Deep Dive into Oracle Database Appliance using Oracle Database 12c Architecture

Tammy Bednar
Oracle

Keywords: Oracle Database Appliance, ODA, Appliance

Introduction

The Oracle Database Appliance is an Oracle Engineered System consisting of hardware and software that saves customers time and money by simplifying deployment, maintenance, and support of high availability database solutions. Built using the world's most popular database, Oracle Database, along with Oracle Real Applications Clusters (Oracle RAC), it offers customers a fully integrated system of software, servers, storage and networking that delivers high availability database services for a wide range of custom and packaged OLTP and Data Warehousing workloads.

The Oracle Database Appliance offers customers capacity-on-demand database software licensing, allowing seamless scalability from 2 to 48 processor cores without any hardware upgrades. The appliance also offers the option of deploying a virtualized platform based on Oracle VM. Support for virtualization allows customers and ISVs to build a solution-in-a-box that efficiently utilizes resources and extends capacity-on-demand licensing to both database and application workloads by leveraging Oracle VM hard partitioning.

The Oracle Database Appliance is a 4 rack unit (RU) system consisting of two x86 servers and one storage shelf. All hardware and software components are provided by Oracle, allowing customers to benefit from streamlined single vendor support. And, by integrating the hardware and software components to work together, the Oracle Database Appliance is engineered to provide a high availability database and application solution that is:

- Simple
- Reliable
- Affordable

The Oracle Database Appliance is ideal for customers who value simplicity and who seek to avoid the complexity, costs, and risks in deploying high availability solutions. Customers can now benefit from high availability (HA) solutions without having special skills or HA expertise.

Oracle Database Appliance Manager

Oracle Database Appliance provides software called Oracle Database Appliance Manager command-line interface, or the `oakcli` commands, also known as known as the Oracle Appliance Kit Command Line Interface, or OAKCLI. Use Oracle Appliance Manager command-line interface to perform Oracle Database Appliance management tasks such deploying the software, configuring core keys, applying patches, monitoring and troubleshooting, managing virtual machines, and creating Oracle Database homes and databases. Since the initial release of the Oracle Database Appliance, the OAKCLI has been extended to provide new functionality. With the latest 12.1.2.1 release, functionality has been added to support database and VM snapshots, and Virtual Disk management. The Appliance Manager software provides the simplicity and automation of manual tasks.

Oracle Database Appliance 12.1.2

With the latest release of Oracle Database Appliance 12.1.2 release, it now supports both Oracle Database 12c and Oracle Database 11gR2 versions. Oracle Database 12c includes exciting new features such as the Oracle Multitenant option, Oracle Active Data Guard Far Sync, information lifecycle management enhancements and new data types just to name a few. Customers wishing to take advantage of these and other new features will often need to upgrade their existing databases from older versions to Oracle Database 12c. The Oracle Database Appliance makes it easy to provision and upgrade your Oracle Database Appliance database to the latest Oracle Database 12c version.

Provisioning Oracle Database Appliance

When your new Oracle Database Appliance arrives, you will need to unpack and cable it in your data center. The Oracle Database Appliance documentation set provides step-by-step instructions included in the Oracle Database Appliance Setup Poster to setup and install the Oracle Database Appliance hardware. This includes cabling of servers and storage, and powering up the two server nodes. The Oracle Database Appliance Setup Poster can be viewed and downloaded from http://download.oracle.com/docs/cd/E22693_01/index.htm. Additional Oracle Database Appliance documentation, including the Getting Started Guide provides a checklist of IP addresses, domain names, NTP servers, and node names that are required during the initial deployment.

> Best Practice Tip: Determine your IP addresses, type of deployment (bare metal or virtualized), backup location, and system name before you deploy. Use the Oracle Appliance Manager Offline Configurator to validate your network configuration. By having this information planned and validated ahead of time, it will make the deployment seamless.

