

OpenStack Community Activity Report  
April-June, 2015  
Report sponsored by the OpenStack Foundation



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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.

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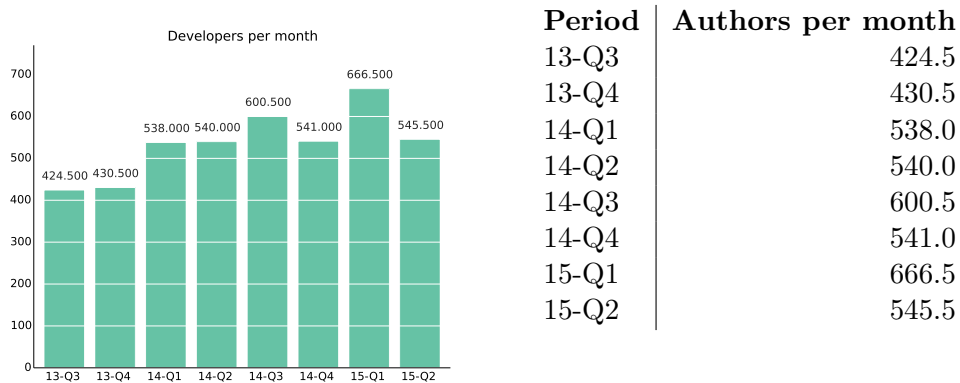
<sup>1</sup>The analyzed data sources are available in appendixB

<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	68482 commits	4%
Tickets	13958 closed tickets	29%
Mailing Lists	41523 sent emails	6%
Gerrit	64539 submitted reviews	19%
Askbot	5973 posted questions	343%
IRC	1696590 messages	1%

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.

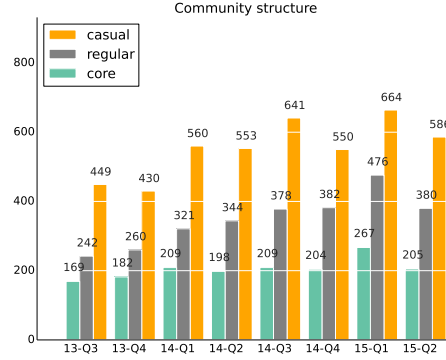


Figure 1.1: Evolution of the last 8 quarters of the core, regular and casual developers (Git activity)

Period	Core	Regular	Occasional
13-Q3	169	242	449
13-Q4	182	260	430
14-Q1	209	321	560
14-Q2	198	344	553
14-Q3	209	378	641
14-Q4	204	382	550
15-Q1	267	476	664
15-Q2	205	380	586

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	0.77	0.65	4.15 days
sahara	0.78	0.7	4.99 days
ceilometer	0.77	0.64	3.19 days
horizon	0.74	0.71	3.09 days
heat	0.81	0.77	2.71 days
nova	0.58	0.51	11.06 days
trove	0.77	0.63	4.17 days
swift	0.69	0.51	3.52 days
glance	0.69	0.56	6.84 days
cinder	0.7	0.66	5.35 days
keystone	0.75	0.61	4.87 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

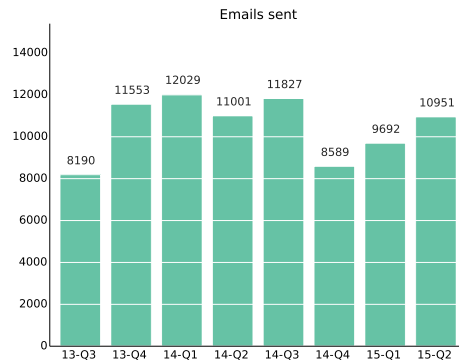
# Communication and Support-Related Activities

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.

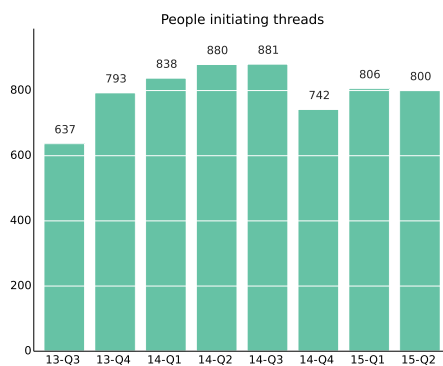
## 2.1. MAILING LISTS



Period	Emails
13-Q3	8190
13-Q4	11553
14-Q1	12029
14-Q2	11001
14-Q3	11827
14-Q4	8589
15-Q1	9692
15-Q2	10951



Period	People
13-Q3	983
13-Q4	1214
14-Q1	1287
14-Q2	1351
14-Q3	1337
14-Q4	1189
15-Q1	1267
15-Q2	1279



Period	People
13-Q3	637
13-Q4	793
14-Q1	838
14-Q2	880
14-Q3	881
14-Q4	742
15-Q1	806
15-Q2	800

