Intro to IoT & JavaScript

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Agenda

(I know! Very aggressive.)

- What is IoT?
- Elements of IoT
- Thing-side
- Cloud services
- Client-side
- Google Applications Script
- What is JavaScript?
- Other options (IFTTT, MQTT)

What is IoT?

Internet of Things

Traditionally the internet has been dominated by PCs, routers, workstations, and servers. With the mass adoption of low-power microcontrollers, small, high-speed, CPUs, and low-power WiFi chips, we can extend the internet to things that were previously considered ‘dumb’ and make them ‘smart’ and ‘aware’.

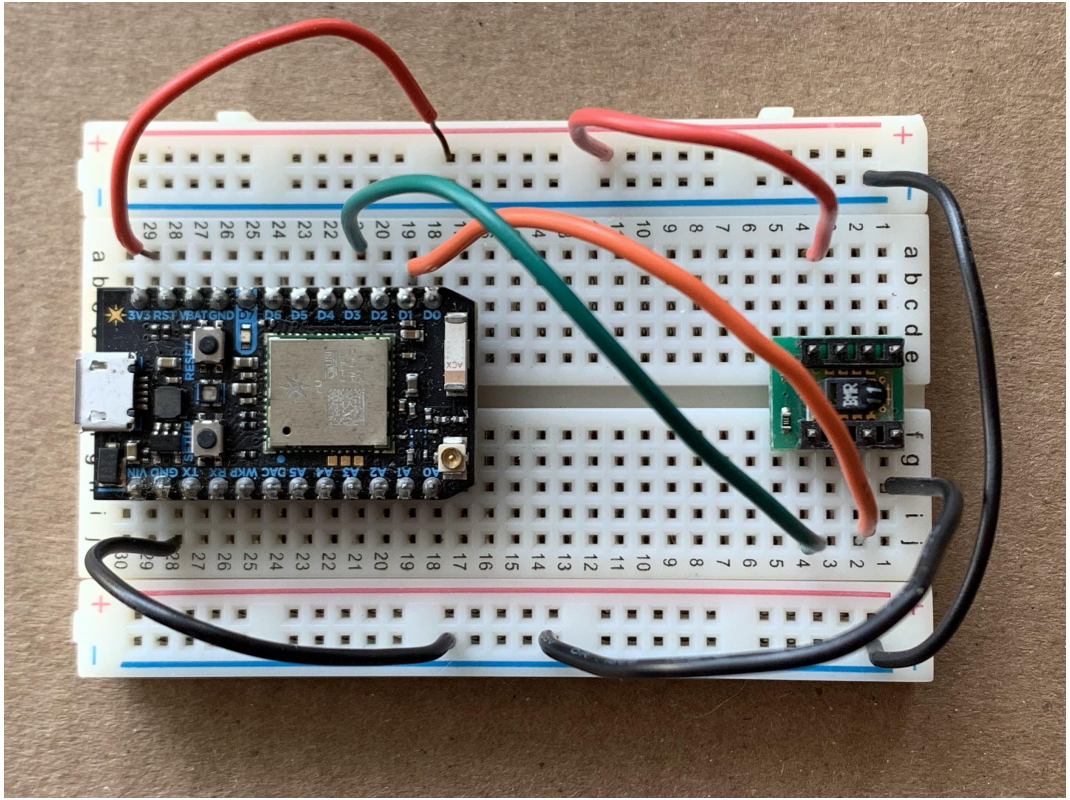
From Wikipedia, the free encyclopedia

The **Internet of things** (**IoT**) is the network of devices such as vehicles, and home appliances that contain electronics, software, sensors, actuators, and connectivity which allows these things to connect, interact and exchange data.[1][2][3][4]

Not just a thing— a system Elements:

