Bridging the Divide Between HPC and Commodity System Software

(Invited Talk)

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ABSTRACT

Cloud computing holds great promise for High Performance Computing (HPC) users and applications. Accordingly a large amount of work has gone into exploring and enabling the use of current cloud service architectures to support HPC applications. While the allure of cloud based HPC systems is very compelling, there are still a number of issues that prevent the cloud from becoming a truly viable HPC platform. In particular, application performance has been found to suffer from competing workloads, randomized layouts and node assignments, as well as competing network flows. All of these issues arise from the fact that HPC applications are forced to share and compete for resources along with a wide variety of other commodity applications. Unfortunately, the presence of these competing workloads is critical to the success of the cloud model, which relies on the economics of leveraging shared resources. While this inherent tension has so far acted as a barrier to the deployment of HPC applications in the cloud, we claim that it can be overcome using multiple specialized system software stacks that are capable of providing isolated partitions for co-located workloads. This talk will focus on the design and development of system software capable of effectively supporting HPC applications in a commodity cloud environment through the use of dynamic resource partitioning and isolated management layers.

Speaker Bio

John Lange is an Assistant Professor of Computer Science and Computer Engineering at the University of Pittsburgh. Before joining the faculty at Pittsburgh he received his M.S. and Ph.D. degrees at Northwestern University where he conducted research in high performance, distributed, and cloud computing. While at Northwestern he developed the Palacios Virtual Machine Monitor, an OS independent virtualization architecture targeting high performance environments. Palacios has been deployed on a large variety of HPC systems including commodity compute clusters and large scale supercomputers. Since moving to Pittsburgh, he has conducted research on specialized high performance system software architectures and approaches for adopting these specialized approaches in commodity cloud environments. During the last few years his work has focused on supporting performance isolation in consolidated environments through the use of multiple independent specialized system software stacks. His research group has also contributed many of the underlying system software components for the next generation exascale OS/R prototype being developed by the Hobbes project for the Department of Energy.

Categories and Subject Descriptors

D.4.7 [Operating Systems]: Organization and Design

General Terms

Design, Performance, Experimentation

Keywords

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