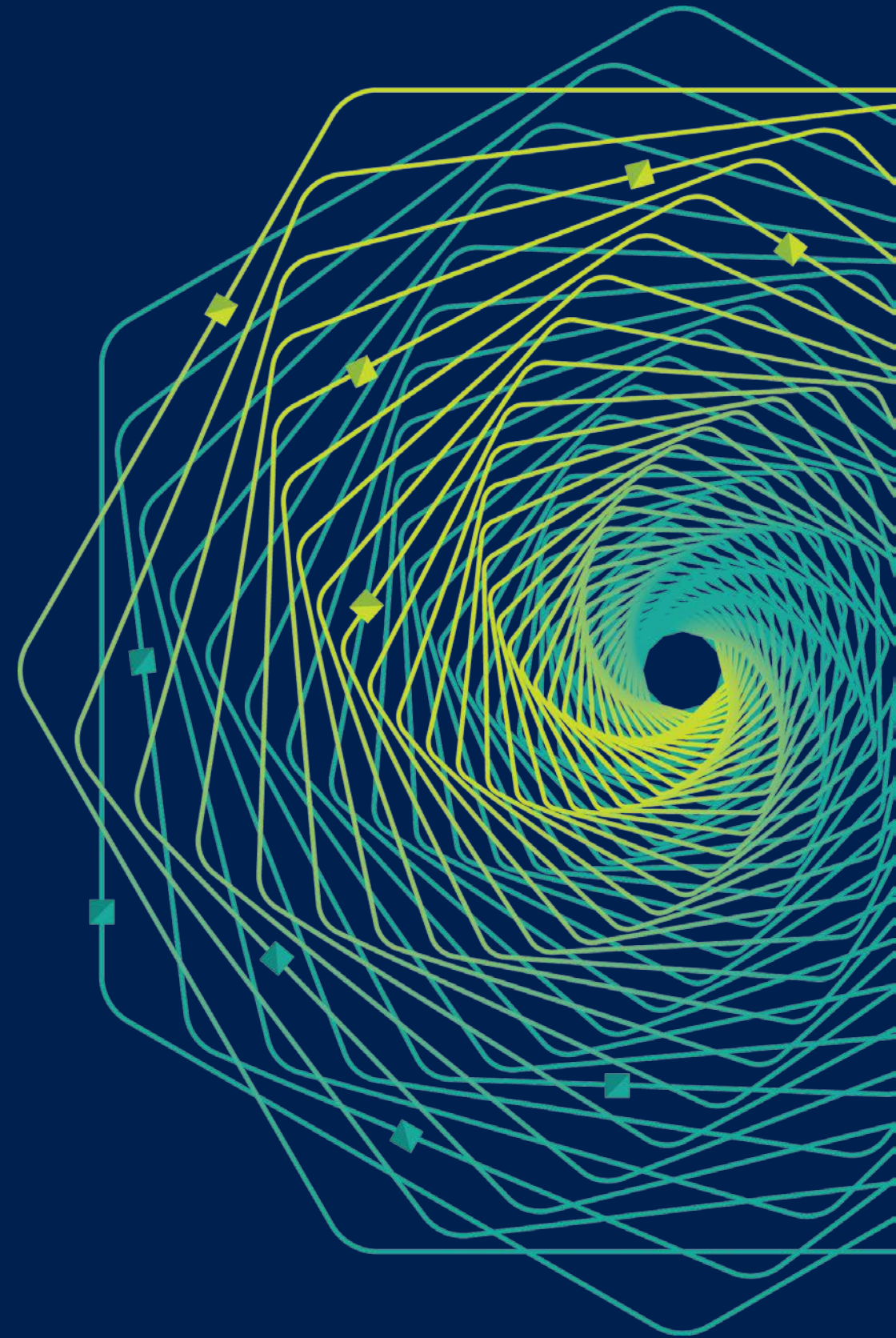




# Research Faculty Summit 2018

