Introduction and Agenda

Window 10 IoT Intro

Windows 10 IoT Core Overview
  One Windows Platform
  Secured
  Connected

Tools

Requirements

Summary
Modern business trends

Reduce costs and inefficiencies

Increase revenue

Create new business models
The Internet of Things helps you respond to these trends

- Gain insight and agility
- Build competitive edge
- Open new business opportunities
Core aspects of the Internet of Things
$7.2 TRILLION worldwide market for IoT solutions by 2020

25 BILLION Connected “things” will be in use by 2020

IDC: Worldwide and Regional Internet of Things (IoT) 2014–2020 Forecast
Windows Devices

Device Capabilities
Windows 10 IoT

**Windows 10 IoT Enterprise**
Desktop Shell, Win32 apps, Universal Windows Apps and Drivers
1 GB RAM, 16 GB Storage
X86

**Windows 10 IoT Mobile Enterprise**
Modern Shell, Universal Windows Apps and Drivers
512 MB RAM, 4 GB storage
ARM

**Windows 10 IoT Core**
No Shell, Universal Windows Apps and Drivers
256 MB RAM, 2 GB storage
X86 or ARM
Secured Identities  Secured Data  Secured Device
Seamless connectivity to Microsoft Azure

Interoperability across devices

Easy incorporation of sensors and peripherals

Seamless connectivity to Microsoft Azure
Windows 10 IoT Core

- Optimized Windows 10 platform for small and low-cost IoT devices
- Targeted boot experience
- Single LoB App model
Optimized Platform

Silicon choices

Target devices with lower system requirements

Opportunities for targeting new device types
Targeted Boot Experience

Boot straight into desired app
No Microsoft or Windows Branding

Easily create custom device experiences
Single LoB App Model

Modern app dev experience

Single UWP
Multiple UWP background tasks

Win32 background tasks / Services
**Windows 10 IoT Core: Benefits**

<table>
<thead>
<tr>
<th>Scalable Platform</th>
<th>Servicing</th>
</tr>
</thead>
<tbody>
<tr>
<td>• UWP extended to small devices</td>
<td>• Bring latest technology updates to small class of devices</td>
</tr>
<tr>
<td>• UD driver model</td>
<td></td>
</tr>
<tr>
<td>• Lower cost silicon</td>
<td></td>
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<tr>
<td>• Low barrier to entry</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Device Connectivity</th>
<th>Manageability</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Wireless connectivity (BLE, Wi-Fi, MBB)</td>
<td>• Manage IoT devices like any other Windows device</td>
</tr>
<tr>
<td>• Wired connectivity (Ethernet, USB)</td>
<td></td>
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<tr>
<td>• Access to busses (GPIO, I2C, SPI)</td>
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<tr>
<td>• AllJoyn</td>
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</table>

<table>
<thead>
<tr>
<th>Security</th>
<th>Cloud Integration</th>
</tr>
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<tbody>
<tr>
<td>• Windows grade security for small devices</td>
<td>• Built in cloud connectivity</td>
</tr>
<tr>
<td>• Support for Trusted Platform Module</td>
<td>• Azure IoT services</td>
</tr>
</tbody>
</table>
One Windows Platform
Universal App Platform

Scale investments
Built in LoB peripheral support
Reuse existing development skills
## Windows Universal App Platform

**Converged** APIs, write **ONE** Universal App and target all Windows 10 editions

**Scale** and get **higher ROI** by selling same App to all Windows 10 editions OEMs/ODMSs

Reuse **existing development skills**

---

### Windows Universal Platform

**Common & Consistent APIs**

<table>
<thead>
<tr>
<th>Languages</th>
<th>UI Frameworks</th>
<th>APIs</th>
<th>Deployment and Execution</th>
<th>Tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>• C++ /CX</td>
<td>• HTML</td>
<td>• WinRT</td>
<td>• APPX</td>
<td>• Visual Studio</td>
</tr>
<tr>
<td>• C#, VB</td>
<td>• Xaml</td>
<td>• Win32</td>
<td>• XCopy</td>
<td>• PowerShell</td>
</tr>
<tr>
<td>• JS</td>
<td>• DirectX</td>
<td>• .NET</td>
<td>• App Isolation</td>
<td></td>
</tr>
<tr>
<td>• Python</td>
<td></td>
<td>• Wiring</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Node.js</td>
<td></td>
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</tr>
</tbody>
</table>
Building IoT Devices with UWP

“Embedded” Mode
- Extend UWP to IoT capabilities on all Windows 10 editions

Access to system settings
- APIs to change system settings such as power state, radio control and Bluetooth.

