**Managing ATLAS Simulation Workloads on Titan with PanDA**

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**Abstract**

The PanDA software is used for High Throughput Computing (HTC) workload management on distributed grid resources by the ATLAS experiment at the Large Hadron Collider (LHC) at CERN. The BigPanDA project, funded by the US Department of Energy (DOE-ASCR), extended PanDA to access High Performance Computing (HPC) resources, allowing supercomputers such as Titan at Oak Ridge National Laboratory to be used as grid sites in the Worldwide LHC Compute Grid (WLCG). ATLAS now consumes more than 25 million core hours monthly on Titan as part of its production workflow for simulations, using two different operational modes: a â€œtraditionalâ€ mode that uses ALCC allocations, and a â€œbackfillâ€ mode through a DD program that opportunistically consumes idle resources. For the traditional mode, new techniques were implemented to shape large jobs for consuming allocations on a leadership-class machine, while in the backfill mode, work is streamed steadily to Titan to backfill high priority leadership-class jobs. The backfill mode is particularly interesting because it lies at the intersection of HTC and HPC, and its successful operation has increased overall throughput and utilization on Titan without significant side effects, while benefiting the physics objectives of ATLAS. For both modes, BigPanDA has integrated traditional grid computing with HPC architecture for ATLAS production workflows, and ATLAS has replicated this accomplishment to additional HPC centers around the world. This presents a summary of the innovations to use Titan successfully for LHC physics goals.