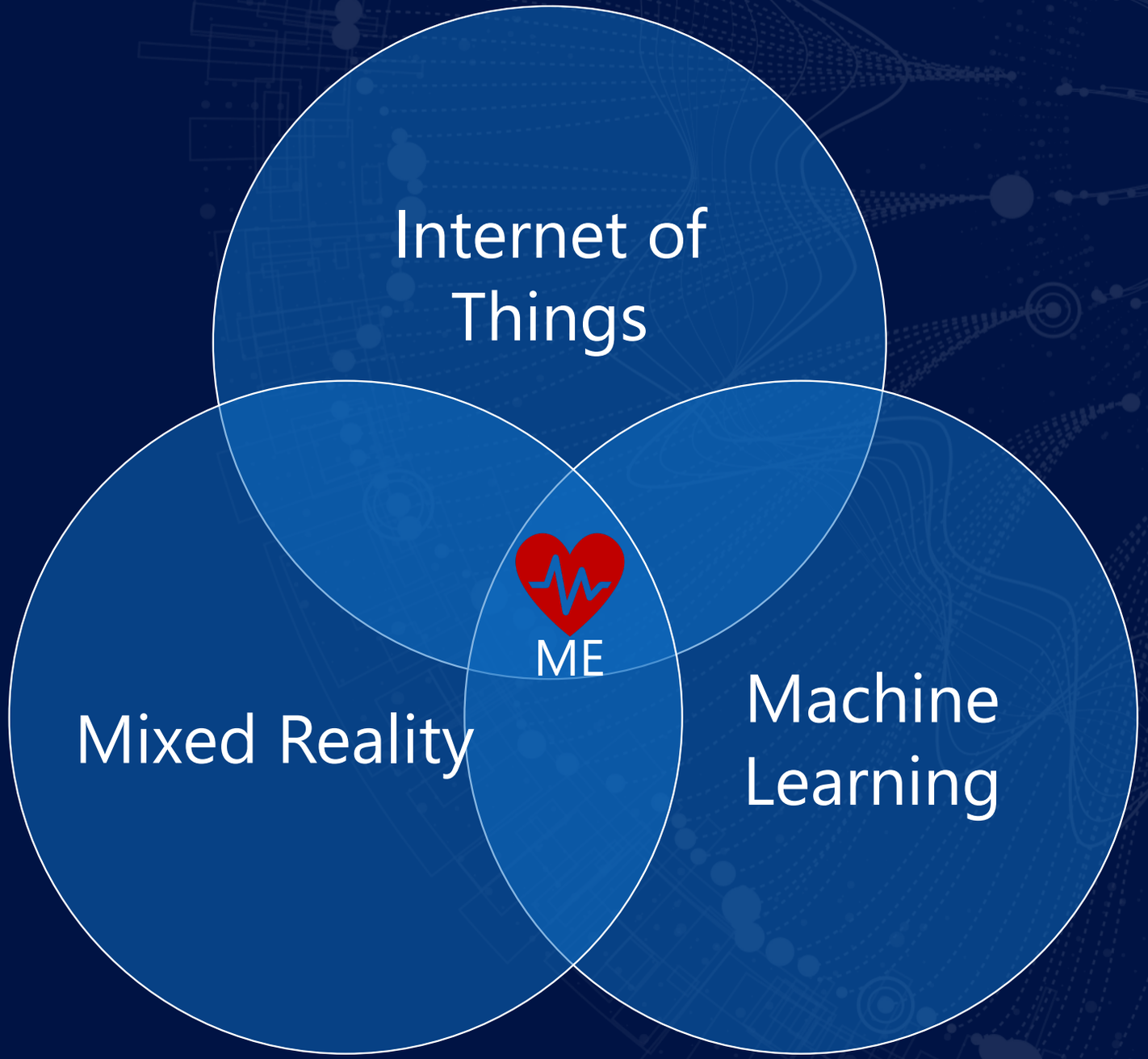
Exploring land of IoT on Azure

Ron Dagdag


Internet of Things
Mixed Reality
Machine Learning
ME

Build me a house

From these pieces

Build me a house

From these pieces

Would this be simpler?

Agenda

- Internet of Things
- IoT Central
- Benefits of IoT Central
- Device Template
- IoT Plug and Play
- Visualize data
- Integration

What is IoT?

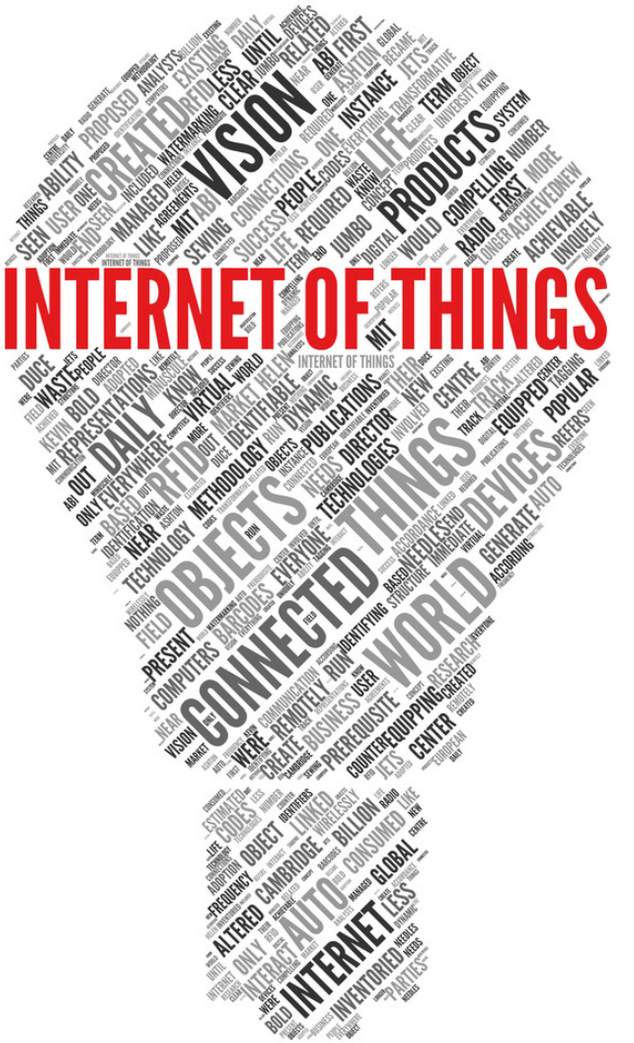
THINGS CLOUD TRANSFORMATION

What is IOT?
Internet of Things

- connecting Internet to physical world via sensors

- World's first IoT device
early 1980s Carnegie Melon Univ
  - vending machine report contents through a network

