

ORACLE®

Reduce Costs and Simplify IT with a Converged Infrastructure for Rapid Cloud Deployments

ORACLE WHITE PAPER | AUGUST 2015



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Table of Contents

Executive Summary	1
Factors Driving the Need for Converged Infrastructures	2
Overview of Oracle Private Cloud Appliance	2
Accelerate Deployment and Enhance Agility	3
83 Percent Faster Deployment with Pre-Configured Oracle VM Templates	4
SAP Software Certification	5
Enhanced Agility for Oracle Applications Running on Microsoft Windows	5
Reduce IT Complexity	5
Fully Automated Server Hardware Provisioning	6
Private Cloud Appliance Controller Software	6
Integrated Storage	6
Simplified Updates with Integrated Patches	6
Single Point of Contact for Support	7
Jumpstart the Cloud	7
Fully Redundant Rack	7
Fabric Virtualization with Oracle Virtual Networking	7
Cloud Management	8
Improve Total Cost of Ownership (TCO)	8
Investment Protection for Existing Applications and Tools	8
Lower Software Licensing Costs	9
Free Downloads of Oracle VM Templates for Oracle Applications	9
Analyze the Savings with Oracle VM TCO Calculator	9
Case Study — BT in Spain Reduces Capital Expenditures by 50 Percent and Enables Clients to Deploy Oracle Solutions Up to 7x Faster	10
Conclusion	10
Learn More	10



Executive Summary

The computer industry is going through a significant shift in response to IT constraints around time and budget. Oracle has been a pioneer in engineered systems and converged infrastructure solutions that address these issues by simplifying IT and driving greater efficiency for IT operations. Oracle's converged infrastructure offering, Oracle Private Cloud Appliance (formerly named Virtual Compute Appliance), was ranked as one of the ten coolest servers of 2014 by CRN.¹ It combines the performance of Oracle's integrated hardware and software stack with software-defined networking and powerful virtualization technologies, resulting in a core infrastructure that radically simplifies the way organizations install, deploy, and manage IT systems.


Fully engineered, factory tested, and pre-configured, the Private Cloud Appliance is delivered ready to provision and run any Linux, Oracle Solaris, or Microsoft Windows application. The appliance recently received SAP certification, enabling multiple SAP landscapes such as development, test, and production to be cost-effectively consolidated and migrated into a virtualized infrastructure.

New application services can be deployed rapidly with pre-configured Oracle VM Templates, enabling entire applications such as Oracle E-Business Suite to be provisioned up to 83 percent faster than with a traditional approach. This increases productivity and results in faster ROI.

Another key benefit of the Private Cloud Appliance is reduced IT complexity. A single patch bundle for the entire appliance allows the appliance to be maintained as a single system rather than as many individual servers or individual VMs. In addition, the combination of software-defined networking and automatic discovery of compute resources dramatically simplifies system expansion and adaptability for growing business needs.

The appliance also includes Oracle virtualization technologies at no extra cost, enabling savings of up to 14x compared to VMware vSphere. (See section titled, "Improve Total Cost of Ownership (TCO)".) Oracle's virtualization technologies include trusted partitioning, a unique feature that helps decrease software licensing costs by controlling CPU usage in a way that allows software licenses to be based on the number of CPU cores in a VM instead of total CPU cores in the complete system.

¹ "The 10 Coolest Servers Of 2014 (So Far)," by Joseph F. Kovar, July 15, 2014. <http://www.crn.com/slideshows/storage/300073418/the-10-coolest-servers-of-2014-so-far.htm/pgno/0/7>. (Product referred to by its former name, Oracle Virtual Compute Appliance.)



Lastly, the entire infrastructure is built for the cloud using cloud technologies that are integrated into Oracle's complete hardware and software stack. Hosting companies such as Tier1 and Secure-24 use the Private Cloud Appliance as an infrastructure to deliver cloud services to their customers.

Factors Driving the Need for Converged Infrastructures

Faced with the growing cost and complexity of traditional IT deployments, many IT organizations are looking for new ways to accelerate deployment and easily manage their IT infrastructure to save costs and increase agility.

