FlashGrid

Reference Architecture and Deployment Guide for Highly Available Oracle E-Business Suite in AWS

rev. 18.06-2018.07.25

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1 Introduction

Running highly available Oracle E-Business Suite in AWS requires having the database tier based on Oracle Real Application Clusters (RAC). FlashGrid Cloud Area Network software and FlashGrid Storage Fabric software enable running Oracle RAC clusters in AWS cloud. FlashGrid Cloud Provisioning simplifies the deployment process by automating configuration of multiple components required for an Oracle RAC cluster, including Grid Infrastructure.

Oracle RAC has the following infrastructure requirements that are not directly available in AWS:

- Shared high-performance storage accessible from all database nodes
- Multicast enabled network between all database nodes
- Separate networks for different types of traffic: client, cluster interconnect, and storage

FlashGrid Storage Fabric™ and FlashGrid Cloud Area Network™ software address these requirements and enable running highly available Oracle E-Business Suite clusters with Oracle RAC database in AWS.

This document provides architectural overview of the solution and step-by-step instructions for system and database administrators deploying Oracle E-Business Suite in AWS. Additional information about running Oracle RAC in AWS is available in the following white paper: *"Mission-Critical Databases in the Cloud. Oracle RAC on Amazon EC2 Enabled by FlashGrid®."*

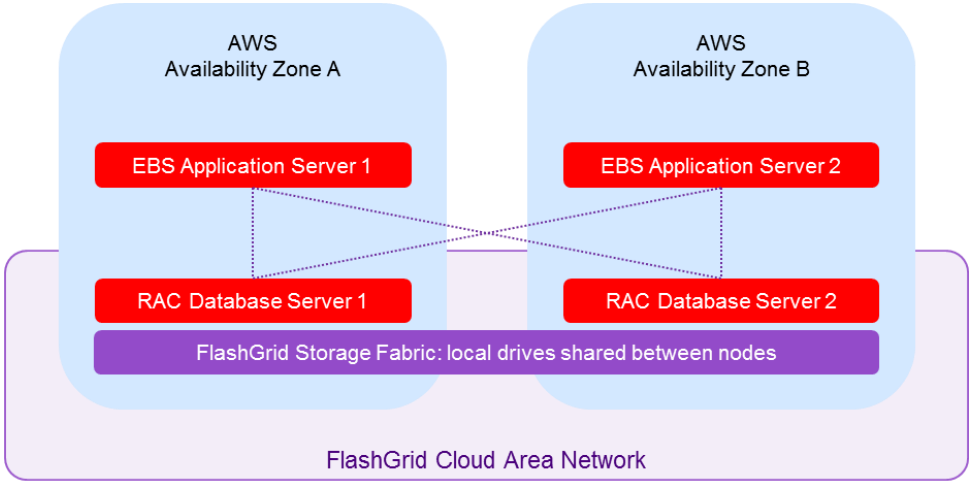


Figure 1. EBS cluster with 2 DB nodes and 2 APP nodes. (Quorum node not shown)

2 Architecture Highlights

- FlashGrid Cloud Area Network™ enables high-speed overlay networks with multicast and virtual IP support for transparent connectivity between the database and app tier nodes.
- FlashGrid Storage Fabric turns local drives (elastic block storage or local instance-store SSDs) into shared drives accessible from all nodes in the cluster
- FlashGrid Read-Local™ Technology minimizes network overhead by serving reads from local drives
- 2-way or 3-way mirroring of data across separate nodes or Availability Zones
- Oracle ASM and Clusterware provide data protection and availability

3 Supported Cluster Configurations

The FlashGrid architecture enables variety of EBS cluster configurations in AWS. This document focuses on a configuration with two database nodes and two app tier nodes. However, the architecture can be extended to a larger number of nodes. Two or three node database tier clusters are recommended in most cases. Clusters with four or more database nodes can be used for extra HA or performance. Nodes of a cluster can be in one availability zone or can be spread across availability zones.

4 Compatibility

The following versions of software are covered in this guide:

- Oracle E-Business suite 12.2
- Oracle Grid Infrastructure: ver. 12.2.0.1 with April'18 Release Update
- Operating System: Oracle Linux 7
- FlashGrid Storage Fabric: ver. 18.06
- FlashGrid Cloud Area Network: ver. 18.03

The solution can be deployed on the following Amazon EC2 instance types: M4, M5, R4, i3, X1, X1E.

5 Deployment Steps

5.1 Getting Access to FlashGrid AMI

To be able to create cluster your AWS account must have a subscription to a FlashGrid AMI via AWS Marketplace. FlashGrid AMIs are based on either Oracle Linux 7 or RHEL 7. Please contact your FlashGrid representative if you need to customize the AMI.

To get access to the FlashGrid AMI

1. Open FlashGrid product page at AWS Marketplace
2. Click ***Continue*** button
3. Select ***Manual Launch*** tab
4. Click ***Accept Software Terms*** button

5.2 Uploading Oracle Installation Files to S3

During cluster provisioning Oracle installation files will be downloaded from an S3 bucket. The following files must be placed in the S3 bucket:

- oracle-instantclient12.2-basic-12.2.0.1.0-1.x86_64.rpm
- linuxx64_12201_grid_home.zip
- p27468969_122010_Linux-x86-64.zip (GI APR 2018 RELEASE UPDATE 12.2.0.1.180417. Requires Oracle support subscription.)
- p6880880_122010_Linux-x86-64.zip (OPatch patch, Release: OPatch 12.2.0.1.0, Platform: Linux x86-64. Requires Oracle support subscription.)

Two options are available for allowing access to the files in the S3 bucket for the cluster node instances:

- Enabling public access to each file for the duration of cluster provisioning

OR

- Assigning the cluster node instances an IAM role that has permissions for accessing files in the bucket

To allow public access to the files in S3

1. Create an S3 bucket/folder for uploading the installation files
2. Upload the required files to the S3 bucket/folder
3. In S3 Management Console navigate to the bucket and the folder to see the list of files
4. Select all files
5. Click ***More*** -> ***Make Public***
6. You can disable public access after the cluster completes initialization

To use an IAM role for access to the files in S3

1. Create an S3 bucket/folder for uploading the installation files
2. Upload the required files to the S3 bucket/folder
3. In IAM Management Console create a new policy named ***GetOracleFilesFromS3*** that allows *s3:GetObject* action on all uploaded files. See an example below.
4. In IAM Management Console create a new role named ***GetOracleFilesFromS3*** and attach the ***GetOracleFilesFromS3*** policy to it.
5. Use the ***GetOracleFilesFromS3*** role when configuring cluster parameters in the FlashGrid Cloud Provisioning tool.

Example of an IAM policy:

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Sid": "Stmt1508867055000",
            "Effect": "Allow",
            "Action": [
                "s3:GetObject"
            ],
            "Resource": [
                "arn:aws:s3:::mybucket/mydirectory/*"
            ]
        }
    ]
}
```

5.3 Preparing the VPC

When creating a new cluster you have two options:

- **Automatically create a new VPC.**
  This option is usually used for test clusters isolated in their own sandbox VPCs. A VPC will be created together with the required subnets, placement group(s), and security groups. By default the VPC will be created with CIDR 10.100.0.0/16

- **Create the cluster in an existing VPC.**
  This option is used for majority of production deployments where other systems (e.g. app servers) share the same VPC as the cluster. You will need to provide the VPC ID in the Cloud Provisioning tool and subnet IDs and security group IDs in the CloudFormation Manager.

If using an existing VPC then make sure that the following pre-requisites are met before creating a cluster:

- The VPC has a subnet in each of the availability zones used for the cluster nodes.
- The VPC has an S3 endpoint configured (required unless public IPs can be enabled for access to S3)
- The VPC has a security group with the following ports open for inbound traffic:
    - UDP ports 4801, 4802, 4803 between any members of the security group
    - TCP ports 1521, 1522, 1528 for SCAN and Local Listener access to the database nodes from app servers and other database clients. These are default port numbers that can be changed in the Cloud Provisioning tool.
    - TCP port 22 for SSH access to the cluster nodes
    - TCP port 5901 if you choose to use VNC for running Oracle tools in GUI mode
- Create a *Spread Placement Group* that will be used for the VM instances. The use of the spread placement group is not required only if each VM is placed in a separate availability zone, e.g. 2 db nodes + 1 quorum node across three AZs, or 3 db nodes + 2 quorum nodes across five AZs. It is required in all other cases to guarantee that all nodes are running on separate physical hosts.

5.4 Creating cluster with CloudFormation

The FlashGrid Cloud Provisioning tool simplifies provisioning of Oracle Grid Infrastructure cluster by automating the following tasks:

- Creating and configuring EC2 VPC, subnets, security group (optional)
- Creating EC2 instances for database, quorum, and app tier nodes
- Creating EBS volumes
- Installing and configuring FlashGrid Cloud Area Network
- Installing and configuring FlashGrid Storage Fabric
- Installing and patching Oracle Grid Infrastructure software
- Configuring Grid Infrastructure cluster
- Creating ASM disk groups

To create a cluster

7. Log in to AWS Management Console with a user account that has the following privileges:
    - AWSCloudFormationFullAccess
    - AmazonEC2FullAccess
    - AmazonVPCFullAccess (required only if creating a new VPC)
8. Open FlashGrid Cloud Provisioning tool for EBS: https://1806.cloudprov.flashgrid.io/upload?s3_file=18.06/AWS-2nodes-for-EBS-Marketplace.cfg
9. Configure parameters of the cluster
10. Click *Verify* button
11. If verification passes then click *Create Cluster* button, which will take you to AWS CloudFormation Manager
12. Click *Next*
13. Select your SSH key
14. If using an existing VPC, then select a spread placement group, subnet(s), and security group.
15. Click *Next*
16. Click *Next* (if you added tags at the cluster configuration page then do not add the same tags in CloudFormation Manager)
17. Click *Create*
18. Wait until the status of the stack changes to *CREATE_COMPLETE*
19. If creating the stack fails:
    a) Check for the cause of the failure on the *Events* tab
    b) Correct the cause of the error
    c) Delete the failed stack

d) Repeat the steps for creating a new stack

20. Get IP addresses of the newly launched instances on the *Outputs* tab
21. SSH to the first (as it was specified on the cluster configuration page) cluster node as user fg@
22. If the cluster initialization is still in progress or failed then you will see a corresponding welcome message. If there is no welcome message then the cluster initialization has completed successfully.
23. Wait for cluster initialization (including Oracle software installation and configuration) to complete. You will receive a broadcast message when initialization completes or fails. Cluster initialization takes approximately 90 minutes.

5.5 Verifying cluster health

On any of the cluster nodes run `flashgrid-cluster` command to verify that the cluster status is *Good* and all checks are passing.

```
[fg@rac1 ~]$ flashgrid-cluster
FlashGrid 18.06.29.46032 #95f2b5603f206af26482ac82386b1268b283fc3c
License: via Marketplace Subscription
Support plan: 24x7
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
FlashGrid running: OK
Clocks check: OK
Configuration check: OK
Network check: OK

Querying nodes: quorum, rac1, rac2 ...

