Research Faculty Summit 2018

Systems | Fueling future disruptions
Making Edge Computing Real—Opportunities and Challenges

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IoT Application pattern

- Things
- Cloud Gateway
- Insights
- Actions
IoT Application pattern + Edge

- Things
- Cloud Gateway
- Insights
- Actions
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
Edge in action – Low latency control loops based on machine intelligence
Today’s SCADA solution

Well site

SMS/email alert

Supervision site
IoT Edge and ML in action

Well site

Replaying pump readings

Azure IoT Edge

Modbus

Azure IoT Hub
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**

- WiFi connection
- DJI AI
- Azure IoT Edge
- Base Station
- DJI Win SDK

**Onflight**

- DJI AI
- Azure IoT Edge

**DJI Mavic Air**

**DJI Matrice M210**
Azure IoT Edge Deployment
Cognitive Services Vision

Drone Video Camera

IoT Edge Device (Drone)

Azure IoT Hub

Deployment Manifest

Custom Code (video collection)

Docker Container

Azure Cognitive Services (Custom Vision)

Docker Container

Custom Code (local display)
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

- 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

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<thead>
<tr>
<th>OPEN</th>
<th>SECURE</th>
<th>INTELLIGENT</th>
<th>ENTERPRISE READY</th>
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<tbody>
<tr>
<td>Open source Azure IoT Edge</td>
<td>Zero-touch provisioning of Edge devices at scale with Device Provisioning Service</td>
<td><strong>Services onboarded</strong>&lt;br&gt;Custom Vision&lt;br&gt;Azure Functions&lt;br&gt;Azure Stream Analytics&lt;br&gt;SQL Server of Edge&lt;br&gt;Azure Machine Learning</td>
<td>Scaled deployments with Automatic Device Configuration Service</td>
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<td>Moby-based container runtime, compatible with Docker containers</td>
<td>Security Manager for end to end security and support for variety of hardware-based root of trust</td>
<td><strong>Module SDKs in multiple languages (C, C#, Node, Python, Java)</strong>&lt;br&gt;Development tooling in VSCode</td>
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<td>Azure Edge Marketplace for Edge modules</td>
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<td><strong>Multi-person development tools for CI/CD using VSTS</strong></td>
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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!