Open Source, Open Daylight, and the ONF: How it all fits together

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Agenda

- What is Hydrogen
  - And What Did We Learn?

- Introduction to Helium

- Next Steps – Beyond Helium

- Discussion/Question and Answer
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.

<table>
<thead>
<tr>
<th>Code</th>
<th>Acceptance</th>
<th>Community</th>
</tr>
</thead>
<tbody>
<tr>
<td>To create a robust, extensible, open source code base that covers the major common components required to build an SDN solution</td>
<td>To get broad industry acceptance amongst vendors and users</td>
<td>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.</td>
</tr>
</tbody>
</table>
What is OpenDaylight building?

OpenDaylight is an open community that is building:

- An evolvable SDN **platform** capable of handling diverse use cases and implementation approaches
- Common abstractions of capabilities NorthBound for people to program
- Intermediation of those capabilities to multiple Southbound implementations
- Programmable Network services
- Network Applications
- Consume OpenFlow spec and NBI models from ONF
  - Possibly more
- Whatever else we need to make it work
Project Framework

- Network applications, orchestration, and services
  - user interfaces
  - network applications, orchestration, and services

- Controller platform
  - OpenDaylight APIs (REST)
  - network service functions
  - platform services
  - extensions

- Southbound interfaces & protocols
  - Service Abstraction Layer (SAL)
    - OpenFlow
    - other standard protocols (ONF, IETF, ...)
    - vendor-specific interfaces

- Data plane elements (virtual switches, physical device interfaces)
Who is OpenDaylight Project?
OpenDaylight Simultaneous Release

- OpenDaylight is multi-project
  - 20+ projects in Bootstrap or Incubation State

- Bringing components together in a simultaneous release
  - CodeName: Hydrogen
  - Planned release date: Dec 12, 2013

- Several “editions” to group related functionality together
  - base, virtualization, service provider
  - virtualization edition will provide OpenStack integration
## Simultaneous Release Plan

<table>
<thead>
<tr>
<th>Milestone</th>
<th>Offset 0 Date</th>
<th>Offset 1 Date</th>
<th>Offset 2 Date</th>
<th>Events</th>
</tr>
</thead>
<tbody>
<tr>
<td>M0</td>
<td>6/24/2013</td>
<td>6/26/2013</td>
<td>6/28/2013</td>
<td>Simultaneous Release Open</td>
</tr>
<tr>
<td>M1</td>
<td>7/22/2013</td>
<td>7/24/2013</td>
<td>7/26/2013</td>
<td>1. Projects must have declared intent to participate in Simultaneous Release 2. Participating Projects must have published a candidate Release Plan for public comment</td>
</tr>
<tr>
<td>M2</td>
<td>8/19/2013</td>
<td>8/21/2013</td>
<td>8/23/2013</td>
<td>Participating Projects must have declared their final Release Plan</td>
</tr>
<tr>
<td>M3</td>
<td>9/16/2013</td>
<td>9/18/2013</td>
<td>9/20/2013</td>
<td>Latest possible Continuous Integration Test Start</td>
</tr>
<tr>
<td>M4</td>
<td>10/14/2013</td>
<td>10/16/2013</td>
<td>10/18/2013</td>
<td>1. API Freeze 2. Latest possible Continuous System Test Start</td>
</tr>
</tbody>
</table>
| M5        | 11/11/2013    | 11/13/2013    | 11/15/2013    | Code Freeze (long fixes only from here)  
| RC0       | 11/18/2013    | 11/20/2013    | 11/22/2013    | String Freeze (all internationalizable strings frozen to allow for translation) |
| Formal Release | 12/9/2013 | | | |

03 Feb 2014
Impressive List of Projects in $H_2$

- Controller
- VTN
- OpenDove
- Affinity Management Service
- LISP Mapping Service
- Yang Tools
- Defense4All
- BGP-LS/PCEP
- OpenFlow Protocol
- OpenFlow SB Plugin
- OVSDB
- SNMP4SDN
- DLUX
- STI
OpenDaylight APIs (REST)

Service Abstraction Layer (SAL)
(plug-in mgr., capability abstractions, flow programming, inventory, …)

Controller Platform

OSGi Bundles

Network Applications Orchestration & Services

OpenStack Neutron

Controller Platform

OpenStack APIs

Controller Platform

Network Applications Orchestration & Services

Data Plane Elements (Virtual Switches, Physical Device Interfaces)

