# Get Started Developing with Azure IoT Hub

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**Microsoft**

# Agenda

Intro to Azure IoT Hub

ABC for developing with IoT Hub
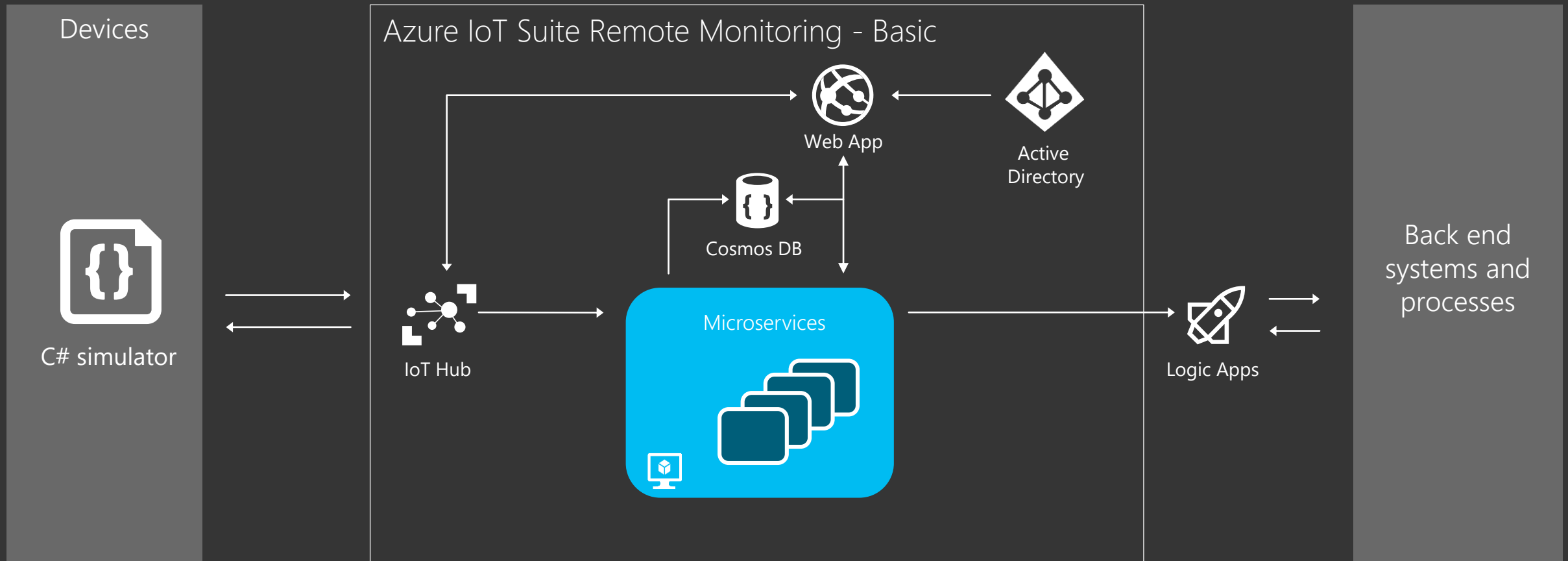
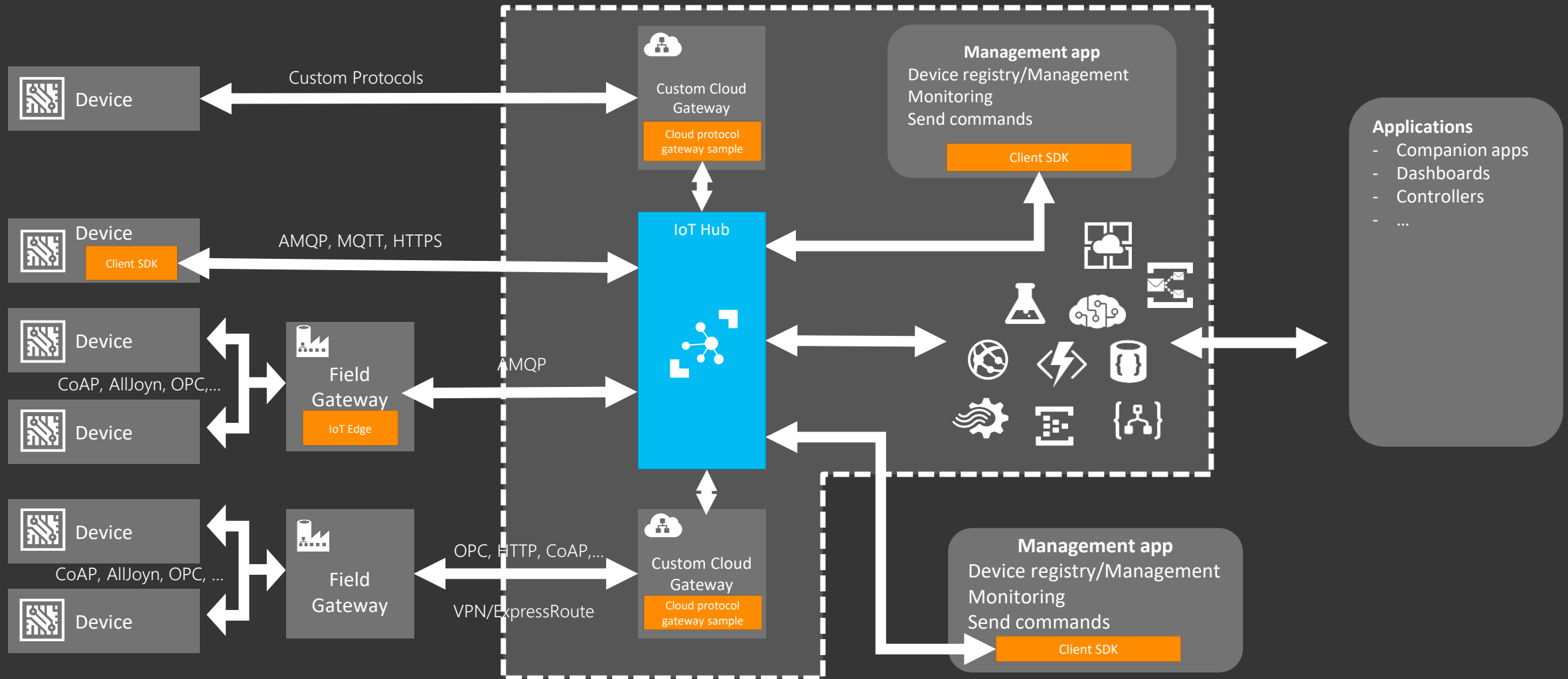Create an IoT Hub instance

