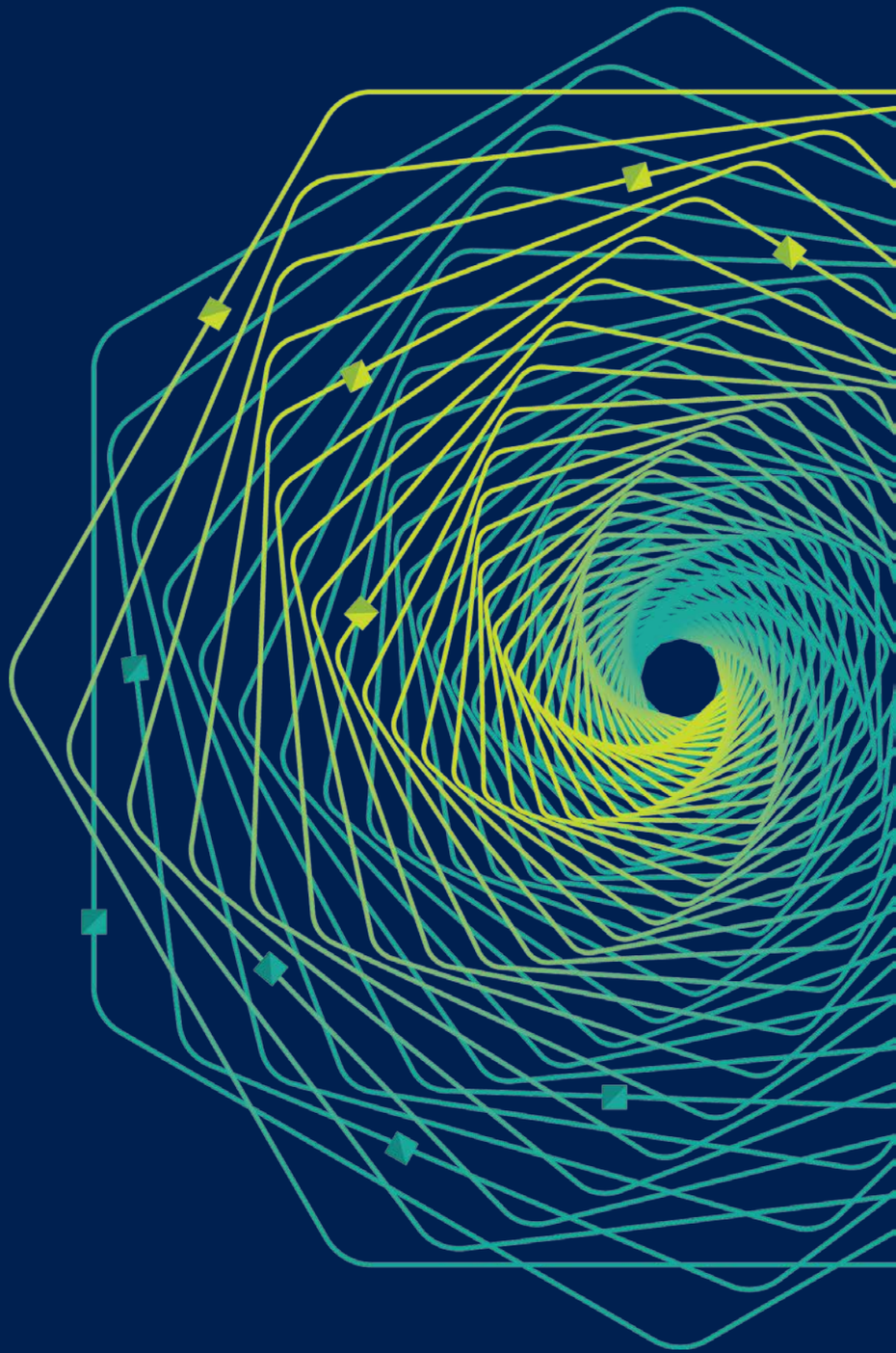
Microsoft

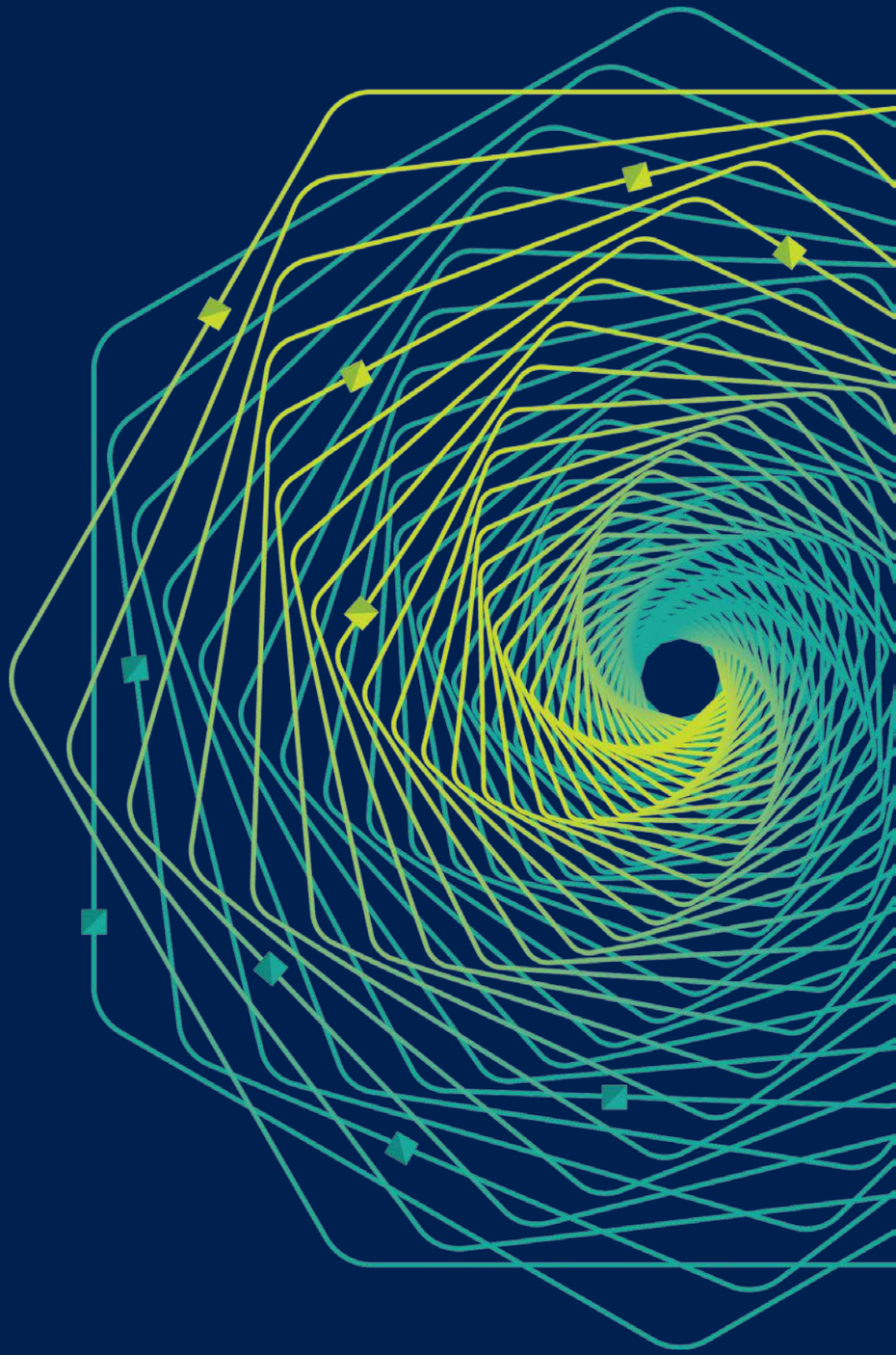
Research Faculty Summit 2018

