

# Google Cloud

NEXT



**IoT Users Club**  
#Let's Do IoT

# 3 C's of IoT

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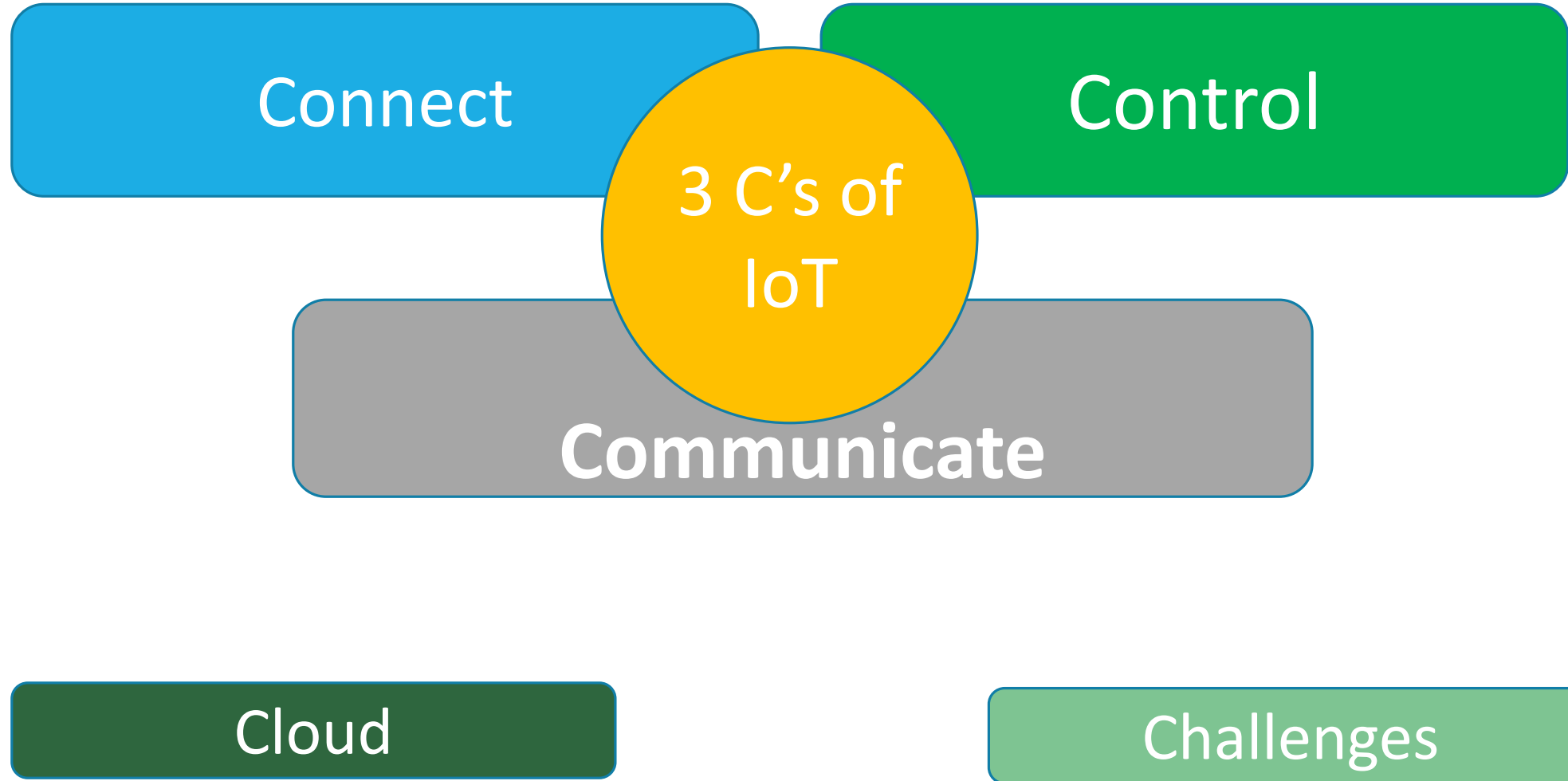
**Connect Control Communicate**