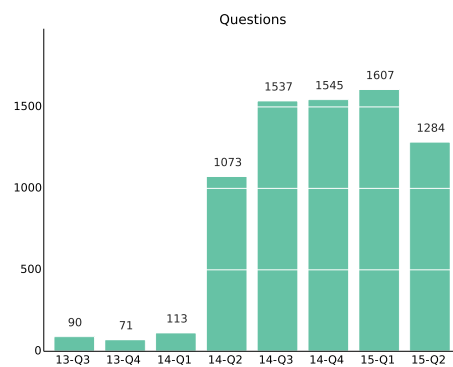
Initial Author and Date	Subject	Number Messages
jaypipes 2015-06-15	[openstack-dev] [api][nova][ironic] Microver- sion API HTTP header	64
Nikola Dipanov 2015-06-24	[openstack-dev] [Nova] The unbearable lightness of specs	62
Angus Salkeld 2015-04-07	[openstack-dev] [all] how to send messages (and events) to our users	51
filip-blaha 2015-05-06	[openstack-dev] [Murano] [Mistral] SSH workflow action	50
Neil.Jerram@metaswitch.com 2015-04-08	[openstack-dev] [neutron] Neutron scaling datapoints?	48
Russell Bryant 2015-04-22	[openstack-dev] [Neutron] A big tent home for Neutron backend code	47
hejie.xu@intel.com 2015-06-04	[openstack-dev] [api] [Nova] [Ironi] [Magnum] Microver- sion guideline in API-WG	46
Chris Dent 2015-04-23	[openstack-dev] [all] Question for the TC candidates	43
yngvith@siminn.is 2015-06-26	[Openstack] error creating in- stance	42
Joe Gordon 2015-05-11	[openstack-dev] [nova][all] Ar- chitecture Diagrams in ascii art?	42

Initial Author and Date	Subject	Diff. People
John Garbutt 2015-06-25	[openstack-dev] [Nova] The unbearable lightness of specs	26
jaypipes 2015-04-24	[openstack-dev] Please stop reviewing code while asking questions	25
Dolph Mathews 2015-06-15	[openstack-dev] [api][nova][ironic] Microversion API HTTP header	24
Marco.Fargetta@ct.infn.it 2015-05-12	[openstack-dev] [nova][all] Architecture Diagrams in ascii art?	24
Dean Troyer 2015-04-24	[openstack-dev] [all] Question for the TC candidates	23
Salvatore Orlando 2015-06-03	[openstack-dev] [all][infra][tc][ptl] Scaling up code review process (subdir cores)	19
hejie.xu@intel.com 2015-06-05	[openstack-dev] [api] [Nova] [Ironic] [Magnum] Microversion guideline in API-WG	17
ArkadyKanevsky 2015-05-26	[openstack-dev] [cinder] Some Changes to Cinder Core	17
Kyle Mestery 2015-04-23	[openstack-dev] [Neutron] A big tent home for Neutron backend code	16
Gordon Chung 2015-04-07	[openstack-dev] [all] how to send messages (and events) to our users	16

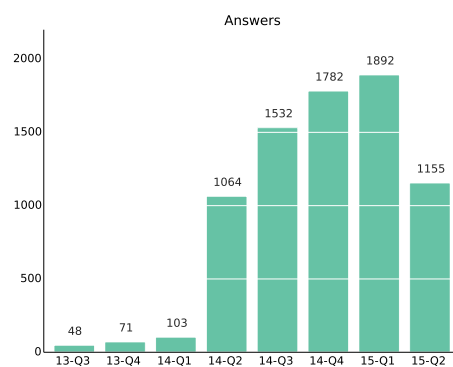
## 2.2 Questions and Answers

The following charts show activity in the Ask OpenStack site. Total number of questions, number of answers, number of comments and people sending

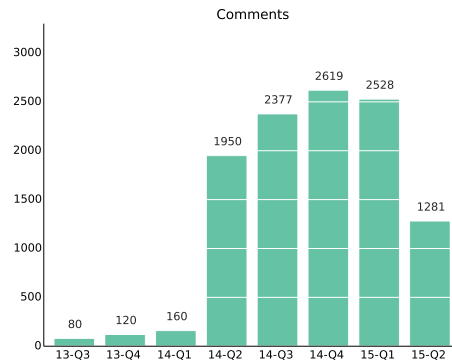
questions are depicted. In addition four tables represent the hot topics activity in the Ask OpenStack site. Those show information about the top visited questions, questions with the highest number of comments, questions with the highest number of different people participating and the tags with the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



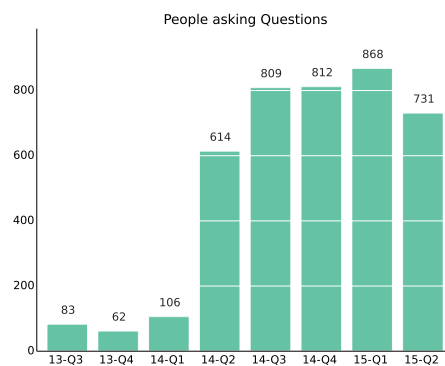
Period	Questions
13-Q3	90
13-Q4	71
14-Q1	113
14-Q2	1073
14-Q3	1537
14-Q4	1545
15-Q1	1607
15-Q2	1284



Period	Answers
13-Q3	48
13-Q4	71
14-Q1	103
14-Q2	1064
14-Q3	1532
14-Q4	1782
15-Q1	1892
15-Q2	1155



Period	Comments
13-Q3	80
13-Q4	120
14-Q1	160
14-Q2	1950
14-Q3	2377
14-Q4	2619
15-Q1	2528
15-Q2	1281



Period	People asking
13-Q3	83
13-Q4	62
14-Q1	106
14-Q2	614
14-Q3	809
14-Q4	812
15-Q1	868
15-Q2	731

- Top visited questions.

Question subject	Visits
no log or console for instance+	57728
kilo heat topo view in horizon+	791
new kilo instance launch dialogue stays+	584
rdo kilo novalidhost no valid host+	525
kilo on centos7 keystone throws http+	521
switching from vnc to spice console+	390
how many mutiple nics can be+	353
is there any mechanism to provide+	329
how can i deploy multi node+	323
error unable to connect to neutron+	318

- Top questions with more comments.