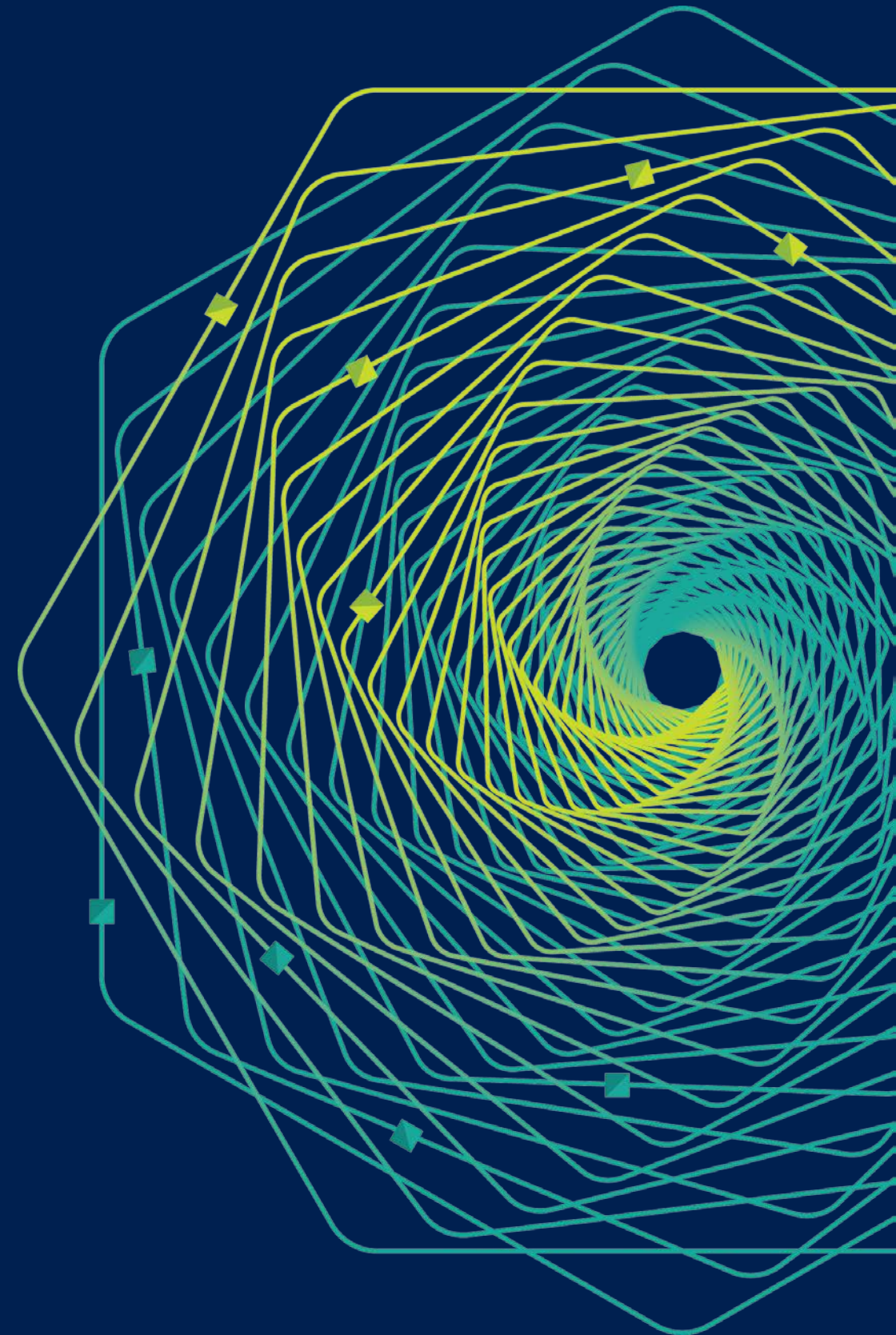
Systems | Fueling future disruptions



