

Azure IoT

Ansley Yeo



Microsoft IoT is already delivering great results across industries

FINNING

"Fining's IoT solution has enabled customers to quickly solve business problems from a dashboard, transport more than 1 million additional tons of cargo via machine learning, reduce fuel consumption by reducing ideling by 17%, and increase ROI and competitiveness for the long term."



Rolls-Royce™

Cutting fuel usage by 1 percent could save **\$250,000 per plane per year**



Tetra Pak's IoT business results show down-time cut down by up to 48 hours for each packaging line saving up to 30,000 Euros for customers."

HERSHEY'S

Ensure the licorice extruders on Twizzler's production line are **performing at peak optimization, saving over \$500K/year** on licorice alone.

RAC

By analyzing driving trends on its own patrol fleet, RAC has **reduced its accident rate by 25%, and reduced fuel usage by 20% - reporting annual savings of \$1.8 million**



By telling farmers such things as when to irrigate, how to control diseases and where to fight pests, agroNET provides an action plan to maximize efficiency. This solution has seen yield increases of 30% due to data & machine learning informed irrigation decisions and reductions in water use by 20%."

Rockwell Automation

Improves **access** to production and supply chain **data** worldwide, reducing downtime costs by as much as **\$300,000 per day**



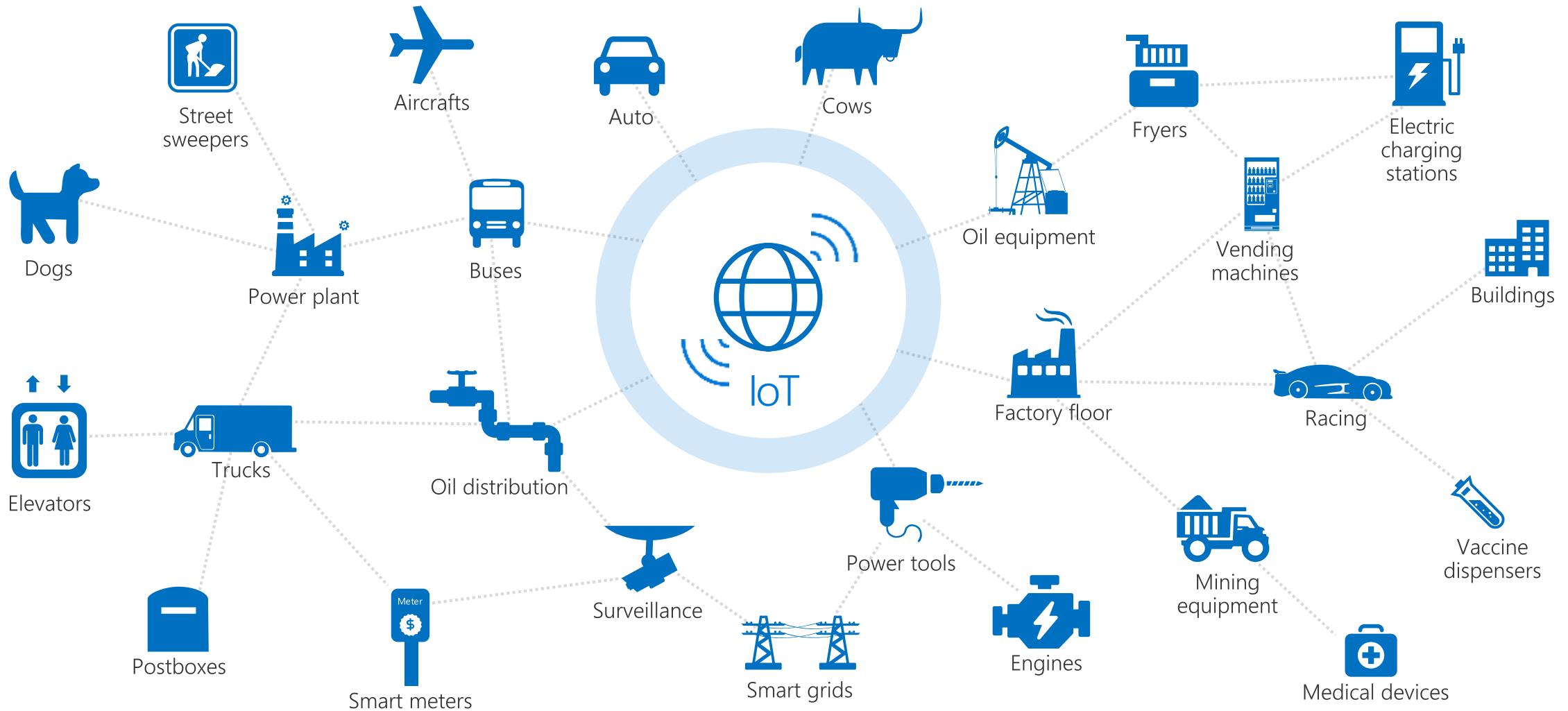
thyssenkrupp

Gathers data from sensors and systems to create valuable business intelligence and **reduce downtime by 50%**

IoT Solution has a common pattern



Innovation at work – real IoT use cases



IoT projects can be complex



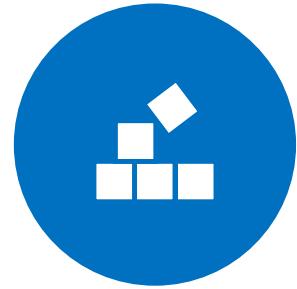
Difficult to maintain cohesive security



Time-consuming to get started

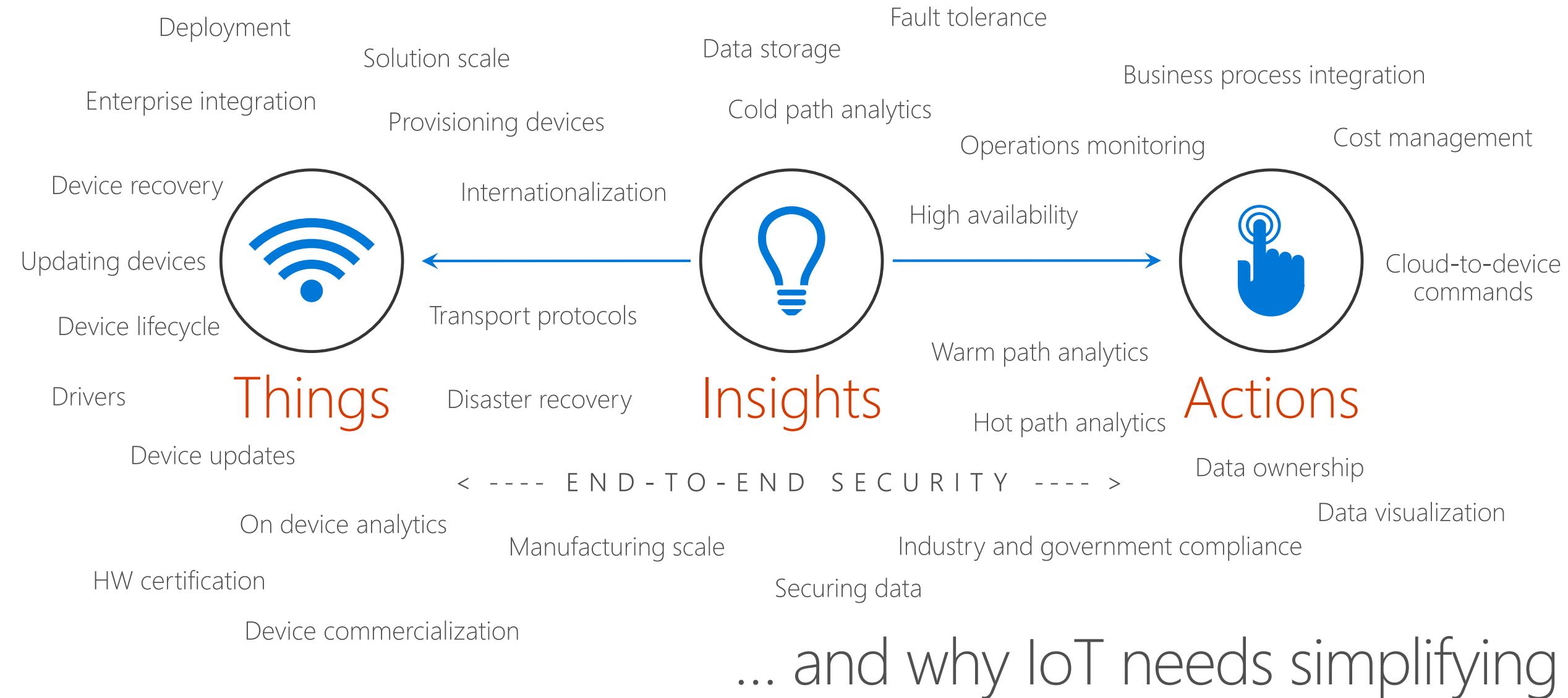


Incompatible with existing infrastructure



Challenging to **scale** over time

A more realistic view...



However, IoT projects can be complex



Long project timelines



Hard to analyze project outcomes



Incompatible with current infrastructure



Difficult to stand up

Take the complexity out with Azure IoT Suite



Long project timelines



Enable fast solution development



Hard to analyze project outcomes

10101
01010
00100

Facilitate new insights by harnessing power of untapped data



Incompatible with current infrastructure



Provide connectivity to both existing and new devices



Difficult to stand up



Connect to existing business systems

Microsoft is simplifying IoT

Microsoft is simplifying IoT

Azure IoT Suite

Easier to build secure, scalable solutions from device to cloud for common IoT scenarios



Remote Monitoring | Predictive Maintenance | Connected Factory

Microsoft IoT Central

Solutions from device to cloud
Fully managed SaaS
No cloud solution expertise required



Azure IoT Hub

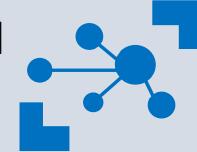
Device Provisioning Service

Fully managed service for securely provisioning devices at scale



Azure IoT Hub

Easier to provision and manage devices at scale
IoT cloud gateway, secure, bi-directional communication with billions of devices sending trillions of messages



Azure Time Series Insights

Easier to find insights from your IoT devices
Explore and analyze time series data fast, and at scale with a fully managed offering



Easier to infuse devices with intelligence

Azure IoT Edge

Easier to infuse devices with intelligence
Securely distribute cloud intelligence locally, and at scale



Microsoft is simplifying IoT

Azure IoT Suite

Preconfigured solutions for common IoT scenarios



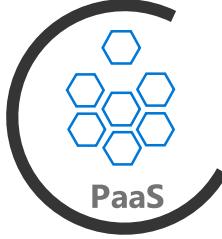
Remote Monitoring | Predictive Maintenance | Connected Factory

Microsoft IoT Central

Fully managed IoT SaaS
No cloud solution expertise required



Choosing Between Approaches



Azure IoT Suite

Primary usage

Custom solutions that need maximum flexibility



Microsoft IoT
Central

Straightforward IoT solutions that don't require deep service customization

Microsoft IoT Central

-  Device Connectivity & Management
-  Telemetry Ingestion and Command & Control
-  Monitoring Rules & Triggered Actions
-  User roles and permissions
-  Dashboards, Visualization & Insights
-  Fully Hosted & Managed by Microsoft



Microsoft IoT Central

Builders



Product Modeler



Digital-twin Management



Template Management



Rules & Workflows

Administrators



App Manager



User Management



Identity Management

Operators



Intuitive discoverability



Asset Visualizations



Time-series Insights



Device Management

Azure IoT Suite



Device Connectivity & Management



Data Ingestion and Command & Control



Stream Processing & Predictive Analytics



Workflow Automation and Integration



Dashboards and Visualization



Preconfigured Solutions

Remote monitoring

Predictive maintenance

Connected factory



Azure IoT Suite Today

Three independent solutions

Solution types



Remote monitoring

Connect and monitor your devices to analyze untapped data and improve business outcomes by automating processes.



Connected factory

Accelerate your journey to Industrie 4.0 – connect, monitor and control industrial devices for insights using OPC UA to drive operational productivity and profitability.



Predictive maintenance

Anticipate maintenance needs and avoid unscheduled downtime by connecting and monitoring your devices for predictive maintenance.

Select

Select

Select

www.azureiotsuite.com

Open source code

The screenshot shows the GitHub interface with three repository cards:

- Azure / azure-iot-predictive-maintenance**: Watched 113, Starred 34, Forked 26. Description: Azure IoT Predictive Maintenance preconfigured solution. 1326 commits, 101 branches, 7 releases, 41 contributors. Last commit: Merge branch 'feature' from https://github.com/Azure/azure-iot-remote-monitoring 20 days ago.
- Azure / azure-iot-connected-factory**: Watched 16, Starred 10, Forked 4. Description: Azure IoT Connected Factory preconfigured solution. 1326 commits, 101 branches, 7 releases, 41 contributors. Last commit: Add default 'Night' simone 26 days ago.
- Azure / azure-iot-remote-monitoring**: Watched 349, Starred 180, Forked 752. Description: Azure IoT Remote Monitoring preconfigured solution. 1326 commits, 101 branches, 7 releases, 41 contributors. Last commit: Merge branch 'feature' from https://github.com/Azure/azure-iot-remote-monitoring 20 days ago.

<https://github.com/Azure/azure-iot-predictive-maintenance>

<https://github.com/Azure/azure-iot-connected-factory>

<https://github.com/Azure/azure-iot-remote-monitoring>

Azure IoT Suite

Remote Monitoring V2

Preview coming in October 2017

GOALS



Beautiful & Functional

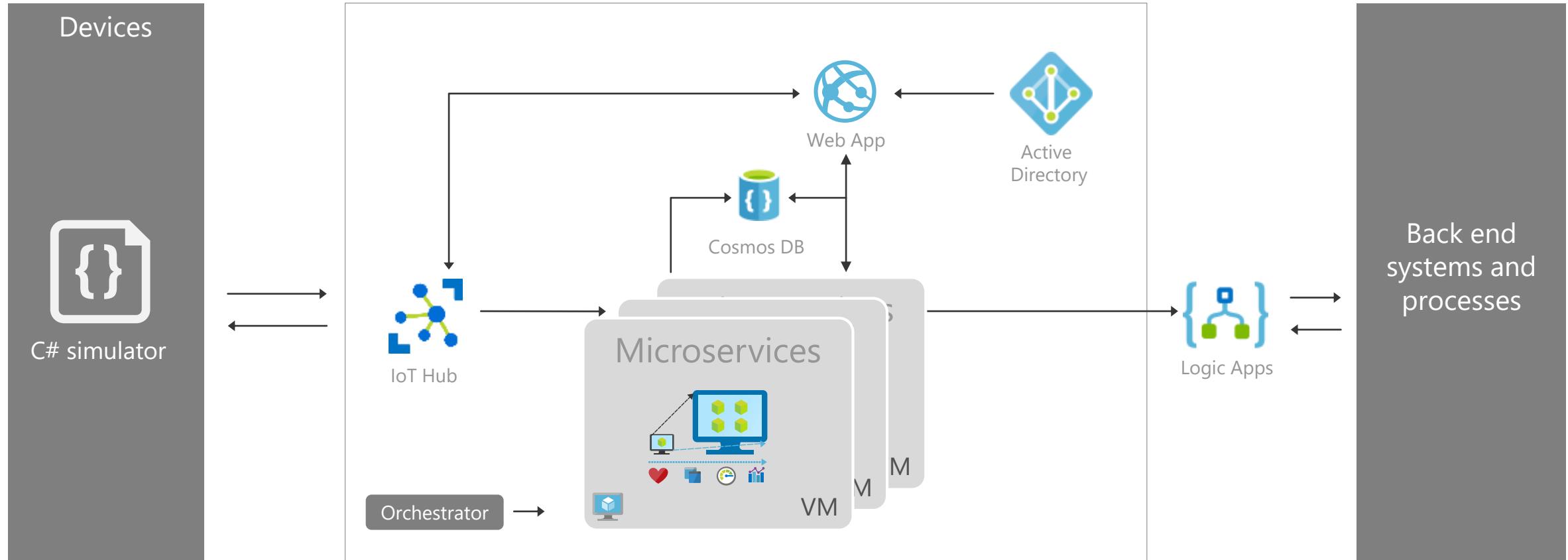


Agile & Scalable



Customizable

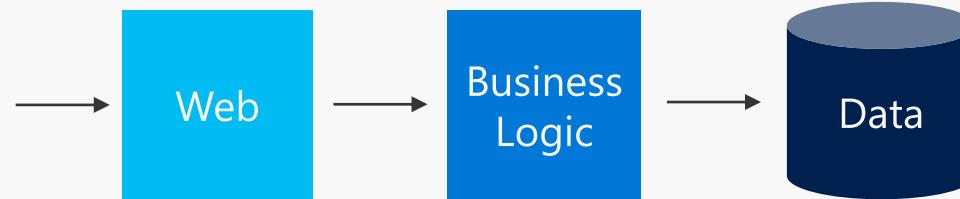
Azure IoT Suite Remote Monitoring – Basic Deployment



Application Models

Monolithic

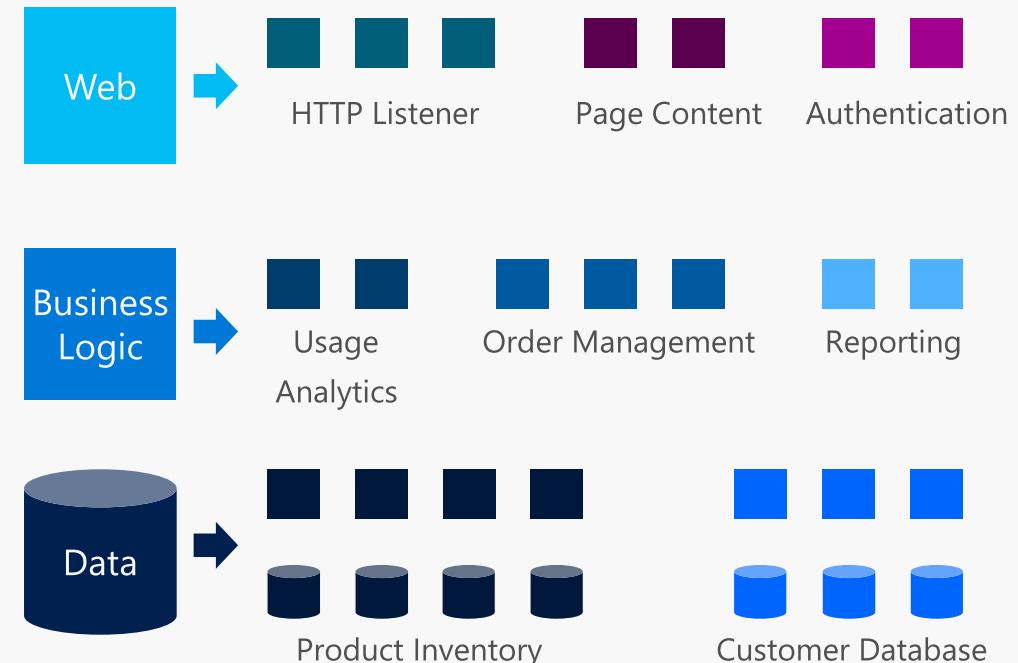
HW Influenced – scale, performance (caching)
Static – little incentive to decompose



3-Tier Monolithic Application

Microservices

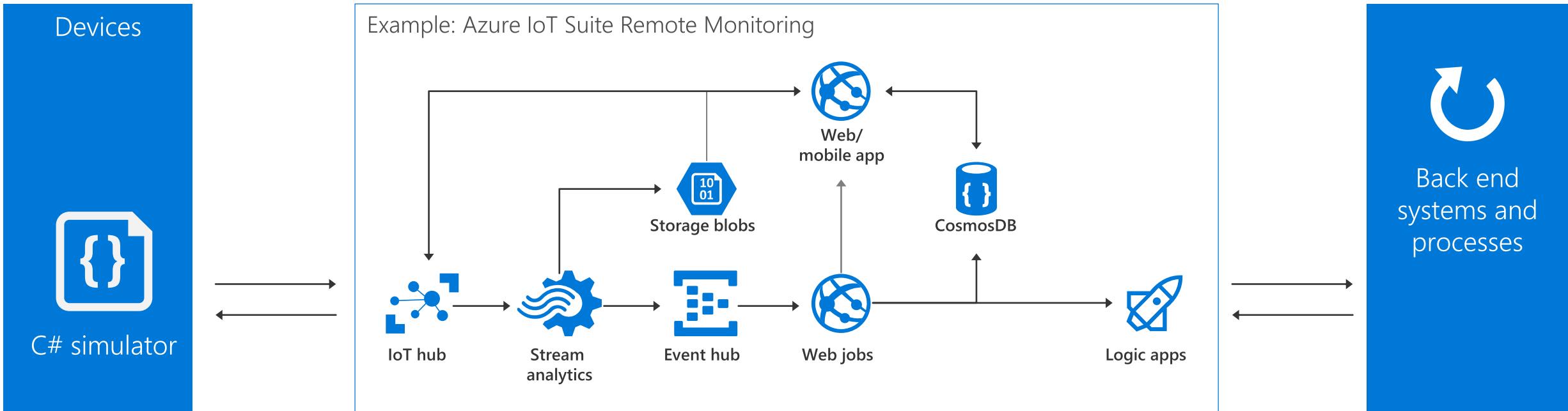
Agility, Scale, Reliability
Deliver Isolated Value
Well defined contracts (RESTful interfaces)
Versioned Independently
Loose Coupling → Rapid Evolution



