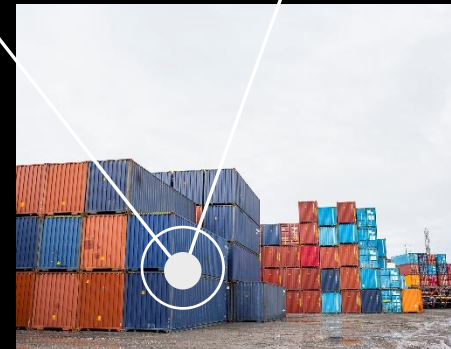
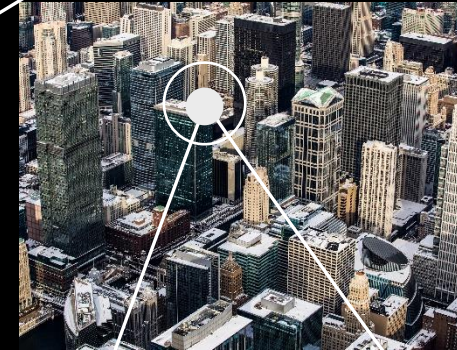


Build end-to-end IoT solutions

Device provisioning at scale

Pamela Cortez
Microsoft Azure IoT



Build end-to-end IoT solutions – Workshop Series

<https://aka.ms/IoT-online-workshop>



Transform your business with IoT



Devices and device communication



Device provisioning at scale



Messaging processing, analytics, and business integration



Work with Azure IoT Edge

Device provisioning at scale

Overview of Device Provisioning Service

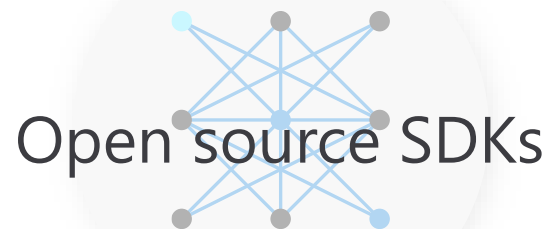
Developer Tools

Lab: Provision IoT devices securely and at scale with Device Provisioning Service

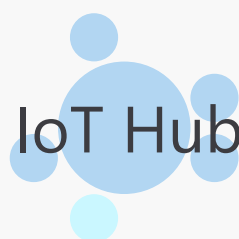
- Create an Azure IoT Hub
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Developer Resources & Getting started

Biggest challenges with devices



Developing and maintaining
a connected,
secure, serviceable and
supportable device



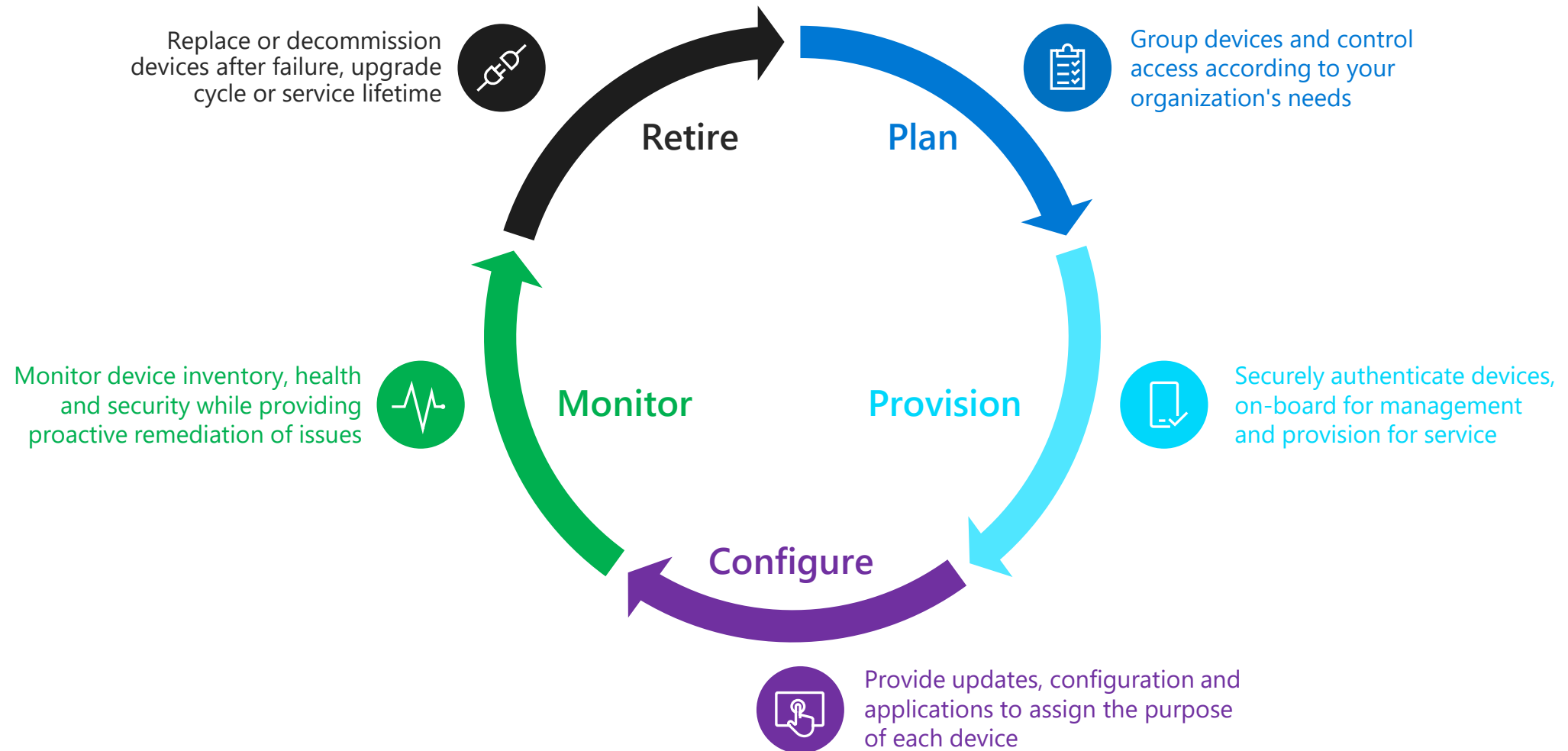
Integrating devices and their
data into cloud services



