The Smart Commons: Sensor-Based Space Assessment of Learning Environments

Jonathan Bradley

Web Learning Environments Application Developer

Patrick Tomlin

Associate Director for Learning Environments

Brian Mathews

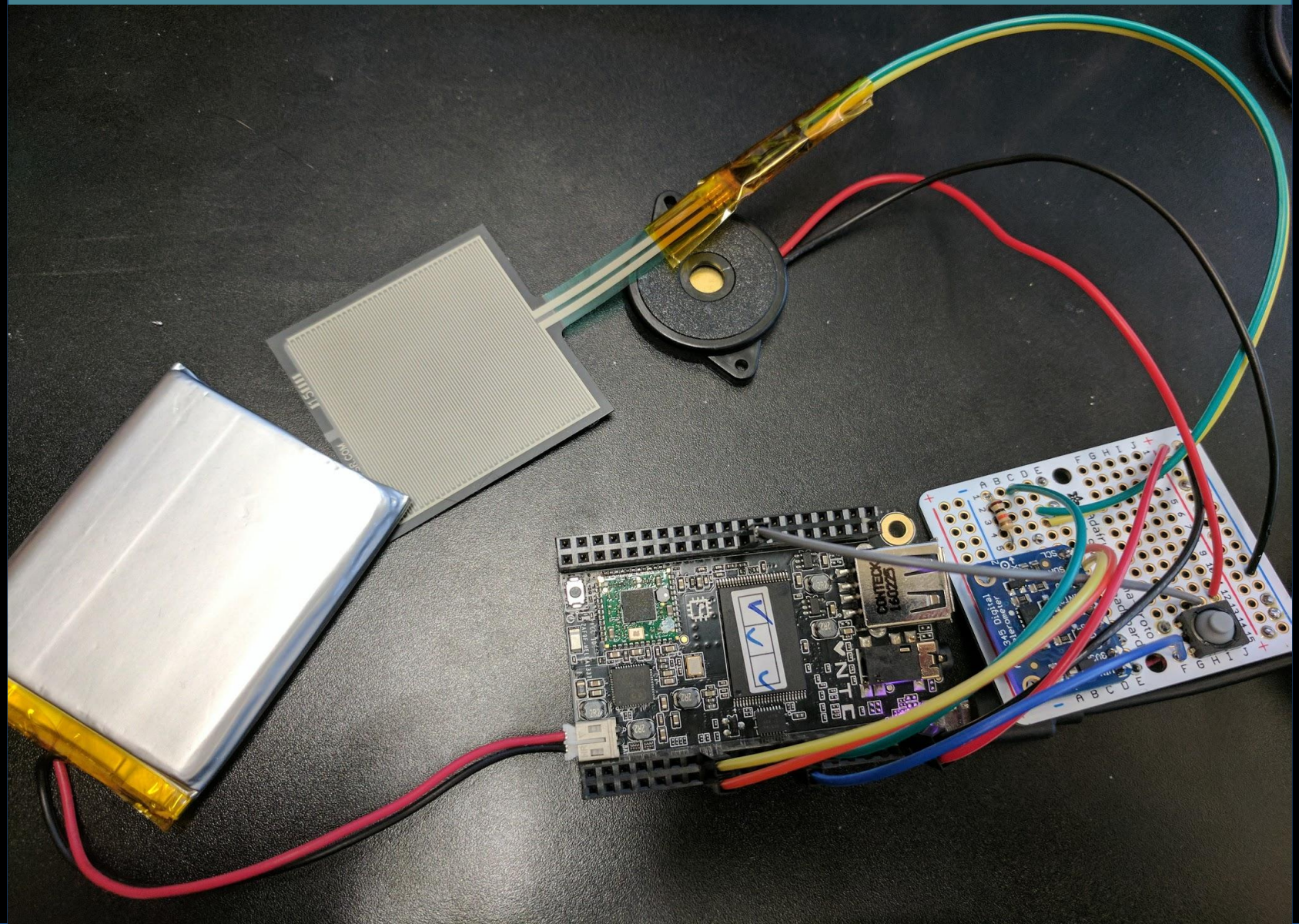
Associate Dean, Learning

Slides available at: https://goo.gl/GLA8H2

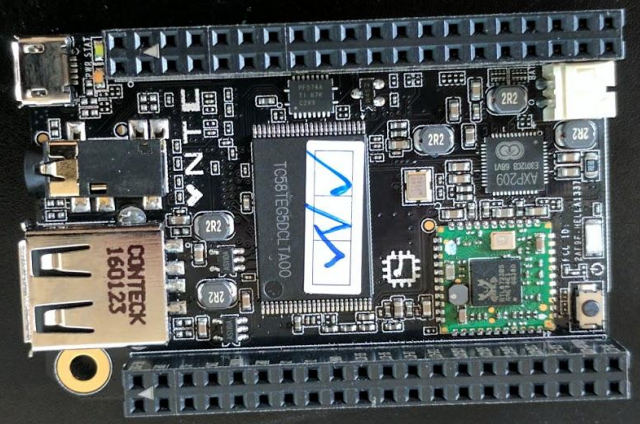
What is the Internet of Things?

What can the Internet of Things do for libraries?

