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Mixed Reality with Microsoft HoloLens

Philipp Bauknecht
@GrillPhil

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Microsoft Regional Director
Microsoft MVP
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4x

Microsoft®
Most Valuable
Professional

Image: Microsoft

Roadmap

Mixed Reality

Hardware

Demo

Use Cases

Developer Story

The Evolution of Device I/O

How do we get computer understand the world?

Image: Microsoft

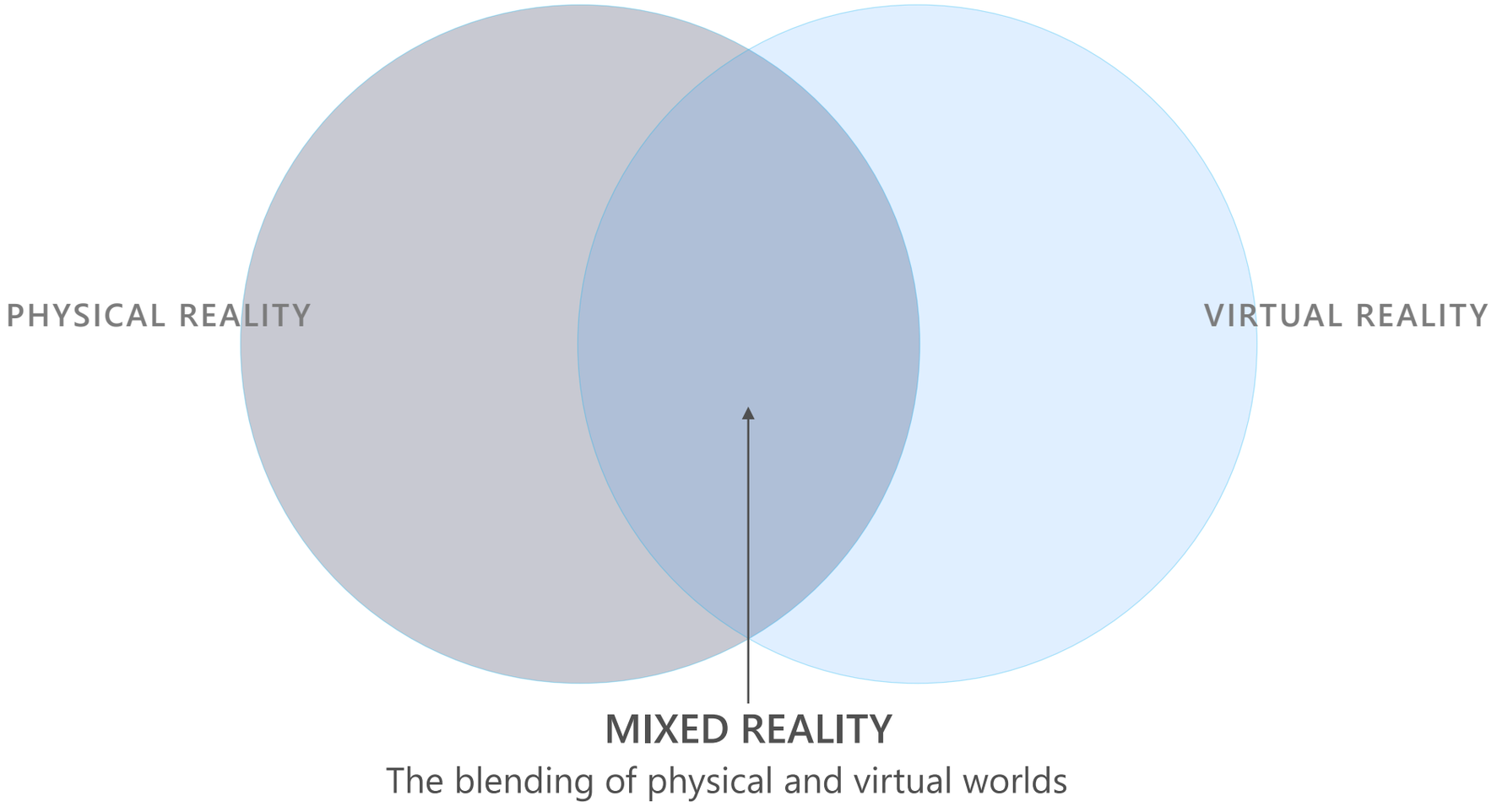
Between Realities

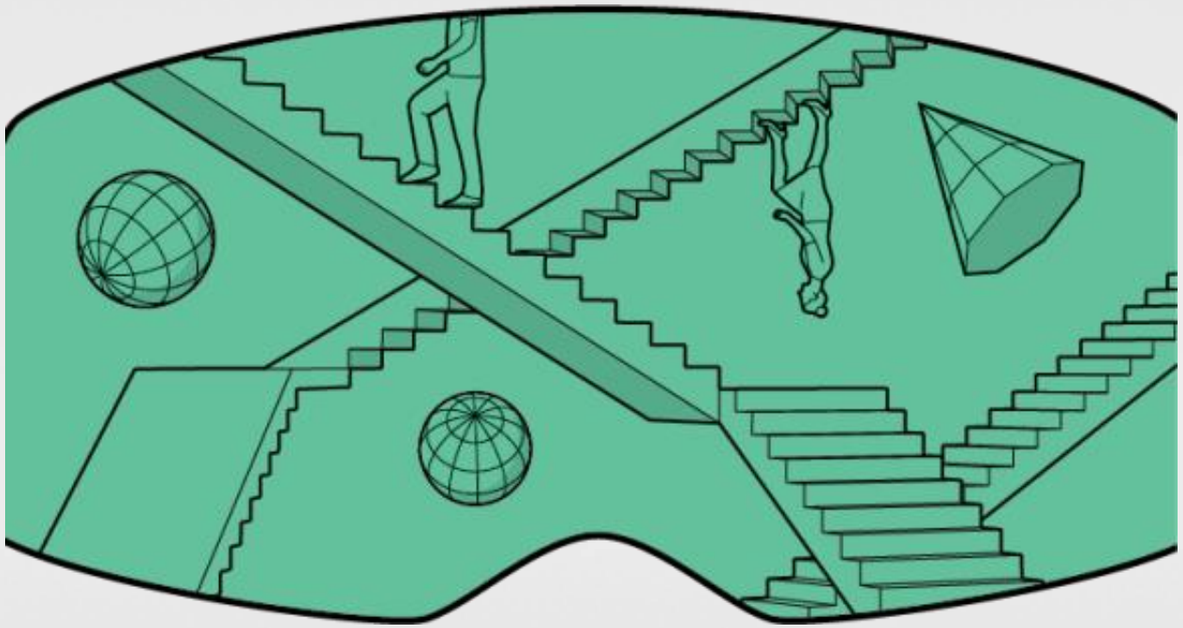
Mixed Reality

Image: Microsoft

The state of things as they “actually exist” through our human senses without any technology.

Artificially created sensory experiences of people, environments and objects, which can include sight, touch, hearing, and smell.


PHYSICAL REALITY
VIRTUAL REALITY
MIXED REALITY
The blending of physical and virtual worlds



Virtual Reality

VR places the User in another location entirely. It entirely occludes the user´s natural surroundings.

Wired Magazine

Image: Microsoft

Augmented Reality

In a augmented reality the visual natural world is overlaid with a layer of digital content.

Wired Magazine

Image: Microsoft

Mixed Reality

Virtual objects are integrated into – and responsive to – the natural world

Wired Magazine

Image: Microsoft

Image: Microsoft

Image: Microsoft

What is a Hologram?