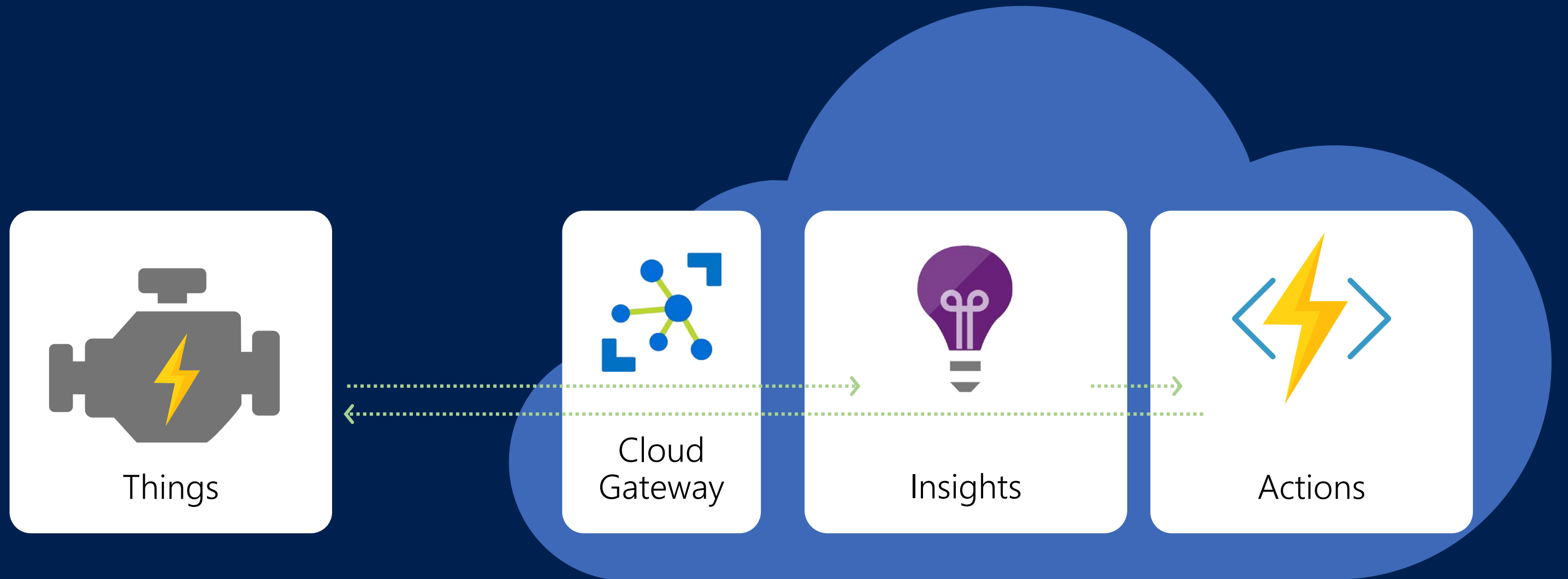
# Making Edge Computing Real— Opportunities and Challenges

