

Commentary

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Why SMI-S Compliance is Key to Efficient Storage Management

The rapid rise of storage networking has improved the effectiveness of managing storage assets. The downside has been increased complexity from trying to manage numerous heterogeneous storage networking components. Point storage management tools do not have a comprehensive-enough view to allow them to address all of the resulting inefficiencies. In an environment of SMI-S conformant products, a single storage management tool can perform the basic functions of storage management — discovery, monitoring, and control — on all physical storage assets. Thus, SMI-S is a foundation upon which more efficient storage management can be built.

The Storage Networking Tower of Babel

The SMI-S (Storage Management Initiative – Specification) standard is important to IT organizations. They should track its progress, assess how they can use the results of the standards body’s SMI-S labors so far, and encourage vendors to move the standard forward as planned.

Why is SMI-S important? To understand that, IT organizations must first understand the storage networking “Tower of Babel” and the negative impacts that can occur.

Storage networking freed storage from a direct dependency upon a single server. That meant that storage assets could be provisioned and managed more effectively

Unfortunately, there is a flip side. The introduction of storage area networks (SANs) resulted in enterprises having to learn and deploy new storage

technologies, such as Fibre Channel (FC) switches and directors (along with familiar technologies, such as disk storage arrays). Not only does storage networking require a number of different products within the whole storage networking I/O “food pyramid” (hosts, fabrics, arrays and libraries), but many organizations use many similar products from more than one storage vendor. This ‘vendor heterogeneity’, combined with the diverse product types, leads to a ‘combinatorial problem.’ A combinatorial problem, in this case, is a problem that becomes exponentially worse each time a new vendor or product is added, because each addition must be connected to all existing products, and none of these share the same connecting “language” as the addition.

The combinatorial challenge — coupled with the explosive growth in the amount of storage in recent years — has increased the complexity of trying to

manage a storage networking environment dramatically. The consequences upon the business are as follows:

- *Increased inefficiencies for storage networking processes and operations* — for example, using many storage management software tools with different user interfaces requires high training costs and limits expertise to only a few
- *Higher than needed operational expenses (OPEX) and capital expenses (CAPEX)* — for example, having to buy more storage management software tools than necessary (capital cost) and having to train people in multiple tools (operational cost)
- *Business performance may suffer through greater risk in meeting service level agreements (SLAs)* — determining that a problem occurred, that it is important, deciding what to do, and then taking corrective action is impaired when multiple tools each have only partial information of the storage environment, and that information is not well-coordinated; this can lead to less application availability than can be tolerated
- *Increased data security risks* — more product types and more vendors increase the number of possible points of security exposure

The continuing high rate of growth of storage has only added (and will continue to add) to the problem. And that is where the SMI-S standard comes in.

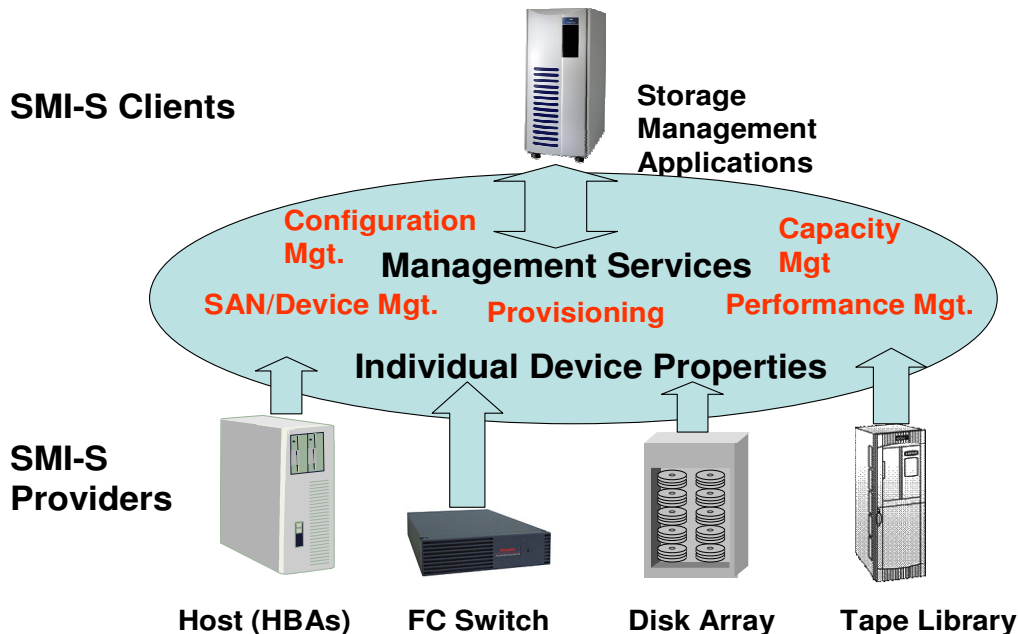
What is SMI-S?

