

Webizing MAR contents

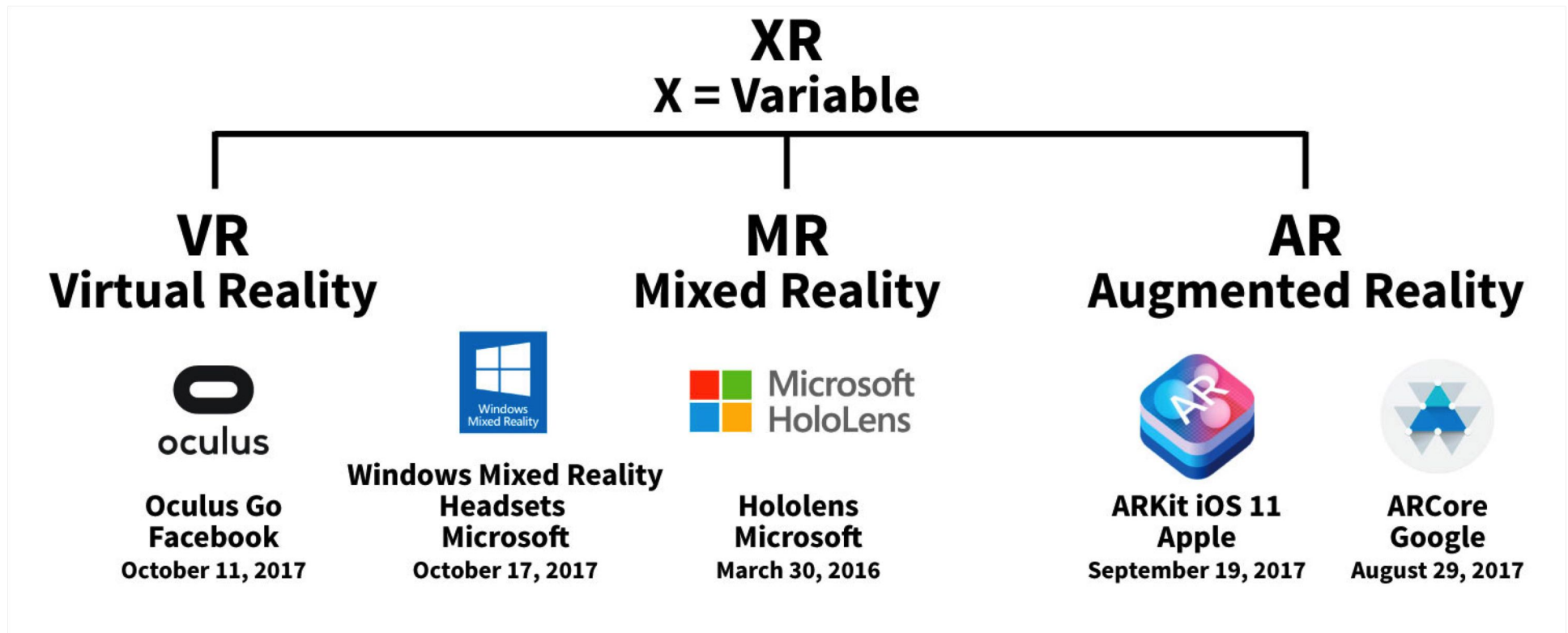
WXR Library

(Webized X Reality)

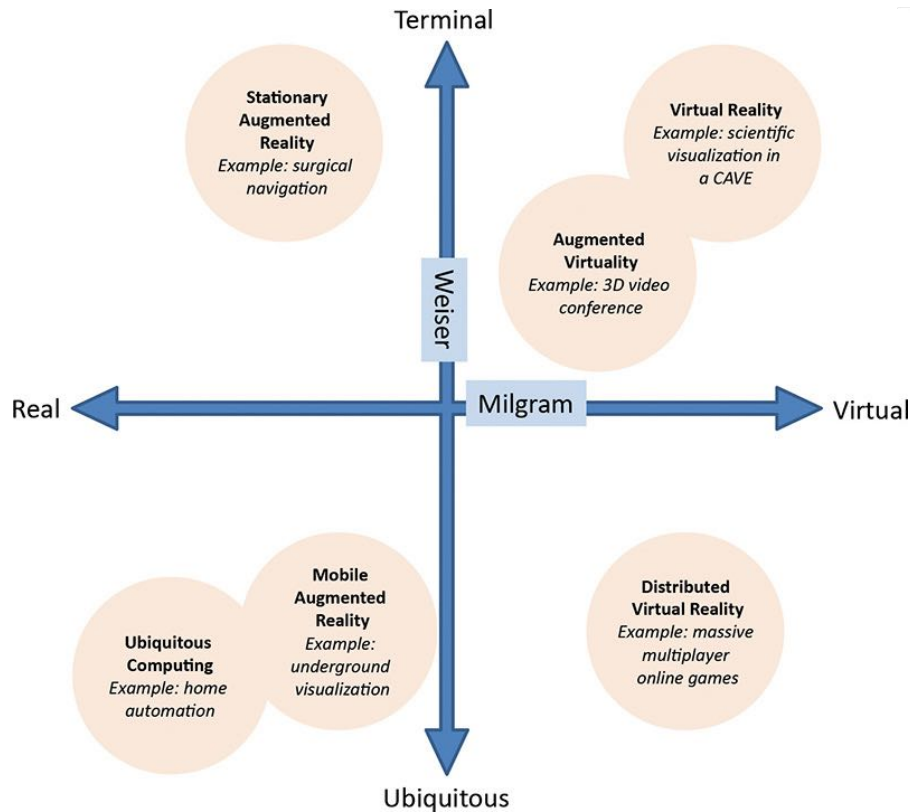
Byoungyun Yoo

Webizing Research Laboratory (WRL) 
Korea Institute of Science and Technology

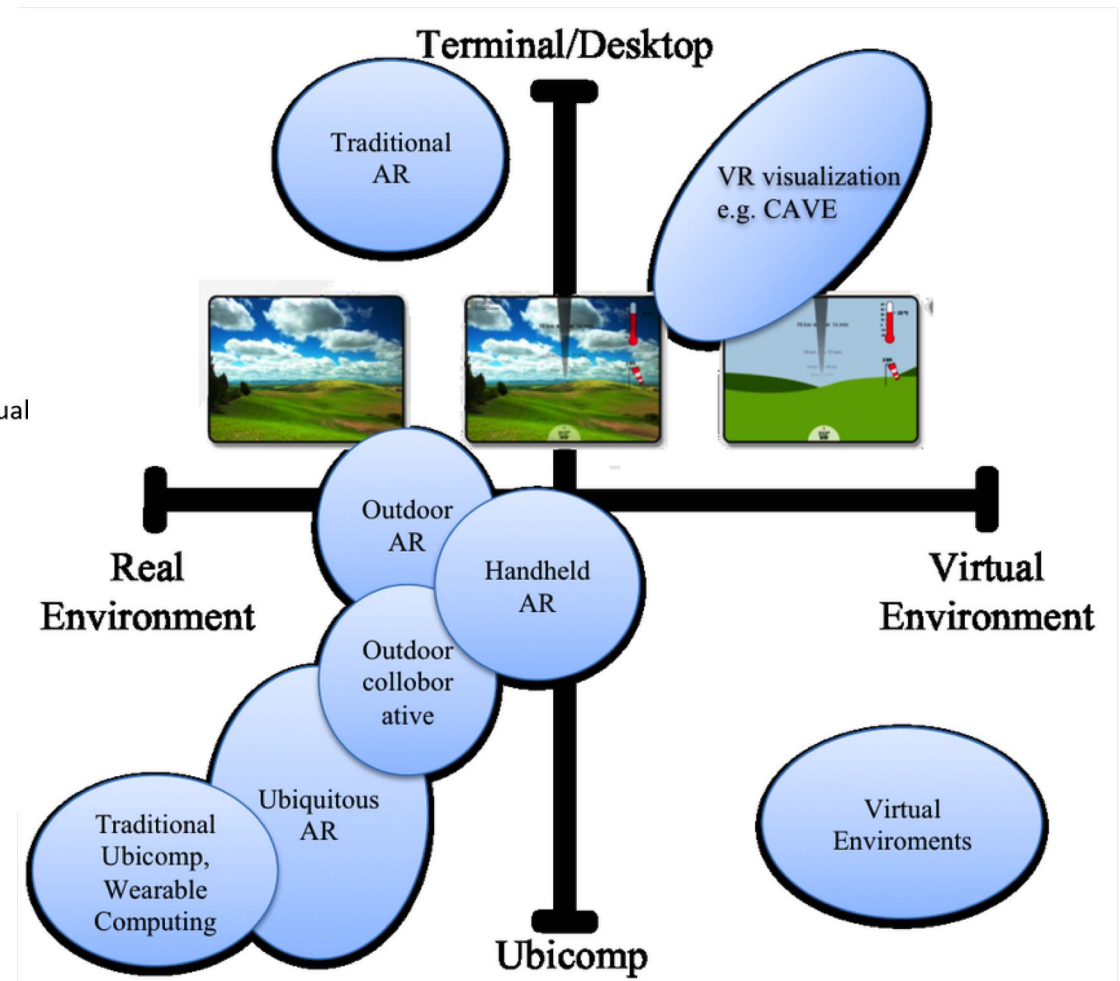
XR



Milgram-Weiser continuum

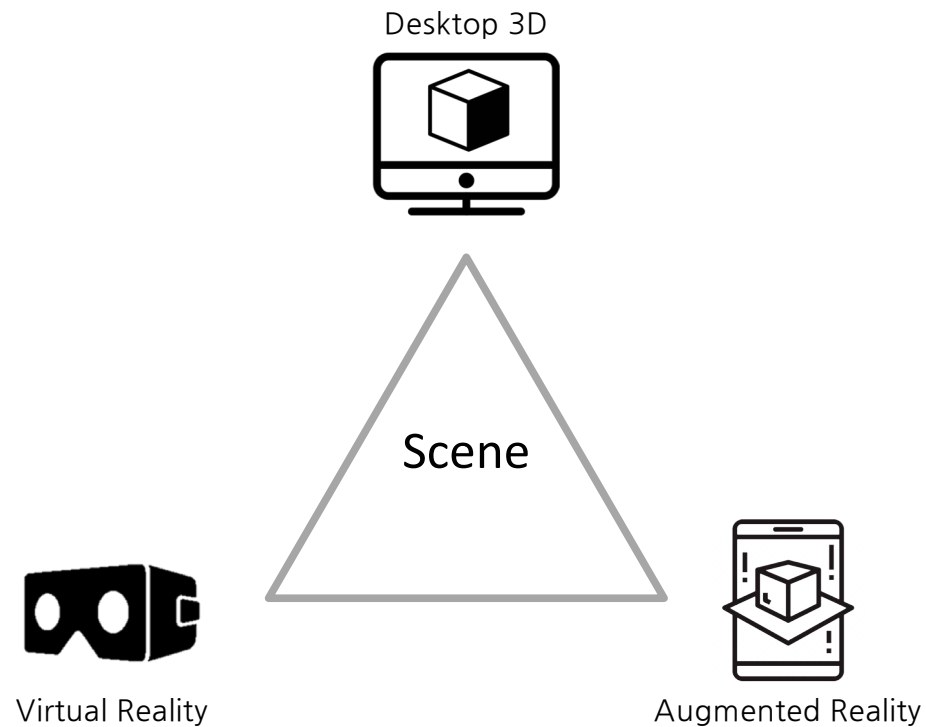


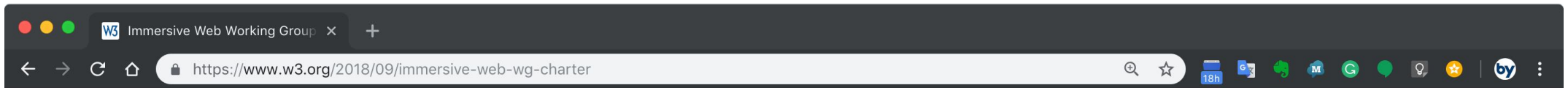
Newman, J., Bornik, A., Pustka, D., Echtler, F., Huber, M., Schmalstieg, D., & Klinker, G. (2007, March). Tracking for distributed mixed reality environments. In Workshop on Trends and Issues in Tracking for Virtual Environments at the IEEE Virtual Reality Conference (VR'07).



Motivation

- Experience XR in your browser
- No matter what kind of device you have





Immersive Web Working Group Charter

The **mission** of the [Immersive Web Working Group](#) is to help bring high-performance Virtual Reality (VR) and Augmented Reality (AR) (collectively known as XR) to the open Web via APIs to interact with XR devices and sensors in browsers.

[Join the Immersive Web Working Group.](#)

- [Background](#)
- [Scope](#)
- [Deliverables](#)
- [Coordination](#)
- [Participation](#)
- [Communication](#)
- [Decision Policy](#)
- [Patent Policy](#)
- [Licensing](#)
- [About this Charter](#)

Start date	24 September 2018
End date	1 March 2020
Chairs	Ada Rose Cannon (Samsung), Chris Wilson (Google)
Team Contacts	Dominique Hazael-Massieux (0.2 FTE)
Meeting Schedule	<p>Teleconferences: topic-specific calls may be held</p> <p>Face-to-face: we will meet during the W3C's annual Technical Plenary week; additional face-to-face meetings may be scheduled by consent of the participants, usually no more than 3 per year.</p>

1. Background

A new generation of head-mounted displays and environment sensing capabilities on mobile devices are enabling augmented and virtual reality (collectively known as XR) to emerge as a critical field of evolution for human-machine interactions.