- Kevin Ashton in 1999
- any device that interacts with physical world around it



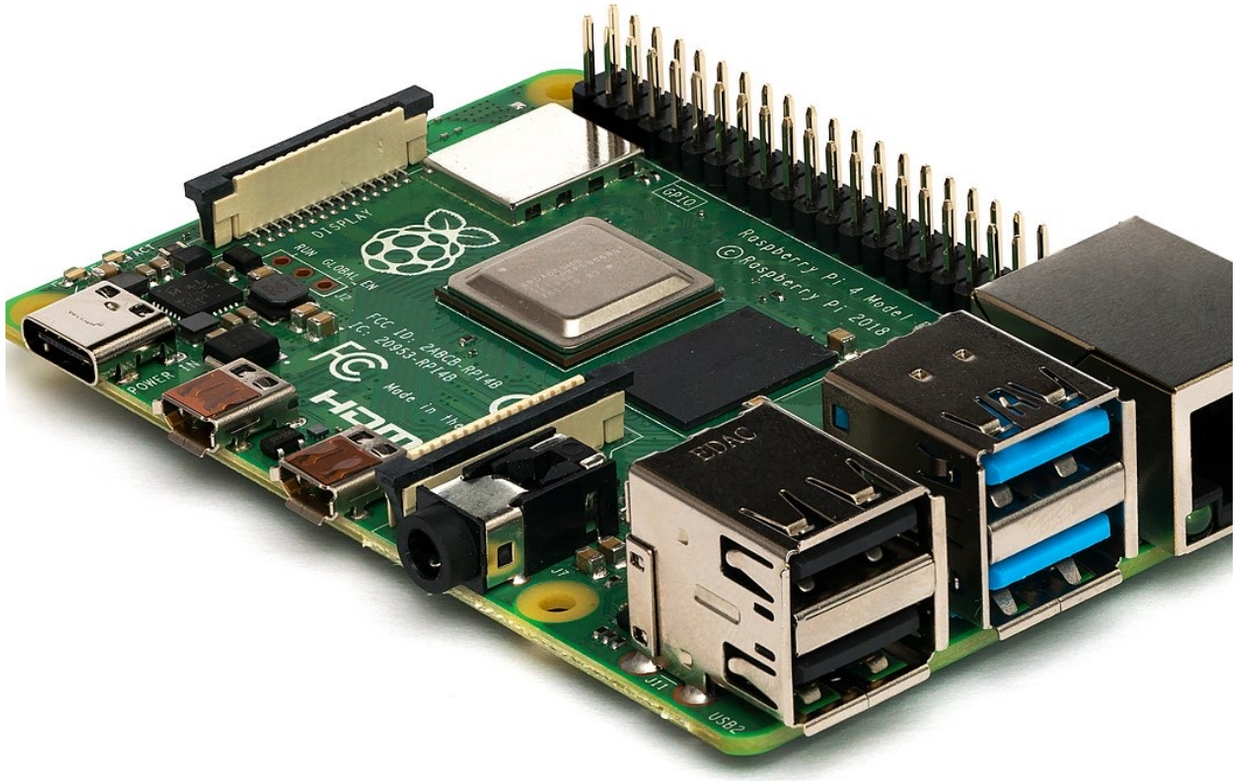
Remotely Monitor

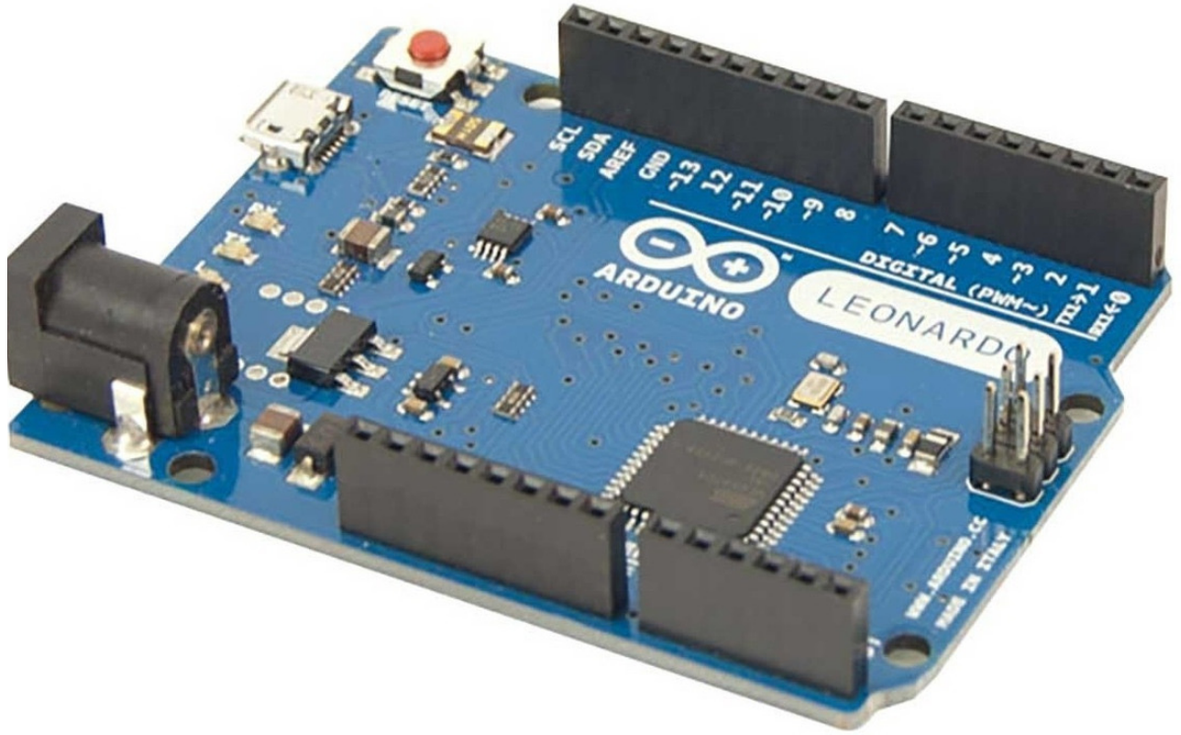
- Gather Data
- Device Processing
- Device Status

Control Device

- Send Commands
- Set Device Properties

Internet Of Things





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Attributes of successful IoT Solutions

Scale

(storage,compute, networking, multi-tenancy)

Device Management

(provisioning, updating)

Big data management

(hot,warm, cold path)

Analytics, insights, and Extensibility

(rule, automate actions and integration)

High availability and disaster recovery

(mission-critical, resilient)

Security and compliance

(connectivity, integration, data protection)

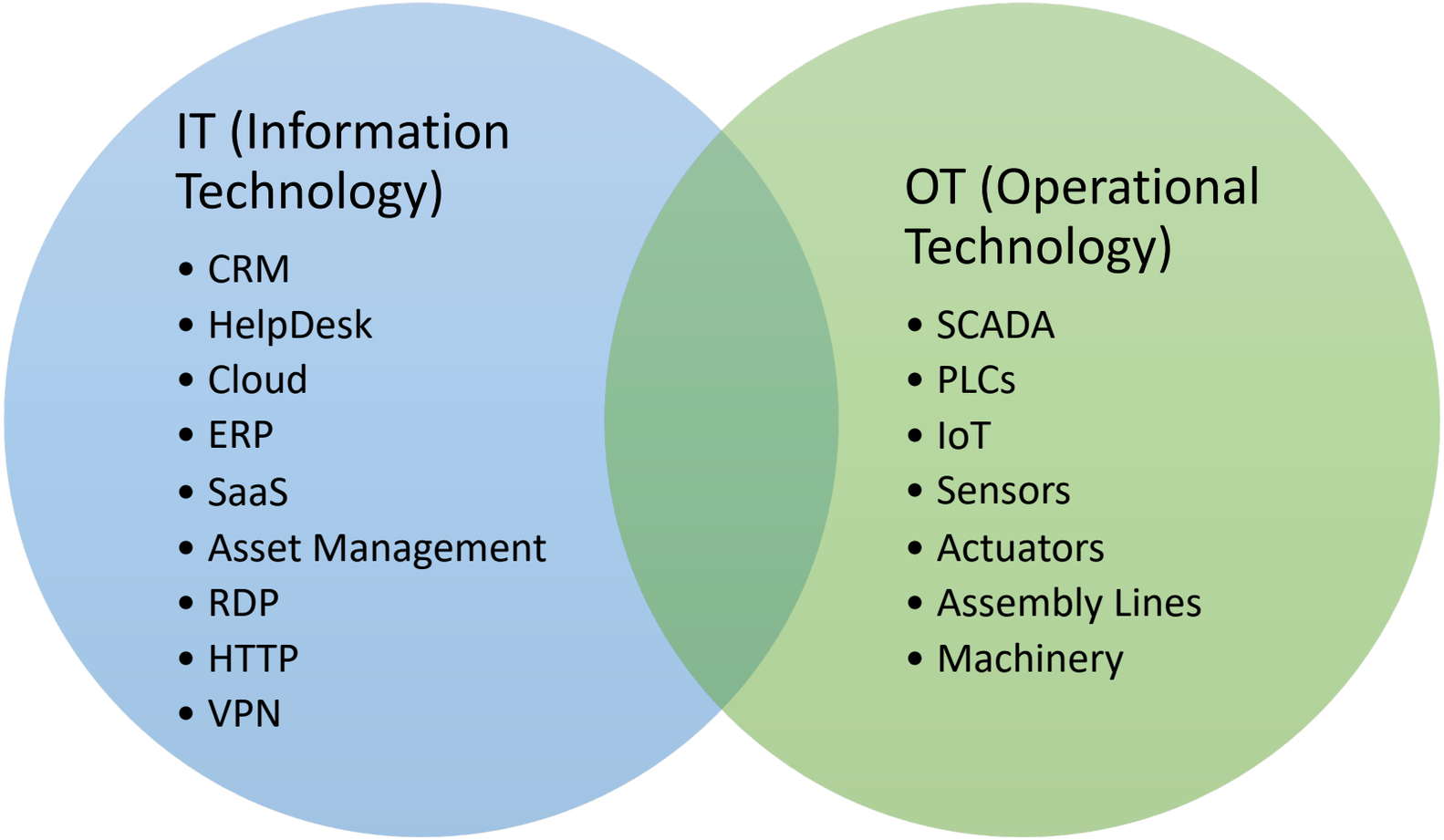
Managing IoT solutions w/ DevOps

(build, Manage, provision, deploy code)

Understanding total cost of ownership (TCO)

https://azure.microsoft.com/en-us/resources/8-attributes-of-successful-iot-solutions/

Information Technology (IT) vs. Operational Technology (OT)



User Roles in IoT

Administrator - handles administrative tasks, assigning user roles and permissions.

Device Developer - writes code for IoT devices.

Operator - manages devices connected to IoT cloud application.

Solution Builder - builds the IoT cloud solution that devices connect to

What is IoT Central?

connect, monitor and manage your IoT assets at scale

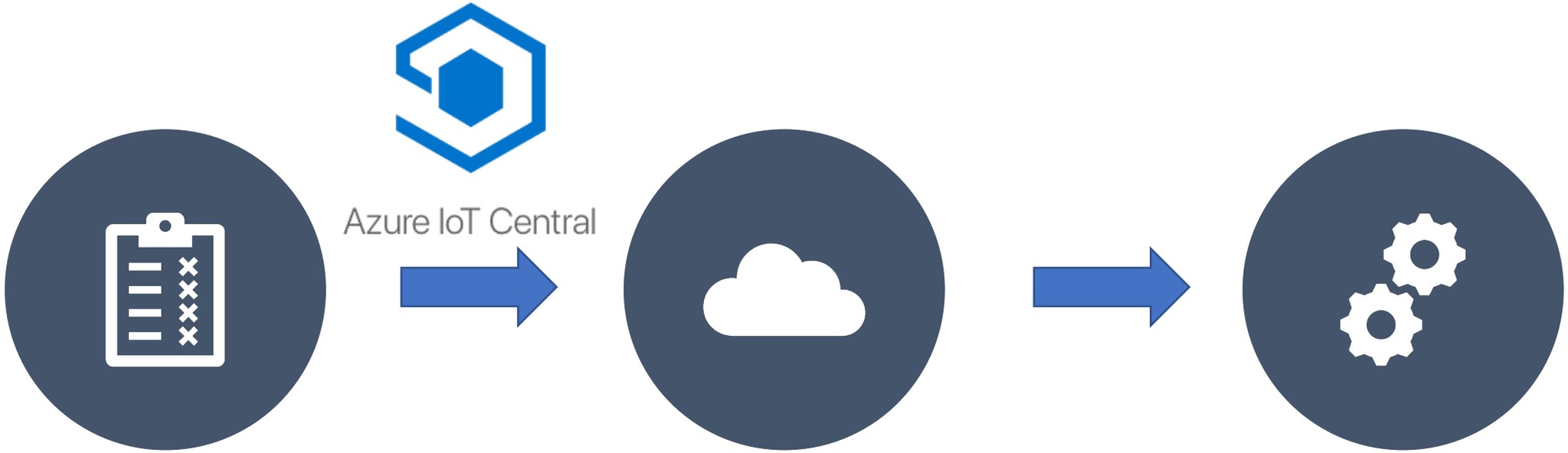
Quick connectivity

Centralized management

Visualizations and analysis

Bridge between business applications and IoT data

What is IoT Central?



DEVICES

ACQUIRE, CONNECT, SECURE, MANAGE

USING IOT DATA

IOT Central can do this!

You can do this!

