OVERNET.

2023 WPC

Azure Services:

Per spingersi coraggiosamente dove nessun IoT è mai giunto prima

Marco Dal Pino

Technical Consultant

Microsoft

Welcome

Enterprises are transforming their operations

Modernizing physical operations with latest digital technology

1. Gain greater visibility
2. Reduce costs
3. Improve efficiency and productivity
4. Increase customer satisfaction
5. Run agile, resilient, sustainable operations

Data-growth is powering digital operations

Fueling innovation, scalability, and faster decision-making

125B

Number of connected assets by 2030

>50%

Data processed at the edge by 2025

>50%

AI/ML driven edge computing deployments by 2026

Resulting requirements:

- Low latency, high bandwidth for faster processing, response
- Easy connection, communication and data flows across heterogenous device environment
- Processes mission-critical data at the edge; push and pull appropriate data to and from Cloud
- Need for AI/ML-systems to make real-time decisions

Data from Gartner

Customer needs for digital transformation

End-to-end solutions that are simplified, secure, observable, and dependable

Discover & Connect Industrial Assets

- Meet assets where they are – brownfield & agent-less
- Find and securely onboard diverse assets easily using their data models and interfaces

Seamless Integration & Processing

- Embrace open & industry standards - K8s, MQTT & OPC UA
- Collect, ingest and process data at the edge for cloud to edge data analytics

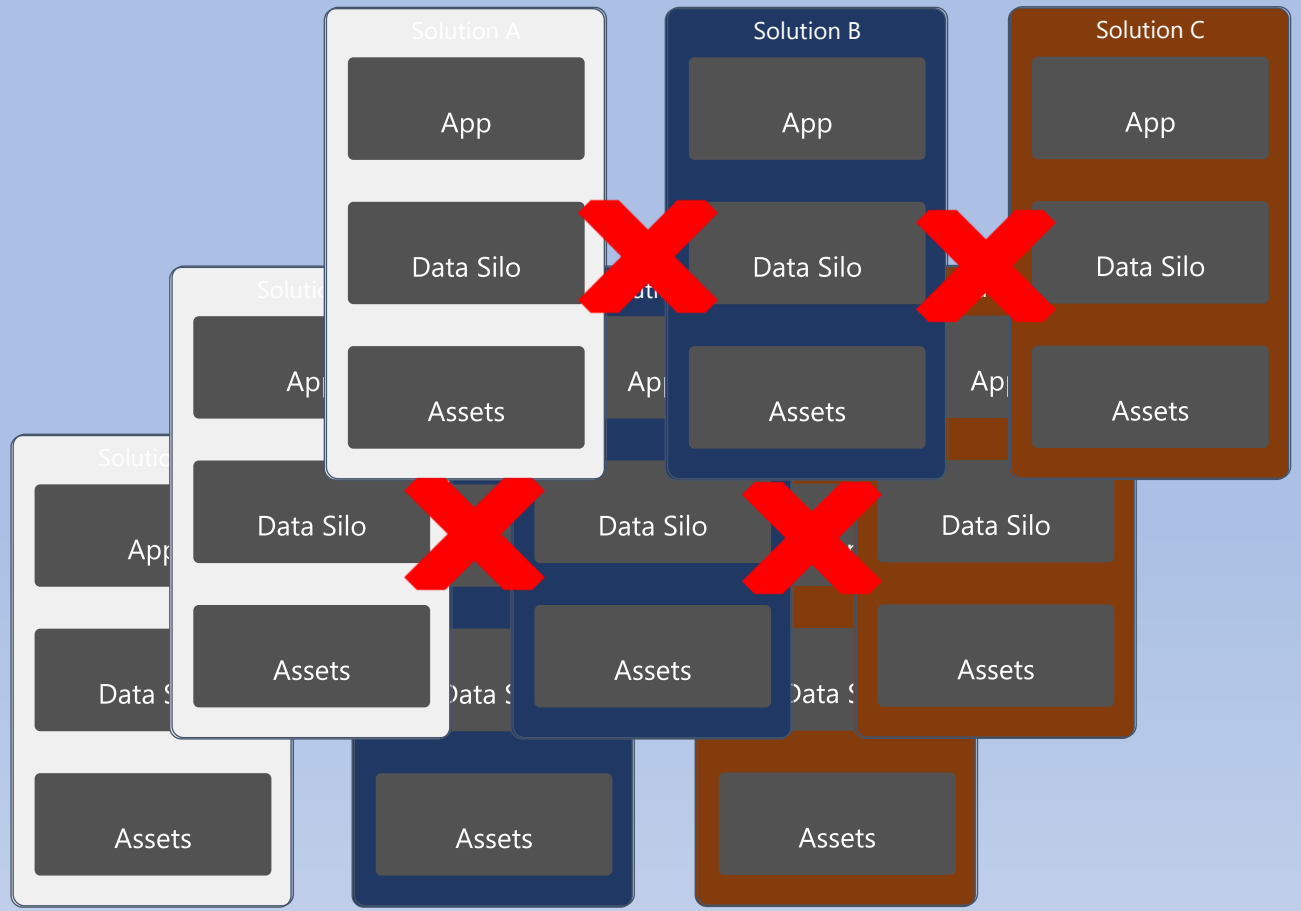
Unified Control & Management

- Manage, govern data across cloud and edge with unified management plane
- Centralized data policies, standards that ensure security and sovereignty

Siloed solutions break interoperability

Heterogeneous solutions in multitude of silos

1. Locked data
2. Lost repeatability
3. Increased cost of scale



Ideal solution enables scale and interoperability

Empowering continuous business value, competitive advantage and significantly lowering costs

1. Gain process & operational efficiencies with digital feedback loops
2. Accelerate innovation on global scale
3. Maximize investments and reduce technology and infrastructure spend

Customer Learnings

What is required to scale the digital transformation of physical operations?

- ✓ Simplified, unified experiences and onboarding for IT & OT
- ✓ Flexible, composable services that integrate seamlessly
- ✓ Consistent control, management & security practices
- ✓ Cloud to edge data processing and analytics/AI
- ✓ Common cloud native app and DevOps experiences
- ✓ Embrace open & industry standards -K8s, MQTT & OPC UA
- ✓ Meet devices where they are – brownfield & agent-less

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Microsoft’s strategy and investments

How Azure IoT is expanding to support Digital Transformation needs

Managing devices and operations at scale

Connected products

- Connect devices to deliver new product offerings with expanded capabilities and user experiences
- Remotely monitor, control, and troubleshoot large-scale fleets of devices (often millions)
- Develop new hardware to enable end-user opportunities

Azure IoT Hub, Azure IoT Edge, DPS

+

Connected operations

- Understand, operate & automate my factory, store, hospital, etc.
- Consistently onboard enterprise assets across numerous sites
- Utilize existing and third-party hardware to enable my business

Azure IoT Operations, Azure IoT Operations Experience

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Product Investment Themes

Azure

Azure Scale

Converged Experiences for IT and OT

Asset Modelling and Onboarding

- Edge workload deployment
- Asset discovery
- Asset creation
- Digital twin model creation

Data Processing and Analytics

- Edge data processing
- Route data to analytics platform
- Route data to event processors in the cloud

Workload Management

- Monitor solution health
- Manage updates to infrastructure and workloads
- Device fleet management

