Understanding Oracle Certification, Support and Licensing for VMware Environments

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Oracle databases, middleware and applications are increasingly running on the VMware vSphere® platform. A benchmarking survey from January 2011 revealed that on average more than 30 percent of our customers' Oracle applications are already running in VMware® environments, showing a marked increase from a year earlier. Driving this rapid adoption is the fact that VMware delivers an industry-leading intelligent virtual infrastructure that maximizes performance, scalability and availability while enabling fully automated disaster recovery, better-than-physical security and proactive management of service levels. Here is a summary of the benefits of virtualizing mission-critical Oracle applications on VMware. (To learn more about the VMware advantage, see Appendix 1.)

Improve quality of service:

- Better application performance with dynamic scalability and resource allocation
- Outstanding virtual machine scalability providing up to 32 vCPUs and 1TB of RAM per virtual machine
- Enhanced availability and automated disaster recovery (DR) for all applications

Increase efficiency:

- Lower hardware and software costs with 5–10x consolidation
- Reduced operating expenditures (OpEx) with intelligent policy management

Accelerate time to market:

- Provisioning times reduced from weeks to minutes
- Streamlined testing/development cycles with private cloud management

The rapid virtualization of Oracle applications raises important questions regarding the impact of virtualization on Oracle support and licensing. There is a lot of confusion in the market about these issues, and the purpose of this guide is to provide customers with information regarding certification, support and licensing of Oracle on VMware vSphere. This information is based on the experience and knowledge that VMware has acquired in working with many customers who are successfully virtualizing Oracle on vSphere.

This guide does not provide official policies or legal advice concerning a customer's license or support agreement with Oracle or any other third party. Customers must discuss these issues directly with Oracle, and in many cases these issues will depend on the specific commercial relationship between the customer and Oracle. Rather, this guide is intended to help customers understand the issues and be better prepared for discussions with Oracle and third-party vendors.

1. Oracle Certification and Support for VMware Environments

Oracle has an official support policy for virtualization on VMware vSphere, articulated in MyOracleSupport Document ID #249212.1, which customers can access with a valid MyOracleSupport login. A copy of the document also appears in Appendix 2 of this guide. In November 2010, Oracle expanded this support policy to include Oracle Real Application Clusters (RAC) on vSphere. We see this as a tacit acknowledgment by Oracle that customers are increasingly running even their most mission-critical systems on vSphere, and that the vSphere platform is technically sound for running these applications.

1.1 Certification

Oracle has not certified any of its products on VMware vSphere (or on any third-party platform below the operating system).

Oracle does not certify any third-party infrastructure elements below the operating system. In the physical world, Oracle doesn't certify any traditional HP, Dell or IBM hardware platform. But customers don't allow this to limit their choice to deploying only on Oracle (formerly Sun) hardware, and instead most customers exercise their options by deploying on noncertified hardware.

Similarly, in a virtualized environment, Oracle officially certifies only its own Oracle VM platform, but customers shouldn't allow this to limit their options. As in the physical world, customers should choose the virtualization platform that best meets their needs. As long as customers run a certified operating system on VMware, and that operating system is certified by Oracle, customers should feel confident that the most rigorous testing has occurred across the different layers of the stack.

1.2 Support

Oracle has an official support statement for VMware.

The Oracle support policy states that "Oracle will only provide support for issues that either are known to occur on the native OS, or can be demonstrated not to be as a result of running on VMware." This statement may create a perception that customers are somehow at risk, but the growing number of customers virtualizing Oracle on VMware have chosen to do so after carefully weighing the benefits against this implied risk. We believe that three considerations are especially relevant to this assessment:

- You can evaluate the risk by considering the following facts:
  - VMware does not modify the native OS, so the solution Oracle provides for the native OS is fully expected to work for that same OS running on VMware.
  - VMware has received no reports of incidents in which vSphere was determined to have caused a technical issue in the Oracle application or database.
  - At worst, Oracle might ask a customer to reproduce the issue on a physical server, particularly if Oracle's solution does not work. This request is seldom made, and even in the physical world Oracle reserves the right to request reproduction on different physical hardware in this situation.
- You can negotiate the terms in your support agreement with Oracle and insist that Oracle provide you with the support commitment that meets your needs, including support for Oracle products running on vSphere. Some industry analysts have stated that it is commercially unacceptable to have policies that are difficult for Oracle customers to locate on Oracle's Web site and that are changeable without notice.
- VMware has its own policy to support customers running Oracle applications on VMware, available at https://www.vmware.com/support/policies/oracle-support.html. If required, VMware will take ownership of the support request and pursue rapid resolution, in collaboration with the Oracle support organization through TSANet as needed. Because VMware customers virtualize all types of Tier 1 applications, we have significant expertise in making this a seamless support experience.