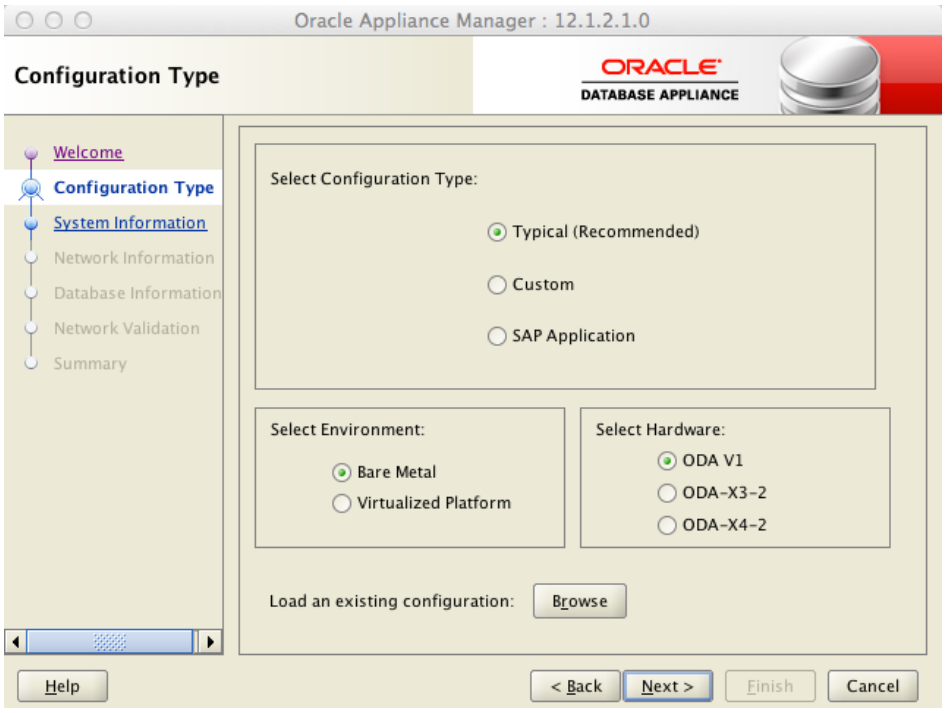
Oracle Database Appliance includes the Integrated Lights out Manager. Oracle Integrated Lights Out Manager (ILOM) is an embedded service processor that enables full out-of-band management, providing a “Just like being there” remote management capability. You will setup the ILOM on each Oracle Database Appliance server node by connecting a keyboard, video, and mouse (KVM) to Oracle Database Appliance server node 0 and boot the server by pressing the power button on the front of the server. As the server starts to boot, press the F2 key to enter the BIOS setup menu and then configure ILOM network. Refer to My Oracle Support note 1393191.1 for instructions on how to setup ILOM using the BIOS menu. Using the ILOM means you can remotely mange and complete the provisioning of the Oracle Database Appliance from your desk.

The Oracle Appliance Manager configurator is a Java-based tool that enables you to generate your deployment plan and validate your network settings before the actual deployment. If you wish to use this tool before deployment, then you must download and run the configurator on a local client system that can be a Linux, UNIX, MAC, or Windows system. However, if you prefer to configure your system at the time you deploy it, you can wait and use the online configurator that is part of the base Oracle Database Appliance software.

Download the standalone Oracle Appliance Manager configurator that matches your version of Oracle Database Appliance software. All versions of the configurator are available at http://www.oracle.com/technetwork/server-storage/engineered-systems/database-appliance/index.html

At the end of an offline configurator session, you can save your deployment plan in a configuration file. When you are ready to deploy, copy the configuration file to Oracle Database Appliance and run the online Oracle Appliance Manager configurator to import and deploy your saved plan. You can also print the file's content and use the printout as a checklist for setting up your external network configuration.

Prior to saving your configuration file, Oracle recommends that you test your network settings. However, this will only work correctly if your client system is connected to same network that you will use for Oracle Database Appliance.



After you have entered the required information in the configurator, the Appliance Manager will automatically complete the following steps in a less than an hour.

Command: `oakcli deploy`

1. Configure the network: Configure domain name, DNS server addresses, public and VIP addresses for your two nodes, SCAN name and addresses, Netmask and Gateway addresses.

2. Configure the storage: Double or Triple mirroring, Internal/External backups determine usable disk space. Internal backups configure 40% of useable storage for database files while external backups configure 80% of the usable storage for database files.

3. Create the cluster: Clusterware installed.

4. Create the database (optional – can be deployed later): Database templates are provided that incorporates all best practice database init parameters as well as for the sizing for CPU and Memory, out of the box allocation for SGA and PGA, and advise on the storage characteristics, plus multiple sizes to satisfy various workloads

5. Deploy Auto Service Request (optional – can be configured later)

Patching the Oracle Database Appliance

All patching of Oracle Database Appliance is accomplished with the regular Oracle Database Appliance Patch-Set Bundle. The Patch-Set Bundle provides all relevant patches for the entire system, including:

- BIOS
- Hardware drivers
- Oracle Linux
- Oracle ILOM
- Oracle Database clone binaries with the latest PSU
- Oracle Grid Infrastructure updates

When the Oracle Database Appliance Patch Set Bundle is available, log on to My Oracle Support as the registered Oracle Database Appliance software owner. Follow the instructions in My Oracle Support note 888888.1 as well as the instructions in the patch README file for information about patching the system.

