

The OpenDaylight Open Source Project

Sergio ArROUTbi Braojos



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About OpenDaylight

- FLOSS SDN Controller
- SDN/NFV: Next big Networking industry revolution
- Started in April 8, 2013
- Hosted by Linux Foundation
- Cisco, Ericsson, Juniper, IBM, HP, Microsoft, Red Hat, Dell, Citrix, Brocade
- Two releases: Hydrogen, Helium

About SDN

- Separate Networking Control Logic from Networking Hardware
- Homogenize Networking Resources Administration
- Opex Reduction
- Based on OpenFlow protocol
- SDN Architecture:
 - Open Standards/Vendor-Neutral
 - Directly Programmable
 - Agile
 - Centrally Managed
 - Programmatically Configured
- OpenDaylight SDN Controller: Manage network devices through OpenFlow



OpenDaylight: SDN Controller

OpenDaylight - Mozilla Firefox

File Edit View History Bookmarks Tools Help

OpenDaylight 10.125.136.52:8080 admin

OPENDAYLIGHT Devices Flows Troubleshoot

Nodes Learned

Search

Nodes Learned

Name	Node ID	Port
None	OF 00:00:00:00:00:00:02	3
None	OF 00:00:00:00:00:00:03	3
None	OF 00:00:00:00:00:00:01	2
None	OF 00:00:00:00:00:00:04	3
None	OF 00:00:00:00:00:00:07	3

1-5 of 7 items

Static Route Configuration

Add Static Route Remove Static Route

Search

Static Route Configuration

Name	Static Route	Next Hop Address

0 items

Subnet Gateway Configuration SPAN Port Configuration

Add Gateway IP Address Remove Gateway IP Address Add Ports

Search

Subnet Gateway Configuration

Name	Gateway IP Address/Mask	Ports

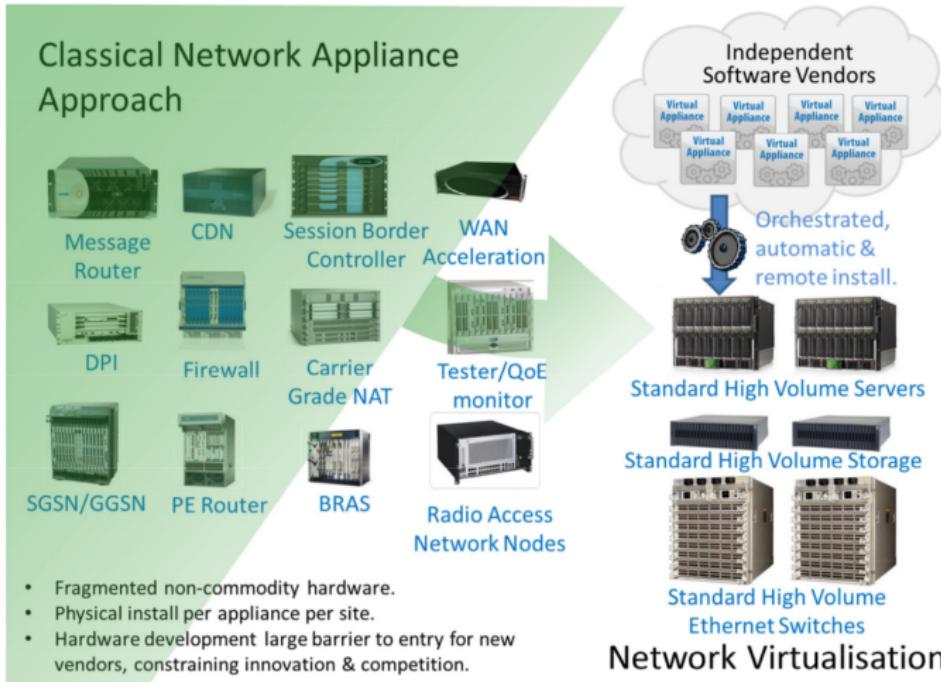
0 items

The screenshot shows the OpenDaylight SDN Controller interface running in Mozilla Firefox. The main window displays a network topology with several switches represented by blue rectangles and their connection paths. The connections are labeled with MAC addresses: OF|00:00:00:00:00:00:04, OF|00:00:00:00:00:00:03, OF|00:00:00:00:00:00:07, OF|00:00:00:00:00:00:02, OF|00:00:00:00:00:00:05, and OF|00:00:00:00:00:00:01. Below the topology, there are three main configuration panels: 'Nodes Learned' (listing learned nodes with their MAC addresses and ports), 'Static Route Configuration' (empty), and 'Subnet Gateway Configuration' (empty). The 'Devices' tab is selected in the navigation bar.

