Microsoft Azure

Azure IoT Academy

Transforming your business

Special Speaker: Jerry Emens
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Microsoft

Rebekah Midkiff
Technical Specialist
Microsoft

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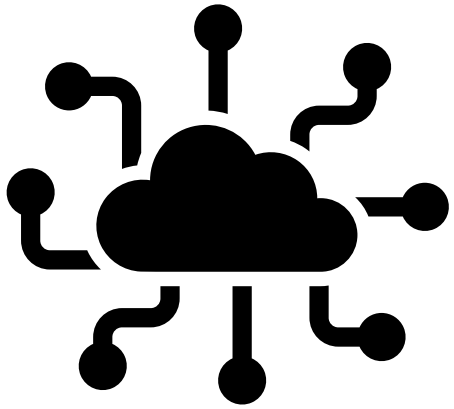
Sr. Technical Specialist
Microsoft

Eric Johnston
Sr. Technical Specialist
Microsoft

IoT Academy Expectations



- *We have a very large audience, so please keep yourself on mute except when called.*
- *Please raise your hand and wait for acknowledgement before unmuting to ask a question.*
- *Use Teams reactions to ease interactions of a large audience*
- *We want this to be interactive so please don't hesitate to let us know if you have a question (comment in chat or raise hand).*
- *If you're stuck on a hands-on lab, we request that you notify us in chat and raise your hand so we can move you to a breakout meeting for assistance.*

IoT Academy Journey

Month 1

- IoT Core Services
- IoT Central
- IoT Hub
- Device Provisioning
- Azure Data Explorer
- Azure Stream Analytics
- Partner Showcase

Month 2

- IoT Edge
- EFLOW
- Azure Digital Twins
- Log Analytics
- Azure Monitor
- Partner Showcase

Month 3

- IoT Security
- Azure Sentinel
- Defender
- Partner Showcase
- Awards Ceremony

Day One Agenda (All times are in ET)

- 10:05am - 10:10am Jerry Emens – Special Speaker
- 10:10am - 10:30am Introduction/Expectations Kickoff
- 10:30am - 11:30pm PowerPoint Presentation/IoT Core
- 11:30am - 11:45am Coffee Break
- 11:45am - 1:00pm Hands on Lab (HOL)
- 1:00pm - 1:45pm Lunch Break
- 1:45pm - 3:15pm HOL
- 3:15pm - 3:30pm Coffee Break
- 3:30pm - 4:00pm HOL

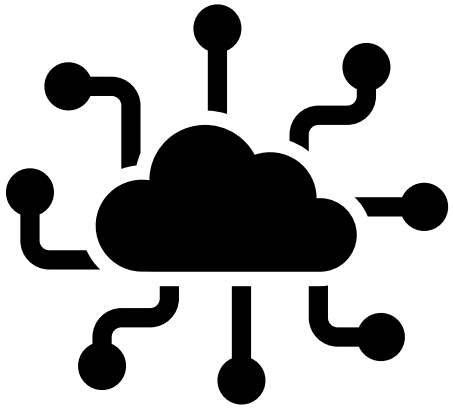
Day Two Agenda (All times are in ET)

- 10:05am - 10:20am Introduction/Expectations Kickoff - Team
- 10:20am - 12:00pm HOL
- 12:00pm - 12:15pm Coffee Break
- 12:15pm - 1:00pm HOL
- 1:00pm - 1:45pm Lunch Break
- 1:45pm - 3:15pm HOL
- 3:15pm - 3:30pm Coffee Break
- 3:30pm - 4:00pm HOL

Day Three Agenda (All times are in ET)

- 10:15am - 10:30am Introduction/Expectations Kickoff - Team
- 10:30am - 12:00pm Partner Showcase
- 12:00pm - 12:15pm Coffee Break
- 12:15pm - 1:15pm Partner Showcase
- 1:15pm - 2:00pm Lunch Break
- 2:00pm - 3:00pm Partner Showcase
- 3:00pm - 3:15pm Coffee Break
- 3:15pm - 3:30pm Close/Recap/Q&A

What is IoT?



"The internet of things, or IoT, is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers (UIDs) and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction." (Alexander S. Gillis)

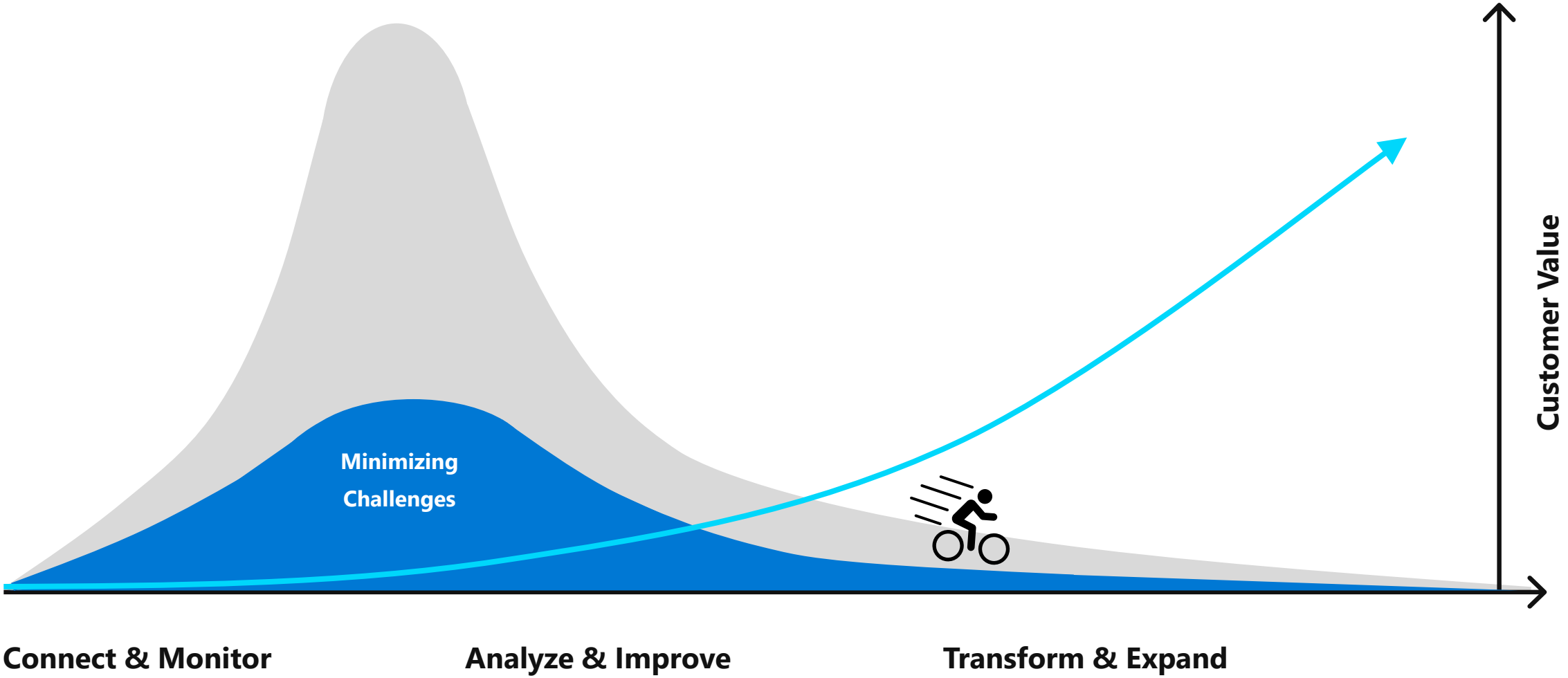
The Internet of Things (IoT) has been defined in Recommendation ITU-T Y.2060 (06/2012) as a global infrastructure for the information society, enabling advanced services by interconnecting (physical and virtual) things based on existing and evolving interoperable information and communication technologies (www.itu.int)

"IoT enables your organization to analyze and act on data, allowing you to make smart decisions in real-time. With the timely and relevant insights about your business and customers that come with these new sources of data"
(https://azure.microsoft.com/en-us/overview/internet-of-things-iot/what-is-the-internet-of-things)

Some IoT Examples

- *Remote Monitoring*
- *Predictive Maintenance*
- *Facilities Management*
- *Operational Efficiency*
  - *Manufacturing*
  - *Industrial*
- *Connected Products*
  - *Smart locks*
  - *Health devices*
  - *Cameras*

Remove Barriers and Minimize Obstacles



Why IoT?

$100M average increase in operating income among more digitally transformed enterprises.[1]

49% of organizations improve product or service quality with IoT.

