

SPEC ACCEL 1.2 for OpenMP 4.5 offload released

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Achievement:

New SPEC ACCEL 1.2 allows users to compile and run codes using directives in the OpenACC and OpenMP suites for measuring peak performance based on real-world applications. SPEC's High-Performance Group (SPEC/HPG) has released a new version of its SPEC ACCEL software that adds a suite of OpenMP applications for measuring the performance of systems using hardware accelerator devices and supporting software.

Significance and Impact:

There are two main architectural trends on the road to Exascale: one relies in manycore processors, and another using attached accelerators. The OLCF's Summit system is an example of a heterogeneous accelerator-based system that will use POWER9 processors and NVIDIA Volta GPUs. To understand the performance that new systems can provide, a widely used standard set of benchmarks is necessary. This work showcases the Standard Performance Evaluation Corporation (SPEC) High Performance Group (HPG) benchmark suites. The SPEC benchmark suites are widely used to measure the performance of architectures as well as compiler implementations. For those reasons, the OLCF will use the SPEC benchmark suites for Summit's acceptance.

- The SPEC ACCEL benchmark suites are a valuable tool to both validate correct functionality of compiler implementations as well as measure and compare the performance of different implementations on diverse architectures.
- The OLCF will use the SPEC OMP2012, SPEC ACCEL ACC, and SPEC ACCEL OMP benchmark suites during acceptance of the OLCF's next-generation supercomputer, Summit.
- The suites have been a valuable asset to determine the maturity of the compilers that will be available on Summit, as shown by the results obtained on Summitdev.

Challenges:

This is the first official benchmark for OpenMP 4.5 to explore a performance portable programming style for accelerators. The benchmark uses a single code base to target multiple accelerators including: multicore, intel Xeon Phi, and GPUs. One of the lessons learned is that compilers and runtimes need to be advanced enough to optimize implementation-defined behavior of OpenMP 4.5 such as picking the # of teams, thread limit, # of threads in parallel regions, length of SIMD, loop schedules, etc.

Sponsor/Facility: NCCS

Papers & Presentations:

- Juckeland, Guido, Hernandez, Oscar, et al. "From Describing to Prescribing Parallelism: Translating the SPEC ACCEL OpenACC Suite to OpenMP Target Directives." *International Conference on High Performance Computing*. Springer International Publishing, 2016.
- SPEC ACCEL: <https://www.spec.org/accel/>
- Hernandez, O., Bernholdt, D., and Vergara Larrea V.G., "SPEC ACCEL", presentation at DOE Centers of Excellence Performance Portability Meeting, Glendale, Arizona, April 2016