FG Resource Report

Release 0.4

Hyungro Lee **Gregor von Laszewski**
Fugang Wang **Geoffrey C. Fox**

January 03, 2014

CONTENTS

Date Created: Fri, 03 Jan 2014

CHAPTER

ONE

SUMMARY REPORT (ALL)

- Period: January 01 – December 23, 2013
- Cloud(india.futuregrid.org): eucalyptus, openstack
- Cloud(sierra.futuregrid.org): eucalyptus, nimbus
- Cloud(hotel.futuregrid.org): nimbus
- Cloud(alamo.futuregrid.org): nimbus
- Cloud(foxtrot.futuregrid.org): nimbus
- Metrics: VMs count, Users count, Wall hours, Distribution by Wall Hours, Project, Project Leader, and Institution, and Systems

1.1 Wall Hours by Clusters (Total, monthly)

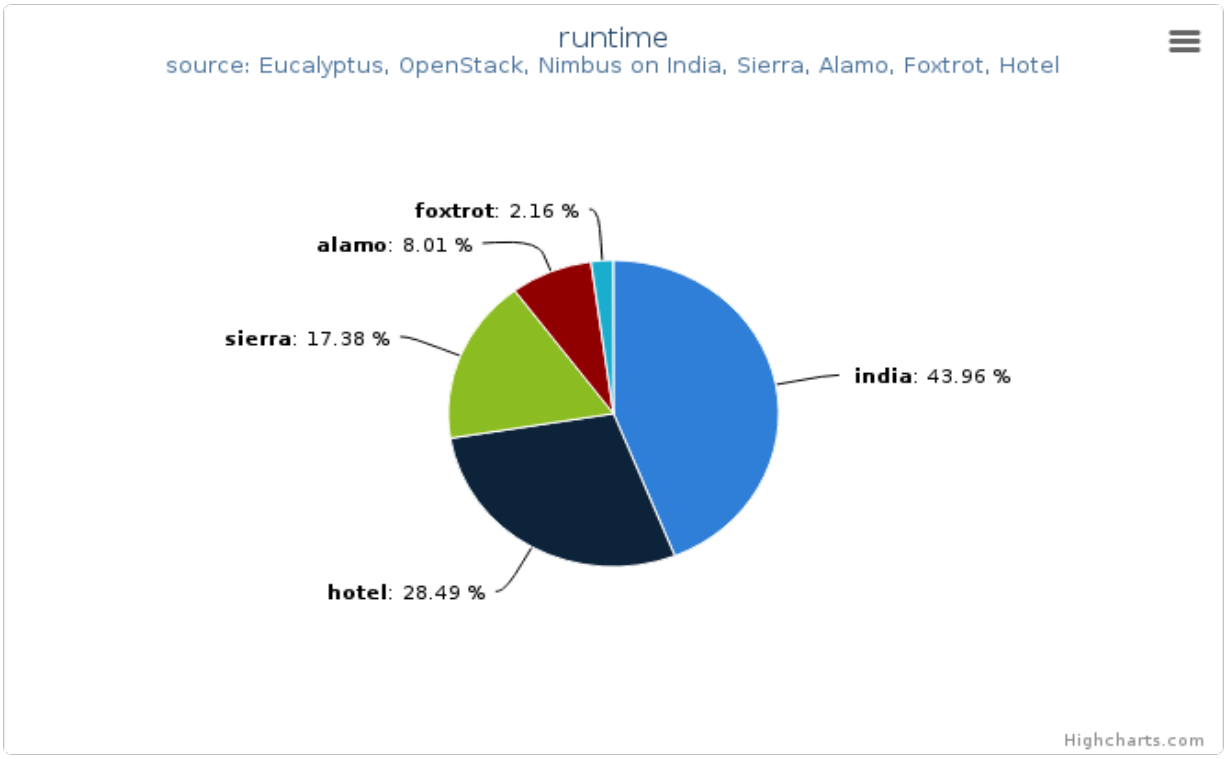

Figure 1. Wall time (hours) by Clusters
This chart represents overall usage of wall time (hours).

- Period: January 01 – December 23, 2013
- **Cloud:**
  - india: Eucalyptus, Openstack
  - sierra: Eucalyptus, Nimbus
  - hotel: Nimbus
  - alamo: Nimbus
  - foxtrot: Nimbus

Table 1.1: Wall time (hours) by Clusters

Total	Value
india	701674.0
hotel	454807.0
sierra	277410.0
alamo	127815.0
foxtrot	34510.0

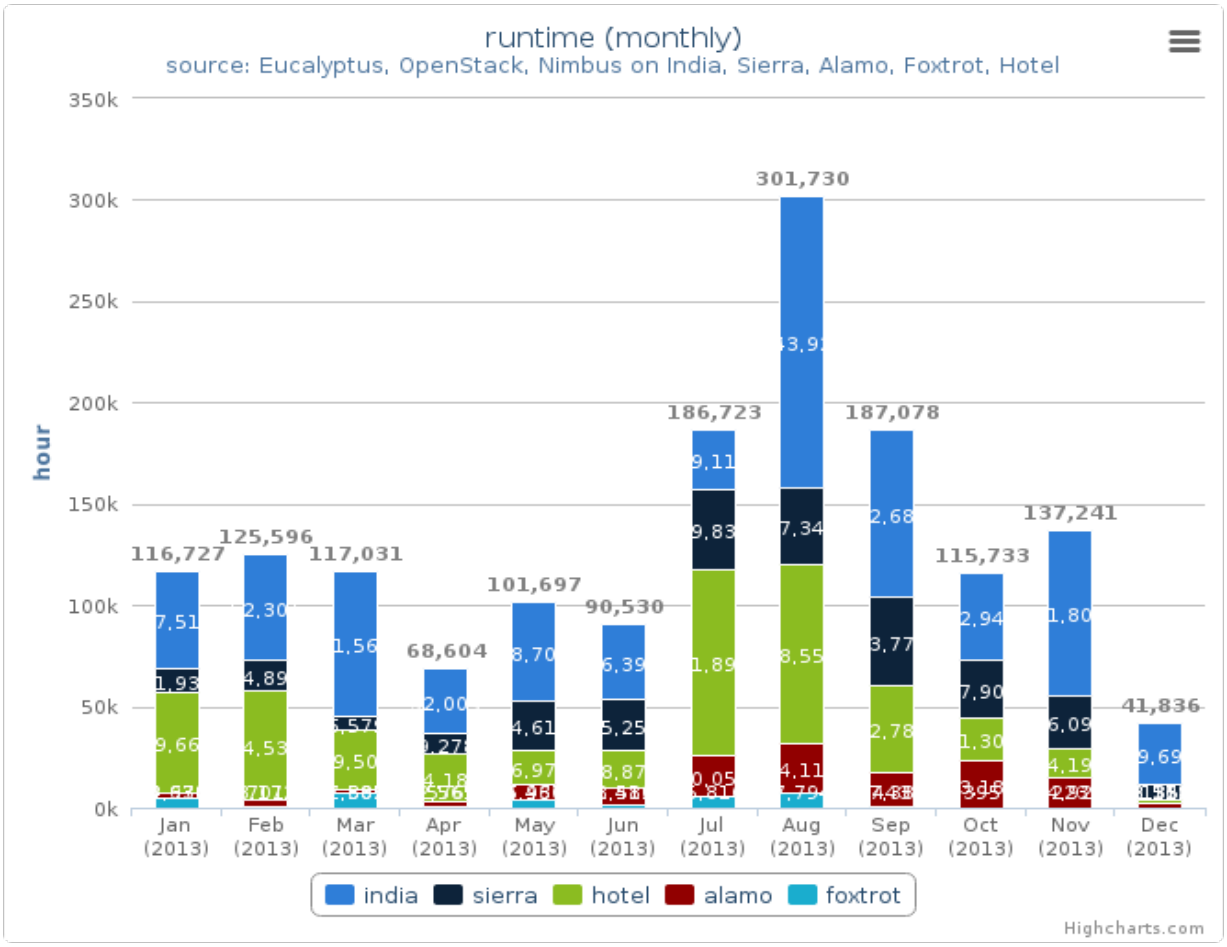

Figure 2. Wall time (hours) by Clusters (monthly)
This stacked column chart represents average monthly usage of wall time (hours).

- Period: January 01 – December 23, 2013
- **Cloud:**
  - india: Eucalyptus, Openstack
  - sierra: Eucalyptus, Nimbus
  - hotel: Nimbus
  - alamo: Nimbus
  - foxtrot: Nimbus

1.2 VM Count by Clusters (Total, monthly)

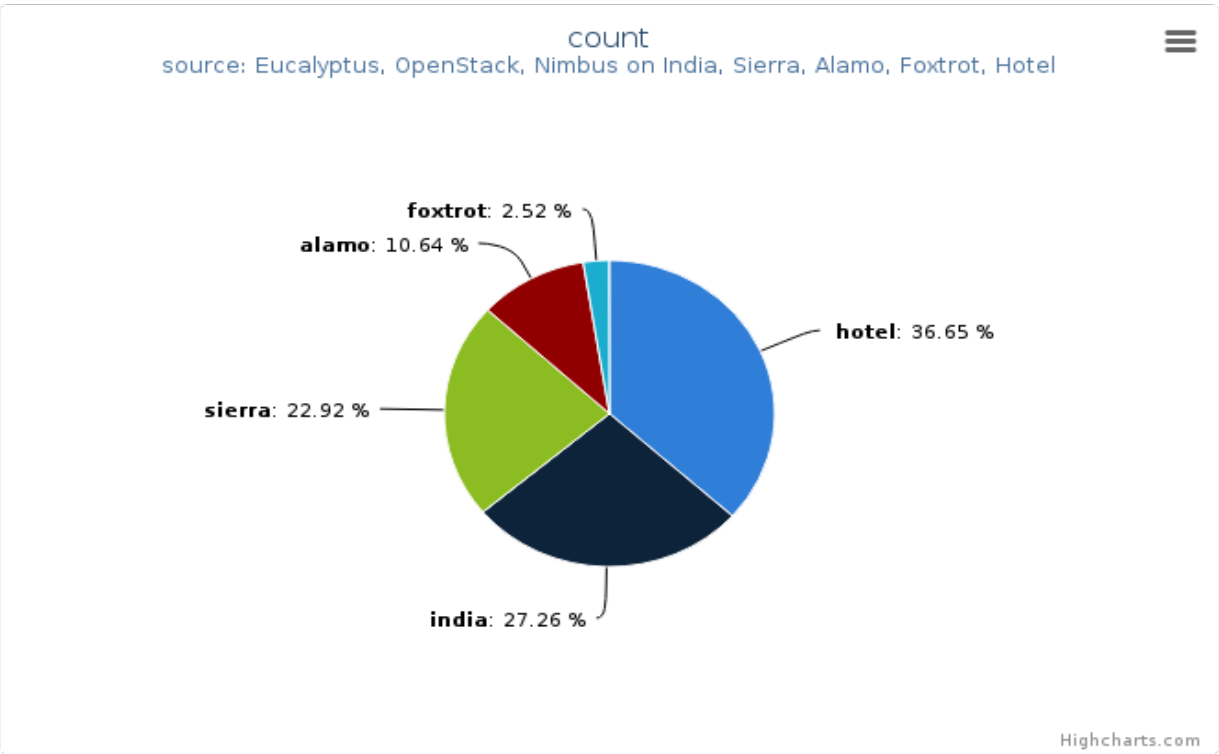

Figure 3. VMs count by Clusters
This chart represents overall VM instances count during the period.

- Period: January 01 – December 23, 2013
- **Cloud:**
  - india: Eucalyptus, Openstack
  - sierra: Eucalyptus, Nimbus
  - hotel: Nimbus
  - alamo: Nimbus
  - foxtrot: Nimbus

Table 1.2: VM instance count by Clusters

Total	Value
hotel	30244
india	22496
sierra	18911
alamo	8784
foxtrot	2083

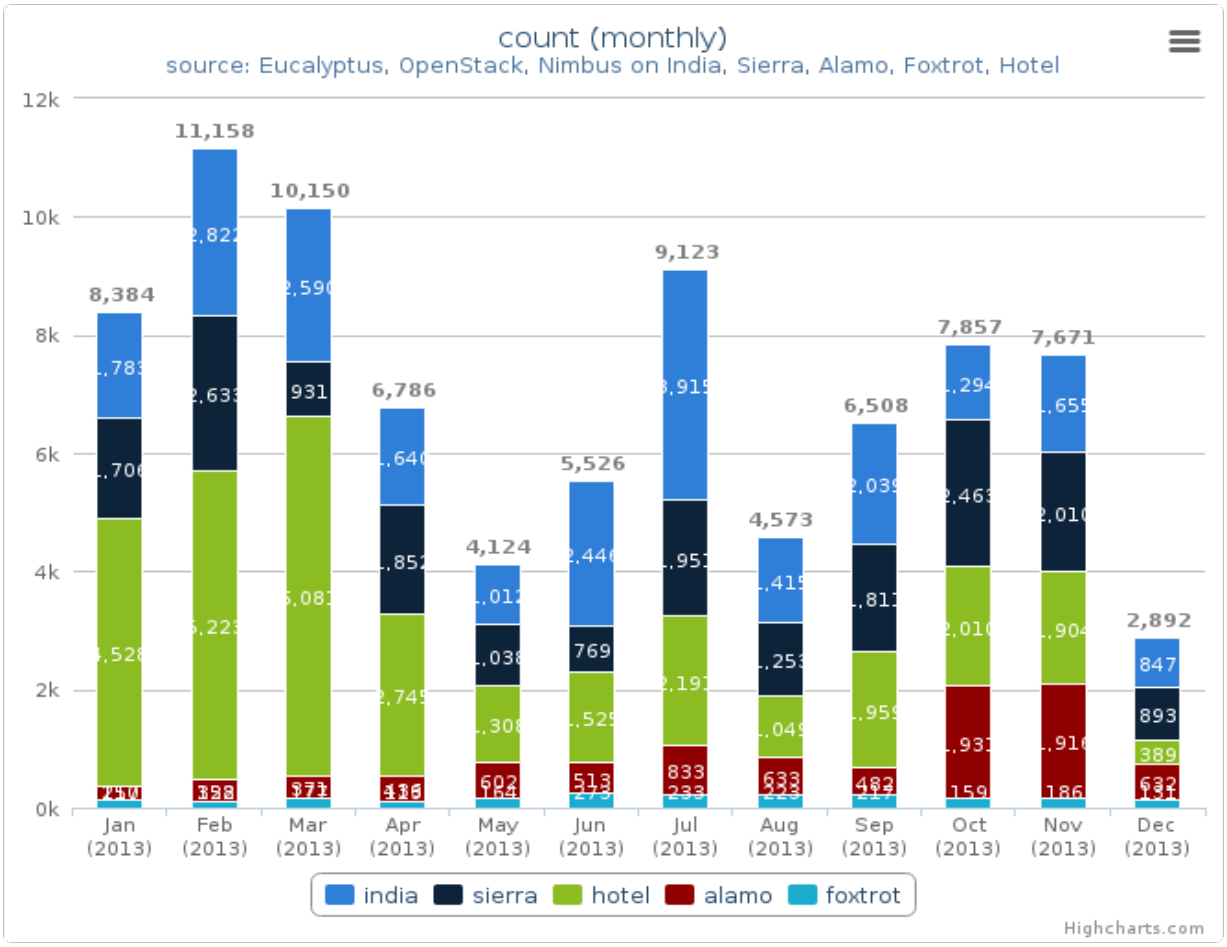

Figure 4. VMs count by Clusters (monthly)
This stacked column chart represents average VM instances count per month.

- Period: January 01 – December 23, 2013
- **Cloud:**
  - india: Eucalyptus, Openstack
  - sierra: Eucalyptus, Nimbus
  - hotel: Nimbus
  - alamo: Nimbus
  - foxtrot: Nimbus

1.3 Users Count by Clusters (Total, monthly)

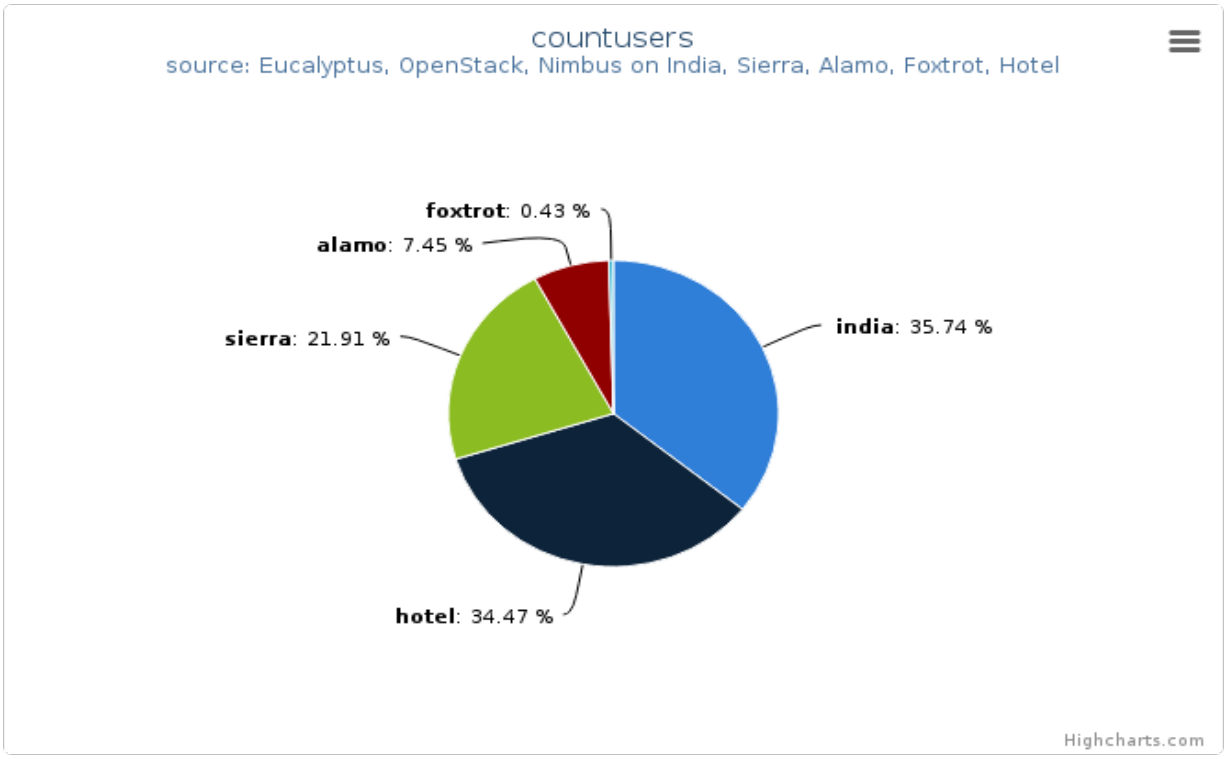

Figure 5. Unique User count by Clusters
This chart represents total number of unique active users.

- Period: January 01 – December 23, 2013
- **Cloud:**
  - india: Eucalyptus, Openstack
  - sierra: Eucalyptus, Nimbus
  - hotel: Nimbus
  - alamo: Nimbus
  - foxtrot: Nimbus

Table 1.3: Unique User count by Clusters

Total	Value
india	168
hotel	162
sierra	103
alamo	35
foxtrot	2

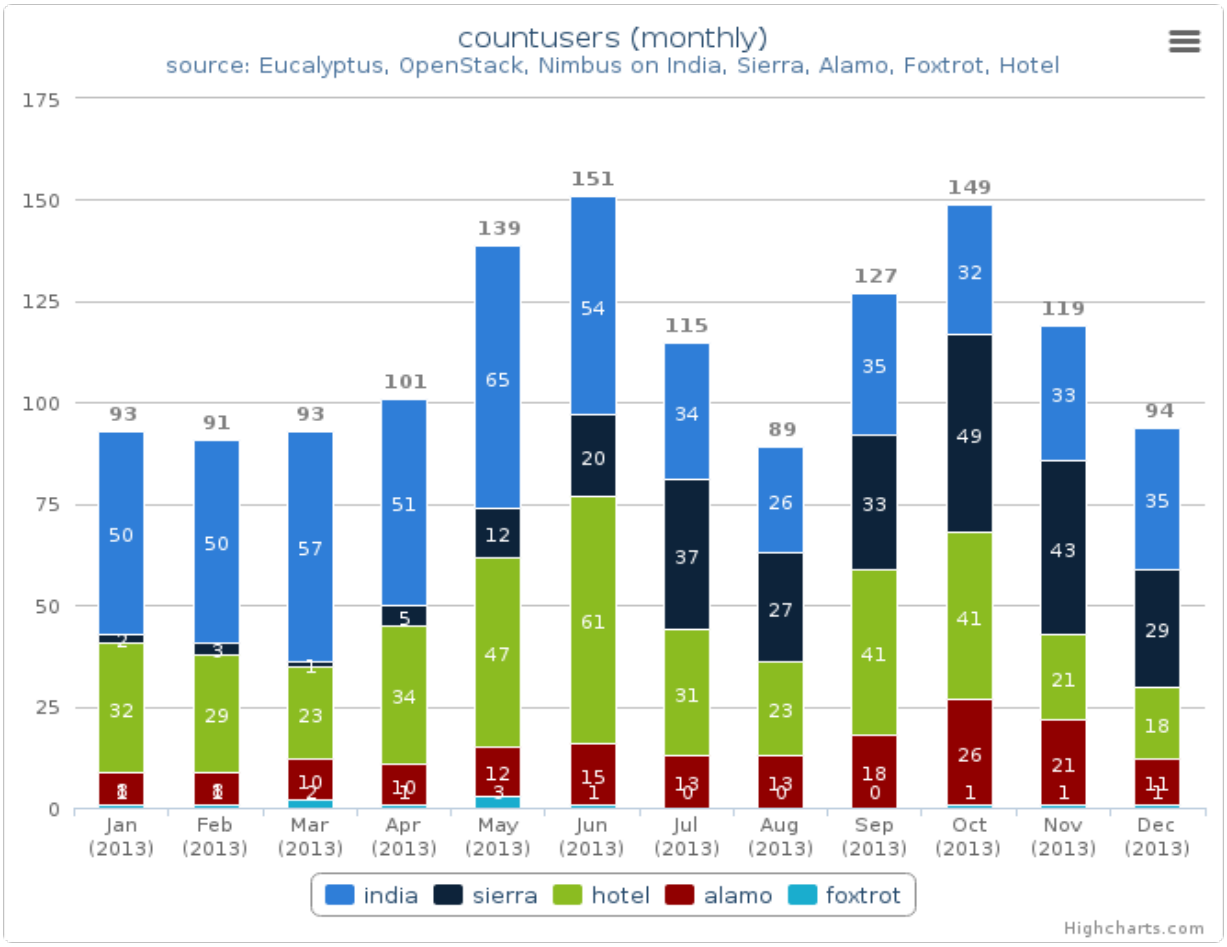

Figure 6. Users count by Clusters (Monthly)
This stacked column chart represents average count of active users per month.

- Period: January 01 – December 23, 2013
- **Cloud:**
  - india: Eucalyptus, Openstack
  - sierra: Eucalyptus, Nimbus
  - hotel: Nimbus
  - alamo: Nimbus
  - foxtrot: Nimbus

CHAPTER

TWO

USAGE REPORT INDIA

- Period: January 01 – December 23, 2013
- Hostname: india.futuregrid.org
- Services: openstack, eucalyptus
- Metrics: VMs count, Users count, Wall time (hours), Distribution by wall time, project, project leader, and institution, and systems

2.1 Histogram

2.1.1 Summary (Monthly)

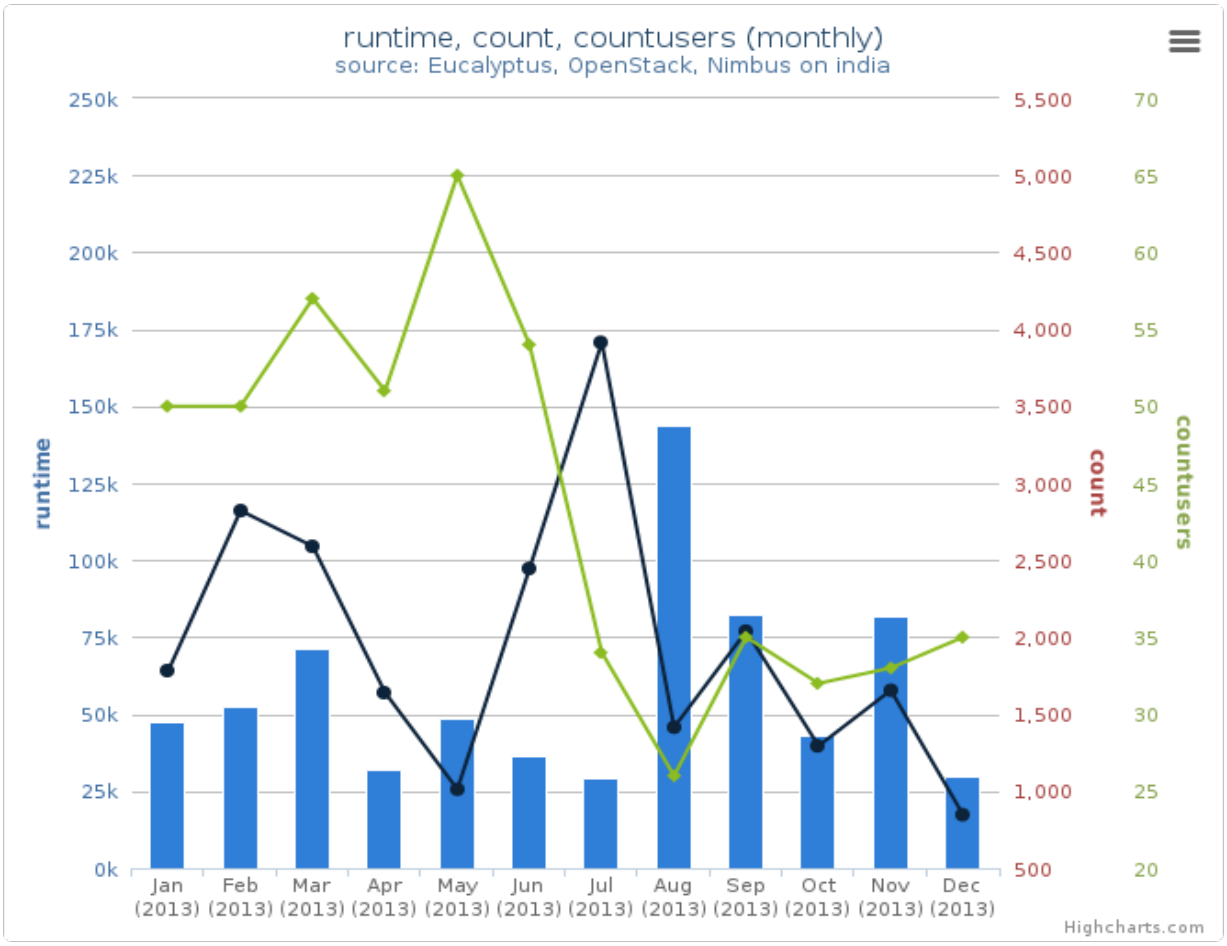

Figure 1: Average monthly usage data (wall time (hour), launched VMs, users)
This mixed chart represents average monthly usage as to wall time (hour), the number of VM instances and active users.

- Period: January 01 – December 23, 2013
- Cloud(IaaS): openstack, eucalyptus
- Hostname: india
- **Metric:**
  - Runtime (Wall time hours): Sum of time elapsed from launch to termination of VM instances
  - Count (VM count): The number of launched VM instances
  - User count (Active): The number of users who launched VMs

2.1.2 Summary (Daily)

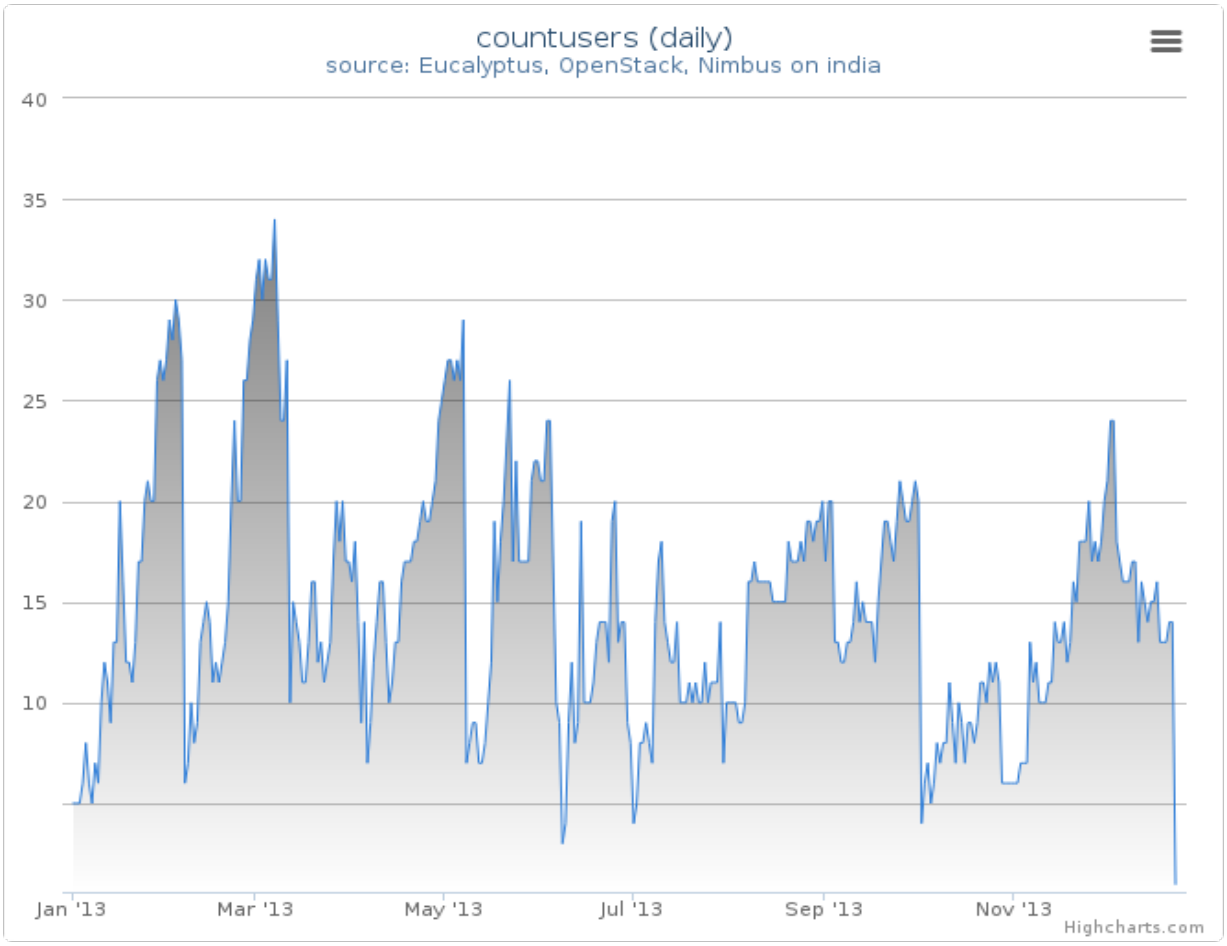

Figure 2: Users count

This time series chart represents daily active user count for cloud services and shows historical changes during the period.

