



# Azure IoT

## Complete Cloud Offerings for the IoT Revolution

Presenter Name

Title

Contact Info

# Topics Covered

The IoT Revolution

Our Industry Leading IoT Offerings

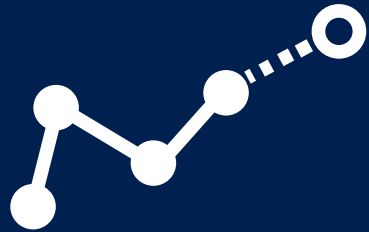
New Offering Announcements

# The IoT Revolution

# IoT is the Next Revolution



Hardware  
is Cheap



Connectivity  
is Pervasive



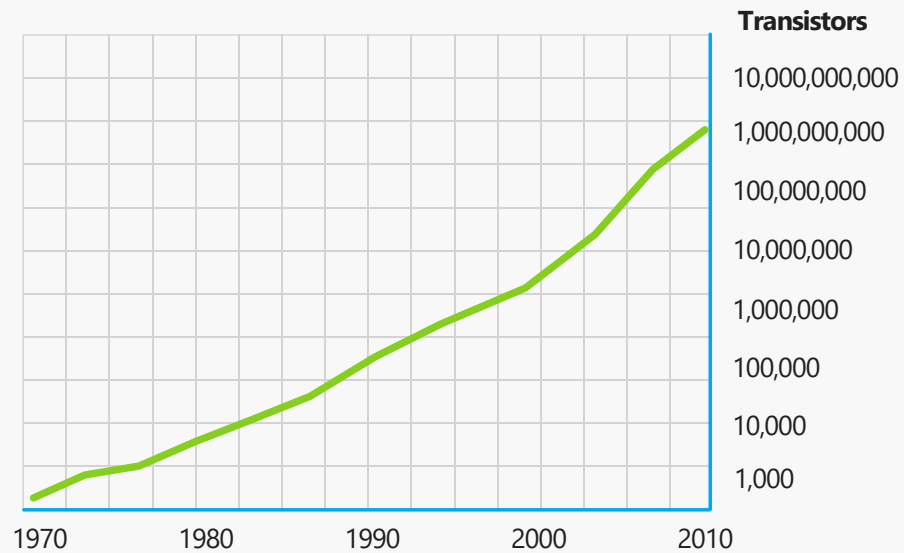
Development  
is Easy



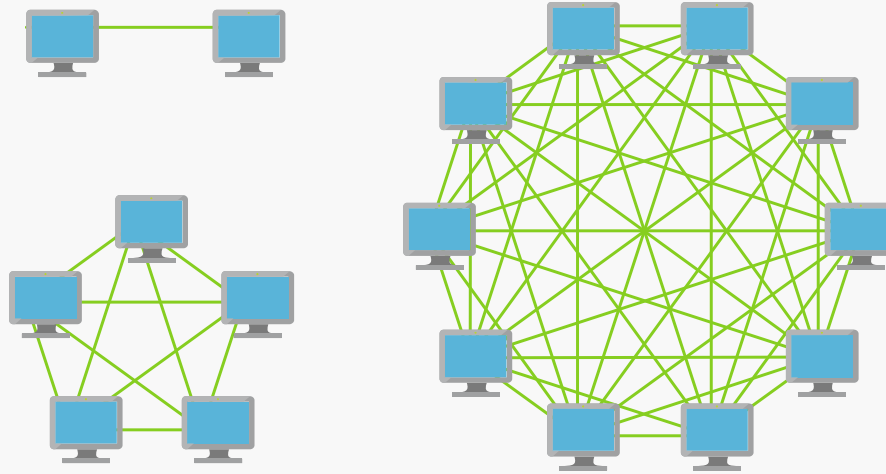
New Innovative  
Scenarios

# The IoT Revolution

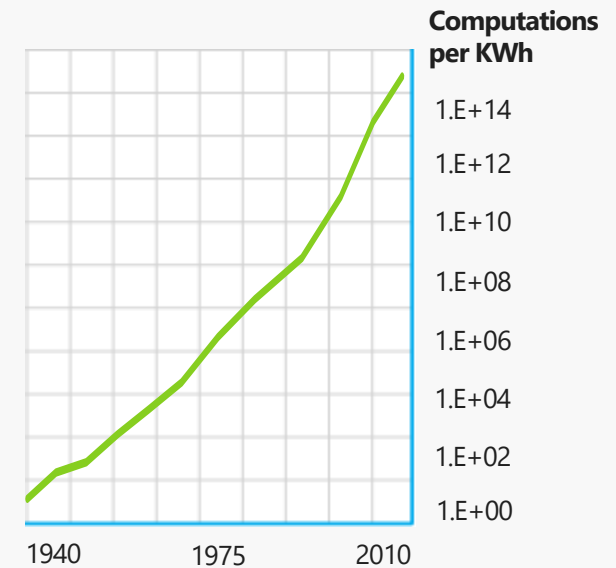
## Moore's Law



## Metcalf's Law



## Koomey's Law



And more importantly:

*What can you do by combining and analyzing signals from all of these IoT devices?*

# Harnessing the IoT Revolution

What if my things could tell me when they go someplace they shouldn't?

What if I could use device telemetry to improve next generation devices?

**It all starts with a great idea...**

What if I knew when my things were going to break before they did?

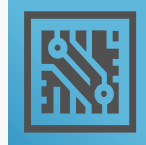
What insights could I find from *all* of my devices?

What if I simply knew where my things were?

What if I could tell when it's the best time for my things to \_\_\_\_\_ ?

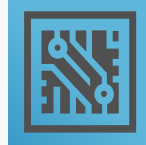
# Harnessing the IoT Revolution

Next comes a device...



# Harnessing the IoT Revolution

And data from that device...

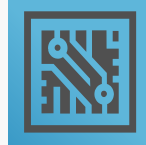


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# Harnessing the IoT Revolution

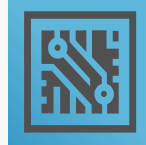
And securing the device...



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# Harnessing the IoT Revolution

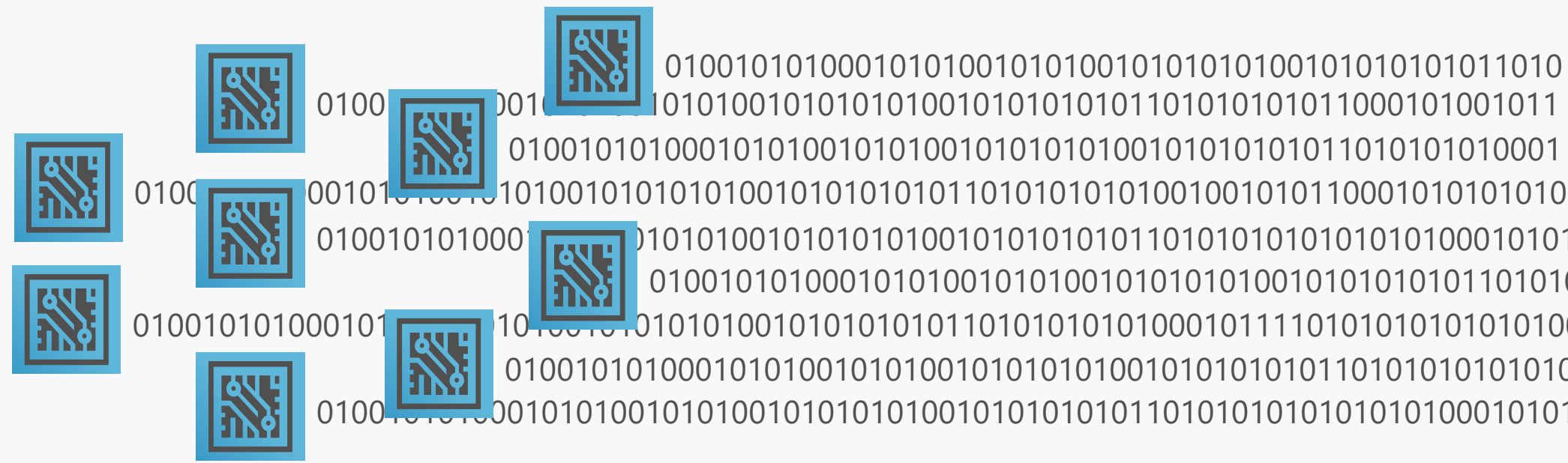
And insights from that data...



