# TABLE OF CONTENTS

EXECUTIVE SUMMARY .................................................. 1  
NEW FUNCTIONALITY .................................................. 2  
  » Self-Service Portal .............................................. 2  
  » Service Catalog ................................................ 4  
  » Cloud Administration ......................................... 4  
  » Orchestration ................................................. 4  
  » Provisioning .................................................. 5  
    - Server .................................................... 5  
    - Storage ................................................ 6  
    - Network ................................................. 8  
    - Public cloud .......................................... 8  
    - Applications ......................................... 9  
CMDB AND CLOUD LIFECYCLE MANAGEMENT .......................... 9  
OPTIONAL COMPONENTS .............................................. 9  
  » Change Management .......................................... 9  
  » Compliance ................................................ 10  
  » Monitoring ................................................ 10  
KEY DIFFERENTIATORS ............................................... 11  
  » Commitment to heterogeneity ................................ 11  
  » Full-stack provisioning ..................................... 11  
CONCLUSION ......................................................... 12  
APPENDIX .......................................................... 12
EXECUTIVE SUMMARY

BMC Cloud Lifecycle Management provides a complete solution for establishing and enabling a cloud environment, including a service catalog that defines service offerings, a self-service portal for procuring resources, and management capabilities to control the cloud. By combining the best practices of Business Service Management (BSM) with the flexibility and efficiency of cloud computing, you can achieve enterprise-class service quality.

BMC Cloud Lifecycle Management brings together the benefits of traditional IT management, including operational excellence, automation, and service delivery models, and merges them with the dynamic potential of cloud architectures. It provides the foundation for a strong, flexible, and valuable cloud infrastructure that supports IT operations and delivers exceptional service quality to the business.

The BMC solution was designed to leverage the best practices of your physical data center environments and ensure that those best practices are appropriately applied to cloud-based services. By ensuring continuity between both environments, your private cloud can be enterprise-class from the start.

This paper will discuss the functionality found in the BMC Cloud Lifecycle Management solution, including:

- Self-Service Portal
- Service Catalog
- Cloud Administration
- Orchestration
- Provisioning

In so doing, it will describe how the following products within the solution work together to deliver on your cloud initiative:

- BMC Cloud Lifecycle Management
- BMC Atrium Orchestrator
- BMC Atrium CMDB
- BMC BladeLogic Server Automation Suite
- BMC Service Request Management
- BMC BladeLogic Network Automation (optional)

Finally, throughout the paper, we will discuss how the BMC Cloud Lifecycle Management solution integrates with other BMC solutions, such as BMC Remedy Change and Release Management and BMC ProactiveNet Performance Management, to provide a complete management platform for BSM.
BMC CLOUD LIFECYCLE MANAGEMENT FUNCTIONALITY

SELF-SERVICE PORTAL

One of the key requirements for any cloud initiative is the ability to support self-service. Users of the cloud environment should be able to request, customize, and manage their cloud services through an interactive portal, without requiring the support of an administrator.

The BMC Cloud Lifecycle Management solution provides an innovative self-service interface that combines the power of BMC Service Request Management with a completely new interface, built on the BMC Remedy platform, called myServices Portal. The myServices Portal is intuitive and easy to use, allowing end users to request, manage, and view their provisioned servers.

Figure 1. The Implementation Architecture of BMC Cloud Lifecycle Management

Figure 2. The myServices Portal
From the myServices Portal, an end user can request new cloud services. As the user initiates a new cloud service request, a call is made to BMC Service Request Manager both to recall the list of role-based, pre-defined cloud service offerings for the end user and also to manage the overall fulfillment of the request. The offerings themselves are stored in the Service Catalog.

Figure 3. Example of a new cloud service request

Once a request has been submitted, it is passed via a web service call to BMC Atrium Orchestrator for fulfillment.

