



Developing at the edge with Microsoft Windows 10 IoT Enterprise

Computers are everywhere—in people’s pockets, checkout scanners at grocery stores, cars, and even appliances like refrigerators. These edge devices make up the internet of things (IoT), where devices both in the home and the workplace connect to the internet, gathering and analyzing all kinds of data. To serve those working in the IoT space, Microsoft offers a targeted operating system, Windows 10 IoT Enterprise, that can deliver strong connectivity, security, and management capabilities.

Windows 10 IoT Enterprise offers the familiarity of the Windows 10 operating system for people who develop and use the apps that connect to edge devices. Users can manage and update using the same tools and policies they use with other Windows 10 devices. Windows 10 IoT Enterprise offers flexible service plans with Windows supportability and long-term support from Microsoft, integration with Microsoft Azure, device lockdown features that allow non-developers to configure images, and customization options to meet a wide range of business needs. Using publicly available information, including customer testimonials, Principled Technologies compiled the facts about Microsoft Windows 10 IoT Enterprise and the benefits the operating system can provide to solution providers in the IoT space and users at the edge.

The business benefits of using Windows 10 IoT Enterprise

Businesses employing Windows 10 IoT Enterprise can benefit in a number of ways:

- **Service plans targeted at each business's unique needs.** Because of their extended lifecycles, IoT solutions can present unique management challenges. Microsoft addresses this problem with the Long-Term Servicing Channel (LTSC) service model, which delivers regular security and quality updates (but not feature updates) over a period of 10 years.
 - **Long-Term Servicing Channel.** With the LTSC model, devices serving a single purpose can remain reliable without introducing updated features that may require IoT software updates. According to Microsoft, their LTSC plan is "ideal for commercial IoT devices, such as point-of-sale systems, ATMs and industrial equipment controllers, which typically require the highest levels of stability and security to perform a single important task and don't need feature updates as frequently as other types of devices."¹
- **Shared management.** Companies can manage Windows 10 IoT Enterprise devices with the same Microsoft or third-party mobile device management (MDM) tools they use for their mobile and desktop devices running other Windows 10 versions.
- **Security.** A number of features make this a secure operating system for IoT.
 - **Windows as a service (WaaS).** It used to be necessary for administrators to conduct compatibility tests before deploying new updates on critical embedded systems, prolonging periods of vulnerability. In Windows as a service, Microsoft separates feature updates from security and reliability updates, calling them quality updates. Windows 10 IoT Enterprise devices on the LTSC receive only quality updates and no feature updates, so there is no need for testing. Just as with desktop systems, administrators automate Windows 10 IoT Enterprise software updates with servicing tools such as System Center Configuration Manager (SCCM), Windows Server Update Services (WSUS), Windows Update, Windows Update for Business, and Intune. According to Microsoft, "Updating devices and keeping them up to date are key pillars in keeping business information secure, particularly in an ever-evolving threat landscape. We don't need to wait for large version releases and then plan the full upgrade deployments to roll out new and improved operating system and security features..."² Microsoft is watching for vulnerabilities and providing timely patches automatically in Windows as a service. Microsoft will keep providing quality updates for the next 10 years for devices on the LTSC, simplifying deployment and management throughout the life of most devices.

1 Microsoft, "Windows 10 IoT delivers innovation and intelligence at the edge with the October 2018 Update," accessed March 27, 2019, <https://blogs.windows.com/windowsexperience/2018/10/04/windows-10-iot-delivers-innovation-and-intelligence-at-the-edge-with-the-october-2018-update/#mhy5cYKQXdpsDRxd.97>.

2 Microsoft, "Keeping Windows devices up to date with Microsoft Intune and Windows Update for Business," accessed July 12, 2019, <https://www.microsoft.com/en-us/itshowcase/keeping-windows-10-devices-up-to-date-with-microsoft-intune-and-windows-update-for-business>.

