SC’22 Booth Talk Series

SOLLVE OpenMP Validation and Verification Testsuite

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OpenMP Validation and Verification Testsuite

• What is it?
  • Suite of tests encompassing of the OpenMP features (directives, constructs, runtime calls)

• Why is it?
  • Evaluate OpenMP readiness of various systems and their compilers
  • Help Compiler Developers
    • Peer reviewed, publicly available, up-to-date
    • Test conformance for different releases
  • Help Application Developers
    • Before attempting to utilize a new feature, take a look
Latest OpenMP Specification: 5.2

- Released November 2021
- Around 27 modifications (new features, deprecated features, behavior changes)
  - Fortran specific features
    - Metadirectives, assumption directives, nothing directive, error directives, and loop transformation constructs for pure procedures
    - allocators construct
    - dispatch construct with end directive
- Few-to-none of these modifications to the specification are implemented in popular compilers
  - GCC provides status here [https://gcc.gnu.org/onlinedocs/libgomp/OpenMP-5_002e2.html#OpenMP-5_002e2](https://gcc.gnu.org/onlinedocs/libgomp/OpenMP-5_002e2.html#OpenMP-5_002e2)
  - LLVM provides status here [https://clang.llvm.org/docs/OpenMPSupport.html](https://clang.llvm.org/docs/OpenMPSupport.html)
- How do we generate tests from scratch, especially when there are no implementations
Writing a test from scratch (Our abridged workflow)

Select a feature from application developer’s priority list

Identify if this is a new feature or redefinition of an existing feature

Existing Test

Adapt a previous test of ours to a newer version of the specification with consideration towards changes in OpenMP specification

New Test

Consult OpenMP specification and OpenMP examples document to determine proper context and usage of the feature.

Submit Test for Review

Receive two approvals and merge into main suite.
Running the test suite

1. Clone our repo [https://github.com/SOLLVE/sollve_vv](https://github.com/SOLLVE/sollve_vv)
2. Setup your environment (install or ‘module load’ your compilers)
3. Use our make commands to compile and run a single test or the whole suite

Running a single test:

```
make CC=gcc CXX=g++ FC=gfortran VERBOSE=1 VERBOSE_TESTS=1 LOG=1 LOG_ALL=1 SYSTEM=summit DEVICE_TYPE=nvidia OMP_VERSION=5.1 SOURCES=*
```

Running the entire suite:

```
make CC=gcc CXX=g++ FC=gfortran VERBOSE=1 VERBOSE_TESTS=1 LOG=1 LOG_ALL=1 SYSTEM=summit DEVICE_TYPE=nvidia OMP_VERSION=5.1 SOURCES=*
```
Compilers We Test

- AMD
- GNU
- HPE/Cray
- IBM
- LLVM
- NVIDIA

Systems of Interest

- Summit (Oak Ridge National Lab)
- Perlmutter (NERSC)
- Spock (Oak Ridge National Lab)
Results Reporting

- Our testsuite can easily be included in your weekly/nightly runs
  - As simple as running ‘make report_json’
  - Run results nicely formatted in .json
  - Easily consumable by your visualization tools (spreadsheets, Elasticsearch)
  - Can also run ‘make report_summary’ to get quick overview of your total pass/fail numbers
Coverage

OpenMP 5.0
• 258 tests
  • 100% coverage for C/C++
  • 70% coverage for Fortran

OpenMP 5.1
• 45 tests
  • 85% coverage for C/C++
  • 5% coverage for Fortran

OpenMP 5.2
• 6 tests
  • 20% overall coverage

Test creation priority is based on needs of application developers.
Progression of Compilers Over Time

**NVHPC & 5.0 [Summit]**

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<th>NVHPC versions</th>
<th>PASS</th>
<th>FAIL</th>
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**GCC & OMP 5.0 [Summit]**

<table>
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<th>GCC Versions</th>
<th>PASS</th>
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Community Interaction

- Recent Success Stories
  - Test had a ‘slip-up’ that led to a patch in GCC [https://gcc.gnu.org/PR102972](https://gcc.gnu.org/PR102972)
  - Test led to issue filed for inclusion in OpenMP 6.0 specification
  - Test led to a new description of the threadprivate directive.
- OpenMP Official Examples Document has adapted one of our test cases
Ways to collaborate

Get involved in our project through Github!

- https://github.com/SOLLVE/sollve_vv
Acknowledgment

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