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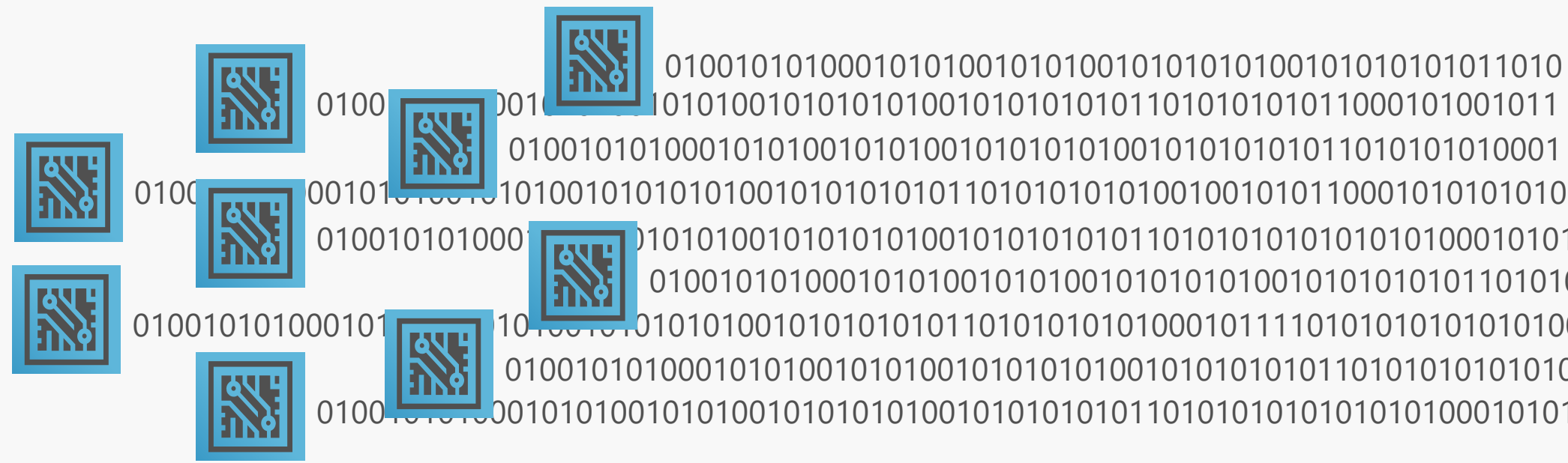
# Harnessing the IoT Revolution

Then lots of devices and data...



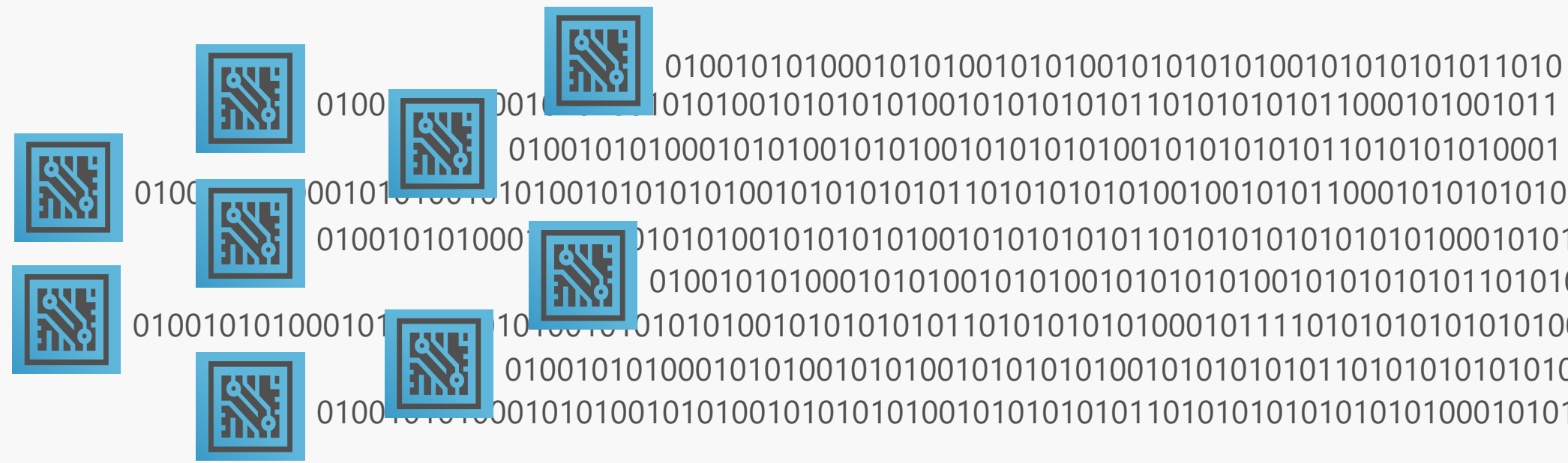
# Harnessing the IoT Revolution

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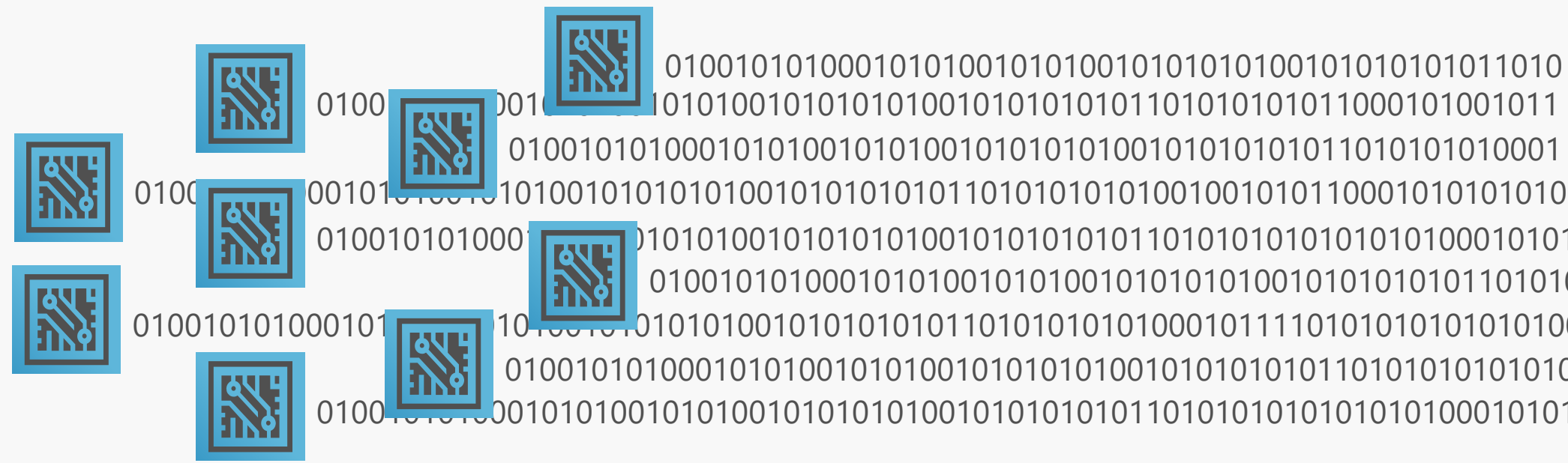
# Harnessing the IoT Revolution

Then monitoring their data in real time...



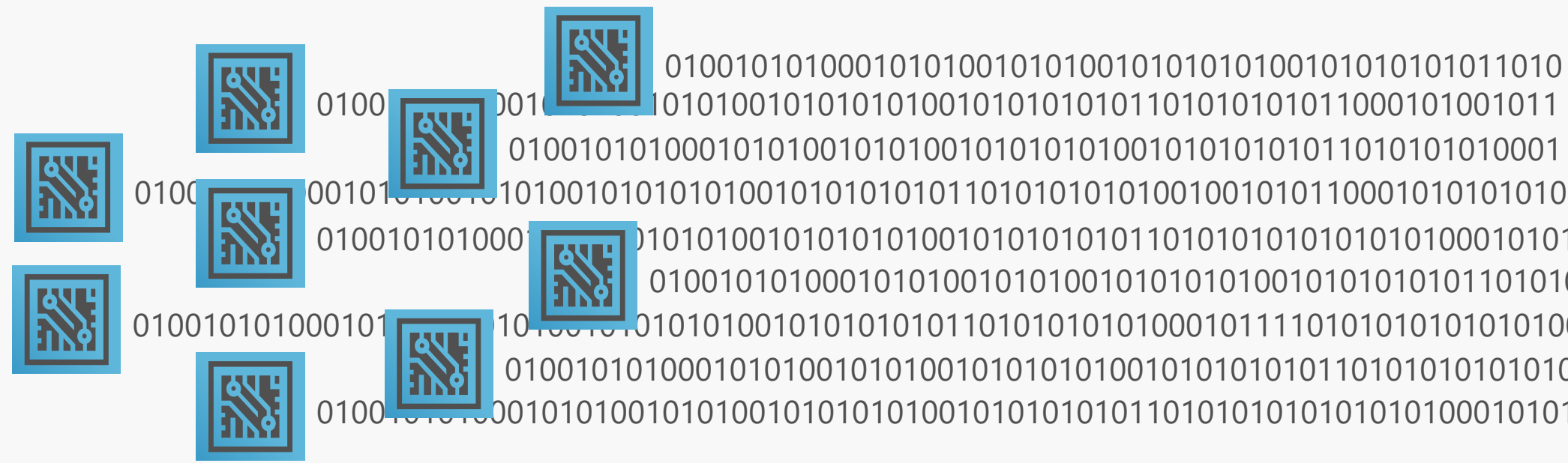
# Harnessing the IoT Revolution

Then looking for patterns and insights in the data over time...



