

Managing IoT Devices in Azure: the simpler way

Ron Dagdag

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Azure Data Conference

POWERED BY

Azure Data Community & Azure Data Conf

Build me a house

From these pieces



Build me a house

From these pieces

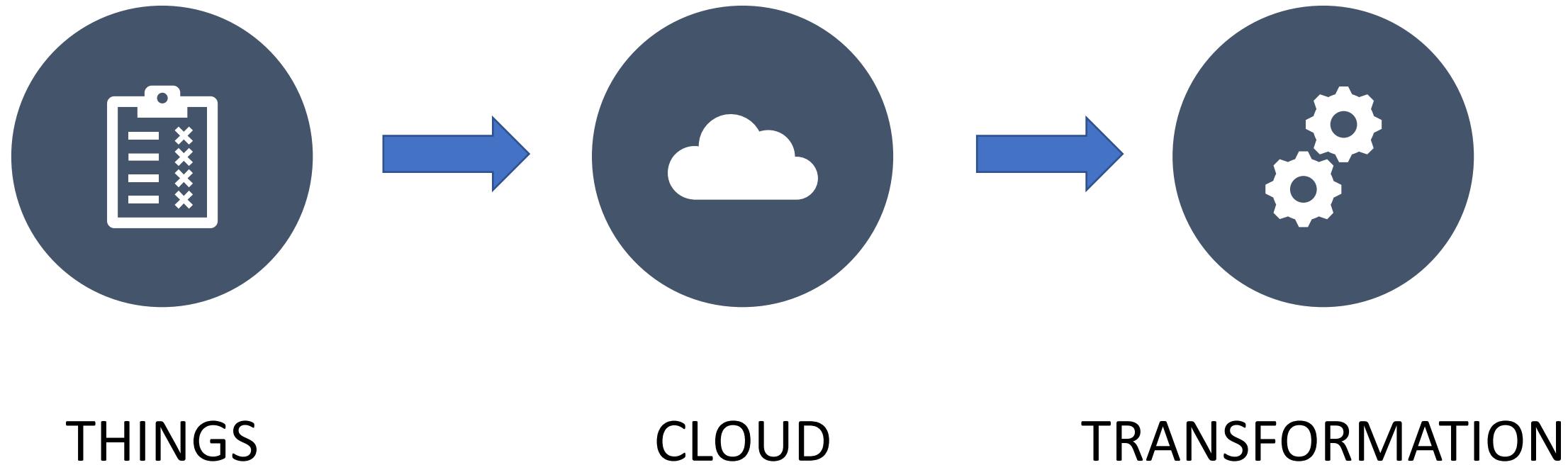
Would this be simpler?



Agenda

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

What is IoT?

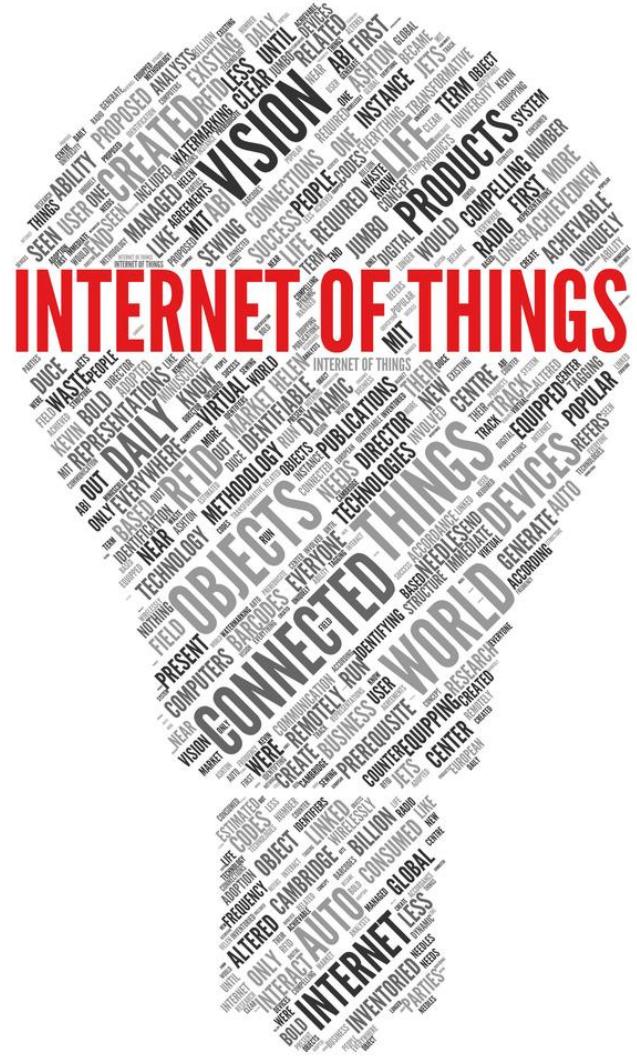


What is IOT?

Internet of Things

- connecting Internet to physical world via sensors
- World's first IoT device early 1980s Carnegie Melon University
 - vending machine to report contents through a network
- Kevin Ashton in 1999
- any device that interacts with physical world around it





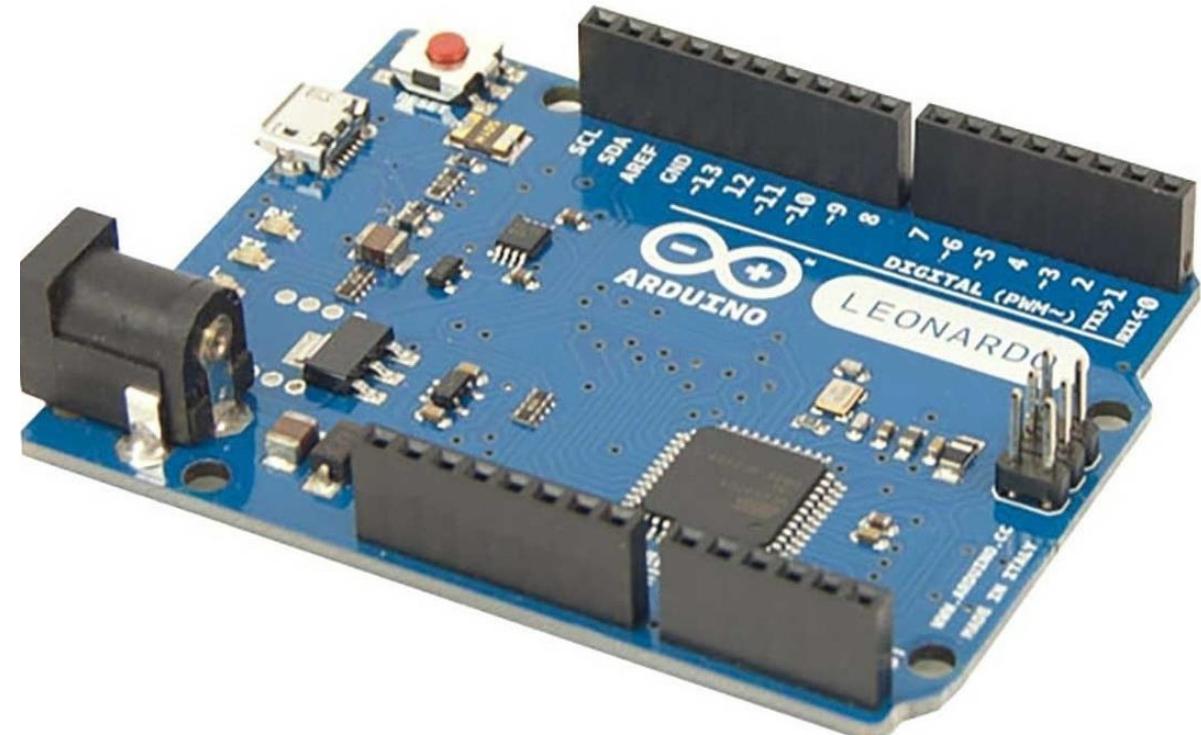
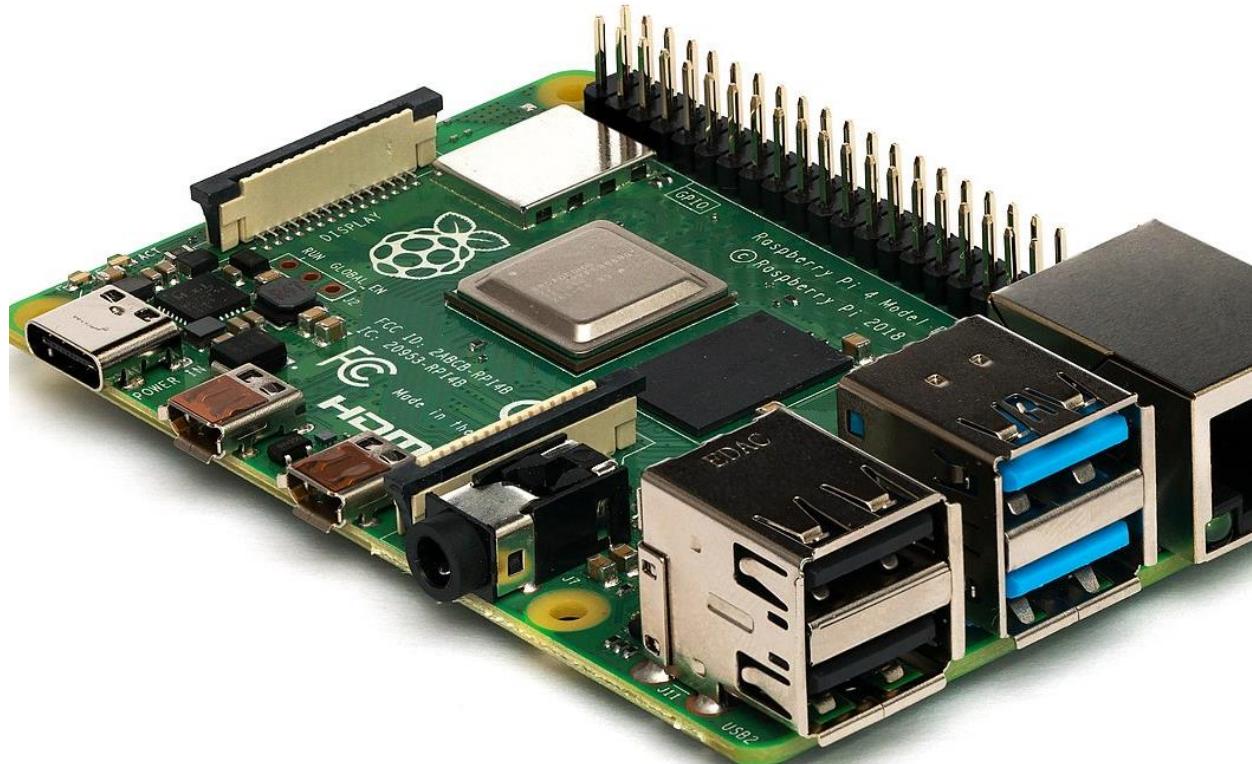
Remotely Monitor