SMI-S is a standard that integrates information from storage devices with storage management applications (here, storage management applications are defined as software that focuses on discovering, monitoring, and controlling physical storage assets). More specifically, SMI-S is an object-oriented API (Application Programming Interface) for the management of storage devices.

The SMI-S API has base classes which have common properties that all vendors share. When a vendor provides an API that serves as a gateway to access information about one of its products, then that vendor's product is considered to be a conformant SMI-S *provider*. When a vendor has an application that can gather information from an SMI-S conformant provider, that application is said to be a *client*. A vendor can choose to extend the base classes of a particular provider with proprietary properties that extend the common ones. There is no need for vendors to swap APIs, as any client can understand the common functions that each vendor delivers in a provider API for a specific product.

The evolution of the SMI-S standard from its initial creation is the work of the Storage Management Initiative (SMI) within the Storage Networking Industry Association. The categories of products that can be providers crosses a broad range of storage networking devices, including Host Bus Adapters (HBAs) on hosts, storage switches/directors, disk arrays, and tape libraries (Figure 1). These products provide information on the status of individual devices that a storage management application can then use to provide any number of services — including, but not limited to, the management of SANs/devices,

Figure 1: SMI-S Providers and Clients Working Together



Source: Mesabi Group, SNIA April 2006

capacity and performance monitoring, and configuring and provisioning. As might be expected, the number of providers (several hundred) far exceeds the number of clients (around a dozen).

SMI-S Enables One Window to the World

Organizations need many different device products (providers), but getting down to one storage management application (client) is the hoped-for goal. That goal is sometimes called the single pane of glass, but a better phrase might be one window to the world. A pane is but a piece of glass, but a window is about what can be seen through it. With the one window to the world that SMI-S enables, all that is going on within an enterprise's

storage networking world becomes visible. That visibility leads to both knowing and doing — having the information to make decisions, and having the ability to execute on those decisions. And that leads to the heart of the matter — taking actions to improve the efficiency of managing storage.

The Webster's Dictionary definition of efficiency is the ability to accomplish a job with the least expenditure of time and effort. Peter Drucker gave an even shorter definition: "Efficiency is doing things right." So how does SMI-S help increase the efficiency of storage management software?

Just knowing what an IT department has in the way of storage assets, knowing where those assets are, and knowing how

well those assets are being used may be beyond the available resources of an IT organization. Although each independent storage management software tool may be superb in its individual functionality, together they do not provide a comprehensive picture in a heterogeneous storage networking environment.

That information, in turn, might be transcribed to a do-not-erase white board or a Microsoft Excel spreadsheet. Both are manual processes; neither is very dynamic in its ability to adjust to changing information inputs. An SMI-S client application can update its information dynamically by accessing the relevant providers automatically.

Then there is the “small” matter of flexibility. Adding and changing storage networking components in a heterogeneous storage environment should be done non-disruptively. The storage management application should be able to discover and understand the individual device properties through the SMI-S interface (otherwise it is not plug-and-play).

Finally, because SMI-S allows all products to “talk the same talk and walk the same walk,” the combinatorial problem is greatly reduced. And that leads to:

- *Increased operational efficiencies* — SMI-S can abet better provisioning and configuration management, as well as lowered training costs
- *Lowered capital costs* — better asset utilization can defer expenditures and wider choice may lead to more cost efficient storage component acquisitions

- *Higher quality of service (QoS)* — SMI-S enables better prevention of potential SLA-threatening actions (proactive management) and faster troubleshooting of actual events through having more comprehensive information available and being able to take corrective action faster
- *Decreased security risks* — having fewer storage management applications enables better control for security purposes

SMI-S Enables the Three Basic Storage Management Tasks

The first storage management task is *discovery*. A client application located on, say, a SAN management server can discover each conformant device and collect all the information to form a topology of the SAN.

The second storage management task is *monitoring*. The client can gather the status for each device, including comprehensive health and fault management status checks.

