

Deploying Oracle RAC using Oracle VM Templates—An Economic Impact Assessment

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Evaluator Group

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Executive Summary

Server virtualization allows IT administrators to maximize the efficient use of server resources. However, a virtualization project should also focus on avoiding unintended consequences such as the creation of additional management processes that add complexity and inefficiency. The overall economic gain an organization can realize from a virtualization project depends a great deal on the way virtualized servers are deployed.

As a specific case in point, Evaluator Group studied the creation and use of virtualized server templates as an administrative process for server deployments in an Oracle RAC environment—a process that can be surprisingly complex if done manually within any database environment.

This study was done in two ways:

1. Evaluator Group conducted an independent lab¹ comparison of template creation methods in an Oracle database application environment. We first built templates “from scratch” and deployed virtualized servers for Oracle RAC under VMware while tracking the time consumed for each step in the process. We then repeated the same process of deploying virtualized Oracle RAC servers, but in this second iteration we used Oracle Virtual Machine (Oracle VM) and the templates that are included with Oracle VM to create clones of virtual machines. Again, we tracked the time consumed for each step in this process.
2. We also interviewed an Oracle systems administrator as a basis for additional comparison of building templates in a production environment. For this customer, templates were a “game changer” because of an ability to deploy database and business intelligence services up to twenty times faster for their customers.

Evaluator Group conducted this study of both methods to compare the two on the basis of management complexity, risk resulting from administrative error, and overall time consumed. We first present the results of this study where we found that we could build Oracle RAC templates five times faster in the lab vs. building them “from scratch” in a VMware environment. We then use the results to compare the economic impact of using Oracle VM-based template creation on enterprise IT administrative processes as well as overall business impact vs. doing the same thing in a VMware environment. We also compared our results with the “real world” experience of an Oracle VM customer and equate that customer’s experience to economic impact.

¹ Lab testing was done in conjunction with Ed Whalen, Oracle ACE, Performance Tuning Corp without the assistance of Oracle or VMware.

Comparing Oracle VM Templates vs. User-created VMware Templates

The use of templates for VMware can facilitate the provisioning of virtualized servers. For complex Oracle RAC environments, the use of templates can be seen as an important enabler of faster enterprise application deployment. However, when using templates under VMware, an administrator builds these templates manually—a process that requires an administrator to manually install an application on a guest OS and then, through scripts, tools and cloning, generate a VMware template. In the past, we have seen that some of the challenges of a manual build can include:

- Slow and error-prone deployment during the install of the many separate components needed for Oracle RAC with dependences on patches, OS versions, and other packages. This can make deployment time consuming and difficult to manage.
- Installation documentation is not always current with the version of software being installed. Critical steps can sometimes be missed.
- Critical files that must be downloaded and unzipped may be missed.
- Configuration mistakes (network, storage, etc.)
- Java popups can get hidden behind other windows
- Encountering permissions problems with application installer scripts that can require an administrator to restart the install from the beginning.

We believe that these issues can be avoided in Oracle database environments by using Oracle VM Templates that are designed for reliable and repeatable use. Oracle VM Templates consists of a virtual machine (VM), or group of VMs, containing Oracle or other software that is pre-built, pre-configured and ready to use. In deploying virtualized applications with Oracle VM Templates, the IT administrator always starts from the same known state².

Part of the value of the Oracle VM Templates is the elimination of the time spent on the common challenges noted above. Because the OS and OS patches are pre-installed and pre-configured by product experts and developers, we believe that a high degree of repeatability and consistency can be achieved every time these applications are installed. To test this belief, Evaluator Group assessed Oracle VM Templates under Oracle VM/Oracle RAC 12c for x86 vs. templates created manually for Oracle RAC under VMware in Q4 2014.

² Oracle VM Templates, including Oracle Linux, Oracle Solaris, Oracle Database, Fusion Middleware, and many more; are available at www.oracle.com.

Test Plan and Objectives

As noted above, there were two deployment scenarios, both on two-node clusters:

Oracle VM and Oracle RAC

1. Deploy an Oracle VM environment on a two-node RAC cluster using the Oracle Template
2. Update Oracle 12c with two updates using the updated template
3. Create a new test and development environment with the template

VMware ESXi and Oracle RAC

1. Deploy an Oracle RAC cluster without a template
2. Update Oracle 12c with two updates
3. Clone the above environment and create a VMware template
4. Deploy a test and development environment with the template
5. Record the additional level of effort (if any) needed to achieve full usable deployment comparable to the Oracle VM template

Test Bed

Both scenarios were tested on a two-node cluster with iSCSI storage as shown in Figure 1 below.