Benefits of IoT Central

Low-code environment

Fast and Easy way for Data Analysis and Visualization

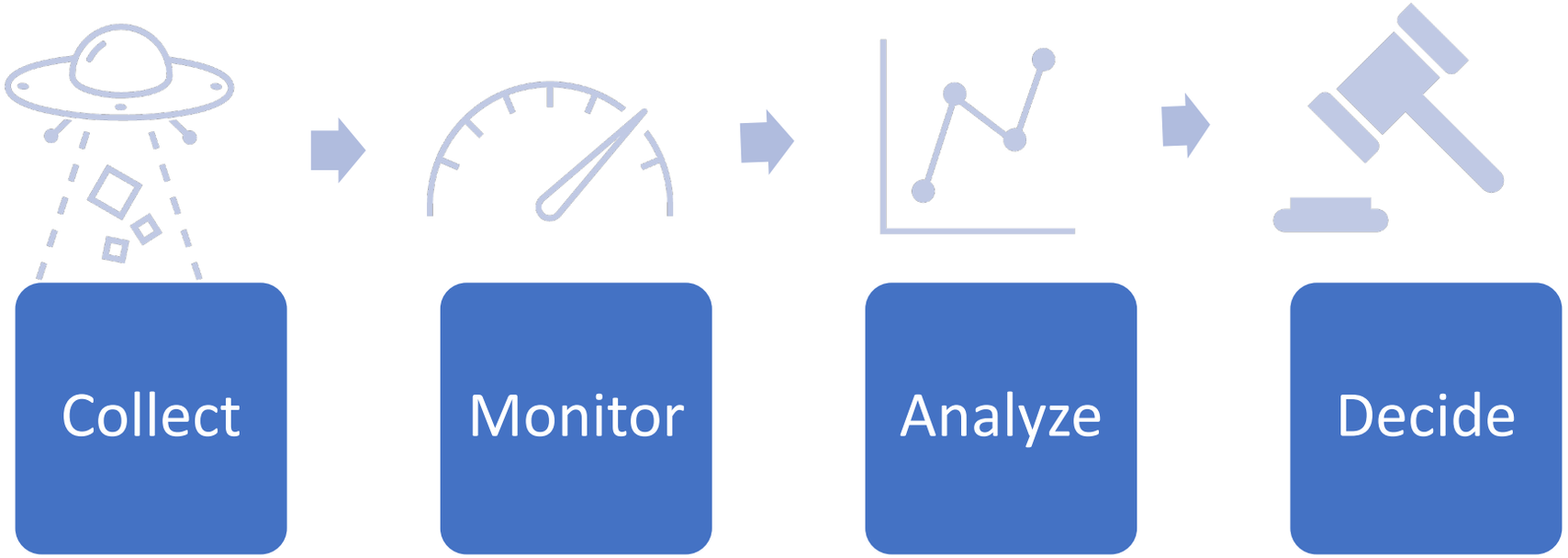
Dealing with non-frequently changing data

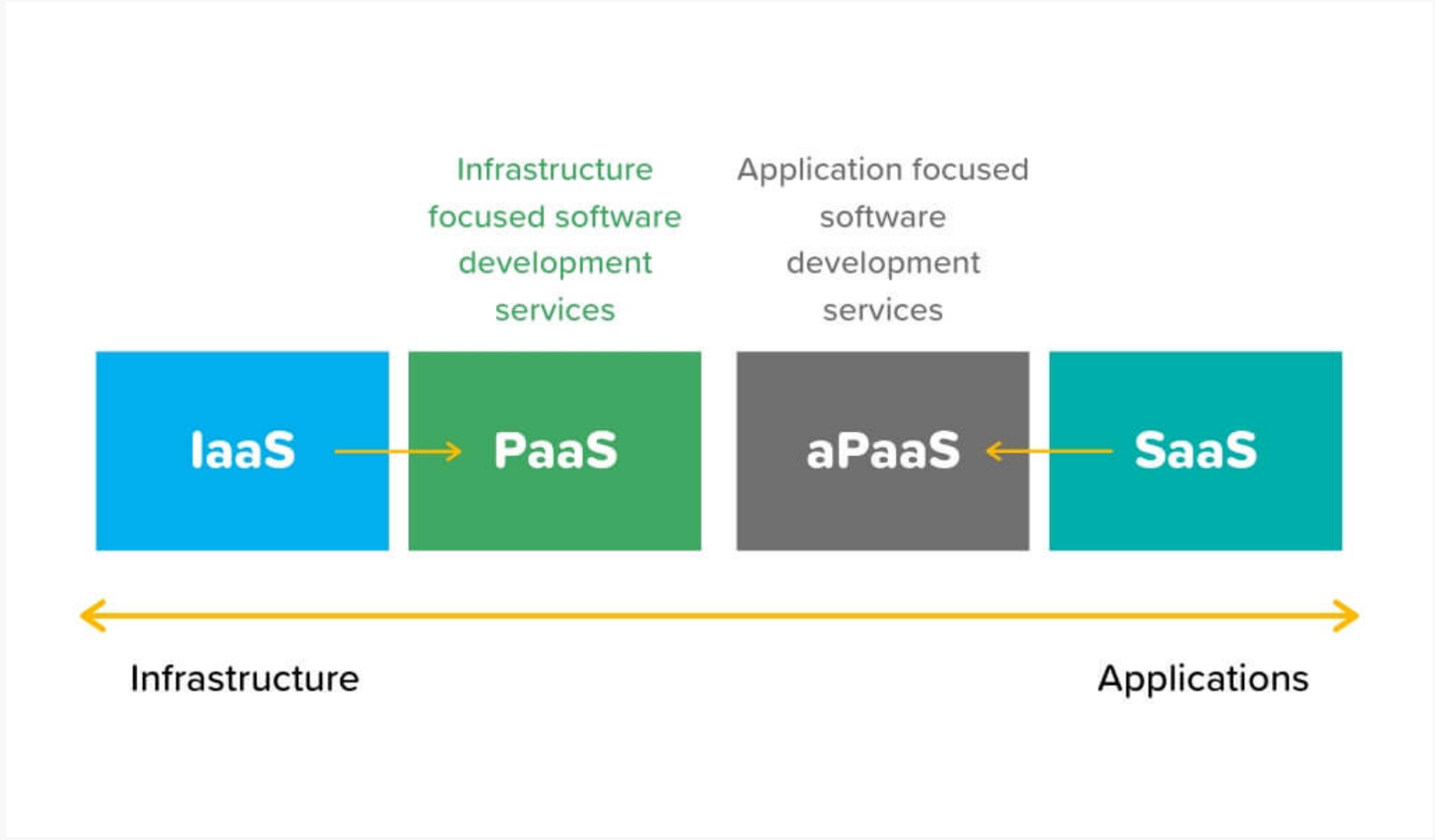
Ready-to-use templates

Support for different types of device measurement

Highly secure authorization and authentication

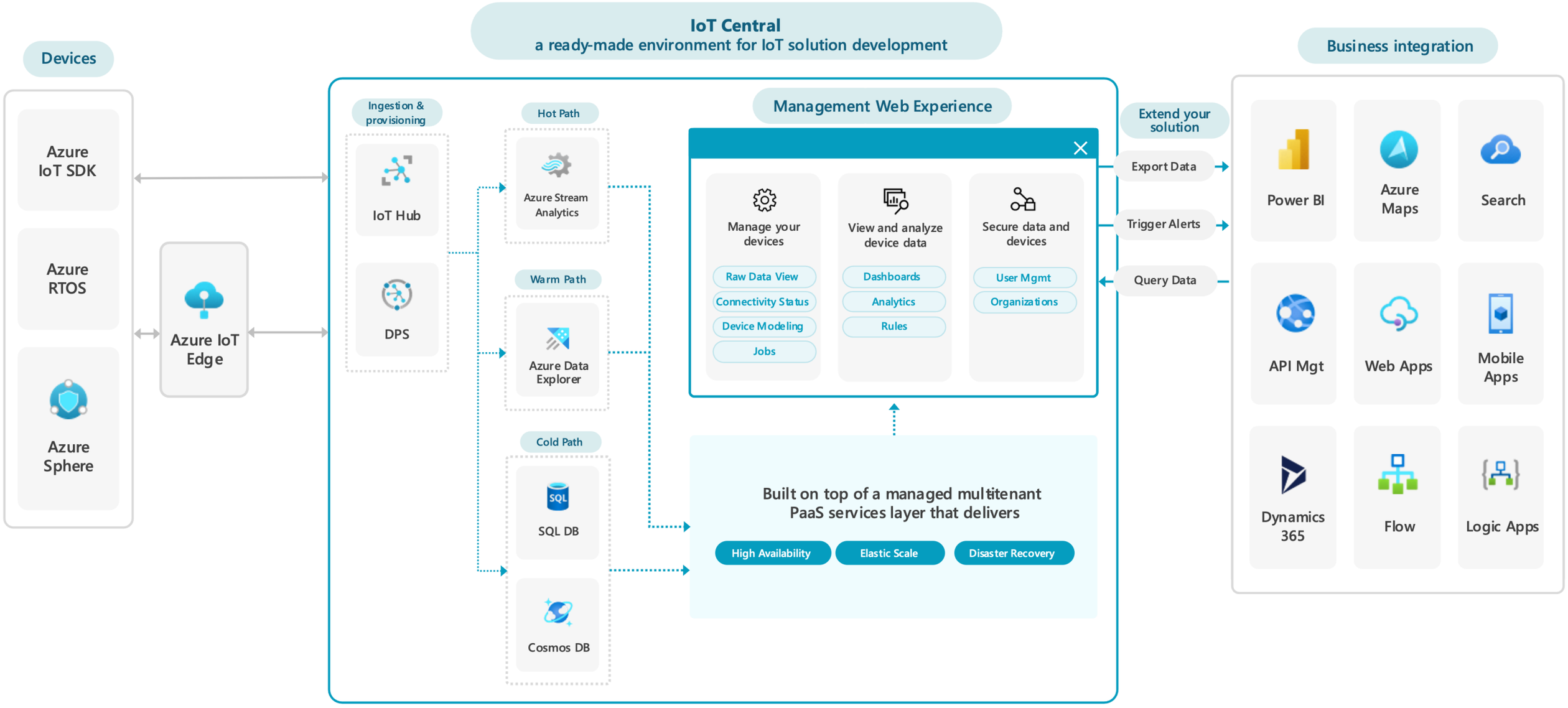
Leverage Azure IoT Central




Infrastructure focused software development services
Application focused software development services
IaaS
PaaS
aPaaS
SaaS
Infrastructure
Applications


American Girl
REBUILD
RECONSTRUIS
Grace's 2-in-1 Buildable Home
Maison à construire 2 en 1 de Grace
749
8+

