OpenStack Community Activity Report
October-December, 2014
Report sponsored by the OpenStack Foundation

Bitergia

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Executive Summary

Contents

Chapter 1

Overview of the Project

1.1 General Activity

A more detailed information about the community activity ...

Data source	Activity 365 days	Change (wrt to prev. 365 days)
Gits	51758 commits	34%
Tickets	11455 closed tickets	44%
Mailing Lists	42649 sent emails	33%
Gerrit	55924 submitted reviews	40%
Askbot	5880 posted questions	79%
IRC	1898640 messages	134%

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

Focusing on the development activity,

Integrated Project	Commits
neutron	597
sahara	164
ceilometer	145
horizon	261
heat	324
nova	700
trove	61
swift	75
glance	122
cinder	233
keystone	169

Table 1.2: Last quarter integrated projects number of commits

1.2 Development and Conversations

Regarding to the community, developers are divided into three main sets, core, regular and occasional[1].
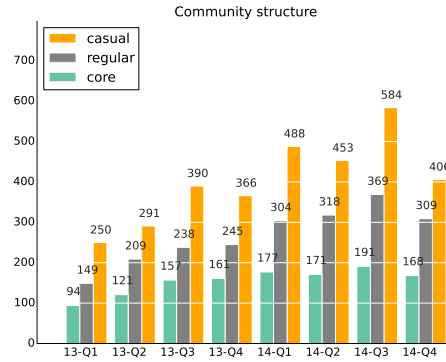
Figure 1.1: Evolution of the last 8 quarters of the core, regular and occasional developers (Git activity)

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[1]Contributing developers are characterized as core, regular and occasional 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 occasional contributors.

Period	Core	Regular	Occasional
13-Q1	94	149	250
13-Q2	121	209	291
13-Q3	157	238	390
13-Q4	161	245	366
14-Q1	177	304	488
14-Q2	171	318	453
14-Q3	191	369	584
14-Q4	168	309	406

Table 1.3: Characterization of developers by their total contribution to the OpenStack projects

The mean number of developers per month
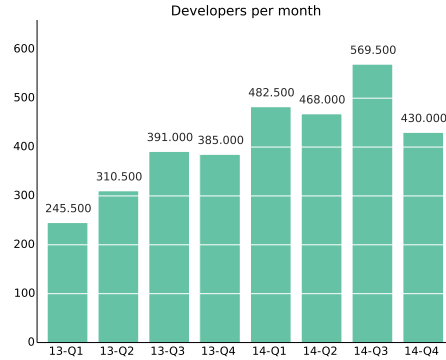
Figure 1.2: Number of developers per month in mean for each quarter

1.3 Efficiency

Two metrics have been identified to measure efficiency: the review efficiency index (REI) and the Time to Merge. REI is measured as the number of closed (merged or abandoned) changesets out of the submitted changesets in a given period. Time to Merge is measured as the time since a review is submitted until this is closed. Typical BMI values in the OpenStack Integrated projects rounds a 0.75, what indicates that for 100 opened changesets in a period, the community closes 75. Besides, the median Time to Merge is of 7.82, having an increase from the previous period.

Integrated project	REI	TTM	BMI	
neutron	0.69	5.75	0.55	days
sahara	0.9	2.02	0.89	days
ceilometer	0.8	3.28	0.77	days
horizon	0.66	3.16	0.7	days
heat	0.74	4.12	0.75	days
nova	0.64	10.8	0.58	days
trove	0.74	10.4	0.59	days
swift	0.64	2.73	0.51	days
glance	0.65	7.97	0.71	days
cinder	0.77	2.83	0.55	days
keystone	0.61	5.9	0.42	days

Table 1.4: Closed changesets out of opened changesets and median Time to Merge in Gerrit

Chapter 2

Per Project break down

This chapter aims at providing a detailed report on the activity of the OpenStack Foundation projects. This is mainly focused on the activity per project as defined, stressing the point on the 'integrated' projects.

Each of the projects is divided into three sections and provides 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 changesets, Time to Merge (mean and median), number of patchests (iterations) per changeset and study on the time waiting for a reviewer or submitter action in the patchset review process.

2.1 Overall OpenStack Programs

2.2 Activity

Commits in Git, submitted, merged and abandoned reviews in Gerrit and opened and closed issues in Launchpad.
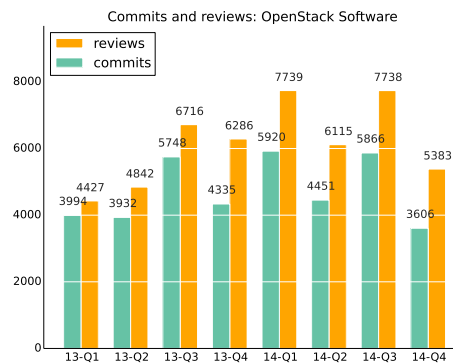
Period	Commits	Reviews
13-Q1	3994	4427
13-Q2	3932	4842
13-Q3	5748	6716
13-Q4	4335	6286
14-Q1	5920	7739
14-Q2	4451	6115
14-Q3	5866	7738
14-Q4	3606	5383
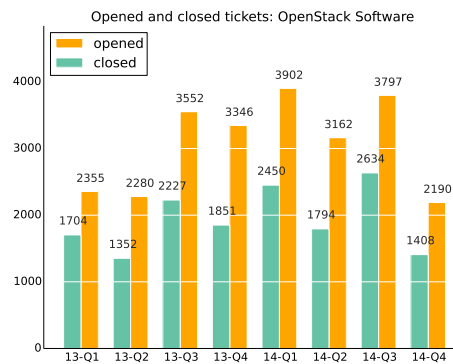
Period	Closed	Opened
13-Q1	1704	2355
13-Q2	1352	2280
13-Q3	2227	3552
13-Q4	1851	3346
14-Q1	2450	3902
14-Q2	1794	3162
14-Q3	2634	3797
14-Q4	1408	2190

Merged and abandoned reviews: OpenStack Software
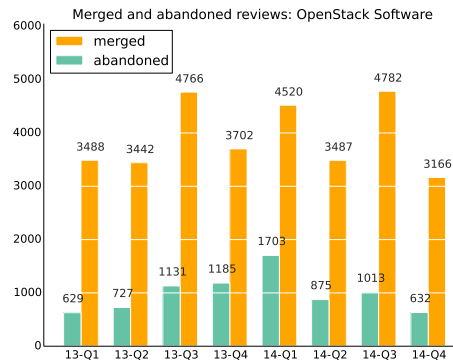
Period	Merged	Abandoned
13-Q1	3488	629
13-Q2	3442	727
13-Q3	4766	1131
13-Q4	3702	1185
14-Q1	4520	1703
14-Q2	3487	875
14-Q3	4782	1013
14-Q4	3166	632

2.3 Community

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

Active Core Reviewers: OpenStack Software
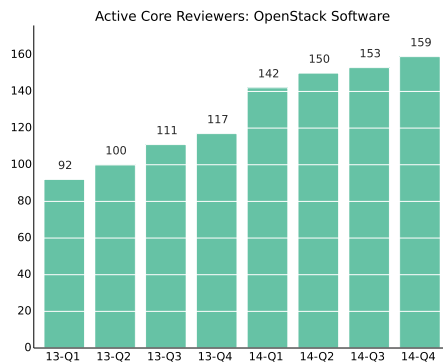
Period	Active Core
13-Q1	92
13-Q2	100
13-Q3	111
13-Q4	117
14-Q1	142
14-Q2	150
14-Q3	153
14-Q4	159

Authors OpenStack Software
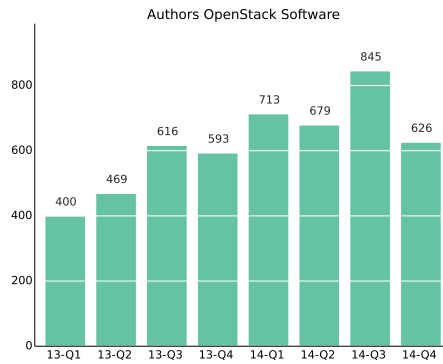
Period	Authors
13-Q1	400
13-Q2	469
13-Q3	616
13-Q4	593
14-Q1	713
14-Q2	679
14-Q3	845
14-Q4	626