56% of organizations improve efficiency and productivity with IoT.[4]

80% of companies have increased revenue as a result of IoT implementation.[3]

It's no surprise that **90%** of organizations now **consider IoT as critical** to the overall success of their business.[6]

IoT Challenges

The highly technical nature of implementing an IoT platform presents challenges that many companies are not necessarily equipped to solve on their own. Key barriers sited by prospective adopters include:

32% said the main reason for failure to adopt was the cost of scaling

47% say they don't have enough skilled workers

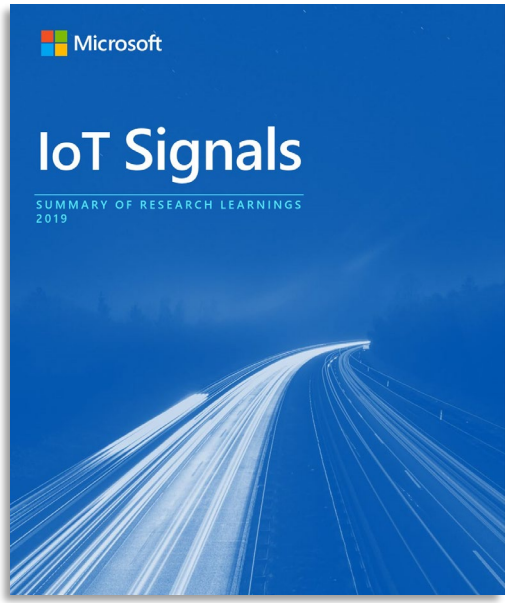
38% say that technical complexities are overwhelming

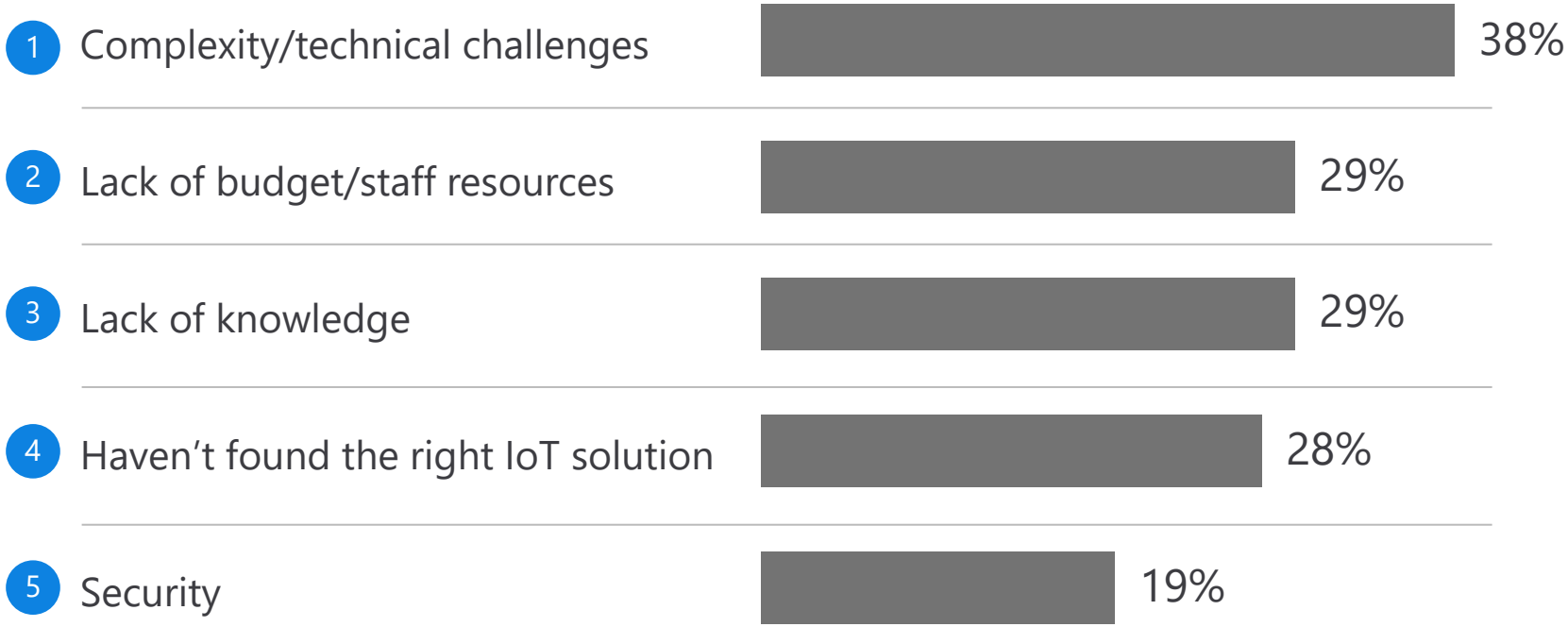
IoT is not Easy

IoT Signals Report

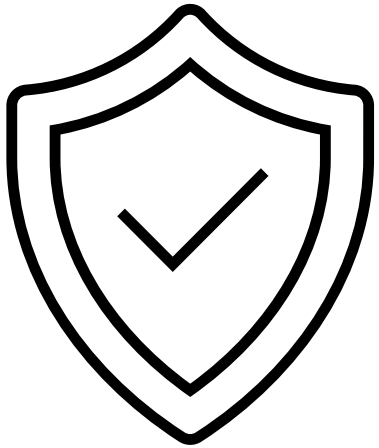
Published: 7/25/2019

IoT is the gateway to business transformation, creating significant opportunity. While 88 percent of companies credit IoT as critical to their success… many challenges exist on the path to scalable, reliable, IoT installations.





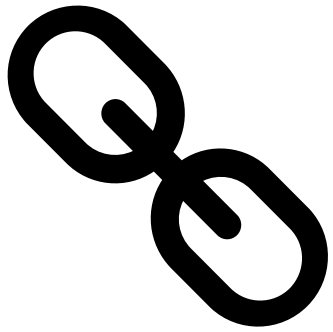
Important Security Topics IoT Devices



- Identity
- Trust
- Physical protection
- Device operating system and software controls
- Device software updates (OTA, firmware updates)
- Endpoint threat detection

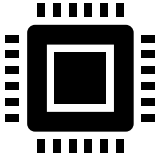
- Microsoft Defender for IoT

Technical Complexity
Distributed Systems & Constraints

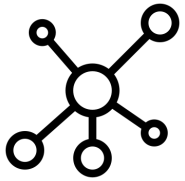


- IoT systems are distributed systems
- Distributed: shared or spread out
- Example Constraints
  - Compute: processing, storage
  - Network: latency, bandwidth
  - Time
  - Physical separation and distance
- Systems Design: Theory of Constraints

