



VMware Virtualization and Cloud Management Solutions

Managing IT in the Cloud Era

WHITE PAPER

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IT Transformation is Underway

Virtualization and cloud computing are transforming IT. Cloud computing leverages virtualization to enable a more scalable and elastic model for delivering IT services. As a result, enterprises gain a more agile and efficient IT environment that is better able to respond to business needs.

The principal driver behind the rapid adoption of virtualization has been cost reduction through server and other infrastructure consolidation. With virtualization, enterprises are no longer restricted to the traditional ratio of 1:1:1 for servers, operating systems and applications. Applications abstracted from the infrastructure enable IT to turn underutilized infrastructure into an elastic, resilient and secure pool of compute resources available to users on demand.

Global IT organizations have been quick to adopt virtualization to achieve cost benefits. By replacing physical IT assets with virtual resources, organizations are achieving up to 60 percent savings in capital expenses in their datacenters. According to IDC, server virtualization has become a standard feature in datacenter environments over the last few years, with virtual machine deployment outnumbering physical server shipments in 2009.¹

A virtualization platform with embedded management capabilities, such as high availability, automated load balancing and fault tolerance, reduces infrastructure complexity. Through automation and built-in manageability, it eliminates many time-consuming manual management tasks, significantly driving down operational IT costs. Cost reduction, however, is proving to be just one of the many benefits of virtualization.

Realize the Full Benefits of Virtualization and Cloud through Management

When enhanced with advanced management capabilities, virtual infrastructure delivers even greater advantages—enabling IT teams to move to cloud computing and respond faster to business needs, while reducing operational expenses. Many IT organizations with mature virtualization deployments also report that security and compliance with regulatory requirements, industry standards and IT best practices are easier to attain.² Previously, security and compliance were perceived as the major concerns for moving to the cloud, as indicated by a 2010 survey of chief information officers.

If enterprises are to confidently move to the cloud and deliver IT as a service, they must rethink their approach to IT management. VMware® virtualization and cloud management solutions increase IT and business agility. They provide the visibility and proactive management capabilities that free IT resources to shift from maintenance to innovation. They enable enterprises to simplify the deployment of a highly automated, virtualized infrastructure, the foundation for both private and hybrid cloud-computing initiatives.

New Requirements Challenge Traditional Management Approach

Infrastructure cost savings can be achieved with virtualization without changing IT management tools and processes. However, in order to move to a full cloud model, enterprises must reexamine their approach to IT management and assess how they will unlock the full potential of the virtualization platform and its intelligent policy management functions. Specifically, organizations must address the IT management challenges raised by these issues:

- **More rapid change in IT environments** – In a virtualized environment, enterprise IT organizations must manage many more changes. Moreover, changes occur much more quickly in a virtualized environment than in a physical environment. This is straining the capabilities of traditional management tool sets to effectively provide visibility and control of the entire IT infrastructure.
- **A new delivery model of IT infrastructure and services** – Virtualization enables IT to turn underutilized infrastructure into on-demand compute resources. Unlike the dedicated systems in physical environments, virtualized resources are shared across multiple workloads and shifted as needed. Self-service provisioning portals, designed to give end users direct access to virtualized systems, create greater management challenges as virtual machines are added at the rate of growing business demands, requiring automated enforcement of IT policies to eliminate sprawl.

¹ IDC. "Accelerate Hybrid Cloud Success: Adjusting the IT Mindset." Giorgio Nebuloni, Al Gillen and Gary Chen. February 2011.

² Enterprise Strategy Group. "Virtualization Market and the ESG Virtualization Maturity Model." Mark Bowker and Jon Oltsik. April 2011.

- **Increasing demands for applications and quality of service** – Software as a service (SaaS) has blurred the lines between applications owned by corporate IT and service providers. SaaS has also amplified the issue of responsibility for application quality of service. In addition, smart mobile phones, tablets and applications on demand have raised the expectations for IT teams to deliver services faster. New applications and services—resulting in more virtual machines running—require IT to increase staff productivity through higher levels of standardization and automation.

Manage Smarter in the Cloud Era

Cloud computing requires organizations to embrace a new management approach—one that is as agile, flexible and dynamic as their new IT infrastructure. VMware delivers comprehensive virtualization and cloud management solutions that support proactive IT management and enable IT as a service. VMware management solutions feature embedded, integrated and converged management capabilities that provide unprecedented visibility into, and control of, infrastructure and application health and performance, as well as service costs and risks. Leveraging the unique VMware management approach, enterprises surface greater value from existing virtualization and cloud infrastructure investments.

Traditional management tools, designed primarily to react to system events in a physical world, fall short in providing the capabilities necessary to manage today’s emerging cloud computing environments. Traditional management tools lack the built-in automation and control needed to meet the continuously changing demands of inherently dynamic virtualized environments. Legacy tools are unable to extend existing IT investments, and can’t aggregate and correlate data from every layer of a modern IT architecture, which prevents IT leaders from isolating and determining the root cause of performance problems.

The global leader in virtualization and cloud infrastructure with more than 250,000 customers and 25,000 partners, VMware delivers new levels of automation and intelligent policy management at every layer of a modern IT architecture. VMware embedded and tightly integrated management solutions leverage the industry’s leading virtualization platform, VMware vSphere®. VMware solutions enable enterprises to manage their private clouds while designing for hybrid cloud environments.

