



**Khronos Group**  
**Request for Proposals**  
**SYCL 2020 CTS**  
**June 2022**

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# 1. Background

This project will improve the existing SYCL Conformance Test Suite (CTS)<sup>[3]</sup> targeting the SYCL 2020 standard specification<sup>[1]</sup> in two ways:

- improved test coverage of SYCL 2020 tests;
- CTS Framework refactoring to reduce development barriers to creating and deploying new tests.

The work described in this RFP covers 6 months of work aiming for breadth-first coverage, with the possibility of extension at the WG’s discretion for further depth coverage

# 2. Methodology

Khronos has a fixed budget for this project. Khronos has provided a prioritized list of CTS test coverage in ‘Scope’ below. Bidders will be asked how many items from the list can be delivered within budget. In particular, an estimate detailing which test cases / feature coverage improvements can be delivered for each month of the contract period should be provided.

This RFP is open and will be circulated to all Khronos members, and any interested non-Khronos members are welcome to respond.

Khronos will use the SYCL email list for communications regarding this project and any interested Khronos member may join. Short status and verbal progress reports should be prepared for the weekly SYCL working group meetings while the project is underway, in particular detailing recent activities and raising open questions or blocking issues.

All code development shall take place through Pull Requests to an agreed branch of the public Khronos SYCL GitHub CTS Repository<sup>[3]</sup>.

New features, improvements and other changes to the testing framework should include documentation added to the CTS repository.

The SYCL working group shall review and accept each CTS modification when complete, with particular attention focused on the delivery of the first deliverable to establish best practices for subsequent deliverables, including the general SYCL CTS documentation, that can be easily extended with each subsequent CTS deliverable.

The Contractor shall provide a designated point contact for the duration of the project.

For all changes made to the CTS, the contractor shall ensure that the CTS always compiles for a recent version of each of the three major SYCL implementations (ComputeCpp, DPC++ and hipSYCL). The necessary infrastructure to support this (continuous integration, compile-time disabled test cases, preprocessor macros) is already in place.

### 3. Scope

The execution shall be divided into two phases, each limited to a fixed number of months. Work for each phase must be delivered in the order specified.

#### ○ 3.1 Phase 1: Creation of a Development Plan

**Time budget: 1 month.**

The contractor shall devise a plan for how to approach development work on the SYCL CTS over the contract period. In particular, this should cover the following aspects:

1. The contractor shall develop a methodology for assessing the current state of CTS coverage reading a particular SYCL feature or concept, possibly through automated or manual means, or a combination thereof.
2. The contractor shall develop a system for structuring test code and conformance report generation taking account off:
  - a. Optional features (e.g. USM, kernel bundles)
  - b. Device capabilities/aspects (e.g. FP16, images)
  - c. Deprecated functionality
  - d. Functionality involving multiple devices (e.g. moving buffers between devices)
  - e. Reduced feature set
  - f. Backend interop
3. The contractor shall select a representative set of devices to be tested on, in accordance with the working group. In particular, at least one CPU and GPU device should be selected, as well as one OpenCL-backend and one non-OpenCL-backend device should be selected.
4. The contractor shall devise a system of tracking development progress and planning. In particular this process needs to be conducted in a way that allows coordination with other contributors such as Khronos Group members as well as third party open-source contributors. The working group suggests the usage of GitHub issues, pull requests and project boards for this purpose.

#### ○ 3.2 Phase 2: Continuous CTS Development

**Time budget: 5 months.**

The contractor shall perform continuous work on the SYCL CTS by adding new test cases, improving existing ones as well as extending the underlying testing infrastructure as needed.

For each SYCL feature or concept that is to be tested, the following procedure should be adhered to:

1. Assessment of current CTS coverage of the feature or concept.
2. Creation of a test plan in accordance with the SYCL working group. Examples of test plans can be found in the public Khronos SYCL CTS GitHub repository<sup>[3]</sup>.
3. Implementation of said test plan.

The SYCL working group favors a “breadth-first” approach regarding coverage of SYCL features or concepts. In particular this includes coverage of important headline features added in SYCL 2020, including, but not limited to:

- Backends & interoperability
- Unified Shared Memory
- Reductions
- Group algorithms

In addition, development resources should be spent on updating existing 1.2.1 tests for SYCL 2020:

- Focus on removed APIs, and Identify new, and changed cases within existing tests
- Revisit generated test cases (sycl::vec, math-builtins)
  - **FAQ:**
- Should there be PRs and a review period?
  - YES: We simply need to put more WG resources into weekly PR reviews.
- Should contractors be in charge of reviewing external contributions?
  - NO: We'll do that.
- Test plans: Do we use them? Should contractors create them? Do we provide them (like Vulkan SC WG does)?
  - Contractors should create them before tackling new tests.

## 4. Deliverables

Besides contributing source code to the public Khronos SYCL CTS GitHub repository, the contractor shall submit the following deliverables at the specified dates.

### ○ 4.1 SYCL CTS Development Plan (once)

A document detailing the procedures for continuous development of the CTS, as detailed above, including an estimate on how many tasks can be completed within the contract period.

**Due Date:** At the end of month 1 of the contract period.

**Acceptance Criteria:** signoff after discussions with the SYCL Working Group that the plan is feasible and practical.

### ○ 4.2 Test Case Development (once per week)

Continuous development of test cases to improve SYCL 2020 feature coverage, in the form of test plans and source code contributed to the public Khronos SYCL CTS GitHub repository<sup>[3]</sup>.

Each CTS tests shall consist of:

- Source code in designated public Khronos GitHub repository;
- Extended CI and CMake configuration files, as applicable;
- Confirmation of successful compilation and execution on agreed platforms;
- User documentation added to the CTS, as applicable.

**Due Date:** Once per week at the beginning of the SYCL working group call.

**Acceptance Criteria:** the SYCL working group shall confirm the above components are present, correct and follow reasonable coding standards, or require updates before acceptance, on the weekly call following at least one week of review.

### ○ 4.3 SYCL CTS Development Report (once per month)

A report detailing the ongoing development of CTS tests and supporting features, as described in Section 3. To be delivered in the form of a small document containing references to relevant commits, issues and pull requests, as well as an outlook of plans for the next month.

**Due Date:** At the end of months 2, 3, 4, 5, and 6 of the contract periods.

**Acceptance Criteria:** signoff after discussions with the SYCL working group that implemented changes meet the expected quality and scope, and those future plans align with the working group's priorities

## 5. Schedule and Budget

Khronos has an upper budget limit of 100K USD for this project and expects work to be complete within six months of project initiation, with agreed payment due on completion and acceptance of CTS based on agreed schedule between contractor and WG.

## 6. Selection Process

Khronos shall designate a Khronos RFP Manager and will use an RFP email list ([sycl\\_rfp@lists.khronos.org](mailto:sycl_rfp@lists.khronos.org)) that can be used to contact the RFP Manager and all other 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 in August 2022.
- Confirmation that if your bid is accepted, you are willing to work under the terms of the Khronos Contractor Agreement <sup>[2]</sup>.
- 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 5PM PT on Monday July 25, 2022** and should be sent to the RFP list. 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 winning bid based on timescales, and relevant experience and expertise.

Khronos expects to announce the selected bid one week 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. Contractors Agreement

The selected contractor will be required to execute the Khronos Contractors Agreement 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. References

[1] SYCL Registry <https://www.khronos.org/registry/SYCL/>

[2] Khronos Contractors Agreement template <https://members.khronos.org/document/dl/23303>

[3] SYCL Conformance Test Suite <https://github.com/KhronosGroup/SYCL-CTS>