OpenStack and OpenDaylight: An integrated IaaS for SDN and NFV

OpenStack Summit Boston | May 2017

Nir Yechiel
Senior Product Manager, Red Hat OpenStack Platform

Andre Fredette
Technical Director for SDN, Red Hat’s Office of Technology
Agenda

- An integrated infrastructure for SDN and NFV?
- OpenDaylight and how it interacts with OpenStack
- The NetVirt project
- OpenDaylight and Red Hat

Slides:
https://goo.gl/prU2lW
SETTING CONTEXT
Enterprise IT vs. Telco?
The Networks is Transforming

### Automate Existing Operations
Move from manual tasks to automated tasks and shared knowledge

### Next-Generation Architecture
New ways of developing, delivering, and integrating applications

### Network Function Virtualization
Deliver services faster and more reliably at lower cost

### DevOps & Cultural Changes
Leverage enabling technologies and adapt new skill sets
Common Use Cases

- **Network Virtualization**
  - Data Center Virtual Networks
  - Campus/Branch Virtual Networks
  - Micro Segmentation

- **Residential Services**
  - Virtualized Customer Premises Equipment (vCPE)

- **Mobile Services**
  - Virtualized Radio Access Network (vRAN)
  - Virtualized Evolved Packet Core (vEPC)
  - Virtualized value-added services (VAS), including GiLAN

- **Business Services**
  - Managed L2/L3 VPNs with different SLAs
Residential Services - Example
Mobile Services - Example
Mobile Services - Example
Mobile Services - Example

Diagram showing the components and connections of a mobile network, including:
- Antenna
- Ethernet or Fiber
- WiFi
- Virtual Infrastructure with nodes such as vBBU, vSGW, vPGW, vPDG, vMME, HSS, PCRF, vCDN, vGiLAN, Internet

The diagram illustrates the flow of services and connectivity in a mobile network environment.
Mobile Services - Example

Antenna

Ethernet or Fiber

WiFi

Virtual Infrastructure

Internet

vBBU

vMME

vSGW

vPDG

vPGW

vCDN

vGiLAN

HSS

PCRF
Common Requirements

- Standardized control of network - both physical (underlay) and virtual (overlay)
  - Fabric configuration and control
  - Overlay configuration and control
  - Support for the Neutron API
- Support for different datapath connectivity types
- Open source, standard-based approach, across the entire stack
- Service chaining for disaggregated composable services
- Platform reliability and availability
  - Fault and event correlation
  - Security
- Design with IPv6 in mind - from day one
- Ready for future innovation
The Two Napkin Protocol (1989)

Source: www.computerhistory.org
MP-BGP (2017)

- IPv4 Unicast
- IPv4 Multicast
- VPN IPv4
- IPv6 Unicast
- IPv6 Multicast
- VPN IPv6
- IPv4 + label
- L2VPN
- VPLS
- EVPN
- ...

...
OpenDaylight is the New BGP

Many Applications

- Edge Services
- IP Routing
- Optical Transport
- DC Fabric
- DC Overlay
- vCPE & VAS Orchestration

Services and Plugins
Runtime Load / Upgrade
Model Driven API
Common Datastore
OPENDAYLIGHT AND OPENSTACK
OpenStack Neutron

- REST API
- Orchestration layer
  (Translate Neutron calls into configuration of a network across a deployment)
- Programmable datapath
  (Controlled by the orchestration layer)
OpenStack Neutron
Upstream “Reference Architecture”

- **REST API**
- **Orchestration layer**
  (Translate Neutron calls into configuration of a network across a deployment)
- **Programmable datapath**
  (Controlled by the orchestration layer)
- **neutron-server**
- **ML2/OVS driver**
- **Neutron agents**
  (OVS, L3, DHCP, Metadata)
- **Open vSwitch**
OpenDaylight with OpenStack
Using NetVirt

REST API

Orchestration layer
(Translate Neutron calls into configuration of a network across a deployment)

Programmable datapath
(Controlled by the orchestration layer)

neutron-server

ML2/ODL driver (networking-odl)
OpenDaylight (NetVirt)

Open vSwitch (OVS)
OVS-DPDK
L2GW
VPP
What is OpenDaylight?