With VMware, your organization can adopt a cloud model that addresses your unique business challenges. The VMware approach focuses on delivering your cloud—your enterprise’s journey to the right cloud model to match your business needs. Your cloud accelerates IT, which in turn accelerates meaningful results for your business.

VMware provides customer-proven management solutions for infrastructure and operations, cloud applications, end-user computing and IT business management that increase agility by building on your existing investments. They maximize operational efficiency, simplify management and help you achieve IT as a service—all while enabling IT to maintain control.

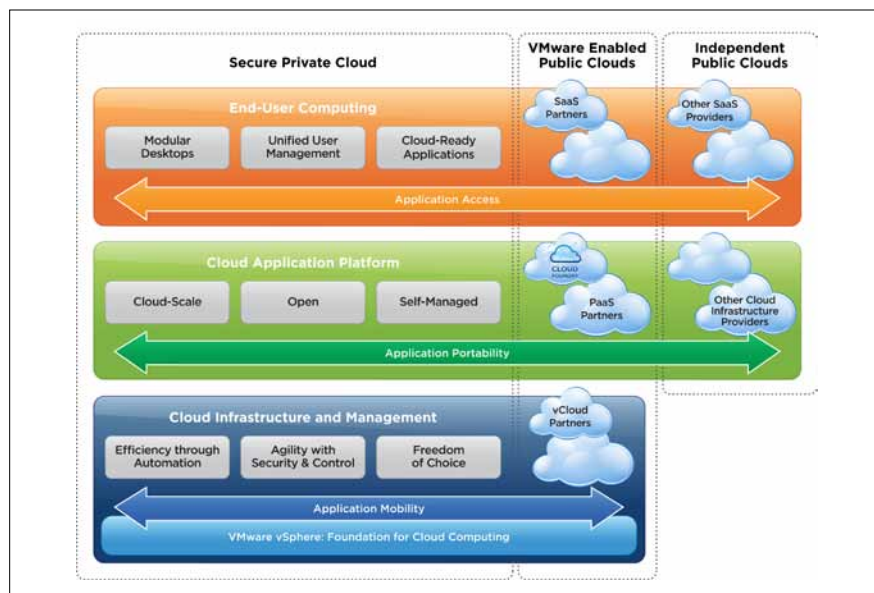


Figure 1. VMware addresses all layers of the IT stack with end-to-end virtualization and cloud management solutions.

Deliver and Manage Infrastructure as a Service

A highly adaptive and scalable, intelligent virtual infrastructure—delivering high levels of security, reliability and service quality—is fundamental to IT transformation and cloud adoption. VMware cloud infrastructure and management solutions provide consistent security, management and service quality regardless of where your workloads run—private cloud in your datacenter, VMware enabled public clouds or both. With VMware, enterprises can have the datacenter of the future, today, with an intelligent virtual infrastructure to:

- Run business-critical applications with confidence by eliminating downtime and reducing TCO.
- Deliver high quality of service and reduce operational expenses with built-in intelligence and automation.
- Increase agility without compromise—on an enterprise hybrid cloud, gaining a flexible architecture for delivering on-demand access to resources wherever they reside.



Figure 2. VMware infrastructure and operations management solutions, which include the VMware vCenter family of products, fundamentally change how organizations manage IT and deliver services.

Build Your Environment: Enterprise Hybrid Cloud

Private cloud architectures are rapidly emerging as a template for delivering IT services to the enterprise. With VMware cloud infrastructure and management solutions, organizations build secure private clouds that:

- Increase business agility by empowering users to rapidly deploy services on demand through self-service portals.
- Reduce costs by more efficiently delivering resources and by consolidating and standardizing infrastructure.
- Improve security and compliance within multitenant environments through strong access controls and security.
- Enable application portability and interoperability across hybrid clouds while leveraging existing investments.

Through partnerships with leading service providers, VMware solutions extend the private cloud to the enterprise hybrid cloud. As a result, enterprises can seamlessly move applications and workloads between private and VMware enabled public clouds with the performance, security, reliability and compliance that enterprises require.

vSphere, the most trusted, most widely deployed virtualization platform in the world, forms the foundation of the VMware cloud infrastructure suite. This comprehensive suite of technologies amplifies the value IT organizations can realize from virtualized resources by enabling cloud-scale operations. It provides a complete private cloud solution for infrastructure as a service (IaaS) and enables hybrid cloud computing for the enterprise. The VMware cloud infrastructure suite, which delivers the automation, self-service and security capabilities enterprises require from a private cloud, includes VMware vCloud® Director, VMware vCenter™ Operations Management Suite, VMware vShield™ and VMware vCenter Site Recovery Manager. With this suite, VMware helps enterprises accelerate toward more efficient and automated cloud infrastructure, redefining how resources are managed and secured, and ultimately, driving a more productive relationship between IT and the businesses they serve.

