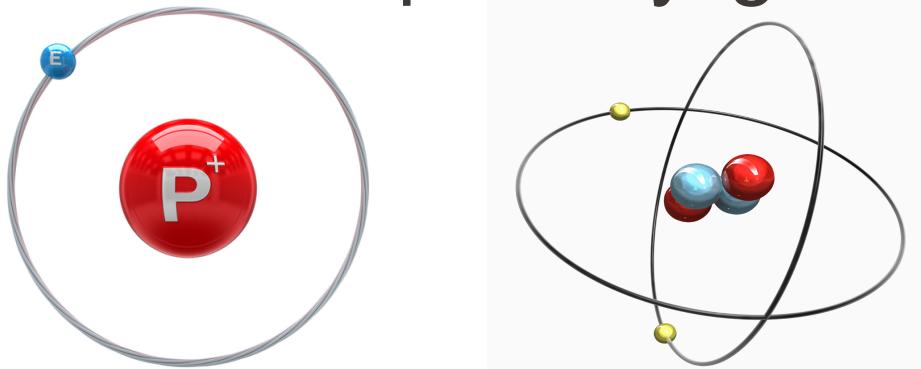




Introduction to OpenDaylight and Hydrogen, Learnings from the Year, and What's Next for OpenDaylight



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Universal Laws, Architecture, and the Hidden Nature of Complexity (and what does this have to do with SDN?)

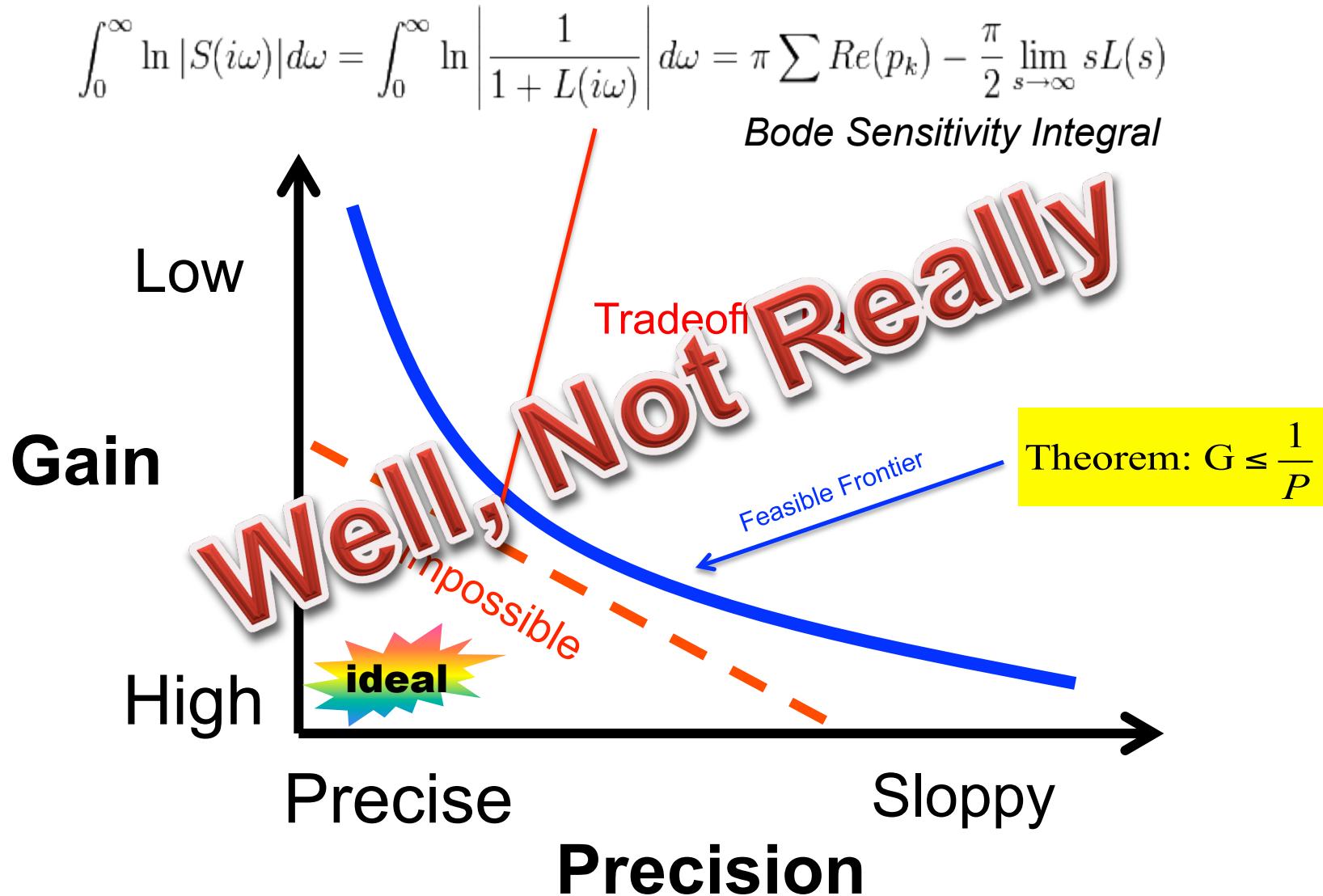


Just Kidding

$$\int_0^\infty \ln |S(i\omega)| d\omega = \int_0^\infty \ln \left| \frac{1}{1 + L(i\omega)} \right| d\omega = \pi \sum Re(p_k) - \frac{\pi}{2} \lim_{s \rightarrow \infty} sL(s)$$

Gain/Sensitivity Tradeoff In Feedback Control

(understanding this is going to wind up being critically important for SDN)



Agenda

- What is OpenDaylight/Hydrogen
- Key Personal Learning from a Year Inside ODP
- A Few Hydrogen/ODP Metrics
- What Is Queued up for “Helium”
- Where we’re going