Question subject	Comments
strange self healing icehouse neutronovs	5
performance+	
add another compute host to junos	5
neutron network node dhcp requests hit+	5
rdo kilo novalidhost no valid host+	5
cant access dashboard on vm installation+	5
openstack allinone deployment using vlan	5
instead+	
how does compute node get ip+	5
connection to neutron failed maximum	5
attempts+	
cirros instance cannot get ip address+	5
how can i assign public ips+	5

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

Question subject	People participating
cant create or delete instances+	7
no valid host was found+	7
error unable to connect to neutron+	7
kilo on centos7 keystone throws http+	7
unable ping google from instance+	6
maximum amount of instances deployed at+	6
accessing the vm from internet+	5
cloud init not assigning ip+	5
keystone socket error errno 98 address+	5
cirros instance cannot get ip address+	5

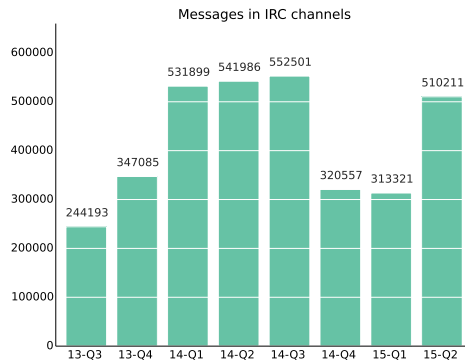
- Top tags

Tag name	Ocurrences
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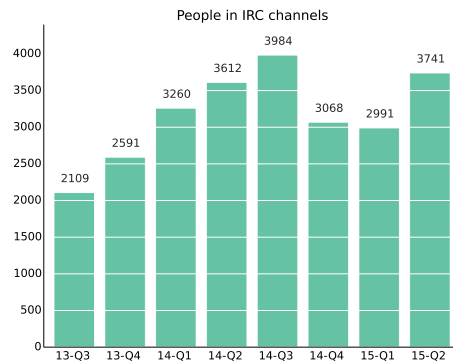
## 2.3 IRC

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	Messages
13-Q3	244193
13-Q4	347085
14-Q1	531899
14-Q2	541986
14-Q3	552501
14-Q4	320557
15-Q1	313321
15-Q2	510211



Period	People
13-Q3	2109
13-Q4	2591
14-Q1	3260
14-Q2	3612
14-Q3	3984
14-Q4	3068
15-Q1	2991
15-Q2	3741



IRC id	Messages sent
morganfainberg	8598
openstack	7343
Jeremy Stanley	7219
sdake	6333
Monty Taylor	6237
rbtcollins	5374
ayoung	5084
clarkb	4933
Matt Riedemann	4824
Thierry Carrez	4811
Sean Dague	4807
Anita Kuno	4549
Lucas Alvares Gomes	4374
jgriffith	4273
dhellmann	4107

## Chapter 3

# Details on OpenStack Integrated and Incubated projects

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

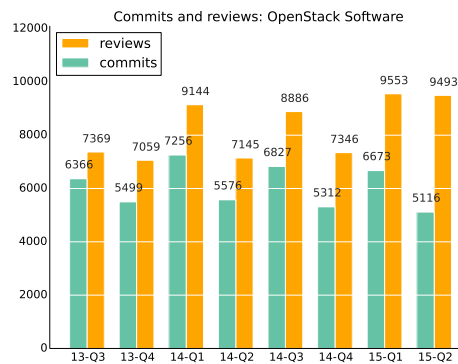
- activity: centered in the following metrics: commits from git activity, submitted, merge and abandoned reviews from the review system and opened and closed tickets from the issue tracking system.
- community: active core reviewers in gerrit, active authors in git and top ten developers and top ten 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).

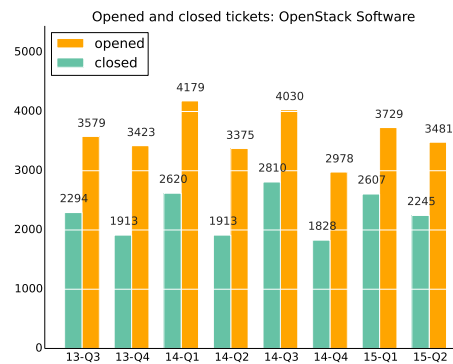
## 3.1 Overview of OpenStack Programs

## 3.2 Activity

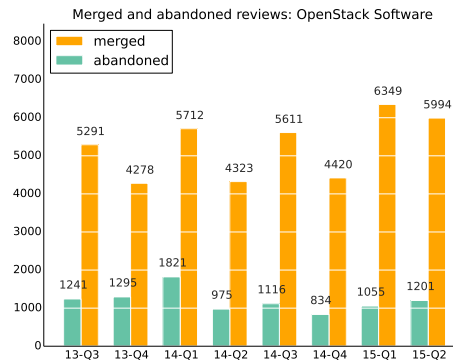
Commits in Git, submitted, merged and abandoned reviews in Gerrit and opened and closed issues in Launchpad.