About NFV I

- Network Functions Virtualization (Network as Utility)
- Capex Reduction
- Hardware Homogenization: Commodity Fragmentation to:
 - Standard High Volume Servers
 - Standard High Volume Storage
 - Standard High Volume Ethernet Switches

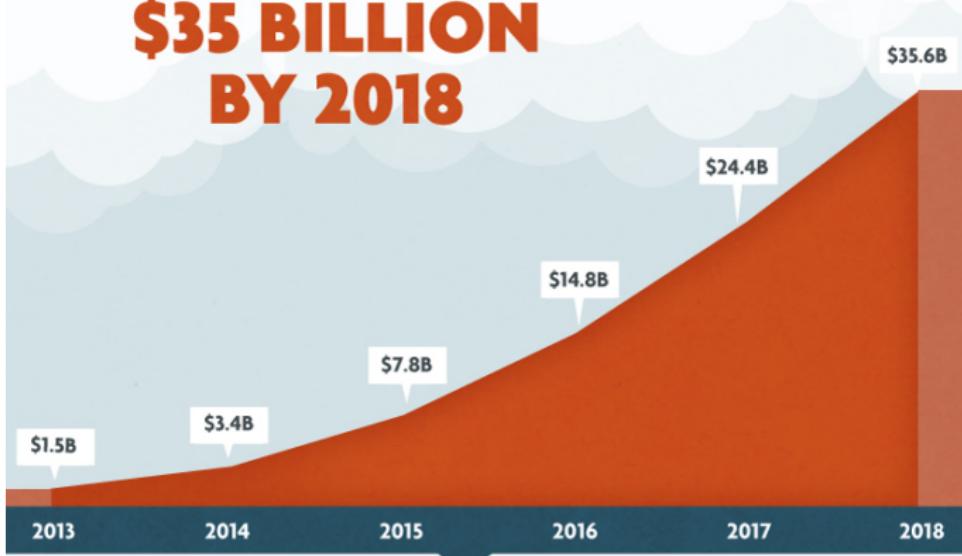
About NFV II



SDN Market Estimations

HOW BIG IS THE SDN MARKET?

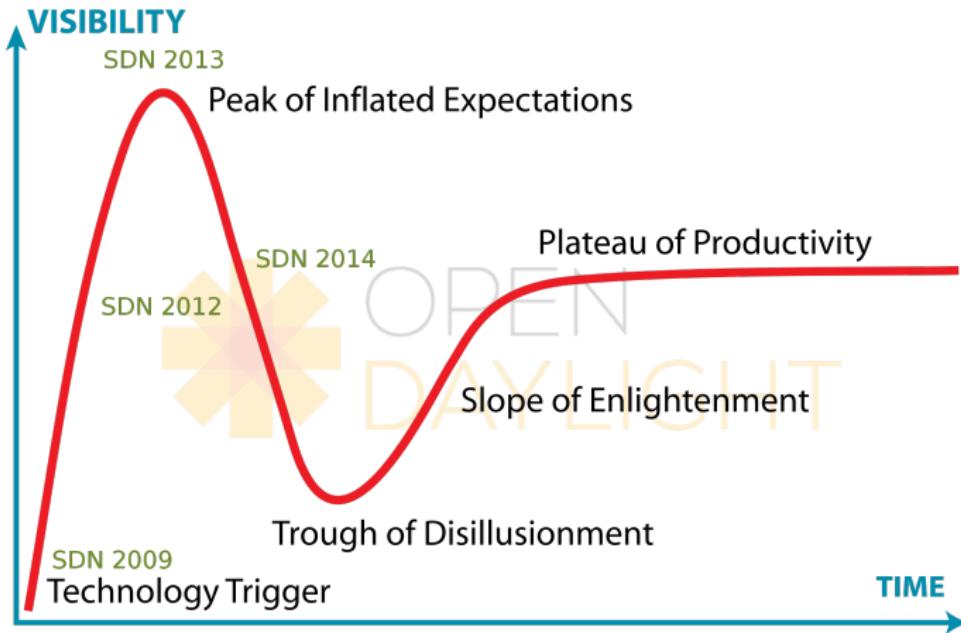
**\$35 BILLION
BY 2018**



Economic Aspects I

- Beginning of 2013:
 - Big Expectations Market
 - Big Impact on Networking Industry
- Late 2014:
 - SDN/NFV: Open Technology, but complicated to implement
 - Hardware Investment is needed
 - Downward Corrections:
 - Optimistic: \$8.0B by 2018
 - Pessimistic: \$3.6B by 2019
 - 2014: Hype Cycle: Towards Trough of Disillusionment

