



OSEHRA Forum

System Installation and Administration

Version 1.0
April 7, 2014

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Revision History

Date	Version	Description	Author
01/29/2014	0.1	Initial Draft Submission for discussion	Landis
3/21/2014	0.2	Reformatting in OSEHRA style	Yaw
3/25/2014	0.3	Inputting Landis additions	Yaw, Landis
3/27/2014	0.4	Add Landis summary	Landis, Yaw
3/31/14	0.5	Incorporate more text at request of M. Henderson	Landis, Yaw
4/1/14	0.6	Restructure document to call out installation steps	Habiel, Landis, Yaw
4/4/14	0.7	Add mailman configuration information	Habiel, Yaw
4/7/14	1.0	Accepted document	

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1 Purpose

This is a write up of how the OSEHRA Forum machines were built.

2 Overview

The base installation of UNIX (in this case CentOS 6) is supplemented with the installation of a few standard services: the GT.M database by Fidelity Information Systems, the OSEHRA VISTA software, and a few support scripts from Fourth Watch BCS. The steps below must be done on both systems, Forum-A and Forum-B.

3 Prerequisites

You must be a moderately experienced Linux system administrator able to do the following:

- Install Linux
- Install Linux packages
- Create and Manager Users
- Set-up DNS
- Set-up an SMTP server
- Administer GT.M
- Configure lsyncd, xinetd, nfs, pvm/lvm, and ssh

4 Steps to Create System

Step 1 Baseline Linux System

Peter Li created the two machines, forum-a.osehra.org and forum-b.osehra.org based on Rackspace CentOS 6. This is done through the Rackspace console.

In addition to this, create two extra disks of 500G and 20G and attach them to the machine. We refer to these disks later.

Step 2 DNS Set-up

The IP address of each of forum-a and forum-b are assigned and do not change. Only one of forum-a or forum-b is the primary, and the well-known address of forum.osehra.org always points to the active primary. It is not expected that any external users are at all aware of there being more than one forum machine. Only system administrators and some forum programmers know that there is more than a single machine. Switching between these is done via a load balancer.

This is done externally on Rackspace.

```
FORUM.OSEHRA.ORG (A) pointing to the either forum-a or forum-b IP address.  
Q-PATCH.OSEHRA.ORG (MX) pointing to FORUM.OSEHRA.ORG  
FORUM.OSHERA.ORG (SPF) (NOT COMPLETED YET)  
REVERSE DNS RECORD TO FORUM.OSHERA.ORG
```

Step 3 Extra packages

Install the following packages on each of the systems.

```
yum install ctags dos2unix figlet git hg locatedb locatem\  
lsb_release lsyncd mailx mlocate nc ntp ntpdate\  
rcs redhat-lsb-core screen system-config-firewall-tui\  
system-config-network-tui system-config-network-tui\  
system-config-services system-config-users tree unzip\  
vim wireshark xinetd
```

Step 4 User and Group Set-up

There are two collections of users (and groups) that have special mention:

- Infrastructure user
- Application user

Infrastructure users are those that hold a special place because of the infrastructure. These users are similar in their role to the root user, in that their presence serves a specific purpose. (Usage of the root user is eschewed for all uses but for the uses that are necessary for management of the system).

These are:

Username	Purpose
gtm	To own the database software
osehra	To own the OSEHRA VISTA repository clone
bup	To own the backup areas
fwbcs	To own the infrastructure support

Application users are those that hold a special place for the VISTA application. There are two:

Username	Purpose
forum	To own the VISTA instance
citizen	For all users of the OSEHRA forum

Any users needing access to Forum VISTA and Linux need to be added to the forum group.

See below for reference tables on how everything is set-up.