2. Oracle Licensing in VMware Environments

Many Oracle products, including the database, are licensed by physical processor. This licensing model works well in a physical world, in which customers typically run one application per host and physical processors are easy to track. But this model is not well-adapted to a virtual world. VMware vSphere enables you to consolidate multiple workloads in the form of virtual machines on a single host. Additionally, VMware enables you to move these virtual machines across hosts with VMware vMotion®, VMware Distributed Resource Scheduler (DRS) and High Availability (HA). When running products that are licensed by physical processor on vSphere, customers should ensure the following:

- Virtual machines are running on hosts fully licensed for Oracle.
- Virtual machine movement within a cluster is restricted to hosts that are fully licensed for Oracle.
- Virtual machine movements are tracked so that customers are able to demonstrate compliance with Oracle licensing policies.

2.1 Hosts: License All CPUs in a Host for Oracle

Many Oracle products are licensed by physical core or socket, and for these products Oracle does not have a virtual CPU-based licensing mechanism. In a vSphere environment, the consequence of Oracle's licensing policy is that customers must license all physical cores or sockets in the vSphere host (fully licensed host). However, once the host is fully licensed, customers are allowed to run an unlimited number of virtual machines and application instances on that host without additional licenses.

The following table outlines the main CPU-licensing strategies, and explains why customers need to license all the CPUs in the host.

LICENSING ALL CPUS IN A HOST	LICENSING A SUBSET OF CPUS IN THE HOST
For multicore hosts, customers typically license all the CPUs for Oracle and load many virtual machines running Oracle applications onto this fully licensed host. This approach enables customers to consolidate Oracle licenses by better utilizing the licensed physical capacity. Customers who don't have enough Oracle applications to fully utilize entire multicore systems typically choose to use systems with fewer cores. We've heard that some customers even choose to turn off half the sockets via BIOS since CPUs can sometimes be cheaper than Oracle licenses.	VMware enables you to pin a virtual machine to certain CPUs inside the host (using CPU pinning or CPU affinity). We believe this technology is every bit as robust and reliable as the "hard partitioned" technologies to which Oracle accords preferential subsystem pricing, and should enable customers to license only a subset of the host capacity. Unfortunately Oracle does not recognize this approach as a valid hard partitioning for its licensing mechanism. So today customers must license all the CPUs in the host and follow the "fully licensed host" approach for VMware environments.

Table 1. CPU Licensing Strategies

2.2 Clusters: Fully Licensed Versus Partially Licensed Clusters

In a vSphere environment, multiple hosts are typically clustered together, enabling virtual machines to move freely between the hosts by means of vMotion, Dynamic Resource Scheduling, VMware HA, and VMware Fault Tolerance. In a vSphere cluster, there are two distinct Oracle licensing scenarios to consider. In the first scenario, all the hosts in the cluster are fully licensed to run the Oracle product (fully licensed clusters). In the second scenario, only a subset of the hosts in the cluster are licensed for Oracle (partially licensed clusters).

Scenario A: Fully Licensed Clusters

When a customer has enough Oracle application instances to justify creating a dedicated cluster for those applications, all the hosts in the cluster can be fully licensed for the application. This approach has multiple advantages:

- Customers can deploy an unlimited number of virtual machines running the Oracle application on the cluster. In essence, the cluster becomes an "all you can eat" cluster from an Oracle licensing standpoint. Typically, this enables a significant reduction in licensing requirements by consolidating physical processors and licenses by a factor of 4x or more.
- Customers can take advantage of VMware software's many advanced features, such as Dynamic Resource Scheduler and vSphere HA, to get the highest possible infrastructure utilization and further reduce licensing costs.

