Automated Life-Cycle Management: A Critical Enabler for Cloud-Ready Datacenters

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by Mary Johnston Turner, IDC #lcUS23991013

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As cloud environments mature, more and more IT organizations will embrace software-defined cloud architectures that depend on standards, automation, and analytics to cost effectively maintain business requirements and service-level agreements (SLAs) even as workload volatility and data volumes increase. Simultaneously, these dynamic, elastic cloud environments must coexist with more traditional and heterogeneous physical and virtual platforms, management tools, and application architectures as enterprises continue to rely on existing mission-critical resources even as newer, self-service cloud architectures are deployed to support emerging applications and business processes.

This Technology Spotlight examines the role that standards, automation, orchestration, and advanced analytics will play in optimizing the full datacenter operations life cycle across today's complex and rapidly changing datacenter environments. This paper also looks at IBM's SmartCloud software portfolio as an example of an integrated solution designed to support the end-to-end service management life cycle across heterogeneous physical and virtual platforms as well as hybrid, public cloud, private cloud, and noncloud environments.

Industry Trends: Complex Datacenter Environments Create New Management Challenges

In the next several years, IDC expects that the growing use of big data analytics and mobile computing will cause most IT organizations to experience significant increases in the volumes of data and transactions that must be supported. Use of virtualization will continue to increase, and more and more organizations will implement multi-hypervisor architectures. At the same time, enterprise IT infrastructure and application environments are becoming more complex and dynamic as elastic, self-service cloud computing joins earlier generations of heterogeneous virtual and physical systems to create physical, virtual, and cloud datacenters that need to be managed and optimized in an integrated, automated, and coordinated fashion.

IDC's research shows that the increase in IT diversity and operational complexity is causing a shift in IT management priorities. Historically, IT management priorities most often focused on the health and performance of individual components and technology silos. In a cloud-oriented datacenter, the emphasis is on consistent, reliable, and agile end-to-end service delivery and SLAs. The ability to deliver business services quickly and efficiently depends on the ability of IT organizations to integrate and coordinate management workflows, monitoring data and analytics across multilayer applications that often span multiple generations of middleware, databases, analytic engines, and infrastructure. It also requires consistent use of standard configuration and provisioning templates, policy-based automation, real-time capacity and performance monitoring, and frequent updates and adjustments to keep the entire environment operating efficiently to meet SLAs.
The end-to-end business services delivered by datacenter resources may be enabled by a mix of in-house and public cloud resources as well as traditional in-house or outsourced assets. Regardless of the resources and services mix chosen, however, IT organizations report that IT management processes and tools need to become more integrated through a single pane of glass at the same time that they become more life cycle oriented across resources.

In most cases, IT organizations tackle this set of challenges by leveraging and extending many existing IT management tools and processes while also adding newer and more advanced real-time analytics as well as advanced virtual server management capabilities (see Figure 1).

![Figure 1](image)

Top 5 New Datacenter Management Needs Driven by Introduction of Cloud

Q. What type of new management software have you purchased due to cloud requirements over the past 18 months?

- Capacity planning and analytics: 47.0%
- Automated workload migration and optimization: 43.2%
- Advanced virtual server management tools: 40.9%
- Template design tools for cloud provisioning: 37.9%
- Cloud service catalog: 35.6%

n = 132

Note: Multiple responses were allowed.

Source: IDC's IT Management QuickPoll, January 2013

Going forward, most IT teams will need to maintain reliable, cost-effective operation of mission-critical legacy applications and infrastructure while working with business stakeholders to determine the best way to meet customer needs by leveraging the self-service, dynamic, elastic scaling, and pay-as-you-go benefits of cloud.
Benefits of Integrated Datacenter Life-Cycle Management and Automation

Integrated and automated datacenter life-cycle management allows IT organizations to use a consistent set of policies, workflows, data models, and SLAs to govern the management, monitoring, and control of legacy, on-premise, and offsite IT resources — regardless of whether the workloads are supported by cloud platforms and services or more traditional physical and virtual systems.