- Gather Data
 - Device Processing
 - Device Status

Control Device

- Send Commands
 - Set Device Properties

Internet Of Things





@rondagdag

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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

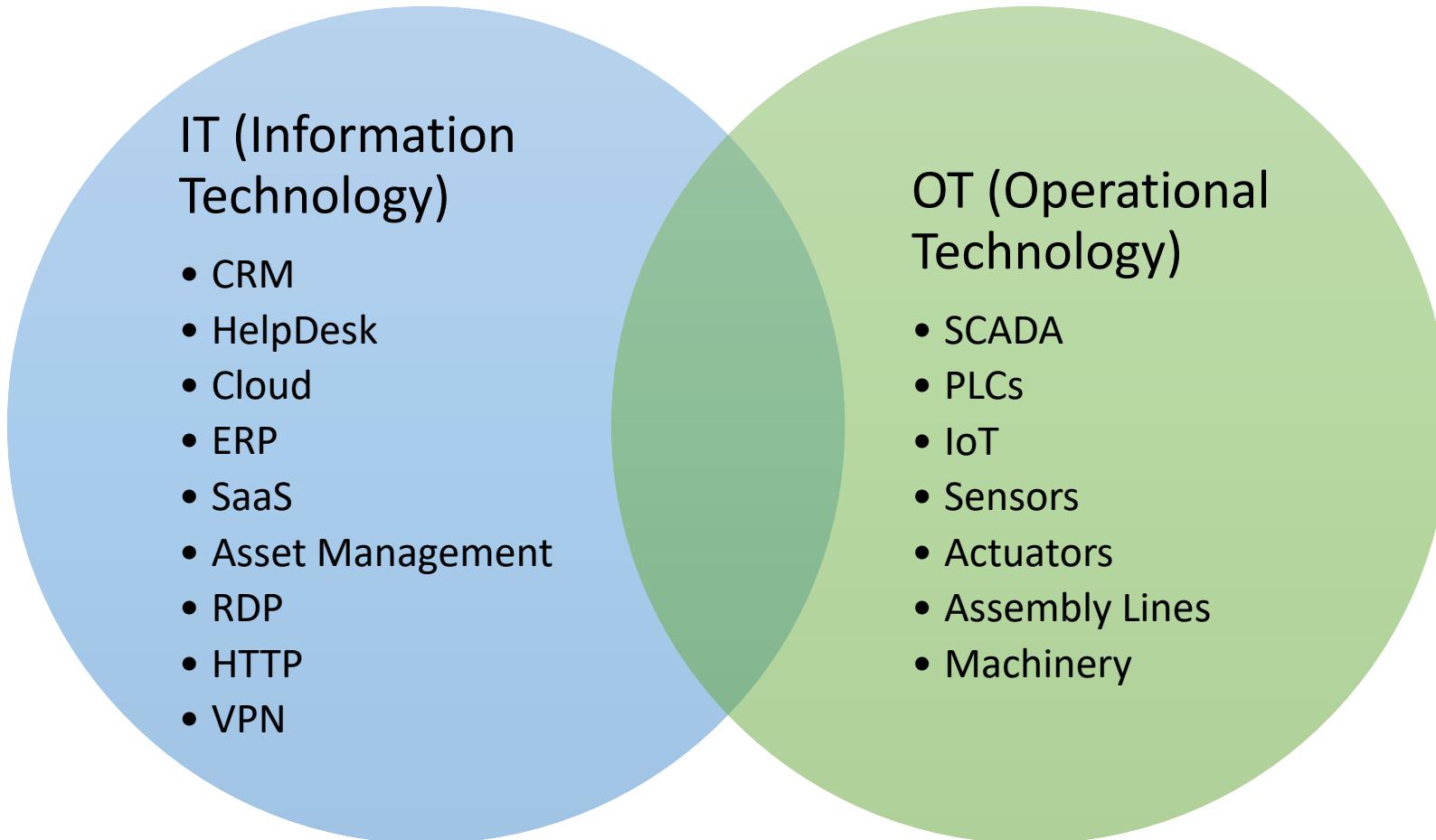
(connectivity, integration, data protection)

Managing IoT solutions w/ DevOps

(build, Manage, provision, deploy code)

Understanding total cost of ownership (TCO)

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.

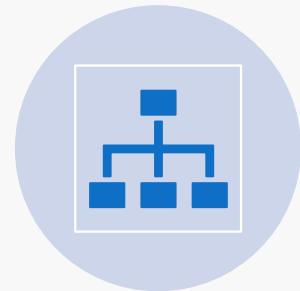
Solution Builder - builds the IoT cloud solution that devices connect to

What is IoT Central?

