

OpenStack Community Activity Report  
January-March, 2015  
Report sponsored by the OpenStack Foundation



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AUTHOR Daniel Izquierdo Cortázar  
Chief Data Officer  
dizquierdo@bitergia.com

AUTHOR Stefano Maffulli  
OpenStack Developer Advocate  
stefano@openstack.org

This report would not exist without the effort of the people involved in the development of the OpenStack Activity Board, Grimoire toolset and the feedback of the people in the development mailing list of the OpenStack Foundation.

## Executive Summary

The January-March 2015 summary of OpenStack Community Activity Report<sup>1</sup> starts to show the maturity reached by the project, with most metrics remaining stable compared to previous quarters. However the project keeps growing as observed with a minimum increase of activity of a 4% if compared to the previous year.

### Key findings:

#### **New peak of code contributors**

With 556 active contributors per month, this quarter has the highest in the history of OpenStack. Compared to previous quarter, core and regular contributors have also increased over 10% the former and 20% the latter.

#### **Development process keeps improving**

The time to merge patches for integrated projects shows similar numbers to previous quarter, with the median time reducing. There seem to be a very positive inversion of trend for time to attend pending patchsets: while one year ago the mean time for a reviewer to give a comment to a patchset was over seven days, in this quarter the mean time is just five days. The median time is also down from one full day to half day. Nova and Glance have very high time to merge, requiring deeper investigation to identify the root cause.

#### **Submitters time to respond starts to decrease**

For the first time, contributors submitting changesets seem to be reacting faster to comments from reviewers and submit new patches more rapidly. These values may be the result of the increased efforts by the OpenStack Foundation targeting newcomers.

#### **Conversations are happening in many new places**

Many discussions have moved to Ask OpenStack and, for development and governance issues, moved to gerrit and the traffic on mailing list has stalled as a side effect.

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<sup>1</sup>This report is produced quarterly to give Community Managers and OpenStack Foundation's management better insights on development activities and online conversations. The quantitative and qualitative assessment start from tracking actions across all OpenStack git repositories, gerrit code reviews, bug trackers as well as IRC channels, mailing lists and questions/answers.

# Contents

<b>1</b>	<b>Overview of the Project</b>	<b>4</b>
<b>2</b>	<b>Communication and Support-Related Activities</b>	<b>8</b>
2.1	Mailing Lists . . . . .	8
2.2	Questions and Answers . . . . .	12
2.3	IRC . . . . .	15
<b>3</b>	<b>Details on OpenStack Integrated and Incubated projects</b>	<b>17</b>
3.1	Overview of OpenStack Programs . . . . .	18
3.2	Activity . . . . .	18
3.3	Community . . . . .	19
3.4	Process . . . . .	20
3.4.1	OpenStack Integrated Programs . . . . .	23
3.5	Activity . . . . .	23
3.6	Community . . . . .	24
3.7	Process . . . . .	25
3.7.1	OpenStack Incubated Programs . . . . .	28
3.8	Activity . . . . .	28
3.9	Community . . . . .	29
3.10	Process . . . . .	30
<b>A</b>	<b>Metrics Definitions</b>	<b>33</b>
<b>B</b>	<b>Source Code and Data Sources</b>	<b>36</b>

# Chapter 1

## Overview of the Project

The OpenStack Community Activity Report is produced quarterly to give Community Managers and OpenStack Foundation's management better insights on development activities and online conversations. The quantitative and qualitative assessment start from tracking actions across all OpenStack git repositories, gerrit code reviews, bug trackers as well as IRC channels, mailing lists and questions/answers site Ask OpenStack.

The report looks at activities across the OpenStack community during the first quarter of 2015, comparing it to previous eight quarters.<sup>1</sup>

The analysis aims at providing a detailed view of how the OpenStack project is evolving with special focus on each of the OpenStack programs<sup>2</sup>. OpenStack Integrated Releases are delivered at the beginning of the second and fourth quarters of each year and cycles of development activity are visible in the report: the first and third quarters of the year are periods of higher activity while during the second and fourth ones show other recognizable patterns of activity in the OpenStack community.

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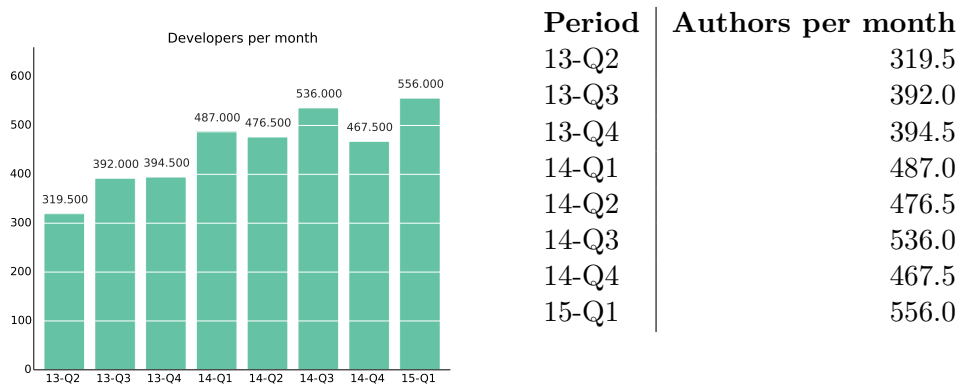
<sup>1</sup>The analyzed data sources are available in appendixB

<sup>2</sup>Each of the projects mentioned are following the analysis of the Programs specified at <http://git.openstack.org/cgit/openstack/governance/tree/reference/programs.yaml>. In addition, the hierarchy of projects and their repositories can be found at the correspondent appendixB

Data source	Activity 365 days	Change (wrt to prev. 365 days)
Gits	53930 commits	9%
Tickets	12290 closed tickets	33%
Mailing Lists	41410 sent emails	4%
Gerrit	55329 submitted reviews	10%
Askbot	6311 posted questions	46%
IRC	1656479 messages	33%

Table 1.1: Activity during the last 365 days and its evolution

The activity around code, from merged commits to code reviews seems to be stable, while bug fixes and conversations on IRC and Ask OpenStack keep increasing, compared to previous year.



In this first quarter of 2015 the mean number of developers active per month has reached a total of 556, the highest number observed so far.

The total number of contributors divided into three sets (core, regular and casual<sup>3</sup>) also has reached its highest observed numbers. While the casual developers seem to grow more slowly, core and regular ones have increased more than 10% since past quarter.

<sup>3</sup>Contributing developers are characterized as core, regular and casual depending on their activity in the git repositories. The classification is built by sorting contributors by their total number of commits; we sum the total commits per each individual contributors: the individuals whose commits sum up to 80% of the total number of commits in the quarter are the core contributors in that quarter. The regular contributors are those whose commits sum up to 95% of the total. The others are the casual contributors.

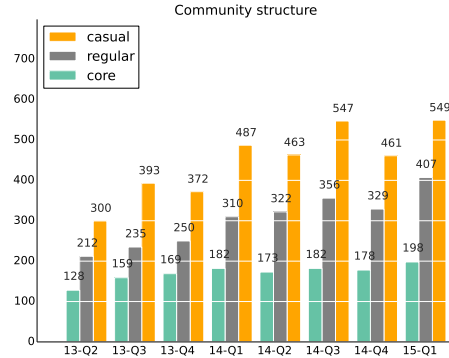


Figure 1.1: Evolution of the last 8 quarters of the core, regular and casual developers (Git activity)

Period	Core	Regular	Occasional
13-Q2	128	212	300
13-Q3	159	235	393
13-Q4	169	250	372
14-Q1	182	310	487
14-Q2	173	322	463
14-Q3	182	356	547
14-Q4	178	329	461
15-Q1	198	407	549

Table 1.2: Characterization of developers by their total contribution to the OpenStack projects

This report aims to provide some insights about the software development process of the OpenStack community measuring efficiency and process of the community based on three metrics: the Review Efficiency Index (REI), the Time to Merge (TTM), and the Backlog Management Index (BMI). REI is measured as the number of closed (merged or abandoned) changesets out of the submitted changesets in a given period. TTM is measured as the time since a review is submitted until this is closed. The BMI is measured as the number of closed tickets out of open tickets in a given period.

The median Time To Merge for Nova and Glance is a lot higher then in other project but the root cause of this is not clearly identifiable.