- Open Source SDN Controller Platform hosted by the Linux Foundation
- ~4 Years Old
- ~1000 Individual Contributors from ~140 organizations
- Mature, Open Governance
- Mature code base
- Dozens of OpenDaylight-based solutions
- Over 100 deployments
OpenStack and OpenDaylight

- OpenDaylight can be an SDN controller for OpenStack
- Provides network virtualization services for OpenStack via the Neutron API
- Supports Neutron API via the networking-odl driver
- Controls multiple devices
networking-odl

- L2: ML2 Plugin
- L3: ODL L3 Plugin
- Services
  - BGPVPN
  - L2GW
  - QoS
  - SFC
  - VLAN trunk
OpenDaylight: a YANG-Based Microservices Platform

- Based on Model-Driven Service Abstraction Layer (MD-SAL)
- Creates well-defined APIs
- Java and RESTCONF APIs auto-generated from YANG
- Controller Clustering
OpenDaylight Boron Architecture

Source: https://wiki.opendaylight.org/view/File:ODL-arch-B.pdf
OpenDaylight Boron Architecture (NetVirt)

Source: https://wiki.opendaylight.org/view/File:ODL-arch-B.pdf
OpenDaylight NetVirt

- One of the OpenStack service provider in OpenDaylight
- Translates NB constructs to forwarding plane agnostic service yang models
- Services: L2, L3, BGP L3VPN, EVPN, ACL, DHCP, QoS, SFC, IPv6, L2GW
- Supports OpenFlow and OVSDB based devices
- BGP to interwork with physical legacy routers
Existing Features (Carbon)

- **Networking**
  - L2/L3 implemented in OpenFlow
  - IPv4/IPv6
- **Provider Networks**
  - VXLAN, VLAN, Flat
  - IPv4
  - Support for multiple external networks
- **OVS vSwitch control**
  - Auto-bridge creation
  - Auto-tunnel creation
  - OVS-DPDK
- **NAT support**
  - Floating IPs
  - SNAT (conntrack & OpenFlow)
- **Security Groups**
  - Stateful using conntrack
  - Learn (for OVS-DPDK)
- **Layer 2 Gateway (hardware VTEP)**
  - Bare metal
  - SR-IOV integration
- **SFC integration (NSH)**
- **Multi-site (BGP VPN, EVPN)**
- **Support for TripleO-based deployment**
Key Future Work Items

- Container Orchestration Engine (COE) Project
  - kuryr integration
  - CNI Plugin for Kubernetes
- Physical Network Control
- EVPN for Intra-Cloud
- VPP/GBP Integration
Cross-Community Collaboration
OPENDAYLIGHT WITH RED HAT
Red Hat Current OpenDaylight Focus

- MD-SAL
- Neutron Northbound
- NetVirt as a Neutron service provider
- SFC
- Integration and Testing
- Southbound protocols
  - OVSDB
  - OpenFlow

- OpenStack
  - Neutron
  - networking-odl
  - TripleO
OpenDaylight with Red Hat OpenStack

- Starting with Red Hat OpenStack Platform 8, Red Hat is bundling a distribution of OpenDaylight as part of the base channel/subscription as a Technology Preview*

- Red Hat provides you with a tested and integrated OpenDaylight NetVirt package
  - The OpenDaylight components included with Red Hat OpenStack Platform is limited to the modules required to support OpenStack deployments via NetVirt

- Find out more here: https://goo.gl/EBZwQk
- Tell us about your use-cases and experience at opendaylight-feedback@redhat.com

*Technology Preview: https://access.redhat.com/support/offerings/techpreview
Red Hat Package
Further Reading

- Select OpenDaylight Projects
  - NetVirt
  - Genius
  - Container Orchestration Engine (COE)

- Red Hat OpenStack Platform
  - Product Documentation

- Red Hat and OpenDaylight
  - SDN with Red Hat OpenStack Platform: OpenDaylight Integration
  - OpenDaylight Product Guide
  - OpenDaylight Installation and Configuration Guide

- Red Hat NFV, SR-IOV and OVS-DPDK Guides
  - Product Guide
  - Planning Guide
  - Configuration Guide
THANK YOU