

HP OpenView Storage Area Manager—Storage Node Manager

Using Storage Node Manager to maintain service level agreements and reduce administration costs



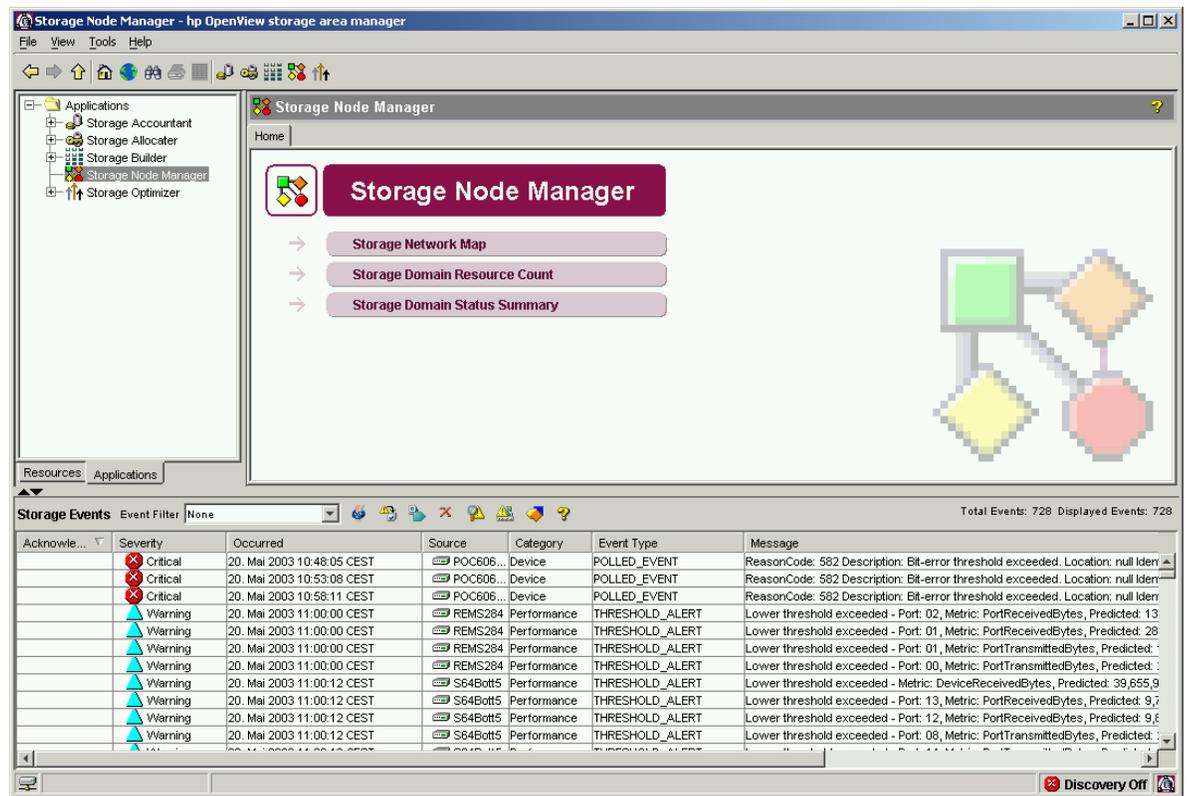
Overview	2
Storage-related concerns, customer requirements, and Acme Corporation introduction.....	3
General considerations	3
Acme Corporation	4
Acme Corporation requirements	5
Storage Node Manager solutions	6
Wrap up and review	12
Appendix	13
Recommended reading.....	13

Overview

Part of HP OpenView Storage Area Manager (SAM), HP OpenView Storage Node Manager provides several storage management functions that enable IT administrators to proactively react to changes in availability status for storage devices, infrastructure, and storage-related host components. In addition, Storage Node Manager displays graphical storage network topology with associated status, including switch zoning presentation. Storage Node Manager's reporting capabilities include event logging, notification, filtering, acknowledgment, and exporting to higher level IT frameworks such as HP OpenView Operations.

Storage Node Manager is a consolidation point for managing the various storage devices throughout the storage network through the ability to launch vendor-supplied and device-specific management tools (for example, Command View EVA and Brocade's WebTools). Scripts, batch files, and application executables can also be launched based on monitored events.

Figure 1. Storage Node Manager home page



This paper offers an example methodology outlining Storage Node Manager capabilities in a given customer scenario. This paper is divided into three sections:

The first section introduces an example corporation, Acme Corporation, that reflects a typical customer scenario having a heterogeneous IT infrastructure, including a storage area network (SAN), direct attached storage (DAS) devices, and a variety of operating systems and hardware platforms. Customer problem areas and storage management needs are identified.

