

# Reality Virtually Hackathon

January 17-21<sup>st</sup>, 2019  
@ the MIT Media Lab

Kevin Vandecar and Lanh Hong  
Developer Advocates  
January 2019



AUTODESK® FORGE



# Industry examples in AR / VR

<File:///D:/work/training/meetups/2019-01-17-RealityVirtually-Hack\IndustryExamples2\IndustryExamples2.mp4>

# Industry examples in AR / VR

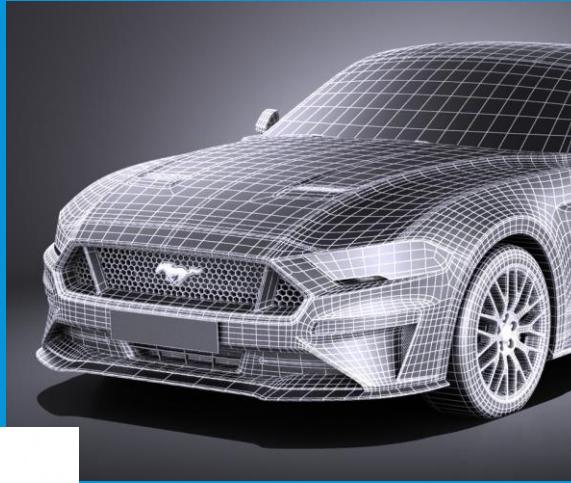
- Construction
  - ConXtech: <http://www.conxtech.com/>
  - Visual Live – HoloLive app: <https://www.visuallive.com/>
- IoT
  - Insider Navigation: <https://www.insidernavigation.com/>
- Collaboration
  - Nvidia Holodeck: <https://www.nvidia.com/en-us/design-visualization/technologies/holodeck/>
  - Microsoft: <https://dynamics.microsoft.com/en-us/mixed-reality/remote-assist/>

# What's common for AR / VR applications?

- 3D Assets
- Additional Design data
- Interactivity



ARCore



- Devices (well, devices... not so much)



# What is Forge? – 3D Design Data platform!

## Autodesk Web services for 3D Design Data

- Model Derivative
- Forge Viewer
- Data Management
- Reality Capture
- Design Automation
  - AutoCAD
  - Inventor (active beta)
  - 3ds Max (active beta)
  - Revit (beta coming soon)

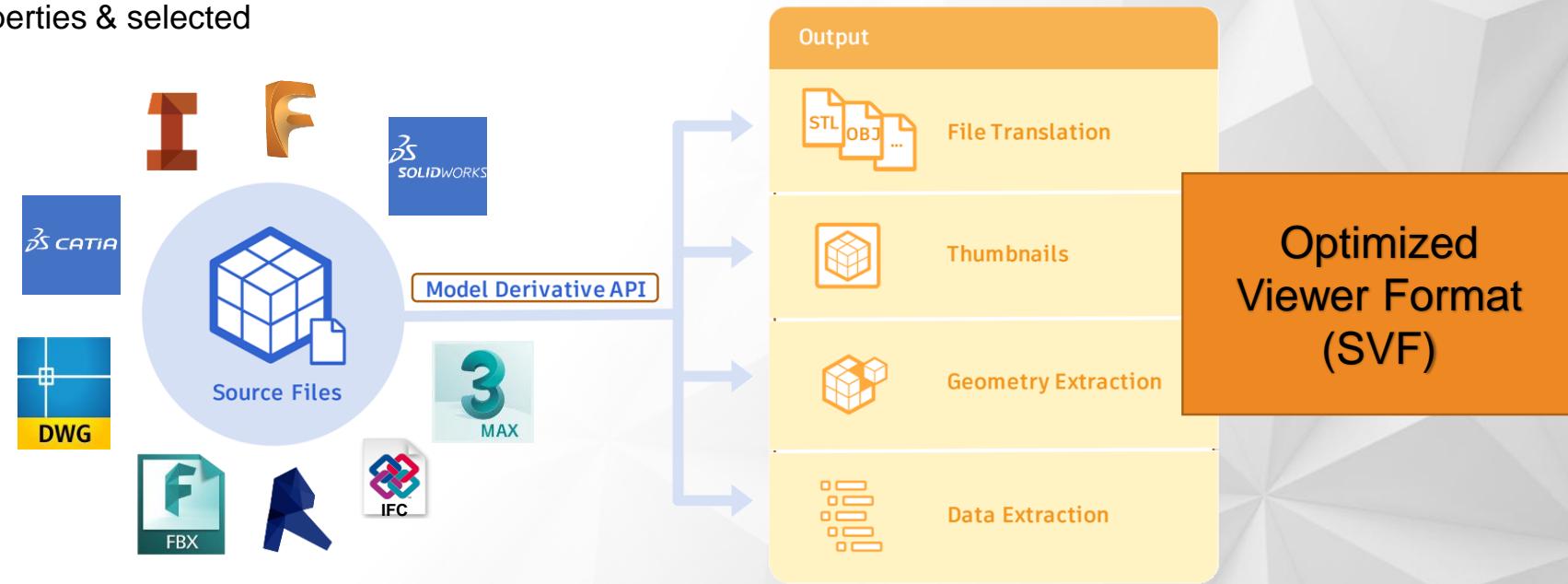
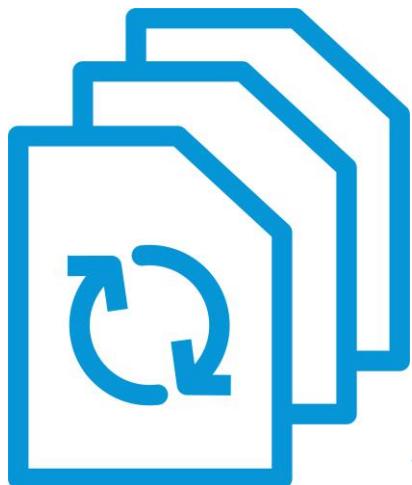


# AUTODESK® FORGE

# Model Derivative Service

Enables users to represent and share their designs in different formats, as well as to extract valuable metadata.

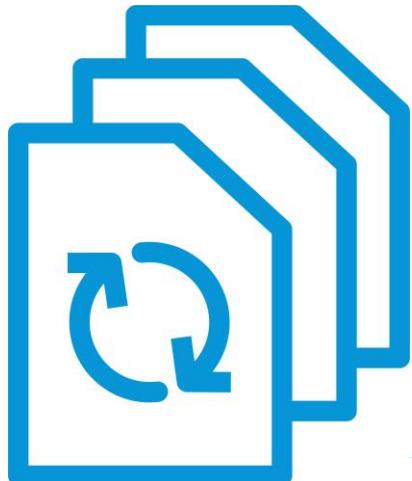
- Converts 2D/3D files to web and mobile viewable format
- Converts designs into formats, such as .stl, .step, .iges & .obj
- Extract object hierarchy trees, properties & selected geometry
- Conversion of Revit to IFC



