



Immersion Sessions

Azure IoT w/ Raspberry Pi

Jason Errett

Azure Specialist - Data & AI

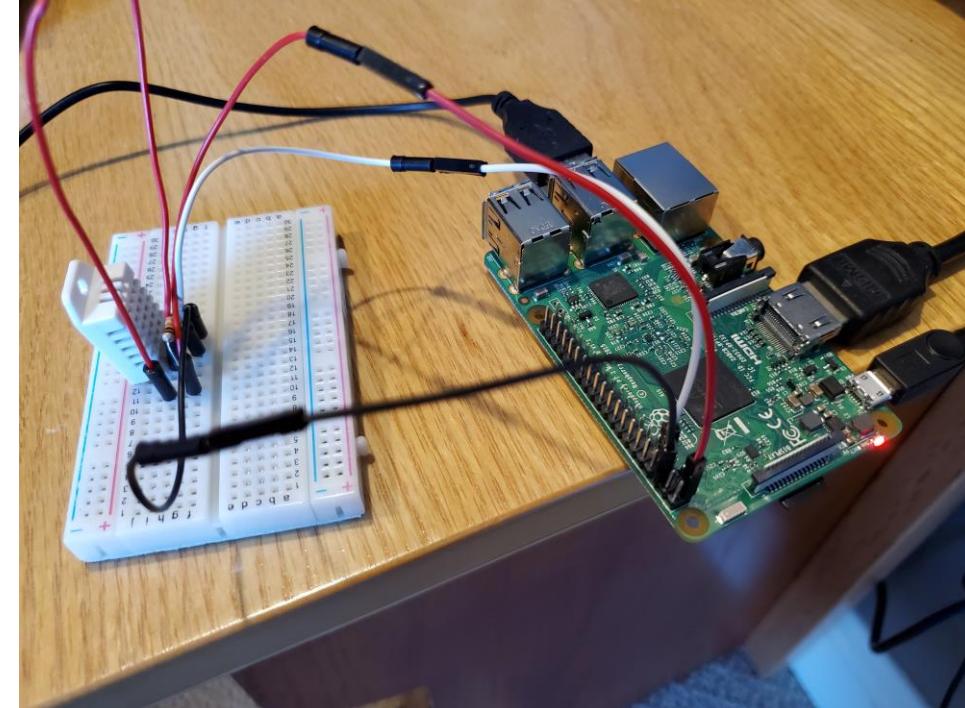
Microsoft Federal





Agenda

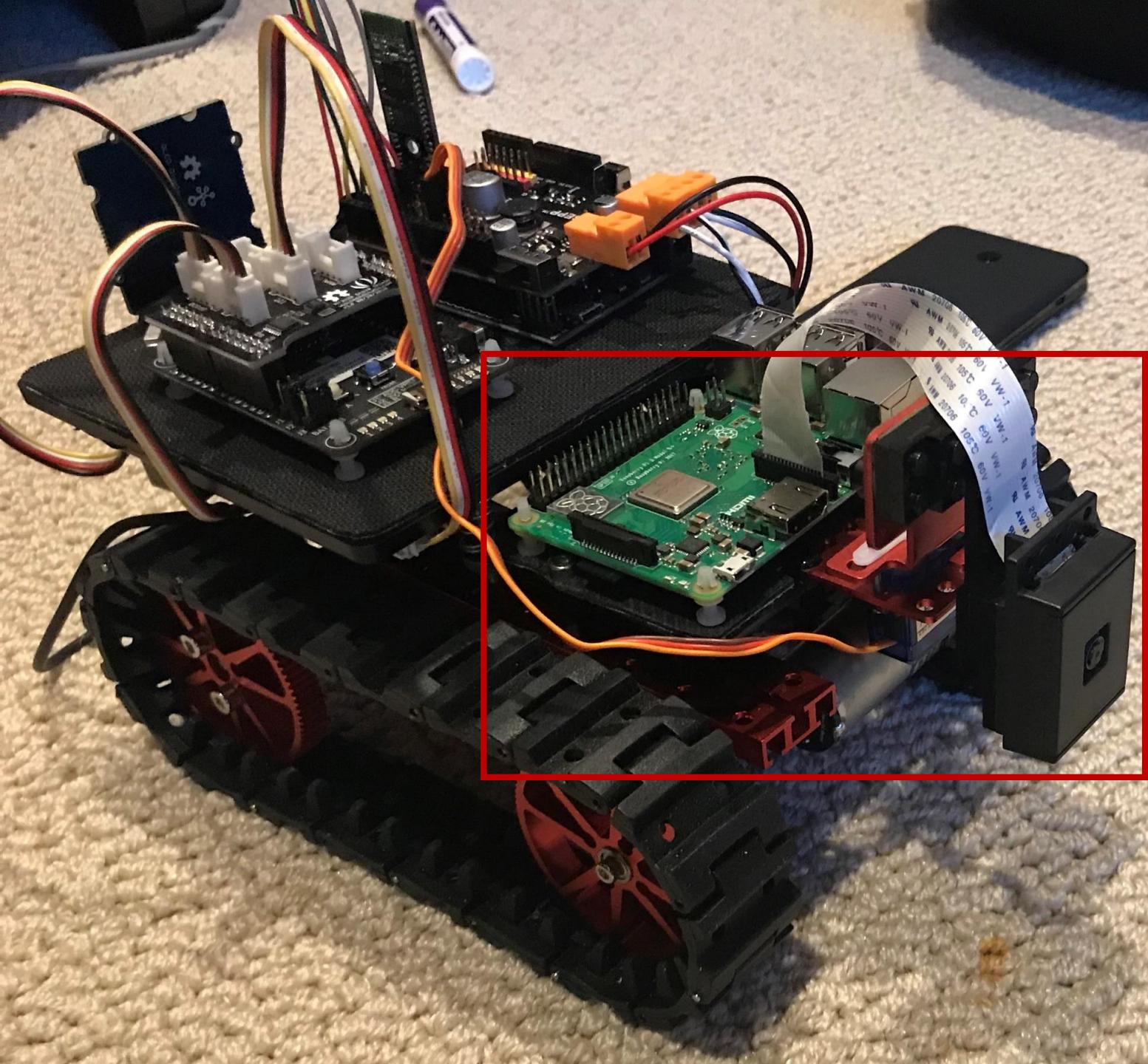
- Overview of Raspberry Pi
- Demo: IoT Hub w/ Raspberry Pi
- Azure IoT Landscape
- IoT Portfolio
 - Solutions
 - Services
 - Intelligent Edge
- What's next?
- GitHub Resources and Azure Docs



Raspberry Pi

Overview





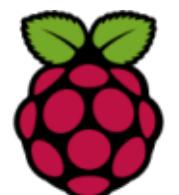
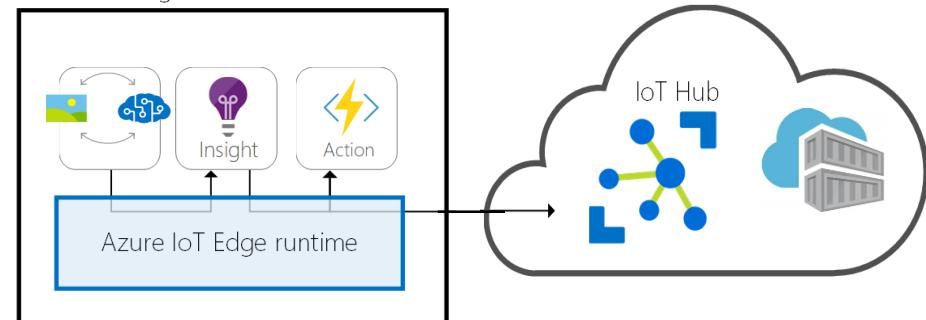
Raspberry Pi w/ IoT Edge

This device is running a Linux distribution called Raspbian. OpenCV is also installed for image pre-processing of the camera asset.

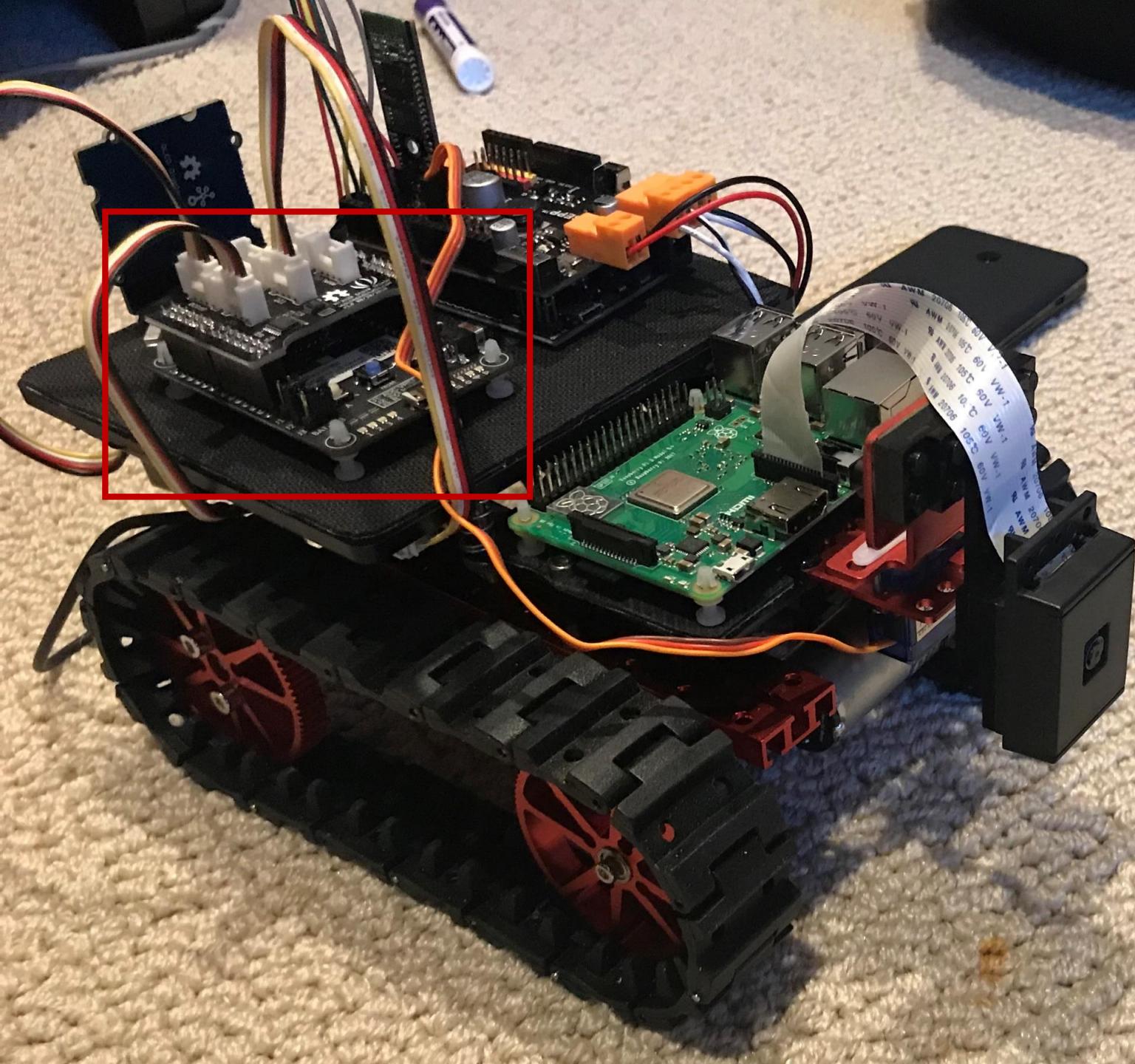
Additionally, the Azure IoT Edge runtime is installed and communicating with IoT Hub in order to pull down the latest containers in order to run analytics at the edge.

