Oracle Build Standards

Version: 1.0

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DOCUMENT CONTROL

The document control section describes the revision history and summary of the changes made to the document.

1.1 Distribution List

Name	Role	Representing

1.2 Document History

Version	Date	Who	Summary of Changes
1.0	Jan, 03rd 2017	Ramiz Sarah	Oracle Build Standard

1.3 Terminology

Term	Definition
ASM	Oracle's Automated Storage Management Feature
DBA	Database Administrator
DBCA	Oracle Database Configuration Assistant
DBMS	Database Management System
OEM	Oracle Enterprise Manager; monitoring and administration tool for Oracle products

1.4 Document Location

The source of the document will be found under the KEC ALLIANCE Documentation section

EXECUTIVE SUMMARY

The purpose of this document is to define and document Livingston global standards, processes, and best practices for installing, building, and managing Oracle Databases to deliver high-quality services based on standard operating environments.

The scope of this document is to define the standard build processes and best practices for Oracle database implementation. This document is intended to be used by the Oracle DBA's who are in charge of the Oracle database management activities. Having common standards defining best practices for each DBMS can streamline database implementation and management tasks and free up the DBA for other valuable duties.

This document does not replace vendor product manuals or processes to accomplish a task mentioned in the vendor product manuals published by Oracle. This document is designed to work in conjunction with Oracle manuals. Always refer to Oracle manuals and release bulletins published by Oracle for the latest information on the subject.

NEW SERVER BUILD – PRE-INSTALLATION TASKS

This section will address requirements that can help database administrator with setup of a new instance of Oracle database server. The following section will detail guidelines, which should be followed to assure a successful and comprehensive setup.

The following tasks should be completed before installing Oracle:

- Ensure Feasibility
- Validate Oracle Software Deployment
- Check for Special Installation Instructions
- Verify Software Installation Naming conventions
- Create OS User Accounts and Groups
- Determine Disk Storage
- Check the Network Requirements
- Check the OS/System Configurations
- Verify Database Naming conventions
- Identify Port Numbers
- Identify the ASM Diskgroups
- Identify Database Files
- Identify the ORACLE_BASE Directories
- Identify Other Database Directories
- Create the Database Directories
- Check the Tablespace Requirements
- Ensure Licenses for Monitoring and Backup/Recovery tools
- Run the Oracle RDA Health Check Validation Engine (HCVE)
- Prepare the implementation plan

1.1 Ensure Feasibility

Prior to server installation, it is very important to understand the application environment. Make sure to understand the user requirements and database performance expectations.

If the DBA is involved in making hardware decisions, visit the hardware vendor's web site and accumulate hardware specifications and TPC benchmark statistics.

The DBA must establish Hardware compatibility in terms of CPU version, memory available, disk space availability, etc with the version of the Oracle product proposed to be installed.

It is recommended not to install an Oracle instance on machine where the application software or any other non-Oracle DBMS software is installed. It is also not recommended to run the OEM Management Server (OMS) on the same server as the Oracle instance.

1.2 Validate Oracle Software Deployment

Deploy the most stable current release from Oracle unless otherwise dictated by the application. Make sure that Oracle version is compatible with third-party tools being used by the application and/or the vendor.
Check for any Oracle Quarterly CPU patches. Additional information is at Oracle Critical Patch Updates and Security Alerts .

This document will not include detailed information on each quarterly patchset. The DBA will be required to read the instructions that come with the patchset. When problems are encountered, this document may be modified to include additional information.

If vendor supported Oracle software cannot be deployed, the DBA must deploy the highest possible stable supported version of the RDBMS software and document the business justifications to support the deployment of the back-leveled RDBMS software.

1.3 Check for Special Installation Instructions

Refer to the Oracle documentation for the latest information on the product for the release version. The documentation is located online from the Oracle Technology Network.

The DBA must review the Release Notes in the Oracle documentation for the release version proposed to be installed for the latest information.