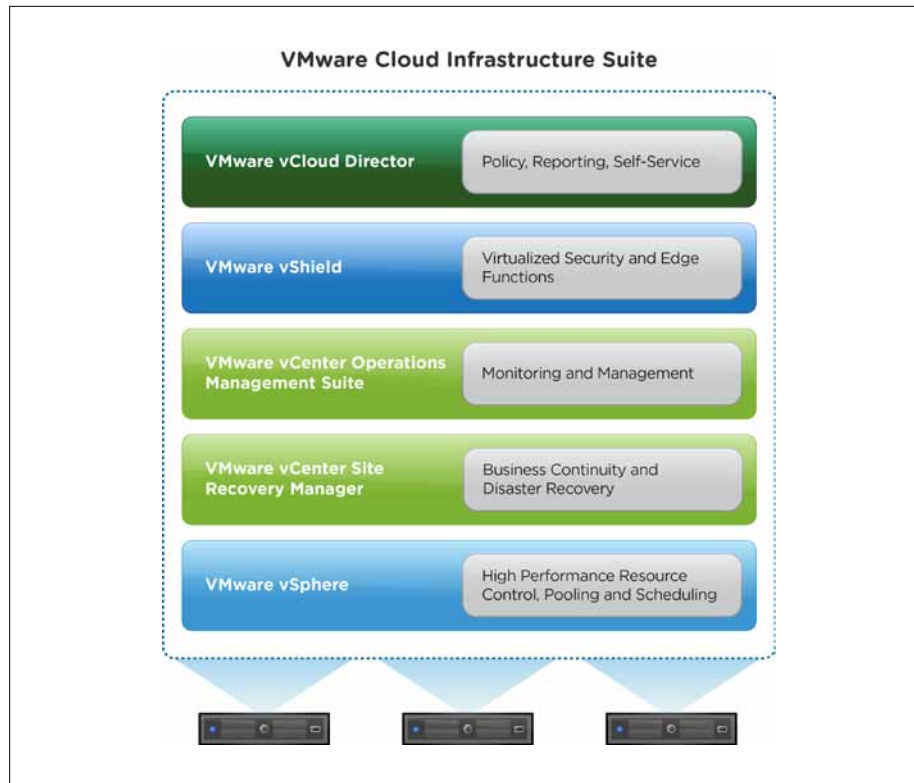


Figure 3. VMware delivers a complete cloud infrastructure suite to enable hybrid cloud computing.

Leveraging vSphere, vCloud Director pools virtual infrastructure—compute, network and storage—resources and delivers them to users as a catalog-based service. By publishing catalogs of predefined IT services accessed through the vCloud Director self-service portal, IT organizations streamline IT delivery and management of infrastructure services and simplify the way in which users access and consume them. vCloud Director allows you to deploy these services to preconfigured logical, or virtual, datacenters that implement and deliver service-level guarantees to the organization. The vCenter Operations Management Suite automates operations management in this dynamic cloud environment. The vShield product family helps enterprises overcome the limits of traditional security solutions by delivering an adaptive, software-based security model designed for virtual and cloud environments, while vCenter Site Recovery Manager is a proven disaster recovery solution.

To facilitate self-service by non-technical IT and business users, as well as provide higher levels of governance and control, VMware Service Manager-Cloud Provisioning provides end-user access to IT and cloud services via a user-friendly service portal and catalog. Leveraging a powerful workflow engine, Service Manager-Cloud Provisioning allows you to add sophisticated approval workflows to service requests, enabling the provisioning and automation of services according to established best practices, speeding service fulfillment and reducing errors.

VMware extends the value of its private cloud solutions to enable the enterprise hybrid cloud, which provides interoperability between applications and services, as well as the ability to scale these applications and services with business operations. VMware works closely with a broad, global community of leading cloud providers to deliver VMware vCloud Datacenter Service offerings. These offerings are built on a VMware developed architecture and certified by VMware to be compatible and secure, in contrast to commodity public cloud services. Moreover, VMware provides enterprises with the flexibility and portability to move applications between clouds without rewriting them—from private clouds to VMware vCloud enabled public clouds and back. This enables enterprises to *burst* existing applications seamlessly, and with confidence, into public clouds when high-business demand requires additional capacity or to deploy new applications directly into public clouds.

Run Your Environment: Automated Operations

Operations management disciplines—performance, capacity and configuration management, in particular—are becoming inseparable as organizations move to cloud computing because of the dynamic nature of converged infrastructure. Configurations are fluid, and capacity is shared and sourced from many places, all of which impacts performance. As a result, enterprises need intelligence—in the form of visibility across the system—and analytics to decipher what is important in their ever-increasing volumes of data.

VMware vCenter Operations Management Suite solutions dramatically simplify and automate operations management in dynamic environments. They support a converged and integrated approach to performance, capacity and configuration management with the following features:

- **Patented analytics** that provide actionable intelligence from data across the entire IT stack, helping you troubleshoot performance problems more quickly and manage your environment proactively.
- **Powerful visualization** of key performance indicators and customizable dashboards, enabling visibility into dynamic infrastructure and applications for rapid problem resolution, which increases productivity and reduces costs.
- **Progressive integration** of performance, capacity and configuration management functions with the vSphere platform and existing monitoring tools, ensuring optimal infrastructure and application performance.

The vCenter Operations Management Suite provides cross-team views for real-time performance, capacity and configuration management, enabling IT to be more proactive and to ensure optimal system performance. Performance data can be abstracted to health, risk and efficiency measures to help IT teams quickly identify escalating performance problems with less effort—and before they affect end users.