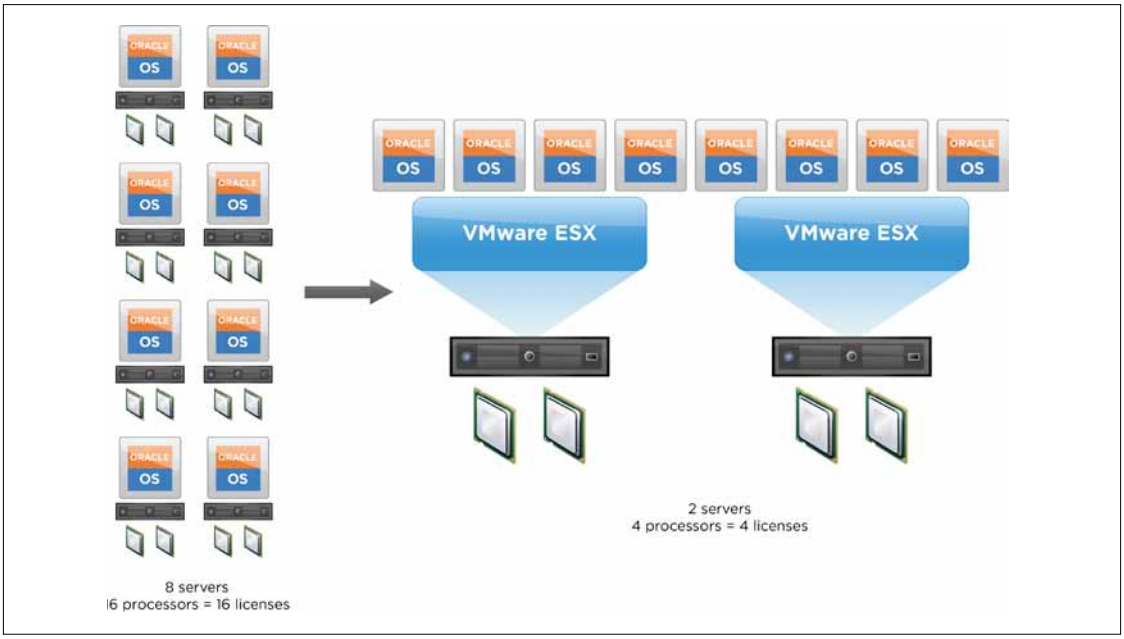

Figure 1. Licensing Example

Scenario B: Partially Licensed Clusters

When a customer does not have enough Oracle application instances to justify creating a dedicated cluster for those applications, only a subset of the hosts in the cluster are licensed for the Oracle application. In this situation, the customer must be careful to restrict the movement of Oracle application instances and virtual machines to only those hosts that are licensed to run the product.

In this case, DRS Host Affinity rules can be used to appropriately restrict the movement of virtual machines within the cluster. DRS Host Affinity is a vSphere feature that enables you to ensure that your Oracle applications are restricted to move only between a subset of the hosts—that is, not all hardware in the cluster is "available" to the Oracle software. DRS Host Affinity is a clustering technology and is not a mechanism for soft or hard partitioning of the servers. As explained in section 2.1, using VMware CPU pinning to partially license a host is not currently recognized by Oracle as a "hard partitioning" mechanism that receives subsystem pricing. However, once you have fully licensed the host, you have the right to design your environment such that the Oracle workloads are free to run on the licensed hosts inside the cluster. At present, Oracle does not have any stated policy regarding clustering mechanisms or DRS Host Affinity. Customers can easily maintain records for compliance purposes as explained in section 2.3.

The advantages of this approach are similar to the advantages achieved with a fully licensed cluster. Because customers are typically able to increase the utilization of licensed processors, they reduce license requirements. However, consolidation ratios tend to be lower, because advanced vSphere features can be employed only on a smaller subset of the hosts.

2.3 Tracking Virtual Machine Movements for Compliance

With VMware vMotion and DRS technologies you can migrate a live virtual machine running Oracle software from Host A to Host B for server maintenance or load-balancing purposes.

