Why Oracle VM is the Best Platform for Deploying Oracle Database
Introduction

Critical business applications—order entry, financials, human resources, customer relationship management, and enterprise resource planning—depend on Oracle Databases. This is also true for Oracle applications such as Oracle Fusion Middleware, Oracle E-Business Suite, and Oracle’s PeopleSoft, JD Edwards EnterpriseOne, and Siebel Customer Relationship Management (Siebel CRM) product lines. Companies rely on these data-driven applications to improve business efficiency, generate revenue, and increase profitability.

As IT departments turn to cloud-based models to deliver strategic applications as on-demand services, they strive to optimize flexibility while delivering services with responsive performance, scalable capacity, tight security, and “always-on” availability. IT’s core value centers on its ability to respond quickly to new Line of Business demands and changing priorities that stem from new business initiatives, acquisitions, compressed deadlines, and shifting customer requirements.

Virtualization is well understood as a means of improving infrastructure flexibility and IT agility. It is widely deployed to consolidate datacenters and reduce server sprawl, improving utilization, simplifying management, and decreasing operational costs associated with space, power, and cooling. While traditional virtualization offers these benefits, many implementations provide only simple virtual machine (VM) containers for Oracle Database and application workloads—they offer no visibility or control of what’s actually executing in the virtual guest.

In contrast, Oracle VM extends the benefits of a traditional virtualization approach, adding the advantages of application-driven virtualization. Oracle VM enhances virtualization because it supplies the ability to deploy, manage, and fully support applications running in virtual environments. Implementing Oracle VM adds value because it effectively supports the full lifecycle of Oracle Database and Oracle application deployments, from initial VM and application provisioning through the stages of development, test, production, ongoing maintenance, and retirement.
Oracle VM: Application-Driven Virtualization

Oracle VM’s integration across the solution stack (Figure 1) brings an increased level of application visibility and management awareness to Oracle Database deployments. Because Oracle products are engineered and tested to work together, there are distinct advantages in running Oracle Database and Oracle application workloads on Oracle VM guests. That’s why Oracle deploys Oracle VM to support virtualized implementations of Oracle Database and Oracle applications internally. In addition, Oracle VM requires no licensing, so there is only a low annual fee for enterprise support. This paper describes the benefits of implementing application-driven virtualization with Oracle VM, specifically highlighting the advantages of running Oracle Database and Oracle application workloads on Oracle VM.

Advantages across the Oracle Database and Application Life Cycle

Beyond the benefits of consolidation, Oracle VM adds value across the database and application lifecycle—from provisioning through decommissioning. Oracle VM enables efficient and cost-effective Oracle Database and Oracle application deployments, with the ability to add pervasive management that drills down to the database and application level (Figure 2).
A case in point is Oracle Managed Cloud Services, which supplies Oracle Databases and Oracle applications as customer-facing private cloud services. The Oracle Managed Cloud Services infrastructure is fully virtualized on Oracle VM, delivering Oracle Database services, Oracle Fusion Middleware, and Oracle applications (e.g., Oracle E-Business Suite, PeopleSoft, Siebel CRM, etc.) to over 5.5 million end-users. To deploy cloud-based application services with the security, availability, performance, and scalability characteristics that each customer demands, Oracle Managed Cloud Services implements and manages over 15,000 virtual machines on Oracle VM. The organization’s administrators rely on Oracle VM software to virtualize database and application services because it supports efficient provisioning, management, and updates for each customer’s private cloud. In addition to Oracle Managed Cloud Services (which is a revenue-generating business), Oracle deploys Oracle VM internally for IT development. The Oracle Product Development IT organization deploys more than 116,000 virtual machines on Oracle VM for internal engineering projects.

Rapid Provisioning with Oracle VM Templates and Oracle Virtual Assembly Builder

In many cases Oracle Databases support applications that are tied to revenue generation, so rapid deployment into production can be a strategic advantage that impacts profitability. To quickly provision virtual machines, Oracle Databases, and a production-ready solution stack, Oracle VM administrators can use Oracle VM Templates or the Oracle Virtual Assembly Builder. Both help administrators speed database and application provisioning at the same time building reliable and repeatable configurations.