Section two provides an implementation example based on Acme's environment and storage requirements.

The final section summarizes the whole scenario with a short review of high-level benefits of Storage Node Manager.

The appendix at the end of this paper details where to find additional OpenView SAM information along with some recommended reading.

This paper is most useful if read before setting up Storage Node Manager. Some of the information used to configure Storage Node Manager might have to be gathered from various sources within your organization.

Storage-related concerns, customer requirements, and Acme Corporation introduction

General considerations

Storage is at the center of today's IT infrastructures. Storage volumes are continually growing at a phenomenal pace causing IT organizations to meet new management challenges. Some of these challenges are:

- Managing a growing networked storage environment with the same number of human resources, some of which may not have specific storage management expertise
- Guaranteeing 24 X 7 data availability
- Managing the vast amount of status events through filtering and prioritizing
- Meeting service level agreements (SLAs)
- Managing complex multivendor and multi-operating system environments
- Consolidating storage management tools into a single pane of glass

The last topic currently represents one of the biggest challenges. In heterogeneous storage environments, the many different device management applications require different configuration interfaces and operation procedures and are often operated by trained administrators only. Tracking status across the whole storage infrastructure requires multiple tools leading to increased administrative effort, increased training requirements, and—finally—increased cost.

A key element for the success of an organization today is information availability. With increasing storage volumes, many companies have already implemented high performance SAN infrastructures replacing their distributed, slow DAS environments.

Among the many benefits of moving from DAS to a SAN environment is the fact that hardware resources, like disk arrays and tape libraries, can be shared, allowing for more efficient and cost-effective use of these resources.

In this case, uptime of the entire storage infrastructure is the most important concern of any IT organization.

To answer the call for high availability and data protection, redundancy through replication has become a standard practice. These additional redundant hardware and software components create a more complex task of tracking events that could lead to an outage. Disaster typically strikes with multiple errors. Storage Node Manager helps simplify the task of tracking component health status of all the storage network devices.

Additionally, Storage Node Manager rolls event-related information up to high-level enterprise management frameworks (like HP OpenView Operations or Computer Associates [CA] Unicenter), enabling IT administrators to manage the storage infrastructure through familiar IT infrastructure management tools.

Many companies are also introducing SLAs to measure IT efficiency, including uptime, and treating IT as an asset that must produce significant return on the capital employed, measured as Return on IT (RoIT). In this respect, IT staff must prove their efficiency through administration of as many IT resources as possible with the least possible amount of human resources.

Therefore, a single application for performing heterogeneous management tasks and automating redundant and repetitive tasks is key to the success of the IT organization's ability to meet SLA requirements.

Acme Corporation

The Acme Corporation is an insurance broker with hundreds of partner offices (franchise agencies) and organizations to support:

