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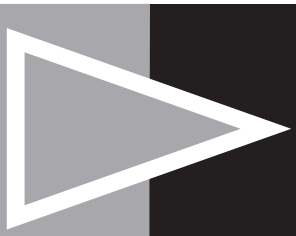

Service Automation and Operation for Virtualized Environments

Best Practices for Maintaining Business Service Orientation in the Dynamic Virtualized Data Center

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Executive summary

Managing the lifecycle of virtual environments, including their physical hosts, is critical to the success of any virtualization initiative. With the use of BMC Service Automation, the newest solution set from BMC Software, companies can improve business responsiveness and availability while maintaining service awareness throughout the virtual lifecycle. BMC Service Automation automates the configuration of both virtual and physical infrastructure components, orchestrates and accelerates cross departmental workflows, identifies and remediates the root cause of application failures and slow-downs, and simplifies many aspects of the request-to-production process required for new business service deployments through the implementation of robust Self-Service capabilities.

From Cradle to Grave—BMC Software products help customers manage mixed virtual and physical environments

Although it is widely assumed to be a disruptive technology innovation, virtualization is neither startling new, nor does it displace existing systems management paradigms. Rather, it is a technology whose accelerating adoption is fueled by its ability to permit the continuation of existing operational models while meeting very specific cost-cutting objectives. In fact, it is well-understood that the management problems posed by virtualization are largely the product of the exacerbation of existing challenges:

"Because it's so easy to create new servers, firms will soon find themselves with more system images than ever, even as they reduce the hardware count. And it won't be easy to track or update images that are scattered around as files. The labor costs associated with managing all these configurations will drive firms toward another key Organic IT technology, data center automation. Firms will start with automated configuration management and eventually move to utility-style automation of server capacity based on business needs."
Forrester Research

With the growth of technology-related operating expenses, companies are looking for alternatives to help reduce the costs of supporting mission-critical systems while adhering to the growing demands of the business. Virtualization is rapidly becoming a key alternative to physical servers because of the prospect of maximizing the potential of physical assets while reducing costs associated with physical systems in the data center, such as power consumption and cooling. As companies expand their adoption of virtualization, the planning, provisioning, management, monitoring, and proactive servicing of these applications become even more critical needs to address.

BMC Software offers products with both the breadth and depth necessary to allow our customers to truly provide Business Service Management, whether their systems are virtual or physical. The BMC Software family of products provides key technologies to manage the life of the virtual and physical assets from cradle to grave by providing support in two key areas: Service Automation and Service Operation. BMC Software and VMware have teamed up to provide thought leadership white papers to tie together key aspects of managing the virtual evolution of the datacenter and provide relevant business service context. This white paper covers the key aspects of Service Automation and Service Operation for assets deployed within a virtualized/physical environment.

Business problem

As little as a decade ago the highest costs associated with running a data center involved the hardware itself. With the commoditization of physical computers, more machines have been brought into the data center, bringing rising power and cooling costs to the forefront of operational expenses. To control costs without having to directly address the problems posed by application coexistence, data centers are moving toward fewer, more powerful computers running multiple virtual images of what were once numerous computers, operating systems and applications. The physical procurement cycle and the need for physical rack and floor space used to be significant growth-limiting factors, but the introduction of virtualization technology eliminates these traditional barriers to the growth of datacenter complexity. Now, complexity can grow as rapidly as is required to respond to the changing needs of the business.

As a consequence of the shift towards virtualized workloads, data centers can save on operating costs, but still require a map of the real-time relationships between workloads and physical computers. As in the mainframe world, more workloads does not necessarily translate to more computers, but the need to monitor capacity and usage becomes more acute.

Business solution

Virtualization enables companies to reduce costs while improving business service availability, agility, and performance. It also enables increased utilization, improved scalability, and the implementation of flexible capacity on demand.