Systems | Fueling future disruptions



Microsoft

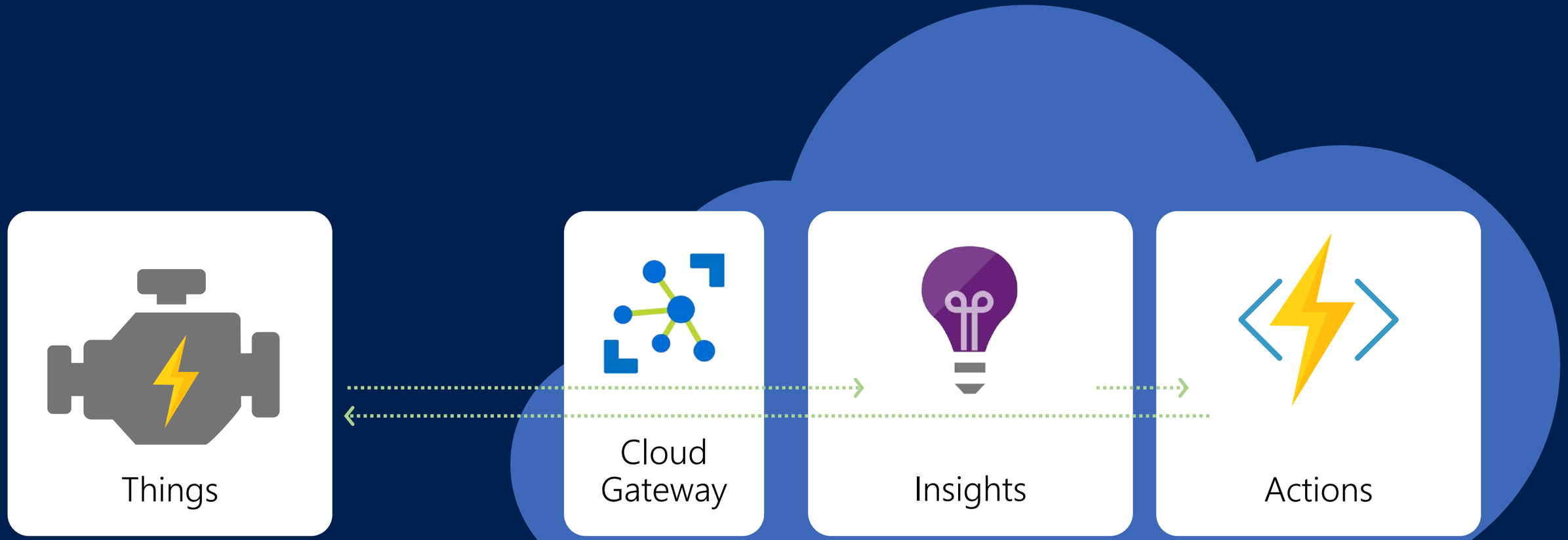
Making Edge Computing Real—Opportunities and Challenges



