



DOC'T

FINAL DEMO : CLEAN ENERGY ELECTRIC TRANSPORTATION SYSTEM

MEET THE TEAM!

Justin Maeder

Justin.Maeder@student.csulb.edu

Responsibility :

1. Software Design
 1. C++ for Arduino
 2. Constructed Database
 3. Created web application
2. Hardware verification



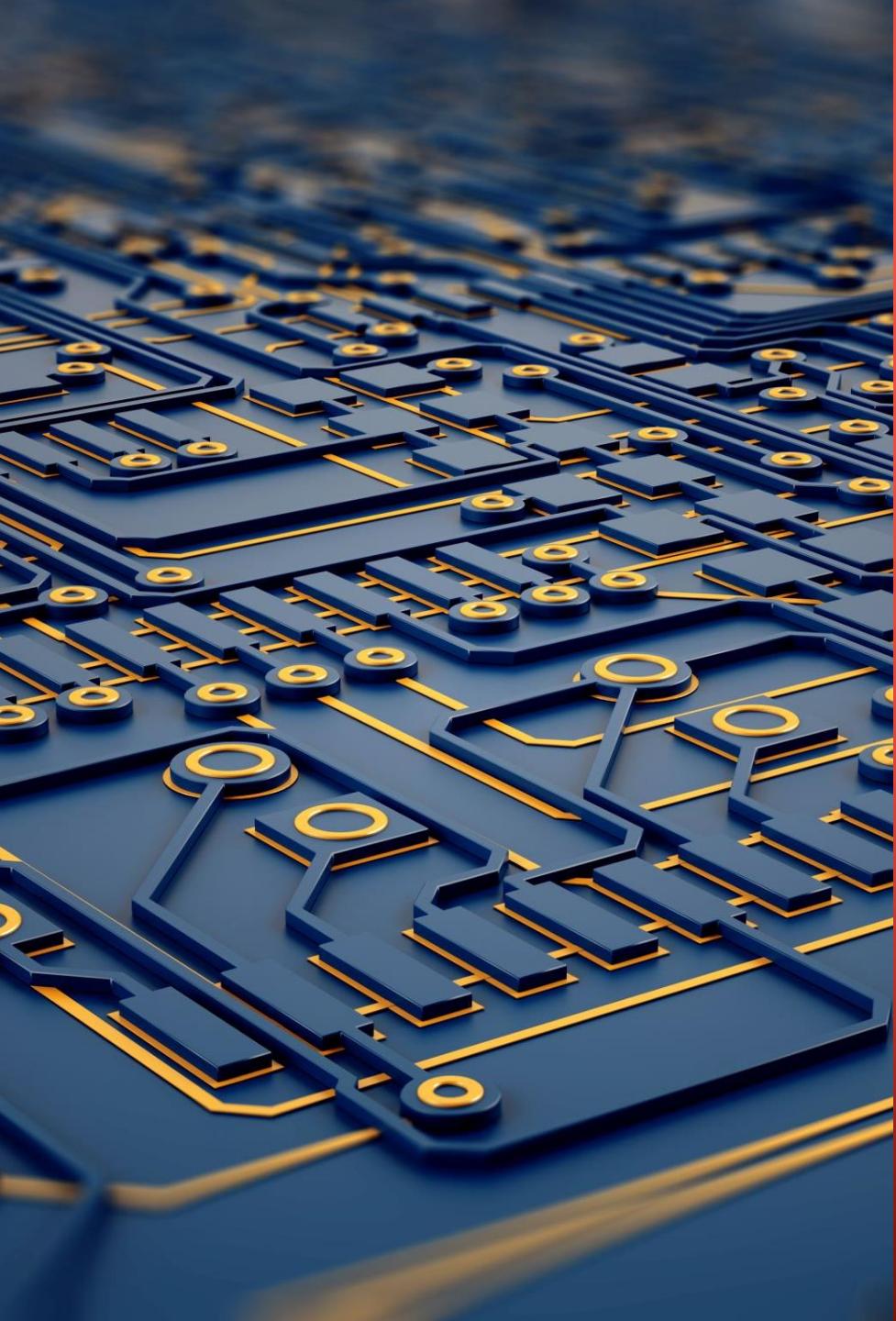
Hung Le

Hung.Le@student.csulb.edu

Responsibility:

1. Hardware Design
 1. Wiring diagram
 2. Hardware assembly/debug
2. Software Verification





OUR ETS

ETS is the electric transportation of the future targeting densely populated areas.

Utilizes clean energy to provide cheap and convenient transportation.

Motivated by the constant reduction of space.