Arjmand Samuel

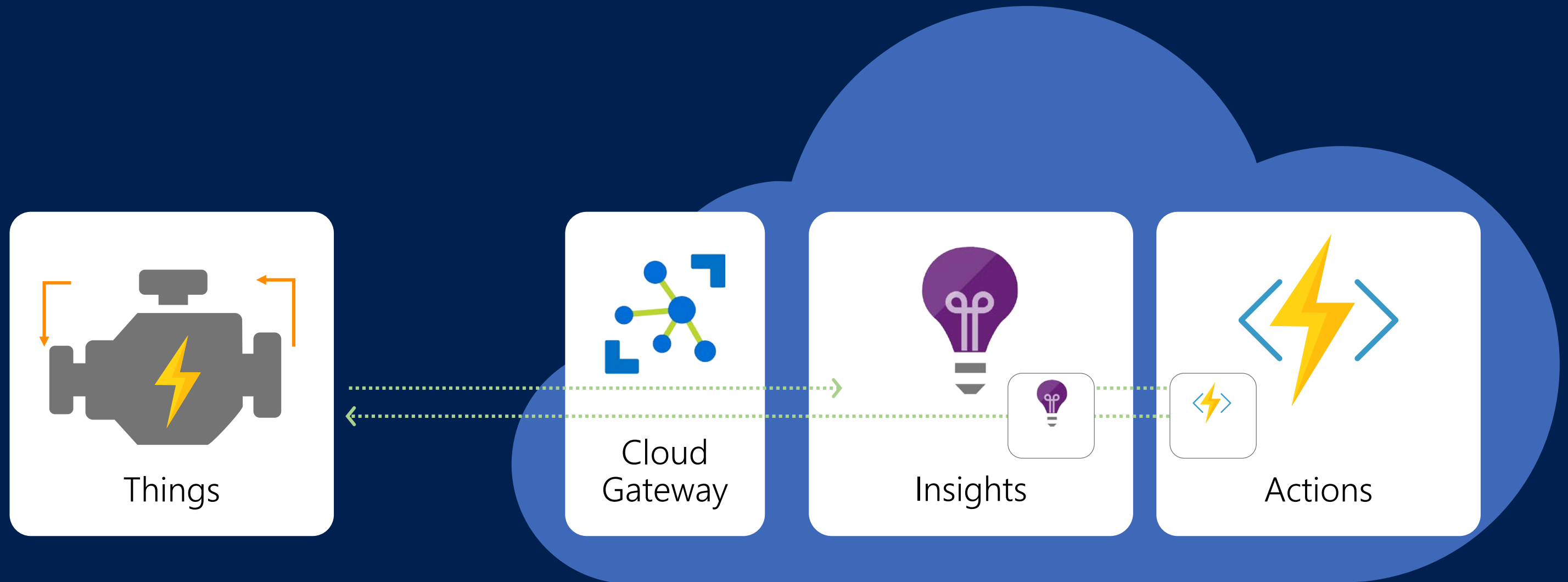
Principal Program Manager, Azure IoT



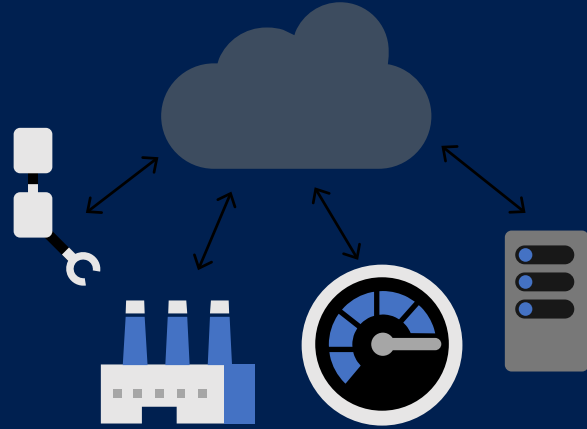
# IoT Application pattern



# IoT Application pattern + Edge

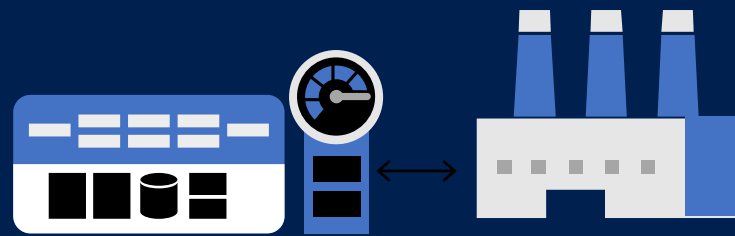