Common Components of an IoT Solution

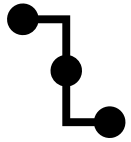


Devices

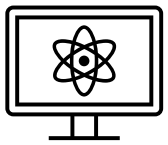


Communications / Message Routing

Processing, Transformation, Analytics

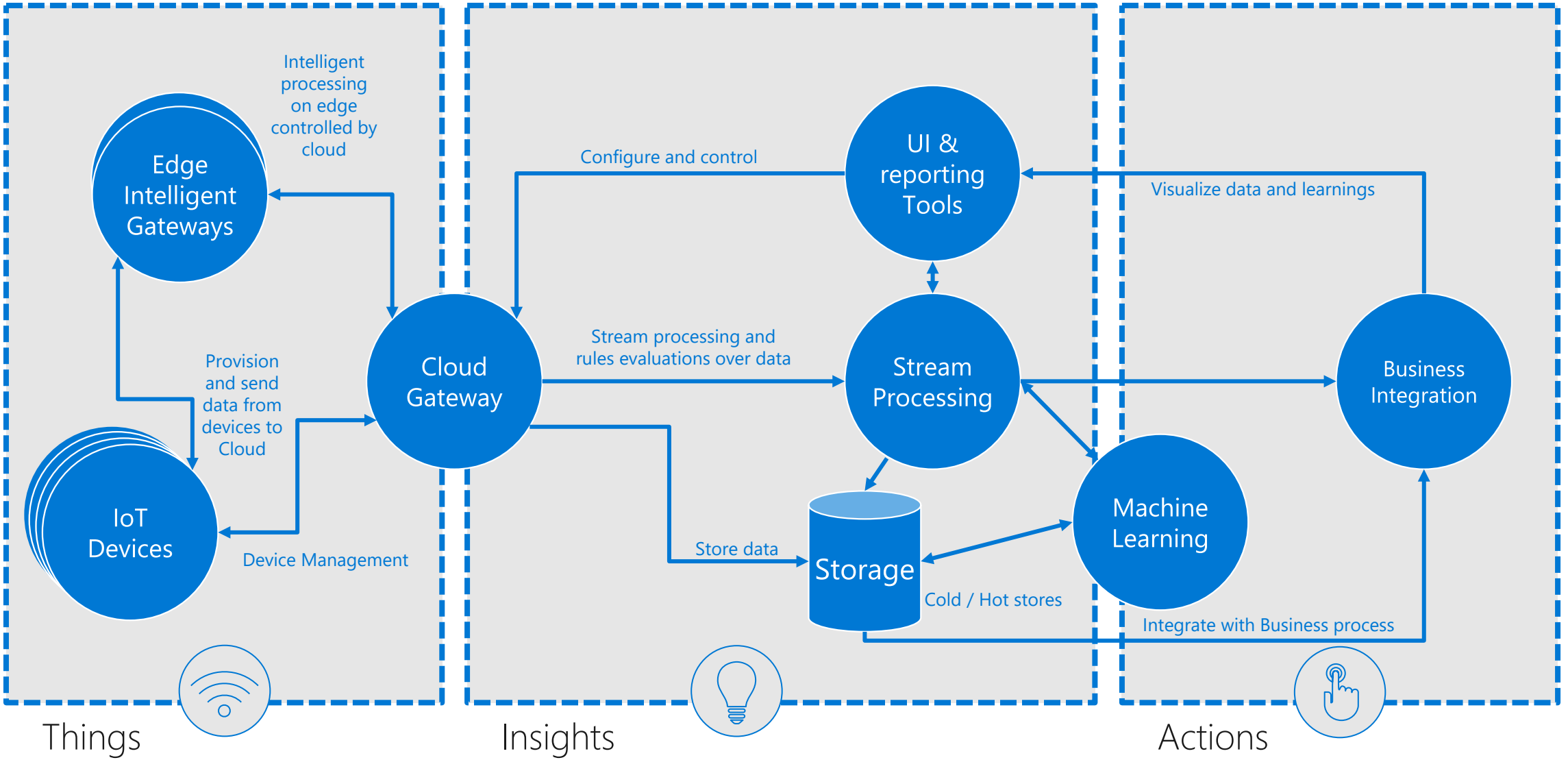


System/Business Integration

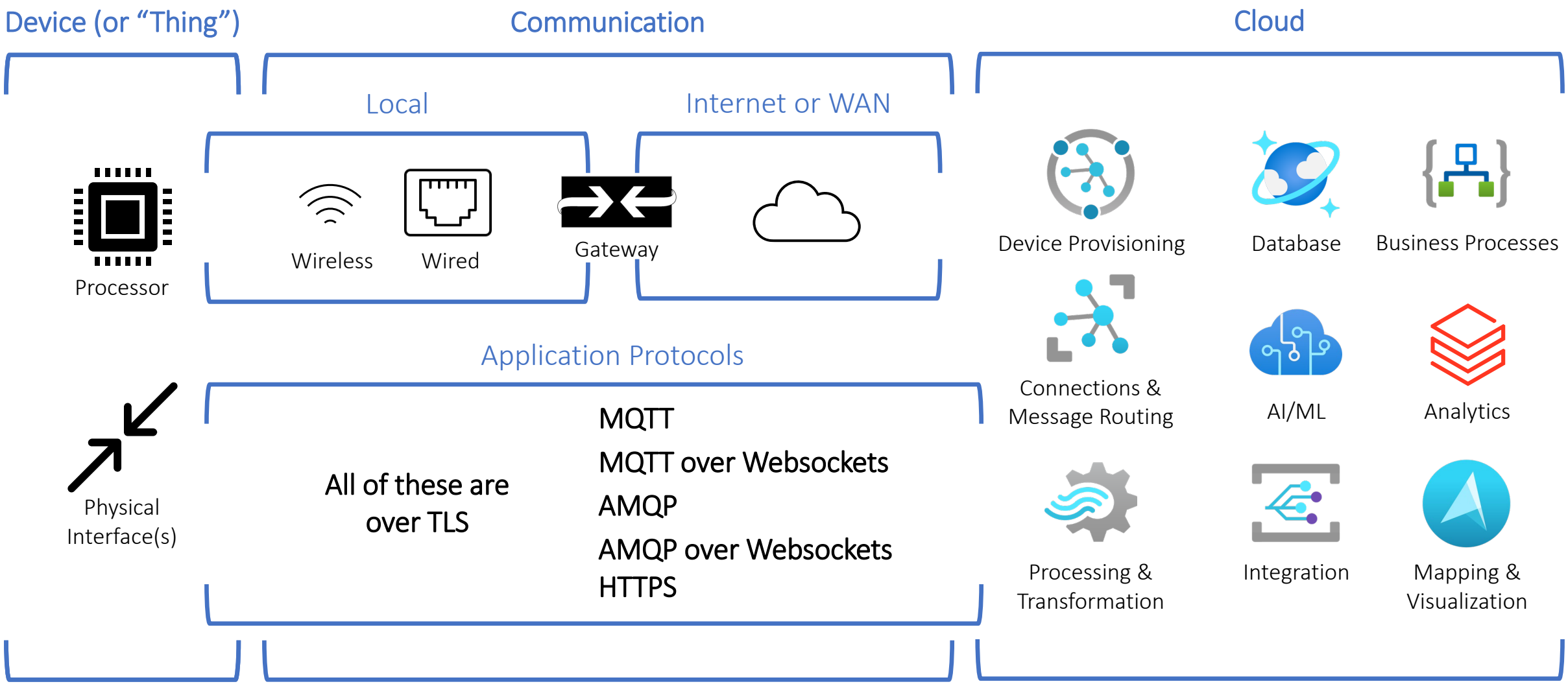


AI + ML

High-Level IoT Architecture

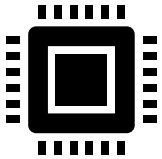


Example IoT Architecture

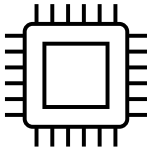


Devices (or “Things”)

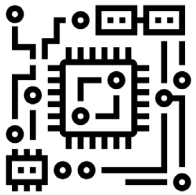
Processing



MCU

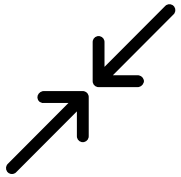


SoC



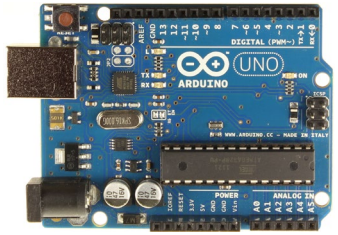
MPU

Interfaces



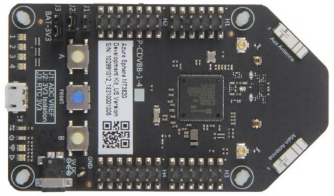
Physical Interfaces (Sensors, Relays, Connectivity, etc)

OTS Hardware Examples



Microchip ATMEGA328P (Arduino)

Raspberry Pi



Azure Sphere Dev Kit

Intel NUC

Operating System

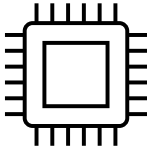
None
Azure RTOS
Azure Sphere
Raspberry Pi OS
Yocto Linux
Android
Windows IoT

Application

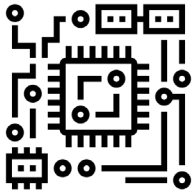
Software or Firmware

Edge Gateways

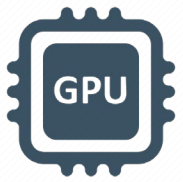
Processing



SoC

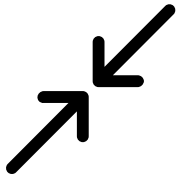


MPU



GPU

Interfaces



Physical Interfaces (Connectivity)

OTS Hardware Examples

Raspberry Pi

Azure Stack Edge

Intel NUC

Operating System

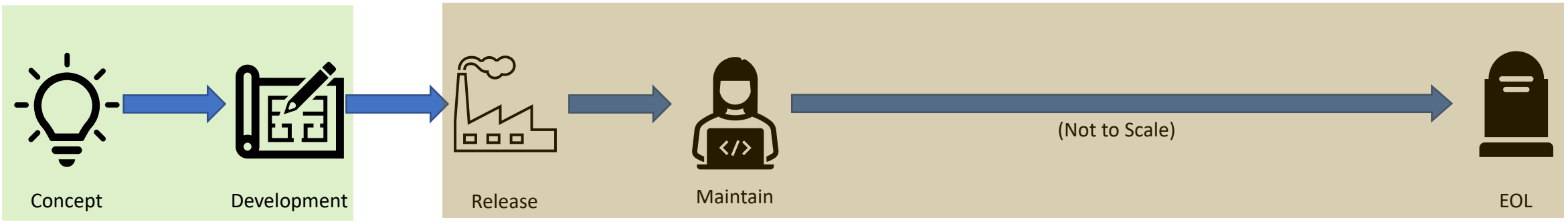
Raspberry Pi OS
Yocto Linux
Android
Windows IoT

Application(s)

Container Engine and Orchestration

Software & Containers

IoT Product Lifecycle



- Short period in the overall lifecycle of an IoT product.
- This is where choices have the most impact.
- Security, scalability, and maintainability considerations here affect the product's life.

- Almost all an IoT product's life is here. Could span decades.
- New releases don't absolve you of maintenance and support of previously released products in the hands of customers.
- Autonomy and bit rot leaves IoT devices vulnerable to attacks.

Messaging in IoT

Device to Cloud (D2C)

Telemetry

Properties (State)

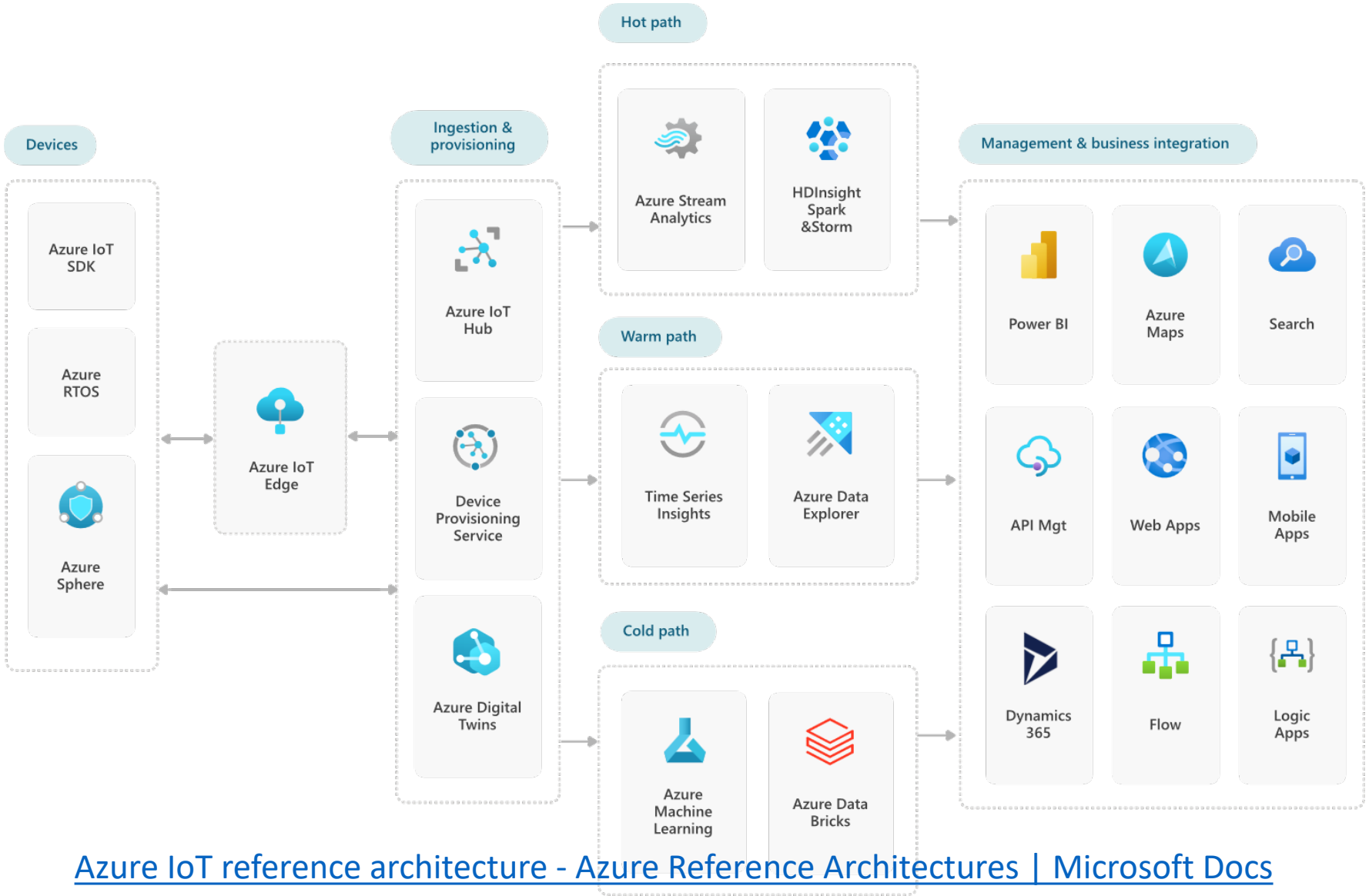
Cloud to Device (C2D)

