

# HoloLens 2的 MR(Mixed Reality)開發入門

鮑承佑



# Agenda

- 一堆『?R』的定義
- HoloLens 2硬體方面介紹
- HoloLens 2軟體操作示範
- HoloLens 2開發框架總覽
- MRTK簡介 & Unity3D上的開發流程
- Azure Spatial Anchor簡介
- 一堆集大成的瑣碎事項
- HoloLens 2實機體驗(假如來得及的話)

## 一堆『?R』的定義

(每年都有新Buzzword)



- AR – Augment Reality
- VR – Virtual Reality
- MR – Mixed Reality
- XR – eXtended Reality

基本上可從總體上虛擬影像成分佔比大小來區分這堆『?R』

實際上現在也有所謂的  
“Pass-through” VR Headset

號稱可帶來比AR眼鏡更佳的使用者體驗



OPTICAL SEE-THROUGH DEVICE



VARJO XR-1

<https://varjo.com/blog/video-pass-through-xr-changes-reality-as-you-know-it/>

# HoloLens 2硬體方面介紹

- <https://docs.microsoft.com/en-us/hololens/hololens2-hardware>
- 基本上可想成一台ARM64架構跑“Windows 10 Mobile”的電腦
- 前鏡頭可擷取可見光/紅外線等深度影像資訊
- Wifi 5(802.11 ac), Bluetooth 5.0 – 可連接藍芽滑鼠鍵盤操作
- USB type-c 充電/資料傳輸孔
- 比前代多了eye-tracing, 能使用視網膜掃描做登入(Lumia 950?!)
- Better FOV



Hololens 1 ( $30^{\circ} \times 17.5^{\circ}$ )

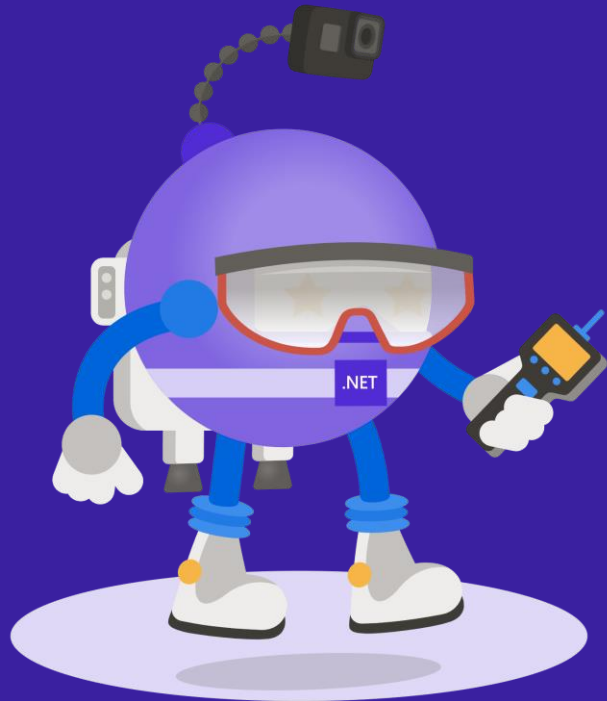
Hololens 2 ( $43^{\circ} \times 29^{\circ}$ )

Magic Leap One ( $40^{\circ} \times 30^{\circ}$ )

<https://uploadvr.com/hololens-2-field-of-view/>

# HoloLens 2硬體方面介紹

- 一般商用版  
(室內或光害不強戶外環境使用)



- Trimble XR10  
第三方客製化工業版  
(高強度工業場所使用)





# Hololens 2

Welcome  
to the  
future!



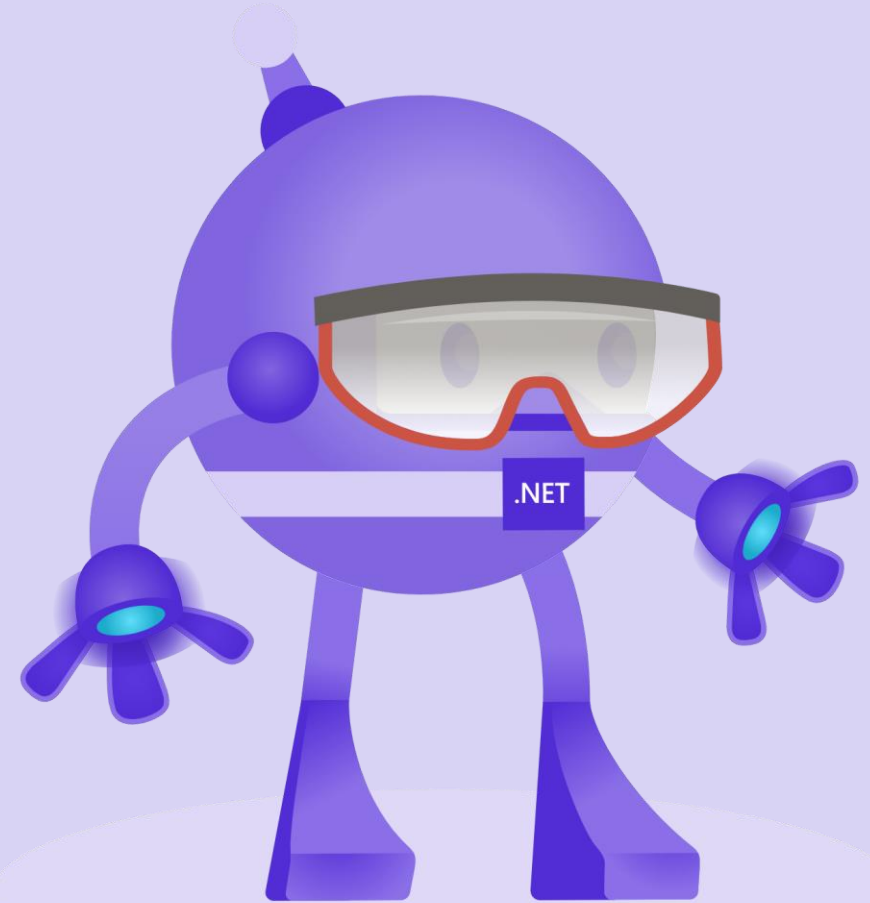
目前在台灣有精誠資訊的販賣通路：<http://tw.system.com/microsoft-hololens2/>



<https://mixedreality.trimble.com/>



# HoloLens 2 軟體操作示範







# HoloLens 2軟體操作示範



- Personalized Login without password
- Hand Gesture\Nature Interaction
- Immersive Experience (3D Home &app)
- 2D app compatible & combine operate
- Voice Command



## HoloLens 2開發框架總覽

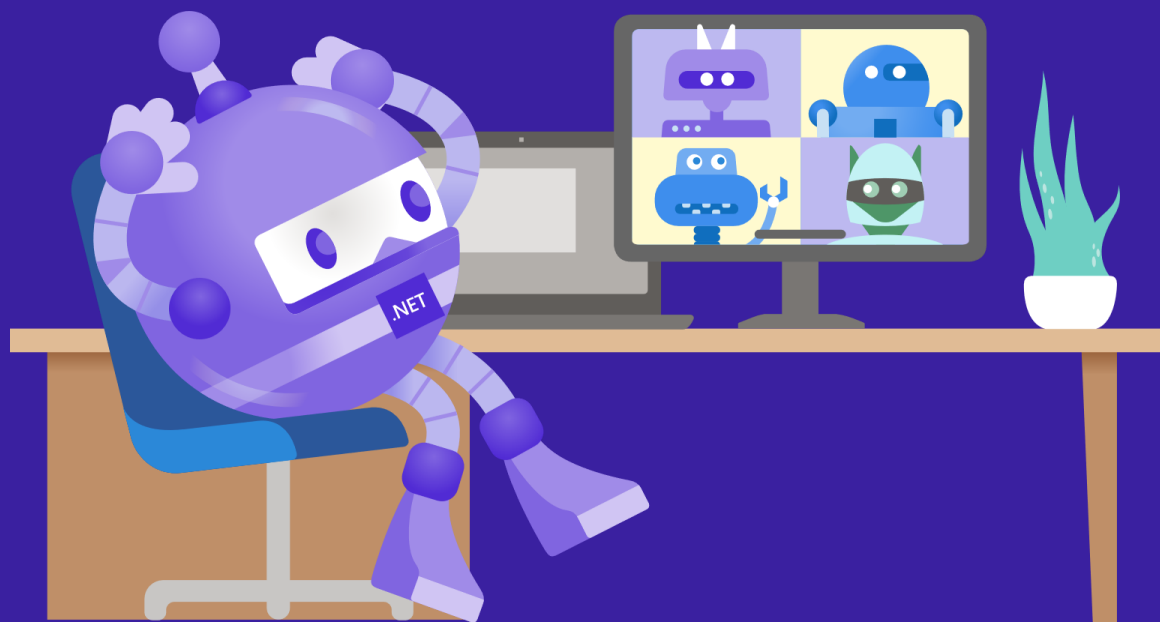
- 基本上除了有內建Edge瀏覽器可以看Web網頁外，其他都要透過UWP平台app store的方式發佈應用。  
<https://docs.microsoft.com/en-us/windows/uwp/>
- Native 2D app：UWP, Xamarin Forms
- Native 3D app：3D Game Engine/Framework