# Model Derivative API

## Sample Code

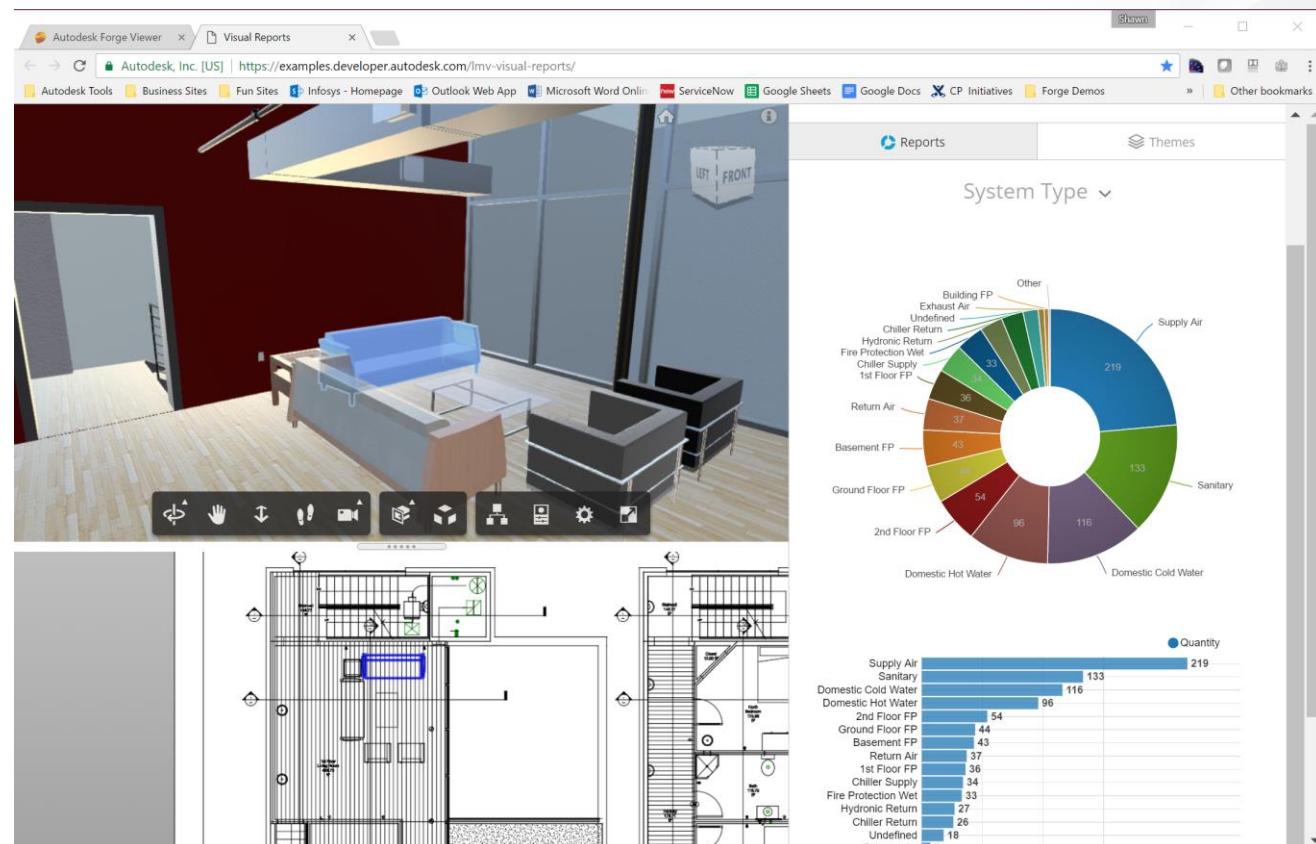
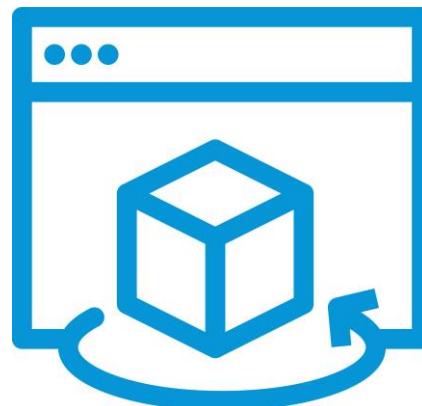
- <https://github.com/Autodesk-Forge/model.derivative-nodejs-sample>
  - Live Demo: <https://derivatives.autodesk.io/>
- <https://github.com/Autodesk-Forge/models.autodesk.io>
  - Live Demo: <https://models.autodesk.io/>



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# Viewer

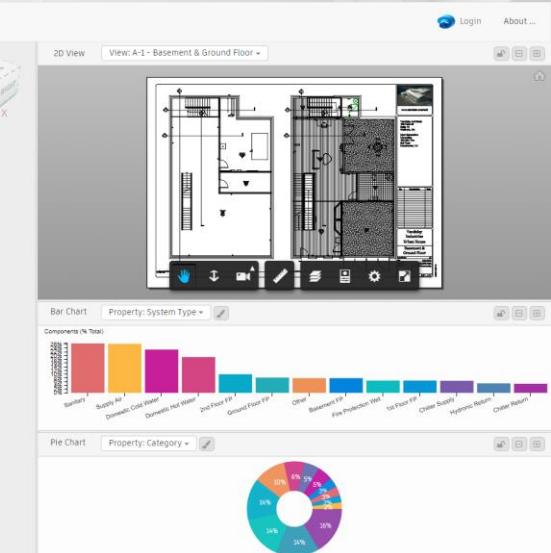
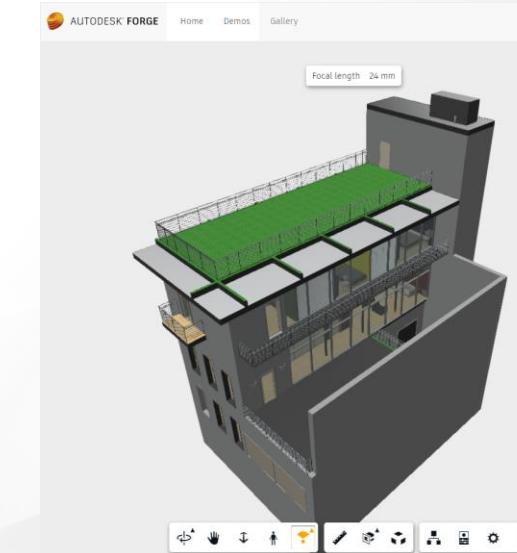
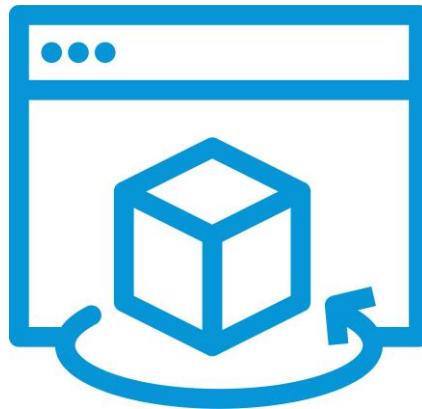
Displays 2D & 3D design files and associated data from 50+ file formats in a web and mobile viewer for presentation and collaboration.



