Metrics and Monitoring on FermiGrid

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Outline

FermiGrid Introduction and Background

Metrics

Service Monitoring

Availability (Acceptance) Monitoring

Dashboard

Lessons Learned

Future Plans

Personnel

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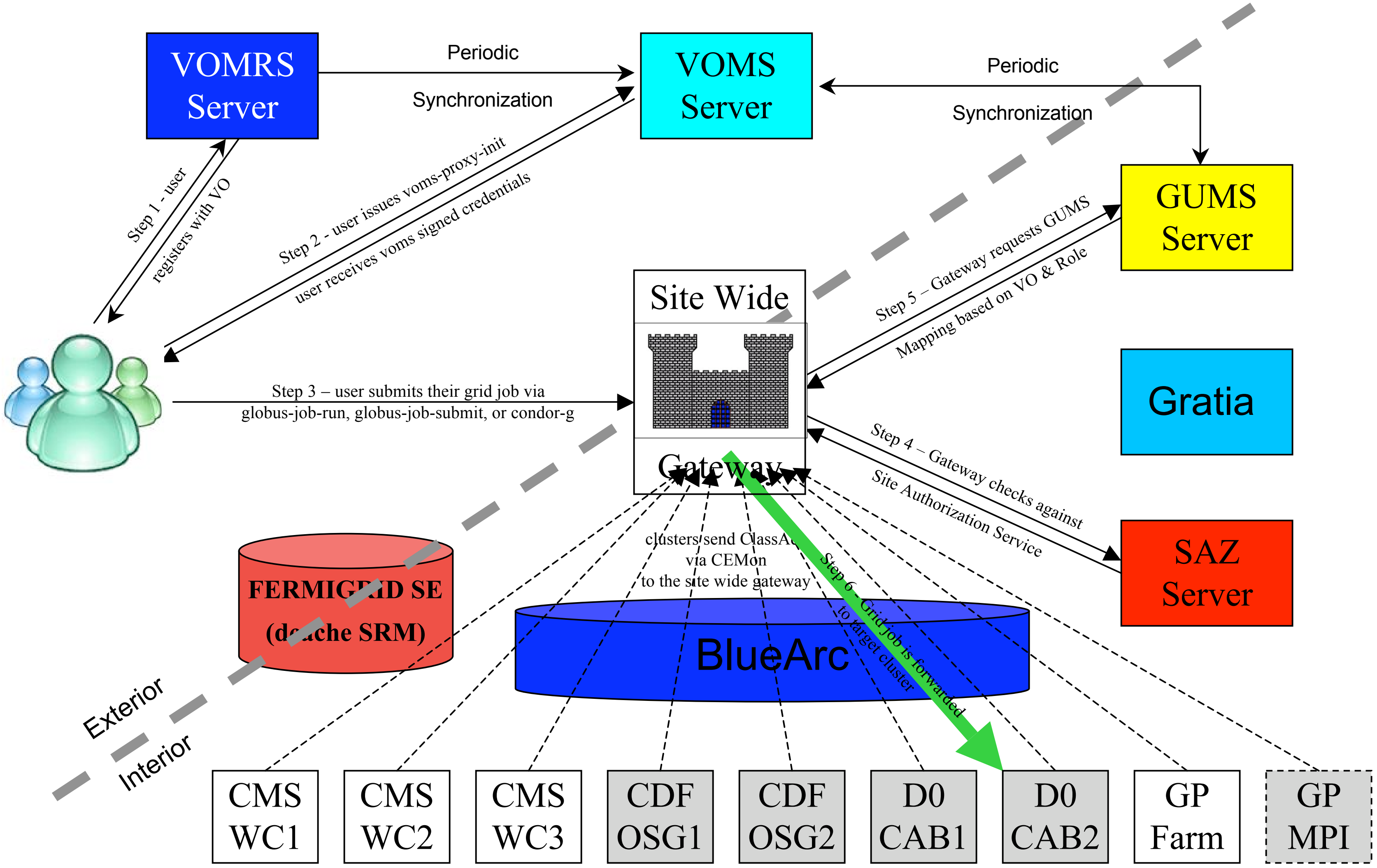
FermiGrid Web Site & Additional Documentation:

- http://fermigrid.fnal.gov/

FermiGrid - Current Architecture


VOMRS Server
Periodic
Synchronization
VOMS Server
Periodic
Synchronization
GUMS Server
Step 1 - user registers with VO
Step 2 - user issues voms-proxy-init
user receives voms signed credentials
Site Wide
Gateway
Step 5 – Gateway requests GUMS
Mapping based on VO & Role
Gratia
Step 3 – user submits their grid job via
globus-job-run, globus-job-submit, or condor-g
Step 4 – Gateway checks against
Site Authorization Service
SAZ Server
clusters send ClassAd
via CEMon
to the site wide gateway
Step 6 - Grid job is forwarded
to target cluster
FERMIGRID SE
(dcache SRM)
BlueArc
Exterior
Interior
CMS WC1
CMS WC2
CMS WC3
CDF OSG1
CDF OSG2
D0 CAB1
D0 CAB2
GP Farm
GP MPI

FermiGrid - Software Stack

Baseline:

- SL 3.0.x, SL 4.x, SL 5.0
- OSG 0.6.0+0.8.0 (VDT 1.6.1+1.8.1, GT 4, WS-Gram, Pre-WS Gram)

Additional Components:

- VOMS (VO Management Service)
- VOMRS (VO Membership Registration Service)
- GUMS (Grid User Mapping Service)
- SAZ (Site AuthoriZation Service)
- jobmanager-cemon (job forwarding job manager)
- MyProxy (credential storage)
- Squid (web proxy cache)
- syslog-ng (auditing)
- Gratia (accounting)
- Xen (virtualization)
- Linux Virtual Server (high availability)

Why Monitor?

Function	Production	Test / Integration	Total
Gatekeepers	8	2	10
Worker Nodes	2000	44	2044
VOMS	3	1	4
GUMS	3	2	5
SAZ	3	2	5
MySQL	2	2	4
Squid	1	1	2
MyProxy	1	1	2

Timeline

FermiGrid services were initially deployed in April 1, 2005.

The first formal metrics collection was commissioned in late August 2005.

- Initially a manual process.
- Automated during the fall of 2005.

Service monitoring was commissioned in June 2006.

VO Acceptance monitoring was commissioned in August 2006.

Availability monitoring was commissioned in June 2007.

Metrics vs. Monitoring

Metrics collection:

- Takes place once per day.

Service Monitoring:

- Takes place multiple times per day (typically once an hour).
- May have abilities to detect failed (or about to failed) services, notify administrators and (optionally) restart the service.
- Generates capacity planning information.

Acceptance Monitoring:

- Does a grid site accept “my” VO and pass a minimal set of tests.
- May not guarantee that a real application can run - just that it can get in the door.

Availability Monitoring:

- Very lightweight.
- Can be run very frequently (multiple times per hour).
- Optional automatic notification if results are “unexpected”.
- Feeds automatic “Dashboard” and “Summary” displays.

Metrics Collection - Mechanics

Metrics collection is implemented on FermiGrid as follows:

- A central metrics collection system launches the central metrics collection process once per day.
  - collect_grid_metrics.sh
- The central metrics collection process in turn launches copies of itself (secondary metrics collection processes) via ssh across all systems (and the services) that are designated for metrics collection.
  - collect_grid_metrics.sh <node> <service> <date> <…>
- The secondary metrics collection processes identify the system, service and metrics to be collected, and then launch a script which has been custom written to collect the desired metrics from the specified service.
  - collect-globus-metrics.sh <date> <…>
  - collect-voms-metrics.sh <date> <…>

Metrics collected within FermiGrid

Globus Gatekeeper:

- # of authenticated, authorized, jobmanager, jobmanager-fork, jobmanager-managedfork
- batch (jobmanager-condor, jobmanager-pbs, etc.), jobmanager-condorg, jobmanager-cemon,
- jobmanager-mis, default.
- # of total IP connections, # of unique IP connections, # of unique IP connections from within Fermilab.

VOMS:

- # of voms-proxy-init’s by VO.
- # of voms-proxy-init’s by group within the fermilab VO.
- # of total IP connections, # of unique IP connections, # of unique IP connections from within Fermilab.

GUMS:

- # of successful GUMS mapping calls & # of failed GUMS mapping calls.
- # of total certificates, # of unique dn, # of unique mappings, # of unique Vos
- # of voms-proxy-inits, # of grid-proxy-inits.
- # of total IP connections, # of unique IP connections, # of unique IP connections from within Fermilab.

SAZ:

- # of successful SAZ calls & # of rejected SAZ calls.
- # of unique DN, # of unique VO, # of unique Role, # of unique CA.
- # of total IP connections, # of unique IP connections, # of unique IP connections from within Fermilab.

Metrics Storage and Publication

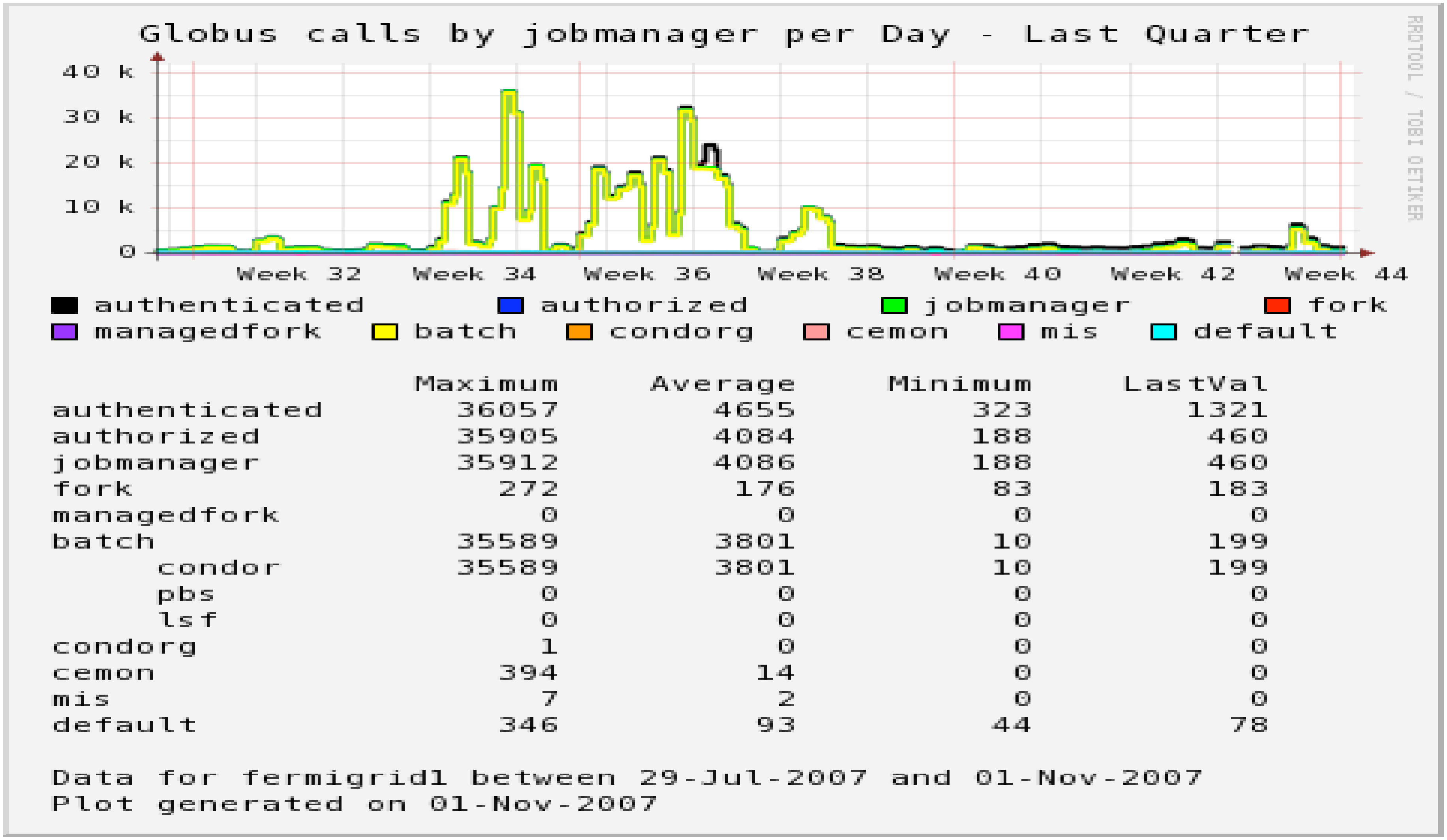
Metrics are stored using two mechanisms:

- First, they are appended to ".csv" files which contain a leading date followed by tag-value pairs. Example:
  - 22-Jun-2007,total=5721,success=5698,fails=53
  - total_ip=5721,unique_ip=231,fermilab_ip=12
- Second, the ".csv" files are processed and loaded in to round robin databases using rrdtool.

A set of "standard" png plots are automatically generated from the rrdtool databases.

All of these formats (.csv, .rrd and .png) are periodically uploaded from the metrics collection host to the central FermiGrid web server.