# 工商服務時間 – 問口罩 App



# HoloLens 2開發框架 總覽

- 原生3D開發根據  
使用語言  
主流Game Engine陣營  
XR開發技術分類：
- 接下來的講說以 Unity3D 為主



框架	使用之開發語言
Unity3D	C#
Unreal Engine	C++
OpenXR	C++

# MRTK簡介 & Unity3D 上的開發流程

- MRTK(Mixed Reality Toolkit)  
<https://github.com/Microsoft/MixedRealityToolkit-Unity>
- 提供一組UI/UX開發框架可方便於加快AR/VR開發
- 支援執行在HoloLens, Oculus, iOS/Android device等XR專用或非專用裝置



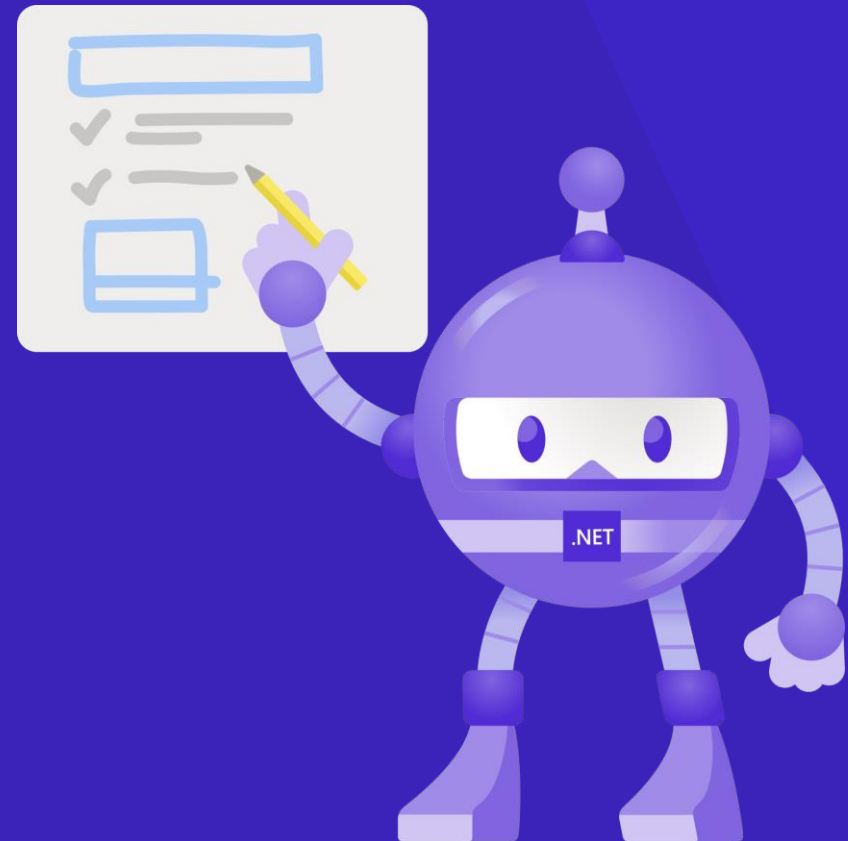
**M R T K**  
Mixed Reality Toolkit  
**For UNITY**





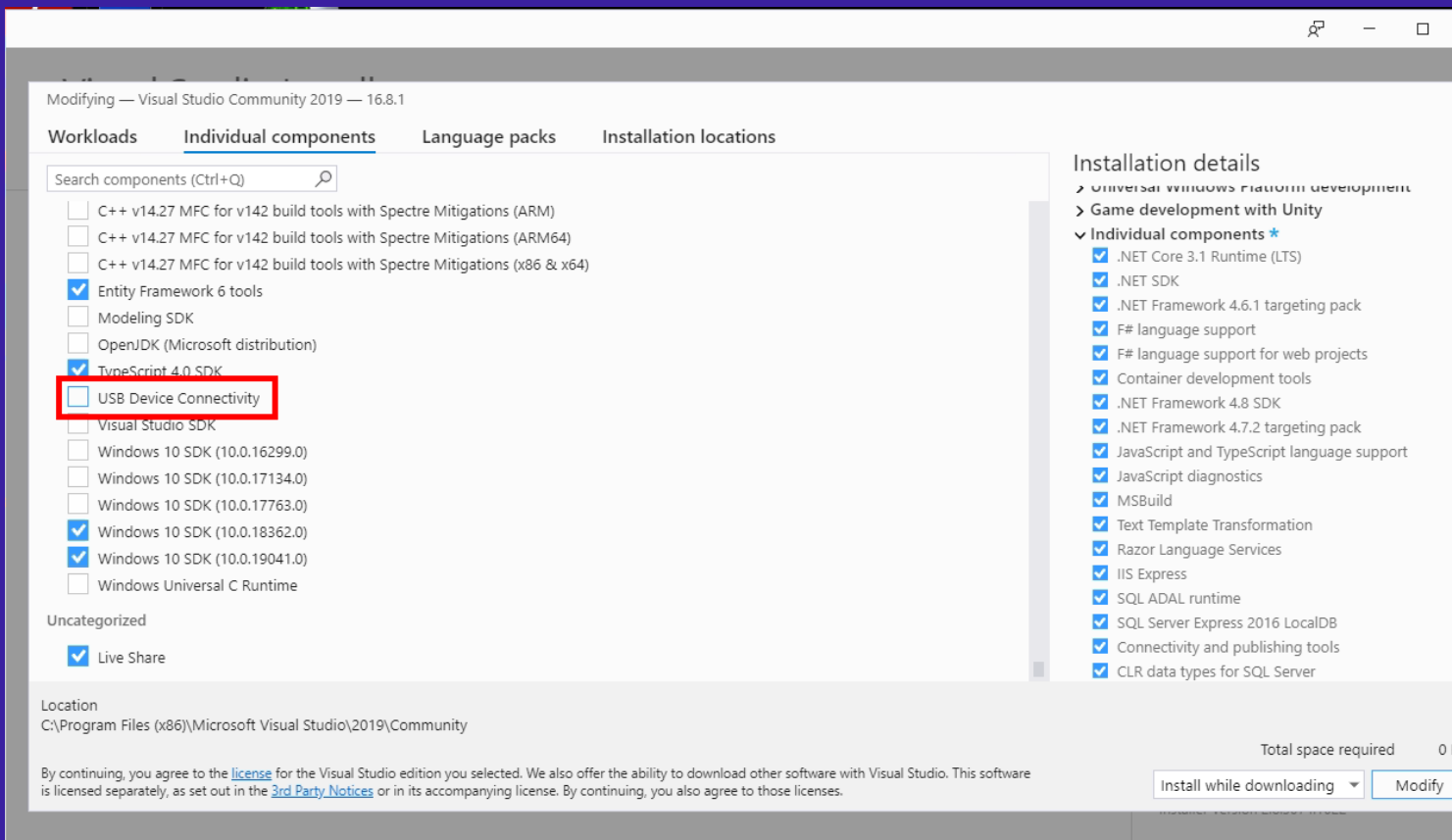
# Unity3D上的開發流程 – 環境準備

- 開發機硬體準備：
  - 效能越強越好的Win10電腦  
(要有3D顯卡)  
(建議有Thunderbolt3 I/O孔)
  - 儲存空間夠大
  - 網路速度不能太慢
  - 有滾輪的滑鼠
- 開發機軟體準備：
  - Visual Studio 2019 / VS Code / Rider
  - Unity3D 2019 LTS





# Unity3D上的開發流程 – 環境準備



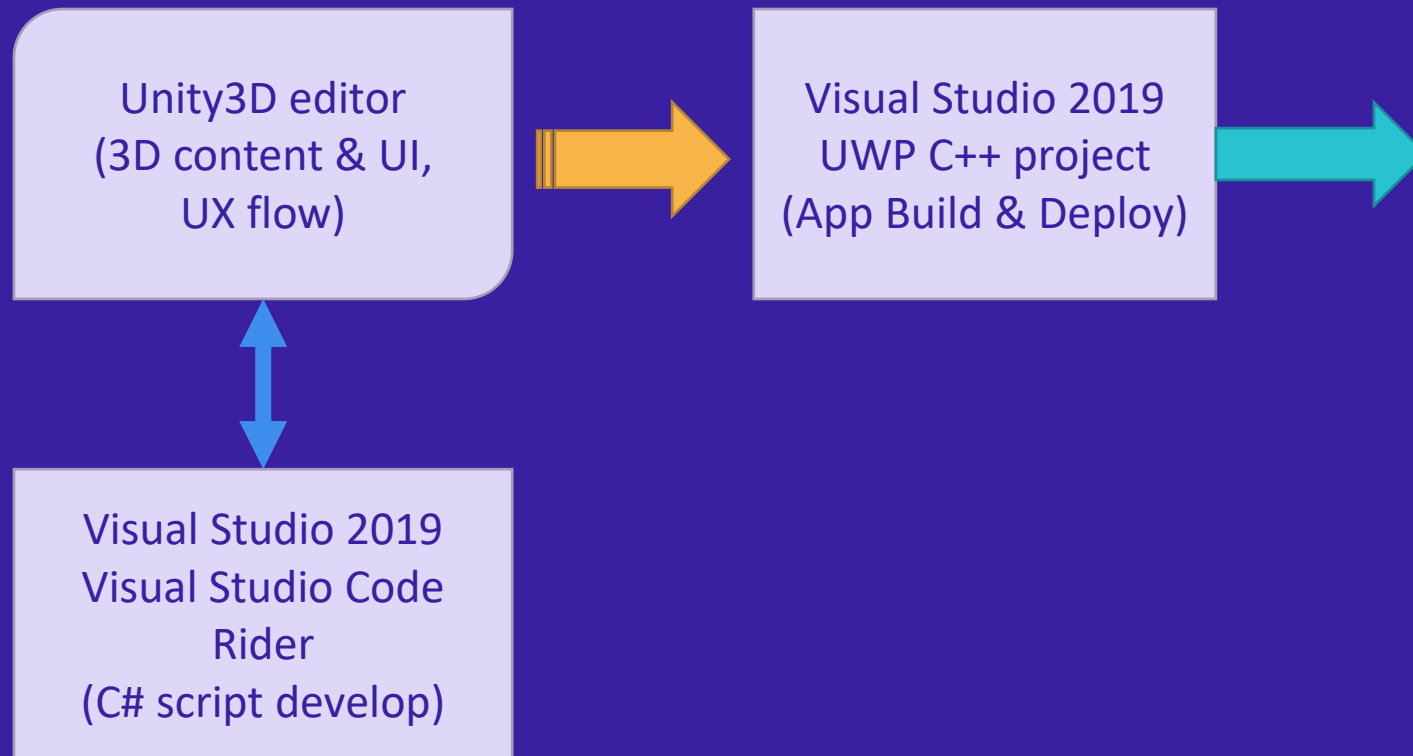
- MRTK所需的開發軟體詳細安裝清單：

<https://docs.microsoft.com/en-us/windows/mixed-reality/develop/install-the-tools?tabs=unity>

