Installation and Configuration Guide to the Oracle Database RAC on Standard Edition

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1   Preface

This document describes a detailed automatic procedure of Oracle 11g RAC installation using RPMs.

This document includes the following:

1.   Oracle Cluster installation instructions

2.   Instructions for creating a RAC database

1.1   Purpose of this Document

This is an Installation guide for Oracle Database RAC for the Database Standard Edition.

1.2   Applicability

This document is intended for engineers and customer support personnel involved with the installation, configuration, and ongoing engineering support for Oracle Database RAC.

It is expected that the reader knows how to deploy and set a virtual machine, has a good understanding of the target Oracle Database system, and has some experience with VMware guest installation and configuration.

2 Cluster RAC Installation for a Standard Database

2.1 Pre-requisites

Read these pre-requisites carefully; then follow the instructions in Appendix A "Deploying a VM RAC Pair for RAC Installation," page 14. After you have finished setting up the two VM guests according to the instructions in the appendix, go over the pre-requisites again and verify that you have gone through them all.

2.1.1 Before RAC Database Installation

> **Note** This procedure should be performed on all servers participating in the RAC Cluster.

- **Host Properties**
  - ◆ Virtual Machine image based on VGH VM release.
- **Network**
  - ◆ Two NICs for each Server with different subnet mask.

> **Note** NIC name, order, and role is very important, should be like this:

- ◆ eth0: Public
- ◆ eth1: Private
- ◆ Two Public IP addresses, one for each server. (Nic eth0)
- ◆ Two Private IP addresses, one for each server for cluster communications (Nic eth1)
- ◆ Two virtual IP addresses, one for each virtual server. (based on public server subnet mask).
- ◆ One SCAN NAME pointing to two IP addresses (one virtual name pointing to two IP addresses using public server subnet mask)

- HDDs

    - Two shared disks with partitions named as follows:

    - `/dev/sdb1`
      For CRS (important: no matter what size , same name)

    - `/dev/sdc1`
      For ORADATA (important: no matter what size , same name)

- **RPM required**

    - `nds_ora_cluster-1.0.0-4_el5_11g.x86_64.rpm` (Oracle Cluster Installation)

    - `nds_mgdb_rac_cabhe-1.0.0-3_el5_11g.x86_64.rpm` (MGDB Oracle RAC Installation for CABHE)

    - `nds_ora_rman-1.0.2-3_el5_11g.x86_64.rpm` (Oracle backup and recovery RPM to restore CABHE_DM and CABHE_UP from image).

    - `nds_ora_RAC_cluster_image-1.0.0-0_el5_11g.x86_64.rpm` (Oracle cluster directory Image. This RPM hold Oracle cluster directory Image).

    - `nds_ora_RAC_db_std_image-1.0.0-0_el5_11g.x86_64.rpm` (Oracle database directory Image. This RPM hold Oracle database directory Image).

- **ASMLIB RPM required (64 bit)**

    - `oracleasm-support-2.1.7-1.el5.x86_64.rpm`

    - `oracleasmlib-2.0.4-1.el5.x86_64.rpm`

    - `oracleasm-<Linux version>.x86_64.rpm`

- **SSH logon without password**

    - Root client needs SSH logon between severs without password.

    - Oracle client needs SSH logon between servers without password.

> **Note** This is an important step for RAC Cluster installation. Before proceeding, test your environment and verify that a short logon without password is possible between servers for the two clients.

Host configuration file parameter:

- Check that the `host.conf` file has the parameter: `multi on`.

2.2   ASMLIB RPM Installation

Use the Red Hat Package Manager (RPM) to install ASMLIB on the Linux platform. The RPM files are located in
`/opt/nds/rpms/ASM_lib/Linux_<Linux version>`

You can find the Linux version by running the following command:

```
uname –r
```

Run ASMLIB RPM installation by running.

```
rpm -Uvh oracleasm-support-2.1.7-1.el5.x86_64.rpm oracleasm-<Linux
version>.x86_64.rpm oracleasmlib-2.0.4-1.el5.x86_64.rpm
```

> **Note**   This procedure should be performed on all servers participating in the RAC Cluster if it is not already installed.

