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What It Takes to Deploy and Manage a Private Cloud with Oracle VM
Introduction

A few days ago I had dinner with my friend Dave. He’s a systems administrator for his company’s private cloud. He was quite excited about what was happening at work and had to tell me all about it.

Apparently his management recently decided to switch over to Oracle VM to power their company’s IT infrastructure. Until then they relied on a mashup of customized applications, scripts, and handwritten procedures for doing everything from allocating storage to users to provisioning virtualized servers, updating and patching operating systems, and deploying applications over the network. He had been complaining for months about the difficulties of trying to satisfy requests from users and clients quickly and how these custom environments were becoming more and more unreliable and difficult to maintain.

Here’s how Oracle VM brings the many components of a private cloud together and simplifies virtualized application deployment and management in a day-in-a-life story.
Implementing a Private Cloud: My Dinner with Dave

So what does it take to manage a cloud infrastructure and applications? Dave drew me a picture on his napkin of the stack of software and hardware that he has to deal with every day.

![Software and hardware stack.](image)

At the top are the applications, middleware, and database software that he needs to keep running. There are unscheduled updates and patches that need to be applied to add new features and fix known problems. And, depending on specific releases and operating environments, there might be individual compatibility and dependency issues that need to be researched and addressed. Dave says that some of his worst nightmares have to do with installing and maintaining new applications. The procedures can be complex and frustrating as scripts fail due to permission problems and bad documentation. Some days even simple tasks seem to take forever.

At the operating system level, Dave told me, is where he spends most of his time, creating new virtual machines (VMs) for users, installing the required OS version, upgrading and managing OSs on existing virtual machines, and tracking down problems caused by software and OS compatibility issues. Each OS presents its own complex maze of configuration issues, and he has to be on top of all them.

Finally, the virtual machines, servers, and storage constantly need scrutiny, Dave said. Are resources properly matched to the shifting workflow? Do virtual machines need to be moved to different servers to even out workloads? Do we have performance bottlenecks, where are they, and what should we do about them? Do we need more physical storage?

This all came to a head last month when they moved in a new rack of servers and storage and Dave’s team was looking at having to provision it all from scratch while at the same time taking care of the existing systems. Dave had anticipated many long days and nights.
Organizations typically follow a layered approach to implementing a cloud. The proper layering is important not only from an architecture perspective, but also from an organizational perspective. As Dave mentioned, he has specialized storage administrators for managing storage; sysadmins for managing servers and the operating system infrastructure; and database, middleware, and application administrators for higher layers of the stack. “The cloud is like an orchestra,” he said; all these performers play in unison, while being still accountable for their respective components.

Dave found that the Oracle private cloud offering is architected exactly that way, with tools for network, storage, and server management, plus a management infrastructure to bring all these together in a single pane of glass. For example, Oracle VM Storage Connect, which provides storage management, is a framework that includes operational capabilities from various storage vendors and is integrated into Oracle VM Manager, the primary tool for virtualized infrastructure management. Oracle VM Manager provides monitoring, provisioning, and resource management capabilities—all the underlying plumbing needed for delivering infrastructure as a service (IaaS)—for Oracle VM.

Dave also pointed out that to make his new private cloud fully operational, he needed self-service, elasticity, and chargeback capabilities, and the ability to integrate with third-party components, such as a help desk implementation. Moreover, to offer platform as a service (PaaS) capabilities, the infrastructure management has to be done within the context of platform components, such as the database and middleware. This is where Oracle Enterprise Manager fits in. It can work seamlessly with Oracle VM Manager to provide a fully automated, self-service, capacity-on-demand environment.

So Dave’s team decided to virtualize and provision the new servers by deploying Oracle VM. That’s what he was so excited to tell me about at dinner.

Why Oracle VM?

Administering a large enterprise data center through resource consolidation and virtualization can be a daunting challenge for any IT department. Not only are managers looking to gain efficiencies by virtualizing servers and doing more with the hardware they have, IT administrators also spend a large portion of their time and energy installing, patching, and updating operating systems and software stacks deployed on those servers. At the same time, IT tries to be flexible enough to provision resources to meet users’ constantly changing needs.

Up to now, data centers have resorted to ad hoc, build-it-yourself solutions that rapidly become hard to manage, update, and extend to match expanding needs, which ultimately puts IT’s ability to meet new challenges at risk.