It's common for a high percentage of data center resources to be spent on non-revenue generating operating expenses (OPEX) and maintenance rather than on innovation. This constrains resources within the IT organization and makes it hard to meet end user expectations for timely deployment of applications and services. In addition, user demand is becoming more variable and unpredictable with today's web-based services. This is partly because more users are external to the organization. Addressing these demand fluctuations requires a highly flexible IT infrastructure in which IT resources can be quickly provisioned and easily reallocated. Yet this degree of flexibility is rare because many IT organizations have not fully modernized their infrastructure to support cloud services.

Another challenge with traditional IT infrastructures is the complexity of integrating hundreds or thousands of servers, networks, and storage systems. There can be hundreds of physical connections in a single server rack. Making a change to this environment is not a simple task even if the need is to simply relocate system resources or upgrade some of the components.

Converged infrastructure systems are the response to these challenges. They can help simplify IT so that a flexible pool of resources can be quickly deployed and put to immediate use — without having to set up, wire, and configure each and every component before even provisioning the first application.

Overview of Oracle Private Cloud Appliance

Oracle Private Cloud Appliance is an easy-to-acquire, easy-to-deploy converged infrastructure system that integrates compute, network, and storage resources into a software-defined fabric that enables agile and efficient data center deployments. Virtually any application, whether running on Linux, Oracle Solaris, or Microsoft Windows, can be quickly deployed in this flexible infrastructure. Using Oracle VM Templates, a full application environment along with a tested patch bundle straight from Oracle can be deployed and in operation in a few hours.

Oracle Private Cloud Appliance X5-2

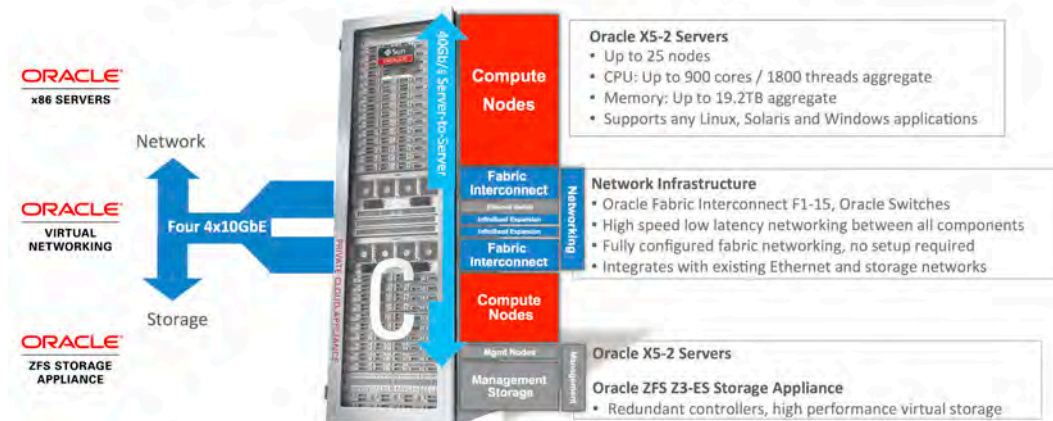


Figure 1. Oracle Private Cloud Appliance

The Private Cloud Appliance greatly reduces operational complexity by providing a “wire-once” system in which I/O paths can be dynamically restructured using software-defined networks — without touching the physical cables. The embedded Oracle Private Cloud Appliance controller software automates the installation, configuration, and management of all the infrastructure components, enabling many administrative tasks to be accomplished at the push of a button.

The system scales linearly from two to twenty-five compute nodes for a total of up to 900 processor cores and 19.2TB of memory. This provides a large pool of resources for consolidating applications with scalable performance. To allocate system resources, administrators need only to enter basic configuration parameters and then create virtual machines (VMs) with the appropriate system resources. Leveraging Oracle VM Templates and assemblies is an even faster way to get a full application up and running.

Adding new server resources to the Private Cloud Appliance is also easy. The system automatically discovers, installs, and configures new servers when they are plugged into the rack. And, the system is designed to fit into existing data centers with support for all the major x86 operating systems as guest operating systems. Included within the appliance is an Oracle ZFS Storage Appliance for internal storage and any Oracle or third party storage system that supports Fibre Channel, NFS, or iSCSI protocols can be connected to the appliance as external storage.

Accelerate Deployment and Enhance Agility

The Private Cloud Appliance is specifically designed for rapid application and cloud deployment. It offers the flexibility of a general-purpose machine while also providing the elasticity and agility of cloud computing. When the Private Cloud Appliance is delivered to a customer site, deployment involves simply wheeling the rack into place, connecting the power and network, and augmenting the existing storage area network (SAN).