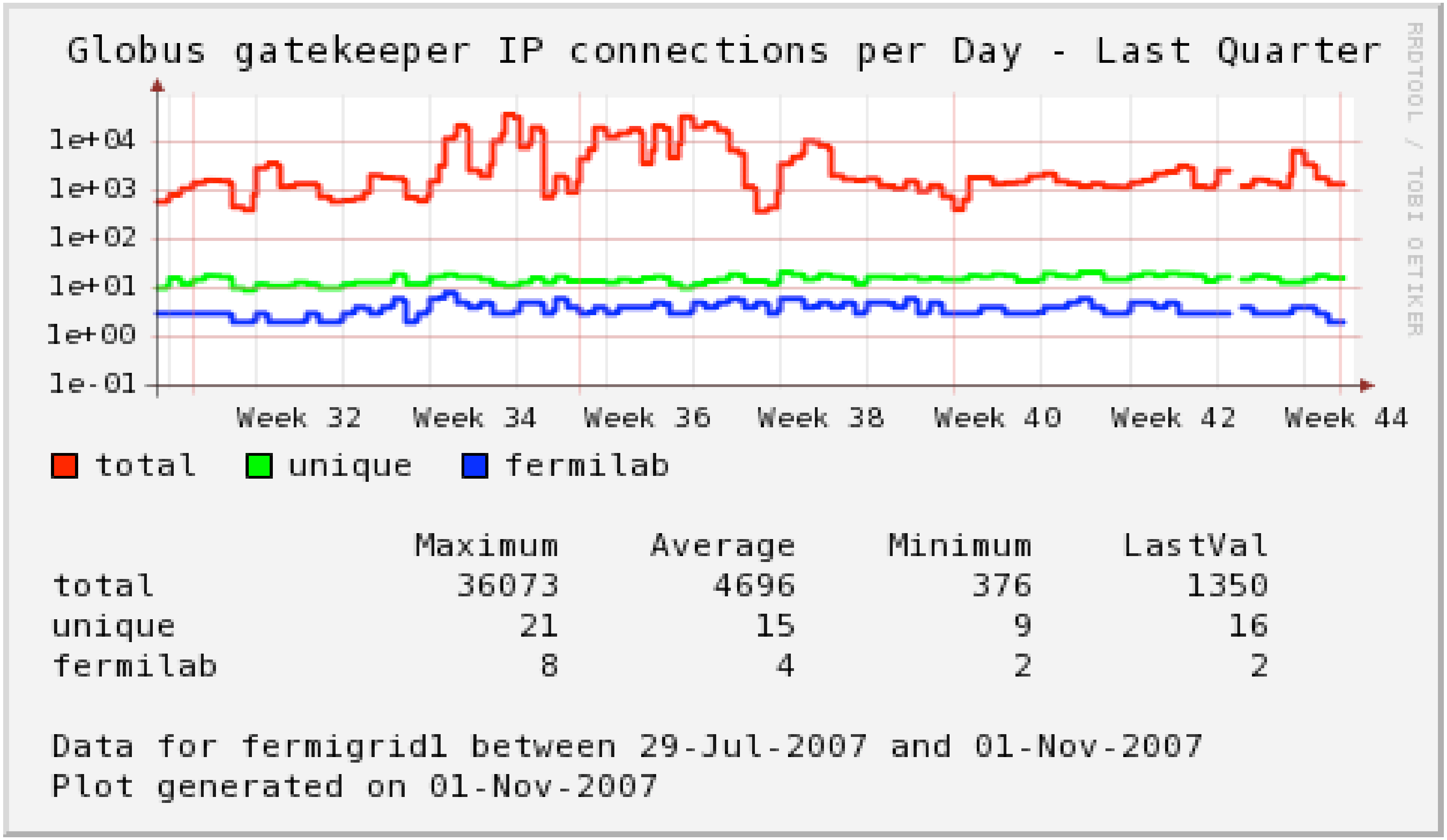
Globus Gatekeeper Metrics 1



```
                     Maximum      Average      Minimum      LastVal
authenticated          36057         4655          323         1321
authorized             35905         4084          188          460
jobmanager             35912         4086          188          460
fork                     272          176           83          183
managedfork                0            0            0            0
batch                  35589         3801           10          199
     condor            35589         3801           10          199
     pbs                   0            0            0            0
     lsf                   0            0            0            0
condorg                    1            0            0            0
cemon                    394           14            0            0
mis                        7            2            0            0
default                  346           93           44           78

Data for fermigrid1 between 29-Jul-2007 and 01-Nov-2007
Plot generated on 01-Nov-2007
```

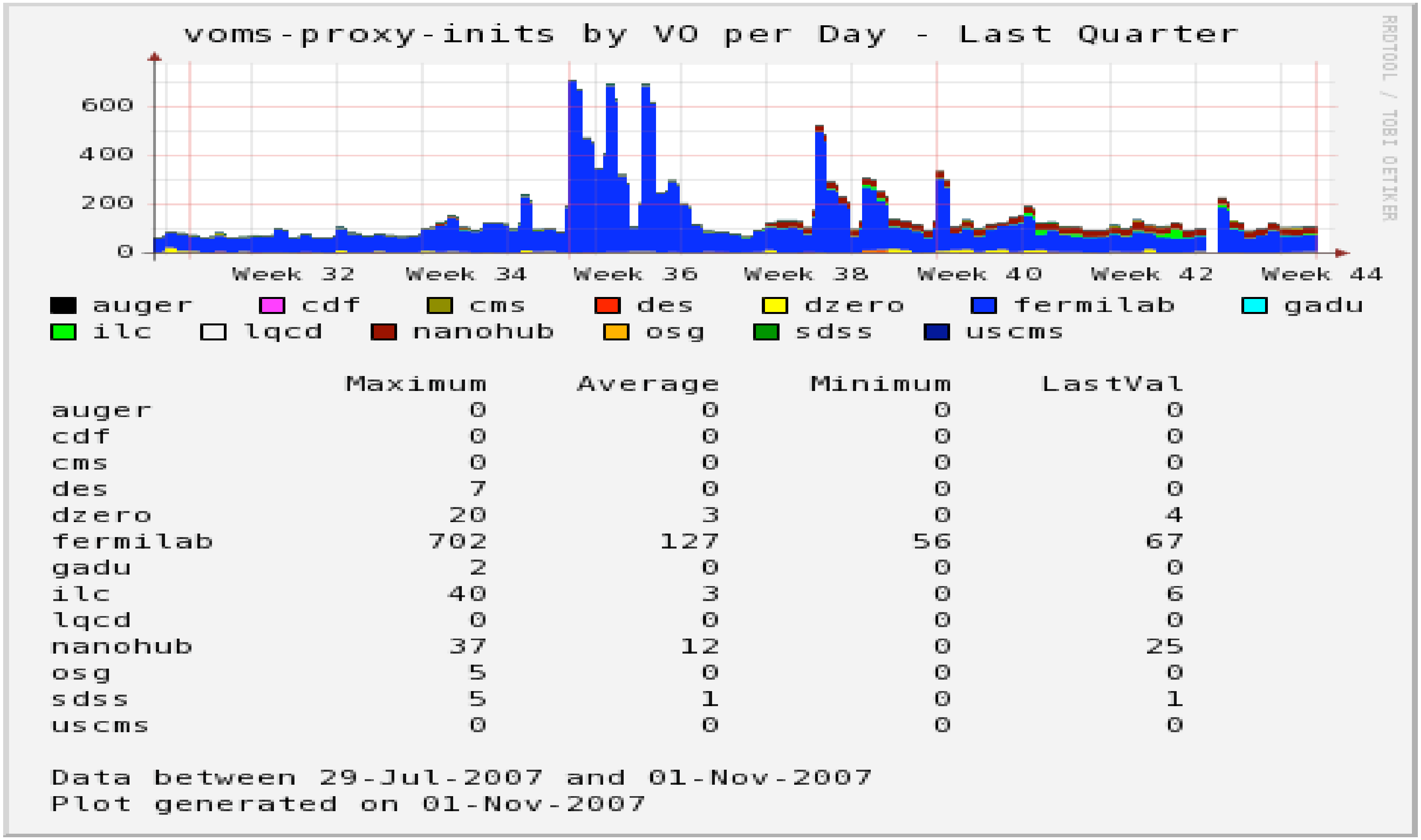
Globus Gatekeeper Metrics 2



```
                    Maximum     Average     Minimum     LastVal
total                 36073        4696         376        1350
unique                   21          15           9          16
fermilab                  8           4           2           2

Data for fermigrid1 between 29-Jul-2007 and 01-Nov-2007
Plot generated on 01-Nov-2007
```

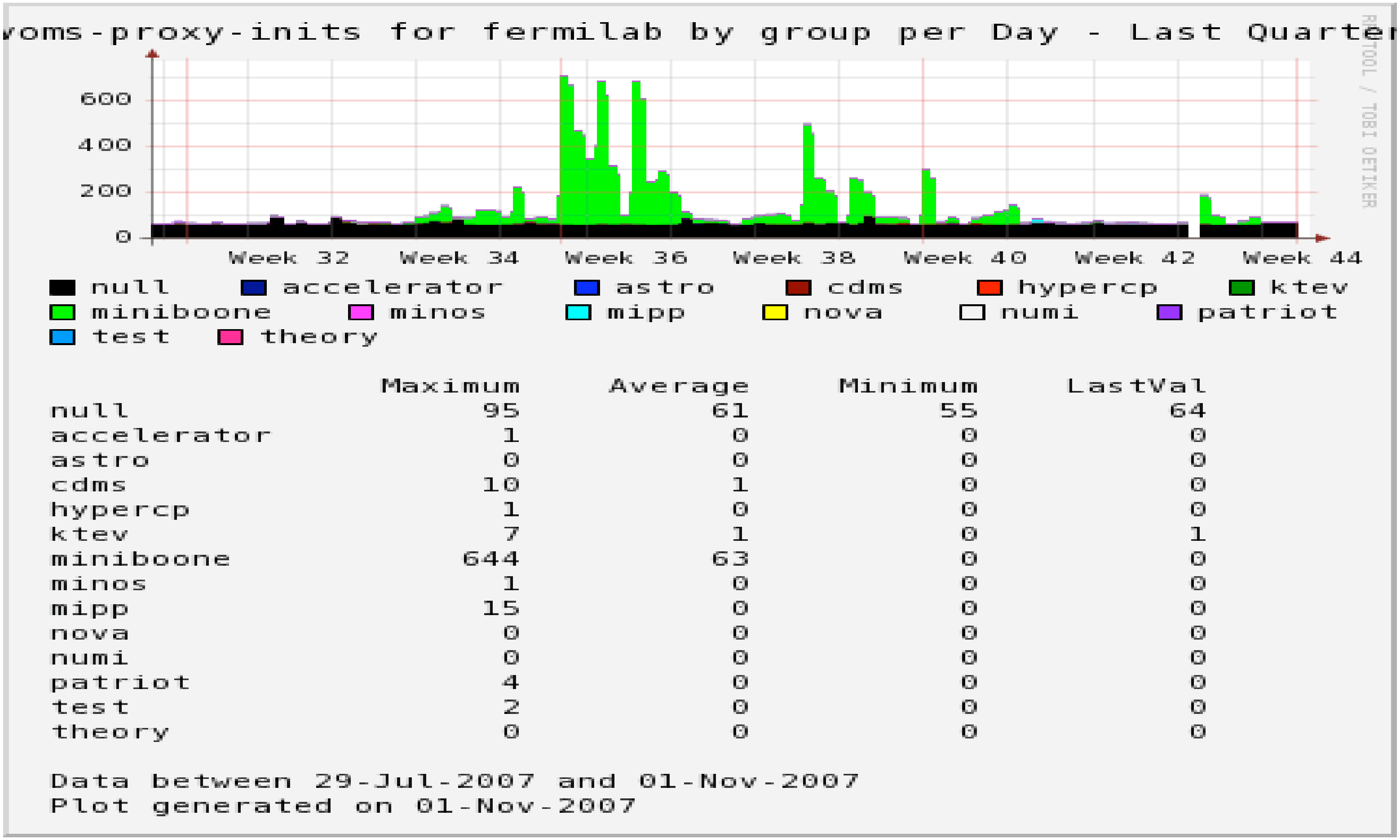
VOMS Metrics 1



	Maximum	Average	Minimum	LastVal
auger	0	0	0	0
cdf	0	0	0	0
cms	0	0	0	0
des	7	0	0	0
dzero	20	3	0	4
fermilab	702	127	56	67
gadu	2	0	0	0
ilc	40	3	0	6
lqcd	0	0	0	0
nanohub	37	12	0	25
osg	5	0	0	0
sdss	5	1	0	1
uscms	0	0	0	0

Data between 29-Jul-2007 and 01-Nov-2007
Plot generated on 01-Nov-2007

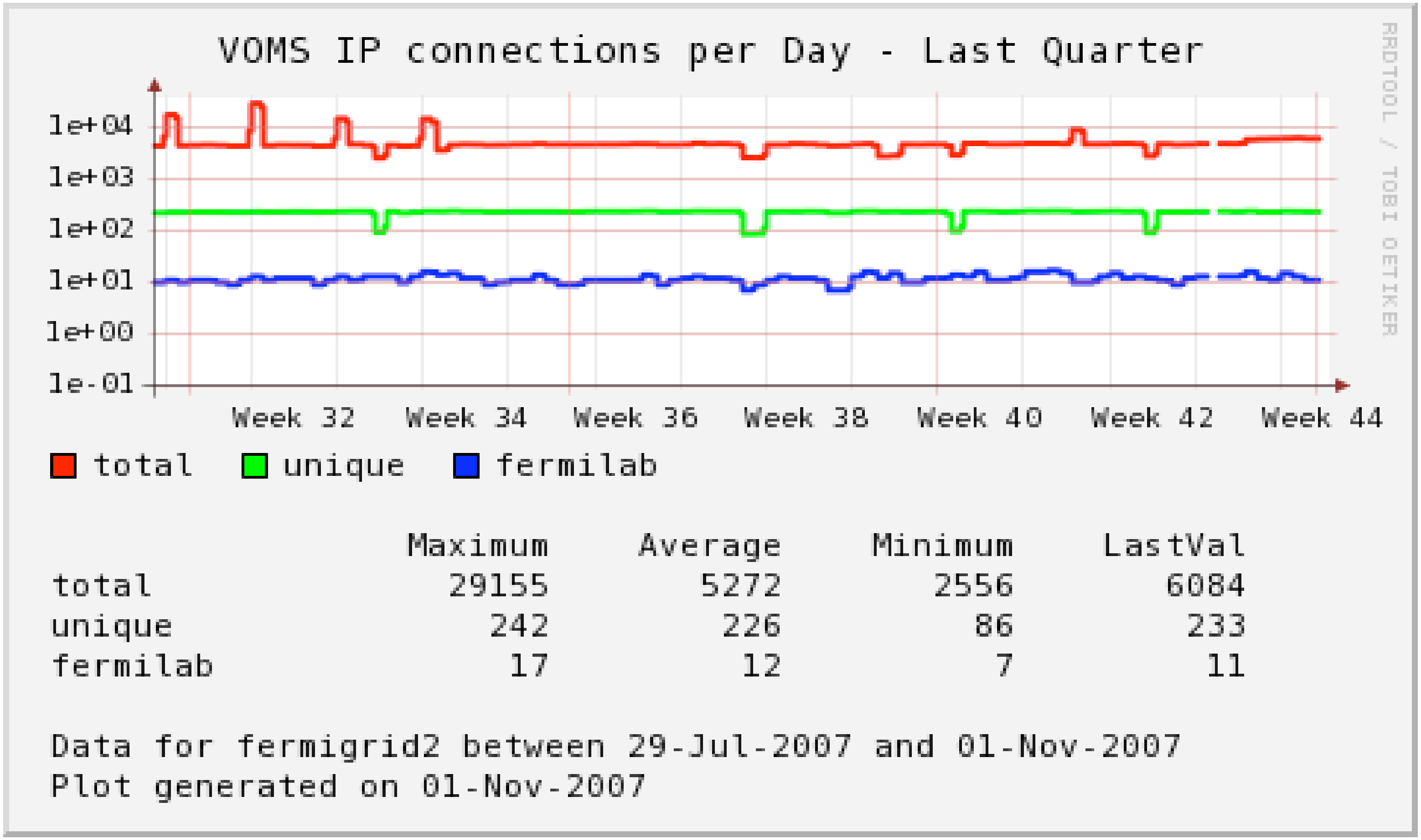
VOMS Metrics 2



```
                        Maximum       Average      Minimum      LastVal
null                         95            61           55           64
accelerator                   1             0            0            0
astro                         0             0            0            0
cdms                         10             1            0            0
hypercp                       1             0            0            0
ktev                          7             1            0            1
miniboone                   644            63            0            0
minos                         1             0            0            0
mipp                         15             0            0            0
nova                          0             0            0            0
numi                          0             0            0            0
patriot                       4             0            0            0
test                          2             0            0            0
theory                        0             0            0            0

Data between 29-Jul-2007 and 01-Nov-2007
Plot generated on 01-Nov-2007
```

