



WHITEPAPER

Strategic Storage Optimization: Radically Organizing that
Chaos

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Service Management

Resource Management (RM)

Storage and Resource Management - Strategy and implementation Practices

Paper Abstract: This white paper describes a service management strategy to managing the resources of an Information Technology infrastructure with a primary focus on optimizing storage for cost and effectiveness.

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Executive Summary

What is Resource Management (RM)? In short, it is the *discipline* that allows an enterprise to effectively manage computing resources. These resources include servers, storage, and networks. Resource Management allows an enterprise to understand how much resource is deployed; how it is configured and connected; the general health and status of the servers, networks, subsystems, logical volumes, databases, and file systems; performance and its implications on application performance; how applications are consuming resources; where demand for capacity and access is coming from; how well the resources are utilized; how much resources cost; and what each area should pay.

Storage Resource Management (SRM) deals with all of the storage components and their relationship to business requirements and applications. Event notification and quota management are fairly well understood, but the need to move beyond this is critical to good Resource Management. It is important to consider the link of storage to the global network and system management environment as organizations look to understand all the components that could be affecting application performance. For example, configuration management provides the information on what equipment is installed and what version. This information can feed into financial and asset management systems. Capacity management provides the view into the server, network and storage environment that will help with allocation of resources when capacity is required and will provide the forecasting tools to determine when new equipment will need to be purchased. Chargeback takes advantage of configuration, asset, and the capacity management information to put a value on the storage resources that a given department or user owns at any given time. These processes and the enabling tools are basic requirements in a service environment where bills will be issued to external customers and increasingly important in other types of organizations where the cost of IT is being spread among departments. As another example, performance management will identify and correct issues and may be needed for availability reporting.

This paper will focus on a service management framework as it applies to storage. However, the techniques and best practices described are applicable to all components of the IT infrastructure including the server farm and networks. All platforms throughout the supported infrastructure are affected. Establishing a focal point for Storage and Resource Management functions allows for efficient planning and execution of these functions on behalf of the business users and development organizations. The resulting visibility will enable these functions to address business capacity and performance requirements for storage, in addition to those for servers and other configuration components.

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Introduction

Highly available applications require highly available storage. Effective Storage Resource Management (SRM) will invariably improve resource efficiency and reduce resource costs. Knowing what is available and how it is used are the first steps. SRM becomes more critical in large enterprise, multiplatform and shared storage environments. SRM is an essential element of a service management orientation.

For many distributed computing support organizations, storage management has been synonymous with backup and recovery. As the storage environment becomes larger and more conducive to being shared, the impact of storage disruption increases. These factors compel enterprises to develop storage management capabilities. As enterprises deploy Storage Area Networks, they move to a shared storage environment in which application ownership of resources can no longer be determined by physical connectivity. Performance and capacity management becomes more complex.

Storage management is expanding from an operational discipline practiced on a system-by-system basis to a discipline oriented to infrastructure projects that touch all major application systems. SAN design and implementation implies the centralization of hardware-oriented storage acquisition and management functions. A shared storage infrastructure requires that server-oriented storage administration evolve into a more general process that includes storage capacity planning. Storage and data must be managed centrally by storage domain rather than by individual server/application. It follows that organizations and job descriptions must change, and that a new set of best practices must develop. The most fundamental change is the organizational change, the creation of storage administrators and storage consumers. Storage administrators manage storage centrally on behalf of the storage consumers, the servers, applications, and related people. Success is most likely if these changes are understood and planned up front, rather than backed into as an afterthought to building a storage network. IT organizations need to develop processes for storage management that are aligned with the IT operations and the tools used to automate systems management. IT organizations must consider and align all aspects of storage management to ensure the successful deployment of emerging storage technologies and a return on investment.

A centralized approach to storage management provides numerous benefits including:

- Various storage resources can be defined logically and automatically managed to certain dynamically definable policies.
- Data performance and availability monitoring help collect, process, and make informed decisions to better support corporate policies.

