Oracle® Retail High-Availability Case Study Oracle Linux

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Installation Overview

Oracle Retail applications can be deployed in a grid computing environment, utilizing Oracle Fusion Middleware Active-Active clustering and Oracle Real Application Cluster (RAC) databases to provide high availability and scalability. This configuration allows lower-cost commodity systems to be combined into a single scalable, fault-tolerant computing environment.

There are many options for configuring an Oracle grid computing environment and these options can have a significant impact on the way that the environment is configured and built. The intent of this case study is not to provide exhaustive documentation on all possible ways to configure a suitable grid computing environment for Oracle Retail, but rather to document a specific configuration that was used for verification purposes. As such, the specific installation steps documented in this case study will only apply in their entirety to the exact hardware and software configuration described here.

This Case Study details the steps used to setup the Oracle Linux systems that will be used as servers for the High-Availability Oracle Retail environment:

1. Create Oracle Linux environment:
   a. Install Oracle Linux 7 on all systems.
   b. Configure Linux for Oracle.
   c. Configure system level pre-requisites.
   d. Configure load-balancer.

> **Note:** This case study uses the hostnames dbserver1, dbserver2, appserver1, appserver2, and appserver3 for the systems involved in the Oracle Retail environment. You should substitute the appropriate names of the hosts for your installation.

2

Installing Oracle Linux

Installing the Oracle Linux Release 7 operating system to prepare for Oracle Fusion Middleware (FMW) and Oracle Real Application Clusters (RAC) installations can be broken down to the following basic steps:

- Hardware and software requirements
- Basic operating system installation
- Configuring Linux for Oracle

Hardware and Software Requirements

This section describes the hardware and software requirements.

Disk Space

The following table shows the internal disk layout used for this case study:

Partition	Allocation (in Mbytes)	File System Type
/	18432	Ext4
/boot	128	Ext4
<swap>	Equal to physical memory size	swap

Kernel Version

Oracle Linux 7 for x86_64 is required. The kernel version is:

```
kernel-uek-3.8.13-35.3.1.el7uek.x86_64
```

Basic Operating System Installation

The following is a detailed, step-by-step procedure to install Oracle Linux 7 on x86-64 hardware in a configuration necessary for successful installation and use of Oracle Database 12.1.0.2, Oracle Fusion Middleware, and Oracle Real Application Clusters.

Installation Procedure

To install Oracle Linux, do the following:

1. Download the Oracle Linux Release 7 Media Pack for x86-64 (64-bit) from the Oracle E-Delivery Web site for Oracle Linux (http://edelivery.oracle.com/linux).

   Note: The source DVD and boot images are not required.

2. Unzip the downloaded files and burn image DVD from the extracted .iso files. The DVD will be mounted as file systems during the installation.
3. Boot the computer using the first DVD. You may need to change the order that the BIOS search devices when trying to boot. The BIOS must search the CD-ROM drive first and the hard drive second.

- On the boot screen, press F2 or F12 immediately to bring up the BIOS maintenance window.

4. On the "Welcome to Oracle Linux Server 7.4!" screen appears, select 'Install or upgrade an existing system' and press return or wait for the auto selection.
5. The Disk Found window appears to begin testing the media before installation.
   - Click **OK** to verify the media or click **Skip** to skip the media test. It is recommended that you verify the media for the first use of the installation DVD.
6. On the Welcome to Oracle Linux 7 window, click **Next**. The Language Selection window opens.
7. Select the appropriate language and click **Next**.
8. On the Keyboard Configuration window, select the appropriate keyboard for the system and click **Next**.
9. Select the type of storage that Linux will be installed on (basic disks or FCoE, iSCSI, zFCP).
10. Click **Next**.
11. To configure networking at this time, Click **Configure Network**.
    a. Select the ethernet device and click **Edit**.
    b. Check Connect automatically.
    c. Configure the appropriate IP version and settings. You should use a fixed, static IP address. Although it is possible to use DHCP addressing, any change in IP address after installation may result in problems later on.
    d. Click **Apply** and then **Cancel**.
    e. Click **Close** on Network Connections window.
    f. Enter the hostname and click **Next**.
12. On the Time Zone Selection window, choose the time settings that are appropriate for your area.

    Note: Setting the system clock to UTC is usually a good practice for servers. To do so, select System clock uses UTC.

13. Click **Next**. The Set Root Password window opens.
14. Enter a password for root, and enter it again to confirm.
15. Click **Next**. The Hard Drive Installation Type window opens.
16. Select Create Custom Layout and click **Next**.
17. On the Disk Setup window, click **Create** to add partitions. For more information about the recommended partitions and sizes, see Disk Space.
18. Click **Next**.
19. Click Write changes to disk.
20. On the Boot Loader Configuration Window, keep the default values and click **Next**.
21. On the Software Default Installation Window, select Basic Server.
22. Select Customize now and click **Next**.
23. The Software Selection window opens. Select only the following pieces from each category. Uncheck any that are not listed below:
    a. **Base System**
       - Base
       - Compatibility libraries

- Debugging Tools
- Large Systems Performance
- Legacy UNIX compatibility
- Network file system client
- Networking Tools
- Performance tools
- Perl Support
- Print client
- Scientific support

b. **Server**
- Print Server
- Server Platform
- System administration tools

c. **Web Services**
- Web Server

d. **Desktops**
- KDE Desktop
- Legacy X Window System compatibility
- X Window System

e. **Development**

Additional Development
- Desktop Platform Development
- Development tools
- Server Platform Development

- Click **Next**. The installation starts at this point.