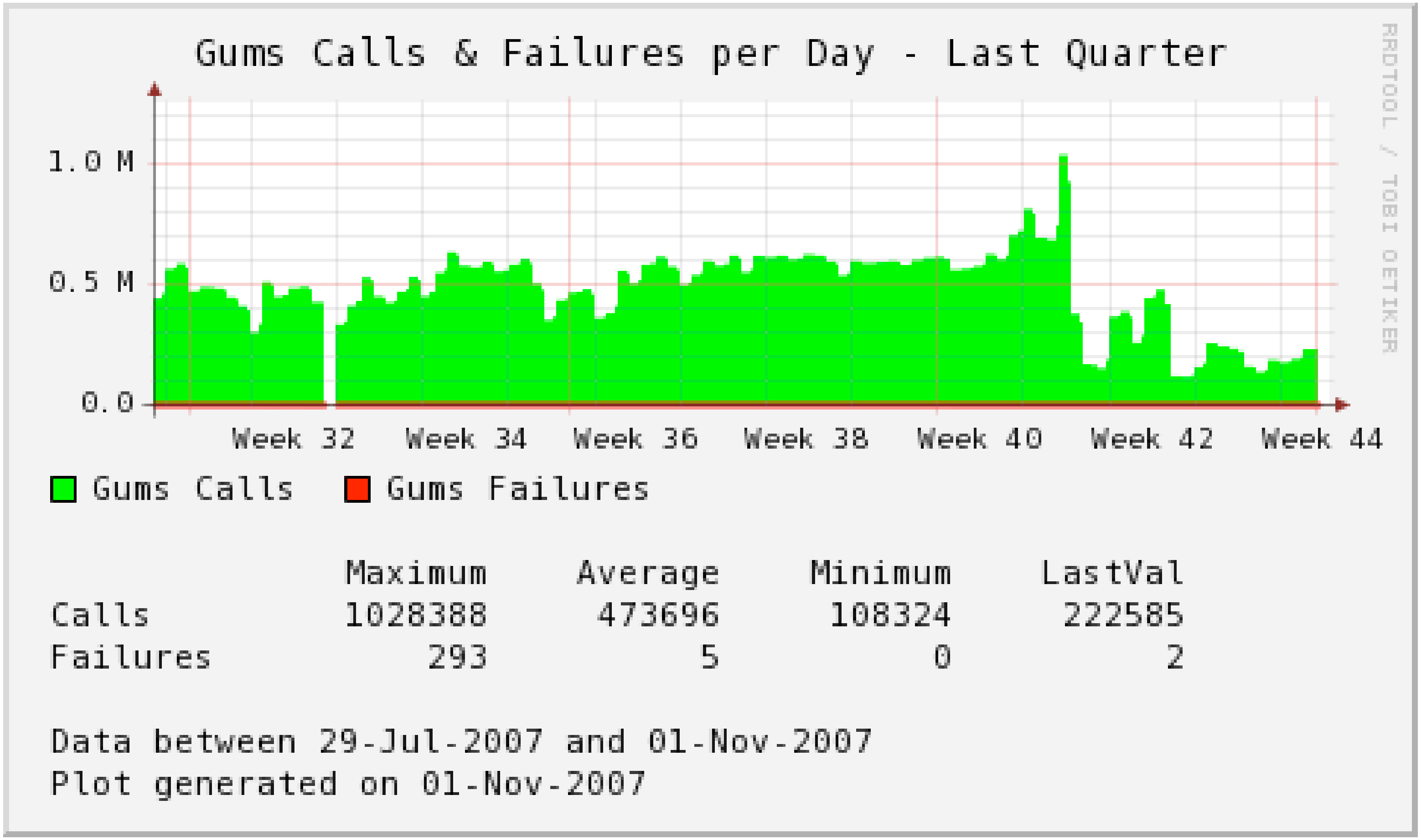
VOMS Metrics 3



```
                    Maximum     Average     Minimum     LastVal
total                 29155        5272        2556        6084
unique                  242         226          86         233
fermilab                 17          12           7          11
```

Data for fermigrid2 between 29-Jul-2007 and 01-Nov-2007
Plot generated on 01-Nov-2007

GUMS Metrics 1



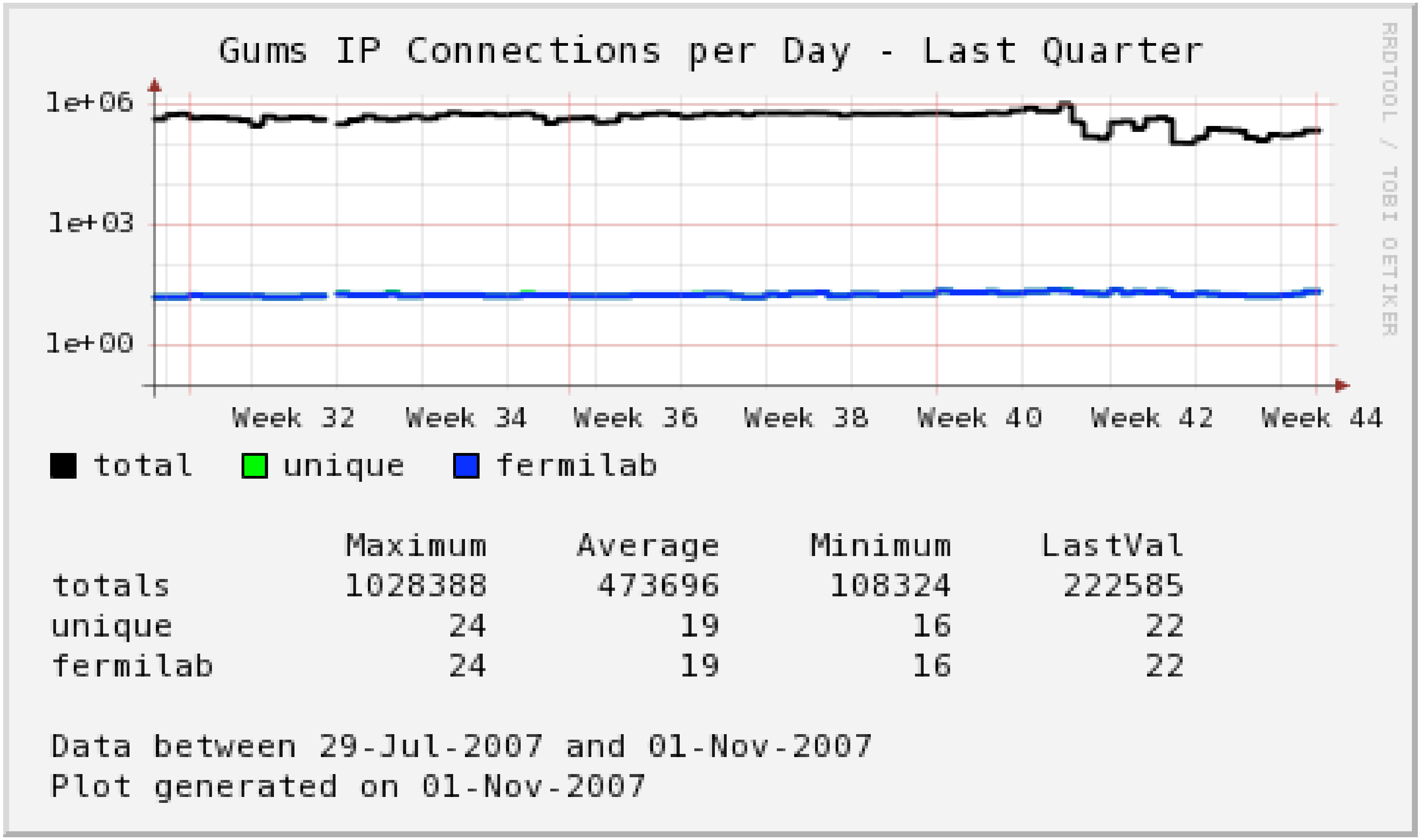
Gums Calls & Failures per Day - Last Quarter

🟩 Gums Calls 🟥 Gums Failures

```
               Maximum     Average     Minimum     LastVal
Calls          1028388      473696      108324      222585
Failures           293           5           0           2

Data between 29-Jul-2007 and 01-Nov-2007
Plot generated on 01-Nov-2007
```

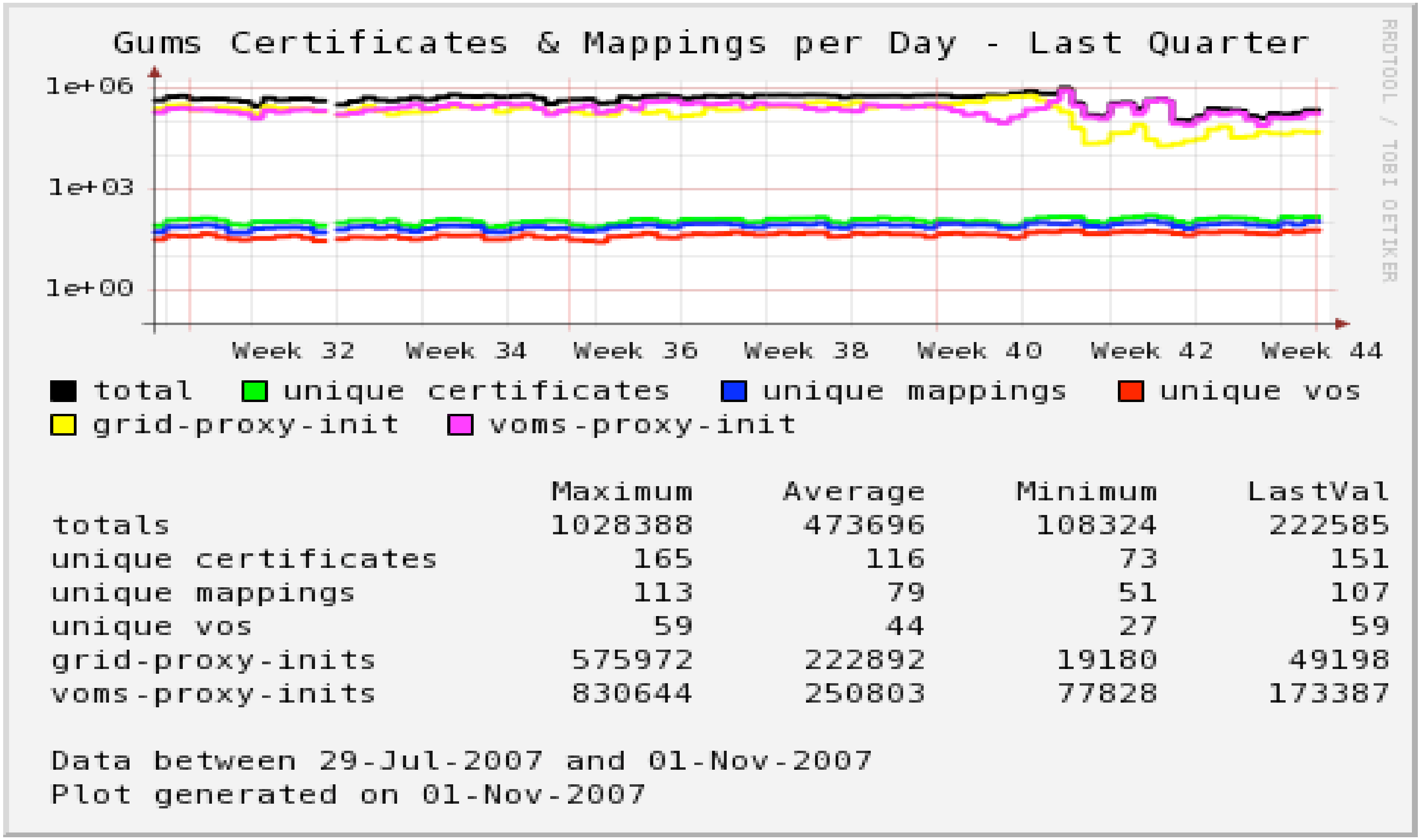
GUMS Metrics 2



```
                Maximum     Average     Minimum     LastVal
totals          1028388      473696      108324      222585
unique               24          19          16          22
fermilab             24          19          16          22

Data between 29-Jul-2007 and 01-Nov-2007
Plot generated on 01-Nov-2007
```