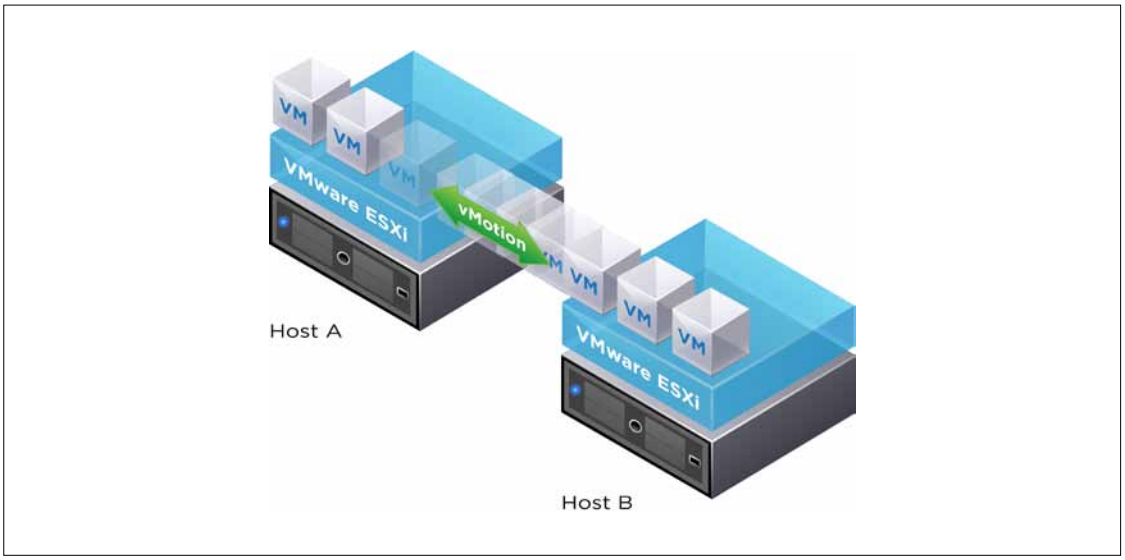

Figure 2. Virtual Machine Migration

In such instances you should ensure that the migration occurs between fully licensed hosts by using vSphere capabilities such as DRS Host Affinity—that is, both Host A and Host B must be fully licensed hosts from an Oracle licensing perspective (as described in section 2.1). VMware vCenter™ Server generates several migration log files maintained at /var/log/vmware/hostd.log and /vmfs/volumes/datastore/vm/vmware.log that can be leveraged to track and record such virtual machine movements across hosts for compliance purposes. Additionally, VMware provides an extensive open API that allows compliance tools to generate user-friendly reports using this data. In particular, VMware vCenter Configuration Manager provides host-level change-tracking mechanisms that enable you to record virtual machine movements across hosts. Since this host-level change tracking leverages an open API, third-party configuration-management solutions may also provide some of this functionality for VMware environments.

2.4 Oracle Licensing Example

Figures 3 and 4 depict a real customer scenario. In this case, the customer had to decide between deploying Oracle on dedicated physical servers or on a vSphere cluster. By deploying on a vSphere cluster, Oracle licensing costs were reduced by half, from a total of $1,520,000 to $760,000.