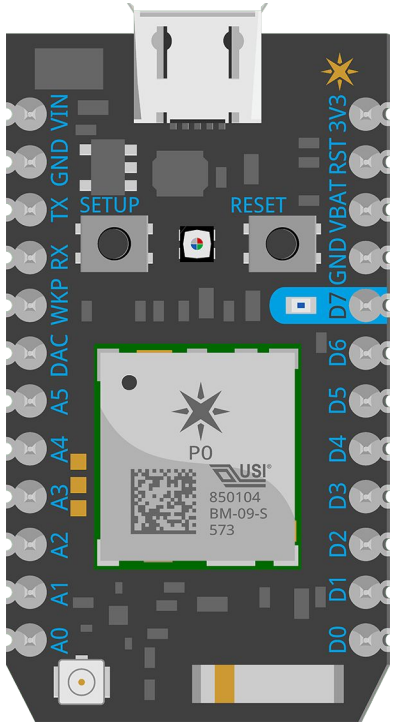
- Smart wifi enabled thing
  - e.g., sensor
- Network
  - wifi or cellular
- Cloud Services
  - Variables
  - Functions
  - Web-hooks
- Web Access
  - Browser or smartphone

Thing-side: Smart wifi enabled thing



Particle.io: Photon

- STM32F205RGY6 120Mhz ARM Cortex M3
- Broadcom BCM43362 Wi-Fi chip
- 1MB flash, 128KB RAM
- 802.11b/g/n Wi-Fi
- 18 Mixed-signal GPIO and advanced peripherals
- Real-time operating system (FreeRTOS)
- FCC, CE and IC certified
- Datasheet: http://bit.ly/2E0n4IU

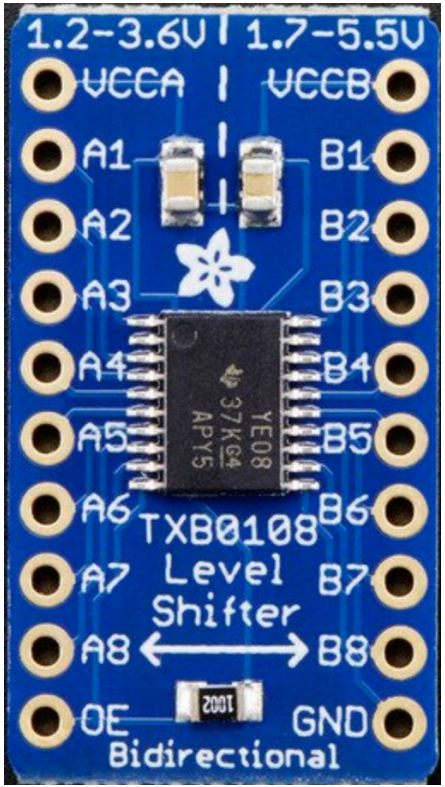


Level Converter / Drivers

Photon (as well as Raspberry Pi, Beagle Bones, etc.) has 3.3V logic and very low drive capability.

Need a level shifter/driver to drive GPIO devices.

Adafruit TXB0108:
http://bit.ly/2IqXaUi



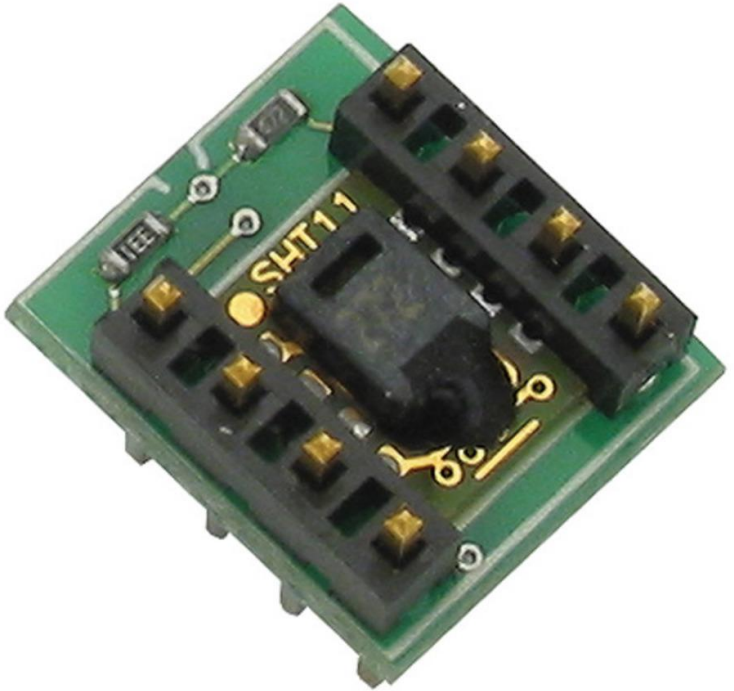
Temperature & Humidity Sensor

SHT-11

Highly accurate serial temperature and humidity sensor.

