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Monado

Open Source Augmented & Virtual Reality



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- What is AR & VR
- Monado
- Wrapping up



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HMD, what?

- HMD (Head Mounted Display)
 - Facebrick containing a screen, some tracking solution (IMU, camera, photodiodes, lasers)

What is Augmented Reality?

- Augment
 - verb
 - /ɔːɡ'mɛnt/
 - make greater by adding to it; increase



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What is Virtual Reality?

- I reject your reality and substitute my own
 - Dungeonmaster, 1984
 - (popularized by Adam Savage)





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What is AR & VR?

- Also known as XR



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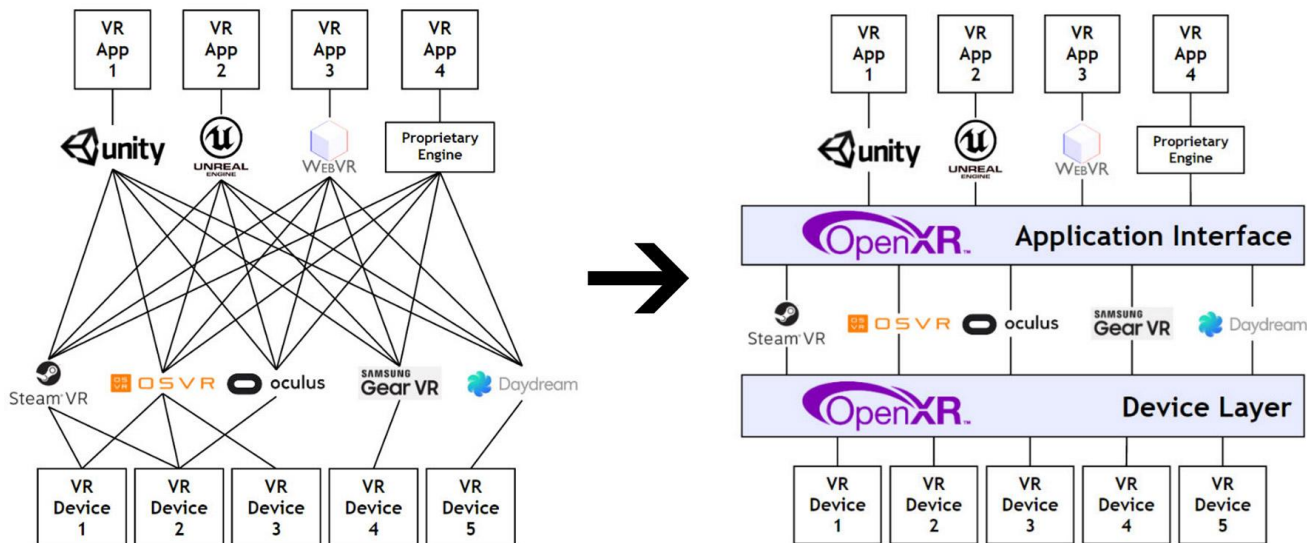


Open standard for Virtual Reality and Augmented Reality



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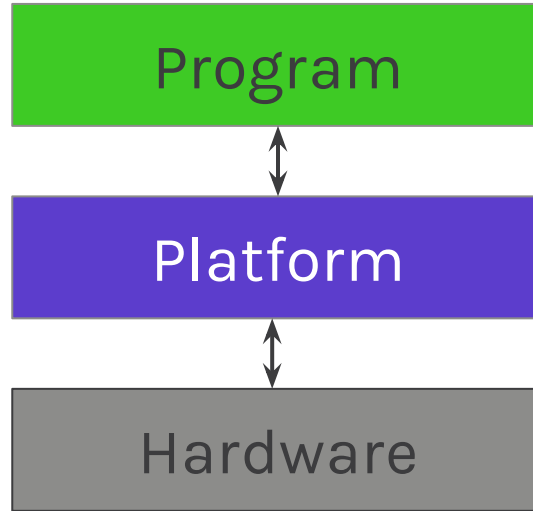
OpenXR



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How do we XR?