1.4 Verify Software Installation Naming Conventions

The Livingston Oracle Naming Standards will be used as the default. For convenience, the Oracle Naming Standard document is compliant-with and based-upon the Midrange Standards.

1.5 Create OS User Accounts and Groups

Create an “oracle” account on the system to perform all installation tasks. This is referred to as the DBMS owner account.

The “oracle” user should perform all the installation, upgrade, and setup tasks. Root privileges are required to complete the installation. Work with Infrastructures to obtain access to the “root” user as needed.

The oracle user default home directory should be set to /u01/app/oracle/home. The permissions for the default home directory must be set to 755.

Request the Korn Shell (ksh) as the default shell.

The primary group for “oracle” should be “oinstall” and the secondary group should be “dba”. The “oinstall” group will be the owner of the ORACLE_HOME and oraInventory directories. The “dba” group will have database administration privileges for the ORACLE_HOME being created. Although “dba” was recommended as the primary group in past releases, “dba” should only be used as the primary group on an exception basis when required by the application.

Authorized users will also need to request individual user id’s on the server. The following table shows the recommended naming conventions for a UNIX or Linux Oracle server.

Category	Naming Convention
ORACLE_USER (DBMS owner) id	oracle
Primary OS Group	oinstall
Secondary OS Group	dba
Default Home Directory	/u01/app/oracle/home or /home/oracle
Default Shell	KSH

1.6 Determine Disk Storage

The following table shows the storage options supported for storing Oracle database files and Oracle database recovery files. Oracle database files include datafiles, controlfiles, redo-log files, the server parameter file, and the password file.

- ASM – recommended, but at this time requires additional purchase of OEM for monitoring.
- File System – use File Systems where ASM cannot be used. Refer to File System requirements for further details.
- Raw Devices – use Raw Devices only where ASM and File Systems cannot be used and higher disk I/O performance is required. Raw Devices are more difficult to manage than ASM or File Systems.

For all installations, you must choose the storage option that you want to use for Oracle database files.

If you want to enable automated backups during the installation, you must also choose the storage option that you want to use for recovery files (the flash recovery area).

Verify disk space is available on the server for installing the Oracle products and creating the user databases. Make sure to ask for the proper RAID level for Oracle file systems and database devices.

Ensure that the Flash Recovery Area or another area on disk is sized properly to store flashback, archive, and online redo logs.

1.7 Check the Network Requirements

The following network items need to be completed:

- Verify that your network software is configured.
- Verify that the hostname can be resolved.
- Interactive terminal access (such as SSH or telnet) to the server for the DBA.
- X-term access to perform Oracle installations.
- Port 1521 (and any other ports that will be used for the Oracle listener) access to IP address configured by default for the Oracle Listener.
- Access to the backup and recovery server for backup and recovery purposes.
- The ability to transfer files to and from the database server.

Optionally, port 25 outbound-only access for SMTP for Sendmail (if required).

1.8 Check the OS/System Configurations

OS/System configuration requirements will vary depending upon the particular OS platform.

Refer to the Oracle Documentation for the specific OS before attempting to install Oracle software to identify and adjust the OS Kernel parameters.

1.9 Verify Database Naming conventions

Refer to the Oracle Naming Standards document.

1.10 Identify Port Numbers

Identify the port numbers to be assigned to the Oracle listeners. Verify with OS administrator if the port numbers are used by some other applications. Ensure the port numbers are recorded in /etc/services to keep them from being used by another application.

All Oracle Net LISTENERS must be protected with an encrypted password. The example below shows the default listener which uses port 1521.

Listener Name	Description	Port Number
LISTENER	Default	1521

1.11 Identify the ASM Diskgroups

If using ASM, identify the ASM Disk Groups and their characteristics. It is recommended to limit the number of disk groups (to two), unless there is a specific requirement or need to create additional groups.