Custom Vision is running at the edge in a container capable of being hot-swapped for additional capabilities without downtime.

Azure IoT edge device



RaspberryPi

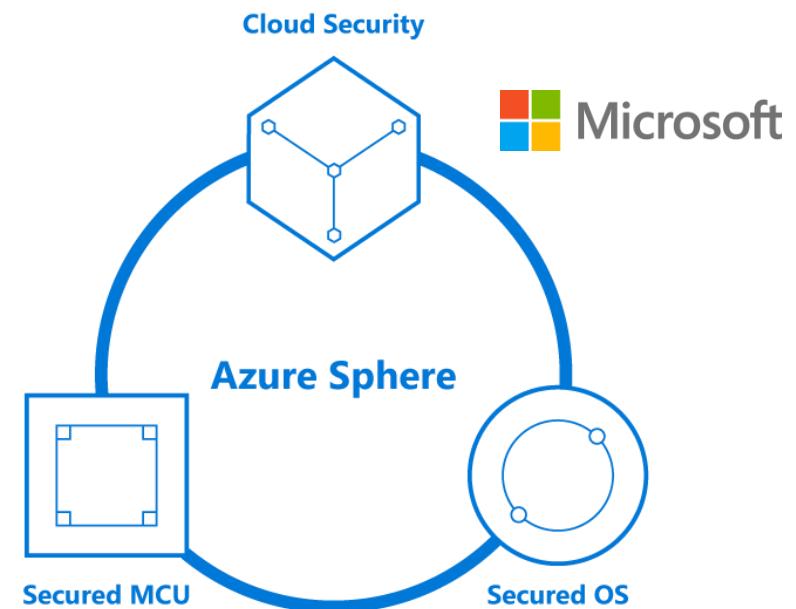


Azure Sphere MT3620

Azure Sphere is a solution for creating highly-secured, connected Microcontroller

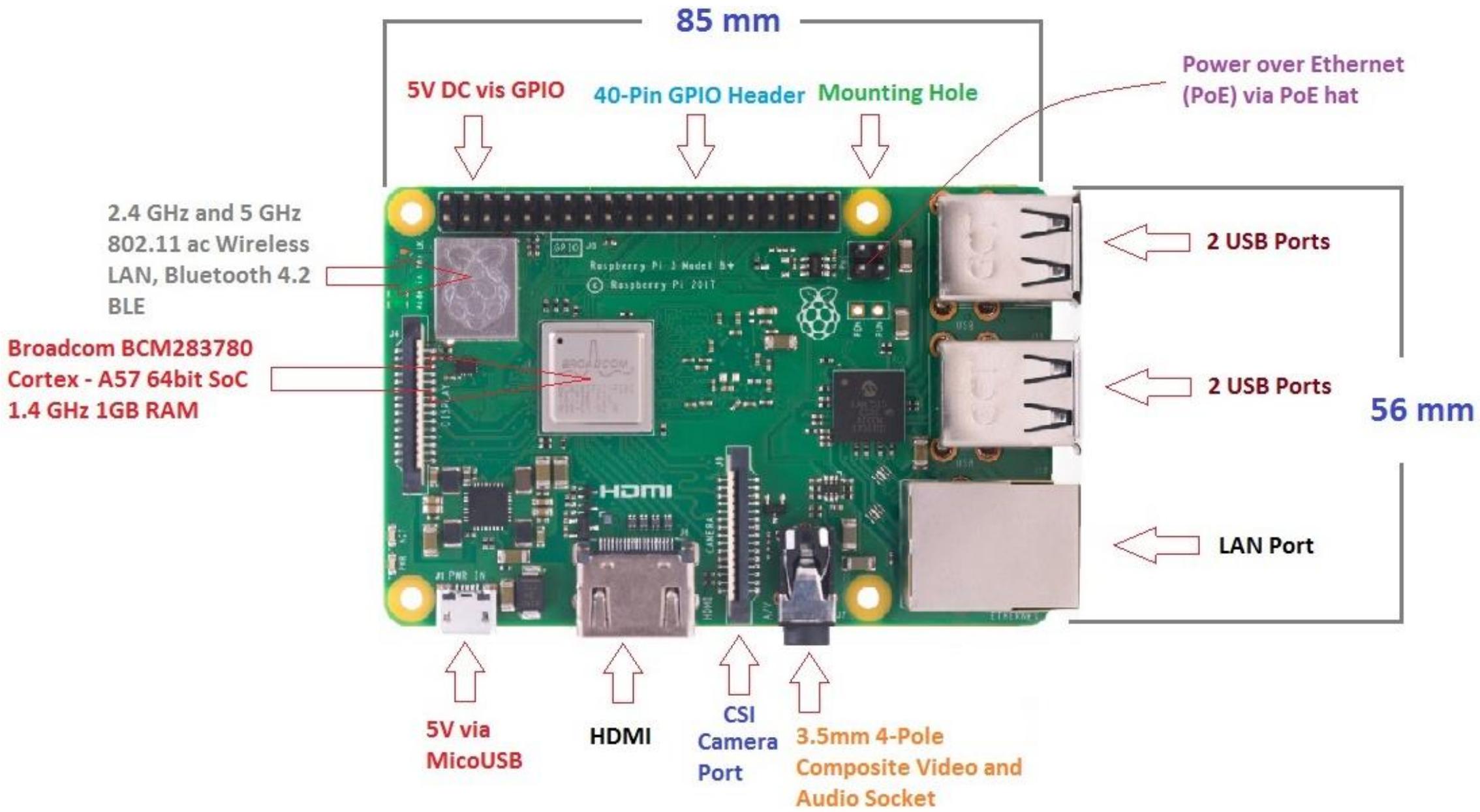
This device is being utilized to securely relay cloud-to-device commands to the vehicle.

Embedded C is remotely deployed and updated to the MCU which controls the LCD screen, temperature/humidity sensor, and send 5v of electricity to peripheral devices via a relay switch.