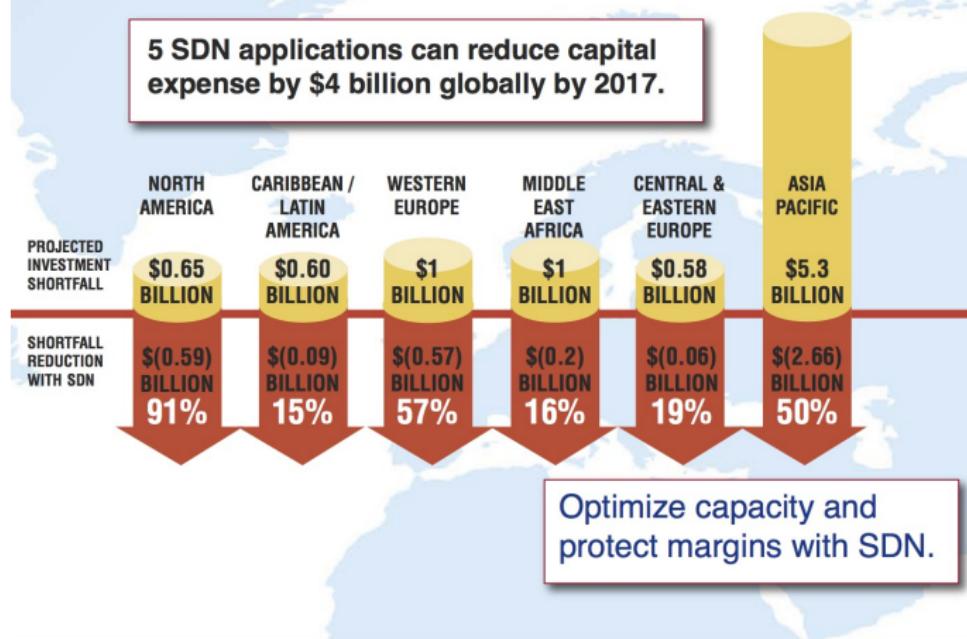
Economic Aspects II



Economic Aspects III

SDN cuts mobile backhaul CapEx

5 SDN applications can reduce capital expense by \$4 billion globally by 2017.



Optimize capacity and
protect margins with SDN.

