POXVine : Multi-Tenant Virtual Network Emulator

B.Tech. Project 2nd Stage Report

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Abstract

Abstract The advent of cloud computing and software defined networks allows tenants to run huge and complex network topologies on shared infrastructure. We built a multi-tenant virtual network emulation application *POXVine* using the POX controller which controls a network over Mininet. In this report, we demonstrate the design and implementation of POXVine.

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Chapter 1

Introduction

1.1 Software Defined Networks

Software defined Networks is an emerging architecture which provides a framework to manage network services through the abstraction of lower level functionality. In SDNs, the *control plane* which makes the decision of where to send traffic is decoupled from the *data plane*, which performs the actual forwarding of traffic. The advantages of SDN over traditional network architectures are listed below.

- *Central State* : The entire state of the network and name bindings exist in a central location, called the controller. All inputs from the network are passed to the controller, which decides the policy needs to be implemented.
- *Decoupled Control and Forwarding* : In SDNs, the control plane is separated from the data plane. The controller performs the route computation and push the forwarding rules to the switches. The switches perform the forwarding of packets.
- *Software Controller* : In SDNs, the controller is implemented in software, so can be modified to implement any kind of policy. The switches perform basic forwarding and expose a common API for the controller to talk to them. Because the control plane is in software, changes in network protocols and services are easier to implement without a major hardware overhaul.

Chapter 2

System Design

POXVine consists of three main components.

- The *host mapper* is responsible to map the virtual network entities (hosts and switches) onto the physical topology. This mapping can be done based on different heuristics, so POXVine allows you to customize the host mapper. We have developed a host mapper *MinSwitchMapper*, which tries to minimize the number of *physical switches* which contain rules to the virtual topology.

- The *network Mapper* is an application built over the *POX* controller which uses the *virtual-to-network* mappings to add the required routing OpenFlow rules on the mininet switches, so that the virtual hosts can talk to one other. Another important design consideration is that the *virtual network abstraction* must be preserved, that is, if a packet is to flow across a route in the virtual topology, on the physical topology, it must traverse the virtual network entities in the same order.

- The *Mininet* infrastructure

Chapter 3

Future Work

Future Work