Using management and virtualization solutions from BMC Software and VMware, IT organizations can implement tools and technologies that are flexible, open, and customer-installable to make managing data center virtualization practical and effective.

Properly deployed, virtualization solutions can significantly reduce the number of physical servers required to meet computing needs. BMC Software solutions relate the virtualized resources to the needs of the business. VMware solutions provide the basis, infrastructure, and tools required for a virtualized data center, and in turn, BMC Software solutions provide the control and automation necessary to operate them efficiently.

BMC Software solutions

An automated approach to managing configurations in the data center ensures maximum efficiency and repeatability through changes in business cycles. In turn, the Service Automation framework provides validation of both the performance of your enterprise applications and virtualized server availability, thus maximizing your confidence in the technologies and solutions that support your business objectives.

VMware solutions

VMware products allow businesses to increase utilization and flexibility while reducing cost. The VMware Infrastructure 3 suite virtualizes servers, storage, and networking. This 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.

Best practices for managing virtual server environments

BMC Software and VMware provide products that can help you manage your increasingly virtualized data center in these key areas:

- Continuous optimization
- Dynamic service model
- Offline image management
- Automated configuration management

Best practice: Continuous optimization

Datacenter optimization does not end with the initial consolidation of servers into a virtual environment. Because these workloads must still be managed, virtualization introduces the possibility of continuous and dynamic resource optimization. The continuous optimization cycle consists of capacity analysis, consolidation, provisioning, and monitoring.

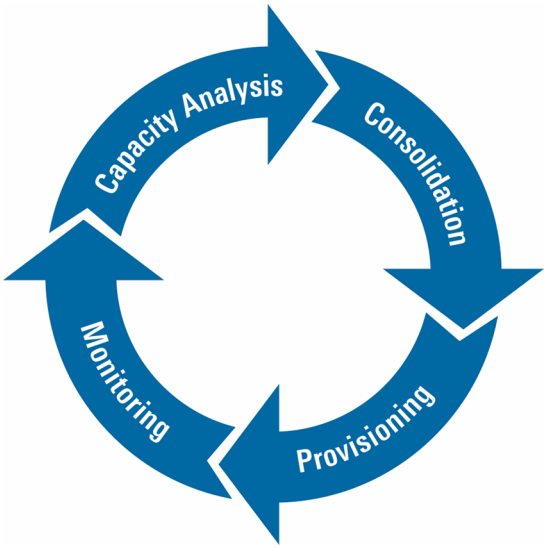

Figure 1 Continuous optimization cycle

Capacity analysis

Virtualized environments, where once dedicated resources are now allocated as "virtual" resources across many virtual machines, provides a new set of challenges to IT organizations who are continually striving to optimize existing resources and deliver a higher quality of service. Couple that with the ease at which organizations can now build and deploy virtual machines – a phenomenon called virtual sprawl – and you have a recipe for disaster in which IT no longer understands the business' true capacity needs, future capacity requirements, or whether their existing capacity has been properly allocated.

Ongoing capacity analysis using products like BMC Performance Assurance effectively manages the resulting dynamic, virtualized environment to deliver the right capacity at the right time — and do so cost-effectively. With the ability to measure, monitor and report on both the physical and virtual layers, along with advanced modeling capabilities specifically instrumented for virtual environments, IT organizations can understand current capacity needs, accurately optimize resources, and predict future capacity requirements in a virtualized environment.

The ongoing measurement of capacity and management of the impact on critical systems is just as important to the ongoing success of the virtualized datacenter as it was originally during the server consolidation phase in the physical datacenter.

Consolidation

Virtualization enables effective workload consolidation and optimizes existing IT resources. With BMC Performance Assurance, IT administrators can easily identify good and bad candidates for virtualization, their optimum placement on a physical host, and the number of virtual machines per physical host. Accurate predictive analysis identifies future needs and when to shift workloads from one physical server to another to avoid disruption of critical systems.