# Viewer

## Sample Code

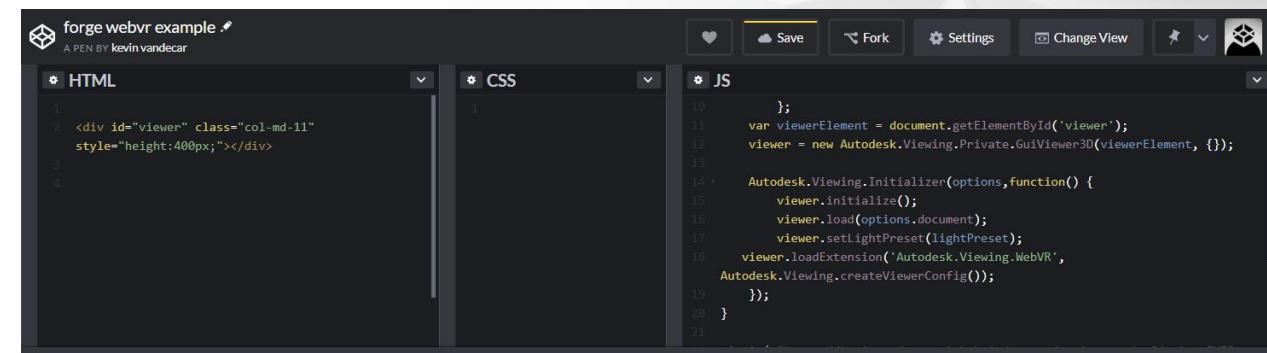
- Tutorial: <https://forge.autodesk.com/developer/idea/viewer-app>
- <https://github.com/Autodesk-Forge/viewer-react-express-headless>
  - Live: <https://viewer-rocks.autodesk.io/>
- <https://github.com/Autodesk-Forge/forge-rcdb.nodejs>
  - Live: <https://forge-rcdb.autodesk.io/configurator?id=57f3739777c879f48ad54a44>



# Viewer – (WebVR Extension)

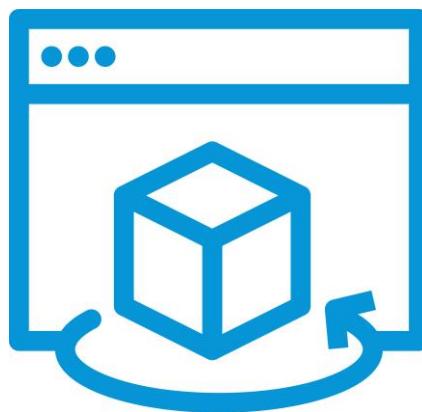
## Sample Code

- Tutorial: <https://forge.autodesk.com/developer/idea/viewer-app>
  - Add the WebVR extension
  - <https://github.com/kevinvandecar/forge.viewer-simple>
  - <https://codepen.io/gonzomustang/pen/WXwNdz>
- Live Demo: <http://vrok.it/v2>



A screenshot of a CodePen interface titled "forge webvr example". The interface shows three tabs: HTML, CSS, and JS. The HTML tab contains a single line of code: <div id="viewer" class="col-md-11" style="height:400px;"></div>. The CSS tab is empty. The JS tab contains the following code:

```
for forge webvr example
A PEN BY kevinvandecar
JS
1
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14
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16
17
18
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20
21
Autodesk.Viewing.Initializer(options,function() {
    var viewerElement = document.getElementById('viewer');
    viewer = new Autodesk.Viewing.Private.GuiViewer3D(viewerElement, {});
    Autodesk.Viewing.Initializer(options,function() {
        viewer.initialize();
        viewer.load(options.document);
        viewer.setLightPreset(lightPreset);
        viewer.loadExtension('Autodesk.Viewing.WebVR',
            Autodesk.Viewing.createViewerConfig());
    });
})
```

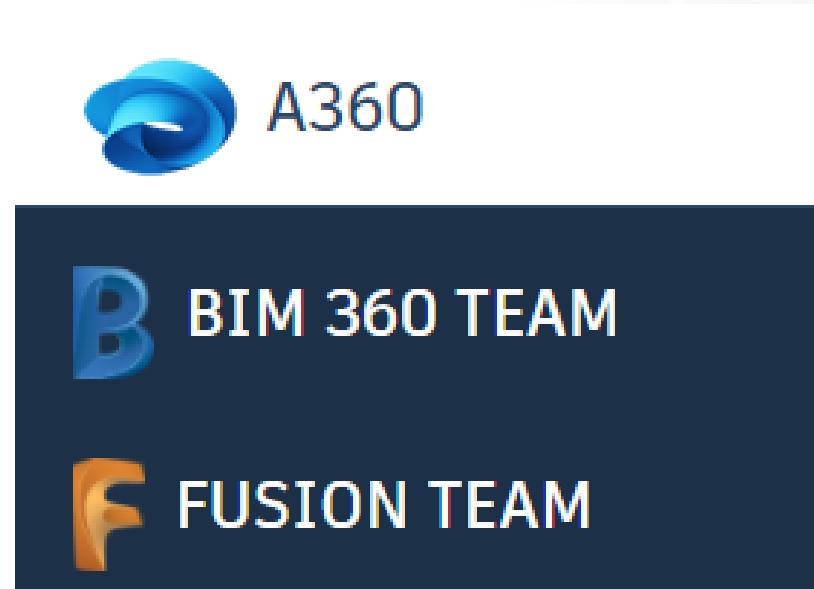


# Data Management API

A unified and consistent way to access data across Autodesk cloud technology: Fusion Team, BIM Team, BIM Docs and A360.

## Features

- Browse projects
- Navigate
- Upload and download files



# Data Management API

## Sample Code

- <https://github.com/Autodesk-Forge/data.management-nodejs-integration.box>
  - Live Demo: <https://forgedmboxintegration.herokuapp.com/>
- <https://github.com/Autodesk-Forge/forge-rcdb.nodejs>
  - Live Demo: <https://forge-rcdb.autodesk.io/>
- <https://github.com/Autodesk-Forge/forge-boilers.nodejs>
  - Live Demo: <https://dm.autodesk.io/>
- <https://github.com/Autodesk-Forge/bim360appstore-data.management-nodejs-transfer.storage>



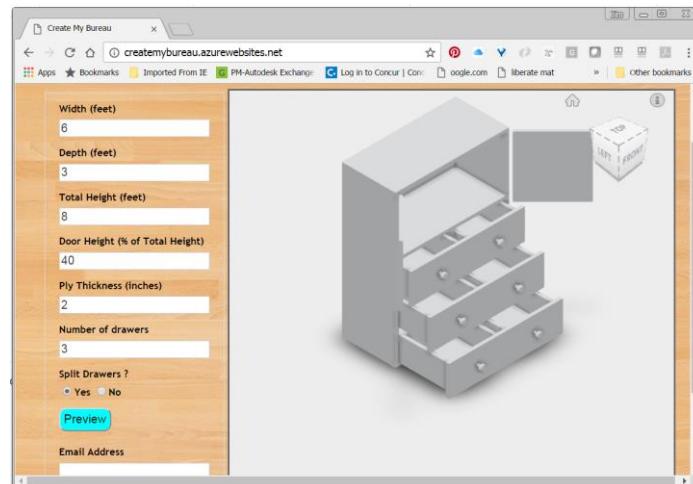
7

# Design Automation

Run automation processes on your Autodesk files, leveraging the scale of the Forge Platform to automate repetitive tasks.

