Growing the CloudXR Marketplace through Open Standards
June 2021
Khronos Connects Software to Silicon

Open, royalty-free interoperability standards to harness the power of GPU, multiprocessor and XR hardware

3D graphics, augmented and virtual reality, parallel programming, inferencing and vision acceleration

Non-profit, member-driven standards organization, open to any company

Well-defined multi-company governance and IP Framework

Founded in 2000

>150 Members ~ 40% US, 30% Europe, 30% Asia
Khronos Standards for XR

Create and deploy 3D assets and scenes

Vision and sensor processing, inferencing acceleration

High-performance, low-latency 3D Graphics

Portable access to native XR runtimes
XR Portability

OpenXR provides cross-platform, high-performance access directly into XR device runtimes across multiple platforms.
Widespread Industry Support

A collaborative design that integrates many lessons from proprietary ‘first-generation’ XR APIs to create a new generation API with cutting-edge capabilities and a flexible, extensible, future-proof architecture.

Companies publicly supporting OpenXR
# OpenXR Widespread Industry Adoption

## Conformant Implementations
- **Microsoft HoloLens 2**  
  Windows Mixed Reality Headsets
- **Oculus Rift S**  
  Quest and Quest 2
- **HTC Vive Cosmos**

## Developer Preview Implementations
- **Valve SteamVR**  
  Transitioning from OpenVR to OpenXR
- **Varjo**  
  Preliminary support shipping now
- **Collabora Monado open-source Implementation**

## Engine Support
- **Unreal Engine**  
  Support in 4.24. Optimizations in 4.25
- **Unity Engine**  
  OpenXR Plugin Preview in 2020.2+
- **Chromium 81 for Chrome and Edge Browsers**  
  OpenXR default backend for WebXR

*Now Conformant! Version 21.0.0*

*All Varjo Headsets Conformant! April 13th, 2021*

*Just Announced!*
Bringing XR to the Web

Native XR Apps

Web XR Apps

Native 3D Engines

Web 3D Engines

Lifting OpenXR functionality into the Web stack

Close cooperation between WebXR and OpenXR

Khronos provides the foundation for native and Web-based 3D/XR
OpenXR Applications

Minecraft's RenderDragon rendering engine uses OpenXR for desktop VR support

Microsoft Flight Simulator Sim Update 2 uses OpenXR for VR functionality

Blender 2.83 integrates OpenXR to deliver native VR scene inspection capabilities

War Thunder Red Skies Release upgrades VR functionality to OpenXR

Launched December 2020

June 2021
OpenXR Conformance Process

OpenXR Implementer

Prototype OpenXR Implementation

Use tests to aid development

Contribute test fixes and enhancements

Submit Test Results

Test Results Approved. Khronos grants Trademark and Patent License

Production OpenXR Implementation

OpenXR Open source Conformance Tests

OpenXR Adopters Website

OpenXR Working Group

A conformant OpenXR can use the OpenXR logo and has patent protection under the Khronos IP Framework.
OpenXR Deployment Flexibility

- Tethered
- All In One

VR

AR

Windows Mixed Reality

Oculus Quest / Quest 2

Microsoft HoloLens 2

Oculus Rift S

HTC Vive Cosmos

Windows 10
Advanced UI Cross-Vendor OpenXR Extensions

Developers can build cross-platform applications that use advanced UI solutions from different technology vendors. OpenXR API layers can be used to implement extensions.

**Hand Tracking**

- 26 unique joints per hand for fully articulated hands visible to the user
- Shipping on HoloLens 2 and [Microsoft Hand Mesh Extension](#) for HoloLens 2 layers over it
- [Ultraleap developer preview](#) available

**Eye Tracking**

- Eye gaze interaction for intuitive interfaces
- 2-Step Interaction
- Hand-eye coordination
- Natural aiming
- Shipping on HoloLens 2

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OpenXR is used with a 3D API

**High-performance, low-latency 3D rendering and composition**
- Multiview
- Context priority
- Front buffer rendering
- Tiled rendering (beam racing)
- Variable rate rendering

**Cross-platform access to XR**
- HMDs and sensors
- XR application lifecycle
- Input device discovery and events
- Sensor tracking and pose calculation
- Frame timing and display composition
- Haptics Control

**Display, composition and optical correction parameters**

*OpenXR can be used with other 3D APIs such as Direct3D, OpenGL and OpenGL ES*

OpenXR is strongly influenced by Vulkan with a shared spec toolchain and support for API layers. OpenXR is a “lower-frequency” API than Vulkan and is a much smaller spec.
Cloud XR with 5G and OpenXR

OpenXR will enable AR applications to run portably on edge server architectures.

Significant industry effort in developing this use case.

Runtime using 5G implemented across device and server and accessed through OpenXR API.

MEC (Multi-access Edge Computing) Server
1. Processes sensor data, can include machine learning for environmental lighting, occlusion, scene semantics, object reconstruction and UI
2. Generates imagery from 3D models, can include stereo, foveal rendering, ray-tracing, optics pre-distortion, varifocal processing.
OpenXR Win-Win-Win

XR Vendors
Can bring more applications onto their platform by leveraging the OpenXR content ecosystem

Now is the time for application developers to leverage OpenXR for widespread application deployment!
www.khronos.org/openxr/

XR ISVs
Can easily ship on more platforms for increased market reach

XR End-Users
Can run the apps they want on their system - reducing market confusion and increasing consumer confidence
Khronos for Global Industry Collaboration

Implement Khronos Standards
- Royalty-free
- IP Protection for conformant implementations
- Open to members and non-members

www.khronos.org/adopters/

Join Khronos
- Influence key open standards that drive your business
- Accelerate time-to-market with early access to specification drafts
- Gain insights into industry trends and directions
- Benefit from Adopter Discounts

www.khronos.org/members/

Now is the time for application developers to leverage OpenXR for widespread deployment!

Benefits of Khronos Membership
- Gather industry requirements for future open standards
- Gain early insights into industry trends and directions
- Influence the design and direction of key open standards that will drive your business
- Accelerate your time-to-market with early access to specification drafts
- Network with domain experts from diverse companies in your industry
- State-of-the-art IP Framework protects your Intellectual Property
- Publicly Release Specifications and Conformance Tests
- Enhance your company reputation as an industry leader through Khronos participation

www.khronos.org/standardization/

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www.khronos.org/adopters/

Khronos Standardization Process

Benefits of Khronos Membership
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