Out-of-the-box provisioning
of devices at scale

But what about device management over the long-term?

IoT Device Management Lifecycle



Why provisioning is hard today

- Solutions must have per-device revocable access
- Provisioning is a manual process
- Initial configuration can become irrelevant between manufacturing and deployment
- Device supply chains are complex

Device Provisioning Service (DPS) brief feature overview

Cross-region, cross-subscription DPS→IoT Hub support for geo-sharded and multitenancy solutions

Automatic re-provisioning supports the device lifecycle

Factory reset

Migration

Flexible, targeted device assignment logic

Static assignment for when you know the hub

Evenly weighted for round-robin assignment

Lowest-latency for geo-shared applications

Custom assignment logic for advanced scenarios

Manage devices at as a group or as individuals

Based on authentication type

Multiple auth methods supported

Symmetric keys for getting started


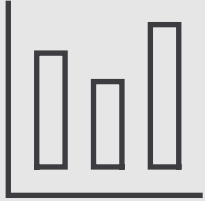
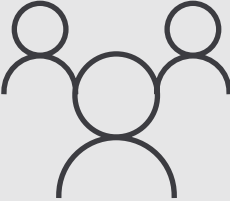

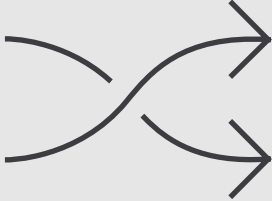
TPM endorsement key for secure storage

X.509 certificates for maximum security

Cross-platform support through open source SDKs

Edge device support

A Selection of Scenarios

Initial connection	Load balancing	Ownership based	Location based	Re-provisioning
Zero-touch provisioning to a single IoT solution	Across multiple hubs	Connecting devices to their owner's IoT solution based on sales transaction data	Connecting a device to the IoT hub with the lowest latency	Based on a change in the device, e.g. change of ownership
				

Microsoft IoT

Broadest portfolio

Industry Solutions



Manufacturing



Retail



Agriculture



Energy



Smart Cities



Healthcare



Transportation

IoT app services



Azure IoT Central



Dynamics Connected Field Service

Azure services for IoT

- Azure IoT Hub
- Azure IoT Hub Device Provisioning Service**
- Azure Digital Twins
- Azure Time Series Insights
- Azure Maps
- Azure Security Center for IoT

- Azure Stream Analytics
- Azure Cosmos DB
- Azure AI
- Azure Cognitive Services
- Azure ML
- Azure Logic Apps
- Azure Active Directory

- Azure Monitor
- Azure DevOps
- Power BI
- Azure Data Share
- Azure Spatial Anchors

IoT & Edge Device Support

- Azure RTOS
- Azure Sphere
- Azure IoT Device SDK
- Azure IoT Edge
- Azure Stack Edge

- Windows IoT
- Azure Certified for IoT—Device Catalog
- Azure Stream Analytics
- Azure Storage

- Azure ML
- Azure SQL
- Azure Functions
- Azure Cognitive Services

Provisioning

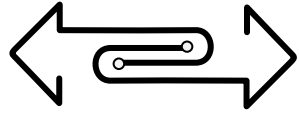


Provisioning Setup = Pre-registration + Device Assignment



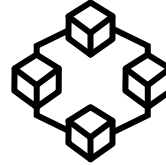
Device Provisioning = Runtime assignment + Initial Set up