Device registry

Connecting devices

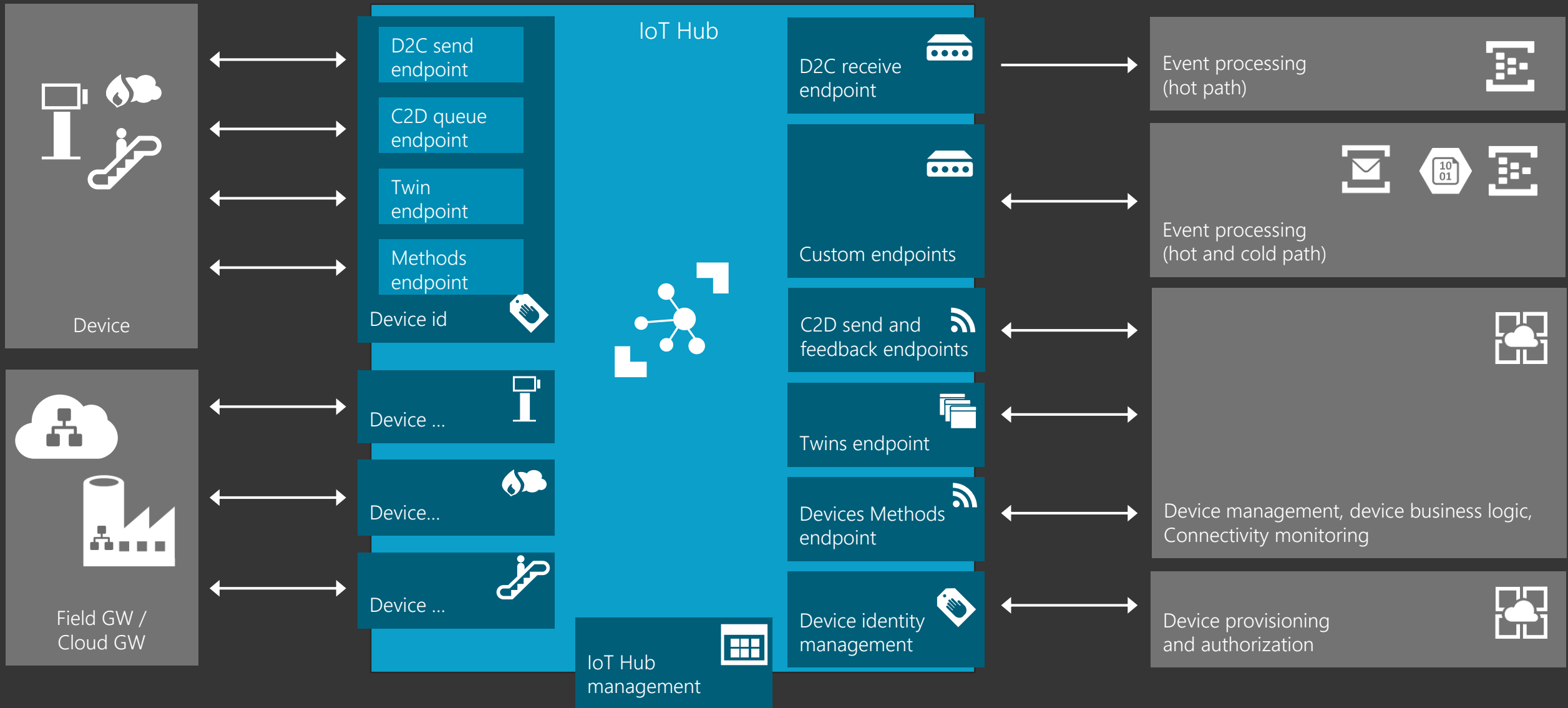Send and receive data

Do more...

# Example of an IoT solution

**Devices**

{} C# simulator

**Azure IoT Suite Remote Monitoring - Basic**

Web App

Active Directory

Cosmos DB

IoT Hub

Microservices

Logic Apps

**Back end systems and processes**

# Azure IoT Hub



Microsoft Azure

Device — Custom Protocols — Custom Cloud Gateway

Cloud protocol gateway sample

**Management app**
Device registry/Management
Monitoring
Send commands

Client SDK

Device — AMQP, MQTT, HTTPS — IoT Hub

Client SDK

**Applications**
- Companion apps
- Dashboards
- Controllers
- ...

Device
CoAP, AllJoyn, OPC,...
Field Gateway

IoT Edge

Device

AMQP

Device
CoAP, AllJoyn, OPC, ...
Field Gateway

Device

OPC, HTTP, CoAP,...