GUMS Metrics 3

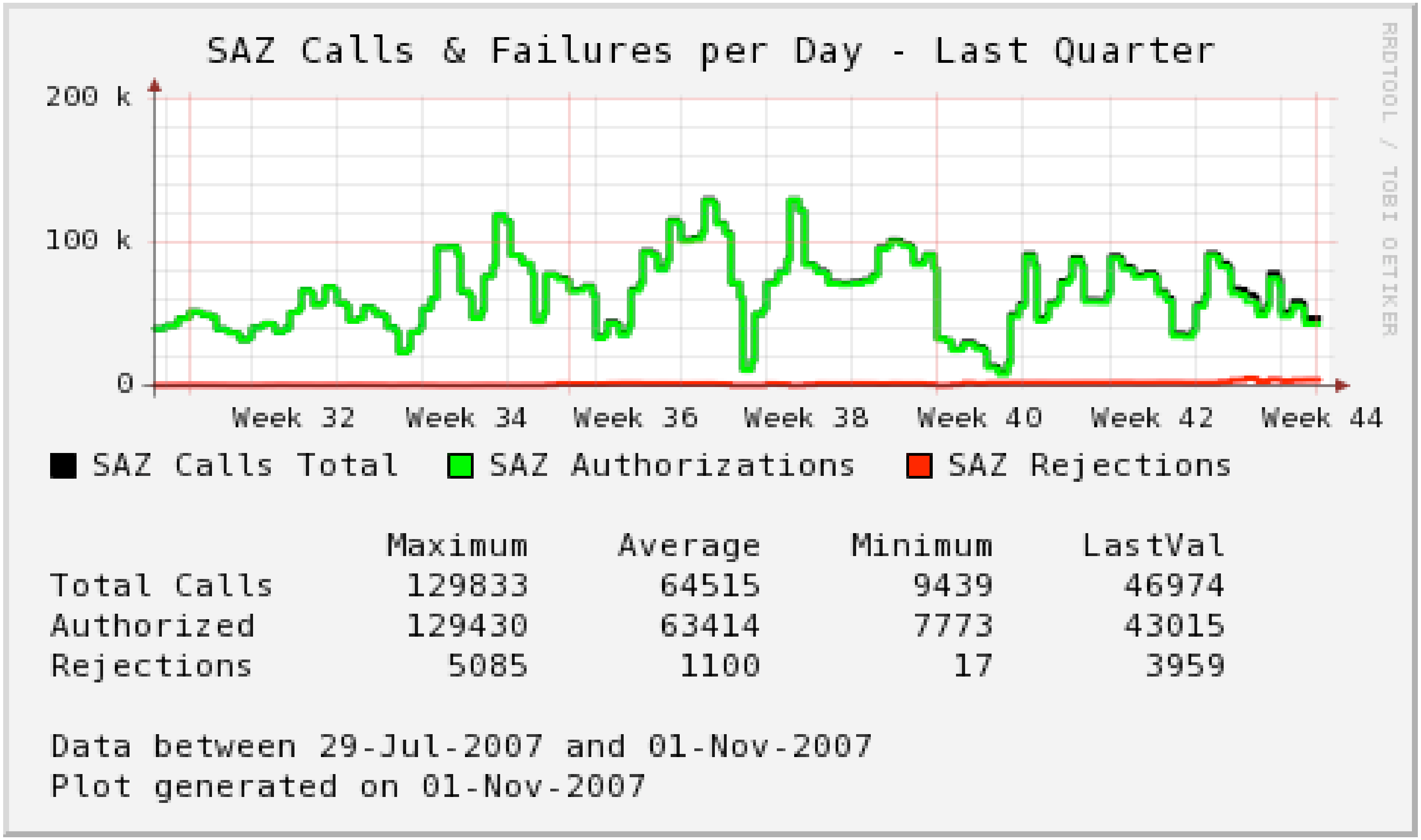


Gums Certificates & Mappings per Day - Last Quarter

	Maximum	Average	Minimum	LastVal
totals	1028388	473696	108324	222585
unique certificates	165	116	73	151
unique mappings	113	79	51	107
unique vos	59	44	27	59
grid-proxy-inits	575972	222892	19180	49198
voms-proxy-inits	830644	250803	77828	173387

Data between 29-Jul-2007 and 01-Nov-2007
Plot generated on 01-Nov-2007

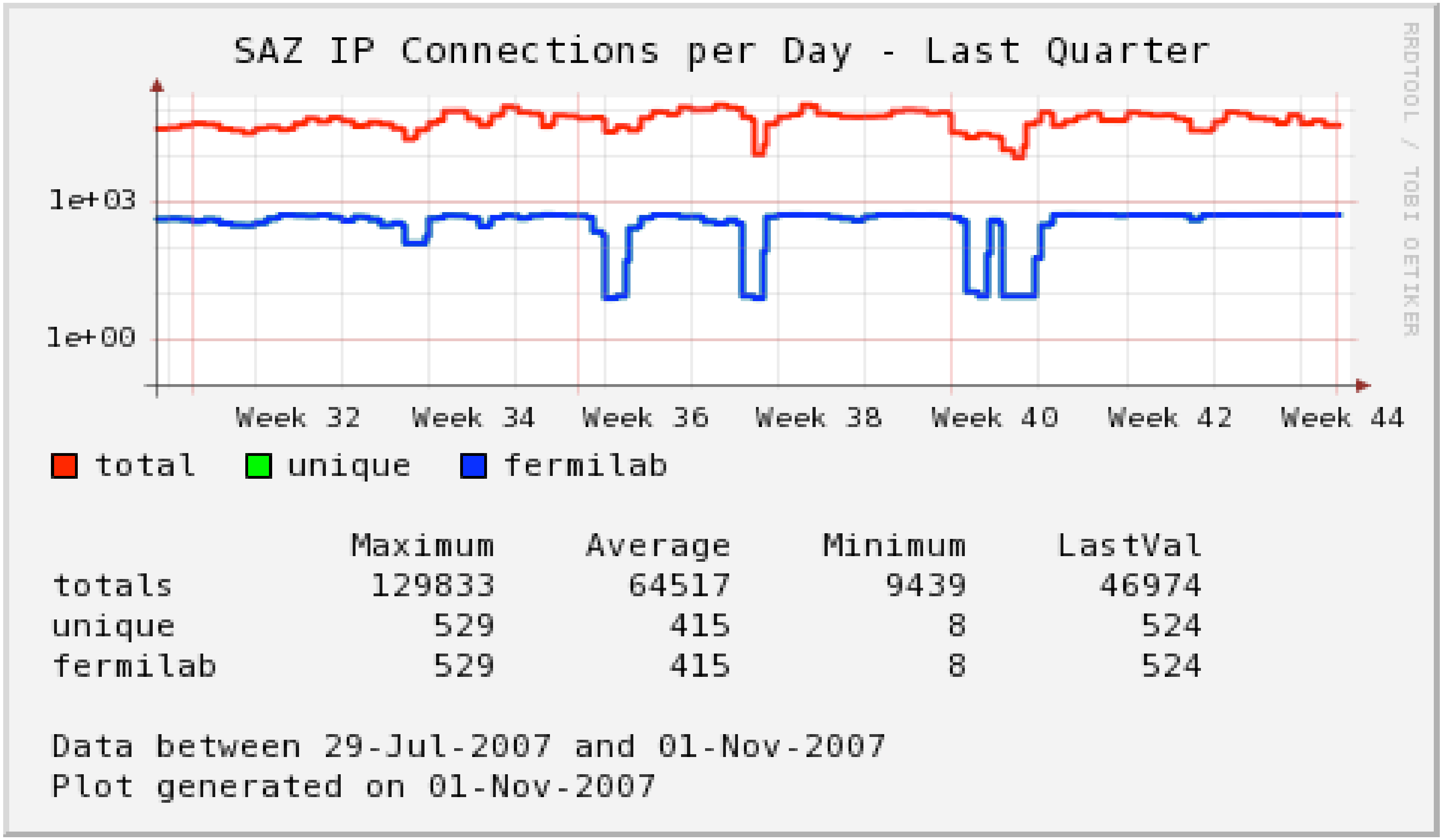
SAZ Metrics 1



```
                      Maximum     Average     Minimum     LastVal
Total Calls            129833       64515        9439       46974
Authorized             129430       63414        7773       43015
Rejections               5085        1100          17        3959

Data between 29-Jul-2007 and 01-Nov-2007
Plot generated on 01-Nov-2007
```

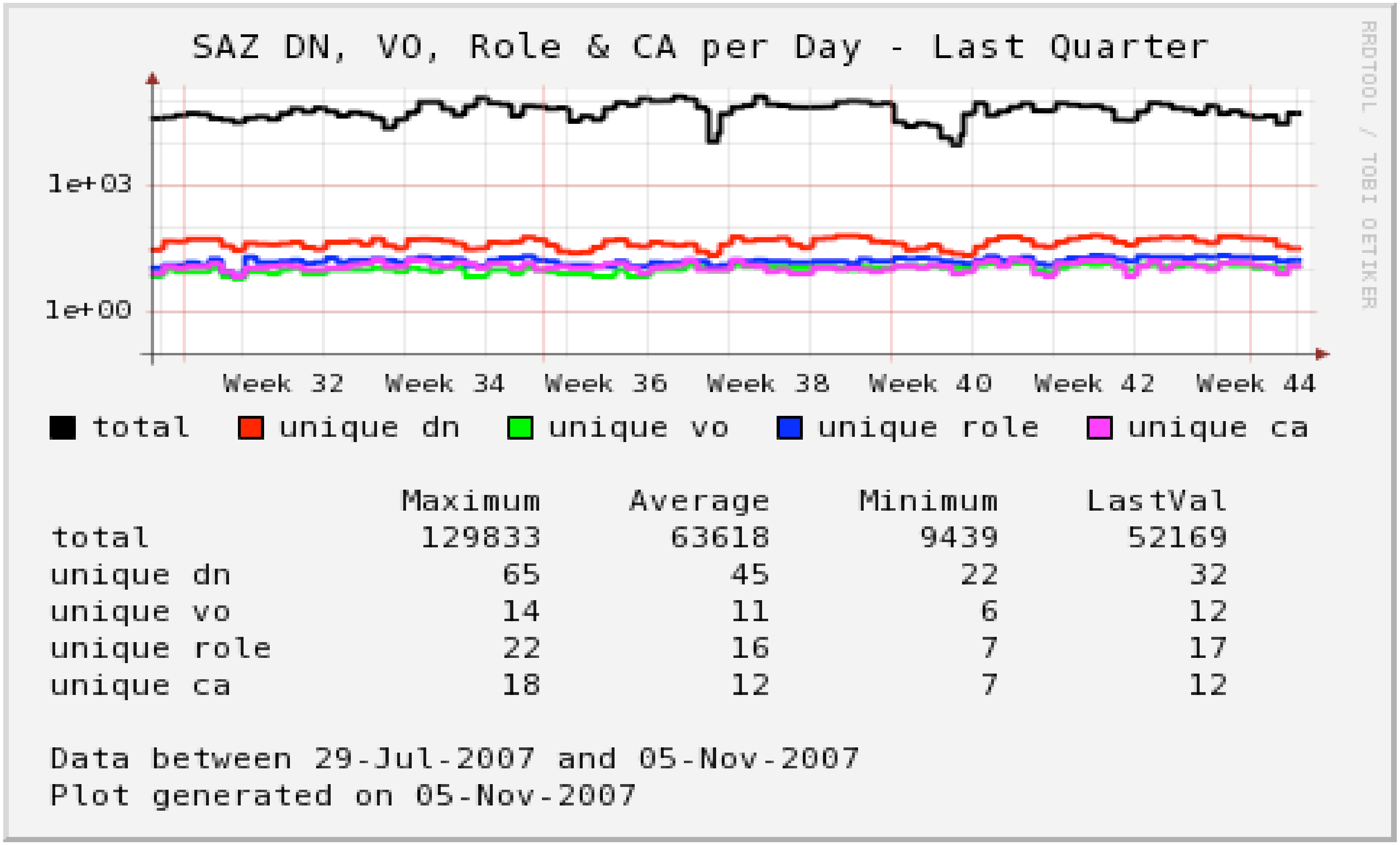
SAZ Metrics 2



	Maximum	Average	Minimum	LastVal
totals	129833	64517	9439	46974
unique	529	415	8	524
fermilab	529	415	8	524

Data between 29-Jul-2007 and 01-Nov-2007
Plot generated on 01-Nov-2007

SAZ Metrics 3



```
                  Maximum     Average     Minimum     LastVal
total              129833       63618        9439       52169
unique dn              65          45          22          32
unique vo              14          11           6          12
unique role            22          16           7          17
unique ca              18          12           7          12

Data between 29-Jul-2007 and 05-Nov-2007
Plot generated on 05-Nov-2007
```

Service Monitoring - Mechanics

- A central service monitor system launches the central service monitor collection script once per hour.
  - monitor_grid_script.sh
- The central service monitor process in turn launches **background** copies of itself (secondary service monitor processes) across all systems (and the services) that are designated for service monitoring.
  - monitor_grid_script.sh
  - These background copies can be launched either via ssh or grid (I.e. globus-job-run).
- The secondary service monitor processes identify the system, service to be monitored, and then launch a script which has been custom written to monitor the specified service.
  - monitor_<service>_script.sh
  - monitor_gatekeeper_script.sh
  - monitor_voms_script.sh
  - monitor_gums_script.sh
  - monitor_saz_script.sh

Service Monitor Configuration

Configuration of the service monitor system is via a central configuration file:

```
fermigrid0    fermigrid0.fnal.gov        master
fermigrid1    root@fermigrid1.fnal.gov   publish      var/www/html
#
fermigrid0    fermigrid0.fnal.gov        vo           fermilab
fermigrid1    fermigrid1.fnal.gov        gatekeeper
fermigrid2    fermigrid2.fnal.gov        voms         voms.fnal.gov
fermigrid3    fermigrid3.fnal.gov        gums         gums.fnal.gov
fermigrid3    fermigrid3.fnal.gov        mapping      cms
fermigrid3    fermigrid3.fnal.gov        mapping      dteam
fermigrid4    fermigrid4.fnal.gov        saz          saz.fnal.gov
fermigrid4    fermigrid4.fnal.gov        myproxy      myproxy.fnal.gov
fermigrid4    fermigrid4.fnal.gov        squid        squid.fnal.gov
#
fcdfosg1      fcdfosg1.fnal.gov          gatekeeper
fcdfosg2      fcdfosg2.fnal.gov          gatekeeper
d0cabosg1     d0cabosg1.fnal.gov         gatekeeper   ssh:/grid/login/chadwick
d0cabosg2     d0cabosg2.fnal.gov         gatekeeper   ssh:/grid/login/chadwick
cmsosgce      cmsosgce.fnal.gov          gatekeeper   grid:/uscms/osg/app/fermilab/chadwick
cmsosgce2     cmsosgce2.fnal.gov         gatekeeper   grid:/uscms/osg/app/fermilab/chadwick
```

Service Monitor - Information Collected

Globus Gatekeeper:

- # of authenticated, authorized, jobmanager, jobmanager-fork, jobmanager-managedfork, batch (condor, pbs, lsf, etc.), condorg/cemon, mis, default.
- The value of uptime, load1, load5 and load15.