Azure IoT Hub



Bi-directional communication

Millions of Devices
Multi-language, open source SDKs
HTTPS/AMQP/MQTT
Send Telemetry
Receive Commands
Device Management
Device Twins
Queries & Jobs



Enterprise scale & integration

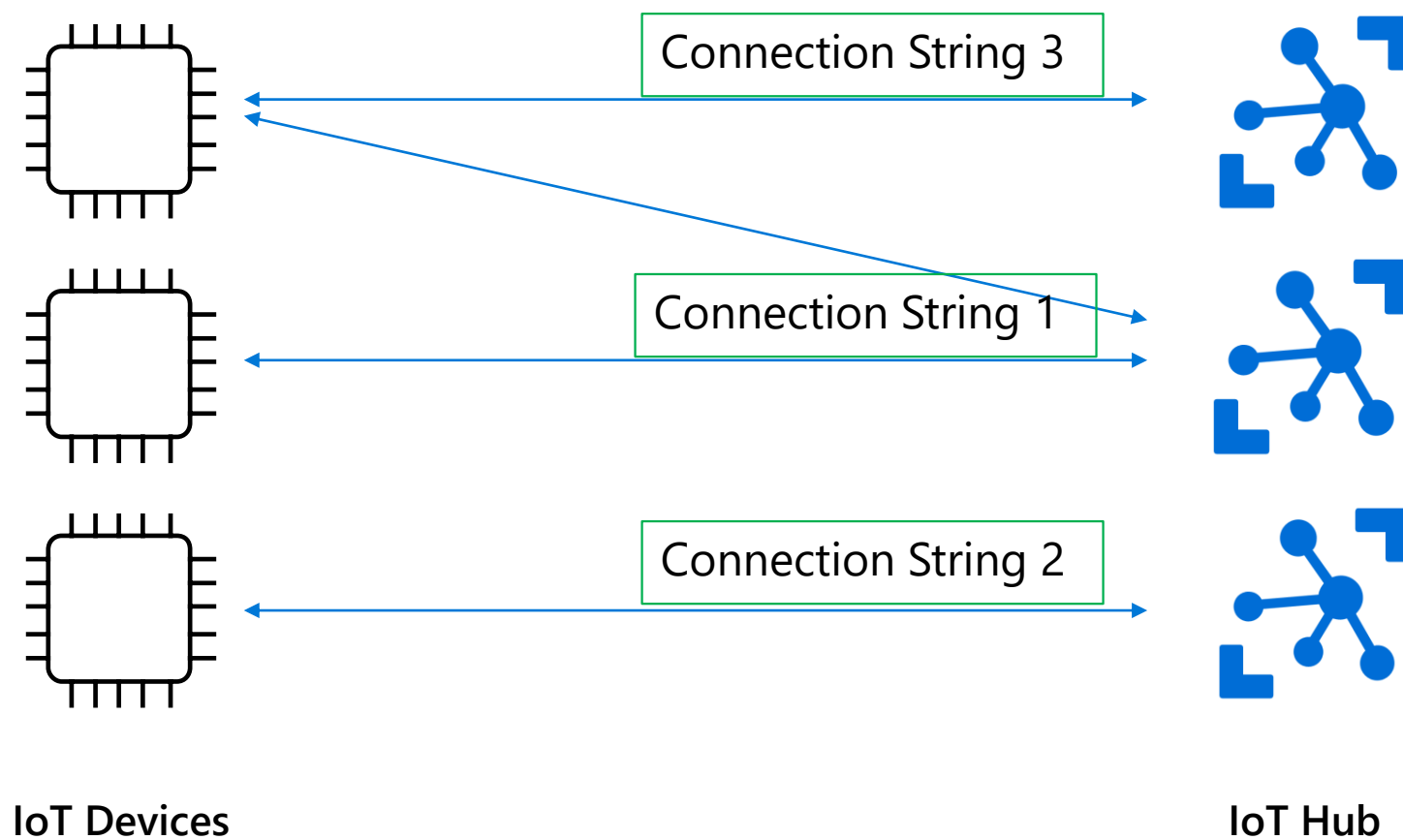
Billions of messages
Scale up and down
Declarative Message Routes
File Upload
WebSockets & Multiplexing
Azure Monitor
Azure Resource Health
Configuration Management



