



IBM® TotalStorage™ Productivity Center

Managing Storage Area Network Configurations

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Managing SAN Configurations with IBM TotalStorage Productivity Center

This document provides a summary of the new configuration management support in IBM TotalStorage Productivity Center Version 3 Release 3.

Overview

Today's IT networks continue to evolve at a rapid pace. As new storage systems are being purchased and put online, storage administrators face complexities with configuring their multi-vendor storage networks. Increasing diversity in the IT network, including virtualization of servers, file systems and storage controllers compounds this complexity.

Acquisitions, mergers, consolidations, new technologies, old technologies and mixed vendor environments are ingredients that make managing IT networks a feat for the strong at heart.

Storage administrators are increasingly turning to more sophisticated management tools to help them overcome these challenges. Storage Resource Management tools are focused on helping the storage administrator deal with configuring these modern IT storage networks. These tools provide a comprehensive view of the end to end storage infrastructure, from the hosts, through the fabric network to the storage arrays.

Administration of the Storage Area Network

The storage administrator must provide a highly available, secure storage network as it provides the core for any successful business. Constant network changes are being introduced to get the newly acquired storage on line. This constant change requires scrutiny and diligence by the storage administrator, as bottlenecks must be avoided, network demand must be accommodated, and service levels must be maintained.

As storage provisioning is required to get new storage online, or to rebalance workloads to ensure service levels are achieved, increasing amounts of time are required to deal with this provisioning. Generally, the size of the storage administration staff is not increasing to deal with this increased workload. For many of you, that's an understatement.

The storage administrator must configure multiple storage systems and host servers in order to get the storage on line and usable. In addition, the storage administrator must ensure the storage is configured optimally (has the right amount of bandwidth and storage type and amount assigned), securely (ensure the hosts accessing the storage are the right ones), and maintains performance load balances to avoid creating bottlenecks.



- Traditionally, storage administrators have used a bevy of tools, provided by each of the hardware vendors, in order to configure the storage to the hosts.
- New capabilities are being delivered by Storage Resource Management software which can significantly help storage administrator deal with the storage configuration tasks.
- These capabilities are designed to improve the storage administrator's productivity.

So, let's summarize some of the key tasks the storage administrator needs to accomplish; maintaining the existing storage network, adding new resources to this network and planning for future expansion of this network.

- Configure the storage
 - Define and configure the storage physical and logical connections to the hosts
 - Provision the storage resources (Host HBA, SAN fabric ports, disk storage)
- Manage the storage network
 - Ensure availability of resources and service levels are met
 - Troubleshoot storage system and network issues
- Plan the evolution of the storage network
 - Reclaim resources (migrate, archive, cleanup)
 - Balance and tune the storage network as new workloads are added



In order to effectively accomplish these tasks, the storage administrator needs to assess the current storage network configuration and workload.

- by providing an end to end view of the storage infrastructure, the storage administrator can see the big picture and understand the underlying connectivity between the hosts, SAN fabrics and storage systems.
- by providing access to the current workloads on the Storage Area Network, including the SAN fabric ports and storage systems, the storage administrator can assess possible storage network constraints and assure new workloads are placed without impacting current performance.
- by providing Best Practice assessments on the storage configuration, storage administrators can assure their storage networks are optimized.

New configuration management features of IBM TotalStorage Productivity Center Version 3 Release 3 were targeted at helping the IT administrator achieved the above tasks.

Configuration Management with IBM TotalStorage Productivity Center

TPC provides an end to end view of the storage network, with an easy to use SAN topology viewer. TPC also provides SAN performance metrics for the SAN fabric switches and storage arrays. TPC captures the underlying SAN configuration and provides reports on its usage, capacity, and availability. Building on this base, IBM TotalStorage Productivity Center Version 3 Release 3 has added some significant new features focused on the configuration management of storage networks.

The design and implementation of new capabilities focus on storage configuration management and provide analysis of current storage utilization and best practice recommendations to provide the storage administrator with analytical input that will provide significant assistance to ensure the storage configuration is optimized.



SAN Configuration Planners

Storage provisioning in SAN environments has long been done manually. Beginning with the basic capacity requirement, an administrator decides how many volumes to create and what their individual sizes should be. Next comes the question of whether there is enough space available in the storage systems to accommodate the new volumes. If the administrator is familiar with the internal structure of the storage system then he can use storage management tools such as TPC to see how much space is available in each pool in the storage system. Sometimes these may not match the chosen volume sizes.

