What's the "Thing" with IoT

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Chariot Solutions

IoT on AWS

A Philly Cloud Computing Event

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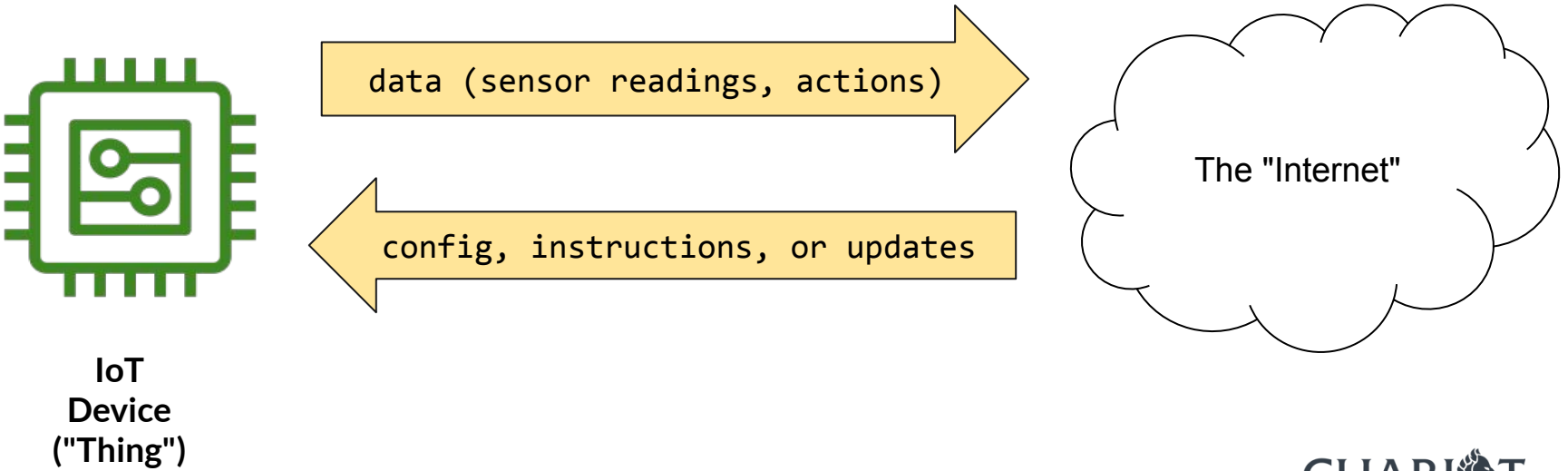
The Internet of Things...



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So, what's a thing?

- IoT is a Marketing Term
  - An IoT "Thing" is a non-"computer" device that is attached to the internet
  - In other words, an embedded processor + a radio + the Internet...
- For example...
  - Some of these IoT solutions have processors that are fully-fledged computers too...
- Many different ways to "do" IoT, this is just one example...

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Things

- Thermostats
- Refrigerators
- Automobiles (Chevy OnStar, Tesla)
- Video Doorbells
- Custom-built monitoring devices with hardware to check temperature, etc...

IoT Devices sense and act on the world around them

- Read data from sensors
- Turn on/off electrical circuits via relays
- Actuate motors
- Adjust the speed, timing, or other settings in a monitored machine
- Open and close valves

