Software-defined networking

An Overview

Johannes M. Scheuermann
Karlsruhe, 09.06.2015
Johannes M. Scheuermann
+JohannesScheuermann
@johscheuer

Working student
IT Engineering & Operations, working with new data center technologies
Some questions to get started
Some challenges in traditional networking

- Difficult to optimize
- Known problems
- Capital costs
- Difficult to customize
What is Software-defined networking?

- Separation of control and data plane
- Vendor-agnostic
- Well-defined API
- Network virtualization
- Definition of flows
<table>
<thead>
<tr>
<th>SDN</th>
<th>NFV</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Campus</td>
<td>• Service Providers</td>
</tr>
<tr>
<td>• Faster innovation</td>
<td>• Reduce costs, space and power</td>
</tr>
<tr>
<td>• Separation of the planes</td>
<td>• Relocation of network functions</td>
</tr>
<tr>
<td>• Cloud orchestration and networking</td>
<td>• Routers, firewalls, CDN, …</td>
</tr>
<tr>
<td>• ONF</td>
<td>• ETSI</td>
</tr>
</tbody>
</table>
How does it look from an abstract view?

- Applications
- Northbound API
- Controller Platform
- Southbound API
- Data plane elements
Protocols - Southbound

- Interface for control and data plane
- OpenFlow (ONF)
- OpFlex (Cisco)
- Open vSwitch Database Management Protocol
Control and data plane

SDN-Controller/Network OS

- Policies
- Routing
- Monitoring
- Etc.

Datapath

Datapath

Datapath

Datapath
Control Plane

• Decides where traffic is sent to
• System configuration and management
• Management plane is a subset
  • Administrative traffic
• Less time-critical
Controllers

- OpenDaylight (Java)
- POX (Python)
- Ryu (Python)
- Floodlight (Java)
- ...
Data Plane

• Forwards traffic to the next hop
• Gets the „logic“ from the control plane
• Packets go through the router
What is a flow?

Flow Table Entry

- Rule
- Action
- Stats
How to set a flow?

- **Proactive**
  - Know what traffic comes

- **Reactive**
  - Communication to Controller
Typical workflow in SDN

1. Packet received
2. TCAM lookup
3. Match
   - Y: Perform action
   - N: Forward to controller
4. Program flow rule
5. Send Packet-out
6. Send Packet
Who uses SDN?

• Google
• Amazon
• Large Hadron Collider (LHC)
• AT&T
• Deutsche Bank
• …
Challenges of SDN

• Running services on existing networks
• FIB and MAC tables vs OpenFlow tables
• Secure/Protect the Controller
• Find experts in SDN/Networking
Benefits of SDN

- Traditional WAN operate with 40% utilization
- Google internal WAN (with SDN) more than 90%
- SDN protocols based on open standards (mostly)
- Enables specific domain-, rights-, and Quality of Service (QoS)-based policies
How to start?

• Use Mininet for testing
• Setup an SDN Controller of your choice
• Get a feeling of SDN
• Try out some Use Cases
Vielen Dank!

Johannes M. Scheuermann
IT Engineering & Operations

inovex GmbH
Ludwig-Erhard-Allee 6
76131 Karlsruhe

Mail:
jscheuermann@inovex.de
Pictures

- http://www.projectfloodlight.org/floodlight
- http://www.noxrepo.org/pox/about-pox
- http://www.opendaylight.org
- http://osrg.github.io/ryu