Azure IoT and Intelligent Edge Devices

Koichi Hirao, Azure IoT S. PM
Xumin Sun, Win IoT S. PM
MICROSOFT WILL INVEST $5 BILLION IN IoT

Our goal is to give every customer the ability to transform their businesses, and the world at large, with connected solutions.
Waves of Innovation

• Cloud
  • Globally available, unlimited compute resources

• IoT
  • Harnessing signals from sensors and devices, managed centrally by the cloud

• Edge
  • Intelligence offloaded from the cloud to IoT devices

• AI
  • Breakthrough intelligence capabilities, in the cloud and on the edge
Microsoft IoT Offerings

Azure
- Available in Azure Regions
- Full functionality
- Deploy and manage cloud services
- Managed by Azure or Azure Stack
- Azure Services & Management on-prem
- Azure IoT Hub

Azure Stack
- Azure IoT Hub

Azure IoT Edge
- Deploy and manage cloud services
- Managed by Azure or Azure Stack
- Azure IoT Edge runs on Windows and Linux

Azure IoT Device SDK
- Multi-device, multi-language, multi-OS
- Linux, iOS, Android, Windows, RTOS

Azure Sphere
- Peerless security for MCU devices
- Connect directly to Azure or via Azure IoT Edge
- Linux Kernel that modernizes MCU devices

Linux & Windows

Linux & Windows

Azure Sphere OS

Azure Sphere OS

Azure IoT Central
- Azure IoT solution accelerators
- Azure IoT Platform Services

Azure Sphere OS

Windows, Linux
IoT application Pattern + Edge
Azure IoT Edge

**OPEN**
- Open source Azure IoT Edge
- Container approach
- Ecosystem of edge hardware and software marketplace

**SECURE**
- Run IoT Edge in the cloud or on-premise
- Secure solution from chipset to cloud
- Enterprise-grade scalability

**INTELLIGENT**
- AI and analytics modules easily deployed via runtime
- Purpose-built hardware for advanced processing
Azure IoT Edge Scenario

- Scenario: Deploy and manage at scale
Azure IoT Edge Deployment

Video Camera

IoT Edge Device

Device provisioning and deployment

Deployment Manifest

Azure IoT Hub

Custom Code (video collection)

Azure Container Registry

Container

Custom Code

Container

Azure Cognitive Services

Container

Custom Code (Display)
What’s new with Azure IoT Edge

Extended Offline (Preview)
Third party Edge modules in Azure Marketplace (GA)
New Azure Blob storage module (GA)
Tooling – support for Visual Studio and more (Preview)
OpenVino (from Intel) tools for IoT Edge
Azure IoT Edge – GA For Windows

Coming soon
Closing the gaps
Windows 10 IoT Core & Enterprise, Windows Server
Intelligent Edge Scenarios

• Edge device as a gateway
  • Transparent gateway
  • Protocol translation
  • Identity translation

• Local compute to find insights at the edge
  • Filter data
  • Deploy event processing
  • ML
  • Image recognition
  • Other high value AI

• Bring intelligence to Local Storage
  • Blob Storage
  • SQL
  • SQLite
Blob Storage module Overview

Azure Blob Storage on IoT Edge is a light-weight Azure consistent module which provides local block blob storage.

Developers can use Azure Storage SDK to access block blobs at the edge.

Aka.ms/AzureBlobStorage-IotModule
Why Windows 10 IoT with Azure

Device-to-cloud platform for secure, manageable intelligent edge devices

Azure ML + Azure IoT Edge + Windows AI
Brings accelerated AI to your device

Windows 10 IoT
Secure, manageable, full-featured IoT OS with long-term support

Windows 10 IoT Device Management
Provided by Azure IoT Hub and enterprise device management

Windows Update + Device Update Center
Keeps devices secure, giving full control to the device maker
# Windows 10 IoT edition comparison highlights

