



# VMware vCenter Product Family:

Service-Level Management for Dynamic IT Infrastructure

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## The Need to Measure and Manage to Business Outcomes

### How do you measure the business value of IT?

According to Bobby Cameron, Forrester Research's principal analyst for CIO issues, it's not as straightforward as you may think. "Too many organizations get lost in a tangle of measures and numbers that may or may not prove meaningful."<sup>1</sup>

If you can't measure it, the saying goes, you can't manage it. IT organizations are awash in spending, performance, risk and ROI metrics that flow into reports and presentations delivered at IT governance meetings. But are they the right metrics? Or are they "a tangle of measures and numbers" that are inward-looking, defined by technical context and missing the forest for the trees? The "forest," so to speak, is the set of services that enable the organization to transact business – in total, these services represent the business itself. The "trees" are the components that underlie the services – the nuts and bolts of IT infrastructure on which the business runs.

IT staff is very good at seeing the "trees" – they are well-practiced at measuring and managing the components of infrastructure. To better understand IT's value, however, requires a better way to manage the services; a fundamentally different approach that raises IT management above the level of components to the level of the services that drive and, in the end, build the business.

### What Is Service-Level Management?

The IT industry has been moving toward the goal of service-level management for many years. This goal is typically defined as the monitoring and management of the quality of service (QoS) of an application using key performance indicators (KPIs). This definition, however, only partially covers the case. It describes a sort of snapshot of a service, once it is up and running. What it does not describe is the nature of the relationship and expectations between IT staff and the consumers of the service; how a service is launched, maintained or decommissioned; who pays for the service and so on.

A comprehensive service-level management model must encompass all of the above and deliver the following capabilities:

- Enable business owners to easily request services, specify desired service levels, and then consume those services – without understanding the intricacies of the infrastructure.
- Enable IT to dynamically manage the underlying resources to ensure proper QoS to the business, based on the business owners' specified requirements – in other words, to manage what business owners and application users understand, the degree of availability, security and performance the service requires.
- Automate, regulate and monitor service level compliance through policies that are built into the IT service definitions provided by the business owners.

- Provide clear cost accountability and a transparent charging model, enabling IT to report regularly on the cost, quality and consumption of IT services, and helping customers understand exactly what services they are paying for.
- Enable IT to maximize cost-effectiveness by optimizing the service delivery and management value chain, which includes building standard IT service offerings for mass consumption and automated delivery, and managing infrastructure largely through lights-out automation.

### A Unique Approach to Service-Level Management

The VMware® vision is to bring a new level of simplicity to IT by enabling such a service-level management model that comprehends everything from how end users request services to how IT manages service levels. VMware continues to advance toward this vision with a platform and products that make IT infrastructure available as a ubiquitous, easily accessible and reliable utility service, conceptually similar to the telephone or electricity.

Such an infrastructure transformation will position IT as a service provider with the ability to seamlessly interact with both business owners (who request new services) and end users (who consume them), clearly understand and manage their expectations, ensure that infrastructure delivers the services efficiently, and transparently allocate costs for the services delivered.

While the notion of service-level management is not new, what is new is the inherent attributes of virtualization technology that can be leveraged to attain it. VMware brings three unique enablers to turn this vision of service-level management into an operational reality:

#### 1) Encapsulation: Encapsulate an entire IT service into a standardized software container.

The first enabler, encapsulation, is provided by VMware vSphere™ 4. As the industry's leading virtualization platform, VMware vSphere abstracts applications from the complexity of underlying compute, storage, and networking infrastructure. VMware vSphere 4 has taken a major leap beyond virtualization to become the industry's first cloud operating system. As such, VMware vSphere enables IT to manage these large collections of infrastructure holistically as a seamless, flexible, and dynamic operating environment – in essence, an internal cloud – whose pooled resources can be allocated very quickly and dynamically to any application. VMware vSphere also gives the underlying infrastructure the intelligence to automatically ensure service levels with built-in management capabilities such as dynamic load balancing and fault tolerance.

<sup>1</sup> Samuel Greengard, "Putting IT Metrics to Work," CIO Insight, 19 April 2009.