APIs to access busses
- GPIO, I2C, SPI and easy access to custom hardware

Background Services for long running tasks
- Hardware monitoring and service hosting
# Porting Existing Apps/Drivers to Windows 10 IoT Core

<table>
<thead>
<tr>
<th>If you are using (not supported on Small Devices)</th>
<th>Instead use</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>App logic and code</strong></td>
<td></td>
</tr>
<tr>
<td>Win32/Native</td>
<td>Win32/Native in OneCore.lib (subset of Desktop API surface)</td>
</tr>
<tr>
<td>.NET libraries</td>
<td>.NET libraries supported in UWP (subset of Desktop .NET APIs)</td>
</tr>
<tr>
<td><strong>Graphic User Interface</strong></td>
<td></td>
</tr>
<tr>
<td>GDI, MFC, WinForms, WPF</td>
<td>XAML, DirectX, HTML</td>
</tr>
</tbody>
</table>
Leverage existing code

You don’t have to start from scratch

API Porting Tool provides OS and UWP level verification to show how much of your existing code will run on Window 10 IoT Core
Universal Drivers for Windows 10 IoT Devices

Same Universal Driver API surface across IoT Client platforms for Windows 10

Scale investment across all Microsoft platforms

Leverage existing development skills
Windows Universal Driver Platform

Write ONE Universal Driver and target all Windows 10 editions - Converged device areas/APIs
Scale and get higher ROI by selling same components to all Windows 10 editions OEMs/ODMSs
We scanned over 100k drivers to create a universal driver API set for you

Windows Universal Platform
Common & Consistent Device Driver APIs

- WDF
- Audio
- Bluetooth
- Buses (USB, SPB)
- HID(Retail), Buttons
- Camera
- Graphics & Display

Location
- Networking - Wired
- Networking - WLAN
- Security - Biometrics
- Security - Crypto
- Security - Smartcard
- Security - TPM

NFC
- Sensors
- Thermal
- Touch
- UEFI
- Video
Easily Build Universal Drivers for Windows 10 IOT Core

Download Visual Studio & WDK

Build and debug the Universal Driver on PC

Optionally test driver using WDK Test

Validate on dev board

Optionally submit for signing

Universal Driver samples & templates available as a starting point
Building Universal Drivers

1) Install WDK on your Visual Studio development machine
2) Start Visual Studio
3) Create a new project using a driver template
4) Write driver code (or Import existing code if evolving an existing driver to UD)
Building Universal Drivers

5) Set Target Platform: Universal

6) Build

7) UD guardrails will alert of non-UD compliance:

“FooBar.exe: warning: API TlsSetValue in kernel32.dll is not supported. CameraPlugin.dll calls this API.”
Building Universal Drivers

8) Select Athens device for driver deployment

9) Provision target Athens device for driver deployment and debug

10) F5 to deploy driver to target Athens device

11) Debug driver through VS
# Why move to Universal Driver?

<table>
<thead>
<tr>
<th>If you are using</th>
<th>Actions to take</th>
<th>Why</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inbox/Class drivers</td>
<td>• It just works! core device types Storage, mouse, keyboard, touch, video,…</td>
<td>Your device automatically leverages a large ecosystem of peripherals</td>
</tr>
<tr>
<td>Kernel Mode drivers</td>
<td>• High backwards-compatibility for converged device areas • Make minimal changes and test</td>
<td>Your driver runs on more editions</td>
</tr>
<tr>
<td>User Mode drivers and services</td>
<td>• Know that Windows Universal Platform Win32 API surface is smaller than desktop Windows • Use replacement APIs where available • Re-design/re-implementation if APIs are not available and test</td>
<td>Your driver runs on more editions</td>
</tr>
</tbody>
</table>
Easily Build Retail Line of Business Solutions