- 模擬器可略過不裝
- Visual Studio 2019有個 **USB Device Connectivity** 的額外元件也要安裝，否則會無法佈署到實體機上

# Unity3D上的開發流程 – Dev Workflow

- Unity3D的開發workflow :





# Unity3D上的開發流程 – 建立專案

- 使用Unity Hub建立3D專案
- MRTK套件建議使用UPM ( Unity Package Manager ) 安裝
  - 減少手動copy/paste的手誤
  - 有效減少需版控的檔案大小
  - 自動加載相依套件，且可快速版本upgrade/downgrade  
<https://microsoft.github.io/MixedRealityToolkit-Unity/Documentation/usingupm.html>
- 版控如果使用git，建議使用 git lfs 來處理一堆二進位檔案。
- MRTK官方有提供.gitignore版控排除清單內容



Importing



com.microsoft.mixedreality.toolkit.foundation\SDK\Experim...\Scripts

## Unity Package Manager Error



Could not establish a connection with the Unity Package Manager local server process. This is most likely due to a proxy or firewall configuration. Make sure the process [C:/Program Files/Unity/Hub/Editor/2019.4.16f1/Editor/Data/Resources/PackageManager/Server/UnityPackageManager.exe] is reachable via HTTP on the IP address 127.0.0.1 in Windows Defender or any other proxy/firewall software configuration.

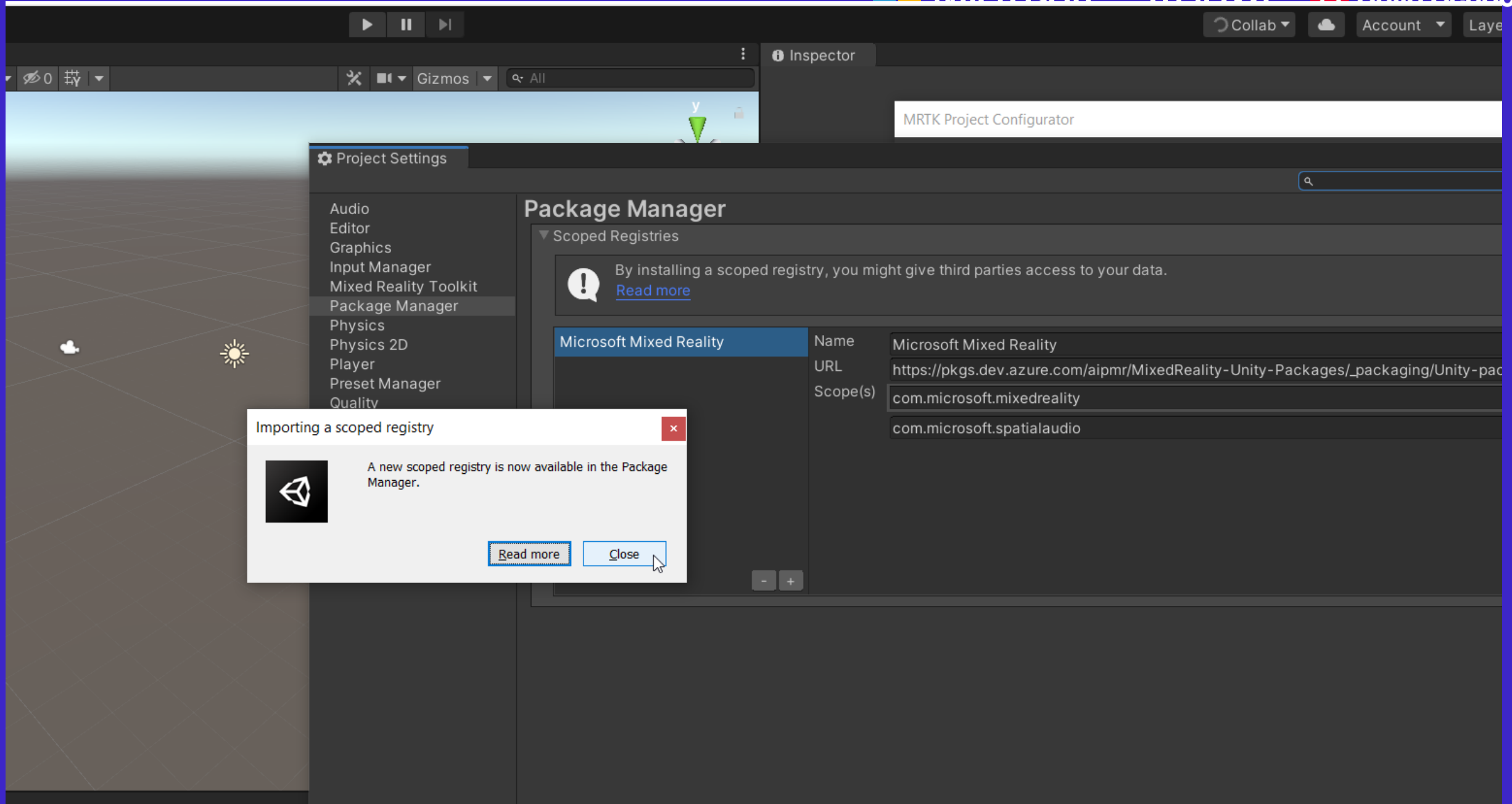
Click on Retry to relaunch Unity and reopen your project.

Click on Diagnose to launch the Unity Package Manager Diagnostics tool.

Retry

Quit

Diagnose





Package Manager
+ In Project
Advanced

Microsoft

Mixed Reality Toolkit Examples 2.5.1 ✓
Mixed Reality Toolkit Extensions 2.5.1 ✓
Mixed Reality Toolkit Foundator 2.5.1 ✓
Mixed Reality Toolkit Tools 2.5.1 ✓

Unity Technologies

JetBrains Rider Editor 3.0.3 ✓
Test Framework 1.1.20 ✓
TextMeshPro 2.1.3 ✓
Timeline 1.2.17 ✓
Unity Collaborate 1.2.16 ✓
Unity UI 1.0.0 ✓
Visual Studio Code Editor 1.2.3 ✓
Windows XR Plugin 2.5.2 ✓
XR Plugin Management 3.2.17 ✓