Digital Operations Experience Investments

Site, Asset onboarding, monitoring and lifecycle management experiences

Site, process, product line management

Asset onboarding, hierarchy & interactivity

Tag/Signal Management

Site, Asset & Edge health, Condition monitoring

Configuration as code to power lifecycle management

Integration with Azure data services and 3rd party partner solutions

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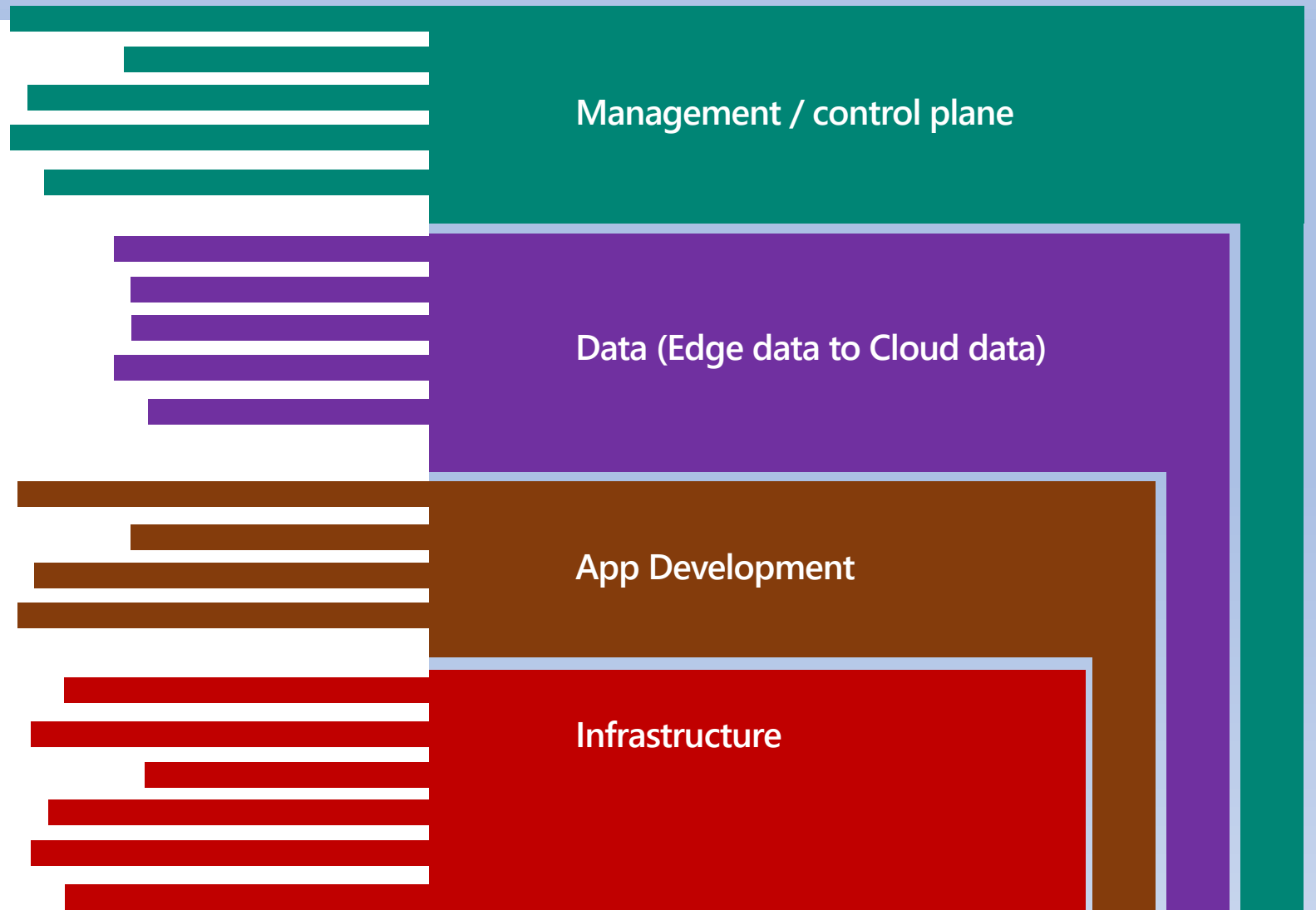
A unified cloud-to-edge approach

Unlock repeatability with platform consistency

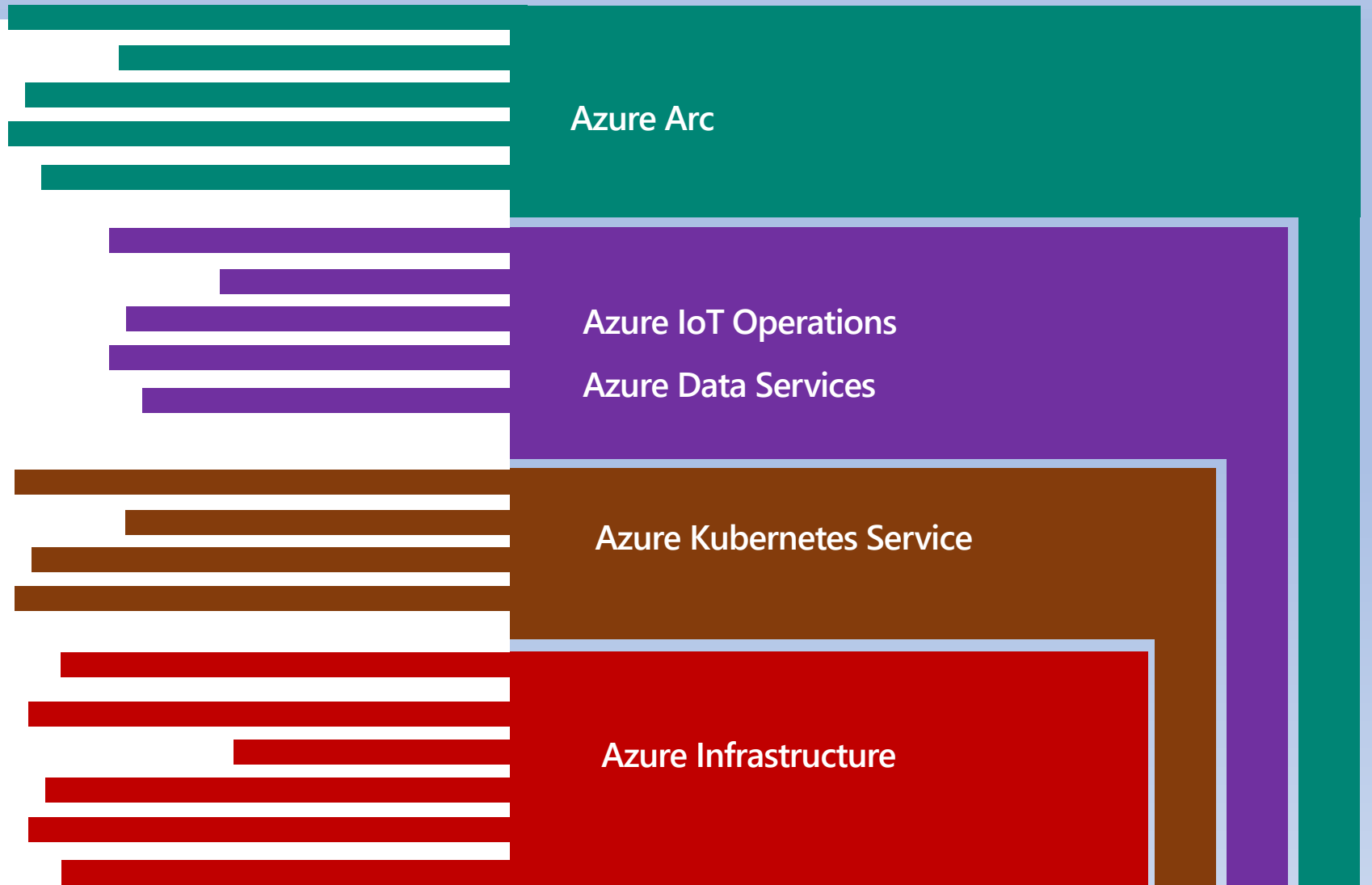
1. Simplify operations, management, and security
2. Deliver cloud agility anywhere
3. Transform physical operations with cloud and AI



Unify cloud-to-edge with Microsoft

Unlock Repeatability to Enable Scale

1. Scalable
2. Repeatable
3. Consistent



Azure Arc-Enabled Infrastructure

Run modern containerized workloads on infrastructure that offers robust high-availability, elastic compute

Azure Arc-enabled

Windows IoT

Operating system optimized for running on embedded devices ranging from robots, kiosks, HMIs to edge gateways.

