

WHITE PAPER

# VMware Infrastructure and SAP Use Cases



**Table of Contents**

**Virtualization Overview..... 3**

**SAP Platform Overview ..... 3**

**Virtualization with VMware Infrastructure ..... 4**

**Use Cases for VMware Virtualization..... 4**

    Server Containment.....4

    Rapid Provisioning.....4

    Change Management.....5

    Upgrading SAP Environments.....5

    Datacenter Optimization: Distributed Resource Management .....6

    High Availability and Business Continuity.....6

    Management and Automation .....7

    Compliance.....9

**Summary ..... 9**

## Introduction

The collaboration between VMware and SAP provides unique value to our customers. SAP has more than 46,100 customers in 120 countries representing 140,000 SAP installations with over 12 million users. Customers have asked VMware and SAP to explain how virtualization can play a role within SAP deployments. This document answers their request and explains 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.

## Virtualization Overview

Virtualization allows multiple applications and operating systems to run independently on a single physical 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 infrastructure that enables effective use of budget resources and helps decrease operational costs.
- Minimize risk and enhance IT service levels: Zero-downtime maintenance capabilities and rapid recovery times for high availability and streamlined disaster.
- 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.

## 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 a customer's business, including 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 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 benefit greatly from implementing these SAP solutions.

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. 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. 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

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, SAP environments may have a low server utilization rate. Those with low utilization rates may be worthwhile targets for virtualization with VMware Infrastructure.

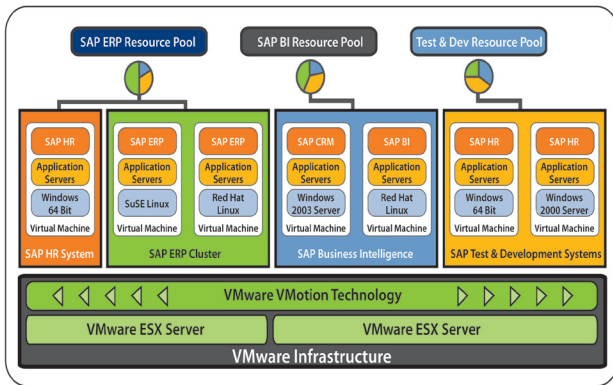


Figure 1 depicts a sample architecture for SAP Enterprise Applications on VMware Infrastructure, with several applications running on the same physical server in virtual machines that contain the SAP application components and the operating system of choice. It is critical to evaluate the usage of the SAP solutions at their collective peak loads to determine which solutions can be deployed together on one physical server. Users should perform a thorough sizing exercise before deployment to understand the CPU, memory and I/O requirements as well as the characterization of each solution.

## Use Cases for VMware Virtualization

### Server Containment

Traditional SAP deployments can generate 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, containing at minimum a DEV, QAS and PRD environment. SAP enterprise environments may also 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.

Almost 66% of SAP implementations run on the Microsoft Windows platform, with an average application server CPU utilization rate of 15-20%. VMware virtualization

technology runs SAP application layers in virtual machines consolidated onto fewer, highly scalable and highly reliable enterprise-class servers, resulting in increased server utilization. Prior to deployment of VMware Infrastructure, customers should perform an analysis 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.

Customers running SAP applications on VMware Infrastructure include a hosting company that can offer a 25-30% price advantage to its customers while providing the same service levels as it did with a purely hardware-based infrastructure. Another customer experienced savings of \$2 - \$3 million over three 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 server containment benefits of VMware Infrastructure include:

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. (Note: best practices state that the QAS architecture should match closely to that of production. Therefore, customers should give careful consideration 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 requiring expenditure for dedicated hardware. By using VMware

Infrastructure, customers can take advantage of virtual machine libraries and virtual machine templates to provision new pre-configured SAP application environments in minutes.

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 enables rapid SAP application deployment 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 rapid provisioning benefits include:

1. Rapidly provision new SAP application layers from virtual machine templates.
2. Pass SAP application images directly from developers to testers.
3. Pass SAP application 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 of VMware virtualization for change management include:

1. Achieve faster change management with fewer system resource requirements.
2. Test patches concurrently on multiple configurations (different versions of OS, SAP application, 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 physical servers while performing maintenance or changes on the current physical server, causing minimal disruption to end users.