The third storage management task is *control*. An SMI-S client enables an IT administrator to take control over, i.e., actively manage, the storage devices in a SAN. For example, configuration management enables LUN (logical unit number) masking and mapping, as the client has access control to LUNs from host FC ports.

In addition, automated-discovery capabilities enable new devices to be configured, monitored, and deployed automatically. That requires that an SMI-S policy has been previously established for automating the configuration process. For example, in a future version, all the LUNs in a newly-discovered array could be automatically configured for RAID 5 or

newly discovered fabric devices could be put into a "quarantined zone" until an administrator could review and make sure that all the new fabric devices are "copasetic."

In SNIA-CTP We Trust

Compliance is what IT wants vendors to do; conformance is what they actually can do that can be independently verified. SNIA does not measure compliance; it only measures conformance.

SNIA has a program called the Conformance Testing Program (CTP). SNIA-CTP certifies SMI-S conformance for vendor products. Vendor products that pass this independent testing process receive an SNIA "mark" for their product. The SNIA-CTP process therefore helps instill trust by reducing the risks of deploying storage management solutions.

SMI-S is an evolving standard. SMI-1.0 was available for CTP product testing in March 2004. V1.1 was available in April 2005 and V1.2 is just now becoming available. That means that more products will have been tested with the original version, fewer with the first upgrade, and very few if any with the latest version.

That can affect the decision of an IT organization to use a conformant client application today. For example, a conformant client application that focuses on the ability of the software to discover the components of a SAN is said to be SMI-Client V1.0 test conformant. A conformant client application that can also modify the components of a SAN is said to be SMI-Client V1.1 test conformant. If IT requires the SAN component modifica-

tion capabilities, then only a V1.1 test conformant product will do — and the product they want to use may not be conformant yet.

The take-away message of SNIA-CTP for an IT manager should be patience and persistence. Patience means that IT should recognize that the SMI-S standard has made real progress, but that not all the capabilities that IT would like may be available yet. Persistence means that IT should be proactive in asking vendors when additional needed capabilities will be available and tracking how well those promises are fulfilled.

SMI-S Has Deep Roots

SMI-S, a SNIA (Storage Networking Industry Association) initiative, uses the CIM (Common Information Model) and WBEM (Web Based Enterprise Management) standards promulgated by the DMTF (Data Management Task Force). That means that SNIA did not try to create a standard from scratch, but rather wisely incorporated the necessary parts of CIM. DMTF is well-respected (which inspires trust), and building upon an established standard as a platform saves time and money.

SMI-S Has a Bright Future

- IT organizations have to understand how the SMI-S standards process works so that they can temper their expectations as to the reality of what can be done today with the promises of what is coming. SMI has been successful in delivering new specifications on roughly an annual basis. Once these arrive, vendors can start to do their work to conform to those specifications. However, providers lead clients by at least six to nine months for the good reason that

there is no sense having clients until there are at least some providers.

Here is the status of SMI-S implementation today:

- *What is generally available today* — products that support V1.0; V1.0 covers the basic discovery and configuration of elements within a FC SAN infrastructure, namely, HBAs, switches, and a disk array
- *Where conformant products are now showing up* — products that support V1.1; V1.1 extends SMI-S to the systems management of all components in a heterogeneous storage environment, including NAS, an iSCSI array, and a tape library
- *Where vendors need to have time to “do their thing”* —the emerging V1.2, which will cover advanced systems management, including single-sign on authentication and other security features, as well as trending features, such as capacity management.

Adding Data Management and Information Management to the Fold

Storage, data, and information management services can work together. For example, a data service (e.g., replication) may be a client of a storage service, making a copy of

data from one set of storage devices to another set.

V1.2 gets into basic data management, but in the future, SMI-S can potentially not only work with storage policies, but also coordinate storage policies with data policies and information policies. Watch for coming attractions.

Conclusion

Manage hard or manage easy. That is the challenge that IT organizations face with their ever-growing-more-complex storage networking environment. SMI-S offers a reality (getting started with the basics) and the promise (implementation of advanced storage management functionality). SMI-S enables a storage management application to “see” (discovery) and to “talk to” (monitoring in a “listening” intake mode and control in an imperative command-giving mode) all the assets involved in storage networking.

The comprehensiveness of that perspective can lead to improved operational efficiencies, lowered costs, and higher quality of service. We strongly advise IT organizations to look into how they can best take advantage of the SMI-S standard both today and tomorrow.

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