Relieving the Pressure of Change in the Data Center

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EXECUTIVE SUMMARY

Pressing on both the accelerator and brakes at the same time when driving an automobile certainly sounds self-defeating. Yet your company may seem to be asking you, as an IT manager, to run the data center in a similar fashion.

On the one hand, the company is pressuring you to accelerate your speed in making changes to the IT environment. Business users want an increasing number of new and enhanced services, and they want them quickly. The financial people want lower IT costs and more efficient use of resources. The security team wants you to keep up with all the latest security updates. In addition, you need to keep up with growing technologies, such as virtualization and cloud computing, to maintain your company's competitive edge.

At the same time, the company is pressuring you for more stability and greater control of the IT environment. Business users want higher service availability and faster performance. The security team wants you to maintain regulatory compliance. The operations team is pleading for relief from a high and increasing number of change activities. These demands can often pressure you to put the brakes on change.

How do you solve this dilemma? You need to maintain a delicate balance between responding to the need for change and responding to the need for control in implementing change. You also need to ensure that the control you put in place does not add unnecessary administrative overhead.

This paper presents a holistic, efficient, and automated approach to change management that will help you meet these challenges. The methodology is based on Business Service Management (BSM) — a comprehensive approach and unified platform for running IT. With BSM, technologies and processes are executed efficiently to deliver new services that create more business value while supporting existing services at lower cost.

The guidelines outlined in this paper will help you improve your ability to quickly implement IT changes, enforce policies to minimize business risk, and automate your change management processes to meet best practices from the IT Infrastructure Library® (ITIL®). As a result, you will reduce costs, increase your responsiveness to business requirements, and position the data center to embrace and benefit from new technologies.

THE PRESSURE OF CHANGE

For most IT organizations, change is a way of life. First, you have to keep up with a relentless torrent of changes to the existing IT infrastructure to meet increasing business demands for new services and to keep up with the latest updates and fixes. On top of this, you have to adopt new technologies, such as virtualization and cloud computing, so you can tap their many benefits, including cost reduction and increased agility. Such adoptions do not remove the need for change management, of course.

Despite the high and increasing volume of change, you have to keep up. Not doing so could expose your company to significant business risk and dull its competitive edge. However, you also have to maintain control of change to avoid exposing your company to risk, such as the risk of devastating system outages and of noncompliance with government regulations.

PRESSURE TO KEEP UP WITH ONGOING CHANGE

Both business and technology issues drive continuous change in the data center infrastructure. Business issues include demands for changes in the IT environment to address changes in the business environment. These demands may include delivering new and enhanced applications and services, expanding computing capacity to meet anticipated usage increases, and enhancing compliance reporting to meet evolving government regulations.

Technology issues also drive a continuing flow of hardware and software changes. These include server hardware enhancements, operating system and application patches and updates, new versions of databases, and new networking and storage software and hardware. Failure to keep up with these ongoing, technology-driven changes can have serious business consequences. It can increase the risk of regulatory noncompliance. It can also expose your data center to serious security threats that may result in the compromise of corporate or customer data, as well as serious financial penalties.

Keeping up with this flurry of changes is difficult at best. Data center infrastructures are highly complex and include a variety of components — servers, network components, databases, enterprise applications, mainframes, and legacy systems. A web of complex dependencies interconnects these components, meaning that a change in one component will likely have far-reaching effects on others. Despite vendor consolidation and standardization of configurations, the extensive heterogeneity and distributed nature of the data center is expected to accelerate, further complicating change management.

PRESSURE TO ACCOMMODATE NEW TECHNOLOGIES

As if the pressure of ongoing change is not enough, you also have to implement changes to exploit new, emerging technologies and architectures. These changes bring with them significant business benefits, such as increased business agility, lower IT costs, and increased return on IT investments.

As an example, many IT organizations have adopted virtualization to reap its many benefits. These include greater agility and higher asset utilization, which result in lower asset costs and higher ROI. Virtualization paves the way for an adaptive computing infrastructure that can adapt in real time to changing conditions in the environment to achieve high-quality service levels at the lowest cost. As an extension to virtualization, cloud computing initiatives are now on the rise in many organizations. Cloud computing requires organizations to rethink change management, accessibility, performance, security, and more.

The implementation of new technologies — such as virtualization and public, private, or hybrid clouds — typically involves major changes in data center architecture, technology, and processes. This situation places an additional and significant burden on data center staff, in that the staff must implement complex changes while still delivering current business services at agreed-upon levels. In addition, the staff has to make these significant technology changes while continuing to roll out a huge volume of ongoing changes to the existing data center resources.