The preloaded appliance controller software automatically discovers, installs, and configures all of the compute servers and the network and storage components in the rack. Administrators can then immediately create virtual machines either manually, or by leveraging Oracle VM Templates and assemblies. This automated process not only saves hundreds of hours of installation and configuration time but also eliminates the risk of hardware and software configuration errors.

While virtually any application can be deployed quickly on the appliance, it is especially well suited for deploying Oracle Applications because the entire Oracle stack from applications to disk has been designed and tested to work together. In addition, there are pre-configured Oracle VM Templates for many Oracle software components, which enables extremely rapid deployment and reduces the risk of configuration errors.

“With Oracle Private Cloud Appliance, we are able to deploy the whole environment about 50 to 60 percent faster.”
— Ajay Arora, Senior Director of Enterprise Architecture, Centroid

83 Percent Faster Deployment with Pre-Configured Oracle VM Templates

Oracle VM Templates and assemblies utilize included Oracle VM server virtualization technology to provide ready-to-run application profiles that can be provisioned in minutes. Because Oracle VM server virtualization supports a variety of guest operating systems such as Oracle Linux, Oracle Solaris, and Microsoft Windows, Oracle VM Templates can be built for almost any application. With support for up to 128 vCPUs per guest VM, the applications running in the Private Cloud Appliance are also highly scalable.

The graphical interface in Oracle VM server makes it fast and easy to set up a new VM. Oracle VM Templates and assemblies offer pre-configured packages for applications, middleware, and databases on ready-to-run VMs that can be dynamically configured as they are deployed. Oracle testing has shown that deployment time can be as much as 83 percent faster than with a traditional installation process. Sophisticated applications such as Oracle Database or Oracle Real Application Clusters (Oracle RAC) can be deployed in minutes — up to 10x faster than deploying multiple tiers using a traditional process.

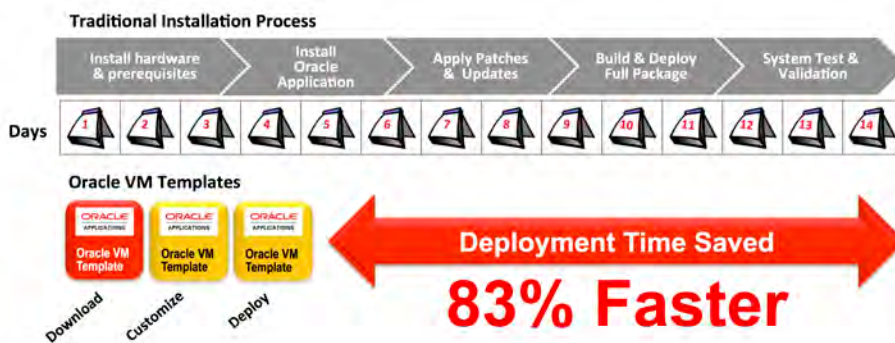


Figure 2. Oracle VM Templates and assemblies enable applications to be deployed up to 83 percent faster.

There are more than a hundred pre-configured templates that can be downloaded from www.oracle.com free of charge.² This includes full application assemblies of multi-tier deployments for all the major Oracle Applications solutions.

Examples of pre-tested assemblies available for free download include:

- » Oracle Database
- » Oracle Fusion Middleware
- » Oracle E-Business Suite
- » JD Edwards

² Software licenses for the applications included in the pre-configured templates must be purchased separately.

- » Siebel CRM
- » Peoplesoft

The use of virtualized templates and assemblies for applications such as Oracle E-Business Suite not only accelerates deployment but also reduces risk because the assemblies contain pre-tested configurations that are known to work and to comply with common security guidelines.

SAP Software Certification

The Private Cloud Appliance can accelerate and simplify deployment of SAP software by eliminating the need for hardware setup and configuration and by making consolidation easy. The appliance enables multiple SAP landscapes such as development, test, and production to be consolidated in the same virtualized infrastructure where they can be managed more easily and cost-effectively. Designed specifically for virtualized application environments, the Private Cloud Appliance also offers extreme flexibility for adapting the SAP software environment to meet changing business needs over time. Whether running SAP software in a cloud or in-house IT environment, the Private Cloud Appliance can help save time and reduce costs.