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- Ubiquitous, high-speed, high-availability access can be maximized and preserved as new server and storage resources are added to the central pool.
- Implementation of consistent policy-based storage management is easier and cleaner.
- Accurate capacity planning facilitates forecasting, typically results in less overbuying and a smoother growth path because resources are added only when needed.

The long-term solution to the challenges of managing enterprise storage is the use of a centralized and integrated storage-management solution to provide a common management interface for all storage tasks across all systems, local and remote. This management approach must be architecturally independent in the sense that it accommodates both the traditional server-centric and the new storage-centric storage deployment models.

Hardly anyone outside of the S/390 mainframe world has implemented effective SRM. All components required to manage and deploy large scale enterprise SANs seamlessly are not fully integrated via the storage vendor supplied solutions. Today's IT organizations must have a central storage management group to manage large centralized storage networks. These groups must be armed with the process and procedures to managed storage. This will enable the function to develop and enforce effective policies. Continued high growth in data, and thus storage, requires better management processes, procedures, policies, and tools to manage the resources using limited staff.

The storage management challenge can be summarized as follows in Figure 1. The remainder of this paper will address various aspects of the service management processes illustrated.

Storage Management Challenge

(Aligning storage management with IT processes)

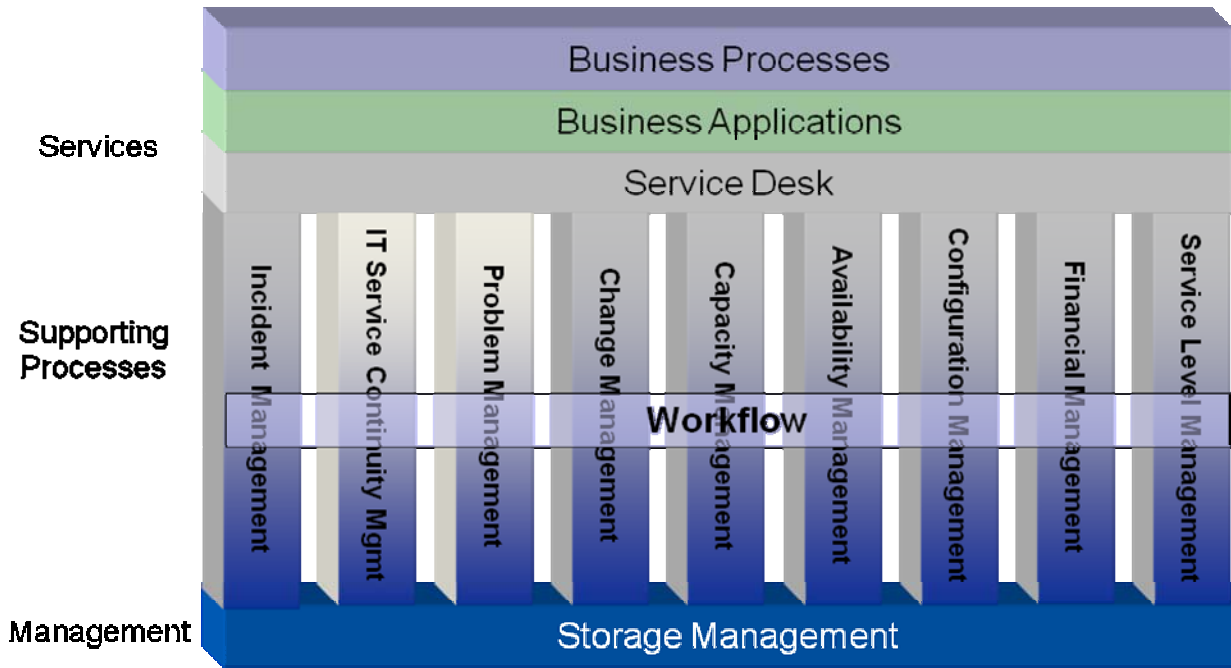


Figure 1 The Storage Management Challenge

A Storage Assessment Methodology

The following is an example of a storage management assessment methodology, one that organizations can use to assess storage management readiness.