PROBLEMS TO BE SOLVED



PUBLIC
TRANSPORTATION



SPACE



EMISSION



SUSTAINABLE



SAFETY

THREE KEY FEATURES OF DOC'T



Electric Transportation

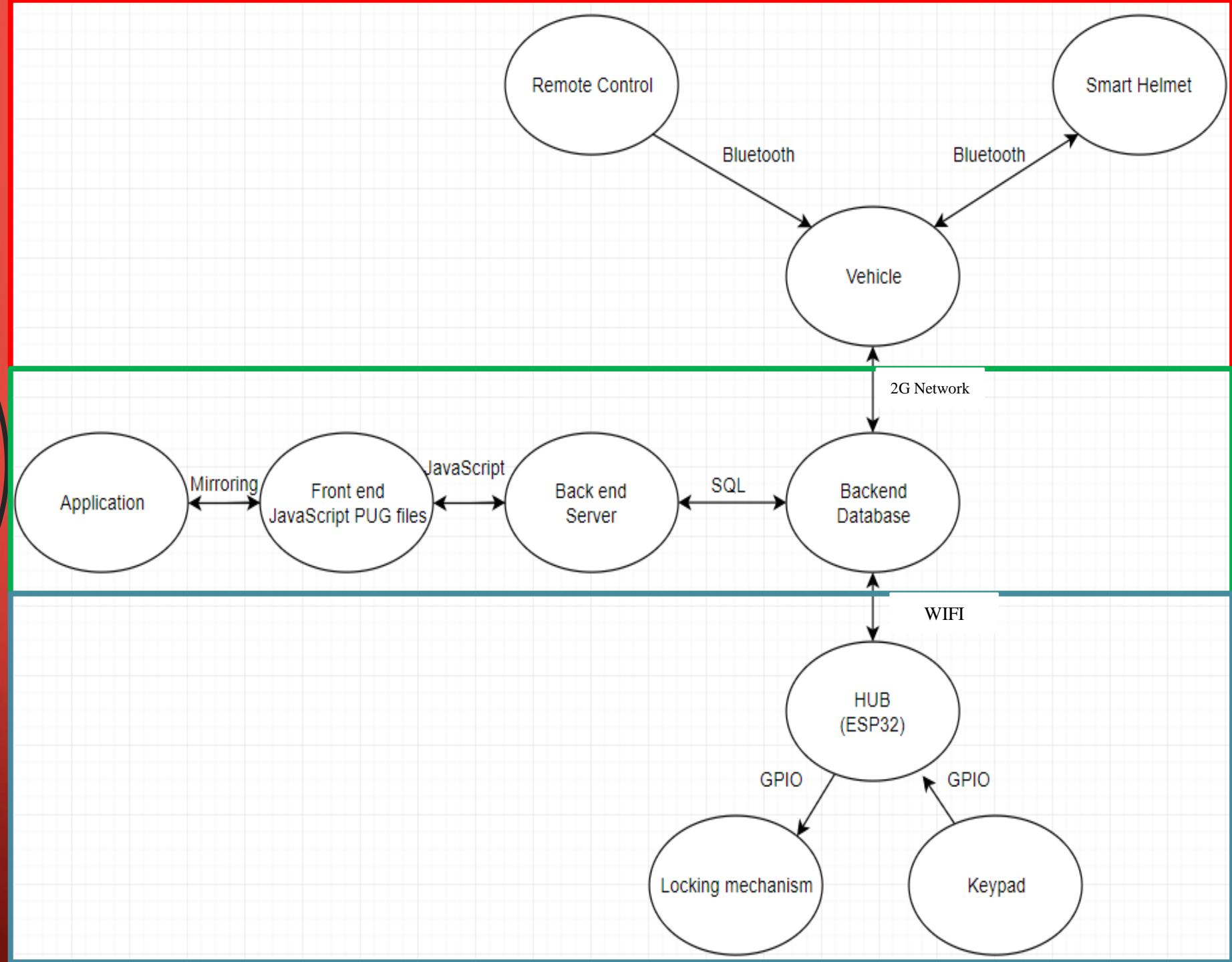


Locking & Docking Hub



Safety

COMMUNICATION FLOW

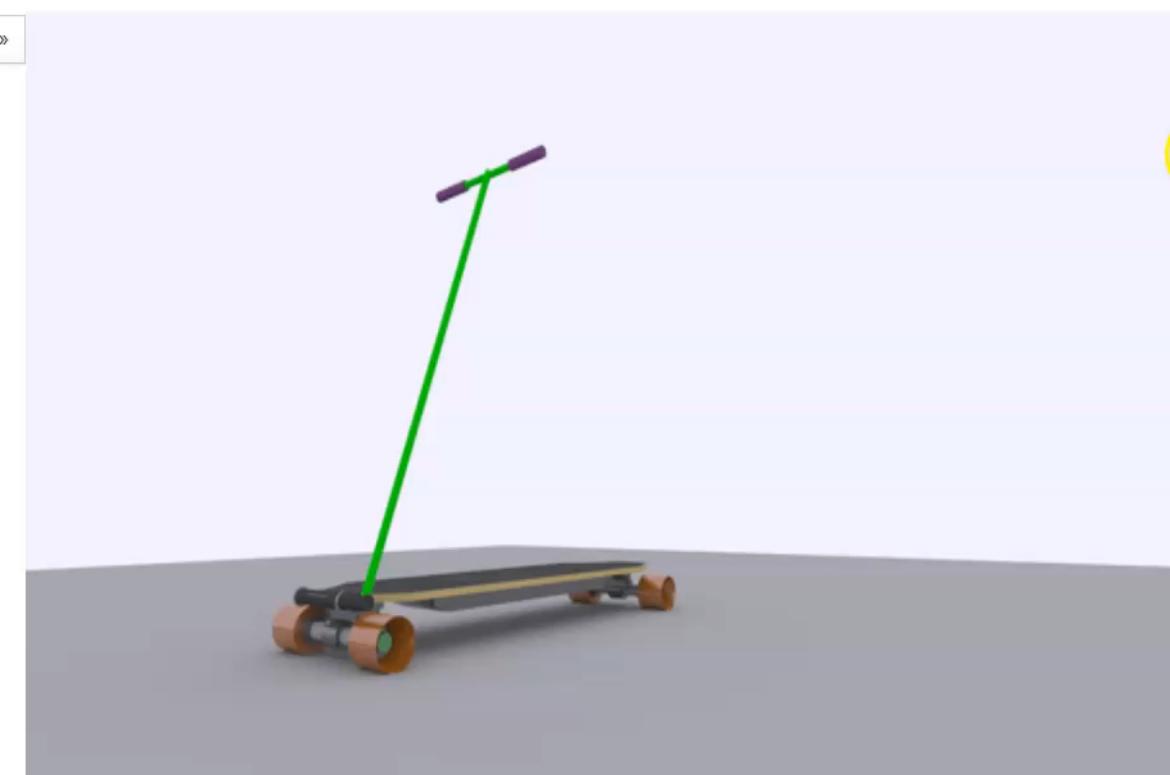




Doc't

Introducing a new generation of Electric Transportation Systems

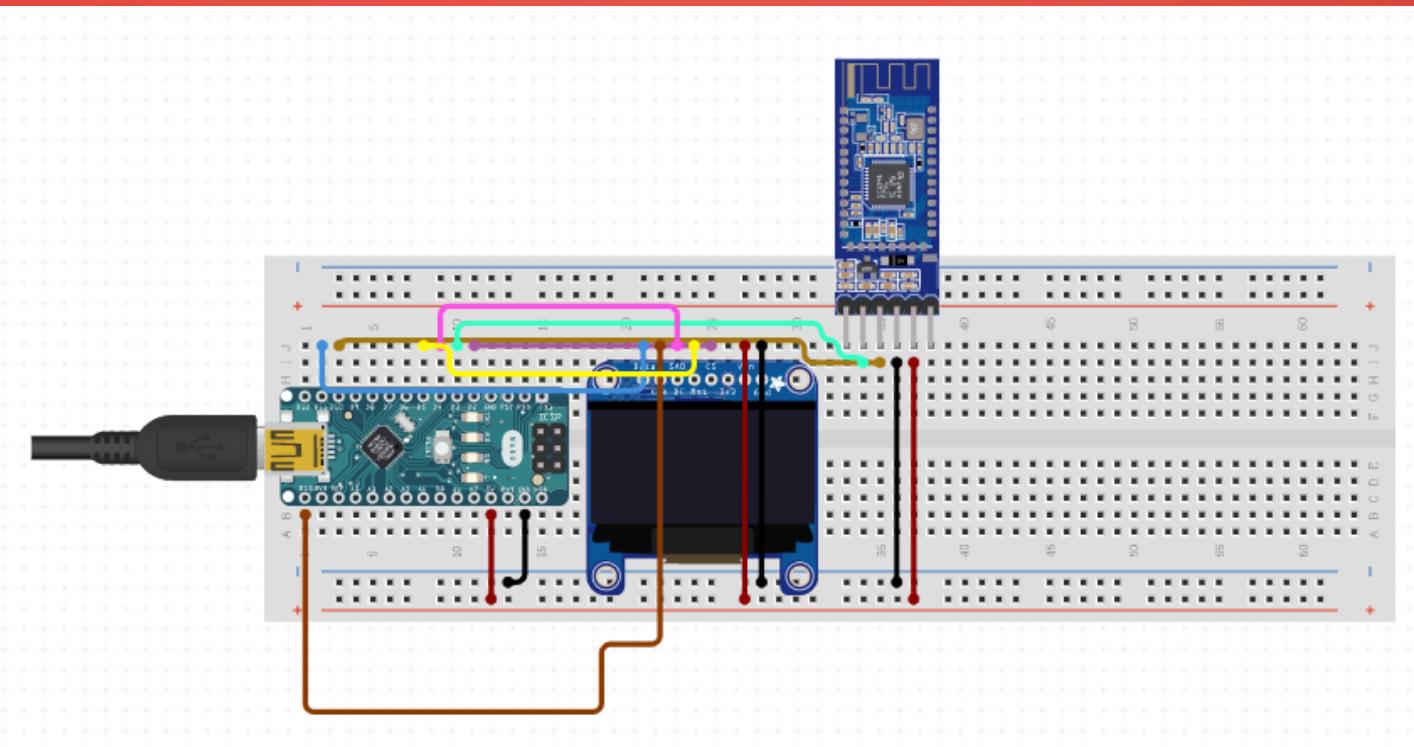
Start your Adventure »



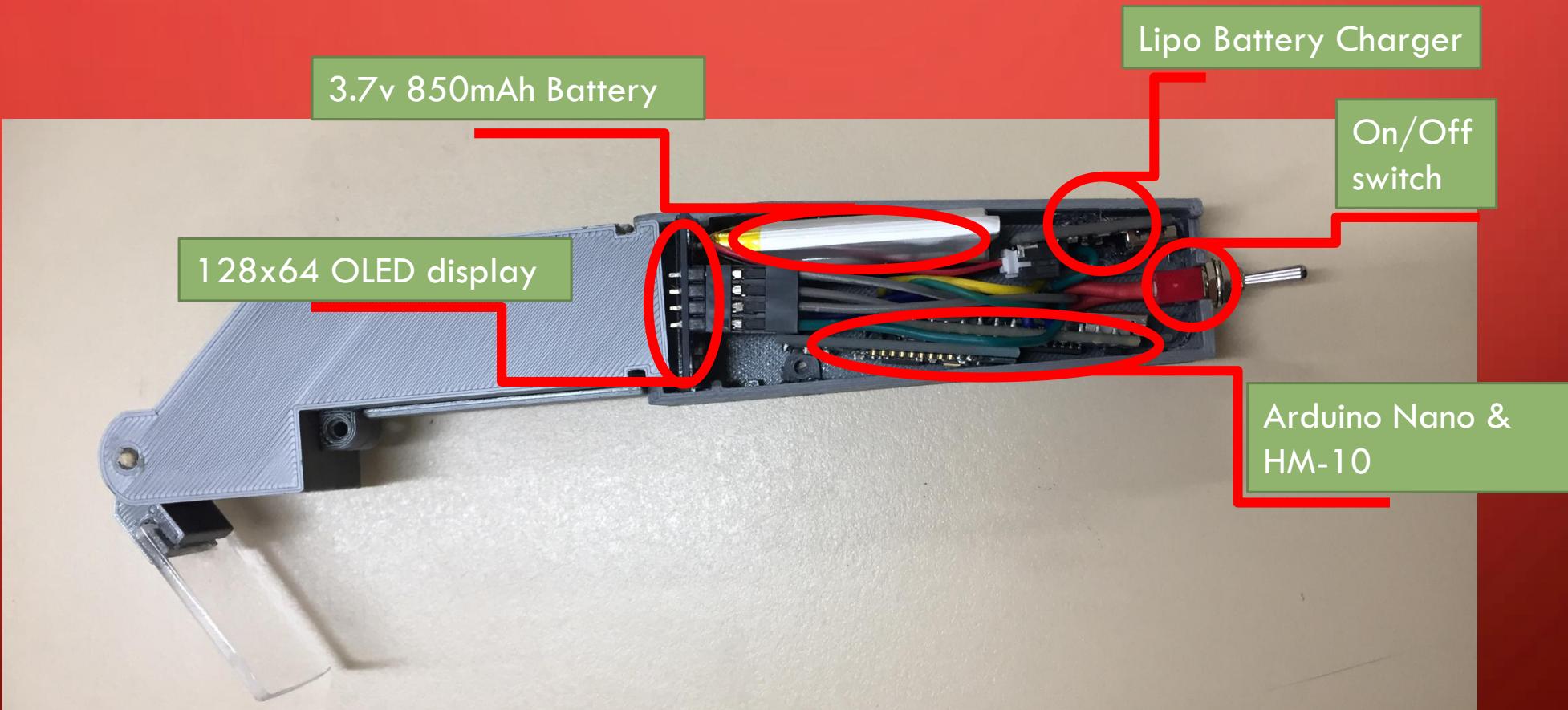


SAFETY (HEAD UP DISPLAY)

HEAD UP DISPLAY (DESIGN)



HEAD UP DISPLAY (HARDWARE)



HEAD UP DISPLAY (SOFTWARE)

```
if(mySerial.available()){
    bt_data = mySerial.read();
    if(bt_data == 115){// s-speed
        sig = 1;
    }
    if(bt_data == 98){ // b-battery
        sig = 2;
    }
    if(bt_data == 114){// r-range
        sig = 3;
    }
    if(bt_data == 116){// t-time
        sig = 4;
    }

    if(sig == 1){
        spd = spd + bt_data;
    }else if(sig == 2){
        batt = batt + bt_data;
    }else if(sig == 3){
        range = range + bt_data;
    }else if(sig == 4){
        tim = tim + bt_data;
    }
}
```

```
#include <Adafruit_GFX.h>
#include <Adafruit_SSD1306.h>
```

```
void set_battery(String batt){
    batt_lvl = batt.toInt();
    if(batt_lvl>0 && batt_lvl<=25){
        draw_fillrect(103,6,104,10);
        draw_clrrect(108,6,109,10);
        draw_clrrect(113,6,114,10);
        draw_clrrect(118,6,119,10);
    }if(batt_lvl>26 && batt_lvl<=50){
        draw_fillrect(103,6,104,10);
        draw_fillrect(108,6,109,10);
        draw_clrrect(113,6,114,10);
        draw_clrrect(118,6,119,10);
    }if(batt_lvl>50 && batt_lvl<=75){
        draw_fillrect(103,6,104,10);
        draw_fillrect(108,6,109,10);
        draw_fillrect(113,6,114,10);
        draw_clrrect(118,6,119,10);
    }if(batt_lvl>75 && batt_lvl<=100){
        draw_fillrect(103,6,104,10);
        draw_fillrect(108,6,109,10);
        draw_fillrect(113,6,114,10);
        draw_fillrect(118,6,119,10);
    }
}
```

```
void set_range(String range){
    clr_range();
    display.setTextColor(SSD1306_WHITE);
    display.setTextSize(1);
    display.setCursor(5,54);
    display.print(range);
}

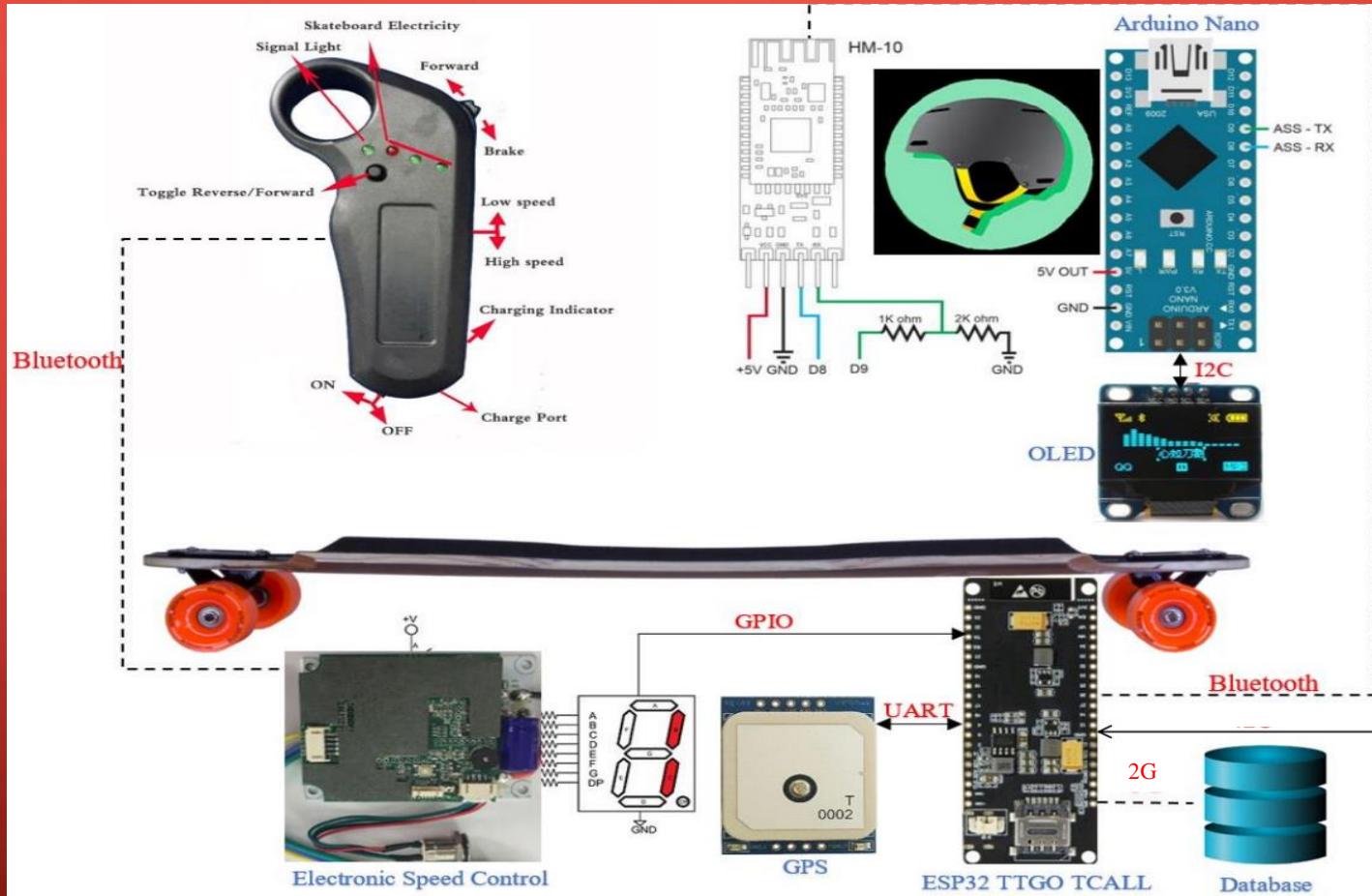
void set_speed(String spd){
    clr_spd();
    display.setTextColor(SSD1306_WHITE);
    display.setTextSize(2);
    display.setCursor(53,27);
    display.print(spd);
}

void set_time(String t){
    clr_time();
    h = t.substring(0,2);
    m = t.substring(2);
    display.setTextColor(SSD1306_WHITE);
    display.setTextSize(1);
    display.setCursor(7,5);
    display.print(h);
    display.setCursor(21,5);
    display.print(m);
}
```