24. Once the installation is complete, remove the installation CD-ROM from the system, and click **Reboot**.
25. The system automatically reboots and a new Welcome window opens. Click **Forward**.
26. Read the license agreement. If you agree to the terms, select **Yes, I agree to the License Agreement** and click **Forward**.
27. Set Up Software Updates window opens. Register for ULN updates and click Forward.
28. On the Create User window, create an account for regular, non-administrative use of your system. Do not create an account for Oracle at this time.
29. Click **Forward**.
30. On the Date and Time window, set the Date and Time.

    Note: If you want to use an NTP server (recommended), select Enable Network Time Protocol and enter the name of the NTP server.

31. Click Forward.
32. On the Kdump window, clear Enable kdump and click **Finish**.

33. A graphical Enterprise Linux login window appears. Congratulations! Your Linux software is now installed.
34. Login to the root account to setup Linux for the installation of the Oracle products.

Required Software Package Versions

The following software packages (or later versions) must be installed on the system before attempting to install the Oracle products. All RPMs can be found on the installation DVD. Failure to have installed all of these packages can result in a failed installation or subsequent operation of the Oracle products.

RPM Name

```
binutils-2.20.51.0.2-5.36.el6.x86_64.rpm
compat-db-4.6.21-15.el6.i686.rpm
compat-db-4.6.21-15.el6.x86_64.rpm
compat-libstdc++-33-3.2.3-69.el6.i686.rpm
compat-libstdc++-33-3.2.3-69.el6.x86_64.rpm
openmotif-2.3.3-5.el6.x86_64.rpm
control-center-2.28.1-38.el6.x86_64.rpm
gcc-4.4.7-3.el6.x86_64.rpm
gcc-c++-4.4.7-3.el6.x86_64.rpm
glibc-2.12-1.107.el6.i686.rpm
glibc-2.12-1.107.el6.x86_64.rpm
glibc-common-2.12-1.107.el6.x86_64.rpm
glibc-devel-2.12-1.107.el6.i686.rpm
glibc-devel-2.12-1.107.el6.x86_64.rpm
glibc-headers-2.12-1.107.el6.x86_64.rpm
gnome-utils-2.28.1-10.el6.x86_64.rpm
libaio-0.3.107-10.el6.i686.rpm
libaio-0.3.107-10.el6.x86_64.rpm
libaio-devel-0.3.107-10.el6.i686.rpm
libaio-devel-0.3.107-10.el6.x86_64.rpm
libgcc-4.4.7-3.el6.i686.rpm
libgcc-4.4.7-3.el6.x86_64.rpm
libstdc++-4.4.7-3.el6.x86_64.rpm
libstdc++-devel-4.4.7-3.el6.x86_64.rpm
make-3.81-20.el6.x86_64.rpm
imake-1.0.2-11.el6.x86_64.rpm
sysstat-9.0.4-20.el6.x86_64.rpm
tzdata-2012j-1.el6.noarch.rpm
ncompress-4.2.4-54.el6_2.1.x86_64.rpm
openmotif22-2.2.3-19.el6.i686.rpm
openmotif22-2.2.3-19.el6.x86_64.rpm
libXp-1.0.0-15.1.el6.i686.rpm
libXp-1.0.0-15.1.el6.x86_64.rpm
libXp-devel-1.0.0-15.1.el6.i686.rp
libXp-devel-1.0.0-15.1.el6.x86_64.rpm
libXpm-3.5.10-2.el6.i686.rpm
libXpm-3.5.10-2.el6.x86_64.rpm
libXpm-devel-3.5.10-2.el6.i686.rpm
libXpm-devel-3.5.10-2.el6.x86_64.rpm
unixODBC-2.2.14-12.el6_3.i686.rpm
unixODBC-2.2.14-12.el6_3.x86_64.rpm
unixODBC-devel-2.2.14-12.el6_3.i686.rpm
unixODBC-devel-2.2.14-12.el6_3.x86_64.rpm
```

Installing Packages

To install the additional packages, perform the following steps to extract them directly from the installation DVD:

1. Insert the DVD disc in the CD-ROM drive. The disc should mount automatically when you insert it. If it does not mount automatically, then execute this command to mount it:

   ```
   mount -t iso9660 /dev/cdrom /media/cdrom
   ```

2. Change to the directory on the disc which contains the RPMs:

   ```
   cd /media/cdrom/Server
   ```

3. Install each additional rpm contained on the DVD with the command:

   ```
   rpm –Uvh –nodeps --force <rpm name>
   ```

4. When finished with the disc, dismount and eject it with the commands:

   ```
   cd eject
   ```

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Configuring Linux for Oracle Products

This chapter describes the steps you must complete to configure Linux for Oracle Database 12.1.0.2, Oracle Fusion Middleware, and Oracle Real Application Clusters (RAC).

