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The Most Complete and Integrated Virtualization: From Desktop to Datacenter

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Introduction

Information Technology (IT) needs are evolving rapidly as datacenters transform into service centers that deliver applications on demand and respond to changing customer requirements with speed and agility. With users demanding access to applications and services 24x7, service-level agreements have become stringent. In addition, cloud computing is gaining in popularity and taking a foothold in datacenters, reflecting user needs to get services at any time.

Things simply must work together, and happen faster, in order to satisfy an increasing appetite for information and services. Users are less accepting of traditional *build it yourself* philosophies, with many now demanding resources just in time. As a result, there is a need for greater optimization and efficiency in how software and solutions that power datacenters are deployed and managed. These trends are pushing IT departments to find better ways to integrate, provision, deploy, and manage systems at a faster pace without straining already burdened budgets.

Virtualization is a key technology used in datacenters to optimize resources. As IT needs continue to evolve, virtualization can no longer be regarded as an isolated technology to solve a single problem. Many companies started the optimization journey by using server virtualization to consolidate systems and reduce capital expenditure (CAPEX). With IT staff now tasked to deliver on-demand services, datacenter virtualization requirements have gone well beyond simple consolidation and CAPEX reduction.

Indeed, virtualization at the operating system level no longer is sufficient. With users looking for a cloud experience, simply provisioning and delivering an operating environment falls short. IT organizations must rapidly deliver services, such as infrastructure-as-a-service (IaaS), platform-as-a-service (PaaS), and software-as-a-service (SaaS). As a result, virtualization solutions need to mature and facilitate flexibility, agility, and speed in deploying complete application stacks to support the new service-based charter.

The Changing Face of Virtualization

The first wave of virtualization focused on consolidating under-utilized resources to lower energy costs, reduce the datacenter footprint, save on equipment, and build standard operating system images to provision new systems faster. While server virtualization succeeded at standardizing and automating operating system builds, it remained focused on the operating system layer. This strategy worked well for high volume file, print, and Web server consolidation, where high availability and scalability requirements are less stringent. It even led to the efficient provisioning of physical servers through the use of virtual machines — yet lacked integration with applications and other software running in virtual environments.

Keeping Pace with Evolving IT Needs

As IT organizations look to deliver on-demand services, virtualization requirements continue to advance — and companies are realizing that server virtualization is only a partial solution. Without the ability to package complete application environments that can be deployed on demand, IT staff must manually customize solutions in order to deliver services. Today's virtualization solutions need to:

- Evolve beyond simple consolidation
- Support comprehensive application environments that meet stringent high availability and scalability requirements
- Integrate with the applications running in the virtual environment
- Make the entire application stack easier to provision, deploy, manage, and support
- Result in greater IT efficiency, agility, and flexibility

Oracle's Virtualization Strategy

Perhaps the most important technology trend in recent years, virtualization is moving beyond isolated projects in the datacenter and fundamentally changing the nature of IT organizations from technology hosts to service providers for the business. Indeed, virtualization is no longer a goal unto itself — it is now a means for enabling services-based IT. By deploying application-aware virtualization solutions, organizations can speed the delivery of IT services.

Only Oracle offers the industry's most complete and integrated virtualization solutions portfolio that can virtualize and manage the full hardware and software stack. With a focus on integrated management, testing, and support from applications to disk, Oracle's unique approach to virtualization not only helps consolidate IT resources — it enables IT to deliver on-demand services rapidly and efficiently. As organizations virtualize more complex and business-critical workloads to get more speed, agility, and flexibility, Oracle's complete, integrated technology stack can help enterprises derive operational expenditure (OPEX) efficiencies in addition to CAPEX reduction.

