Windows 10 IoT Core
Technical Overview

Microsoft Corporation

Windows

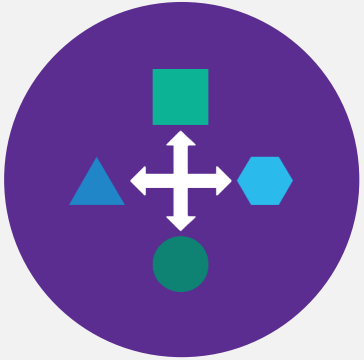
Introduction and Agenda

- 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

Devices

25 BILLION

Connected “things”
will be in use by 2020

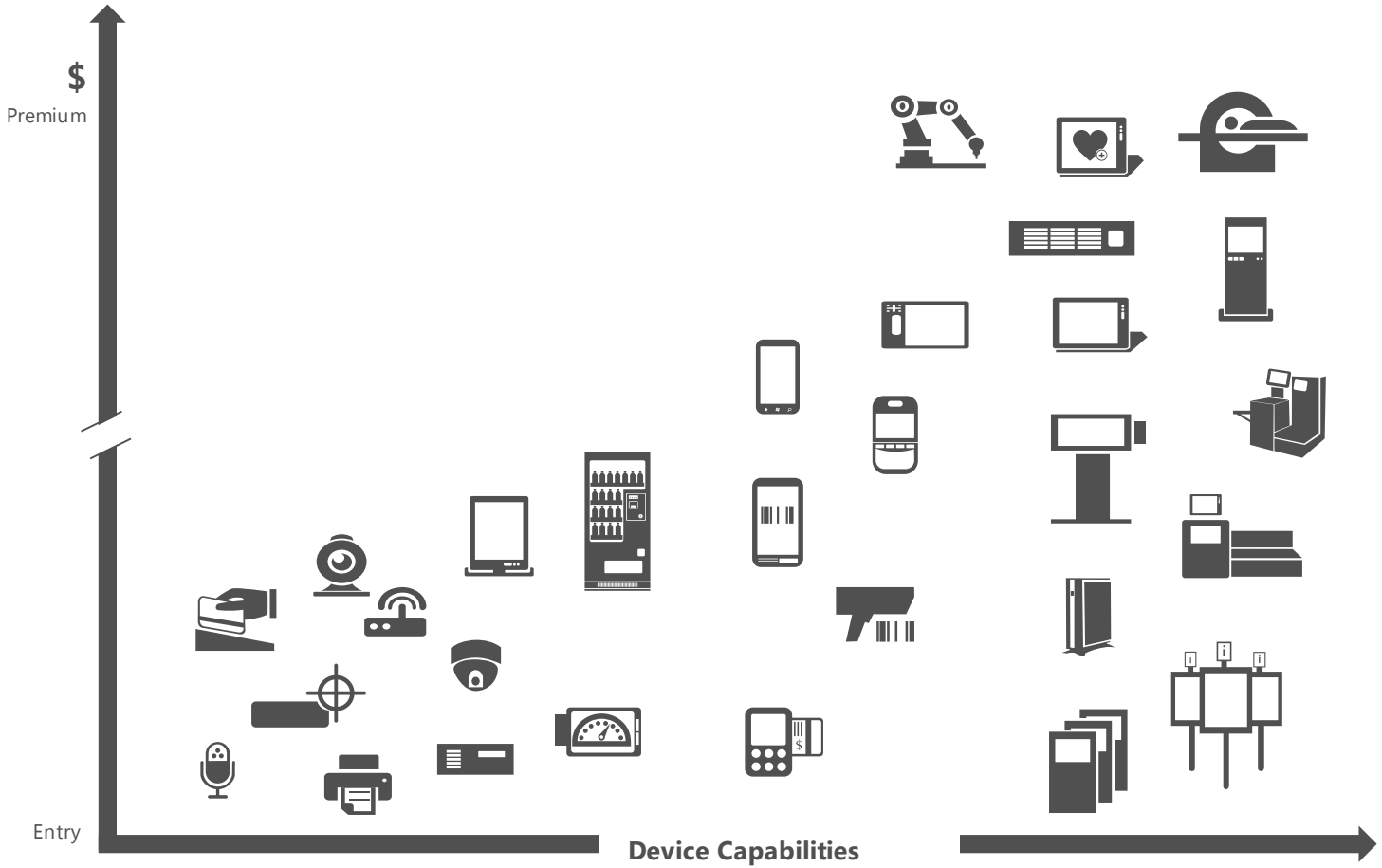
Gartner

$7.2 TRILLION

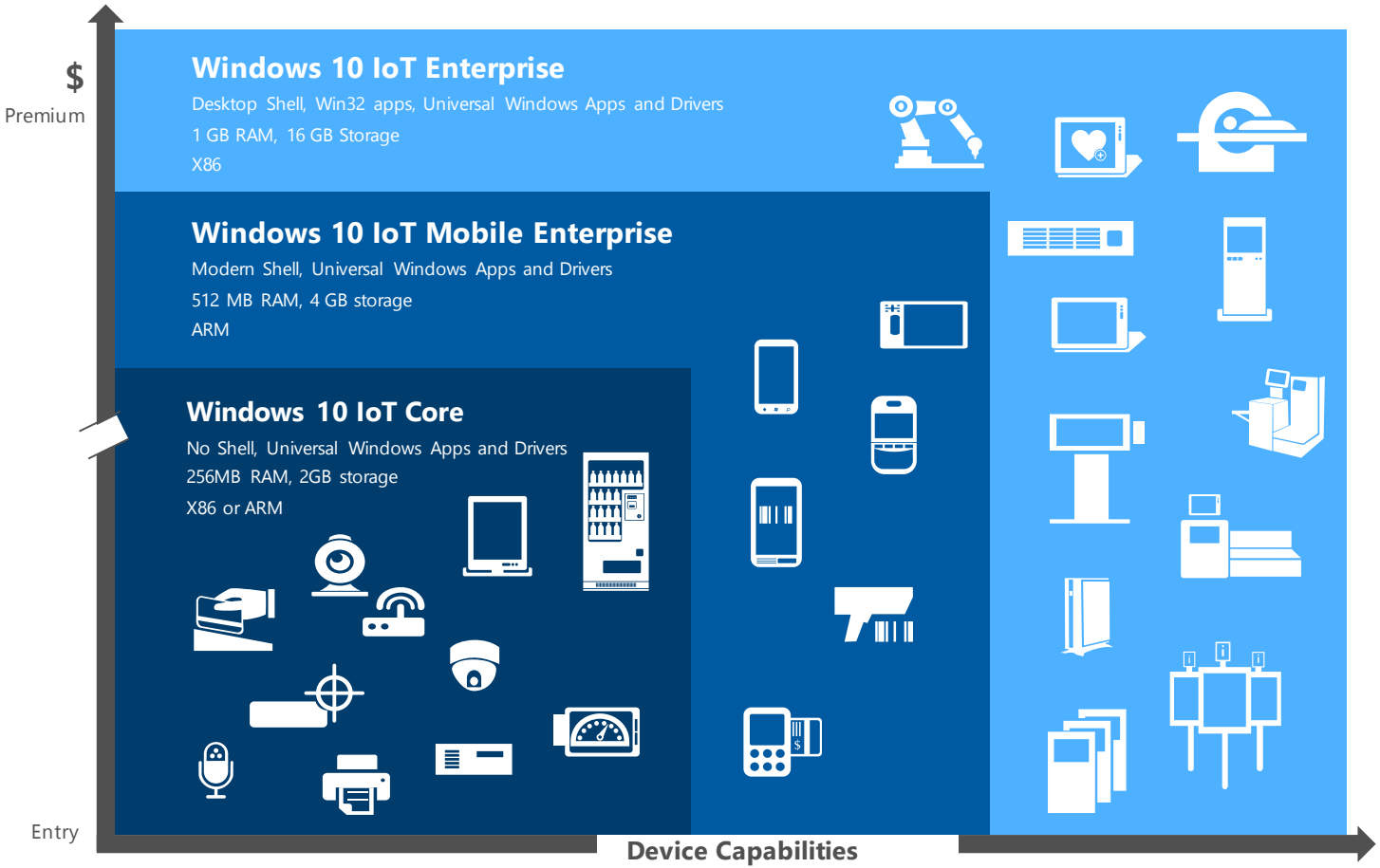
worldwide market for IoT
solutions by 2020