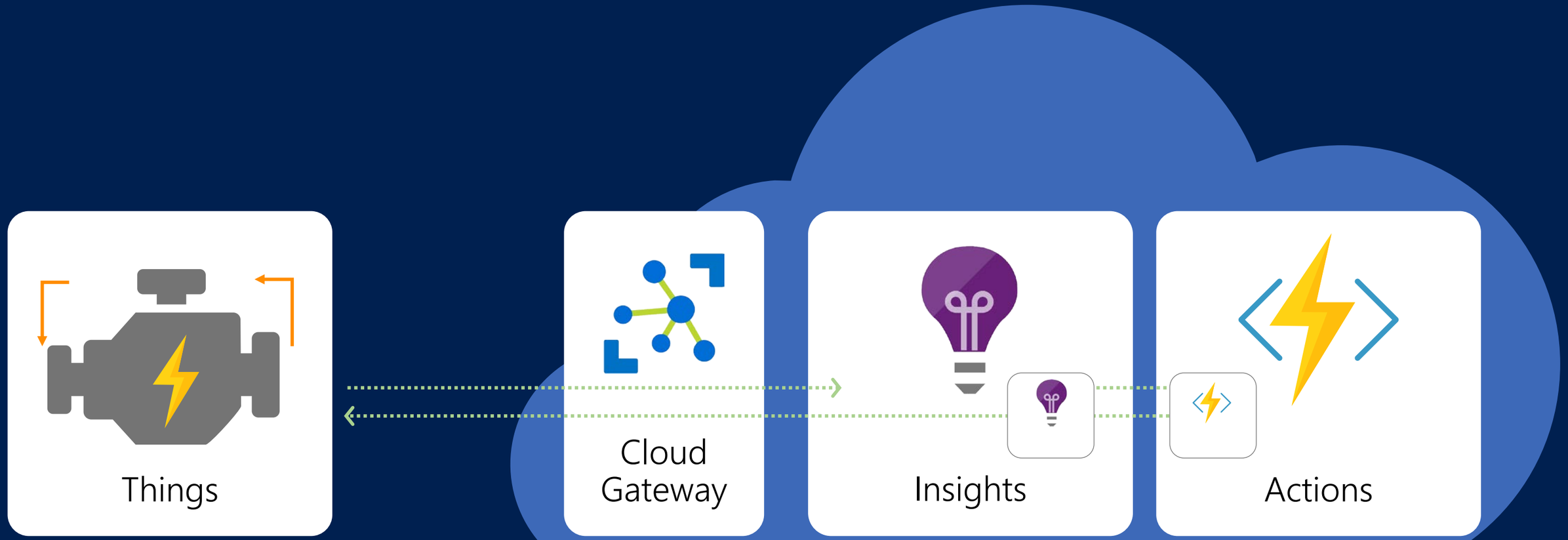
Arjmand Samuel

Principal Program Manager, Azure IoT

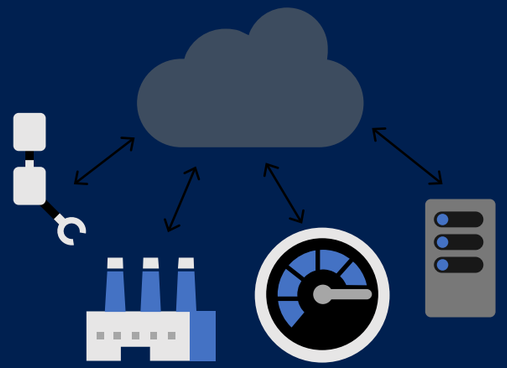
IoT Application pattern



IoT Application pattern + Edge



IoT in the Cloud and on the Edge

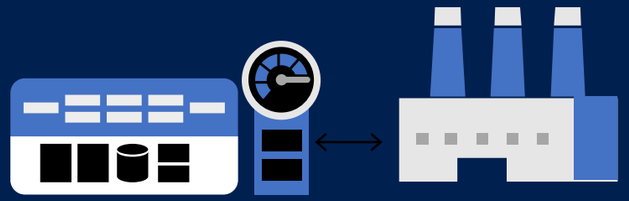


IoT in the Cloud

Remote monitoring and management

Merging remote data from multiple IoT devices