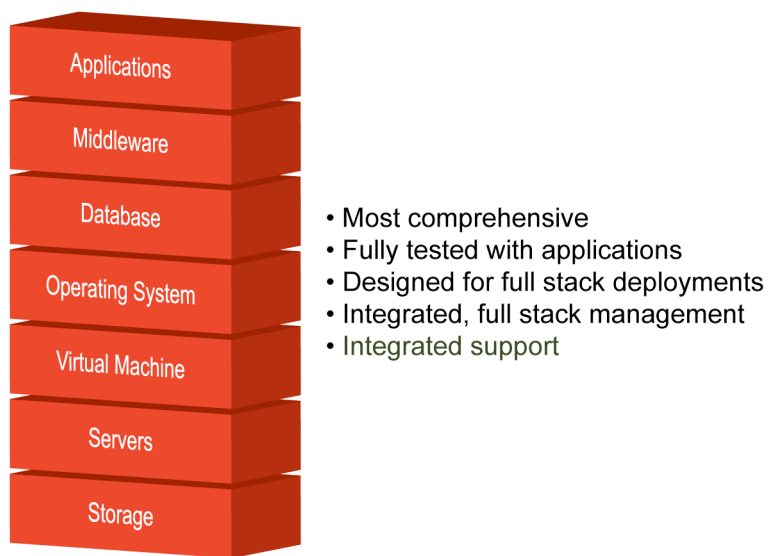


Figure 1. Oracle provides unmatched full stack management for virtualized environments

Oracle's Virtualization Portfolio — From Desktop to Datacenter

With a complete product portfolio that includes applications, middleware, database, operating systems, servers, storage and even thin clients — along with across the stack virtualization and clustering technologies that are optimized to work together — Oracle can help companies realize the true benefits of virtualization and exceed service-level requirements (Figure 2).



Figure 2. Oracle provides the industry's most complete virtualization portfolio

Server Virtualization

Server virtualization technologies help organizations create administrative and resource boundaries between applications. This approach provides improved application performance and security, and also can be a vehicle for rapid application provisioning by delivering pre-installed, pre-configured virtual machine images of enterprise software. Because no two environments have exactly the same needs, Oracle's full range of server virtualization technologies provide varying degrees of isolation, resource granularity, and flexibility, and can be used separately or together to tackle specific deployment challenges. Delivering operating system virtualization, virtual machines, and hard partitioning technologies, Oracle's server virtualization solutions can help companies to consolidate applications onto fewer systems to affect better resource utilization, reduce the number of operating system instances to manage, improve security, lower licensing costs, and reduce the time to install and configure software, thereby speeding time to market.

For example, companies can take advantage of Oracle VM Server for x86, Oracle VM Server for SPARC, and Oracle Solaris Containers to create virtual server environments that can run a wide range of operating systems and take advantage of the latest platform advancements without changing applications, thereby protecting investments. In environments needing bare-metal performance and availability, Dynamic Domains can be used to divide a single system into multiple electrically isolated

partitions for the ultimate in workload isolation. When rapid software deployment is a key concern, organizations can use the pre-installed and pre-configured software images available in Oracle VM Templates to shorten time to market, eliminate installation and configuration costs, and reduce ongoing maintenance and operational costs.

Desktop Virtualization

Workplace flexibility is an ally in the move to reduce expenses. However, giving users the ability to move from place to place without losing the functionality of traditional fixed asset environments poses a host of desktop management and security challenges. To help this effort, Oracle provides a set of integrated client- and server-based desktop virtualization solutions that transcend the limitations of conventional desktop computing to deliver secure, anytime, anywhere access from any device.

Oracle Virtual Desktop Infrastructure provides a complete solution for managing, hosting, and providing access to virtualized Microsoft Windows, Oracle Linux, or Oracle Solaris desktops hosted in the datacenter. Users can access the same complete desktop environment from many different client devices and locations, enabling disaster recovery, remote office and work from home, and green computing through the use of low-power thin-client devices such as Oracle's Sun Ray Clients. When secure access to server-hosted Windows, UNIX®, mainframe, and midrange applications is needed—such as when deploying Siebel or Hyperion client software to end users—Oracle Secure Global Desktop Software can provide access to applications hosted on these disparate platforms on a single PC. For users needing to run multiple independent operating systems on their desktop PC or laptop, Oracle VM VirtualBox enables high-performance virtual machines that can run dozens of operating systems on standards Windows, Mac OS X, Oracle Solaris, Oracle Linux, and other Linux PCs.

Storage Virtualization

As data volumes continue to rise, datacenter managers must cope with expanding storage infrastructure and provide around-the-clock access to data that is stored on reliable and secure media in order to support demand. Oracle's storage virtualization technologies can help organizations eliminate redundant data, reduce bandwidth requirements, gain flexibility, and better utilize existing infrastructure to reduce space, power, and cooling requirements. A broad range of storage virtualization solutions — including integrated storage virtualization capabilities in Oracle Solaris 10, Oracle Sun Unified Storage systems, Oracle Exadata Storage Servers, virtual tape solutions, Oracle Automatic Storage Management, and the upcoming Oracle VM Storage Connect Framework — can help companies achieve optimal performance, simplify storage provisioning and management, and reduce the risk of data loss and downtime.