VOMS:

- # of voms-proxy-init’s
- # of apache and tomcat processes
- The rss and vmz of the Tomcat VOMS server process.
- The value of uptime, load1, load5 and load15.

GUMS:

- # of successful GUMS mapping calls & # of failed GUMS mapping calls.
- # of apache and tomcat processes
- The rss and vmz of the Tomcat GUMS server process.
- The value of uptime, load1, load5 and load15.

SAZ:

- # of successful SAZ calls & # of rejected SAZ calls.
- # of apache and tomcat processes
- The rss and vmz of the Tomcat SAZ server process.
- The value of uptime, load1, load5 and load15.

Service Monitor Storage and Publication

Results of the service monitors are stored using two mechanisms:

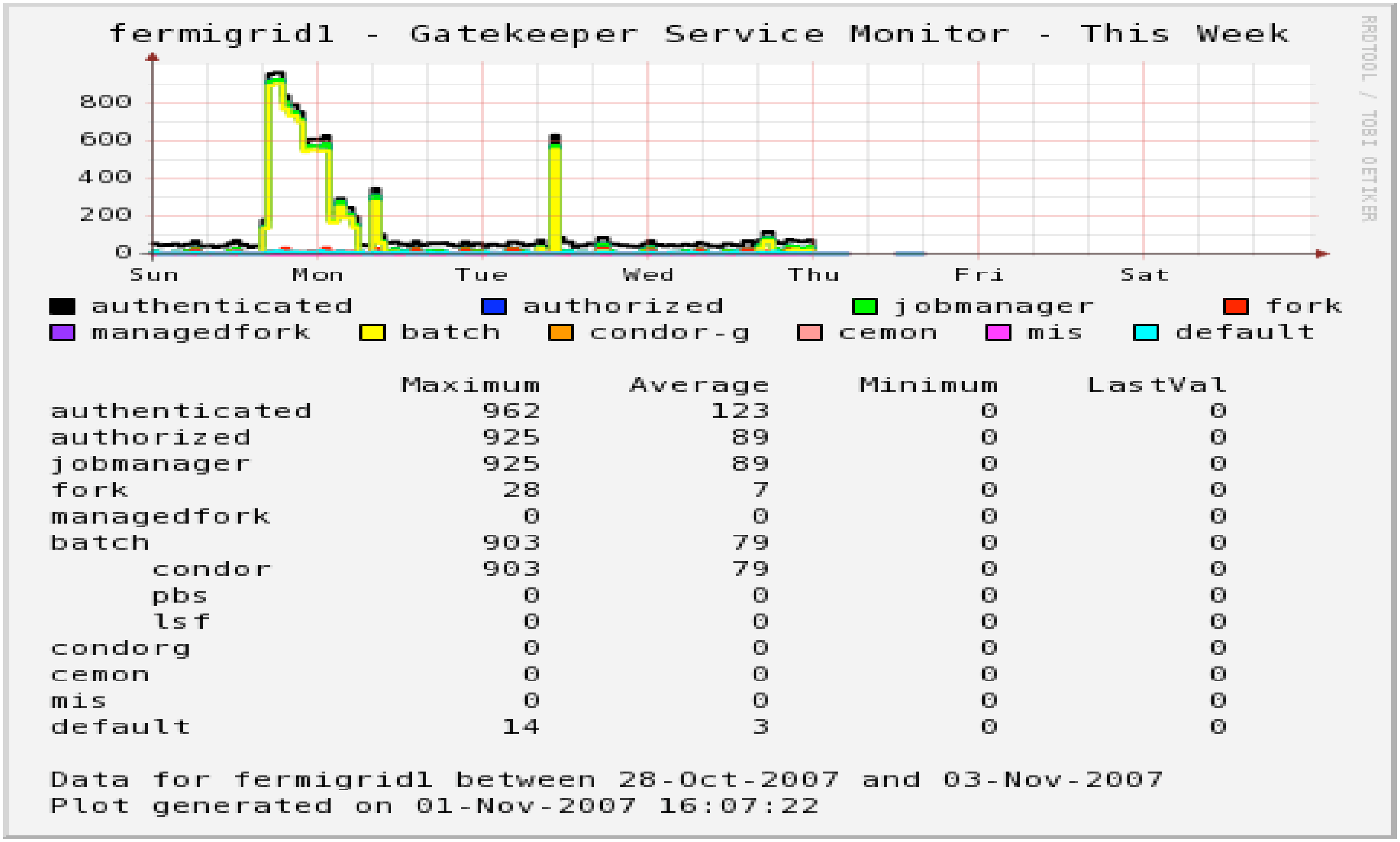
- First, they are appended to ".csv" files which contain a leading time (in seconds from the Unix epoch) followed by tag-value pairs. Example:
  - time=1182466920,authenticated=42,authorized=26,jobmanager=26

Second, the ".csv" files are processed and loaded in to round robin databases using rrdtool.

A set of "standard" png plots are automatically generated from the rrdtool databases.

All of these formats (.csv, .rrd and .png) are periodically uploaded from the metrics collection host to the central FermiGrid web server.

Globus Gatekeeper Monitor 1

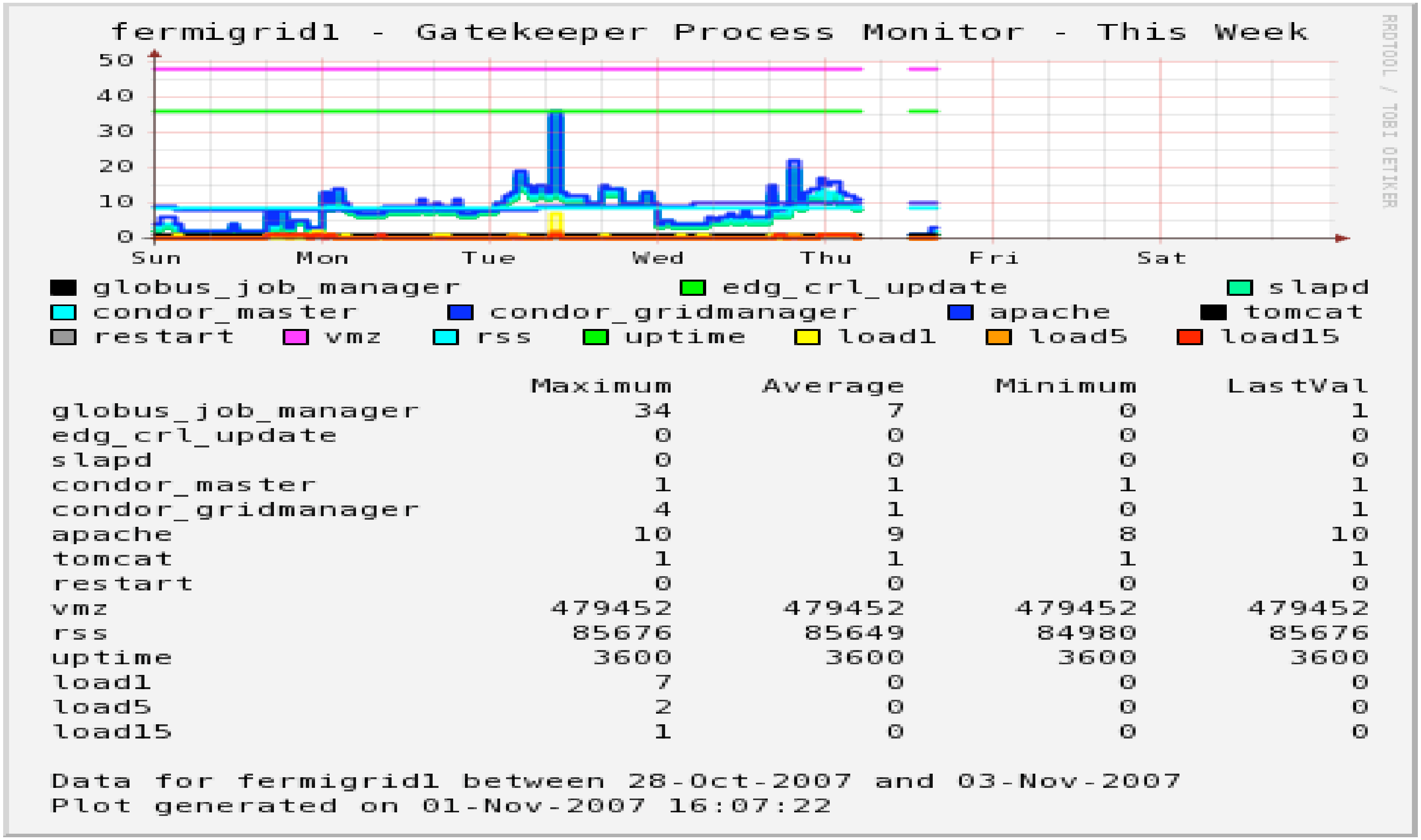


■ authenticated 🟦 authorized 🟩 jobmanager 🟥 fork
🟪 managedfork 🟨 batch 🟧 condor-g ▨ cemon ▨ mis ▨ default

```
                    Maximum     Average     Minimum     LastVal
authenticated           962         123           0           0
authorized              925          89           0           0
jobmanager              925          89           0           0
fork                     28           7           0           0
managedfork               0           0           0           0
batch                   903          79           0           0
         condor         903          79           0           0
         pbs              0           0           0           0
         lsf              0           0           0           0
condorg                   0           0           0           0
cemon                     0           0           0           0
mis                       0           0           0           0
default                  14           3           0           0

Data for fermigrid1 between 28-Oct-2007 and 03-Nov-2007
Plot generated on 01-Nov-2007 16:07:22
```

Globus Gatekeeper Monitor 2

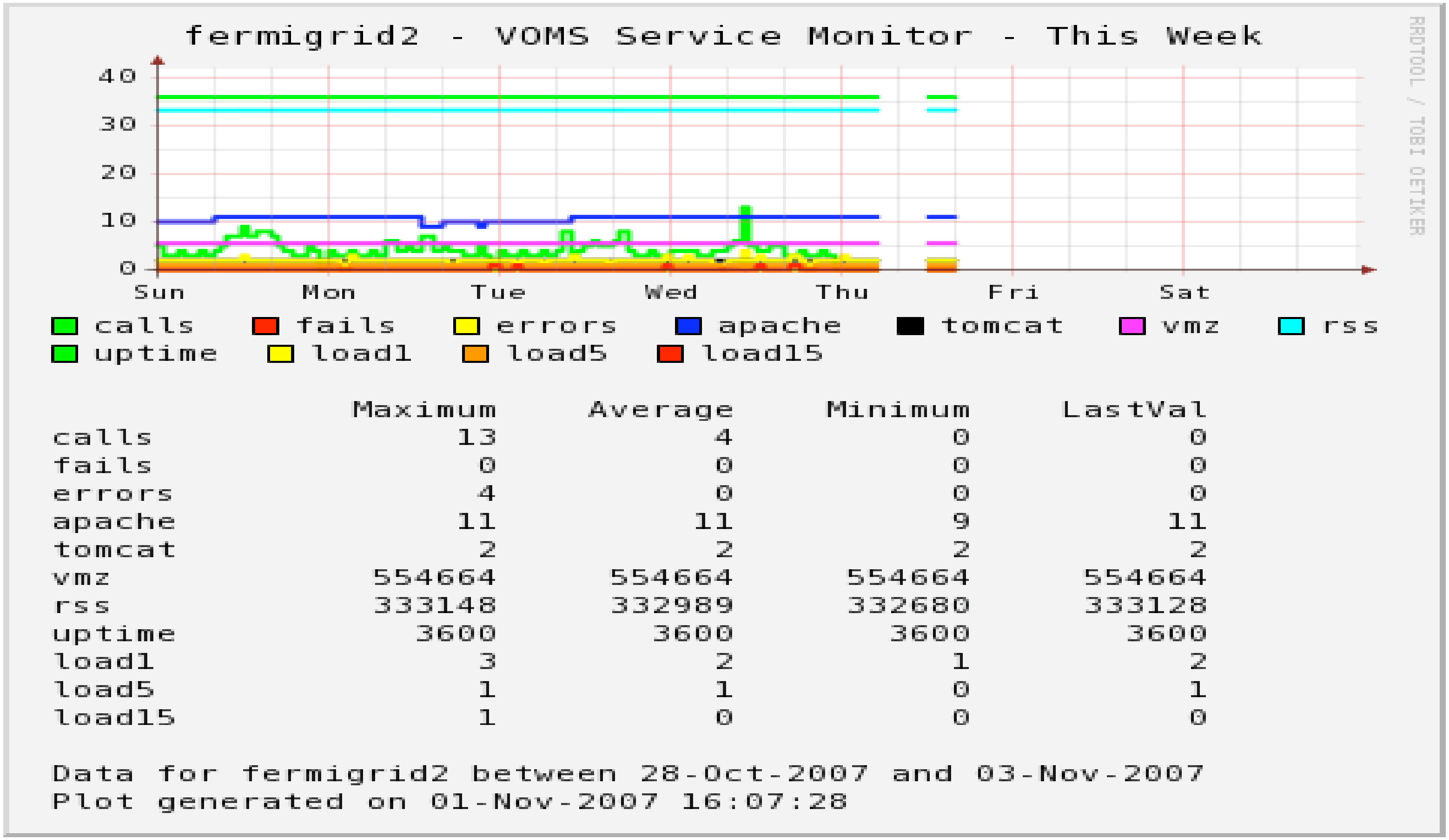


■ globus_job_manager 🟩 edg_crl_update 🟩 slapd
🟦 condor_master 🟦 condor_gridmanager 🟦 apache ■ tomcat
■ restart 🟪 vmz 🟦 rss 🟩 uptime 🟨 load1 🟧 load5 🟥 load15