Due to its inherent low friction and support for ephemeral experiences, the Web provides a promising ecosystem for the creation, distribution, and experiencing of XR content, applications, and services.

Bert Freudenberg



Invited expert

Madlaina Kalunder

Invited expert

Trevor F. Smith



Invited expert

Byounghyun Yoo



Invited expert

Adobe

Michael Bond

Adobe

Qing An



Alibaba Group

Juntao Peng

Alibaba Group

Kyle Roche

Amazon

Nell Waliczek



Amazon

Artem Bolgar



Facebook

Justin Rogers



Facebook

Jacob Rossi



Facebook

Ricardo Cabello

Google, Inc.

Josh Carpenter



Google, Inc.

David Dorwin

Google, Inc.

Iker Jamardo

Google, Inc.

Brandon Jones



Google, Inc.

Stephen Konig

Google, Inc.

John Pallett



Google, Inc.



Sohan Jyoti Ghosh

Huawei

Guido Grassel



Huawei

Xiaosong Wei

Huawei

Zhiqiang Yu

Huawei

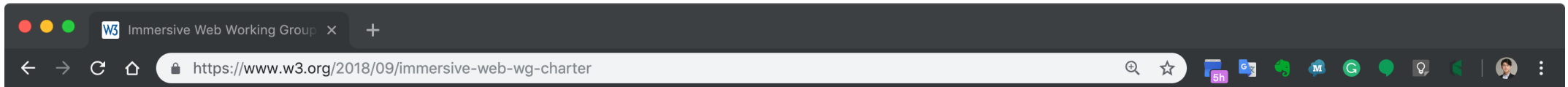
Alexis Menard

Intel Corporation

Sangchul Ahn



Letsee, Inc.



The [October 2016 W3C Workshop](#) explored that potential, relying on browsers to display and interact with content using available head-mounted displays and handheld devices providing a window into virtual space. The [Community-Group incubated WebXR Device API](#) has already gained interest from a number of implementors. This Working Group will build on that momentum to standardize the WebXR Device API as part of the Open Web Platform.

2. Scope

The Immersive Web Working Group will develop standardized APIs to provide access to input and output capabilities commonly associated with XR hardware such as Google's Daydream, the Oculus Rift, the Samsung GearVR, the HTC Vive, and Windows Mixed Reality headsets and sensors as well as mobile handheld devices and standalone headsets such as the Oculus Go. The WG will develop APIs to enable the creation of XR web experiences that are embeddable in the Web of today, enabling progressive enhancement of existing sites.

The **scope** of the Immersive Web Working Group charter is to define APIs which:

- Detect available XR devices and sensors.
- Query XR devices for device-specific capabilities.
- Receive updated information about the device's position and orientation over time.
- Receive updated information about the device's environment.
- Present imagery to the device at the device's native frame rate, using the device's position and orientation over time to provide an immersive experience.
- Provide information about XR-specific input, including tracked controller state and hand gesture.
- For augmenting reality on devices which support AR, enable XR sessions that provide real-world display, and provide the ability to hit-test surfaces in the real world.

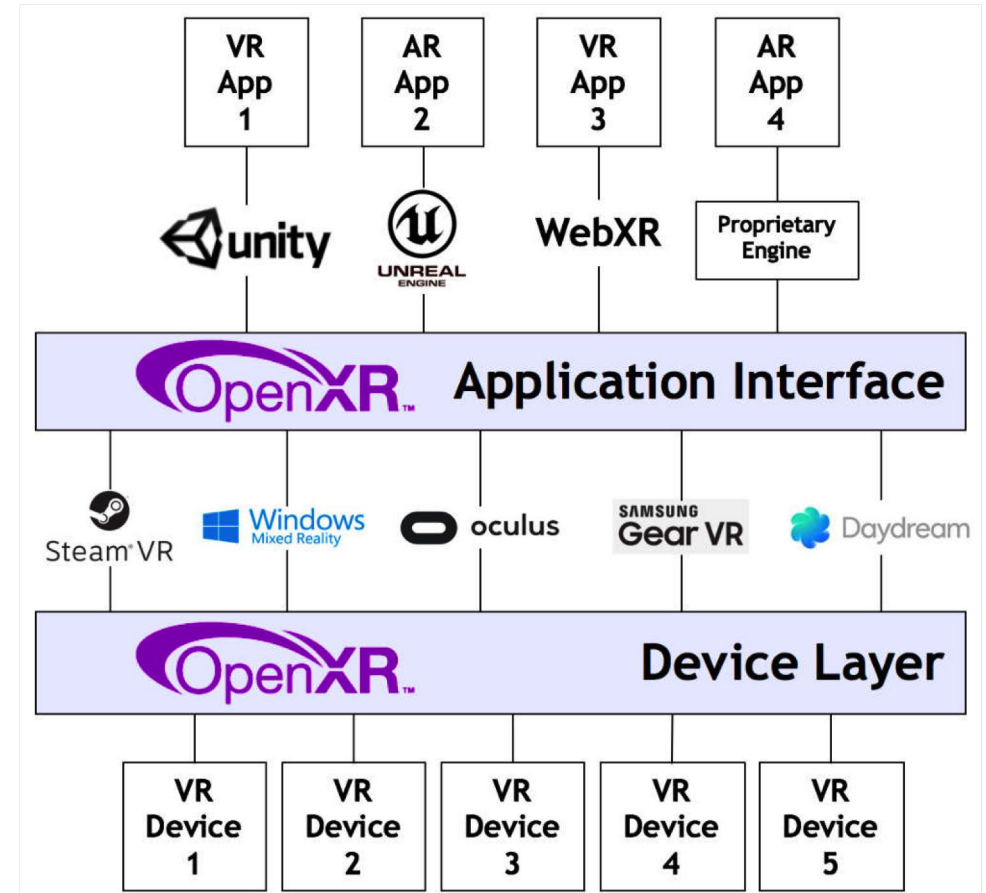
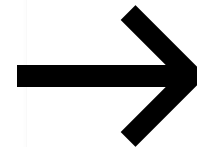
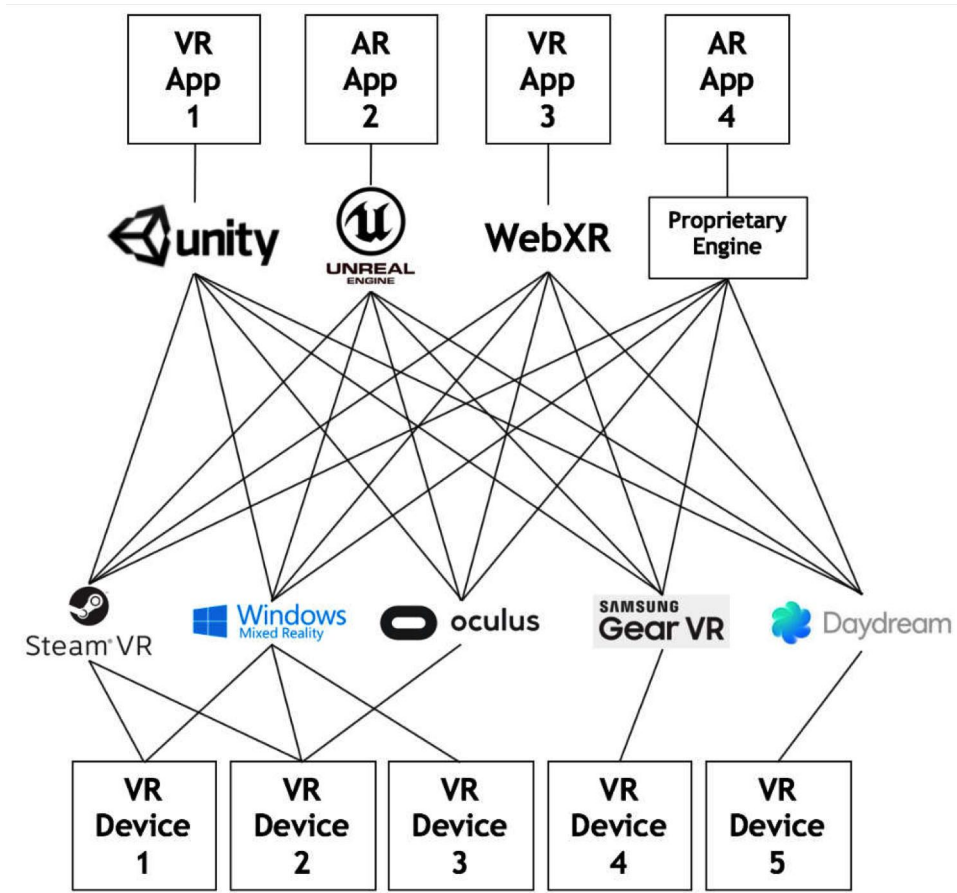
Out of scope:

- Defining browser user experience inside virtual or augmented reality, aside from navigating between XR sites.
- Defining mechanisms for global-scale AR browsing.

2.1 Success Criteria

In order to advance to [Proposed Recommendation](#), each specification is expected to have [at least two independent implementations](#) of each feature defined in the specification.

XR Device

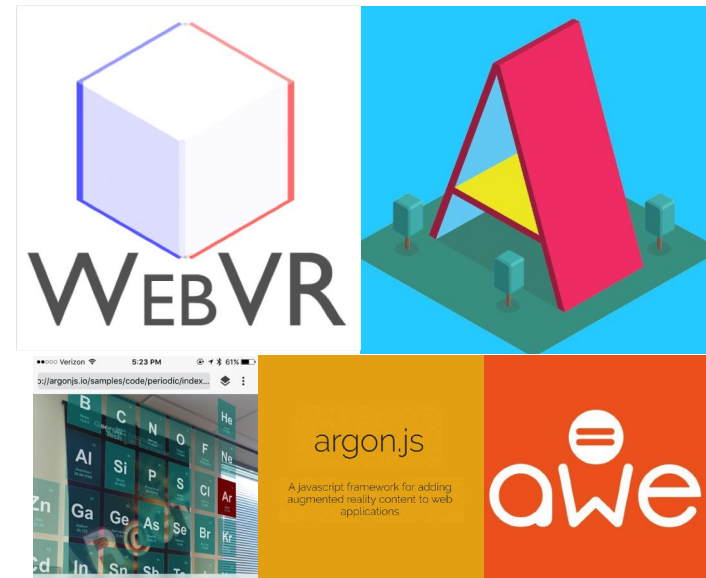


XR Content

- VR
 - X3D 4.0
 - X3DOM
 - XML3D
 - Mozilla A-Frame and WebVR
 - W3C Declarative 3D for the Web Architecture Community Group
 - W3C WebVR Community Group
- AR
 - Chromium WebAR Prototype
 - Argon – Georgia Tech
 - AWE.io
 - AR.js – jeromeetienne
- MAR / XR