Execute the following as root.

```
# groupadd gtm -g 101  
# groupadd osehra -g 102  
# groupadd bup -g 103
```

```
# groupadd fwbc -g 104
# groupadd forum -g 400
# groupadd citizen -g 400
# groupadd fuse -g 603
# useradd gtm -u 101 -g 101 -c "GT.M"
# useradd osehra -u 102 -g 102 -c "OSEHRA Local Git Repository" -G bup
# useradd bup -u 103 -g 103 -c "Backup Manager"
# useradd fwbc -u 104 -g 104 -c "Fourth Watch BCS"
# useradd forum -u 400 -g 400 -c "Forum Database Instance Home" -G
bup,gtm,fuse
# useradd citizen -u 401 -g 401 -c "Forum Citizen" -G forum,fuse
# useradd sampleLinuxUser -u 600 -g 600 -c "A sample user" -G forum
```

After this, create the system administrators and users. They have been redacted from this document for security reasons.

Reference Tables

System Users (100 range)

username	uid	gid	Real Name
gtm	101	101	GT.M
osehra	102	102	OSEHRA Local Git Repository
bup	103	103	Backup Manager
fwbc	104	104	Fourth Watch BCS

Forum and Forum User (400 range)

username	uid	gid	Real Name
forum	400	400	Forum Database Instance Home
citizen	401	401	Forum Citizen

Forum System Administrators (500 range)

username	uid	gid	Real Name
(redacted)	502	502	(redacted)
(redacted)	503	503	(redacted)

Forum Administrative Programmers (600 range)

username	uid	gid	Real Name
(redacted)	600	600	(redacted)
(redacted)	601	601	(redacted)
(redacted)	602	602	(redacted)

Group Membership Assignments

The following group assignments were made to the various users:

Group	Users that are members of the group
bup	forum
gtm	forum, (redacted)
forum	(redacted), citizen
admin	(redacted)
fuse	forum, citizen

Step 5 GT.M Installation

Download the latest version of GT.M from <http://sourceforge.net/projects/fis-gtm/>.

As root, install by untarring and then running `./configure`. As this is interactive, here's a transcript:

```
Script started on Tue 31 Dec 2013 12:07:36 PM PST
[root@forum fis-gtm]# mkdir x
[root@forum fis-gtm]# cd x
[root@forum x]# tar xzf ../Archive/gtm_V61000_linux_x8664_pro.tar.gz
[root@forum x]# ./configure
GT.M Configuration Script
Copyright 2009, 2013 Fidelity Information Services, Inc. Use of this
software is restricted by the provisions of your license agreement.
What user account should own the files? (bin)
What group should own the files? (bin) gtm
Should execution of GT.M be restricted to this group? (y or n) y
```

```

In what directory should GT.M be installed? /opt/fis-gtm/6.1-000/
Directory /opt/fis-gtm/6.1-000/ does not exist. Do you wish to create it as
part of this installation? (y or n) y
Installing GT.M....
Should UTF-8 support be installed? (y or n) n
All of the GT.M MUMPS routines are distributed with uppercase names. You
can create lowercase copies of these routines if you wish, but to avoid
problems with compatibility in the future, consider keeping only the
uppercase versions of the files.
Do you want uppercase and lowercase versions of the MUMPS routines? (y or
n)n
Compiling all of the MUMPS routines. This may take a moment.

Object files of M routines placed in shared library /opt/fis-gtm/6.1-
000//libgtmutil.so
Keep original .o object files (y or n)? n

Removing world permissions from gtmsecshr wrapper since group restricted to
"gtm"
Installation completed. Would you like all the temporary files removed from
this directory? (y or n) y
[root@forum x]# exit
exit
Script done on Tue 31 Dec 2013 12:08:21 PM PST

```

Step 6 FWS Scripts installation

As root, in a temp directory, clone <<https://github.com/ldlandis/lsb-fws>>

```
git clone https://github.com/ldlandis/lsb-fws
```

Copy the files to /opt/lsb-fws

```
cp -rv lsb-fws /opt/
```

Step 7 VISTA Repository

The osehra user holds a local copy of the OSEHRA VISTA, from which the Forum instance is populated. The repositories holding OSEHRA VISTA are cloned as follows.

```

$ su - osehra
$ git clone https://github.com/OSEHRA/VistA
$ git clone https://github.com/OSEHRA/VistA-M