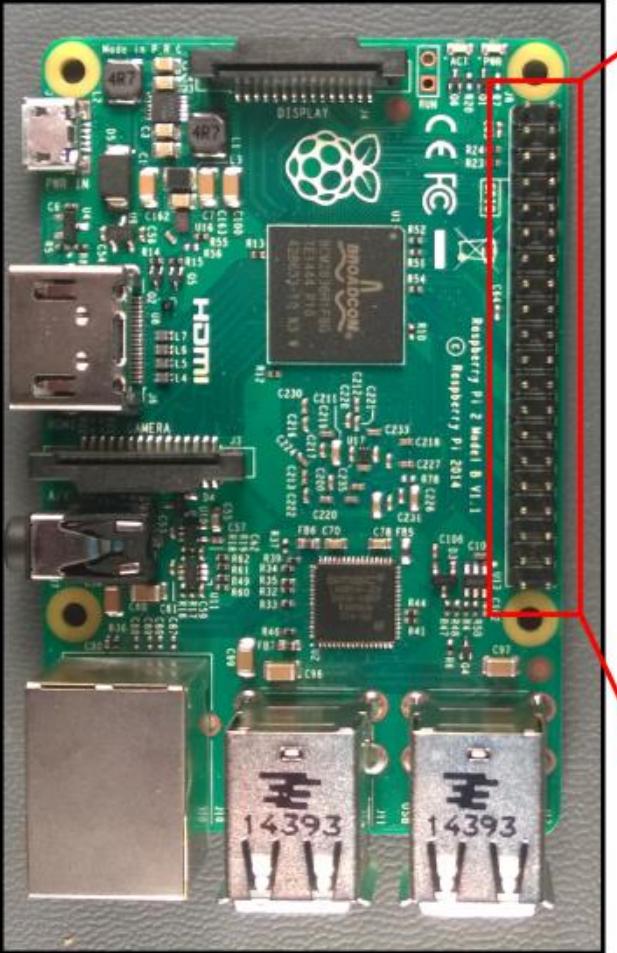


Overview

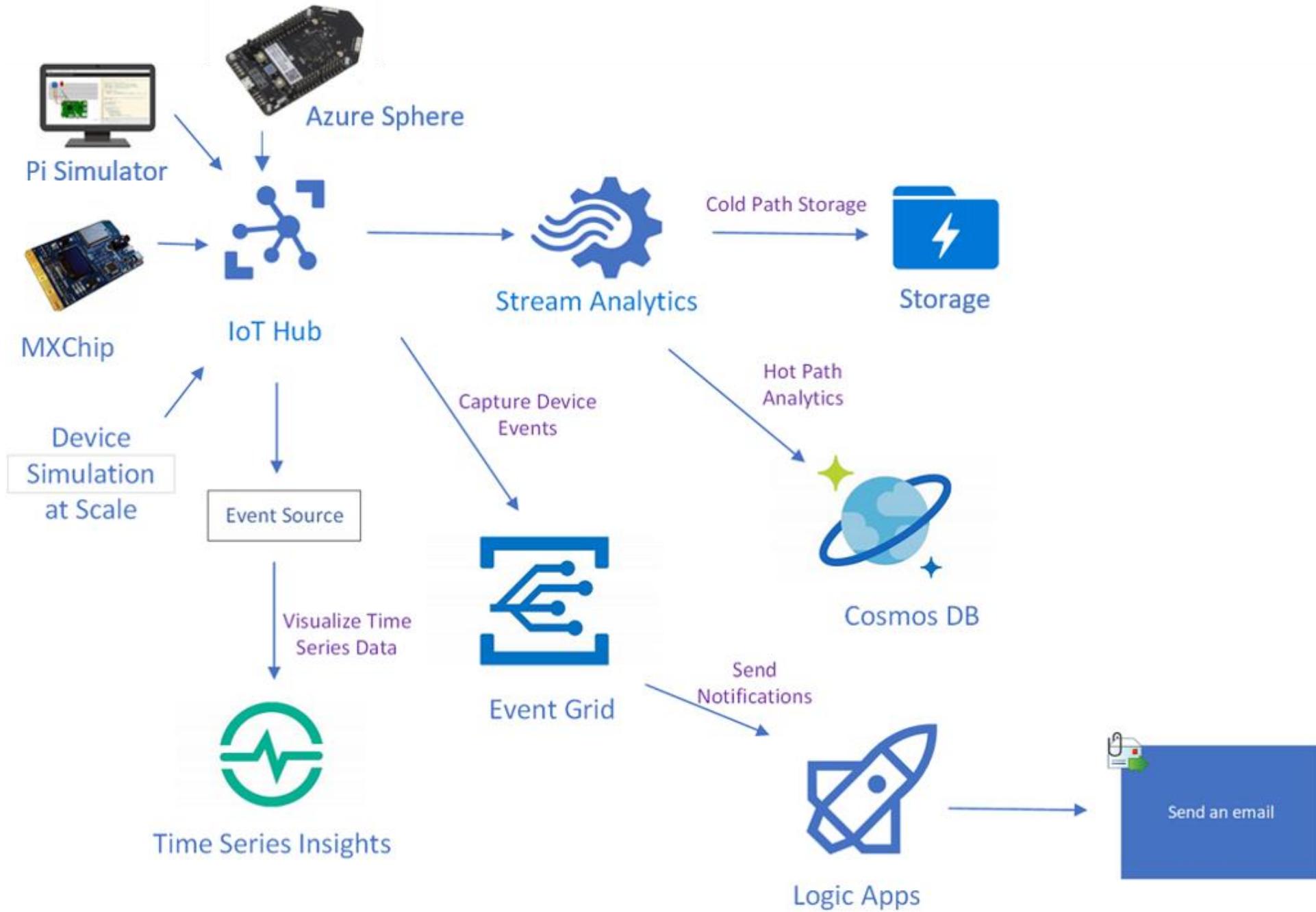
- The Raspberry Pi is a series of small single-board computers first released in 2012
- Latest version is the Raspberry Pi 4 Model B
- The Raspberry Pi Foundation provides Raspbian, a Debian-based Linux distribution for download, as well as third-party Ubuntu, Windows 10 IoT Core, RISC OS, and specialized media center distributions.
- It promotes Python and Scratch as the main programming languages, with support for many other languages.
- <https://www.raspberrypi.org/>



Interface Headers



Alternate Function	
3.3V PWR	1
I2C1 SDA	3
I2C1 SCL	5
GPIO 4	7
GND	9
GPIO 17	11
GPIO 27	13
GPIO 22	15
3.3V PWR	17
SPI0 MOSI	19
SPI0 MISO	21
SPI0 SCLK	23
GND	25
Reserved	27
GPIO 5	29
GPIO 6	31
GPIO 13	33
SPI1 MISO	35
GPIO 19	35
GPIO 26	37
GND	39
Alternate Function	
5V PWR	2
5V PWR	4
GND	6
UART0 TX	8
UART0 RX	10
GPIO 18	12
GND	14
GPIO 23	16
GPIO 24	18
GND	20
GPIO 25	22
GPIO 8	24
GPIO 7	26
Reserved	28
GND	30
GPIO 12	32
GND	34
GPIO 16	36
SPI1 CS0	36
SPI1 MOSI	38
SPI1 SCLK	40



Azure IoT

Analytics Demo

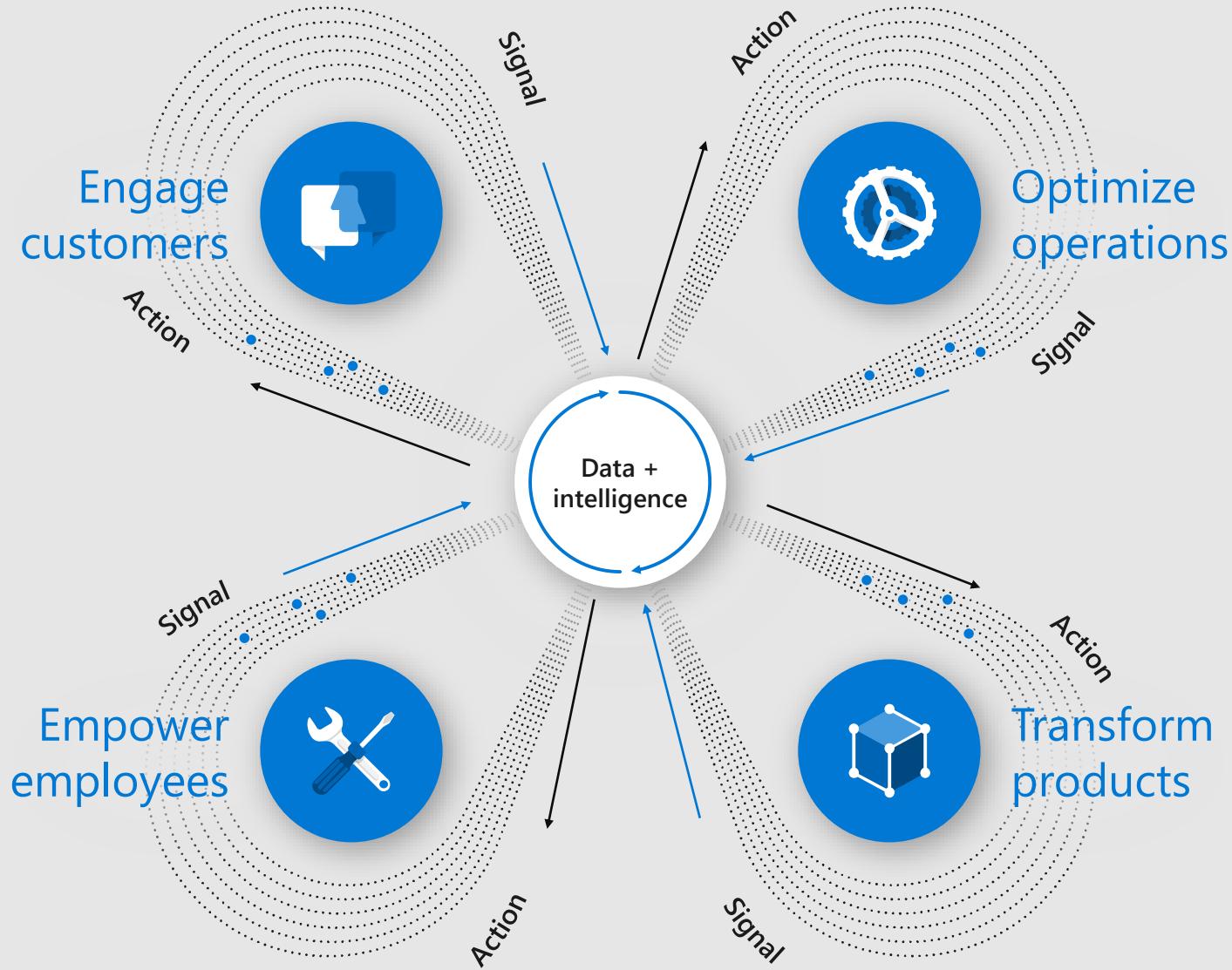
<https://portal.azure.com/>



Azure IoT Landscape

Jason Errett
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80B

Connected "things" by 2025 generating 180ZB of data



\$130B

New monetization avenues due to IoT-related services



80%

Companies that increased revenue as a result of IoT implementation



\$100M

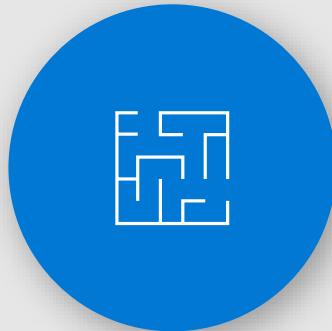
Average increase in operating income (avg. 8%) among the most digitally transformed enterprises

However, IoT projects are complex



Security

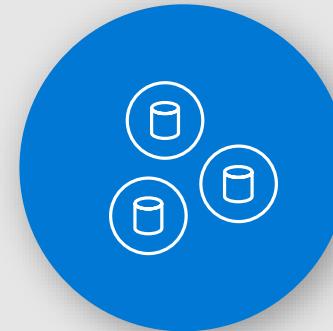
IoT poses unique security, privacy, and compliance challenges



Complexity

Lack of IT/OT integration impedes efficiencies. Difficult to know where to start

Heavy up-front investments can be cost-prohibitive and costs unpredictable



Siloed Data

Large portions of the business are not digitized

Data is siloed across different parts of the company

Unlocking the value of IoT

The IoT opportunity across industries



Energy
More efficient,
cleaner power, and
using less of it
across industries



Smart Cities
More sustainable,
prosperous, and
economically
competitive cities



Healthcare
Improved quality
and better
outcomes for
patients, anywhere



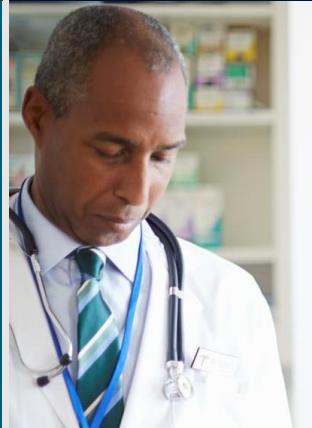
Retail
Better customer
experiences
New market
opportunity



Transportation
People and goods
moving reliably,
more safely, and
using less energy



Agriculture
Better yields and
higher quality with
fewer resources
and less waste



Manufacturing
Realize efficiency,
automation,
customer centricity
and tap into new
revenue sources



Johnson Controls

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



DUNAV NET

Keeping farmers informed about when to irrigate, how to control diseases, and how to fight pests, has led to **increased yields of 30%**, and a **20% reduction** in water use



**ROLLS
ROYCE**

Rolls-Royce

Rolls Royce provides maximize aircraft availability by employing “power by the hour” model; cutting fuel usage by 1 percent could save **\$250,000** per plane per year

Smart Cities



**Schneider
Electric**

Proactive responses with edge analytics

Schneider Electric transformed their solution to better help customers protect their assets and the environment and boost workplace safety by leveraging edge intelligence

[Click to learn more](#)

