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DATABASE APPLIANCE

Upgrade of SAP NetWeaver Environments on Oracle Database Appliance 2.10 with Oracle Database 11g Release 2 to Oracle Database Appliance 12.1.2.6.0 and Oracle Database 12*c* Release 1

Key Guidelines

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Disclaimer

Oracle Database Appliance Software 12.1.2.6.0 on Oracle Database Appliance (ODA) X5-2 models do not support 11.2 databases for SAP environments due to some constraints. Please note earlier versions of ODA models are unaffected and this disclaimer is solely applicable to X5-2 models only.

Oracle MOS Note 888888.1 dictates that databases on ODA Software 12.1.2.6.0 on X5-2 models have to run on ACFS; however SAP and ODA engineering worked together and do support Oracle databases for SAP on classic ASM diskgroup layouts.

The described approach has been successfully tested and verified step-by-step on a sandbox environment. However it is strongly recommended that customers test this upgrade procedure on their SAP environment before applying this procedure to their production environments.

Introduction

This document explains all the necessary steps to upgrade an existing SAP NetWeaver installation on ODA Software version 2.10 running Oracle 11.2.0.4.x to ODA Software version 12.1.2.6.0 and Oracle 12.1.0.2.x. Pursuing this document an existing SAP NetWeaver based application will then operate against Oracle Database 12c on Oracle Linux 6 with ODA version 12.1.2.6.0.

There are multiple scenarios why this is beneficial for customers such as:

» Running multiple databases on different releases including both Oracle Database 11g Release 2 and Oracle Database 12c Release 1
» Taking advantage of Oracle Database 12c new features from SAP NetWeaver based applications perspective
» Improved handling and usage for HA/NFS exports
» Maintain existing solutions in supported environments

ODA software components and procedures ease the upgrade process compared to a classical Oracle Grid Infrastructure and Oracle Database or Oracle Real Application Cluster significantly.

Mixed Grid Infrastructure and RDBMS Versions

If you run more than one database on the Database Appliance it is not required to upgrade all of them. Upgrades are by Database Homes. (`oakcli show dbhomes`). So if you run more than one database out of one ORACLE_HOME and would wish to upgrade only a subset of your databases, you would upgrade the databases of your choice and leave the other ones unchanged. Starting with Grid Infrastructure (GI) version 12.1.0.2 it is now supported to run a certain mix of GI and RDBMS software versions for SAP databases. With GI 12.1.0.2 Oracle supports to run RDBMS 11.2.0.4 and/or RDBMS 12.1.0.2 for SAP databases. Detailed information is being provided in SAP Notes 1677978 and 527843. Please keep in mind the constraint for X5-2 models.

ODA version	OS release	End User Bundle version	Grid Infrastructure version	Database version
12.1.2.6.0	Oracle Linux 6.7	12.1.2.6.0	12.1.2.0.2+	12.1.2.0.2+ RAC 12.1.2.0.2+ Single Instance
12.1.2.6.0	Oracle Linux 6.7	12.1.2.6.0	12.1.2.0.2+	11.2.0.4.x+ RAC* 11.2.0.4.x+ Single Instance* * Not on X5-2 models

Upgrade goals

» Upgrade host, firmware, and other components towards ODA Software 12.1.2.6.0
» Upgrade operating system from Oracle Linux 5 to Oracle Linux 6
» Upgrade Oracle Grid Infrastructure (GI) from 11gR2 (11.2.0.4) to GI 12c (12.1.0.2)
» Upgrade databases from Oracle Database 11gR2 (11.2.0.4) to Oracle Database 12c (12.1.0.2)
» Upgrade SAP NetWeaver related items (limited).
» Upgrade with up-to-date SAP Bundle Patch application

Upgrade considerations

Target of Oracle Database 12c running on Oracle Linux 6 needs to match supported SAP Kernel for SAP NetWeaver and subsequent SAP Application deployments. Consult the SAP Product Availability Matrix (PAM) at http://support.sap.com/pam for your particular environment.

Target of Oracle Database 12c needs to match supported SAP Application specifications.

Note: This document is not a replacement of the SAP Database Upgrade Guide, rather a complement that describes the upgrade procedure with respect to Oracle Grid Infrastructure (GI), ASM and RAC. Further, this document does not replace the Oracle Database documentation.

The upgrade procedure outlined in this document is derived from SAP Notes 2064206 and 1915315, amended with Database Appliance specific steps.

Application downtime is required until completing the upgrade. You must not start SAP Application at any time in between.

Planning, Prerequisites, Preparation

Planning

- » Plan enough downtime
- » Meet the prerequisites
- » Meet the preparation criteria
- » Have read, understood and followed the documentation

Prerequisites

- » ODA Software version is 2.10.
- » Oracle GI and Oracle RDBMS are at the latest SAP Bundle Patch (SBP) available for 11gR2 – 11.2.0.4.160119 – 201602
- » Meet the SAP Kernel and Product certification for Upgrade target as mentioned above.

Preparation

Have following items such as downloads or documentation ready, read, understood, and validated:

1. Oracle Patch 21645601

    ODA Patch Bundle 12.1.2.5.0 for ODA V1, ODA X3-2, ODA X4-2 and ODA X5-2, and for both Bare Metal and Virtualized Platform

    https://docs.oracle.com/cd/E66274_01/doc.121/e65862/toc.htm

    README of Oracle Patch 21645601

2. Oracle Patch 22328442

    ODA Patch Bundle 12.1.2.6.0 for ODA V1, ODA X3-2, ODA X4-2 and ODA X5-2, and for both Bare Metal and Virtualized Platform

    http://docs.oracle.com/cd/E68623_01/doc.121/e68637/toc.htm

    README of Oracle Patch 22328442

3. SAP Bundle Patch 12.1.0.2.160119 – 201602 plus it's README

4. Oracle MOS Note:888888.1 Oracle Database Appliance - 12.1.2 and 2.X Supported ODA Versions & Known Issues

5. SAP Note 2064206 – Database Upgrade to 12.1.0.2 with Grid Infrastructure

6. SAP Note 1915315 – Database Upgrade Scripts for 12.1.0.2

7. SAP Database Upgrade Guide "Upgrade to Oracle Database 12c (12.1): UNIX"

    http://service.sap.com/instguides / Database Upgrades / Oracle

8. Scripts from SAP Note 706927 – Oracle DB-Mon: Installation script for ST04N or DBACockpit

    dbac_drop.sql and dbac_install.sql

9. Database Parameterization Script from SAP Note: 1171650

10. SAP Note 1521371 – Setting of ORACLE_BASE in SAP environments

11. SAP Kernel patches

Operations such as:

» Downloads of ODA Software Patches (12.1.2.5, 12.1.2.6)
» Downloads of ODA Software RDBMS clone files
» Download of SAP Bundle Patch
» Downloads of SAP Kernel Updates (if required)
» Downloads of scripts and other helper utilities
» Transfer of such items towards Database Appliance
» Unpacking of 12.1.2.5.0 items on the Database Appliance

should be conducted in advance as they are not part of the upgrade process itself.

Also ensure you have enough space on your ODA,

`df -h` as root on both nodes:

/boot shall have at least 40 MB of free space. This Oracle bug is fixed with ODA Software version 12.1.2.7.0. If not, contact support to fix this.

<u>Backup first</u>

Essential to have is a proven, validated, backup, restore + recovery scenario. Have tested the approach on a test environment fitting your individual needs throughout the entire stack up to SAP Applications. Have a fallback strategy handy and proven. Have this strategy validated against possible errors <u>during</u> and <u>after</u> the upgrade.

Backup needs to include

» all database related items such as datafiles, control files, archived redo logs, online redo logs
» database related items such as listener configurations, client connection configurations, pfiles, spfiles, password files, certificates
» oracle user account file system content
» sapadm user account file system content
» ora<SAPSID> user account file system content
» <SAPSID>adm user account file system content
» other SAP related file system content such as /etc/services, /usr/sap/sapservices, SAP kernel etc.
» /sapmnt and other shared file systems, if sourced by ODA

Upgrade Process Overview

The upgrade process from Database Appliance Software 2.10 to Database Appliance 12.1.2.6.0 requires an interim step with Database Appliance Software 12.1.2.5.0 as these releases are not necessarily cumulative. ODA Software 12.1.2.6.0 requires the intermediate step with 12.1.2.5.0. Please note that following sequence describes the overview, not the detailed steps. For detailed steps, please follow chapter Upgrade Instructions – step by step.

1. Shutdown SAP Application
2. Be prepared. Have a proven, validated, restore + recovery scenario. Ideally have tested the approach on a test environment fitting your individual needs throughout the entire stack up to SAP Applications. Have a fallback strategy handy and proven.
3. Node 0: Patch Database Appliance Infrastructure to 12.1.2.5.0 – this patches Node 1 as well
4. Node 0: Patch Database Appliance GI to 12.1.2.5.0 – this patches Node 1 as well.
5. Do not touch any database at this point – NOOP.
6. Node 0: Patch Database Appliance Infrastructure to 12.1.2.6.0
7. Node 0: Patch Database Appliance GI to 12.1.2.6.0
8. Node 1: Patch Database Appliance Infrastructure to 12.1.2.6.0
9. Node 1: Patch Database Appliance GI to 12.1.2.6.0
10. Node 0: Deployment for RDBMS clone files for Oracle Database 12.1.0.2
11. Create Oracle Database RDBMS ORACLE_HOME (s)
12. Apply Oracle SAP Bundle Patch (SBBP) sequentially across all Nodes, for both GI ORACLE_HOMEs and all freshly created RDBMS ORACLE_HOMEs.
13. Upgrade Database by Database with their new ORACLE_HOME(s)
14. Post-Install Instructions per Database
15. SAP Kernel updates if applicable, Startup SAP Application. Do Application validation
16. Re-initialize full protection backup.