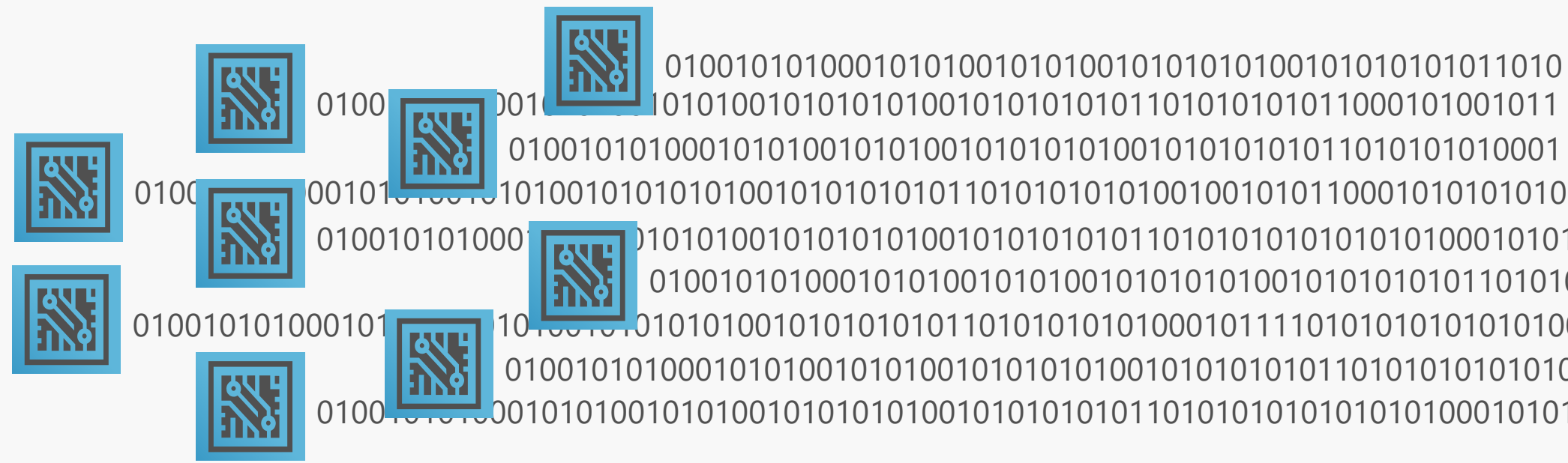
# Harnessing the IoT Revolution

Then managing and updating the software on these devices...



# Harnessing the IoT Revolution

And visualizing and managing all of these services...





# Harnessing the IoT Revolution

IoT can get complicated quickly

And that's where Azure comes in

# Our Industry Leading IoT Offerings

# Azure Services for IoT



## Azure IoT Hub

Connect, secure, communicate, monitor and manage billions of devices



## Azure Stream Analytics

Real time stream processing for billions of IoT devices



## Azure Storage

Blob, SQL, DocumentDB, Data Lake. Storage to meet every need at the scale of IoT



## Azure App Service

Web and mobile apps for any platform on any device



## Power BI

Dashboards and data connectors to visualize any data



## Logic Apps

Powerful workflows to automate business processes

And More...

Platform Services

Security & Management

- Portal
- Azure Active Directory
- Azure AD B2C
- Multi-Factor Authentication
- Automation
- Scheduler
- Key Vault
- Store/ Marketplace
- VM Image Gallery & VM Depot

Services Compute

- Cloud Services
- Service Fabric
- Batch
- RemoteApp

Integration

- Storage Queues
- BizTalk Services
- Hybrid Connections
- Service Bus

Media & CDN

- Media Services
- Content Delivery Network (CDN)

Web and Mobile

- Web Apps
- API Apps
- Mobile Apps
- Logic Apps
- API Management
- Notification Hubs

Developer Services

- Visual Studio
- Azure SDK
- VS Online
- App Insights

Data

- SQL Database
- Data Warehouse
- DocumentDB
- Redis Cache
- Azure Search
- Storage Tables

Analytics & IoT

- HDInsight
- Machine Learning
- Stream Analytics
- Data Lake
- Data Factory
- Event Hubs
- Data Catalog
- IoT Hub
- Mobile Engagement

Hybrid Operations

- Azure AD Health Monitoring
- AD Privileged Identity Management
- Domain Services
- Backup
- Operational Analytics
- Import/Export
- Azure Site Recovery
- StorSimple

Infrastructure Services

OS/Server Compute

- Virtual Machines
- Container Service

Storage

- BLOB Storage
- Azure Files
- Premium Storage

Networking

- Virtual Network
- Load Balancer
- DNS
- Express Route
- Traffic Manager
- VPN Gateway
- App Gateway

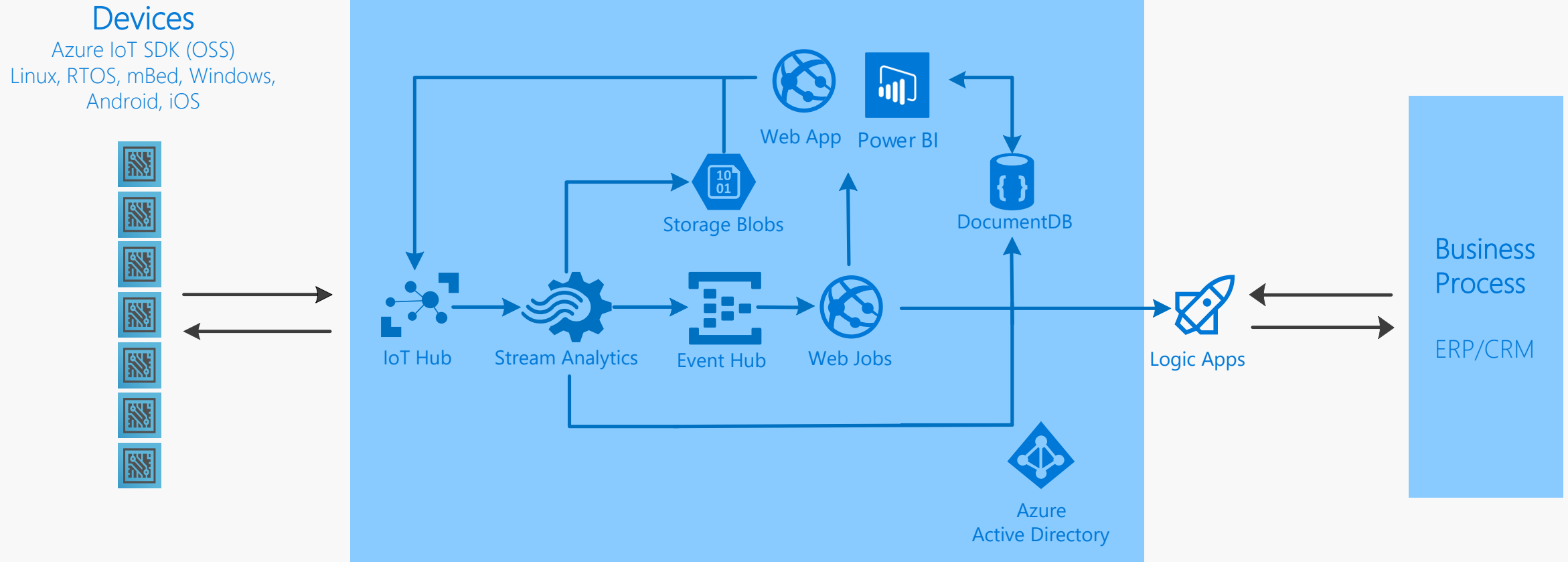
Datacenter Infrastructure (30 Regions, 22 Online)



Wouldn't it be great if someone assembled this for you?

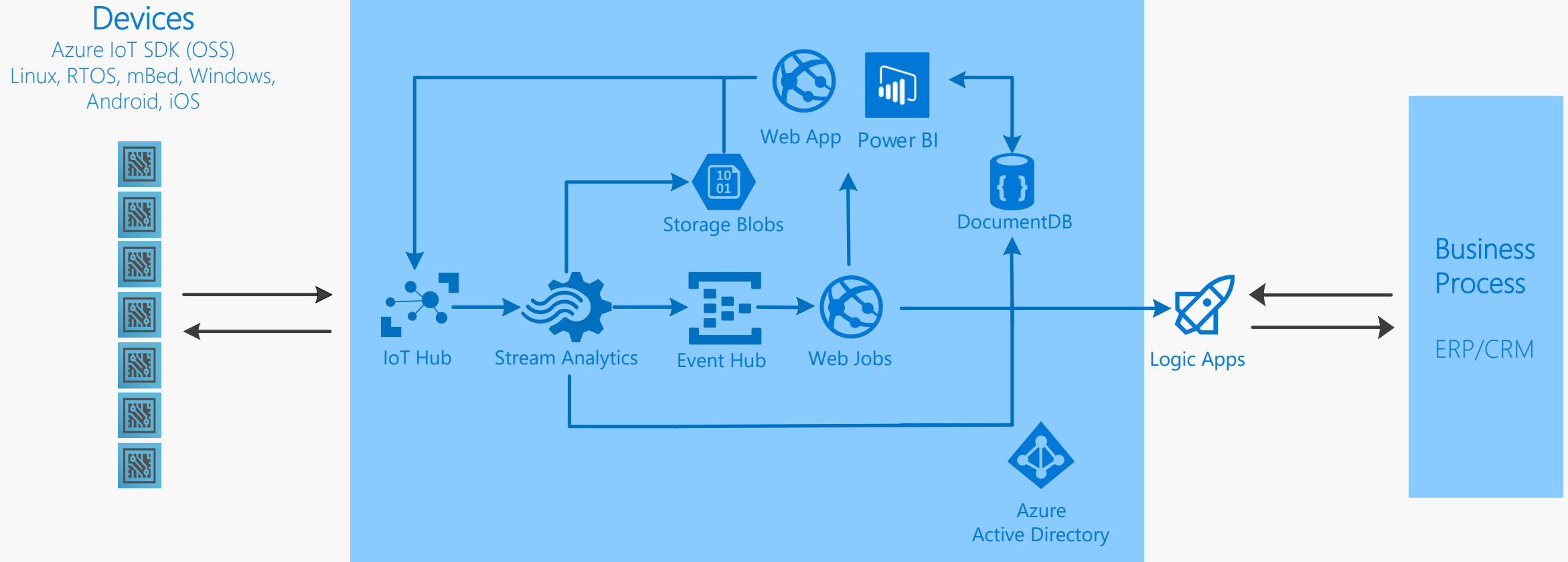
# Azure IoT Suite

Get started in minutes & customize to meet your needs



# Azure IoT Suite

## Remote Monitoring Service Architecture



# Azure IoT Hub

## Designed for IoT

Connectivity, Security & Management for billions of devices

## Service Assisted Communications

Devices are not servers

Use IoT Hub to enable secure bi-directional communications

## Cloud Scale Messaging

Device-to-cloud and Cloud-to-device

Durable message inbox/outbox per device

## Monitor Devices

Delivery receipts, expired messages

Device communication errors

## Per-Device Authentication

Individual device identities and credentials

## Connection Multiplexing

Single device-cloud connection for all communications  
(device-to-cloud, cloud-to-device)