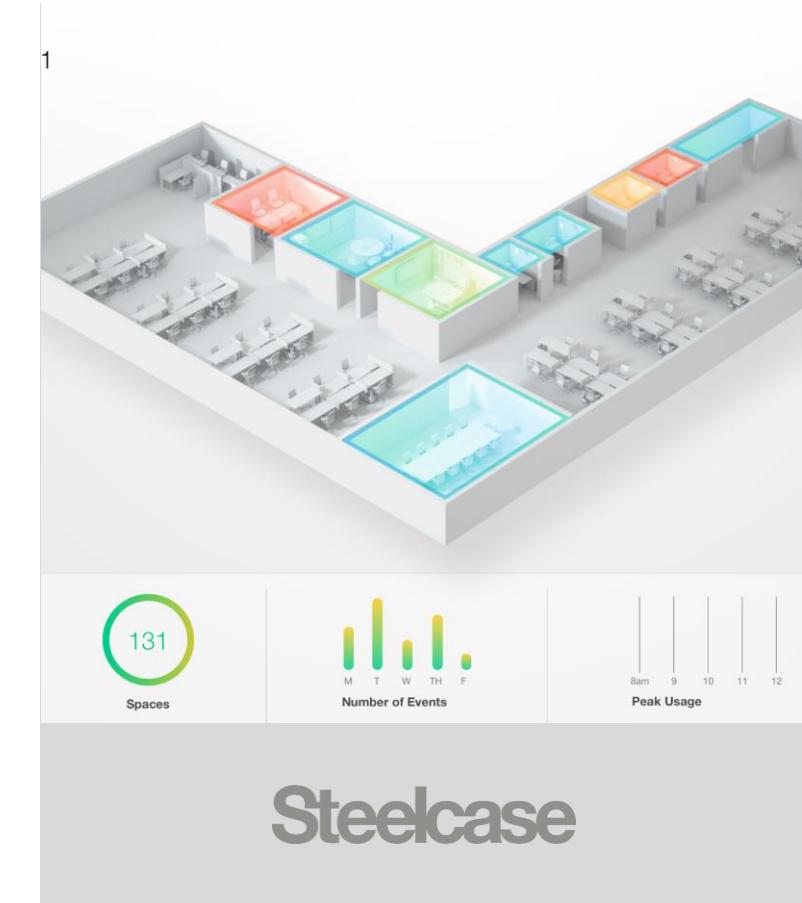


**Johnson
Controls**

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](#)



Steelcase

Increasing value with smart workspaces

A network of wireless infrared sensors on furniture allowed Steelcase to revolutionize the value their solutions bring to customers through real-time usage statistics and insights

[Click to learn more](#)



WELCOME JEFF

Thyssen Report

Profile

New

Location

San LaMonte Building

MAX Data

100 Points for Health & Safety
Autostarting
Self-service
Emergency
Car Repairs
Customer Support
Maintenance
Inspection
Relocation
Reconditioning
Resale
Banking

Transforming elevators with predictive service

thyssenkrupp's elevators predict the maintenance needs using Azure IoT reduces the costs of maintaining elevators and improving uptime for its customers. Using Hololens, thyssenkrupp technicians receive remote assistance by subject matter experts who can provide visual and audible advice

[LEARN MORE >](#)

 thyssenkrupp

A large and growing ecosystem

System integrators



Solution providers



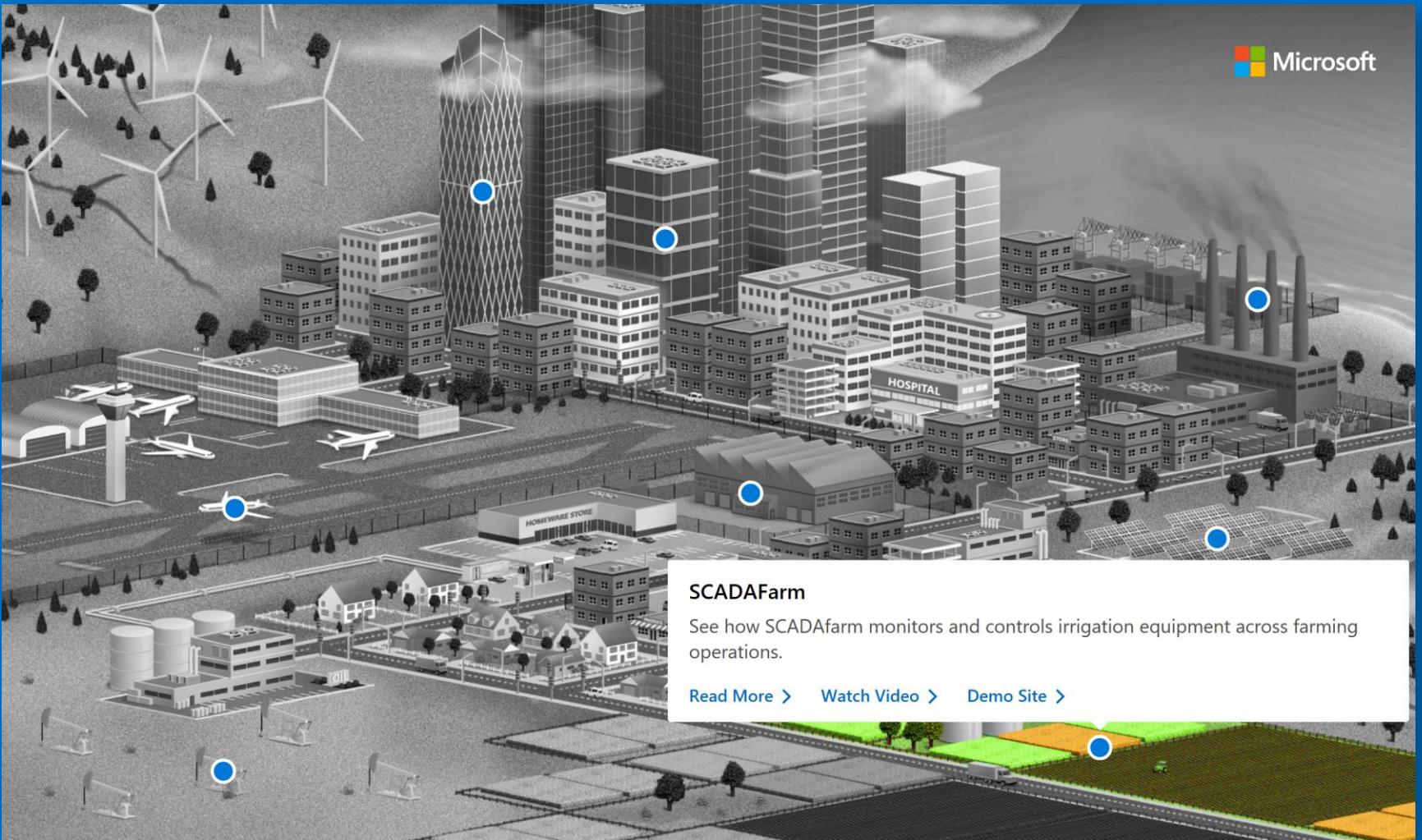
Azure certified
for IoT



Developer, IT
and, productivity



Demos



Get Started Today

Looking to USE an IoT Solution?

Use managed and industry-specific solutions to get started quickly and easily. [Try IoT solutions](#)

Ready to BUILD IoT Applications?

Find everything you need to develop advanced IoT apps using familiar languages and tools. [Build IoT apps](#)

1

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3

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Certified devices and starter kits

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Certified

- ▶ IoT Plug and Play
- ▶ Microsoft Azure IoT Starter Kit
- ▶ Azure IoT Edge
- ▶ Chip Manufacturers
- ▶ Cloud Protocol
- ▶ Connectivity
- ▶ Device Security Services
- ▶ Device Type
- ▶ Geo Availability
- ▶ I/O Hardware Interfaces
- ▶ Industrial Protocols
- ▶ Industry
- ▶ Industry Certification
- ▶ Operating System
- ▶ Programming Languages
- [▶ Secure Hardware](#)
- ▶ Tested Built-in Sensors



VIA Mobile360 D700

By: VIA Technologies, inc

The VIA Mobile360 D700 Drive Recorder integrates dual 1080p front dash and interior cameras in a robust and st...

[IoT Plug and Play](#)

Temp and Humidity Sensor

By: Seeed

SenseCAP is an industrial-grade sensor network developed by Seeed to enable environmental physical data collec...

[IoT Plug and Play](#)

VIA AMOS-3005

By: VIA Technologies, inc

The VIA AMOS-3005 is a compact and ruggedized fanless system designed to meet the most demanding indoor and ou...

[IoT Plug and Play](#)

VIA ARTiGO A820

By: VIA Technologies, inc

The VIA ARTiGO A820 is an ultra-slim fanless enterprise IoT gateway system featuring robust networking connect...

[IoT Plug and Play](#)

Wistron-Tracker

By: Wistron

With Qualcomm advance connectivity functionality, the LTE Hotspot GPS Tracker can support smart city, commerci...



Windows Connected Display

By: Sharp Electronics

The system includes a next generation 4K '70' Class ('69.5' diagonal) interactive display, built-in



APAL – Ruggedized Asset Tracker

By: Compal Electronics, INC.

Asset Tracker makes it possible to follow your valuables anytime & anywhere. Wide area coverage over

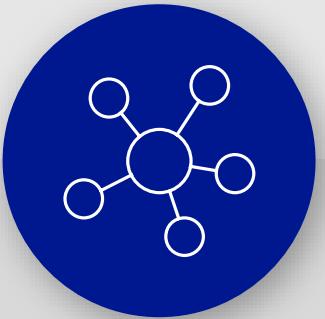


Dashcam Smart Camera

By: ASKEY computer corp.

The Askey Connected Car Cam+, equipped with LTE/Wi-Fi functions, provides uninterrupted connection for IoT app...