Infinite compute and storage to train machine learning and other advanced AI tools



IoT on the Edge

Offline operations

Privacy of data and protection of IP

Pre-process data On-Prem, e.g., video streams

Near real-time response, e.g. low latency control loops

Protocol translation & data normalization

Consistency

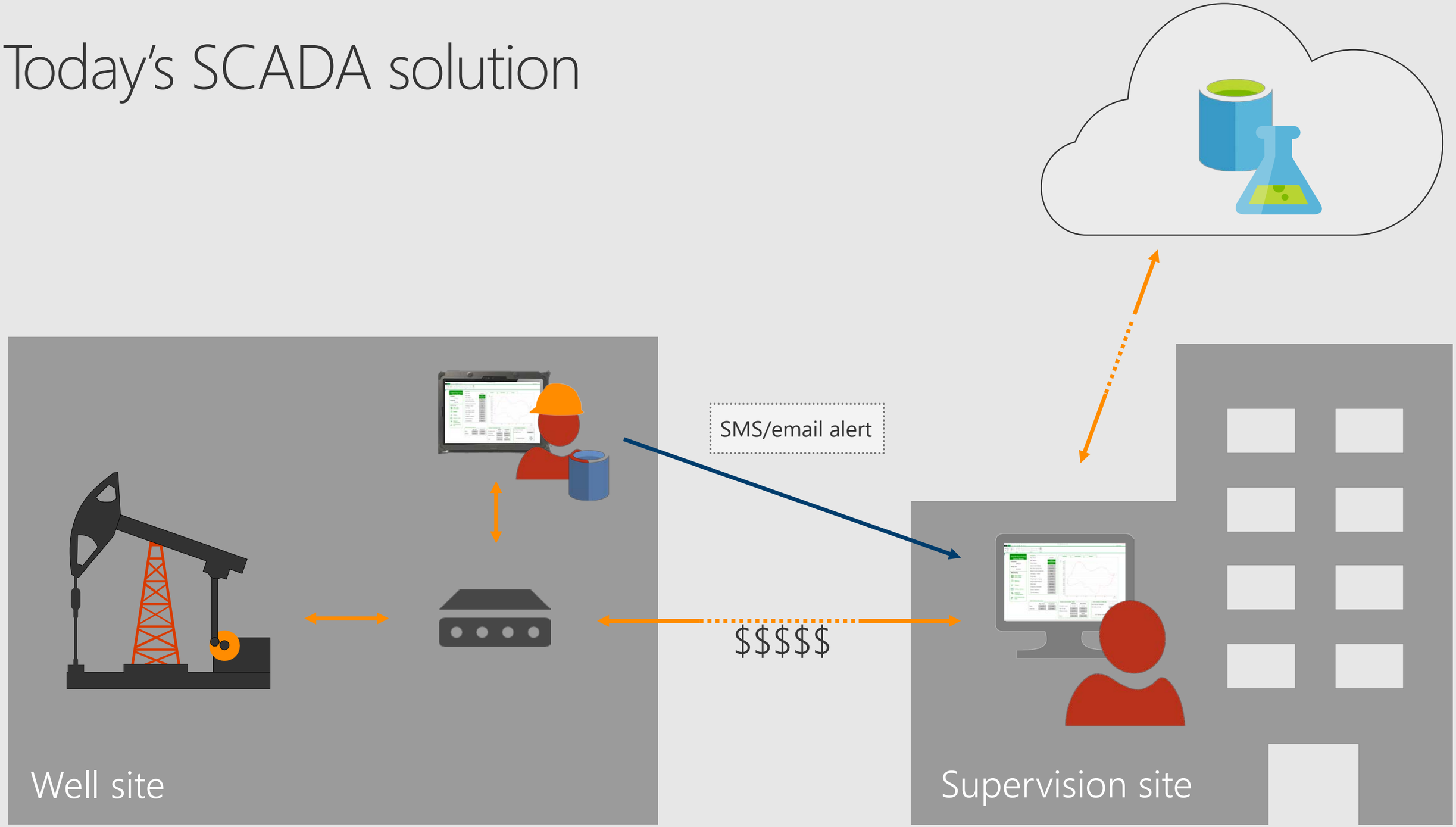
Edge in action – Low latency control loops based on machine intelligence