Despite this increased change workload (pressing on the accelerator), the IT staff must ensure that all changes are managed effectively (pressing on the brakes). That's because the severity of the consequences of improperly managed change is multiplied by new technologies. For example, one of the main goals of cloud computing is to improve server utilization by consolidating more business services onto fewer servers. The flexibility of cloud services to grow, shrink, and move around the environment for load balancing and performance reasons means that control of dependencies and configurations is critical to ensuring continuity of service.

A critical factor of effective change management in the virtualized environment is effective capacity management. There is a higher risk of capacity shortfall in the virtualized environment because of the higher level of contention for shared physical resources. This shortfall can result in performance degradation and service outages. Therefore, in migrating to the virtualized environment, it's important to understand the current and future capacity requirements of the physical servers involved. Only in this way can you build policies for dynamic resource allocation and plan future capacity enhancements to ensure that sufficient capacity is available when and where it is needed.

PRESSURE TO MAINTAIN CONTROL

Not only do you face the pressure of implementing changes in a timely fashion, but you also have to maintain control of the changes. It's important to have sufficiently effective change management processes in place to ensure adequate control.

Change management in many IT organizations has a number of shortcomings. The change process may not be formalized. The data for making change decisions may be scattered throughout the enterprise and difficult to consolidate. Many change processes may be performed manually, making them error-prone and difficult to test. These shortcomings raise the risk of system outages. In fact, failed changes are a major source of outages and can have serious business consequences, including financial loss, tainted company image, and reduced employee productivity. In addition to these drawbacks, manual activities are difficult, if not impossible, to audit, raising the risk of noncompliance with government auditing regulations.

What's required is a better approach to change management, one that enables you to maximize your agility in responding to the need for rapid and continual change, while maintaining the control necessary to keep risk at a minimum.

A STRATEGY FOR SUCCESS

Because of the major impact that changes have on the business, you need to take a critical and objective look at your current change management approach, determine how you can improve it, and take action to make the necessary improvements. This section provides guidance to help you in this endeavor.

The approach presented combines best practices, such as those outlined in ITIL, with a configuration management database (CMDB) to create a holistic, centralized change management capability. It eliminates the problems inherent in a siloed approach.

ASSESS THE CURRENT SITUATION

First, assess the current state of change management in your organization and identify any problems that may be present. A good reference to use in the assessment is a guide published by the Institute of Internal Auditors, titled *Global Technology Audit Guide 2, Change and Patch Management Controls: Critical for Organizational Success.*[1] The guide is written specifically for auditors' use in evaluating compliance with government regulations with respect to change management. It can, however, be of considerable help to you in discovering the problems inherent in your current approach. (You can obtain a copy of the guide at www.theiia.org.)

Table 1 summarizes the guide's list of the main symptoms and indicators of poor change management, control failures, and organizational level issues. Exposure to these risks can have a serious impact on the business. For example, unauthorized changes can result in failure to comply with government regulations. Unplanned outages in internally facing applications can drag down employee productivity. Unplanned outages in customer-facing systems, such as an e-commerce Web site, can result in lower customer satisfaction and lost revenue. Delayed project implementations can result in loss of competitive advantage. Moreover, a low change-success rate drags down the productivity of the IT staff by creating extra work.

Table 1. The main symptoms and indicators of poor change management

Top five risk indicators of poor change management	Symptoms and indicators of control failures due to poorly controlled IT changes	Organizational level indicators for which IT may have systemic change-management-control issues
1. Unauthorized changes (above zero is unacceptable) 2. Unplanned outages 3. Low change-success rate 4. High number of emergency changes 5. Delayed project implementations	» Unavailability of critical services and functions — even for short periods of time » Unplanned system or network downtime, halting execution of critical business processes, such as coordinating schedules with suppliers and responding to customer orders » Downtime on critical applications, databases, or Web servers, preventing users from performing their critical tasks » Negative publicity and unwanted attention from the organization's board of directors	» IT staff spends the majority of time on operations and maintenance (over 70 percent), instead of helping the business in deploying new capabilities » There is failure to complete projects and planned work due to high amounts of fire-fighting and unplanned work » IT management is being awakened in the middle of the night regarding problems » IT staff turnover is high » Adversarial relationships may exist among IT support staff, developers, and business customers (internal or external), usually over poor service quality or late delivery of functionality » Too much time is required for IT management to prepare for IT audits and remediate the resulting findings

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[1] Jay Taylor et al. *Global Technology Audit Guide (CATG) 2, Change and Patch Management Controls: Critical for Organizational Success* (The Institute of Internal Auditors, 2005).

