Storage Management from SMI-S to Management Frameworks

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Topics

• What problem does SMI-S Solve?
• SMI-S is an Object Oriented API
• An Object Oriented Service API for Storage Arrays
• SMI-S moving into Shared Services
• Why SMI-S for DLM/ILM?
• SMI-S Automation of ILM using Services
• New Work: Management Frameworks
Problem: Management Standard for Agents

- Multiple vendor user interfaces
  - Discontinuity leads to inconsistency, errors
- Device support for applications
  - Each vendor must create adapters for proprietary APIs
- No opportunity for automation to reduce the cost and complexity
Multiple Proprietary APIs
from SMI-S* …

*The Storage Management Initiative Specification (SMI-S) is an ISO and ANSI standard for interoperable management of storage resources
SMI-S: Services for Management

Management Services
Object Oriented, Platform Independent, Automated Discovery, Security, Configuration, Provisioning Operations, etc

Individual Device Properties

Disk Arrays  FC, IP Switches  Tape Libraries

Storage Management Applications
SMI-S Clients

CIM-XML & WS-Management

SMI-S Providers

FC, IP HBAs
Object Oriented APIs

SMI-S is an object oriented API for managing storage devices
- Part of API is in common with other vendors
  - Base class(es) have common properties
- Rest of API is an extension of the Base Classes
  - Proprietary properties extend the common ones
- No need to swap APIs
- One transport (protocol) for all functions
  - Public and Private
- API exposed as a **Service**
Object Oriented APIs

Each vendor adds their value to the standard in such a way as to enable clients to understand the common functions.

Vendor B’s API

Vendor A’s API
An Object Oriented Service API for Storage Arrays

• SMI-S consists of multiple *Profiles*
  – Implementations can be thought of as storage *services* implementations (available on the network)
  – The profiles document the API to each type of device/resource

• SMI-S profiles specify how to manipulate the *Information Model* of the device/resource
  – Based on CIM, Accessed through multiple protocols

• The Array Profile in SMI-S forms an *Object Oriented Service API* to monitor and control Storage Arrays
Modeling an Array and its operations

LUN Masking and Mapping is done to one or more host HBA fibre channel ports

A Setting is provided for the volume during creation which specifies performance and availability (QoS)

Virtualization of storage at the pool level allows either refined storage (pools) or virtual volumes to be created

Raw disks are aggregated into an undifferentiated pool of storage from which LUNs can be allocated
Storage Management Tiers

Shared User Interfaces

Shared (CIM) Services

Shared Agents (CIM providers)

Presentation Tier
- GUIs, BUIs, CLIs

Services Tier
- Security, Policy
- Data Management
- Core Framework Services

Agent (Device) Tier
- Device Instrumentation
- CIM Object Managers
Services for the Control Path

Foundation to build interoperable services for any storage resource
Domains for Management

• All of Management can be decomposed along two vectors
  – The type of resource that is being managed and the type of management done to those resources

• Resource Domain
  – The class of resource to which a particular device/resource belongs
  – Example: Storage Domain, Data Domain, Information Domain
  – Example: Server Domain, Network Domain, Application Domain

• Management Domain
  – The class of management to which a particular function belongs
  – Example: Fault, Configuration, Accounting, Performance and Security
Data Services

Data Services are management services in the Data **Resource Domain** - managing the type of resource called “Data”

- Data Services shepherd the data
  - Maintain Copies
  - Play role in the Data’s Lifecycle
- Data Services may be a *Client* of the storage services
- Data Services (or their policies) may also employ *Data Movers* to satisfy lifecycle requirements
- Policies can be employed to maintain lifecycle requirements

**Data Service**: methods for managing the data

**Storage Service**: methods for managing the storage

**Provision Storage**: Volumes, Mirrors, Policies...
Composing Services in Resource Domains

**User Interfaces**: administrate the services

**Storage Domain**
- **Storage Service Client**
- **Storage Services (i.e. config service)**
  - **Provision Storage**: Volumes, Mirrors, Policies...