face

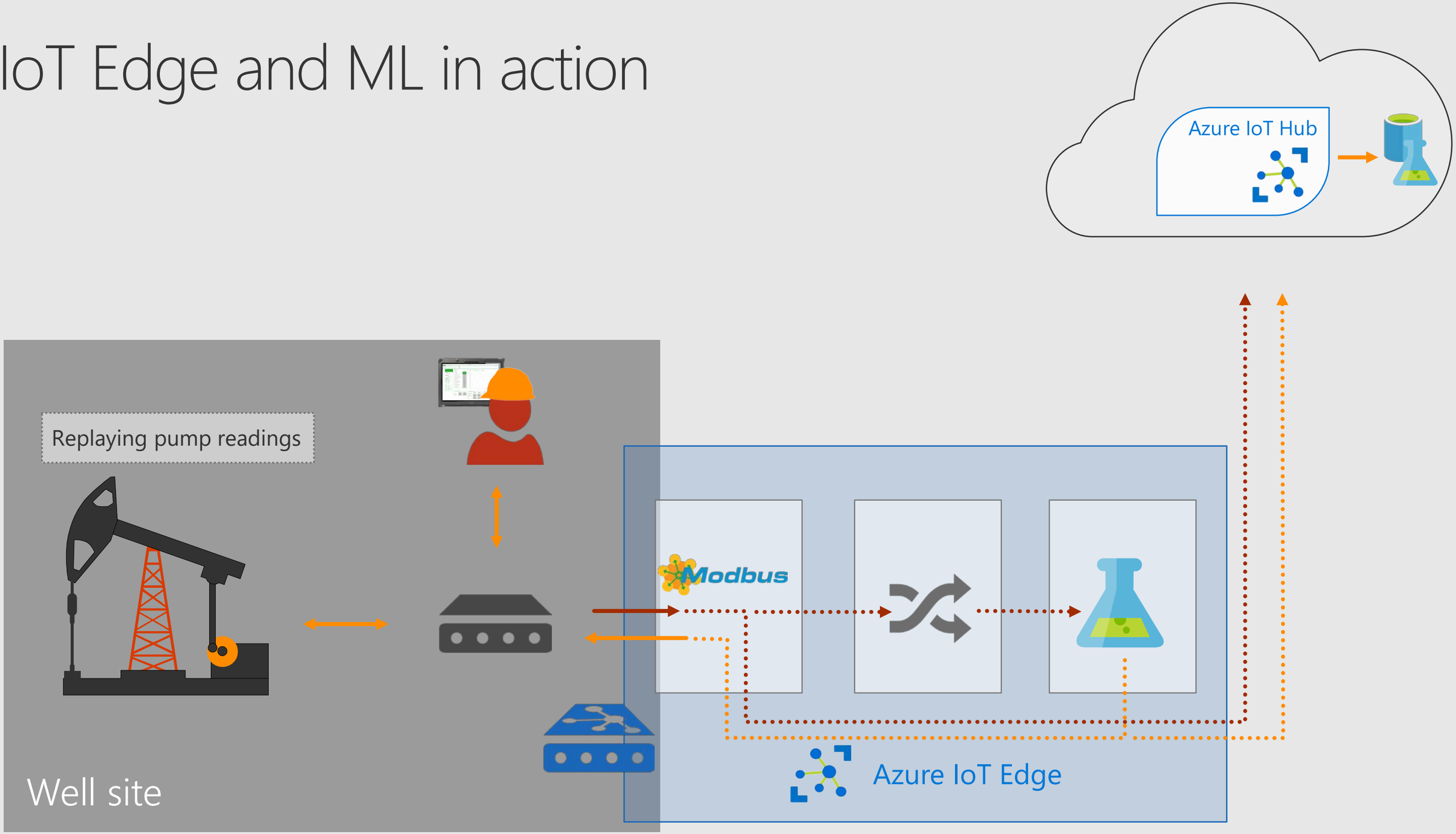
wnhole

Pump position

Today's SCADA solution



IoT Edge and ML in action