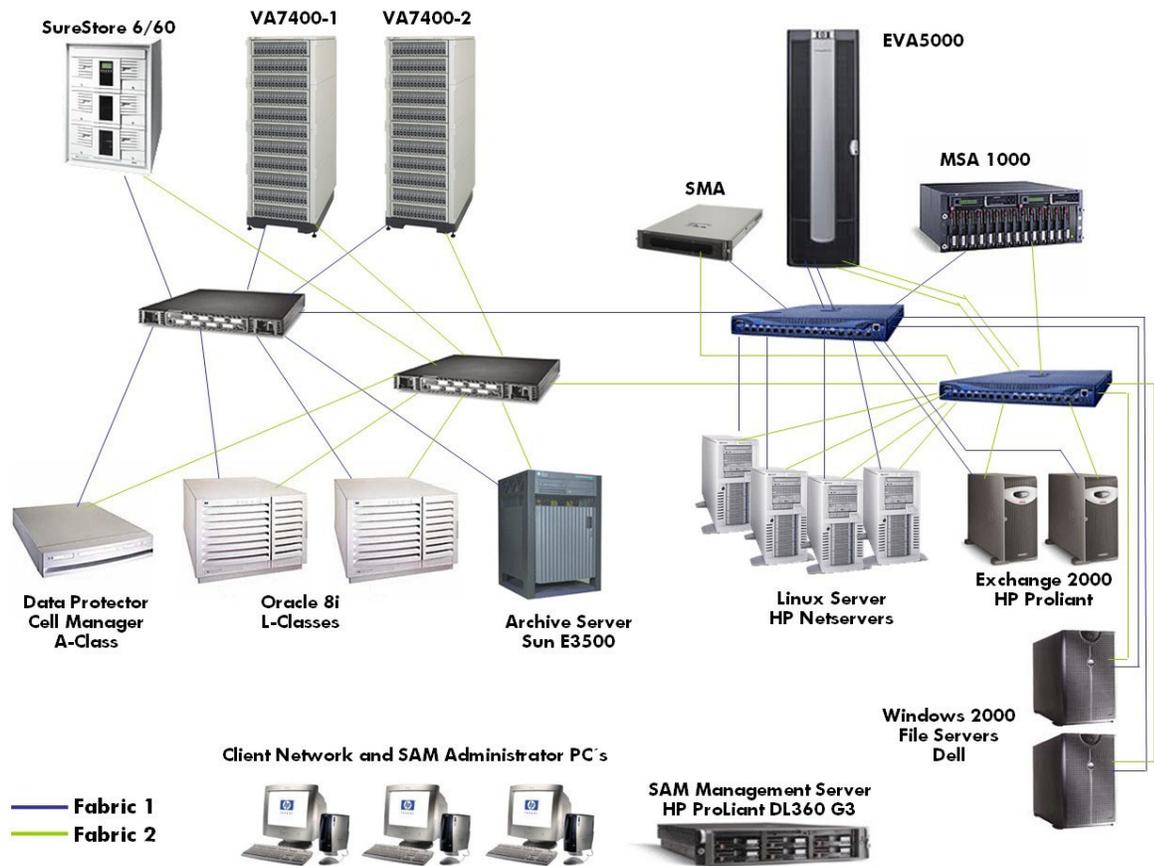
- Corporate Management—Decision support and contractual data
- Financial—Enterprise Resource Planning (ERP) and insurance tariff database
- Marketing—Data warehouse and customer database
- Web services—Business-to-consumer (B2C) and Business-to-Business (B2B) database front end
- Accounting and Controlling—Oracle database
- Agency support (back office)—Software maintenance and distribution
- Messaging—Microsoft® Exchange 2000

Historically, all agencies (or geographies) were supported on dedicated Microsoft Windows® servers connected to the remote offices, resulting in a total of about 70 Windows 2000 file servers. Most of them are still running DAS. Further IT investment plans include consolidation and migration to the SAN environment.

The more business-critical systems like Oracle 8i, Exchange 2000, web services, and some of the larger file servers have already been migrated to a SAN environment to improve performance, availability, and backup speed.

Acme Corporation's SAN infrastructure is shown in Figure 2.

Figure 2. Current SAN infrastructure of Acme Corporation (SMA denotes HP StorageWorks Storage Management Appliance)



The customer's SAN infrastructure consists of two redundant SANs implemented for maximum uptime. Frequently used data or data with higher availability requirements resides on the Enterprise Virtual Array (EVA) 5000, while less frequently used data moves to the Modular SAN Array (MSA) 1000 to meet storage cost requirements. Microsoft Exchange data is exclusively stored on the EVA 5000, while Oracle data is exclusively run on the Virtual Array (VA) 7400s.

The essential parts of the infrastructure are backed up using HP OpenView Storage Data Protector 5.

Acme Corporation requirements

Because Acme Corporation is running about 70 DAS systems and the depicted fabrics, one of the key requirements is centralized monitoring of all storage components in use, including:

- 70 Intel® servers with local SCSI storage
- 4 Linux® servers (SAN attached)
- 2 Microsoft Exchange servers (SAN attached)
- 2 Microsoft Windows 2000 file servers (SAN attached)
- 2 HP9000 L-class Oracle servers (SAN attached)
- 1 HP9000 A-class backup server (SAN attached)
- 1 Sun Solaris 2.7 E3500 archive server (SAN attached)

- 2 Brocade SilkWorm 2400 switches
- 2 HP StorageWorks 16b Fibre Channel switches
- 2 HP StorageWorks VA7400
- 1 HP StorageWorks EVA 5000
- 1 HP StorageWorks MSA1000
- 1 HP StorageWorks Tape Library 6/60

This includes a total of 24 server-based Fibre Channel host bus adapters (HBAs).