Period	Commits	Reviews
13-Q3	6366	7369
13-Q4	5499	7059
14-Q1	7256	9144
14-Q2	5576	7145
14-Q3	6827	8886
14-Q4	5312	7346
15-Q1	6673	9553
15-Q2	5116	9493



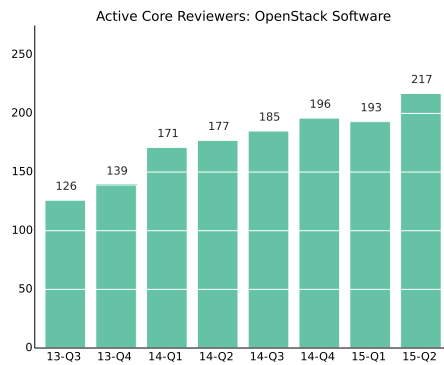
Period	Closed	Opened
13-Q3	2294	3579
13-Q4	1913	3423
14-Q1	2620	4179
14-Q2	1913	3375
14-Q3	2810	4030
14-Q4	1828	2978
15-Q1	2607	3729
15-Q2	2245	3481



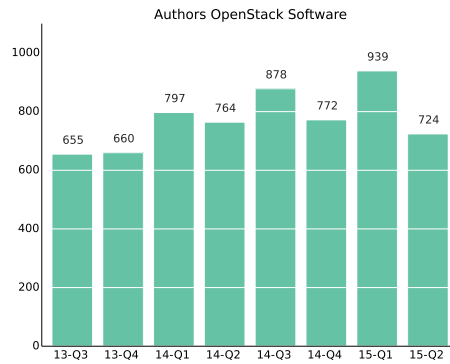
Period	Merged	Abandoned
13-Q3	5291	1241
13-Q4	4278	1295
14-Q1	5712	1821
14-Q2	4323	975
14-Q3	5611	1116
14-Q4	4420	834
15-Q1	6349	1055
15-Q2	5994	1201

### 3.3 Community

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



Period	Active Core
13-Q3	126
13-Q4	139
14-Q1	171
14-Q2	177
14-Q3	185
14-Q4	196
15-Q1	193
15-Q2	217



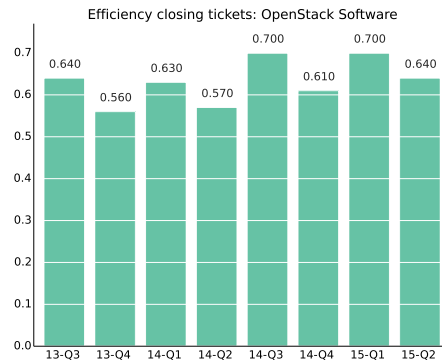
Period	Authors
13-Q3	655
13-Q4	660
14-Q1	797
14-Q2	764
14-Q3	878
14-Q4	772
15-Q1	939
15-Q2	724

Commit (s)	Author
168	Emilien Macchi
134	Jeremy Stanley
119	Colleen Murphy
104	Doug Hellmann
102	Mark Vanderziel
78	Victor Stinner
73	Jamie Lennox
71	Brant Knudson
67	Nikolay Mahotkin
59	Kevin Benton

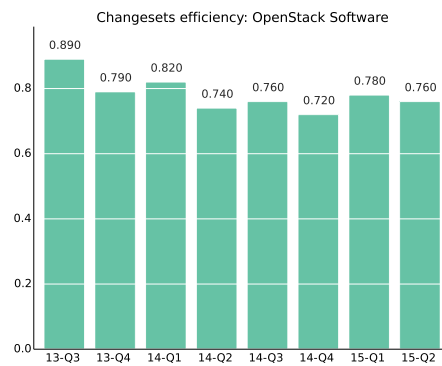
Commit (s)	Organizations
986	Red Hat
636	Mirantis
624	IBM
556	HP
245	Rackspace
185	OpenStack Foundation
143	Huawei
124	Puppet Labs
117	Intel
93	Cisco Systems

### 3.4 Process

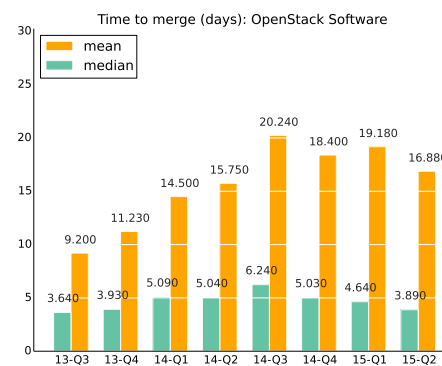
Efficiency closing changesets and tickets, time to review (mean and median), number of patchsets (iterations) per changeset and study on the time waiting for a reviewer or submitter action in the patchset review process.



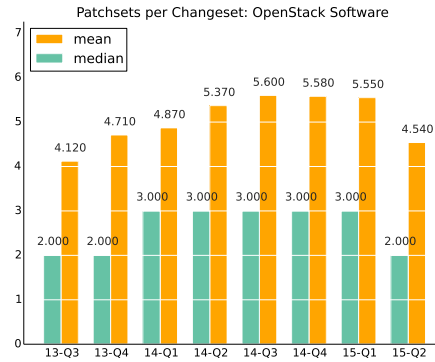
Period	Closed/Opened
13-Q3	0.64
13-Q4	0.56
14-Q1	0.63
14-Q2	0.57
14-Q3	0.7
14-Q4	0.61
15-Q1	0.7
15-Q2	0.64



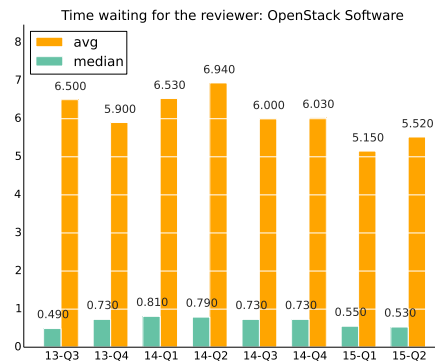
Period	(Aband. and Merg.)/Subm.
13-Q3	0.89
13-Q4	0.79
14-Q1	0.82
14-Q2	0.74
14-Q3	0.76
14-Q4	0.72
15-Q1	0.78
15-Q2	0.76



