

Tuning SANs for Peak Performance with the EMC VisualSAN Performance Manager

As traffic on storage area networks (SANs) increases, the storage and retrieval abilities of the SAN can decrease. The EMC[®] VisualSAN[®] software suite includes several tools for managing SANs. Among these tools is the VisualSAN Performance Manager, which can help administrators to obtain peak performance from their SANs.

BY KEITH R. KAMMER

A storage area network (SAN) should provide adequate storage and applications on demand. As storage requirements increase, traffic on the SAN can ultimately inhibit its ability to efficiently store and provide data. Implementing a SAN management application, such as the EMC[®] VisualSAN[®] software suite, allows administrators to monitor SAN health and identify potential problem areas before they hinder the SAN. This software suite includes the VisualSAN Performance Manager—a performance tool that carries out predictive analysis, enabling administrators to rapidly resolve potential issues and help ensure the SAN runs at peak efficiency.

Examining common problems within the SAN

Saturated links, bottlenecks in heavily used data paths, throughput issues during backups, and the inevitable growth of end-user activities all affect SAN performance. Of these trouble spots, saturated links are probably the easiest to identify, given the right tools. Saturation occurs when the instantaneous load on the link equals or exceeds the number of requests composing the load. Requests then queue up and maintain a constant load on the link. Because of this constant strain, saturated links could lead to premature failure of the hardware devices within a SAN. To alleviate this problem, administrators can add redundant paths or duplicate the logical volume on a different set of storage devices. Identifying saturated links

and providing alternate data paths help increase SAN efficiency and reduce the load on individual devices.

SANs are typically designed with some degree of redundancy. Redundant links allow traffic to be dispersed more evenly throughout the SAN and reduce overall load on individual links. However, the redundant links often use the same paths, causing potential bottlenecks in the SAN. Administrators can manage bottlenecks in much the same manner as they correct saturated links: by identifying the high-traffic culprits to reroute data and avoid bottlenecks.

Systemwide backups can pose difficult dilemmas for SAN administrators. To back up data on the SAN effectively, administrators must reduce the backup window. During backups, zone configurations may change, altering available data paths for access to information. Therefore, SAN administrators must completely understand the ramifications of a backup to limit the effect it will have on data availability. Optimizing the backup data paths can greatly reduce the amount of time backups consume, and can increase the overall efficiency of the SAN.

Finally, as the population of users with access to the SAN grows, all of the previously mentioned problems will be magnified. As more and more users are added to the SAN, saturation within the links and subsequent bottlenecks are more likely to occur, reducing overall performance. Tools that can monitor SAN performance over

time will provide administrators with essential data that can be used to help prevent catastrophes.

Using VisualSAN Performance Manager for SAN management

Given all the potential pitfalls awaiting a poorly configured SAN, administrators must have the right tools to identify, isolate, and help resolve potential problems. The EMC VisualSAN Performance Manager module adds an essential piece to the management puzzle. Fully integrated into the VisualSAN software suite, the VisualSAN Performance Manager enables SAN administrators to proactively manage SANs through a variety of features, including:

- **User-defined alerts:** Help determine which performance variables are critical to SAN health
- **Performance visualization:** Quickly locates hot and cold spots in even the most complex environments
- **Performance reports:** Help analyze data to prevent potential problems

Monitoring SAN health

Customizable performance alerts allow administrators to choose from a variety of parameters on any link, set thresholds, and configure alert notifications. By actively monitoring SAN parameters, administrators are aware when warnings are triggered or critical thresholds are exceeded, giving them time to begin preventive measures before saturation or bottlenecks occur.

The VisualSAN Performance Manager allows administrators to define thresholds for a variety of parameters on each link and to configure each link as a separate entity with its own unique characteristics. Some links may be hotter than others, so administrators may wish to enforce stricter performance requirements to help ensure optimal performance.

As SANs move toward supporting multiple data rate links, administrators need the ability to monitor each link independently and choose which variables are important. EMC VisualSAN and the VisualSAN Performance Manager enable administrators to configure alerts within the SAN quickly and easily through an intuitive user interface. Threshold and alert configuration screens allow administrators to select multiple links and assign thresholds collectively. All of these capabilities provide the necessary tools to proactively monitor the state of the SAN.

Visualizing SAN performance

Once thresholds are configured, the EMC VisualSAN Performance Manager presents threshold levels on a topology map (see Figure 1). Often underutilized, the topology map provides a wealth of information about the SAN, including detailed interconnect information, device status, an overview of the entire SAN, and an overlay of performance information on top of each link.

At any given time, the topology map represents the current threshold state as a color variation on the map. For example, a blue color could indicate an underutilized link, while a red color might signify a critical link. Color mapping allows administrators to quickly identify hot and cold spots within the SAN. Being able to visualize both zone configuration and performance information gives administrators more control over backups and helps them determine where the highest performing links are located.

In addition to the high-level information on the topology map, the VisualSAN Performance Manager provides a comprehensive set of live graphs. The graphs can plot multiple links on the same chart to compare data from any of the link variables. Administrators can adjust the time scale and update rate for complete control of the graphs, allowing them to designate which data is most important.

For example, two graphs may be created within the VisualSAN Performance Manager, one to monitor relatively cold links and one to monitor two high-performing links. The graph monitoring the cold links is updated only every three to five seconds, but the graph monitoring the hot links is updated every second and scaled to show up to an hour's worth of data. By increasing the time scale, administrators can perform live trending analysis. This ability may be especially important during backup windows.

Minimizing backup windows

Even with redundant connections and duplicate volumes, administrators must schedule regular backups of data on the SAN. Data is the most valuable resource a company has, so maintaining its integrity and availability is crucial to the company's success. To optimize the SAN during backup periods and minimize the backup window, administrators must carefully create zone configurations and data paths. Removing a highly utilized link from operation during a backup could cause bottlenecks in other areas and potentially saturate links.

