SAND2019-xxxx R

FY19 ASC L2 Milestone 6813 Place Astra (Vanguard1) in operation and Configured for OHPC and SRN Advanced Prototype Work

Executive Summary

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Introduction

This milestone was created to ensure the Sandia FOUS program has the needed levels of project direction, programmatic information and an escalation path (if needed) for their role within the deployment and operations of the Astra cluster.

Milestone Description

As written in the ASC Implementation Plan, the milestone description is as follows:

““Astra” is an Arm-based Advanced Architecture Prototype High Performance Computing (HPC) System. Including site preparation, the HPC system team will prepare and deploy Astra and its associated system and application software onto the OHPC network and then onto the SRN. The system will be fully functional within the given security environments.”

Impact Statement

As the first Prototype platform running the Arm architecture, it is important that Astra effectively deliver to the needs of SNL and partner labs ASC customers. From pre-deployment to its role on the SCN in support of several FY20 Level 1 milestones, the machine needs to be capable of supporting hardware and code level research as well as production computational runs. As evidenced by the solid results of Astra in FY19, the SNL Astra team has a strong focus on delivering to these needs.

Summary of Work Done

“Astra” is a 2592 node Arm based Advanced Architecture Prototype High Performance Computing (HPC) System deployed at Sandia-NM in building 725East. The Sandia HPC Systems team in collaboration with Sandia’s Scalable Computer Architectures team deployed Astra, its associated system and application software onto Sandia’s Open HPC network (OHPC) and onto the Sandia Restricted Network (SRN). The system supported the use of Sandia and multi-lab codes during each of these phases. Work through-out the year was completed with an eye on delivering to an FY19 ASC Level 2 Milestone titled “Place Astra (Vanguard1) in operation and Configured for OHPC and SRN Advanced Prototype Work”. The completion criteria for this milestone states: “Astra will be a functional HPC cluster capable of successfully executing the tests, demonstrations, benchmarks, and application codes specified by the ATDM (Advanced Technology Develop and Mitigation) program element”. In this article, we describe the tasks performed by the teams within multiple Sandia organizations and HPE (the vendor) to take Astra from its bare bones hardware to a functional HPC system serving the computational needs of Sandia and partner laboratories as well as completing the L2 milestone. As the world’s largest ARM HPC system, Astra presented some unique challenges for the deployment and operations teams. Initial

deployment was handled by the vendor and during that period many challenges were physical in nature, for example; installing the system while the building was still under construction, running with an untested rack-based cooling system, a power bus bar recall and associated re-work. The Sandia HPC Systems team used the early install period to learn about the hardware and the vendor provided software stack "HPCM". During the early "Vendor procurement milestone" phase, the Sandia team provided the necessary network, bastion node, authentication services, external file systems and job scheduling support to enable the system to operate on the Sandia Open HPC network (OHPC). A solid understanding of the HPE provisioning software was needed to enable Sandia to install a TOSS (Tri-lab Operating System Software) stack for use on the SRN. Once on the SRN, the system was securely and effectively used by multi-lab code teams and provided a viable platform for the compilation and running of a Sandia ATDM code (SPARC) meeting the requirements of this milestone. Other codes from Sandia and partner laboratories had success as well and include:

- SNL: EMPIRE, CTH, NALU
- LANL: PARTISn and FLAG
- LLNL: Aries, ALE3D, Ardra, Mercury, pF3D.

During both the OPHC and SRN phases of Astra, the Sandia HPC System's team provided operational, file system (internal and external), scheduling and hardware support for the cluster.

Path Forward

Astra delivered on the core goals as defined in this and other milestones in FY19. With the concerted effort of the Sandia and HPE team it has become a solid foundation to enable the same level of success in FY20. The FOUS team played a pivotal role in all aspects of enabling this machine to deliver production class performance. The Sandia FOUS program provided two dedicated FTE's (Full Time Equivalent) to this effort with 6 staff actively participating and many others providing support as needed (User and application support etc.)