Commit (s)	Author
96	Kevin Benton
85	garyk
64	Russell Bryant
55	Mark McClain
54	Brant Knudson
50	Steven Hardy
44	Angus Lees
39	Flavio Percoco
39	Jeremy Stanley
39	Sergey Reshetnyak

Commit (s)	Organizations
714	Red Hat
525	IBM
382	Mirantis
284	HP
185	Rackspace
120	VMware
96	Bit Switch Networks
88	Huawei
85	NEC
85	Radware

2.4 Process

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

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Efficiency closing tickets: OpenStack Software
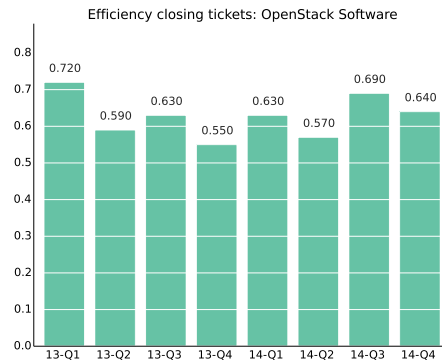
Period	Closed/Opened
13-Q1	0.72
13-Q2	0.59
13-Q3	0.63
13-Q4	0.55
14-Q1	0.63
14-Q2	0.57
14-Q3	0.69
14-Q4	0.64

Changesets efficiency: OpenStack Software
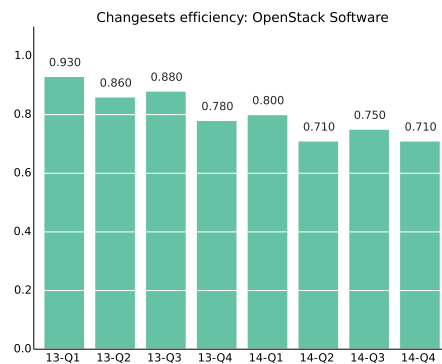
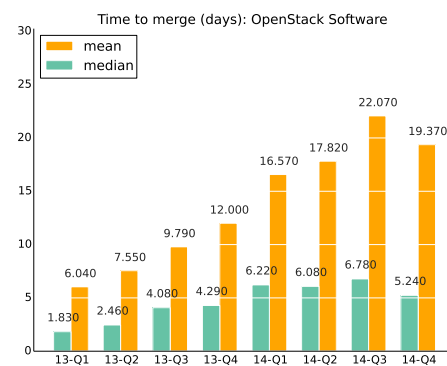| Period	Closed/Opened
13-Q1	0.93
13-Q2	0.86
13-Q3	0.88
13-Q4	0.78
14-Q1	0.8
14-Q2	0.71
14-Q3	0.75
14-Q4	0.71

Time to merge (days): OpenStack Software

Period	Median	Mean
13-Q1	1.83	6.04
13-Q2	2.46	7.55
13-Q3	4.08	9.79
13-Q4	4.29	12.0
14-Q1	6.22	16.57
14-Q2	6.08	17.82
14-Q3	6.78	22.07
14-Q4	5.24	19.37

Patchsets per Changeset: OpenStack Software
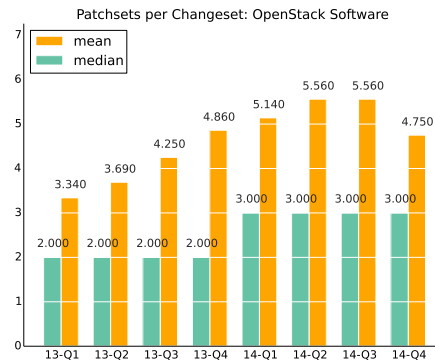
Period	Median	Mean
13-Q1	2.0	3.34
13-Q2	2.0	3.69
13-Q3	2.0	4.25
13-Q4	2.0	4.86
14-Q1	3.0	5.14
14-Q2	3.0	5.56
14-Q3	3.0	5.56
14-Q4	3.0	4.75

Time waiting for the reviewer: OpenStack Software
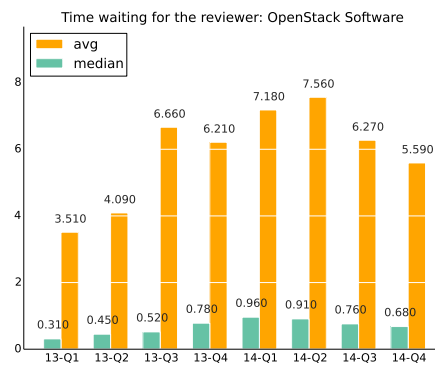
Period	Median	Mean
13-Q1	0.31	3.51
13-Q2	0.45	4.09
13-Q3	0.52	6.66
13-Q4	0.78	6.21
14-Q1	0.96	7.18
14-Q2	0.91	7.56
14-Q3	0.76	6.27
14-Q4	0.68	5.59

Time waiting for the submitter: OpenStack Software
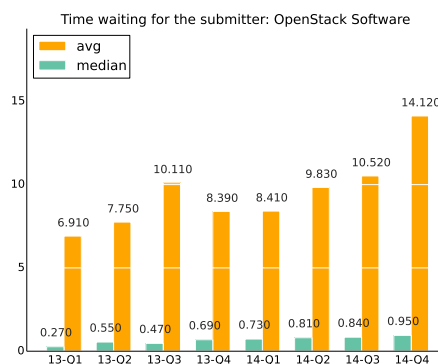
Period	Median	Mean
13-Q1	0.27	6.91
13-Q2	0.55	7.75
13-Q3	0.47	10.11
13-Q4	0.69	8.39
14-Q1	0.73	8.41
14-Q2	0.81	9.83
14-Q3	0.84	10.52
14-Q4	0.95	14.12

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2.4.1 OpenStack Integrated Programs

2.5 Activity

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

Commits and reviews: integrated
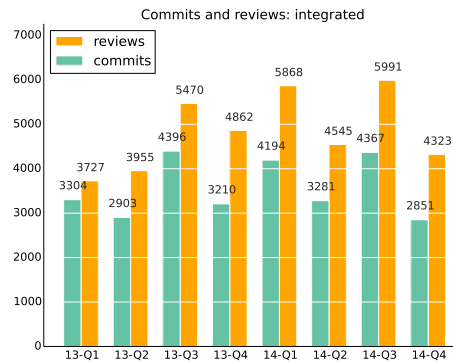
Period	Commits	Reviews
13-Q1	3304	3727
13-Q2	2903	3955
13-Q3	4396	5470
13-Q4	3210	4862
14-Q1	4194	5868
14-Q2	3281	4545
14-Q3	4367	5991
14-Q4	2851	4323

Opened and closed tickets: integrated
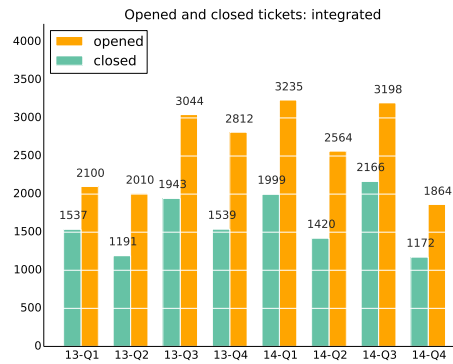
Period	Closed	Opened
13-Q1	1537	2100
13-Q2	1191	2010
13-Q3	1943	3044
13-Q4	1539	2812
14-Q1	1999	3235
14-Q2	1420	2564
14-Q3	2166	3198
14-Q4	1172	1864

Merged and abandoned reviews: integrated
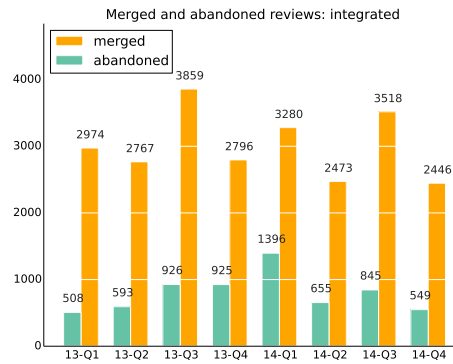
Period	Merged	Abandoned
13-Q1	2974	508
13-Q2	2767	593
13-Q3	3859	926
13-Q4	2796	925
14-Q1	3280	1396
14-Q2	2473	655
14-Q3	3518	845
14-Q4	2446	549

