

WHITE PAPER

VMware® Infrastructure for SAP Enterprise Applications: Use Cases



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Introduction

Virtualization allows you to run multiple applications and operating systems independently on a single server. Administrators can quickly move workloads from one virtual workspace to another - easily prioritizing business needs while maximizing server resources.

For small, medium and large organizations that run SAP applications, across all industries and sectors, VMware® Infrastructure delivers significant benefits:

- Increase operational flexibility and efficiency: Rapid software applications and services deployment, and shortened time to productivity.
- Realize transformative cost savings: Lower TCO with virtualized IT infrastructures that enable effective use of budget resources and help decrease operational costs.
- Minimize risk and enhance IT service levels: Zero-downtime maintenance capabilities and rapid recovery times for high availability and streamlined disaster recovery scenarios across the data center.
- Optimize IT environments: VMware Infrastructure helps optimize and manage the complete enterprise IT server and desktop infrastructure.

By creating a virtual pool of computing resources, users achieve greatly enhanced flexibility in the allocation of computing capacity and are able to consolidate applications and servers. Consolidation eases IT management requirements and expenses, and can help to control computing and datacenter costs.

The collaboration between VMware and SAP provides unique value to our customers. SAP has more than 36,200 customers in 120 countries representing 100,600 SAP installations for more than 12 million users. Customers have asked VMware and SAP to explain how virtualization can play a role within SAP deployments. In this document SAP and VMware answer their request and discuss the benefits of running SAP Enterprise Applications and Business Solutions on VMware Infrastructure. The paper covers use cases that range from server containment to disaster recovery, demonstrating tangible cost reduction, operational efficiency and time-saving benefits.

SAP Platform Overview

Businesses large and small have discovered that the SAP Business Suite is one of the world's most comprehensive family of adaptive business applications, providing best-of-breed functionality built for complete integration, industry-specific functionality, unlimited scalability, and easy collaboration over the Internet.

Individually, SAP Business Suite applications help customers manage their most critical business processes. Collectively, they form a tightly integrated suite that adds value to every facet of customer's business, including their interactions with partners, suppliers and end customers.

The core product from SAP is called SAP ERP. In addition to ERP software, other key SAP product and solution offerings include:

- SAP NetWeaver Business Intelligence Suite (SAP BI)

- Customer Relationship Management (SAP CRM)
- Supply Chain Management (SAP SCM)
- Supplier Relationship Management (SAP SRM)
- Human Resource Management Systems (SAP HRMS)
- Product Life Cycle Management (SAP PLM)
- Exchange Infrastructure (XI)
- Enterprise Portal (EP)
- SAP Knowledge Warehouse (KW)

The SAP Business Suite applications are based on the SAP NetWeaver platform, an application and integration platform. SAP NetWeaver enables rapid but controlled business process change. Through its enterprise services repository, the platform incorporates business functionality in the form of ready-to-use enterprise services and process components. It also provides an integrated platform of composition technologies for orchestrating business processes, composing applications, and deploying innovative solutions.

The SAP Business Suite can reduce total cost of ownership across an IT environment. Organizations that want to respond quickly to changing business requirements can greatly benefit from implementing SAP.

SAP enterprise applications can be deployed in two or three-tier architecture. In terms of software deployment, the three-tier client/server architecture consists of a presentation layer, an application layer, and a database layer. In terms of hardware deployment, these three layers can run separately on different computers or all together on the same computer, depending on the requirements and size of the SAP solution being deployed by each customer. The presentation and application server layers can be distributed over multiple computers. The three-tier architecture scales to support large number of users. The two-tier architecture is usually sufficient for many smaller and midsize companies, as well as for sandbox, development, training and test systems.