Integrated Solutions

Oracle delivers much more than pure virtualization technologies such as hypervisors. Oracle products leverage virtualization technology at every layer of the Oracle stack. For example, Oracle WebLogic Suite Virtualization Option and Oracle Virtual Assembly Builder, both running on Oracle VM server virtualization, are designed to dramatically speed and simplify application deployment—including in

cloud computing environments. Designed to run directly on Oracle VM without an operating system, Oracle WebLogic Server Virtual Edition significantly improves the performance of Java™ technology-based applications. Oracle Virtual Assembly Builder enables IT administrators to quickly create, configure, and provision *assemblies* of applications that can be repurposed and quickly configured to provision entire multitier application topologies onto virtualized and cloud resources, saving administrators time and reducing the likelihood of costly configuration errors.

Once applications are deployed, the integrated Oracle Enterprise Manager tool lets administrators manage entire virtual environments — from applications to operating systems and virtual machines — with a single solution that can be enhanced with integrated, in-depth health and performance monitoring, configuration management, and life cycle automation for maximum efficiency.

Enable IT as a Service Provider

If anything remains a constant in the datacenter, it is consistent growth and change. As IT organizations move from simply hosting applications to delivering services, they must find ways to handle increasing numbers of users and services, and more challenging workloads — and do it all while keeping costs in check. Oracle's comprehensive virtualization solutions are designed to help IT make this transition. With technologies that make it easier to deliver more applications and services faster to a wider audience that can be anywhere in the world, Oracle virtualization solutions deliver on the promise of making IT a more effective service provider.

Accelerate Application and Infrastructure Provisioning and Deployment

Purchasing, configuring, provisioning, and deploying systems and services can be a time-consuming task. Enterprise software often contains numerous components or modules, each of which may need to be installed and configured separately—with its own dependencies on patches, operating system versions, or other packages. Learning how to install products and researching needed patches can be a lengthy process. Furthermore, application complexity can result in the risk of something being overlooked or done incorrectly. The entire process often is viewed as a cost burden that reduces project ROI by lengthening the time it takes to get an application or service up and running reliably.

Oracle's virtualization technologies can be used to simplify deployment. Using Oracle VM Templates, companies can rapidly and easily deploy one or more pre-built, pre-configured, pre-patched virtual environments and their application stacks. Oracle VM Templates contain a complete Oracle software solution, such as Siebel CRM or Oracle Database, including the operating system. Within these templates, Oracle software is laid out in the same manner as the software would be if it were installed and patched using traditional methods. Administrators simply download the template file from the edelivery.oracle.com site, decompress it, and import the resulting template into Oracle VM Manager to create virtual machines (Figure 3). Enterprises can even create their own templates with Oracle VM Template Builder to speed the replication and deployment of entire enterprise software stacks.

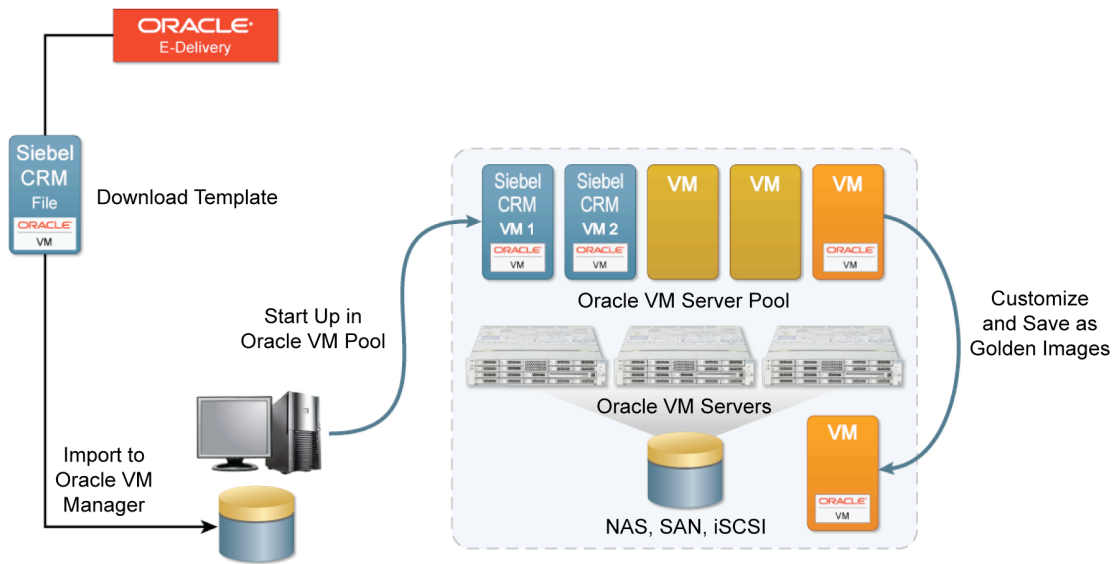


Figure 3. Oracle VM Templates can be used to replicate entire enterprise application stacks to virtual environments

