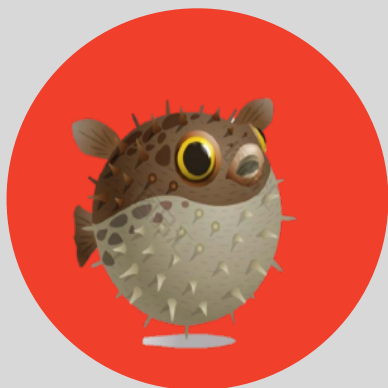# FUGU 项目介绍与技术实践

宋方振

◦ 公司： **ByteDance 字节跳动**

◦ 部门： Web Lab （开源、XR、AI etc)

◦ 工作经历：

  ◦ 2020.06 – 2021.06 Chromium 开源社区
    (Fugu、PWA)

  ◦ 2021.07 – 至今 XR
    (WebXR、MetaWeb)

◦ 公开组织：

  ◦ Chromium 开源社区 (Committer)
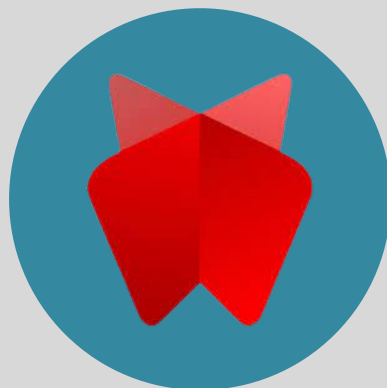
  ◦ W3C Immersive Web Working Group (Participants)
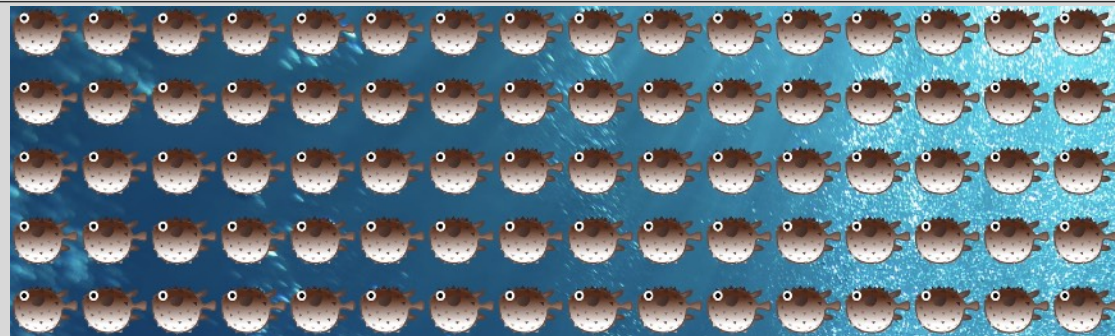
个人介绍

Outline

FUGU 项目介绍

技术实践 (WEBXR)

能力扩展 (METAWEB)

FUGU 项目介绍

项目背景

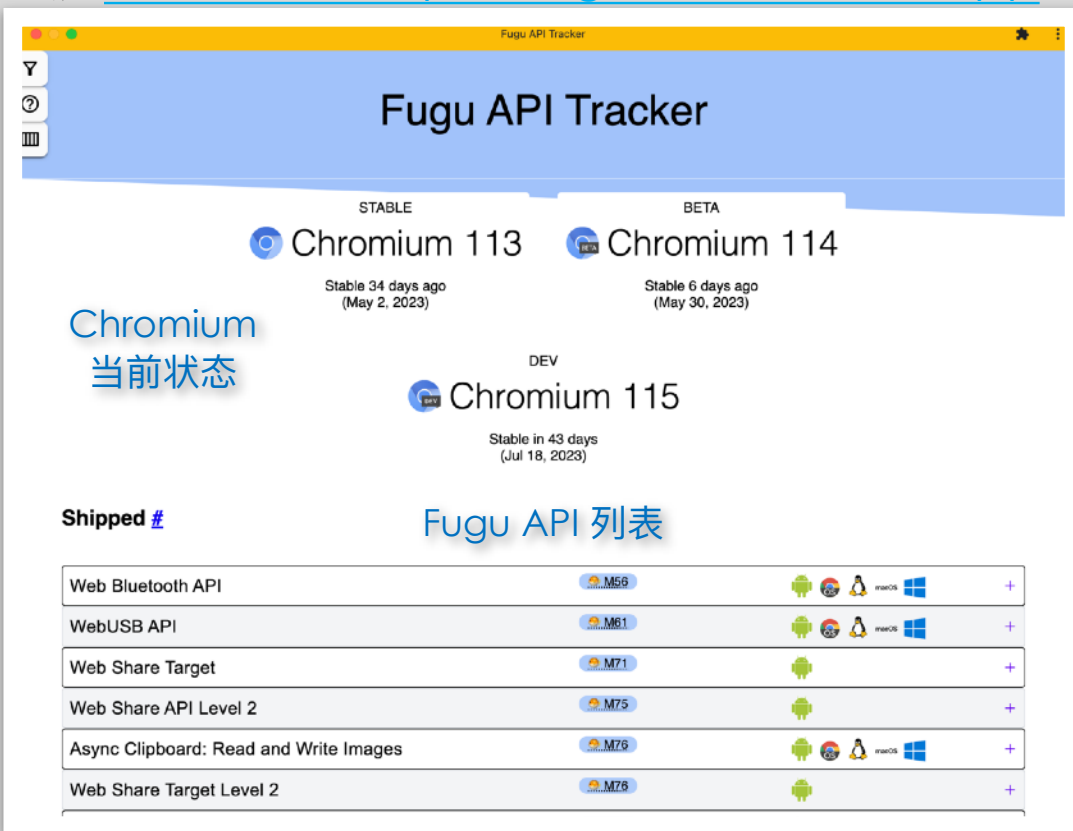| 对比	河豚	Fugu
特点	较强的毒性	Web API(s) 访问设备硬件和操作系统功能
处理得当	餐桌上的美味	更加全面的系统操纵能力 增加应用的跨端能力

终极目标：

仅有一个 Web 浏览器，可以做到任何现有 App 可以做到的事情。

能力状态

🐡 Chromium https://fugu-tracker.web.app

常用 API:

Wake Lock
Web Share Target
Badging API
File System Access
WebCodec

Chromium
当前状态

Fugu API 列表
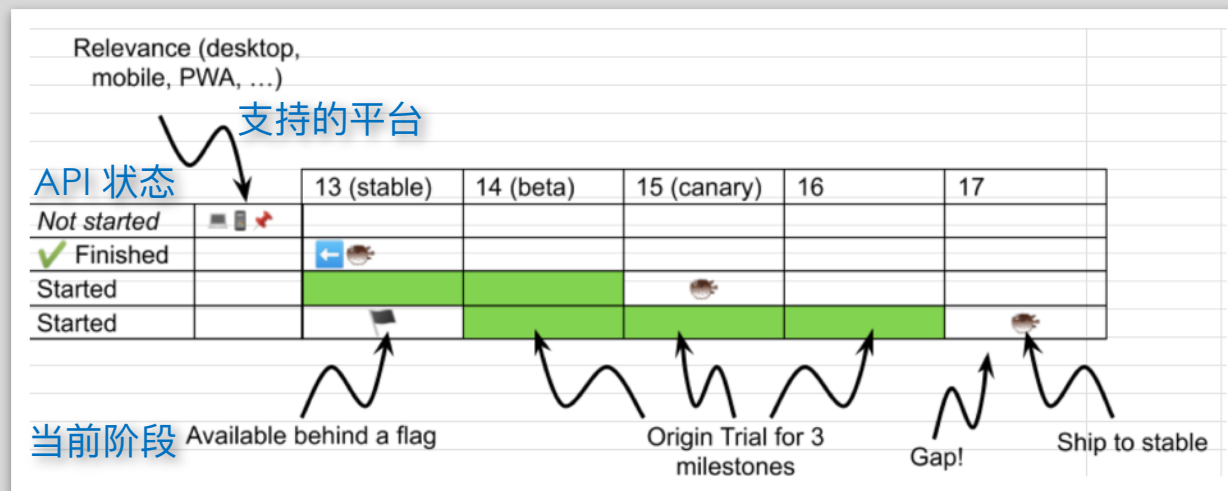
应用示例 01

Betty Crocker Web 版
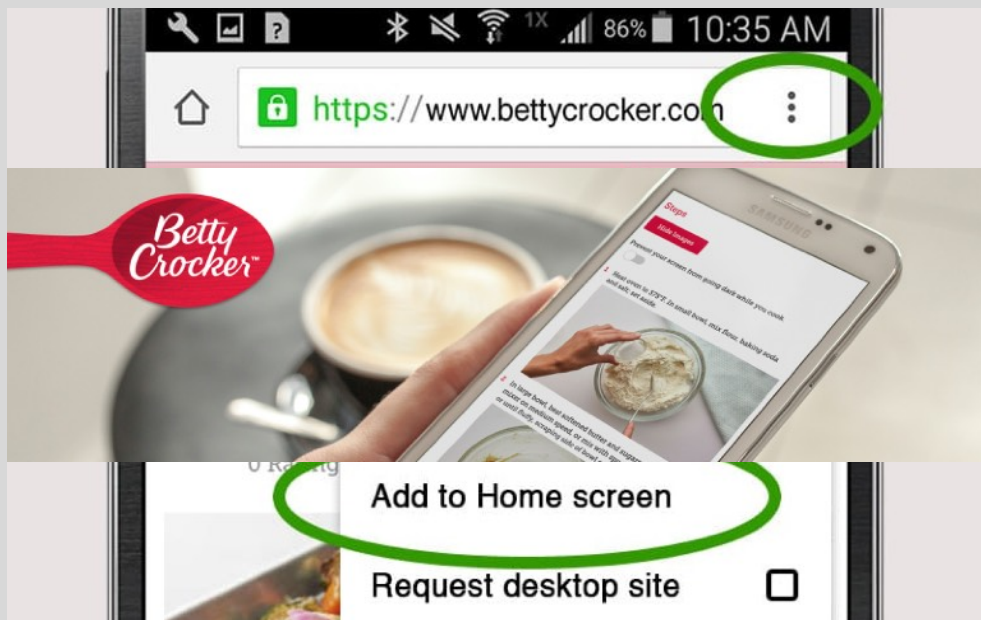
PhotoShop Web 版

关键技术：
Wake Lock、Window Placement
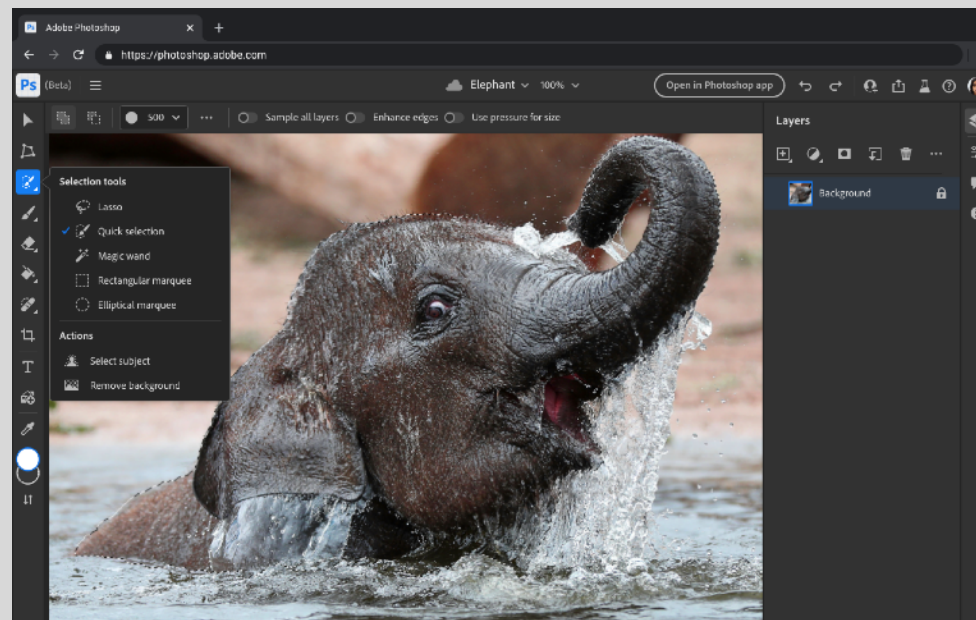
关键技术：
WebAssembly、Service Worker

应用示例 02
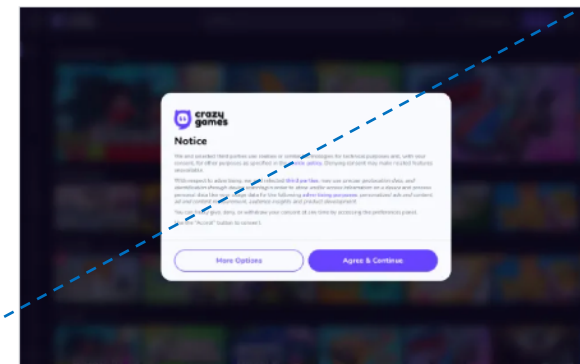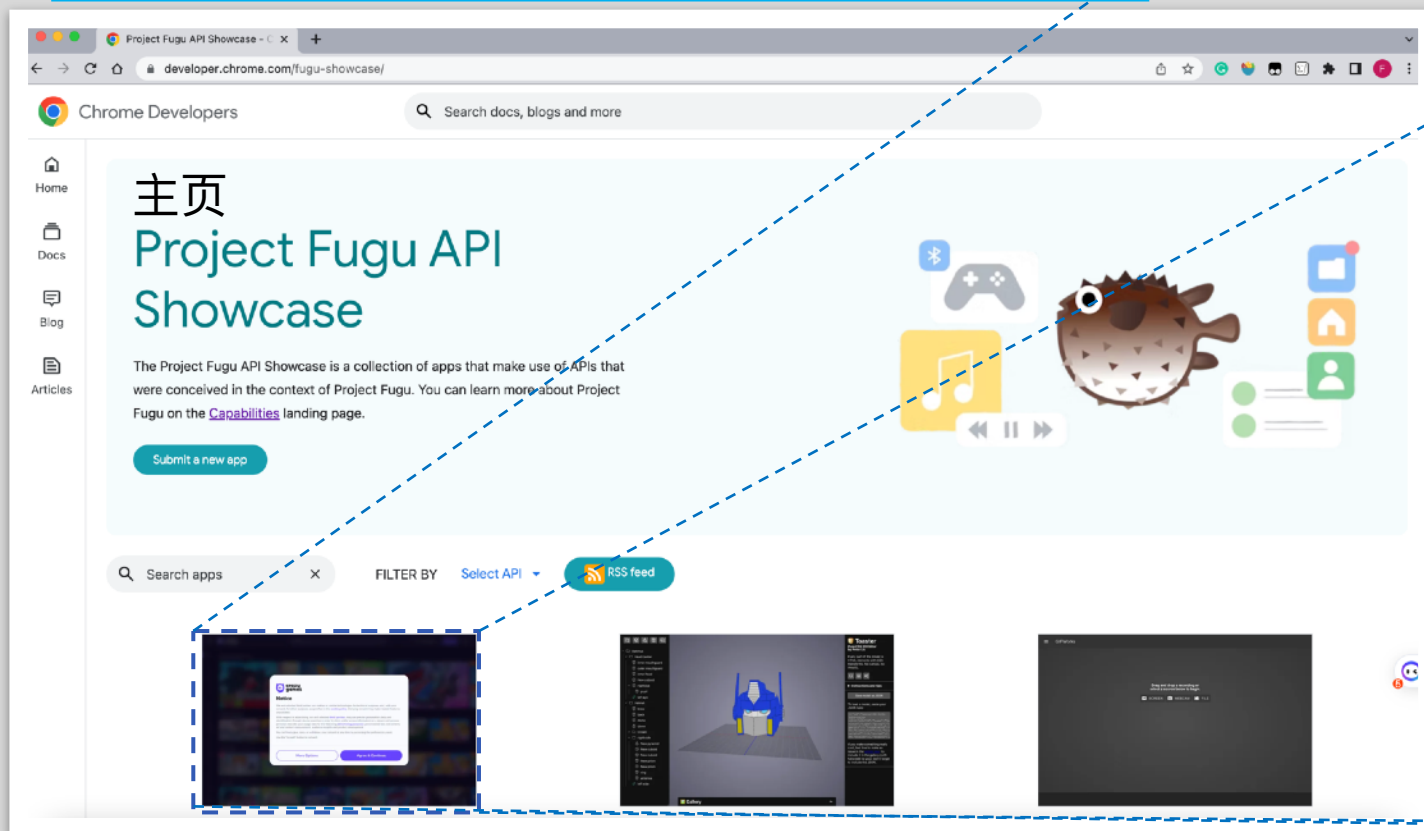
https://developer.chrome.com/fugu-showcase

主页

Web App

用到的
Fugu API(s)