Azure IoT Central aPaaS Architecture



When to use Azure IoT Central

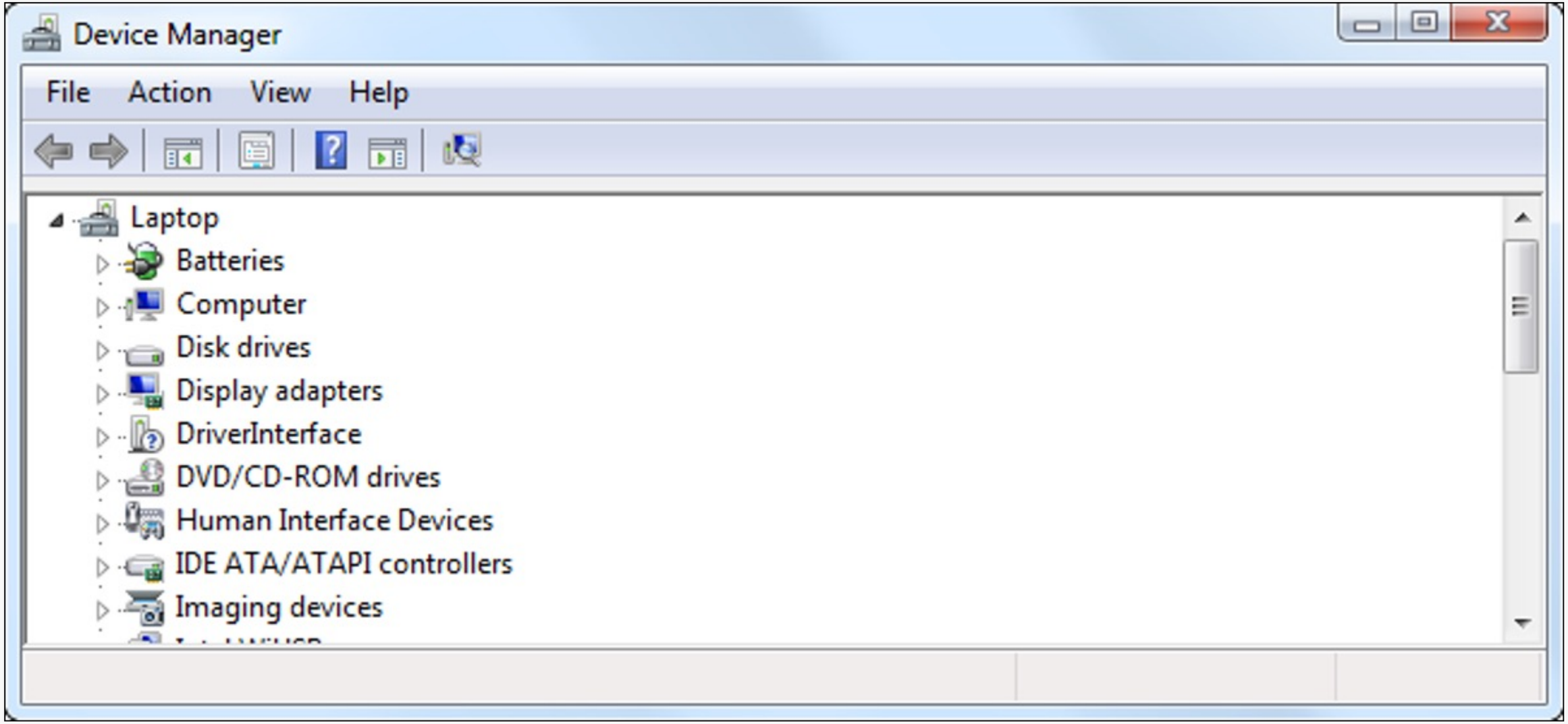
- **Experience**
  - lack of skills and experience (very common)
  - always consider the skills and abilities of the IoT team

- **Customization**
  - IoT Central Platform provides ready-to-use application with few customization options
  - Try building Companion apps than the Custom-built solution from scratch

Azure IoT Hub is the better option for experienced professionals that need full control over their IoT solution

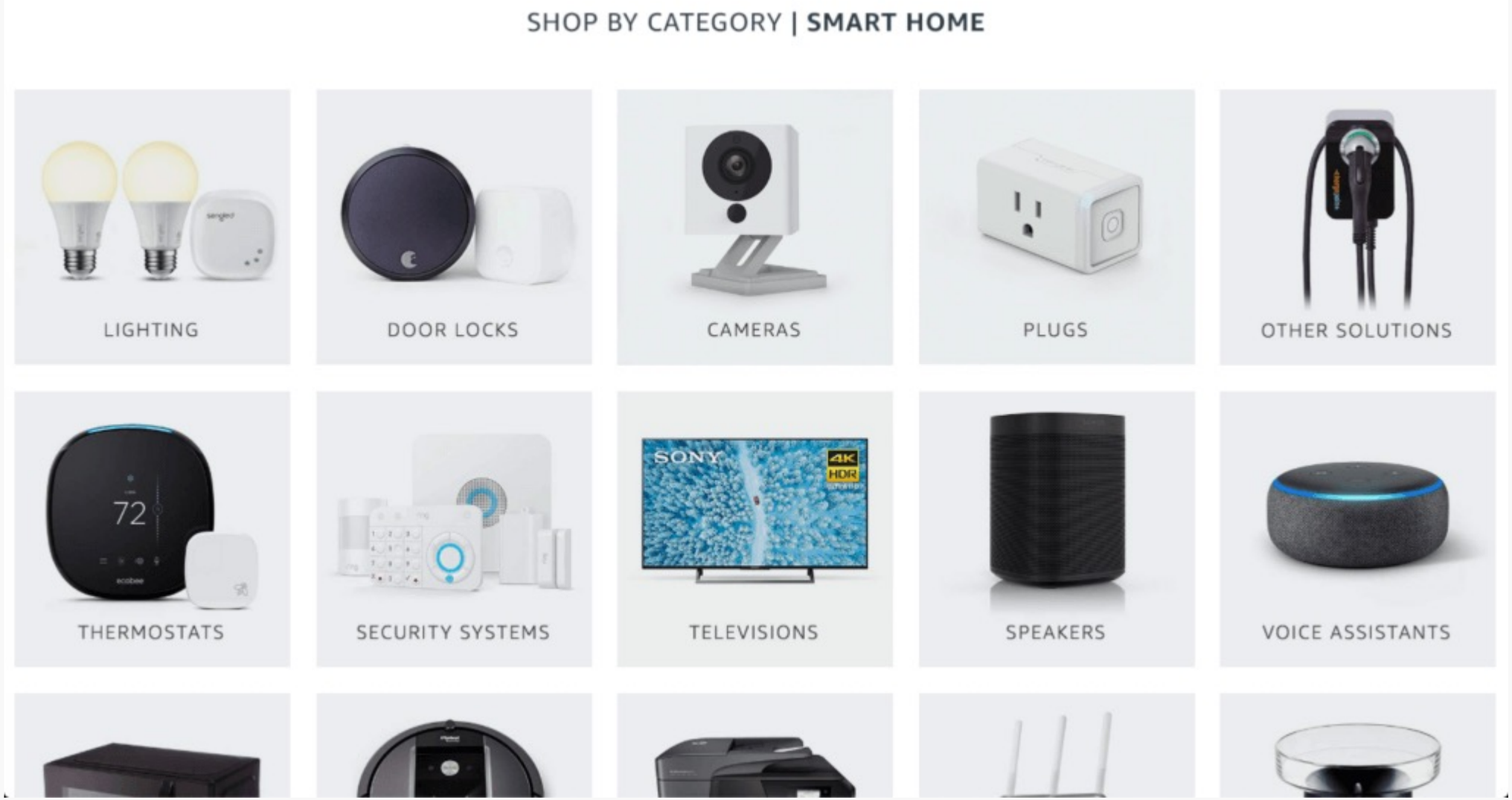
What made Windows successful?

Working with Device manufacturer to have compatible drivers



Alexa Compatible Devices

Working with Device manufacturer



Azure IoT Plug and Play

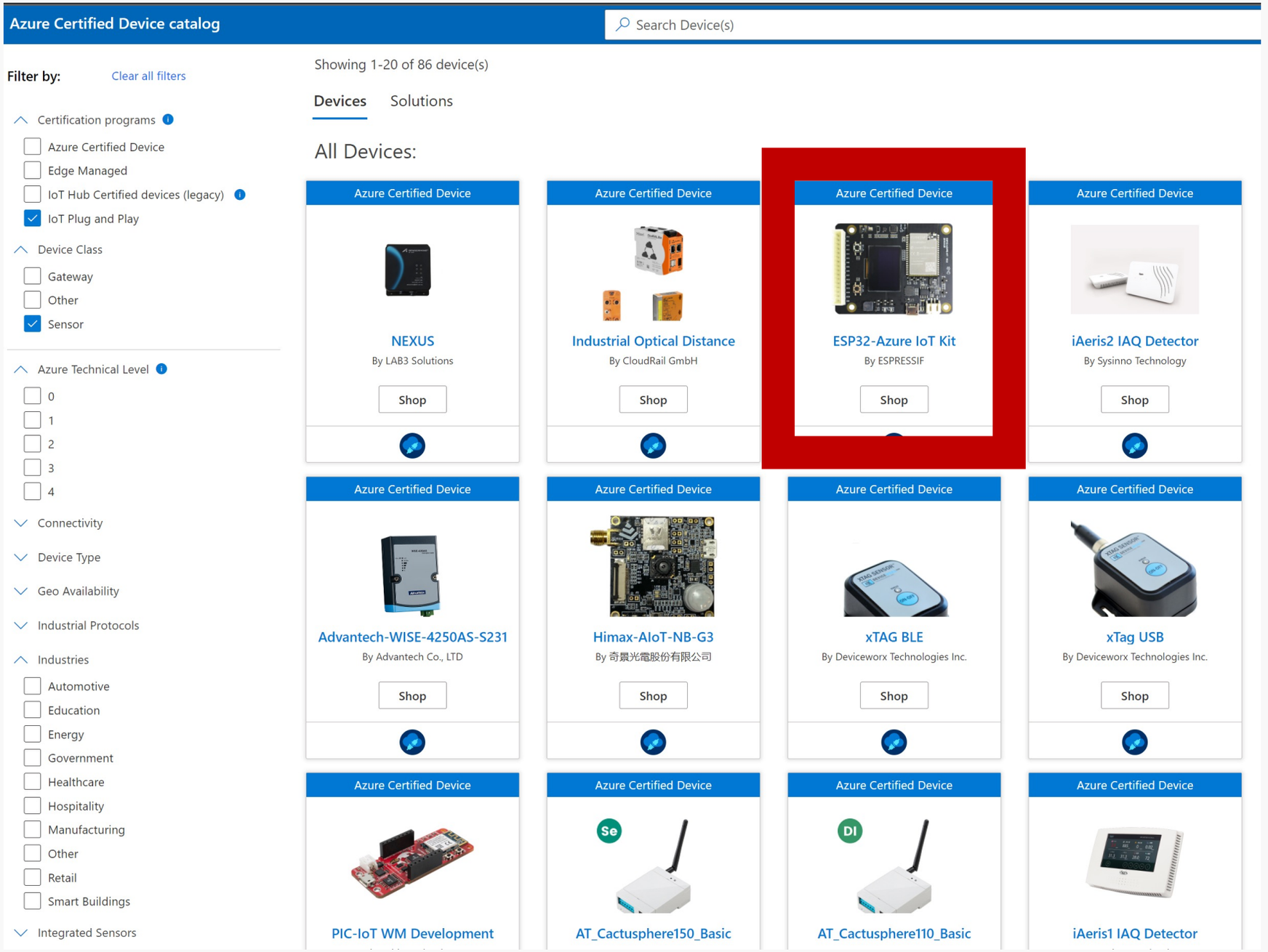
integrate smart devices solutions – no manual configuration

device model - advertises its capabilities to an IoT Central

eliminate the hassle of configuring devices

- creating templates
- adding features and interfaces

Azure Certified Device Catalog



https://devicecatalog.azure.com/

1. Device Types

IoT Device	Free-standing device Sends its individual sensor data directly to IoT Central	Sends telemetry data Reports property values Receives writable property values Responds to commands
IoT Edge Device	Device that connects directly Has ability to process data locally	Acts as a standalone IoT device OR Middleman for other devices that can't connect directly to cloud
Gateway Devices	IoT device that connects to downstream devices	Manages other devices that connect to Azure IoT Central

Connection

- shared access signatures
- X.509 certificates
- Trusted Platform Module (TPM)

Communication Protocols

- MQTT
- AMQP
- HTTPs

2. Device Template

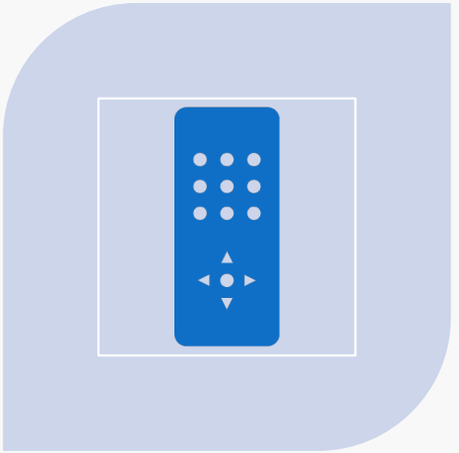
Blueprint definition

TELEMETRY

Device sends to Cloud

PROPERTIES

Device synchronizes with Cloud (device twin)



COMMANDS

Cloud calls on device.

