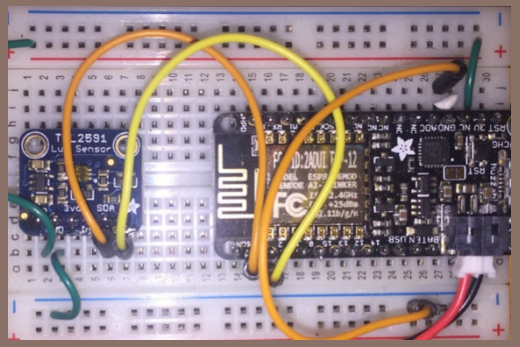
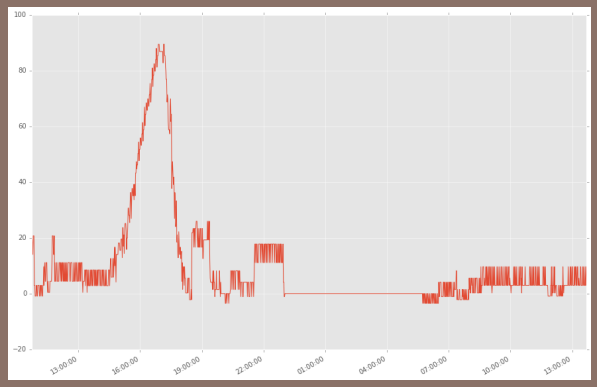
MICROPYTHON IOT HACKATHON

Featuring the ESP8266



Jeff Fischer
Daniel Mizyrycki
Robert Queenin



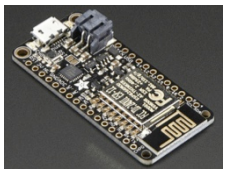
PyBay Conference August 2017

Today's Agenda

- Part 1:
  - Overview lecture
  - Build and test light sensor system (hardware and software)
- Part 2:
  - Break into teams
  - Brainstorm on projects
  - Build projects
  - Demos!

Why Python for IoT?

- High-level, easy to prototype ideas and explore options
- Runs on embedded devices