	Maximum	Average	Minimum	LastVal
globus_job_manager	34	7	0	1
edg_crl_update	0	0	0	0
slapd	0	0	0	0
condor_master	1	1	1	1
condor_gridmanager	4	1	0	1
apache	10	9	8	10
tomcat	1	1	1	1
restart	0	0	0	0
vmz	479452	479452	479452	479452
rss	85676	85649	84980	85676
uptime	3600	3600	3600	3600
load1	7	0	0	0
load5	2	0	0	0
load15	1	0	0	0

Data for fermigrid1 between 28-Oct-2007 and 03-Nov-2007
Plot generated on 01-Nov-2007 16:07:22

VOMS Monitor 1

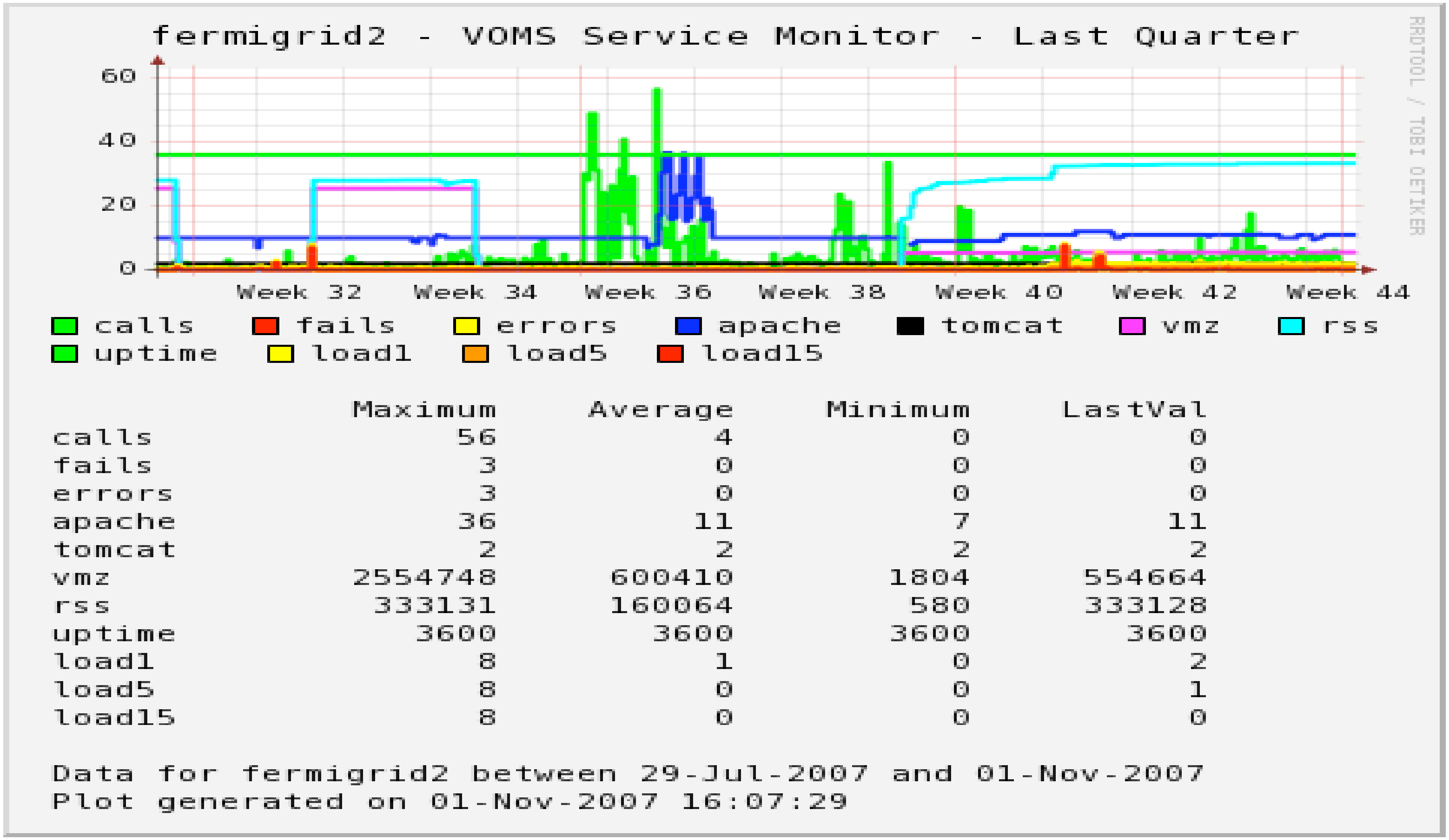


🟩 calls 🟥 fails 🟨 errors 🟦 apache ⬛ tomcat 🟪 vmz 🟦 rss
🟩 uptime 🟨 load1 🟧 load5 🟥 load15

```
                    Maximum     Average     Minimum     LastVal
calls                    13           4           0           0
fails                     0           0           0           0
errors                    4           0           0           0
apache                   11          11           9          11
tomcat                    2           2           2           2
vmz                  554664      554664      554664      554664
rss                  333148      332989      332680      333128
uptime                 3600        3600        3600        3600
load1                     3           2           1           2
load5                     1           1           0           1
load15                    1           0           0           0

Data for fermigrid2 between 28-Oct-2007 and 03-Nov-2007
Plot generated on 01-Nov-2007 16:07:28
```

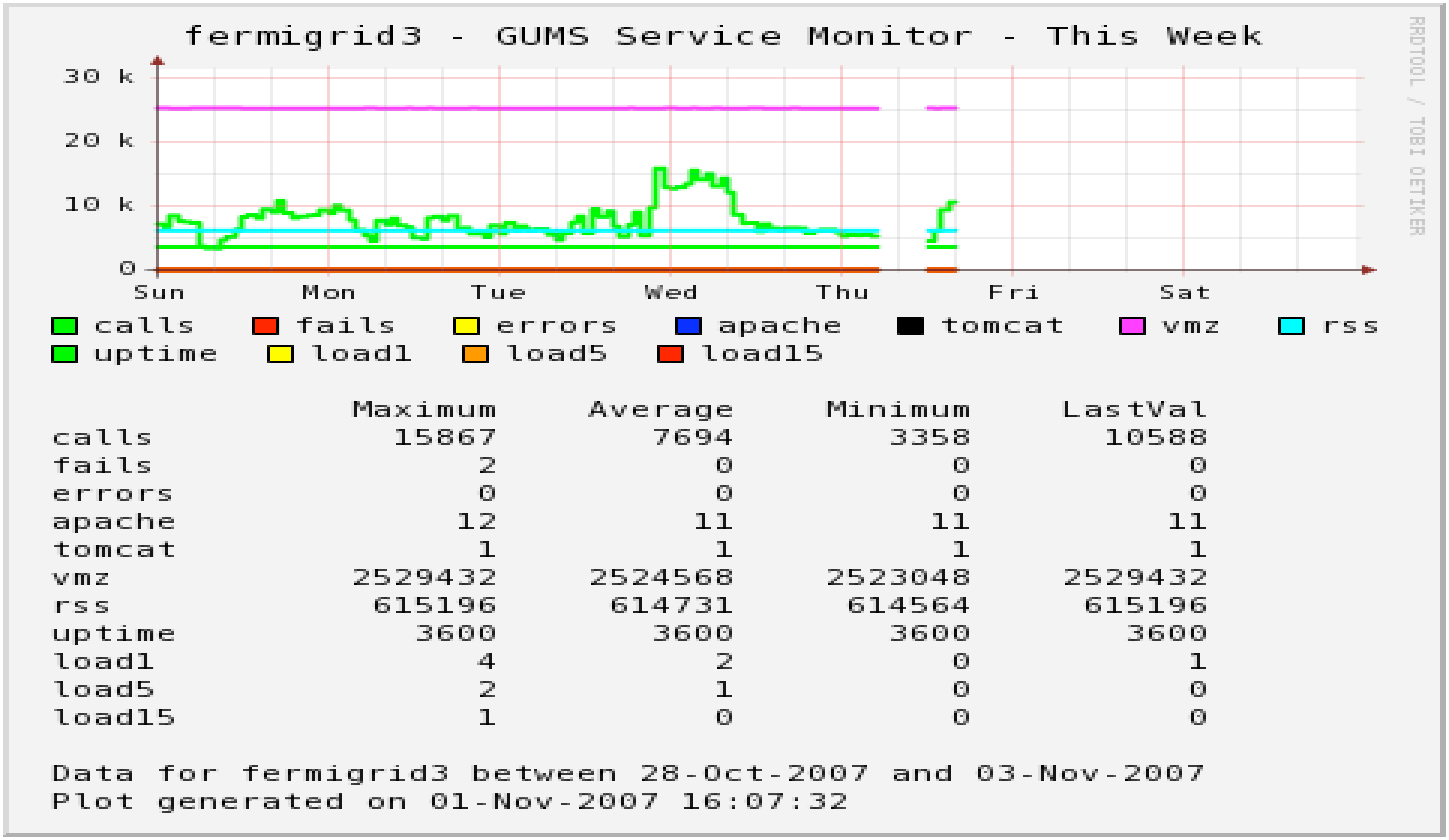
VOMS Monitor 2



```
                    Maximum     Average     Minimum     LastVal
calls                    56           4           0           0
fails                     3           0           0           0
errors                    3           0           0           0
apache                   36          11           7          11
tomcat                    2           2           2           2
vmz                 2554748      600410        1804      554664
rss                  333131      160064         580      333128
uptime                 3600        3600        3600        3600
load1                     8           1           0           2
load5                     8           0           0           1
load15                    8           0           0           0

Data for fermigrid2 between 29-Jul-2007 and 01-Nov-2007
Plot generated on 01-Nov-2007 16:07:29
```

GUMS Monitor 1

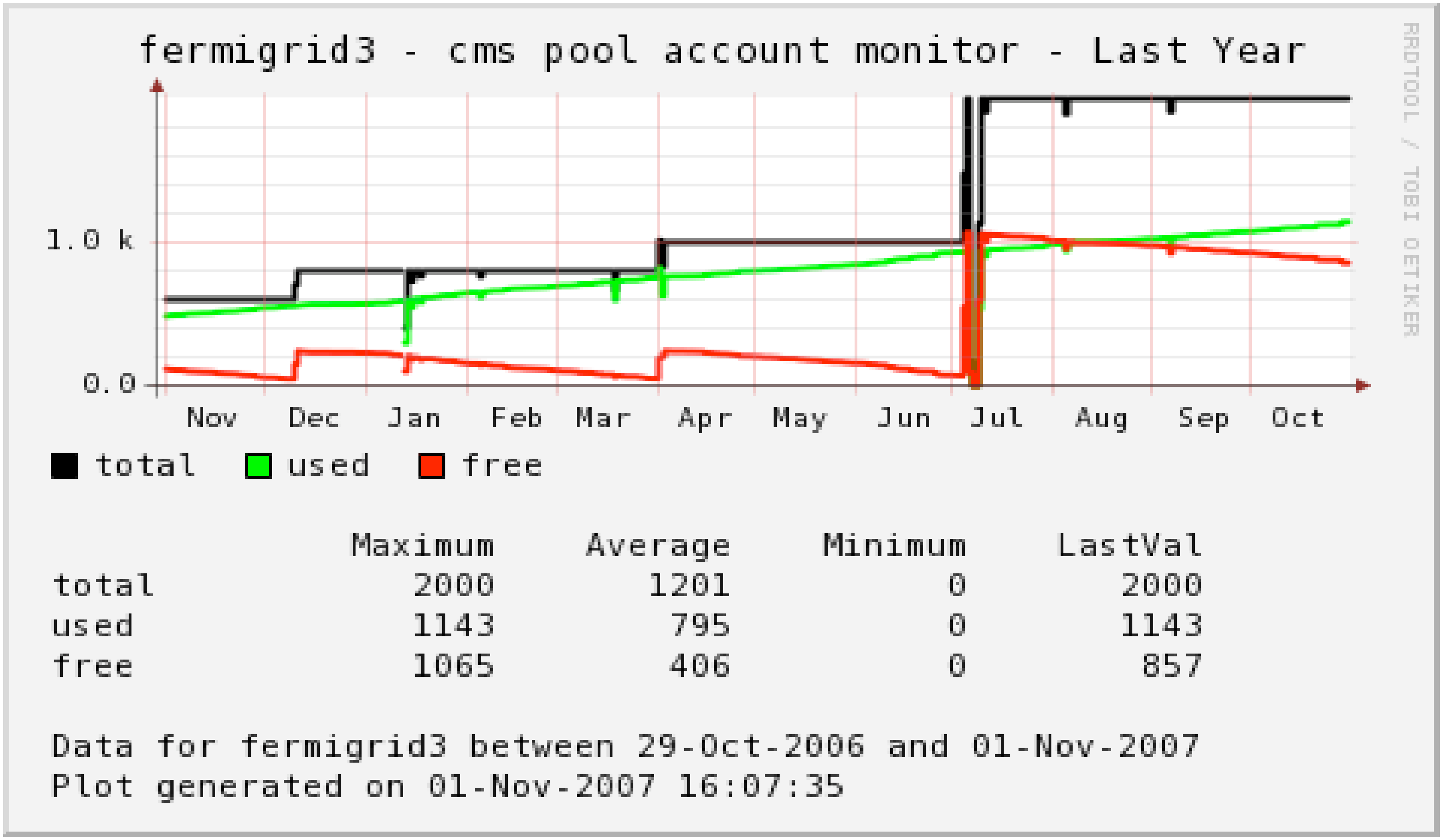


🟩 calls 🟥 fails 🟨 errors 🟦 apache ⬛ tomcat 🟪 vmz 🟦 rss
🟩 uptime 🟨 load1 🟧 load5 🟥 load15

```
                  Maximum       Average       Minimum       LastVal
calls               15867          7694          3358         10588
fails                   2             0             0             0
errors                  0             0             0             0
apache                 12            11            11            11
tomcat                  1             1             1             1
vmz               2529432       2524568       2523048       2529432
rss                615196        614731        614564        615196
uptime               3600          3600          3600          3600
load1                   4             2             0             1
load5                   2             1             0             0
load15                  1             0             0             0

Data for fermigrid3 between 28-Oct-2007 and 03-Nov-2007
Plot generated on 01-Nov-2007 16:07:32
```

