SDN and NFV integration in Openstack Cloud to Improve Network Services and Security

Introduction

- Cloud networking has security problem, major threat like DoS, DDoS, Data loss or Identity theft and insecure cryptography make it vulnerable.

- This paper proposed an architecture that integrates SDN and NFV with Openstack cloud, and claim it can mitigate security problems.
Software-defined networking

- Features of SDN:
  - Decouple control plane and data plane
  - Centralized controller
Network Functions Virtualization

- Decouples the network functions from proprietary hardware appliances so they can run in software.
- Network functions are hosted as a VMs, controlled by hypervisor.
SDN Integrate with Openstack Cloud

- Create Openstack multi node lab with neutron-nova services.
  - One neutron controller node & several compute nodes

- Use Opendaylight(ODL) as SDN controller, which has OvS-neutron manager installed.
  - Improve network security by network isolation.
SDN and OpenDayLight integration with Openstack

Openstack cloud control node

SDN Controller
Implementation of ODL with Cloud

- **Neutron ML2 (Modular layer 2) plugin**
  - Framework in Openstack, used for utilizing the variety of layer 2 networking technologies.

- **OVS (Open Virtual Switch)**
  - Enable massive network automation for VMs that run in the cloud.

- **ODL driver**
  - Offer interface between ODL and ML2 plugin.
NFV Integrate with SDN Cloud

- NFV is integrated in juniper OpenContrail distribution.
  - Install OpenContrail package in cloud controller node.
  - Configure them with SDN controller.

- OpenContrail
  - OpenContrail controller
  - OpenContrail virtual router
    - Extends the network from the physical routers and switches into a virtual overlay network
Proposed Architecture
Proposed Architecture (cont.)

- Cloud network is directly connected with virtual switching devices, which are created using NFV.
  - Networks are isolated using OpenContrail.

- External SDN controller are establish for controlling the cloud network traffic.
Evaluations

- Compare performance of traditional cloud and SDN cloud.
  - Throughput analysis used iperf tool.
  - Latency analysis used wireshark and TCP connection.
Evaluations (cont.)

Throughput Analysis

Throughput (MBps)

- Traditional Network
- SDN-OpenFlow Network

Graph showing comparison between Traditional Network and SDN-OpenFlow Network for Throughput Analysis.
Conclusion

- This paper presents an architecture that integrates SDN and NFV with OpenStack cloud.
- Evaluation shows that performance of the proposed architecture with security improvement is still better than traditional cloud.