```

OSEHRA VISTA routines and data are segmented by package. The forum-a:~osehra/Makefile takes the current clone (in which VISTA is scattered by the various packages) and creates two directories in the home directory of ~osehra:

```
r/          All of the routines
```

```
zwr/      All of the data files
```

The Makefile contents are as follows:

```
all:
  r zwr
  rm r/files.m zwr/files.zwr

r: files.m
  mkdir r/
  while read r ; do cp -p "$$r" r/ ; done < files.m

zwr: files.zwr
  mkdir zwr/
  while read zwr ; do cp -p "$$zwr" zwr/ ; done < files.zwr

files.m: Makefile
  -rm -rf r/
  find . -name "*.m" -print | sed "s:^.:`pwd`:" > files.m

files.zwr: Makefile
  -rm -rf zwr/
  find . -name "*.zwr" -print | sed "s:^.:`pwd`:" > files.zwr
```

Invoke the Makefile as follows (still as the osehra user).

```
$ make all
```

Once gathered from the package directories, the routines and data are now ready to load into a VISTA instance.

Step 8 Installation of VISTA

The forum user is the owner of the Forum database instance.

Change to the forum user:

```
su - forum
```

Make a bunch of directories:

```
mkdir o p r s v j g G p/6.1-000 r/6.1-000 etc lib bin
```

Make symbolic links to lsb-fws and fis-gtm:

```
ln -s /opt/lsb-fws/201301/ ~/lib/fws
ln -s /opt/fis-gtm/6.1-000/ ~/lib/gtm
```

```
ln -s ~/lib/fws/inst.bin/set_env ~/bin/set_env
```

As root, Make init.d symbolic links:

```
cd /etc/init.d/  
ln -s forum voe  
ln -s voe /opt/lsb-fws/201301/inst.bin/voe
```

As root, Make xinet.d symbolic link:

```
cd /etc/xinetd.d  
ln -s mailman-forum-smtp-25 ~forum/etc/mailman-forum-smtp-25
```

As root, Add the additional disks and link them to the globals (g) and journals (j) directory in fstab. Add these two lines to /etc/fstab. You may need to adjust them for the mount names.

```
/dev/xvdb1 /home/forum/g ext3 defaults 0 0  
/dev/xvde1 /home/forum/j ext3 defaults 0 0
```

Remount everything

```
mount -a
```

Go back to being the forum user:

```
sudo su - forum
```

Create the environment file as follows:

```
$ cat etc/env.conf  
#!/usr/bin/env bash  
# $Source: /var/nas/repository/lsb-fws/src/inst.etc/RCS/env.conf-primary,v  
$  
# $Revision: 20130122.1 $  
  
export ENV="forum"  
export BUP="forum-a"  
export GTM_REPLICATION="on" #[on|off]  
#export GTM_REPLICATION="off"    #[on|off]  
export REPL_PORT="50188"    # /etc/services gtmrepl 50188/tcp # GT.M Repl  
export REPL_HOST="forum-b.osehra.org"  
export REPL_HOST="localhost"    #use ssh tunnel  
export REPL_HOST_SSH_HOST="forum-b.osehra.org"  
export REPL_HOST_SSH_PORT="22"  
export REPL_BUFSIZE="4096"    # journal buffer size in 512-byte blocks  
export REPL_AUTOSWITCH=8388600    # ~800MB  
  
##
```

```

# GT.M symbols
export gtm_buffer_size="${REPL_BUFSIZE}"
export gtm_repl_instname="forumaforum"
export gtm_repl_instsecondary="forumbforum"

###
# Nothing should need changes below here
# -----

export DBINST="/home/${ENV}"
export
PATH="${DBINST}/lib/fws/inst.bin:${DBINST}/lib/gtm:${PATH}"
"

##
# Local symbols
export REPL_DAT="${DBINST}/g"      # Database files
export REPL_JNL="${DBINST}/j"      # Database journals
export REPL_CNF="${REPL_DAT}/db.conf" #      Replication
Configuration
export REPL_SIDE="`cat ${REPL_DAT}/db.side`"

##
# GT.M symbols (do not change the symbol names)
export gtm_dist="${DBINST}/lib/gtm"
export gtm_sysid="${ENV}"
export gtm_log="${DBINST}/log"
export gtmgbldir="${REPL_DAT}/db.gld"
if [ ${GTM_REPLICATION} = "on" ] ; then
export gtm_repl_instance="${REPL_DAT}/db.repl"
fi