Many virtual machines are overprovisioned, incurring unnecessary cost to the business. Rightsizing resource capacity—CPU, memory, network and storage—to achieve high efficiency usually means sacrificing capacity availability or efficiency. The vCenter Operations Management Suite includes advanced capacity management capabilities that let you analyze and forecast capacity needs so that you deliver the right amount of capacity at the right time. It can help you rightsize your virtual machines to increase consolidation ratios, reduce costs, and make better use of your compute power and VMware investment.

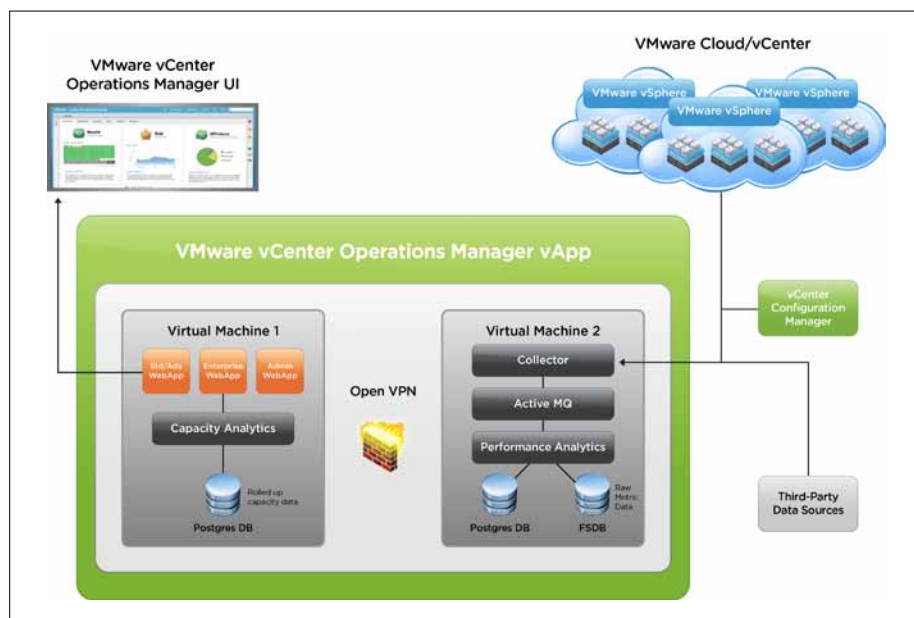


Figure 4. The architecture of vCenter Operations Manager (a vCenter Operations Management Suite solution) consists of two virtual machines that work in unison. Virtual machine 2 is responsible for collecting the data from VMware vCenter Server, VMware vCenter Configuration Manager™ and third-party data sources (metrics, topology and change events) and storing that raw data in its scalable File System Database (FSDB). The analytics engines for capacity and performance periodically process this raw data and store the results in their respective Postgres databases. Users can access the results of the analytics in the form of badges and scores through the WebApps of virtual machine 1.

Configuration changes in the infrastructure or application layer can account for 80 percent of downtime in IT production environments. Automated provisioning and configuration analysis within the vCenter Operations Management Suite enables your IT team to detect these unwanted changes. With real-time, integrated dashboards of performance, capacity and configuration change events, you can proactively manage your environment and ensure that service-level agreements (SLAs) are met. You can also set policy controls across all aspects of the datacenter infrastructure, virtual and physical, to maintain continuous compliance with operational best practices.

With vCenter Configuration Manager (a vCenter Operations Management Suite solution), your IT team can ensure the consistency of system images and save time by automating patching and provisioning. vCenter Configuration Manager enables you to apply patches to large numbers of systems and proactively remediate changes within virtualized and nonvirtualized hosts. As a result, your IT organization increases the number of machines it manages per administrator while decreasing the time it takes to manage those machines.

VMware infrastructure and operations management solutions complement the embedded management capabilities of the vSphere platform—including high availability and fault tolerance management—to support your IT organization in proactively handling changes to virtualized and nonvirtualized infrastructure. The remaining physical systems in heterogeneous environments are supported by the open and extensible architecture of the vCenter Operations Management Suite, which supports third-party monitoring tools.

Ensure Security and Compliance

VMware is dedicated to making VMware enabled cloud deployments more secure and compliant than any other deployment model, while also unlocking the benefits of cloud computing. With vShield and vCenter Configuration Manager, your enterprise benefits from cost-effective, integrated solutions for securing virtual datacenters and cloud environments at all levels—host, network, application, data and endpoint, while ensuring system compliance with regulatory requirements, industry standards and corporate best practices. vShield and vCenter Configuration Manager provide your IT teams with the ability to create and manage business-relevant policies that adapt to dynamic cloud environments.

Traditional approaches to datacenter security based on hardware appliances are unsuited to the constantly changing nature of virtual infrastructures. In contrast, vShield is optimized for virtualization and cloud computing. vShield solutions enable IT organizations to centralize security across the virtual datacenter, secure the edge of the virtual datacenter, protect applications and data from network-based threats, and offload antivirus and anti-malware processing for endpoints. Through embedded policy management, vShield ensures security travels with virtual machines, as they migrate from host to host. vShield scans datacenters, clusters or resource pools to discover unencrypted sensitive data, such as credit card numbers or patient records. Leveraging deep visibility into network communication, it secures both the virtual machines containing the sensitive data, as well as any virtual machine communicating with them. This approach helps to ensure that applications run efficiently within cloud environments, while maintaining trust and network segmentation of users and sensitive data. By delivering a virtualization-aware, adaptive and programmable security infrastructure, vShield helps to ensure that VMware enabled clouds are secure and policy-driven, enabling IT teams to react rapidly to new security threats.

