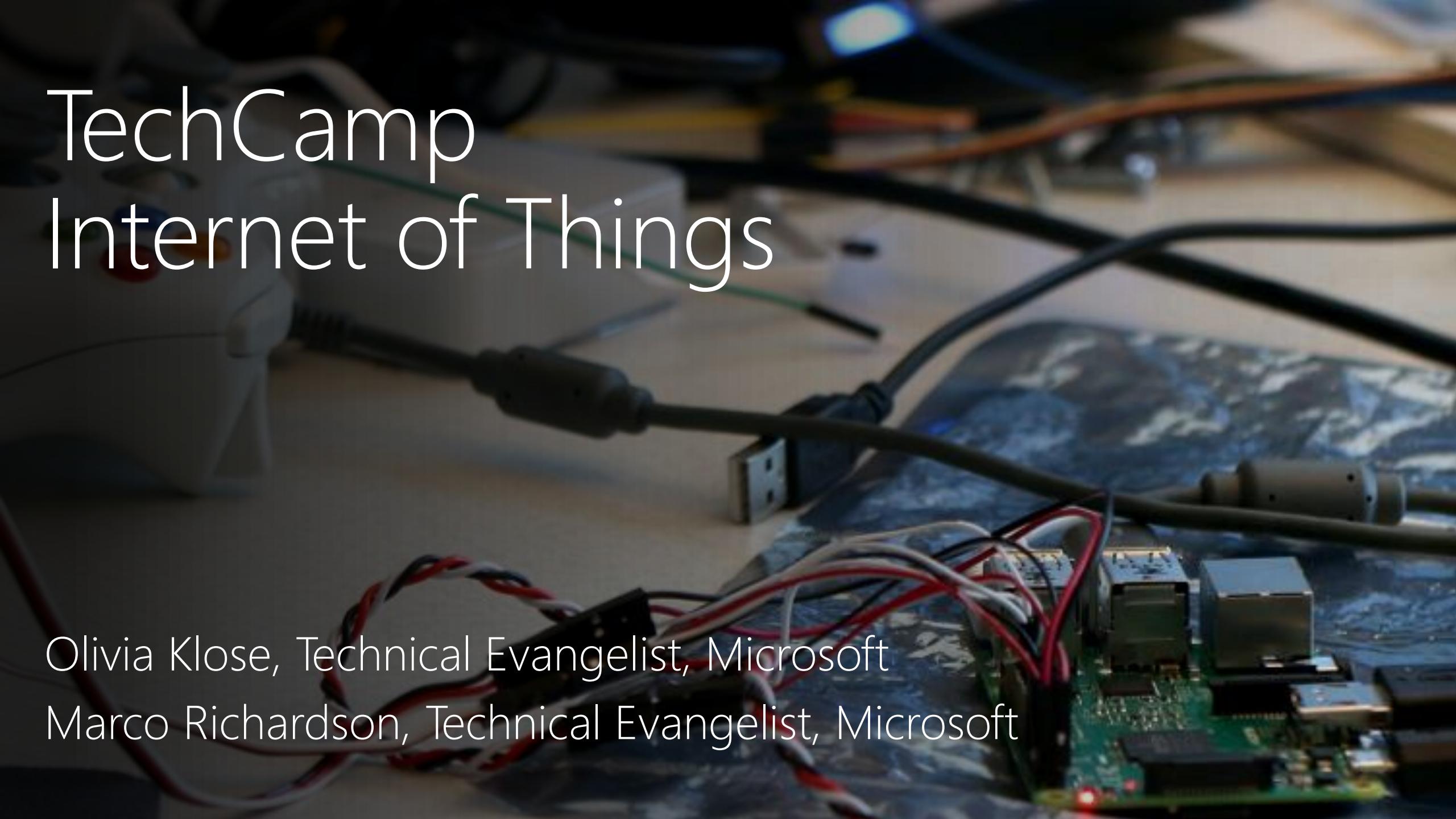


TechCamp Internet of Things



Olivia Klose, Technical Evangelist, Microsoft

Marco Richardson, Technical Evangelist, Microsoft

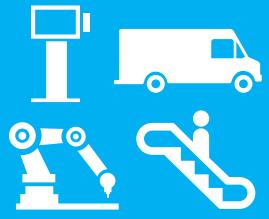
Agenda

1. Intro: What is IoT? What does Microsoft offer?
2. **Things: Windows 10 IoT Overview**
3. Connectivity: Azure IoT Overview
4. Data: Sensor data, cognitive services, etc.
5. Analytics: Stream Analytics, Power BI, Azure Machine Learning
6. Command & Control
7. Wrap-up

Things
Windows 10 IoT Overview
Universal Windows Platform

Defining Internet of Things

Things



Connectivity



Data

10101
01010
00100



Analytics

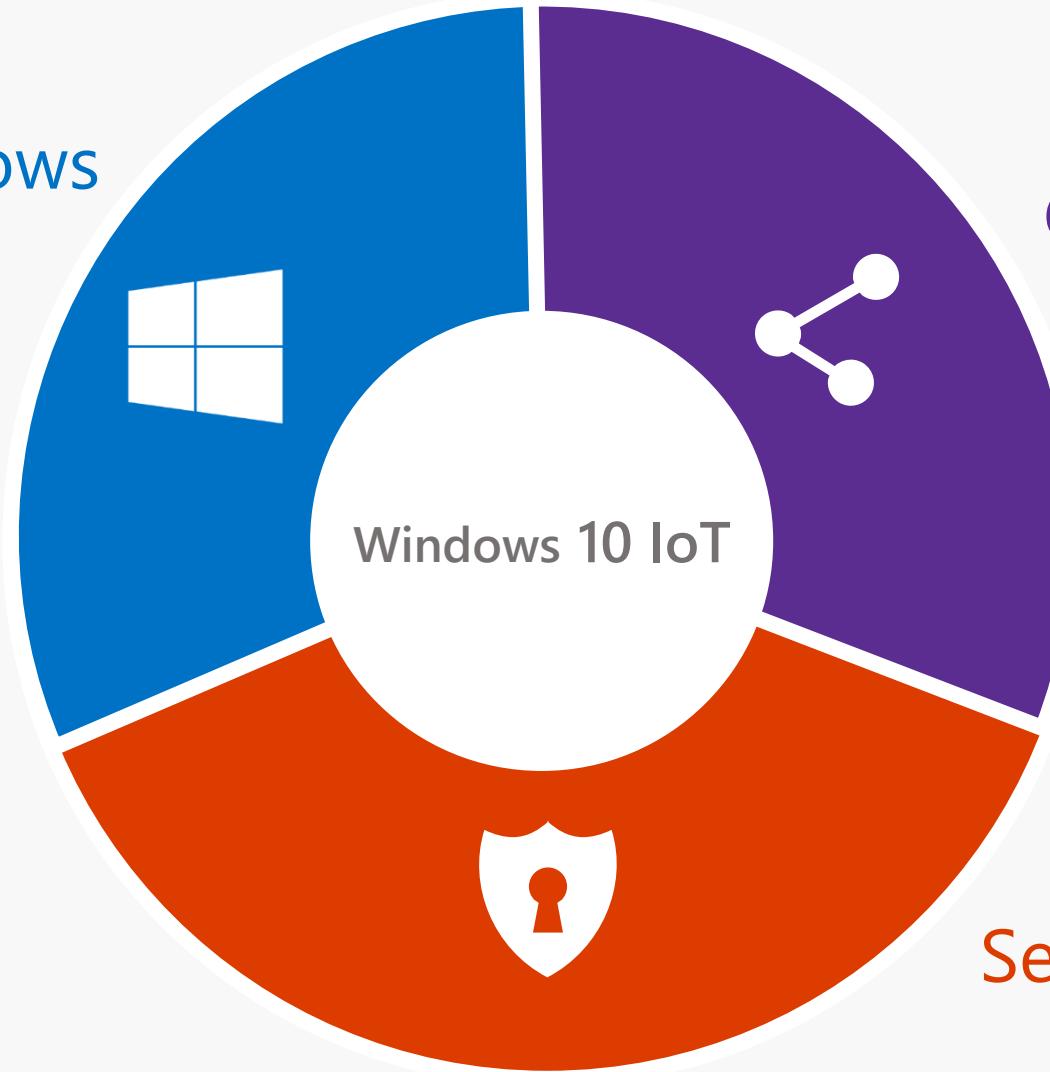
Windows 10 IoT

Powering the Next Generation of Intelligent Devices

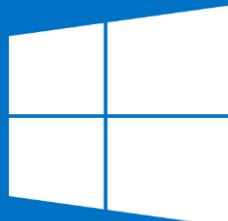
Universal Windows
Platform

Connected

Secure



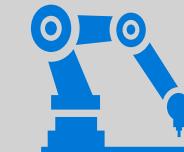
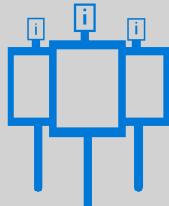
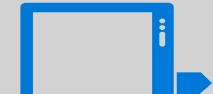
Universal Windows Platform