IMPROVE CHANGE MANAGEMENT PROCESSES

A major goal is to improve your change management processes. The *Global Technology Audit Guide* also provides guidance here. The guide defines five actions that you can take to improve change management processes. Table 2 summarizes these actions.

Table 2. Five action steps to improve the change management process

Action	Observations
» Enforce zero tolerance of unauthorized changes	» Use preventive and detective controls to achieve and sustain this objective, ensuring that all production changes can be reconciled with authorized work orders
» Continuously monitor the number of unplanned outages, an excellent indicator of unauthorized changes and failures in change control	» Use detective controls and root-cause analysis to help uncover where process gaps allow for unauthorized or unplanned changes
» Reduce the number of risky changes by specifying well-defined and enforced maintenance windows for change and freeze activity	» Maximize stability and productivity during production hours

» Use change-success rate as a key IT management performance indicator	» Use effective preventive, detective, and corrective controls to increase the change-success rate
	  – Where changes are unmanaged, unmonitored, and uncontrolled, change-success rates are typically below 70 percent
	  – Each failed change creates potential downtime, unplanned and emergency work, variance from plans, and business risk

» Use unplanned work as an indicator of effectiveness of IT management processes and controls	» High-performing IT organizations spend less than 5 percent of their time on unplanned work, while average organizations often spend 45 to 55 percent of their time on unplanned (and urgent) activities

You need to establish consistent, repeatable change processes that permit you to effectively measure and control changes to the data center infrastructure. This includes ongoing changes, as well as changes necessitated by new architectures and technologies.

Be sure to establish process workflows across the entire spectrum of change, including the following:

» *Change request initiation and approval* — Establish workflow that includes automatic routing of change requests for approvals. Workflow should keep things moving throughout the approval cycle and permit the delegation of authority.
» *Change planning, scheduling, and implementation* — Establish priorities and processes for distributing patches and upgrades. The processes should maximize the efficiency of use of the maintenance window.
» *Risk assessment* — Subject contemplated changes to capacity management assessment in advance, evaluating their impact on service levels, operational performance and availability, and the IT resources required to sustain these changes. Factors to be considered include type of change, affected configuration items, time of change, and the track records of similar changes performed on other systems.
» *Business continuity* — Establish backup, restore, and disaster-recovery processes to permit fast recovery of the data center in the event of problems, such as the corruption of a critical database by a "misbehaving" application or a natural disaster, such as a flood shutting down a data center. Establish accelerated processes for small changes and those related to emergencies.

Processes should be based on best practices to ensure their efficiency and effectiveness. The ITIL framework — worldwide the most widely accepted approach to IT service management — provides a strong foundation for establishing best-practice IT processes. ITIL encompasses incident, problem, change, release, service desk, service level, capacity, availability, finance, and business continuity management disciplines. (For more information on ITIL, visit www.ogc.gov.uk.)

AUTOMATE WHEREVER POSSIBLE

Automation helps you address both sides of the change dilemma, while also eliminating much of the administrative overhead. It helps minimize change-related risk and improves the productivity of data center personnel and technologies. Automation increases speed and efficiency and frees up much of the staff time currently spent on repetitive tasks. It also helps ensure process consistency by enforcing standardized, best-practice processes. Consistency reduces the number of change errors that could cause outages, interrupting the delivery of critical business services.

Automating the routing of change request approvals speeds the process, keeps approvals on track, and ensures that all required approvals are obtained and logged. Automating the distribution and installation of software updates and patches ensures that they all are installed consistently and that all installation attempts are accounted for, including those that fail. Automating the sequencing of new software releases from the test to the production environment permits you to introduce them in a disciplined way that does not jeopardize business continuity. In addition, automating capacity management and resource provisioning processes ensures that the right resources are brought online when needed to provide optimum efficiency, agility, and service levels.

EXPAND VISIBILITY

To assess change impact quickly, the data center staff needs both broad and in-depth visibility into the complex data center IT environment. This requires a consolidated view of the environment, a view that includes such items as deployed assets (hardware, software, and network components), their configurations, their physical and logical dependencies, their locations, and their associated users (employees, business partners, and customers). In addition, data center personnel need a consolidated view of all planned and in-process changes so they know what changes are in the pipeline. This view enables the staff to perform more effective change planning and maximize efficient use of maintenance windows.

The staff must also understand the business impact of changes in order to prioritize change activities, focusing on those with the greatest business impact. This requires a view that shows mapping of the infrastructure components to the business services they support, such as by indicating which infrastructure components support specific SAP modules. With such a view, data center staff can conduct business-aware change management.