<table>
<thead>
<tr>
<th></th>
<th>Windows 10 IoT Core</th>
<th>Windows 10 IoT Enterprise*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>User experience</strong></td>
<td>Single UWP app active in foreground at one time with supporting background apps &amp; services</td>
<td>Traditional Windows shell with advanced lockdown features</td>
</tr>
<tr>
<td><strong>Headless supported</strong></td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>App architecture supported</strong></td>
<td>UWP</td>
<td>UWP &amp; Win32</td>
</tr>
<tr>
<td><strong>Cortana</strong></td>
<td>Cortana SDK</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Management</strong></td>
<td>Azure IoT DM, Intune, MDM &amp; DUC</td>
<td>Azure IoT DM, Intune, MDM &amp; traditional agent-based (e.g. SCCM)</td>
</tr>
<tr>
<td><strong>Device security technologies</strong></td>
<td>TPM, Secure Boot, BitLocker, Device Guard, Device Health Attestation</td>
<td>TPM, Secure Boot, BitLocker, Device Guard, Device Health Attestation, Windows Advanced Threat Protection</td>
</tr>
<tr>
<td><strong>CPU architecture support</strong></td>
<td>x86, x64 &amp; ARM</td>
<td>x86 &amp; x64</td>
</tr>
<tr>
<td><strong>System resources</strong></td>
<td>512MB RAM + 2GB storage</td>
<td>1GB RAM + 16GB storage**</td>
</tr>
<tr>
<td><strong>Licensing</strong></td>
<td>Online licensing terms agreement and embedded OEM agreements, subscription</td>
<td>Direct and indirect embedded OEM agreements</td>
</tr>
</tbody>
</table>
| **Usage scenarios**    | • Digital signage & kiosks  
• IoT gateway  
• Manufacturing devices | • Small medical devices  
• Wearables  
• Smart building  
• Digital signage & kiosks  
• IoT gateway  
• Manufacturing devices  
• Large medical devices  
• Industry tablets  
• POS, ATM |
Windows 10 IoT Core 1809 highlights

• 10 years of support available for IoT Core and IoT Enterprise via the **Long Term Servicing Channel (LTSC)**

• IoT Core support for **NXP i.MX 6/7/8M**

• Windows IoT **Core Services** – a subscription service for support, servicing and security
  • 10 years of LTSC support, otherwise supported via SAC
  • Device Update Center for securely servicing devices
  • Device Health Attestation for increased device security

• **Azure IoT Edge** support to move cloud computing to the Intelligent Edge
NXP + Windows 10 now available

Windows 10 IoT Core on several i.MX6/7/8M SoCs
Hundreds of evaluations in progress
Unique security capabilities like trusted I/O
Commercial release end of 2018
Get started today – http://aka.ms/iotnxp
Windows+ Azure Certified i.MX 6 & i.MX7 Reference Boards & Contacts

- **Aaeon PICO-IMX6**
  - David Hung (DavidHung@aaeon.com.tw)

- **Advantech RSB-4411**
  - Renee Chiang (Renee.Chiang@advantech.com.tw)
  - Winnie Weng (Winnie.weng@advantech.com.tw)

- **Keith & Koep pConXS with Trizeps VII**
  - Charalampos Tzintziras (tzintziras@keith-koep.com)

- **SolidRun HummingBoard Edge**
  - Ilya Viten (ilya@solid-run.com)
  - Systems with Windows 10 pre-installed available

- **Kontron SMARC-sAMX6i**
  - Martin Unverdorben (martin.unverdorben@kontron.com)

Additional devices under development
Windows+ Azure Certified i.MX 6 & i.MX7
Reference Boards & Contacts – Pending Certification

- Compulab **IoT-Gate**
  - Igor Vaisbein (igor@compulab.co.il)

- Geniatech **SoM-iMX6Q-Q7**
  - Mike Decker (mike.decker@geniatech.com)
  - Fang Jijun (Fjj@geniatech.com)

- Geniatech **SoM-iMX7D**
  - Mike Decker (mike.decker@geniatech.com)
  - Fang Jijun (Fjj@geniatech.com)

- VIA **VAB-820**
  - Mike Fox (MichaelFox@via.com.tw)
  - Dream Ku (DreakKu@via.com.tw)

- PHYTEC **phyBOARD-i.MX7-Zeta**
  - Brad Dodson (sales@phytec.com)

- Ka-Ro **TX6UL, TX6S, TX6DL & TX6Q**

Additional devices under development

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Shared under NDA
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Introducing Windows 10 IoT Core Services

Commercialize your project with enterprise-grade security and support

- **Updates**
  - Take control of Windows updates with cloud-based **IoT Core Device Update Center (DUC)**
  - Manage updates for OS, apps, settings, and OEM-specific files from the cloud
  - Distributed over same global CDN used by Windows Update

- **Security**
  - Help ensure the safety of your network and devices with cloud-based **Device Health Attestation (DHA)**
  - Backed by the same security research team and validation process used by 500M Windows 10 devices
  - Leverage hardware and cloud services to provide tamper proofing and remote attestation of device health

- **Support**
  - Count on stable systems with **10 years of LTSC (Long Term Servicing Channel) support** with security updates only (no new features)
  - Access to monthly published Windows IoT Core packages
  - Official Microsoft Lifecycle Support statement - links to software license agreement
  - Access to monthly published Windows IoT Core packages for **building fully patched images** with OEM tools
Windows 10 IoT Enterprise: Assigned Access Overview
More manageable, more locked down

Single app kiosk experience

Restrict the user experience to a single universal windows application.

