Routing services in software-defined networking

Software Defined Networking: The Data Centre Perspective

Xinyuan Yu, 20.03.2015
Papers of This Topic

• Demystifying routing services in software-defined networking
  - Introduce a general high level overview of routing application

• Revisiting Routing Control Platforms with the Eyes and Muscles of Software-Defined Networking
  - Provide a very detailed and concrete example of a routing module for BGP
Outline

- Use Cases
- General overview of routing application
- Detailed example
- Questions
Use Cases

- Load balancing
- Pre-calculating the alternate path
- Automatic route reconfiguration when the physical link connection fails
- Application-Aware routing
- Optimize movement of a virtual machine instance
- ...

Routing Services Architecture Overview

- Link Discovery
- Topology Manager
- Virtual Routing Engine
Link Discovery

- Responsible for discovering and maintaining the status of physical links in the network

- Using LLDP (Link Layer Discovery Protocol) between OpenFlow nodes

- “The information collated by the Link Discovery is used to build the neighbor database”
Topology Manager

• “Build and maintain the topology information in the controller and calculate the routes in the network.”

• Determining the shortest path between two OpenFlow nodes or between OpenFlow and host.
Virtual Routing Engine

- “Generate a virtual networking topology consisting of virtual machines that run traditional routing protocol”

- This module makes interoperability possible between SDN controller and existing networks consisting of traditional routers.
Route Calculation within an Open Flow Island (1)

- The Discovery Process

- The Route Calculation Process
Route Calculation within an Open Flow Island (2)

Sample Data Flow

For Inter Domain Route Distribution (Homogenous)

- We can have a single aggregated routing instance representing all the OpenFlow Switches
For Inter Domain Route Distribution (Heterogenous)

- One Aggregated OSPF/BGP instance for the complete OpenFlow Island

Routing Module for BGP

- “Control plane RRs are sometimes placed in arbitrary locations of core network in large network. The best path selection is performed by RRs. Best path is not optimal for a lot of clients.”

- Have more flexible and intelligent route control
Design—Hybrid Networking Model

- In traditional network, PEs are interconnected by RRs.

- Interconnection of both control and data plane of legacy and new network

- The new control plane is in the form of BGP controller as a gateway.

RFTP (the New Control Plane) Components

- A better layered, distributed system (“the new control panel gets distributed via open flow to data path switched”)

- RF-Client
  - Collects routing and forwarding information from routing engine

- RF-Server
  - Systems core logic (e.g., event processing)

- RF-Proxy
  - Serves RFTP with switch interaction

Protocols and Abstractions

• “The RouteFlow protocol merges together the command/response syntax and a subset of the OpenFlow messages.”

• Openflow is used as the API to datapaths and the vehicle to deliver control plane messages.
Questions

• Does the centered routing services have any draw-backs? For example, if the routing services is centralized, the whole network cannot work, when the routing services is broken down. In this way, it is unstable.

• Which one is better, the model in the general overview or the specific example?
Thank You!