2.6 Community

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

Active Core Reviewers: integrated
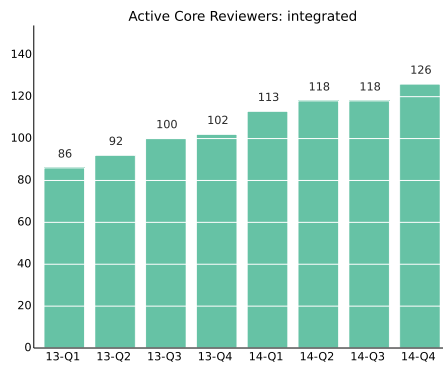
Period	Active Core
13-Q1	86
13-Q2	92
13-Q3	100
13-Q4	102
14-Q1	113
14-Q2	118
14-Q3	118
14-Q4	126

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Authors integrated
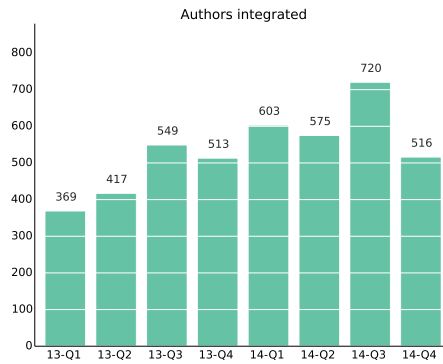
Period	Authors
13-Q1	369
13-Q2	417
13-Q3	549
13-Q4	513
14-Q1	603
14-Q2	575
14-Q3	720
14-Q4	516

Commit (s)	Author	Commit (s)	Organizations
96	Kevin Benton	546	Red Hat
85	garyk	491	IBM
63	Russell Bryant	272	Mirantis
55	Mark McClain	205	HP
45	Steven Hardy	130	Rackspace
44	Angus Lees	119	VMware
36	Brant Knudson	96	Bit Switch Networks
36	Ihar Hrachyshka	85	Radware
35	Angus Salkeld	78	Huawei
35	jichen	76	NEC

2.7 Process

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

Efficiency closing tickets: integrated

Period	Closed/Opened
13-Q1	0.73
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	0.63

Changesets efficiency: integrated
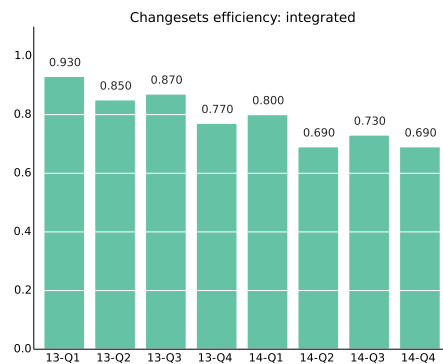
Period	Closed/Opened
13-Q1	0.93
13-Q2	0.85
13-Q3	0.87
13-Q4	0.77
14-Q1	0.8
14-Q2	0.69
14-Q3	0.73
14-Q4	0.69

Time to merge (days): integrated
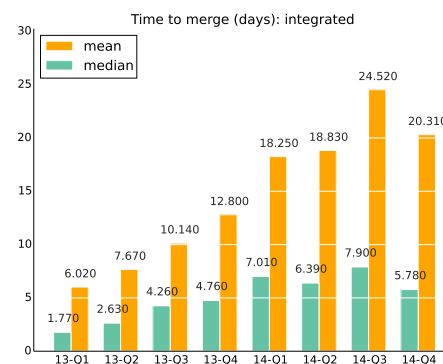
Period	Median	Mean
13-Q1	1.77	6.02
13-Q2	2.63	7.67
13-Q3	4.26	10.14
13-Q4	4.76	12.8
14-Q1	7.01	18.25
14-Q2	6.39	18.83
14-Q3	7.9	24.52
14-Q4	5.78	20.31

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Patchsets per Changeset: integrated
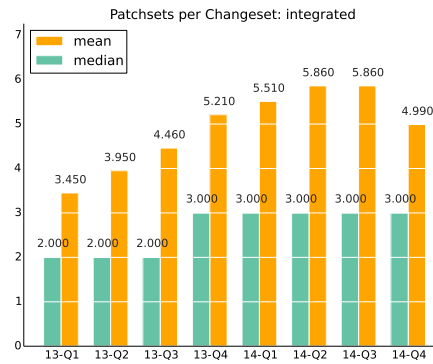
Period	Median	Mean
13-Q1	2.0	3.45
13-Q2	2.0	3.95
13-Q3	2.0	4.46
13-Q4	3.0	5.21
14-Q1	3.0	5.51
14-Q2	3.0	5.86
14-Q3	3.0	5.86
14-Q4	3.0	4.99

Time waiting for the reviewer: integrated
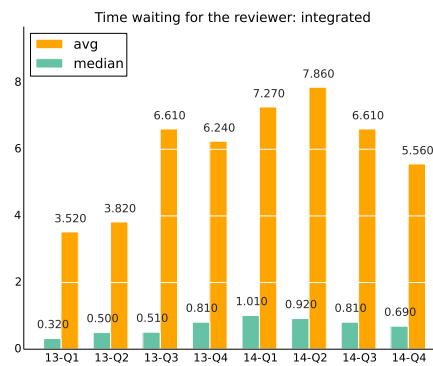
Period	Median	Mean
13-Q1	0.32	3.52
13-Q2	0.5	3.82
13-Q3	0.51	6.61
13-Q4	0.81	6.24
14-Q1	1.01	7.27
14-Q2	0.92	7.86
14-Q3	0.81	6.61
14-Q4	0.69	5.56

Time waiting for the submitter: integrated
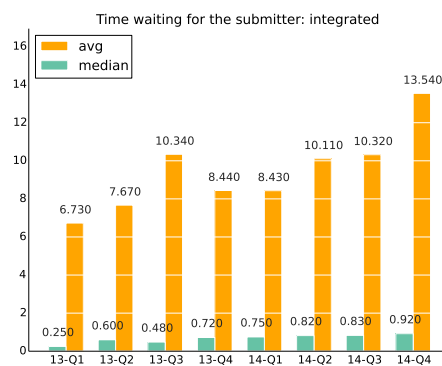
Period	Median	Mean
13-Q1	0.25	6.73
13-Q2	0.6	7.67
13-Q3	0.48	10.34
13-Q4	0.72	8.44
14-Q1	0.75	8.43
14-Q2	0.82	10.11
14-Q3	0.83	10.32
14-Q4	0.92	13.54

2.7.1   Incubated

2.8   Activity

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

Commits and reviews: incubated
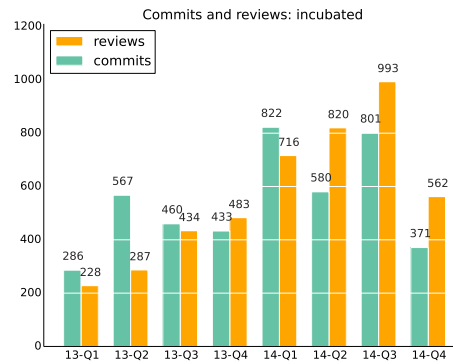
Period	Commits	Reviews
13-Q1	286	228
13-Q2	567	287
13-Q3	460	434
13-Q4	433	483
14-Q1	822	716
14-Q2	580	820
14-Q3	801	993
14-Q4	371	562

Opened and closed tickets: incubated
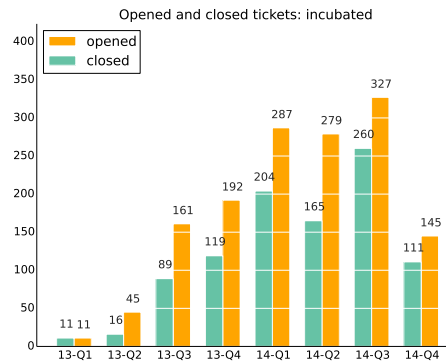
Period	Closed	Opened
13-Q1	11	11
13-Q2	16	45
13-Q3	89	161
13-Q4	119	192
14-Q1	204	287
14-Q2	165	279
14-Q3	260	327
14-Q4	111	145