<b>Integrated project</b>	<b>REI</b>	<b>BMI</b>	<b>TTM</b>
neutron	0.78	0.71	5.1 days
sahara	0.86	0.82	4.85 days
ceilometer	0.85	0.67	3.88 days
horizon	0.73	0.64	3.2 days
heat	0.84	0.83	4.07 days
nova	0.68	0.64	13.17 days
trove	0.79	0.75	7.08 days
swift	0.76	0.34	2.23 days
glance	0.74	0.59	13.22 days
cinder	0.69	0.67	5.32 days
keystone	0.77	0.7	6.06 days

Table 1.3: Closed changesets out of opened changesets (REI), closed ticket out of opened tickets (BMI) and median time to merge in Gerrit (TTM)



## Chapter 2

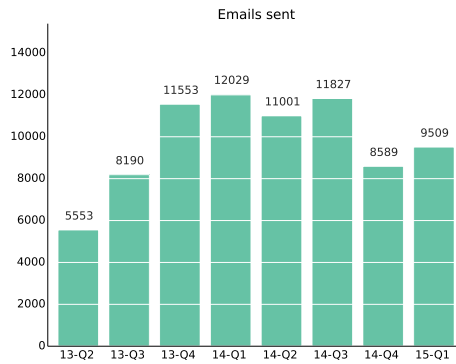
# Communication and Support-Related Activities

The OpenStack community uses several channels for communication and support-related activities. Mailing lists were initially the key place for communications, although part of the activity is moving to the questions and answers tool in the Ask OpenStack site.

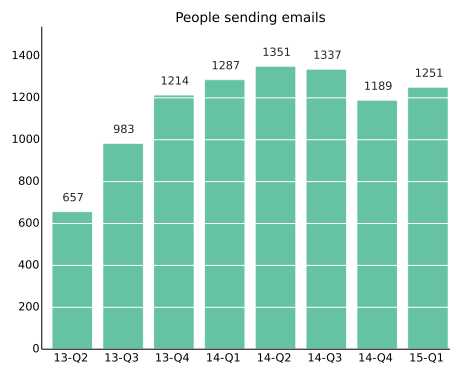
### 2.1 Mailing Lists

The following charts show activity in terms of emails sent, people sending emails and people initiating threads per quarter. In addition, two tables are presented with the hot topics in the several analyzed mailing lists. First table shows hot topics ordered by number of total posts in such thread, while the second table shows hot topics ordered by the total number of different participants in the discussions. The two tables are based on the last quarter period of activity.

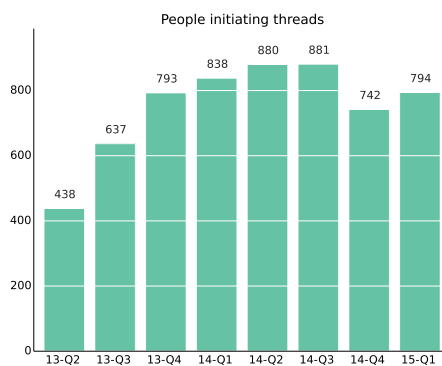
## 2.1. MAILING LISTS



Period	Emails
13-Q2	5553
13-Q3	8190
13-Q4	11553
14-Q1	12029
14-Q2	11001
14-Q3	11827
14-Q4	8589
15-Q1	9509



Period	People
13-Q2	657
13-Q3	983
13-Q4	1214
14-Q1	1287
14-Q2	1351
14-Q3	1337
14-Q4	1189
15-Q1	1251



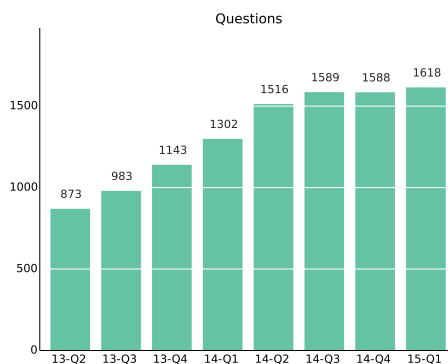
Period	People
13-Q2	438
13-Q3	637
13-Q4	793
14-Q1	838
14-Q2	880
14-Q3	881
14-Q4	742
15-Q1	794

Initial Author and Date	Subject	Number Messages
Flavio Percoco 2015-02-11	[openstack-dev] [all][tc] Lets keep our community open lets fight for it	70
Daniel P. Berrange 2015-02-24	[openstack-dev] [all] Re- evaluating the suitability of the 6 month release cycle	53
Timothy.ClaytonLuce@netapp.com 2015-03-20	[openstack-dev] [cinder] Re- quest exemption for removal of NetApp FC drivers (no vot- ing CI)	43
Eugeniya Kudryashova 2015-01-29	[openstack-dev] [api][nova] Openstack HTTP error codes	42
Matthew Booth 2015-02-04	[openstack-dev] [all][oslo.db][nova] TL; DR Things everybody should know about Galera	39
cpallares 2015-01-05	[openstack-dev] [Glance] IRC logging	38
Ian Cordasco 2015-02-16	[openstack-dev] [sta- ble][requirements] External dependency caps introduced in 499db6b	35
Salvatore Orlando 2015-03-09	[openstack-dev] [api][neutron] Best API for generating sub- nets from pool	34
jaypipes 2015-03-07	[openstack-dev] [nova][api] Microversions. And why do we need API extensions for new API functionality?	33
Sean Dague 2015-03-11	[openstack-dev] [nova] read- out from Philly Operators Meetup	33

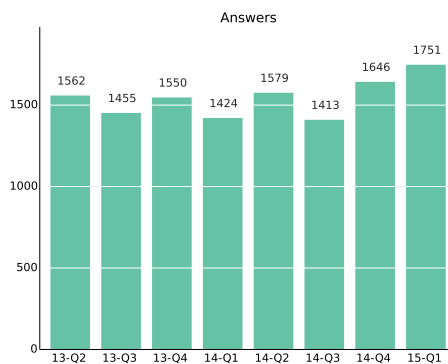
Initial Author and Date	Subject	Diff. People
rbtcollins 2015-02-25	[openstack-dev] [all] Re-evaluating the suitability of the 6 month release cycle	25
liuxinguo@huawei.com 2015-03-21	[openstack-dev] [cinder] Request ex- emption for removal of NetApp FC drivers (no voting CI)	23
Dean Troyer 2015-01-30	[openstack-dev] [Openstack- operators] [all][log] Openstack HTTP error codes	23
Jeremy Stanley 2015-02-12	[openstack-dev] [all][tc] Lets keep our community open lets fight for it	22
Thierry Carrez 2015-01-14	[openstack-dev] [Glance] IRC log- ging	21
vishvananda 2015-02-05	[openstack-dev] Deprecation of in tree EC2 API in Nova for Kilo re- lease	20
Akihiro MO- TOKI 2015-03-07	[openstack-dev] [neutron] Proposal to add Ihar Hrachyshka as a Neu- tron Core Reviewer	19
rbtcollins 2015-02-24	[openstack-dev] [stable][all] Revisit- ing the 6 month release cycle	18
Zhi Yan Liu 2015-03-13	[openstack-dev] [Glance] Proposal to change Glance meeting time.	18
rodrigodsousa 2015-02-13	[openstack-dev] [Keystone] Propos- ing Marek Denis for the Keystone Core Team	17

## 2.2 Questions and Answers

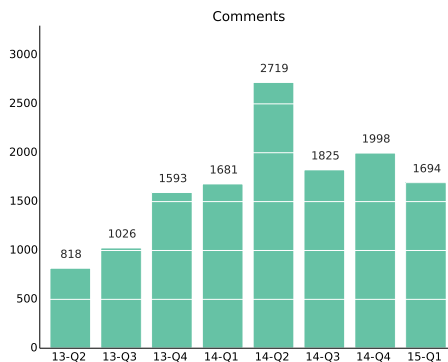
The following charts show activity in the Ask OpenStack site. Total number of questions, number of answers, number of comments and people sending questions are depicted. In addition four tables represent the hot topics activity in the Ask OpenStack site. Those show information about the top visited questions, questions with the highest number of comments, questions with the highest number of different people participating and the tags with the highest number of references.