VPN/ExpressRoute

Custom Cloud Gateway

Cloud protocol gateway sample

**Management app**
Device registry/Management
Monitoring
Send commands

Client SDK

# Pick your favorite to create a hub



IoT Hub

IoT Hub management

Azure Portal

https://portal.azure.com

ARM template

https://azure.microsoft.com/en-us/resources/templates/

Azure CLI

https://github.com/Azure/azure-cli (v2.0 Python)

Powershell

https://docs.microsoft.com/en-us/powershell/azureps-cmdlets-docs/
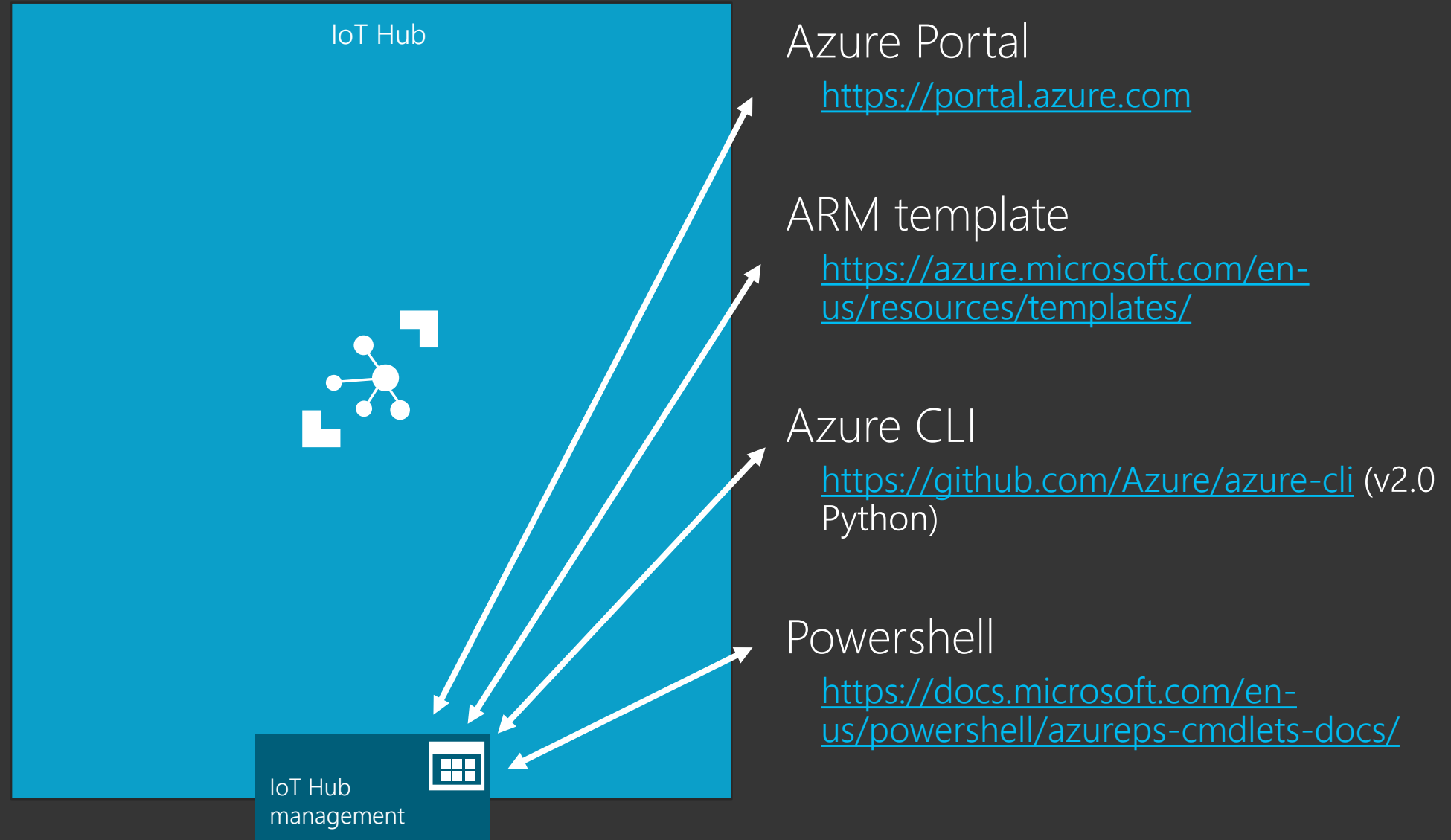
# Demo