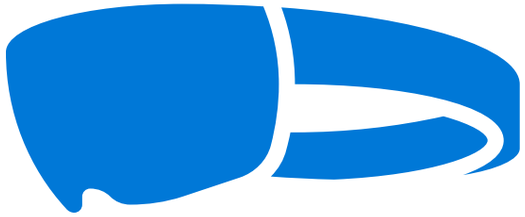
A hologram is an object like any other object in the real world, with only one difference: instead of being made of physical matter, a hologram is made entirely of light.

Holographic objects can be viewed from different angles and distances, just like physical objects.

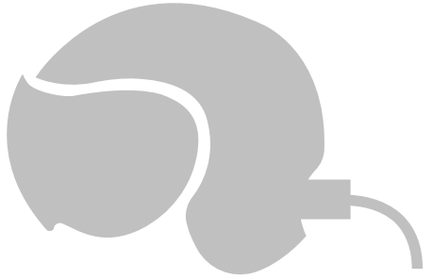
Holograms do not offer any physical resistance when touched or pushed because the don’t have any mass.

Image: Lucasfilm

PHYSICAL REALITY



SEE-THROUGH



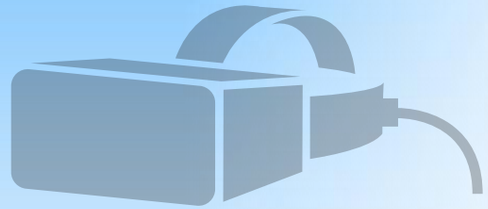
MOBILE PERFORMANCE

PORTABLE

DESKTOP PERFORMANCE

TETHERED

OPAQUE



VIRTUAL REALITY

Microsoft HoloLens spans realities

	Augmented Reality	Mixed Reality	Virtual Reality
Augments the real world with helpful information	✓	✓	
Blends holograms with your real world		✓	
Can transport you to a virtual world		✓	✓
Replaces the real world			✓

Microsoft HoloLens

The Device

Image: Microsoft

Self-contained computer

Containing more computing power than the average laptop, Microsoft HoloLens doesn’t need external wires, markers, or cameras, nor a connection to a phone or PC, so you can move freely and untethered.

Advanced sensors

Microsoft HoloLens has advanced sensors to capture information about what you're doing and the environment you're in.

Transparent lenses

See-through holographic lenses use an advanced optical projection system, so you can see holograms in your world.