Disk Group	Purpose	Redundancy
DATA_GRP	Database files	External
FR_GROUP	Flash Recovery Area	External

1.12 Identify Database Files

Identify the types of files for the database and their associated ASM Disk Group or File Name and size. See the Oracle Naming Standards for file naming standards. See below for files stored in ASM.

File Type	ASM Disk Group
Control Files	DG1 and DG2
Data Files	DG1
Redo Log Files	DG2 and DG2
Archive Log Files	DG2
Temporary Files	DG1
Parameter File (SPFILE)	DG1

1.13 Identify the ORACLE_BASE Directory

Oracle Base Directory	Oracle Home Directory	Use
/u01/app/oracle	/u01/app/oracle/ product/release_number	DBMS software

1.14 Identify Other Database Directories

Directory	Contents
/u01/app/oracle	ORACLE_BASE
/u01/app/oracle/home or /home/oracle	home directory for oracle UNIX id ($HOME)
/u01/app/oracle/oraInventory	oracle inventory directory
/u01/app/oracle/network	Oracle Net files
/u01/app/oracle/network/admin	listener.ora, tnsnames.ora, sqlnet.ora
/u01/app/oracle/network/log	network log files
/u01/app/oracle/network/trace	network trace files
/u01/app/oracle/admin/<db name>	files associated with instance
/u01/app/oracle/admin/diag/rdbms/<db name>/<inst name>/adump	audit trail files for instance, created by DBCA
/u01/app/oracle/admin/diag/rdbms/<db name>/<inst name>/bdump	background dump destination for instance, created by DBCA
/u01/app/oracle/admin/diag/rdbms/<db name>/<inst name>/cdump	core dump destination for instance, created by DBCA
/u01/app/oracle/admin/diag/rdbms/<db name>/<inst name>/pfile	parameter file for instance (spfile will be in ASM)
/u01/app/oracle/admin/diag/rdbms/<db name>/<inst name>/scripts	instance-specific scripts
/u01/app/oracle/admin/diag/rdbms/<db name>/<inst name>/udump	user dump destination for instance, created by DBCA
/u01/app/oracle/scripts	common database scripts
/u01/app/oracle/admin/common	for files common to all databases (e.g., scripts called by OEM and associated parameter files for those scripts)

1.15 Create the Database Directories

Create the Directories required for the install.

Mkdir –p /u01/app/oracle/product/release_number

chown –R oracle:oinstall /u01/app/oracle

chmod –R 775 /u01/app/oracle

For privileges of 775, the permissions are read/write/execute for owner and group and read/execute for other (rwxrwxr-x). For privileges of 755, the permissions are read/write/execute for owner and read/execute for group and other (rwxr-xr-w). For privileges of 644, the permissions are read/write for the owner and read for group and other (rw-r—r--). For privileges of 600, the permissions are read/write for the owner and none for group and other (rw-------).

1.16 Check the Tablespace Requirements

Several tablespaces are created while creating the database.

Tablespace	Purpose	Minimum Recommended Size
SYSTEM	Contains the Oracle Data Dictionary	1 GB
SYSAUX	Auxiliary space for the SYSTEM Tablespace.	500 MB
TEMP	Stores temporary data when processing SQL statements.	Application dependent
UNDO	Stores undo information.	Application dependent

Optional Tablespaces	Purpose	Minimum Recommended Size
USERS	Default tablespace name for user data.	Application Dependent

1.17 Ensure Licensing and Oracle Support Identifier

Ensure the necessary licenses have been acquired for the Oracle software. Also, ensure that a valid CSI number is available for problem resolution.

1.18 Run the Oracle RDA Health Check Validation Engine (HCVE)

The Oracle RDA Health Check Validation Engine (HCVE) can be used to run pre-requisite checks against the server before the Oracle software is installed. The pre-requisite checks will verify items such as the proper O/S version, available memory, disk space, and kernel parameters.

1.19 Prepare an Implementation Plan

Prepare a text file based implementation plan for the actual installation. Do not use MS word or other similar products as the text file should be clear of any formatting.