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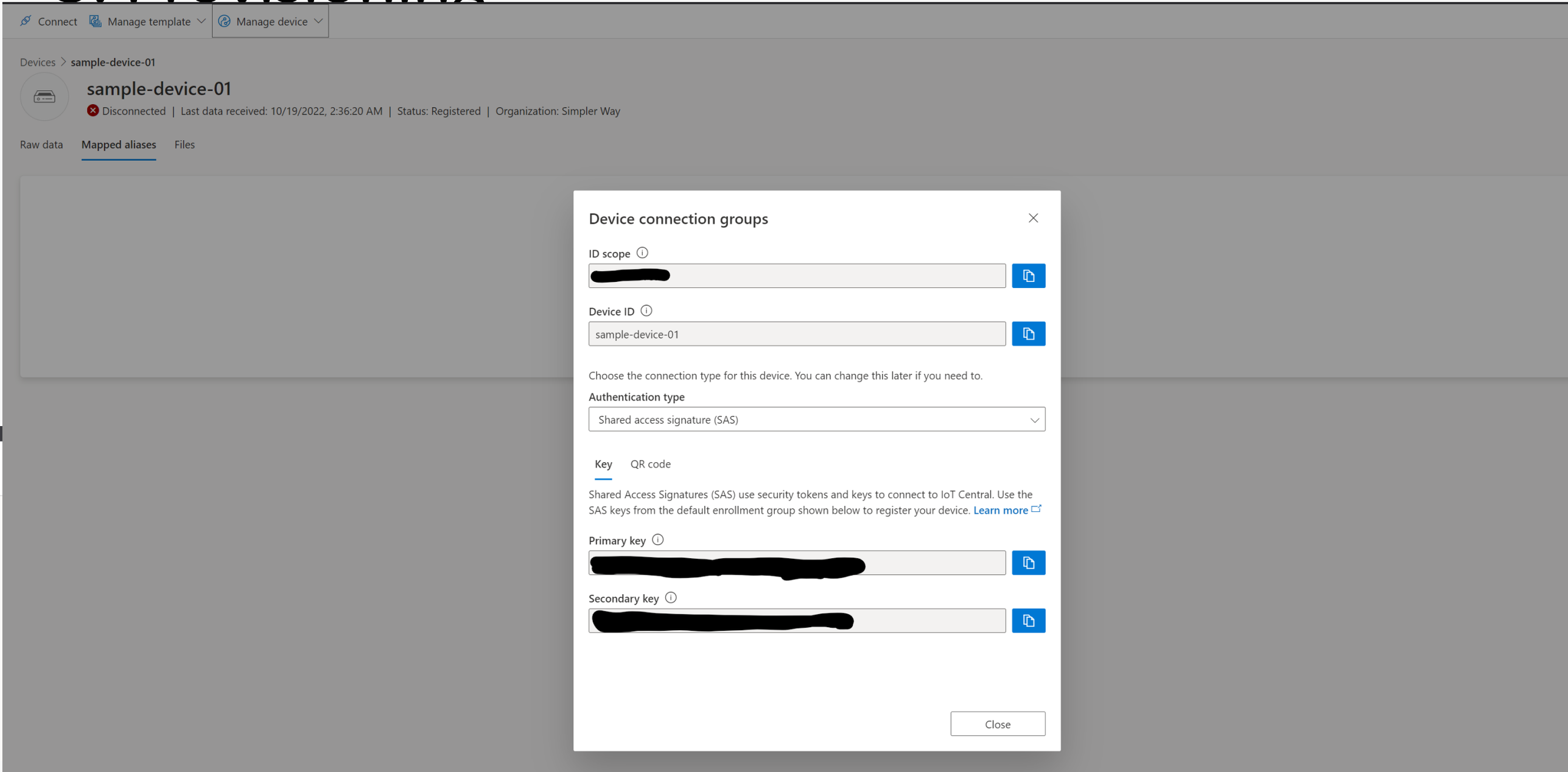
Demo IoT Central Provisioning

1 Million Devices Per IoT Central App

3. Provisioning



4. Monitoring

- monitor the health of applications and IoT devices
- analyze historical data collected by devices in the past

Device monitoring

- monitoring devices to identify when there are issues

Application monitoring

- Metrics are provided by charts
- Azure Portal, REST API, or queries written with PowerShell or Azure CLI.

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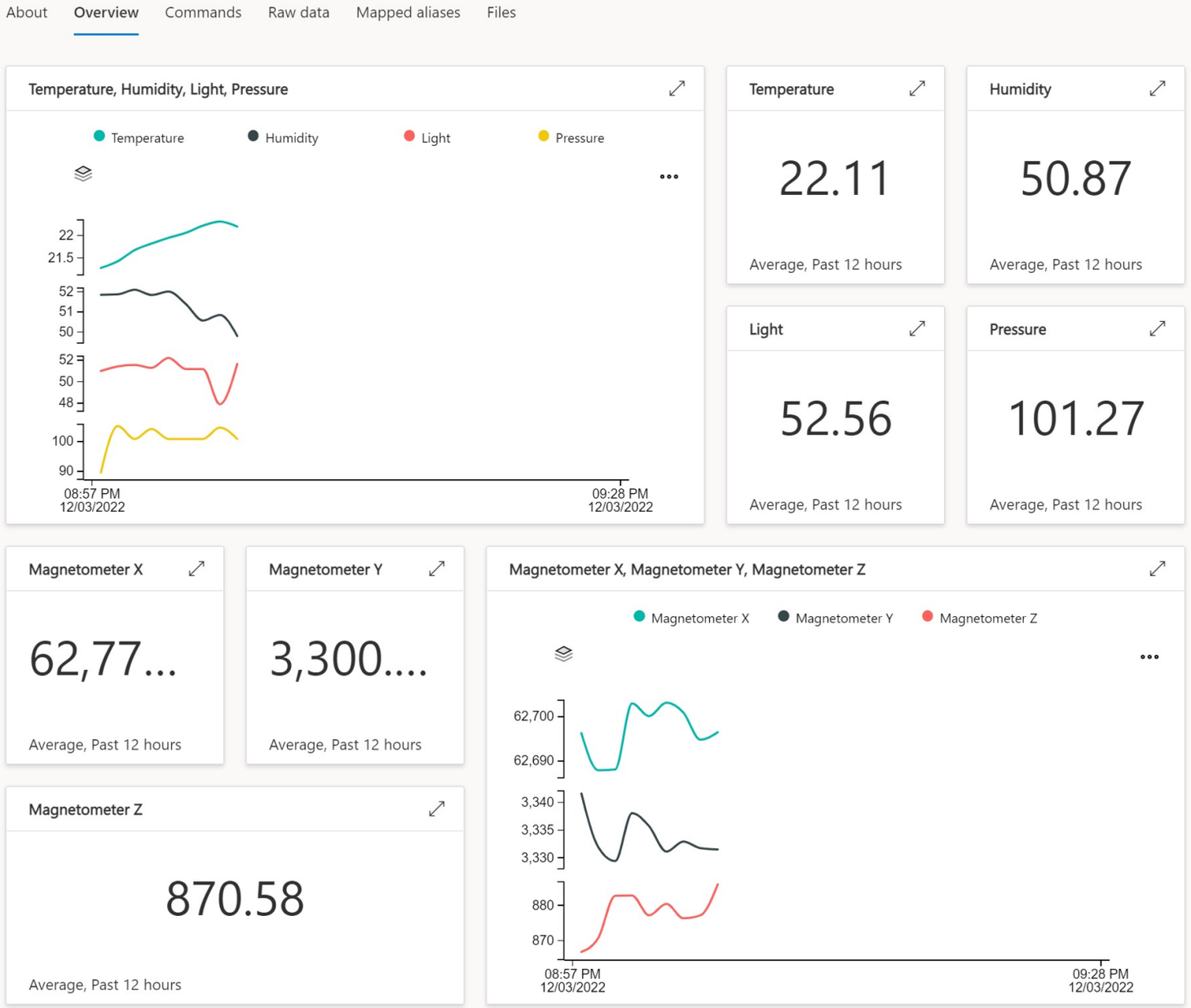
Demo IoT Central Device Monitoring