Holographic Processing Unit

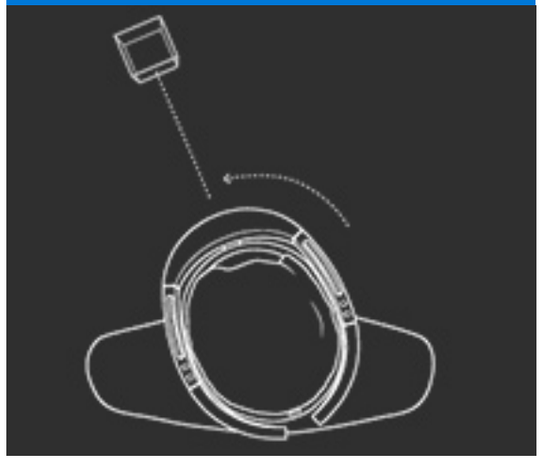
The HPU is custom silicon that processes a large amount of data per second from the sensors, enabling Microsoft HoloLens to understand gestures, where you look, and map the world around you, all in real time.

Spatial sound

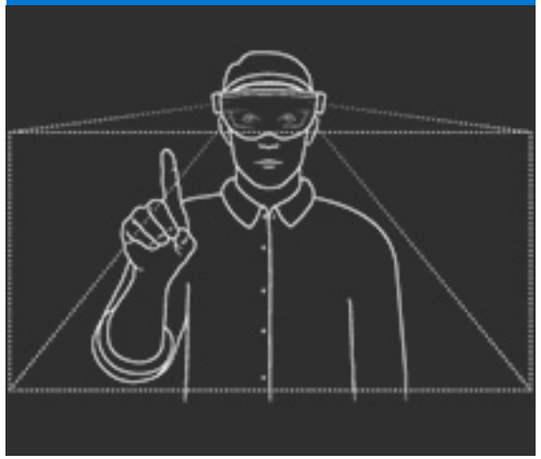
Microsoft HoloLens synthesizes sound so that you can hear holograms from anywhere in the room. It’s immersive, yet won’t block out the real world.