Economic Aspects IV

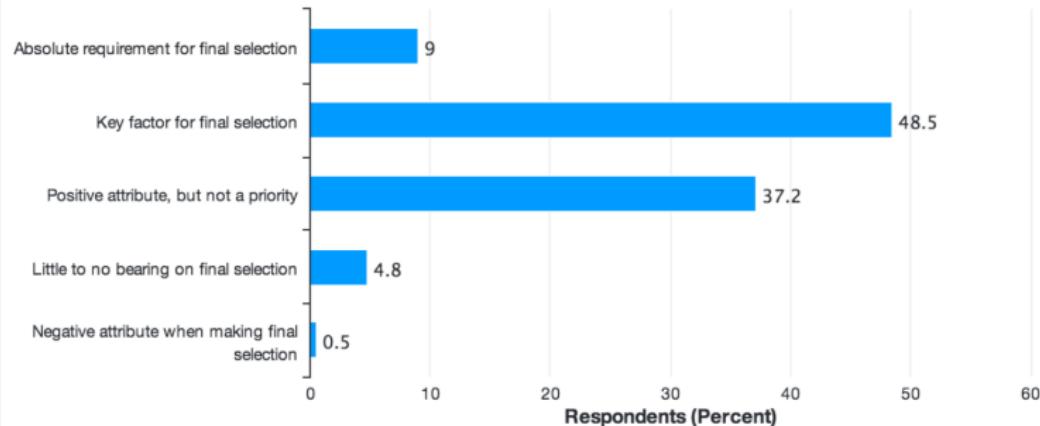
SDN cuts mobile backhaul OpEx

5 SDN applications can reduce operating expense by \$9 billion globally by 2017.



Economic Aspects V

Open source and SDN/NFV - a requirements analysis



<http://research.gigaom.com/>

GIGAOM RESEARCH

License

- EPLv1.0:
 - Open Source License, recognized by OSI and FSF
 - GPL incompatible
 - Weak Copyleft License: Distribution of object code can be done under other license agreement
 - Reasons from OpenDaylight to use EPLv1.0:
 - FLOSS
 - Java-based project
 - 3rd party libraries compatibility (Maven, OpenVSwitch, OpenFlow Java)
 - Avoid licensing fragmentation

Bylaws

- Name, Purposes, Oficces
- Members, Actions of Members
- Directors, Committees, Officers
- Notices, Indemnification
- Books and Records
- Transactions, Grants, Contracts and Loans
- General provisions
- Antitrust, Competition and Availability of Intellectual Property
- Ammendments



Governance: TSC

- Technical Steering Committee
- Define Guiding Principles (Open, Visible, Transparent, Collaborative, Ethic)
- No say in Technical issues
- Governance Evolution
- Operations (Development Process)
- Project Roles:
 - Committers
 - Project Leads
 - Contributors

Governance: Board of Directors

- Set overall project policy
- Describe aggregate scope of projects
- Drive a technical vision and direction
- Define a release guidance to TSC
- Executive Director: Neela Jacques
- Platinum Members representatives: Cisco, Citrix, Red Hat, Brocade, Ericsson, IBM, HP, ...

Communication Channels And Tools

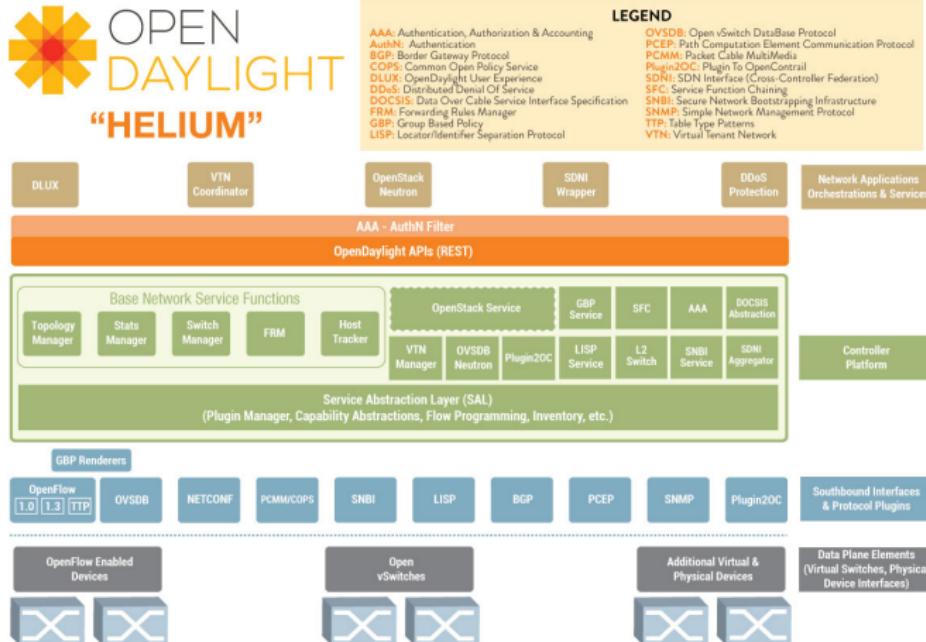
- Communication Channels:
 - Social media: Twitter, Facebook, Google+, Youtube, LinkedIn
 - IRC Channel
 - Mail Lists
 - Blogs
- Community Tools:
 - Wiki
 - Ask (Q&A)
 - Identity Server
 - Bugzilla
 - Jenkins
 - Gerrit
 - Nexus
 - Sonar



Community Building

- Main Events:
 - OpenDaylight Summit: Santa Clara, 2014. 50 speakers, 600 attendees
 - HackFests: Focus on new community members, bugfix coaching sessions
 - Developer Design Forums: Networking, future releases, ...
 - Other Events: OpenDaylight also in events such as OpenStack Summit, Paris 2014
- Community Programs and User Groups:
 - Summer Internship Program: Five student interns in Summer 2014
 - Ambassador Program: OpenDaylight experts members to extend Marketing World Wide
 - User Groups: Regional, self organized groups. Hackatons, social events, etc. Canada, Germany, for instance.