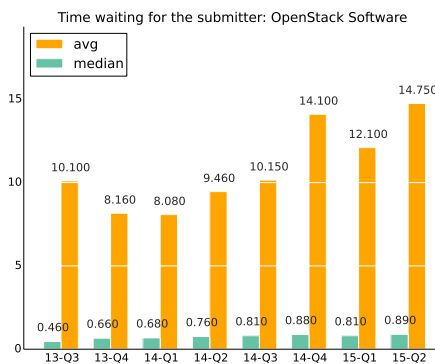
Period	Median	Mean
13-Q3	3.64	9.2
13-Q4	3.93	11.23
14-Q1	5.09	14.5
14-Q2	5.04	15.75
14-Q3	6.24	20.24
14-Q4	5.03	18.4
15-Q1	4.64	19.18
15-Q2	3.89	16.88



Period	Median	Mean
13-Q3	2.0	4.12
13-Q4	2.0	4.71
14-Q1	3.0	4.87
14-Q2	3.0	5.37
14-Q3	3.0	5.6
14-Q4	3.0	5.58
15-Q1	3.0	5.55
15-Q2	2.0	4.54



Period	Median	Mean
13-Q3	0.49	6.5
13-Q4	0.73	5.9
14-Q1	0.81	6.53
14-Q2	0.79	6.94
14-Q3	0.73	6.0
14-Q4	0.73	6.03
15-Q1	0.55	5.15
15-Q2	0.53	5.52

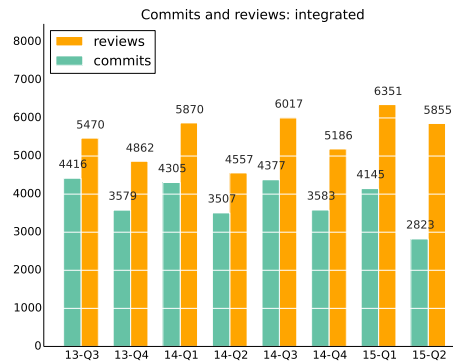


Period	Median	Mean
13-Q3	0.46	10.1
13-Q4	0.66	8.16
14-Q1	0.68	8.08
14-Q2	0.76	9.46
14-Q3	0.81	10.15
14-Q4	0.88	14.1
15-Q1	0.81	12.1
15-Q2	0.89	14.75

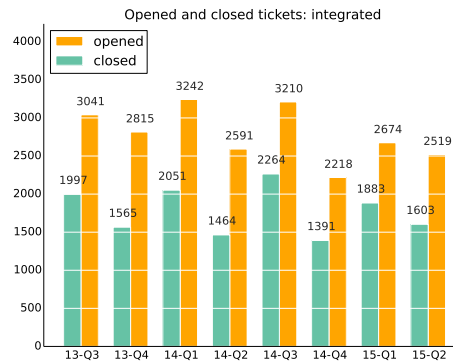
### 3.4.1 OpenStack Integrated Programs

## 3.5 Activity

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

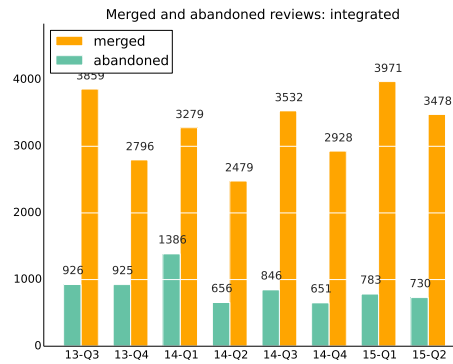


Period	Commits	Reviews
13-Q3	4416	5470
13-Q4	3579	4862
14-Q1	4305	5870
14-Q2	3507	4557
14-Q3	4377	6017
14-Q4	3583	5186
15-Q1	4145	6351
15-Q2	2823	5855



Period	Closed	Opened
13-Q3	1997	3041
13-Q4	1565	2815
14-Q1	2051	3242
14-Q2	1464	2591
14-Q3	2264	3210
14-Q4	1391	2218
15-Q1	1883	2674
15-Q2	1603	2519

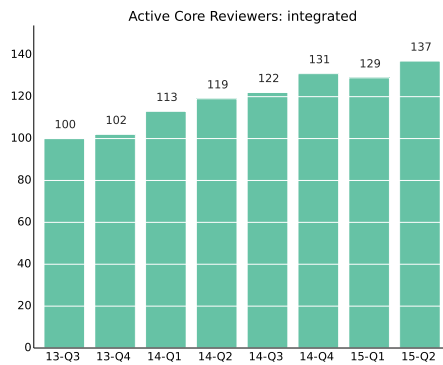




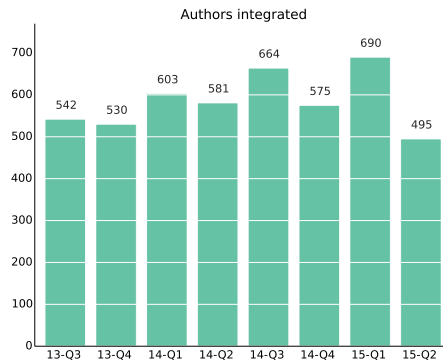
Period	Merged	Abandoned
13-Q3	3859	926
13-Q4	2796	925
14-Q1	3279	1386
14-Q2	2479	656
14-Q3	3532	846
14-Q4	2928	651
15-Q1	3971	783
15-Q2	3478	730