**2) Describing Service Levels: Describe service levels required by the IT service.**

The second enabler is provided by VMware vApp, a new model for describing and managing applications. A vApp expands on the basic power of virtualization - the fact that virtual machines are standardized software files that can easily be moved, copied and managed. Just as a virtual machine encapsulates the application, middleware and OS into a single file, a vApp encapsulates an entire multi-tier application, including multiple virtual machines, as a fully configured and optimized software stack.

vApps offer a standard way to describe operational policies for a service, which is important for the automation and application mobility necessary for service-level management. Just as the UPC bar code contains information about a product, a vApp uses the industry-standard Open Virtualization Format (OVF) to specify and encapsulate all components of the service as well as its service level requirements. The OVF standard "translates" intuitive human-language instructions for levels of availability, security and tolerable application latency (performance) into machine instructions to be executed by the IT infrastructure. In the future this mechanism will let business owners specify service levels and enable the infrastructure to manage to these service levels in a highly automated way. vApps are also a key construct for the private cloud since they will move freely across internal clouds and to external clouds (and back), always with the same service levels no matter where they run.

**3) Policy-based Automation of Critical IT Processes: Dynamically manage service levels through policy-based automation.**

The third critical enabler for service-level management is the VMware vCenter™ family of products. The VMware vCenter family of products has evolved to become a comprehensive set of capabilities for managing IT services with highly-automated, policy-driven administration of operations, from self-service request through chargeback. VMware vCenter uniquely leverages the power of virtualization and the capabilities of the VMware vSphere platform to deliver dramatically simpler and more effective management. VMware vCenter, together with VMware vSphere, understands and executes policies associated with infrastructure and applications which enable IT to simplify or eliminate routine management tasks.

**VMware vCenter Product Family Delivers Efficiency, Control and Flexibility**

The VMware vCenter Product Family comprises a scalable core management platform that is augmented by various solutions that enable service-level management across the entire lifecycle of a service, from end user request to decommissioning.

VMware vCenter Server--the central management server for organizing, monitoring and configuring an IT environment through a single interface--is a universal control center for virtualization management. As virtualization expands across the datacenter, a management platform that can both scale and plug into your existing architecture is critical. VMware vCenter

Server does both, enabling management of up to 1,000 hosts and 10,000 virtual machines from a single console and offering an open plug-in architecture that supports a broad range of additional capabilities from VMware and its partners. More than 200 VMware partners directly integrate with VMware vCenter Server using its APIs, which enables integrated physical and virtual management and freedom to use existing enterprise management tools to connect to VMware vCenter Server.

VMware vCenter Server also serves as the foundation for the VMware vCenter family of products. For customers, the VMware vCenter product family takes a quantum leap forward along three dimensions: Efficiency, control and flexibility:

- Operational efficiencies and savings. Built-in management features and automation in VMware vSphere and VMware vCenter products dramatically simplify IT management, streamlining or eliminating many tedious day-to-day operational tasks, thereby increasing administrator productivity, improving server to administration ratios, and freeing staff to pursue new strategic initiatives.

IXIS Capital Markets has reduced labor costs by as much as \$6,500 per server deployment and deployment time from as many as 17 days to as few as five hours, while increasing its server:admin ratio to 51:1.

- Broadest and deepest capabilities for managing IT services. The VMware vCenter family of products provides unprecedented IT automation for managing and controlling service levels in the areas of provisioning, capacity management, application performance, configuration management, operations management, self-service/request management and chargeback.
- Unprecedented flexibility for greater business value. What used to take weeks or months to accomplish now takes minutes; infrastructure can be provisioned and service levels managed with unprecedented automation. This improved flexibility enables IT to respond and add value to the business with new levels of speed and reliability.

Now, with the next-generation VMware vCenter family of products, IT can fulfill its mission to quickly deliver services in response to the needs of the business and ensure they perform at user-defined levels of availability and reliability while minimizing capital and operating costs.

## How Will Service-Level Management Change Life in the Datacenter?

The VMware vision is to bring a new level of simplicity to IT – a vision of IT in which many typical day-to-day management tasks are eliminated and the infrastructure is always properly deployed, configured, and available to support QoS for workflows of any size or complexity. To see how this vision may actually play out in the datacenter of the near future, let's walk through several scenarios.

### Requesting a New IT Service with Component-level Management

A user requests a service manually, which sets in motion a long, multi-step vetting and development process. A lot of people and heavy lifting are involved. Deployment takes weeks or months as IT waits for equipment to be delivered and then goes through a manual and time consuming process to assemble the many hardware and software piece parts. Hardware sizing is uncertain, usually resulting in over-sizing; because hardware resources are difficult to redeploy once committed to a specific application, increased cost and inefficiency result.