A new way to interact

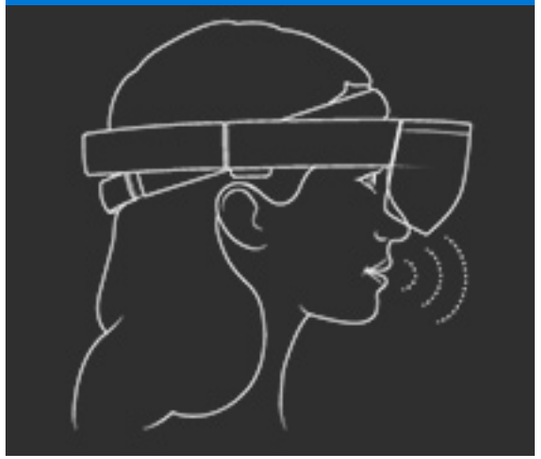
Gaze



Gesture



Voice commands



Mixed Reality + Virtual Reality

Spatial Mapping

Fully unthered

Runs Windows 10

Interaction using gaze, gestures and voice

Image: Microsoft

Live Demo

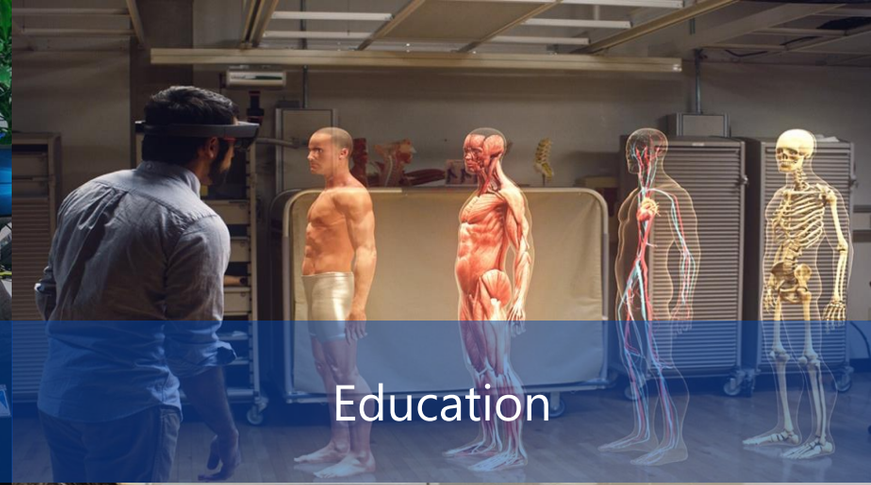
Image: Microsoft

Use Cases

Image: Microsoft

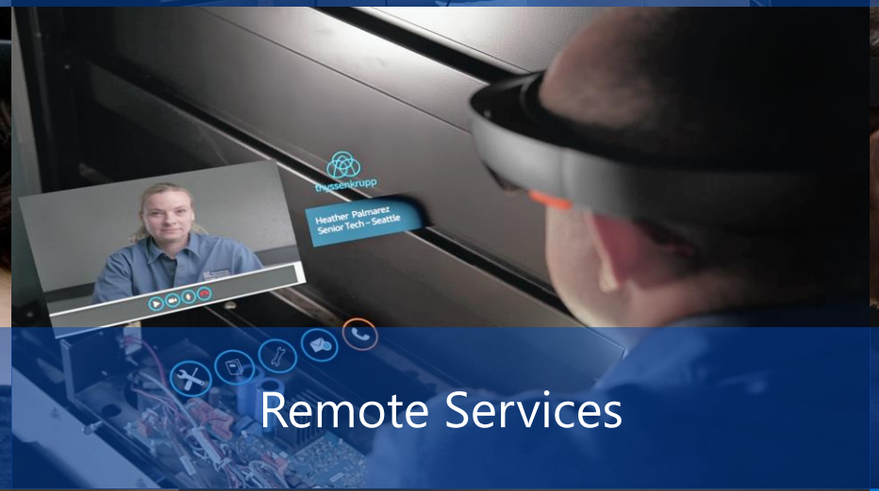
Marketing & Sales

Product Design



Education

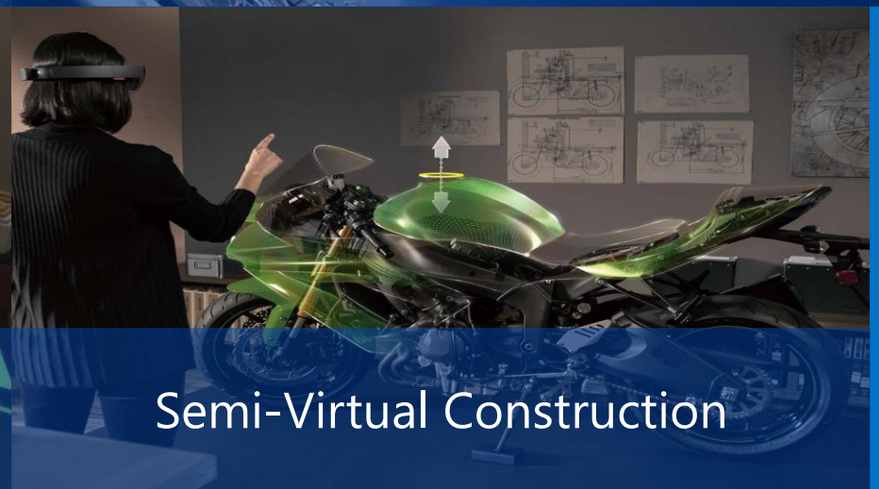
Architecture



Remote Services

Research

Games & Entertainment



Semi-Virtual Construction

Quality Control
Assembly Line
And many more…

Developing for Mixed Reality

Image: Microsoft

App view options

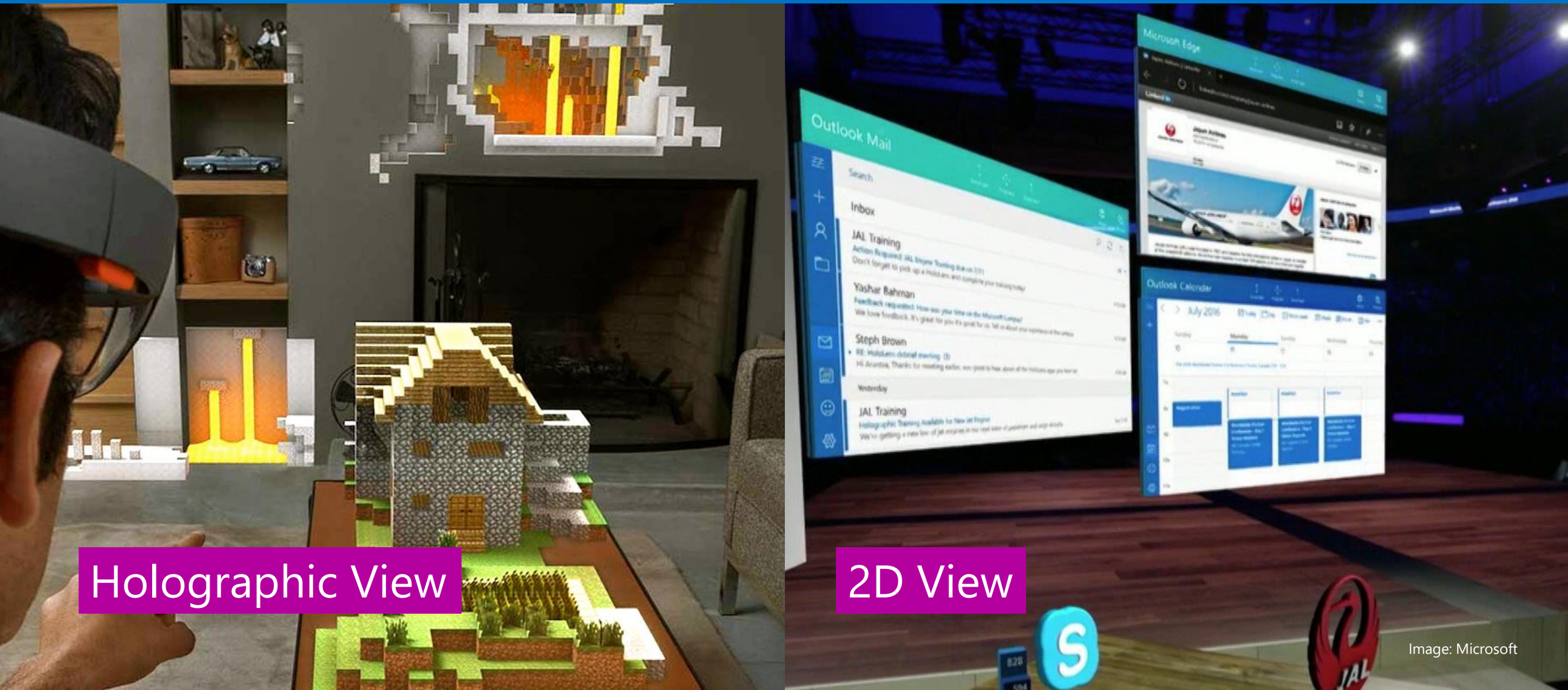


Image: Microsoft

App view options

Holographic View

- Creates holograms
- No other app can draw at the same time
- Can render world-locked holograms
- Shell does not render at the same time
- App is responsible to handle all user input.