web|3D
CONSORTIUM

W3C[®] **moz://a**



Advantage of Webizing MAR Contents

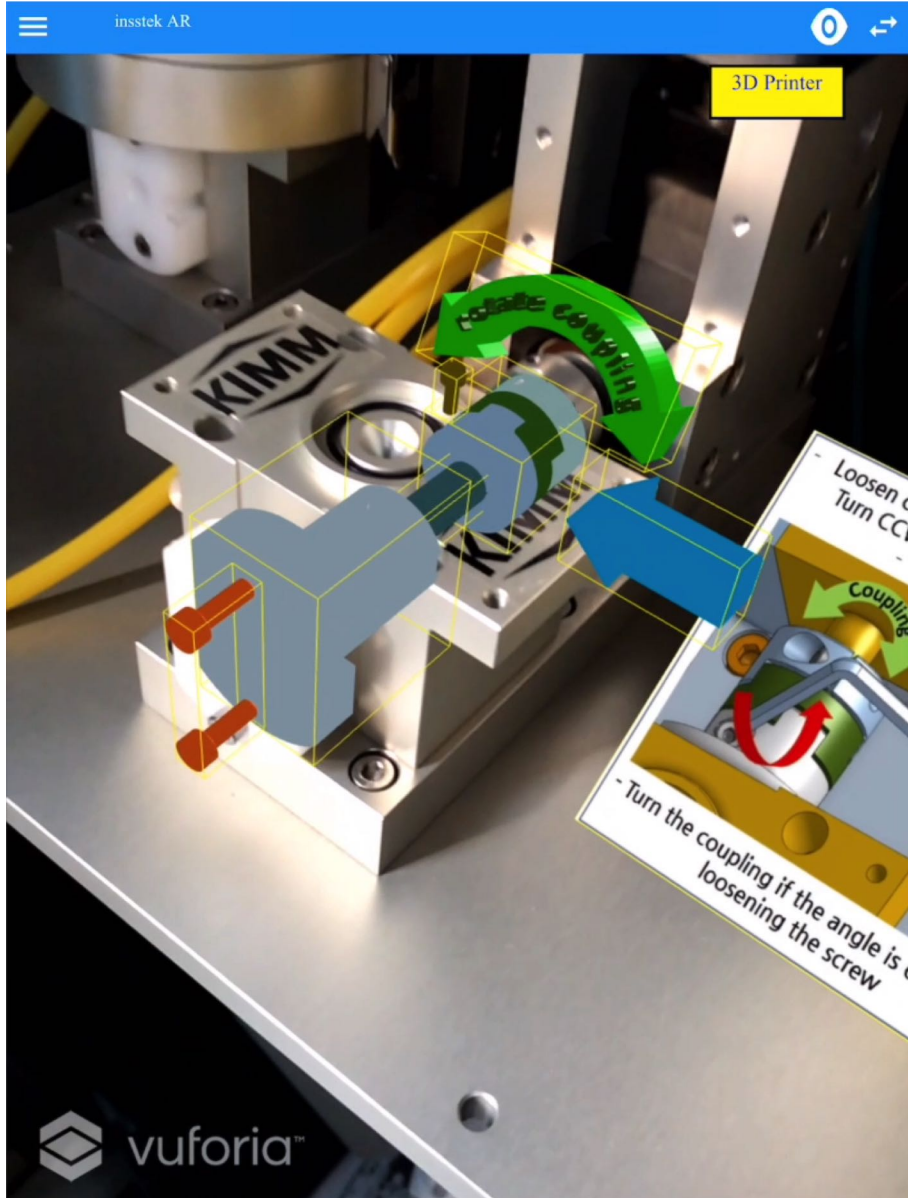


Virtual Reality



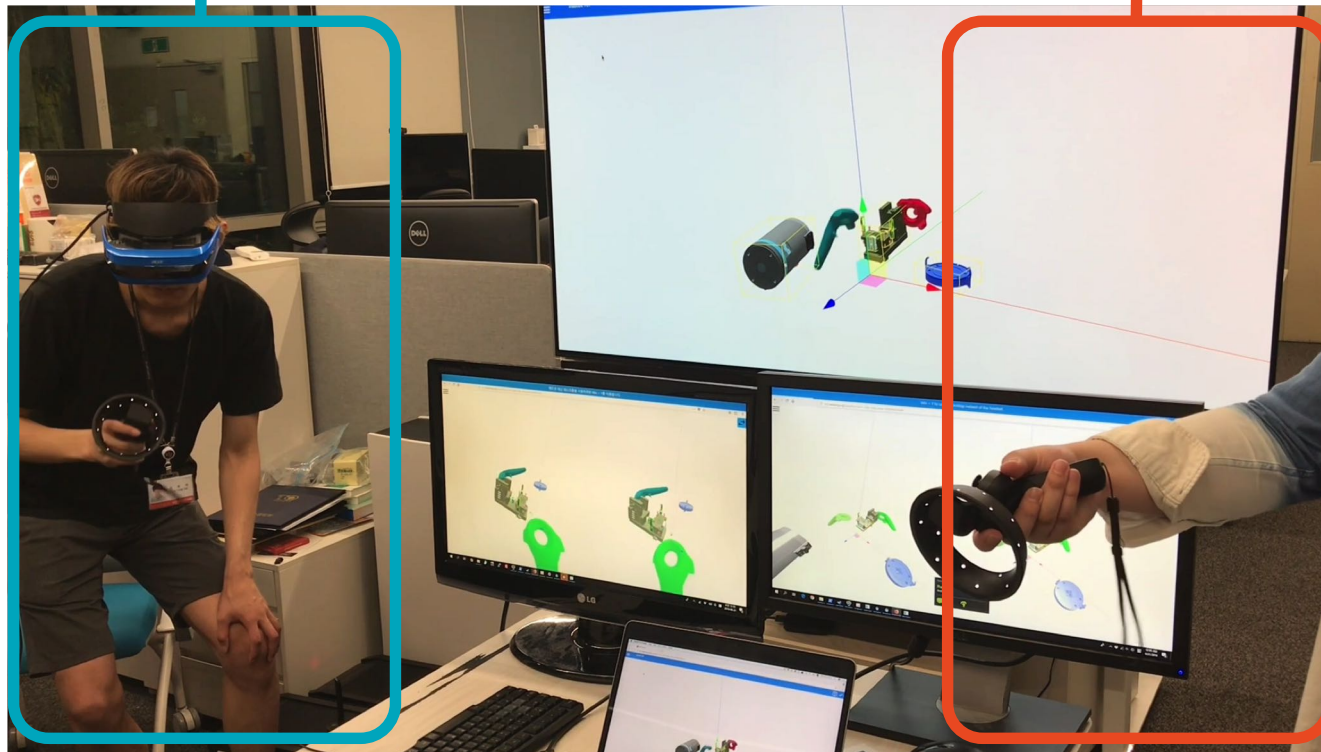
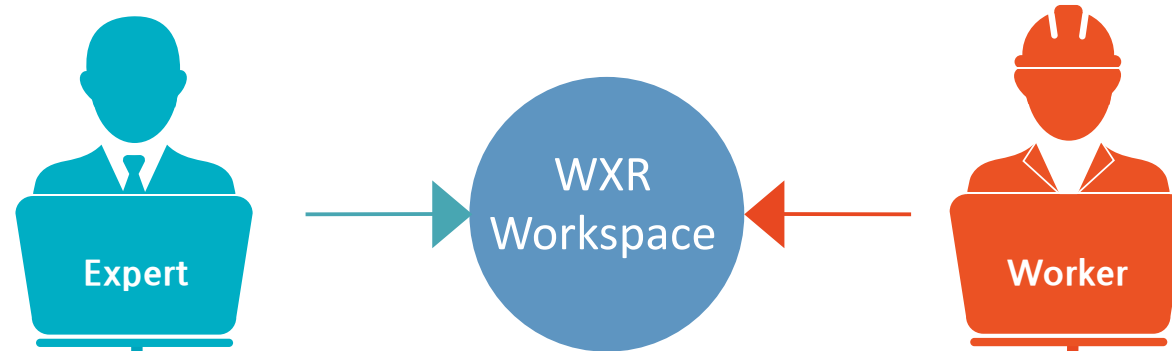
Augmented Reality

AR

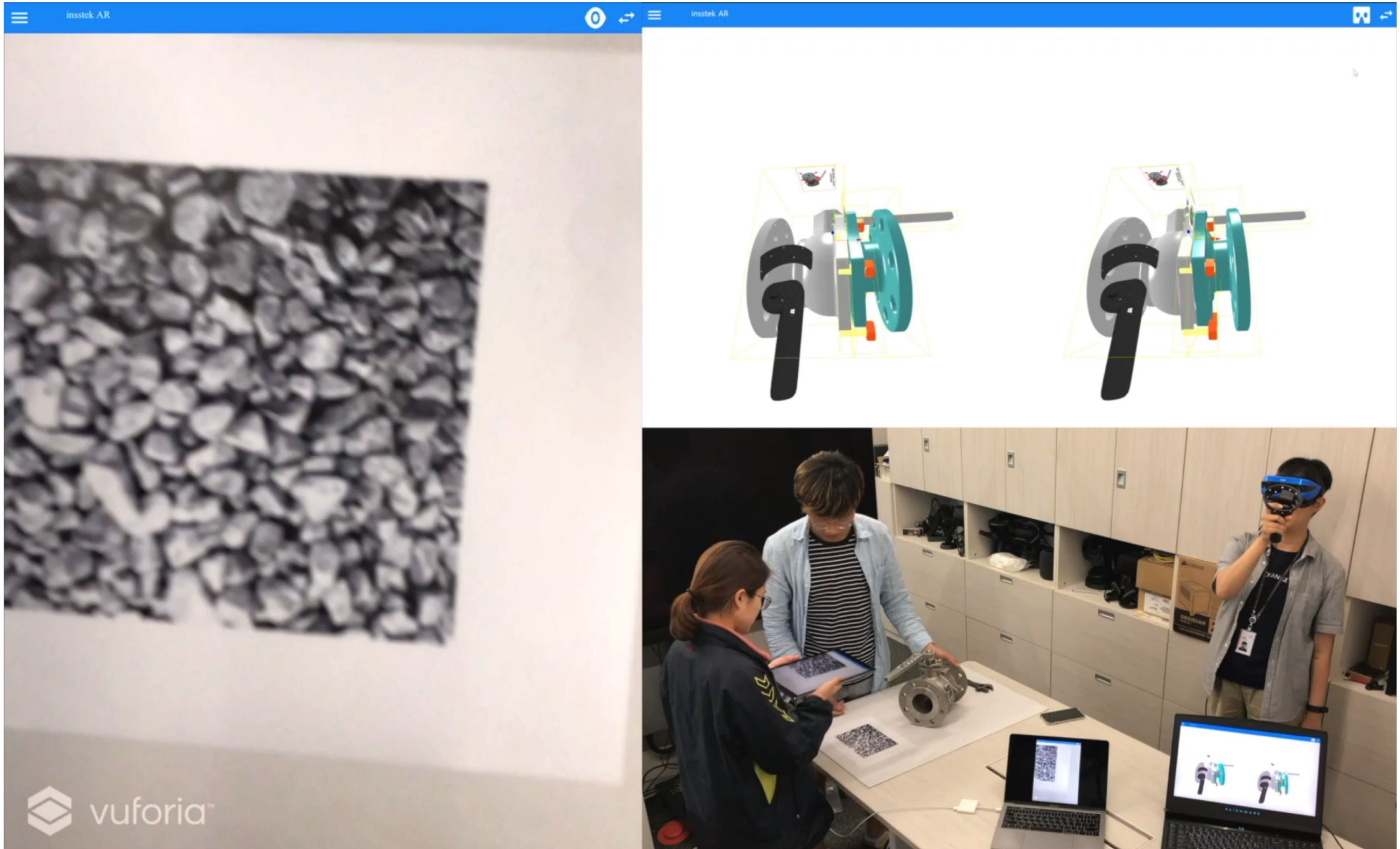


부시(bush) 및 커플링 분해

VR – VR Interaction



AR – VR Interaction



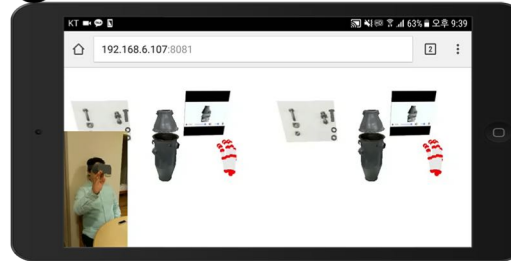
1. WXR Library Development Status
2. How to Authoring Contents & Example
3. Issues & Plans

WXR Library Development Status

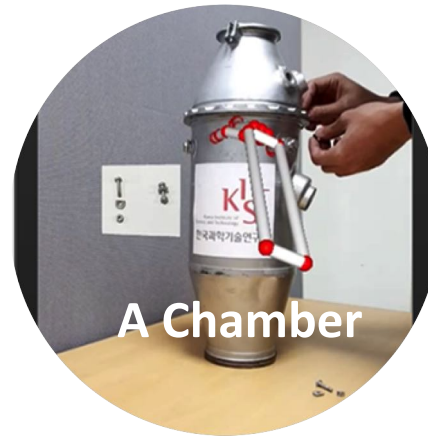
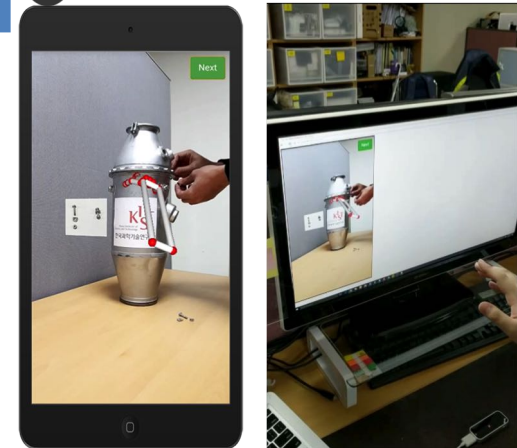
WXR Library Development Status

Concept

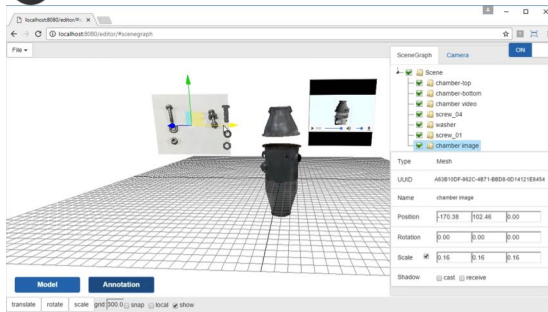
Virtual Reality



Augmented Reality



Desktop 3D



WXR Library Development Status

Concept



WXR Library Development Status

```

1 <script src="https://cdn.rawgit.com/webcomponents/webcomponentsjs/v1.1.0/webcomponents-lite.js"></script>
2 <link href="https://libs.webizing.org/wxr-0.8.html" rel="import">
3 <style id="internal">
4
5 wxr-camera
6 {
7   --wxr-transform:translate3d(0,1.5,0.6)rotate3d(0,0,0);
8 }
9 wxr-light-ambient
10 {
11   --wxr-transform:translate3d(0,0.5,0);
12 }
13 wxr-light-directional
14 {
15   --wxr-transform:translate3d(0,0,0.5);
16 }
17 #handle_arrow
18 {
19   --wxr-transform:translate3d(-0.15,-0.033,0.02)rotate3d(-1.5708,0,0)scale3d(2,2,2);
20 }
21 #handle
22 {
23   --wxr-transform : translate3d(-0.14314130320526366,0.00118852789006789,-0.025979195634589843) rotate3d(1.5708,0,0) scale3d(1.4,1.4,1.4);
24 }
25 #annotation01
26 {
27   --wxr-transform:translate3d(-0.215,-0.1,0)rotate3d(0,0,3.14)scale3d(0.08,0.08,0.08);
28 }
29 #STEP01
30 {
31   --wxr-transform:translate3d(-0.2,1.04,0)rotate3d(-1.5708,0,3.14)scale3d(1,1,1);
32 }
33
34 ...
35
36 </style>