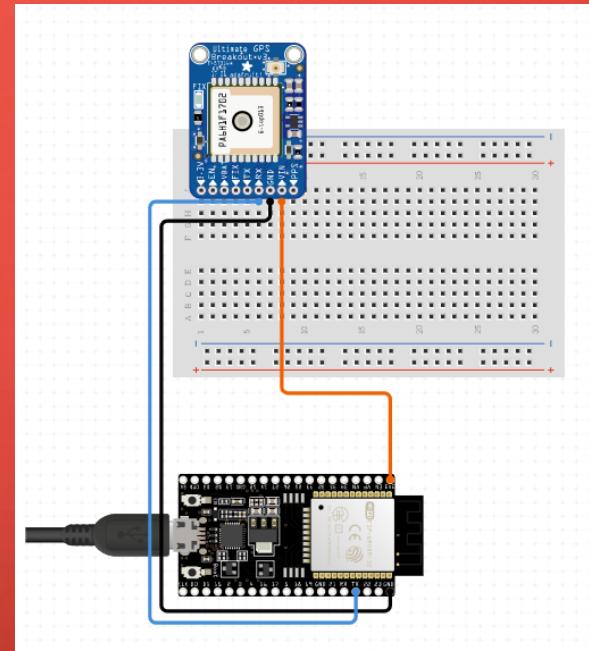
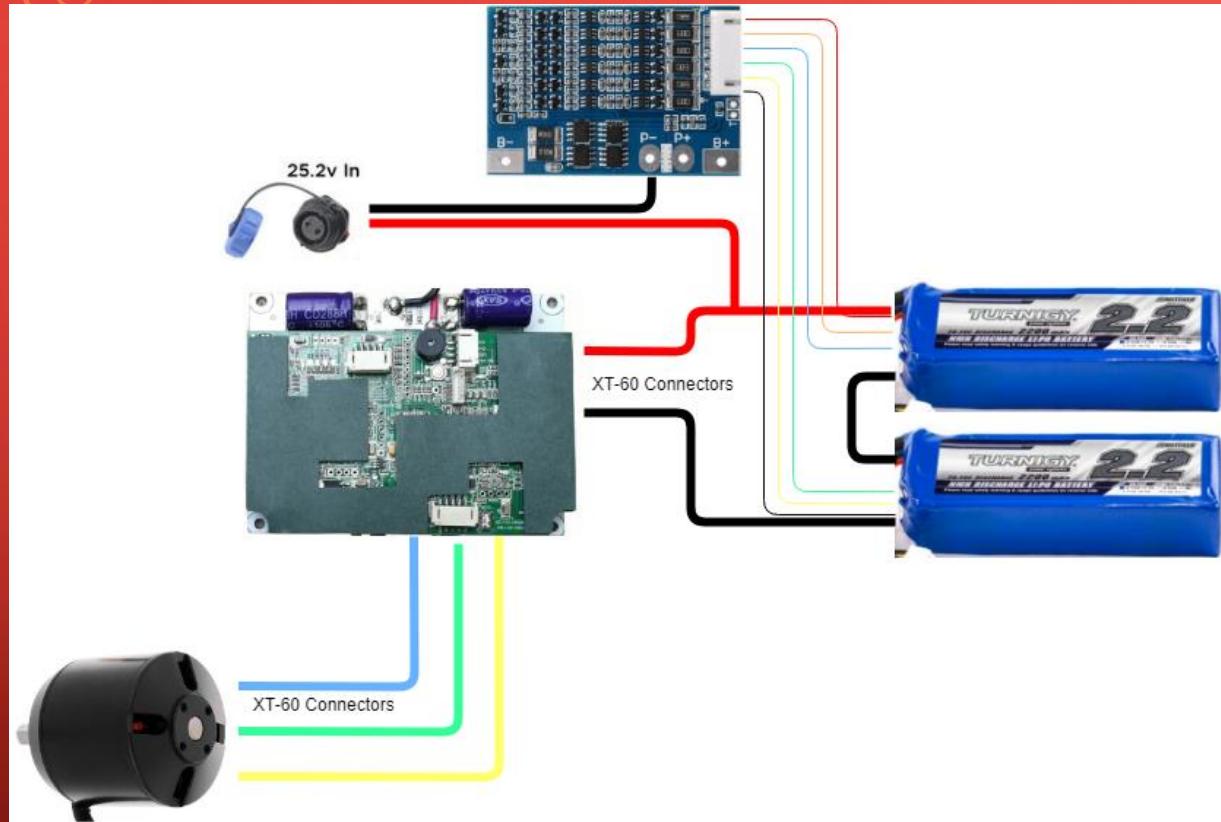


VEHICLE

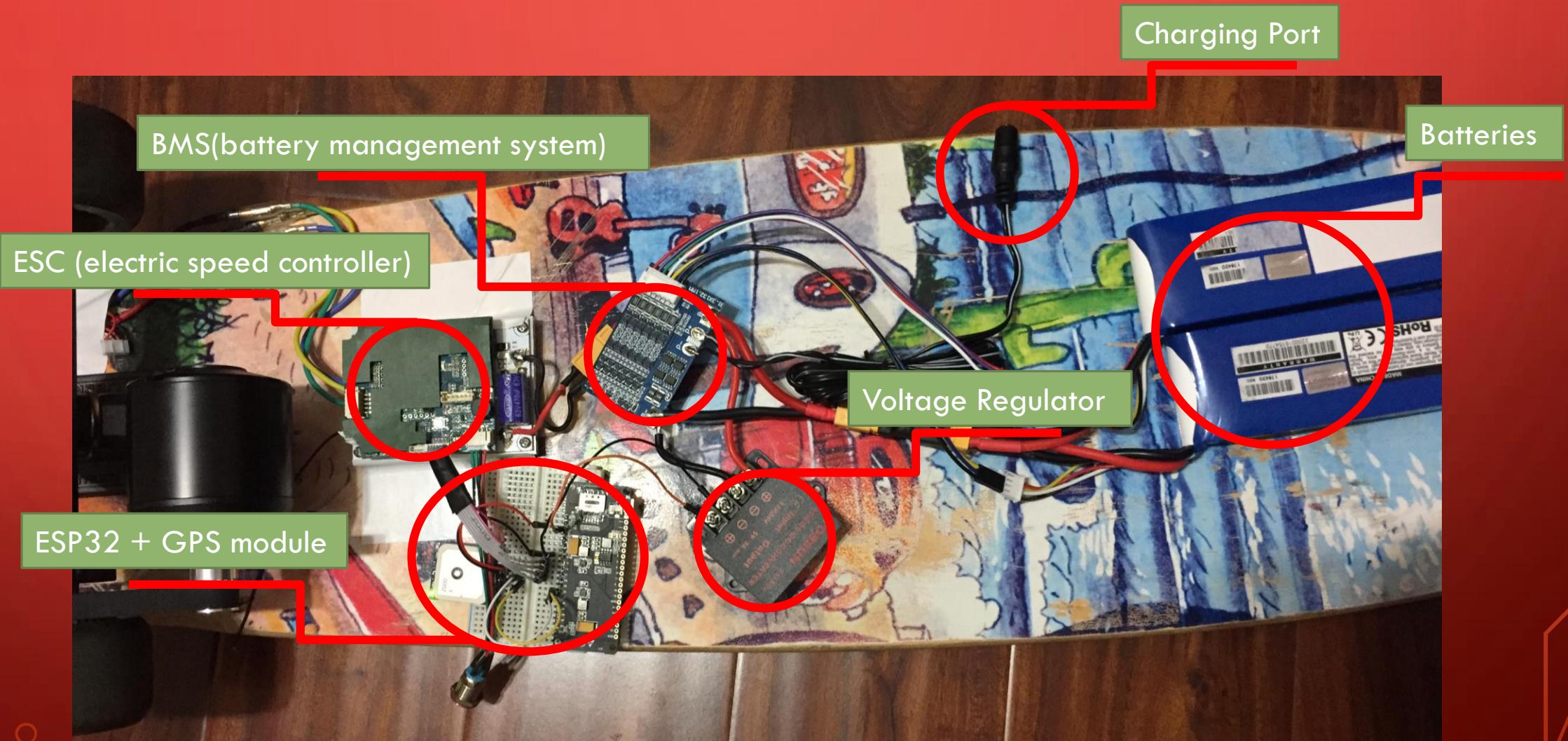
VEHICLE (COMMUNICATION)



VEHICLE (HARDWARE DESIGN)



VEHICLE (HARDWARE)



VEHICLE (SOFTWARE)

```
while(mySerial.available() > 0){  
    gps.encode(mySerial.read());  
}
```

```
if(gps.location.isUpdated()){  
    lati = gps.location.lat();  
    lngi = gps.location.lng();  
}  
  
if(gps.time.isUpdated()){
```

```
    hr = (gps.time.hour()); // Hour (0-23) (u8)  
    mn = (gps.time.minute()); // Minute (0-59) (u8)  
    hr = hr + 4;  
    hr = hr % 12;  
    if (hr < 10){  
        h = "0" + String(hr);  
    }else{  
        h = String(hr);  
    }  
    if (mn < 10){  
        m = "0" + String(mn);  
    }else{  
        m = String(mn);  
    }
```

```
if(gps.speed.isUpdated()){  
    spd = gps.speed.mph();  
    sp = String(spd);  
}
```

```
#include "BLEDevice.h"  
#include "TinyGPS++.h"
```

```
// Service und Characteristic des HM-10 Moduls  
static BLEUUID serviceUUID("0000FFE0-0000-1000-8000-00805F9B34FB");  
static BLEUUID charUUID("0000FFE1-0000-1000-8000-00805F9B34FB");
```

```
if (connected){  
    String cmp = "s00b00r00t0000\n";  
    String HUD_data = "";  
    String s = "s" + sp;  
    String b = "b60";  
    String r = "r23";  
    String tim = "t" + h + m + "\n";  
    HUD_data = s + b + r + tim;  
  
    if (millis() - count > 820){  
        pRemoteCharacteristic->writeValue(HUD_data.c_str(), HUD_data.length());  
        Serial.print("sent: ");  
        Serial.print(HUD_data);  
        count = millis();  
    }  
    digitalWrite(23,HIGH);  
    digitalWrite(22,LOW);  
}
```

VEHICLE (SOFTWARE)

```
#include <TinyGsmClient.h>
```

```
//-------------------------------------------------------------------------------------------------
SerialMon.print("Waiting for network...");
if (!modem.waitForNetwork(240000L)) {
    SerialMon.println(" fail");
    return;
}
SerialMon.println(" OK");

if (modem.isNetworkConnected()) {
    SerialMon.println("Network connected");
}

SerialMon.print(F("Connecting to APN: "));
SerialMon.print(apn);
if (!modem.gprsConnect(apn, gprsUser, gprsPass)) {
    SerialMon.println(" fail");
    return;
}
SerialMon.println(" OK");

SerialMon.print("Connecting to ");
SerialMon.print(server);
if (!client.connect(server, port)) {
    SerialMon.println(" fail");
    return;
}
SerialMon.println(" OK");

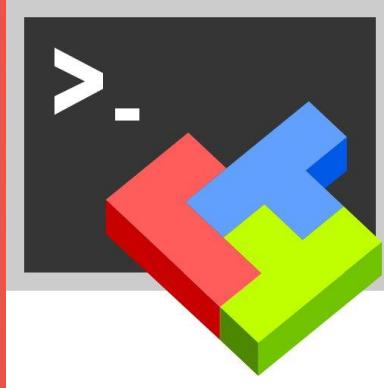
// Make a HTTP GET request:
SerialMon.println("Performing HTTP GET request...");
```

