Evaluating DAOS Usage and Performance for a Classic HPC Application

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Abstract

While the Distributed Asynchronous Object Storage (DAOS) is essentially a key-value store that makes consequent use of modern technologies, it also allows usage for traditional file-based workflows using different approaches. In this presentation, the latter capability is evaluated using the Fortran-based large-eddy simulation code PALM. The application itself has support for multiple ways to create and read checkpoints: Using unformatted Fortran IO with a file-per-process scheme and two MPI IO based methods that use a single shared file. For the latter, a subvariant targets shared-memory systems and aggregates data locally in a single MPI process instead of performing IO individually. It can therefore be used to compare those typical IO patterns while maintaining the same application functionality. In addition, DAOS also provides applications with different interfaces, which creates an option space: MPI libraries supporting DAOS natively, emulating POSIX filesystems, and using high-level APIs like HDF5 are possibilities to use DAOS with classic HPC application. The presentation will reveal early performance numbers of the Fortran IO and the two MPI IO variants in PALM using 9.216 MPI processes and both MPICHs native DAOS support as well as mounted DAOS containers in the Linux filesystem. The DAOS system used in the study provides approx. 0.5 PB of storage using Optane memory technology distributed accross 19 storage nodes and is connected to the HPC system via an Omni-Path interconnect. Finally, the DAOS performance numbers are also compared to Lustre and GPFS filesystems in production and connected to the same HPC system.

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