## Features

- Able to Automate / batch process in cloud
- AutoCAD V2 in production
- AutoCAD, Inventor, 3ds Max V3 in public beta
- Revit coming end of month (no access for now)



# Design Automation

## Sample Code

- AutoCAD: <https://github.com/KeanW/Jigsawify>
  - Live Demo: <http://www.jigsawify.com/>
- Beta
  - Inventor <https://github.com/Developer-Autodesk/design.automation.inventor-csharp-basics>
  - 3ds Max: <https://github.com/Autodesk-Forge/design.automation.3dsmax-nodejs-basic>



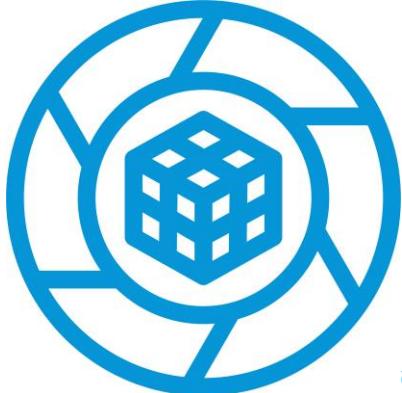
c. 2017

# Reality Capture

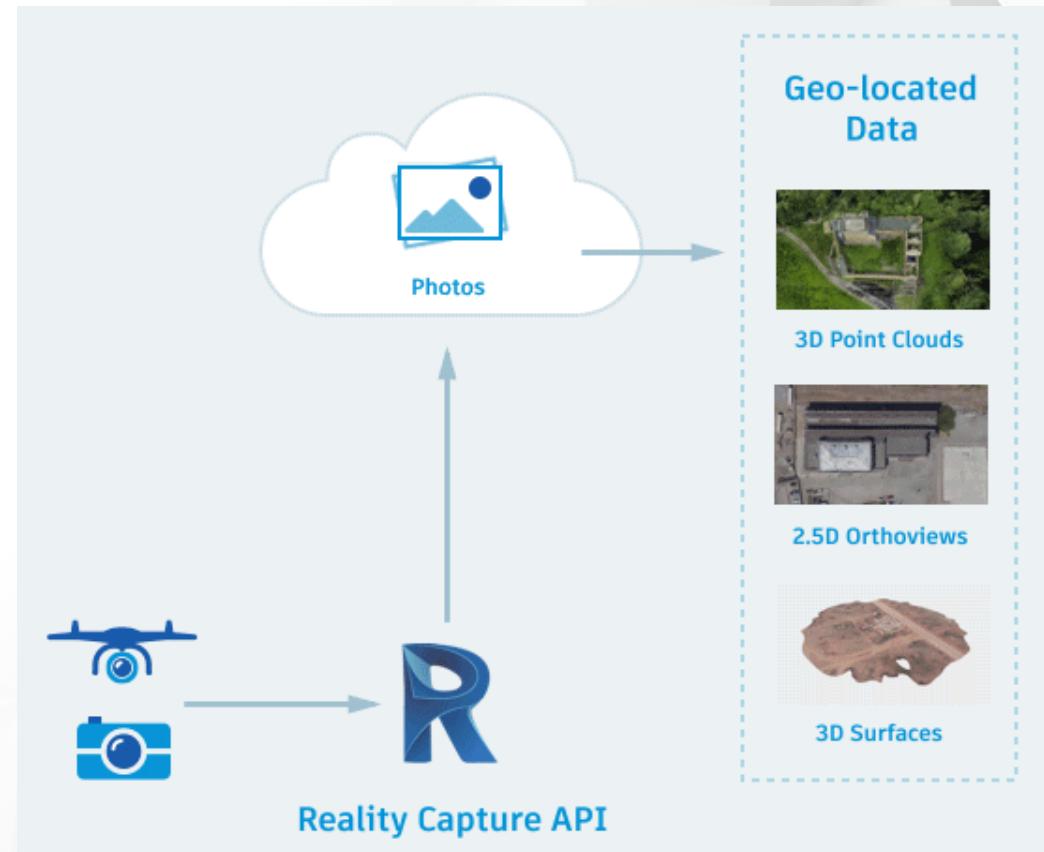
3D model creation by aerial and camera photogrammetry

## Features

- photogrammetry capability to process digital images into high resolution textured meshes, dense point clouds and orthophotos.



7



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# Reality Capture

## Sample Code

- Tutorial: <https://forge.autodesk.com/developer/idea/recap-app>
- Blog: <https://forge.autodesk.com/blog/hitchhikers-guide-reality-capture-api>
- Sample: <https://github.com/apprentice3d/reality.capture-go-photoll3D>



c. 2017

# How does Forge help the AR / VR story?

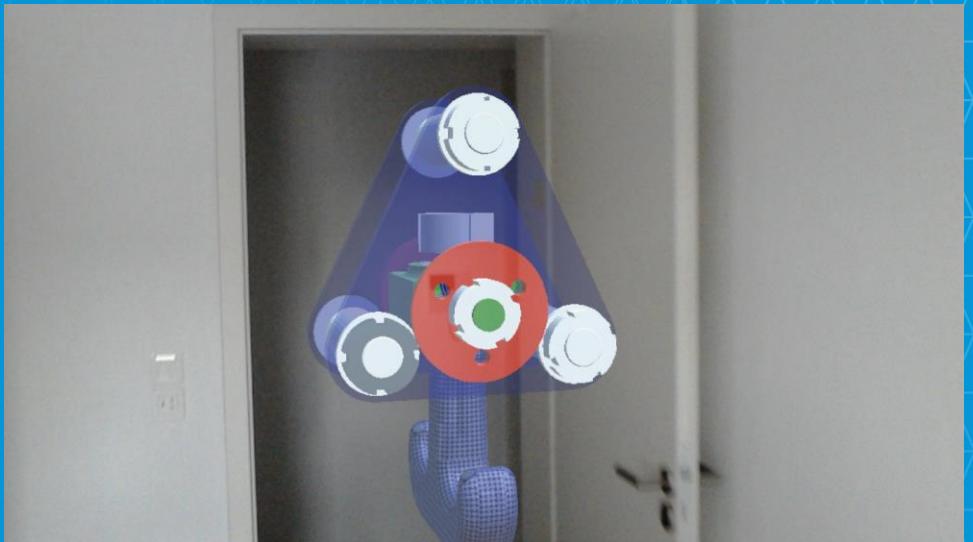
Forge Viewer has a WebVR extension

- Allows Google Cardboard style experience
- Useful if you want a regular website or app, to also have WebVR support for viewing