Creating an IoT Hub with Azure CLI v2

# Security first!

Client SDKs
- C
- Java
- C# (.Net Standard 1.3)
- Python

Device

SSL + Device Authentication

Device id

IoT Hub
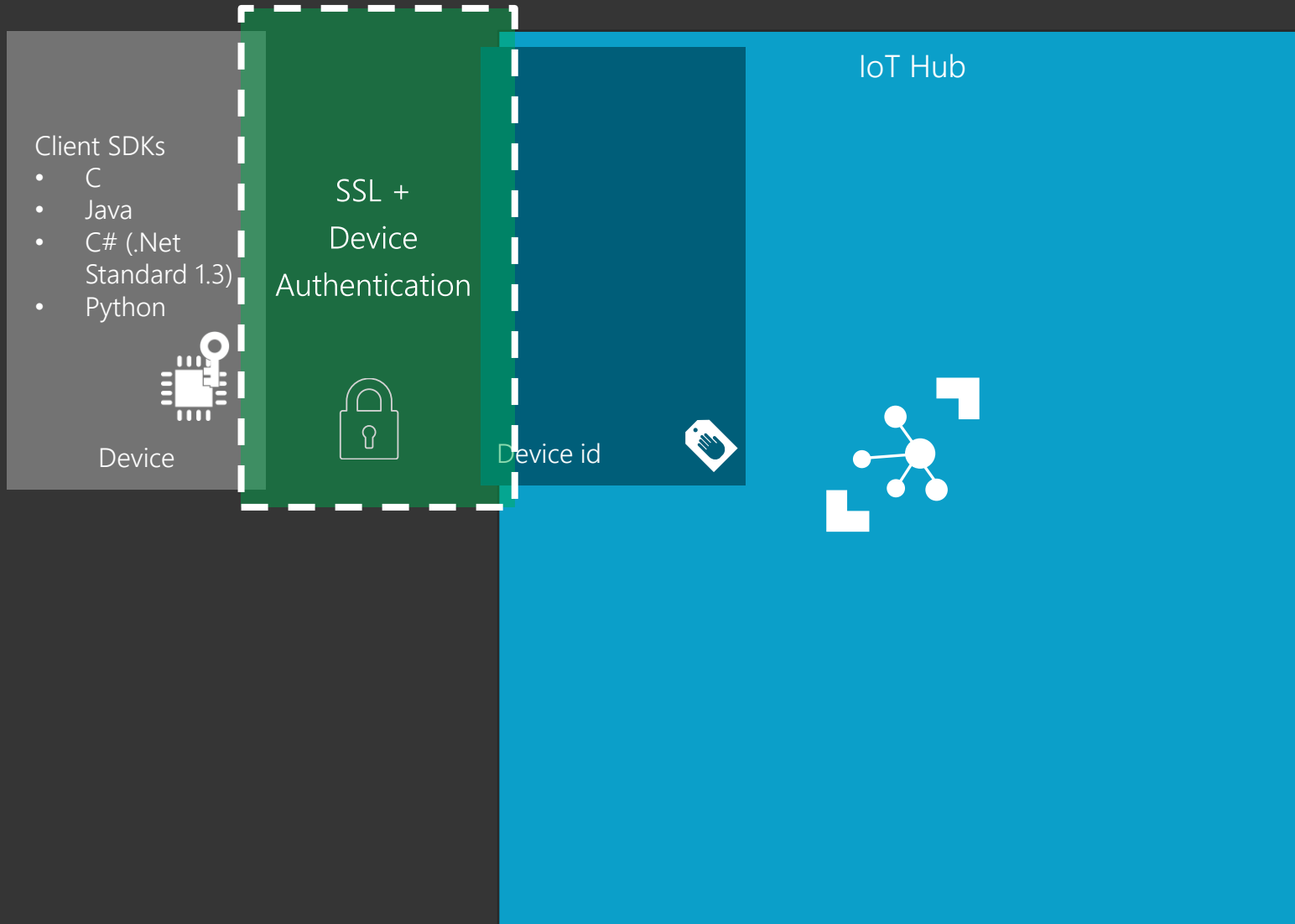
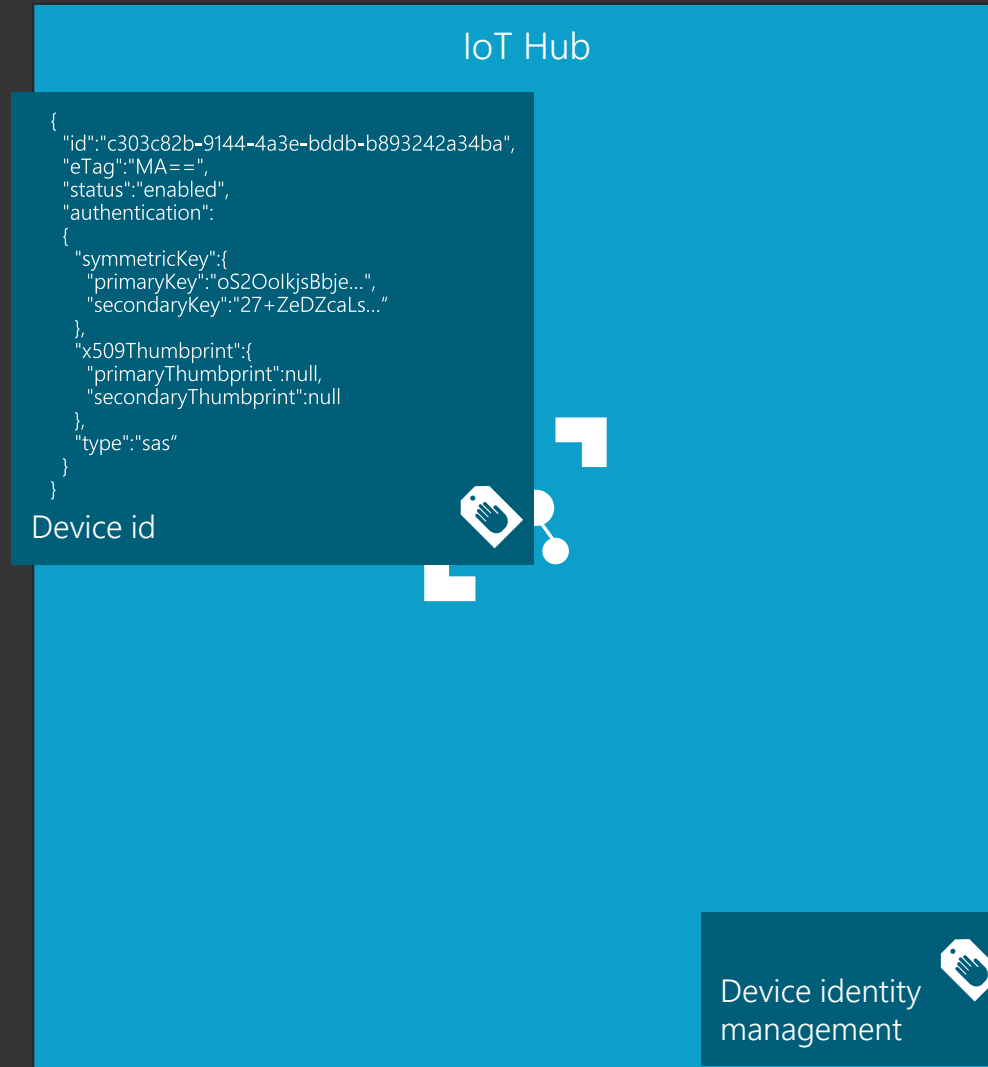Private Key -> SAS Token

x.509 Certificate
- Self Signed
- CA

# Device registry

Unique id for each device

Unique credentials for authentication
- Private Key/SAS Token
- X.509 Certificates