Works with AKS Edge Essentials to create light-weight platform for running containerized applications on edge devices.

Azure Stack HCI

Server-class infrastructure that provides an out-of-the-box Arc-enabled platform for running and managing Azure edge solutions.

Works with AKS on Azure Stack HCI to run containerized applications on server class devices.

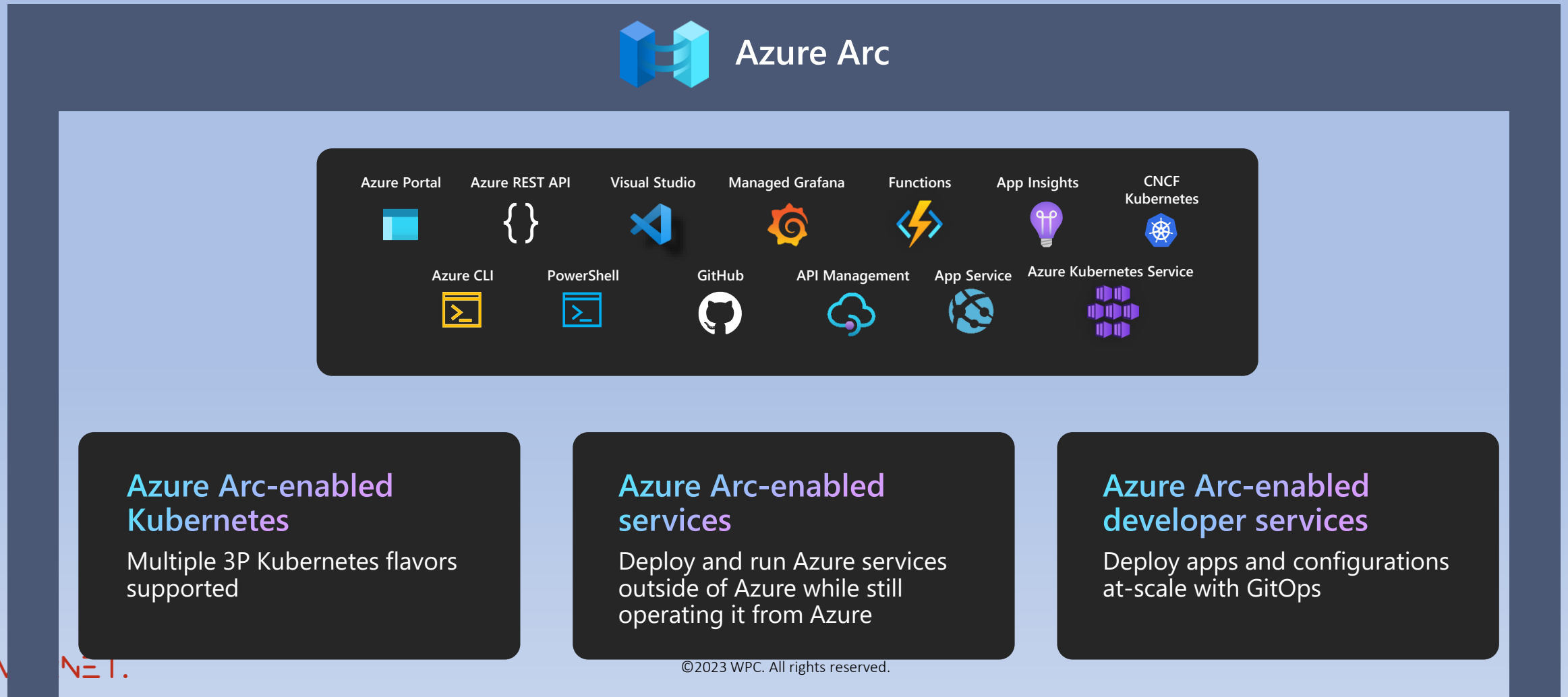
Microsoft supported software stack from kernel to cloud, Windows to Azure covering your solution from top to bottom

Azure cloud-to-edge infrastructure

Connect, manage and operate on any infrastructure with consistent and familiar tools

Azure's cloud-to-edge application platform

Connect, manage and operate applications and Kubernetes clusters running anywhere



Azure's cloud-to-edge data platform

The data platform for the era of AI

Azure Arc + Azure IoT Operations

Locally Aware

Ingest and process data

Open Standards (MQTT, OPCUA)