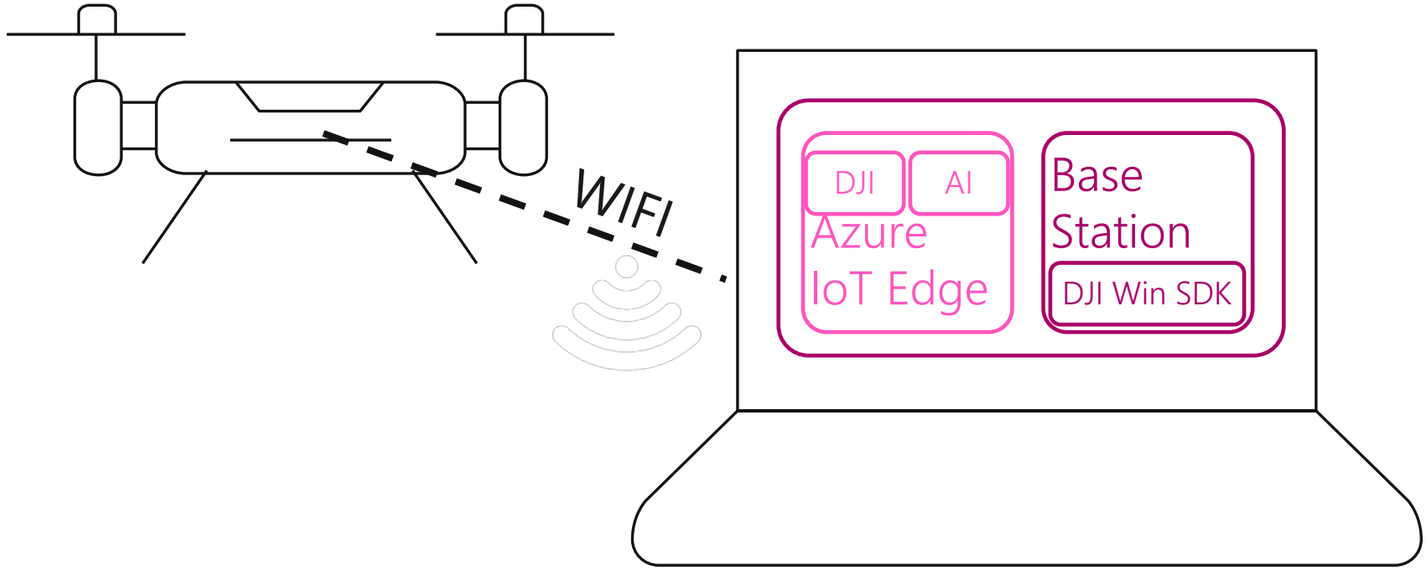
Edge in action - Real-time artificial intelligence on the Edge