Oracle VM Templates

Oracle VM Templates are pre-configured, pre-optimized, and pre-patched guest VMs based on best practices and standards. Developed and tested by Oracle, templates automate the provisioning of complete production-ready application environments, installing operating systems, Oracle Database 11g or 12c releases, and even Oracle applications in fully configured virtual machines. Because templates automate the creation and replication of fully patched and fully tested solutions, they reduce the possibility of human error, increasing reliability and lowering the expertise barrier for complex configurations. Templates allow an administrator to install a single instance Oracle Database in minutes or a production-ready Oracle Real Application Clusters (RAC) configuration (with any number of nodes) in a matter of hours. As an example, after downloading and importing an Oracle VM Template, a fully configured, production-ready, two-node Oracle RAC cluster can be built in less than a half-hour. The webinar “Oracle VM Templates: Best Practices for Rapid Oracle Database Deployment” shows just how fast and easy it is to deploy a single instance database (5-6 minutes) or a 100-node Oracle Database 12c Flex Cluster (with 20 hub and 80 leaf nodes in only a few hours).

Oracle VM Templates can be freely downloaded from Oracle’s e-delivery site or from My Oracle Support. Oracle provides validated templates for many Oracle Database configurations, including single instance (with Oracle Restart), Oracle RAC, and templates that implement advanced Oracle Database 12c features such as Flex Clusters and Flex ASM. In addition, Oracle provides Oracle VM Templates to deploy full Oracle application stacks with Oracle Fusion Middleware, Oracle E-Business Suite, or Oracle’s PeopleSoft, J.D. Edwards EnterpriseOne, or Siebel CRM products. The complete list

The Evaluator Group (an independent lab commissioned by Oracle) compared overall application deployment times for Oracle VM and VMware vSphere using two Oracle workloads—Oracle RAC 11g and Oracle E-Business Suite. As shown in Figure 3, Oracle VM Templates enabled application deployments that were 7 to 10 times faster than deployments on VMware vSphere.¹

![Figure 3. Oracle VM Templates reduce installation times, making them 7x-10x faster than on VMware vSphere.](image)

**Oracle Virtual Assembly Builder**

Oracle Virtual Assembly Builder helps administrators easily create complex multi-tier application topologies that can then be replicated and scaled on Oracle VM virtual machines. Using the Oracle Virtual Assembly Builder interface, administrators can capture an existing set of software components (Oracle as well as non-Oracle products) and then structure them into an application blueprint or “assembly.” Assemblies represent a complete standardized topology for a multi-tier application stack, and can be customized as needed to create multiple unique deployments on Oracle VM guests. In this way Oracle Virtual Assemblies streamline the provisioning and reproduction of complex multi-tier application stacks.

Creating pre-built assemblies is extremely powerful and can help to lower operational costs and complexity. Assemblies automate the many tasks required to replicate multi-tier infrastructures, enabling fast datacenter build-outs (to replicate sites, add redundancy, or increase capacity) or to deploy infrastructure for private clouds. Since assemblies encompass all components and systems that make up a potentially complex application infrastructure—web servers, application servers, Oracle Fusion Middleware, Oracle Database software, etc.—they facilitate a high level of standardization and consistency while implementing best practices and reducing the likelihood of administrator error.

Performance and Scalability

Oracle Database deployments require fast transactions and scalable capacity as user populations grow and new applications are added. Although virtualization technology is quite mature, there are still some IT organizations that are hesitant to virtualize Oracle Database workloads—they hold on to a misconception that, while virtualization has its advantages, it can't deliver the performance and scale required for critical Oracle Database and Oracle application workloads. As a matter of fact, virtualizing Oracle Database workloads on Oracle VM can provide similar and sometimes better performance than those same workloads on bare metal, at the same time providing benefits like flexibility and agility.

In performance tests comparing virtual and physical servers, Open Universities Australia (OUA) found that they could run virtualized Oracle RAC and Oracle application workloads on Oracle VM guests with equivalent or better performance, along with excellent stability and resource utilization. OUA conducted testing of PeopleSoft Campus and PeopleSoft CRM workloads and saw significant performance improvements (Figure 4). In addition, OUA was able to use hard partitioning with Oracle VM to bind virtual CPUs to processor cores, helping to reduce software licensing costs while fully complying with Oracle's licensing policies. (See the Oracle partitioning policy and whitepaper for more information.)