Ugrade Instructions – Step by Step

Note: If `oakcli` is not in your search path, use `/opt/oracle/oak/bin/oakcli`.

#	Step	Description
0	Shutdown SAP Application	Shutdown the entire SAP application stack for this SAPSID. Keep it down until completion of the entire upgrade process. Do not stop the Oracle stack – the upgrade procedure requires this to be up.

1	Unpack 12.1.2.5	Can be done in advance:
		
		Copy Oracle Patch 21645601 (both parts) to Node 0 <u>and</u> Node 1 into a particular directory. Login as root to <u>each</u> node, and unpack both files:
		
		`oakcli unpack -package /path/to/p21645601_121250_Linux-x86-84_1of2.zip`
		`oakcli unpack -package /path/to/p21645601_121250_Linux-x86-84_1of2.zip`
		
		In order to save some space you may delete both uploaded files now.
		`rm /path/to/p21645601_121250_Linux-x86-84_*of2.zip`

2	Pre-check 12.1.2.5	Can be done in advance, on Node 0 only, execute: `oakcli validate -c ospatch -ver 12.1.2.5.0`

3	Patch Infra 12.1.2.5	On Node 0 only, execute:
		
		`oakcli update -patch 12.1.2.5.0 --infra`
		
		This process can take up to 2 hours which is also announced during patching. However experience is it takes less time than that.
		
		Validate the output using:
		
		`oakcli show version –detail`
		
		It will report that GI + DB versions need patching.
		
		Possible, but not encountered items in sandbox testing are along the README for 12.1.2.5.0 which says:
		
		"19. After infra patching, during reboot, local hard disk might not be on the top of the priority boot order. This is identified as bug 17473037.
		
		Workaround: Manually move the local hard disk to the top of the boot priority in BIOS, under Boot tab, and then Boot Option Priority tab. Please refer to this doc."
		
		OS patching may fail if current deployment contains packages that are not part of the OL 5.9 to OL 5.11 upgrade. In such a case remove those packages and repeat `-infra` patching per host.

4	Patch GI 12.1.2.5	On Node 0 only, execute ``` oakcli update -patch 12.1.2.5.0 --gi ``` You will notice the 60 mins announcement. Timing is realistic. Possible, but not encountered items in sandbox testing are along the README for 12.1.2.5.0 which says: *"9. If encountering a failed out-of-place GI Patching from lower version oda 2.2-2.10 to oda 12.1.2 or higher, please refer to MOS Note 1665754.1 and 2009201.1 for how to diagnose the failed GI upgrade, how to clean up and how to re-run the patching."* Execute: `oakcli show version -detail` for validation.
5	Unpack 12.1.2.6	If not done yet, copy Oracle Patch 22328442 (both parts) to Node 0 <u>and</u> Node 1 into a particular directory. Login as root to <u>each</u> node, and unpack both files: ``` oakcli unpack -package /path/to/p22328442_121260_Linux-x86-64_1of2.zip oakcli unpack -package /path/to/p22328442_121260_Linux-x86-64_2of2.zip ``` In order to save some space you may delete both uploaded files now. ``` rm /path/to/p22328442_121260_Linux-x86-64_*of2.zip ```
6	Pre-check 12.1.2.6	If not done yet, copy validateOL6.zip to Node 0 <u>and</u> Node 1. Login as root to <u>each</u> node and execute: ``` oakcli validate -c ol6upgrade -prechecks cd /path/to/validateOL6.zip ; mkdir validate unzip -d validate validateOL6.zip ; cd validate ./validateOL6PreChecks oakcli update -patch 12.1.2.6.0 -verify ``` There is <u>no need to execute</u> as documentation says: ``` oakcli validate -c ospatch -ver 12.1.2.6.0 ``` Continue if and only if there are no issues reported. If there are issues reported, fix them and repeat this pre-check until issues are addressed <u>on each node</u>.
7	Patch Infra 12.1.2.6 on Node 0	On Node 0 only, ideally via ILOM or /SP/console CLI (it's actually helpful to run this via /SP/console and watching ILOM remote console in parallel), execute: ``` oakcli update -patch 12.1.2.6.0 --infra --local ``` Following Oracle MOS Note:888888.1, we experienced several times issue #9: *"9. During the infra patching, after step 12 completed, IPMI, HMP done, if it appeared to be hang during Patching OAK with the following two lines*

|		*INIT: Sending processes the TERM signal*
		INIT: no more processes left in this runlevel
		JDK is not patched; the infra patching is not complete to the end.
		Workaround: To reboot the appeared hang node manually, then run
		# oakcli update -patch 12.1.2.6 --clean
		# oakcli update -patch 12.1.2.6.0 --infra –local
		To let it complete the infra patch cleanly"
		Upon completion, verify:
		`oakcli show version –detail`
8	Patch GI 12.1.2.6 on Node 0	On Node 0 only, ideally via ILOM or /SP/console CLI execute:
		`oakcli update -patch 12.1.2.6.0 --gi --local`
		*When getting asked the question "Are you patching Oracle Database Home on SAP environment? [Y/N] then respond with "**n**" being **no**.*
		`chmod 755 /u01/app/12.1.0.2/grid/bin/osdbagrp`
		`chmod 755 /u01/app/12.1.0.2/grid/lib/acfsreplcrs.pl`
		Following Oracle MOS Note:888888.1, watch out issue #12:
		"12. If encountering a failed out-of-place GI Patching from lower version oda 2.2-2.10 to oda 12.1.2 or higher, please refer to MOS Note 1665754.1 and 2009201.1 for how to diagnose the failed GI upgrade, how to clean up and how to re-run the patching."
9	Verify Node 0	On Node 0 only, execute:
		`oakcli validate -c ol6upgrade –postchecks`
10	Patch Infra 12.1.2.6 on Node 1	On Node 1 only, ideally via ILOM or /SP/console CLI execute:
		`oakcli update -patch 12.1.2.6.0 --infra --local`
		Following Oracle MOS Note:888888.1, we experienced several times issue #9:
		"9. During the infra patching, after step 12 completed, IPMI, HMP done, if it appeared to be hang during Patching OAK with the following two lines
		INIT: Sending processes the TERM signal
		INIT: no more processes left in this runlevel
		JDK is not patched; the infra patching is not complete to the end.
		Workaround: To reboot the appeared hang node manually, then run
		# oakcli update -patch 12.1.2.6 --clean
		# oakcli update -patch 12.1.2.6.0 --infra –local
		To let it complete the infra patch cleanly"

		Upon completion, verify:
		`oakcli show version -detail`
11	Patch GI 12.1.2.6 on Node 1	On Node 1 only, ideally via ILOM or /SP/console CLI execute:
		`oakcli update -patch 12.1.2.6.0 --gi --local`
		*When getting asked the question "Are you patching Oracle Database Home on SAP environment? [Y/N] then respond with "**n**" being **no**.*
		Following Oracle MOS Note:888888.1, watch out issue #12:
		"12. If encountering a failed out-of-place GI Patching from lower version oda 2.2-2.10 to oda 12.1.2 or higher, please refer to MOS Note 1665754.1 and 2009201.1 for how to diagnose the failed GI upgrade, how to clean up and how to re-run the patching."
		Follow these instructions. When local GI patching is complete, execute:
		`chmod 755 /u01/app/12.1.0.2/grid/bin/osdbagrp` `chmod 755 /u01/app/12.1.0.2/grid/lib/acfsreplcrs.pl`
12	X5-2 models only	Run as root from the first node only:
		`python /opt/oracle/oak/bin/infiniFixSetup.py`
		Watch out for possible issues reported in Oracle MOS Note 888888.1 Known Issues 12.1.2.6.0 – section 1b.
13	Verify Node 1	`oakcli validate -c ol6upgrade -postchecks`
14	Unpack RDBMS clone files	Copy Oracle Patch 19520042 for Release 12.1.2.6.0 to <u>Node 0 only </u>into a particular directory. As root on <u>Node 0 only</u>, execute:
		`oakcli unpack -package /path/to/p19520042_121260_Linux-x86-64.zip`
		This command creates: /opt/oracle/oak/pkgrepos/orapkgs/DB/12.1.0.2.160119
		In order to save some space you may delete the uploaded file now. `rm /path/to/p19520042_121260_Linux-x86-64.zip`
15	Create new DB home	As root on <u>Node 0 only</u>, execute:
		`oakcli create dbhome -version 12.1.0.2.160119` `oakcli show dbhomes`
		If you need more than one ORACLE_HOME because you may want to run multiple databases against individual ORACLE_HOMEs, repeat this step respectively.

