

Storage Management And ITIL: Where To Begin?

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Here's why storage needs to be more closely integrated with other management processes.

After working with many IT organizations this past year, we have noticed a maturation of storage management. These IT organizations, which range from leading edge to traditional Fortune 1000 types to governmental organizations, are looking to make large strides in many IT areas, while struggling to understand how to marry the processes of ITIL (Information Technology Infrastructure Library) with these efforts.

These organizations are not just looking for tools that monitor and manage this critical part of the infrastructure, but also for ways to integrate them into larger, process-based initiatives that will automate and streamline their overall IT processes. Without this integration effort, the value of their storage management tools is reduced and the tools' full capability remains unrealized. Enterprises often have difficulty finding and retaining technical and managerial talent who understand how virtualization and storage can be managed and leveraged. Consequently, many organizations have had only partial success with the process aspect of these deployments.

It's puzzling that, while server and network management are regularly included in integrated infrastructure management processes, storage management processes and tools rarely are. Storage is one of the most expensive line items in the IT budget, both as a one-time cost and operationally, and it is undeniably one of the most critical pieces of infrastructure. Although we have seen awful things happen across an enterprise when the storage infrastructure fails or degrades sharply in performance, many organizations still view storage as a single box in an architecture diagram, a checklist item for deploying an application, or a large collection of hard drives.

Our recent work in the field has shown us some places where storage management can be brought together with ITIL best practices, which are the *de*

facto standard for IT management processes. We believe that organizations can benefit significantly by integrating their existing storage resource management tools (e.g., Akorri BalancePoint, EMC Control Center, Hitachi HiCommand, HP Storage Essentials and IBM Tivoli TotalStorage Productivity) and processes with the ITIL processes and the tools used to automate them. This strengthens the entire infrastructure management process, which in most large organizations is already enabled by IT Service Management (ITSM) tools such as HP ServiceCenter, BMC Remedy and CA Unicenter.

Basic Concepts Of ITIL

The ITIL framework describes an integrated set of management processes used to effectively deliver IT services to both the business and its customers. In the 1980s a British government organization defined an efficient and cost effective approach for the use of IT resources. Originally intended for British public sector organizations, the ITIL had supplier independence as a primary principle.

By the mid-1990s, many organizations of all sizes throughout Europe were adopting the ITIL framework. Meanwhile, in 1991 an independent collection of commercial and government organizations in the UK formed the IT Service Management Foundation (www.itsmf.org) to support and grow the IT Service Management best practices defined in the ITIL guides. Today there are ITSMF chapters throughout the world. Since then, ITIL and ITSM have become common reference points both for IT service organizations and for the vendors who market to them. (For more about ITIL, see *BCR*, December 2006, pp. 48–52).

For the purposes of this article, we are going to focus on the key processes addressed by the ITIL and that are implemented, in various degrees of maturity, in most Global 2000 companies and large government bodies. These are shown in Table 1, (pp. 56–57), as they are described by the ITIL documents and as they are experienced today in storage management.

As shown in Figure 1, (p. 58), these manage-

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ment processes are related, not only to the entities they serve, but also to the data, systems and services which they describe and deliver. But storage resource management has not, at least so far, incorporated the ITIL/ITSM view. Instead, storage has been seen as a point technology, probably stemming from the days of direct-attached storage where it was handled as part of the server management.

Current State Of Storage Management

While many IT organizations have fairly robust processes for incident, problem and change management in their storage silos, most of them were developed out of the need to be reactive to the business, application and other requirements of the organization. Remember that storage area networks (SANs) have only been in existence for 15 years, and only in the past 8 years or so have the storage silos begun to join servers, networks, security and other silos as equals in an IT organization.

Because storage is a relatively new discipline, many IT folk who take on the storage management challenge have brought with them principles and processes from the other silos. They quickly find that, compared to the tools they used to depend on to enable the processes that are fairly mature in the other silos, storage resource management tools, frameworks and processes are either very young or nonexistent.

This is the current situation: We have had three years of vendor consolidation, so that a few huge companies (EMC, Hitachi, HP, IBM) sell the majority of storage solutions. They also sell the majority of the frameworks and tool sets that are enabling our current storage management practices. While these tool sets are very good for managing the specific vendors' hardware, they aren't standardized and they don't interoperate. That means any enterprise that wants to dual source—and almost everyone does, to keep vendors honest and to exercise some cost controls—will face the need for vendor-specific storage resource management frameworks.