Figure 4. In OAU’s testing of PeopleSoft workloads on Oracle VM, tasks were 75% faster on virtual servers compared to physical servers.

---


In a separate testing exercise, Revera Limited (an infrastructure service provider in New Zealand) compared single instance Oracle Database 11g performance on Oracle VM, on physical servers, and on a competitive virtualization solution. Oracle VM delivered better response times (and more transactions per minute, even exceeding bare metal in some cases), while using less CPU than the non-Oracle virtualization technology.\(^4\)

![Figure 5. In Revera Limited’s testing of Oracle Database (single instance), Oracle VM showed faster response times than bare metal and that of a competitive virtualization solution.](image)

Oracle VM also benefits from greater scalability than competitive virtualization solutions. Its architecture is highly scalable, supporting a maximum of 160 physical CPUs and 4TB of memory. Oracle has conducted extensive scalability testing on the Oracle Sun Server X2-8 system, an 8-socket x86 enterprise-class server. Guest VMs can be configured with up to 128 virtual CPUs and 2TB RAM, enabling excellent scalability within a single guest.

When Oracle Virtual Networking is used in conjunction with Oracle VM, it’s possible to realize huge I/O performance gains. Oracle Virtual Networking is a high-bandwidth (40Gbps) fabric that enables dynamic, low-latency connections between servers, networks, and storage appliances. For database backup applications, some customers have seen a significant decrease in backup times simply by adding an additional virtual Fibre Channel connection to the virtual server.

Availability

Minimizing both planned and unplanned downtime is key to continuous application availability. Oracle VM’s Live Migration feature eliminates planned downtime that is otherwise necessary in non-virtualized deployments when administrators perform software patching and upgrades. Live Migration moves an active virtual machine from one system to another while the VM and any applications it

---

supports continue to run. It can be used to preserve application continuity by moving a virtual server and its workload to another physical machine, allowing maintenance to be performed on the first machine, its VMs, or the application or operating system software within the VM. Live Migration can also be used to simplify hardware upgrades, load balancing, or resource changes—allowing the VM to be moved to a server in the pool with more physical memory, more CPU capacity, or a better I/O subsystem.

For applications that do not require failover at the transaction level, Oracle VM offers an affordable way to speed server and database recovery. To maintain uninterrupted availability of virtual machines, the administrator can set up virtual servers to be highly available; this means that when an Oracle VM server is restarted or shut down, its VMs are either restarted or migrated to another Oracle VM server in the pool. As long as there are adequate resources for all VMs to run concurrently, application services can be restarted and continue in spite of a server failure. For many customers, this capability can significantly shorten an otherwise long recovery process (such as acquiring or rebuilding a new physical server and reinstalling the software stack).

Oracle VM can also contribute to the design of effective Disaster Recovery (DR) solutions. The State University of New York (SUNY) implemented a Disaster Recovery solution with Oracle VM to support application continuity for its 450,000 students, 64 campuses, and distance learning courseware. A white paper and webcast give the details of how they created a 2-site active/standby DR solution that incorporates Oracle VM and SAN storage.³

### Oracle VM and Oracle RAC

To support strategic business applications, many Oracle Database workloads demand 24/7 continuity, requiring transaction failover. Oracle VM is the server virtualization technology that is fully certified for all Oracle products (including Oracle RAC) with Oracle hardware and software, providing an optimal virtualization solution for mission-critical Oracle Databases.

In cases where Oracle RAC is deployed on servers with low CPU utilization, Oracle VM enables workload consolidation and more efficient resource use. The Oracle VM administrator can define resource limits for each guest VM, designating specific resources for each Oracle RAC node. This is essentially how Oracle VM facilitates hard partitioning of CPU resources, which limits virtual CPUs and associated cores to the use of a particular VM guest. Through hard partitioning (or “CPU pinning”), customers can use a subset of the available CPUs and take advantage of sub-capacity licensing.⁶

---


Oracle RAC complements the application-driven nature of Oracle VM. Oracle RAC deployments on Oracle VM allow for more granular detection (and therefore faster recovery) when a problem occurs. Oracle RAC monitors the relevant Oracle Database components inside the virtual guest, while Oracle VM High Availability enables an immediate response to node failures. Placement rules (discussed in the paper “Oracle Real Application Clusters in Oracle VM Environments”) ensure that the Oracle RAC instances are dispersed across physical servers to avoid a single point of failure. Server Pool guidelines can further optimize virtual guest placement as part of an automated Database as a Service (DBaaS) offering.7

