TOMORROW starts here.
OpenDaylight Overview including Cisco Applications for Service Providers

BRKSDN-1200

Robert Grasby
Open SDN Controller Product Management Leader
Agenda

- What is OpenDaylight?
- Cisco Open SDN Controller
- Developer Support
- Targeted Use Cases
- Cisco WAN Automation Engine + Open SDN Controller
- Call To Action
What is OpenDaylight?
OpenDaylight SDN Platform

Linux Foundation

Open Source

Software Defined Networking

Innovation

Collaboration

Network Function Virtualization
SDN, NFV and OpenDaylight

New Revenue
Open, Programmable APIs

Service Agility
Orchestration, Automation and MANO

Virtualization and Abstraction Layer

Lower Cost
SDN Resets Business Opportunities

- New architecture with separate Control and Data planes
- Open Programmable Networks and APIs
- New business models and revenue opportunities
- Efficiency in both capital and operational expenses

SDN Platform (OpenDaylight focus area)

Open protocols with enablement for proprietary extensions

- Applications
- Security, load balancing, etc. services

Physical Network

- APIs

Physical Network

- Security, load balancing, etc. services
- Applications
Open Source Benefit

- Faster, lower cost and higher quality development through sharing of resources via collaboration
- Community decisions about new features and roadmaps
- A common environment for uses and App developers
- Ability to focus resources on differentiating development

Flexibility  Innovation
Choice  Control
Community and Governance

Developer Community
Open to all

Transparency

Meritocracy

Board of Directors

Technical Steering Committee
OpenDaylight Platform

Hydrogen
- Released February 2014

Helium
- Released October 2014
- 1.87M+ lines of code
- 28 Projects
- 256 Contributors

Lithium
- June 2015 planned release
Developer Community/Activity

1.9M lines of code since projects launch

10,411 total
OpenDaylight Membership

Platinum Members

![Logos of Platinum Members: Brocade, Cisco, Citrix, Dell, Ericsson, HP, IBM, Intel, Juniper Networks, Microsoft, and Red Hat.]

Continuous Growth to 41 Members
OpenDaylight Helium Contributions

- Cisco: 25%
- Independent: 21%
- Noiro: 18%
- NEC: 12%
- Inocybe: 10%
- Radware: 3%
- Brocade: 4%
- RedHat: 3%
- Pantheon: 3%
- Others: 3%

Source: http://spectrometer.opendaylight.org/?metric=loc
Cisco Open SDN Controller
Cisco Commercial Distribution of OpenDaylight

Network Applications

Application 1 Application 2 Application 3 Application 4 ••• Application ‘n’

REST APIs

DLux User Interface

BASE NETWORK SERVICE FUNCTIONS
- Topology Manager
- Statistics Manager
- FRM
- Host Tracker
- L2 Switch
- AAA Service
- GBP Service

3RD PARTY NETWORK SERVICE FUNCTIONS
- Network Service 1
- Network Service 2
- Network Service 3
- Network Service 4
- •••
- Network Service ‘n’

Model Driven Service Abstraction Layer
(Plugin Manager, Capability Abstraction, Flow programming, Inventory, etc)

Cisco Open SDN Controller Platform

Cisco Open SDN Controller

Data Plane Elements

OpenFlow Interface

OVSBDB Interface

NETCONF Interface

BGPLS Interface

PCEP Interface

OpenFlow Enabled Devices

Open vSwitches

Cisco & 3rd Virtual & Physical Devices
Open SDN Controller vs Cisco XNC
Re-bases XNC on OpenDaylight Helium Release
Open SDN Controller vs OpenDaylight Helium

Common Content
- LISP Flow Mapping
- Defense4all
- Precluded OpenDaylight Content
- SNMP4SDN
- PacketCable PCMM
- AD-SAL
- SDNi
- OpenContrail Plugin
- L2 Switch
- OVSDP
- Openflow Plugin

Cisco Supported
- Logs
- Metrics
- OVA Distribution
- One Click Install
- Incremental Cisco Value
- Monitoring
- Central Mgmt & Admin
- Developer Support
- Plug-in Clustering

Helium
- Community Support
- Cisco Supported
- Incremental Cisco Value
- Precluded OpenDaylight Content
- SNMP4SDN
- VTN Project
- PacketCable PCMM
- L2 Switch
- OVSDP
- Openflow Plugin