Azure IoT portfolio



Solutions

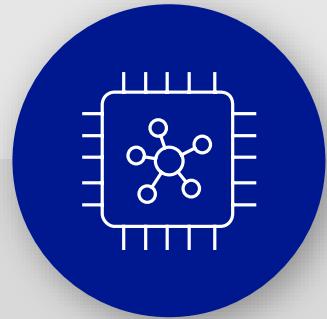
Azure IoT Central

Azure IoT Remote Monitoring
Azure IoT Predictive Maintenance
Azure IoT Device Simulation
Azure IoT Connected Factory



Services

Azure Digital Twins
Azure IoT Hub
Azure IoT Security



Edge

Azure IoT Edge
Azure Sphere
Windows IoT



Azure IoT Central



Fully hosted and managed by Microsoft



No cloud development expertise required



Device connectivity and management



Monitoring rules and triggered actions



User roles and permissions



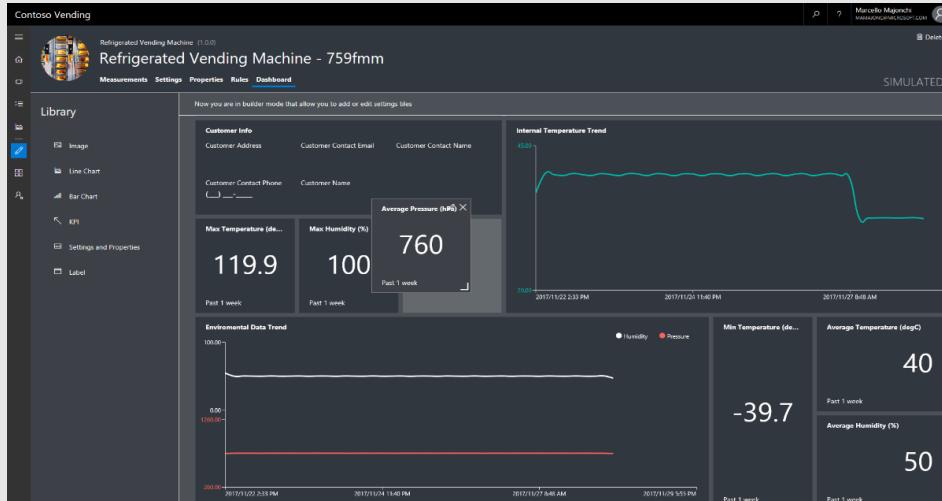
Analytics, dashboards and visualization



Risk-free trial with simplified pricing

Try today: <http://azureiotcentral.com>

Builder



Operator



Product modeler



Device settings



Template management



Rules workflows



User and identity management



Device management



Analytics and dashboards

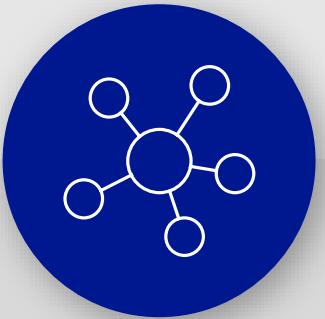


Time-series insights



Alerts and actions

Azure IoT portfolio



Solutions

Azure IoT Central

Azure IoT Remote Monitoring

Azure IoT Predictive Maintenance

Azure IoT Device Simulation

Azure IoT Connected Factory

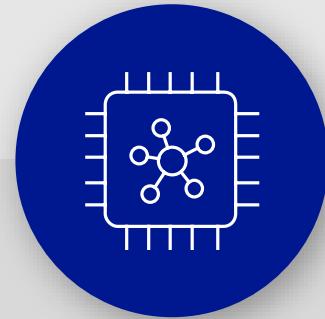


Services

Azure Digital Twins

Azure IoT Hub

Azure IoT Security



Edge

Azure IoT Edge

Azure Sphere

Windows IoT



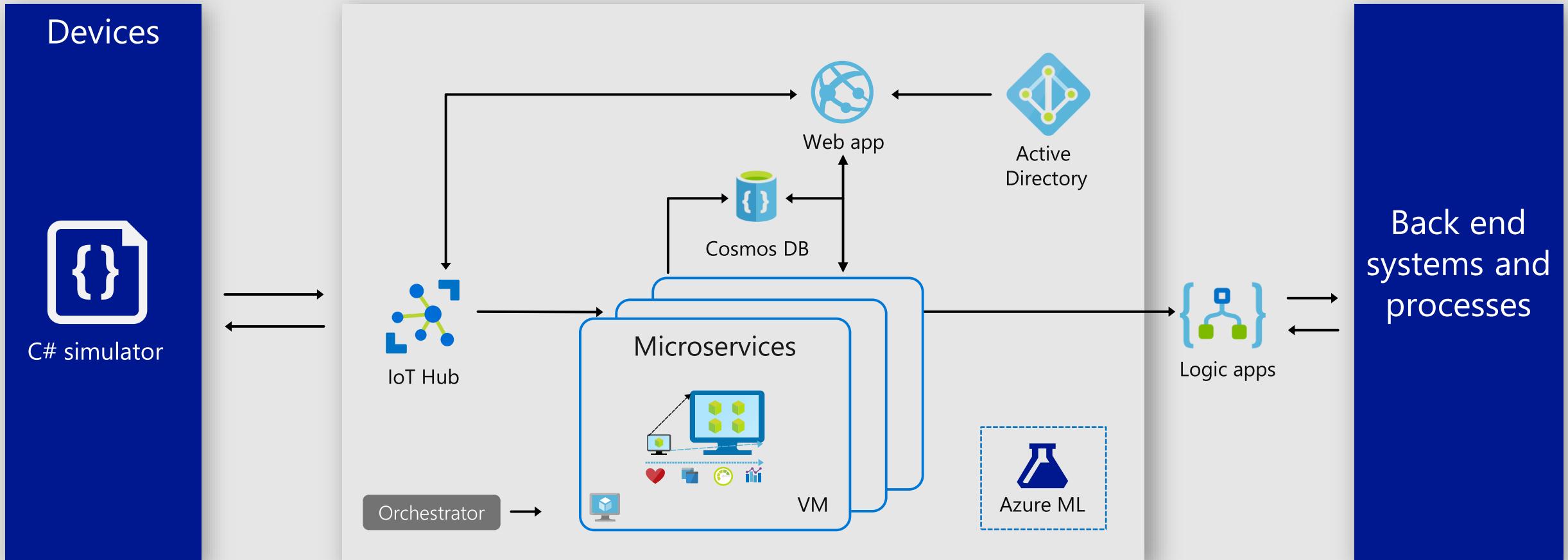
Generally available

Azure IoT solution accelerators

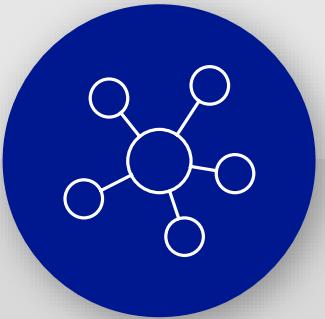
-  End-to-end implementation
-  Completely customizable
-  Open-source microservices based architecture
-  Device connectivity and management
-  Dashboards, visualization, and insights
-  Workflow automation and integration
-  Command and control
-  Preconfigured solutions
-  Remote monitoring
-  Connected factory
-  Predictive maintenance
-  Device simulation

Components of a pre-configured solution

Remote monitoring | Predictive maintenance | Connected factory | Device simulation



Azure IoT portfolio



Solutions

Azure IoT Central

Azure IoT Remote Monitoring

Azure IoT Predictive Maintenance

Azure IoT Device Simulation

Azure IoT Connected Factory

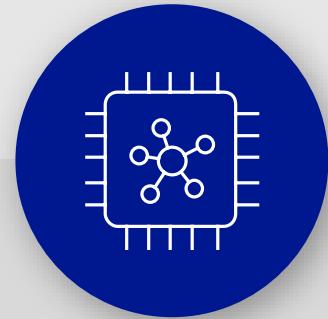


Services

Azure Digital Twins

Azure IoT Hub

Azure IoT Security



Edge

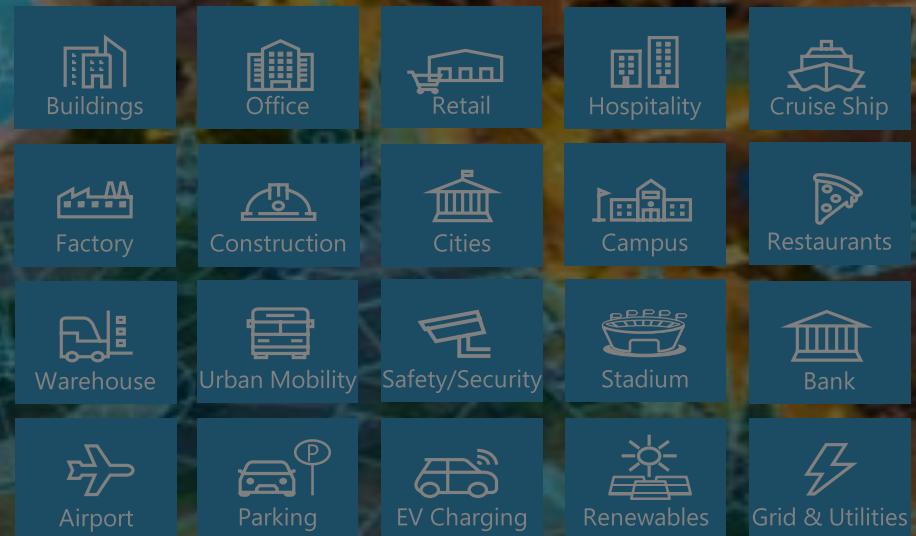
Azure IoT Edge

Azure Sphere

Windows IoT

Public preview

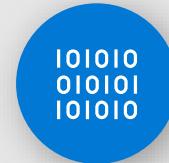
Azure Digital Twins



Build next generation IoT solutions with Azure Digital Twins



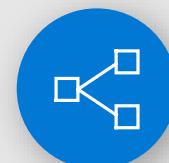
Virtually represent the physical world with a digital twin that models the relationships between people, places and devices



Leverage predefined and extensible Twin Object Models to build contextually-aware solutions uniquely attuned to your industry domain