## Multi-Protocol

Natively supports AMQPS, HTTPS, MQTT

Extensible protocol support for custom protocol needs

## Multi-Platform

Device SDKs available for multiple platforms

RTOS, Linux, Windows, iOS, Android

Service SDK supports multiple languages (Node, Java, C#)



# Azure IoT Device SDK

## Open Source

Everything is on GitHub, open source under MIT license

## Cross-Platform Support

RTOS, Linux, Windows, iOS, Android

## Multi-Language Support

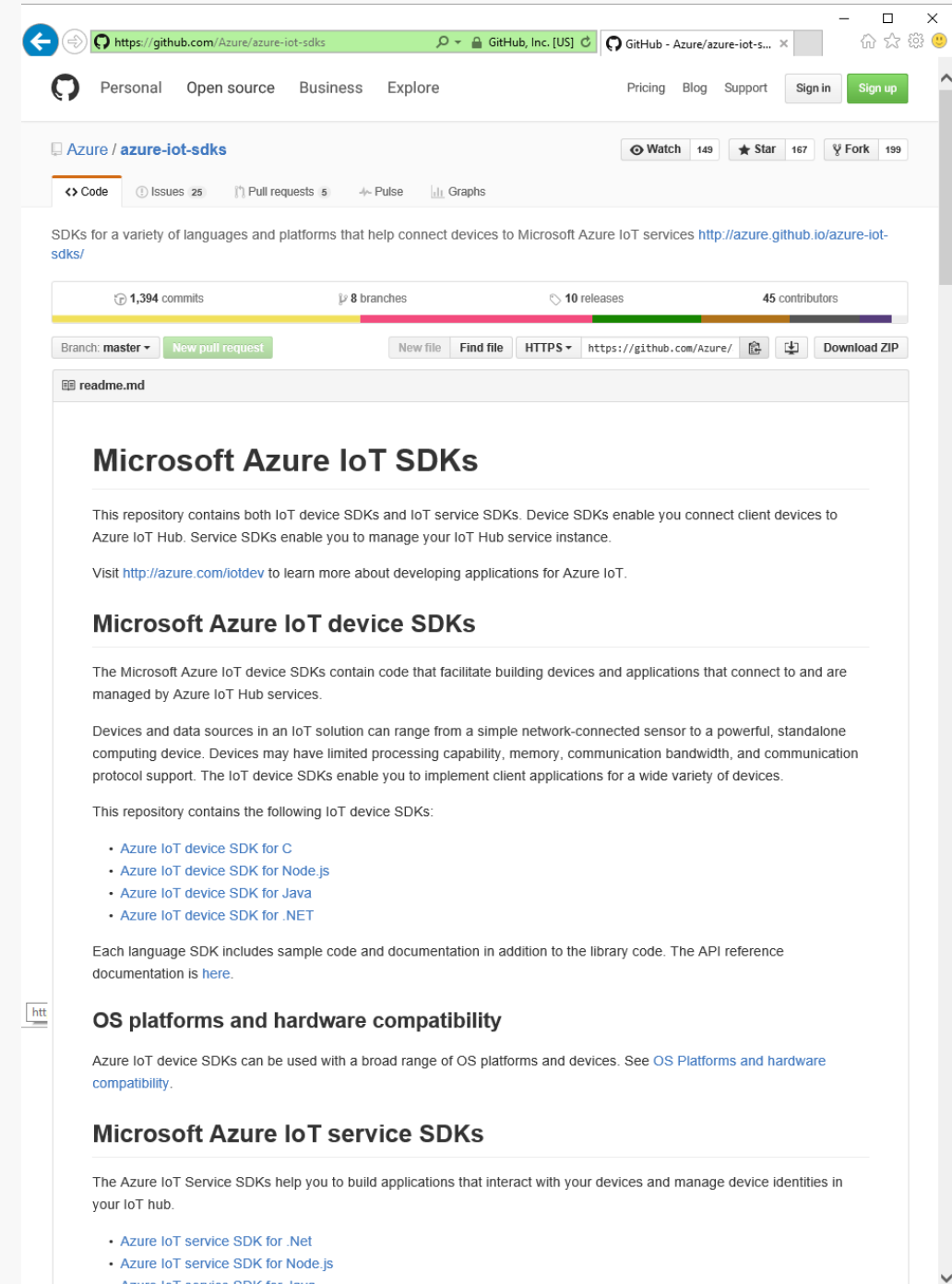
C, Node.js, Java, C#, Python

## Xamarin Compatible

Includes Xamarin compatible libraries

## Easy To Get Started

Samples, walkthroughs to get you started quickly



The screenshot shows the GitHub repository page for 'Azure / azure-iot-sdks'. The repository is open source, licensed under MIT, and has 1,394 commits, 8 branches, 10 releases, and 45 contributors. The README file is displayed, titled 'Microsoft Azure IoT SDKs'. It explains that the repository contains both IoT device SDKs and IoT service SDKs. Device SDKs enable connecting client devices to Azure IoT Hub, while service SDKs enable managing IoT Hub service instances. A link to 'http://azure.github.io/azure-iot-sdks/' is provided. The README also lists the following IoT device SDKs: Azure IoT device SDK for C, Azure IoT device SDK for Node.js, Azure IoT device SDK for Java, and Azure IoT device SDK for .NET. It mentions that each language SDK includes sample code and documentation, with a link to the API reference documentation. The README also includes a section on 'OS platforms and hardware compatibility', stating that the SDKs can be used with a broad range of OS platforms and devices, with a link to 'OS Platforms and hardware compatibility'. Finally, it lists the following IoT service SDKs: Azure IoT service SDK for .Net, Azure IoT service SDK for Node.js, and Azure IoT service SDK for Java.

https://github.com/Azure/azure-iot-sdks

Personal Open source Business Explore Pricing Blog Support Sign in Sign up

Azure / **azure-iot-sdks** Watch 149 Star 167 Fork 199

Code Issues 25 Pull requests 5 Pulse Graphs

SDKs for a variety of languages and platforms that help connect devices to Microsoft Azure IoT services <http://azure.github.io/azure-iot-sdks/>

1,394 commits 8 branches 10 releases 45 contributors

Branch: master New pull request New file Find file HTTPS https://github.com/Azure/ Download ZIP

readme.md

### Microsoft Azure IoT SDKs

This repository contains both IoT device SDKs and IoT service SDKs. Device SDKs enable you connect client devices to Azure IoT Hub. Service SDKs enable you to manage your IoT Hub service instance.

Visit <http://azure.com/iotdev> to learn more about developing applications for Azure IoT.

### Microsoft Azure IoT device SDKs

The Microsoft Azure IoT device SDKs contain code that facilitate building devices and applications that connect to and are managed by Azure IoT Hub services.

Devices and data sources in an IoT solution can range from a simple network-connected sensor to a powerful, standalone computing device. Devices may have limited processing capability, memory, communication bandwidth, and communication protocol support. The IoT device SDKs enable you to implement client applications for a wide variety of devices.

This repository contains the following IoT device SDKs:

- [Azure IoT device SDK for C](#)
- [Azure IoT device SDK for Node.js](#)
- [Azure IoT device SDK for Java](#)
- [Azure IoT device SDK for .NET](#)

Each language SDK includes sample code and documentation in addition to the library code. The API reference documentation is [here](#).

### OS platforms and hardware compatibility

Azure IoT device SDKs can be used with a broad range of OS platforms and devices. See [OS Platforms and hardware compatibility](#).

### Microsoft Azure IoT service SDKs

The Azure IoT Service SDKs help you to build applications that interact with your devices and manage device identities in your IoT hub.