Furthermore workloads vary significantly in terms of their performance requirements and behavior. Some are read intensive with infrequent writes while others are write-intensive (e.g. archival). Some have a predominantly sequential access pattern while others are more random. They further vary in terms of number of IO operations per second and average transfer size for each operation. With an understanding of the nature of the new workload, the administrator can try to choose where to place the new volumes so that it is not adversely affected by the preexisting workloads. This is a challenging task. It requires not only familiarity with the internal structure of the storage systems and access to storage system components' resource utilization and performance but also the ability to analyze and match them appropriately.

Modern storage systems have sophisticated internal structures with interlinked components and bottlenecks are likely to occur in multiple places. For example, an overloaded device adapter in a storage system could adversely affect not just the new workload but all the preexisting workloads allocated in any of the pools below the adapter. Care must be taken to not overload any of the components while allocating new volumes.

While there are some administrators who regularly read technical white papers and attend conferences to keep up-to-date with the technology trends and industry best practices, they are more of the exception than the rule. Even expert administrators need help with provisioning storage, as the numbers of storage systems workloads and the number of parameters to be considered increase.

Three new SAN configuration planners were specifically designed to assist with recommending storage configuration changes based on new workloads being added, taking into consideration the current workloads, available capacity and best practices.

1. Volume Planner

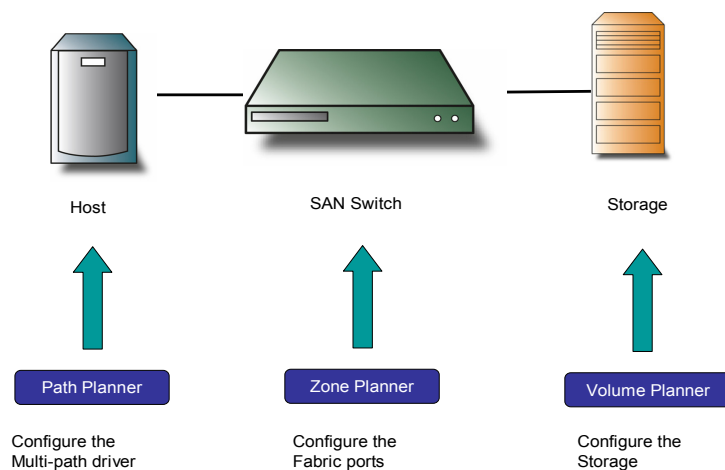
The Volume Planner helps administrators plan for the provisioning of system storage based on capacity, storage controller type, number of volumes, volume size, performance requirements, RAID level, performance utilization, and capacity utilization.

2. Zone Planner

The Zone Planner enables the administrator to plan for zoning and LUN masking configuration based on the following information: host ports, storage controller ports, zones, zone sets, switches, user zoning input, user LUN masking input, existing LUN masking or mapping. The Zone Planner uses Best Practices in providing its recommendations.

3. Path Planner

The Path Planner enables system administrators to plan and implement storage provisioning for hosts and storage systems with multi-path support in fabrics managed by IBM TotalStorage Productivity Center.



These new planners support the IBM Subsystem Device Driver (SDD) multi-path driver, SAN Fabric switches (as supported by TPC) and the IBM DS8000, DS6000 and ESS Model 800 storage systems. Like to Zone Planner, the Path Planner selects paths using Best Practices.

These planners can be invoked either separately or together in an integrated manner from a single user interface.

SAN Configuration Analyzer

Adherence to best practices is essential for successful configuration and deployment of complex systems in a well managed data storage infrastructure. In such scenarios, experts rely on personal experience as well as repositories of documented best practice guidelines to proactively prevent any configuration problems while deploying a storage system in a data center. The generation of the best practices using manual methods requires many man-years of data gathering and analysis.



IBM's Storage Area Network (SAN) Central team is a worldwide diagnostic team focused on resolving SAN infrastructure problems. These problems not only include problems that occur in a pure IBM brand environment but also if multi-vendor infrastructures. The SAN Central database was used to examine all known storage area network configuration issues and cataloged in the form of best practices. These best practices have helped the SAN Central team reduce the time required in resolving configuration errors from 2 weeks to 2 days. During this investigation, it was discovered that 80% of the configuration problems are caused by the violation of best practices. It should be noted that creating these best practices required 20 man-years of data gathering and analysis. More importantly, the best practices are dynamic and can change as new technologies and devices are introduced.

TPC 3.3 introduces an extensible policy-based analytic framework to validate storage infrastructures against best practice violations called SAN Configuration Analyzer and uses input from the expertise and multiple years of experience of the SAN Central Team.