Merged and abandoned reviews: incubated
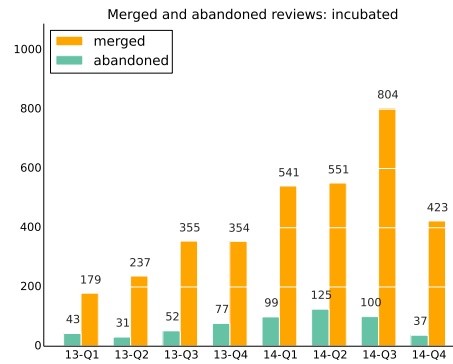
Period	Merged	Abandoned
13-Q1	179	43
13-Q2	237	31
13-Q3	355	52
13-Q4	354	77
14-Q1	541	99
14-Q2	551	125
14-Q3	804	100
14-Q4	423	37

2.9 Community

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

Active Core Reviewers: incubated
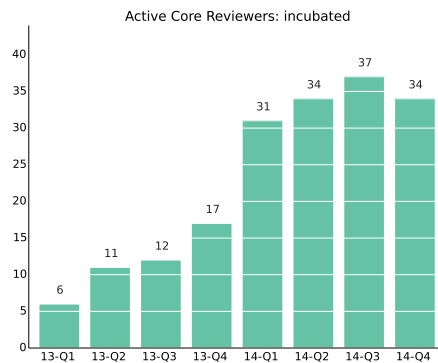
Period	Active Core
13-Q1	6
13-Q2	11
13-Q3	12
13-Q4	17
14-Q1	31
14-Q2	34
14-Q3	37
14-Q4	34

Authors incubated
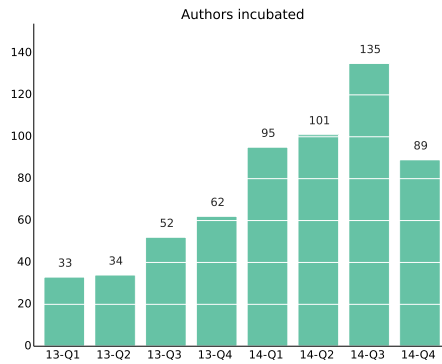
Period	Authors
13-Q1	33
13-Q2	34
13-Q3	52
13-Q4	62
14-Q1	95
14-Q2	101
14-Q3	135
14-Q4	89

Commit (s)	Author
26	Kiall Mac Innes
25	Flavio Percoco
19	Andreas Jaeger
18	Valeriy Ponomaryov
17	Jim Rollenhagen
16	Lucas Alvares Gomes
15	Lei Zhang
11	John Vrbanac
11	Thomas Dinkjian
11	Vladyslav Drok

Commit (s)	Organizations
52	HP
50	Mirantis
48	Rackspace
29	Red Hat
19	SUSE
13	OpenStack Foundation
10	Yahoo!
5	eBay
4	Ericsson
4	IBM

2.10 Process

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

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Time to merge (days): incubated
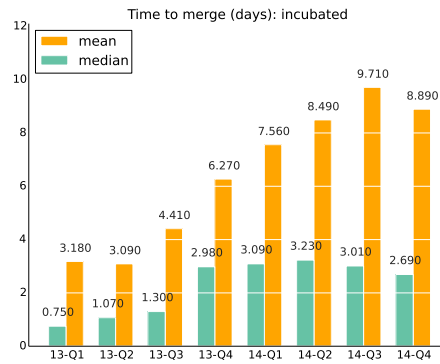
Period	Median	Mean
13-Q1	0.75	3.18
13-Q2	1.07	3.09
13-Q3	1.3	4.41
13-Q4	2.98	6.27
14-Q1	3.09	7.56
14-Q2	3.23	8.49
14-Q3	3.01	9.71
14-Q4	2.69	8.89

Efficiency closing tickets: incubated
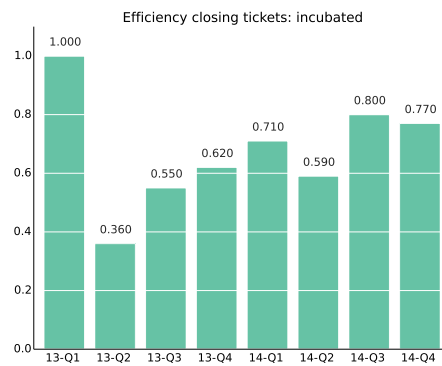
Period	Closed/Opened
13-Q1	1.0
13-Q2	0.36
13-Q3	0.55
13-Q4	0.62
14-Q1	0.71
14-Q2	0.59
14-Q3	0.8
14-Q4	0.77

Changesets efficiency: incubated
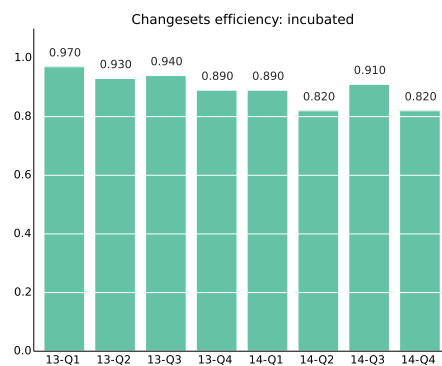
Period	Closed/Opened
13-Q1	0.97
13-Q2	0.93
13-Q3	0.94
13-Q4	0.89
14-Q1	0.89
14-Q2	0.82
14-Q3	0.91
14-Q4	0.82

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Patchsets per Changeset: incubated
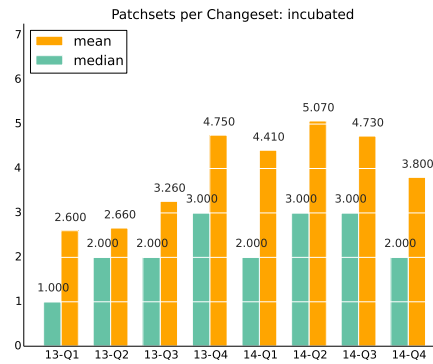
Period	Median	Mean
13-Q1	1.0	2.6
13-Q2	2.0	2.66
13-Q3	2.0	3.26
13-Q4	3.0	4.75
14-Q1	2.0	4.41
14-Q2	3.0	5.07
14-Q3	3.0	4.73
14-Q4	2.0	3.8

Time waiting for the reviewer: incubated
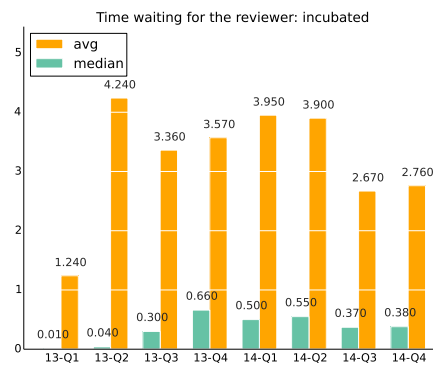
Period	Median	Mean
13-Q1	0.01	1.24
13-Q2	0.04	4.24
13-Q3	0.3	3.36
13-Q4	0.66	3.57
14-Q1	0.5	3.95
14-Q2	0.55	3.9
14-Q3	0.37	2.67
14-Q4	0.38	2.76

Time waiting for the submitter: incubated
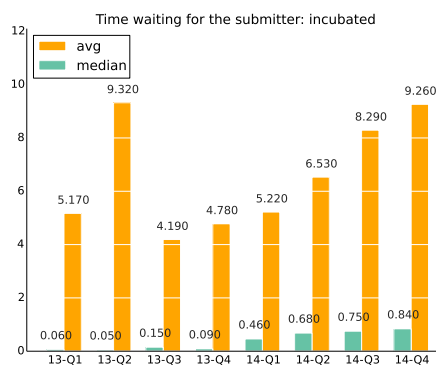
Period	Median	Mean
13-Q1	0.06	5.17
13-Q2	0.05	9.32
13-Q3	0.15	4.19
13-Q4	0.09	4.78
14-Q1	0.46	5.22
14-Q2	0.68	6.53
14-Q3	0.75	8.29
14-Q4	0.84	9.26

