VERITAS™
ARCHITECT NETWORK

MANAGING MULTI-VENDOR SANS WITH VERITAS SANPOINT CONTROL

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TABLE OF CONTENTS

Managing Heterogeneous Storage Networks

Whether arrived at by chance or by design, IT storage professionals face the challenge of managing a heterogeneous mix of networked resources every day. Multi-vendor hardware and multi-release level firmware and operating software add confusing interoperability issues to the already complex task of managing a storage area network (SAN).

SAN management software significantly alleviates the burden of administering a storage network. But, like the physical elements of the SAN, management tools face numerous interoperability hurdles.

For a SAN to function, all components of the data path must work together seamlessly. Any interruption, due to unsupported hardware or software, will cause a complete breakdown of communication. Management tools, on the other hand, reside outside of the SAN data path, and an encounter with unsupported network components can usually be overcome using alternate paths to the desired functionality. This means that a SAN administrator can gain value from management software even if all components of the network are not fully supported.

SAN Management Software Interoperability Continuum

SAN management software – a generic term encompassing storage resource management (SRM), storage network management (SNM), data management and visualization, and policy-based resource management tools – allows the productive management of heterogeneous networked storage resources. According to industry analysts, management tools play a significant role in lowering the total cost of ownership (TCO) of an enterprise SAN. Real-world studies of deployed SAN management software have identified significant improvements in resource availability, server and storage consolidation enablement, and storage utilization. When combined, these benefits substantially increase the value of an IT storage investment.

Physical hardware components of the SAN face a black or white interoperability choice. Either the components work together or they don't. This elevates the importance of any interoperability problem.

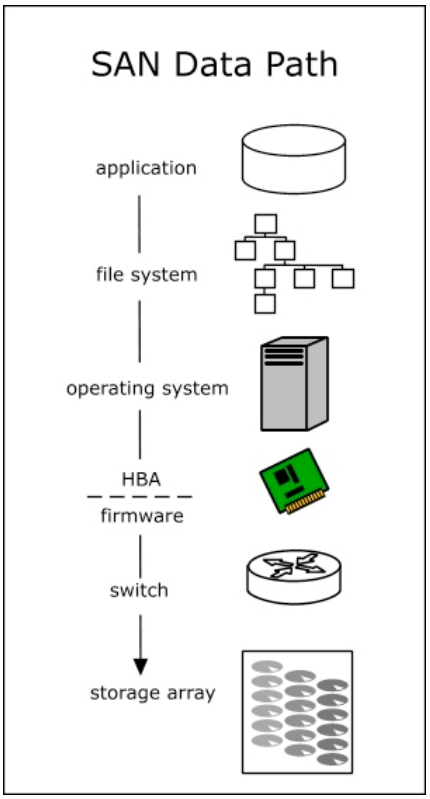

Figure 1. Example SAN data path

SAN management software, on the other hand, operates along a continuum of compatibility. At one end of the continuum all components of the SAN are

supported, allowing the tools to provide storage managers with a complete range of automation, monitoring, and reporting functionality. At the other end of the spectrum, where unsupported components of the physical environment have introduced interoperability problems, SAN administrators are still able to benefit from the management and reporting features of the SAN management software.

The effects of interoperability on SAN management tools can best be illustrated by example.

Host Bus Adapter Compatibility

Application data passes through many software and hardware elements on the way to and from a storage device. The software application itself - an Oracle database, for example - originates the I/O request by communicating with a server-resident file system. The file system, be it TempFS, UFS, JFS, VxFS, HPFS, NTFS, or FAT, determines the physical target of the application I/O and hands the request to a host bus adapter (HBA) for transmission over the network. Firmware in the HBA provides logic to determine the most efficient path to the target storage device. The HBA then transmits the I/O request over the network as a Fibre Channel message. Once on the network, application I/O is relayed to a storage device by a fabric switch. And, after arriving at the storage device, firmware in the device controller shepherds the I/O to its final destination on a physical hard disk or tape.

The server, HBA, switch, and storage device provide the physical components of the network that must interoperate for the SAN to provide a viable data path for I/O requests. Software and firmware environments, on the application server, HBA, and storage device controller, add further interoperability elements to the matrix.