Mapping Monitor

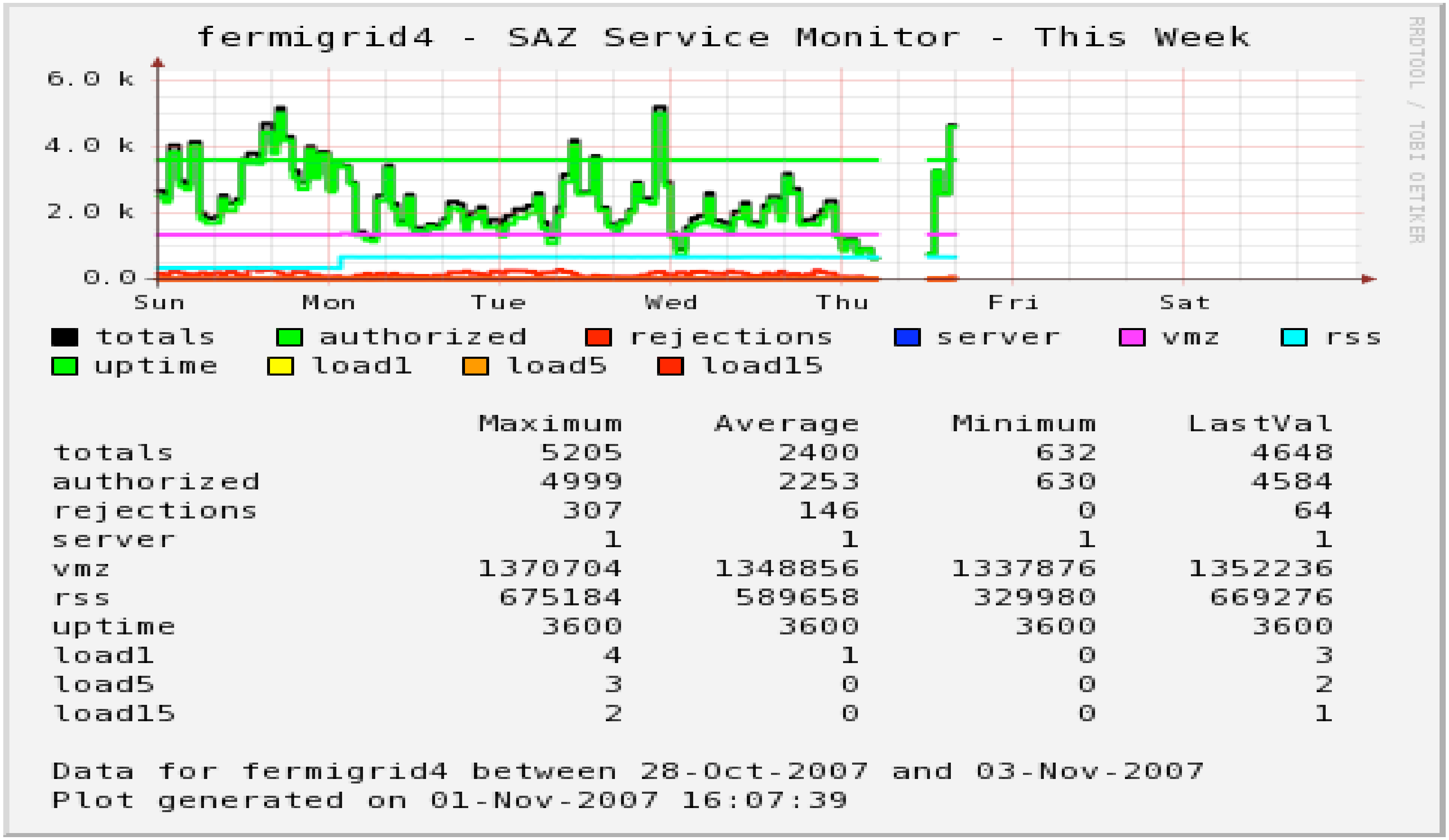


■ total 🟩 used 🟥 free

```
                    Maximum     Average     Minimum     LastVal
total                  2000        1201           0        2000
used                   1143         795           0        1143
free                   1065         406           0         857

Data for fermigrid3 between 29-Oct-2006 and 01-Nov-2007
Plot generated on 01-Nov-2007 16:07:35
```

SAZ Monitor 1



```
                          Maximum      Average      Minimum      LastVal
totals                       5205         2400          632         4648
authorized                   4999         2253          630         4584
rejections                    307          146            0           64
server                          1            1            1            1
vmz                       1370704      1348856      1337876      1352236
rss                        675184       589658       329980       669276
uptime                       3600         3600         3600         3600
load1                           4            1            0            3
load5                           3            0            0            2
load15                          2            0            0            1

Data for fermigrid4 between 28-Oct-2007 and 03-Nov-2007
Plot generated on 01-Nov-2007 16:07:39
```

VO Acceptance Monitoring

Monitor the acceptance of a VO across a Grid in order to:

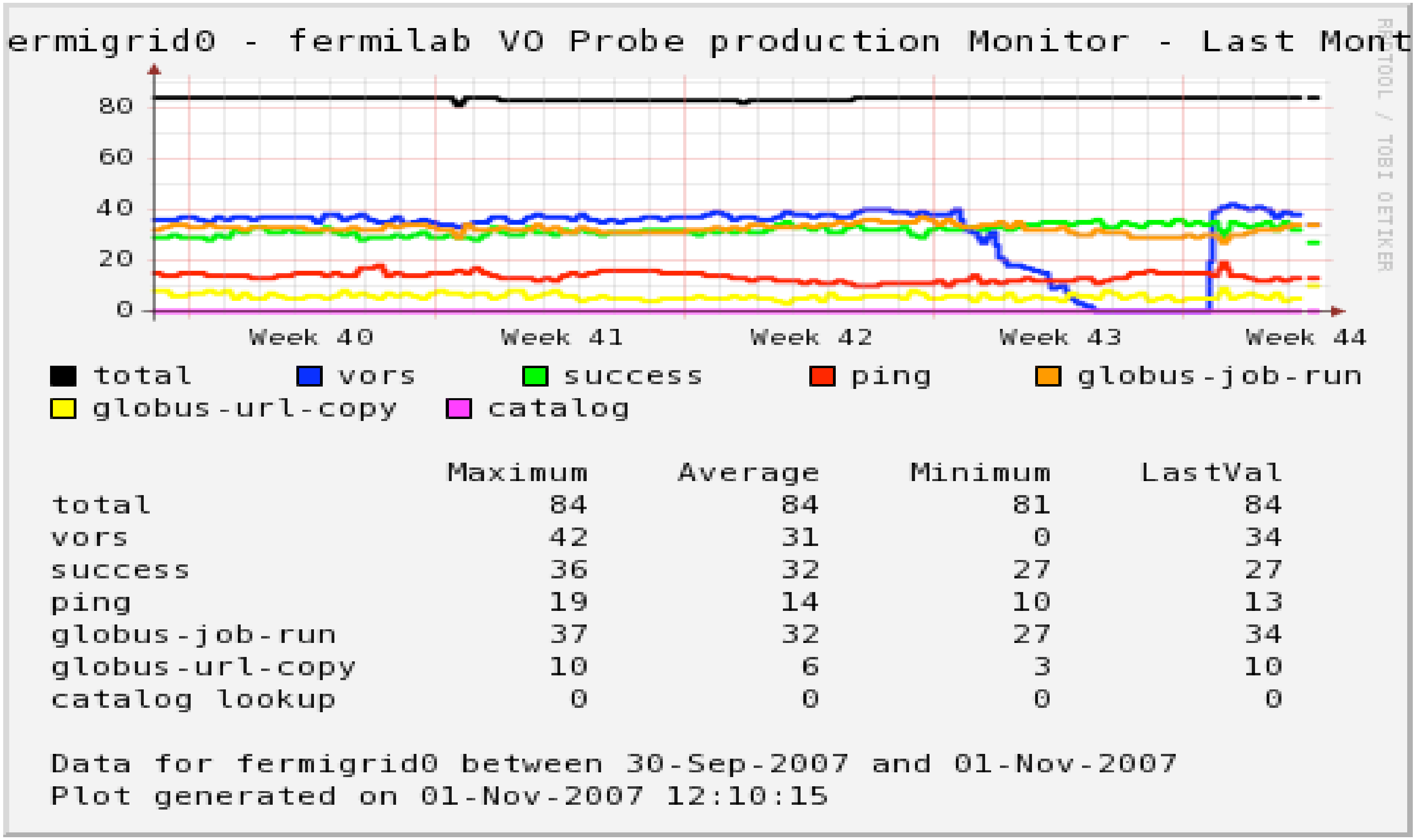
- Identify where the members of the VO can consider running jobs.
  - Not a guarantee that the job can actually run.
- Identify misconfigured sites that advertise that they “support” the VO but to not actually accept jobs from VO members.
- Log formal trouble tickets through the OSG GOC.
  - Ideally have the sites respond and fix their configuration.
  - Unfortunately some sites have not been very responsive.
  - And still other sites have responded by removing support for the VO.

VO Acceptance Monitoring Mechanics

How it is done:

- A cron script periodically launches kcroninit.
- kcroninit launches a script which does authentication:
  - kx509
  - kxlist -p
- Robot certificate "issued" by the Fermilab KCA:
  - /DC=gov/DC=fnal/O=Fermilab/OU=Robots/CN=cron/CN=Keith Chadwick/UID=chadwick
- Get VO signed credentials:
  - voms-proxy-init -noregen -voms fermilab:/fermilab
- Pulls the list of OSG sites from the OSG gridscan reports
  - http://scan.grid.iu.edu/cgi-bin/get_grid_sv?get=set1
- For each site in the report, the acceptance monitor tests:
  - Standard Unix ping.
  - globusrun -a -r (authenticate).
  - globus-job-run (existing application - typically /usr/bin/id).
  - globus-url-copy (to and from).
- Periodically I review the list of failing sites and if appropriate, log trouble tickets.

VO Acceptance Monitor 1



```
                        Maximum      Average      Minimum      LastVal
total                        84           84           81           84
vors                         42           31            0           34
success                      36           32           27           27
ping                         19           14           10           13
globus-job-run               37           32           27           34
globus-url-copy              10            6            3           10
catalog lookup                0            0            0            0
```

Data for fermigrid0 between 30-Sep-2007 and 01-Nov-2007
Plot generated on 01-Nov-2007 12:10:15

Availability (Infrastructure) Monitoring

Designed to be very “lightweight”.

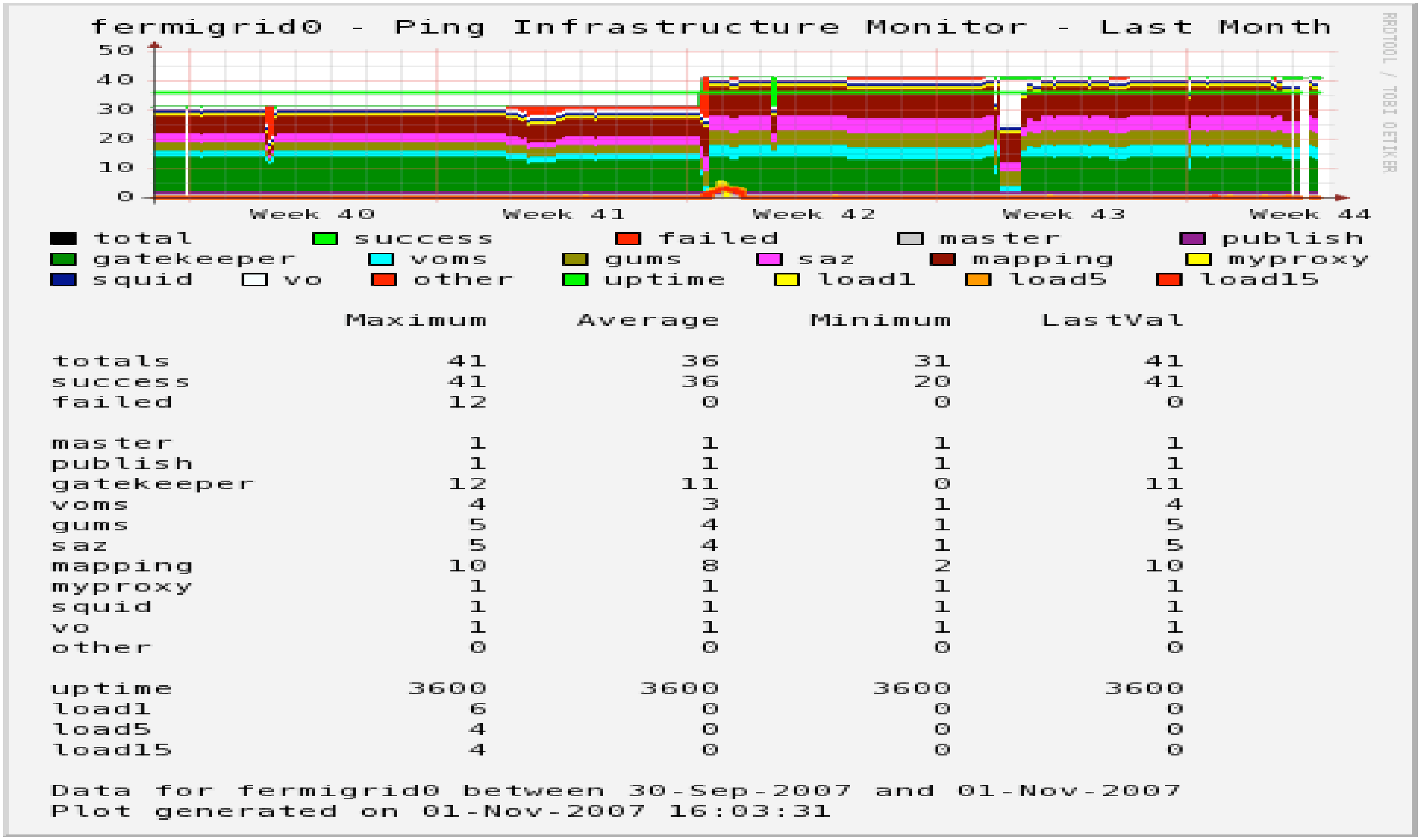
Currently running with the service monitor, but designed and implemented so that it can run much more frequently.

Monitors both the host system and the service which is running on the system.