### 3.6 Community

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



Period	Active Core
13-Q3	100
13-Q4	102
14-Q1	113
14-Q2	119
14-Q3	122
14-Q4	131
15-Q1	129
15-Q2	137



Period	Authors
13-Q3	542
13-Q4	530
14-Q1	603
14-Q2	581
14-Q3	664
14-Q4	575
15-Q1	690
15-Q2	495

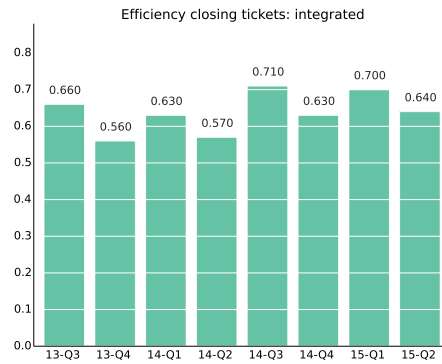
Commit (s)	Author
76	Victor Stinner
60	Jamie Lennox
59	Kevin Benton
54	Brant Knudson
50	Matt Riedemann
45	Dan Smith
41	Tianhua Huang
37	Thierry Carrez
35	cedric.brandily
35	Doug Hellmann

Commit (s)	Organizations
507	Red Hat
423	IBM
310	HP
291	Mirantis
122	Rackspace
93	Huawei
74	Cisco Systems
68	Intel
65	VMware
59	Bit Switch Networks

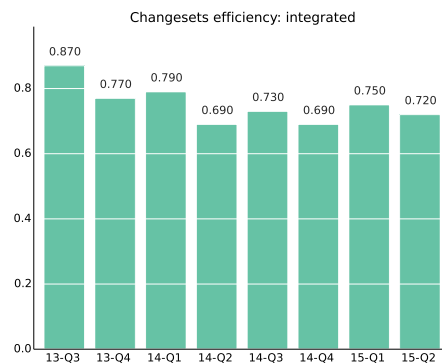
### 3.7 Process

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.

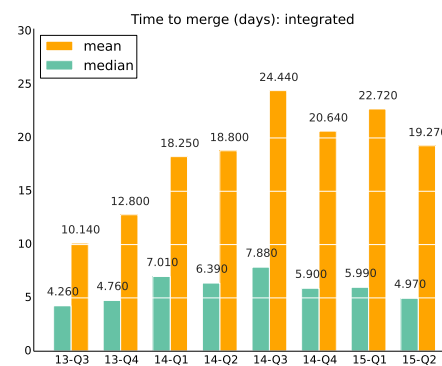
### 3.7. PROCESS



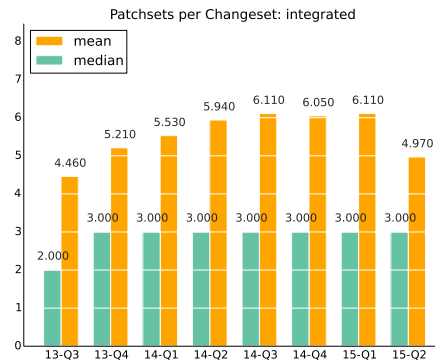
Period	Closed/Opened
13-Q3	0.66
13-Q4	0.56
14-Q1	0.63
14-Q2	0.57
14-Q3	0.71
14-Q4	0.63
15-Q1	0.7
15-Q2	0.64



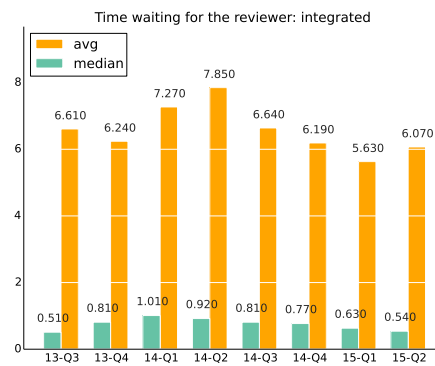
Period	(Aband. and Merg.)/Subm.
13-Q3	0.87
13-Q4	0.77
14-Q1	0.79
14-Q2	0.69
14-Q3	0.73
14-Q4	0.69
15-Q1	0.75
15-Q2	0.72



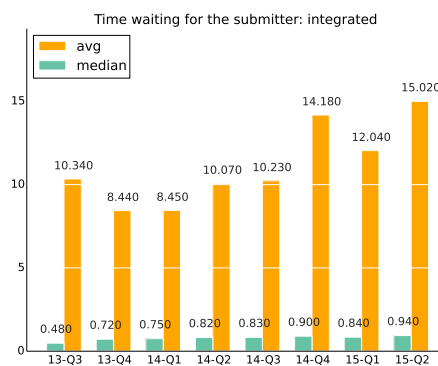
Period	Median	Mean
13-Q3	4.26	10.14
13-Q4	4.76	12.8
14-Q1	7.01	18.25
14-Q2	6.39	18.8
14-Q3	7.88	24.44
14-Q4	5.9	20.64
15-Q1	5.99	22.72
15-Q2	4.97	19.27



Period	Median	Mean
13-Q3	2.0	4.46
13-Q4	3.0	5.21
14-Q1	3.0	5.53
14-Q2	3.0	5.94
14-Q3	3.0	6.11
14-Q4	3.0	6.05
15-Q1	3.0	6.11
15-Q2	3.0	4.97



