IoT in Action – Intelligent Edge with Windows 10 IoT Enterprise

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Agenda

Windows 10 IoT overview
Windows 10 IoT Enterprise deep dive
Migration to Windows 10 IoT Enterprise
What’s new in the October 2018 Update?
ROS on Windows
Windows 10 IoT Powers the Intelligent Edge

- **Faster time-to-market**: Create and deploy solutions faster, integrating by design with Azure IoT.
- **Intelligent security**: Protect your devices, data and identities with built-in Windows 10 security that’s always up-to-date.*
- **Intelligent Edge**: Gain insight and take action with devices that do more at the edge.

*For the supported lifetime of the device.
Windows IoT industry examples

Transforming industries, enhancing customer experiences and empowering a modern workforce — while ensuring that business data and devices are safeguarded from external threats.
Windows 10 IoT industry examples

Transforming industries, enhancing customer experiences and empowering a modern workforce — while ensuring that business data and devices are safeguarded from external threats.

**Retail**
- Increase business growth and brand loyalty.
- Monitor inventory and quality.
- Track consumer behavior and recommend products (i.e. hotel’s tracking room usage, tailoring to guest preferences).

**Smart cities**
- Create safer cities with connected infrastructure.
- Optimize energy usage.
- Improve field service.
- Monitor environmental conditions like air and water.

**Manufacturing**
- Monitor equipment to predict maintenance and improve field-service efficiency.
- Leverage incoming data to create new business models tailored to customer needs.

**Healthcare**
- Manage patient care at home with wearable sensors.
- Monitor medical assets to save staff time.
- Maintain vital equipment by fixing problems before they occur.
- Track equipment usage with intelligent sensors.

**Smart buildings**
- Connect building devices and systems to bring more efficient operation and control to building owners, operators and occupants.
- Optimize energy, air quality, security, lighting and HVAC with machine learning.

**Financial**
- Increase productivity and security while reducing management costs, with thin clients.
- Improve customer experiences and protection from cybersecurity threats with next generation ATMs.

**Security and Surveillance**
- AI enabled cameras can identify people and activities to increase facility security by using machine learning models trained in the cloud, but running at the edge on Windows ML.
Windows 10 IoT editions

Windows 10 IoT Core
Minimum requirements:
- Supported X86, X64 or ARM CPU
- 512 MB RAM
- 2 GB storage

Windows 10 IoT Enterprise
Minimum requirements:
- 1 GHz or faster X86 or X64 CPU
- 1 GB RAM (2 GB for 64-bit)
- 16 GB Storage (20 GB for 64-bit)

Small-footprint smart edge devices
- Universal Windows Platform (UWP) app experience
- Small hardware footprint
- Optimized for devices with and without displays
- Support for ARM CPUs
- No OS-shell UX
- Familiar Windows security, tools, apps and manageability
- No operating system royalty

Powerful smart devices
- A rich user experience with Win32 and UWP apps
- Advanced threat protection and device security
- Same deployment, manageability and servicing as desktops
- Familiar interface with granular user interface (UI) lockdown controls
- Identical to Windows 10 Enterprise, but sold through the OEM channel instead of volume licensing

For details see https://docs.microsoft.com/windows-hardware/design/minimum/minimum-hardware-requirements-overview
Windows 10 IoT Enterprise: bringing the full power of Windows to smart devices

- All the power of Windows
- Specialized features for dedicated devices
- Windows 10 security is in its DNA
- Built for the cloud
Windows 10 IoT Enterprise: The right OS for smart devices

<table>
<thead>
<tr>
<th>Product</th>
<th>Description</th>
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<tbody>
<tr>
<td><strong>CompactLogix 5480</strong></td>
<td>Programmable logic controller launched at Automation Fair 2017</td>
</tr>
<tr>
<td><strong>Innowi ChecOut</strong></td>
<td>Mobile POS introduced at NRF 2018</td>
</tr>
<tr>
<td><strong>iBASE SI-60E</strong></td>
<td>Digital Signage media player that can drive up to 12 HDMI displays</td>
</tr>
<tr>
<td><strong>Mondelez vending machine</strong></td>
<td>40-inch touch screen display allows consumers to interact with products in 3-D</td>
</tr>
<tr>
<td><strong>HPE GL20 IoT Gateway</strong></td>
<td>Rugged compute solution designed to operate in industrial environments</td>
</tr>
</tbody>
</table>
| **Dell Wyse Thin Client 5070**              | Secure, reliable, cost-effective Wyse thin clients are designed to integrate into any virtualized or web-based infrastructure,
Why Windows 10 IoT Enterprise

