The Hidden Mysteries of Proxy Applications

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To curate a suite of proxy applications that are representative of the intended characteristics of their respective parent applications and are easy to obtain and use. Characteristics include hardware bottlenecks (e.g., memory, computation, communication) and programming models.

**Mission**

**GPU Performance**

- Memory and cache bandwidths measured using microbenchmarks
- V100: 829 GB/s achieved HBM BW; MI-60: 806 GB/s achieved HBM BW
- HIP versions of SW4lite and PENNANT provided by AMD
- Arithmetic intensity measured using nvprof on V100 and rocprof on MI-60
- Proxy app kernels 20-30% more slowly on MI-60 consistent with lower achieved HBM BW.

**Continuous Integration**

CI on ECP CI @ORNL:
- Builds 49 apps using Spack on ORNL’s Ascent machine
- Power9 with GPUs
- XL compiler chain

CI on Travis: Every night we build 48 proxy apps using the latest Spack in Ubuntu and Fedora containers
- Upsides: free, in the open, early warnings on Spack and spackage breakages
- Downsides: only 2 cores, no MPI, no GPUs, no testing against TOSS etc.
- Use ECP-CI when more than a smoke test is needed

**Cosine Similarity**

- Quantifies the similarity of two applications’ signatures
- Identifies gaps and artifacts in a proxy set representation of a workload
- Defines a minimal set of applications that span the observable underlying behaviors (computation, memory, and communication)

**Problem Selection Matters**

- Berkeley-h20: Production topography
- Gaussian Hills: Synthetic topography
- CTS2 Benchmark: Quicksilver

**Coming Soon: Machine Learning Proxy Suite**

The Proxy App Project is currently collecting candidate proxy apps and use cases for a new proxy app suite focused on applications of machine learning to scientific applications.

Please send your suggestions to ECP-PROXY-APPS@listserv.llnl.gov