Demo Rig #1



TESTING





SERVER & WEB APPLICATION



```
16:55:58.468 -> Initializing modem...
16:56:06.396 -> Modem: SIM800 R14.18
16:56:06.396 -> Waiting for network... OK
16:56:12.558 -> Network connected
16:56:12.558 -> Connecting to APN: hologram OK
16:56:19.930 -> Connecting to 167.99.109.182 OK
16:56:20.504 -> Performing HTTP GET request...
16:57:48.146 -> -----
16:57:48.146 -> Speed = 4
16:57:48.146 -> Battery = 60
16:57:48.146 -> Latitude = 33.789227000
16:57:48.146 -> Longitude = -118.163274333
16:57:48.146 -> {'unitID':'50','batt':'60','lat':'33.789227000','long':'-118.163274333','spd':'4'}
16:57:58.185 ->
16:57:59.164 -> -----
16:57:59.164 -> Speed = 1
16:57:59.164 -> Battery = 60
16:57:59.164 -> Latitude = 33.789249333
16:57:59.164 -> Longitude = -118.163311333
16:57:59.164 -> {'unitID':'50','batt':'60','lat':'33.789249333','long':'-118.163311333','spd':'1'}
16:58:09.178 ->
16:58:10.159 -> -----
16:58:10.159 -> Speed = 3
16:58:10.159 -> Battery = 60
16:58:10.159 -> Latitude = 33.789215333
16:58:10.159 -> Longitude = -118.163472000
16:58:10.159 -> {'unitID':'50','batt':'60','lat':'33.789215333','long':'-118.163472000','spd':'3'}
16:58:20.169 ->
16:58:21.141 -> -----
16:58:21.141 -> Speed = 0
16:58:21.141 -> Battery = 60
16:58:21.141 -> Latitude = 33.789204500
16:58:21.141 -> Longitude = -118.163424667
16:58:21.141 -> {'unitID':'50','batt':'60','lat':'33.789204500','long':'-118.163424667','spd':'0'}
16:58:31.184 ->
```

- Devices
- Usage
- Billing
- Routes
- Settings

NAME
Doct (56576)TAGS
 vehicle

READY

2G

SIM NUMBER
8944500105191456576IMEI
863576043290977DEVICE ID
657700LINK ID
613202

Pause

[Status](#) [Usage](#) [Messaging](#) [Data Plan](#) [Spacebridge](#) [Webhooks](#) [Routes](#)

Overview

**CARRIER**

T-Mobile USA, Inc

APN

hologram

LAST CONNECTED

a few seconds ago

USAGE THIS PERIOD

152.04 KB

SESSION START

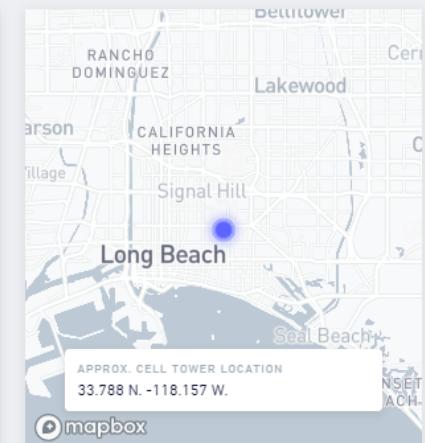
March 20, 2020 06:41:08 PM PDT

BYTES THIS SESSION

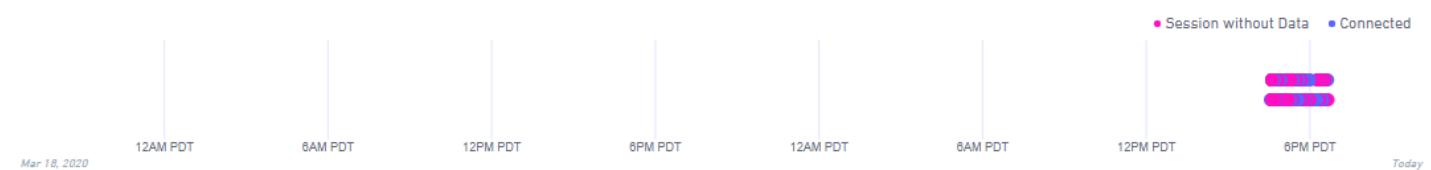
6.08 KB

SESSION END

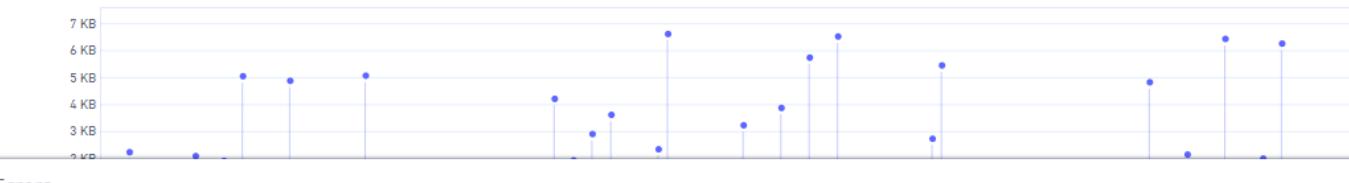
March 20, 2020 06:44:46 PM PDT



Network Connections in the Last 48 Hours



Recent Data Sessions



```
18  const server = new Net.Server();
19
20  server.listen(port, function() {
21    console.log(`Server listening for connection requests on socket localhost:${port}`);
22  });
23
24  server.on('connection', function(socket) {
25    console.log('A new connection has been established.');
26
27
28    socket.on('data', function(chunk) {
29      //if(!chunk.toString().length < 3) return
30      console.log(`Data received from client: ${chunk.toString()}`);
31      if(chunk.toString().includes('unitID')){
32        recentJson = chunk.toString()
33      }
34    });
35
36    socket.on('end', function() {
37      console.log('Closing connection with the client');
38    });
39
40    socket.on('error', function(err) {
41      console.log(`Error: ${err}`);
42    });
43  });
44
```

167.99.109.182

Terminal Sessions View X server Tools Games Settings Macros Help

Session Servers Tools Games Sessions View Split MultiExec Tunneling Packages Settings Help

X server Exit

Quick connect...

3. 167.99.109.182

```
root@ubuntu-s-1vcpu-1gb-sfo2-01:~/myproject# nc -l -v -p 8081
Listening on [0.0.0.0] (family 0, port 8081)
Connection from 139.166.35.5.jtgglobal.com 33468 received!
{'unitID': '24', 'batt': '60', 'lat': '33.790708167', 'long': '-118.159945667', 'spd': '2'}
{'unitID': '24', 'batt': '60', 'lat': '33.790300167', 'long': '-118.160943000', 'spd': '1'}
{'unitID': '24', 'batt': '60', 'lat': '33.789910000', 'long': '-118.161756500', 'spd': '1'}
{'unitID': '24', 'batt': '60', 'lat': '33.789642000', 'long': '-118.162321167', 'spd': '1'}
{'unitID': '24', 'batt': '60', 'lat': '33.789478500', 'long': '-118.162539167', 'spd': '1'}
{'unitID': '24', 'batt': '60', 'lat': '33.789412167', 'long': '-118.162594167', 'spd': '1'}
{'unitID': '24', 'batt': '60', 'lat': '33.789332667', 'long': '-118.162689000', 'spd': '1'}
{'unitID': '24', 'batt': '60', 'lat': '33.789247000', 'long': '-118.162811500', 'spd': '1'}
{'unitID': '24', 'batt': '60', 'lat': '33.789214667', 'long': '-118.162761500', 'spd': '1'}
{'unitID': '24', 'batt': '60', 'lat': '33.789146000', 'long': '-118.162913167', 'spd': '1'}
{'unitID': '24', 'batt': '60', 'lat': '33.789110833', 'long': '-118.163138500', 'spd': '1'}
{'unitID': '24', 'batt': '60', 'lat': '33.789071667', 'long': '-118.163295000', 'spd': '1'}
{'unitID': '24', 'batt': '60', 'lat': '33.789059000', 'long': '-118.163305500', 'spd': '0'}
{'unitID': '24', 'batt': '60', 'lat': '33.789046167', 'long': '-118.163292833', 'spd': '0'}
{'unitID': '24', 'batt': '60', 'lat': '33.789040333', 'long': '-118.163343167', 'spd': '0'}
{'unitID': '24', 'batt': '60', 'lat': '33.789028167', 'long': '-118.163388500', 'spd': '0'}
{'unitID': '24', 'batt': '60', 'lat': '33.789017833', 'long': '-118.163407667', 'spd': '0'}
{'unitID': '24', 'batt': '60', 'lat': '33.789004000', 'long': '-118.163429667', 'spd': '0'}
{'unitID': '24', 'batt': '60', 'lat': '33.788991000', 'long': '-118.163466000', 'spd': '0'}
{'unitID': '24', 'batt': '60', 'lat': '33.788990667', 'long': '-118.163488000', 'spd': '1'}
```

Remote monitoring

Follow terminal folder

ubuntu-s-1vcpu-1gb-sfo2-01 21% 0.25 GB / 0.96 GB 0.02 Mb/s 0.02 Mb/s 119 days root /run: 1% /: 23% /run/lock: 0% /sys/fs/cgroup: 0% /boot/efi: 4% /run/user/0: 0%

UNREGISTERED VERSION - Please support MobaXterm by subscribing to the professional edition here: <https://mobaxterm.mobatek.net>

Quick connect...

3.167.99.109.182

```
root@ubuntu-s-1vcpu-1gb-sfo2-01:~/myproject# nc -l -v -p 8081
Listening on [0.0.0.0] (family 0, port 8081)
```

```
^C
```

```
root@ubuntu-s-1vcpu-1gb-sfo2-01:~/myproject# nc -l -v -p 8081
Listening on [0.0.0.0] (family 0, port 8081)
```

```
Connection from 139.166.35.5.jtglobal.com 27088 received!
```

```
{"unitID":'58','batt':60,'lat':33.789092667,'long':-118.163260833,'spd':'0'}  
{"unitID":'58','batt':60,'lat':33.789025667,'long':-118.163261167,'spd':'0'}
```

Sessions

Tools

Macros

Sftp

Logs

/root/myproject/

Name	Size (KB)	Last
..	201	
.git	201	
config	201	
controllers	201	
models	201	
node_modules	201	
public	201	
test	201	
uploads	201	
views	201	
.dockerignore	1	201
.env.example	2	202
.eslintrc	1	201
.gitignore	1	201
.travis.yml	1	201
app.js	11	201
CHANGELOG.md	19	201
docker-compose.yml	1	201
Dockerfile	1	201
LICENSE	1	201
npm-debug.log	2	202
package-lock.json	269	201
package.json	2	201
prod-checklist.md	3	201
README.md	74	201

 Remote monitoring
RECORDED WITH SCREENCASTOMATIC

PubNub Google Maps Tutorial - Live Device Location



Home - Doc't

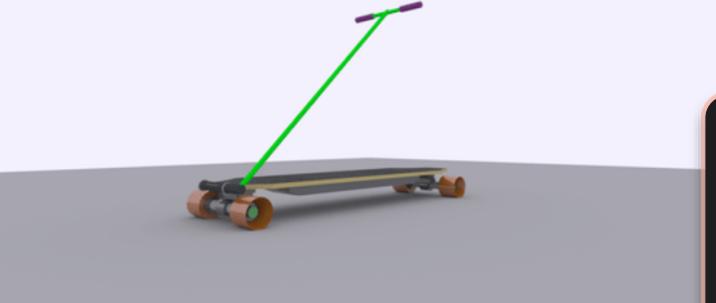
Not secure | doct.fbi.moe

Doc't HOME CONTACT STATUS LOGIN CREATE ACCOUNT

Doc't

Introducing a new generation of Electric Transportation Systems

Start your Adventure »



```
3 block content
4   h1(style="text-align:center;") Doc't
5   p(style="text-align:center;").lead Introducing a new generation of Electric Transportation Systems
6   hr
7   .row
8     h2(style="text-align:center;")
9     a.btn.btn-raised(href='http://doct.fbi.moe/bookRide', role='button') Start your Adventure »
10    p
11    p(style="text-align:center;")
12      |
13    p
14  
```