Here’s where Oracle’s virtualization technology really helps. By providing a solution that can virtualize the server environment, rapidly deploy applications, and manage the server farms, Oracle VM together with Oracle Enterprise Manager gives Dave’s team the fully integrated tools they need to manage, test, deploy, and support everything from applications to storage in a virtual environment.
Oracle VM (shown in Figure 2)—an enterprise-class server virtualization solution composed of Oracle VM Server and Oracle VM Manager—enables you to deploy operating systems and application software within a fully supported virtualization environment. The browser-based Oracle VM Manager controls the complete virtualization environment, creating and monitoring Oracle VM servers and virtual machines. Oracle VM Manager is actually an Oracle Fusion Middleware application based on the Oracle WebLogic Server that uses a bundled MySQL database or Oracle Database for its management repository.

Figure 2. Oracle VM.
Oracle VM Server for x86 installs directly on x86 server hardware and does not require a host operating system. An Oracle VM Server consists of a hypervisor and privileged domain (Dom0) that allows multiple domains or virtual machines (Linux, Oracle Solaris, Windows, and so on) to run on one physical machine. Dom0 runs a process called the Oracle VM Agent that receives and processes management requests, and provides event notifications and configuration data to Oracle VM Manager. It gives you a Web-based interface, Oracle VM Manager, you can use to intuitively manage Oracle VM Servers, virtual machines, and resources, along with the Oracle VM Server virtualization environment itself for hosting virtual machines.

Oracle VM includes unified management capabilities for Oracle VM Server for x86 and Oracle VM Server for SPARC, which provides virtualization and partitioning technology on Oracle’s SPARC T-Series servers. Oracle VM Server for SPARC leverages the SPARC hypervisor to subdivide supported platform resources (CPUs, memory, I/O, and storage) by creating partitions called logical domains, taking advantage of the massive thread scale offered by SPARC T-Series servers and the Oracle Solaris operating system.

An integrated virtualization approach using Oracle VM can help consolidate applications onto fewer systems for better resource utilization and reduce the number of OS instances to manage, while also improving security, reducing risk, and reducing installation and configuration time—helping administrators to more quickly satisfy user demands for access to applications and services.

Now that Oracle VM has the ability to manage Oracle VM Server for SPARC and Oracle VM Server for x86 virtual machines in the same console, organizations have a comprehensive way to manage all of their x86 and SPARC server resources with a single point of control.

Application-Driven Virtualization

Dave told me that he was spending most of his time installing operating systems and applications for individual users, and running into time-consuming problems updating and patching them. Users were not happy with the delays. But all that changed dramatically when he started using Oracle VM and deploying preconfigured Oracle VM Templates.

Traditional software deployment in a data center tends to be complex, time-consuming, and error-prone. Industrial-strength software often contains many components that might need to be installed and configured separately, each with its own unique dependencies on patches, OS versions, and other packages or libraries. Such complexities create a significant risk that something will be overlooked or done incorrectly, resulting in more time lost or worse.
Oracle VM eliminates wasted time by providing a way to rapidly and securely deploy prebuilt, preconfigured, prepatched VMs in the form of Oracle VM Templates. These templates contain a complete software solution, such as Oracle Database, Oracle Real Application Clusters (Oracle RAC), or Oracle’s Siebel Customer Relationship Manager (Siebel CRM)—along with an operating system environment—all ready to go. This can be a significant time saver.

An independent study¹ has shown that the time savings just from not having to download individual software components can be anywhere from a few hours to days. Overall, the time it takes to download, install, and get applications up and running using Oracle VM Templates went from a week to just a few hours.

Oracle VM Templates (Figure 3) can have one or more VM images. Complex applications might include, say, a Web server, an app server, and an Oracle Database server integrated together into a single compressed archive file that delivers the Oracle VM Template for the full product or solution. A single template can be used for creating any number of guest VMs.

¹ Evaluator Group report dated August 8, 2012.
Dave said that what really impressed him was how easy it was to customize a template and use the updated template to create VMs that automatically include those customizations. Previously, this would have been a hair-raising job due to a lack of standardization and consistency across VMs and applications.

Dave found that he was also able to create his own Oracle VM Templates from scratch. The components he needed were all downloadable from the Oracle Technology Network site, which allowed him to package those components together into a self-contained template.

Using templates, an administrator can evaluate and install applications easily and quickly without having to spend a lot of time working through complex installation and configuration procedures. This can significantly lower the risk of making mistakes due to missed dependencies or incomplete documentation, and it can dramatically shorten time-to-deployment for mission-critical applications.