2D View

- Renders on a slate
- Slates are world-locked and can be adjusted in size and position by the user
- Apps resolution stays fixed
- Apps have to switch into 2D view for keyboard entry
- All desktop UWP apps can run in 2D view without modifications

Image: Microsoft

Development Options

Unity

Best productivity

Built-in HoloLens support

Great support from Microsoft and the community

Free for personal use

Direct3D

DirectX 11

C++
or
C# with SharpDX

UrhoSharp

Cross-platform 3D-Engine by Xamarin

HoloJS

Javascript
WebGL

Pure UWP

XAML
C#/VB/C++

Or

WinJS

Holographic View

2D View

Universal Windows Platform (UWP)

91%

https://twitter.com/unity3d/status/859110422833762305

Tooling

Visual Studio 2017 or Visual Studio 2015, Update 3

Free Community Edition

HoloLens Emulator

Unity 5.5

Free Personal Edition

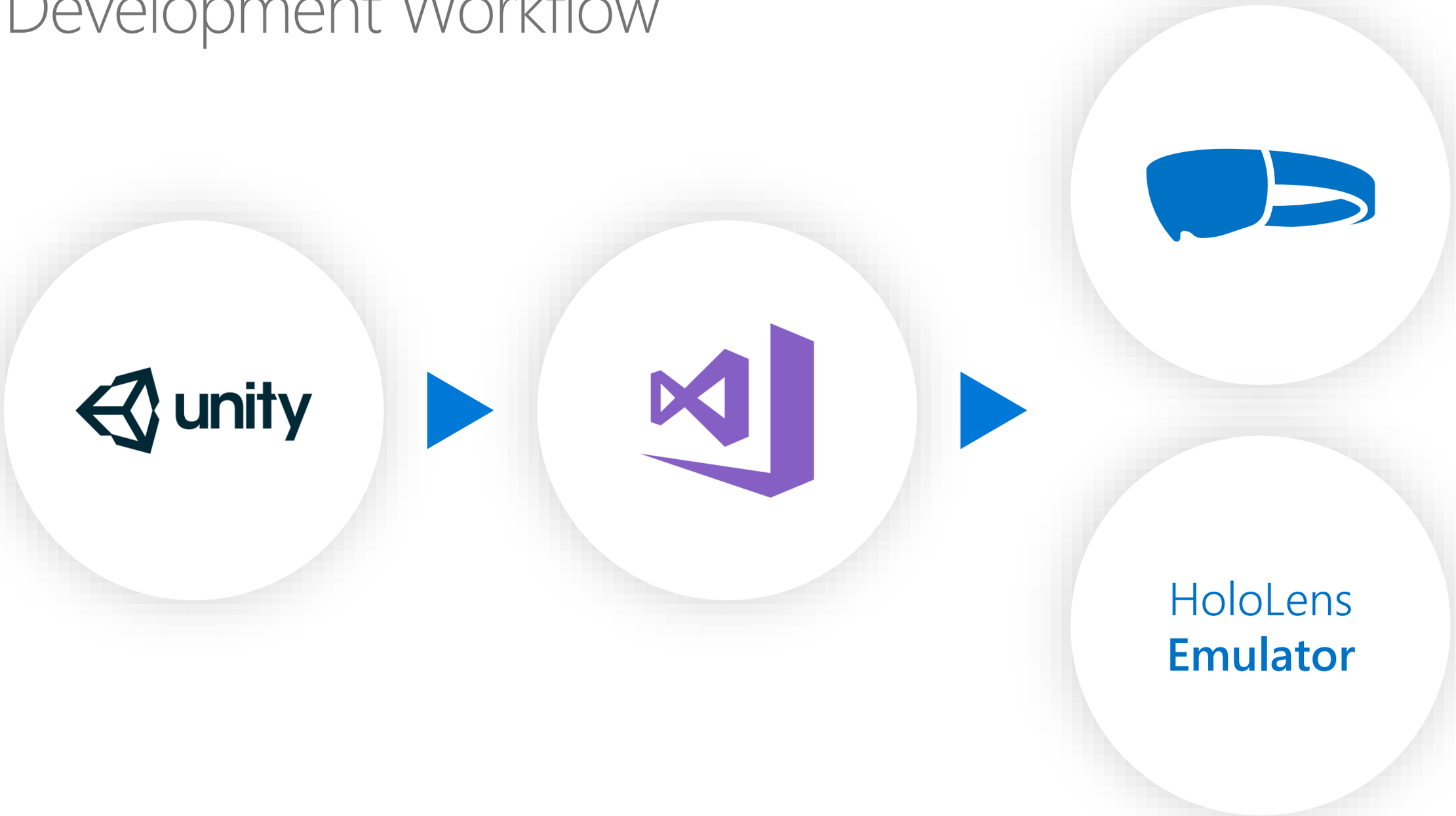
Holographic Toolkit

https://github.com/Microsoft/HoloToolkit-Unity

Vuforia (optional)