Provisioning

Over the course of normal operations, approved changes will need to be rolled out to production workloads. Using an automation framework like BMC Run Book Automation in conjunction with an automated provisioning product like BMC Configuration Automation gives administrators the ability to automatically implement approved changes such as applications, patches, or OS updates. The changes are applied to both the physical and abstracted virtualized infrastructures to ensure compliance with key operational directives.

Monitoring

Monitoring the environment using both event-oriented and capacity-oriented tools remains critical to the smooth operation of the datacenter. Products like BMC Performance Manager integrate readily with the CMDB to provide service model awareness and business service context to

monitoring data, making it easy to track and maintain service level agreements.

BMC Performance Manager proactively manages the health and performance of both virtual and physical distributed computing environments, including hardware, operating systems, middleware, applications, and databases. Each product in the suite increases the performance and availability of the discrete computing elements, including the virtual operating system, to deliver business-centric systems management and intelligent optimization of the distributed infrastructure and business applications. All of the products in the suite work together to increase system availability and performance while also improving problem resolution to minimize system downtime.

The continuous optimization cycle repeats as the demands posed by the business change and evolve. Therefore, it is important to choose management tools that can grow and adapt as the distribution of workloads across different physical and virtual platforms changes over time.

Best practice: Dynamic service model

In the past, an implicit relationship existed between a workload and its underlying hardware, but with the introduction of virtualization, there is a need to manage the service model at a level that straddles both virtual and physical. A variety of new technologies are using virtualization to introduce the concept of resource pools to which workloads may be dynamically assigned in response to changing capacity demands. But in the context of mature change management processes that enable SLAs, impact analysis, chargebacks and other business-critical functions, workloads cannot simply be moved across different hardware in a vacuum. Other process-dependent changes, such as updating service models in the CMDB, making changes to the monitoring infrastructure, altering VLAN configurations for applications that span multiple workloads, etc., must be coordinated hand-in-hand with the movement of workloads across the physical infrastructure.

BMC Atrium CMDB features virtualization-specific data model classes that maintain the relationships between physical and virtual systems. Our best practice is to leverage this capability to maintain relationships between virtual systems and the underlying physical infrastructure, as well as business service impact relationships between virtual and physical systems, in the CMDB.

Using an automation framework like BMC Run Book Automation can play an important role to keep virtual CMDB relationships up to date. By driving changes through a BMC Run Book Automation abstraction layer, it becomes possible to introduce regular processes around virtual provisioning scenarios. The critical process for the dynamic service model is to update impacted services in the CMDB when a provisioning step occurs.

Introducing processes that maintain the up-to-the-minute accuracy of business service models protects the customer's investment in Business Service Management and ITIL® processes. It also prevents virtualization technology from disrupting the business/IT alignment required to maintain service desk efficiency, event impact and root-cause analysis, and tracking of service level agreements. Such processes enable the tracking required for IT chargeback and multi-tenant service provider scenarios.

Best practice: Offline image management

Virtualization makes it easy to clone and create new environments for testing and development purposes, but the process of bringing an old virtual image online has broad security implications. Safely managing the complexity introduced by VM sprawl requires maintaining the relationship between a virtual machine and its image file, policy-based application and patch management, and a coordinating orchestration technology.

Introducing an automation framework like BMC Run Book Automation can help businesses automatically create, approve, verify and close corresponding change requests related to virtual images used for quality assurance purposes, enabling the same auditable tracking and change control functions that enterprises typically require for the management of physical computers.

QA and development changes

Virtualization has proven itself to be an important technology for quality assurance testing and development environments, not only in the software business, but for any large IT shop that must develop and maintain custom applications. But as in the data center, the employment of virtualization in the development environment introduces new stresses into the IT management ecosystem.