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Chapter 3

General Activity and Community Evolution

3.1 Git Community Structure
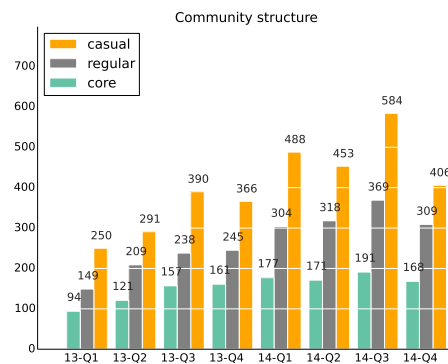
Developers per Month

Period	Core	Regular	Occasional
13-Q1	94	149	250
13-Q2	121	209	291
13-Q3	157	238	390
13-Q4	161	245	366
14-Q1	177	304	488
14-Q2	171	318	453
14-Q3	191	369	584
14-Q4	168	309	406

Developers per month
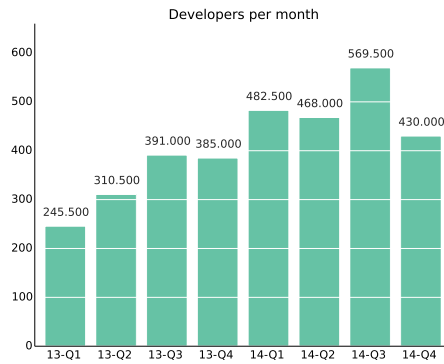
Period	Authors per month
13-Q1	245.5
13-Q2	310.5
13-Q3	391.0
13-Q4	385.0
14-Q1	482.5
14-Q2	468.0
14-Q3	569.5
14-Q4	430.0

3.2 Mailing Lists

Emails sent
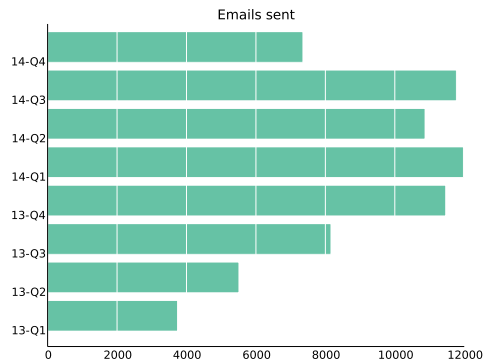
Period	Emails
13-Q1	3743
13-Q2	5511
13-Q3	8162
13-Q4	11466
14-Q1	11977
14-Q2	10872
14-Q3	11775
14-Q4	7354

People sending emails
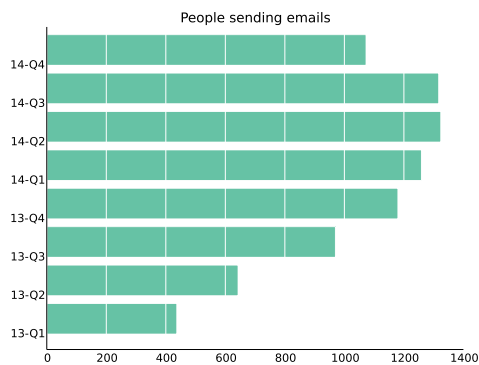
Period	People
13-Q1	437
13-Q2	643
13-Q3	970
13-Q4	1180
14-Q1	1259
14-Q2	1324
14-Q3	1317
14-Q4	1073

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Bitergia

People initiating threads
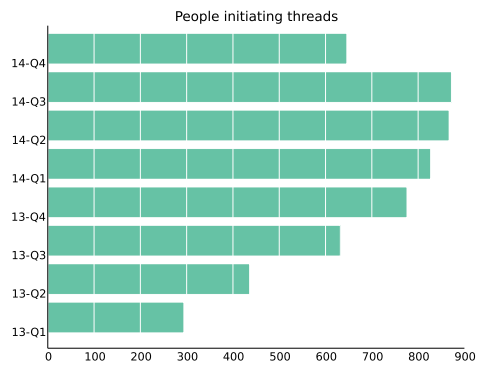
Period	People
13-Q1	294
13-Q2	436
13-Q3	632
13-Q4	776
14-Q1	827
14-Q2	867
14-Q3	872
14-Q4	646

Initial Author and Date	Subject	Number Messages
alawson 2014-10-13	[openstack-dev] [Nova] Automatic evacuate	58
Angus Lees 2014-10-14	[openstack-dev] [kolla] on Dockerfile patterns	49
azemlyanov 2014-11-05	[openstack-dev] [Fuel] fuel master monitoring	41
Doug Hellmann 2014-10-02	[openstack-dev] [all][tc] governance changes for "big tent" model	37
Richard Jones 2014-11-11	[openstack-dev] [Horizon] the future of angularjs development in Horizon	35
Alexis Lee 2014-11-05	[openstack-dev] [Heat] New function: $first_n onnull$	33
Everett Toews 2014-10-08	[openstack-dev] [api] Forming the API Working Group	32
Michael Still 2014-12-05	[openstack-dev] [Nova] Spring cleaning nova-core	31
Michael Krotscheck 2014-12-02	[openstack-dev] [Fuel][Nailgun] Web framework	29
Salvatore Orlando 2014-10-03	[openstack-dev] Quota management and enforcement across projects	29

Initial Author and Date	Subject	Diff. People
Anita Kuno 2014-12-04	[openstack-dev] [neutron] Changes to the core team	23
Craig Tracey 2014-11-08	[Openstack-operators] Proposal for an 'Operations' project	17
Sylvain Bauza 2014-10-14	[openstack-dev] [Nova] Automatic evacuate	17
Angus Salkeld 2014-10-17	[openstack-dev] [all] add cyclomatic complexity check to pep8 target	16
vishvananda 2014-12-10	[openstack-dev] [Nova] Spring cleaning nova-core	15
Kevin Benton 2014-12-12	[openstack-dev] [Neutron] Unique-Constraint for name and $tenant_i dinsecuritygroup$	15
ERROR 2014-11-21	[openstack-dev] [Fuel] fuel master monitoring	15
rbtcollins 2014-11-25	[openstack-dev] [tc][neutron] Proposal to split Neutron into separate repositories	15
e.aslan@logicom.com.tr 2014-11-28	[Openstack-operators] Operations project: Packaging	14
Chris Yeoh 2014-10-14	[openstack-dev] [api] Forming the API Working Group	14

3.3 Questions and Answers
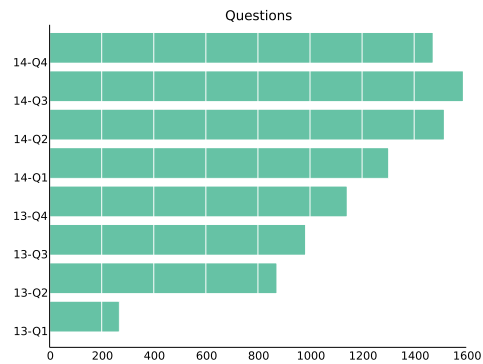
Period	Questions
13-Q1	268
13-Q2	873
13-Q3	983
13-Q4	1143
14-Q1	1302
14-Q2	1516
14-Q3	1589
14-Q4	1473
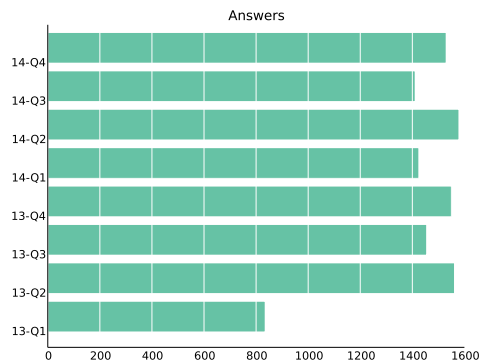
Period	Answers
13-Q1	835
13-Q2	1562
13-Q3	1455
13-Q4	1550
14-Q1	1425
14-Q2	1579
14-Q3	1411
14-Q4	1530
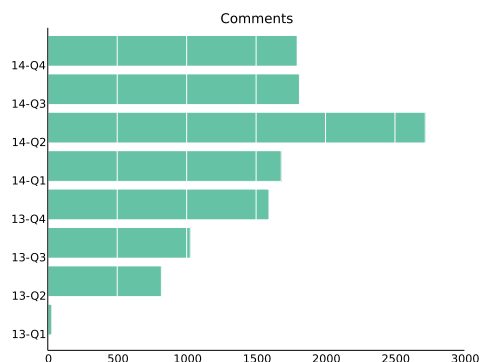
Period	Comments
13-Q1	29
13-Q2	818
13-Q3	1026
13-Q4	1593
14-Q1	1681
14-Q2	2718
14-Q3	1812
14-Q4	1796