Breaking the Monolith into Microservices

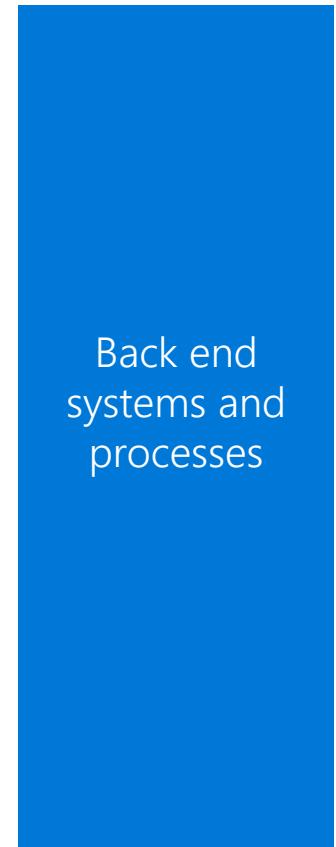
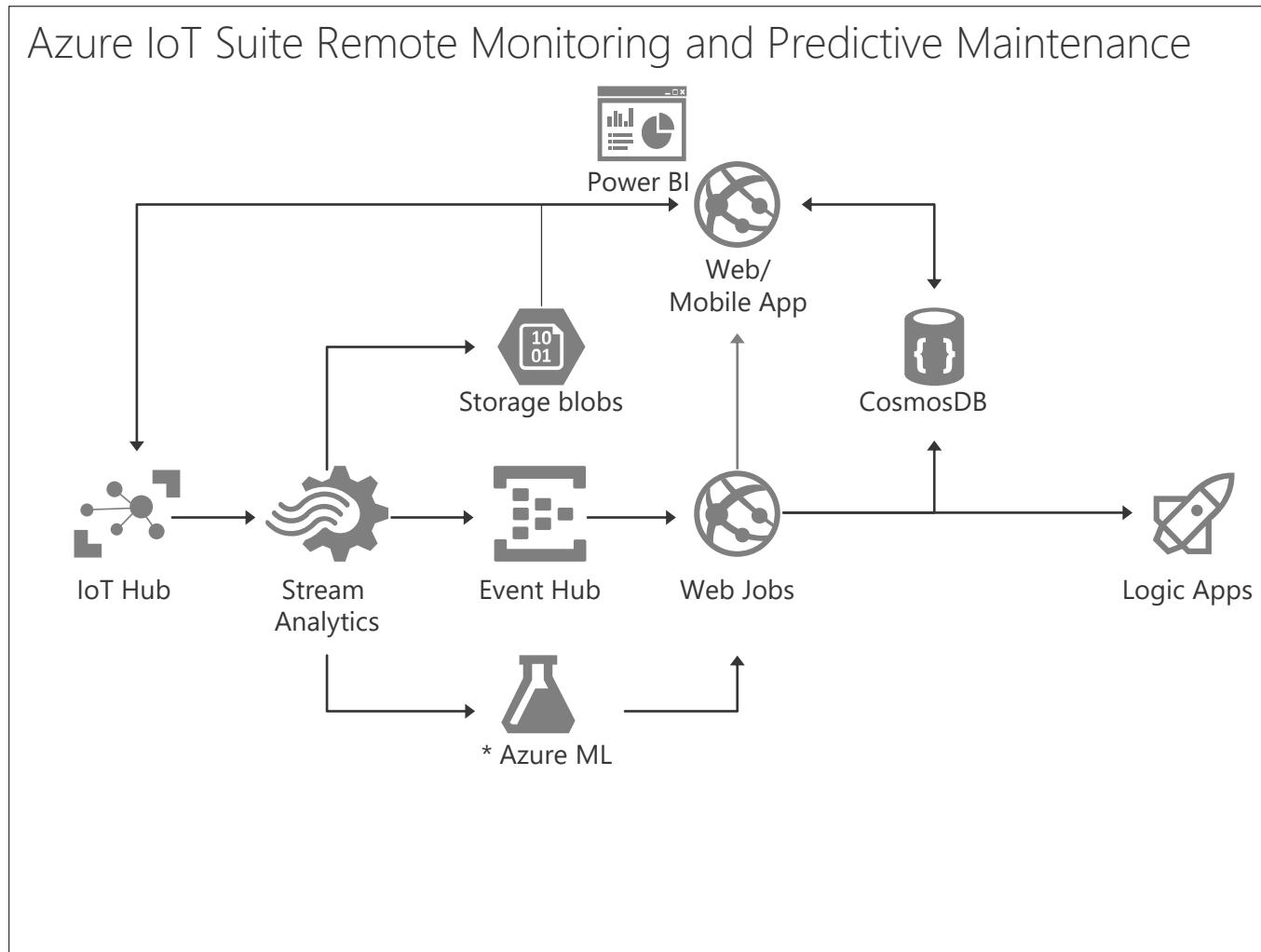
What you get with a preconfigured solution

Remote monitoring | Predictive maintenance | Connected factory



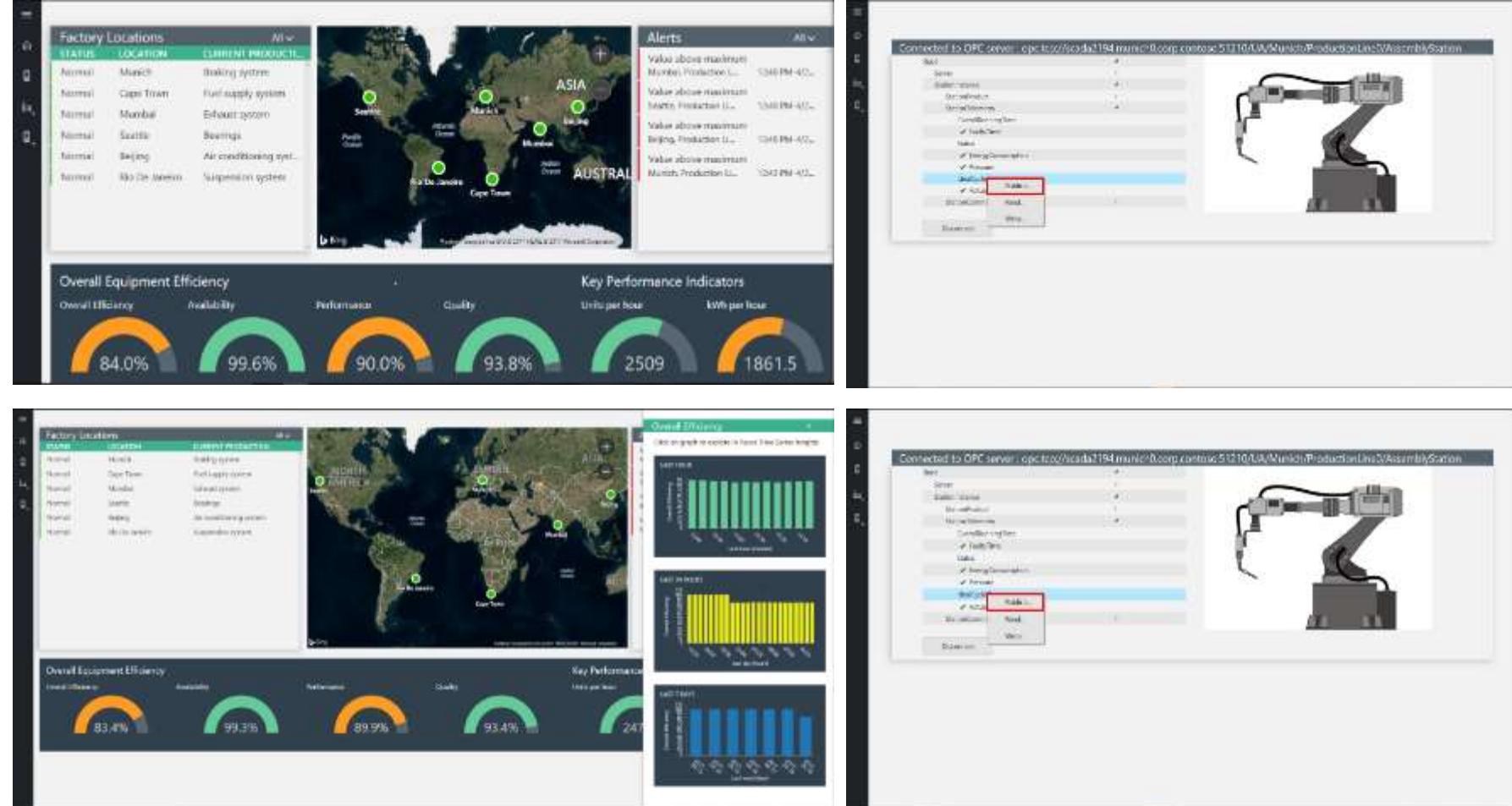
- Remote monitoring includes Cisco Jasper Control Center and Ericsson DCP integration
- Predictive maintenance adds Azure ML
- Connected factory adds support for OPC UA

What is behind these IoT Suite preconfigured solutions

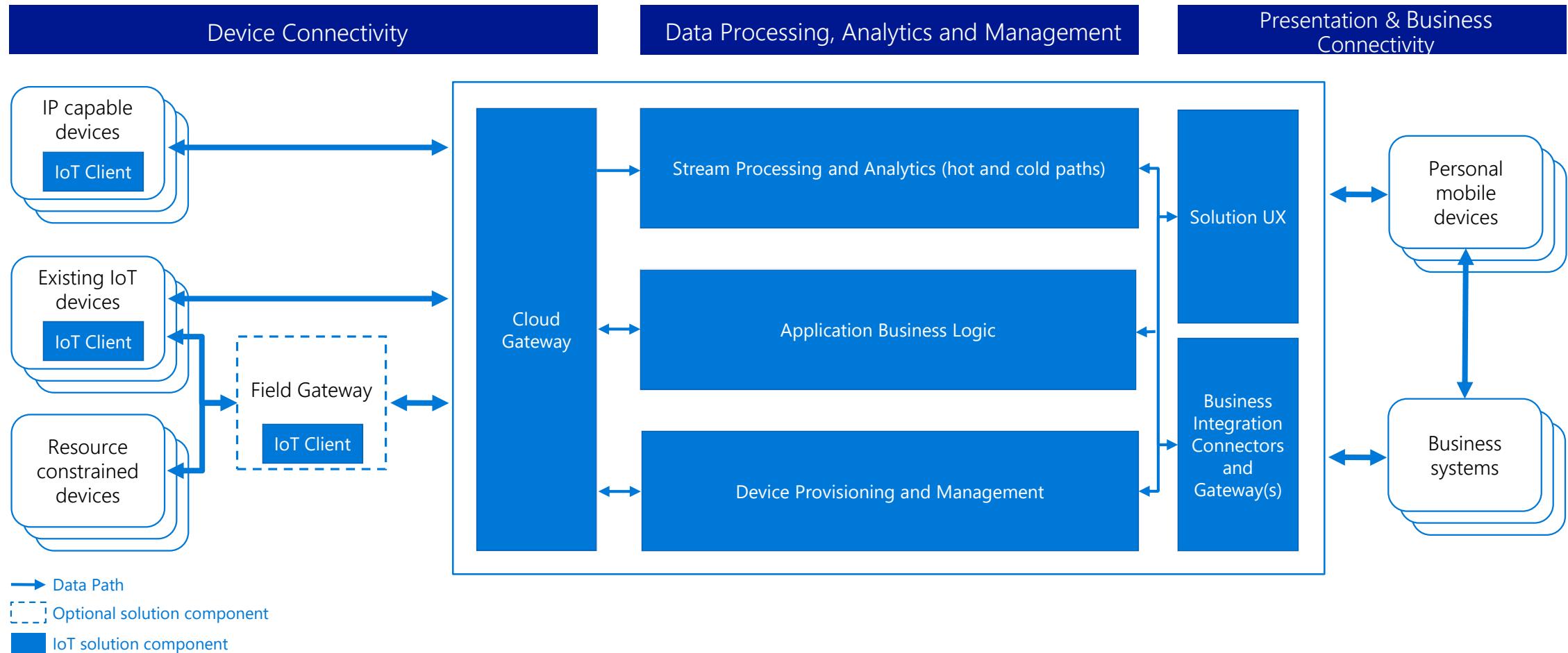


PCS: Connected Factory azureiotsuite.com

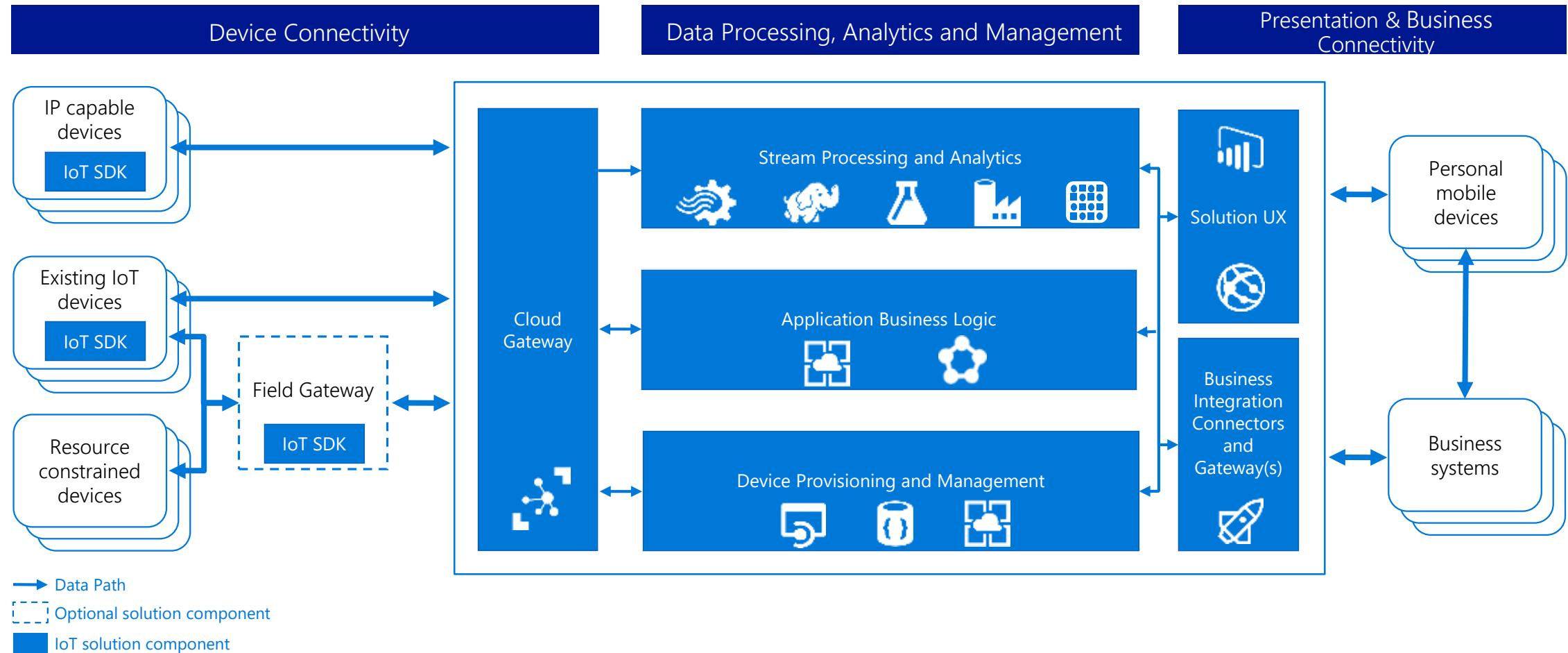
- Connect to OPC Devices via Azure IoT Gateway
- Get started in minutes, simple to configure
- Decide which data to ingest from OPC devices
- Find insights using included Azure Time Series Insights
- Optionally call methods on OPC devices to control them remotely



