Welcome to Country

We wish to acknowledge the traditional custodians of the land we are meeting on, the Whadjuk (Perth region) people. We respect their continuing culture and the contribution they make to the life of this city and this region.

This meeting is being held on the traditional lands of the Noongar people. We acknowledge that this meeting is being held on Aboriginal land and recognise the strength, resilience and capacity of Noongar people in this land.

South West Aboriginal Land & Sea Council

Microsoft

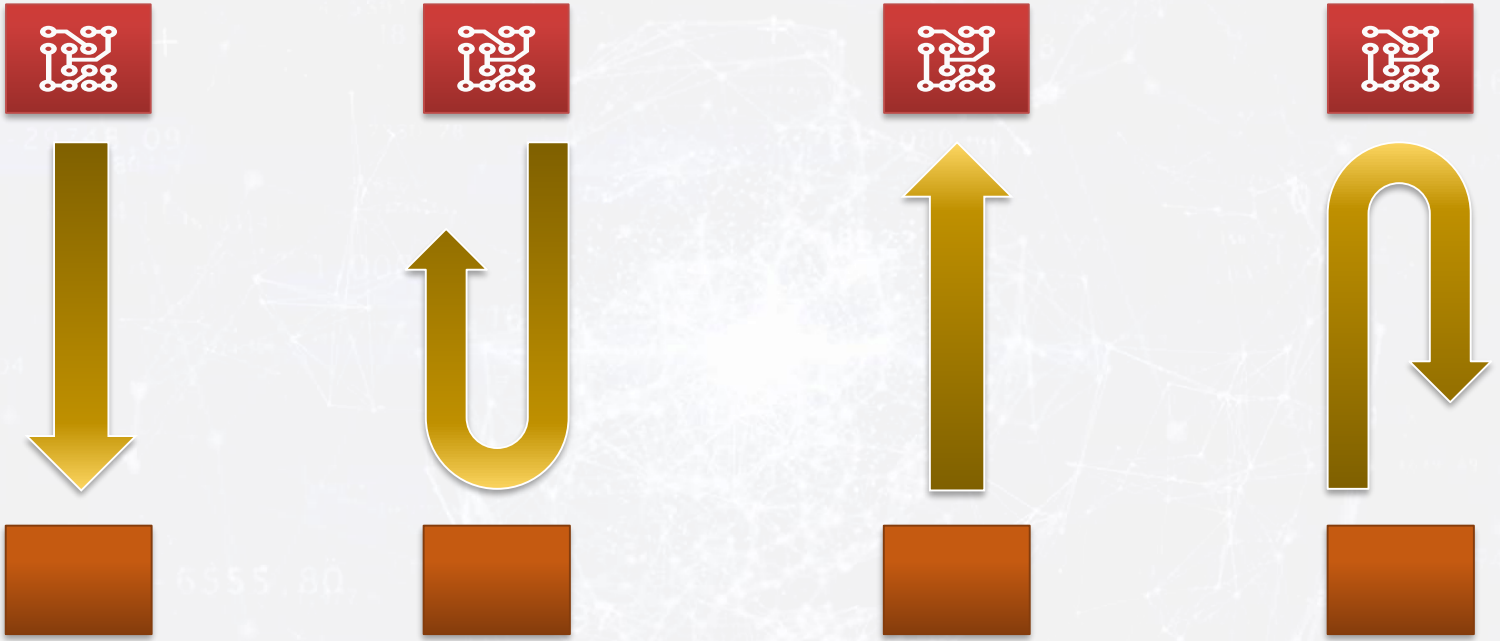
All Things IoT Hub

Martin Abbott
@martinabbott

The IoT challenge

- Devices are often embedded systems, fully automated
- Devices can be in remote or inhospitable locations, where physical access is dangerous
- Once deployed, devices may only be reachable through a backend system
- Devices may have limited power and processing resources requiring wake ups and occasionally on scenarios
- Connectivity may be intermittent, slow, or expensive
- Connectivity may need proprietary, custom, or industry-specific application protocols
- Everyone can suddenly be an electronics engineer and access a range of software platforms