These frameworks include EMC ECC, Hitachi Hi-Command, HP Storage Essentials and IBM TivoliStorage Productivity. Independent software vendors and others also offer solutions, including CA's BrightStor and Symantec's Command Central for Storage.

Many of the frameworks are getting facelifts to address tiered storage, server virtualization, change management, asset management and other pieces of ITIL and/or ITSMs. Tiered storage highlights the differences in how storage is managed today versus direct attached storage and how processes really need to be mapped to ITSM.

Tiered storage essentially creates multiple classes of storage for the purpose of controlling costs for different applications. It's a great idea in principle, but it has many gotchas, the biggest one

being the lack of a single management solution for multiple storage types with different characteristics. Charging back tiered storage costs to internal organizations can also be complicated, as it can be based on multiple cost factors, such as capacity, replication, availability, performance and compliance.

As tiered storage began to be promoted a few years ago, it became apparent that it was very difficult to move data between tiers of storage without a new set of tools. Over the past few years, companies have answered with storage migration tools inside of frameworks and startups outside of frameworks. Some of these solutions move data from one array to another permanently, while others focus on storage virtualization, which abstracts the storage from the server perspective and allows the storage administrator to allocate multiple types of storage with different characteristics. This could range from using SAS (serial-attached-SCSI), SATA (serial-attached-ATA), or FC (Fibre Channel) types of disk spindles. Virtualization technology and tiered storage techniques allow for arrays with more or less front end cache to be allocated, which could bring cost savings.


Meanwhile, SAN-fabric virtualization technology is in the process of maturing. EMC Invista, HDS Tagmator, IBM's SVC and NetApp V-series all have been on the market for years now, and storage virtualization (or storage abstraction) within arrays has been around for many years (e.g., EMC Symmetrix, HP EVA and NetApp FAS series).

Storage administrators are getting more comfortable, and shipments of this type of SAN-fabric based virtualization software are up, but the actual usage rate for the software is still fairly low. Once again this is a place where technology has outpaced the processes needed to effectively deploy it. In many cases, the storage teams at major organizations do not have time to put the processes in place because they're too busy with day-to-day fire fighting activities.

The feeling from the executive-level customers we talk to is that the industry is now at a turning point and that process is increasingly important. The operational and capital expense associated with storage and storage management in general have brought visibility to the process issue. As process has become more important, new tools for enabling these processes also are starting to show up on the market.

Process Enablement And The New Tools

This is definitely a case of "everything that is old is new again." IT organizations went through a similar transition in learning to manage mainframes, networks, client/server and open systems (which is still continuing). In each case, a transition occurs when vendors have made great strides in instrumenting their hardware, while creating an ecosystem for new companies to add missing



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pieces that enable different parts of the process. As those new companies come out with their solutions, the larger companies try to enable their frameworks to utilize the smaller companies' technologies, or they buy the new innovators or they build the new functions themselves.

Three of the smaller companies that are pushing technology that enables processes within the storage and server domains include:

■ **Akorri's BalancePoint** provides cross-domain

(servers and storage) application visibility and performance management across servers and storage that are connected, in order to facilitate problem identification, performance-based capacity management, and impact analysis for problem and incident management.

■ **Monosphere Storage Horizon** enables gigabyte-based capacity management to manage growth and utilization of storage arrays and bill back to organizations.

TABLE 1 Key Processes

Description of ITIL Management Process

The primary goal of the **Incident Management** process is to restore normal service operation as quickly as possible and minimize the adverse impact on business operations. 'Normal service operation' is defined here as service operation within service level agreement (SLA) limits (from the OGC ITIL Service Support Guide).

The two goals of **Problem Management** are (1) to react to incidents and problems that are caused by errors within the IT Infrastructure by solving them and minimizing their adverse impact, and (2) to proactively prevent the recurrence of such errors, and to identify and solve problems and known errors before incidents occur.

The objective of **Change Management** is to ensure that standard methods and procedures are used for all changes to controlled IT infrastructure, whether they arise from problems or planned changes. This improves efficiency, minimizes the number and impact of related incidents, and helps achieve balance between the need for changes and the potential detrimental impact of changes.