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

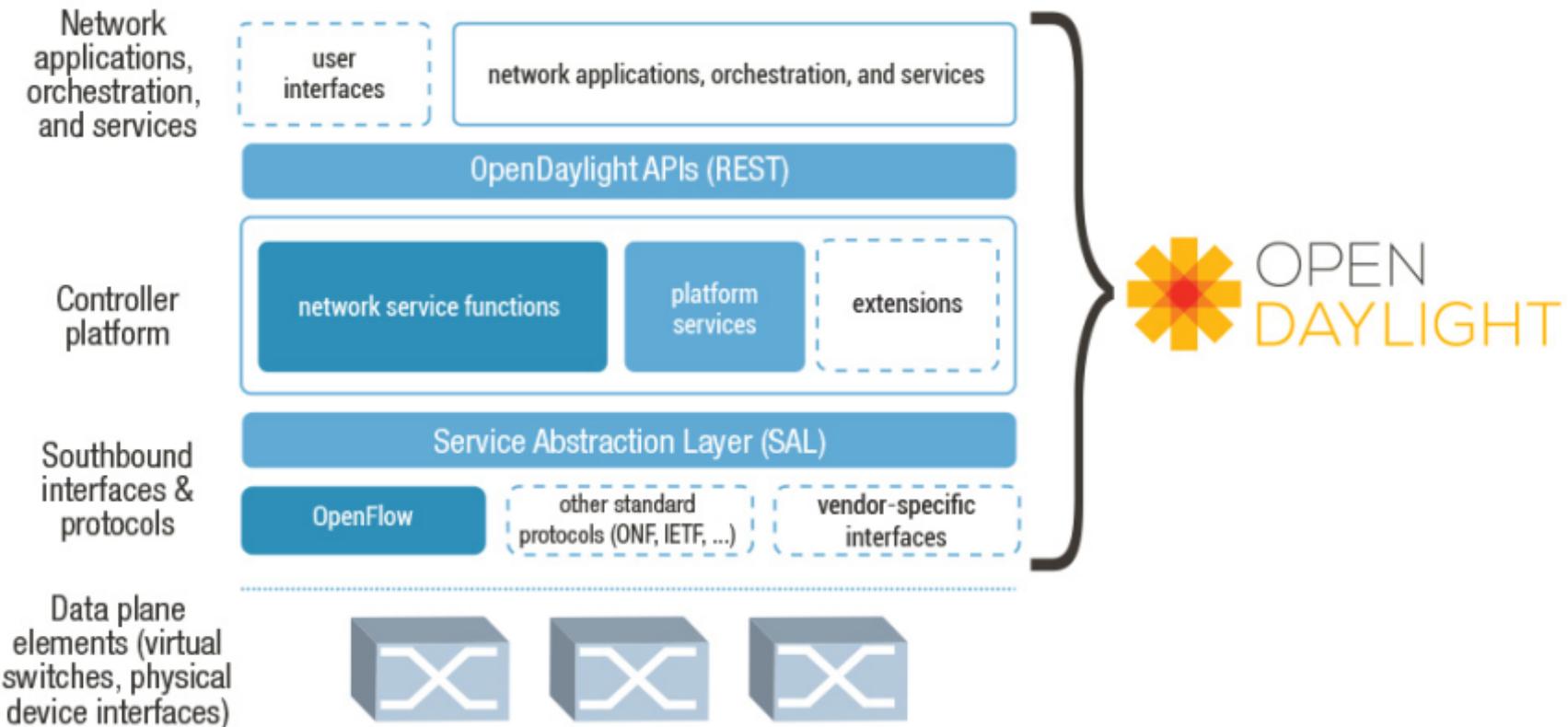
Code	Acceptance	Community
To create a robust, extensible, open source code base that covers the major common components required to build an SDN solution	To get broad industry acceptance amongst vendors and users <ul style="list-style-type: none">• Using OpenDaylight code directly or through vendor products• 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.

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
 - Whatever else we need to make it work

Project Framework



Who is OpenDaylight? (the corporate sponsors)

Platinum Members



Gold Members



Silver Members



OpenDaylight Simultaneous Release

- OpenDaylight is multi-project
 - 15 projects currently in “bootstrap” or “incubation”
 - Bringing components together in a simultaneous release
 - CodeName: Hydrogen
 - Release on: Jan 28, 2014
- Several “editions” to group related functionality together
 - base, virtualization, service provider
 - *virtualization edition will provide OpenStack integration*

Simultaneous Release Plan

Milestone	Offset 0 Date	Offset 1 Date	Offset 2 Date	Events
M0	6/24/2013	6/26/2013	6/28/2013	Simultaneous Release Open
M1	7/22/2013	7/24/2013	7/26/2013	1. Projects must have declared intent to participate in Simultaneous Release 2. Participating Projects must have published a candidate Release Plan for public comment
M2	8/19/2013	8/21/2013	8/23/2013	Participating Projects must have declared their final Release Plan
M3	9/16/2013	9/18/2013	9/20/2013	Latest possible Continuous Integration Test Start
M4	10/14/2013	10/16/2013	10/18/2013	1. API Freeze 2. Latest possible Continuous System Test Start
M5	11/11/2013	11/13/2013	11/15/2013	Code Freeze (bug fixes only from here) String Freeze (all internationalizable strings frozen to allow for translation) Latest possible date for commencing User Facing Documentation
RC0	11/18/2013	11/20/2013	11/22/2013	
RC1	11/25/2013	11/27/2013	11/29/2013	
RC2	12/2/2013	12/4/2013	12/6/2013	Participating Projects must hold their Release Reviews, including User Facing Documentation.
Formal Release	12/9/2013			

Well



What Hydrogen Delivered

- OpenDaylight is multi-project
 - 15 projects
 - Project diversity v. mono-culture
- *Simultaneous Release*
- Release Date: Dec 9, 2013 ~ Feb 03 2014
- Various Issues/Learning's