Communication in the IoT



Telemetry Query Notification Command

Event Hub vs IoT Hub

Feature	Event Hub	IoT Hub
Communication patterns	Telemetry	Telemetry, Query, Notification, Command
Protocol Support	AMQP, AMQP over WebSockets, HTTP	As Event Hub but also MQTT and custom protocols through IoT Protocol Gateway
Security	Shared Access Policies	Per device security, SAS, revocation
Scale	Huge scale	Huge scale
SDKs	Many languages supported plus direct AMQP and HTTP interfaces	Many languages supported plus direct AMQP and HTTP interfaces
Monitoring	Aggregated metrics	Extensive list of diagnostic and operational metrics including security and connectivity

IoT Hub walkthrough

- It's about security
  - Service Assisted Communication *
  - Security is paramount (cf. SCADA)
  - Per device security, renewable and revocable
  - Devices registry
  - Per device authentication with SAS token (from device id and device key)
  - Secured via an encrypted channel at the application protocol level (SSL/TLS)
- It's about both directions
  - Devices need to send and receive information
  - IoT Hub maintains device specific queues (inbox / outbox) to store and forward
  - Devices only send and receive to channels they trust and are peered with

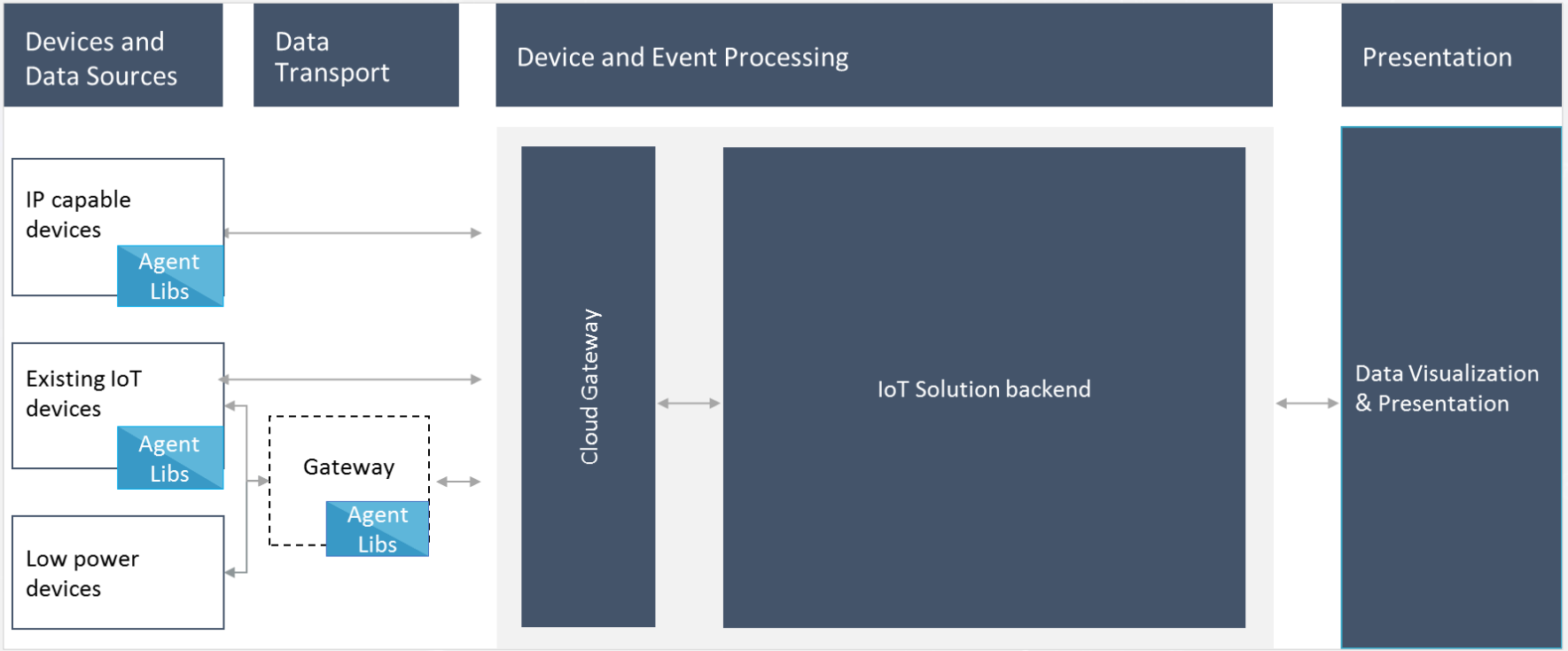
* "Service Assisted Communication" for Connected Devices by Clemens Vasters (@clemensv)