Properties (Desired State)

Commands

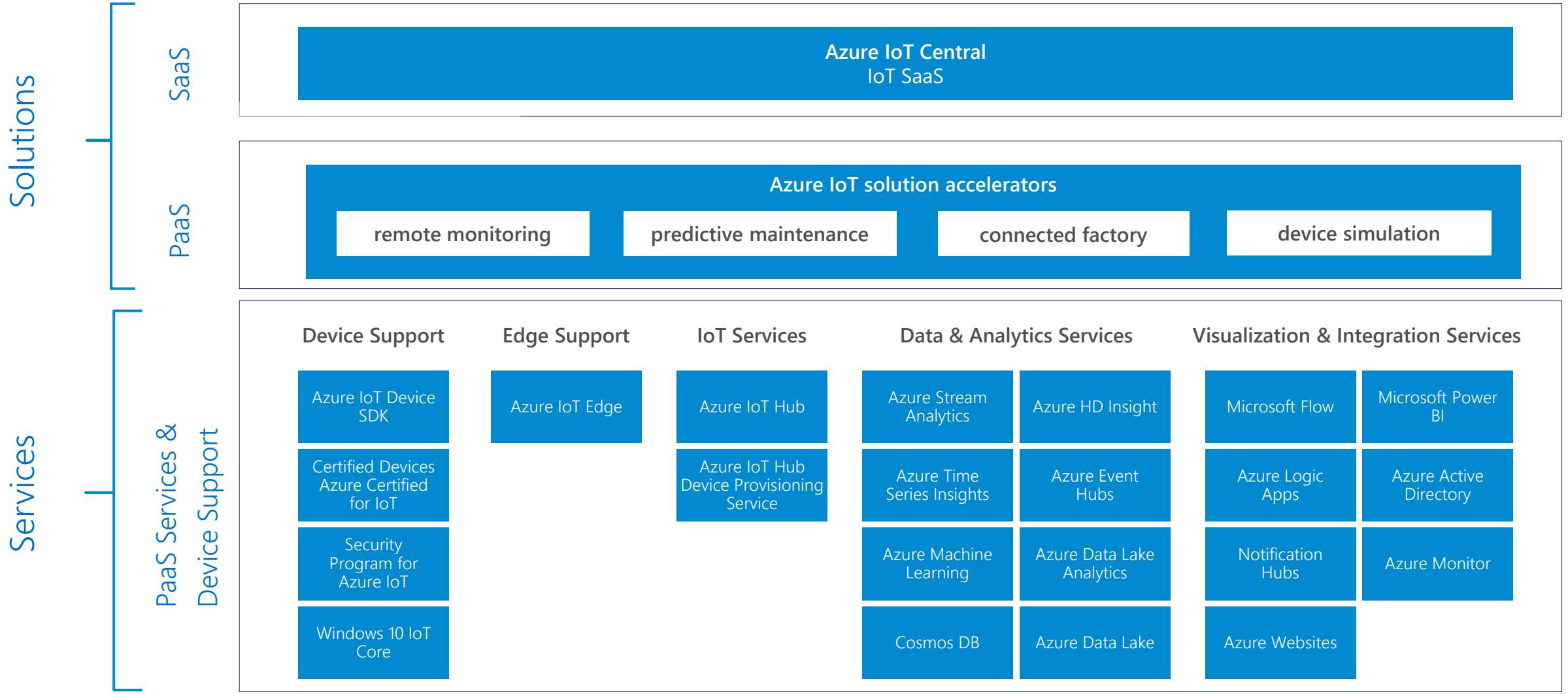
Message Routing

Azure IoT Reference Architecture



[Azure IoT reference architecture - Azure Reference Architectures | Microsoft Docs]

Comprehensive Set of Capabilities for IoT Solutions

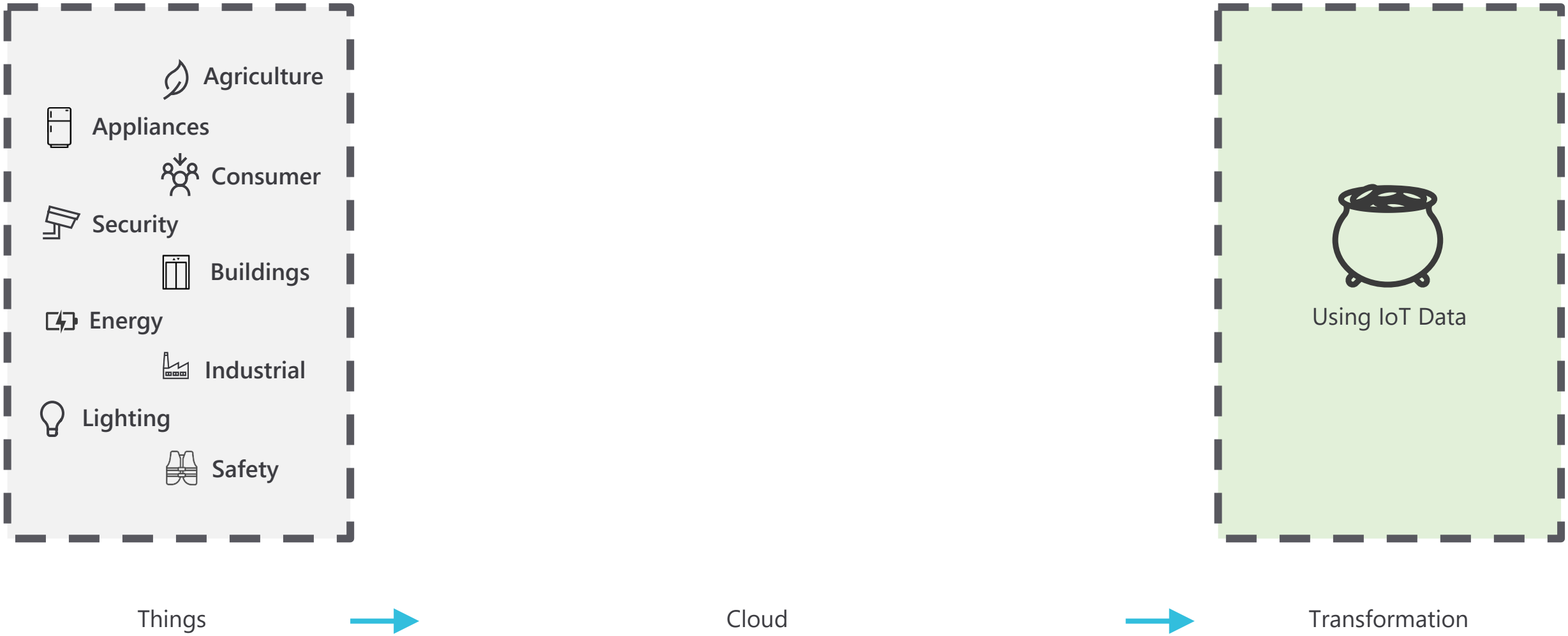


A rich partner ecosystem offers third-party solutions to address a wide range of needs

Device → Connectivity Provider → ISV → Service Provider → SI → Professional Services → Consulting → Solutions → Customer

