



# Khronos Group Request for Proposals (RFP)

## Monado Improvements

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# Request for Proposals: Monado Improvements

## 1. Background

The OpenXR Working Group was established in January 2017 to create a royalty-free, open standard that provides high-performance access to Augmented Reality (AR) and Virtual Reality (VR) -- collectively known as XR -- platforms and devices.

One of the OpenXR runtimes that has risen in popularity these past few years is called Monado. Monado is developed as an open source project and is licensed under various permissive licenses explicitly listed here :

<https://gitlab.freedesktop.org/monado/monado/-/tree/main/LICENSES>

## 2. Project Goal

The main goal of the project is to improve the general suitability of Monado when used for XR display devices and companion devices as well as enhance various select key features that are considered important by Khronos.

## 3. Deliverables

The Work consists of targeted improvements to Monado components listed in 3.1. The Work shall not target or depend on any specific device - other than a simulation device for testing purposes - and should be well usable on all complete XR systems, such as VR headsets, AR glasses, autostereoscopic devices and magic window devices. Additionally within scope is ensuring that delivered Monado improvements can be used well on all 3 major XR platforms (Android, Linux and Windows), unless specified otherwise.

Note :

- Monado is an open-source project not owned by Khronos. Any file solely built for this effort will be copyrighted to Khronos and files modified by this Work will be jointly copyrighted to the current copyright owners and Khronos.
- New code added to the Monado project should follow those code style guidelines and conventions: <https://monado.pages.freedesktop.org/monado/conventions.html>

## 3.1 Code

What follows is a list of deliverables for the project.

**3.1.1** - Support for unbounded, no stage, re-centering and local floor reference spaces.

**3.1.2** - Improvements to the ``xrt_space`` system to handle the `XrEventDataReferenceSpaceChangePending` event, as listed in the 1.0.27 OpenXR core specification.

**3.1.3** - Enhancements to the compositor so that it uses ``xrt_space`` for poses.

**3.1.4** - Implementation of "Direct Mode" compositor 'target' on Windows platform.

**3.1.5** - Implementation of Helper code and configuration format for device attachment hierarchy (note: config format to be made in collaboration with Monado community).

**3.1.6** - Refactoring of the compositor graphics pipeline code to the new render architecture.

**3.1.7** - Refactoring of the layer "squashing" code to process each view separately (note: That code is the one that composites the layers for distortion or transmission).

**3.1.8** - Addition of the layer "squasher" helper function(s). (note: this code must be reusable e.g. packaged in a library).

**3.1.9** - New code for cylinder and equirect2 layer types to compute path and equirect (note: cubemap may also be added if time permits but is not a priority).

**3.1.10** - Support for Generic IPC channels in order to ease the process of adding new extensions.

**3.1.11** - Add support for select extensions:

**3.1.12.1** - XR\_KHR\_visibility\_mask

**3.1.12.2** - XR\_KHR\_vulkan\_swapchain\_format\_list

**3.1.12.3** - XR\_EXT\_conformance\_automation

**3.1.12.4** - XR\_EXT\_debug\_utils

**3.1.12.5** - XR\_EXT\_eye\_gaze\_interaction

**3.1.12.6** - XR\_EXT\_hand\_joints\_motion\_range

**3.1.12.7** - XR\_EXT\_palm\_pose

**3.1.12.8** - XR\_EXT\_win32\_appcontainer\_compatible

**3.1.13** - Improvements to binding code to lay the foundations for user-driven input remapping, aka action based remapping (has external dependency of input improvement project).

**3.1.14** - Implementation of an interface for tracking plugins (to use Monado as a testbed for tracking).

Note: All code delivered within this project scope shall be properly commented source code integrated into the existing Monado GitLab repository which uses C and C++.

## 3.2 Tests and CI

**3.2.1** - Addition of more unit tests for various important components of Monado.

**3.2.2** - Fixes to all clang-tidy errors (note: actual fixed or simple silencing if appropriate)

**3.2.3** - clang-tidy setup on CI to enforce checking.

**3.2.4** - OpenXR-CTS setup on CI for automated testing of the runtime.

Note: Unit tests shall be added to the Monado GitLab repository where applicable, with appropriate test result reporting, both successful and failure cases within the existing Catch2 framework under the `tests/` sub-folder.