Kevin Ashton

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Trailblazer & Father of  
The Internet of Things





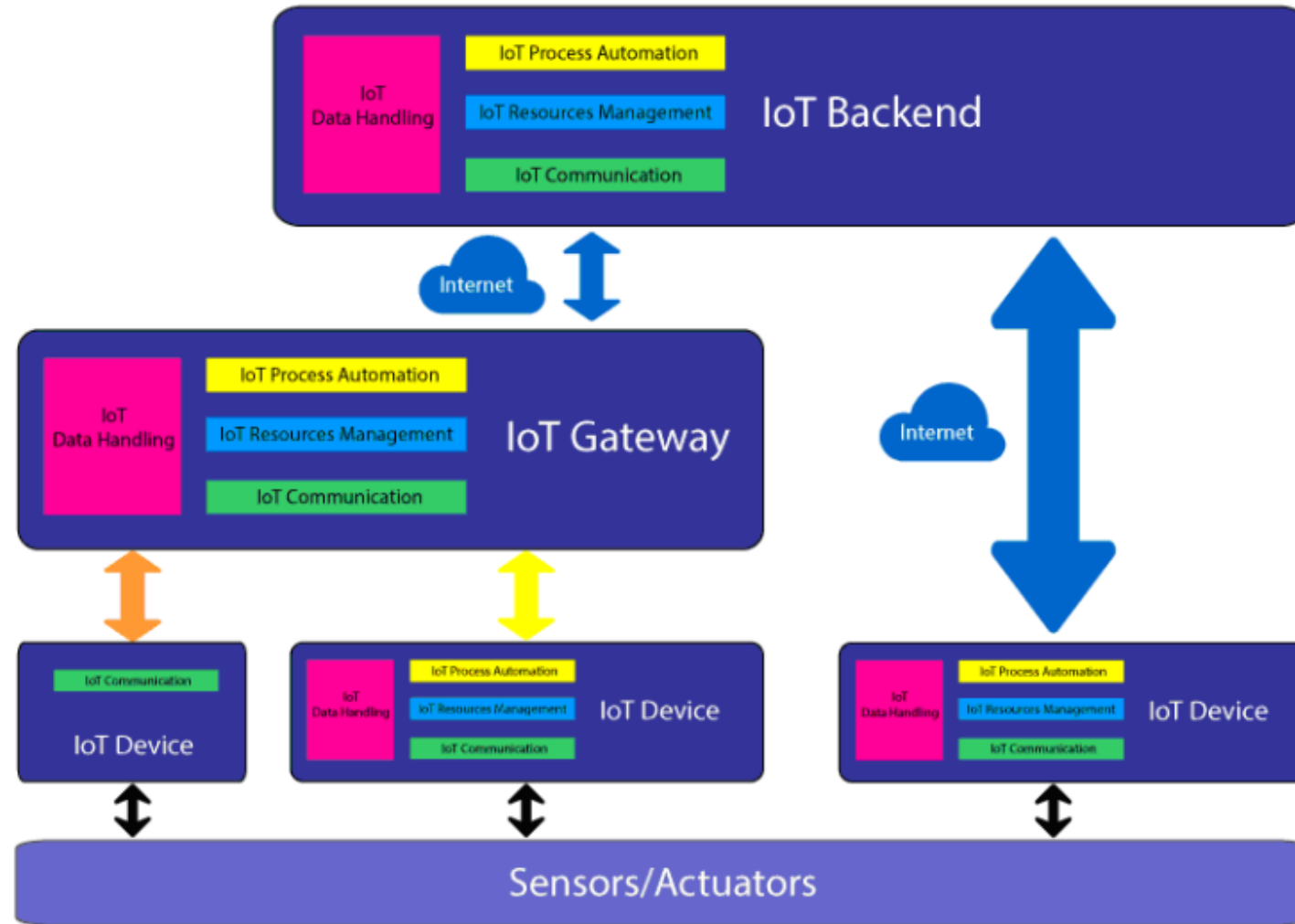
# WHAT IS IOT

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The **Internet of things (IoT)** is the inter-networking of

- physical devices,
- vehicles (also referred to as "connected devices" and "smart devices"),
- buildings, and
- other items embedded with electronics, software, sensors, actuators, and network connectivity

which enable these objects to collect and exchange data.