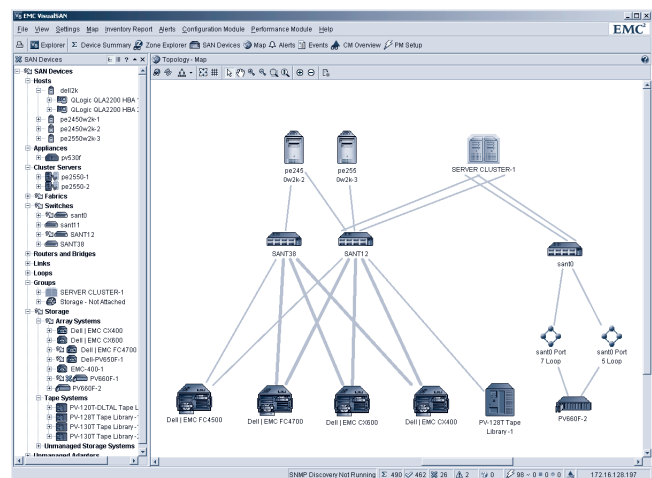


Figure 1. EMC VisualSAN topology map

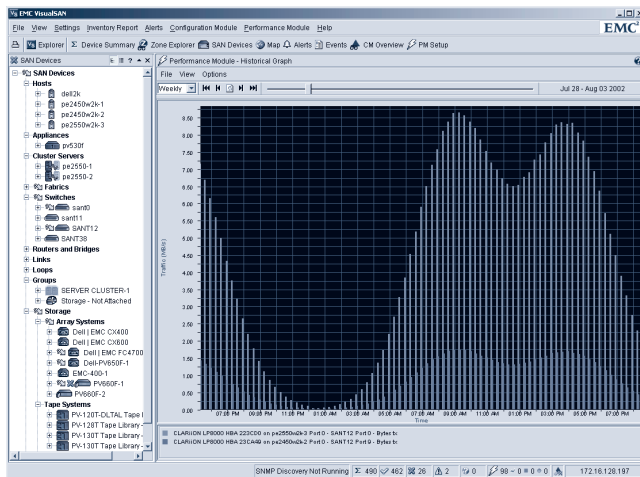


Figure 2. VisualSAN Performance Manager historical trend analysis

The VisualSAN Performance Manager provides administrators with the necessary details for determining how to optimize SAN performance and thus decrease the backup window. Optimization can come in many forms, including enabling multiple links between the storage devices to increase bandwidth; removing links being used by normal operations; or reconfiguring the data path between the devices through zoning.

Having all of the necessary data will allow administrators to make better choices in configuring the SAN and will help reduce the amount of troubleshooting necessary to optimize overall SAN performance.

Evaluating SAN trends

The VisualSAN Performance Manager incorporates a persistent database to monitor performance metrics within the SAN. This database lets administrators evaluate trends in the SAN, not just over a day or two, but over months and even years, leading to a more accurate assessment of future needs. Administrators can select the parameters that will be stored in the database for each link, and can select each parameter that should be charted on historical graphs (see Figure 2). This functionality gives administrators complete control over the analysis of the SAN.

Administrators can use the VisualSAN Performance Manager to spot trends and proactively manage the SAN before performance problems arise. Administrators can select ranges of data to be viewed and analyzed. Preset trending algorithms can help to easily diagnose problems in the SAN. These features are available through an easy-to-use graphical user interface (GUI).

Managing performance data


Hundreds or even thousands of parameters might be logged into the database, which can reach an unmanageable size over time. To efficiently manage all of the data, administrators can use database

management tools such as those provided by VisualSAN Performance Manager. These tools allow administrators to compress the data while leaving important artifacts intact. Such artifacts include peak sustained value, highest value, lowest value, and average value over a user-defined period of time.

Administrators can specify how the compression events take place. The compression techniques condense the data at user-defined intervals of one day, one week, one month, or one year. All data within an interval will be compressed to a single data point (or collection of points, depending on the criteria). VisualSAN also contains tools to help administrators estimate the amount of storage necessary to collect performance data, and the capability to set alerts based upon the size of the performance database.

More advanced database management functions include the ability to compress data differently depending on its correlation to the current date and time. Older data can be more aggressively compressed, while preserving the newest data. Alerts can be triggered to notify administrators when the database reaches a specified size. Administrators can also script a policy that automatically performs a user-defined task, such as compressing data older than one month, or dropping the oldest data in the database to make room for the new data while conforming to pre-defined size restrictions.

Decreasing total cost of ownership

Using performance management tools for SANs can allow administrators to shift focus from addressing SAN problems to preparing for SAN growth. In today's fast-paced environments, monitoring SAN health and tracking one or two data points on a switch is not sufficient to maintain high data availability. By using VisualSAN Performance Manager, administrators can obtain enhanced event and alert notification, link performance visualization and tracking, and historical references for trending analysis. These capabilities provide the necessary tools to decrease total cost of ownership, thus increasing return on investment. 

Keith R. Kammer (keith_kammer@dell.com) is a senior product marketing consultant with the Systems Storage Group at Dell. He has more than 20 years of experience in the storage industry from working with Burroughs, Unisys, and Dell. Keith has a B.B.A. in Finance from Walsh College of Business and Accountancy in Troy, Michigan, and an M.S. in Administration from Central Michigan University.

FOR MORE INFORMATION

Dell | EMC partnership: <http://www.dell.com/emc>

VisualSAN: http://www.dell.com/us/en/esg/topics/products_software_pedge_storage_config.htm#partner7