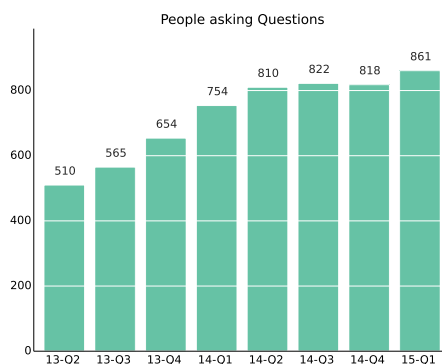
Period	Questions
13-Q2	873
13-Q3	983
13-Q4	1143
14-Q1	1302
14-Q2	1516
14-Q3	1589
14-Q4	1588
15-Q1	1618



Period	Answers
13-Q2	1562
13-Q3	1455
13-Q4	1550
14-Q1	1424
14-Q2	1579
14-Q3	1413
14-Q4	1646
15-Q1	1751



Period	Comments
13-Q2	818
13-Q3	1026
13-Q4	1593
14-Q1	1681
14-Q2	2719
14-Q3	1825
14-Q4	1998
15-Q1	1694



Period	People asking
13-Q2	510
13-Q3	565
13-Q4	654
14-Q1	754
14-Q2	810
14-Q3	822
14-Q4	818
15-Q1	861

- Top visited questions.

Question subject	Visits
failed to allocate the networks not+	585
juno centos 7 ceph how to+	510
adding a new datacentre swift object+	496
heat scaling are the scale up+	405
migrate vms from ovirt to openstack+	342
attempt to install nova docker driver+	311
neutron error unable to create tunnel+	308
why the bufferedhttpresponse stops proceeding requests+	304
ubuntu 1404 all in one vm+	303
openstack instance high availabilityhow to make+	302

- Top questions with more comments.

<b>Question subject</b>	<b>Comments</b>
neutron solution without promiscuous mode+	5
ceilometer api does not list meters+	5
permission denied in dhcp agent+	5
sahara stuck in waiting then goes+	5
glance api fails to start and+	5
import kvm vm to openstack ceph+	5
solved cannot access console of instance+	5
the server has either erred or+	5
instances stucks in buildspawning state+	5
nova list all tenants faced error+	5

- Top questions with the highest number of different people participating.

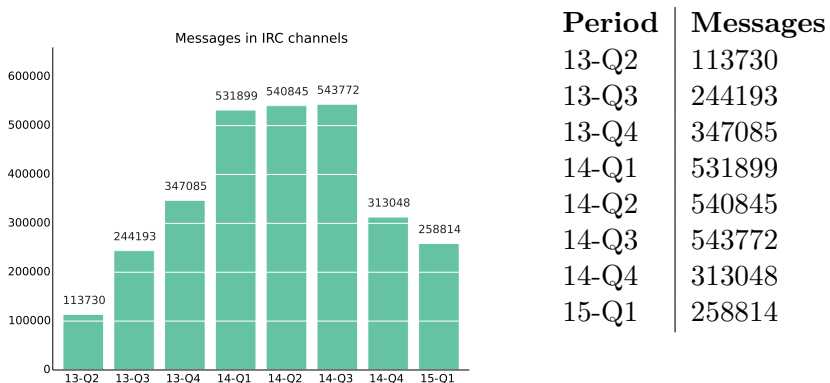
<b>Question subject</b>	<b>People participating</b>
instance error launcing instance gives error+	7
instances stucks in buildspawning state+	7
guide for installing swift alone+	7
what is the difference between single+	6
icehouse on fedora21+	6
instance and image+	6
dhcp request does not reach tapxxx+	5
where does high level openstack discussion+	5
keystone endpoint create 500 error+	5
does neutron br int accepts nova+	5

- Top tags

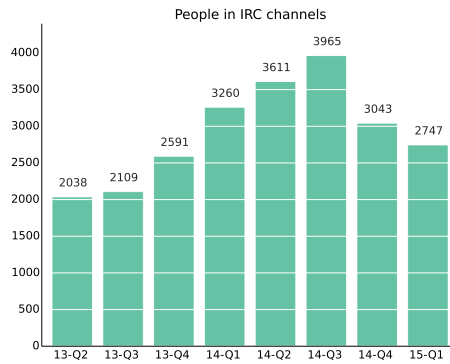
Tag name	Ocurrences
forum	816
OpenStack	815
community	684
Ask	655
gerrit	619
stackforge	431
cloud	423
iaas	242
ovs	192
branch	171
create	63
ad	49
soft-lockup	38
neutron-rootwrap	37
packstack	36

## 2.3 IRC

Finally, the community of OpenStack uses several IRC channels for asynchronous communication. This section shows information about the total number of messages sent in the community during the last 8 quarters together with the number of the several people participating in such discussions. In addition, a list with the top participants in the IRC channels is provided.







Period	People
13-Q2	2038
13-Q3	2109
13-Q4	2591
14-Q1	3260
14-Q2	3611
14-Q3	3965
14-Q4	3043
15-Q1	2747

IRC id	Messages sent
jroll	5549
clarkb	4172
Anita Kuno	4105
morganfainberg	4074
openstack	3960
NoBodyCam	3761
Devananda	3760
dhellmann	3417
Lucas Alvares Gomes	3309
Angus Salkeld	3120
rameshg87	3005
Monty Taylor	2859
John Dickinson	2707
Thierry Carrez	2624
Sam-I-Am	2492

## Chapter 3

# Details on OpenStack Integrated and Incubated projects

Each breakdown is divided into three sections with information from the last eight quarters:

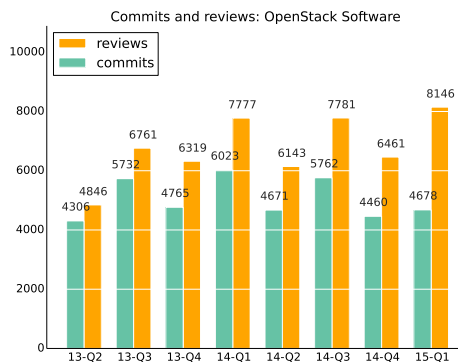
- activity: centered in the following metrics: commits from git activity, submitted, merge and abandoned reviews from the review system and opened and closed tickets from the issue tracking system.
- community: active core reviewers in gerrit, active authors in git and top ten developers and top ten organizations contributing to the development in the last quarter. of each project.
- process: efficiency closing tickets, efficiency closing changesets, Time to Merge (mean and median), number of patchsets (iterations) per changeset and study on the time waiting for a reviewer or submitter action in the patchset review process.

Details on individual OpenStack programs are provided in separate documents on [git.openstack.org/cgit/openstack-infra/activity-board/tree/reports/2015-q1](http://git.openstack.org/cgit/openstack-infra/activity-board/tree/reports/2015-q1).

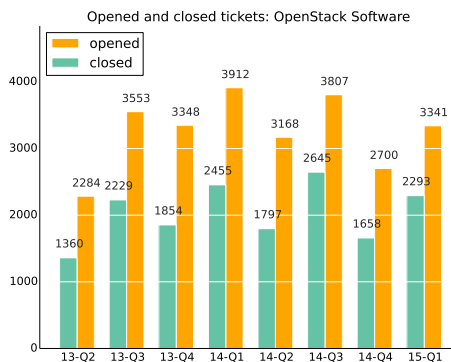
### 3.1 Overview of OpenStack Programs

### 3.2 Activity

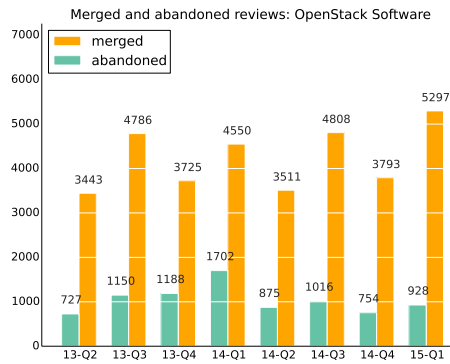
Commits in Git, submitted, merged and abandoned reviews in Gerrit and opened and closed issues in Launchpad.