```

1. Load WXR Library

2. Define Transformation

```

38 <wxr-user user-id="jungmin.ha@wrl.onl" authority="owner" me=""></wxr-user>
39
40 <wxr-description title="Ballvalve VR" img="https://wxr.nyc3.digitaloceanspaces.com/ar3dp/thumb/ar-thumb.png" desc="insstek 3D printer maintenance using WXR AR browser"></wxr-description>
41 <wxr-view default="3D" current="3D" modes="['&quot;3D&quot;; &quot;AR&quot;; &quot;VR&quot;]"></wxr-view>
42 <wxr-ar engine="vuforia"></wxr-ar>
43
44 <wxr-camera fovy="61" near="0.05000024999875001" far="10000.099999934488" fov="48.971829803354346" aspect="0.7494508982741055"></wxr-camera>
45 <wxr-space src="http://content.wxr.webizing.org/space/1" augbase="https://wxr.nyc3.digitaloceanspaces.com/ar3dp/target/test/stones">
46
47   <wxr-light-ambient color="0xf0f0f0" intensity="0.6"></wxr-light-ambient>
48   <wxr-light-directional color="0xf0f0f0" intensity="0.1"></wxr-light-directional>
49
50   <wxr-target id="STEP01" src="https://wxr.nyc3.digitaloceanspaces.com/ar3dp/target/ballvalve/01">
51     <wxr-obj id="handle" mtl="00_handle.mtl" obj="00_handle.obj" base-url="https://wxr.nyc3.digitaloceanspaces.com/ar3dp/resources/models/valve_3d" observetrigger="true"></wxr-obj>
52     <wxr-obj id="handle_arrow" mtl="00_arrow.mtl" obj="00_arrow.obj" base-url="https://wxr.nyc3.digitaloceanspaces.com/ar3dp/resources/models/valve_3d"></wxr-obj>
53     <wxr-plane id="annotation01" texture="https://wxr.nyc3.digitaloceanspaces.com/ar3dp/resources/dialog/valve_ar/step01.jpg"></wxr-plane>
54   </wxr-target>
55
56   ...
57
58 </wxr-space>

```

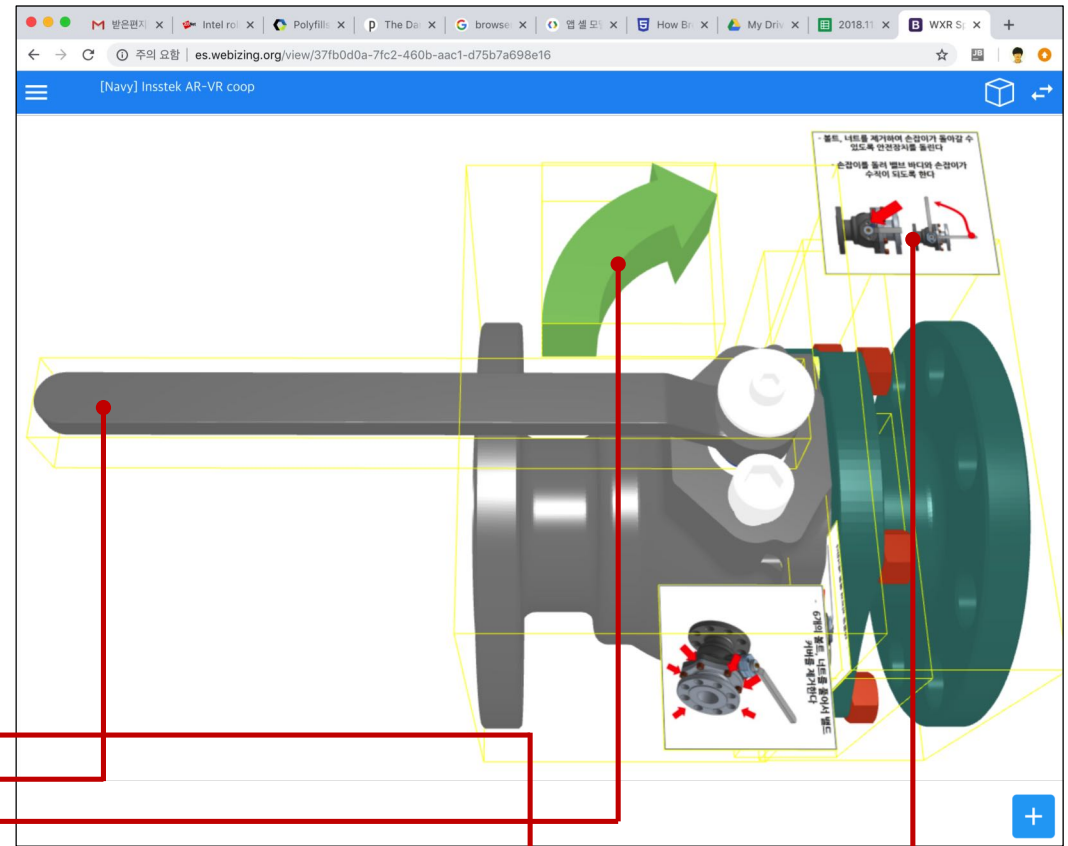
3. Define Scene Tree

Concept

```

38 <wxr-user user-id="jungmin.ha@wrl.or
39
40 <wxr-description title="Ballvalve VF
41 <wxr-view default="3D" current="3D"
42 <wxr-ar engine="vuforia"></wxr-ar>
43
44 <wxr-camera fovy="61" near="0.050000
45 <wxr-space src="http://content.wxr.v
46
47 <wxr-light-ambient color="0xf0f0
48 <wxr-light-directional color="0>
49
50 <wxr-target id="STEP01" src="htt
51 <wxr-obj id="handle" mtl="00
52 <wxr-obj id="handle_arrow" m
53 <wxr-plane id="annotation01"
54 </wxr-target>
55
56 ...
57
58 </wxr-space>

```



Configuration Management

WXR PROJECT

Group

Repository

WXR-Core

- wxr.js
- wxr-three.js
- polymer-elements
- wxr-www
- wxr-element
- wxr-example

WXR-Browser

- wxr-android-browser
- wxr-ios-browser

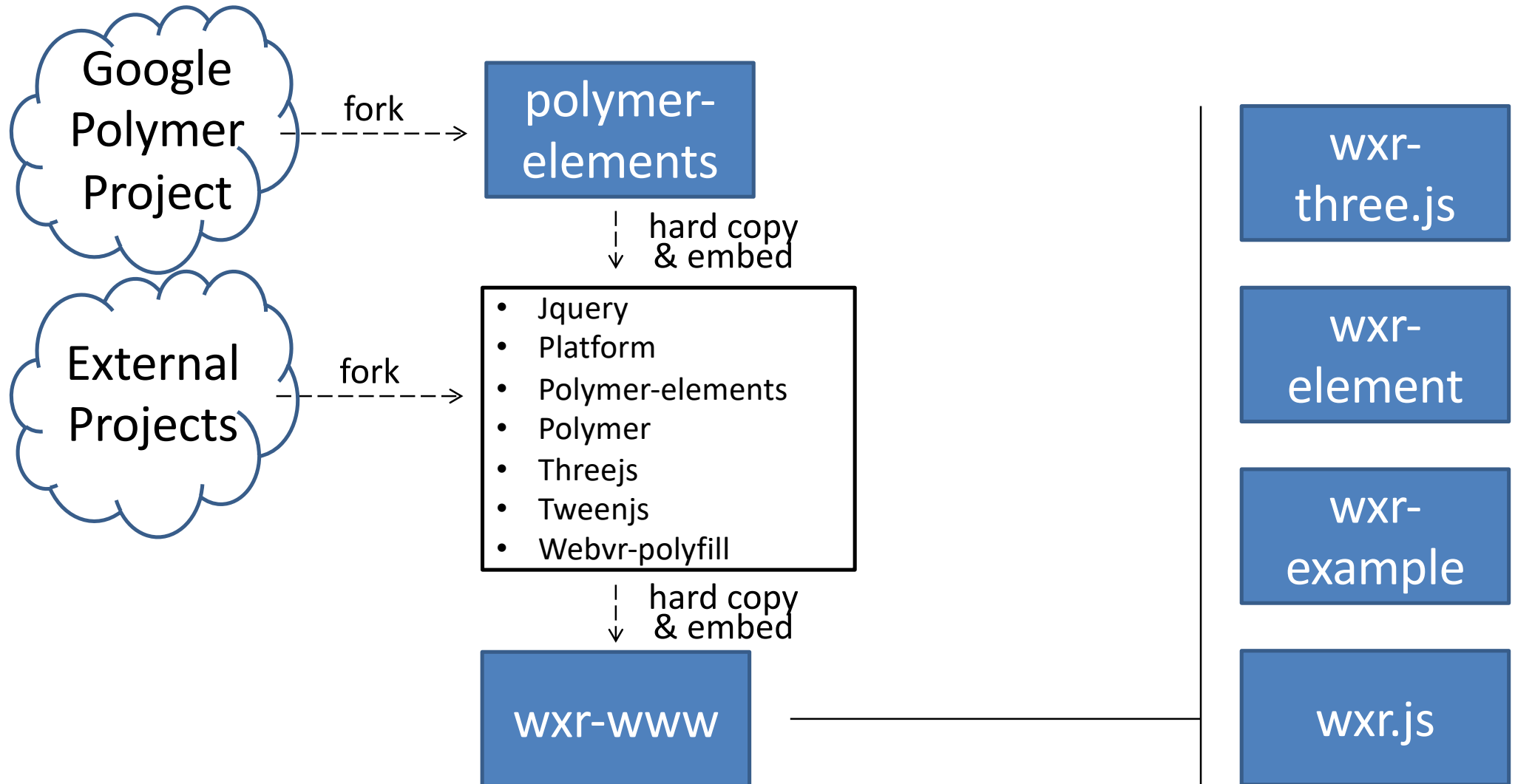
WXR-Server

- wxr-space-server

WXR-Device

- wxr-webizing-device-manager
- wxr-dummy-device-adaptor
- wxr-hand-leapmotion-adaptor
- wxr-hand-steamvrcontroller-adaptor
- wxr-tracker-optitrack-adaptor
- socket.io-client-cpp