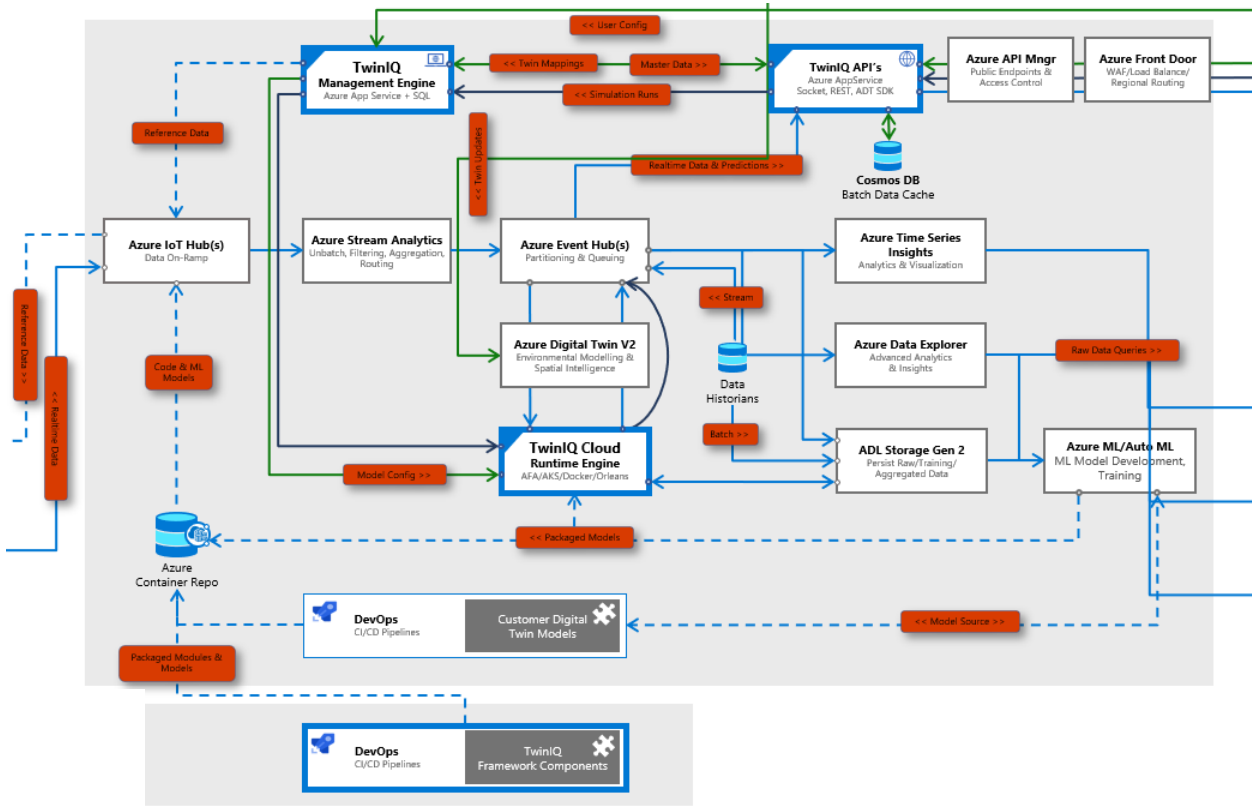
Developer Community	Partner Ecosystem	
Visual Studio, GitHub, hadoop, docker, php, nodeJS, Powershell, eclipse, python, ARMmbed, MySQL, Ruby, Java, mongoDB, Chef + Puppet	System Integrators & Advisors	accenture, CGI, HCL, EY, TATA CONSULTANCY SERVICES, HARMAN, eBECS, T-Systems, KPMG, Cognizant, Infosys, Tech Mahindra, SOGETI, avanade, pwc, DXC.technology, LARSEN & TOUBRO, Reply, wipro, Capgemini, robotron, MOQdigital
	Solution Providers	Schneider Electric, GE, ABB, esri, OSI, ICONICS, Rockwell Automation, ActionPoint, conplement, codit, Johnson Controls, Honeywell, SAP, ptc, C3IoT, energisme, SIEMENS, Atos Worldline, DUNAV NET, Hitachi Solutions, Schlumberger, COPADATA, relayr
	Solution Aggregators	ARROW ELECTRONICS, INC., SYNNEX, MESHSYSTEMS, CMI, Insight, happiest minds, ICT, AVNET, Tech Data, INGRAM, Mobiliya, SIGMA, at&t, M
	Devices	ST life.augmented, RENESAS, CISCO, kontron, RaspberryPi, DELL, libelium, Itron, intel, MOXA, Qualcomm, cradlepoint, BECKHOFF, HITACHI Inspire the Next, embedded systems, TOSHIBA Leading Innovation, Panasonic, NEXCOM, Hewlett Packard Enterprise, ADVANTECH, FUJITSU, Toradex, ARBOR

Complexity Emerges Quickly



Complexity Emerges Quickly

- Agriculture
- Appliances
- Consumer
- Security
- Buildings
- Energy
- Industrial
- Lighting
- Safety



Using IoT Data

Things → Cloud → Transformation

Complexity Emerges Quickly

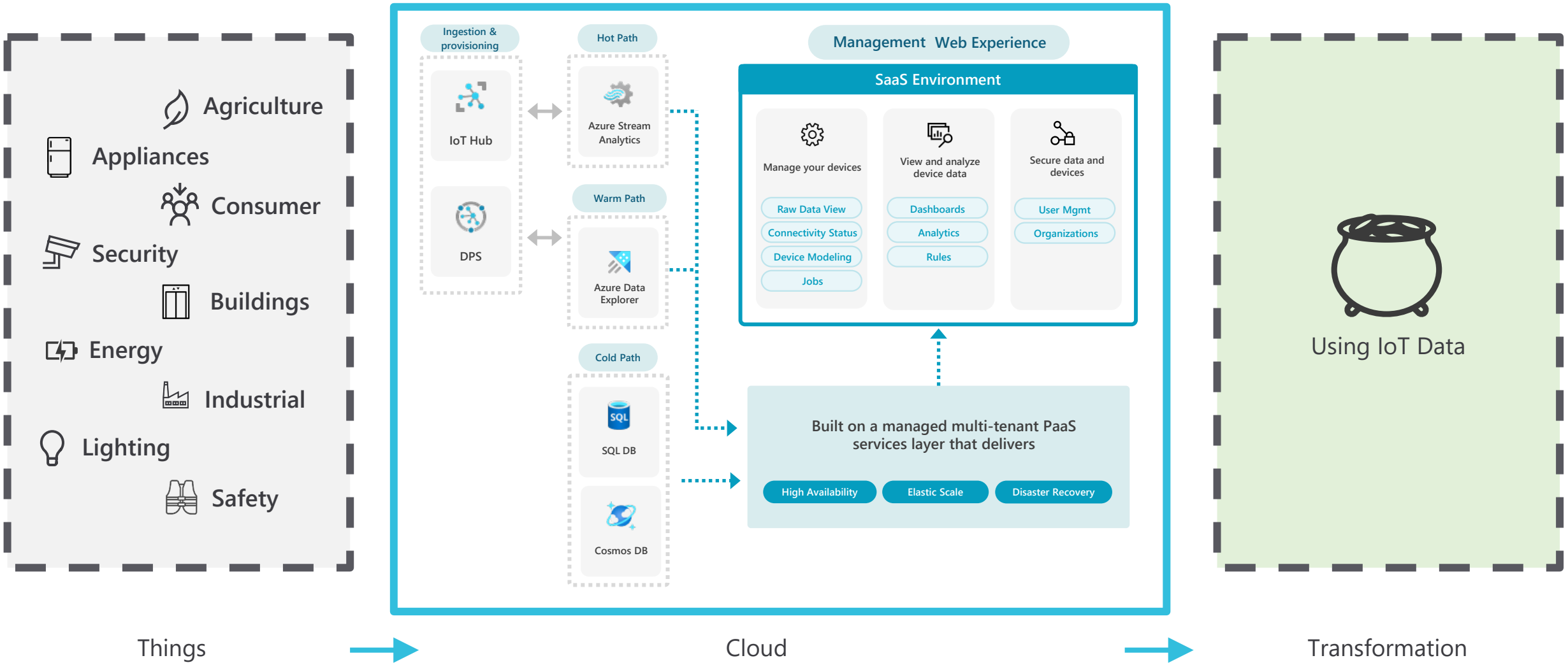
Agriculture
Appliances
Consumer
Security
Buildings
Energy
Industrial
Lighting
Safety

- How do I ensure this **scales**?
- What about **HA/DR**?
- How do I **model** my IoT data?
- Where do I **manage devices**?
- How can I manage **user access**?
- What about hot, warm, and cold **storage**?
- How do I know if my fleet is **connected**?
- How can I get support for **multi-tenancy**?
- How can I run **commands** against my devices?
- What about APIs to **access my data** from other apps?
- How can I **transform data** on ingress and egress?
- ….

Using IoT Data

Things → Cloud → Transformation

Removing Complexity



Removing Complexity

Agriculture

Appliances

Consumer

Security

Buildings

Energy

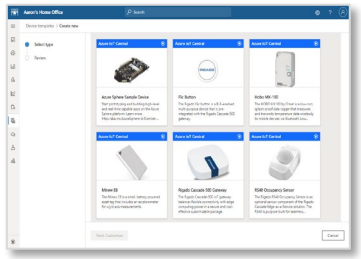
Industrial

Lighting

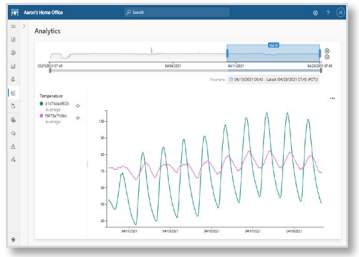
Safety

Azure IoT Central

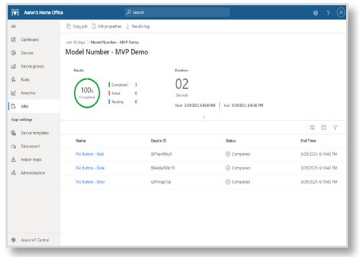
Connect devices



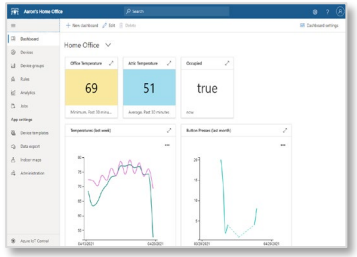
View and structure IoT Data



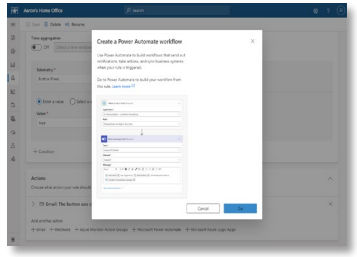
Cloud to device interactions



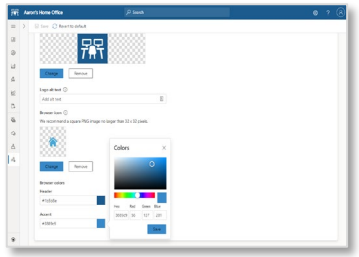
Monitor device health



Integrate with business apps



Customize



A ready-made environment for IoT solution development

Using IoT Data

Things

Scalable, Repeatable, Reliable

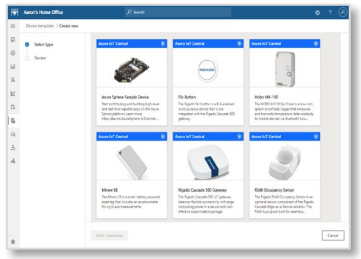
Transformation

Shifting the Focus to New Differentiated Value

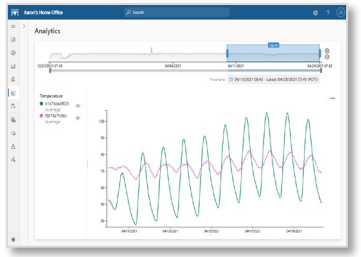
Agriculture
Appliances
Consumer
Security
Buildings
Energy
Industrial
Lighting
Safety