5. Visualize Data



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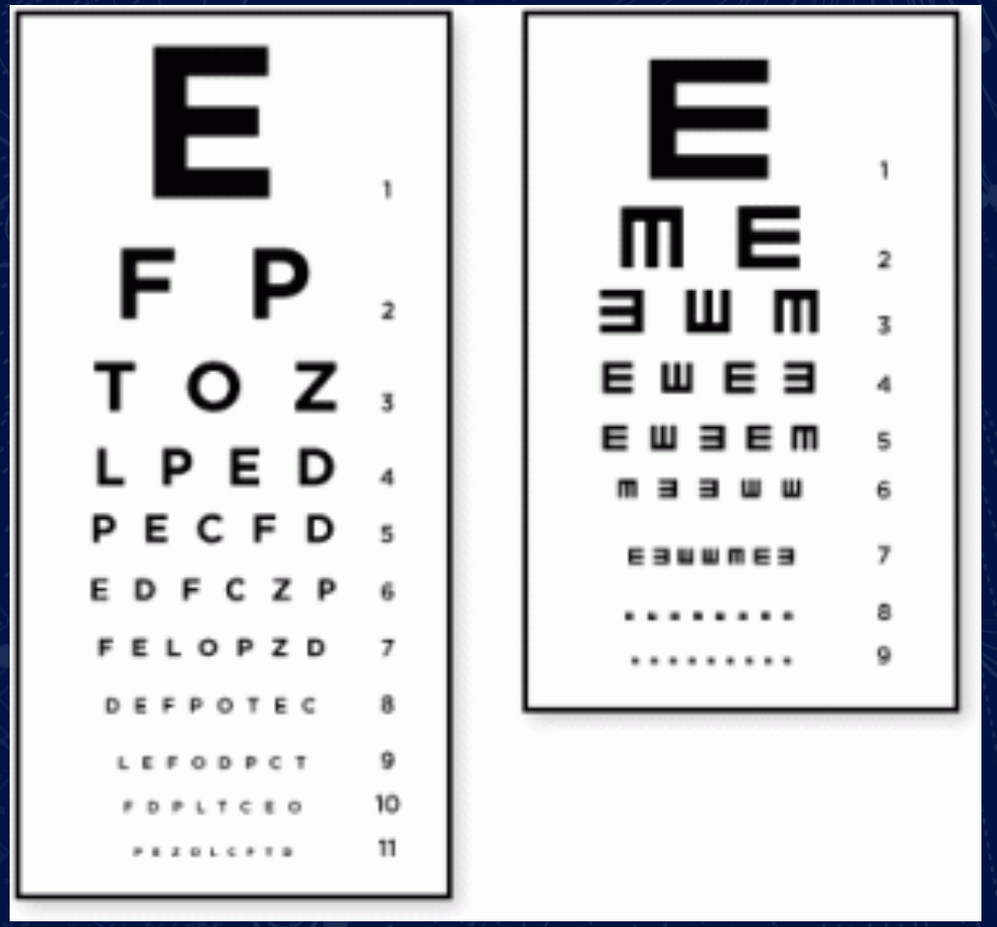
Demo
IoT Central Data Visualization



6. Jobs

- manages connected devices at scale
- do bulk updates to
    - Device properties
    - cloud properties
    - run commands
    - change device template
- use CSV files to import and export devices in bulk.

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Demo
IoT Central Jobs

5 concurrent
job executions

Review

Connect
Devices
Device groups
Device templates
Edge manifests
Analyze
Data explorer
Dashboards
Manage
Jobs
Extend
Rules

Configuration Edit

Job name	send command to devices to display hello
Description	-
Device group	Espressif ESP32 Azure IoT Kit - All devices 1 device
Organization	Simpler Way

Job type: Command

DisplayText

```
1  {
2      "Request": "Hello World!"
3  }
```

the next queued batch starts.

e threshold to all of your devices, or make it specific to

Previous Run

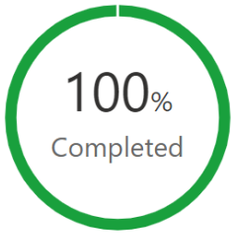
Save and exit

Copy job | Job properties | Results log

30-day history > Rerun send command to devices to display hello

Rerun send command to devices to display hello

Results



Completed	1
Failed	0
Pending	0

Duration

05
Seconds

Start 12/3/2022, 8:57:26 PM
End 12/3/2022, 8:57:30 PM

Name	Device ID	Status	End Time
mydevice	mydevice	Completed	12/3/2022, 8:57:30 PM

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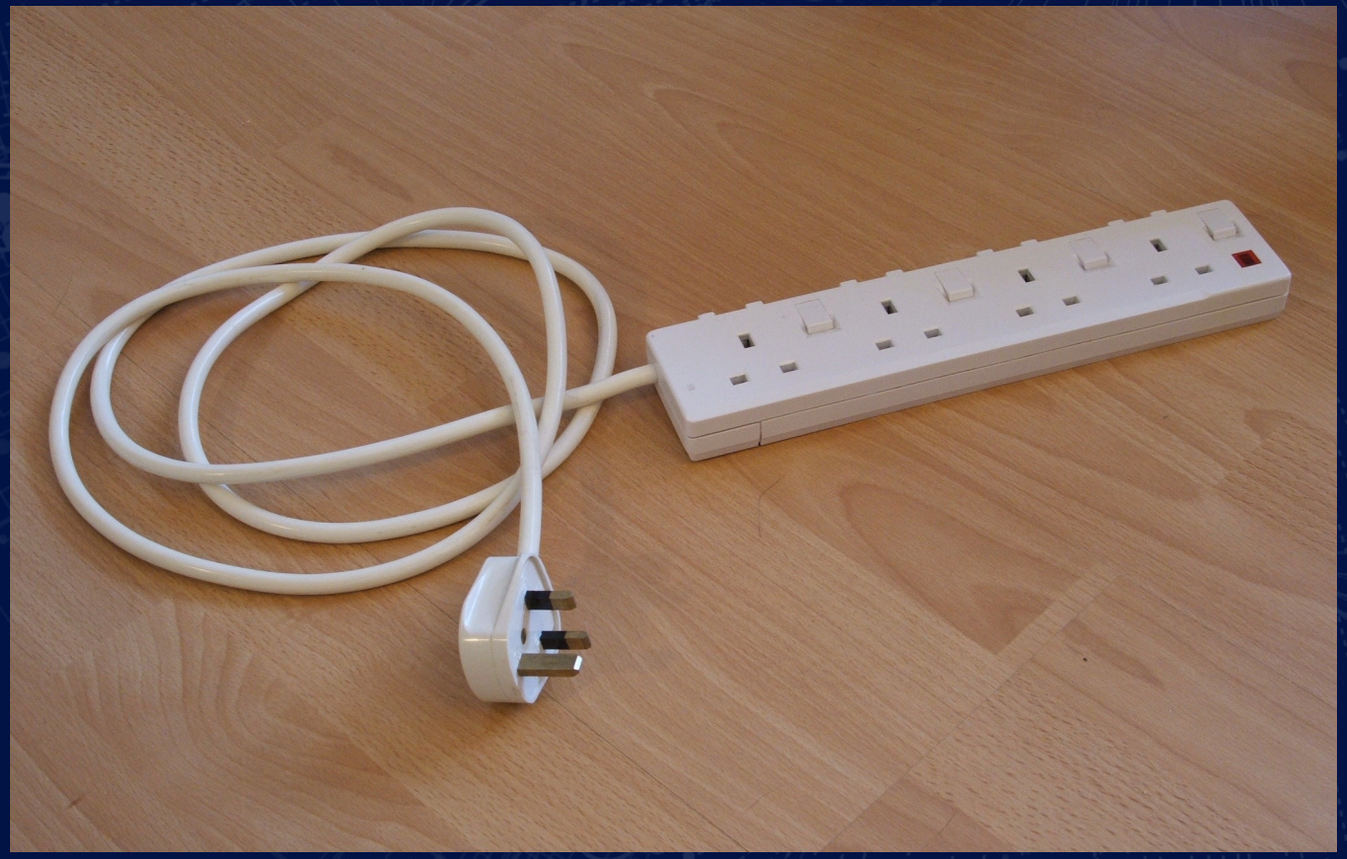
Extending IoT Central