开发流程
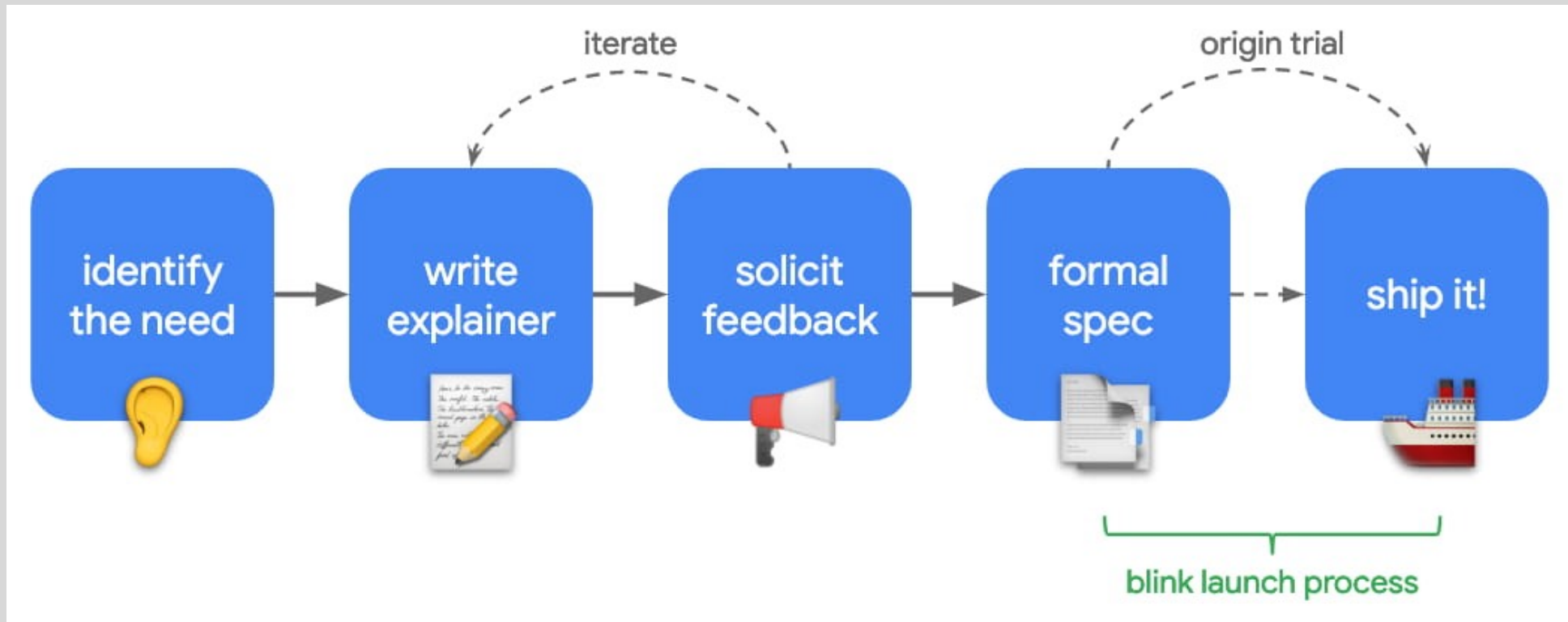
| 发现需求 | 撰写
说明文档 | 项目审查
文档更新
代码开发 | 输出
标准文档 | 使能特性 |

案例详解 – Direct Sockets 01

IWA 状态： Started

发现需求

"[Filling the remaining gap between WebSocket, WebRTC and WebTranspor](#)"

撰写说明文档

[https://github.com/WICG/direct-sockets/blob/main/docs/explainer.md](#)
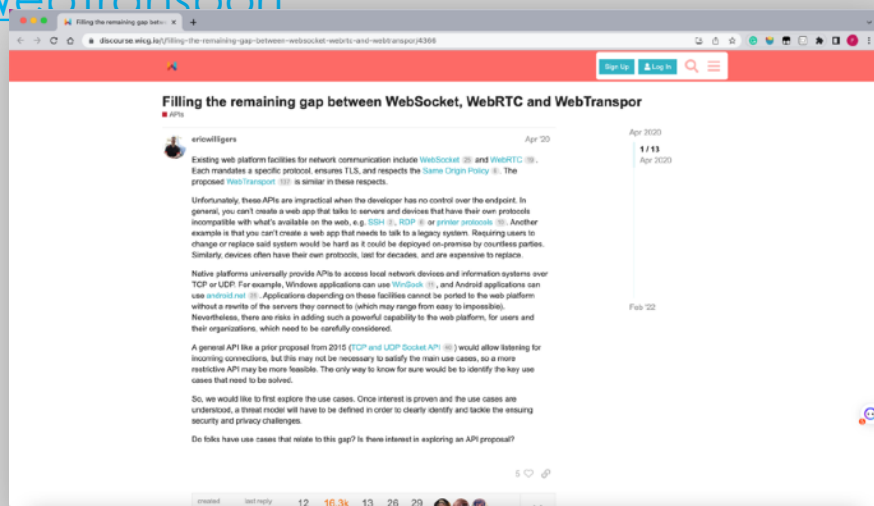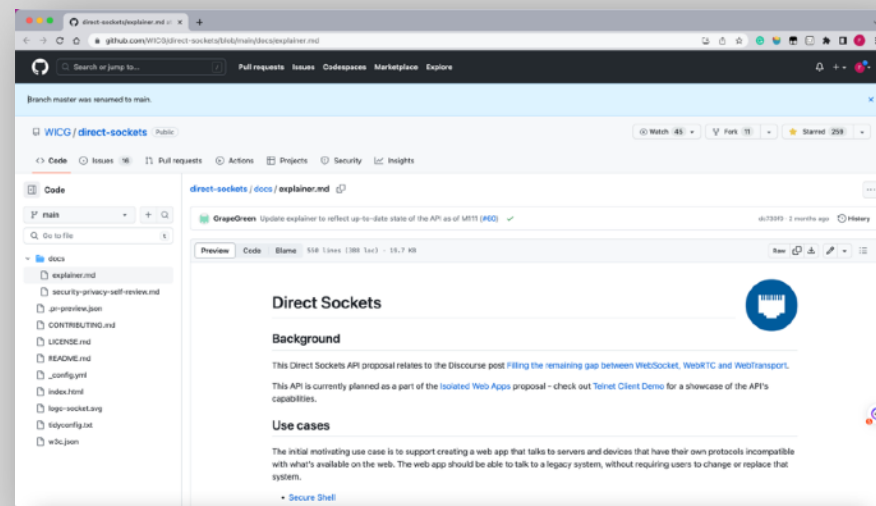
案例详解 – Direct Sockets 02

IWA 状态：Started

项目审查

TCPSocket

```
interface TCPSocket {
    [RaisesException, CallWith=ScriptState, NotEnumerable]
Promise<void> close();

    readonly attribute DOMString remoteAddress;
    readonly attribute unsigned short remotePort;
    readonly attribute ReadableStream readable;
    readonly attribute WritableStream writable;
};
```
IDL

```
const options = {
    remoteAddress: 'example.com',
    remotePort: 7,
    keepAlive: false,
    noDelay: false
};
navigator.openTCPSocket(options).then(tcpSocket => { ... }).else(error => { ... });

        let readableStream = tcpSocket.readable;
        let writableStream = tcpSocket.writable;
        ...
        tcpSocket.close();
```
示例

文档更新

Security Considerations

"web app 可能会在用户没有意识到的情况下进行网络连接的发起。"

应对策略

This web application is requesting permission to connect to a network device.

If you would like to proceed, please enter the device's IP address or hostname.

Address: [   ]

Port: [22]

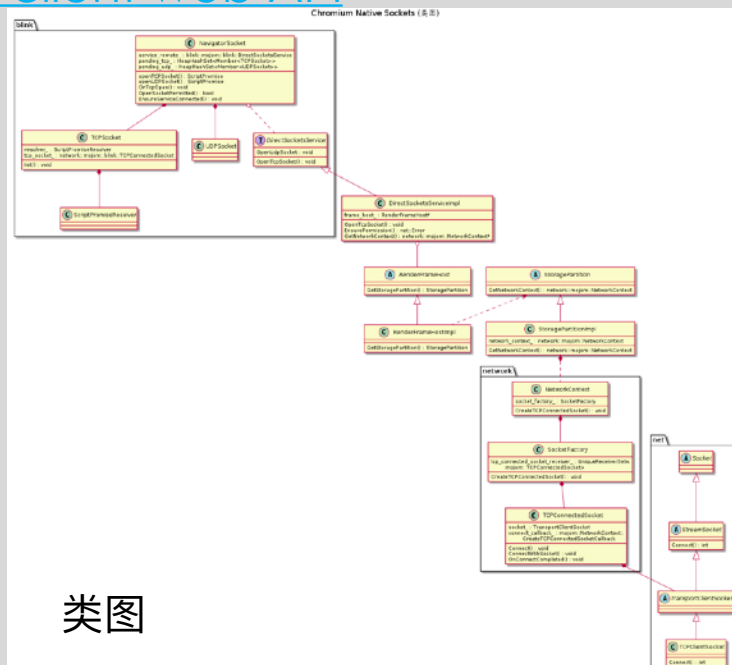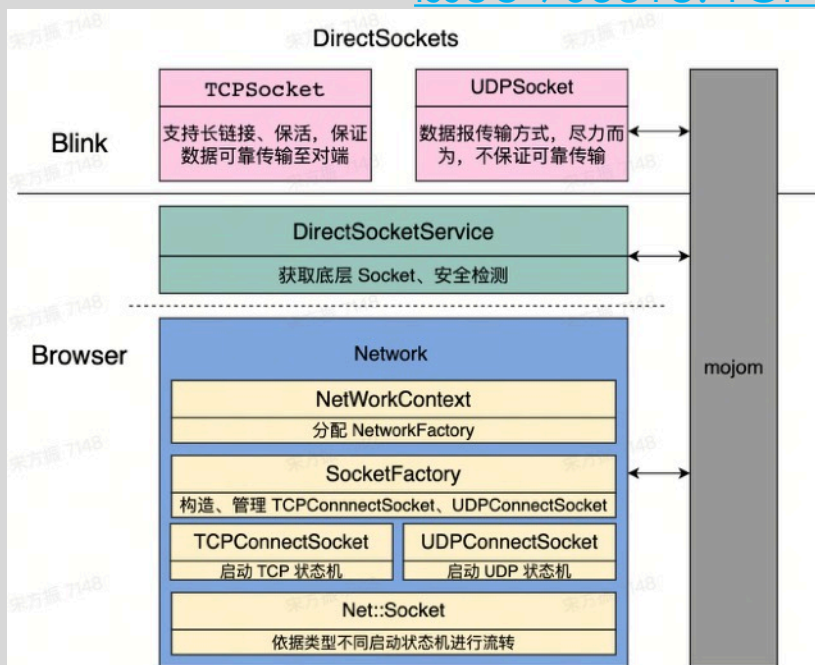☐ Allow future connections to this address from **www.example.com**