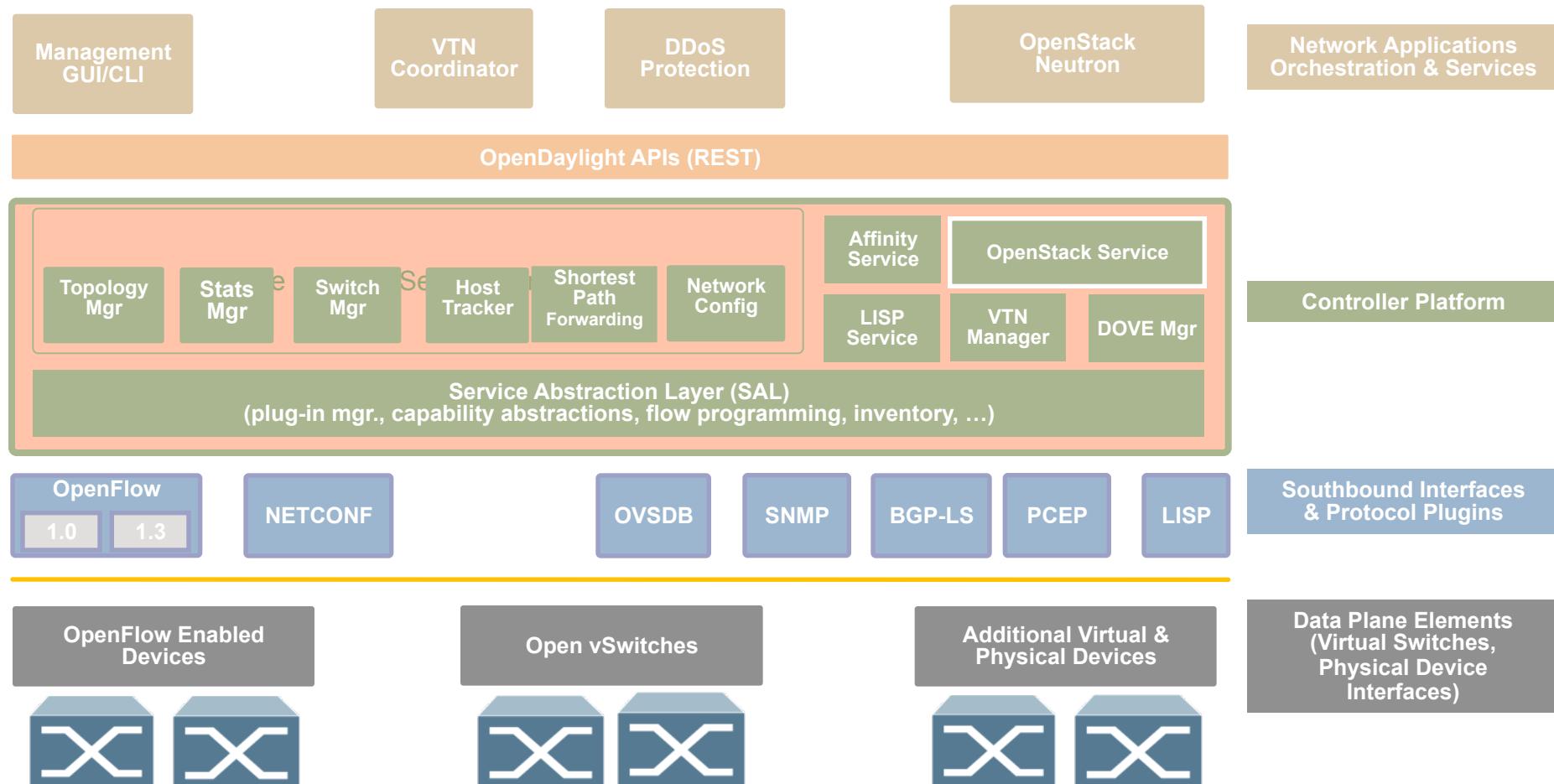
Impressive List of Projects in H₂

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





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

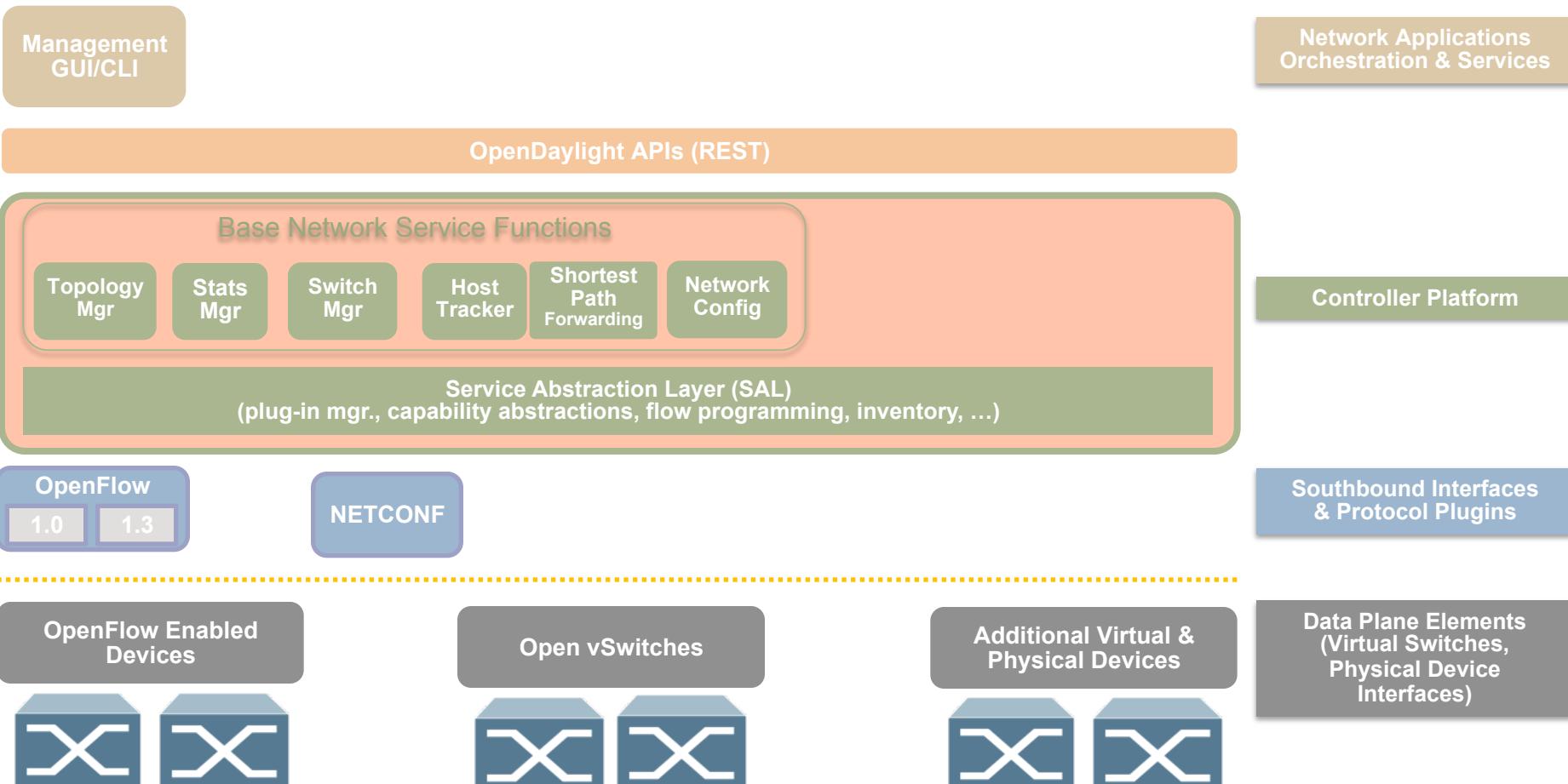
BGP: Border Gateway Protocol

PCEP: Path Computation Element Communication Protocol

SNMP: Simple Network Management Protocol