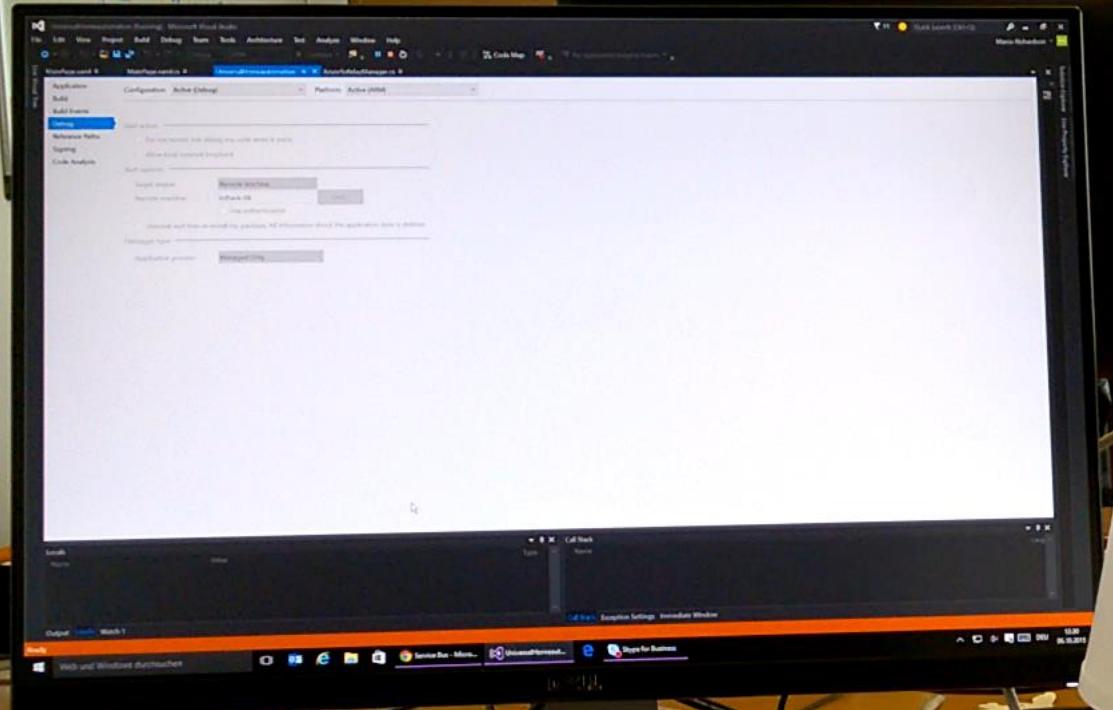


UWP apps

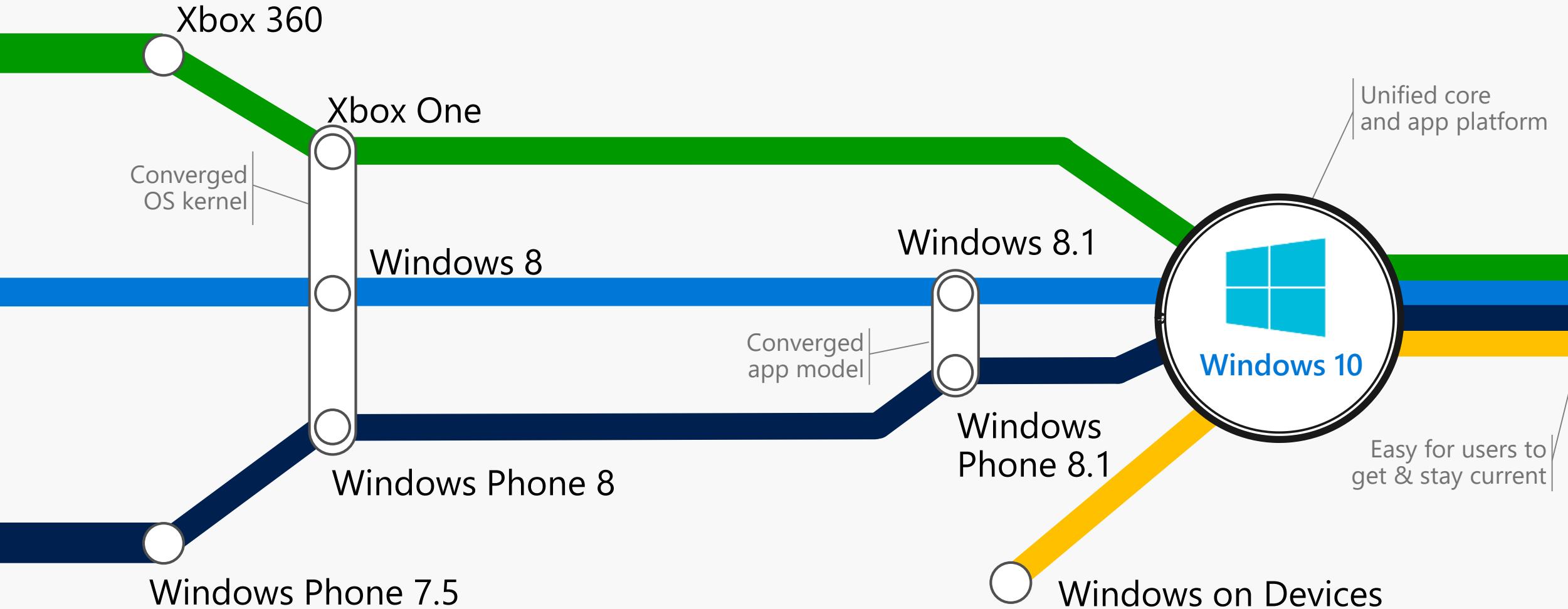
Natural & rich user
experience

One management & servicing
approach





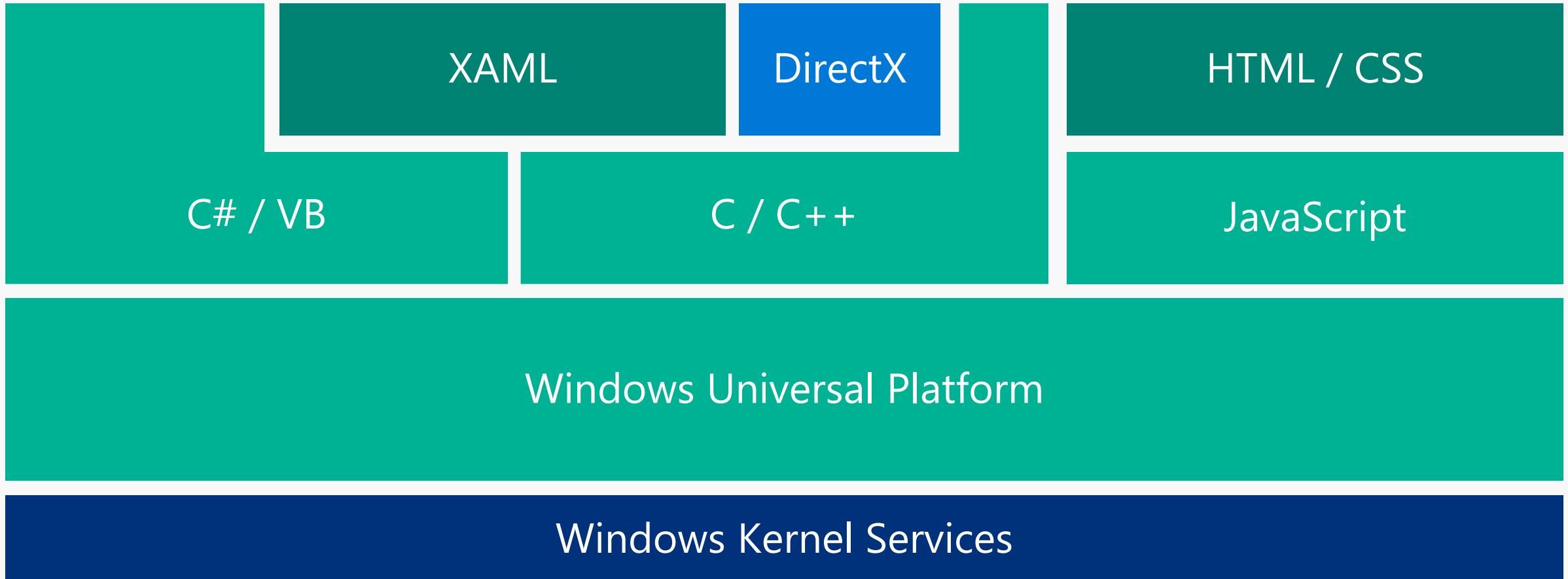
The convergence journey



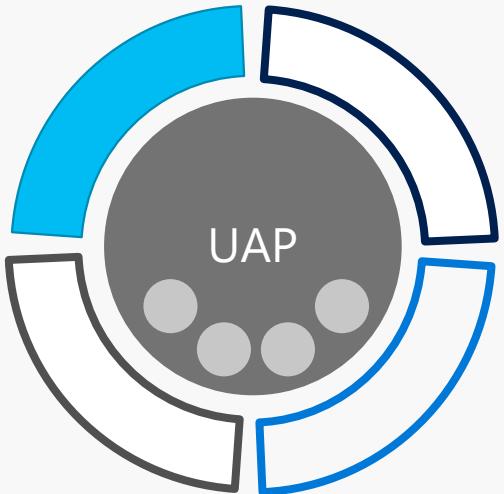
One app platform



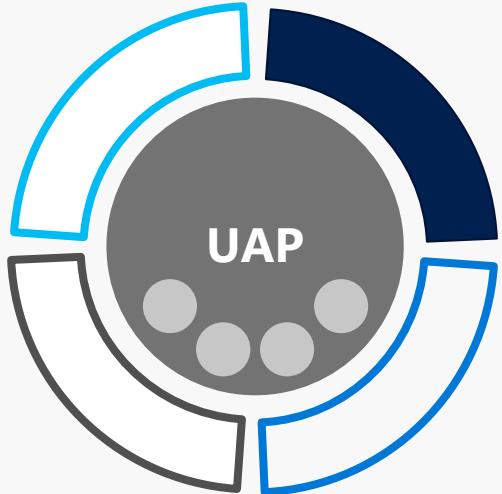
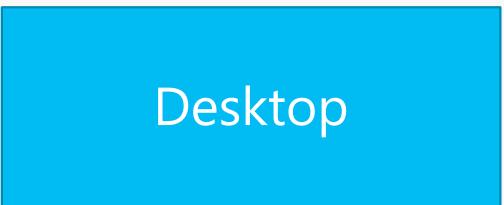
One API. One Package. Same Platform.