DJI M210 with **payload**
running Azure IoT Edge

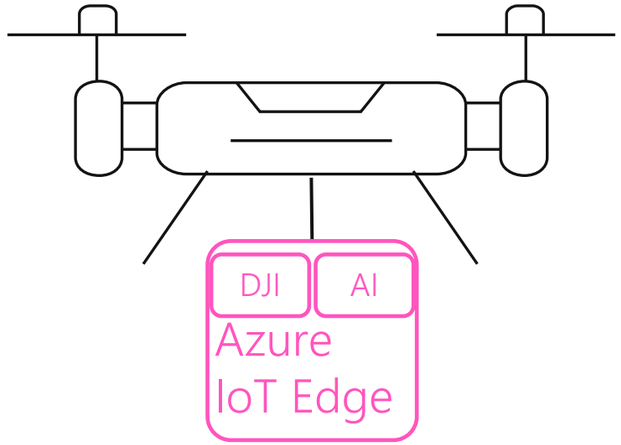
Many use cases for drones with local Computer Vision capabilities

Push AI workloads to any DJI drones with IoT Edge

From base station



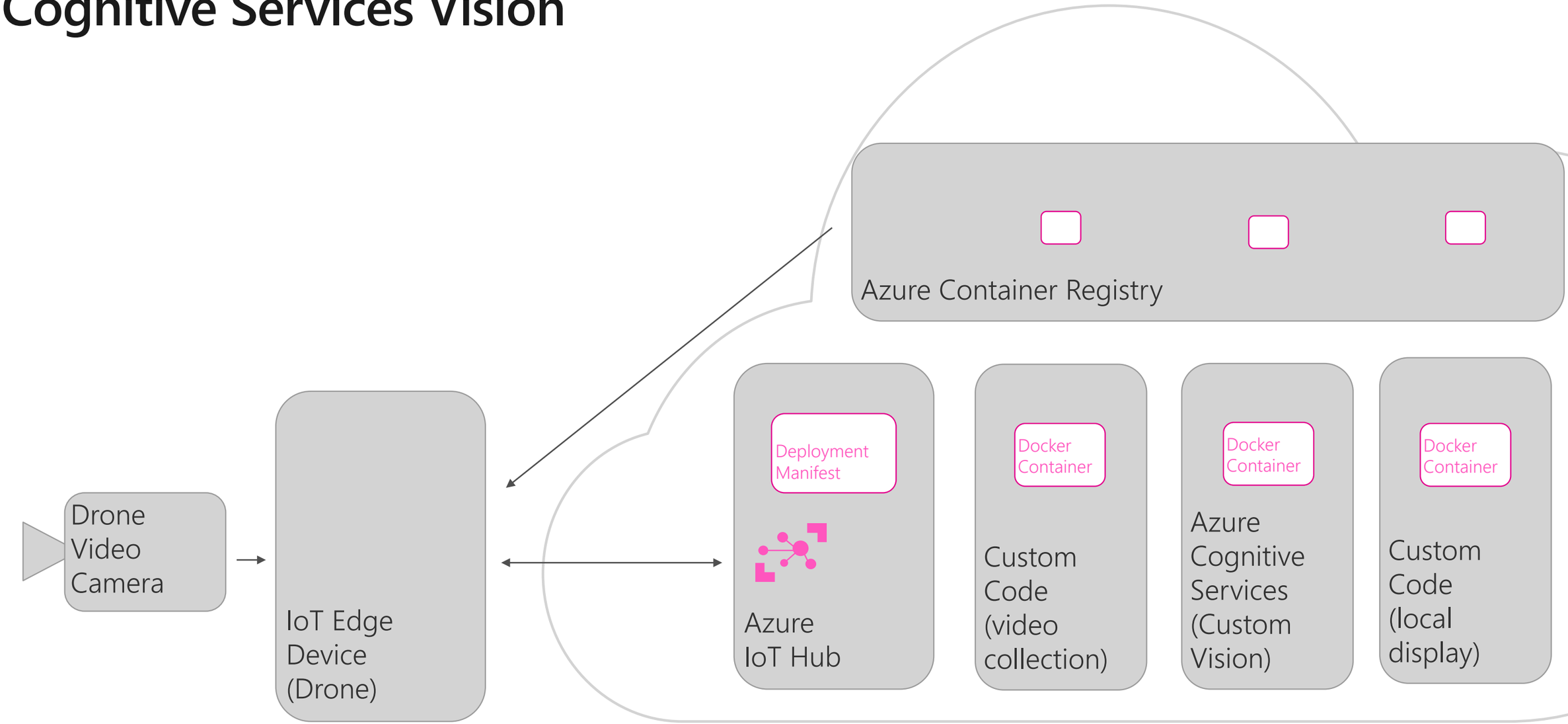
Onflight



DJI Mavic Air

DJI Matrice M210

Azure IoT Edge Deployment
Cognitive Services Vision



Design principles

Secure

Provides a secure connection to the Azure IoT Edge, update software/firmware/configuration remotely, collect state and telemetry and monitor security of the device