### **Upgrading SAP Environments**

Upgrading your SAP enterprise applications can be a time consuming process involving multiple levels of testing (functional and performance) and replication of production environment. Some of the challenges in rolling out SAP upgrades include:

- Duplication of production SAP environments for Upgrades and Patch testing.
- Require dedicated Hardware to support upgrade processes
- Testing multiple changes (OS, App, hardware) can be

very resource intensive and time consuming

- Complex undo procedures during upgrade failures to recover stable state

Also, more often than not, Software upgrade cycles coincide with hardware refresh cycles (and vice versa).

VMware infrastructure helps customers eliminate the dedicated and costly hardware resources required to support the SAP upgrade process. By the use of Templates, Clones and Snapshots, the upgrade test environment is provisioned rapidly. If there are problems during upgrade, the SAP instances are quickly rolled back to the stable state using virtual machine snapshots. These capabilities provide for simple and powerful tools that can reduce costs and increase operational efficiency.

### ***Datacenter 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 of VMware DRS for datacenter optimization include:

1. Dynamically reassign SAP environments that require additional capacity to a physical server with more available resources. (Note: Users need to determine 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 to manage resource allocations efficiently for different developer, test and production SAP environments.
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 datacenter 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 all virtual machines running distributed SAP and non-SAP application environments.

### ***High Availability and Business Continuity***

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 in the pool that have spare capacity. VMware HA minimizes downtime and IT service disruption while elim-

inating 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 host machines.

Key high availability and disaster recovery benefits include:

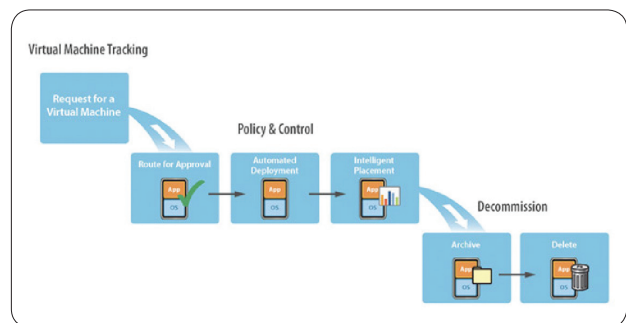
1. Save development and test images for backup, audit or other requirements using Snapshots and Consolidated Backup.
2. Save layers of images for regression testing (ie, keep exact version of OS, SAP components, patches, state etc.) using Snapshots and Consolidated Backup.
3. Enable point in time restores 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 VMotion 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.

**Management and Automation**

As the SAP enterprise solution evolves to address complex business problems, newer versions of SAP software and more advanced capabilities are often introduced. VMware Infrastructure delivers the ability to provide capacity on demand for SAP functionality, with minimal service interruption with the following Management and Automation products

**VMware® Lifecycle Manager**

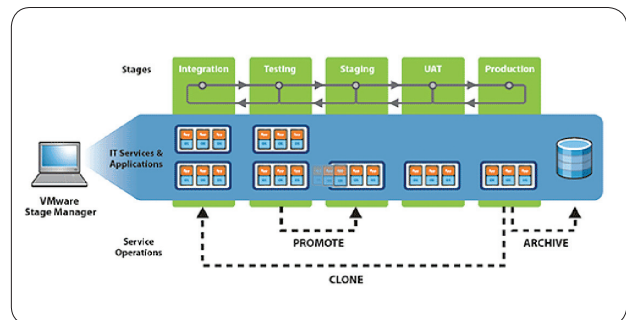
The functions of VMware Lifecycle Manager start with a user making a request for a virtual machine. Each request is routed for approval within the organization. Once approved, the virtual machine is deployed automatically because Lifecycle Manager has all the information about the machine’s required resources. This level of intelligence eliminates potential manual errors as virtual machines are deployed to a pre-defined and approved location. Finally, virtual machines are moved into a decommission process that involves archiving and ultimately deleting the virtual machine when it’s no longer needed.