End-to-end security

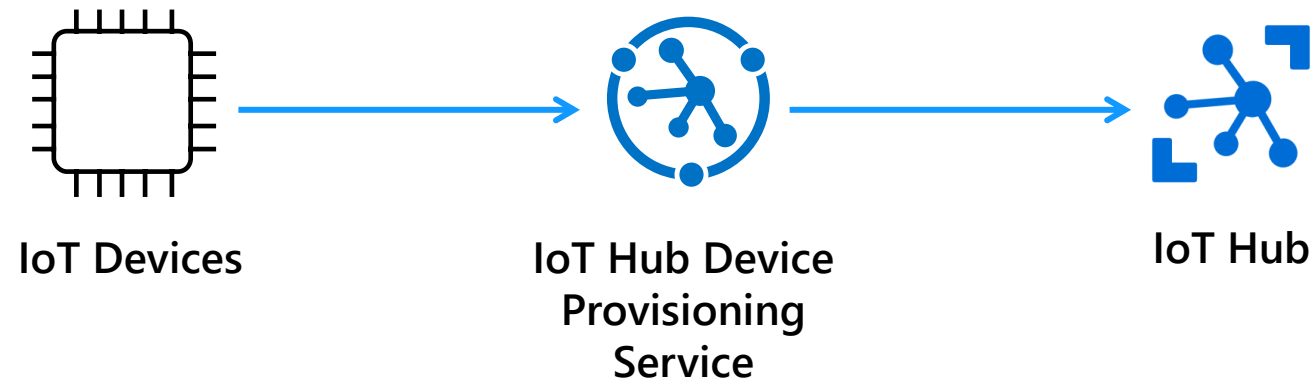
Per Device Certificates
Per Device Enable/Disable
TLS Security
X.509 Support
IP Whitelisting/Blacklisting
Shared Access Policies
Firmware/Software Updates