Repository Dependency: WXR-Core

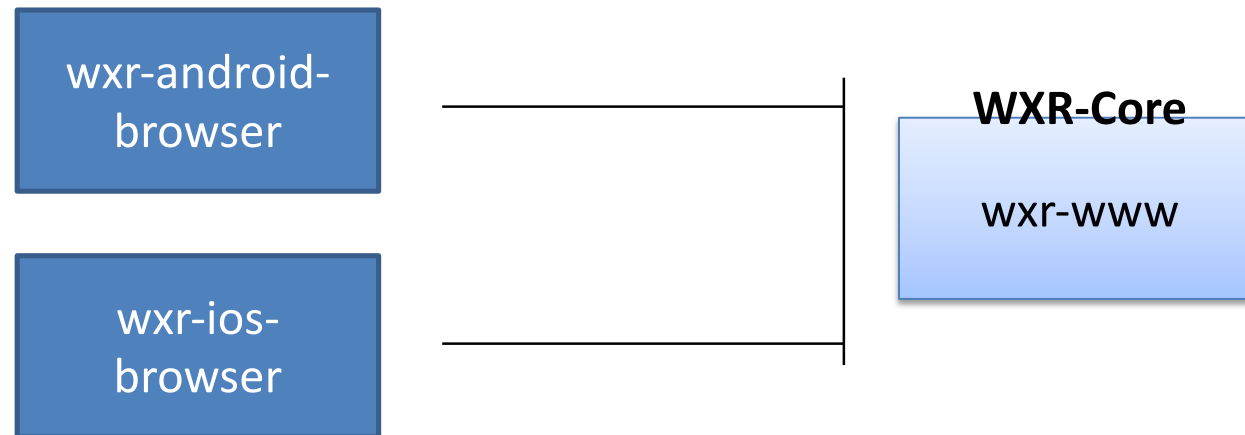


Packaging followings as wxr.html

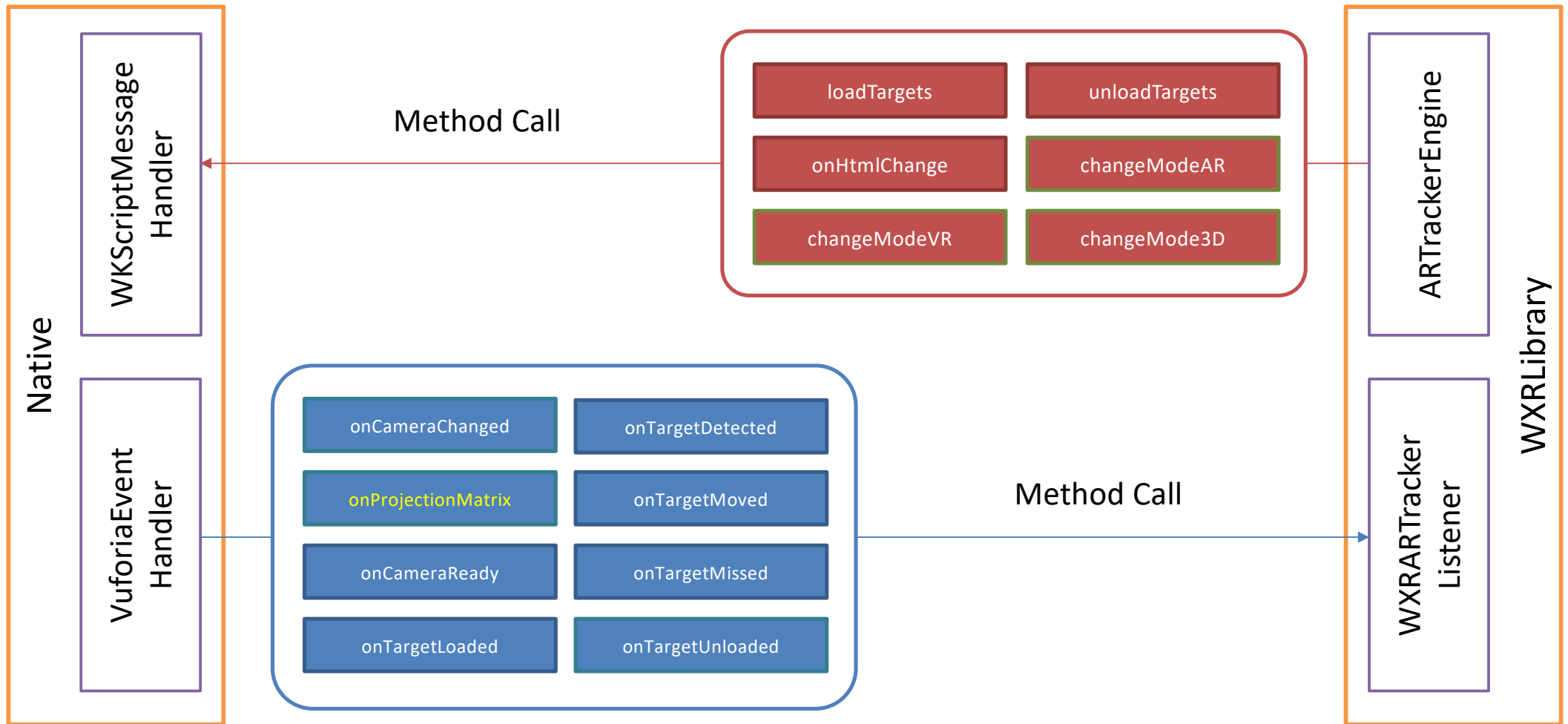
Class Hierarchy of wxr-element

polymer.Element	wxr-element	wxr-world					
		wxr-camera					
		wxr-space					
		wxr-geometry	wxr-light	wxr-light-ambient	wxr-light-directional	wxr-light-point	wxr-light-spot
			wxr-axes				
			wxr-boundary				
			wxr-box				
			wxr-circle				
			wxr-collada				
			wxr-cylinder				
	wxr-obj						
	wxr-plane						
	wxr-ring						
	wxr-sphere						
	wxr-teapot						
wxr-trigger							
wxr-target							
wxr-html							
wxr-peripheral	wxr-peripheral-hmd	wxr-hmd-mixedreality	wxr-hmd-oculus	wxr-hmd-vive	wxr-ar-vuforia		
	wxr-peripheral-ar						
	wxr-device-hand	wxr-hand-leapmotion	wxr-hand-oculustouch	wxr-hand-steamvrcontroller	wxr-hand-vivecontroller		
	wxr-peripheral-tracker	wxr-hand-motioncontroller	wxr-tracker-vivetracker	wxr-tracker-tobiieyex	wxr-tracker-realsense		
	wxr-peripheral-iot				wxr-iot-foobot		
wxr-ui	wxr-appbar						
	wxr-debug						
	wxr-editor						
	wxr-layerui						
wxr-slider							
wxr-ar							
wxr-description							
wxr-animation							
wxr-requirement							
wxr-user							
wxr-view							