The API - Setup

- `xrCreateInstance()`
- `xrGetSystem()`
 - `XR_FORM_FACTOR_HEAD_MOUNTED_DISPLAY`
 - `XR_FORM_FACTOR_HANDHELD_DISPLAY`
- `xrEnumerateViewConfigurations()`
 - `XR_VIEW_CONFIGURATION_TYPE_PRIMARY_MONO`
 - `XR_VIEW_CONFIGURATION_TYPE_PRIMARY_STEREO`
- `xrCreateSession()`, `xrBeginSession()`
 - D3D10, 11, 12, OpenGL, OpenGL ES, Vulkan, Headless
 - Right now: no simultaneous Sessions (e.g. “Overlays”)
- `xrCreateSwapchain()`
 - Textures, that are sent to the runtime

The API - Rendering

- `xrWaitFrame`, `xrBeginFrame`, `xrEndFrame`
 - Render for predicted pose at next frame interval
 - `XrCompositionLayerProjection`
 - `XrCompositionLayerQuad` (UI, Video Stream, “Overlays”)
 - Optional: Cube, Cylinder, Depth, Equirect
 - `XR_ENVIRONMENT_BLEND_MODE_OPAQUE`
 - `XR_ENVIRONMENT_BLEND_MODE_ADDITIVE`
 - `XR_ENVIRONMENT_BLEND_MODE_ALPHA_BLEND`
- `xrLocateViews()`
 - App builds projection & view matrix



The API - Actions

- Similar to OpenVR Actions
- `XrCreateAction()`
 - Name, Type, suggested Input path mapping
 - `BOOLEAN`, `VECTOR1F`, `VECTOR2F`, `POSE`, `VIBRATION`
- Input path example
 - `/user/hand/left/input/select/click`
- Interaction Profiles
 - `khv/simple_controller`, `google/daydream_controller`,
`htc/vive_controller`, `htc/vive_pro`, `microsoft/motion_controller`,
`microsoft/xbox_controller`, `oculus/go_controller`,
`oculus/touch_controller`, `valve/knuckles_controller`



The API - Actions

6.4.1. Khronos Simple Controller Profile

Path: */interaction_profiles/khr/simple_controller*

Valid for user paths:

- */user/hand/left*
- */user/hand/right*

This interaction profile provides basic pose, button, and haptic support for applications with simple input needs. There is no hardware associated with the profile, and runtimes which support this profile **should** map the input paths provided to whatever the appropriate paths are on the actual hardware.

Supported component paths:

- *.../input/select/click*
- *.../input/menu/click*
- *.../input/grip/pose*
- *.../input/aim/pose*
- *.../output/haptic*



The API - Spaces

- `xrCreateReferenceSpace`
 - `XR_REFERENCE_SPACE_TYPE_VIEW = 1`
 - `XR_REFERENCE_SPACE_TYPE_LOCAL = 2`
 - `XR_REFERENCE_SPACE_TYPE_STAGE = 3`
 - `XR_REFERENCE_SPACE_TYPE_UNBOUNDED_MSFT`
-
- Input remapping

Compositor

- Extended Mode, Direct Mode
- Reprojection
- Overlays
- Vulkan, OpenGL Interopt
- Distortion Correction
 - Quad Shader
 - Mesh Undistortion

Hardware support

- HDK
- PSVR, PS Move
- Razor Hydra
- Other devices through OpenHMD

Notable FOSS Tracking projects

- OpenHMD (Open Source drivers)
- libsurvive (Open Source lighthouse)
- Maplab (SLAM Tracking)
- Others: Lighthouse Redox, PSMoveService, OpenPSVR, OSVR, Opentrack, openvslam



Community

- VR Enthusiasts
- Want to improve Open Source VR in their free time
- Create drivers for all Headsets they have access to
- Regular Hackfests
- Friendly Boost Licence
- <http://openhmd.net>



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Reverse Engineering

- IMU (Accelerometer, Gyroscope)
- Firmware communication
 - Lots of wireshark (thanks usbmon!)
 - Decrypting hex like a boss
- Camera access
- Display modes



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Demo!

Ish



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Questions?