## Mixed Reality Toolkit Foundation


Version 2.5.1 - October 20, 2020

**Name**  
com.microsoft.mixedreality.toolkit.foundation

**Links**  
[View documentation](#)  
[View changelog](#)  
[View licenses](#)

**Author**  
Microsoft

**Registry** Microsoft Mixed Reality

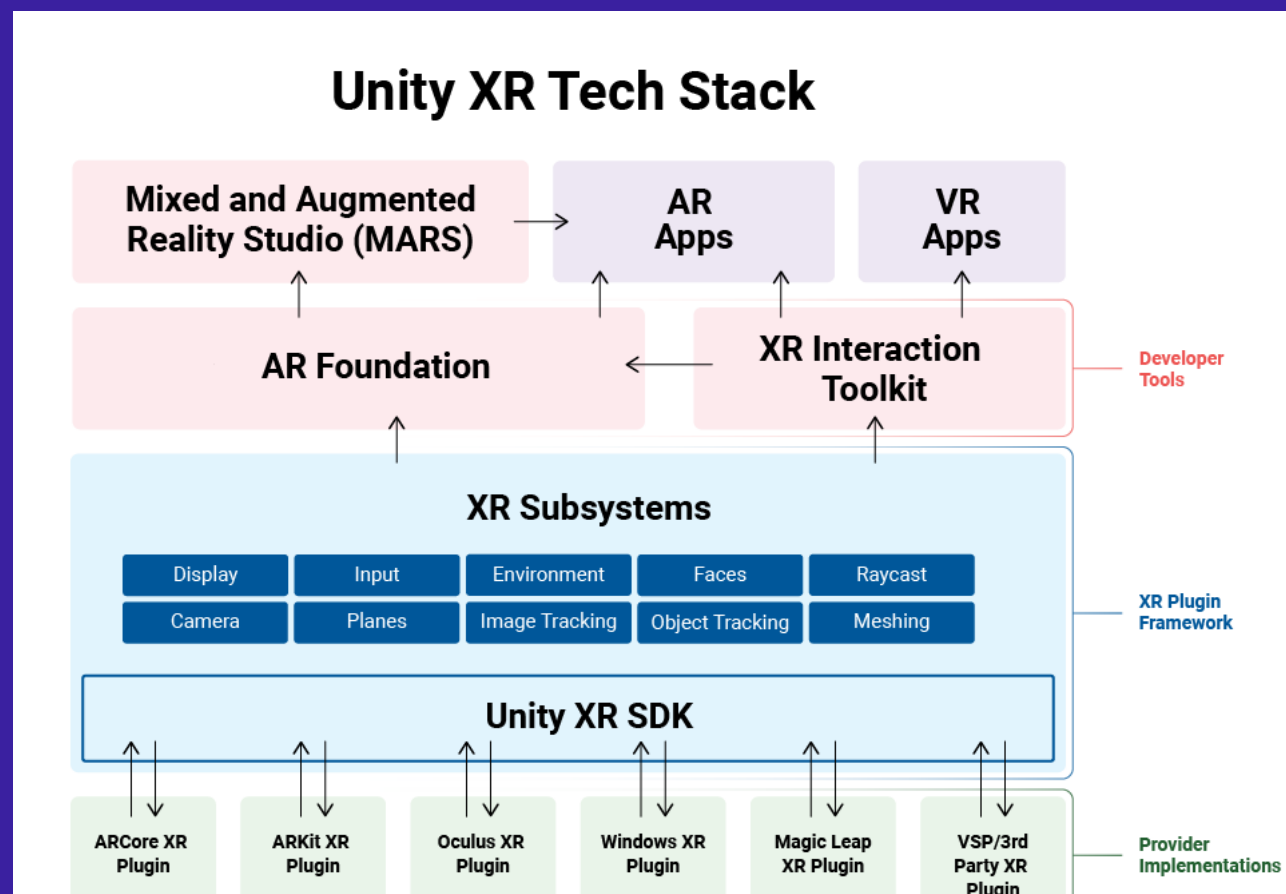

This package is hosted on a Scoped Registry.  
[Read more](#)

**Published Date**  
October 20, 2020

The Mixed Reality Toolkit a set of foundational components and features to

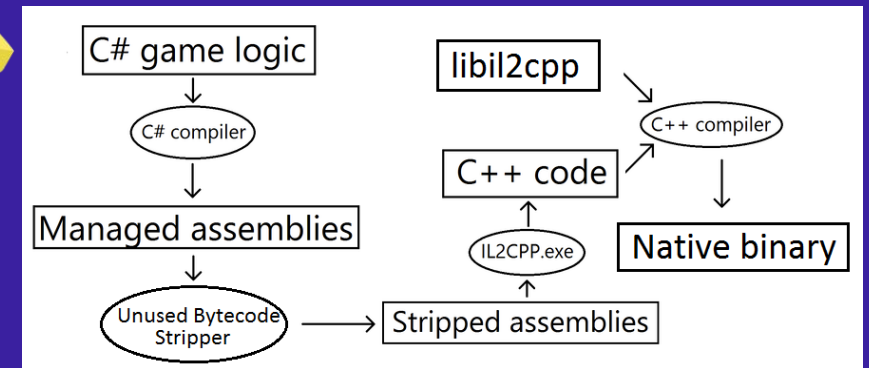
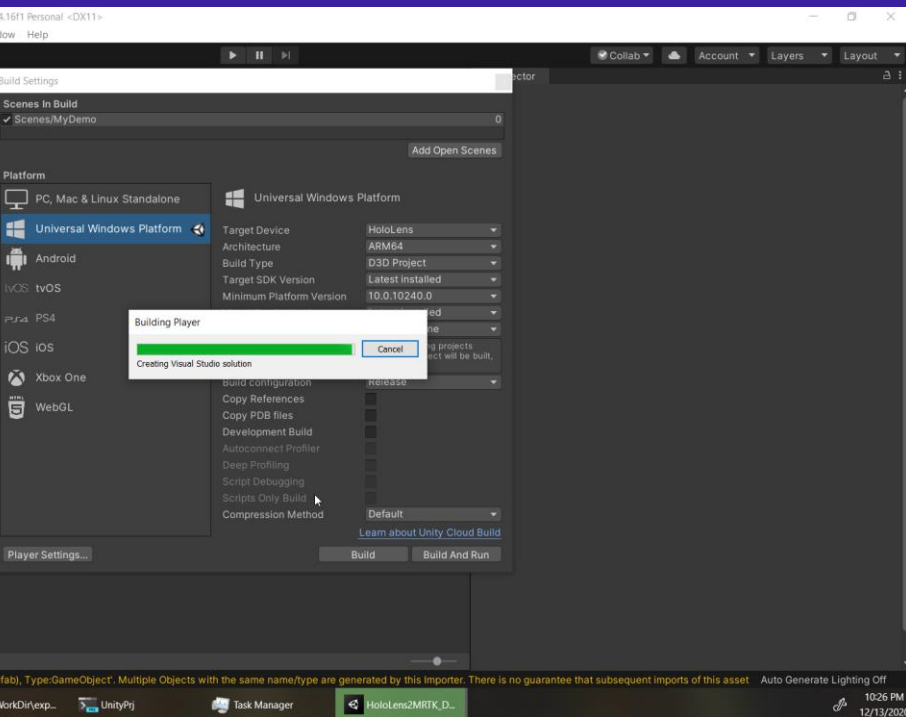
# Unity3D上的開發流程 – 專案設定

- 目前由於Unity3D版本本身對於XR開發技術架構的對應關係，MRTK相關的Profiles設定目前分為兩種：
  - Legacy：87%功能MRTK提供
  - Unity XR Plugin：使用Unity3D v2019.2之後的XR Tech Stack
- 第一種對於第三方元件/雲端服務的相容性好，但建置速度慢
- Unity3D 2020 Lts版本正式發佈後會把第一種方式廢除  
<https://microsoft.github.io/MixedRealityToolkit-Unity/Documentation/GettingStartedWithMRTKAndXRSDK.html>



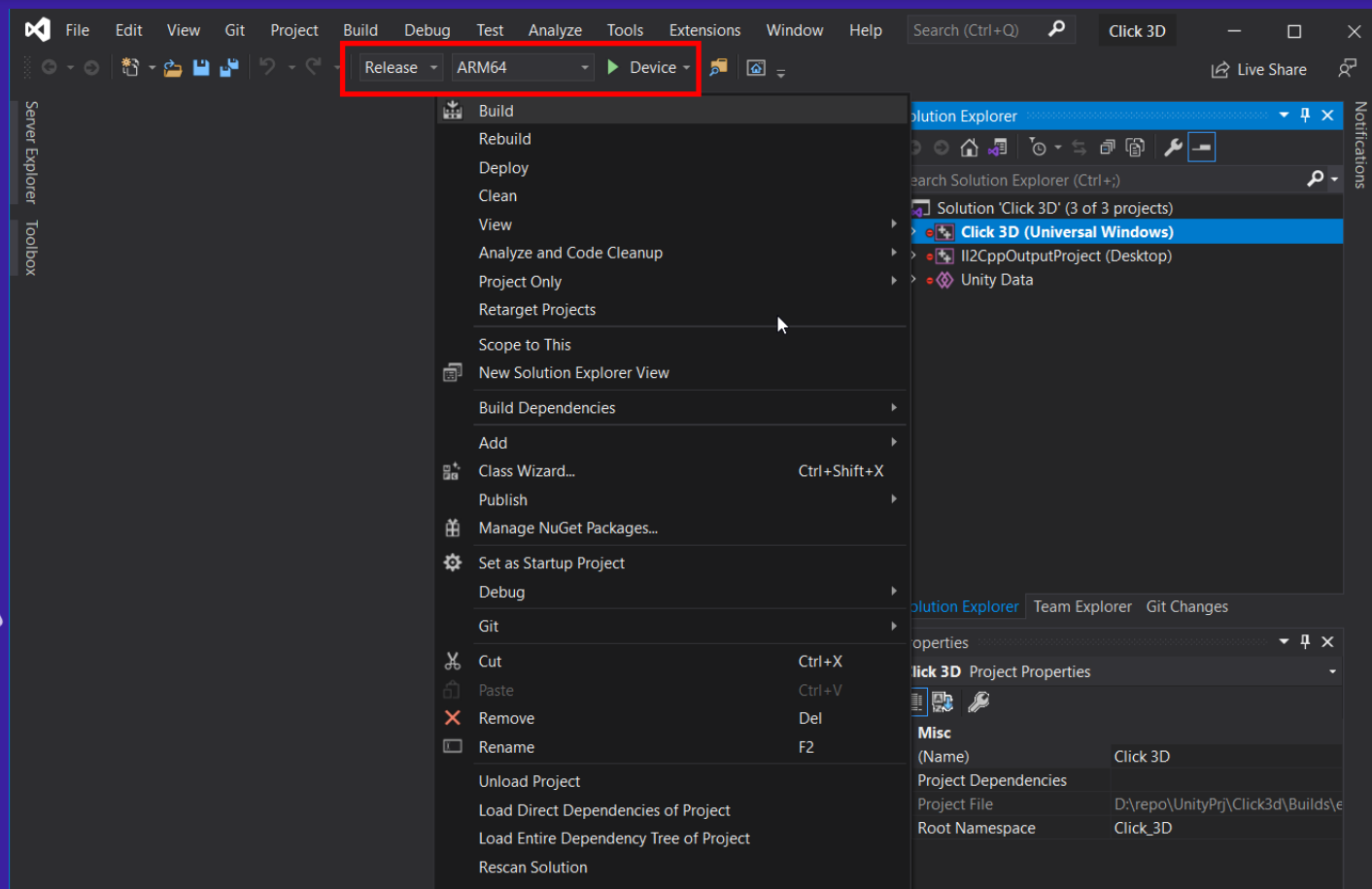
# Unity3D上的開發流程 – 包裝佈署

- Unity Editor使用{IL2Cpp}技術將mono C# bytecode轉換為UWP C++ 專案
- 會隨著Unity專案變大而變久(本來就很久)，得耐心等候