Cloud managed

Enables rich management of Azure IoT Edge from Azure, provides a complete solution instead of just an SDK

Cross-platform

Enables Azure IoT Edge to target the most popular edge operating systems, such as Windows and Linux

Portable

Enables Dev/Test of edge workloads in the cloud with later deployment to the edge as part of a continuous integration / continuous deployment pipeline

Extensible

Enables seamless deployment of advanced capabilities such as AI from Microsoft, and any third party, today and tomorrow

Enabling the intelligent edge spectrum

GPU/DSP

FPGA

Sensor Tier | Constrained Tier | Interactive Tier | Industrial Tier | Gateway Tier | Accelerated Tier

LOW POWER CAPABILITIES

HIGH POWER CAPABILITIES

Azure IoT Edge hardware requirements

Rich OS – Windows or Linux

Flexible HW – ARM or x64

Moby-compatible container runtime

Hardware based security – HSM or Enclave

Hardware sizing depends on workload

AZURE IOT EDGE

Key Features

OPEN

Open source Azure IoT Edge

Moby-based container runtime, compatible with Docker containers

Azure Edge Marketplace for Edge modules

SECURE

Zero-touch provisioning of Edge devices at scale with Device Provisioning Service

Security Manager for end to end security and support for variety of hardware-based root of trust

INTELLIGENT

Services onboarded

Custom Vision

Azure Functions

Azure Stream Analytics

SQL Server of Edge

Azure Machine Learning

ENTERPRISE READY

Scaled deployments with Automatic Device Configuration Service

Module SDKs in multiple languages (C, C#, Node, Python, Java)

Development tooling in VSCode

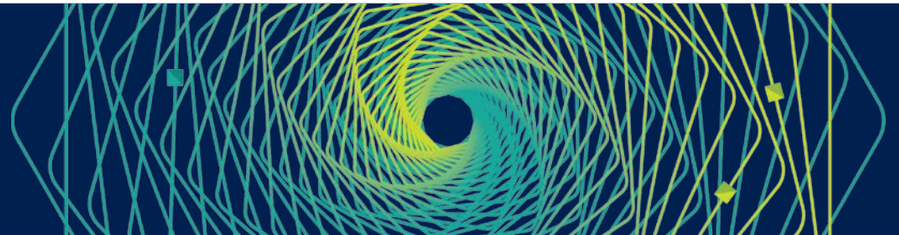
Multi-person development tools for CI/CD using VSTS

Edge computing research challenges

- Scale
  - Deploying a fleet of Edge devices with zero touch
  - Managing a fleet of Edge devices centrally
  - Adapting Edge workloads based on constraints (HW, cost, network, etc.)

- Security
  - Moving cloud workloads to on-prem Edge devices requires new security models
  - Securing not just the device, but also data, with provenance
  - Security models for a highly distributed occasionally connected devices

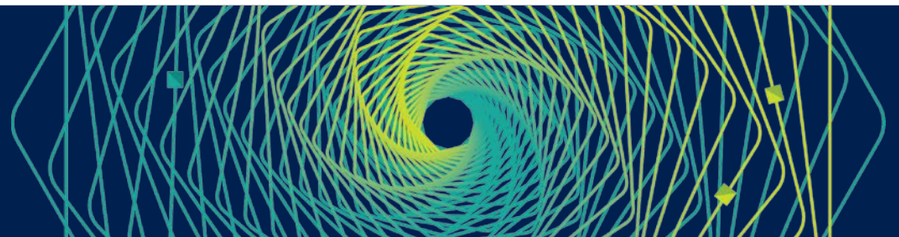
- Operations
  - High availability with low cost devices
  - Multi-vendor, multi-purpose devices – how to control and manage
  - Diverse hardware architectures, OSes, operating conditions



Finally…

- Deploy Azure services to Azure IoT Edge devices
- Deploy your own code in language of your choice
- Manage Azure IoT Edge and downstream devices
- Do all of this securely, in a scalable fashion from the Azure IoT Hub

Azure IoT Edge is free and open source
github.com/azure/iotedge



Thank you!

Microsoft