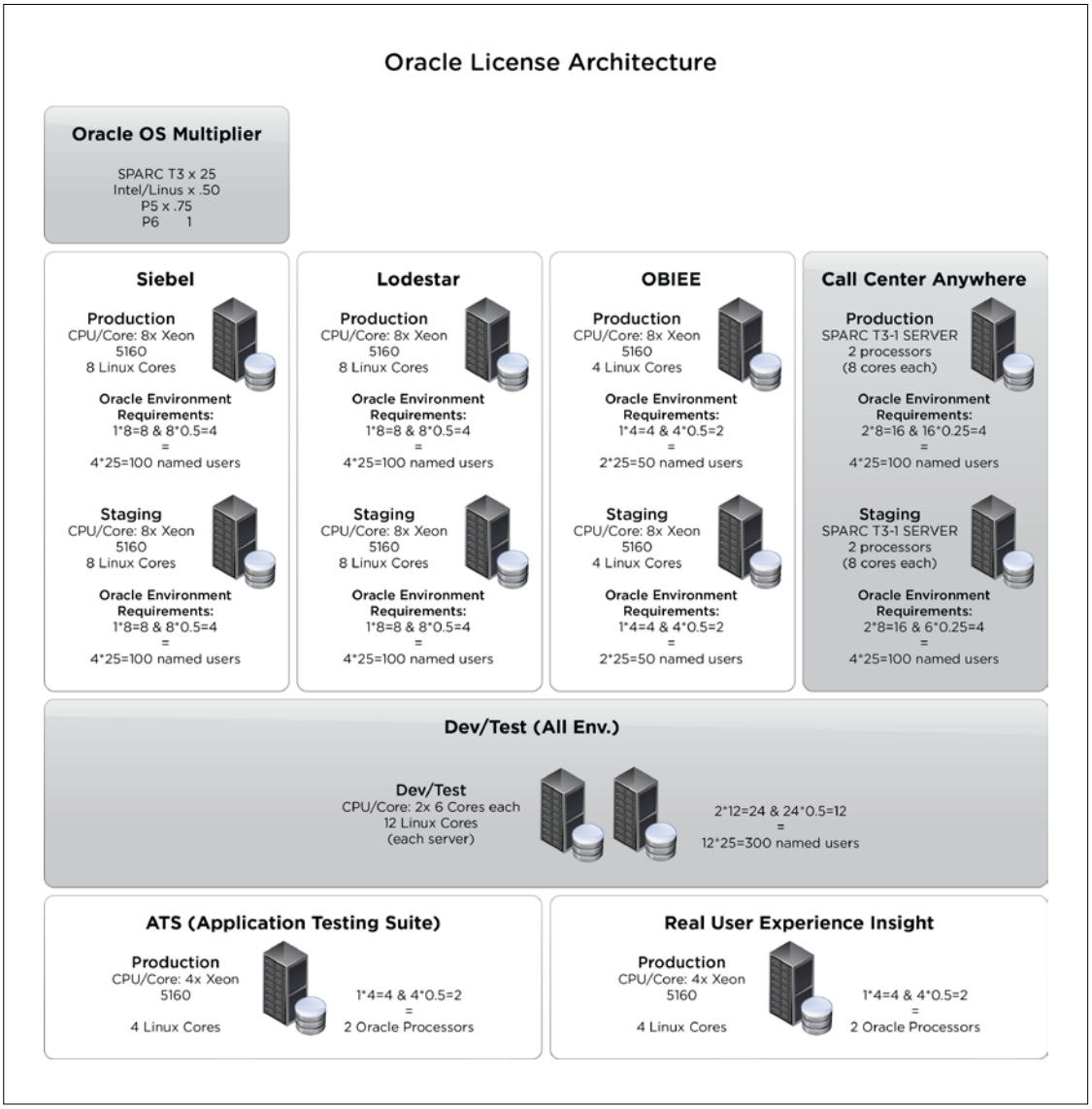

Figure 3. Physical Configuration

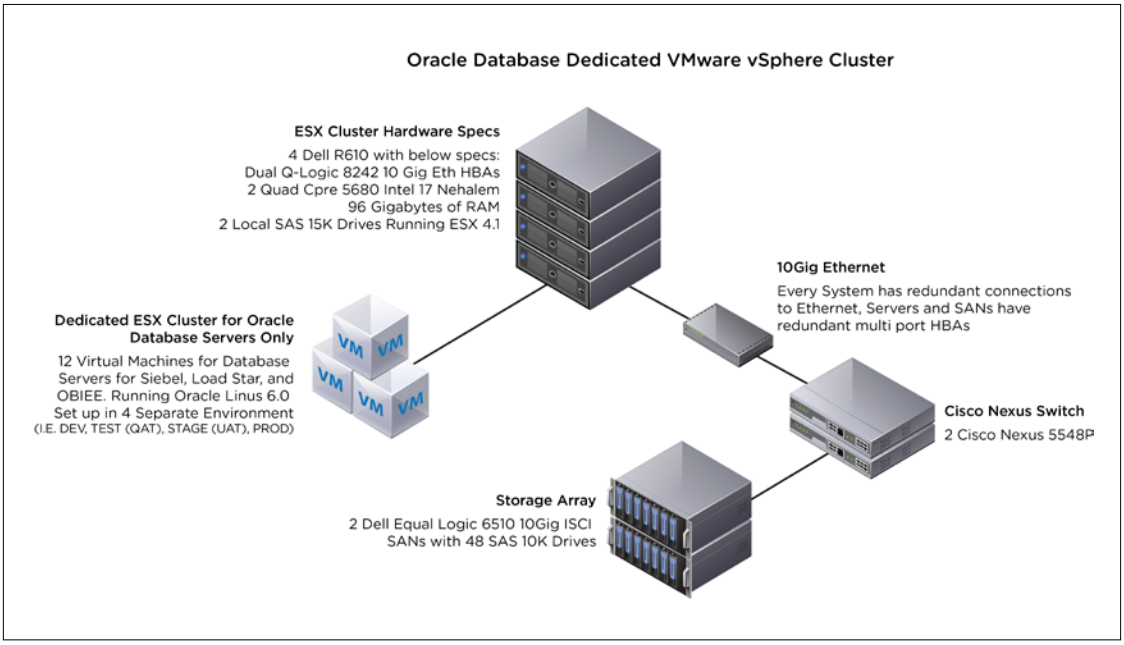

Figure 4. Virtual Configuration with VMware
Source: Anthony Rivieccio, Virtualization Architect, ProSys

The following table compares costs associated with the physical and virtual configurations shown in Figures 3 and 4.

ORACLE DATABASE LICENSING IN PHYSICAL CONFIGURATION	ORACLE DATABASE LICENSING IN VIRTUAL CONFIGURATION WITH VMWARE
Total cores = 64 Total cores x .50 (Intel multiplier) = M M x $47,500 = total licensing cost M = 32 x $47,500 Total licensing cost = **$1,520,000**	Total cores = 32 Total cores x .50 (Intel multiplier) = M M x $47,500 = total licensing cost M = 16 x $47,500 Total licensing cost = **$760,000**

Table 2. Comparison of Oracle Licensing in Physical and Virtual Configurations

Summary

- Oracle chooses not to certify any third-party virtualization product or hardware that sits below the operating system. As in the physical world, the lack of certification should not limit customers' choice of virtualization platform. As long as the OS is certified by Oracle and supported by VMware, customers can run Oracle on VMware with the same level of confidence as on physical systems.
- Oracle has an official support statement for VMware. Many VMware customers are successfully running Oracle on VMware vSphere while receiving the required level of support from Oracle.
- Oracle cannot be licensed by virtual CPUs today, but as long as Oracle software runs on fully licensed hosts, customers are not in violation of published Oracle policies. In particular, DRS Host Affinity rules can be used to run Oracle on a subset of the hosts within a cluster. In many cases, customers can use vSphere to achieve substantial licensing savings.

Resources