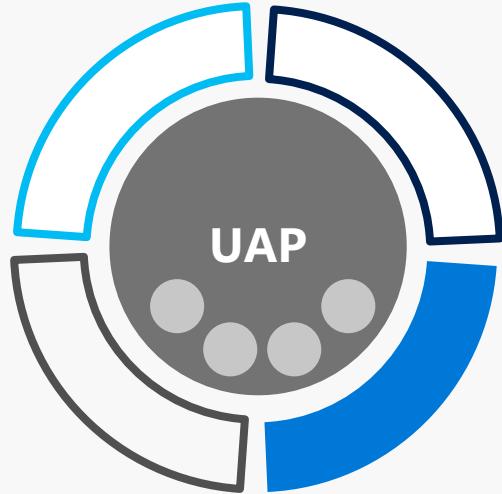
Extension SDKs



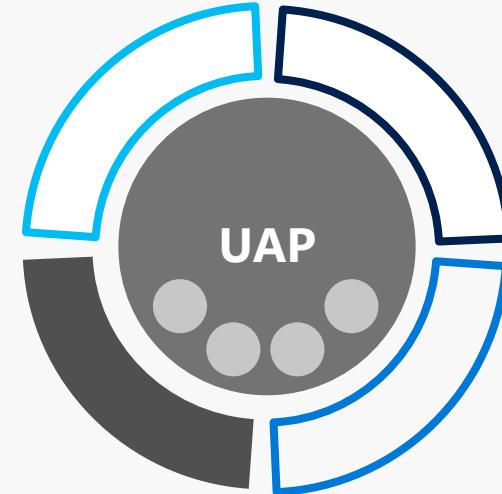
Windows Core



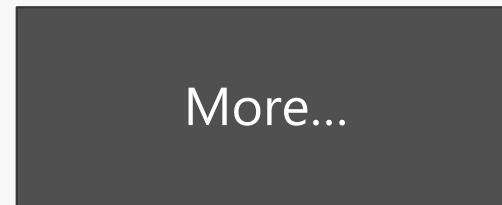
Windows Core



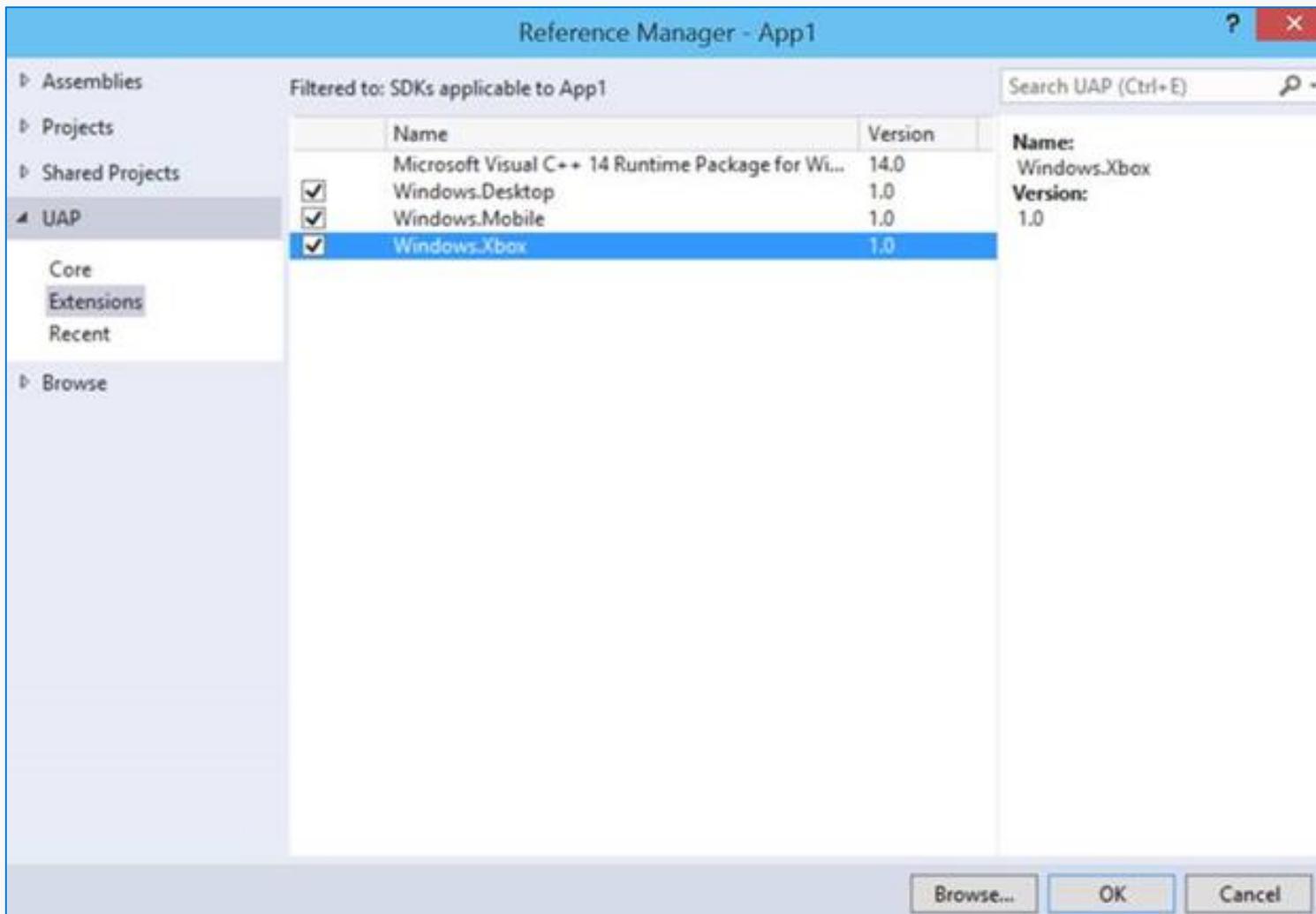
Windows Core



Windows Core

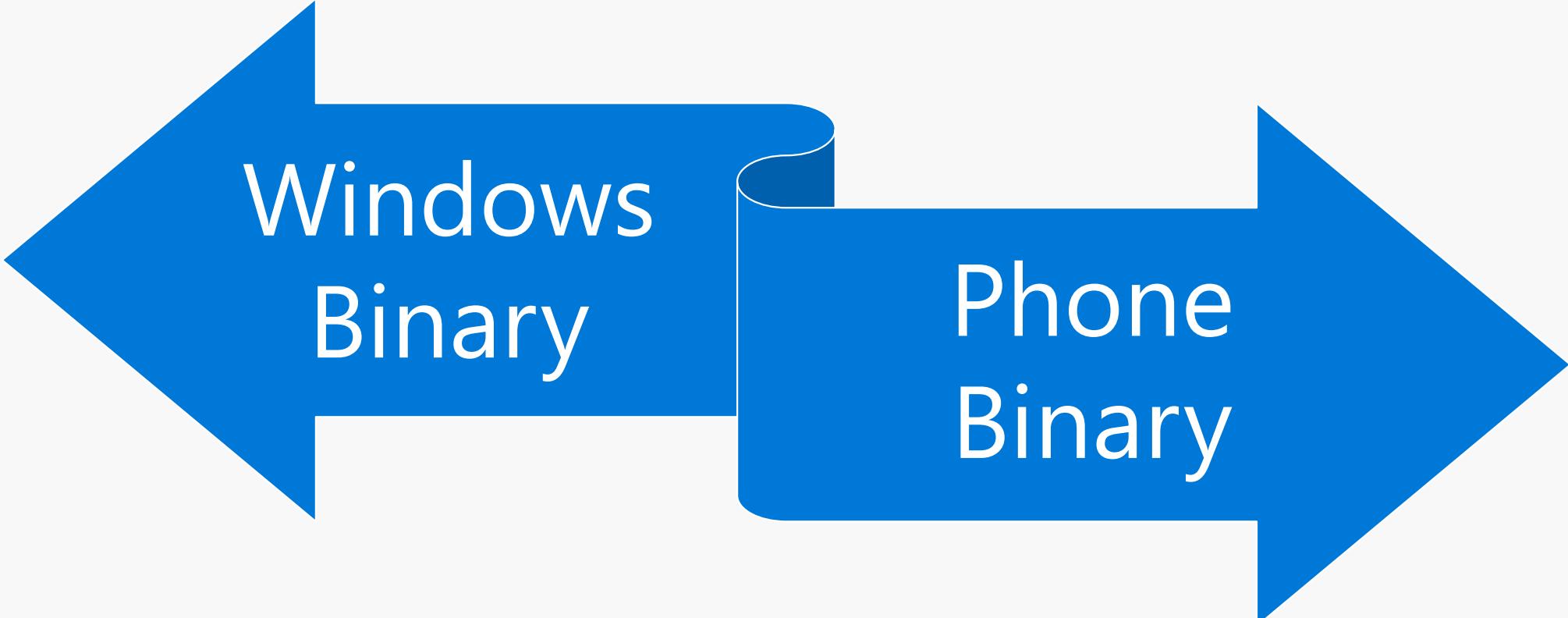


Adding extensions



Shared Projects

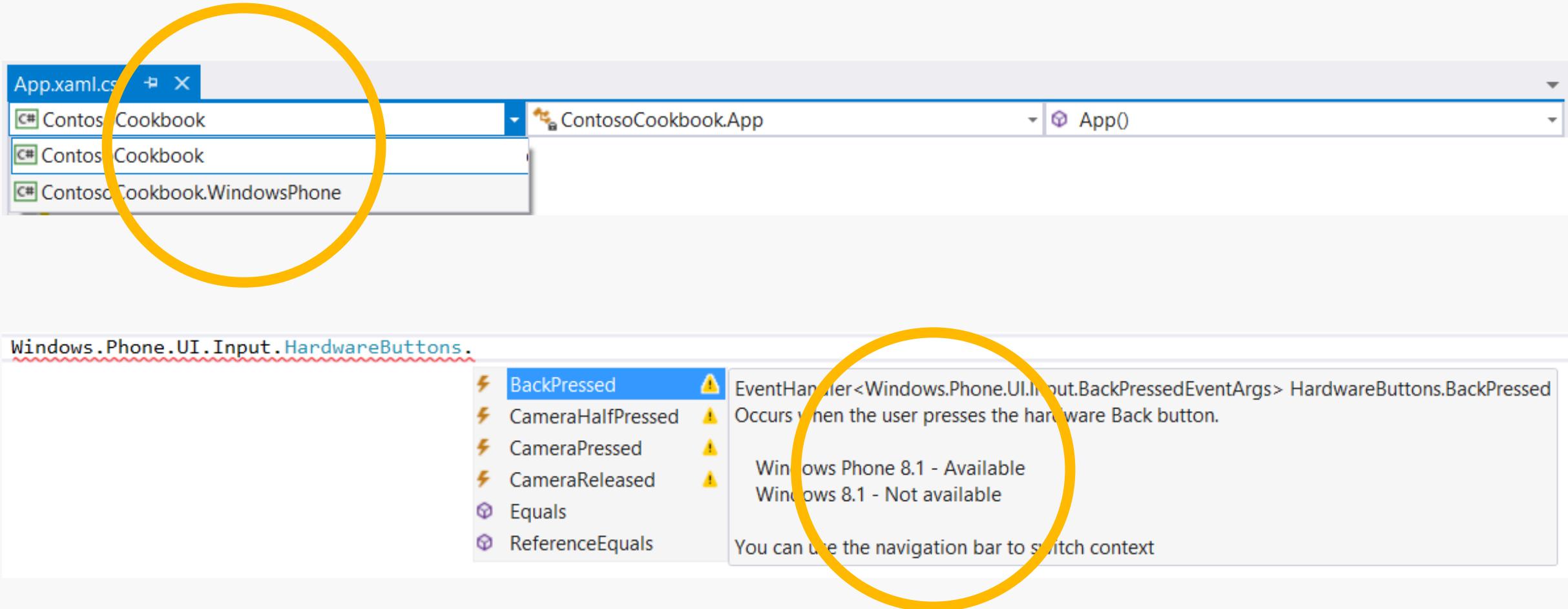
Looking Back to Windows 8.1 and Windows Phone 8.1



