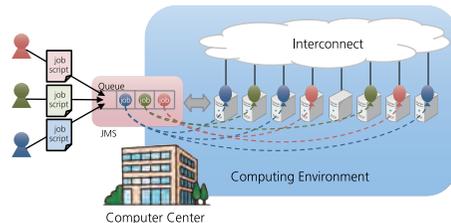


Mechanism for Handling Network and Virtualized Computational Resources on SDN-enhanced Job Management System

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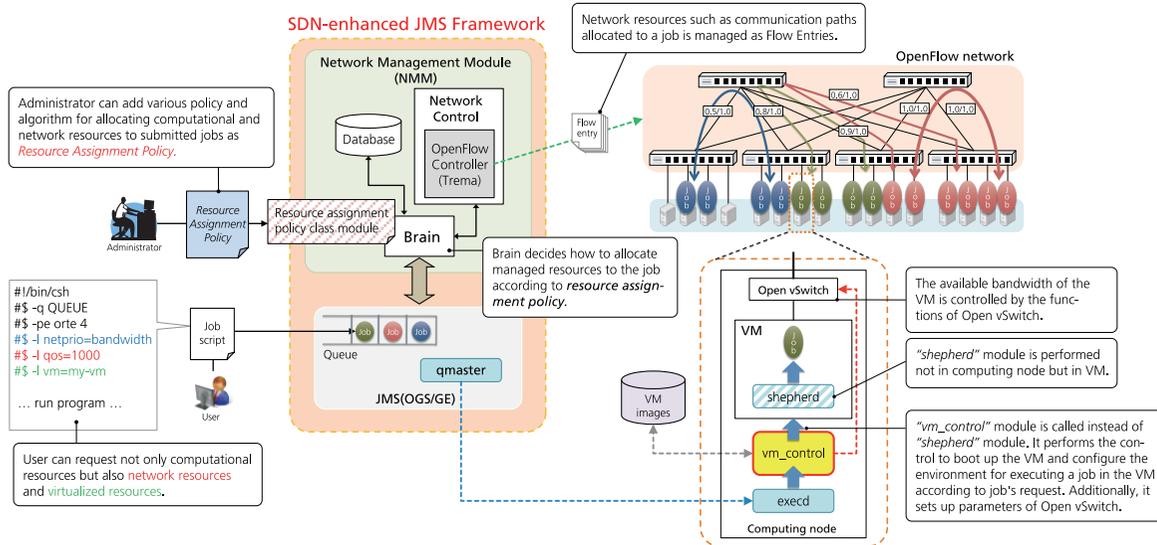
Motivation and Objectives

Nowadays, users' computation requests to a high-performance computing (HPC) environment have been increasing and diversifying for performing large-scale simulations and analysis in the various science fields. Since computer center flexibly complies such computation requests, efficient and flexible resource management system is essential for guaranteeing high performance computing capabilities for multiple users and gaining high job-throughput in computing environment.



Mechanism on SDN-enhanced JMS Framework

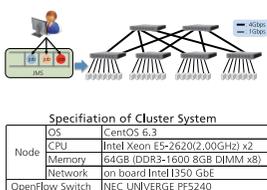
We have been studying and developing a novel Job Management System (JMS) for various resources of computing environment. For handling interconnect as network resources, the *SDN-enhanced JMS Framework* has been implemented by leveraging Software-Defined Networking (SDN) concept, which can dynamically control an entire network in a centralized manner [1]. Moreover, we have also been developing a mechanism for deploying job's processes to virtual machines (VMs) on computing nodes, and controlling available bandwidth on communication paths allocated to a job by using QoS functions of Open vSwitches (OVSS) connected with VMs.



Evaluation

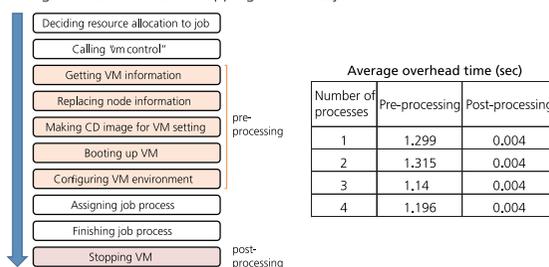
1) Effectiveness of job execution time by network resource management

An experiment was conducted to assess the effectiveness of network resource management. In the experiment, multiple parallel jobs, each of which generates four processes for executing NAS Parallel Benchmarks (Class B) were submitted. As a result, the SDN-enhanced JMS Framework achieved the reduction of average job execution time, even if a cluster system with fat-tree interconnect has enough bandwidth capacity.



2) Overhead to handle virtualized computational resources

We measured the overhead caused by the *vm_control* for managing VMs on the SDN-enhanced JMS Framework. The overhead of the *vm_control* has the pre-processing and the post-processing: the configuration process to prepare the environment in a VM before it starting, and removing additional setting for the VM after it stopping individually.



Acknowledgments

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[1] Y. Watahisha, S. Date, H. Abe, Y. Kido, K. Ichikawa, H. Yamanaka, E. Kawai, S. Shimojo, and H. Takemura, "Performance Characteristics of an SDN-enhanced Job Management System for Cluster Systems with Fat-tree Interconnect", Emerging Issues in Cloud (EIC) Workshop, The 6th IEEE International Conference on Cloud Computing Technology and Science (CloudCom 2014), pp. 781-786, December 2014.

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