connect, monitor and manage your IoT assets at scale



Quick connectivity



Centralized
management

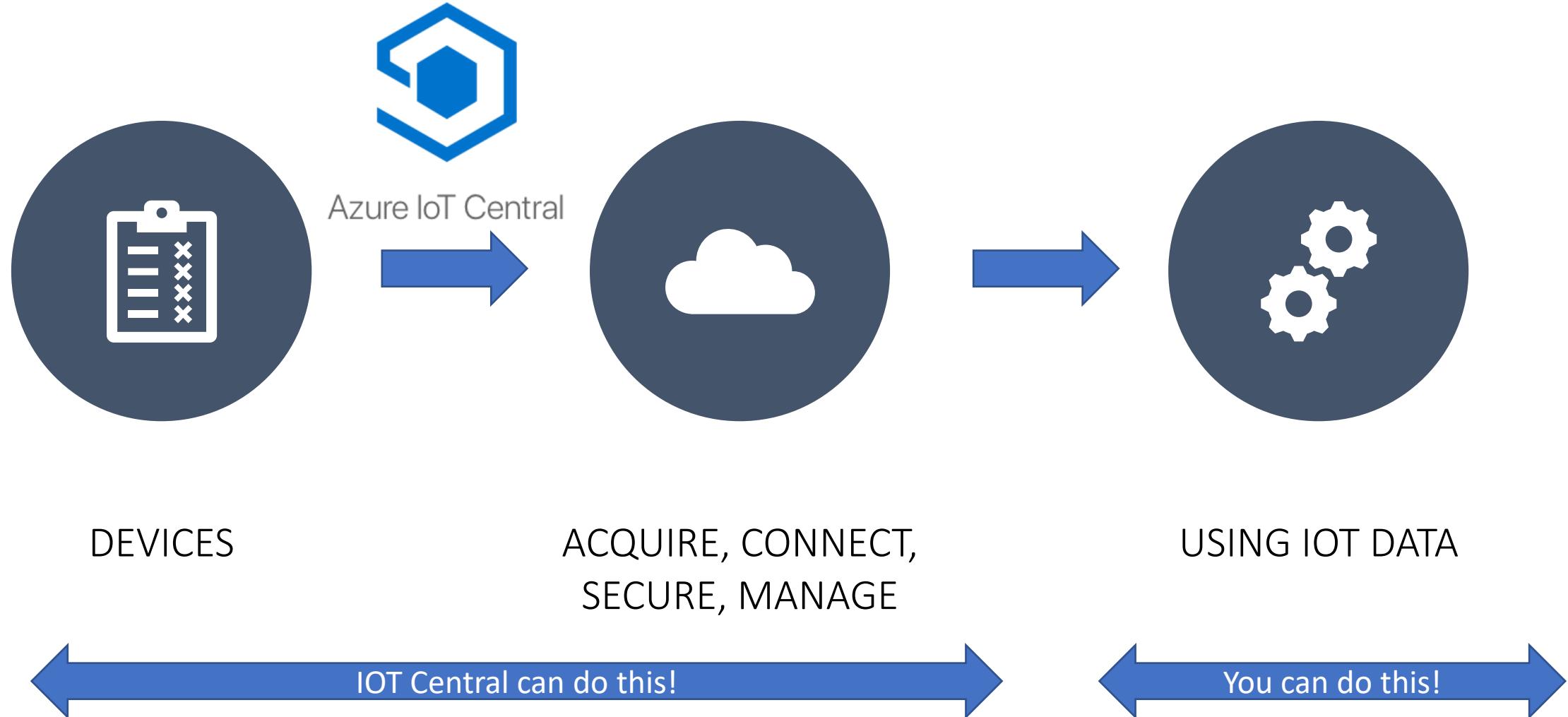


Visualizations and
analysis



Bridge between business
applications and IoT
data

What is IoT Central?



Benefits of IoT Central

Low-code environment

Fast and Easy way for Data Analysis and Visualization

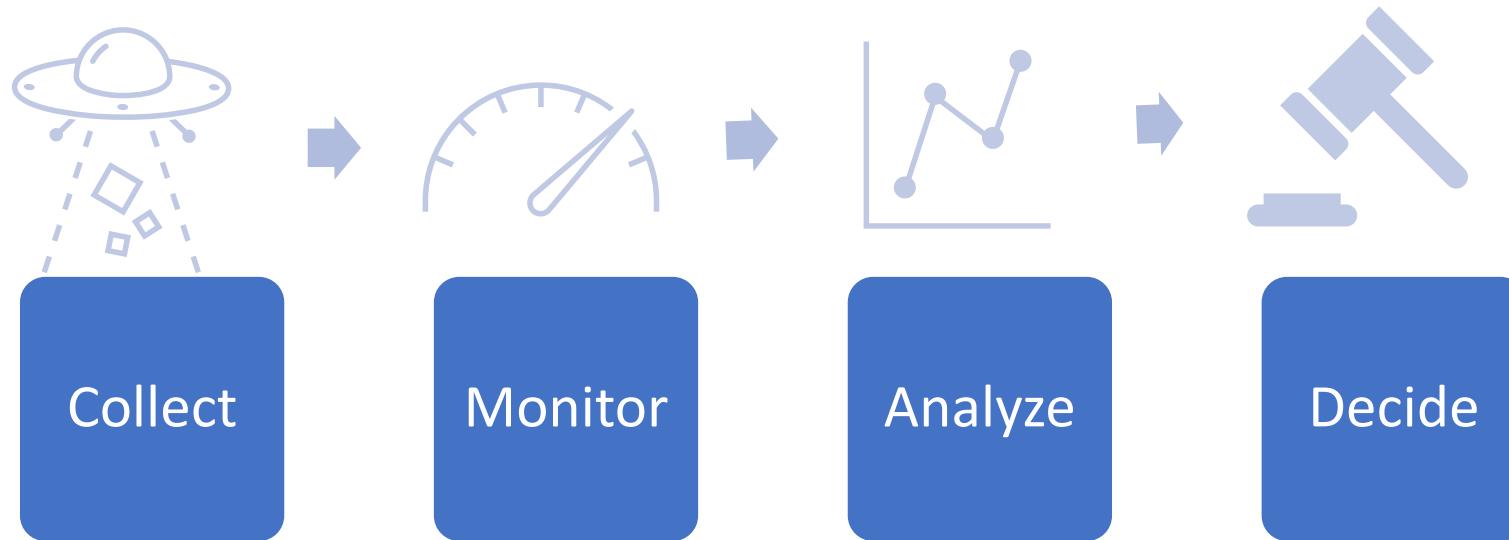
Dealing with non-frequently changing data