For many organizations, meeting regulatory standards can be difficult, expensive, arduous and error prone. However, non-compliance can be even more costly (e.g., fines levied and customer confidence lost). To help your organization comply with regulatory requirements, industry and corporate standards, and security best practices, vCenter Configuration Manager automatically assesses and reports on the compliance status of your virtual infrastructure and applications, as well the impact of any planned or unplanned changes. It provides out-of-the-box compliance policies for most of today's common business standards, including PCI (Payment Card Industry), the Sarbanes-Oxley Act and the Health Insurance Portability and Accountability Act (HIPAA). Unlike traditional tools that provide only out-of-compliance reports, vCenter Configuration Manager offers a simple, one-click method for quickly remediating issues and bringing a system back into compliance.

VMware delivers a platform that enables IT organizations to keep IT environments in a continuous state of compliance. By leveraging an integration between vShield and vCenter Configuration Manager, your IT team can establish a regular process—nightly, weekly or another interval—to automatically determine which virtual machines contain confidential or sensitive information. The solution then determines the set of virtual machines that are

communicating with the virtual machines that contain the sensitive information, and automatically places all of them into one security group, segmenting them from the rest of the environment. This automated process enforces the network isolation required to meet compliance mandates. Finally, the solution hardens these virtual machines to ensure the operating system (OS) configurations are secured based on best practices and compliance standards. In this automated fashion, VMware solutions enable IT teams to more frequently and affordably maintain continuous compliance.

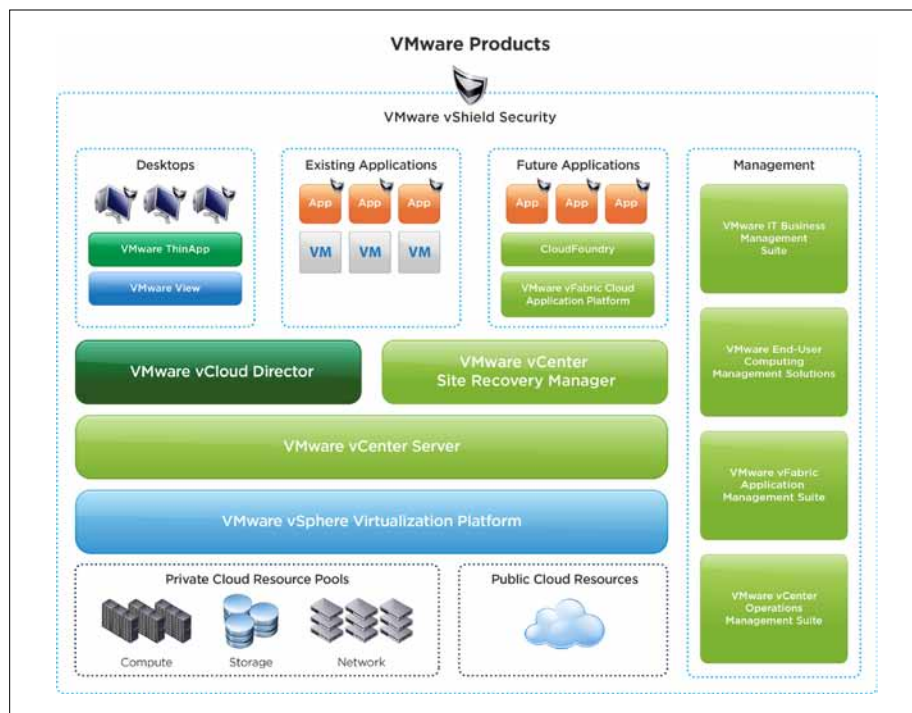


Figure 5. VMware embedded, integrated and converged management solutions deliver high levels of security, reliability and service quality.

Support Business Continuity and Disaster Recovery

Management capabilities embedded into and integrated with the vSphere platform support business continuity. They eliminate planned downtime, provide higher availability independent of hardware, OS and applications, and enable rapid recovery from server failures with automatic start of systems.

Although unexpected application outages can be devastating to a business, Site Recovery Manager takes the risk and worry out of disaster recovery. It substitutes automated workflows for the complex paper runbooks associated with traditional disaster recovery processes. More effective and reliable, Site Recovery Manager provides continuous disaster recovery protection for all of your business-critical applications.

Site Recovery Manager includes the industry's first hypervisor-based replication to ensure cost-efficient replication for vSphere environments and enable the use of heterogeneous storage across sites. vSphere Replication simplifies replication by managing it directly through vCenter Server at a more granular and flexible virtual-machine level. Using Site Recovery Manager, your IT organization can perform planned, routine migrations with application-consistent recovery and zero data loss. Site Recovery Manager features automatic failback—automatically managing the reversal of replication and the fail back to the original production site to streamline routine migrations.

As you leverage VMware solutions to automate and optimize your IT infrastructure, you reduce operational expenses and increase agility, which frees up IT staff and resources to focus on modernizing applications and supporting end users.