- [Azure IoT service SDK for .Net](#)
- [Azure IoT service SDK for Node.js](#)
- [Azure IoT service SDK for Java](#)

# Azure Certified for IoT

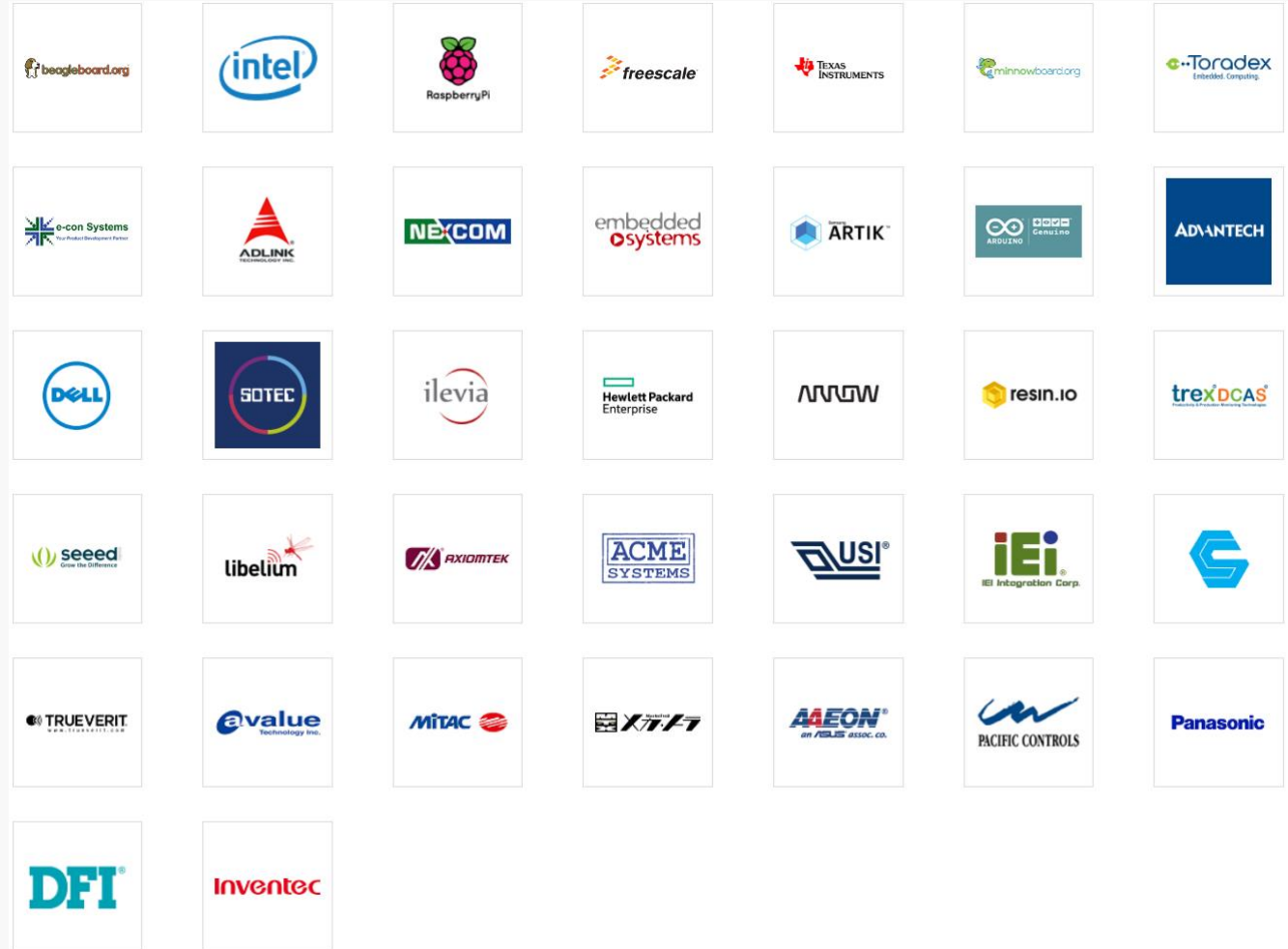
## Certified to Work Great with Azure IoT

Operating systems & devices

## Over 50 Partners & Growing

## Azure IoT Device SDK Supports Even More!

Azure IoT Device SDK supports more than Azure Certified for IoT and is easy to adapt to new devices and operating systems



# New Offering Announcements

# New Offering Announcements

## Azure IoT Hub Device Management

Update firmware, software, configuration on *any* device running *any* operating system  
Organize and update devices based on hierarchical topologies

## Azure IoT Gateway SDK

Cross platform middleware for field gateways  
Connect, manage and monitor multiple devices  
Protocol translation & data normalization

## Azure IoT Starter Kits

5 new kits to get started quickly

## New Region Availability

# Azure IoT Hub Device Management

## Update Software, Firmware, Configuration

Going beyond simple 'Create, Remove, Update and Delete' for devices

Fully extensible - works on any device running any operating system or firmware

## Standards Based

Based on OMA LWM2M

## Manage Devices The Way You Want

Group devices into custom topologies

Update devices based on sub-sections of that topology

Role based access control

## Enables IT/OT Coordination

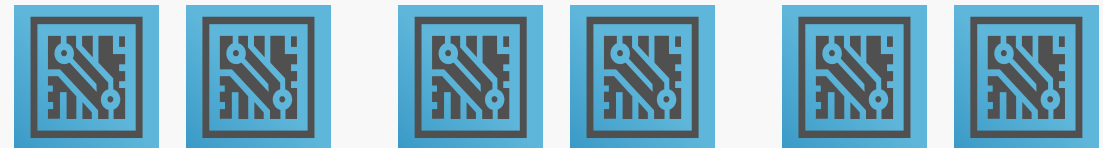
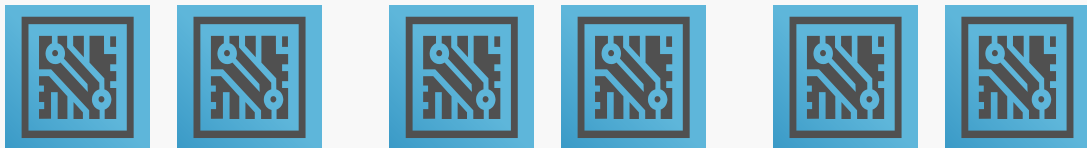
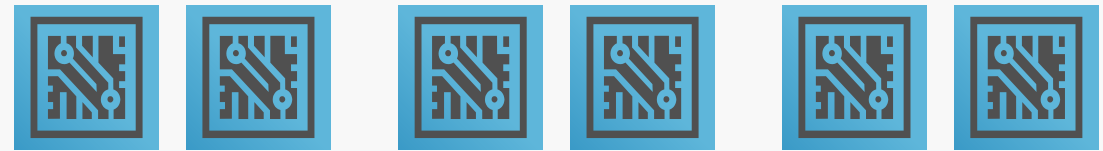
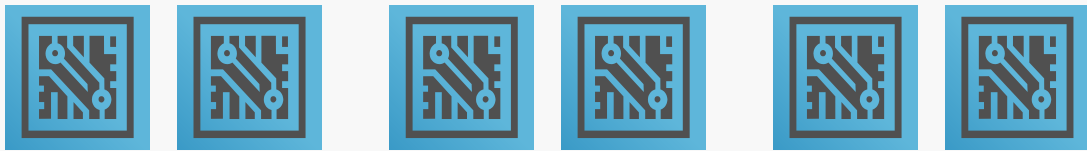
OT is responsible for keeping things running, IT is responsible for keeping things secure

IoT requires IT/OT coordination

# Azure IoT Hub – Device Topology Support

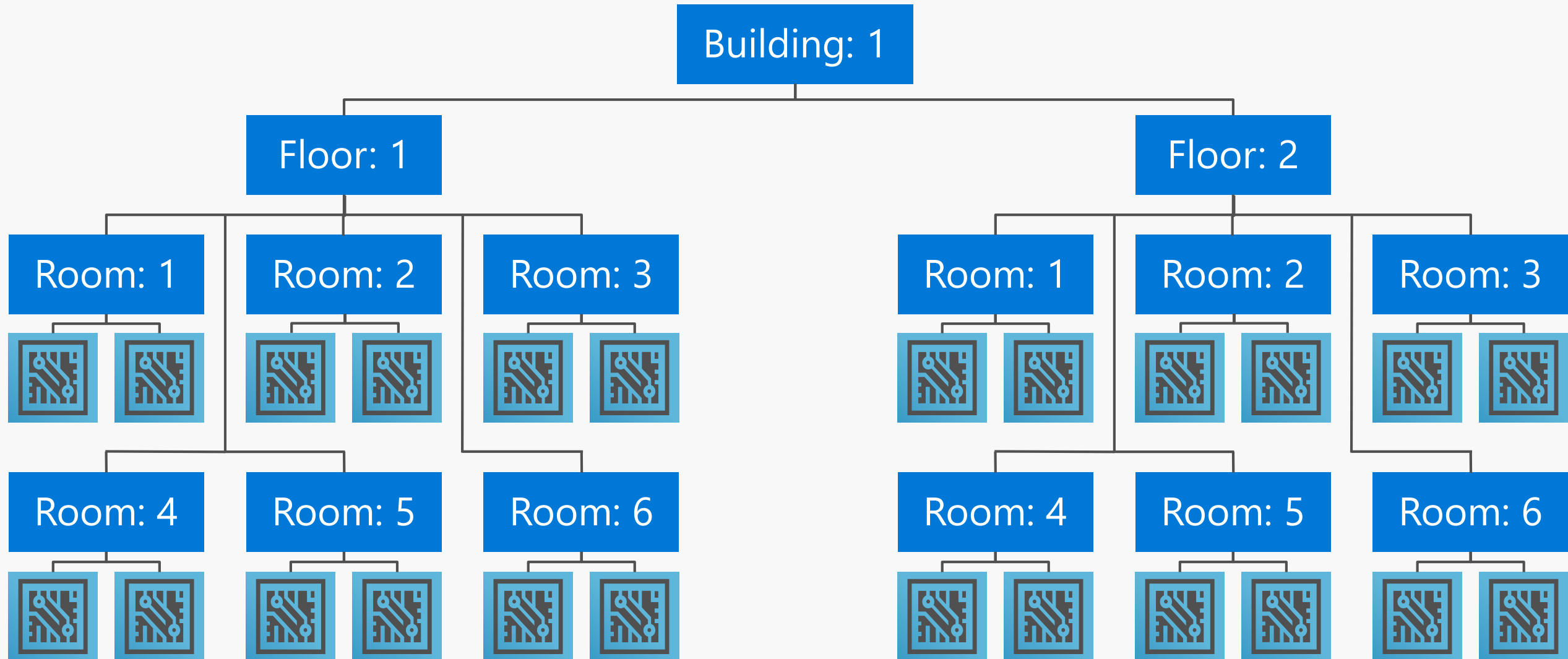
## Group & Manage Devices Based On Your Scenario