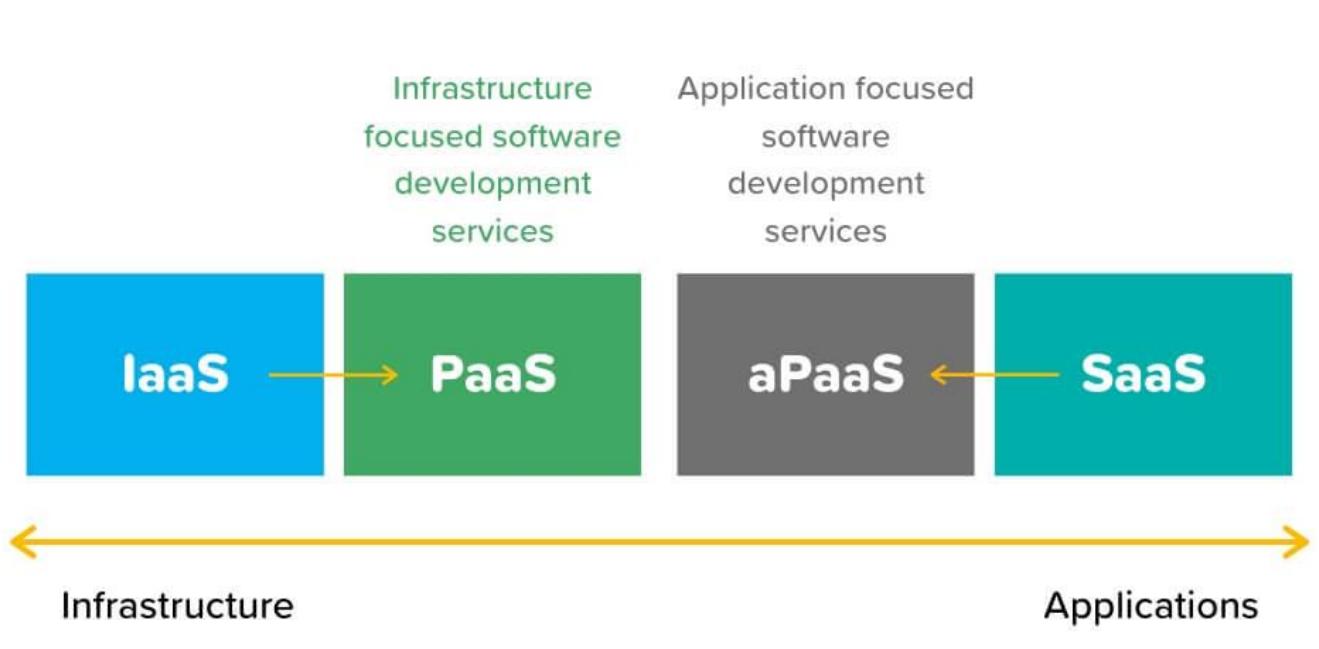
Ready-to-use templates

Support for different types of device measurement

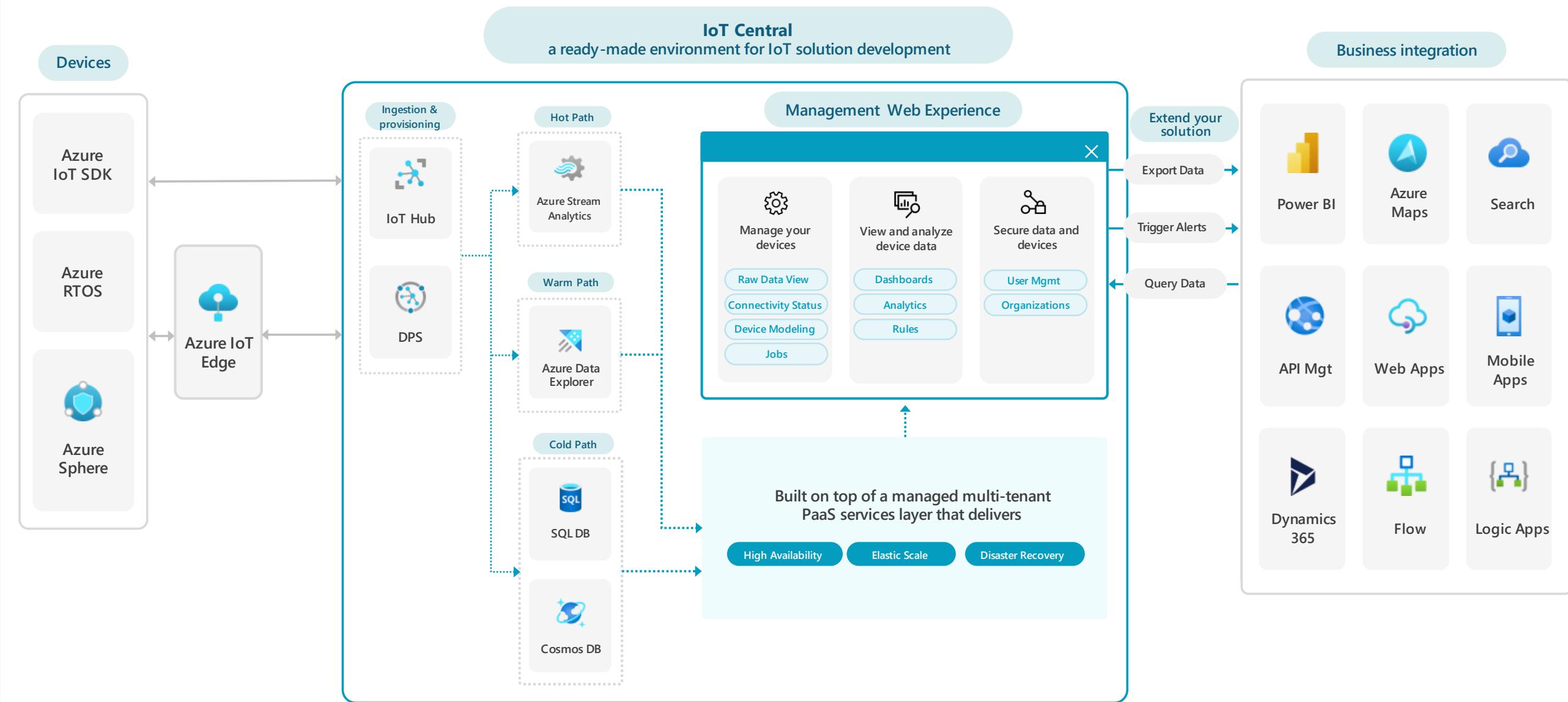
Highly secure authorization and authentication

Leverage Azure IoT Central





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 your 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

Get Whova for DEVintersection, Microsoft Azure + AI Conference, Azure Data and M365 Conference - Fall 2022

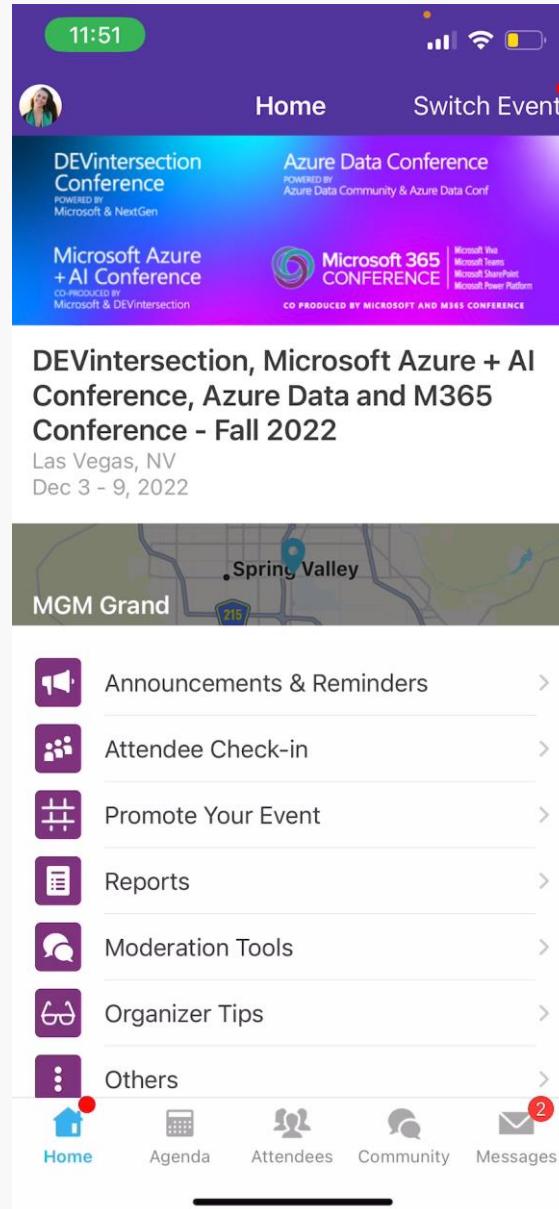


DEVintersection, Microsoft Azure + AI Conference,
Azure Data and M365 Conference - Fall 2022 Official
Event App

- Explore the **professional profiles** of event speakers and attendees
- Send **in-app messages** and **exchange contact info**
- **Network and find attendees** with common affiliations, educations, shared networks, and social profiles
- Receive **update notifications** from organizers
- Access the **event agenda**, GPS guidance, maps, and parking directions at your fingertips



The event invitation code is:
FallConf22



Session Feedback Surveys

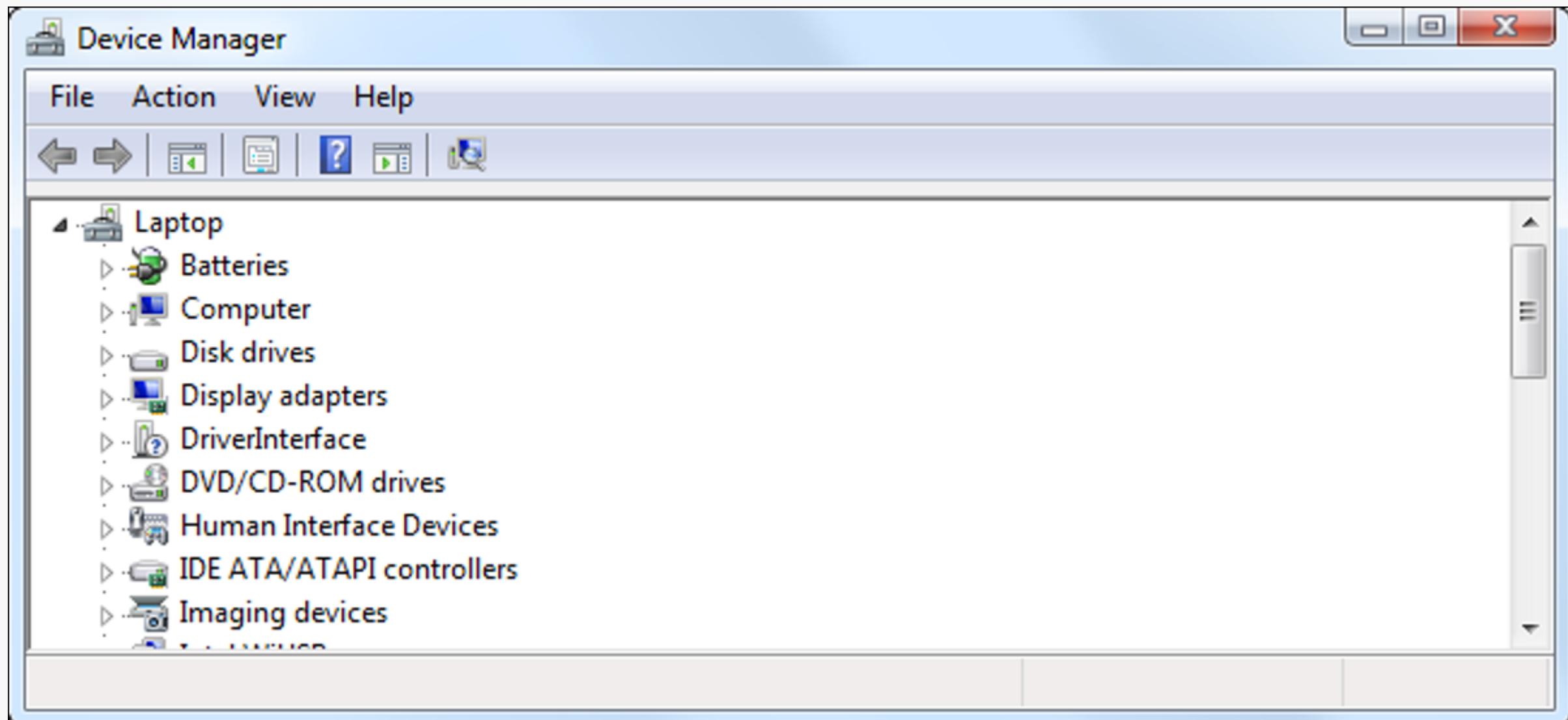
In the pursuit of making our conferences even better, we need to hear your feedback about this session.

