

NTT West – Beyond Neutron,

taking control of a physical multi-vendor network with OpenDaylight

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Disclaimer

- NTT West and Brocade has developed the following Proof of Concept (PoC).
- Future deployment of the PoC into a production environment is not yet guaranteed.

Summary

- NTT West commissioned Proof of Concept showcasing OpenStack and OpenDaylight. Brocade supported the solution.
- The purpose of the PoC was to:
 - ✓ Utilize OpenDaylight southbound interfaces to configure physical network elements
 - ✓ Present this capability northbound as an OpenStack service with:
 - OpenStack API
 - Horizon Dashboard

Context on the PoC

Business need to utilize physical network elements as a service

Virtual Network Functions

- Pros
 - ✓ Replaceable
 - ✓ Upgradeable
 - ✓ Extensible
 - ✓ Cheaper
 - ✓ Easily integrated into OpenStack
- Cons
 - x Limited functionality
 - x Non-performant

Physical Network Functions

- Pros
 - ✓ Performance
 - ✓ Feature-rich
- Cons
 - x Limited API
 - x Not extensible
 - x Difficult to integrate
 - x Domain knowledge required

Results of the PoC

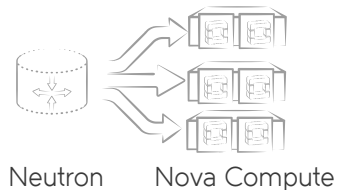
FWaaS with Physical Network Element

- Yang modeled configuration stanzas of a physical firewall appliance.
- OpenDaylight application is able to manage the device programmatically in a NETCONF like manner using CLI over SSH
- Multi-tenancy was inherent to the device
- The device capability was exposed as an OpenStack service
- Device configuration management possible through Horizon UI

Orchestration with OpenDaylight through OpenStack

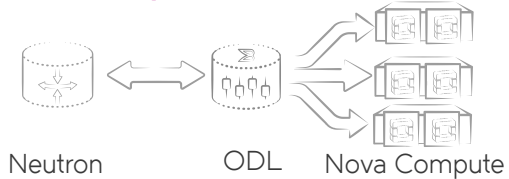
Neutron and OpenDaylight

Traditional Neutron



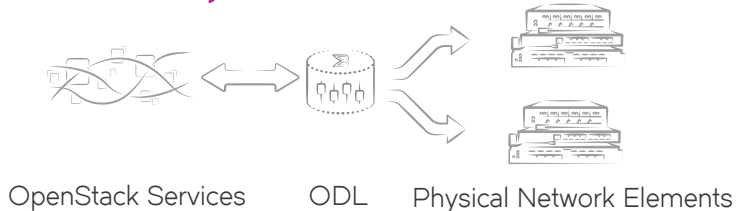
- Neutron directly programs the OVS instances on each compute node
- Simple L2 functionality

ODL with OpenStack



- Neutron proxies requests through to ODL, which has responsibility of programming the OVS on each compute node.
- Tight API integration between Neutron southbound and ODL northbound.

Possibility



- Any new or existing OpenStack service can leverage ODL northbound RESTCONF interface.
- Network elements can be configured with NETCONF, or CLI over SSH
- Can present physical devices as a service to tenants. E.g. physical FWaaS.

Advantages of OpenDaylight

Topology Discovery

- Automatic discovery of hosts and links
- Discovers IP Addresses, MAC Addresses

Scalability and Redundancy

- Use of AKKA toolkit allows for clustering.
- State distribution

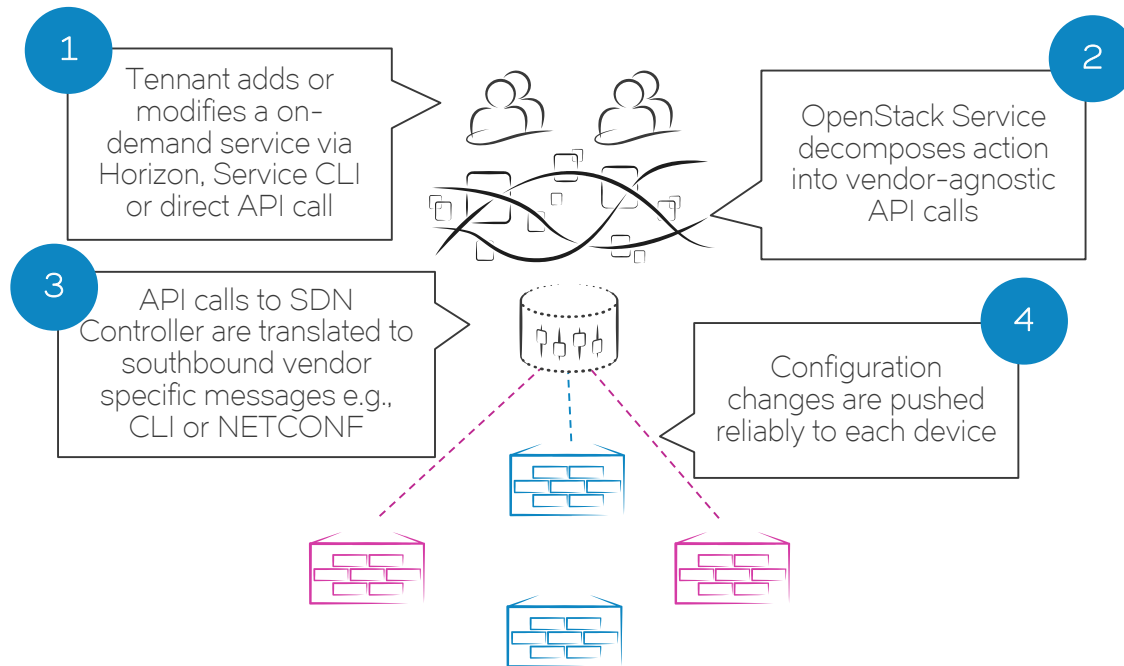
Multiple Southbound APIs

- Vendor agnostic device configuration
- SDN capable hardware (OpenFlow)

