FermiGrid High Availability Installation & Configuration Guides

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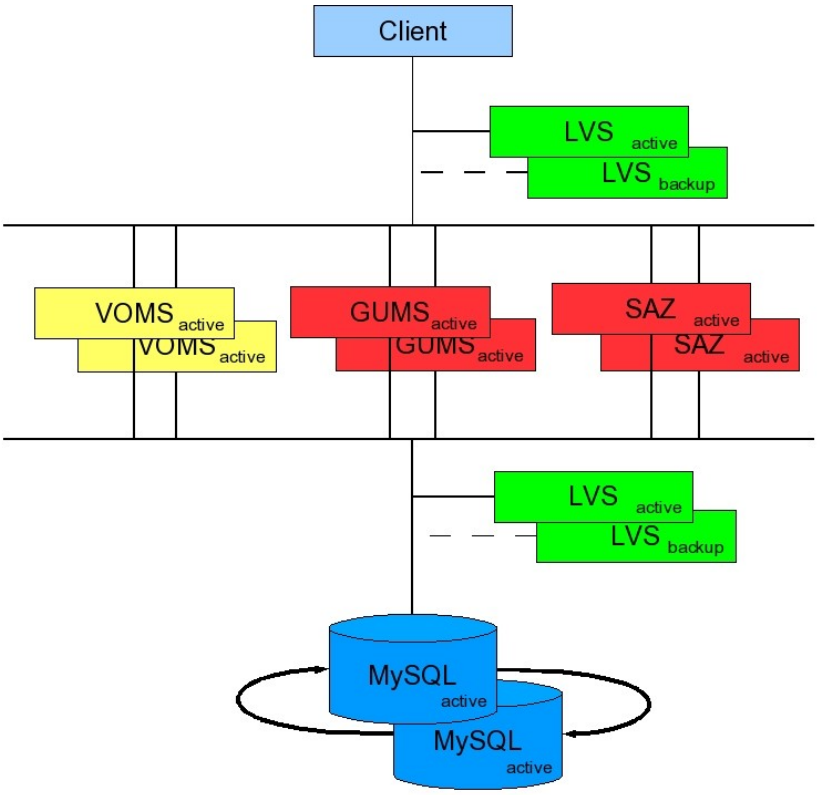
Last Edited on Dec 5, 2007

Introduction

This set of guides is meant to be a concise set of recipes to install and configure the FermiGrid High Availability authentication and authorization middleware system. They are not meant to be detailed guides that cover every possible alternative method of installation and configuration. The goal of these guides is produce a Highly Available, Fault Tolerant system in the shortest amount of time with the least amount of effort. If more detail is required than what is provided herein, that exercise is left to the user. For your convenience, links to those external guides are provided.

The latest version of this document can always be found here:
http://docs.google.com/Doc?id=ddszv68g_19d88pzv



Note 1: All network connections are on the public network
Note 2: LVS directors displayed separately for convenience – they are the same in reality

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Acknowldegements

Work supported by the U.S. Department of Energy under contract No. DE-AC02-07CH11359.

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Circularly Replicated MySQL Installation & Configuration

This section describes the procedures to install a circular replicating, 2-node, highly available MySQL cluster. This system does not use MySQL Clustering engine (ndbd). Alternatively, this system is also described as a MySQL multimaster replication system.

This recipe is based on the Advanced MySQL Replication Techniques OnLamp article written by Giuseppe Maxia, as well as Chapter 15, Replication of the MySQL 5.0 Reference Manual. This guide is only valid for MySQL v5.0 and later.

Master Installation and Configuration (e.g., fg5x4.fnal.gov)

Install the server and client rpm packages:

```
yum -y install mysql mysql-server
```

Edit /etc/my.cnf and add the following to the [mysqld] section:

```
###################
# For server tuning
set-variable = key_buffer_size=512M
set-variable = table_cache=512
set-variable = myisam_sort_buffer_size=100M
set-variable = max_connections=500
# If innodb is used.
innodb_flush_log_at_trx_commit=1
sync_binlog=1
# For replication. **Note** server-id and auto_increment_offset values!
server-id=1
log-bin=mysql-bin
auto_increment_increment=10
auto_increment_offset=1
master-host = fg6x4.fnal.gov
master-user = repl
master-password = <password>
relay-log=fg5x4-relay-bin
####################
```

Enable and start the server:

```
chkconfig mysqld on
service mysqld start
```

Start the mysql client and issue these commands:

```
mysql> grant replication slave, replication client on *.*
        -> to 'repl'@'fg6x4.fnal.gov' identified by '<password>';
mysql> grant replication slave, replication client on *.*
        -> to 'repl'@'fg5x4.fnal.gov' identified by '<password>';
mysql> show master status;
```

Record the values of `File` and `Position` used below:

```
mysql> FLUSH TABLES WITH READ LOCK;
```

Remain logged into the mysql client to maintain the lock, then from another terminal do this:

```
cd /var/lib/mysql
tar -cvf /tmp/master-mysql-snapshot.tar \
--exclude relay-log.info --exclude \
master.info .
scp /tmp/master-mysql-snapshot.tar fg6x4:/var/tmp
```

Unlock the tables:

```
mysql> UNLOCK TABLES;
```

Slave Installation and Configuration (fg6x4.fnal.gov):

(In the instance of a catastrophic single server failure, start from here)

Install the server and client software:

```
yum install mysql mysql-server
```

Copy the databases from the master:

```
cd /var/lib/mysql
tar -xvf /var/tmp/master-mysql-snapshot.tar
```

Edit /etc/my.cnf and add these lines to the [mysqld] section:

```
####################
# For server tuning
set-variable = key_buffer_size=512M
set-variable = table_cache=512
set-variable = myisam_sort_buffer_size=100M
set-variable = max_connections=500
# If innodb is used.
innodb_flush_log_at_trx_commit=1
sync_binlog=1
# For replication. **Note** server-id and auto_increment_offset values!
server-id=2
log-bin=mysql-bin
auto_increment_increment=10
auto_increment_offset=2
master-host = fg5x4.fnal.gov
master-user = repl
master-password = <password>
relay-log=fg6x4-relay-bin
####################
```

Enable and start the server:

```
chkconfig mysqld on
service mysqld start
```

Start the mysql client and issue these commands:

```
mysql> slave stop;
mysql> change master to
       -> master_log_file='<recorded log file name, above>',
       -> master_log_pos=<recorded log position, above>; # <- note lack of quotes
       -> start slave;
```

To check the status of the slave on each machine:

```
mysql> show slave status\G;
```

THis command should yield an output similar to this:

```
*************************** 1. row ***************************
            Slave_IO_State: Waiting for master to send event
               Master_Host: fg5x4.fnal.gov
               Master_User: repl
               Master_Port: 3306
             Connect_Retry: 60
```

```
            Master_Log_File: mysql-bin.000001
        Read_Master_Log_Pos: 98
             Relay_Log_File: fg6x4-relay-bin.000002
              Relay_Log_Pos: 235
      Relay_Master_Log_File: mysql-bin.000001
          Slave_IO_Running: Yes
         Slave_SQL_Running: Yes
etc...
```

Restart Procedure After an Unclean Shutdown

After the machines have been rebooted, and the mysql servers have been started, determine which mysql server is out-of-sync - log into both systems and issue the `show slave status` command. On the system that reports back `waiting for master to reconnect` perform the commands `slave stop` and `slave start`. Then re-issue the `show slave status` command to verify that the connection has been re-established.

Logrotate mysql.log

There is a bug in mysql logrotation using 'mysqladmin flush-logs': it doesn't work as it's supposed to. See http://bugs.mysql.com/bug.php?id=6061. A solution is to use the copytruncate option in the /etc/logrotate.d/mysql conf file:

```
/var/log/mysqld.log {
# create 600 mysql mysql
notifempty
daily
rotate 31
missingok
compress
# Because flush-logs doesn't work use this:
copytruncate
postrotate
# just if mysqld is really running
if test -x /usr/bin/mysqladmin && \
/usr/bin/mysqladmin ping &>/dev/null
then
/usr/bin/mysqladmin flush-logs
fi
endscript
}
```

Configure Iptables

Since only one host exists on the mysql server, we don't need to bring up a separate IP and we can use Horm's transparent proxy to rewrite IP packet headers. Therefore, use the mysql server iptables file.

Files and Directories to Sync Between fg5x4 and fg6x4

/etc/sysconfig/iptables

Piranha Linux Virtual Server Installation & Configuration

This section describes the steps to install and configure the Linux Virtual Server (LVS) using the Red Hat piranha package. It is meant to be a concise recipe, not a comprehensive HOWTO.