Adafruit ID: 246
http://bit.ly/2DWa1s5

Discontinued, there are better and cheaper I2C ones.

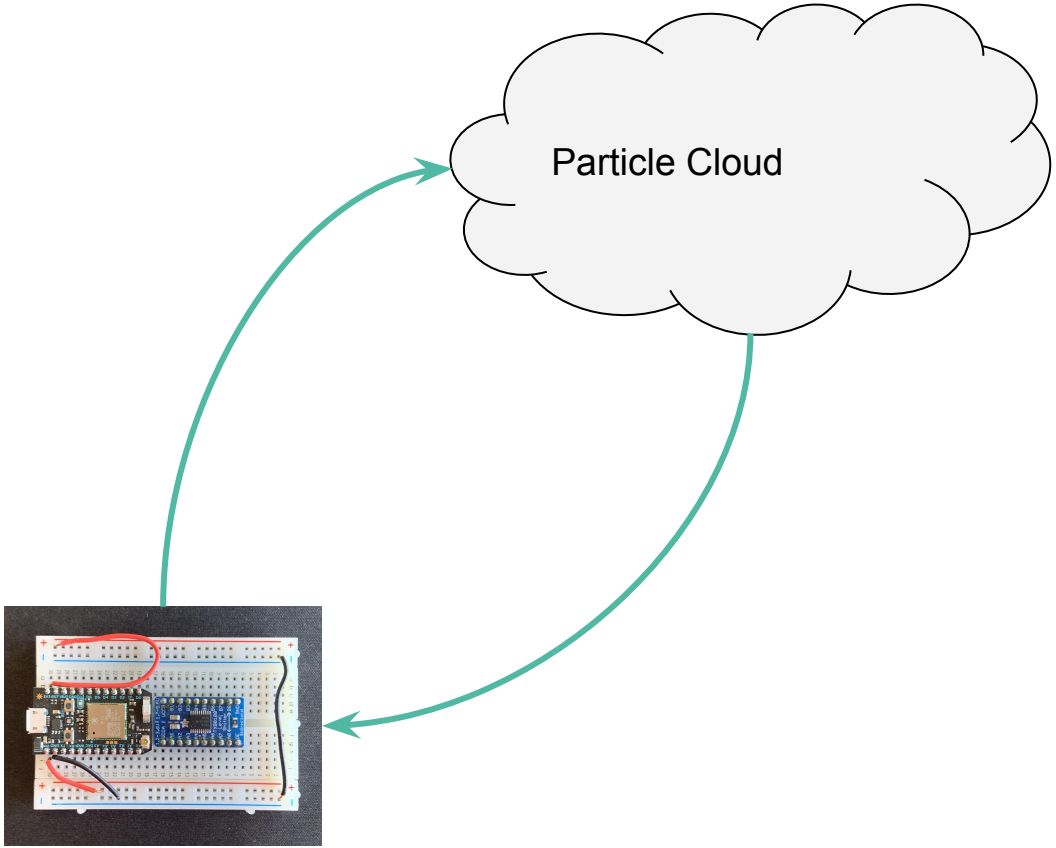


Cloud Services

- JSON
  - {“temperature”: 98.6}
- REST
  Representational State Transfer
  - HTTPS {GET, POST, PUT, DELETE, ...}