Example: Building Management



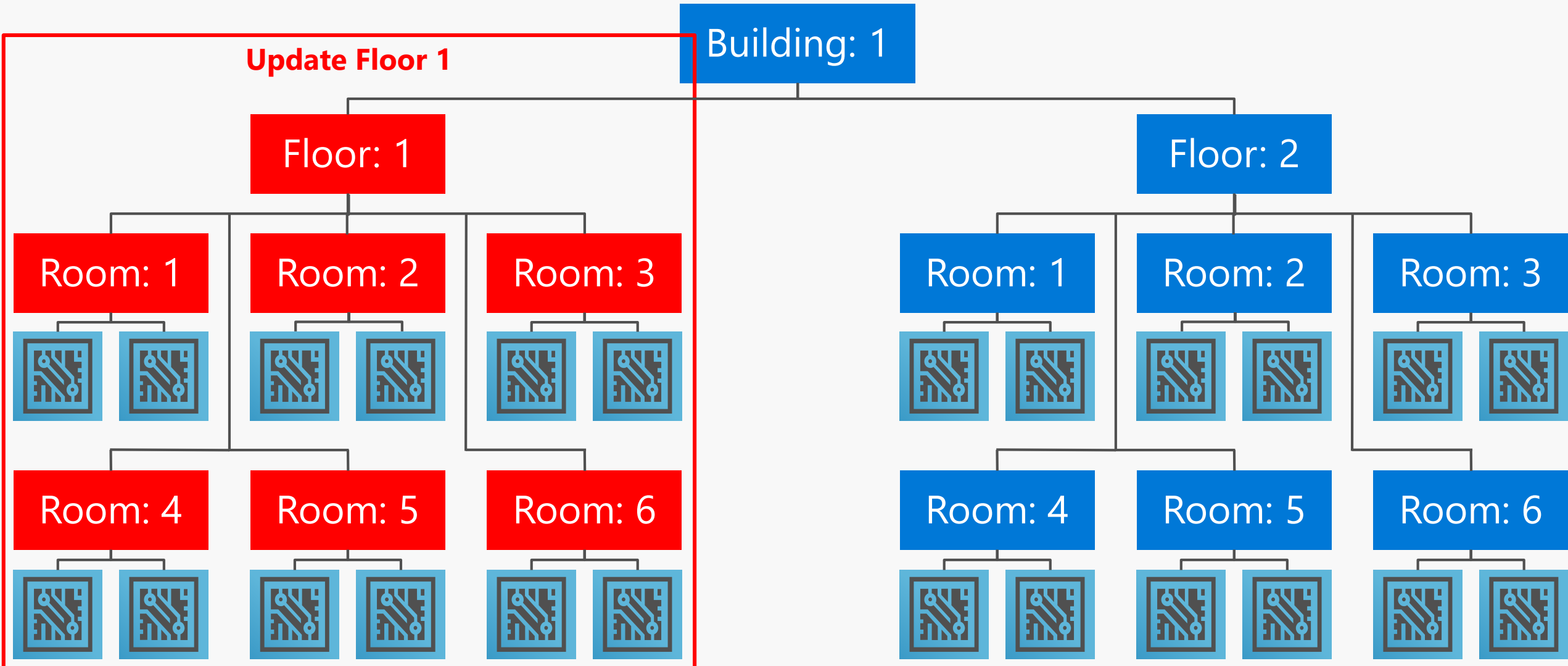
# Azure IoT Hub – Device Topology Support

## Group & Manage Devices Based On Your Scenario



# Azure IoT Hub – Device Topology Support

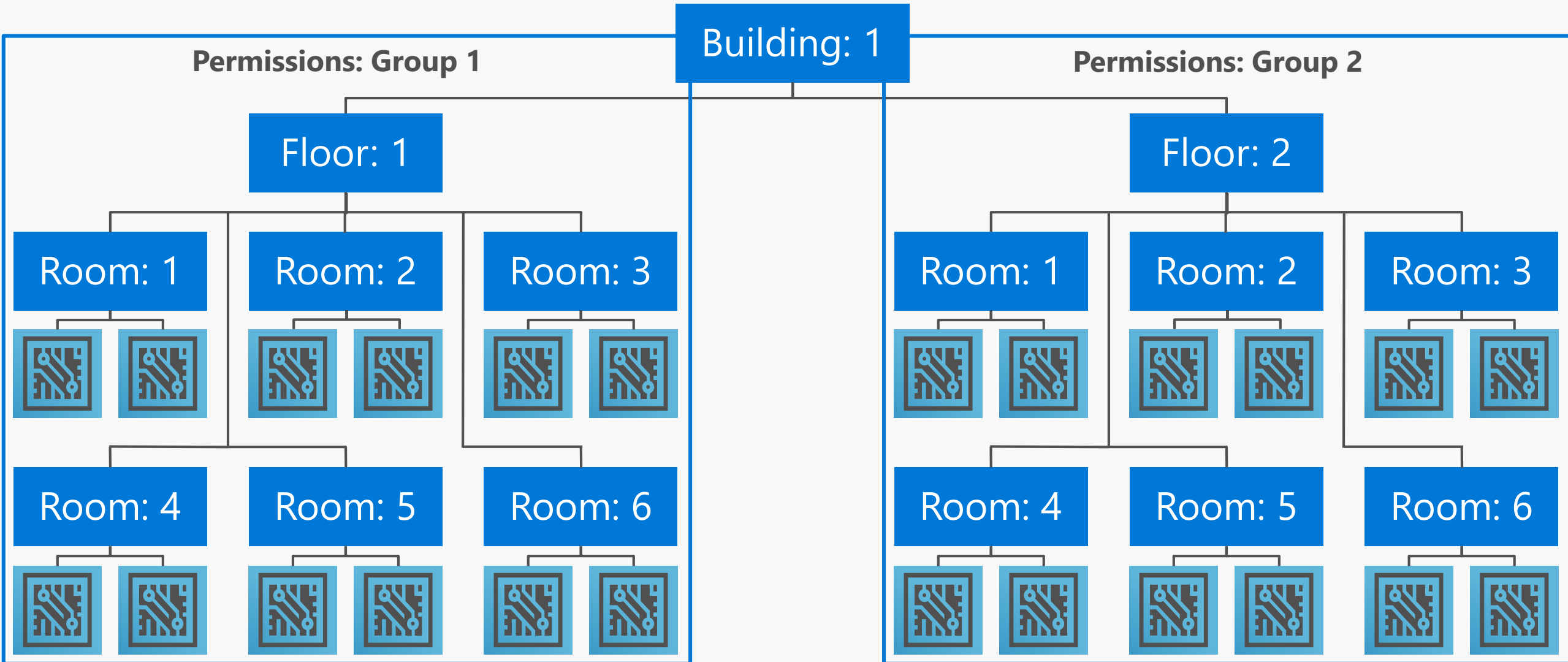
## Update Devices Based on Sub-Topologies





# Azure IoT Hub – Device Topology Support

## Create Permissions Groups Based on Device Topology



# Azure IoT Hub Device Management

## Enroll Devices

Enroll devices and determine properties and available operations

## Organize Devices

Group & manage based on your scenario

Role based access to sub-groups

## Maintain Devices

Update software, firmware, configuration using “device jobs”

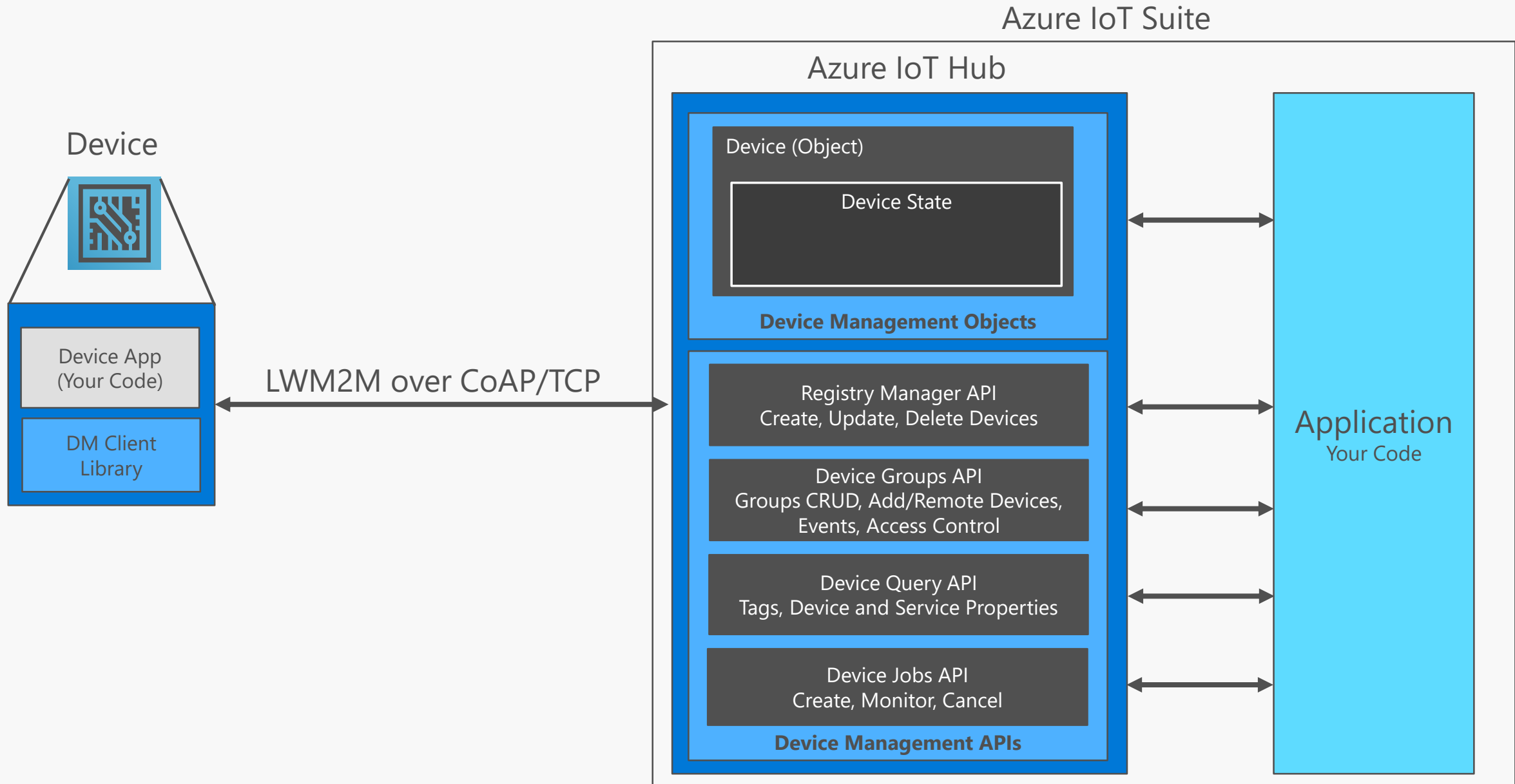
Operators can monitor device health and signal when it is safe to update devices