[Proceed] [Cancel]

案例详解 – Direct Sockets 03

状态：Started

代码开发

[Issue 905818: TCP Socket client web API](...)

类图

技术实践

WebXR

项目背景

Web API

WebXR

运行平台

VR / AR 设备

Oculus   Vive   Playstation   PICO

能力提供

头部追踪
手部姿势
3D 场景渲染
手柄交互
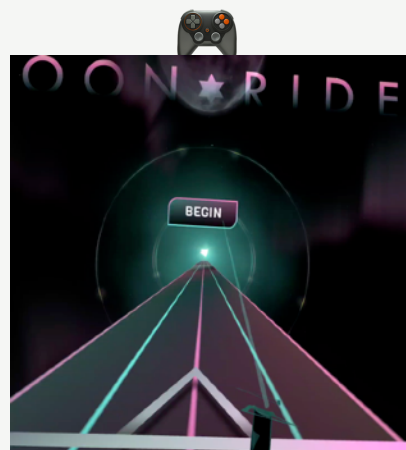
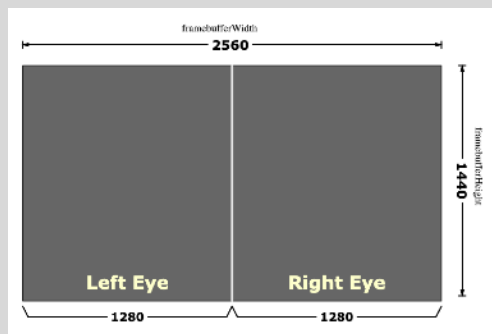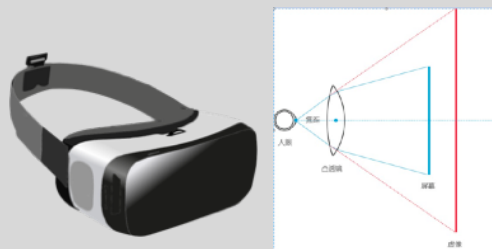Moon Rider   Stereo Video Player   360-photos

应用类型
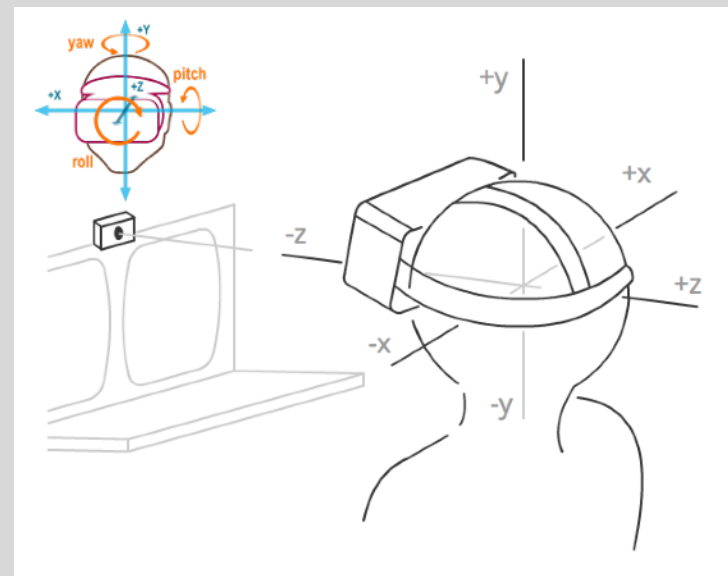
游戏
视频
图片
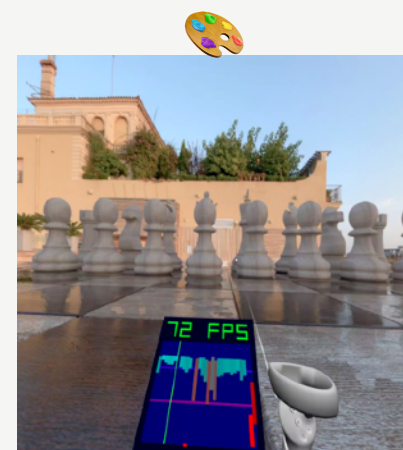
基础知识
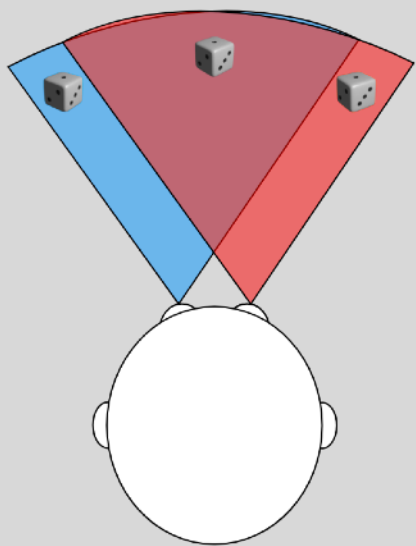
FOV (field of view)
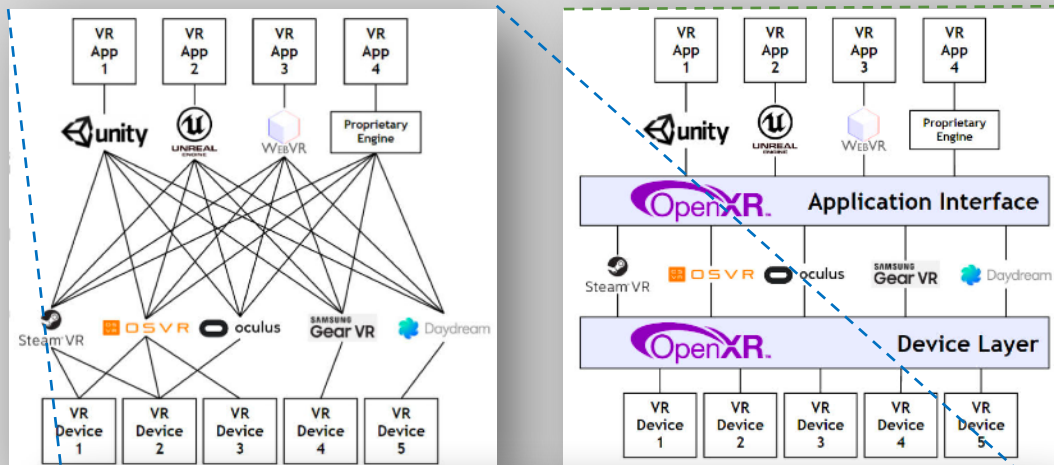双目成像