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

Windows Devices



Windows 10 IoT



One Windows Platform

IoT Gateways

Handheld Terminals

Thin Clients

Industry Tablets

POS Terminals

Digital Signs

ATMs

Industry Robotics

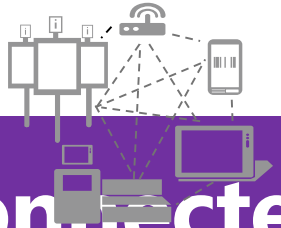
Medical Devices

Secured

Secured Identities

Secured Data

Secured Device



Connected

Interoperability across devices

Easy incorporation of sensors and peripherals

Seamless connectivity to Microsoft Azure

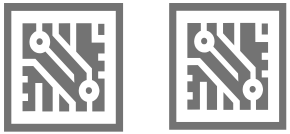
Windows 10 IoT Core

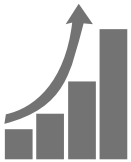
Optimized Windows 10 platform for small and low-cost IoT devices

Targeted boot experience

Single LoB App model

Optimized Platform





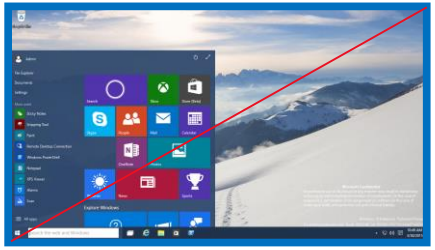
Silicon choices

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

Visual Studio 2015

Modern app dev experience

Single UWP

Multiple UWP background tasks

Win32 background tasks / Services

Windows 10 IoT Core: Benefits

Scalable Platform	• UWP extended to small devices • UD driver model • Lower cost silicon • Low barrier to entry
Servicing	• Bring latest technology updates to small class of devices
Device Connectivity	• Wireless connectivity (BLE, Wi-Fi, MBB) • Wired connectivity (Ethernet, USB) • Access to busses (GPIO, I2C, SPI) • AllJoyn
Manageability	• Manage IoT devices like any other Windows device
Security	• Windows grade security for small devices • Support for Trusted Platform Module
Cloud Integration	• Built in cloud connectivity • Azure IoT services

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

Languages
- C++ /CX
- C#, VB
- JS
- Python
- Node.js

UI Frameworks
- HTML
- Xaml
- DirectX

APIs
- WinRT
- Win32
- .NET
- Wiring

Deployment and Execution
- APPX
- XCopy
- App Isolation

Tools
- Visual Studio
- PowerShell

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

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

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

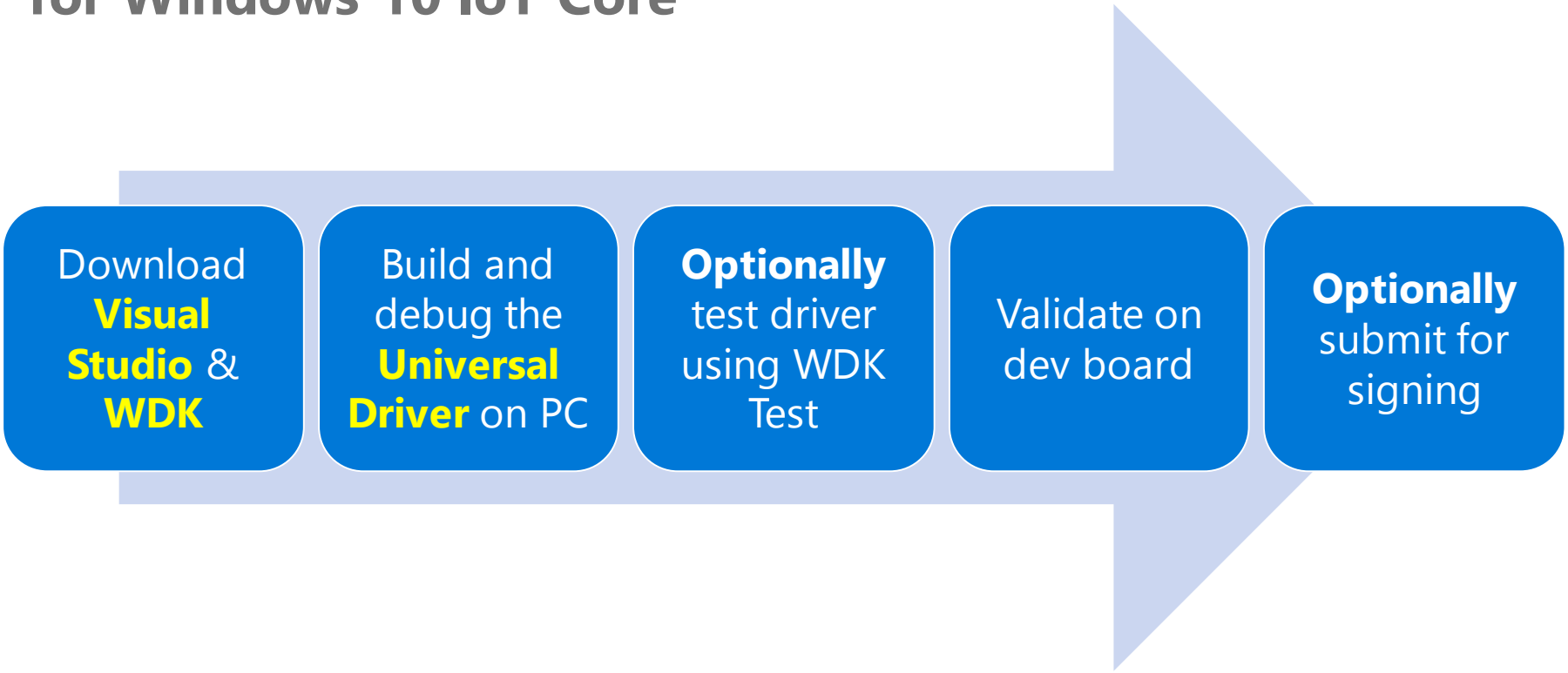
Write **ONE** Universal Driver and target all Windows 10 editions - **Converged** device areas/APIs
Scale and get **higher ROI** by selling same components to all Windows 10 editions OEMs/ODMSs
We scanned over **100k drivers** to create a **universal driver API set** for you