Period	Median	Mean
13-Q3	0.51	6.61
13-Q4	0.81	6.24
14-Q1	1.01	7.27
14-Q2	0.92	7.85
14-Q3	0.81	6.64
14-Q4	0.77	6.19
15-Q1	0.63	5.63
15-Q2	0.54	6.07

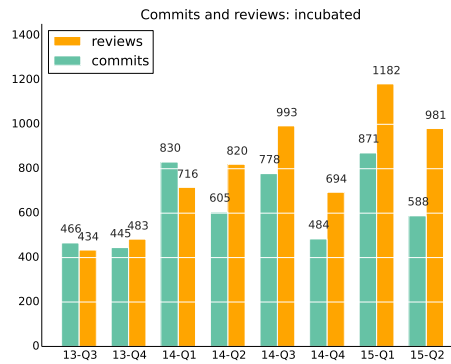


Period	Median	Mean
13-Q3	0.48	10.34
13-Q4	0.72	8.44
14-Q1	0.75	8.45
14-Q2	0.82	10.07
14-Q3	0.83	10.23
14-Q4	0.9	14.18
15-Q1	0.84	12.04
15-Q2	0.94	15.02

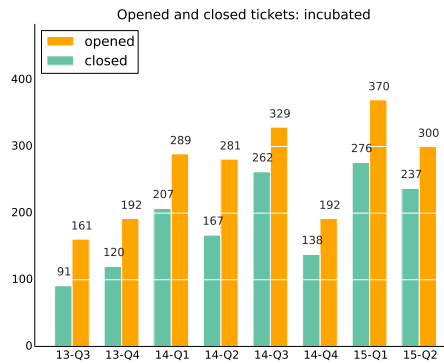
### 3.7.1 OpenStack Incubated Programs

## 3.8 Activity

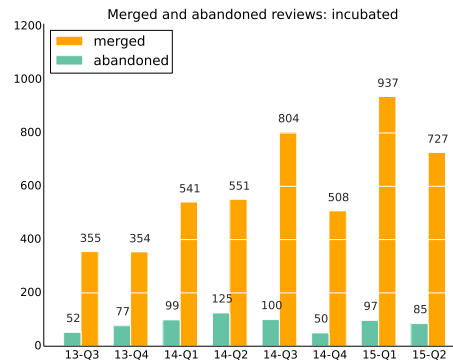
Commits in Git, submitted, merged and abandoned reviews in Gerrit and opened and closed issues in Launchpad.



Period	Commits	Reviews
13-Q3	466	434
13-Q4	445	483
14-Q1	830	716
14-Q2	605	820
14-Q3	778	993
14-Q4	484	694
15-Q1	871	1182
15-Q2	588	981



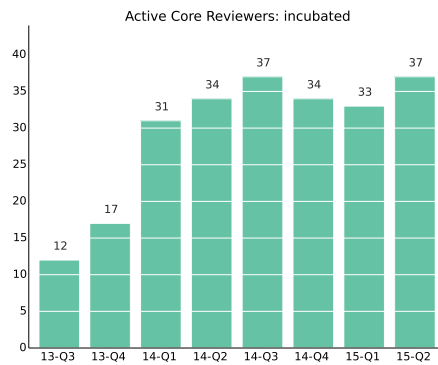
Period	Closed	Opened
13-Q3	91	161
13-Q4	120	192
14-Q1	207	289
14-Q2	167	281
14-Q3	262	329
14-Q4	138	192
15-Q1	276	370
15-Q2	237	300



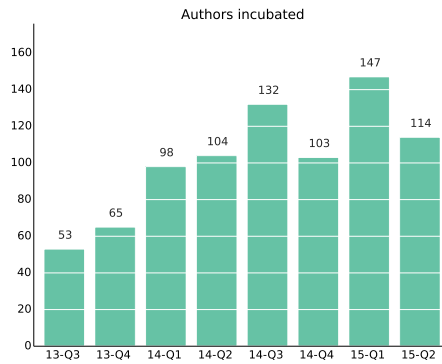
Period	Merged	Abandoned
13-Q3	355	52
13-Q4	354	77
14-Q1	541	99
14-Q2	551	125
14-Q3	804	100
14-Q4	508	50
15-Q1	937	97
15-Q2	727	85

### 3.9 Community

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



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

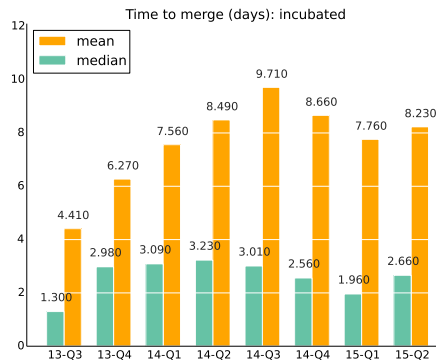


Period	Authors
13-Q3	53
13-Q4	65
14-Q1	98
14-Q2	104
14-Q3	132
14-Q4	103
15-Q1	147
15-Q2	114