Device Twin

## IoT Hub

```
{
  "id":"c303c82b-9144-4a3e-bddb-b893242a34ba",
  "eTag":"MA==",
  "status":"enabled",
  "authentication":
  {
    "symmetricKey":{
      "primaryKey":"oS2OoIkjsBbje...",
      "secondaryKey":"27+ZeDZcaLs..."
    },
    "x509Thumbprint":{
      "primaryThumbprint":null,
      "secondaryThumbprint":null
    },
    "type":"sas"
  }
}
```

Device id

Device identity management

Azure Portal
Development tools
- Azure CLI
- VSCode extension
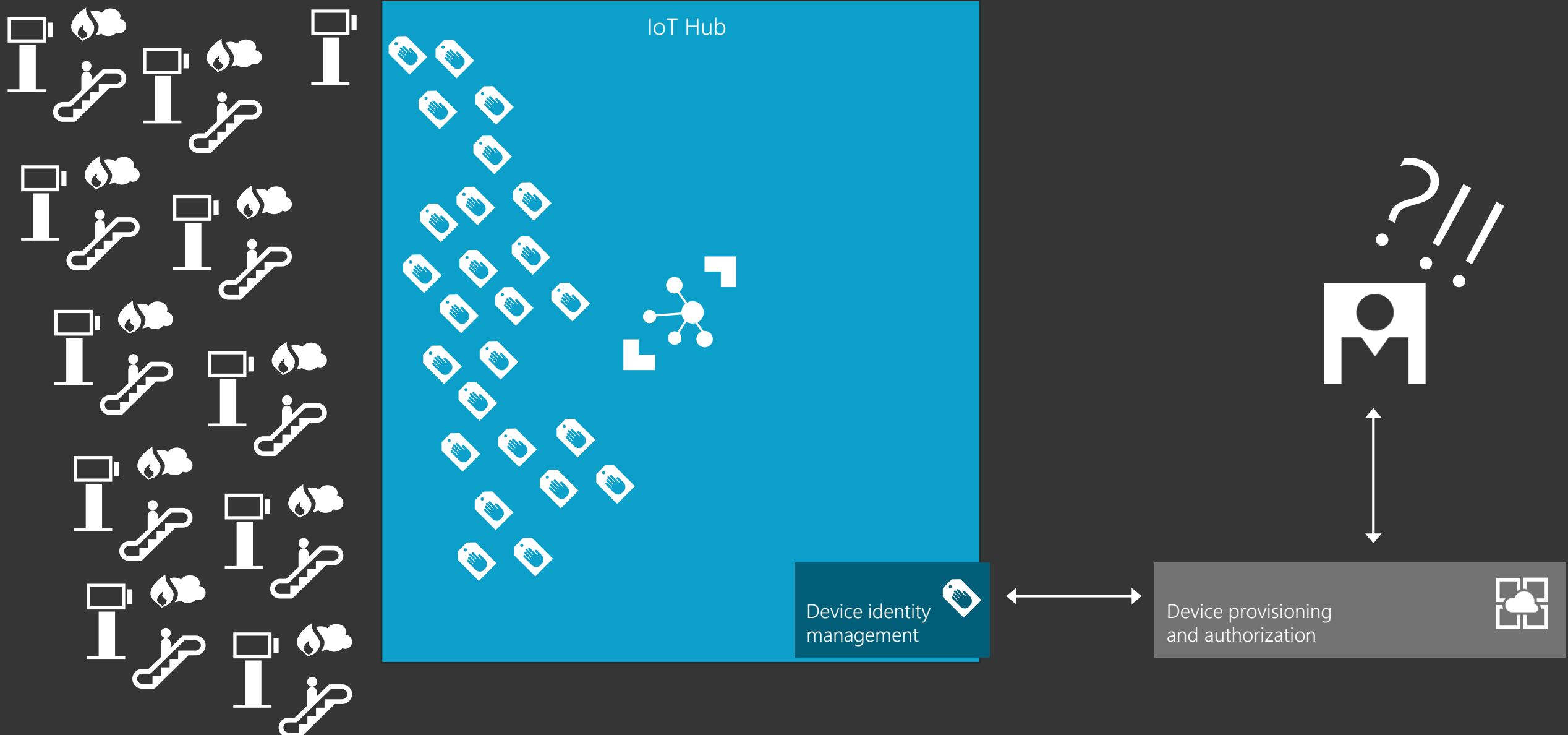
Using a client SDK
- .Net
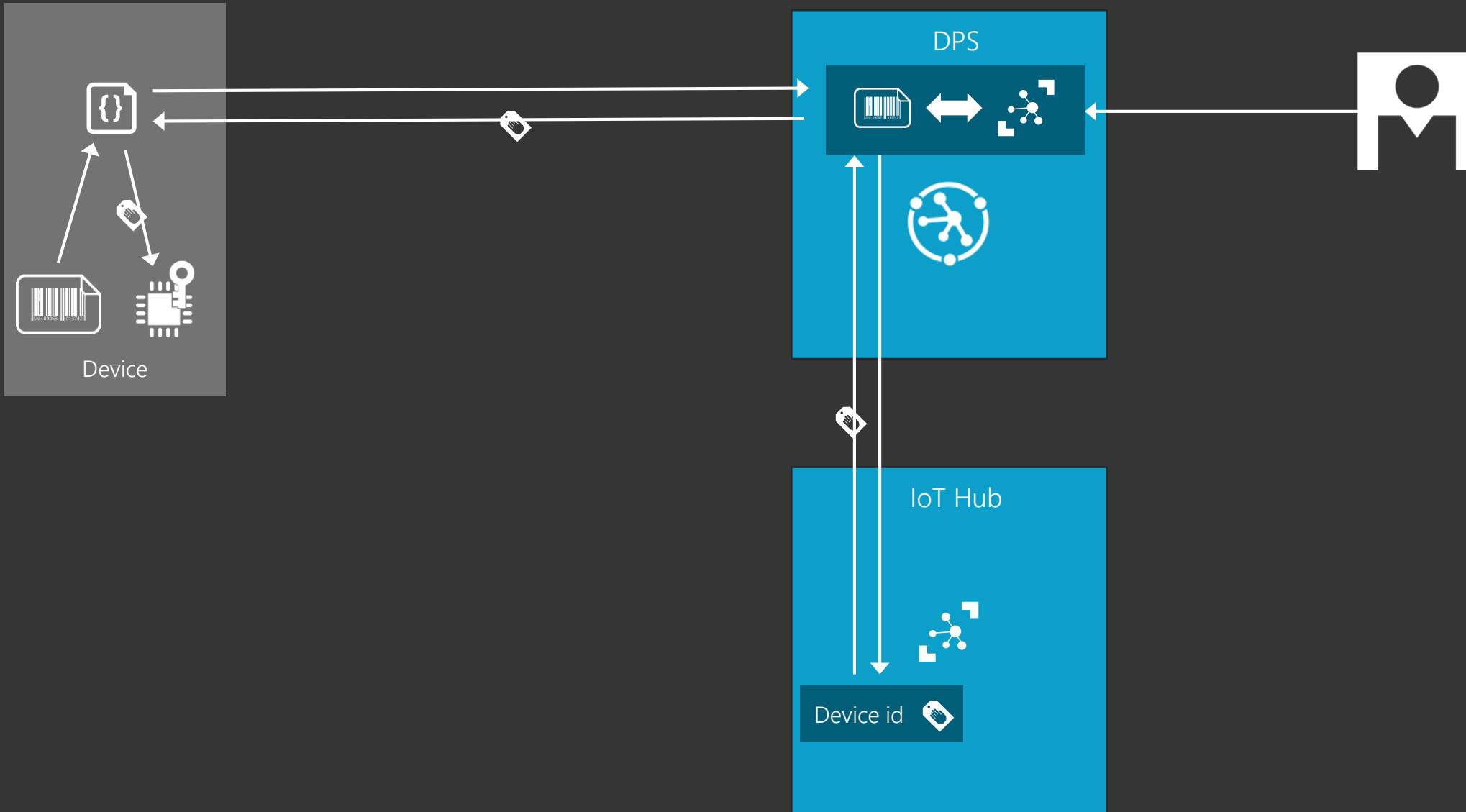- Node
- Java
- Python