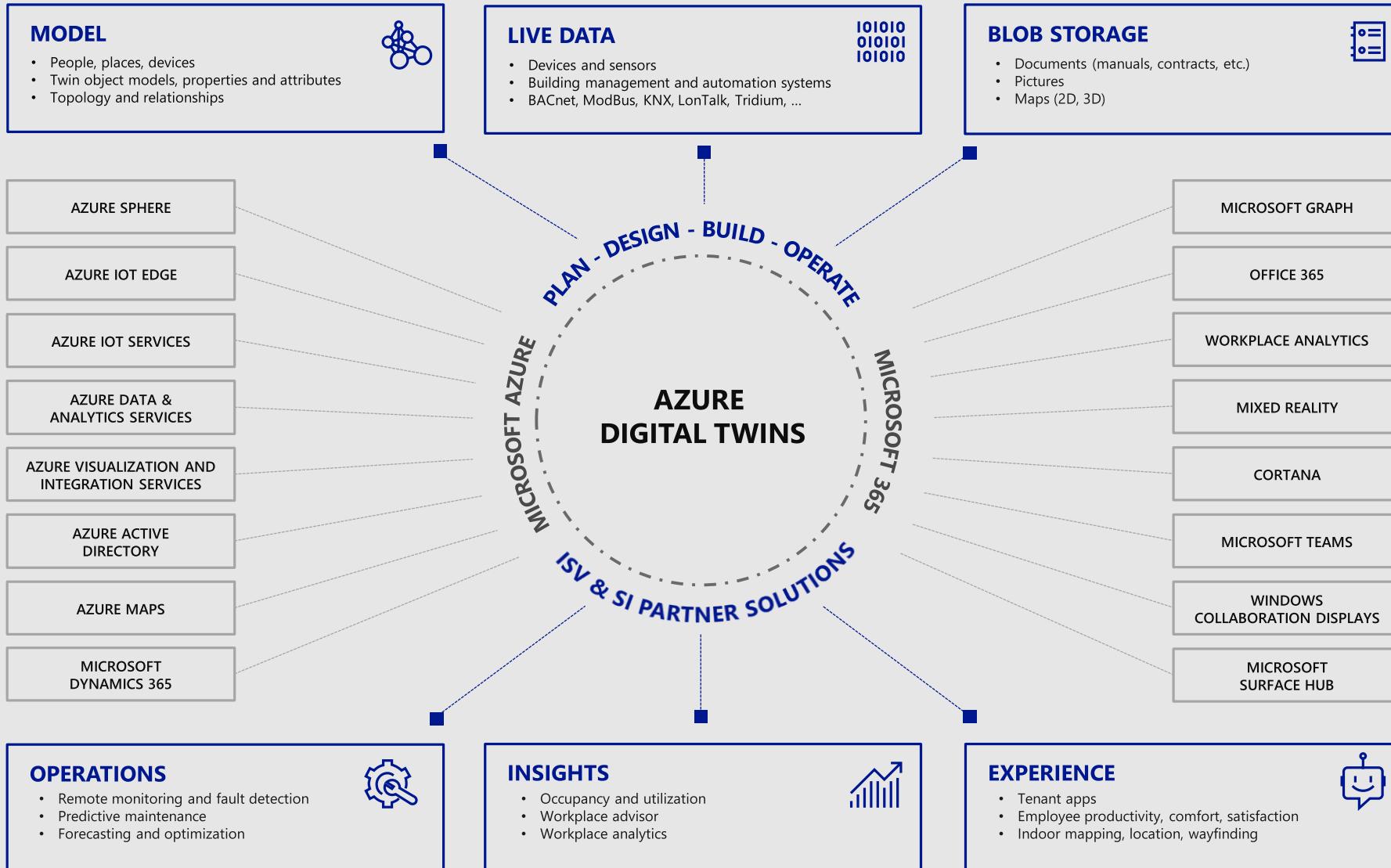


Automate actions in a space with custom functions that send events and/or notifications to endpoints based on incoming telemetry

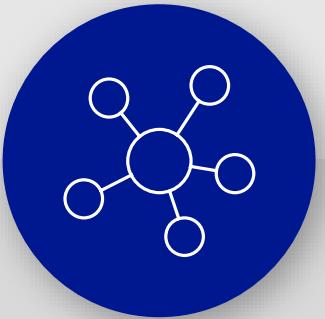


Securely replicate solutions across multiple tenants through built-in multi and nested-tenancy

Azure Digital Twins for Smart Spaces



Azure IoT portfolio



Solutions

Azure IoT Central

Azure IoT Remote Monitoring

Azure IoT Predictive Maintenance

Azure IoT Device Simulation

Azure IoT Connected Factory

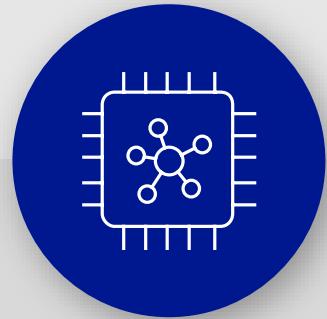


Services

Azure Digital Twins

Azure IoT Hub

Azure IoT Security

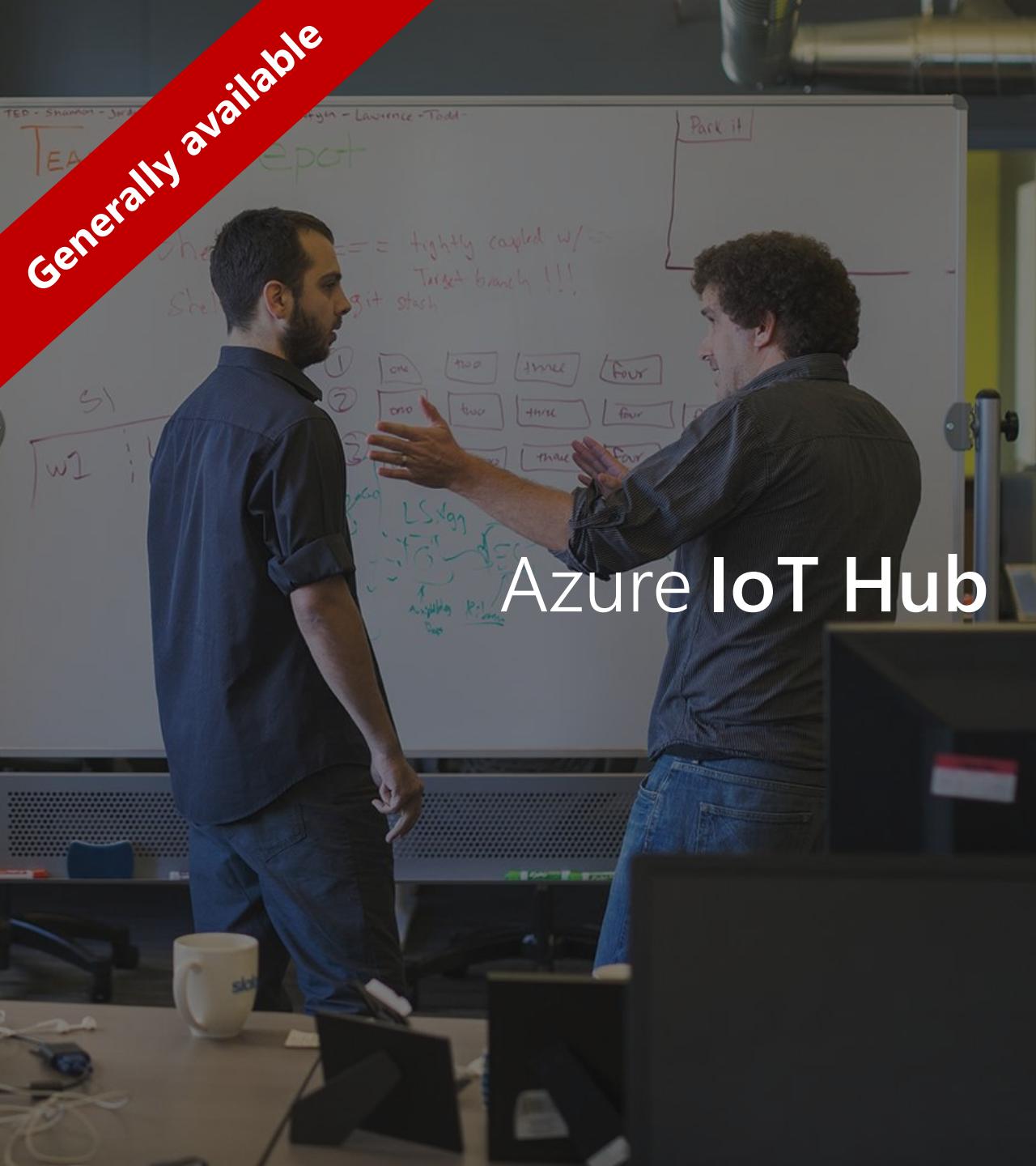


Edge

Azure IoT Edge

Azure Sphere

Windows IoT



Generally available

Azure IoT Hub



Establish bi-directional communication with billions of IoT devices



Enhance security with per device authentication



Provision devices at scale w/IoT Hub Device Provisioning Service

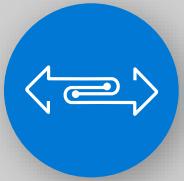


Manage devices at scale with device management



Multi-language and open source SDKs

Azure IoT Hub



Bi-directional communication

Millions of devices
Multi-language, open source SDKs
HTTPS/AMQPS/MQTT-S
Send Telemetry
Receive commands
Device management
Device Twins
Queries and jobs



Enterprise scale and integration

Billions of messages
Scale up and down
Declarative message routes
File Upload
WebSockets and 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 security center support

Azure IoT Hub Device Provisioning Service



IoT-scale automated provisioning

Zero-touch provisioning
Centralize your provisioning workflow
Load balance across multiple IoT Hubs
Re-provisioning support
Supports TPM + X.509