Some detailed storage-related requirements that will help Acme achieve its strategic goals have been defined:

- Ability to centrally monitor the status of links and devices attached to the SAN to reduce the number of monitoring tools required. The over-arching goal is to improve uptime and consistently meet SLAs.
- Ability to centrally monitor server/disk/Logical Unit Number (LUN) status for the DAS servers to respond to server-related storage problems faster than they currently can using operating system utilities and to proactively monitor hosts, rather than reactively respond to user complaints.
- Ability to centrally launch device management tools for EVA, VA, MSA, 6/60, and Fibre Channel switches as well as other devices that may be added to the network over time. This would save administration efforts by not having to search for individual device management tools.
- Better integration between storage management applications and data management applications. Ability to centrally launch Storage Data Protector.
- Ability to consolidate event management to reduce the time it takes to identify and resolve problems.
- Ability to retain a history of event records. This will enable Acme to provide content for review by “internal” and “external” customers to meet SLA and audit requirements.
- Implementation of automated management policies to reduce human intervention and increase staff efficiency.
- Ability to quickly identify interdependencies between storage devices and to flag areas where compatibility could be an issue. Actions could then be defined to assure interoperability of the storage network.
- Implementation of automated management policies in order to reduce human intervention and increase staff efficiency.

Storage Node Manager solutions

Acme Corporation defined numerous high-level objectives where Storage Node Manager provides storage management benefits.

1. Centralized status monitoring of links and devices
Storage Node Manager enables centralized monitoring of Acme EVA5000, VA7400s, MSA1000, four Fibre Channel switches, Tape Library 6/60, and all deployed servers.

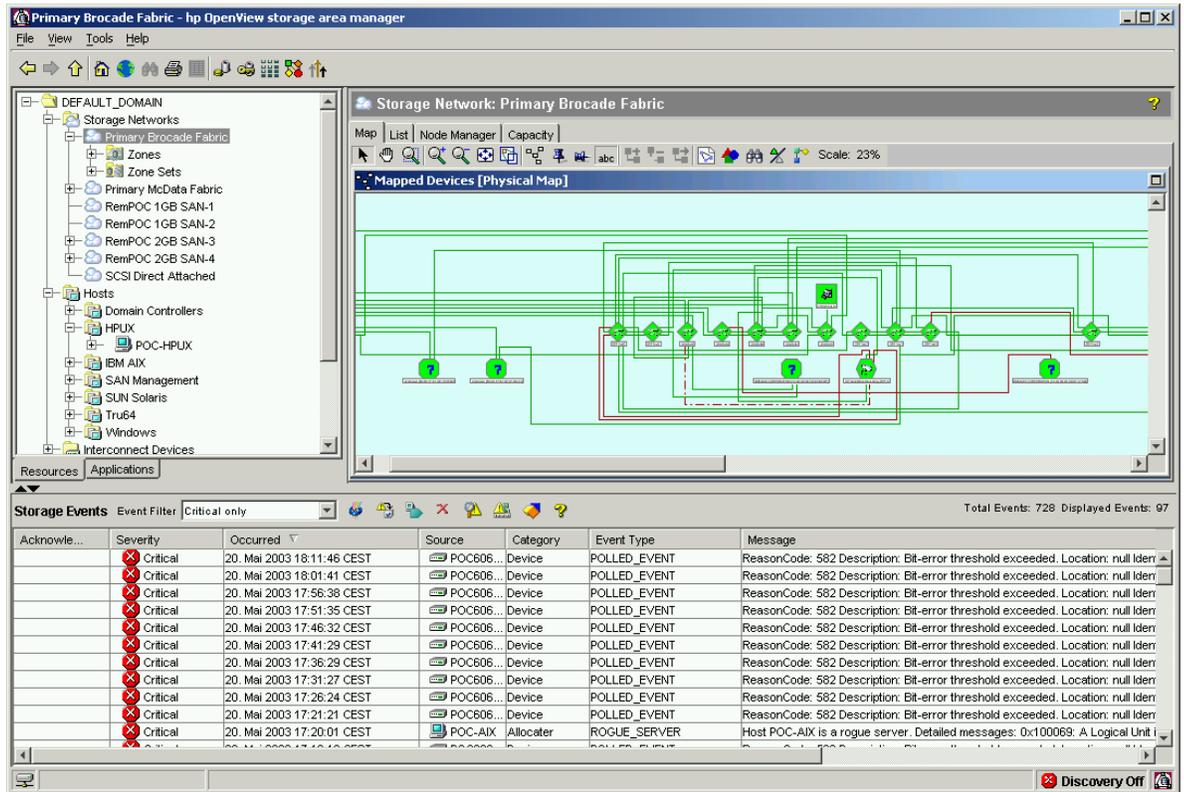
By monitoring the link or device status from within Storage Node Manager rather than using the six different tools that were previously necessary, complexity is dramatically reduced. The consolidated event log indicates events in different predefined severity levels and enables faster reactions, faster root cause analysis, and faster problem resolution.

The Storage Node Manager event browser enables administrators to quickly identify important event types thus reducing the amount of information administrators must review. Another option for

fast access to event information is available at the monitored device level. A dedicated tab on the view panel of each discovered device presents only events for the particular device. These two options significantly reduce potential for human error and improve administrator effectiveness and efficiency.