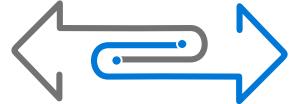
Azure IoT Reference Architecture



Azure IoT Services



Azure IoT Hub



Bi-directional communication

Millions of Devices

Multi-language, open source SDKs

HTTPS/AMQPS/MQTTs

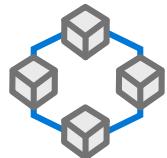
Send Telemetry

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

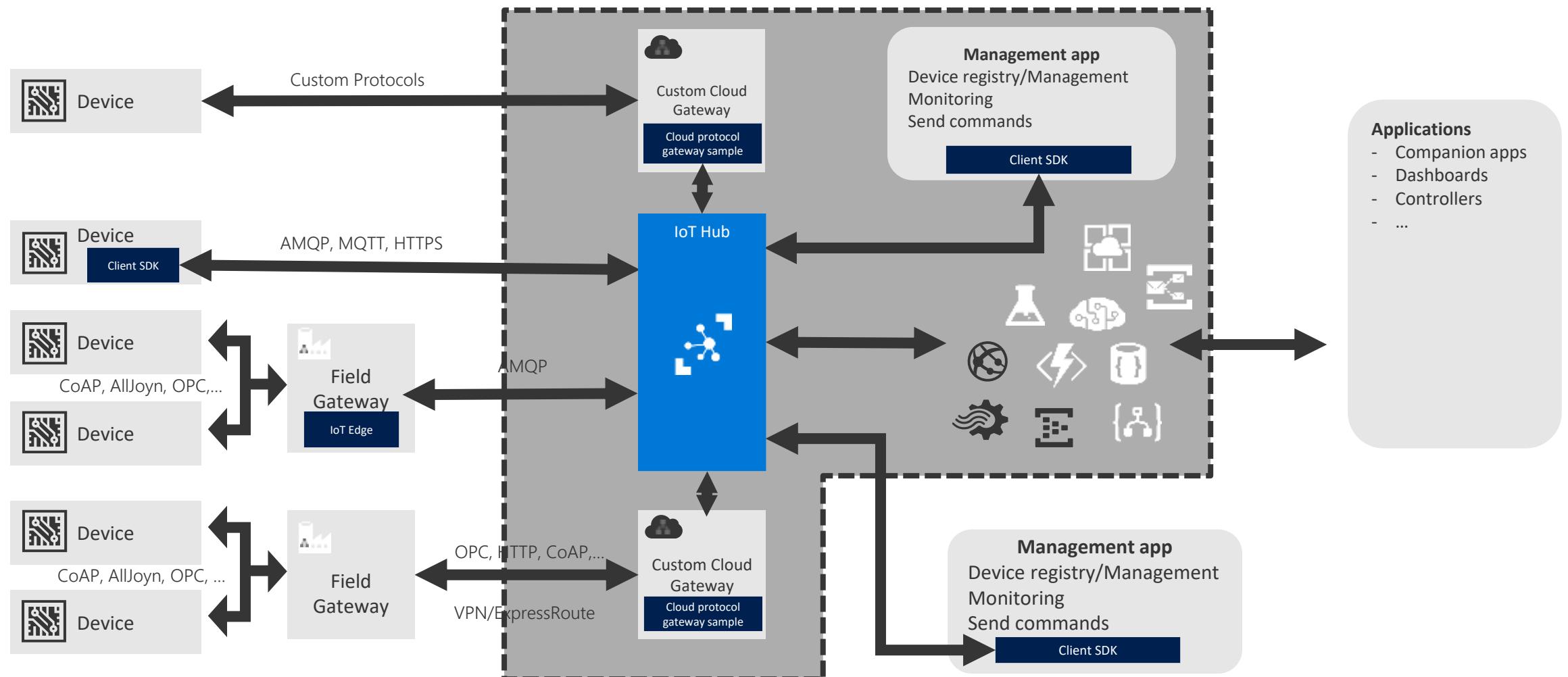
X.509 Support

IP Whitelisting/Blacklisting

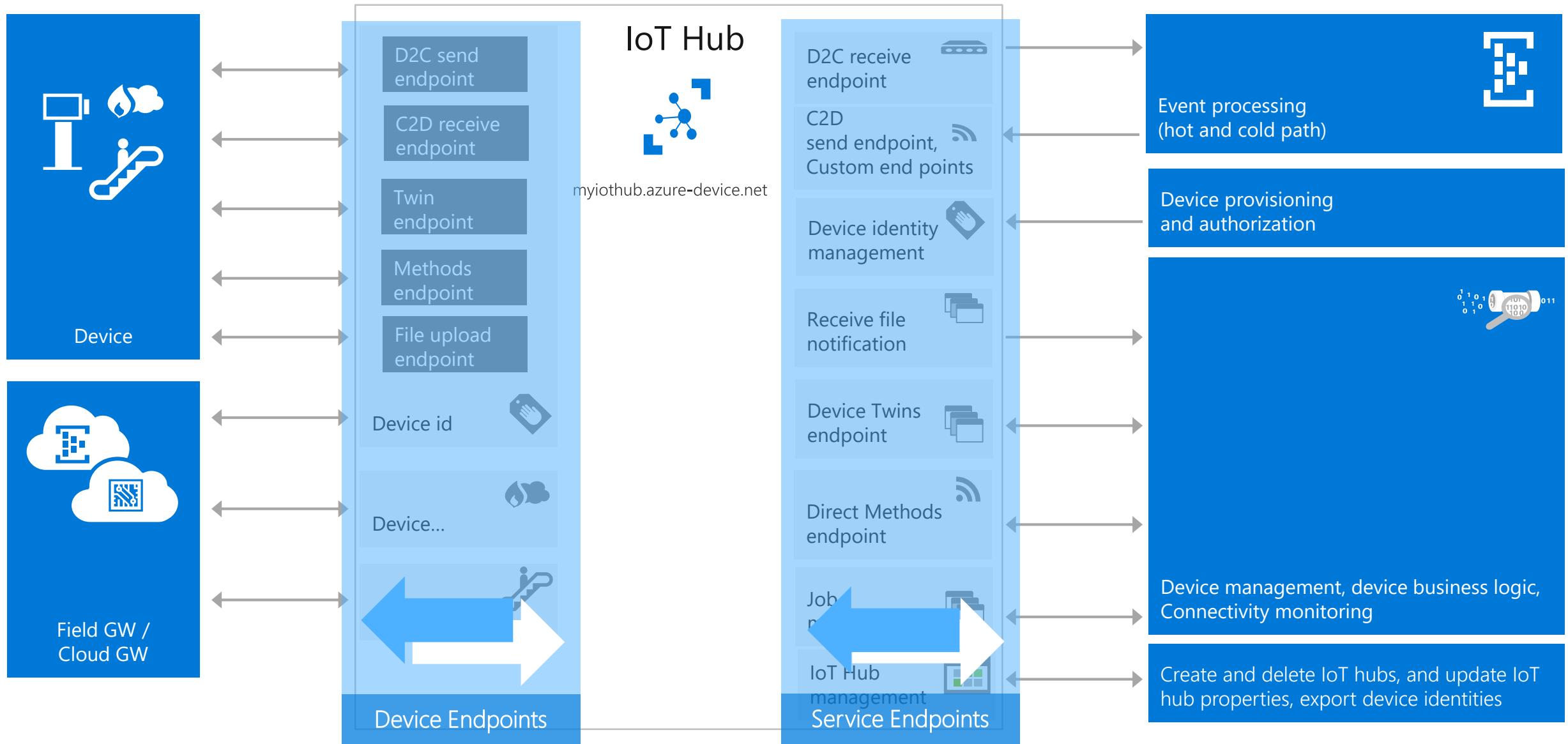
Shared Access Policies

Firmware/Software Updates

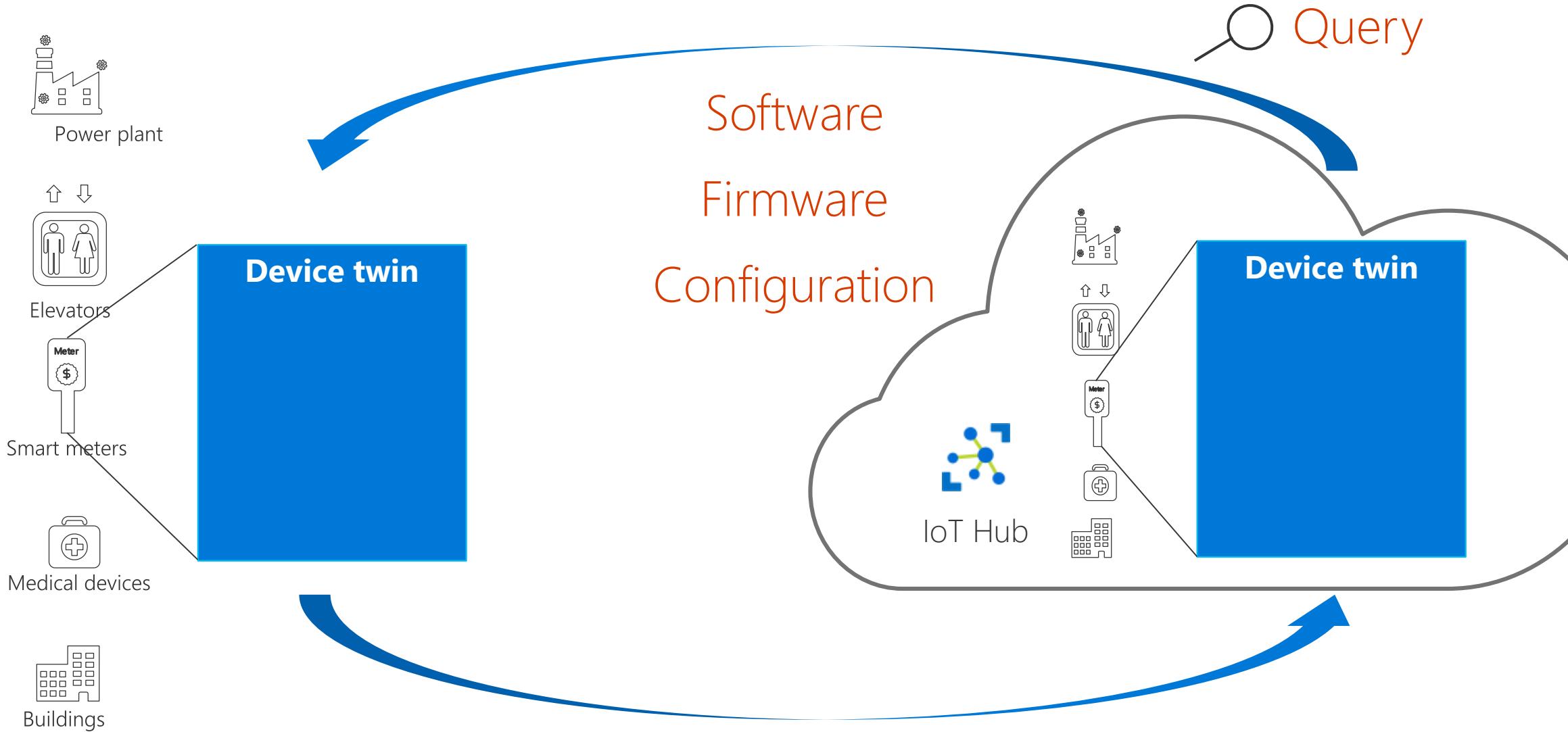
Azure IoT Hub



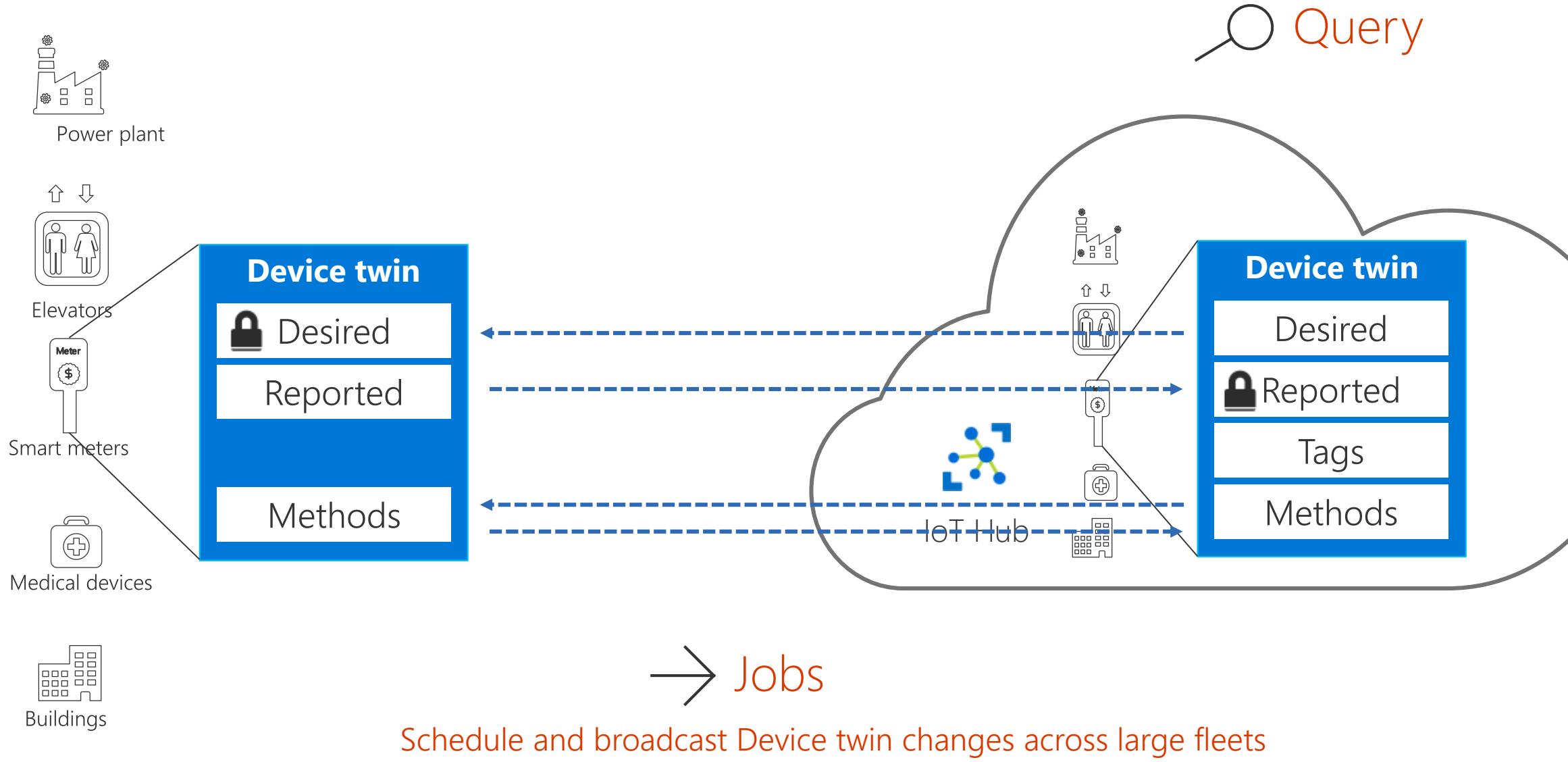
IoT Hub Key Functions



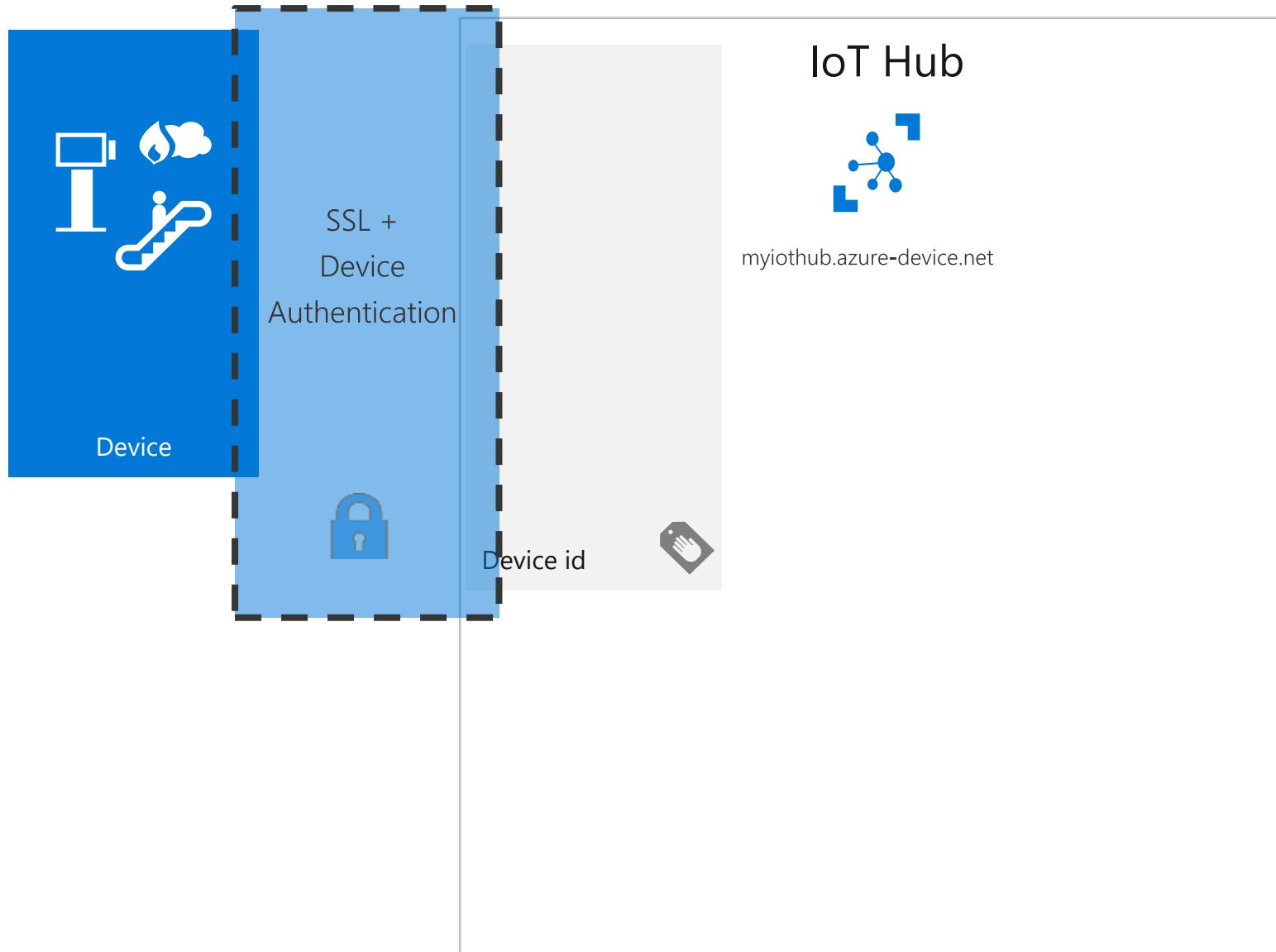
Azure IoT Hub Device Management



Azure IoT Hub Device Management



Device Communication



Private Key -> SAS Token

x.509 Certificate

- Self Signed
- CA

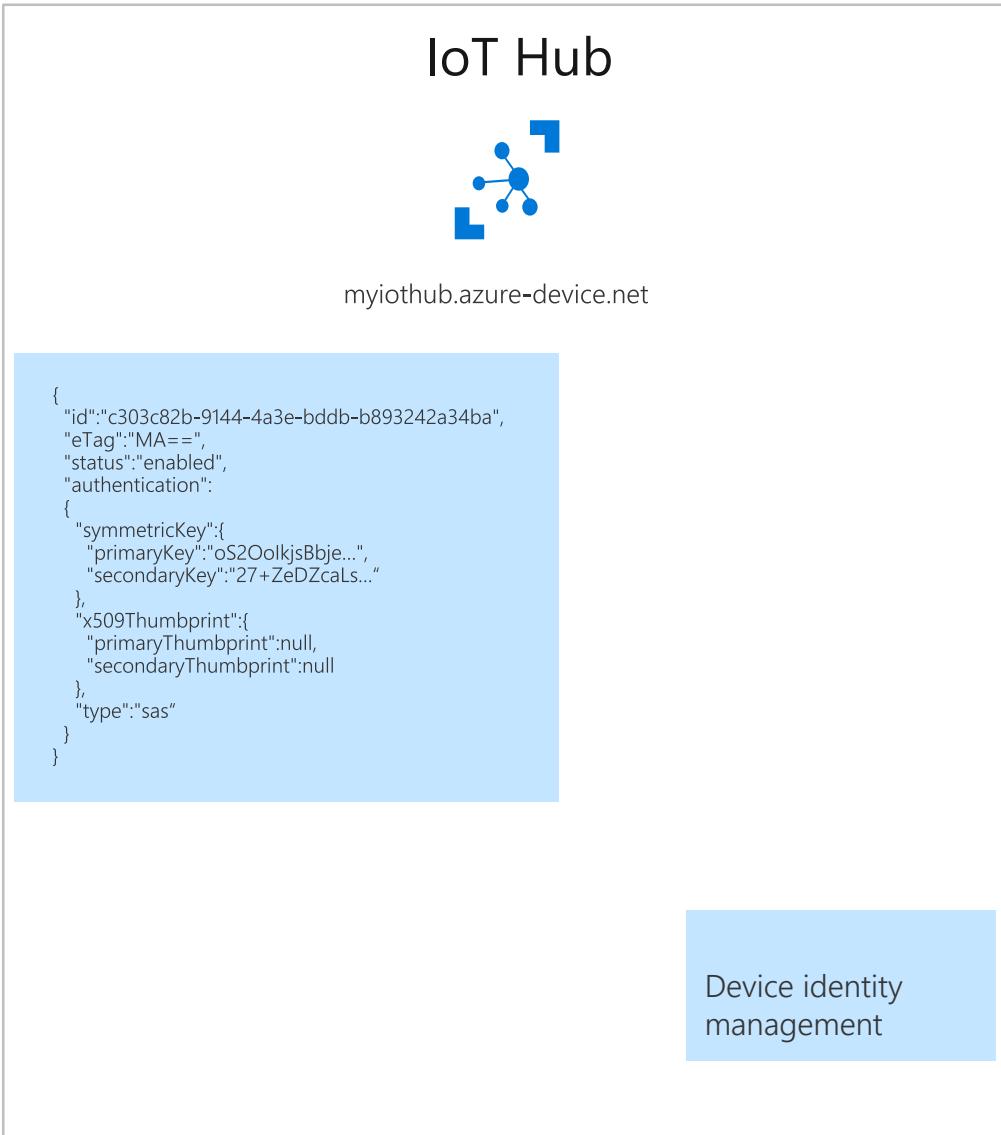
Device Registry

Unique id for each device

Unique credentials for authentication

- Private Key/SAS Token
- X.509 Certificates

Device Twin



Azure Portal
Development tools

- Azure CLI
- VSCode extension

Using a client SDK

- .Net
- Node
- Java
- Python

Device provisioning
and authorization

Structured data

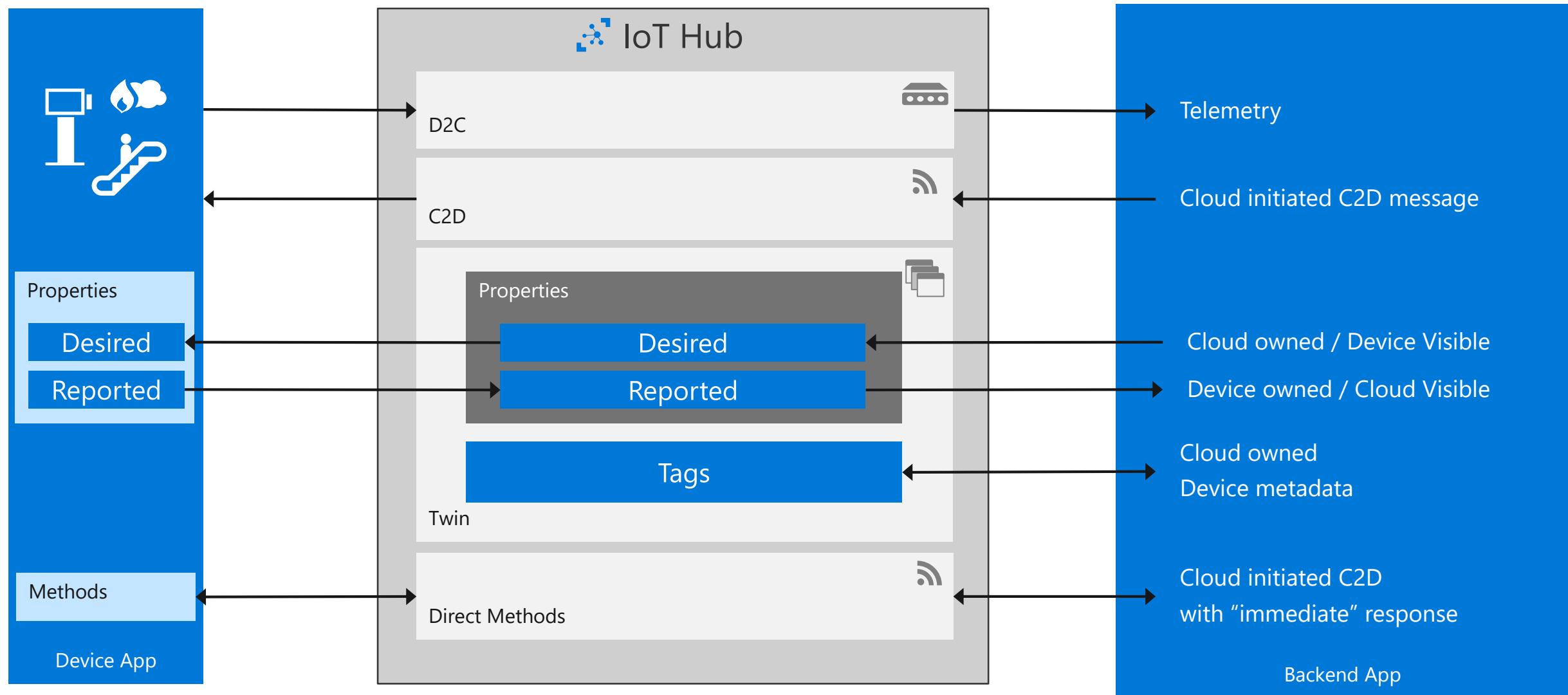
Device Twins

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

Device Direct Methods

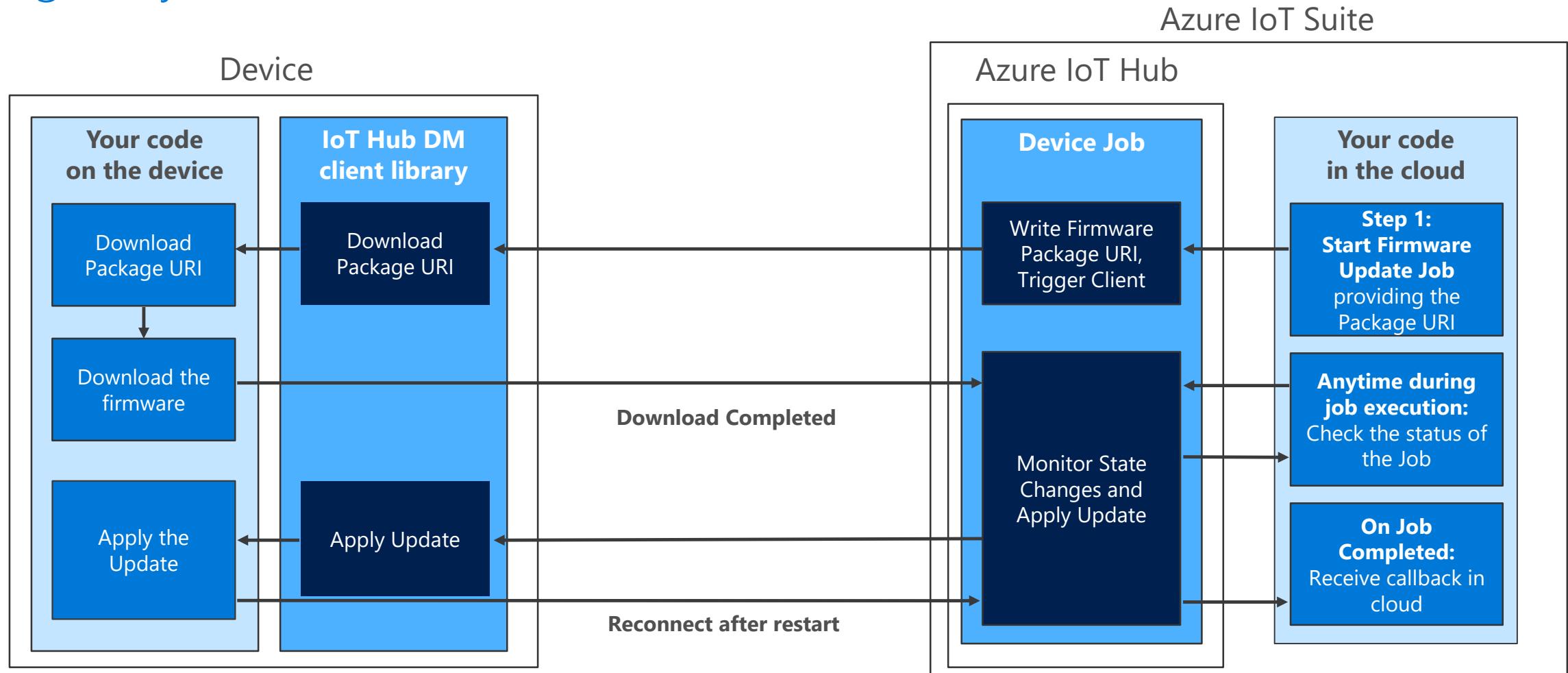
- Invoke method on device from Cloud
- “Immediate” response

Manage through Device Twin and Methods



Device Job - Firmware Update Example

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



IoT Hub Direct Method

Http Post Request:

Uri: {iot hub}/twins/{device id}/methods/

Header: authorization, request id, content type, content encoding

Body:

```
"methodName": "reboot",
"timeoutInSeconds": 60,
"payload": { "input1": "someInput"}
```

2

Device Request:

\$iothub/methods/POST/{method name}/?\$rid={request id}

2

Device Response:

\$iothub/methods/res/{status}/?\$rid={request id}

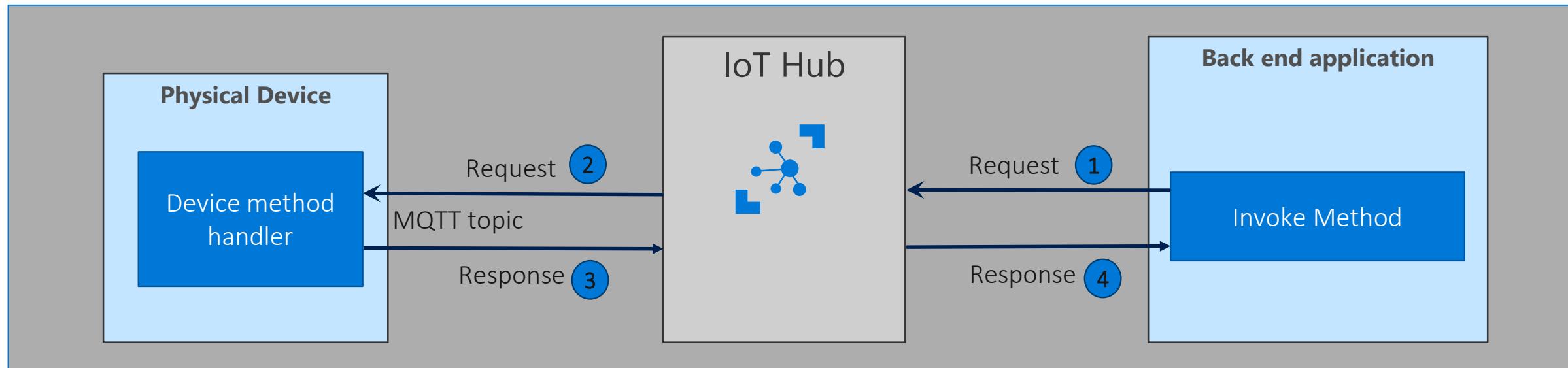
3

4. Http Response:

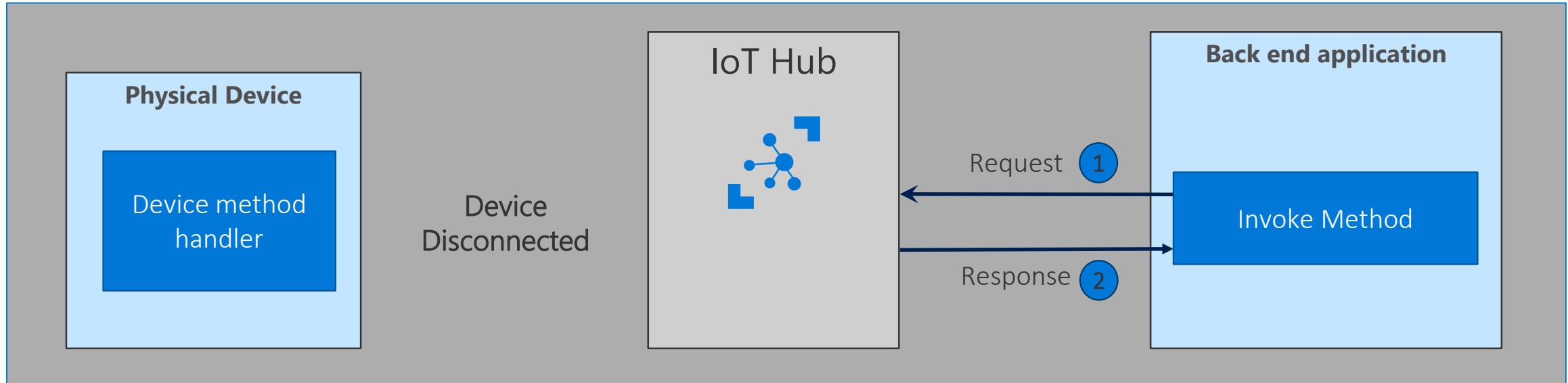
HttpStatusCode: 200, 404, 500

Body: "status" : 200, "payload" : {...}

4



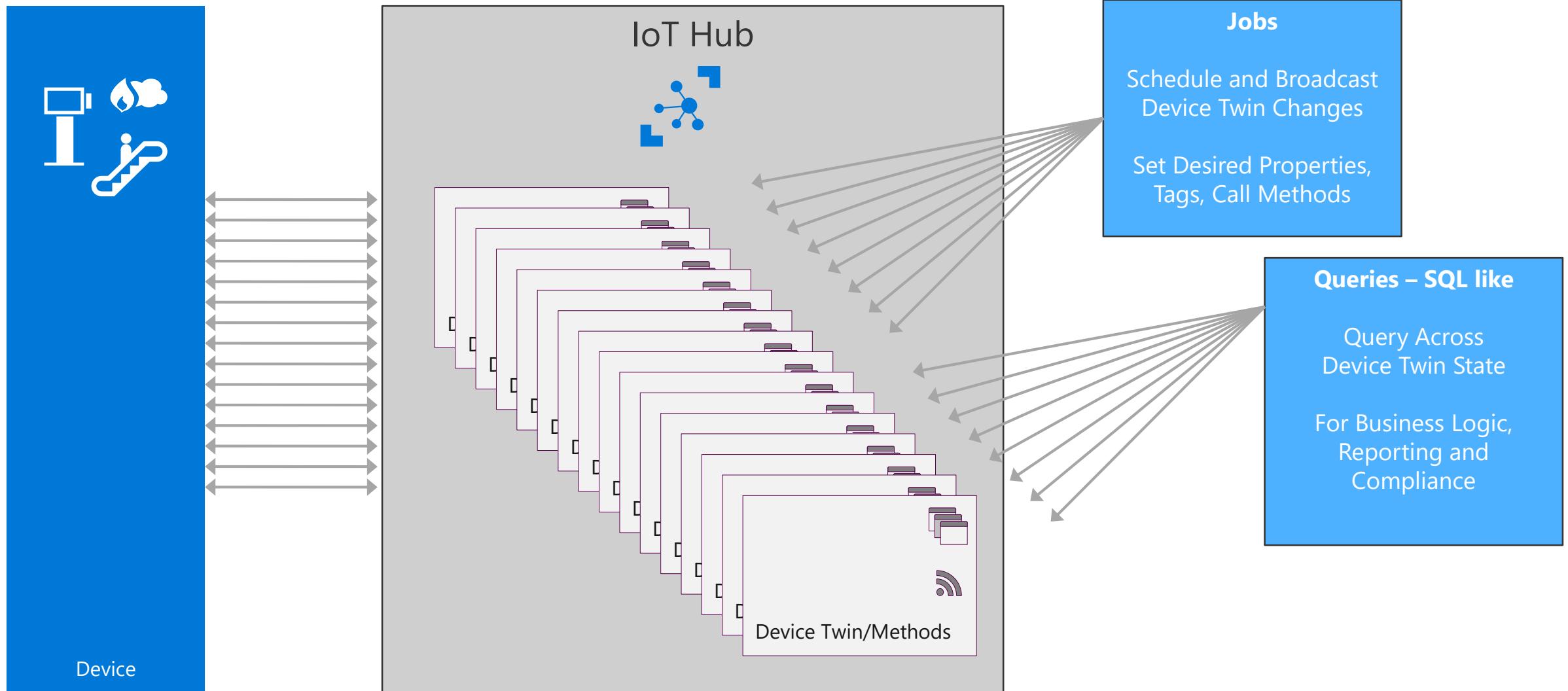
IoT Hub Direct Method (disconnected device)



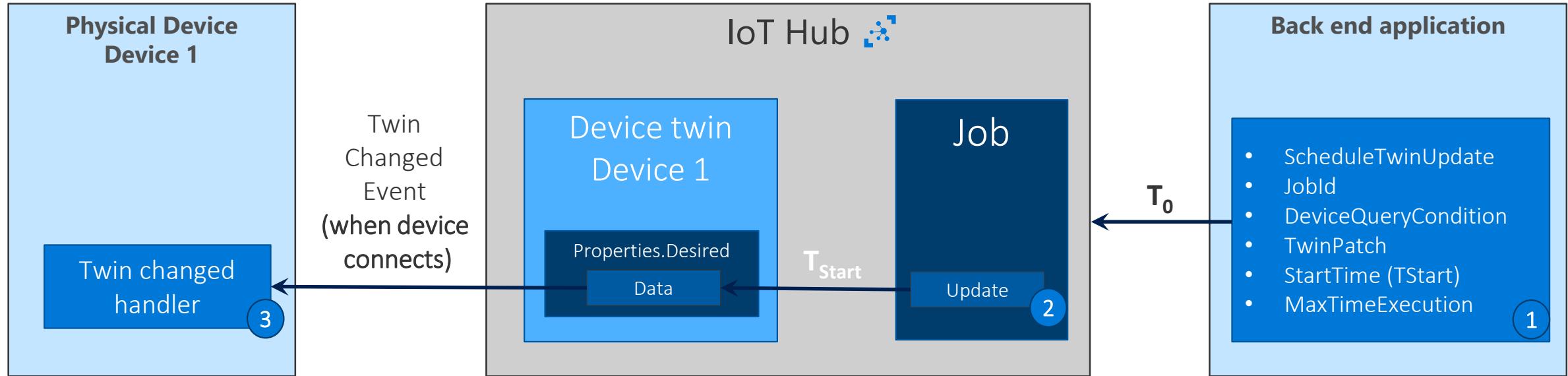
Http Response:
HttpStatuscode: 404
Body:

2

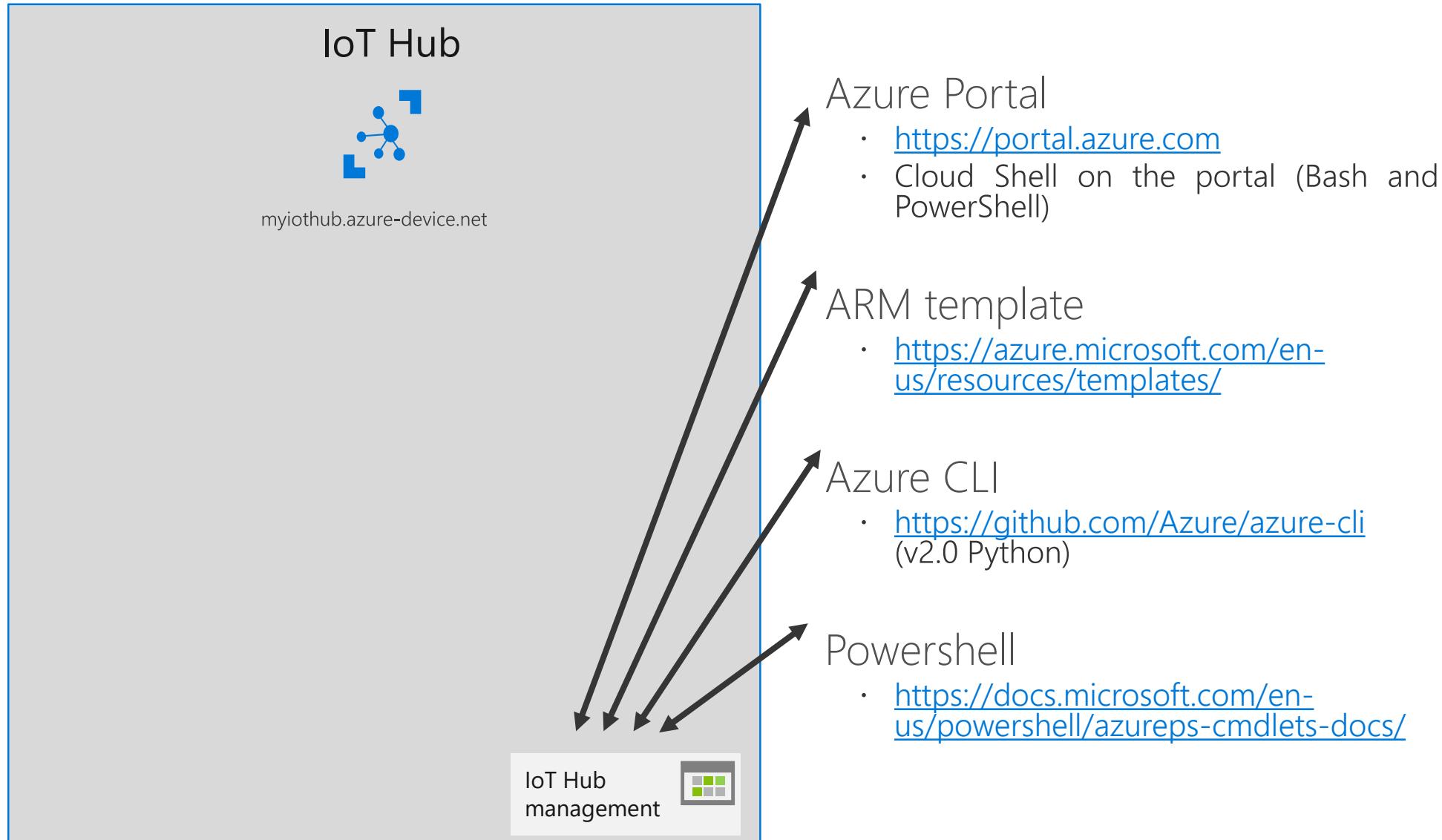
Manage through Jobs and Queries



Job for scheduling device twin updates



Creating your IoT Hub



Device SDK Libraries

SDK, agent libraries

Easily accessible libraries in GitHub

Cross platform/language support

RTOS, Linux, Windows, Android, or iOS
C, C#, JS, Java, Node.js, and Python

IoT protocols

MQTT, AMQP, and HTTP

Connect IP, and non-IP devices

Support for direct connection devices and resource constrained or non-IP devices via gateway and field protocols

Package & Libraries support

Nuget, Apt-Get, Npm, Maven, PyPi, Mbed lib, etc

Open source framework

Develop custom agents for your devices

Secure communication

Secure D2C and C2D connectivity for messaging, device management and command and control

Dev tool support & samples

IoTHub-explorer, Device Explorer, iothub-diagnostics

D2C scenario recommendations

	D2C message	Twin's Reported Properties	File Upload
Scenario	Telemetry and alerts (time series, read sequential)	Synchronizing long-running workflows, such as configuration and software updates.	Large media files. (cold storage)
Size	Up to 256KB messages	Maximum reported properties size is 8KB.	Maximum file size supported by Azure Blob Storage.
Frequency	High	Medium	Low

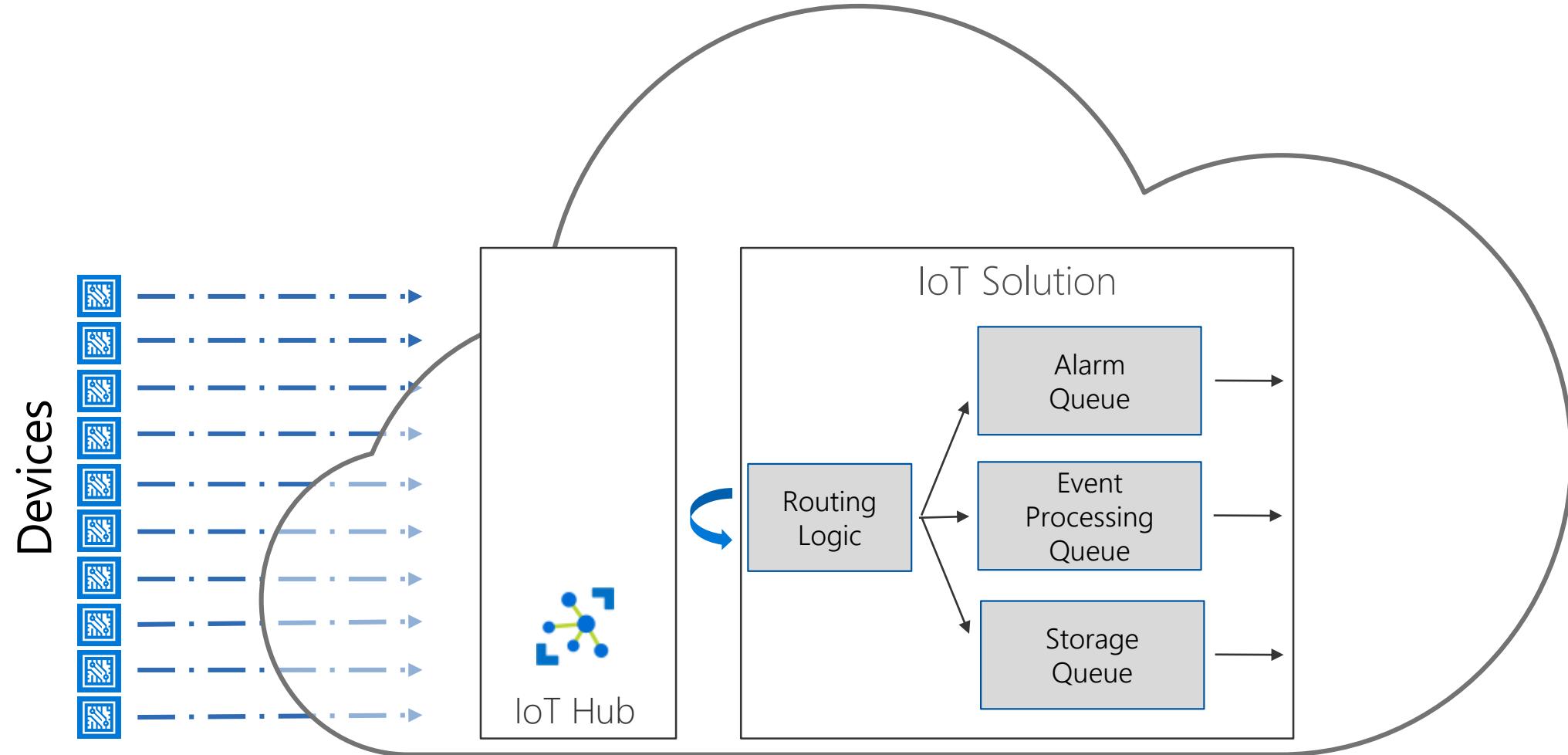
C2D scenario recommendations

	Direct methods	Twin's Desired Properties	C2D messages
Scenario	Commands that require immediate confirmation	Long-running commands	One-way notifications to the device
Size	8KB requests / 8KB responses.	Maximum 8KB	64KB
Frequency	High	Medium	Low

IoT Hub Routing

Azure IoT Hub Message Routes

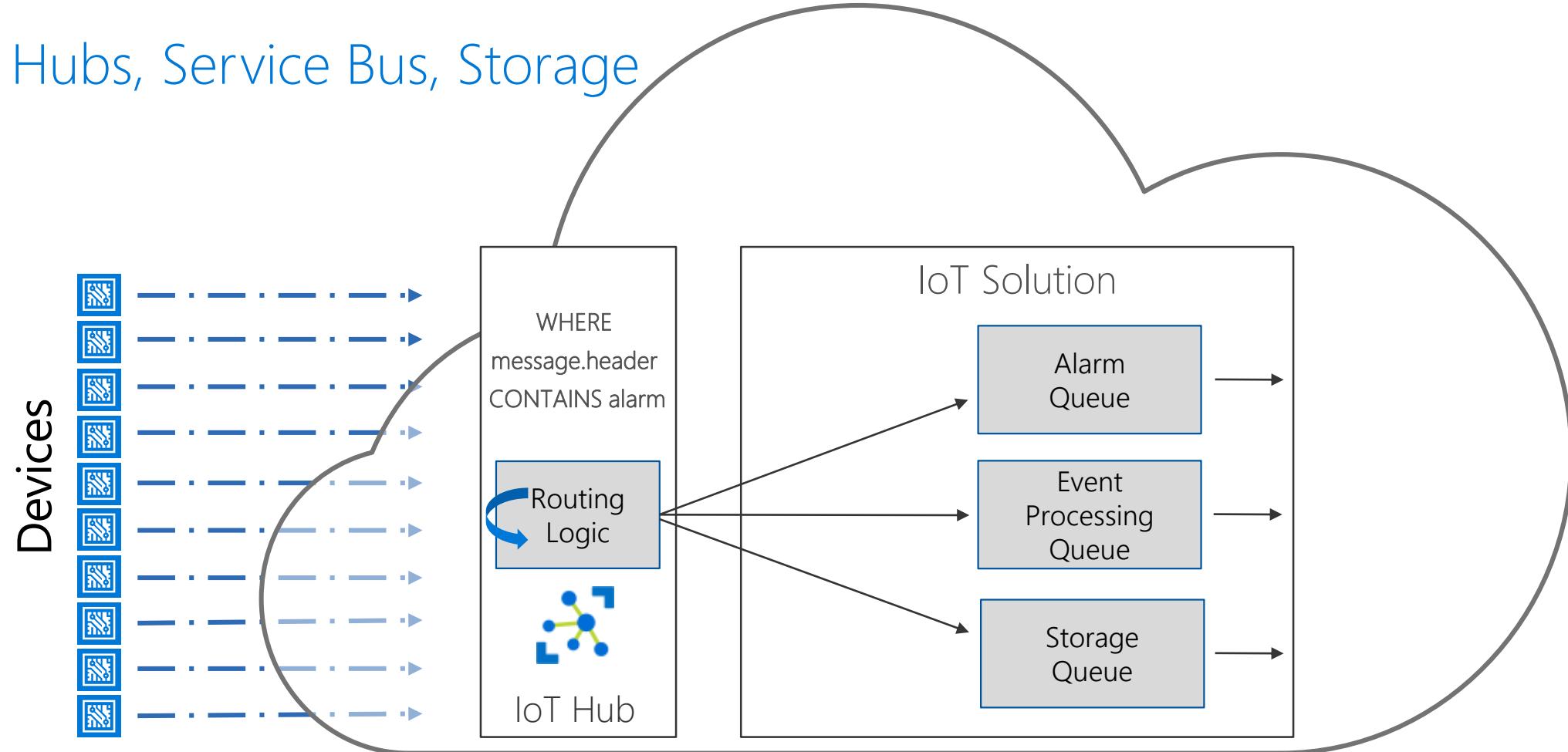
Remember email before inbox rules?



Azure IoT Hub Message Routes

Automatically route messages based on headers or JSON message body

Event Hubs, Service Bus, Storage



Routing messages

1. Endpoints

- Event Hub
- Service Bus Queue
- Service Bus Topic
- Storage Container (new)

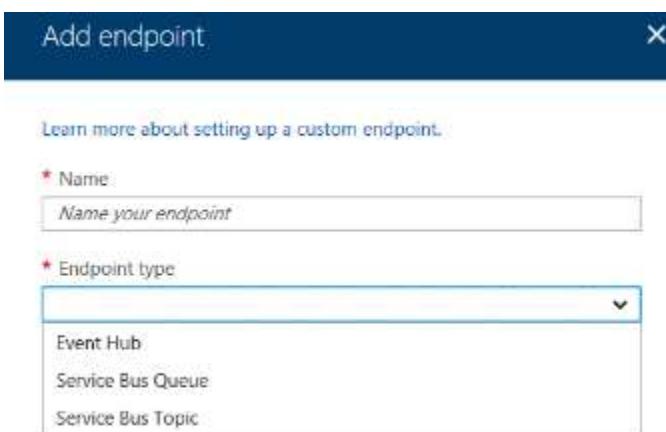
Add endpoint ×

Learn more about setting up a custom endpoint.

* Name

* Endpoint type

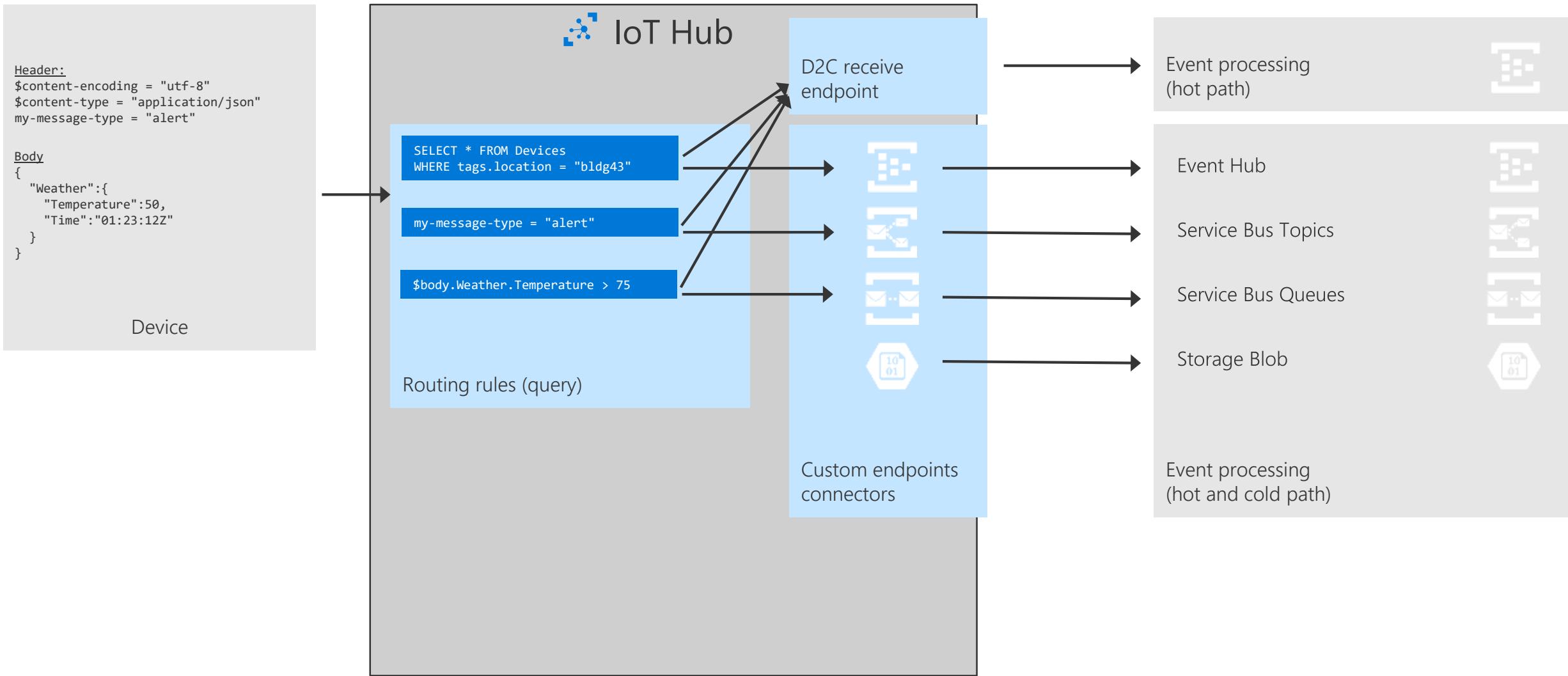
Event Hub
Service Bus Queue
Service Bus Topic