VMware Lifecycle Manager can help the SAP administrator keep a firm control on the requesting, approving, deploying, updating, and retiring of virtual machines in their environment.

**VMware® Stage Manager**

Minimizing risk as new SAP modules are rolled into production or changes are made to existing services can be challenging. With physical infrastructure, inefficiencies during these procedures waste IT resources, slow down service delivery and impair the ability to respond quickly to changing business conditions. Often, there is no way to systematically and accurately move complex system changes through the stages of pre-production before bringing them into production.



VMware Stage Manager relieves process and infrastructure inefficiencies while minimizing risk associated with moving new or updated systems into production. VMware Stage Manager uses virtual machines as standardized software containers to run IT services and business applications on VMware Infrastructure. You can quickly and consistently transition service configurations through the stages of the release process – integration, testing, staging and user acceptance testing – into production. VMware Stage Manager gives you a single viewpoint for managing all service configurations running in the enterprise. VMware Stage Manager inherits resource pools from VMware® VirtualCenter and dynamically assigns them to particular services and stages, giving you unprecedented control over the use of datacenter resources. With a purpose-built interface for visualizing, managing and automating service transition activities and processes, VMware Stage Manager empowers you to:

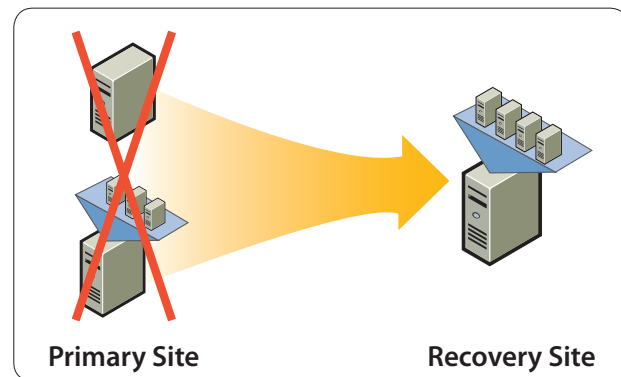
1. Manage and automate the change, configuration and release processes for production-bound software systems.
2. Visualize, organize and streamline resources needed for pre-production and service transition activities.
3. Reduce server sprawl and increase the resource utilization efficiency of IT services hosted on VMware Infrastructure.
4. Ensure all environments used for pre-production integration and testing are exact copies of current production systems.

### **VMware® Site Recovery Manager**

Protecting the production data centers running SAP enterprise applications during disasters is most critical to any business. VMware Site Recovery manager (SRM) perfectly compliments the application availability capabilities that SAP provides to an enterprise data center by automating the testing and failover of SAP production data centers to a disaster recovery environment.

In case of disaster, VMware SRM fails over all the SAP and non-SAP application instances on to the DR site, brings up the new virtual machines and restarts the application environments. Site Recovery Manager integrates and leverages the storage replication software from leading storage vendors to simplify the use of storage replication software with VMware Infrastructure.

Testing DR scenarios could be a complex and time consuming process to setup and execute. SRM can automate the testing process as part of the virtual center management interface and ensure zero disruption to the production SAP environment.



Some of the key features of VMware Site Recovery Manager include:

#### **Non-Disruptive Testing**

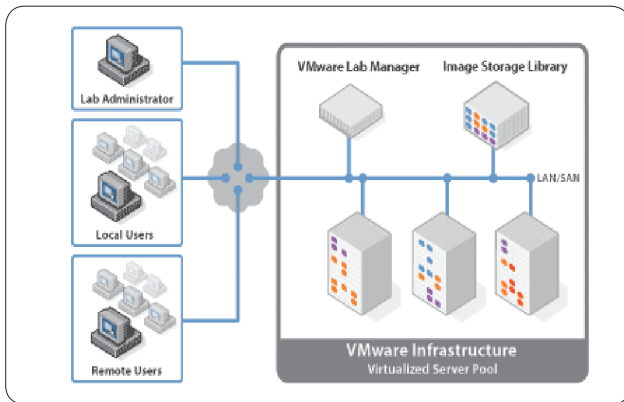
- Create and manage recovery plans directly from VMware VirtualCenter management interface.
- Extend recovery plans with custom scripts to provide for SAP application instance failover and re-start.
- Store, view and export results of test and failover execution from VMware VirtualCenter.
- Connect virtual machines to an existing isolated network for testing purposes.
- Automate execution of recovery plans.
- Automate cleanup of testing environments after completing failover tests.