In addition, the graphical representation of status information in the GUI enables IT managers who do not deal with technical details to review overall infrastructure health directly without prompting administrators for reports.

Figure 3. Mapped Devices in Storage Node Manager. Link and device status is reflected by different colors. In this example, all links and icons are green, indicating normal operation. The event panel at the bottom of the window tracks event messages and enables fast problem determination. Currently, the view is filtered for critical events so both current and historical critical events are displayed.



Using Storage Node Manager improves overall availability, reduces administrative effort and potential for human error, and reduces training costs because only a single tool is used rather than six.

2. Status monitoring of DAS hosts

Once the responsibility of operating system administrators, the implementation of Storage Node Manager now enables storage administrators to track health and status of DAS LUNs on 70 Windows hosts directly. The biggest improvement compared to an environment without Storage Node Manager implemented is centralized storage monitoring, which was previously unavailable due to the limited monitoring capabilities of the operating system tools.

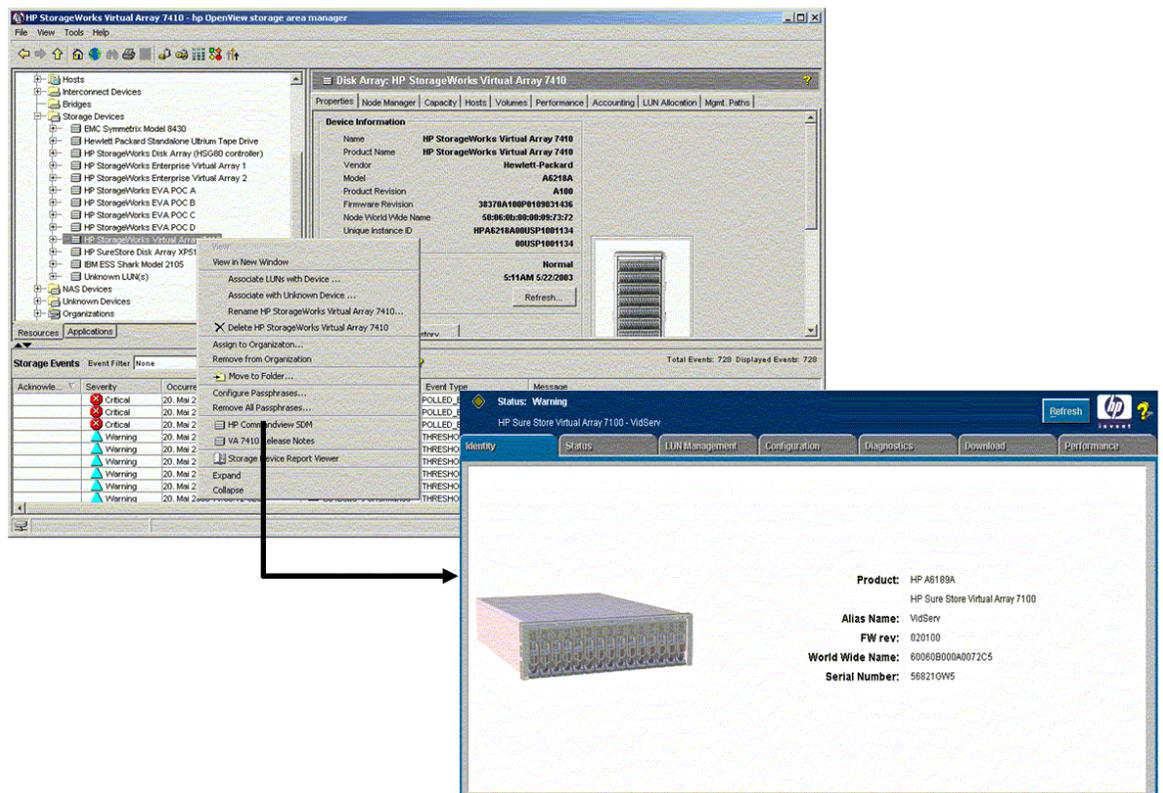
This Storage Node Manager feature reduces communication efforts between two management teams and enables faster reaction times to storage-related problems.

The implementation of “device-specific application links” enables storage administrators to track the status of devices and actively start troubleshooting from within Storage Node Manager, again saving time and additional administrative effort.

3. Centralized launch of device managers

Storage Node Manager provides faster centralized launches of the five different device managers for the EVA500, VAs, tape library, MSA1000, and Fibre Channel switches by right-clicking the element in the map or OpenView SAM Resource tree.