Device provisioning and authorization
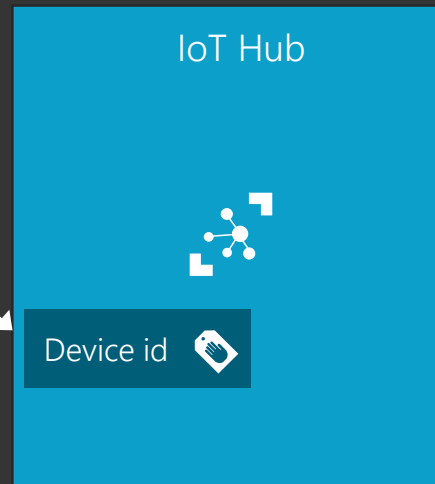
# Demo

Creating and managing device identities

# Provisioning at scale

IoT Hub
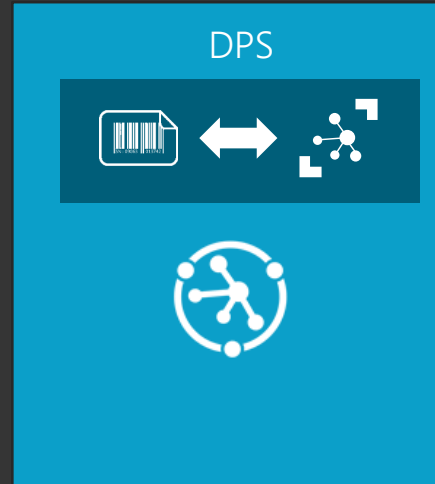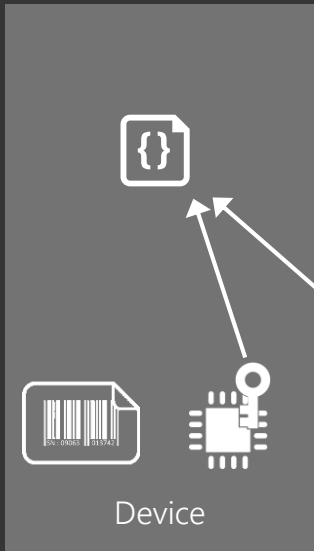
Device identity management