### Vision for Service-Level Management

Under the service-level management model, self-service is available to requestors through pre-configured service offerings (for most applications), infrastructure to support the service is automatically deployed, and there is upfront visibility into the associated costs.

Let's look more closely at how the self-service system might work: A business team collects and discusses requirements for the service – including availability, security, monitoring and resolution response times. Armed with these requirements, the business team logs into a self-service portal and is presented with a set of standard vApp service offerings; deployment options (such as for development, test, pre-production, or production); and service-level options. Each option includes OVF metadata that describes the service and its service level requirements, and is used by the infrastructure to drive how the vApp is deployed, configured and managed.

A "Production" deployment, for example, might automatically determine that an application is assigned to a certain network, is backed up every night, runs on a Tier 1 SAN with array-based replication, etc. A service-level selection would package certain QoS attributes with the vApp, such as availability requirements, security policies, level of monitoring, application performance, etc., and map business requirements to how IT plans to deploy and manage the IT service to meet its defined service levels.

The business team members don't need to understand anything about the infrastructure that underlies their choices – they simply focus on their business requirements. And these requirements, once specified, are then translated into machine instructions to be executed by the IT infrastructure – a key to reducing repetitive IT tasks and driving automation through the system.

### Today's VMware vCenter Building Blocks

VMware vCenter Lifecycle Manager allows administrators to implement a consistent, automated workflow to track and control virtual machines throughout their entire lifecycle, from provisioning to operating to decommissioning.

With Lifecycle Manager, IT can create a catalog of standard, pre-defined IT services. This makes it easy for users to select from a self-service catalog, while enabling administrators to maintain control over what types of resources are deployed into the IT environment. The request and approval process is streamlined with Lifecycle Manager's consistent and scalable mechanism for routing virtual machine requests, which ensures compliance with internal policies and also facilitates tracking virtual machine ownership and lifecycle status. In addition, chargeback metrics can be associated with specific virtual machines and tied back to specific business groups or tied in to existing financial systems.

### Customer Example

**TradeBeam**, based in the San Francisco Bay Area and with operations in the US, Europe, China, and India, is a Global Trade Management (GTM) software and services company. With more than 5,000 customers, TradeBeam faces the same challenges as traditional IT departments but on a much larger scale. The company needed the ability to instantly provide an environment where any of its customers can come in and test solutions before putting them into production.

With VMware vCenter Lab Manager and VMware vCenter Lifecycle Manager, TradeBeam can quickly and easily accommodate software builds and validations using the same resources for multiple functions simultaneously.

"If a customer wants to see how a particular system works, we built out a virtual environment for them behind the scenes," says Nasser Mirzai, senior director of IT at TradeBeam. "If they like it, then we simply move to the next phase which is integrated with production. If they don't like it, we can decommission that setup, wipe out the virtual machine, and then move to the next customer."

"It used to take two to three people about a week to set up and configure a customer environment," says Mirzai. "With VMware, that's something we can now accomplish in half a day. We're probably saving as much as a month of man hours when it comes to configuration of environments."

"By leveraging the VMware platform, I can scale with a relatively small amount of hardware and not have scores of servers just sitting there in case I need them."

## Provisioning a New IT Service

### With Component-level Management

With the component-level management approach, simply deploying a new server – let alone provisioning an entire application – “was a pain in the neck,” says Jim Jones, a network administrator for an independent telephone company located in the Flint Hills of Kansas. “You’d have to size the machine, plan on it being bigger, buy it, get it in, and it’s not like the last machine you got, so you can’t deploy your standard image on it. You have to install your operating systems from scratch, get your drivers rounded up, mount the servers in the racks and possibly disrupt service if you start knocking cables around. Then you have to make sure you have enough power.”

Then there’s testing and troubleshooting, which can be notoriously inefficient processes. At many companies, there is no dedicated testing infrastructure. When there are dedicated facilities, they’re too often out of sync with production – either the OS/app configuration or the app data. Test systems have to be re-provisioned often, which is inefficient and slow. Testing and troubleshooting can be a major cause of lead time and staff overhead, especially with multi-tier apps where the cause of app problems can be more difficult to identify and changes must be tested in the context of the other app components.