Three ways to talk

1. Variables
2. Functions
3. Webhooks

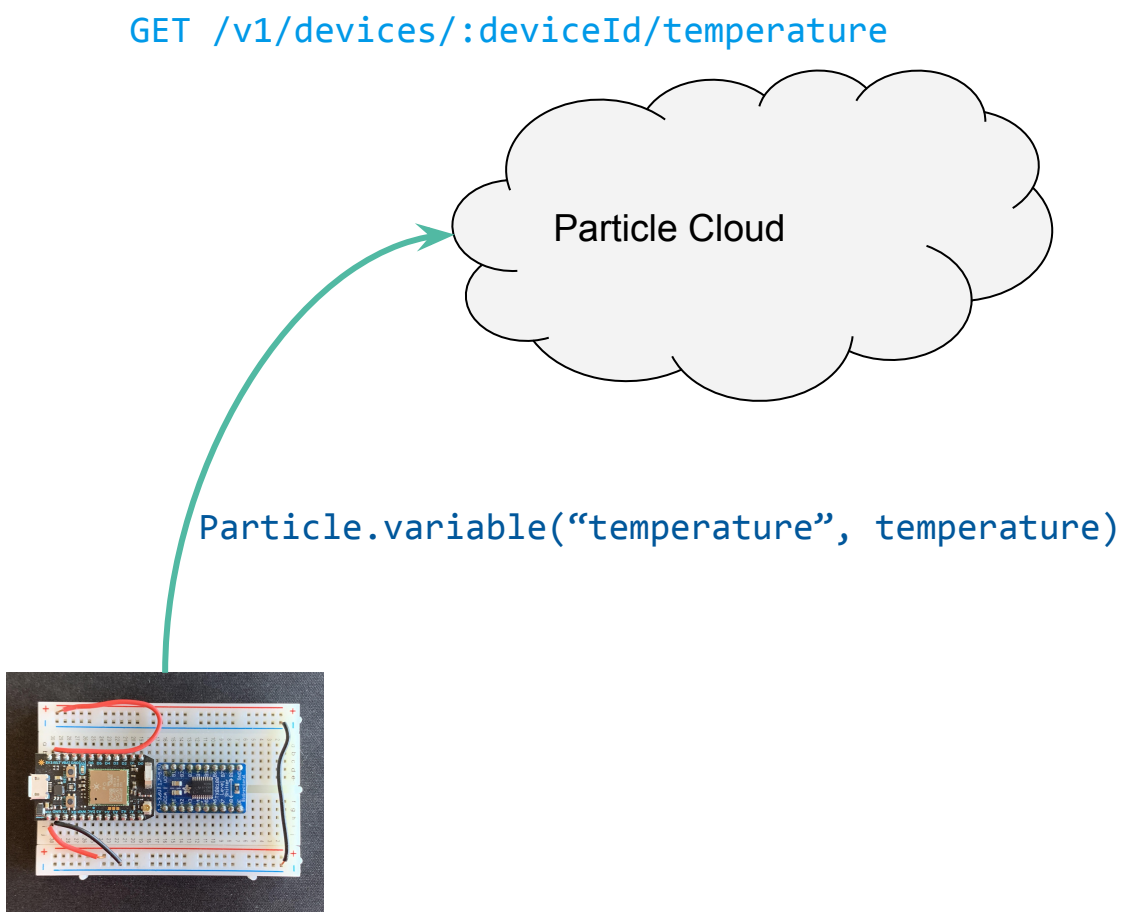


Variables

Publishing a variable (e.g., `temperature`) to the cloud makes it visible to those with permissions to see it.

Every time the local variable is written to, it changes the global variable to match in the cloud.

The local temperature is always available in the cloud.



