

Oracle Database Appliance Solution in a Box - Technical Deep Dive

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Introduction

Oracle Database Appliance is a simple, reliable, and affordable Engineered System from Oracle. It consists of hardware and software integrated to work together that saves customers time and money by simplifying deployment, maintenance, and support of high availability database and application solutions. Oracle Database Appliance Virtualized Platform, based on Oracle VM, enables customers to quickly deploy both database and application workloads in a single virtualized appliance. Combining the advantages of Oracle's Engineered Systems with Oracle or ISV applications, Oracle Database Appliance provides customers a comprehensive solution-in-a-box. The benefits of simplifying deployment, maintenance, and support of high availability database solutions are extended to the application tier through the additional flexibility provided by support for virtualization. Customers benefit from a fully integrated system that delivers high availability database and application services, efficiently utilizes resources, and takes advantage of capacity-on-demand licensing for multiple workloads by leveraging Oracle VM hard partitioning.

Oracle Database Appliance Overview

Oracle Database Appliance is an Oracle Engineered System designed for simplicity to help customers reduce the risk and uncertainty associated with deploying, maintaining, and supporting highly-available database and application solutions. Built using Oracle Database and Real Application Clusters (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 applications. Additional flexibility provided by support for virtualization extends high availability to the application tier by enabling customers to host both database and application workloads in the appliance.

To help customers easily deploy and manage their databases, Oracle Database Appliance features the Appliance Manager software for one-button automation to provision, patch, and diagnose database servers. The Appliance Manager feature greatly simplifies the deployment process and ensures that the database configuration adheres to Oracle's best practices. It drastically simplifies maintenance by patching the entire appliance, including all firmware and software, in one operation, using an Oracle-tested patch engineered specifically for the appliance. The Appliance Manager software also has built-in commands and diagnostic tools to streamline both the management and maintenance of the appliance.

Oracle Database Appliance offers a unique capacity-on-demand database software licensing model to quickly scale the number processor cores without any hardware upgrades. Customers can deploy the system and license as few as 2 processors cores and incrementally scale up to the maximum number of

processor cores in the system. This enables customers to deliver the performance and high availability that businesses demand, and align software spending with business growth.

Oracle Database Appliance offers the option of deploying a virtualized platform based on Oracle VM. Support for virtualization adds additional flexibility to the already complete and fully integrated database solution. Customers can use the capabilities of Oracle VM to efficiently allocate resources to databases and applications running on the same physical server. Rather than simply disabling unnecessary database server cores, customers can use the excess capacity to host application workloads. This enables consolidation of both databases and applications, while retaining the ease of deployment and management associated with Oracle Database Appliance.

Why a Solution-in-a-Box

Many application systems are mission critical and require reliable, performant, and secure database and application environments. Oracle Database Appliance provides a standards based platform that simplifies deployment, maintenance, and support of highly available solutions while embedding Oracle's best practices into the configuration. The appliance enables customers to host both the databases and applications in the appliance to create a solution-in-a-box and eliminate the cost associated with additional servers. Customers can also take advantage of capacity-on-demand licensing for Oracle Applications by licensing only the processor cores required for the application workloads. As a result, not only is the appliance a simple and affordable solution for small and midsize application deployments, but it also provides the reliability necessary to meet service level expectations.

Traditional storage environments have evolved over time by improving capacity, reliability, and availability; however, bottlenecks caused by latency and I/O limitations associated with these solutions often impact database and application performance. Competitive solutions often attempt to address performance limitations with large external disk arrays, but only use a small portion of the capacity on the highest-performance, fastest-spinning portions of the disk. This approach underutilizes the real capacity of the disks, leading to a larger, inefficient, and more expensive solution. Oracle Database Appliance storage architecture helps address potential performance bottleneck issues with high performance direct-attach storage, eliminating latency and reliability issues associated with additional switches required for traditional SAN and NAS storage environments.

Oracle Database Appliance also optimizes data layout to improve database performance and efficiently utilize storage capacity. Separating the different types of data classes into separately tuned storage environments is crucial for database performance since it is dependent on the speed with which redo logs can write and data can be read. Solid state disks are used for the write-intensive database redo logs to improve IOPS and reduce write latency. Frequently accessed data is written to the highest-performing, fastest-spinning outer platters of the disks so more data can be read in a single pass. Backup data is written to the inner platters of the disks since it is not accessed as often. Incorporating Oracle's best practices with the hardware architecture and data layout ensures that Oracle Database Appliance customers get a performant and efficient solution out of the box.

