Advanced Resource Control for OpenStack

Context

OpenStack is a management framework that provides users access to pools of compute, storage, and networking resources through a web-based dashboard. Hence, it basically offers a framework to realize an IaaS cloud. Our institute runs an instance of OpenStack on its own hardware resources and uses this installation in research projects to test new technology, algorithms, and strategies. One of the most common features is (starting and) running so-called Virtual Machines that OpenStack will map to a physical machine.

The concept of cloud computing inherently takes into consideration that two Virtual Machines may be run at the very same physical machine competing for physical resources such as CPU, RAM, network bandwidth, and disk access. By default, OpenStack does not provide any sophisticated mechanisms to restrict the amount of physical resources a Virtual Machine consumes. For instance, two Virtual Machines may both access the disk and consequently cause congestion harming the performance of both of them.

Scope of the Thesis

This thesis deals with the challenge of enhancing OpenStack with resource control mechanisms. You shall investigate different approaches to integrate such resource control mechanisms into OpenStack. In particular, you shall compare your view with the blueprint for the realization that already exists in the OpenStack community (https://wiki.openstack.org/wiki/Admin-set-resource-quota-dynamically).

Based on the outcome of this evaluation, you prepare a strategy of how to mechanisms for each of the four aspects CPU, RAM, disk I/O, network I/O. Then, you shall realise a prototypical implementation that covers at least the I/O aspects and deploy your solution on our testbed.

The thesis is concluded with a performance evaluation of disk-intensive and of network-intensive applications competing for the respective resources. In particular, the set-up with and without your extensions shall be compared.

Requirements and Comments

If this thesis achieves good progress and outcome, its results are to be integrated in the CACTOS research project (http://cactosfp7.eu) which is released under an OpenSource license. For that reason, we appreciate if you are ready to OpenSource your results.

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