Manageability

Oracle VM enables comprehensive and centralized management of the entire virtualized environment, monitoring and governing all Oracle VM servers and virtual machines. It includes an easy-to-use, browser-based interface—Oracle VM Manager—that configures and controls server, network, and storage resources for both SPARC and x86 servers. Management capabilities include real-time monitoring of Oracle VM Server utilization, with the ability to add resources dynamically, rebalance the server pool, and migrate VMs to less heavily loaded servers. When deploying Oracle Database workloads, Oracle VM Manager facilitates shifting resources as needed, allowing administrators to reassign them, for example, from test and development VMs to production VMs.

Oracle VM makes it easier and less complex to manage server resources and the deployment lifecycle of virtualized Oracle Databases and Oracle applications. Oracle VM Templates and Oracle Virtual Assembly Builder simplify initial provisioning. Live Migration simplifies patching, resource assignment, and load balancing. In addition, Live Migration allows IT to initiate a hardware refresh without incurring downtime since VMs can be migrated and operations can continue while systems are upgraded incrementally.

Using a consistent set of tools can save considerable labor costs, especially compared to environments that use a variety of tools from different vendors. Oracle VM’s deep integration with components in the Oracle solution stack make it easier to manage an Oracle Database infrastructure. Oracle VM includes (at no cost) Oracle Enterprise Manager, which complements Oracle VM Manager. Oracle Enterprise Manager supplies an intuitive and comprehensive interface for managing Oracle hardware, firmware, virtual systems, and operating system instances (including patching and updates).

By adding other software in the Oracle Enterprise Manager family, such as Cloud Management Packs for Oracle Database or Oracle Middleware, administrators can gain fine-grained control of Oracle Databases and Oracle applications across the enterprise. The Cloud Management Pack for Oracle

Database supports Database as a Service (DBaaS) deployments on virtual servers, making possible self-service database provisioning that adheres to administrative policy and resource quotas. Self-service provisioning eliminates the lag time that's normally required to deploy new test, development, or production environments, and Oracle Enterprise Manager can address database decommissioning and deletion when an environment is no longer needed.

Figure 6. DBaaS capabilities (including self-service provisioning and chargeback) can extend an Oracle VM deployment.

Proven Virtualization Technology

Oracle VM has been proven in customer deployments as well as in Oracle Managed Cloud Services and Oracle Product Development IT. It's frequently used to virtualize Oracle Databases, Oracle Fusion Middleware, and Oracle applications, along with non-Oracle workloads.8

Because of the flexibility, performance, and reliability it brings to data-driven workloads, Oracle VM is also a core component in several Oracle Engineered Systems. These fully integrated, validated systems are optimized for performance and engineered to accelerate deployment while reducing the cost and complexity of implementing IT infrastructure. Oracle Engineered Systems that incorporate Oracle VM include:

- **Oracle Database Appliance.** This is an entry-level 2-node database appliance that pre-integrates Oracle RAC, Oracle Linux, Oracle VM, x86 servers, storage, and networking. It is a fully integrated

---

system that delivers highly available database services for a range of online transaction processing (OLTP) and data warehousing applications.

- **Oracle Exalogic Elastic Cloud.** This Oracle engineered system integrates compute, network, and storage components with Oracle VM virtualization, providing a high-performance infrastructure on which to deploy Oracle business applications, Oracle Fusion Middleware, or other software products. Oracle VM is tightly integrated with the I/O backplane using a technique called Single-Root I/O Virtualization (SR-IOV). SR-IOV allows the same InfiniBand I/O adapter to be shared by up to 63 virtual machines, eliminating overhead and delivering exceptional application performance.

- **Oracle Virtual Compute Appliance.** This appliance is a turnkey converged infrastructure solution that integrates Oracle VM with compute, network, and storage resources in a software-defined fabric. It supplies an infrastructure that can scale from 2 to 25 compute nodes per rack. When coupled with Oracle VM Templates, administrators can create ready-to-run VMs on the appliance in minutes. The webcast “Virtualization and Cloud Made Simple and Easy with Oracle's Latest Engineered System” shows how, within one hour of power-on, a DBA have a production-ready Oracle Database up and running using Oracle VM.