Configuration Management tracks all the individual configuration items (CI) in the IT environment, from devices to personnel and workgroups. Configuration management is a key supporting process for all of the ITIL best practice processes and is also supported by the other processes. (also see *BCR*, February 2007, pp. 54–57)

Service Level Management provides ongoing identification, monitoring and review of the levels of IT services specified in the SLAs, making sure internal and external IT support providers meet their commitments. This is the natural place for metrics to be established and monitored against benchmarks in the operational level agreements (OLAs) and underpinning contracts (UpCs).

The goal of **Capacity Management** is to ensure that IT capacity cost-effectively meets current and future requirements. In the ITIL, there are three sub processes: business capacity management, service capacity management, and resource capacity management.

Request Management specs are defined, as part of Service Level Management, in the IT Service Catalog along with their service level metrics. There is a strong link between Request Management and Change Management as most infrastructure related requests are subject to the Change Management process prior to implementation or fulfillment of these requests.

Availability Management amounts to each component performing at an agreed level over a period of time. Availability does not refer solely to the outage time of a component, but rather to the reliability, security, maintainability, serviceability and resilience of the component.

Current Reality Of Process In Relation To Storage Management

Incident Management currently is a disjointed process between storage and many other parts of the organization. Although some companies have done some custom integration to enable fault or event based trouble tickets and work flow to be enabled, they tend to treat storage as one configuration item. This limits their ability to see the impact caused by outages or performance degradations.

Problem Management for storage is very strong within many of the storage management frameworks when there is a "hard down" (e.g., a broken piece of storage infrastructure), but less capable in dealing with a "soft down" (e.g. application brownout).

Change Management is fairly well integrated in major storage implementation projects and, in some companies, in the weekly IT change management meetings. A good job is often done mapping hardware configuration changes, less so in identifying and tracking the impact of changes on particular applications.

Configuration Management is handled in many element management and framework tools, although they tend not to be integrated with the rest of the infrastructure. The frameworks do a good job of storage- focused configuration management and some startup SRM vendors also are focusing in this area.

Service Level Management has been difficult in many facets of application and infrastructure management. SLAs in storage management, as handled in the frameworks, tend only to focus on the mature processes of configuration management and in provisioning.

Capacity Management is widely deployed but thinly implemented in the storage environment. Getting the utilization of arrays higher has been one focus in the last few years, but this is a multi-dimensional problem. Raw storage capacity is easy to see and monitor, while true throughput capacity is much tougher.

Request Management is usually simple for storage folks. Sometimes they have their own queue in a request management system, but more often than not they are a sub-queue of the server, operations, or infrastructure silos. Storage requests are not being defined in the IT Service Catalog, so SLAs for storage requests are not defined or measured. This can slow fulfillment of these requests, and it makes measurement difficult.

Availability Management means "measured uptime" for most IT infrastructure, while it means "response time" for most applications. Combining these two gives a better view of an application's ability to do work, and has long been the focus of storage vendors. Redundancy has been their response to the need for availability.

■ **Onaro's SANscreen** provides change management from a storage workflow perspective, to enable configuration and asset management for SAN fabrics and storage arrays.

In each case, these companies are enabling processes above the level of fault-based incident management, which already is very well served by the framework providers. The value added by the newer companies is in their focus and the ability

to enable particular ITSM/ITIL processes for server and storage management. Of course, new tools can't solve issues of poorly managed processes. Companies and industry groups both need to embrace storage management and apply the processes.

Merging Management And Processes—Tools Of The Trade

All too often, we find that people are following, or they are trying to follow the ITIL or ITSM processes as defined by their organizations, but the process is not integrated with other critical IT management sub-processes, or the tools that they are using can't support the interoperability or integration between these processes. For example:

■ How can you effectively manage change in the production infrastructure, if you have no visibility into the configuration of infrastructure components and their logical and physical relationships to other components?

■ What if your infrastructure monitoring tools are triggering alerts in the operations center and they are opening an incident ticket while, at the same time, users are phoning the help desk, which is opening additional tickets? How do you correlate these different impacts and determine it is the same issue which needs to be addressed?

■ Do your business end users have to use multiple different systems to request different services from the IT department? Does your IT fulfillment team have to move among multiple tools and then manually integrate these processes (through phone calls, emails and data re-entry) into multiple incident management, change management or provisioning systems?

These are common issues that stem from broken processes. To fix a process that is broken, you first have to be able to measure it and analyze the key performance indicators associated with this process. In order to measure it, you need to at least track it in a single tool or a set of integrated tools.