Cluster Name: myrac
Cluster status: Good
-------------------------------------------------------------
Node    Status  ASM_Node  Storage_Node  Quorum_Node  Failgroup
-------------------------------------------------------------
rac1    Good    Yes       Yes           No           RAC1
rac2    Good    Yes       Yes           No           RAC2
racq    Good    No        No            Yes          QUORUM
-------------------------------------------------------------
-------------------------------------------------------------------------------------------------------------
GroupName  Status  Mounted   Type    TotalMiB  FreeMiB  OfflineDisks  LostDisks  Resync  ReadLocal  Vote
-------------------------------------------------------------------------------------------------------------
GRID       Good    AllNodes  NORMAL  12588     3376     0             0          No      Enabled    3/3
DATA       Good    AllNodes  NORMAL  2048000   2048000  0             0          No      Enabled    None
FRA        Good    AllNodes  NORMAL  1024000   1024000  0             0          No      Enabled    None
-------------------------------------------------------------------------------------------------------------
```

5.6 OS User Accounts

During cluster initialization the following OS user accounts are created:

- *fg* - the user account used to SSH to the VMs with the SSH key that was selected when creating the cluster configuration. It can also be used for running FlashGrid Storage Fabric or FlashGrid Cloud Area Network utilities. The user *fg* has sudo rights.
- *grid* - Grid Infrastructure owner. GI environment variables are preconfigured.
- *oracle* - Database home owner. Database environment variables, except ORACLE_SID and ORACLE_UNQNAME, are preconfigured. After creating a database you can configure ORACLE_SID and ORACLE_UNQNAME by editing `/home/oracle/.bashrc` file on each database node.

Note that no passwords are configured for any users. Also password-based SSH authentication is disabled in `/etc/ssh/sshd_config`. Key-based authentication is recommended for better security. Creating passwords for any user is not recommended.

User *fg* has sudo rights and allows switching to any other user without requiring a password (which is not configured by default). Example:

```
$ sudo su - grid
```

Users *fg*, *grid*, and *oracle* have key-based SSH access configured between the nodes of the cluster. The corresponding key pairs are generated automatically during cluster initialization. For example, if you are logged in to *node1* as user *fg* then you can SSH into *node2* by simply running `'ssh node2'` without entering a password or providing a key.

5.7 Changing ASM passwords

A temporary password for ASM users SYS and ASMSNMP is configured during cluster initialization. The temporary password is "*MyPassword2017*". Use the following commands to set new password(s):

```
$ sudo su - grid
$ sqlplus / as sysasm
SQL> alter user sys identified by "MyNewPassword";
SQL> alter user asmsnmp identified by "MyNewPassword";
```

5.8 Preparing DB Nodes for EBS Installation

Perform the following tasks on each of the database nodes.

1. Add entries in /etc/hosts corresponding to each database node's *fg-pub* IP (192.168.1.x subnet) and App node's VPC Private IP using the following format:

   ```
   [ip_address] [node_name].[domain_name] [node_name]
   ```

   Example:

   ```
   192.168.1.1 rac1.example.com rac1
   192.168.1.2 rac2.example.com rac2

   10.100.100.101 app1.example.com app1
   10.100.100.102 app2.example.com app2
   ```

2. Modify iptables
   - on DB node 1:
     `-A PREROUTING -i eth0 -p tcp -m tcp --dport 1528 -j DNAT --to-destination 192.168.1.1`
   - on DB node 2:
     `-A PREROUTING -i eth0 -p tcp -m tcp --dport 1528 -j DNAT --to-destination 192.168.1.2`

3. Restart iptables service:

   ```
   # systemctl restart iptables.service
   ```

4. Add one of the following lines to /etc/oratab file:
   - on DB node 1:
     `+ASM1:/u01/app/12.2.0/grid:N`
   - on DB node 2:
     `+ASM2:/u01/app/12.2.0/grid:N`

5. Install rpms for EBS:

```
# yum install -y --enablerepo=ol7_addons oracle-ebs-server-R12-preinstall
# ldconfig -v
```

6. Create a directory for EBS installation:

```
# mkdir /ebs/Install
# chown -R oracle:oinstall /ebs
# chmod -R 775 /ebs
```

7. Modify the following entry in /etc/security/limits.conf:

```
oracle hard memlock unlimited
```

8. On DB nodes only, add user *oracle* to *asmadmin* group:

```
# usermod -a -G asmadmin oracle
```

5.9 Preparing App Nodes for EBS Installation

1. Launch App node instances using the same FlashGrid AMI used for the database nodes. Place the App nodes in the same VPC used for the DB nodes or in a peered VPC.

2. Add HOSTNAME, DOMAINNAME, and 'NOZEROCONF=yes' parameters in /etc/sysconfig/network. Example:

```
# cat /etc/sysconfig/network
HOSTNAME=app1
DOMAINNAME=example.com
NOZEROCONF=yes
```

3. Add entries in /etc/hosts corresponding to each DB and App node's VPC Private IP using the following format:

```
[ip_address] [node_name].[domain_name] [node_name]
```

Example:

```
10.100.0.1 rac1.example.com rac1
10.100.0.2 rac2.example.com rac2

10.100.0.101 app1.example.com app1
10.100.0.102 app2.example.com app2
```

4. Add records on the DNS servers used by the App nodes

On the DNS server(s) used by clients, for each database node add two records resolving to the VPC Private IP address of the node VM:

- Hostname of the database node
- SCAN address

Example for a 2-node cluster:

```
rac1.example.com 10.100.0.1
rac2.example.com 10.100.0.2
```

```
myrac-scan.example.com 10.100.0.1
myrac-scan.example.com 10.100.0.2
```

5. Install rpms for EBS:

```
# yum install -y --enablerepo=ol7_addons oracle-ebs-server-R12-preinstall
# ldconfig -v
```

6. On APP nodes only, add 300G size disk and create a filesystem for EBS installation:

```
# pvcreate /dev/xvdz
# vgcreate ebs_vg /dev/xvdz
# lvcreate -l 100%FREE ebs_vg
# mkfs -t ext4 /dev/ebs_vg/lvol0
# mkdir /ebs
# mount /dev/ebs_vg/lvol0 /ebs
```

7. On APP nodes only, add mount point in /etc/fstab:

```
/dev/ebs_vg/lvol0 /ebs ext4 defaults 0 0
```

8. Create a directory for EBS installation:

```
# mkdir /ebs/Install
# chown -R oracle:oinstall /ebs
# chmod -R 775 /ebs
```

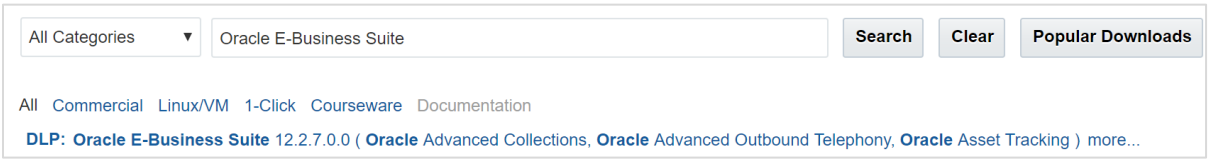
5.10 Opening Network Access between App and DB Nodes

1. Make sure that ICMP traffic is open between DB and App servers in the corresponding AWS security group settings.

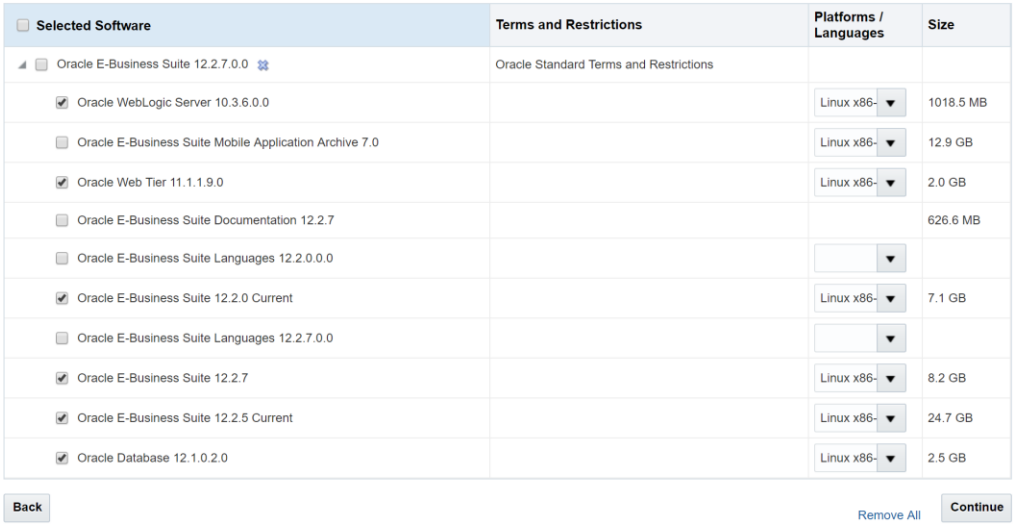
2. Make sure TCP ports 1521, 1522, and 1528 are open from App to DB servers in the corresponding AWS security group settings.

5.11 Downloading EBS software

1. Open https://edelivery.oracle.com/:
2. In search box enter: "**Oracle E-Business Suite 12.2.7.0.0"**



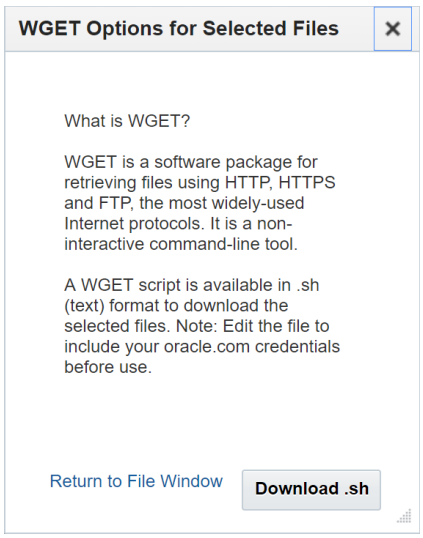
3. Select the required components, select Linux x86_64 platform, and click *Continue*:



4. Agree to the license terms and continue:

5. Click on **WGET options**:

6. Click ***Download .sh*** button in the popup window:

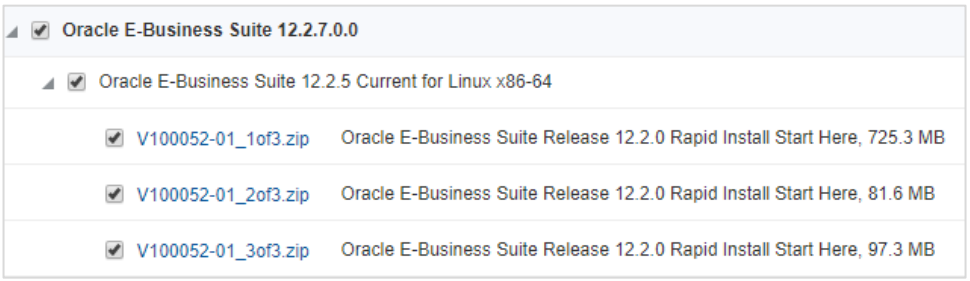


1. Place the *wget.sh* file in /ebs/Install directory on the first DB node (e.g. *rac1*) and on the first App node (e.g. *app1*) and run it to download the files using your Oracle account:

```
# chmod 777 /ebs/Install/wget.sh
# chown -R oracle:oinstall /ebs
# sudo su - oracle
$ cd /ebs/Install
$ ./wget.sh
SSO User Name:myname@mycompany.com
SSO Password:
```

Note: After entering password, press Enter twice.

2. When download is finished, unzip parts of StartHere CD on the first database node and the first app node. Names of zip files that contain startCD can be identified from the download page:




```
$ cd /ebs/Install
$ unzip V100052-01_"*".zip
$ chmod -R 777 /ebs/Install
```

5.12 Installing EBS Database Tier

5.12.1 Create stage area on the first database node (e.g. rac1)

```
[oracle@rac1 ~]$ cd /ebs/Install/startCD/Disk1/rapidwiz/bin/
[oracle@rac1 ~]$ ./buildStage.sh
Press Enter to continue...