Azure IoT Central

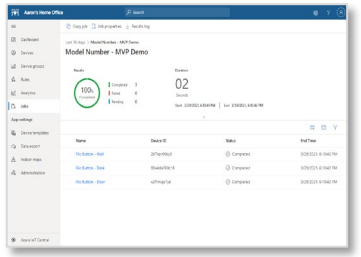
Connect devices



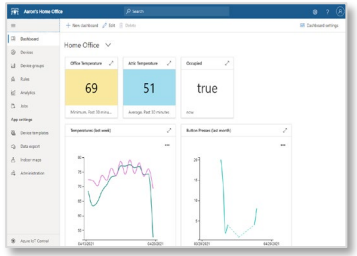
View and structure IoT Data



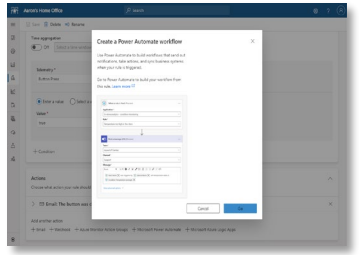
Cloud to device interactions



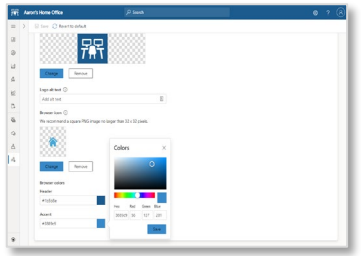
Monitor device health



Integrate with business apps



Customize



A ready-made environment for IoT solution development

for experiences and insights

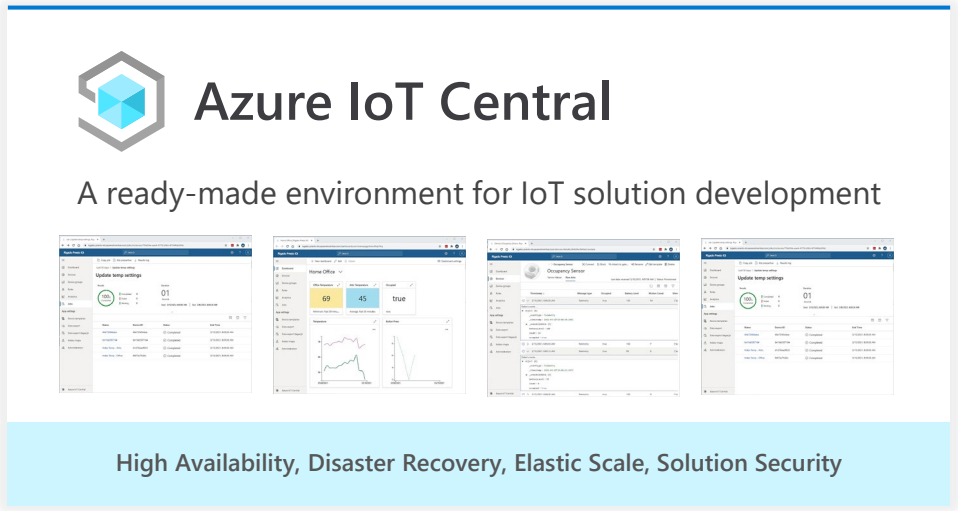
for storage or analysis

for business automation

for further computations

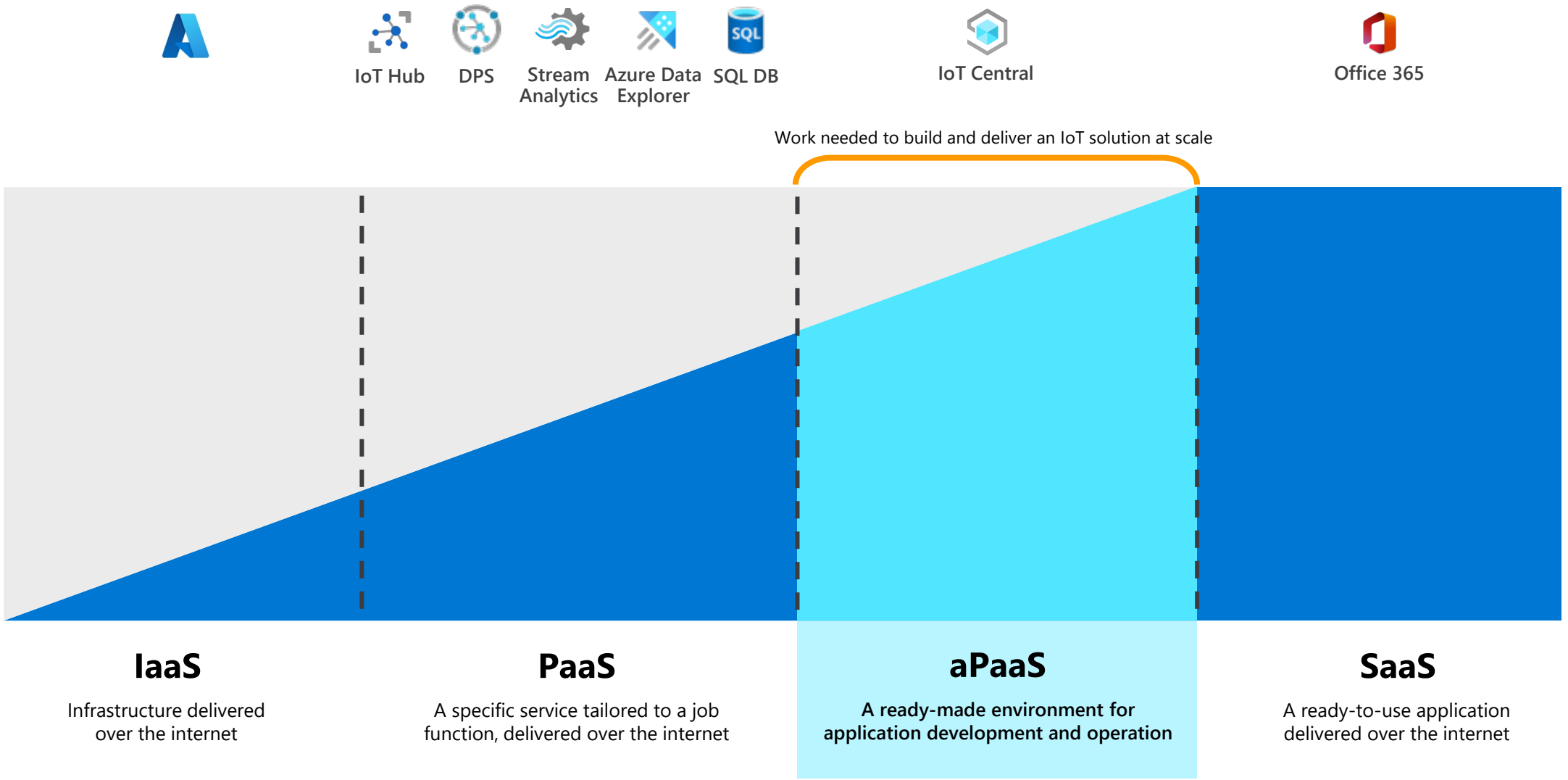
Things → Scalable, Repeatable, Reliable → Transformation

What is a “ready-made environment”?



aPaaS

aPaaS – Application Platform as a Service

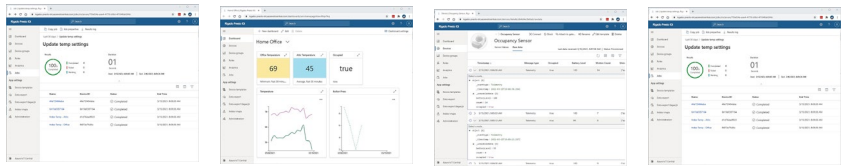


What's Included with IoT Central?

- Device & Telemetry Modeling
- Device Management
- 30 Days of Data Storage
- Dashboards
- Data Export

Azure IoT Central

A ready-made environment for IoT solution development

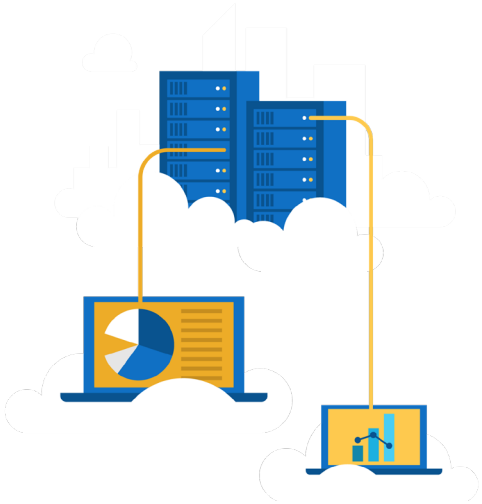


High Availability, Disaster Recovery, Elastic Scale, Solution Security

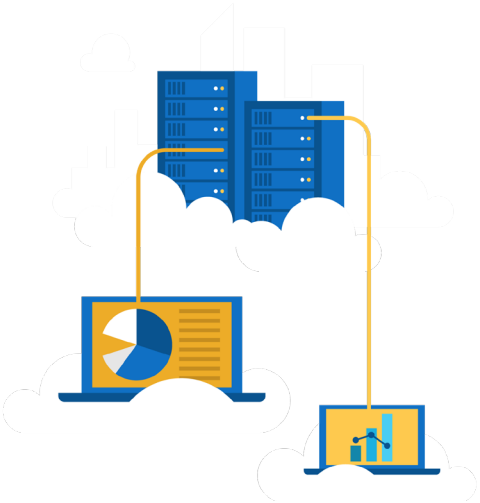
- Data Transformation
- Event Rules
- APIs
- Customization
- Multi-Tenancy

Break Time!

