



Reduce the Total Cost of Ownership in Your  
Virtual Data Center with BMC Software and  
VMware Solutions

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## Executive Summary

Efficient use of computer resources is essential to a company's overall success. Yet maintaining a data center can be costly and overwhelming. The right combination of business service management and virtualization can lower total cost of ownership (TCO), deliver faster and more comprehensive services, increase revenue opportunities, and reduce overall risk to the business. BMC® solves common data-center-lifecycle management problems by enabling you to discover and analyze your current environment which enables you to predict future needs, as well as supplying the framework for continuous control of business services, allowing delivery of higher service availability and performance through automated policy-based orchestration. Separately, or in combination, this results in lower TCO, increased revenue opportunities and reduced risk to the business.

VMware® technology works with your current infrastructure solutions by enabling you to eliminate hardware dependencies which gives you the flexibility to choose the right operating system for the right application. Virtualization solutions from VMware reduce your TCO and increase your Return on Investment (ROI) by providing opportunities for server consolidation, rapid provisioning, and availability and resource management, thereby creating an efficient, highly utilized, and available infrastructure.

This paper describes common business problems and explains how BMC, in its partnership with VMware, can help you identify and solve these problems. Business scenarios describe how a combination of BMC applications and best practices — with virtualization technology from VMware — addresses data center problems and improves overall efficiency.

## Business Problem

For most businesses, TCO is increasing. Several factors contribute to this increase. Your business might have adequate computing resources, but that might mean it has four or five times the resources necessary. These resources cost money to maintain. Routine maintenance, space requirements, cooling expenses, security patches, and other factors add to the overall cost of server maintenance. [Table 1](#) describes some common IT problems that many businesses face.

Table 1 Common IT Problems for Businesses

Problem	Description
Monitoring is costly.	Constantly monitoring and reacting to server failures can be costly.
Physical servers fail.	When a physical server fails, it must be replaced before it affects service levels.
More servers are needed.	Data center administrators request more servers; however, most of the existing servers are less than 15 percent utilized.
Resource planning is difficult.	Businesses need to know exactly what resources are needed and when they are needed. Inadequate planning leads to high IT costs and risk to services.
Security patches are cumbersome.	Upgrading several servers with the latest security patches is time-consuming and takes time away from more productive tasks.
Users overload services.	Servers need to be added to a particular service before customers overload the available servers.
Servers are sprawling.	One-to-one failover for servers equals too many servers to maintain, as well as an increase in space utilized, and inefficient use of personnel and other resources.
Servers eat power costs.	The more servers in a data center, the higher the cooling and overall power costs are.
Too much time is spent on low-value tasks.	Tasks such as procurement, provisioning, support, re-imaging disks, and re-racking the data center consume valuable IT time – time better spent on more important, strategic work.

Additionally, ROI is impacted when you attempt to simultaneously eliminate resource capacity risks and cost-effectively meet application or service performance expectations. Without an effective solution to address these problems, supporting business agility with automated resource capacity while simultaneously attempting to increase efficiency, reduce costs, and meet risk management requirements becomes increasingly difficult.

## Business Solution

Virtualization enables companies to reduce costs while improving business service availability, agility, and performance. Together, BMC and VMware offer a robust virtualization solution for the X86 environment. For more information about solutions see [Table 2](#) and [Table 3 on Page 6](#).

### VMware: Transform Server and Desktop Computing Through a Virtualized Infrastructure

VMware Infrastructure 3 is the next generation of industry-leading infrastructure virtualization software that virtualizes servers, storage, and networking. This software enables multiple unmodified operating systems and their applications to run independently in virtual machines while sharing physical resources. VMware Infrastructure provides built-in management, resource optimization, application availability, and operational automation capabilities that deliver cost savings, as well as increased operational efficiency, flexibility, and IT service levels.

VMware ESX Server is the foundation for delivering virtualization-based distributed service to IT environments. It is a core building block of VMware Infrastructure, Sharing hardware resources across a large number of virtual machines increases hardware utilization and dramatically decreases capital and operating costs. Virtual machines can be equipped with high availability, resource management, operational automation, and security

features that improve service levels even to the most resource-intensive, mission-critical applications. ESX Server delivers the highest levels of performance and scalability required for enterprise IT environments.