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FRONTEND (SOFTWARE)

Create Account - Doc't

Not secure | doct.fbi.moe/signup

Doc't HOME CONTACT STATUS LOGIN CREATE ACCOUNT

Sign up

Email

Password

Confirm Password

 Signup

© 2020 D

```
3  block content
4    .pb-2.mt-2.mb-4.border-bottom
5    h3 Sign up
6    form(id='signup-form', method='POST')
7      input(type='hidden', name='_csrf', value=_csrf)
8      .form-group.row
9        label.col-md-3.col-form-label.font-weight-bold.text-right(for='email') Email
10       .col-md-7
11         input.form-control(type='email', name='email', id='email', placeholder='Email', autofocus, autocomplete='email', required)
12      .form-group.row
13        label.col-md-3.col-form-label.font-weight-bold.text-right(for='password') Password
14       .col-md-7
15         input.form-control(type='password', name='password', id='password', placeholder='Password', autocomplete='new-password', minlength='8', required)
16      .form-group.row
17        label.col-md-3.col-form-label.font-weight-bold.text-right(for='confirmPassword') Confirm Password
18       .col-md-7
19         input.form-control(type='password', name='confirmPassword', id='confirmPassword', placeholder='Confirm Password', autocomplete='new-password', minl
20      .form-group.offset-sm-3.col-md-7.pl-2
21        button.btn.btn-success(type='submit')
22          i.fas.fa-user-plus.fa-sm
23          | Signup
24
```

Login - Doc't

Not secure | doc.tfbimoe/login

Doc't HOME CONTACT STATUS

LOGIN CREATE ACCOUNT

Sign in

Email

Password

[Login](#) [Forgot your password?](#)

[Sign in with Facebook](#)

[Sign in with Google](#)

[Sign in with Instagram](#)

```
block content
1
2
3
4
5
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13
14
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16
17
18
19
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21
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23
24
25
26
27
28
29
30
31
32
33
34
35
```

.pb-2.mt-2.mb-4.border-bottom

h3 Sign in

form(method='POST')

input(type='hidden', name='_csrf', value=_csrf)

.form-group.row

label.col-md-3.col-form-label.font-weight-bold.text-right(for='email') Email

.col-md-7

input.form-control(type='email', name='email', id='email', placeholder='Email', autofocus, autocomplete='email', required)

.form-group.row

label.col-md-3.col-form-label.font-weight-bold.text-right(for='password') Password

.col-md-7

input.form-control(type='password', name='password', id='password', placeholder='Password', autocomplete='current-password', required)

.form-group

.offset-md-3.col-md-7.pl-2

button.col-md-3.btn.btn-primary(type='submit')

i.far.fa-user.fa-sm

| Login

a.btn.btn-link(href='/forgot') Forgot your password?

.form-group

.offset-md-3.col-md-7.pl-2

hr

.form-group

.offset-md-3.col-md-7.pl-2

a.btn.btn-block.btn-facebook.btn-social(href='/auth/facebook')

i.fab.fa-facebook-f.fa-sm

| Sign in with Facebook

a.btn.btn-block.btn-google.btn-social(href='/auth/google')

i.fab.fa-google-plus-g.fa-xs

| Sign in with Google

a.btn.btn-block.btn-instagram.btn-social(href='/auth/instagram')

i.fab.fa-instagram.fa-sm

| Sign in with Instagram

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Account Management - Doc't x +

Not secure | doc.t.fbi.moe/account

Doc't HOME CONTACT STATUS

JUSTIN_MAEDE@HOTMAIL.COM

Profile Information

Email Unverified: [Send verification email](#)

Name

Gender Male Female Other

Location

Website

Gravatar 

[Update Profile](#)

Change Password

New Password

Confirm Password

[Change Password](#)

Delete Account

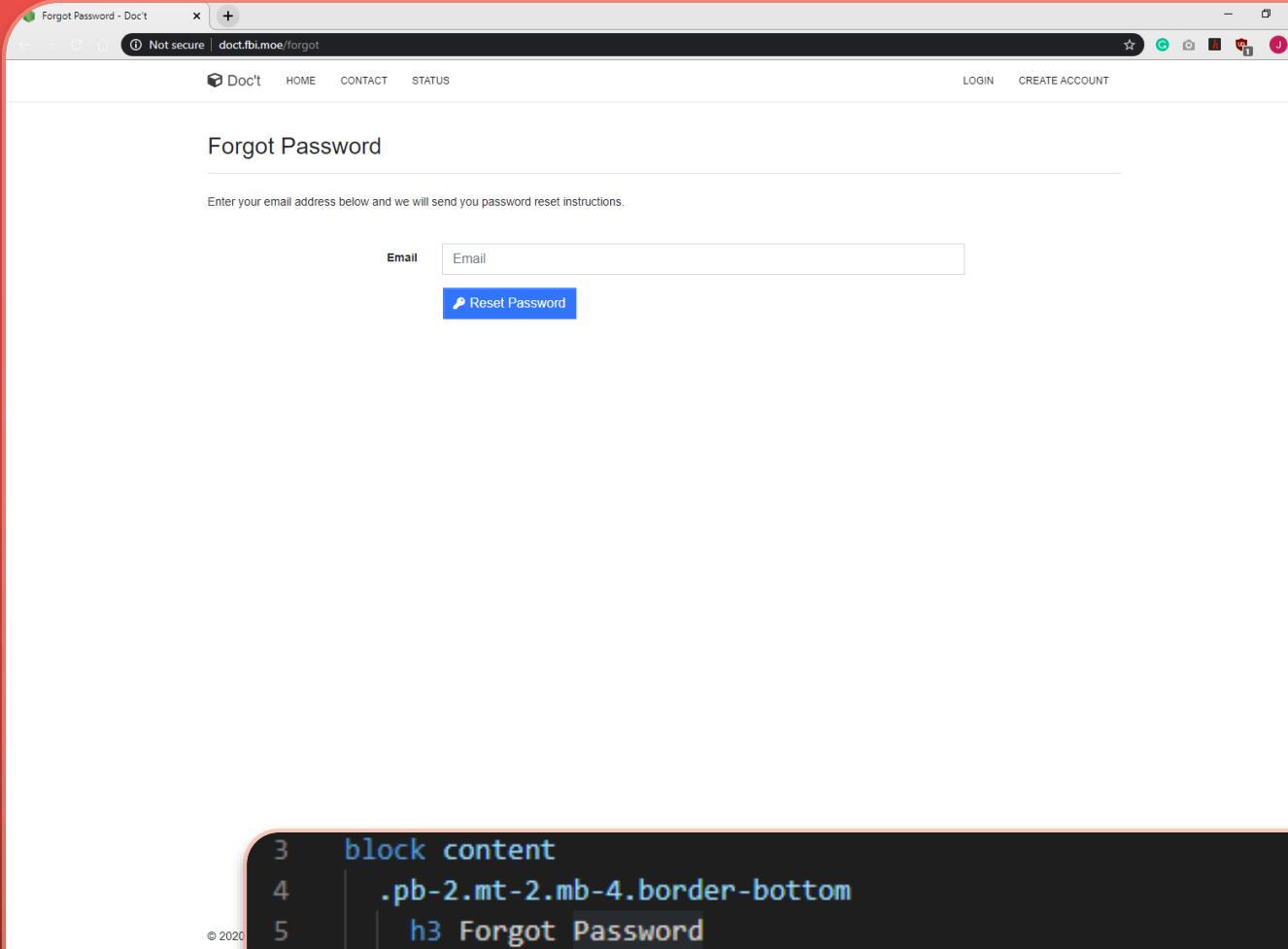
You can delete your account, but keep

[Delete my account](#)

Linked Accounts

[Link your Instagram account](#)

```
3  block content
4  .pb-2.mt-2.mb-4.border-bottom
5  | h3 Profile Information
6
7  form(action='/account/profile', method='POST')
8  input(type='hidden', name='_csrf', value=_csrf)
9  .form-group.row
10 | label.col-md-3.col-form-label.font-weight-bold.text-right(for='email') Email
11 | .col-md-7
12 |   input.form-control(type='email', name='email', id='email', value=user.email, autocomplete='email', required)
13 |   .offset-sm-3.col-md-7.pl-3
14 |   if user.emailVerified
15 |     .text-success.font-italic
16 |     | Verified
17 |   else
18 |     .text-danger.font-italic
19 |     | Unverified: &nbsp;
20 |     | Send verification email
21 | .form-group.row
22 | label.col-md-3.col-form-label.font-weight-bold.text-right(for='name') Name
23 | .col-md-7
24 |   input.form-control(type='text', name='name', id='name', value=user.profile.name, autocomplete='name')
```



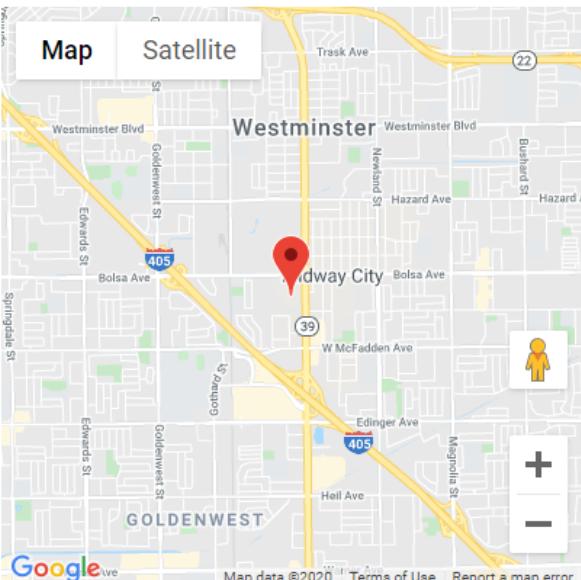
```
3  block content
4    .pb-2.mt-2.mb-4.border-bottom
5      h3 Forgot Password
6      form(method='POST')
7        input(type='hidden', name='_csrf', value=_csrf)
8        p.pb-4 Enter your email address below and we will send you password reset instructions.
9        .form-group.row
10       label.col-md-3.col-form-label.font-weight-bold.text-right(for='email') Email
11       .col-md-7
12       input.form-control(type='email', name='email', id='email', placeholder='Email', autofocus, autocomplete='email', required)
13       .form-group.offset-sm-3.col-md-7.pl-2
14       button.btn.btn-primary(type='submit')
15         i.fas.fa-key.fa-sm
16         | Reset Password
```



Doc't

Introducing a new generation of Electric Transportation Systems

The nearest vehicle to your location is:



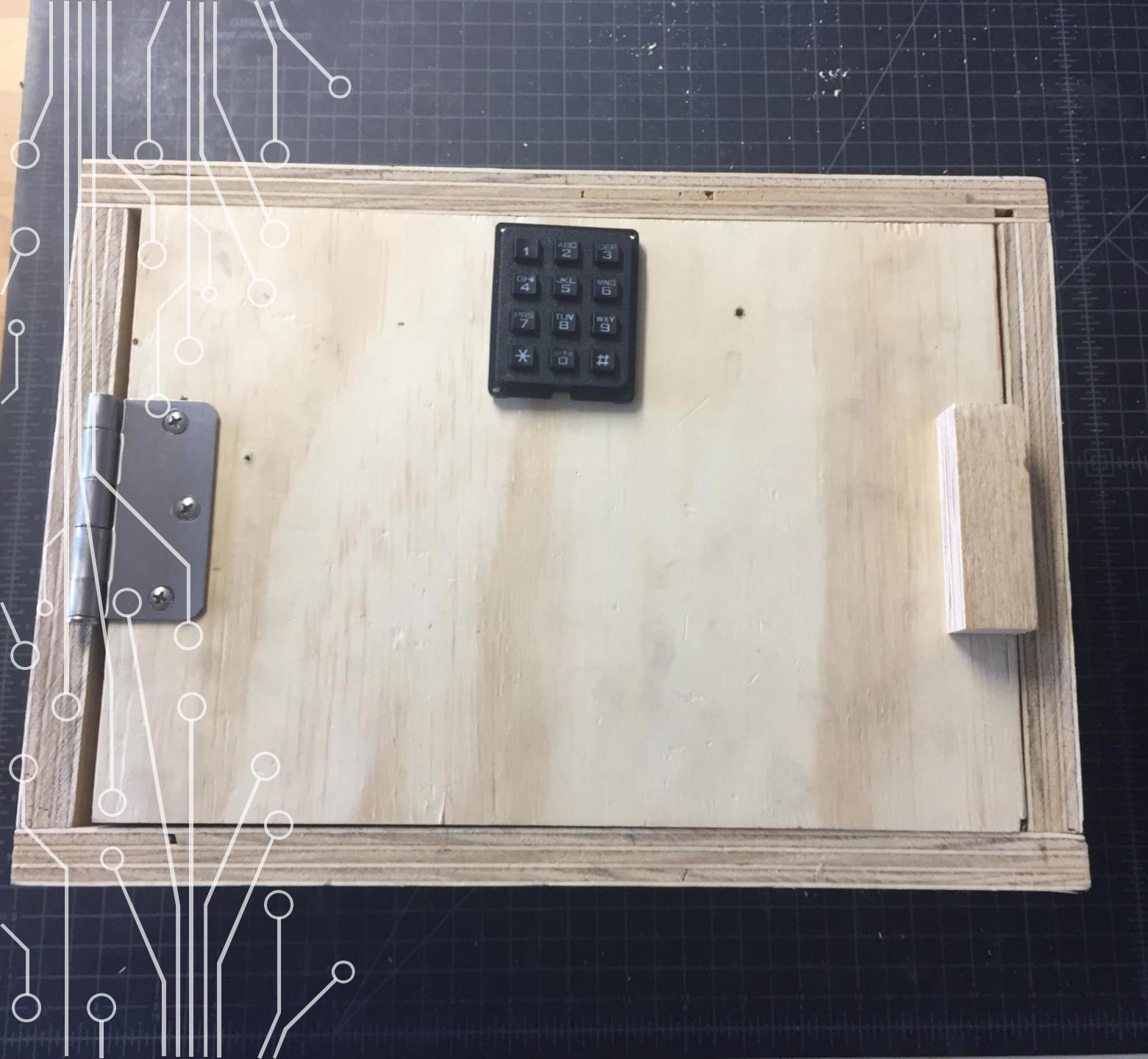
Please enter the 4 digit pin below (followed by #):

5841

```
var val = Math.floor(1000 + Math.random() * 9000);
console.log("\n4 Digit PIN:",val.toString(),"\n");
```

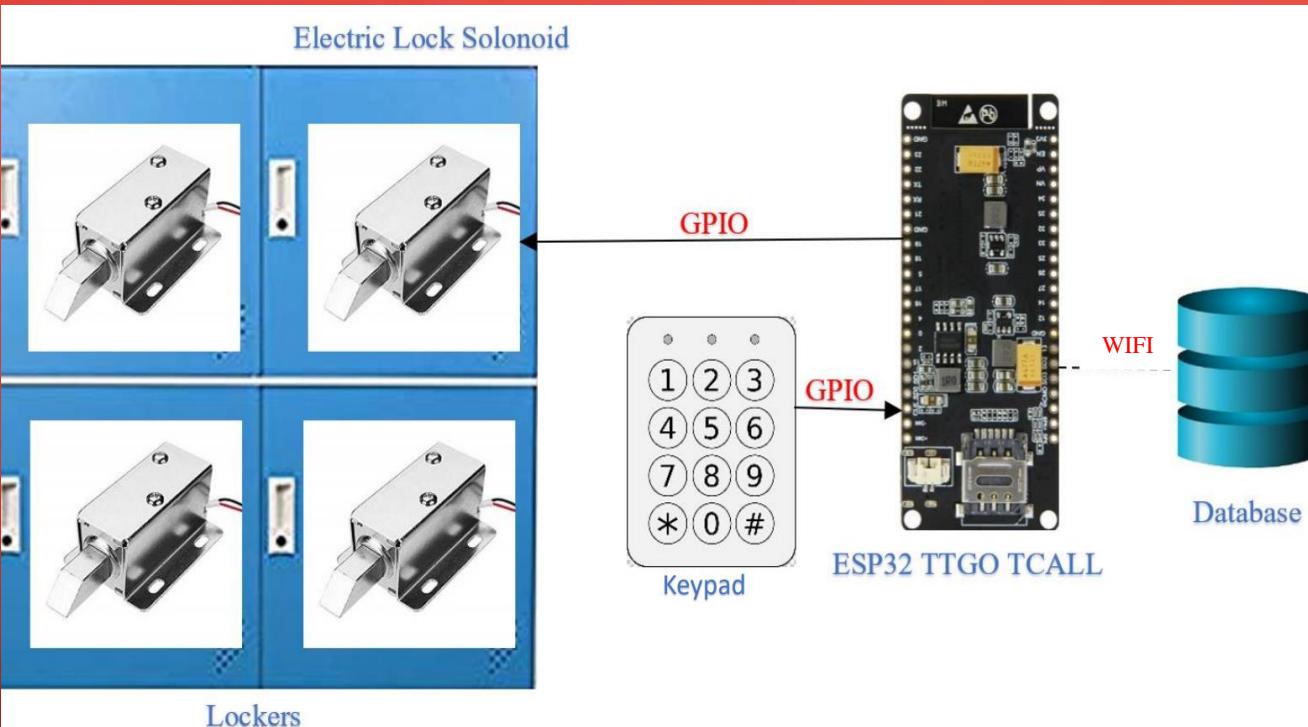
```
app.get('/locker', function(req, res) {
  res.sendFile(path.join(__dirname + '/f.html'));
});
```

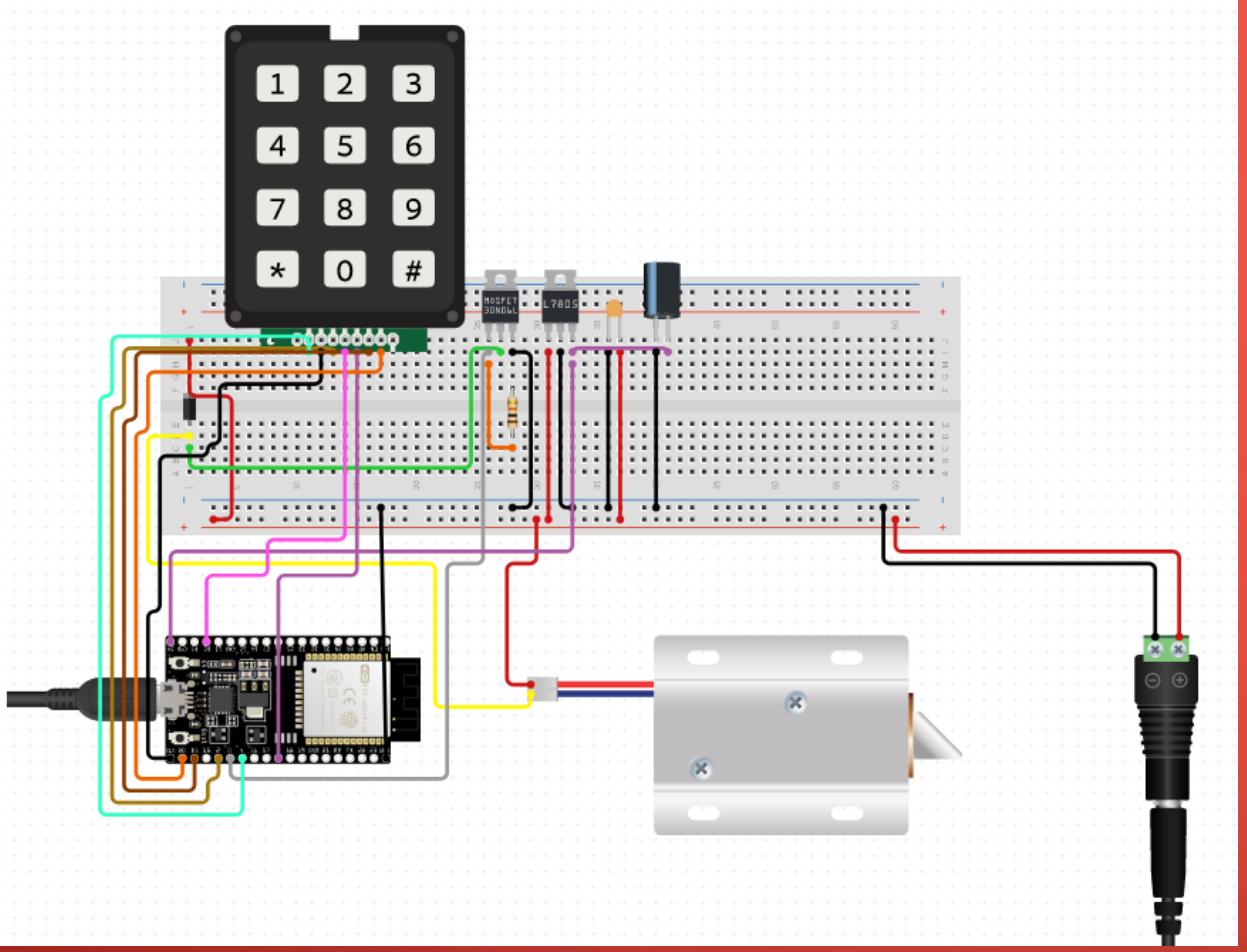
```
app.get('/pin', (req, res) => res.send(val.toString()));
app.get('/loc', function(req, res) {
  res.sendFile(path.join(__dirname + '/t.html'));
});
```

A photograph of a light-colored wooden box with a black digital keypad lock mounted on its front. A small, rectangular wooden device is docked into a slot on the right side of the box. The background is a dark grid surface.

LOCKING & DOCKING HUB

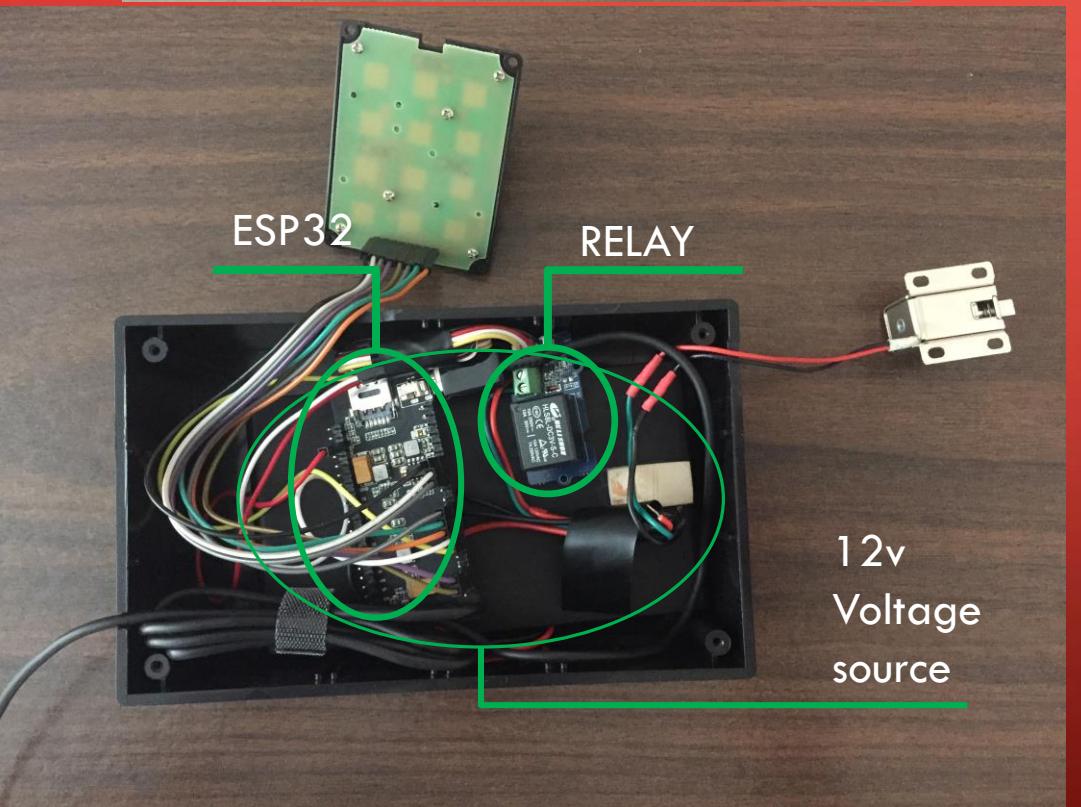
LOCKING & DOCKING HUB DATA FLOW





Original hardware design

- Keypad:
 - Connect keypad to Esp32 according to wiring diagram.
 - Connect power to keypad to 5v input.
- 5v regulator:
 - Connect 7805 voltage regulator in parallel with capacitors.
 - Wire 5v to Esp32, locking solenoid, and keypad.
- Locking solenoid:
 - Power solenoid with 5v from regulator.
 - Connect signal wire to mosfet output according to wiring diagram.
- ESP32 TTGO T-Call:
 - Connect signal wires from keypad to GPIO of ESP32.
 - One GPIO output to mosfet to control locking solenoid.