Windows Universal Platform
Common & Consistent Device Driver APIs

WDF	Location	NFC
Audio	Networking - Wired	Sensors
Bluetooth	Networking - WLAN	Thermal
Buses (USB, SPB)	Security - Biometrics	Touch
HID(Retail), Buttons	Security - Crypto	UEFI
Camera	Security - Smartcard	Video
Graphics & Display	Security - TPM	

Easily Build Universal Drivers

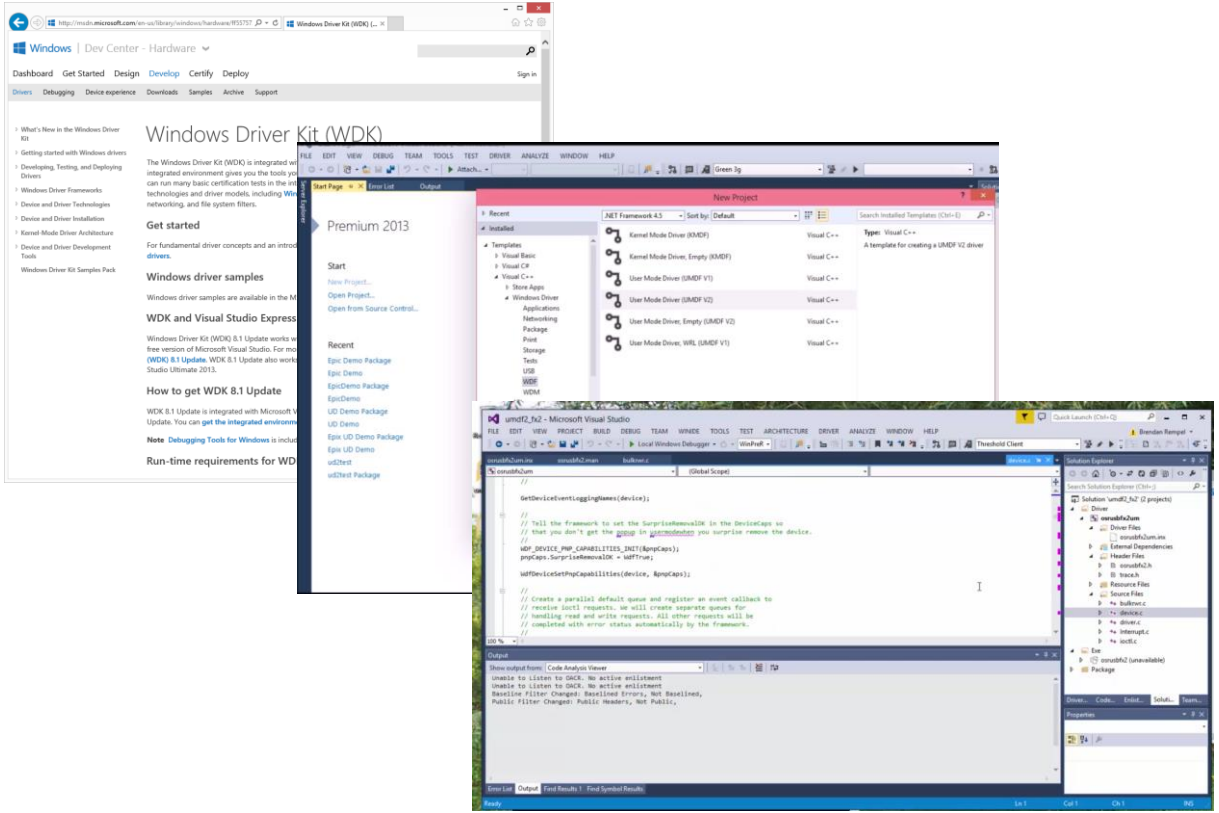
for Windows 10 IoT Core



Universal Driver samples & templates available as a starting point

Building Universal Drivers

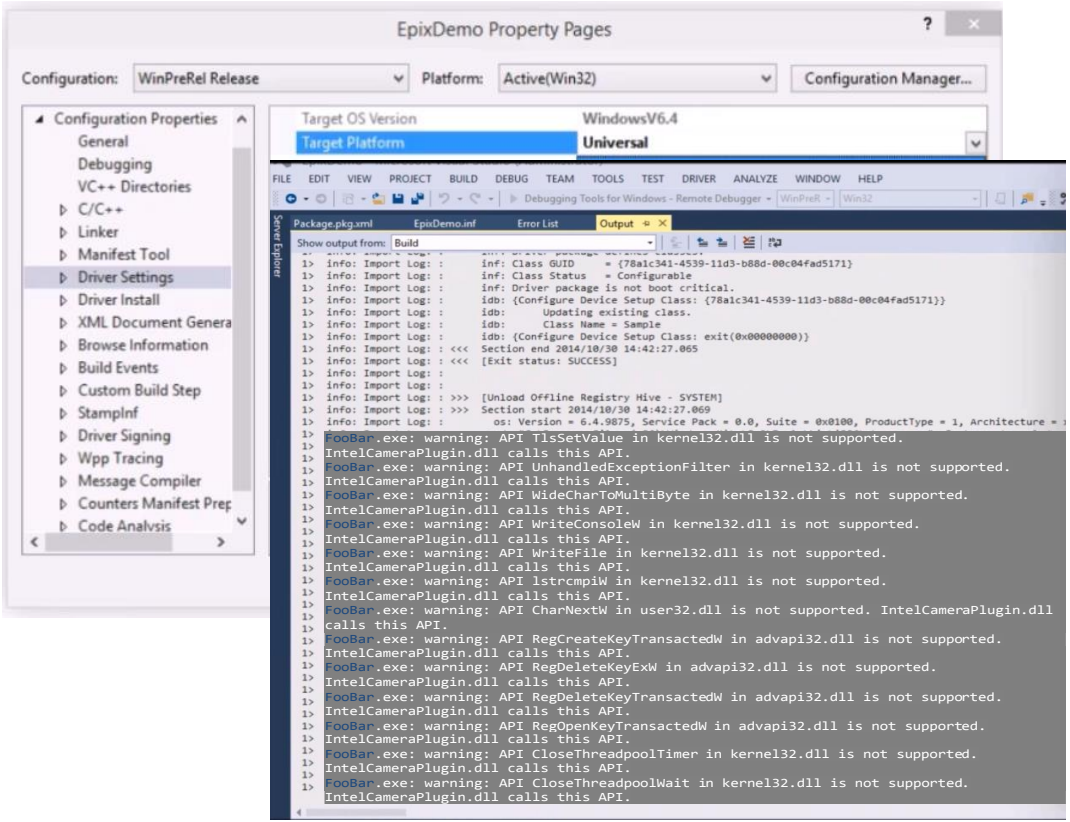
1) Install WDK on your Visual Studio development machine
2) Start Visual Studio
3) Create a new project using a driver template
4) Write driver code (or Import existing code if evolving an existing driver to UD)