LVS Installation

On the master LVS node perform the following as root:

```
   yum install piranha
yum install rusers

chkconfig --on piranha-gui

service piranha-gui start

piranha-password
```

(and set the password)

Configure iptables

For transparent failover to a backup director, stateful connections should not be maintained in iptables. See the following:

http://www.austintek.com/LVS/LVS-HOWTO/HOWTO/LVS-HOWTO.failover.html#stateful_failover

"On failover, a director configured with no filter rules, can be replaced with an identically configured backup with no interuption of service to the client. There will be a time in the middle of the changeover where no packets are being transmitted (and possibly icmp packets are being generated), but in general once the new director is online, the connection between client and realserver should continue with no break in established tcp connections between the client and the realserver... If stateful filter rules are in place (e.g. only accept packets from ESTABLISHED connections) then after failover, the new director will be presented packets from tcp connections that are ESTABLISHED, but of which it has no record. The new director will REJECT/DROP these packets."

LVS director iptables

NOTE: for voms.fnal.gov and voms.opensciencegrid.org, the `--set-mark` value in iptables MUST match the `fwmark` in the lvs.cf file.

Restart IP tables:

```
service iptables restart
```

Configure Virtual Servers

Open a browser to http://fermigrid5.fnal.gov:3636

The username is 'piranha', the password is whatever was set, above.

Click on "Global Settings" tab and fill in the fields:

Primary server public IP: 131.225.107.36
Primary server private IP: 192.168.18.16

Verify routing is: direct

IMPORTANT!!!! --> Click "Accept"

Click on the "Redundancy" tab and fill in the fields:

Redundant server public IP: 131.225.107.76
Redundant server private IP: 192.168.18.19

Heartbeat interval: 6
Assume dead after: 18
Heartbeat runs on port: 539
Monitor NIC links for failures: [X]

IMPORTANT!!!! --> Click "Accept"

Click on the "Virtual Servers" tab.

Click "Add"

Click the radio button next to the new unnamed service and click "Edit"

Fill in the fields:

Name: SERVICE_NAME:<port number>
Application port: <port number>
Protocol: tcp
Virtual IP Address: <IP of system associated with service>
Virtual IP Network Mask: 255.255.255.0
Firewall Mark: <port number> <- for convenience, only used for voms-admin services
Device: eth0:<N> <- where N is a unique number not held by another interface
Re-entry Time: 15
Service timeout: 6
Quiesce server: Yes
Load monitoring tool: rup
Scheduling: weighted least-connections
Persistence: (only used if using fwmark)
Persistence Network Mask: Unused

IMPORTANT!!!! --> Click "Accept"

Click on the "Real Server" tab

Click "Add"

Select the radio button next to the new, unnamed server and click "Edit"

Fill in the fields:

Name: <short name of the *first* real server hosting the service>
Address: <IP of this real server hosting the service>
Weight: <number of CPUS * speed of CPUs (in MHz) * speed of
network (in Mbps)/1M>

IMPORTANT!!!! --> Click "Accept"

Click on the "Real Server" tab, again.

Click "Add"

Select the radio button next to the new, unnamed server and click "Edit"

Fill in the fields:

Name: <short name of the *second* real server hosting the service>
Address: <IP of this real server hosting the service>
Weight: <number of CPUS * speed of CPUs (in MHz) * speed of network (in Mbps)/1M>

IMPORTANT!!!! --> Click "Accept"

Click on the "Monitoring Scripts" tab.

Fill in the fields. If the service is an non-ssl enabled web server, the defaults are fine. If not, then either the path to a custom "Sending Program" will be needed or a custom "Expect" string is required.

The following list of scripts go into /usr/local/bin/ and the full path must be specified when calling the script. If the service is available, then the string "up" is issued and this is what the "Expect" field should contain.

lvs-ha-check-voms-admin.sh
lvs-ha-check-mysql.sh
lvs-ha-check-gums.sh

IMPORTANT!!!! Don't forget to add the "%h" to the end of the "Sending Program" field.

IMPORTANT!!!! --> Click "Accept"

After completing the above for each service, you should have a file that looks like lvs.cf.

Files and directories to sync between fermigrid5 and fermigrid6:

/etc/sysctl.conf
/etc/sysconfig/iptables
/etc/sysconfig/ha
/usr/local/bin/

VOMS Installation & Configuration

This section describes the steps to install and configure the Virtual Organization Management Server (VOMS) in conjunction with an LVS director. It is meant to be a concise recipe, not a comprehensive HOWTO.

VOMS Installation and Configuration

Generate and install host and http certificates.

Install VOMS per the instructions in the VOMS Install Guide.

Dump the voms_* databases and reload them on fg5x4:

```
for i in `mysql -B -e 'show databases;' | grep voms_`;
```

```
    do
        mysqldump $i > $i-`date +%m%d%y`.sql;
    done
  scp *.sql fg5x4:/var/tmp
```

On the database server:

```
    for i in `ls *.sql`;
    do
        j=`echo $i | awk -F- '{print $1}'`;
        mysql -B -e "create database $j;";
        mysql $j < $i;
    done
```

NOTE ## If dumping from a VDT 1.6.1 installation, the following commands must be issued after restoring the databases on the database server:

```
for i in `mysql -B -e 'show databases;' | grep voms`; do mysql -B -e "use $i;
CREATE TABLE attributes (
    a_id BIGINT NOT NULL PRIMARY KEY,
    a_name VARCHAR(255) NOT NULL,
    a_desc LONGTEXT,
    UNIQUE KEY (a_name)
) TYPE = InnoDB;

CREATE TABLE usr_attrs (
    u_id BIGINT NOT NULL,
    a_id BIGINT NOT NULL,
    a_value LONGTEXT,
    UNIQUE KEY (u_id, a_id),
    INDEX (u_id),
    INDEX (a_id)
) TYPE = InnoDB;

CREATE TABLE group_attrs (
    g_id BIGINT NOT NULL,
    a_id BIGINT NOT NULL,
    a_value LONGTEXT,
    UNIQUE KEY (g_id, a_id),
    INDEX (g_id),
    INDEX (a_id)
) TYPE = InnoDB;

CREATE TABLE role_attrs (
    r_id BIGINT NOT NULL,
    g_id BIGINT NOT NULL,
    a_id BIGINT NOT NULL,
    a_value LONGTEXT,
    UNIQUE KEY (r_id, g_id, a_id),
    INDEX (r_id),
    INDEX (g_id),
    INDEX (a_id)
) TYPE = InnoDB;"
done
```

Add users who can access the databases. On the voms server, do:

```
    for i in `find . -print | grep voms.pass`;
```

```
do
     j=`echo $i | awk -F \/ '{print $2}'`;
     echo "mysql -B -e 'grant all privileges on voms_${j}.* to
\"${j}_adm\"@\"fg5x1.fnal.gov\" identified by \"`cat $i`\" with grant option;'";
     echo "mysql -B -e 'grant all privileges on voms_${j}.* to
\"${j}_adm\"@\"fg6x1.fnal.gov\" identified by \"`cat $i`\" with grant option;'";
done
```

Cut and paste the output from the previous command into a shell on the db server.

Continue on the voms server:

```
service tomcat-5 stop
service mysql stop
chkconfig mysql off
vdt-register-service --disable mysql
```

Edit $VDT_LOCATION/vdt-app-data/voms/voms/*/voms.conf files to contact fg-mysql
add --contactstring=fg-mysql.fnal.gov
change --port=3306

Edit $VDT_LOCATION/vdt-app-data/voms/voms/dzero/voms.conf and change the voms extended attribute timeout to 15 days. Add this line:
--timeout=1296000

Edit $VDT_LOCATION/glite/var/etc/voms-admin/*/voms.database.properties
change jdbc:mysql://fg-mysql.fnal.gov:3306/voms_<VO>
i.e.,

```
cd $VDT_LOCATION/glite/var/etc/voms-admin/
for i in `ls */voms.database.properties`
     do perl -pe 's/localhost:49155/fg-mysql.fnal.gov:3306/g;' -i $i
done
service tomcat-5 restart
```

Configure iptables

Since we're bringing up real IP addresses for the different voms servers (voms.fnal.gov and voms.opensciencegrid.org) and not mangling IP packet headers using Horm's Transparent Proxy, no special iptables are necessary. The one addition that is necessary is the range of ports that the voms servers run on must be accessible to outside the fnal.gov domain. See the iptables for VOMS section in the appendix.