Manage Applications as a Service

Increasingly Web-oriented, dynamic, data-intensive, real-time and virtualized, modern applications also require a new management approach in the cloud era. The new cloud-operating model—which bifurcates application and infrastructure management—can provide application owners and developers with increased agility, flexibility, control and performance. This model also enables application owners to take more responsibility for their applications, resulting in the emergence of increasingly common DevOps teams that manage cloud application performance for the business. The VMware active application management approach, which provides early instrumentation, automatic configuration and code change updates, and native remediation and optimization, facilitates unprecedented collaboration between development, build and release, and operations teams. VMware is at the forefront of transforming application management, as well as application development and delivery, on private, public and hybrid clouds.

Time-to-market pressures have IT leaders focused on increasing the velocity of new application development. VMware application management solutions support building modern applications through the VMware open standards-based platform as a service (PaaS), Cloud Foundry. Representing a new generation of application platform, Cloud Foundry streamlines the development, delivery and operations of modern applications, while embracing the widest choice of public and private clouds; industry-standard, high-productivity developer frameworks; and application infrastructure services.

At the same time, VMware delivers a trusted cloud application platform for modernizing legacy applications for the cloud, as well as for building and delivering new ones. VMware vFabric™ Application Management Suite solutions enable you to deploy and manage Web-oriented applications quickly and deliver cloud-ready applications that are optimized to run on virtual infrastructure. In addition, vFabric Application Management Suite solutions enhance application portability between public and VMware enabled private clouds and increase the reliability, availability and scalability of applications. These solutions also give you the insight you need into applications and infrastructure at every stage of your virtualization journey so that you don't have to continually retool your monitoring solutions.

The vFabric Application Management Suite for transforming cloud application management provides the following capabilities:

- **Standardized, compliant policy-based enforcement** – Standardize your media library of approved IT components and activate monitoring and scaling policies seamlessly during provisioning.
- **Automated deployment and mobility of multitier applications** – Streamline and accelerate the deployment of applications onto hybrid IaaS, while optimizing application placement according to infrastructure service levels.
- **Optimized performance and remediation** – Measure application experience from the end-user perspective, adapting scale to meet agreed-upon service levels, and accelerate resolution through integrated monitoring and remediation.

Application Provisioning and Deployment

According to recent VMware and EMC research, hybrid cloud deployment could reduce typical total IT spend by approximately 20–30 percent.³ This lower IT expenditure comes from virtualization and consolidation, optimized workload sourcing, optimized provisioning, and higher productivity in application development and maintenance.

VMware vFabric AppDirector™ (a vFabric Application Management Suite solution) provides unmatched deployment automation and self-service provisioning by standardizing, streamlining and automating application release for multitier, multizone applications into hybrid cloud environments. vFabric AppDirector makes it easy to define cloud deployment environments and establish a library of standardized application components to build and deploy applications. Integrated orchestration allows deployment workflows with callouts for notifications and third-party product integrations to be created quickly.

³ Gartner, IDC market data; Gartner IT Key Metrics Data 2009; EMC and VMware team analysis SaaS, Private cloud and IaaS savings modeled only for x86 workloads (assumed 80% of spend)

Starting with a drag-and-drop canvas, vFabric AppDirector enables you to construct an application blueprint that can be deployed across any cloud. With virtual machine templates, application components and scripts organized in a media library, it takes just minutes to organize an application deployment topology. It is easy to create dependencies, edit configurations and override system defaults to define the execution plan and deploy applications at will.

Application Performance

The move toward cloud and the use of modern application frameworks and methodologies is causing application operations teams to think differently about managing the performance of applications. Today's business environment is increasing demand for applications and functionality, and this speed of change requires a new approach to application performance management to ensure service levels.

VMware vFabric Application Performance Manager (a vFabric Application Management Suite solution) monitors and manages Web and custom application performance in virtual and cloud environments. It provides you with the automation, intelligence and interoperability necessary to manage and control the fast-paced changes demanded of applications deployed to virtualized and cloud infrastructure. Its integrated resource, transaction and code monitoring approach simplifies performance management, while providing unprecedented visibility and control of application performance in the cloud.

Simple to set up, use and extend, vFabric Application Performance Manager is driven by VMware vFabric AppInsight (another vFabric Application Management Suite solution), which provides a next-generation, application-operations dashboard. With vFabric AppInsight, application components are discovered automatically and transaction paths are monitored from a user perspective to help application owners view true performance. Integrated with the vFabric AppInsight dashboard, additional details—such as correlated metrics on resource performance from VMware vFabric Hyperic® and byte-code instrumentation—make it easy to identify root causes and take action at the code level to fix problems quickly.

Data from vFabric Application Performance Manager can also be fed into the vCenter Operations Manager for higher-level analysis. The combination of vFabric Application Performance Manager and vCenter Operations Manager gives you complete visibility across all layers of the infrastructure and application stack. Furthermore, the patented analytics in vCenter Operations Manager enable application owners, database administrators and infrastructure operations teams to collaborate more effectively and to proactively ensure performance SLAs for the business.

Deliver and Manage End-User Computing as a Service

End users require anytime, anywhere access to applications on a wide variety of devices. IT seeks to maintain security and control to protect intellectual property and sensitive data, especially as businesses merge, reorganize and expand. It is a desktop dilemma resulting from systems that are too complex to manage.