Retail Peripherals Supported Inbox

- APIs in Windows 10 SDK and DDK
- Adapted from UnifiedPOS standard

- 3rd provided libraries

Barcode Scanner
Mag-Stripe Reader
Receipt Printer
Cash Drawer
Payment Terminal

3rd Party Enabled
Device Management for
Windows 10 IoT Devices

Consistent across PC/mobile and IoT

MDM support

One Windows Platform
Consistent Device Management
for all Windows 10 IoT devices

- Windows Intune
- 3rd Party MDM
- SC Config Man
- OMA DMI

Windows 10 IoT

Industry Devices
- Converged MDM Stack
- Converged Servicing Stack
- Common CSPs

Mobile Devices

Small Devices
Secured
Securing IoT Devices

- Protect from malware
  - "Secure Boot" and enable remote attestation with "Measured Boot"

- Protect customer data
  - Enterprise grade device encryption and secure key storage

- Resist tampering
  - Authenticity with a strong, hardware-bound device identity using Trusted Platform Modules (TPMs)
Windows Firewall blocking inbound connections except those that you specifically allow

Configure firewall settings with `netsh advfirewall`
Secure Remote Device Connection

Trusted relationship between your host PC and your device

Host PC
PowerShell

Target
Device
Connected
Bringing it all together

The latest connectivity options
- Ethernet, Mobile Broadband – MBB USB Class driver, OEM BSP support
- Wi-Fi, Wi-Fi Direct, Bluetooth, BTLE

Your devices work together
- Device interoperability with open standards

Sensor access from Universal Windows apps
- Directly interact with hardware busses to build innovative IoT devices

Sensor to Cloud
- Azure services to build IoT solutions
Interoperability across devices - AllJoyn

Your Devices Work Together
Across Protocol and Ecosystem Barriers
Access to Sensor Hardware
with Universal Windows apps

Easily integrate and communicate to sensors, microcontrollers and other peripherals
UWP Access to Custom Hardware

Support external component(s) connected through standard busses

GPIO (General Purpose Input/Output)
I2C (I squared C)
SPI (Serial Peripheral Interface)

Easily integrate and communicate to sensors, microcontrollers and other small peripherals

WinRT API
Hardware Abstraction Layer
Secure Driver
On-Board Pin

Wiring API
# Microsoft Azure IoT Services

<table>
<thead>
<tr>
<th>Devices</th>
<th>Device Connectivity</th>
<th>Storage</th>
<th>Analytics</th>
<th>Presentation &amp; Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Device Icon]</td>
<td>![Event Hubs Icon]</td>
<td>![SQL Database Icon]</td>
<td>![Machine Learning Icon]</td>
<td>![App Service Icon]</td>
</tr>
<tr>
<td>![Device Icon]</td>
<td>![Service Bus Icon]</td>
<td>![Table/Blob Storage Icon]</td>
<td>![Stream Analytics Icon]</td>
<td>![Power BI Icon]</td>
</tr>
<tr>
<td>![Device Icon]</td>
<td>![External Data Sources Icon]</td>
<td>![DocumentDB Icon]</td>
<td>![HDIInsight Icon]</td>
<td>![Notification Hubs Icon]</td>
</tr>
<tr>
<td>![Device Icon]</td>
<td>![External Data Sources Icon]</td>
<td>![Data Factory Icon]</td>
<td></td>
<td>![Mobile Services Icon]</td>
</tr>
<tr>
<td>![Device Icon]</td>
<td>![External Data Sources Icon]</td>
<td></td>
<td></td>
<td>![BizTalk Services Icon]</td>
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</tbody>
</table>
Tools
ADK & ICD

Same tools across PC, Phone and now IoT

Easier to customize the Device Experience
Windows Assessment and Deployment Kit (ADK)

Windows Assessment Toolkit

Windows Performance Toolkit

NEW

Windows Imaging and Configuration Designer
Configure OS to create your device experience

Image Configuration Designer (ICD) making it easier to customize the Device Experience
Windows IoT Core API Porting Tool

Migrating your current Win32 applications and libraries to Windows IoT Core

IoTAPIPortingTool.exe
Location: C:\Program Files (x86)\Microsoft IoT
Installed from: WindowsDeveloperProgramforIoT.msi
Requirements

System requirement & Silicon targets for Windows 10 IoT Core
# Min System Requirements (Draft)