People asking Questions

Period	People asking
13-Q1	181
13-Q2	510
13-Q3	565
13-Q4	654
14-Q1	754
14-Q2	810
14-Q3	822
14-Q4	770
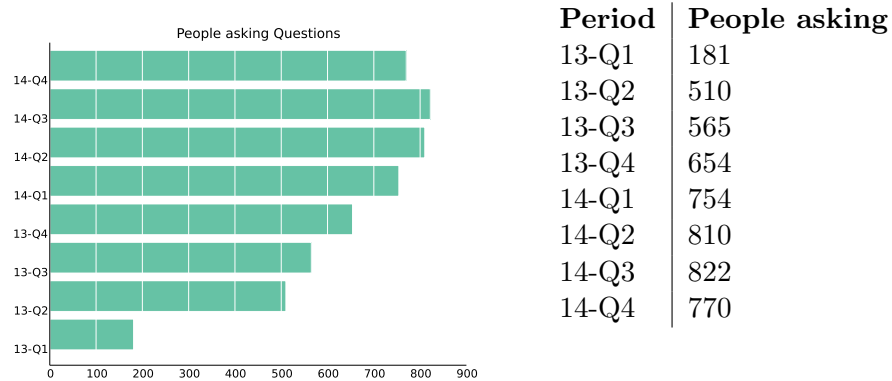
- Top visited questions.

Question subject	Visits
nova list error httpconnectionpoolhostcontroller port8774 max+	1027
how to extend the time allowed+	892
mongodbpp error when installing rdo on+	830
authentication failed when setting up two+	700
rdo installation problem on centos 7+	556
error connectionerror httpconnectionpoolhostopenstack port8774 max retries+	478
rdo deploy openstack error execution of+	420
devstack not starting because of urllib3connectionpool+	402
what are the supported tenant network+	375
juno error while launching instance+	370

- Top questions with more comments.

Question subject	Comments
cant remove router spanning tree+	5
systemctl status neutron serverservice is not+	5
cannot attach volume to instance+	5
calling http1692541692542009 04 04meta datainstance id+	5
need help setting up neutron networking+	5
ceilometer api critical error openstack icehouse+	5
vms not getting ip through dhcp+	5
ssh public key cant be injected+	5
vm cant access external network with+	5
nova instance console error failed to+	5

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

Question subject	People participating
cant create instances status got error+	9
mongodbpp error when installing rdo on+	8
juno error while launching instance+	7
nova list error httpconnectionpoolhostcontroller port8774 max+	7
error in creating instances+	7
rdo deploy openstack error execution of+	7
openstack nuetron and vmware standard switches+	6
juno vm stuck at spawning state+	6
where is devstackorg+	6
systemctl status neutron serverservice is not+	6

- Top tags

Tag name	Ocurrences
OpenStack	1473
forum	1473
community	1241
Ask	1234
gerrit	977
cloud	930
stackforge	604
iaas	554
branch	314
ovs	309
qemu	100
create	90
unreachable	80
soft-lockup	74
neutron	74

3.4 IRC

Messages in IRC channels
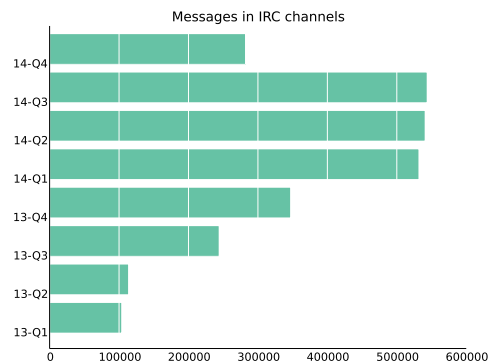
Period	Messages
13-Q1	103851
13-Q2	113730
13-Q3	244193
13-Q4	347085
14-Q1	531899
14-Q2	540845
14-Q3	543772
14-Q4	282124

People in IRC channels
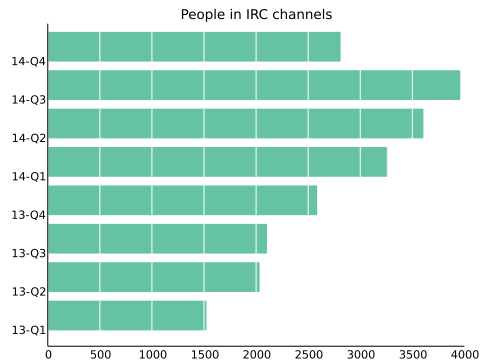
Period	People
13-Q1	1528
13-Q2	2038
13-Q3	2109
13-Q4	2591
14-Q1	3260
14-Q2	3611
14-Q3	3965
14-Q4	2816

IRC id	Messages sent
clarkb	7224
Jeremy Stanley	5970
ayoung	5403
morganfainberg	4989
Anita Kuno	4421
jroll	3585
flaper87	3332
Angus Salkeld	3282
sdake	3131
Thierry Carrez	2961
Devananda	2858
Sam-I-Am	2800
mtreinish	2776
dhellmann	2659
NoBodyCam	2548

Appendix A

Metrics Definitions

Metrics depicted in each OpenStack program:

- Commit: this is defined as the action(s) that performes a change in the source code. Bots, merges and other type of automatic activity is removed from the records. Besides, when aggregating several Gits, 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. Besides, this metric is 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 changeset 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 depicted 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[1].

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[2] provided by the OpenStack Foundation.

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

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[1]`https://github.com/VizGrimoire/GrimoireLib/blob/master/vizGrimoireJS/openstack_report.py`.
In order to download the exact version used for this analysis with the hash *xxxx*

[2]urlhttp://git.openstack.org/cgit/openstack/governance/tree/reference/programs.yaml

cinder	scm	https://github.com/openstack/cinder.git
cinder	scr	review.openstack.org_openstack/cinder
clients	its	https://bugs.launchpad.net/python-ceilometerclient
clients	its	https://bugs.launchpad.net/python-cinderclient
clients	its	https://bugs.launchpad.net/python-designateclient
clients	its	https://bugs.launchpad.net/python-glanceclient
clients	its	https://bugs.launchpad.net/python-heatclient
clients	its	https://bugs.launchpad.net/python-keystoneclient
clients	its	https://bugs.launchpad.net/python-neutronclient
clients	its	https://bugs.launchpad.net/python-novaclient
clients	its	https://bugs.launchpad.net/python-saharaclient
clients	its	https://bugs.launchpad.net/python-swiftclient
clients	its	https://bugs.launchpad.net/python-zaqarclient
clients	scm	git://git.openstack.org/openstack-dev/heat-cfnclient
clients	scm	git://git.openstack.org/openstack/python-kiteclient
clients	scm	git://git.openstack.org/openstack/python-saharaclient
clients	scm	git://git.openstack.org/openstack/python-zaqarclient
clients	scm	https://github.com/openstack/python-ceilometerclient.git
clients	scm	https://github.com/openstack/python-cinderclient.git
clients	scm	https://github.com/openstack/python-glanceclient.git
clients	scm	https://github.com/openstack/python-heatclient.git
clients	scm	https://github.com/openstack/python-ironicclient.git
clients	scm	https://github.com/openstack/python-keystoneclient.git
clients	scm	https://github.com/openstack/python-neutronclient.git
clients	scm	https://github.com/openstack/python-novaclient.git
clients	scm	https://github.com/openstack/python-swiftclient.git
clients	scm	https://github.com/openstack/python-troveclient.git
clients	scr	review.openstack.org_openstack/python-ceilometerclient
clients	scr	review.openstack.org_openstack/python-cinderclient
clients	scr	review.openstack.org_openstack/python-glanceclient
clients	scr	review.openstack.org_openstack/python-heatclient
clients	scr	review.openstack.org_openstack/python-ironicclient
clients	scr	review.openstack.org_openstack/python-keystoneclient
clients	scr	review.openstack.org_openstack/python-kiteclient
clients	scr	review.openstack.org_openstack/python-neutronclient
clients	scr	review.openstack.org_openstack/python-novaclient
clients	scr	review.openstack.org_openstack/python-saharaclient
clients	scr	review.openstack.org_openstack/python-swiftclient
clients	scr	review.openstack.org_openstack/python-troveclient
clients	scr	review.openstack.org_openstack/python-zaqarclient

