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SCTuner— an autotuner for I/O library

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In HPC, typical scientific codes often manage a massive amount of data utilizing I/O middleware libraries, such as HDF5, PnetCDF, ADIOS, etc. These libraries support a variety of data structures and allow end users to optimize I/O performance by tuning configurations across multiple layers of the HPC I/O middleware stack. This work proposes SCTuner, an autotuner built within the I/O library itself to tune the configurations across I/O layers dynamically and agilely at application runtime. To this end, we introduce an I/O statistical benchmarking method to profile the behaviors of individual supercomputer I/O subsystems with varied configurations across I/O layers. Next, we use the benchmarking results as the built-in knowledge in SCTuner, implement an I/O pattern extractor, and plan to implement an online performance tuner as the runtime of SCTuner. We conducted a benchmarking analysis on the Summit supercomputer and its GPFS file system Alpine. The preliminary results show that our method can effectively extract the consistent I/O behaviors of the target system under production load, building the base for I/O autotuning at application runtime.

Student?

No

Supervisor name

Supervisor email

Primary author: Dr XIE, Bing (ORNL)

Presenter: Dr XIE, Bing (ORNL)

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