Connected to Azure

Lake centric and open

OneLake

One Copy

Open at every tier

Complete Analytics Platform

Familiar and intuitive

Built into Microsoft 365

Insight to action

AI Powered

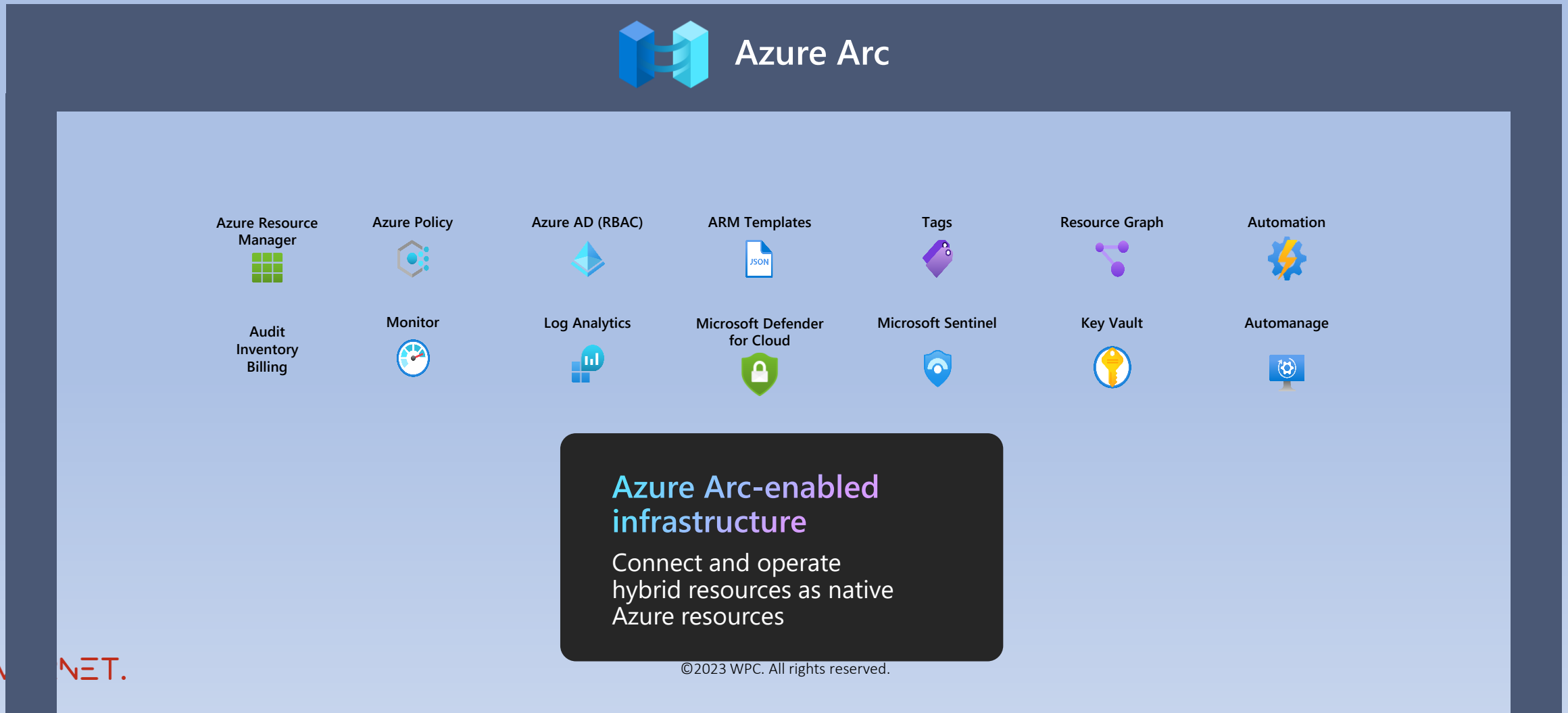
Copilot accelerated

ChatGPT on your data

AI driven insights

Azure's cloud-to-edge management platform

Single control plane to simplify operations, management, and security



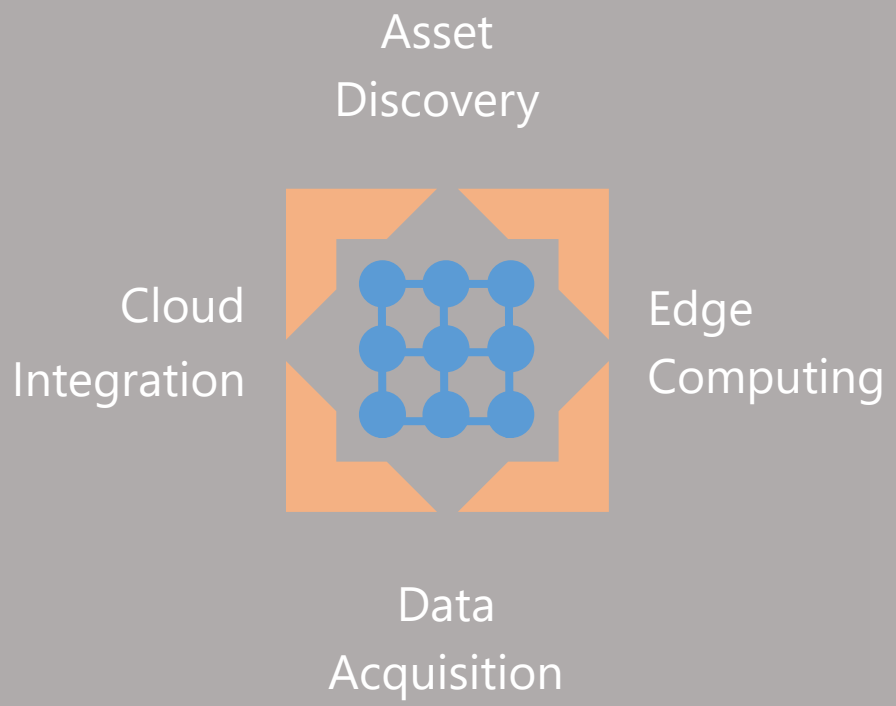
Introducing: Azure IoT Operations, enabled by Azure Arc

In Private Preview since July

Azure IoT Operations

An Arc-enabled suite of composable and **modular services that help organizations discover assets, capture insights, and take actions to optimize their operations:**

- Out of box compatibility with existing Arc-connected infrastructure: Windows IoT, AKS Edge Essentials, AKS on Azure Stack HCI, and more
- Designed for high availability, resiliency, scalability, and security
- An edge-native data plane built on industry standards (MQTT, OPC UA, OTel)
- Bring cloud-native development to the edge through Kubernetes
- Simplifies management of all edge services from cloud using Azure Arc



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Azure IoT Operations

The Arc-enabled suite of services for Digital Transformation

1. **Discover and onboard assets easily**
2. **Edge-native data plane with built in bi-directional cloud-to-edge communication**
3. **Efficiently process data at the edge**
4. **Control devices in isolated network layers**
5. **Rely on ready-to-use cloud connectors**
6. **Push and pull the right data to and from the cloud**
7. **Single control plane for management and security**
8. **Scalable approach to application development and deployment**
9. **Use orchestration to simplify the deployment, configuration, and updates**
10. **Troubleshooting & monitoring via industry-standard tools**

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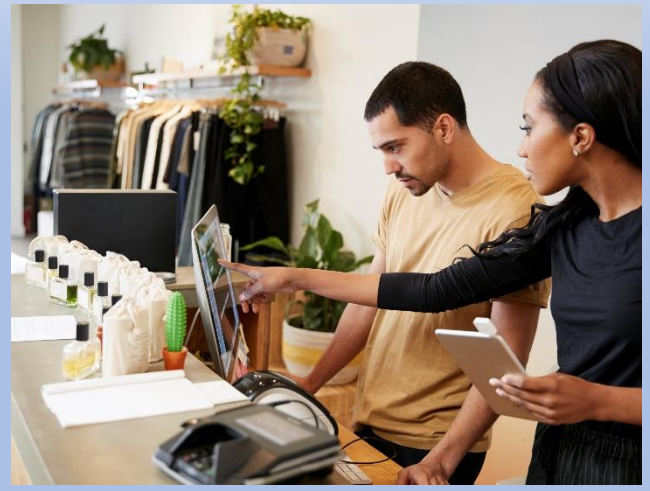
Azure IoT Operations Use Cases

Industrial

Predictive Maintenance
Asset Health
Factory Automation



Retail

Contactless Checkout
Inventory Management
Edge Vision AI

Healthcare

Patient Monitoring
Real-time Diagnosis
Intelligent Devices

Financial Services

Fraud Detection
Real-time Analytics
Compliance
Monitoring

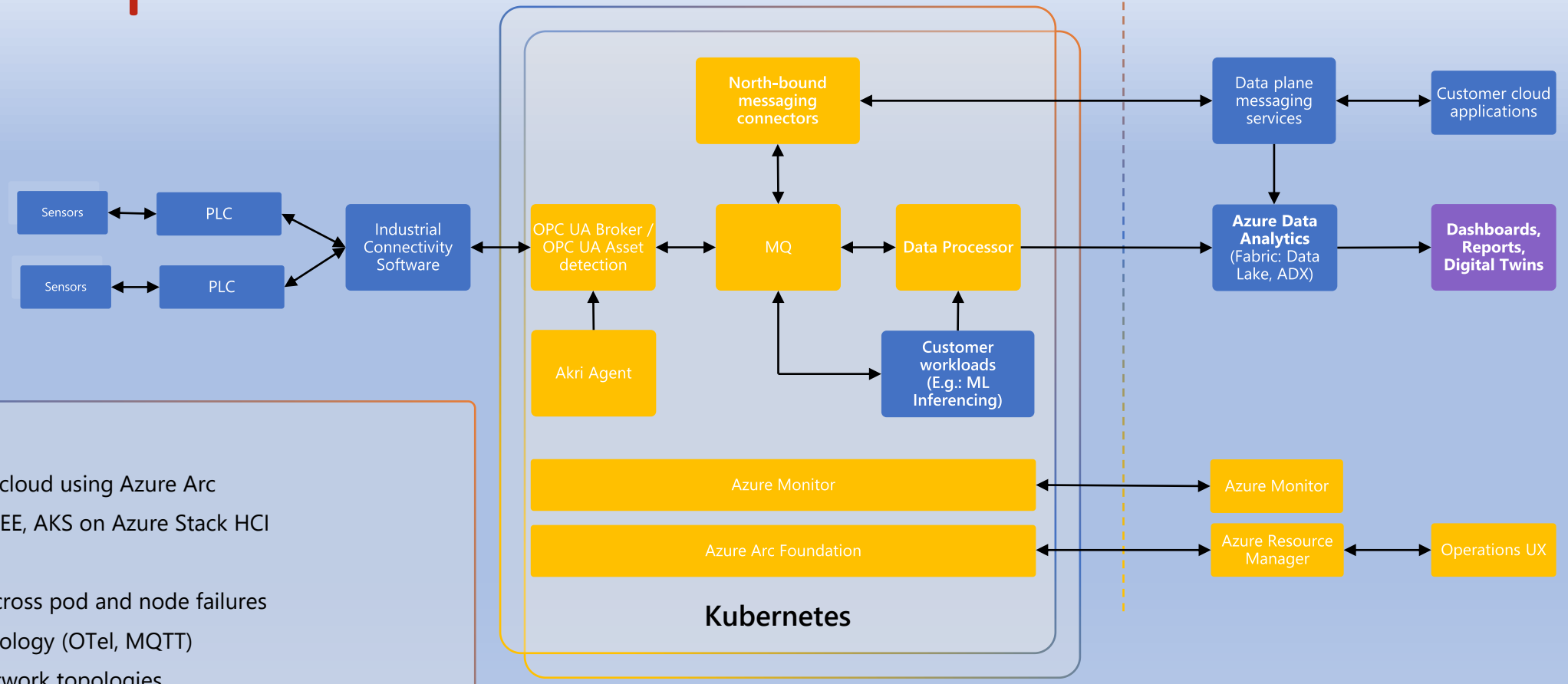
Common needs for holistic integration, security and cost optimization