OpenContrail Plugin
- AAA
- Group Policy
- Controller
- DLUX
- MD-SAL
- BGP-LS
- Basic Clustering
- Secure Network Bootstrap Infra
- PCEP
- Secure Network Bootstrap Infra
- Central Mgmt & Admin
- Developer Support
- Plug-in Clustering

OpenDaylight Content
- Defense4all
- Precluded OpenDaylight Content
- VTN Project
- PacketCable PCMM
- AD-SAL
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- OpenContrail Plugin
- L2 Switch
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OpenContrail Plugin
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L2 Switch
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- Openflow Plugin

OVSDP
- Openflow Plugin
Deployment Options

**Standalone**

- Application 1
- Application 2
- Application 3
- Application 4
- Application ‘n’

**3 Node Cluster**

- Application 1
- Application 2
- Application 3
- Application 4
- Application ‘n’

**REST APIs**

- DLux User Interface

**BASE NETWORK SERVICE FUNCTIONS**

- Topology Manager
- Statistics Manager
- FRM
- Host Tracker
- L2 Switch
- AAA Service
- GBP Service

**3rd PARTY NETWORK SERVICE FUNCTIONS**

- Network Service 1
- Network Service 2
- Network Service 3
- Network Service 4

**Model Driven Service Abstraction Layer**

- (Plugin Manager, Capability Abstraction, Flow programming, inventory, etc.)

**OpenFlow Interface**

- OVSDB Interface
- NETCONF Interface
- BGPLS Interface
- PCEP Interface

**OpenFlow Enabled Devices**

- Open vSwitches
- Cisco & 3rd Virtual & Physical Devices

Southbound plugin clustering to be contributed to OpenDaylight Lithium
Deployment Experience

One Click Installation

Open Virtualization (OVA) Format

VMware ESXi and Oracle Virtual Box support

Single “click” to select standalone vs clustered installation

Seamless software upgrades
Web Based User Interface

Centralized Management and Administration
- Installed applications
- System management
- System monitoring
Native Applications

BGPLS Manager

Visualize network topology based on Boarder Gateway (BGP) Protocols
Native Applications (cont’d)

Inventory

Enhanced OpenDaylight “Nodes” user interface

Device vendor

Platform IDs

Series numbers
Native Applications (cont’d)

Model Explorer
- OpenDaylight YANG
- User Interface
- Call functions
- Parameters
- JSON body preview
Native Applications (cont’d)

OpenFlow Manager

- OpenFlow topology visualization
- Advanced flow management
- Flow based troubleshooting
- JSON body preview
Native Applications (cont’d)

PCEP Manager
- Auto-create Label-Switched Paths (LSPs)
- Manually create LSPs
- Delete LSPs
System Management

Feature Administration
- Provision
- Enable / disable

User Administration
- Provision
- Role assignment
System Monitoring

Services Status
Details on each node in a cluster
System status
Controller status
Metrics status
Logs status
System Monitoring (cont’d)

Real Time Event Logging
Event visualization
Adhoc queries
Filtered queries
System Monitoring (cont’d)

Real Time Metrics
- CPU utilization
- Memory usage
- System load
- Controller heap size
- Network usage
- Free disk space
REST APIs

RESTCONF APIs
For checking configuration and operational states

List of exposed Northbound APIs available via DevNet and on platform
JAVA APIs

For network services creation; event listening, specifications and forming patterns

SAL Binding APIs, Common APIs, Connector APIs and Core APIs provided

List of exposed JAVA APIs available via DevNet
# Device Support

<table>
<thead>
<tr>
<th>Protocol</th>
<th>Cisco</th>
<th>3rd Party</th>
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<tr>
<td>OpenFlow</td>
<td>Nexus 3000, ASR 9000</td>
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<td>NetConf/Yang</td>
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Cisco Compatible platforms are qualified via the Cisco Solution Partner Program Interop Verification Testing.
Open SDN Controller 2015 Roadmap
Bi-Monthly Agile Release

- MDSAL based Opendaylight Helium distribution + bug fixes
- Admin UI, serviceability & management apps
- Openflow 1.0/1.3, Netconf/Yang, BGPLS, PCEP, OVSDB support
- Clustering (controller + OpenFlow southbound interface)
- VPP-virtual switch control
- Nexus 3K and ASR9K support