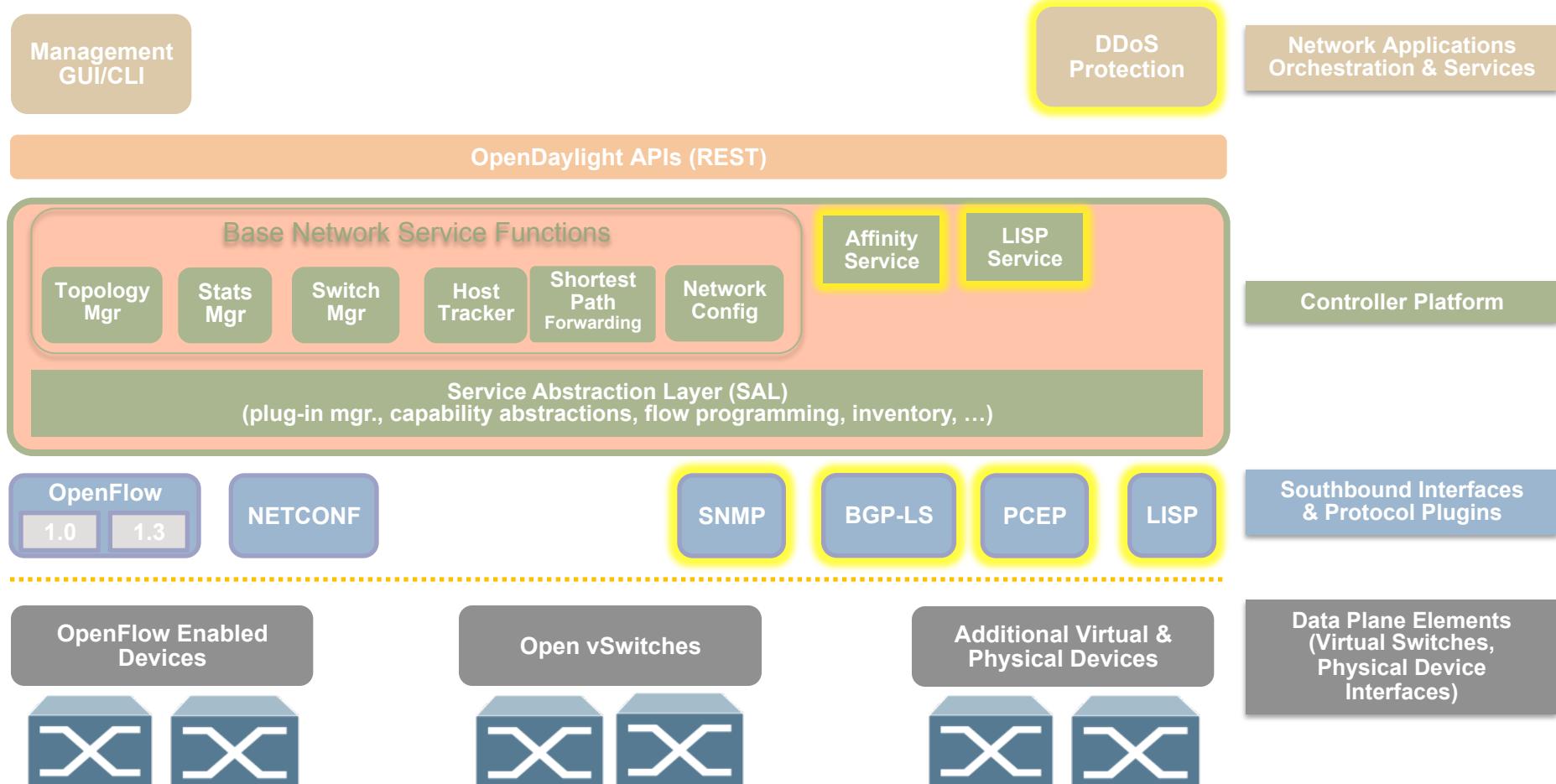
Base Edition



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



VTN: Virtual Tenant Network

DOVE: Distributed Overlay Virtual Ethernet

DDoS: Distributed Denial Of Service

LISP: Locator/Identifier Separation Protocol

OVSDB: Open vSwitch DataBase Protocol

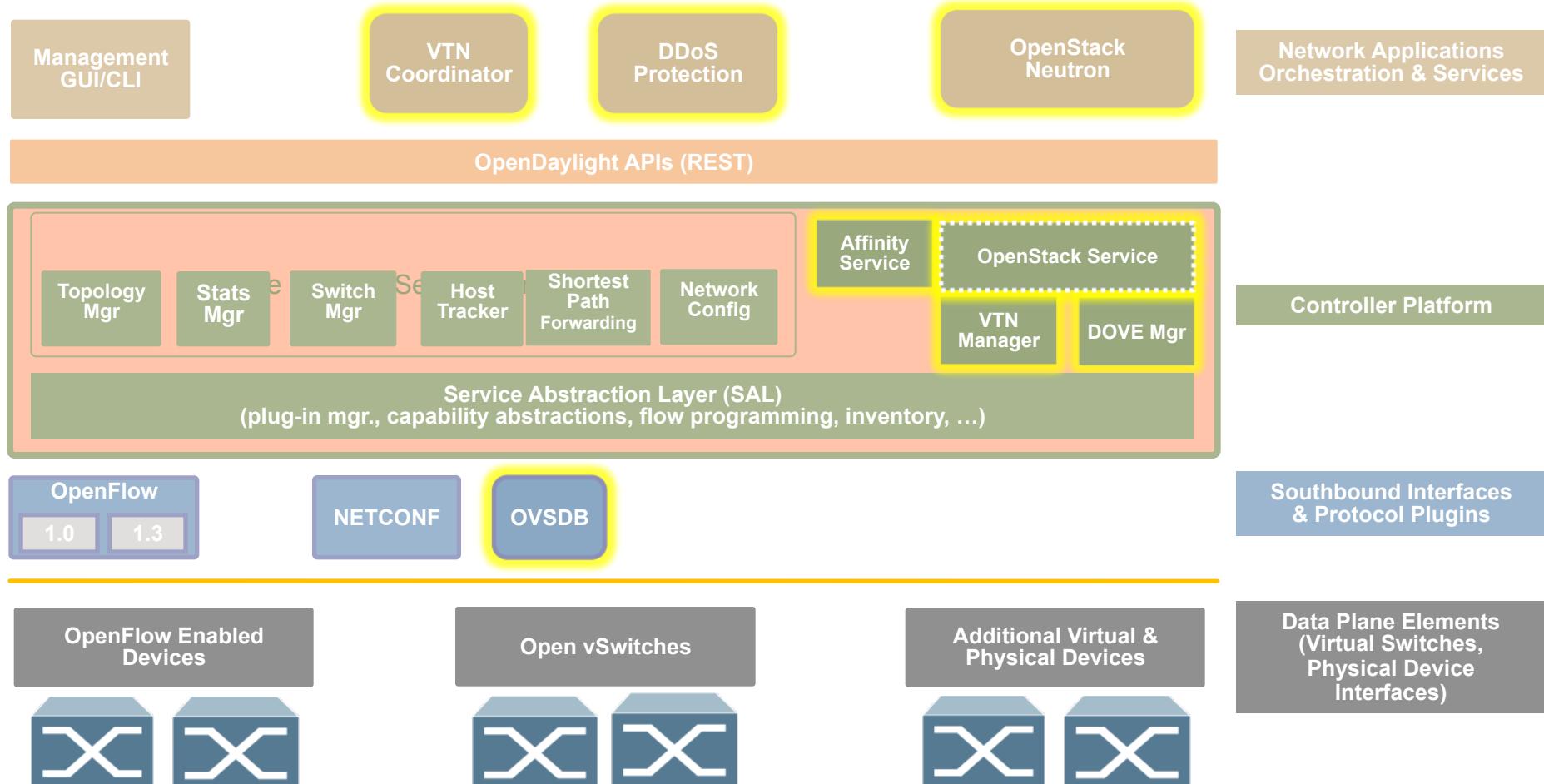
BGP: Border Gateway Protocol