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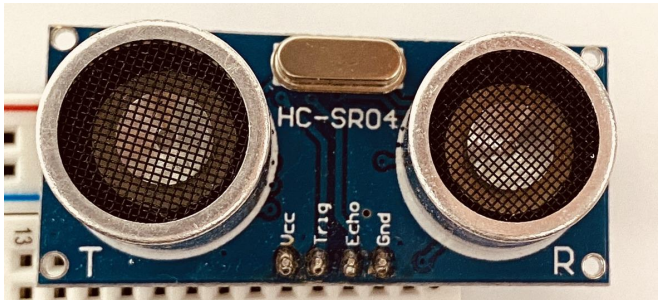
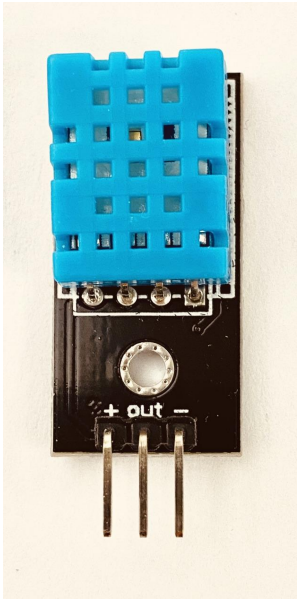
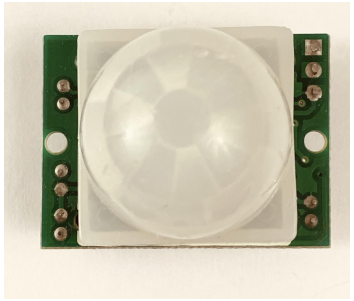
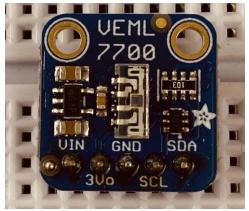
Sensors/Actuators









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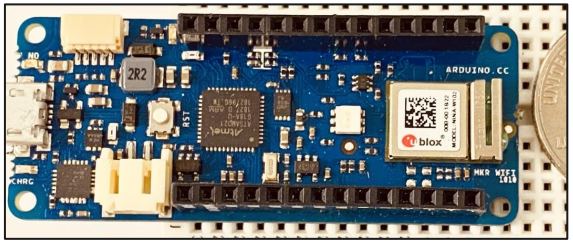
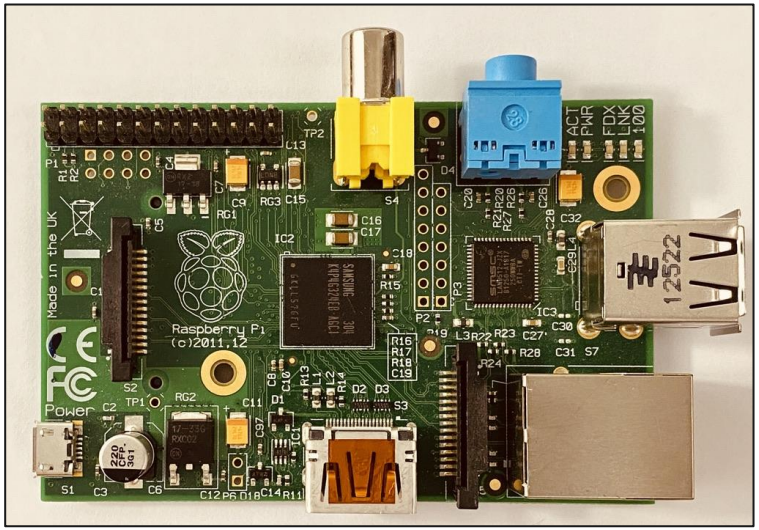
Design factors…

- Battery powered?
- Bandwidth needs
- Intermittently connected?
- Connection coverage is difficult?

Choice: MCU or SBC?



Microcontroller



Single **B**oard **C**omputer (SBC)

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Our Lab Board: Arduino MKR-1010

A Low-cost, open-source board

- Contains a MicroController (SAMD21 Cortex-M0+)
- Also has networking, encryption processors
- Enables analog and digital I/O
- Uses C Arduino SDKs
- Develop with the Arduino IDE