We don't bite

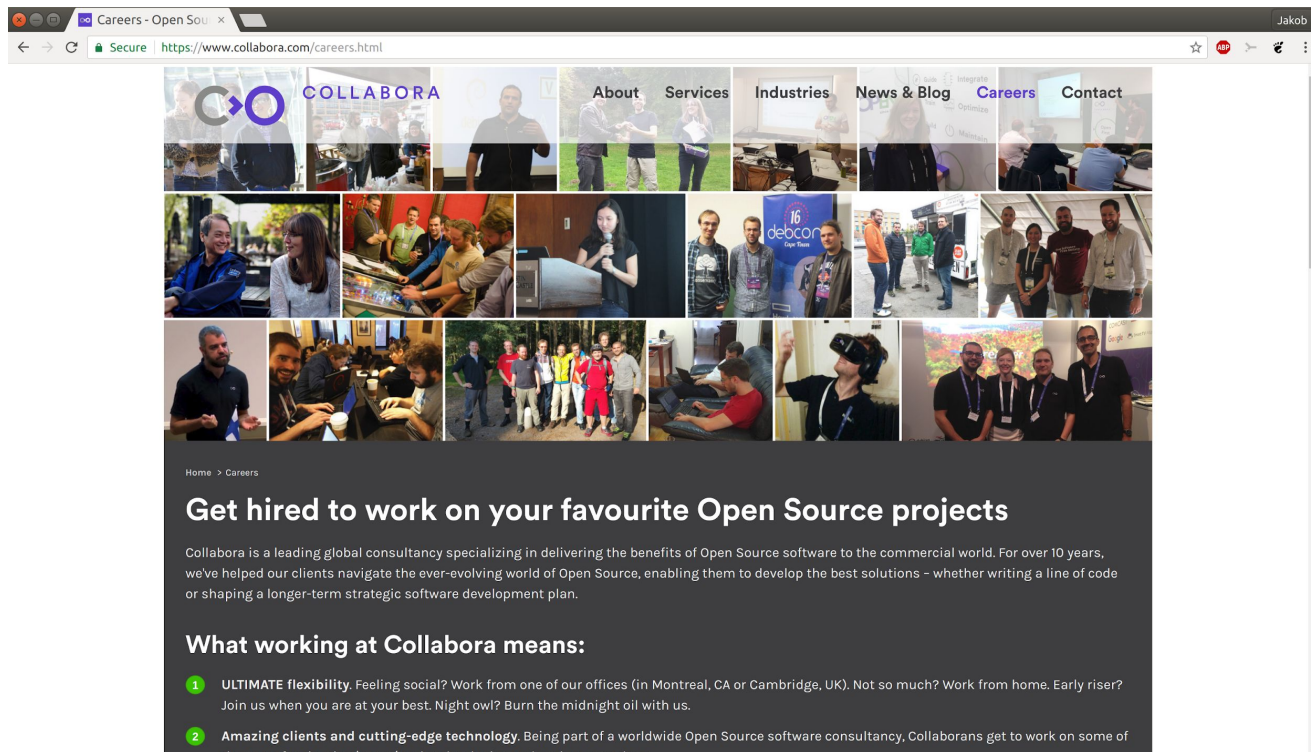


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Get in touch

- <https://gitlab.freedesktop.org/monado>
- <https://monado.dev>
- Irc.freenode.net - #Monado
- joey.ferwerda@collabora.com
- christoph.haag@collabora.com

We are hiring



The screenshot shows a web browser window with the URL <https://www.collabora.com/careers.html>. The page features a navigation bar with links: About, Services, Industries, News & Blog, Careers, and Contact. Below the navigation bar is a large grid of 18 small images showing various people working in different settings, including office environments, conferences, and team photos. The main content area has a dark background with the heading "Get hired to work on your favourite Open Source projects". Below this heading is a paragraph of text: "Collabora is a leading global consultancy specializing in delivering the benefits of Open Source software to the commercial world. For over 10 years, we've helped our clients navigate the ever-evolving world of Open Source, enabling them to develop the best solutions – whether writing a line of code or shaping a longer-term strategic software development plan." Below the paragraph is the section "What working at Collabora means:" followed by two numbered points: 1. **ULTIMATE flexibility.** Feeling social? Work from one of our offices (in Montreal, CA or Cambridge, UK). Not so much? Work from home. Early riser? Join us when you are at your best. Night owl? Burn the midnight oil with us. 2. **Amazing clients and cutting-edge technology.** Being part of a worldwide Open Source software consultancy, Collaborans get to work on some of the most fascinating / groundbreaking technologies and projects out there.

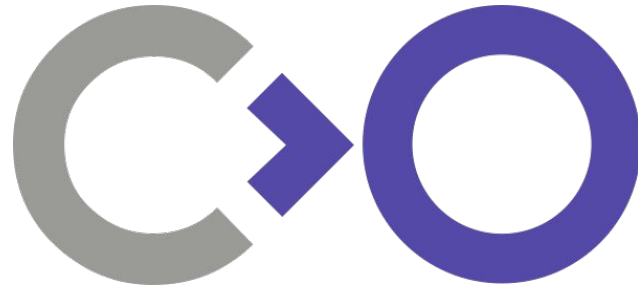
Home > Careers

Get hired to work on your favourite Open Source projects

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Thank you!



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