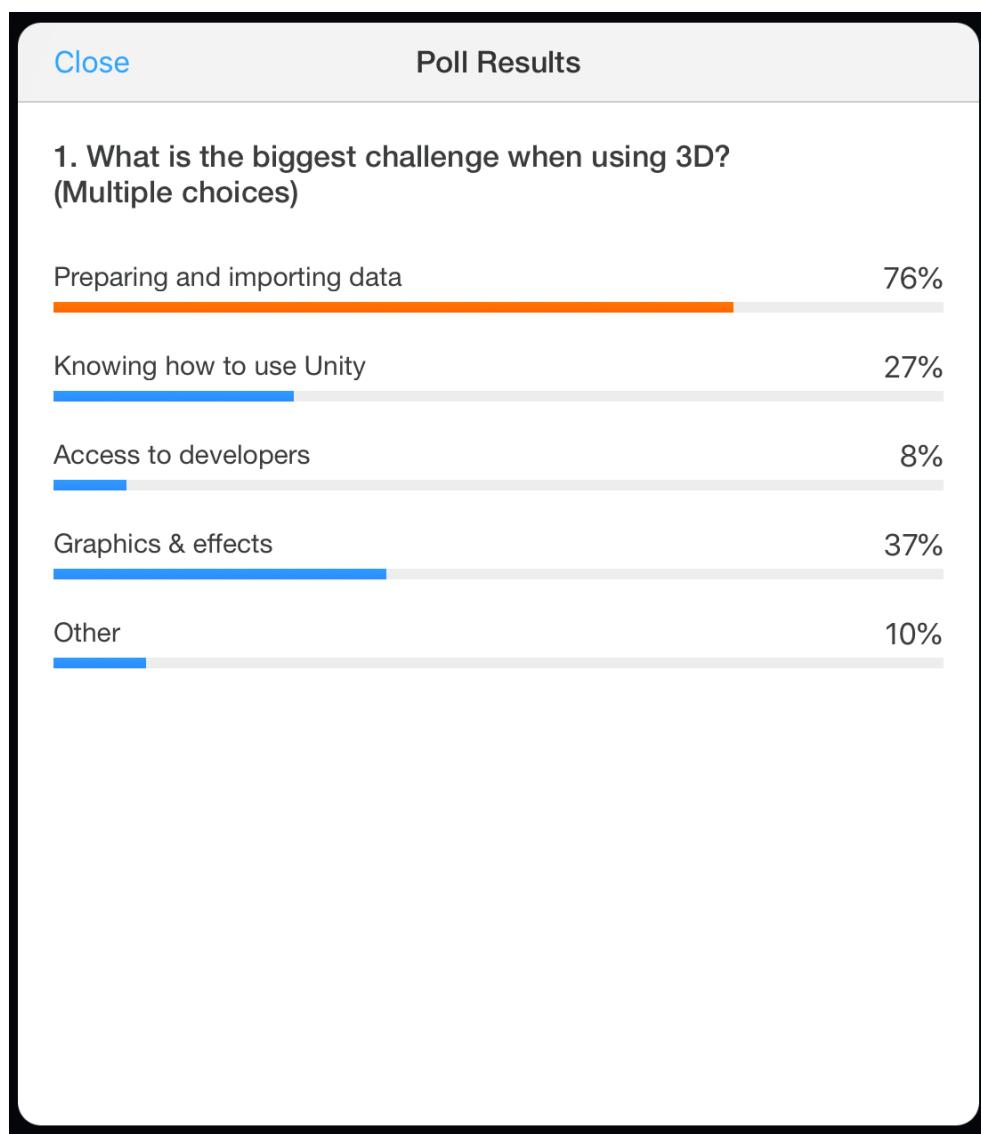


Forge AR/VR Toolkit in beta

- Currently supports Unity
- Allows fully immersive experiences with Forge Asset from Model Derivative service



# DATA PREPARATION



Survey from Unity webinar "CAD to Unity"



Procedia CIRP  
Volume 41, 2016, Pages 358-363  
open access



CAD to VR – A Methodology for the Automated Conversion of Kinematic CAD Models to Virtual Reality



k Philipp Klimant

[Get rights and content](#)

conversion becomes context virtual ill play a defining products, factory systems to keep up graphic seamless and o VR/AR systems. n just plain here of a CAD duce the use case m defined ering SMEs in the nnot be affordent workflow for an lism adoption. We concepts for each on a proof of



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[Home](#) / Design / From Solid Geometry to Responsive AR-VR

## From CAD to AR

In immersive VR apps, the high-res photo-real imagery takes center stage. On the other hand, in AR, gesture-driven natural interaction takes precedence. The way you rotate a digital object using your fingers, or the way you poke a virtual button to activate certain operations—these generally define AR functions.

The biggest challenge of 3D CAD integration into an AR experience is "format compatibility," notes Abraham Georgiadis, AR developer ManoMotion's UX designer. "I personally believe that since we are already following a format agnostic approach in other content cases, the 3D CAD format should be treated as such," he says.

The computer screen is simply not up to the task when it comes to merging pixels with reality. That's something AR applications are better positioned to do, Georgiadis notes. Take automotive design, for instance. "Wouldn't it be much more beneficial to project the design of a car in a real-world setting, like a garage or the road, and inspect it for the criteria that have been set?" he asks.

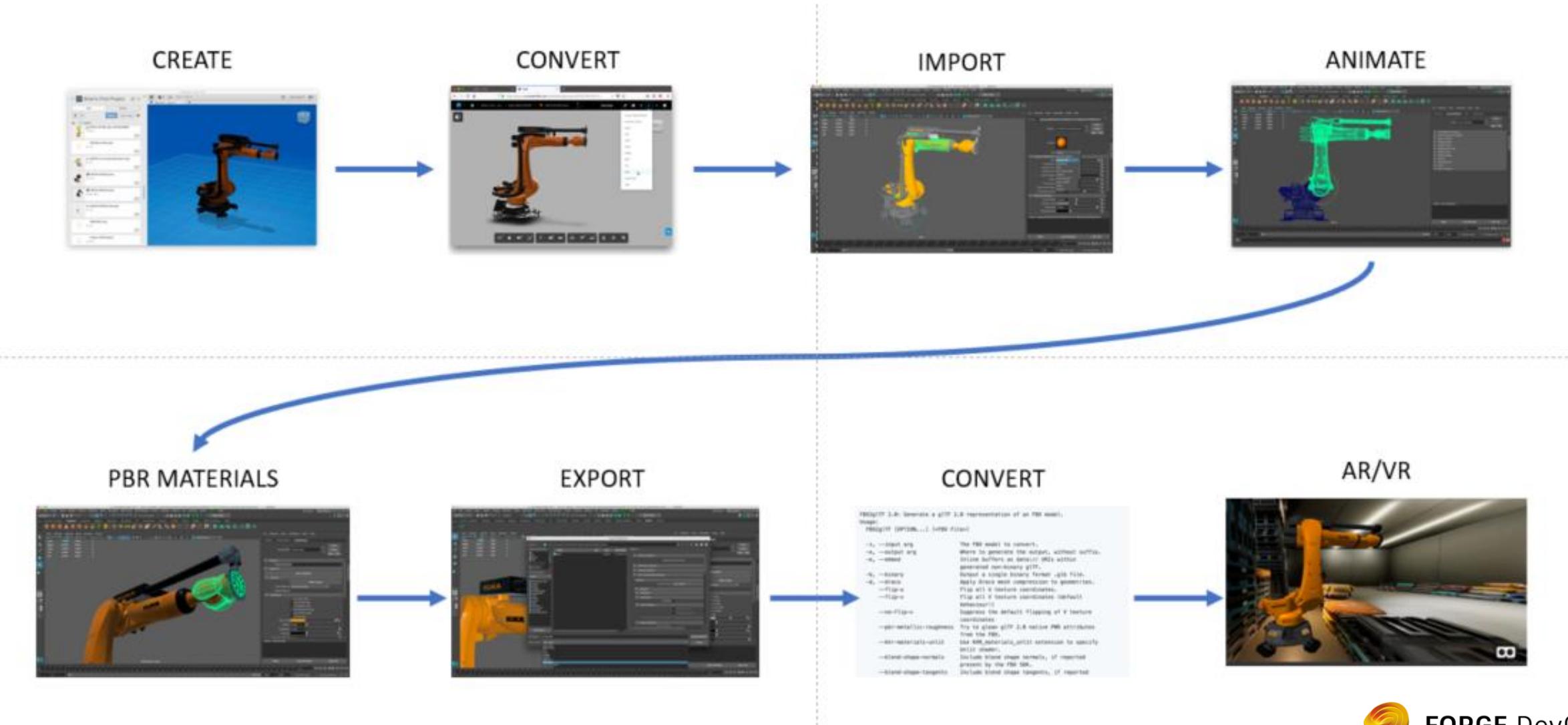
"We could take the next step and test our initial assumptions ... Does this car have enough space for the driver to feel comfortable?" Georgiadis says, imagining the possibilities in AR. "Are the aerodynamics in place? What would happen if we swapped the model of the engine for the next one?" These tests are only possible if the human, the real environment and the digital design can share the same space—something AR can facilitate.