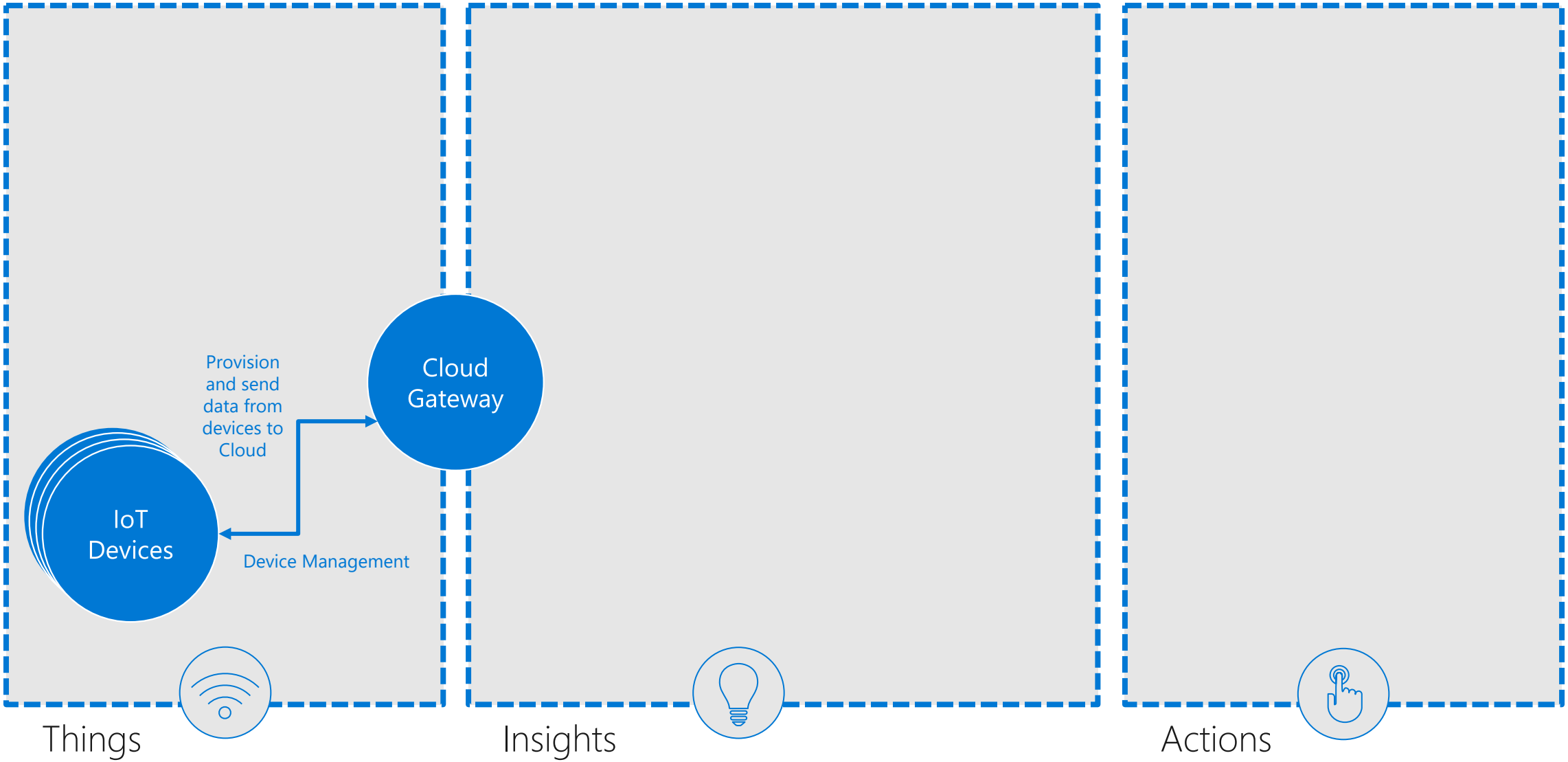
Hands-On Lab: IoT Central



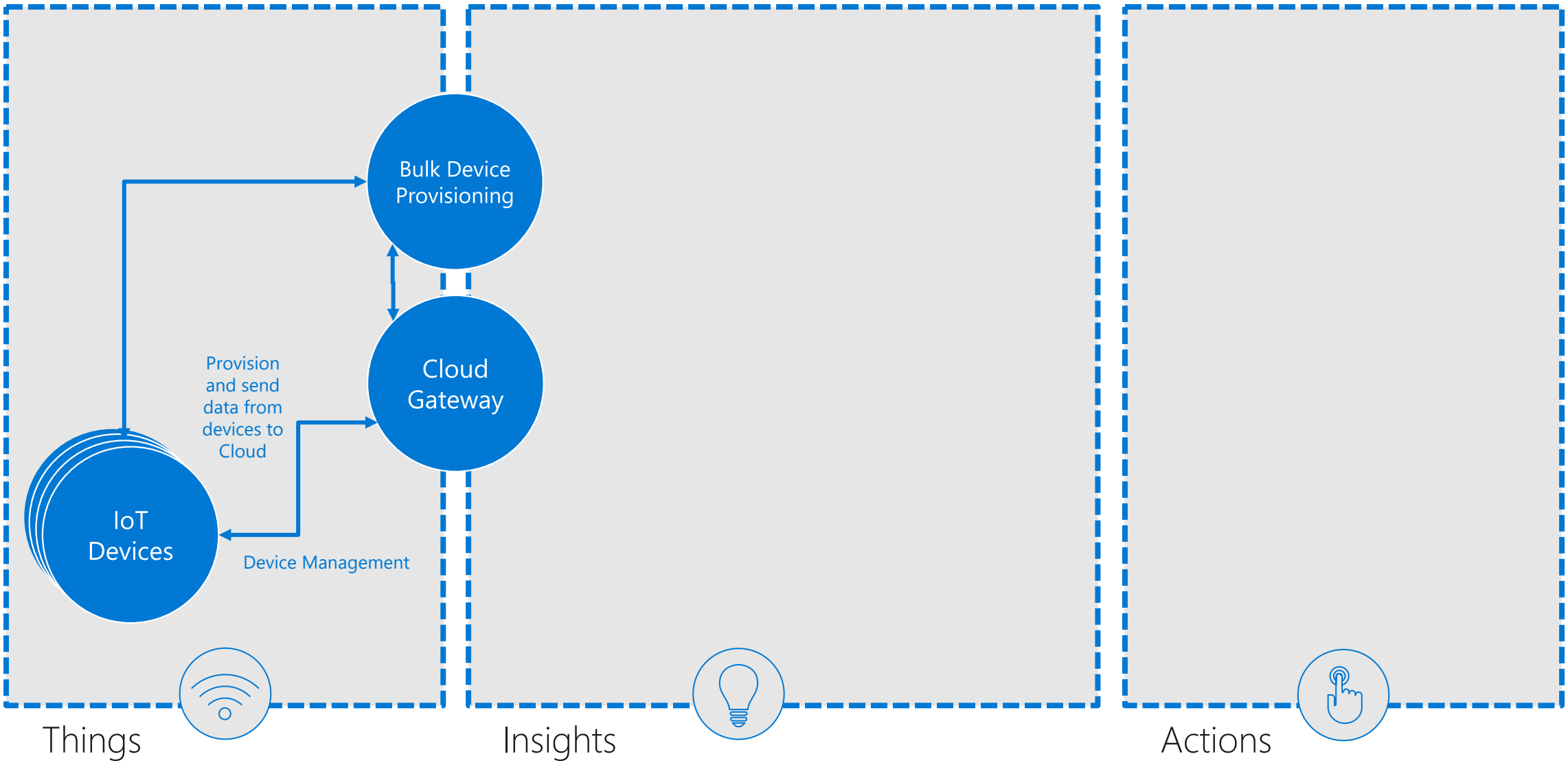
What did we learn?
Send questions to iotacademy@microsoft.com
We start tomorrow at 10am ET