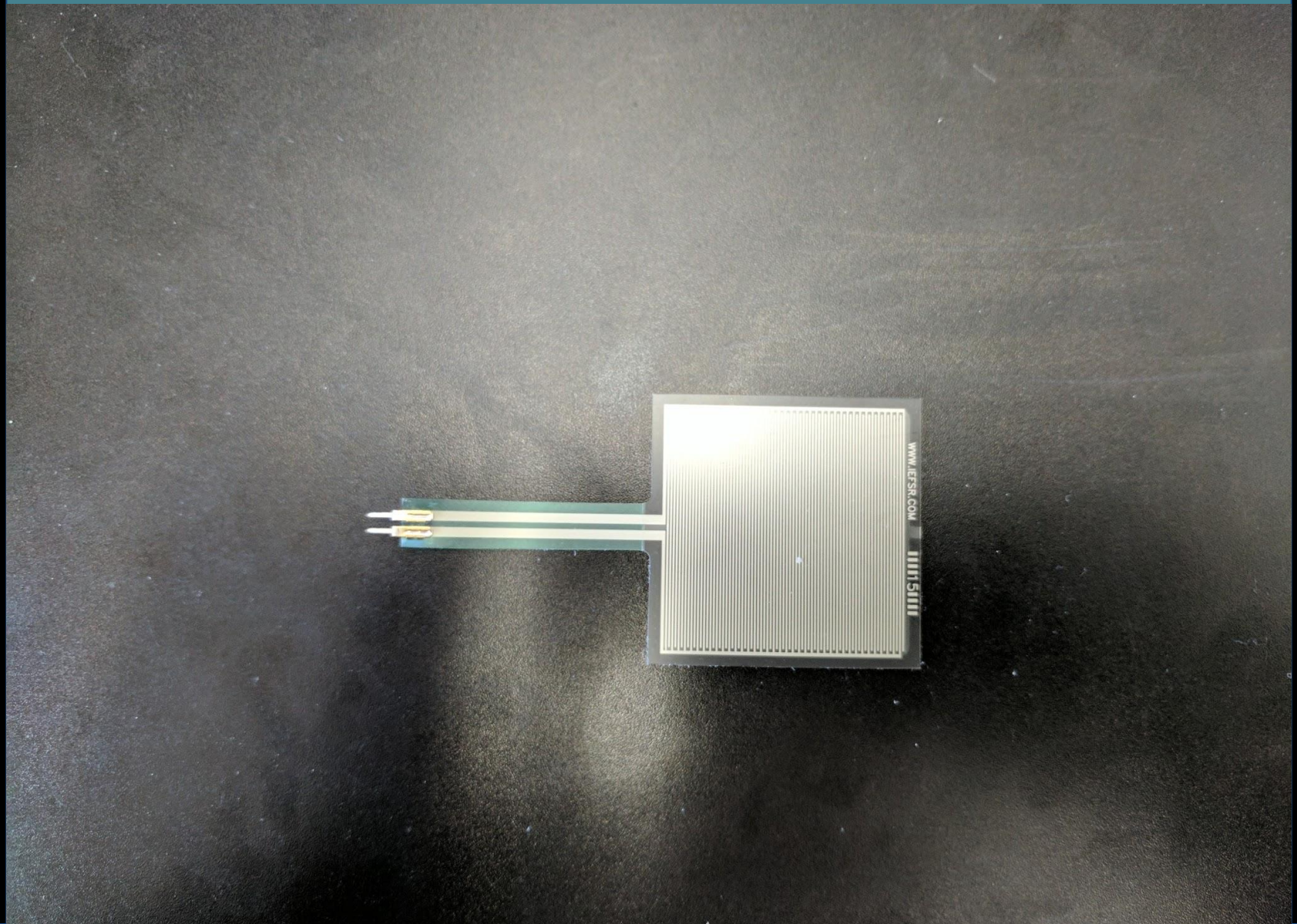
The Prototype Hardware



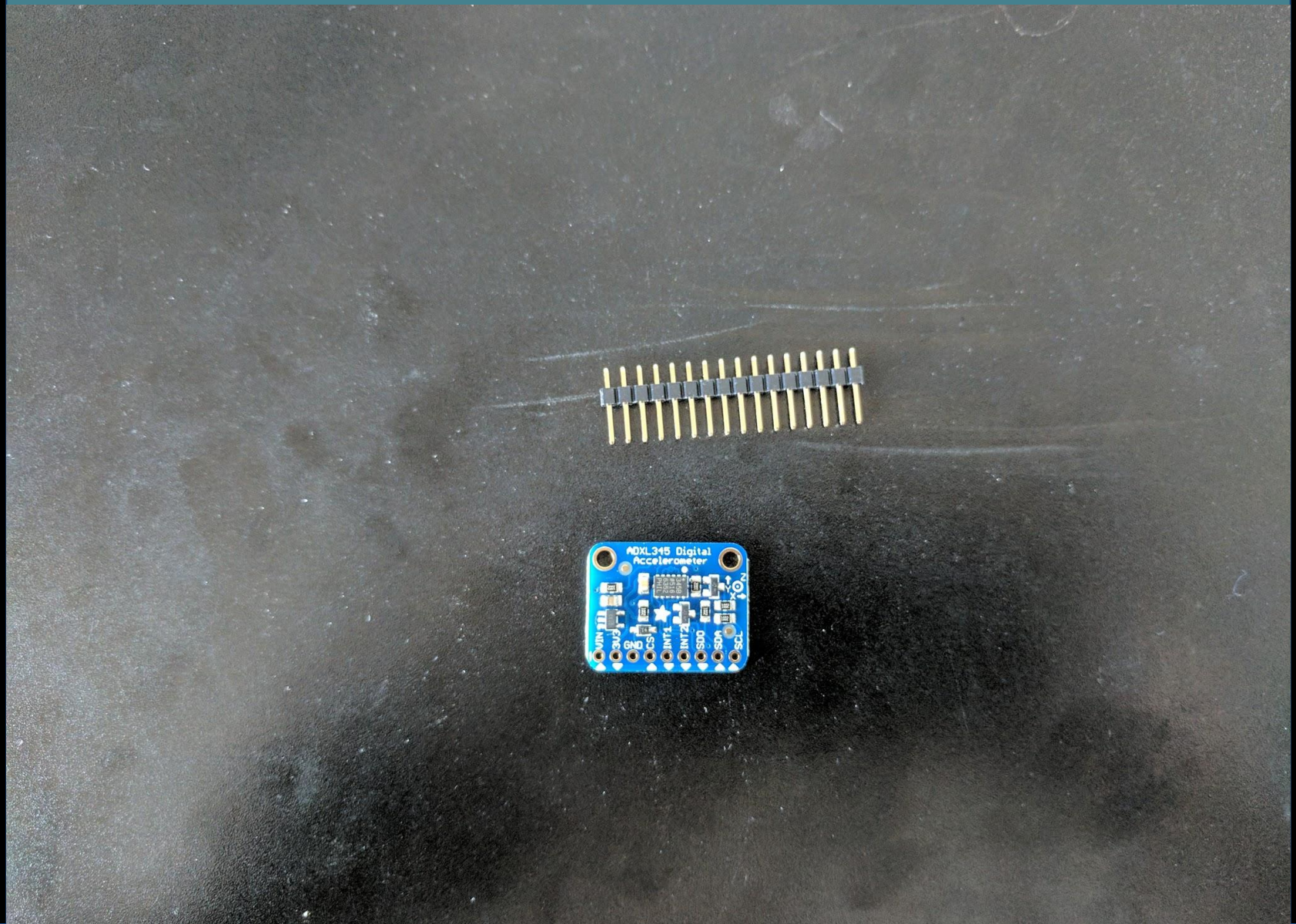
C.H.I.P. Controller



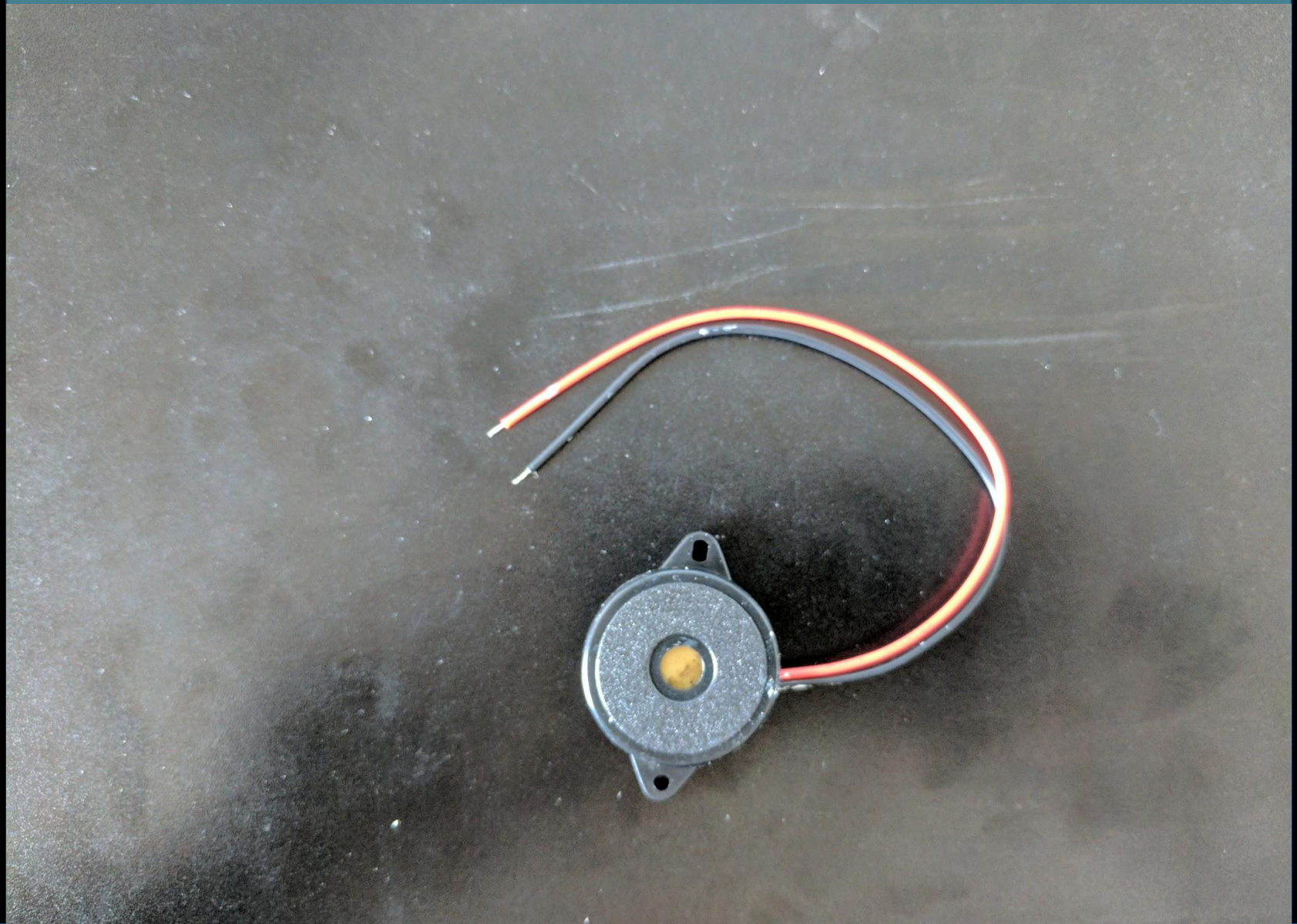
Force Sensitive Resistor



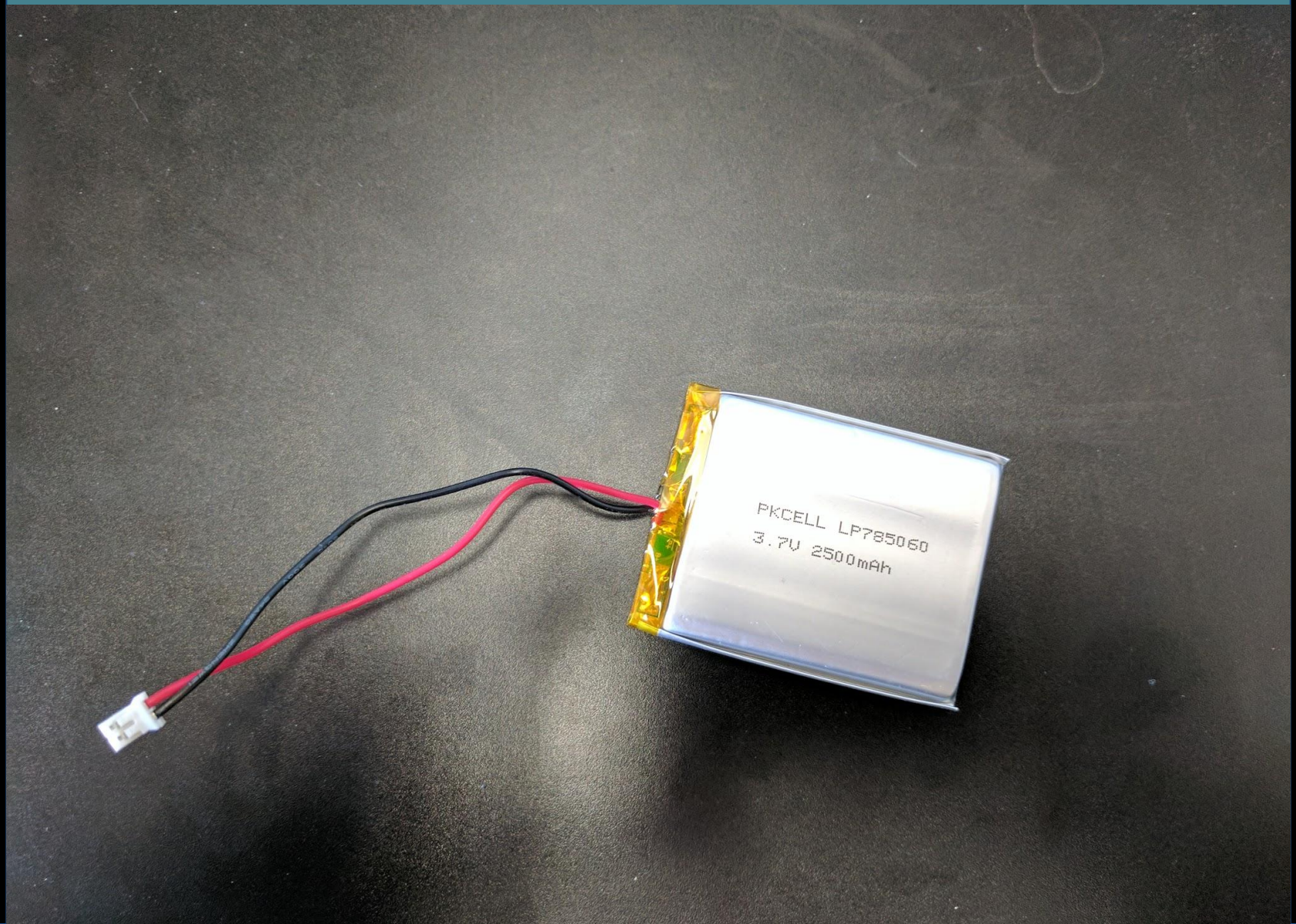
ADXL345 Accelerometer



Piezo Element

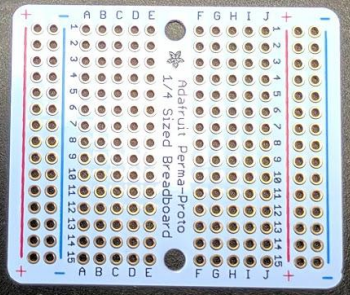


Lithium Polymer Battery

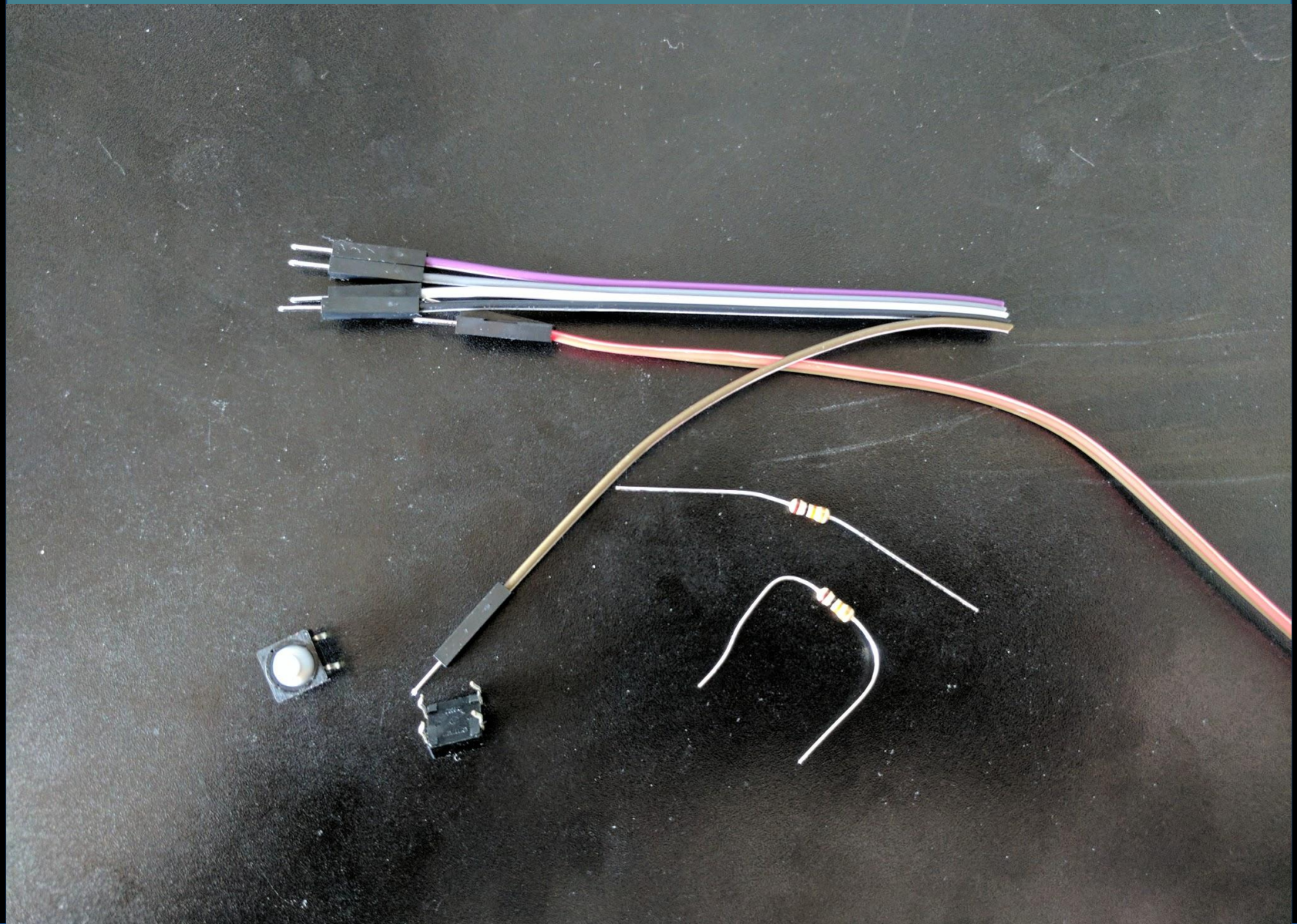