## Simple Equation for IoT

**Internet of Things (IoT)**



=

Physical Things (Objects)

+

Microcontrollers ,Sensors and Actuators

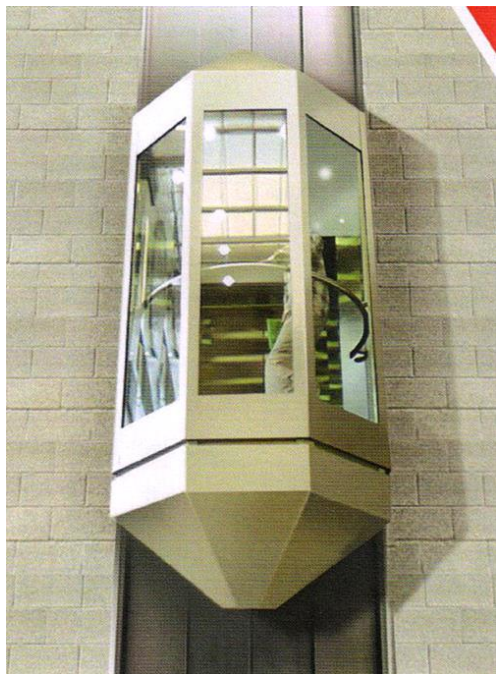
+

Internet

# 1. Connect

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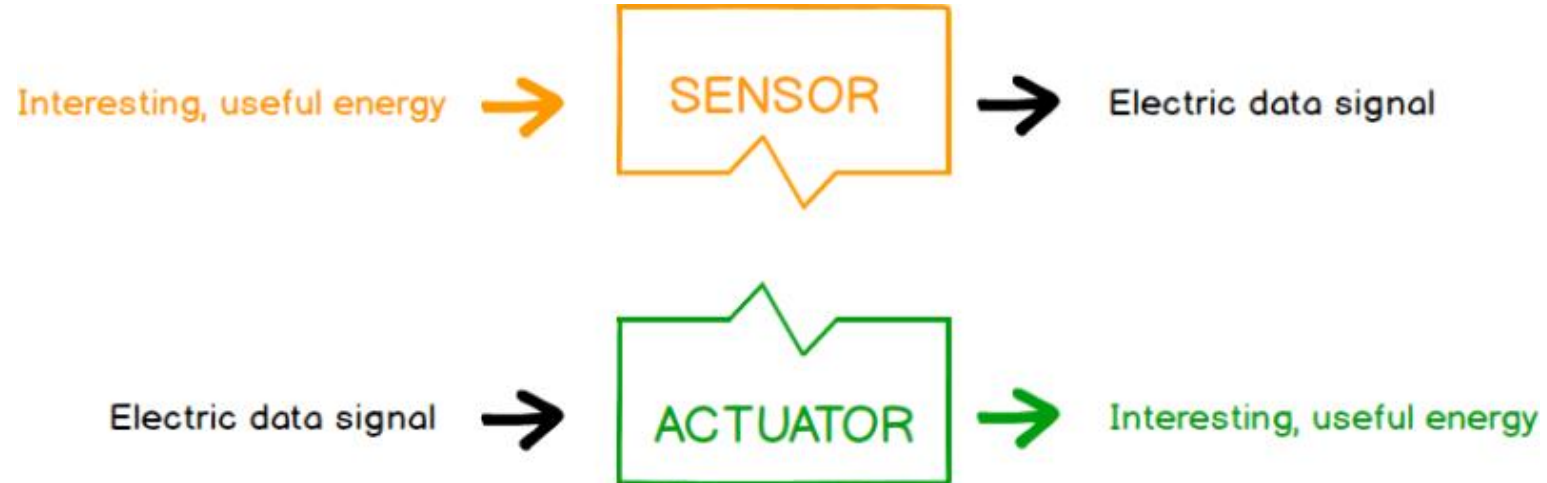