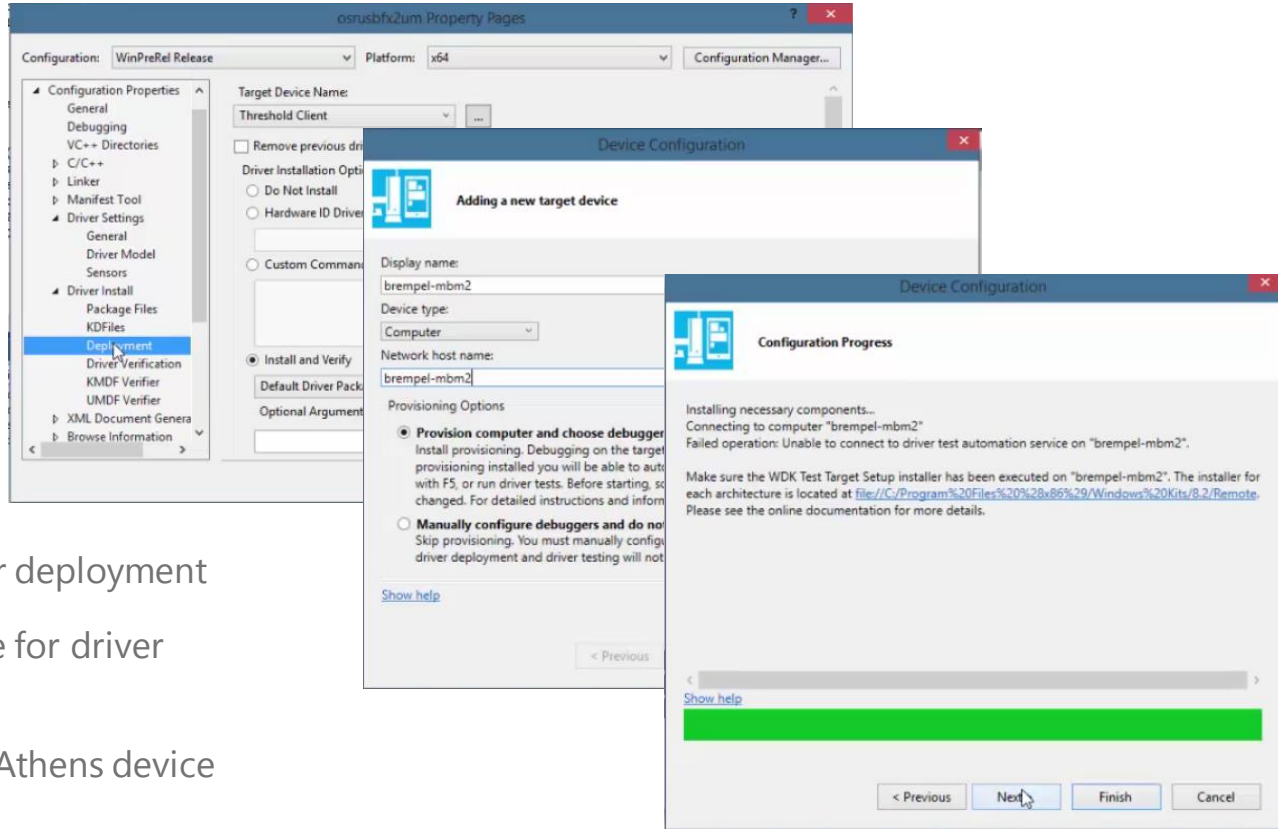
Building Universal Drivers

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?

If you are using	Actions to take	Why
Inbox/Class drivers	• It just works! core device types Storage, mouse, keyboard, touch, video,…	**Your device automatically leverages a large ecosystem of peripherals**
Kernel Mode drivers	• High backwards-compatibility for converged device areas • Make minimal changes and test	**Your driver runs on more editions**
User Mode drivers and services	• 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	**Your driver runs on more editions**

Easily Build Retail Line of Business Solutions

Retail Peripherals Supported Inbox

Barcode Scanner	Mag-Stripe Reader	Receipt Printer	Cash Drawer	Payment Terminal
8.1+	8.1+	NEW	NEW	3rd Party Enabled
				