Driven by the same configuration file as the service monitor.

http://fermigrid.fnal.gov/monitor/fermigrid0-ping-monitor.html

Base Infrastructure Monitor



fermigrid0 - Ping Infrastructure Monitor - Last Month

```
                       Maximum     Average     Minimum     LastVal

totals                      41          36          31          41
success                     41          36          20          41
failed                      12           0           0           0

master                       1           1           1           1
publish                      1           1           1           1
gatekeeper                  12          11           0          11
voms                         4           3           1           4
gums                         5           4           1           5
saz                          5           4           1           5
mapping                     10           8           2          10
myproxy                      1           1           1           1
squid                        1           1           1           1
vo                           1           1           1           1
other                        0           0           0           0

uptime                    3600        3600        3600        3600
load1                        6           0           0           0
load5                        4           0           0           0
load15                       4           0           0           0

Data for fermigrid0 between 30-Sep-2007 and 01-Nov-2007
Plot generated on 01-Nov-2007 16:03:31
```

Dashboard & Summary Displays

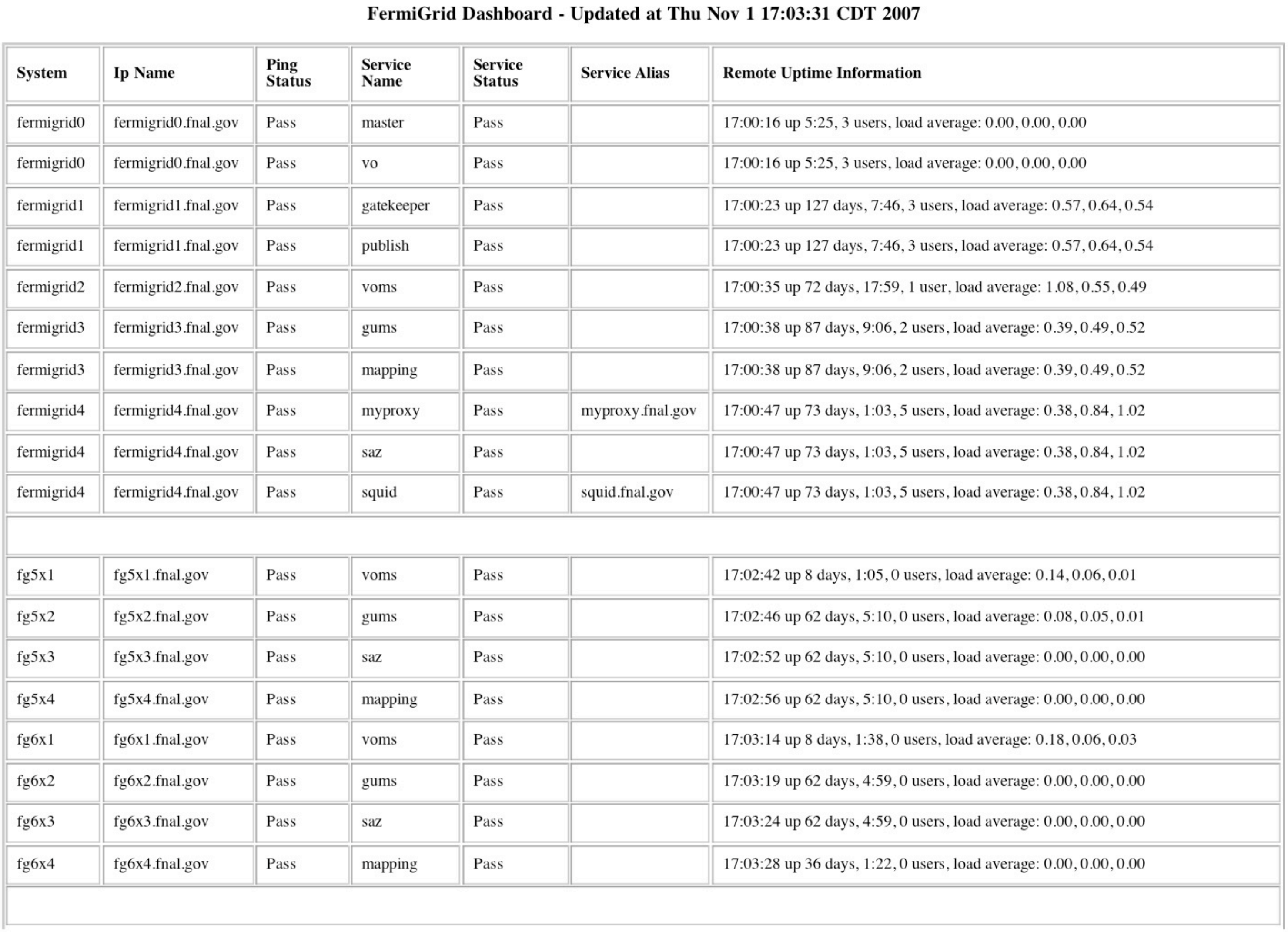
Based on a secondary analyses of the infrastructure monitor data.

Designed to be a simple "health" dashboard and summary display for the user community:

http://fermigrid.fnal.gov/monitor/fermigrid-dashboard.html

http://fermigrid.fnal.gov/monitor/fermigrid-summary.html

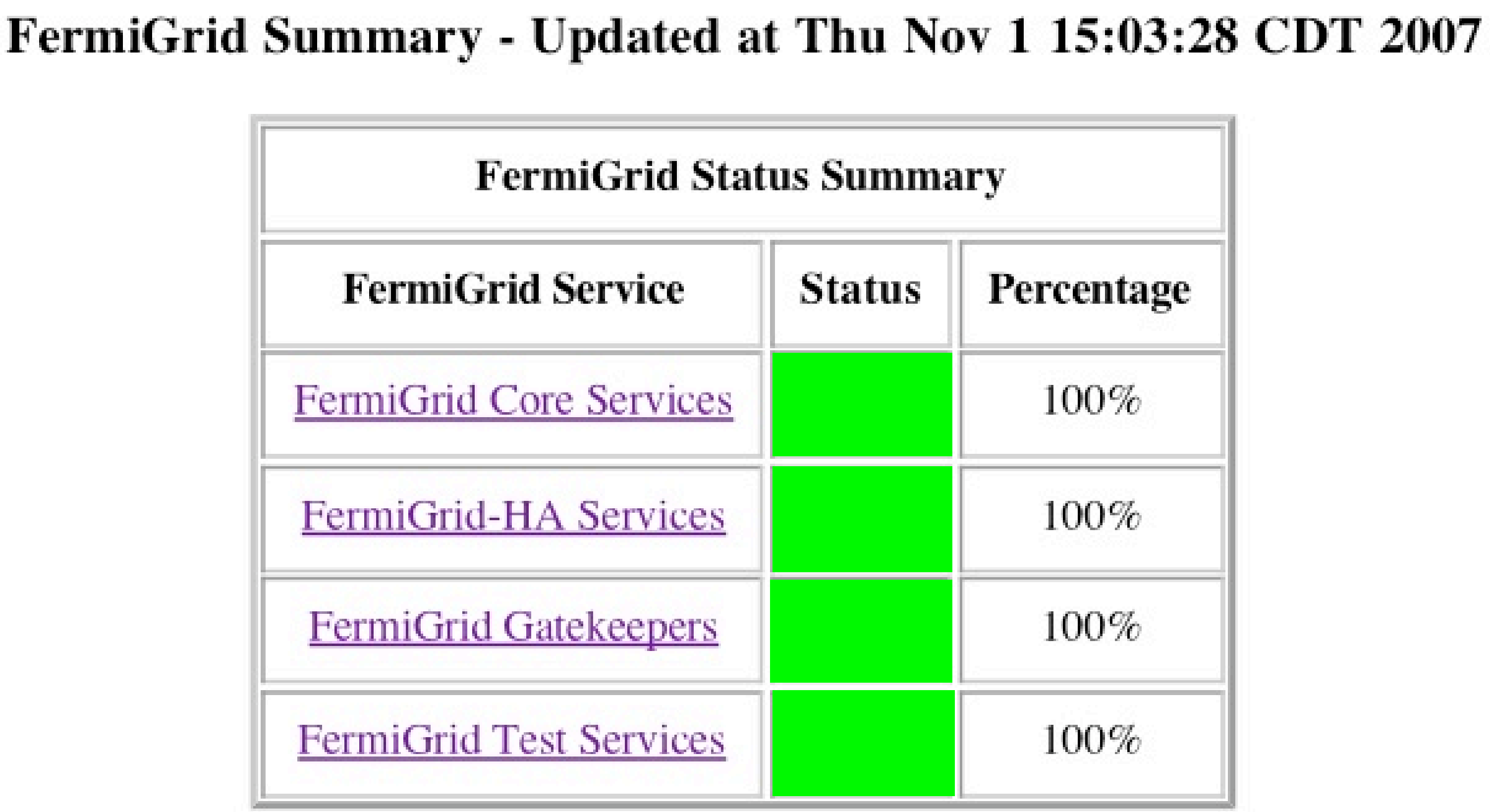
Dashboard - Typical Display



FermiGrid Dashboard - Updated at Thu Nov 1 17:03:31 CDT 2007

System	Ip Name	Ping Status	Service Name	Service Status	Service Alias	Remote Uptime Information
fermigrid0	fermigrid0.fnal.gov	Pass	master	Pass		17:00:16 up 5:25, 3 users, load average: 0.00, 0.00, 0.00
fermigrid0	fermigrid0.fnal.gov	Pass	vo	Pass		17:00:16 up 5:25, 3 users, load average: 0.00, 0.00, 0.00
fermigrid1	fermigrid1.fnal.gov	Pass	gatekeeper	Pass		17:00:23 up 127 days, 7:46, 3 users, load average: 0.57, 0.64, 0.54
fermigrid1	fermigrid1.fnal.gov	Pass	publish	Pass		17:00:23 up 127 days, 7:46, 3 users, load average: 0.57, 0.64, 0.54
fermigrid2	fermigrid2.fnal.gov	Pass	voms	Pass		17:00:35 up 72 days, 17:59, 1 user, load average: 1.08, 0.55, 0.49
fermigrid3	fermigrid3.fnal.gov	Pass	gums	Pass		17:00:38 up 87 days, 9:06, 2 users, load average: 0.39, 0.49, 0.52
fermigrid3	fermigrid3.fnal.gov	Pass	mapping	Pass		17:00:38 up 87 days, 9:06, 2 users, load average: 0.39, 0.49, 0.52
fermigrid4	fermigrid4.fnal.gov	Pass	myproxy	Pass	myproxy.fnal.gov	17:00:47 up 73 days, 1:03, 5 users, load average: 0.38, 0.84, 1.02
fermigrid4	fermigrid4.fnal.gov	Pass	saz	Pass		17:00:47 up 73 days, 1:03, 5 users, load average: 0.38, 0.84, 1.02
fermigrid4	fermigrid4.fnal.gov	Pass	squid	Pass	squid.fnal.gov	17:00:47 up 73 days, 1:03, 5 users, load average: 0.38, 0.84, 1.02
fg5x1	fg5x1.fnal.gov	Pass	voms	Pass		17:02:42 up 8 days, 1:05, 0 users, load average: 0.14, 0.06, 0.01
fg5x2	fg5x2.fnal.gov	Pass	gums	Pass		17:02:46 up 62 days, 5:10, 0 users, load average: 0.08, 0.05, 0.01
fg5x3	fg5x3.fnal.gov	Pass	saz	Pass		17:02:52 up 62 days, 5:10, 0 users, load average: 0.00, 0.00, 0.00
fg5x4	fg5x4.fnal.gov	Pass	mapping	Pass		17:02:56 up 62 days, 5:10, 0 users, load average: 0.00, 0.00, 0.00
fg6x1	fg6x1.fnal.gov	Pass	voms	Pass		17:03:14 up 8 days, 1:38, 0 users, load average: 0.18, 0.06, 0.03
fg6x2	fg6x2.fnal.gov	Pass	gums	Pass		17:03:19 up 62 days, 4:59, 0 users, load average: 0.00, 0.00, 0.00
fg6x3	fg6x3.fnal.gov	Pass	saz	Pass		17:03:24 up 62 days, 4:59, 0 users, load average: 0.00, 0.00, 0.00
fg6x4	fg6x4.fnal.gov	Pass	mapping	Pass		17:03:28 up 36 days, 1:22, 0 users, load average: 0.00, 0.00, 0.00

FermiGrid Summary - Typical Display



FermiGrid Summary - Updated at Thu Nov 1 15:03:28 CDT 2007

FermiGrid Status Summary		
FermiGrid Service	**Status**	**Percentage**
FermiGrid Core Services	🟩	100%
FermiGrid-HA Services	🟩	100%
FermiGrid Gatekeepers	🟩	100%
FermiGrid Test Services	🟩	100%

Lessons Learned 1

Metrics and Service Monitoring is difficult:

- Every service has it's own log file format (at least today).
  - find, grep, awk are your friends.
  - The format of the messages within the service log file will change as new versions of the services are deployed.
- Some services don't log all necessary and/or interesting information "out of the box", they need additional logging options enabled.
  - You may have to work with the service developers to insure that they log the necessary service information.
- Some services are extremely "talkative" and place lots of information (that I am certain is useful to the developers) in the log file along with the "golden nuggets" that is needed by the metrics collection and service monitoring.
  - You may have to work with the service developers to insure that they log the necessary service information.
- You may have to extract and correlate information from multiple logs.
- You must also monitor services that the monitored Grid service depends on (especially apache, tomcat and mysql).

Lessions Learned 2

Out of band access and monitoring is quite useful and necessary.

- ssh, ksu as well as grid.

Using grid services to monitor other grid services may not correctly identify the problem:

- Did some local (non-grid) service fail?
  - kx509
  - kxlist -p
- Did the local grid service fail?
  - voms-proxy-init
- Did some intermediate service fail or timeout?
  - Network congestion
- Did the remote grid service fail or timeout?
  - Globus gatekeeper
    - globusrun -a -r
    - globus-job-run
- Did a remote service fail or timeout?
  - NFS server

Lessons Learned 3

Service monitoring with automatic service recovery can be very useful.

- Especially when responding to automated security probing,
- And also for getting a full nights rest…

Automatic service recovery will usually require some level of root access.

- Sites are understandably reluctant to grant “remote” root access (I know that I am…).

Robot certificates are extremely useful for automating grid service monitoring.

Plans for the Future

Continue with the development of additional metrics and monitor probes.

Continue with the development of automated reports & publication.

Integrate/incorporate the new OSG SAM probes to fermilab VO monitoring.

Work towards making this infrastructure more portable.

Fin

Any questions?