# INTERLOCKING



# Sensor Vs Actuator

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# Sensors

Temperature and Humidity Sensor



Hall Sensor

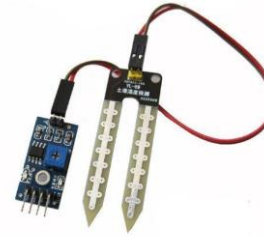


Sound Detection Sensor



PIR Motion Sensor

Soil Moisture Sensor



Rain Sensor

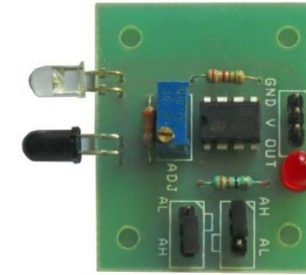


RGB Color Sensor





MQ – 135 Air Quality Sensor



IR Sensor



MQ-7 Carbon Monoxide Gas Sensor

Flame Sensor



MQ -2 LPG Gas Sensor



Ultrasonic Sensor

# Home Automation

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Temperature Sensor

Relay

Rain Sensor

Gas Sensors

CMOS Sensor (Camera)

PIR Sensor

Water Flow Sensor

Light Sensor



# ACTUATORS



LED's



Relay's



Loud Speaker



Servo Motor's



LCD Display



## 2. Control

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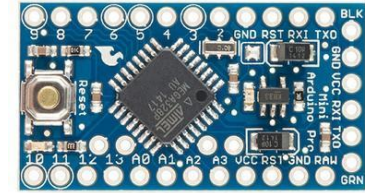
# ARDUINO