**Windows 10 IoT Core OS only**

<table>
<thead>
<tr>
<th>Component</th>
<th>With UI</th>
<th>Without UI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processor</td>
<td>x86 and ARM, 600MHz or faster</td>
<td>x86 and ARM, 400MHz or faster</td>
</tr>
<tr>
<td>RAM</td>
<td>512MB (Design dependent)</td>
<td>256MB (Design dependent)</td>
</tr>
<tr>
<td>Storage</td>
<td>Flash = 2GB</td>
<td>Flash = 2GB</td>
</tr>
<tr>
<td>Display</td>
<td>Frame buffer graphics and 2D optional (720p HDMI / 1080p+ HDMI / 3D GPU optional for modern UI support)</td>
<td>N/A</td>
</tr>
<tr>
<td>Audio</td>
<td>Optional</td>
<td>Optional</td>
</tr>
<tr>
<td>Connectors</td>
<td>Optional</td>
<td>Optional</td>
</tr>
<tr>
<td>Wireless</td>
<td>Optional</td>
<td>Optional</td>
</tr>
<tr>
<td>Accelerometer &amp; Proximity Sensor</td>
<td>Optional</td>
<td>Optional</td>
</tr>
<tr>
<td>Touch UI</td>
<td>Optional</td>
<td>Optional</td>
</tr>
</tbody>
</table>
## Silicon Targets for Windows 10 IoT Core

<table>
<thead>
<tr>
<th>Partner</th>
<th>Chipset</th>
<th>Windows 10 IoT Core*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intel</td>
<td>Baytrail M/D/I</td>
<td>✓</td>
</tr>
<tr>
<td>Qualcomm</td>
<td>APQ8016</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>APQ8052*</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>APQ8009</td>
<td>✓</td>
</tr>
<tr>
<td>Broadcom</td>
<td>BCM2836</td>
<td>✓</td>
</tr>
</tbody>
</table>

* This is based on the current plan of record, subjective to changes.

Contact your silicon representative for more information on the chipsets supported.
# Dev Boards for Windows 10 IoT Core

Rapidly prototype Windows 10 IoT Core solution

<table>
<thead>
<tr>
<th>Developer Boards</th>
<th>CPU*</th>
<th>Board details*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raspberry Pi 2</td>
<td>900MHz quad core ARM Cortex-A7</td>
<td>4 x USB 2.0&lt;br&gt;40 pin GPIO&lt;br&gt;I2C &amp; SPI bus&lt;br&gt;Full HDMI&lt;br&gt;Ethernet&lt;br&gt;Audio jack&lt;br&gt;Micro CD card slot&lt;br&gt;Memory: 1 GB</td>
</tr>
<tr>
<td>MinnowBoard MAX</td>
<td>64-bit Intel Atom E38xx Series SoC&lt;br&gt;E3815 Single-Core or E3825 dual-core 1.33 GHz</td>
<td>1 x USB 2.0&lt;br&gt;1 x USB 3.0&lt;br&gt;Memory: Up to 2GB&lt;br&gt;8 GPIO&lt;br&gt;I2C &amp; SPI bus&lt;br&gt;Mini HDMI&lt;br&gt;Ethernet&lt;br&gt;1 x SATA2 3Gb/sec&lt;br&gt;Audio jack&lt;br&gt;Micro CD card slot</td>
</tr>
</tbody>
</table>

* Reference online for latest specs and more details on dev boards
Powering The Next Generation of IoT Devices

One Windows Platform

Secured

Connected

Windows 10 IoT
Get Windows 10 today

Sign-up at WindowsOnDevices.com

Design your devices using Windows 10

Start building universal drivers and UWP apps

Connect to the cloud with Azure IoT
## Resources for Windows IoT Core

### Internal / NDA Content
- Sales guide
- Datasheet
- Business overview deck
- Technical overview deck

### Online Technical Content
- Getting Started
- Docs and Tutorials
- Samples

### Online Open Source
- Projects
- Source Code

Visit: [http://infopedia/SMG/Pages/Windows10-IoT.aspx](http://infopedia/SMG/Pages/Windows10-IoT.aspx)

Visit: [https://dev.windows.com/en-us/iot](https://dev.windows.com/en-us/iot)

Servicing
Servicing for Windows 10 IoT Core

Note: Servicing for Windows 10 IoT Core is still in planning and subject to change.
Flexible Servicing Options

Devices can be always up to date - Features and security updates

Devices can be configured to Never update

Note: Servicing for Windows 10 IoT Core is still in planning and subject to change
Options to control update behavior

OEMs and Enterprises have options to control update behavior

Define update behavior through policy and maintenance windows
Control download, install and reboot

Devices can connect directly to Windows Update (WU)

Enterprises can further control update through Windows Server Update Services (WSUS) and MDM

Note: Servicing for Windows 10 IoT Core is still in planning and subject to change