Azure IoT Hub Device Provisioning Service

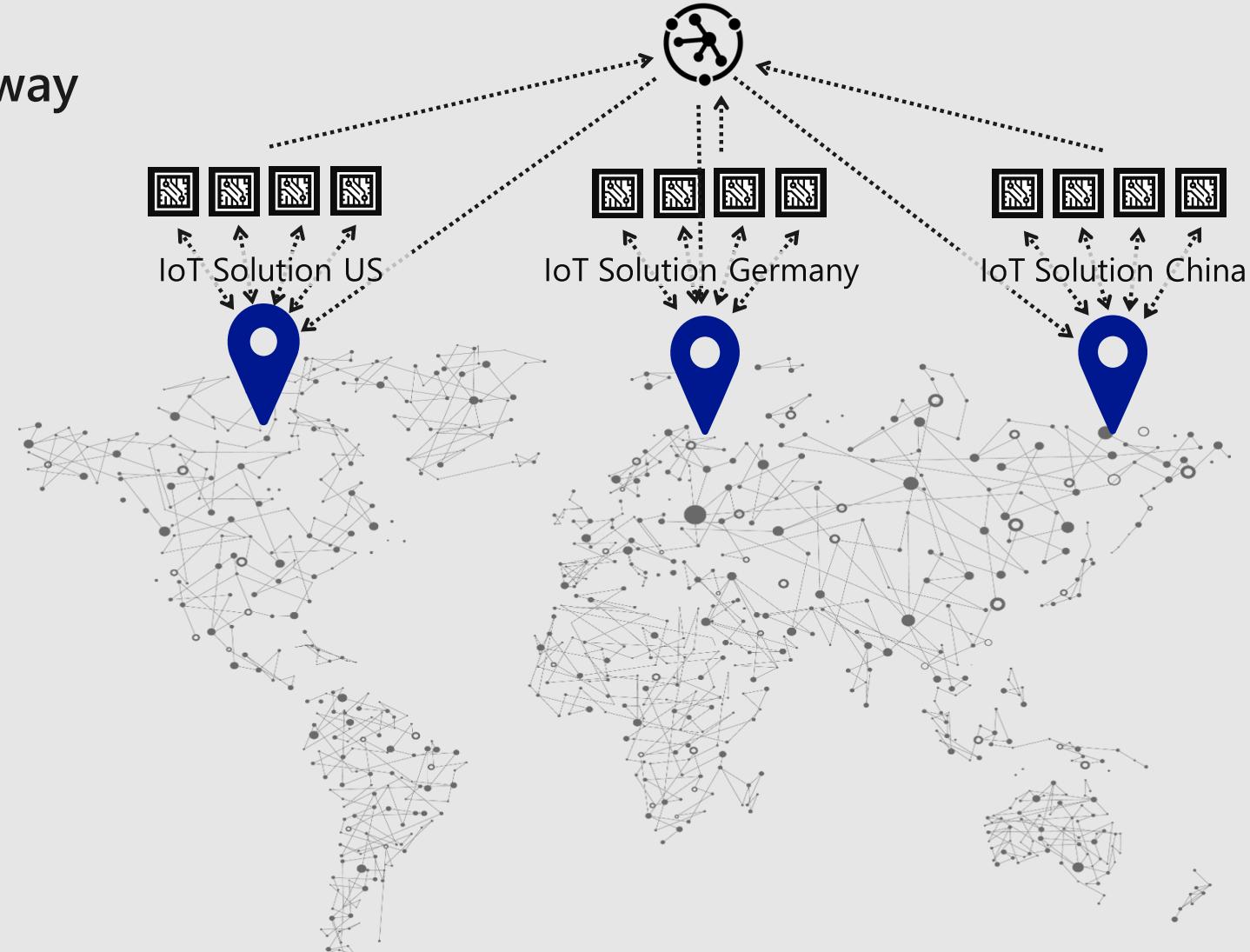
Register and provision devices with zero-touch in a secure and scalable way

Simple "plug and play" provisioning

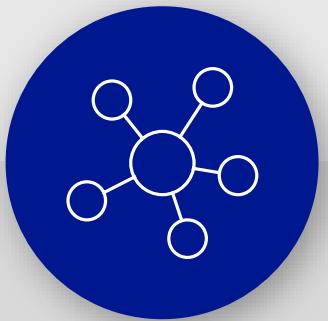
Minimize manual connection requirements

Enhanced security through HSM

Global availability



Azure IoT portfolio



Solutions

Azure IoT Central

Azure IoT Remote Monitoring

Azure IoT Predictive Maintenance

Azure IoT Device Simulation

Azure IoT Connected Factory

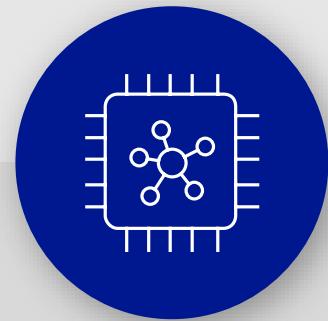


Services

Azure Digital Twins

Azure IoT Hub

Azure IoT Security

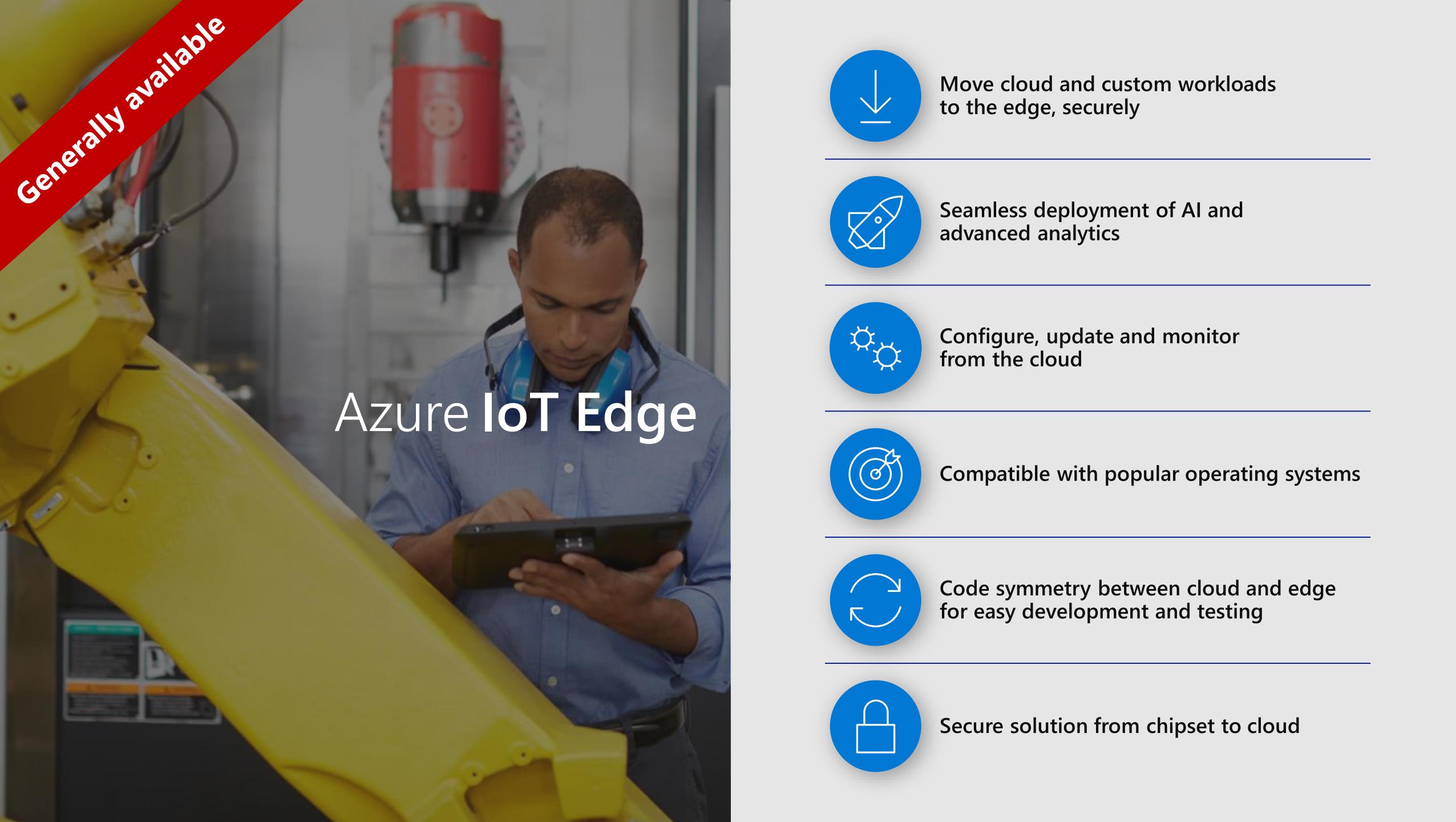


Edge

Azure IoT Edge

Azure Sphere

Windows IoT



Azure IoT Edge

Generally available



Move cloud and custom workloads
to the edge, securely



Seamless deployment of AI and
advanced analytics



Configure, update and monitor
from the cloud



Compatible with popular operating systems

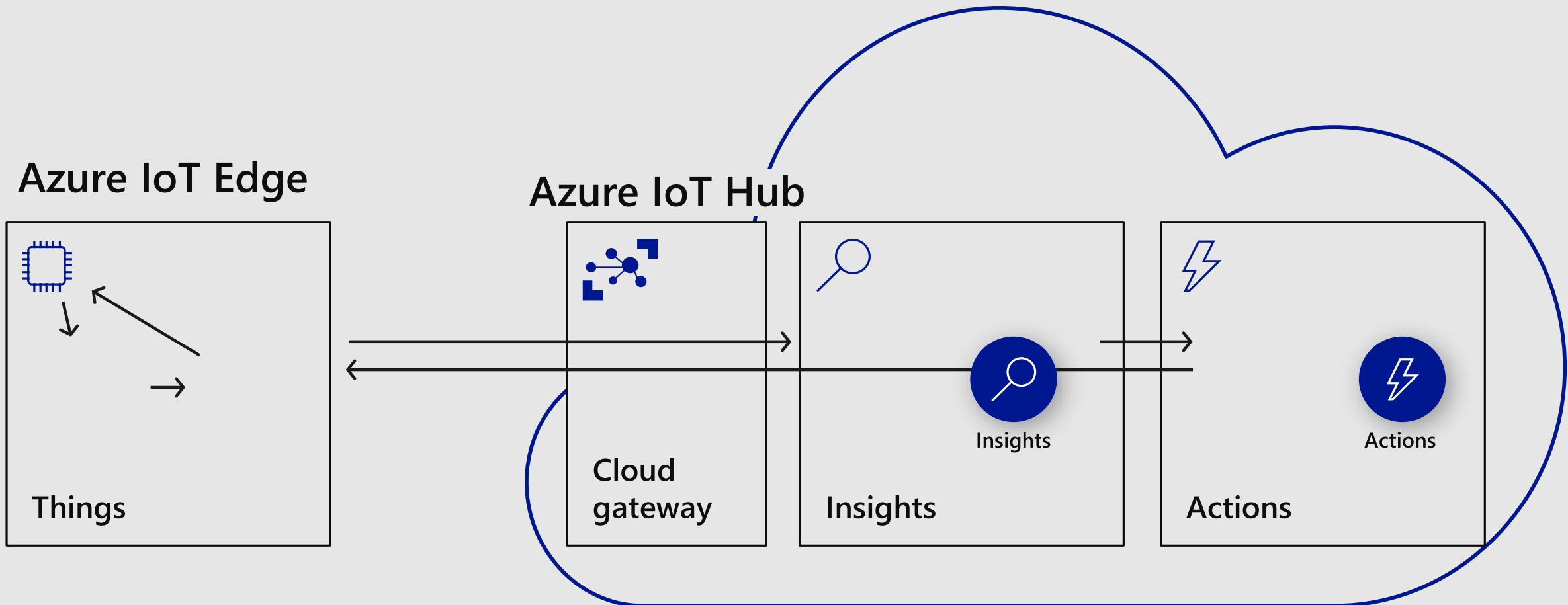


Code symmetry between cloud and edge
for easy development and testing



Secure solution from chipset to cloud

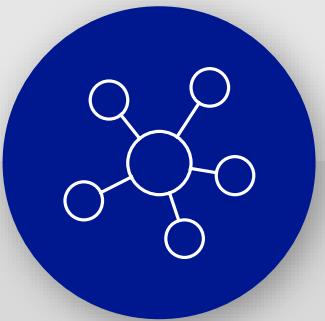
IoT pattern + edge



Cognitive Services at the Edge

- Anomaly Detector
- Computer Vision
- Face
- Form Recognizer
- Language Understanding
- Speech Service API
- Text Analytics