HUB(SOFTWARE)

```
#include <Keypad.h>

const String unlock_pin = "0234";

const byte rows = 4; //four rows
const byte cols = 3; //three columns
char keys[rows][cols] = {
    {'1','2','3'},
    {'4','5','6'},
    {'7','8','9'},
    {'*','0','#'}
};

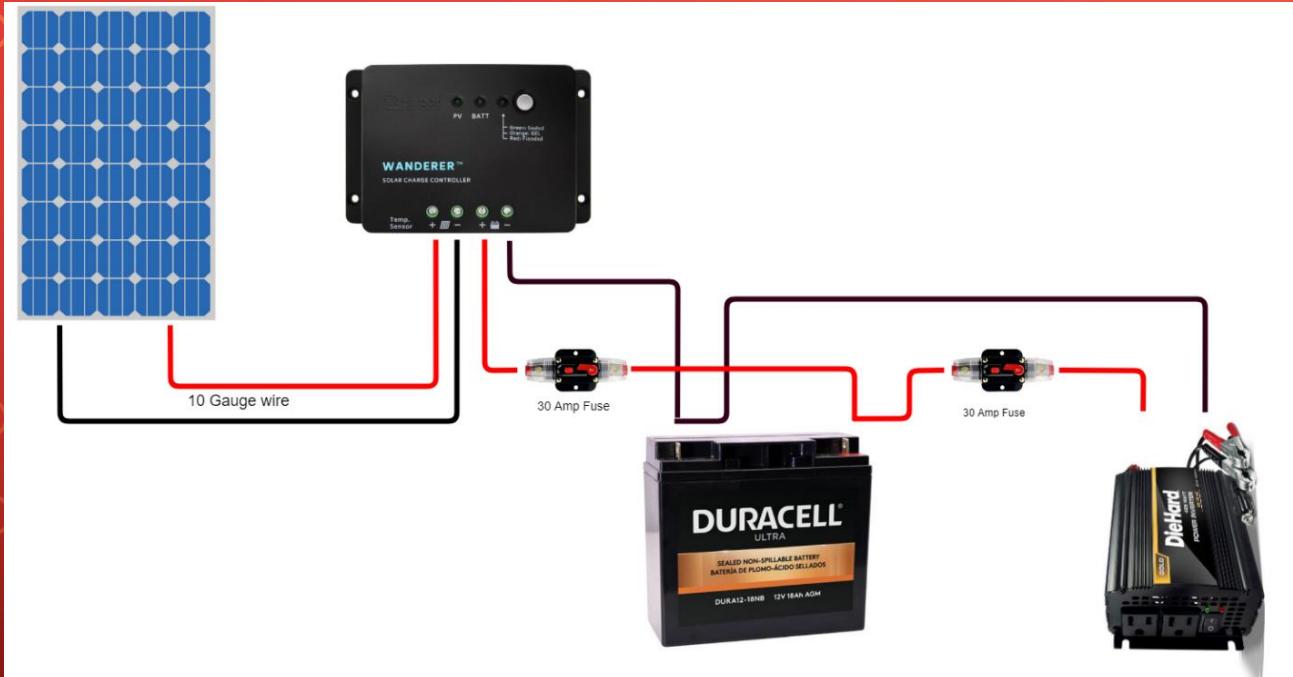
byte rowPins[rows] = {22, 23, 5, 18}; //connect to the row pinouts of the keypad
byte colPins[cols] = {2, 0, 4}; //connect to the column pinouts of the keypad

char key = keypad.getKey();
delay(10);
if(key != NO_KEY){
    pin = pin + key;
    if (key == '#'){
        pin = pin.substring(0,pin.length() - 1);
        Serial.println(pin);
        if(pin == unlock_pin){
            Serial.println("Unlock");
            digitalWrite(unlock_sig , HIGH);
            delay(3000);
            digitalWrite(unlock_sig , LOW);
        }
        pin = "";
    }
}
```

```
//-----Getting pin from server-----//
get_pin:
pinMode(unlock_sig, OUTPUT);
delay(100);
WiFiClient client;
Serial.printf("\n[Connecting to %s ... ", host);
if (client.connect(host, 3000)){
    Serial.println("[connected]");
    client.println("GET /pin HTTP/1.0\n");
    Serial.println("[Response:]");
    while (client.connected() || client.available()){
        if (client.available()){
            String line = client.readStringUntil('\n');
            if(line.length() == 4){
                Serial.println("gotthepin");
                unlock_pin = line;
                Serial.println(unlock_pin);
                goto pin_input;
            } //End if
        } // End if
    } // End while

    client.stop();
    Serial.println("\n[Disconnected]");
}
else{
    Serial.println("connection failed!");
    client.stop();
}
```

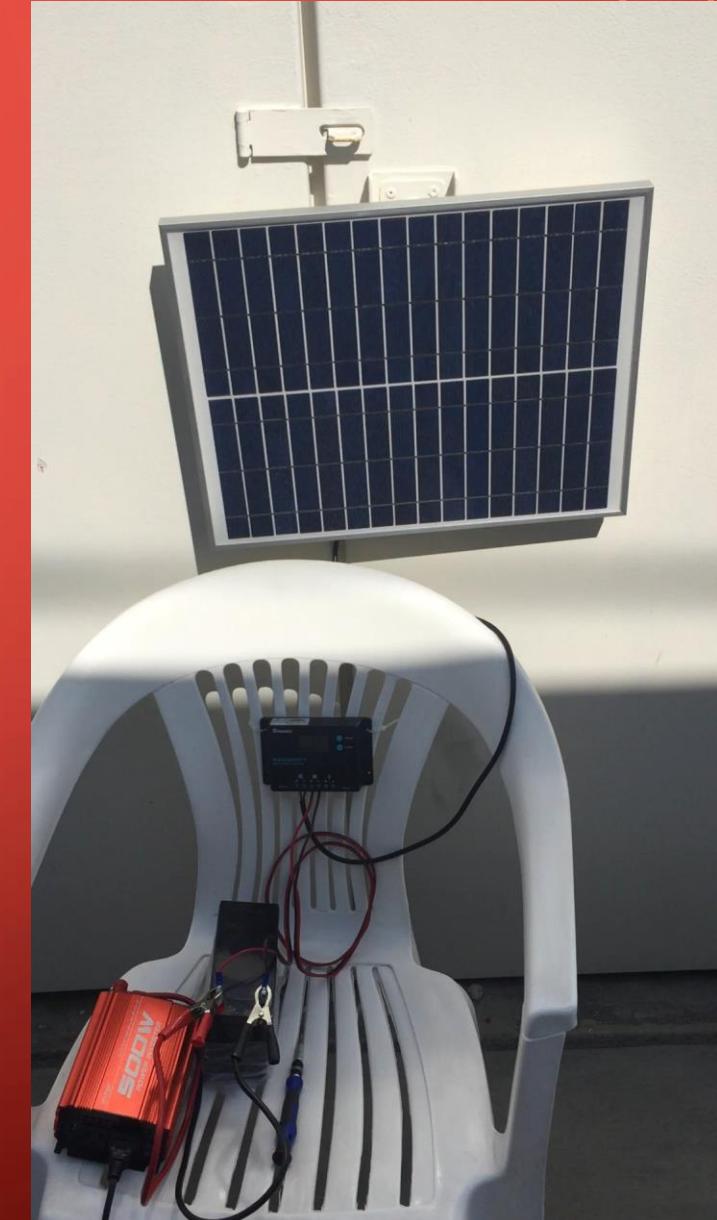
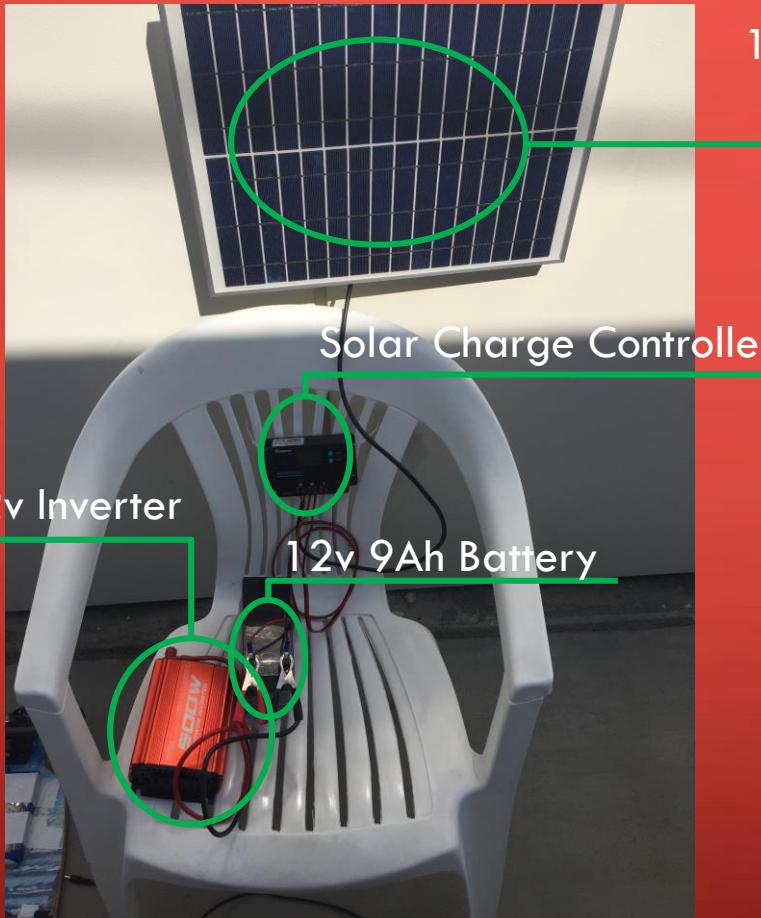
BUILDING CHARGING SYSTEM(HARDWARE)



Original hardware design

- Solar Panel:
 - Wire solar panel with 10-gauge wire.
 - Connect power wires to input of charge controller.
- Charge controller:
 - Wire charge controller with 10-gauge wire.
 - Connect +/- output of charge controller to +/- terminals of battery.
- Inverter:
 - Wire inverter with 10-gauge wire.
 - Connect inverter +/- cables to +/- terminals of battery.