Before virtualization, IT had to manage a variety of mini-laboratories scattered throughout an enterprise, but virtualization technologies have all but eliminated the need to procure new hardware to create an application-specific testing or development environment. New lab workloads are created with

Solution example: Automated provisioning

The following use case illustrates how a service automation implementation can reduce the time associated with provisioning a new server, standardize the entire virtual image lifecycle, maintain control of change, and dramatically increase workload-to-admin ratios. The business language interface to IT provided by BMC Run Book Automation shortens days or weeks of work and eliminates chances of misunderstood requirements and building the wrong solution.

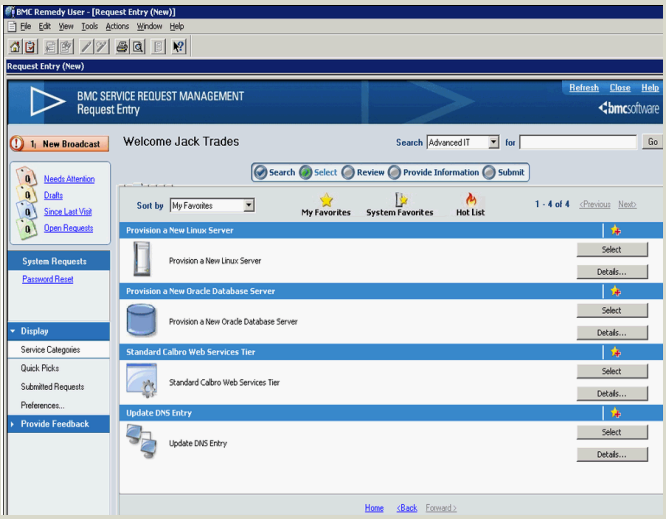

Figure 2 Request for new VM through BMC SRM

An administrator requests a new Oracle® server through BMC Service Request Management (Figure 2). A change is automatically initiated and invokes a workflow in BMC Run Book Automation. BMC Run Book Automation instructs VMware VirtualCenter to install the correct VM image and the new configuration is updated in the CMDB.

An ACL is updated to allow the new image to communicate on the desired network. The CMDB and Definitive Software Library (DSL) are updated accordingly.

To provision the VM with the correct application set, BMC Run Book Automation selects the applications specific to the service request from the DSL, ensures via BMC Remedy Asset Management that licenses are available, and installs them on the new VM. For example, BMC Remedy Asset Management can be instructed to decrement Red Hat and Oracle development licenses by one before the applications are installed.

After the new licenses are installed, the CMDB is updated.

The BMC Change Management application routes the task to a DBA (Figure 3) to set up the new database and the DBA configures the database and updates the ticket. BMC Run Book Automation selects and runs a completion and verification script, then closes the change ticket. The administrator receives a confirmation email that the virtual machine request was completed.

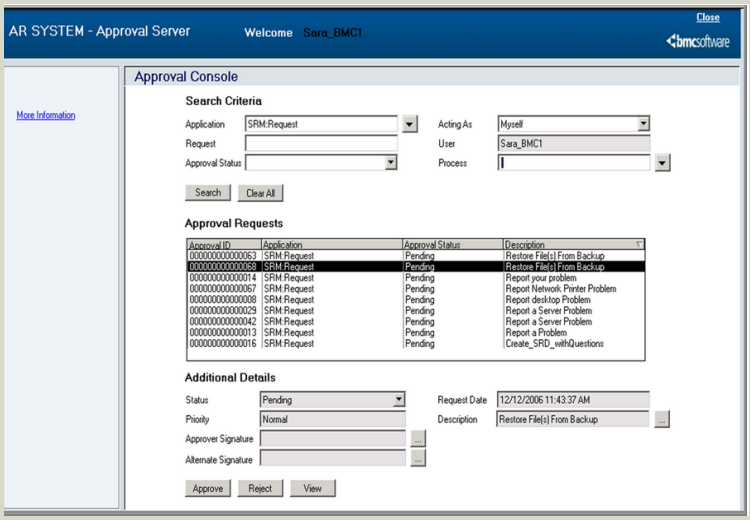

Figure 3 BMC Change Management routes task to DBA

According to BMC Software customer research, without using tools such as those that BMC Software provides, it may take up to thirty days to provision a new standard-build server, not counting the time to run patch tools, investigate and remediate common incidents, and discover port misconfigurations. In our example, the request was completed in less than two hours.

ease, but their corresponding image files tend to be very large. Over time, their proliferation puts a significant strain on the enterprise storage infrastructure.