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Virtualization Edition



VTN: Virtual Tenant Network

DOVE: Distributed Overlay Virtual Ethernet

DDoS: Distributed Denial Of Service

LISP: Locator/Identifier Separation Protocol

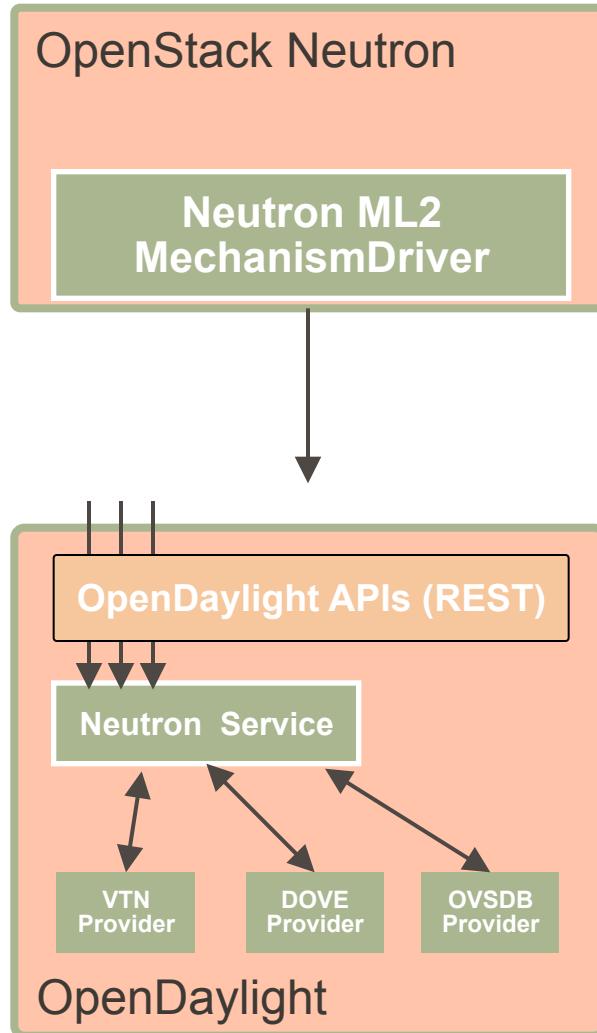
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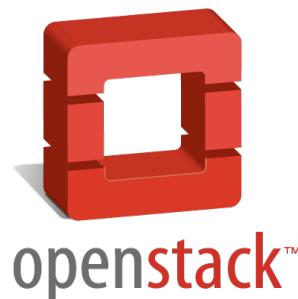
OpenStack Integration