Azure IoT Operations Services

Modular, composable services for diverse needs

- Azure IoT Akri
- Azure IoT OPC UA Broker
- Azure IoT MQ
- Azure IoT Data Processor
- Azure IoT Layered Network Management
- Azure IoT Orchestrator

Azure IoT Operations Architecture



Key Attributes:

- Manage all edge services from cloud using Azure Arc
- Out of the box works with AKS EE, AKS on Azure Stack HCI
- Extensible, scalable, and secure
- High availability and resilient across pod and node failures
- Built on standards-based technology (OTel, MQTT)
- Built-in support for isolated network topologies
- Customer workloads integrated into the platform as a unified solution
- Supports GitOps configuration as code flows for deployment and updates
- Natively integrates with Azure Data Analytics (Data Lake, ADX) in the cloud
- Common operational model (deploy, configure and update)
- Common support model using support bundles for expedited CSS troubleshooting

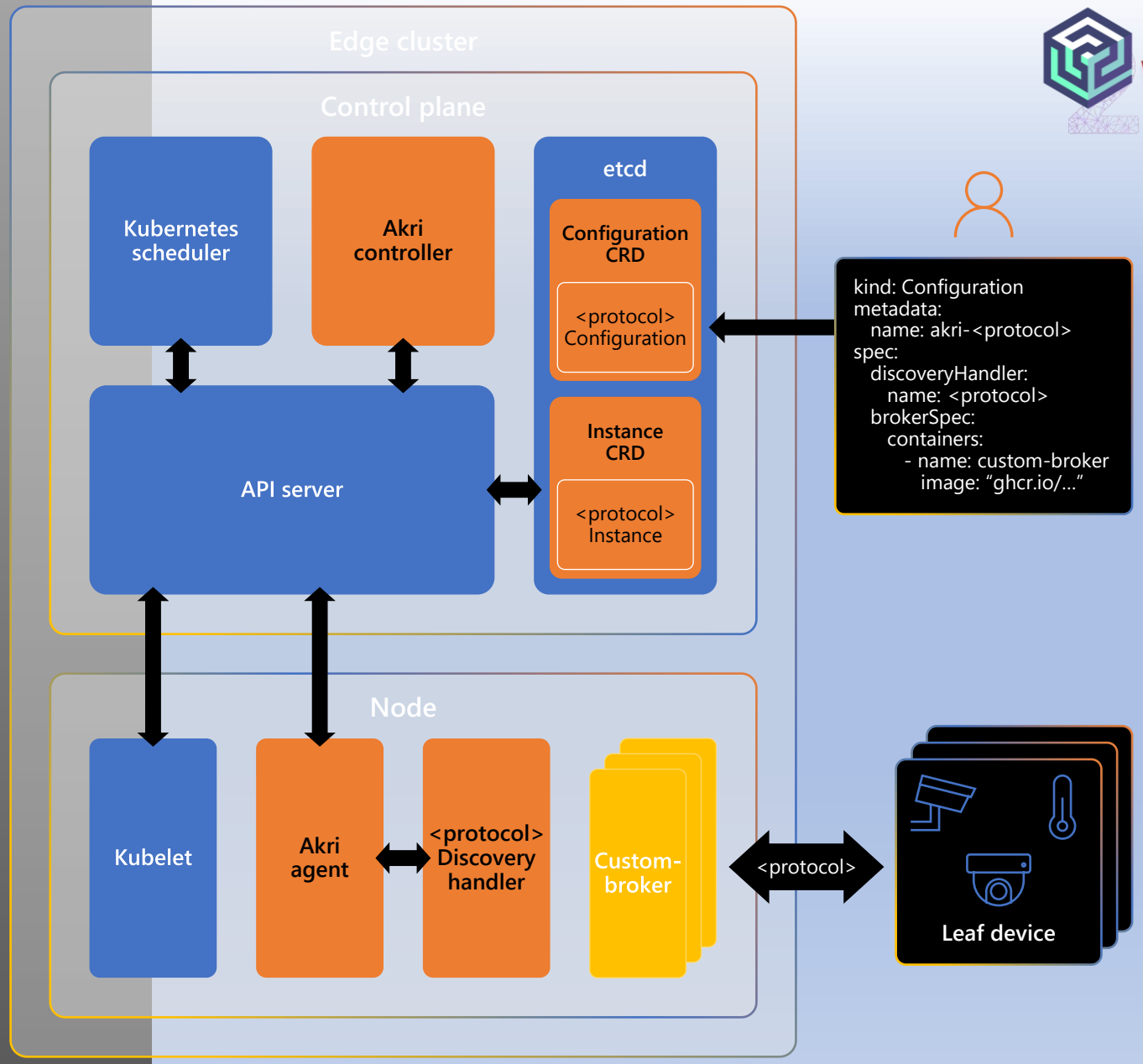
Azure IoT Akri overview

Enables connections to devices via their protocols (OPC UA, ONVIF, udev, etc.) thus extending our reach to both off-cluster and non-K8s devices

Detects new devices automatically or on-demand, making scaling up or down very easy

Registers devices as Kubernetes resources, just like memory or CPUs

Assign workloads to specific devices or group of devices, even if attached to other nodes



Azure IoT OPC UA Broker overview

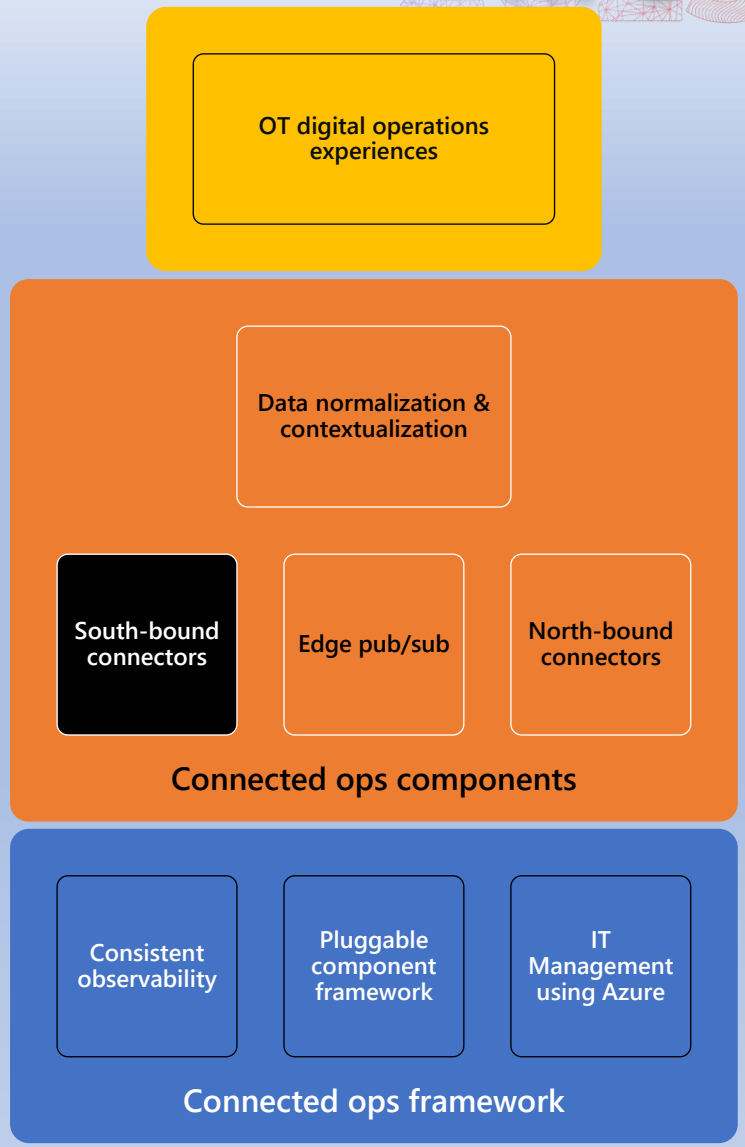
- OPC UA Broker is enriching and simplifying the experience OT experts and developers have when integrating the necessary functions required to connect to local OPC UA.