Examples:
- Digital signage
- Interactive display
- ATM, POS, Healthcare

Multi-app kiosk experience

Restrict the user experience to a curated set of applications.

Examples:
- Interactive kiosk
- Tablets used by store employees for business operation
Windows 10 IoT Long Term Support Silicon

• **Windows 10 IoT Enterprise**
  - AMD® 6th Generation Processors Series Ax-8xxx & E-Series Ex-8xxx & FX-870K
  - AMD® 7th Generation Processors Series Ax-9xxx & E-Series Ex-9xxx & FX-9xxx
  - AMD® Ryzen™ 3/5/7 1xxx
  - AMD® Ryzen™ 3/5/7 2xxx
  - AMD® G-Series, R-Series
  - AMD® V1xxx
  - 4th 5th 6th 7th 8th Generation Intel® Core™ Processors
  - Intel® Atom™ processor E3900 series
  - Intel® Atom™ x5-E8000 Processor
  - Intel® Atom™ x5-Z8350 Processor
  - Intel® Atom™ Processor E3800 Product Family
  - Intel® Pentium® and Celeron® Processor N and J Series

• **Windows 10 IoT Core**
  - Broadcom® 2836 (Raspberry Pi 2)
  - Broadcom® 2837 (Raspberry Pi 3)
  - Intel® Atom™ processor E3900 series
  - Intel® Atom™ x5-E8000 Processor
  - Intel® Atom™ x5-Z8350 Processor
  - Intel® Atom™ Processor E3800 Product Family
  - Intel® Pentium® and Celeron® Processor N and J Series
  - NXP® i.MX 6QuadPlus, 6Quad, 6DualPlus, 6Dual, 6DualLite
  - NXP® i.MX 6SoloX, 6SoloLite, 6ULL
  - NXP® i.MX 7Solo
  - NXP® i.MX 7ULP
  - NXP® i.MX 8M Family
  - Qualcomm® Snapdragon™ 410E
Windows Server as Intelligent Edge OS

- High availability
- High security
- ML
- Windows Admin Center
  - Completely integrated with Azure
  - System Insights
- Azure IoT Edge
  - Azure Blob Storage on the Edge accelerates edge-local processing like local video analytics
    - SQL, SQLite
- Edge HCI
Demo Time!

System Insights
<table>
<thead>
<tr>
<th>Capability name</th>
<th>State</th>
<th>Status</th>
<th>Status description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU capacity forecasting</td>
<td>Enabled</td>
<td>Ok</td>
<td>CPU usage is forecasted to remain within the available capacity.</td>
</tr>
<tr>
<td>Networking capacity forecasting</td>
<td>Enabled</td>
<td>Ok</td>
<td>Network usage is forecasted to remain within the available capacity.</td>
</tr>
<tr>
<td>Total storage consumption forecasting</td>
<td>Enabled</td>
<td>Ok</td>
<td>Disk usage is forecasted to remain within the available capacity.</td>
</tr>
<tr>
<td>Volume consumption forecasting</td>
<td>Enabled</td>
<td>Critical</td>
<td>Disk usage is forecasted to exceed available capacity in the next 7 days.</td>
</tr>
<tr>
<td>Capability name</td>
<td>State</td>
<td>Status</td>
<td>Status description</td>
</tr>
<tr>
<td>---------------------------------------</td>
<td>-------</td>
<td>--------</td>
<td>------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>CPU capacity forecasting</td>
<td>Enabled</td>
<td>✔ Ok</td>
<td>CPU usage is forecasted to remain within the available capacity.</td>
</tr>
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<td>Networking capacity forecasting</td>
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<td>✔ Ok</td>
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<tr>
<td>Volume consumption forecasting</td>
<td>Enabled</td>
<td>❌ Critical</td>
<td>ES is forecasted to exceed available capacity in the next 7 days.</td>
</tr>
</tbody>
</table>
Calling AFS programmatically

Set-up

Initiate AFS

1. Determine which volume reported a critical status
2. Securely authenticate to Azure
3. Define all sync variables
4. Create the sync group and cloud endpoint
5. Create the server endpoint for the critical volume

# Step 4: Create the sync group and cloud endpoint
Function Create-Sync-Group-And-Cloud-Endpoint {
    $NewAzureRmStorageSyncGroup -SyncGroupName $SyncGroupName
    -StorageSyncService $StorageSyncName

    # Get a storage account with desired name
    $StorageAccount = Get-AzureRmStorageAccount -ResourceGroupName $ResourceGroupName
    | Where-Object { $_.StorageAccountName -eq $StorageAccountName }