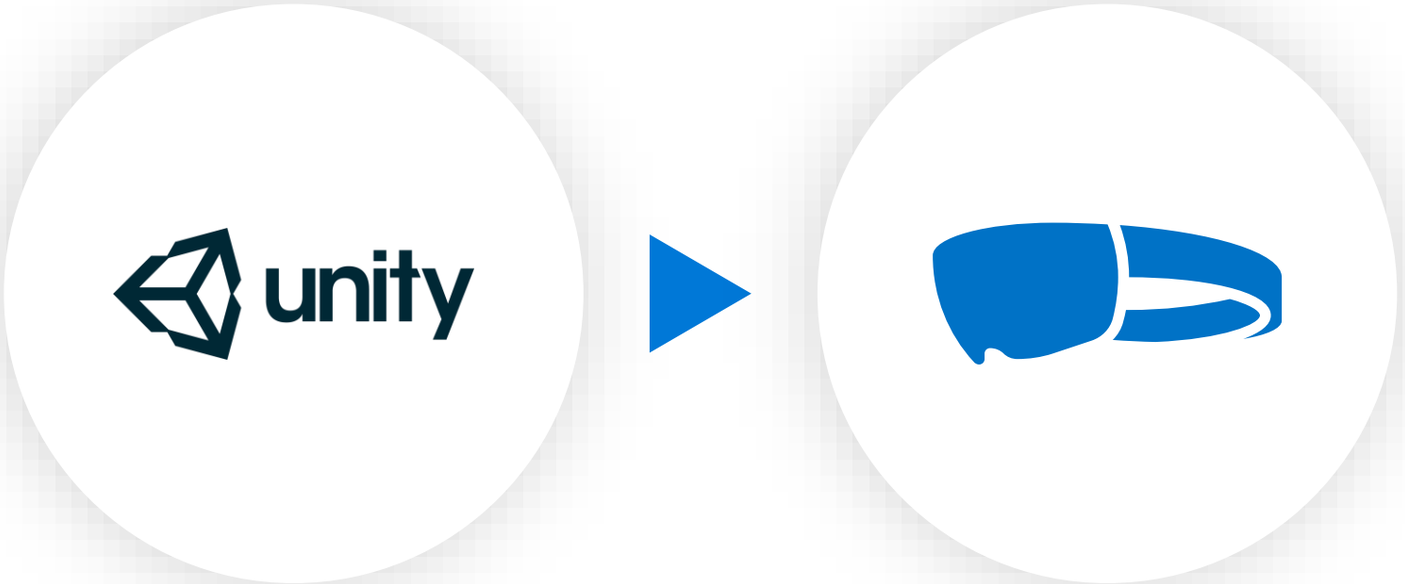
https://developer.microsoft.com/en-us/windows/mixed-reality/install_the_tools