产生立体感

HMD (Head-Mounted Display)
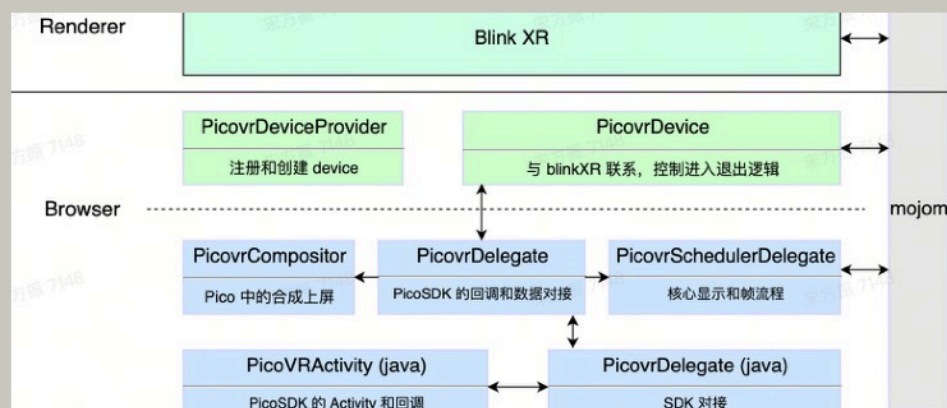显示分区

透镜折射

DOF (Degrees of freedom)
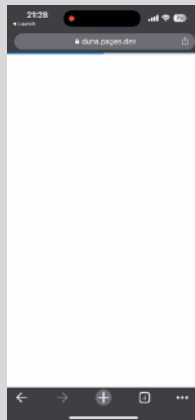旋转角度
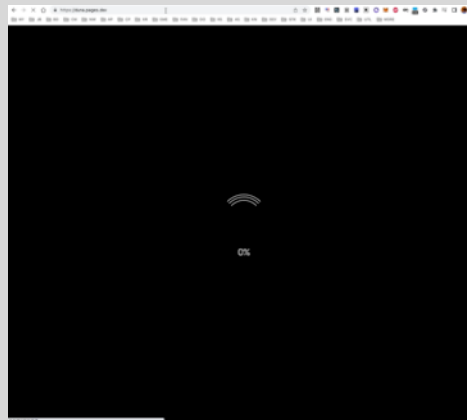
位移距离

能力支持

SDK 版本

OpenXR 版本
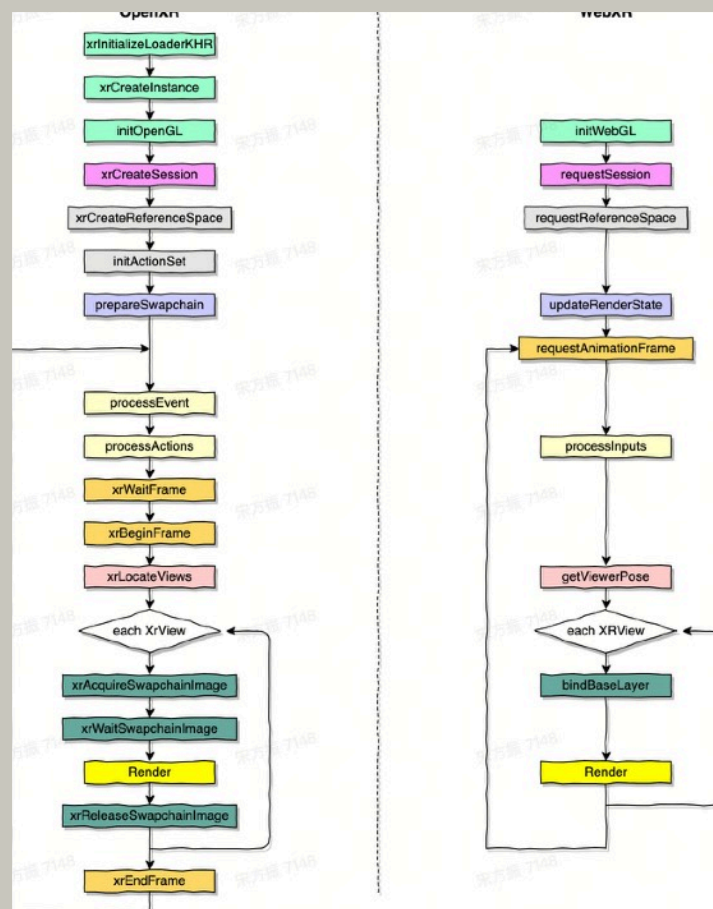
页面跳转 – 背景

冗余 2D 页面
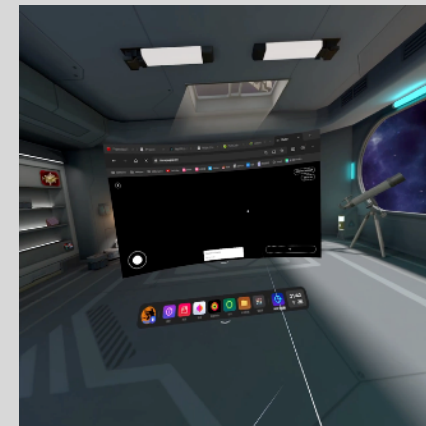
企业/品牌官网

mobile   desktop   WebXR
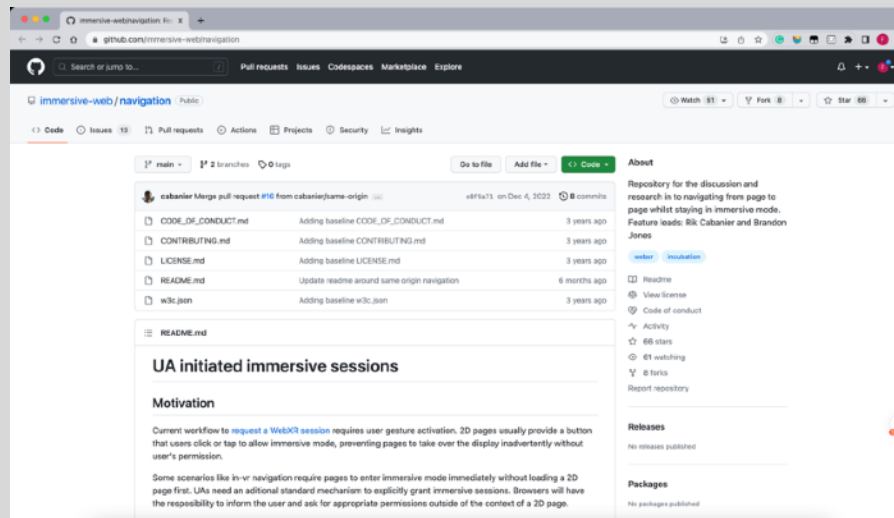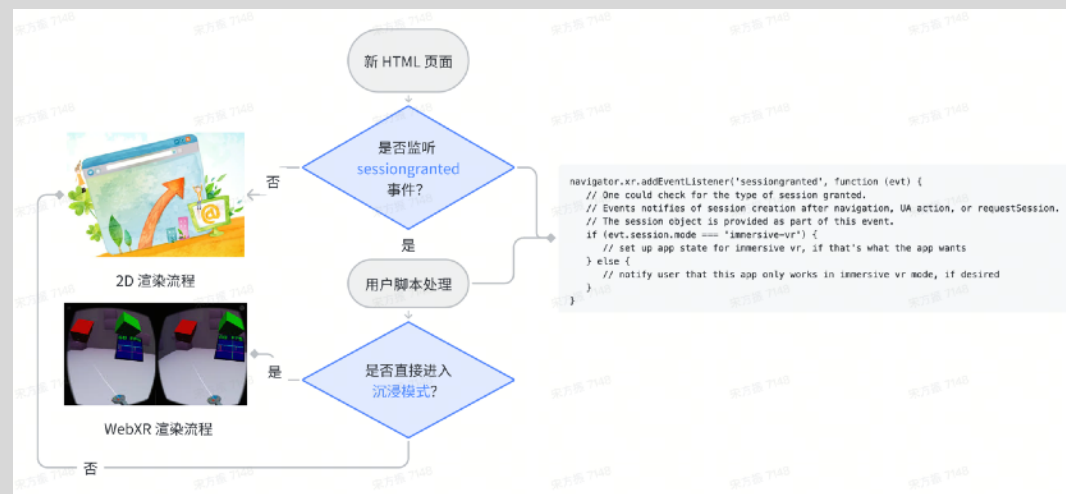