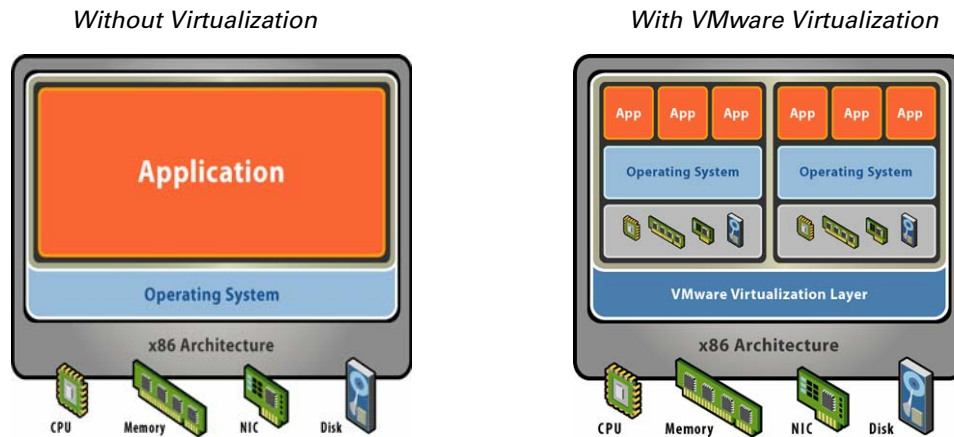


Figure 1 VMware Virtualization Infrastructure

VMware VMotion™ enables the live migration of virtual machines from one physical server to another. This enables companies to perform hardware maintenance without scheduling downtime and disrupting business operations. VMotion also enables virtual machines to be continuously and automatically optimized within resource pools for maximum hardware utilization, flexibility, and availability. VMotion is a key component of the dynamic, automated, and self-optimizing data center.

VMware Distributed Resource Scheduler (DRS) aligns computing resources with business goals while ensuring flexibility and efficient utilization of hardware resources. When virtual machine resources are constrained, additional capacity is made available by migrating live virtual machines to a different physical server using VMware VMotion.

VMware High Availability (HA) provides easy-to-use, cost-effective high availability for virtual machines. In the event of server failure, affected virtual machines are automatically restarted on other production servers that have spare capacity. VMware HA minimizes downtime and IT service disruption while eliminating the need for dedicated stand-by hardware. VMware HA provides uniform high availability across the entire VMware virtualized IT environment.

VirtualCenter delivers the highest levels of simplicity, efficiency, security, and reliability required to manage a virtualized IT environment of any size.

For more information on VMware solutions for virtualization, visit <http://www.vmware.com/products>.

### BMC: Optimize Data Center Management Through Business Service Management

BMC solutions complement VMware technologies by providing the key link to an organization's business and Service Level Agreements (SLAs), enabling organizations to continually tie IT decisions to business needs. Rather than providing virtualization at the system level, the data center optimization (DCO) solutions from BMC represent how a business service is performing, in addition to the underlying system resources, thus providing a comprehensive understanding of the overall resources required to meet business demands. BMC solutions can prevent potential performance problems by using predictive capabilities that enable an IT organization to plan and avoid impacts to service.

Through Business Service Management (BSM), BMC helps customers realize even greater savings in their IT departments by enabling them to understand, plan for, and meet specific needs. Using BMC solutions, customers can use an operational and management lifecycle approach to monitor servers they already have, identify opportunities for physical or virtualized consolidation, and comprehensively evaluate how their applications would perform if virtualized by using predictive modeling techniques. This ability ensures that customers can "right size" their VMware environments to support their application workload resource requirements.

For more information on BMC DCO solutions for virtualization, visit <http://www.bmc.com/dco>.

## Virtualization Solution Summary

Table 2 and Table 3 list key virtualization solutions from both VMware and BMC.