Configuring the Linux Kernel Parameters

Use the following commands to make the necessary kernel parameter changes to the `/etc/sysctl.conf` file:

```
cp /etc/sysctl.conf /etc/sysctl.conf.bak
cat > /etc/sysctl.conf <<EOF
# Kernel sysctl configuration file for Red Hat Linux
#
# For binary values, 0 is disabled, 1 is enabled. See sysctl(8) and
# sysctl.conf(5) for more details.
# Controls IP packet forwarding
net.ipv4.ip_forward = 0
# Controls source route verification
net.ipv4.conf.default.rp_filter = 1
# Do not accept source routing
net.ipv4.conf.default.accept_source_route = 0
# Controls the System Request debugging functionality of the kernel
kernel.sysrq = 0
# Controls whether core dumps will append the PID to the core filename.
# Useful for debugging multi-threaded applications.
kernel.core_uses_pid = 1
# Kernel sysctl configuration file for Red Hat Linux
#
# For binary values, 0 is disabled, 1 is enabled. See sysctl(8) and
# sysctl.conf(5) for more details.
# Controls IP packet forwarding
net.ipv4.ip_forward = 0
# Controls source route verification
net.ipv4.conf.default.rp_filter = 1
# Do not accept source routing
net.ipv4.conf.default.accept_source_route = 0
# Controls the System Request debugging functionality of the kernel
kernel.sysrq = 0
# Controls whether core dumps will append the PID to the core filename.
# Usefun forndebugging multi-threaded applications.
kernel.msgmnb = 65535
kernel.msgmni = 2878
kernel.sem = 256 32000 100 142
kernel.shmmax = 6442450942
kernel.shmall = 2097152
kernel.shmmni = 4096
fs.aio-max-nr = 1048576
net.ipv4.ip_local_port_range = 9000 65500
net.core.rmem_default = 262144
net.core.rmem_max = 4194304
net.core.wmem_default = 262144
net.core.wmem_max = 1048576
net.ipv4.tcp_rmem = 4096 87380 8388608
net.ipv4.tcp_wmem = 4096 65536 8388608
net.ipv4.tcp_mem = 4096 4096 4096
```

```
fs.file-max = 6815744
EOF
```

Configuring symlinks

Run the following commands:

```
mv /usr/lib/libXtst.so.6 /usr/lib/libXtst.so.6.ORIG
ln -s /usr/X11R6/lib/libXtst.so.6 /usr/lib/libXtst.so.6
ln -s /bin/awk /bin/nawk
ln -s /usr/lib/libgdbm.so.2.0.0 /usr/lib/libdb.so.2
```

Configuring /etc/modprobe.conf

Run the following commands:

```
echo alias net-pf-10 off >> /etc/modprobe.conf
echo alias ipv6 off >> /etc/modprobe.conf
```

Configuring the Pluggable Authentication Module (PAM)

Use a text editor to add the following entry near the bottom of the PAM file `/etc/pam.d/login`:

```
session required /lib64/security/pam_limits.so
```

Configuring the Hangcheck-Timer Module

The hangcheck-timer driver is a method for catching kernel hangs and pauses. It is already included in the Linux kernel but it needs to be configured in the `/etc/modules.conf` and `/etc/rc.local` files. To make these changes, run the following commands as root:

```
cat >> /etc/modules.conf <<EOF
options hangcheck-timer hangcheck_tick=30 hangcheck_margin=180
EOF
cat >> /etc/rc.local <<EOF
modprobe hangcheck-timer
EOF
```

Rebooting the Server

At this point the server should be rebooted to pick up the kernel parameter changes and load the hangcheck-timer module.

Configuring the Hangcheck-Timer Module

The hangcheck-timer driver is a method for catching kernel hangs and pauses. It is already included in the Linux kernel but it needs to be configured in the `/etc/modules.conf` and `/etc/rc.local` files. To make these changes, run the following commands as root:

```
cat >> /etc/modules.conf <<EOF
options hangcheck-timer hangcheck_tick=30 hangcheck_margin=180
EOF
cat >> /etc/rc.local <<EOF
modprobe hangcheck-timer
EOF
```

Rebooting the Server

Rebooted the server to pick up the kernel parameter changes and load the hangcheck-timer module.

Allocating Disk

Following is a high level list of which disks need to be in place before starting any of the RAC or FMW installations:

- Amount of disk space needed on Application Servers and its layout.
- Amount of non-shared disk space for RAC Database Server and its location.
- Amount of shared disk space for RAC Database Servers and its location.

For this case study, the following was requested for the RAC database cluster, the Fusion Middleware cluster, and the Fusion Middleware standalone server:

1. Application Server Space:

   For each Application Server (appserver1, appserver2 and appserver3):

   `/u00 - 100G local, NAS or SAN space (i.e. separate /u00s on each)`
2. Non-Shared disk space for RAC DB Servers:

   For each RAC Database Server (dbserver1 and dbserver2)

   `/u00 - 100G local, NAS or SAN space (i.e. separate /u00s on each)`
3. Shared NFS disk space for RAC Database Servers.