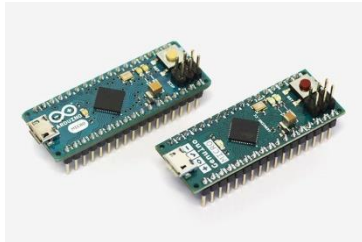
Arduino Uno



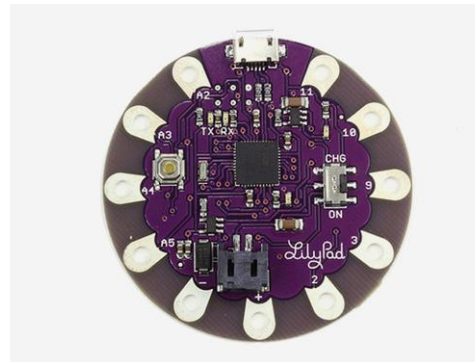
Arduino Mega



Arduino Pro Mini



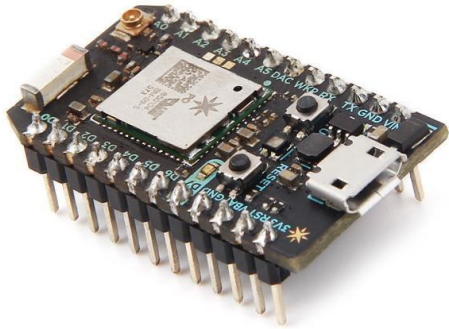
Arduino Micro



Arduino Lilypad



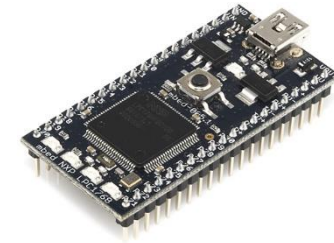
Arduino Nano



Particle Board



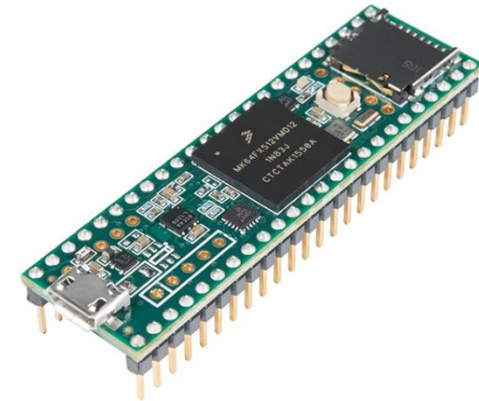
ESP 32



mBed



FiPy - WiFi, BLE, cellular LTE-CAT M1/NB1, LoRa and Sigfox



Teensy





Raspberry Pi



Raspberry Pi Zero



Beagle Bone



Asus Tinker Board

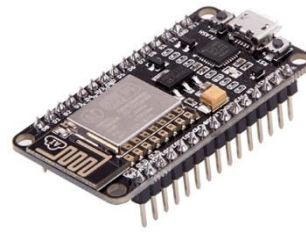
# Brains of IoT

## Arduino



C / C ++  
Johnny Five  
JavaScript

## ESP 8266



C / C++  
MicroPython  
n  
JavaScript  
Lua

## Raspberry Pi



C / C++  
Python  
JavaScript  
Nodejs  
Java  
Ruby/Go  
C#

# 3.Communication

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# Communication

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- Wifi
- Bluetooth
- Zigbee
- Cellular
- NFC
- LoRa





Standard: Based on 802.11n (most common usage in homes today)

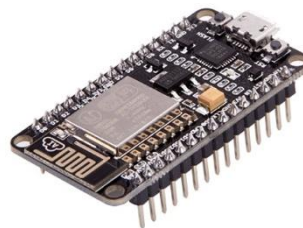
Frequencies: 2.4GHz and 5GHz bands

Range: Approximately 50m

Data Rates: 600 Mbps maximum, but 150-200Mbps is more typical, depending on channel frequency used and number of antennas (latest 802.11-ac standard should offer 500Mbps to 1Gbps)



ESP 01



Nodemcu



Arduino wifi Shield



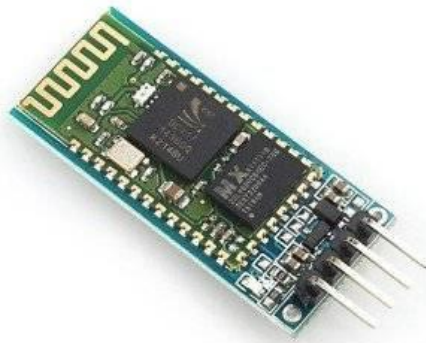
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Standard: Bluetooth 4.2 core specification

Frequency: 2.4GHz (ISM)

Range: 50-150m (Smart/BLE)

Data Rates: 1Mbps (Smart/BLE)



Classic Bluetooth Module



Bluetooth 4.0 Module



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Standard: ZigBee 3.0 based on IEEE802.15.4

Frequency: 2.4GHz

Range: 10-100m

Data Rates: 250kbps





Standard: GSM/GPRS/EDGE (2G), UMTS/HSPA (3G), LTE (4G)

Frequencies: 900/1800/1900/2100MHz

Range: 35km max for GSM; 200km max for HSPA

Data Rates (typical download): 35-170kps (GPRS), 120-384kbps (EDGE), 384Kbps-2Mbps (UMTS), 600kbps-10Mbps (HSPA), 3-10Mbps (LTE)



GSM Module



GSM GPRS GPS Module A7



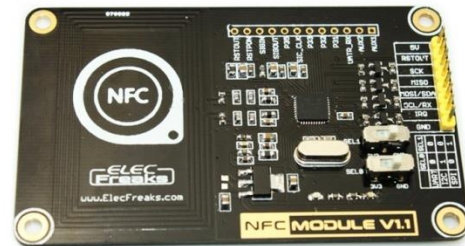
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Standard: ISO/IEC 18000-3

Frequency: 13.56MHz (ISM)

Range: 10cm

Data Rates: 100–420kbps





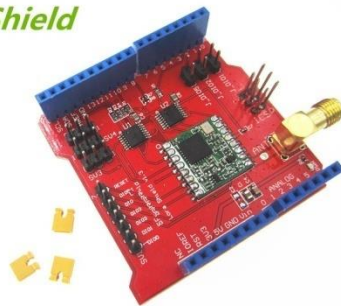
Standard: LoRaWAN

Frequency: Various (433/ 868 / 915 MHz)

Range: 2-5km (urban environment), 15km (suburban environment)

Data Rates: 0.3-50 kbps.