Going beyond templates, Dave was amazed to find that he could capture existing software components and package them as self-contained, standardized, and customizable building blocks called appliances. And these appliances could be further combined and connected together to form complex application blueprints called assemblies that can be quickly instantiated into a collection of VMs configured and wired to communicate with each other automatically and seamlessly. The magic that makes this possible is Oracle Virtual Assembly Builder and its graphical interface for creating and provisioning complex application configurations over virtualized resources.

“That,” Dave said, “was when my world changed forever!”

Managing Storage with Oracle VM Storage Connect

By the time we got to dessert, Dave was telling me about what was the biggest nightmare facing his data center: storage. It seems that many application owners quickly exceeded their storage allocations and were constantly requesting more storage. This meant working with a storage admin to provision storage devices and provide access in a virtual environment. And none of this happened quickly enough to satisfy the user. Users would request more than they needed, just to be on the safe side, so a lot of storage was actually unused. Today, Dave said, storage provisioning and management is all available directly from the Oracle VM Manager console. It’s much simpler and more efficient, and he is now able to satisfy those storage requests faster than before.

Oracle VM Storage Connect is a framework that lets administrators provision and manage storage platforms through Oracle VM Manager. This greatly accelerates the task of managing storage in the virtual infrastructure by being much simpler and fully integrated. Also, plug-ins written by individual storage vendors allow Oracle VM Storage Connect to leverage the unique capabilities of a vendor’s array and take advantage of any advanced built-in features in these devices.

The layer of abstraction that Oracle VM Storage Connect provides means that virtualization administrators don’t need to know the specific behavior of each storage array they install; instead, integrating many complex operations automatically is a natural part of the resource provisioning process. This makes IT organizations more agile by reducing dependencies, accelerating the provisioning cycle, and increasing efficiency.
In typical IT organizations, where data center tasks are somewhat centralized, a small staff manages compute, storage, and networking resources. Oracle VM Storage Connect makes it possible for these admins to create virtualized disks, assign them to an access group, and resize and clone them, all from the same virtualization management tool, Oracle VM Manager, a critical time-saver.

**Pulling It All Together—Oracle Enterprise Manager**

So what Dave was telling me is that Oracle VM is really on top of the latest virtualization technology. And going one step further, Dave said he’s now managing the entire Oracle VM–based application environment with Oracle Enterprise Manager 12c.

Oracle Enterprise Manager wraps the entire virtualized software stack into a single point of administration (Figure 4), enabling him to easily monitor the complete infrastructure, allocate physical server and storage resources, and automate virtual machine provisioning and patching.

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**Figure 4.** Oracle Enterprise Manager.

Oracle Enterprise Manager 12c leverages its integration with Oracle VM Manager to run the Oracle VM–based infrastructure and offers complete control of the entire software and systems stack—ranging from infrastructure to development platforms, databases, and business applications. It delivers built-in manageability for the entire cloud lifecycle across private and hybrid clouds, so you can deliver on the promise of cloud computing.
Oracle VM Templates and an entire assembly of multitier applications can be published in the software library of Oracle Enterprise Manager for provisioning via a self-service portal. The self-service capability of Oracle Enterprise Manager allows application owners to select, test, and deploy applications on demand and reduces enterprise application deployment time from months and days to hours.

For example, when an application that needs to be deployed requires a guest VM to power on, Oracle Enterprise Manager uses a pool load-balancing algorithm to automatically select—from a pool of healthy, available servers—the physical Oracle VM Server that is used. This, along with performance and resource monitoring offered by Oracle Enterprise Manager, is the kind of automation organizations need.

Finally, Oracle Enterprise Manager’s Chargeback feature gives organizations a mechanism to meter cloud resources and charge internal users based on their consumption. This means that users pay only for the resources they use, allowing them to monitor their usage accurately and efficiently. Chargeback can create charge plans that define metered resources that should be charged for, and it can set their rates. Chargeback has helped Dave’s cloud users understand how their resource usage translates to a cost for services, and it encourages them to control their IT costs by adjusting their usage.

Conclusion

Oracle VM, Oracle Enterprise Manager, and Oracle VM Templates are all available as free downloads from http://www.oracle.com/technetwork/indexes/downloads/index.html. Dave encouraged me to visit the site and also look at the choice of templates that he can now access and deploy.

By the time our dinner was over, I’d had a thorough excursion around Dave’s new admin world. Moving to Oracle VM and Oracle Enterprise Manager certainly changed things for him at work. He was definitely in a very good mood, because he even offered to pay the bill!

For More Information

- Oracle Virtual Assembly Builder: http://www.oracle.com/technetwork/middleware/ovab/overview/index.html
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Hardware and Software, Engineered to Work Together