Windows
Binary

Phone
Binary

Not all APIs were available everywhere



Compilation directives

C# Syntax

```
#if WINDOWS_PHONE_APP
    Windows.Phone.UI.Input.HardwareButtons
        .BackPressed += this.HardwareButtons_BackPressed;
#endif
```

C++ Syntax

```
#if WINAPI_FAMILY==WINAPI_FAMILY_PHONE_APP
    _backPressedEventToken = HardwareButtons
        ::BackPressed += ref new EventHandler
            <BackPressedEventArgs^> (this,
                &NavigationHelper::HardwareButton_BackPressed);
#endif
```

Feature Detection

Testing for capabilities

`Windows.Foundation.Metadata.ApiInformation`

`IsApiContractPresent`

`IsEnumNamedValuePresent`

`IsEventPresent`

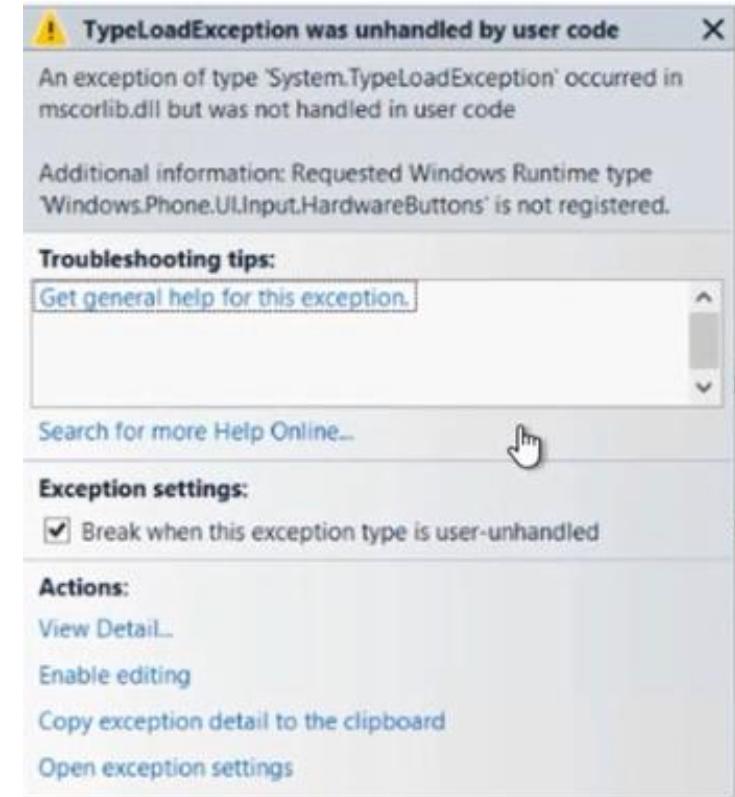
`IsMethodPresent`

`IsPropertyPresent`

`IsReadOnlyPropertyPresent`

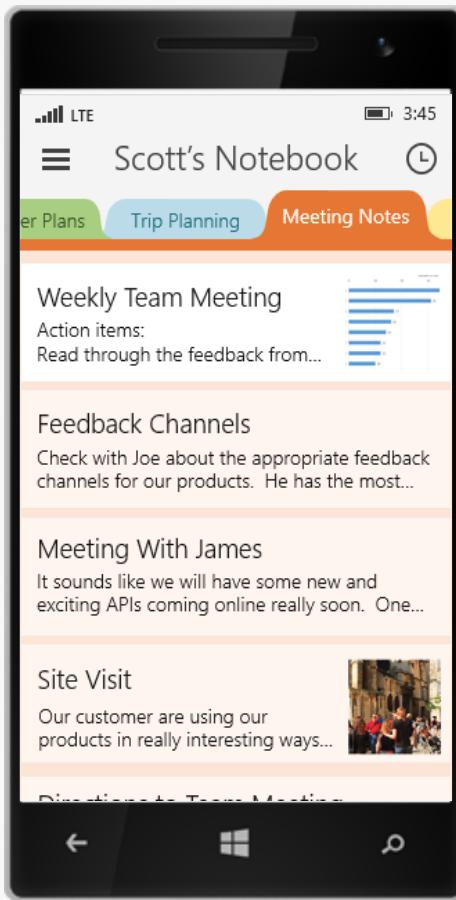
`IsTypePresent`

`IsWriteablePropertyPresent`



Adaptive UI

Adaptive UI



Introducing the Relative Panel

Windows XAML layout controls

Grid

Stack
Panel

Canvas

Scroll
Viewer

Border

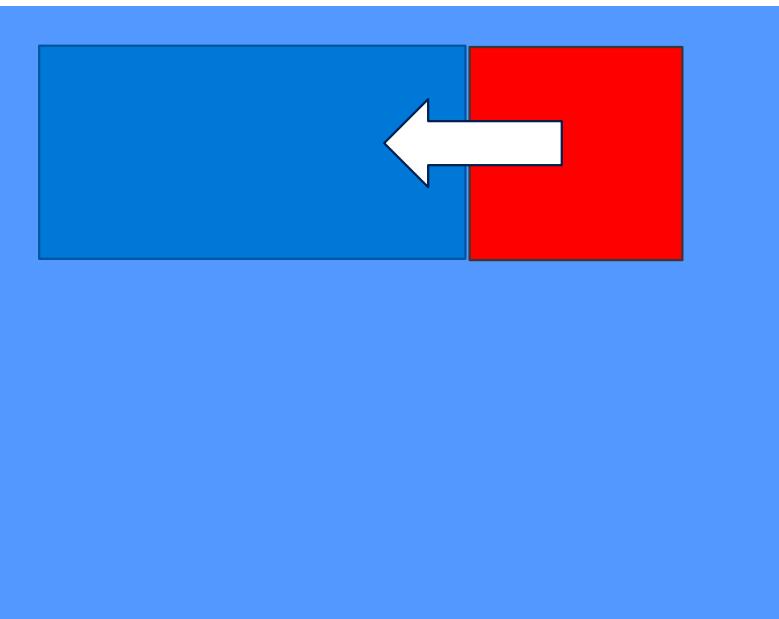
View
Box

Wrap
Grid

Relative
Panel

Relative Panel is a XAML layout control. It arranges children by declaring relationships between them.

Relative Panel (XAML)



```
<RelativePanel>

    <Rectangle x:Name="BlueRect"
        Height="100" Width="100" Fill="Blue" />

    <Rectangle x:Name="RedRect"
        Height="100" Width="100" Fill="Red"
        RelativePanel.RightOf="BlueRect"
        RelativePanel.AlignVerticalCenterWith="BlueRect" />

</RelativePanel>
```

Visual State Triggers

```
<VisualStateGroup x:Name="WindowSizeStates">
    <VisualState x:Name="WideState">
        <VisualState.StateTriggers>
            <AdaptiveTrigger MinWindowWidth="720" />
        </VisualState.StateTriggers>
        <!-- more --!>
    </VisualState>
</VisualStateGroup>
```

Secure

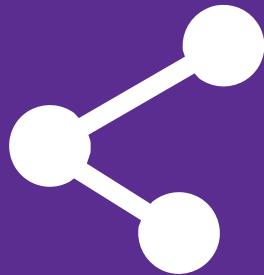


Protect devices

Protect data

Protect identities

Connected



Seamless connectivity to
Microsoft Azure

Interoperability across
connected devices

Easy incorporation of sensors
and peripherals

Windows IoT Core Connection to Azure IoT

End-to-end Azure Connection Setup and Sample for Maker Images

The image consists of three side-by-side screenshots of the Azure IoT Dashboard interface.

Screenshot 1: Provision your device

This screenshot shows the initial step of provisioning a device. It includes fields for selecting an IoT Hub ("Select your IoT Hub" dropdown with "Create a new IoT Hub" button) and an Azure Device ID ("Sprinkler_1" dropdown with "Create new device ID" button). Below these, a "Device to provision" section shows "myRPi3" and "172.33.168.191" with a "Provision" button.

Screenshot 2: IoT Dashboard

This screenshot shows the main IoT Dashboard after provisioning. It displays a summary of connected devices, including "myRPi3" and its IP address. A "Cloud in my Device" button is visible at the top.

Screenshot 3: Provisioning successful

This screenshot shows the confirmation of successful provisioning. It features a large blue cloud icon and text prompting to run a sample app. It includes a "Run this app on your device" section with a "Device" dropdown set to "myRPi3" and "172.33.168.191" and a "Deploy and run" button.