- Faster time to market
- Intelligent Security
- Intelligent Edge
Faster time to market

Easy to build

Easy to connect

Easy to manufacture

Easy to deploy
Easy to build
Tools and services make building IoT solutions fast and easy

Windows “just works” - professionally tested

Natural User Interface
Voice, touch, and gesture
Windows Ink
Cortana

Lock-down features
Shell lock-down
OEM customization capabilities

Embedded mode
Access to system settings and capabilities
Easily access hardware directly from app code
Background services for long-running tasks

More
Familiar development environment with best-in-class tools
Robust set of languages and locales
Great app compatibility support
Easy to connect
Connects to different devices

Smart things
OPC-UA, and other industry standard protocols
Legacy protocols

Azure IoT services

Your Windows 10 IoT solution

Legacy Systems

Sensors

IoT in Action
Easy to manufacture
Leverage the Windows ecosystem

Build devices faster working with the Windows ecosystem of hardware providers and manufacturing partners.

Rely on Microsoft manufacturing guidance and tooling to jump-start production lines.
Easy to deploy
Zero touch provisioning—easily deploy large volume of devices

Azure IoT Hub Device Provisioning Service
Register and provision devices with zero-touch in a secure and scalable way
• Simple plug-and-play provisioning
• Minimize manual connection requirements
• Enhanced security through Hardware Security Module (HSM)
• Global availability

Windows Autopilot
Transform a brand new device into a business-ready and cloud managed state, without needing to touch the device. Integrated seamlessly with Azure Active Directory and Microsoft Intune.
Why Windows 10 IoT Enterprise

- Faster time to market
- Intelligent Security
- Intelligent Edge
Intelligent security

- Device protection
- Data protection
- Threat disruption
- Security management
Device protection

Secured hardware implementation and secure boot

Only validated firmware and operating system components can execute

Trusted Platform Module (TPM) provides protection for keys and certificates
Encrypt the entire device storage with BitLocker technology

Secure authenticated connections to the intranet or the cloud can be created and protected with TLS or VPN

Windows 10 IoT supports secure network protocols like TLS 1.3 and SSL as well as IPsec VPN connections
Threat disruption

Windows as a Service provides regular security updates, so you can keep your devices protected.

Exercise control by running only the apps you have selected and signed.

Rely on preventative protection with Windows Defender Advanced Threat Protection (ATP).

Get next-generation protection with Windows Defender Antivirus, powered by the Intelligent Security Graph.
Monitor and manage the health of a large volume of IoT devices

Windows Defender Advanced Threat Protection (ATP) provides preventative protection, detects attacks and zero-day exploits

Automate security health checks with Windows Device Health Attestation (DHA)
IoT end-to-end security offering

Leverage our security expertise so you can focus on your business. Help keep your business protected with:

**Windows 10 IoT Enterprise**
- **Device protection**
  - Trusted Platform Module (TPM)
  - Device Health Attestation
  - Lockdown features
  - Secure Boot
  - BitLocker
- **Threat resistance**
  - Windows as a Service
  - Device Guard
  - Windows Firewall
  - Windows Defender ATP
- **Data protection in-motion**
  - X.509/TLS-Based Handshake and Encryption
- **Device Health Attestation**

**Azure IoT**
- **Cloud security**
  - Encryption at Rest
  - Azure Active Directory
  - Key Vault
  - IP-based blocking
  - Secure Device Registration
  - Standards-based best practices
- **Security management**
  - Device management
  - Policy-based access control
  - Device recovery
  - Device-specific repudiation
Why Windows 10 IoT Enterprise

- Faster time to market
- Intelligent Security
- Intelligent Edge
Intelligent edge

- Azure IoT Edge support
- Hardware choices
- Full-featured platform
- Natural user interface

Hans new slide. I used this photo earlier, so please replace with new one.
Azure IoT Edge Support
Hardware choices
Tailor your solution to fit industry needs with array of options

Runs on industry standard devices
Windows 10 IoT Enterprise is the binary equivalent of Windows 10 Enterprise with the same broad CPU support

Windows as a Service adds new features to help you evolve your IoT solution while continuing support for older releases for device stability

Create a variety of devices
Industrial devices, medical devices, gateways, kiosks, digital signs, cash registers, ATMs, thin clients, vending machines, tablets and more

Compatible with industry peripherals
Barcode readers, industrial automation devices, cash drawer peripherals, Receipt Printers, and more
Full-featured platform
Built on the heritage of the world’s leading business operating system