IoT Hub walkthrough

- It's about operations
  - Device identity operations
  - Device telemetry
  - Cloud-to-device commands
  - Connections
- It's about huge scale
  - Pay for what you need (message metering at 4KB, D2C max size 256KB, C2D max size 64KB)
    - S1 with 200 units allows ~1K messages/sec
    - S2 with 200 units allows ~14K messages/sec
  - Switch between plans
  - For more than 200 units contact support
  - Provisioning APIs provide automation
  - Monitoring at scale via Event Hub
  - Think mine sites, smart meters, connected cars and connected cows

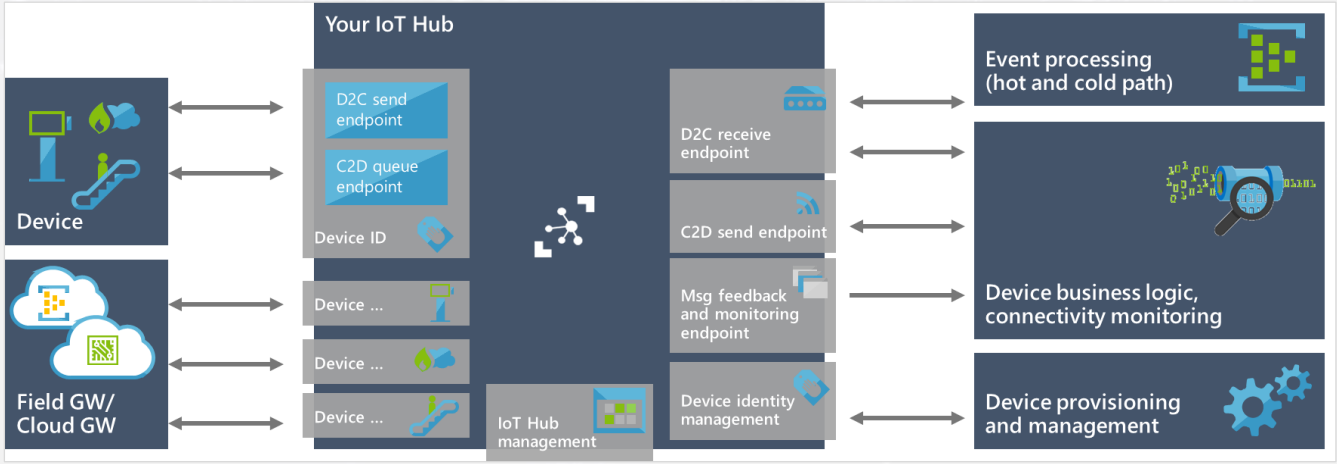
Anatomy of IoT Hub

IoT Hub Reference Architecture



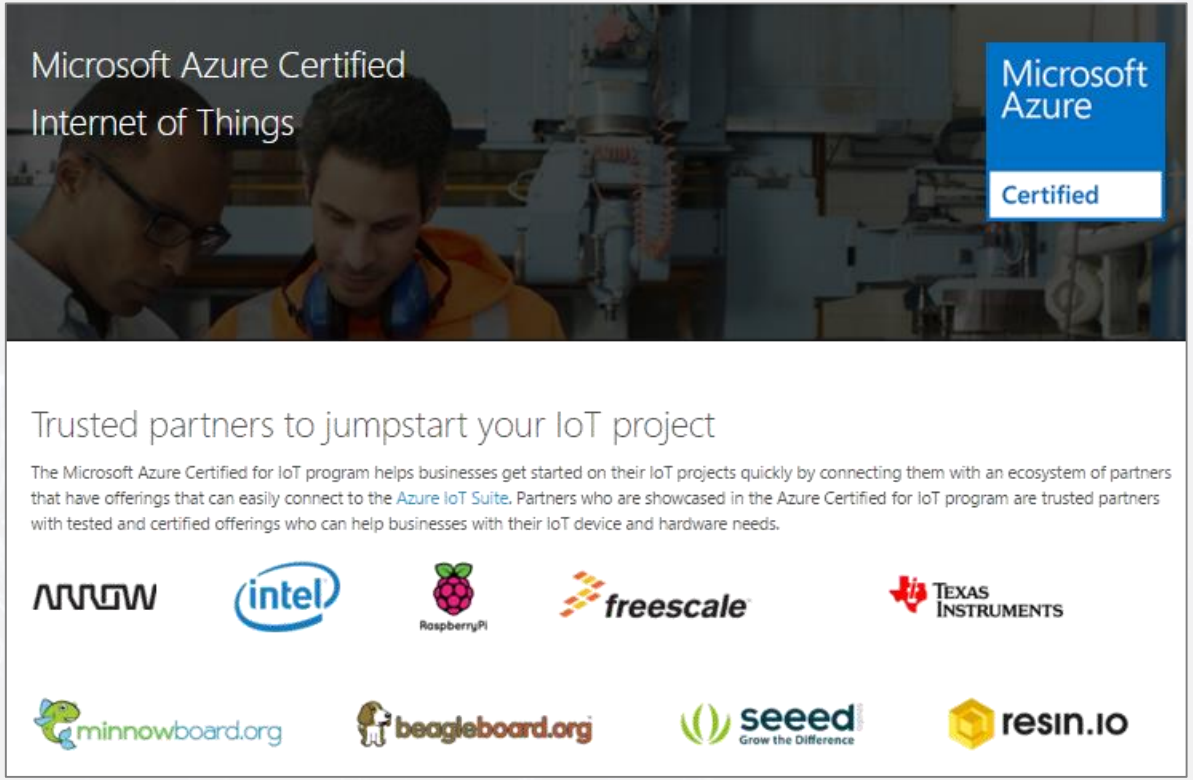
IoT, big data and what to do with it

- Gather it
  - Devices, Field Gateways
- Receive it
  - IoT Hub
- Stream it
  - Azure Stream Analytics
  - Cloud services