Battery Bank

Perma-proto Perf Board

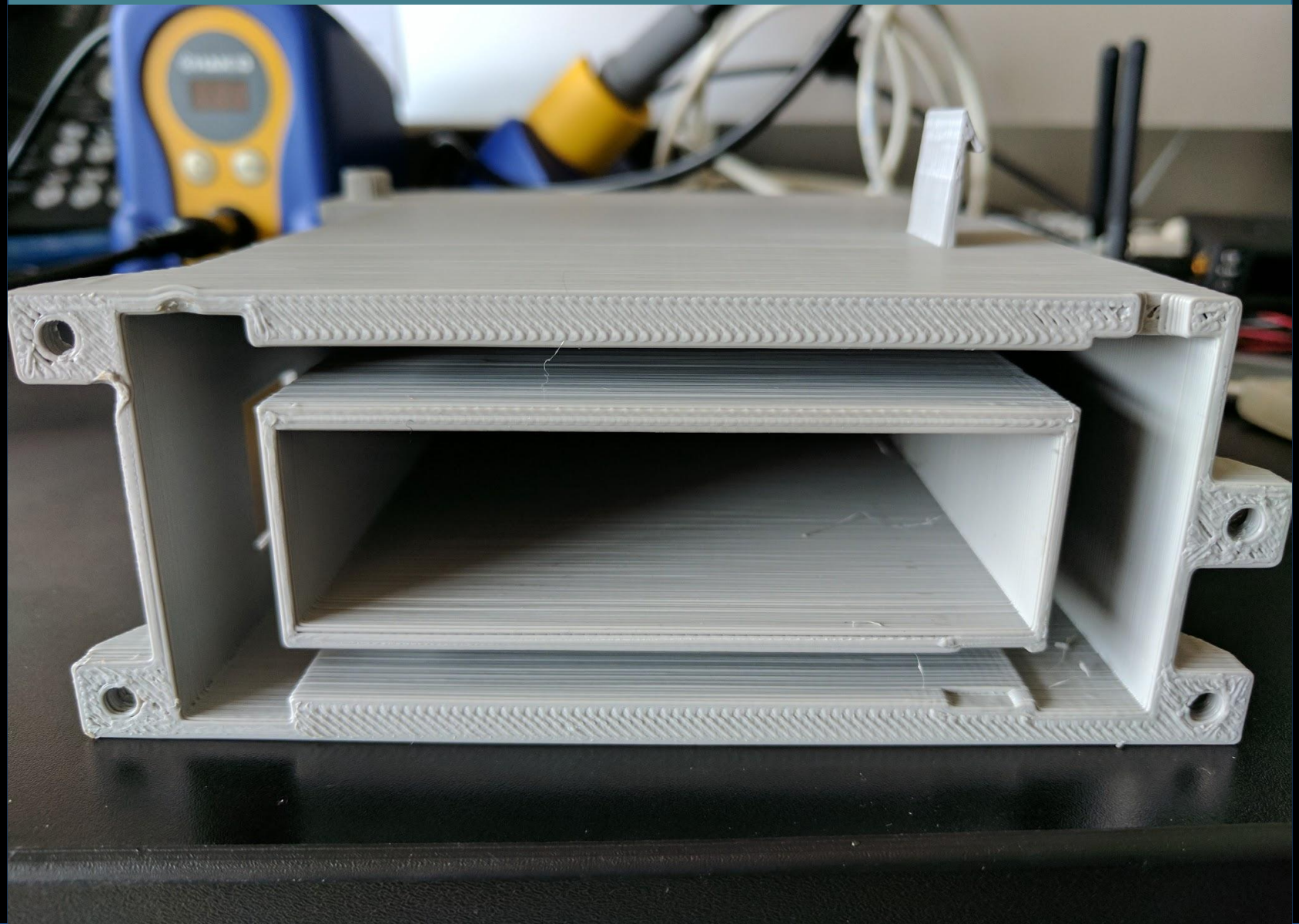


Misc

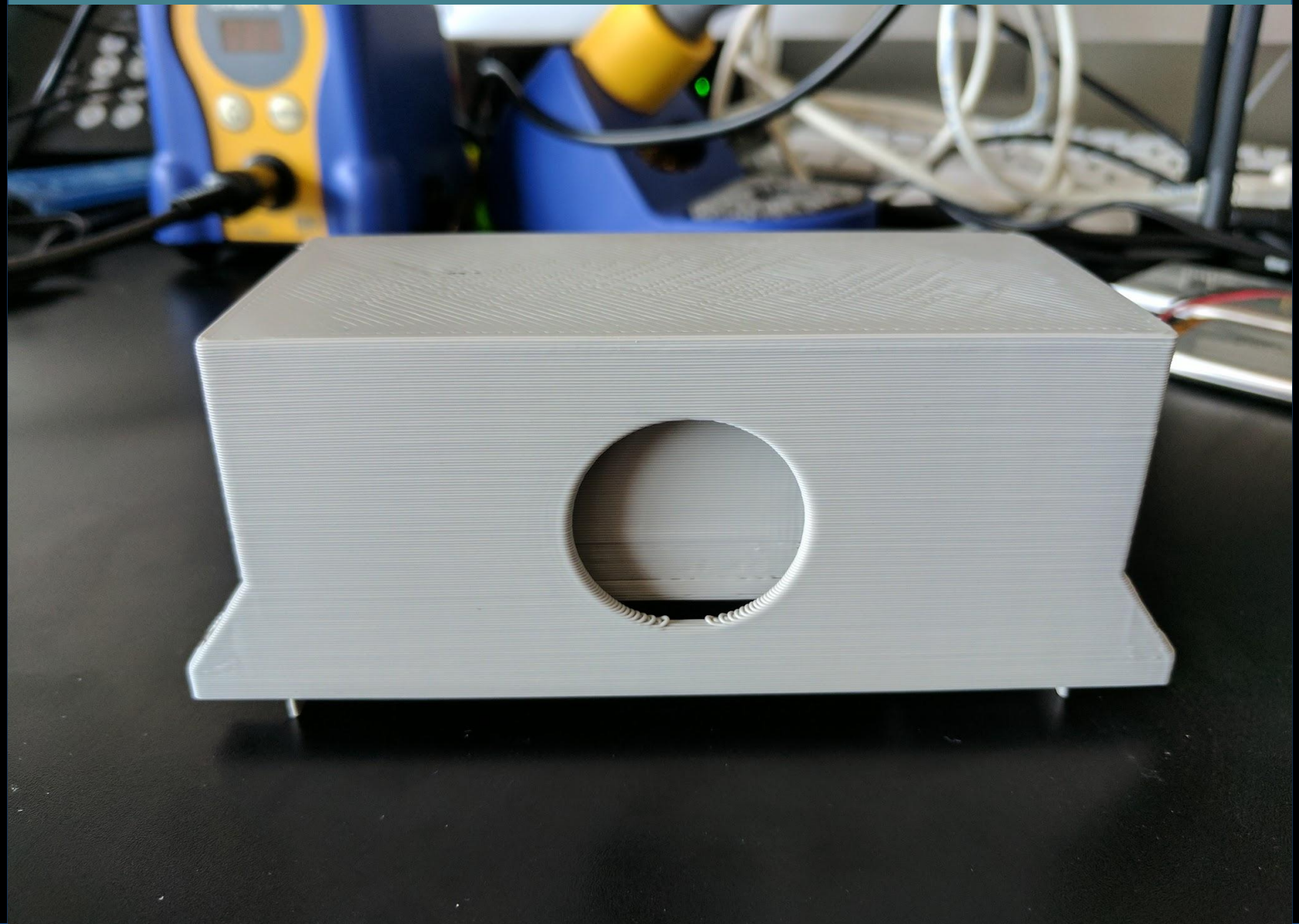


3D Printed Enclosures

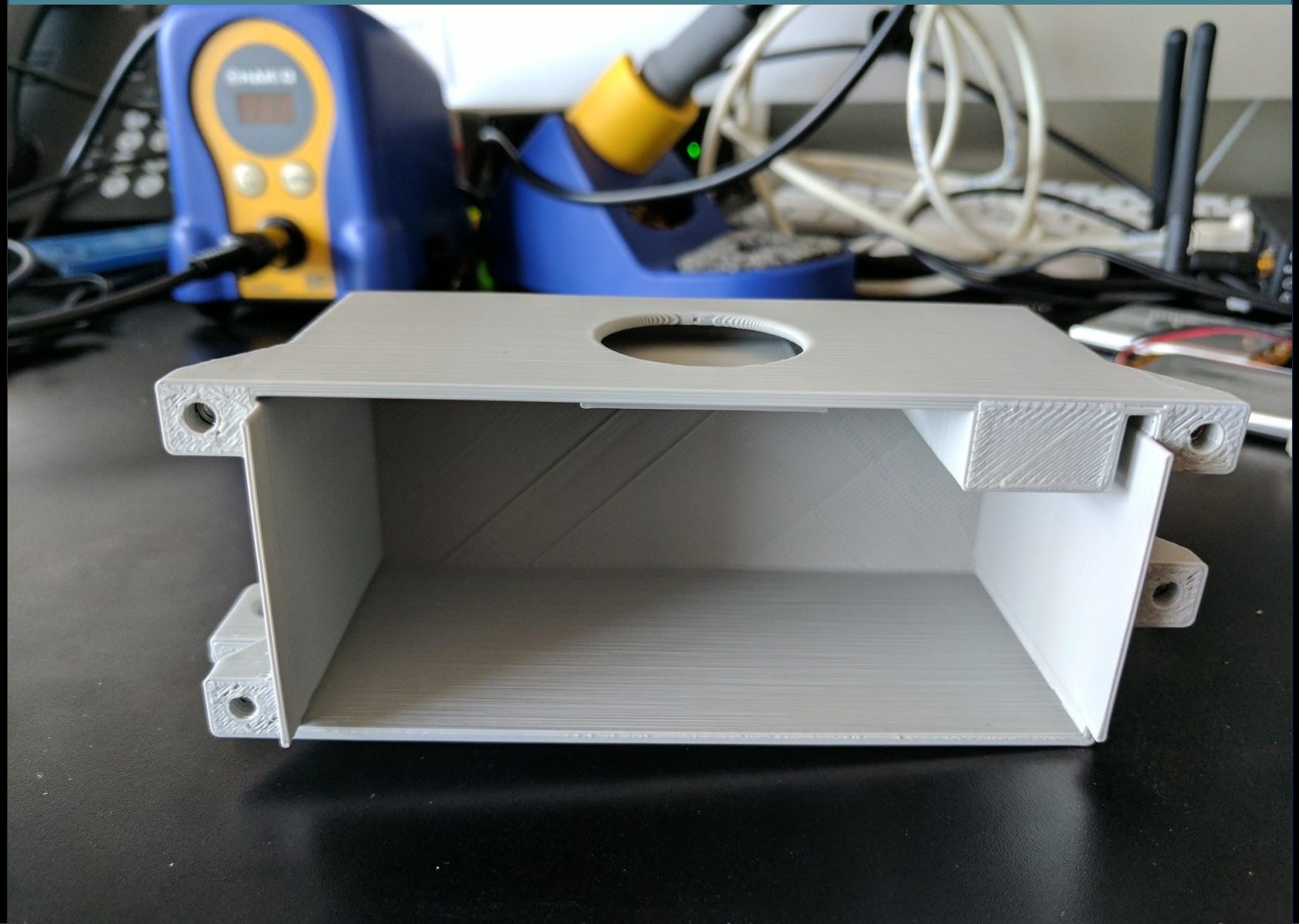
3D Printed Enclosures



3D Printed Enclosures

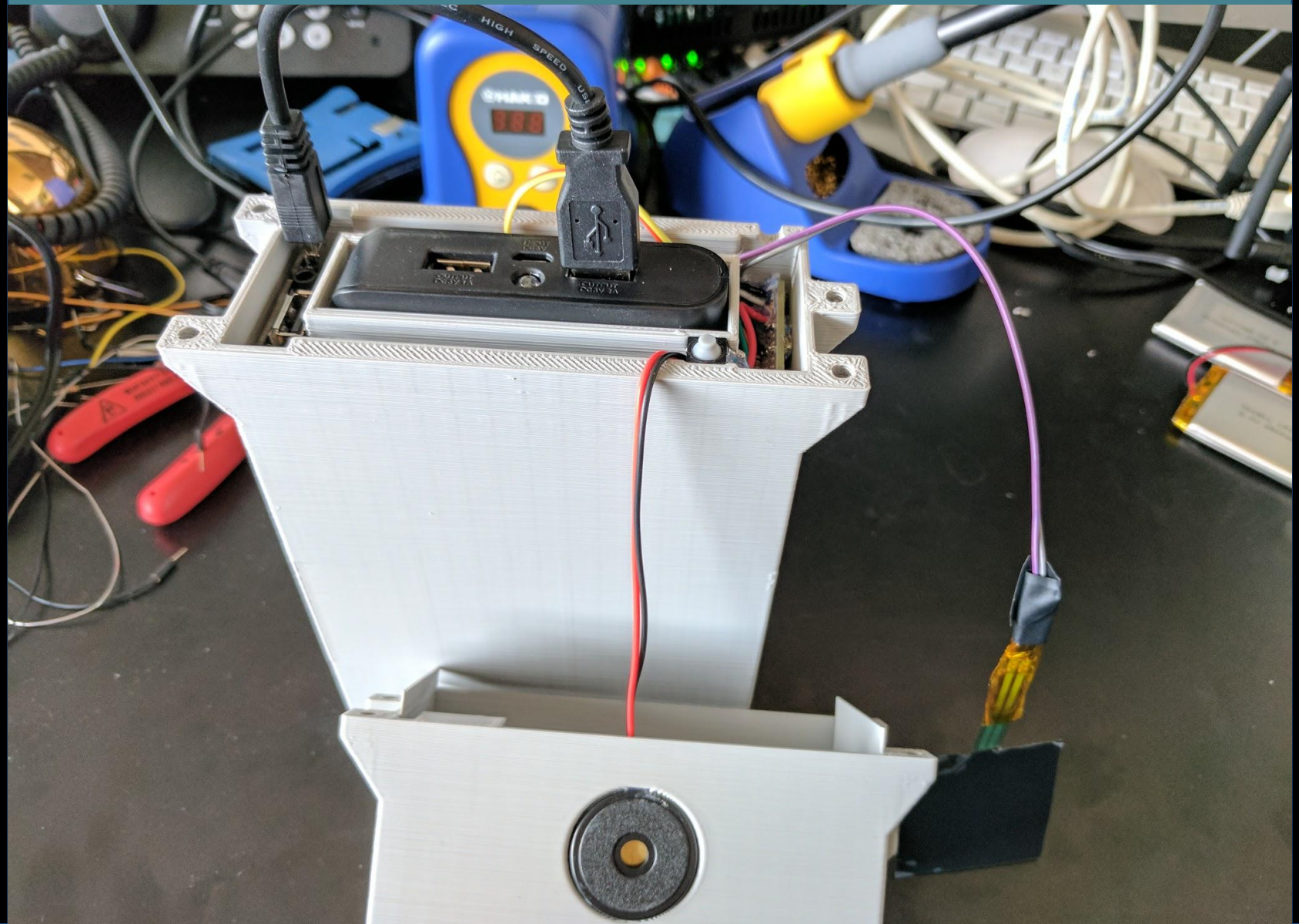


3D Printed Enclosures



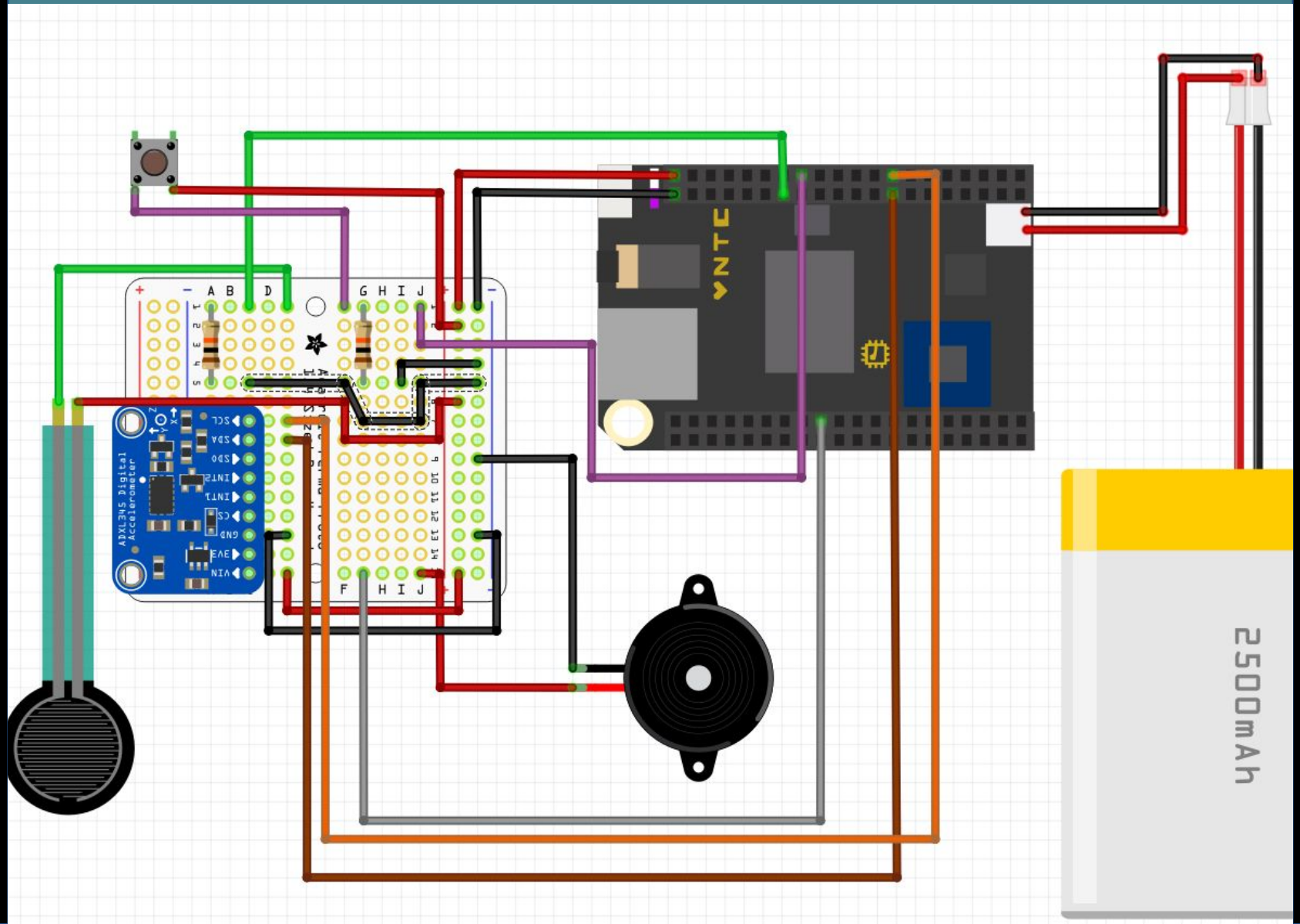
3D Printed Enclosures