2.3   RPM Installation

Use the Red Hat Package Manager (RPM) to install Oracle Database RAC Cluster on the Linux platform. The Following RPM files are located in `/opt/nds/rpms.`

- `rpm –ivh nds_ora_cluster-1.0.0-4_el5_11g.x86_64.rpm`
- `rpm –ivh nds_ora_RAC_cluster_image-1.0.0-0_el5_11g.x86_64.rpm`
- `rpm –ivh nds_ora_RAC_db_std_image-1.0.0-0_el5_11g.x86_64.rpm`

> **Note**   This procedure should be performed on all servers participating in the RAC cluster if it is not already installed.

2.4   Configuration Files for RAC Cluster

The following sections show how to create a configuration file to run Database RAC Cluster installation.

2.4.1   Directory Tree after RPM Installation for RAC Cluster

Under `/opt/nds/`, the RPM installation process creates a link to `ora_cluster` .

`ora_cluster -> /opt/nds/installed/ora_cluster-1.0.0-4`

The directory structure under the link `db_cluster` will appear as follows.

```
db_cluster/
|-- bin
|-- docs
|-- etc
|   |-- cluster.config
|-- licenses
|-- log -> /var/log/nds/ora_cluster
```

```
|-- sql
|    `-- ORADATA.sql
`-- utils
    |-- launcher.sh
    |-- recover_db.sh
    |-- rollback_cluster.sh
```

2.4.2   Cluster Configuration File Parameters

The following section shows how to correctly configure the RAC cluster configuration file before you run a RAC cluster installation.

2.4.2.1   Editing the File's Parameters

Open the file `/opt/nds/db_cluster/etc/cluster.config` and edit its parameters as shown in table 1.

Remove < >

Keep double quotes " "

Table 1   Configuration File Parameters

Parameter	Explanation	Example
PRIMARY_HOST	Refers to the First Host name participating in the RAC Cluster.	PRIMARY_HOST="RACtest1a"
SECONDARY_HOST	Refers to the Second Host name participating in RAC Cluster.	SECONDARY_HOST="RACtest1b"
SCAN_NAME	Name of Virtual IP for SCAN LISTENER. This SCAN NAME holds two IP Addresses.	SCAN_NAME="racscan"
SCAN_PORT	Port number for SCAN LISTENER.	SCAN_PORT="1535"
PRIMARY_VIRTUAL_NAME	Virtual Name that answers Primary Virtual IP Host.	PRIMARY_VIRTUAL_NAME="racvip1"

Parameter	Explanation	Example
SECONDARY_VIRTUAL_NAME	Virtual Name that answers Secondary Virtual IP Host.	SECONDARY_VIRTUAL_NAME="racvip2"

2.5   Running RAC Installation Procedure

> **Note**   Run this section only on node A.

The following sections show how to run RAC cluster installation.

> **WARNING!**
>
> The following step should be performed with no active X graphical server (i.e., plain PUTTY connection).

Run as root user:

> **Note**   If launcher script fails, try running the environment file first:
> ```
> . /opt/oracle/CRS.env
> ```

```
cd /opt/nds/db_cluster/utils/
./launcher.sh
```

After successful installation you will receive the following confirmation.

```
=================================================================
Oracle Cluster installation Process finish on Servers:
$PRIMARY_HOST
$SECONDARY_HOST
=================================================================
```

> **Note**   If the installation process fails, before re-running this script uninstall cluster configuration by running the script rollback_cluster.sh as described in section 3 "RAC Cluster Uninstallation," page 11.

2.6   Log Files after RAC Cluster Installation

After installation, several log file are created in the log directory.

```
|-- log -> /var/log/nds/ora_cluster
root root     588  creating_ASM_disks-2012-Aug-11:30:42.log
root root 1214272  populating_ora_clust_home-2012-Aug-11:30:42.log
root root    4390  cloning_ora_clust_home-2012-Aug-11:30:42.log
root root    1128  root_sh_on_nodes-2012-Aug-11:30:42.log
root root    9070  final_cluster_config-2012-Aug-11:30:42.log
root root 3770972  populating_ora_home-2012-Aug-11:30:42.log
```

```
root root      3718   cloning_ora_home-2012-Aug-11:30:43.log
root root       442   database_root_sh_on_nodes-2012-Aug-11:30:43.log
```

Every log records several steps of the installation process:

- `creating_ASM_disks-2012-Aug-11:30:42.log`
  Records ASM disk creation.