All SAP products based on SAP NetWeaver 7.x and available on Oracle Linux 5, Oracle Linux 6, Oracle Solaris 10 or Oracle Solaris 11 have been certified for use on the Oracle Private Cloud Appliance. Both Three-Tier and Two-Tier installations (Oracle Database and SAP applications) are supported to run on the Private Cloud Appliance. For further information about the SAP certification, including conditions and restrictions, see SAP Note 2052912, which is available on the SAP support portal at support.sap.com/notes.

Enhanced Agility for Oracle Applications Running on Microsoft Windows

Oracle VM Templates now also support deploying Oracle Applications on Microsoft Windows. Entire multi-tier applications such as Oracle E-Business Suite can be now be deployed at reduced time and cost on Microsoft Windows as well as on Oracle Solaris and Oracle Linux.

A single tested patch bundle simplifies deployment of virtualized environments running Microsoft Windows while providing a proven virtualized architecture that reduces risk, improves security, and accelerates implementation. Oracle Private Cloud Appliance supports deployment of Microsoft Windows versions of Oracle VM Templates and simplifies cloud deployment by enabling multiple Microsoft workloads to run on a single system and by offering improved management efficiency using Oracle Enterprise Manager 12c to manage the application infrastructure.

Reduce IT Complexity

Oracle Private Cloud Appliance is built from innovative Oracle products that have been proven and tested in enterprise deployments throughout the world over multiple product generations. The entire stack has been optimized to work together, enabling IT organizations to avoid the snags that often occur in getting a multi-vendor environment up and running. The appliance simplifies complex data center deployments with its wire-once solution and software-defined network configurations that can reduce infrastructure complexity by up to 70%.

Whereas traditional IT environments can require days for provisioning a new server and deploying an application on it, the Private Cloud Appliance enables new IT services to be provisioned in minutes. Furthermore, the entire virtualized infrastructure can be managed as a single system. Management and provisioning are simplified through fully automated server hardware provisioning, GUI-based controller software, and one-step updates with integrated patches.

“With technology already engineered and integrated together, Oracle Private Cloud Appliance allows us to enable our clients to spend more time adding value to their company and less time managing the day-to-day issues that come with supporting their own Oracle environment.”

— Edward Eichler, Chief Operating Officer, Tier1 Inc.

Fully Automated Server Hardware Provisioning

Automated hardware provisioning saves IT administrators from having to run cabling and manually provision bare-metal systems to get them up and running. To add more compute power to the Private Cloud Appliance, just plug in another Oracle x86 server node. The Private Cloud Appliance controller software will automatically detect the server, provision its I/O connections, and install the appropriate operating system. The new node is then immediately available for deploying VMs and running applications.

Private Cloud Appliance Controller Software

The controller software for the Private Cloud Appliance runs on two redundant management nodes and provides a GUI dashboard for managing and monitoring all of the hardware systems in the appliance. The controller software enables administrators to perform software upgrades and monitor utilization of all system resources in real-time. It provides visibility across all compute nodes in the appliance and all virtualized server, storage, and network resources. Administrators also use the controller GUI to create new virtual resources, or to deploy Oracle VM Templates or assemblies.

Integrated Storage

An integrated storage subsystem provides centralized data storage for VMs as well as data needed for the management environment. It uses a network attached storage (NAS) platform, the Oracle ZFS Storage ZS3-ES. This storage subsystem is built using Oracle's enterprise-class storage products and technology and is designed to be fully redundant for maximum fault tolerance and serviceability in production. The Oracle Private Cloud Appliance storage subsystem is loaded with high-performance DIMM and flash memory for optimal read/write performance under the most demanding file storage workloads.

Simplified Updates with Integrated Patches

Before the advent of converged infrastructure solutions, data center managers had to contend with thousands of servers and even more VMs to be maintained and patched. Oracle Private Cloud Appliance is maintained and patched as a single system rather than many individual servers or many individual VMs.

A single patch incorporates updates for the server firmware, OS, networking, virtualization, and storage components so that components do not need to be patched separately. The entire system can be upgraded at once, making it easy to service. An upgrade patch is downloaded as a single ISO image that can be applied in hours. Not only does this save time but also ensures that the entire system is updated with consistent and compatible patches from firmware to applications.