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

- 3rd provided libraries

Device Management for Windows 10 IoT Devices

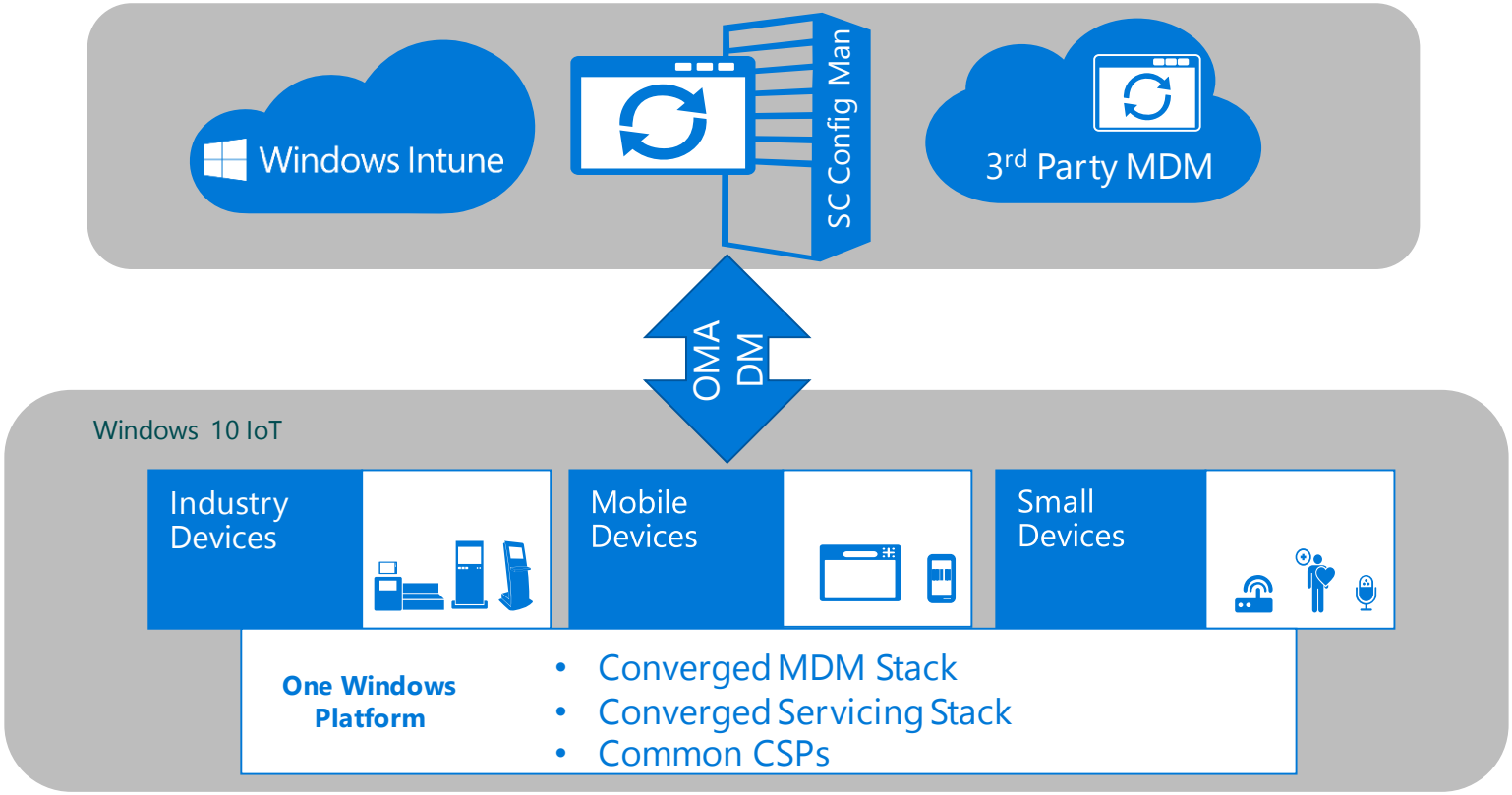
One Windows Platform

Consistent across PC/mobile and IoT

MDM support

Consistent Device Management

for all Windows 10 IoT devices



Secured

Securing IoT Devices

Protect from malware

"Secure Boot" and enable remote attestation with *"Measured Boot"*

Protect customer data

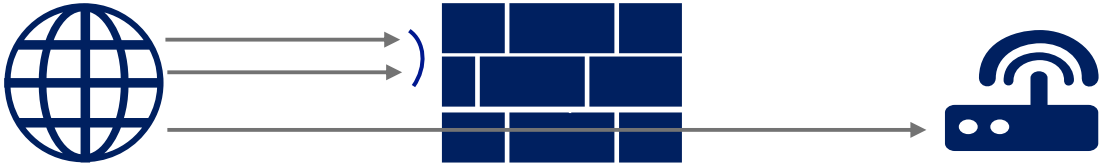
Enterprise grade *device encryption and secure key storage*

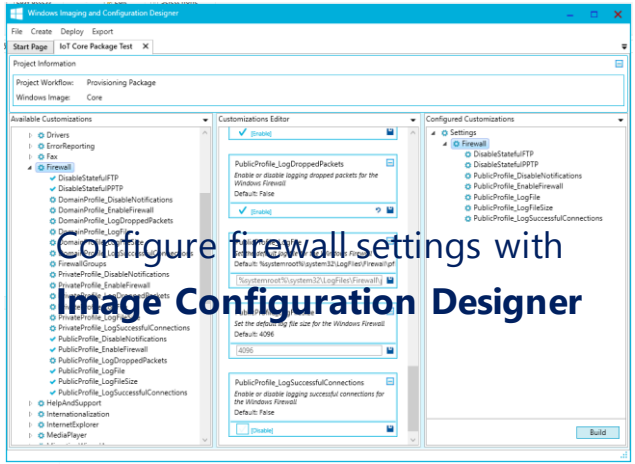
Resist tampering

Authenticity with a strong, hardware-bound device identity using Trusted Platform Modules (TPMs)

Windows Firewall

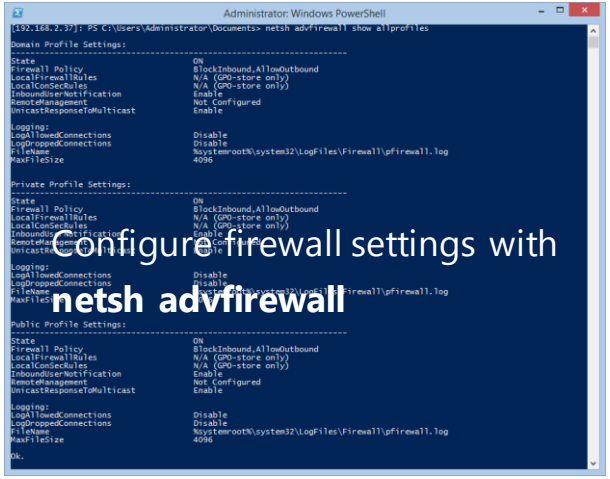
blocking inbound connections except those that you specifically allow