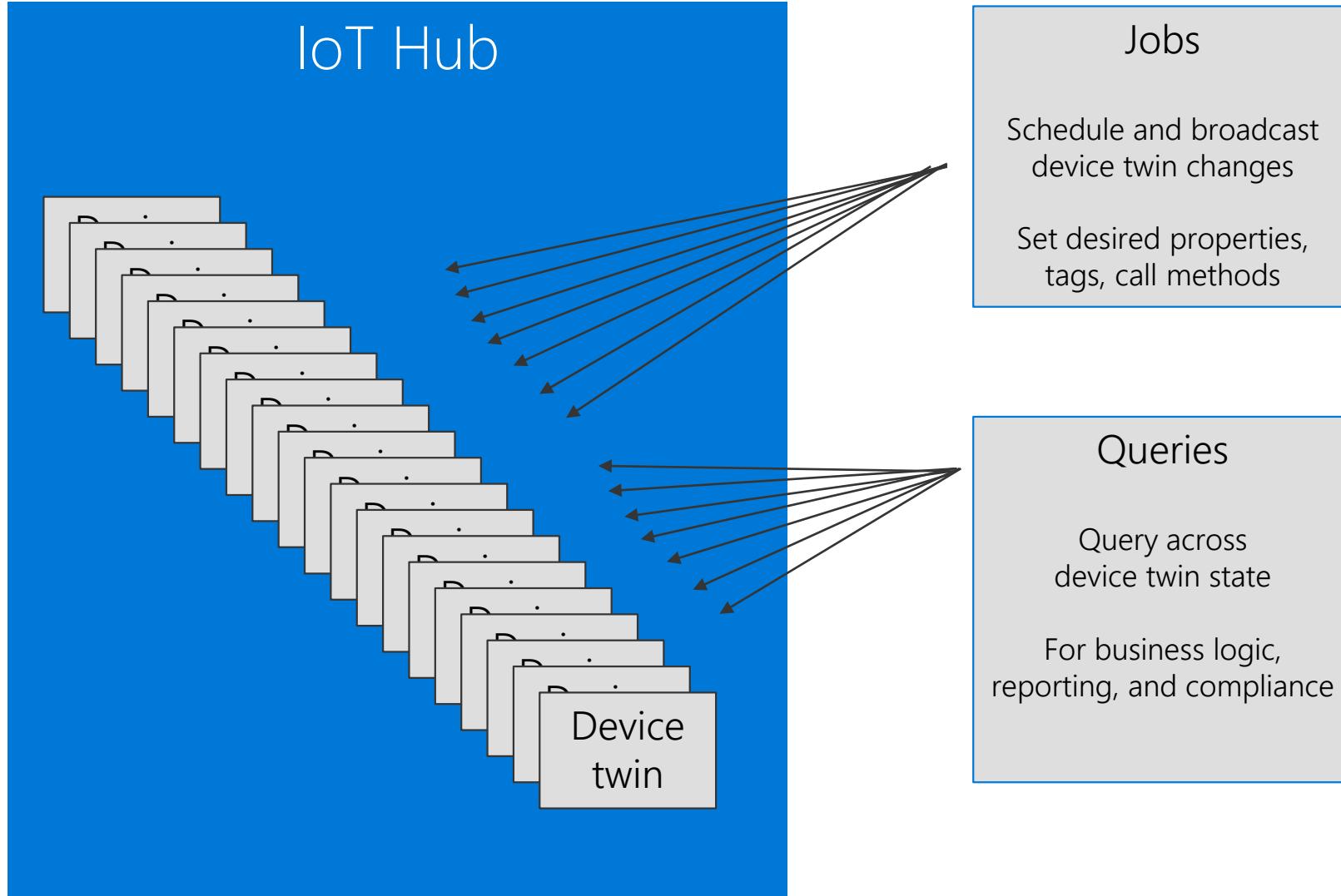
2. Routes

- Endpoint destination (point 1)
- Data source
(Device Messages, Twin Change Events, Device Lifecycle events)
- Query (on message header or body)
- Enable/disable routes

Routing telemetry data

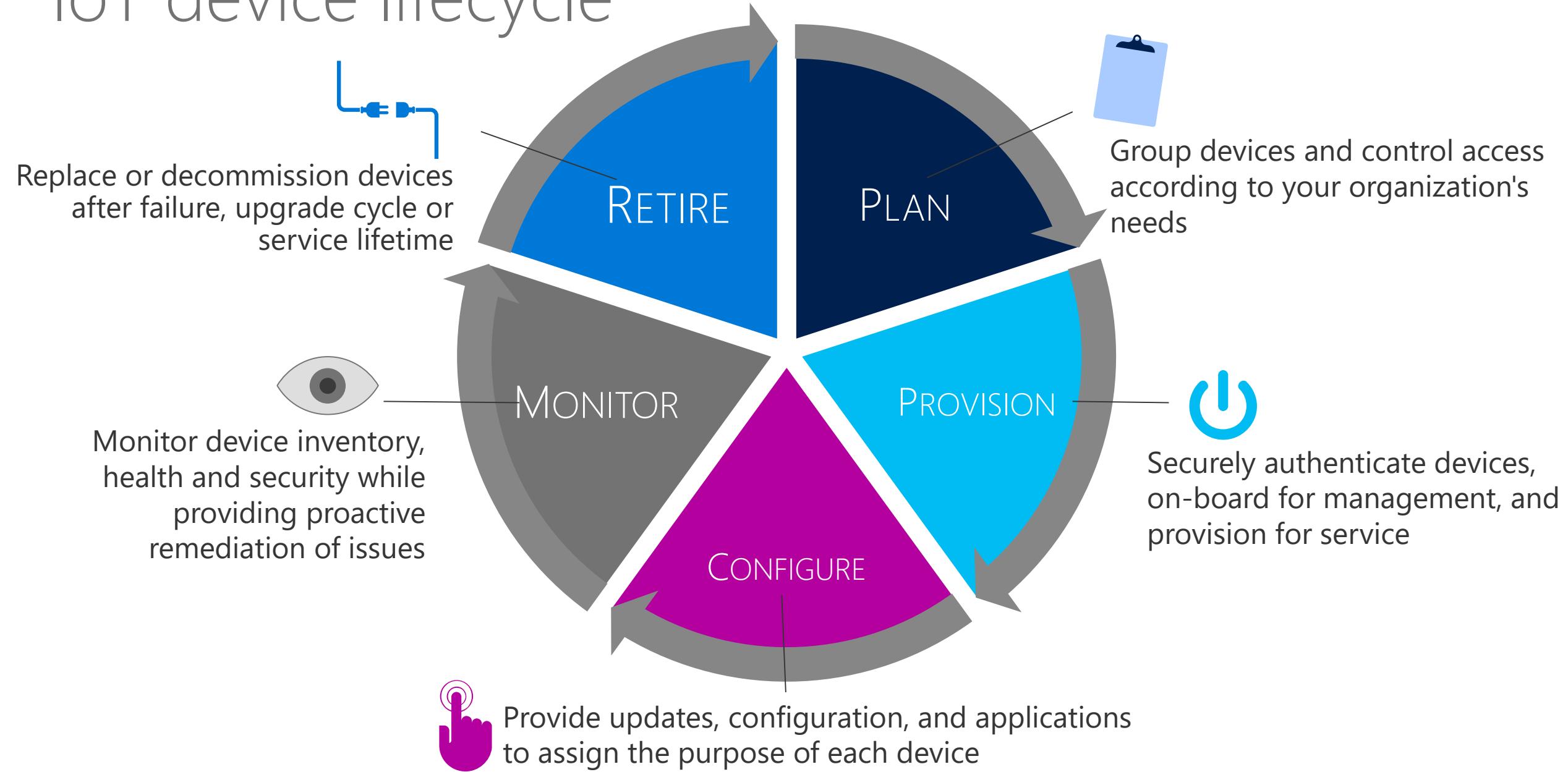


Azure IoT Hub device management



Device Lifecycle

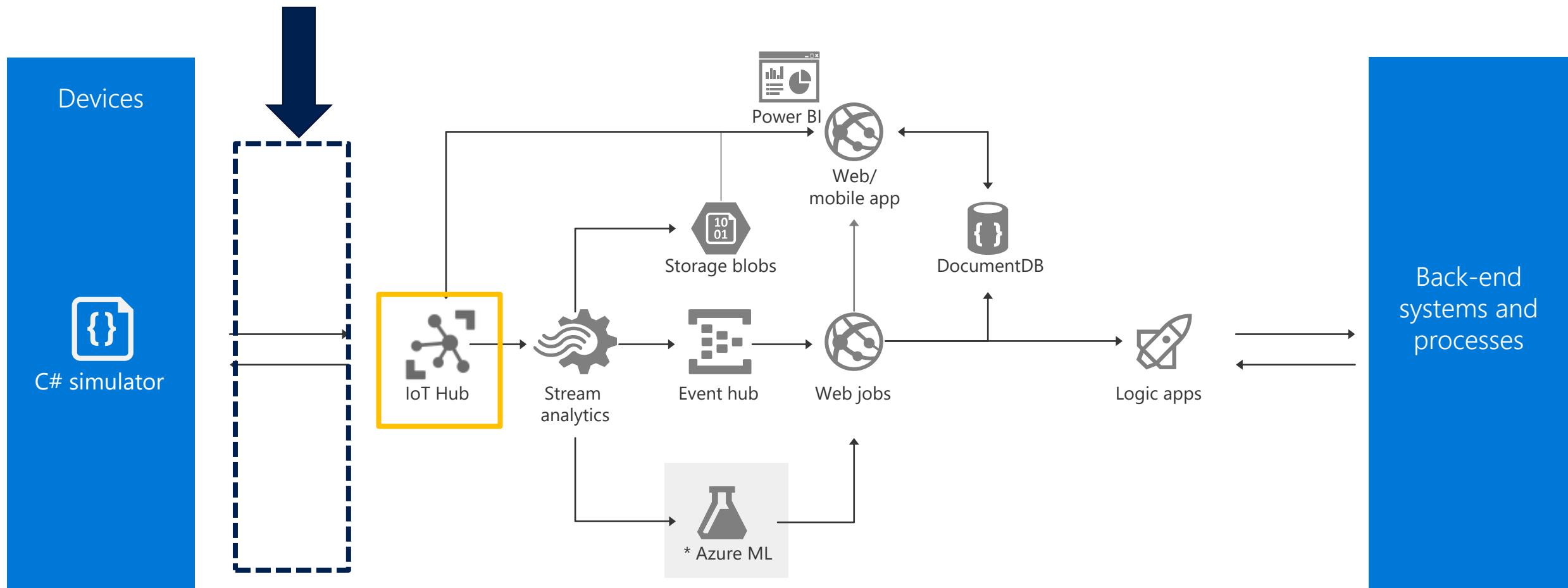
IoT device lifecycle



What is provisioning?



Quick orientation



Device Provisioning Service

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



Mergers, acquisitions, and bankruptcies can orphan devices



Device supply chains are complex

Let's talk supply chain



Building devices is complicated



Most common supply chain: OEM → ODM → SI → customer



Updating manufacturing process is hard if not impossible



Supply chain problems

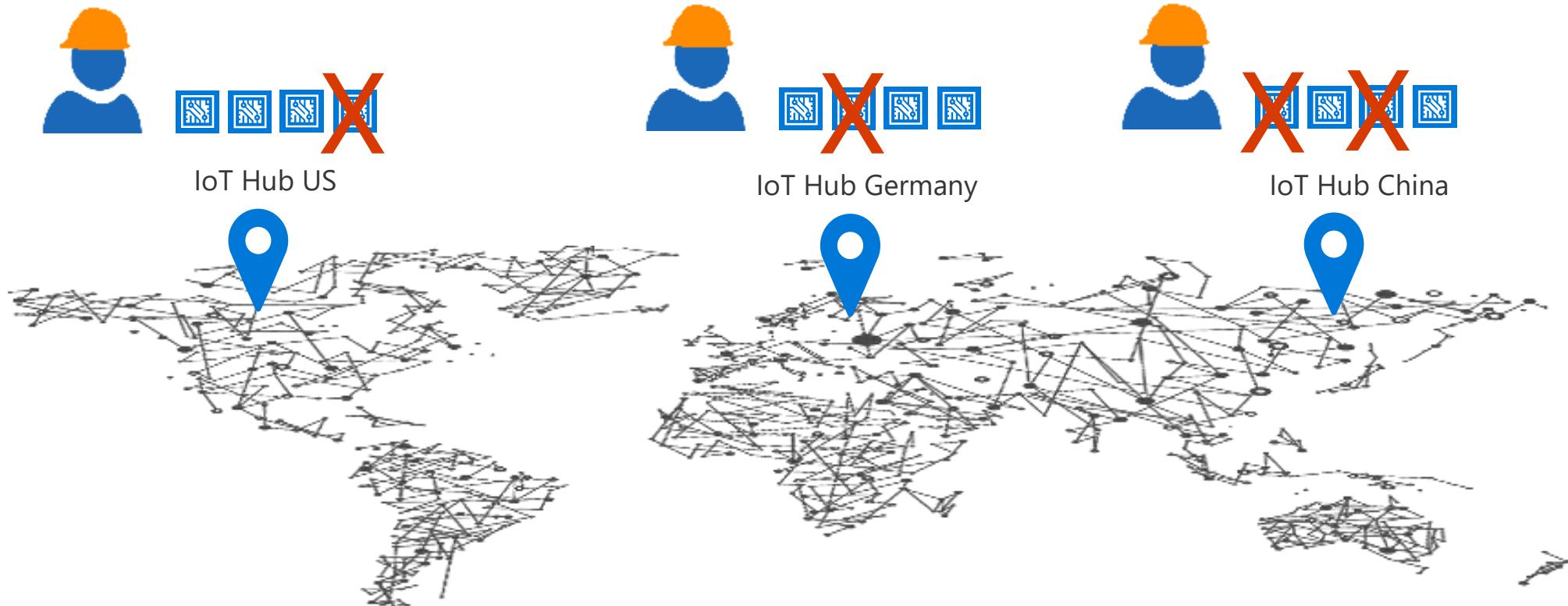
Producing certificates, injecting certificates, re-flashing devices, data ownership changes, etc.

Example: cars



IoT Device Provisioning Challenges

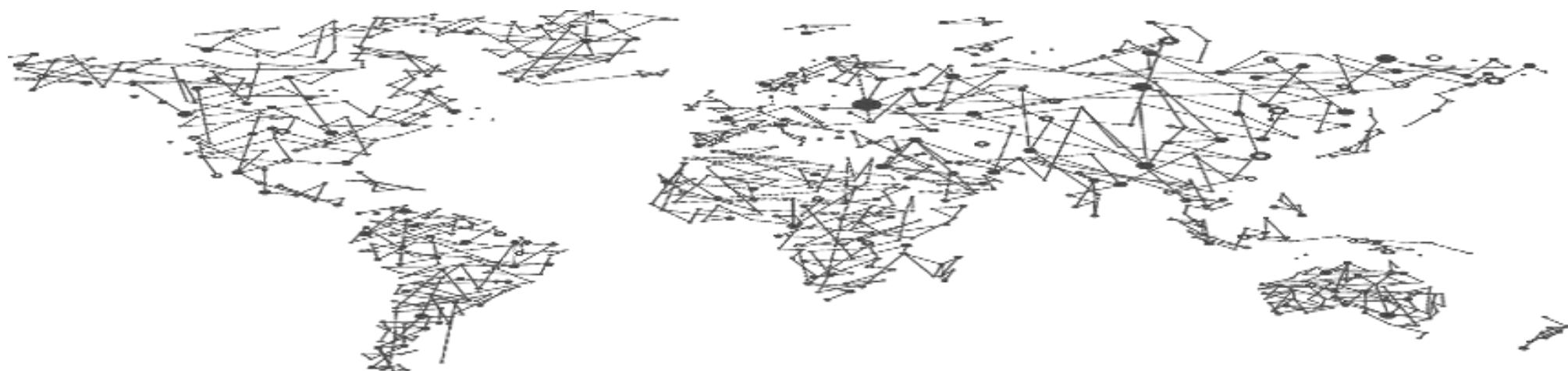
Adding devices to an IoT solution has historically been very manual
And error prone



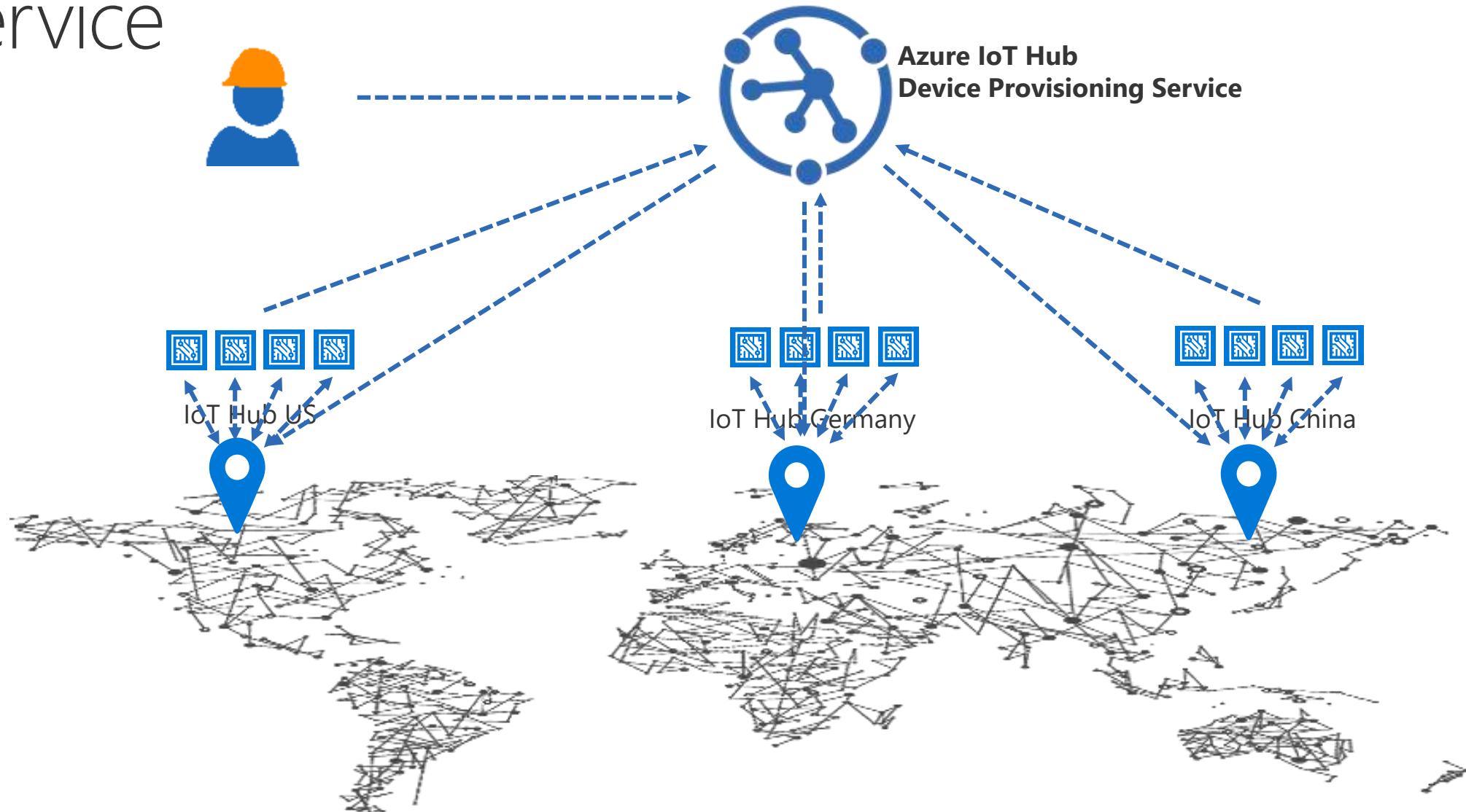
IoT Device Provisioning Challenges

What IoT needs is “plug and play” device provisioning

Where the automation and repeatability controlled in a central location



Available: Azure IoT Hub Device Provisioning Service



Azure IoT Hub Device Provisioning Service

Simplify with zero touch provisioning

Supports multiple locations

Easiest way to mass-provision devices

URL stability

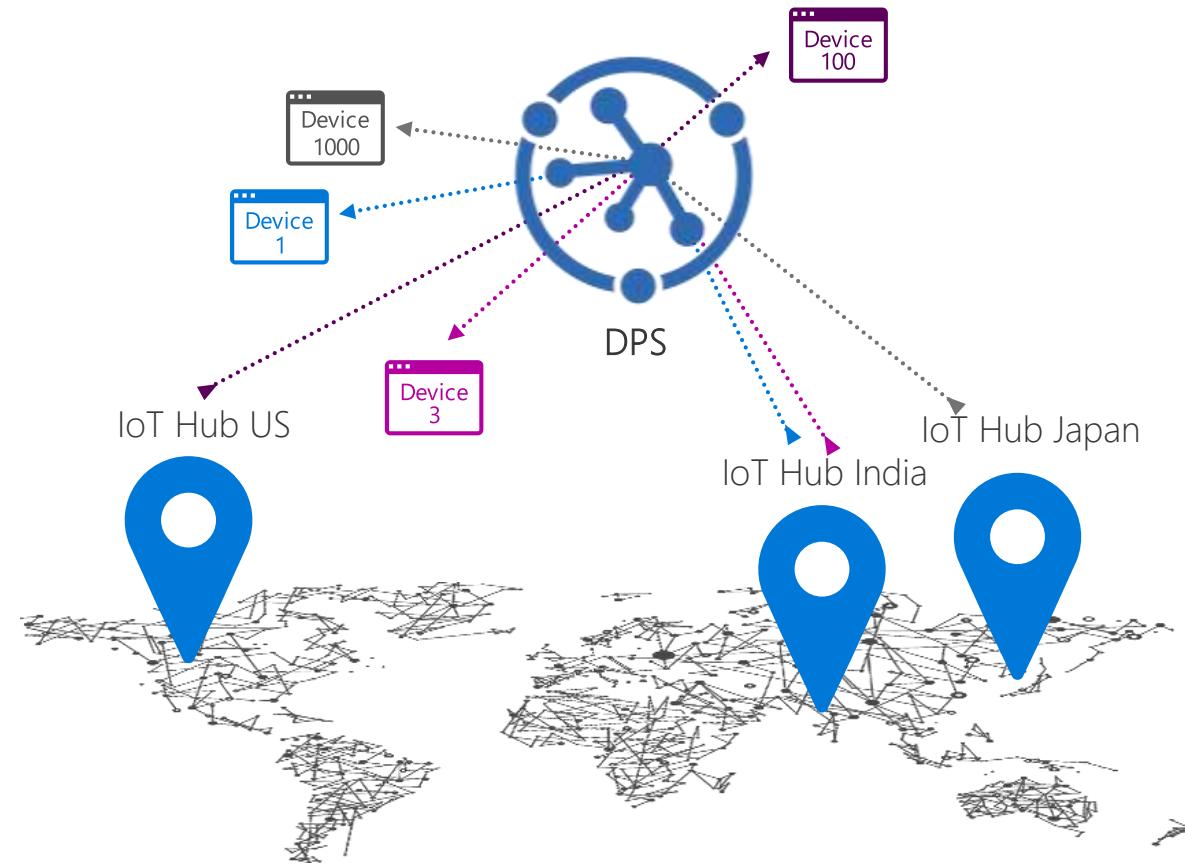
Enhanced security through HSM

For any device compatible with IoT Hub

Remove human error

Minimize manual connection requirements

Multitenancy support



DPS knows exactly which IoT Hub to connect and provision

Goals for device provisioning with Azure IoT

Securely automate the provisioning process

Devices are automatically and securely connected to the IoT Hub service and provisioned with an initial configuration