IT can update and rollback during maintenance windows

## Decommission Devices

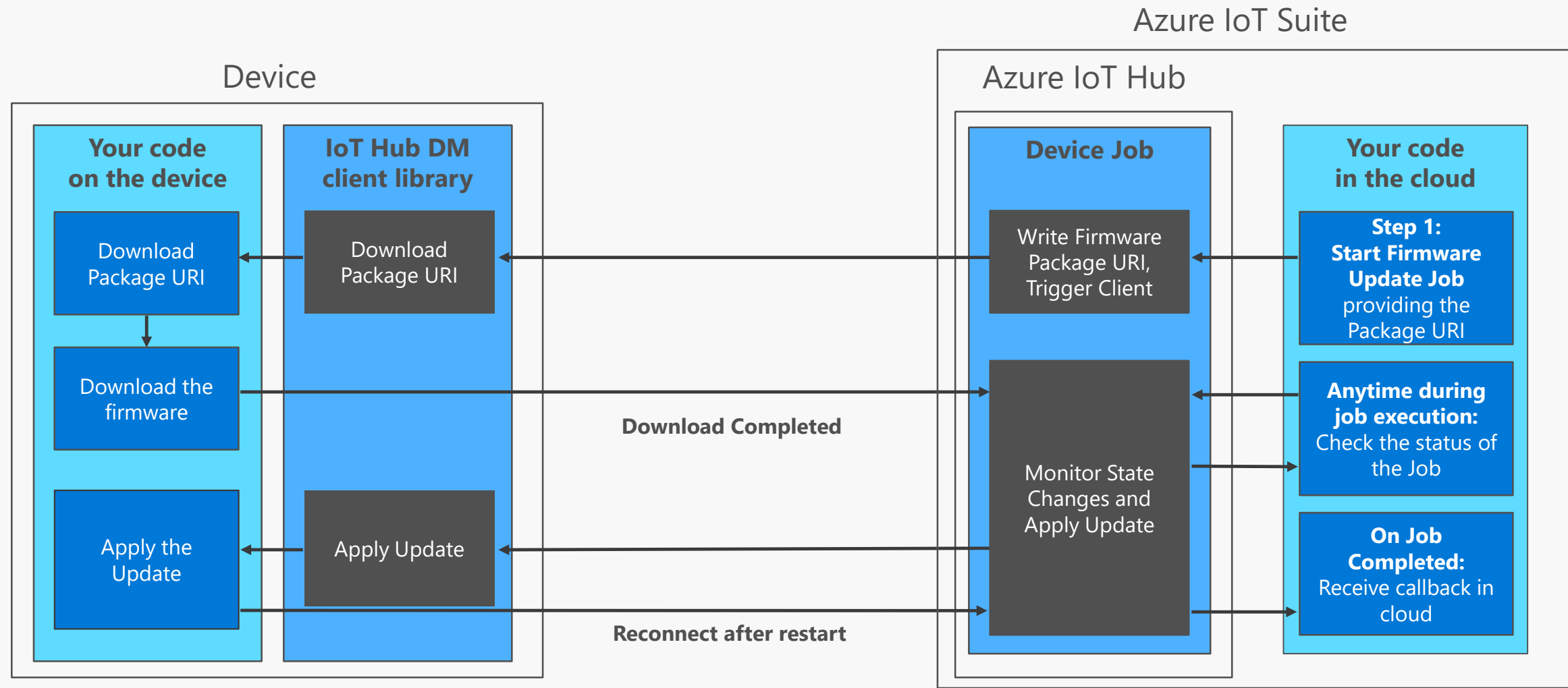
Decommission and replace devices after service lifetime

# Azure IoT Hub Device Management



# Device Job - Firmware Update Example

A Device Job is a multi-step device orchestration on a set of devices managed by Azure IoT Hub



# Azure IoT Gateway SDK

Open source IoT gateway middleware that enables:

- Cloud connectivity for devices that don't speak TCP/IP
- Security Isolation for devices can't be updated/secured
- Protocol translation for existing and new protocols
- Data transformation compression, annotation, filtering
- Local intelligence local processing for low latency needs

# Azure IoT Starter Kits

Get started quickly



## Raspberry Pi 2 Kit

Windows 10 and Raspbian  
Samples in C and C#



## Feather M0 Wi-Fi Kit

RTOS  
Samples in Arduino IDE and C



## Feather Huzzah ESP8266 Kit

RTOS  
Samples in Arduino IDE and C



## Intel Edison Kit

Linux Yocto  
Samples in JavaScript (Node.js)