Oracle VM - -

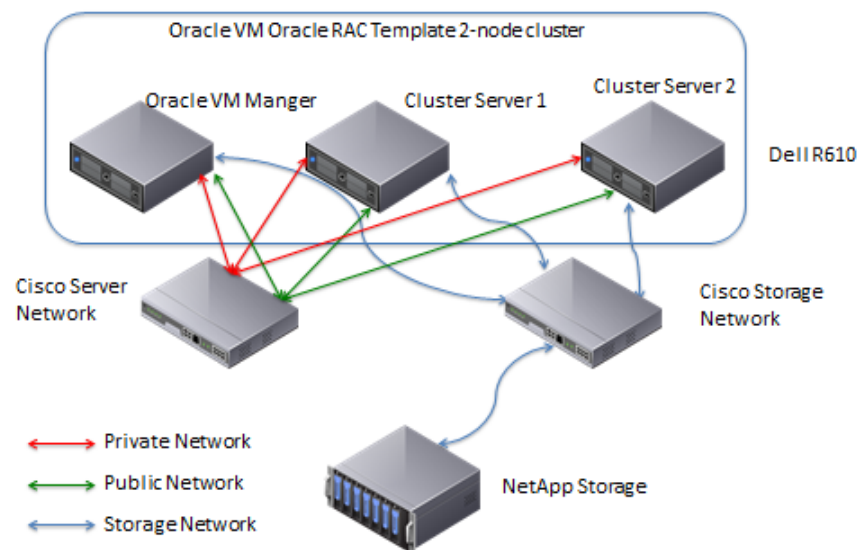


Figure 1 – 2-node Oracle VM cluster with management console and NAS storage

VMware --

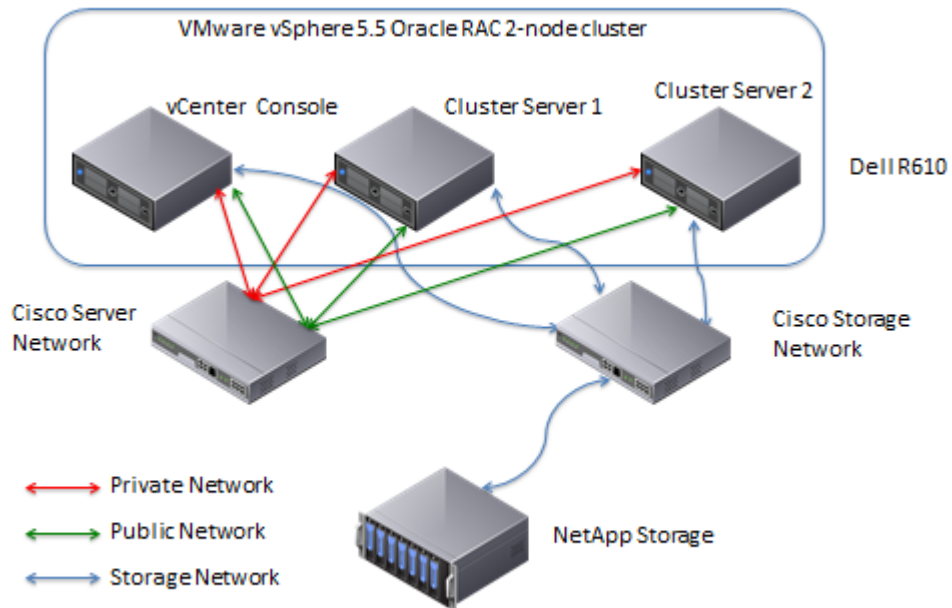


Figure 2 – 2-node VMware cluster with management console and NAS storage

Lab Evaluation Objectives

The Evaluator Group lab testing focused primarily on validating Oracle’s claims with regard to time saving and ease of use that users could realize from using Oracle VM Templates to deploy VMs for Oracle RAC vs. building them “from scratch” and deploying them under VMware vSphere. The goal was to validate Oracle’s claim of rapid VM deployment with Oracle VM Templates within test/development environments that would lead to VM deployment in production environments.