Oracle Database Appliance addresses one of the biggest management challenges for application platforms. Managing a consistent infrastructure for a multitude of development, test, and production systems can be challenging for administrators. These ancillary systems can easily diverge from a standardized configuration. With Oracle Database Appliance it is easy to synchronize the configuration since the deployment and patching process is standardized across database environments.

System Configuration

The Oracle Database Appliance consists of two dual socket x86-64 class servers combined with one or two storage shelves. Together, they provide a highly available platform for both database and application deployment. The base configuration for each server includes two 8-core Xeon processors and 256MB memory. The storage shelf provides 800GB SSD, and 18TB traditional storage, shared between both servers. A second identical shelf can be optionally added to double the storage capacity.

Oracle Database Appliance X3-2

Base Configuration Specifications

More Processing Power

- 2 x 1RU x86 Servers. Each Server Contains:
 - 2 x 8-core Intel Xeon Processors E5-2690
 - 256 GB RAM (16 x 16 GB)
 - 2 x 600 GB Boot Disks (mirrored)
 - 4 x 1/10 GBase-T Ethernet Ports
 - Redundant 10GBase-T Interconnect
- 1 x 2RU Storage Shelf – Direct-Attached
 - 4 x 2.5" 200 GB SSDs for Redo
 - 20 x 2.5" 900 GB HDDs for Data

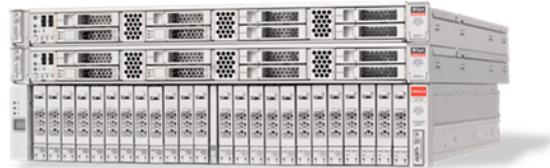
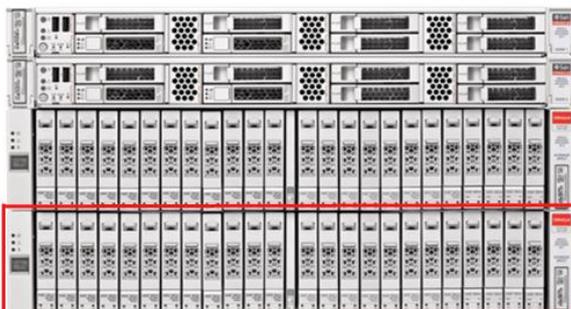


Illustration. 1: ODA Base Configuration

The storage expansion shelf can be added at any time. It requires no administration to add the storage shelf. Once cabled, the system will detect the additional storage and automatically set up storage multipathing and add the disks to their respective ASM diskgroups.

ODA X3-2 Storage Expansion Shelf

Zero-Admin/Online Storage Expansion



Double Available Storage Capacity

- Additional 18 TB HDD, 36 TB total
- Additional 800GB SSD, 1.6TB total

Zero Administration

- Automatically integrates when plugged in
- Data automatically distributes to new shelf

Online Expand Storage

- Hot-plug storage expansion shelf
- No database downtime

Illustration. 2: Zero Admin Storage Expansion

Virtualized Platform

The Oracle Database Appliance supports both bare metal and virtualized configurations. Running on top of the Oracle VM hypervisor enables running both database and other workloads such as applications in the same physical appliance, while providing isolation between the tiers. Thus, with the virtualized platform, customers and ISVs can deploy a complete solution in a single box. The diagram below shows the basic architecture of the Oracle Database Appliance Virtualized Platform.