Provision Challenges

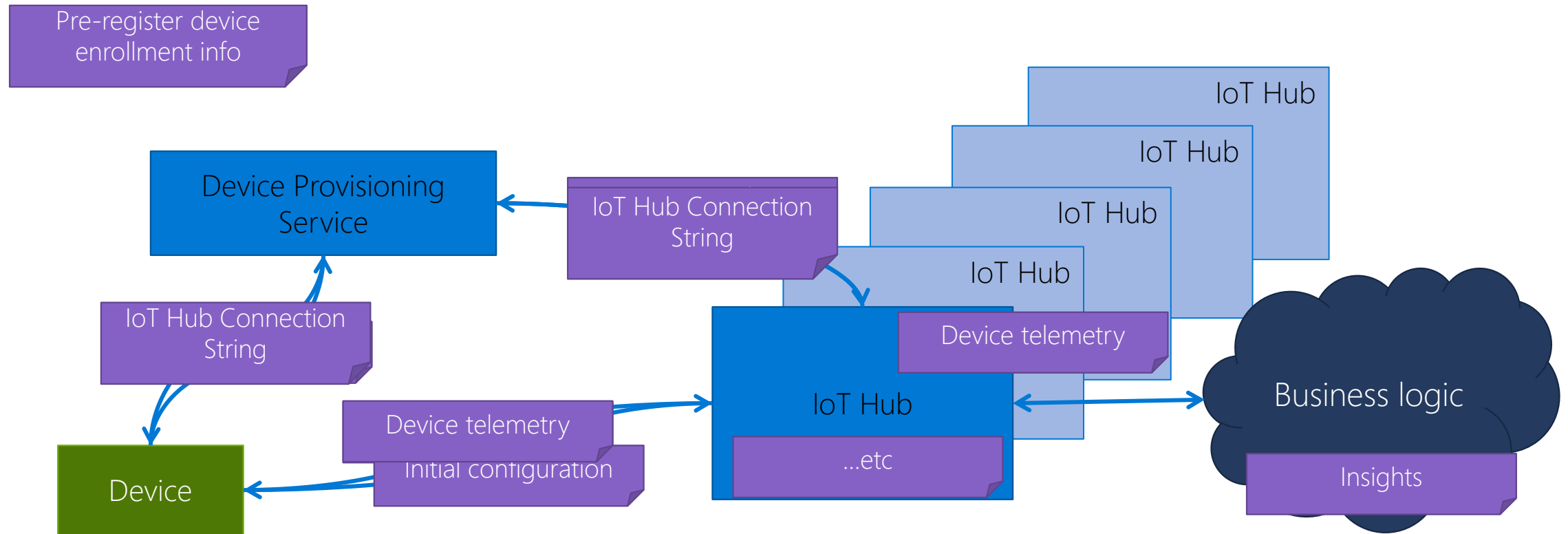


IoT Hub Device Provisioning Service

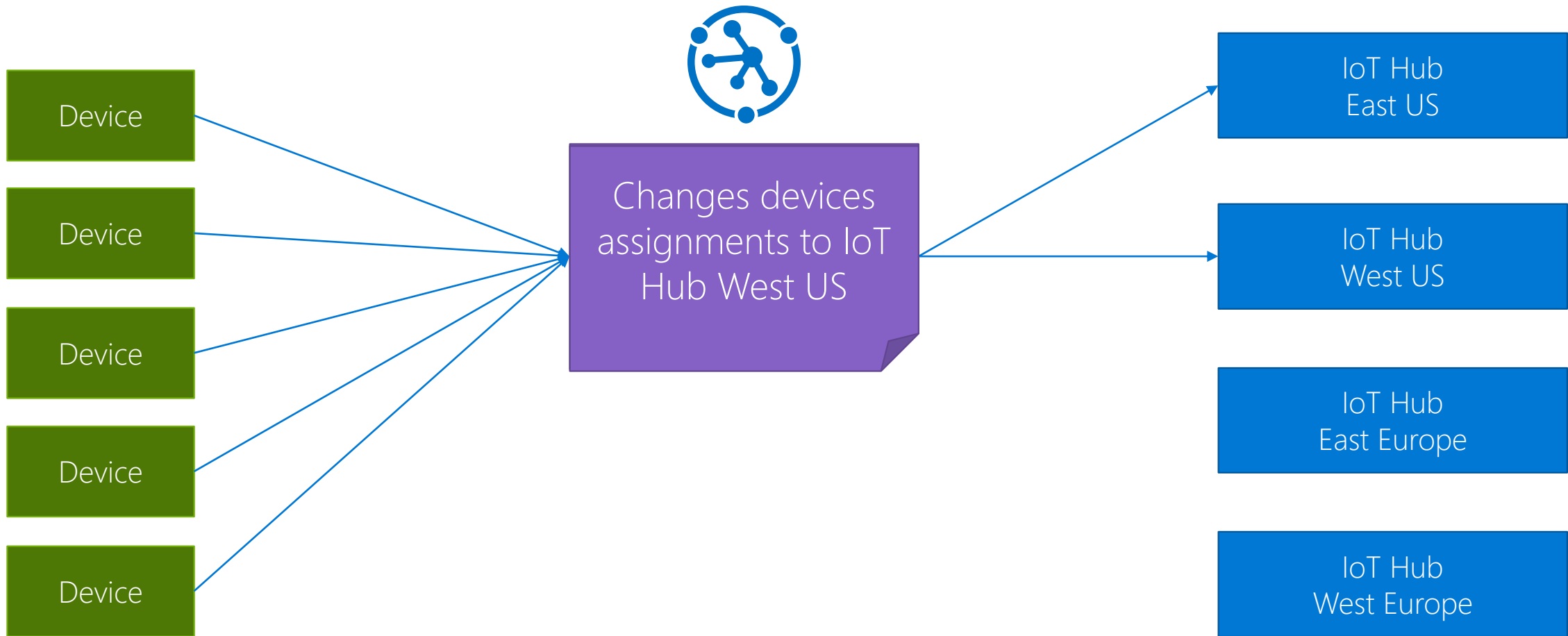
A helper service for IoT Hub that enables zero-touch, just-in-time provisioning to the right IoT hub without requiring human intervention.



Provisioning with IoT Hub Device Provisioning Service



Re-Provisioning at Scale



IoT Hub & Device Provisioning Service Support

FEATURE	BASIC	STANDARD / FREE
Device-to-cloud telemetry	✓	✓
Per-device identity	✓	✓
Message Routing, Event Grid Integration	✓	✓
HTTP, AMQP, MQTT Protocols	✓	✓
DPS Support	✓	✓
Monitoring and diagnostics	✓	✓
Device Streams ^{PREVIEW}		✓
Cloud-to-device messaging		✓
Device Management, Device Twin, Module Twin		✓
IoT Edge		✓

Easy upgrade from basic to standard tier.

Only standard allows cloud-to-device commands, device twin operations and IoT Edge

[Learn about IoT Hub scaling](#)

Device provisioning at scale

Overview of Device Provisioning Service

Developer Tools

Lab: Provision IoT devices securely and at scale with Device Provisioning Service

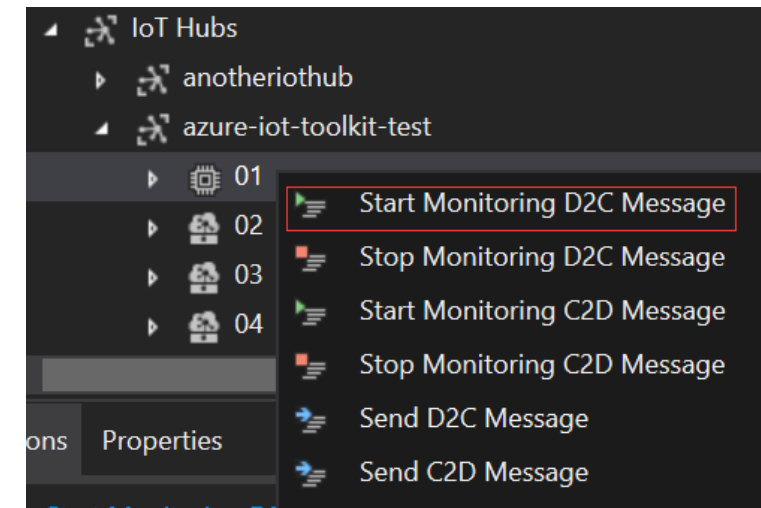
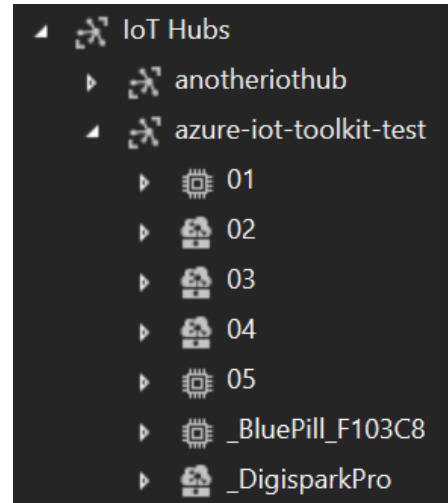
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Developer Resources & Getting started