Benefits

- Simplified, plug and play experience for OPC UA enabled equipment
- Scalability and high availability
- Support for publishing, control loops, alarms and events
- Targeting “zero-data-loss”
- Seamless integration with Azure (e.g., Azure Arc-enable)

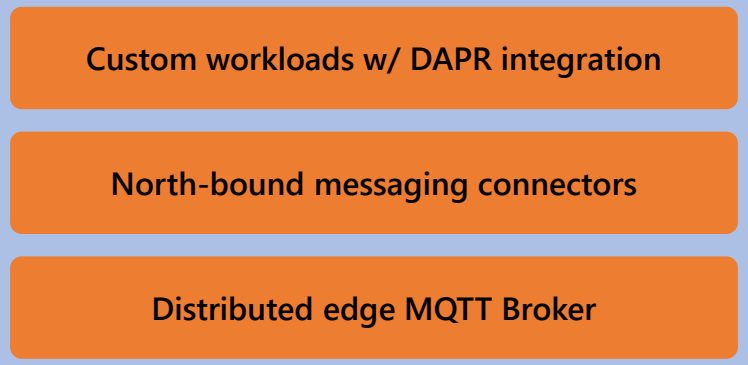
Features

- Native Kubernetes workload connected to E4K
- HA and 0-data-loss with active/standby model on E4K data plane
- Asset detection based on OPC UA Companion Specifications
- GitOps –ready
- OPC UA Events, Browsing, and Read/Write/Call



Azure IoT MQ

Kubernetes-native, Azure Arc-enabled MQTT data plane platform for the edge



Edge-native

- Efficient, tunable resource usage
- Built-in self-healing capabilities
- Operationally simple with minimal dependencies and rich self-help tooling
- Message persistence built-in for network outage resilience

Spec-compliant MQTT ++

- High performance, highly available and scalable MQTT Broker – MQTT v3.1.1 and v5 spec compliant
- Kubernetes-native configuration and management – CRDs + operator
- Built-in HA key value store facility
- Rich, modern observability instrumentation

Gateway to the cloud

- Flexible bi-directional cloud/edge connectivity via first-party north-bound connectors:
  - MQTT Bridge to Event Grid MQTT Broker
  - Kafka / Event Hub
  - IoT Hub
- Nested ISA-95 network topology support

Integrate workloads your way

- Works seamlessly with standard MQTT client libraries
- Implements Dapr pub/sub and state store building blocks
- MQTT Sparkplug B friendly
- Enables use of low-code platforms like Node-RED

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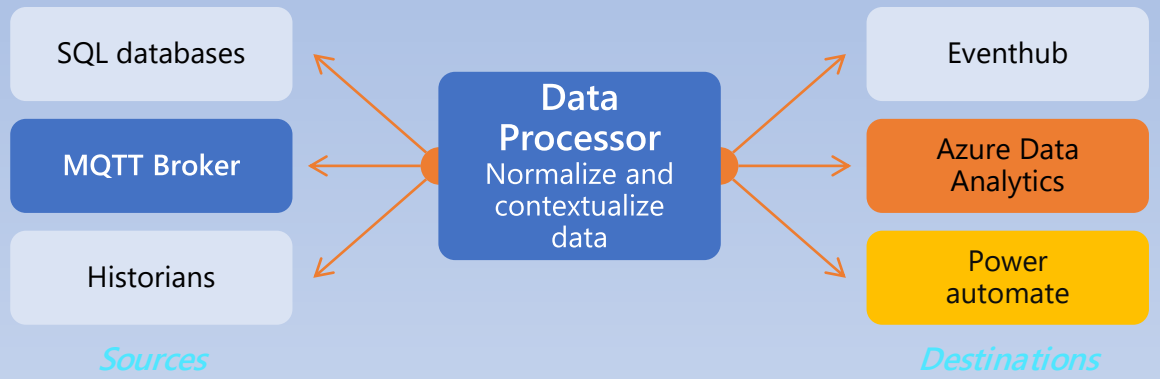
Azure IoT Data Processor

Why

Customers are trying to get value from their data easily and quickly, however IoT data is difficult to work with.

IoT data challenges:

- Assets generate data in different formats
  - JSON, Protobuf, CBOR, MessagePack
- Assets use various protocols for communication
- Data stored in multiple data silos
  - Historian, MES, OPCUA server
- Structure of data is not conducive for easy query



What

Data Processor is an Azure ARC-enabled service that runs on the edge.

- Integrates with E4K on the edge
- Provides flexible data normalization and foundational contextualization in near real-time
- **Normalization**
  - Format conversion (Protobuf, binary etc.)
  - Homogenize units of measures
  - Metric extraction, computed metrics
  - Un batching, down sampling, aggregations
- **Contextualization**
  - Forward fill with Last Known Value
  - Enrich messages with contextual data about assets from on-prem data sources (SQL, InfluxDB, HTTP)
- Built-in Azure Data Analytics integration to easily analyze "clean data" coming out of Bluefin
- Provides clean data for partners to build higher value solutions on

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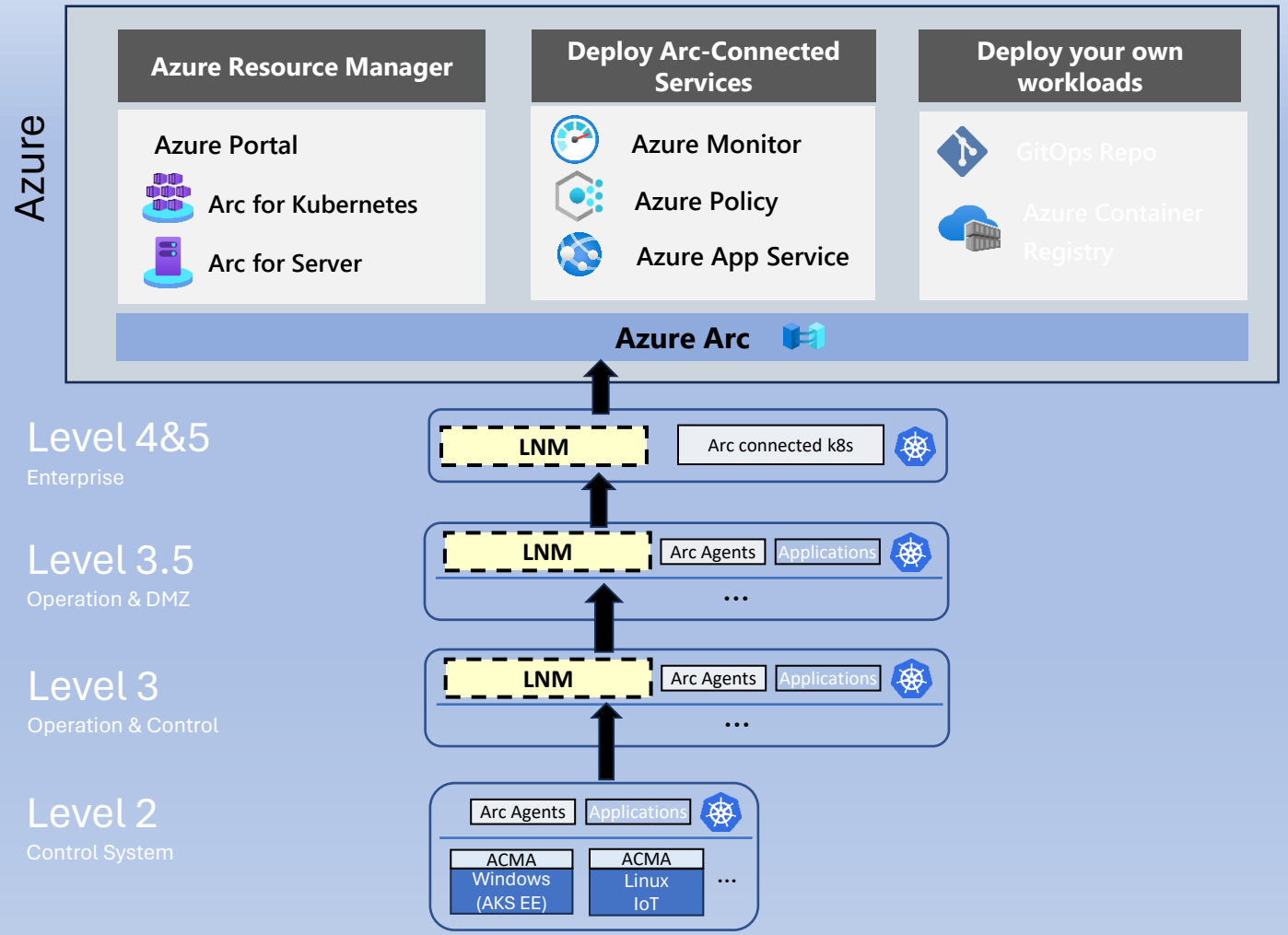
Azure IoT Layered Network Management (LNM)