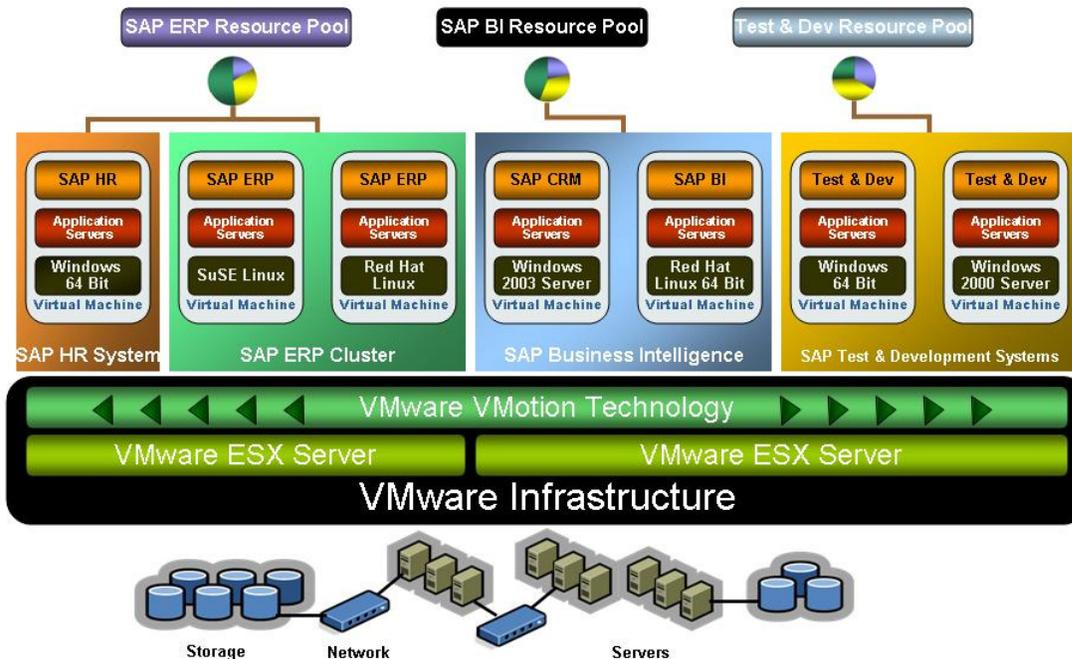
Virtualization with VMware Infrastructure

VMware Infrastructure is the most widely deployed software suite for optimizing and managing industry standard IT environments through virtualization - from the desktop to the datacenter. The only production-ready virtualization software suite, VMware Infrastructure is proven to deliver results at more than 20,000 customers of all sizes, used in a wide variety of environments and applications. The suite is fully optimized, rigorously tested and certified for the widest range of hardware, operating systems and software applications. VMware Infrastructure provides built-in management, resource optimization, application availability and operational automation capabilities that deliver transformative cost savings as well as increased operational efficiency, flexibility and IT service levels.

Solution Architecture

A complete SAP implementation can consist of tens to a hundred servers with different SAP applications running on dedicated servers. Depending on the layer of the application stack and the time of month processing, many SAP environments may have a low server utilization rate. Those with low utilization rates may be worthwhile targets for virtualization with VMware Infrastructure.

Using VMware Infrastructure makes it possible to deploy virtual machines running different operating systems on the same physical server. Figure 1 depicts a sample architecture for SAP Enterprise Applications on VMware Infrastructure, in which several applications can run on the same physical server in virtual machines that contain the SAP application components and the operating system of choice. It is critical to evaluate the usage of the SAP solutions at their collective peak loads to determine which solutions can be deployed on the same physical server. A sizing should be done before deployment to understand the CPU, memory and I/O requirements as well as the characterization of each solution, in order to determine what can be run together.



Server Containment

In traditional SAP deployments, there can be significant server sprawl primarily due to the need to provision separate systems for development (DEV), quality assurance/test (QAS) and production (PRD) environments. Each SAP solution typically has its own system landscape, each containing at minimum a DEV, QAS and PRD environment. SAP

Enterprise environments also can contain multiple layers in the application architecture, including database, application server, and web server layers. In a typical deployment every layer of the environment is hosted on dedicated physical systems that are not fully utilized at all times.

VMware's virtualization technology contains this server sprawl by running SAP application layers in virtual machines consolidated onto fewer, highly scalable and highly reliable enterprise-class servers, resulting in increased server utilization. Almost 66% of SAP implementations are on the Microsoft Windows platform. These implementations have an average application server CPU utilization rate of 15-20%. Prior to deployment of VMware Infrastructure, analysis should be performed to determine which layers in the stack are appropriate for consolidation. For example, database servers may have higher loads at various periods and may need to remain on dedicated resources.

Customer successes with running SAP applications on VMware Infrastructure include hosting companies that can offer a 25-30% price advantage to their customers while providing the same service levels as they did when they used a purely hardware-based infrastructure. Other customers have experienced infrastructure savings of \$2 - \$3 million over 3 years after consolidating and migrating from a proprietary environment to a Windows environment running on VMware infrastructure. In addition, customers using VMware Infrastructure have been able to consolidate multiple virtual machines per physical processor, thereby drastically increasing server utilization and containing server sprawl.

Key benefits:

1. Provide all developers with dedicated and isolated SAP environments containing multiple tiers of the application, consolidated to run on a single physical system.
2. Achieve consolidation and lower total cost of ownership (TCO) by running multiple SAP enterprise applications on the same physical system.
3. Eliminate the need for dedicated hardware and provide for interoperability with multiple operating system and SAP versions running on the same physical machine.
4. Eliminate the need for dedicated test systems with multiple test environments sharing same physical system. (It should be noted that best practices state that the QAS architecture should match closely to that of production. Therefore, careful consideration should be given to the architecture deployed in each environment within a system landscape.)

