

Exposé

zur Bachelorarbeit

Arbeitstitel

Design and implementation of a connectivity manager for virtual scalable network environments

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1. Introduction

The demands on networks have changed dramatically in the past two decades, with an ever-growing number of people and devices relying on applications and services. The underlying infrastructure has been left mostly unchanged and is reaching its limits. In order to resolve this Software Defined Networking (SDN) is going to be extending and replacing parts of traditional networking infrastructures. SDN separates the network's control and forwarding planes and therefore allows a more efficient orchestration and automation of network services.

In virtualized cloud infrastructure like OpenStack, the placement of Virtual Machines (VMs) on a particular compute node can be decided on by comparing different run-time parameters. The network connectivity between those VMs has to be prioritized and classified into different classes, depending on the service that are running on it.

Currently there are a number of solutions for managing network connectivity between VMs. A comparison and their current limitations follows in the next section. The chosen approach is to extend the existing network control and management services with Quality of Service (QoS) capabilities. In support of the thesis the Connectivity Manager will be implemented and the differences in bandwidth usage will be shown in one use-case.

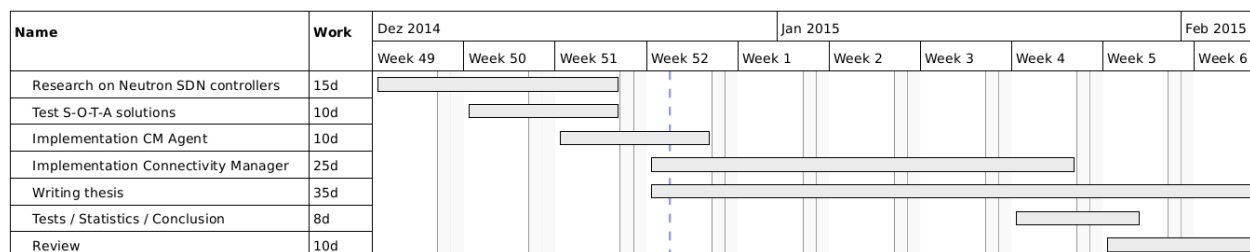
2. Background

Today a number of SDN controllers that extend OpenStack Neutron already exist. These solutions enable different types of Quality of Service and offer additional extensions for the basic networking services that Neutron offers. A number of those SDN controllers have been tested in a testbed, however the features of the latest official releases couldn't be successfully deployed in conjunction with OpenStack Juno. The latest version of OpenStack (Juno) offers better network bandwidth for cloud infrastructures at scale at a higher stability which is why it is a prerequisite to use the latest version. The implementation of the Connectivity Manager will be split in two components, with the Connectivity Manager Agent running on the Cloud Orchestrator within the infrastructure and the Connectivity Manager being set up externally. The Agent will be handling the requests that are being made through a ReST API, but the entire network logic is part of the Connectivity Manager. The two main functions are to choose the best-fitting Compute Nodes (OpenStack Nova hosts) for deploying a new stack and enabling QoS on VMs with high bandwidth needs. The use-case for the research is the NUBOMEDIA project. NUBOMEDIA is the first cloud platform specifically designed for hosting interactive multimedia services. These multimedia services run on media servers which scale with the amount of users and computing needs. Upon this infrastructure the Connectivity Manager will be tested and statistics about the network usage will be made.

3. Project outline

First of all the state-of-the solutions will be tested and their limitations and current state of integration with OpenStack Neutron documented. An algorithm for determining the placement of Virtual Machines within the infrastructure will be investigated and integrated into the Connectivity Manager. The Connectivity Manager Agent will be implemented and run on a test environment. As the last step the Connectivity Manager is integrated into the existing NUBOMEDIA infrastructure management tool and the implementation will be tested.

Timeline



Research on Neutron SDN controllers

For a further understanding of how Neutron interacts with the overall OpenStack cloud infrastructure software and how it makes use of Software-Defined Networking (SDN) the different configurations are researched.

Test of state-of-the-art solutions

Three state-of-the-art solutions, to be specific OpenDaylight, Ryu and a Neutron QoS extension have been selected as a comparison and also motivation for implementing the Connectivity Manager. Their setup, configuration and current state of achievability of the goals set for our use-case are documented and compared.

Implementation of Connectivity Manager Agent

The Connectivity Manager Agent will be running within the OpenStack cloud on the control node from where it has access to all of the Compute Nodes and virtual network switches. It's function is to forward information about the current state about the computing and network infrastructure to the Connectivity Manager. The information will be exchanged through a ReST API.

Implementation of Connectivity Manager

The Connectivity Manager will be implemented as a service for the existing NUBOMEDIA cloud infrastructure tool (Elastic Media Manager). It receives information about the current state of the datacenter from the Agent and decides about the placement of newly deployed Virtual Machines. It does so by comparing Computing and Network parameters and choosing the best-fitting Compute Node based on an algorithm. The Virtual Machines are classified depending on the services that they run, which is how their network bandwidth requirements are chosen.

Writing of thesis

Part of the time during the implementation phase is already reserved for writing the thesis in order to document the current state and prior investigations that have been finished.

Tests / Statistics / Conclusion

At the end of the implementation phase tests regarding the outcome and a comparison to the existing solution will be made. Furthermore these tests will conclude the outcome of the research and its contribution to the stated problem within the use-case.

Review

All parts of the thesis will be reviewed by the supervisor and discussed for final changes.

4. Bibliography

- What's coming in OpenStack Networking for Juno Release
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- Neutron Networking concepts
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