Introduction to OpenDaylight: Current Events and OpenStack Neutron Integration

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Note: This deck contains slides courtesy Colin Dixon and a cast of 1000s
Agenda

• What is OpenDaylight?
• History: Helium
• What’s in store for Lithium
• Some Personal Learnings
• Neutron Integration?
• Q&A
What is OpenDaylight

OpenDaylight is an **Open Source Software** project under the **Linux Foundation** with the goal of furthering the adoption and innovation of **Software Defined Networking (SDN)** through the creation of a common industry supported platform.

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<th>Code</th>
<th>Acceptance</th>
<th>Community</th>
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| To create a robust, extensible, open source code base that covers the major common components required to build an SDN solution. | To get broad industry acceptance amongst vendors and users  
  • Using OpenDaylight code directly or through vendor products  
  • Vendors using OpenDaylight code as part of commercial products | To have a thriving and growing technical community contributing to the code base, using the code in commercial products, and adding value above, below and around. |
Who is OpenDaylight?
Who is OpenDaylight? (Really)

• Like any Open Source Project, OpenDaylight primarily consists of those who show up to do the work.

• Running around 150–200 commits per week
  • 30 Days: ~400 commits, ~55 contributors
    • During releases this is >= 1000 commits and >= 100 committers
  • 12 Months: ~10,000 commits, ~260 contributors

• Strong integration and testing community
  • This stuff really matters
  • Staffing I&T is well, challenging

Source: https://www.openhub.net/p/opendaylight
Why Open Source?

• **Short version:** this is how modern infrastructure is built
  • Modern way to build “undifferentiated” plumbing

• **Long version:**
  • Build more, better code faster via collaboration
  • Make better decisions with devs and users at the table
  • Spend more time on the code that matters
    • 80/20 rule: 80% of code is non-differentiating
### Aside: Release Naming

#### Periodic Table of Elements

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For elements with no stable isotopes, the mass number of the isotope with the longest half-life is in parentheses.

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Brief Note on Project Lifecycles

- **Creation Review**
  - Proposal Posted for 2 weeks:
    - Name (trademark) OK
    - Repo Name Specified
    - Description Complete
    - Scope well defined
    - Resources Committed (developers committed to work)
    - Committers identified
    - Vendor Neutral
    - Meets Board Policy (including IPR)
    - Review by TSC and Approval

- **Graduation Review**
  - Graduation Proposal Posted for 2 weeks:
    - Working code base
    - Active Community
    - History of Revisions (using Milestone Release Process)
    - Destination Top Level Project Specified
    - Acceptance of terms and conditions of proposed TLP
    - Committers vote on seeking graduation
    - Accepted by vote of destination
    - Review by TSC and Approval

- **Promotion Review**
  - Promotion Proposal Posted for 2 weeks:
    - Statement of centrality of role
    - Committers vote on seeking promotion
    - Review by TSC and Approval

- **Elevation Review**
  - Elevation Proposal Posted for 2 weeks:
    - Scope of acceptable subprojects
    - Statement of requirements placed on subprojects, both mature and incubator
    - Identified at least two proposed subproject
    - Committers vote on seeking elevation
    - Review by TSC and Approval

- **Termination Review**
  - Elevation Proposal Posted for 2 weeks:
    - States reason termination is sought
    - Calls out impact on other projects, users, communities and how they will be mitigated
    - Indicates where the project will be archived
    - Can be initiated by vote of the committers
    - Can be initiated by TSC or PMC if containing project is:
      - Project has no remaining committers
      - Project has had no commits in SCM in 18 months
    - Review by TSC and Approval

- **Anyone can propose a project**
- **Mature Projects need not progress to Core**
- **Top level projects have a Project Management Committee (PMC) that votes on its decisions including accepting new PMC members and new subprojects**
- **Proposal**
  - Creation Review
  - Incubation
  - Graduation Review
  - Mature
  - Promotion Review
  - Core
  - Elevation Review
  - Top Level
  - Termination Review
  - Archived
Agenda