Period	Commits	Reviews
13-Q2	4306	4846
13-Q3	5732	6761
13-Q4	4765	6319
14-Q1	6023	7777
14-Q2	4671	6143
14-Q3	5762	7781
14-Q4	4460	6461
15-Q1	4678	8146



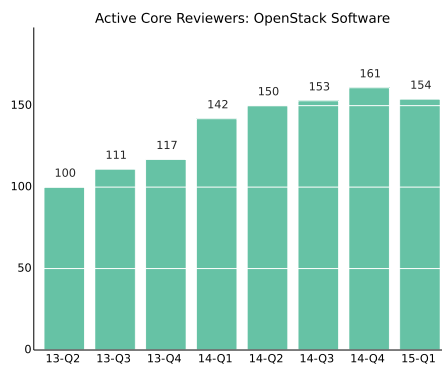
Period	Closed	Opened
13-Q2	1360	2284
13-Q3	2229	3553
13-Q4	1854	3348
14-Q1	2455	3912
14-Q2	1797	3168
14-Q3	2645	3807
14-Q4	1658	2700
15-Q1	2293	3341



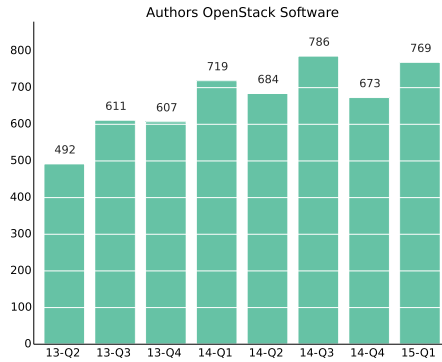
Period	Merged	Abandoned
13-Q2	3443	727
13-Q3	4786	1150
13-Q4	3725	1188
14-Q1	4550	1702
14-Q2	3511	875
14-Q3	4808	1016
14-Q4	3793	754
15-Q1	5297	928

### 3.3 Community

Active core reviewers in Gerrit, active authors in Git, top authors and organizations in the last quarter



Period	Active Core
13-Q2	100
13-Q3	111
13-Q4	117
14-Q1	142
14-Q2	150
14-Q3	153
14-Q4	161
15-Q1	154

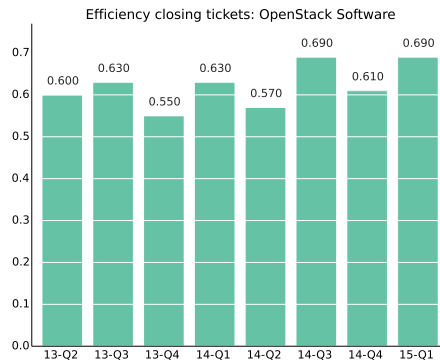


Period	Authors
13-Q2	492
13-Q3	611
13-Q4	607
14-Q1	719
14-Q2	684
14-Q3	786
14-Q4	673
15-Q1	769

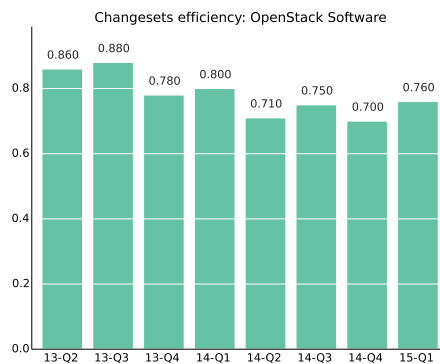
Commit (s)	Author	Commit (s)	Organizations
85	Brant Knudson	753	Red Hat
74	Angus Salkeld	635	IBM
63	Ihar Hrachyshka	525	Mirantis
59	Matt Riedemann	503	HP
59	Steve Martinelli	322	Rackspace
58	Valeriy Ponomaryov	140	Intel
54	Juan Antonio Osorio Robles	116	Cisco Systems
52	Davanum Srinivas	101	Huawei
52	Kiall Mac Innes	80	VMware
48	Dan Smith	78	NEC

### 3.4 Process

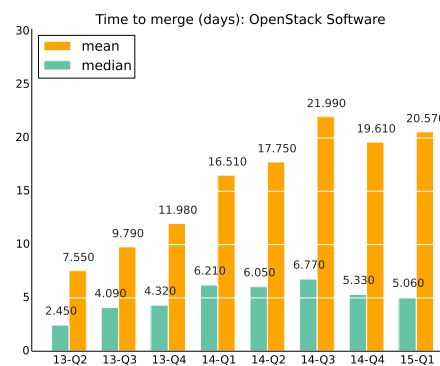
Efficiency closing changesets and tickets, time to review (mean and median), number of patchsets (iterations) per changeset and study on the time waiting for a reviewer or submitter action in the patchset review process.



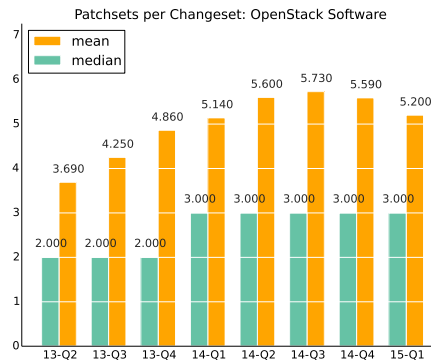
Period	Closed/Opened
13-Q2	0.6
13-Q3	0.63
13-Q4	0.55
14-Q1	0.63
14-Q2	0.57
14-Q3	0.69
14-Q4	0.61
15-Q1	0.69



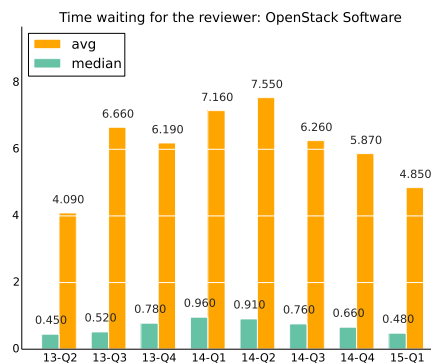
Period	(Aband. and Merg.)/Subm.
13-Q2	0.86
13-Q3	0.88
13-Q4	0.78
14-Q1	0.8
14-Q2	0.71
14-Q3	0.75
14-Q4	0.7
15-Q1	0.76



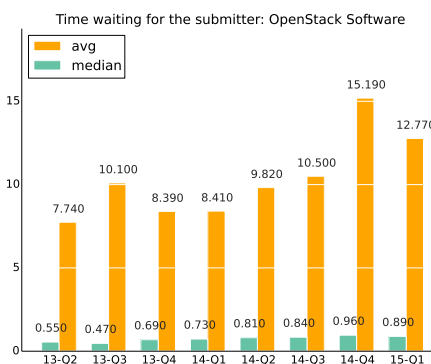
Period	Median	Mean
13-Q2	2.45	7.55
13-Q3	4.09	9.79
13-Q4	4.32	11.98
14-Q1	6.21	16.51
14-Q2	6.05	17.75
14-Q3	6.77	21.99
14-Q4	5.33	19.61
15-Q1	5.06	20.57



Period	Median	Mean
13-Q2	2.0	3.69
13-Q3	2.0	4.25
13-Q4	2.0	4.86
14-Q1	3.0	5.14
14-Q2	3.0	5.6
14-Q3	3.0	5.73
14-Q4	3.0	5.59
15-Q1	3.0	5.2



Period	Median	Mean
13-Q2	0.45	4.09
13-Q3	0.52	6.66
13-Q4	0.78	6.19
14-Q1	0.96	7.16
14-Q2	0.91	7.55
14-Q3	0.76	6.26
14-Q4	0.66	5.87
15-Q1	0.48	4.85

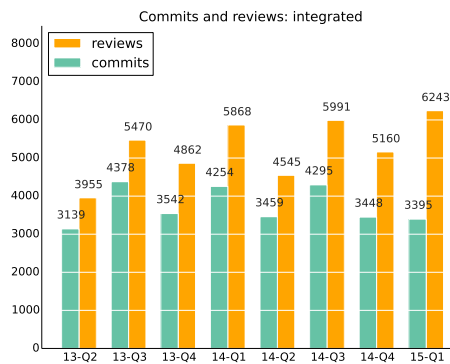


Period	Median	Mean
13-Q2	0.55	7.74
13-Q3	0.47	10.1
13-Q4	0.69	8.39
14-Q1	0.73	8.41
14-Q2	0.81	9.82
14-Q3	0.84	10.5
14-Q4	0.96	15.19
15-Q1	0.89	12.77

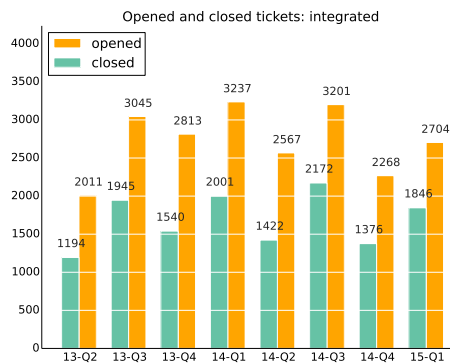
### 3.4.1 OpenStack Integrated Programs

## 3.5 Activity

Commits in Git, submitted, merged and abandoned reviews in Gerrit and opened and closed issues in Launchpad.