As a result, enterprises need to manage workloads relative to physical storage. Administrators need to know when a workload is no longer needed so they can free up that space, and when a workload goes unused, they need to understand its original purpose to determine whether to keep it running or remove it. One best practice is for IT organizations to offer virtual machines in the context of a set of IT services that are provided to the business. Using BMC Service Request Management makes it easy to automate virtual machine provisioning while also initiating the necessary approval workflows that will enable charge-backs and ongoing associations in the CMDB between a newly-provisioned image and its owner (Solution example: Automated provisioning on page 7).

Security

Virtualization makes it easy to clone and create new environments for testing and development scenarios, but the process of bringing an old VM image online has implications that are reminiscent of laptop management scenarios—the VM image may not be at the latest required patch levels.

If a dormant image is brought back online, does the image pose a security risk? Do your images have vulnerabilities that require patching? You need tools to understand what is on the images and a change and configuration management vendor with experience with these kinds of problems.

An automated patch management product such as BMC Patch Management, integrated with the CMDB, makes it easy to analyze the compliance levels of previously discovered image files that may have been kept offline for some time. Additionally, employing an automation framework such as BMC Run Book Automation as an abstraction layer makes it possible to enforce repeatable processes when performing virtual machine provisioning operations. A best practice is to configure an isolated VLAN for the virtual machine that only allows communication to the BMC Configuration Automation server infrastructure before starting the virtual machine. Then, execute and verify targeted BMC Configuration Automation patch policies before placing the VM on the desired network.

Best practice: Automated configuration management

As previously discussed, the elimination of physical barriers to change in the datacenter allows increasing complexity to grow unabated by traditional constraints. The need to implement industry-standard practices around change management, and the need to effectively employ tools that automate and track the deployment of change becomes increasingly urgent in this environment. In the meantime, it is unlikely that the scope and pace of hardware and platform changes will themselves suddenly abate. Therefore, it is important to select tools that have a proven track record across a wide variety of both physical and virtual platforms and to select a tools vendor with the strategic vision necessary to navigate an increasingly fluid and dynamic IT and business landscape.

Using BMC Configuration Automation in conjunction with the BMC Atrium CMDB and BMC Run Book Automation allows customers to readily integrate with monitoring, change, and asset management systems, and provides a solid foundation for IT to build service-oriented offerings that are tailored to the needs of the business. At the same time, that foundation remains flexible enough to accommodate a changing platform landscape that is comprised of a variety of virtual and physical devices.

Business benefits

Together, the products offered by BMC Software and VMware work to track and manage your virtual assets, enable software compliance, manage virtualized software, automate your security applications, and migrate your operating systems to meet your increasingly virtualized business needs.

Tracking and managing virtual assets

Today's virtual enterprise networks comprise a diverse mix of hardware and software elements, including servers running various software on multiple platforms. The assets you need to track might include computers belonging to employees inside the firewall as well as those working outside the firewall (for example, those working from a remote location). Often, you are required to use numerous solutions to track and apply updates across such a variety of IT assets, which can be costly and time consuming.

Software compliance automation

Enterprises need to be aware of and abide by numerous compliance initiatives, such as software license compliance. The number of software audits to ensure license compliance is on the rise. Non-compliance with software usage rights can be extremely costly and can also result in negative publicity for enterprises. In a changing economy, a company goes through many changes, such as acquisitions and mergers. This fluctuating environment makes it difficult to keep track of the company's licenses and meet compliance requirements in a virtualized environment. To meet compliance, companies need an automated and efficient way to gather inventory data about their assets and to enforce key company policies on complying with appropriate access.