Figure 4. Command View SDM from within OpenView SAM. The VA7410 device was selected in the Resource tree of the OpenView SAM GUI. Right-click this device to open the context menu and launch Command View SDM. As Storage Node Manager is aware of the VA7410 serial number, it directly opens the correct device manager even if more VA disk arrays are present in the SAN.



The ability to launch device management tools, especially command line scripts, directly from Storage Node Manager rather than using the command line in the device management tool is an important feature for Acme. For example, within the VA environment Acme can launch Command View SDM command line scripts directly from Storage Node Manager. Because backup, restore, and testing of Oracle (running on the VA) is a routine task, business copies must be created, synchronized, and restored for backup and on-demand testing and batch processing purposes. By implementing predefined scripts, this process is no longer a complicated and time-consuming task, but rather a single mouse-click available through the VA icon in Storage Node Manager. The benefits of this are dramatic reduction of potential for human error, resulting in improved availability and faster execution of routine tasks, enabling even people not trained on the VA to execute these tasks.

Similar procedures can be applied for EVA5000 and MSA1000, as well as other third-party storage devices¹.

4. Centralized launch of Storage Data Protector

In the Acme environment, Storage Data Protector plays a central role for data management and protection. Acme uses many Storage Data Protector command line scripts to perform routine tasks on-demand, in addition to the regular schedule.

The integration of these Storage Data Protector command line scripts into Storage Node Manager enables leveraging standard routine backup and restore tasks in a comprehensive “right-click” scenario, similar to that mentioned in the previous section. The integration enables faster access to these routine tasks and allows associating certain actions with certain map icons.

5. Consolidated event management and event record retention

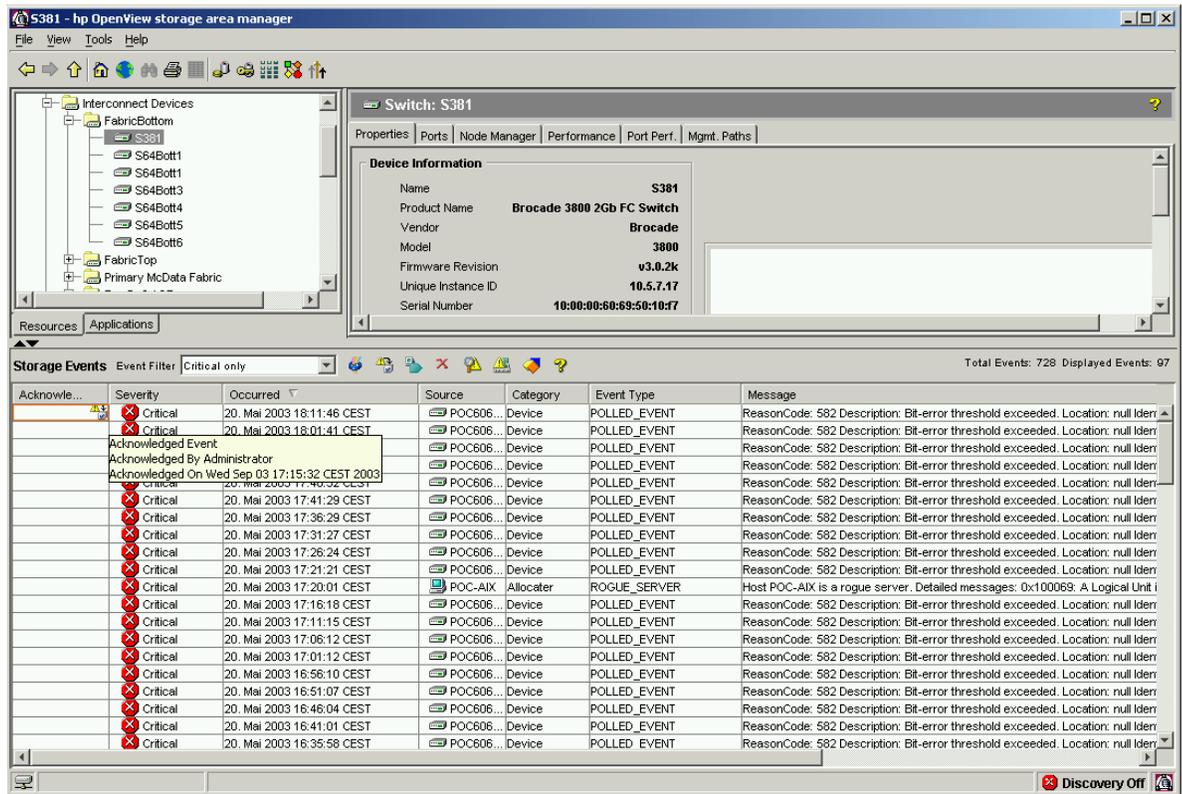
Receiving event information from many different sources can result in misunderstanding the critical nature of the monitored events. The Storage Node Manager event filter enables administrators to display only events matching certain selection criteria—like severity level, source, or date, thus reducing the amount of information administrators must review.