**Data Domain**
- **Data Service Client**
- **Data Services**
  - **Data Service**: methods for managing the data

**Information Domain**
- **Information Service Client**
- **Information Services**
  - **Info Service**: methods for managing the information
- **Information Policies**: determine behavior of information management

**Policy “Managers”**: policy runtime and execution environment

- **Information Policies**: determine behavior of information management
- **Data Policies**: determine behavior of data management
- **Storage Policies**: determine behavior of storage management
- **Manage Policies**: control lifecycle of the policies themselves

Communication is via SMI-S over CIM-XML and WS-Management protocols.
… to Management Frameworks*

*A Management Framework is a set of common components, exposed as reusable services for use by management applications and other management services, components, etc. in the management environment.
The Evolution of Management Solutions

- Phase 1
  - Individual Vendor Management Tools
- Phase 2
  - Enterprise Management Applications
- Phase 3
  - SMI-S Integration
- Today’s issues and how to solve them
- Phase 4
  - Management Frameworks and Common Components
Phase 1 – Individual Vendor Management Tools

- Limited integration among tools ... maybe “link and launch”
- Vendor Differentiation:
  - Device by device functionality but new device ... new interface.
- Value
  - Support device administration
- End User Perspective:
  - High operational costs (training, platforms, integration)
  - Limited ability for user to deploy multivendor components
  - No commonality
Phase 2 – Enterprise Management Applications

- Integration of device management on a single application
- Vendor Differentiation:
  - Breadth of device support
  - But … expensive to maintain and improve
- Perceived Value
  - Broad device support
- End-User Perspective
  - Not enough device coverage
  - Limited to no improvement in functionality … a box of tools
Phase 3 – SMI-S Integration

- Standard interface to devices
- Vendor Differentiation:
  - Increased support of devices
  - Using a “standard” interface
- Value
  - Device support -> automation, policy
- End-user perspective
  - Broader access to devices
  - Common management “profiles”
    … similar operations across dissimilar devices
One of the problems

• Time to market
• Vendor develops new functionality
  – Standard takes a year
  – Provider Implementation another 6 months
  – Client implementation from 2 Years to Never
• Need to accelerate delivery to end user faster
Phase 4 – Framework and Modular Applications

- Integrated framework and repository for end-to-end device view
- Vendor Differentiation:
  - Deliver functionality across multiple devices, e.g. storage provisioning
  - Modular applications with scaled functionality
  - Integrated information model
- Value
  - Framework -> Applications
- End-user perspective
  - Emergence of integrated management
  - But … single vendor lock-in
  - Storage management still did little to reduce operational costs.
The new opportunity

- Standard framework interface(s) for use by storage management applications
- Support for multi-vendor applications using the common framework
- Vendor differentiation
  - Leverage framework investment across multiple vendors
  - Ability to support applications from multiple partners
  - Easier to integrate support from SMI devices
- Benefit to users:
  - Access to a broader set of functionality from multiple vendors
  - Results in lower cost of management
Management Frameworks

• In order to support the shared services, a set of common components, factored out of management applications, should be standardized
  – Similar to the CIM Object Manager for Agent Tier
• This work will accelerate SMI-S Client development
  – Leverage standard frameworks for applications
  – Customers get to choose best of breed management functions from multiple vendors
• Services are available both locally and remotely
Anatomy of a Framework

Framework

**Domain Specific Services**: Specific to Resource or Management domains that perform application functions

- **Domain Specific 1**
- **Domain Specific 2**
- ... (indicated by ellipsis)

**Data Model**: Secure, persistent storage of historical and other data

- **Data Model Services**
  - **Discovery**: Discovery of new agents and profiles that need collection

**Topology**: Domain specific service that provides topology from the data collected into the Data Model

- **Topology**
  - **Collectors**: services that collect historical, topology and other information from agents

**Policy**: Core service for interpretation and execution of policy statements

- **Policy**

**Event Service**: Service that creates indications and listens on behalf of other services

- **Event Service**

Communication is via SMI-S over CIM-XML and WS-Management protocols

Agent Tier

Services Tier
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  - Data Classification
    - Key to Service Level Management
  - Data Security and Protection
    - Data Assurance Solutions to Meet Corporate Requirements
  - IP Storage
    - iSCSI, Your IP SAN
  - Storage Management
    - Manage Storage or Be Managed By It
  - Storage Virtualization
    - Increasing Productivity
  - Zero to SAN
    - Fibre Channel Connectivity in No Time

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- Please send any questions or comments on this presentation to SNIA:
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Many thanks to the following individuals for their contributions to this tutorial.

  SNIA Education Committee

Management Frameworks TWG
Storage Management Initiative Marketing Committee
Ray Dunn
Edgar St. Pierre
Thank You!

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