Oracle and IBM performed tests using Oracle VM to virtualize Oracle E-Business Suite and JD Edwards, and found the following performance characteristics¹.

Oracle VM with Oracle E-Business Suite R12

- Batch and online workloads on Oracle VM and standalone
- Response time and duration of runs were essentially the same
- Observed only 2% to 3% overhead with Oracle VM

JD Edwards 9.0 Day in the Life Benchmark with Oracle VM

One of the many advantages to installing JD Edwards EnterpriseOne via Oracle VM and pre-defined templates is how quickly and easily the systems is up and running. The complete lab environment was functional in less than two days. Test results were as follows.

- Scaled successfully to 1,000 users with sub-second response time
- Three virtual machines: database applications, and Web
- Observed as low as 2% overhead with Oracle VM

¹ Source: <http://www.ibm.com/support/techdocs/atmastr.nsf/WebIndex/WP101597> and <http://www.ibm.com/support/techdocs/atmastr.nsf/WebIndex/WP101520>.

Gain Greater Security and Access with Virtual Desktops

Desktop systems are critical to maximizing user productivity. Yet assigning one desktop system per user can place administrators in the difficult position of managing hundreds or even thousands of individual systems. In addition, many engineering and technical organizations need to supply multiple desktop environments per user, further exacerbating the problem. Complicating the situation is the desire for workplace flexibility. However, giving users the ability to move from place to place with appropriate data security without losing the functionality of traditional fixed asset environments poses a host of desktop management and security challenges. With users demanding the ability to access IT resources from any kind of traditional system or laptop or newer handheld device, managing desktops is fast becoming a burden.

Effectively managing a sprawling and evolving desktop community can be extremely challenging. Oracle's desktop virtualization solutions transcend the limitations of conventional desktop computing to deliver secure, anytime, anywhere access to IT resources from nearly any device. Providing varying capabilities, Oracle's desktop virtualization technologies can be used separately or together to affect better resource utilization and increase management efficiency. These technologies can help companies increase flexibility, take better advantage of client device independence, create true mobility for workers, streamline management tasks, and optimize security.

- **Deliver anytime, anywhere access from nearly any device.** Oracle's desktop virtualization solutions reduce server, client, platform, network, and application software dependencies, helping IT managers to provide more services—including outsourced desktop services—to users regardless of client system characteristics. Eliminating the constraints so often placed on users, Oracle's solutions let users run virtually any application on nearly any device at any time. Companies can publish Microsoft Windows, Oracle Linux, Oracle Solaris, other UNIX® based operating systems, midrange, or mainframe applications to network-attached clients with access to wired or wireless LANs or WANs.
- **Simplify configuration and administration** Oracle's desktop virtualization solutions only require administrators to install and maintain a single instance of an application on a server or virtual desktop image. Each application is made available securely to all qualified users over the network, eliminating the need to install and maintain individual applications on every client device and increasing administrator productivity.
- **Gain secure, centralized management.** While Oracle's desktop virtualization solutions give users unprecedented freedom in how and when they access enterprise IT services, managers retain full and centralized control over who has what kind of access to specific resources and information. This level of management includes a wealth of data security features that help maintain data integrity and reduce administrative overhead even as enterprise computing becomes much more flexible.

Take Advantage of Integrated Management

Managing a virtual environment containing point products from multiple vendors can be challenging. Oracle's virtualization solutions and integrated management facilities change the equation. Indeed, Oracle is the only vendor in the marketplace today with combined management capabilities that span

applications and supporting infrastructure for physical, virtual, and private cloud computing environments. Now companies can take advantage of a unique applications-to-disk approach to physical and virtual systems management to administer the full stack and gain application environment efficiency while reducing complexity.