### Vision for Service-Level Management

We’ve already seen the business team making its self-service choices based on the available vApp service offerings and deployment and service-level options.

Now, the VMware system takes in the request from the business team and drives automatic deployment and configuration to support the required service levels. The system first checks to determine if sufficient capacity is available to support the requirements of the new service. If not, new servers can be provisioned and automatically added to the pool of available resources.

Once capacity availability is assured, the system then decides on which infrastructure to place the servers (let’s say Web, application and database servers, in this case) that are needed to support the service. It makes this decision by policy-driven mappings that have been set up by the infrastructure team. In the case of the vApp offering that was chosen by our business team, the servers need to be provisioned to high-end servers, tier-1 storage and a high-speed network.

While provisioning the servers to support the IT service, the system is already in the process of configuring the environment to ensure that the defined service levels are met. In this case, the system enables High Availability and Fault Tolerance; auto-configures Disaster Recovery which creates a shadow virtual machine at a secondary failover site, initiates nightly backup, and ensures that network access abides by the Tier 1 security policies.

In addition to infrastructure configuration, the system automatically configures how the new IT service will be managed. It does this by auto-configuring alarm thresholds and event levels, setting policies that restrict the ability to make changes to the servers without proper change approval and windows, mapping the service for proper cost accounting back to the business owner, and configuring transaction monitoring to ensure overall service health.

By the time the service is ready for production, not only has it been auto-configured but it has also created a map of visibility and relationships that exist across the entire IT service. This information is made available to the IT team to help them troubleshoot any potential future issues as well as understand the potential upstream and downstream effects of making any changes to the service over time.

### Today’s VMware vCenter Building Blocks

**VMware vCenter Lab Manager** provides on-demand access and automated management of an internal cloud environment for development and testing. This building block provides self-service access for application owners, development, QA, and training teams who can deploy, capture and share multi-tier application environments in seconds. Lab Manager saves time, simplifies administration of fast changing environments and enables project teams to get to market faster.

**VMware vCenter Orchestrator** is a powerful automation orchestration tool that enables you to put together, via an easy drag-and-drop interface, automated workflows of tasks and processes specific to your needs and environment. With Orchestrator, you can schedule and automate tasks through building blocks that represent more than 800 virtual infrastructure processes. This enables you to visualize and build flexible workflows without the need to know scripting.

For example, one advanced Orchestrator user created a workflow to automate datacenter migration. This workflow migrates an entire datacenter with the click of a button, performing a series of VMware vCenter operations on each virtual machine in a cluster, including a VMware VMotion™ migration, until the entire set of virtual machines has been migrated to a cluster in another datacenter.



### Customer Example

**Alstom**, as designer, builder, and servicer of technologically advanced products and systems for the world's energy and transport infrastructure, has built the plants that supply around 20 percent of the world's electrical power. "It's not just about saving money on hardware, but also about simplifying things like application provisioning, maintenance, high availability, and disaster recovery," says Dirk Holzwarth, Alstom's Team Leader for VMware Infrastructure. "It's just easier to get things done with VMware. Thanks to VMware, my wife and kids see me more often."

Recently, Alstom's CEO decided that he wanted BlackBerry up and running for the company in two months max. With physical infrastructure, provisioning the hardware, configuring the OS, and deploying BlackBerry would have taken four months. With VMware, it took one month – half the time mandated by the CEO. The IT team spent a few weeks creating VM templates that met their requirements, then provisioned BlackBerry from the templates in a matter of hours onto the VMware platform.

"As one of the largest global manufacturing companies, it is important for us to keep operational costs low," says Daniel Liyew, Alstom's Director, Data Centre Service Line. "We have standardized on VMware Infrastructure and its comprehensive application management toolset to improve flexibility and maximize operational efficiency."

**VMware vCenter CapacityIQ** helps ensure that adequate capacity is available to virtual machines, resource pools, and entire data centers by modeling the effect of capacity changes, forecasting shortfalls and proactively reclaiming excess capacity. Administrators can perform "what-if" impact analyses to model the effect of capacity changes by simulating real-world use cases such as the addition of new headcount or workloads through growth or acquisitions. CapacityIQ continuously profiles, analyzes and tracks your capacity needs at multiple levels – virtual machine, host, cluster and datacenter – which enables forecasting of the timing of capacity shortfalls and bottlenecks to deliver the right capacity at the right time to avoid such problems – and the costs and QoS hits associated with them. CapacityIQ helps determine if resources are over- or under-provisioned to virtual machines, and by right-sizing or decommissioning over-allocated, idle or inactive virtual machines, safely frees up any unused capacity to eliminate waste and reduce costs.