Multitenancy support

A single DPS can provide service for multiple IoT hubs (in multiple regions)

Flexible device assignment

Customers provide rules and logic to assure the right device is attached to the right IoT solution (and associated IoT Hub)



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

An IoT device's relationship to DPS

Initial setup	Retrieving a key	Rolling a key	Hard reset
Getting the device ready for the first time	For devices with limited or no key storage capabilities	Applicable only for devices which connect via a SAS token	When the device needs to be treated as new in-box

How it works

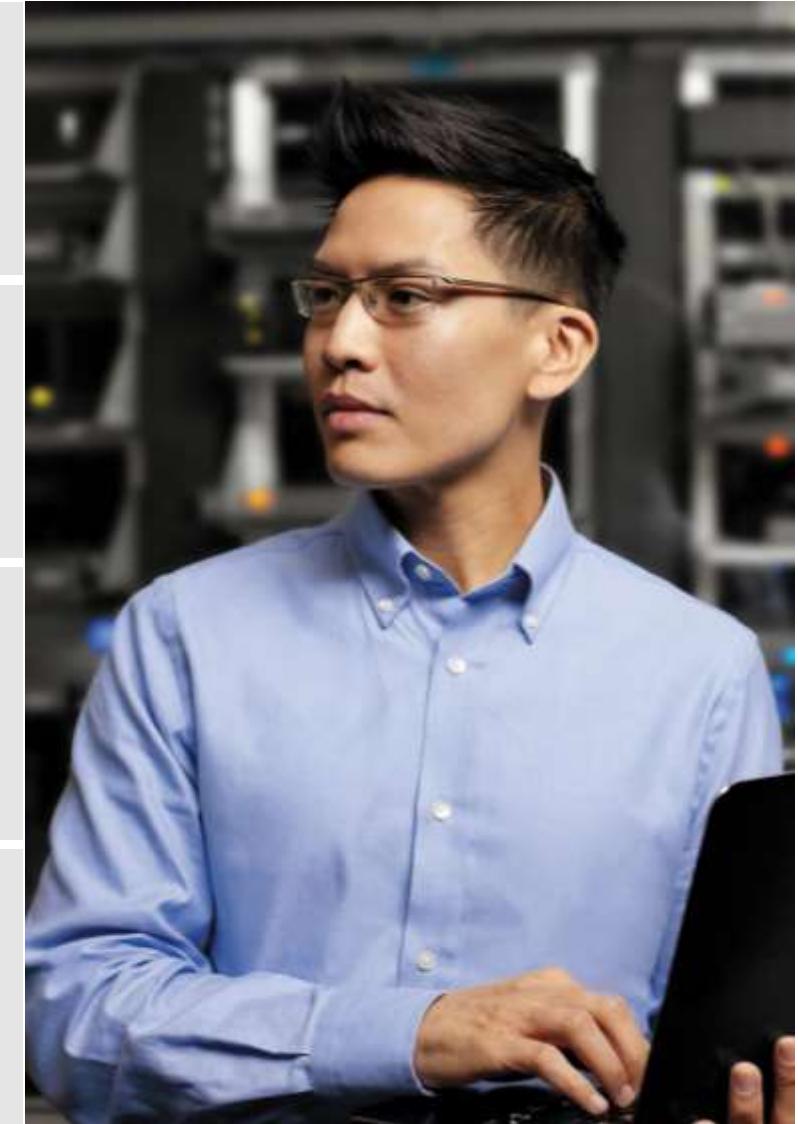
Setup

Devices know how to phone home

Enrollment list has been populated

IoT hubs have been linked to DPS

Device allocation policy has been set



Enrollment list



One-stop shop for everything needed to provision a device

- Attestation information – this is the right device
- Initial configuration
- Additional device info



Support for

- Individual enrollments – good for devices with individual configuration needs (unique setup)
 - TPM, SAS Tokens
- Enrollment groups – good for lots of devices with the same initial configuration
 - Root CA



Updatable throughout the supply chain

Linked IoT hubs



Linking an IoT hub to DPS gives DPS permissions to register devices to the hub



Links can be cross-region or cross-subscription (Multi-tenancy)

Allocation policies



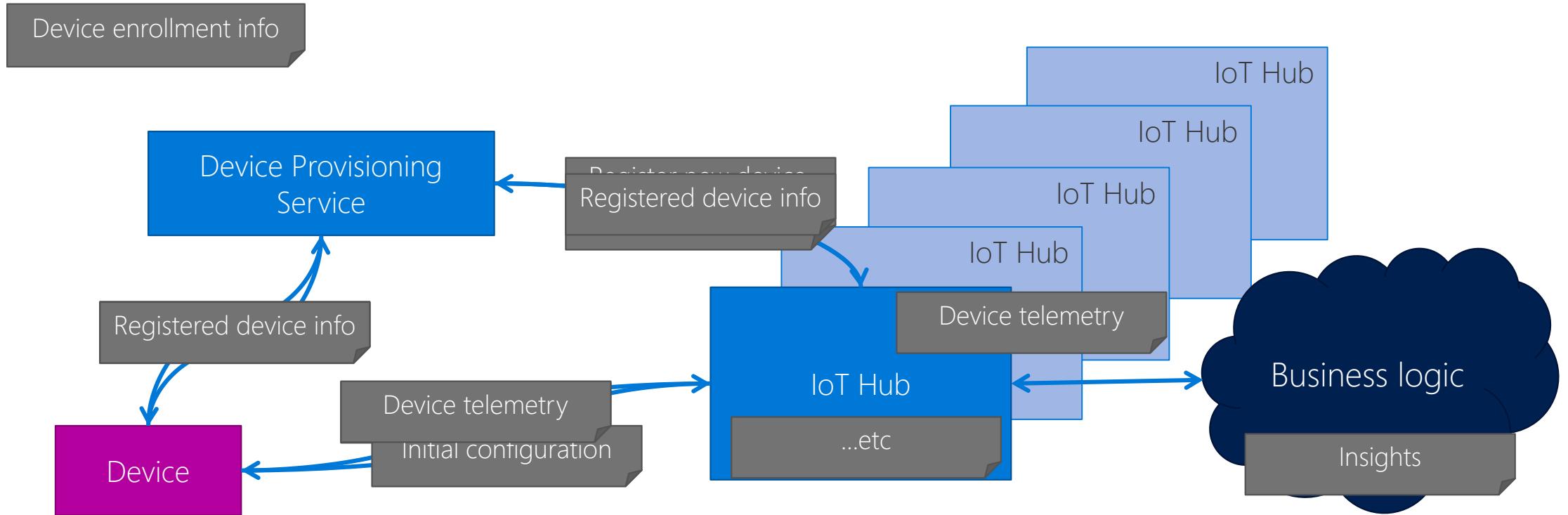
Determines how DPS assigns devices to linked hubs

- Evenly weighted distribution
- Lowest latency
- Static configuration via the enrollment list

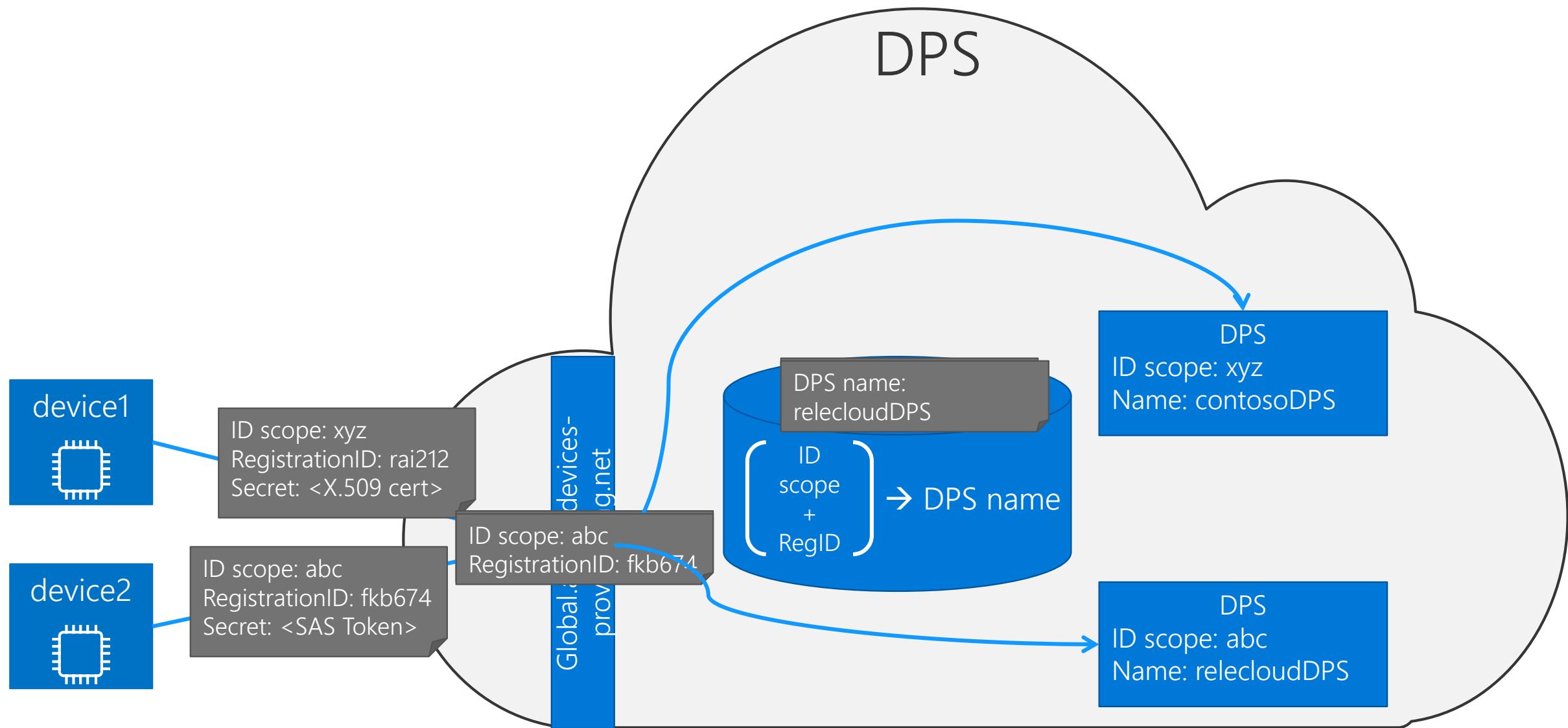


The allocation policy can be overridden per enrollment entry

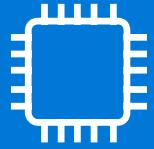
Provisioning with DPS



Using a global device endpoint



SDK support in public preview



DPS device SDK composes easily with the IoT Hub device SDK

C

HTTPS

...with full language/protocol support to come in GA



Service SDK for easy management of the service

C#

HTTPS

...with full language support to come in GA



The goal is for the same device support that IoT Hub offers

Verifying a device's identity

Two types of device attestation supported

X.509: following the standard X.509 authentication flow

Trusted Platform Module: following the TPM standard for verifying possession of the TPM's private endorsement key

Four ways to store keys
(in order of security strength)

HSM using X.509 certificates
Trusted Platform Module (a type of HSM)
Emulated X.509 certificates
Emulated TPM

Provisioning process

There are two distinct steps with security flows

The manufacture step in which the enrollment information is harvested and placed in the enrollment list

The registration step in which the device phones home to the DPS

Provisioning process

There are two distinct steps with security flows

The manufacture step in which the enrollment information is harvested and placed in the enrollment list

The registration step in which the device phones home to the DPS

Waves of Innovation

Cloud

Globally available, unlimited compute resources

IoT

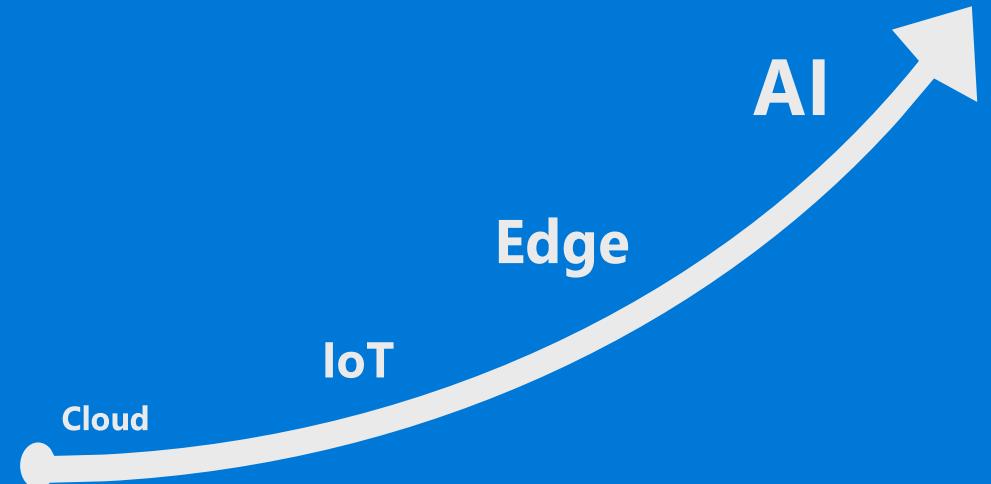
Harnessing signals from sensors and devices, managed centrally by the cloud

Edge

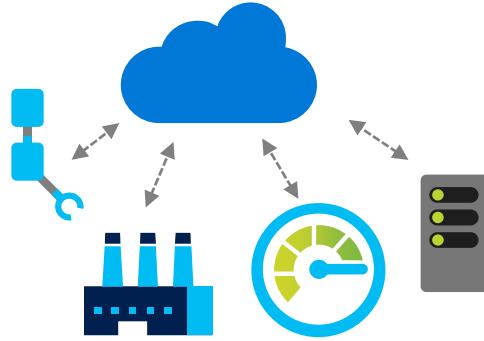
Intelligence offloaded from the cloud to IoT devices

AI

Breakthrough intelligence capabilities



Why the edge?

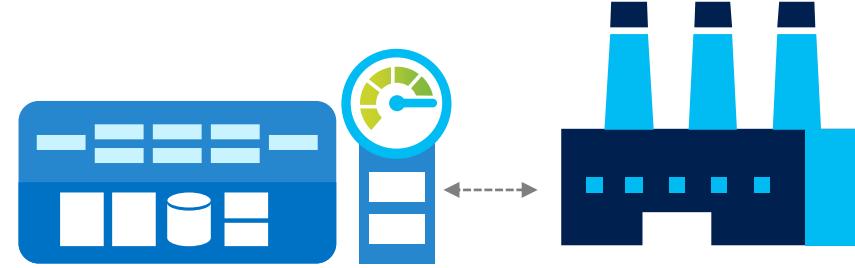


IoT in the Cloud

Remote monitoring and control

Merging remote data from across multiple IoT devices

Near infinite compute and storage to train machine learning and other advanced AI tools



IoT on the Edge

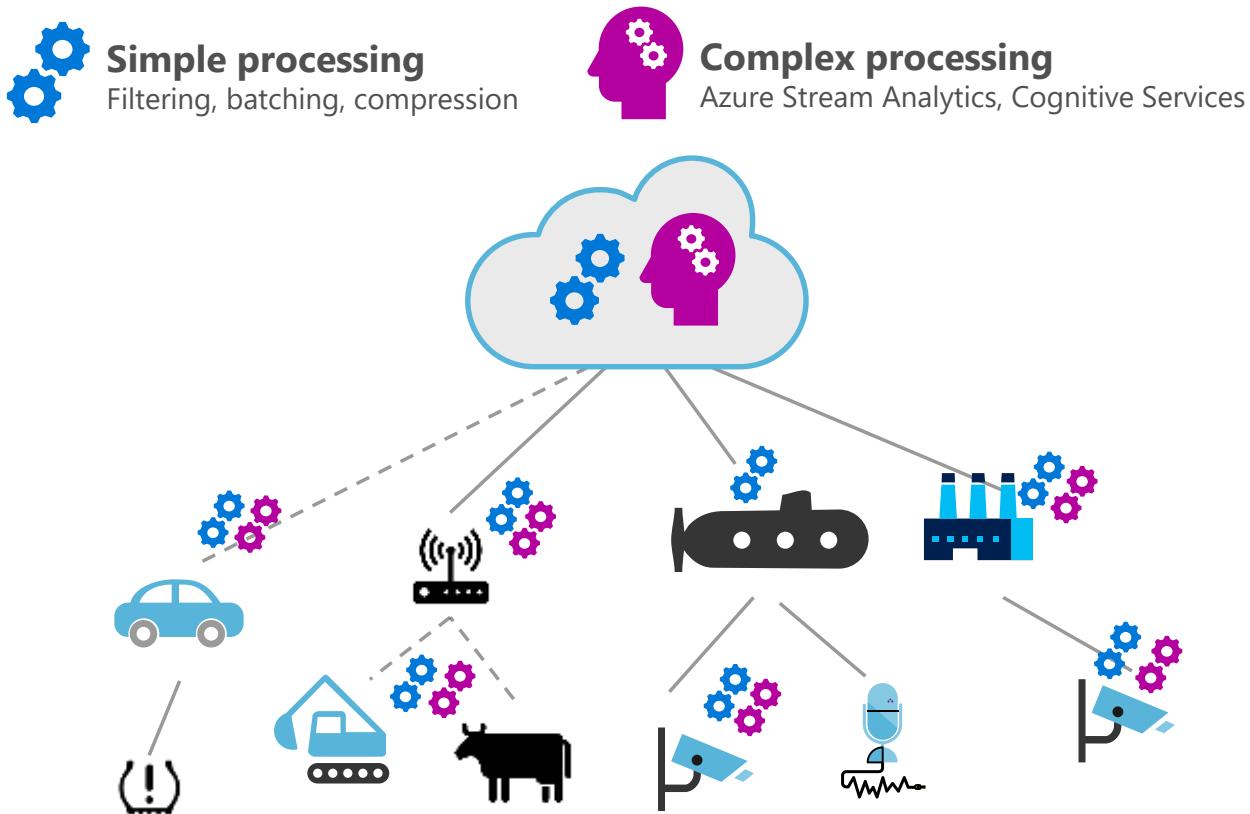
Low latency tight control loops require near real-time response

Public internet inherently unpredictable

Privacy of data and protection of IP

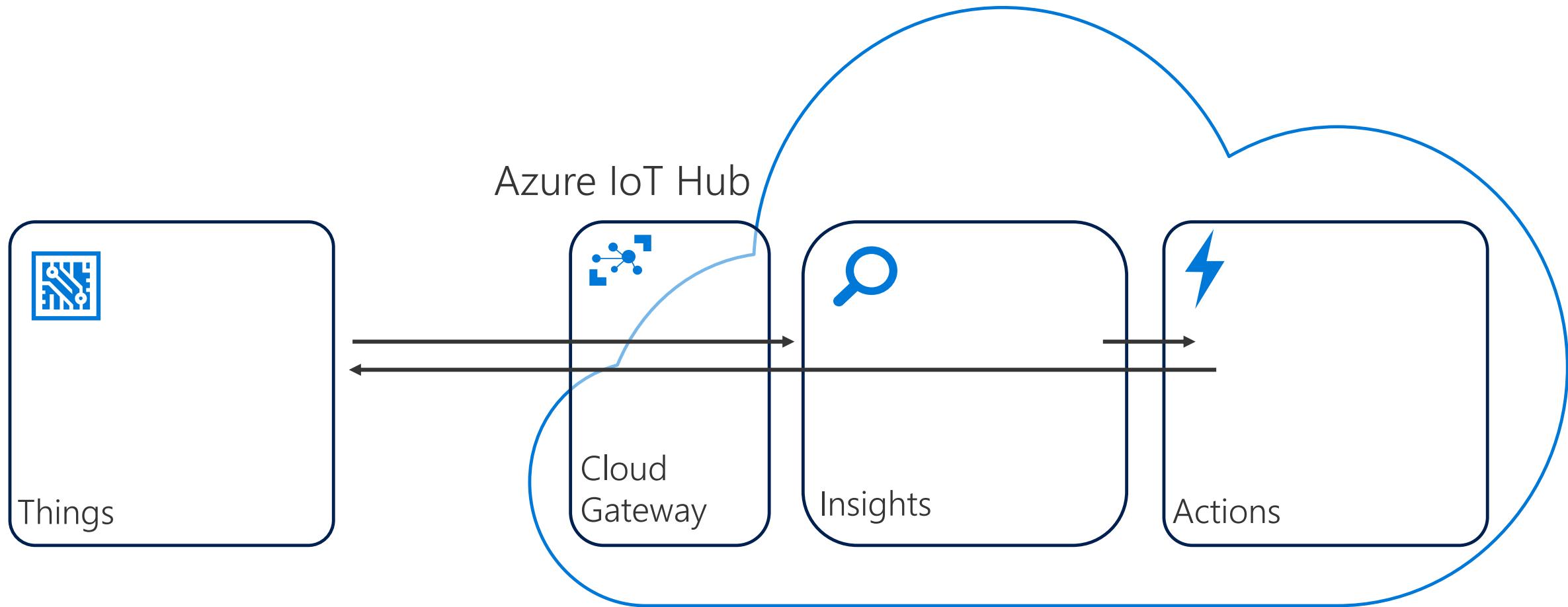
Symmetry

Lifecycle management and configuration of edge device

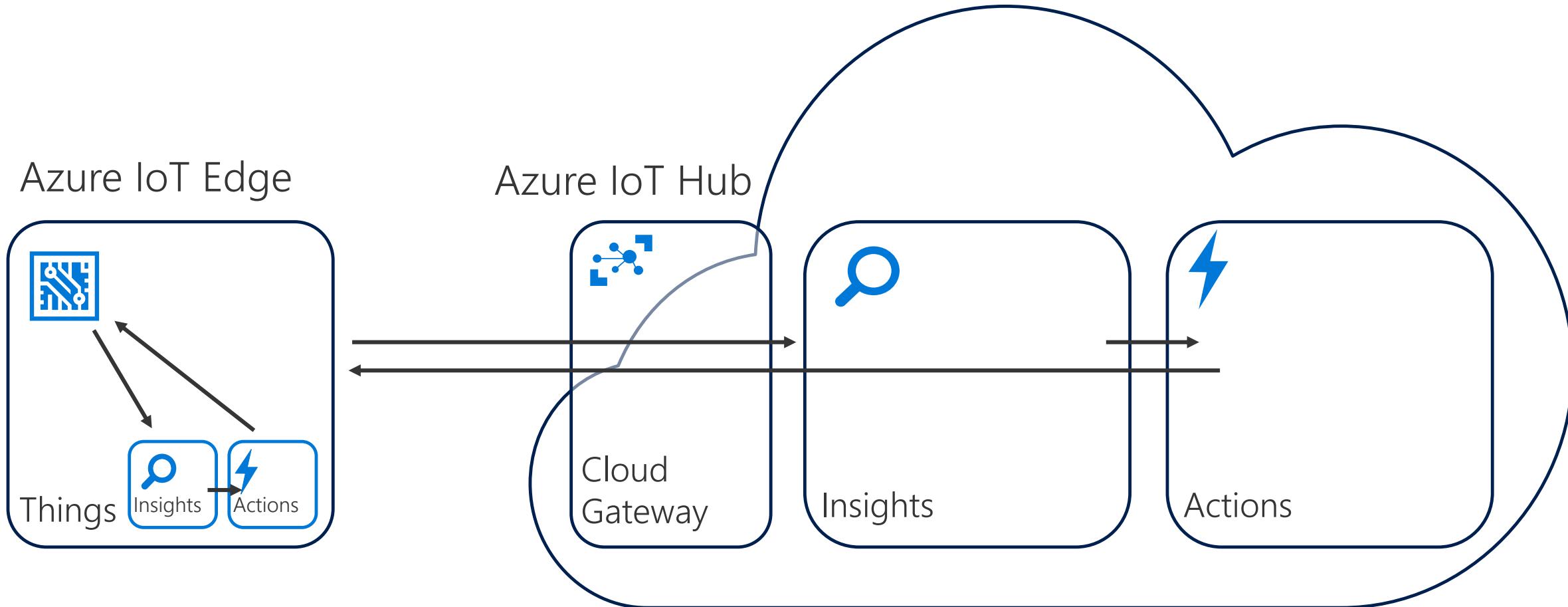


- Enable any service (Microsoft or third-party) to offload intelligence to edge devices
- Compose these services in solutions spanning edge and cloud
- Declarative configuration of edge
- Manage edge configuration, from provisioning to decommissioning, without touching the device