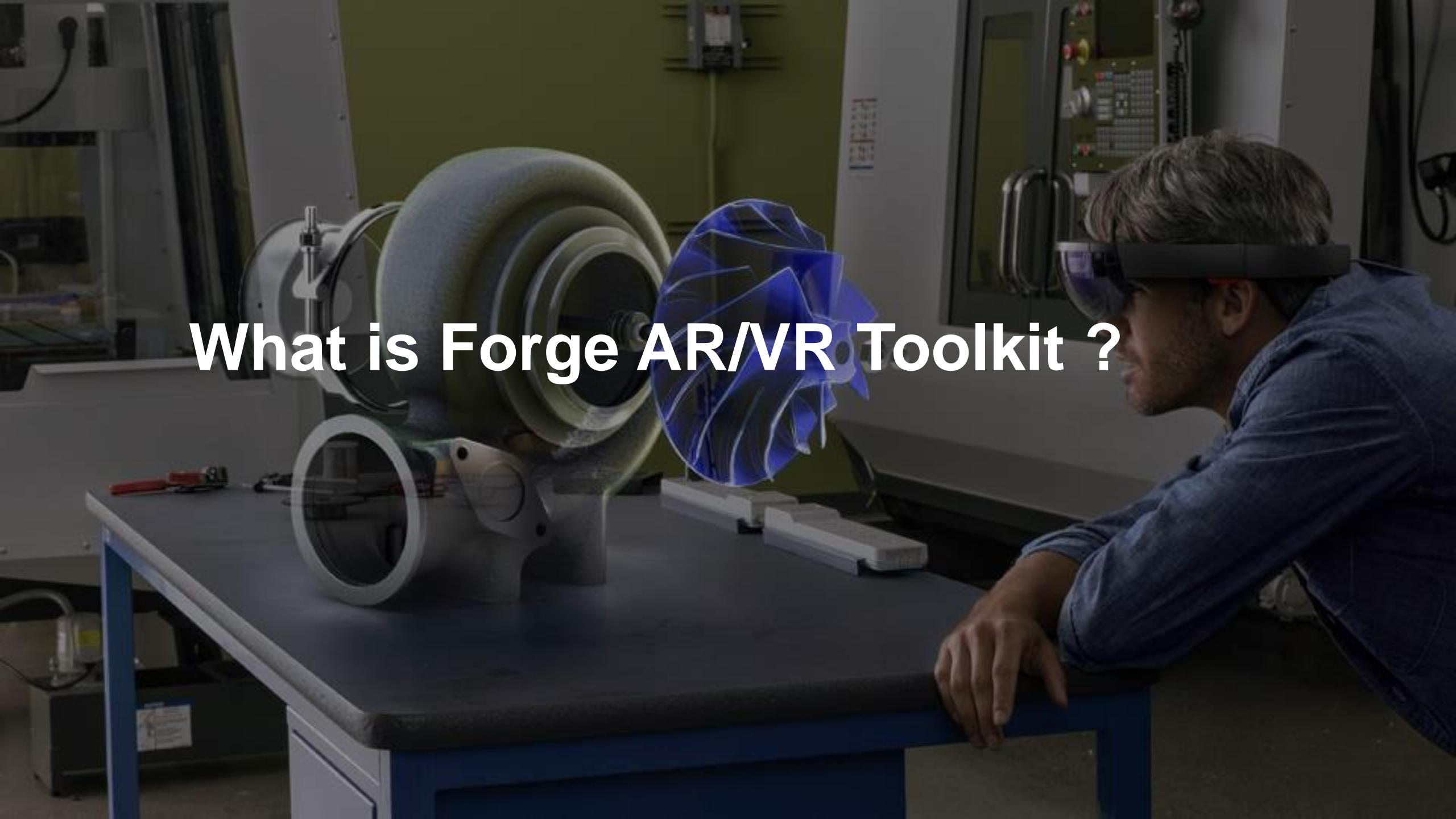


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# TRADITIONAL WORKFLOW

complex, laborious, involving several tools and users with varying skillsets



A photograph of a man in a factory or workshop environment. He is wearing a virtual reality headset and looking down at a large, cylindrical metal part on a workbench. A blue, translucent 3D model of a gear or similar mechanical component is overlaid on the physical part, indicating a digital inspection or assembly process. The background shows industrial equipment and control panels.

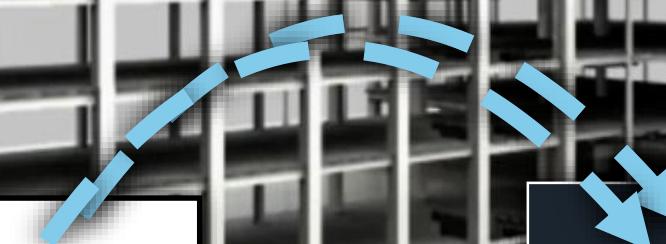
What is Forge AR/VR Toolkit ?

As your Design Data changes over time...

Forge AR\VR Toolkit can stream the data into Unity,  
without manual data-prep



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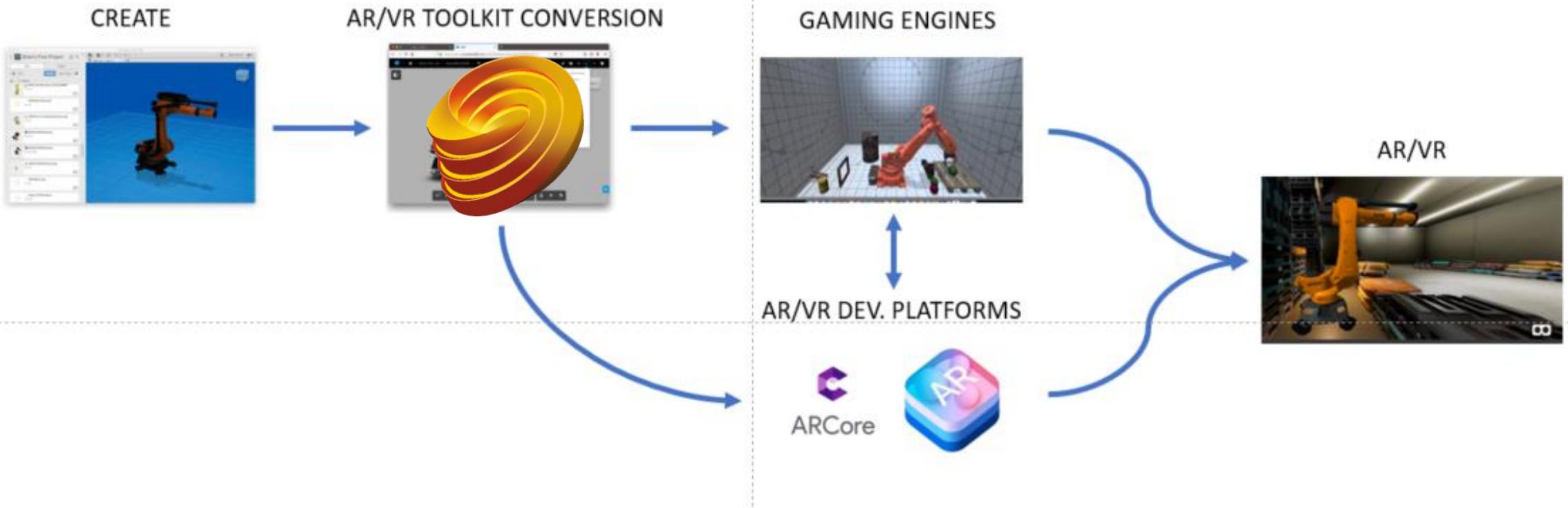