Technical Architecture

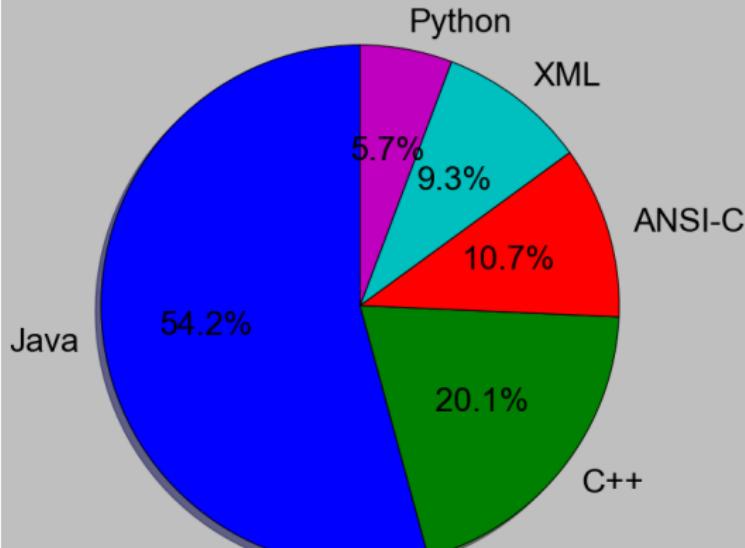


OpenDaylight Projects

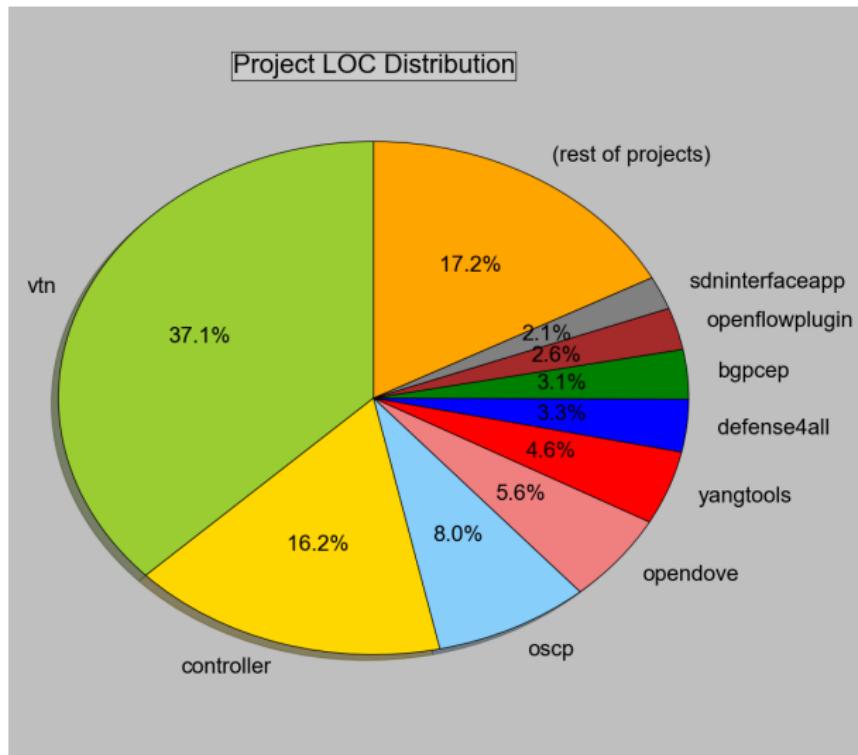
- 24 projects in OpenDaylight Helium release
- Main Project: Controller
- NorthBound APIs: VTN, OpenStack Neutron Interface, etc.
- Controller Platform: AAA, Stats, Topology, SFC, DOCSIS, OVSDB, ... (REST to NB, SAL to SB)
- SouthBound APIs and Protocols (OpenFlow, NETCONF, PCEP, LISP, PCMM/COPS, ...)