- **Device lockdown features.** Non-developers can use audit mode commands to enable lockdown features in custom Windows 10 IoT Enterprise images such as:
 - ◆ **Keyboard filter.** The keyboard filter suppresses undesirable key presses or key combinations.
 - ◆ **Unified Write Filter (UWF).** The UWF protects the device configuration by redirecting drive writes to a virtual overlay.
 - ◆ **Unbranded boot.** Unbranded boot suppresses Windows elements such as the crash screen.
 - ◆ **Custom logon.** Custom logon suppresses Windows UI elements like Blocked Shutdown Resolver.³
- **Windows 10 Enterprise-grade security.** In addition, Windows 10 IoT Enterprise protects IoT devices with the same threat protection and device security that Windows 10 Enterprise offers for desktop and mobile devices. Built-in hardware and software security features, such as Secure Boot, BitLocker, Device Guard, and Credential Guard, enable enterprises to lock down a device to protect it, its data, and its users' identities.
- **Azure IoT Device Agent.** The Azure IoT Device Agent is an open-source project that provides a ready-to-build agent to integrate all Windows 10 IoT versions to Azure cloud solutions such as Azure IoT Central or Azure Solution Accelerators.⁴
- **Legacy app support.** Microsoft offers the same long-term legacy app support as for Windows 10 Enterprise.
- **Windows Hardware Compatibility Program.** According to Microsoft, "The Windows Hardware Compatibility Program is designed to help your company deliver systems, software, and hardware products that are compatible with Windows and run reliably on Windows 10 and Windows Server 2019. The program also provides guidance for developing, testing, and distributing drivers."⁵ Windows has a longstanding history and strength in the area of device and peripheral compatibility. IoT users stress the importance of hardware compatibility. For example, *iotforall.com* quotes a startup advisor as saying, "While working with several IoT startups, I found that one of the most common issues faced by companies was in regards to the compatibility between the devices used, when a device failure happens, it becomes very difficult to get it replaced and this is especially a problem in places where IoT has only begun to take root."⁶

Customer testimonial: Acquire Digital

Acquire Digital designs content management software, specializing in customized digital displays. The company used Windows 10 IoT Enterprise and Microsoft Azure to build a digital communications platform. According to Microsoft, "The platform powers a wide range of solutions including interactive directories and a one-of-a-kind digital display for Simon Property on the renowned Las Vegas Strip."⁷ The display, which is 85 feet tall and uses 6,000 feet of LED screens, showcases a range of advertising content.

Neil Farr, Managing Director of Acquire Digital, explains the impact of using Windows 10 IoT and Microsoft Azure technology: "***With Windows 10 IoT and Azure, we can use built-in features to implement a wide array of technologies [...] There is so much complexity with this digital display solution that it could really only be handled by a Windows 10 IoT platform.***"⁸

3 Microsoft, "Device Lockdown Features," accessed July 12, 2019, <https://docs.microsoft.com/en-us/windows-hardware/manufacture/desktop/iot-ent-device-lockdown-features>.

4 GitHub, "Azure IoT Device Agent," accessed July 12, 2019, <https://github.com/ms-iot/azure-client-tools/blob/master/docs/device-agent/device-agent.md>.

5 Microsoft, "Windows Hardware Compatibility Program," accessed July 12, 2019, <https://docs.microsoft.com/en-us/windows-hardware/design/compatibility/>.

6 IoT for All, "Addressing the Challenges in IoT Development," accessed July 12, 2019, <https://www.ietfforall.com/challenges-in-iot-development/>.

7 Microsoft, "Innovative digital display captures attention on the Las Vegas Strip," accessed March 26, 2019, <https://customers.microsoft.com/en-us/story/acquire-digital>.

8 Microsoft, "Innovative digital display captures attention on the Las Vegas Strip."

How Windows 10 IoT Enterprise can help companies save

According to Advantech, an IoT solutions provider and authorized Microsoft Windows 10 IoT distributor, Windows 10 IoT Enterprise helps organizations generate new revenue by “driving customer engagement, creating new products, business models and streamlining operations.”⁹ Features that can help companies save include:

- **A unified Windows platform across devices.** With Windows 10 IoT Enterprise, companies can integrate the operating system into their existing Windows environments, sharing applications and code with other Windows platforms. Solution providers can use the tools and languages they are familiar with, potentially shortening development cycles. This could help an organization save on development costs, cut the time a device takes to get to market, and meet customer needs sooner, potentially boosting revenue.
- **Lower licensing costs.** OEMs provide sales and support for Windows 10 IoT Enterprise through embedded OEM agreements (as opposed to through Microsoft volume licensing channels). Thanks to this model, Windows 10 IoT Enterprise licenses cost less than Windows 10 Pro licenses. The CPU of each IoT device determines its license (Entry, Value, or High End for low-, medium- or high-performance processors).
- **Ease of deployment and maintenance.** With Windows 10 IoT Enterprise, solution providers can deploy, manage, and secure devices with the same MDM tools and policies that they use for their other Windows devices. This ease of use could cut down on deployment time and ongoing maintenance costs.
- **Updated security.** With long-term service plans, businesses using Windows 10 IoT Enterprise could spend less time and money testing and deploying feature updates for devices that don't require them. Up-to-date security could provide additional protection against threats, potentially avoiding the remediation costs that a security breach would incur.