Mount Point	Size	NFS Mount Options
/u02/ocr1	500M	hard,nointr,rsize=32768,wsize=32768,tcp,noac,timeo=600
/u02/ocr2	500M	hard,nointr,rsize=32768,wsize=32768,tcp,noac,timeo=600
/arch	50G	hard,nointr,rsize=32768,wsize=32768,tcp,actimeo=0,timeo=600
/u03	100G	hard,nointr,rsize=32768,wsize=32768,tcp,actimeo=0,timeo=600
/u04	100G	hard,nointr,rsize=32768,wsize=32768,tcp,actimeo=0,timeo=600
/u05	100G	hard,nointr,rsize=32768,wsize=32768,tcp,actimeo=0,timeo=600

Setting Shell Limits for the Oracle User

Run the following command as root to configure operating system limits for the Oracle user:

```
cat >> /etc/security/limits.conf <<EOF oracle soft nproc 16384
oracle hard nproc 16384
oracle soft nofile 4096
oracle hard nofile 65536
oracle soft stack 32768
oracle hard stack 32768
webadmin soft nproc 16384
webadmin hard nproc 16384
webadmin soft nofile 10240
webadmin hard nofile 65536
webadmin soft stack 32768
webadmin hard stack 32768
EOF
```

Setting u Basic Load-Balancer

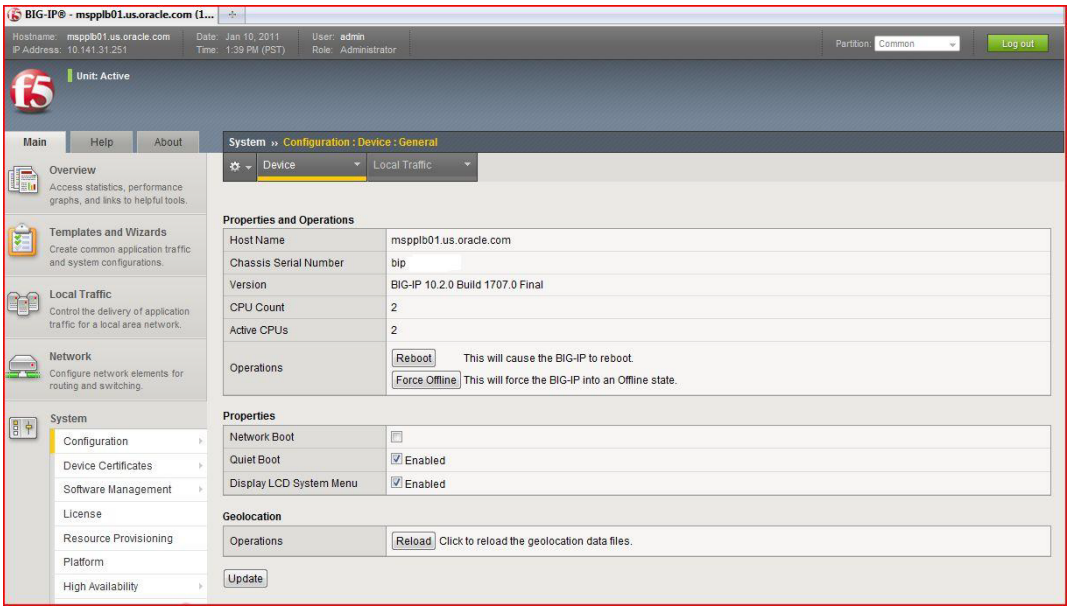
Follow the instructions to set up BIG-IP in the BIG-IP Reference Guide.

> **Note:** For access to technical documentation, including the BIG-IP Reference Guide, register for a free account on the Ask F5 Web site.

Ensure that the Configuration utility web interface is available and ready for configuration.

Launch a Web browser and navigate to the configuration utility:

`https://<HTTPD Admin IP Address>/xui/`

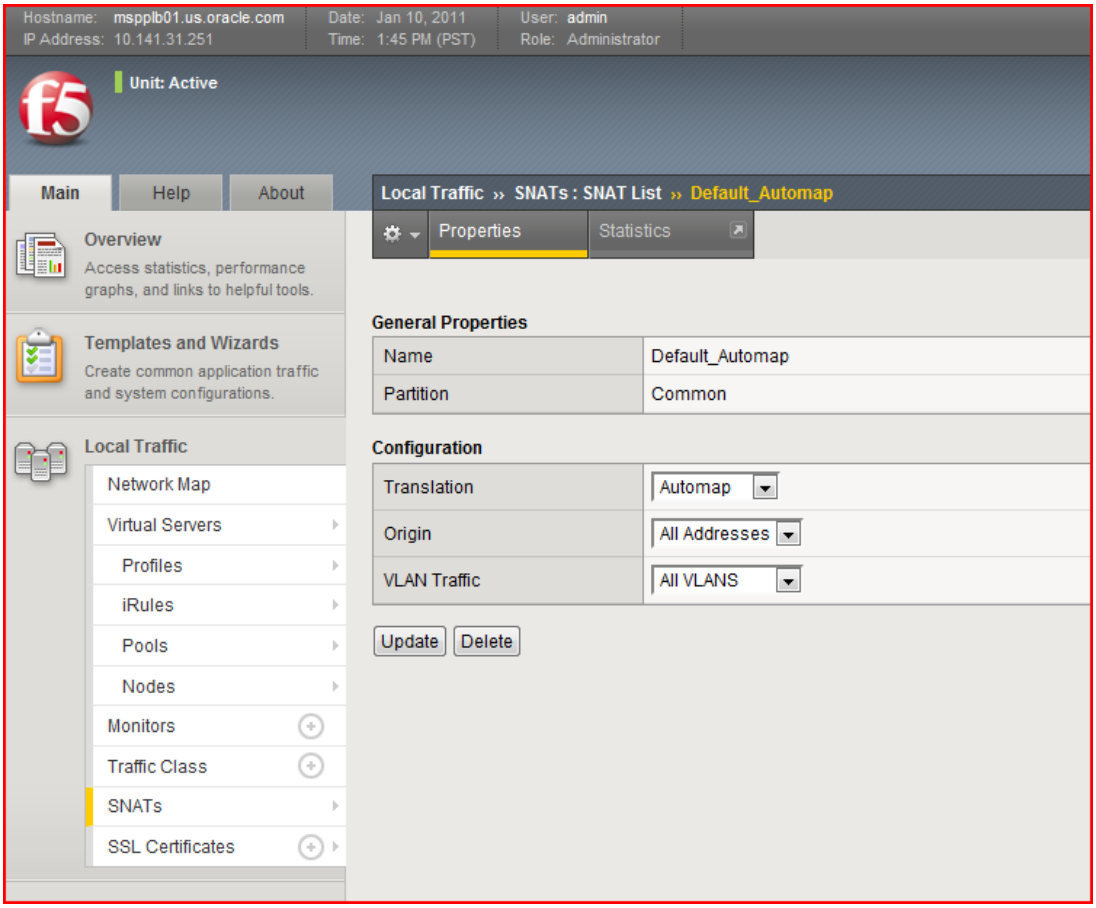


Configuring SNATs

To configure SNATs:

Click **Local Traffic**.

Click **SNATs**.



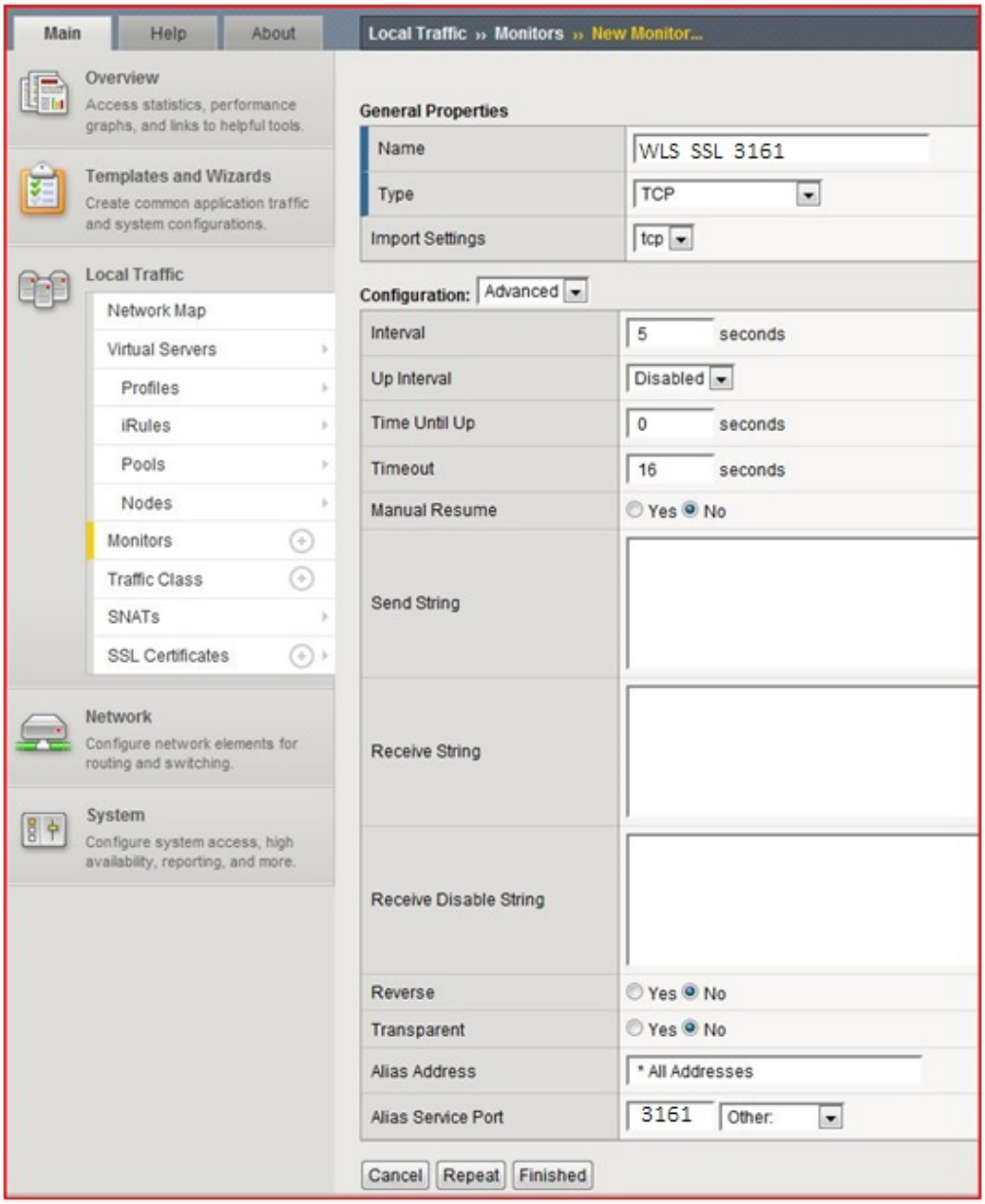
Update the configuration dropdowns.

Click **Update**.

Creating Monitors

To create the monitors:

Select **Monitors** from the left menubar. You will need to create three monitors with settings similar to the ones shown in this screenshot. A few key items will differ for each monitor, and those settings are detailed below.