                     Build Stage Menu
   ------------------------------------------------------
   1.     Create new stage area
   2.     Copy patches to existing stage area
   3.     List files in TechPatches directory
   4.     Exit menu

   Enter your choice [4]: 1

         Rapid Install Platform Menu
   ------------------------------------------------------
   1.    Oracle Solaris SPARC (64-bit)
   2.    Linux x86 (64-bit)
   3.    IBM AIX on Power Systems (64-bit)
   4.    HP-UX Itanium
   5.    Exit Menu

   Enter your choice [5]: 2

Running command:
…
Specify the directory containing the zipped installation media:
/ebs/Install
…
------------------------------------------------------
 1.     Create new stage area
 2.     Copy patches to existing stage area
 3.     List files in TechPatches directory
 4.     Exit menu

 Enter your choice [4]: 4
```

5.12.2 Patch adrun12c.sh script

According to Doc 2041374.1, Grid Infrastructure version 12.1 has the bug 16875041 when using connection pooling. As a result, during the installation script adrun12c.sh hangs waiting for the following command to complete:

```
sh -c "asmcmd ls $DATAFILES"
```

To avoid this bug during the installation, backup and patch the **adrun12c.sh** script on the first database node (e.g. *rac1*):

```
$ cp /ebs/Install/startCD/Disk1/rapidwiz/template/adrun12c.sh
/ebs/Install/startCD/Disk1/rapidwiz/template/adrun12c_backup.sh

$ sed -i -e 's/asmcmd/asmcmd --nocp/g'
/ebs/Install/startCD/Disk1/rapidwiz/template/adrun12c.sh
```

5.12.3 Patch rapidwiz template file to avoid NTP check error

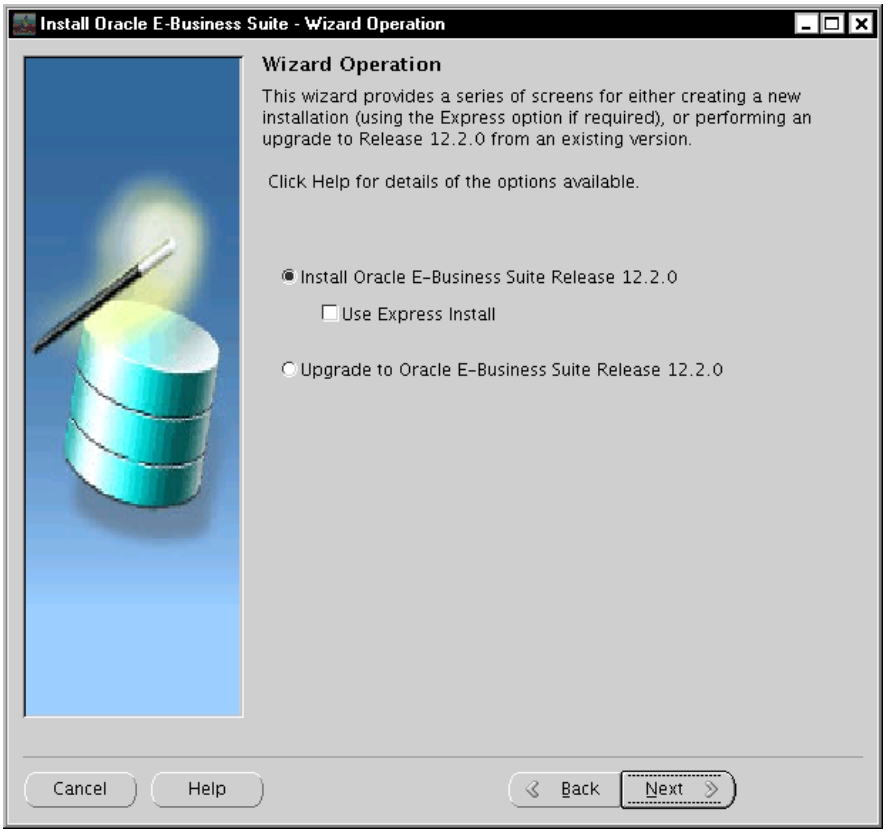
CHRONYD service is installed instead of NTPD for NTP synchronization. This patch prevents NTP check failure.

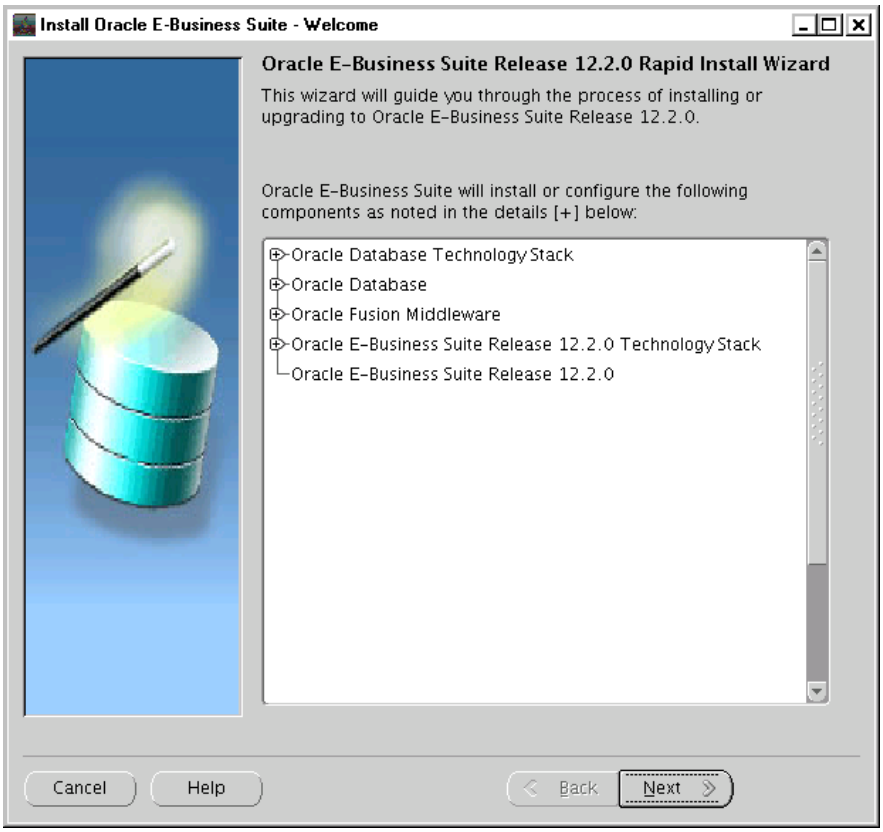
```
# cp /ebs/Install/startCD/Disk1/rapidwiz/TechInstallers/DBInstallHome/fnd/admin/template/txkCfgDB12cR1_tmpl.xml
/ebs/Install/startCD/Disk1/rapidwiz/TechInstallers/DBInstallHome/fnd/admin/template/txkCfgDB12cR1_tmpl_backup.xml