Develop in the languages you already know and reuse code with Visual Studio
Built-in advanced features like Machine Learning, advanced audio & video processing, mixed reality capabilities and more
Universal Windows Platform apps can run on all Windows 10 devices, allowing for code sharing
Management options include Azure IoT DM, Intune, SCCM and 3rd party MDM
Service applications through the Microsoft Store or Device Management systems like Intune
Natural user interface

Design devices for rich interaction based on scenario

- Touch and gesture
- Windows Ink (e.g. signature capture)
- Speech platform
  - Beamforming for array mics
  - Noise suppression and echo cancellation
- Windows Hello authentication and Face detection
- Camera barcode scanner built-in
Scalable IoT solutions, from device to the cloud

Energize your business by creating solutions faster and connecting intelligent edge devices to the cloud with capabilities like these

- **Dashboards and visualization**
- **Azure IoT Edge**
- **Artificial intelligence**
- **Machine learning**
- **Familiar development tools, languages and frameworks**
- **Advanced lockdown features**
  - UWP app platform with touch, inking and voice
  - Container Hosting
  - Windows Machine Learning
  - Cortana
  - Azure IoT device SDKs
  - Enables data ingestion, stream processing and predictive analytics
- **Turn-key connectivity** to Azure IoT Hub or Microsoft IoT Central
- **Modern management**
  - Azure IoT twin device management
  - Modern device management
  - Provisioning service
  - Device recovery
  - Flexible app servicing
- **IoT Edge**
  - Dashboards and visualization
  - Azure IoT Edge
  - Artificial intelligence
  - Machine learning

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**Windows 10 IoT Enterprise**

**Intelligent**

- Container Hosting
- Windows Machine Learning
- Cortana
- Azure IoT device SDKs
- Enables data ingestion, stream processing and predictive analytics

**Cloud connected**

- Turn-key connectivity to Azure IoT Hub or Microsoft IoT Central

**Modern management**

- Azure IoT twin device management
- Modern device management
- Provisioning service
- Device recovery
- Flexible app servicing

**IoT Edge**

- Dashboards and visualization
- Azure IoT Edge
- Artificial intelligence
- Machine learning
If you have devices running Windows Embedded 7 products,
Now is the time to move to Windows 10 IoT

Windows Embedded 7

Windows Embedded Standard 7
Componentized version of Windows with Embedded Enabling Features
• Thin clients, Industrial controllers, etc.

Windows 7 for Embedded Systems
Full version of Windows 7 with special licensing to support dedicated devices
• ATMs, HMI, etc.

Windows Embedded POSReady 7
Custom version of Windows 7 with retail-specific features for POS systems

Windows 10 IoT Enterprise (Binary equivalent of Windows 10 Enterprise**)
• Excellent application and peripheral compatibility
• Improved lockdown features over Windows Embedded 7
• Runs Win32 and UWP apps
• Runs on x86/x64 silicon
• Compatible with existing management infrastructure
• 10 year lifecycle for device stability
• Designed for cloud connectivity and AI/ML
• Same hardware requirements as Windows 7*

*The upgradeability of a device includes factors beyond the system specification. This includes driver and firmware support, application compatibility, and feature support, regardless of whether or not the device meets the minimum system specification for Windows 10.

**Licensing is not the same, Enterprise is licensed through volume licensing and IoT Enterprise is licensed through OEM.
Windows 10 IoT Enterprise servicing options

**Long Term Servicing Channel (LTSC)**
- 10 years of support with monthly security and non-security updates
- No feature updates
- Optional new LTSC releases every 2-3 years

*Note: This is a distinct build from SAC and select in-box apps are not included (e.g. Microsoft Edge, Microsoft Store, Cortana)*

**The Semi-Annual Channel (SAC)**
- Feature releases occur every six months with monthly security and non-security updates
- Fall releases have 30 months of support per release
- Spring releases have 18 months of support per release
- Upgrading to a newer release restarts the support period
Predictable and manageable OS lifecycle

Windows 10 IoT Enterprise LTSC offers 10 years of OS support, the same amount of time Microsoft provided for Windows Embedded 7.

Long Term Servicing Channel (LTSC) builds remain stable and don’t receive feature updates. They do however, receive cumulative security and non-security fixes.
IoT silicon support process

New silicon can be supported on the most current LTSC release.