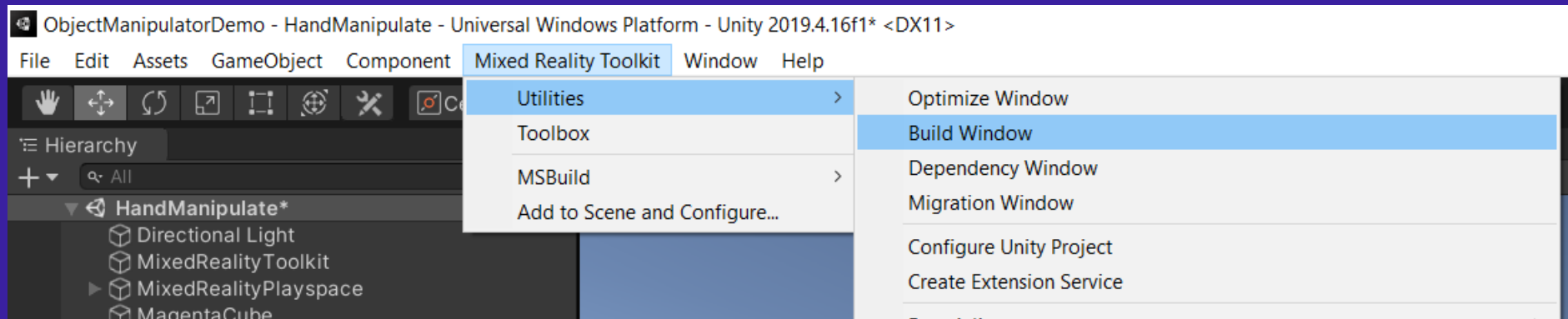
# Unity3D上的開發 流程 – 包裝佈署

- 產生的VS UWP C++專案建置時建議使用Release Build，Debug Build的實際執行速度往往都沒超過30fps
- 這邊會比前面的Unity3D轉出專案更久




# Unity3D上的開發流程 – 包裝佈署

- MRTK提供一個額外的tools套件，可以在Unity Editor裡直接打包甚至遠端佈署到USB連接的HoloLens 2裝置上



- 但使用這種方式的佈署無法使用連接debugger遠端偵錯功能

# Scene Game Build Window



MRTK  
MIXED REALITY  
TOOLKIT

Build Directory Builds/WSAPlayer

Select Folder

Open

Build all, then Install

Open Player Settings

Unity Build Options

Appx Build Options

Deploy Options

Target Type Remote

HOLOLENSGRANDEN - 127.0.0.1

+

-

HoloLens over USB

IpAddress127.0.0.1

Username

Password\*\*\*\*\*

☒ Use SSL?

☒ Verify SSL Certificates?

Test Connection

Successful connection to 127.0.0.1 [HOLOLENSGRANDEN], 12 minutes ago

Open Device Portal

Refresh Builds

☒ Execute action on all devices

☒ Always uninstall before install

Install AppX

Uninstall AppX

Launch App

View Player Log

ObjectManipulatorDemo\_1.0.3.0\_ARM64\_Test (2020/12/17 03:44:49)

Install AppX

Uninstall AppX

Launch App

View Player Log

ObjectManipulatorDemo\_1.0.2.0\_ARM64\_Test (2020/12/17 01:31:57)

Install AppX

Uninstall AppX

Launch App

View Player Log

ObjectManipulatorDemo\_1.0.1.0\_ARM64\_Test (2020/12/17 01:18:29)

Install AppX

Uninstall AppX

Launch App

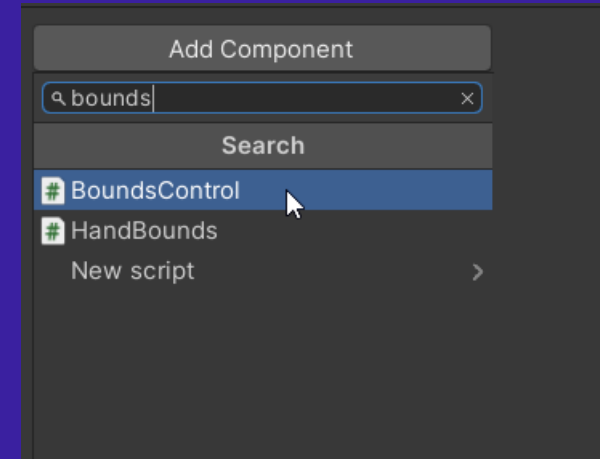
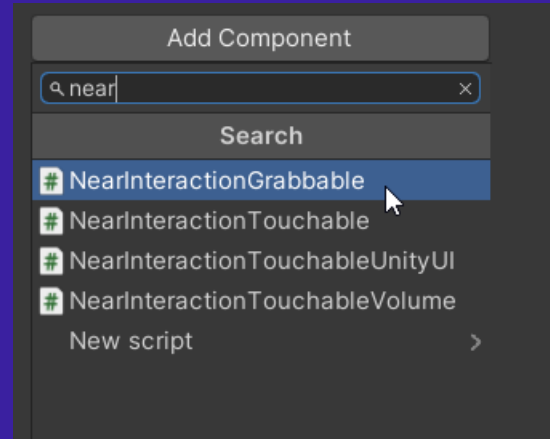
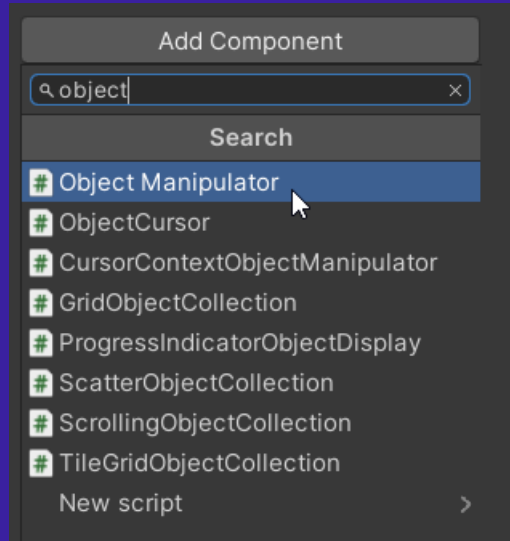
View Player Log

ObjectManipulatorDemo\_1.0.0.0\_ARM64\_Test (2020/12/17 01:14:41)

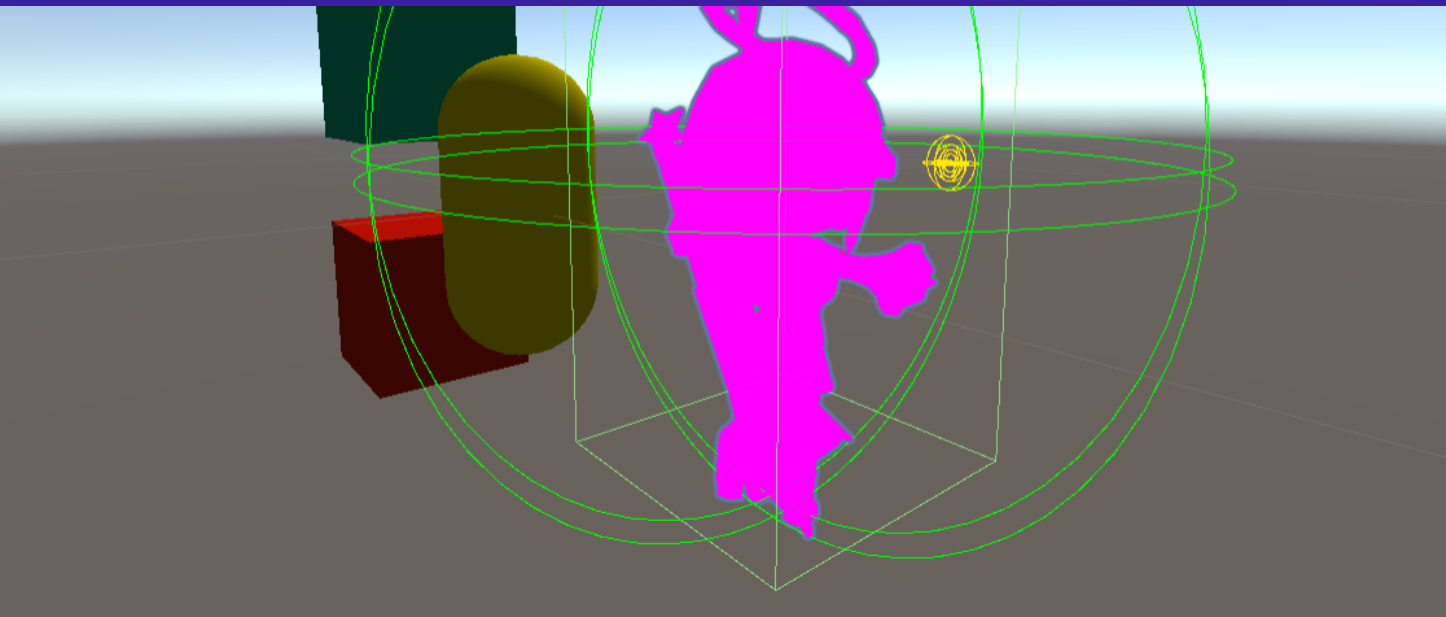


# Unity3D上的開發流程 – 3D物件操作範例

- 範例專案原始碼：  
<https://github.com/GranDen-Corp/Click3d/tree/Unity-XR-plugin>
- 使用MRTK提供的元件
  - **ObjectManipulator**
  - **NearInteractionGrabbable**
  - **BoundsControl**