The centralized database also provides centralized acknowledgment of events. As each user logging in to OpenView SAM is identified by a unique user name, all administrators and operators can find out who has acknowledged an event and when, eliminating the need to investigate again.

Another option for fast access to event information is available at the monitored device level. A dedicated tab on the view panel of each discovered device presents only events for the particular device. These two options significantly reduce potential for human error and improve administrator effectiveness and efficiency.

¹ For a list of supported devices, see the HP OpenView Storage Area Manager Quick Specifications available at <http://h18006.www1.hp.com/products/storage/software/sam/specifications.html>

Figure 5. Event Panel showing filtered events. In this example, only critical events are displayed. The yellow box opens while hovering over the “acknowledged” icon and provides further information about when and by whom an event was acknowledged.



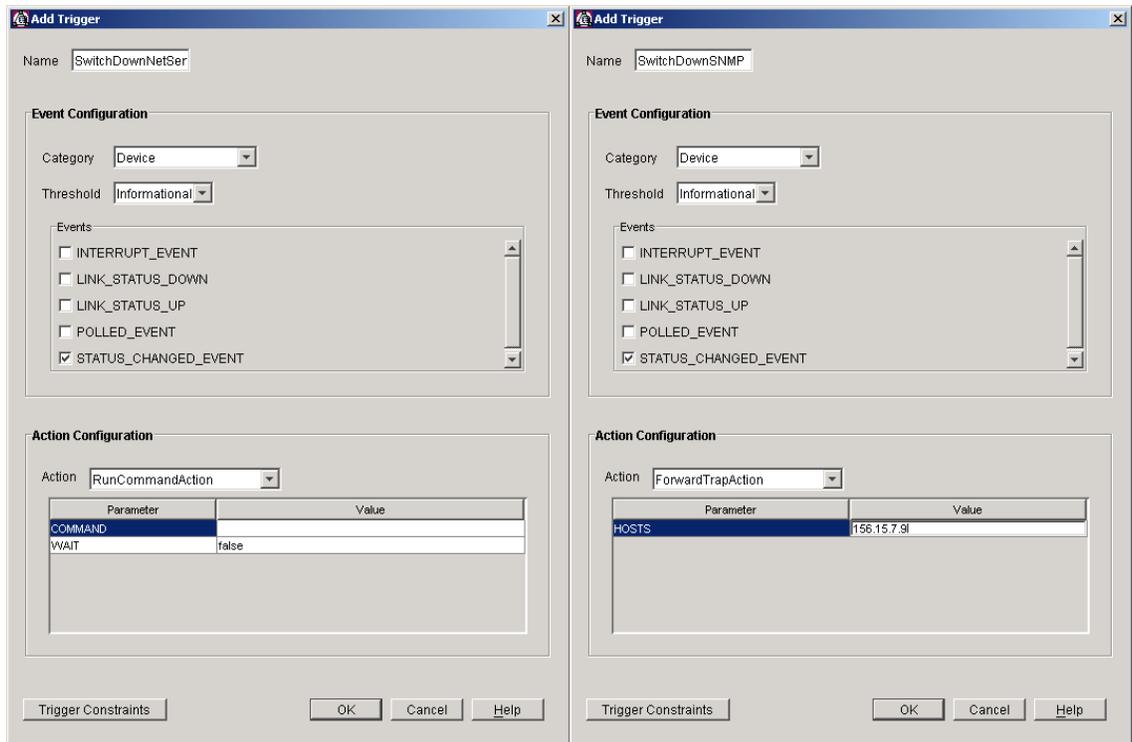
Storage Node Manager enables the Chief Information Officer or IT manager to track and record event resolution, because it details when an event has occurred and when it was acknowledged and solved. To meet regulatory or audit requirements, Storage Node Manager allows long-term retention and provides export capabilities to keep track of even the longest event history.

Centralized event management improves SLA efficiency and significantly reduces administrative effort.

6. Automated event management

Of all the Storage Node Manager features, configuring triggers offers the greatest impact. Some call this Policy Automation. Acme implemented hundreds of triggers.