Development Workflow



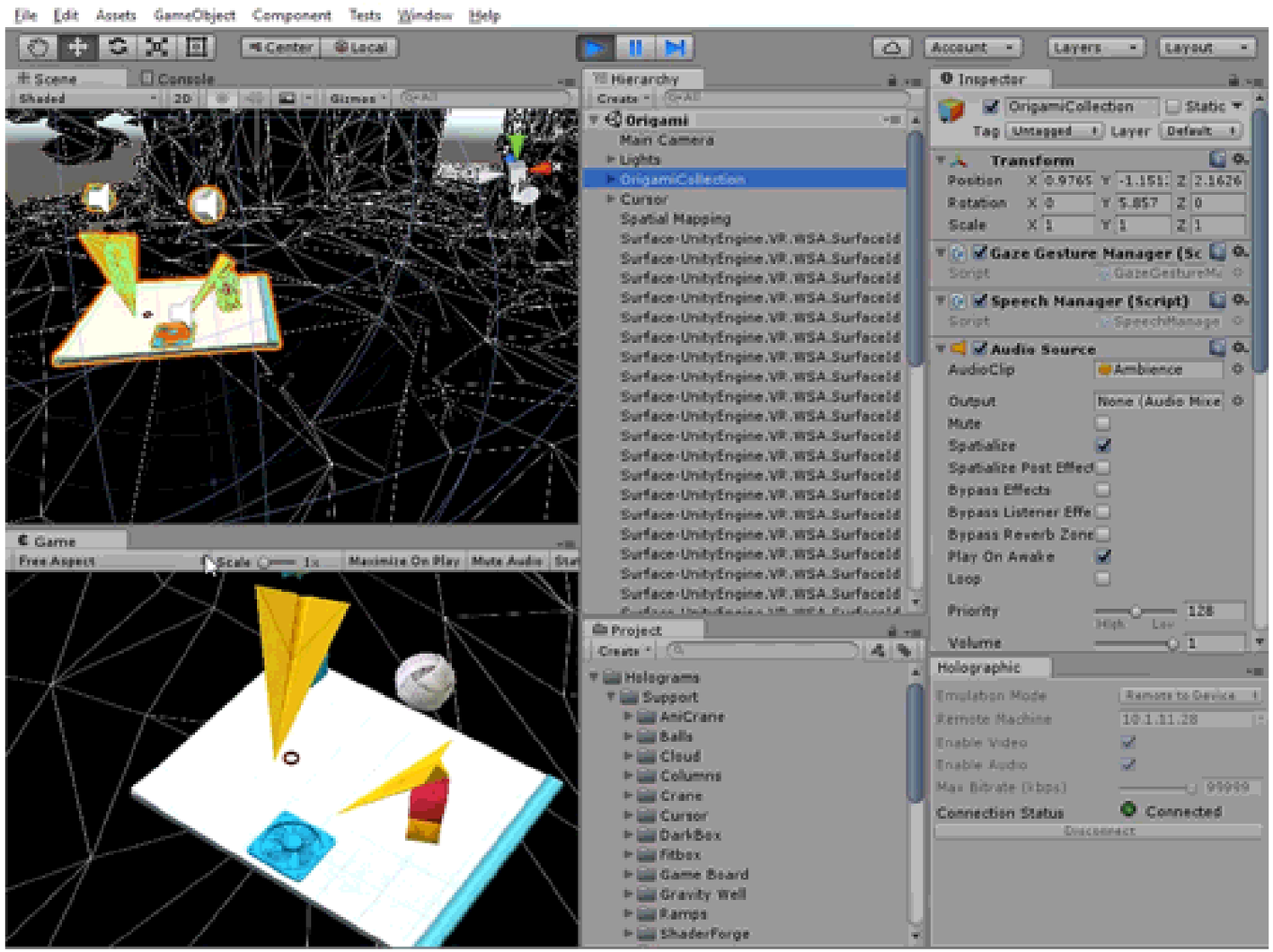
Development Workflow optimized

Holographic Emulation introduced with Unity 5.5 allows to directly run a Holographic App from Unity in the Editor (Simulation) or on a HoloLens device (Remoting).



https://blogs.unity3d.com/2016/09/29/introducing-holographic-emulation/

Development Workflow optimized



Holographic Simulation in Editor

10 Learnings from our projects

Learnings 1/10
HoloLens is a mobile device

http://kodierer.blogspot.com/2016/04/top-10-hololens-development.html
https://developer.microsoft.com/en-us/windows/mixed-reality/performance_recommendations_for_unity
https://developer.microsoft.com/en-us/windows/mixed-reality/performance_recommendations_for_hololens_apps

Learnings 2/10

Don’t forget to anchor your holograms

https://developer.microsoft.com/en-us/windows/mixed-reality/world_anchor_in_unity
https://developer.microsoft.com/en-us/windows/mixed-reality/focus_point_in_unity

Learnings 3/10
Use existing tools & patterns

https://github.com/Microsoft/HoloToolkit-Unity
https://developer.microsoft.com/en-us/windows/mixed-reality/design