Configure Web Servers

Edit $VDT_LOCATION/apache/conf/extra/httpd-ssl.conf and add the following bits:

On fg5x1:

```
Listen 131.225.107.102:8443
```

On fg6x1:

```
Listen 131.225.107.106:8443
```

On both:

```
Listen 131.225.107.112:8443 # this will change to the real IP after testing
Listen 131.225.107.114:8443 # this will change to the real IP after testing
```

and these VirtualHost directives:

NOTE - the first VirtualHost directive should be this line:

One fg5x1:

```
<VirtualHost 131.225.107.102:8443>
```

On fg6x1:

```
<VirtualHost 131.225.107.106:8443>
```

Then append the following to the end of the file:

```
##########################################
# <VirtualHost voms.opensciencegrid.org:8443>
<VirtualHost 131.225.107.114:8443>

RewriteEngine on
RewriteRule ^/edg-voms-admin/(.*)$ /voms/$1 [noescape,redirect=permanent]

# The following sends vomrs requests to fermigrid2
RewriteEngine on
RewriteRule ^/vomrs/(.+) https://fermigrid2.fnal.gov:8443/vomrs/$1 [R,L]

DocumentRoot "/usr/local/vdt/apache/htdocs"
ServerName voms.opensciencegrid.org:8443
ServerAdmin helpdesk-admin@fnal.gov
ErrorLog /usr/local/vdt/apache/logs/error_log
TransferLog /usr/local/vdt/apache/logs/access_log

SSLEngine on
SSLCipherSuite
ALL:!ADH:!EXPORT56:RC4+RSA:+HIGH:+MEDIUM:+LOW:+SSLv2:+EXP:+eNULL

SSLCertificateFile /etc/grid-security/http/vomsopensciencegrid-httpcert.pem
SSLCertificateKeyFile /etc/grid-security/http/vomsopensciencegrid-httpkey.pem

SSLCACertificatePath /usr/local/vdt/globus/TRUSTED_CA
SSLVerifyClient require
SSLVerifyDepth 10
SSLOptions +OptRenegotiate +ExportCertData +StdEnvVars
<FilesMatch "\.(cgi|shtml|phtml|php)$">
  SSLOptions +StdEnvVars
</FilesMatch>
<Directory "/usr/local/vdt/apache/cgi-bin">
  SSLOptions +StdEnvVars
</Directory>

BrowserMatch ".*MSIE.*" \
     nokeepalive ssl-unclean-shutdown \
     downgrade-1.0 force-response-1.0

CustomLog /usr/local/vdt/apache/logs/ssl_request_log \
      "%t %h %{SSL_PROTOCOL}x %{SSL_CIPHER}x \"%r\" %b"

</VirtualHost>

# <VirtualHost voms.fnal.gov:8443>
<VirtualHost 131.225.107.112:8443>
```

```
RewriteEngine on
RewriteRule ^/edg-voms-admin/(.*)$ /voms/$1 [noescape,redirect=permanent]

# The following sends vomrs requests to fermigrid2
RewriteEngine on
RewriteRule ^/vomrs/(.+) https://fermigrid2.fnal.gov:8443/vomrs/$1 [R,L]

DocumentRoot "/usr/local/vdt/apache/htdocs"
ServerName voms.fnal.gov:8443
ServerAdmin helpdesk-admin@fnal.gov
ErrorLog /usr/local/vdt/apache/logs/error_log
TransferLog /usr/local/vdt/apache/logs/access_log

SSLEngine on
SSLCipherSuite
ALL:!ADH:!EXPORT56:RC4+RSA:+HIGH:+MEDIUM:+LOW:+SSLv2:+EXP:+eNULL

SSLCertificateFile /etc/grid-security/http/vomsfnal-httpcert.pem
SSLCertificateKeyFile /etc/grid-security/http/vomsfnal-httpkey.pem

SSLCACertificatePath /usr/local/vdt/globus/TRUSTED_CA
SSLVerifyClient require
SSLVerifyDepth 10
SSLOptions +OptRenegotiate +ExportCertData +StdEnvVars
<FilesMatch "\.(cgi|shtml|phtml|php)$">
  SSLOptions +StdEnvVars
</FilesMatch>
<Directory "/usr/local/vdt/apache/cgi-bin">
  SSLOptions +StdEnvVars
</Directory>

BrowserMatch ".*MSIE.*" \
     nokeepalive ssl-unclean-shutdown \
     downgrade-1.0 force-response-1.0

CustomLog /usr/local/vdt/apache/logs/ssl_request_log \
      "%t %h %{SSL_PROTOCOL}x %{SSL_CIPHER}x \"%r\" %b"

</VirtualHost>
```

Add the following lines to the $VDT_LOCATION/apache/htdocs/index.html file, just above the voms links:

```
<li><a href="https://fermigrid2.fnal.gov:8443/vomrs/vo-fermilab/vomrs">VOMRS:
fermilab</a>
<li><a href="https://fermigrid2.fnal.gov:8443/vomrs/vo-dzero/vomrs">VOMRS:
dzero</a>
<li><a href="https://fermigrid2.fnal.gov:8443/vomrs/vo-sdss/vomrs">VOMRS: sdss</a>
<li><a href="https://fermigrid2.fnal.gov:8443/vomrs/vo-cms/vomrs">VOMRS: cms</a>
<li><a href="https://fermigrid2.fnal.gov:8443/vomrs/vo-des/vomrs">VOMRS: des</a>
<li><a href="https://fermigrid2.fnal.gov:8443/vomrs/vo-gadu/vomrs">VOMRS: gadu</a>
<li><a href="https://fermigrid2.fnal.gov:8443/vomrs/vo-cdf/vomrs">VOMRS: cdf</a>
<li><a href="https://fermigrid2.fnal.gov:8443/vomrs/nanohub/vomrs">VOMRS:
nanohub</a>
<li><a href="https://fermigrid2.fnal.gov:8443/vomrs/ilc/vomrs">VOMRS: ilc</a>
<li><a href="https://fermigrid2.fnal.gov:8443/vomrs/lqcd/vomrs">VOMRS: lqcd</a>
<li><a href="https://fermigrid2.fnal.gov:8443/vomrs/i2u2/vomrs">VOMRS: i2u2</a>
<li><a href="https://fermigrid2.fnal.gov:8443/vomrs/osg/vomrs">VOMRS: osg</a>
<P>
```

Create /usr/local/vdt-1.8.1/apache/htdocs/robots.txt and

/usr/local/vdt-1.8.1/tomcat/v5/webapps/robots.txt with the following contents:

```
User-agent: *
Disallow: /
```

Configure sysctl.conf

Add the following to /etc/sysctl.conf to solve the arp problem:

```
##########################################
# Enable configuration of arp_ignore option
net.ipv4.conf.all.arp_ignore = 1

# When an arp request is received on eth0, only respond if that address is
# configured on eth0. In particular, do not respond if the address is
# configured on lo
net.ipv4.conf.eth0.arp_ignore = 1

# Ditto for eth1, add for all ARPing interfaces
net.ipv4.conf.eth1.arp_ignore = 1


# Enable configuration of arp_announce option
net.ipv4.conf.all.arp_announce = 2

# When making an ARP request sent through eth0 Always use an address that
# is configured on eth0 as the source address of the ARP request.  If this
# is not set, and packets are being sent out eth0 for an address that is on
# lo, and an arp request is required, then the address on lo will be used.
# As the source IP address of arp requests is entered into the ARP cache on
# the destination, it has the effect of announcing this address.  This is
# not desirable in this case as adresses on lo on the real-servers should
# be announced only by the linux-director.
net.ipv4.conf.eth0.arp_announce = 2

# Ditto for eth1, add for all ARPing interfaces
net.ipv4.conf.eth1.arp_announce = 2
##########################################
```

And load the settings:

```
/sbin/sysctl -p
```

Create the following files with these contents:

/etc/sysconfig/network-scripts/ifcfg-lo:112

```
##########################################
DEVICE=lo:112
IPADDR=131.225.107.112
NETMASK=255.255.255.255
NETWORK=131.225.107.0
BROADCAST=131.225.107.255
ONBOOT=yes
NAME=loopback
##########################################
```

/etc/sysconfig/network-scripts/ifcfg-lo:138

```
##########################################
DEVICE=lo:138
IPADDR=131.225.107.138
```

```
NETMASK=255.255.255.255
NETWORK=131.225.107.0
BROADCAST=131.225.107.255
ONBOOT=yes
NAME=loopback
##########################################
```

Bring up the interfaces:

```
ifup lo:112
ifip lo:114
```

Bring up apache:

```
service apache start
```

Fles and directories to sync between fg5x1 and fg6x1:

/etc/sysctl.conf
/etc/sysconfig/iptables
/etc/sysconfig/network-scripts/ifcfg-lo:112 #names will change when IPs do
/etc/sysconfig/network-scripts/ifcfg-lo:138
/etc/grid-security
/usr/local/vdt-1.8.1 # except for apache, voms, and tomcat logs

---

GUMS Installation & Configuration

This guide describes the steps to install and configure the Grid Users Management Server (GUMS) in conjunction with an LVS director. It is meant to be a concise recipe, not a comprehensive HOWTO.

GUMS Installation and Configuration

On fg5x2 and fg6x2, install the host and http certificates and keys.