# IoT in the Cloud and on the Edge



## 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



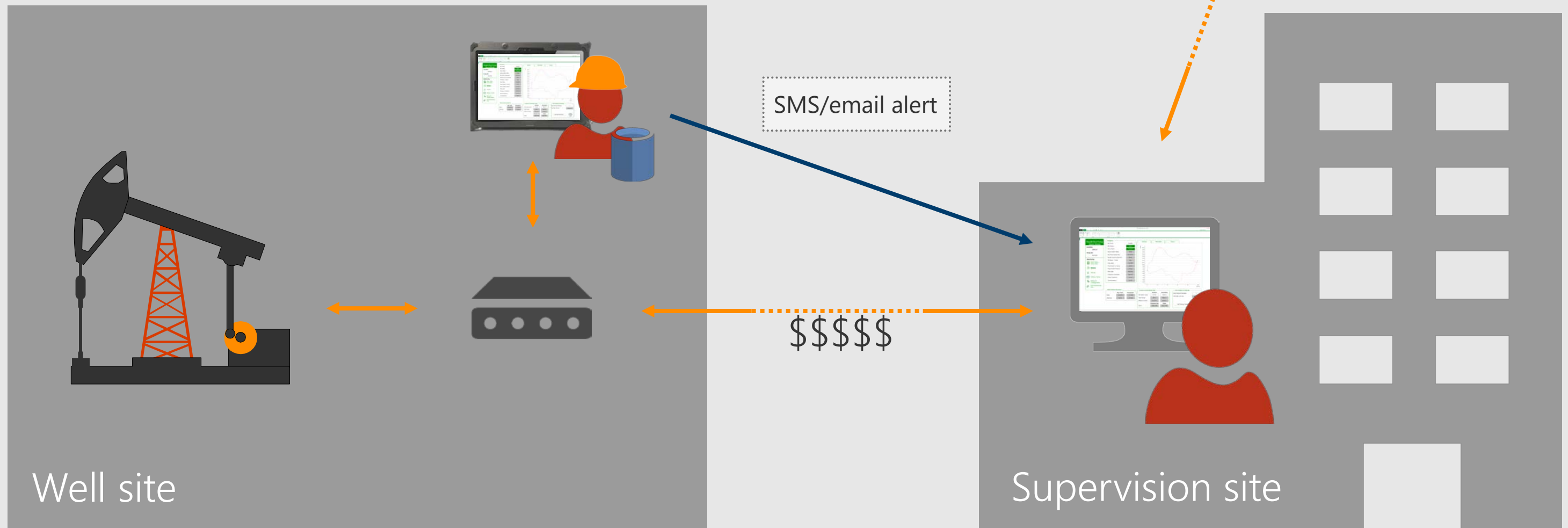
face

whole

Pump position

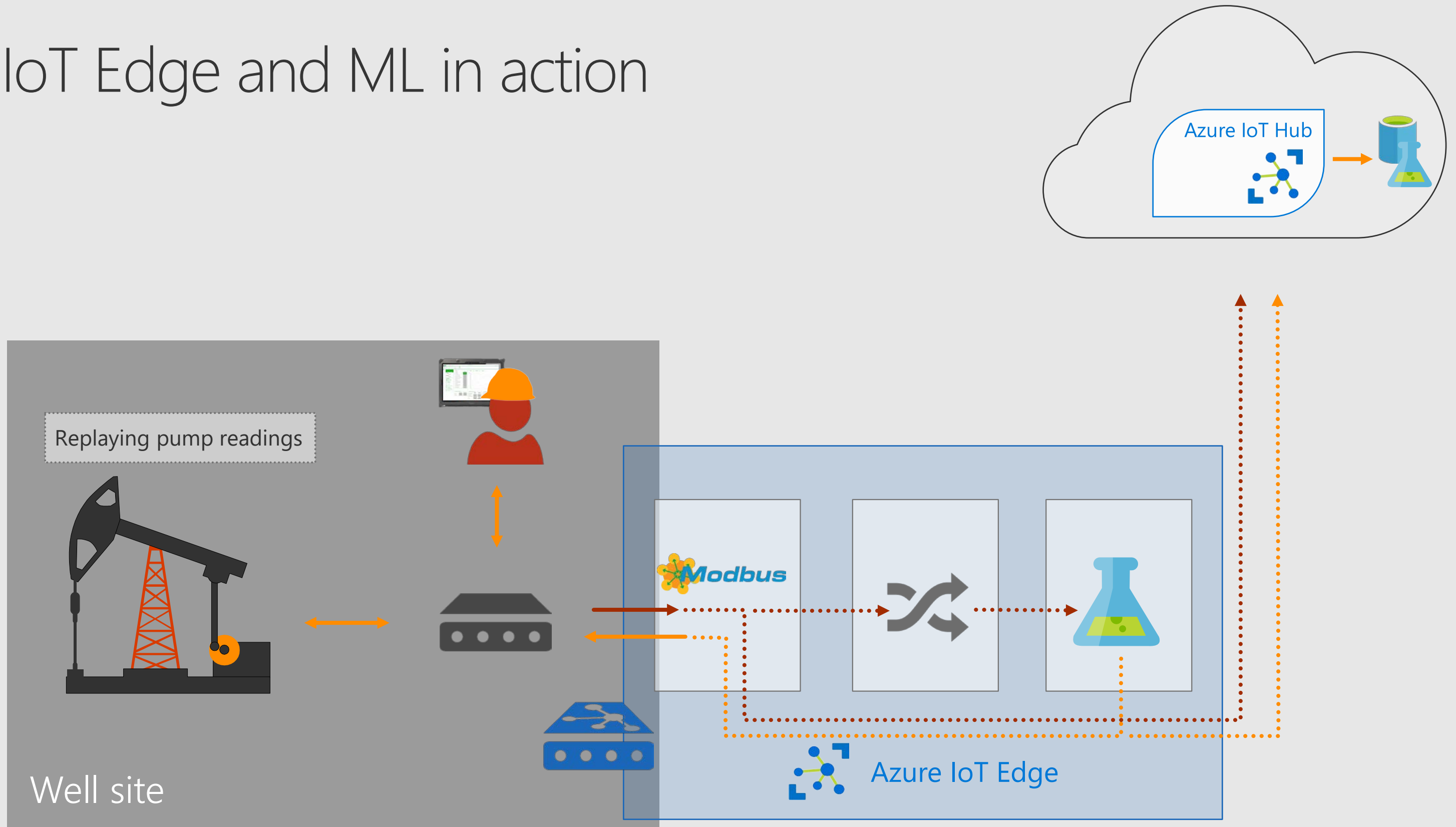