- `populating_ora_clust_home-2012-Aug-11:30:42.log`
  Records how TAR opened the database cluster image.

- `cloning_ora_clust_home-2012-Aug-11:30:42.log`
  Records the cloning process of ORACLE_CLUSTER_HOME directory on both servers.

- `root_sh_on_nodes-2012-Aug-11:30:42.log`
  Records a log of `root.sh` (Oracle scripts that should be run after clonning process).

- `final_cluster_config-2012-Aug-11:30:42.log`
  Records all the final steps of Oracle RAC Cluster configuration.

- `populating_ora_home-2012-Aug-11:30:42.log`
  Records how TAR opened the database software image.

- `cloning_ora_home-2012-Aug-11:30:43.log`
  Records the cloning process of the `ORACLE_DATABASE_HOME` directory on both Servers.

- `database_root_sh_on_nodes-2012-Aug-11:30:43.log`
  Records a log of `root.sh` (Oracle scripts that should be run after the clonning process).

3 RAC Cluster Uninstallation

3.1 Running RAC—the Uninstallation Procedure

To completely remove any installation including database and configuration files for RAC.

Run the following script:

```
rollback_cluster.sh
```

Notes

1. Proceed with caution. This script will delete all database, ASM disks, and Cluster configuration from both servers participating in the Oracle RAC cluster.

2. This procedure should be performed on the primary node only.

4 MGDB CABHE Installation for RAC

4.1 Pre-requisites

Before installation of the MGDB CABHE RPM, `mgdb_rac_cabhe` should be installed on both servers.

Install the RPM `nds_mgdb_rac_cabhe-1.0.0-2_el5_11g.x86_64.rpm`.

```
rpm –i nds_mgdb_rac_cabhe-1.0.0-2_el5_11g.x86_64.rpm
```

> **Note** This procedure should be performed after a successful RAC Cluster installation.

4.2 MGDB Configuration Files

The following sections show how to create a configuration file to run MGDB CABHE RAC and MGDB VAM RAC installation.

4.2.1 Directory Tree after MGDB for RAC RPM Installation

The mgdb RPM creates the following directory.

```
/opt/nds/installed/mgdb_rac_cabhe-1.0.0-2
```

Or

```
/opt/nds/installed/mgdb_rac_vam-1.0.0-2
```

The directory structure under this directory will appear as follows.

```
|-- bin
|-- docs
|-- etc
|-- licenses
|-- log -> /var/log/nds/mgdb_rac_cabhe
|-- sql
`-- utils
```

4.2.2 MGDB RAC Configuration File Parameters

The following sections show how to configure MGDB configuration file to run CABHE RAC Database or VAM RAC Database installation.

The file is located in the `etc` directory:

```
File CABHE.config
```

4.2.2.1 Linking RAC Cluster Configuration File

Under /opt/nds/installed/mgdb_rac_cabhe/etc, create a link to
cluster.config.

```
ln -s /opt/nds/ora_cluster/etc/cluster.config cluster.config
```

> **Note** The cluster.config file is located in a different directory and is part of the ora_cluster RPM.

4.3 Running MGDB for RAC Installation

To install a database based on MGDB CABHE or MGDB VAM, run the following script:

```
/opt/nds/installed/mgdb_rac_cabhe<VER>/utils/launcher_cluster.sh CABHE
```

Or:

```
/opt/nds/installed/mgdb_rac_vam<VER>/utils/launcher_cluster.sh VAM
```

> **Note** DATABASE_NAME should not exceed 8 characters. If it exceeds 8 characters the installation process will fail.
> Use capital letters for DATABASE_NAME.

Sample:

```
/opt/nds/installed/mgdb_rac_cabhe<VER>/utils/launcher_cluster.sh CABHE
```

> **Note** This procedure should be performed on the primary node only.