The SAN management software operating platform exists outside of the application I/O data path. Automated device discovery features of the management tools leverage functionality of a server's HBA to determine the topology of the storage network. If communication with the HBA is frustrated, due to either unsupported hardware or firmware, device discovery cannot follow the usual path. However, from its unique vantage point outside of the SAN the management software is able to route around these problems. Communicating directly with the fabric switch, using SNMP queries over an IP network, gives the management software an alternate path to SAN topology and connectivity data.

Managing a Heterogeneous IT Environment

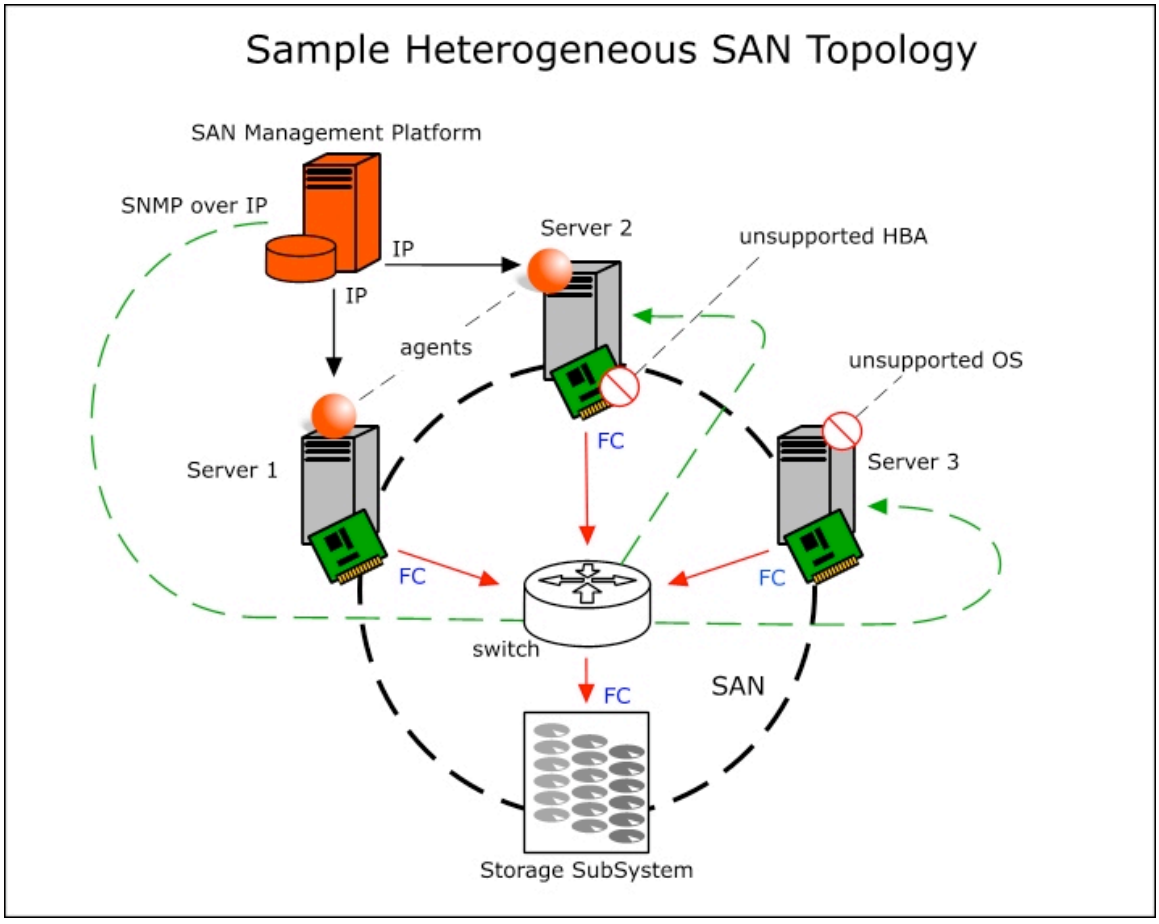

Figure 2. Sample heterogeneous SAN configuration.

The diagram in figure 2 illustrates an over-simplified, but representative, depiction of a heterogeneous networked storage configuration. Variations of this topology will likely be found in many enterprise IT environments.

Servers 1, 2, and 3 highlight the range of interoperability scenarios faced by SAN management software. In the first server configuration both the operating system (OS) of the server platform and the hardware and firmware of the HBA are fully supported by the SAN management software. In this scenario the administrator has access to the complete discovery, monitoring, and management features of the tool. Server 2 demonstrates the impact of deploying the SAN management software in a configuration with an unsupported HBA. Agent software is able to perform local management functions but in-band querying of the switch, to determine the layout of the SAN, is no longer possible. The final configuration example, Server 3, depicts an unsupported OS and HBA. In this situation agent software cannot be deployed on the server, limiting the management of local storage resources, and the HBA cannot be contacted to determine storage configurations.