三端不一致的用户体验
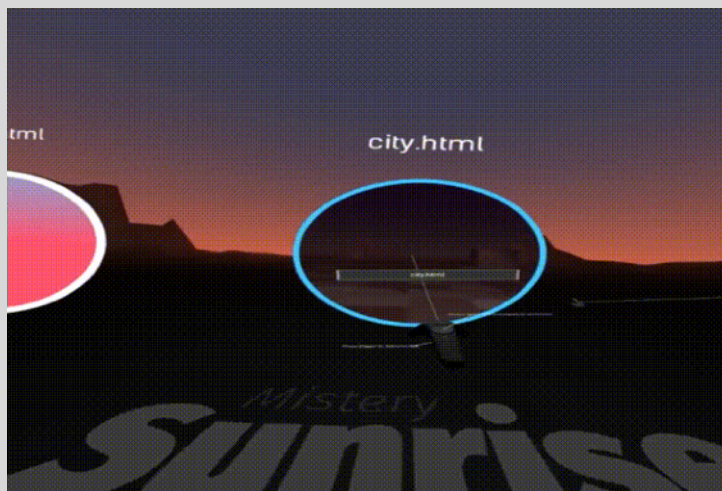
A-FRAME link

流畅导航穿梭效果

页面跳转 – 实现

效果展示
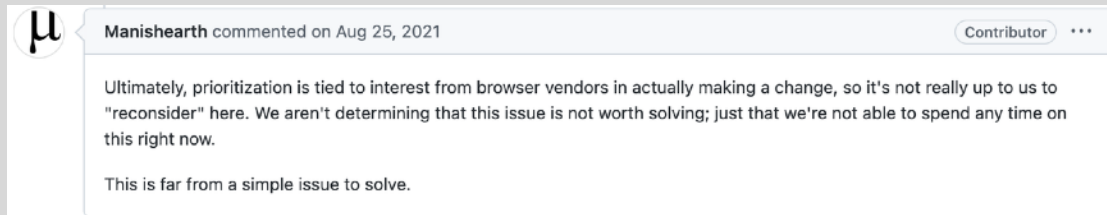

启动进入沉浸
流畅页面切换

流程示意

独立线程 – 背景
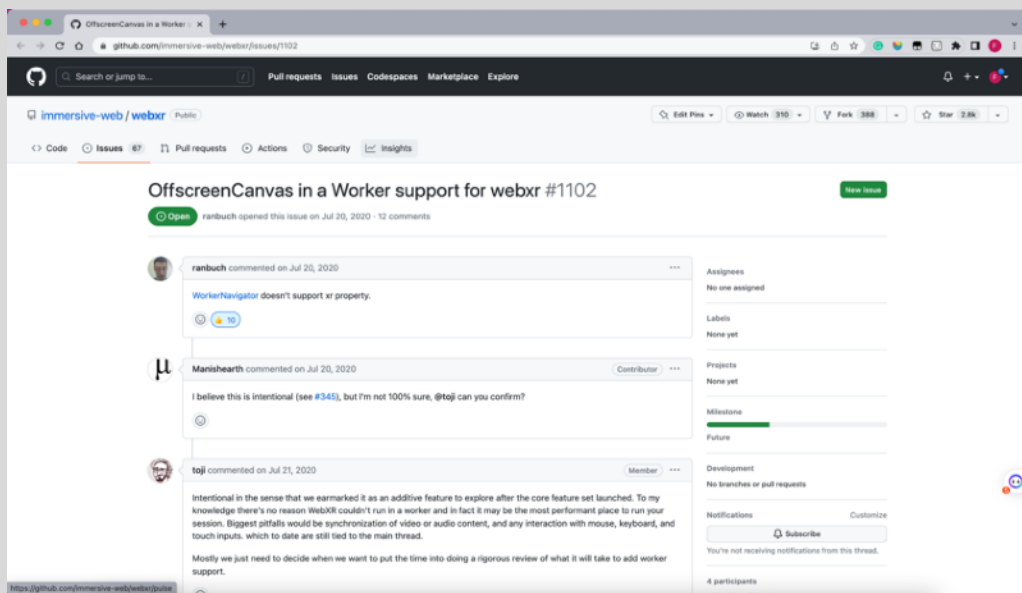
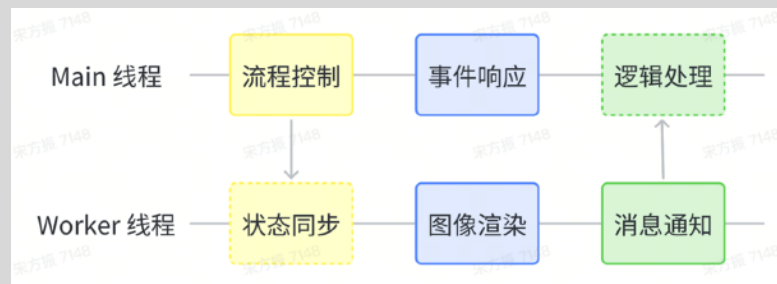WorkerNavigator 尚未支持 xr 属性

能力状态
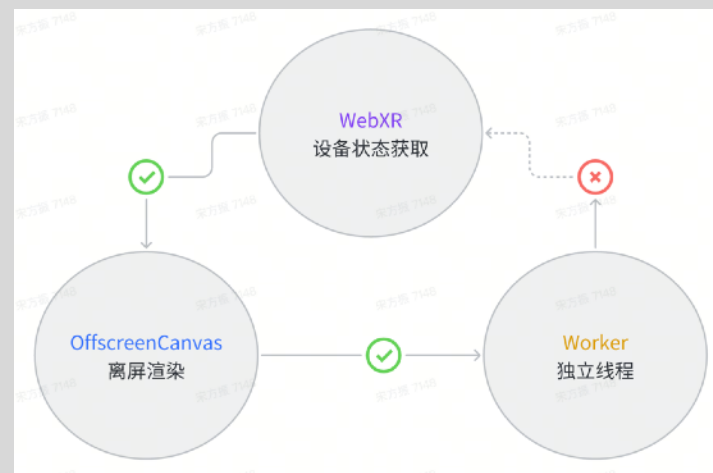
社区规划

独立线程 – 实现

效果展示

独立线程渲染
逻辑渲染分离

IDL


```
// Copyright 2017 The Chromium Authors. All rights reserved.
// Use of this source code is governed by a BSD-style license that can be
// found in the LICENSE file.

// https://immersive-web.github.io/webxr/#xrsystem-interface
// WebXR system 基本接口声明
[
  SecureContext,
  Exposed=(DedicatedWorker, Window),
  RuntimeEnabled=WebXR
] interface XRSystem : EventTarget {
  attribute EventHandler ondevicechange;
  [CallWith=ScriptState, DeprecateAs=XRSupportsSession, RaisesException] Promise<void> supportsSession(XRSessionMode mode);
  [CallWith=ScriptState, MeasureAs=XRIsSessionSupported, RaisesException] Promise<boolean> isSessionSupported(XRSessionMode mode);
  [CallWith=ScriptState, MeasureAs=XRRequestSession, RaisesException] Promise<XRSession> requestSession(XRSessionMode mode, optional
XRSessionInit options = {});
};
```

```
// Copyright 2017 The Chromium Authors. All rights reserved.
// Use of this source code is governed by a BSD-style license that can be
// found in the LICENSE file.

// https://immersive-web.github.io/webxr/#xrsystem-interface
// Window 环境下的 XRSystem 接口声明
[
  SecureContext,
  Exposed=Window,
  RuntimeEnabled=WebXR
] interface MainXRSystem : XRSystem {
};
```
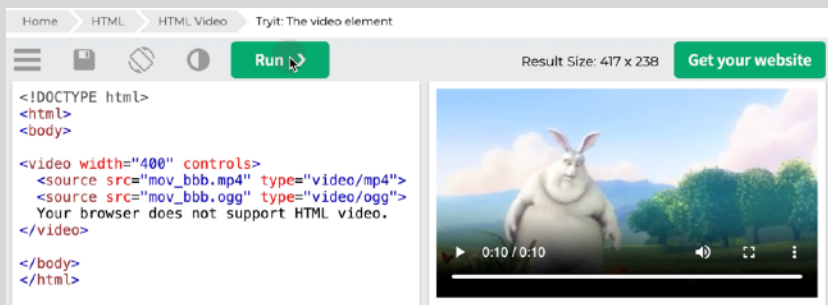
```
// Copyright 2023 The Chromium Authors. All rights reserved.
// Use of this source code is governed by a BSD-style license that can be
// found in the LICENSE file.

// https://immersive-web.github.io/webxr/#xrsystem-interface
// Worker 环境下的 XRSystem 接口声明
[
  SecureContext,
  Exposed=DedicatedWorker,
  RuntimeEnabled=WebXR
] interface WorkerXRSystem : XRSystem {
};
```
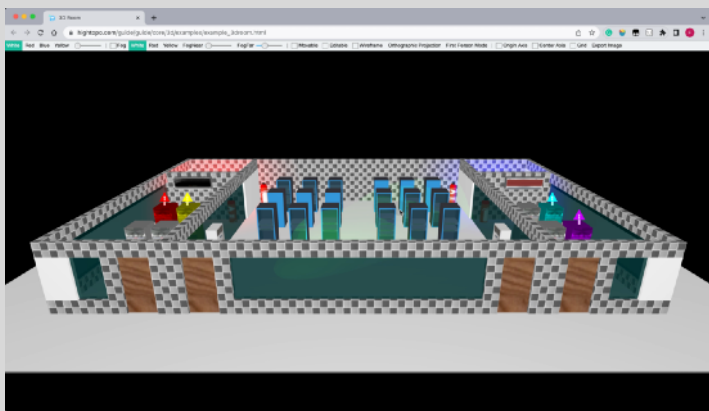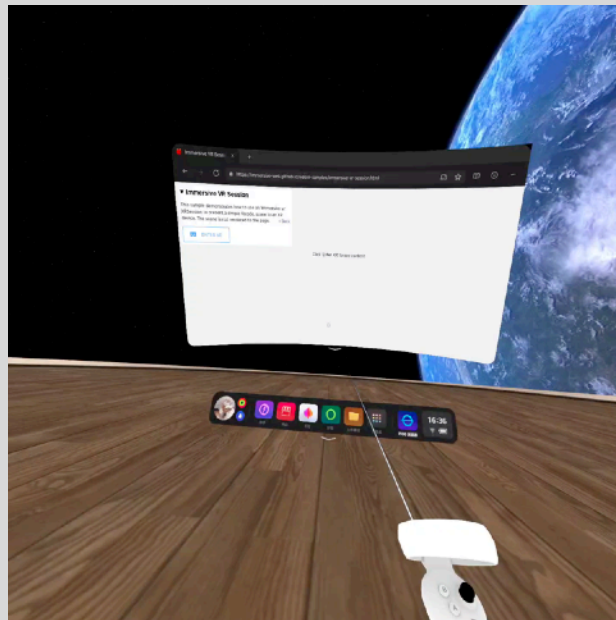
能力扩展