Install vdt_181_cache:GUMS per the instructions in the GUMS Installation Guide. Stop the tomcat server and disable the mysql server:

```
service tomcat-5 stop
service mysql stop
chkconfig mysql off
vdt-register-service --disable mysql
```

Dump the GUMS_1_1 database from fermigrid2, copy to a database server and reload:

```
mysqldump GUMS_1_1 > gums.sql
scp gums.sql fg5x4:/var/tmp
```

On fg5x4:

```
mysql < gums.sql
```

Add gums user on fg5x4:

```
mysql> grant all on GUMS_1_1.* to gums@fg5x2.fnal.gov identified by '<password>';
mysql> grant all on GUMS_1_1.* to gums@fg6x2.fnal.gov identified by '<password>';
```

Edit $VDT_LOCATION/vdt-app-data/gums/config/gums.config file to contact fg-mysql:

change: jdbc:mysql://fg-mysql.fnal.gov:3306/GUMS_1_1

Restart the tomcat server and enable gums-host-cron:

```
service tomcat-5 start
/usr/local/vdt-1.8.1/vdt/sbin/vdt-register-service -name gums-host-cron --enable
/usr/local/vdt-1.8.1/vdt/sbin/vdt-control --on gums-host-cron
```

Edit $VDT_LOCATION/tomcat/v55/webapps/gums/WEB-INF/web.xml on fg5x2 to change update time to 1 hr, and edit the same file on fg6x2 to change update time to 17 years. To make sure these changes aren't overwritten accidentally, change the file attribute to imuutable on fg6x3:

```
if [ `hostname -s` -eq fg6x3 ]; then
  chattr -i $VDT_LOCATION/tomcat/v55/webapps/gums/WEB-INF/web.xml
fi
```

On each node, edit $VDT_LOCATION/tomcat/v55/webapps/gums/WEB-INF/config/gums.config.local and change the following line to point at the mysql server and port:

change: hibernate.connection.url="jdbc:mysql://fg-mysql.fnal.gov:3306/GUMS_1_1"

Create sym links in /var/log to the tomcat logs.

```
ln -s $VDT_LOCATION/tomcat/v55/logs tomcat
```

Change permissions on /etc/grid-security/http/httpkey.pem and httpcert.pem to daemon.daemon.

```
chmod daemon.daemon /etc/grid-security/http/http{cert,key}.pem
```

Configure iptables

Since only one host exists on the gums server, we don't need to bring up separate IPs for each server and we can use Horm's transparent proxy to rewrite IP packet headers. Therefore, use this GUMS iptables section in the appendix.

Files and Directories to Sync Between fg5x2 and fg6x2

/etc/sysconfig/iptables
/etc/grid-security
/usr/local/vdt-1.8.1/ #except for $VDT_LOCATION/tomcat/v55/webapps/gums/WEB-INF/web.xml

---

SAZ Installation & Configuration

```
this needs to be completed.
edit /var/log/saz/log4j.properties for correct path
edit /etc/init.d/sazserver for log file locations
edit $VDT_LOCATION/server-1.9.1/conf/saz.conf for database server and port
 * where is password set? it can't be hard coded, can it??!??
create /etc/grid-security/vomsdir/ dir and put hostcert.pem in there
 * this will get fixed soon
add sazadmin login script to fg5x3 and fg6x3.
```

```
change sazadmin script to contact the correct mysql database server
make ssh to saz-admin HA
```

This guide describes the steps to install and configure the Site AuthoriZation server (SAZ) in conjunction with an LVS director. It is meant to be a concise recipe, not a comprehensive HOWTO.

SAZ Installation and Configuration

On fg5x3 and fg6x3, install the host and http certificates and keys.

Install vdt_cache_1.8.1:Globus_Base_SDK and vdt_cache_1.8.1:JDK-1.6 per the instructions in the VDT Express Installation Guide.

Dump the SAZDB database from fermigrid4, copy to a database server and reload:

```
mysqldump SAZDB > saz.sql
scp saz.sql fg5x4:/var/tmp
```

On fg5x4:

```
mysql < saz.sql
```

Add sazdbuser user on fg5x4:

```
mysql> grant all on SAZDB.* to sazdbuser@fg5x3.fnal.gov identified by '<password>';
mysql> grant all on SAZDB.* to sazdbuser@fg6x3.fnal.gov identified by '<password>';
```

Troubleshooting

Note:

When using Horm's Transparent Proxy, the VIPs much match in the iptables on the LVS director and on the real servers.
For instance on the director (fermigrid5) this line exists:

-A PREROUTING -d 131.225.107.124/32 -p tcp -m tcp --dport 3306 -j MARK --set-mark 3306

On the real servers the corresponding line is this:

-A PREROUTING -d 131.225.107.124 -p tcp --dport 3306 -j REDIRECT

Note:

On the director, in the iptables file the --set-mark value must match the value fwmark in the lvs.cf. For instance, using the same line from above:

-A PREROUTING -d 131.225.107.124/32 -p tcp -m tcp --dport 3306 -j MARK --set-mark 3306

In the lvs.cf file this value must be set:

fwmark = 3306

Note:

On director and voms-admin real servers, enable access to port 8443 from outside fnal.gov, *but* only to the destination VIP (not all IPs).

Note:

Something is wrong with arptables, don't use it. Use arp_announce and arp_ignore. For more details, read the following:

http://www.ultramonkey.org/3/topologies/hc-ha-lb-eg.html

Note:

There is a bug in mysql logrotation using 'mysqladmin flush-logs': it doesn't work as it's supposed to. See http://bugs.mysql.com/bug.php?id=6061. A solution is to use the copytruncate option in the /etc/logrotate.d/mysql conf file:

```
/var/log/mysqld.log {
       # create 600 mysql mysql
       notifempty
       daily
       rotate 31
       missingok
       compress
       # Because flush-logs doesn't work use this:
       copytruncate
   postrotate
       # just if mysqld is really running
       if test -x /usr/bin/mysqladmin && \
          /usr/bin/mysqladmin ping &>/dev/null
       then
          /usr/bin/mysqladmin flush-logs
       fi
   endscript
}
```

IP Migration (Fermi Specific)

```
# ******************************
# Use this either as a script or as a guideline to manually
# migrate the voms.fnal.gov, voms.opensciencegrid.org, and
# gums.fnal.gov hostnames to the FermiGrid HA system.
#
# Steps to accomplish:
#
# migrate gums and saz dbs
# point vomrs at new voms
# change iptables on director
# change lvs.cf on director
# change iptables on real servers
# change http-ssl.conf on real servers
# change host cert/keys on real servers
#
# On the day before, re-assign the hostnames to new IPs, start those
# new IPs on the LVS and let the DNS take care of the migration.
```

Should test this in this order:

voms.opensciencegrid.org - successfully completed Nov 29, 2007
voms.fnal.gov
gums.fnal.gov

****

```
export DATE=`date +%y%m%d`
export NEW_OSG_IP=131.225.107.138
export NEW_VOMS_IP=
export NEW_GUMS_IP=
export SHORT_OSG_IP=`echo $NEW_OSG_IP | awk -F. '{print $NF}'`
export SHORT_VOMS_IP=`echo $NEW_VOMS_IP | awk -F. '{print $NF}'`
export SHORT_GUMS_IP=`echo $NEW_GUMS_IP | awk -F. '{print $NF}'`
export VDT_LOCATION=/usr/local/vdt
```

On the day before the DNS servers get updated, the following changes must be
made:

Initially, point the vomrs servers on fermigrid2 to the voms server on
fg5x1. After the IPs have been migrated to the LVS director, point vomrs at
the voms.fnal.gov hostname.
#

```
     ################################
     # Edit all /opt/vomrs-1.3/var/etc/*/vomrs.xml files
     ################################

     OLD_VOMS_HOSTNAME=fermigrid2.fnal.gov
     NEW_VOMS_HOSTNAME=fg5x1.fnal.gov

     if [ `hostname -s` -eq fermigrid2 ]; then
          for i in `ls /opt/vomrs-1.3/var/etc/*/vomrs.xml
          do
               perl -pe "s/$OLD_VOMS_HOSTNAME:8443/$NEW_VOMS_HOSTNAME:8443/g" -i $i
          done
     fi

     ################################
     # Restart vomrs
     ################################

     service vomrs restart
```