- Python data analysis ecosystem

NumPy

Array and matrix processing

pandas

High level data analysis tools

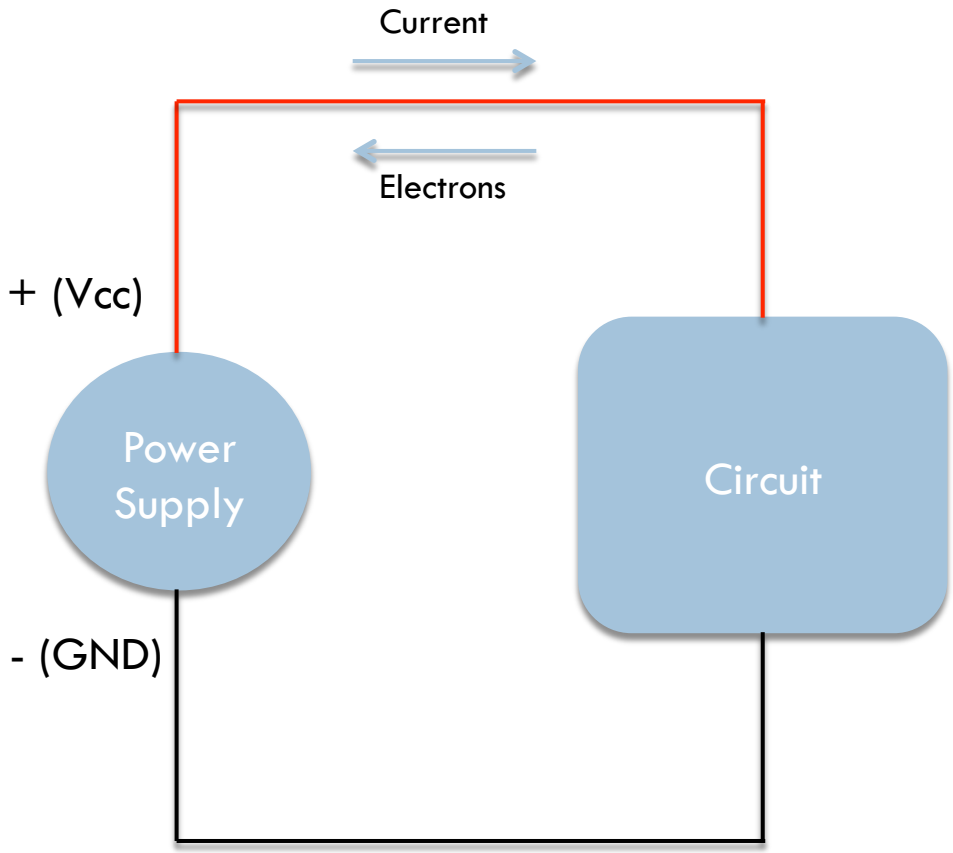
SciPy

Numerical analysis routines

scikit learn HMMLearn

Machine learning

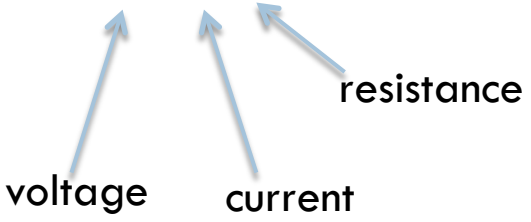
Basic Electronics



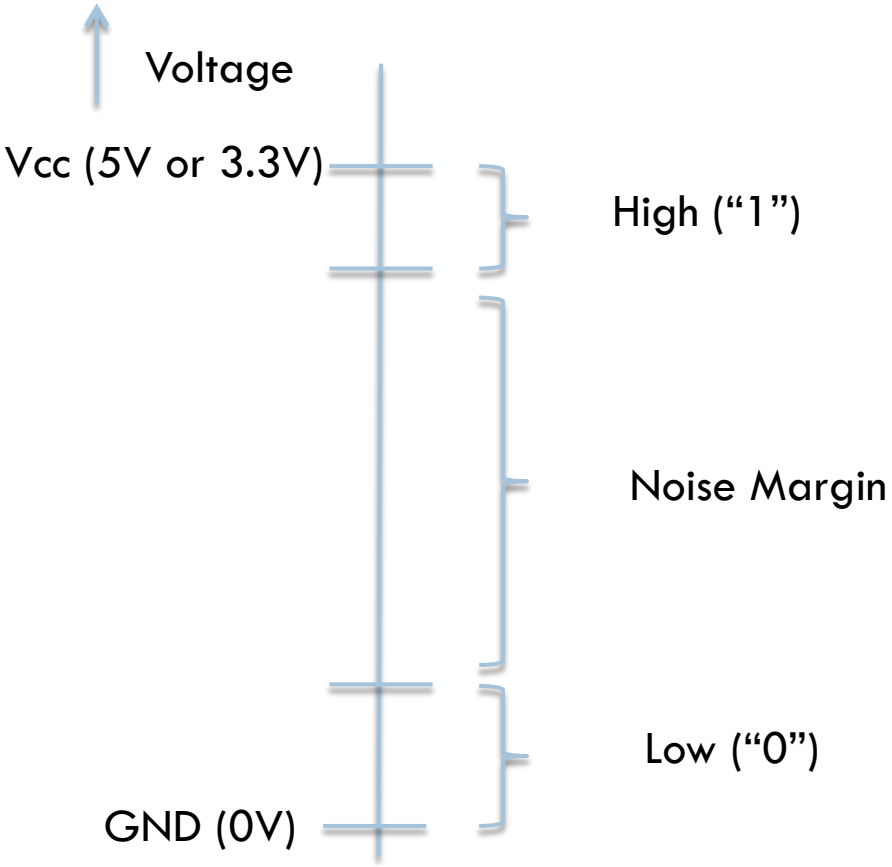
Voltage = Electrical Pressure
Current = Flow of electric charge
Resistance = Difficulty to pass electric charge