Each of the interoperability scenarios illustrated in figure 2 can benefit from the deployment of SAN management software. Even in the worst case

scenario, SAN administrators have access to a wide range of management and reporting functionality.

VERITAS SANPoint Control™

VERITAS SANPoint Control (SPC) gives storage administrators end-to-end control of the heterogeneous networked storage data path. SPC offers a complete range of storage management functionality, including SAN topology discovery and mapping, application and file system discovery, device monitoring and alert notification, performance monitoring, policy management, capacity allocation, zoning, and LUN masking and binding. Using VERITAS SPC storage administrators gain centralized control of all physical resources of a heterogeneous SAN.

The value added by SAN management software correlates to the amount of control storage administrators gain over the SAN. Heterogeneous environments complicate this calculation by introducing the potential for unsupported elements in the SAN, diminishing the overall value of the tools.

By analyzing VERITAS SPCs response to incompatible hardware and software, storage administrators are able to get a more complete picture of how a SAN management tool's promise translates to the reality of a heterogeneous storage environment.

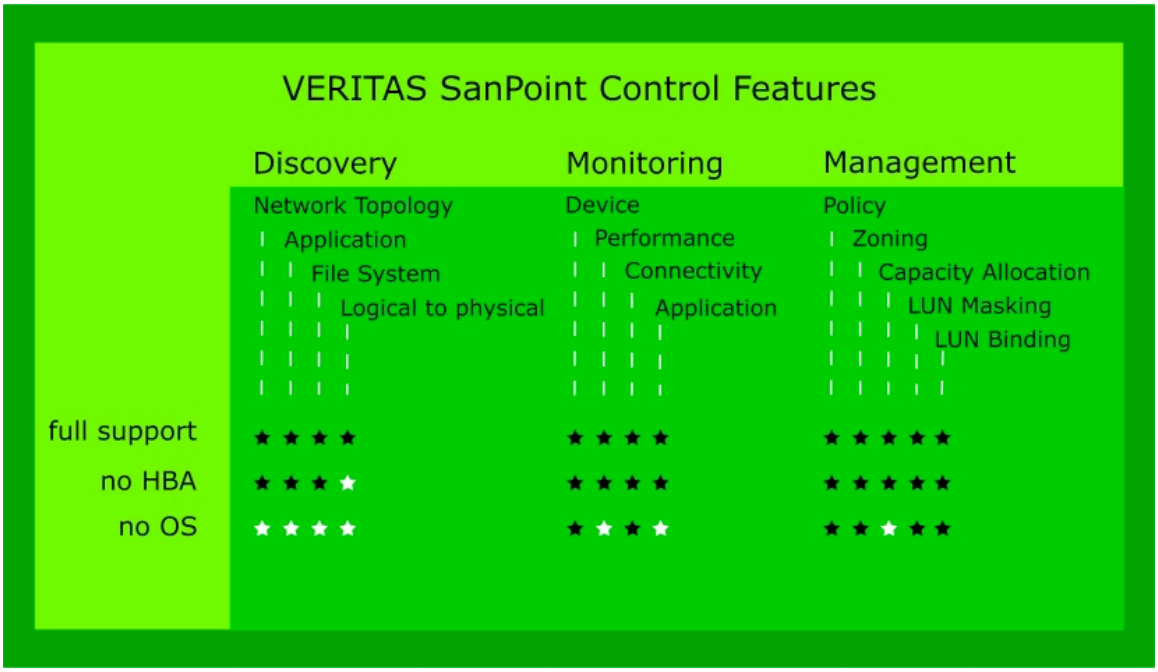

Figure 3. VERITAS SANPoint Control Interoperability

Scenario One: Full Compatibility

Deploying VERITAS SPC in a fully supported environment allows the administrator to take advantage of all management and control features of the product. Automated host and device discovery provides detailed information about SAN topology and resource attributes. Administrators can

configure reports, for example showing host and zone configurations, and automated alerts and notification, allowing close monitoring and management of the SAN. SPC can signal administrators to the presence of potential problems before they happen, for example resource allocation shortages. Long term monitoring of resource use also helps to identify trends, providing valuable input to capacity planning activities.

