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Albuquerque, New Mexico 87185-0101
Livermore, California 94551-0969

*date:* September 5, 2017

*to:* Scott Collis, 1400
David Womble, 1120
Ken Alvin, 1420
Ron Brightwell, 1423
Kevin Pedretti, 1423

*from:* Review Panel: Robert Hoekstra, SNL (1422, Chair); Simon Hammond, SNL (1422); Scott Hemmert, SNL (1422); Ann Gentile, SNL (9328); Ron Oldfield, SNL (1461); Mike Lang, LANL; and Steve Martin, Cray, Inc.

*subject:* Final Review of FY17 ASC CSSE L2 Milestone #6018 entitled "Analyzing Power Usage Characteristics of Workloads Running on Trinity"

The final review for the FY17 ASC Computational Systems and Software Environment (CSSE) L2 Milestone #6018 was conducted on August 30, 2017 at Sandia National Laboratories in Albuquerque, New Mexico. The review panel unanimously agreed that the milestone has been successfully completed.

Kevin Pedretti (1423) led the milestone team and presented the results. The review panel was comprised of staff from several Department of Energy national laboratories that are involved with next generation platform development from both a hardware and software perspective. The Panel consisted of Robert Hoekstra, SNL (1422, Chair); Simon Hammond, SNL (1422); Scott Hemmert, SNL (1422); Ann Gentile, SNL (9328); Ron Oldfield, SNL (1461); Mike Lang, LANL; and Steve Martin, Cray, Inc. The presentation documented the technical approach of the team and summary of the results with sufficient detail to demonstrate both the value and the completion of the milestone. A separate SAND report was also generated with more detail to supplement the presentation.

In anticipation of practical power consumption limits, the ASC program requires guidance for power management of future platforms and applications. The Trinity program's Advanced Power Management (APM) Non-recurring Engineering (NRE) project is delivering integrated power monitoring and control capabilities in the Trinity platform, building on prior work developing the Power API. This milestone focused on utilization and demonstration of these capabilities to collect information on the power usage characteristics of the ASC production workload running on Trinity. Methods will be developed to assist with understanding and applied to assess the potential impact of power-constraints in future ASC platforms. This milestone lays the necessary groundwork for addressing the long-term goal of

determining how to best use and operate future ASC platforms to achieve the greatest benefit subject to a constrained power budget.
**Completion Criteria: "**This milestone will be completed when the above-mentioned analyses are complete and a report or presentation is provided summarizing the key results and recommendations."

*The milestone review team unanimously agrees that the completion criteria were fully met and in some cases exceeded.*

The milestone work was primarily focused on analyzing the performance and correlated power usage of SNL's ATDM SPARC application, a compressible flow code used for analysis of re-entry body performance at hypersonic velocities. It was demonstrated that power management through "p-states" and/or power capping could be very effective at reducing power consumption by the Trinity platform with very little impact to runtimes. In addition, a number of proxy applications were analyzed with similar results. The review team commends the milestone team for producing results which have the potential to significantly impact current and future ASC platforms with regards to power use and reliability. These results have proven the value of the PowerAPI development and its potential impact on the HPC community.