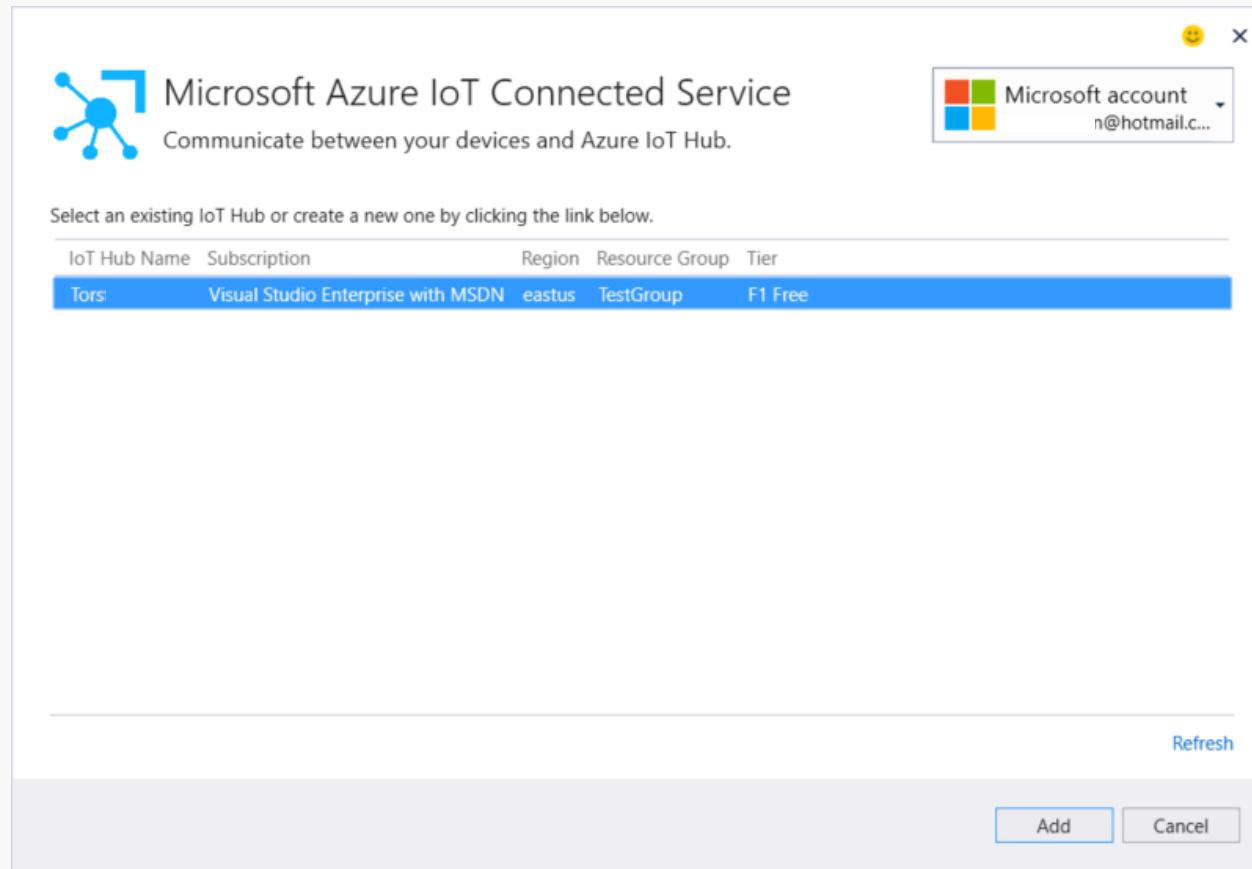
Windows IoT Core Connection to Azure IoT

Platform Supported Secure Azure Device Key Storage

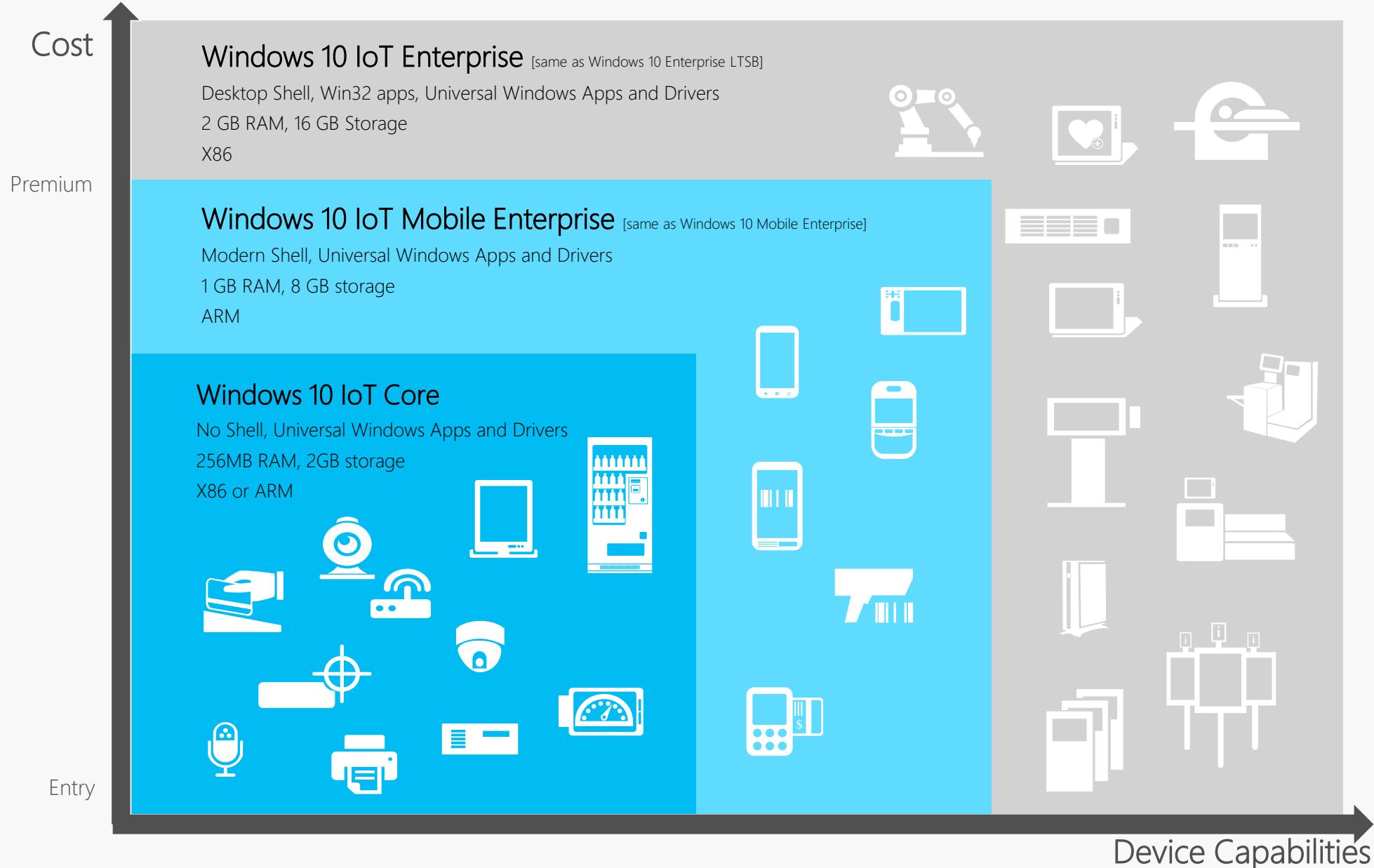
The screenshot shows the "Trusted Platform Module configuration" screen in the Windows IoT Core interface. The left sidebar lists various utilities like Home, Apps, Processes, Performance, Debugging, ETW, Perf Tracing, Devices, Bluetooth, Audio, Networking, Windows Update, IoT Onboarding, TPM configuration, and Remote. The "TPM configuration" option is currently selected. The main panel displays "TPM information" and "Logical devices settings". Under "Logical devices settings", there is a dropdown for "Logical device ID" set to 0, a "Device Id" field containing a long GUID, an "Azure Key" field with placeholder text "Enter Azure key value", and an "Azure URI" field with placeholder text "Enter Azure URI value". At the bottom are "Save" and "Reset" buttons. The top right corner shows the date and time as "10:15 AM 3/22/2016".

Windows IoT Core Connection to Azure IoT

Visual Studio Extension for Azure IoT Hub Client



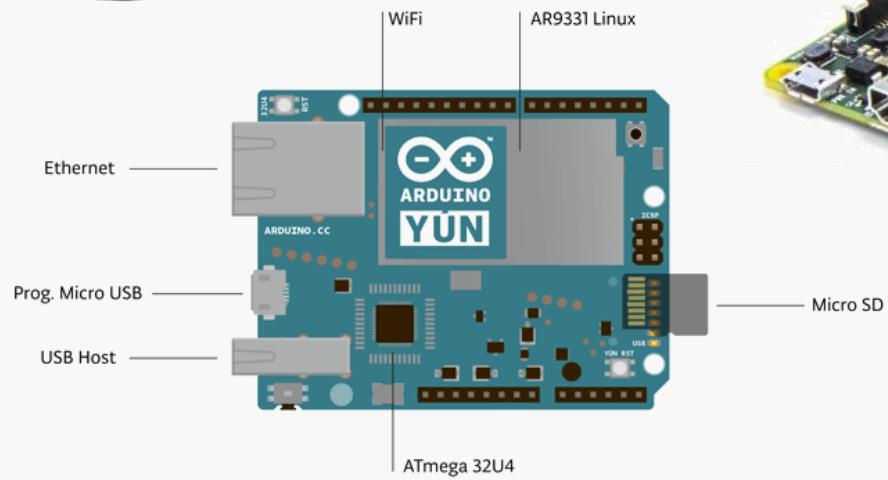
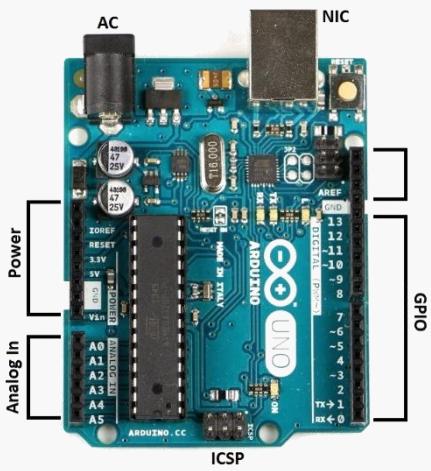
Windows IoT Editions