Visit the VMware Business Critical Applications page for more details on virtualizing Oracle:
http://www.vmware.com/solutions/business-critical-apps/index.html

Read customer success stories:

– **University of British Columbia**
http://www.vmware.com/files/pdf/customers/11Q1_University_of_British_Columbia_Case_Study.pdf

– **American Tire Distributors**
http://www.vmware.com/files/pdf/customers/11Q1_American_Tire_Distributors_Case_Study.pdf

Download the Oracle Databases on VMware Best Practices Guide:
http://www.vmware.com/files/pdf/partners/oracle/Oracle_Databases_on_VMware_-_Best_Practices_Guide.pdf

Appendix 1: VMware Advantage

Over the past decade, VMware has emerged as the industry's leading virtualization platform. Today, more than 250,000 customers have chosen to build their virtual and cloud infrastructures on vSphere, trusting their mission-critical applications and production environments to the advanced capabilities and reliability that only vSphere provides.

VMware vSphere 5 delivers enhanced scalability with 32-way VMware Virtual Symmetric Multiprocessing, increased I/O performance, and additions of brand-new, industry-first capabilities such as Profile-Driven Storage, Storage DRS and vSphere Auto Deploy that Oracle VM just cannot match. Independent industry experts agree that vSphere 4 had "at least a 5-year pure technology lead" over competing virtualization platforms. With the release of vSphere 5, that gap widens even further.

As you make infrastructure decisions, consider how virtualization and cloud computing is transforming your datacenter into a seamless pool of dynamic resources. Creating suboptimized silos of technology fails to deliver the true benefits of virtual infrastructure, such as dynamic resource allocation, built-in availability, automated disaster recovery and intelligent policy management.