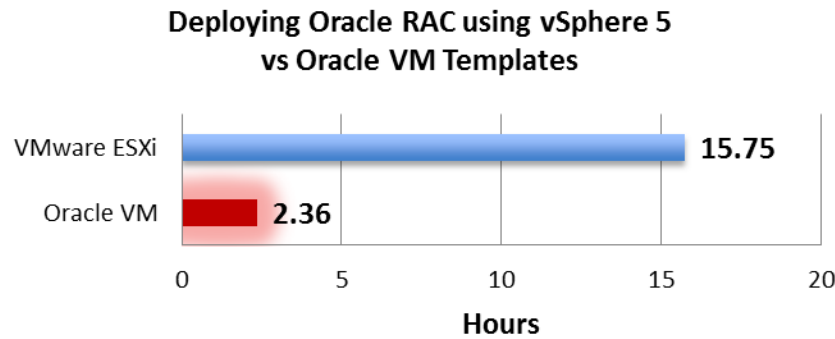
For this validation, no performance measurements of the products were made. Our objectives were to:

1. Measure the time required to create configure, and install, copies of the Oracle 12c database in a test and development environment for each of the two scenarios;
2. Disclose any additional tools needed to configure the environment.

The test environment was designed to be representative of typical IT test and development environments, utilizing a 2-node cluster in each scenario with a management console and iSCSI storage. For the VMware vSphere 5.5 deployment rapid installers for Oracle RAC 12c were used.

Evaluator Group Findings

For the VMware/Oracle configuration we measured 15 hours, 45 minutes to create a VMware template. Deploying Oracle RAC 12c using the Oracle VM Templates on Oracle VM was significantly faster than a manual template creation and install performed in a VMware vSphere environment (see results below).



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We measured only 2 hours, 22 minutes to create VMs using the Oracle VM Template. This time included 0.5 hours to build a database and verify a working database and 0.5 hours to install 2 patches with OPatch.

Manual template creation and deployment with VMware took us significantly longer (15 hours, 45 minutes) because additional tasks were required to reach the same end result. These included writing a script that enabled:

- Shutdown of the VM and creation the VM template from a clone
- Template deployment by changing the IP addresses for the two cluster nodes and hostnames. Storage on the second node was re-configured to support the method of identifying ASM disks.
- Database validation and running of the new cloned VM from the VMware template.

After this script was written, two additional patches were applied and the process was repeated and verified.

We also note that if a database administrator is writing the script and creating a new template for the first time, additional research and development time will be required. Because this is a complex process requiring multiple steps that are not well documented, we measured approximately 60 hours speaking with Oracle support and Oracle ACE Director Resources mostly to learn and verify the process of modifying the hostname. It then took us an additional six hours to determine a valid cloning solution by cloning the VMs, modifying the network addresses and properly identifying the storage for the script.

Note: Evaluator Group performed a similar test during the summer of 2012. The results of this test are available in a report entitled “Oracle VM—Quantifying the Value of Application-driven Virtualization.” For this report, an Oracle RAC 11g environment was used as the basis of comparison. In addition, our time measurements included set-up of the Oracle and vSphere environments as well as deployment of Oracle E-Business Suite. Here we have focused solely on template creation for Oracle RAC 12c as a way to demonstrate realizable time saving from using Oracle VM templates.

Customer Interview

To further validate our lab findings, we interviewed an Oracle VM plus Oracle Linux customer who has compared the use of Oracle VM Templates to deploy Oracle RAC vs. deployment of Oracle RAC in a physical server environment. This customer is an elastic cloud-based, marketing analytics services provider (DBaaS and BaaS) specializing in database marketing, email marketing and loyalty programs. As such, virtualization using Oracle VM has become a core technology. Oracle RAC is also essential to their services delivery model and, in the words of this customer; the use of Oracle VM Templates has become a “game changer.”

Early on in their history, they manually provisioned physical server resources. As their business progressed they started using Oracle VM on SPARC servers and Oracle VM templates. As a result, the process of provisioning customized, fully tested, production-ready analytics application services for an individual customer has gone from months to a matter of a few hours. As this was happening, the number of nodes deployed in an Oracle cluster was growing from two nodes to as many as twelve. However, the most common clusters now consist of between six and eight nodes.

In provisioning with Oracle VM, this customer is guided by the following objectives:

- Because rapid services provisioning is a business revenue driver, they need to stand-up elastic and production ready clusters in the shortest time possible.
- Individual customer needs are recognized and each customer is treated differently. Oracle VM Templates greatly simplify the customization process.
- A solution that meets the most stringent requirements is needed. Oracle VM Templates allow them to start with the base template and modify to their production quality standards.

There are a number of factors that result in delivering perceived value to using Oracle VM Templates by this customer. These fall into two general categories: IT administrative and business revenue generation.

Administrative – Oracle VM Templates are used four to five times per month. Significant factors relating to the value of Oracle VM Templates as experienced by this customer:

- Because Oracle RAC requires that all nodes be configured the same way, the use of Oracle VM Templates ensures deployment consistency and thereby reduces human error during deployment. This customer creates one database template per Oracle version and one for

Oracle Enterprise Business Intelligence (OBIEE). These are “frozen” in order to minimize configuration creep.