Appendix A   Deploying a VM RAC Pair for RAC Installation

A.1   Download and Deploy a Pair of VM Guests

1. Download VGH5.8.1 VMguest from Blackwidow (Browse Releases > VGH >VGH VM> 5.8.1) and save it to your computer.

2. Use the image to create two VM guests on <u>two separate</u> ESX hosts:

    a. The two guests will be thin provisioned.

    b. Stored on <vmguest> datastore.

    c. Guest 1 VM name: RAC_5.8.1_A

    d. Guest 2 VM name: RAC_5.8.1_B

3. Do not start the guests yet!

A.2   Edit VM Settings NICs and HDDs

Edit the guest settings:

1. Each guest will contain:

    a. Two NICs in this order: NIC1 (eth0) – Network Label of a public network subnet

    b. NIC2 (eth1) – Network Label of a private network subnet

A.2.1   On the First VM Guest

1. **A**dd three additional Hard disks as NEW disks only on the first VMguest

    a. Each add-on disk **MUST** be thick provisioned / eager zero; Independent; persistent;

    b. Disk 1 – 2GB   SCSI-ID 1.0 – Store on Oracle data store

    c. Disk 2 – 60GB   SCSI-ID 1.1 – Store on Oracle data store

    d. Disk 3 - 60GB   SCSI-ID 1.2 - Store on Oracle data store

Note	Modify the size of Disks 2, and 3 according to your needs, in any case it should not be smaller than 60GB and not exceed 2TB.

2. Edit the SCSI Controller 1– Change 'SCSI controller type' to "VMware paravirtual", and 'SCSI bus sharing' to "physical"

3.   Wait for the disks to be provisioned.

A.2.2   On the Second VM Guest

1.   On the second VM, add the <u>two</u> disks but do not select **New**.

2.   Select **Already Exists** and browse the data store. The HDDs will be found
     under the VMguest name for your 1st vmguest (e.g.,
     `Oracledatastore/RAC_5.8.1_A`).

3.   For Disk 1 select SCSI-ID 1.0, for Disk2 select SCSI-ID 1.1 for Disk 3 select
     SCSI-ID 1.2

4.   Edit the SCSI Controller 1– Change 'SCSI controller type' to "paravirtual",
     and 'SCSI bus sharing' to "physical"

A.2.3   Oracle RAC VM guest changes

Note	This section needs to be done on both guests.

Oracle RAC VM guest added disks need additional parameters added to the guest
configuration file.

The Oracle RAC VM Guest must be in a power off state before you can make the
changes.

From your vSphere, or vCenter client highlight your RAC VM guest, right click
the mouse and select "Edit Settings" .
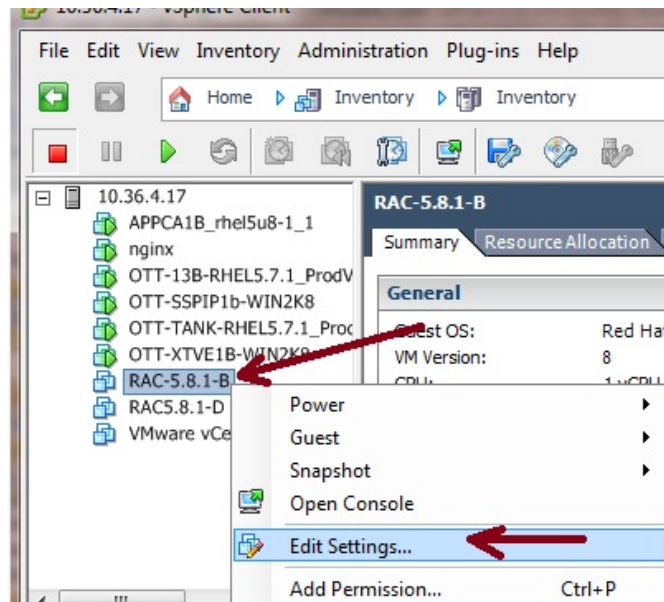
From the "Edit Settings" panel