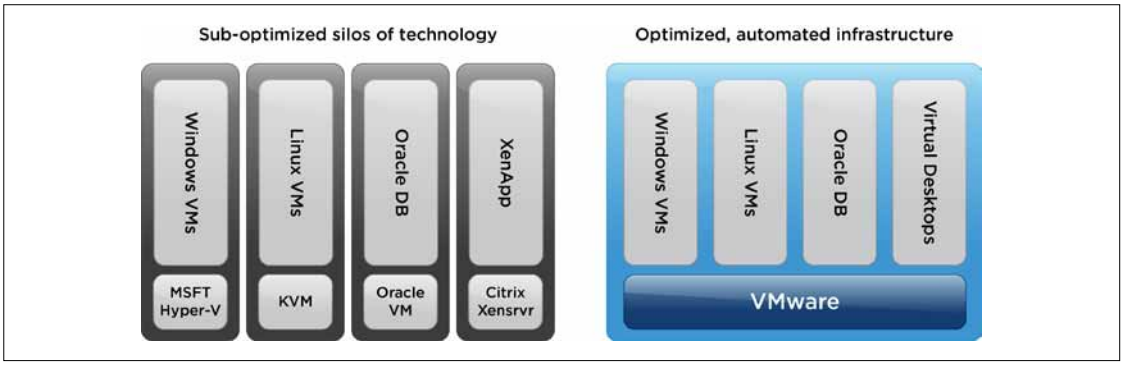

Figure 5. Evolution of the Datacenter

Hypervisor Architectures Do Matter

The VMware purpose-built, thin hypervisor is designed for virtualization. Oracle VM is based on the Xen hypervisor, which relies on a general-purpose operating system in the "parent partition." This mixed architecture introduces reliability concerns, because the parent OS has a much larger attack surface and becomes a single point of failure. The far thinner VMware vSphere hypervisor architecture removes dependence on a general-purpose OS in the virtualization layer and requires no patching or maintenance to secure the generic operating system code that has nothing to do with virtualization.

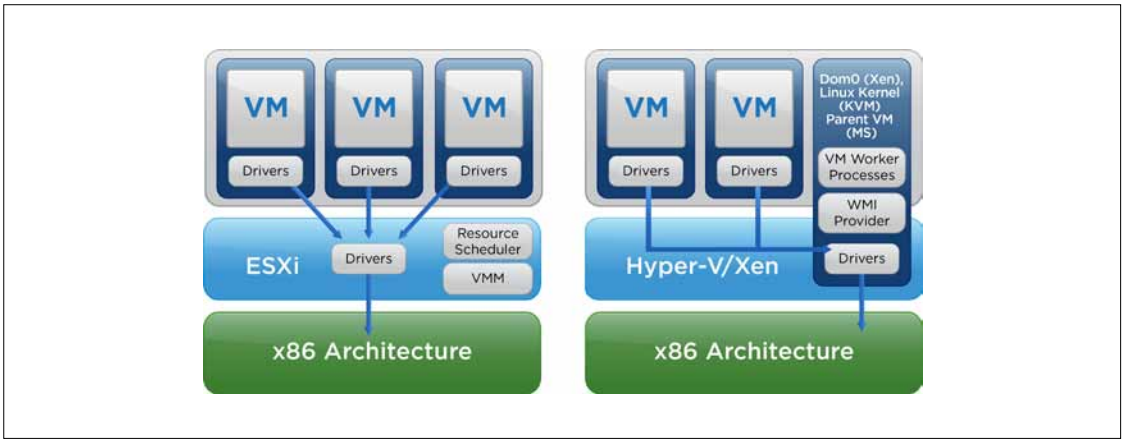

Figure 6. Hypervisor Architectures Matter

Oracle VM also uses an indirect I/O design that routes all virtual machine network and storage traffic through the parent OS. Rather than relying on I/O drivers known to be the least reliable component of a general-purpose OS, vSphere uses a direct I/O design that avoids bottlenecks by connecting virtual machines to host hardware with drivers embedded in the hypervisor. The drivers are specifically hardened and optimized for virtualization.