Easy-to-use visual interfaces and out-of-the-box best practices for reusable deployment patterns, provisioning workflows, and capacity analytics are important capabilities that ensure that an organization can make the most effective use possible of its datacenter resources. The use of open standards–based solutions simplifies integration across multiple functions and technology building blocks, just as the definition and consistent implementation of standard patterns make it easier to spin up resources and services as needed.

By implementing a standards-based, service-centric approach to service design, provisioning, and ongoing operations, IT organizations will be well positioned to maintain consistent SLAs for end users even as the enabling infrastructure and application architectures evolve over time. This approach also facilitates the integration of existing systems and historical data of record with applications and data developed across real-time virtual and cloud environments.

Benefits of taking this integrated, service-centric life-cycle approach to complex datacenter management include a number of improvements to business agility and IT operational productivity. For example:

- The ability to respond more quickly to business priorities by reducing the time needed to deploy new resources using self-service provisioning and policy-based automation to streamline internal approvals and workflows

- Higher levels of IT staff productivity due to the elimination of many frequently repeated manual configuration and change control tasks that can be standardized and automated (The use of automation and standard templates and images across server, storage, network and software deployment, and patch and provisioning activities can reduce human error and allow IT generalists to take primary responsibility for many tasks, freeing specialists to focus on innovation or more complex concerns.)

- Reduced business risk and downtime as a result of standardizing and better controlling compliance using automation to maintain configuration and security policies

- Lower costs related to datacenter power, cooling, facilities, and associated management software licensing and support as a result of consolidation and improved utilization of resources and management tools

Regardless of whether an enterprise is in the early stages of implementing cloud or has already made major commitments, life-cycle management strategies that take full advantage of best practice reusable workflows, configuration templates, and industry standards are critical to an organization's ability to cost effectively scale up operations, maintain service levels, and respond to business priorities.
Considering IBM SmartCloud Life-Cycle Management Solutions for Cloud-Ready Datacenters

IBM's SmartCloud family of integrated management software solutions for cloud-ready datacenters relies on shared sets of standards and patterns to deliver end-to-end support for service design, provisioning, monitoring, and ongoing operations. As shown in Figure 2, the SmartCloud common framework takes a layered approach to integrating policies, workload provisioning, infrastructure scaling, and third-party support.

Figure 2

IBM SmartCloud Common Cloud Management Services

Orchestration and Governance Services

Platform Level Services
(Image Lifecycle Mgmt) (Pattern Services)

Infrastructure Level Services
(Provisioning, configuration, resource allocation, security, metering, etc.)

Cloud Resources

Source: IBM, 2013
Each component is supported by key emerging cloud standards as well as IBM's best practice patterns and analytics. Specifically:

- **Orchestration and Governance Services** are used to coordinate complex tasks and leverage existing processes and artifacts. These services leverage the emerging OSLC/Linked Data standard being developed under the W3C Open Services for Lifecycle Collaboration (OSLC) project, which has the goal of creating application-level data sharing standards that can streamline monitoring, integration, and software life-cycle management workflows across diverse applications. Examples include specifications to link configuration management, patching, application life-cycle management (ALM), and asset tracking data across currently separate applications in order to better integrate and optimize end-to-end service levels, operational costs, and maintenance.

- **Platform Level Services** provide customers with a robust library of out-of-the-box best practice patterns for middleware, application, and infrastructure deployments as well as a pattern editor to support customized pattern development. Image life-cycle management, including image analytics, enables users to optimize workload placement, migration, and control. Platform services are built on TOSCA, the OASIS Topology and Orchestration Specification for Cloud Applications. These services focus on promoting workload and complex application portability via the use of self-defining service templates and patterns that can be written once and deployed universally across heterogeneous on-premise and public cloud infrastructure. Consistent use of TOSCA simplifies deployment and life-cycle management of complex middleware and application patterns and avoids vendor lock-in.

- **Infrastructure Level Services** provide automated provisioning and sharing of large pools of heterogeneous compute, storage, and networking resources across hybrid, public, and private cloud infrastructure resources. The services leverage the OpenStack standards that are currently supported by the more than 850 member organizations of the OpenStack Foundation, including IBM, Microsoft, Google, VMware, HP, Cisco, NEC, Intel, and Boeing.