Configure firewall settings with

Image Configuration Designer

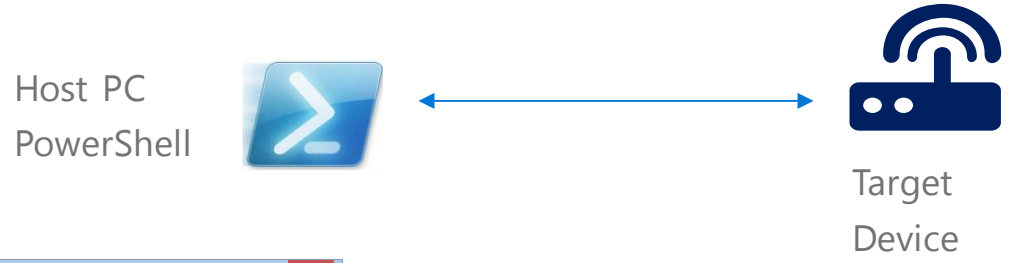


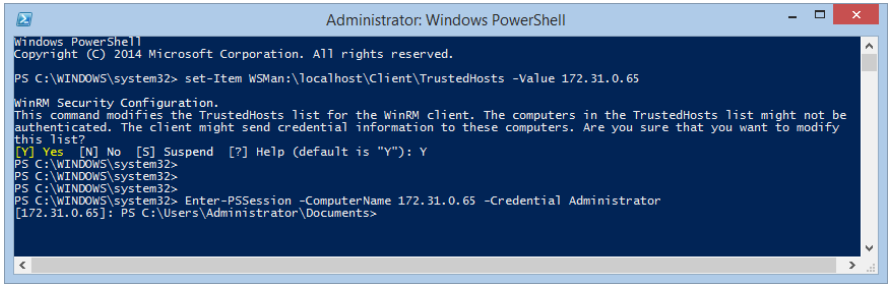
Configure firewall settings with

netsh advfirewall

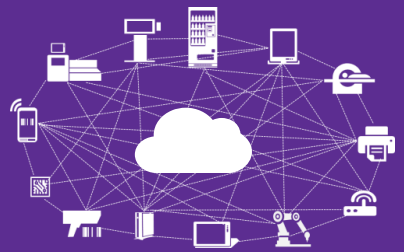
Secure Remote Device Connection

Trusted relationship between your host PC and your 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

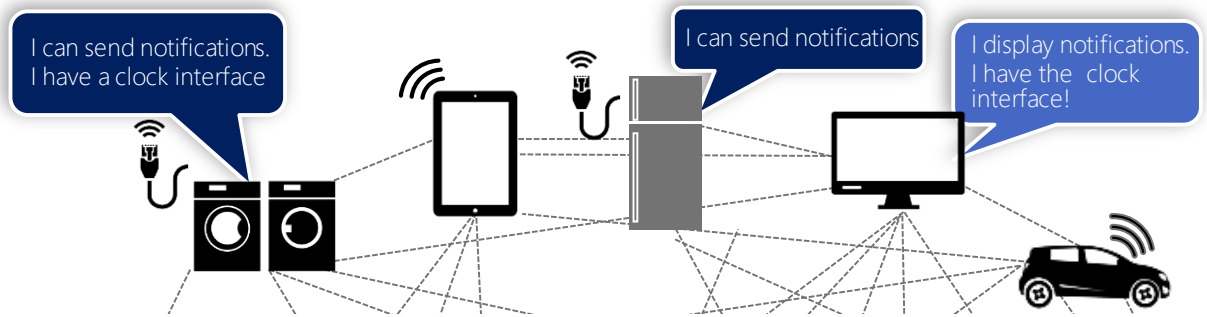
Directly interact with hardware busses to build innovative IoT devices

Sensor to Cloud

Azure services to build IoT solutions

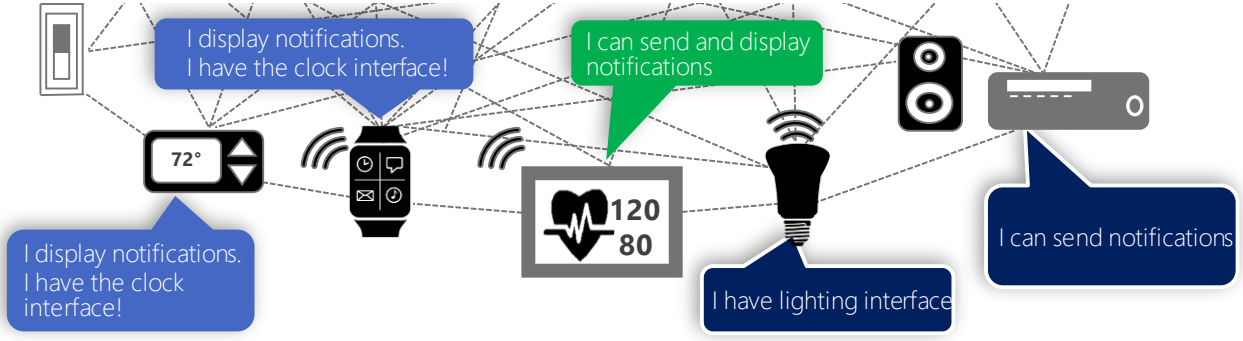
Interoperability across devices - AllJoyn

- Discovery
- Security
- Management
- Interoperability
- Open Source
- Cross Platform



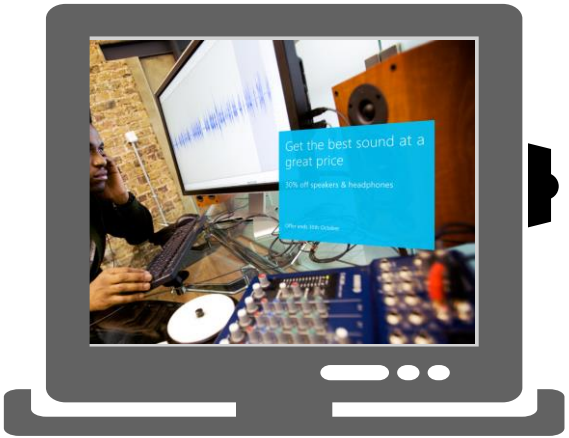
Your Devices Work Together

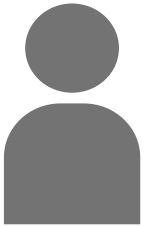
Across Protocol and Ecosystem Barriers



Access to Sensor Hardware

with Universal Windows apps





Easily integrate and communicate to sensors, microcontrollers and other peripherals