Modular Architecture (MD-SAL)

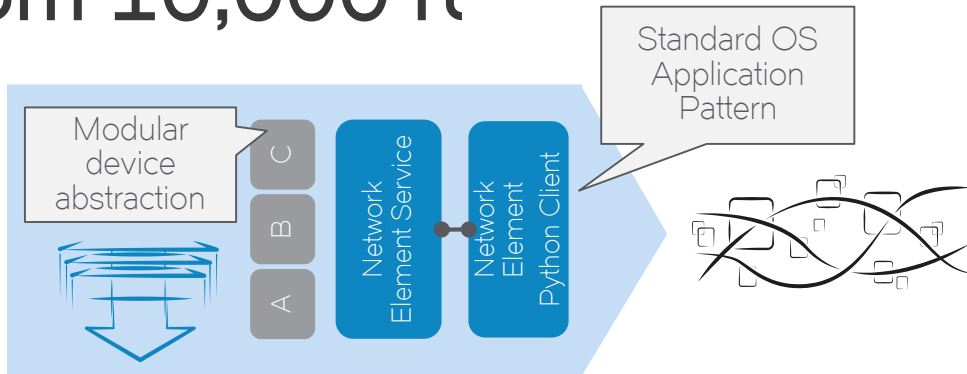
- Separation of configuration and operational datastores
- Loose coupling and abstraction of services

Automated Provisioning with ODL from 30,000 ft



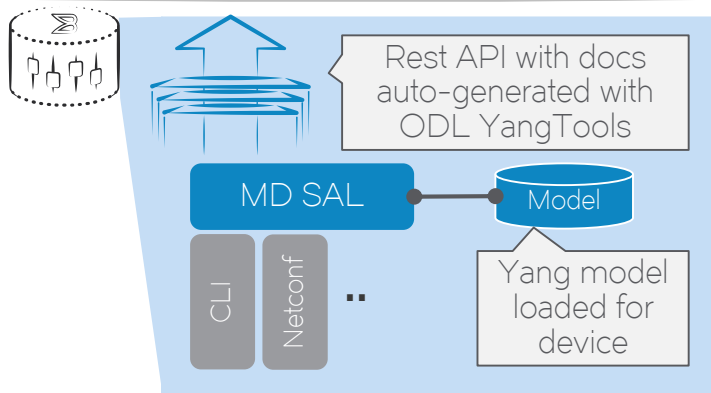
Automated Provisioning with ODL from 10,000 ft

OpenStack



- The OpenStack toolchain allows quick development of standardized OpenStack projects.
 - pbr, cookiecutter templates, etc.
- Easy integration with other OpenStack services
 - Keystone, Horizon etc.

OpenDaylight



- Simple to create new Southbound interface (CLI over SSH) due to modular architecture
- YangTools provide a very simple way to compile the model and in one hit generate north bound Rest API
- API is self-documenting
- Allows any device to be modeled and interacted with in a NETCONF like manner

Demo

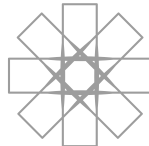
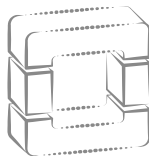
Neutron and OpenDaylight

Complimentary not supplementary

Neutron focus on configuring compute networking

OpenDaylight extends tenant reach to physical layer

Broader spectrum of devices and programmability
methods



Futures

Ideal World and Reality

Ideal World

- Software Defined Infrastructure (SDI)
 - (REST) APIs inherent in physical network elements
 - Most physical network functions (PNFs) replace by network function virtualisation (NFVs)

Reality

- Utilize physical network functions where appropriate
 - Underlay
 - Performance
- SDI applied to create Overlay networks

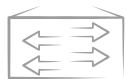
Challenges

NTT West is using OpenStack to build SDI server farm

- The challenges faced:
 - Combining physical network elements into SDI environment seamlessly
 - Multivendor hardware equipment

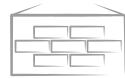
Current Target Applications

OpenStack tenants will be able to operate the following physical network functions



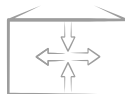
Switch

- VLAN creation
- Port Assignment



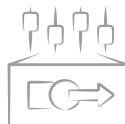
Firewall

- Context Creation
- VLAN Assignment
- FW Policy Configuration (⇒in this PoC)



Router

- Virtual Router Creation
- VLAN Assignment
- Routing Configuration



Load Balancer

- Context Creation
- VLAN Assignment
- LB Policy Configuration

Closing

NTT West continues to utilize OpenStack and is an active member of the community.

By utilizing OpenDaylight it is possible to extend the functionality of OpenStack.

NTT West continues to explore other technologies as well



Thank you