**Conclusion**

By deploying Oracle VM to virtualize Oracle Databases and applications, IT departments can achieve efficiencies from workload consolidation while enhancing the agility and speed of database and application deployments. Using Oracle VM Templates, IT organizations can realize huge time savings and efficiencies across the database deployment lifecycle, accelerating the provisioning of development, QA, and production databases and even creating production-ready Oracle RAC deployments in a matter of hours. Oracle VM's Live Migration feature eliminates downtime for patching and hardware refresh, helping IT meet demanding Service Level Agreements (SLAs).

In several tests that compare database performance on virtual and physical servers, Oracle VM has been shown to provide similar (and in some cases, even better) transaction response times. To enhance application continuity, Oracle VM guests can be quickly restarted on the same or another Oracle VM server if a problem occurs. Administrators also find that the recovery of Oracle RAC nodes can even be faster if they are virtualized. While Oracle RAC is supported on other virtualization technologies, Oracle VM is the only virtualization technology on which Oracle RAC is fully certified for Oracle software and hardware.

In addition to the efficiencies gained through consolidation, Oracle VM has zero licensing costs, which helps keep total cost of ownership (TCO) for your virtualization solution in check. Other commercially available virtualization products require both licensing and support fees. In contrast, Oracle VM customers pay only a low fee for enterprise support. And Oracle Enterprise Manager is included at no additional cost.

Oracle VM is backed by Oracle's internal engineering and development teams that work closely to optimize and validate the full end-to-end Oracle solution stack. Oracle invests heavily in engineering and quality assurance, validating Oracle Database and Oracle applications on Oracle VMs hosted on
both Oracle and non-Oracle hardware. In addition to pre-integrated Oracle Engineered Systems, Oracle Validated Configurations offer pre-tested database architectures that including third-party hardware and storage products. Oracle VM Templates are fully patched and tested installation tools that can also speed time-to-production for Oracle Database and Oracle application deployments.

Oracle’s global 24x7 support organization gives you a support contact for the entire software stack—Oracle applications, Oracle Fusion Middleware, Oracle Database, Oracle VM, and Oracle Linux or Oracle Solaris. With one call, you can get a software problem identified and resolved quickly from a single vendor.

For More Information

For more information, visit the resources listed below.

<table>
<thead>
<tr>
<th>TABLE 1. RESOURCES FOR MORE INFORMATION</th>
<th>WEB URL</th>
</tr>
</thead>
<tbody>
<tr>
<td>WEB RESOURCES</td>
<td></td>
</tr>
<tr>
<td>Oracle VM Download</td>
<td><a href="http://edelivery.oracle.com/oraclevm">http://edelivery.oracle.com/oraclevm</a></td>
</tr>
<tr>
<td>Oracle VM Virtual Assembly Builder</td>
<td><a href="http://www.oracle.com/technetwork/middleware/ovab/overview/index.html">http://www.oracle.com/technetwork/middleware/ovab/overview/index.html</a></td>
</tr>
<tr>
<td>Oracle Validated Configurations for Oracle Linux and Oracle VM</td>
<td><a href="http://www.oracle.com/technetwork/topics/linux/validated-configurations-085828.html">http://www.oracle.com/technetwork/topics/linux/validated-configurations-085828.html</a></td>
</tr>
<tr>
<td>WEBCASTS</td>
<td>WEB URL</td>
</tr>
<tr>
<td>Top 5 Reasons why Oracle VM is Best for Oracle Database</td>
<td><a href="http://event.on24.com/r.htm?e=725350&amp;s=1&amp;k=1512E332202610FE9518AB8B01354C6A&amp;partnerref=OVMDemand">http://event.on24.com/r.htm?e=725350&amp;s=1&amp;k=1512E332202610FE9518AB8B01354C6A&amp;partnerref=OVMDemand</a></td>
</tr>
<tr>
<td>WHITE PAPERS</td>
<td>WEB URL</td>
</tr>
<tr>
<td>------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>&quot;Oracle VM on Oracle Real Application Clusters, Physical vs. Virtual Database&quot; (IOUG)</td>
<td>Available by registering on the IOUG Website, <a href="http://www.ioug.org/">http://www.ioug.org/</a></td>
</tr>
</tbody>
</table>