Cloud connect devices in isolated network layers
(without direct line of sight to the Internet)

Data flows compliant to security standards such as ISA-95

Manage and configure all hybrid workloads remotely from single Arc control plane

Configure endpoints to whitelist at each network level



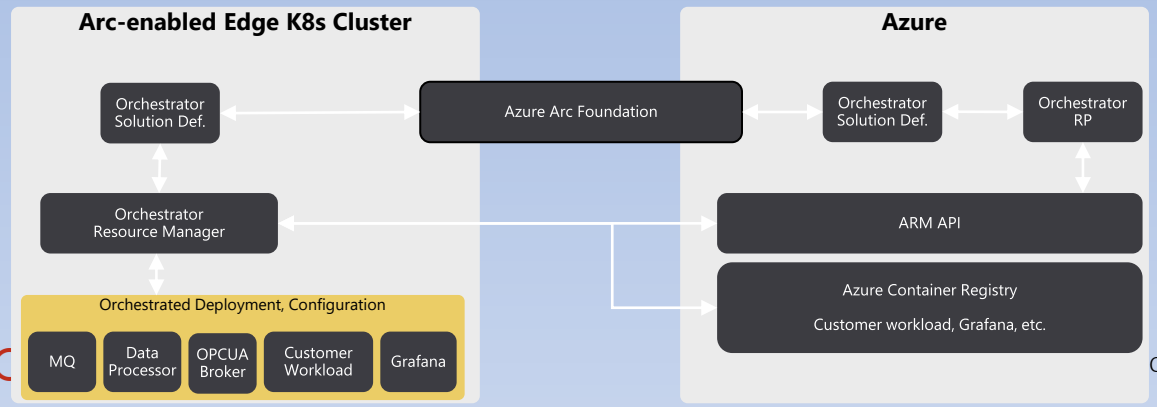
Azure IoT Orchestrator

Why

Customers are trying to deploy, manage and configure their workloads uniformly. However, platforms are heavily fragmented.

Customer challenges:

- Heterogeneous hardware that is fragmented heavily
  - One of our customers has 13 OS variants; E.g.: AUTOSR, Linux, Android, QNX
- Want to adopt Kubernetes, but still have lot of legacy apps
- Solutions typically contain combination of native Windows/Linux apps, Kubernetes services, and cloud services
- Application workloads are built and deployed using varying tech
  - Containers (Helm), Windows applications (MSI), Linux apps (Snap/RPM/), Android APKs, etc.