16	Copy SAP Bundle Patch	Copy the SAP Bundle Patch (SBP) DBPSU12_ODA_Mar2016 (or newer) consisting of 3 files as user oracle to each node into a particular directory.
		Additionally, copy the attached file patchenv_ABC_12stack to that directory, also as user oracle.
17	Create new symbolic links	For each SAPSID, create new OHRDBMS symbolic links on both hosts. Align the IHRDBMS value if you have more than one ORACLE_HOME. Perform this as user oracle.

```
ln -s <ORACLE_HOME> /oracle/<SAPSID>/121
```

Example for SAPSID = ABC:

```
ln -s /u01/app/oracle/product/12.1.0.2/dbhome_1 /oracle/ABC/121
```

Verify them:

```
ls -l /oracle/<SAPSID>
```

Example:

```
ls -l /oracle/ABC
```

| 18 | Rollback Oracle patch 21948354 | Oracle Patch 21948354 comes with our fresh ORACLE_HOMEs created in Step 15. However this impacts the application of the SBP and hence it needs to be rolled back. |

In order to remove Oracle Patch 21948354 from RDBMS ORACLE_HOMEs, execute on each node as user oracle:

```
export SBPFUSER=/sbin/fuser
export OHGRID=/u01/app/12.1.0.2/grid
export IHRDBMS=/u01/app/oracle/product/12.1.0.2/dbhome_1
export ORACLE_HOME=$IHRDBMS
echo $ORACLE_HOME (verification)
$ORACLE_HOME/OPatch/opatch rollback -id 21948354 -local \
-all_subpatches
```

Verify Oracle Patch 21948354 is gone:

```
$ORACLE_HOME/OPatch/opatch lspatches
```

Repeat above step for each IHRDBMS ORACLE_HOME.
Next, we have to rollback this patch also from the GI ORACLE_HOMEs. Execute on each node as user oracle:

```
su root -c "$SBPFUSER $IHRDBMS/bin/oracle"
su root -c "/sbin/acfsutil info fs -o mountpoints | xargs $SBPFUSER \
-mu"

su root -c "$OHGRID/crs/install/rootcrs.pl -prepatch -nonrolling"
```

```
env ORACLE_HOME=$OHGRID $OHGRID/OPatch/opatch rollback -id 21948354 \
-silent -local -all_subpatches

su root -c "$OHGRID/rdbms/install/rootadd_rdbms.sh"
su root -c "$OHGRID/crs/install/rootcrs.pl -postpatch -nonrolling"
```

Verify Oracle Patch 21948354 is gone <u>on each node</u>:

```
env ORACLE_HOME=$OHGRID $OHGRID/OPatch/opatch lspatches
```

19	Apply SAP Bundle Patch (SBP) for the 12.1 Home	For each host as user oracle: `cd /path/to/patchenv_ABC_12stack` Modify the script according to your needs (such as SAPSID and individual directories). Add the execute bit to your script(s): `chmod u+x <yourscript>` and execute it. Example: `chmod 755 patchenv_ABC_12stack ; . ./patchenv_ABC_12stack` For each ORACLE_HOME you want to upgrade, follow SBP README in <u>non-rolling</u> mode until Step 13. The last command executed will be `postpatch.sh -dbhome $IHRDBMS`.

20	Database Upgrade Prechecks	Run and verify prechecks for database upgrade either as user oracle, <SAPSID>adm, or, ora<SAPSID>. For each RDBMS home to be upgraded, change your directory to the SAP ORACLE_HOME /oracle/<SAPSID>/121/sap/ora_upgrade/pre_upgrade. Below example uses ABC as <SAPSID>. Execute on one host only. Environment variables ORACLE_HOME and ORACLE_SID need to fit (against 11.2.0.4 ORACLE_HOME).
		
		`cd /oracle/ABC/121/sap/ora_upgrade/pre_upgrade`
		`sqlplus / as sysdba`
		`startup`
		`@pre_upgrade_tasks.sql`
		`@pre_upgrade_checks_ora.sql`
		`@pre_upgrade_checks_sap.sql`
		`exit`

21	Drop DBACockpit views	`cd /path/to/dbac_drop.sql`
		`sqlplus / as sysdba`
		`@dbac_drop.sql`

22	Guaranteed Restore Point	Create and verify a guaranteed restore point. This would enable us to flashback the database in case of our upgrade(s) would fail for any reason.
		
		`cd /oracle/ABC/121/sap/ora_upgrade/pre_upgrade` (example ABC <SAPSID>)
		`@grp_create_restore_point.sql`
		`@grp_list_restore_point.sql`
		
		This implicitly shuts down an instance and changes the content of the `FLASHBACK_ON` attribute in `v$database`.

| 23	Running olspreupgrade.sql	If Oracle Label Security or Database Vault is installed in the source database(s) release that you are upgrading you must run the OLS preprocess `olspreupgrade.sql` in the source database before upgrading to Oracle Database 12.1. However, the pre-upgrade scripts from Step 20 shall have us told us about this. Consequently, make sure this has been executed accordingly.
24	Verify /etc/oratab	The Oracle Database Upgrade Assistant, DBUA, requires a valid entry for each database to be upgraded, syntax is <SID>:<ORACLE_HOME>:Y|N. In our example, this reads as: `ABC:/oracle/ABC/112:N`

25	Run DBUA (wrapper)	As oracle, change to /oracle/<SAPSID>/121/sap/ora_upgrade/post_upgrade.
		
		`cd /oracle/ABC/121/sap/ora_upgrade/post_upgrade`
		
		Make sure X-Windows works, (for example running xclock). This is mainly controlled via the DISPLAY environment variable. See MOS Note 110934.1 "FAQ: X Windows Overview - Setup and Enviroment Within Unix" for help if it doesn't work for you.
		
		Further, set following environment variables, according to our example:
		
		`export DB_SID=ABC (set to origin's database DB_UNIQUE_NAME)`
		`export ORACLE_HOME_SRC=/oracle/ABC/112`
		`export ORACLE_HOME_TGT=/u01/app/oracle/product/12.1.0.2/dbhome_1`
		`export ORACLE_SID=ABC001`
		`export ORACLE_BASE=/u01/app/oracle`
		
		Invoke dbua.sap.sh –h in order to familiarize yourself with the command options:
		`./dbua.sap.sh -h`
		
		Subsequently, invoke dbua.sap.sh in test/query mode whether you are ready to upgrade:
		`./dbua.sap.sh -t rac -q`
		
		Fix potential problems, re-run in query mode until no issues reported. When ready for upgrade, omit –q flag for dbua.sap.sh.
		`./dbua.sap.sh -t rac`
		