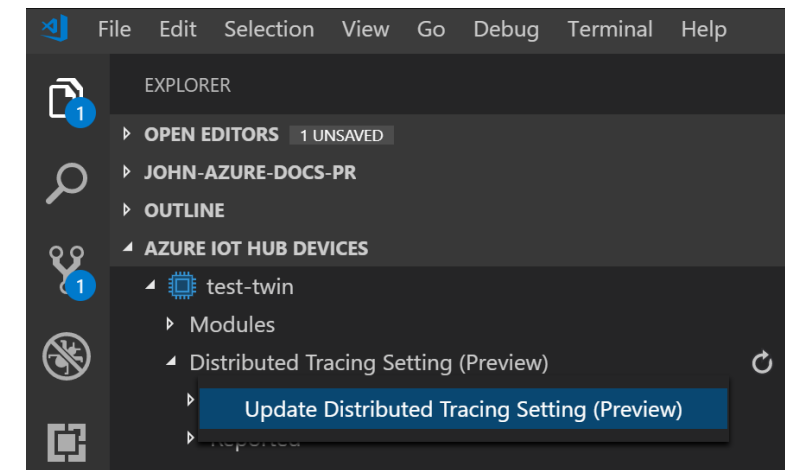
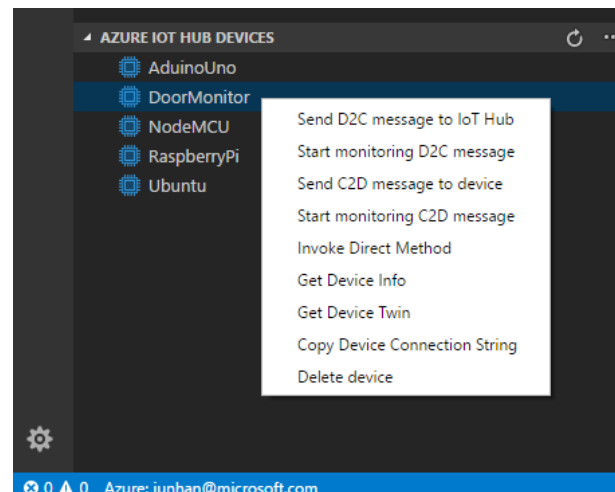
Azure IoT Hub tools