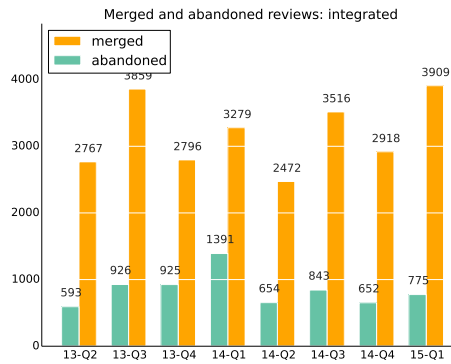


Period	Commits	Reviews
13-Q2	3139	3955
13-Q3	4378	5470
13-Q4	3542	4862
14-Q1	4254	5868
14-Q2	3459	4545
14-Q3	4295	5991
14-Q4	3448	5160
15-Q1	3395	6243



Period	Closed	Opened
13-Q2	1194	2011
13-Q3	1945	3045
13-Q4	1540	2813
14-Q1	2001	3237
14-Q2	1422	2567
14-Q3	2172	3201
14-Q4	1376	2268
15-Q1	1846	2704

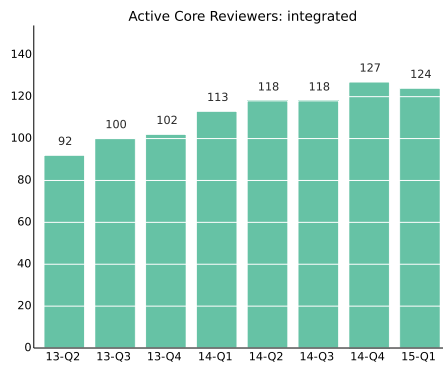




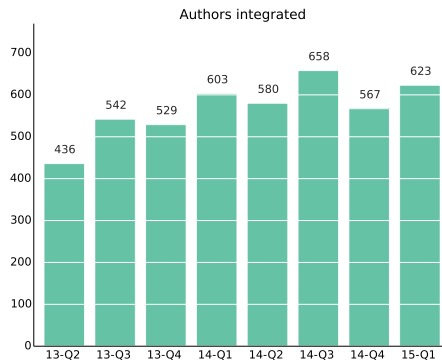
Period	Merged	Abandoned
13-Q2	2767	593
13-Q3	3859	926
13-Q4	2796	925
14-Q1	3279	1391
14-Q2	2472	654
14-Q3	3516	843
14-Q4	2918	652
15-Q1	3909	775

### 3.6 Community

Active core reviewers in Gerrit, active authors in Git, top authors and organizations in the last quarter



Period	Active Core
13-Q2	92
13-Q3	100
13-Q4	102
14-Q1	113
14-Q2	118
14-Q3	118
14-Q4	127
15-Q1	124



Period	Authors
13-Q2	436
13-Q3	542
13-Q4	529
14-Q1	603
14-Q2	580
14-Q3	658
14-Q4	567
15-Q1	623

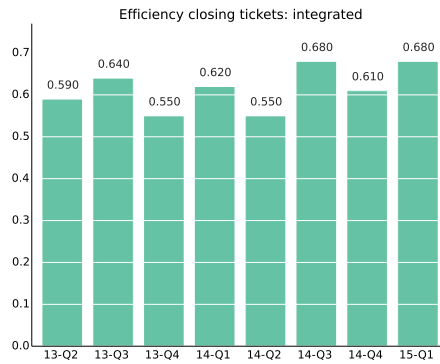
Commit (s)	Author
74	Angus Salkeld
72	Brant Knudson
61	Ihar Hrachyshka
58	Matt Riedemann
58	Steve Martinelli
50	Davanum Srinivas
48	Dan Smith
41	Armando Migliaccio
40	Gordon Chung
38	Sean Dague

Commit (s)	Organizations
574	IBM
565	Red Hat
388	Mirantis
337	HP
160	Rackspace
109	Intel
102	Cisco Systems
84	Huawei
80	VMware
57	NEC

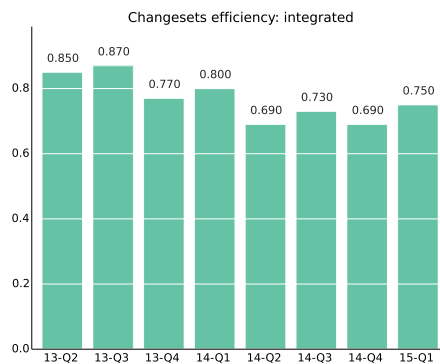
### 3.7 Process

Efficiency closing changesets and tickets, time to review (mean and median), number of patchsets (iterations) per changeset and study on the time waiting for a reviewer or submitter action in the patchset review process.

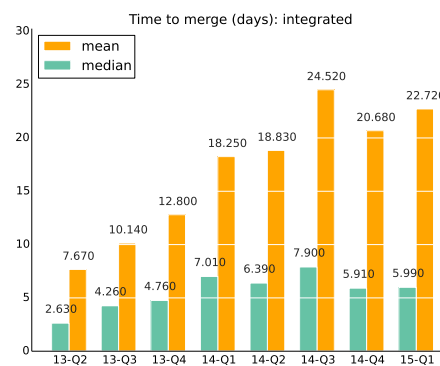
### 3.7. PROCESS



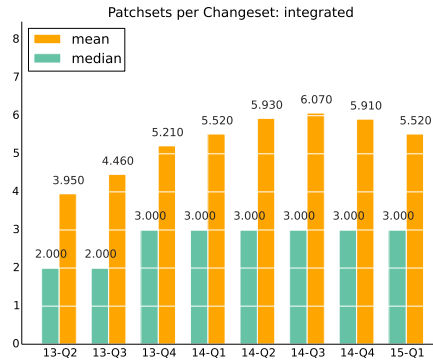
Period	Closed/Opened
13-Q2	0.59
13-Q3	0.64
13-Q4	0.55
14-Q1	0.62
14-Q2	0.55
14-Q3	0.68
14-Q4	0.61
15-Q1	0.68



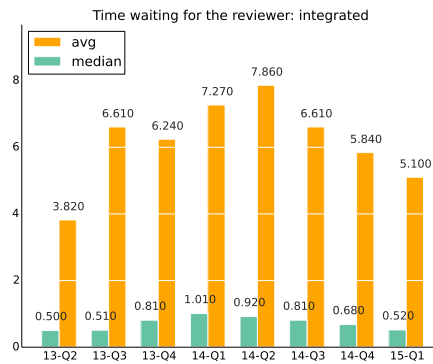
Period	(Aband. and Merg.)/Subm.
13-Q2	0.85
13-Q3	0.87
13-Q4	0.77
14-Q1	0.8
14-Q2	0.69
14-Q3	0.73
14-Q4	0.69
15-Q1	0.75



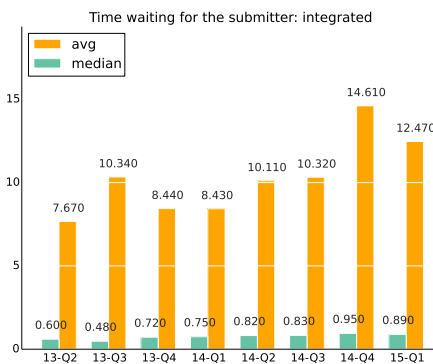
Period	Median	Mean
13-Q2	2.63	7.67
13-Q3	4.26	10.14
13-Q4	4.76	12.8
14-Q1	7.01	18.25
14-Q2	6.39	18.83
14-Q3	7.9	24.52
14-Q4	5.91	20.68
15-Q1	5.99	22.72



Period	Median	Mean
13-Q2	2.0	3.95
13-Q3	2.0	4.46
13-Q4	3.0	5.21
14-Q1	3.0	5.52
14-Q2	3.0	5.93
14-Q3	3.0	6.07
14-Q4	3.0	5.91
15-Q1	3.0	5.52



Period	Median	Mean
13-Q2	0.5	3.82
13-Q3	0.51	6.61
13-Q4	0.81	6.24
14-Q1	1.01	7.27
14-Q2	0.92	7.86
14-Q3	0.81	6.61
14-Q4	0.68	5.84
15-Q1	0.52	5.1