Here's How -

- Simply go to the Whova App on your smartphone
- Go to the conference homepage
- Scroll down to 'Additional Resources' and click 'Surveys'.
- Click 'Session Feedback'.
- Scroll down to click on this session title.
- Complete the session feedback survey.
- Finally, click 'Submit'

What made Windows successful?

Working with Device manufacturer to have compatible drivers



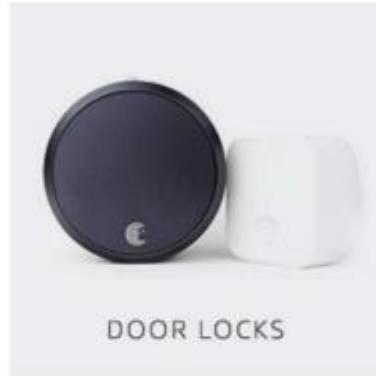
Alexa Compatible Devices

Working with Device manufacturer

SHOP BY CATEGORY | SMART HOME



LIGHTING



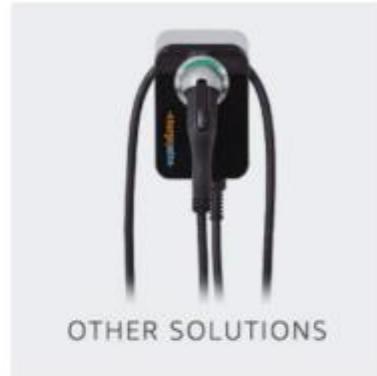
DOOR LOCKS



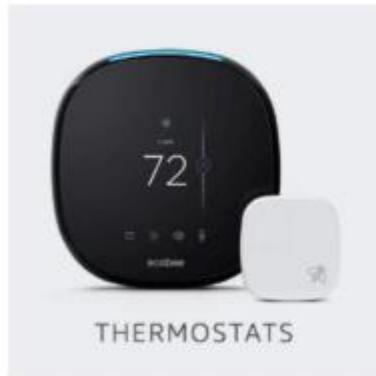
CAMERAS



PLUGS



OTHER SOLUTIONS



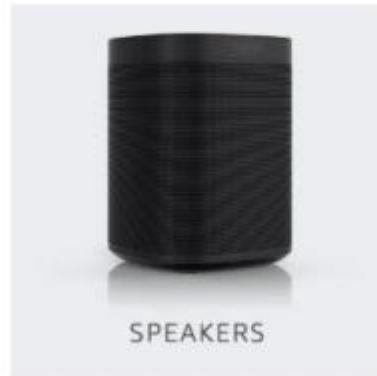
THERMOSTATS



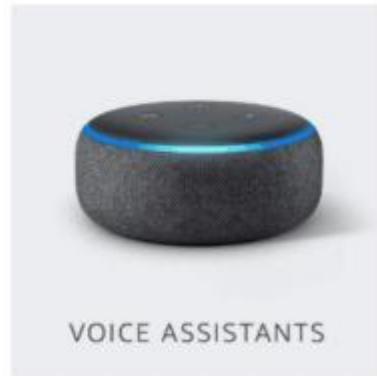
SECURITY SYSTEMS



TELEVISIONS



SPEAKERS



VOICE ASSISTANTS



Azure IoT Plug and Play

integrate smart devices solutions – no manual configuration

device model that a device advertises its capabilities to an IoT Central

eliminate the hassle of configuring devices such as creating templates and adding features and interfaces.

Azure Certified Device Catalog

Azure Certified Device catalog

Search Device(s)

Filter by: [Clear all filters](#)

[Certification programs](#) 1

- Azure Certified Device
- Edge Managed
- IoT Hub Certified devices (legacy)
- IoT Plug and Play

[Device Class](#)

- Gateway
- Other
- Sensor

[Azure Technical Level](#) 1

- 0
- 1
- 2
- 3
- 4

[Connectivity](#)

[Device Type](#)

[Geo Availability](#)

[Industrial Protocols](#)

[Industries](#)

- Automotive
- Education
- Energy
- Government
- Healthcare
- Hospitality
- Manufacturing
- Other
- Retail
- Smart Buildings

[Integrated Sensors](#)

Showing 1-20 of 86 device(s)

[Devices](#) [Solutions](#)

All Devices:

Azure Certified Device



NEXUS
By LAB3 Solutions

[Shop](#)



Azure Certified Device



Industrial Optical Distance
By CloudRail GmbH

[Shop](#)



Azure Certified Device



ESP32-Azure IoT Kit
By ESPRESSIF

[Shop](#)



Azure Certified Device



iAeris2 IAQ Detector
By Sysinno Technology

[Shop](#)



Azure Certified Device



Advantech-WISE-4250AS-S231
By Advantech Co., LTD

[Shop](#)



Azure Certified Device



Himax-AIoT-NB-G3
By 奇景光電股份有限公司

[Shop](#)



Azure Certified Device



xTAG BLE
By Deviceworx Technologies Inc.

[Shop](#)



Azure Certified Device



xTag USB
By Deviceworx Technologies Inc.

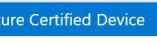
[Shop](#)



Azure Certified Device



PIC-IoT WM Development



Azure Certified Device



AT_Cactusphere150_Basic



Azure Certified Device



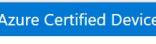
AT_Cactusphere110_Basic



Azure Certified Device



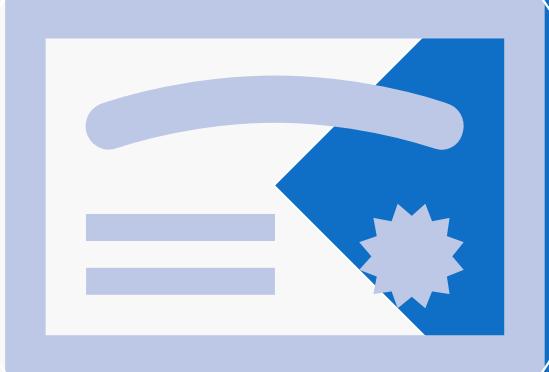
iAeris1 IAQ Detector



<https://devicecatalog.azure.com/>

Device Types

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



Connection

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

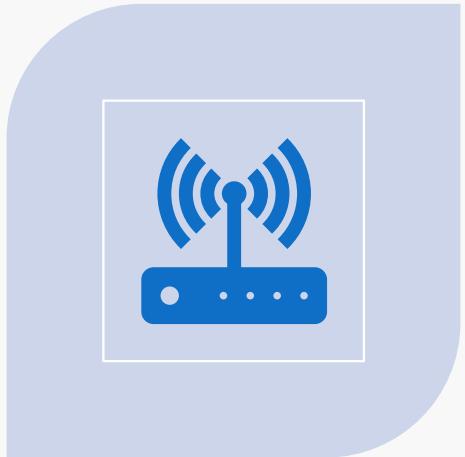


Communication Protocols

- MQTT
- AMQP
- HTTPS

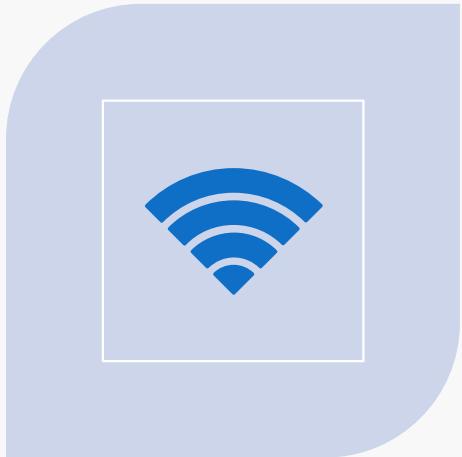
Device Template

Blueprint definition



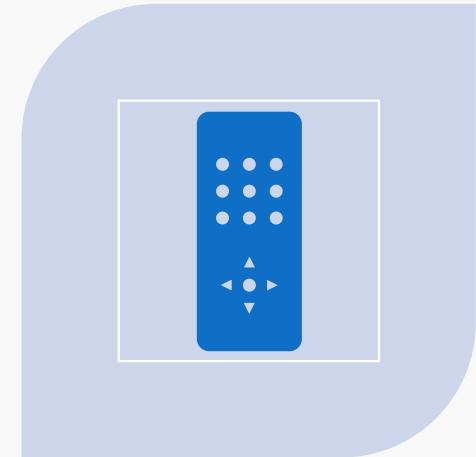
TELEMETRY

Device sends to Cloud



PROPERTIES

Device synchronizes with Cloud
(device twin)



COMMANDS

Cloud calls on device.