Source Code I

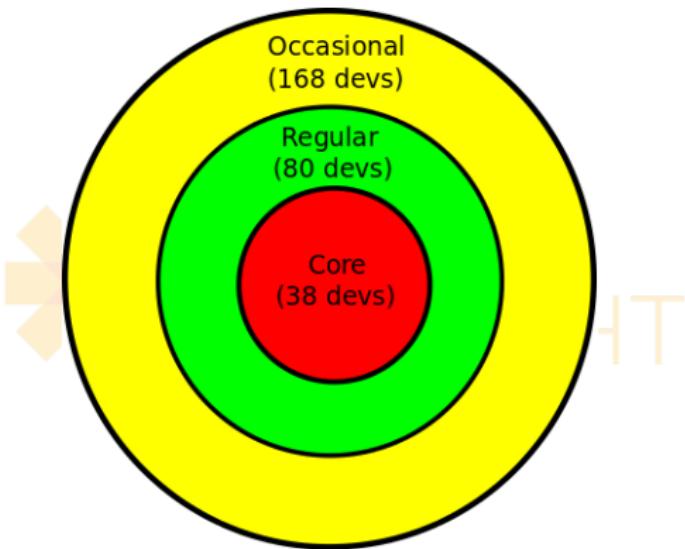
Programming Language Distribution



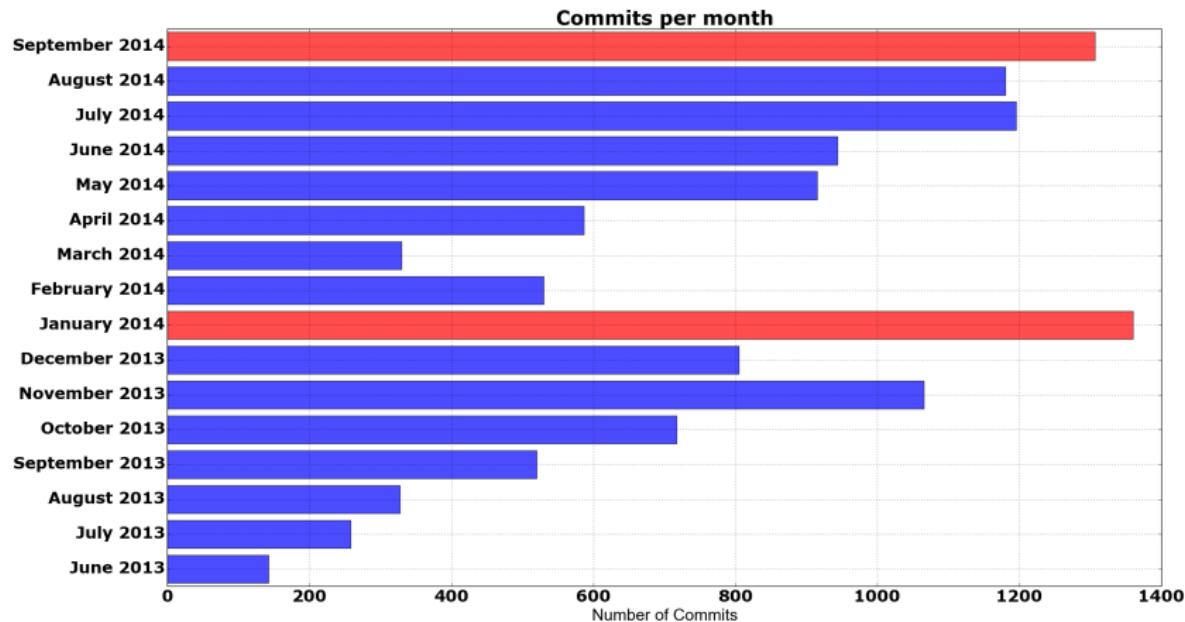
Source Code II



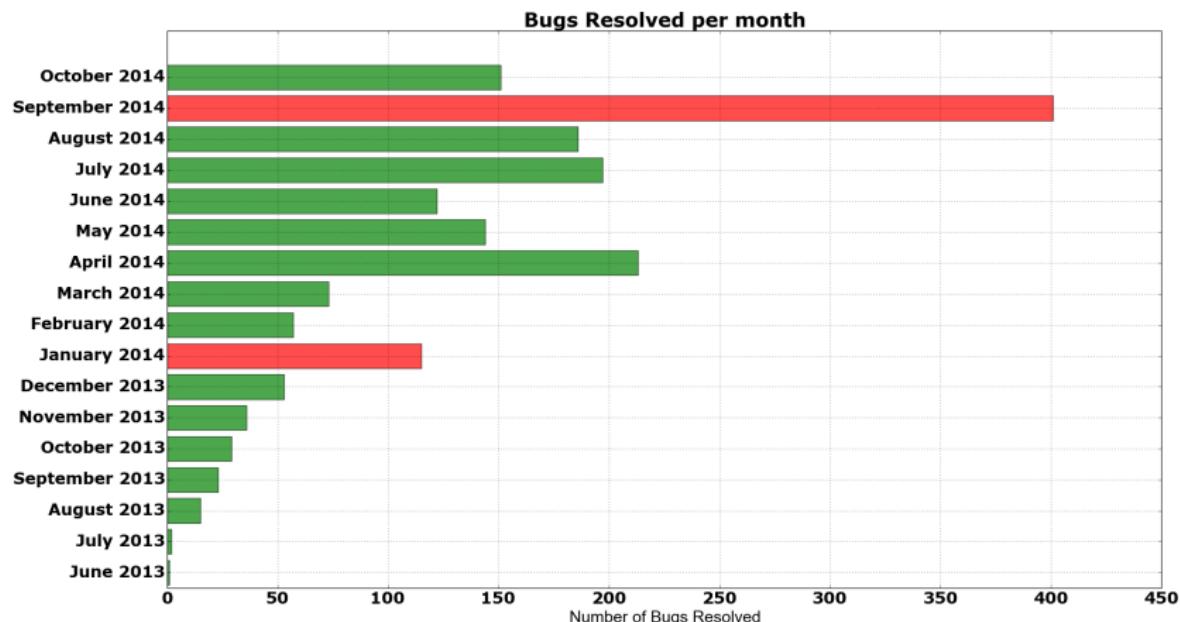
Project Evaluation I



Project Evaluation II

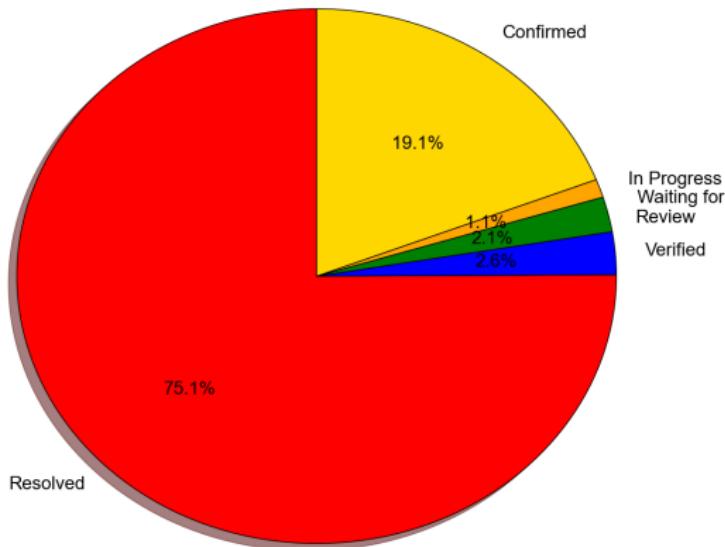


Project Evaluation III