Timeline of silicon requests and support with LTSC releases

- New silicon requested in current LTSC
- Silicon isn’t enabled in previous LTSC
- Silicon support included in next LTSC
- Silicon requested in current LTSC
- LTS C 2016

1607 1703 1709 1803 1809 SAC +1 SAC +2 SAC +3 SAC +4 SAC +5 SAC +6 SAC +7 SAC +8 SAC +9

LATSC 2019
**Hardware support**

Windows 10 IoT Enterprise LTSC 2019 has the same hardware requirements as Windows 7.*

**Verify CPU support for existing hardware**

For new silicon on existing LTSC builds, please contact your vendor for more information

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**Fall 2018 Long Term support silicon details**

<table>
<thead>
<tr>
<th>Windows 10 IoT Enterprise</th>
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<tbody>
<tr>
<td>AMD® 6th Generation Processors Series Ax-8xxx &amp; E-Series Ex-8xxx &amp; FX-870K</td>
</tr>
<tr>
<td>AMD® 7th Generate' Processors Series Ax-9xxx &amp; E-Series ex-9xxx &amp; FX-9xxx</td>
</tr>
<tr>
<td>AMD® Ryzen™ 3/5/7 1xxx, AMD® Ryzen™ 3/5/7 2xxx</td>
</tr>
<tr>
<td>AMD® G-Series, AMD® R-Series, AMD® V1xxx</td>
</tr>
<tr>
<td>4th/5th/6th/7th/8th/9th Generation Intel® Core™ Processors</td>
</tr>
<tr>
<td>Intel® Atom™ Processor E3900 series</td>
</tr>
<tr>
<td>Intel® Atom™ x5-E8000 Processors, x5-Z8350 Processors</td>
</tr>
<tr>
<td>Intel® Atom™ Processor E3800 Product Family</td>
</tr>
<tr>
<td>Intel® Pentium™ and Celeron™ Processors N and J Series</td>
</tr>
</tbody>
</table>

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*The upgradeability of a device includes factors beyond the system specification. This includes driver and firmware support, application compatibility, and feature support, regardless of whether or not the device meets the minimum system specification for Windows 10.
Advanced lockdown features for a dedicated device

Windows 10 IoT Enterprise offers consistent and predictable device lockdown across form factors.

- **Unified write filter & HORM**: Easily create read-only devices. Improve system uptime.
- **USB access**: Only enable approved USB devices.
- **Keyboard filter**: Block hotkeys and other key combinations. Customize a breakout key sequence.
- **App locker**: Control which apps can run.
- **Edge swipe policy**: Block edge swipe gestures.
- **Assigned access**: Enable a single Universal Windows app or multiple app kiosk experience.
- **Shell launcher**: Enable a single Win32 app kiosk experience.
- **Microsoft Edge kiosk mode**: Provide a tailored browsing experience for kiosks or digital signs.

*Only available on SAC release*
Granular UI customization for a dedicated device

Windows 10 IoT Enterprise offers a broad set of user experience customization capabilities across form factors.

- **Unbranded boot**
  - Customize boot experiences
  - Suppress device crash screen

- **Custom logon**
  - Control Windows logon and shutdown screen

- **Layout control**
  - Customize the Start & Taskbar layout
  - Configure Start UI elements
  - Disable context menu of Start

- **Touch keyboard policies**
  - Configure available keyboard mode

- **Update notification**
  - Customize the Windows update notification level
  - Ability to turn off all update prompts

- **Settings page visibility**
  - Show or hide specific pages in the Settings app

- **Microsoft Store access**
  - Allow private store only experience within the Microsoft Store app
  
  *Only available on SAC release
Retail Peripherals

Native Windows 10 Support (UWP & Win32)

- Barcode Scanner
- Receipt Printer
- Cash Drawer
- Customer Display
- Mag-Stripe Reader

**New** Software Barcode Decoding via Camera Lens

More Info: [https://aka.ms/pointofservice](https://aka.ms/pointofservice)

Legacy Compatibility (Win32 Only)

- OPOS
- JavaPOS
- POS for .NET

Desktop Bridge

- Access legacy peripherals via Win32 process from a modern UWP user experience.
- Distribute your Win32 app through the Microsoft Store

Weight Scale Sample: [https://aka.ms/pointofservice.build2017](https://aka.ms/pointofservice.build2017)

More Info: [https://aka.ms/desktopbridge](https://aka.ms/desktopbridge)
Windows 10 IoT gets better with each update

Each Windows 10 IoT Enterprise release offers our latest features, including specific updates made to address customer requests.
What’s new in the October 2018 Update?
Exciting new updates