Changes on the director:

```
if [ `hostname -s` -eq fermigrid5 -o `hostname -s` -eq fermigrid6 ]; then

     ################################
     # Edit /etc/sysconfig/iptables
     ################################

     cp /etc/sysconfig/iptables /etc/sysconfig/iptables.$DATE

     # change IP for voms-fg5x1 to voms.fnal.gov
     perl -pe "s/112/$SHORT_VOMS_IP/g;" -i /etc/sysconfig/iptables
```

```
    # change IP for voms.opensciencegrid.org
    perl -pe "s/114/$SHORT_OSG_IP/g;" -i /etc/sysconfig/iptables

    # change IP for gums-fg5x2 to gums.fnal.gov
    perl -pe "s/113/$SHORT_GUMS_IP/g;" -i /etc/sysconfig/iptables

    ################################
    # Edit /etc/sysconfig/ha/lvs.cf
    ################################

    cp /etc/sysconfig/ha/lvs.cf /etc/sysconfig/ha/lvs.cf.$DATE

    # rename lvs rules appropriately
    perl -pe "s/voms-fg5x1/voms/g;" -i /etc/sysconfig/ha/lvs.cf
    perl -pe "s/osg-voms-saz-fg5x1/voms-osg/g;" -i /etc/sysconfig/ha/lvs.cf
    perl -pe "s/gums-fg5x2/gums/g;" -i /etc/sysconfig/ha/lvs.cf

    # change IP for voms-fg5x1 to voms.fnal.gov
    perl -pe "s/131.225.107.112/$NEW_VOMS_IP/g;" -i /etc/sysconfig/ha/lvs.cf
    perl -pe "s/eth0:112/eth0:$SHORT_VOMS_IP/g;" -i /etc/sysconfig/ha/lvs.cf

    # change IP for saz-fg5x1 to voms.opensciencegrid.org
    perl -pe "s/114/$SHORT_OSG_IP/g;" -i /etc/sysconfig/ha/lvs.cf
    perl -pe "s/eth0:114/eth0:$SHORT_OSG_IP/g;" -i /etc/sysconfig/ha/lvs.cf

    # change IP for gums-fg5x2 to gums.fnal.gov
    perl -pe "s/131.225.107.113/$NEW_GUMS_IP/g;" -i /etc/sysconfig/ha/lvs.cf
    perl -pe "s/eth0:113/eth0:$SHORT_GUMS_IP/g;" -i /etc/sysconfig/ha/lvs.cf

    ################################
    # Restart iptables and pulse
    ################################

    service iptables restart
    service pulse restart

fi

# Changes on voms real servers:

if [ `hostname -s` -eq fg5x1 -o `hostname -s` -eq fg6x1 ]; then

    ################################
    # Edit /etc/sysconfig/iptables
    ################################

    # cp /etc/sysconfig/iptables /etc/sysconfig/iptables.$DATE

    # change IP for voms-fg5x1 to voms.fnal.gov
    # perl -pe "s/131.225.107.112/$NEW_VOMS_IP/g;" -i /etc/sysconfig/iptables

    # change IP for saz-fg5x3 to voms.opensciencegrid.org
    # perl -pe "s/131.225.107.114/$NEW_OSG_IP/g;" -i /etc/sysconfig/iptables

    ################################
    # change IPs brought up on the lo device
    ################################

    ifdown lo:112
```

```
    ifdown lo:114

    # for voms.opensciencegrid.org
    mv /etc/sysconfig/network-scripts/ifcfg-lo:114 /etc/sysconfig/network-
scripts/ifcfg-lo:$SHORT_OSG_IP
    perl -pe "s/114/$SHORT_OSG_IP/g;" -i /etc/sysconfig/network-scripts/ifcfg-
lo:$SHORT_OSG_IP

    # for voms.fnal.gov
    mv /etc/sysconfig/network-scripts/ifcfg-lo:112 /etc/sysconfig/network-
scripts/ifcfg-lo:$SHORT_VOMS_IP
    perl -pe "s/112/$SHORT_VOMS_IP/g;" -i /etc/sysconfig/network-scripts/ifcfg-
lo:$SHORT_VOMS_IP

    ################################
    # Bring up the lo interfaces
    ################################

    ifup lo:$SHORT_VOMS_IP
    ifup lo:$SHORT_OSG_IP

    ################################
    # Edit /usr/local/vdt/apache/conf/extra/httpd-ssl.conf
    ################################

    cp $VDT_LOCATION/apache/conf/extra/httpd-ssl.conf
$VDT_LOCATION/apache/conf/extra/httpd-ssl.conf.$DATE

    # change IP for voms.fnal.gov
    perl -pe "s/131.225.107.112/$NEW_VOMS_IP/g;" -i
$VDT_LOCATION/apache/conf/extra/httpd-ssl.conf

    # change IP for voms.opensciencegrid.org
    perl -pe "s/131.225.107.114/$NEW_OSG_IP/g;" -i
$VDT_LOCATION/apache/conf/extra/httpd-ssl.conf

    ################################
    # Restart iptables and apache
    ################################

    # service iptables restart
    service apache restart
fi

# Changes on gums real servers:

if [ `hostname -s` -eq fg5x2 -o `hostname -s` -eq fg6x2 ]; then

    ################################
    # Edit /etc/sysconfig/iptables
    ################################

    cp /etc/sysconfig/iptables /etc/sysconfig/iptables.$DATE

    # change IP for gums-fg5x2 to gums.fnal.gov
    perl -pe "s/131.225.107.113/$NEW_GUMS_IP/g;" -i /etc/sysconfig/iptables

    ################################
    # Re-link the httpcert and httpkey sym links to the cert/key that
    # contain the gums.fnal.gov hostnames
```

```
    ##############################

    if [ -L /etc/grid-security/http/httpcert.pem -a -L /etc/grid-
security/http/httpkey.pem ]; then
         rm -f /etc/grid-security/http/httpcert.pem /etc/grid-
security/http/httpkey.pem
         ln -s /etc/grid-security/http/gumshttpcert.pem /etc/grid-
security/http/httpcert.pem
         ln -s /etc/grid-security/http/gumshttpkey.pem /etc/grid-
security/http/httpkey.pem
    fi

    ##############################
    # Restart iptables and apache
    ##############################

    service iptables restart
    service apache restart
fi

# Submit changes to the GOC

#     In vomses file, all instances of host/fermigrid2.fnal.gov need to change
#     to http/voms.fnal.gov.
```

Fault Tolerance and Performance Testing

MySQL Testing - completed Nov 1, 2007

Basic:

Does it replicate? Yes

Insert and delete on both live.
** Auto increment on primary keys does not produce duplicates.
Insert and delete on A live, B dead.
** B automatically replays logs from A upon restart of server.
Insert and delete on A dead, B live.
** A automatically replays logs from B upon restart of server.

How fast? average - 1.56ms

loop	data size	master insert	slave retrieval	total repl. time	bare time
1	1000	0.000590	0.000505	0.001106	0.000011
2	1000	0.000659	0.000486	0.001155	0.000010
3	2000	0.000642	0.000578	0.001230	0.000010
4	3000	0.000659	0.000520	0.001189	0.000010
5	4000	0.000708	0.000550	0.001272	0.000014
6	5000	0.000719	0.000345	0.001508	0.000444
7	6000	0.000785	0.000342	0.001593	0.000466
8	7000	0.000740	0.000343	0.001544	0.000461
9	8000	0.000782	0.000345	0.001638	0.000511
10	9000	0.000818	0.000346	0.001670	0.000506
11	10000	0.000897	0.000342	0.001716	0.000477

Review the following for potential issues:

http://dev.mysql.com/doc/refman/5.0/en/replication-features.html

No issues found.

Advanced:

Shutdown IP on one mysql server

GUMS server
For gums client connections, it has been observed that the gums client hangs for 10 minutes. This is due to the server waiting for a reply from the database server. After the 10 minute timeout, everything works as intended.

SAZ server
For sazclient connections, it has been observed that the sazclient hangs for ~50 seconds. After the saz server times out, everything works as intended.

VOMS server
For voms-proxy-init connections, it has been observed that the voms server can hang for several seconds if the LVS director directs a connection to a mysql server that has just failed, but before it has been removed from the connection table. After the voms server times out, everything works as intended.

General notes
Open TCP connections are lost as they should be. There is no way to migrate the syn/ack packet sequence to another machine in the HA cluster and for connections to continue.

Mysql master/slave negotiation takes up to a minute to re-establish it's connection, but it does succeed. As with the basic test, data is sync'd after the connection is re-established.

After re-enabling the connection, lvsd correctly re-balances the load across the mysql database servers (no thundering herd problem).

Stress test (part of the GUMS and SAZ testing)

MySQL easily manages 9.7M gums mappings with 1m, 5m, and 15m load averages of 0.1 and cpu idle times of 92%.

VOMS Testing - Completed Nov 1, 2007

Basic:

voms-proxy-init against HA IP: succeeds

access voms-admin interface using HA IP: succeeds

Advanced:

Shutdown IP on one voms server.

Open TCP connections are lost as they should be. There is no way to migrate the syn/ack packet sequence to another machine in the HA cluster and for connections to continue.

The voms-proxy-init hangs for ~54 seconds before timing out and failing to generate a voms-proxy certificate. After the timeout, everything works as intended.

GUMS Testing - completed Oct 31, 2007

Basic:

Point CE at HA gums server: succeeds

Advanced:

Point 25 CEs at HA saz server at 2Hz succeeds - 4.3M mappings/day
gums servers: 2
mysql servers: 1
load on gums: ~1.2
load on mysql: 0.1
cpu idle on gums: 60%
cpu idle on mysql: 92%
mappings/day: 4.3M (extrapolated)

Point 25 CEs at HA saz server at 4.5Hz succeeds - 9.7M mappings/day
gums servers: 2
mysql servers: 2
load on gums: ~9.5
load on mysql: 0.1
cpu idle on gums: 15%
cpu idle on mysql: 92%
mappings/day: 9.7M (extrapolated)

Shutdown IP on one gums server

Open TCP connections are lost as they should be. There is no way to migrate the syn/ack packet sequence to another machine in the HA cluster and for connections to continue.