Ohm's Law

$V = I R$



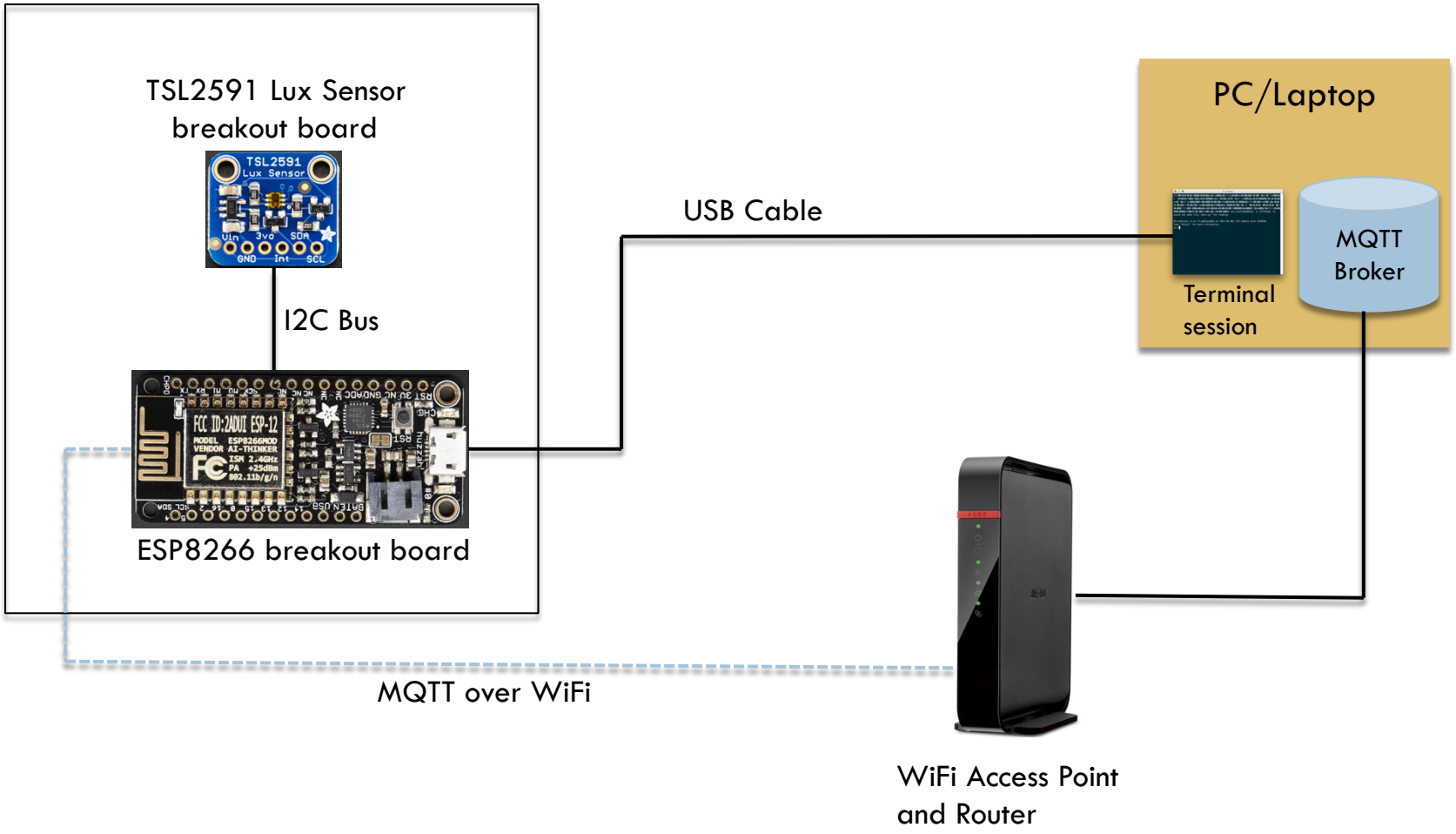
Digital Logic



Cautions

- Do not connect power and ground directly to each other ("shorting")
- Chips are sensitive to static discharge, be careful
  - You might touch some metal (e.g. your laptop chassis before handling the electronics)