Oracle Database Appliance Manager provides a single command to patch the complete hardware and software stack, `oakcli update -patch.`

Command: Updates all firmware, OS, ILOM, Appliance Manager, and ASR
```
oakcli update -patch 12.1.2.1.0 --infra
```

Command: Updates Grid Infrastructure
```
oakcli update -patch 12.1.2.1.0 --gi
```

Command: Update one, set or all databases to the latest PSU
```
oakcli update -patch 12.1.2.1.0 --database
```

The patching of the Oracle Database Appliance requires the 'infra' and 'gi' to be completed first before the latest database PSU is applied. If you choose to upgrade your database from an earlier release, Oracle Database Appliance Manager also provides commands to automate the task.

Best Practice Tip: If you want the flexibility to patch individual databases, it is recommended to create a separate Oracle Home for each database. When the Oracle Database Appliance patches a database, it patches the Oracle Home that it is associated with. Therefore all databases in that Oracle Home are also patched.

To upgrade an Oracle Database, an Oracle Home with the version you want to upgrade to must exist. If it does not, you can use the Appliance Manager command to create it: `oakcli create dbhome –version 12.1.0.2.1.` The Appliance Manager automatically assigns a name to the Oracle Home as you currently cannot assign a custom tag. You are now ready to upgrade your database.

Command: `oakcli upgrade database –db <dbname> –to <dest_home>`

ASM Cluster File System (ACFS) Integration

Oracle Database Appliance software stack has adopted Oracle ASM Cluster File System (ACFS) as the primary cluster file system to store database files and general-purpose data. Three default file systems are created automatically in the Oracle Database Appliance ASM disk groups (DATA, RECO, and REDO) when Appliance Manager 12.1.2+ patchset is deployed or imaged. When new databases are created, the associated database files are created in these three ACFS file systems instead of in the ASM disk groups directly.

Oracle ACFS is the default for your database version 11.2.0.4.2 or higher. However, if you are upgrading a previous release to 12.1.2.+, the databases that were previously created on ASM can co-exist with the new databases that are created on ACFS. In addition, you may choose to migrate your existing databases from ASM to ACFS.

Oracle ACFS was chosen as the primary file system for Oracle Database Appliance because it provides:

- Increased functionality without requiring additional management
- No performance penalty versus Oracle ASM
- Ability to manage all data (database and general purpose files) with a single file system
- Industry standard and simple user interface

- Database snapshots to quickly and easily provision test and development environments at a fraction of the disk storage required with full database copies
- Industry standard CIFS/NFS network file storage protocol support for sharing (exporting) file systems over the network to share data with application or database servers. In addition, Oracle ACFS comes with a highly available HANFS feature that enables highly available file system exports over virtual IPs.
- Complimentary increased functionally for non-database files that may need management along side with database files. These functions include file system replication, tagging, security, encryption, audit and snapshot. Please note that these functions, except snapshot, are not supported for database files because corresponding functionality available directly from the database.

Internal testing of database workloads has show similar performance for Oracle ACFS and ASM. Both Oracle ACFS and ASM provide direct I/O to disk resulting in high performance for database files. In addition, Oracle ACFS performs buffered I/O for non-database files that benefit from cached data in the system memory.