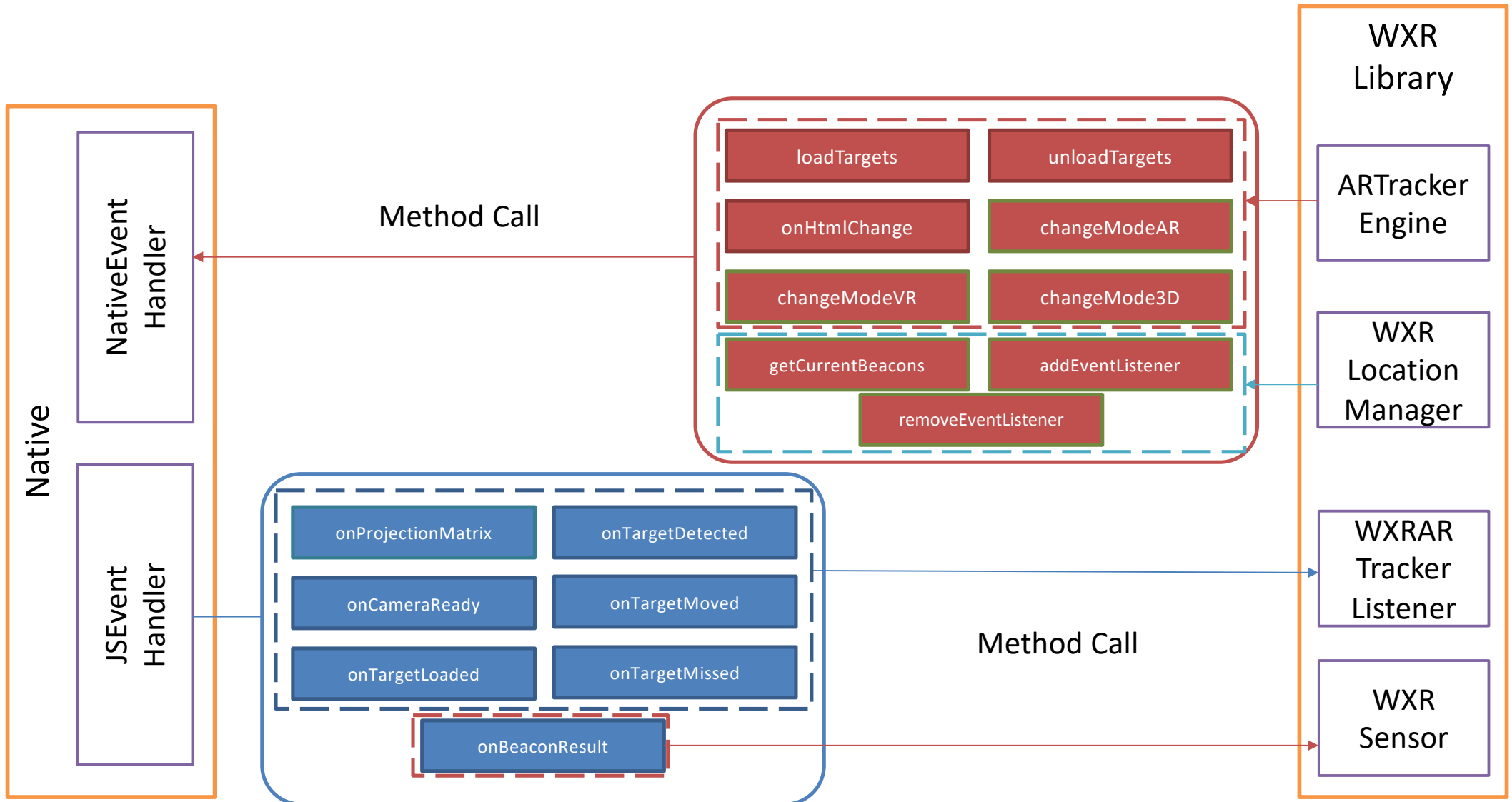
Repository Dependency: WXR-Browser



Communicate with Native Mobile: wxr-ios-browser



Communicate with Native Mobile: wxr-android-browser

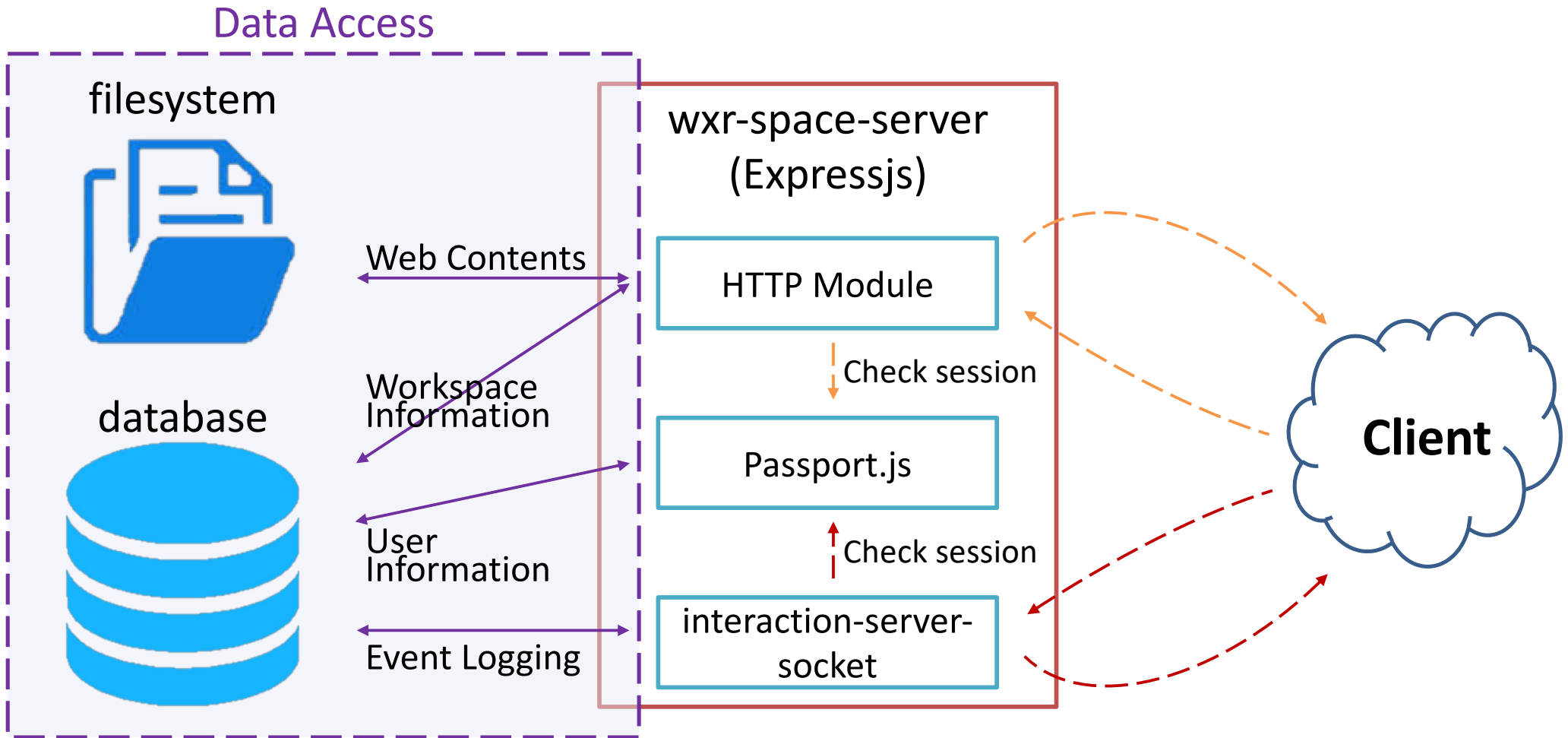


WXR Library Development Status

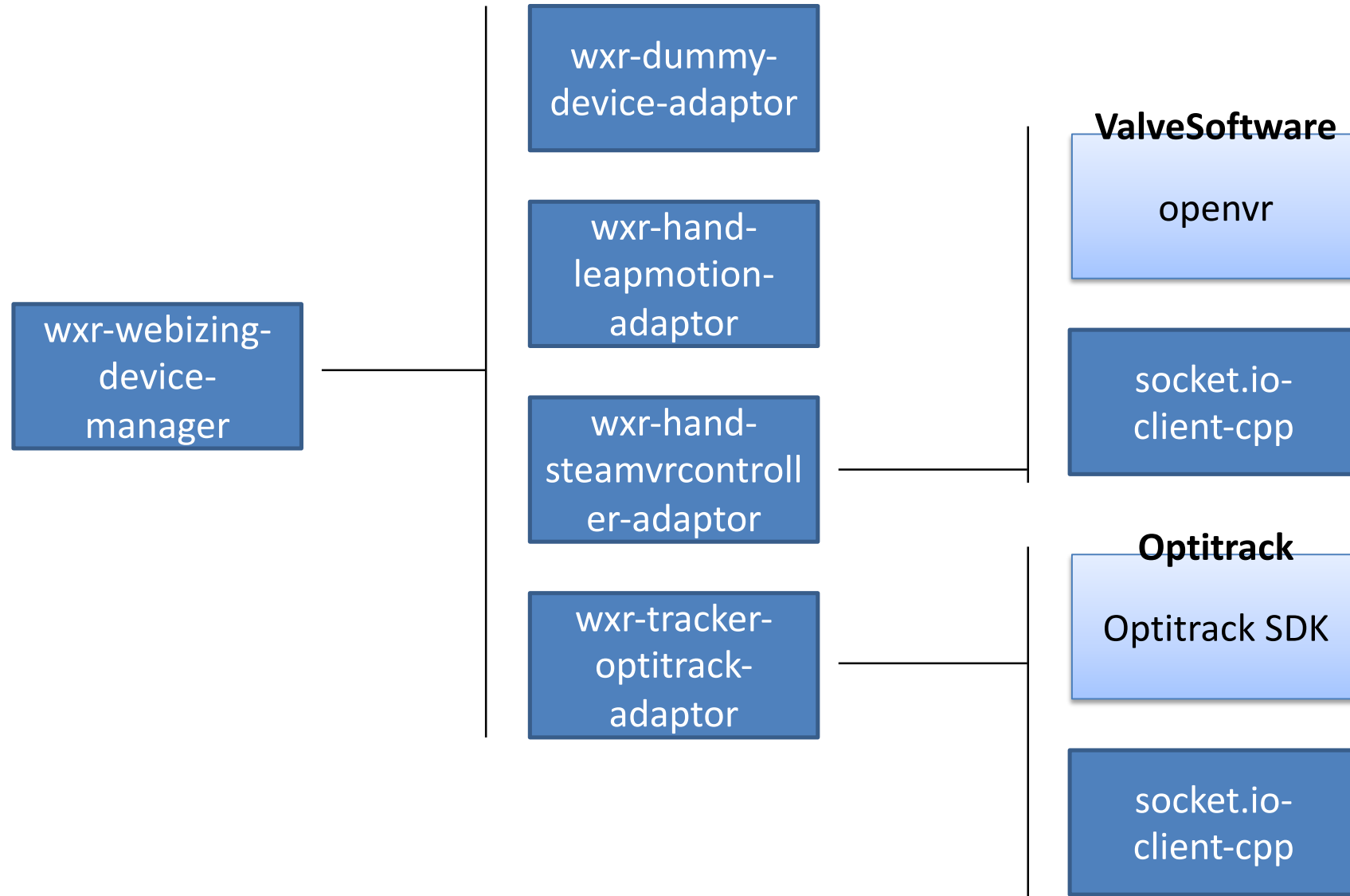
Repository Dependency: WXR-Space-Server

wxr-space-
server

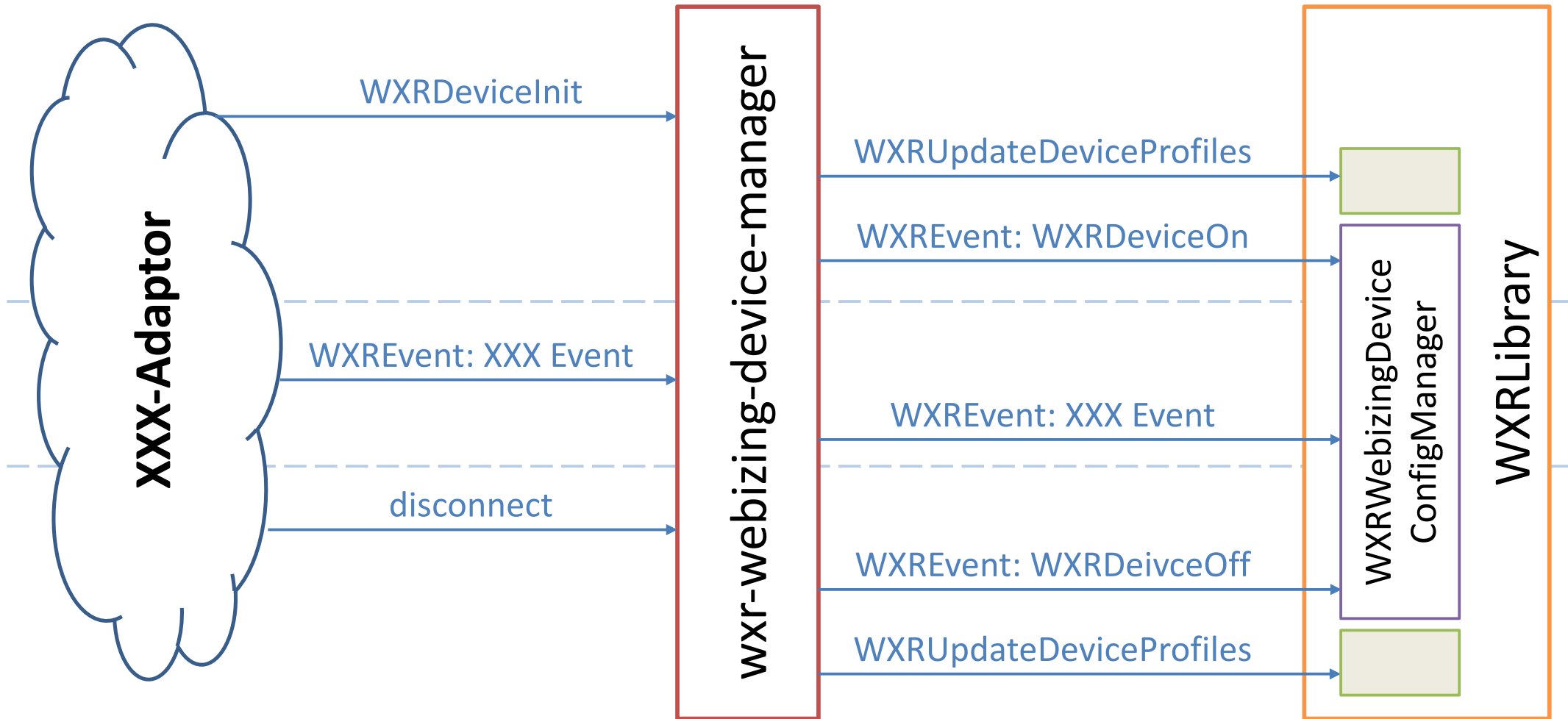
WXR Library Development Status
Application Flow Chart



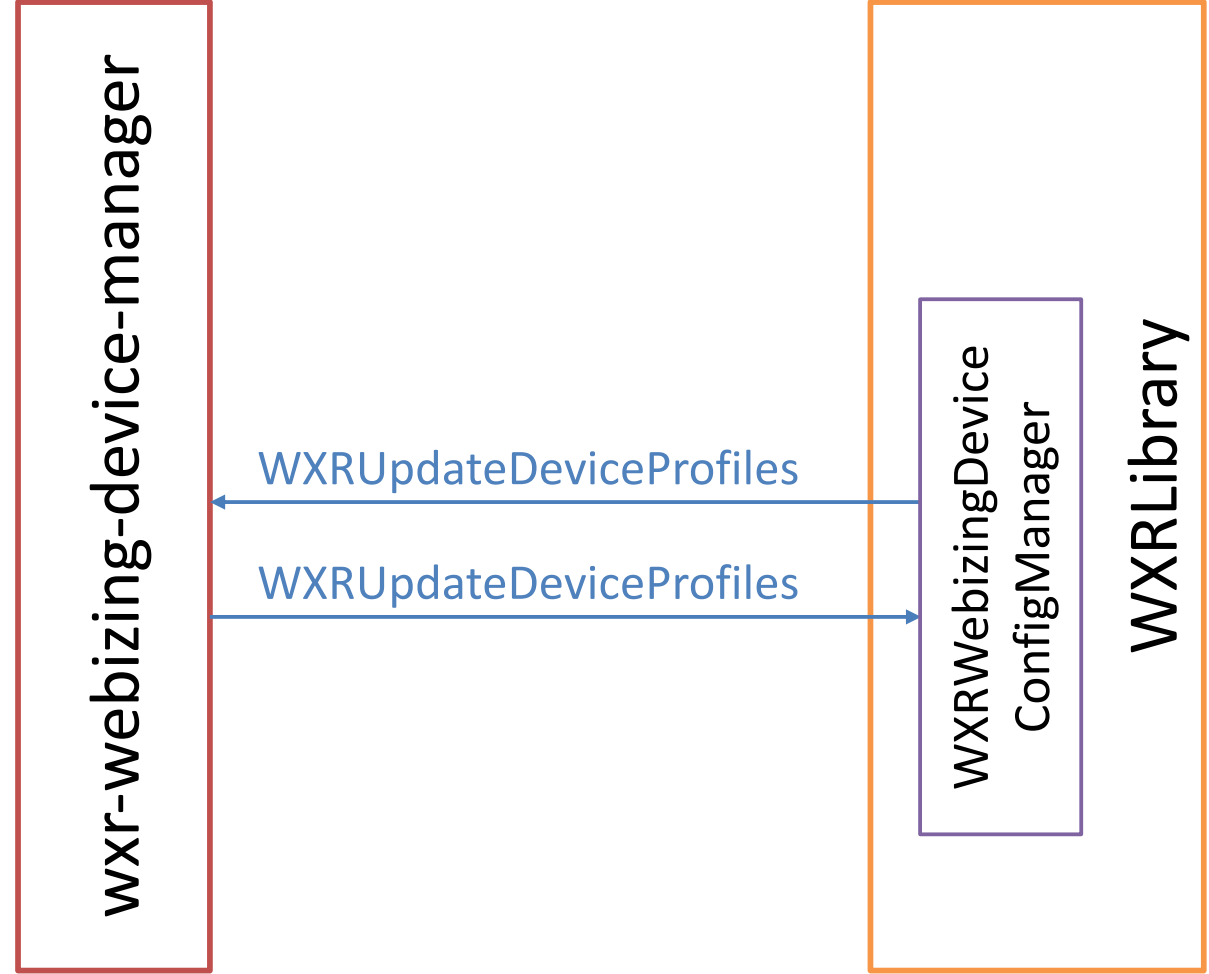
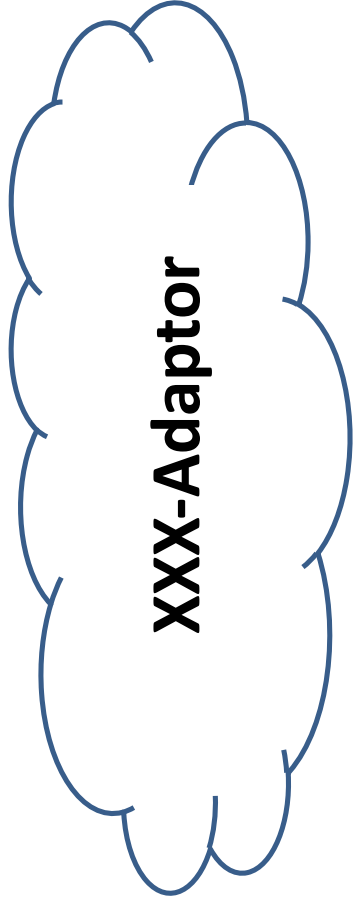
Repository Dependency: WXR-Device



Application Flow Chart: Device Connecting, Disconnecting, Event Streaming



Application Flow Chart: Configuring Device Profile



Demo: Authoring Scene (Source Code)

☰ Title 📦 ↔

WRL - 3D Printer

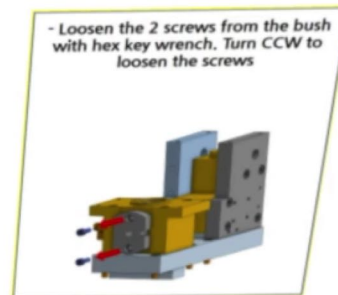
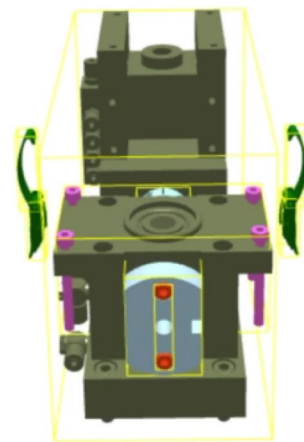
Source code

```
61 <wxr-html id="anno" css3d_uuid="A98FD3D0-9926-4E87-B4E8-832A228042B3" WebGL_uuid="86E7939C-88FD-4B2C-9123-996731BE10D2">
62   <div class="bno">
63     <h3>Sun</h3>
64     <iframe width="1100" height="1300" src="http://203.255.251.35:8321" frameborder="0" allowfullscreen=""></iframe>
65   </div>
66 </wxr-html>
67 <wxr-animation type="rotation" to="1 0 0" duration="5000" repeat="Infinity" easing="linear"></wxr-animation>
68 <wxr-animation type="movement" to="1 0 0" duration="5000" repeat="1" easing="linear">
69
70 </wxr-box>
71
72 <wxr-box id="box02" width="0.05" height="0.1" depth="0.1" color="0xffff00" WebGL_uuid="CB93A79A-F455-4786-8023-2950C70C2C1E" css3d_uuid="48803711-7FAB-467E-855B-FBA44AE12A8C">
73   <wxr-animation type="movement" to="1 0 0" duration="5000" repeat="1" easing="linear">
74   <wxr-animation type="movement" to="1 0 1" duration="5000" repeat="2" easing="linear"></wxr-animation>
75
```

확인

+

Demo: Authoring Scene (GUI)