Device provisioning and authorization

# Device Provisioning Service
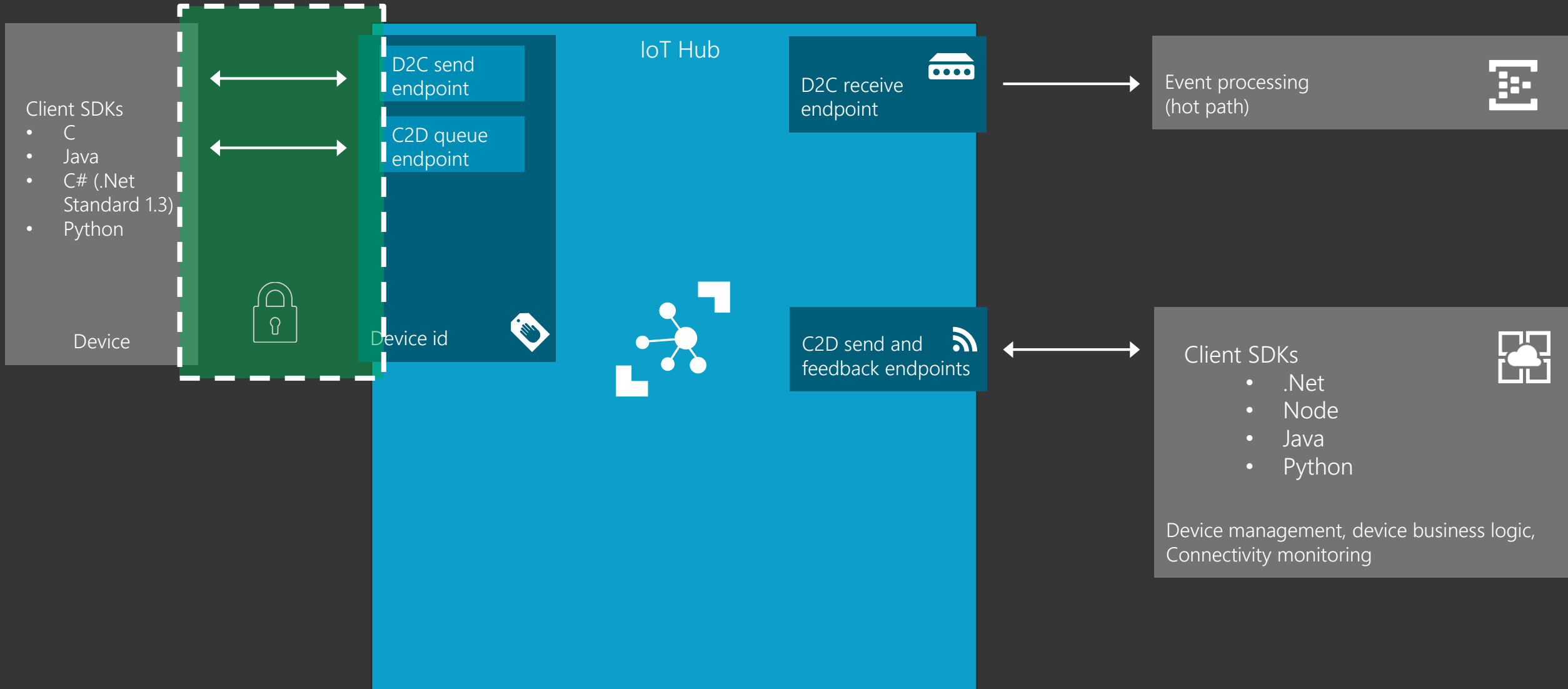
# Device Provisioning Service



Device

DPS

IoT Hub

Device id

Check out
session BRK4026

# Send/receive data
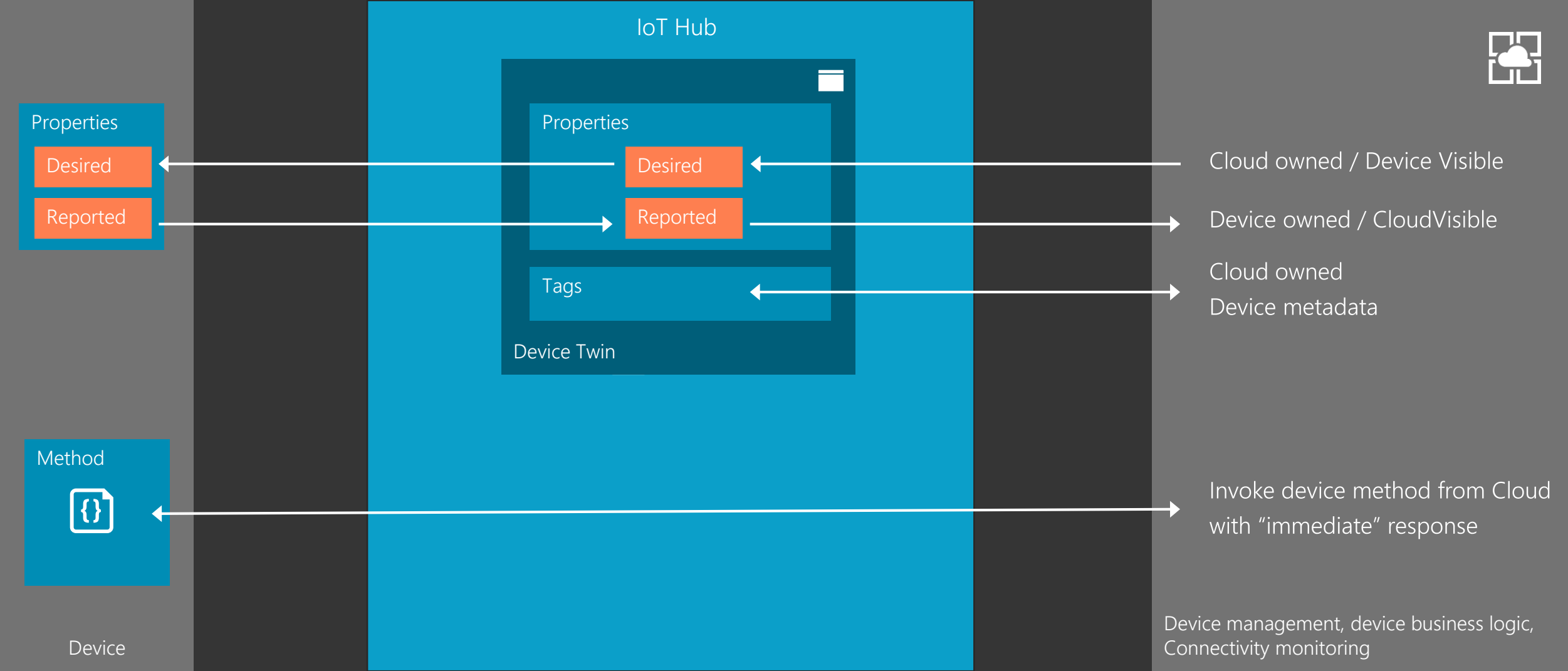
# Demo

Telemetry

# Structured data

## Device Twins

- Last known state of device
- Desired state configuration
- Group devices

## Device Direct Methods

- Invoke method on device from Cloud
- "Immediate" response

# Structured data

**Properties**

| Desired |
| Reported |

**IoT Hub**

Properties

| Desired | ← Cloud owned / Device Visible |
| Reported | → Device owned / CloudVisible |