- Period: January 01 – December 23, 2013
- Cloud(IaaS): openstack, eucalyptus
- Hostname: india

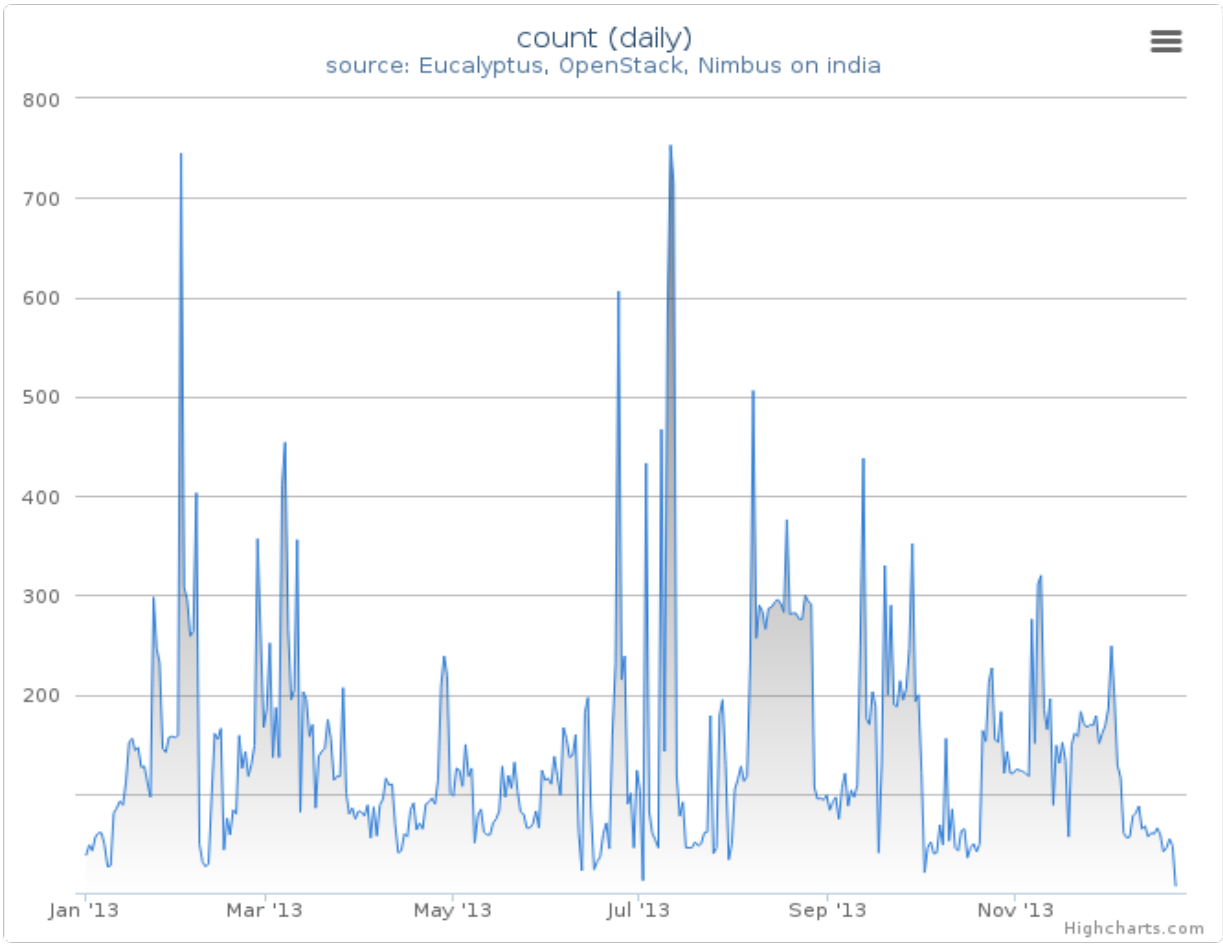

Figure 3: VMs count

This time series chart represents the number of daily launched VM instances for cloud services and shows historical changes during the period.

- Period: January 01 – December 23, 2013
- Cloud(IaaS): openstack, eucalyptus
- Hostname: india

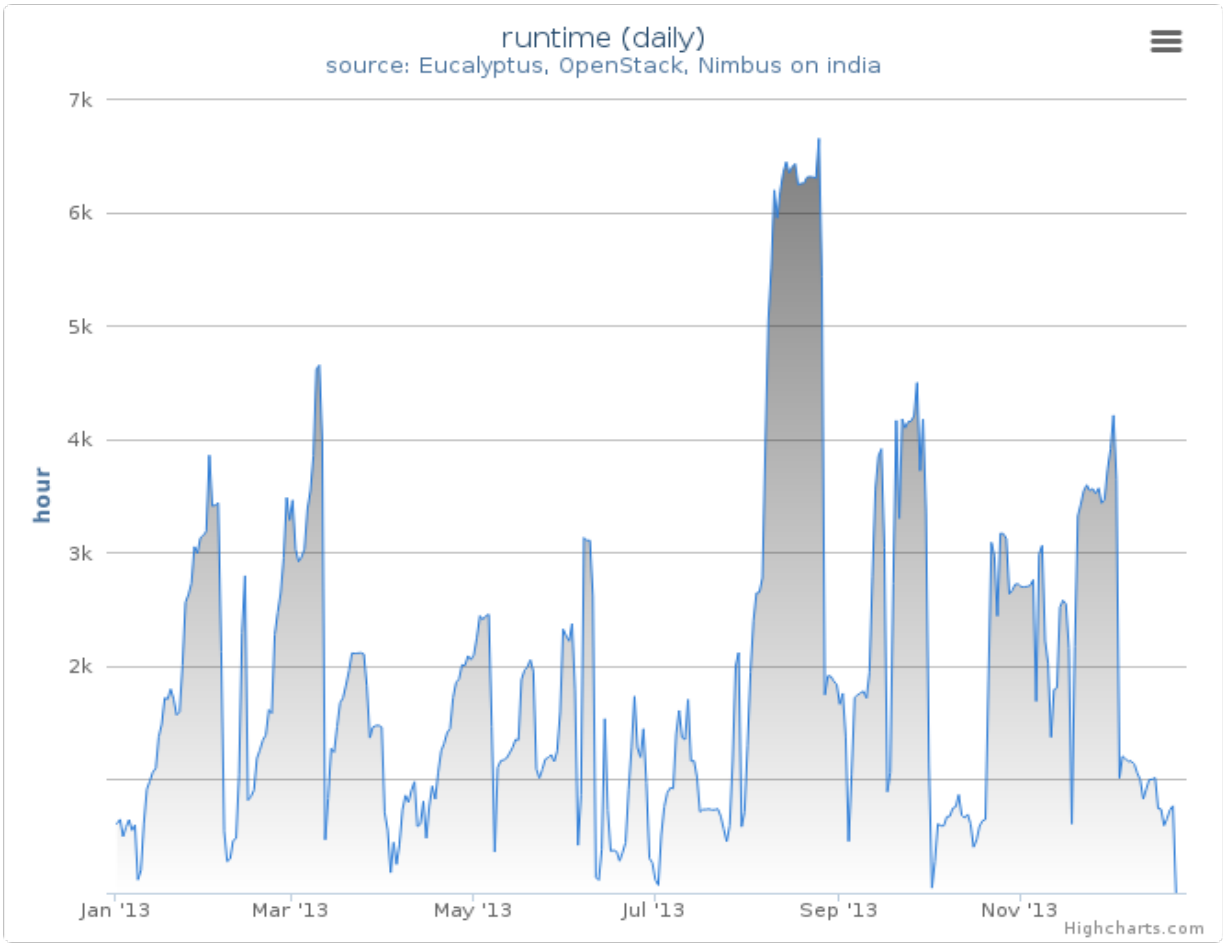

Figure 4: Wall time (hours)

This time series chart represents daily wall time (hours) for cloud services and shows historical changes during the period.

- Period: January 01 – December 23, 2013
- Cloud(IaaS): openstack, eucalyptus
- Hostname: india

2.2 Distribution

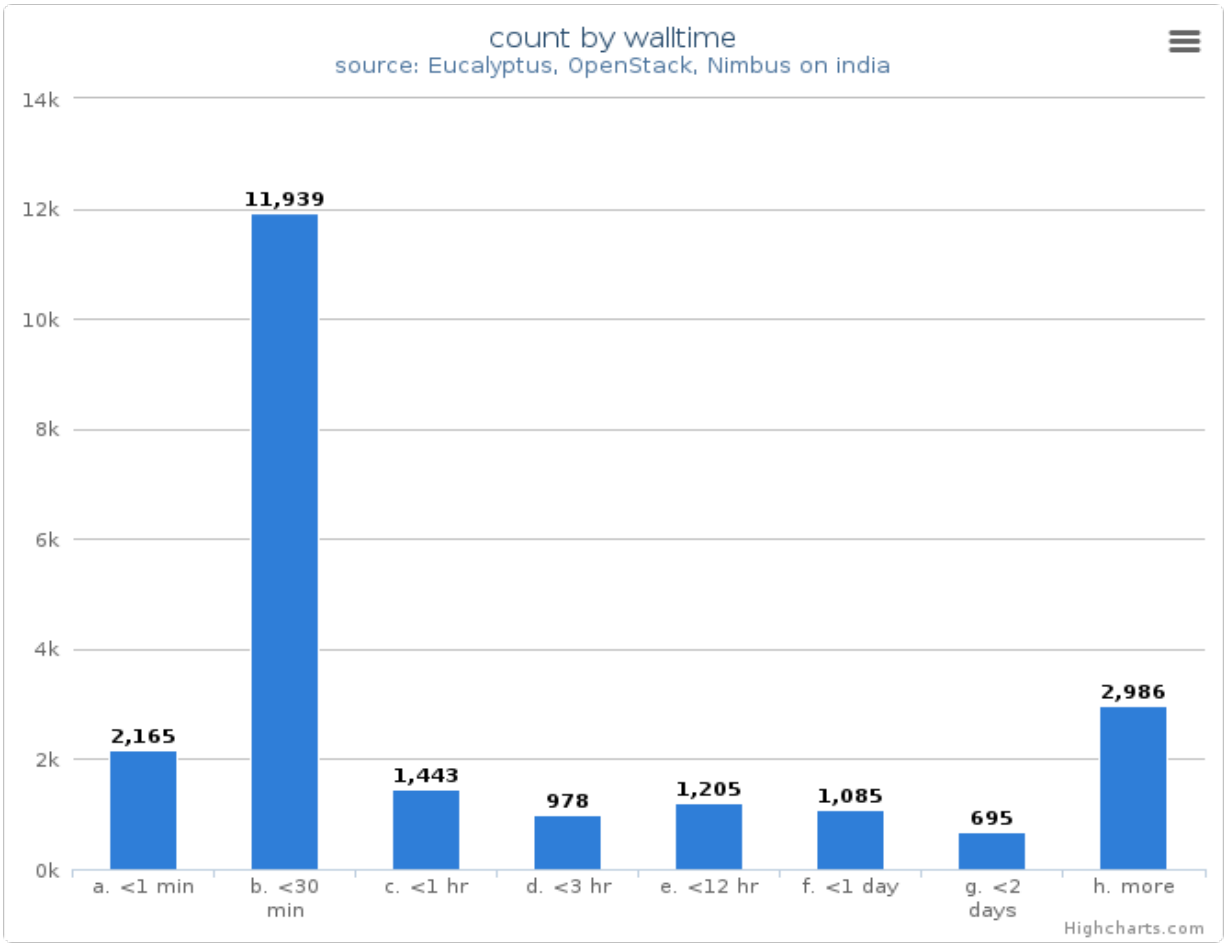

Figure 5: VM count by wall time
This chart illustrates usage patterns of VM instances in terms of running wall time.

- Period: January 01 – December 23, 2013
- Cloud(IaaS): openstack, eucalyptus
- Hostname: india

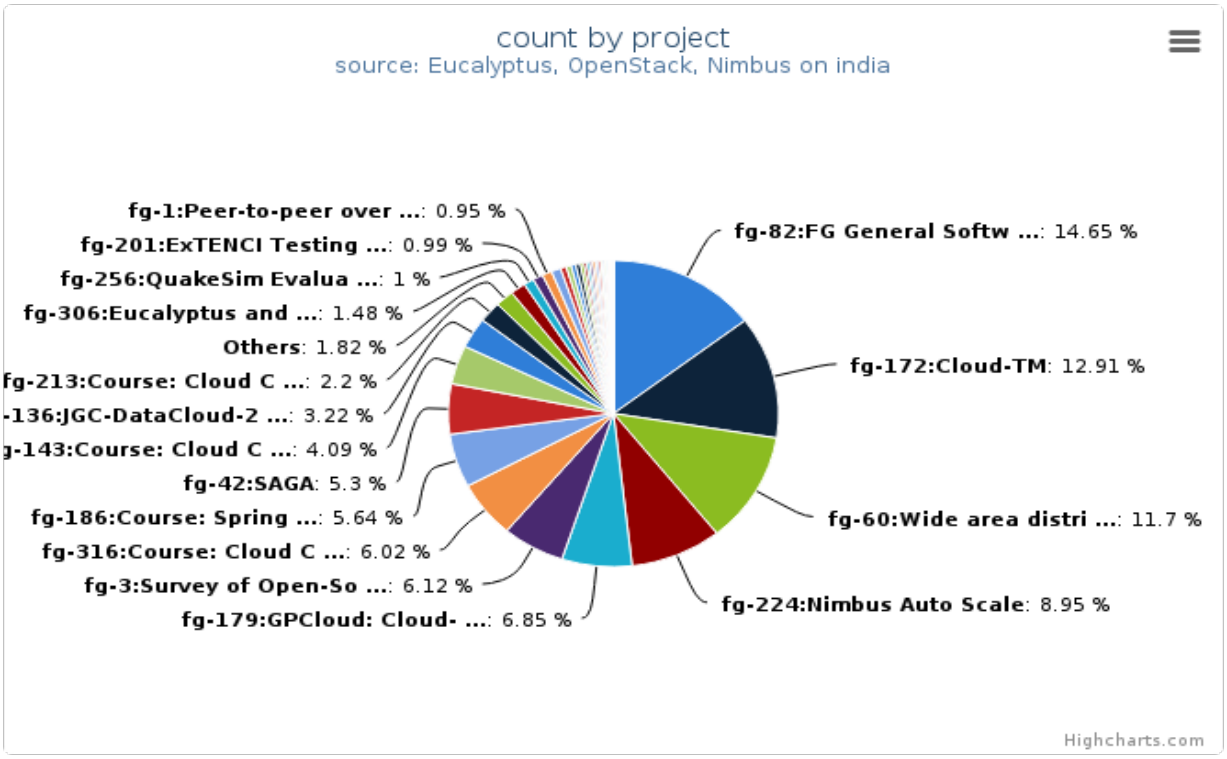

Figure 6: VMs count by project

This chart illustrates the proportion of launched VM instances by project groups. The same data in tabular form follows.

- Period: January 01 – December 23, 2013
- Cloud(IaaS): openstack, eucalyptus
- Hostname: india

Table 2.1: VMs count by project

Project	Value
fg-82:FG General Software Development	1707
fg-172:Cloud-TM	1505
fg-60:Wide area distributed file system for MapReduce applications on FutureGrid platform	1364
fg-224:Nimbus Auto Scale	1043
fg-179:GPCloud: Cloud-based Automatic Repair of Real-World Software Bugs	798
fg-3:Survey of Open-Source Cloud Infrastructure using FutureGrid Testbed	713
fg-316:Course: Cloud Computing Class - third edition	702
fg-186:Course: Spring 2012 B534 Distributed systems Graduate Course	657
fg-42:SAGA	618
fg-143:Course: Cloud Computing for Data Intensive Science Class	477
fg-136:JGC-DataCloud-2012 paper experiments	375

Continued on next page

Table 2.1 – continued from previous page

Project	Value
fg-213:Course: Cloud Computing class - second edition	256
Others	212
fg-306:Eucalyptus and Openstack	173
fg-256:QuakeSim Evaluation of FutureGrid for Cloud Computing	117
fg-201:ExTENCI Testing, Validation, and Performance	115
fg-1:Peer-to-peer overlay networks and applications in virtual networks and virtual clusters	111
fg-315:Biome representational in silico karyotyping	108
fg-297:Network Aware Task Scheduling in Hadoop	67
fg-249:Large Scale Computing Infrastructure 2012 Master class	57
fg-97:FutureGrid and Grid‘5000 Collaboration	53
fg-180:STAMPEDE	52
fg-244:Course: Data Center Scale Computing	39
fg-54:Investigating cloud computing as a solution for analyzing particle physics data	34
fg-294:Predicting economic activities using social media	34
fg-52:Cost-Aware Cloud Computing	34
fg-4:Word Sense Disambiguation for Web 2.0 Data	33
fg-130:Optimizing Scientific Workflows on Clouds	31
fg-176:Cloud Interoperability Testbed	30
fg-253:Characterizing Performance of Infrastructure Clouds	18
fg-131:HBase Application and Investigation	17
fg-134:Distributed Mapreduce	14
fg-233:CINET - A Cyber-Infrastructure for Network Science	12
fg-251:Course: Fall 2012 B534 Distributed Systems Graduate Course	12
fg-257:Particle Physics Data analysis cluster for ATLAS LHC experiment	11
fg-20:Development of an information service for FutureGrid	9
fg-9:Distributed Execution of Kepler Scientific Workflow on Future Grid	8
fg-301:Course: Advanced Networking class University of Colorado	7
fg-168:Next Generation Sequencing in the Cloud	7
fg-189:Pegasus development and improvement platform	6
fg-243:Applied Cyberinfrastructure concepts	3
fg-239:Community Comparison of Cloud frameworks	2
fg-149:Metagenome analysis of benthic marine invertebrates	2
fg-241:Course: Science Cloud Summer School 2012	2
fg-69:Investigate provenance collection for MapReduce	2
fg-23:Hardware Performance Monitoring in the Clouds	2
fg-132:Large scale data analytics	1
fg-299:Pluggable Event Architecture for Cloud Environments	1
fg-263:Hello MapReduce	1
fg-293:Future Testbeds	1
fg-273:Digital Provenance Research	1
fg-122:Course: Cloud computing class	1

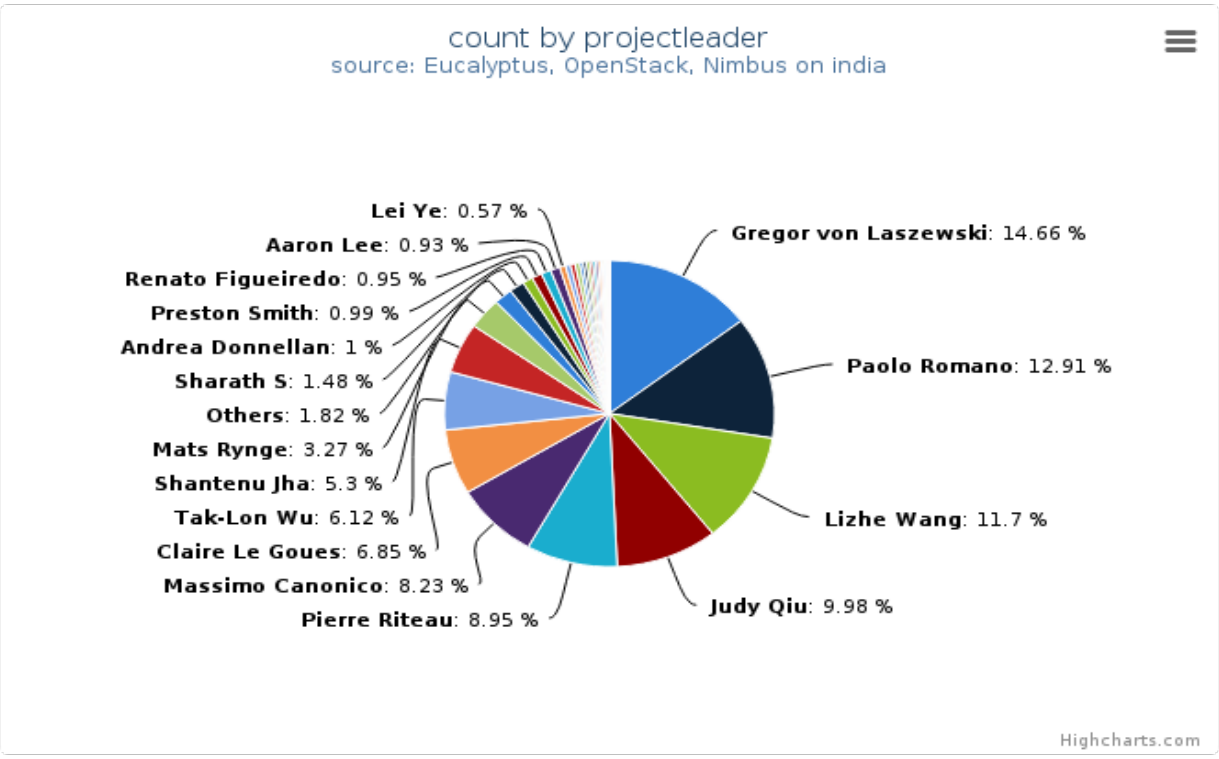

Figure 7: VMs count by project leader

This chart also illustrates the proportion of launched VM instances by project Leader. The same data in tabular form follows.

- Period: January 01 – December 23, 2013
- Cloud(IaaS): openstack, eucalyptus
- Hostname: india

Table 2.2: VMs count by project leader

Projectleader	Value
Gregor von Laszewski	1709
Paolo Romano	1505
Lizhe Wang	1364
Judy Qiu	1163
Pierre Riteau	1043
Massimo Canonico	959
Claire Le Goues	798
Tak-Lon Wu	713
Shantenu Jha	618
Mats Rynge	381
Others	212

Continued on next page

Table 2.2 – continued from previous page

Projectleader	Value
Sharath S	173
Andrea Donnellan	117
Preston Smith	115
Renato Figueiredo	111
Aaron Lee	108
Lei Ye	67
Sergio Maffioletti	57
Mauricio Tsugawa	53
Dan Gunter	52
Jonathan Klinginsmith	40
Dirk Grunwald	39
Shuyuan Deng	34
David Lowenthal	34
Randall Sobie	34
Weiwei Chen	31
Alan Sill	30
Paul Marshall	18
Chenyu Wang	14
Keith Bisset	12
Doug Benjamin	11
Hyungro Lee	9
Ilkay Altintas	8
Eric Keller	7
Nirav Merchant	3
Yong Zhao	2
Jiaan Zeng	2
Shirley Moore	2
Jason Kwan	2
Yogesh Simmhan	1
Robert Ricci	1
Mohammed Rangwala	1
Dong Wang	1
Jeffrey Cox	1

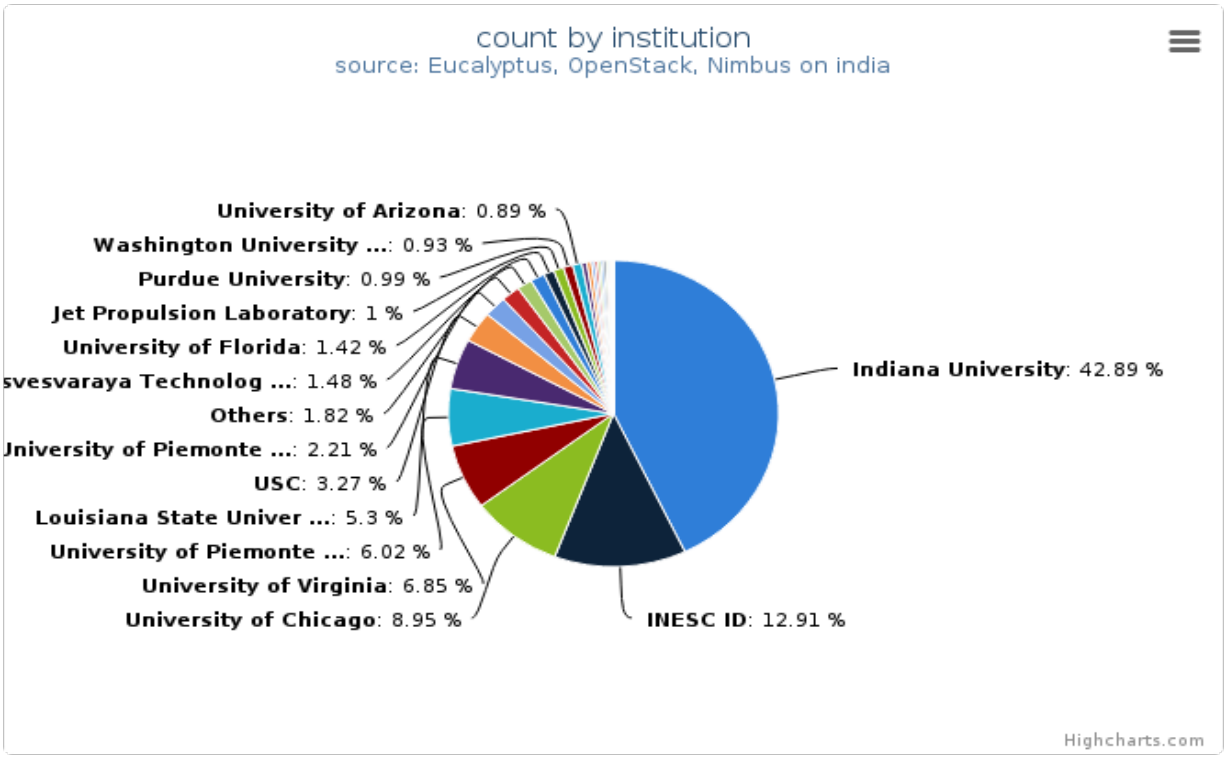

Figure 8: VMs count by institution
This chart illustrates the proportion of launched VM instances by Institution. The same data in tabular form follows.

- Period: January 01 – December 23, 2013
- Cloud(IaaS): openstack, eucalyptus
- Hostname: india

Table 2.3: VMs count by institution

Institution	Value
Indiana University	4999
INESC ID	1505
University of Chicago	1043
University of Virginia	798
University of Piemonte Orientale, Computer Science Department	702
Louisiana State University	618
USC	381
University of Piemonte Orientale	257
Others	212
Visvesvaraya Technological University, Computer science organiza	173
University of Florida	165
Jet Propulsion Laboratory	117

Continued on next page

Table 2.3 – continued from previous page

Institution	Value
Purdue University	115
Washington University at St Louis, School of Medicine, Departmen	108
University of Arizona	104
University of Zurich	57
LBNL	52
Univ. of Colorado	39
University of Victoria	34
University of Wisconsin -Milwaukee	34
University of Southern California	32
Texas Tech University	30
University of Colorado at Boulder	18
University of Minnesota	14
Virginia Tech	12
Duke University	11
UCSD	8
University of Colorado	7
University of Utah	3
Computer Science	2
University of Electronic Science and Technology	2
University of Tennessee	2
Indiana University Purdue University Indianapolis	1

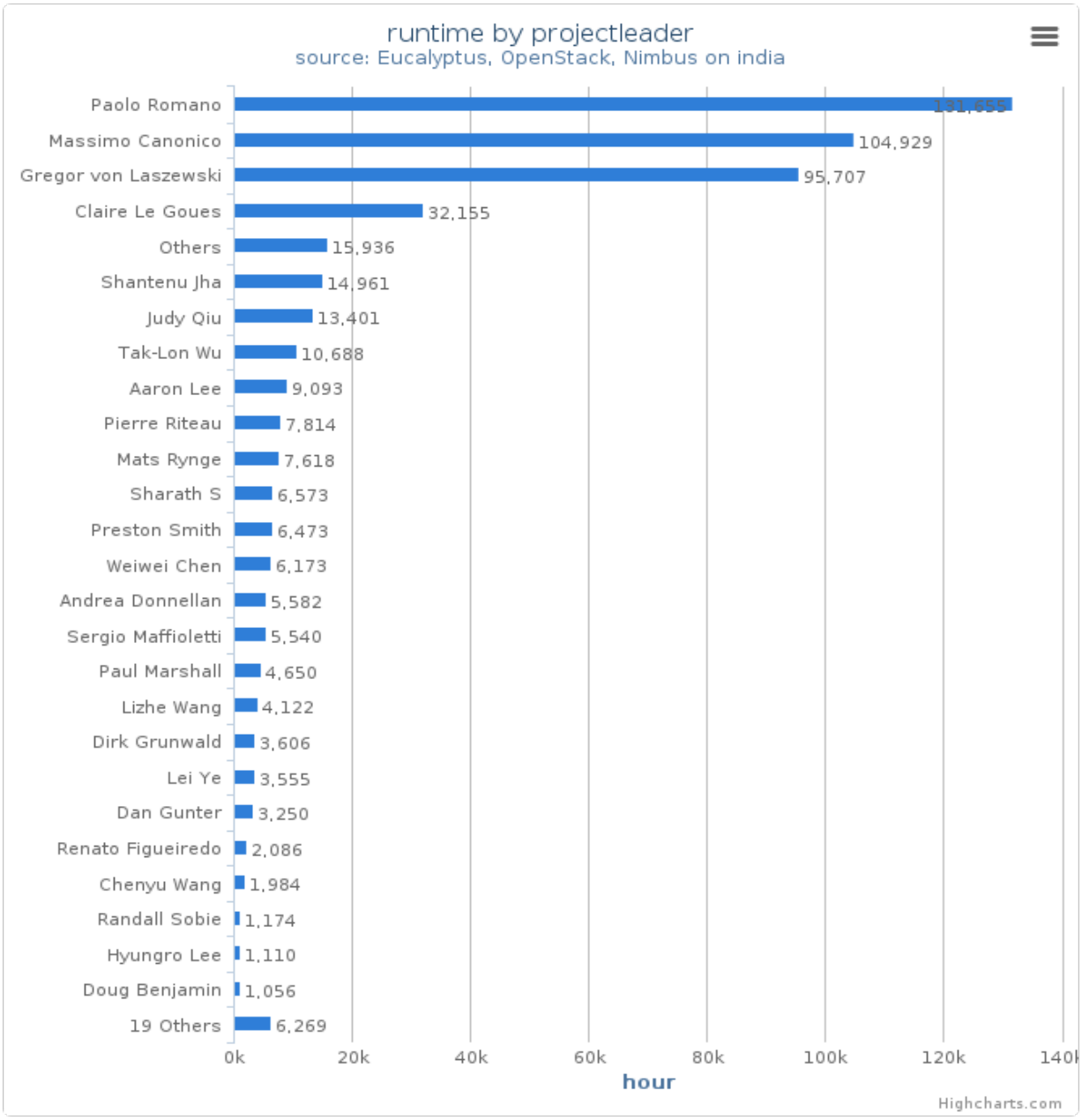

Figure 9: Wall time (hours) by project leader
This chart illustrates proportionate total run times by project leader.

- Period: January 01 – December 23, 2013
- Cloud(IaaS): openstack, eucalyptus
- Hostname: india

2.3 System information

System information shows utilization distribution as to VMs count and wall time. Each cluster represents a compute node.

