HPC Hyper-Converged Virtualized Software-Defined Storage Framework

Hussein Al-Azzawi[1,2] Damion Terrell[1] Shuang Yang[1] Jose Sanchez[1] Prof. Hameed Badawy[2] Prof. Patrick G. Bridges[1]

[1]Center for Advanced Research Computing, University of New Mexico, Albuquerque NM • [2]Department of Electrical and Computer Engineering, New Mexico State University, Las Cruces NM

Background

Virtualizing HPC storage systems would increase the reliability, manageability, and flexibility of these systems.

This project is examining a wide range of HPC storage virtualization, architectures, focusing on the performance costs of different approaches.

Objective

Fully virtualize HPC parallel file systems such as Lustre.

Utilizing the InfiniBand network using SR-IOV.

Cluster configuration scenarios and tradeoffs

Baseline - bare-metal cluster
- Max performance
- Hard to manage, no virtualization, least hardware utilization

VMware - pure passthrough
- Slightly lower performance than bare-metal
- Simpler management

VMware - VMDK and SR-IOV
- Decreased, yet acceptable performance
- Much easier to manage, higher resource utilization, and provides disaster recovery