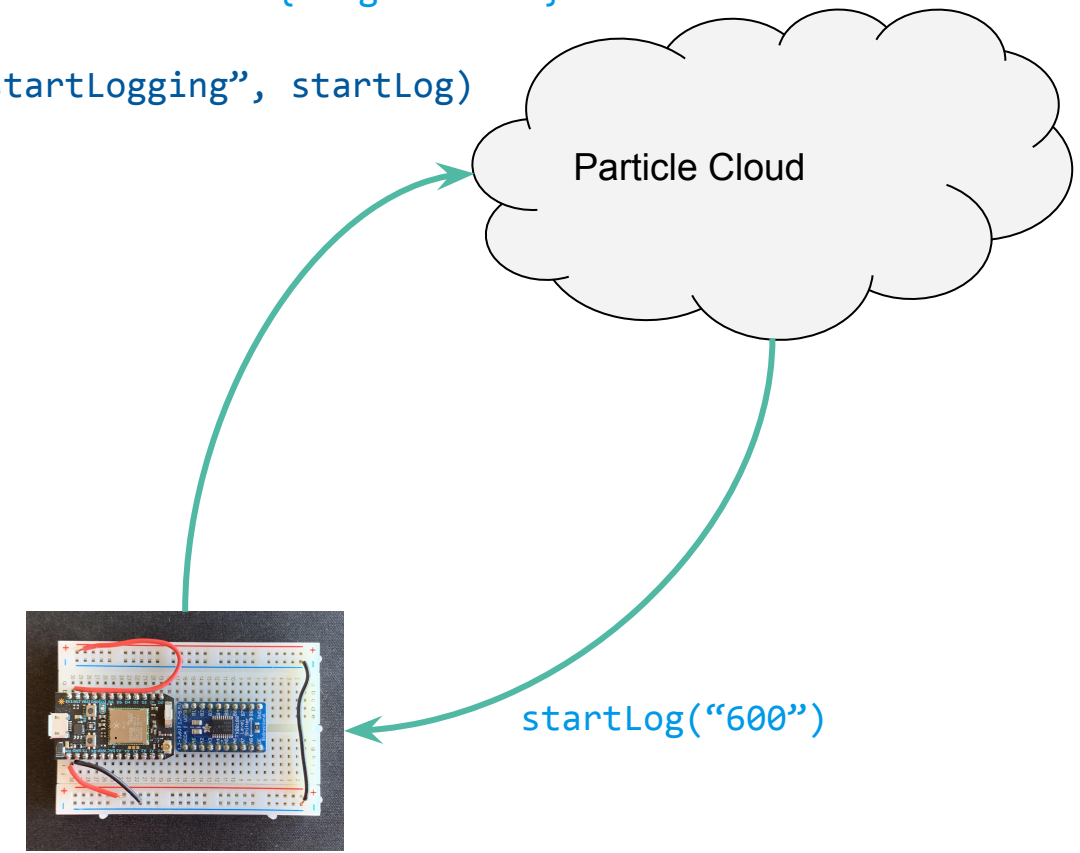
Functions

Publishing a function to the cloud makes it available to invoke in the cloud to those with permission.

Example: `startLog(period)`

Every time the local variable is written to, it changes the global variable to match in the cloud.

The local temperature is always available in the cloud.