Tags ← Cloud owned / Device metadata

Device Twin

**Method**

{ }

← Invoke device method from Cloud with "immediate" response

Device

Device management, device business logic, Connectivity monitoring

# Demo

Device Twin and Methods

# Jobs and Queries



IoT Hub

Device Twin/Methods

Devices

## Jobs

Schedule and Broadcast Device Twin Changes

Set Desired Properties, Tags, Call Methods

## Queries

Query Across Device Twin State

For Business Logic, Reporting and Compliance

Device management, device business logic, Connectivity monitoring
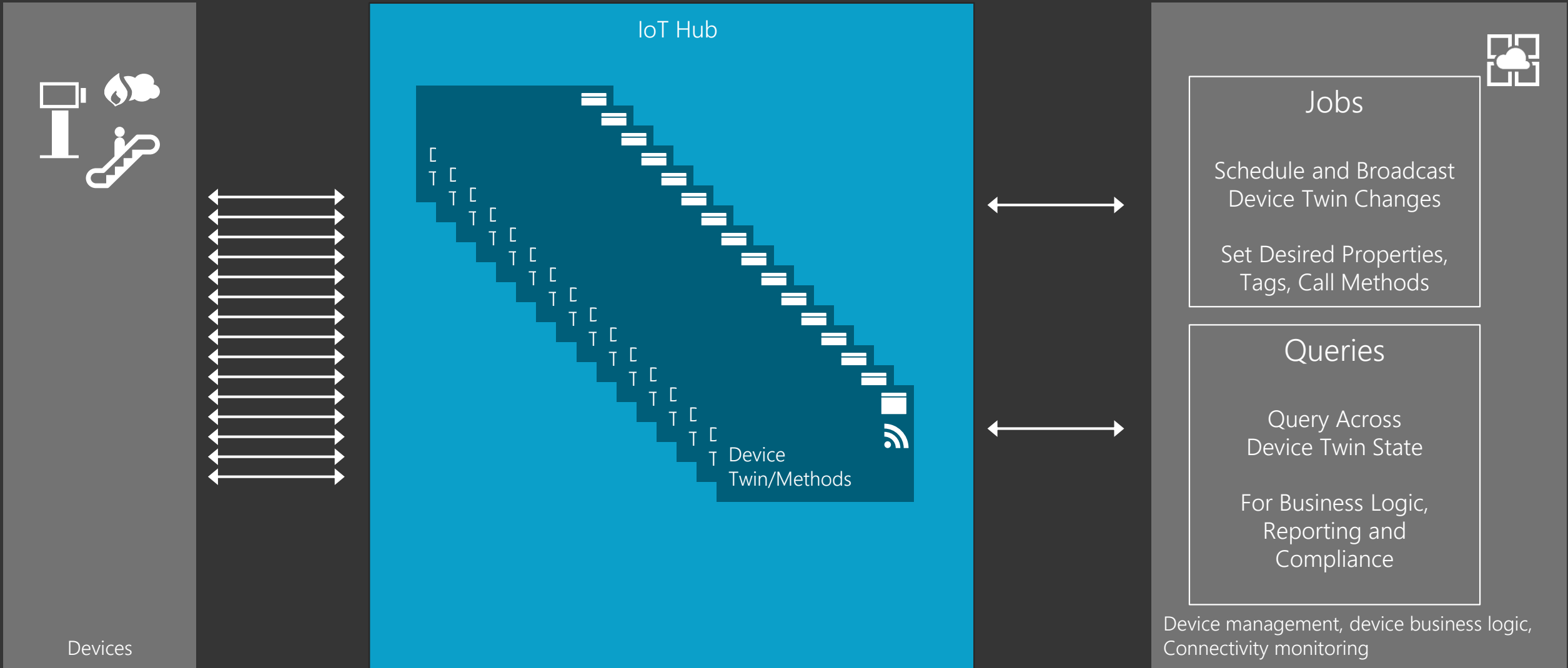
# What's next now that I have data flowing in?



Learn more: https://aka.ms/azureiotgetstarted

# Routing telemetry data

Header:
$content-encoding = "utf-8"
$content-type = "application/json"
my-message-type = "alert"

Body
{
    "Weather":{
        "Temperature":50,
        "Time":"01:23:12Z"
    }
}

**Device**

**IoT Hub**

D2C receive endpoint

```
SELECT * FROM Devices
WHERE tags.location = "bldg43"
```

```
my-message-type = "alert"
```

```
$body.Weather.Temperature > 75
```

Routing rules (query)

Custom endpoints connectors

Event processing (hot path)

Event Hub

Service Bus Topics

Service Bus Queues

Storage Blob

Event processing (hot and cold path)

# Demo

Simple routing

# Demo

Let's explore some IoT solutions

# Azure IoT Starter Kits

Quickly build IoT prototypes that leverage Azure IoT
H/W bundle +Step-by-step tutorials
Created by "Certified for IoT" Partners
Learn more: http://aka.ms/iotstarterkits

# Training for Azure IoT

| Training provider | Class | Price |
|---|---|---|
| edX | [Developing IoT Solutions with Azure IoT](#) | Free (auditing) or $99 (certificate of completion) |
| MVA Microsoft Virtual Academy | [Introduction to Azure IoT](#) | Free |
| Linux Academy | [Azure IoT Essentials](#) | Free |
| Linux Academy | [IoT for the Enterprise](#) | Paid (Free 7-day trial, $19/month afterwards) |
| CloudAcademy | [Internet of Things with Azure](#) | Paid (Free 7-day trial, $29/month afterwards) |
| opsgility | [Building IoT Solutions with Azure](#) | Paid (Free 7-day trial, $29.95/month afterwards) |

Learn more: http://aka.ms/iottraining

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