Cloud Explorer for VS 2017/2019



VS Code IoT Hub Toolkit

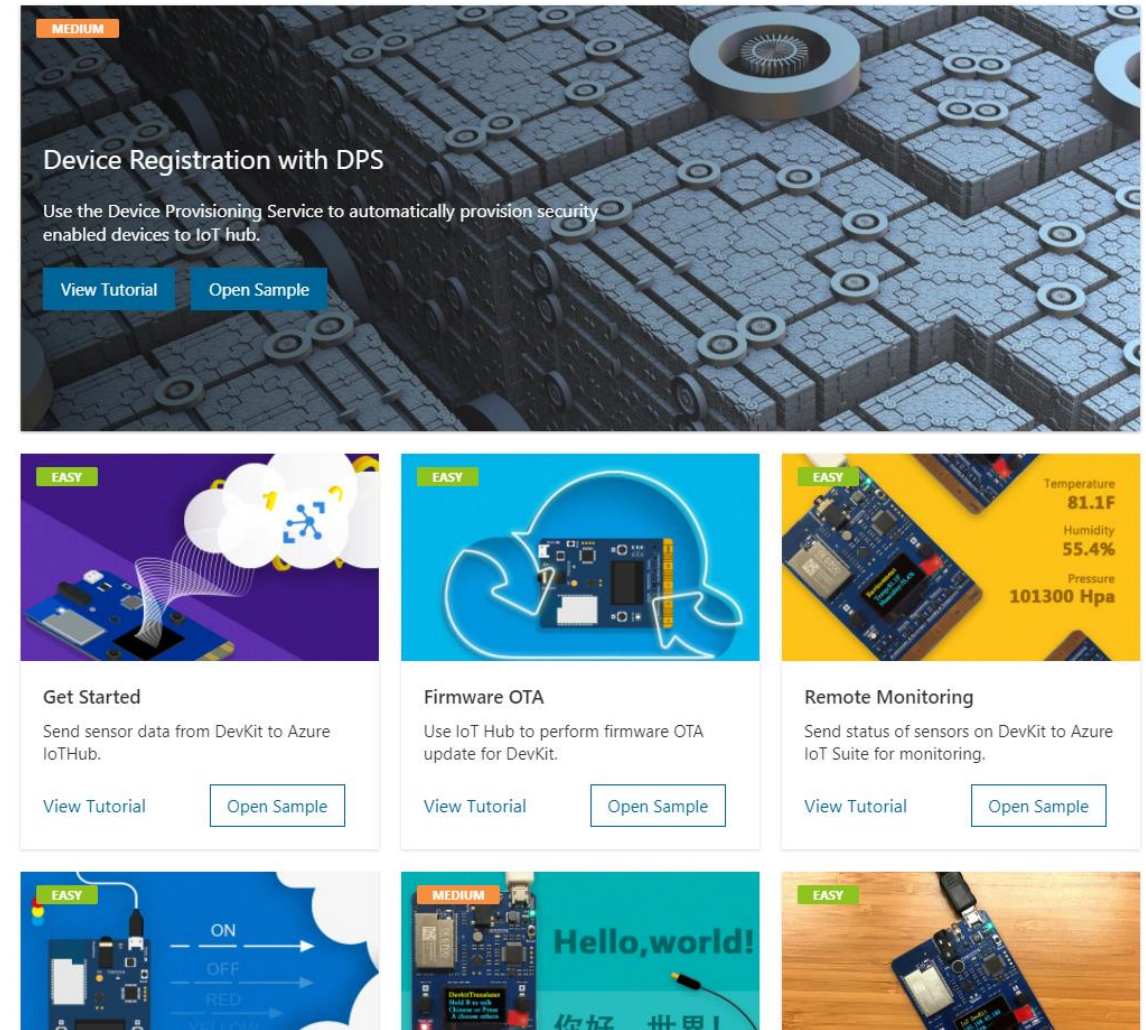


Azure IoT CLI Extension

<https://github.com/Azure/azure-iot-cli-extension>.

Azure IoT Device Workbench for VS Code

- Support Certified Azure IoT Devices
- Start from Solution Gallery or custom IoT project
- Code, build, deploy and debug



Device provisioning at scale

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Developer Resources & Getting started

Get Started Now!



<https://aka.ms/SecurelyConnectDevicesLearningPath>



<https://aka.ms/IntroAzureIoTLearningPath>

Sign-up for Build end-to-end IoT solutions – Workshop Series

<https://aka.ms/IoT-online-workshop>

- Transform your business with IoT
- Devices and device communication – *IoT Hub*
- Device provisioning at scale – *Device Provisioning Service*
- Messaging processing, analytics, & business integration – *Time Series Insights, Event Grid, Azure Stream Analytics*
- Work with Azure IoT Edge – *IoT Edge*



Remotely monitor and control devices with Azure IoT Hub

1100 XP

56 min • Module • 9 Units

★★★★★ 4.7 (60)

Create an IoT Hub device app, and a back-end service app. As a scenario, we use the monitoring, and controlling, of the temperature and humidity of a cheese cave.

Overview ▾



Automate IoT devices management with Azure IoT Hub

1200 XP

53 min • Module • 9 Units

★★★★★ 4.8 (20)

Automate IoT devices management with Azure IoT Hub



Automatically provision IoT devices securely and at scale with the Device Provisioning Service

900 XP

57 min • Module • 8 Units

★★★★★ 4.7 (34)

The focus of this module is on creating a Device Provisioning Service (DPS) to securely handle multiple remote devices. First, you create an IoT Hub, and add the DPS service. Next, an X.509 root certificate, and multiple leaf certificates, are created to handle security. Code for a simulated device is provided. You then link all the pieces together, and verify that your DPS resource works. After completing the module, you should have a good understanding of how to provision Azure IoT devices at scale.

Overview ▾



Learn how to get started with IoT

Building IoT solutions with Azure Developer Guide

<https://discover.microsoft.com/azure-iot-building-solutions-dev-guide/>

Microsoft Learn learning paths

<http://aka.ms/mslearniot>

Microsoft Learn is a newer learning platform that offers sandbox online training

Azure IoT Reference Architecture Guide

<https://docs.microsoft.com/azure/architecture/reference-architectures/iot/>

This reference architecture shows a recommended architecture for IoT applications on Azure using PaaS (platform-as-a-service) components.