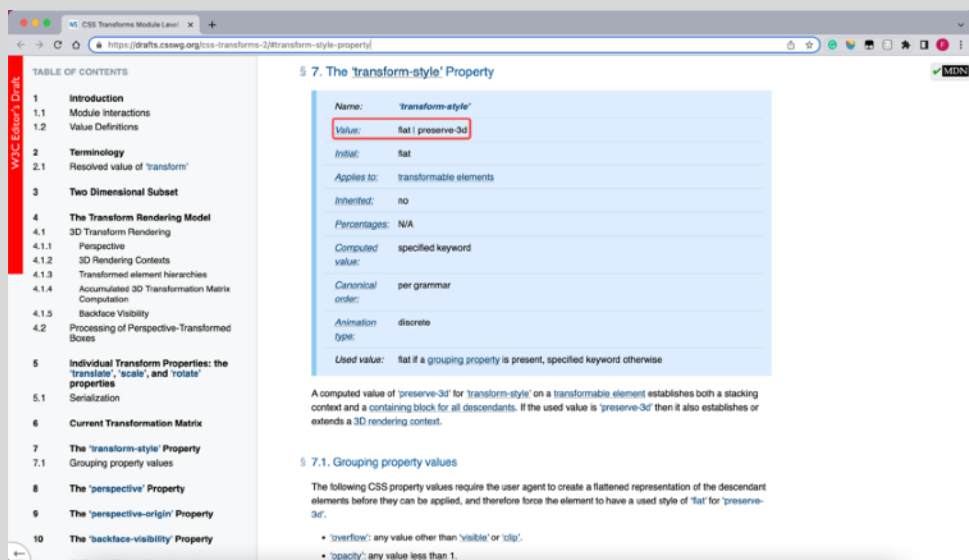MetaWeb

项目背景

传统 Web

声明式的 HTML 标签语法

纯 2D 或伪 3D 场景

WebXR

复杂 3D 场景渲染

A-FRAME

three.js

BABEL.js

+

WebGL

+

WebXR

入门难度较高

3D CSS – 能力介绍

transform-style

detached

```
.translateDetached {
    transform-style: detached;
    transform: translate3d(-50px, 0, +50px);
}
```

```
.rotateDetached {
    transform-style: detached;
    transform: rotate3d(1, 1, 0, 40deg);
}
```
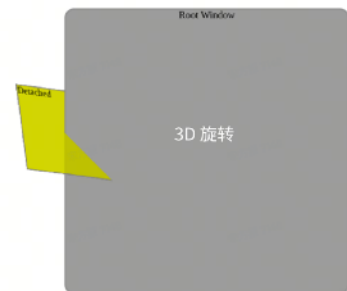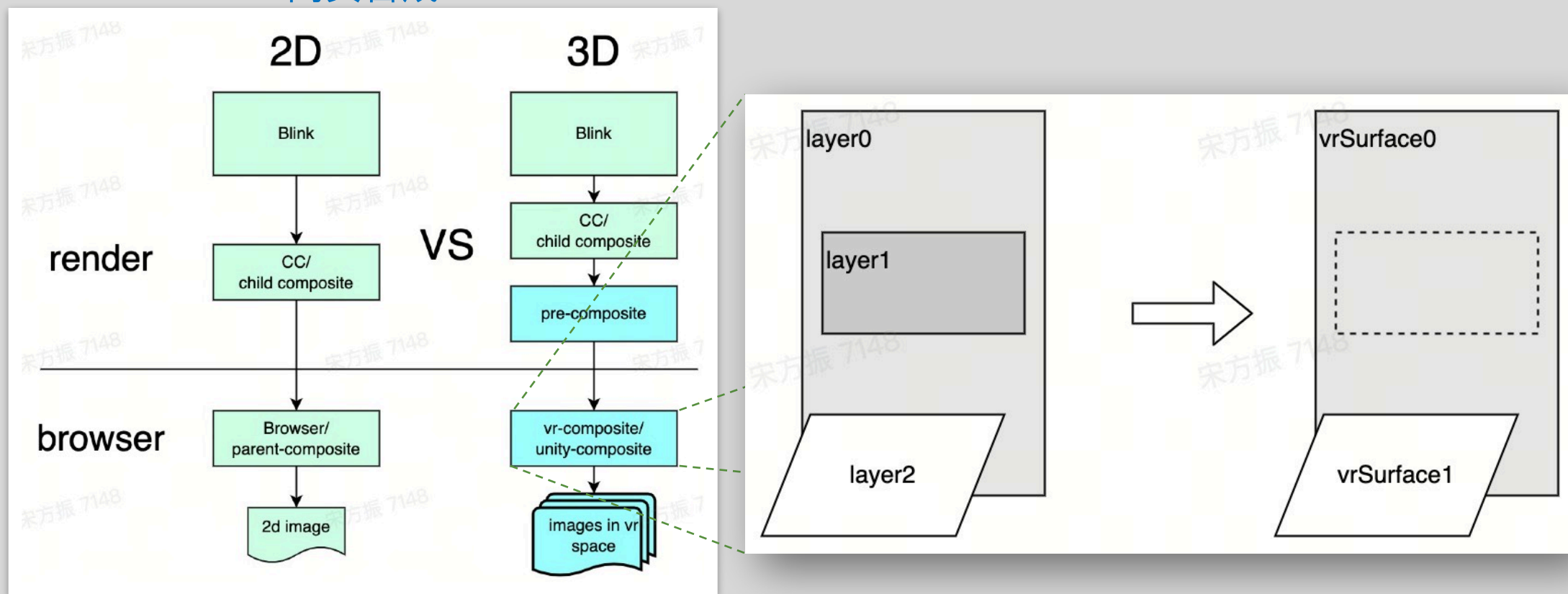
```
.scaleDetached {
    transform-style: detached;
    transform: scale3d(2, 2, 2);
}
```
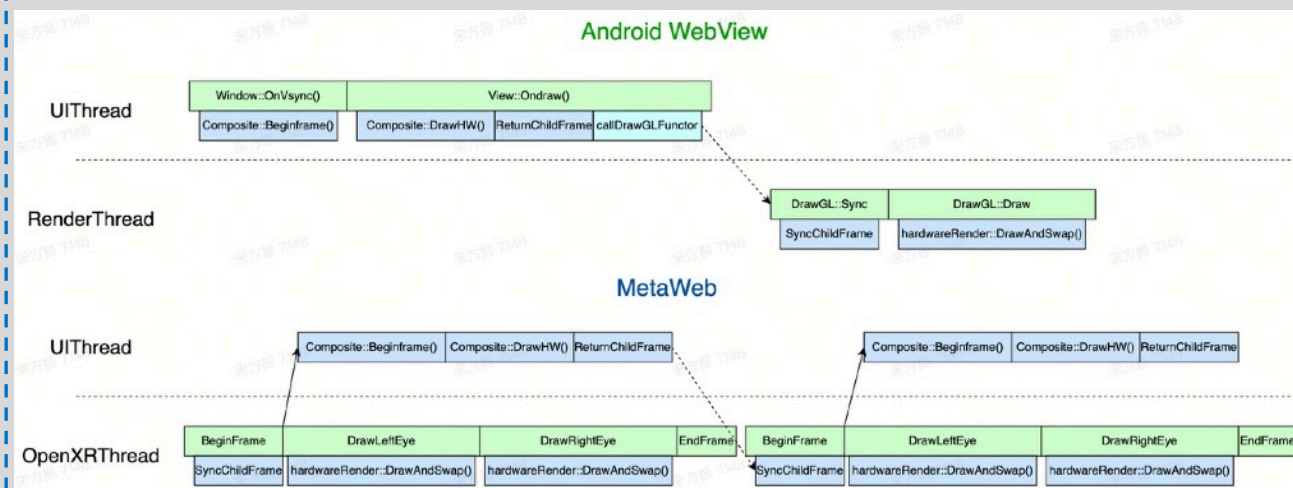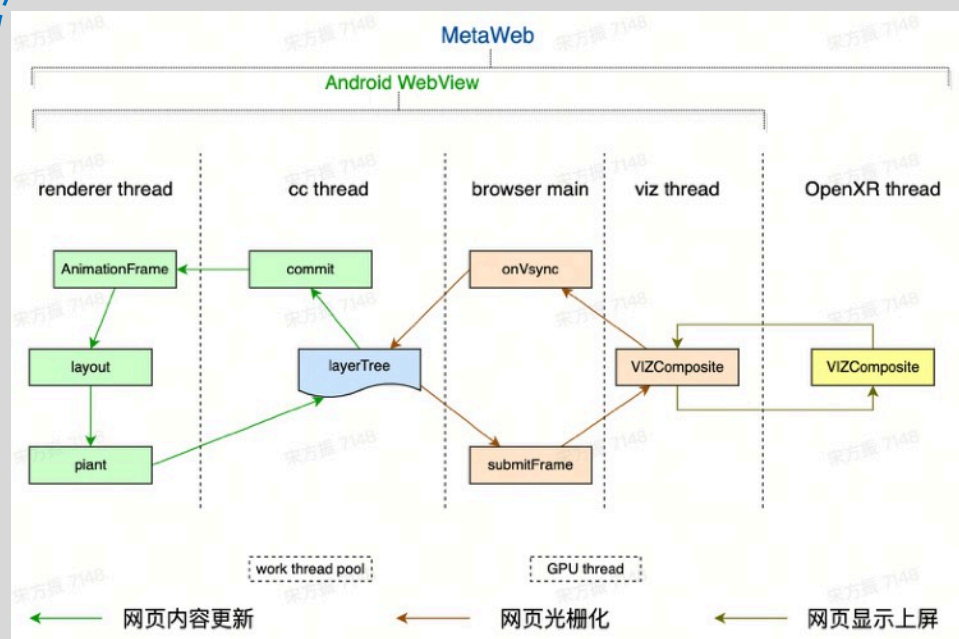
3D 平移