# Today's SCADA solution





# IoT Edge and ML in action



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



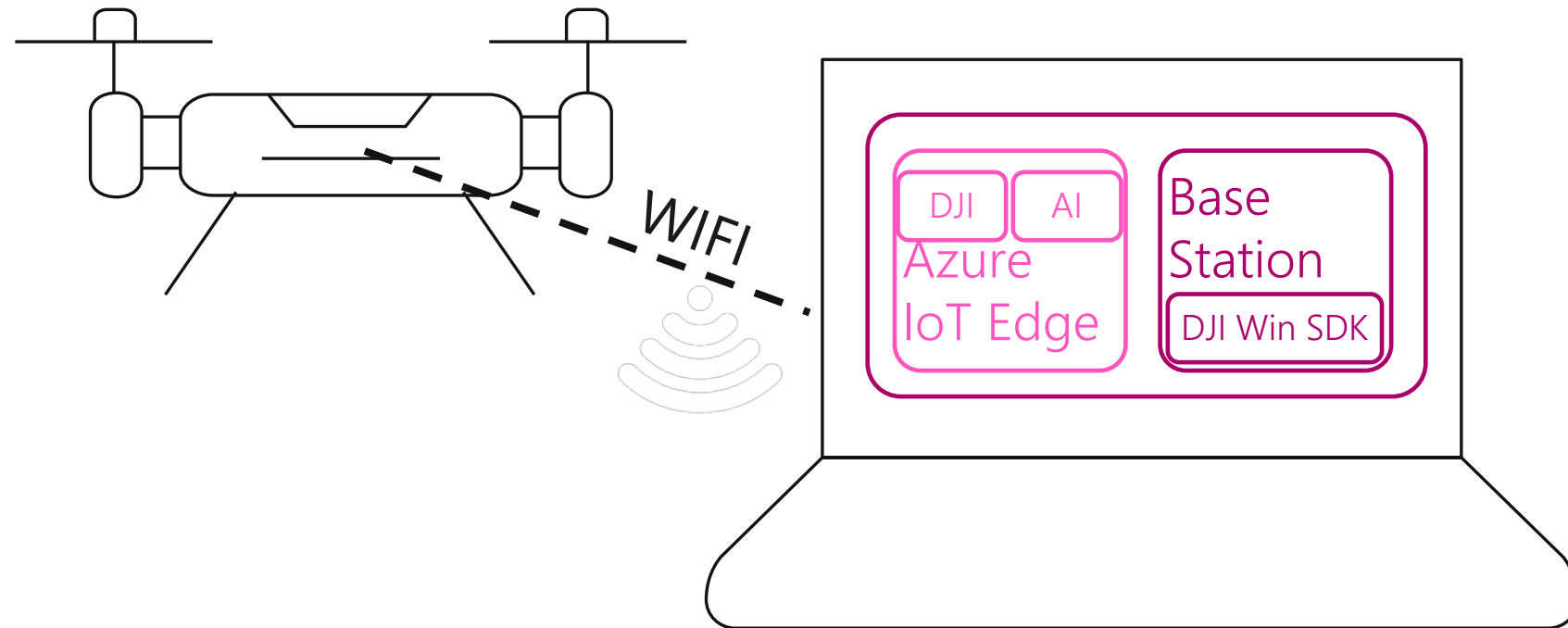
DJI M210 with **payload**  
running Azure IoT Edge