If enabled, BMC Atrium Orchestrator will make a web-services connection to the integrated BMC Remedy Change and Release Management application; create a change request with all of the required details and tasks for fulfillment; and wait for change approval. BMC Atrium Orchestrator will then interface with the provisioning engine, as outlined in the Provisioning section below.

When the BMC Remedy Change and Release Management application is not integrated, BMC Atrium Orchestrator can optionally utilize the approvals functionality from BMC Service Request Management, which is included as part of the BMC Cloud Lifecycle Management solution. Once approved — or without any approval system established — BMC Atrium Orchestrator interfaces directly with the provisioning mechanism, as outlined in the Provisioning section below.

From the same myServices portal, an end user can select cloud services and take operational actions, such as power on and power off. When a user selects an action, the myServices portal directs BMC Atrium Orchestrator to fulfill the request. Similar to when a new cloud service is requested, BMC Atrium Orchestrator will automatically interface with BMC Remedy Change and Release Management (if configured) to document and acquire approvals before implementing the operations action.

The set of operations actions presented to the myServices Portal user can be extended and modified to fit organizational requirements by editing the BMC Cloud Lifecycle Management module in BMC Atrium Orchestrator. In addition, the myServices Portal can be customized to provide additional "requestable" options to end users.
SERVICE CATALOG
The service catalog provides a repository for the storage of standardized cloud offerings. In BMC Cloud Lifecycle Management v1.0x, the service catalog is stored in the BMC Service Request Management application, which includes cloud administration forms to manage the contents of the catalog.

BMC Service Request Management queries the service catalog to display the options to end users in the myServices portal. The service catalog is populated by administrators through the administrative interface to BMC Cloud Lifecycle Management.

CLOUD ADMINISTRATION
Cloud administration actually begins with server administration. As part of the BMC Cloud Lifecycle Management solution, the BMC BladeLogic Server Automation Suite defines jobs that will provision instances of cloud VMs, run compliance scans, deploy applications, and update server configuration parameters. References to these BMC BladeLogic Server Automation elements are synchronized into BMC Remedy background forms via a BMC Atrium Orchestrator cache population job that is executed via a BMC Remedy escalation.

Once the cache population has completed, a cloud administrator associates the BMC BladeLogic Server Automation elements with logical offerings for compliance, applications, monitoring instrumentation, and requestable offerings, which will be displayed to the end users via the myServices Portal.

A complete administrative environment is available through BMC Cloud Lifecycle Management, ensuring the cloud environment can be customized to meet the unique needs of the organization's users.

ORCHESTRATION
BMC Atrium Orchestrator plays a key role in the BMC Cloud Lifecycle Management solution. Its workflows control the overall process of creating, extending, and retiring cloud services, including server, network, and storage resources.

BMC Atrium Orchestrator utilizes several master-control workflows that concurrently handle the creation of new cloud services. These workflows handle the provisioning of server (compute), network, and storage resources; ensure that they are properly configured and attached; and interface with the optional change management component to ensure continuous updates.

Figure 4. Sample BMC Atrium Orchestrator workflow
BMC Atrium Orchestrator also interfaces with the BMC Atrium CMDB via the CMDB web services API to ensure that all configuration items are created and updated in real time.

**PROVISIONING**

Provisioning occurs using different mechanisms for each element of the resources and software stack. Orchestrated through BMC Atrium Orchestrator, BMC Cloud Lifecycle Management ensures that the full stack required to fulfill the user’s request is assembled and delivered rapidly and effectively, without the use of templates. By provisioning each piece on demand, cloud administrators are not faced with the burden of maintaining an ever-growing template library — and users get precisely what they need.

**SERVER**

BMC BladeLogic Server Automation Suite acts as the default provisioning component of the overall BMC Cloud Lifecycle Management solution. Once BMC Atrium Orchestrator receives notification that a server provisioning task has been assigned (from an approved change request), it will invoke BMC BladeLogic Server Automation Suite to provision the environment based on the information captured in a data field of the task object (which was populated from the original user request submission).