To optimize the cost efficiency of configuration-related changes, the staff also needs to understand the performance implications of planned changes — how much and what type of capacity will be required to successfully balance service levels and budgets — before the changes are authorized. This requires the ability to perform predictive analysis on information gathered from the current IT environment to determine the effect of planned changes.
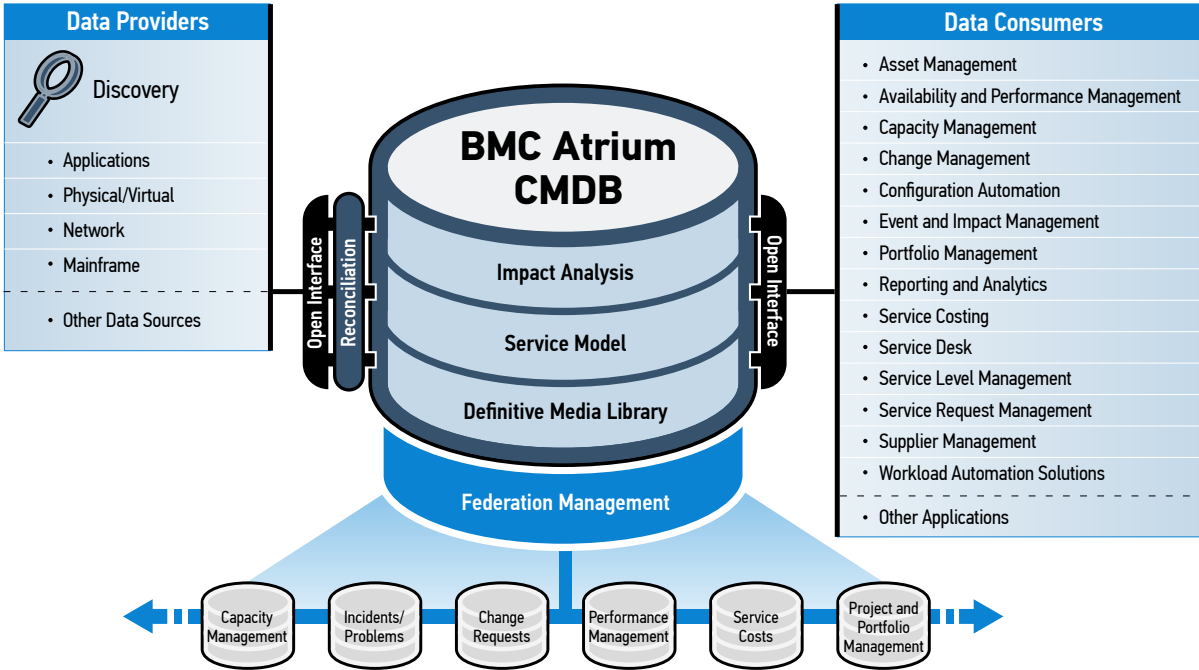
It's important to track and report business service levels — before, during, and after changes are implemented — to facilitate cross-organizational stakeholder alignment and support for change-related activities. For optimal alignment, these reports should detail actual-versus-planned service level performance and associated resource utilization. Finally, you need to track and report all change activities to enable better-informed change planning, facilitate compliance audits, monitor change effectiveness, and identify problem areas.

PROVIDE CONSISTENT INFORMATION

One of the key requirements for effective change management is that all involved people have access to accurate and consistent information about the IT environment. The most cost-effective way to provide this access is through a well-architected CMDB. As illustrated in Figure 1, such a CMDB provides a data source for generating the views of the IT infrastructure that the data center staff needs for change planning and management. Moreover, a CMDB provides a single, consistent, and accurate source of data for other groups, both inside and outside of IT, that also need this information.

What differentiates a CMDB from traditional asset stores is that the CMDB captures the physical and logical interrelationships of the assets, as well as the relationships of the assets to the business services they support. As part of an extended CMDB, a capacity management database ensures that all performance and capacity information regarding infrastructure-related assets is managed and leveraged in the appropriate context.

Figure 1. Configuration management database

Data Providers

Discovery

- Applications
- Physical/Virtual
- Network
- Mainframe
- - - - - - - - - - - - - -
- Other Data Sources

Open Interface
Reconciliation

BMC Atrium CMDB

Impact Analysis

Service Model

Definitive Media Library

Open Interface

Federation Management

Capacity Management | Incidents/Problems | Change Requests | Performance Management | Service Costs | Project and Portfolio Management

Data Consumers

- Asset Management
- Availability and Performance Management
- Capacity Management
- Change Management
- Configuration Automation
- Event and Impact Management
- Portfolio Management
- Reporting and Analytics
- Service Costing
- Service Desk
- Service Level Management
- Service Request Management
- Supplier Management
- Workload Automation Solutions
- - - - - - - - - - - - - - - - -
- Other Applications

ESTABLISH PROCESS CONTROLS

One of the most important functions of change management is to establish control over change activities. This can be accomplished by establishing and enforcing policies that define processes, such as change request and approval workflow, authorization of staff members to implement changes, and deployment of standard configurations. Controls reduce the risk of outages due to inadequately planned or unauthorized changes, and they reduce the risk of noncompliance with government regulations.