		Follow the screenshots for our example SAPSID ABC.
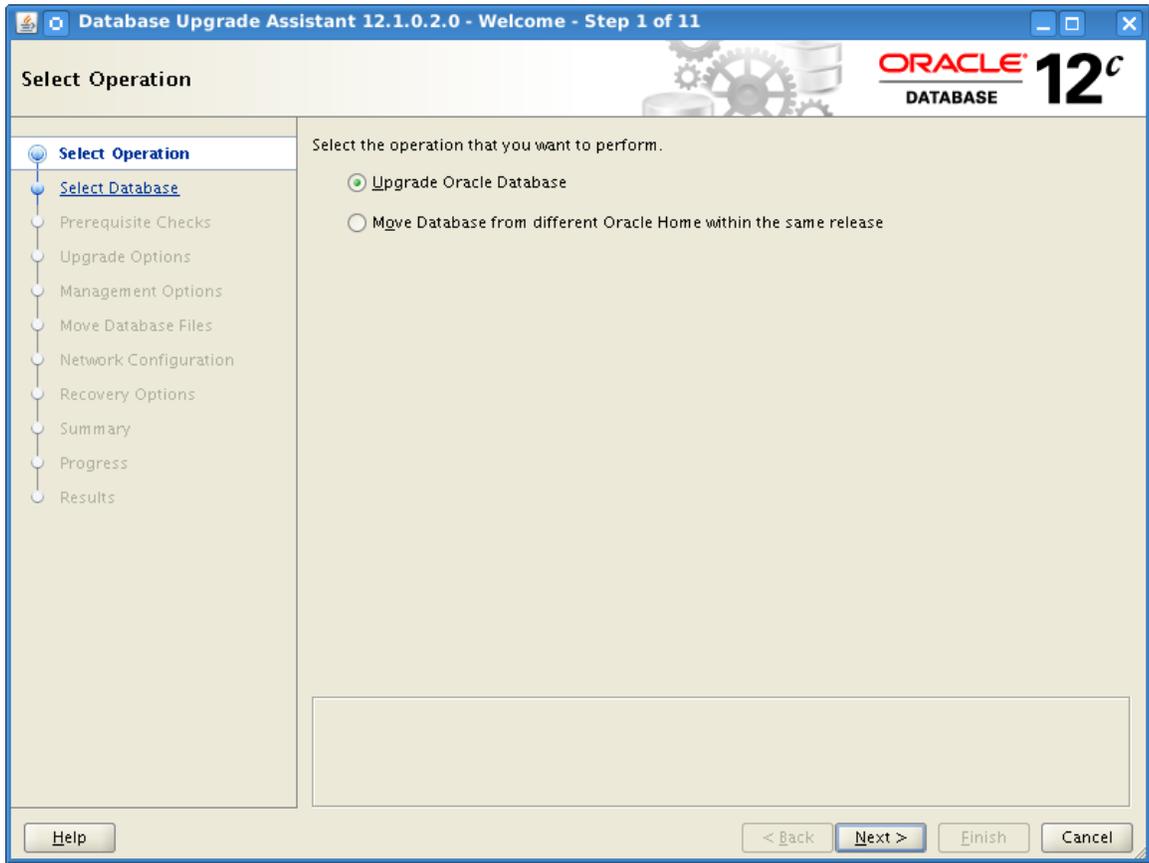
Choose "Upgrade".
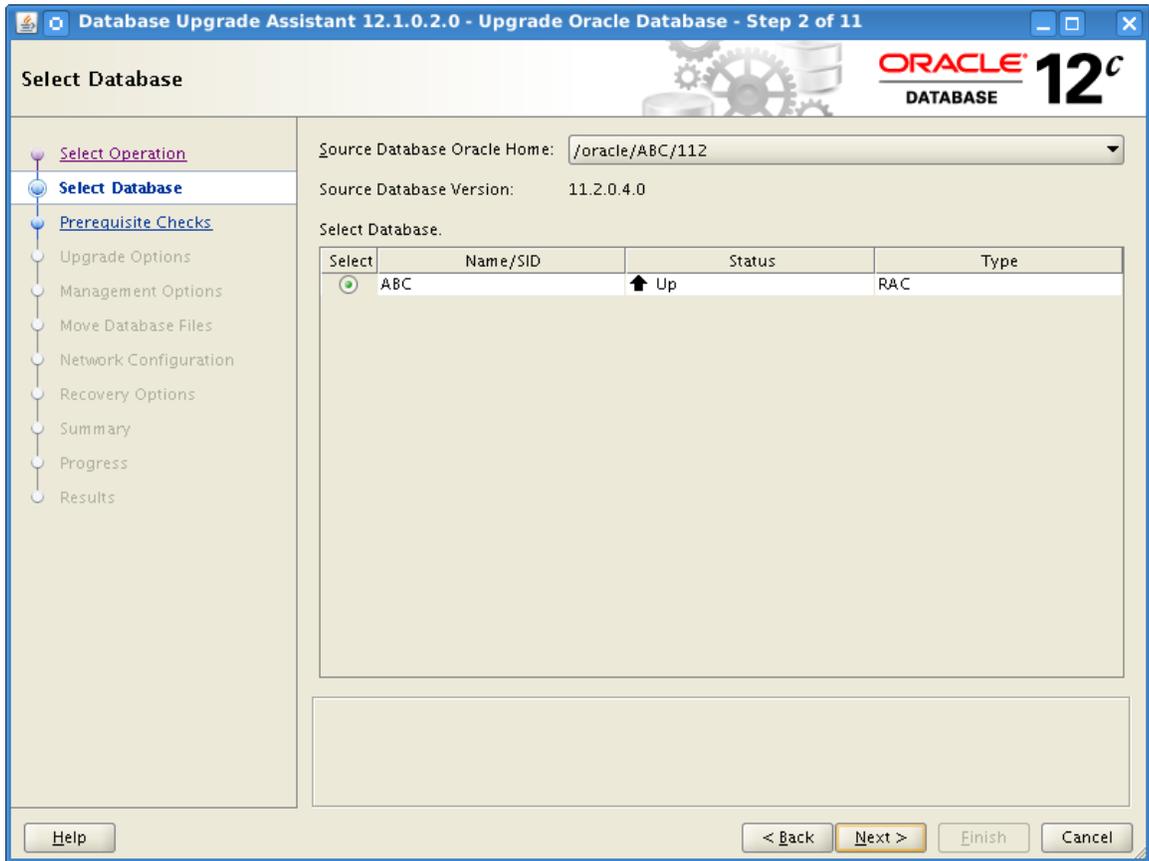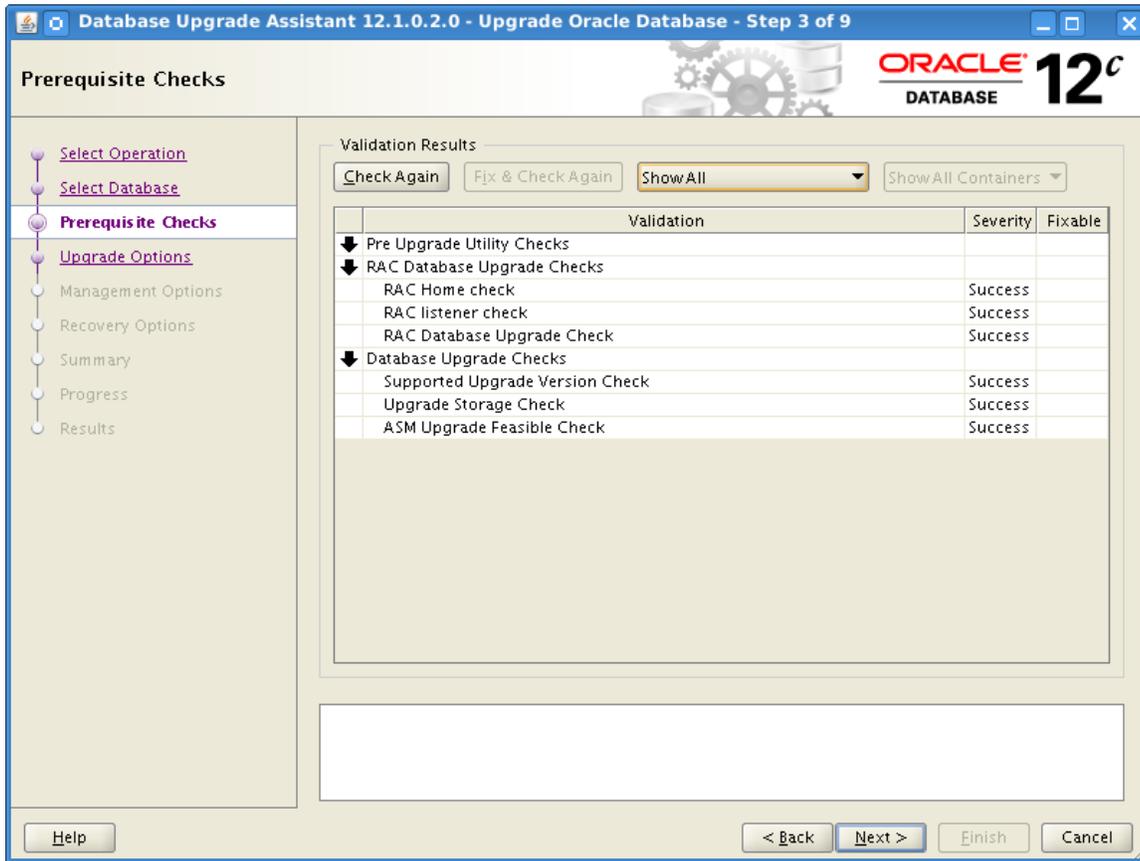
Prerequisite checks take a little time.
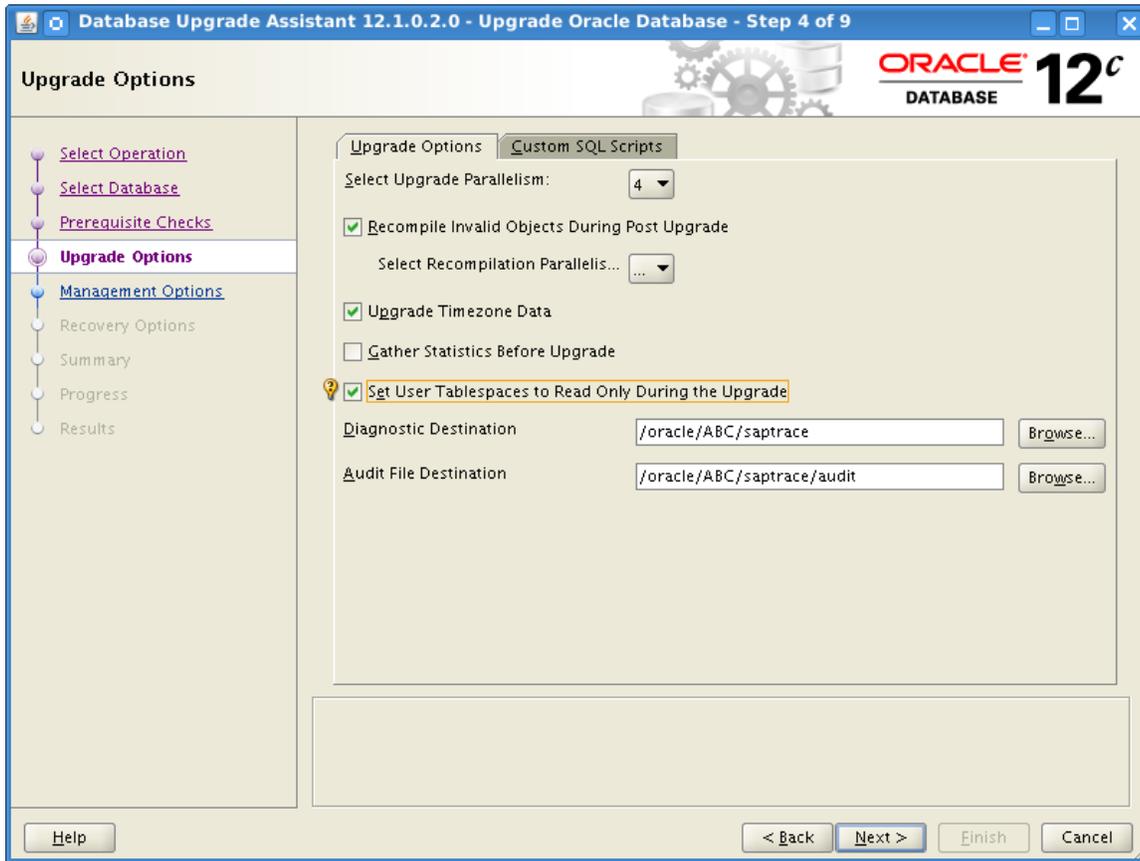
We have already gathered statistics during the pre-upgrade stage, therefore deselect this item. Make sure to tick the other checkboxes as shown above.
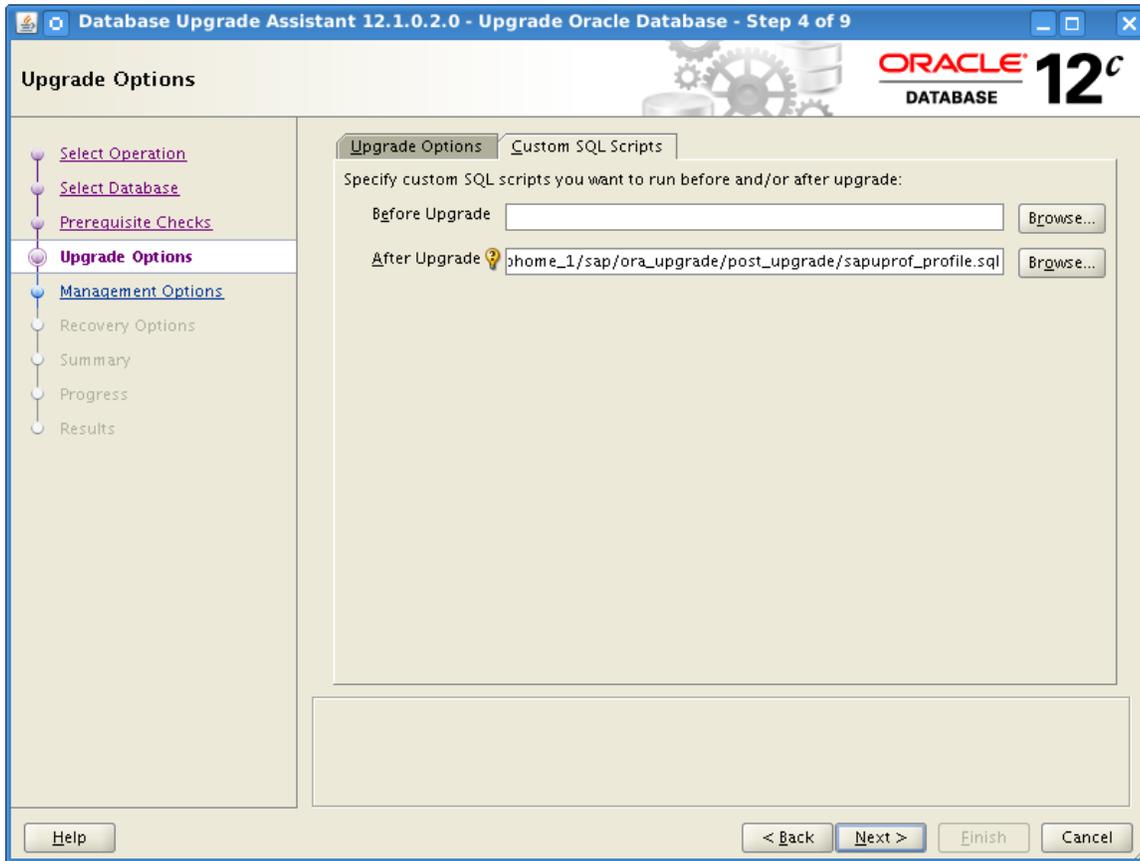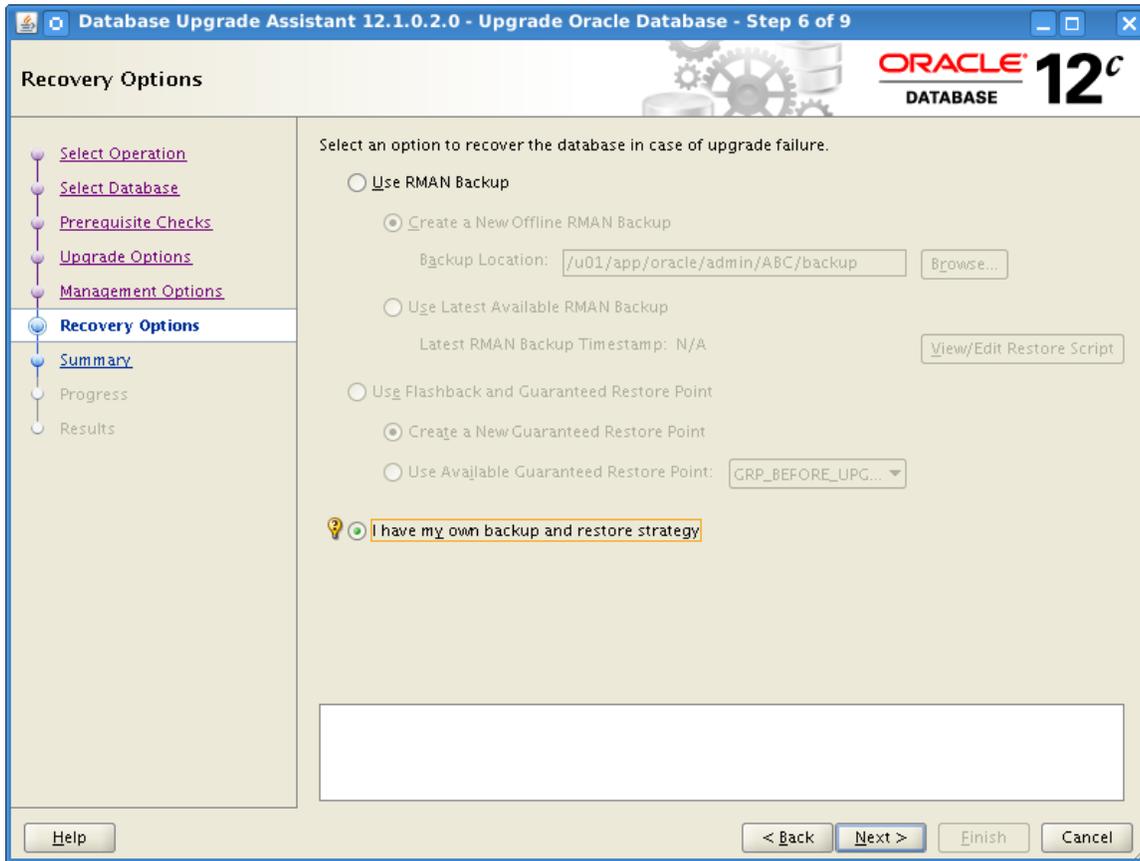
Default settings for post-upgrade scripts are:

» post_upgrade_tasks

» set_compatible – this one actually will not be executed when a guaranteed restore point has been established.
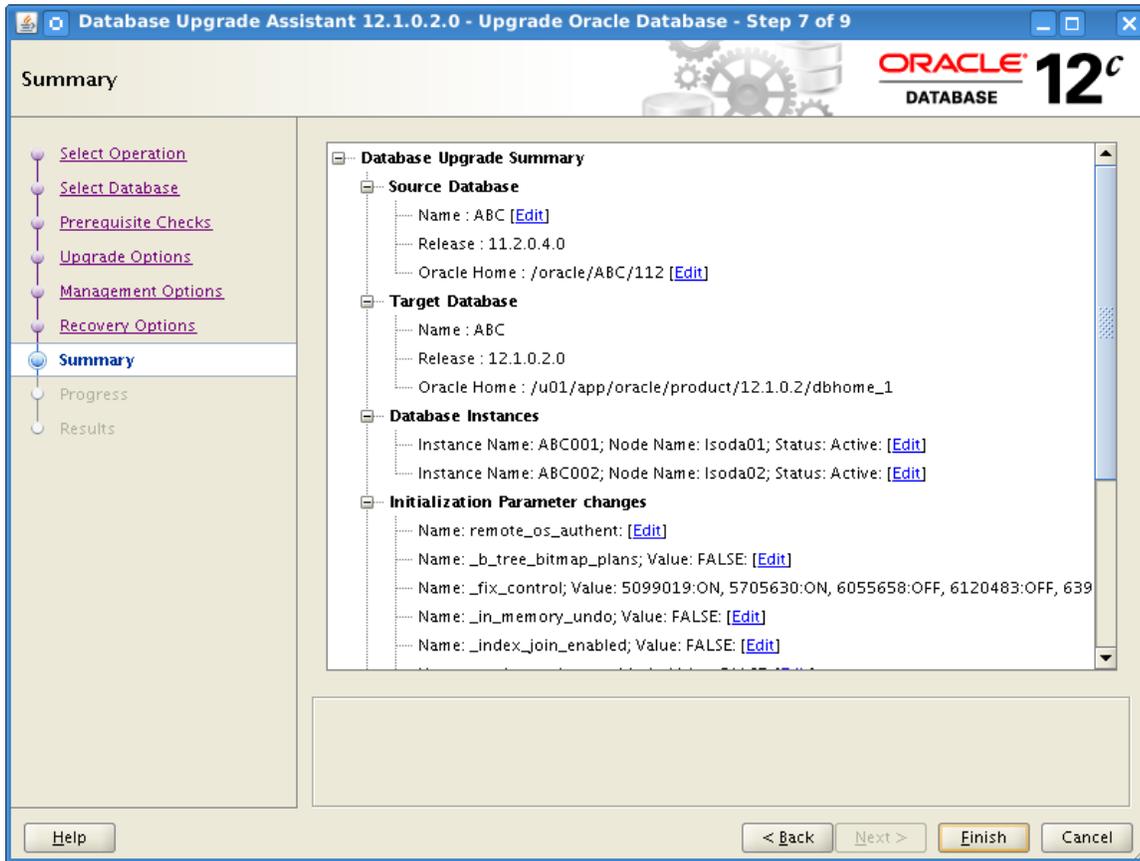
» sapupprof_profile
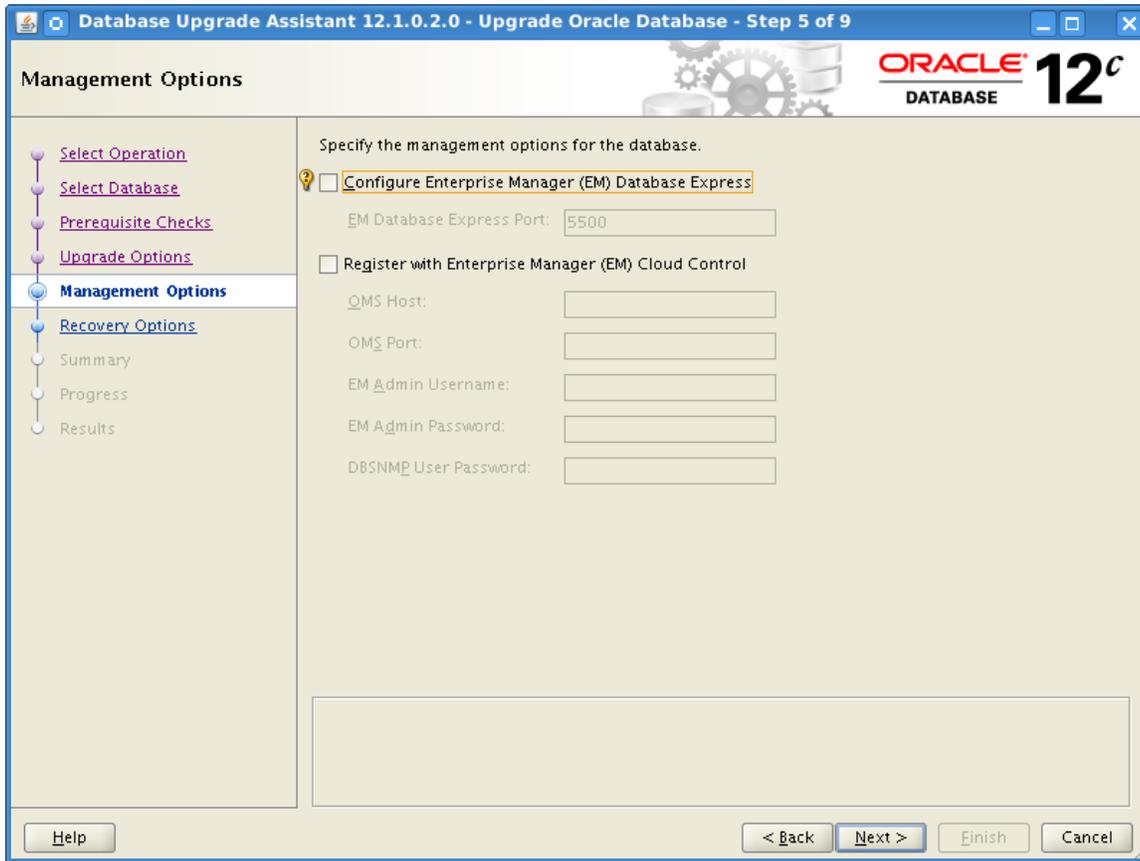
Deselect Enterprise Manager Express configuration.