The automated patching process applies patches to each server and management node as well as to the integrated Oracle ZFS Storage Appliance. Redundant servers enable the system to continue operating during the patch process. The redundant management nodes are patched in sequence so that the master node is always running. First, the secondary node is patched and then the master management node is rebooted while the updated secondary management node assumes the master role. The original master management node is then also updated and becomes the backup management node.



Single Point of Contact for Support

Another big benefit of the single vendor converged infrastructure solution from Oracle is the single point of contact for support. One phone call to Oracle connects the caller to support for the entire hardware and software stack, including Oracle Applications, Oracle Database, Oracle Fusion Middleware, Oracle Solaris, Oracle Linux, and the server and storage hardware. This translates to reduced risk for the business and can help streamline IT operations by eliminating the need to trace issues to a specific system before calling for support.

Jumpstart the Cloud

The Private Cloud Appliance can help IT organizations hit the ground running with an infrastructure that is already designed and configured for the cloud. In addition to a hardware and software stack that is engineered for cloud services, the system includes many enterprise availability and virtualization technologies that provide the foundation for agility and reliable delivery of cloud services.

All of the cloud features described in the following subsections help increase agility and availability. IT organizations can use these cloud technologies to deploy applications faster and spend less time configuring and optimizing the infrastructure to adapt to the workload requirements. Valuable IT resources are thus freed up to focus on innovation and respond to new business opportunities.

Fully Redundant Rack

The Private Cloud Appliance includes a fully redundant rack with up to twenty-five compute nodes, redundant power supplies, redundant I/O connections, and two management nodes that are configured for high availability with automatic failover. The failover process enables the management node's controller software to continue operating seamlessly so that applications don't even notice the failover. Network virtualization services can automatically failover as well when deployed across redundant management servers. To create high availability for applications, the applications can be deployed across multiple compute nodes on the Private Cloud Appliance. Application availability will then depend on the application architecture and how its software components are deployed.


For redundant I/O connections, the fabric interconnect contains multiple redundant QDR InfiniBand switches and multiple redundant Oracle Fabric Interconnect systems that serve as gateways to the data center's Ethernet network. These physical network components are overlaid with a virtual network infrastructure that can also allow for multiple virtual I/O ports to connect an application's software components.

The integrated ZFS Storage Appliance also contains redundant storage controllers and RAID arrays to offer fault tolerance for the internal storage subsystem.

Fabric Virtualization with Oracle Virtual Networking

Traditional data center networks are rigid and hierarchical because server, storage, and network connectivity is constrained by the network's physical cabling and switch topology. Oracle Virtual Networking employs virtualization to simplify the infrastructure and make it more agile. This software-defined networking (SDN) capability is used within the Private Cloud Appliance to create a factory-configured cloud infrastructure that is very cost-effective to manage. The time to provision new applications decreases from days to minutes.

With Oracle Virtual Networking, all traffic types, including Ethernet and Fibre Channel, traverse a converged infrastructure, resulting in a simpler, more efficient, wire-once environment with flexible connectivity. Physical cabling between servers, storage, and management nodes as well as to the external Ethernet is factory-installed by Oracle.



Oracle Virtual Networking is interoperable with leading server, storage, and networking products and is supported on all major hypervisors and operating systems. Administrators can use virtualization tools such as Oracle VM Server to provision I/O and networking for guest domains using vNICs and vHBAs because the virtualization tools recognize the vNICs and vHBAs as physical resources.

Cloud Management

Oracle also offers a complete cloud lifecycle management solution with Oracle Enterprise Manager 12c, which enables administrators to quickly set up, manage, and support enterprise clouds as well as traditional IT environments. Oracle Enterprise Manager 12c provides complete control of the cloud lifecycle — from planning, building, and deployment, to management, monitoring, and optimization. By adding Oracle Enterprise Manager 12c to the Private Cloud Appliance, IT teams can quickly build and manage a private cloud within the data center.

In addition to providing a single integrated view of the entire cloud infrastructure, administrators can use Oracle Enterprise Manager 12c to provision and manage the detailed hardware and software components of the Private Cloud Appliance from a single pane of glass. This means there is no need to switch back and forth between tools to monitor and manage the environment.