clients	scr	review.openstack.org_stackforge/python-designateclient
Common Libraries	its	https://bugs.launchpad.net/hacking
Common Libraries	its	https://bugs.launchpad.net/oslo.messaging
Common Libraries	its	https://bugs.launchpad.net/pbr
Common Libraries	its	https://bugs.launchpad.net/taskflow
Common Libraries	scm	git://git.openstack.org/openstack-dev/oslo-cookiecutter
Common Libraries	scm	git://git.openstack.org/openstack/oslo.concurrency
Common Libraries	scm	git://git.openstack.org/openstack/oslo.context
Common Libraries	scm	git://git.openstack.org/openstack/oslo.db
Common Libraries	scm	git://git.openstack.org/openstack/oslo.i18n
Common Libraries	scm	git://git.openstack.org/openstack/oslo.rootwrap
Common Libraries	scm	git://git.openstack.org/openstack/oslo.vmware
Common Libraries	scm	git://git.openstack.org/openstack/oslosphinx
Common Libraries	scm	git://git.openstack.org/openstack/pycadf
Common Libraries	scm	git://git.openstack.org/openstack/stevedore
Common Libraries	scm	git://git.openstack.org/openstack/taskflow
Common Libraries	scm	git://git.openstack.org/openstack/tooz
Common Libraries	scm	https://github.com/openstack/oslo-incubator.git
Common Libraries	scm	https://github.com/openstack/oslo.config.git
Common Libraries	scm	https://github.com/openstack/oslo.messaging.git
Common Libraries	scm	https://github.com/openstack/oslo.version.git
Common Libraries	scr	review.openstack.org_openstack-dev/hacking
Common Libraries	scr	review.openstack.org_openstack-dev/pbr
Common Libraries	scr	review.openstack.org_openstack/oslo-incubator
Common Libraries	scr	review.openstack.org_openstack/oslo.concurrency
Common Libraries	scr	review.openstack.org_openstack/oslo.config
Common Libraries	scr	review.openstack.org_openstack/oslo.context
Common Libraries	scr	review.openstack.org_openstack/oslo.db
Common Libraries	scr	review.openstack.org_openstack/oslo.i18n
Common Libraries	scr	review.openstack.org_openstack/tooz
Deployment	its	https://bugs.launchpad.net/python-tuskarclient
Deployment	its	https://bugs.launchpad.net/tuskar
Deployment	scm	git://git.openstack.org/openstack/os-apply-config
Deployment	scm	git://git.openstack.org/openstack/os-cloud-config
Deployment	scm	git://git.openstack.org/openstack/os-collect-config
Deployment	scm	git://git.openstack.org/openstack/os-refresh-config
Deployment	scm	git://git.openstack.org/openstack/python-tuskarclient
Deployment	scm	git://git.openstack.org/openstack/tripleo-puppet-elements
Deployment	scm	git://git.openstack.org/openstack/tuskar
Deployment	scm	https://github.com/openstack/tripleo-heat-templates.git

Deployment	scm	https://github.com/openstack/tripleo-image-elements.git
Deployment	scm	https://github.com/openstack/tripleo-incubator.git
Deployment	scr	review.openstack.org_openstack/diskimage-builder
Deployment	scr	review.openstack.org_openstack/os-apply-config
Deployment	scr	review.openstack.org_openstack/os-cloud-config
Deployment	scr	review.openstack.org_openstack/os-collect-config
Deployment	scr	review.openstack.org_openstack/os-refresh-config
Deployment	scr	review.openstack.org_openstack/python-tuskarclient
Deployment	scr	review.openstack.org_openstack/tripleo-heat-templates
Deployment	scr	review.openstack.org_openstack/tripleo-image-elements
Deployment	scr	review.openstack.org_openstack/tripleo-incubator
Deployment	scr	review.openstack.org_openstack/tripleo-puppet-elements
Deployment	scr	review.openstack.org_openstack/tuskar
designate	its	https://bugs.launchpad.net/designate
designate	scm	git://git.openstack.org/openstack/designate
designate	scr	review.openstack.org_openstack/designate
Documentation	its	https://bugs.launchpad.net/openstack-api-site
Documentation	its	https://bugs.launchpad.net/openstack-manuals
Documentation	scm	git://git.openstack.org/openstack/ha-guide
Documentation	scm	git://git.openstack.org/openstack/openstack-doc-tools
Documentation	scm	git://git.openstack.org/openstack/operations-guide
Documentation	scm	git://git.openstack.org/openstack/security-doc
Documentation	scm	git://git.openstack.org/openstack/training-guides
Documentation	scm	https://github.com/openstack/api-site.git
Documentation	scm	https://github.com/openstack/compute-api.git
Documentation	scm	https://github.com/openstack/identity-api.git
Documentation	scm	https://github.com/openstack/image-api.git
Documentation	scm	https://github.com/openstack/netconn-api.git
Documentation	scm	https://github.com/openstack/object-api.git
Documentation	scm	https://github.com/openstack/openstack-manuals.git
Documentation	scm	https://github.com/openstack/volume-api.git
Documentation	scr	review.openstack.org_openstack/api-site
Documentation	scr	review.openstack.org_openstack/compute-api
Documentation	scr	review.openstack.org_openstack/ha-guide
Documentation	scr	review.openstack.org_openstack/identity-api
Documentation	scr	review.openstack.org_openstack/image-api
Documentation	scr	review.openstack.org_openstack/netconn-api
Documentation	scr	review.openstack.org_openstack/object-api
Documentation	scr	review.openstack.org_openstack/openstack-doc-tools
Documentation	scr	review.openstack.org_openstack/openstack-manuals

Documentation	scr	review.openstack.org_openstack/operations-guide
Documentation	scr	review.openstack.org_openstack/security-doc
Documentation	scr	review.openstack.org_openstack/training-guides
Documentation	scr	review.openstack.org_openstack/volume-api
glance	its	https://bugs.launchpad.net/glance
glance	scm	git://git.openstack.org/openstack/glance_store
glance	scm	https://github.com/openstack/glance.git
glance	scr	review.openstack.org_openstack/glance
glance	scr	review.openstack.org_openstack/glance_store
heat	its	https://bugs.launchpad.net/heat
heat	scm	git://git.openstack.org/openstack/heat-translator
heat	scm	https://github.com/openstack/heat.git
heat	scr	review.openstack.org_openstack/heat
heat	scr	review.openstack.org_openstack/heat-translator
horizon	its	https://bugs.launchpad.net/horizon
horizon	scm	https://github.com/openstack/horizon.git
horizon	scr	review.openstack.org_openstack/horizon
Infrastructure	its	https://bugs.launchpad.net/openstack-ci
Infrastructure	scm	git://git.openstack.org/openstack-dev/openstack-nose
Infrastructure	scm	git://git.openstack.org/openstack-infra/activity-board
Infrastructure	scm	git://git.openstack.org/openstack-infra/elastic-recheck
Infrastructure	scm	git://git.openstack.org/openstack-infra/groups
Infrastructure	scm	git://git.openstack.org/openstack-infra/irc-meetings
Infrastructure	scm	git://git.openstack.org/openstack-infra/nodepool
Infrastructure	scm	git://git.openstack.org/openstack-infra/odsreg
Infrastructure	scm	git://git.openstack.org/openstack-infra/os-loganalyze
Infrastructure	scm	git://git.openstack.org/openstack-infra/project-config
Infrastructure	scm	git://git.openstack.org/openstack-infra/storyboard
Infrastructure	scm	git://git.openstack.org/openstack-infra/storyboard-webclient
Infrastructure	scm	git://git.openstack.org/openstack-infra/subunit2sql
Infrastructure	scm	git://git.openstack.org/openstack-infra/tripleo-ci
Infrastructure	scm	git://git.openstack.org/openstack-infra/zuul-packaging
Infrastructure	scm	https://github.com/openstack-infra/askbot-theme.git
Infrastructure	scm	https://github.com/openstack-infra/config.git
Infrastructure	scm	https://github.com/openstack-infra/devstack-gate.git
Infrastructure	scm	https://github.com/openstack-infra/gear.git
Infrastructure	scm	https://github.com/openstack-infra/gearman-plugin.git
Infrastructure	scm	https://github.com/openstack-infra/gerritbot.git
Infrastructure	scm	https://github.com/openstack-infra/gerritlib.git