Demo IoT Central Provisioning



IoT Central Monitor

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

Device monitoring

- monitoring your devices allows you to identify when there are issues with them

Application monitoring

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

Provisioning

Connect Manage template Manage device

Devices > sample-device-01



sample-device-01

Disconnected | Last data received: 10/19/2022, 2:36:20 AM | Status: Registered | Organization: Simpler Way

Raw data Mapped aliases Files

Device connection groups ×

ID scope i
d

Device ID i
d

Choose the connection type for this device. You can change this later if you need to.

Authentication type
▼

Key QR code
Key QR code

Shared Access Signatures (SAS) use security tokens and keys to connect to IoT Central. Use the SAS keys from the default enrollment group shown below to register your device. [Learn more](#)

Primary key i
d

Secondary key i
d

Close

Demo IoT Central Device Monitoring



Visualize data

Smart inventory management 23zka8dnqa1

Search for devices

New dashboard Edit Delete Copy

Dashboard settings

Northwind Traders inventory management dashboard

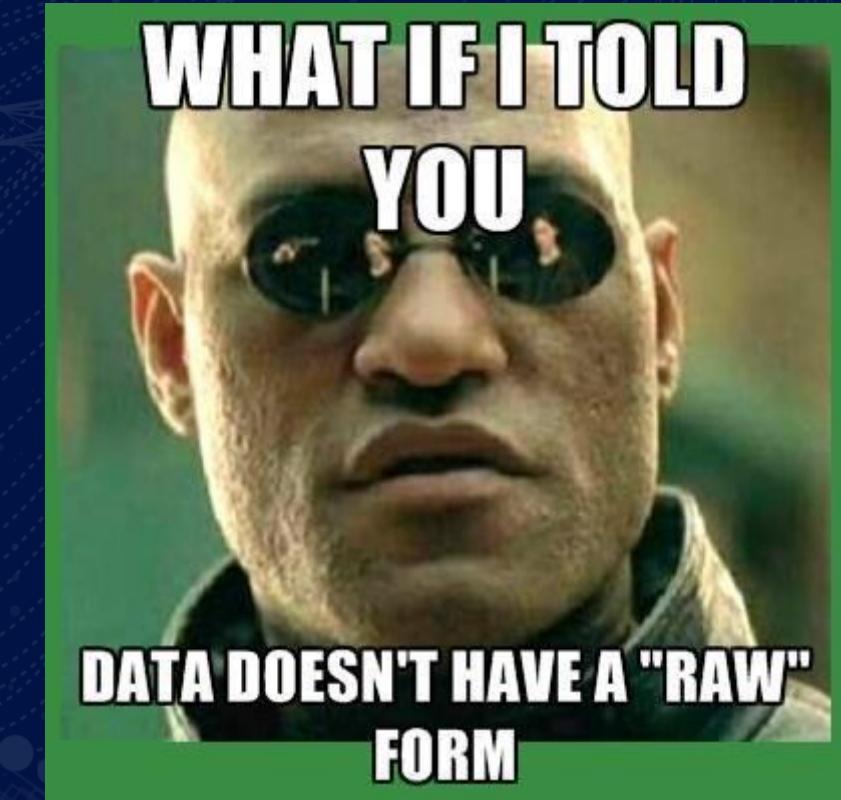
The dashboard features a large purple header with the text "NORTHWIND traders". Below it are several data visualizations:

- Warehouse:** A bar chart showing four teal bars representing different metrics.
- Delivery Truck:** A diagram showing a green box labeled "Delivery Truck" connected to a purple box labeled "Regional Distribution".
- Retail Store:** A diagram showing a green box labeled "Retail Store" connected to a purple box labeled "Checkout".
- Documentation:** A section with a book icon and text: "Learn more about IoT Central for Retail." with a link icon.
- Tag & reader trends:** Two line charts showing trends over time for BLE Tags (green), Readers Count (blue), and Total Tags (red).
- Location:** A map of the world with a red dot indicating a location in the Atlantic Ocean.
- RFID gateway state:** A section showing the status "Online" with a timestamp: "1 minute ago".

Left sidebar menu:

- Connect
- Devices
- Device groups
- Device templates
- Analyze
- Data explorer
- Dashboards
- Manage
- Jobs
- Extend
- Rules
- Data export
- Security
- Permissions
- Settings

Demo IoT Central Data Visualization



Jobs

- manages your 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.

Demo IoT Central Jobs



I DID A GOOD JOB

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 [\(i\)](#) Espressif ESP32 Azure IoT Kit - All devices
1 device