Table 2 VMware Key Virtualization Solutions

VMware Key Virtualization Solutions	
VMware ESX Server	Is a robust, production-proven virtualization layer that abstracts processor, memory, storage and networking resources into multiple virtual machines. ESX Server delivers the highest levels of performance, scalability and robustness required for enterprise IT environments.
VMotion	Enables the live migration of virtual machines from one physical server to another with zero downtime, continuous service availability, and complete transaction integrity.
VMware HA	Provides cost-effective high availability for virtual machines, regardless of their operating system or underlying hardware configuration. VMware HA eliminates the need for dedicated stand-by hardware.
VMware DRS	Dynamically allocates and balances computing capacity across collections of VMware host resources aggregated into logical resource pools by continuously monitoring utilization across resource pools and intelligently allocating available resources among virtual machines.
VirtualCenter	Delivers centralized management, operational automation, resource optimization, and high availability to IT environments. Virtualization-based distributed services provided by VMotion, DRS, and HA equip the dynamic data center with unprecedented levels of serviceability, efficiency, and reliability.

Table 3 BMC Key Virtualization Solutions (part 1 of 2)

BMC Key Virtualization Solutions	
BMC <sup>®</sup> Discovery	Provides an accurate, complete, and up-to-date picture of your IT environment and the end users who depend on it. Paired with a configuration management database, it provides a solid foundation for successful business service management. A specialized VMware extension automatically discovers the physical and virtual topology, simplifying the complex underlying environment for rapid troubleshooting.
BMC <sup>®</sup> Performance Manager for Virtual Servers	Proactively manages a VMware deployment to maximize availability and performance across enterprise environments. It provides real-time monitoring and management of critical resources, generating events when performance thresholds are exceeded. BMC Performance Manager takes VMware information and provides ongoing monitoring and operational management of physical and virtual resources across the enterprise.
BMC <sup>®</sup> Performance Assurance <sup>®</sup> Suite for Virtual Servers	Provides comprehensive management of VMware performance and server capacity. This suite of products gives you the ability to properly size, consolidate, and understand how business applications are, and will be, performing, and it facilitates performance optimization of virtual machines through a view of overall system use. The products also reduce risks while accelerating the move from physical to virtual, and manages physical and virtual complexities from the perspective of application response time, business cycles, and resource contention.

Table 3 BMC Key Virtualization Solutions (part 2 of 2)

BMC Key Virtualization Solutions	
BMC® Virtualizer	Helps companies deliver higher levels of application availability, reduce costs, and achieve data center consolidation by monitoring VMware VM-based applications and business services while also delivering automatic, policy-based orchestration and provisioning of resources in a physical and virtual environment delivering high availability and capacity on demand. BMC Virtualizer extends VMware HA and DRS with application and business service monitoring and control to maintain service levels
BMC® Configuration Management	Automatically provisions software, applications, and patches to optimize availability and manage total configuration change across the enterprise.
BMC® Performance and Capacity Management Services	Balances your business resources, investment, and risks associated with purchasing software and hardware, and hiring and training staff. BMC offers the following managed services: BMC® Performance Visualization Service, BMC® Performance Management Service, BMC® Capacity Planning Service, and BMC® Performance Assurance Service.

## Business Scenario

The flexibility of virtualization technology from VMware and BMC enables you to adopt virtualization in your data center at any stage in your business cycle. This section illustrates the process through a practical business scenario. A company is dealing with an over-purchase of servers, driving up administrative costs. The company has 4500 servers and 4500 employees, yet each department in the company is asking for more resources. How can any department need more resources when one server exists for each employee? The IT department is challenged with accommodating system growth while controlling costs and meeting business demands.

The company has chosen to consolidate physical servers onto a virtualized infrastructure and centralize these resources. This approach requires that the company answer key questions about its most pertinent business problems, such as what assets does it own, what level of “server sprawl” exists in its data center, and what is the effect of a large-scale adoption of virtualization to everyday operations.

## Virtualization Through a Lifecycle Methodology

Solving data center problems requires an optimization methodology that can manage operations—not just monitor them—through all business cycles. Although many active/passive failover operations are service-based, they are hardware-laden and cost-prohibitive. Conversely, virtualized data centers employ a software system based on policy and orchestration. However, after virtualization technologies are implemented, the company must maintain its virtual environment and ensure that virtualization and failover processes occur efficiently to maintain service levels. It must be able to consistently deploy a virtualization strategy that measures and manages resources in response to changes in business cycles.