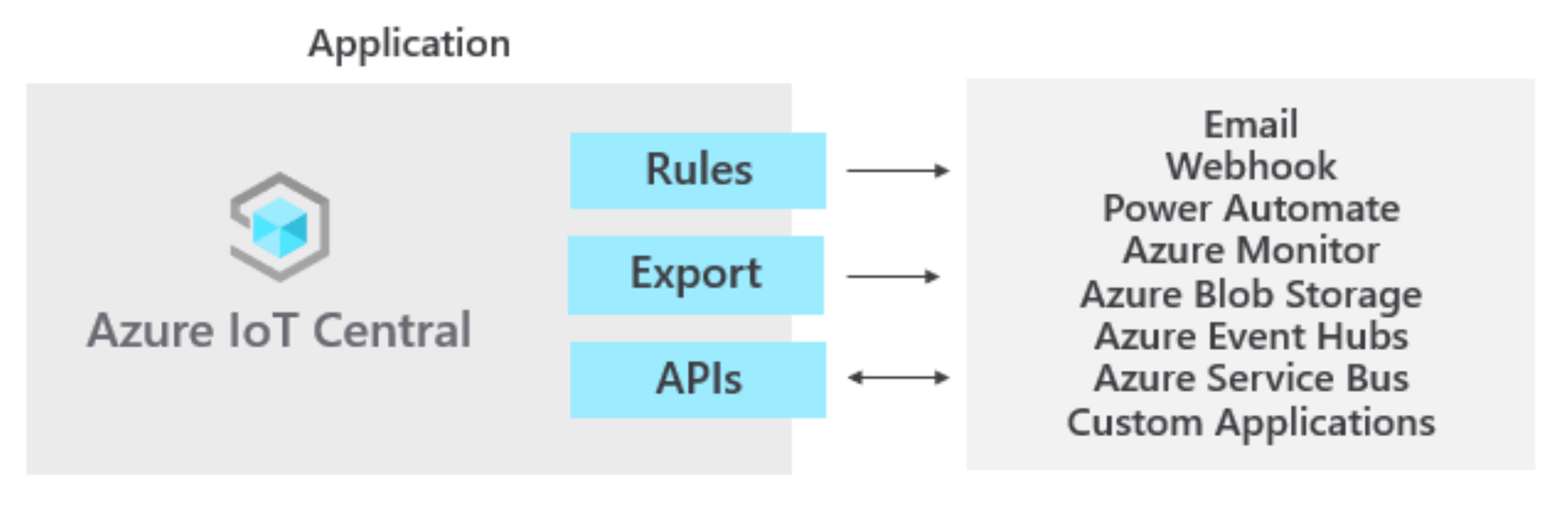
Extending IoT Central

DATA EXPORT

RULES

REST API

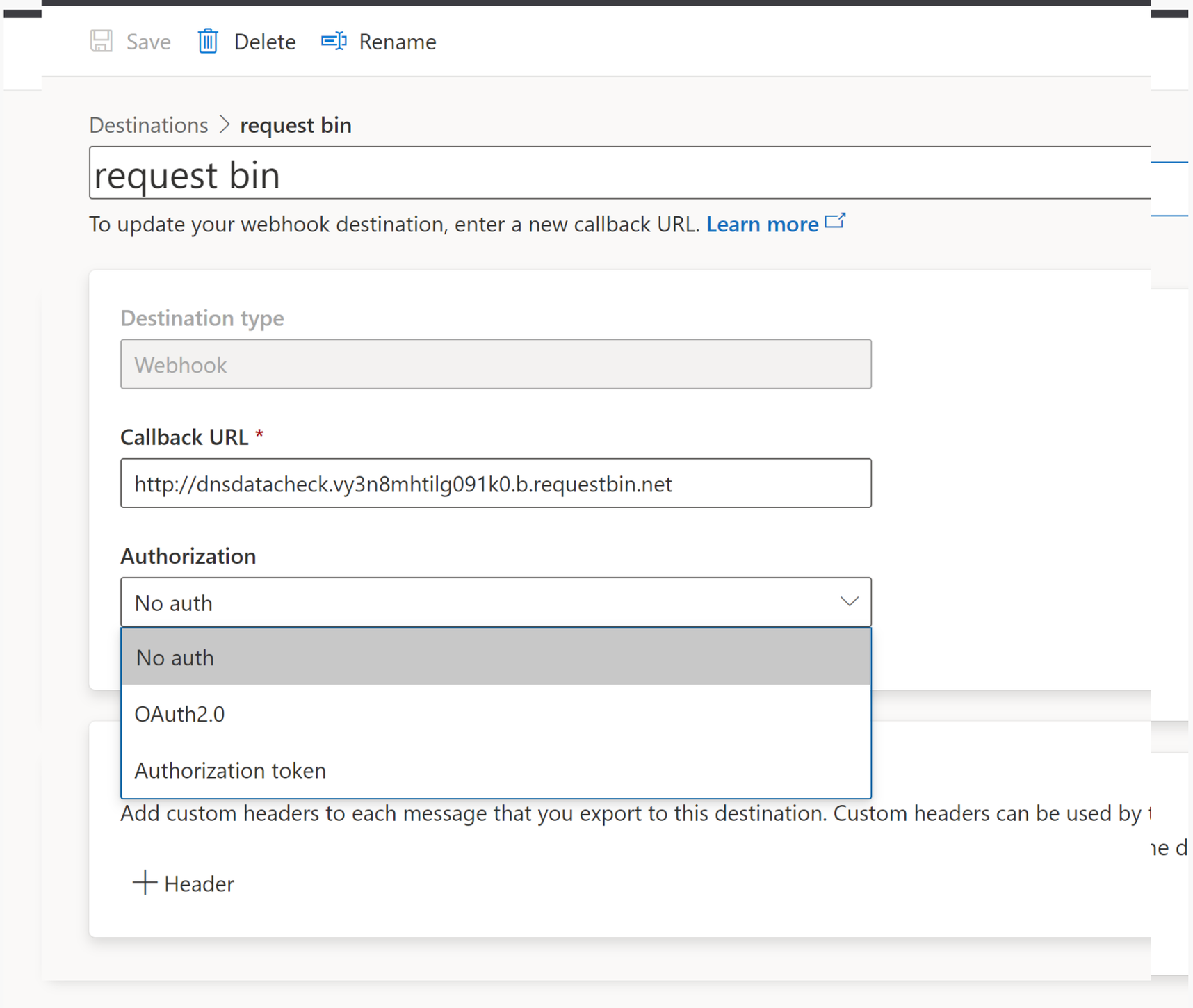
Integrate with other services



7. Data Export

Azure Service	Use
Azure Event Hubs	Process, transform, and store millions of events with speed and precision
Azure Service Bus	Send messages between devices, applications, and services in the cloud
Azure Blob Storage	Store large amounts of unstructured data
Azure Data Lake Storage	Process and analyze large amounts of data
Webhook Endpoints	Trigger *HTTP* callbacks to other applications based on predefined rules

Destination



Data Export

Enrichments

Add additional information to your export. This will appear as a key value pair in exported messages. Learn more

Key *	Value *	
IsSample	true	✕
Organization	Organizations	✕

+ Custom string + Property

Destinations

Select destinations for your export. If you can't find your destination, create a new one.

Destination *	Data transformation	Export status	Details
request bin	Edit	✓ Healthy	

+ Destination

Export Data Transformation

Telemetry values

- restructure JSON payloads
- rename fields
- filter out fields
- run simple calculations

Limitations

- 10 data export jobs
- 10 data export destinations
- 10 data expert destinations per job
- 10 filters and enrichments per data export job

Data Transformation

```
import "iotc" as iotc;
{
    schema: "default@v1",
    deviceName: .device.name,
    templateName: .device.templateName,
    messageSource: .messageSource,
    messageType: .messageType,
    enqueuedTime: .enqueuedTime,
    enrichments: .enrichments,
    model: .device.properties.reported |
iotc::find(.name == "model").value
}
```


```
{
    "deviceName": "neural bandwidth",
    "enqueuedTime": "2011-05-
29T05:54:00.76817568Z",
    "enrichments": null,
    "messageSource": "deviceConnectivity",
    "messageType": "disconnected",
    "model": "Quia veritatis dicta a.",
    "schema": "default@v1",
    "templateName": "Espressif ESP32 Azure
IoT Kit"
}
```

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Demo
IoT Central Data Integration

8. Rules

- Notifying operators in other systems
- Starting business processes or flows
- Monitoring alerts on a custom dashboard

- 50 rules per application
- 5 actions per rule
- 1 alert email per rule
- 1 webhook alert every 10 seconds

Actions

Choose what action your rule should take.

Webhook: Webhook 1

Notify external systems when a rule is triggered in IoT Central. When the conditions of the rule are met, a POST request will be sent to the callback URL you provide.

Learn about the structure of the payload

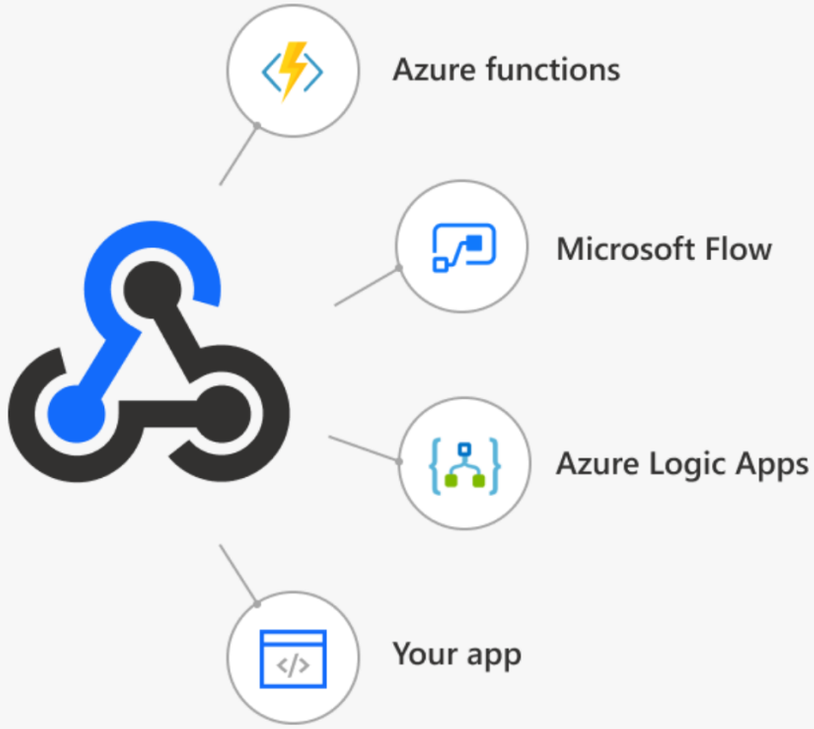
Display name

Webhook 1

Callback URL *

http://dnsdatacheck.vy3n8mhtilg091k0.b.requestbin.net

Done



Add another action

+ Email + Webhook + Azure Monitor Action Groups + Microsoft Power Automate + Microsoft Azure Logic Apps

9. REST API

App Management

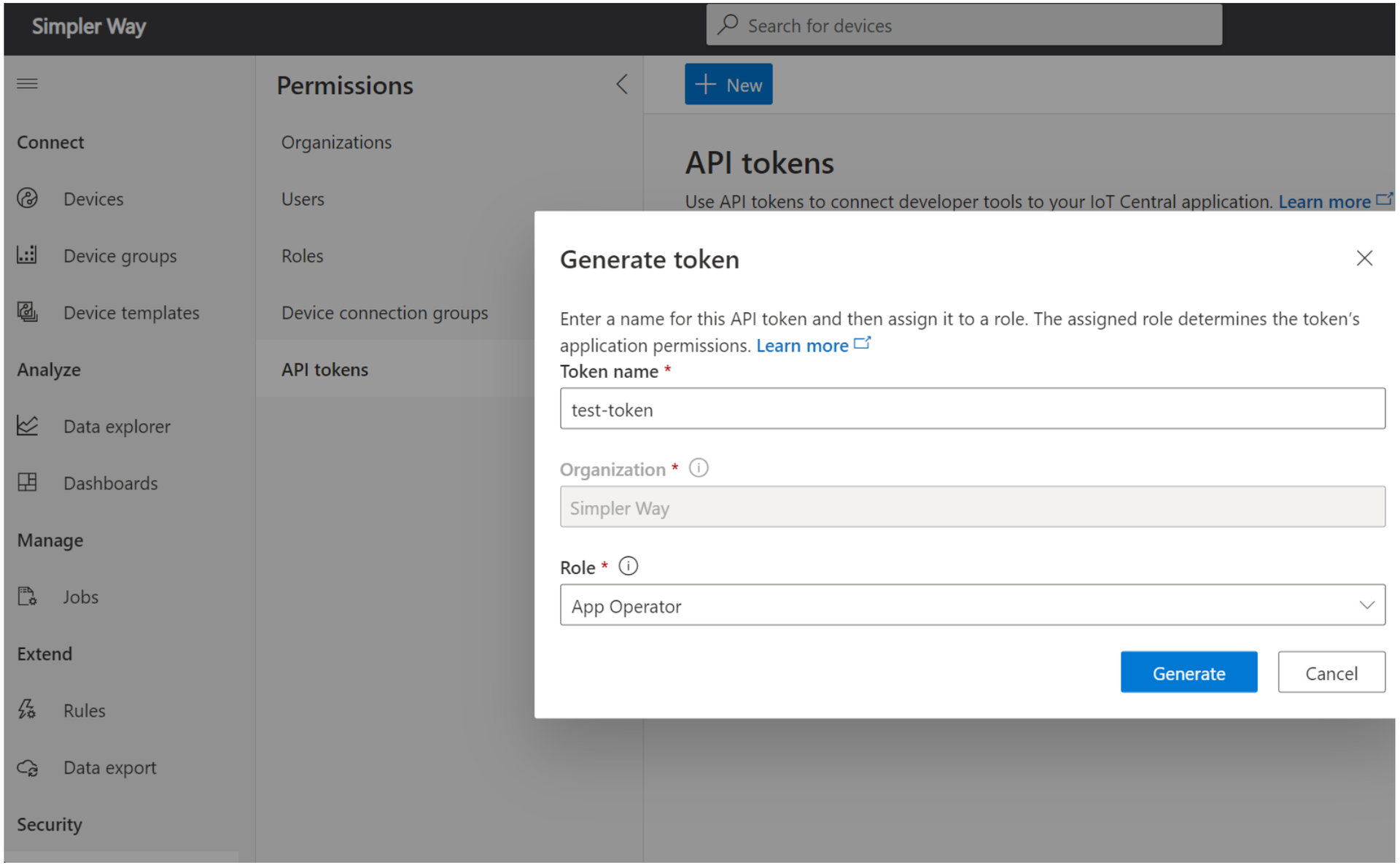
Device Modelling

Device Onboarding

Device Management

Data and Insights

Limitations –
1 query API req/s
20 API req/s


Simpler Way
Search for devices
Permissions
Organizations
Users
Roles
Device connection groups
API tokens
New
Connect
Devices
Device groups
Device templates
Analyze
Data explorer
Dashboards
Manage
Jobs
Extend
Rules
Data export
Security
API tokens
Use API tokens to connect developer tools to your IoT Central application. Learn more
Generate token
Enter a name for this API token and then assign it to a role. The assigned role determines the token's application permissions. Learn more
Token name *
test-token
Organization *
Simpler Way
Role *
App Operator
Generate
Cancel