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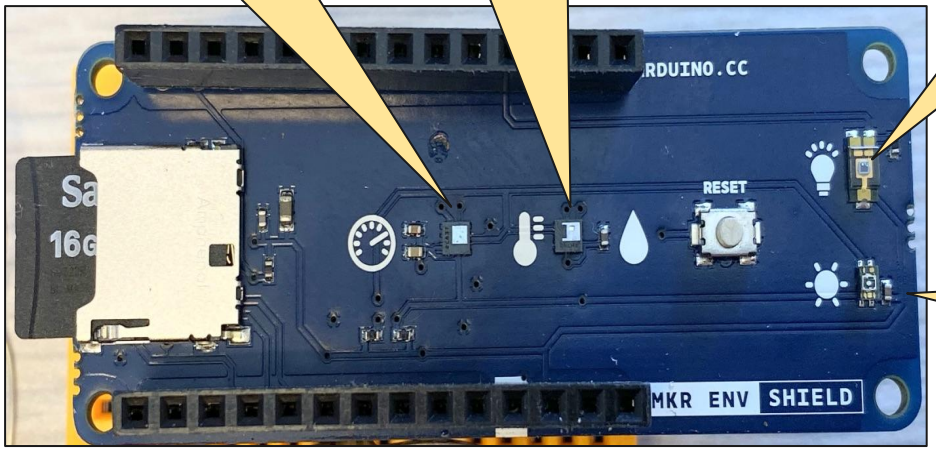
IoT Experiment "Shields" - MKR ENV

LPS22HB - Atmospheric Pressure Sensor

HTS221 - Temp and Humidity Sensor

TEMT6000 - Illuminescence



VEML6075 UV A/B Sensor

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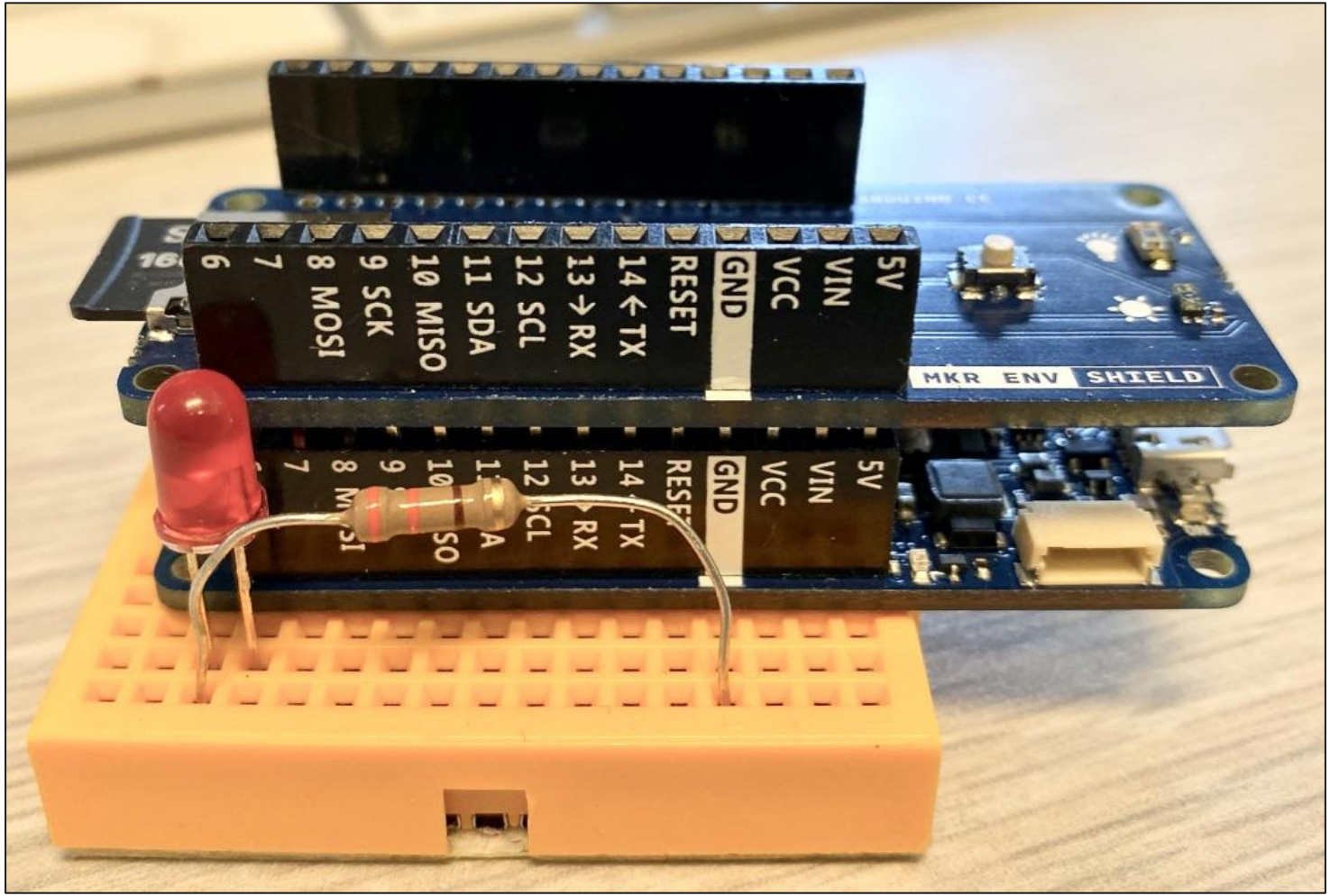
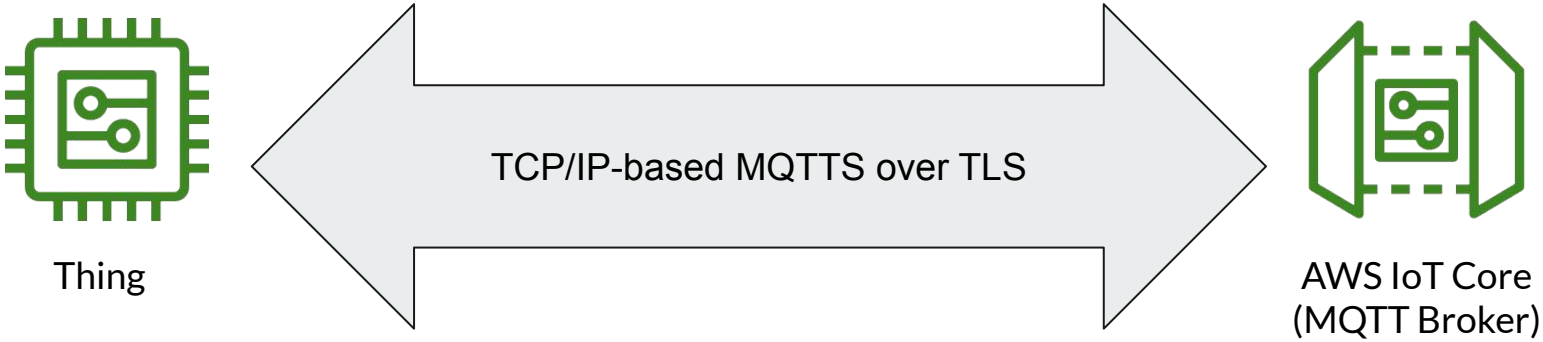

6
7
8 MOSI
9 SCK
10 MISO
11 SDA
12 SCL
13 → RX
14 ← TX
RESET
GND
VCC
VIN
5V
MKR ENV SHIELD

How do Things communicate?



- Private Key
- Client Certificate
- Secured destination
- Secured traffic enroute

- AWS Certificate Authority
- Contains Server Certificate
- Verify Client via Certificate

*Each IoT device must have its **own key pair** and **certificate** so that compromised keys only affect a single device!*

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Review and Resources

- IoT - a marketing term, could be anything
- Usually IoT Devices are Microprocessors, sometimes CPU-based devices
- Sensors and actuators can inform / act on the world around the device
- Device selection criteria is driven by requirements like power consumption, network availability, data send/receive requirements, sensors needed, etc.

- For a longer and more detailed view of IoT devices, see:
  - WTF IoT or IoT FTW?

    The definitive talk by Don Coleman on IoT Devices

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Our team includes many of the top software architects in the area, with deep technical expertise, industry knowledge and a genuine passion for software development.

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Microcontrollers in IoT: SAMD21 Cortex-M0+

Programmed for specific, discrete tasks like monitoring sensors

Arduino MKR WiFi 1010 Board

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