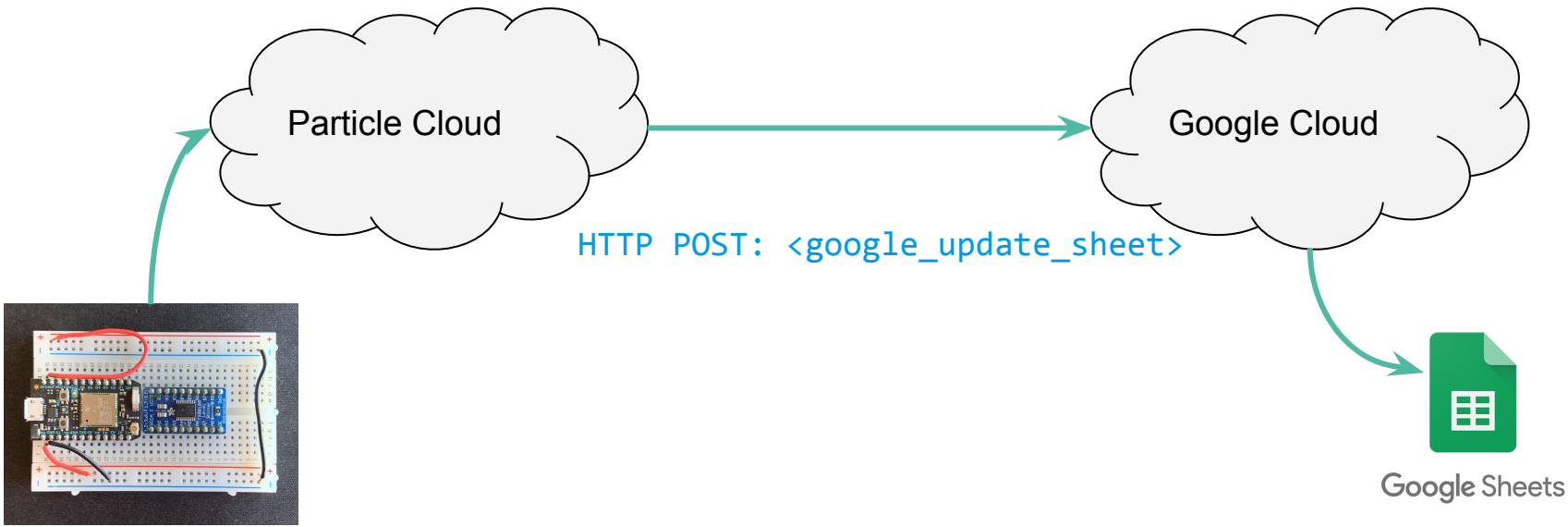


Webhooks

Webhooks are more complicated. They are ‘events’ that are ‘published’ to the cloud. When the events ‘fire’ the Webhook is invoked. They webhook itself is an HTTP POST to another cloud REST endpoint.

In this case the photon publishes a temperature at a set period to the cloud. When the temperature changes, it calls the webhook to the Google Sheets API to log the temperature.

```
Particle.publish(“tempMeasurement”, temp, PUBLIC)
```



Google Applications Script

https://developers.google.com/apps-script/

JavaScript APIs for all of Google's G-Suite of applications.

Very, very powerful APIs

JavaScript

- ECMAScript 2015, ES6, Nodejs.org
- Invented by Netscape as the language of the web.
- Supported in every web browser
- Server-side by Node.js
  Raspberry Pi, Beagle Bone, etc.
- Serverless Functions: (AWS (lambda), Google Cloud (firebase cloud functions), Azure (Functions))
- **Procedural**, **Functional**, and **Declarative** models natively supported in syntax