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• Q&A
Java chosen as an enterprise-grade, cross-platform compatible language

Java Interfaces are used for event listening, specifications and forming patterns

Maven – build system for Java

OSGi:
  - Allows dynamically loading bundles
  - Allows registering dependencies and services exported
  - For exchanging information across bundles

Karaf: Light-weight Runtime for loading modules/bundles
  - OSGi based. Primary distribution mechanism for Helium
$ wget http://nexus.opendaylight.org/content/groups/public/org/opendaylight/integration/distribution-karaf/0.2.0-Helium/distribution-karaf-0.2.0-Helium.zip

$ unzip distribution-karaf-0.2.0-Helium.zip

$ cd distribution-karaf-0.2.0-Helium

$ ./bin/karaf

opendaylight-user@root> feature:list  (get all apps available)
opendaylight-user@root> feature:install odl-dlux-core
opendaylight-user@root> feature:install odl-openflowplugin-all
opendaylight-user@root> feature:install odl-l2switch-all
opendaylight-user@root> bundle:list | grep Active

Now your controller is ready to connect to switches and handle incoming flows.
• The MD-SAL data store, notifications and RPCs now work in a cluster
  • Built using the RAFT consensus algorithm on top of Akka messaging
  • Tolerates f controller failures if you have 2f+1 controllers
  • Uses sharding for scale-out performance

• Lithium work items
  • Finer-grained, configurable sharding
  • Migrating plugins to take advantage of clustering and support failover
  • Provide clearer models for building clustered applications
ODL Helium: DLUX

- Based on modern frameworks: node.js, AngularJS

- Completely decoupled from the core controller
  - Run it from any location
  - Modular, easy to extend
Policy is everywhere at them moment
  - Group-based Policy, Congress, Intent, ACI, ...

At least three policy-oriented projects in ODL
  - Service Function Chaining
  - Group-based Policy
  - Network Intent Composition

ODL is acting as a proving ground for policy approaches where engineers and users can play with different approaches
• OpenDaylight exposes a single common OpenStack Service Northbound
  • Matches Neutron API precisely
  • *Multiple implementations* of Neutron in OpenDaylight

• New features in Helium
  • Distributed L3 forwarding
  • OpenStack Security Groups
  • LBaaS implementation
Growth from Hydrogen to Helium

The Lithium Release opened with more than 40 Projects

1.9M lines of code since projects launch

Projects

Contributors

Hydrogen
Helium
Adoption
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Lithium Dependency Graph

Opendaylight Lithium Project Dependencies
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Key Personal Learning:
Open Source is the Modern Way to Develop Non-Differentiated “Plumbing”

• **Community building** is a core Open Source objective
  • Both intra and inter project

• **Code** is the coin of the realm
  • But don’t forget the importance of testing and integration, documentation, ...

• **Engineering systems** are as important as artifacts

*Putting this all together* →
Implication: Engineering artifacts are no longer the source of sustainable advantage and/or innovation.
Bio-techno Convergence and The Hidden Nature of Complexity

David Meyer
CTO and Chief Scientist, Brocade
Director, Advanced Technology Center, University of Oregon
Network Complexity Research Group
IETF 88
Vancouver, BC
dmm@{brocade.com, uoregon.edu, 1-4-5.net, ...}
http://www.1-4-5.net/~dmm/talks/ncrg88.pdf
Said Another Way: 
*Open Source has Transformed the Good-Cheap-Fast Development Cycle*

Why? Because you can build **Good** or **Cheap** from **Fast** by using OS Development methodologies and leveraging the OS communities (this is a form of leveraged Investment)
Transparency

• Transparency matters

• When there are disagreements in the community
  • Transparency makes everyone feel heard
  • Transparency makes sure the community does not fracture

• OpenDaylight is transparent to the extreme
  • Calls, mailing lists, wikis... are open to anyone
  • Even the technical steering committee calls
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Neutron Update

• 5+ projects wanting to do Neutron integration

• Includes VTN, Dove, GBP, OVSDB, LISP Flow Mapping, VPN Service, ...