Additional Virtual & Physical Devices

Open vSwitches

Open vSwitches

OpenFlow Enabled Devices

OpenFlow Enabled Devices

OpenFlow

OpenFlow

OpenFlow 1.0

OpenFlow 1.3

NETCONF

NETCONF

OVSDB

OVSDB

SNMP

SNMP

BGP-LS

BGP-LS

PCEP

PCEP

LISP

LISP

Southbound Interfaces & Protocol Plugins

Hydrogen

Release

(Jan 2014)

VTN: Virtual Tenant Network
DOVE: Distributed Overlay Virtual Ethernet
DDoS: Distributed Denial Of Service
LISP: Locator/Identifier Separation Protocol
OVSDB: Open vSwitch Database Protocol
BGP: Border Gateway Protocol
PCEP: Path Computation Element Communication Protocol
SNMP: Simple Network Management Protocol
OpenDaylight APIs (REST)

Base Network Service Functions
- Topology Mgr
- Stats Mgr
- Switch Mgr
- Host Tracker
- Shortest Path Forwarding
- Network Config

Service Abstraction Layer (SAL)
(plug-in mgr., capability abstractions, flow programming, inventory, …)

OpenFlow
1.0
1.3

NETCONF

Network Applications Orchestration & Services

Controller Platform

Southbound Interfaces & Protocol Plugins

Data Plane Elements
(Virtual Switches, Physical Device Interfaces)

OpenFlow Enabled Devices

Open vSwitches

Additional Virtual & Physical Devices

VTN: Virtual Tenant Network
DOVE: Distributed Overlay Virtual Ethernet
DDoS: Distributed Denial Of Service
LISP: Locator/Identifier Separation Protocol
OVSDB: Open vSwitch DataBase Protocol
BGP: Border Gateway Protocol
PCEP: Path Computation Element Communication Protocol
SNMP: Simple Network Management Protocol
Service Provider Edition

Management
GUI/CLI

OpenDaylight APIs (REST)

Base Network Service Functions
- Topology Mgr
- Stats Mgr
- Switch Mgr
- Host Tracker
- Shortest Path Forwarding
- Network Config

Service Abstraction Layer (SAL)
(plug-in mgr., capability abstractions, flow programming, inventory, …)

Controller Platform

OpenDaylight APIs (REST)

- DDoS Protection
- Network Applications Orchestration & Services

OpenFlow
1.0 1.3

NETCONF

SNMP  BGP-LS  PCEP  LISP

Southbound Interfaces & Protocol Plugins

OpenFlow Enabled Devices
- Open vSwitches
- Additional Virtual & Physical Devices

Data Plane Elements (Virtual Switches, Physical Device Interfaces)

VTN: Virtual Tenant Network
DOVE: Distributed Overlay Virtual Ethernet
DDoS: Distributed Denial Of Service
LISP: Locator/Identifier Separation Protocol
OVSDB: Open vSwitch DataBase Protocol
BGP: Border Gateway Protocol
PCEP: Path Computation Element Communication Protocol
SNMP: Simple Network Management Protocol
Virtualization Edition

Management GUI/CLI

VTN Coordinator
DDoS Protection
OpenStack Neutron

Network Applications Orchestration & Services

OpenDaylight APIs (REST)

Controller Platform

Service Abstraction Layer (SAL)
(plug-in mgr., capability abstractions, flow programming, inventory, …)

OpenFlow
1.0
1.3

NETCONF

OVSDB

OpenFlow Enabled Devices

Open vSwitches

Additional Virtual & Physical Devices

Data Plane Elements (Virtual Switches, Physical Device Interfaces)

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OpenStack Integration

- OpenDaylight exposes a single common OpenStack Service Northbound
  - API exposed matches Neutron API precisely
  - multiple implementations of Neutron networks in OpenDaylight
- OpenDaylight OpenStack Neutron Plugin simply passes through
  - simplifies OpenStack plugin
  - pushes complexity to OpenDaylight
OpenStack Integration: Status

- **ML2 Driver available in Icehouse release!**
  - Supports VXLAN and GRE tunnel networks
  - devstack support merged upstream
    - Run *OpenDaylight as a top-level service in devstack!*
- **OpenStack Neutron API Service** available now in OpenDaylight
  - provides Neutron API handling for multiple implementations
- Initial ML2 plugin focused on core Neutron functionality
  - Still uses Neutron [DHCP, L3] agents
OpenStack Integration: Next Steps

• Updates planned for Helium and Juno:
  • VIF plugging changes for stability improvements
    • Notify from ODL to MechanismDriver once ODL has setup the port on the host
  • Security groups implemented using OpenFlow rules
  • L3 routing handled by OpenDaylight
    • *Removes the need for the L3 agent*
  • Additional refinements and bug fixes
OpenDaylight project creation