- Analyse it
  - Azure Stream Analytics
  - HDInsight and Storm
  - Machine Learning
- React to it
  - WebJobs
  - Logic Apps
- Store it
  - SQL Database
  - DocumentDB
  - Service Fabric Reliable Actors
- Send it
  - IoT Hub



Device, device, device

- Operating Systems
  - Windows 10 IoT Core, .NET, Node.js, Python
  - Linux, Python, Qpid, HTTP
  - Embedded, MQTT
- Platforms
  - Raspberry Pi 2 / 3
  - Grove Pi
  - Arduino and shields
  - Minnowboard Max
  - etc.
- Sensors
- Fritzing



Device Management

- Device management through the Device Registry using RegistryManager class

```
device = await registryManager.AddDeviceAsync(new Device(deviceId));
```

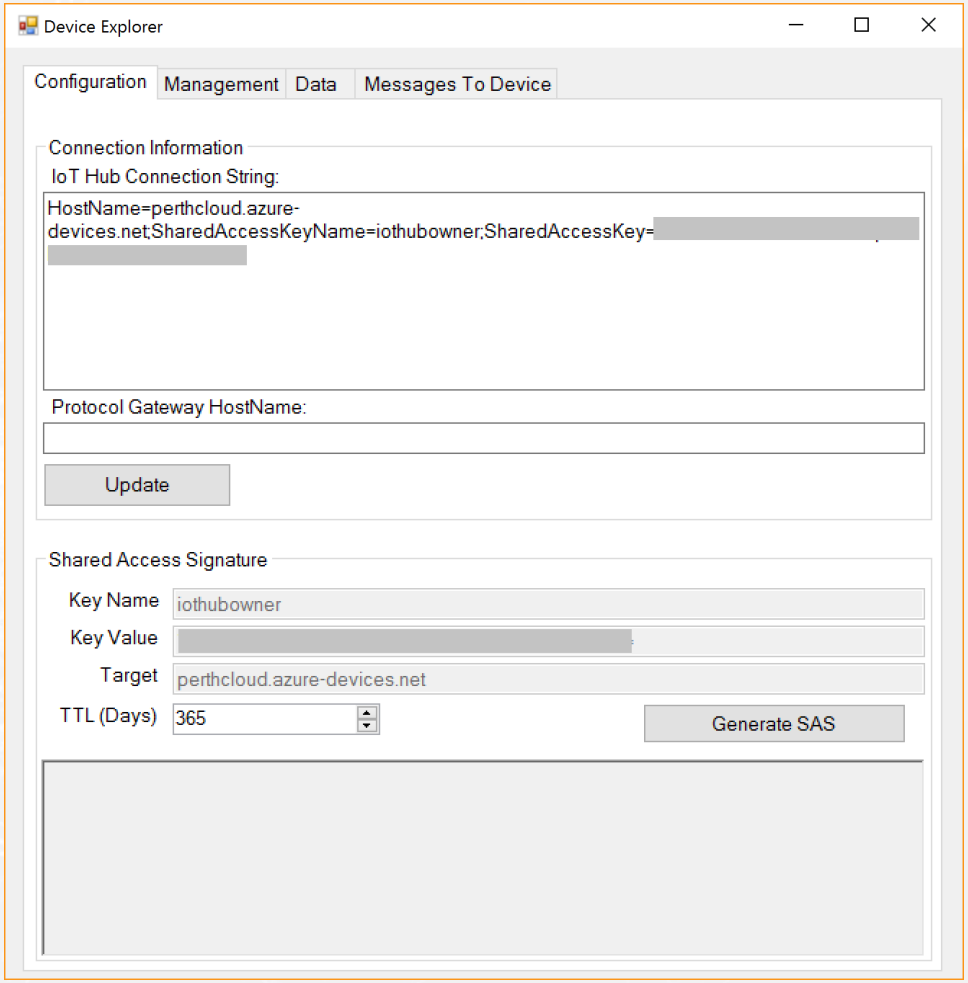
- Bulk import or export the registry to synchronise from or to blob storage

```
importJob = await registryManager.ImportDevicesAsync(containerSasUri,
containerSasUri);
```

