TEL510E

Telecommunication Network Planning and Management

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Project Proposal

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Proposed Research Topic : OpenFlow based Load Balancing for Fat-Tree Networks

INTRODUCTION

Nowadays data center environment requires high data traffic demand in each hosts. Fat –tree network commonly used for this need. In this network there are two important target; maximizing system throughput and minimizing network latency. Therefore lots of different load balancing methods are used. Load balancing methods offer higher bandwidth utilization in fat tree network, besidesthis type networks contain more than one link between hosts so this topology can offer higher available link which means also higher bandwidth usage [1].

TARGET

In traditional networks which use static switches, load balancing process is based on hash calculations of packets. In this approach, each packet of a flow follows the single pre-defined path through the network. When something happen like a switch breakdown or physical layer damage, packets tend to drop or the other switches need to be manually configured for choosing a different path. This becomes a difficult task for large networks. Also, disadvantage of hashing is that all links gets the same percentage of hash values, this means all paths have the same capacity. Even if the network is hard coded to work in as multipath network, because of the equal capacity issue, efficient load balancing might not be achieved. An alternative solution for this issue is Software Defined Networking (SDN).

In this project, we aim to make some improvements over load balancing in fat-tree topology networks by using SDN technology. SDN is a concept where a central controller makes the decision where the packet is send, contrariwise switches decide this in traditional networks . Controller dynamically detects the topology by listening to the switches and calculates available path with less load. Controller then directs the switches with forwarding entries needed for the paths [2] . We will design a dynamic routing algorithm to obtain these directions by controller thus we will be achieved an efficient load balancing for each seperate flow.

TOOLS

The implementation of this project will be done by using Mininet as a network emulator that creates a network of virtual hosts, switches, controllers, and links [3]. A Mininet host behaves just like a real machine, you can ssh into it and run arbitrary programs that is installed on the underlying Linux system. Packets can be handled by the Mininet switches, with a given link speed and delay. Mininet switches support OpenFlow as a communication protocol. Connection of the switches and the controller software, which is Floodlight in this project, will be established by OpenFlow. Due to generate traffic, Iperf network testing tools will be used so that TCP or UDP data streams will be created accordingly. Bandwith, delay jitter and datagram loss can be monitored on Iperf [4].

While Floodlight SDN controllers beginning based on Beacon, open source controller, it was built using Apache Ant which is a very popular software build tool that makes the development of Floodlight easier and flexible [5]. Floodlight has an active community and has a large number of features to create a system that meets the requirements of the specific organization. Floodlight is designed to work with the growing number of switches, routers, virtual switches, and access points that support the OpenFlow standard. Web based and Java based GUIs are available on this controller.

REFERENCES

[1] Li, Y., & Pan, D. OpenFlow based Load Balancing for Fat-Tree Networks with Multipath Support.

[2] B. Lantz, B. Heller & N. McKeown. A Network in a Laptop: Rapid Prototyping for Software-Defined Networks.

[3] Mininet. mininet.org

[4] Iperf. https://iperf.fr/

[5] Floodlight. http://www.projectfloodlight.org/