Search: All In Packages In Assets 'Prefab' Asset Store: 6/30

- BoundingBox
- BoundingBox
- BoundingBox
- BoundingBox
- BoundingBoxGrabbed
- BoundingBoxHandleBlue
- BoundingBoxHandleBlueGrabbed
- BoundingBoxHandleWhite
- BoundingBoxHelper
- BoundingBoxInspector
- BoundingBoxLines
- MRTK\_BoundingBox\_RotateHandle
- MRTK\_BoundingBox\_RotateHandle
- MRTK\_BoundingBox\_ScaleHandle
- MRTK\_BoundingBox\_ScaleHandle
- MRTK\_BoundingBox\_ScaleHandle\_Slate
- MRTK\_BoundingBox\_ScaleHandle\_Slate
- MRTK\_BoundingBox\_TranslateHandle
- MRTK\_BoundingBox\_TranslateHandle

### Visuals

#### Box Configuration

Editing a local version of Box Display Configuration.

Box Display Configuration (local): (BoxDisplayConfiguration)

Script	BoxDisplayConfiguration
Box Material	BoundingBox
Box Grabbed Material	BoundingBoxGrabbed
Flatten Axis Display Scale	0

#### Scale Handles Configuration

Editing a local version of Scale Handles Configuration.

Scale Handles Configuration (local): (ScaleHandlesConfiguration)

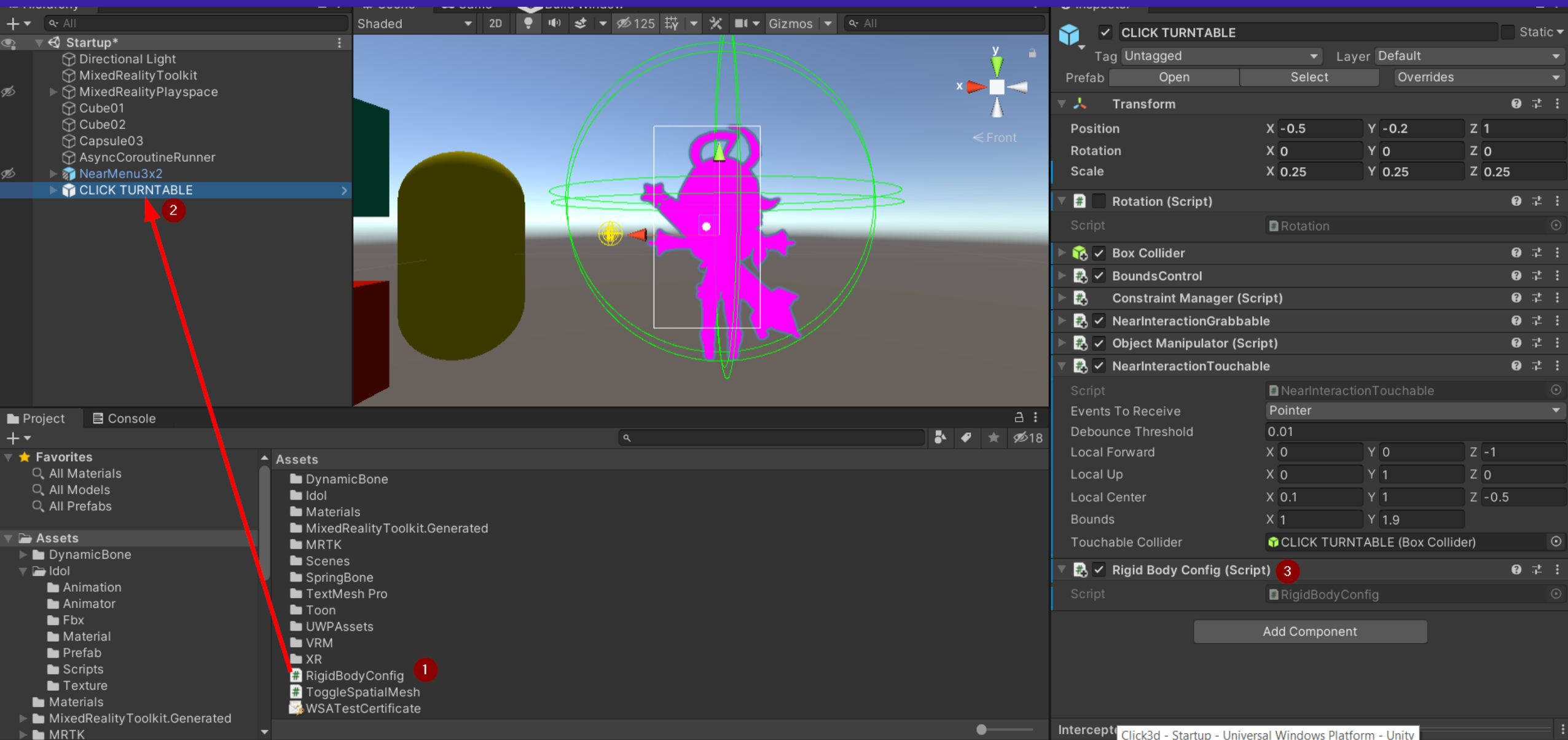
Script	ScaleHandlesConfiguration
Handle Material	BoundingBoxHandleWhite
Handle Grabbed Material	BoundingBoxHandleBlueGrabbed
Handle Prefab	MRTK_BoundingBox_ScaleHandle
Handle Size	0.016
Collider Padding	X 0.016 Y 0.016 Z 0.016
Draw Tether When Manipulating	<input checked="" type="checkbox"/>
Handles Ignore Collider	None (Collider)
Handle Slate Prefab	MRTK_BoundingBox_ScaleHandle_Slate
Show Scale Handles	<input checked="" type="checkbox"/>
Scale Behavior	Uniform

#### Rotation Handles Configuration

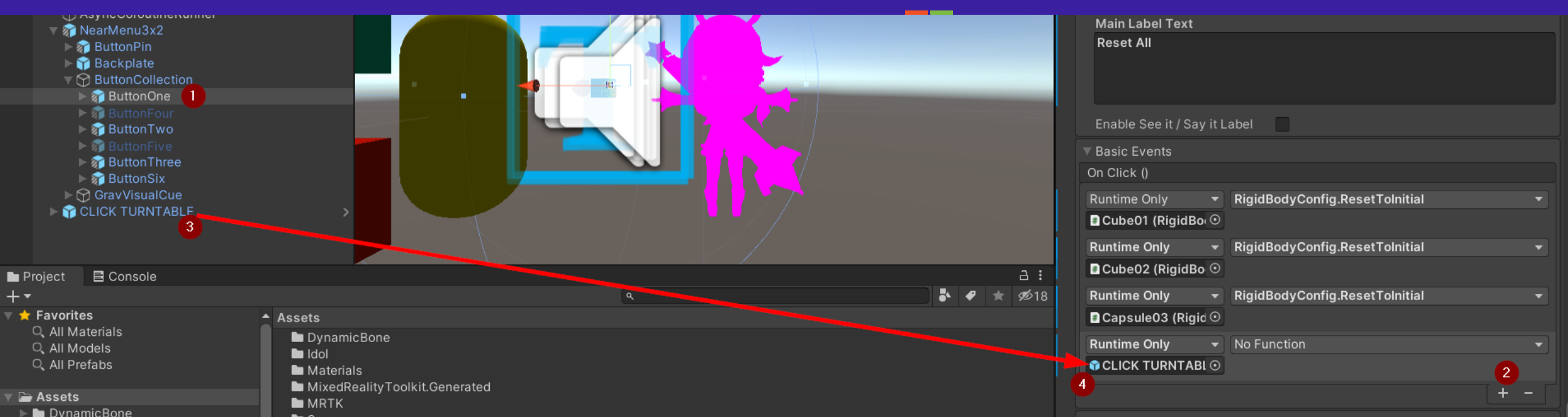
Editing a local version of Rotation Handles Configuration.