In establishing control, it's important to strike a balance with responsiveness. You need to maintain control without obstructing the data center staff from responding to customer needs, such as by burdening them with oppressive administrative processes. You also need to balance the level of control with the magnitude of the impact of the change. For example, operating system upgrades or significant patches can have a significant impact on service delivery, so they should be done under strict controls, especially on systems that support critical business services. Lesser changes — such as minor application patch updates or peripheral hardware changes that do not typically have significant impact on service delivery — require less rigid control.

STREAMLINE INTERACTION WITH OTHER I.T. DISCIPLINES

Process integration is fundamental to BSM and to ITIL. By integrating change management processes and sharing data with other IT disciplines — such as asset management, configuration management, incident and problem management, and distributed systems management — you can streamline the interaction of the data center staff with these disciplines. The CMDB provides an ideal point of integration in that it provides a single source of accurate information for all disciplines, ensuring information consistency.

Here are some examples of the value of process integration and data sharing with other IT disciplines:

» *Incident and problem management* — Improves operational effectiveness in resolving issues. The incident and problem management team can hand off change requests directly to the change management team, and monitor change activity and status directly from the CMDB.
» *Capacity management* — Enables the performance analysis and capacity planning team to keep up to date with current configuration information. Ensures that all planned changes are subjected to capacity planning for upfront performance and capacity-risk evaluation. Enables the capacity planning staff to initiate requests for configuration changes that address performance issues, and to recommend upgrades or new purchases to increase capacity where needed.
» *Asset management* — The asset management team can leverage the automated software configuration policies implemented by the change management team to proactively enforce software license policies, such as by distributing or removing software based on user role and software usage data. In addition, the asset management team can stay current on infrastructure changes by directly accessing the CMDB.
» *Proactive performance and availability management* — Integrating workflow with event management permits fast response to detected service quality degradations, such as by allocating additional hardware resources to a server whose performance is degrading.
» *Identity and access management* — Permits close coordination of change, configuration, and identity management processes in performing installs, moves, adds, and changes. This coordination ensures smooth and controlled provisioning of user access to resources and applications.

BSM SUPPORTING TECHNOLOGIES
BSM technology is available that provides important capabilities to support the strategy outlined in this paper:

» *Best-practice processes* — BSM solutions are available that implement best-practice change management and configuration automation processes, such as those outlined in ITIL, out of the box. The use of best-practice processes enables you to better balance agility and control. Out-of-the-box implementation speeds time to value.
» *CMDB* — Some BSM solutions include advanced CMDB technology that maintains a centralized repository of IT environment data. Some also include an automatic discovery capability that discovers all the assets in the IT environment, their configurations, their physical and logical topologies, and their relationships to the services they support. Auto-discovery CMDBs also automatically scan the environment for changes and update the environment data whenever changes are discovered.
» *Automation* — BSM solutions automate several change processes, including change request approval routing, software patch and update distribution, and server provisioning. Automation increases the productivity of the data center staff. It also increases control by enforcing the use of repeatable, standardized processes.
» *Process integration and data sharing* — BSM technologies include solutions for other IT disciplines in addition to change management, such as incident and problem management, configuration automation, and asset management. Some BSM offerings include solution suites in which the solutions are tightly integrated and share data. Integration and data sharing streamlines workflow between the change management group and other IT disciplines.

CONCLUSION
The change pressure on the data center is already high, and it's building. This paper presents an approach to improving change management that helps relieve that pressure. The approach eliminates the fragmented, inconsistent, and manual change practices found in many of today's data centers. It replaces them with a unified and centralized approach that employs ITIL-based best practices, automation, a CMDB, and tight integration with other IT disciplines. The approach is supported with available BSM solutions that speed implementation and, consequently, time to value.

By pursing the approach presented, you can resolve the apparent dilemma of responsiveness versus control by balancing the use of the change accelerator and the brake pedals. As result, you'll maximize agility while minimizing risk.

For more information about BSM solutions that can help alleviate the pressure of change in the data center, visit www.bmc.com/dca.

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