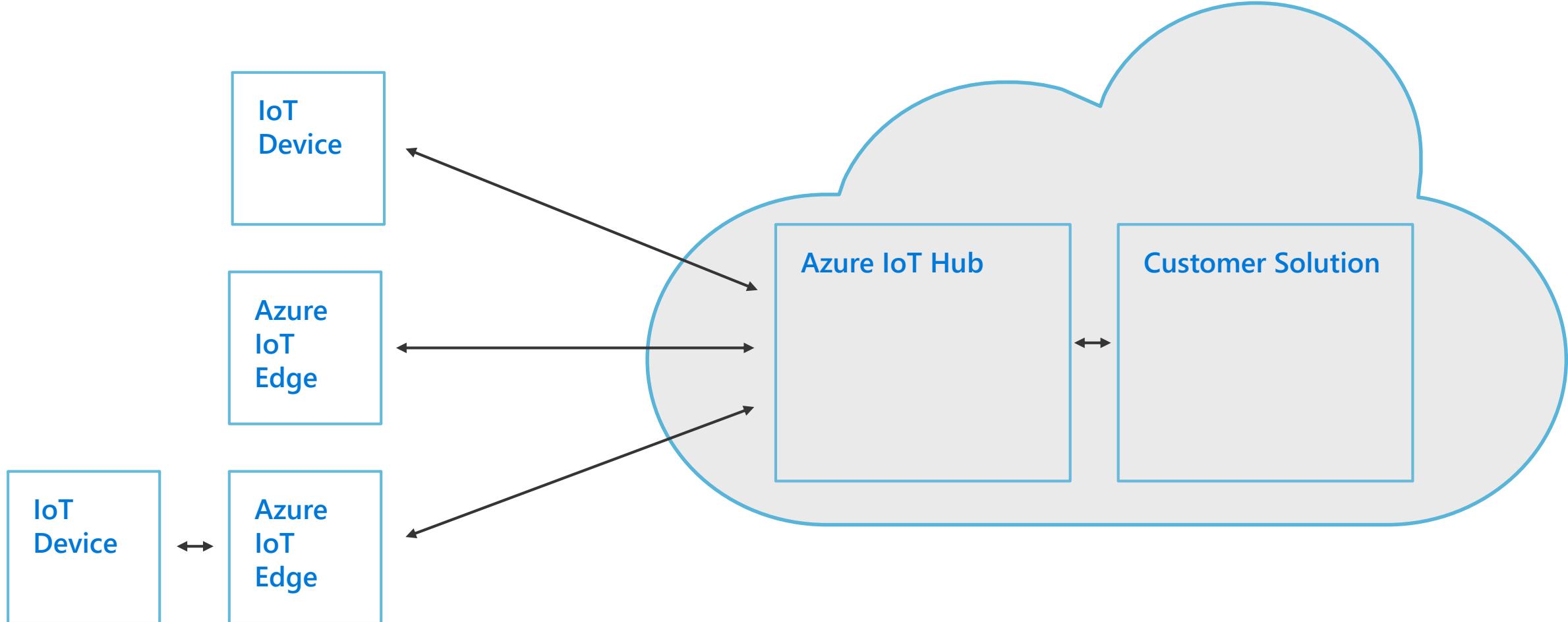
IoT Pattern



IoT Pattern + Edge

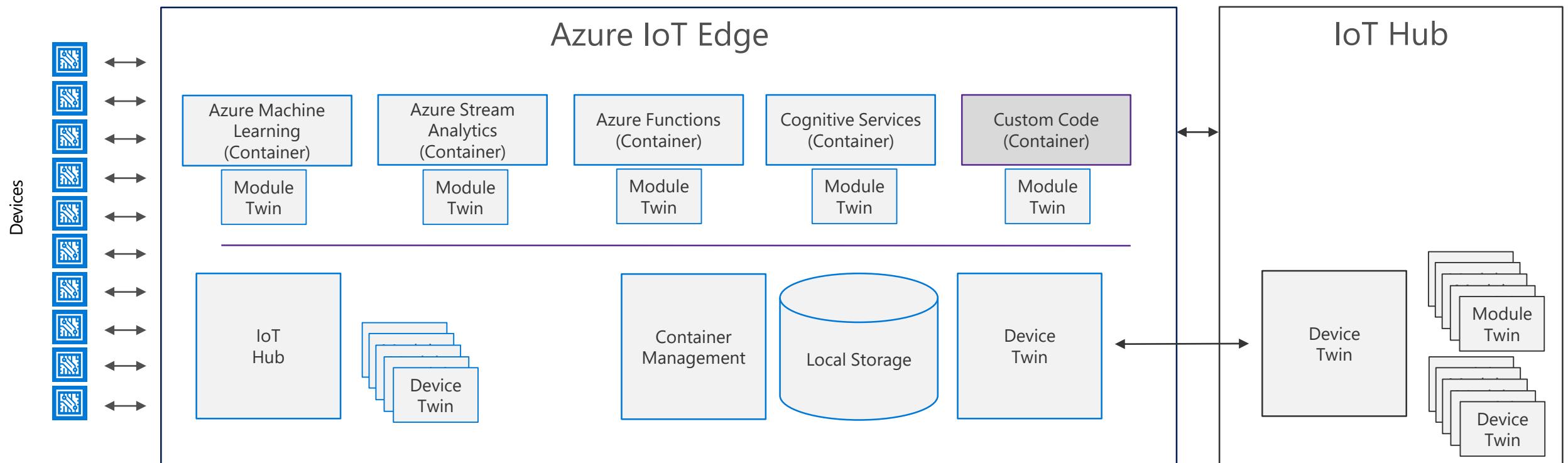


High level topology



Azure IoT Edge

- Container based workloads
 - Azure Functions
 - Azure Stream Analytics
 - Azure Machine Learning
 - Cognitive Services
- Offline / Synchronized Device Twins
 - Local Storage
 - Container Management
 - Local IoT Hub
 - HA/DR, Cloud Dev/Test Support



Azure IoT Edge

Secure

Provides a secure connection to the Azure IoT Edge, update software/firmware/configuration remotely, collect state and telemetry and monitor security of the device

Cloud managed

Enables rich management of Azure IoT Edge from Azure provide a complete solution instead of just an SDK

Cross-platform

Enables Azure IoT Edge to target the most popular edge operating systems, such as Windows and Linux

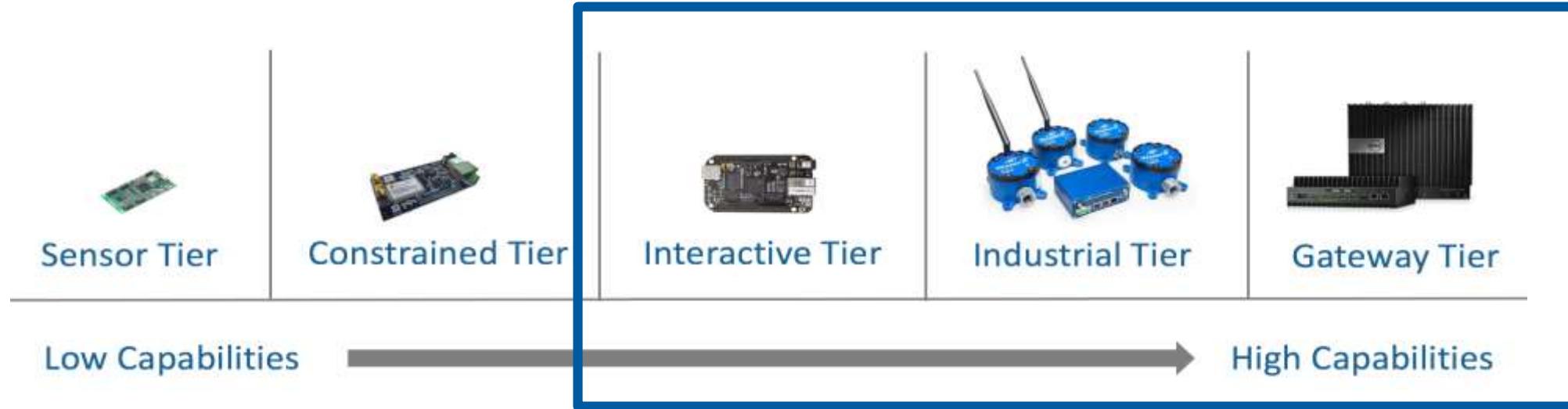
Portable

Enables Dev/Test of edge workloads in the cloud with later deployment to the edge as part of a continuous integration / continuous deployment pipeline

Extensible

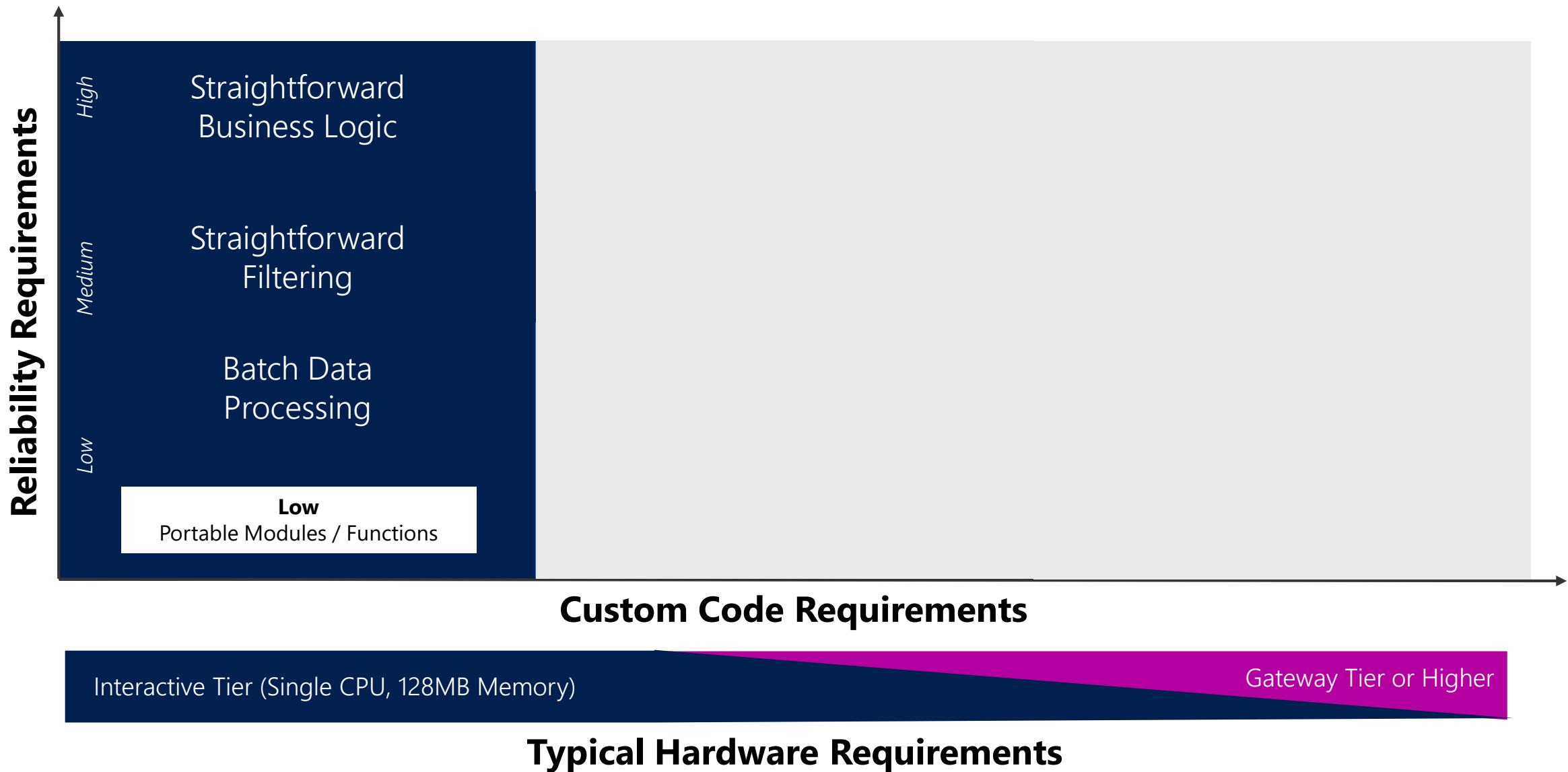
Enables seamless deployment of advanced capabilities such as AI from Microsoft, and any third party, today and tomorrow

Hardware for Azure IoT Edge



Ability to run on devices smaller than a Raspberry Pi
128 MB memory
Support best-in-class operating systems such as Windows and Linux

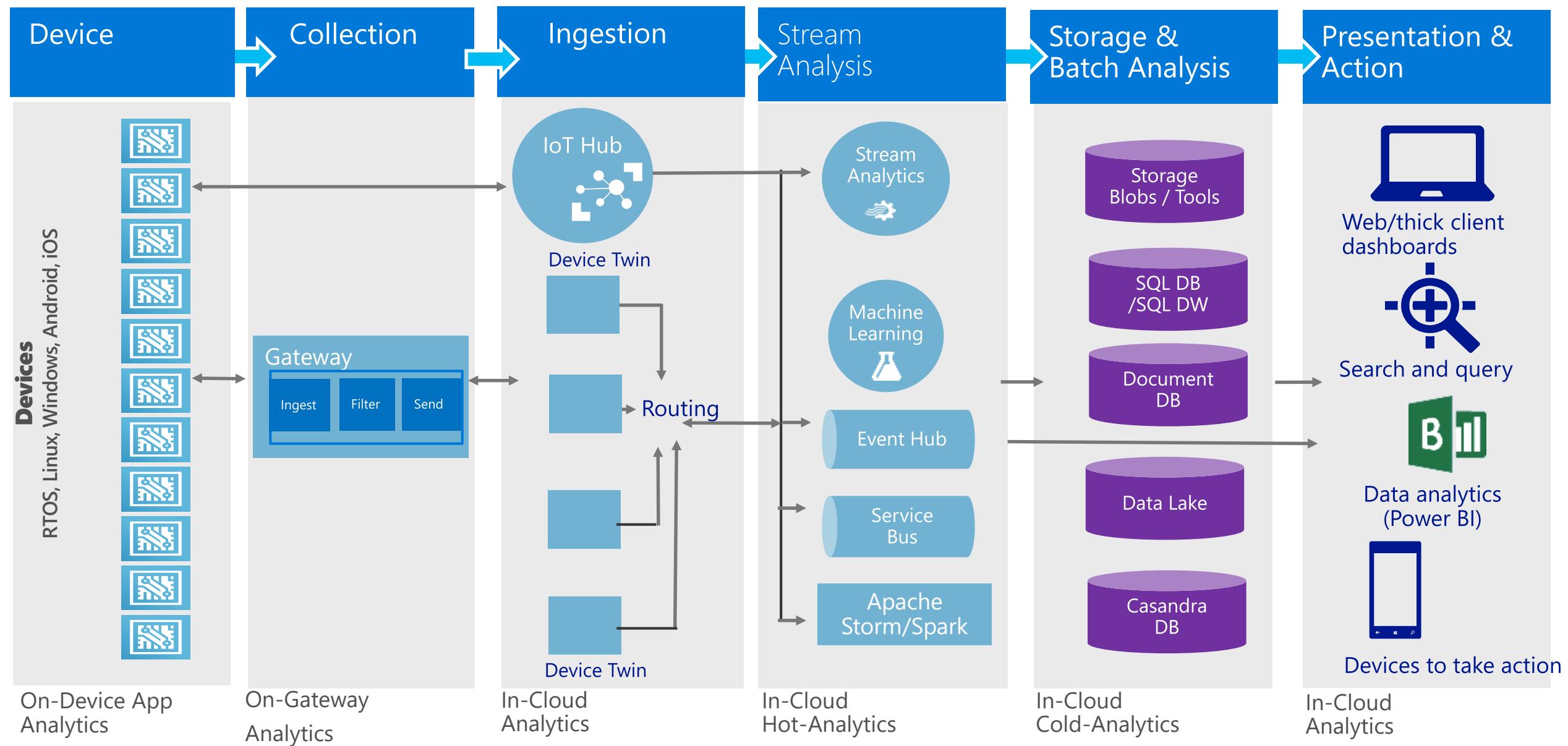
Edge Processing Scenarios & Requirements



Data & Analytics

- Time Series Insights
- Azure Stream Analytics
- Azure ML
- Cosmos DB

Azure IoT Analytics Patterns



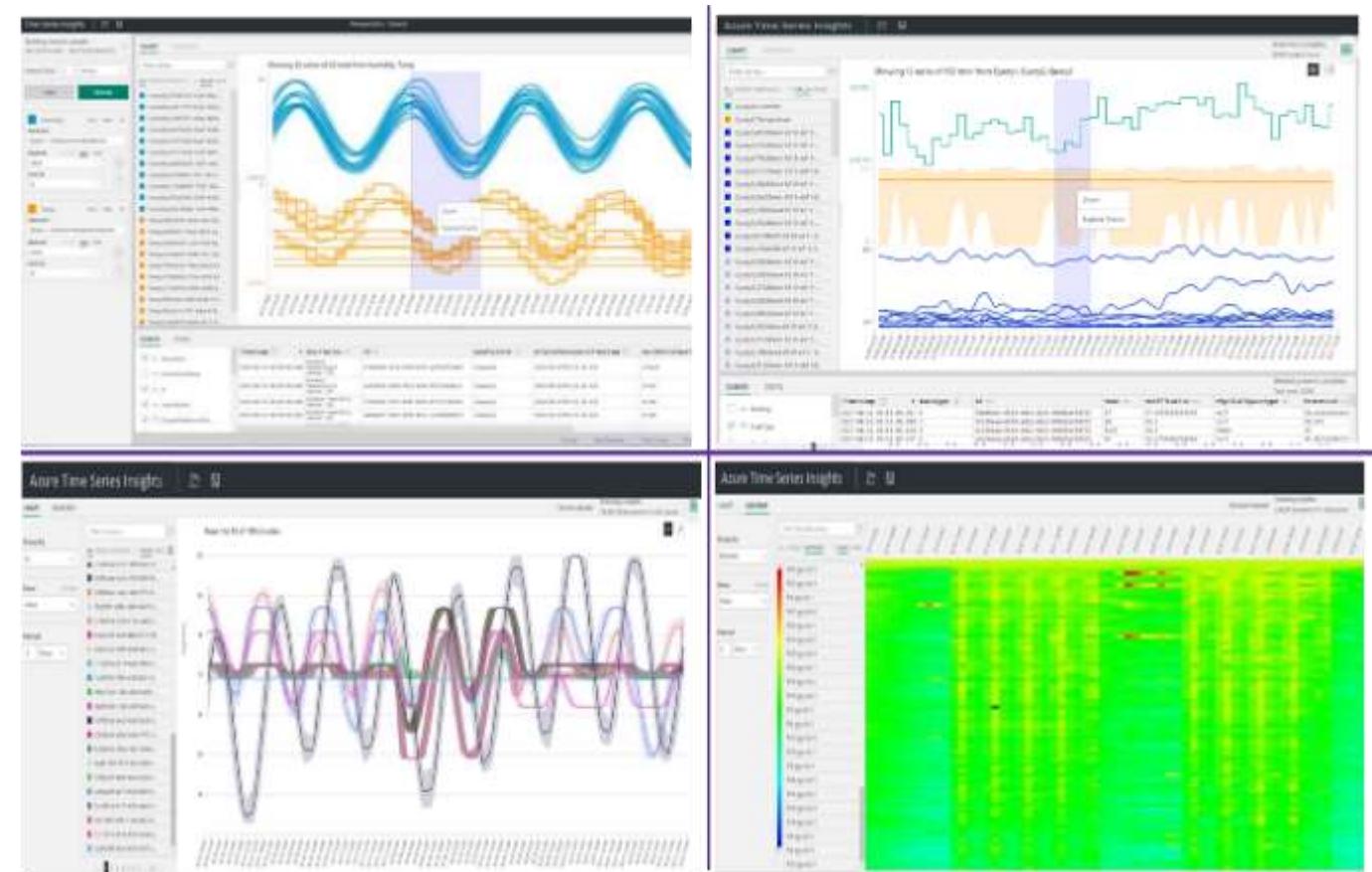
IoT Devices and “Time-Series” Data

- IoT sensor data typically consists of time base measurements
- Storing, indexing, querying, analyzing, visualizing can be challenging
- Especially considering “IoT scale”



Azure Time Series Insights

- IoT scale time-series data store
- Schema-less store, just send data
- Easy IoT Hub connection
- Store, query and visualize billions of events
- Simple and fast navigation

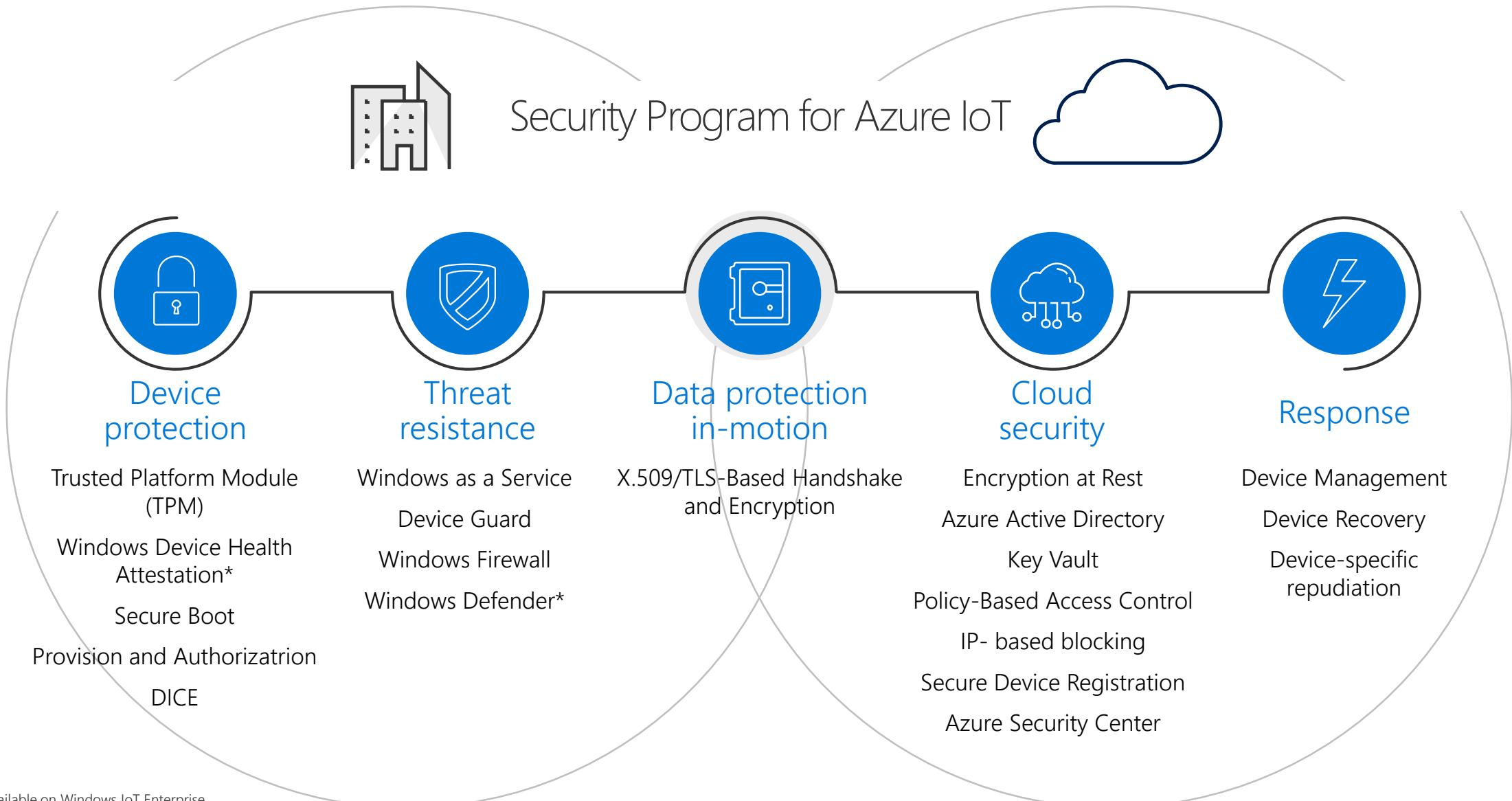


Driving Security Innovation: 7 Properties of Device Security

- Well understood security principles and practices
- Device security rooted in hardware, but guarded with secure, evolving software
- aka.ms/7properties

Property	Hardware-based Root of Trust	Small Trusted Computing Base	Defense in Depth	Compartmentalization	Certificate-based Authentication	Renewable Security	Failure Reporting
Key Questions	Does the device have a unique, unforgeable identity that is inseparable from the hardware?	Is most of the device's software outside the device's trusted computing base?	Is the device still protected if the security of one layer of device software is breached?	Does a failure in one component of the device require a reboot of the entire device to return to operation?	Does the device use certificates instead of passwords for authentication?	Is the device's software updated automatically?	Does the device report failures to its manufacturer?