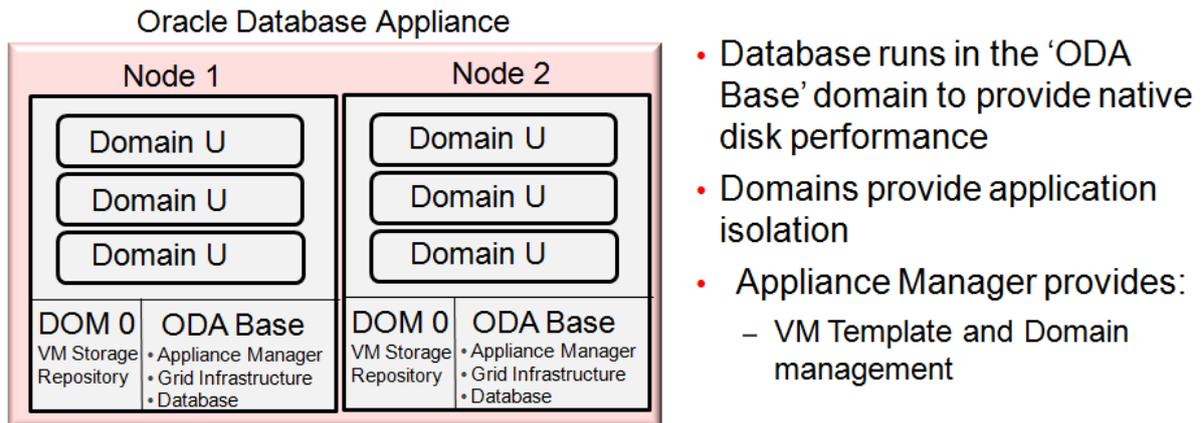


Illustration. 3: Oracle Database Appliance Virtualized Platform

The ODA Virtualized Platform differs from a traditional Oracle VM deployment in that all management is done from the ODA Base Domain. The ODA Base Domain contains the ODA Appliance Manager, and also runs the Grid Infrastructure and any databases. ODA Base is a privileged domain, and can be used to manage all aspects of the virtualized appliance. This has important benefits. ODA provides a streamline simpler to manage environment, albeit limited to two nodes. It also means no additional hardware is required to host a management environment such as OVM Manager. All management is done via the ODA Appliance Manager. And, as in a bare metal deployment, the Appliance Manager will automate the deployment, management, patching and support of the Grid Infrastructure and any databases deployed in ODA Base.

The Appliance Manager is able to manage the virtual machines deployed in an appliance because it communicates with the administrative domain, Dom0, similar to the way OVM Manager is able to manage an OVM deployment. The illustration below shows how the appliance manager is able to manage the system.

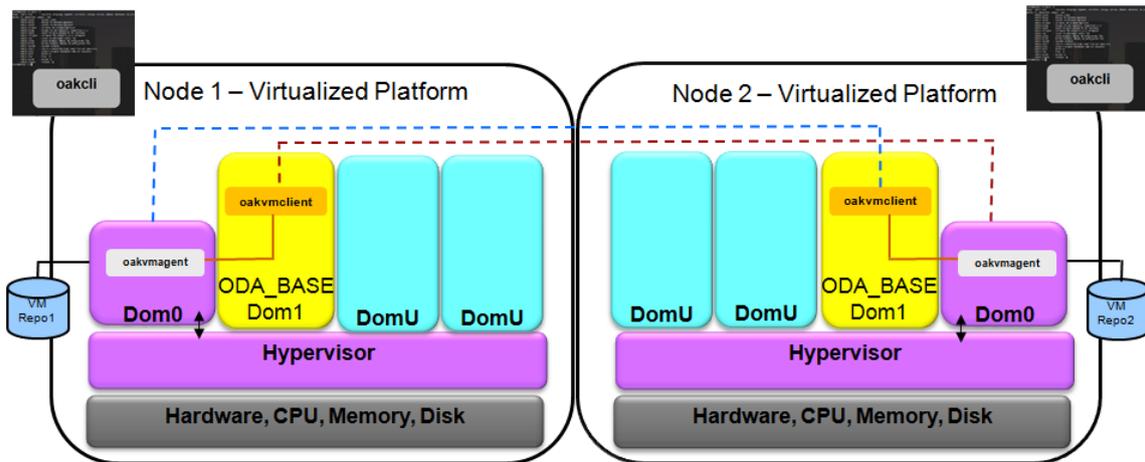


Illustration. 4: Management of the Virtualized Platform

The Appliance Manager talks to the oakvmagent running in Dom0 and is thus able to pass management commands to the Dom0 administrative domain and manage the system.

Shared Storage

In a traditional Oracle VM deployment, all storage is connected to and managed by Dom0. In the ODA Virtualized Platform, storage is directly connected to ODA Base. This gives the databases running in ODA Base bare metal I/O performance, ensuring they will perform on par with a bare metal deployment. From a database perspective, ODA Base looks and behaves just like a bare metal ODA deployment.

CPU Pinning

Oracle VM supports pinning virtual machines to specific cores, limiting license requirements for those virtual machines to the pinned cores. The Appliance Manager automatically manages this pinning for ODA Base, making it trivial to limit ODA Base to a set of cores, reducing the need to license the entire box for the databases running in ODA Base. Customers can grow and shrink the footprint of ODA Base as their requirements change.

The diagram below shows a typical 8-core per server ODA Base Deployment. ODA Base is pinned to 8 cores per server, and 8 cores per server remain in an unpinned pool for use by other virtual machines.