## 3.3 Documentation

**3.3.1** - Proper documentation of newly added code.

Note : User/design documentation shall be added to the [Monado doxygen documentation \[2\]](#) (or other suitable Monado web resource) where applicable (For example, in case complex logic/features gets added to the codebase).

## 4. Schedule and Budget

Khronos has a budget of \$72K USD for this project and expects work to be completed within six (6) months of project initiation.

**\*\*Project type:\*\*** Because of the complexity of the Scope, this project type is expected to be T&M (Time and Material).

**\*\*Billing:\*\*** Contractor will invoice Khronos on a monthly basis. Proposals must outline the cost per engineer per month.

**\*\*Team Structure:\*\*** There is no requirement on the team size and team structure. Proposals must however outline number of resources available for the available budget, as well as weekly allocations for each resources proposed for the Work.

## 5. RFP Methodology

This RFP is being circulated publicly, and any interested company is welcome to respond.

Once awarded, Khronos will establish an email list and a communication channel regarding this project that any interested Khronos member may join. Status and progress reports should be prepared for the OpenXR meetings, in particular raising questions or resolving blocking issues.

All code and documentation development shall take place in a public GitHub/GitLab repository of the developer's choosing with the delivery target of the [Monado GitLab repository \[1\]](#). Work shall follow good development practices, and allow for regular reviews through incremental commits.

## 6. Selection Process

Khronos shall designate a Khronos RFP Manager and will use an RFP email list ([openxr\\_monado\\_improvements\\_rfp@lists.khronos.org](mailto:openxr_monado_improvements_rfp@lists.khronos.org)) that can be used to contact the RFP Manager and all other OpenXR Working Group members involved in the bid selection process. No member making a bid shall be on the RFP list. Any company considering making a bid in response to the RFP should notify the RFP list as soon as possible. Any potential bidder may request additional information and submit questions directly to the RFP manager or on the RFP email list. Any additional Khronos information and RFP clarifications will be distributed equally to all potential bidders.

All bidders should provide the following information in the format of their choice:

- Proposed schedule, assuming work starts 11th of September 2023.
- Confirmation that if your bid is accepted, you are willing to work under the terms of the [Khronos Contractor's Agreement \[3\]](#).
- Any issues or risk factors that they wish to highlight.
- Supporting materials, including background materials about their company, highlighting experience and expertise relevant to this project.

**RFP responses are requested by 6am PDT on 3rd of August 2023**, and should be sent to the RFP list. All bids must be valid at least through 8th of September 2023. Bidders may update their bid as they wish before the submission deadline. In exceptional circumstances a requested submission deadline extension may be issued to all bidders at Khronos' discretion.

Khronos will evaluate all bids and select the bid based on proposed features, budget, schedule, relevant experience, and expertise.

Khronos expects to announce the selected bid within two weeks after the submission deadline and will immediately notify all bidders and enter into contract negotiations with the selected bidder to finalize deliverables and payment schedule. Khronos will immediately notify all other bidders once contract negotiations are complete. In the case contractual agreement cannot be reached, Khronos may select an alternative bidder and re-enter negotiations.

Work can start immediately when the contract is negotiated and executed by both parties.

## **7. Contractor's Agreement**

The selected contractor will be required to execute the [Khronos Contractors Agreement \[3\]](#) with Milestones and Costs entered into Exhibit B and Contractor Disclosures entered into Exhibit C.

No work shall begin, and Khronos shall be liable for no costs or expenses, until the selected contractor is in receipt of a mutually executed Contractor's Agreement.

It is important that contractors understand that, under the terms of the Contractors Agreement, Khronos will assess progress on a regular basis and reserves the right to terminate or renegotiate the contract in the event of insufficient progress or other issues.

## **8. Project Continuation**

If this project is completed satisfactorily, the selected bidder may be invited to bid on a continuation project that has yet to be defined.

## **9. References**

### **9.1 The Monaco GitLab repository**

[<https://gitlab.freedesktop.org/monado/monado>](https://gitlab.freedesktop.org/monado/monado)

### **9.2 Monaco doxygen documentation**

[<https://monado.pages.freedesktop.org/monado/>](https://monado.pages.freedesktop.org/monado/)

## 9.3 Khronos Contractors Agreement template

<https://members.khronos.org/document/d1/23303>