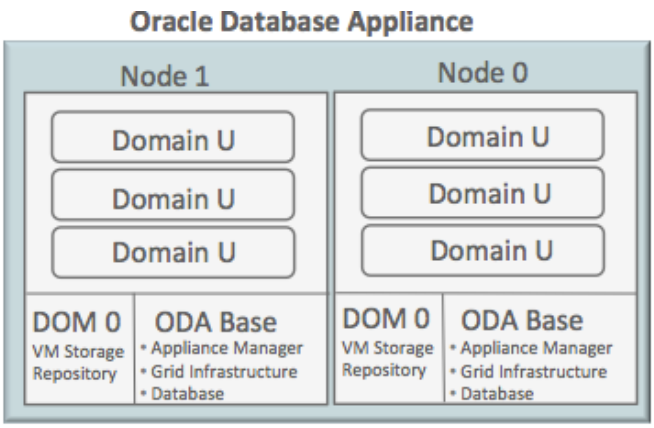
Database Snapshots

Oracle Database Appliance ACFS databases can take advantage of advanced ACFS functionality to create a rapid and space efficient snapshot in about 5 minutes – regardless the size of the database. An Oracle ACFS snapshot is an online, read-only or read-write, point in time copy of an Oracle ACFS file system. The snapshot copy is space-efficient and uses Copy-On-Write functionality. Before an Oracle ACFS file extent is modified or deleted, its current value is preserved in the snapshot to maintain the point-in-time view of the file system. The Oracle Database Appliance Manager has extended its command line to automate the creation of a database snapshot.

```
Command: oakcli create snapshotdb -db <snap_dbname> -from
<dbname>
```

Oracle Database Appliance Virtualized Platform

Oracle Database Appliance provides the choice to deploy bare metal or virtualized platform. The Virtualized platform provides the ability to deploy addtional software such as Oracle WebLogic and applications and the flexiblity to modify resources to the guest VMs.



With the current architecture, all databases are deployed in the privileged domain called ODA Base. ODA Base is deployed on both nodes with the same number of cores. All management of the Oracle

Database Appliance is executed from within ODA Base. Other software can be deployed using the resources not allocated to ODA Base.

The Appliance Manager commands are extended to provision and manage the virtualized platform. The following capabilities are managed from Appliance Manager:

- Partitioning of cores to VMs to isolate workloads
- Support VLan to provide additional networks and security
- High Availability of Guest VMs with automatic restart and failover
- Start/Stop VMs
- Creation and management of shared repositories for the storage of VMs and Virtual Disk

The latest release of Appliance Manager includes VM snapshots and Virtual Disk management.

VM Snapshots

Utilizing ACFS, snapshots of VMs are rapid and storage efficient. VM snapshots can be used to clone or register a VM from a vmtemplate or take a point in time snapshot from an existing VM.

Command: Create VM Snapshot from VM template
```
oakcli clone vm <vmname> -vmtemplate <template_name> -snap
```

Command: Create VM Snapshot from existing VM
```
oakcli clone vm <vmname> -vm <src_name> -snap
```

Deployment time of VMs can be greatly decreased by using the clone-template-snap capability. The latest Oracle Database Appliance-Oracle WebLogic templates take advantage of this new feature to decrease the deployment time from 90 minutes to 15 minutes.

VDisk Management

Oracle Database Appliance provides for the dynamic addition of storage to existing VMs with extended Appliance Manager commands. In addition, a VDisk can be attached to a single VM referred to as local attachment or shared between clustered VM deployments.

Command: Create VDisk
```
oakcli create vdisk <vdisk_name> -repo <repo_name> -size <size>
-type <shared|local>
```

Command: Show VDisk
```
oakcli show vdisk <vdisk_name> -repo <repo_name>
```

Command: Delete VDisk
```
oakcli delete vdisk <vdisk_name> -repo <repo_name>
```

Command: Attach VDISK to VM
```
oakcli modify vm <vmname> -attachvdisk <vdisk_name>
```

Command: Detach VDisk from VM
```
oakcli modify vm <vmname> -detachvdisk <vdisk_name>
```

Command: Clone (snapshot) VDisk
```
Oakcli clone vdisk <new_vdisk_name> -repo <repo_name> -src
<source_vdisk_name>
```

Taking advantage of the integrated VM management, you can easily upgrade VMs by deploying the software on the VDisk. When it is time to upgrade, you simply detach to the VDisk containing the older version of the software and attach the VDisk containing the newer version of the software. This eliminates long downtime due to the time it takes to upgrade the software online.

Summary

For customers seeking a simple, reliable, and affordable database solution, the Oracle Database Appliance is the ideal choice. The Oracle Database Appliance is the first enterprise-class highly available database solution that:

- Reduces complexity
- Reduces risk
- Reduces cost

To learn more about the Oracle Database Appliance X4-2, please visit:

www .oracle.com/goto/databaseappliance

Contact address:

Tammy Bednar
Oracle
400 Oracle Parkway
Redwood Shores, CA 94065
USA

Phone: +1 650-506-4780
Email tammy.bendar@oracle.com
Internet: http://www.oracle.com/technetwork/database/database-appliance/overview/index.html