- RESTful HTTP API for device management

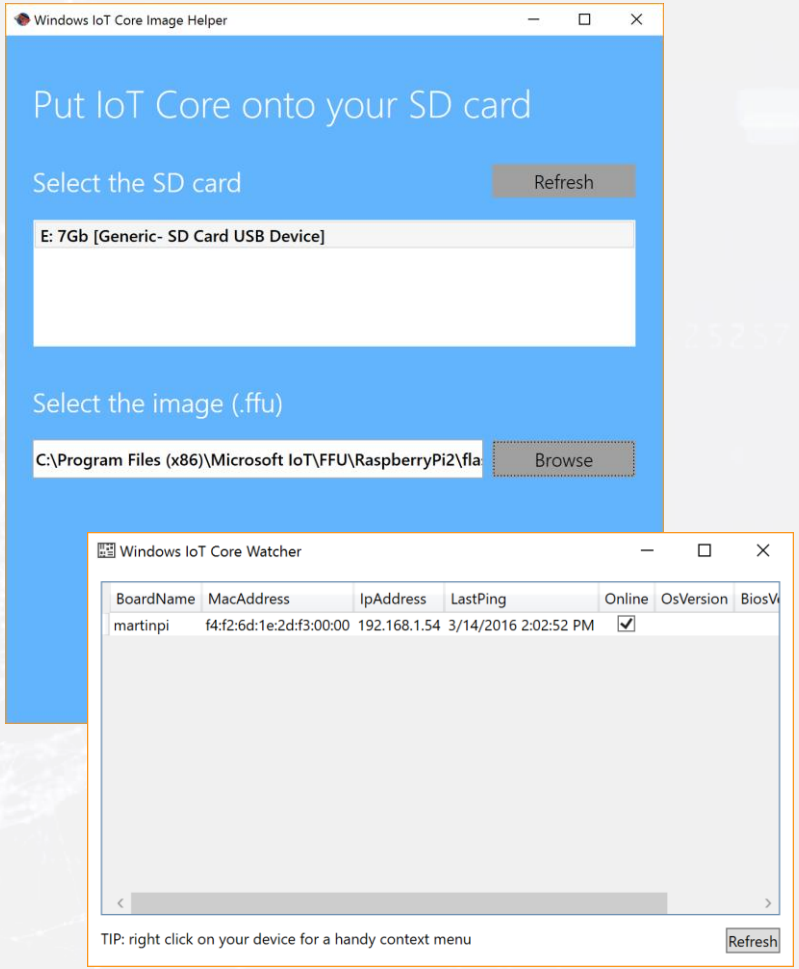
Device Explorer

- Great tool for starting with IoT Hub
- Create and manage devices easily
- Receive data from devices
- Send messages to devices
- Generate SAS keys with a given expiry