Organization Simpler Way

Job type: Command

DisplayText

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

→ 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

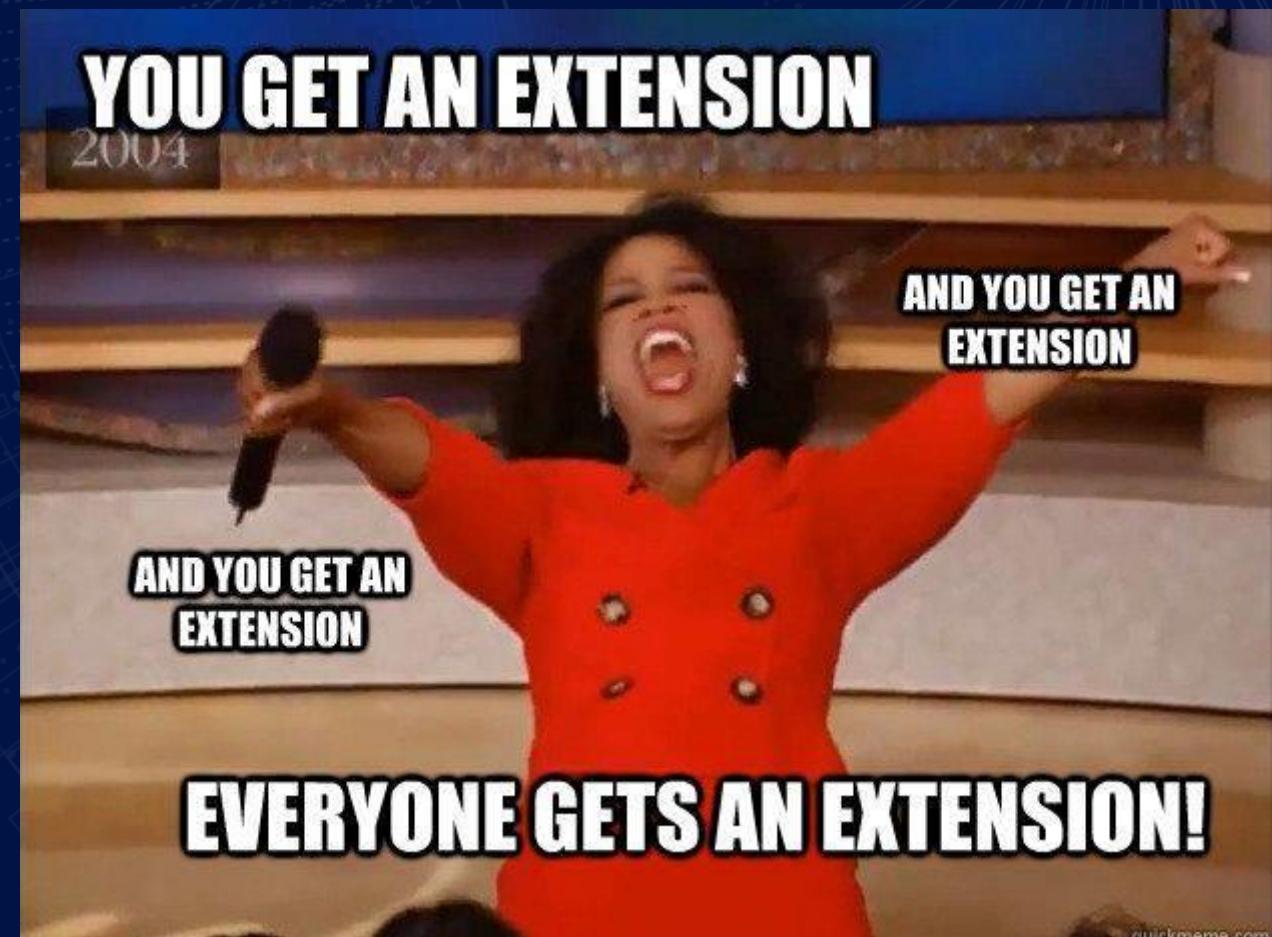
mydevice

mydevice

 Completed

12/3/2022, 8:57:30 PM

Extending IoT Central



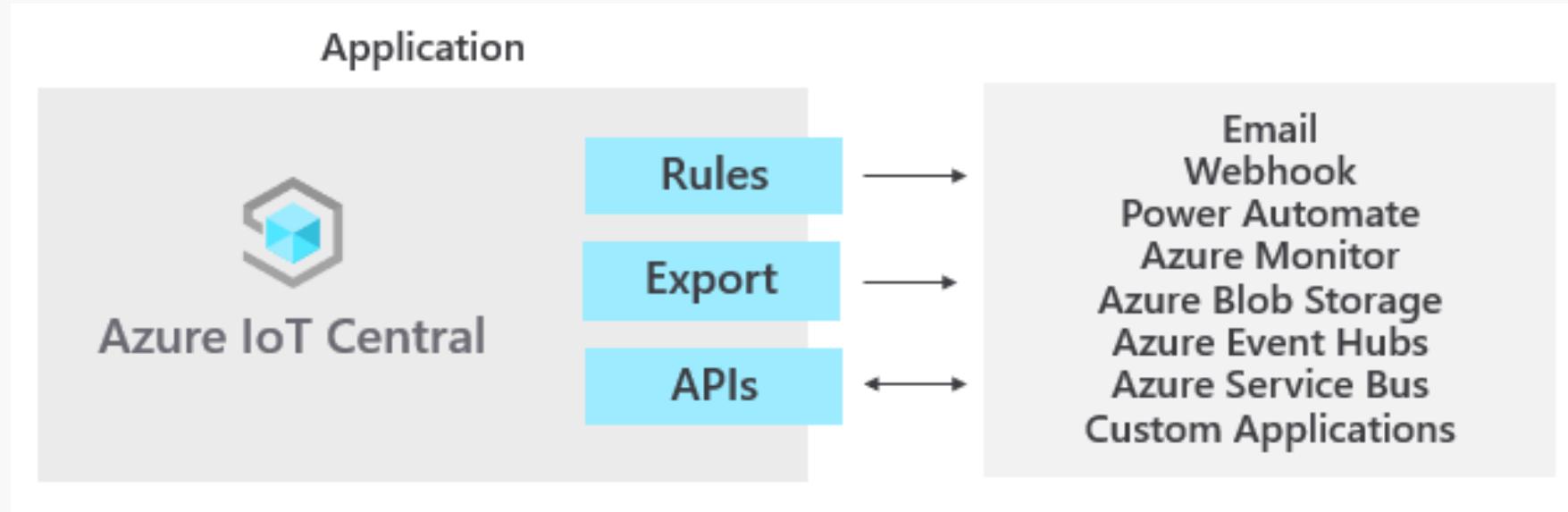
Extending IoT Central

DATA
EXPORT

RULES

REST API

Integrate with other services



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 your 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 <i>HTTP</i> callbacks to other applications based on predefined rules

Destination

Destinations > request bin

request bin

To update your webhook destination, enter a new callback URL. [Learn more](#)

Destination type

Webhook

Callback URL *

http://dnsdatacheck.vy3n8mhtlg091k0.b.requestbin.net

Authorization

No auth

No auth

OAuth2.0

Authorization token

Add custom headers to each message that you export to this destination. Custom headers can be used by [triggers](#) and [actions](#).

+ Header

Data Export

Enrichments

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

Key *	Value *	X
IsSample	true	X
Organization	Organizations	X

[+ 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

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"  
}
```

Demo IoT Central Data Integration



READY FOR INTEGRATION, CAPTAIN

Rules

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

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](#)

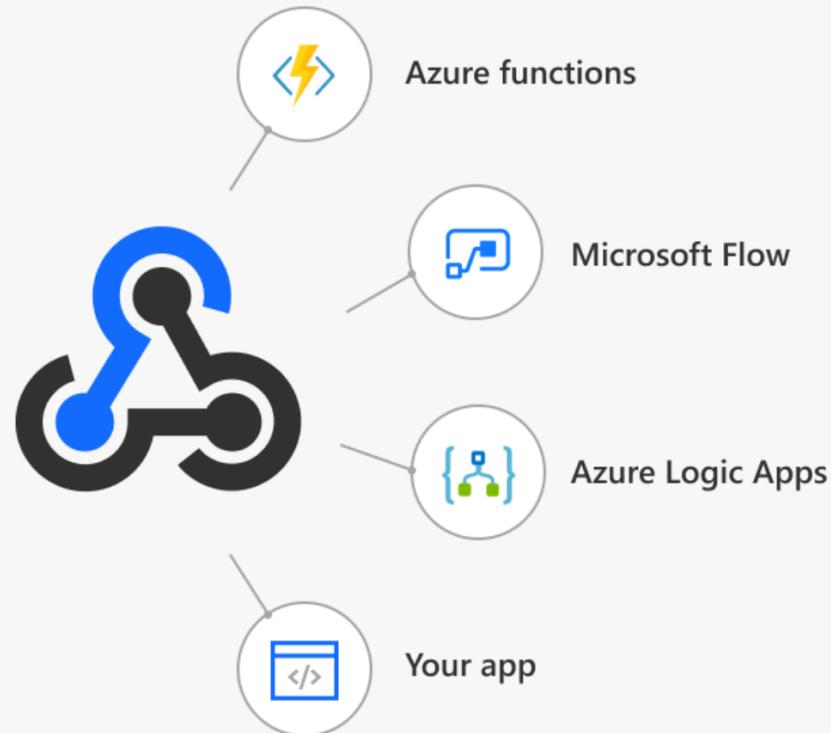
Display name

Webhook 1

Callback URL * ⓘ

<http://dnsdatacheck.vy3n8mhtlg091k0.b.requestbin.net>

Done



Add another action

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

RULES

Action type	Output format
Email	Standard IoT Central email template
SMS	Azure IoT Central alert: \${applicationName} - "\${ruleName}" triggered on "\${deviceName}" at \${triggerDate} \${triggerTime}
Voice	Azure I.O.T Central alert: rule "\${ruleName}" triggered on device "\${deviceName}" at \${triggerDate} \${triggerTime}, in application \${applicationName}
Webhook	{ "schemaId" : "AzureIoTCentralRuleWebhook", "data": regular webhook payload }

REST API



**App
Management**



**Device
Modelling**



**Device
Onboarding**



**Device
Management**



**Data and
Insights**

Simpler Way

Search for devices

Permissions < + 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 X

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 *

Organization *

Role *

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..
```