# Many use cases for drones with local Computer Vision capabilities



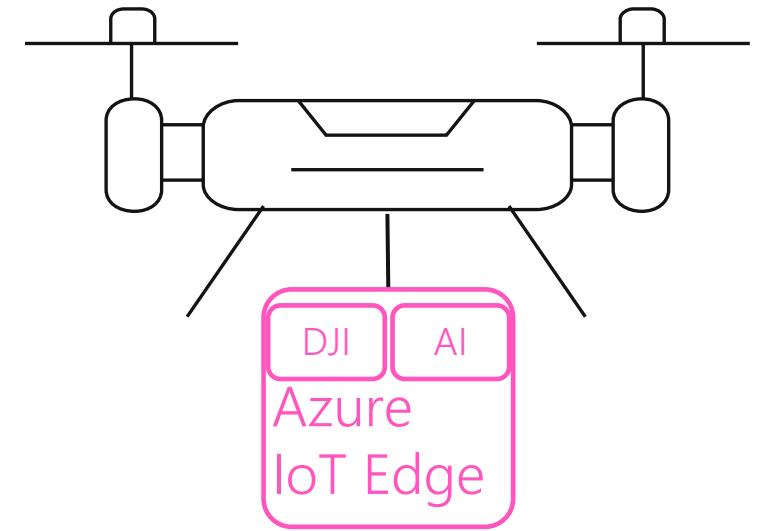
# Push AI workloads to any DJI drones with IoT Edge