In the same way that VMware virtualization transformed infrastructure in the datacenter, VMware virtualization is transforming desktop computing. VMware helps you transition from a device-centric to a user-centric computing model by delivering desktops as a managed service. VMware is developing solutions for transforming end-user computing management with capabilities that will do the following:

- **Enable rapid, secure, compliant desktop provisioning and deployment** – Standardize and centralize a set of approved desktop images and automate desktop entitlement and patching.
- **Guarantee a consistent end-user experience** – Establish standard measurements for desired end-user experiences, identify and remediate degradations, and visualize infrastructure status and problem hot spots for end users and operations.
- **Deliver just-in-time resource allocation** – Automatically learn user patterns and trends, allocate and deallocate resources in advance of known trends, and minimize resource safety buffers to reduce TCO.

Desktop Provisioning and Management

VMware end-user computing management solutions reduce IT complexity and cost. They enable end users to freely choose devices, while ensuring that corporate assets are secure and centrally managed. VMware View™ simplifies IT manageability and control, while providing a high-fidelity desktop virtualization experience. It increases IT security through centralized desktop security policies.

VMware View delivers higher availability and agility of desktop services unmatched by traditional PCs while reducing the total cost of desktop ownership up to 50 percent. End users can enjoy new levels of productivity and the freedom to access desktops from more devices and locations while giving IT greater policy control.

With VMware View, your IT team maintains and delivers virtual desktops, applications and data from the datacenter as centralized services. A single, powerful administrative console provides oversight of desktop services while enabling IT teams to execute previously cumbersome tasks like provisioning, updates and patches with a few clicks of a mouse. Your IT organization can use VMware View to manage desktop components separately for greater flexibility in provisioning, updates and delivery. They can easily apply policies and quickly enable and disable users, all from a centralized console for optimal business response.

In virtual desktop environments, a broad range of factors contributes to end-user satisfaction. Infrastructure components, user behavior and application interactions are interdependent and often drive real-time changes in the quality of the user experience. Variances in the health of virtual desktop infrastructure (VDI) environments have immediate business impact, often leaving users without a fallback to maintain productivity during outages or *brownouts*. Isolation of root-cause is both challenging and urgent for VDI. Only a purpose-built monitoring tool can tame the complexity, illuminating the real issues and focusing remediation efforts.

Leveraging the core technologies of the vCenter Operations Management Suite, VMware is developing a solution to solve the most challenging issues associated with managing virtual desktops and their infrastructure. This solution collects data from all VDI technology silos—compute, network, storage, end-user sessions and the VMware View application—and correlates it with a holistic view of how the overall VDI environment is performing. By leveraging PCoIP protocol statistics to measure end-user experience impact, the solution identifies trouble spots and bottlenecks locally over a LAN or remotely over a high-latency WAN, dramatically reducing mean time to identification (MTTI). It will also help your IT team to identify early user-experience degradation trends significantly before end users are affected. The result is no impact to user productivity and no user complaints.

Secure Access to Applications in Your Cloud

VMware solutions also enable end users to securely access their personalized virtual desktop from a wide variety of devices—without compromise. With VMware Horizon Application Manager™, you can give end users access to SaaS and Web applications across different devices while retaining control and visibility, and ensuring compliance through policy-driven management. Horizon App Manager lets you provision and entitle secure access to end users, track SaaS license activity, and get usage reports, as well as benefit from enterprise lifecycle management of SaaS and Web applications. With Horizon Application Manager, your enterprise can lower your TCO for cloud-based applications and give users simple and secure access from their preferred devices—anytime, anywhere.

Using Horizon App Manager, your IT organization can extend users' enterprise identity to the public cloud, simplifying the security of application access. In addition, strong policy management delivers robust user activity reporting. Users, even those with multiple devices, have a single login and simplified, self-service access to the organization's application store. Horizon App Manager bridges the gap between the private and public cloud for organizations of any size.

Manage the Business of IT

Once enterprises undertake initiatives for infrastructure transformation, application modernization and end-user productivity, an important element to achieving IT as a service will be better management of the business of IT. Never more critical than in today's cloud era, IT business management solutions enable you to better align IT resources with business needs and increase business agility.

To run the business of IT effectively, enterprises need the ability to measure performance across all of the services—infrastructure, application and end-user computing—that the IT organization delivers. In addition, enterprises must be able to measure the cost of delivering those services because measuring services allows IT teams to manage and improve them. Without continuous improvement, IT teams are challenged to shift spending from maintenance to innovation. However, many IT organizations lack visibility into costs, service levels and vendors. Unable to capture and aggregate the necessary data and having no single source of truth, IT fails to communicate its value to the business in the language of the business—which includes not just ROI and internal rate of return (IRR) metrics, but an understanding of IT's impact on revenues and profits.

VMware delivers IT business management solutions that offer the following advantages:

- **Service orientation** – Base portfolio decisions on services while managing the end-to-end service lifecycle and base vendor management on SLAs.
- **Financial insight and discipline** – Collect, model and report costing data; budget, trend and forecast IT expenditures; and communicate to stakeholders through meaningful measurements and reports.
- **Intelligent governance** – Govern IT based on internal best practices, managing risk against industry benchmarks and complying with industry regulations.

Today, the IT business management portfolio from VMware includes solutions for IT financial management, service-level management, vendor management, compliance and chargeback, as well as a Web-based self-service portal and catalog. VMware IT Business Management Suite solutions provide unprecedented visibility into, and control of, costs and risks to help you run IT like a business, leveraging both private and public cloud services.