# sed -i -e 's/ignoreSysPrereqs/ignoreSysPrereqs -ignorePrereq/g'
/ebs/Install/startCD/Disk1/rapidwiz/TechInstallers/DBInstallHome/fnd/admin/template/txkCfgDB12cR1_tmpl.xml
```

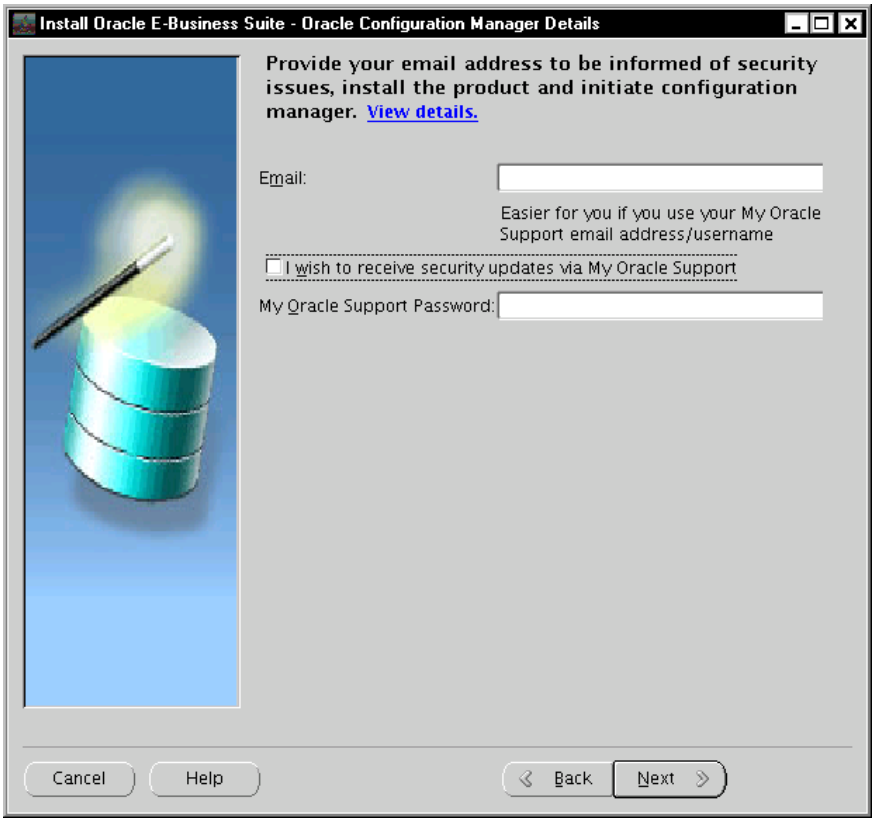
5.12.4 Run rapidwiz

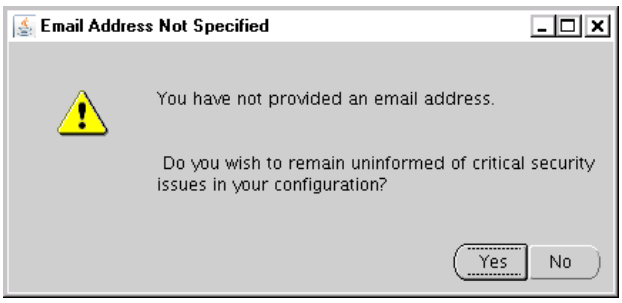
Configure X11 Forwarding, run rapidwiz on the first database node (e.g. *rac1*), and select options according to the screenshots below:

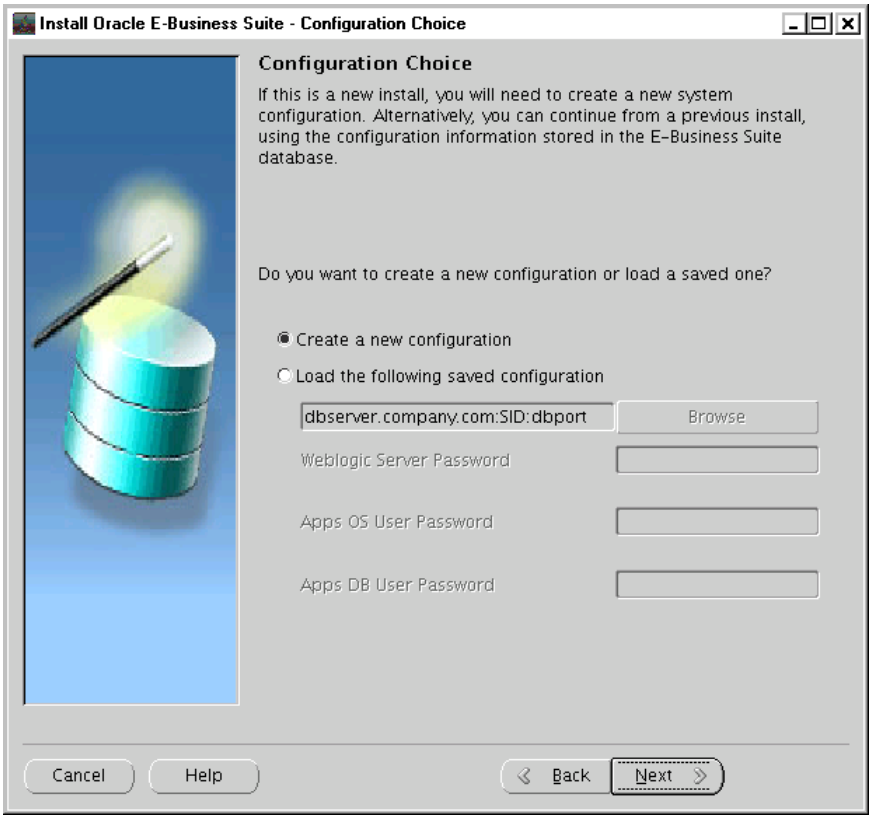
```
[oracle@rac1~]$ /ebs/Install/startCD/Disk1/rapidwiz/rapidwiz
```




Install Oracle E-Business Suite - Welcome
Oracle E-Business Suite Release 12.2.0 Rapid Install Wizard
This wizard will guide you through the process of installing or upgrading to Oracle E-Business Suite Release 12.2.0.
Oracle E-Business Suite will install or configure the following components as noted in the details [+] below:
Oracle Database Technology Stack
Oracle Database
Oracle Fusion Middleware
Oracle E-Business Suite Release 12.2.0 Technology Stack
Oracle E-Business Suite Release 12.2.0
Cancel
Help
Back
Next

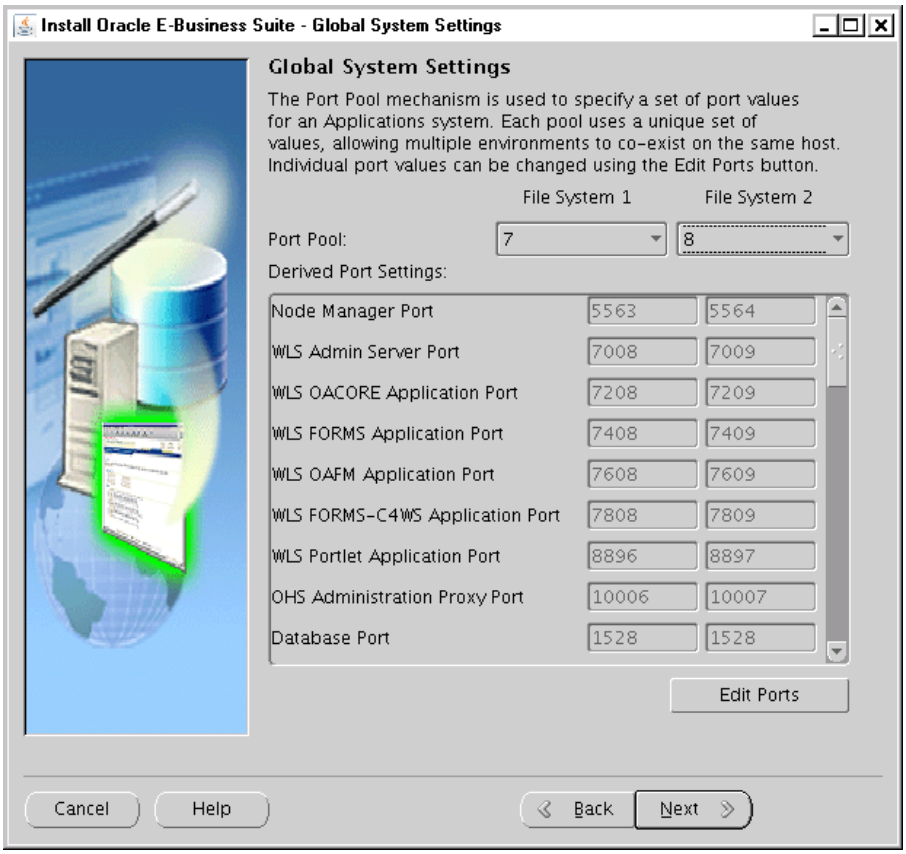

Install Oracle E-Business Suite - Oracle Configuration Manager Details
Provide your email address to be informed of security issues, install the product and initiate configuration manager. View details.
Email:
Easier for you if you use your My Oracle Support email address/username
I wish to receive security updates via My Oracle Support
My Oracle Support Password:
Cancel
Help
Back
Next

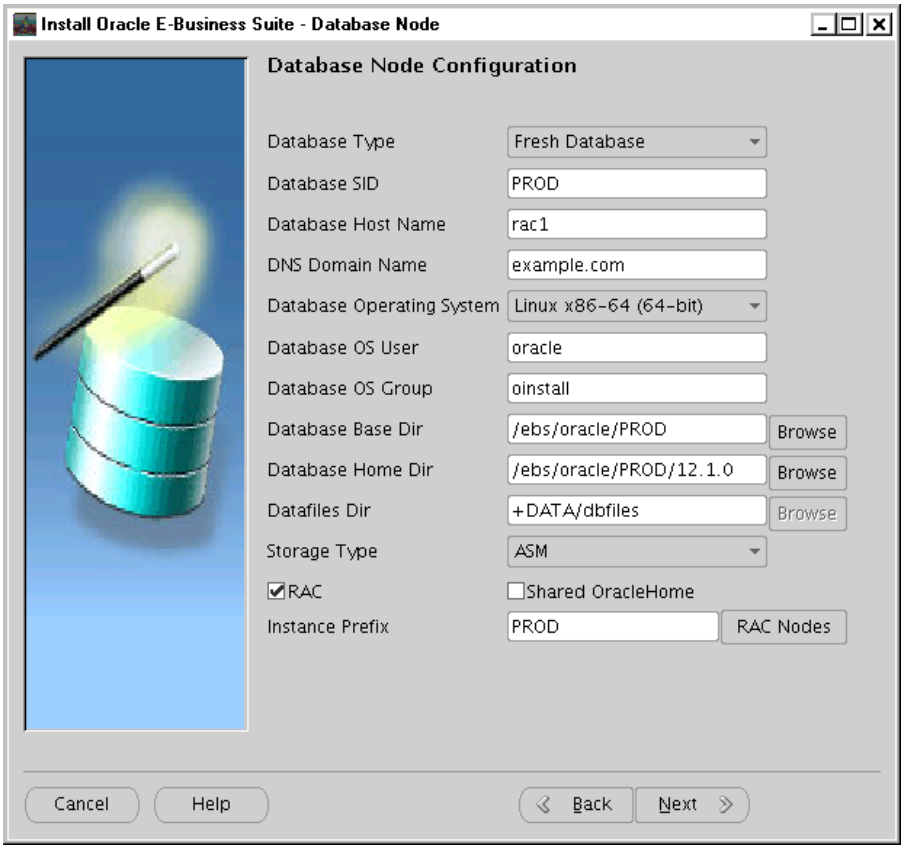


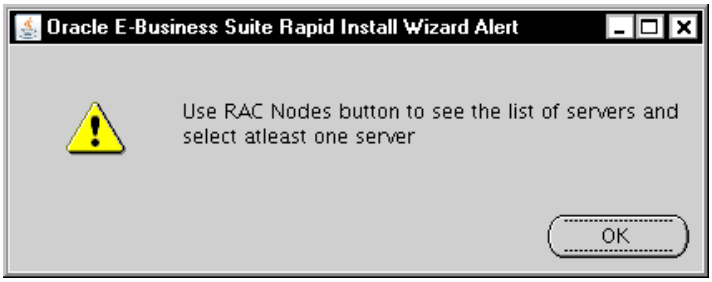


Note: At the port selection screen check that the database port (in our case 1528) is available on each DB node. The following command must return empty results on **each DB node**:

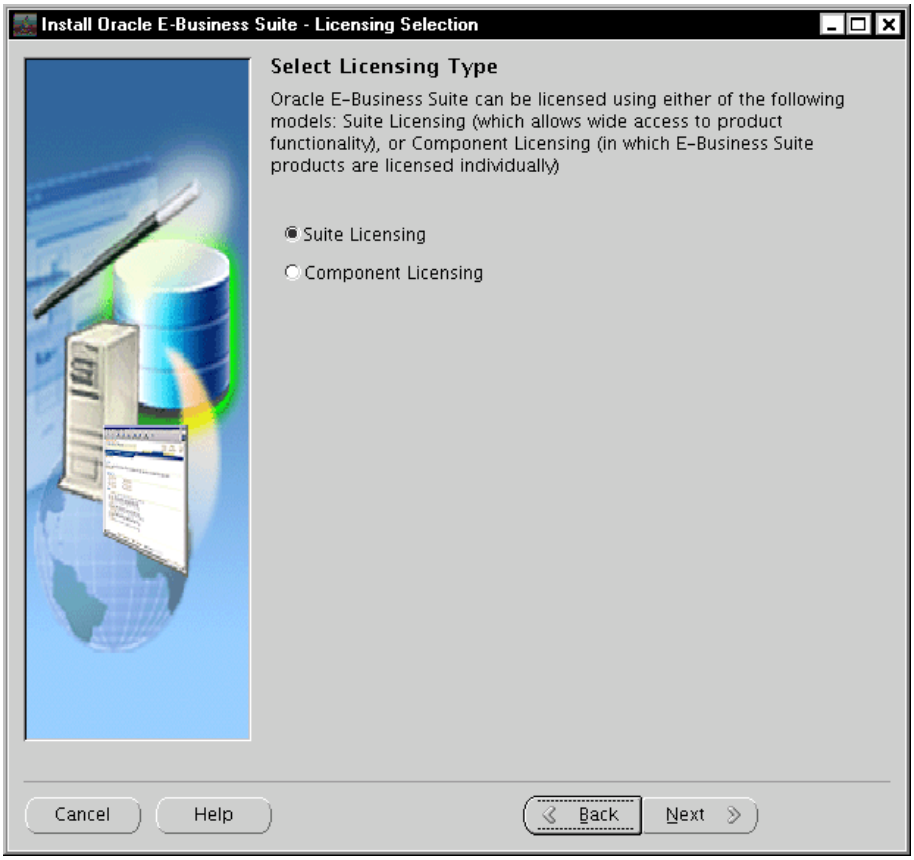
```
# netstat -nltp|grep 1528
```

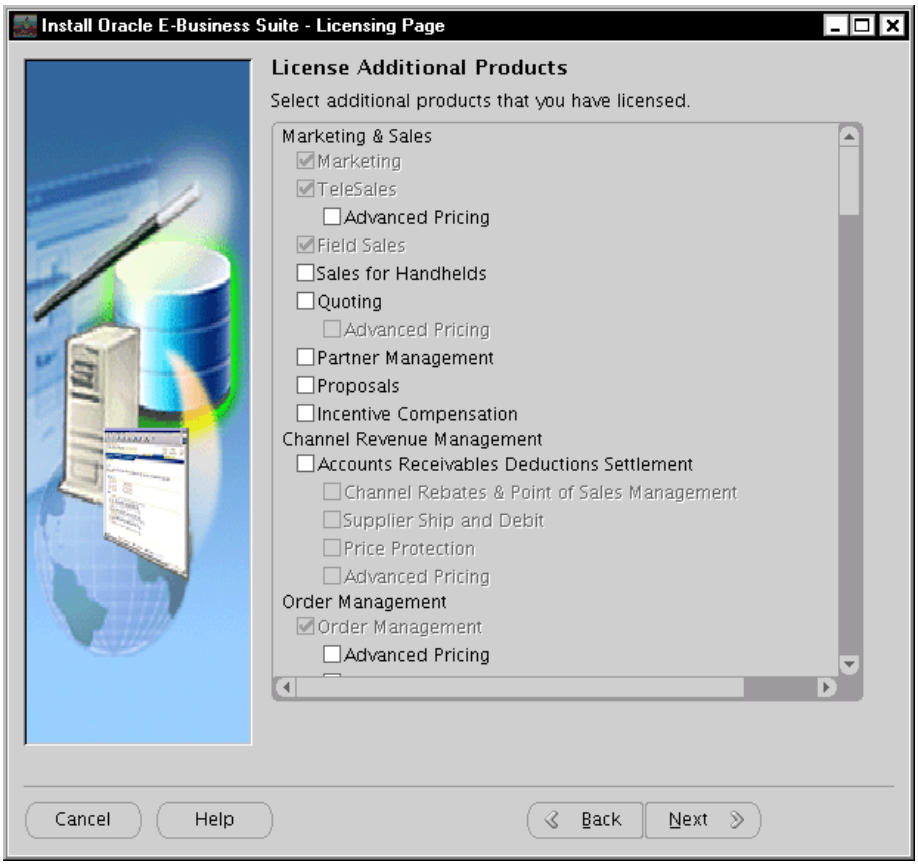

Install Oracle E-Business Suite - Global System Settings
Global System Settings
The Port Pool mechanism is used to specify a set of port values for an Applications system. Each pool uses a unique set of values, allowing multiple environments to co-exist on the same host. Individual port values can be changed using the Edit Ports button.
File System 1
File System 2
Port Pool:
7
8
Derived Port Settings:
Node Manager Port 5563 5564
WLS Admin Server Port 7008 7009
WLS OACORE Application Port 7208 7209
WLS FORMS Application Port 7408 7409
WLS OAFM Application Port 7608 7609
WLS FORMS-C4WS Application Port 7808 7809
WLS Portlet Application Port 8896 8897
