

ABSTRACT

The need of computer network technologies in companies and corporations are growing fast. Network performance, more complex additional configuration made network controlling uneasy and not flexible. Software Defined Network (SDN) is a network paradigm where the control plane is separated from the forwarding plane. SDN can also be used to run conventional methods such as IP forwarding, access list and MPLS. Multi Protocol Label Switching (MPLS) is a network architecture defined by Internet Engineering Task Force (IETF) to combine forwarding mechanism on layer 2 with routing on layer 3, by encapsulate labels on IP Packets.

In this final task, an SDN-based MPLS network simulation being tested where 2 important MPLS components which control plane and data plane can be separated from switch, so that the network control is focused on a controller. Ryu is used as the control plane and Mininet as the data plane. The simulation was tested using an SDN application called SNHx, which uses Djikstra algorithm and its own label algorithm on building the LSP. The network performance analysis was done in simulation process, to acknowledge the network convergence time, resource utilization and QoS parameters. Singlepath IP routing is used as a benchmark, to summarize how is the SDN-based MPLS network performance. Beside of that, scalability will be tested by increasing the number of switches.

The test results SDN-based MPLS network performance shows that the value of the four QoS parameters remain on the value of the standard ITU-T G.1010 and has a better value than the QoS of IP networks, although not significantly. It proves that MPLS can runs on SDN platform and will be optimal if applied to the MPLS service such as VPN, traffic engineering, QoS and any transport over MPLS. Delay average generated for data is 7.1 ms (UDP) and 14.16 ms (TCP), for VoIP is 7.12 ms, and for video is 12.48 ms (UDP) and 18.9 ms (TCP). The provisions suggested of ITU-T for the data is under 15 s, VoIP is under 150 ms, and the video is under 10 s. Jitter average generated for data is 0.018 ms (UDP) and 5.8 ms (TCP), for VoIP is 0.02 ms, and for video is 4.35 ms (UDP) and 7.05 ms (TCP). With a standard jitter under 1 ms for VoIP and not specified for data and video. The resulting packet loss for all kinds of traffic are 0% (UDP) up to 75 Mbps provision of background traffic. The recommended value is 0% for data, under 3% for VoIP, and under 6% for the video. Throughput average generated for data is 38.23 kbps, 73.32 kbps for VoIP, and 5224.25 kbps for video. Then the network convergence time is obtained with a range of values from 0.08 to 16.77 second until giving 50 switches on network. And the value of convergence time when handle link failure is about 2.07 minutes.

Keywords : MPLS, Algoritma Djikstra, OpenFlow, SDN, SNHx