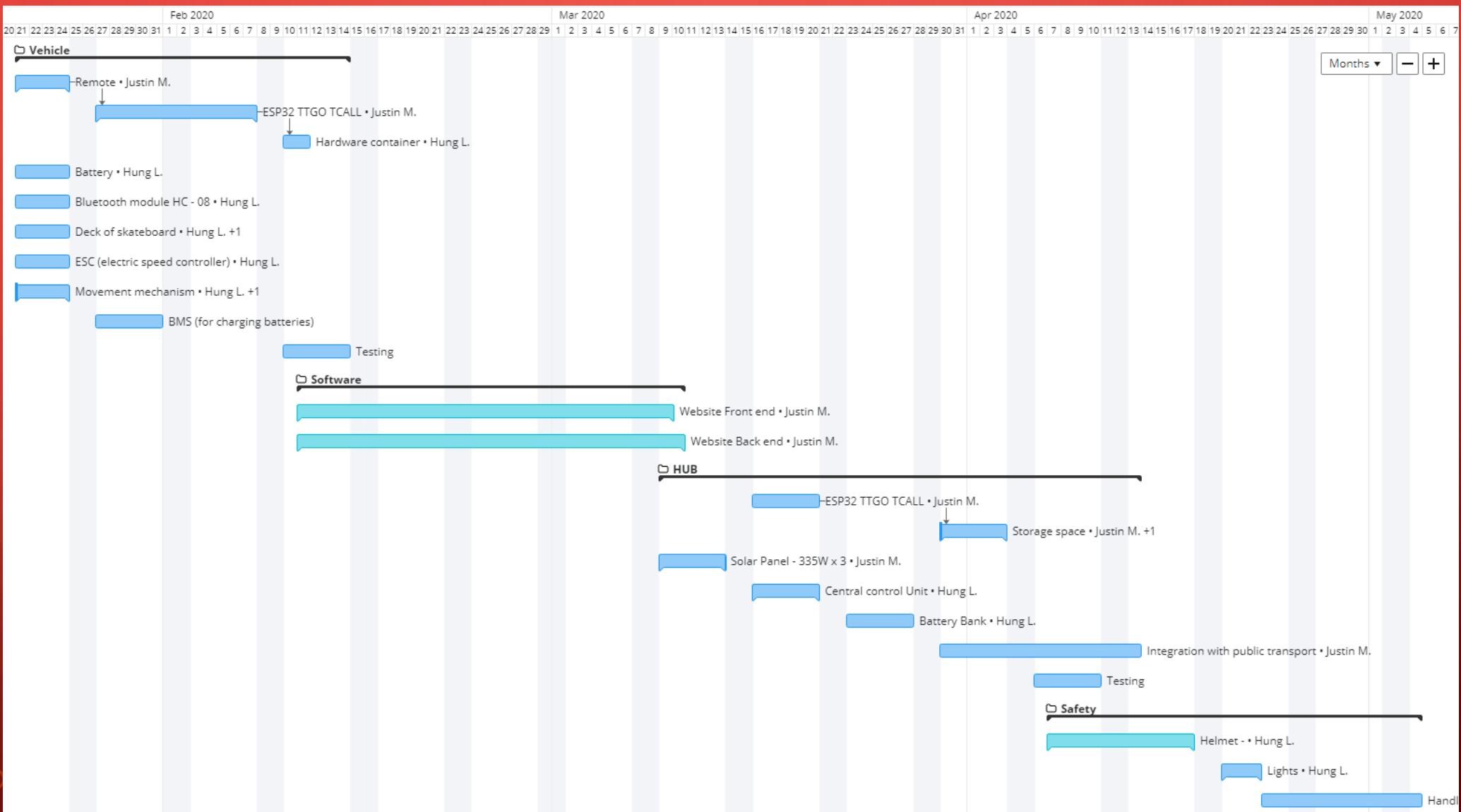
BUILDING CHARGING SYSTEM(HARDWARE)



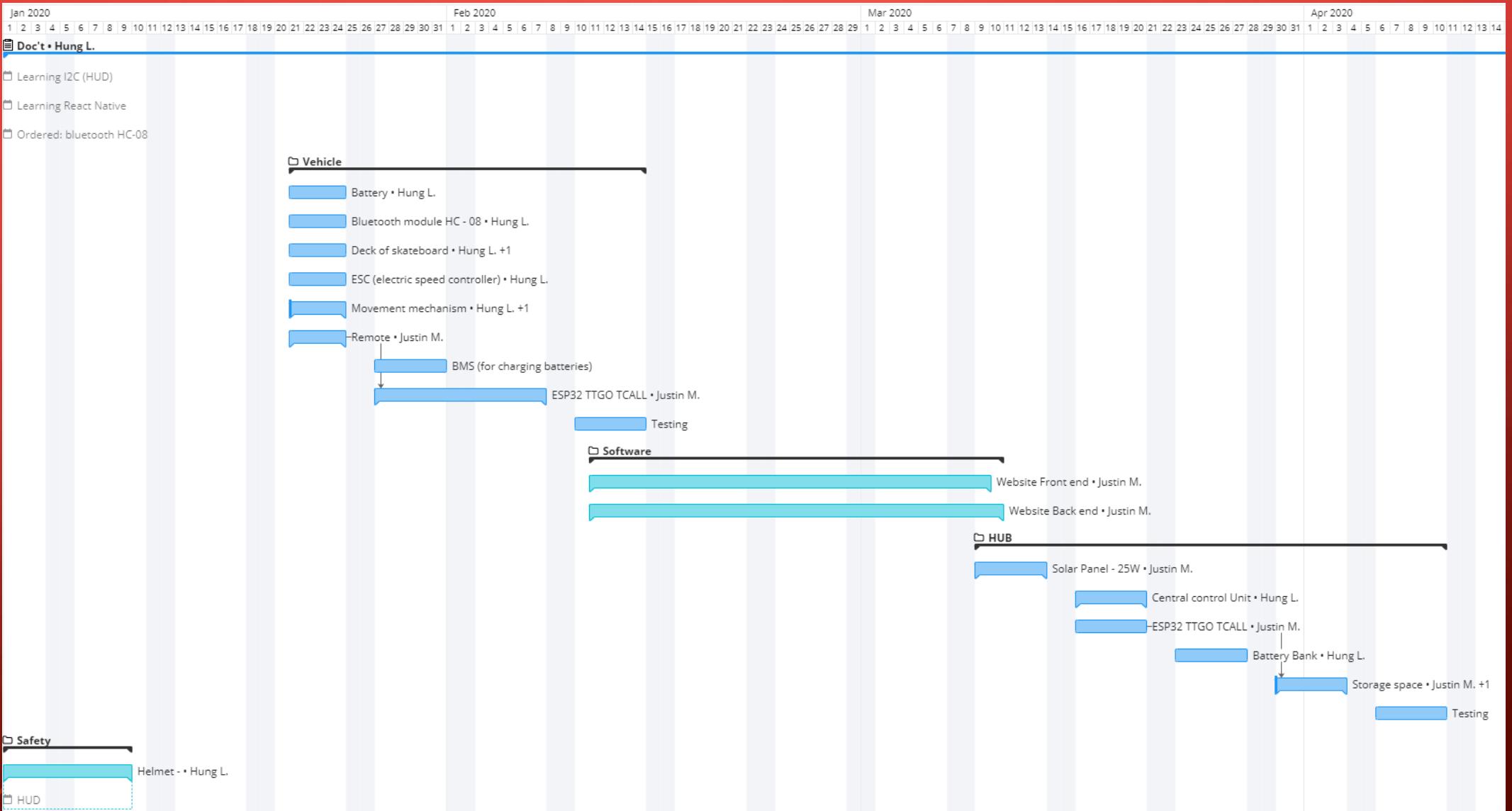
PROBLEMS WE ENCOUNTERED

- Getting reliable longitude and latitude from vehicle
- Learning database
- Secured connect between components
- Designing 3d components
- Building locker space

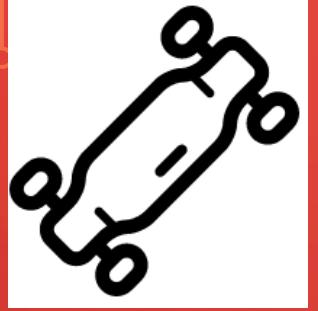
Projected Timeline



Actual Timeline



COST BREAK DOWN



TRANSPORTATION VEHICLE

Part	Parts number	Cost
Motor	C6374 – 170kV	\$54
Battery	Turnigy 3s 5000mAh	\$24 x 2
Skateboard	Gullwing longboard	FREE
ESC	ESC for 6s battery	\$52.80
Mounting hardware	Gears, belts, bracket	\$58
ESP32 Cellular	LILYGO TTGO T-Call V1.3	\$15
GPS module	REYAX RY8253F 10Hz GPS	\$14
Wiring harness		\$15
BMS	Battery managing system	\$7

\$263.80



HUB

Part	Parts number	Cost
ESP32 Cellular	LILYGO TTGO T-Call V1.3	\$15
Solar panels	SunPower P17 335W	\$105* X
Battery	Duracell Ultra 12v SLW 18AH	\$75
Charge controller	Renogy Wanderer 30 Amp 12v	\$36
Inverter	DieHard 7149656	\$56
Fuse	Anioshi 20A fuse	\$13 x 2

\$313 – 200



SAFETY

Part	Parts number	Cost
Helmet	JBM Skateboard Helmet CPSC ASTM Certified Impact Resistance Ventilation	\$25
Bluetooth Transceiver	HM-10	\$8
Yellow LED's x100	100pcs Ultra Bright 5mm LED Light Emitting Diode Diffused Yellow	\$6.52
OLED display	FR30W0040-0317	\$12 * X
Arduino Nano	A000005	\$4.67
Handlebars	3D printed	FREE
Headlight	BLITZY Cyborg 168H USB Rechargeable Headlight	\$17.37
Reflectors	Shoreline Marine Stick-On Trailer Reflector Red	\$4.14
Under glow	Ponis-Limos 100Pcs Multicolor 4pin 5mm RGB diode	\$11.99

\$86

Total: \$462.80

CONTRIBUTORS, INVESTORS, AND EXTERNAL HELP

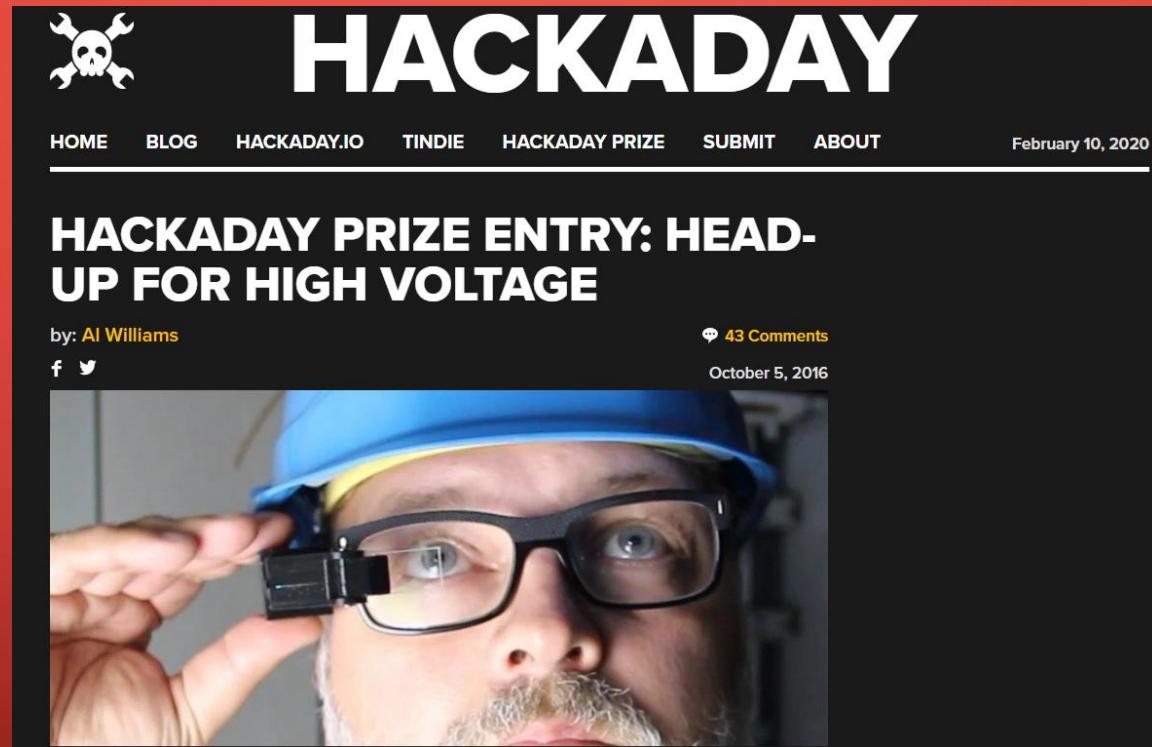
TAYLOR SMYTH AT AVALON SHEET METAL



LONG LE AT ANDESIGN LAB



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REFERENCES : VEHICLE

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<http://ardiniana.org/libraries/tinygpsplus/>
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 - <https://www.adafruit.com/product/1824>
 - <https://www.youtube.com/watch?v=cgEvCLJuBkg>

CHECK OUT OUR LIVE DEMO!

- Please pin Hung's camera on zoom



QUESTIONS?