UWP Access to Custom Hardware

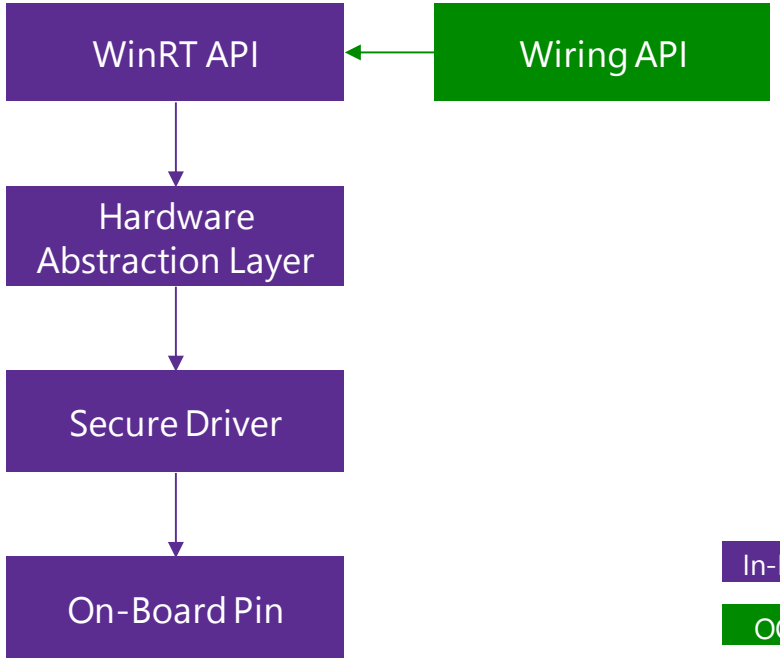
Support external component(s) connected through standard busses

GPIO (General Purpose Input/ Output)

I2C (*I squared C*)

SPI (Serial Peripheral Interface)

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



Microsoft Azure IoT Services

Devices	Device Connectivity	Storage	Analytics	Presentation & Action
	 Event Hubs	 SQL Database	 Machine Learning	 App Service
	 Service Bus	 Table/Blob Storage	 Stream Analytics	 Power BI
	 External Data Sources	 DocumentDB	 HDInsight	 Notification Hubs
		 External Data Sources	 Data Factory	 Mobile Services
				 BizTalk Services

Tools

ADK & ICD

One Windows Platform

Same tools across PC, Phone and now IoT

Easier to customize the Device Experience

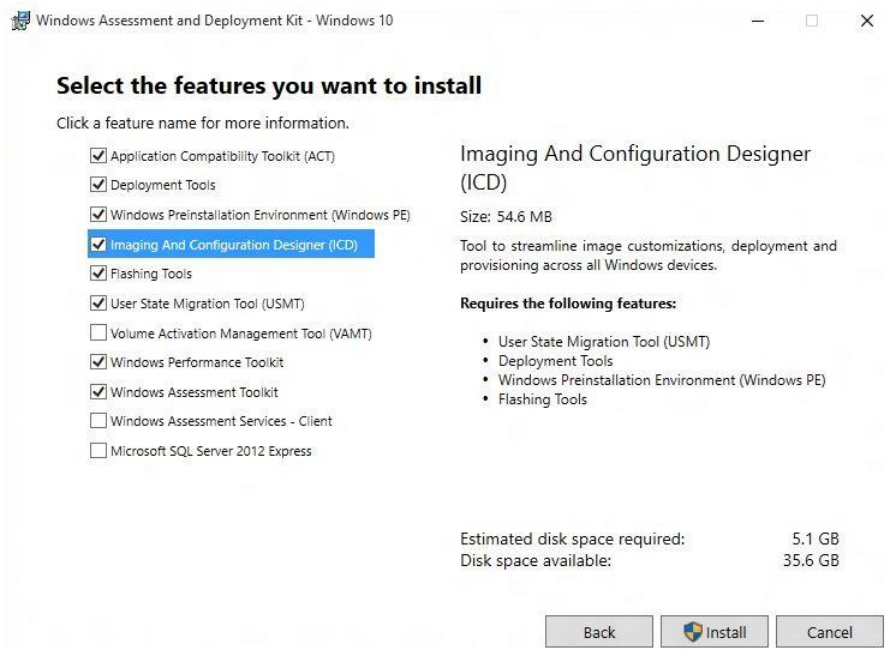
Windows Assessment and Deployment Kit (ADK)

Windows Assessment Toolkit

Windows Performance Toolkit

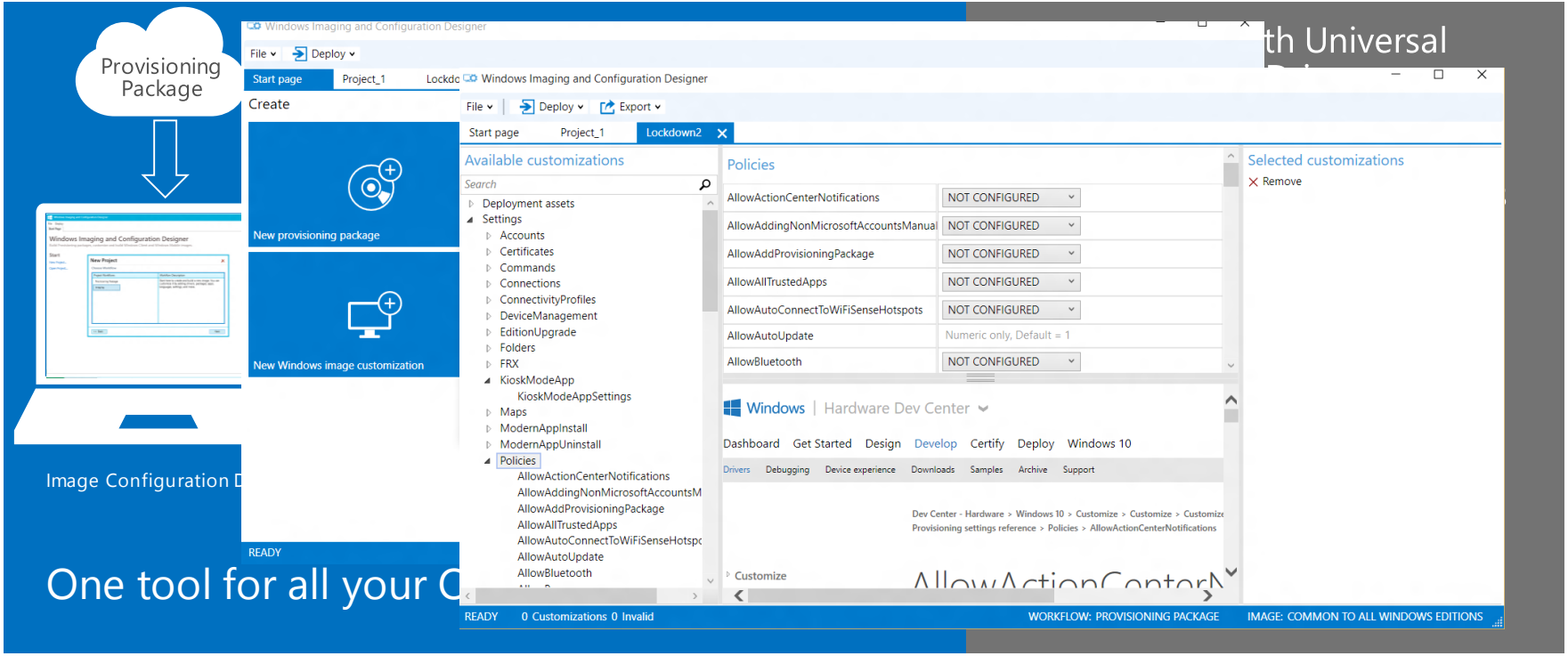
NEW

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

Component	With UI	Without UI
Processor	x86 and ARM, 600MHz or faster	x86 and ARM, 400MHz or faster
RAM	512MB (Design dependent)	256MB (Design dependent)
Storage	Flash = 2GB	Flash = 2GB
Display	Frame buffer graphics and 2D optional (720p HDMI / 1080p+ HDMI / 3D GPU optional for modern UI support)	N/A
Audio	Optional	Optional
Connectors	Optional	Optional
Wireless	Optional	Optional
Accelerometer & Proximity Sensor	Optional	Optional
Touch	Optional	Optional
UI		