    # Get or create an Azure file share within the desired storage account
    | Where-Object { $_.Name -eq $FileShareName -and $_.IsSnapshot -eq $false }

    if ($FileShare -eq $null) {
        -Name $FileShareName
    }

    # Create the cloud endpoint
    New-AzureRmStorageSyncCloudEndpoint
    -StorageSyncServiceName $StorageSyncName
    -SyncGroupName $SyncGroupName
    -StorageAccountResourceId $StorageAccount.Id
    -StorageAccountShareName $FileShare.Name
}

# Step 5: Create the sync group and cloud endpoint
Function Create-Server-Endpoint {
    $CloudTieringDesired = $true
    $CloudTieringDesired
}

1. Determine which volume reported a critical status
2. Securely authenticate to Azure
3. Define all sync variables
4. Create the sync group and cloud endpoint
5. Create the server endpoint for the critical volume
### Microsoft Azure - Cloud Endpoints

**Cloud Endpoints**

<table>
<thead>
<tr>
<th>Azure File Share</th>
<th>Provisioning State</th>
<th>Resource Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>file-share-insights-volume-e</td>
<td></td>
<td>system-insights-ignite-rg</td>
</tr>
</tbody>
</table>

**Server Endpoints**

<table>
<thead>
<tr>
<th>Server</th>
<th>Health</th>
<th>Files Not Syncing</th>
<th>Sync Activity</th>
<th>Path</th>
<th>Cloud荣</th>
<th>Last Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>gw-xmlt.redmond.corp.microsoft.com</td>
<td></td>
<td>0</td>
<td>Syncing</td>
<td></td>
<td>Enabled</td>
<td>9/13/2018 7:30 AM</td>
</tr>
</tbody>
</table>
Canonical Intelligent Edge roles

Pattern#1
- ("Complex") IoT device
- Data collection, protocol bridging

Pattern#2
- ("Simple") IoT device
- Data collection
- Protocol bridging, pre-processing/annotating

Pattern#3
- (Either) IoT device
- Data collection
- Protocol bridging, pre-processing/annotating
- Edge Server(s)
- Data buffering, Local reactive, predictive & cognitive analytics

Pattern#4
- (Either) IoT device
- Data collection
- Protocol bridging, pre-processing/annotating
- Edge Server(s)

MS product offerings
- Azure Sphere, Windows IoT Core & IoT Enterprise
- Windows IoT Enterprise (Azure IoT Edge), Windows Enterprise Client (Azure IoT Edge)
- Windows Server (Azure IoT Edge), Azure Databox Edge
- Azure Stack
- Hybrid cloud

Everything this direction is Microsoft Intelligent Edge!
## Recap: Windows as Intelligent Edge OS

Commercialize your project with enterprise-grade security and support

<table>
<thead>
<tr>
<th>Windows IoT Core</th>
<th>Windows IoT Enterprise</th>
<th>Windows Server</th>
</tr>
</thead>
<tbody>
<tr>
<td>• SoC: Intel, Raspberry Pi, Qualcomm, <strong>NXP</strong></td>
<td>• SoC: Intel, AMD</td>
<td>• SoC: Intel, AMD</td>
</tr>
<tr>
<td>• Small footprint: 512MB RAM+2G storage</td>
<td>• Windows 10 IoT Enterprise <strong>LTSC</strong> 1809</td>
<td>• <strong>Windows Server 2019</strong></td>
</tr>
<tr>
<td>• IoT Core Services</td>
<td>• Lockdown</td>
<td>• <strong>Windows Admin Center</strong></td>
</tr>
<tr>
<td>• <strong>DUC</strong></td>
<td>• <strong>assigned access</strong></td>
<td>• <strong>System insights</strong></td>
</tr>
<tr>
<td>• <strong>LTSC</strong></td>
<td>• Security</td>
<td>• Azure backup</td>
</tr>
<tr>
<td>• Security</td>
<td>• Machine Learning</td>
<td>• Security</td>
</tr>
<tr>
<td>• Machine Learning</td>
<td>• Azure IoT Edge</td>
<td>• Machine Learning</td>
</tr>
<tr>
<td>• Azure IoT Edge</td>
<td></td>
<td>• <strong>High Availability</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• <strong>Hyper Converged Infrastructure (HCI)</strong></td>
</tr>
</tbody>
</table>

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Call to Action

• Download and test Windows IoT, provide feedback
• Download and test Azure IoT Edge, provide feedback
• Start Azure IoT Edge certification process and get certified
• Plan and build Intelligent Edge devices
• Check out NXP on Windows IoT Core [https://aka.ms/iotnxp](https://aka.ms/iotnxp)
• Start planning Intelligent Edge capability on Windows Server

Contact us [iotcertdisc@microsoft.com](mailto:iotcertdisc@microsoft.com), [EEAPIOTPartner@microsoft.com](mailto:EEAPIOTPartner@microsoft.com)
Thank You!