Project Proposal

EECS 428

Title

Virtual Network Bandwidth Guarantee Methods in Software Defined Network

Author Names

Jiaqi Yang (jxy530), Ziqin Zhai (zxz962)

Introduction

Virtual networks (VN) bandwidth guarantee is an essential topic in the settings, such as enterprise network and multi-tenant data center. In order to ensure the users' experience, how to guarantee application-bandwidth efficiently is important. Instead of using traditional distribution controlling, the appearance of SDN provides separation between the control and data plane, make it easier to deploy different applications, and therefore improves the scalability. Therefore, it is more feasible to guarantee bandwidth through SDN technique, more specifically, Ryu controller covered in the course.

Related Work

In Qu, Liao, An, and Fan's work [1], they proposed a virtual network bandwidth guarantee method, which uses Ryu SDN controller and Open vSwitch to allocate the available bandwidth by VN's priority. The simulation results prove that their proposed method could effectively allocate the bandwidth resource in a guaranteed manner while maximizing the bandwidth utilization.

In another related work by Cao, Tong, Lv, and Jiang [2], they proposed another method implemented by Floodlight under Mininet simulation environment. Their method performed coarse granularity classification of different applications and carried out Application-towards Bandwidth Guarantee (ATBG) algorithm. Their simulation proved that the method guarantees different service bandwidth.

Implementation

Since the team consists of an undergraduate student and a graduate student, the implementation plan divides into two parts: 1) implementation of cited work [1] in Ryu controller by Jiaqi and 2) more innovative exploration beyond the current works by Ziqin.

- Implementation of Qu, Liao, An, and Fan's work

  In the study described in the previous section, Qu, Liao, An, and Fan's work proposed a method to guarantee bandwidth in a priority-based manner. The study provides a dozen lines of pseudocode for the core method, _packet_in_handler, while it does not provide further implementation detail or any source codes. Therefore, Jiaqi's work will be the implementation of their method in Ryu controller, the simulation of the implemented method in Mininet, and the analysis of acquired data to determine the validity of the implemented method.

- Beyond the current work

  According to Qu, Liao, An, and Fan's work, a new method is proposed to configure the QoS queues on the concerned port of the Open vSwitch and the way to develop a VNBG app on the Ryu controller. It can be considered that the method can be used with the use of meter tables of the OpenFlow protocol 1.3.

Evaluation Plan

Since the goal of our research is to implement and test our bandwidth guarantee methods, which will be implemented in Ryu controller, we could simply set up a network topology in Mininet and generate network traffic to measure the usable bandwidth for each virtual network. If the monitored data of bandwidth allocation fits the expectation, which is bandwidth guaranteed pattern, then our design is valid.

References

1. S. Cao, M. Tong, Z. Lv and D. Jiang, "A Study on Application-Towards Bandwidth Guarantee Based on SDN," *2016 IEEE Globecom Workshops (GC Wkshps)*, Washington, DC, 2016, pp. 1-6. doi: 10.1109/GLOCOMW.2016.7848827

2. Q. Fu, L. Qing, A. Yingzhu and F. Yamei, "A priority based virtual network bandwidth guarantee method in software defined network," *2015 6th IEEE International Conference on Software Engineering and Service Science (ICSESS)*, Beijing, 2015, pp. 153-156. doi: 10.1109/ICSESS.2015.7339026