Specifically (in the case of virtual servers), BMC Atrium Orchestrator dynamically generates a Virtual Guest Job that references a Virtual Guest Package, and executes that Virtual Guest Job. Through the details of the Virtual Guest Package, BMC BladeLogic Server Automation Suite interfaces with the virtualization platform, such as VMware vCenter, to provision the VM from a template or to create a new blank VM. In the case of a new blank VM, BMC BladeLogic Server Automation Suite can provision the operating system just as it would for a physical server.

![Figure 5. BMC BladeLogic Server Automation Console – Provisioning the Base of the Cloud Service](image)
Some server resources, however, may be directly provisioned by BMC Atrium Orchestrator via API calls without invoking BMC BladeLogic Server Automation Suite. For example, if the requested server instance is targeted for deployment in a public cloud, such as Amazon EC2, BMC Atrium Orchestrator will directly interface with the EC2 service to provision the server instance. Once the server is provisioned, BMC Atrium Orchestrator will ensure that a BMC BladeLogic Server Automation Suite agent is installed and that the server is registered with the BMC BladeLogic server to allow for ongoing administration. More detail on provisioning public cloud resources is in the Public Cloud section below.

**STORAGE**

Storage management can be provided in BMC Cloud Lifecycle Management via customization of the myServices Portal. Actions, such as creating and deleting storage instances, can be added to the left panel below the options for New Server Instances / Extend Server Instance / Retire Server Instance.
A custom "Create New Storage" option could be linked to a custom BMC Service Request Management form, such as the following:

In this sample BMC Cloud Lifecycle Management environment, a NetApp adapter for BMC Atrium Orchestrator is used to interface with the NetApp storage solution. The service level options provided to the user coincide with provisioning policies defined in the NetApp environment.
NETWORK
In order to support both private and shared public cloud environments, the network must be provisioned as a service, initiated by BMC Atrium Orchestrator using the BMC BladeLogic Network Automation licensed add-on. The management of the network as a service involves discovery, implementation, and validation of network services in support of virtual data center management, compute resource management, and movement of compute resources. More specifically the requirements involve:

» Discovery
  - Deep discovery of network devices, topology, and components involved in service provisioning
  - Reconciliation of discovered components with resource pools

» Implementation
  - Management of segmented environment in support of multi-tenancy, both for internal and public cloud environments
  - Support for new provisioning and cloud service motion in conjunction with the segmented network environment

» Validation
  - Configuration settings compliant with organizational policies
  - Network availability confirmation and actively managed network capacity

Network containers, which are often called virtual data centers, environments, secured zones, and other terms, are the BMC implementation of secure, network-based multi-tenancy, implemented in conjunction with Cisco systems. Each network container can vary by level of security or performance. Network container definitions are customizable by the administrator, and can be designated by policy (i.e. Silver, Gold, and Platinum). Each network container can be defined by a single construct, or through the amalgamation of a set of building-block definitions. BMC BladeLogic Network Automation and BMC Atrium Orchestrator enable these network containers, managed through the BMC Cloud Lifecycle Management solution.

BMC BladeLogic Network Automation supports both the execution of single actions and pre-defined sequences of actions. This provides the flexibility of varying the automation between the service orchestration tool (i.e. BMC Atrium Orchestrator) and the network automation tool (i.e. BMC BladeLogic Network Automation) according to the needs of the environment.

PUBLIC CLOUD
Enterprises are seeking ways to leverage external service providers for utility computing. Through this model, they can obtain additional computing resources quickly and inexpensively, paying only for the time that they use, rather than having to buy on-premise resources through lengthy capital procurement cycles.