Azure IoT Docs

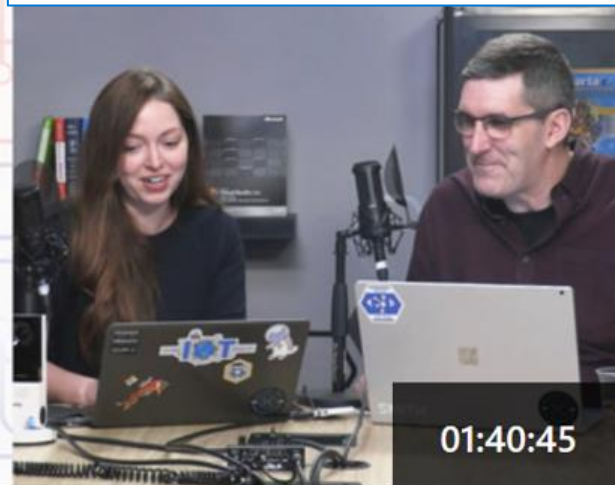
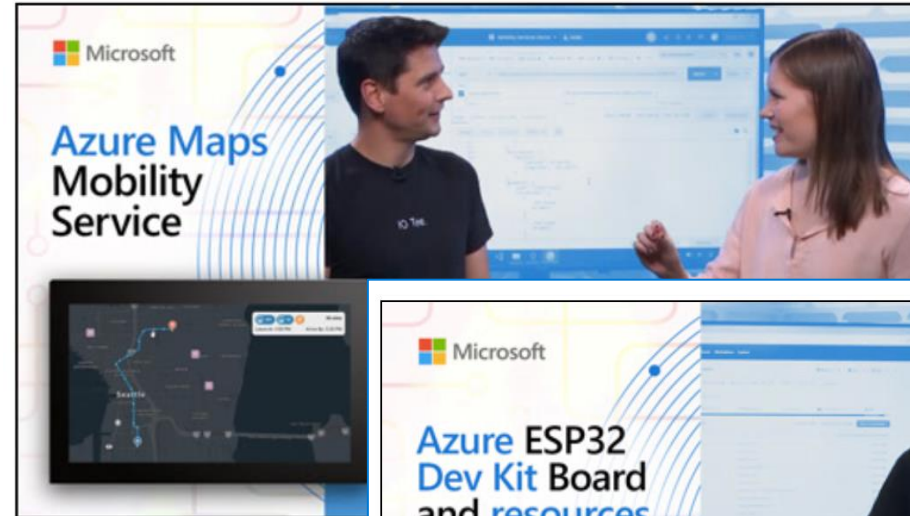
Getting Started, Tutorials, How-to guides, reference, whitepapers

The collage features three main components:

- Microsoft Learn Search Results:** A screenshot of the Microsoft Learn search interface for 'iot'. It shows a search bar with 'iot' entered, a 'Learning Path' filter, and one result found: 'Working with Connected Field Service for Dynamics 365 and Azure IoT'. The result includes a duration of 5 hr 56 min, 5 modules, and a brief description of the learning path.
- Azure IoT documentation homepage:** A screenshot of the Azure IoT documentation page. It has a blue header with the title 'Azure IoT documentation' and a subtitle 'The Azure Internet of Things (IoT) is a collection of Microsoft-managed cloud services that connect, monitor, and control billions of IoT assets.' Below the header is a grid of tiles for 'OVERVIEW' (What is Azure IoT?), 'DOWNLOAD' (Install VS Code tools for Azure IoT), 'ARCHITECTURE' (Azure IoT reference architecture), 'LEARN' (Azure IoT on Microsoft Learn), 'CONCEPT' (Secure your Azure IoT deployment), and 'HOW-TO GUIDE' (Support and help options).
- Azure IoT reference architecture diagram:** A detailed diagram titled 'Azure IoT reference architecture' dated 01/09/2019. It shows the flow of data from 'Things' (IoT Edge devices, IoT devices, Bulk device provisioning) through a 'Cloud gateway' and 'Stream processing' (Stream Analytics) to 'Insights' (Data transformation, Warm path store, Cold path store, Machine learning) and finally to 'Action' (Business integration, User management, UI reporting and tools). The diagram is organized into three main sections: Things, Insights, and Action.

IoT Show

New video every Monday (Deep Dives on Wednesdays!) Subscribe to stay up-to-date with latest Microsoft IoT announcements, product and features demos, customer and partner spotlights, top industry talks, and technical deep dives with IoT Show! aka.ms/IoTShow



IoT Tech Community

Community forum to stay to update on latest announcements, connect with other developers, share your projects, and ask questions!

Fast growing vibrant community

One Microsoft IoT voice

<http://aka.ms/iottechcommunity>