Rotation Handles Configuration (local): (RotationHandlesConfiguration)

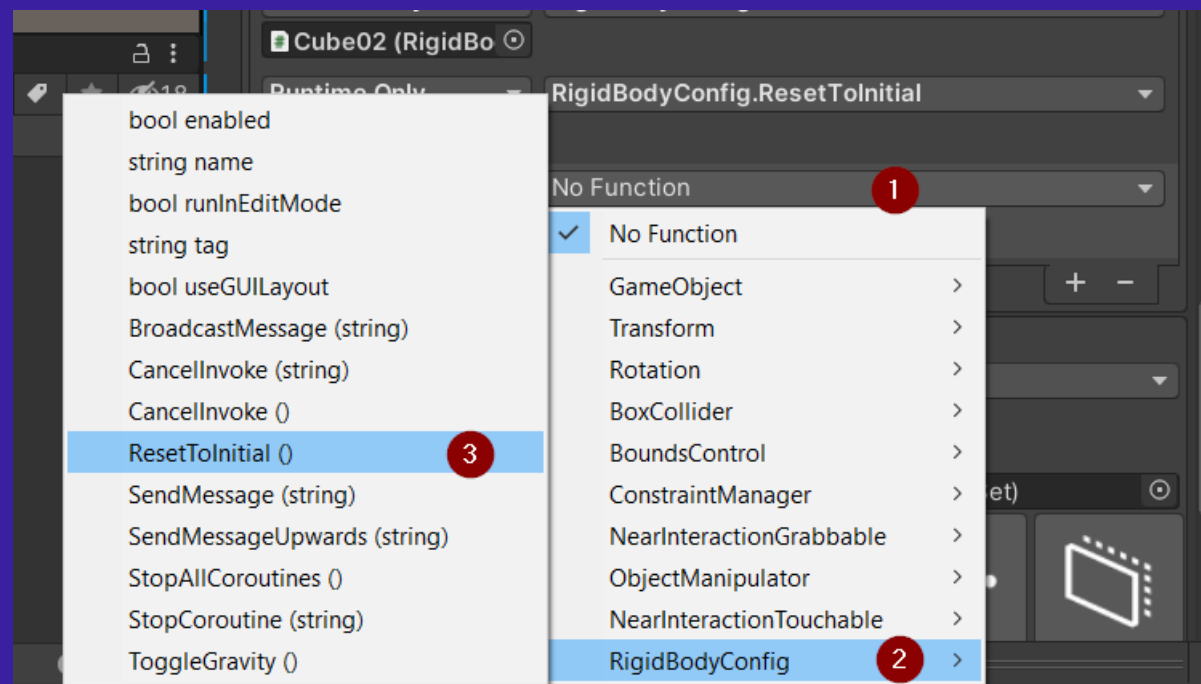
Script	RotationHandlesConfiguration
Handle Material	BoundingBoxHandleWhite
Handle Grabbed Material	BoundingBoxHandleBlueGrabbed
Handle Prefab	MRTK_BoundingBox_RotateHandle
Handle Size	0.016
Collider Padding	X 0.016 Y 0.016 Z 0.016
Draw Tether When Manipulating	<input checked="" type="checkbox"/>
Handles Ignore Collider	None (Collider)
Handle Prefab Collider Type	Box
Show Handle For X	<input checked="" type="checkbox"/>



為物件加上配合撰寫的C# Script，使其可程式化的動作

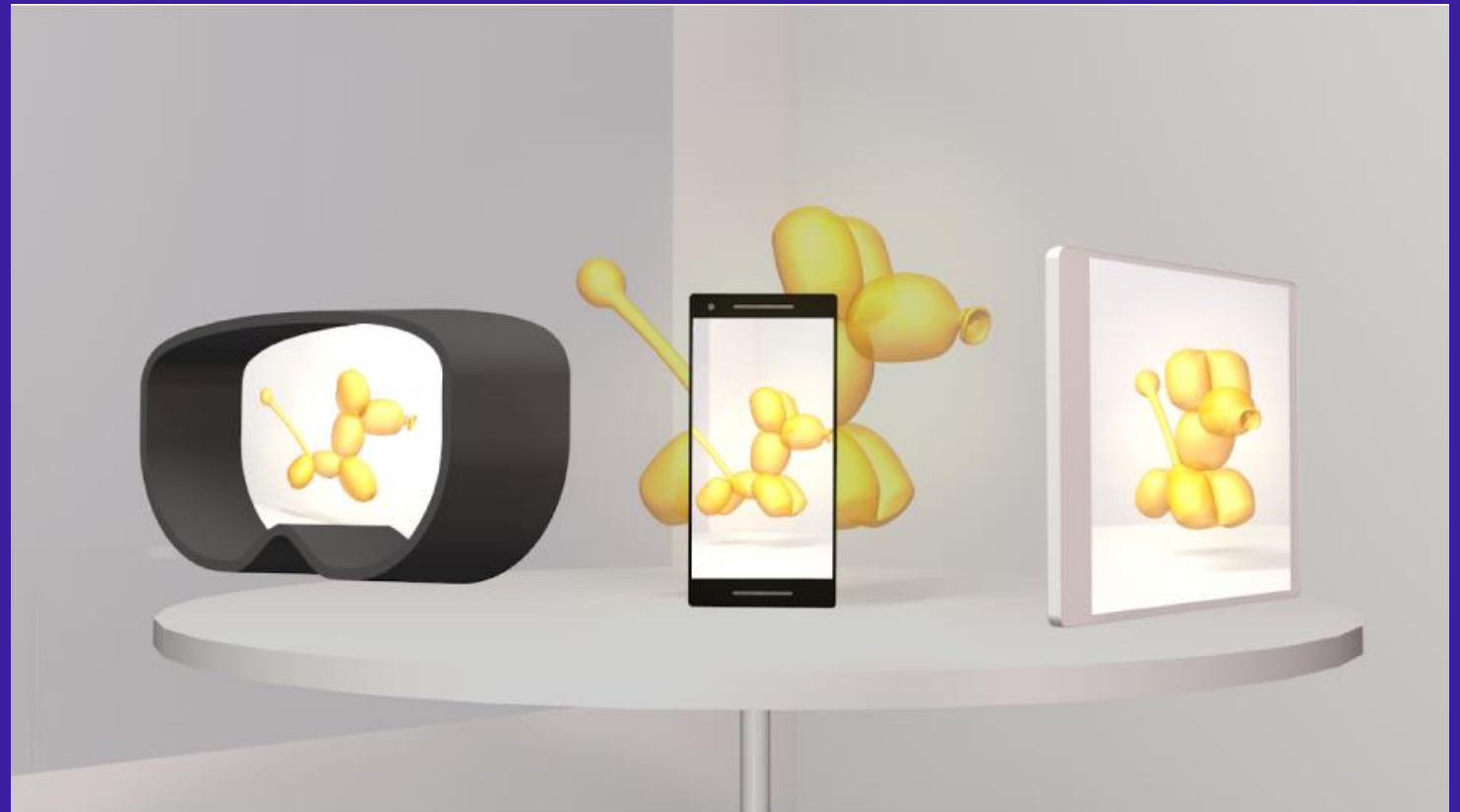


物件可以加入到其他GameObject的事件內，  
選擇要觸發的C# Script方法



# Azure Spatial Anchor簡介

- <https://azure.microsoft.com/en-us/services/spatial-anchors>
- 提供AR應用的虛擬物體定位資訊同步服務
- 提供各主流開發平台API
  - UWP
  - iOS
  - Android
  - Xamarin
  - Unity3D





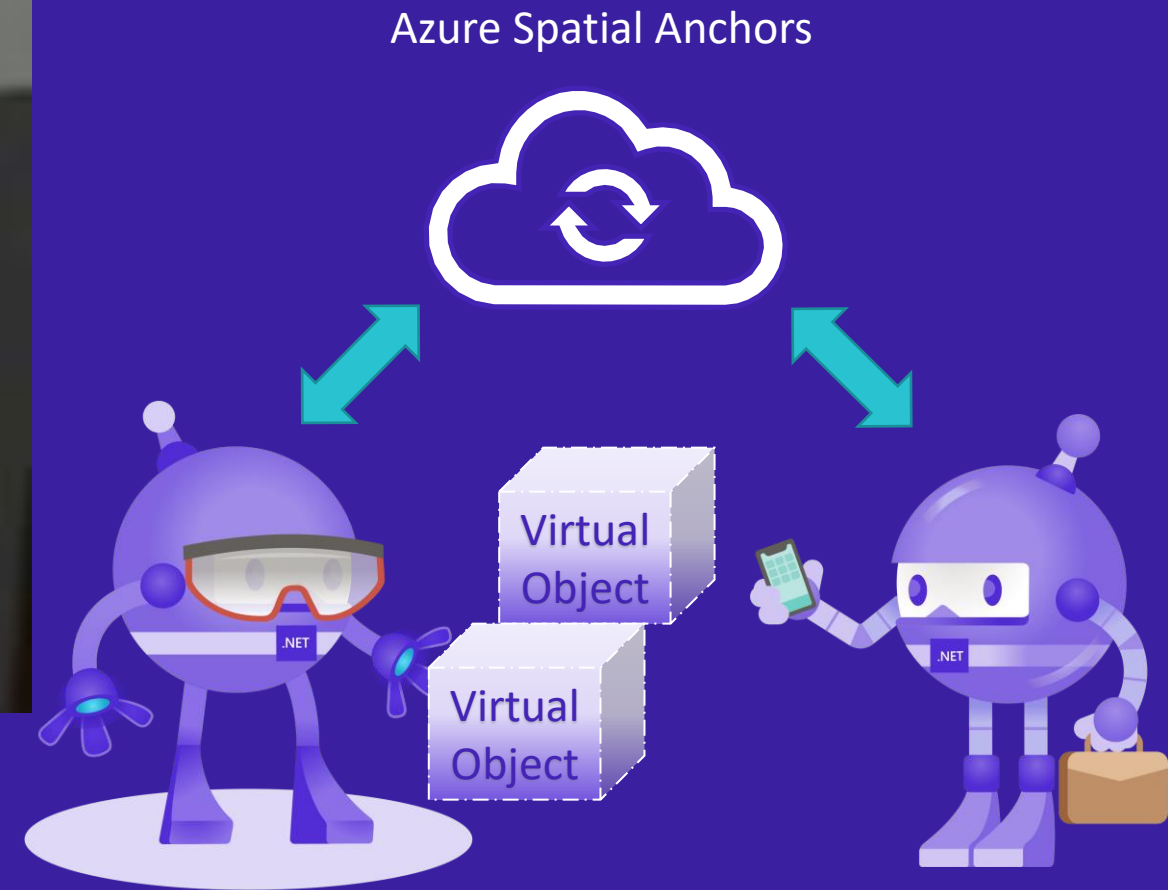
# Azure Spatial Anchor 應用 - SpectatorView