BMC provides the first integrated DCO solution that automates the entire planning-to-implementation lifecycle for data center management, consolidation, and virtualization projects. Coupled with VMware’s lifecycle strategy to assess, plan, build, and manage a computer infrastructure using virtualization, BMC delivers a continual improvement cycle for data center operations, as depicted in [Figure 2](#). The lifecycle methodology is the key differentiator between a BMC and VMware partnered solution and other management solutions. Although the lifecycle model depicts numbered processes, you can start at any point in the cycle and still achieve results with high ROI.

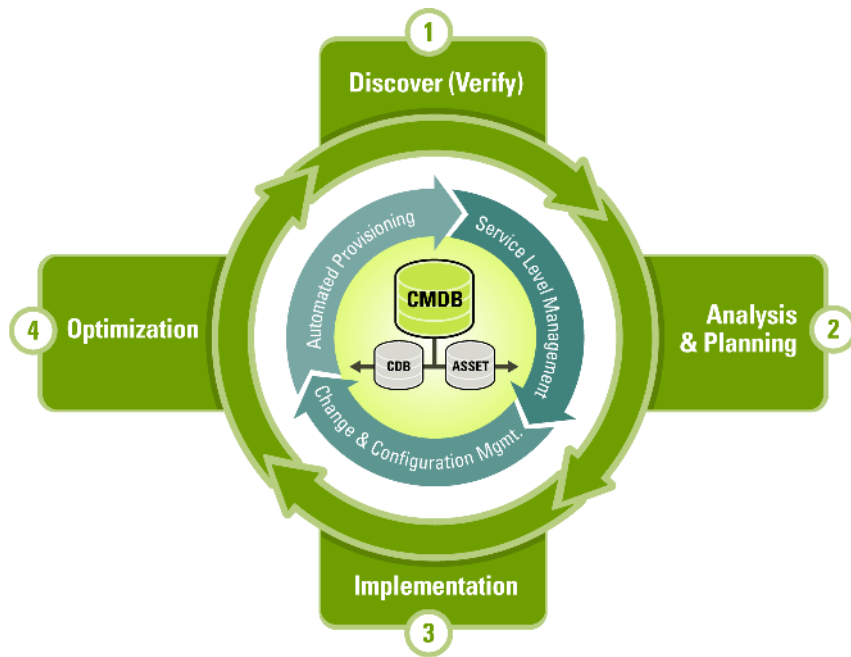


Figure 2 BMC Data Center Management Lifecycle

The following sections describe how the company in this scenario used a lifecycle methodology to achieve and accelerate virtualization across its infrastructure.

### Discover

Before successfully implementing virtualization, the company must first understand its present environment, verify the current utilization of assets, and assess any server sprawl that exists.

The company used a number of solutions including VMware ESX Server, BMC Discovery, BMC® Performance Manager Express, and BMC Configuration Management (formerly Marimba®) to identify server assets, their configurations, supported business services, and initial utilization behavior.

VMware ESX Server helps assess the effect of adopting virtual machines to operations, enabling a customer to reduce hardware and combine applications into fewer resources. The results of the inventory scan and server assessment were fed into an asset repository. The BMC® Atrium™ Configuration Management Database (BMC Atrium CMDB) maintains a data repository that provides a common view of all configuration items in an IT environment. It receives, reconciles, and stores data about IT assets—including their configurations, relationships, and dependencies—from the asset repository.

After collecting raw performance data with BMC Performance® Manager for Servers, the company used this information to determine which systems were the most likely candidates for virtualization and/or consolidation. For example, if the company has 10,000 servers, BMC Performance Manager for Servers (operating in agentless mode) can give initial CPU utilization graphs and reports to find the CPUs that are running with little or no utilization. Those servers are candidates for re-purposing or retirement. Also, in conjunction with the BMC Discovery solutions, BMC Performance Manager for Servers can find the servers that are running the same application, each of which is using an average of 10 -15 percent CPU. These servers would be candidates for consolidation or virtualization.