Device to Cloud Security



Device Identifier Composition Engine – DICE

Secure By Design

- Use silicon gates to create hardware-based device identities
- Security built into the DNA of the device
- Scalable security framework with minimal hardware requirements for device identification and attestation
- Trust anchor upon which various security solutions for authentication, secure boot, remote attestation, and more can be built



aka.ms/iotdice

Security Program for Azure IoT

- Microsoft's Security Program
 - Trusted security auditors trained on Azure IoT
 - Discover issues, get recommended remediations
 - Keep your IoT Solution secure



Not all partners may be listed; check internetofyourthings.com for latest status

More certifications than any other cloud provider



ISO 27001



SOC 1 Type 2



SOC 2 Type 2



PCI DSS Level 1



Cloud Controls Matrix



ISO 27018



Content Delivery and Security Association



Shared Assessments

FedRAMP JAB
P-ATOHIPAA /
HITECH

FIPS 140-2

21 CFR
Part 11

FERPA



DISA Level 2



CJIS



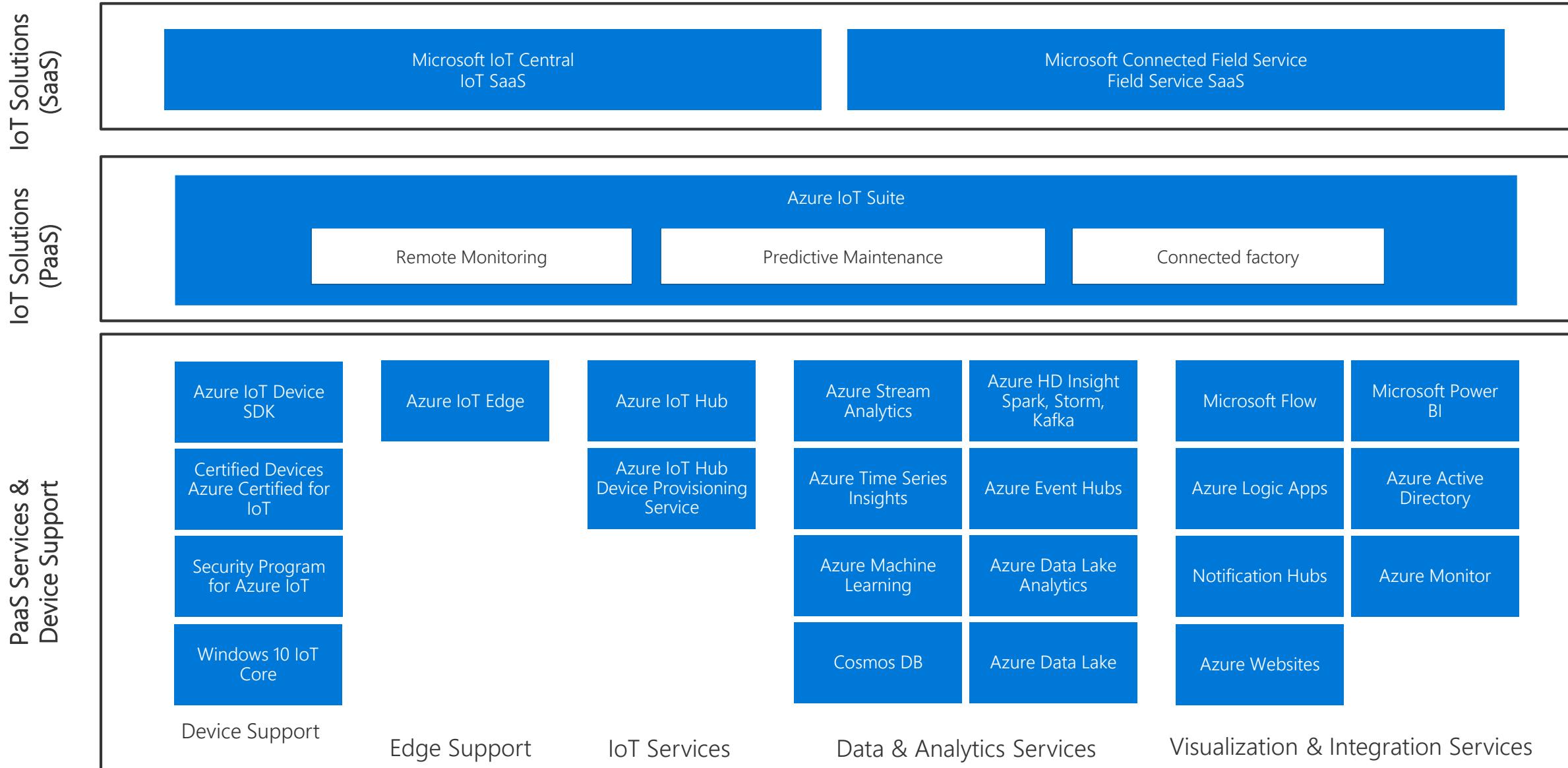
IRS 1075



ITAR-ready

Section 508
VPATEuropean Union
Model ClausesEU Safe
HarborUnited Kingdom
G-CloudChina Multi
Layer Protection
SchemeChina
GB 18030China
CCCPPFSingapore
MTCS Level 3Australian
Signals
DirectorateNew Zealand
GCIOJapan
Financial ServicesENISA
IAF

Comprehensive set of offerings for IoT



IoT is already delivering results across industries



Connected chillers are back online 9x faster than unconnected equipment, avoiding more than \$300,000 in hourly downtime costs



"Power by the hour" model maximizes aircraft availability, while cutting fuel usage by 1%, saving \$250,000 per plane, per year



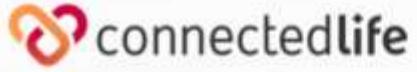
Data from sensors and systems create valuable business intelligence and reduce downtime by 50%



Access to production and supply chain data worldwide can reduce downtime costs by as much as \$300,000 per day



Smart Home



An Effortless Experience

HOME ABOUT US SERVICES FEATURES CONTACT US

ConnectedLife's smart home sensing solution is a simple yet sophisticated approach to home care. With plenty of room for flexibility to choreograph the sensors and devices to work together, you can get a comprehensive picture of your overall health and wellness. Installation is quick and we will advise you on where to best place the sensors and devices. With minimal maintenance and strategic communication, you can simply go about your daily activities and let ConnectedLife do the work. Get the most out of our system and create a safer and smarter home for you.



Smart Home (2 of 2)



Creating Connectivity for Home

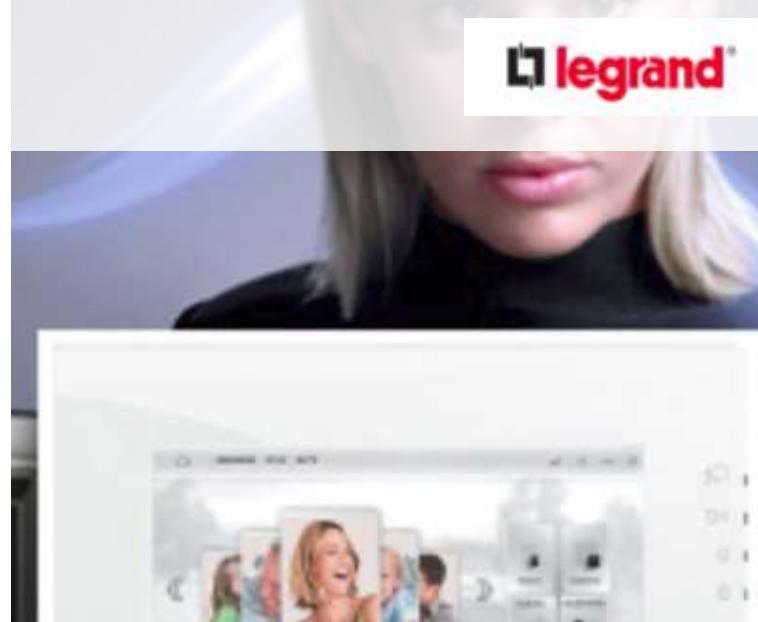
Using IoT and Cortana to connect all the devices at home

[Click to learn more](#)

Morning Mode is active

06:30

INDENTIVE



Home of the future

Speed up the deployment of its connected devices that would "facilitate the emergence of connected buildings wherever IoT can enhance use value for all users."

[Click to learn more](#)

legrand



Honeywell

Concentrate on Business

Honeywell needed a secure, standards-based, enterprisewide IoT software platform that can connect devices and analyze real-time data generated across all its commercial, residential, and industrial applications. .

[Click to learn more](#)

Manufacturing (1 of 2)



**Rockwell
Automation**

Moving from action to insights

Reduced development time and cost by 80% by gathering and analyzing data more efficiently and increasing automation across the company.

[Click](#) to learn more



SANDVIK

Optimizing the factory floor

Used IoT, machine learning, artificial intelligence, and CRM to optimize processes, planning, and predictive maintenance scheduling to avoid downtime.

[Click](#) to learn more



**ROLLS
ROYCE**

Rolls-Royce®

Filtering the signal from the noise

Used analytics to discover actionable insights around fuel usage, predictive maintenance and stop unscheduled delays.

[Click](#) to learn more

Manufacturing (2 of 2)



Transforming the urban landscape

Gathered data from sensors and systems to create valuable business intelligence and shift from reactive to proactive maintenance.

[Click](#) to learn more



Connecting the factory floor to detect problems early on

Used predictive maintenance on machinery and the factory floor to create a scrap and re-work savings of 17% and 10% energy savings.

[Click](#) to learn more



Keeping the power on when customers need it most

Used analytics predictive models to schedule maintenance for generators and prevent potential issues from impacting customers.

[Click](#) to learn more

Smart Cities (1 of 2)



Schneider
Electric

Brightening Nigeria's future

IoT-enabled solar panels keep the lights on and power running at schools and hospitals in remote locations in Nigeria.

[Click](#) to learn more



YORK
Johnson
Controls

Building efficiency with IoT

Connected chillers are back online 9x faster than unconnected equipment, avoiding more than \$300,000 in hourly downtime costs

[Click](#) to learn more



ENIGA

Creating an efficient smart apartment-building

Stockrose property owners in Sweden estimate \$42 million in hot water cost savings within the next 10 years from usage tracking.

[Click](#) to learn more

Smart Cities (2 of 2)



Saving families from natural disasters in Mexico

Utilizing IoT and analytics to predict disasters and send millions of notifications in less than two seconds - notifying citizens of earthquakes up to two minutes ahead of time.

[Click](#) to learn more



Using the intelligent edge to save water in New Zealand

Farmers in New Zealand integrate weather predictions and sensor data to adjust irrigation and save up to 50% of water usage.

[Watch](#) to learn more



Improving oyster yield in Tasmania

Connecting oyster beds promises to reduce unnecessary harvesting closures by 30%, saving \$5.3 million a year for Tasmania growers.

[Click](#) to learn more

Transportation (1 of 2)



Fathym enables Alaskan officials to keep drivers safe

Using highly localized road condition and weather data, Fathym keeps drivers safe by recommending reroutes, and avoiding unnecessary use of expensive assets.

[Click](#) to learn more



Improving the spectator experience for fans

Combining IoT and predictive analytics, racing fans can understand how their favorite drivers are performing and make more informed predictions for future races.

[Click](#) to learn more



Assisting drivers and preventing vehicle failures

Using telematics on more than 100k vehicles, RAC provides better roadside assistance and can even prevent faults in member vehicles.

[Click](#) to learn more

Transportation (2 of 2)



DAIMLER

Connecting vehicles for the long haul

Daimler connects their fleets for predictive maintenance, optimized fleet management and routing, and to create better vehicles for the future.

[Click](#) to learn more



Revolutionizing air-traffic control

Rich streams of data sent in-flight increases safety, reduces aircraft separation standards, allows more flights at peak times, and greater utilization of efficient routes.

[Click](#) to learn more



Ensuring forklifts never run out of power

This power management system, using IoT-enabled real-time alerts and predictive maintenance, cuts battery and power supply costs by 25%.

[Click](#) to learn more

Retail (1 of 2)



Machine Learning + Twizzlers

Combining ML with data from licorice extruders allows Hershey to save on expensive ingredients and learn more about customer behavior.

[Click](#) to learn more

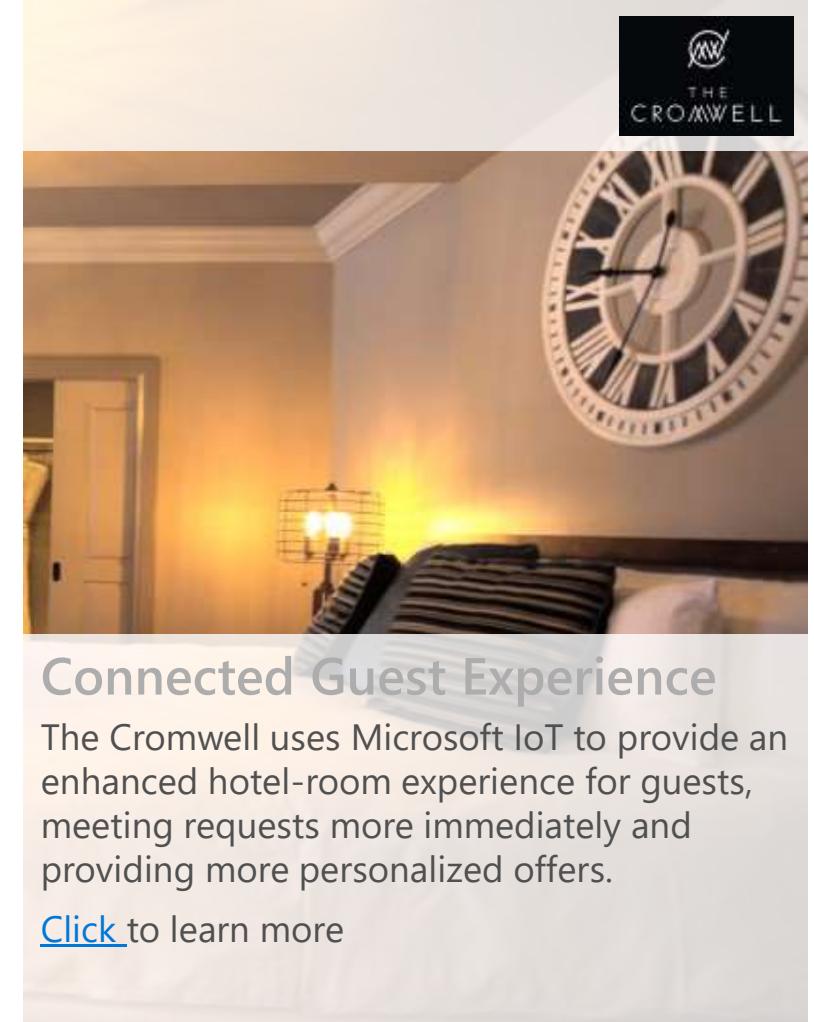
Smarter Snack Food

Using customer location and preference data allows Mondelez to provide highly personalized, informative customer snacking experiences.

[Click](#) to learn more



Mondelez International



Connected Guest Experience

The Cromwell uses Microsoft IoT to provide an enhanced hotel-room experience for guests, meeting requests more immediately and providing more personalized offers.

[Click](#) to learn more

Retail (2 of 2)



The supermarket of the future

Coop Italia uses IoT technology to track customer behaviors and create interactive, informative displays based on customer location.

[Click](#) to learn more



Enhancing workroom break times

Microsoft IoT and Advanced Analytics ensure snack machines are never out of stock, and enable MARS to better understand customer behavior.

[Click](#) to learn more



Connected Coffee Machines

Analyzing data from customer espresso machines allows BUNN to provide predictive maintenance, saving customers up to \$250 per incident and keeping business buzzing.

[Click](#) to learn more

Health (1 of 2)



Smart fridge saves lives

IoT-enabled smart-fridges ensure the \$40-60k worth of life saving vaccines stored in each fridge are kept at the appropriate temperature, delivered at the expected locations, and at the appropriate times.

[Click](#) to learn more



Creating healthier hospitals

Using IoT to connect sanitization stations throughout hospitals, Gojo ensured hospital staff were properly and frequently sanitizing their hands to avoid spreading diseases.

[Watch](#) to learn more



Ensuring safety in kid's rooms

Mattel has created the first connected kids room, which allows parents to remotely monitor children and ensure their safety, while simultaneously providing educational content.

[Click](#) to learn more



Health (2 of 2)



Optimizing diagnostic devices

Roche Diagnostics enabled remote monitoring of their diagnostic devices, optimized device utilization via predictive maintenance, and optimized device recommendations based on patient needs.

[Click](#) to learn more



Understanding brain disease

BTT Corp uses Microsoft IoT technology to detect, track, and analyze hyper-localized, minor changes in brain temperature to prevent and research brain diseases.

[Click](#) to learn more



Creating smarter diabetes management

Zion China uses personalized IoT solutions to help patients with diabetes manage their behavior and dietary habits to live healthier lives.

[Click](#) to learn more



T-Systems delivers real-time insights from virtually any machine or device with IoT

T-Systems, a global leader in information and communication technologies, is helping organizations in many industries gain instant insight into virtually all kinds of digitally connected "things"—including industrial machines, cars, appliances, and mobile devices—with an innovative Internet of Things (IoT) solution that runs on Microsoft Azure. The transformative solution ingests and deciphers any kind and amount of data in real time. Customers can store their data anywhere they choose, in the cloud or on-premises. They can also analyze their data, along with information from existing systems, using preconfigured solutions by T-Systems, which are based on Microsoft Power BI and Azure Machine Learning. Hundreds of organizations are already using the seven-month-old IoT solution to drive innovation and growth.

 T-Systems

Products and Services

Microsoft Azure IoT Hubs
Microsoft Azure Machine Learning
See speaker notes for full list of products

Organization Size

46,000 employees

Industry

Telecommunications

Country

Germany

Partner

daenet

Business Need

Business Agility
Cloud and Server Platform
Internet of Things



An ecosystem ready to support your IoT needs

<http://azureiotpartners.azurewebsites.net>

<https://catalog.azureiotsuite.com/>

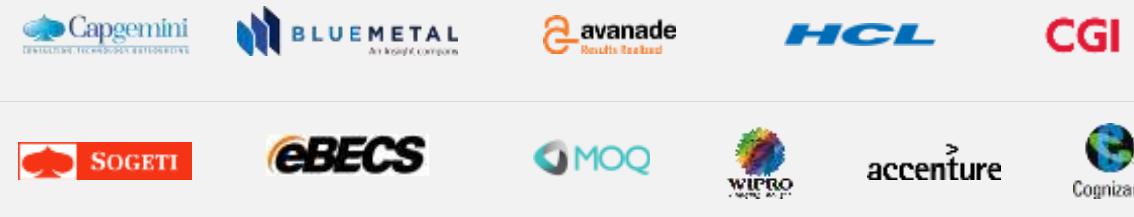
Dev, IT & Productivity



Azure Certified for IoT



System Integrators



Solution Providers (ISVs)



Open-source SDKs

The image shows five GitHub repository pages for Azure IoT SDKs, each with a different programming language:

- Azure / azure-iot-sdk-c**: A C99 SDK for connecting devices to Microsoft Azure IoT services. It has 2,396 commits.
- Azure / azure-iot-sdk-node**: A Node.js SDK for connecting devices to Microsoft Azure IoT services. It has 680 commits.
- Azure / azure-iot-sdk-csharp**: A C# SDK for connecting devices to Microsoft Azure IoT services. It has 767 commits.
- Azure / azure-iot-sdk-python**: A Python SDK for connecting devices to Microsoft Azure IoT services. It has 139 commits.
- Azure / azure-iot-sdk-java**: A Java SDK for connecting devices to Microsoft Azure IoT services. It has 428 commits.

Each repository page includes tabs for Code, Issues, Pull requests, and Gist. The Java repository page also shows options for Unwatch, Star, and Graphs.

Device SDKs platform/OS support

Android (Java or Xamarin)
Arduino
Debian Linux (v 7.5)
ESP8266
Fedora Linux (v 20)
FreeRTOS
iOS (Xamarin)
mbed OS (v 2.0)
OpenWRT
Raspbian Linux (v 3.18)
STM32
TI RTOS
Ubilinux (v3.0)
Ubuntu Linux (v 14.04)
Windows Desktop (7, 8, 10)

Windows IoT Core (v 10)
Windows Server (v 2012 R2)
Yocto Linux (v 2.1)
... more @ [Azure Certified for IoT device catalog.](#)

Azure IoT starter kits

Quickly build IoT prototypes that leverage Azure IoT
H/W bundle and step-by-step tutorials

Created by “Certified for IoT” partners

Learn more: <http://aka.ms/iotstarterkits>

Training for Azure IoT

Training provider	Class	Price
	<u>Developing IoT Solutions with Azure IoT</u>	Free (auditing) or \$99 (certificate of completion)
 Microsoft Virtual Academy	<u>Introduction to Azure IoT</u>	Free
 Linux Academy	<u>Azure IoT Essentials</u>	Free
 Linux Academy	<u>IoT for the Enterprise</u>	Paid (Free 7-day trial, \$19/month afterwards)
 CloudAcademy	<u>Internet of Things with Azure</u>	Paid (Free 7-day trial, \$29/month afterwards)
 Real Code. Real Labs. Real Learning.	<u>Building IoT Solutions with Azure</u>	Paid (Free 7-day trial, \$29.95/month afterwards)

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