Customer testimonial: StratosMedia

StratosMedia positions themselves as a “complete, centrally controlled solution for all digital content delivery needs.”¹⁰ The company used Windows 10 IoT Enterprise and Microsoft Azure to create a digital communications platform that, according to Microsoft, integrates with “virtually any data source” and works with “multiple types of devices including smartphones, kiosks, and video walls,” helping organizations broadcast their content across a variety of platforms.¹¹

Brian Hammett, Chief Executive Officer at StratosMedia, says of Windows 10 IoT, ***“It suits organizations that have complex networks or large ecosystems with potentially thousands of devices already connected. Running a digital communication platform based on Microsoft technology makes a lot of sense, because they can integrate it with their existing system.”***¹²

Jason Rigg-McPherson, Chief Technical Officer at StratosMedia, also thanks Windows 10 IoT for helping bolster the security of their digital display: ***“Security should be embedded in all products, and Windows 10 IoT offers very strong protection. We address the whole ecosystem and the way security works at every checkpoint, whether it's the cloud, a two-way data stream, or a device.”***¹³

9 Advantech, “Why Windows 10 IoT?” accessed March 27, 2019, <http://select.advantech.com/windows-10-iot/>.

10 StratosMedia, accessed March 26, 2019, <https://stratosmedia.com/>.

11 Microsoft, “Transforming digital communications with a new content delivery platform,” accessed March 26, 2019, <https://customers.microsoft.com/en-us/story/stratos-media>.

12 Microsoft, “Transforming digital communications with a new content delivery platform.”

13 Microsoft, “Transforming digital communications with a new content delivery platform.”

Example uses of Windows 10 IoT Enterprise

Windows 10 IoT Enterprise brings the familiarity and security of the Windows 10 OS to the IoT space, backing IoT devices in manufacturing, health, government, retail, and many other industries across the world. It supports a wide range of fixed-use devices from ATMs to manufacturing and medical devices. Since Windows 10 IoT Enterprise is a full version of Windows 10, it provides the same UI and management tools PC users have enjoyed for years. Solution providers building on Windows 10 IoT Enterprise can design a range of devices with interfaces that are familiar to Windows users. The platform supports many device capabilities out of the box, including desktop functionality, Win32/UWP apps, communication capabilities (Bluetooth, NFC, cellular), touchscreen support, speech recognition, and more. Some examples of devices suited to Windows 10 IoT Enterprise include:

- POS kiosks
- Digital signs
- Smart speakers
- Appliances with screens
- Music players

There are two other versions of Windows 10 IoT:

- **Windows 10 IoT Core.** Built for small devices such as IoT Gateways, wearables, and smart home devices that run a single app; smaller footprint than Windows 10 Enterprise.
- **Windows Server IoT 2019.** A full version of Windows Server 2019.

Customer testimonial: Rockwell Automation

Rockwell Automation specializes in what they call “industrial automation and information.”¹⁴ According to Rockwell Automation, they are the largest company with this specialization in the world.¹⁵ Microsoft explains the process of incorporating Windows 10 IoT Enterprise: “The company decided to integrate the Windows 10 IoT Enterprise operating system with existing manufacturing equipment and software, and connect the on-premises infrastructure to the Microsoft Azure IoT solution accelerators.”¹⁶

“Windows 10 IoT with Azure is a flexible, scalable platform,” says Dan DeYoung, Market Development Director at Rockwell Automation. **“We can reuse applications and tailor them for different outcomes and products in the architecture [...] That really helps speed our time-to-market and enables us to scale for different purposes.”**¹⁷

According to Microsoft, the familiar nature of the Microsoft technologies enabled easy management.¹⁸ Keith Staninger, Global Business Director at Rockwell Automation, explains, **“Customers don’t need to be IT experts to use Rockwell Automation products with Windows 10 IoT, and it’s a way to reduce the learning curve and still have that rich data directly available on the plant floor.”**¹⁹

14 Rockwell Automation, accessed March 26, 2019, https://www.rockwellautomation.com/en_NA/about-us/overview.page?pagetitle=Our-Company&docid=d56238b9aed19ae573610a1eed5cd5ed.

15 Rockwell Automation.

16 Microsoft, “Making industrial machines smarter with cloud-connected IoT solution,” accessed March 26, 2019, <http://customers.microsoft.com/en-us/story/rockwell-automation>.