3D 旋转

3D 缩放

3D CSS – 流程改造

网页合成

Pre-composite

3D CSS – 底层实现

渲染管线

上屏逻辑

<model> – 能力介绍

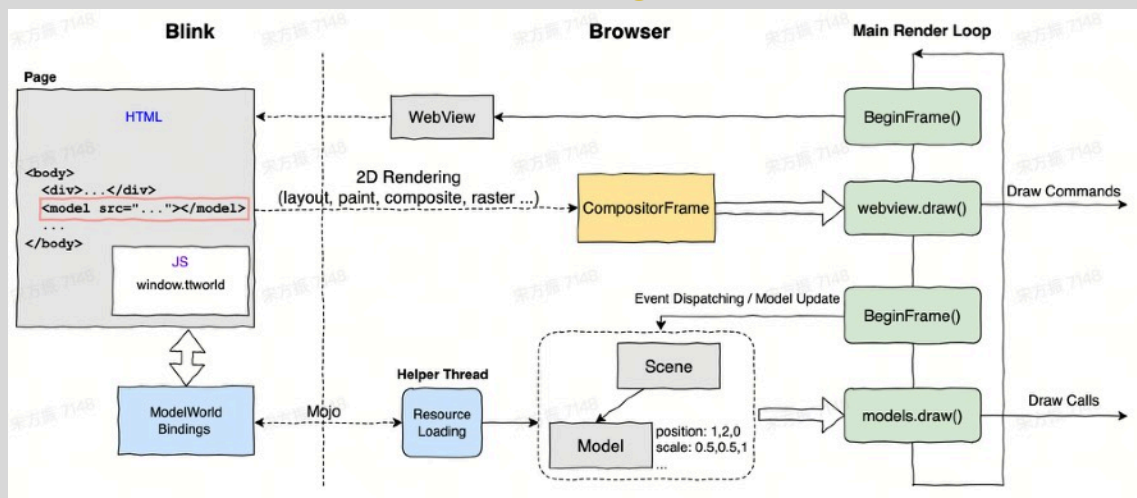<model> element

调用方式

展现形式

<model> – 底层实现

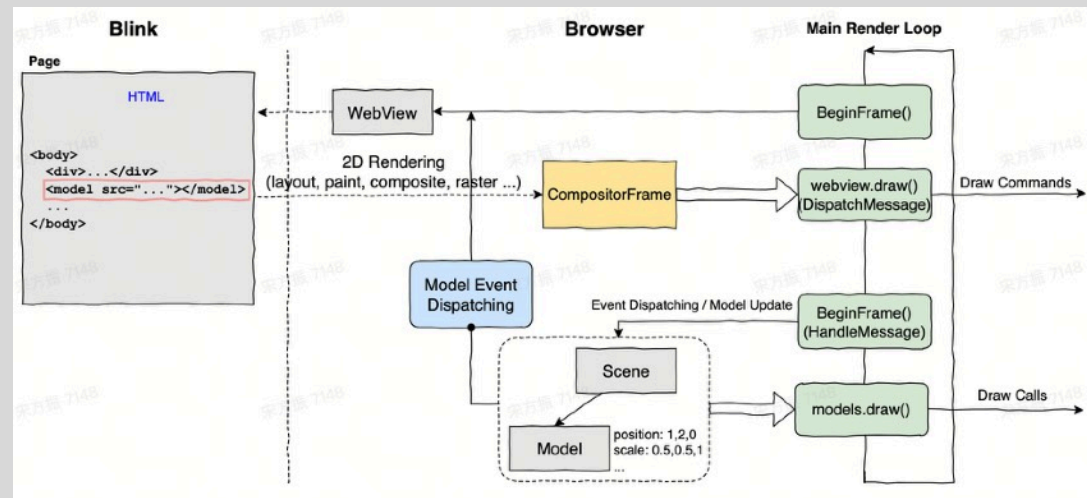
1.0 版本
Custom Emlement | JS Binding | Stereo Kit

2.0 版本
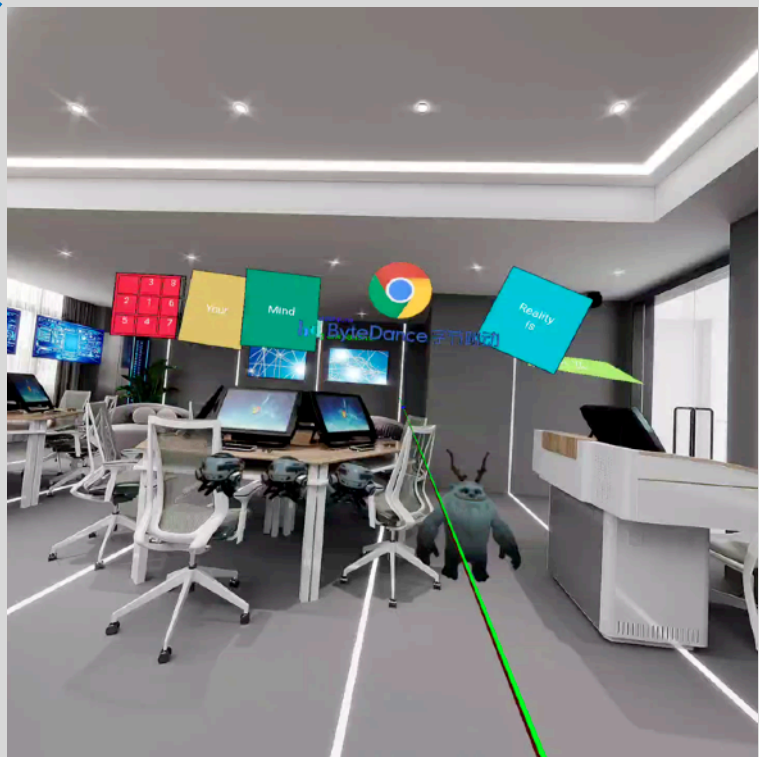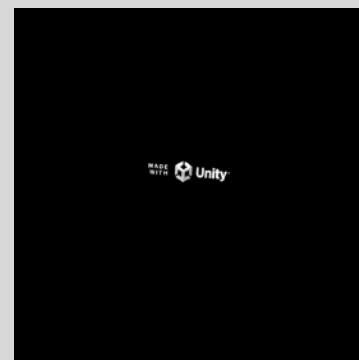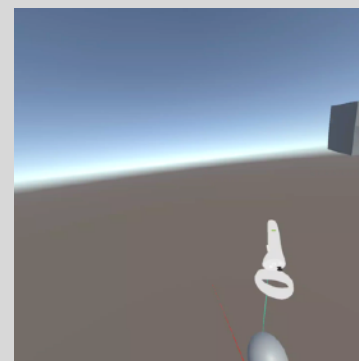HTMLModel Element | WebView 转发 | Stereo Kit

能力展示

基础能力

应用搭建

全景视频
<pano-video>

Unity 集成

页面多开

感谢倾听！

Q&A