Entire Module



Entire Module

Schematic



The Prototype Software

Node.js

Johnny-Five

Bleacon

Slim Framework

The Prototype Software

```
43
44  module.exports = {
45    closestBeacon: closestBeacon,
46    getLocationName: function (beacon) {
47      var name
48      config.areas.forEach(function (area, index) {
49        if (area['major'] === beacon.major) {
50          name = area['name']
51        }
52      })
53      return name
54    },
55    watchForRelocation: function (request, battery, alarm) {
56      Bleacon.startScanning(config.uuid)
57      Bleacon.on('discover', function (beacon) {
58        if (module.exports.closestBeacon === '') {
59          module.exports.closestBeacon = beacon
60        }
61        if (beacon.major !== module.exports.closestBeacon.major) {
62          if (getProximity(beacon) > getProximity(module.exports.closestBeacon)) {
63            if (delayedTest(beacon)) {
64              var location = module.exports.getLocationName(beacon)
65              console.log(module.exports.getLocationName(beacon))
66              var event = 'Moved from ' + module.exports.getLocationName(module.exp
                    getLocationName(beacon)
67              var timestamp = moment()
68              request.post(config.postOptions, function (error, response, body) {
69                if (error) {
70                  console.log('Error: ' + error)
71                } else {
72                  console.log('Beacon POST response: ' + response.statusCode)
73                }
```