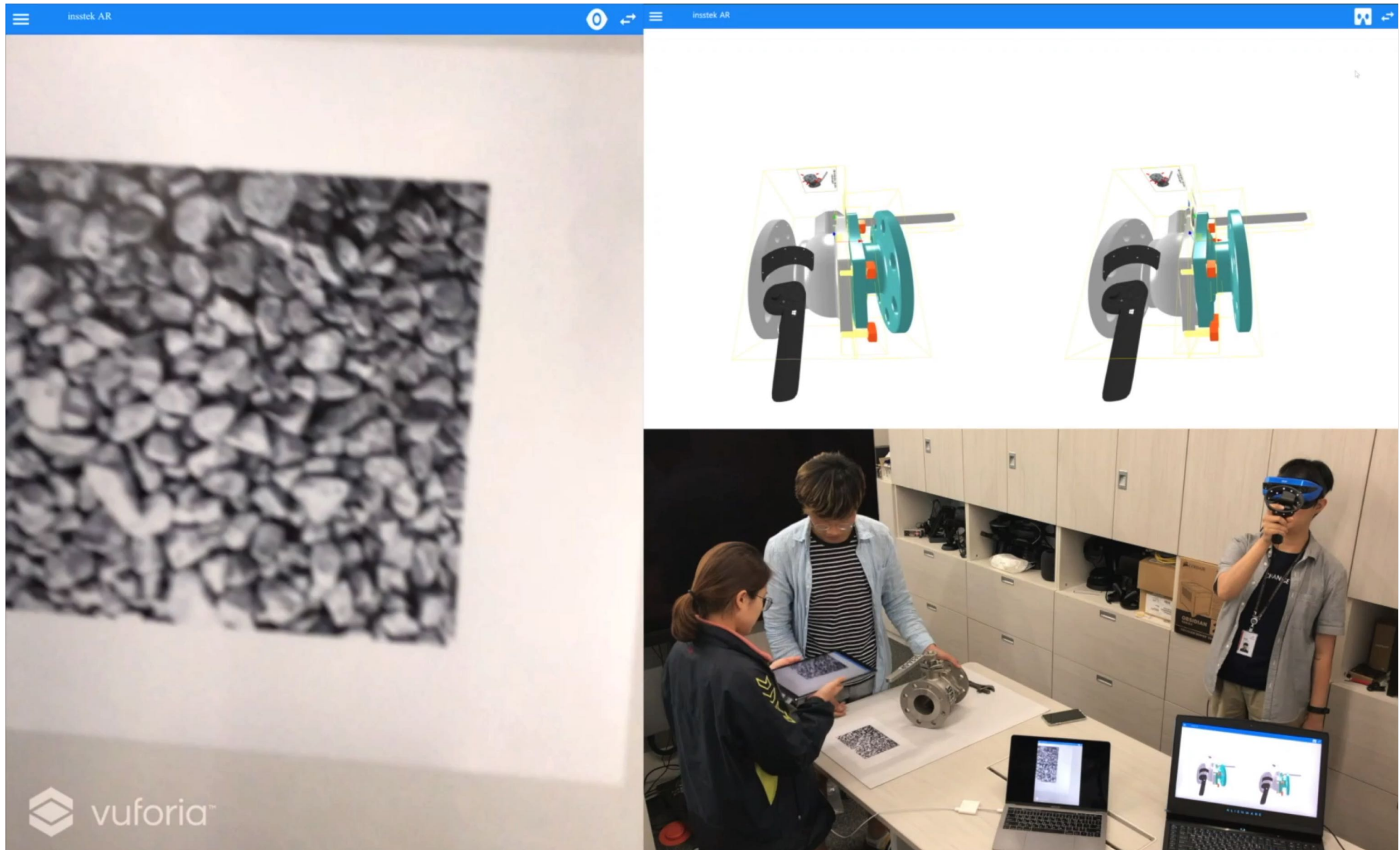
WXR Library Development Status

Demo: Colaborating between VR and VR



WXR Library Development Status

Demo: Colaborating between AR and VR



How to Authoring Contents & Authoring Examples

Upload 3D models to use on the Web



WXR

<https://wxr.nyc3.digitaloceanspaces.com> / 321.5 MB / 469 items

Files Settings

Start typing to filter the list of files and folders

Actions ▾

New Folder

Upload Files

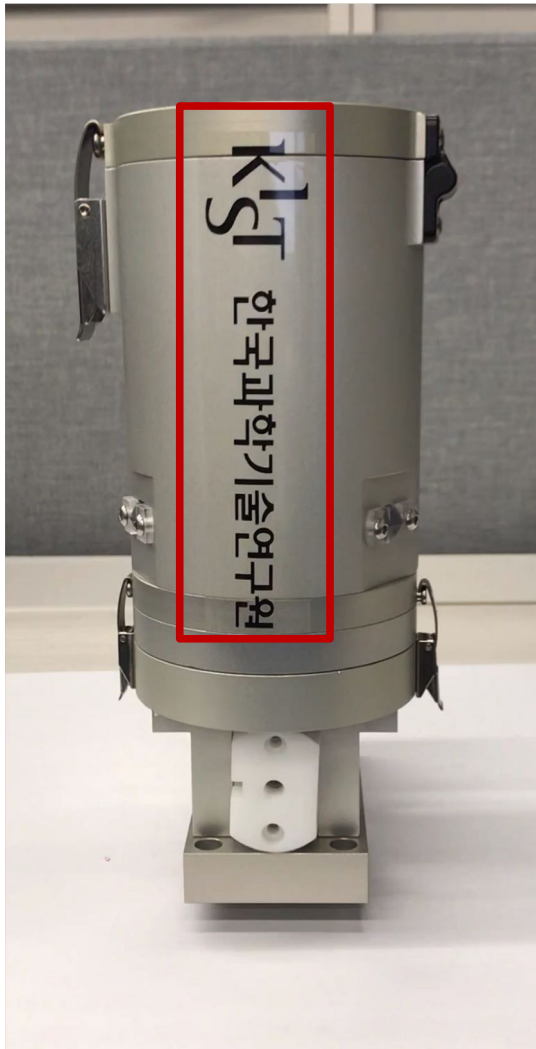
wxr > ar3dp > resources > models > nozzle

48 items

<input type="checkbox"/>	Name	Size	Last Modified	
<input type="checkbox"/>	 destroyed.mtl	229 B	2 months ago	More ▾
<input type="checkbox"/>	 destroyed.obj	165.1 KB	2 months ago	More ▾
<input type="checkbox"/>	 hexkey.mtl	225 B	2 months ago	More ▾
<input type="checkbox"/>	 hexkey.obj	14 KB	2 months ago	More ▾

How to Authoring Contents & Example Register markers on Vuforia

AR target marker



ng

vuforia™ Developer Portal Hello jlee1021 | Log Out

Home Pricing Downloads Library **Develop** Support

License Manager **Target Manager**

Target Manager > 3Dprinter-nozzle

3Dprinter-nozzle [Edit Name](#)

Type: Device

Targets (14)

[Add Target](#) [Download Database \(All\)](#)

<input type="checkbox"/>	Target Name	Type	Rating	Status	Date Modified
<input type="checkbox"/>	plate5	Single Image	★★★★☆	Active	Oct 23, 2018 14:31
<input type="checkbox"/>	new2	Single Image	★★★★★	Active	Oct 23, 2018 14:29
<input type="checkbox"/>	destroyed2	Single Image	★★★★☆	Active	Oct 23, 2018 14:28
<input type="checkbox"/>	body2	Single Image	★★★★☆	Active	Oct 22, 2018 22:55
<input type="checkbox"/>	body	Single Image	★★★★☆	Active	Oct 22, 2018 22:54
<input type="checkbox"/>	new1	Single Image	★★★★★	Active	Sep 19, 2018 17:00
<input type="checkbox"/>	destroyed1	Single Image	★★★★☆	Active	Sep 19, 2018 17:00
<input type="checkbox"/>	plate4	Single Image	★★★★☆	Active	Sep 19, 2018 16:55
<input type="checkbox"/>	new	Single Image	★★★★☆	Active	Sep 19, 2018 03:11
<input type="checkbox"/>	destroyed	Single Image	★★★★☆	Active	Sep 19, 2018 03:10
<input type="checkbox"/>	plate	Single Image	★★★★☆	Active	Sep 14, 2018 15:18
<input type="checkbox"/>	printer3	Single Image	★★★★☆	Active	Sep 14, 2018 15:18
<input type="checkbox"/>	printer2	Single Image	★★★★☆	Active	Sep 14, 2018 15:17
<input type="checkbox"/>	printer1	Single Image	★★★★★	Active	Sep 14, 2018 15:17

Last updated: Today 01:03 PM [Refresh](#)

How to Authoring Contents & Example

Upload marker data on the Web





 **WXR**
<https://wxr.nyc3.digitaloceanspaces.com> / 321.5 MB / 469 items

Files Settings

Start typing to filter the list of files and folders

Actions ▾ New Folder Upload Files

wxr > ar3dp > target > coffee > grinder03 4 items

<input type="checkbox"/>	Name	Size	Last Modified	
<input type="checkbox"/>	 index.json	366 B	4 months ago	More ▾
<input type="checkbox"/>	 pg3.dat	23 KB	4 months ago	More ▾
<input type="checkbox"/>	 pg3.jpg	8 KB	4 months ago	More ▾
<input type="checkbox"/>	 pg3.xml	251 B	4 months ago	More ▾

Download marker data from Vuforia

How to Authoring Contents & Example URL will be property of tag

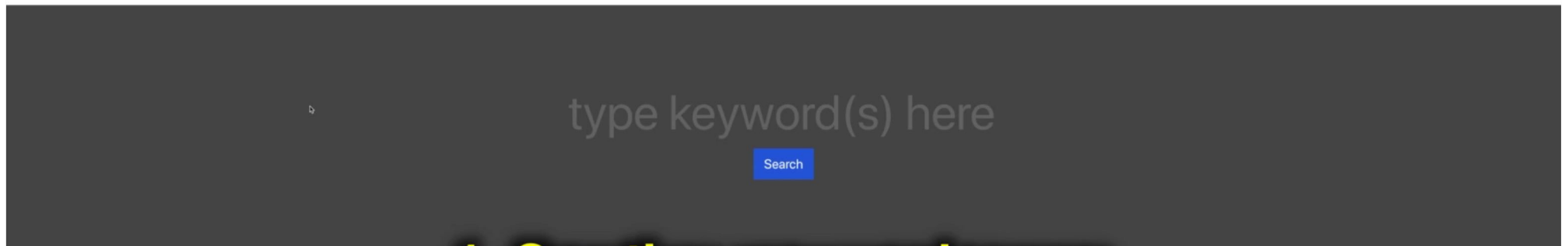
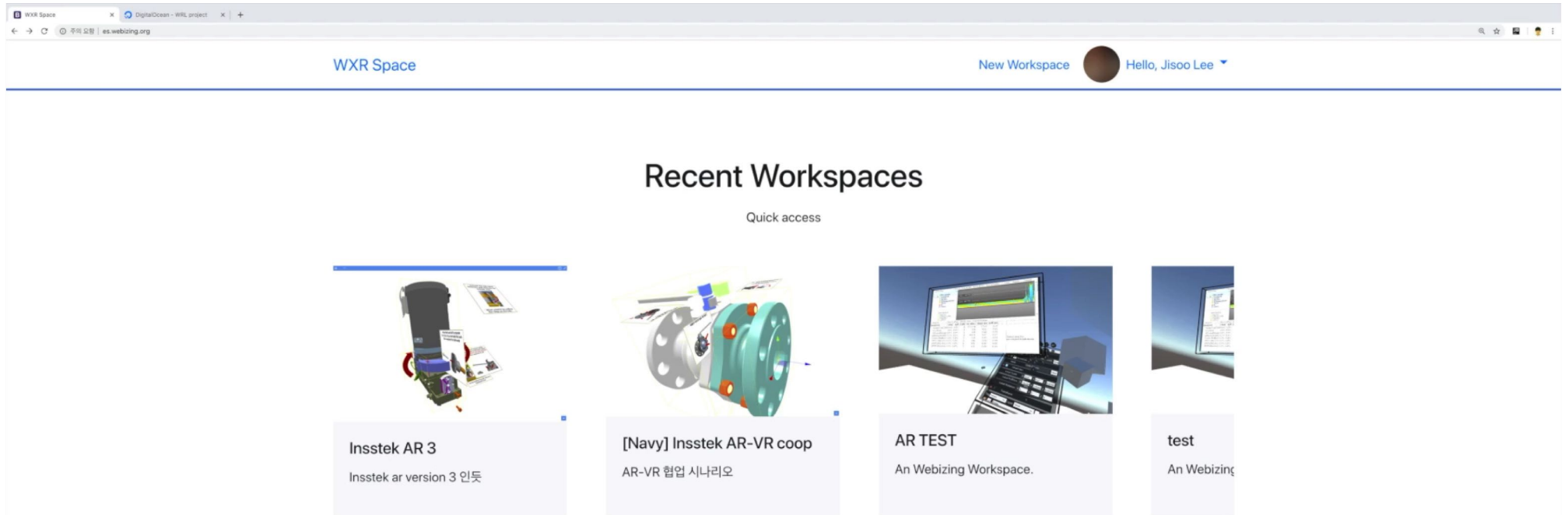
```

35
36 </style>
37
38 <wxr-user user-id="jungmin.ha@wrl.onl" authority="owner" me=""></wxr-user>
39
40 <wxr-description title="Ballvalve VR" img="https://wxr.nyc3.digitaloceanspaces.com/ar3dp/thumb/ar-thumb.png" desc="insstek 3D printer maintenance using WXR AR browser"></wxr-description>
41 <wxr-view default="3D" current="3D" modes="[{"type":"3D","label":"VR"}]"></wxr-view>
42 <wxr-ar engine="vuforia"></wxr-ar>
43
44 <wxr-camera fovy="61" near="0.05000024999875001" far="10000.099999934488" fov="48.971829803354346" aspect="0.7494508982741055"></wxr-camera>
45 <wxr-space src="http://content.wxer.webizing.org/space/1" augbase="https://wxr.nyc3.digitaloceanspaces.com/ar3dp/target/test/stones">
46
47   <wxr-light-ambient color="0xf0f0f0" intensity="0.6"></wxr-light-ambient>
48   <wxr-light-directional color="0xf0f0f0" intensity="0.1"></wxr-light-directional>
49
50   <wxr-target id="STEP01" src="https://wxr.nyc3.digitaloceanspaces.com/ar3dp/target/ballvalve/01">
51     <wxr-obj id="handle" mtl="00_handle.mtl" obj="00_handle.obj" base-url="https://wxr.nyc3.digitaloceanspaces.com/ar3dp/resources/models/valve_3d" observetrigger="true"></wxr-obj>
52     <wxr-obj id="handle_arrow" mtl="00_arrow.mtl" obj="00_arrow.obj" base-url="https://wxr.nyc3.digitaloceanspaces.com/ar3dp/resources/models/valve_3d"></wxr-obj>
53     <wxr-plane id="annotation01" texture="https://wxr.nyc3.digitaloceanspaces.com/ar3dp/resources/dialog/valve_ar/step01.jpg"></wxr-plane>
54   </wxr-target>
55
56   ...
57
58 </wxr-space>
59

```

Use these location at Digital Ocean to add target or object.
Transform the target or object in style tag. (optional)
Additionally add functions or tags to implement the contents.