We often find enterprises have implemented frameworks to monitor, manage and provision the resources in the data storage environment, but we seldom see that these tools are properly integrated with the rest of the IT Service Management processes. Therefore, the only folks that benefit

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What Needs To Be Done

Storage management tools need to be fully integrated to provide cross-domain visibility into the incident management process and system, so staff can see the true impact of a storage-related incident and more quickly restore the service.

More detailed configuration information from the storage management tools would help staff with root cause analysis, resulting in better classification, diagnosis and known error document creation. This in turn will reduce the amount of recurring incidents in the storage environment.

If storage management were integrated into the configuration management database (CMDB), organizations would be able to better manage risk and plan appropriately when storage changes are requested.

By integrating these storage management tools with the CMDB, organizations will get a detailed picture of the storage environment in context with server, application, database and network components and be able to relate these to other configuration items in the environment.

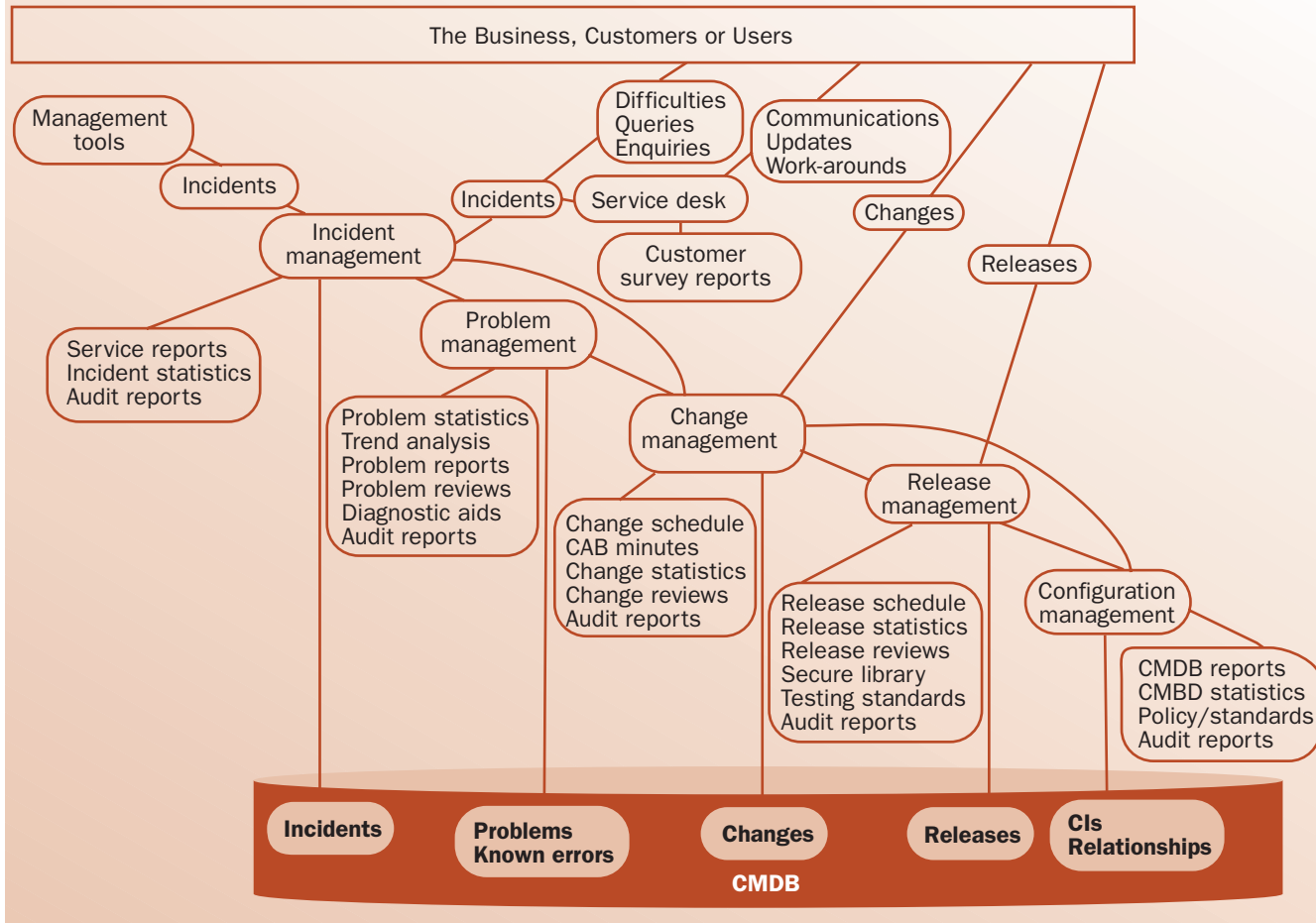
Startup vendors are working to enable integration with the rest of the processes around application and infrastructure management. This will enable organizations to measure the detailed OLAs in the storage environment as part of the overall SLAs.