- 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

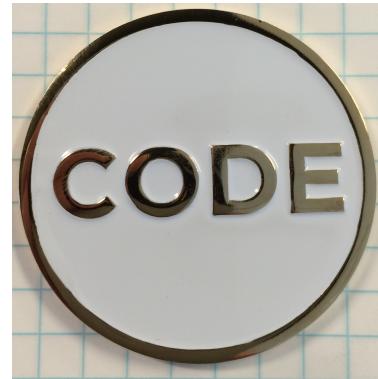
- Updates planned for Helium and Juno:
 - VIF plugging changes for stability improvements
 - Notify from ODL to MechanismDriver once ODL has setup the port on the host
 - Security groups implemented using OpenFlow rules
 - L3 routing handled by OpenDaylight
 - *Removes the need for the L3 agent*
 - Additional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



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Key Learnings

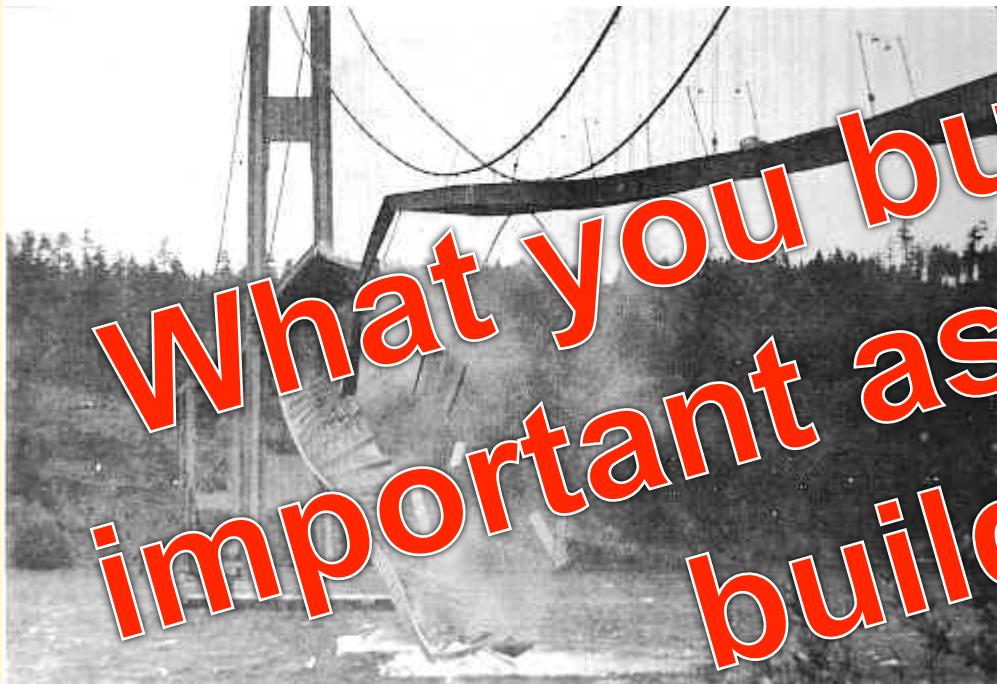


- ***Community building*** is a core objective
 - In fact, innovation through collaboration is one of the most powerful features of OSD
- ***Code*** is the coin of the realm
- ***Engineering systems*** are as important as artifacts

Putting this all Together →

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

Trend: Engineering artifacts are *no longer* the source of sustainable advantage and/or innovation



Perhaps surprisingly, the “hyper-scale” nature of open source communities have taught me that actual artifacts (in our case network applications as well as HW/SW) are ephemeral entities and that the only source of sustainable advantage/innovation consists of

- Engineering Systems culture
- People/Process

<http://en.wikipedia.org/wiki/Aeroelasticity - Flutter>

One Way To Think About OSD



David Meyer

March 28 · Edited

One way to think about open source development: Early on things are chaotic, there is a lot of stuff orbiting anything with enough gravity, there are epic collisions and everything is molten (e.g., like the surface of the earth during the LHB [0]). But if you wait a couple of billion years and let things evolve you can wind up with a beautiful blue planet or the Linux kernel or ...