- **Development and Operational Extensions** are available via APIs and out-of-the-box tooling. IBM allows third parties and customers to create customized images, patterns, and process flows. IBM and third parties can publish and distribute certified content via the IBM Cloud Marketplace. IBM also provides core tooling out of the box to allow support for reusable open source automation components as well as a wide range of published APIs and content created by third parties. This includes integrations with third-party service desk products and a number of public cloud services.

Products currently supporting the SmartCloud Common Cloud Management Services include the following:

- **IBM SmartCloud Orchestrator** enables pattern-based workflow orchestration and provisioning across infrastructure resources, middleware, and workloads, including provisioning, configuration management, and policy-based optimization, during the life cycle of the service.

- **IBM SmartCloud Virtual Storage Center** provides efficient virtualization and management of heterogeneous storage systems, including the ability to quickly migrate data to cloud architectures.
IBM Endpoint Manager for Server Automation enables users to perform advanced automation tasks across servers, including task sequencing — without the need for programming skills. It includes a rich set of prebuilt automation scripts and enables users to create and reuse their own automation flows.

IBM SmartCloud Control Desk is unified asset and service management software that provides a common control center for managing both digital and physical assets. It is accessible through public and private clouds and mobile devices and integrates with social media and development tools.

IBM Tivoli Netcool Configuration Manager provides automated network configuration and change management and integrates with fault management, network automation, and performance management applications to manage networks more efficiently.

IBM SmartCloud Application Performance Management provides integrated application component discovery, end-user experience monitoring, transaction tracing, application performance diagnostics, and root cause analysis in traditional IT, virtualized, cloud, and hybrid environments.

IBM Tivoli System Automation reduces the frequency and duration of service disruptions using policy-based automation to enable the high availability of critical applications and middleware running on a range of hardware platforms and operating systems. It offers a single point of control for managing heterogeneous high-availability solutions and IT service dependencies that span Linux, AIX, Windows, Solaris, and IBM z/OS.

Challenges

IBM has put significant effort into the development of cloud standards; the company is a platinum member of the OpenStack Foundation and is one of the top code and design contributors to most OpenStack projects. It is a founding sponsor of the 400-member Cloud Standards Customer Council, which is dedicated to driving faster identification of cloud use cases and to providing a forum for vetting potential standards with real users. IBM was also an initial advocate for the W3C OSLC/Linked Data and the OASIS TOSCA standards. The company currently dedicates over 500 engineers to open standard initiatives.

IBM has championed these standards in the belief that customers will demand choice when it comes to selecting infrastructure hardware, applications, middleware software, and third-party hosted and cloud services. IBM also believes that, for many years into the future, most customers will need to integrate existing mission-critical transactional applications and systems of record with new, built-for-cloud applications and services.

The challenge IBM faces in driving adoption of its standards-based cloud-ready management software portfolio is tied to this strong commitment to standards that most mainstream IT buyers are only just beginning to understand. To differentiate its SmartCloud portfolio, IBM will need to educate customers as to the benefits of using these standards to integrate its datacenter management life-cycle portfolio. IBM can overcome these concerns by clearly demonstrating how its approach is able to more quickly deliver value while holding down the cost of cloud-ready datacenter operations.
Conclusion

IDC believes that as cloud environments mature, more and more customers will look for alternatives to tightly coupled, single-vendor stacks and will prioritize hybrid software-defined cloud options. Automation, integration, and analytics will be needed on a large scale to cost effectively maintain SLAs while accommodating increasing workload volatility and rapidly escalating volumes of data and analytics to meet business requirements.

Standards and open source solutions for cloud infrastructure, interoperability, and management have the potential to drive down the cost of building and operating dynamic, elastic scaling cloud environments while enabling more efficient and cost-effective application provisioning and life-cycle optimization. With its standard-based framework and commitment to open integration, IBM has an opportunity to help customers reduce the cost and complexity of managing highly heterogeneous cloud-ready datacenters.