Managing virtualized software

Applications are essential to every aspect of business. IT organizations are coming under increasing pressure to make sure that business-critical applications are up to date and available. This is no small undertaking considering the increased mobility of today's workforce and the continuing need for application upgrades and new application deployments. Enterprises need a solution that addresses these issues by automating application management across the virtual environment of an enterprise, improving service levels, and reducing business risks through reliable application delivery.

Automating security application deployment

The rise of malicious virus attacks and security breaches places organizations at risk of potentially devastating business losses, reduced employee productivity, and network downtime. These risks make it critical for enterprises to rapidly detect vulnerabilities and deploy the updates necessary to protect their systems. As attention to these security risks has increased, software vendors have increased both the number of patches they issue to address security vulnerabilities as well as the frequency with which they issue them. Manually applying these patches and fixes is time-consuming, costly, and inefficient. Enterprises need a solution that will allow them to quickly identify missing patches and automatically deliver critical patches and fixes to thousands of endpoints.

Migrating operating systems

Migrating computers to new operating system (OS) releases is at the top of many CIO project lists and is destined to stay near the top, given that Microsoft has modified its licensing and support programs for Windows. The requirement to keep the Windows OS up to date has resulted in migrations becoming an ongoing management process rather than a one-time project.

Summary

In today's increasingly virtualized IT landscape, the need arises for automated solutions to the unique problem areas inherent to such environments. The products that compose the BMC Service Automation and Service Operation suites are able to automate management tasks across both physical and virtual devices and platforms, enabling businesses to successfully contend with issues in the key problem areas of continuous optimization, dynamic service modeling, offline image management, and automated configuration management.

- Continuous optimization—To effectively manage the continuous optimization cycle, consisting of capacity analysis, consolidation, provisioning, and monitoring, businesses need tools like BMC Performance Assurance and BMC Performance Manager that can monitor change and adapt as the distribution of workloads across different physical and virtual platforms changes.

- Dynamic service modeling—New technologies leverage virtualization to dynamically assign workloads in response to changing capacity demands. But in the context of mature change management processes that enable business-critical functions, other process-dependent changes must be coordinated with the movement of workloads across the physical infrastructure. Using an automation framework like BMC Run Book Automation can play an important role in dynamically managing the service model and keeping relationships current.

- Offline image management—To help administer offline images, such as those created and cloned for testing purposes, businesses can use an automation framework like BMC Run Book Automation. BMC Run Book Automation can offer the means for businesses to automatically create, approve, verify, and close corresponding change requests related to virtual images. Additionally, BMC Run Book Automation can enable the same auditable tracking and change control functions that enterprises typically require for the management of physical computers.

- Automated configuration management—An automated configuration management product like BMC Configuration Automation, used in conjunction with a CMDB and an automation framework like BMC Run Book Automation that can integrate readily with critical management systems, provides a dependable foundation to create service-oriented offerings that are specific to the needs of your business.

The automated approach to managing data center virtualization allows the business to accurately track and manage its virtual assets, ensure that its software licenses are in compliance, keep its virtual applications current and available, automate patch deployment, and migrate operating systems on virtual images.

Service Automation combines automated configuration management with proven, industry-standard, ITIL-based best practices to drive tremendous improvements in operational efficiency while ensuring compliance, auditability, service availability, and responsiveness to changing business needs.

In summary, BMC Software is raising the bar by helping customers track assets from cradle to grave, whether those assets are virtual or physical. Through combining industry-leading technologies in capacity planning, provisioning, ongoing consolidation, task orchestration, and monitoring of critical business systems, BMC provides products that are vital to automating the datacenter across both virtual and physical systems. BMC enables modeling at the service level to allow companies to take the complexity out of the technology and help IT be more responsive to the needs of the business.

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