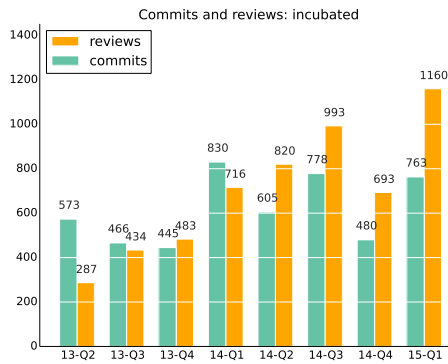


Period	Median	Mean
13-Q2	0.6	7.67
13-Q3	0.48	10.34
13-Q4	0.72	8.44
14-Q1	0.75	8.43
14-Q2	0.82	10.11
14-Q3	0.83	10.32
14-Q4	0.95	14.61
15-Q1	0.89	12.47

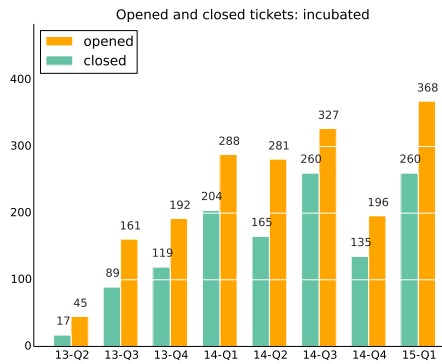
### 3.7.1 OpenStack Incubated Programs

## 3.8 Activity

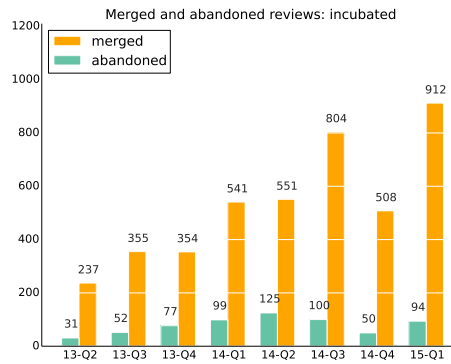
Commits in Git, submitted, merged and abandoned reviews in Gerrit and opened and closed issues in Launchpad.



Period	Commits	Reviews
13-Q2	573	287
13-Q3	466	434
13-Q4	445	483
14-Q1	830	716
14-Q2	605	820
14-Q3	778	993
14-Q4	480	693
15-Q1	763	1160



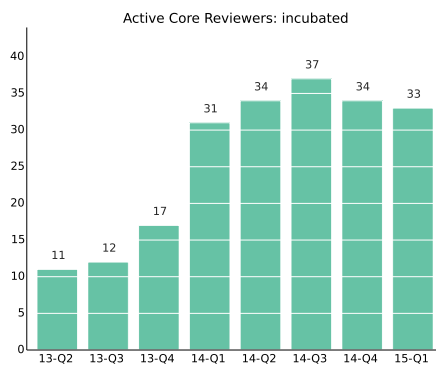
Period	Closed	Opened
13-Q2	17	45
13-Q3	89	161
13-Q4	119	192
14-Q1	204	288
14-Q2	165	281
14-Q3	260	327
14-Q4	135	196
15-Q1	260	368



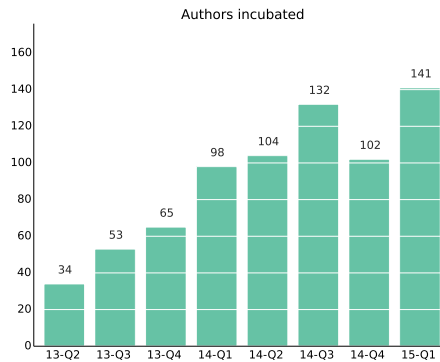
Period	Merged	Abandoned
13-Q2	237	31
13-Q3	355	52
13-Q4	354	77
14-Q1	541	99
14-Q2	551	125
14-Q3	804	100
14-Q4	508	50
15-Q1	912	94

### 3.9 Community

Active core reviewers in Gerrit, active authors in Git, top authors and organizations in the last quarter



Period	Active Core
13-Q2	11
13-Q3	12
13-Q4	17
14-Q1	31
14-Q2	34
14-Q3	37
14-Q4	34
15-Q1	33

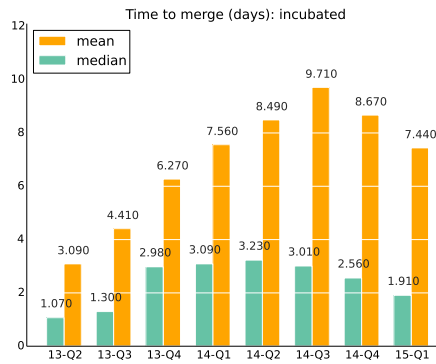


Period	Authors
13-Q2	34
13-Q3	53
13-Q4	65
14-Q1	98
14-Q2	104
14-Q3	132
14-Q4	102
15-Q1	141

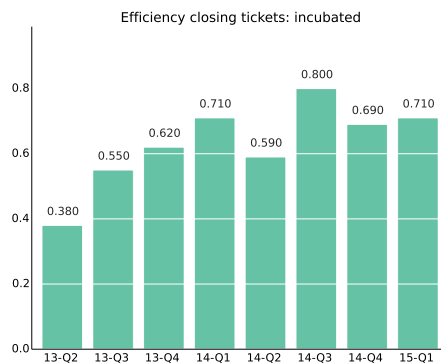
Commit (s)	Author	Commit (s)	Organizations
58	Valeriy Ponomaryov	120	HP
52	Kiall Mac Innes	117	Rackspace
48	Juan Antonio Osorio Robles83		Mirantis
31	John Vrbanac	55	Red Hat
27	Lucas Alvares Gomes	48	Ericsson
24	Graham Hayes	21	NetApp
22	Ramakrishnan G	20	Intel
20	Vinod Mangalpally	20	Yahoo!
19	Jim Rollenhagen	14	Fujitsu
18	Devananda	11	JHU APL

### 3.10 Process

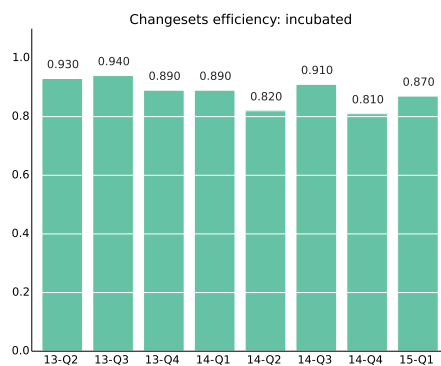
Efficiency closing changesets and tickets, time to review (mean and median), number of patchsets (iterations) per changeset and study on the time waiting for a reviewer or submitter action in the patchset review process.



Period	Median	Mean
13-Q2	1.07	3.09
13-Q3	1.3	4.41
13-Q4	2.98	6.27
14-Q1	3.09	7.56
14-Q2	3.23	8.49
14-Q3	3.01	9.71
14-Q4	2.56	8.67
15-Q1	1.91	7.44

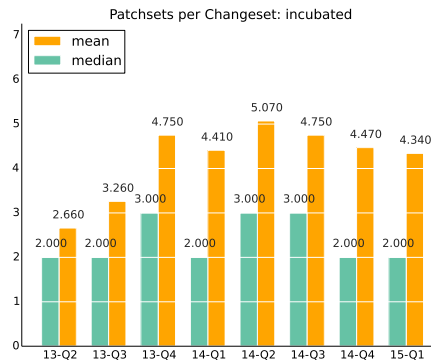


Period	Closed/Opened
13-Q2	0.38
13-Q3	0.55
13-Q4	0.62
14-Q1	0.71
14-Q2	0.59
14-Q3	0.8
14-Q4	0.69
15-Q1	0.71

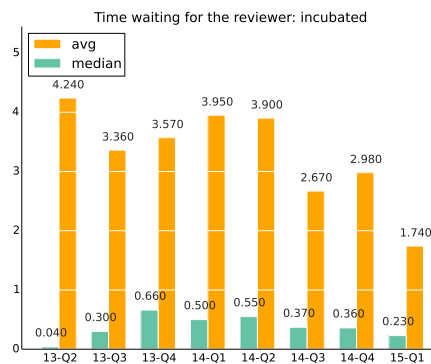


Period	(Aband. and Merg.)/Subm.
13-Q2	0.93
13-Q3	0.94
13-Q4	0.89
14-Q1	0.89
14-Q2	0.82
14-Q3	0.91
14-Q4	0.81
15-Q1	0.87