7 new project proposals pending
### OpenDaylight code volume (ohloh.net)

**Languages**

- **Total Lines:** 1,548,552
- **Code Lines:** 1,045,938
- **Percent Code Lines:** 67.5%
- **Total Comment Lines:** 322,675
- **Percent Comment Lines:** 20.8%
- **Total Blank Lines:** 179,939
- **Percent Blank Lines:** 11.6%

**Code, Comments and Blank Lines**

- **Java:** 461,768
- **C++:** 291,849
- **C:** 146,115
- **Python:** 33,539

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[Graph showing the increase in code volume from 2013 to 2014]
Project comparisons (ohloh.net)

In a Nutshell, OpenDaylight...

- has had 4,759 commits made by 154 contributors representing 1,045,938 lines of code
- is mostly written in Java with an average number of source code comments
- has a young, but established codebase maintained by a very large development team with stable Y-O-Y commits
- took an estimated 292 years of effort (COCOMO model)

<table>
<thead>
<tr>
<th>LOC</th>
<th>contributors</th>
</tr>
</thead>
<tbody>
<tr>
<td>OpenStack</td>
<td>1.67M</td>
</tr>
<tr>
<td>CloudStack</td>
<td>1.5M</td>
</tr>
<tr>
<td>Eclipse platform</td>
<td>2.67M</td>
</tr>
<tr>
<td>OpenDaylight</td>
<td>1.05M</td>
</tr>
<tr>
<td>Floodlight</td>
<td>97K</td>
</tr>
<tr>
<td>contrail-vrouter</td>
<td>19K</td>
</tr>
<tr>
<td>contrail controller</td>
<td>258K</td>
</tr>
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www.opendaylight.org
Membership — who wants to play

April 8 launch

June 3

June 5

June 15

October 3

January 16

February 4

www.opendaylight.org
Agenda

- What is Hydrogen
  - A bit of personal learning
- Introduction to Helium
- Next Steps – Beyond Helium
- Discussion/Question and Answer
Key Personal Learning: Open Source is the New Way to Develop Non-Differentiated “Plumbing”

- **Community building** is a core Open Source objective
- **Code** is the coin of the realm
- **Engineering systems** are as important as artifacts

*Putting this all together* →

[www.opendaylight.org](http://www.opendaylight.org)
Implication: Engineering artifacts are no longer the source of sustainable advantage and/or innovation.

• Engineering Systems
• Culture
• People/Process

Perhaps surprisingly, the “hyper-scale” and open-source communities have taught me that the only source of sustainable advantage/innovation consists of:

http://www.sdncentral.com/education/david-meyer-reflections-opendaylight-open-source-project-brocade/2014/03/
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)

Transformation →

Pick any Two
Agenda

- What is Hydrogen
  - A bit of personal learning

- Introduction to Helium

- Next Steps

- Discussion/Question and Answer
Introduction to Helium -- Naming

Periodic Table of Elements

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

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<td>4/14/2014</td>
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<td>Last call for new projects eligible to join</td>
<td>4/30/2014</td>
<td>This is the latest date a project proposal can be brought and still have the two week public comment period before its project creation review at the last TSC meeting before it needs to declare its intent to join the Simultaneous Release at M1.</td>
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</table>
| M1              | 5/12/2014  | 1. Projects must have declared intent to participate in Simultaneous Release  
2. Participating Projects must have published a candidate Release Plan for public comment ([Release Plan Template](#))  
3. TSC commits to initiate public discussion of Lithium Simultaneous Release Plan |
| M2              | 6/09/2014  | 1. Participating Projects must have declared their final Release Plan  
2. TSC commits to finalize basic dates and Milestones for the Lithium Simultaneous Release Plan (some details of requirements and Milestone contents may be decided later).  
3. TSC commits to initiate public discussion of Release Vehicles |
| M3              | 7/07/2014  | 1. Latest possible Continuous Integration Test Start  
2. TSC commits to decide on Final Release Vehicles Defined  
3. Latest possible date for commencing Documentation |
| M4              | 8/04/2014  | 1. API Freeze  
2. Latest possible Continuous System Test Start  
3. TSC commits to begin public discussion of Stable Update Expectations |
| M5              | 9/1/2014   | 1. Code Freeze (bug fixes only from here)  
2. String Freeze (all internationalizable strings frozen to allow for translation)  
3. TSC commits to have finalized Stable Update Expectations |
| RC0             | 9/9/2014   | Participating Projects must hold their Release Reviews, including User Facing Documentation. |
| RC1             | 9/15/2014  |                                                                                                                                           |
| RC2             | 9/22/2014  |                                                                                                                                           |
2. Latest possible date for each project to add a stable/helium branch |
| SU1 (Stable Update 1 aka Helium.1) | 11/10/2014 | First Stable Update for Helium. See [Stable Update](#) section. NOTE: This date is provisional, but will not move earlier. Please note, event based Updates (security/critical bugs) are distinct and may occur at any point. |
| SU2 (Stable Update 2 aka Helium.2) | 01/12/2015 | Second Stable Update for Helium. See [Stable Update](#) section. NOTE: This date is provisional, but will not move earlier. Please note, event based Updates (security/critical bugs) are distinct and may occur at any point. |
What’s in the queue for Helium?
(projects that have advanced to Incubation state)