NEW SERVER BUILD – INSTALLATION TASKS

This section describes the installation process a DBA must consider during the Oracle software installation.

1.1 Software Installation

- Oracle recommends installing products as the “oracle” user. Root permissions are required to complete the installation.
- Download and extract the Oracle install binaries from the website and/or the Oracle EDelivery site.
- Log in as “oracle”.
- Change to the directory where the installation files are located.
- Unzip and uncompress the installation files.
- Launch the Oracle Installer.
- Start the installer by entering:
    - ./runInstaller
    - Select the installation type (Enterprise, Standard, or Custom)
    - Fill in the blanks to install the software based on your requirements.
- Install the latest Patchset and Quarterly Patch.

1.2 Creation of Databases with DBCA

Follow the Oracle documentation and run DBCA to create the required database.

- Verify databases names and any special parameters.
- Verify ORACLE_HOME and ORACLE_BASE are set for the proper Database.
- Verify that the ORACLE_HOME/bin is in the path.
- Start DBCA: $ORACLE_HOME/bin/dbca

1.2.1 Configuration Changes for Compliance with Standards

When creating a database, adhere to the following for best practices including:

- Create a minimum of three copies of the control file.
- Create a minimum of three redo log groups with at least two members in each group.
- Create a remote login password file.
- Create an spfile.
- Configure the temporary tablespace with temp files.
- Set up automatic undo management (AUM).
- Configure automatic segment space management (ASSM).
- Use local extent management (with uniform extents).
- Use a default temporary tablespace.
- Use a default permanent tablespace.
- Collect system statistics after initial database creation.
- Ensure auditing is enabled.
- Ensure the Flash Recovery Area is configured.
- Ensure Archiving is enabled.

NEW SERVER BUILD – POST INSTALLATION TASKS

This section describes the post installation steps a DBA must consider during the Oracle software installation.

1.1 Configure Networking

Prior to server installation, it is very important to understand the application environment. Make sure to understand the user requirements and database performance expectations. Run “netca” to configure the tnsnames.ora and listener.ora configuration files (if necessary).

1.2 Verify Oracle Instance

- Verify that the Oracle background processes are running. There should be at least seven Oracle background processes running. Use the ‘ps’ command on Unix as follows:

  - **`ps –ef | grep ora_`**

- Check the Oracle Alert Log to see if there are any errors.
- Search the file for ORA- errors. ORA- errors are not normally present in the file, and may indicate problems.
- Issue an ‘lsnrctl status’ command to verify that the Oracle listener is running.
- Verify the database is accessible with SQLPLUS.
- While in SQLPLUS, check the banner upon sign-on to verify the database version.

  - **`sqlplus userid/password`**
  - **`select count(*) from dba_tables;`**

- Check may be necessary. For example, logging on as a non-DBA operating system user and verifying with SQLPLUS.

1.3 Reboot Server

Configure the database and listener to restart automatically. Reboot the server and verify the database and listener are restarted properly.

1.4 Change Default Passwords

If not done earlier, change the ‘sys’ and ‘system’ database users’ password to a non-default value. Change any default passwords for any other Oracle products. See My Oracle Support Doc ID 160861.1 for a complete list.

1.5 Configure and Test Database Backup Process

All database backup procedures must include a method to confirm that the backup was completed successfully. Backup procedures must be tested before a database is designated as “production”.

A successful backup test must include the following:

- Verify that the backup procedures are being performed.
- Review backup procedures for necessary changes and/or improvements
- Verify availability and integrity of the files required for a restoration process

1.6 Configure and Test Database Restore Process

The database must have a clear documented restore process for a number of scenarios. Depending upon the process, the database and/or application may be online during the data restoration. The DBA must limit application access to the level that is required for a successful restoration of data. The restoration process must ensure that the integrity of the data being restored is not compromised by application access during the process.