OHS Administration Proxy Port 10006 10007
Database Port 1528 1528
Edit Ports
Cancel
Help
Back
Next

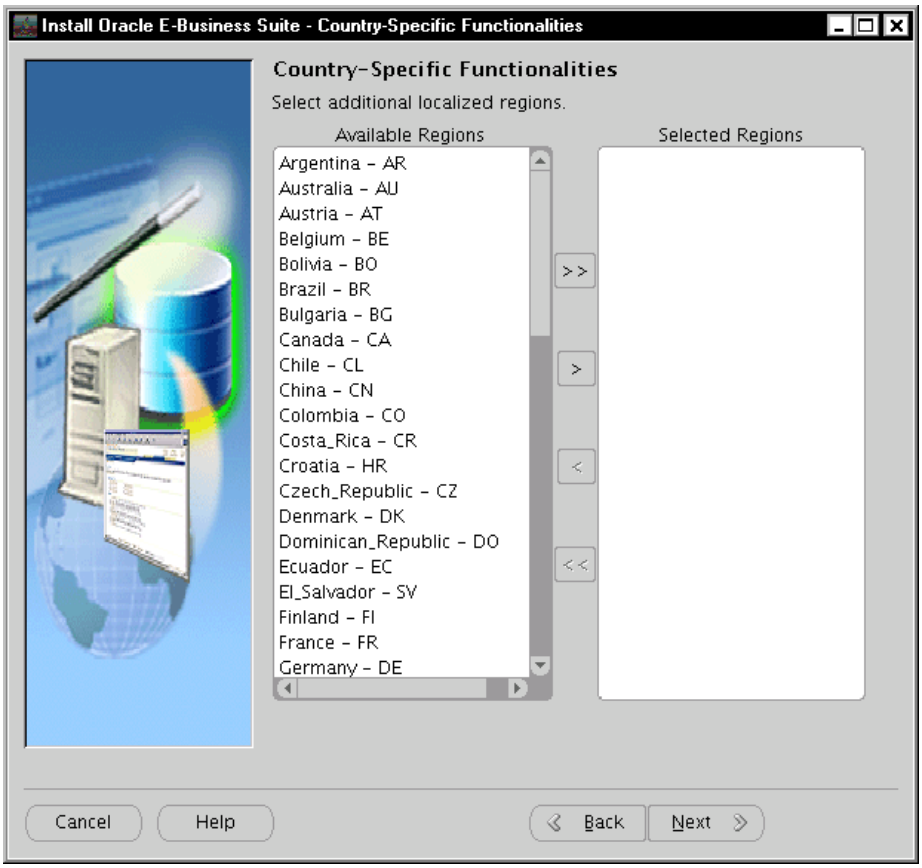

Install Oracle E-Business Suite - Database Node
Database Node Configuration
Database Type Fresh Database
Database SID PROD
Database Host Name rac1
DNS Domain Name example.com
Database Operating System Linux x86-64 (64-bit)
Database OS User oracle
Database OS Group oinstall
Database Base Dir /ebs/oracle/PROD Browse
Database Home Dir /ebs/oracle/PROD/12.1.0 Browse
Datafiles Dir +DATA/dbfiles Browse
Storage Type ASM
RAC
Shared OracleHome
Instance Prefix PROD
RAC Nodes
Cancel
Help
Back
Next

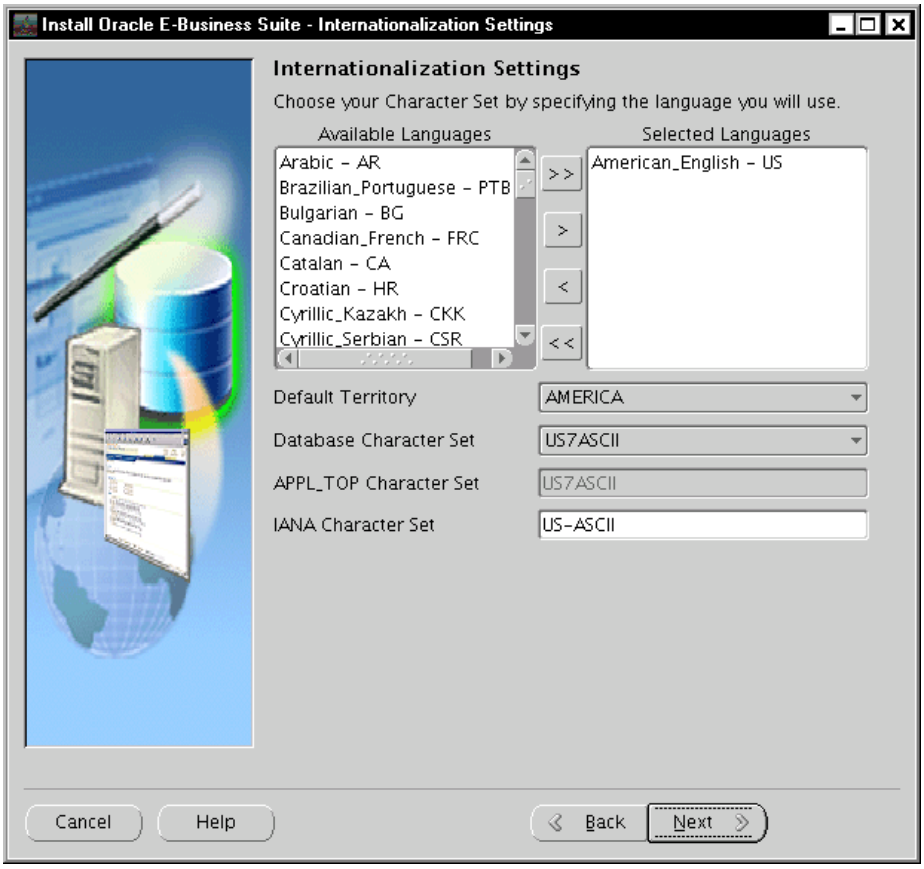

Oracle E-Business Suite Rapid Install Wizard Alert
Use RAC Nodes button to see the list of servers and select atleast one server
OK


Servers in CRS
rac1
rac2
Select

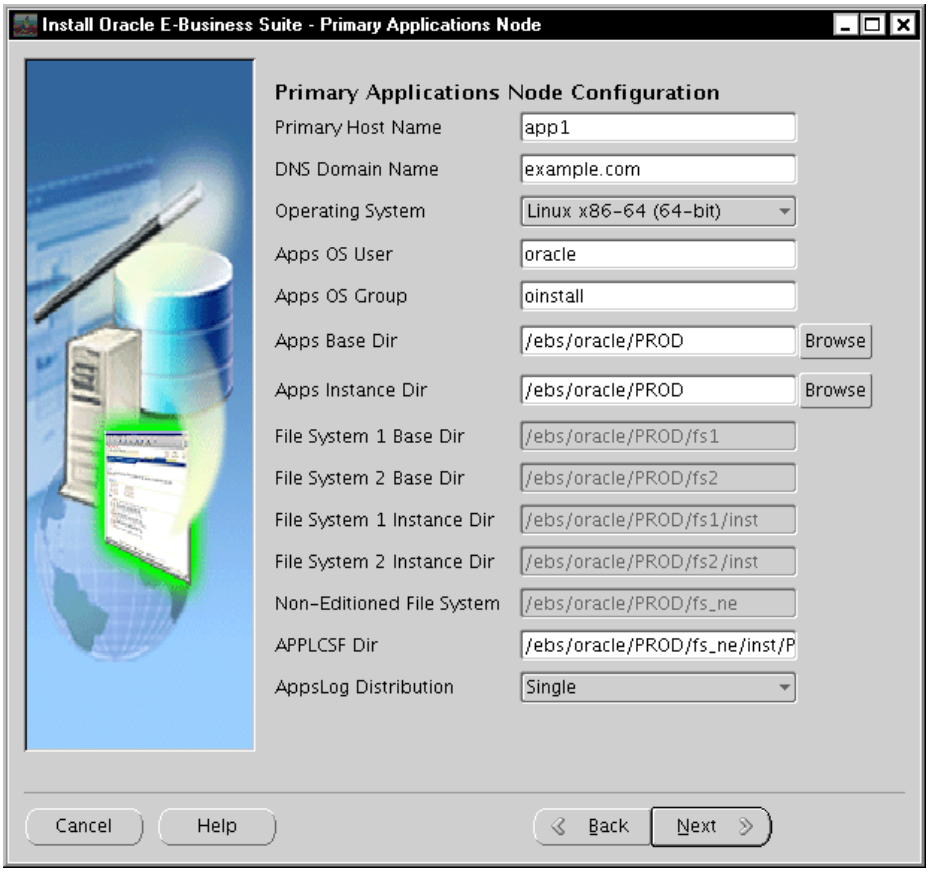

Install Oracle E-Business Suite - Licensing Selection
Select Licensing Type
Oracle E-Business Suite can be licensed using either of the following models: Suite Licensing (which allows wide access to product functionality), or Component Licensing (in which E-Business Suite products are licensed individually)
Suite Licensing
Component Licensing
Cancel
Help
Back
Next

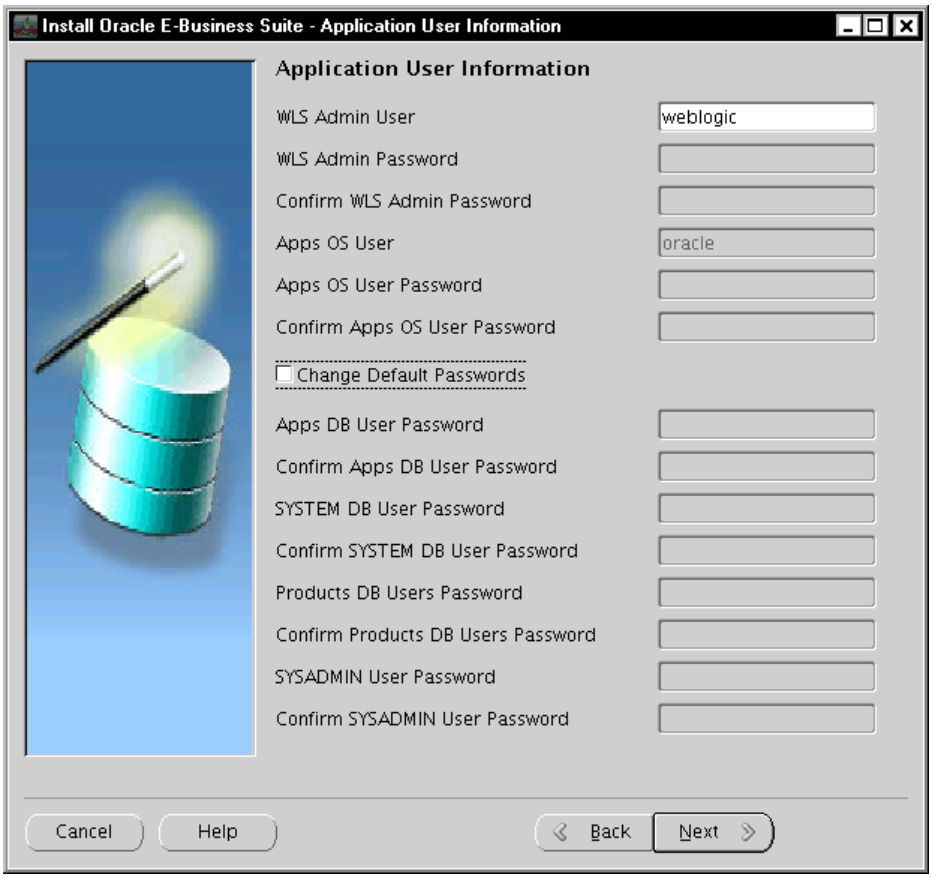

Install Oracle E-Business Suite - Licensing Page
License Additional Products
Select additional products that you have licensed.
Marketing & Sales
Marketing
TeleSales
Advanced Pricing
Field Sales
Sales for Handhelds
Quoting
Advanced Pricing
Partner Management
Proposals
Incentive Compensation
Channel Revenue Management
Accounts Receivables Deductions Settlement
Channel Rebates & Point of Sales Management
Supplier Ship and Debit
Price Protection
Advanced Pricing
Order Management
Order Management
Advanced Pricing
Cancel
Help
Back
Next

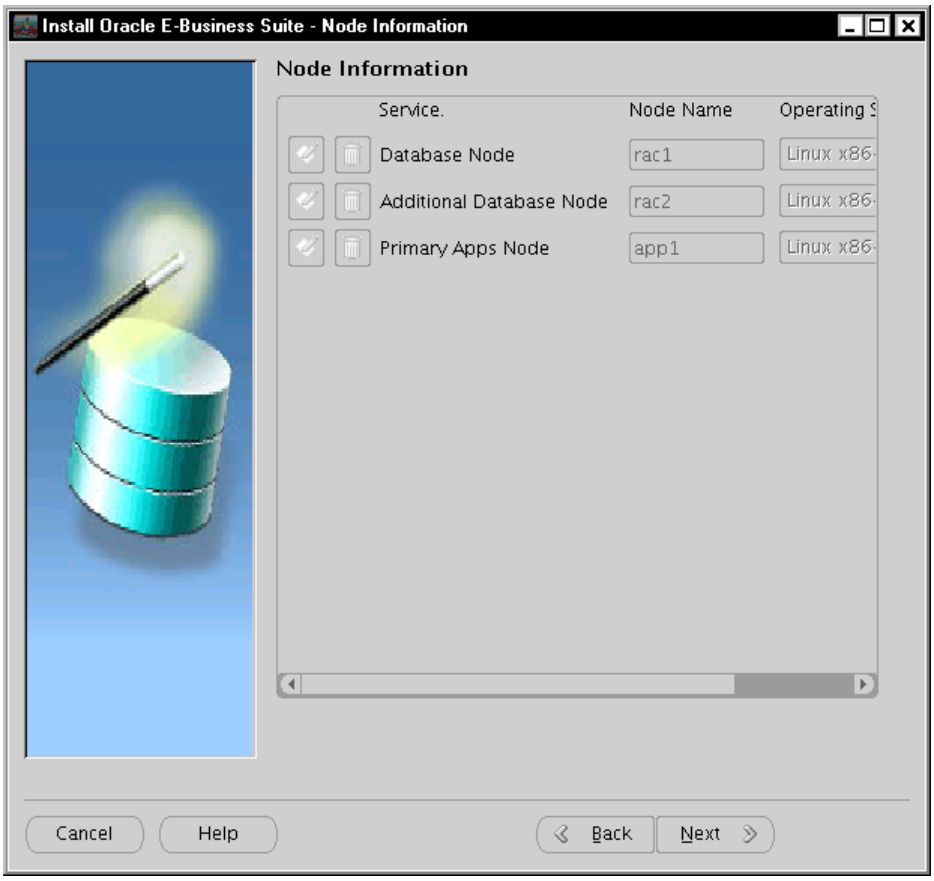

Install Oracle E-Business Suite - Country-Specific Functionalities
Country-Specific Functionalities
Select additional localized regions.
Available Regions
Selected Regions
Argentina - AR
Australia - AU
Austria - AT
Belgium - BE
Bolivia - BO
Brazil - BR
Bulgaria - BG
Canada - CA
Chile - CL
China - CN
Colombia - CO
Costa_Rica - CR
Croatia - HR
Czech_Republic - CZ
Denmark - DK
Dominican_Republic - DO
Ecuador - EC
El_Salvador - SV
Finland - FI
France - FR
Germany - DE
>>
>
<
<<
Cancel
Help
Back
Next

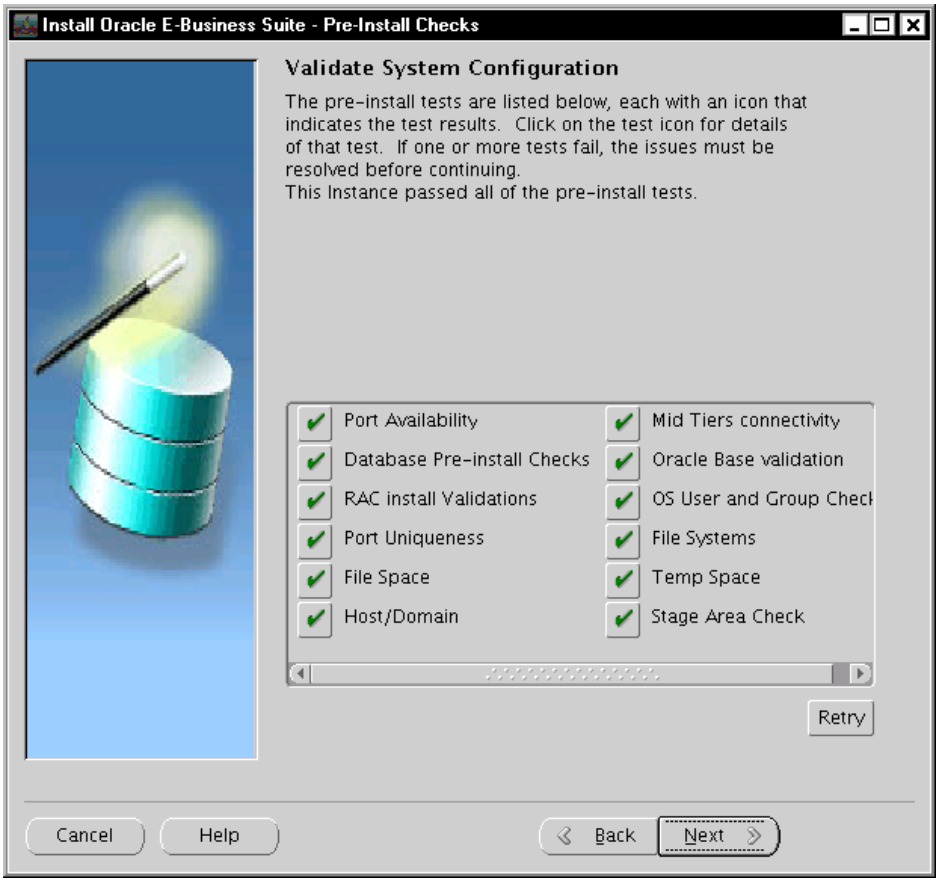


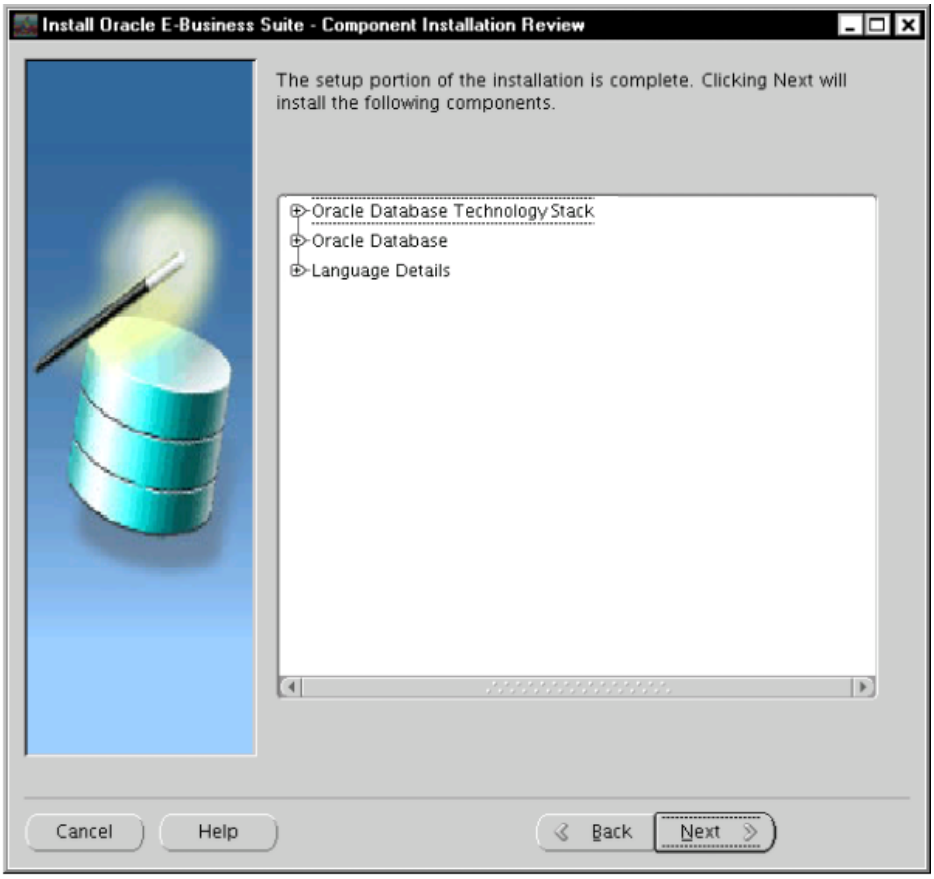
Fill Application Tier details:



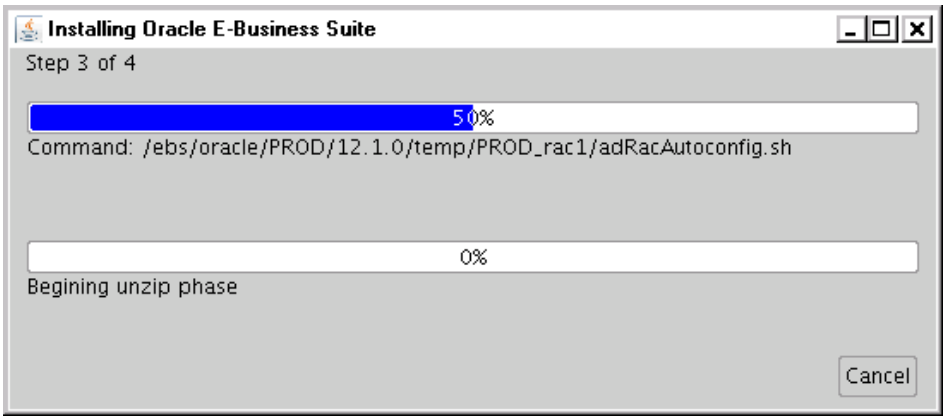