The gums client hangs for ~54 seconds before timing out and failing to map a user.

SAZ Testing - completed Oct 31, 2007

Basic:

Point CE at HA gums server: succeeds

Advanced:

Point 25 sazclients at HA saz server at 2Hz: 1.1M

saz servers: 2
mysql servers: 2
load on saz servers: ~12
load on mysql servers: 0.1
cpu idle on saz servers: 0%
cpu idle on mysql servers: 98%
authorizations/day: 1.1M (extrapolated)

Shutdown IP on one saz server

Open TCP connections are lost as they should be. There is no way to migrate the syn/ack packet sequence to another machine in the HA cluster and for connections to continue.

The sazclient hangs for ~50 seconds before timing out and failing to authorize a user.

LVS Testing - completed Nov 2, 2007

Basic:

Shutdown LVS on master.

How long to failover IPs and connections to the backup?

~6 seconds.

Are active connections migrated per the following:
http://www.austintek.com/LVS/LVS-HOWTO/HOWTO/LVS-HOWTO.failover.html#stateful_failover?

Yes.

Future Work

This is a list of projects should would enhance LVS in general and the FermiGrid HA system in particular.

Item 1
Add the ability to control lvs from piranha web UI with sudo.

Item 2
Add the ability to control individual lvs services from piranha web UI without having to use the system rc script to stopt/start all services at the same time. A nice DHTML interface.

Appendix

---

iptables for mysql servers (click to download)

```
# mysql iptables
# horm's tranparent proxy for LVS
*nat
:PREROUTING ACCEPT [7:786]
:POSTROUTING ACCEPT [0:0]
:OUTPUT ACCEPT [0:0]
# The following IP must be the floating IP address from the LVS director
-A PREROUTING -d 131.225.107.124 -p tcp --dport 3306 -j REDIRECT
COMMIT

*filter
```

```
:INPUT ACCEPT [35:5488]
:FORWARD ACCEPT [0:0]
:OUTPUT ACCEPT [22:1588]
-A INPUT -m state --state RELATED,ESTABLISHED -j ACCEPT

# Accept all from localhost
-A INPUT -s 127.0.0.1/255.255.255.255 -j ACCEPT

# Accept all from fg{5,6}x[1-4] to port 3306, *only*
-A INPUT -s 131.225.107.36/255.255.255.255 -p tcp -m tcp --dport 3306 -j ACCEPT
-A INPUT -s 131.225.107.102/255.255.255.255 -p tcp -m tcp --dport 3306 -j ACCEPT
-A INPUT -s 131.225.107.103/255.255.255.255 -p tcp -m tcp  --dport 3306 -j ACCEPT
-A INPUT -s 131.225.107.104/255.255.255.255 -p tcp -m tcp --dport 3306 -j ACCEPT
-A INPUT -s 131.225.107.105/255.255.255.255 -p tcp -m tcp --dport 3306 -j ACCEPT
-A INPUT -s 131.225.107.76/255.255.255.255 -p tcp -m tcp --dport 3306 -j ACCEPT
-A INPUT -s 131.225.107.106/255.255.255.255 -p tcp -m tcp --dport 3306 -j ACCEPT
-A INPUT -s 131.225.107.107/255.255.255.255 -p tcp -m tcp --dport 3306 -j ACCEPT
-A INPUT -s 131.225.107.108/255.255.255.255 -p tcp -m tcp --dport 3306 -j ACCEPT
-A INPUT -s 131.225.107.109/255.255.255.255 -p tcp -m tcp --dport 3306 -j ACCEPT

# Accept all from within 131.225.0.0
-A INPUT -s 131.225.0.0/255.255.0.0 -j ACCEPT

# Allow ssh
-A INPUT -p tcp -m tcp --dport 22 -j ACCEPT
-A INPUT -p udp -m udp --dport 22 -j ACCEPT

# Allow kerberized telnet
-A INPUT -p tcp -m tcp --dport 23 -j ACCEPT
-A INPUT -p udp -m udp --dport 23 -j ACCEPT

# Allow klogin
-A INPUT -p tcp -m tcp --dport 543 -j ACCEPT
-A INPUT -p udp -m udp --dport 543 -j ACCEPT

# Allow kshell
-A INPUT -p tcp -m tcp --dport 544 -j ACCEPT
-A INPUT -p udp -m udp --dport 544 -j ACCEPT

# Allow eklogin
-A INPUT -p tcp -m tcp --dport 2105 -j ACCEPT
-A INPUT -p udp -m udp --dport 2105 -j ACCEPT

# drop everything else
-A INPUT -j DROP

COMMIT
```

---

iptables for LVS Director and Backup (click to download)

```
# LVS director iptables
*mangle
:PREROUTING ACCEPT [407:41667]
:INPUT ACCEPT [407:41667]
:FORWARD ACCEPT [0:0]
:OUTPUT ACCEPT [278:22960]
:POSTROUTING ACCEPT [280:23232]

# For VOMS
-A PREROUTING -d 131.225.107.112/32 -p tcp -m tcp --dport 8443 -j MARK --set-mark
```

```
11280
-A PREROUTING -d 131.225.107.138/32 -p tcp -m tcp --dport 8443 -j MARK --set-mark
13880
COMMIT

*filter
:INPUT ACCEPT [35:5488]
:FORWARD ACCEPT [0:0]
:OUTPUT ACCEPT [22:1588]

# Accept all from localhost
-A INPUT -s 127.0.0.1/255.255.255.255 -j ACCEPT

# Accept all from within 131.225.0.0
-A INPUT -s 131.225.0.0/255.255.0.0 -j ACCEPT

# Allow ssh
-A INPUT -p tcp -m tcp --dport 22 -j ACCEPT
-A INPUT -p udp -m udp --dport 22 -j ACCEPT

# Allow kerberized telnet
-A INPUT -p tcp -m tcp --dport 23 -j ACCEPT
-A INPUT -p udp -m udp --dport 23 -j ACCEPT

# Allow httpd
-A INPUT -p tcp -m tcp --dport 80 -j ACCEPT
-A INPUT -p udp -m udp --dport 80 -j ACCEPT

# Allow VOMS ports
-A INPUT -p tcp -m tcp --dport 15001:15030 -j ACCEPT

# Allow https to voms.fnal.gov VOMS servers
-A INPUT -d 131.225.107.112 -p tcp -m tcp --dport 8443 -j ACCEPT
-A INPUT -d 131.225.107.112 -p udp -m udp --dport 8443 -j ACCEPT

# Allow https to voms.opensciencegrid.org VOMS servers
-A INPUT -d 131.225.107.138 -p tcp -m tcp --dport 8443 -j ACCEPT
-A INPUT -d 131.225.107.138 -p udp -m udp --dport 8443 -j ACCEPT

# Allow klogin
-A INPUT -p tcp -m tcp --dport 543 -j ACCEPT
-A INPUT -p udp -m udp --dport 543 -j ACCEPT

# Allow kshell
-A INPUT -p tcp -m tcp --dport 544 -j ACCEPT
-A INPUT -p udp -m udp --dport 544 -j ACCEPT

# Allow eklogin
-A INPUT -p tcp -m tcp --dport 2105 -j ACCEPT
-A INPUT -p udp -m udp --dport 2105 -j ACCEPT

# Allow MySQL
# -A INPUT -p tcp -m tcp --dport 3306 -j ACCEPT
# -A INPUT -p udp -m udp --dport 3306 -j ACCEPT

# Allow VOMS ports
-A INPUT -p tcp -m tcp --dport 15001:15030 -j ACCEPT

# drop everything else
-A INPUT -j DROP
COMMIT
```

iptables for VOMS servers (click to download)

```
# iptables for VOMS real servers

*filter
:INPUT ACCEPT [35:5488]
:FORWARD ACCEPT [0:0]
:OUTPUT ACCEPT [22:1588]
-A INPUT -m state --state RELATED,ESTABLISHED -j ACCEPT

# Accept all from localhost
-A INPUT -s 127.0.0.1/255.255.255.255 -j ACCEPT

# Accept all from within 131.225.0.0
-A INPUT -s 131.225.0.0/255.255.0.0 -j ACCEPT

# Allow ssh
-A INPUT -p tcp -m tcp --dport 22 -j ACCEPT
-A INPUT -p udp -m udp --dport 22 -j ACCEPT

# Allow kerberized telnet
-A INPUT -p tcp -m tcp --dport 23 -j ACCEPT
-A INPUT -p udp -m udp --dport 23 -j ACCEPT

# Allow httpd
-A INPUT -p tcp -m tcp --dport 80 -j ACCEPT
-A INPUT -p udp -m udp --dport 80 -j ACCEPT
-A INPUT -p tcp -m tcp --dport 8443 -j ACCEPT
-A INPUT -p udp -m udp --dport 8443 -j ACCEPT

# Allow klogin
-A INPUT -p tcp -m tcp --dport 543 -j ACCEPT
-A INPUT -p udp -m udp --dport 543 -j ACCEPT

# Allow kshell
-A INPUT -p tcp -m tcp --dport 544 -j ACCEPT
-A INPUT -p udp -m udp --dport 544 -j ACCEPT

# Allow eklogin
-A INPUT -p tcp -m tcp --dport 2105 -j ACCEPT
-A INPUT -p udp -m udp --dport 2105 -j ACCEPT

# Allow MySQL
# -A INPUT -p tcp -m tcp --dport 3306 -j ACCEPT
# -A INPUT -p udp -m udp --dport 3306 -j ACCEPT

# Allow VOMS ports
-A INPUT -p tcp -m tcp --dport 15001:15030 -j ACCEPT

# drop everything else
-A INPUT -j DROP

COMMIT
```