Azure IoT portfolio



Solutions

Azure IoT Central

Azure IoT Remote Monitoring

Azure IoT Predictive Maintenance

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Azure IoT Connected Factory

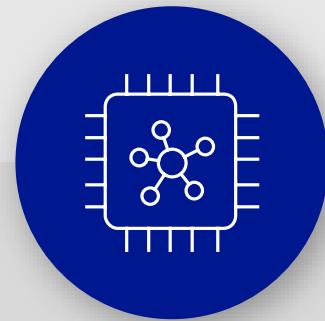


Services

Azure Digital Twins

Azure IoT Hub

Azure IoT Security



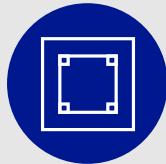
Edge

Azure IoT Edge

Azure Sphere

Windows IoT

Public preview



A new **Azure Sphere class of MCUs**, from silicon partners, with built-in Microsoft security technology provide connectivity and a dependable **hardware root of trust**

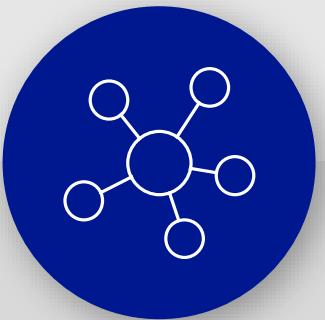


A new **Azure Sphere OS** secured by Microsoft for the devices 10-year lifetime to create a **trustworthy platform** for new IoT experiences



The **Azure Sphere Security Service** guards every Azure Sphere device; it **brokers trust** for device-to-device and device-to-cloud communication, **detects emerging threats**, and **renews device security**

Azure IoT portfolio



Solutions

Azure IoT Central

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Azure IoT Connected Factory

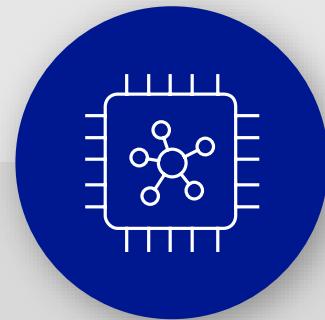


Services

Azure Digital Twins

Azure IoT Hub

Azure IoT Security



Edge

Azure IoT Edge

Azure Sphere

Windows IoT



Windows 10 IoT



Open platform that seamlessly connects things, endpoints, and the cloud



Commercial OS for IoT devices and a modern user experience



Supports the languages and frameworks you already know



Trusted platform for security and servicing of for cloud-connected devices



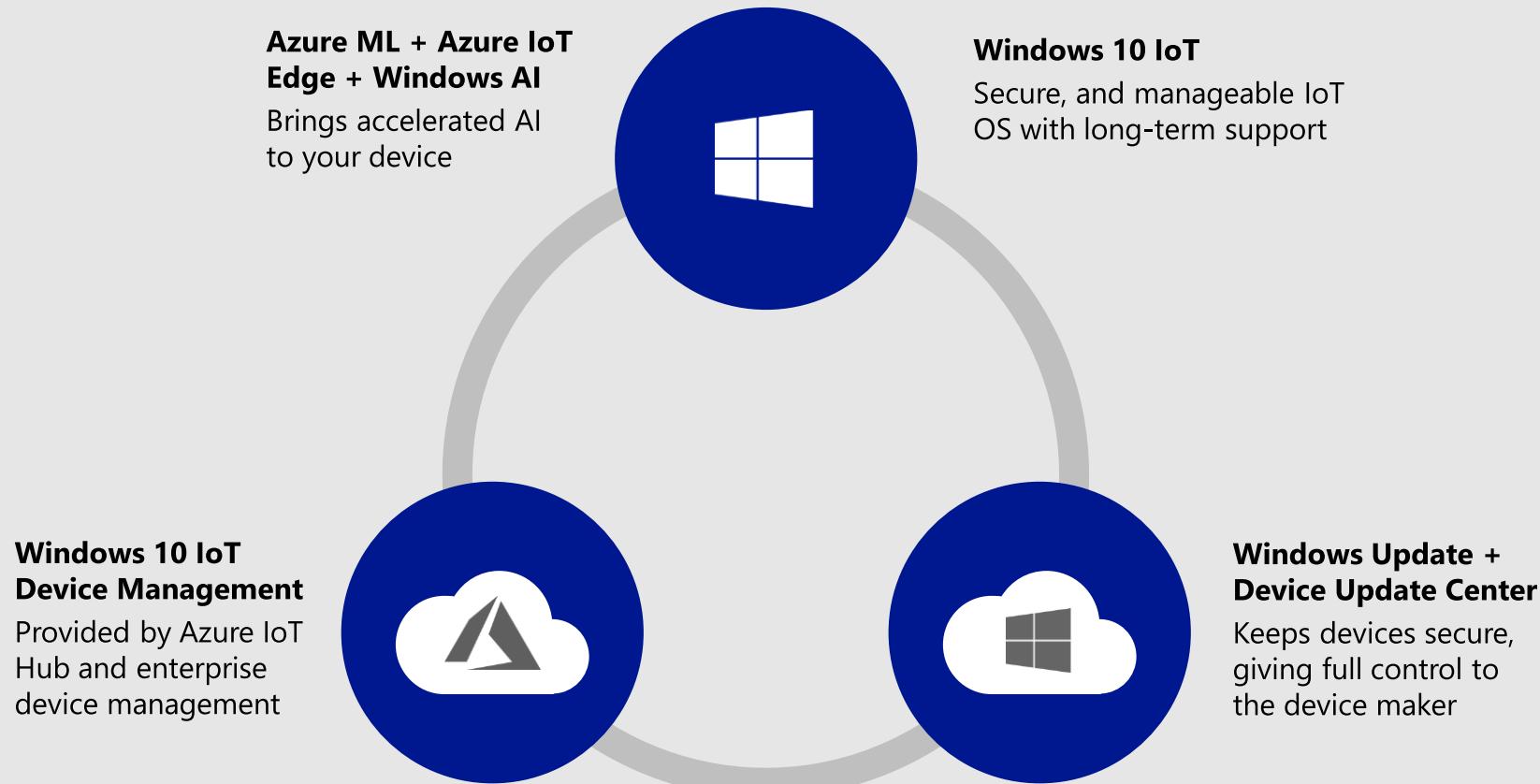
Bring power and capability to the edge



Enable a more nature user interface

Windows 10 IoT + Azure

Device-to-cloud platform for secure, manageable intelligent edge devices





Azure Time Series Insights



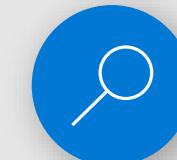
IoT scale time-series data store



Schema-less store, just send data



Easy IoT Hub connection



Store, query, and visualize billions of events



Get near real-time insights in seconds



Build apps using Time Series Insights APIs

Azure Time Series insights

New features coming!

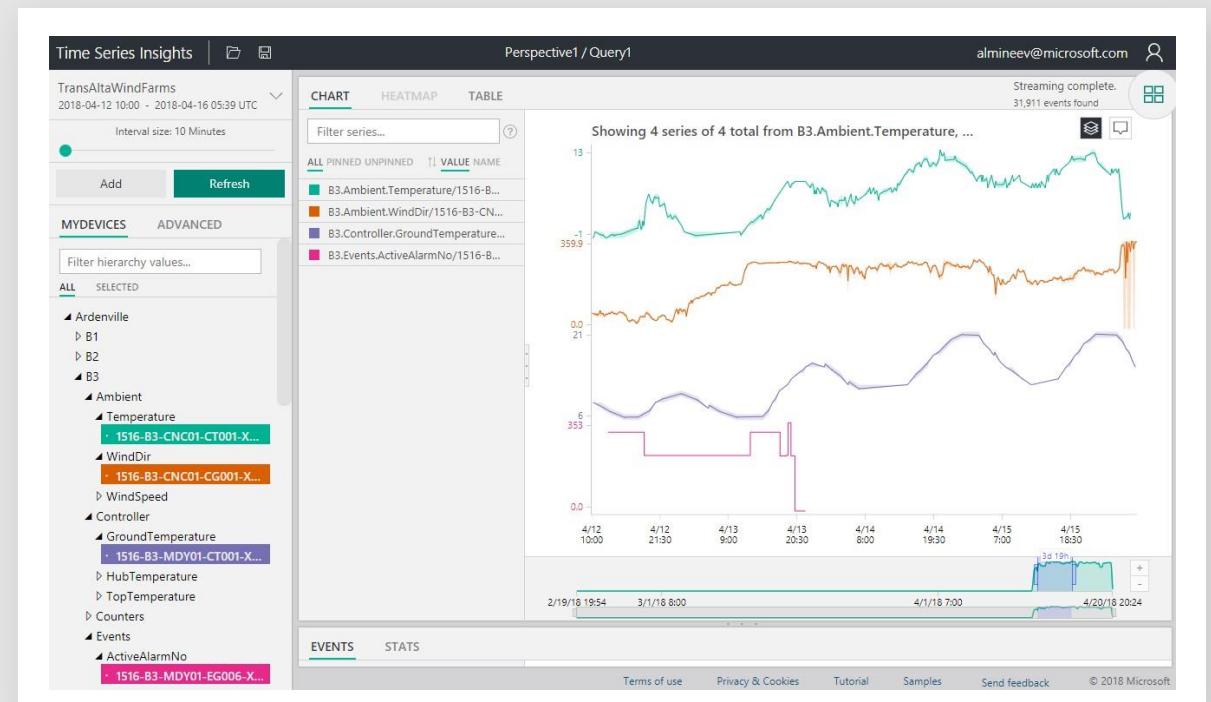
“Tag-based” user experience that makes it easy to group time series data into logical “things” and hierarchies of “things”

Business reports with Power BI integration

Predictive analytics with Azure Machine Learning integration

Data analysis with Jupyter and Apache Zeppelin notebook integration

Advanced analytics with Azure Databricks, Apache Hadoop, and Apache Spark integration



Additional Documentation on GitHub

https://github.com/jasonerrett/AzureIoT_HelloRpi



Thank you

감사합니다 TEŞEKKÜRLER

DANK U WEL СПАСИБО

ευχαριστώ OBRIGADO

הודות MULTUMESC நன்றி

HVALA SALMAT PO MERCI