[0] http://en.wikipedia.org/wiki/Late_Heavy_Bombardment



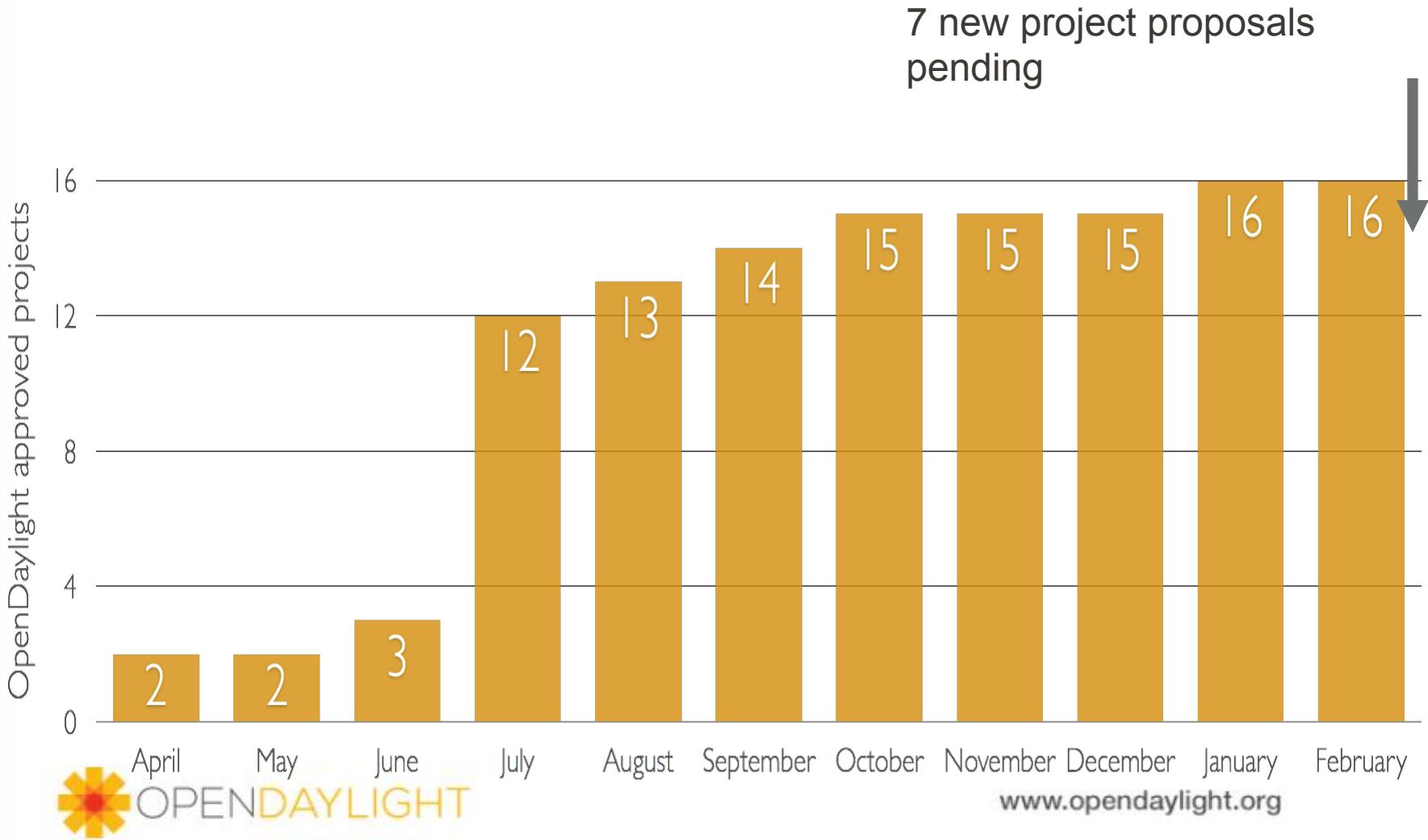
Like · Comment · Promote · Share

Michael Howard, Chris Grundemann, Ken'ichiro Hashimoto and 11 others like this.

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OpenDaylight project creation



www.opendaylight.org

OpenDaylight code volume (ohloh.net)

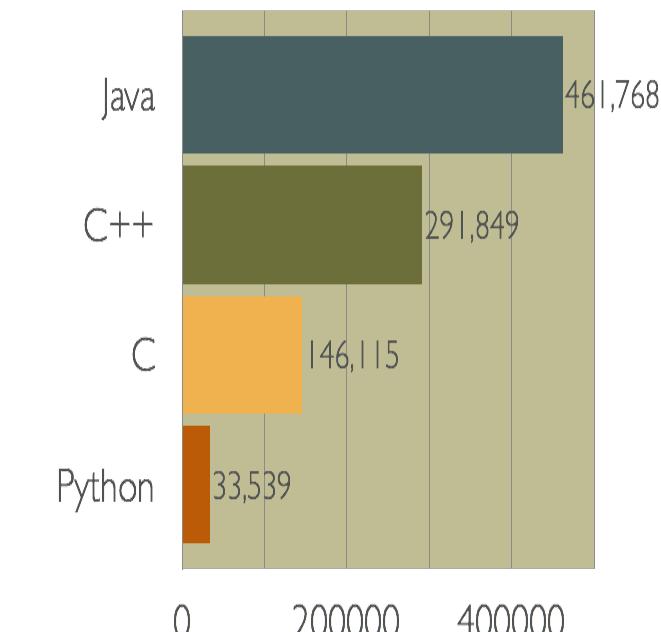
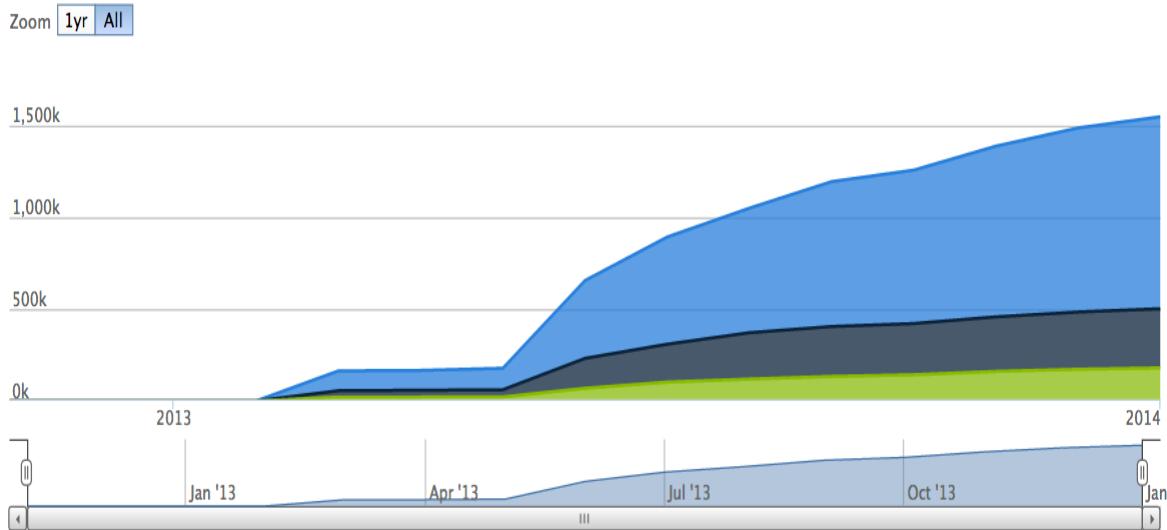


Languages

① Analyzed 10 days ago based on code collected 12 days ago

Total Lines :	1,548,552	Code Lines :	1,045,938	Percent Code Lines :	67.5%
Number of Languages :	18	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



www.opendaylight.org

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)

Quick Reference

Project Links: [Homepage](#)

Code Locations: (14 Locations)

Licenses: EPL-1.0

Similar Projects:  CDO Model  Centreon

Re...



