Technology Brief

SMI-S HBA Provider

Paving the way for an end-to-end, SMI-S based storage network management interface

Position Statement

The increasing deployment of dedicated Storage Area Networks (SANs) in IT environments is a natural outgrowth of the problems they addressed for users, whose raw capacity requirements and dependency on reliable and fast access to a broad range of data have increased exponentially over the years. Initially, direct attached storage was used in enterprise environments, but as IT networks evolved, offloading the storage function to its own dedicated network resolved a host of problems, ranging from unmanageable backup windows and restricted access to data to consumption of server processing power that was required for application performance.

The power and flexibility of SANs has spawned numerous product developments that have enabled SAN users to expand the capabilities and efficiencies of their storage network infrastructures. This has led to an increased level of choice for users and has driven the proliferation of heterogeneous, multi-vendor SAN environments. Management of heterogeneous, multi-vendor SANs has therefore become more challenging for vendors, end-users and integrators alike. Each device on the SAN typically requires its own, unique management application. While today's vendor solutions provide considerable value, they may not always interface well with each other. At present, these point solutions are not being designed around a common management interface, which leaves little opportunity for the development of higher-level services such as automation, or holistic, self-managed storage architectures. Recognizing the growing need for a unified development platform for device management applications, the Storage Networking Industry Association (SNIA) launched the Storage Management Initiative (SMI) in mid-2002 to create and then foster the adoption of an open interface for the management of storage networks. The resulting specification (SMI-S) holds out tremendous promise for unifying the broad array of SAN products under a single development standard umbrella and for fueling new and exciting SAN technology deployments.

The benefits of the storage networking industry's broad implementation of SMI-S go well beyond future technology development initiatives. As existing management applications implement SMI-S, SAN adoption will benefit in multiple ways. First, it frees end-users to aggressively embrace storage networking technologies by creating a level playing field that offers choice based on intrinsic product value. In addition, it naturally expands the range of compatible solutions, which in turn lowers total cost of ownership (TCO) for users, who reap the benefits of lower management overhead. Similarly, vendors' efforts to deliver solutions that bring real business value to the marketplace will benefit from reduced time-to-market and development cycles, an inherently extended level of management reach, and greater levels of interconnectivity.

SANs are becoming more complex and inter-connected in enterprise deployments. At the same time they are becoming mainstream in small and medium business (SMB) environments, where ease-of-use and plug-and-play attributes are prevalent. Without broad adoption of the SMI-S, these trends will undoubtedly compound and increasingly amplify product compatibility issues.

As the storage networking industry embraces SMI-S, vendors will be able to make SANs easier to deploy and manage, enabling much wider adoption of this compelling storage architecture.

The Vision for SMI

The SMI's goal is to deliver open storage network management interface technology in the form of an SMI Specification (SMI-S). SMI-S is intended to be the unifying factor between the objects that must be managed in a storage network and the tools used to manage them. It provides a standardized, architected, and vendor-neutral platform for integrating storage devices with storage management applications.

Once broadly adopted, the SNIA SMI-S will build upon and unify today's multiple disparate object models, protocols, and transports into common models for each object class and a common protocol for management interactions. Vendors will be able to leverage their previous investments in Application Programming Interfaces (APIs) and application development to migrate their products toward a common, SMI-S-based interface. With all components presenting a common interface, implementing management functionality becomes simpler, less costly, and more robust for both storage devices and management applications.

Ultimately, customers will be able to adopt storage networking technology faster and build larger more powerful storage networks to efficiently and cost-effectively manage the ever-increasing demand for information storage. Simultaneously, management application developers and device component vendors will be able to concentrate their efforts on developing features and functions that truly add increased business value for customers. Such standards will serve to make SANs easier to deploy and manage.

Above and beyond addressing existing issues, SMI-S opens the door to new class of creative opportunities in storage resource management. Treading through and making sense of the unrelated management data reported from various sources currently requires highly skilled system and storage administrators. With the advent of SMI-S, one can envision a single management solution correlating data and traversing relationships across the whole storage value chain to compile actionable intelligence, and trigger the appropriate level of automation.

Value Proposition

With one set of object models and one protocol stack, management of networked storage becomes simpler and less expensive. SMI-S brings compelling value to storage device vendors, management application developers, and end-users.