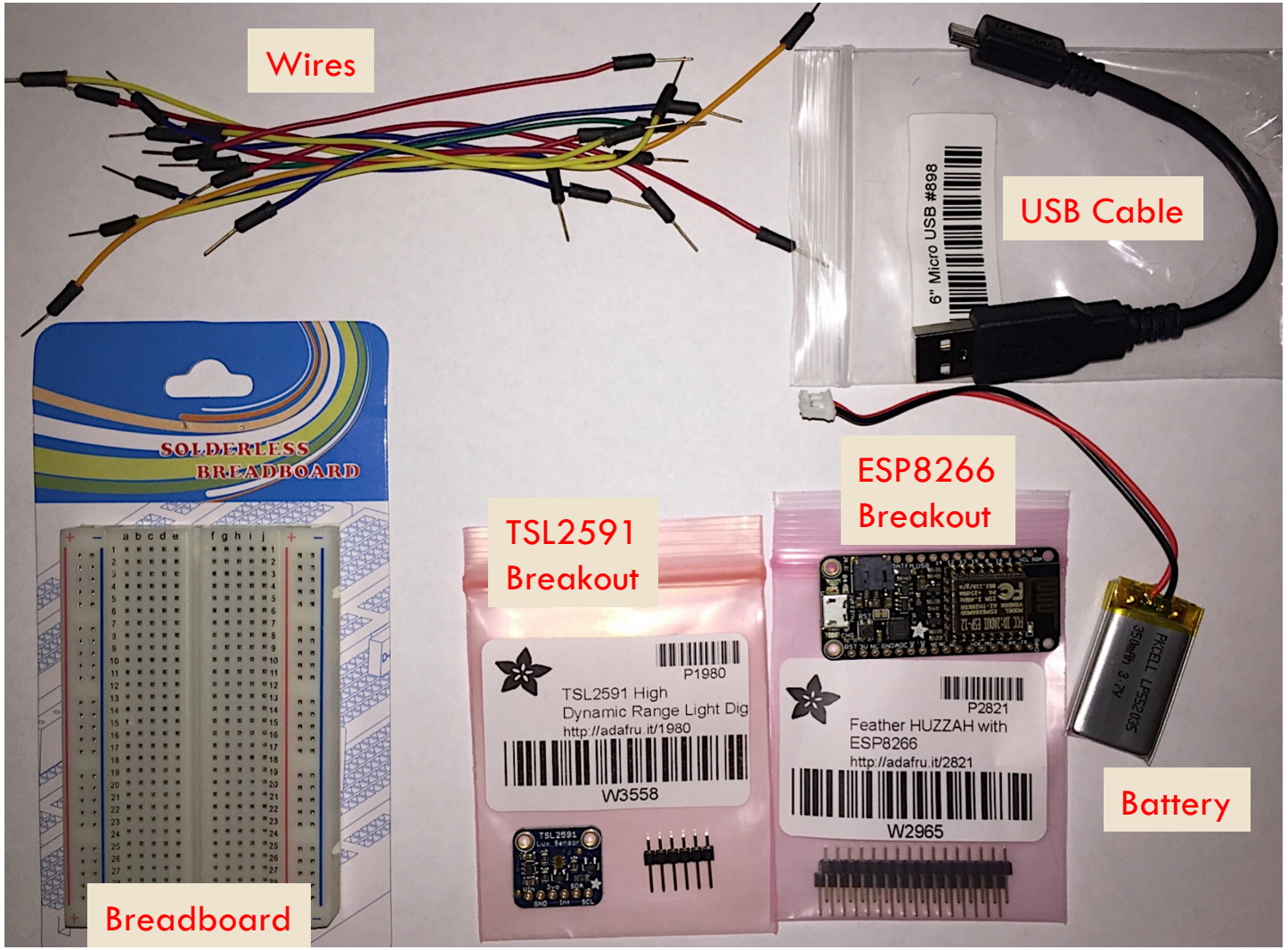
Light Sensor System Overview



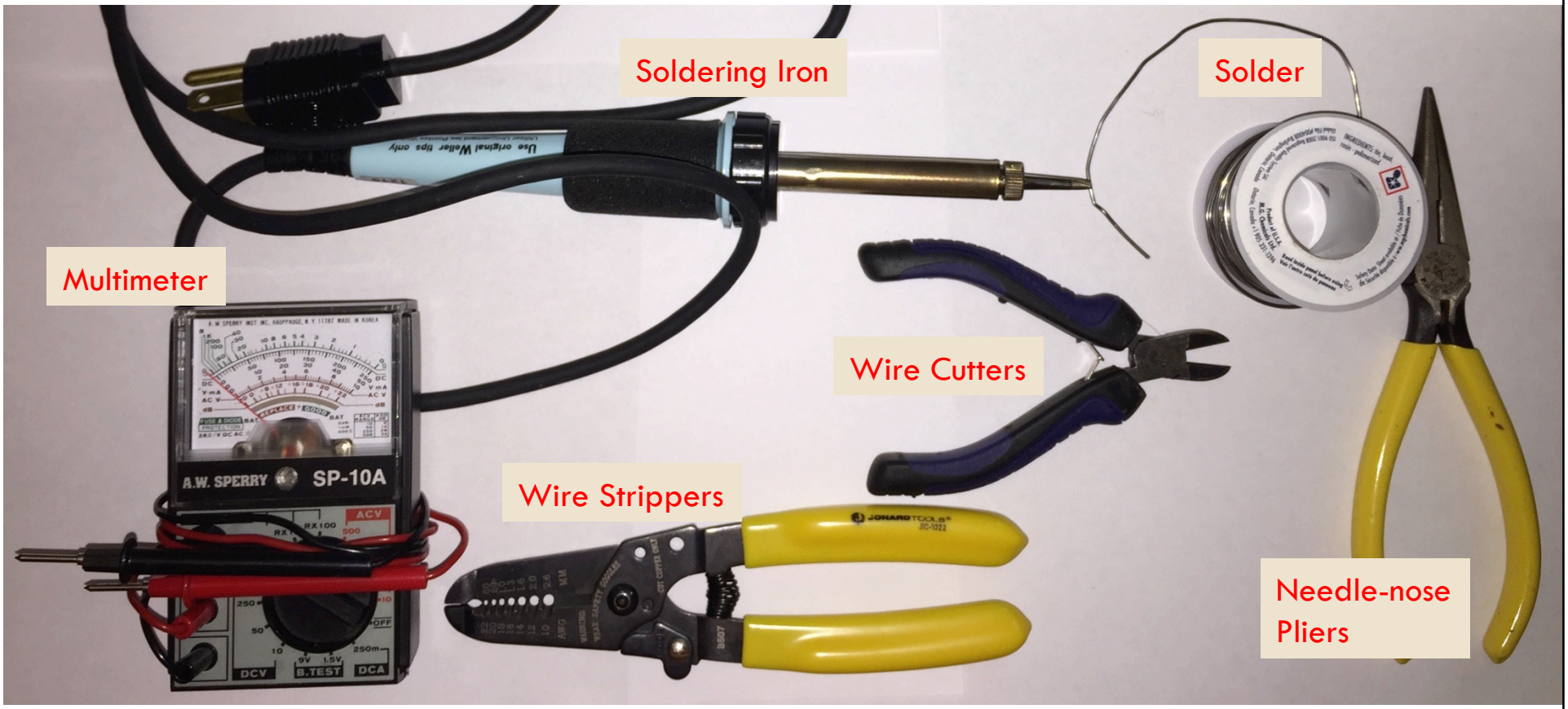
Steps

1. Hardware Assembly
2. Firmware and software install