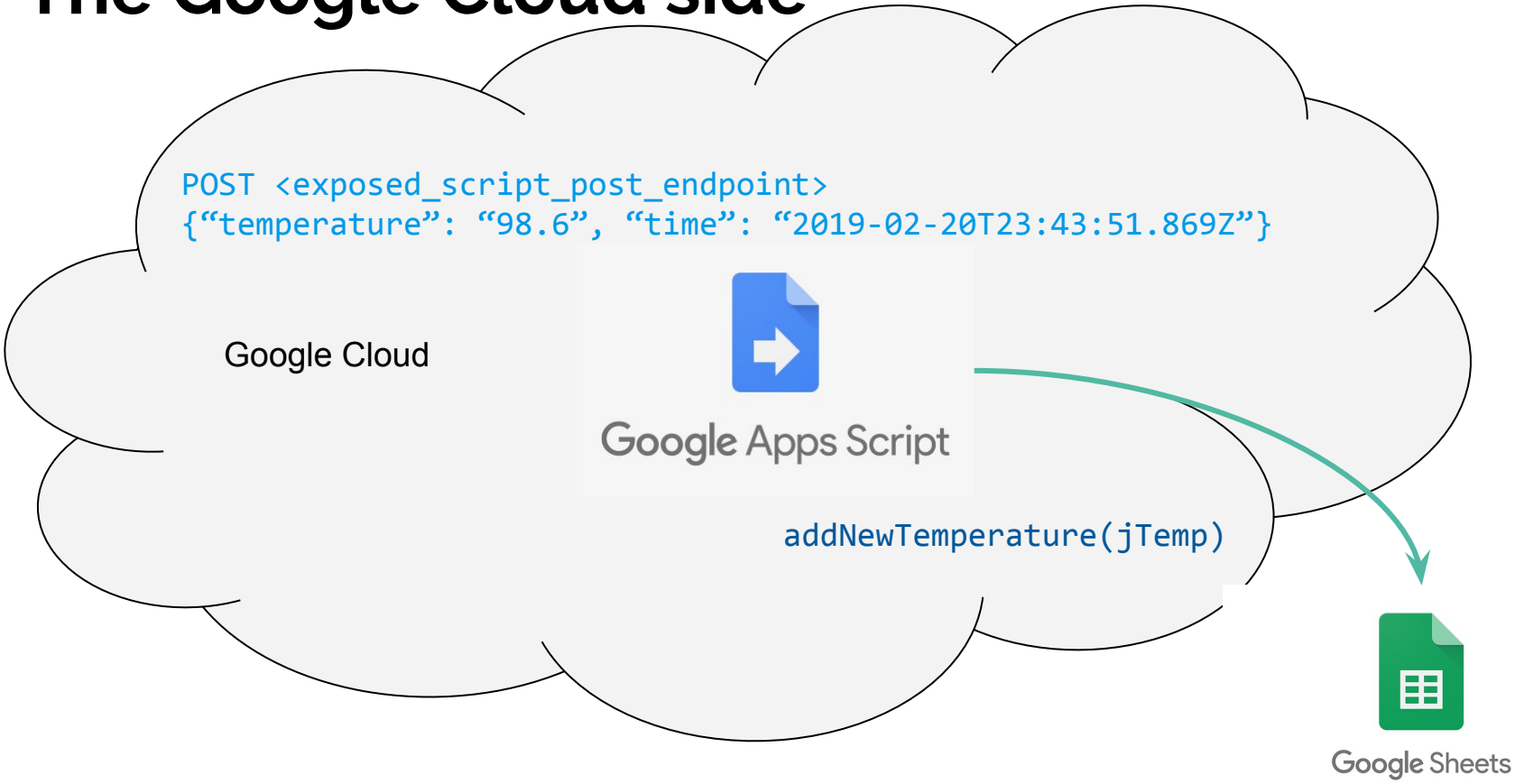
“Hello world” in JavaScript

```
// This is a comment and does not execute anything after the //
/* This is also an in-line comment but needs an end. */

let name = 'Jon "W1JP"' // An ES6 string
const pi = 3.14159 // An ES6 number
var array = [0, 1, 2, 3, 4] // An ES5 array
const object = {
      name: name,
      callSign: ‘W1JP’,
      latlng: [26.929317, -82.333849],
} // An ES6 object

console.log('Hello '+object.name) // prints “Hello Jon (W1JP)” to console
console.log(`Hello ${object.name}`) // new in ES6
console.log('My latitude is'+object.latlng[0]) // “My latitude is 26.9..”
```

The Google Cloud side



Demo

IFTTT: If This Then That

A service that many companies have exposed capabilities to be consumed by the IoT market. You can chain applets together to do interestings things.

Example: Use Alexa to change your thermostat setting.

MQTT: Message Queuing Telemetry Transport

An OASIS specification creating a light-weight message queue system for use in low power components.

- Simple
- Text based
- No security
- Requires brokerage

Useful Links

This presentation	http://bit.ly/2SgrDUE
Particle Electronics	https://www.particle.io
Particle Photon Datasheet	http://bit.ly/2E0n4IU
Adafruit Level Shifter	http://bit.ly/2IqXaUi
Sensirion Sensor	http://bit.ly/2DWa1s5
Particle Cloud API	http://bit.ly/2NlznDS
Google Applications Script	http://bit.ly/2BJsjfV

More useful links

IFTTT Documentation	https://ift.tt/2SjqawN
Adafruit IoT Platform	http://bit.ly/2NlApje
MQTT OASIS Spec	http://mqtt.org
Adafruit MQTT Service	http://bit.ly/2tw48Nw

JavaScript Links

W3Schools	http://bit.ly/2EqDR9v
Mozilla Reference	https://mzl.la/2SmVBqa
Node.js	https://nodejs.org
ES6 (ECMAScript 2015)	https://mzl.la/2SoxUOa

Thank you!
73,
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