Learnings 4/10

Leverage Spatial Audio

Learnings 5/10

Choose the right input mode for your audience

Learnings 6/10

Choose Master Build Configuration when distributing the app for testing

Learnings 7/10

Lights matter for Holograms

Learnings 8/10

Use UWP part of your app for data access

Learnings 9/10

Choose the right build type for your app

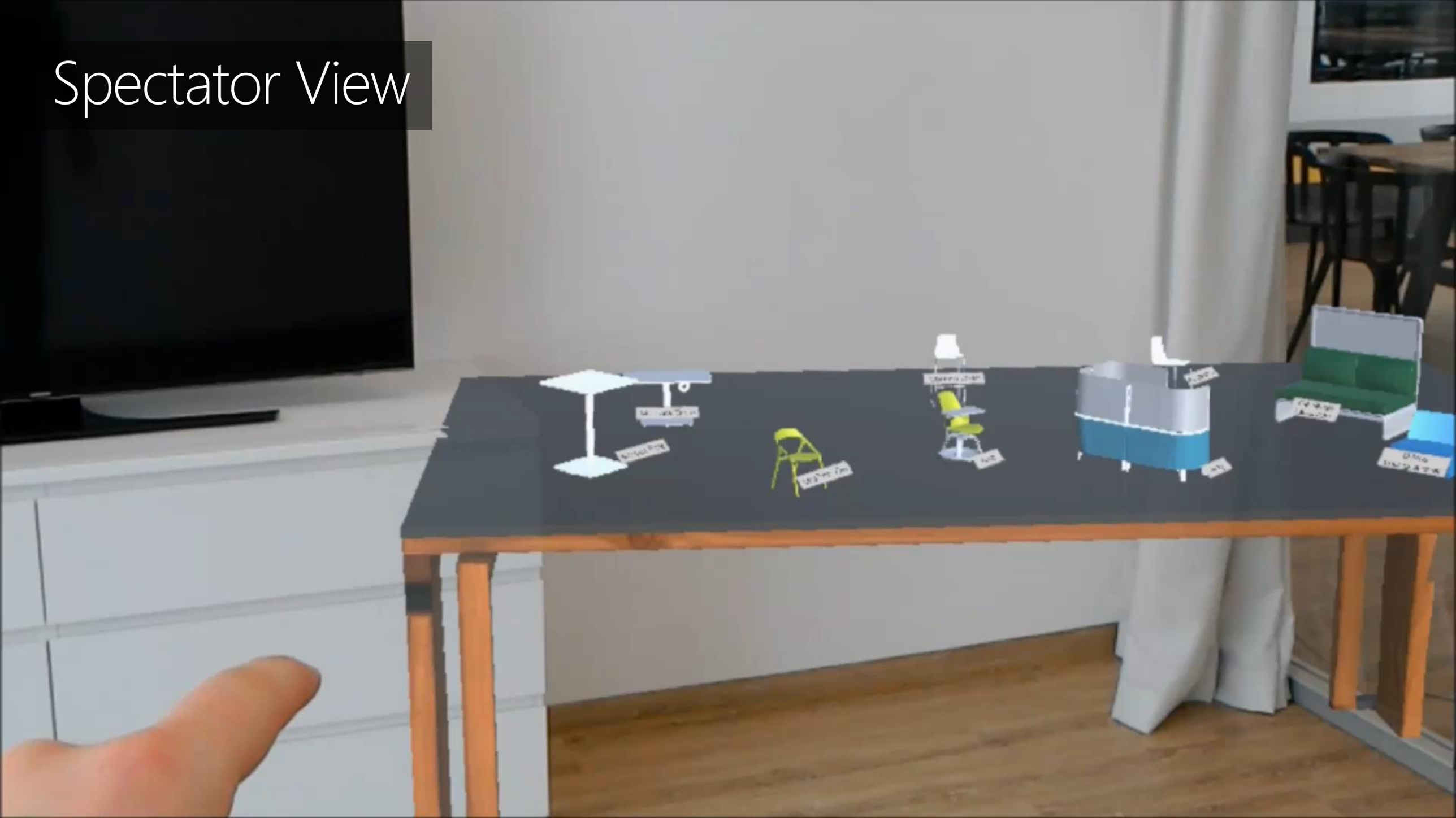
Learnings 10/10

Test early in your target environment

Spectator View

https://developer.microsoft.com/en-us/windows/mixed-reality/spectator_view

Spectator View



The big Picture
Windows Mixed Reality

Image: Microsoft

Windows Mixed Reality

Platform for Mixed Reality, built right into Windows. Shipping with Creators Update.

https://aka.ms/windows-mixed-reality

Relatively low hardware requirements

https://developer.microsoft.com/en-us/windows/mixed-reality/Install_the_tools.html#system_requirements

Choice of inexpensive immersive headsets with inside-out tracking from various OEMs including Acer, ASUS, Dell, HP and Lenovo starting at $299 coming later 2017.

https://developer.microsoft.com/en-us/windows/mixed-reality/immersive_headset_hardware_details

Input support for Gamepad, Mouse, Keyboard and Voice

Image: Microsoft

HoloLens Editions

Developer Edition

Commercial Edition

Image: Microsoft

Image: Microsoft

Enterprise Features

Available only with the Commercial Suite

- **Windows Store for business**

Your IT department can also set up an enterprise private store, containing only your company's apps for your specific Hololens usage. Securely distribute your enterprise software to selected group of enterprise users.

- **Mobile Device Management (MDM) for HoloLens**

Your IT department can manage multiple Hololens devices simultaneously using solutions like Microsoft InTune. You will be able to manage settings, select apps to install and set security configurations tailored to your organization's need.

- **Kiosk mode**

With Hololens kiosk mode, you can limit which apps to run to enable demo or showcase experiences.

- **Windows Update for Business**

Controlled operating system updates to devices and support for long term servicing branch.

- **Identity**

Azure Active Directory and next generation credentials with PIN unlock.

- **Data security**

BitLocker data encryption and secure boot is enabled on Hololens to provide the same level of security protection as any other Windows device.

- **Work access**

Anyone in your organization can remotely connect to the corporate network through a virtual private network on a Hololens. Hololens can also access Wi-Fi networks that require credentials.

Where to start

1. Grab the tools
2. Attend the free Holographic Academy online
   https://developer.microsoft.com/EN-US/WINDOWS/HOLOGRAPHIC/ACADEMY
3. Deep dive into the Holographic App Development documentation
   https://developer.microsoft.com/en-us/windows/holographic/documentation
4. Check you open source Galaxy Explorer app on GitHub
   https://github.com/Microsoft/GalaxyExplorer
5. Submit your first app to the Windows Store
6. Showcase your app using Spectator View
   https://developer.microsoft.com/en-us/windows/mixed-reality/spectator_view

Questions?

Image: Microsoft

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Please

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