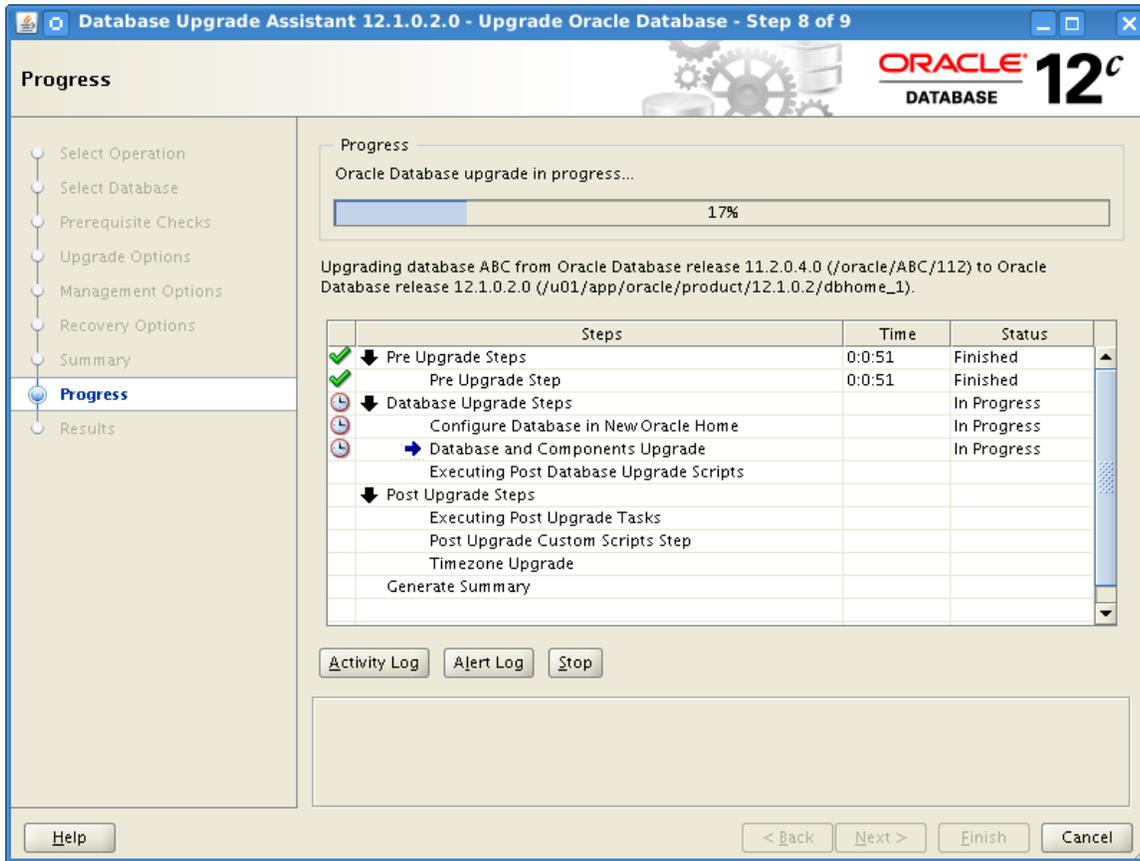However if you wish to register the database with EM Cloud Control you are free to do so.

A working, proven, restorable and recoverable backup is a prerequisite of the entire upgrade process.
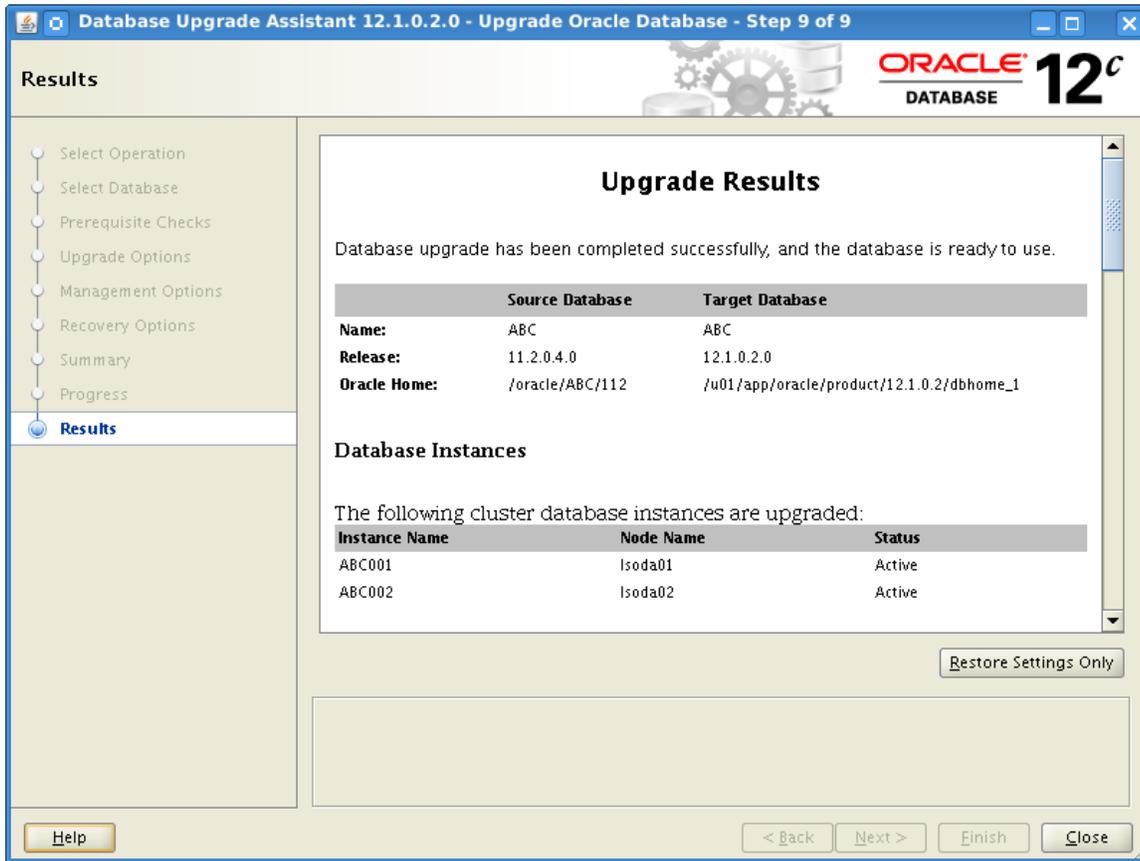
Time to carefully review database upgrade settings.

