Performance Portability in the exascale computing project

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ABSTRACT

The Exascale Computing Project (ECP), funded by the US Department of Energy (DOE), is preparing science applications and software technologies for the next generation of computing platforms expected to deliver exascale performance. These platforms will be heterogeneous, with a large fraction of their computing power coming from accelerators. Performance portability was identified as a critical issue for the Exascale Computing Project because of nontrivial architectural differences between today’s machines and those expected at exascale and beyond. Obtaining good performance on current machines (e.g., Summit at Oak Ridge National Laboratory) is no guarantee that modifications and developments so far will meet the requirements at exascale. Many ECP teams in Application Development (AD) and Software Technology (ST) are working toward performance portability by investing in revised software design and refactoring, while leveraging advances in programming models, runtimes, and development tools. At the beginning of ECP, a wide gap existed between emerging programming models and other supporting technologies and their readiness for use by the applications. The space of available design choices for performance portability was huge, with little direct experience to inform decision making. Consequently, many diverse approaches have come into play in different projects. Collectively, these projects represent a fairly comprehensive state-of-knowledge about performance portability. We believe that scientific computing community at large will benefit from learning about the experiences and findings of ECP. We propose a minisymposium that will include presentations from members of the ECP leadership who have been deeply involved in advancing the dialogue on performance portability. Perspectives will be presented from Applications with special focus on interesting use cases, from co-design centers that have become the linchpin for performance portability solutions for their client applications, and from software technologies that do foundational work enabling application teams to meet their goals. We expect that the proposed minisymposium will be highly informative and valuable to the European exascale efforts.

**REFERENCES**

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