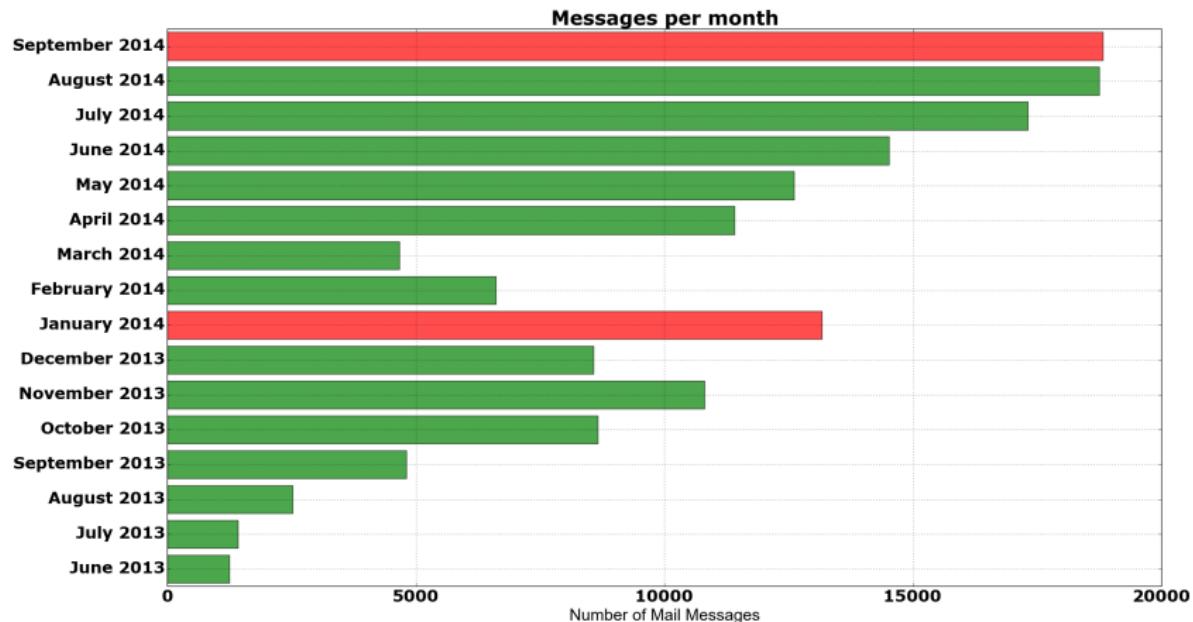


Project Evaluation IV

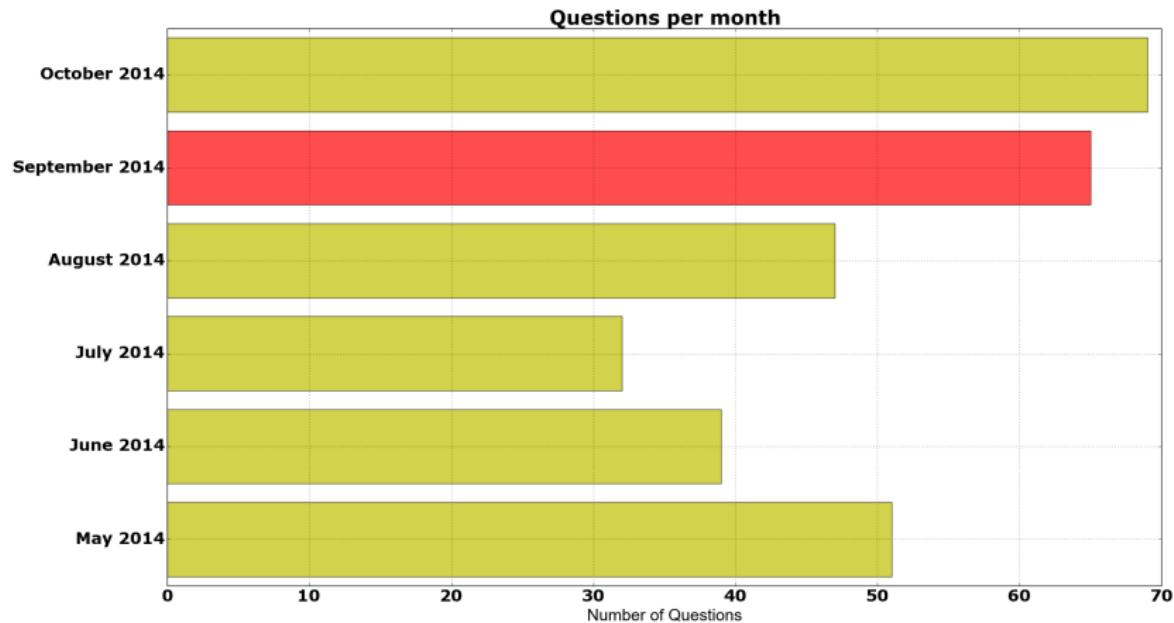
Bug Status Distribution



Project Evaluation V



Project Evaluation VI



Conclusions And Future Work

Conclusions:

- MSWL applied to a particular FLOSS project, OpenDaylight in this case
- FLOSS/Open as best option to start collaborating around incipient technologies
- FLOSS as the most desirable option by customers
- FLOSS projects: better to be evaluated

Future Work:

- Spread Any of the Knowledge in different OpenDaylight Open Source Project aspects
- Apply this study to a similar project in incipient technology (e.g.: OPNFV)