## Maintaining Clean Configurations

### With Component-level Management

It is difficult to maintain a clean state for applications and virtual machines because of configuration drift, especially in a dynamic virtual environment. Virtualization tends to drive an increased rate of configuration change. Virtual machines can enter and exit the environment at a much faster rate than physical machines, and their temporal state can change rapidly as they are created, deleted, moved, suspended, cloned, etc. Configuration management data kept in a spreadsheet needs to be manually updated and quickly becomes out of date. Reporting is ad hoc, and the impact of configuration changes to IT often is unknown. All of this increases the need for configuration management – the need for visibility into the state of virtual machines anywhere in the system, the need for automated discovery of configuration changes, and the need to control changes and their impacts.

### Vision for Service-Level Management

Virtualization tends to drive an increased rate of configuration changes, as noted, but it also enables new ways and a greater degree of configuration automation and control. Under the service-level management model, administrators can discover, track and model configuration data and relationships across all infrastructure layers, and make informed decisions based on a continuous, real-time operational view of the virtual environment. Administrators can set desired-state policies and then proactively manage and validate configurations against these policies, identifying non-compliant configurations to proactively remediate and understand "what changed" in order to troubleshoot. Moreover, administrators not only have greater visibility into historical changes in order to control configuration drift, they also have insight into prospective configuration changes and can perform impact analysis for planned configuration changes against the modeled virtual environment, avoiding QoS hits or violations to compliance requirements. Administrators also benefit from proactive policy enforcement, for example, by setting policies that prevent an unauthorized action from taking place in the first place. These policies have unprecedented breadth and control because virtualization introspects the layers of server, storage and networking infrastructure.

### Today's VMware vCenter Building Blocks

VMware vCenter ConfigControl (as of writing scheduled for availability 1H 2010) lets you harness the flexibility and velocity of virtual infrastructure while improving control. The result is faster change that creates value for the business without increasing risk.

**ConfigControl** provides greater configuration visibility, automatically discovering information about configurations, dependencies and compliance across your environment, including all virtual configuration elements. This intelligence puts historical and real-time data at your fingertips with powerful search, modeling and contextual visualization. The change management database is auto-populated – no more manual updating – and reports are pre-defined and auto-run.

ConfigControl also reduces risk and downtime from non-compliance by enforcing desired configuration states. You can identify issues before they cause downtime with dependency analysis for planned changes, automated remediation of host profiles, and best practice views of host, virtual machine, storage and network configuration drift.

### Ensuring Service Levels

#### With Component-level Management

In the component-level management model, the administrator sets alerts at various infrastructure levels. But it's usually the end user who discovers a service-level problem in the form of slow or spotty application performance, and calls the help desk. The help desk routes a trouble ticket for investigation. Administrators troubleshoot the problem, often by physically going to the user's desktop, and attempt to fix it. Understanding the causes of performance degradation caused by the infrastructure, as opposed to the desktop itself, is difficult and time-consuming and can degrade service levels if left unresolved.

#### Vision for Service-Level Management

Under the new model, once a IT service is requested and provisioned onto the infrastructure, the system not only will monitor it and send notifications based on events, it will automatically regulate itself to help ensure compliance, self-correct configuration errors, protect workloads from unplanned changes, and self-update.

Working with administrator-set policies, the system will have a high-level of built-in intelligence that enables it to understand and correlate events that are occurring in order to make automated decisions that may resolve potential issues without an administrator having to get involved. To ensure compliance related to configuration policies such as network and host settings, the system will establish "gold standard" configurations that all elements in the environment are measured against for consistency. Any variations from desired state will be auto-corrected to bring the infrastructure back into line.

Infrastructure will be able to automatically scale according to demand and policies set by the administrator. For example, if the system detects that the IT service's Web server is running out of memory, it could automatically take corrective action to hot-add memory to the virtual machine. If the application takes on too much load, the system can automatically provision a new Web server to help balance transactions and then remove the added web server when load returns to normal.