17 Microsoft, “Making industrial machines smarter with cloud-connected IoT solution.”

18 Microsoft, “Making industrial machines smarter with cloud-connected IoT solution.”

19 Microsoft, “Making industrial machines smarter with cloud-connected IoT solution.”

Customization options with Windows 10 IoT Enterprise

In addition to its baseline features, Windows 10 IoT Enterprise offers businesses a number of customization options. Technology blog Now Micro calls Windows 10 IoT Enterprise “the best OS for use in digital signage environments and any embedded/purpose built computing environment” due to its “flexible licensing, simple activation and custom settings.”²⁰ These custom settings include:

- **Custom device experience and branding.** Solution providers can use lockdown capabilities, user experience configuration tools, and MDM policies to control the launch of desktop or universal Windows apps, device access to peripherals, and how the user interacts with the device. These are Windows policies that solution providers can customize at image creation time, via MDM, via a provisioning package in Windows Configuration Designer delivered either through physical media or pushed from the enterprise, or via powershell. Developers can also hide or replace Windows UI features and put their applications in the forefront, giving the device their company's custom branding.
- **Advanced lockdown capabilities.** Windows 10 IoT Enterprise offers embedded lockdown capabilities including a write filter, an app locker, layout control, and a shell launcher.²¹

According to Now Micro, other customization features include the ability to “exclude unwanted features such as Cortana and pre-installed Store Apps [...] block edge gestures and other UI features that can't be disabled with Windows 10 Pro, [and] limit application visibility and system notifications.”²²

Customer testimonial: Cloverleaf

Cloverleaf developed a product called shelfPoint™, an interactive LCD display they describe as “the first digital display at the shelf edge that combines dynamic marketing content with artificial emotional intelligence.”²³

According to Gordon Davidson, the Founder and Chief Executive Office of Cloverleaf, they chose to develop shelfPoint with Windows 10 IoT Enterprise because they “**wanted to focus on the data and content, not the underlying technology. We've had very good success with Microsoft products, and choosing Windows 10 IoT with the Azure IoT solution accelerators made the most sense [...] We didn't have to worry about the underlying architecture with Windows 10 IoT; we could just build.**”²⁴

Davidson claims that shelfPoint, running on Windows 10 IoT, can help brick-and-mortar retailers “**significantly increase customer engagement and drive sales higher.**”²⁵ An initial pilot study showed that using shelfPoint with Windows 10 IoT boosted retailers' profits by around 40 percent and increased shopper engagement by 500 percent.²⁶

20 Now Micro, “Windows 10 IoT Enterprise vs Windows 10 Pro – which is best for Digital Signage?”, accessed March 27, 2019, <https://blog.nowmicro.com/2017/02/14/windows-10-iot-enterprise-vs-windows-10-pro-which-is-best-for-digital-signage/>.

21 Advantech, “Windows 10 IoT,” accessed March 27, 2019, [https://advdownload.blob.core.windows.net/productfile/PIS/Windows%2010%20IoT/Product%20-%20Datasheet/Windows%2010%20IoT_DS\(12.19.17\)20171219174849.pdf](https://advdownload.blob.core.windows.net/productfile/PIS/Windows%2010%20IoT/Product%20-%20Datasheet/Windows%2010%20IoT_DS(12.19.17)20171219174849.pdf).

22 Now Micro, “Windows 10 IoT Enterprise vs Windows 10 Pro – which is best for Digital Signage?”

23 shelfPoint, accessed March 26, 2019, <http://www.shelfpoint.com/>.

24 Microsoft, “Taking a new look at retail: interactive digital displays drive profits up 40 percent,” accessed March 26, 2019, <https://customers.microsoft.com/en-us/story/cloverleaf>.

25 Microsoft, “Taking a new look at retail: interactive digital displays drive profits up 40 percent.”

26 Microsoft, “Taking a new look at retail: interactive digital displays drive profits up 40 percent.”



Conclusion

With the world of IoT in constant flux, companies need an operating system they can depend on. Windows 10 IoT Enterprise brings the benefits of the Windows 10 operating system to the IoT space, offering flexible service options, a unified Microsoft platform, and varied customization options. With familiar Microsoft tools and languages at their fingertips, solution providers can create apps quickly, potentially cutting time to market. Based on the publicly available information we gathered, Windows 10 IoT Enterprise can bring a breadth of capabilities to companies that adopt it.

This project was commissioned by Microsoft.



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