```

```
##
# Get GT.M version in use
export GTMVER=`ls -l lib/gtm | awk '{print $NF}'`
export GTMVER=`basename ${GTMVER}`

#export m2web="${DBINST}/w"
export ewd="${DBINST}/w/${GTMVER} (${DBINST}/w) "
##
# Build up GT.M Routine Path (using GTMVER where needed)
#export gtmroutines="${DBINST}/p/${GTMVER} (${DBINST}/p) "
export
                    gtmroutines="${gtmroutines}
${DBINST}/r/${GTMVER} (${DBINST}/r) "
export gtmroutines="${gtmroutines} lib/gtm/libgtmutil.so"

export gtm_zinterrupt='I $$JOBEXAM^ZU($ZPOSITION) '

# Added by VEN/SMH
export gtm_prompt="DEV,FORUM>"
export EDITOR=`which vim`
```

Make sure to invoke set_env every time you log in:

```
echo 'source bin/set_env' >> ~/.bash_profile
```

Source it yourself:

```
source ~/bin/set_env
```

Copy the etc files ~/lib/fws/inst.etc/* to your etc

```
cp -v ~/lib/fws/inst.etc/* ~/etc/
```

Create the Global directory as follows:

```
File: ~/g/db.gde

Change    -segment DEFAULT -file="${DBINST}/g/default.dat" -allocation=400000
-block_size=4096 -lock_space=1000 -extension_count=0
add       -segment TEMPGBL -file="${DBINST}/g/tempgbl.dat" -allocation=10000
          -block_size=4096 -lock_space=1000 -extension_count=0
change    -region  DEFAULT -record_size=4080 -key_size=355
```

```

add      -region  TEMPGBL -record_size=4080 -key_size=355 -dyn=TEMPGBL
add      -name    HLTMP   -region=TEMPGBL
add      -name    TMP     -region=TEMPGBL
add      -name    UTILITY -region=TEMPGBL
add      -name    XTMP    -region=TEMPGBL
add      -name    XUTL    -region=TEMPGBL
show     -all

```

Load the Global Directory into GT.M:

```
mumps -r GDE < g/db.gde > g/db.gde.out 2>&1
```

Create the Databases:

```
mupip create
```

Routines were loaded and compiled from the OSEHRA repository (located in ~osehra) using the following script:

```

File: bin/cprtns.sh

(cd ~osehra/; tar cf - r) | (tar xf -)
(cd r/${GTMVER};
date > compile.log
for r in ../*.m ; do mumps ${r} >> compile.log 2>&1 ; done
date >> compile.log
)

```

Data was loaded into the database from the OSEHRA repository (located in ~osehra) using the following script:

```

File: bin/loadddb.sh

for z in ~osehra/zwr/*.zwr ; do cp -v "${z}" x ; mupip load x ; done
rm x

```

Step 9 External OS configuration for Mailman

As root, install postfix.

```
# yum install postfix
```

Postfix's function is to send emails to the outside world from VISTA.

In '/etc/postfix/main.cf', 'mynetworks_style = host' was added to have postfix only listen to the localhost for messages.

In '/etc/postfix/master.cf', comment out the smtp line and add a line for listening on 10025.

```

#smtp      inet        n       -       n       -       -       smtpd # VEN/SMH - don't
listen on 25 but on 10025

10025      inet        n       -       n       -       -       smtpd

```

After that is done and tested, create a xinetd service for Mailman on port 25 to run the shell script.

```
[forum@forum-a ~]$ cat /etc/xinetd.d/mailman-smtp-25
# Written by Sam Habiell on 30 Dec 2013 for Mailman

service mailman-forum-smtp-25
{
    port                = 25
    socket_type         = stream
    protocol            = tcp
    type                = UNLISTED
    user                = forum
    server               = /home/forum/bin/mailman_smtp.sh
    wait                = no
    disable              = no
    per_source          = UNLIMITED
    instances            = UNLIMITED
    env                 = HOME=/home/forum
}
```