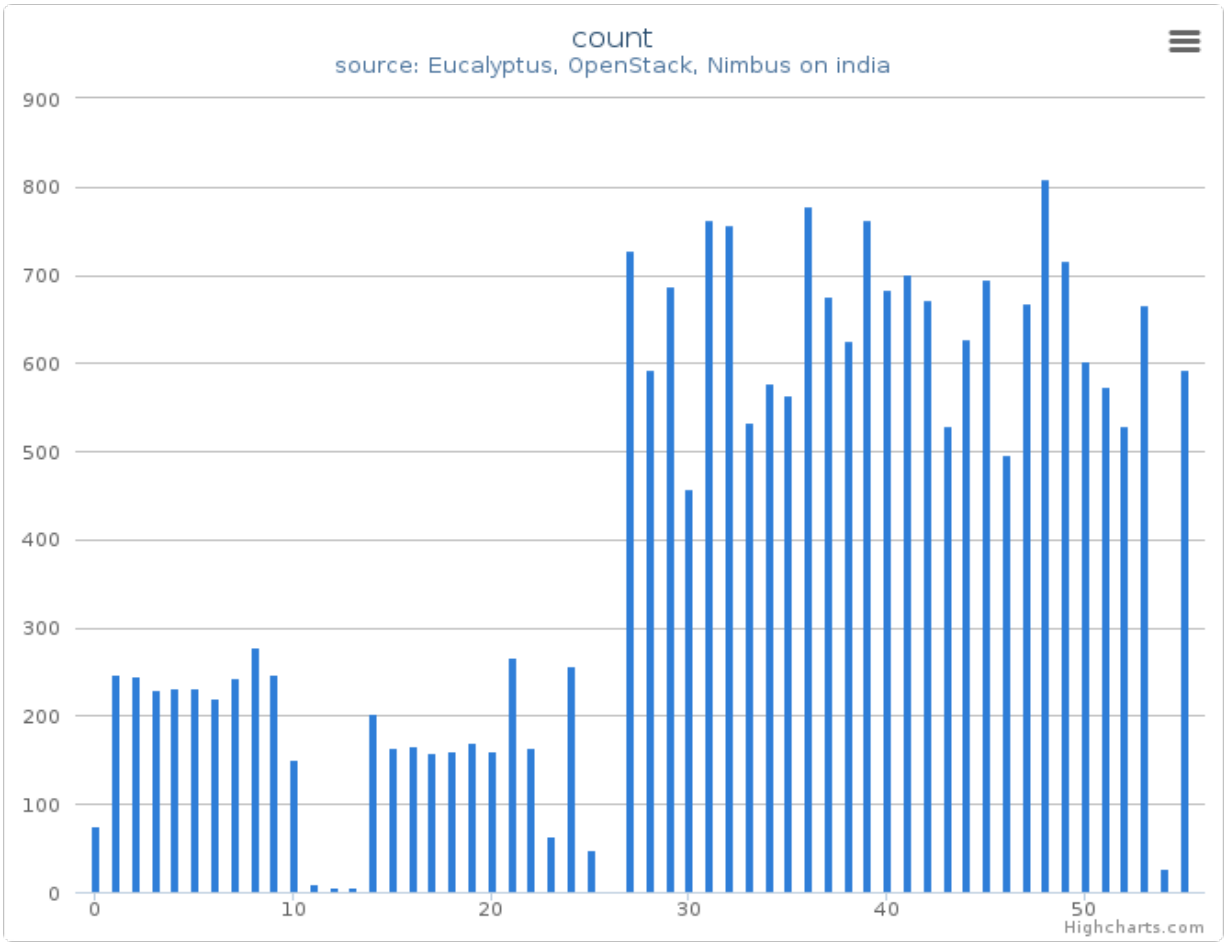

Figure 10: VMs count by systems (compute nodes) in Cluster (india)
This column chart represents VMs count among systems.

- Period: January 01 – December 23, 2013
- Cloud(IaaS): openstack, eucalyptus
- Hostname: india

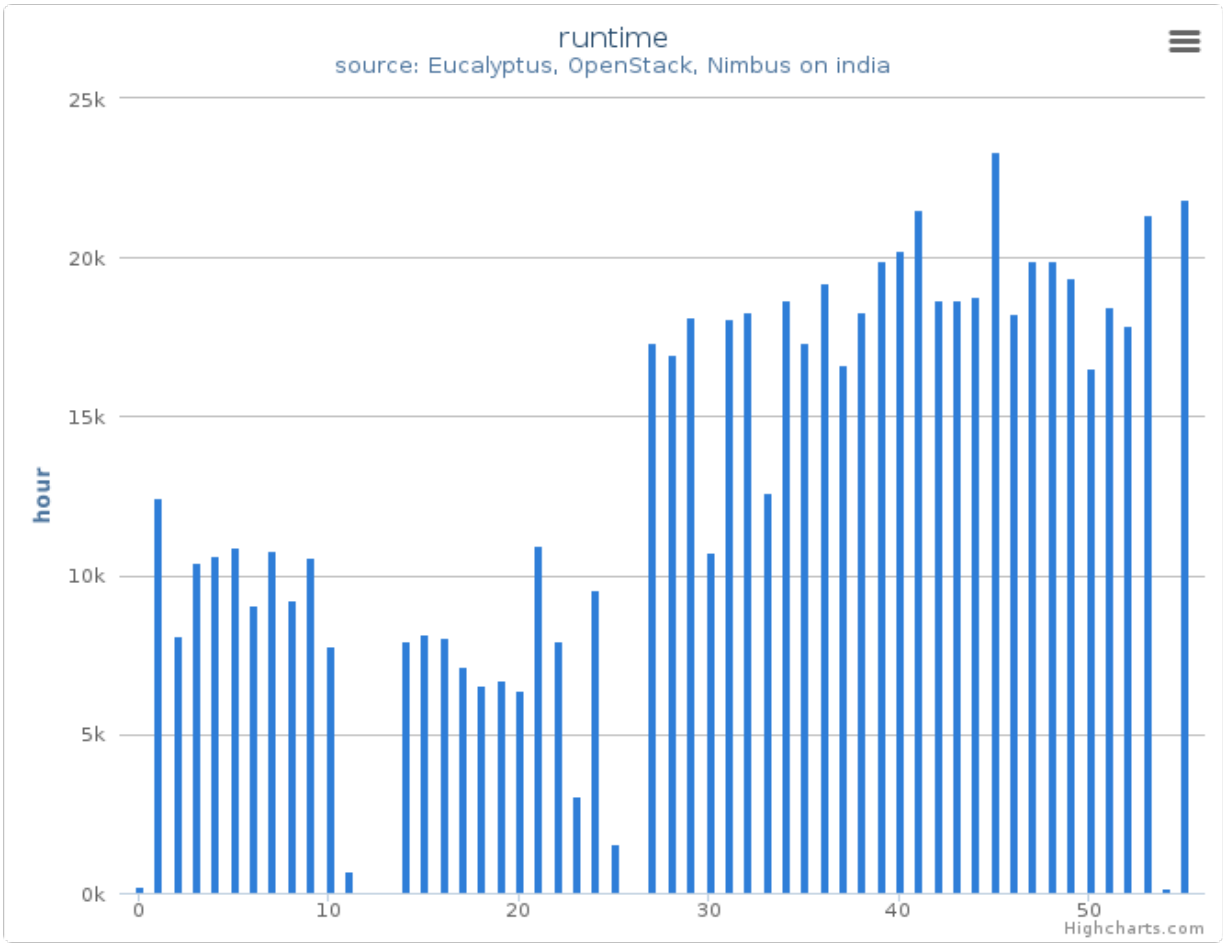

Figure 11: Wall time (hours) by systems (compute nodes) in Cluster (india)
This column chart represents wall time among systems.

- Period: January 01 – December 23, 2013
- Cloud(IaaS): openstack, eucalyptus
- Hostname: india

CHAPTER

THREE

USAGE REPORT SIERRA

- Period: January 01 – December 23, 2013
- Hostname: sierra.futuregrid.org
- Services: nimbus, openstack, eucalyptus
- Metrics: VMs count, Users count, Wall time (hours), Distribution by wall time, project, project leader, and institution, and systems

3.1 Histogram

3.1.1 Summary (Monthly)

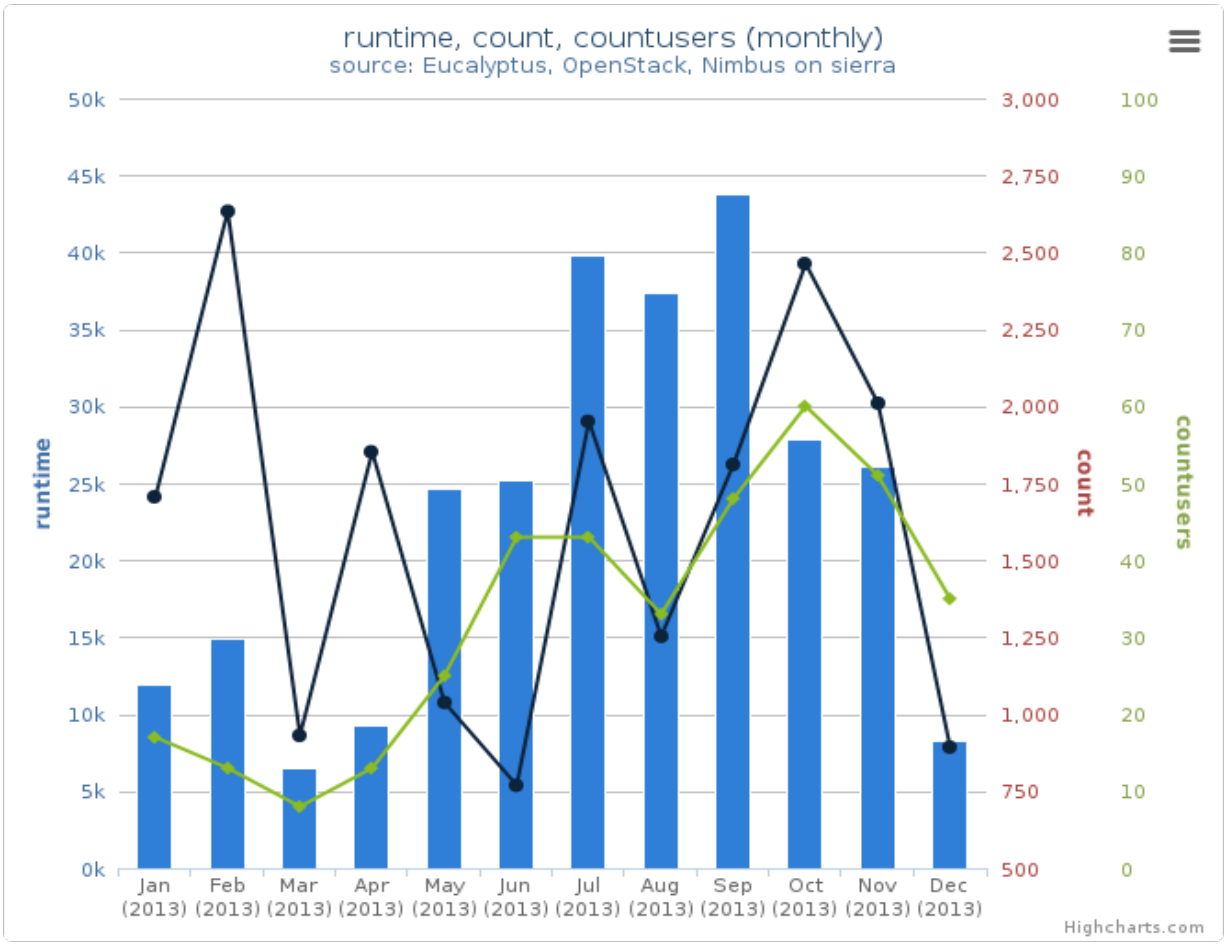

Figure 1: Average monthly usage data (wall time (hour), launched VMs, users)
This mixed chart represents average monthly usage as to wall time (hour), the number of VM instances and active users.

- Period: January 01 – December 23, 2013
- Cloud(IaaS): nimbus, openstack, eucalyptus
- Hostname: sierra
- **Metric:**
  - Runtime (Wall time hours): Sum of time elapsed from launch to termination of VM instances
  - Count (VM count): The number of launched VM instances
  - User count (Active): The number of users who launched VMs

3.1.2 Summary (Daily)

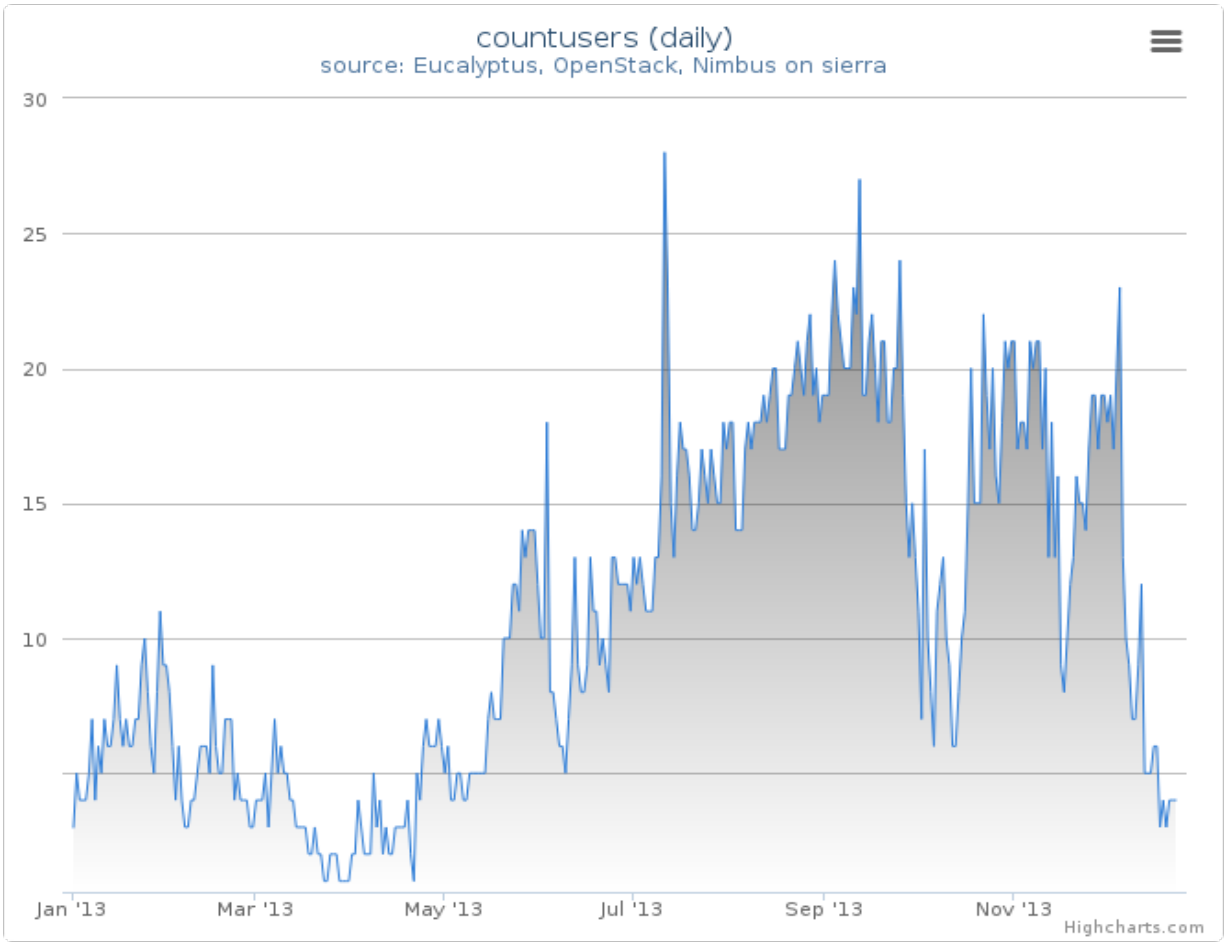

Figure 2: Users count

This time series chart represents daily active user count for cloud services and shows historical changes during the period.

- Period: January 01 – December 23, 2013
- Cloud(IaaS): nimbus, openstack, eucalyptus
- Hostname: sierra

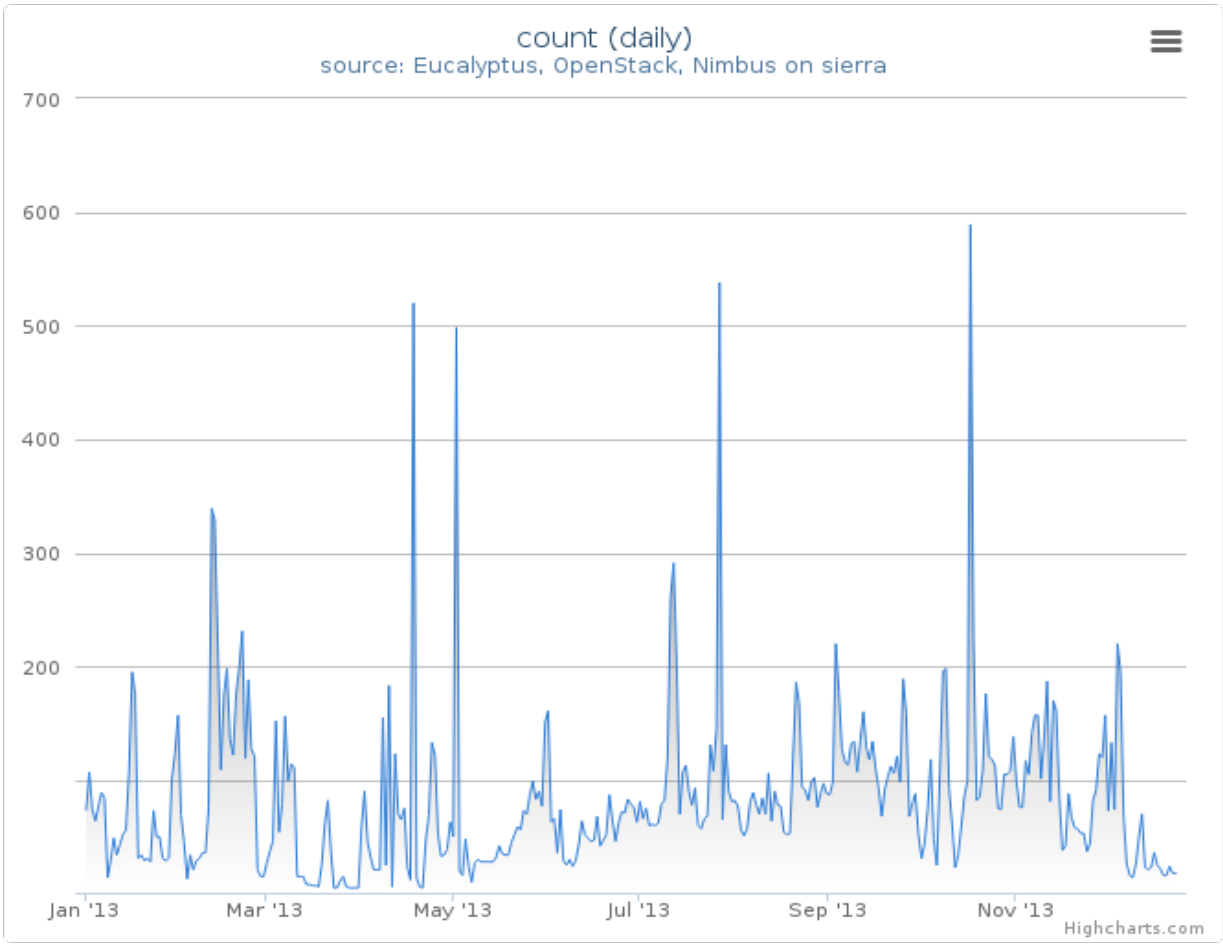

Figure 3: VMs count

This time series chart represents the number of daily launched VM instances for cloud services and shows historical changes during the period.

- Period: January 01 – December 23, 2013
- Cloud(IaaS): nimbus, openstack, eucalyptus
- Hostname: sierra

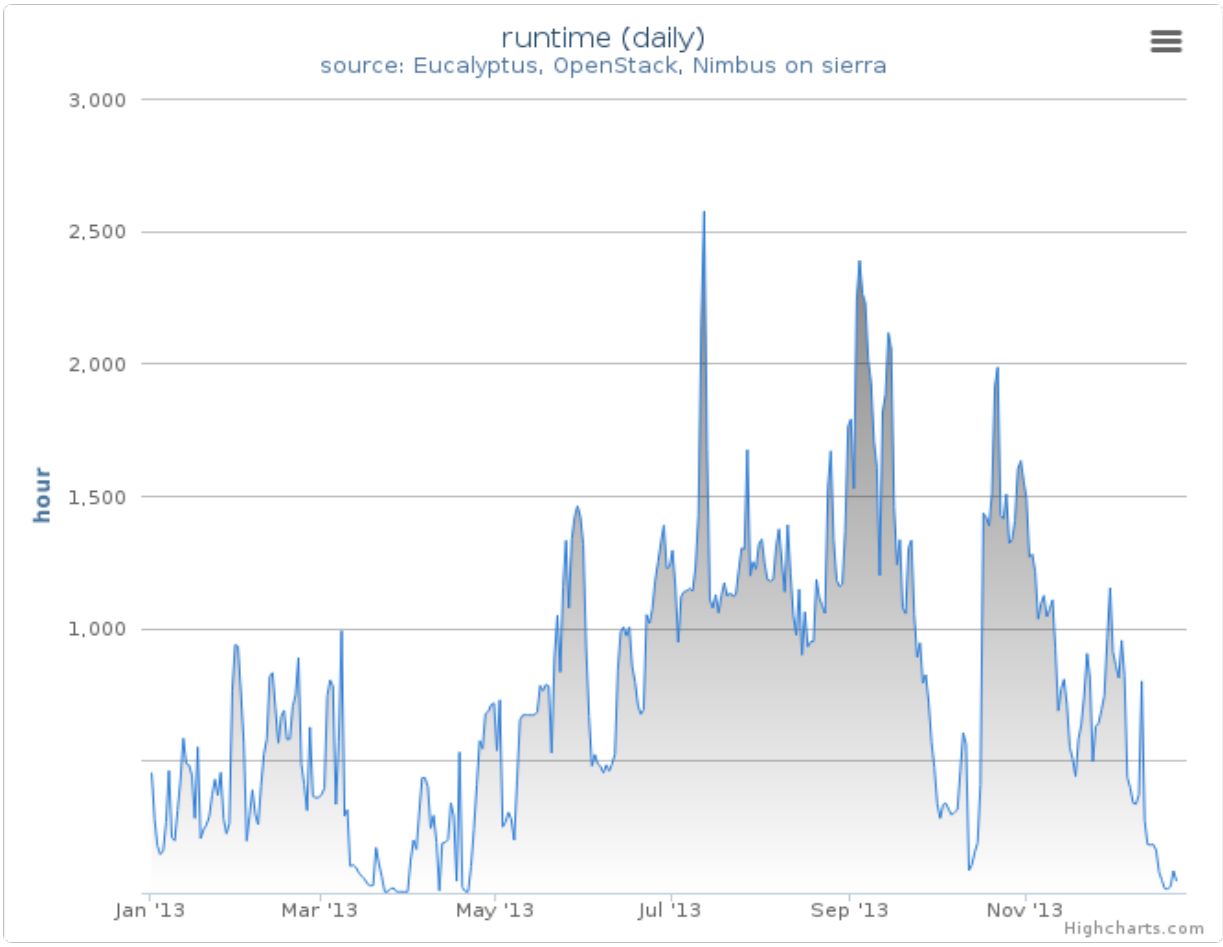

Figure 4: Wall time (hours)

This time series chart represents daily wall time (hours) for cloud services and shows historical changes during the period.

- Period: January 01 – December 23, 2013
- Cloud(IaaS): nimbus, openstack, eucalyptus
- Hostname: sierra

3.2 Distribution

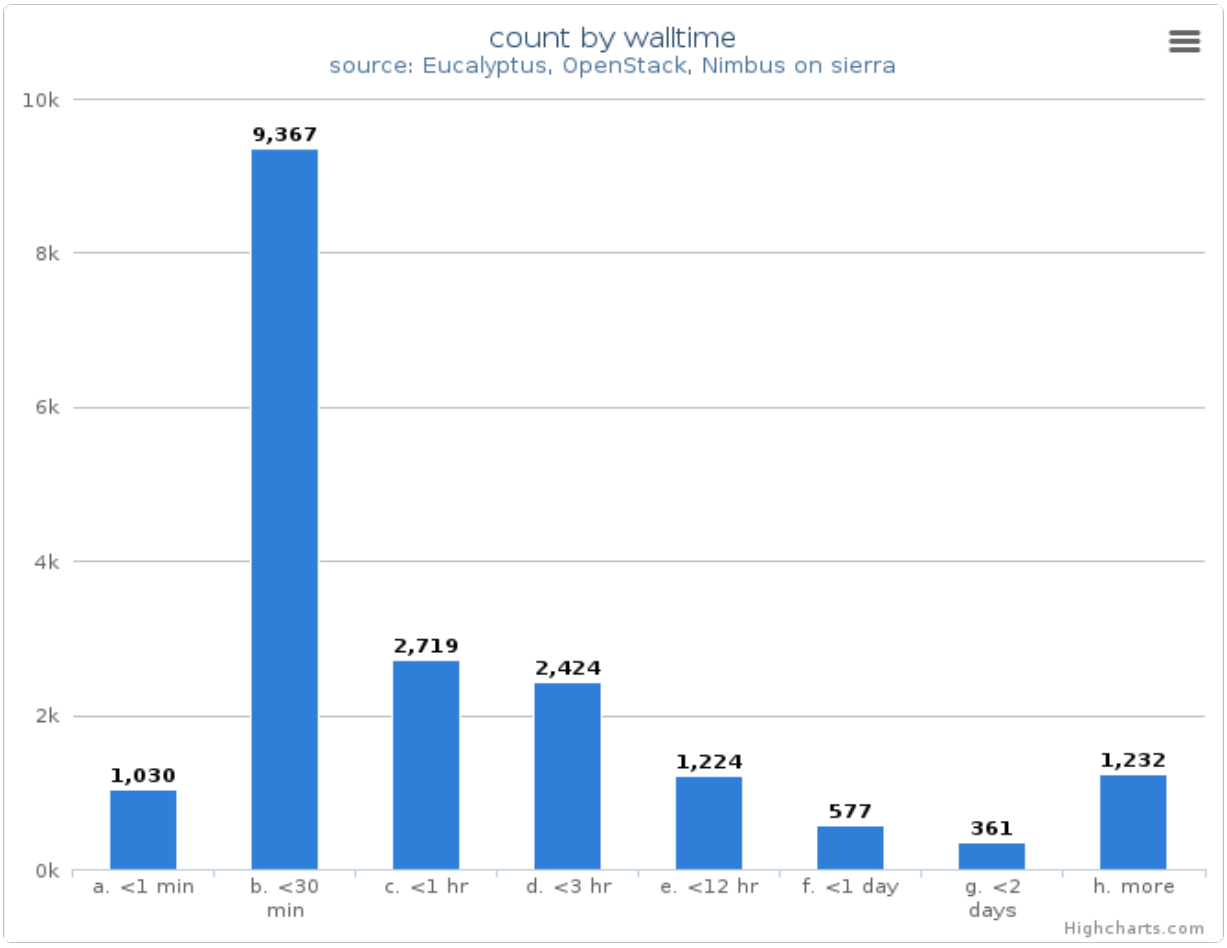

Figure 5: VM count by wall time
This chart illustrates usage patterns of VM instances in terms of running wall time.

- Period: January 01 – December 23, 2013
- Cloud(IaaS): nimbus, openstack, eucalyptus
- Hostname: sierra

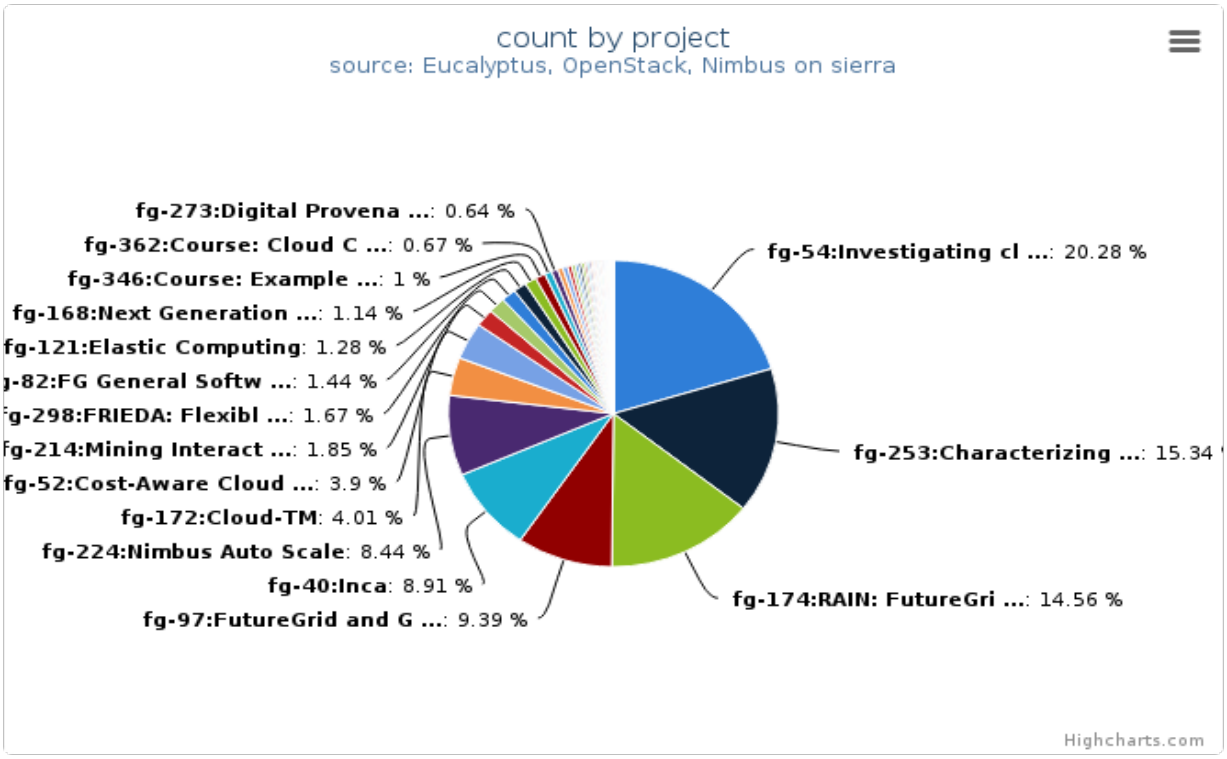

Figure 6: VMs count by project

This chart illustrates the proportion of launched VM instances by project groups. The same data in tabular form follows.