---

iptables for GUMS servers (click to download)

```
# iptables for GUMS real server
# horm's tranparent proxy for LVS
*nat
```

```
:PREROUTING ACCEPT [7:786]
:POSTROUTING ACCEPT [0:0]
:OUTPUT ACCEPT [0:0]
-A PREROUTING -d 131.225.107.113 -p tcp --dport 8443 -j REDIRECT
COMMIT


*filter
:INPUT ACCEPT [35:5488]
:FORWARD ACCEPT [0:0]
:OUTPUT ACCEPT [22:1588]
-A INPUT -m state --state RELATED,ESTABLISHED -j ACCEPT

# Accept all from localhost
-A INPUT -s 127.0.0.1/255.255.255.255 -j ACCEPT

# Accept all from within 131.225.0.0
-A INPUT -s 131.225.0.0/255.255.0.0 -j ACCEPT

# Allow ssh
-A INPUT -p tcp -m tcp --dport 22 -j ACCEPT
-A INPUT -p udp -m udp --dport 22 -j ACCEPT

# Allow kerberized telnet
-A INPUT -p tcp -m tcp --dport 23 -j ACCEPT
-A INPUT -p udp -m udp --dport 23 -j ACCEPT

# Allow httpd
-A INPUT -p tcp -m tcp --dport 80 -j ACCEPT
-A INPUT -p udp -m udp --dport 80 -j ACCEPT
-A INPUT -p tcp -m tcp --dport 8443 -j ACCEPT
-A INPUT -p udp -m udp --dport 8443 -j ACCEPT

# Allow klogin
-A INPUT -p tcp -m tcp --dport 543 -j ACCEPT
-A INPUT -p udp -m udp --dport 543 -j ACCEPT

# Allow kshell
-A INPUT -p tcp -m tcp --dport 544 -j ACCEPT
-A INPUT -p udp -m udp --dport 544 -j ACCEPT

# Allow eklogin
-A INPUT -p tcp -m tcp --dport 2105 -j ACCEPT
-A INPUT -p udp -m udp --dport 2105 -j ACCEPT

# Allow MySQL
-A INPUT -p tcp -m tcp --dport 3306 -j ACCEPT
-A INPUT -p udp -m udp --dport 3306 -j ACCEPT

# drop everything else
-A INPUT -j DROP

COMMIT
```

---

iptables for SAZ servers (click to download)

```
# iptables for SAZ real server
# horm's tranparent proxy for LVS
*nat
:PREROUTING ACCEPT [7:786]
```

```
:POSTROUTING ACCEPT [0:0]
:OUTPUT ACCEPT [0:0]
-A PREROUTING -d 131.225.107.126 -p tcp --dport 8888 -j REDIRECT
COMMIT

*filter
:INPUT ACCEPT [35:5488]
:FORWARD ACCEPT [0:0]
:OUTPUT ACCEPT [22:1588]
-A INPUT -m state --state RELATED,ESTABLISHED -j ACCEPT

# Accept all from localhost
-A INPUT -s 127.0.0.1/255.255.255.255 -j ACCEPT

# Accept all from within 131.225.0.0
-A INPUT -s 131.225.0.0/255.255.0.0 -j ACCEPT

# Allow ssh
-A INPUT -p tcp -m tcp --dport 22 -j ACCEPT
-A INPUT -p udp -m udp --dport 22 -j ACCEPT

# Allow kerberized telnet
-A INPUT -p tcp -m tcp --dport 23 -j ACCEPT
-A INPUT -p udp -m udp --dport 23 -j ACCEPT

# Allow httpd
-A INPUT -p tcp -m tcp --dport 80 -j ACCEPT
-A INPUT -p udp -m udp --dport 80 -j ACCEPT
-A INPUT -p tcp -m tcp --dport 8443 -j ACCEPT
-A INPUT -p udp -m udp --dport 8443 -j ACCEPT

# Allow klogin
-A INPUT -p tcp -m tcp --dport 543 -j ACCEPT
-A INPUT -p udp -m udp --dport 543 -j ACCEPT

# Allow kshell
-A INPUT -p tcp -m tcp --dport 544 -j ACCEPT
-A INPUT -p udp -m udp --dport 544 -j ACCEPT

# Allow eklogin
-A INPUT -p tcp -m tcp --dport 2105 -j ACCEPT
-A INPUT -p udp -m udp --dport 2105 -j ACCEPT

# drop everything else
-A INPUT -j DROP

COMMIT
```