Figure 6. VMware solutions support IT organizations as they manage the business of IT.

VMware IT financial management, vendor governance and service-level management capabilities provide the rigor and discipline required to optimize the business value of your IT investments and to improve your control over IT activities. They deliver complete, consolidated visibility into IT costs—from capital and operating costs to service costs—across a broad range of financial data sources. To explain the real financial value of virtual machines, for example, organizations measure and track the cost of resources and services consumed by end users. This process, in turn, drives better resource utilization and IT budgeting. With VMware vCenter Chargeback™ (a vCenter Operations Management Suite solution) IT organizations establish pay-for-use models for each department or team, reflecting virtual datacenter and actual usage parameters as IT transforms existing datacenters into cost-effective, flexible private cloud environments.

VMware solutions collect and abstract information, model it and publish service, cost and governance models. They allow enterprises to manage IT agendas with deep financial discipline, leveraging fact-based decisions across the IT portfolio so that leaders make informed financial trade-offs aligned to business priorities. Ultimately, they enable more effective engagement with your chief financial officer (CFO) and your line-of-business stakeholders through meaningful measurements and reports, including a bill of IT services, chargeback, service level reporting and vendor scorecards.

As IT organizations accelerate their adoption of virtualization and move to cloud computing, this growing maturity is often accompanied by a transition from a technology-centric to a service-centric IT model. With its open, configurable platform and intelligent automation, VMware Service Manager enables IT organizations to deliver service excellence in dynamic virtualization and cloud environments. VMware Service Manager-Cloud Provisioning enhances these benefits by providing end user self-service access to IT and cloud services via a user friendly service portal and service catalog and by governing service requests and approvals using sophisticated workflows.

As VMware capabilities in this area expand, your enterprise will be able to plan, manage and optimize cost and value in the emerging world of cloud-based, dynamic IT. VMware IT Business Management Suite solutions help your IT organization to make informed sourcing decisions based on fundamental criteria such as cost, risk, performance and compliance, and to successfully communicate those decisions to your CFO and line-of-business stakeholders. Ultimately, they enable your CIO to act as a broker of IT services in full alignment with business needs.

Transform Management in the Cloud Era with VMware

Cloud computing promises to deliver greater agility and lower costs. VMware virtualization and cloud management solutions provide the visibility and proactive management capabilities required to accelerate the realization of these benefits. VMware management solutions provide an evolutionary path to a more flexible and dynamic environment so that you can maximize the return on your existing IT investments.

By automating and integrating expensive, time-consuming, primarily manual IT operations, VMware management solutions free IT resources to shift their attention from maintenance to innovation. As infrastructure costs decline, IT leaders can begin to invest in application modernization, end-user computing and IT business management—further steps on the journey to enabling IT as a service. VMware management solutions support IT transformation, which leads to greater IT and business agility. As a result, you can better meet your business needs.

Only VMware delivers management solutions that provide efficiency through utilization and automation to make smarter and better use of virtual and cloud environments. Only VMware offers dynamic compliance and performance in the face of accelerating change, and only VMware supports freedom of choice through management interoperability with cloud ecosystem partners as you transform IT and your business.

By leveraging VMware virtualization as the foundation for your cloud and managing applications in a private, public or hybrid cloud, you can make your organization more responsive. Whether you are just getting started or you are already well on your way to achieving IT as a service, VMware solutions help IT keep up with the speed of your business. With VMware management solutions, you can create the improvements that lead your business to increased self-service and lower operational costs, ultimately enabling you to deliver IT as a service.

VMware IT Management Suites and Services

VMware delivers three distinct and compatible IT management solution suites supported by professional services.

VMware vCenter Operations Management Suite

An integrated performance, capacity and configuration management solution, it leverages the deep insight of vSphere performance and optimization characteristics. Its capabilities include patented analytics that unify performance data and speed time to resolution; automated capacity analytics to identify over-provisioned virtual machines and rightsize infrastructure resources; and automated provisioning and configuration analysis to help IT maintain continuous compliance with operational best practices, security policies and regulatory requirements.

VMware vFabric Application Management Suite

Purpose built to work across virtual and cloud computing environments, its closed loop application provisioning and monitoring capabilities enable tighter and more effective cooperation between development and operations teams. Integrated with the vFabric Spring Tool Suite, it is built on an open, standards-based, extensible framework, and includes autodiscovery, intelligent monitoring, and policy-based monitoring, alerting and control.

VMware IT Business Management Suite

A single pane of glass revealing real-time IT costs, services measurement and management, and vendor governance, its capabilities include modeling and inter-relating cost structures, service provisioning, service-level measurement, service support and vendor governance. It features streamlined applications and processes for the dynamic nature of cloud computing; balanced score cards to optimize decisions on costs, services and vendors; and benchmarks to compare your cloud metrics against peers.

VMware Professional Services

To accelerate the adoption and implementation of VMware IT Management Suites, VMware Professional Services offers the following:

VMware Consulting Services

In-depth expertise to help enterprises administer and optimize the operations of infrastructure and applications in virtualized and cloud computing environments using proven, repeatable delivery methodologies.

VMware Education Services

Industry-leading technical training and certification programs that build the management and operations expertise of virtualization and cloud computing in IT organizations.

VMware Technical Account Manager

Cross-functional VMware experts who help enterprises reach their IT management goals.