- Period: January 01 – December 23, 2013
- Cloud(IaaS): nimbus, openstack, eucalyptus
- Hostname: sierra

Table 3.1: VMs count by project

Project
fg-54:Investigating cloud computing as a solution for analyzing particle physics data
fg-253:Characterizing Performance of Infrastructure Clouds
fg-174:RAIN: FutureGrid Dynamic provisioning Framework
fg-97:FutureGrid and Grid‘5000 Collaboration
fg-40:Inca
fg-224:Nimbus Auto Scale
fg-172:Cloud-TM
fg-52:Cost-Aware Cloud Computing
fg-214:Mining Interactions between Network Community Structure and Information Diffusion
fg-298:FRIEDA: Flexible Robust Intelligent Elastic Data Management
fg-82:FG General Software Development
Continued on

Table 3.1 – continued from previous page

Project
fg-121:Elastic Computing
fg-168:Next Generation Sequencing in the Cloud
fg-346:Course: Example Course On Advanced Cloud Computing
fg-362:Course: Cloud Computing and Storage (UF)
fg-273:Digital Provenance Research
fg-1:Peer-to-peer overlay networks and applications in virtual networks and virtual clusters
fg-389:Investigating the Apache Big Data Stack
fg-130:Optimizing Scientific Workflows on Clouds
fg-355:Course: Data Center Scale Computing Class
fg-367:Optimize rapid deployment and updating of VM images at the remote compute cluster
fg-316:Course: Cloud Computing Class - third edition
fg-372:Mobile Device Computation Offloading over SocialVPNs
fg-216:Scaling-out CloudBLAST: Deploying Elastic MapReduce across Geographically Distributed Virtulized Resources for BLAST
fg-10:TeraGrid XD TIS(Technology Insertion Service) Technology Evaluation Laboratory
fg-264:Course: 1st Workshop on bioKepler Tools and Its Applications
fg-364:Course: EEL6871 Autonomic Computing
fg-136:JGC-DataCloud-2012 paper experiments
fg-363:Course: Applied Cyberinfrastructure concepts
fg-374:Course: Cloud and Distributed Computing
fg-239:Community Comparison of Cloud frameworks
fg-288:Federating HPC, Cyberinfrastructure and Clouds using CometCloud
fg-217:Cloud Computing In Education
fg-315:Biome representational in silico karyotyping
fg-248:Geophysical fluid dynamics education and research
fg-244:Course: Data Center Scale Computing
fg-251:Course: Fall 2012 B534 Distributed Systems Graduate Course
fg-384:Graph/network analysis Resource manager
fg-215:FuturGrid Directory Entry
fg-334:Tutorial on Cloud Computing and Software-defined Networking
fg-371:Characterizing Infrastructure Cloud Performance for Scientific Computing
fg-132:Large scale data analytics
fg-175:GridProphet, A workflow execution time prediction system for the Grid
fg-341:Course: Parallel Computing
fg-380:FutureGrid Support for BigData MOOC
Others
fg-233:CINET - A Cyber-Infrastructure for Network Science
fg-382:Reliability Analysis using Hadoop and MapReduce
fg-369:Testing of Network Facing Services for the Open Science Grid
fg-243:Applied Cyberinfrastructure concepts
fg-176:Cloud Interoperability Testbed
fg-381:Authentication of Mobile Cloud Computing
fg-314:User-friendly tools to play with cloud platforms
fg-356:IPython pipelines for training life sciences researchers on NGS data analysis
fg-170:European Middleware Initiative (EMI)
fg-301:Course: Advanced Networking class University of Colorado
fg-180:STAMPEDE
fg-340:Research: Parallel Computing for Machine Learning
fg-241:Course: Science Cloud Summer School 2012
fg-150:SC11: Using and Building Infrastructure Clouds for Science

Continued on

Table 3.1 – continued from previous page

Project
fg-69:Investigate provenance collection for MapReduce

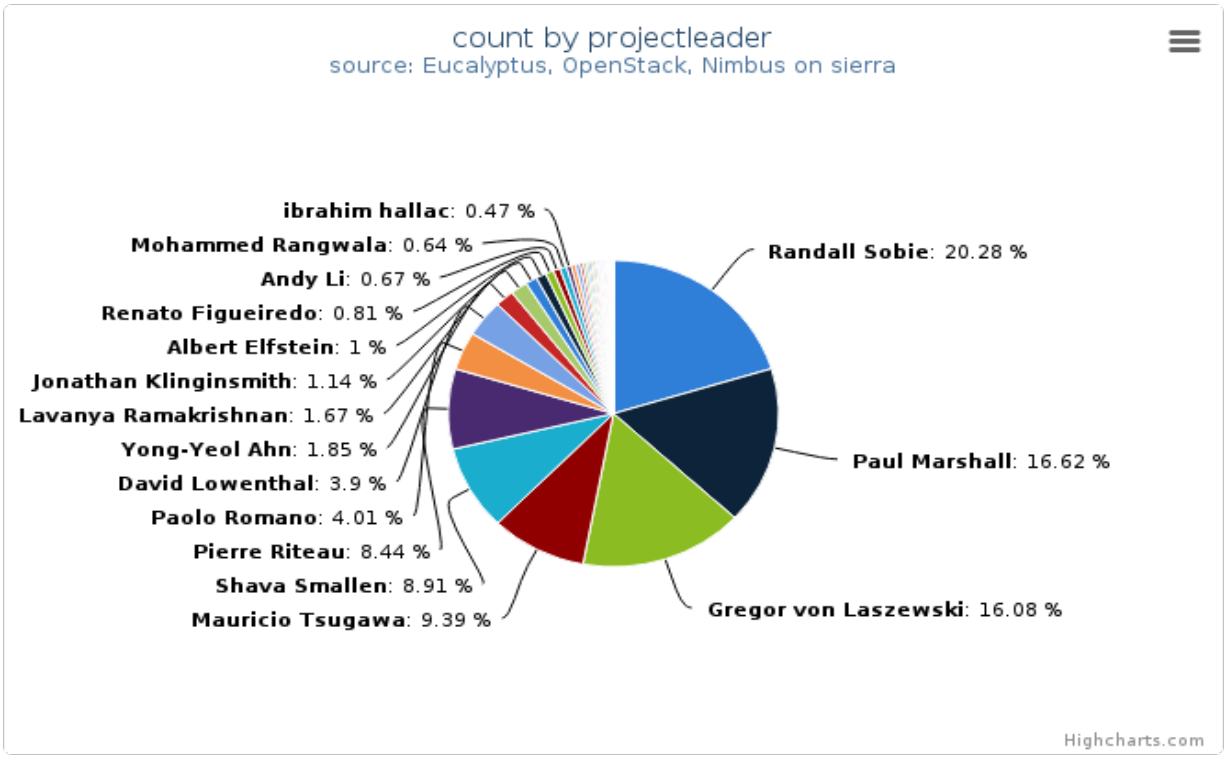

Figure 7: VMs count by project leader

This chart also illustrates the proportion of launched VM instances by project Leader. The same data in tabular form follows.

- Period: January 01 – December 23, 2013
- Cloud(IaaS): nimbus, openstack, eucalyptus
- Hostname: sierra

Table 3.2: VMs count by project leader

Projectleader	Value
Randall Sobie	3198
Paul Marshall	2621
Gregor von Laszewski	2536
Mauricio Tsugawa	1481
Shava Smallen	1406
Pierre Riteau	1331
Paolo Romano	633

Continued on next page

Table 3.2 – continued from previous page

Projectleader	Value
David Lowenthal	615
Yong-Yeol Ahn	292
Lavanya Ramakrishnan	264
Jonathan Klinginsmith	180
Albert Elfstein	157
Renato Figueiredo	127
Andy Li	106
Mohammed Rangwala	101
ibrahim hallac	74
Dirk Grunwald	71
Weiwei Chen	66
Massimo Canonico	52
Jan Balewski	50
Andrea Matsunaga	38
John Lockman	35
Ilkay Altintas	34
Meng Han	32
Nirav Merchant	27
Mats Rynge	25
Yong Zhao	19
Philip Rhodes	19
Javier Diaz Montes	18
Aaron Lee	17
Željko Šeremet	17
Glenn Flierl	16
Judy Qiu	14
Tirtha Bhattacharjee	12
Jose Fortes	11
Yogesh Simmhan	10
Thomas Fahringer	10
Theron Voran	10
Wilson Rivera	7
Others	6
Abhilash Koppula	6
Keith Bisset	5
Carl Walasek	5
Igor Sfiligoi	4
Shane Green	3
Todd Blevins	3
Alan Sill	3
Morris Riedel	2
John Bresnahan	1
Eric Keller	1
Jiaan Zeng	1
Dan Gunter	1

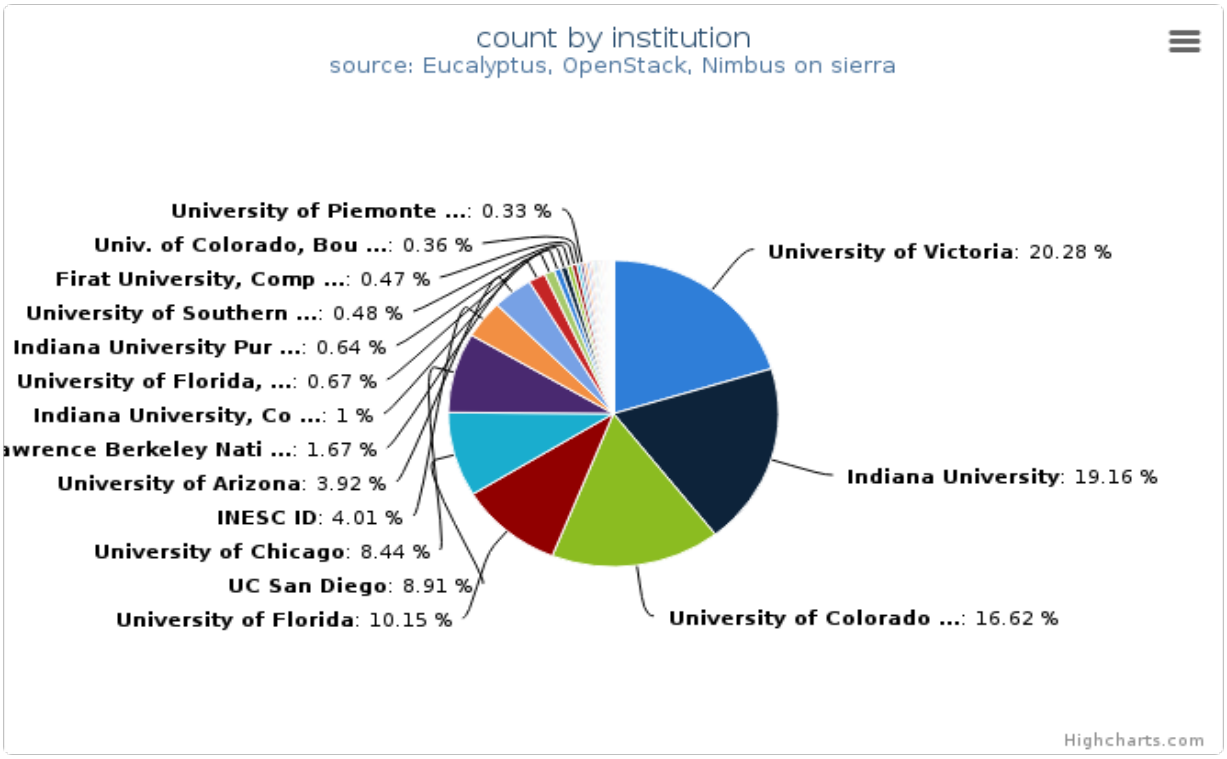

Figure 8: VMs count by institution
This chart illustrates the proportion of launched VM instances by Institution. The same data in tabular form follows.

- Period: January 01 – December 23, 2013
- Cloud(IaaS): nimbus, openstack, eucalyptus
- Hostname: sierra

Table 3.3: VMs count by institution

Institution	Value
University of Victoria	3198
Indiana University	3022
University of Colorado at Boulder	2621
University of Florida	1601
UC San Diego	1406
University of Chicago	1331
INESC ID	633
University of Arizona	619
Lawrence Berkeley National Lab	264
Indiana University, Computer Science Department	157
University of Florida, Department of Electrical and Computer Eng	106
Indiana University Purdue University Indianapolis	101

Continued on next page

Table 3.3 – continued from previous page

Institution	Value
University of Southern California	76
Firat University, Computer Science Department	74
Univ. of Colorado, Boulder, Computer Science	56
University of Piemonte Orientale, Computer Science Department	52
Massachusetts Institute of Technology, Laboratory for Nuclear Sc	50
University of Florida, Electrical and Computer Engineering	45
University of Texas at Austin	35
UCSD	34
University of Florida, ACIS	32
USC	25
University of Arizona, Arizona Research Laboratories, School of	23
University of Mississippi, Department of Computer Science	19
University of Electronic Science and Technology	19
Rutgers	18
Washington University at St Louis, School of Medicine, Departmen	17
University of Mostar	17
Massachusetts Institute of Technology	16
Univ. of Colorado	15
Virginia Bioinformatics Institute, Virginia Polytechnic Institut	12
University of Florida, Advanced Computing and Information System	11
University of Innsbruck	10
University of Colorado at Boulder, Computer Science Department	10
University of Puerto Rico, Electrical and Computer Emgineering D	7
Others	6
Indiana University, Community Grids Lab	6
University of the Sciences , Mathematics, Physics, and Statistic	5
Virginia Tech	5
University of California San Diego, Physics Department	4
Colorado Technical University, Computer Science and Engineering	3
Indiana University, Depts of Biology and Molecular and Cellular	3
Texas Tech University	3
Juelich Supercomputing Centre	2
University of Colorado	1
Nimbus	1
Computer Science	1
LBNL	1

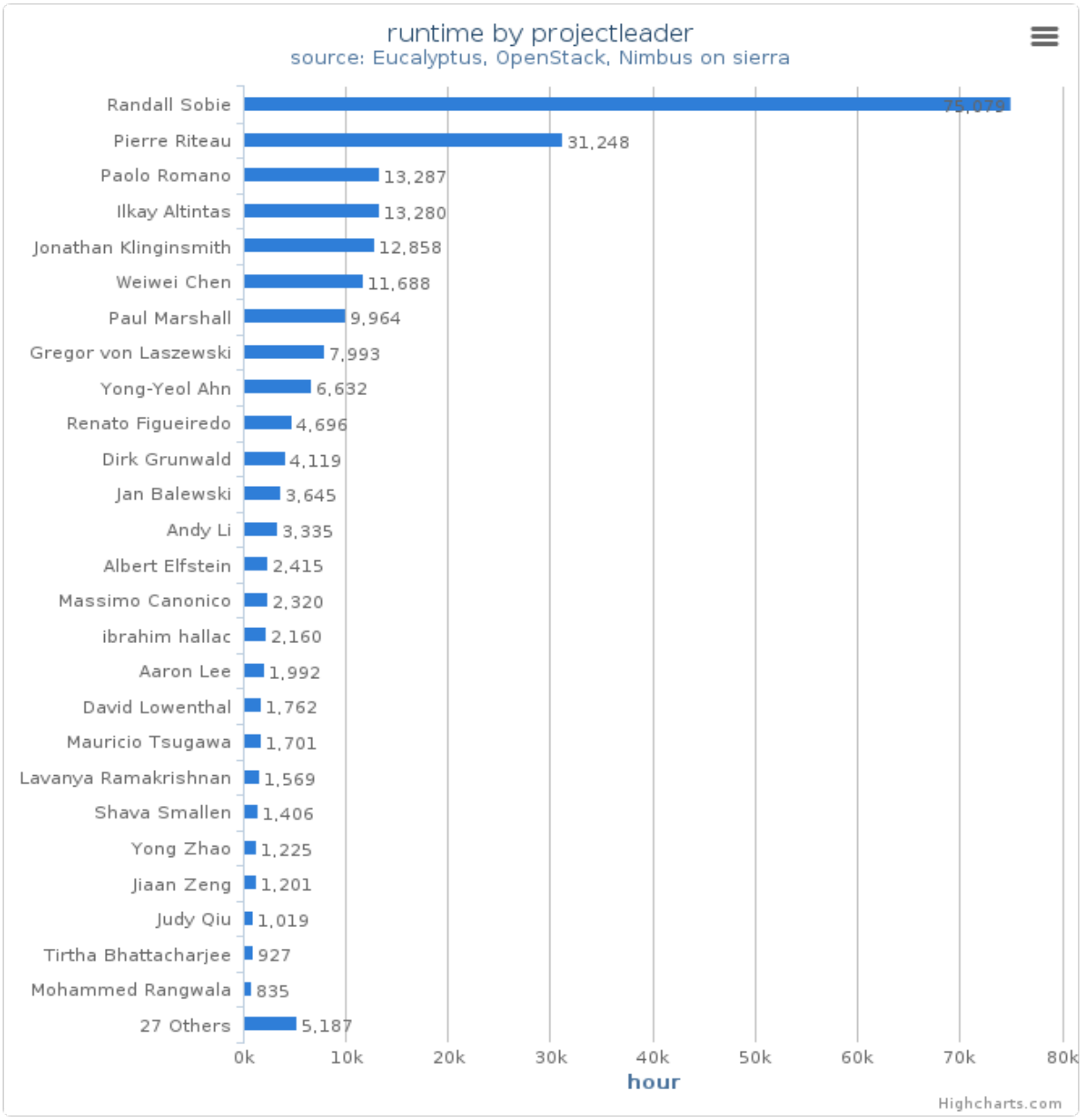

Figure 9: Wall time (hours) by project leader
This chart illustrates proportionate total run times by project leader.

- Period: January 01 – December 23, 2013
- Cloud(IaaS): nimbus, openstack, eucalyptus
- Hostname: sierra

3.3 System information

System information shows utilization distribution as to VMs count and wall time. Each cluster represents a compute node.

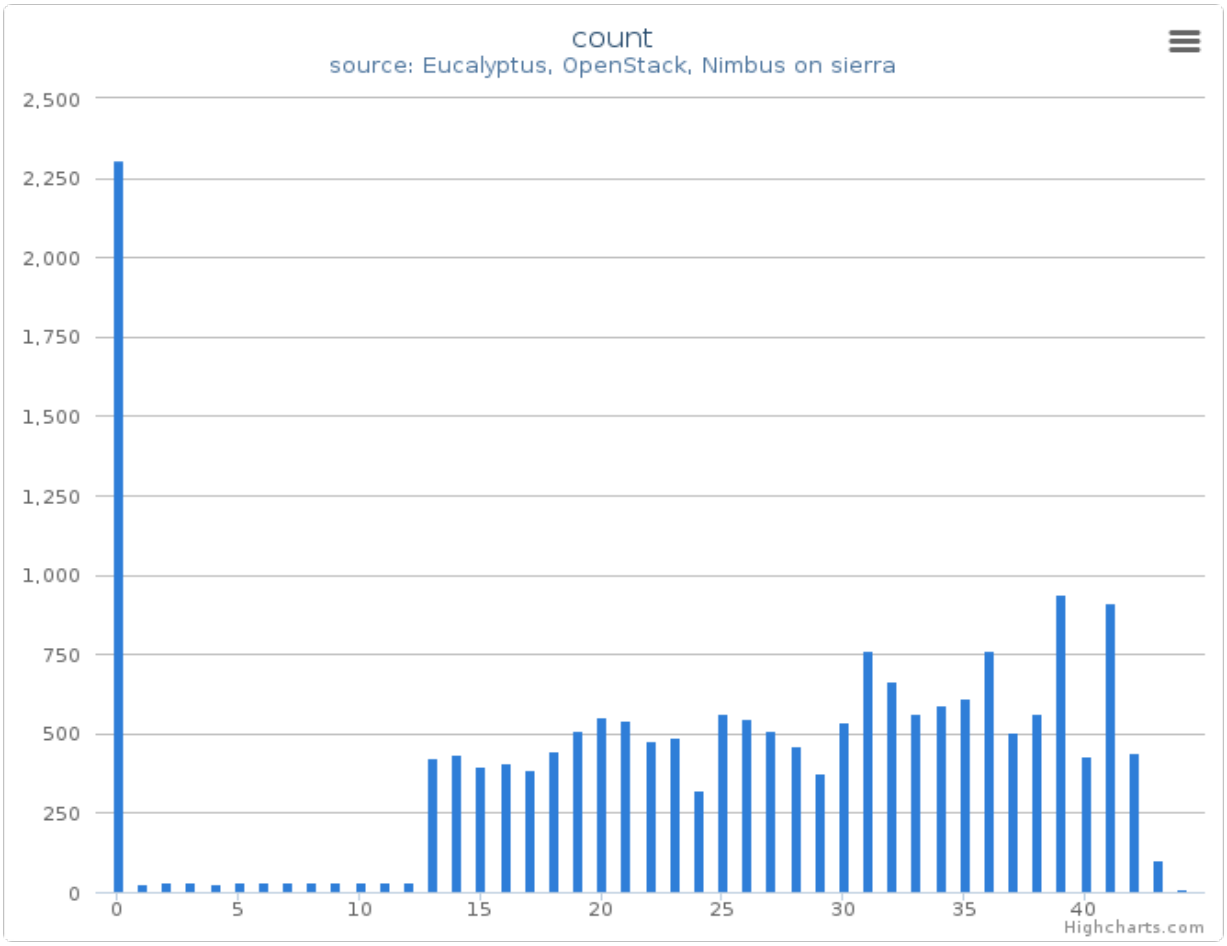

Figure 10: VMs count by systems (compute nodes) in Cluster (sierra)
This column chart represents VMs count among systems.

- Period: January 01 – December 23, 2013
- Cloud(IaaS): nimbus, openstack, eucalyptus
- Hostname: sierra

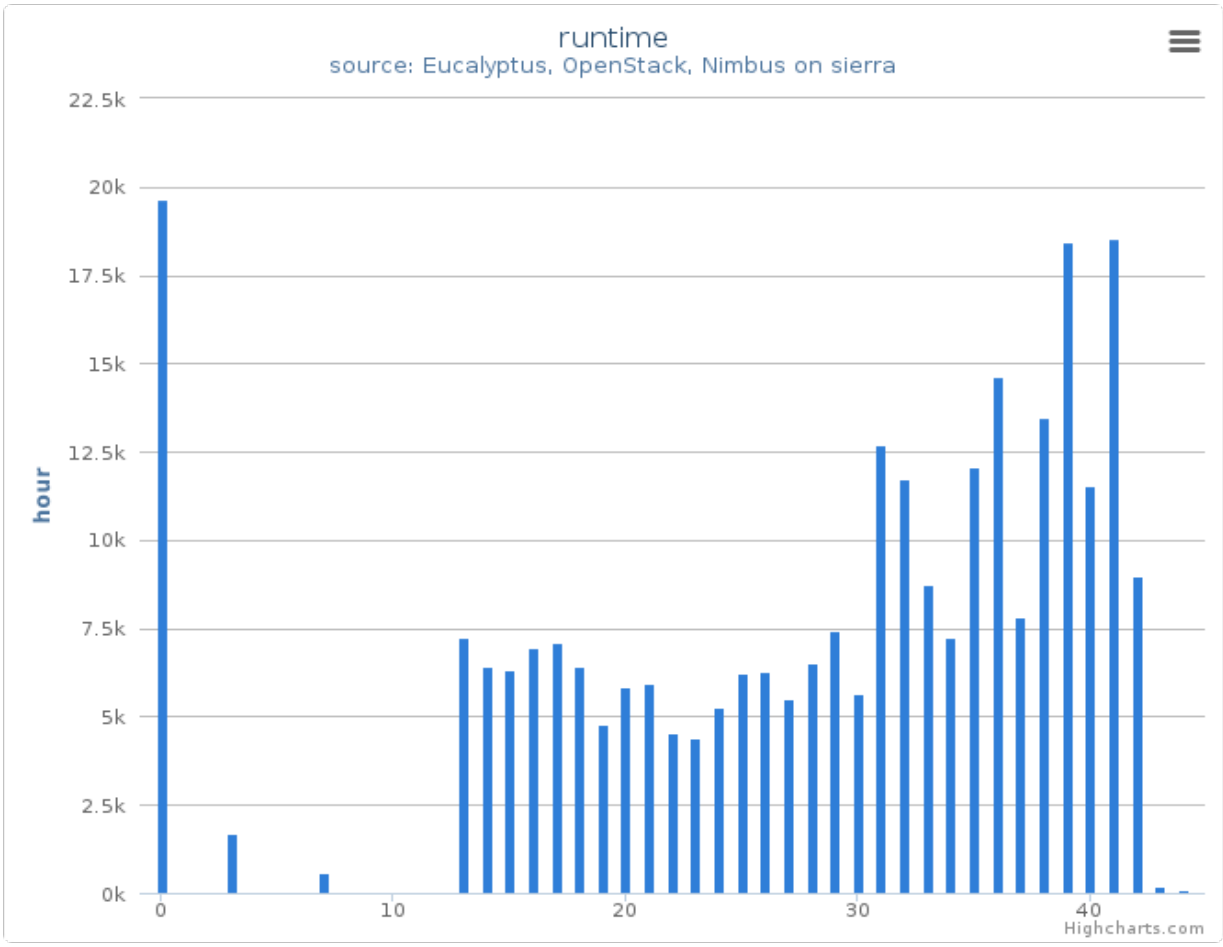

Figure 11: Wall time (hours) by systems (compute nodes) in Cluster (sierra)
This column chart represents wall time among systems.

- Period: January 01 – December 23, 2013
- Cloud(IaaS): nimbus, openstack, eucalyptus
- Hostname: sierra

CHAPTER

FOUR

USAGE REPORT ALAMO

- Period: January 01 – December 23, 2013
- Hostname: alamo.futuregrid.org
- Services: nimbus, openstack
- Metrics: VMs count, Users count, Wall time (hours), Distribution by wall time, project, project leader, and institution, and systems

4.1 Histogram

4.1.1 Summary (Monthly)

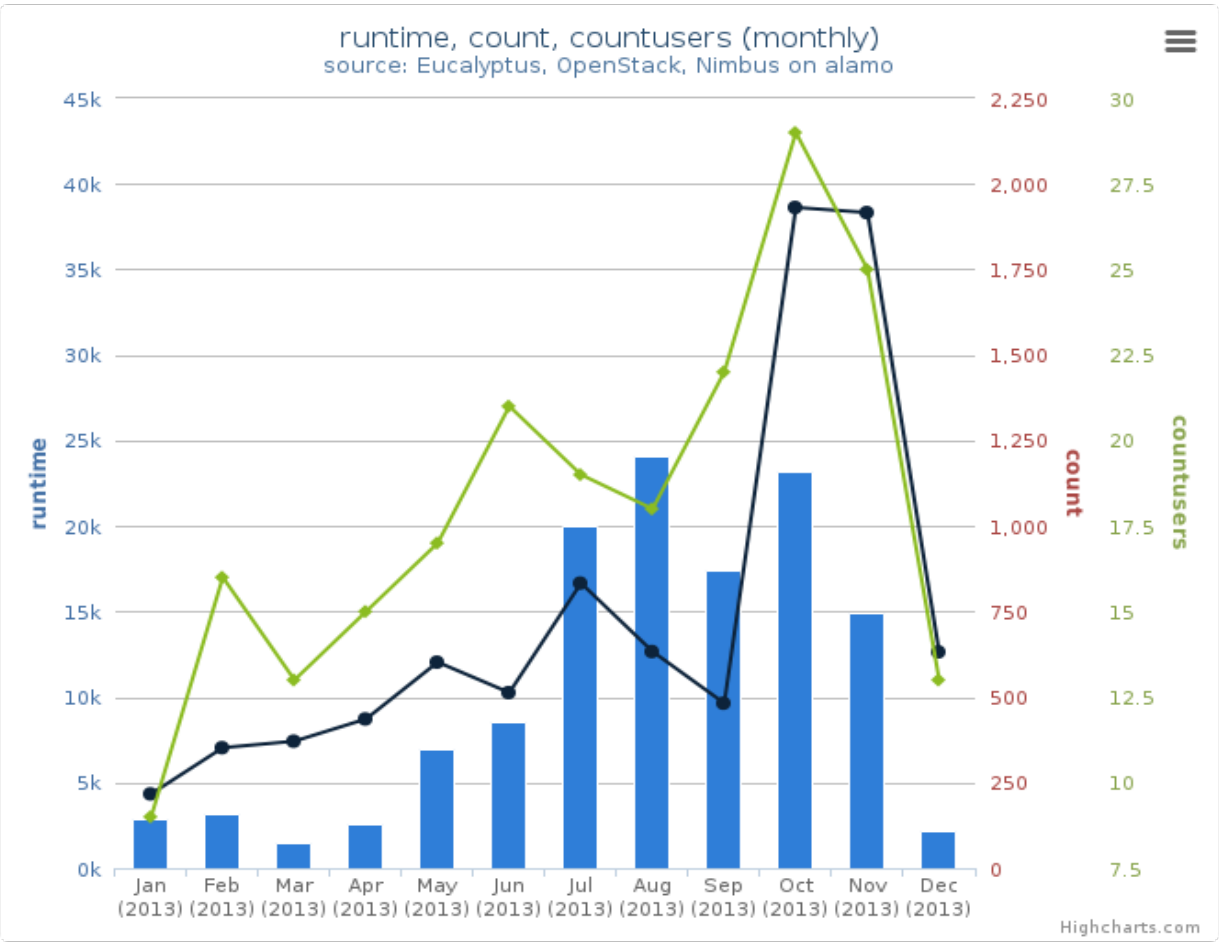

Figure 1: Average monthly usage data (wall time (hour), launched VMs, users)
This mixed chart represents average monthly usage as to wall time (hour), the number of VM instances and active users.

- Period: January 01 – December 23, 2013
- Cloud(IaaS): nimbus, openstack
- Hostname: alamo
- **Metric:**
  - Runtime (Wall time hours): Sum of time elapsed from launch to termination of VM instances
  - Count (VM count): The number of launched VM instances
  - User count (Active): The number of users who launched VMs

4.1.2 Summary (Daily)

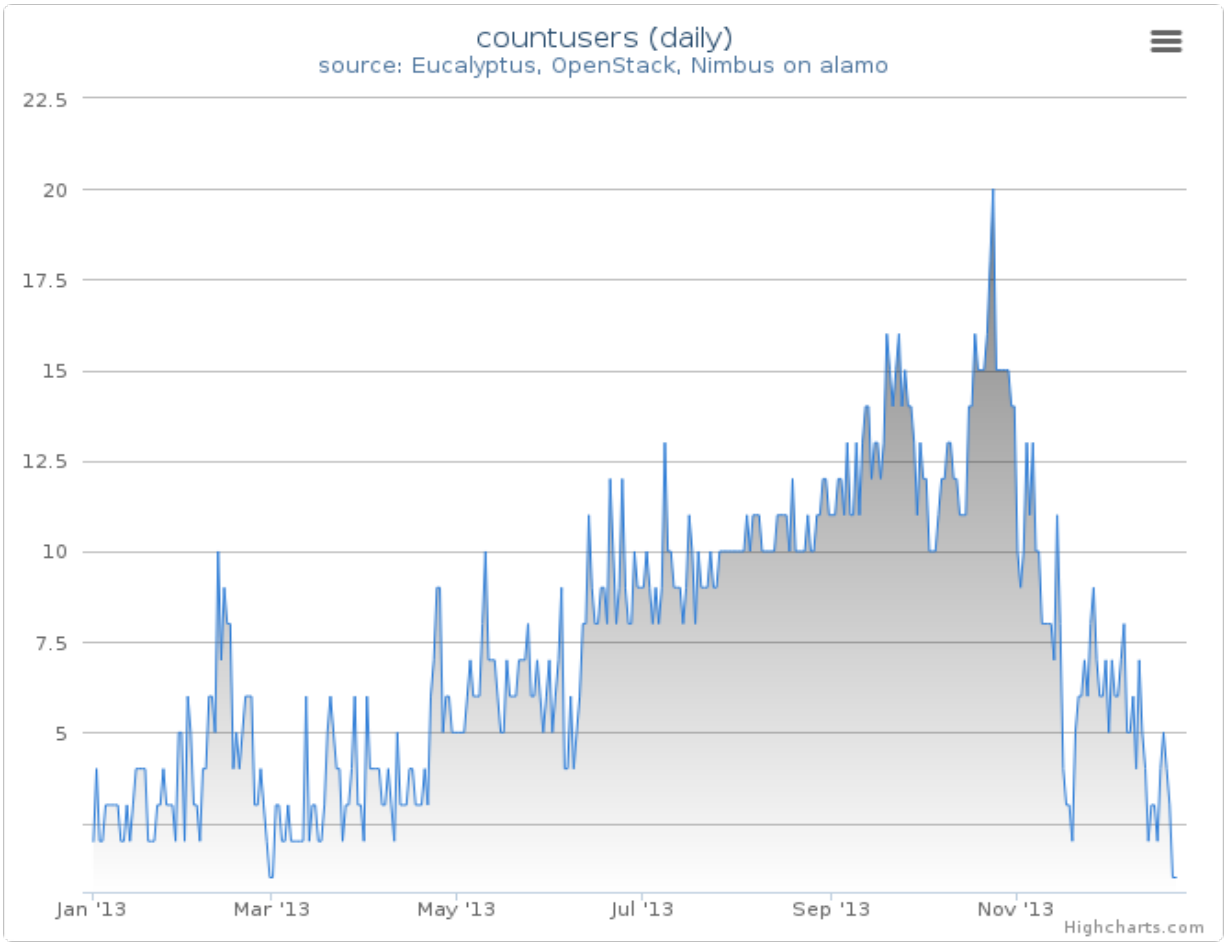

Figure 2: Users count

This time series chart represents daily active user count for cloud services and shows historical changes during the period.