Sandbox upgrade alert. The warning can be safely ignored.
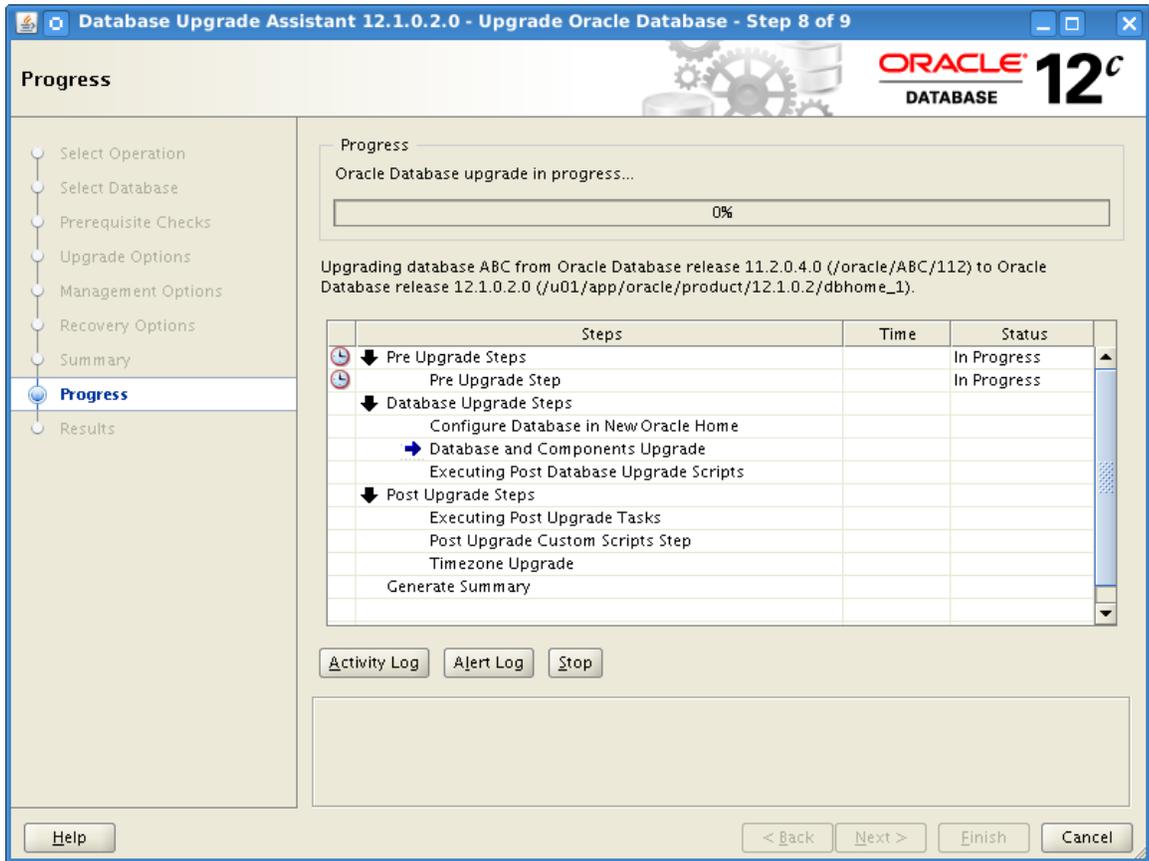
Once complete press the button titled "Upgrade Results" in order to get to the next screen.

dbua.sap.sh itself shall return after a successful execution like this:

```
. (INFO) - File /u01/app/oracle/cfgtoollogs/dbua/ABC/upgrade1/UpgradeResults.html
found.
.
. RAC database ABC will be stopped now.
.
. Executing now  /u01/app/oracle/product/12.1.0.2/dbhome_1/bin/srvctl stop database
-d ABC
. RAC database ABC shut down.
.
. Upgrade Results
.
. (INFO) - DBUA return code (0) indicates successful upgrade.
. (SUCCESS) - DBUA has finished the database upgrade.
.
. DBUA started  at: 2016-05-23 16-26-03
. DBUA finished at: 2016-05-23 17-00-43
.
. For database upgrade results, see
/u01/app/oracle/cfgtoollogs/dbua/ABC/upgrade1/UpgradeResults.html
. For custom scripts results, see
/u01/app/oracle/cfgtoollogs/dbua/ABC/upgrade1/CustomScript.log
. The log file of dbua.sap.sh is /home/oracle/12cupgrade-12102-ABC.log
. (EXIT)    -  (0)
[oracle@lsoda01 post_upgrade]$
```

26	Adjust /etc/oratab	During upgrade, we touch /etc/oratab, however, with the installation ORACLE_HOME. SAP mandates to have this adjusted towards SAP ORACLE_HOME. From a software perspective, it's srvctl code that controls the content of /etc/oratab. We stop the upgraded database, and change the runtime ORACLE_HOME in /etc/oratab. As user oracle, execute: `srvctl stop database –d ABC` (according to our example), if not stopped already by the `dbua.sap.sh` wrapper script.
		
		`srvctl modify database -d ABC –oraclehome /oracle/ABC/121`
		
		`srvctl config database -d ABC` (verify the updated –oraclehome)
		
		Start only the first instance for completion of the SAP Bundle Patch application, running catsbp:
		
		`srvctl start instance -i ABC001 -d ABC`
		
		Verify /etc/oratab – it should read now as:
		
		`ABC:/oracle/ABC/121:N`

27	Update environment scripts	For the OS accounts <SAPSID>adm – and if present, the account ora<SAPSID>, adjust their environment setup script contents in the .dbenv* files. Essentially, any occurrence for the previous ORACLE_HOME needs to be replaced with the value of the new ORACLE_HOME. It's advisable to have a backup of these for a potential restore. In our example for the <SAPSID> ABC this sed command does this job (replacing the string /oracle/ABC/112 with /oracle/ABC/121): `sed -i -e 's/\/oracle\/ABC\/112/\/oracle\/ABC\/121/g' .dbenv*` Do not make any mistakes at this step.

28	Run post-upgrade scripts	Standard Oracle post-upgrade scripts:
		`sqlplus / as sysdba`
		`@?/rdbms/admin/utlu121s.sql`
		`@?/rdbms/admin/utluiobj.sql`
		
		If not already executed during the DBUA phase you must run out of new ORACLE_HOME (in our example, /oracle/ABC/121) /sap/ora_upgrade/post_upgrade/post_upgrade_tasks.sql.
		
		`@post_upgrade_tasks.sql`
		
		If there are any invalid objects left, recompile them:
		
		`@?/rdbms/admin/utlrp.sql`
		
		Finally, run SAP specific post-upgrade checks:
		
		`@?/sap/ora_upgrade/post_upgrade/post_upgrade_checks.sql`

29	Drop Guaranteed Restore Point and raise compatible value	In Step 22 we created a guaranteed restore point which enables us for a fast recovery in case of failure but also preventing us from raising the RDBMS compatible parameter. If upgrade succeeded so far we drop the guaranteed restore point and raise the compatible parameter.
		``
cd /oracle/ABC/121/sap/ora_upgrade/pre_upgrade
sqlplus / as sysdba
@grp_list_restore_point.sql
@grp_drop_restore_point.sql
exit
cd /oracle/ABC/121/sap/ora_upgrade/post_upgrade
sqlplus / as sysdba
@set_compatible.sql
show parameter compatible
```
Resetting compatible requires an instance restart. |
| 30 | Restart first instance | ```
srvctl stop instance -i ABC001 -d ABC -f
```
-f flag required because instance has registered services that can't fail over as at the current state pre-catsbp only single instance is allowed to be up.
```
srvctl start instance -i ABC001 -d ABC
``` |
| 31 | Optional – Create guaranteed restore point before running catsbp | ```
sqlplus / as sysdba
create restore point GRP_AFTER_UPGRADE_12102 guarantee flashback database;
select name from v$restore_point where guarantee_flashback_database='YES';
``` |
| 32 | Complete SAP Bundle Patch | In Step 19 we applied the SBP until including step 13.
It is expected that only the first instance of the upgraded database is up and running which reflects step 14 of the SBP application steps.
```
cd /path/to/patchenv_ABC_12stack
. ./patchenv_ABC_12stack
```
Consequently run step 15 of the SBP application along its REAMDE, followed by the necessary event and fix_control settings update <u>on the first host only</u> including the remaining steps such as upgrading the RMAN catalog if in use. |

33	Verify ORACLE_BASE
	
	orabtt Patch and update
		May require another shutdown cycle per host if patching is needed.
		
		As user oracle on each node, invoke `. oraenv` and pass the new DBSID value, in our case ABC. If the output is:
		
		<pre>"The Oracle base remains unchanged with value /u01/app/grid
		Resetting ORACLE_BASE to its previous value or ORACLE_HOME
		The Oracle base remained unchanged with value /u01/app/grid",</pre>
		then apply Oracle Patch 22819075 from SAP Note 1521371 locally as user oracle <u>on each node</u>. When unpacked and understood the README, `$ORACLE_HOME/OPatch/opatch apply –local` <u>on each host</u>. This patch will be included in subsequent SAP Bundle Patches.
		
		Invoke `$ORACLE_HOME/sap/orabtt/orabtt.sh –check –dbsid ABC` (for our example). If the output contains "`(Warning) – No entry found for database ABC`", invoke `$ORACLE_HOME/sap/orabtt/orabtt.sh –add –dbsid ABC` (for our example).
		
		Repeat this step on the remaining node.

34	Post-Upgrade Tasks	Continue with post-upgrade tasks documented in the SAP guide "Upgrade to Oracle Database 12c (12.1.0.2): Unix". A couple of those tasks are documented herein.

35	Reinstall DBACockpit views	In step 21 we dropped the DBACockpit views before the upgrade. Now we're going to reinstall them. We assume SAPSR3 to be the relevant schema here.
		
		<pre>cd /path/to/dbac_install.sql
		sqlplus / as sysdba
		@dbac_install.sql SAPSR3</pre>

36	Check Database Parameterization	Download and execute the parameter_check_12 script from SAP Note 1171650. Ensure that database parameters are configured according to SAP Parameter recommendations for Oracle Database outlined in SAP Note:1888485.

37	Run Database Vault Post-Upgrade scripts	Applicable if and only if your database is configured for Database Vault, as oracle, or, <sidadm>:
		
		<pre>sqlplus / as sysdba
		@?/sap/ora_dbvault/dv_install/dv_lock_accounts.sql
		sqlplus / as sysdba
		@?/sap/ora_dbvault/dv_install/dv_recompile.sql</pre>
		Drop role SAPCRED:
		<pre>sqlplus / as sysdba
		drop role SAPCRED;</pre>
		Reference: SAP Note:2218115 – Oracle Database Vault 12c

38	Configure Database Vault Policy	Applicable if and only if your database is configured for Database Vault, as oracle, or, <sidadm>, configure the new SAP NetWeaver Database Vault standard policy for release 12c (12.1).
		
		``sqlplus secadmin
		@?/sap/ora_dbvault/dv_policy/dv_policy policy upgrade```
		
		Enable Database Vault:
		
		``sqlplus secadmin
		SQL> exec DBMS_MACADM.ENABLE_DV;```
		
		Restart your database (according to our ABC example)
		
		```srvctl stop database -d ABC ; srvctl start database -d ABC```
		
