■		
Barcode		■		■			



● Closing ●

Questions ?