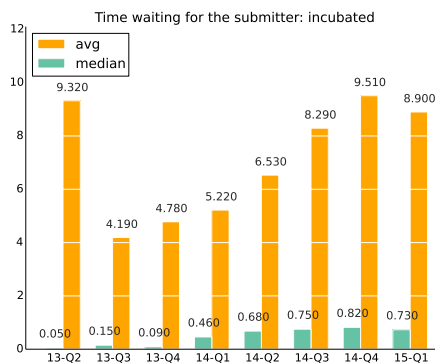




Period	Median	Mean
13-Q2	2.0	2.66
13-Q3	2.0	3.26
13-Q4	3.0	4.75
14-Q1	2.0	4.41
14-Q2	3.0	5.07
14-Q3	3.0	4.75
14-Q4	2.0	4.47
15-Q1	2.0	4.34



Period	Median	Mean
13-Q2	0.04	4.24
13-Q3	0.3	3.36
13-Q4	0.66	3.57
14-Q1	0.5	3.95
14-Q2	0.55	3.9
14-Q3	0.37	2.67
14-Q4	0.36	2.98
15-Q1	0.23	1.74



Period	Median	Mean
13-Q2	0.05	9.32
13-Q3	0.15	4.19
13-Q4	0.09	4.78
14-Q1	0.46	5.22
14-Q2	0.68	6.53
14-Q3	0.75	8.29
14-Q4	0.82	9.51
15-Q1	0.73	8.9

# Appendix A

## Metrics Definitions

Metrics measured in each OpenStack program:

- Commit: this is defined as the action(s) that performs a change in the source code. Bots, merges and other type of automatic activity is removed from the records. In addition, when aggregating several git repositories, this metric only counts unique revisions (unique hashes found in the git repositories). Finally, all branches are aggregated to the analysis.
- Submitted changeset: a changeset is the process of peer reviewing source code changes. A commit is not merged to the master code of a given project till this is approved for at least one core reviewer of such project. A submitted changeset is defined as any changeset submitted to the Gerrit system. However, given the limitations of the current version of the tool, with at least 5,900 changesets detected as having an erroneous creation date, this metric counts the first patchset upload action.
- Merged and abandoned changsets: a merge is defined as the patchset that was finally submitted to the source code. An abandoned changeset is a potential merge that was finally dismissed by developers as being part of the source code. This status is found in the status of the final patchset. However, although a patchset can be merged or abandoned, this action can be reverted. If a patchset presents several of these changes in the same period of time, only one of them is counted (the very last one). On the other hand, if those changes take place in different periods of analysis, both status would be counted.

- Open and closed ticket: a ticket in Launchpad is counted as closed if the status of such ticket is defined as 'Fix Released'. The rest of the tickets are counted as opened tickets.
- Active Core Reviewer: a core reviewer has the possibility to use +2 or -2 actions when reviewing the code. However, if there are developers that for some period do not use those actions, those can not be measured as core reviewer. Thus, this metric provides information about 'active' core reviewers. This can be also defined as those developers that actively have used the +2 or -2 review action. This metric is also filtered by branch of activity, only using 'master'. This helps to detect actual core reviewers in each of the projects.
- Authors: a developer is defined as author if she is the owner of the patchset sent for reviewing and this is merged into the source code. As previously indicated, automatic commits such bot's are removed from this analysis.
- Efficiency closing issues: this metric is a derivation of the Backlog Management Index (BMI) that measures the number of closed tickets out of the opened tickets in a period of time. Values under 1.0 indicates that the number of closing issues is lower than the number of opened issues arriving. On the contrary, higher charts would indicate better maintenance effort by the community.
- Efficiency closing changesets: this metric is a derivation of the Backlog Management Index as it is named as Review efficiency index (REI). As similarly used in the BMI index, this metrics measures the number of closed changesets (merged or abandoned) out of the total number of new changesets.
- Time to Merge: this time consists of the time between the first upload of the first patchset (as defined as a submitted changeset) till the last patchset of the changeset is merged into the code and this is indicated in the comments side of the Gerrit tool. This metric is provided in number of days.
- Patchsets per changeset: this metric calculates the total number of iterations in a changeset till this is abandoned or merged.
- Time waiting for the reviewer or the submitter: a changeset is waiting for a reviewer action if a new patchset upload or a new changset arrives

to the system. On the other hand, a submitter action is required when a specific negative verification or reviewing action takes place (Verified -1/-2 or Code-Review -1/-2). In addition, when a Code-Review +2 action takes place, it is assumed that the changset is closing and no more times are registered either for the reviewer or the submitter. For this analysis, those patchsets flagged as work in progress are ignored.

Metrics measured in the general overview:

- Community structure, core, regular and casual developers: developers are ordered in descendant order by the number of commits authored for a given period. Core developers are defined as the list of developers that reach 80% of the total commits. Regular is the set of developers that are between that 80% and 95% of the commits. Casual developers are found in the rest of the 5%. Bots are ignored in this list of developers.
- Developer per month: average of developers per month ignoring bots.
- Emails sent: number of emails sent by people to the several mailing lists. Bots are not registered.
- People sending emails: number of people sending those emails ignoring bots.
- People initiating threads: a thread is defined as a list of emails that has the same root. There may exist threads of one email.
- Top threads: this list provides the longest threads in terms of number of emails that have a common root email.
- Questions, answers and comments in Askbot.
- People asking questions in Askbot: number of people sending a new question.
- Top visited questions.
- Top tags: each of the questions has a list of associated tags. The top tags are those with the highest number of repetitions aggregating all of the questions.
- Messages and people in IRC: this analysis ignores as a message those entries in the IRC channels that provide information about people entering or leaving the system.

## Appendix B

# Source Code and Data Sources

The data source used to provide the data of this analysis can be found at the GrimoireLib library. Specifically the `openstack_report.py` file<sup>1</sup>.

With respect to the list of analyzed repositories per project, the following table lists all of them. There are three data sources: git activity (`scm`), tickets activity (`its`) and review activity (`scr`). This information is based on the information listed in the `yaml` organizational file<sup>2</sup> provided by the OpenStack Foundation.

Program	Data source	Repository
barbican	its	<a href="https://bugs.launchpad.net/barbican">https://bugs.launchpad.net/barbican</a>
barbican	scm	<a href="https://git.openstack.org/openstack/barbican">git://git.openstack.org/openstack/barbican</a>
barbican	scm	<a href="https://git.openstack.org/openstack/castellan">git://git.openstack.org/openstack/castellan</a>
barbican	scm	<a href="https://git.openstack.org/openstack/kite">git://git.openstack.org/openstack/kite</a>
barbican	scr	<a href="https://review.openstack.org/openstack/barbican">review.openstack.org_openstack/barbican</a>
barbican	scr	<a href="https://review.openstack.org/openstack/castellan">review.openstack.org_openstack/castellan</a>
barbican	scr	<a href="https://review.openstack.org/openstack/kite">review.openstack.org_openstack/kite</a>
ceilometer	its	<a href="https://bugs.launchpad.net/ceilometer">https://bugs.launchpad.net/ceilometer</a>
ceilometer	scm	<a href="https://github.com/openstack/ceilometer.git">https://github.com/openstack/ceilometer.git</a>
ceilometer	scr	<a href="https://review.openstack.org/openstack/ceilometer">review.openstack.org_openstack/ceilometer</a>
cinder	its	<a href="https://bugs.launchpad.net/cinder">https://bugs.launchpad.net/cinder</a>

<sup>1</sup>[https://github.com/VizGrimoire/GrimoireLib/blob/master/vizGrimoireJS/openstack\\_report.py](https://github.com/VizGrimoire/GrimoireLib/blob/master/vizGrimoireJS/openstack_report.py). Commit identified with the hash `d33b6f5951662fb5bd895eee89c0b0344b09c956`