Oracle Enterprise Manager 12c also supports a number of key features that can help IT organizations gain the full benefit of cloud computing. It provides all of the tools needed to quickly build a self-service interface so that users can provision their own instances of pre-configured IT services. It also offers fine-grained metering of database and application usage as well as charge-back and show-back reporting and billing, making it easy to assign costs to end users. Administrators can create pre-defined categories of VMs that can be deployed in the cloud infrastructure as well as rules for VM deployment. These features make it possible for IT organizations or cloud providers to deliver cloud service models such as Infrastructure as a Service (IaaS) or Database as a Service (DBaaS).

Consider an example where an IT organization wants to offer a small, medium, and large version of a database service to its community of users. For each configuration, the appropriate amount of memory, CPU resources, and disk capacity would be pre-configured in a virtual machine that runs an instance of Oracle Database 12c. The pre-configured VMs could also be saved as Oracle VM Templates for even faster provisioning. The administrator might also create restraints on which types of users (based on user roles) could deploy each VM type. For a database service, it may make sense to require a database administrator (DBA) role for deploying the database VMs. Business rules for chargeback can also be customized based on number of users, total usage time, storage space, or other chargeback parameters.

Improve Total Cost of Ownership (TCO)

By protecting investments in existing applications and tools and by reducing software licensing costs with no cost virtualization and trusted partitioning, Oracle Private Cloud Appliance enables lower TCO and thus a better return on investment.

Investment Protection for Existing Applications and Tools

The Private Cloud Appliance helps protect investments in existing applications and management tools by providing support for all of the major x86 operating systems, including Oracle Solaris, Oracle Linux, Red Hat Enterprise Linux, SUSE Linux Enterprise Server, and Microsoft Windows Server. By default, all Oracle software that has been certified for use with Oracle VM is also certified for Oracle Private Cloud Appliance. This includes Oracle Database, Oracle Fusion Middleware, Oracle Applications, and Oracle Real Application Clusters.

Lower Software Licensing Costs

The Private Cloud Appliance helps reduce software licensing costs by providing built-in virtualization software at no extra cost. In addition, trusted partitioning in the appliance helps reduce software license costs for applications by controlling CPU usage in a way that allows software license costs to be based on the number of CPU cores in the VM rather than on the number of cores in the complete system. Oracle recognizes the virtualized CPU boundaries in the Private Cloud Appliance as “Hard Partitions” and thus software license costs can be reduced for Oracle Applications running in a Solaris Zone or in a domain established by Oracle VM Server. This allows new IT services to get started with minimal software license fees based on just a few processor cores in a small VM. As the IT service grows, CPU resources can then be added and scaled linearly all the way up to the full 25 compute nodes available in the Private Cloud Appliance.

Free Downloads of Oracle VM Templates for Oracle Applications

Pre configured Oracle VM Templates for many Oracle software products are available for download at no extra cost. (See www.oracle.com/technetwork/server-storage/vm/templates-101937.html.) A fully configured software stack for key Oracle products such as Oracle Linux, Oracle Database, Oracle Fusion Middleware, and Oracle E-Business Suite can be downloaded and installed at no charge beyond the standard software license costs.

Analyze the Savings with Oracle VM TCO Calculator

To see how the Private Cloud Appliance can save money using Oracle VM application-driven virtualization, use Oracle’s online cost calculator at www.oracle.com/us/media/calculator/vm/vm-home-2132015.html.

Figure 3 shows a savings of approximately one million dollars or 14x lower costs when running Oracle VM with Oracle Linux versus VMware vSphere with Red Hat Enterprise Linux. The analysis is based on a system with 25 servers and 50 processor cores, which is the maximum capacity of the Private Cloud Appliance.