Shell script that invokes `GTMLNX^XMRUCX`:

```
[forum@forum-a ~]$ cat /home/forum/bin/mailman_smtp.sh
#!/bin/bash
# Written by Sam Habiell on 30 December 2013

cd # goto home directory
source /home/forum/bin/set_env

$gtm_dist/mumps -run GTMLNX^XMRUCX 2>> /home/forum/log/mailman.log
```

Step 10 SSH Configuration

In `/etc/ssh/sshd_config`, modify or add the following directives.

```
# Allow other users as needed, but sparingly!!
AllowUsers forum citizen

PermitRootLogin no

GSSAPIAuthentication no
```

```
GSSAPICleanupCredentials yes
```

```
UsePAM yes
```

```
X11Forwarding yes
```

```
ClientAliveInterval 30
```

```
ClientAliveCountMax 30
```

Then put a nice banner in `/etc/issue.net`

```
CentOS release 6.5 (Final)
```

```
Welcome to the  
forum.osehra.org
```

```
      _____  
      |  _  |  _  _  _  _  _  _  _  _  _  _  _  _  _  _  _  _  
Welcome to the |  /  \  \  '  _  |  |  |  '  _  \  _  _  /  _  |  
forum.osehra.org |  _  (  )  |  |  |  _  |  |  |  |  _  _  |  (  _  |  
                  |  _  \  _  /  _  _  \  _  _  |  _  |  _  _  \  _  _  |
```

To get to the forum instance:

```
$ sudo su - forum
```

```
$ mumps -dir
```

Then enable ssh through the firewall.

```
cat /etc/sysconfig/system-config-firewall
```

```
--enabled
```

```
--service=ssh
```

Step 11 Sudo configuration

We allow sudo privileges for users citizen and forum.

```
cat /etc/sudoers.d/citizen
```

```
# User citizen
```

```
## Allows users of various VistA instances to access the instance
```

```
%citizen          ALL=      NOPASSWD: /bin/su - citizen
```

```
## citizen captive user
```

```
citizen  ALL=      NOPASSWD: /bin/chown
```

```
citizen  ALL=      NOPASSWD: /bin/chmod
```

```
citizen          ALL=      NOPASSWD:  /bin/su    -    forum    -c  
/home/forum/lib/fws/inst.bin/captive_user
```

```

citizen          ALL=          NOPASSWD:    /bin/su      -    forum      -c
/home/forum/lib/fws/inst.bin/interactive_shell

cat /etc/sudoers.d/forum

%forum           ALL=          NOPASSWD:    /bin/su      -    forum

```

Step 12 Cloud Backup

We use Cloudfuse to mount Rackspace Cloud files for backups as they are cheaper.

As root,

```

wget https://github.com/redbo/cloudfuse/archive/master.zip
yum install gcc.x86_64
yum install libcurl-devel.x86_64
yum install libxml2-devel.x86_64
yum install fuse-devel.x86_64
unzip master
cd master
./configure
make
sudo make install

```

Create Cloudfuse configuration file under /root. Note that this is a hidden file - .cloudfuse, also the username is the account name to the Rackspace account and the api_key comes from the key that belongs to the account.

```

# cat /root/.cloudfuse
username=xxxxxxxxxxxxxxxxxxxx
api_key=7777777777777777
authurl=https://auth.api.rackspacecloud.com/v1.0
region=ORD
cache_timeout=600

```

Create a directory as the mount point for the Rackspace Cloudfile container, set group owner to “fuse” so other users can have access

```

cd /
mkdir cloudbkup
chown root:fuse cloudbkup

```

Edit /etc/fstab by adding the following entry, note that the gid is the “fuse” group id

```

cloudfuse /cloudbkup fuse defaults,gid=603,umask=002,allow_other

```

Remount fstab by running:

```

mount -a

```

Step 13 GT.M Replication Set-up

GT.M Replication has to be set-up to replicate globals and replicate routines. Globals are replicated using GT.M replication; routines are replicated using lsync.