- Period: January 01 – December 23, 2013
- Cloud(IaaS): nimbus, openstack
- Hostname: alamo

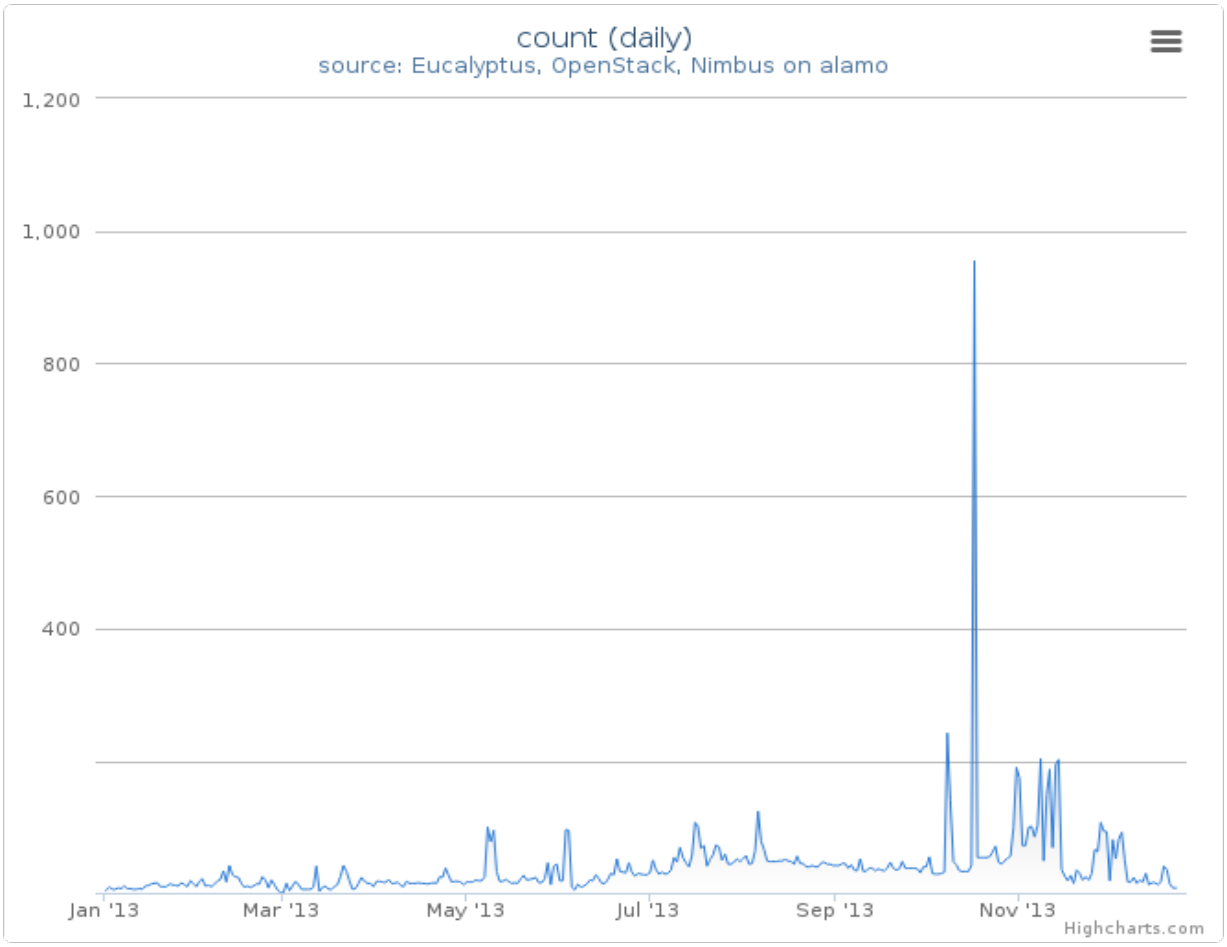

Figure 3: VMs count

This time series chart represents the number of daily launched VM instances for cloud services and shows historical changes during the period.

- Period: January 01 – December 23, 2013
- Cloud(IaaS): nimbus, openstack
- Hostname: alamo

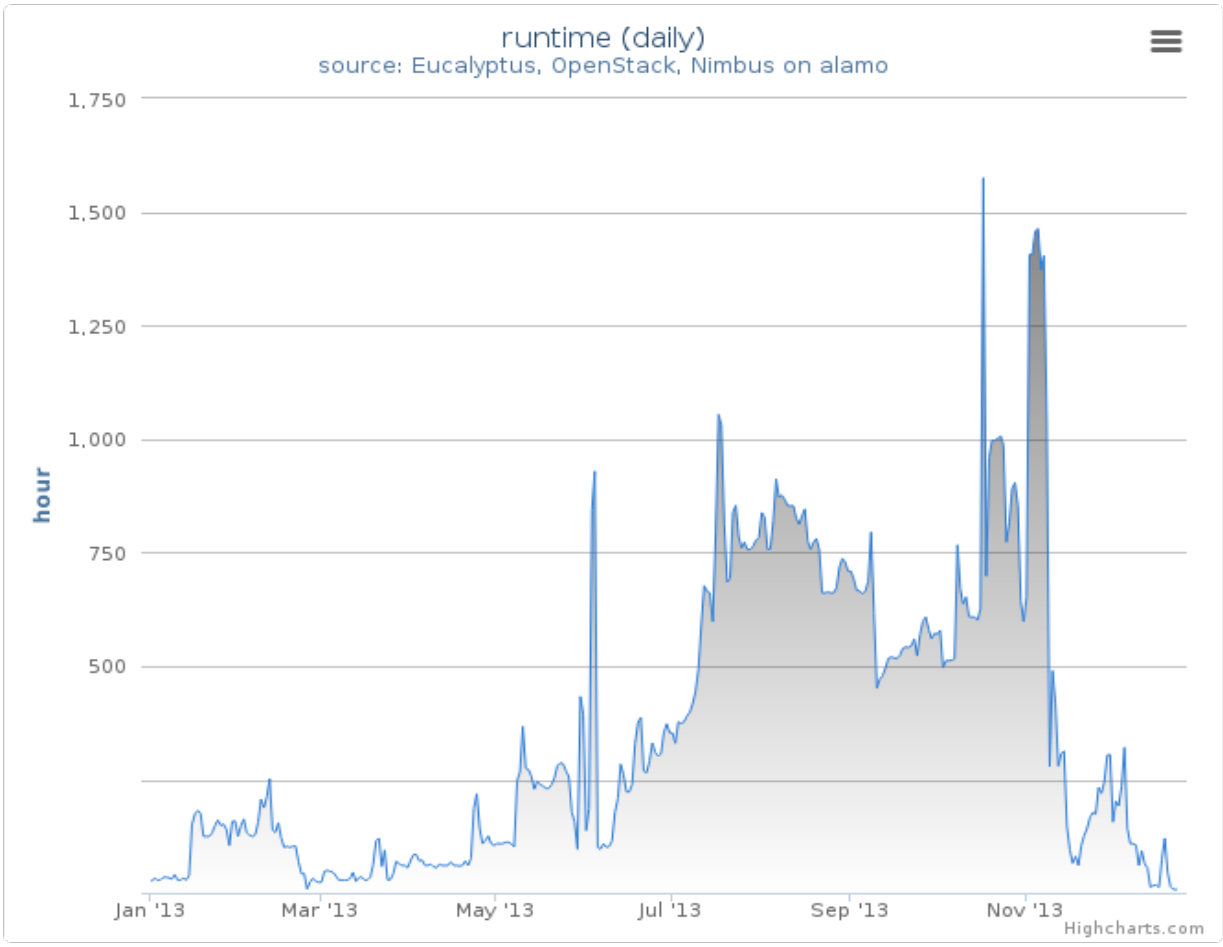

Figure 4: Wall time (hours)

This time series chart represents daily wall time (hours) for cloud services and shows historical changes during the period.

- Period: January 01 – December 23, 2013
- Cloud(IaaS): nimbus, openstack
- Hostname: alamo

4.2 Distribution

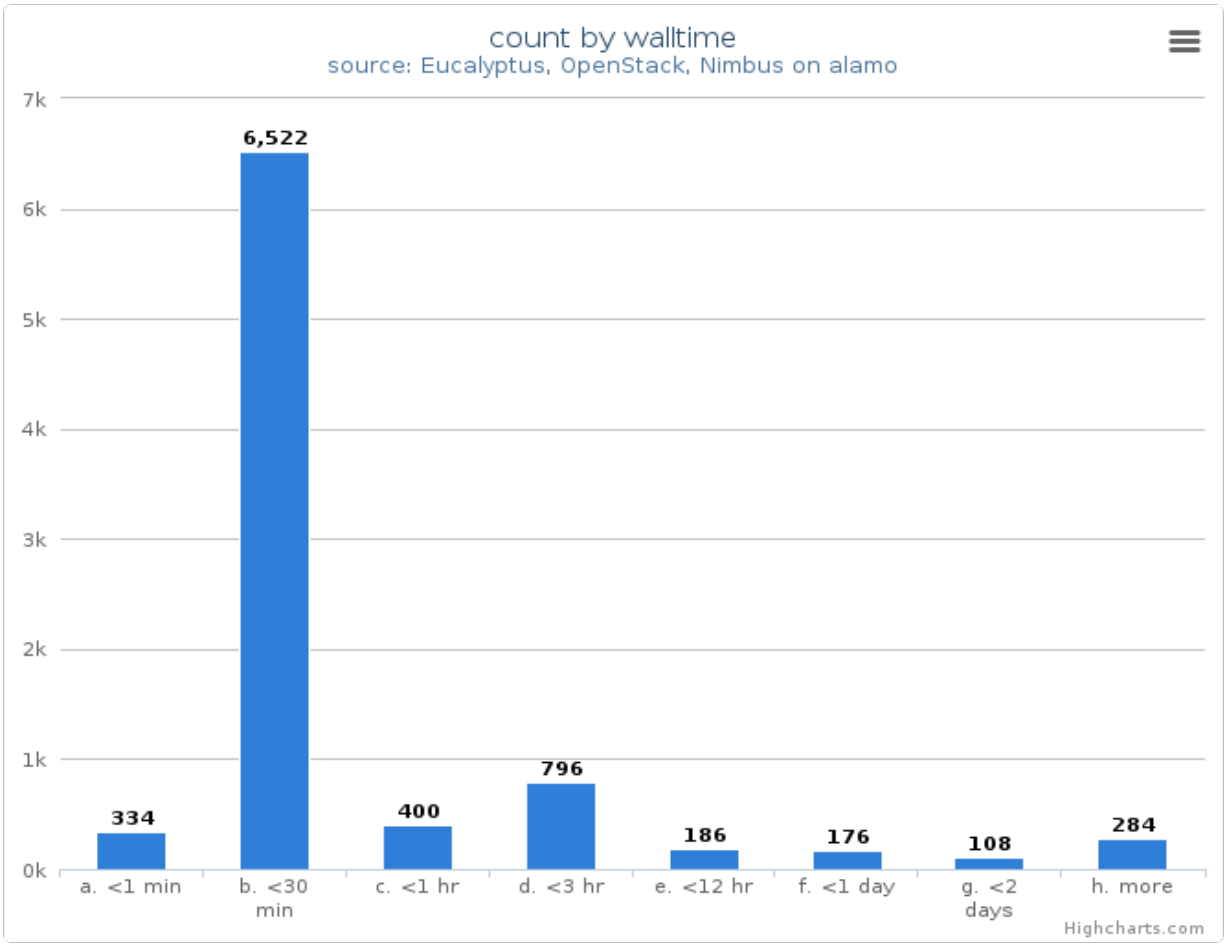

Figure 5: VM count by wall time
This chart illustrates usage patterns of VM instances in terms of running wall time.

- Period: January 01 – December 23, 2013
- Cloud(IaaS): nimbus, openstack
- Hostname: alamo

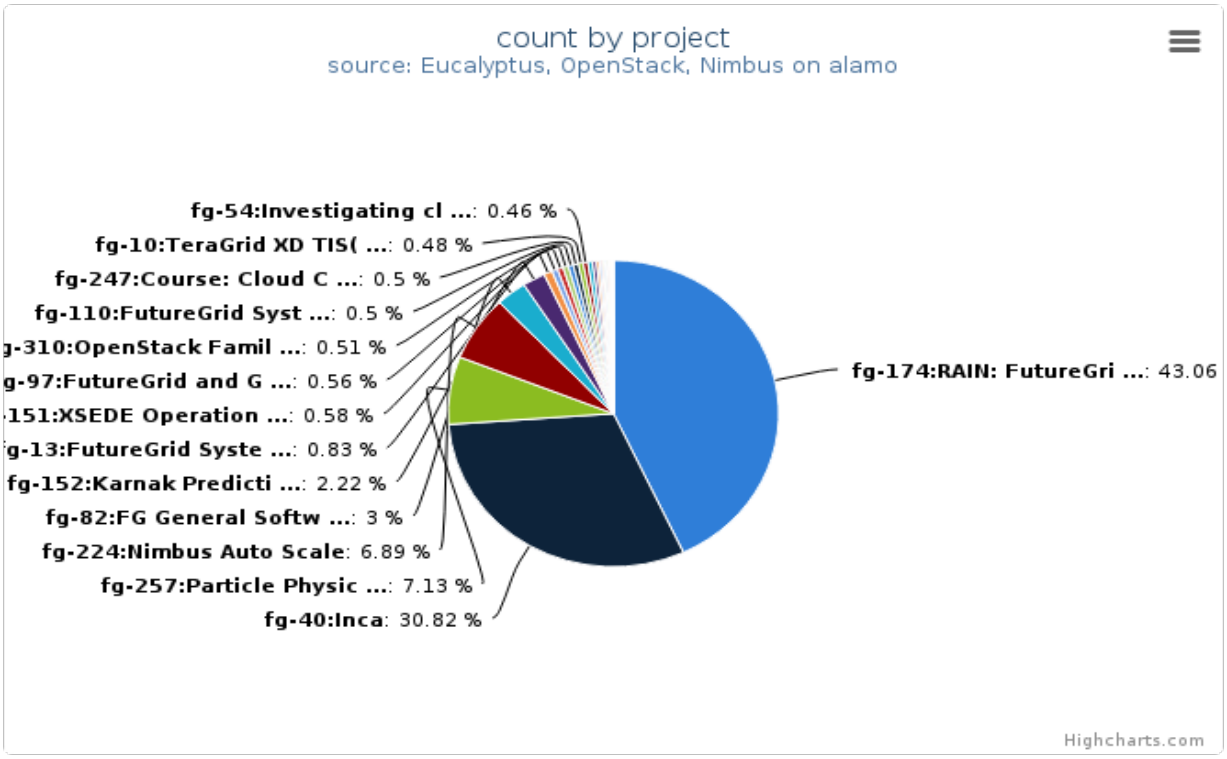

Figure 6: VMs count by project

This chart illustrates the proportion of launched VM instances by project groups. The same data in tabular form follows.

- Period: January 01 – December 23, 2013
- Cloud(IaaS): nimbus, openstack
- Hostname: alamo

Table 4.1: VMs count by project

Project
fg-174:RAIN: FutureGrid Dynamic provisioning Framework
fg-40:Inca
fg-257:Particle Physics Data analysis cluster for ATLAS LHC experiment
fg-224:Nimbus Auto Scale
fg-82:FG General Software Development
fg-152:Karnak Prediction Service
fg-13:FutureGrid Systems Development and Prototyping
fg-151:XSEDE Operations Group
fg-97:FutureGrid and Grid‘5000 Collaboration
fg-310:OpenStack Familiarization for TACC
fg-110:FutureGrid Systems Development

Table 4.1 – continued from previous page

Project
fg-247:Course: Cloud Computing and Storage Class
fg-10:TeraGrid XD TIS(Technology Insertion Service) Technology Evaluation Laboratory
fg-54:Investigating cloud computing as a solution for analyzing particle physics data
fg-1:Peer-to-peer overlay networks and applications in virtual networks and virtual clusters
Others
fg-266:Secure medical files sharing
fg-360:XSEDE Software Development and Integration Testing
fg-341:Course: Parallel Computing
fg-8:Running workflows in the cloud with Pegasus
fg-20:Development of an information service for FutureGrid
fg-312:Sensor-Rocks: A novel integrated framework to improve software Operations and Management (O&M) and power manageme
fg-253:Characterizing Performance of Infrastructure Clouds
fg-139:Course: Cloud Computing and Storage Class
fg-175:GridProphet, A workflow execution time prediction system for the Grid
fg-362:Course: Cloud Computing and Storage (UF)
fg-248:Geophysical fluid dynamics education and research
fg-130:Optimizing Scientific Workflows on Clouds
fg-367:Optimize rapid deployment and updating of VM images at the remote compute cluster
fg-136:JGC-DataCloud-2012 paper experiments
fg-172:Cloud-TM
fg-176:Cloud Interoperability Testbed
fg-90:Unicore and Genesis Experimentation

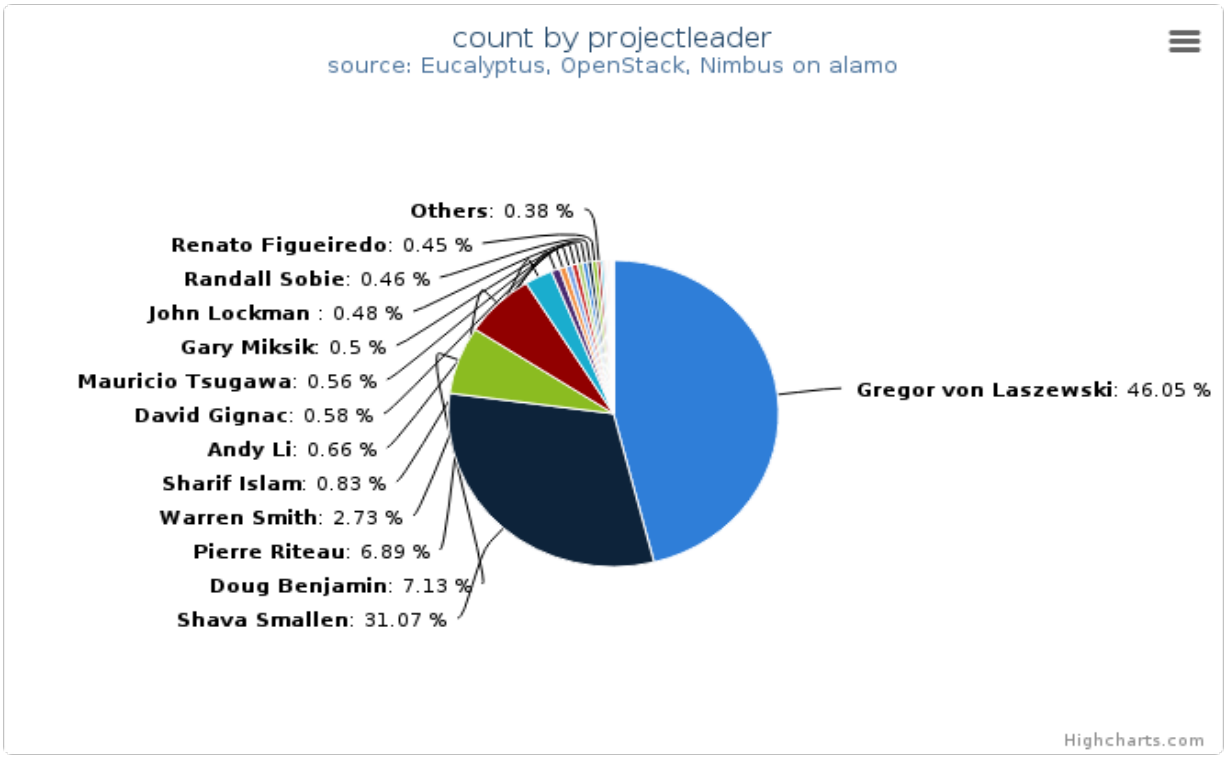

Figure 7: VMs count by project leader
This chart also illustrates the proportion of launched VM instances by project Leader. The same data in tabular form follows.

- Period: January 01 – December 23, 2013
- Cloud(IaaS): nimbus, openstack
- Hostname: alamo

Table 4.2: VMs count by project leader

Projectleader	Value
Gregor von Laszewski	2782
Shava Smallen	1877
Doug Benjamin	431
Pierre Riteau	416
Warren Smith	165
Sharif Islam	50
Andy Li	40
David Gignac	35
Mauricio Tsugawa	34
Gary Miksik	30
John Lockman	29
Randall Sobie	28
Renato Figueiredo	27
Others	23
Abdelkrim Hadjidj	17
Wilson Rivera	10
Gideon Juve	9
Hyungro Lee	8
Sameer Tilak	8
Paul Marshall	6
Thomas Fahringer	5
Glenn Flierl	3
Mats Rynge	2
Weiwei Chen	2
Jan Balewski	2
Alan Sill	1
Paolo Romano	1

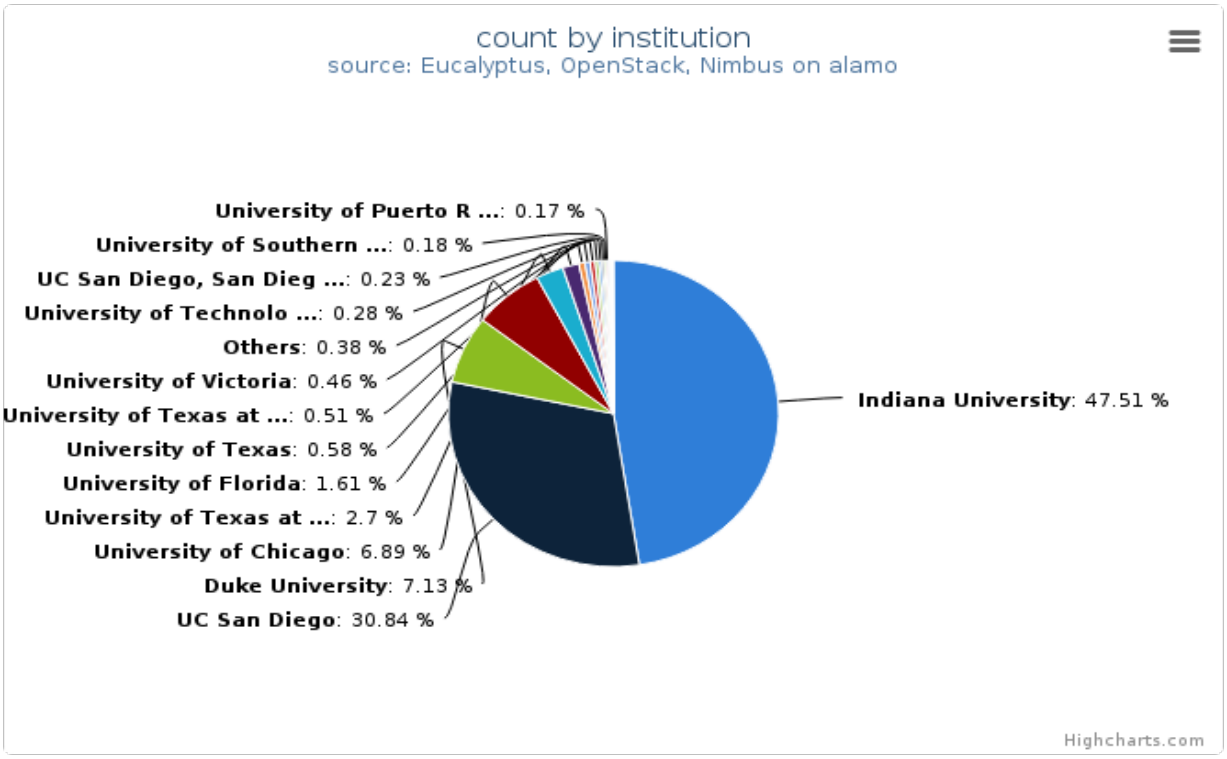

Figure 8: VMs count by institution
This chart illustrates the proportion of launched VM instances by Institution. The same data in tabular form follows.

- Period: January 01 – December 23, 2013
- Cloud(IaaS): nimbus, openstack
- Hostname: alamo

Table 4.3: VMs count by institution

Institution	Value
Indiana University	2870
UC San Diego	1863
Duke University	431
University of Chicago	416
University of Texas at Austin	163
University of Florida	97
University of Texas	35
University of Texas at Austin, Texas Advanced Computing Center	31
University of Victoria	28
Others	23
University of Technology of Compiegne	17
UC San Diego, San Diego Supercomputer Center	14
University of Southern California	11
University of Puerto Rico, Electrical and Computer Emgineering D	10
UCSD, Calit2, UCSD	8
University of Colorado at Boulder	6
University of Innsbruck	5
University of Florida, Department of Electrical and Computer Eng	4
Massachusetts Institute of Technology	3
USC	2
Massachusetts Institute of Technology, Laboratory for Nuclear Sc	2
Texas Tech University	1
INESC ID	1

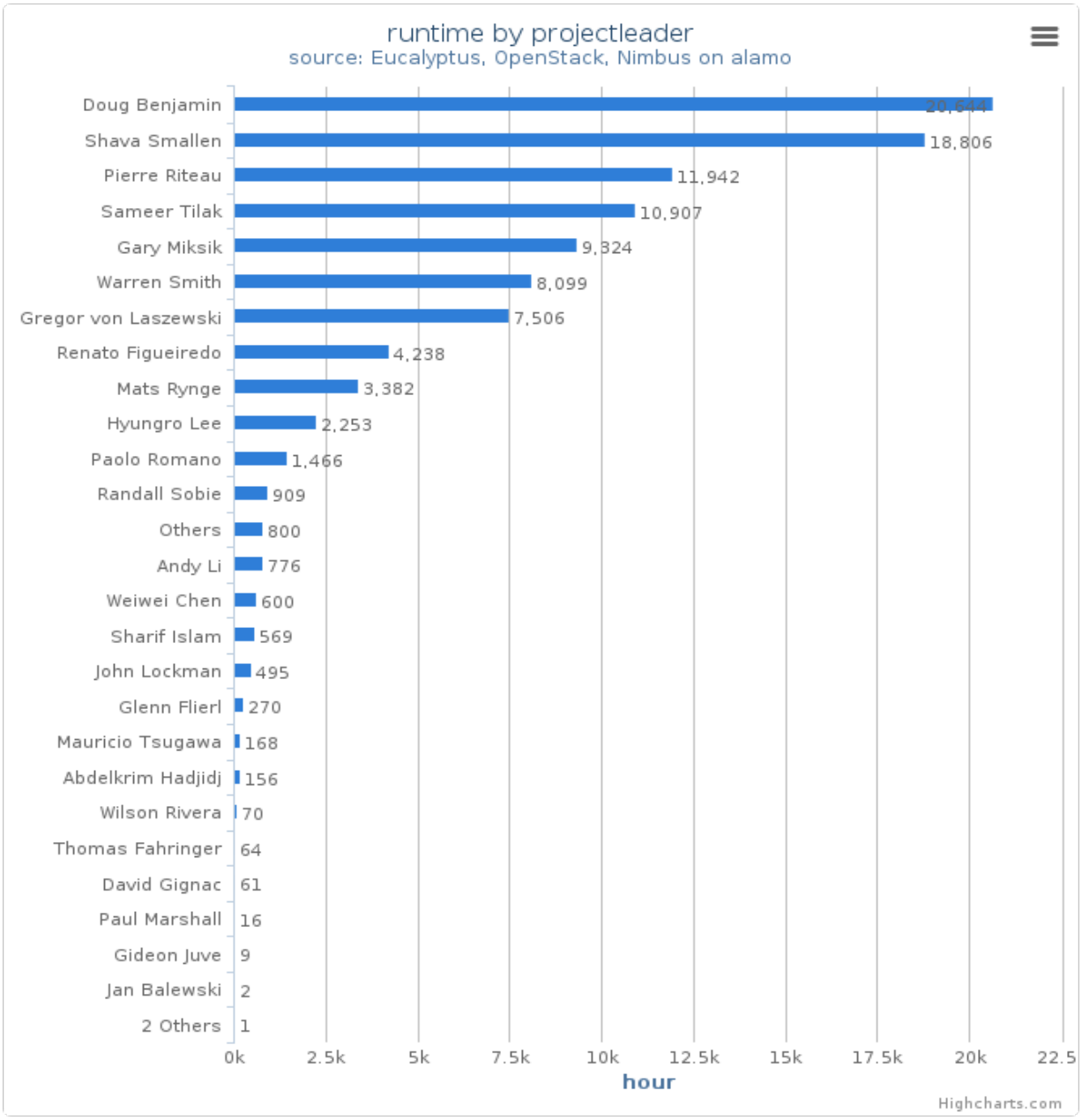

Figure 9: Wall time (hours) by project leader
This chart illustrates proportionate total run times by project leader.

- Period: January 01 – December 23, 2013
- Cloud(IaaS): nimbus, openstack
- Hostname: alamo

4.3 System information

System information shows utilization distribution as to VMs count and wall time. Each cluster represents a compute node.

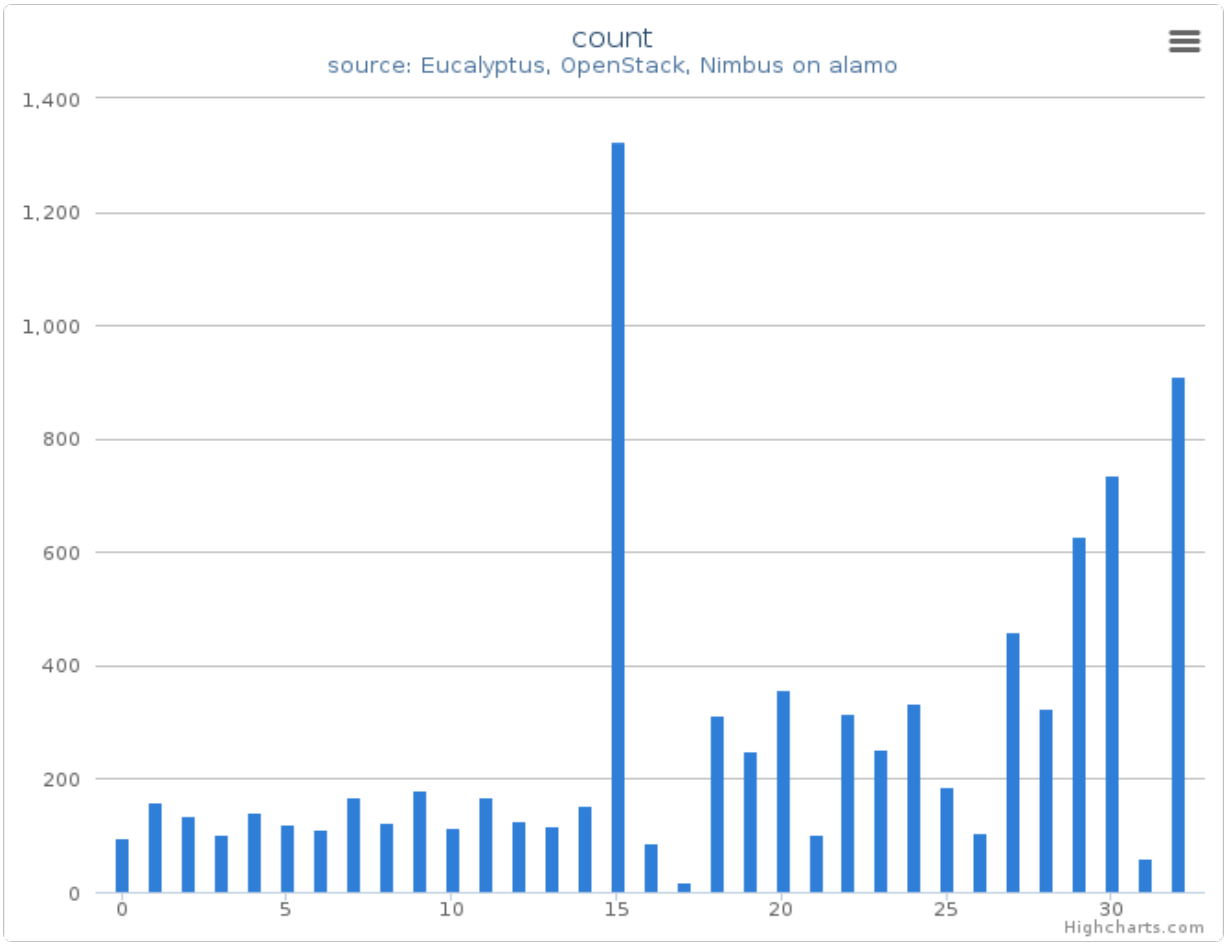

Figure 10: VMs count by systems (compute nodes) in Cluster (alamo)
This column chart represents VMs count among systems.