Go to Options tab, highlight "General" (under Advanced) and select
"Configuration Parameters"
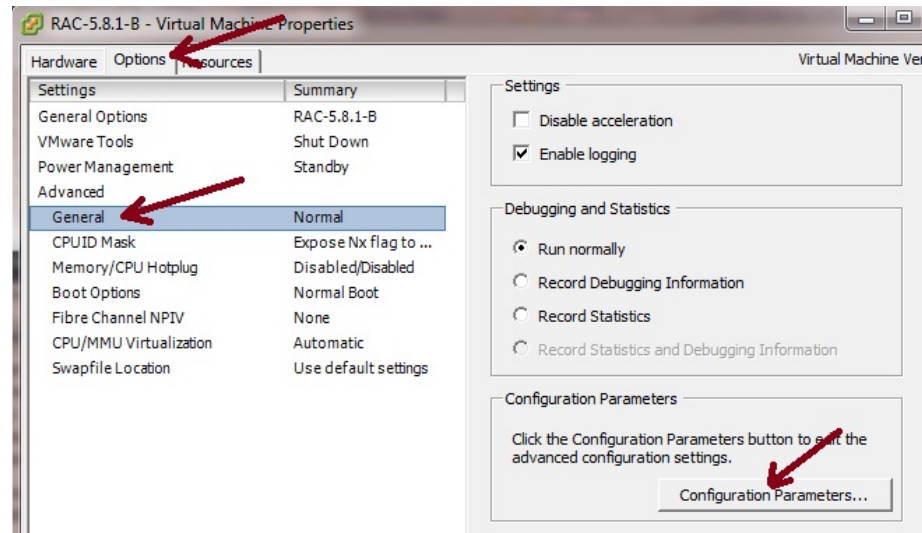
From "Configuration Parameters"

 Select "Add row"

For the "Name" enter scsi1:0.sharing

For the "Value" enter multi-writer
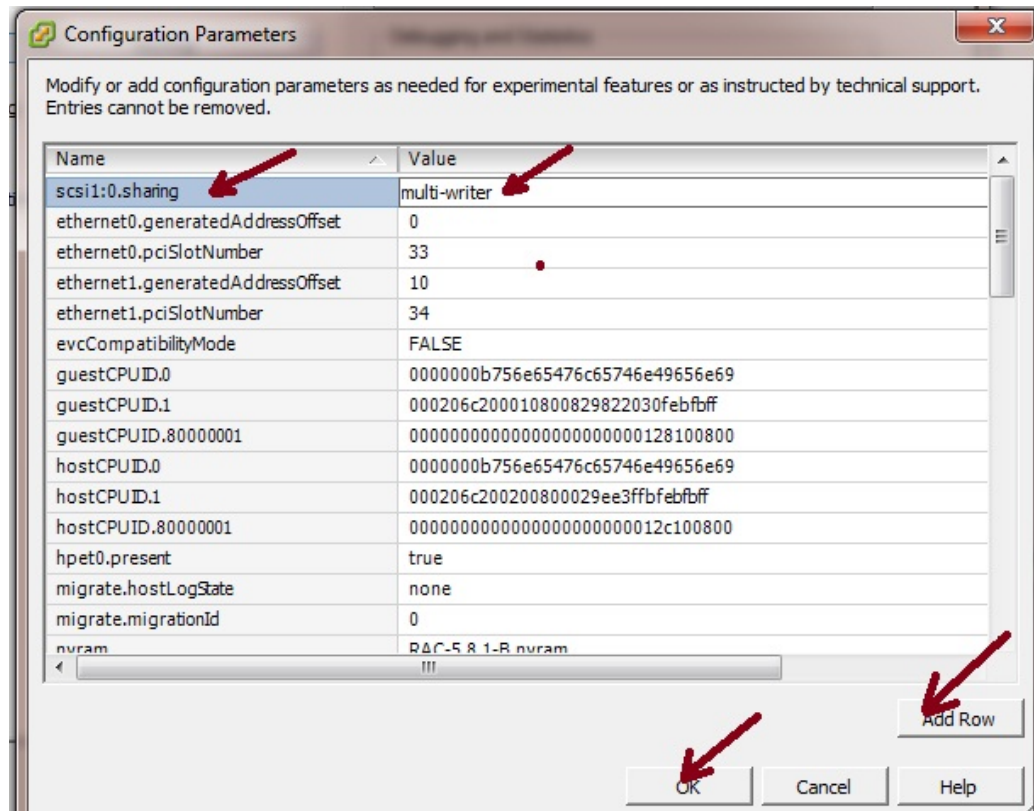
Select OK.