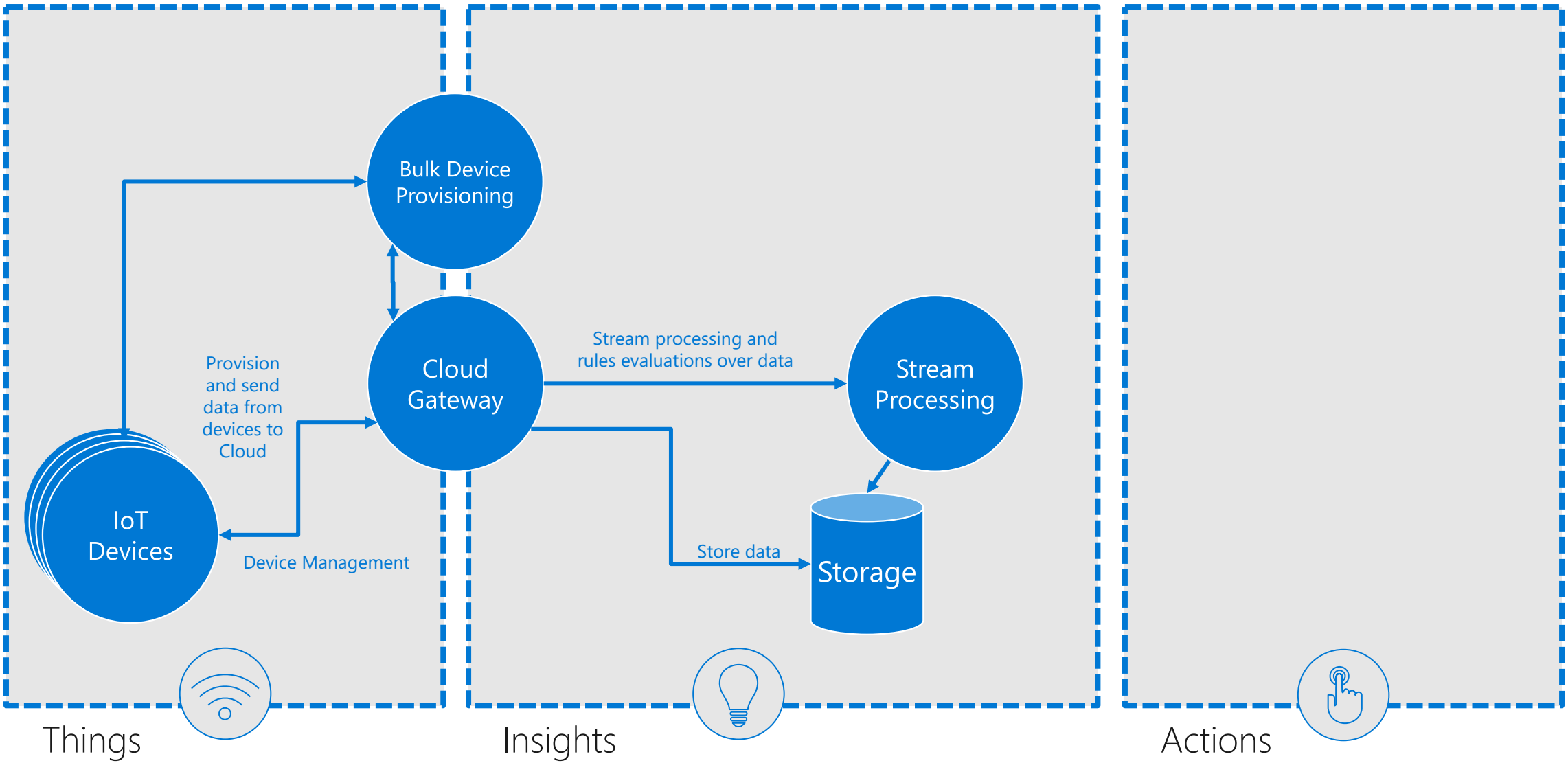
High-level IoT Architecture



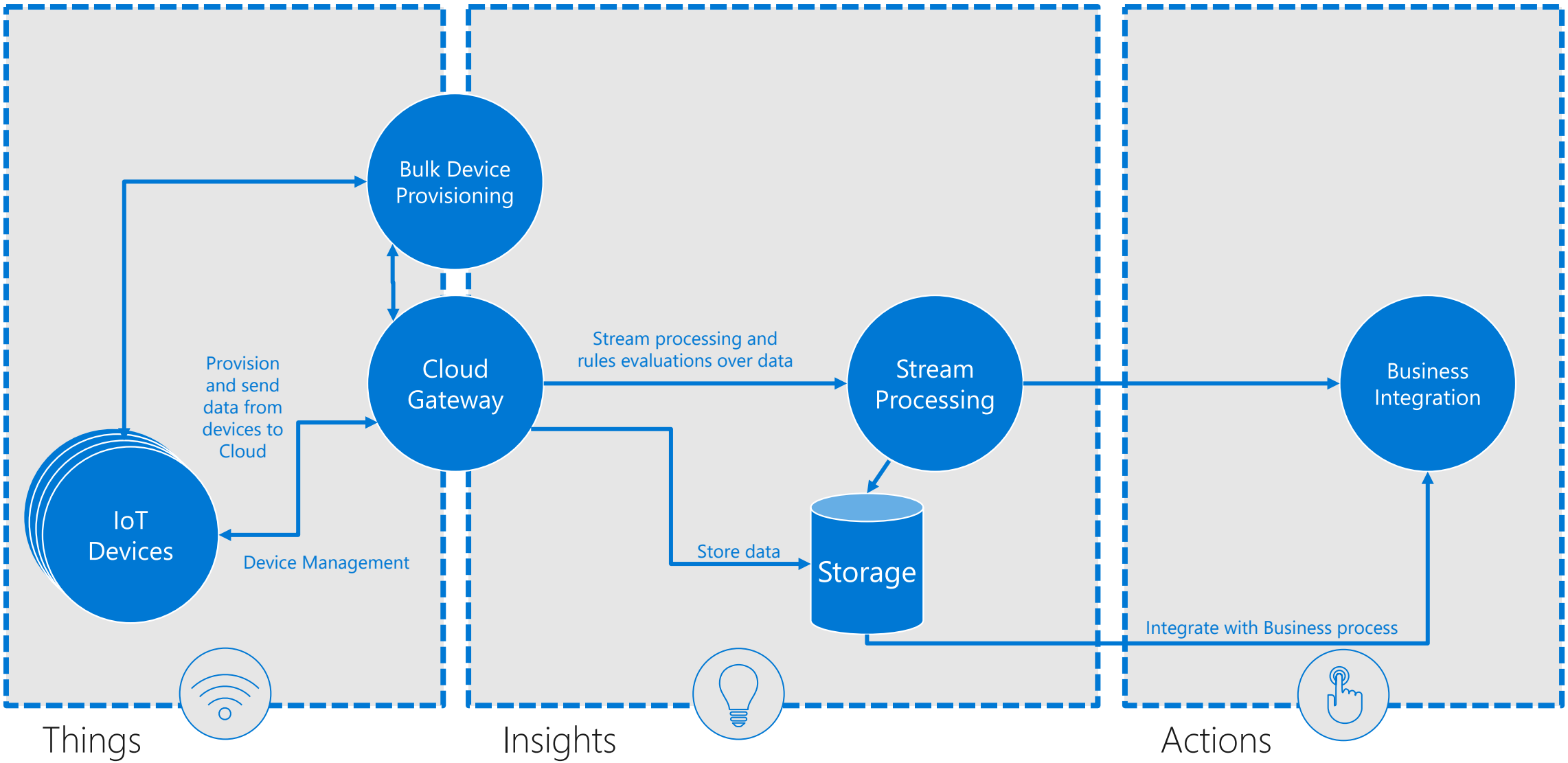
High-level IoT Architecture



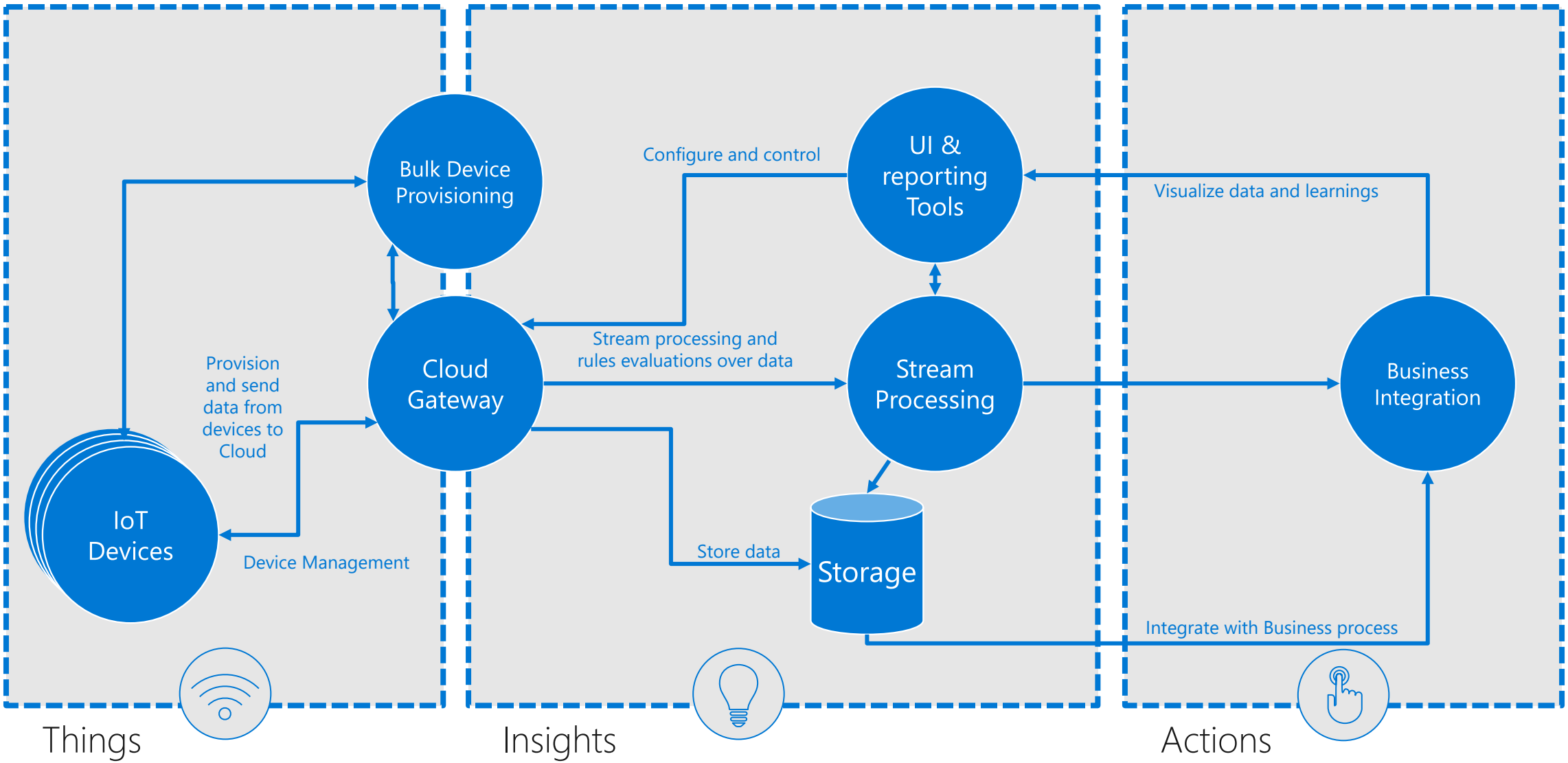
High-level IoT Architecture



High-level IoT Architecture



High-level IoT Architecture



High-level IoT Architecture