LVS lvs.cf file (click to download)

```
serial_no = 119
primary = 131.225.107.36
primary_private = 192.168.18.16
service = lvs
backup_active = 1
backup = 131.225.107.76
backup_private = 192.168.18.19
heartbeat = 1
heartbeat_port = 539
keepalive = 6
```

```
deadtime = 18
network = direct
debug_level = NONE
monitor_links = 1
virtual MYSQL:3306 {
   active = 1
   address = 131.225.107.124 eth0:124
   vip_nmask = 255.255.255.0
   port = 3306
   expect = "up"
   use_regex = 0
   send_program = "/usr/local/bin/lvs-ha-check-mysql.sh %h"
   load_monitor = rup
   scheduler = wlc
   protocol = tcp
   timeout = 6
   reentry = 15
   quiesce_server = 1
   server fg5x4 {
     address = 131.225.107.105
     active = 1
     weight = 3
   }
   server fg6x4 {
     address = 131.225.107.109
     active = 1
     weight = 3
   }
}
virtual SAZ:8888 {
   active = 1
   address = 131.225.107.126 eth0:126
   vip_nmask = 255.255.255.0
   port = 8888
   send = "quit"
   use_regex = 0
   load_monitor = rup
   scheduler = wlc
   protocol = tcp
   timeout = 6
   reentry = 15
   quiesce_server = 1
   server fg5x3 {
     address = 131.225.107.104
     active = 1
     weight = 3
   }
   server fg6x3 {
     address = 131.225.107.108
     active = 1
     weight = 3
   }
}
virtual voms-fg5x1:8443 {
   active = 1
   address = 131.225.107.112 eth0:112
   vip_nmask = 255.255.255.0
```

```
   fwmark = 11280
   port = 8443
   persistent = 600
   pmask = 255.255.255.0
   expect = "up"
   use_regex = 0
   send_program = "/usr/local/bin/lvs-ha-check-voms-admin.sh %h"
   load_monitor = rup
   scheduler = wlc
   protocol = tcp
   timeout = 6
   reentry = 15
   quiesce_server = 1
   server fg5x1.fnal.gov {
     address = 131.225.107.102
     active = 1
     weight = 3
   }
   server fg6x1.fnal.gov {
     address = 131.225.107.106
     active = 1
     weight = 3
   }
}
virtual voms-osg:8443 {
   active = 1
   address = 131.225.107.138 eth0:138
   vip_nmask = 255.255.255.0
   fwmark = 13880
   port = 8443
   persistent = 600
   pmask = 255.255.255.0
   expect = "up"
   use_regex = 0
   send_program = "/usr/local/bin/lvs-ha-check-voms-admin.sh %h"
   load_monitor = rup
   scheduler = wlc
   protocol = tcp
   timeout = 6
   reentry = 15
   quiesce_server = 1
   server fg5x1.fnal.gov {
     address = 131.225.107.102
     active = 1
     weight = 3
   }
   server fg6x1.fnal.gov {
     address = 131.225.107.106
     active = 1
     weight = 3
   }
}
virtual gums-fg5x2:8443 {
   active = 1
   address = 131.225.107.113 eth0:113
   vip_nmask = 255.255.255.0
```

```
   port = 8443
   expect = "up"
   use_regex = 0
   send_program = "/usr/local/bin/lvs-ha-check-gums.sh %h"
   load_monitor = rup
   scheduler = wlc
   protocol = tcp
   timeout = 6
   reentry = 15
   quiesce_server = 1
   server fg5x2.fnal.gov {
     address = 131.225.107.103
     active = 1
     weight = 3
   }
   server fg6x2.fnal.gov {
     address = 131.225.107.107
     active = 1
     weight = 3
   }
}
virtual voms-auger:15007 {
   active = 1
   address = 131.225.107.112 eth0:112
   vip_nmask = 255.255.255.0
   port = 15007
   use_regex = 0
   load_monitor = rup
   scheduler = wlc
   protocol = tcp
   timeout = 6
   reentry = 15
   quiesce_server = 1
   server fg5x1.fnal.gov {
     address = 131.225.107.102
     active = 1
     weight = 3
   }
   server fg6x1.fnal.gov {
     address = 131.225.107.106
     active = 1
     weight = 3
   }
}
virtual voms-cdf:15020 {
   active = 1
   address = 131.225.107.112 eth0:112
   vip_nmask = 255.255.255.0
   port = 15020
   use_regex = 0
   load_monitor = rup
   scheduler = wlc
   protocol = tcp
   timeout = 6
   reentry = 15
   quiesce_server = 1
```

```
   server fg5x1.fnal.gov {
     address = 131.225.107.102
     active = 1
     weight = 3
   }
   server fg6x1.fnal.gov {
     address = 131.225.107.106
     active = 1
     weight = 3
   }
}
virtual voms-cms:15015 {
   active = 1
   address = 131.225.107.112 eth0:112
   vip_nmask = 255.255.255.0
   port = 15015
   use_regex = 0
   load_monitor = rup
   scheduler = wlc
   protocol = tcp
   timeout = 6
   reentry = 15
   quiesce_server = 1
   server fg5x1.fnal.gov {
     address = 131.225.107.102
     active = 1
     weight = 3
   }
   server fg6x1.fnal.gov {
     address = 131.225.107.106
     active = 1
     weight = 3
   }
}
virtual voms-des:15017 {
   active = 1
   address = 131.225.107.112 eth0:112
   vip_nmask = 255.255.255.0
   port = 15017
   use_regex = 0
   load_monitor = rup
   scheduler = wlc
   protocol = tcp
   timeout = 6
   reentry = 15
   quiesce_server = 1
   server fg5x1.fnal.gov {
     address = 131.225.107.102
     active = 1
     weight = 3
   }
   server fg6x1.fnal.gov {
     address = 131.225.107.106
     active = 1
     weight = 3
   }
```

```
}
virtual voms-dzero:15002 {
   active = 1
   address = 131.225.107.112 eth0:112
   vip_nmask = 255.255.255.0
   port = 15002
   use_regex = 0
   load_monitor = rup
   scheduler = wlc
   protocol = tcp
   timeout = 6
   reentry = 15
   quiesce_server = 1
   server fg5x1.fnal.gov {
     address = 131.225.107.102
     active = 1
     weight = 3
   }
   server fg6x1.fnal.gov {
     address = 131.225.107.106
     active = 1
     weight = 3
   }
}
virtual voms-fermilab:15001 {
   active = 1
   address = 131.225.107.112 eth0:112
   vip_nmask = 255.255.255.0
   port = 15001
   use_regex = 0
   load_monitor = rup
   scheduler = wlc
   protocol = tcp
   timeout = 6
   reentry = 15
   quiesce_server = 1
   server fg5x1.fnal.gov {
     address = 131.225.107.102
     active = 1
     weight = 3
   }
   server fg6x1.fnal.gov {
     address = 131.225.107.106
     active = 1
     weight = 3
   }
}
virtual voms-gadu:15018 {
   active = 1
   address = 131.225.107.112 eth0:112
   vip_nmask = 255.255.255.0
   port = 15018
   use_regex = 0
   load_monitor = rup
   scheduler = wlc
   protocol = tcp
   timeout = 6
```

```
   reentry = 15
   quiesce_server = 1
   server fg5x1.fnal.gov {
     address = 131.225.107.102
     active = 1
     weight = 3
   }
   server fg6x1.fnal.gov {
     address = 131.225.107.106
     active = 1
     weight = 3
   }
}
virtual voms-i2u2:15026 {
   active = 1
   address = 131.225.107.112 eth0:112
   vip_nmask = 255.255.255.0
   port = 15026
   use_regex = 0
   load_monitor = rup
   scheduler = wlc
   protocol = tcp
   timeout = 6
   reentry = 15
   quiesce_server = 1
   server fg5x1.fnal.gov {
     address = 131.225.107.102
     active = 1
     weight = 3
   }
   server fg6x1.fnal.gov {
     address = 131.225.107.106
     active = 1
     weight = 3
   }
}
virtual voms-ilc:15023 {
   active = 1
   address = 131.225.107.112 eth0:112
   vip_nmask = 255.255.255.0
   port = 15023
   use_regex = 0
   load_monitor = rup
   scheduler = wlc
   protocol = tcp
   timeout = 6
   reentry = 15
   quiesce_server = 1
   server fg5x1.fnal.gov {
     address = 131.225.107.102
     active = 1
     weight = 3
   }
   server fg6x1.fnal.gov {
     address = 131.225.107.106
     active = 1
```

```
      weight = 3
   }
}
virtual voms-lqcd:15024 {
   active = 1
   address = 131.225.107.112 eth0:112
   vip_nmask = 255.255.255.0
   port = 15024
   use_regex = 0
   load_monitor = rup
   scheduler = wlc
   protocol = tcp
   timeout = 6
   reentry = 15
   quiesce_server = 1
   server fg5x1.fnal.gov {
      address = 131.225.107.102
      active = 1
      weight = 3
   }
   server fg6x1.fnal.gov {
      address = 131.225.107.106
      active = 1
      weight = 3
   }
}
virtual voms-nanohub:15022 {
   active = 1
   address = 131.225.107.112 eth0:112
   vip_nmask = 255.255.255.0
   port = 15022
   use_regex = 0
   load_monitor = rup
   scheduler = wlc
   protocol = tcp
   timeout = 6
   reentry = 15
   quiesce_server = 1
   server fg5x1.fnal.gov {
      address = 131.225.107.102
      active = 1
      weight = 3
   }
   server fg6x1.fnal.gov {
      address = 131.225.107.106
      active = 1
      weight = 3
   }
}
virtual voms-osg:15027 {
   active = 1
   address = 131.225.107.138 eth0:138
   vip_nmask = 255.255.255.0
   port = 15027
   use_regex = 0
   load_monitor = rup
   scheduler = wlc
```

```
   protocol = tcp
   timeout = 6
   reentry = 15
   quiesce_server = 1
   server fg5x1.fnal.gov {
     address = 131.225.107.102
     active = 1
     weight = 3
   }
   server fg6x1.fnal.gov {
     address = 131.225.107.106
     active = 1
     weight = 3
   }
}
virtual voms-sdss:15014 {
   active = 1
   address = 131.225.107.112 eth0:112
   vip_nmask = 255.255.255.0
   port = 15014
   use_regex = 0
   load_monitor = rup
   scheduler = wlc
   protocol = tcp
   timeout = 6
   reentry = 15
   quiesce_server = 1
   server fg5x1.fnal.gov {
     address = 131.225.107.102
     active = 1
     weight = 3
   }
   server fg6x1.fnal.gov {
     address = 131.225.107.106
     active = 1
     weight = 3
   }
}
```

LVS Check Mysql script (click to download)

```
#!/bin/bash
#lvs_ha_check_mysql.sh



if [ $# -eq 0 ]; then
     echo "host not specified"
     exit 1
fi

/usr/bin/mysql test -h $1 -u user1 --password=pass1 -B -e 'show tables;' &> /dev/nu
ll

if [ $? -eq 0 ]; then
```

```
    echo "up"
else
    echo "down"
fi
```

LVS Check VOMS Admin script (click to download)

```
#!/bin/bash
#lvs-ha-check-voms-admin.sh


if [ $# -eq 0 ]; then
    echo "host not specified"
    exit 1
fi

curl -s --insecure --cert /etc/grid-security/hostcert.pem --key /etc/grid-security/
hostkey.pem https://${1}:8443 | grep "Virtual Data Toolkit" &> /dev/null

if [ $? -eq 0 ]; then
    echo "up"
else
    echo "down"
fi
```

LVS Check GUMS script (click to download)

```
#!/bin/bash
# lvs-ha-check-gums.sh

if [ $# -eq 0 ]; then
    echo "host not specified"
    exit 1
fi

curl -s --insecure --cert /etc/grid-security/hostcert.pem --key /etc/grid-
security/hostkey.pem https://${1}:8443/gums/services/GUMSAuthorizationServicePort |
grep "Hi there" &> /dev/null

if [ $? -eq 0 ]; then
    echo "up"
else
    echo "down"
fi
```