- Period: January 01 – December 23, 2013
- Cloud(IaaS): nimbus, openstack
- Hostname: alamo

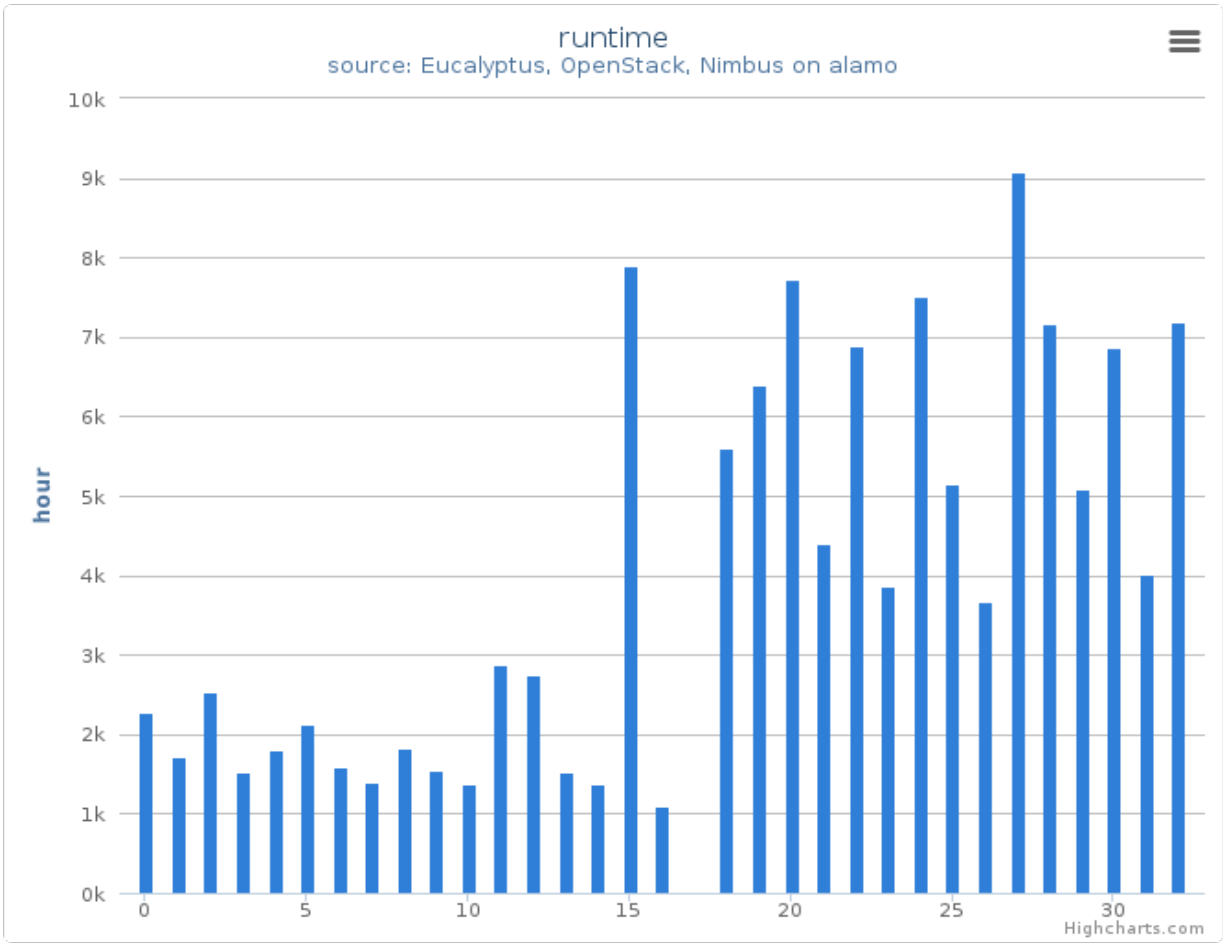

Figure 11: Wall time (hours) by systems (compute nodes) in Cluster (alamo)
This column chart represents wall time among systems.

- Period: January 01 – December 23, 2013
- Cloud(IaaS): nimbus, openstack
- Hostname: alamo

CHAPTER

FIVE

USAGE REPORT FOXTROT

- Period: January 01 – December 23, 2013
- Hostname: foxtrot.futuregrid.org
- Services: nimbus
- Metrics: VMs count, Users count, Wall time (hours), Distribution by wall time, project, project leader, and institution, and systems

5.1 Histogram

5.1.1 Summary (Monthly)

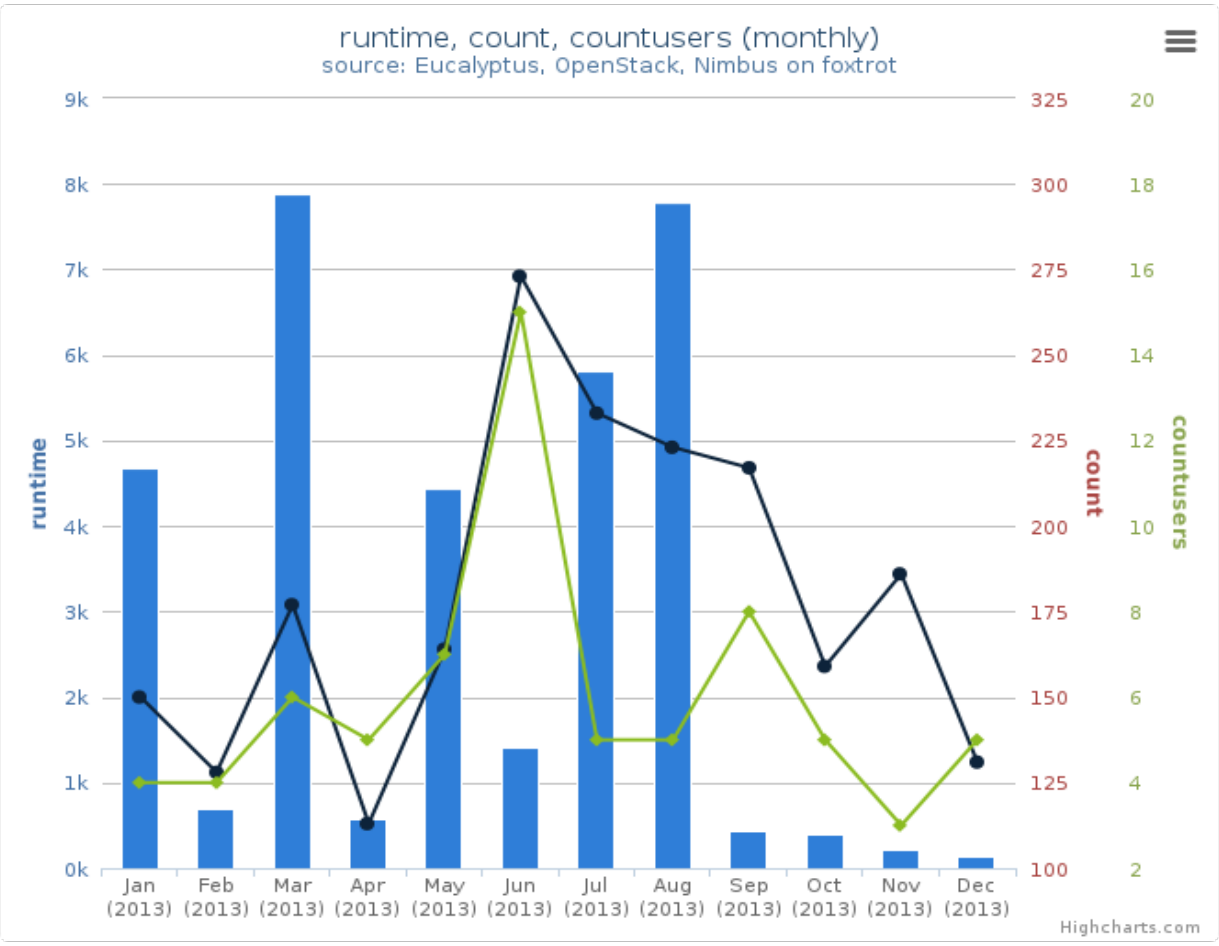

Figure 1: Average monthly usage data (wall time (hour), launched VMs, users)
This mixed chart represents average monthly usage as to wall time (hour), the number of VM instances and active users.

- Period: January 01 – December 23, 2013
- Cloud(IaaS): nimbus
- Hostname: foxtrot
- **Metric:**
  - Runtime (Wall time hours): Sum of time elapsed from launch to termination of VM instances
  - Count (VM count): The number of launched VM instances
  - User count (Active): The number of users who launched VMs

5.1.2 Summary (Daily)

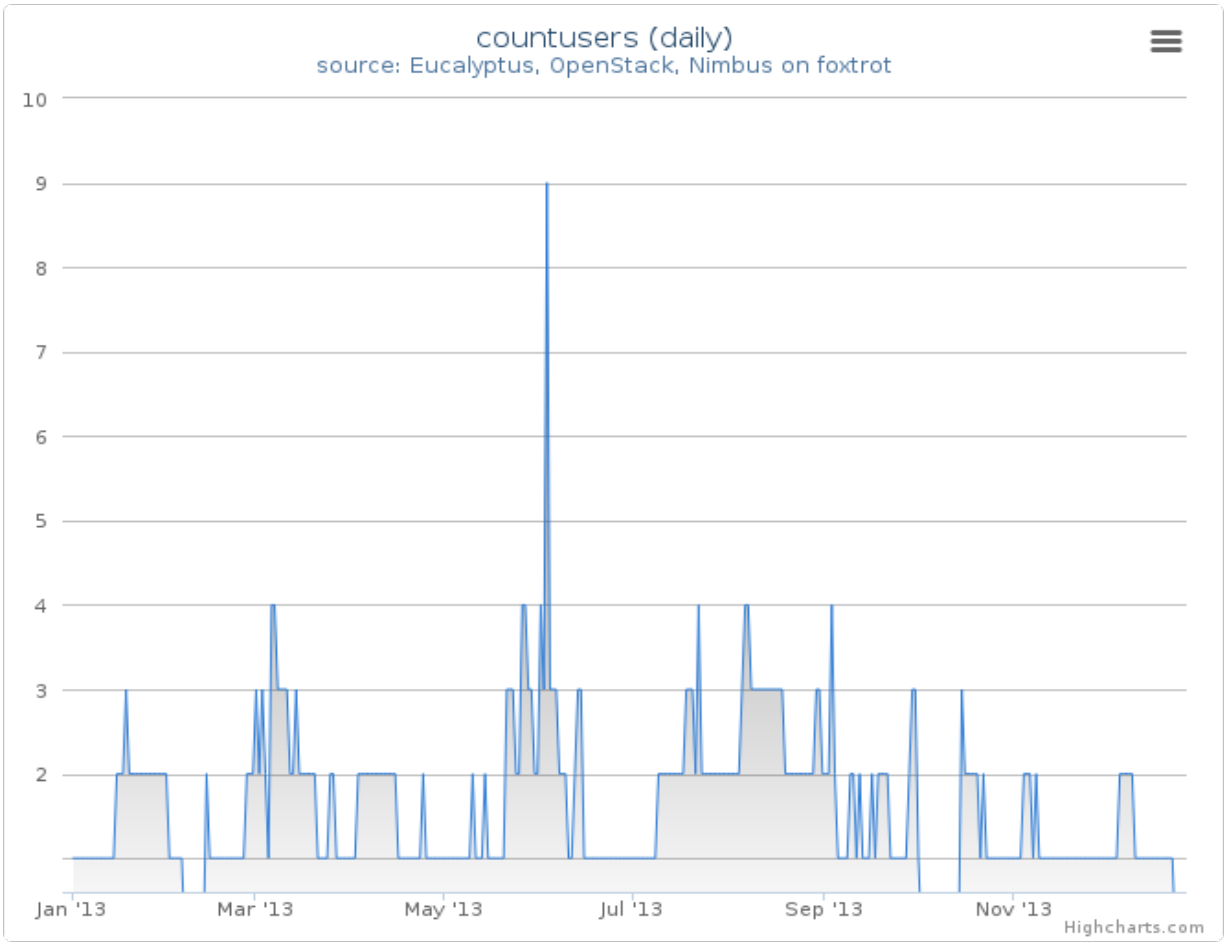

Figure 2: Users count

This time series chart represents daily active user count for cloud services and shows historical changes during the period.

- Period: January 01 – December 23, 2013
- Cloud(IaaS): nimbus
- Hostname: foxtrot

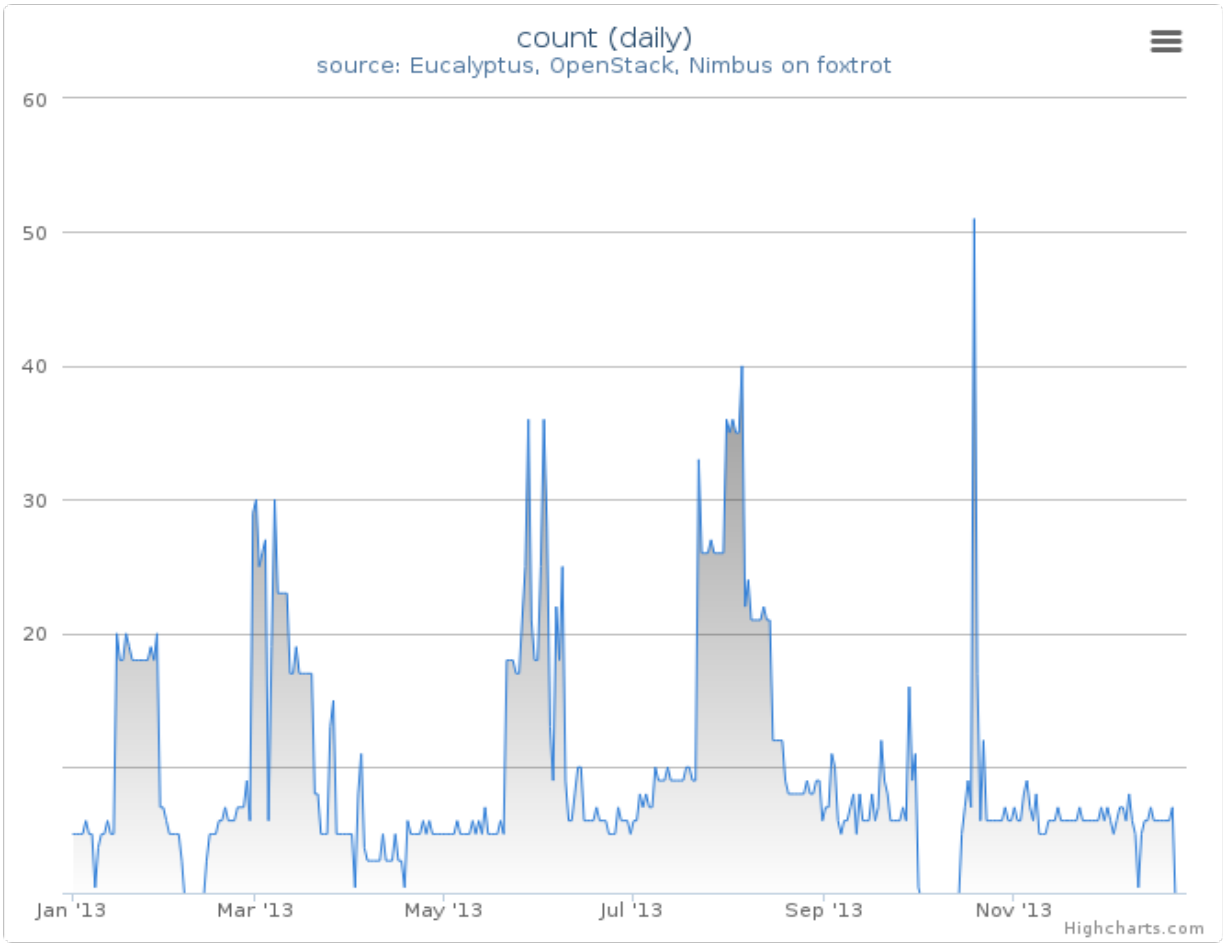

Figure 3: VMs count

This time series chart represents the number of daily launched VM instances for cloud services and shows historical changes during the period.

- Period: January 01 – December 23, 2013
- Cloud(IaaS): nimbus
- Hostname: foxtrot

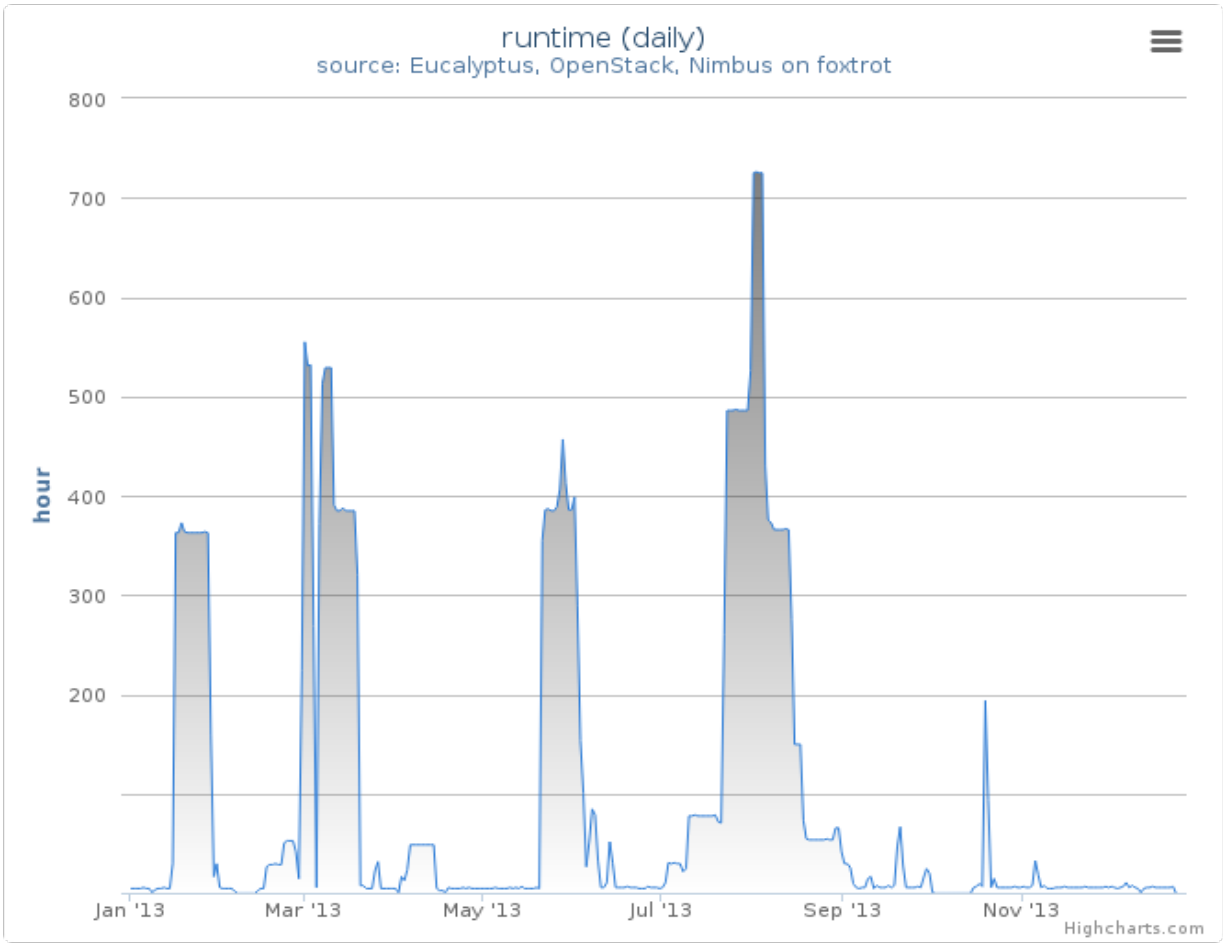

Figure 4: Wall time (hours)

This time series chart represents daily wall time (hours) for cloud services and shows historical changes during the period.

- Period: January 01 – December 23, 2013
- Cloud(IaaS): nimbus
- Hostname: foxtrot

5.2 Distribution

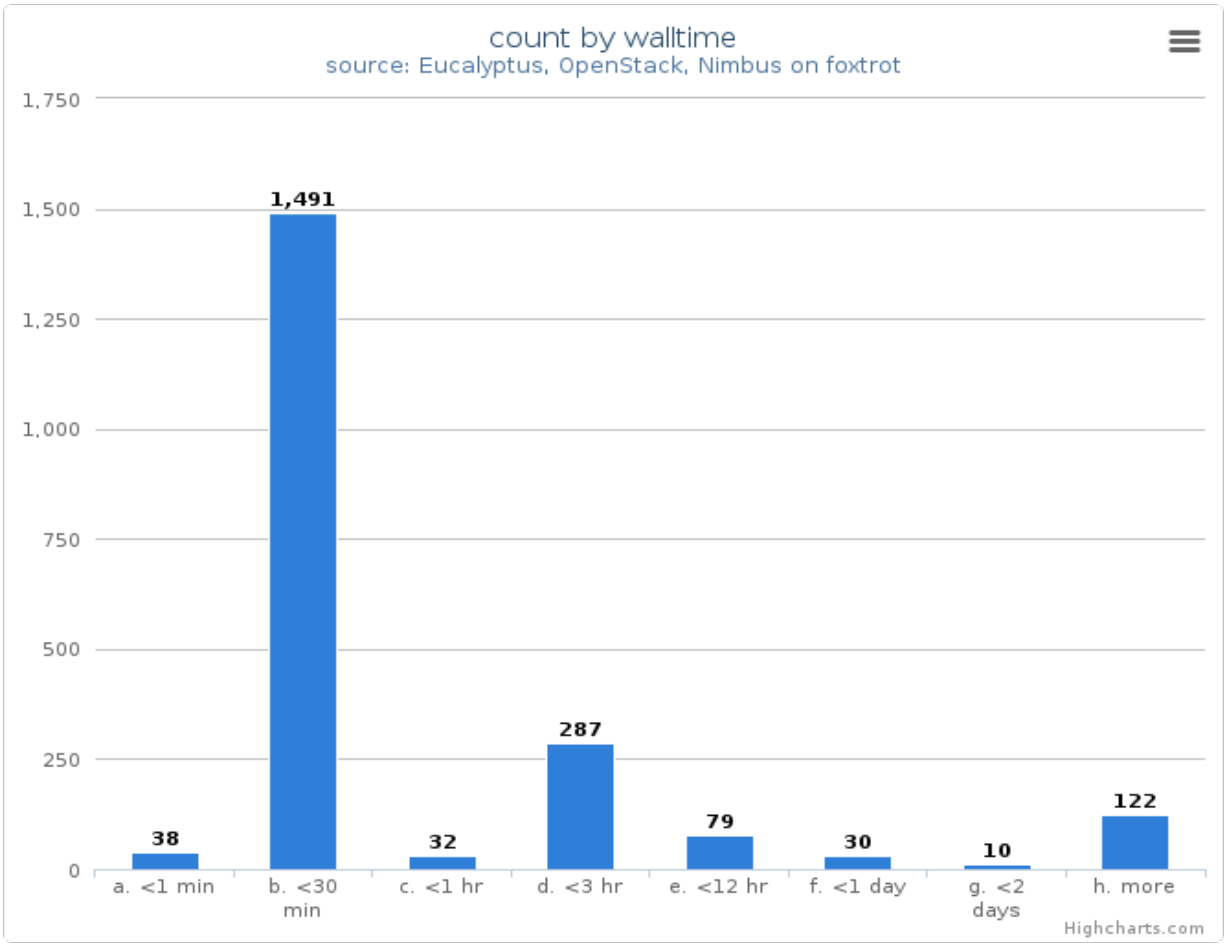

Figure 5: VM count by wall time
This chart illustrates usage patterns of VM instances in terms of running wall time.

- Period: January 01 – December 23, 2013
- Cloud(IaaS): nimbus
- Hostname: foxtrot

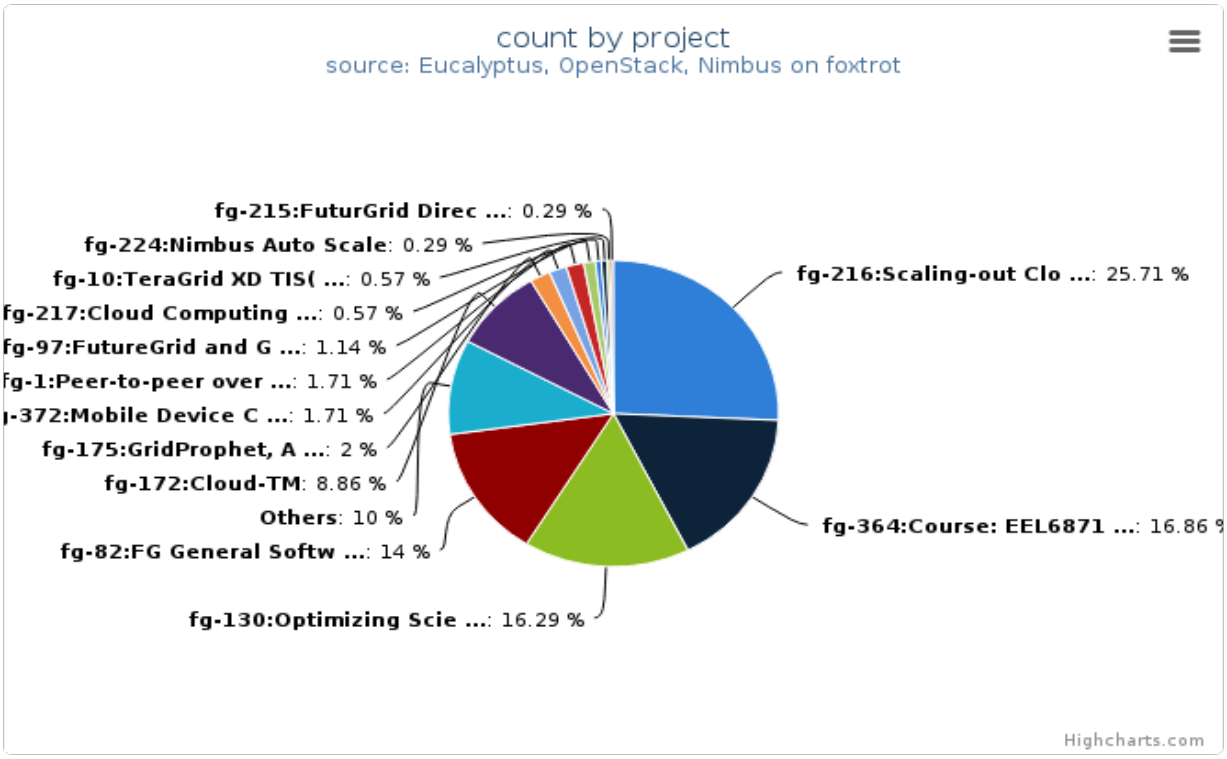

Figure 6: VMs count by project
This chart illustrates the proportion of launched VM instances by project groups. The same data in tabular form follows.

- Period: January 01 – December 23, 2013
- Cloud(IaaS): nimbus
- Hostname: foxtrot

Table 5.1: VMs count by project

Project	Value
fg-216:Scaling-out CloudBLAST: Deploying Elastic MapReduce across Geographically Distributed Virtulized Resources for BLAST	90
fg-364:Course: EEL6871 Autonomic Computing	59
fg-130:Optimizing Scientific Workflows on Clouds	57
fg-82:FG General Software Development	49
Others	35
fg-172:Cloud-TM	31
fg-175:GridProphet, A workflow execution time prediction system for the Grid	7
fg-372:Mobile Device Computation Offloading over SocialVPNs	6
fg-1:Peer-to-peer overlay networks and applications in virtual networks and virtual clusters	6
fg-97:FutureGrid and Grid'5000 Collaboration	4
fg-217:Cloud Computing In Education	2
fg-10:TeraGrid XD TIS(Technology Insertion Service) Technology Evaluation Laboratory	2
fg-224:Nimbus Auto Scale	1
fg-215:FuturGrid Directory Entry	1

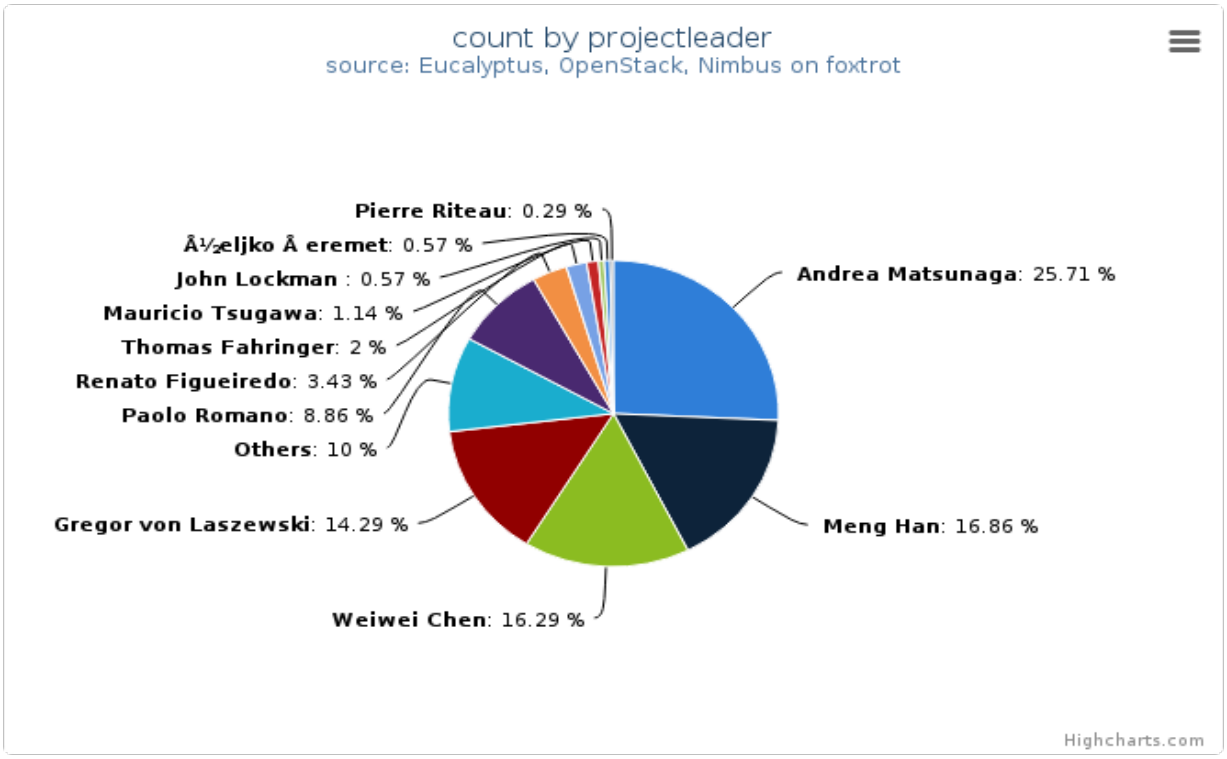

Figure 7: VMs count by project leader

This chart also illustrates the proportion of launched VM instances by project Leader. The same data in tabular form follows.