		Reference: SAP Note:2218115 – Oracle Database Vault 12c

39	Check Database Vault Configuration Status	Applicable if and only if your database is configured for Database Vault, as oracle, or, <sidadm>: ```sqlplus / as sysdba @?/sap/ora_dbvault/dv_install/dv_check.sql``` Reference: SAP Note:2218115 – Oracle Database Vault 12c

40	Dropping guaranteed restore point	Obtain, drop, and re-validate any guaranteed restore points that were created before, during, or after the database upgrade to protect the database upgrade process.
		
		``SQL> select name from v$restore_point where
		guarantee_flashback_database='YES';```
		
		```SQL> drop restore point GRP_AFTER_UPGRADE_12102;```
		
		``SQL> select name from v$restore_point where
		guarantee_flashback_database='YES';```

41	Check passwordfile	If using password files verify they reside on both hosts in the new ORACLE_HOME.

42	Check SPFILE	Ensure <SID>adm users have proper init<SID>.ora files. Say on Node 0 we refer to initABC001.ora file then we need to refer to initABC002.ora on Node 1. This init<ORACLE_SID>.ora file essentially contains a pointer to the stored parameter file (*spfile*) in Oracle ASM. If needed only, copy the init file from a good host to the remaining one as per below example as user oracle:
		
		```cd /oracle/ABC/121/dbs```
		
		```scp initABC001.ora <node2>:/oracle/ABC/121/dbs/initABC002.ora```

		Create a backup of your spfile using:
		`create pfile='/path/to/pfile<nodeX>' from spfile;`
43	Check central inventory	After upgrade we are supposed to have 4 ORACLE_HOMEs per node. Invoke: `$ORACLE_HOME/OPatch/opatch lsinventory –all	more` Expected is a list that includes "List of Oracle Homes".
44	Deinstall pre-upgrade GI OH	Best practice: Keep the pre-upgrade GI ORACLE_HOME for a while before deleting it. Use SAP Note:1915314 in order to achieve this.
45	Deinstall pre-upgrade RDBMS home	Best practice: Keep the pre-upgrade RDBMS ORACLE_HOME for a while before deleting it. Use `oakcli delete dbhome` and/or SAP Note:1915314 in order to achieve this. Delete also the symbolic links /oracle/<SAPSID>/112 on each node.

46	Verify the proper OS oper group in new RDBMS home	This is a sanity step:
		
		 `cd $ORACLE_HOME/rdbms/lib ; grep 'define.*SS_OPER_GRP' config.c`
		
		 If the output is different from:
		
		 #define SS_OPER_GRP "oper"
		
		 then this needs to get corrected. Backup config.c, edit config.c towards above line. Then:
		
		 `$ORACLE_HOME/bin/relink all`

47	Update the Oracle InstantClient	The installed Oracle InstantClient version 11.2.0.4 is compatible against Database Version 12.1.0.2. However it is recommended to update the InstantClient on all involved hosts. Follow SAP Note: 819829. In our sandbox environment for this worked like:
		
		 `SAPCAR –xvf 12164.SAR`
		
		 `cd /oracle/client/12x ; ln –s instantclient_12102 instantclient`
		
		 Updating .dbenv* scripts as abcadm: `sed –i –e 's/11x_64/12x/g' .dbenv*`
		
		 Logout, Login. `genezi -v`
		
		 `cd /sapmnt/ABC/exe ; ldd dboraslib.so` (must not report undefined symbols)
		
		 `R3trans –x`

48	ASM DiskGroup compatibility	Consider changing your ASM diskgroup compatible settings if not running nor planning to run any 11.2 database. After this change one cannot run any 11.2 RDBMS out of these disk groups. Keep in mind you cannot run 11.2 database on X5-2 models on ASM. Also not as proposed on ACFS as it's not supported by SAP. Login as user oracle. As these are shared disks it's a one-time task. `[oracle@lsoda01 ]$ . oraenv`

```
+ASM1
[oracle@lsoda01 ]$ asmcmd lsattr –lm | egrep "Name|compatible"
```

If that output would report any non 12.1 output, run following commands for each diskgroup:

```
[oracle@lsoda01 ]$ sqlplus "/ as sysasm"

alter diskgroup <DG> set attribute 'compatible.asm'='12.1.0.2';

alter diskgroup <DG> set attribute 'compatible.advm'='12.1.0.2';

alter diskgroup <DG> set attribute 'compatible.rdbms'='12.1.0.2';
```

49	Apply SAP Kernel change	Depending on your NetWeaver stack, you would have to apply an SAP Kernel change. This however depends on your stack and as outlined at the beginning, needs to match the Database Release (12) and Platform (Linux x86-64), OS Release (which changed from Oracle Linux 5 to Oracle Linux 6) across all attached SAP Application servers.
50	Update BR*Tools	It is recommended to upgrade SAP BR*Tools. Review SAP Note 2087004 for this.
51	Verify ora<SID> user account	Earlier versions of SAP SWPM on Engineered Systems didn't install the ora<SAPSID> account. However, it is recommended to have this account (on both hosts). As root on each host according to our example, `id oraabc` If not present (`id: oraabc: No such user`), create it on <u>both</u> hosts. Please follow SAP Note 2204211 – SWPM: Install ora<dbsid> User for Oracle 12.1.

52	Delete aged repository data	Saving some filesystem space, delete aged repository data, the first command might fail if that was the first one deployed, the current release cannot be deleted (12.1.2.6.0). Perform this action on <u>both</u> hosts.
		
		`oakcli manage cleanrepo –ver 2.10.0.0.0`
		
		`oakcli manage cleanrepo –ver 12.1.2.5.0`

53	Perform Backup	Re-instantiate backups (both databases and file systems) that cover the upgraded operating system, SAP kernel, environment details, client updates and others.
54	Start SAP Application stack	Start SAP Application stack and verify operational fit.

Appendix A – patchenv_ABC_12stack

patchenv_ABC_12stack:

```
#!/bin/sh
SBPFUSER=/sbin/fuser
IHRDBMS=/u01/app/oracle/product/12.1.0.2/dbhome_1
OHRDBMS=/oracle/ABC/121
OHGRID=/u01/app/12.1.0.2/grid
echo PatchEnv set for OHGRID OHRDBMS IHRDBMS SBPFUSER
echo OHGRID=$OHGRID
echo IHRDBMS=$IHRDBMS
echo OHRDBMS=$OHRDBMS
```

Documentation References

[1] ODA Documentation

http://www.oracle.com/technetwork/server-storage/engineered-systems/database-appliance/documentation/index.html

[2] Upgrade of SAP NetWeaver installation to Oracle Grid Infrastructure 12.1.0.2 and Oracle Real Application Clusters 12c Release 1

http://scn.sap.com/community/oracle

[3] SAP Database Upgrade Guide "Upgrade to Oracle Database 12c (12.1): UNIX"

> http://service.sap.com/instguides / Database Upgrades / Oracle

[4] Relevant SAP Notes, Oracle Notes

SAP Notes

SAP Notes	SAP Related Notes
2290084	SAP Software and ODA Version 12.1
1760737	SAP Software and Oracle Database Appliance Versions 2.x (ODA)
2064206	Database Upgrade to 12.1.0.2 with Grid Infrastructure
2133079	Oracle Database 12c Integration in SAP Environment
527843	Oracle RAC support in the SAP environment
1677978	Mixed GI/RDBMS Versions or Mixed SAP/Non-SAP Environments on Exadata
1915315	Database upgrade scripts for 12.1.0.2
2087004	BR*Tools Support for Oracle 12c
1914631	Oracle 12c: Central Technical Note for Oracle 12c
1598594	BR*Tools configuration for Oracle installation using user "oracle"
819829	Oracle Instant Client Installation and Configuration on Unix
1171650	Automated Oracle DB parameter check
1627541	BR*Tools support for Oracle ASM and Exadata/ODA
1635808	Oracle Linux 6.x SAP Installation and Upgrade
1521371	Setting of ORACLE_BASE in SAP environments
706927	Oracle DB-Mon: Installation script for ST04N or DBACockpit – Oracle DB-Mon: Installation script for ST04N or DBACockpit
2204211	SWPM: Install ora<dbsid> User for Oracle 12.1

ORACLE NOTES

Oracle Note	Oracle MOS Note Title
888888.1	Oracle Database Appliance - 12.1.2 and 2.X Supported ODA Versions & Known Issues
1409835.1	ODA (Oracle Database Appliance): Deployment & Cleanup Steps
1934030.1	ODA (Oracle Database Appliance): HowTo export ACFS (cloudfs) using HANFS
337737.1	Oracle Clusterware (CRS/GI) - ASM - Database Version Compatibility

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