*Lora Shield*



Lora Shield for Arduino

*lora shield HAT 868*



Lora Shield for Raspberry Pi

# Communication

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HTTP

MQTT

WebSockets

CoAP

# 4.Cloud

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Google Cloud



**AWS IoT**



IBM **Bluemix**<sup>™</sup>



Microsoft  
**Azure**



# 5. Challenges

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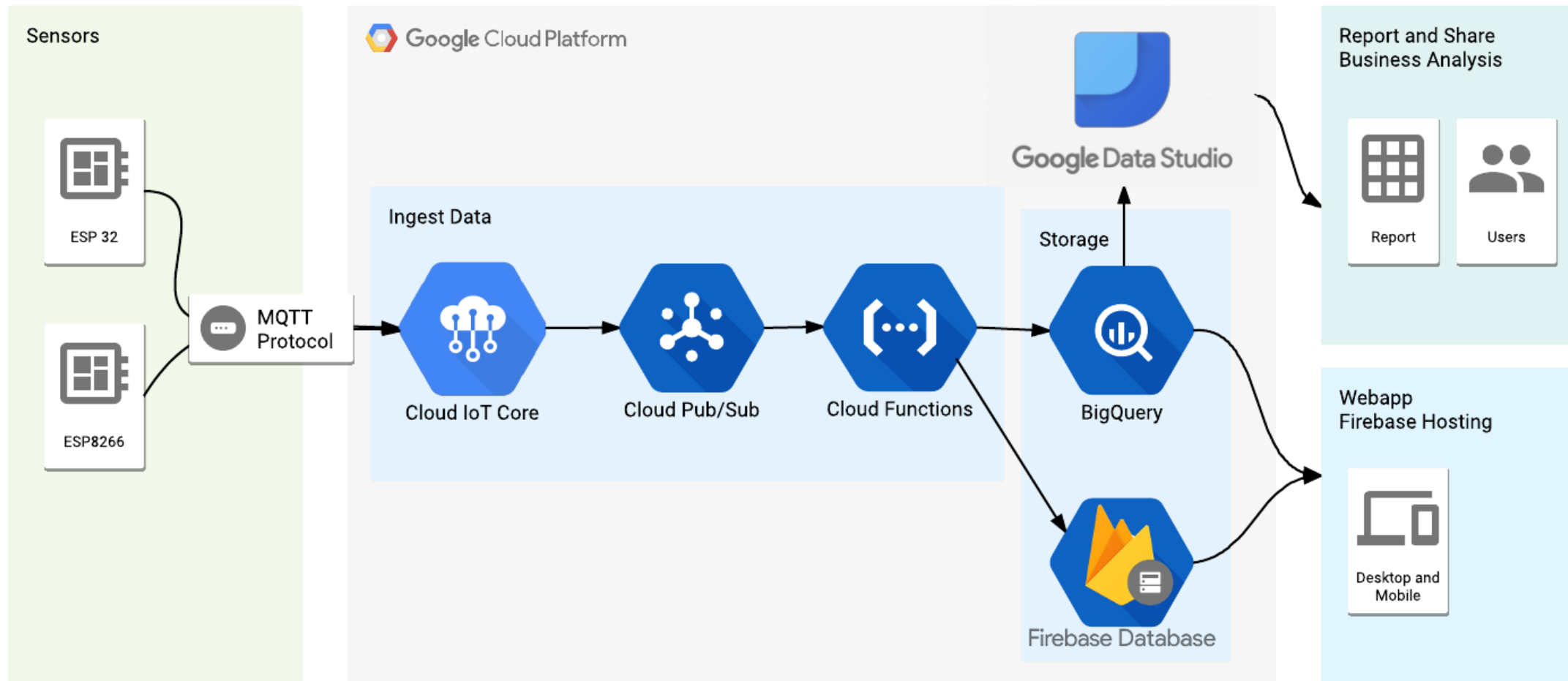
Security