## Analyze and Plan

Using the information determined in discovery, the company focused on those servers, applications, and business services considered the most important and cost-effective. The company used BMC<sup>®</sup> Performance Assurance for Servers and BMC Performance Assurance for Virtual Servers to provide an enterprise view of server performance from a business perspective, and to display the performance data correlated to its assets on-screen and in hardcopy reports.

The company identified the application assets and performance characteristics of the physical servers that are *appropriate* candidates for consolidation. Using the predictive capabilities of the BMC Performance Assurance solutions, various configuration options were evaluated in terms of how existing and new business services, changes in demand or other infrastructure changes associated with virtualization and consolidation might impact business service throughput and response time. Using information from BMC Remedy<sup>®</sup> Asset Management added a financial and contractual perspective to the decision-making process of where to start consolidation and virtualization. The following solutions supply data for asset analysis:

- > BMC Performance Assurance Suite for Servers provides the ability to characterize workloads, which in turn helps to determine what workloads could be shared in a consolidation, and how they would perform after consolidation and virtualization.
- > BMC Remedy Asset Management cross-references asset utilization data with the asset costs and inventory records in the asset management system.

## Implement

The company used VMware ESX Server to start building a virtual data center. ESX Server abstracts processor, memory, storage, and networking resources into multiple virtual machines, providing greater hardware utilization and flexibility. Virtualization reduces hardware and combined applications into fewer resources. VMware Server and ESX Server run directly on system hardware to provide a secure platform for easily deploying, managing, and remotely controlling multiple operating systems.

The following solutions helped the company in this example to get the most out of its virtualized environment. For more information, see [“Virtualization Solution Summary” on Page 6](#).

- > VMware VirtualCenter let the company rapidly provision virtual machines and monitor performance of physical servers and their associated virtual machines.
- > VMotion let the company move virtual machines from one physical server to another with no impact to end users and zero downtime.
- > VMware DRS dynamically allocated and balanced computing capacity across collections of VMware host resources aggregated into logical resource pools.
- > VMware HA delivered virtual machine high availability across the entire VMware virtualized IT environment. In addition to VMware HA, BMC Virtualizer for High Availability added application and business service monitoring and control.
- > BMC Virtualizer allowed applications and business services to become highly available by monitoring critical business services and automatically orchestrating a replacement when a failure occurs at the application or business service level in concert with VMware.
- > BMC Virtualizer enabled the company to use VMware ESX Server in concert with VMware VirtualCenter to deliver application and business service high availability and scale-out to maintain performance and to establish policies for applications and their priorities.
- > ESX Server helped create a high level of server consolidation, leading to reduced TCO.

## Optimize

The company determined failover and capacity-on-demand requirements based on business needs. For mission-critical, customer-facing applications, enterprises require near-zero time latency when failures occur. However, other applications may be able to sustain small outages. Dynamic resource provisioning solutions enabled the company to prioritize its services and choose specific provisioning strategies based on the criticality of the service and the cost of provisioning. If an application can sustain 30 minutes of latency, a full provisioning strategy might be applicable. Such a strategy reduces licensing costs and power consumption.

The following solutions helped in the optimization and the ongoing operational management of the virtualized environment:

- > BMC Virtualizer enabled organizations with small and large server clusters to provide high levels of service availability and performance—and capacity on demand—through policy-based orchestration and automated provisioning. If near-zero latency is required, a possible strategy is to have a standby virtual server under VMware that BMC Virtualizer uses as a failover. BMC Virtualizer enables multiple provisioning strategies based on customer-defined requirements:
  - BMC<sup>®</sup> Virtualizer for High Availability ensured service high availability by creating a shared pool of failover servers available across applications that it dynamically provisioned when it detected that a failure would impact service availability.
  - BMC<sup>®</sup> Virtualizer for Capacity on Demand ensured service capacity on demand by configuring servers and policies for scheduled and dynamic capacity requirements, and complemented VMware DRS by performing scale-out of servers and multiple virtual machines as service performance was impacted by increased activity.
- > VMware DRS continuously monitored utilization across resource pools and intelligently allocates available resources among virtual machines. When a larger VM on another host system is not enough, VMware DRS can be extended with BMC Virtualizer for Capacity on Demand, to deliver scale-out to multiple virtual machines. BMC Virtualizer adds an additional head room to horizontally scalable applications by automatically adding additional virtual machines to an application or business service under spike load.
- > BMC Configuration Management (formerly Marimba) deployed applications by automatically delivering application updates to the associated group of users or computers.
- > VMware VirtualCenter provided detailed controls for virtual machines and fed this information to BMC Performance Manager to monitor the environment.
- > BMC Performance Manager provides ongoing monitoring and operational management of networks, applications, servers, and operating systems from a central console for both physical and virtual resources.
- > BMC Performance Assurance delivered ongoing tracking and optimization of performance and capacity of the consolidated and virtualized environment across subsequent changes in demand or configuration.
- > BMC Discovery continually ensures that current configuration information (ITIL configuration items – CIs) across all IT resources is tracked and recorded in the CMDB, including virtual machines, with ties back to the corresponding applications.

## Business Benefits

IT centers everywhere are under pressure to cut costs and optimize their data centers. As the most expensive real estate in any organization, the data center quickly comes under scrutiny. Although initial costs to purchase a server are no longer particularly high, the ongoing cost to maintain servers and house them in the specialized environments they require increases as more servers are acquired and utilized at typically only 15 percent of

their capacity. Virtualization transforms industry-standard server and desktop computing to reduce TCO and increase business agility in an organization.

In addition to the problem of managing physical servers, companies are faced with the problem of spending too much time and money on low-value tasks, such as procurement, provisioning, support, re-imaging disks, and re-racking their data center. VMware slows the physical growth of a data center by reducing the number of servers and maximizing utilization of existing server resources, thereby enabling companies to achieve more efficient use of their space while decreasing support and operational costs. The key to achieving this lies in the ability of VMware products to minimize TCO of computing infrastructure. With VMware, customers can realize a responsive data center that dynamically manages shared utilities and provides for zero-maintenance downtime.

Using BMC solutions in concert with VMware, customers can plan and manage business resources, in a lifecycle fashion, to better react to change. The key to doing this lies in the ability of BMC solutions to tie together crucial data center management disciplines that have traditionally existed in separate IT silos. With BMC DCO solutions, customers can achieve agility in their business processes and realize even greater savings across their organization.

## Conclusion

Given the prospect of cutting costs in half, and potentially lowering TCO by 30-70 percent, enterprises have made virtualization mainstream. Ten percent of all new x86 servers are deployed in virtual machines, and more than 25 percent of VMware customers have already standardized on a virtualized infrastructure. The overwhelming trend toward virtualization, particularly in data centers, proves that consolidating servers and driving business flexibility is becoming necessary for companies to adapt to change and remain competitive.

Working together, BMC and VMware provide the solutions to key business problems by accelerating the adoption of virtualization technologies and implementing a virtual infrastructure that increases your business agility, performance, and return on investment.

## Helping You Maintain Advantage

BMC Software Education Services offers a strategic investment for your business, maximizing the value for your employees and Business Service Management initiatives. Education ensures successful product implementation, promoting mastery of all product capabilities and highest productivity with your BMC Software solutions. To explore our education offerings, visit our web page at <http://www.bmc.com/bmceducation>, or contact BMC Software Education Services by telephone or e-mail:

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## About BMC Software

BMC Software delivers the solutions IT needs to increase business value through better management of technology and IT processes. Our industry-leading Business Service Management solutions help you reduce cost, lower risk of business disruption, and benefit from an IT infrastructure built to support business growth and flexibility. Only BMC provides best practice IT processes, automated technology management, and award-winning BMC® Atrium™ technologies that offer a shared view into how IT services support business priorities. Known for enterprise solutions that span mainframe, distributed systems, and end-user devices, BMC also delivers solutions that address the unique challenges of the mid-sized business. Founded in 1980, BMC has offices worldwide and fiscal 2006 revenues of more than \$1.49 billion. Activate your business with the power of IT. [www.bmc.com](http://www.bmc.com).