In addition to self-scaling, the system will also monitor against point hardware failures and make proactive decisions to move servers to support the IT service and reduce or eliminate the chance of an outage. For any hardware components that might be failing, the system will not only take remedial action, but will also mark nodes as bad so that other workloads do not run on them while the administrative team resolves the issues.

For unplanned changes, if an administration tries to shut down one of the servers or modify the networks to which a server has access, the system will use policies to automatically lock down these actions from occurring without proper approval. Policies can also be defined to drive automated decision-making for when and how new updates and patches are implemented to the infrastructure in a way that reduces the need for application downtime.

#### Today's VMware vCenter Building Blocks

Availability services built into VMware vSphere enable IT administrators to provide applications with varying levels of high availability depending on their priority, without the need for complex redundant hardware or clustering software. Through such unique capabilities as VMware VMotion and VMware Storage VMotion, scheduled downtime due to server maintenance or storage maintenance can be eliminated; and unscheduled downtime or data loss can be eliminated or minimized through unique products and features such as VMware vCenter Site Recovery Manager, VMware High Availability, VMware Fault Tolerance, and VMware Data Recovery.

**VMware vCenter Site Recovery Manager** integrates seamlessly with VMware vSphere and VMware vCenter Server to make recovery plans easier to manage and update, turning the complex paper runbooks associated with traditional disaster recovery into an integrated part of your virtual infrastructure management. By simplifying and automating recovery, Site Recovery Manager eliminates error-prone manual steps in the recovery process and ensures that recovery procedures are consistently, quickly, and reliably executed as intended.

**VMware vCenter AppSpeed** provides answers to many of the performance questions relating to end users. With proactive performance management and service-level reporting for apps running within virtual machines, AppSpeed provides visibility into multi-tier applications (performance, usage, and dependencies) running across both virtual and physical infrastructure. Easy to install and non-intrusive, this self-configuring solution discovers, monitors, and reports within minutes of download.

AppSpeed is packaged as a virtual appliance. Once deployed on VMware vSphere, it enables you to:

- Automatically discover and map IT services to individual apps and infrastructure components.
- Monitor end-user service levels, identify bottlenecks, and correlate them to the performance of individual components.
- Size infrastructure dynamically and optimally to ensure that service levels are met most cost-effectively.

## Understanding Cost and Charging for IT Services

### With Component-level Management

Under the existing model, business units may pay for new servers when they request a service, and some costs may be roughly allocated to different units, but IT costs are not accurately understood or allocated in terms of resource consumption.

### Vision for Service-Level Management

Under the new model, business owners have visibility into the cost of new services from the time that they request a service, and both they and IT administrators have visibility into the actual consumption of resources, with business units paying for what they consume. Visibility into the cost and quality of services both upon request and on an ongoing basis helps business users make decisions that ensure service level requirements are met and cost is minimized for the business.

### Today's VMware vCenter Building Blocks

**VMware vCenter Chargeback** ensures accountability and drives efficiency across the business by allocating and reporting on costs associated with the use of virtual infrastructure. With Chargeback, multiple factors such as cost-based models and fixed costs can be mapped to datacenter resources and then applied across cost centers.

For organizations that may not yet be ready to implement fully a chargeback model, Chargeback provides valuable information to the business with a clear view into resources consumed and their associated costs. For organizations that are ready to transform IT from a cost center to a value center, Chargeback automatically creates detailed billing reports, enabling different amounts to be charged for different tiers of infrastructure. Now, business units can optimize resource consumption and costs based on an accurate understanding of how much of the business' resources they are consuming.

## Maintaining IT Services

### With Component-Level Management

With component-level management, testing and deploying an application is a manual, time-consuming and resource-intensive process that requires long lead times for provisioning, replicating bugs manually, re-building systems at each stage, etc., and often involves spiraling complexity.

### Vision for Service-Level Management

Applications and updates to production environments are rolled out using an internal compute cloud which enables self-service access to a library of multi-tier configurations, instant sharing and movement of exact configurations from one phase to another, and much easier collaboration among groups (e.g., dev to test, across geos). Capital costs are reduced because far less hardware is required, and opex is cut through faster time-to-market for new services, which means both less labor and quicker return on investment. Furthermore, reliability increases due to fewer mistakes in rolling out updated applications, which equals less rework and less downtime.