Durability

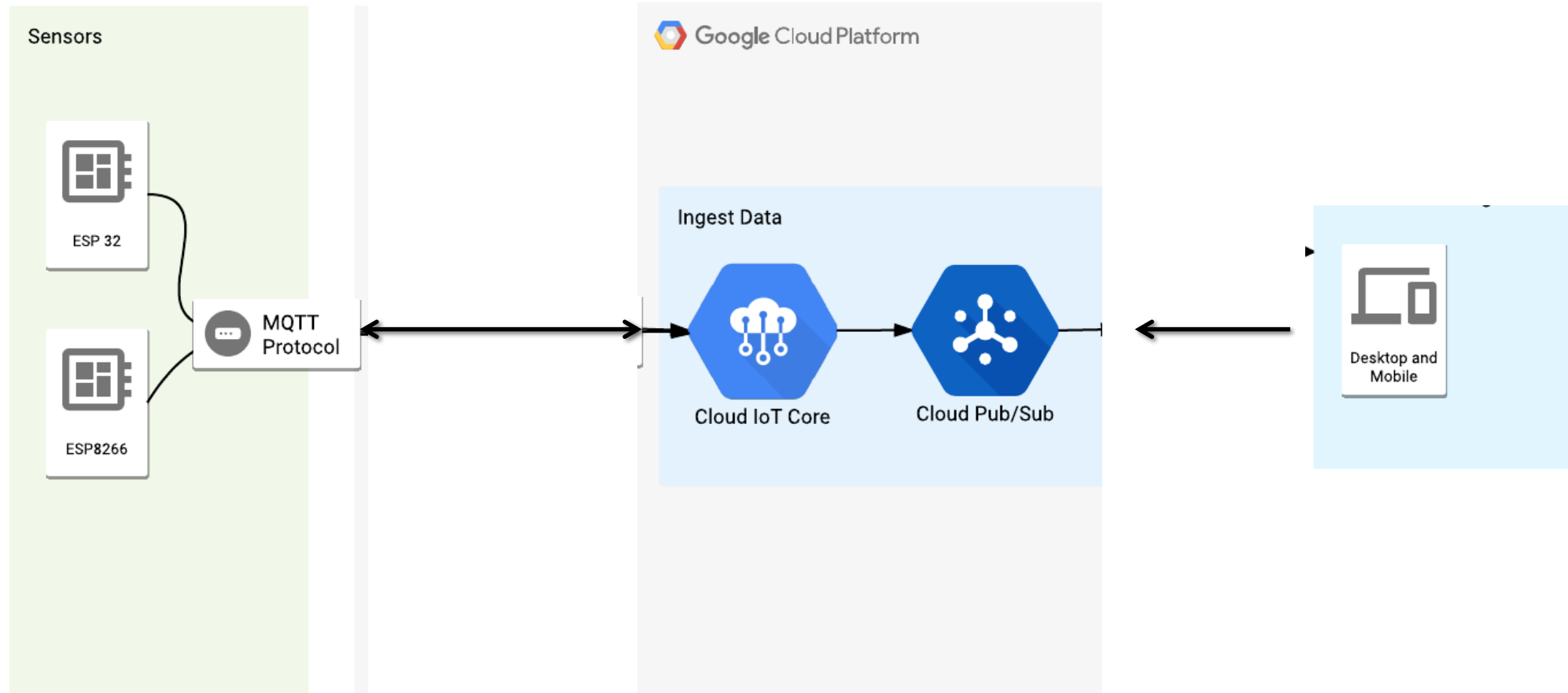
Power Consumption

Interoperability

Reliability



# Demo



# Let's Make Things Smart

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