- Period: January 01 – December 23, 2013

- Cloud(IaaS): nimbus
- Hostname: foxtrot

Table 5.2: VMs count by project leader

Projectleader	Value
Andrea Matsunaga	90
Meng Han	59
Weiwei Chen	57
Gregor von Laszewski	50
Others	35
Paolo Romano	31
Renato Figueiredo	12
Thomas Fahringer	7
Mauricio Tsugawa	4
John Lockman	2
Željko Šeremet	2
Pierre Riteau	1

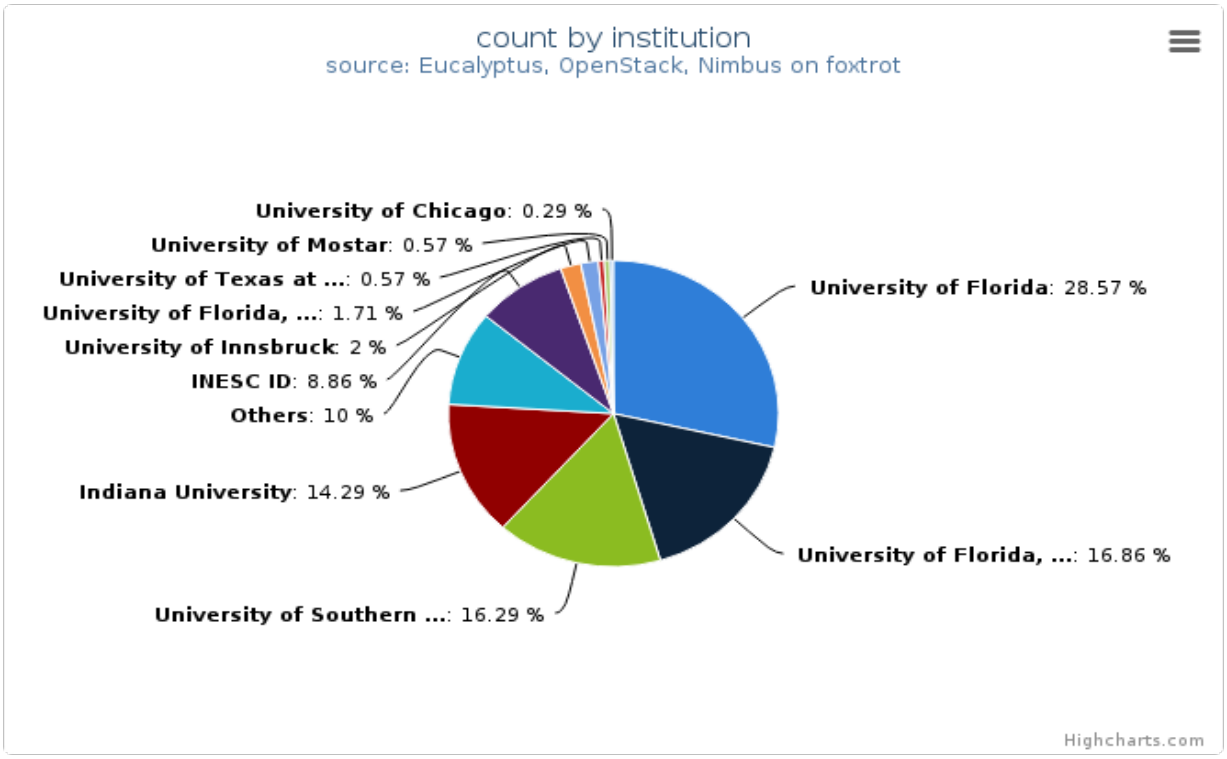

Figure 8: VMs count by institution
This chart illustrates the proportion of launched VM instances by Institution. The same data in tabular form follows.

- Period: January 01 – December 23, 2013

- Cloud(IaaS): nimbus
- Hostname: foxtrot

Table 5.3: VMs count by institution

Institution	Value
University of Florida	100
University of Florida, ACIS	59
University of Southern California	57
Indiana University	50
Others	35
INESC ID	31
University of Innsbruck	7
University of Florida, Electrical and Computer Engineering	6
University of Texas at Austin	2
University of Mostar	2
University of Chicago	1

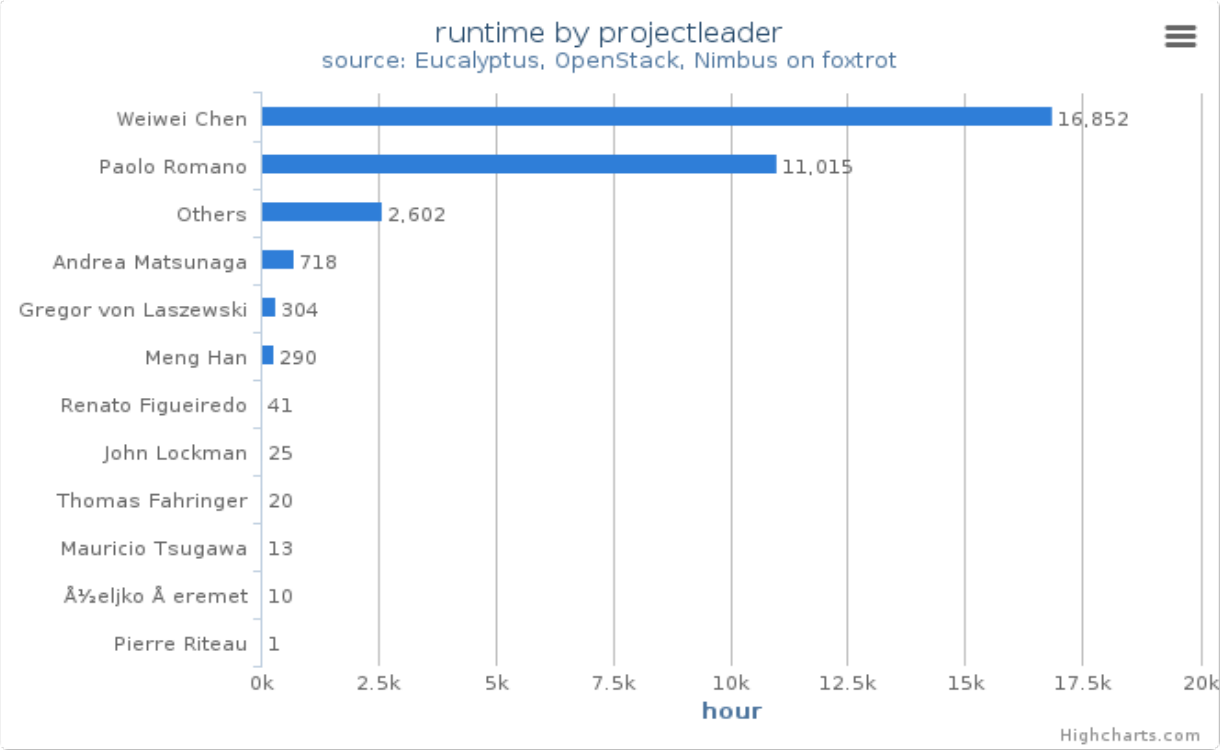

Figure 9: Wall time (hours) by project leader
This chart illustrates proportionate total run times by project leader.

- Period: January 01 – December 23, 2013
- Cloud(IaaS): nimbus
- Hostname: foxtrot

5.3 System information

System information shows utilization distribution as to VMs count and wall time. Each cluster represents a compute node.

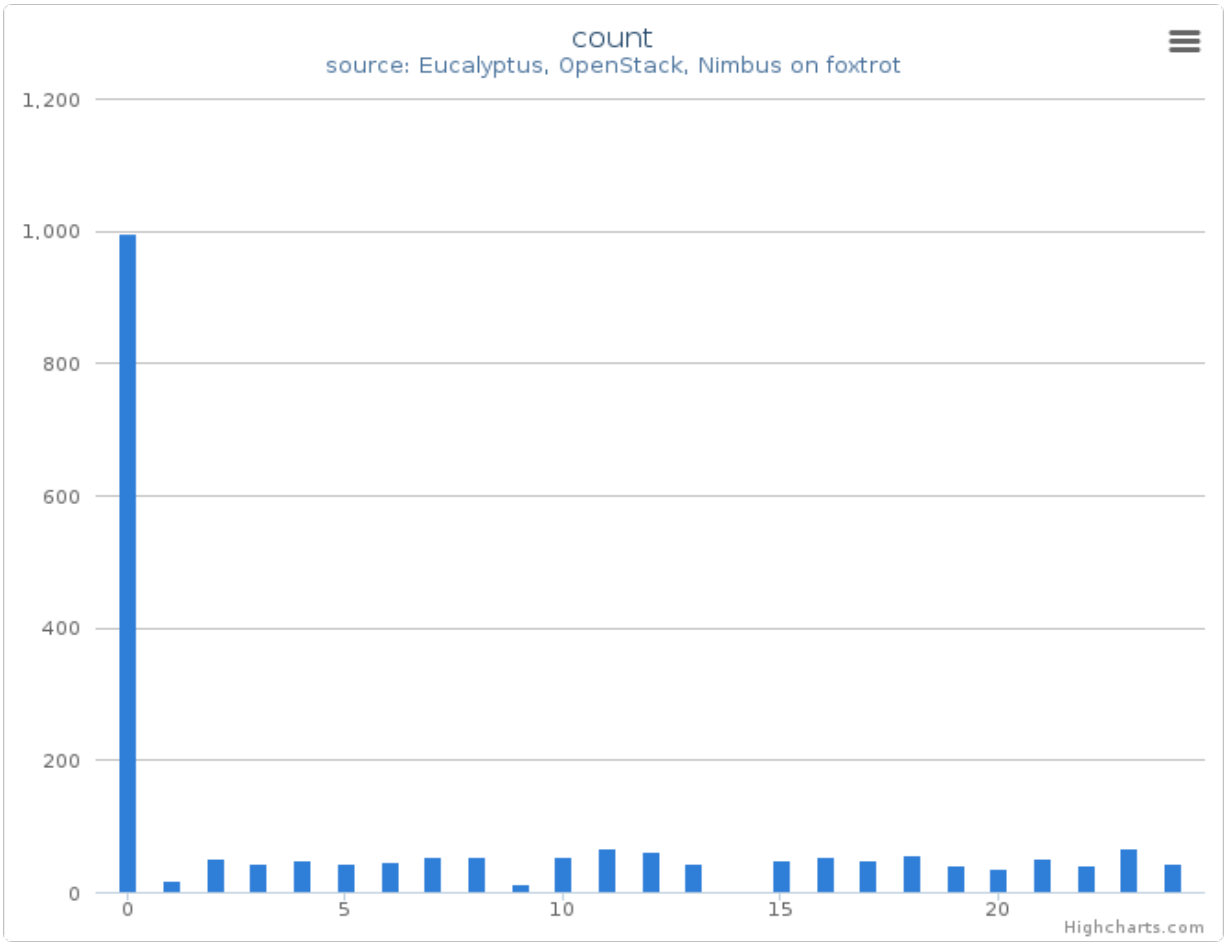

Figure 10: VMs count by systems (compute nodes) in Cluster (foxtrot)
This column chart represents VMs count among systems.

- Period: January 01 – December 23, 2013
- Cloud(IaaS): nimbus
- Hostname: foxtrot

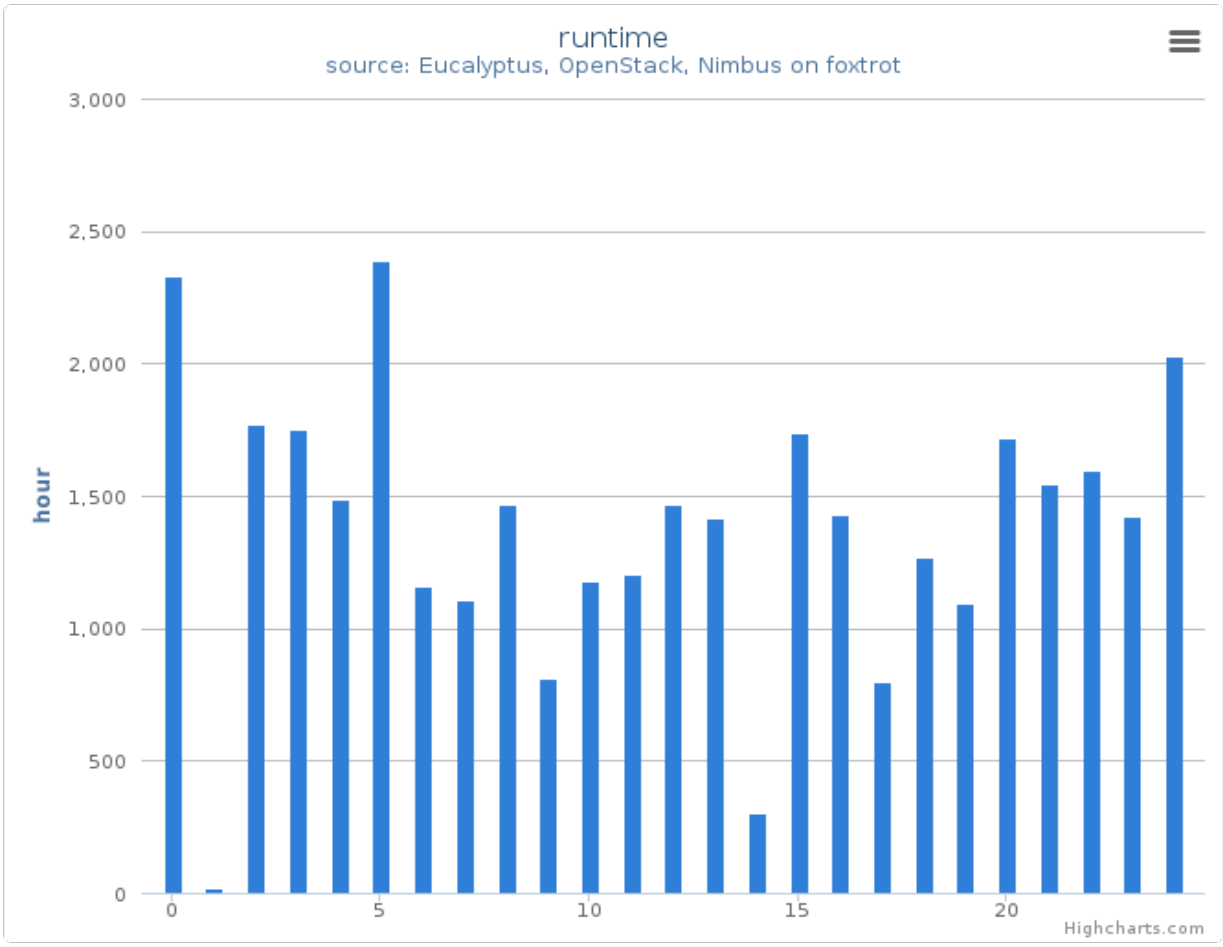

Figure 11: Wall time (hours) by systems (compute nodes) in Cluster (foxtrot)
This column chart represents wall time among systems.

- Period: January 01 – December 23, 2013
- Cloud(IaaS): nimbus
- Hostname: foxtrot

CHAPTER

SIX

USAGE REPORT HOTEL

- Period: January 01 – December 23, 2013
- Hostname: hotel.futuregrid.org
- Services: nimbus
- Metrics: VMs count, Users count, Wall time (hours), Distribution by wall time, project, project leader, and institution, and systems

6.1 Histogram

6.1.1 Summary (Monthly)

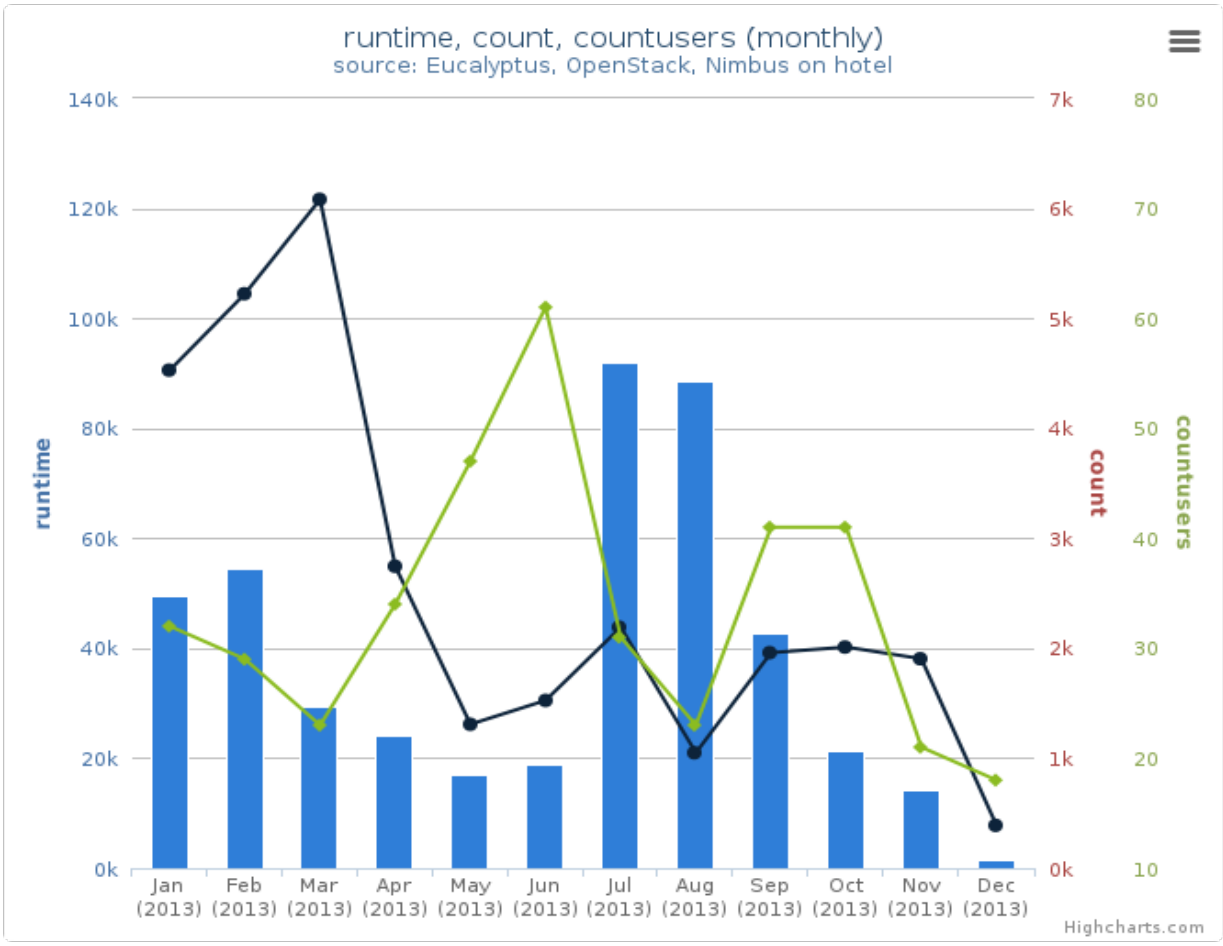

Figure 1: Average monthly usage data (wall time (hour), launched VMs, users)
This mixed chart represents average monthly usage as to wall time (hour), the number of VM instances and active users.

- Period: January 01 – December 23, 2013
- Cloud(IaaS): nimbus
- Hostname: hotel
- **Metric:**
  - Runtime (Wall time hours): Sum of time elapsed from launch to termination of VM instances
  - Count (VM count): The number of launched VM instances
  - User count (Active): The number of users who launched VMs

6.1.2 Summary (Daily)

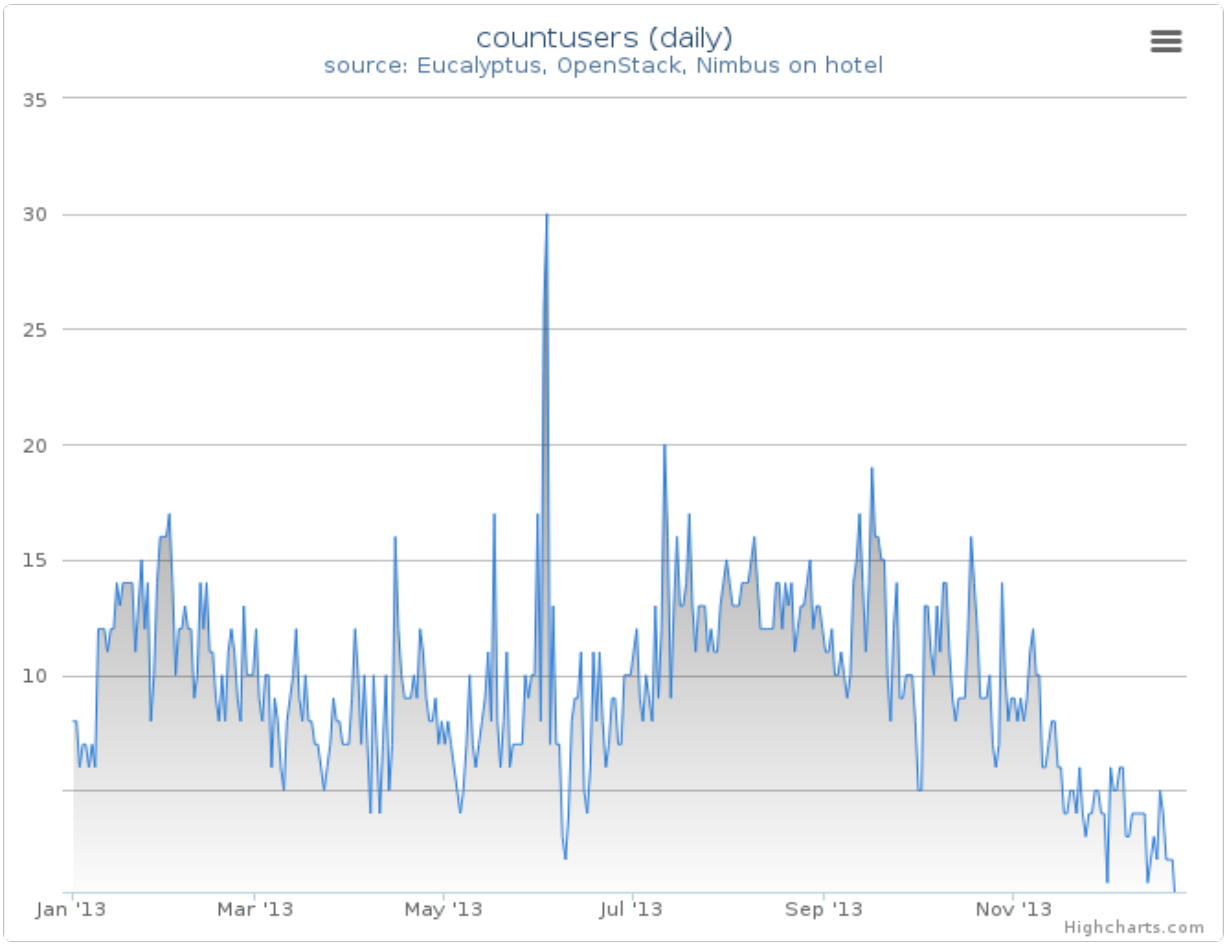

Figure 2: Users count

This time series chart represents daily active user count for cloud services and shows historical changes during the period.

- Period: January 01 – December 23, 2013
- Cloud(IaaS): nimbus
- Hostname: hotel

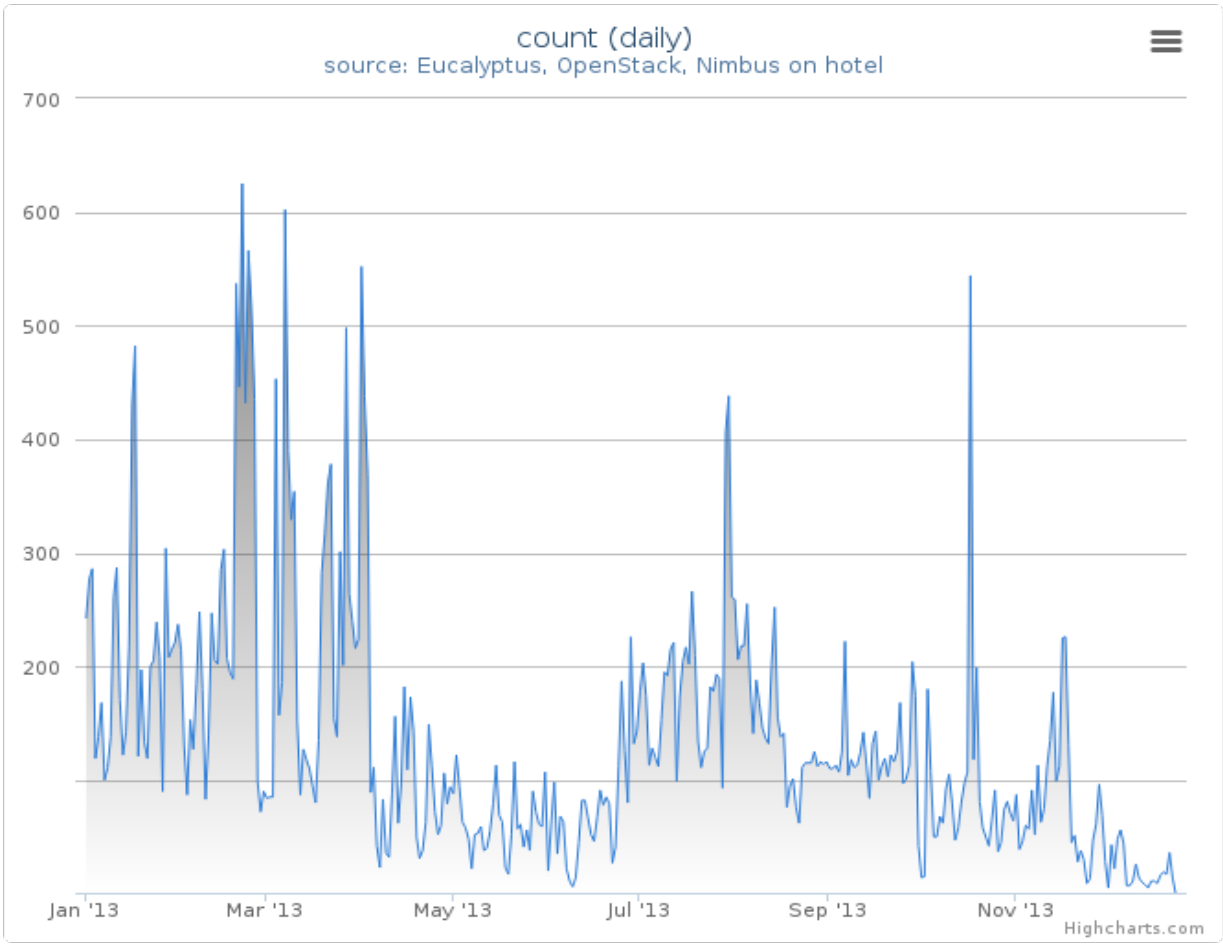

Figure 3: VMs count

This time series chart represents the number of daily launched VM instances for cloud services and shows historical changes during the period.

- Period: January 01 – December 23, 2013
- Cloud(IaaS): nimbus
- Hostname: hotel

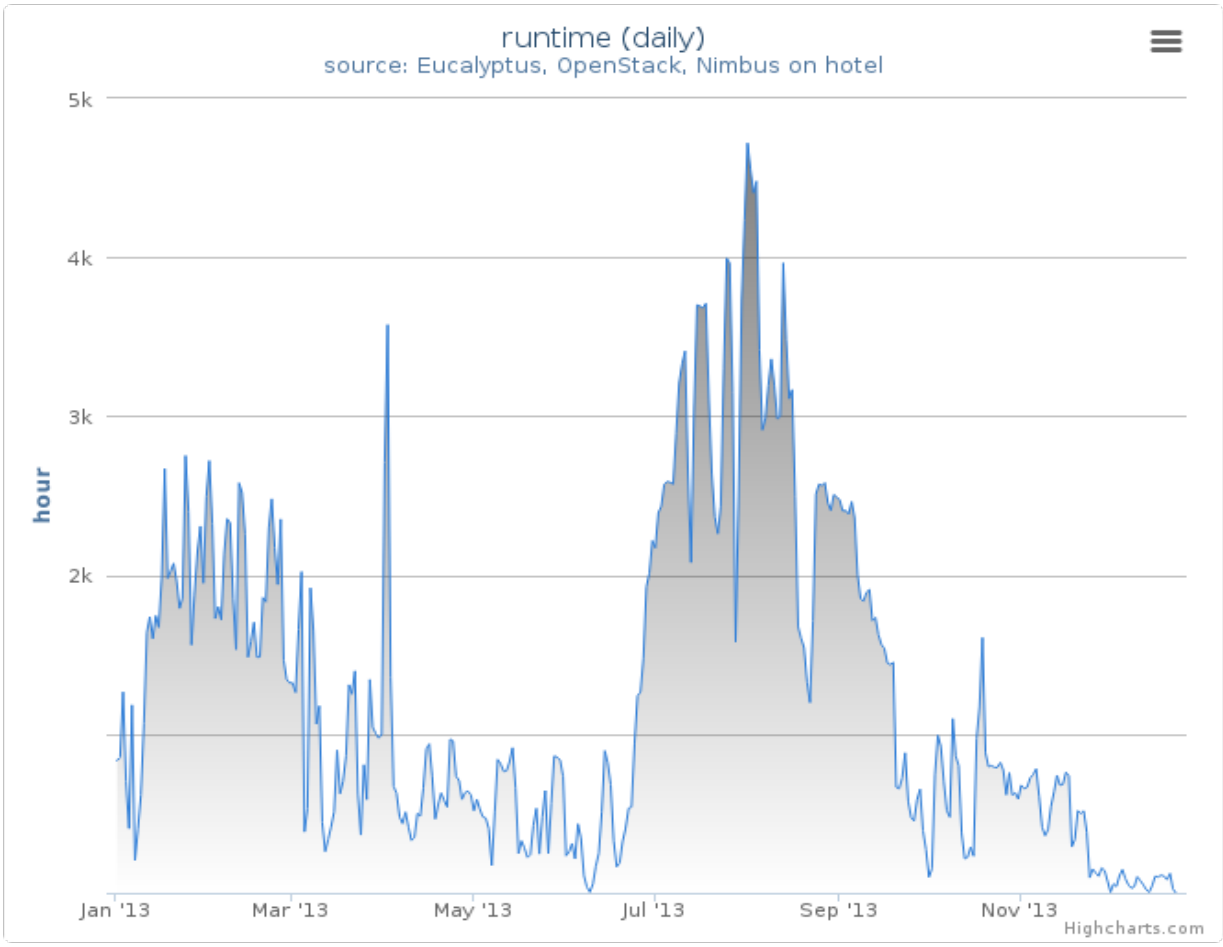

Figure 4: Wall time (hours)
This time series chart represents daily wall time (hours) for cloud services and shows historical changes during the period.