We add three extra disks for the RAC guest. These three disks should be listed as scsi1:0, scsi1:1 and scsi1:2

You will need to repeat "adding rows" to the configuration parameters for the second and third disks

Select "Add row"

For the "Name" enter scsi1:1.sharing

For the "Value" enter multi-writer

Select OK.

From the "Edit properties" Hardware tab verify that SCSI Controller 1 is set to Paravirtual.
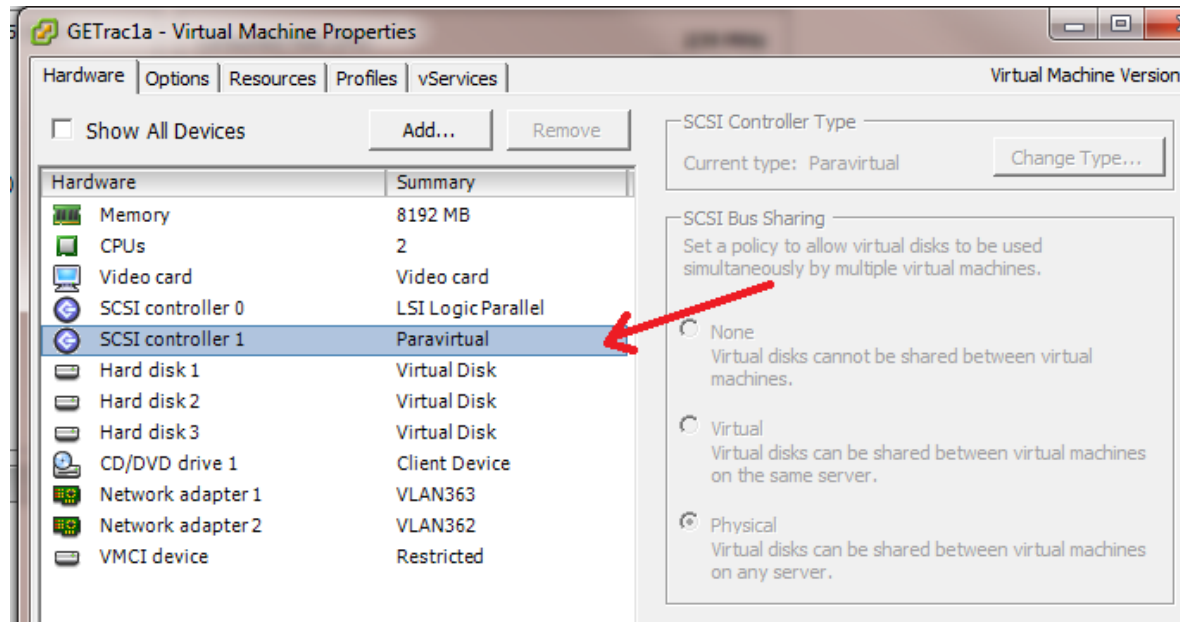
If not, change it.

When all changes are complete, select "OK" on the Edit properties screen.

Don't try to start the guest immediately after selecting "OK" it may take a few minutes for the configuration changes to take effect.

Under 'Recent tasks' of the main vShpere screen you should see:

'Reconfigure Virtual Machine' and next to it the status. When the status is "complete" you can power on the guest.

Note	If when powering up the guests one of them fails to start, this is probably due to missconfuguration of the sharing disks options.

A.3   Configure Network Interfaces

A.3.1   On Both VM Guests [now scripted]

1. Through the vShpere UI, Enter the guest console as root using the credentials supplied to you with VM image.

1. `cd /opt/nds/custom_tools/utils`

2. Run ./provision.sh.

3. Enter hostname, IP, netmask, gateway.

4. service network restart (this will make the guest available to ssh through putty).

5. Edit /etc/hosts on both nodes. The file should include for each of the guests:

    a. Inner CA network IP

    b. RAC scan virtual IP

    c. Additional Virtual IP

    d. Management IP (on the private network subnet)

Example of Full /etc/hosts for the Two Guests

```
#### Inner CA network
10.36.42.1 RACtest1a
10.36.42.2 RACtest1b

#### Oracle RAC for CA segment additional IPs
10.36.42.64     racscan
10.36.42.65     racscan
10.36.42.105    racvip1
10.36.42.104    racvip2
10.36.44.63     rac1mgmt            ### Separate segment
10.36.44.64     rac2mgmt            ### Separate segment

### NTP server
10.63.3.13      ntpprimary casper
10.63.3.13      ntpbackup
```

6. You will need to edit /etc/sysconfig/network-scripts/ifcfg-eth1 to enter the information for the management segment and IP.