The SAN configuration analyzer will assess the current SAN configuration and provide a report on its conformance with best practices. The SAN configuration analyzer is:

- Designed to help system administrators to ensure the correctness of the storage network configurations, such as zoning, multi-pathing, and access control.
- Designed to help enforce best practices in storage systems by using the cutting edge policy technologies for configuration analytics.
- Designed to provide an integrated experience for configuration management along with other storage management capabilities, such as storage configuration.
- Sends dynamic alerts when best practices policies are being violated.

For more information on the SAN Configuration analyzer, refer to the TPC Configuration Checker White Paper.

SAN Configuration History Viewer

Storage networks are undergoing significant growth as business continues to digitize content and provide electronic access to more and more aspects of their business data. With constant growth comes constant updates and changes to the storage network.

Enterprise-scale storage environments are typically very complex, with potentially tens of different device types and hundreds of instances of each device type. Systems Management tools are used by administrators to

manager such complex environments. A key goal of system management tools is to accurately represent the state of a complex system in various levels of detail.

An administrator may need several levels of abstraction to manage complex environments. The big picture is needed to get an overview of the storage network, to understand its interconnectivity. When problems occur, storage administrators need an easy way to quickly understand the business impact of these problems. These tools also need to allow the administrator to look at subsections of a system in a lot of detail. Typically, it is not possible to fully address both goals at the same time because of the massive scale of systems, and the ensuing information overload. Typically, a system management tool considers only the current state of the system, or the last reported state for parts of the system.

The inherent complexity in managing an enterprise storage infrastructure is further compounded when changes need to be made to the configuration. It is well documented that a high percent of storage downtime is caused by incorrect configuration changes (for example, pulling out the wrong disk drive in replacing a failed drive). Often times, the diagnosis of which configuration change caused a particular outage is done by a person other than the effector of the change, located at a remote site, and at a later point in time.

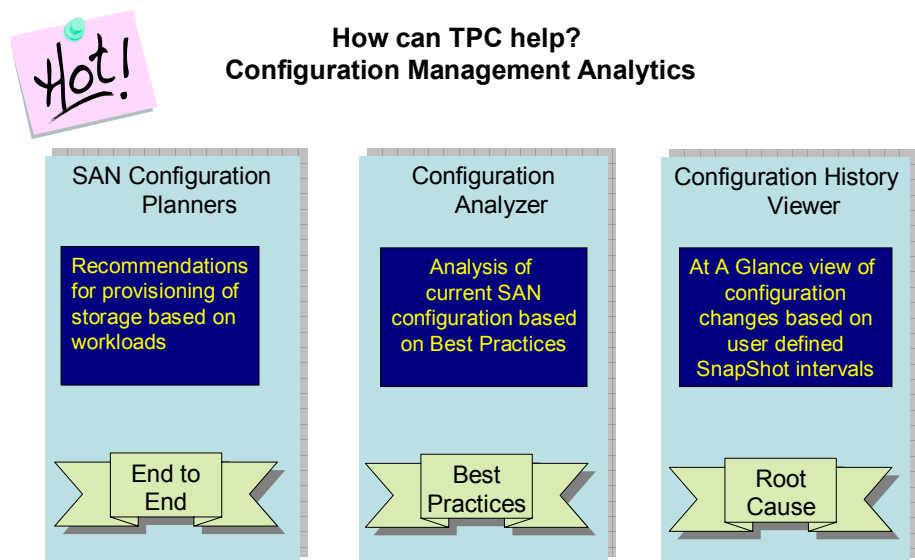
The challenge in managing a typical enterprise storage infrastructure, where tens of daily configuration changes can be effected by multiple administrative or service personnel, is to empower systems management tools with the availability of variable granularity configuration history, so that an administrator can accurately reconstruct the precise state of the infrastructure at a given point in time, and use this information for problem determination, change management or auditing purposes.

The Configuration History Viewer is a powerful tool that gives the storage administrator this capability.

The SAN configuration history viewer provides the storage administrator with the ability to quickly isolate storage configuration changes across the SAN over different time periods.

The SAN configuration history viewer is designed to:

- provide a visual traversal through storage infrastructure configuration change history
- aid the administrator in problem determination by interactively viewing configuration change history
- reduce problem determination time by providing an end-to-end view of configuration changes for complex, multi-device environments
- designed to easily identify the configuration differences between two points-in-time for a given asset and provide a scalable way to visualize storage configuration at a specific point in time, or to compare configurations at specific points in time.
- Allow user control of when configuration history is captured and for how long it was/is retained
- Synchronized graphical and tabular view of temporal configuration data for rapid problem determination



“True analytics = Best Practices + Guidance”

Appendix

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