Create a monitor called **WLS_HTTP** with the following settings:

Setting	Value
Defaults From	HTTP
Interval	30
Timeout	91
Send String	GET /

Create a monitor called **WLS_LDAP_3060** with the following settings:

Setting	Value
Defaults From	ldap
Interval	10
Timeout	31
Alias Service Port	3060

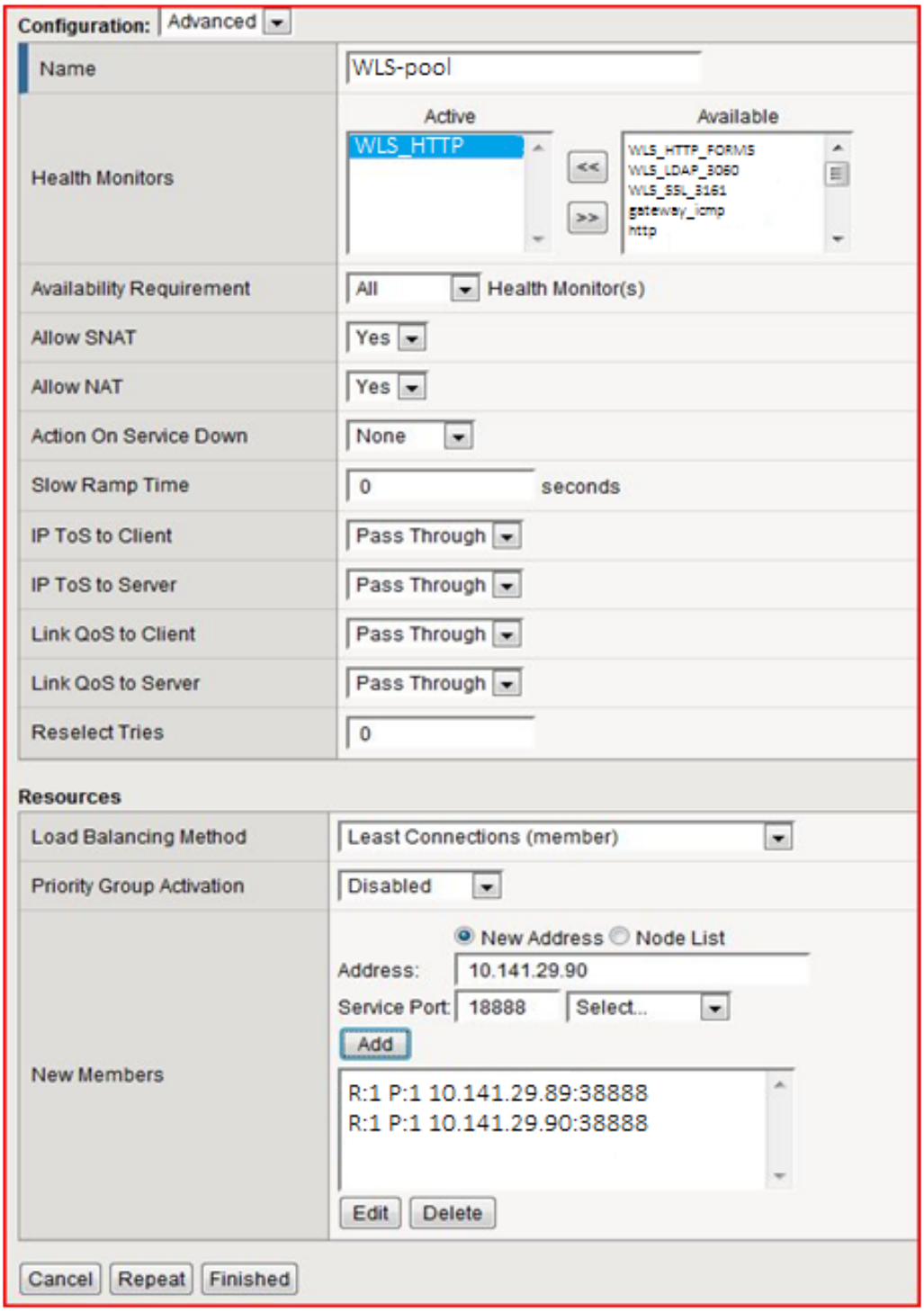
Create a monitor called **WLS_SSL_3161** with the following settings:

Setting	Value
Defaults From	TCP
Interval	5
Timeout	16
Alias Service Port	3161

Creating Pools

To create pools:

Select **Pools** from the left menubar. You will need to create four pools with settings similar to the ones shown in the following figure. A few key items will differ for each pool, and those settings are detailed below.



Create a pool called **WLS_Pool** with these settings:

Setting	Value
Name	WLS_Pool
Health Monitors	WLS_HTTP
Allow SNAT	Yes
Allow NAT	Yes
Load Balance Method	Least Connections (member)
Members	10.141.29.89:38888 (appserver1) 10.141.29.90:38888 (appserver2)

Create a pool called **WLS_LDAP_3060** with these settings:

Setting	Value
Name	WLS_LDAP_3060
Health Monitors	WLS_LDAP_3060
Allow SNAT	Yes
Allow NAT	Yes
Load Balance Method	Least Connections (member)
Members	10.141.29.89:3060 (appserver1) 10.141.29.90:3060 (appserver2)