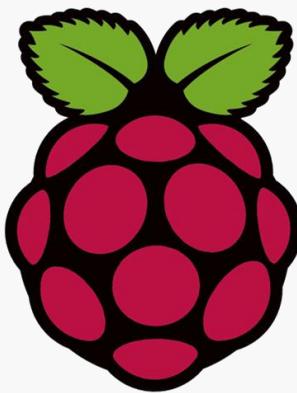


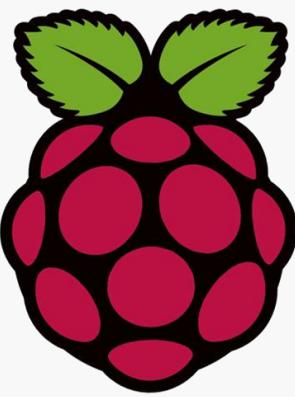
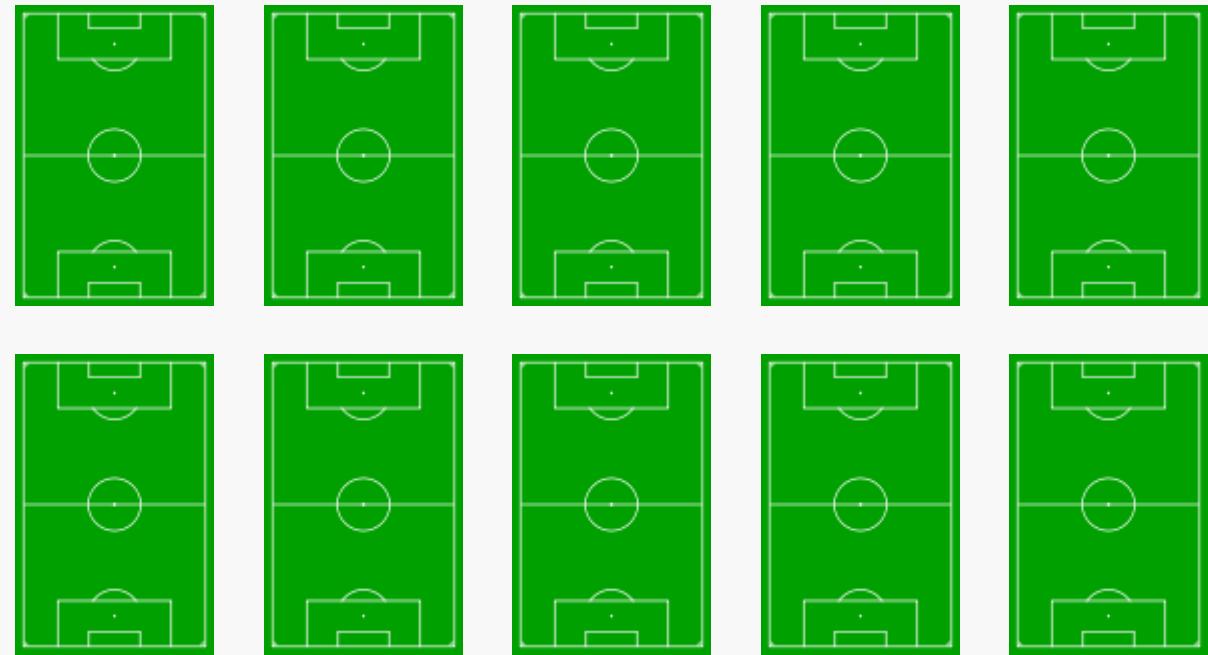
Hands-on Lab

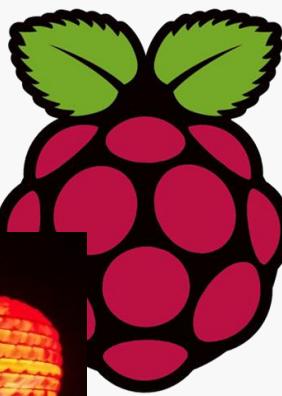
Lab 1: Setup

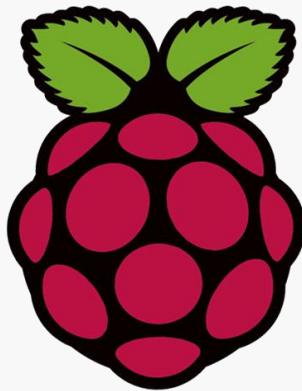
Checklist, Boot Raspberry Pi 2



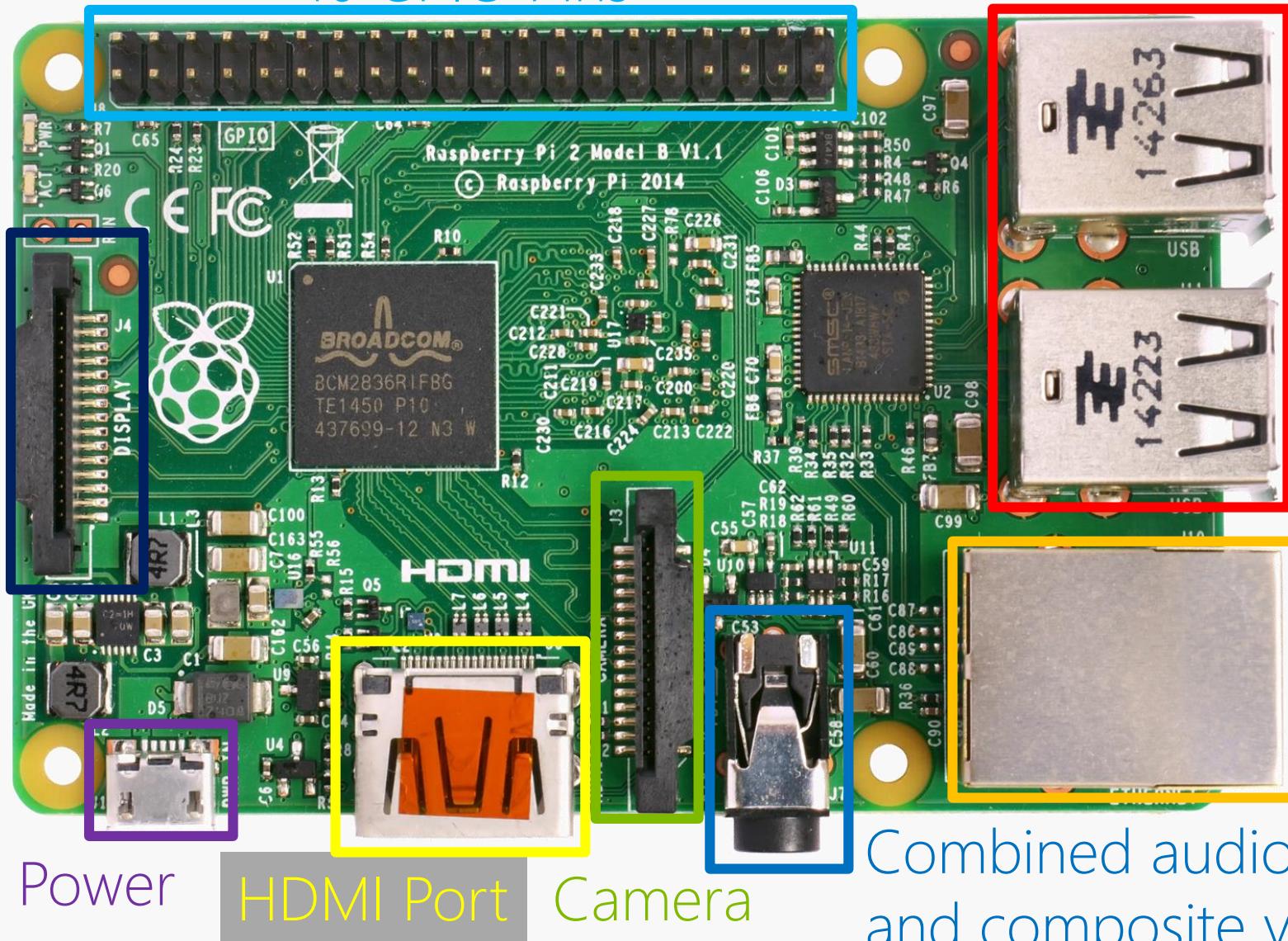








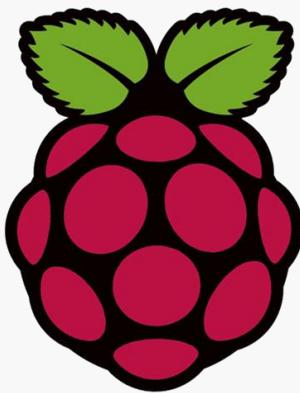
Display (DSI)