### Today's Building Blocks

**VMware vCenter Lab Manager**, introduced in 2006 and now in its fourth generation, enables IT to create and manage an internal cloud for dev-test, accelerating processes through self-service access to the resources needed to develop, test, stage, and deploy complex, multi-tier applications. With Lab Manager, developers have on-demand, role-based access to a shared library of pre-configured multi-virtual machine environments, which eliminates the need for repetitive system setup and teardown, while enabling IT to maintain full security and administrative control. With Lab Manager, complex IT services can be provisioned in minutes using snapshots and clones, tested faster using exact replicas of production environments, and the entire application lifecycle can be automated – from integration to testing to staging to user acceptance and into production. This dramatically increases speed of putting IT services into production and reduces the risk of problems once deployed.

“VMware vCenter Lab Manager obsoletes many manual processes and lets us be more pro-active and innovative,” says Jay M. Leone, Lab Manager for Avaya, a market leader in voice and data technology for the enterprise. “I can't think of any other product, process, or project that has had a greater impact in our daily activities. Everything just runs with little interference. We've become hugely reliant on Lab Manager to help us test our software better and faster. Ultimately, we've found VMware not only offers invaluable tools, but a way of life.”

## Customer Example

**Princeton Softech**, acquired by IBM in late 2007, provides enterprise data management software that helps organizations manage information, improve application performance, mitigate risk, and control IT costs. The company's IT team already had its hands full supporting basic test environments needed by dev and QA teams; on top of that, in pursuit of new market opportunities the company began providing integration with ERP and CRM applications.

"Originally, we had to ensure compatibility with a larger number of complex application environments," says Jim Rhodes, VMware Administrator for Princeton Softech. "Now, we have to support different flavors of ERP and CRM applications, each with its own different versions, in combination with each of the major databases. We moved from testing against a dozen combinations to supporting hundreds of application combinations. What was initially a tough job was becoming impossible without increasing hardware spending and IT headcount."

Princeton Softech solved its lab challenges with VMware vCenter Lab Manager. "Before Lab Manager, we didn't have the versatile, on-demand environment we needed. Virtualization helped, but even then, requiring IT support to provision specific environments created bottlenecks," says Rhodes. "Lab Manager allows us to support as many ERP and CRM environments as possible to satisfy the needs of our engineering talent and to achieve our business objectives. With Lab Manager, we simply capture the entire multi-virtual machine environment for future use. The time spent went from hours to seconds."

The self-service aspects of Lab Manager also helped relieve a strained IT department. "Our QA, development, and product support teams all have browser-based access to the Lab Manager library of environments," says Rhodes. "With a few clicks, they can access an environment that fits their requirements. Or, if the needed environment does not exist, they can provision a new one. And Lab Manager allows me to control the number of VMs allocated to a given user to make sure that resources are being used effectively."

## Summary

We started this paper with a nod to the fact that measuring and managing to business outcomes is a desirable goal – but a goal that is easier said than done.

Today, many companies are moving from a component-level management approach to a service-level management model, and they are doing so by first transforming their data centers with virtualization.

The goal at VMware is to bring new levels of simplicity and automation to IT to enable our customers to move toward the model of IT as a service provider – delivering IT services to the organization in much the same way that phone or electricity services are delivered.

Just as with those services, providing IT as a service enables business users and application owners to easily request services, specify desired service levels and consume and pay for those services, all with a high degree of reliability and without having to understand the underlying infrastructure.

In essence, the VMware approach hides the complexity of the infrastructure from users. It changes, in fundamental ways, how end users request services and how IT delivers service levels with dynamic, flexible, and reliable IT infrastructure. This transformation positions IT as a service provider with the ability to seamlessly interact with end users, clearly understand and manage their expectations, and ensure that IT infrastructure delivers what the business needs and transparently allocates costs for services delivered.

We've looked at how the VMware vCenter product family, together with vSphere, represent the only complete stack for shifting the data center paradigm from component-level infrastructure management to true service-level management of dynamic IT infrastructure. And we've seen how the service-level management approach enabled by VMware, as compared with the old component-level management approach, delivers tremendous advances in efficiency, control, and flexibility. From component-level management to the internal cloud and true service-level management, VMware provides an evolutionary approach that delivers revolutionary results.

For more information, please visit [www.vmware.com](http://www.vmware.com) or contact your VMware representative.