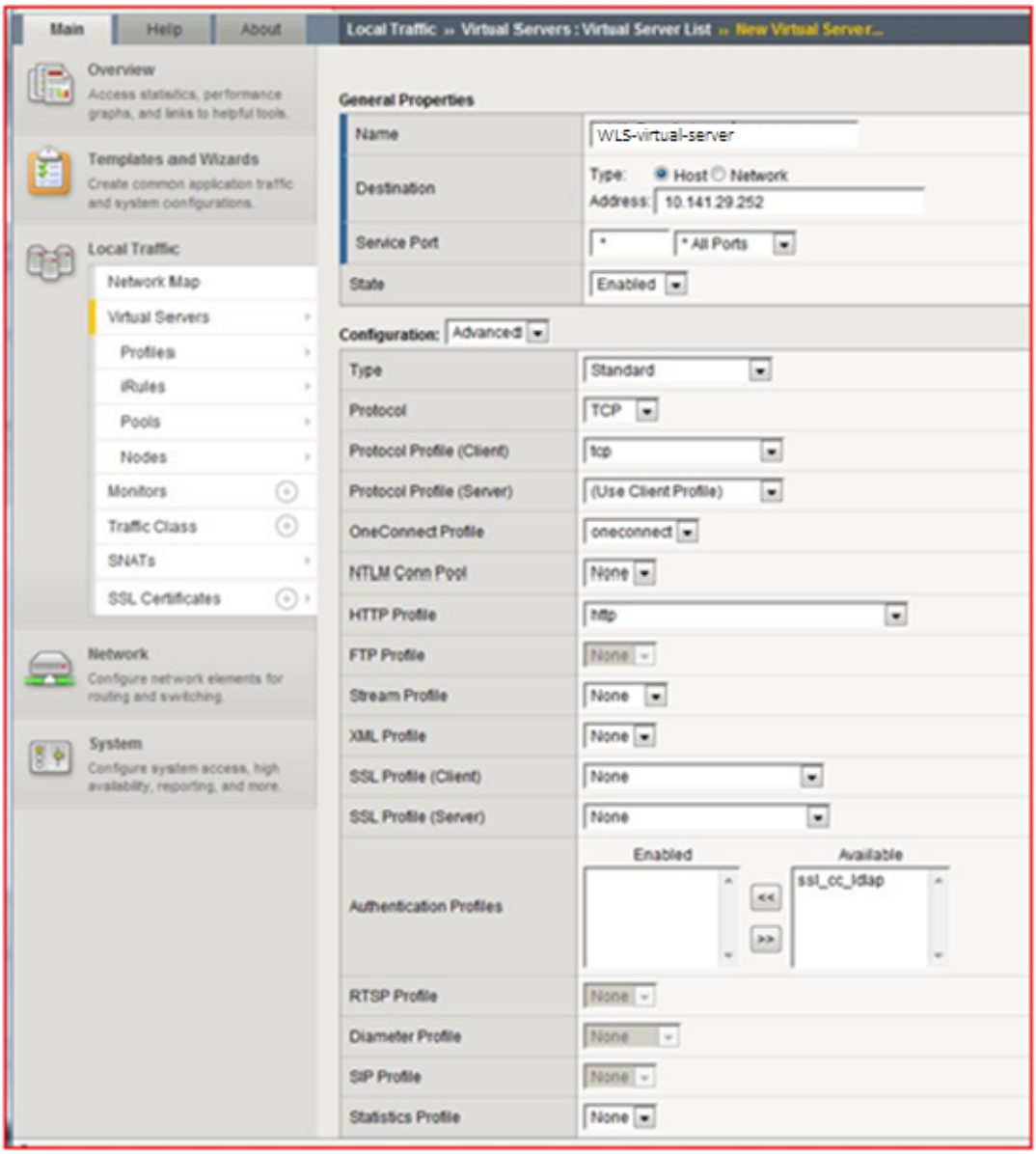
Create a pool called **WLS_SSL_3161** with these settings:

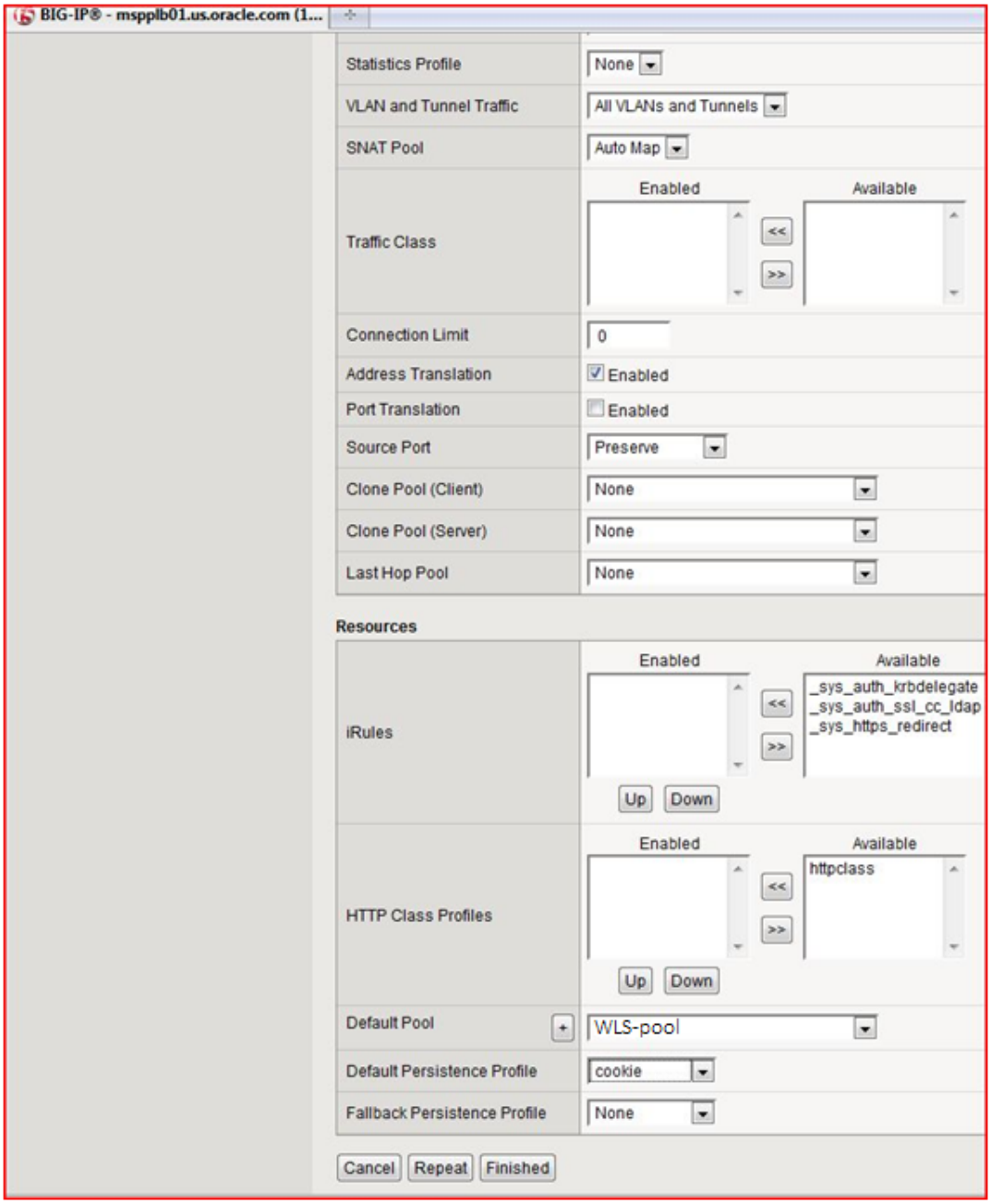
Setting	Value
Name	WLS_SSL_3161
Health Monitors	WLS_SSL_3161
Allow SNAT	Yes
Allow NAT	Yes
Load Balance Method	Least Connections (member)
Members	10.141.29.89:3161 (appserver1) 10.141.29.90:3161 (appserver2)

Creating Virtual Servers

To create virtual servers:

Select **Virtual Servers** from the left menubar. You will need to create four virtual servers with settings similar to the ones shown in this screenshot. A few key items will differ for each virtual server, and those settings are detailed below.




BIG-IP® - mspplb01.us.oracle.com (1...
Statistics Profile
None
VLAN and Tunnel Traffic
All VLANs and Tunnels
SNAT Pool
Auto Map
Traffic Class
Enabled
Available
Connection Limit
0
Address Translation
Enabled
Port Translation
Enabled
Source Port
Preserve
Clone Pool (Client)
None
Clone Pool (Server)
None
Last Hop Pool
None
Resources
iRules
Enabled
Available
_sys_auth_krbdelegate
_sys_auth_ssl_cc_ldap
_sys_https_redirect
Up
Down
HTTP Class Profiles
Enabled
Available
httpclass
Up
Down
Default Pool
WLS-pool
Default Persistence Profile
cookie
Fallback Persistence Profile
None
Cancel
Repeat
Finished

Create a virtual server called **WLS_Virtual_Server** with these settings:

Setting	Value
Name	WLS_Virtual_Server
Destination	host
Destination	10.141.31.254
Service Port	*
Service Port	*All Ports
State	Enabled
Protocol	TCP
Protocol Profile (Client)	tcp
Protocol Profile (Server)	(Use Client Profile)
OneConnect Profile	oneconnect
HTTP Profile	http
SNAT Pool	Auto Map
Default Pool	WLS_Pool
Default Persistence Profile	cookie
Fallback Persistence Profile	none

Create a virtual server called **WLS_LDAP_3060** with these settings:

Setting	Value
Name	WLS_LDAP_3060
Destination	host
Destination	10.141.31.254
Service Port	3060
State	Enabled
Protocol	TCP
Protocol Profile (Client)	tcp
Protocol Profile (Server)	(Use Client Profile)
OneConnect Profile	oneconnect
HTTP Profile	http
SNAT Pool	Auto Map
Default Pool	WLS_LDAP_3060
Default Persistence Profile	none
Fallback Persistence Profile	none

Create a virtual server called **WLS_SSL_3161** with these settings:

Setting	Value
Name	WLS_SSL_3161
Destination	host
Destination	10.141.31.254
Service Port	3161
State	Enabled
Type	Performance (Layer 4)
Protocol	TCP
Protocol Profile (Client)	fastL4
OneConnect Profile	None
Address Translation	Enabled
Port Translation	Enabled
Source Port	Preserve
SNAT Pool	Auto Map
Default Pool	WLS_SSL_3161
Default Persistence Profile	none

Setup Complete

At this point the load-balancer setup should be complete and activated automatically.

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