unity

# A New Workflow...

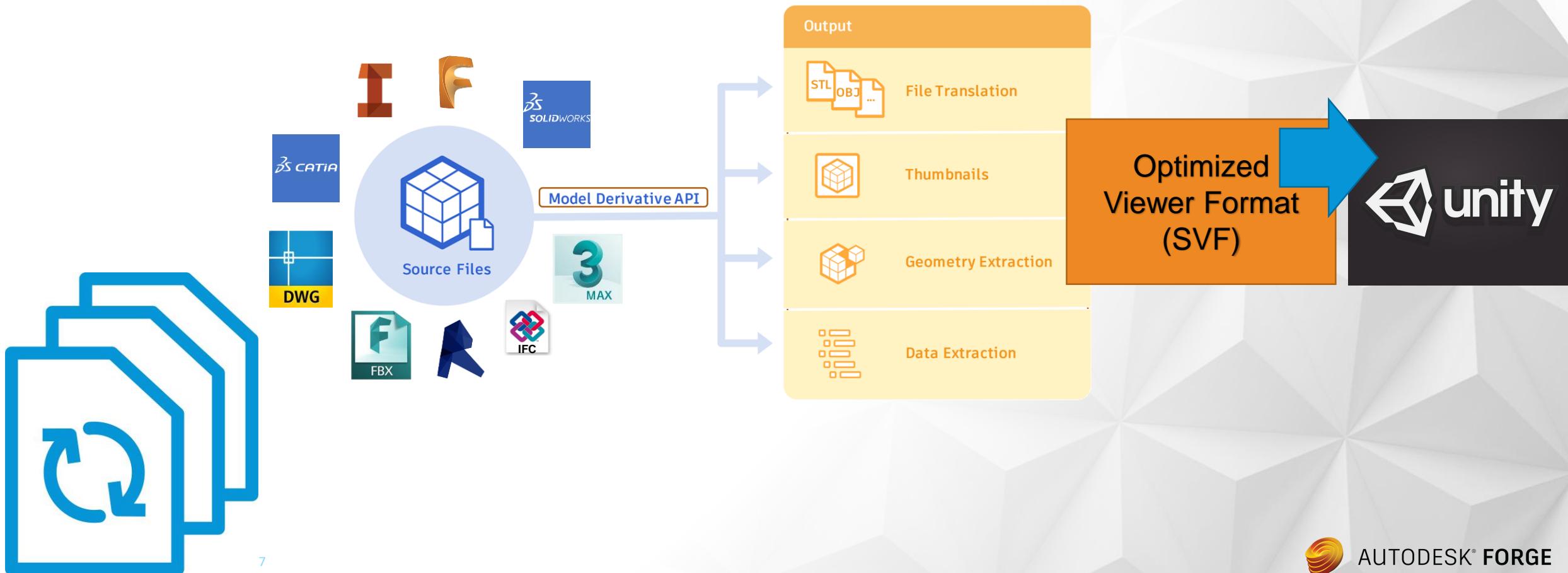
## WORKFLOW WITH AR \ VR TOOLKIT

simpler, less time-consuming, scalable, involving fewer tools  
allowing customers to focus on better experiences



# Model Derivative Service -> Unity

Enables users to represent and share their designs in different formats, as well as to extract valuable metadata.



# forgeToolkit.com

- Website: <http://forgetoolkit.com>
- - download Unity package
- - API documentation
- - tutorials for Hololens & OculusGo

Overview - AR|VR Toolkit For x

Not Secure | forgetoolkit.com/#/

Type to search APIs

## Getting Started

- Overview
- Features
- Installation
- Disclaimer
- License

## Tutorial

## Downloads

- Unity Package
- Scene Preparation

## Guides

- Hello World
- Hololens example
- Filter by String
- Spatial Filter

## API Reference

- APIs

## Component Library

AUTODESK® FORGE AR|VR Toolkit

npm package 0.25.5 build passing coverage 100% gitter join c

The Forge Services now support Unity ! (in beta)

Use the new "Forge AR|VR Toolkit" to help you connect into BIM/Navisworks/Revit/Solidworks data-streams directly inside Unity.

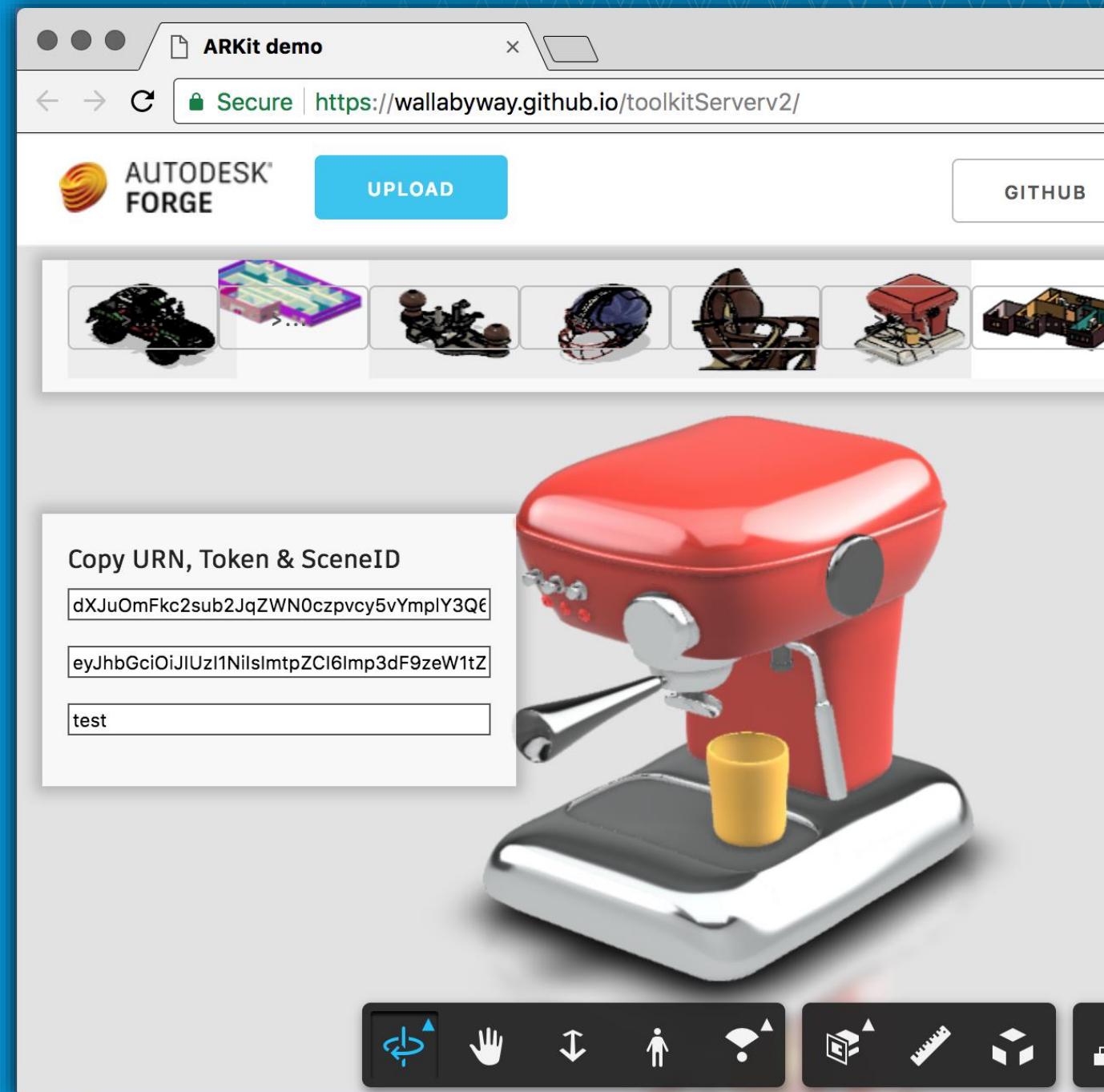
The diagram illustrates the integration of Forge Services with Unity and Web platforms. It shows a central 'Forge Services' component connected to various data sources (Revit, Navis, Solidworks) and destination platforms. On the left, a 'Web Platform' is shown with a 'Forge-Viewer.js' component running in a 'Browser'. On the right, a 'Unity Platform' is shown with a 'Unity App' component. Arrows indicate the flow of data from the central services to both platforms. A 'New' icon is highlighted on the Unity side, suggesting a recent addition or feature.

