Intel Cloud Orchestration Networking

Spring Midterm Progress Report

Matthew Johnson, Cody Malick, and Garrett Smith

Team 51, Cloud Orchestra

Abstract

This document outlines the progress of the Cloud Orchestration Networking project for Spring 2017. It contains a short description of the project's purposes and goals, current progress, code samples, current issues, and any solutions to those issues.

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I. Project Goals

Our project is to first switch the Linux-created GRE tunnel implementation in Ciao to use GRE tunnels created by Open vSwitch. From that point we will switch the actual tunneling implementation from GRE to VxLAN/nvGRE based on performance measurements of each on data center networking cards. After this is completed, a stretch goal is to replace Linux bridges with Open vSwitch switch instances.

These goals changed somewhat by the middle of the Winter term. The primary goal now is to replace the Linux bridges with Open vSwitch switch instances because of an assumption that was found to be incorrect. It was discovered that a full implementation of Open vSwitch was required. Initially, we had planned on using a third party API, `libovsdb` to interface with the Open vSwitch management database.[1] While providing the necessary functionality, it added undocumented overhead. Specifically, all bridges and tunnels generated by Ciao had to be known about in the calling library. After extensive research and discussion with our client, we aimed to fully implement Open vSwitch into Ciao, rather than use it to exclusively create tunnels.

II. Purpose

The current implementation of Ciao tightly integrates software defined networking principles to leverage a limited local awareness of just enough of the global cloud's state. Tenant overlay networks are used to overcome traditional hardware networking challenges by using a distributed, stateless, self-configuring network topology running over dedicated network software appliances. This design is achieved using Linux-native Global Routing Encapsulation (GRE) tunnels and Linux bridges, and scales well in an environment of a few hundred nodes.

While this initial network implementation in Ciao satisfies current simple networking needs, all innovation around software defined networks has shifted to the Open vSwitch (OVS) framework. Moving Ciao to OVS will allow leverage of packet acceleration frameworks like the Data Plane Development Kit (DPDK) as well as provide support for multiple tunneling protocols such as VxLAN and nvGRE. VxLAN and nvGRE are equal cost multipath routing (ECMP) friendly, which could increase network performance overall.

References

[1] Socketplane. (2016, dec) libovsdb. [Online]. Available: https://github.com/socketplane/libovsdb/blob/master/README.md