- Period: January 01 – December 23, 2013
- Cloud(IaaS): nimbus
- Hostname: hotel

6.2 Distribution

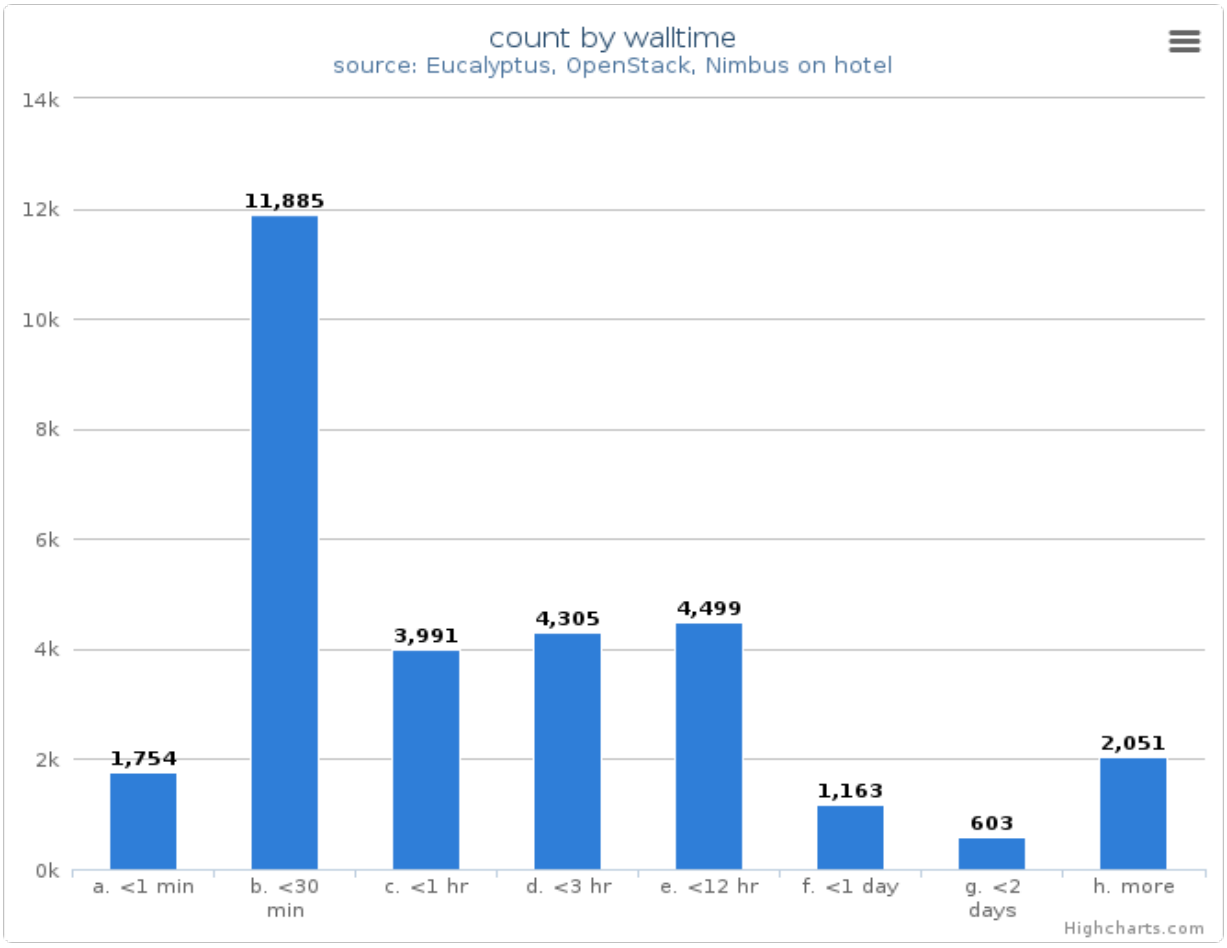

Figure 5: VM count by wall time
This chart illustrates usage patterns of VM instances in terms of running wall time.

- Period: January 01 – December 23, 2013
- Cloud(IaaS): nimbus
- Hostname: hotel

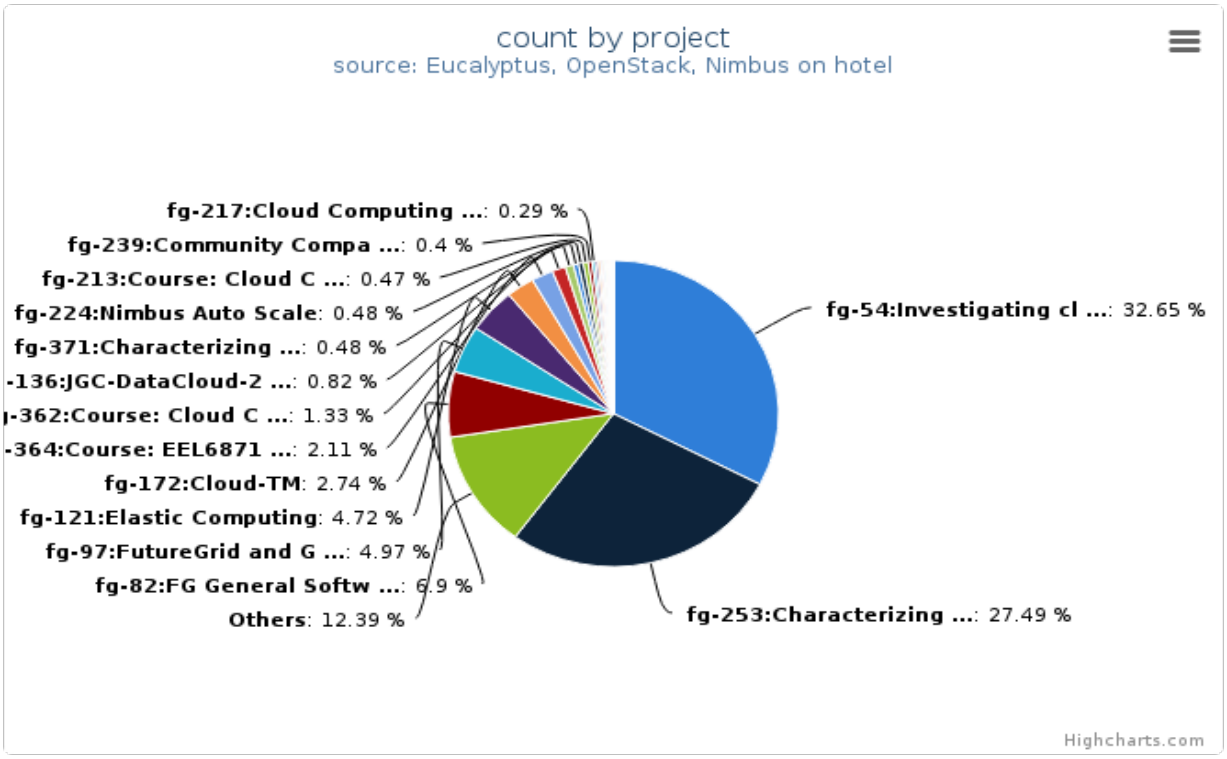

Figure 6: VMs count by project

This chart illustrates the proportion of launched VM instances by project groups. The same data in tabular form follows.

- Period: January 01 – December 23, 2013
- Cloud(IaaS): nimbus
- Hostname: hotel

Table 6.1: VMs count by project

Project
fg-54:Investigating cloud computing as a solution for analyzing particle physics data
fg-253:Characterizing Performance of Infrastructure Clouds
Others
fg-82:FG General Software Development
fg-97:FutureGrid and Grid'5000 Collaboration
fg-121:Elastic Computing
fg-172:Cloud-TM
fg-364:Course: EEL6871 Autonomic Computing
fg-362:Course: Cloud Computing and Storage (UF)
fg-136:JGC-DataCloud-2012 paper experiments
fg-371:Characterizing Infrastructure Cloud Performance for Scientific Computing

Continued on

Table 6.1 – continued from previous page

Project
fg-224:Nimbus Auto Scale
fg-213:Course: Cloud Computing class - second edition
fg-239:Community Comparison of Cloud frameworks
fg-217:Cloud Computing In Education
fg-130:Optimizing Scientific Workflows on Clouds
fg-10:TeraGrid XD TIS(Technology Insertion Service) Technology Evaluation Laboratory
fg-367:Optimize rapid deployment and updating of VM images at the remote compute cluster
fg-175:GridProphet, A workflow execution time prediction system for the Grid
fg-150:SC11: Using and Building Infrastructure Clouds for Science
fg-47:Parallel scripting using cloud resources
fg-52:Cost-Aware Cloud Computing
fg-1:Peer-to-peer overlay networks and applications in virtual networks and virtual clusters
fg-374:Course: Cloud and Distributed Computing
fg-273:Digital Provenance Research
fg-247:Course: Cloud Computing and Storage Class
fg-381:Authentication of Mobile Cloud Computing
fg-165:The VIEW Project
fg-257:Particle Physics Data analysis cluster for ATLAS LHC experiment
fg-340:Research: Parallel Computing for Machine Learning
fg-241:Course: Science Cloud Summer School 2012
fg-216:Scaling-out CloudBLAST: Deploying Elastic MapReduce across Geographically Distributed Virtulized Resources for BLAST
fg-125:The VIEW Project
fg-201:ExTENCI Testing, Validation, and Performance
fg-341:Course: Parallel Computing
fg-372:Mobile Device Computation Offloading over SocialVPNs
fg-225:Budget-constrained workflow scheduler
fg-294:Predicting economic activities using social media
fg-215:FuturGrid Directory Entry
fg-391:Topics in Parallel Computation
fg-316:Course: Cloud Computing Class - third edition
fg-60:Wide area distributed file system for MapReduce applications on FutureGrid platform
fg-355:Course: Data Center Scale Computing Class
fg-266:Secure medical files sharing
fg-139:Course: Cloud Computing and Storage Class

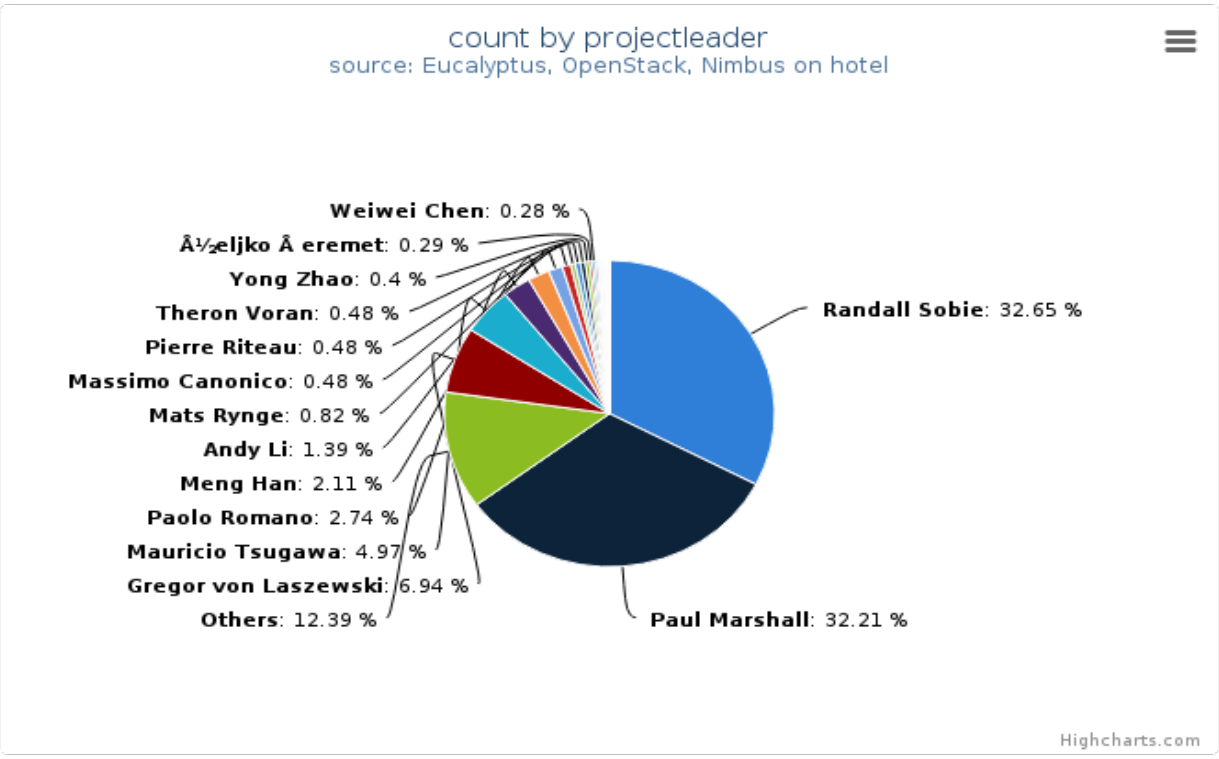

Figure 7: VMs count by project leader

This chart also illustrates the proportion of launched VM instances by project Leader. The same data in tabular form follows.

- Period: January 01 – December 23, 2013
- Cloud(IaaS): nimbus
- Hostname: hotel

Table 6.2: VMs count by project leader

Projectleader	Value
Randall Sobie	8647
Paul Marshall	8532
Others	3281
Gregor von Laszewski	1838
Mauricio Tsugawa	1316
Paolo Romano	726
Meng Han	560
Andy Li	368
Mats Rynge	216
Massimo Canonico	127
Pierre Riteau	127

Continued on next page

Table 6.2 – continued from previous page

Projectleader	Value
Theron Voran	127
Yong Zhao	105
Željko Šeremet	76
Weiwei Chen	75
John Lockman	65
Thomas Fahringer	39
Jan Balewski	39
John Bresnahan	32
Michael Wilde	31
David Lowenthal	24
Renato Figueiredo	22
Shiyong Lu	20
Philip Rhodes	16
Mohammed Rangwala	16
Shane Green	14
Wilson Rivera	13
Doug Benjamin	10
Andrea Matsunaga	7
Preston Smith	5
Adrian Muresan	4
Shuyuan Deng	3
Heru Suhartanto	2
Abdelkrim Hadjidj	1
Lizhe Wang	1
Dirk Grunwald	1

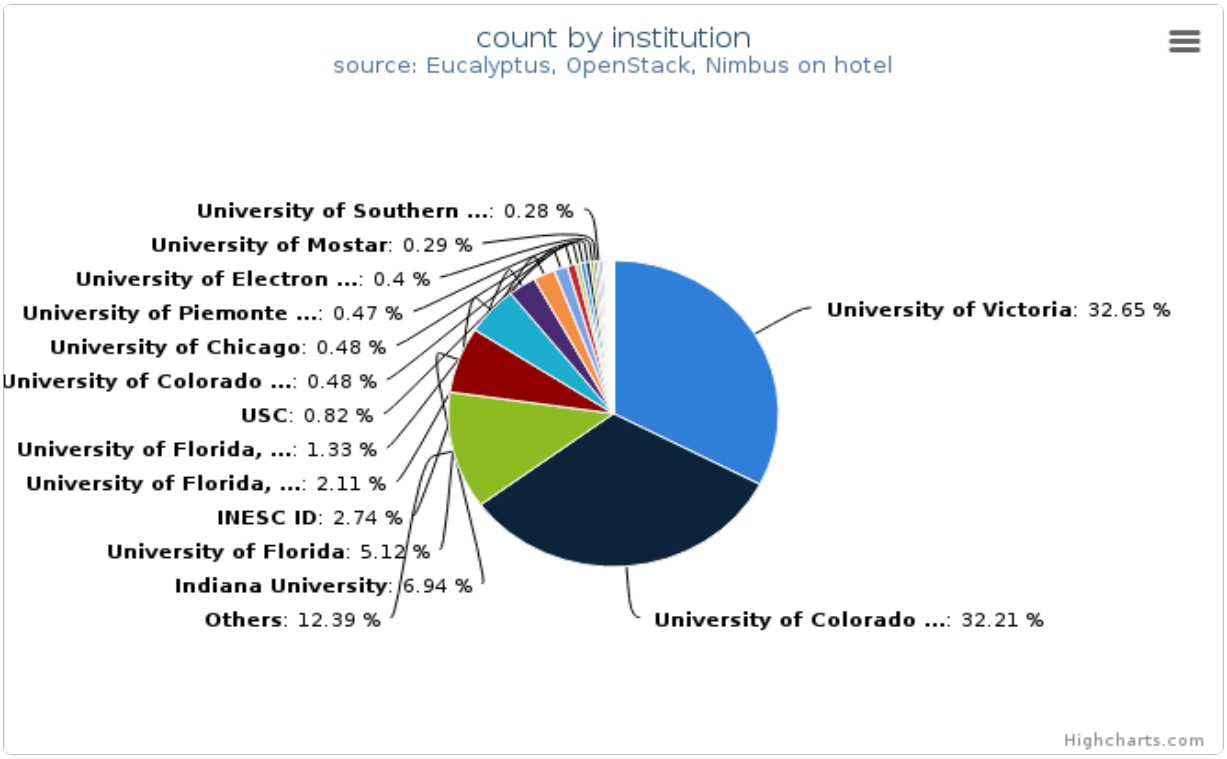

Figure 8: VMs count by institution
This chart illustrates the proportion of launched VM instances by Institution. The same data in tabular form follows.

- Period: January 01 – December 23, 2013
- Cloud(IaaS): nimbus
- Hostname: hotel

Table 6.3: VMs count by institution

Institution	Value
University of Victoria	8647
University of Colorado at Boulder	8532
Others	3281
Indiana University	1839
University of Florida	1356
INESC ID	726
University of Florida, ACIS	560
University of Florida, Department of Electrical and Computer Eng	352
USC	216
University of Colorado at Boulder, Computer Science Department	127
University of Chicago	127
University of Piemonte Orientale	125

Continued on next page

Table 6.3 – continued from previous page

Institution	Value
University of Electronic Science and Technology	105
University of Mostar	76
University of Southern California	75
University of Texas at Austin	65
University of Innsbruck	39
Massachusetts Institute of Technology, Laboratory for Nuclear Sc	39
Nimbus	32
Argonne National Laboratory	31
University of Arizona	24
Wayne State University	20
University of Mississippi, Department of Computer Science	16
Indiana University Purdue University Indianapolis	16
Colorado Technical University, Computer Science and Engineering	14
University of Puerto Rico, Electrical and Computer Emgineering D	13
Duke University	10
University of Florida, Electrical and Computer Engineering	5
Purdue University	5
ENS Lyon	4
University of Wisconsin -Milwaukee	3
Universitas Indonesia, Faculty of Computer Science	2
University of Piemonte Orientale, Computer Science Department	2
University of Technology of Compiegne	1
Univ. of Colorado, Boulder, Computer Science	1

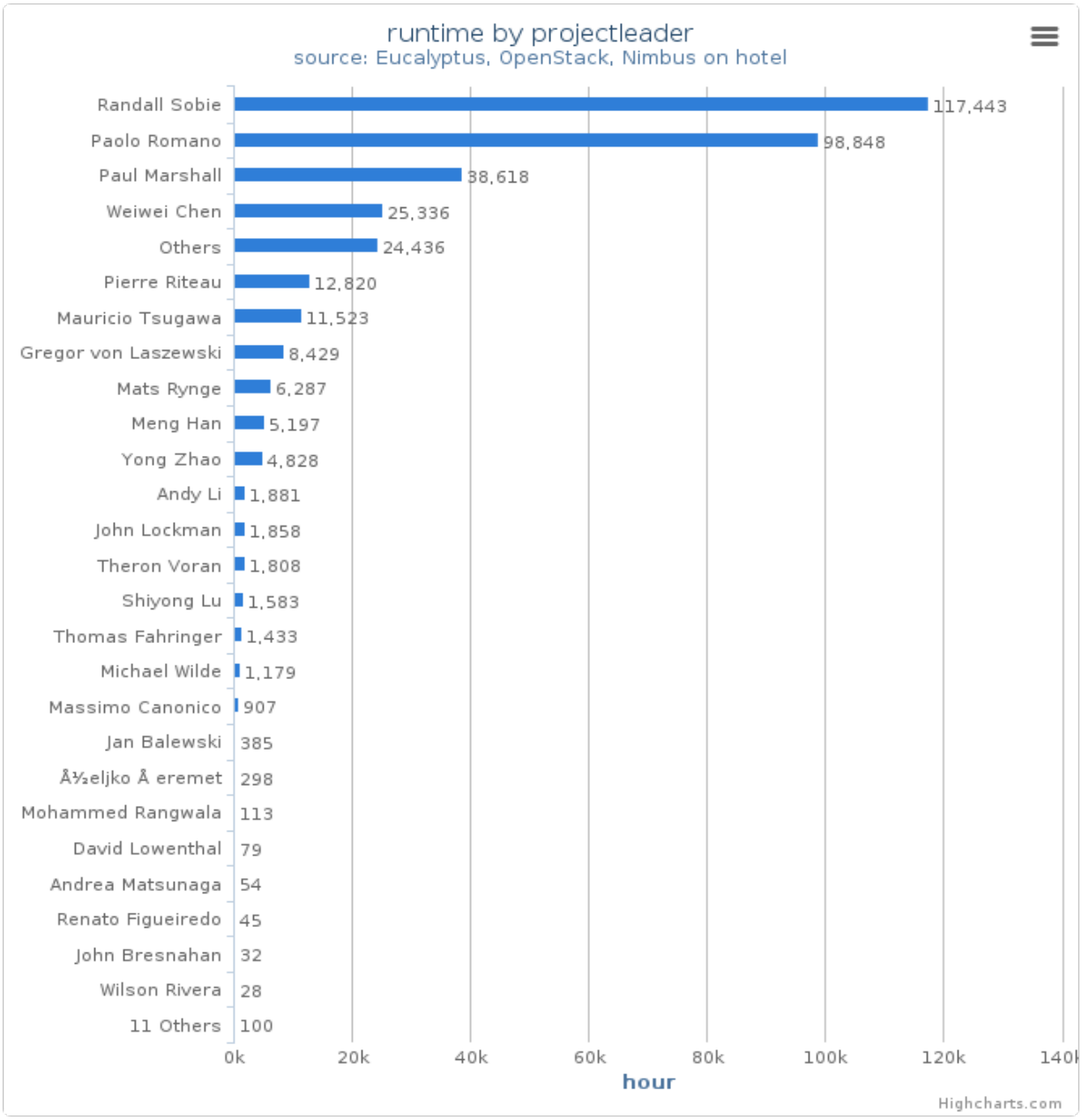

Figure 9: Wall time (hours) by project leader
This chart illustrates proportionate total run times by project leader.

- Period: January 01 – December 23, 2013
- Cloud(IaaS): nimbus
- Hostname: hotel

6.3 System information

System information shows utilization distribution as to VMs count and wall time. Each cluster represents a compute node.

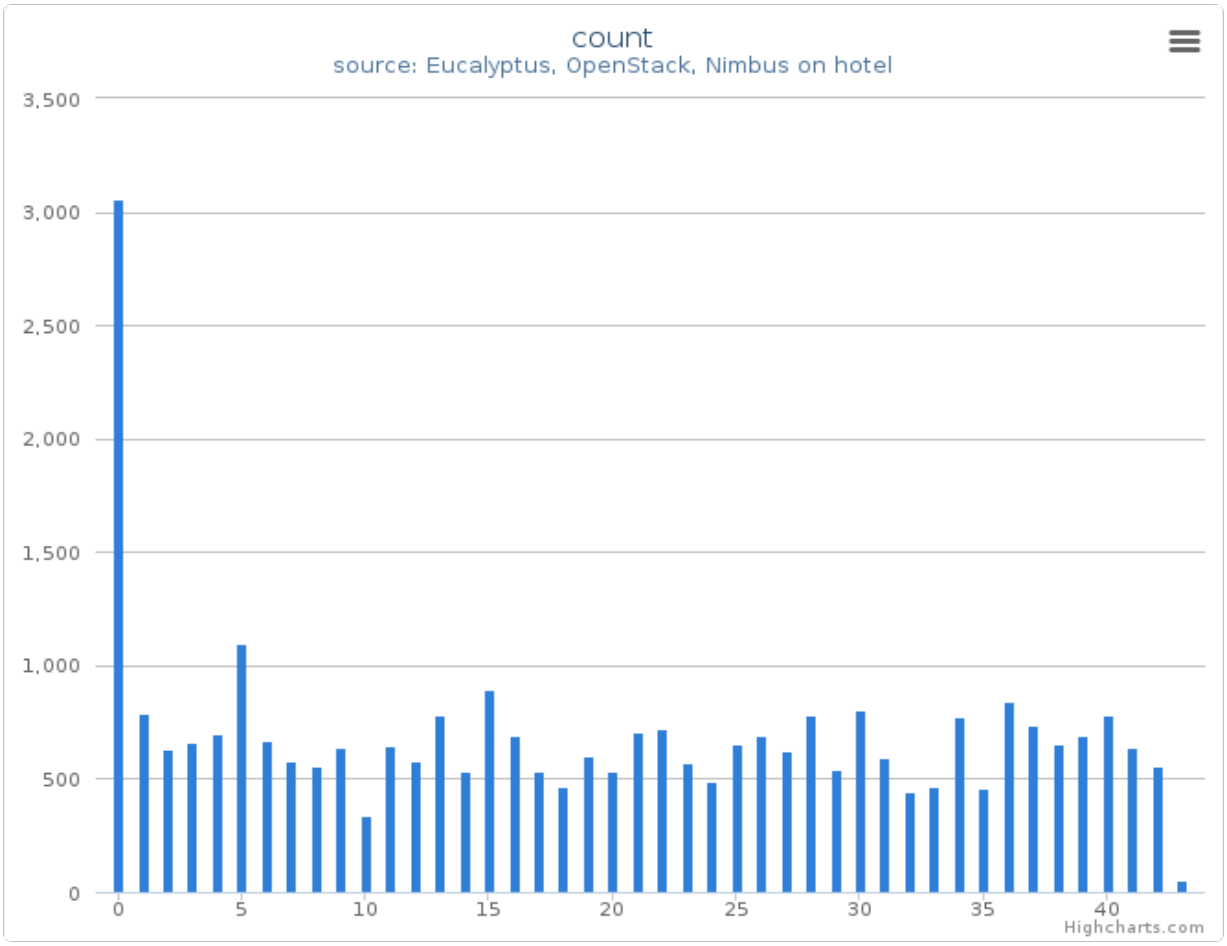

Figure 10: VMs count by systems (compute nodes) in Cluster (hotel)
This column chart represents VMs count among systems.

- Period: January 01 – December 23, 2013
- Cloud(IaaS): nimbus
- Hostname: hotel

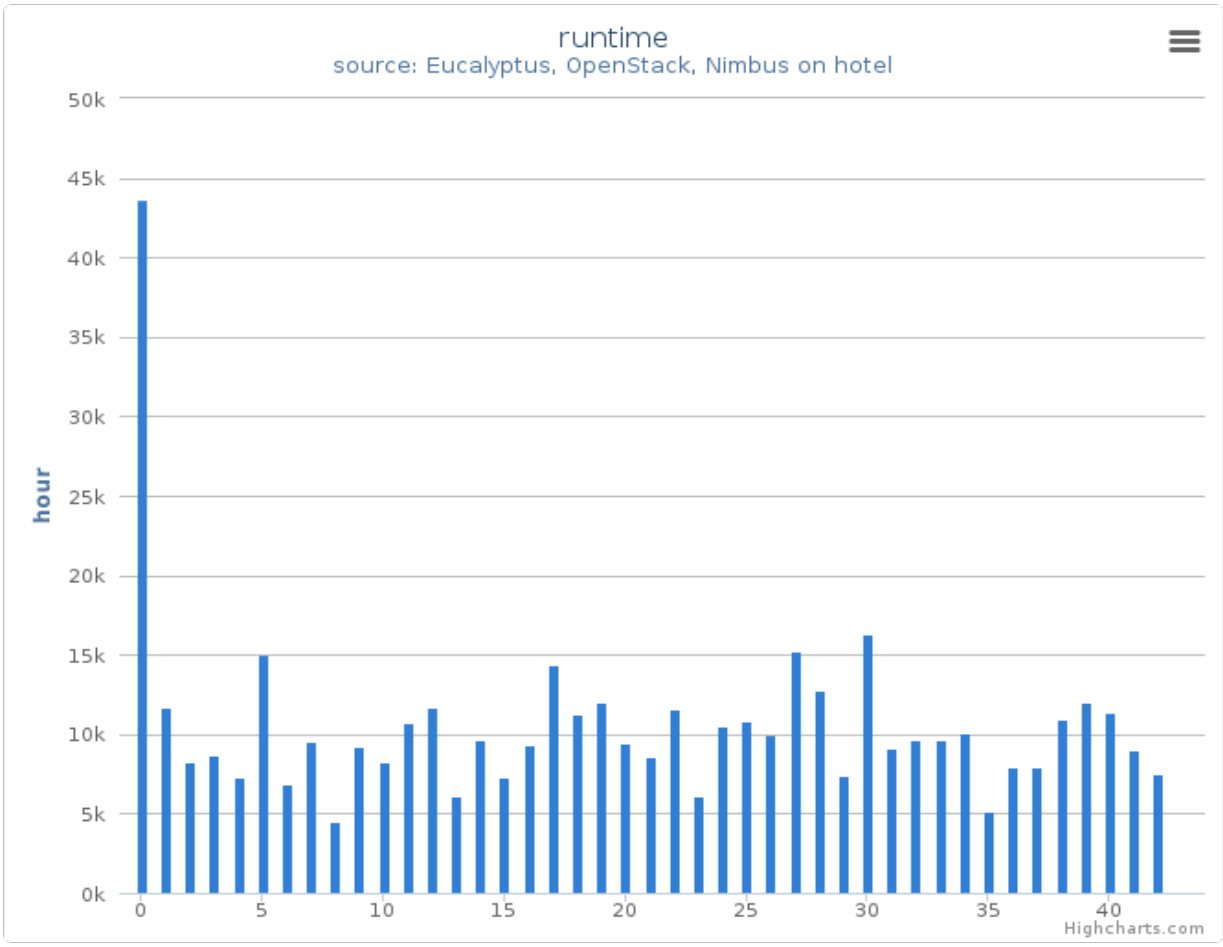

Figure 11: Wall time (hours) by systems (compute nodes) in Cluster (hotel)
This column chart represents wall time among systems.

- Period: January 01 – December 23, 2013
- Cloud(IaaS): nimbus
- Hostname: hotel

CHAPTER

SEVEN

USER TABLE (CLOUD)

This table provides wall time usage of cloud users with the project id (first appearance). - Cloud:

- india.futuregrid.org: openstack, eucalyptus
- sierra.futuregrid.org: nimbus, (openstack expected soon)
- hotel.futuregrid.org: nimbus
- alamo.futuregrid.org: nimbus, (openstack expected soon)
- foxtrot.futuregrid.org: nimbus

CHAPTER

EIGHT

USER TABLE (HPC)

This table provides detailed information on users, including average job size, average wait time, and average run time. - HPC: alamo, bravo, hotel, india xray, sierra - Data obtained from ubmod.futuregrid.org **** Missing user name is represented as a hidden userid under asterisks.