Install Oracle E-Business Suite - Application User Information
Application User Information
WLS Admin User
weblogic
WLS Admin Password
Confirm WLS Admin Password
Apps OS User
oracle
Apps OS User Password
Confirm Apps OS User Password
Change Default Passwords
Apps DB User Password
Confirm Apps DB User Password
SYSTEM DB User Password
Confirm SYSTEM DB User Password
Products DB Users Password
Confirm Products DB Users Password
SYSADMIN User Password
Confirm SYSADMIN User Password
Cancel
Help
Back
Next

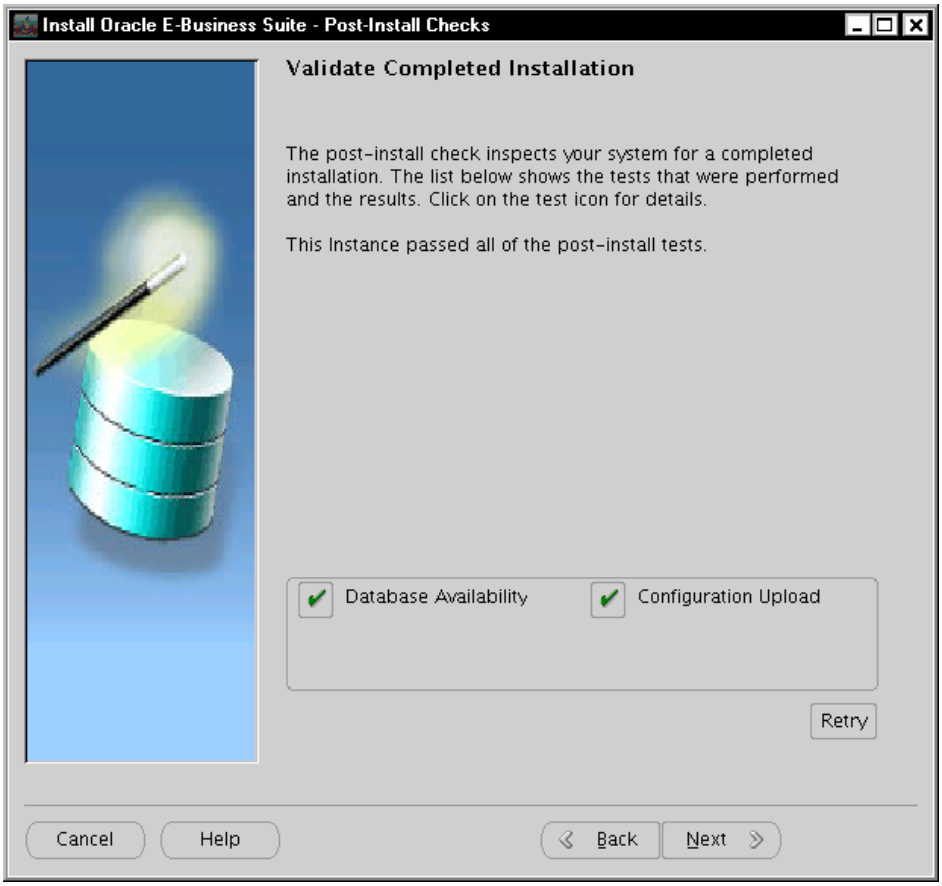

Install Oracle E-Business Suite - Node Information
Node Information
Service.
Node Name
Operating S
Database Node
rac1
Linux x86-
Additional Database Node
rac2
Linux x86-
Primary Apps Node
app1
Linux x86-
Cancel
Help
Back
Next

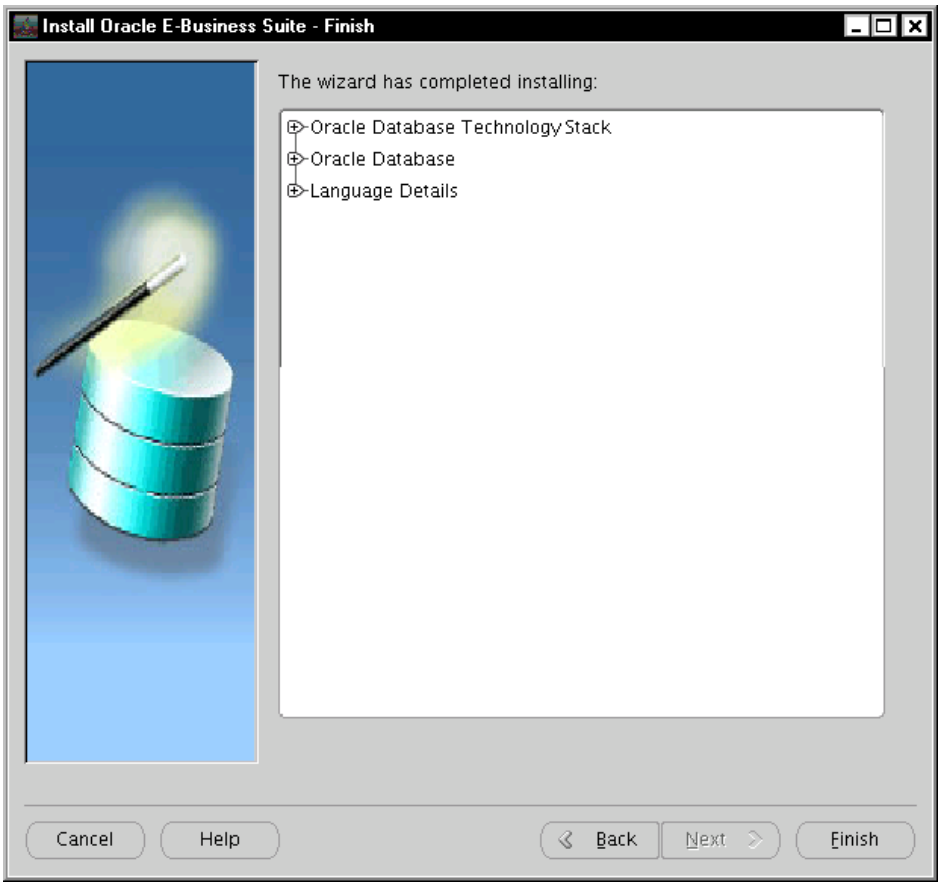

Install Oracle E-Business Suite - Pre-Install Checks
Validate System Configuration
The pre-install tests are listed below, each with an icon that indicates the test results. Click on the test icon for details of that test. If one or more tests fail, the issues must be resolved before continuing.
This Instance passed all of the pre-install tests.
Port Availability
Database Pre-install Checks
RAC install Validations
Port Uniqueness
File Space
Host/Domain
Mid Tiers connectivity
Oracle Base validation
OS User and Group Check
File Systems
Temp Space
Stage Area Check
Retry
Cancel
Help
Back
Next


Install Oracle E-Business Suite - Component Installation Review
The setup portion of the installation is complete. Clicking Next will install the following components.
Oracle Database Technology Stack
Oracle Database
Language Details
Cancel
Help
Back
Next


Oracle E-Business Suite Rapid Install Wizard Alert
The Rapid Install Wizard is ready to install Oracle E-Business Suite on this machine. Do you want to begin the installation now?
Yes
No


Installing Oracle E-Business Suite
Step 3 of 4
50%
Command: /ebs/oracle/PROD/12.1.0/temp/PROD_rac1/adRacAutoconfig.sh
0%
Begining unzip phase
Cancel


Install Oracle E-Business Suite - Post-Install Checks
Validate Completed Installation
The post-install check inspects your system for a completed installation. The list below shows the tests that were performed and the results. Click on the test icon for details.
This Instance passed all of the post-install tests.
Database Availability
Configuration Upload
Retry
Cancel
Help
Back
Next



5.12.5 Configure LOCAL_LISTENER parameter

On each DB node, create IFILE that is indicated at the end of `<EBS TNS ADMIN>/tnsnames.ora` and add `NODEFQDN` entry.

DB node 1:

```
$ .  /ebs/oracle/PROD/12.1.0/PROD1_rac1.env

$ cat $TNS_ADMIN/tnsnames.ora |grep IFILE
IFILE=/ebs/oracle/PROD/12.1.0/network/admin/PROD1_rac1/PROD1_rac1_ifile.ora
$ vi $TNS_ADMIN/PROD1_rac1_ifile.ora
```

```
DONOTDELETE,NODEFQDN = (ADDRESS = (PROTOCOL = TCP)(Host = rac1.example.com)(Port = 1528))
```

Set `local_listener` parameter:

```
$ .  /ebs/oracle/PROD/12.1.0/PROD1_rac1.env

$ sqlplus / as sysdba
SQL> ALTER SYSTEM SET LOCAL_LISTENER="NODEFQDN" scope=both sid='PROD1';
```

DB node 2:

```
$ .  /ebs/oracle/PROD/12.1.0/PROD2_rac2.env

$ cat $TNS_ADMIN/tnsnames.ora |grep IFILE
IFILE=/ebs/oracle/PROD/12.1.0/network/admin/PROD2_rac2/PROD2_rac2_ifile.ora
```

```
$ vi $TNS_ADMIN/PROD2_rac2_ifile.ora
DONOTDELETE,NODEFQDN = (ADDRESS = (PROTOCOL = TCP)(Host = rac2.example.com)(Port = 1528))
```

Set `local_listener` parameter:

```
$ .  /ebs/oracle/PROD/12.1.0/PROD2_rac1.env
$ sqlplus / as sysdba
SQL> ALTER SYSTEM SET LOCAL_LISTENER="NODEFQDN" scope=both sid='PROD2';
```

5.12.6 Enable SCAN support:

On each DB node, regenerate context file and run AutoConfig.

DB node 1:

```
$ . /ebs/oracle/PROD/12.1.0/PROD1_rac1.env

$ /ebs/oracle/PROD/12.1.0/appsutil/bin/adbldxml.pl
…
Enter Database Service Name: PROD

Do you want to enable SCAN addresses[N]:Y

Specify value for s_scan_name[]: myebs-scan

Specify value for s_scan_port[]:1521

Enter the value for Display Variable: localhost:1
…
$ /ebs/oracle/PROD/12.1.0/appsutil/scripts/PROD1_rac1/adautocfg.sh
```

DB node 2:

```
$ . /ebs/oracle/PROD/12.1.0/PROD2_rac2.env

$ /ebs/oracle/PROD/12.1.0/appsutil/bin/adbldxml.pl
…
Enter Database Service Name: PROD

Do you want to enable SCAN addresses[N]:Y

Specify value for s_scan_name[]: myebs-scan

Specify value for s_scan_port[]:1521

Enter the value for Display Variable: localhost:1

…
$ /ebs/oracle/PROD/12.1.0/appsutil/scripts/PROD2_rac2/adautocfg.sh
```

Note: If the installation failed, because of some misconfiguration, you can re-run DB tier installation using saved configuration file without going through all the configuration steps again:

1. Create copy of the configuration file:
   `$ cp /ebs/oracle/PROD/12.1.0/appsutil/conf_PROD.txt /tmp/conf_PROD.txt`
2. Clean up failed software, please see section *6. Uninstalling Software.*
3. Rerun it as follows:
   `[oracle@rac1 ~]$ /ebs/Install/startCD/Disk1/rapidwiz/rapidwiz -silent -config /tmp/conf_PROD.txt`

5.13 Installing EBS APP Tier

5.13.1 Create stage area on the first app node (e.g. app1)

```
[oracle@app1 ~]$cd /ebs/Install/startCD/Disk1/rapidwiz/bin/
[oracle@app1 ~]$./buildStage.sh
   Press Enter to continue...
         Build Stage Menu
 ------------------------------------------------------
 1.     Create new stage area
 2.     Copy patches to existing stage area
 3.     List files in TechPatches directory
 4.     Exit menu

 Enter your choice [4]: 1

       Rapid Install Platform Menu
-------------------------------------------------------
 1.    Oracle Solaris SPARC (64-bit)
 2.    Linux x86 (64-bit)
 3.    IBM AIX on Power Systems (64-bit)
 4.    HP-UX Itanium
 5.    Exit Menu

Enter your choice [5]: 2

Running command:
…
Specify the directory containing the zipped installation media:
/ebs/Install
…
-------------------------------------------------------
 1.     Create new stage area
 2.     Copy patches to existing stage area
 3.     List files in TechPatches directory
 4.     Exit menu

 Enter your choice [4]: 4
```

5.13.2 Copy configuration from database node to the app node

1. Copy /ebs/oracle/PROD/12.1.0/appsutil/conf_PROD.txt from the first database node to `/tmp` on the first app node (e.g. *app1*).
2. Set necessary permissions for the copied file:

   `[root@app1 tmp]# chmod a+r /tmp/conf_PROD.txt`

5.13.3 Add inventory location in /etc/oraInst.loc

```
[root@app1 ~]# cat /etc/oraInst.loc
inventory_loc=/ebs/oracle/oraInventory
inst_group=oinstall
```

Double-check that there is no extra space after "`/ebs/oracle/oraInventory`".

5.13.4 Run rapidwiz on the first App node:

Configure X11 forwarding and run rapidwiz.

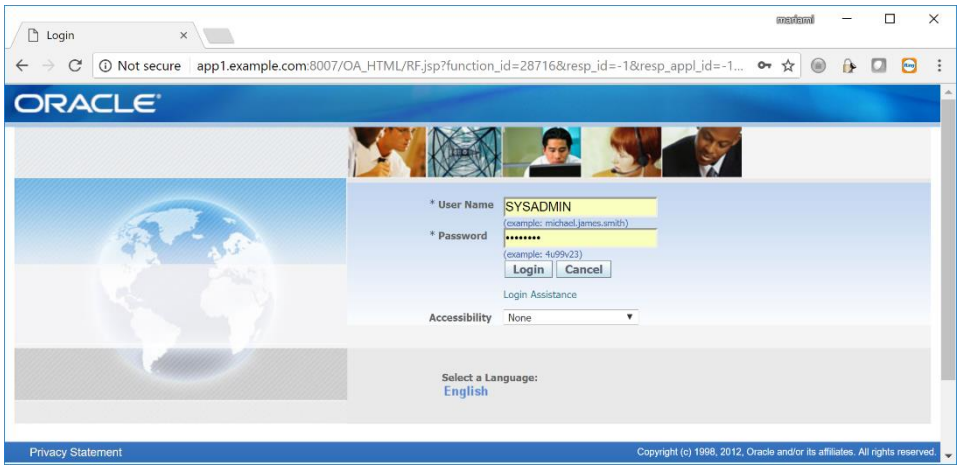
```
[oracle@app1 ~]$ /ebs/Install/startCD/Disk1/rapidwiz/rapidwiz -silent -config
/tmp/conf_PROD.txt
```

5.13.5 Log in to EBS

1. Find login URL at the end of the installation log file or by querying the EBS database:

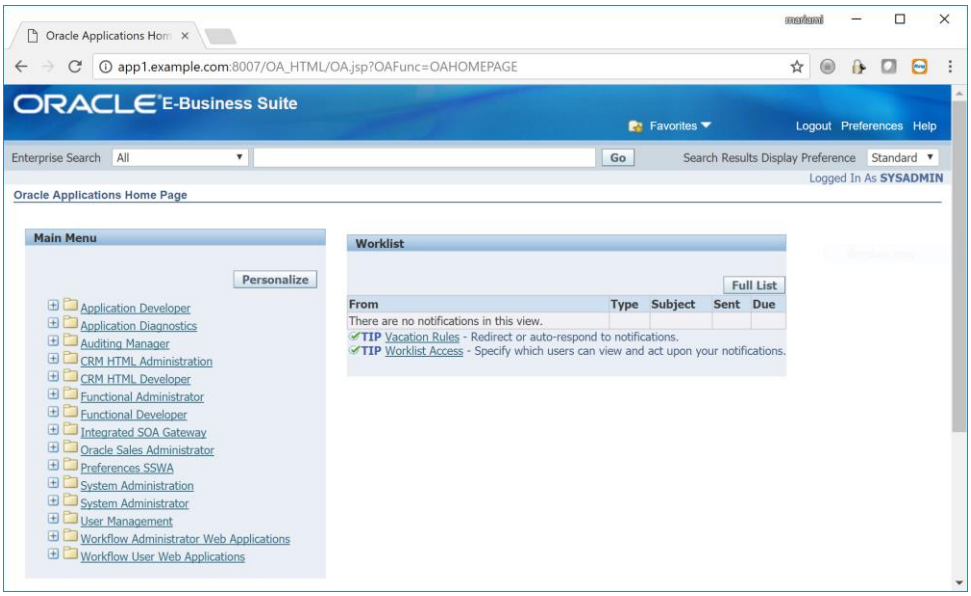
```
[oracle@rac1 ~]$ .  /ebs/oracle/PROD/12.1.0/PROD1_rac1.env