# Azure Spatial Anchor應用 - SpectatorView

- <https://github.com/microsoft/MixedReality-SpectatorView>
- 同步提供XR應用的第三方視角
- HoloLens 2的操作實況可藉由下列三種硬體裝置播放
  1. 支援ARKit/ARCore的手機
  2. 第二台HoloLens 2 + PV Camera
  3. Azure Kinect連接的電腦
- 但目前看到除了微軟官方的Build2019 demo之外，只有另一個日本HoloLabs的微軟MVP有成功試出來 

[https://akihiro-document.azurewebsites.net/post/hololens2\\_spectatorview2019.4/](https://akihiro-document.azurewebsites.net/post/hololens2_spectatorview2019.4/)

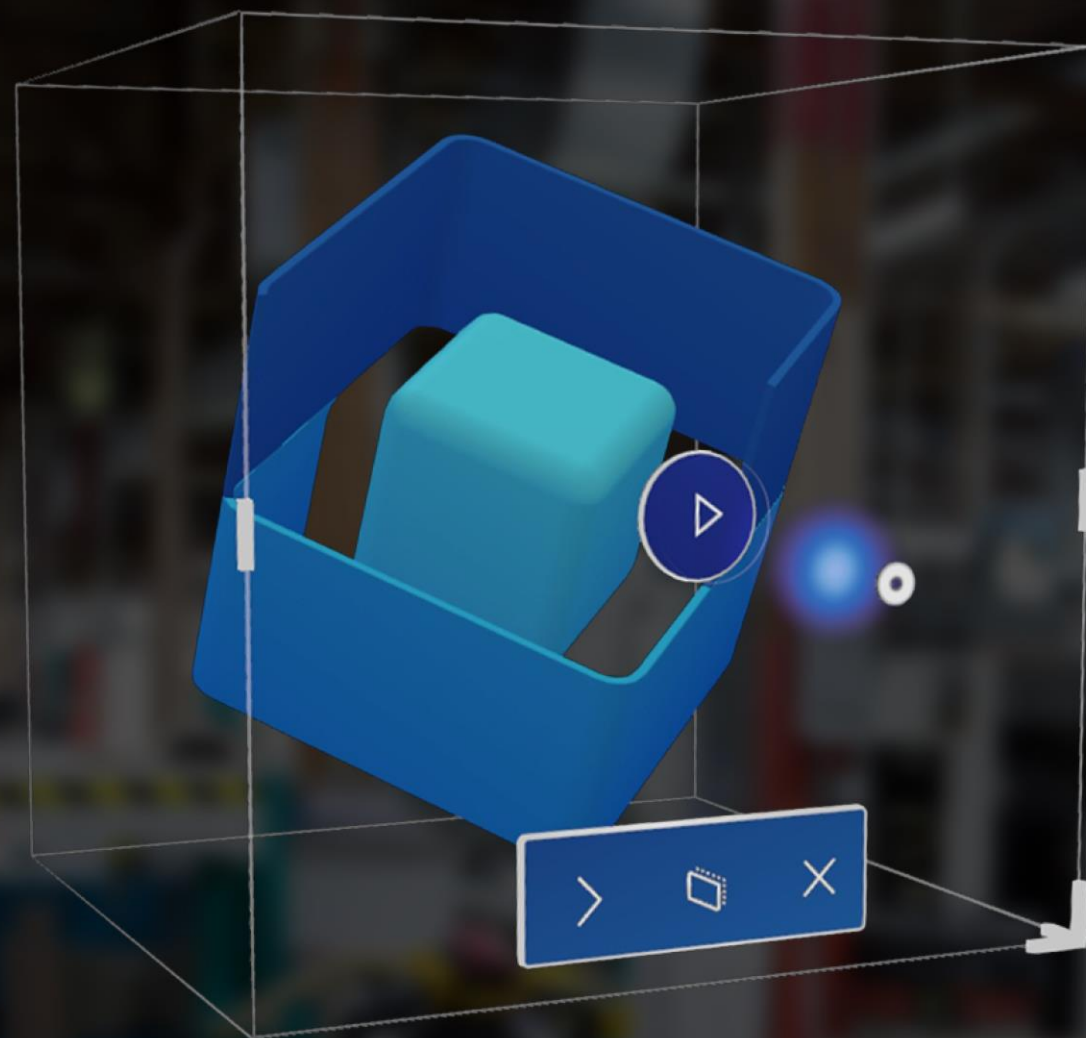




# 一堆集大成的 瑣碎事項

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- [HoloLens 2 Research Mode](#)
- [HoloLens 2 Kiosk mode](#)
- [Azure Pipelines sample configuration](#)
- [Holographic Remoting](#)
- [App Icon & 3D app Launcher](#)
- [OpenXR for HoloLens 2 on Unity3D 2020.2](#)
- [WaveEngine.MRTK](#)
- [Hologram Design Lab](#)



# Thanks for joining!



.NET Conf  
2020

# 特別感謝

91APP  
Technical Network



KKKTIX



HackMD

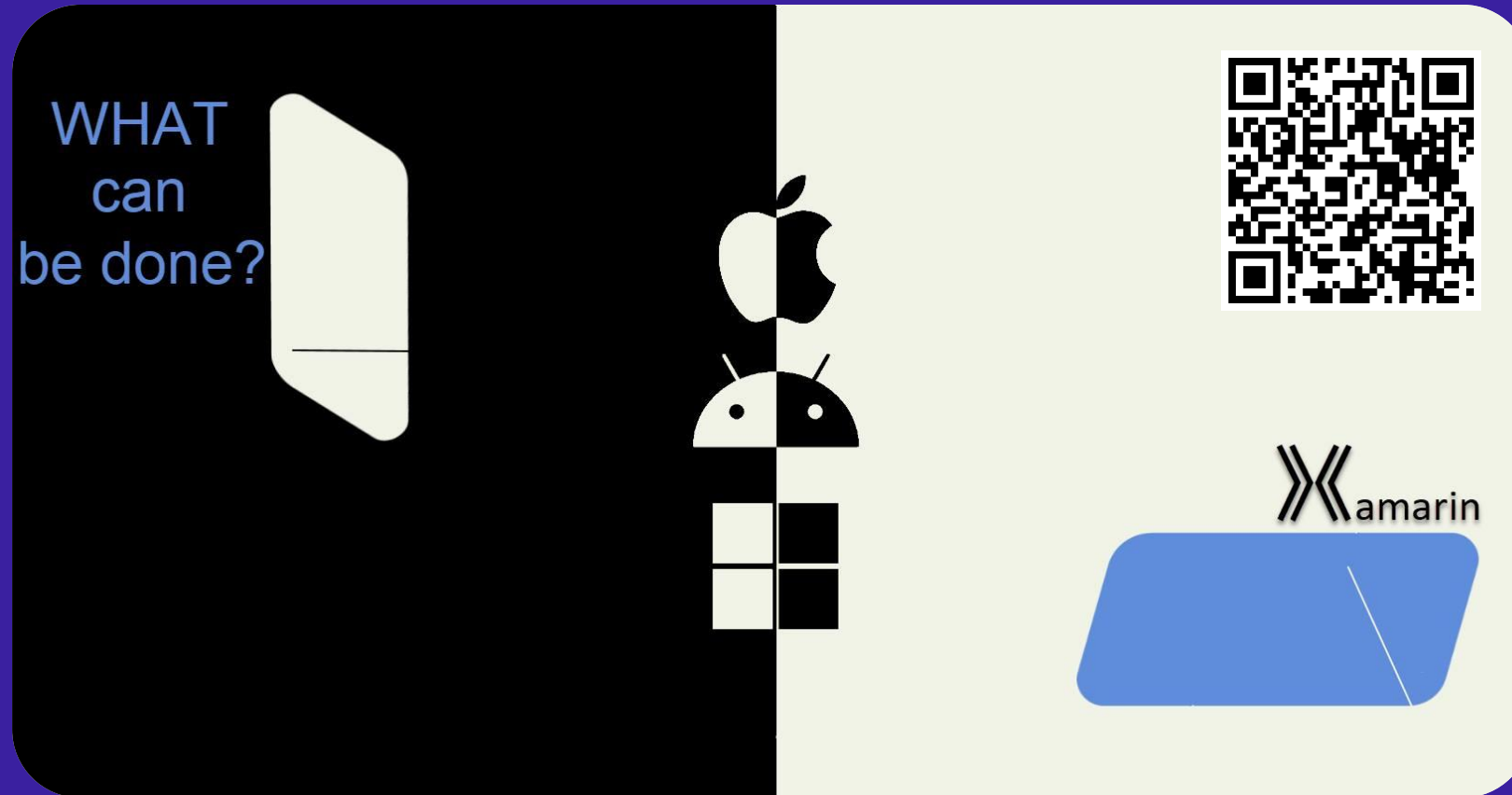


STUDY4  
為 學 習 而 生

以及各位參與活動的你們



# Xamarin Asia Developers 社群 推廣



<https://www.facebook.com/groups/XamarinAsiaDevelopers>

# 工商服務時間 – App 開發實戰演練



<https://www.accupass.com/event/2011011803371152380847>