- Group Based Policy Plugin (Application Policy Plugin)
- Packet Cable PCMM Manager
- SDNi App
- Southbound Plugin to the OpenContrail Platform
- L2 Switch
- Secure Network Bootstrapping Infrastructure
- AAA Service
- ODL Toolkit
- Dynamic Resource Reservation
- TTPs
- Opflex
- Root Parent
- Documentation
- **TCP-MD5**
- And more…
- [https://wiki.opendaylight.org/view/Project_Proposals:Main](https://wiki.opendaylight.org/view/Project_Proposals:Main)
Brief Note on Project Lifecycles

- Anyone can propose a project.

- Proposal:
  - 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

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

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

- Core:
  - 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

- Archived:
  - Termination Review:
    - Termination 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 committees
      - Can be initiated by TSC or PMG if containing project if:
        - Project has no remaining committees
        - Project has had no commits in SCM in 18 months
        - Review by TSC and Approval
Agenda

- What is Hydrogen
  - A bit of personal learning

- Introduction to Helium

- Next Steps – Beyond Helium

- Discussion/Question and Answer
Next Steps
A Few Technical Details

- MD-SAL
- Stable Release
- Simultaneous Release Cadence
- Future Release Vehicles/Package
  - Small OSGi runtime/containerization
- Quasi-technical Issues
Quasi-technical things we want to work on (necessarily incomplete list)

- Continue to build/refine our community
  - Including increasing committer diversity across the projects
  - Code Quality and Coverage
    - Stability, Performance, Bug fixes ($Major.$Minor)
    - Distributed Systems Issues (Akka, Infinspan)

- “Staffing”
  - Release engineering
  - 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
Lithium?

- Release after Helium
- Target Release Date: 04.20.2015
- Simultaneous Release Plan
- Regularized/Deterministic Release Cadence
- Too early for projects
# Lithium Simultaneous Release Plan

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2. Participating Projects must have published a candidate Release Plan for public comment (Release Plan Template)  
3. TSC commits to initiate public discussion of Lithium Simultaneous Release Plan |
| M2        | 12/12/2014 | 1. Participating Projects must have declared their final Release Plan  
2. TSC commits to finalize basic dates and Milestones for the Lithium Simultaneous Release Plan (some details of requirements and Milestone contents may be decided later).  
3. TSC commits to initiate public discussion of Release Vehicles |
| M3        | 1/23/2015  | 1. Latest possible Continuous Integration Test Start  
2. TSC commits to decide on Final Release Vehicles Defined  
3. Latest possible date for commencing Documentation |
| M4        | 2/20/2015  | 1. API Freeze  
2. Latest possible Continuous System Test Start  
3. TSC commits to begin public discussion of Stable Update Expectations |
| M5        | 3/23/2015  | 1. Code Freeze (bug fixes only from here)  
2. String Freeze (all internationalizable strings frozen to allow for translation)  
3. TSC commits to have finalized Stable Update Expectations |
| RC0       | 3/30/2015  | Participating Projects must hold their Release Reviews, including User Facing Documentation. |
| RC1       | 4/6/2015   |                                                                          |
| RC2       | 4/13/2015  |                                                                          |
| Formal Lithium Release | 4/20/2015  | 1. Formal Lithium Release  
2. Latest possible date for each project to add a stable/Lithium branch |
| SU1 (Stable Update 1 aka Lithium.1) | 6/1/2015   | First Stable Update for Lithium. See Stable Update section. NOTE: This date is provisional, but will not move earlier. Please note, event based Updates (security/critical bugs) are distinct and may occur at any point. |
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Get Involved!

- 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
Thanks!