#### **Automated Failover**

- Monitor availability of remote site and alert users of possible site failures.
- Initiate recovery plan execution from VMware VirtualCenter with a single button.
- Execute user-defined scripts and halts during recovery.
- Reconfigure SAP virtual machines to match network configuration at failover site.
- Manage and monitor execution of recovery plans within VMware VirtualCenter.

## VMware Lab Manager

With VMware Lab Manager, an SAP administrator can automate the setup, capture, storage and sharing of multi-machine system configurations with VMware Lab Manager. With its shared image library and shared pool of virtualized servers, VMware Lab Manager enables efficient storage and sharing of multi-machine configurations across teams and geographies.



Key Lab Manager Benefits include:

a) Rapid Provisioning of Multi-Machine SAP environments: Provisioning SAP on existing hosts will typically take several hours for each application. With a single click, you can provision multi-tier systems nearly instantly with VMware Lab Manager. You can also give users self-service access to the image library, allowing them to fulfill their own provisioning needs while leaving IT in control of user management, storage quotas and server deployment policies—achieving the best of both worlds.

b) Reduce Capital and Operating Costs: Consume resources as they are needed instead of maintaining multiple systems that are only used sporadically. VMware Lab Manager lets you pool and share resources to meet the needs of users resulting in maximum utilization—and increased cost savings.

### Compliance

Regulatory Compliance requires some industries to develop their products on “Approved” hardware and Software. Maintaining system integrity and consistency on hardware (and software) is difficult across the different stages of the SAP deployment. Older hardware requires “refresh” to stay compliant and current. 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.

Using VMware Infrastructure provides the following benefits:

- Define and enforce standards across the SAP environments using pre-configured library of VM templates
- Faster deployment of ‘approved’ server configurations by deploying from templates
- Streamline and Automate Provisioning, Management and Policy Compliance across your Dev/Test/Stage and Production using VMware IT Service Delivery solutions.
- Consolidate older environments and archives on virtual machines saving hardware costs
- Re-host applications on VMware infrastructure and newer and compliant hardware without changes to the Application environment

VMware IT service delivery solutions using the management and automation solutions further enhances and ensures compliance to IT processes and standards across the complete life cycle of a SAP implementation.

### 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 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. The management and automation of the SAP deployment using VMware solutions enhances overall operational efficiency and ensures adherence IT standards and compliance.



**VMware, Inc. 3401 Hillview Ave Palo Alto CA 94304 USA Tel 877-486-9273 Fax 650-427-5001 [www.vmware.com](http://www.vmware.com)**

Copyright © 2008 VMware, Inc. All rights reserved. Protected by one or more of U.S. Patent Nos. 6,961,806, 6,961,941, 6,880,022, 6,397,242, 6,496,847, 6,704,925, 6,496,847, 6,711,672, 6,725,289, 6,735,601, 6,785,886, 6,789,156, 6,795,966, 6,944,699, 7,069,413, 7,082,598, 7,089,377, 7,111,086, 7,111,145, 7,117,481, 7,149,843, 7,155,558, 7,222,221, 7,260,815, 7,260,820, 7,268,683, 7,275,136, 7,277,998, 7,277,999, 7,278,030, 7,281,102, 7,290,253; patents pending. VMware, the VMware "boxes" logo and design, Virtual SMP and VMotion are registered trademarks or trademarks of VMware, Inc. in the United States and/or other jurisdictions. All other marks and names mentioned herein may be trademarks of their respective companies.