1. Identify and interview key management and IT personnel to understand current storage issues, processes and strategies and their associated impact on the organization.
2. Assess the impact of existing storage management techniques and compare it to an enterprise wide storage solution in terms of:
 - **Financial Impact** - The measurement of current storage management practices against a fully deployed enterprise wide storage management approach
 - **Operational Impact** - Changing operations by enhancing such areas as configuration management, disaster recovery, backup and restore, storage utilization, and problem resolution
 - **Business Impact** - Business impact is a measurable customer benefit that provides extended business value beyond what may have been originally anticipated
 - **Hardware/Software** - The benefits and enhancements derived from utilizing existing or deploying additional hardware and software products

A Storage Management Assessment is an evaluation of a client's overall storage management practices and techniques currently used to manage the storage infrastructure. This entails auditing backup and restore as well as disaster recovery practices and providing recommendations for improving current processes and creating a customized strategy for developing and deploying an effective Enterprise Storage Management group. Some of the areas addressed include:

- Processes and Procedures
- Storage Management Responsibilities
- Storage Management Policies and Standards
- Capacity Planning
- Storage Management Tools
- Storage Monitoring and Reporting
- Service Level Agreements
- Risks and Exposures
- Total Cost of Ownership

Storage Management Strategies and Recommendations

The Enterprise Storage Management Group

The most important piece to the storage management puzzle is the creation of a central Enterprise Storage Management organization.

This organization should have total responsibility for storage management strategy, tool selection, problem resolution, procurement, allocation, reclamation, monitoring, and reporting for all storage within the infrastructure. This responsibility should include all levels of support and span all storage media as well (i.e. tape, disk and optical). Additionally, the team would be responsible for developing and enforcing all Service Level Agreements and Standards regarding storage practices and processes.

- The purpose of the Enterprise Storage Management group is to provide the entire business organization with services that efficiently, economically and predictably, manage all aspects of the enterprise storage infrastructure.
- The formation of an Enterprise Storage Management group will provide the ability to take a more proactive approach to the management of the storage infrastructure. Less time will be spent on fire fighting and more time on planning and strategy. The impact of these disruptions to the organization can be immeasurable.

The Enterprise Storage Management group should interface with the application development process and be included at all application planning meetings. Not only does this keep the group informed of upcoming projects early within their life cycle, but will allow the group to contribute and potentially influence total project costs and direction.

The implementation of an Enterprise Storage Management group provides the following benefits:

- Improve communication between end-user groups
- Efficient and cost effective utilization of the organization's storage media
- Compliance with business and regulatory requirements for information management
- Effective recovery of data in the event of corruption, deletion or disaster
- Ability to support new application storage requirements as requested (storage on demand)
- Support for business or market fluctuations and opportunities as they occur
- Lower hardware, software and vendor services costs through execution of an enterprise-wide volume purchasing strategy

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- Best practices – shared among all business groups. These include but are not limited to:
 - ✓ Develop, monitor and maintain standards and Service Level Agreements
 - ✓ Contingency management and recovery
 - ✓ Storage management techniques and tools
 - ✓ Standardize operations
 - ✓ Platform independent application development
 - ✓ Enhance capacity planning
 - ✓ Enhance floor space management

Storage Management Holds the Key to Reducing Costs

Hardware costs, although the most visible and the most tangible, on average represent only 5 percent to 15 percent of the overall cost of storage, according to most industry reports. The remainder of the costs is post-purchase including software acquisitions, management, staffing (likely the most significant cost), amongst other costs.

Centralizing storage administration and providing a common storage management interface is a critical development in most successful efforts to reduce the costs of managing storage.

Reducing the overall cost of storage is best facilitated by focusing on the management of storage rather than the hardware acquisition. Users may want to do internal audits quantifying the cost of managing storage that will give users a more realistic view of their total storage costs.