*From base station*



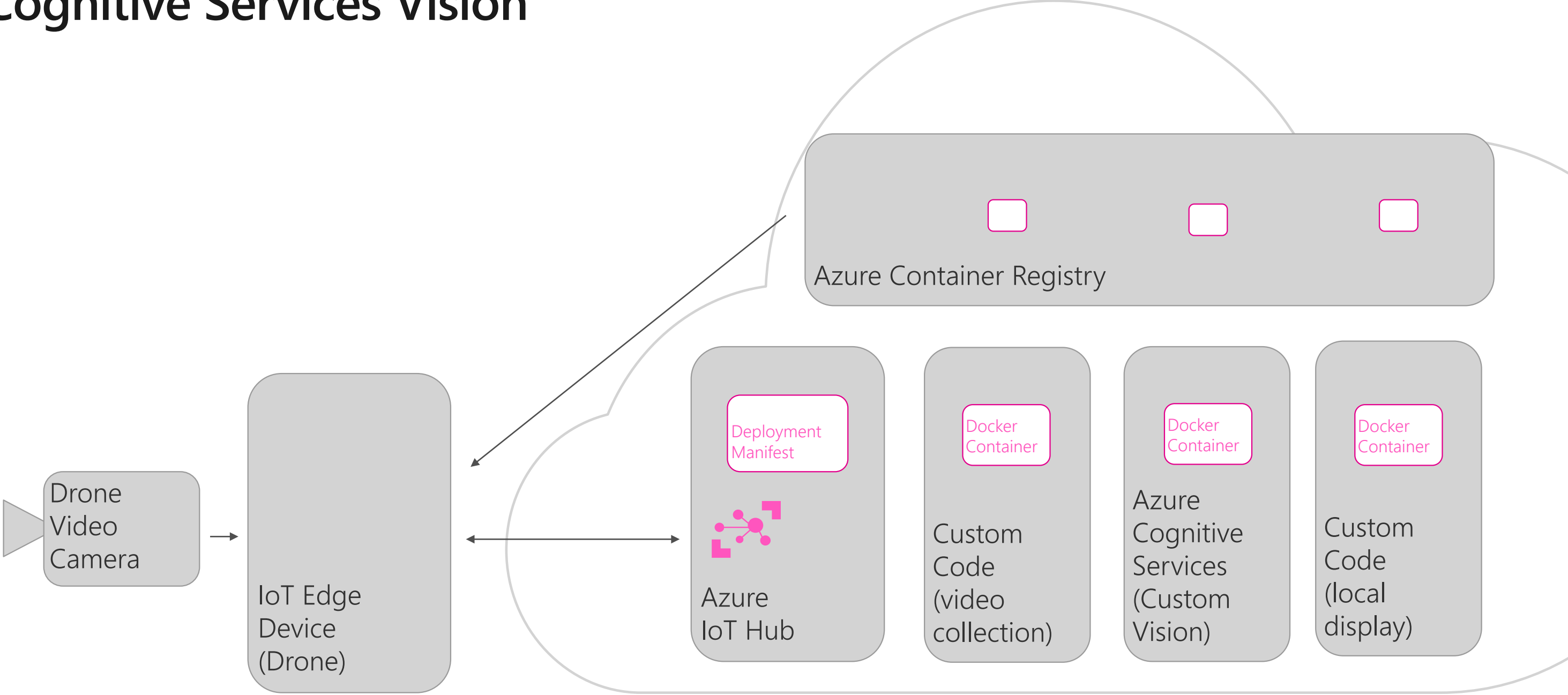
DJI Mavic Air

*Onflight*



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



**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)

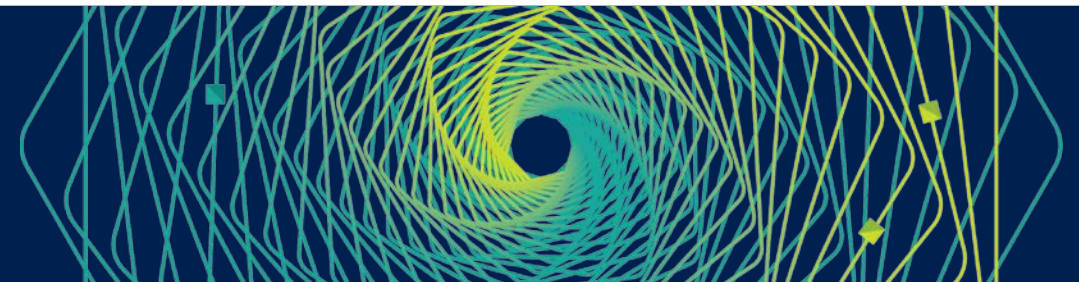
Development tooling in VSCode

Multi-person development tools  
for CI/CD using VSTS



# Edge computing research challenges

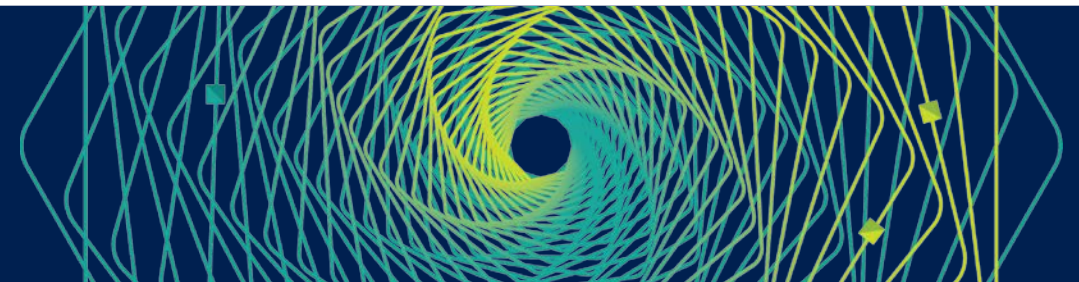
- Scale
  - Deploying a fleet of Edge devices with zero touch
  - Managing a fleet of Edge devices centrally
  - Adapting Edge workloads based on constraints (HW, cost, network, etc.)
- Security
  - Moving cloud workloads to on-prem Edge devices requires new security models
  - Securing not just the 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](https://github.com/azure/iotedge)



Thank you!