For GT.M Replication, it's done as follows:

In etc/env.conf, these lines accomplish the replication on forum-a TO forum-b:

```
export BUP="forum-a"
export REPL_HOST="forum-b.osehra.org"
export REPL_HOST_SSH_HOST="forum-b.osehra.org"
export gtm_repl_instname="forumaforum"
export gtm_repl_instsecondary="forumbforum"
```

On forum-b, the corresponding lines in etc/env.conf are:

```
export BUP="forum-b"
export REPL_HOST="forum-a.osehra.org"
export REPL_HOST_SSH_HOST="forum-a.osehra.org"
export gtm_repl_instname="forumbforum"
export gtm_repl_instsecondary="forumaforum"
```

Routines are replicated using lsync. In the ~forum/etc directory, there is an lsync file, one for forum-a and one for forum-b. The only difference between them is in the host directive, where forum-a refers to forum-b, and the converse.

```
$ cat forum-a-lsyncd.conf
settings {
logfile      = "/home/forum/log/lsyncd.log",
pidfile      = "/home/forum/log/lsyncd.pid",
statusFile   = "/home/forum/log/lsyncd.status.log",
statusInterval = 20
}

sync {
default.rsynccssh,
source      = "/home/forum/p",
host        = "forum-b",
targetdir   = "/home/forum/p",
exclude     = "*.o",
rsync       = {
archive    = true,
verbose    = true,
compress   = true
```

```

}
}

sync {
default.rsyncssh,
source      = "/home/forum/r",
host        = "forum-b",
targetdir   = "/home/forum/r",
exclude     = "*.o",
rsync       = {
archive    = true,
verbose    = true,
compress   = true
}
}
}

```

Step 14 Back-up

Load this crontab into cron on the forum user.

```

PATH=/home/forum/bin:/home/forum/lib/fws/inst.bin:/usr/bin:/bin:/home/foru
m/lib/gtm

00 * * * * gtm_journal_switch.sh >> log/gtm_journal_switch.log 2>&1
05 * * * * gtm_journal_backup.sh >> log/gtm_journal_backup.log 2>&1
00 18 * * * gtm_journal_purge.sh
01 00 * * * gtm_backup.sh > log/gtm_backup.log 2>&1
#0-55/5 * * * * run.sh P gtm_repl_stat.sh
#1-56/5 * * * * run.sh P gtm_repl_stat_alert.sh
0-55/5 * * * * run.sh B gtm_freecnt_alert.sh
00 06 * * * run.sh B gtm_freecnt.sh
00 00 * * * ls -la j >> log/ls-l-j.log 2>&1

```

Step 15 Enabling Journaling and Replication for GT.M

From /opt/lsb-fws/201301/inst.bin/, run the following to start journaling:

```
sh gtm_journal_enable.sh
```

To disable:

```
sh gtm_journal_disable.sh
```

To enable replication:

```
sh gtm_replication_start.sh
```

To disable replication:

```
sh gtm_replication_stop.sh
```

Step 16 Configuring the tied user (citizen)

We previously configured sudo and ssh for the tied user. Now configure .bash_profile.

```
cat ~citizen/.bash_profile
# .bash_profile

trap "" INT
stty susp undef
stty rows 24 columns 80

# Get the aliases and functions
if [ -f ~/.bashrc ]; then
. ~/.bashrc
fi

# User specific environment and startup programs
if false ; then
#if true ; then
echo "Sorry, in maintenance mode"
read -s x # the password is 'xyzzy'
if [ "`echo ${x} | md5sum`" != "89d447eb9afaeb94e463615e8ded6479  -" ] ;
then
exit
fi

PATH=$PATH:$HOME/bin
export PATH

# Allow users to use screen
sudo chown forum `tty`
sudo chmod 666 `tty`

sudo su - forum -c /home/forum/lib/fws/inst.bin/captive_user
exit
```