The Prototype Data

MySQL Database

REST API

Location Data

Movement Data

Battery Levels

Pressure Data

Timestamps

Security and Privacy

All anonymous data

Transmitted data is all encrypted

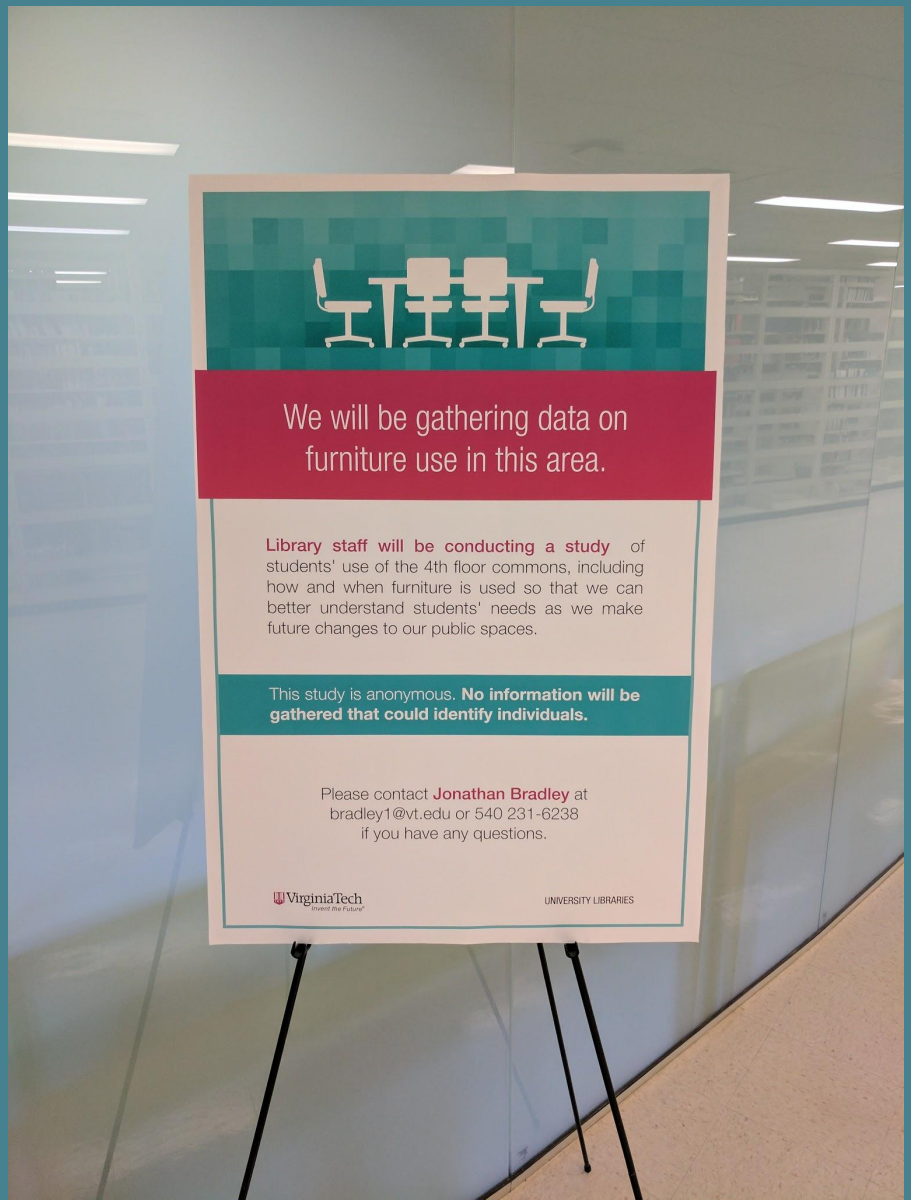
Individual devices do not act as servers

Unused ports are blocked

API Key required for reporting data

Transparency of study

Security and Privacy



Moving Forward

Size

Battery Life

Real-time Feed w/ Socket.io and Rawgraphs.io

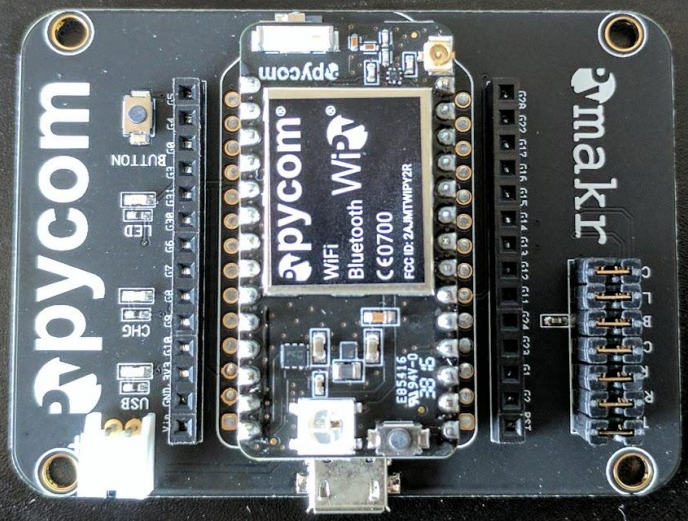
Other Sensors/Devices:

PIR

Thermal Cameras

Humidity/Temperature

ESP32


pycom
BUTTON
LED
CHG
USB
pycom
WiFi
Bluetooth
CE 0700
FCC ID: 2AJMTWIPY2R
makr

Questions?

https://github.com/VTUL/smart-commons

bradley1@vt.edu