- The customer’s application environment is multi-tiered. Oracle VM Templates eliminate the complexity inherent in installing all of the required components. There can be approximately 50 VMs in their cloud databases that use Oracle VM Server for x86 and more in their legacy environment that uses Oracle VM Server for SPARC.
- All services are customized for each of their individual customers. In addition, their customers can have complex requirements. Using Oracle VM Templates, testing of a customized and complex service deliverable prior to deployment in production is simplified. If administrators encounter issues, they can simply revert to a basic template that was used as a starting point and restart the process from there. Using this streamlined process, testing now occurs twenty times faster.

Templates can be modified in, less than two hours to incorporate new releases and introduce new technologies to the environment. According to the customer, this is the area where templates are a game changer. Templates allow them to quickly deploy a fully tested, multi-tiered technology stack in their environment without having to spend several man hours learning, provisioning, configuring and testing a new technology. It’s also helps the team to setup fully functional training environments to rapidly learn new technologies. A good example on this was seen when they wanted to try the new Oracle Enterprise Manager for 12c—a multi-tiered (database plus middleware) system that, in the words of the customer, “has hundreds of knobs and configuration parameters. Configuring this without a template would easily take weeks and even with all that time spent, it won’t be fully up to the best practices. With template not only does this take a few hours but it is also highly available due to native HA that Oracle VM offers.”

Business opportunity and revenue generation - Significant factors relating to the value of Oracle VM Templates:

- Their customers don’t start paying until they are able to use the service in production. Without a template as a starting point, there is a much longer list of things to do to get to revenue generation and human error only elongates the process.
- Their customers like to be able to leverage new technologies and new products as they become available. Oracle VM Templates allow them to quickly spin-up and test new technologies in a sandbox environment. A resulting template speeds deployment of new technology, thereby enhancing customer loyalty.
- Using templates allows for the continued implementation of best practices that eliminate or reduce the amount of time required to resolve customer issues once a service is in production, again enhancing customer loyalty.
- New applications and services that generate more revenue from existing customers can be brought to market more quickly.

- New internal management processes like automation that enhances efficiency, reduce operational expense and thereby increase net income can also be put into production and more quickly.

To sum up the business impact of Oracle VM and the use of Oracle VM Templates in the words of this customer: “With the help of Oracle VM technology, we serve up data and deliver services twenty times faster for our customers and reduce total cost of ownership by 35% while further improving the overall environment resilience by 50% with Oracle VM and Oracle Linux.

Economic Impact: Oracle VM Templates vs VMware Templates Created Manually

In keeping with our delineation of factors that enhance administrative management efficiency vs. factors that generate increased revenue, we can look these in the light of economic impact in the same way. Below, we list factors that contribute to economic impact falling in the same two general categories. However, because every enterprise is different with regard to business model and IT services delivery, exactly how these calculations are arrived at will be different for each enterprise.

Management Efficiency

Users have a choice when deciding how to deploy Oracle RAC in a virtualized server environment using templates; they can use the templates provided by Oracle in conjunction with Oracle VM or build VMware templates for Oracle RAC manually. In order to arrive at an ROI-based justification for the use of Oracle VM Templates vs. the VMware alternative, we suggest making two basic sets of calculations—one using management efficiency as a basis, the other using business revenue.

ROI related to management efficiency takes an estimation of administrative time saved and equates it to the cost of a full time IT administrator (FTE)—roughly \$125K per year. Applicable factors include the amount of time saved (Oracle VM vs. VMware) or eliminated as shown in Figure 4 below.

Eliminating the need to create templates that requires downloading, extracting, installing and configuring software

Reducing the time needed to clone, modify, customize and update templates

Reducing the time needed to clone server nodes and deploy templates

Simplifying the process of deploying clusters and cluster nodes

Simplifying the deployment of updates, patches, new OS versions, new database instances and upgraded infrastructure