For example, Oracle Enterprise Manager provides a single integrated console that administrators can use to monitor, manage, provision, and patch the entire Oracle software stack—whether it resides on a physical or virtual system, in a local or remote datacenter, or in a private cloud. Monitoring, management, and life cycle management capabilities for Oracle solutions and a wide variety of third-party technologies are available to help simplify administration across the enterprise. In fact, Oracle Enterprise Manager integrates with many other event management systems and help desk applications to ease datacenter integration and management.

Enable Private Clouds

An important staple in every datacenter, virtualization makes it possible to consolidate systems and services efficiently. Now virtualization is expanding and combining with intelligent management techniques to foster the distribution and automation of the entire hardware and software stack. The next step—private cloud computing—makes that efficient technology architecture available to users through a self-service interface that boasts a rich service catalog and flexible pricing. Indeed, cloud computing is a natural evolution for IT organizations. With a self-service, scale-out, pay-as-you-go premise, cloud computing offers an ideal platform on which applications can expand, contract, and adapt to business and workload requirements more quickly and easily than ever before.

While private cloud computing is not necessary or useful for every application or service, it can simplify and speed the acquisition of technology to meet business needs. Wherever service allocation can be standardized and automated, the abstraction created by virtualization and private cloud computing gives IT the power to quickly leverage alternative sourcing based on business priorities. For example, organizations can use the resources of third-party service providers to help meet peak loads, or to handle lower-priority workloads. By building private clouds with Oracle hardware and virtualization solutions, and taking advantage of unique Oracle tools, businesses can experience reduced total cost of ownership, increased flexibility, and greater business agility.

- **Deploy services to the cloud quickly and easily.** Designed to run directly on a virtualized server with no operating system, Oracle WebLogic Server Virtualization Option uses the power of Oracle VM to enable the creation of substantially smaller appliances that run on bare hardware. These appliances—consisting of a computing platform and solution stack—can be integrated into private clouds to provide a service. Companies can deploy highly sophisticated applications quickly, without the cost of purchasing and managing underlying hardware and software platforms. With smaller and more focused application components, these appliances reduce live migration time, simplify administration, and improve security by minimizing opportunities for security breaches.
- **Reuse applications and speed deployment.** Many applications are a composite of different entities distributed across machines. Every time the application is built, developers must recreate the topology—such as the operating system application server, and Web server stack—and add the

modules that are unique to the application. Oracle Assembly Builder simplifies the task by packaging multitenant, distributed applications into an *assembly* that can be used in ways similar to appliances. The assembly contains the images of the constituent appliances, as well as information about how they are to be configured, connected, and initiated. Developers simply add unique application code and deploy the prebuilt assembly in the cloud to make it available to users.

Rest Assured with One-Stop Support

Oracle knows how to best deploy virtualization solutions and optimize investments in Oracle products. Services teams and tools are tightly integrated across Consulting, Development, Support, Education, and Global Delivery. With deep know-how in deploying, managing and optimizing every layer of the hardware and software stack, Oracle Customer Services deliver a single point of contact for the entire applications to disk stack, along with the tools and expert knowledge needed to help companies improve performance, increase availability, and reduce implementation and deployment times.

Oracle's Ongoing Commitment to Virtualization

For decades Oracle has been a thought leader in enterprise software solutions. With the integration of Sun hardware, Oracle offers unique value to customers with hardware and software products that are engineered to work together. Now Oracle provides the most complete virtualization portfolio in the industry that is fully tested and integrated with enterprise applications and the infrastructure. The result is complete, open, and integrated solutions that make it easier to deploy and manage software and get the best performance and reliability possible.

Unlike other vendors that provide virtualization solutions focused solely on the infrastructure layer and consolidation, Oracle takes a unique perspective: focusing on making applications easier to deploy, manage, and support. In fact, Oracle is continuing its commitment to the development of innovative virtualization technology and its integration into the application stack. By taking a holistic approach that addresses all layers of the enterprise datacenter, Oracle virtualization solutions can help companies transform into effective service providers that support business priorities at lower cost.

For More Information

To learn more about Oracle's virtualization technologies, visit the resources listed in Table 1.

TABLE 1. REFERENCES

Oracle's Virtualization Strategy	http://oracle.com/virtualization
Oracle Virtualization Blog	http://blogs.oracle.com/virtualization
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Contributing Authors: Monica Kumar,
Susan Roberts, Chris Kawalek

Oracle Corporation
World Headquarters
500 Oracle Parkway
Redwood Shores, CA 94065
U.S.A.

Worldwide Inquiries:
Phone: +1.650.506.7000
Fax: +1.650.506.7200
oracle.com



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