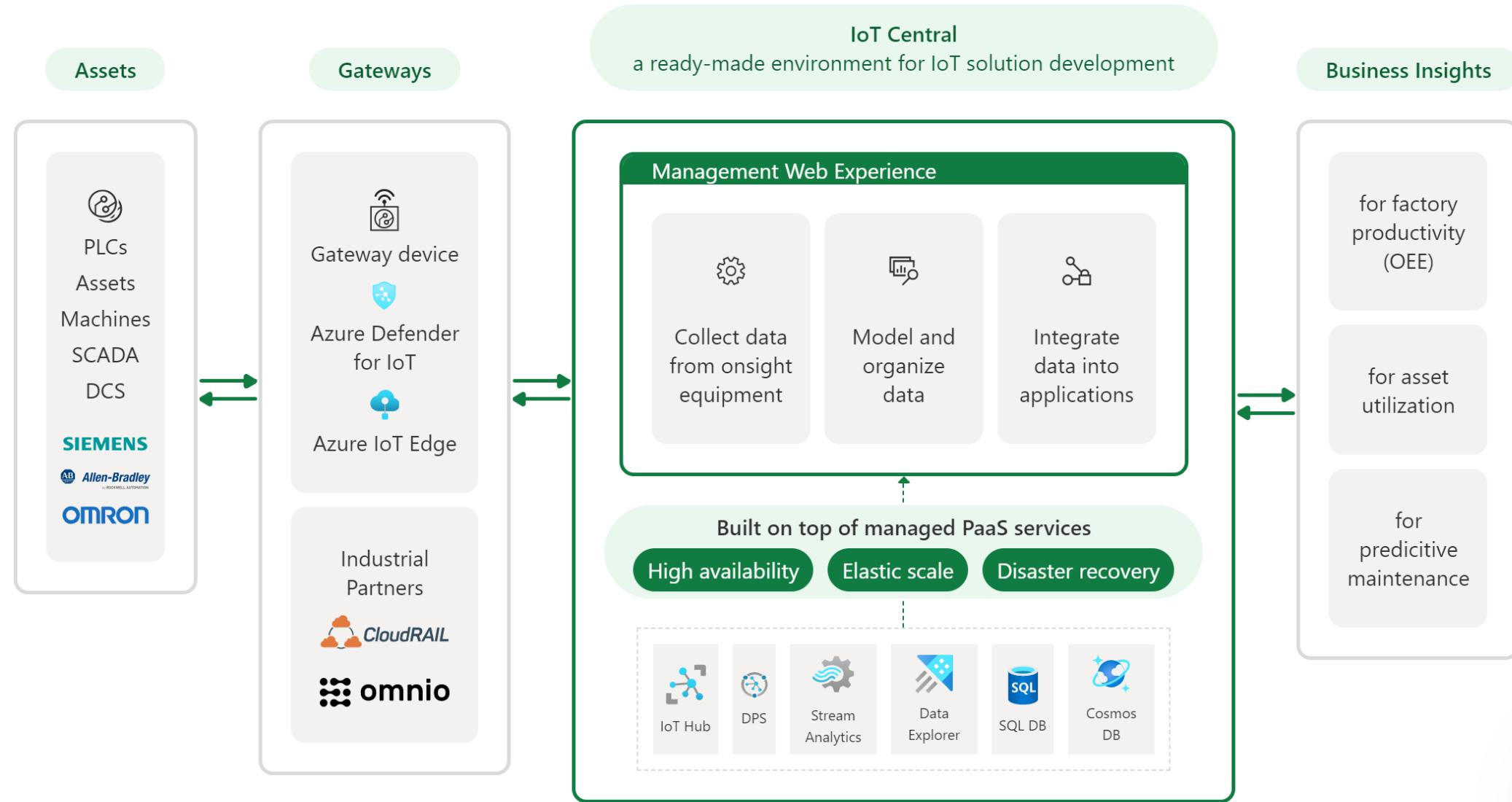
```
{
  "request": "Hello World!"
}
```



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

Device Template – Telemetry, Properties, Commands

IoT Plug and Play – azure certified device catalog

Visualize data - Dashboard

Integration – Rules, Data Export, API



<https://github.com/rondagdag/simpler-way-iot-central-demo>

Call to Action

- Learn more about IoT Central on [Microsoft Learn](https://apps.azureiotcentral.com/home)
<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>

**Award Categories**

AI, Windows Development

First year awarded:

2017

Number of MVP Awards:

6

<https://linktr.ee/rondagdag>

About Me

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6th year Microsoft MVP awardee

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www.linkedin.com/in/rondagdag/

Feedback is appreciated. Did you learn something new?

**DEC 5-7
2023**

**WORKSHOPS
DEC 3, 4 & 8**

**DEVintersection
Conference**

DEVintersection.com

**Microsoft Azure
+ AI Conference**

AzureAIConf.com

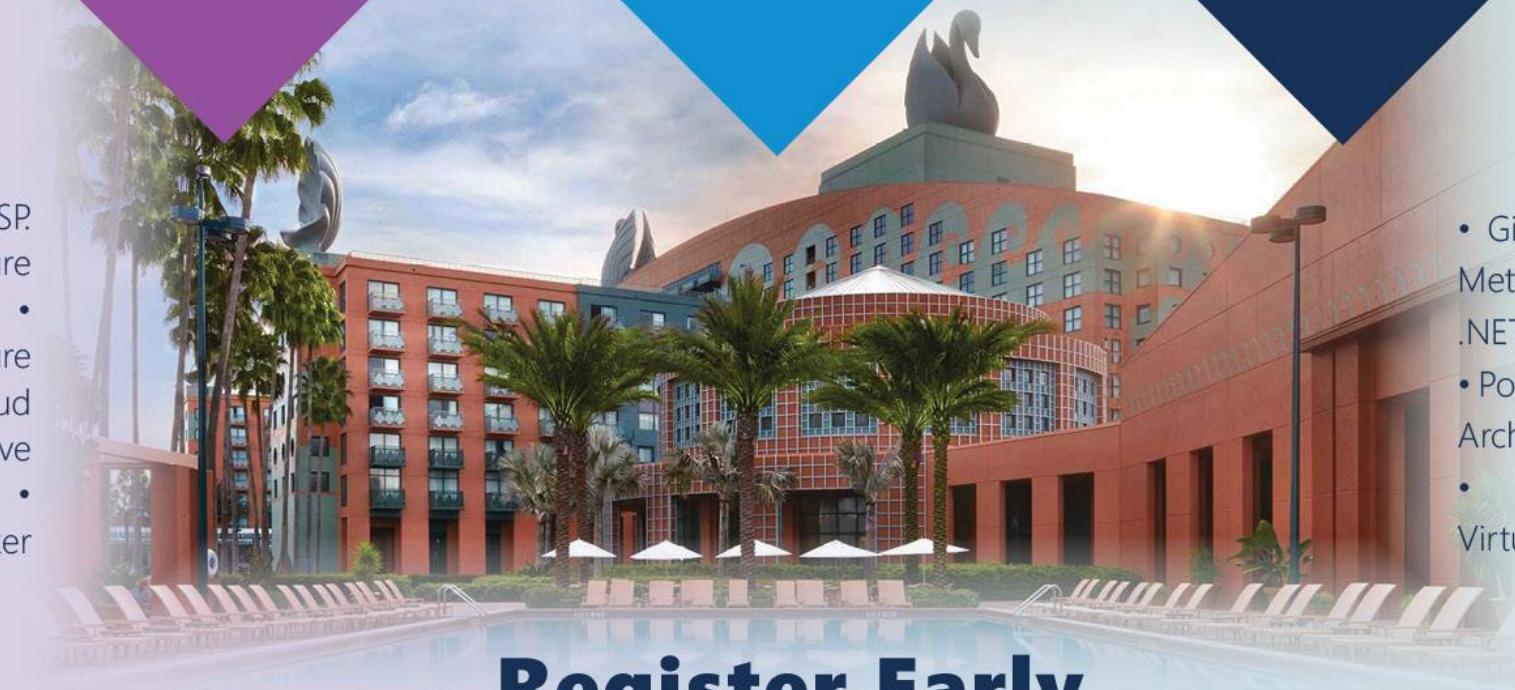
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**DISNEY
WORLD**
**SWAN &
DOLPHIN
RESORT**

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• GitHub Actions • Machine Learning • Metaverse • Microservices • MySQL • .NET • .NET MAUI • Node.js • PostgreSQL • Power Apps • Power BI • React • Scalable Architectures • Security & Compliance • SQL Server 2022 • TypeScript • Virtual Machines • Visual Studio



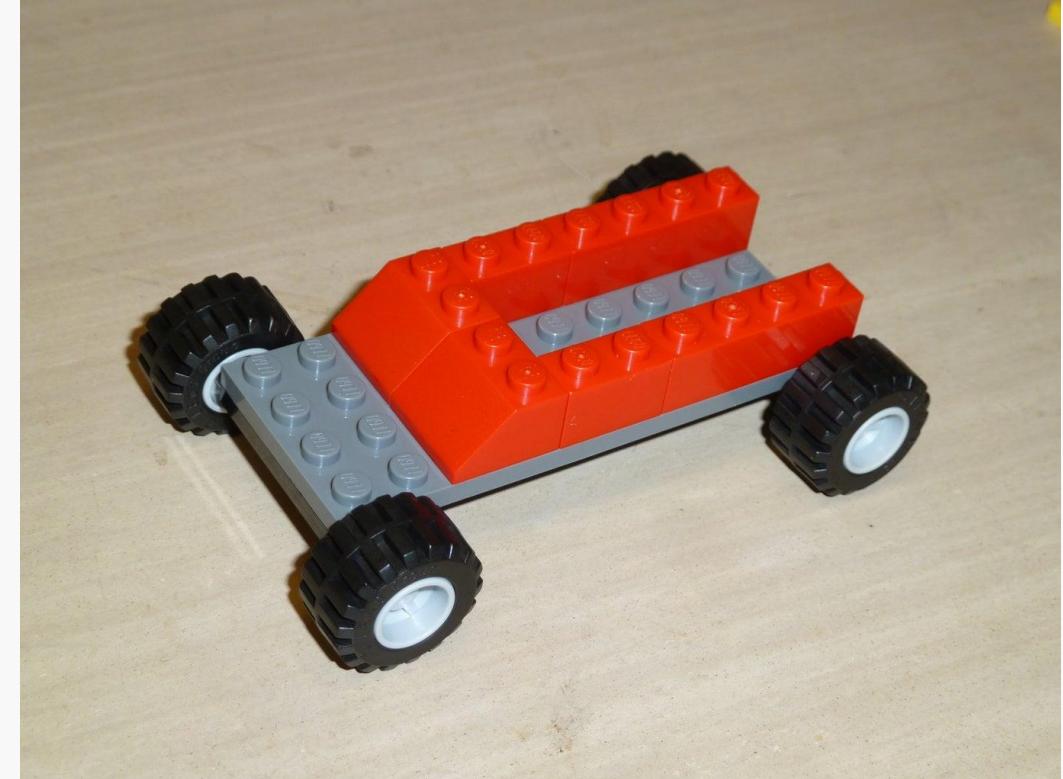
**Register Early
for Optional Workshops**



and Receive Your Option of Hardware

Build me a car

From these pieces



Build me a car

From these pieces



CLASSIC