[oracle@rac1 ~]$ sqlplus apps/apps

SQL> SELECT home_url FROM icx_parameters;
HOME_URL
--------------------------------------------------------------------------------
http://app1.example.com:8007/OA_HTML/AppsLogin
```

2. Make sure port 8007 (TCP) is open via the EC2 security group settings.
3. Make sure the server address is resolvable from the client system by adding the app node servers to either the DNS server, or to /etc/hosts on the client.



4. Use the following default credentials:

   Username: SYSADMIN
   Password: SYSADMIN



5.13.6 Start OPMN managed processes

Before starting processes, some configuration files must be corrected:

1. Find remote port number

```
[root@app1 ~]# cat /ebs/oracle/PROD/fs1/EBSapps/10.1.2/opmn/conf/opmn.xml | grep
remote
<port local="6000" remote="6001" request="6002"/>
```

2. Modify /ebs/oracle/PROD/fs1/EBSapps/10.1.2/opmn/conf/ons.conf as follows:

```
nodes=<AppsTier Hostname>:<Remote port number from 1>
```

Example:

```
nodes=app1.example.com:6001
```

3. Download and apply the patch 6078836 from My Oracle Support to fix an issue with the Oracle HTTP Server (missing libdb.so.2). Place libdb.so.2 in /usr/lib and set the necessary permissions:

```
[root@app1 ~]# chmod 755 /usr/lib/libdb.so.2
```

4. Create the following soft link:

```
[root@app1 ~]# ln -s /usr/lib/libdb-4.7.so /usr/lib/libdb-4.3.so
```

5. Change group name from *autobldgrp* to *oinstall* in httpd.conf file:

```
[root@app1 ~]# sed -i -e 's/autobldgrp/oinstall/'
/ebs/oracle/PROD/fs1/EBSapps/10.1.2/Apache/Apache/conf/httpd.conf
```

6. Change group name in webcache.conf file:

```
[root@app1 ~]# sed -i -e 's/autobldgrp/oinstall/'
/ebs/oracle/PROD/fs1/EBSapps/10.1.2/webcache/webcache.xml
```

7. Run autoconfig:

```
[root@app1 ~]# su – oracle
[oracle@app1 ~]$
/ebs/oracle/PROD/fs1/inst/apps/PROD_app1/admin/scripts/adautocfg.sh
```

8. In case vncserver is running, stop it to free up port 6001:

```
[oracle@app1 ~]$ vncserver -kill :1
```

9. Start processes using *opmnctl* and check that the status is *Alive* for each component:

```
[oracle@app1 ~]$/ebs/oracle/PROD/fs1/EBSapps/10.1.2/opmn/bin/opmnctl startall

[oracle@app1 ~]$/ebs/oracle/PROD/fs1/EBSapps/10.1.2/opmn/bin/opmnctl startproc ias-
component=LogLoader

[oracle@app1 ~]$/ebs/oracle/PROD/fs1/EBSapps/10.1.2/opmn/bin/opmnctl startproc ias-
component=dcm-daemon

[oracle@app1 ~]$/ebs/oracle/PROD/fs1/EBSapps/10.1.2/opmn/bin/opmnctl status
-------------------+--------------------+---------+---------
ias-component      | process-type       |     pid | status
-------------------+--------------------+---------+---------
LogLoader          | logloaderd         |   22250 | Alive
HTTP_Server        | HTTP_Server        |   22113 | Alive
dcm-daemon         | dcm-daemon         |   22286 | Alive
WebCache           | WebCache           |   22129 | Alive
WebCache           | WebCacheAdmin      |   22115 | Alive
OC4J               | home               |   22116 | Alive
```

5.14 Adding a node to APP Tier

This section provides high-level steps for adding a node to the App tier. For detailed instructions see **Doc ID 1383621.1** ***Section 5.3 Adding a New Application Tier Node to an Existing System***.

1. Follow *5.6 Configuring OS for EBS installation* and *5.7 Configuring NTP service* sections for preparing the new application node.

2. Apply the AD/TXK (Delta) patches on the source.

3. On DB nodes only, update the *tcp.invited_nodes* parameter in sqlnet.ora and add *host.domain* for the new node being added. For changes to take effect restart PROD listener.

4. On app2, add inventory location in /etc/oraInst.loc.

5. On app1, start admin server from Run and Patch Edition File Systems.

6. Run adpreclone.pl on Run and Patch Edition File Systems in the primary application tier node.

7. Setup SSH Key-Based Authentication between application nodes.

8. Copy the Run Edition File System to the target secondary node.

   Only the following directories should be copied:
   <APPL_TOP>
   <COMMON_TOP>
   <OracleAS Tools 10.1.2 ORACLE_HOME>

9. Execute adcfgclone.pl to clone both the Run and Patch file system.

10. Register the newly added application tier node with the application tier TNS listener.

11. If the Node Manager service is up on the Patch Edition File System of the newly added application tier node, shut it down.

12. Shut down the Admin Server and the Node Manager on the Patch Edition File System of the primary node.

13. Run AutoConfig on all database tier nodes to add the newly added node to the Access Control List.

14. Start services on application nodes.

15. Make sure the server address is resolvable from the client system by adding the app node servers to either the DNS server, or to /etc/hosts on the client.

After adding new nodes, refer to My Oracle Support Knowledge Document 1375686.1, *Using Load-Balancers with Oracle E-Business Suite Release 12.2*, for details on how to set up load balancing.

5.15 Configuring TNS parameters on APP Tier

The following parameters must be specified in the connect string:

- `TRANSPORT_CONNECT_TIMEOUT=3`
  The time, in seconds, for a client to establish a TCP connection to the database server. The default value is 60 seconds. It must be changed to avoid a long wait in case one of the database servers is down.

- `RETRY_COUNT=6`
  The number of connection attempts before the connection is terminated.

Add new TNS alias that contains the above parameters in IFILE indicated at the end of `$INST_TOP/ora/10.1.2/network/admin/tnsnames.ora`:

Example:

```
$ .  /ebs/oracle/PROD/fs1/EBSapps/appl/PROD_app1.env

$ cat $INST_TOP/ora/10.1.2/network/admin/PROD_app1_ifile.ora

PROD_BALANCE2=
        (DESCRIPTION=(TRANSPORT_CONNECT_TIMEOUT=3)(RETRY_COUNT=6)
            (ADDRESS=(PROTOCOL=tcp)(HOST=myebs-scan.example.com)(PORT=1521))
            (CONNECT_DATA=
                (SERVICE_NAME=PROD)
            )
        )
```

Update the following variables in application context file by the following way:

```
$ .  /ebs/oracle/PROD/fs1/EBSapps/appl/PROD_app1.env

$ java oracle.apps.ad.context.UpdateContext $CONTEXT_FILE
s_apps_jdbc_connect_alias PROD_BALANCE2
```

```
$ java oracle.apps.ad.context.UpdateContext $CONTEXT_FILE s_tools_twotask
PROD_BALANCE2

$ java oracle.apps.ad.context.UpdateContext $CONTEXT_FILE s_weboh_twotask
PROD_BALANCE2

$ java oracle.apps.ad.context.UpdateContext $CONTEXT_FILE s_cp_twotask
PROD_BALANCE2

$ java oracle.apps.ad.context.UpdateContext $CONTEXT_FILE
s_apps_jdbc_connect_descriptor
"jdbc:oracle:thin:@(DESCRIPTION=(TRANSPORT_CONNECT_TIMEOUT=3)(RETRY_COUNT=6)(ADDR
ESS=(PROTOCOL=tcp)(HOST=myebs-
scan.example.com)(PORT=1521))(CONNECT_DATA=(SERVICE_NAME=PROD)))"

$ java oracle.apps.ad.context.UpdateContext $CONTEXT_FILE
s_jdbc_connect_descriptor_generation false
```

Run AutoConfig:

```
$ adautocfg.sh
```

Restart App Tier services:

```
$ adstpall.sh apps/apps
Enter the WebLogic Server password: welcome1

$ adstrtal.sh apps/apps
Enter the WebLogic Server password: welcome1
```

5.16 Enabling Strict Read-Local Mode for a New Database

It is recommended that *Strict Read-Local* mode is enabled for every new database.

ASM does not allow reads from disks that are resynchronizing data (SYNCING state) after being offline. As a result, if database is running on a node whose local disks are in SYNCING state, all reads will be performed remotely over the network. This may result in lower performance of the database instance on a node that has just rebooted and is still resynchronizing its data.

Strict Read-Local mode prevents such performance asymmetry between nodes. When the *Strict Read-Local* mode is enabled, a database instance start will be delayed until its local disks complete resynchronization.

Use the following commands to enable, disable, and show status of Strict Read-Local mode:

```
$ flashgrid-cluster strict-read-local-enable
$ flashgrid-cluster strict-read-local-disable
$ flashgrid-cluster strict-read-local-show
```

Note that enabling *Strict Read-Local* mode changes the setting only for existing databases. Re-running the *enable* command is required after creating new database(s).

Note that in order to unmount a disk group while Strict Read-Local mode is enabled, `srvctl stop diskgroup` command with `-force` option must be used. Example:

```
$ srvctl stop diskgroup -diskgroup DGNAME -node rac1,rac2 -force
```

5.17 Enabling instance termination protection

It is strongly recommended to enable instance termination protection for all cluster nodes.

6 Uninstalling EBS software

6.1 Uninstalling APP Tier

Delete the software directory and restart the server:

```
# rm -rf /ebs/oracle
# reboot
```

6.2 Uninstalling DB Tier

1. On each DB node Delete the following home entries from /u01/app/oraInventory/ContentsXML/inventory.xml

```
<HOME NAME="OraDB12Home1" LOC="/ebs/oracle/PROD/12.1.0" TYPE="O" IDX="2">
<NODE_LIST>
  <NODE NAME="rac1"/>
   <NODE NAME="rac2"/>
</NODE_LIST>
</HOME>
```

2. On each DB node delete the software directory:

```
# rm -rf /ebs/oracle
# reboot
```

3. If +DATA/dbfiles and +DATA/PROD directories exist remove them by running the bellow command on the first database node:

```
[oracle@rac1 ~]$ . oraenv
ORACLE_SID = [+ASM1] ? +ASM1
[oracle@rac1 ~]$ asmcmd --nocp rm -rf +DATA/dbfiles
[oracle@rac1 ~]$ asmcmd --nocp rm -rf +DATA/PROD
```

4. Remove PROD service if it exists. Run the following on the first database node:

```
[oracle@rac1 ~]$ . oraenv
ORACLE_SID = [+ASM1] ? +ASM1
[oracle@rac1 ~]$ srvctl remove database -db PROD
Remove the database PROD? (y/[n]) y
```

7 Monitoring Cluster Health

The following methods of monitoring cluster health are available:

- The *flashgrid-cluster* utility displays status of the cluster and its main components.
- Alerts about failures are recorded in system log and can be analyzed by 3rd-party tools.
- Email alerts can be sent to one or several email addresses.
- ASM disk group monitoring and alerting via Oracle Enterprise Manager.

To test email alerts

1. On all nodes (including quorum node) run

```
$ flashgrid-node test-alerts
```

2. Check that test alert emails were received from all cluster nodes at each of the configured email addresses.

To modify the list of email alert recipients

As user fg@ on any database node run

```
$ flashgrid-cluster set-email-alerts name1@host1 name2@host2 ...
```

Note that by default the *From* address is set to *flashgrid@localhost.localdomain*. This will ensure that delivery failure notifications are sent to root's mailbox on the originating node, which can help with troubleshooting delivery issues. It is recommended to add this address to the whitelist of senders on the receiving email server and in the email clients.

8 Deleting a cluster

To delete a cluster

1. Disable instance termination protection for all cluster nodes
2. Open AWS CloudFormation Manager console
3. Delete the stack corresponding to the cluster

9 Additional Information

For additional information about deploying Oracle RAC in AWS see the following documents:

- Whitepaper: Mission-Critical Databases in the Cloud. Oracle RAC on Amazon EC2 Enabled by FlashGrid® Software.
- FlashGrid Provisioning and Maintenance Guide for Oracle RAC in AWS

10 Contacting FlashGrid Technical Support

For help with troubleshooting an issue on an existing FlashGrid cluster please use Technical Support Request form located at https://www.flashgrid.io/support/

To expedite troubleshooting please also collect diagnostic data by running '`flashgrid-node collect-diags`' command on each node and upload it using a secure upload form provided to your company by FlashGrid technical support.

Customers with Mission-Critical SLA subscription may also use the 24x7 telephone hotline for reporting critical issues that require immediate attention: +1-650-641-2421 ext 7