- 10 years of support as an LTSC release
- Azure IoT device management support
- Windows Artificial Intelligence (AI) platform support for Azure IoT Edge
- Device lockdown: Assigned Access and Unified Write Filter improvements
- Native support for retail peripherals, including reading barcodes through a standard camera lens.
- Windows 10 IoT Enterprise manufacturing and deployment guide
- ROS on Windows experimental release
Faster time to market

New Windows 10 IoT Enterprise manufacturing and deployment guide
  • Deployment labs with automation scripts

Azure IoT Hub device management
  • Include a set of common configurations and actions such as certificate management, diagnostics, reboot

Advanced kiosk features
  • Enhanced kiosk status reporting support with MDM
  • Ability to auto launch an app in a multi-app kiosk
  • Microsoft Edge kiosk mode support
  • Assigned access API

Enhanced Unified Write Filter disk overlay
  • Free space passthrough
  • Persistent overlay mode (in beta)
  • Improved the write filter interoperability with common 3rd party filter drivers
Intelligent security

Security updates for 10 years with LTSC

Threat protection
- Attack surface area reduction
- Next generation protection

Identity protection
- Web Authentication in Microsoft Edge
- Fast Login
- Biometric for Remote Desktop
- Windows 10 TLS 1.3 (preview)
Windows Artificial Intelligence (AI) platform uses trained ML models locally
  • HW GPU acceleration with DX12 driver

Azure IoT Edge support moves cloud computing to the intelligent edge

Hardware access is available in Windows containers
Get the tools needed to build and customize IoT Enterprise images
- Windows ADK
- Windows 10 IoT Enterprise OPK
- Feature on Demand ISO
- Language Pack ISO
- ...

Create a basic image and customize a reference device in Audit Mode
- Create a bootable USB key
- Install on a reference device and boot into Audit Mode
- Customize the device under Audit Mode (optional)
  - Features on Demand
  - Drivers
  - Languages
  - Updates
  - OEM apps
  - ...

Configure device lockdown features (optional)
- Keyboard Filter
- Unified Write Filter
- Unbranded Boot
- Custom Logon
- ...

Customize additional policy settings (optional)
- Control Windows Updates
  - Active hours
  - Update notifications
  - Manual update scenarios
- Suppress blue screen (BSOD)
- Suppress notifications and popups
- Configure security Baseline
- Customize Windows Defender
- ...

Sysprep, capture and deploy
- Sysprep the reference device
- Capture your device image
  - Create a WinPE USB drive
  - Boot the reference device to WinPE and capture the image
- Deploy the captured WIM image from WinPE
- ...

Configure assigned access or shell launcher (optional)
- Auto logon
- Assigned access, or
- Shell launcher
- ...

Learn more
Bringing the power of Windows 10 to the Robot Operating System
Bringing the power of Windows 10 to ROS

- Announced an experimental release of ROS1 for Windows at ROSCon, 2018
- Actively enabling more ROS packages on Windows
- Target end of 2018 to complete the core porting effort
- Bringing advanced features like hardware-accelerated Windows AI Platform + Azure cloud technologies to industrial robots
- http://aka.ms/ros
ROS – The Robot Operating System

- Mature framework for operating robots
- ROS Industrial Consortium bringing ROS to the factory
- Complex robot behavior is broken down into nodes
- Thousands of community implemented nodes
- Nodes available for Manipulation, Mobility, Air, Marine, and Space
- Has many features for developing and debugging robots

Diagram:

- ROS Master
- Topic: /chatter
- talker.py
- publish
- listener.cpp
- subscribe
- snoop.cpp
- subscribe
Running ROS on Windows natively for the supported ROS packages
- Accelerated graphics and physics
- Projection of Windows specific features
- Enterprise security and manageability support

Running ROS via Windows Subsystem for Linux for the non-supported ROS packages
- Supported for non-UI & non-media packages
- Recommended for proprietary solutions like Navigation

Running ROS on Linux
- Works with ROS on Windows
- Azure packages supported
Get started

Using ROS on Windows

- Getting started guide - http://aka.ms/ros
- Uses Chocolatey for ROS runtime and dependency distribution
- ROS Nodes are built in a Visual Studio command line

Connect to Azure IoT Hub

- ros_azure_iotHub: https://github.com/Microsoft/ros_azure_iotHub
Call to Action
Call to action

• Download and test Windows 10 IoT, provide feedback
• Download and test Azure IoT Edge, provide feedback
• Plan and build Intelligent Edge devices, tell us about them for co-marketing opportunities
• Check out the new manufacturing and deployment guide for Windows 10 IoT Enterprise, and provide feedback
• Try ROS on Windows and provide feedback
• Contact us and join EEAP
Thank you