Storage Management Standards

Information is regarded as a mission-critical corporate asset and competitive weapon. The explosive growth of information maintained online has led to the establishment of enterprise storage strategies that provide maximum data availability, consistency, control, integrity, security and protection from loss. As these strategies are deployed, it is necessary to have in place the appropriate controls in the form of policies, standards and processes, as well as service delivery mechanisms.

Allocation of storage resources requires greater control to effectively utilize available storage assets. The Enterprise Storage Management group should be directing this effort by creating, publishing and enforcing storage allocation standards, as well as ensuring adherence and compliance to the standards.

Conducting regular client review meetings for standards adherence, project status, issues and future planning across all platforms can be an effective weapon. These

meetings can also be a vehicle for an application walk-through that could result in better design, process efficiencies, and adherence to standards.

Capacity Planning

It is typical for organizations to implement applications without a clear understanding of the impact applications have on the total environment. Regardless of whether the storage capacity planning process is organized as part of the Enterprise Storage Management group or whether it is maintained as a separate organization, performance and capacity problems usually arise after an application has been implemented. These problems can be within the application itself, the overall system, or both.

Capacity Management (CM) is the science and practice of predicting future resource requirements. Specific to storage, it is a set of procedures to ensure proper storage capacity management, to support the optimum and cost-effective provisioning of IT services by ensuring that organizations match IT storage resources to the demands of the business. CM covers all aspects of server and storage capacity including planning, implementation, and post-implementation review for all platform environments. The elements of capacity planning include Capacity Management Database (CDB) creation and reporting, workload management, application sizing, production of the capacity plan, resource management (storage management, technology assessment, etc.), and demand management.

Performance Management

Performance Management (PM) is the practice of maximizing performance (i.e. response times and utilization) of existing storage resources. PM establishes relevant performance metrics and thresholds. PM monitors and logs performance data, then reduces these data to reports used to establish performance baselines, identify trends, bottlenecks, and tuning opportunities.

Configuration Management

Configuration Management provides the detailed information about installed hardware and software resources within the operational environment. Any and all information that can assist in major operational processes such as Capacity Management, Problem Management, Service Level Management, and Change Management must be maintained. Others, such as Asset Management, will also rely on the detailed information about the actual installed hardware and software.

Storage Management Tools

The IT environment always benefits from effective allocation standards. Consistent and frequent use of Enterprise Storage Management tools to monitor and automatically

manage under-utilized assets would regularly free up additional space and potentially allow future acquisitions to be deferred.

The Enterprise Storage Management group should conduct a thorough review of storage management tools to:

- determine capabilities required to manage current and future storage needs
- understand current capabilities of installed tools
- determine specific staff expertise in current tool set
- determine if the correct tools are already in place or whether they should be replaced with alternative technology
- determine if current tools overlap in functionality, potentially reducing the total number of tools to diminish support complexity while reducing software maintenance costs

Storage Technology Evaluation

One of the core functions and responsibilities of the Enterprise Storage Management group is to evaluate emerging storage technologies by including within their charter the responsibility to:

- Track technology trends
- Define criteria for storage technology evaluation
- Act as a program office for storage technology evaluation projects

Support the Implementation of Storage Management

Establishing Standards and Service Level Agreements

The key here is “Do not dictate - but do not be dictated to”

The single most effective method for managing storage and delivering the desired service to your business is to establish effective Standards and Service Level Agreements (SLA). In order to accomplish this in the most effective manner, you must include the participation of your business units in order to understand their actual storage requirements. Without the business owner’s involvement, the Standards and SLA’s become worthless since you will never be able to have them agreed to and receive signoff. Why would a business manager sign a commitment by you to deliver a certain level of managed service when you do not understand nor have discussed with them exactly what levels of service they require?

Getting Buy-in

The most successful standards are those that are decided with the inclusion of widespread representation, including development and infrastructure representatives. If standards are created by a central team of full-time architects, they are often perceived at the grassroots level as being handed down from the ivory tower and their applicability is questioned at the outset. However, if the process is inclusive of the entire IT population, buy-in is much more likely.