- OpenDaylight Lithium distribution
- Customer prioritized features tbd

Blue = Committed
Grey = Planned

- OpenDaylight Helium maintenance and bug fixes
- Early OpenDaylight Lithium contributions
- Clustering enhancements
- Scaling improvements
- Additional southbound interfaces

- OpenDaylight Lithium maintenance and bug fixes
- Early OpenDaylight Beryllium contributions
- Customer prioritized features tbd
Developer Support
Open Developer Eco-system

developer.cisco.com/site/openSDN
Application Marketplace

marketplace.cisco.com/catalog
Targeted Use Cases
SDN Use Cases

Device and Topology Management

Traffic Engineering

Network Function Virtualization
Applicable data at your fingertips

Flexible data displays on and off the topology

Resource graphic, color, &/or animation clearly identifying type & status

Views & filters for rapid problem discovery & resolution

Immediately implement configuration or flow changes to one or synchronously to many selected resources
Trusted Flow Firewall Bypass (Science DMZ)

Trusted flows bypass firewall to improve application performance.
# Source – Destination Steering

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Resilient Port-to-Port Forwarding
Resilient Port-to-Port Forwarding

Server1

Port1

VLAN-100

Switch1

Port2

VLAN-200

Switch2

Port1

Switch3

Port1 VLAN-300

Server2

Default route

Switch4

Switch5
Resilient Port-to-Port Forwarding

Automatic re-route on link failure
Per Flow Latency Control

Open SDN Controller

WAN Application
Campus/DC Application

REST API

BGP-LS
PCEP
OpenFlow 1.3

Data Center #1
DC Edge Router
Flow 1
Flow 2
Open Standard SDN Switch

Data Center #2

Data Center #3

Congested Link

TE 1
50 Mb

TE 2
75 Mb

P1
PE1
P2
P3
P4
PE2
PE3

Cisco Public
Cisco WAN Automation Engine
Build, Automate, Scale, Secure, and Visualize Your Network in New Ways

Online Visualization, Analytics, and Business Intelligence

Automated Tunnel Creation and Traffic Load Management

Managing Inventory, Security, and Maintenance Windows

Additional Application and Network Optimization Apps

Optimal Bandwidth Placement Between Two or More Sites

Offline Planning, Design and Analysis

BGP Route Visualizer
Weather Map
Business Intelligence

Tunnel Builder
Tunnel Splitter
Tunnel Balancer

Inventory
Maintenance Window Scheduler
Network ACL Manager

Segment Routing Optimizer
Application Latency Routing

Bandwidth on Demand
Bandwidth Calendaring

Offline Planning
IGP Convergence Analyzer
Failure Analysis
WAE - Optimization Opportunity

Present Mode of Operation

- Upgrade at 40% peak per interface to allow room for failure
- Push peak usage to 70+% (room for failure response)
- Rebalance automatically

Desired Mode
WAE Block Diagram

Service, Network, and Analytics REST APIs

Analytics

Collector

Deployment Drivers

Deployment Drivers

Network Devices

Collectors Drivers

Analytics

Current Model

Plan

New Model

Optimization and Prediction

Calendaring

SNMP CLI NetFlow BGP-LS NMS/EMS

PCeP Configlets OpenFlow I2RS

Multivendor Network Devices
Call To Action
Call to Action

• World of Solutions
  – OpenSDN Controller demo in the Cisco Campus
  – Walk in Labs - MIL1520632, Hands-On OpenDaylight
  – Technical Session - LABSDN 1335, Getting Started with OpenDaylight, Friday January 31st, 9AM – 1PM

• DevNet Zone
  – SDN Panel Discussion, Wednesday January 29th, 2:30 – 3PM
  – Learning Labs, on-going

• User group [www.opendaylight.org/software/opendaylight-user-groups-odlug](http://www.opendaylight.org/software/opendaylight-user-groups-odlug)
Complete Your **Online Session Evaluation**

- Please complete your online session evaluations after each session. Complete 4 session evaluations & the Overall Conference Evaluation (available from Thursday) to receive your Cisco Live T-shirt.

- All surveys can be completed via the Cisco Live Mobile App or the Communication Stations
Thank you.