Rapid Provisioning

VMware Virtualization solutions reduce the time to provision new SAP (development, test or production) application environments. A new deployment typically requires procurement of new hardware, after which the operating system and applications are installed. This process takes up valuable time and IT resources in addition to the need for dedicated hardware with its attendant costs. By using VMware Infrastructure, SAP customers can take advantage of virtual machine libraries and virtual machine templates to provision new pre-configured SAP application environments in minutes on virtualized infrastructure hardware. Customers can also use the VMware® Lab Manager solution to automate the setup, capture, storage and sharing of multi-machine software configurations, streamlining the provisioning of development and test

environments. Development and test teams can access these configurations on demand through a self-service portal. With its shared library and shared pool of virtualized servers, VMware Lab Manager allows efficient sharing of multi-machine configurations across software development and test teams and facilities.

VMware Infrastructure provides for rapid SAP application deployments with sophisticated automation capabilities. Administrators can have centralized control and responsibility for hardware resources, while business units and application owners retain complete control over how resources are utilized.

Key benefits:

1. Rapidly provision new SAP application layers from virtual machine templates.
2. Pass SAP development images directly to testers.
3. Testers pass SAP virtual machine images back to development for problem replication and resolution.
4. Recreate distributed multi-server SAP production environments in a single physical system for test purposes.
5. Reset test images after test completion from templates and virtual machine libraries, cutting down on setup and reset time.
6. Store different SAP applications and versions in virtual machine libraries that can be provisioned instantly.
7. Roll back development and test images by using virtual machine snapshots during problem resolution.
8. Rapidly provision additional SAP application servers during peak loads.
9. Automate the development and test environment software life cycle with VMware Lab Manager.

Change Management

IT departments face two key challenges in change management: patch testing, and testing upgrades for compatibility with standard corporate hardware, operating system and application configurations. IT organizations traditionally need to procure identical hardware and create test beds that mirror the operating system and application configurations of the production environment. The typical SAP landscape has a constant DEV, QAS and PRD setup; although sometimes it is ideal to have additional testing environments. With VMware Infrastructure, IT can clone production, or create a set of virtual machine libraries that mirror production, which can then be used to provision the test environment. The latest patches and upgrades can be tested against these virtual machines running SAP applications, eliminating the need for dedicated hardware to perform these tests. Patches can then be rolled into production with minimal interruption to end users. In case of problems, the virtual machines can be instantly rolled back using the VMware® Snapshot feature.

Key benefits:

1. Achieve faster change management with fewer system resource requirements.
2. Test patches concurrently on multiple configurations (different versions of OS, SAP, Web etc) that are hosted on the same physical system.

3. Instantly roll back SAP virtual machines using Snapshots (during problem resolution).
4. Replicate production to test environment by cloning, perform changes, and convert them into production virtual machines, minimizing downtime.
5. Create a library of standard production configurations to perform change management testing and deployment.
6. Dynamically reassign SAP virtual machines to other systems while performing maintenance or changes on the current physical system, causing minimal disruption to end users.

Data Center Optimization: Distributed Resource Management

A VMware Infrastructure environment provides additional management capabilities that help optimize the infrastructure resources used by SAP and non-SAP applications. SAP provides distributed transaction processing, automated load balancing and replicated service framework that offer high levels of scalability and resource optimization for the application environment.

VMware Infrastructure solutions support these capabilities by addressing resource management across the entire datacenter infrastructure and across multiple distributed SAP application servers. VMware® Distributed Resource Scheduler (DRS) dynamically allocates and balances computing capacity across a collection of hardware resources aggregated into logical resource pools. VMware DRS continuously monitors utilization across resource pools and intelligently allocates available resources among the virtual machines based on pre-defined rules that reflect business needs and changing priorities. When an SAP virtual machine experiences an increased load, VMware DRS automatically allocates additional resources by redistributing virtual machines across the physical servers. VMware DRS optimizes IT environments to align resources with business goals while ensuring flexibility and efficient utilization of hardware resources.

Key benefits:

1. Dynamically reassign development, test and production SAP environments that require additional capacity to the appropriate physical server with the optimal resource capacity. (Note: Consideration should be given to which systems are allowed to move dynamically. For example, a database server should be assigned according to resource requirements and architecture constraints.)
2. Define resource pools, policies and priorities for different developer, test and production SAP environments to efficiently manage resource allocations.
3. Allocate processor and memory resources to virtual machines running on the same physical servers and prioritize access to those resources across virtual machines.
4. Optimize SAP application deployment across a virtualized enterprise data center by providing reserved resource pools with pre-defined minimum and maximum resource requirements.
5. Assure IT autonomy and service levels to applications and business organizations.
6. Automate physical server maintenance by dynamically relocating SAP virtual machines with minimal disruption to end users.

7. Optimize the service level of distributed applications by controlling the aggregate allocation of resources for the entire set of virtual machines running the distributed SAP and non-SAP application environments.