There are numerous challenges that complicate such use of external utility computing providers by enterprises, including (but not limited to):

» Performance monitoring
» Software license monitoring
» Software deployment
» Configuration management
» Patching
» Compliance
In essence, organizations need to manage computing resources provided by external providers using the same tools and processes used for internal computing resources. BMC Cloud Lifecycle Management addresses these challenges in the following ways:

- End user requests can be facilitated by BMC Service Request Manager, through which the specifics of internal and external resource requests can be abstracted away from the end users, so that they simply specify their request, not the fulfillment mechanism, through the myServices portal.
- The selection of internal or external fulfillment can be performed via customizable logic represented in BMC Atrium Orchestrator.
- The review and approval of the user request for internal and external computing resource changes can be carried out using BMC Remedy Change and Release Management.
- The actual provisioning and decommissioning of internal and external resources may be automated through a combination of BMC Atrium Orchestrator and BMC BladeLogic Server Automation.
- The tracking of internal and external computing resources, including cost accounting and automatic expiration notification and decommissioning, can be handled via BMC Remedy Asset Configuration Management.
- Configuration management, patching, application deployment, and compliance activities for internal and external computing resources can all be conducted via the BMC BladeLogic Server Automation Suite.

**APPLICATIONS**

Administrators can define a set of applications and middleware that can be provisioned onto a cloud service, and set policy-based rules governing the circumstances and users to whom they will be made available through the myServices portal. As with server provisioning, the Cloud Administrator chooses from deployment jobs in BMC BladeLogic Server Automation Suite, which are then populated into BMC Remedy background forms via the cache population process.

When an end user selects one or more application stacks within a new cloud service request, BMC Atrium Orchestrator adds the details of those selections to one of the post provisioning tasks in the change request. When such a task moves to the assigned state within an approved change request, BMC Atrium Orchestrator invokes BMC BladeLogic Server Automation Suite to execute the application deployment job.

**CMDB AND CLOUD LIFECYCLE MANAGEMENT**

As a core component of the BMC Cloud Lifecycle Management solution, the BMC Atrium CMDB is leveraged by the myServices portal to retrieve configuration items that are displayed in the portal as the list of services owned by that user.

**OPTIONAL COMPONENTS**

**CHANGE MANAGEMENT**

While one of the hallmark attributes of a cloud environment is rapid fulfillment of requests, such as provisioning new instances, change governance is still a necessity in virtually all enterprise environments. But traditional change governance typically adds more delay to the fulfillment of user requests.

In BMC Cloud Lifecycle Management, the various kinds of end-user requests — from a new cloud service request, to the extension, modification, and retirement of existing instances, to the management actions on existing servers — can all be configured to generate change requests. These change requests can be pre-approved or can require manual approval. This allows the IT organization to ensure that change audit trails are provided for the entire infrastructure, even for requests that need to be fulfilled seemingly immediately via pre-approved changes. And for higher impact requests, human approval can still be employed.

Nevertheless, change management usage as a whole is still an option for the BMC Cloud Lifecycle Management deployment. When requests are submitted by end users in the myServices Portal, BMC Atrium Orchestrator receives those requests and checks a configuration parameter to determine whether BMC Remedy Change and
Release Management is enabled. If so, it creates the change request following further configuration parameters, and then delays fulfillment of the request until the change is approved. If not, BMC Atrium Orchestrator can fulfill the request immediately.

**COMPLIANCE**

Although included as a core component of the BMC Cloud Lifecycle Management solution, the BladeLogic Server Automation Suite includes additional capabilities that are optional in a cloud deployment. For example, it can play a key role as the compliance engine that ensures that the provisioned cloud services adhere to specified compliance policies and do not drift from their approved configurations. This is accomplished by compliance scanning jobs (usually a batch job with child jobs for discovery and audit), which are linked by the Cloud Administrator to the compliance policy choices presented to the end users in the request for a new server. BMC Atrium Orchestrator translates the user request details into a post-provisioning task in the change request. When that task is assigned within an approved change, BMC Atrium Orchestrator will execute that compliance job against the brand new service.