DIFFERENTIATORS	VMWARE ARCHITECTURE	ORACLE VM ARCHITECTURE
Hypervisor disk footprint	True, thin hypervisor with no general-purpose OS Impact: far smaller code size means extremely high reliability, fewer vulnerabilities, less patching	Relies on Linux in dom0 management partition Impact: more code to patch and secure; introduces single point of failure
Driver model	Direct, purpose-built drivers in hypervisor Impact: more efficient I/O path; utilizes drivers hardened and optimized for virtualization	Indirect I/O handled by generic drivers in management OS Impact: I/O bottlenecks; single point of failure from nonoptimized drivers

Table 3. Architecture Comparison

Appendix 2: Oracle Support for Oracle Products Running on VMWare

MyOracleSupport Note 249212.1

Support Position for Oracle
Products Running on VMware Virtualized Environments [ID 249212.1]

Modified 08-NOV-2010 *Type* ANNOUNCEMENT *Status* PUBLISHED

Purpose

Explain to customers how Oracle supports our products when running on VMware

Scope & Application

- For Customers running Oracle products on VMware virtualized environments.
- No limitation on use or distribution.
- Support Status for VMware Virtualized Environments

Oracle has not certified any of its products on VMware virtualized environments. Oracle Support will assist customers running Oracle products on VMware in the following manner: Oracle will only provide support for issues that either are known to occur on the native OS, or can be demonstrated not to be as a result of running on VMware.

If a problem is a known Oracle issue, Oracle support will recommend the appropriate solution on the native OS. If that solution does not work in the VMware virtualized environment, the customer will be referred to VMware for support. When the customer can demonstrate that the Oracle solution does not work when running on the native OS, Oracle will resume support, including logging a bug with Oracle Development for investigation if required.

If the problem is determined not to be a known Oracle issue, we will refer the customer to VMware for support. When the customer can demonstrate that the issue occurs when running on the native OS, Oracle will resume support, including logging a bug with Oracle Development for investigation if required.

NOTE: Oracle has not certified any of its products on VMware. For Oracle RAC, Oracle will only accept Service Requests as described in this note on Oracle RAC 11.2.0.2 and later releases.

Reprint of Oracle policy. Not authored by VMware.

Appendix 3: VMware Support for Oracle Products Running on VMware

VMware Oracle Support

VMware is committed to the success of its customers in deploying simplified, cost-effective, and better Information Technology services. To further this, we recently announced expanded support for Oracle Database technical issues with the VMware vSphere platform. This expanded technical support is driven by our VMware customers' choice to deploy increasing amounts of their Oracle Database software with VMware products.

This expanded support is targeted at Oracle Database usage "above and below" vSphere, where the Oracle database is:

- used as a data store for VMware products
- run within a virtual machine on vSphere/ESX

VMware Oracle Support provides customers the following new advantages as part of the existing Support and Subscription contract at no additional charge:

- Total ownership of Oracle Database technical issues reported to VMware Support
- Access to a team of Oracle DBA resources within VMware Support to troubleshoot related to Oracle Databases used as a data store or run within a VM -
- Performance tuning and best practices related to Oracle Database used as a data store or run within a VM
- Faster resolution of technical issues in VMware environments via a collaborative support arrangement between VMware Support and Oracle Support

Total Ownership

VMware Support will accept accountability for any Oracle-related issue reported by a customer. By being accountable, VMware Support will drive the issue to resolution regardless of which vendor (VMware, Oracle, or others) is responsible for the resolution. In most cases, reported issues can be resolved via configuration changes, bug fixes, or feature enhancements by one of the involved vendors.

In the rare situation that another vender is unable or unwilling to provide a satisfactory technical resolution, VMware Support will immediately notify the customer, assist in escalation and explore other potential technical workarounds with the customer.

VMware will also assist its customers with technical issues for other Oracle software products, besides the Oracle Database and provide similar escalation assistance if needed.

Besides technical assistance, VMware Support will advocate on the customer's behalf to:

- Provide any relevant evidence that virtualization does not play a part in the Oracle product technical problem
- Engage Oracle Support in resolving the customer's technical issue, escalating management attention as appropriate

Summary

VMware's business mission is to reduce complexity, lower costs, and improve information technology service delivery for customers. This extended support perform delivers this, by driving resolution of customer technology issues that involve multiple product venders. VMware is committed to its customers' success and supports their choice to run Oracle software in modern, virtualized environments.

VMware, Inc. 3401 Hillview Avenue Palo Alto CA 94304 USA Tel 877-486-9273 Fax 650-427-5001 www.vmware.com