How to Authoring Contents & Example Demo: Authoring Example



1. Creating new workspace

Issues & Plans

○ Issues

- ~~Unstable connection between Firefox and SteamVR~~
- Low recognition rate of AR Marker
- Hard to synchronize scene with massive users

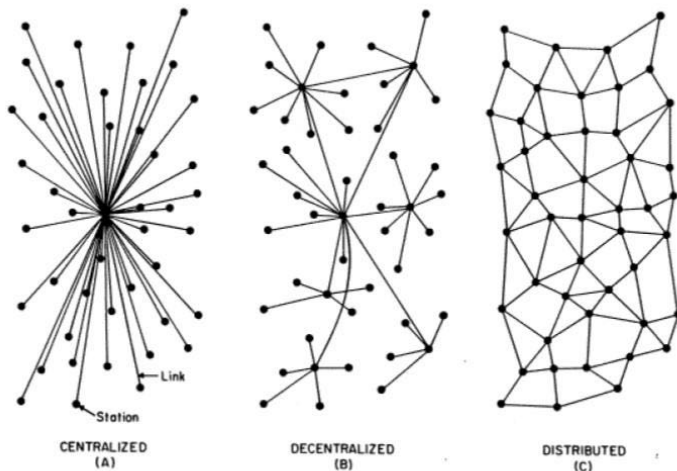
○ Plans

- To stable connection between Firefox and SteamVR
- Custom tag hierarchy architecture remodeling
- Extension for more variety of Human Interaction Device
- Extension to using **decentralized Web**
- Upgrade third party libraries' version

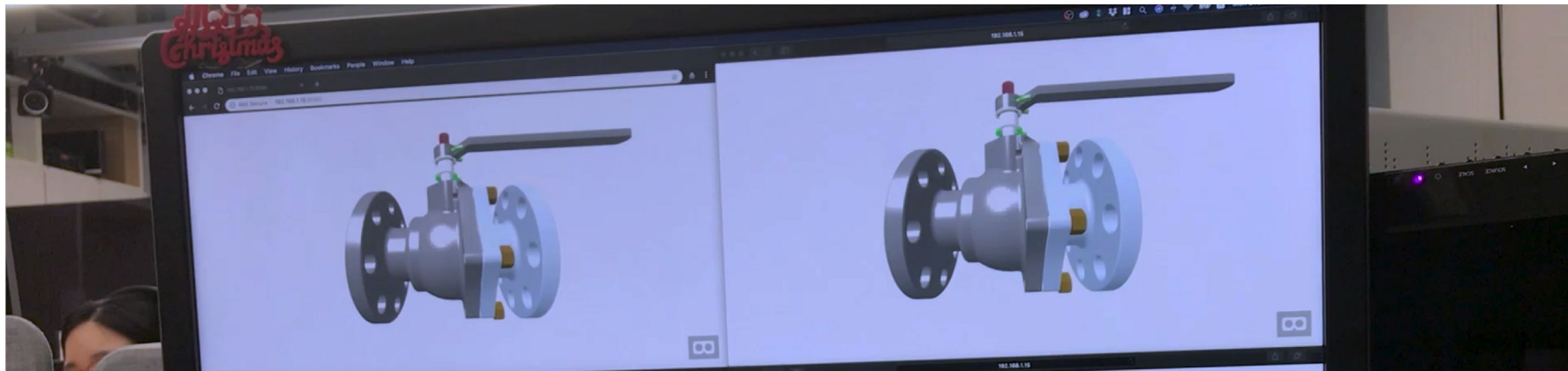
Decentralized WebXR

- Decentralized Web

- Killing the server : Redesigning data structures
- From data monarchy to data democracy
- Web 3.0 Technology Stack



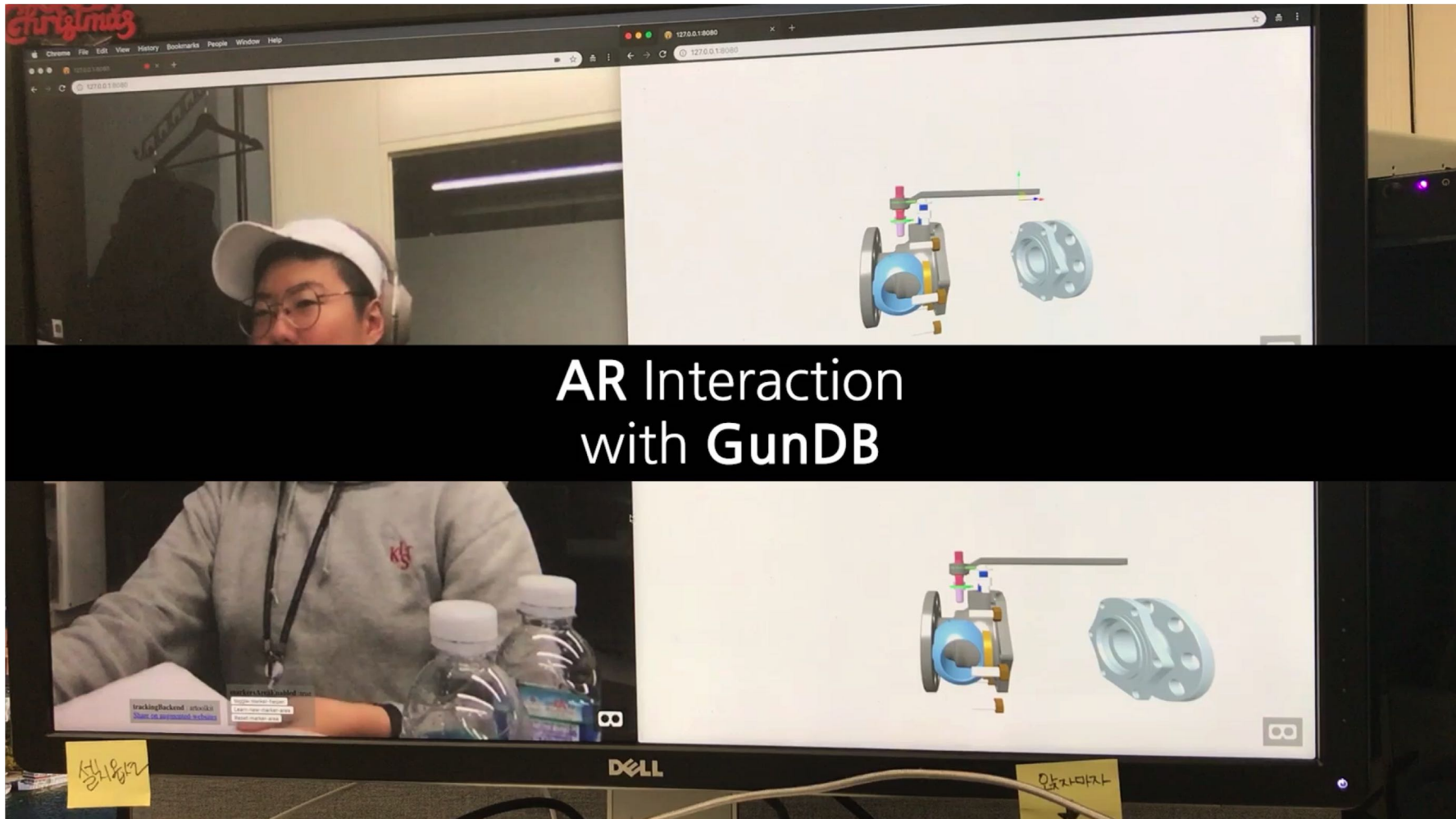
DWXR



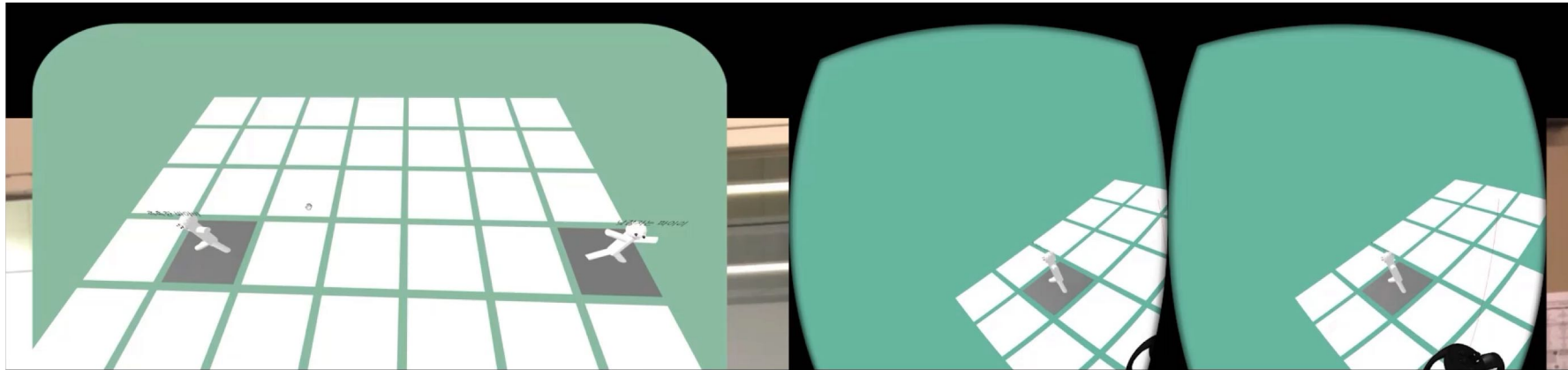
Data Synchronization with GunDB



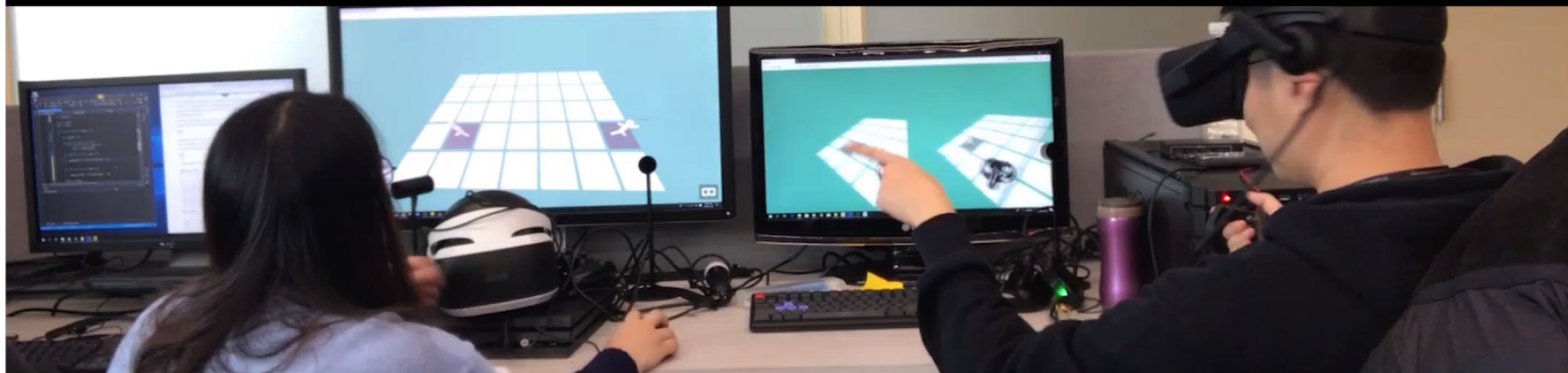
DWXR – AR Interaction



DWXR – VR Interaction



VR Interaction
with GunDB



Thank You



Webizing Research Laboratory (WRL)

<http://www.wrl.onl>

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