![BMC BladeLogic Scans for Compliance on Cloud Services](image)

If the closed-loop server compliance workflows are leveraged, any discrepancies found in the compliance scan will automatically trigger an incident ticket in BMC Remedy Service Desk to notify the help desk of the condition, and a change request detailing the remediation actions to be generated. If the change request is approved — either manually or automatically — BMC BladeLogic Server Automation Suite will automatically perform the remediation steps to make the cloud service compliant with the related policy.

**MONITORING**

The BMC Cloud Lifecycle Management solution allows for flexible monitoring capabilities. BMC ProactiveNet Performance Management can be activated as an out-of-the-box monitoring solution for cloud environments. The solution can also be configured to deploy or instrument virtually any monitoring and management platform. This is accomplished by creating a BMC BladeLogic application deployment job that is controlled by BMC Atrium Orchestrator during the provisioning process.
The BMC ProactiveNet Performance Management node baselines the performance of any virtual machines provisioned by the BMC Cloud Lifecycle Management solution. It optimizes application performance by reducing the number of events, speeding up MTTR, and improving the operational efficiency.

**KEY DIFFERENTIATORS**

**COMMITEMNT TO HETEROGENEITY**
In the overwhelming majority of large enterprise IT environments, there is a mix of platform types. Very few organizations standardize on just one platform. Yet, many cloud management solutions, developed by platform vendors, support primarily or exclusively their own platforms. BMC is not a hardware or virtualization platform vendor. With a commitment to heterogeneous support, the BMC Cloud Lifecycle Management solution supports a wide range of platforms, including:

- Physical servers
- Virtual environments
- Public cloud services
- Networking hardware
- Storage hardware
- Applications

BMC’s commitment to heterogeneity even extends within its cloud lifecycle management solution. The BMC Cloud Lifecycle Management solution is architected to allow for non-BMC components, including:

- Customized self-service environments
- Change management solutions
- Performance monitoring solutions

BMC believes strongly in enabling customers to avoid vendor lock-in, and has provided — and will continue to provide — solutions that support the heterogeneous data center.

**FULL-STACK PROVISIONING**
Just provisioning servers is not enough for a robust cloud solution. In addition, applications, networking and storage must also be provisioned.

With alternative cloud solutions, in order to offer a given base cloud service with the option of 1 to "n" number of applications installed, it would require n * (n - 1) unique template images to be generated. With BMC’s incorporation of server provisioning capabilities into the BMC Cloud Lifecycle Management solution, cloud administrators need only define a single server template and n number of application deployment packages. The end users receive more thorough handling of their customization needs, while the IT organization enjoys a more scalable management approach.

For cloud users that require network isolation, particularly those who need separate network zones for multi-tier applications, the BMC Cloud Lifecycle Management solution provides unrivalled capabilities. Network containers with potentially multiple separate zones can be defined. They can also be assigned various networking services such as load balancing and firewalling, creating a spectrum of networking classes of service. Either end users or administrators acting on behalf of end users can create instances of network containers, specifying the necessary class of service. Then, server instances can be requested and deployed into specific zones within a given customer’s network container.

These capabilities afford cloud users maximum flexibility and protection for the services being delivered from their cloud instances.
CONCLUSION
BMC Cloud Lifecycle Management brings the best of Business Service Management (BSM) into the cloud environment. It ensures that the flexibility and precision of provisioning supports the needs of your cloud customers. What’s more, it can help you achieve closed-loop compliance, as well. The cloud may be a new environment, but the fundamental benefits of BSM apply, only far more flexibly and dynamically than before.

Business runs on IT. IT runs on BMC Software.
Business thrives when IT runs smarter, faster and stronger. That’s why the most demanding IT organizations in the world rely on BMC Software across distributed, mainframe, virtual and cloud environments. Recognized as the leader in Business Service Management, BMC offers a comprehensive approach and unified platform that helps IT organizations cut cost, reduce risk and drive business profit. For the four fiscal quarters ended September 30, 2010, BMC revenue was approximately $1.96 billion. Visit www.bmc.com for more information.