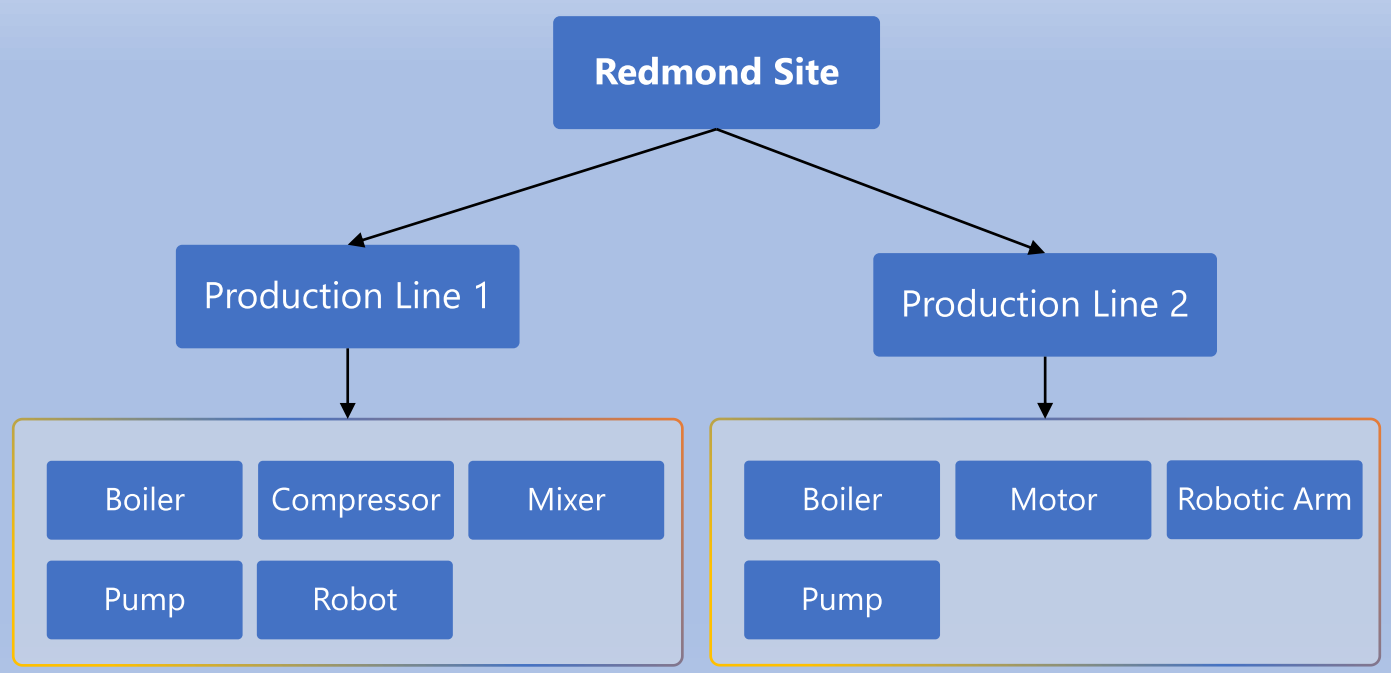


What

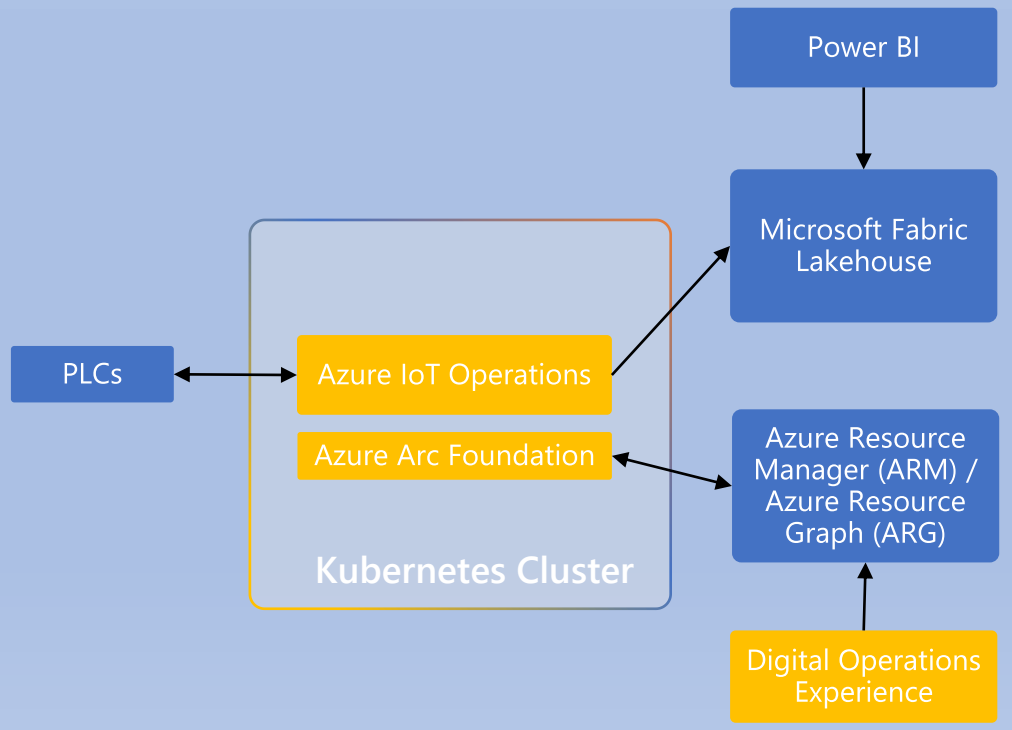
Orchestrator is a highly extensible orchestration engine that can manage infrastructure, policies, and applications across a wide range of platforms.

- Customer can describe the solution using three simple concepts
  - Solution Template: list of all components in a solution
  - Target: a deployment target for a solution
  - Instance: bind a solution to a target
- Executes state seeking via an extensible provider model
  - Out of the box support for Helm, Kubectl, Arc, etc.
- Dependency chaining between components within a cluster
- Configure each service and their interdependencies such as secrets for cross service communication
- Parameterization of configuration, plus component overrides
- Approval gates at multiple levels
- GitOps can be easily overlayed on top of Symphony RP

Demo



Plant Layout



Architecture

Contoso OEE - Redmond Site

Asset

- PL1_boiler
- PL1_compressor
- PL1_mixer
- PL1_pump
- PL1_robot
- PL2_boiler
- PL2_motor
- PL2_pump
- PL2_roboticArm

Manufacturer

- Compression Industrial
- Mixer Dynamics
- MotorZap
- Pump Productions LLC
- Robotech
- Steam Innovations

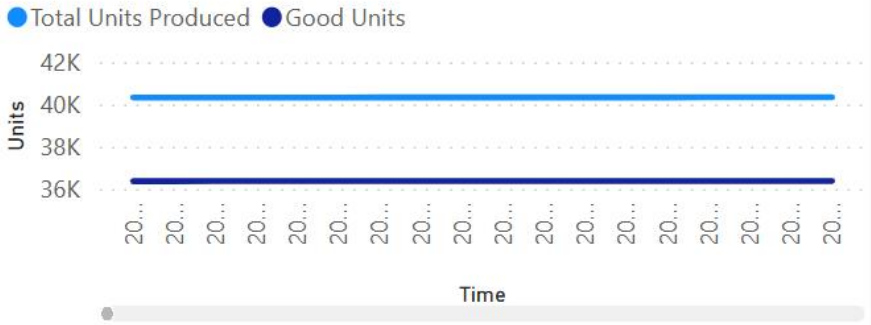
Site

OEE

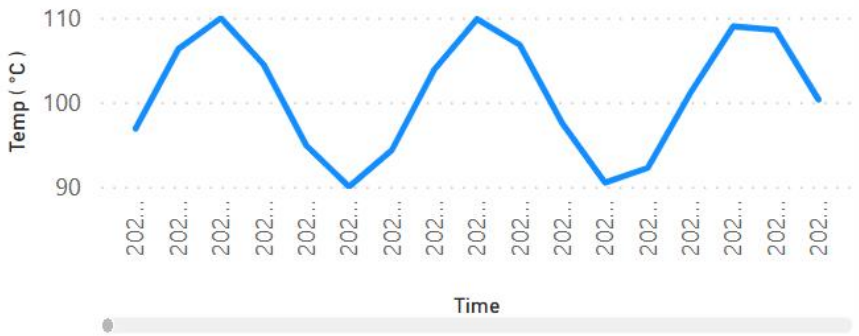
97.4%

Availability	Performance	Quality
100.0%	98.7%	98.7%

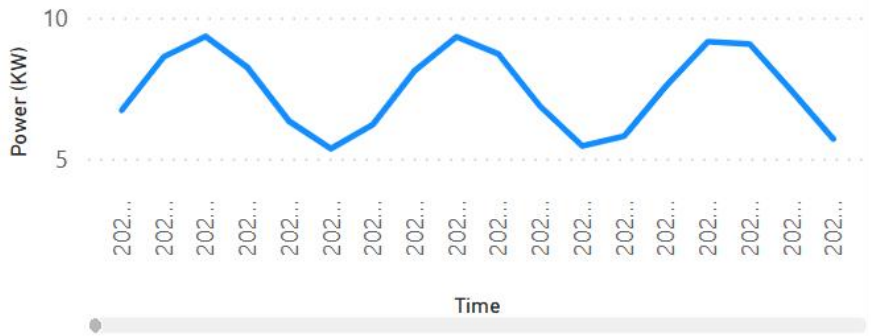
Units Produced



Temperature



Power Consumption



assetID	serialNumber	lastMaintainenceDate	manufacturer	customerName	equipmentName	site
PL1_boiler	BR83627	06/12/2023	Steam Innovations	Contoso	Boil Master 2.0	Redmond
PL1_compressor	CR85623	07/09/2023	Compression Industrial	Contoso	Compressorizer 9000	Redmond
PL1_mixer	MR72057	07/08/2023	Mixer Dynamics	Contoso	MixerMax	Redmond
PL1_pump	PP73526	06/24/2023	Pump Productions LLC	Contoso	PumpPro	Redmond
PL1_robot	RT13748	07/02/2023	Robotech	Contoso	Robo19	Redmond
PL2_boiler	BR64926	07/07/2023	Steam Innovations	Contoso	Boil Master 2.0	Redmond
PL2_motor	MR96735	06/03/2023	MotorZap	Contoso	MotoMech 4.0	Redmond
PL2_pump	PP35458	06/05/2023	Pump Productions LLC	Contoso	PumpPro	Redmond
PL2_roboticArm	RA39572	06/27/2023	Robotech	Contoso	RoboA28	Redmond

How to get involved

1. Help us validate the product by participating in Private Preview
2. Increase awareness about the new product at Ignite announcement
3. Nominate your

- Customer as early adopter to get preview access and explore a PoC
- Partner as launch partner to help address ecosystem needs for digital transformation solutions

4. Reach out to the Jumpstart team if you would like to contribute automations – arcjumpstart@microsoft.com

Welcome to the Azure IoT Operations Private Preview

Marco Dal Pino

Technical Consultant
Microsoft

- 30+ years in IT (Developer, Architect, Consultant, PM, Trainer, MCT)
- Speaker, Community addicted
- IoT Influencer

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https://www.twitch.tv/techchat

Microsoft Most Valuable Professional Reconnect

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28, 29, 30 NOVEMBRE NH MILANO CONGRESS CENTRE

Valuta la sessione

G R A Z I E !