Benefits for device vendors

- No need to push unique proprietary management interfaces at application developers
- Wider reach among management applications
- Streamlined development and testing
- Improved time-to-market for new devices or capabilities
- Shielded and tighter control over native management instrumentation
- Ability to innovate within a standard framework for advanced, value-add features

Benefits for management application developers

- Ability to support devices from multiple vendors quickly and reliably because they "look alike" and behave coherently
- Accelerated development and testing
- Improved time-to-market for new applications or features
- Reduced development costs
- Straightforward access to advanced, value-add features built into any given element

Benefits to End-users

- Ability to manage heterogeneous environments with a single, coherent interface
- Reduced management complexity
- Lowered Total Cost of Ownership (TCO)
- Wider selection and greater flexibility in terms of avoiding vendor lock-in
- Streamlined training for storage staff due to common interface
- Increased functionality, reliability and scalability
- Smoother, less disruptive SAN upgrade and expansion
- Shortened implementation and deployment phases
- Extended investment protection

Background

SMI-S achieves interoperability between storage solutions from different vendors by creating common models describing storage components and their functions. These models define common attributes and behavior for standard features. Furthermore, management actions are communicated using a single management protocol. The models and protocols comprising SMI-S are platform-independent, enabling applications to be developed for any platform, and enabling applications running on different types of platforms to interoperate. SMI-S object models are extensible, enabling easy addition of new devices and functionality to the model, and allowing vendor-unique extensions for added-value functionality.

SMI-S is based on the Common Information Model (CIM) and Web Based Enterprise Management (WBEM) standards developed and maintained by the Distributed Management Task Force (DMTF).

CIM is an object-oriented framework for describing management information. It defines the physical (i.e. the "what") as well as the logical (i.e. the "how") structure and behavior of objects to be managed. While CIM describes a method for representing management data, SMI-S defines the data and data-types, along with their model representation.

SMI-S consists of a single object-oriented model for each type of component in a storage network. Virtually anything storage related can be defined as a CIM object and grouped into modules that interoperate within a system, regardless of who built them, provided that the modules use CIM language and adhere to sets of specifications called CIM schema.

SNIA ratified SMI-S 1.0 as an official SNIA Architecture in November 2003. With the release of final CIM schema 2.8, SMI-S 1.0 was submitted to the American National Standards Institute's (ANSI) International Committee for IT Standards (INCITS).

Architecture

At the high level, SMI-S defines clients and providers. Clients are management software applications. Providers are the devices under management within the storage fabric, such as disk arrays, switches, and host bus adapters (HBAs). SNIA has developed storage-specific CIM "profiles" to model these devices. The list of existing profiles includes: Array, Switch, HBA, and Fabric.

Providers communicate with clients through middleware software components called agents, who essentially act as brokers between storage management applications and the providers. The CIM Object Manager (CIMOM) agent is a centerpiece of the SMI-S solution. It aggregates multiple devices within a system, and centralizes a number of functions such as repository of information, device discovery, status monitoring, event reporting, configuration and control.

SMI-S HBA Provider

Emulex Corporation is fully committed to SMI-S and was the first major HBA supplier to deliver an SMI-S HBA Provider. This marks a major milestone for the industry as it paves the way for an end-to-end, all SMI-S-based management value chain. Together with a host of storage industry leaders, the Emulex commitment to SMI-S will help accelerate the industry's adoption of this new specification.

The Emulex SMI-S HBA Provider is a native, SMI-S 1.0 compliant implementation operating across its entire family of LightPulse™ HBAs, on all major platforms (Windows 32/64, Linux 32/64, Solaris and HP-UX). Furthermore, it is fully backwards compatible with the entire installed based of Emulex HBAs, enabling today's SANs to benefit from tomorrow's advances. Emulex's unique firmware based HBA architecture, together with its SMI-S HBA Provider, offers customers an exceptional combination of investment protection and a seamless pathway to ongoing SMI-S compliance.

The Emulex HBA Provider also leverages the comprehensive management instrumentation built into the company's well-known HBAnyware centralized HBA management framework. As the driver-based instrumentation and advanced management features HBAnyware enables go well beyond what SMI-S 1.0 defines, Emulex intends to expose its innovations by implementing legitimate extensions to relevant SMI-S models. As a result, the Emulex SMI-S HBA Provider offers an efficient and seamless way for SAN management partners to easily integrate advanced, in-depth management of Emulex HBAs natively.

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