High Availability: Business Continuity and Disaster Recovery

VMware virtualization works alongside SAP to deliver enhanced infrastructure and application high availability for critical business functions. Using VMware Infrastructure, customers can implement a unified disaster recovery (DR) platform that allows many production SAP virtual machine servers to be recovered in the event of failure without investing in an exact replica of the production hardware. VMware infrastructure capabilities such as VMware® VMotion™, VMware® High Availability (HA) and VMware® Consolidated Backup deliver enhanced levels of availability to virtualized SAP environments.

While SAP provides automated load balancing, distributed transaction processing and application failover to ensure continuous service availability and transaction integrity, VMware VMotion enables the live migration of running SAP virtual machines from one physical server to another with minimal downtime. Live migration of virtual machines enables companies to perform hardware maintenance without scheduling full system downtime and disrupting business operations.

VMware HA provides easy to use and cost-effective high availability for SAP applications running in virtual machines. In the event of physical server failure, SAP virtual machines can be automatically restarted on other servers within the pool that have spare capacity. VMware HA minimizes downtime and IT service disruption while eliminating the need for dedicated stand-by hardware. It provides high availability across the entire virtualized IT environment without the cost and complexity of failover solutions that are tied to either operating systems or specific applications.

VMware Consolidated Backup provides an easy to use, centralized facility for LAN-free backup of virtual machines. Consolidated Backup simplifies backup administration and reduces the load for VMware® ESX Server host machines.

Key benefits:

1. Save development and test images for backup, audit or other requirements using Snapshots and Consolidated Backup.
2. Save layers of images for regression testing (ie, keep exact version of OS, SAP, patches, state etc.) using Snapshots and Consolidated Backup.
3. Enable point in time restores and rollbacks during test and development problem resolution with Snapshots.
4. Automatically restart failed SAP application virtual machines using VMware HA.
5. Ensure capacity availability to support SAP virtual machine failovers.
6. Perform full and incremental file backup of virtual machines using VMware Consolidated Backup
7. Back up the full image of SAP virtual machines for disaster recovery.

8. Migrate SAP application virtual machines from failing server hardware using Live Migration without disruption to end users.
9. Restore from snapshots and backups during system failures or disaster recovery.
10. Provide failover during disaster recovery by using SAN replication and restarting SAP virtual machines in DR sites.

Hardware Lifecycle Management

As the SAP enterprise solution evolves to address more complex business problems, newer versions of SAP software and newer capabilities are introduced. Often these new versions require more resources, resulting in upgrades to existing infrastructure or additional hardware purchases. VMware Infrastructure delivers the ability to provide capacity on demand for SAP functionality with minimal service interruption. Once the reassignment is completed, the older hardware can be re-purposed for test and development environments or other SAP and non-SAP workloads, thereby reducing the cost and time to migrate and upgrade SAP environments and maximizing the utilization of existing capacity.

Legacy SAP Systems

Compliance with regulatory requirements such as the Sarbanes-Oxley (SOX) Act, as well as other IT policies, might require older SAP environments and data to remain active beyond normal hardware and software upgrade cycles. The need for dedicated hardware to host these older environments beyond their maintenance or warranty cycle may lead to additional costs. Virtualization with VMware allows consolidation of the SAP application environments on fewer, new generation physical servers and creates cost and support benefits.

Summary

Deploying SAP applications on VMware Infrastructure drives tangible benefits through the complete software deployment lifecycle - from development through production and maintenance. By expediting and simplifying the application development and testing processes, customers experience faster time to production while maintaining high quality throughout these processes.

By enabling rapid provisioning and efficient change management in production environments IT flexibility increases, allowing timely response to sudden and changing business needs. Datacenter optimization enables efficient resource pooling and maximized utilization of system resources. Implementing business continuity solutions for SAP applications on VMware Infrastructure delivers enhanced high availability while minimizing the need for duplicate hardware.

SAP, Inc.

SAP [AG](#) is the largest [European software](#) enterprise, with headquarters in [Walldorf, Germany](#). SAP was founded in [1972](#) and is the third largest software company in the world. It ranks after [Microsoft](#) and [IBM](#) Software in terms of [market capitalization](#). SAP is also the largest business application and [Enterprise Resource Planning \(ERP\) software provider](#) in terms of revenue.

SAP has more than 36,200 customers in 120 countries. This represents 100,600 SAP installations for more than 12 million users.

VMware, Inc.

VMware modernized and brought virtualization to the x86 platform in 1998 and has saved its customers hundreds of millions of dollars by offering solutions for server consolidation and containment, business continuity, test and development automation as well as enterprise desktop management.

More than 4 million users and 20,000 corporate customers of all types and sizes use VMware software, including 99 of the Fortune 100 companies.



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7,082,598 and 7,089,377; patents pending.