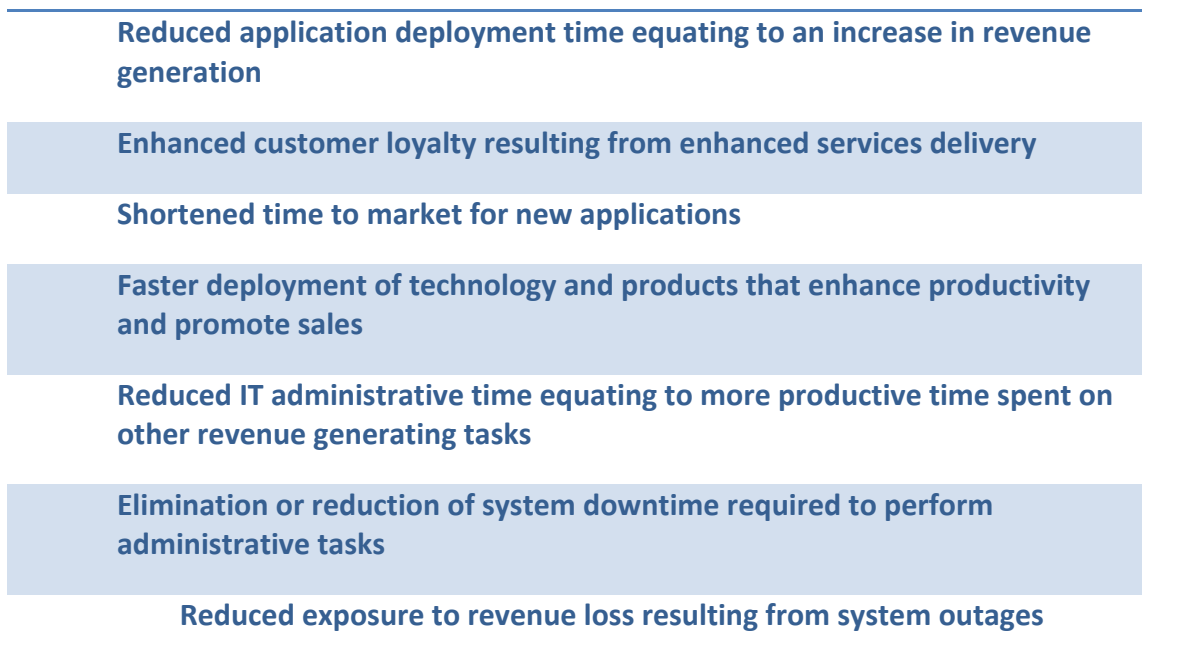


Figure 4: Factors that Enhance Management Efficiency

Looking at our test lab results comparing template deployment times—2.36 hours for Oracle VM vs. 15.75 in the VMware environment—there is a time savings of 13.39 hours per deployment. Assuming that an IT organization could repeat this process up to five times per month (as was reported in our Oracle VM customer interview) a savings on a monthly basis of 66.955 hours or 803.4 hours per year could be realized. This equates to a savings in IT administrative costs of approximately \$50,188.50³.

Revenue Generation and Business Growth

Looking at the environment of the customer we interviewed, we see opportunities to enhance revenue generation and business growth as noted in Figure 5 below.



³ Assumes the cost of a FTE at \$125K per year.

Figure 5: Factors that Contribute to Either Business Opportunity or Revenue Generation

Applying the above factors, one can build a model that can be used to demonstrate, if and when needed, the TCO and ROI impacts of using Oracle VM Templates vs. building templates in a VMware environment. The Oracle VM customer we interviewed reported an ability to deploy database and business intelligence services up to twenty times faster for their customers. And while not specifically quantified, we can easily imagine a significant gain in yearly top line revenue as a result. This customer also reported a reduction in TCO of 35% vs. what was experienced before using Oracle VM. Finally, the customer saw a 50% improvement in their overall production environment resilience with Oracle VM and Oracle Linux.

Evaluator Group Assessment

It is clear from our lab test results that deployment time for new Oracle VM infrastructure resources is significantly shortened when using templates available with Oracle Virtual Machine vs creating templates to accomplish the same tasks under VMware. As reported, this factor alone, when repeated over the course of a year, can add up to savings. This alone could give IT administrators and DBAs reason to favor the use of Oracle VM vs VMware to virtualize Oracle database application servers. And while not tested in our lab, we note that there are other reasons including the use of a virtualization platform that is optimized and stabilized for critical Oracle database application environments, and the use of Oracle VM to more efficient use of processing resources that support Oracle database applications.

More specifically, we note that templates alone can be used in multiple ways to increase IT administrative productivity, reduce system downtime, and accelerate application delivery leading to increased top line revenue. In addition, they can be seen as an enabler of a private cloud-based services delivery model as is evidenced by our Oracle VM customer interview. For the cloud-based analytics services provider we interviewed, Oracle VM templates are used to bring new clients online within hours, speed deployment of new/updated applications and infrastructure, and maintain a high level of client satisfaction—all resulting in a very positive return on this customer's investment in Oracle VM.

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