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Using NERSC High-Performance Computing (HPC) systems for high-energy nuclear physics applications

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High-Performance Computing Systems are powerful tools tailored to support large-scale applications that rely on low-latency inter-process communications to run efficiently. By design, these systems often impose constraints on application workflows, such as limited external network connectivity and whole node scheduling, that make more general-purpose computing tasks, such as those commonly found in high-energy nuclear physics applications, more difficult to carry out. In this work, we present a tool designed to simplify access to such complicated environments by handling the common tasks of job submission, software management, and local data management, in a framework that is easily adaptable to the specific requirements of various computing systems. The tool, initially constructed to process stand-alone ALICE simulations for detector and software development, was successfully deployed on the NERSC computing systems, Carver, Hopper and Edison, and is being configured to provide access to the next generation NERSC system, Cori. In this report, we describe the tool and discuss our experience running ALICE applications on NERSC HPC systems. The discussion will include our initial benchmarks of Cori compared to other systems and our attempts to leverage the new capabilities offered with Cori to support data-intensive applications, with a future goal of full integration of such systems into ALICE grid operations.

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