Some of the recovery scenarios that should be tested for are:

- Tablespace Recovery (recovery of a dropped tablespace)
- RMAN Restore on another machine with different file system- same database name
- RMAN duplicate database on the same host
- Loss Of All Files – Disaster Recovery
- Incomplete Recovery (until point in time)
- Incomplete Recovery (until log sequence)
- Loss of all online redo log files
- Loss of all controlfiles
- Recovery when no backup exists of a datafile
- Corrupted Block Recovery
- Loss of Non SYSTEM datafile
- Testing the full restore and recovery of a database backup on another test or scratch server
- Refreshing a Test or Development Database from a Production Database RMAN backup
- Recovery through RESETLOGS and reset of incarnation
- Performing a database clone using a Data Guard physical standby database
- Diagnosing and Repairing Failures using the 11g Data Recovery Advisor (loss of control files)
- Restoring an ASM backup to non-ASM
- Recovery from loss of SPFILE (with and without AUTOBACKUP configured)

1.7 Establish Monitoring

- Setup monitoring script with the required directory structure(s) for the newly created instance.
- See the Oracle Monitoring Guide for the Oracle monitoring Baseline.

NEW SERVER BUILD – INSTALLATION CHECK LIST

This is a checklist for building the database. It should be used in conjunction with the design document provided by the developers and/or the application team.

Item	Complete?
Pre-Installation	
Review the Design Document. Understand the application, user, and performance requirements.	
Understand the hardware being used for the database. Visit the hardware vendor's website. Verify database compatibility with the hardware being used including cpu, disk, and memory.	
Ensure that Oracle will installed and executing on a server by itself without the application or other non-Oracle DBMS.	
Refer to the Oracle Current Software Level Guide to obtain the latest supported Oracle software version.	
Check for the latest Oracle Quarterly CPU patches to be applied.	
Review the latest documentation for the release on the Oracle Technology Network site including the Release Notes.	
Confirm the DBMS Version, Standard/Enterprise, 32 or 64 bit.	
Determine if any special Oracle components (such as Ultrasearch, spatial, external tables, blobs, etc.) need to be installed?	
Verify naming standards.	
Request an "oracle" account on the system.	
Obtain "root" privileges for the install.	
Determine the amount and type of disk storage needed.	
Verify the hostname can be resolved on the network.	
Verify terminal access to the server is available.	
Verify X-term access is available for interactive installations.	
Verify connectivity to the backup server.	
Verify file transfer connectivity if required.	
Verify outbound sendmail port 25 is open if needed.	
Verify the O/S configuration including any kernel parameters.	
Identify port numbers needed for the Listener and make sure they are accessible through the firewall.	
Identify the ASM disk groups or database filesystems.	
Identify and create the Oracle directories.	
Verify the tablespaces needed including initial sizing requirements for each and contents (data, index, temporary, undo)	
Determine the Oracle instance configuration parameters.	
Verify database names and parameter requirements.	
Determine if there are any special Character Set requirements.	
Ensure valid licensing and Oracle CSI number.	
Verify the server backup schedule.	
Run the Oracle Health Check Validation Engine to check pre-requisites.	
Prepare an Implementation Plan.	

Software Installation	
Install the latest Patchset and Quarterly Patch.	
Database Creation	
Create the database using DBCA.	
Implement additional changes to comply with standards and best practices.	
Post-Installation	
Configure networking.	
Verify the Oracle background processes are running.	
Check the Oracle Alert Log for errors.	
Verify that the listener is running.	
Verify the database is accessible with SQLPlus.	
Reboot the server and verify automatic database restart.	
Change any default o/s and database passwords.	
Configure and test backup and restore.	
Save a control file trace to disk.	
Establish and test monitoring.	
Ensure Statspack or AWR is configured and running.	
Setup replication or Data Guard if needed.	
Determine the standard maintenance window.	
Enable auditing per the Oracle Security Baseline	
Document any special circumstances, requirements, issues, etc. that may be needed for on-call support.	
Install application software as required.	
Setup jobs for regular database tasks such as analyze of the database objects, file cleanup, etc.	