Neither an absolute "command and control" management style nor a purely "kind and gentle" approach will work well for gaining the buy-in and cooperation of the IT community regarding architecture standards. The combination of management support and a thorough communication effort is crucial to the success of an enterprise architecture effort.

Implementing a Storage Request Process

Although a formal storage request process will not totally eliminate those “I need it yesterday” requests, it does offer some day-to-day relief in trying to support growth in a pro-active manner. A storage request process allows the storage consumers to communicate storage requirements before they get to the critical mass stage. Unfortunately, this is not always the case when unexpected growth and storage spikes arise that nobody expected or can predict. However, it does relieve a lot of the daily fire fighting that occurs when storage space becomes exhausted and applications begin to fail.

In addition to implementing a storage request process, include Enterprise Storage Management group representatives in the application development life cycle. This

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gives the Storage Management group an early insight into what applications are being developed and alerts the group of future storage requirements. With this advanced knowledge, the group can effectively plan for the deployment of storage when it is required - not after it is urgently needed.

Service Level Reporting

By now, most IT functions (both in-house and outsourced) have adopted Peter Drucker's often repeated incantation: "If you can't measure it, you can't manage it," and will sagely quote it as evidence of their maturity. All too often, however, only half the message has really hit the mark. This is frequently evident in service-level reports. Often graphically rich and using every available color on the printer, service-level reports frequently tell the reader only one thing: we met (or exceeded) the Service Level Agreement (SLA), or we didn't (and we're very sorry). The accompanying text generally comes straight from the political spin-doctor's handbook and is accompanied by endless tables and graphs that deliver little insight to the reader.

In short, what is usually presented is basic information — binary in nature (we succeeded/failed), accompanied by largely meaningless data. In failing to analyze this data and convert it into useful management information, a great opportunity is being missed to understand why and where problems are arising and to feed this information back to an embedded root-cause analysis and resolution process. Careful analysis can reveal information about behavioral patterns and working practices in parts of the organization (a good help desk system is an essential enabler here) and facilitate effective understanding and cooperation between IT and business functions.

Staying Visible and Effective

Now that you have everything under control, it is time to plan how you are going to maintain the quality relationships you have worked so hard to establish with your business community and management. There are several approaches and techniques, which can be deployed to accomplish this task. By no means should the ideas presented here be considered a complete and exhaustive list. Your organization is unique and what works best for you and your organization as well as what the team can effectively support will necessarily be unique.

Maintaining Relationships is beneficial; here are some ideas

- Meeting Regularly with Your Business Unit Managers
- Presenting Quarterly Updates to Senior Management
- Value Management
- Quickly Responding to Questions and Problems

- Scheduling Your Vendors for Group Discussions
- Maintaining Up-To-Date Documentation and Inventory
- Designing and Distributing a Quarterly Newsletter

Conclusion

The key to successfully implementing an Enterprise Storage Management group is predicated not only on a solid strategy but also with the complete and unwavering support of Senior Management. It is only with leadership's support that the organization can be structured in a way that makes it truly effective and ultimately successful.

Defining the group's mission statement and charter is paramount to establishing what the group is, what they will (and will not) be responsible for and how they will ensure effective management of the entire IT storage infrastructure. This mission statement should be clearly defined from the very beginning and included in the presentation to senior management when requesting sponsorship.

Simply put, the purpose of the Enterprise Storage Management group is to provide the entire business organization with services that efficiently, economically and predictably manage all aspects of the enterprises storage infrastructure.

Jim Ryan leads the Baltimore / Washington office and is a Principal of Implementation and Consulting Services, Inc. (ICS), a national Data Center Management Process consulting firm and Data Center Management Software provider. ICS assists their clients by serving the needs of complex Data Centers for strategic planning, software and tools, storage solutions, relocations, consolidations and technical conversions including new implementations. ICS continues to lead the pack in identifying and implementing "best industry practices" for Enterprise Data Centers nationwide. For more information, call (610) 355-7750 or visit <http://www.ics-corporate.com>.

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