VERITAS SPC provides administrators with a wizard-driven interface for allocating SAN resources to groups. Related objects - for example all switches, resources owned by a particular business group or application, or components sharing similar attributes, all RAID 1 devices for example - can be grouped together for targeted reporting and monitoring.

Policy-based actions give the administrator access to a wide variety of storage management automation functionality. Over 250 polices are included with SPC and these can be personalized according to site-specific information. Policies can be customized using additional scripting. The combination of event monitoring, customized actions, and rules-based policies greatly reduces the complexity and cost of managing the SAN, transforming VERITAS SPC into an automated storage management solution.

Scenario Two: The Rogue HBA

The reality of heterogeneous enterprise IT environments dictates that there will be occasions when elements of the SAN are not fully supported by the SAN management tool. VERITAS SANPoint Control addresses this situation with minimal loss of functionality.

Under ideal circumstance VERITAS SPC will use industry standard programming interfaces, like the Storage Network Industry Association (SNIA) Common HBA API and Common Transport (CT) commands, to discover the SAN configuration. CT commands make use of the SCSI protocol underlying all Fibre Channel communication along the SAN. The host-based VERITAS SPC software agent issues in-band CT discovery commands, using the same Fibre Channel path to the switch taken by application data.

When VERITAS SPC software is deployed with an unsupported HBA, or a supported HBA with unsupported firmware, Fibre Channel communication with the downstream switch is not possible. However, an alternate path to the switch exists. Network management tools use SNMP over an IP connection to monitor and manage switch activity. VERITAS SPC is able to leverage the same IP and SNMP connectivity to discover the topology of the SAN.

Although SNMP-based discovery does not give the detailed level of device data provided by SCSI-based CT commands, the available information can be supplemented by manually adding device attributes. VERITAS SANPoint Control supports the addition of an unlimited number of attributes for each device in the SAN. Once attributes exist in the SPC database they are available for use with resource management, reporting, alert, and notification functions. In addition, the VERITAS SPC software development kit (SDK) gives storage administrators the tools to add support for any SAN device that utilizes an SNMP MIB.

The flexibility to use out-of-band, SNMP-based discovery to augment in-band, Fibre Channel-based data eliminates many of the problems associated with unsupported HBAs.

Scenario Three: Unsupported Server Operating System

VERITAS SPC utilizes agent software, residing on local servers, to perform many resource discovery and storage management functions. However, with a wide range of server platforms and OS releases available in the enterprise, agent software compatibility problems are inevitable. Although an unsupported server OS prevents VERITAS SPC from deploying a local agent, the product is able to use alternate methods to identify and monitor unsupported servers.

Fibre Channel communication across the SAN relies on the presence of a Name Server deployed on a fabric switch. When an HBA connects to the SAN it obtains a 24-bit Port Worldwide Name (WWN) from the Name Server. Each HBA also has a unique 64-bit WWN allocated by the manufacturer. The combination of HBA and port WWNs provides VERITAS SPC with the qualifying data needed to monitor the server from the switch using SNMP-based connectivity.

The WWN data identifies the HBA vendor and provides VERITAS SPC with a mechanism to uniquely reference the server. A Host Wizard function allows storage administrators to allocate a graphic icon for the server and manually add an unlimited number of attributes, for example host name, cost, location, and OS platform data.

Although manual configuration is needed, once attributes have been allocated to VERITAS SPC, switch connectivity can be monitored and the server can participate in policy-based alerts and notifications. This will significantly reduce recovery times in the event of a connectivity problem. The server is also able to participate in switch-based functionality that uses WWN, such as zoning and LUN masking

Conclusion

Heterogeneous SAN configurations are now routinely deployed across the enterprise, and expecting all elements of the network to be fully supported by SAN management software is unrealistic. A handful of unsupported SAN components, however, should not invalidate the enormous gains to be had from deploying SAN management tools.

VERITAS SANPoint Control is able to deliver significant value to enterprise storage managers, even when faced with varying levels of device compatibility. Able to provide, perhaps for the first time, a complete and accurate inventory of all SAN resources, SANPoint Control goes one step further and allows unsupported resources to participate in many of the management features available to fully-supported SAN resources. Whether analyzing the SAN from the privileged vantage point of server-resident agent software or looking out at the SAN from the perspective of a fabric switch, VERITAS SANPoint Control provides the flexibility to manage every system in every configuration.

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