Silicon Targets for Windows 10 IoT Core

Partner	Chipset	Windows 10 IoT Core*
	Baytrail M/D/I	√
	APQ8016	√
	APQ8052*	√
	APQ8009	√
	BCM2836	√

Contact your silicon representative for more information on the chipsets supported.

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

Dev Boards for Windows 10 IoT Core

Rapidly prototype Windows 10 IoT Core solution

Developer Boards	CPU*	Board details*
Raspberry Pi 2  BROADCOM.	900MHz quad core ARM Cortex-A7	4 x USB 2.0 40 pin GPIO I2C & SPI bus Full HDMI Ethernet Audio jack Micro CD card slot Memory: 1 GB
MinnowBoard MAX minnowboard.org  intel	64-bit Intel Atom E38xx Series SoC E3815 Single-Core or E3825 dual-core 1.33 GHz	1 x USB 2.0 1 x USB 3.0 Memory: Up to 2GB 8 GPIO I2C & SPI bus Mini HDMI Ethernet 1 x SATA2 3Gb/sec Audio jack Micro CD card slot

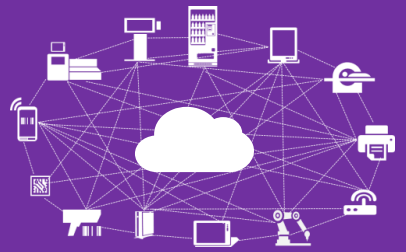
* Reference online for latest specs and more details on dev boards

Powering The Next Generation of IoT Devices

One Windows Platform

Secured

Connected



Windows 10 IoT

Windows 10

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

Visit: http://infopedia/SMSG/Pages/Windows10-IoT.aspx

Online Technical Content
Getting Started
Docs and Tutorials
Samples

Visit: https://dev.windows.com/en-us/iot

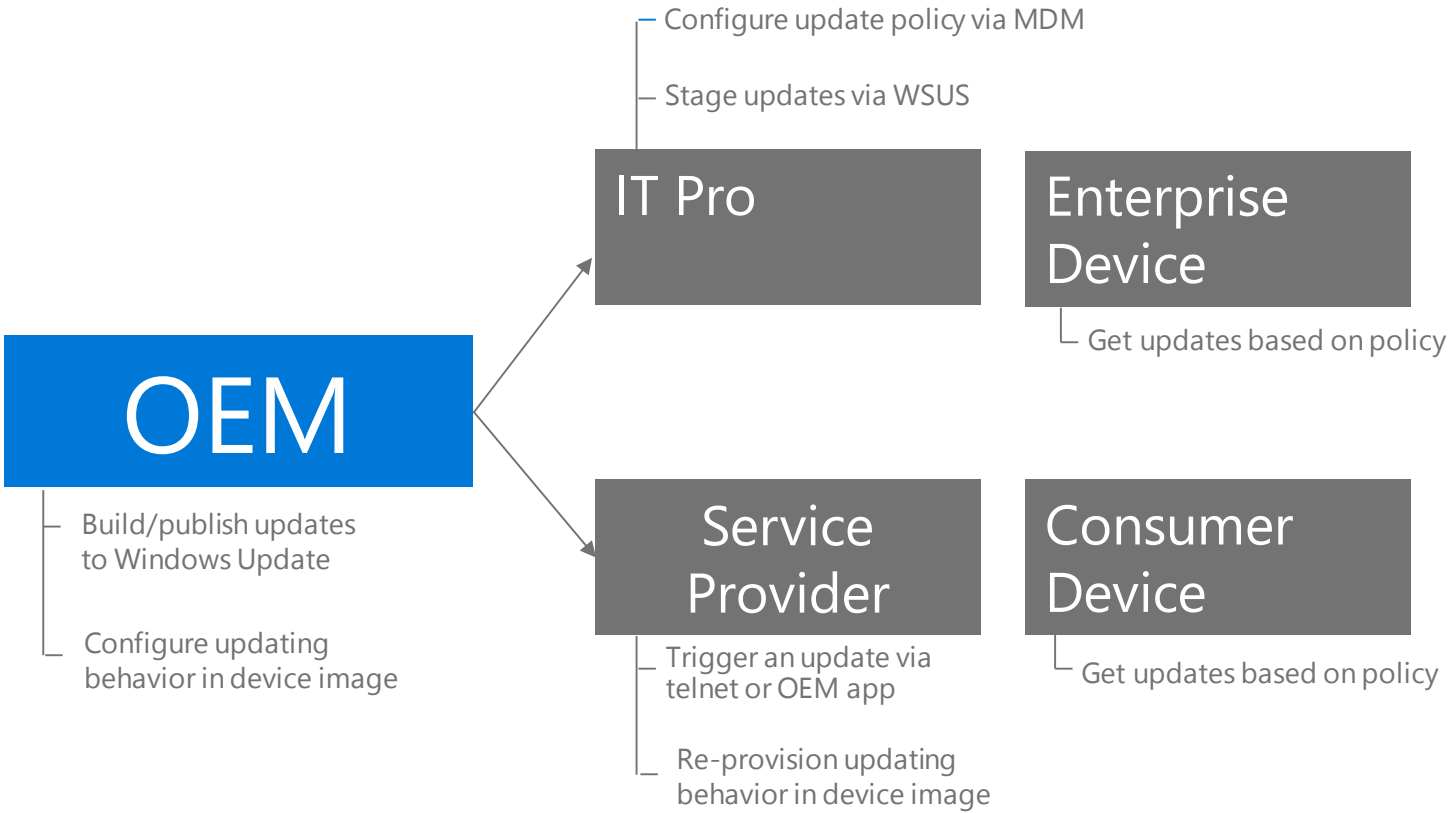
Online Open Source
Projects
Source Code

Visit: https://microsoft.hackster.io/en-US

https://github.com/ms-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