Infrastructure	scm	https://github.com/openstack-infra/git-review.git
Infrastructure	scm	https://github.com/openstack-infra/jeepyb.git
Infrastructure	scm	https://github.com/openstack-infra/jenkins-job-builder.git
Infrastructure	scm	https://github.com/openstack-infra/nose-html-output.git
Infrastructure	scm	https://github.com/openstack-infra/releasestatus.git
Infrastructure	scm	https://github.com/openstack-infra/reviewday.git
Infrastructure	scm	https://github.com/openstack-infra/statusbot.git
Infrastructure	scm	https://github.com/openstack-infra/zmq-event-publisher.git
Infrastructure	scm	https://github.com/openstack-infra/zuul.git
Infrastructure	scm	https://github.com/openstack/openstack-planet.git
Infrastructure	scr	review.openstack.org_openstack-dev/openstack-nose
Infrastructure	scr	review.openstack.org_openstack-infra/askbot-theme
Infrastructure	scr	review.openstack.org_openstack-infra/config
Infrastructure	scr	review.openstack.org_openstack-infra/devstack-gate
Infrastructure	scr	review.openstack.org_openstack-infra/gear
Infrastructure	scr	review.openstack.org_openstack-infra/gearman-plugin
Infrastructure	scr	review.openstack.org_openstack-infra/gerrit
Infrastructure	scr	review.openstack.org_openstack-infra/gerritbot
Infrastructure	scr	review.openstack.org_openstack-infra/gerritlib
Infrastructure	scr	review.openstack.org_openstack-infra/git-review
Infrastructure	scr	review.openstack.org_openstack-infra/gitdm
Infrastructure	scr	review.openstack.org_openstack-infra/irc-meetings
Infrastructure	scr	review.openstack.org_openstack-infra/jeepyb
Infrastructure	scr	review.openstack.org_openstack-infra/jenkins-job-builder
Infrastructure	scr	review.openstack.org_openstack-infra/lodgeit
Infrastructure	scr	review.openstack.org_openstack-infra/meetbot
Infrastructure	scr	review.openstack.org_openstack-infra/nose-html-output
Infrastructure	scr	review.openstack.org_openstack-infra/odsreg
Infrastructure	scr	review.openstack.org_openstack-infra/project-config
Infrastructure	scr	review.openstack.org_openstack-infra/publications
Infrastructure	scr	review.openstack.org_openstack-infra/puppet-apparmor
Infrastructure	scr	review.openstack.org_openstack-infra/puppet-dashboard
Infrastructure	scr	review.openstack.org_openstack-infra/puppet-vcsrepo
Infrastructure	scr	review.openstack.org_openstack-infra/pypi-mirror
Infrastructure	scr	review.openstack.org_openstack-infra/releasestatus
Infrastructure	scr	review.openstack.org_openstack-infra/reviewday
Infrastructure	scr	review.openstack.org_openstack-infra/statusbot
Infrastructure	scr	review.openstack.org_openstack-infra/subunit2sql
Infrastructure	scr	review.openstack.org_openstack-infra/zmq-event-publisher

Infrastructure	scr	review.openstack.org_openstack-infra/zuul
Infrastructure	scr	review.openstack.org_openstack/openstack-planet
ironic	its	https://bugs.launchpad.net/ironic
ironic	scm	git://git.openstack.org/openstack/ironic-python-agent
ironic	scm	https://github.com/openstack/ironic.git
ironic	scr	review.openstack.org_openstack/ironic
ironic	scr	review.openstack.org_openstack/ironic-python-agent
keystone	its	https://bugs.launchpad.net/keystone
keystone	scm	git://git.openstack.org/openstack/keystonemiddleware
keystone	scm	git://git.openstack.org/openstack/keystonemiddleware
keystone	scm	git://git.openstack.org/openstack/python-keystoneclient-federation
keystone	scm	git://git.openstack.org/openstack/python-keystoneclient-kerberos
keystone	scm	https://github.com/openstack/keystone.git
keystone	scr	review.openstack.org_openstack/keystone
keystone	scr	review.openstack.org_openstack/keystonemiddleware
keystone	scr	review.openstack.org_openstack/python-keystoneclient-federation
keystone	scr	review.openstack.org_openstack/python-keystoneclient-kerberos
manila	its	https://bugs.launchpad.net/manila
manila	scm	git://git.openstack.org/openstack/manila
manila	scr	review.openstack.org_openstack/manila
neutron	its	https://bugs.launchpad.net/neutron
neutron	scm	git://git.openstack.org/openstack/neutron-fwaas
neutron	scm	git://git.openstack.org/openstack/neutron-lbaas
neutron	scm	git://git.openstack.org/openstack/neutron-vpnaas
neutron	scm	https://github.com/openstack/neutron.git
neutron	scr	review.openstack.org_openstack/neutron
neutron	scr	review.openstack.org_openstack/neutron-fwaas
neutron	scr	review.openstack.org_openstack/neutron-lbaas
neutron	scr	review.openstack.org_openstack/neutron-vpnaas
nova	its	https://bugs.launchpad.net/nova
nova	scm	https://github.com/openstack/nova.git
nova	scr	review.openstack.org_openstack/nova
others	its	https://bugs.launchpad.net/django-openstack-auth
others	its	https://bugs.launchpad.net/heat-cfntools
others	its	https://bugs.launchpad.net/heat-templates
others	its	https://bugs.launchpad.net/swift-bench

others	its	https://bugs.launchpad.net/tuskar-ui
others	scm	git://git.openstack.org/openstack/django_openstack_auth
others	scm	git://git.openstack.org/openstack/heat-cfntools
others	scm	git://git.openstack.org/openstack/sahara-dashboard
others	scm	git://git.openstack.org/openstack/sahara-extra
others	scm	git://git.openstack.org/openstack/sahara-image-elements
others	scm	git://git.openstack.org/openstack/swift-bench
others	scm	git://git.openstack.org/openstack/trove-integration
others	scm	git://git.openstack.org/openstack/tuskar-ui
others	scr	review.openstack.org_openstack/heat-cfntools
others	scr	review.openstack.org_openstack/heat-templates
others	scr	review.openstack.org_openstack/sahara-dashboard
others	scr	review.openstack.org_openstack/sahara-extra
others	scr	review.openstack.org_openstack/sahara-image-elements
others	scr	review.openstack.org_openstack/trove-integration
Quality Assurance	its	https://bugs.launchpad.net/devstack
Quality Assurance	its	https://bugs.launchpad.net/tempest
Quality Assurance	scm	git://git.openstack.org/openstack-dev/devstack
Quality Assurance	scm	git://git.openstack.org/openstack-dev/grenade
Quality Assurance	scm	git://git.openstack.org/openstack/tempest-lib
Quality Assurance	scm	https://github.com/openstack/tempest.git
Quality Assurance	scr	review.openstack.org_openstack-dev/devstack
Quality Assurance	scr	review.openstack.org_openstack-dev/grenade
Quality Assurance	scr	review.openstack.org_openstack/tempest
Quality Assurance	scr	review.openstack.org_openstack/tempest-lib
Release cycle management	scm	git://git.openstack.org/openstack-infra/release-tools
Release cycle management	scm	git://git.openstack.org/openstack/requirements
Release cycle management	scr	review.openstack.org_openstack/requirements
sahara	its	https://bugs.launchpad.net/sahara
sahara	scm	git://git.openstack.org/openstack/sahara
sahara	scr	review.openstack.org_openstack/sahara
swift	its	https://bugs.launchpad.net/swift
swift	scm	https://github.com/openstack/swift.git
swift	scr	review.openstack.org_openstack/swift
trove	its	https://bugs.launchpad.net/trove
trove	scm	https://github.com/openstack/trove.git
trove	scr	review.openstack.org_openstack/trove

zaqar	its	https://bugs.launchpad.net/zaqar
zaqar	scm	git://git.openstack.org/openstack/zaqar
zaqar	scr	review.openstack.org_openstack/zaqar