OPEN CH

# HelloWorld!

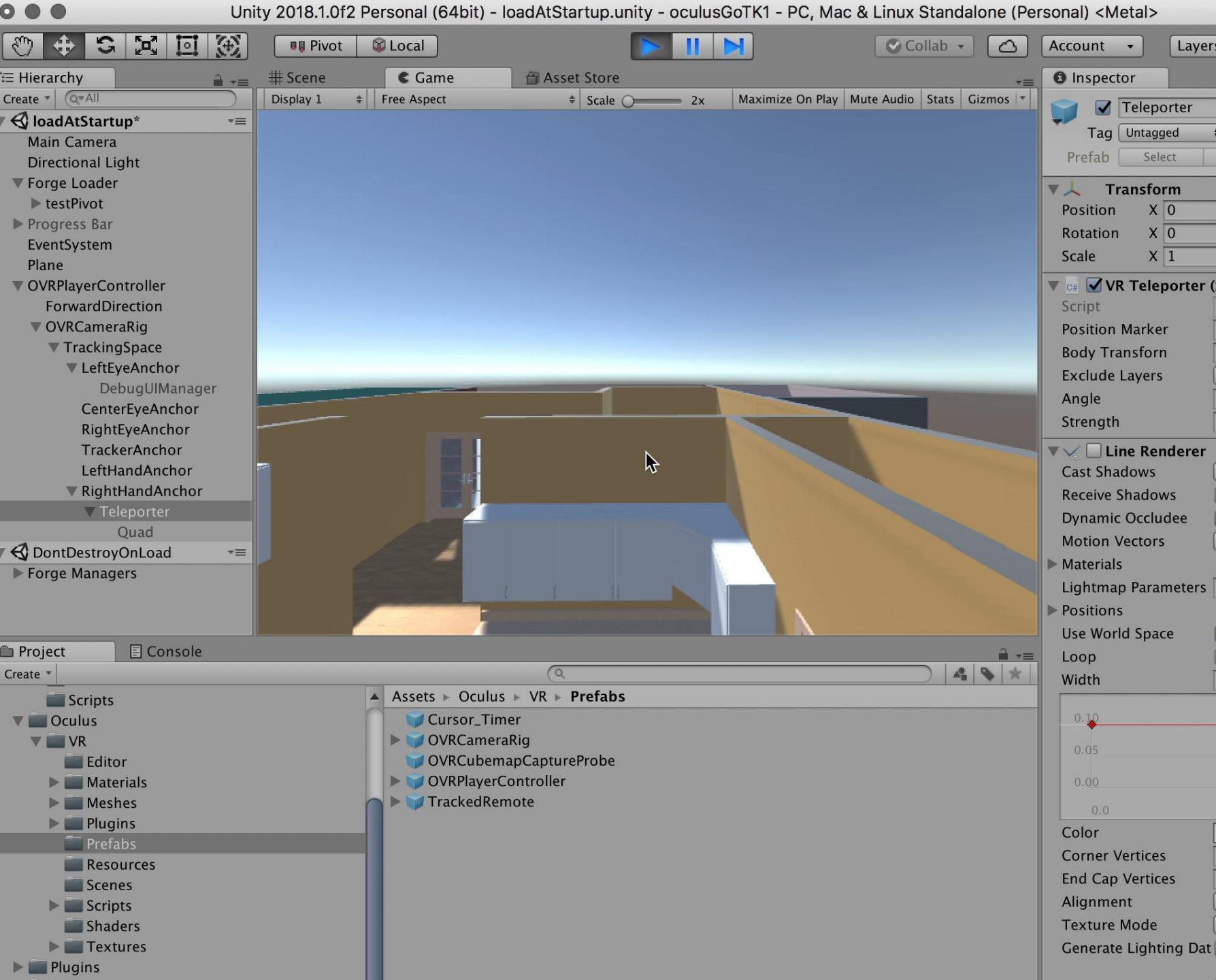
Sample Gallery site:

[wallabyway.github.io/toolkitServerv2/](https://wallabyway.github.io/toolkitServerv2/)



# Unity

- Property Panel's
- Lighting
- Explode
- VR



# Forge APIs - Access

- 1 Year free trial
- Startup and Edu



# Getting Started – WebVR Extension for Forge Viewer

Get starting using the tutorial here:

<https://forge.autodesk.com/developer/learn/viewer-app/overview>

- Uses Node JS + express server (easy and free)
- Allows you to translate your own asset/model (helps meet the requirements of no purchased assets).
- Add few lines of code to enable the WebVR Extension  
(example here: <https://github.com/kevinvandecar/forge.viewer-simple>)

```
var documentId = 'urn:' + getUrlParameter('urn');
// Added to support WebVR
var config = {
    extensions: ['Autodesk.Viewing.WebVR'],
    //experimental: [ 'webVR_orbitModel' ]
};

// Run this when the page is loaded
Autodesk.Viewing.Initializer(options, function onInitialized(){
    viewerApp = new Autodesk.Viewing.ViewingApplication('MyViewerDiv');
    // Added config to support WebVR
    viewerApp.registerViewer(viewerApp.k3D, Autodesk.Viewing.Private.GuiViewer3D, config);
    viewerApp.loadDocument(documentId, onDocumentLoadSuccess, onDocumentLoadFailure);
});
```

# Getting Started – Unity w/Forge toolkit

See here: <https://forgetoolkit.com>

- Use Model Derivative to translate your asset/model (can use a sample website, or build it yourself).
- Import appropriate Forge package into Unity
- Import appropriate AR or VR frameworks
- Use the Forge toolkit Unity functionality to load the MD asset
- Tips:
- Pay attention to versions
- Because of toolkit collisions, one trick is to use the static Forge Import just for asset. Save the project and then reload into another version you need. Of course Unity versions can also collide so some testing is sometimes necessary.

# Getting Started – Unity w/Forgetoolkit Oculus Go Example

See here: <http://forgetoolkit.com/#/oculusgo>

More details:

<https://medium.com/inborn-experience/how-to-build-an-app-for-the-oculus-go-from-start-to-finish-with-unity-cb72d931ddae>

<https://scriptable.com/blog/oculus-go-unity-setup-quick-start>

# Getting Started – Unity w/Forgetoolkit Hololens Example

See here: <http://forgetoolkit.com/#/hololens>

# Q&A



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