Towards a Lightweight RDMA Para-Virtualization for HPC

Abstract:
Virtualization has gained increasing attention in the recent High Performance Computing (HPC) development. While HPC provides scalability and computing performance, HPC in the cloud benefits in addition from the agility and flexibility that virtualization brings. One of the major challenges of HPC in virtualized environments is RDMA virtualization. Existing implementations of RDMA virtualization focused on supporting VMs running Linux. However, HPC workloads rarely need a full-blown Linux OS. Compared to traditional Linux OS, emerging Library OSes, such as OSv, are becoming popular choices as they provide efficient, portable and lightweight cloud images. To enable virtualized RDMA for lightweight library OSes, drivers and interfaces must be re-designed to accommodate the underlying virtual devices. In this paper we present a novel design, the virtio-rdma driver for OSv, which aims to provide RDMA para-virtualization for lightweight library OS. We compare this new design with existing implementations for Linux, and analyze the advantages of virtio-rdma's architecture, its ease of migration to different operating systems, and the potential for performance improvement. We also propose a solution for integrating this para-virtualized driver into HPC platforms, enabling HPC application users to deploy their use cases smoothly in a virtualized HPC environment.

Stichworte:
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