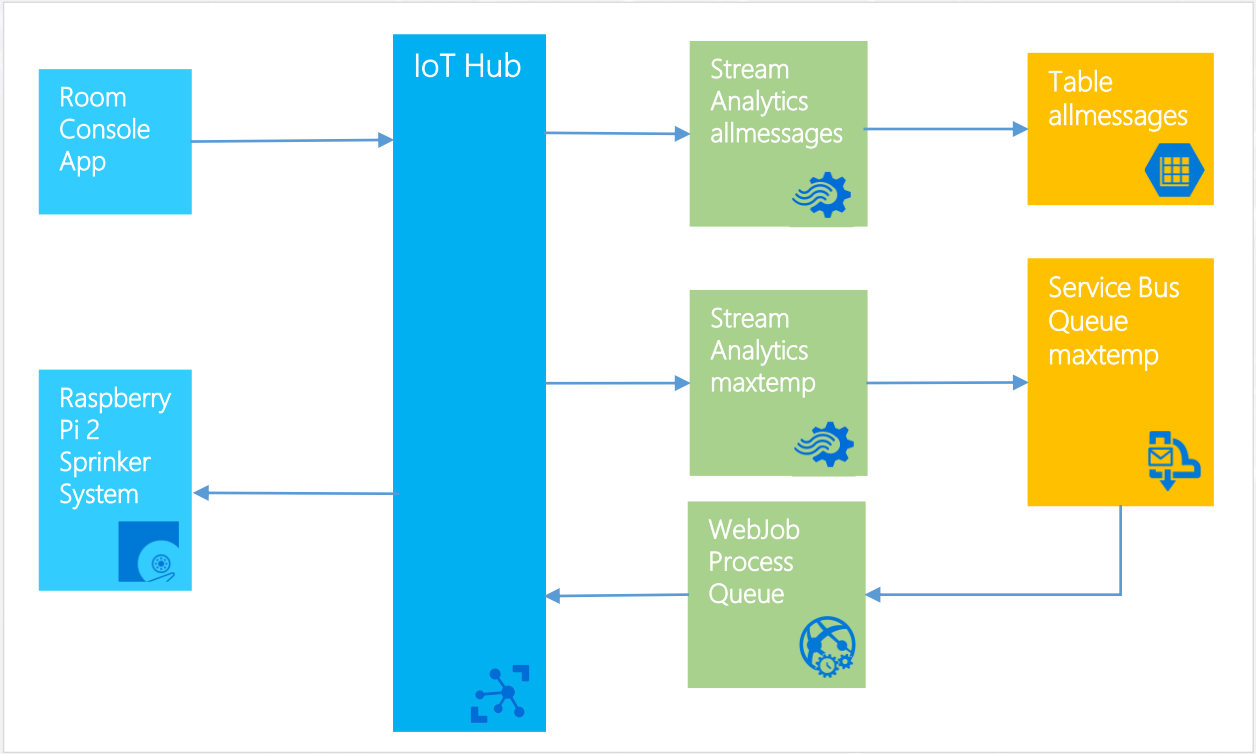
Other useful tools

- For devices
  - Windows 10 IoT Core Dashboard
  - Windows 10 IoT Core Image Helper
  - Windows 10 IoT Core Watcher
  - Web-based access to Windows 10 IoT Core device
- For Visual Studio
  - Connected Service for IoT Hub
    - For device and service templates



Demo architecture

- Building management solution



IoT Hub End-to-End

Azure IoT Suite

Can be hard to know where to start; enter IoT Suite, fully pre-configured solutions

- Remote Monitoring
  - Connect and monitor your devices to analyze untapped data and improve business outcomes by automating processes
- Predictive Maintenance
  - Anticipate maintenance needs and avoid unscheduled downtime by connecting and monitoring your devices
- Full code available on Github
- BEWARE: Charges apply!

IoT Suite

Summary

- IoT is at the top of the hype cycle but more than likely to stay there
  - Billions of devices predicted in the next 10 years
  - Trillions of dollars predicted in the next 10 years
- IoT Hub is Microsoft's answer to large scale ingress and egress of device data
  - Security is paramount
  - Multi-protocol support and direct access via AMQP, HTTP, MQTT
  - Managed SDKs for many languages
  - Platform service, building blocks
- Devices are the unit of IoT, many kits exist so get making!

More information

- Azure IoT Hub : https://azure.microsoft.com/en-us/services/iot-hub/
- Azure IoT Suite : http://www.azureiotsuite.com
- Azure IoT Dev center : http://www.azure.com/iotdev
- Azure IoT SDKs : https://github.com/Azure/azure-iot-sdks
- Azure Certified IoT : https://azure.microsoft.com/en-us/marketplace/certified-iot-program/
- Let's connect : https://azure.microsoft.com/en-us/develop/iot/get-started/
- IoT Protocol Gateway : https://github.com/Azure/azure-iot-protocol-gateway


Thank you!