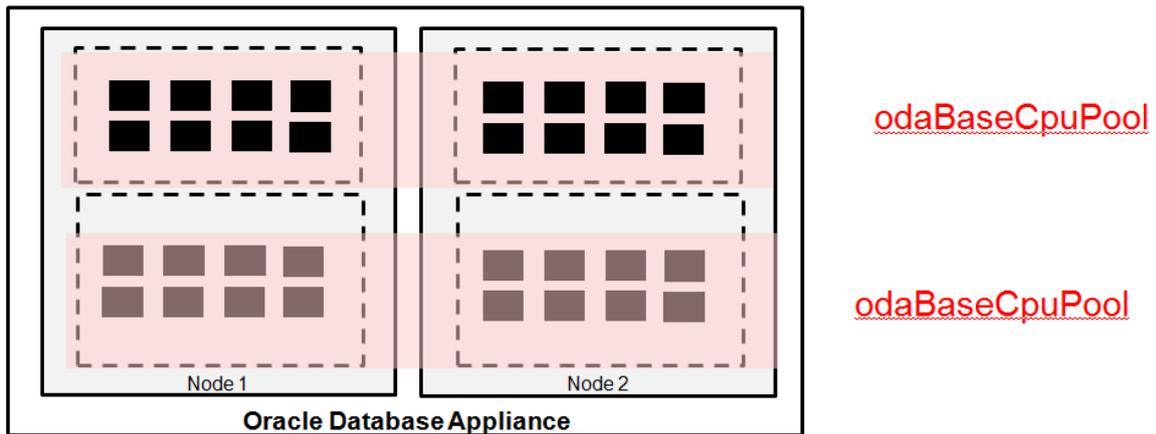


Illustration. 5: CPU Pinning

Customers can choose to create other cpu pools and pin other VMs into those pools. If the VMs running in those pools are running Oracle software and are licensed per cpu, this will limit the license requirements for these products as well. The Appliance Manager provides the necessary APIs to create and manage additional pools, and to pin other VMs to those pools.

WebLogic on ODA

The Oracle Database Appliance Virtualized Platform can run any application supported by Oracle VM. Applications based on Oracle WebLogic, and take advantage of a streamlined deployment wizard that is ODA aware and will deploy a highly available clustered WebLogic Deployment in two hours. Using an interface similar to the Appliance Manager’s own deployment wizard, customers simply fill in an easy GUI worksheet and hit “go.” When complete, the system will be running WebLogic servers, administrative servers, and load balancing servers configured for high availability. The diagram below illustrates a basic WebLogic Server configuration.

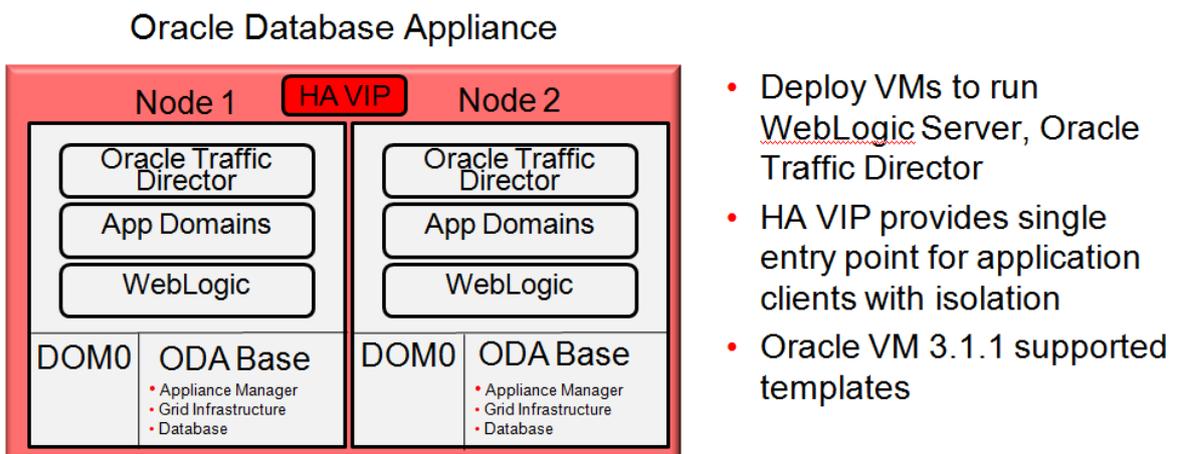


Illustration. 6: WebLogic on ODA

Conclusion

The Oracle Database Appliance is a simple, reliable and affordable high availability platform for deploying Oracle Database. With the introduction of Oracle Database Appliance running OVM, it now provides a complete integrated virtual platform for deploying not only the database, but also you applications. Running everything in a single box provides efficiencies for hardware and data center usage, especially in branch office locations where space is at a premium, and administrative skill may be remote.

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