## ThingDev Kit

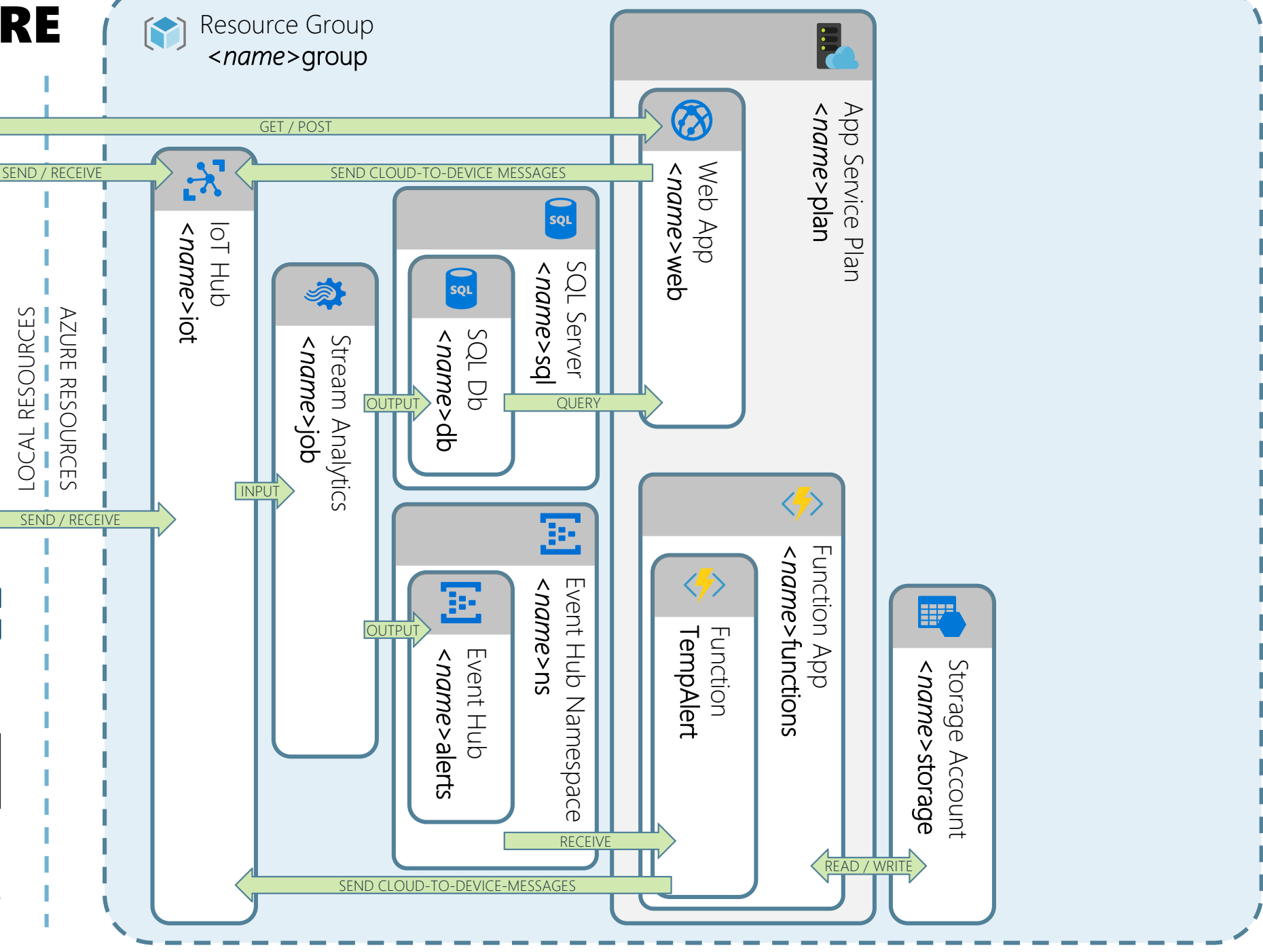
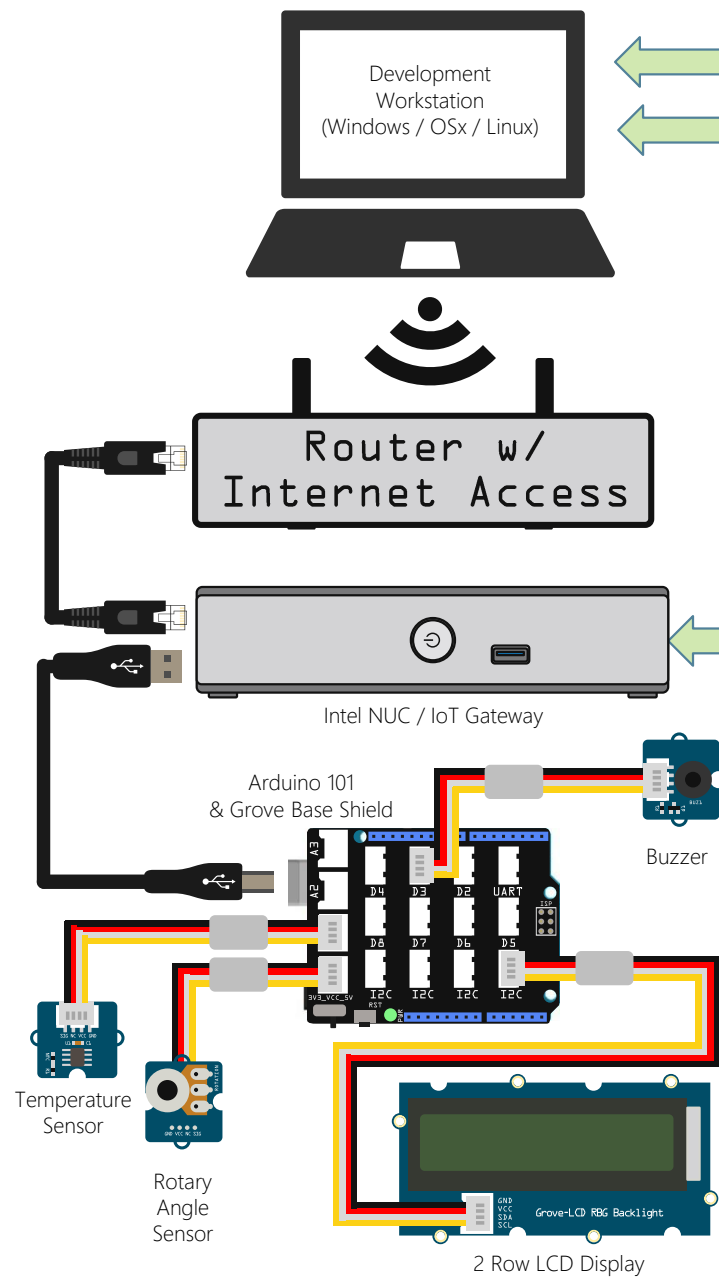
RTOS  
Samples in Arduino and C

Start today: <http://azure.com/iotstarterkits>

# LAB OVERVIEW



# LAB ARCHITECTURE





# PREREQUISITES

Now is a great time to setup or install these if you don't have them already.  
*There are copies of the software on the yellow USB drives...*

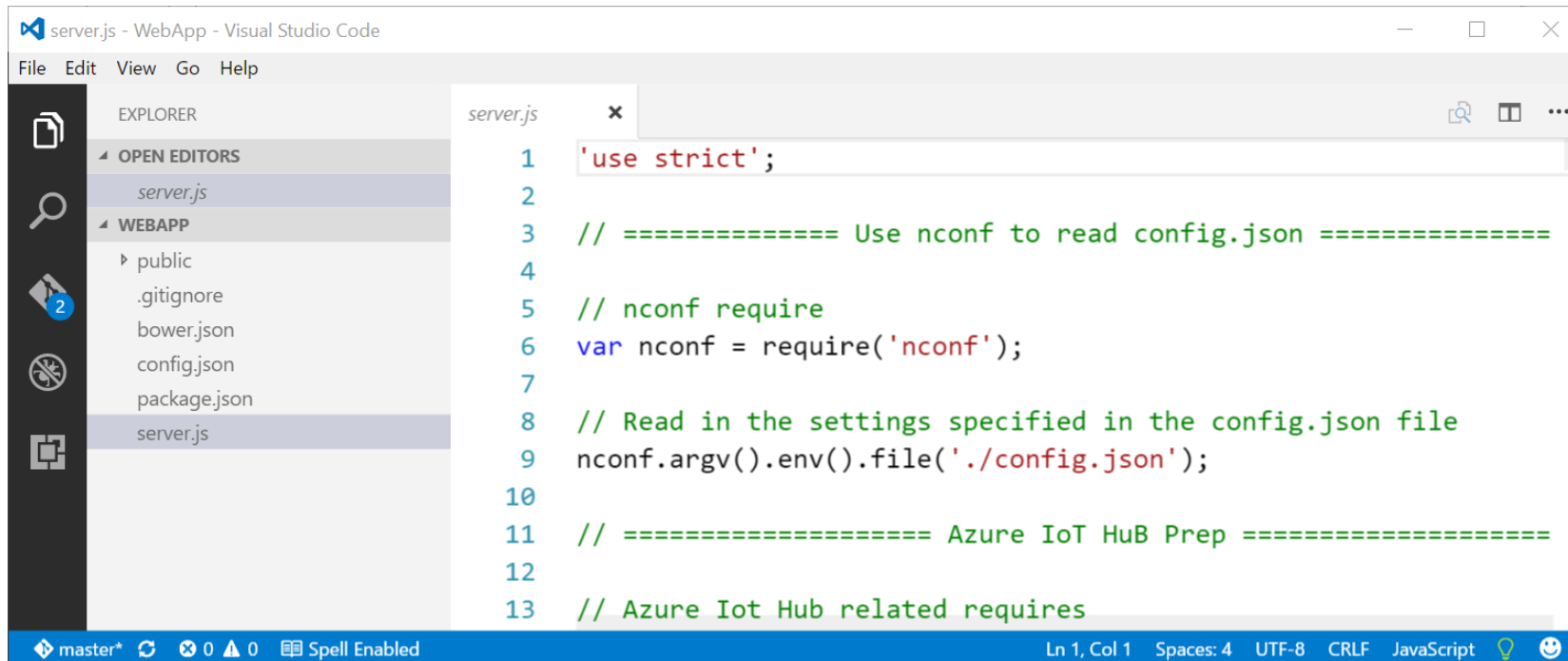
- An active Microsoft Azure Subscription.
- Node.js 4.x or later. You can install Node.js from [nodejs.org](https://nodejs.org)
- Visual Studio Code. You can install it from [code.visualstudio.com](https://code.visualstudio.com)
- Git installed and in your system path. Install it from:
  - [git-scm.com/downloads](https://git-scm.com/downloads) or if you prefer GitHub...
  - [desktop.github.com](https://desktop.github.com)
  - Make sure your git global config is setup:

```
git config --global user.name "Your Name"  
git config --global user.email "Your Email"
```



# VISUAL STUDIO CODE

We'll be using Visual Studio Code as development environment in this lab. It is a light weight, free, open source, cross-platform development tool, and we think you'll love it!



```
server.js - WebApp - Visual Studio Code
File Edit View Go Help

EXPLORER
  OPEN EDITORS
    server.js
  WEBAPP
    public
    .gitignore
    bower.json
    config.json
    package.json
    server.js

server.js
1 'use strict';
2
3 // ===== Use nconf to read config.json =====
4
5 // nconf require
6 var nconf = require('nconf');
7
8 // Read in the settings specified in the config.json file
9 nconf.argv().env().file('./config.json');
10
11 // ===== Azure IoT HuB Prep =====
12
13 // Azure Iot Hub related requires
```

master\* 0 0 Spell Enabled Ln 1, Col 1 Spaces: 4 UTF-8 CRLF JavaScript



# GIVE THE INTEL NUC TIME! SERIOUSLY!

The Intel IoT Gateway “NUC” is an Atom Based computer with a “Wind River” Yocto Based Linux Image on it.

It's running an nginx web server instance that hosts the “Intel IoT Gateway Developer Hub” (Dev Hub) and Node-RED, plus it's going to do all the sending and receiving of messages to Azure!

Most laptops don't boot up seconds, so don't expect the NUC to either. Give it time to boot, load, and be awesome!



# BEST PRACTICES FOR A FUN LAB...

- Use the `<name>xyz` naming convention. It helps!
- Put all of your Azure resources in a single, new “Resource Group” created just for this lab. This will make it super easy to clean up!
- Put all of your Azure resources in a single “Region” that is near you. That will help keep things fast and low cost.
- Work with you neighbors! You'll learn more!
- We are here to help, but try thinking about how to solve your issue before you ask for help!

