Jonas Sæther Markussen

SmartIO: Device sharing and memory disaggregation in PCIe clusters using non-transparent bridging

Cluster computing and other distributed applications often need to process large amounts of data, leading to high performance requirements to I/O resources, such as flash storage, graphics cards, and network cards. However, while such resources are now common in individual computer systems, distributing them across machines in a cluster in a way that maximizes both performance and resource utilization is a challenge. Our SmartIO solution enable computers in a computing cluster to share their I/O resources with each other. Machines can lend out their internal devices and borrow remote resources from other machines. By using a special network adapter called a Non-Transparent Bridge, SmartIO memory maps remote resources for a local system. Software can be written as if all resources are local, greatly reducing programming complexity compared to existing sharing solutions, which require distributed programming paradigms. In other words, resource sharing becomes easier with SmartIO. Our thorough performance evaluation proves that devices can be shared and used with minimal performance overhead using our SmartIO solution, increasing the overall resource utilization in the cluster.

Dissertation for the Degree of PhD 2022
Department of Informatics
Faculty of Mathematics and Natural Sciences ISSN 1501-7710 No. 2561

Jonas Sæther Markussen

SmartIO: Device sharing and memory disaggregation in PCIe clusters using non-transparent bridging

2022

UNIVERSITY OF OSLO

Faculty of Mathematics and Natural Sciences

Jonas Sæther Markussen

SmartIO: Device sharing and memory disaggregation in PCIe clusters using non-transparent bridging