REST API

Sample Request

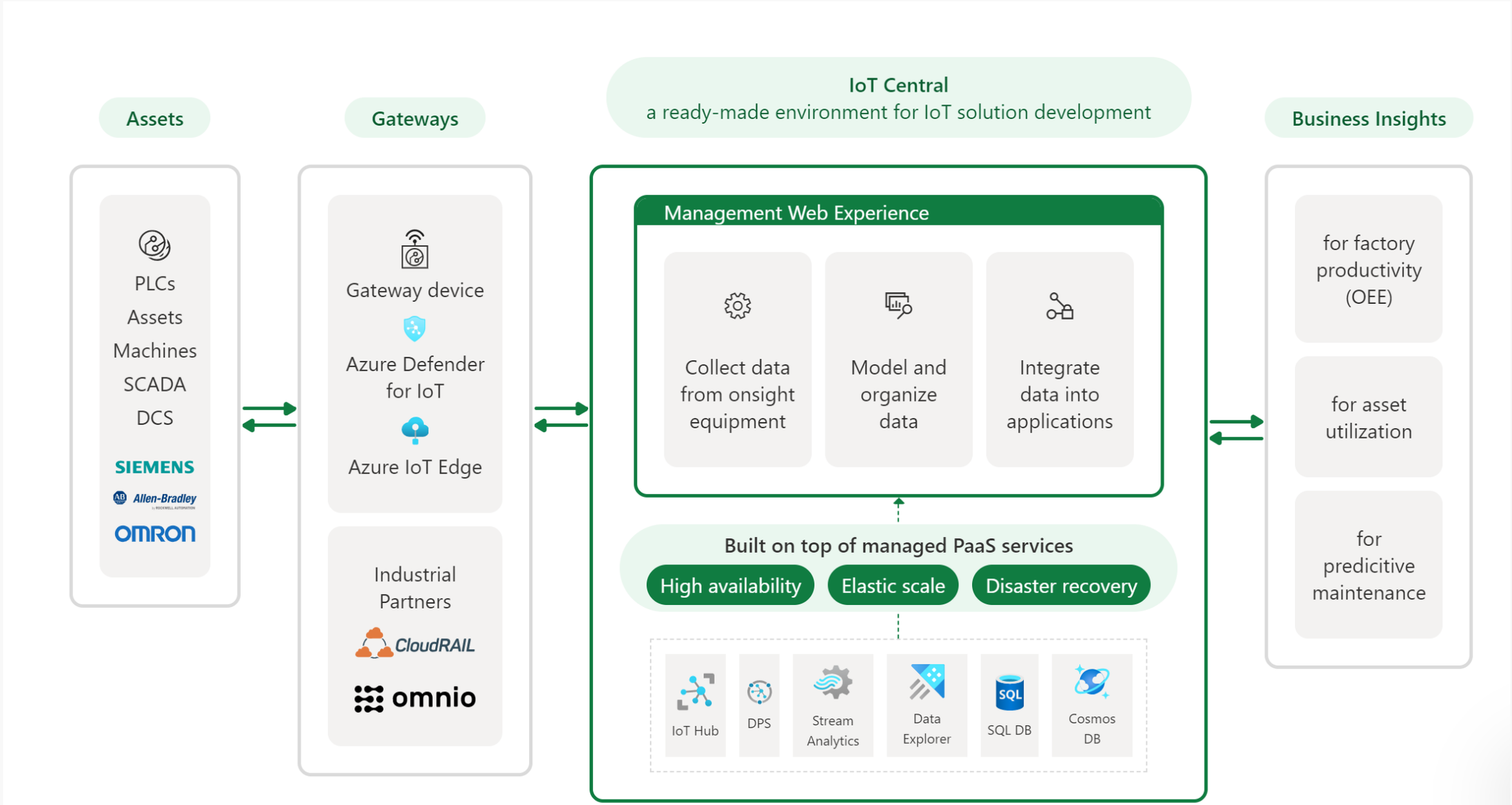
```
POST https://simpler-way.azureiotcentral.com/api/devices/mydevice/commands/DisplayText?api-version=2022-07-31
Content-Type: application/json
Authorization: SharedAccessSignature sr=6c8..

{
 "request": "Hello World!"
}
```

Sample Response

Status code: 201

```
{
  "request": "Hello World!",
  "response": {},
  "responseCode": 200
}
```

Industrial IoT



Summary

Internet of Things – Remotely Monitor and Control Device

IoT Central – simplifies the creation of IoT solutions

Benefits of IoT Central – low-code environment

1. Device Type
2. Device Template
3. Provisioning
4. Monitoring
5. Visualize Data
6. Jobs
7. Data Export
8. Rules
9. REST API

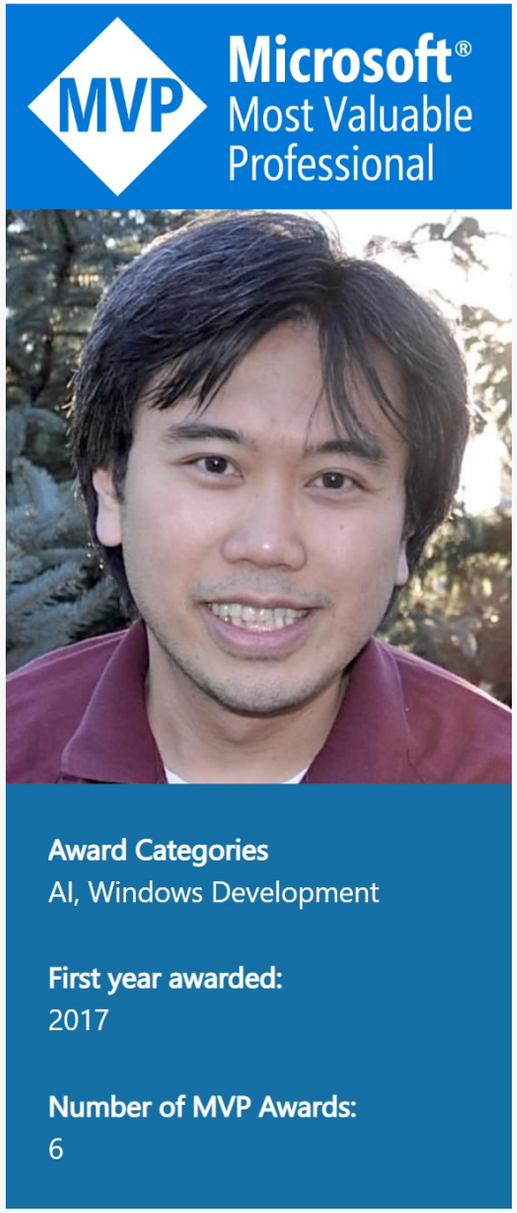
https://github.com/rondagdag/exploring-land-of-iot-on-azure

Call to Action

- Learn more about IoT Central on Microsoft Learn
  https://apps.azureiotcentral.com/home
- IoT Central REST API
  https://docs.microsoft.com/en-us/rest/api/iotcentral/
- Connect ESPRESSIF to IoT Central
  https://learn.microsoft.com/en-us/azure/iot-develop/quickstart-devkit-espressif-esp32-freertos

About Me

Ron Dagdag



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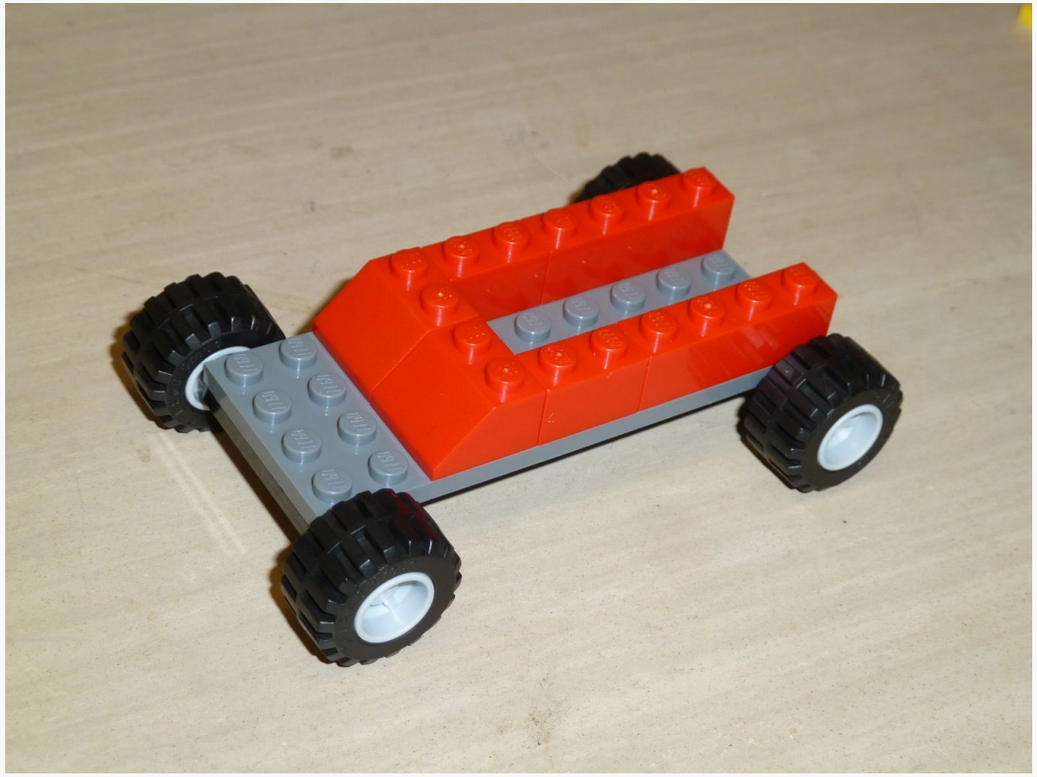
- 6th year Microsoft MVP awardee
- ron@dagdag.net
  @rondagdag
- Linked In
  www.linkedin.com/in/rondagdag/
- Feedback is appreciated. What did you learn that's new?

Build me a car

From these pieces



Build me a car

From these pieces