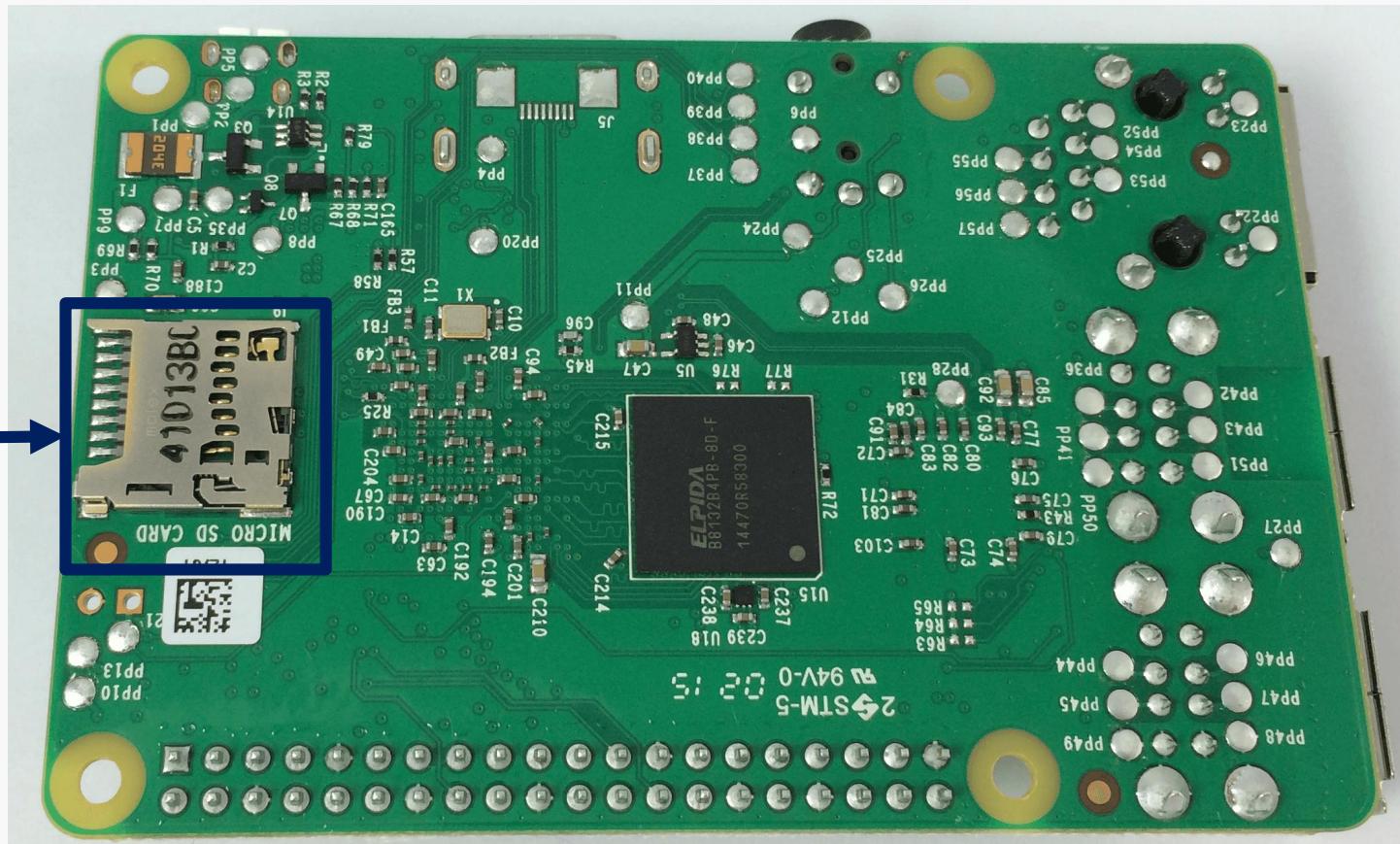
4 USB Ports

Ethernet port

Combined audio jack and composite video



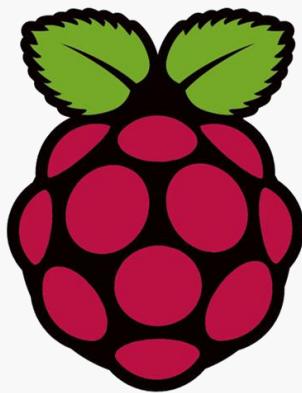
Micro SD
card slot





3.3V PWR	1
I2C1 SDA	3
I2C1 SCL	5
GPIO 4	7
GND	9
SPI1 CS0	11
GPIO 27	13
GPIO 22	15
3.3V PWR	17
SPI0 MOSI	19
SPI0 MISO	21
SPI0 SCLK	23
GND	25
Reserved	27
GPIO 5	29
GPIO 6	31
GPIO 13	33
SPI1 MISO	35
GPIO 26	37
GND	39
2 5V PWR	40
4 5V PWR	
6 GND	
8 Reserved	
10 Reserved	
12 GPIO 18	
14 GND	
16 GPIO 23	
18 GPIO 24	
20 GND	
22 GPIO 25	
24 SPI0 CS0	
26 SPI0 CS1	
28 Reserved	
30 GND	
32 GPIO 12	
34 GND	
36 GPIO 16	
38 SPI1 MOSI	
40 SPI1 SCLK	

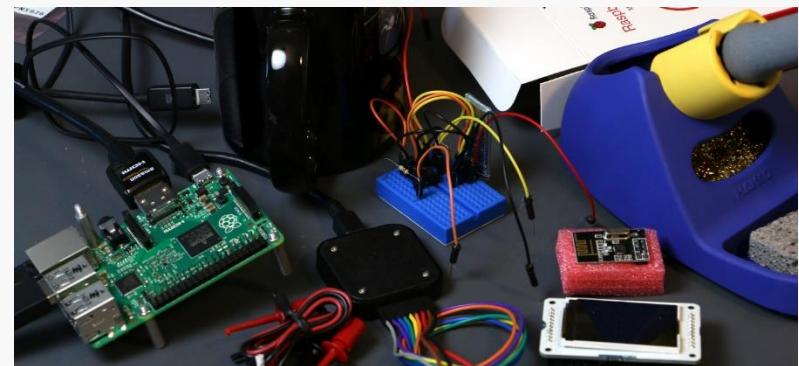
Windows 10 on Raspberry Pi 2 & 3



Windows 10



Visual Studio



Hands-on Labs

← → ⌂ | GitHub, Inc. [US] github.com/oliviak/IoT-Camp/tree/master/connectthedots/WindowsIoTCorePi2FezHat

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oliviak IoT Camps with IoT Hub Latest commit f61a466 11 minutes ago

..		
Assets/Website	IoT Camps with IoT Hub	11 minutes ago
Code	IoT Camps with IoT Hub	11 minutes ago
Images	IoT Camps with IoT Hub	11 minutes ago
docs	IoT Camps with IoT Hub	11 minutes ago
1-Setup.md	IoT Camps with IoT Hub	an hour ago
README.md	IoT Camps with IoT Hub	11 minutes ago
license.txt	IoT Camp material FEZ HAT	5 months ago

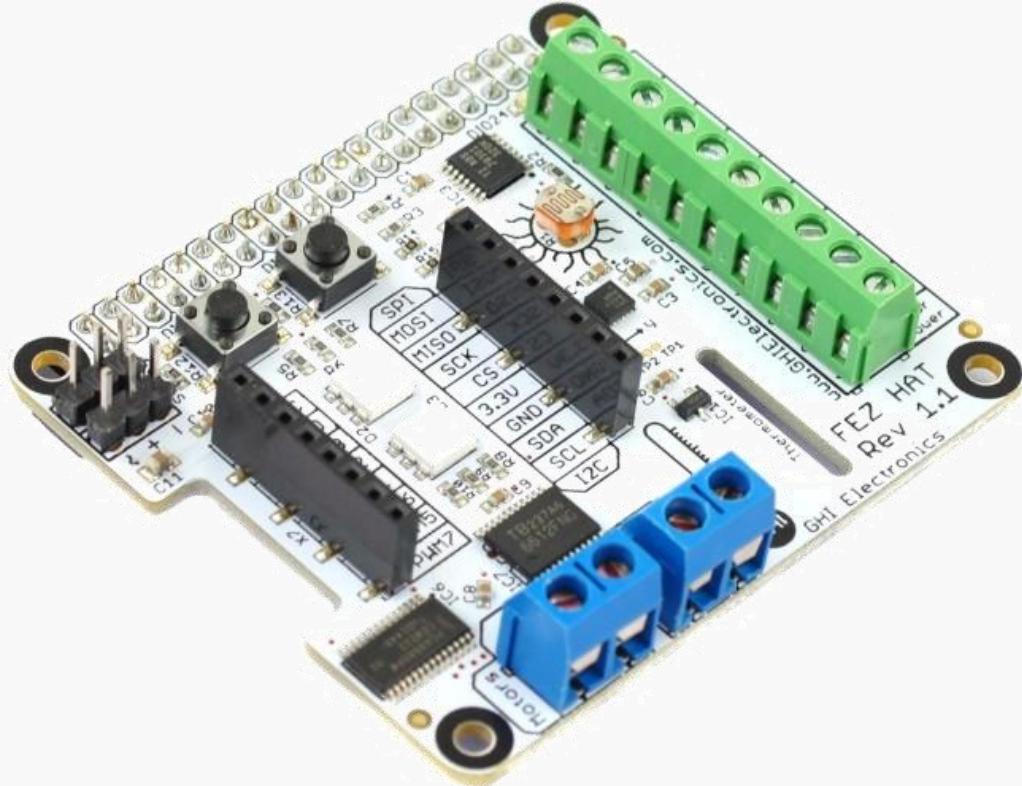
README.md

Windows 10 IoT Core Hands-on Lab

ConnectTheDots will help you get my devices connected to Microsoft Azure, and to implement great IoT solutions taking advantage of Microsoft Azure advanced analytic services, such as Azure Stream Analytics and Azure Machine Learning.

<http://aka.ms/iotcamp-de>

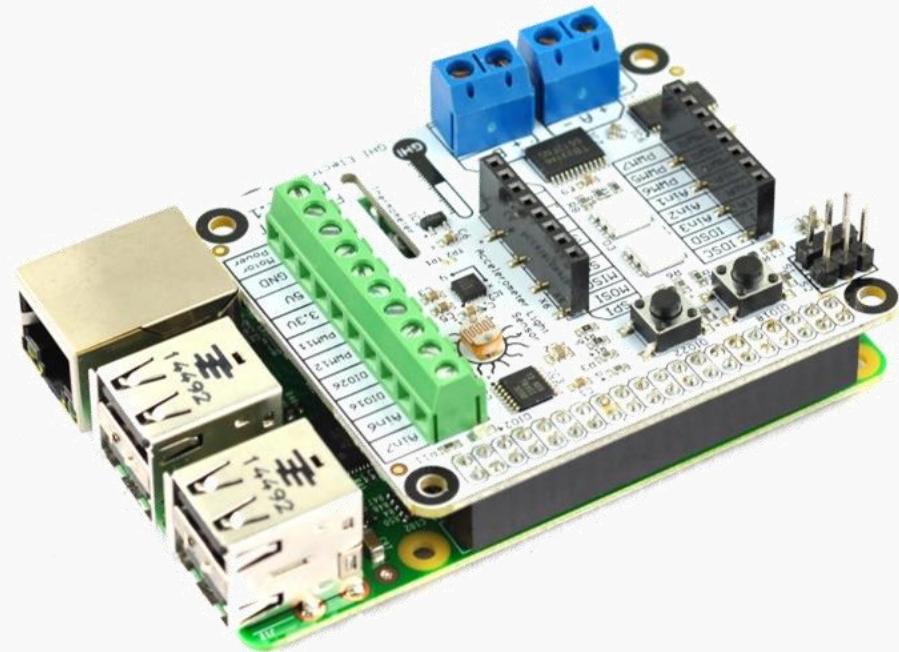
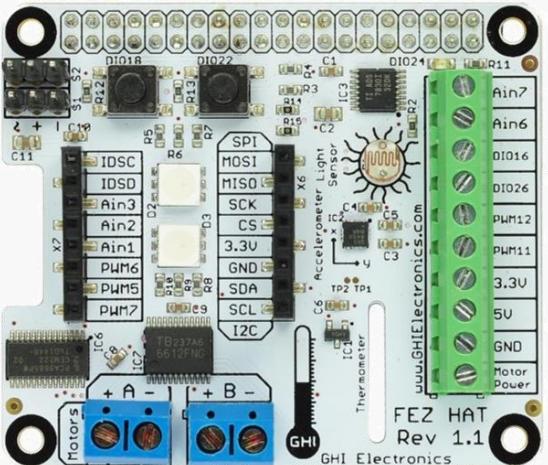
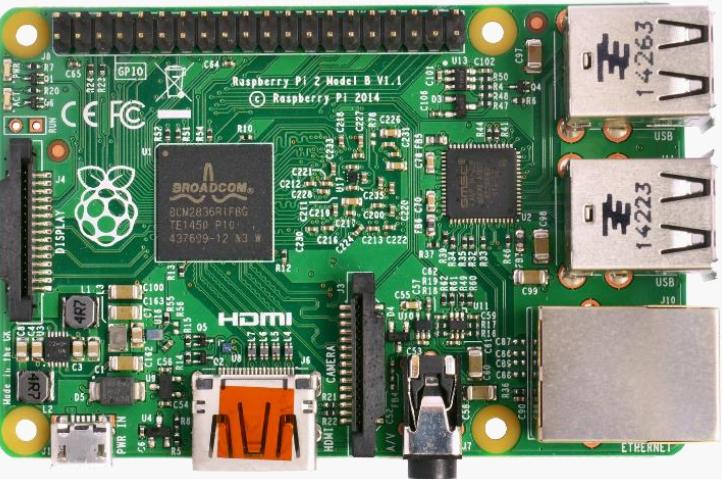
FEZ HAT



