Runtime Environment for High Performance Computational Fluid Dynamics Applications based on SAGA

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Abstract

*We propose a runtime environment for high-performance computational fluid dynamics (CFD) applications in supercomputing resource pool. We direct to ease technical difficulties in submitting/scheduling specific CFD applications on traditional batch queues through the use of a pilot-job implementation. We address three kinds of CFD applications which suffer from the difficulty in scheduling: a single large-scale long-term job, multiple jobs for parametric study and coupled multi-component jobs. A BigJob framework (needs reference!!!!!) on the basis of SAGA (Simple API for Grid Applications) is introduced to solve above difficulties, in which the technical basis for effectively scheduling multiple jobs [**?**] or redistributing resources for coupled applications [**?**] has been already explored. So we focus on implementing a framework for running a long-term job by the single launch from users' perspective. The idea is to submit a number of BigJobs in tandem and migrate to the latest allocation until the completion of a simulation, within the extent of administrating policies of supercomputing centers and generally agreeable morals. Along with this technical development, we also design an interface to conveniently submit those types of CFD jobs. We present our use cases in this paper, one which is fixed in size and whose simulation time exceeds the maximal wall time of a single allocation (unsteady flapping motion of an insect), the other which contains multiple moderate jobs in size and time whose time-for-completion might exceed one job allocation (fluid-structure interaction for aerodynamic shape optimization), and still the other which is composed of multiple coupled jobs (coupled simulation of aerodynamics and combustion).*