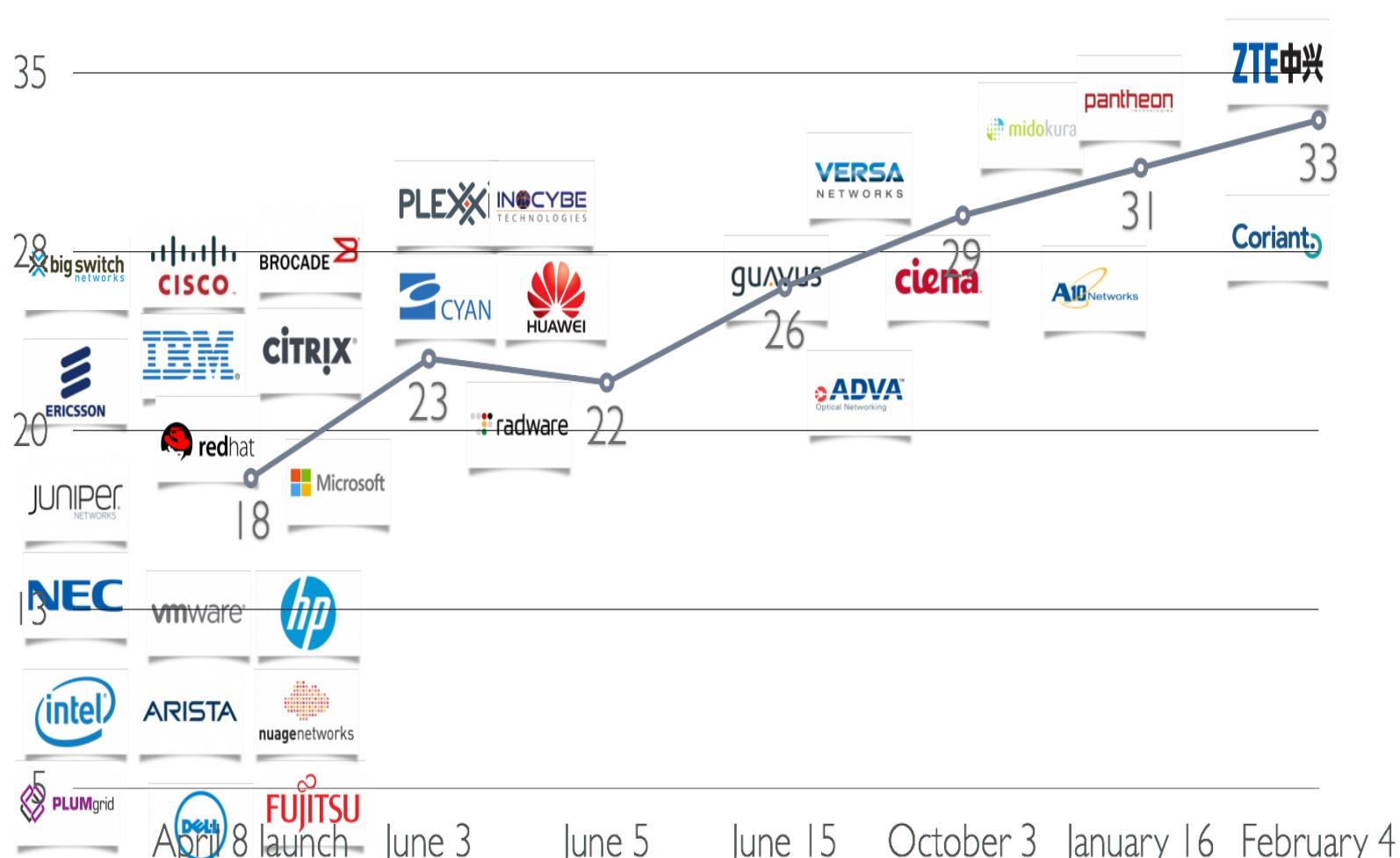
OpenNMS

Managers: mavenugo

	LOC	contributors
OpenStack	1.67M	1,974
CloudStack	1.5M	250
Eclipse platform	2.67M	404
OpenDaylight	1.05M	154
Floodlight	97K	52
contrail-vrouter	19K	15
contrail-controller	258K	53

www.opendaylight.org

Membership — who wants to play



www.opendaylight.org

CONEXSTREAM

QOSMOS
Your Network is Information

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What's in the queue?

https://wiki.opendaylight.org/view/Project_Proposals:Main

- Application Policy Plugin
- Developer Toolkit (archetypes, etc)
- Packet Cable PCMM Manager
- Dynamic Resource Reservation
- Documentation
- SDN Simulation Platform
- Data Persistence
- Distributed Systems (Infinispan, Akka, ...)
- Python OpenDaylight Client

Agenda

- Key Personal Learning from a Year Inside ODP
- Quick Level Set: What is Hydrogen
- A Few Hydrogen/ODP Metrics
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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, Inifinspan)
 - Splitting up the controller
 - MD-SAL, ...
- “Staffing”
 - Release engineering
 - Documentation
- Continue to refine our engineering systems
 - Thanks Andrew!
 - Fewer humans in the loop
- We need more code that writes code
 - MD-SAL is an example
 - Fewer humans in the loop
 - More automation more better

And of course

- Sustaining Engineering
 - No end to the number of bugs we find
- Performance and scalability
- Again, Code Quality
- New Projects
 - I mentioned a few
 - Several others were informally proposed at the ODP Summit



Thanks!