FEZ HAT

- On-Board Analog Input and PWM chips.
- Two DC Motor Drivers, suitable for building small robots.
- Terminal Blocks for wiring in DC motors without the need for soldering.
- Two Servo Motor Connections.
- Two Multi Color LEDs, connected to PWM for thousands of colors.
- Single Red LED.
- Temperature Sensor.
- Accelerometer.
- Light Sensor.
- Two user buttons.
- Terminal block with 2x Analog, 2x Digital I/O, 2x PWM and power.
- Female headers with SPI, I2C, 3x Analog, 3x PWM.
- Dedicated power input for driving the servo motors and DC motors

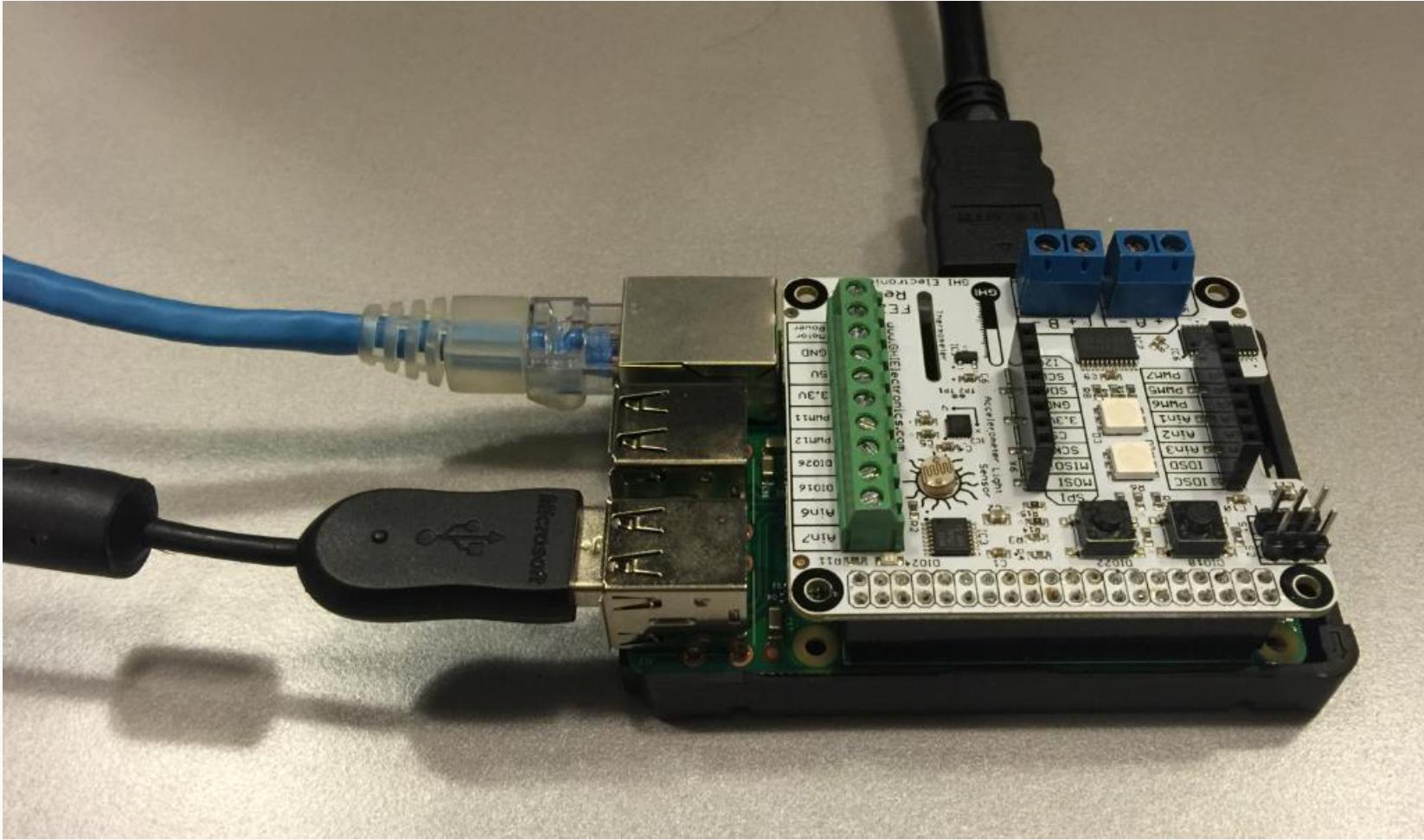
Devices



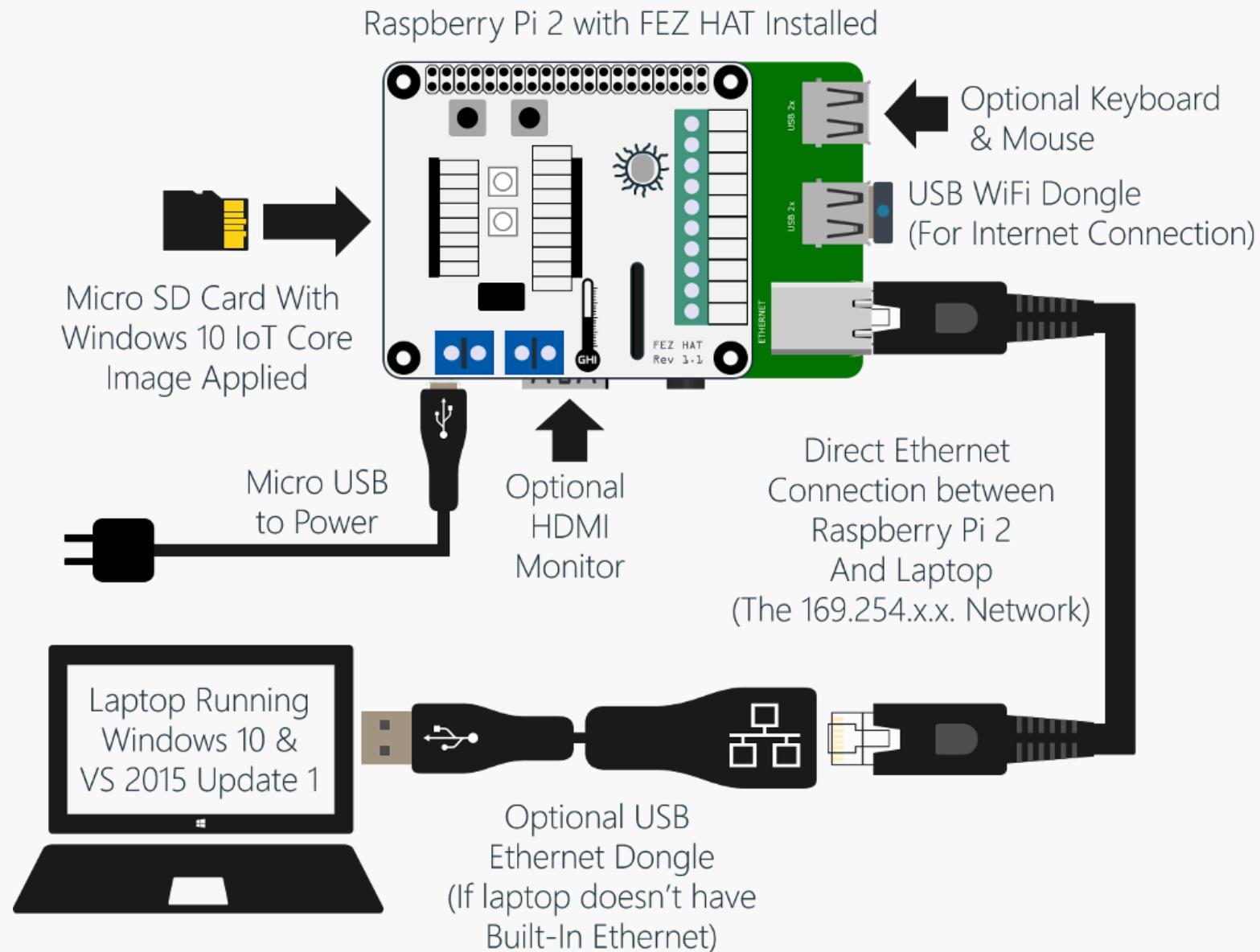
Lab 1: Setup – Checklist

1. IP-Address
2. Windows 10 (build 10240) & developer mode
3. Visual Studio 2015: version 14.0.23107.0 D14Rel
4. VS Tools for Universal Windows Apps: 14.0.23121.00 D14OOB
5. Windows IoT Core Project Templates
New Project → Templates → Visual C# → Windows → Windows IoT Core → Background Application (IoT)
6. Device Explorer: <http://aka.ms/device-explorer>
7. Web Deploy: <http://aka.ms/web-deploy>
8. IoT Core Dashboard <http://aka.ms/iot-core-dashboard>

Lab 1: Setup



Lab 1: Setup



Lab 1: Setup – IoT Core Dashboard

The screenshot shows the 'My devices' section of the IoT Dashboard. On the left, there's a sidebar with icons for 'My devices' (selected), 'Set up a new device', 'Try some samples', and 'Settings'. The main area has a title 'My devices' and a 'Filter' dropdown set to 'All'. A table lists nine devices:

Name	Type	IP Address	Settings	Open in Device Portal	OS
xbwVMWtt00	Virtual Machine	10.125.148.97	Edit	View	10.0.10586
piinthesky	Raspberry Pi 2 Model B	10.125.148.98	Edit	View	
rpi2_touch4	Raspberry Pi 2 Model B	10.125.148.99	Edit	View	10.0.10586
jochi-wtt-2	MinnowBoard MAX D0 PLATFORM	10.125.148.100	Edit	View	10.0.10586
MVPDemo	Minnowboard Max B3 PLATFORM	10.125.148.108	Edit	View	10.0.10586
rokleins-pi2ad	Raspberry Pi 2 Model B	10.125.148.111	Edit	View	10.0.10584
minwinpc	Minnowboard Max B3 PLATFORM	10.125.148.123	Edit	View	10.0.11063
minwinpc	Minnowboard Max D0 PLATFORM	10.125.148.124	Edit	View	10.0.10586
jochi_mbm_bt	Minnowboard Max D0 PLATFORM	10.125.148.120	Edit	View	10.0.10586

At the bottom, it says 'Can't find your device?' and 'Learn more'.



Further Resources

[Windows 10 for the Internet of Your Things](#)

[Windows Dev Center – The Internet of your things](#)

<http://aka.ms/iot-ctd-field-labs>