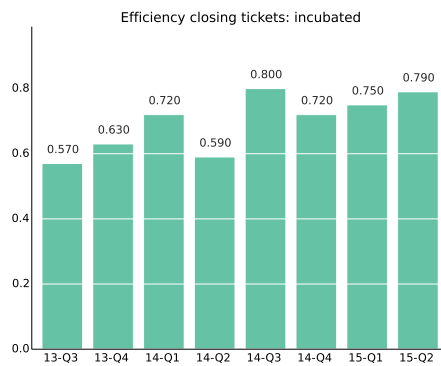
Commit (s)	Author	Commit (s)	Organizations
48	Kiall Mac Innes	104	HP
25	Lucas Alvares Gomes	73	Rackspace
23	Valeriy Ponomaryov	71	Mirantis
22	John L. Villalovos	32	Intel
19	Graham Hayes	27	Red Hat
18	Igor Malinovskiy	25	OpenStack Foundation
16	Dave McCowan	19	Yahoo!
16	Ruby Loo	16	Cisco Systems
15	Endre Karlson	15	Ericsson
15	Juan Antonio Osorio Robles	10	NEC

### 3.10 Process

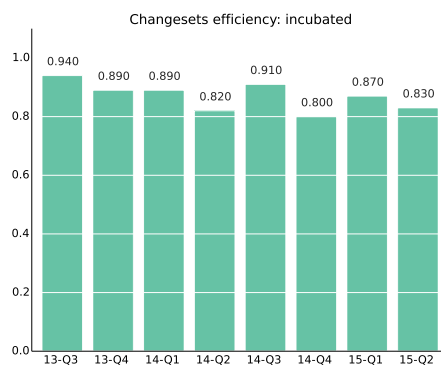
Efficiency closing changesets and tickets, time to review (mean and median), number of patchsets (iterations) per changeset and study on the time waiting for a reviewer or submitter action in the patchset review process.



Period	Median	Mean
13-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	8.66
15-Q1	1.96	7.76
15-Q2	2.66	8.23

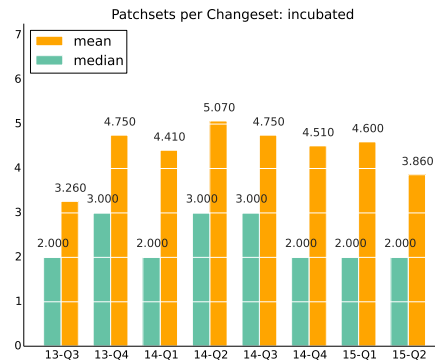


Period	Closed/Opened
13-Q3	0.57
13-Q4	0.63
14-Q1	0.72
14-Q2	0.59
14-Q3	0.8
14-Q4	0.72
15-Q1	0.75
15-Q2	0.79

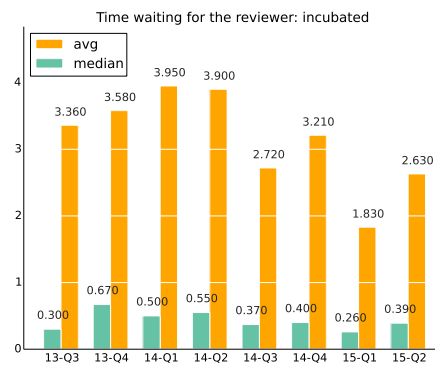


Period	(Aband. and Merg.)/Subm.
13-Q3	0.94
13-Q4	0.89
14-Q1	0.89
14-Q2	0.82
14-Q3	0.91
14-Q4	0.8
15-Q1	0.87
15-Q2	0.83

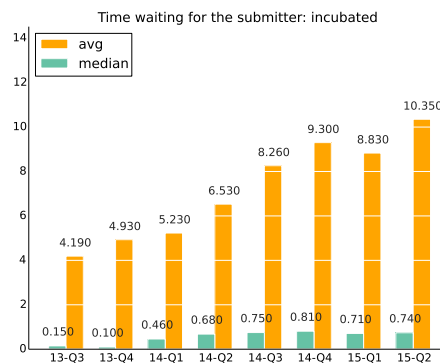




Period	Median	Mean
13-Q3	2.0	3.26
13-Q4	3.0	4.75
14-Q1	2.0	4.41
14-Q2	3.0	5.07
14-Q3	3.0	4.75
14-Q4	2.0	4.51
15-Q1	2.0	4.6
15-Q2	2.0	3.86



Period	Median	Mean
13-Q3	0.3	3.36
13-Q4	0.67	3.58
14-Q1	0.5	3.95
14-Q2	0.55	3.9
14-Q3	0.37	2.72
14-Q4	0.4	3.21
15-Q1	0.26	1.83
15-Q2	0.39	2.63



Period	Median	Mean
13-Q3	0.15	4.19
13-Q4	0.1	4.93
14-Q1	0.46	5.23
14-Q2	0.68	6.53
14-Q3	0.75	8.26
14-Q4	0.81	9.3
15-Q1	0.71	8.83
15-Q2	0.74	10.35

## 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-saharacclient">https://bugs.launchpad.net/python-saharacclient</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-saharacclient">git://git.openstack.org/openstack/python-saharacclient</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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manila	scr	<a href="https://review.openstack.org/openstack/manila">review.openstack.org_openstack/manila</a>
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neutron	scm	<a href="https://git.openstack.org/openstack/neutron-lbaas">git://git.openstack.org/openstack/neutron-lbaas</a>
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neutron	scr	<a href="https://review.openstack.org/openstack/neutron-fwaas">review.openstack.org_openstack/neutron-fwaas</a>
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others	its	<a href="https://bugs.launchpad.net/swift-bench">https://bugs.launchpad.net/swift-bench</a>
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Quality Assurance	its	<a href="https://bugs.launchpad.net/tempest">https://bugs.launchpad.net/tempest</a>
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Quality Assurance	scm	<a href="https://git.openstack.org/openstack-dev/grenade">git://git.openstack.org/openstack-dev/grenade</a>
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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>
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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>
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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>
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