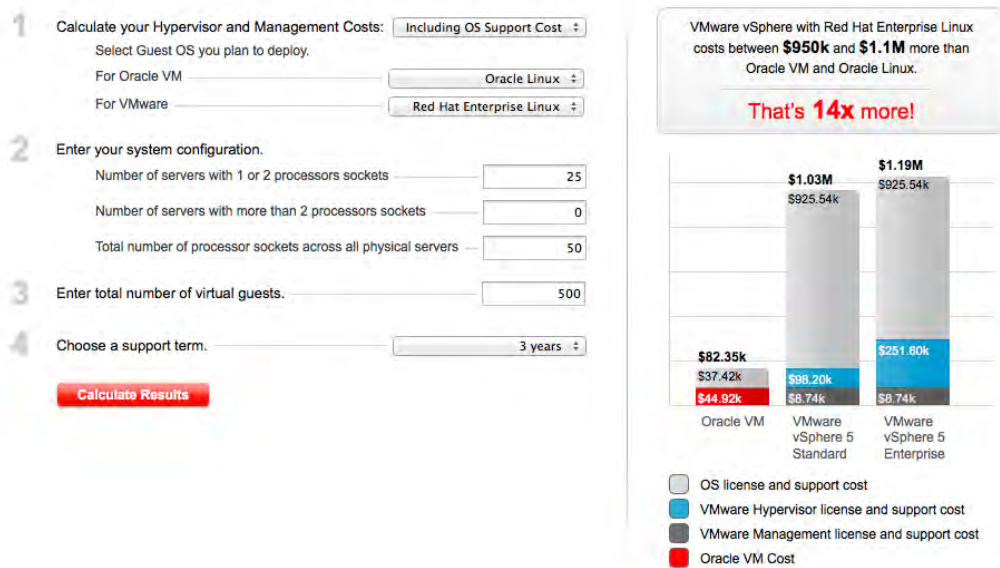


Figure 3. Sample results with Oracle VM TCO calculator.

Case Study — BT in Spain Reduces Capital Expenditures by 50 Percent and Enables Clients to Deploy Oracle Solutions Up to 7x Faster

To provide customers with Oracle Cloud applications and other infrastructure-as-a-service solutions, the Spanish subsidiary of BT Global Services, BT in Spain, deployed Oracle Private Cloud Appliance in its main data center located in Madrid.

BT in Spain's platform enables the company's clients to deploy Oracle solutions up to 7x faster than with any other platform, with no configuration errors, and it optimizes operating costs. The Oracle converged infrastructure solution has also enabled BT in Spain to reduce capital expenditures by 50 percent and instantly respond to existing and new customer requests. The ability to design and deploy tailor-made databases faster and more efficiently gives BT in Spain an undeniable edge in the crowded cloud-hosting market.

"Time-to-application with Oracle Private Cloud Appliance was remarkable. In a matter of minutes, not days or weeks, we were operational and in a position to instantly respond to our customers' needs."

— Raul Chico, Head of Business Development, BT in Spain

Conclusion

Oracle Private Cloud Appliance delivers a complete converged infrastructure from a single vendor, with single vendor support. It is comprised of proven hardware and software technologies that can help organizations get their cloud infrastructure up and running almost immediately.

By leveraging Oracle's converged infrastructure offering, IT organizations can get out of the mode of spending considerable time planning their deployment architecture and configuring hardware components from scratch. Instead, the focus can be on delivering flexible cloud services that can meet the rapidly changing needs of today's user communities.

Learn More

For more information about how Oracle Private Cloud Appliance can help accelerate deployments, reduce IT complexity, and provide the foundation for cloud services, call +1.800.ORACLE1 to speak to an Oracle representative or visit the web resources in Table 1 and Table 2.

TABLE 1. WEB RESOURCES FOR ORACLE PRODUCTS

Oracle Private Cloud Appliance	http://oracle.com/pca
Oracle Applications	http://oracle.com/applications/
Oracle Enterprise Manager 12c	http://oracle.com/enterprise-manager
Oracle ZFS Storage Appliance	http://oracle.com/storage/nas
Oracle x86 servers	http://oracle.com/us/products/servers-storage/servers/x86/
Oracle VM Templates	http://oracle.com/technetwork/server-storage/vm/templates-101937.html
Oracle VM TCO Calculator	http://www.oracle.com/us/media/calculator/vm/vm-home-2132015.html



TABLE 2. RELATED WHITE PAPERS, TECHNICAL ARTICLES, AND EBOOKS




IDC White Paper: Oracle Virtual Networking Delivering Fabric Virtualization and Software-Defined Networks	http://go.oracle.com/LP=1301?elqCampaignId=2460
List of supported products for Oracle Virtual Networking	https://wikis.oracle.com/display/SystemsComm/Oracle+Virtual+Networking++Compatibility
Oracle VM – Quantifying The Value of Application-Driven Virtualization (Third party test validation report)	http://www.oracle.com/us/technologies/virtualization/oraclevm-validation-report-final-1741583.pdf



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Integrated Cloud
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August 2015