• What’s missing?

• Clearly need an abstraction for projects wanting to use Neutron
Neutron-ODL Stack Evolution -- Proposal

**Current World**

- OpenStack
  - Neutron (REST)
  - OpenFlow + OVSDB + Nicira Extensions
  - Many h/w- and v-switches

- OVS
  - OVSDB
  - This project is a monolithic combination of:
    1. a network virtualization layer that is 'hard-wired' to Neutron above and OVS below as well as
    2. an OVSDB protocol library.

- Near Future

  - OpenStack
  - Neutron (REST)
  - REST/YANG Adapter
  - Neutron (YANG)
  - Tunnel Mgmt
  - Traffic Direction
  - Many h/w- and v-switches

  - OVS
    - OVSDB
      - Plugin
      - Relevant Southbound Protocol
      - Many h/w- and v-switches
    - NETCONF
      - If developers show up to help
      - Relevant Southbound Protocol
    - OpenFlow + Nicira Extensions
      - If developers show up to help
      - Relevant Southbound Protocol

- Lithium Release?

  - OpenStack
  - Neutron (REST)
  - REST/YANG Adapter
  - Neutron (YANG)
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- Long-Term Strategy

  - OpenStack
  - Neutron (REST)
  - REST/YANG Adapter
  - Neutron (YANG)
  - Tunnel Mgmt
  - Traffic Direction
  - Many h/w- and v-switches

  - OVS
    - OVSDB
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- Possible Future API Layers

  - OpenStack
    - Neutron (REST)
    - REST/YANG Adapter
    - Neutron (YANG)
    - Tunnel Mgmt
    - Traffic Direction
    - Many h/w- and v-switches

  - OVS
    - OVSDB
      - Plugin
      - Relevant Southbound Protocol
      - Many h/w- and v-switches
    - NETCONF
      - If developers show up to help
      - Relevant Southbound Protocol
    - OpenFlow + Nicira Extensions
      - If developers show up to help
      - Relevant Southbound Protocol

Major needed work:

1. Factor apart two halves of the OVSDB project—network virt. layer and OVSDB library.
2. Migrate network virt. layer to use the MD-SAL.
3. Turn OVSDB protocol library into a plugin—not just a library.
4. Migrate OVSDB protocol plugin to use the MD-SAL.
5. Close feature gap between network virt. layer and OVS OS plugin, e.g., FwaaS, Vpnaas.
6. Test/improve scale, stability, and performance of the stack.
7. Migrate network virt. layer’s NB API from Neutron (REST) to Neutron (YANG) to Policy/Intent.
8. Migrate network virt. layer’s SB APIs from OVS-specific to tunnel management and traffic direction (into tunnels).

$(NEW NAME FOR OVSDB NETVIRT)

Network virtualization layer that is still ‘hard-wired’ to Neutron above, but now uses more general APIs below.

$(NEW NAME FOR OVSDB NETVIRT)

Network virtualization layer that now uses the more general APIs above and below.

Slide courtesy Chris Wright and Colin Dixon
Quasi-technical things we’re working on (necessarily incomplete list)

• Continue to build/refine our community
  • Including increasing committer diversity within and across the projects
• Code Quality and Coverage
  • Stability, Security, Performance, Bug fixes ($Major.$Minor)
• Distributed Systems Issues
• **S3P – Stability, Scalability, Security, and Performance**

• “Staffing”
  • Release engineering
  • Testing and Integration
  • Documentation
  • ...

• Continue to refine our engineering systems
  • Thanks Linux Foundation!

• We need more code that writes code
  • MD-SAL is an example
  • Fewer humans in the loop
  • More automation more better
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Get Involved!

- Pull code and try it out
- TSC weekly calls open to everyone

- [http://wiki.opendaylight.org](http://wiki.opendaylight.org)

- Keep informed and join the conversation
  - IRC: #opendaylight on irc.freenode.net
  - Email: lists.opendaylight.org
  - Facebook: @openDaylightSDN
  - Twitter: #OpenDaylight
Q&A

Thanks!