

# 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 " "

#### Parameter Explanation Example PRIMARY\_HOST PRIMARY\_HOST="RACtest1a" Refers to the First Host name participating in the RAC Cluster. SECONDARY\_HOST="RACtest1b" SECONDARY\_HOST Refers to the Second Host name participating in RAC Cluster. SCAN\_NAME SCAN\_NAME="racscan" Name of Virtual IP for SCAN LISTENER. This SCAN NAME holds two IP Addresses. SCAN\_PORT="1535" SCAN\_PORT Port number for SCAN LISTENER. PRIMARY\_VIRTUAL\_NAME="racvip1" PRIMARY\_VIRTUAL\_NAME Virtual Name that answers Primary Virtual IP Host.

#### Table 1 Configuration File Parameters

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 two separate 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. Add 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 two disks but do not select New.
- Select Already Exists and browse the data store. The HDDs will be found under the VMguest name for your 1<sup>st</sup> 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.

Name .	Value
scsi1:0.sharing	multi-writer 🎽
thernet0.generatedAddressOffset	0
thernet0.pciSlotNumber	33
ethernet1.generatedAddressOffset	10
thernet1.pciSlotNumber	34
evcCompatibilityMode	FALSE
guestCPUID.0	000000b756e65476c65746e49656e69
guestCPUID.1	000206c200010800829822030febfbff
guestCPUID.80000001	0000000000000000000128100800
nostCPUID.0	000000b756e65476c65746e49656e69
nostCPUID.1	000206c200200800029ee3ffbfebfbff
nostCPUID.80000001	0000000000000000000012c100800
npet0.present	true
migrate.hostLogState	none
migrate.migrationId	0
vram	RAC-5.8.1-B nyram

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.

5	💋 GE	Trac1a - Virtual Machine Prope	rties			
L	Hardy	ware Options Resources Profi	les VServices	Virtual Machine Version		
l		Show All Devices	Add Remove	SCSI Controller Type		
Hardware		dware	Summary			
L	110	Memory	8192 MB	SCSI Bus Sharing		
L		CPUs	2	Set a policy to allow virtual disks to be used		
L		Video card	Video card	simultaneously by multiple virtual machines.		
h	0	SCSI controller 0	LSI Logic Parallel			
L	O	SCSI controller 1	Paravirtual	V None Virtual diska capped be obared between virtual		
L		Hard disk 1	Virtual Disk	machines.		
L		Hard disk 2	Virtual Disk			
		Hard disk 3	Virtual Disk	C Virtual		
		CD/DVD drive 1	Client Device	virtual disks can be shared between virtual machines on the same server.		
ł	<b>1</b> 20	Network adapter 1	VLAN363			
L	<b>1</b> 2	Network adapter 2	VLAN362	Physical		
		VMCI device	Restricted	Virtual disks can be shared between virtual machines on any server.		

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.
- 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
10.36.44.64 rac2mgmt
                                     ### Separate segment
                                      ### 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.
- 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
missing.
```

<- Add this line too if it's

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.

7 Time Configuration							
General							
Date and Time Set the date and time for the host in	n the vSphere Client's local time.						
Time: 03:31:13 PM ÷							
Date: 06 December 20	12 💌						
Client will receive the host's data in the vSphere Client's local time.							
Outgoing Port: 123							
Protocols: udp							
NTP Client Enabled	Options						
	OK Cancel Help						

# A.5 Allocate HDDs

## A.5.1 Only on the First VM Guest

- 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 -1 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.
- 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
- 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.

#### On the First VM Guest

- 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

- 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