<sup>2</sup><http://git.openstack.org/cgit/openstack/governance/tree/reference/projects.yaml>

cinder	scm	<a href="https://github.com/openstack/cinder.git">https://github.com/openstack/cinder.git</a>
cinder	scr	<a href="https://review.openstack.org/openstack/cinder">review.openstack.org_openstack/cinder</a>
clients	its	<a href="https://bugs.launchpad.net/python-glanceclient">https://bugs.launchpad.net/python-glanceclient</a>
clients	its	<a href="https://bugs.launchpad.net/python-novaclient">https://bugs.launchpad.net/python-novaclient</a>
clients	its	<a href="https://bugs.launchpad.net/python-cinderclient">https://bugs.launchpad.net/python-cinderclient</a>
clients	its	<a href="https://bugs.launchpad.net/python-zaqarclient">https://bugs.launchpad.net/python-zaqarclient</a>
clients	its	<a href="https://bugs.launchpad.net/python-heatclient">https://bugs.launchpad.net/python-heatclient</a>
clients	its	<a href="https://bugs.launchpad.net/python-saharaclient">https://bugs.launchpad.net/python-saharaclient</a>
clients	its	<a href="https://bugs.launchpad.net/python-designateclient">https://bugs.launchpad.net/python-designateclient</a>
clients	its	<a href="https://bugs.launchpad.net/python-neutronclient">https://bugs.launchpad.net/python-neutronclient</a>
clients	its	<a href="https://bugs.launchpad.net/python-ceilometerclient">https://bugs.launchpad.net/python-ceilometerclient</a>
clients	its	<a href="https://bugs.launchpad.net/python-keystoneclient">https://bugs.launchpad.net/python-keystoneclient</a>
clients	its	<a href="https://bugs.launchpad.net/python-swiftclient">https://bugs.launchpad.net/python-swiftclient</a>
clients	scm	<a href="https://github.com/openstack/python-ceilometerclient.git">https://github.com/openstack/python-ceilometerclient.git</a>
clients	scm	<a href="https://github.com/openstack/python-keystoneclient.git">https://github.com/openstack/python-keystoneclient.git</a>
clients	scm	<a href="https://github.com/openstack/python-troveclient.git">https://github.com/openstack/python-troveclient.git</a>
clients	scm	<a href="https://git.openstack.org/openstack/python-magnumclient">git://git.openstack.org/openstack/python-magnumclient</a>
clients	scm	<a href="https://git.openstack.org/openstack-dev/heat-cfnclient">git://git.openstack.org/openstack-dev/heat-cfnclient</a>
clients	scm	<a href="https://github.com/openstack/python-heatclient.git">https://github.com/openstack/python-heatclient.git</a>
clients	scm	<a href="https://github.com/openstack/python-novaclient.git">https://github.com/openstack/python-novaclient.git</a>
clients	scm	<a href="https://git.openstack.org/openstack/python-designateclient">git://git.openstack.org/openstack/python-designateclient</a>
clients	scm	<a href="https://github.com/openstack/python-cinderclient.git">https://github.com/openstack/python-cinderclient.git</a>
clients	scm	<a href="https://git.openstack.org/openstack/python-zaqarclient">git://git.openstack.org/openstack/python-zaqarclient</a>
clients	scm	<a href="https://git.openstack.org/openstack/python-barbicanclient">git://git.openstack.org/openstack/python-barbicanclient</a>
clients	scm	<a href="https://git.openstack.org/openstack/python-saharaclient">git://git.openstack.org/openstack/python-saharaclient</a>
clients	scm	<a href="https://github.com/openstack/python-ironicclient.git">https://github.com/openstack/python-ironicclient.git</a>
clients	scm	<a href="https://github.com/openstack/python-swiftclient.git">https://github.com/openstack/python-swiftclient.git</a>
clients	scm	<a href="https://git.openstack.org/openstack/python-kiteclient">git://git.openstack.org/openstack/python-kiteclient</a>
clients	scm	<a href="https://github.com/openstack/python-glanceclient.git">https://github.com/openstack/python-glanceclient.git</a>
clients	scm	<a href="https://github.com/openstack/python-neutronclient.git">https://github.com/openstack/python-neutronclient.git</a>
clients	scr	<a href="https://review.openstack.org/openstack/python-neutronclient">review.openstack.org_openstack/python-neutronclient</a>
clients	scr	<a href="https://review.openstack.org_stackforge/python-designateclient">review.openstack.org_stackforge/python-designateclient</a>
clients	scr	<a href="https://review.openstack.org_openstack/python-barbicanclient">review.openstack.org_openstack/python-barbicanclient</a>
clients	scr	<a href="https://review.openstack.org_openstack/python-ironicclient">review.openstack.org_openstack/python-ironicclient</a>
clients	scr	<a href="https://review.openstack.org_openstack/python-swiftclient">review.openstack.org_openstack/python-swiftclient</a>
clients	scr	<a href="https://review.openstack.org_openstack/python-zaqarclient">review.openstack.org_openstack/python-zaqarclient</a>
clients	scr	<a href="https://review.openstack.org_openstack/python-glanceclient">review.openstack.org_openstack/python-glanceclient</a>
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others	scm	<a href="https://git.openstack.org/openstack/sahara-dashboard">git://git.openstack.org/openstack/sahara-dashboard</a>
others	scm	<a href="https://git.openstack.org/openstack/tuskar-ui">git://git.openstack.org/openstack/tuskar-ui</a>
others	scm	<a href="https://git.openstack.org/openstack/django-openstack-auth">git://git.openstack.org/openstack/django-openstack-auth</a>
others	scm	<a href="https://git.openstack.org/openstack/swift-bench">git://git.openstack.org/openstack/swift-bench</a>
others	scm	<a href="https://git.openstack.org/openstack/sahara-extra">git://git.openstack.org/openstack/sahara-extra</a>
others	scr	<a href="https://review.openstack.org_openstack/trove-integration">review.openstack.org_openstack/trove-integration</a>
others	scr	<a href="https://review.openstack.org_openstack/sahara-extra">review.openstack.org_openstack/sahara-extra</a>
others	scr	<a href="https://review.openstack.org_openstack/heat-templates">review.openstack.org_openstack/heat-templates</a>
others	scr	<a href="https://review.openstack.org_openstack/sahara-image-elements">review.openstack.org_openstack/sahara-image-elements</a>
others	scr	<a href="https://review.openstack.org_openstack/sahara-dashboard">review.openstack.org_openstack/sahara-dashboard</a>
others	scr	<a href="https://review.openstack.org_openstack/heat-cfn-tools">review.openstack.org_openstack/heat-cfn-tools</a>
Quality Assurance	its	<a href="https://bugs.launchpad.net/tempest">https://bugs.launchpad.net/tempest</a>
Quality Assurance	its	<a href="https://bugs.launchpad.net/devstack">https://bugs.launchpad.net/devstack</a>
Quality Assurance	scm	<a href="https://git.openstack.org/openstack/tempest-lib">git://git.openstack.org/openstack/tempest-lib</a>
Quality Assurance	scm	<a href="https://git.openstack.org/openstack-dev/grenade">git://git.openstack.org/openstack-dev/grenade</a>
Quality Assurance	scm	<a href="https://git.openstack.org/openstack-dev/devstack">git://git.openstack.org/openstack-dev/devstack</a>
Quality Assurance	scm	<a href="https://github.com/openstack/tempest.git">https://github.com/openstack/tempest.git</a>
Quality Assurance	scr	<a href="https://review.openstack.org_openstack-dev/grenade">review.openstack.org_openstack-dev/grenade</a>
Quality Assurance	scr	<a href="https://review.openstack.org_openstack/tempest">review.openstack.org_openstack/tempest</a>
Quality Assurance	scr	<a href="https://review.openstack.org_openstack/tempest-lib">review.openstack.org_openstack/tempest-lib</a>
Quality Assurance	scr	<a href="https://review.openstack.org_openstack-dev/devstack">review.openstack.org_openstack-dev/devstack</a>
Release cycle management	scm	<a href="https://git.openstack.org/openstack/requirements">git://git.openstack.org/openstack/requirements</a>
Release cycle management	scm	<a href="https://git.openstack.org/openstack-infra/release-tools">git://git.openstack.org/openstack-infra/release-tools</a>

Release cycle management	scr	review.openstack.org_openstack/requirements
sahara	its	<a href="https://bugs.launchpad.net/sahara">https://bugs.launchpad.net/sahara</a>
sahara	scm	<a href="git://git.openstack.org/openstack/sahara">git://git.openstack.org/openstack/sahara</a>
sahara	scr	review.openstack.org_openstack/sahara
swift	its	<a href="https://bugs.launchpad.net/swift">https://bugs.launchpad.net/swift</a>
swift	scm	<a href="https://github.com/openstack/swift.git">https://github.com/openstack/swift.git</a>
swift	scr	review.openstack.org_openstack/swift
trove	its	<a href="https://bugs.launchpad.net/trove">https://bugs.launchpad.net/trove</a>
trove	scm	<a href="https://github.com/openstack/trove.git">https://github.com/openstack/trove.git</a>
trove	scr	review.openstack.org_openstack/trove
zaqar	its	<a href="https://bugs.launchpad.net/zaqar">https://bugs.launchpad.net/zaqar</a>
zaqar	scm	<a href="git://git.openstack.org/openstack/zaqar">git://git.openstack.org/openstack/zaqar</a>
zaqar	scr	review.openstack.org_openstack/zaqar