Figure 6. Two examples of event trigger configurations. The left window will launch an external shell script if the status (that is, availability) of any Fibre Channel switch in the storage domain changes. In addition, the trigger configured in the right window will send an SNMP trap to an IP address specified in this configuration screen. Both triggers will work concurrently, launching an automatic troubleshooting procedure and notifying an SNMP management application.



Triggers enhance notification capabilities by making it possible to send e-mails or network messages to inform operators and administrators of error conditions. With this alerting capability, administrators resolve problems much faster, dramatically increasing uptime. In addition, automated corrective actions using scripts, batch files, or application executables reduce human interference, cutting administration costs significantly.

7. Flexible event filtering

Event triggers with “StoreAction” and “Trigger Constraints” filter events before they arrive in the database. For example, a standard trigger saves any device-related event to the database. By applying a trigger constraint and selecting the severity level of “Informational,” the event is only stored to the database if the severity level is different from “Informational.”

The “hourly cleanup” feature allows defining criteria for automatically deleting events. The actual deletion activity occurs on an hourly basis. For example, OpenView SAM can be configured to automatically delete all Informational events that are 120 days or older.

By using these automated routines, Storage Node Manager tabs and event panel filters—outlined earlier in this paper—are used for day-to-day management of devices, while the huge amount of event handling is performed automatically.

8. Event integration and management application integration
The OpenView SAM trigger configuration options also provide trap forwarding, enabling notification about storage-related events in virtually any SNMP capable enterprise management application, including BMC, Tivoli, CA, and HP OpenView.

With HP OpenView Operations for UNIX® and Windows, HP OpenView Service Desk, and HP OpenView Reporter, a tight integration is accomplished through bridges or smart plug-ins, enhancing the capabilities of these tools to be aware of storage-related issues.²

As a value add for third-party frameworks, HP offers an enterprise management integration Software Development Kit (SDK) free of charge to enable customers to build their own integrations with their installed management frameworks.

As a simple way of transferring detailed event information to other applications, OpenView SAM can export events into text, CSV³, or XML files. This transfer can be accomplished using the GUI or command line interface (CLI). Using CLI scripts, the export of events can also be automated, offloading routine tasks from the administrator.

9. Storage Node Manager discovers and displays the interdependencies between storage devices and provides asset level attributes. Firmware levels and operating system versions require an almost constant revision-level check against published support matrices to assure interoperability and uptime.

Wrap up and review

Storage Node Manager provides several means of facilitating routine and normally time-consuming management tasks.

By leveraging information from different management utilities into a single tool, a customer can use consolidated event handling and monitoring to reduce administrative effort.

By consolidating application launch of device managers and ISV applications into Storage Node Manager, customers gain faster access to storage configuration and data management tools. Going even further, by implementing custom scripts for complex repetitive tasks, Storage Node Manager can save considerable amounts of time and reduce the risk of human error.

Visualization of the storage environment through the Resource tree and storage maps provides an easy-to-understand and comprehensive view even for people who are unfamiliar with storage concepts.

The most striking enhancement to an existing environment is the automation of reactions on certain events. This automation speeds reaction times by taking over automated notification or even break/fix actions.

Overall, Storage Node Manager can have a dramatic positive impact on storage availability by reducing staffing and trainings costs and offering the necessary tools to more accurately meet SLA requirements.

² For more detail on OpenView SAM integration with HP OpenView enterprise management solutions, visit: http://www.openview.hp.com/go/sam_integrations

³ Comma separated value format, a common data interchange format that can be used by spreadsheet and database applications.

Appendix

Additional OpenView SAM information and product manuals are available at <http://www.openview.hp.com/go/sam>

Send any comments about this paper to wolfgang.weith@hp.com.

Recommended reading

1. Toigo, Jon William
The Holy Grail of Data Storage Management
2nd edition, Prentice Hall PTR, 2000
ISBN 0-13-013055-9
2. Tardugno, Anthony F., DiPasquale, Thomas R., and Matthews, Robert E.
IT Services—Costs, Metrics, Benchmarking, and Marketing
Prentice Hall PTR, 2000
ISBN 0-13-019195-7

© 2004 Hewlett-Packard Development Company, L.P.

The information contained herein is subject to change without notice. The only warranties for HP products and services are set forth in the express warranty statements accompanying such products and services. Nothing herein should be construed as constituting an additional warranty. HP shall not be liable for technical or editorial errors or omissions contained herein.

Intel is a trademark or registered trademark of Intel Corporation or its subsidiaries in the United States and other countries. Linux is a U.S. registered trademark of Linus Torvalds. Microsoft and Windows are U.S. registered trademarks of Microsoft Corporation. UNIX is a registered trademark of The Open Group.

5982-2449EN, Rev. 1, 05/2004