3. Application to read the sensor
4. Messaging with MQTT

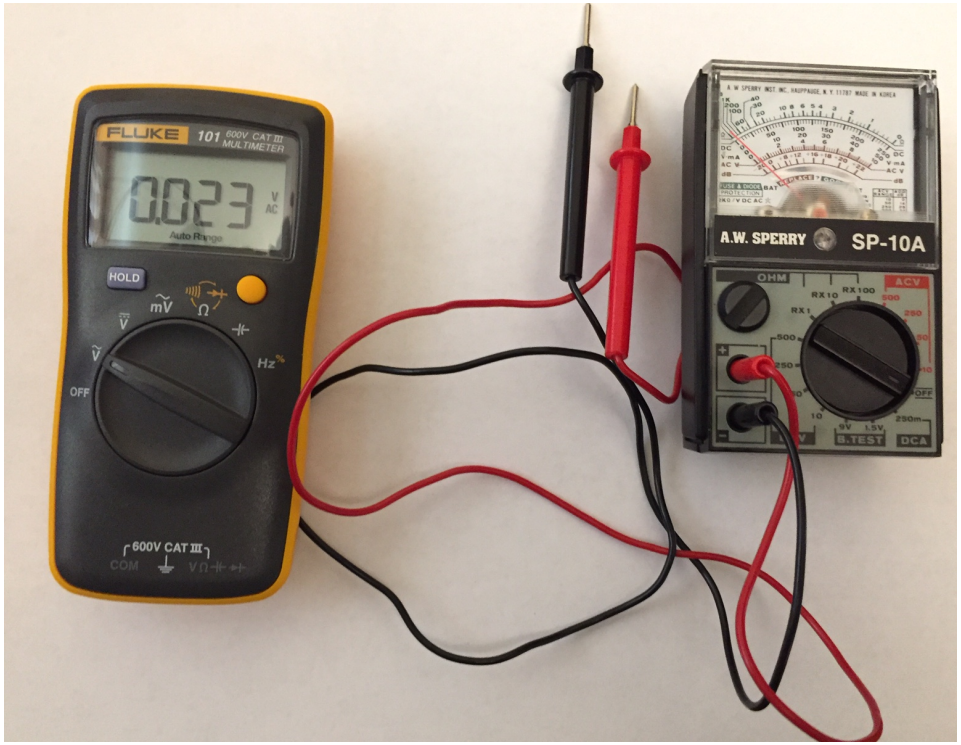
Parts



Recommended Tools



Multi-testers

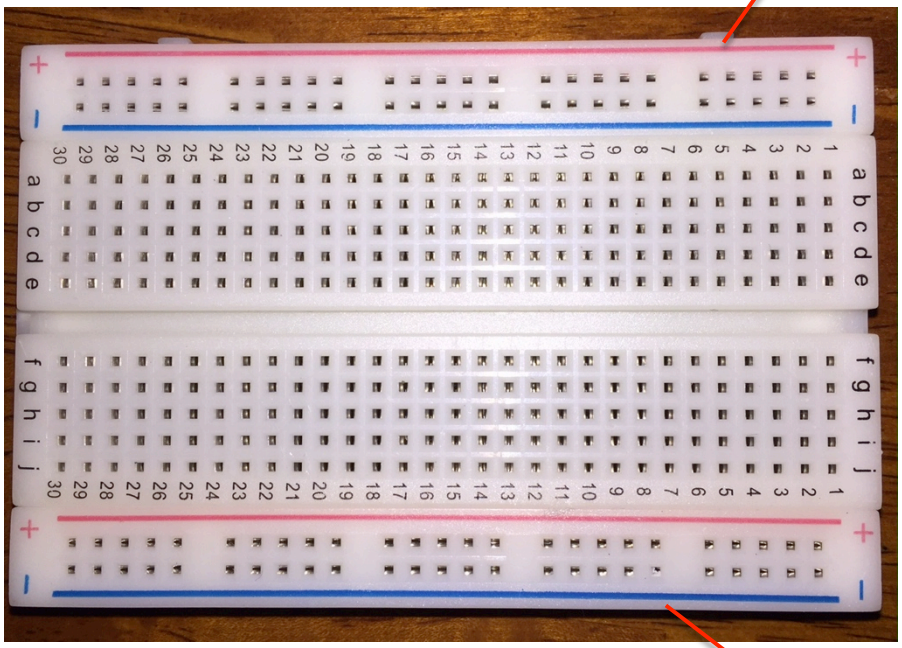


- Measures Volts, Amps, and Ohms (resistance)
- Digital and analog flavors
- Analog may require manually setting the range
- Use resistance to check continuity:

  0 Ohms = Connection

Breadboards

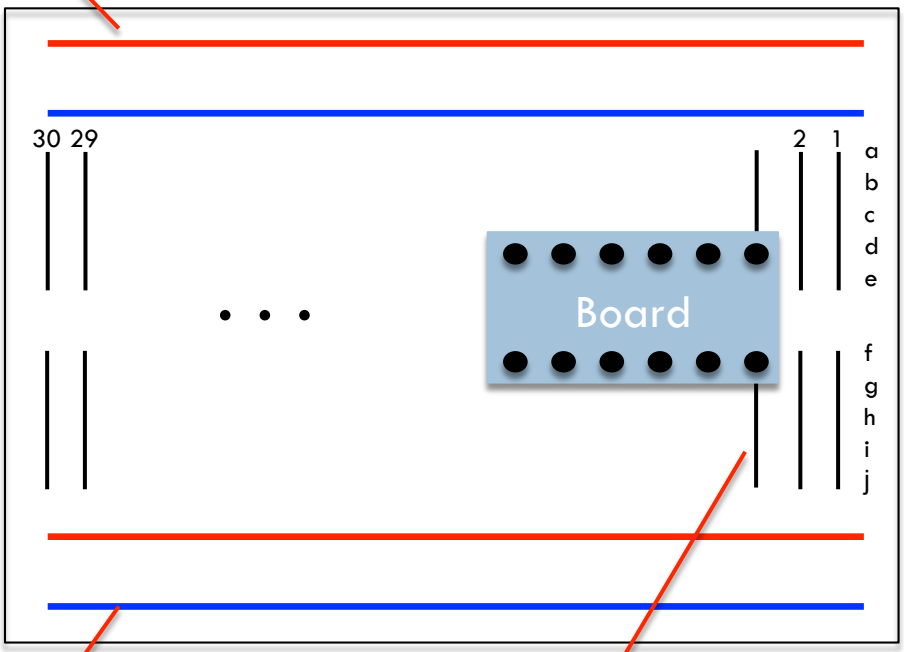
Photo



Use for Power

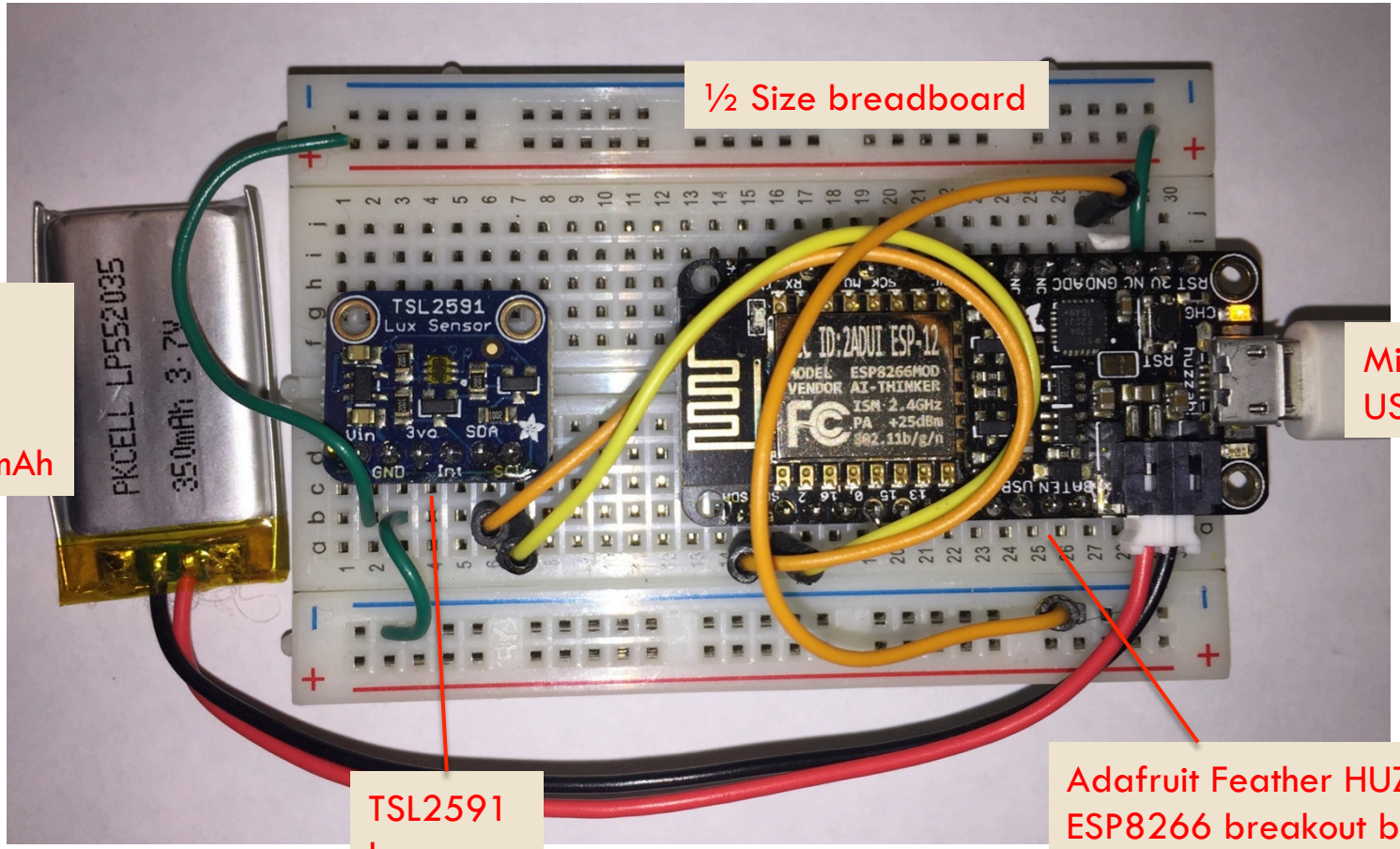
Use for GND

Electrical Connections

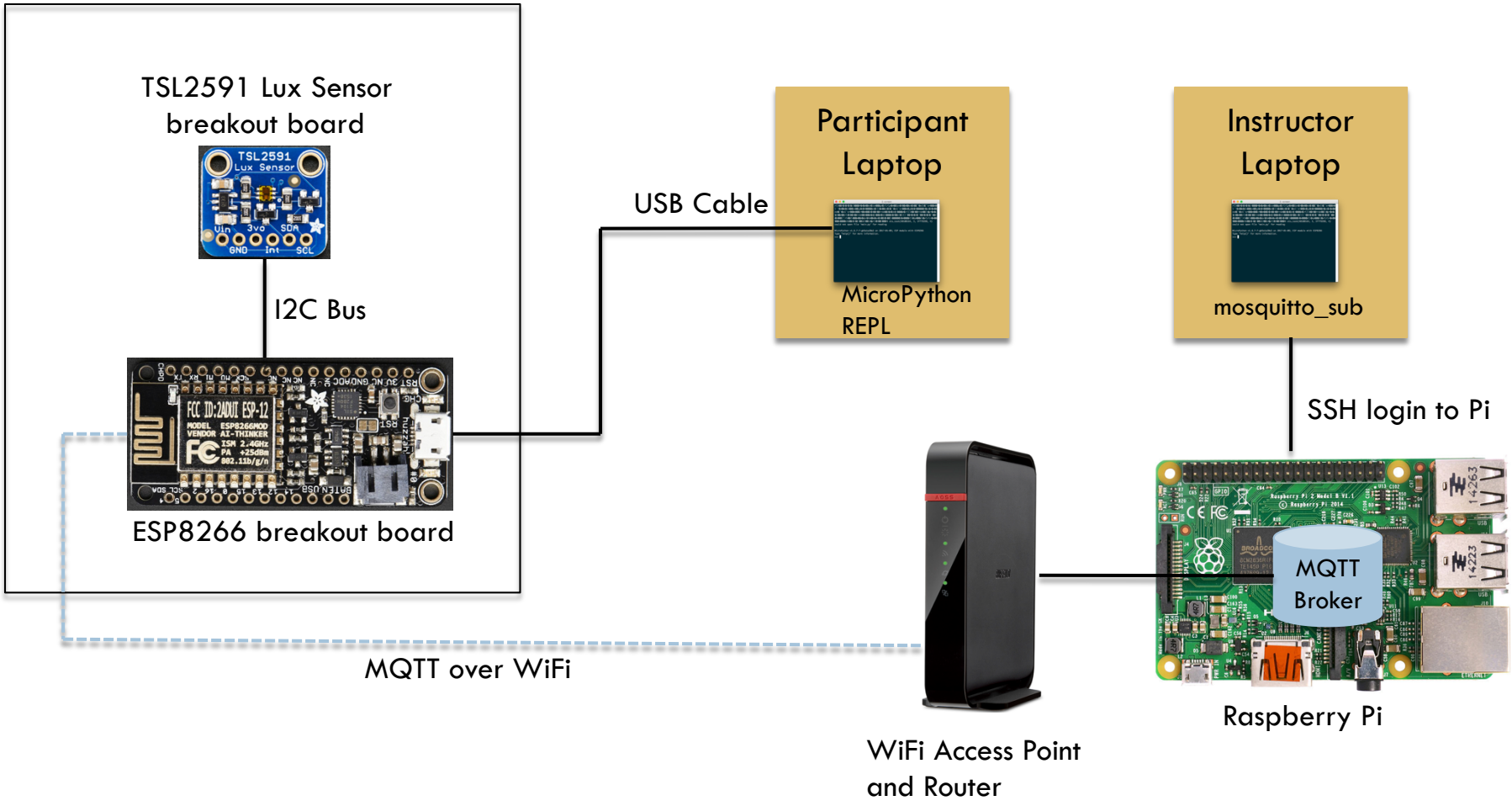


Use for pin connections

System with Adafruit Feather HUZZAH



Today's MQTT Setup



Zip Directory Tree Structure

- micropython-iot-software/
  - docs/
    - micropython-iot-hackathon/
    - micropython/
    - thingflow-python/
  - drivers/ (for MacOS and Windows)
  - esp8266-20170612-v1.9.1.bin (Firmware image)
  - example_code/ (from hackathon repository)
  - micropython/ (ThingFlow and other code for ESP8266)
  - python-tools/ (Python libraries for your laptop)
  - terminal/ (PuTTY for Windows, screen for Linux)
  - thingflow-python/ (repo with source and example code)

Next Steps

- Follow the detailed instructions in the HTML documentation, starting with "Hardware Assembly"
- For software install, use either the shorter version (chapter 9 for Linux and Mac only) or the longer version (chapter 4)
- You can skip the section on the MQTT broker – you can connect to my Raspberry Pi
- If you get done early, take a look at the extra projects section
- Feel free to ask for help!

Thank You

Questions?

More information

Email: jeff@data-ken.org

Hackathon Tutorial: http://micropython-iot-hackathon.readthedocs.io/en/latest/

Website and blog: https://data-ken.org

ThingFlow: https://github.com/mpi-sws-rse/thingflow-python