By integrating the utilization data captured by the storage management tool into the CMDB and/or capacity management system, a company could analyze and plan for storage capacity as an individual component and, more important, as part of the service that the storage environment is supporting.

If storage management tools were properly integrated with the request management system, storage resources could be more quickly provisioned, in some cases on a nearly automatic basis, once the necessary approvals and planning processes were completed.

Through integration with the CMDB and the availability management system, a storage management tool could provide detailed availability metrics regarding individual components of the storage environment and not just the framework as a whole.

FIGURE 1 ITIL Best Practices



from this data are the small group of storage wizards managing and tuning the environment.

If the SRM data were to be integrated into the ITSM systems, IT service support and service delivery teams would benefit in the same way that they benefit from integrated network and server management data today. Some of these benefits are as follows:

- Management would have visibility into the current and historical consumption of storage resources, both from a gigabyte and performance-based perspective, to help them plan for future capacity if the storage management tools were integrated with the Configuration Management Database (CMDB).

- If the storage management tools were integrated with the incident management tool, and a problem arises in the SAN, then network, server and applications teams can be notified proactively and they won't lose time troubleshooting their own systems for the root cause.

- Tasks like storage provisioning, utilizing frameworks, managing tiered storage and storage virtualization could be handled in near real time when integrated with the request management system instead of taking weeks or months as it does today.

- The investigation and diagnosis of the root cause of one or more incidents would take less time if storage management tools were integrated with the CMDB. Operations coordination between IT silos also could be attained.

- Storage environment outage and availability metrics could be tracked and measured as part of the overall SLA, for specific IT services such as email to business customers.

These benefits should get you thinking about other possibilities, and other potential benefits of integrating your storage management tools with your ITIL or other best practice IT process management tools. To some extent, this is already occurring, at least in a few of the organizations we have worked with.

Storage Management And ITIL: Working Together

The number one thing that is enabling storage management folks to adopt ITIL processes is the advancement in vendor tool sets, especially getting beyond fault and event management. We are also seeing that more operations folks are monitoring and triaging storage related incidents as storage performance management tools are intro-

duced into the operations centers. This has started with some simple do-it-yourself integration among existing tool sets, but it is continuing to progress.


For example, operations centers that do not see the full picture, including servers and storage, can't know for sure how applications are running, so storage, servers and storage management have to come out of the "back of the datacenter," at least in terms of ops center visibility. Several companies have solutions for this. For example, EMC SMARTS Storage InSight for Availability looks to find hardware issues and the root cause of events by deduping hundreds of event messages gathered from the hardware, and Akorri's BalancePoint measures application performance in terms of throughput and latency across server and storage infrastructure.

Conclusion

Virtualization of server and storage resources will make visibility and rapid root cause determination even more critical, because the application performance will be at the mercy of more and more distributed and ad hoc processes running on more distributed infrastructure.

The main message of ITIL, ITSM, storage management—and, for that matter, every management process—is that, at the end of the day, all these processes are put in place to provide services

that enable the business side of the organization. More often than not, the service provided to the business takes the form of an application. Most IT shops would love to connect the dots and see a cross-domain view of these applications issues with the potential impact of configuration changes, or the performance impact of adding another application to the shared infrastructure. If they can't see the usefulness of such management integration now, they will see it when they begin deploying storage virtualization and server virtualization, using such virtualization foundations as VMWare, Xen, and IBM AIX with LPARs□



Virtualization of storage resources will make visibility and rapid root cause analysis even more critical

Companies Mentioned In This Article

Akorri (www.akorri.com)
CA (www.ca.com)
EMC (www.emc.com)
Hewlett Packard (www.hp.com)
Hitachi Data Systems (www.hds.com)
IBM (www.ibm.com)
Intact Technology (www.intact-tech.com)
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