7. You will need to create /etc/sysconfig/network-scripts/route-eth1 to include the network address, gateway, and net mask for eth1. Follow this sample file:

```
ADDRESS0=10.36.44.0
GATEWAY0=10.36.44.254
NETMASK0=255.255.255.0
```

8. Edit /etc/sysconfig/network-scripts/ifcfg-eth0 and remove the GATEWAY reference

9. Edit /etc/sysconfig/network and add the GATEWAY reference for eth0. For example:

```
NETWORKING=yes
NETWORKING_IPV6=no
HOSTNAME=RACtest1a
```

```
GATEWAY=10.36.42.254
NOZEROCONF=yes                          <- Add this line too if it's
missing.
```

10. Service network restart.
    Now both eths should be available.

A.4   Time Server on ESX Host

Verify VM time sync to ESX host is disabled on both hosts [To be verified]

From vSphare: click on the host, Configuration Tab, Time Configuration,
Properties.
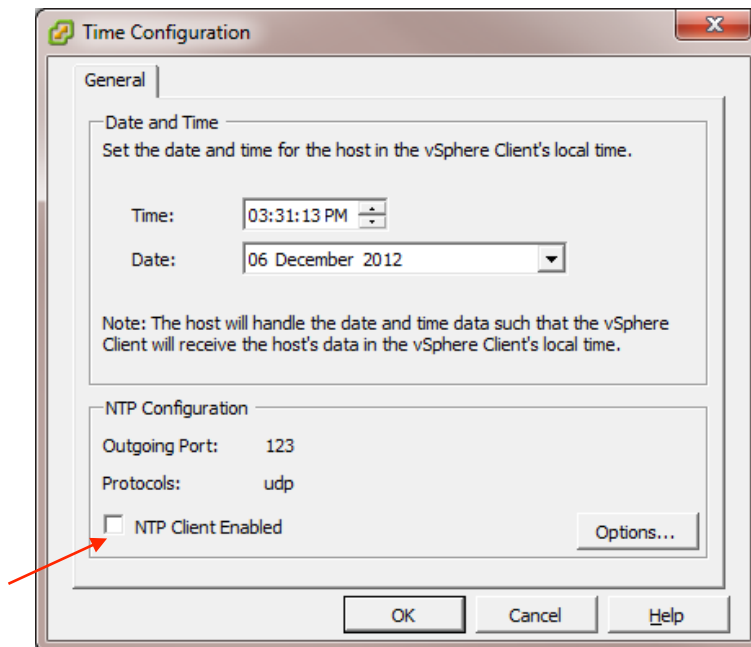
A.5   Allocate HDDs

A.5.1   Only on the First VM Guest

1. Add the disks to the Linux host
   `fdisk /dev/sdb`

2. Create new primary partition (press 'N' for new, then 'P' for primary)

3. Partition number: 1

4. Press ENTER to accept default first and last cylinder (partition size will be the
   whole disk).

   a. You can press 'P' to see and verify what you have configured.

5. Important! Press '**W**' to commit the changes to the disk.

6. Repeat steps 1 through 5 for sdc to create partition `/dev/sdc1`:
    `fdisk /dev/sdc`

7. Issue `fdisk –l` **on both nodes** and verify that both of them can see sdb1 and
    sdc1.

8. Verify that `/dev/sdb1 and /dev/sdb1`   `TYPE (Id)` is 83(linux)
    NOT 8E(lvm).

A.6   Create Group and User for Oracle

On Both VM Guests

1. Create group dba and user oracle:

    a. `groupadd –g 300 dba`

    b. `useradd –g 300 –u 300 oracle`

    c. `password oracle` (set a password for the new oracle user; record this
        password for later)

A.7   Create Key Pairs between the Guests

RAC installation requires ssh-keys set up for both users root and Oracle:

As Root on the First VM Guest

Note	Rreplace <VMRAC1> and <VMRAC2> with the respective hostnames.

1. `ssh-keygen –t rsa`   (press ENTER for each question, to accept
    default values).

    a. This will create a file in `/root/.ssh/id_rsa.pub`.

2. Copy this file to `<RACVM1>:/root/.ssh/<RACVM1>.id_rsa.pub`

3. Do the same on the second node:

    a. `ssh-keygen –t rsa` (press ENTER for each question, to accept default
        values).

    b. This will create a file in `/root/.ssh/id_rsa.pub`.

4. Copy this file to `<RACVM2>:/root/.ssh/<RACVM2>.id_rsa.pub`.

5. `scp <RACVM1>:/root/.ssh/<RACVM1>.id_rsa.pub to`
    `<RACVM2>:/root/.ssh/<RACVM1>.id_rsa.pub`

6. `scp <RACVM2>:/root/.ssh/<RACVM2>.id_rsa.pub to`
    `<RACVM1>:/root/.ssh/<RACVM2>.id_rsa.pub`

On the First VM Guest

1. `cd  /root/.ssh`

2. `cat <RACVM1>.id_rsa.pub > authorized_keys`

3. `cat <RACVM2>.id_rsa.pub >> authorized_keys`

4. `scp authorized_keys <RACVM2>:/root/.ssh`

5. Switch (su) to `user oracle` and repeat the process of creating ssh-keys.

As Oracle on the First VM Guest

> **Note**   Replace <VMRAC1> and <VMRAC2> with the respective hostnames.

1. `ssh-keygen -t rsa` (press ENTER for each question, to accept default values).

   a.   This will create a file in `/home/oracle/.ssh/id_rsa.pub`

2. Copy this file to `<RACVM1>:/home/oracle/.ssh/<RACVM1>.id_rsa.pub`

3. Do the same **on the second node**.

4. `ssh-keygen -t rsa` (press ENTER for each question, to accept default values).

   a.   This will create a file in `/home/oracle/.ssh/id_rsa.pub`.

   b.   Copy this file to `<RACVM2>:/home/oracle/.ssh/<RACVM2>.id_rsa.pub`.

5. `scp <RACVM1>:/home/oracle/.ssh/<RACVM1>.id_rsa.pub to`
   `<RACVM2>:/home/oracle/.ssh/<RACVM1>.id_rsa.pub`

6. `scp <RACVM2>:/home/oracle/.ssh/<RACVM2>.id_rsa.pub to`
   `<RACVM1>:/home/oracle/.ssh/<RACVM2>.id_rsa.pub`

On the First VM Guest

1. `cd  /home/oracle/.ssh`

2. `cat <RACVM1>.id_rsa.pub > authorized_keys`

3. `cat <RACVM2>.id_rsa.pub >> authorized_keys`

4. `scp authorized_keys <RACVM2>:/home/oracle/.ssh`

Last

1. Exit back to root **on the first node**:
   `ssh <RACVM1> date` (yes, we are ssh'ing into the same host) [press RETURN so that `known_hosts` gets updated].

2. `ssh <RACVM2> date`   [press return so that `known_hosts` gets updated].

3. Switch to `User Oracle` on the first node.

4. `ssh <RACVM1> date` (yes, we are ssh'ing into the same host) [press RETURN so that `known_hosts` gets updated].

5. `ssh <RACVM2> date` [press return so that `known_hosts` gets updated].

6. Exit back to root.

On the Second Node:

1. `ssh <RACVM2> date` (yes, we are ssh'ing into the same host) [press RETURN so that `known_hosts` gets updated].

2. `ssh <RACVM1>  date` [press return so that `known_hosts` gets updated].

3. Switch to `user Oracle` on the second node.

4. `ssh <RACVM2>  date` (yes, we are ssh'ing into the same host) [press return so that `known_hosts` gets updated].

5. `ssh <RACVM1>  date` [press return so that `known_hosts` gets updated].
    This will allow either root or Oracle to ssh into any host from any host without password, and Yacov's install will not need to press <ENTER> for each request to update `known_hosts`.

A.8   Host.conf file

On Both VM Guests

Edit the file /etc/host.conf and add the line:
`multi on`

A.9   Set up ntpd

On both VM Guests

1. `ntpdate ntpprimary`

2. `nds_service ntpd add`

3. `nds_service ntpd start`