

SAN Management & Mode Pages

Roger Cummings

May 2, 2001

Background

- Management applications need to obtain information from the SAN via 4 methods:
 - SNMP (over Ethernet)
 - FC Generic Services
 - SCSI Mode and Log Pages
 - SCSI Inquiry Data
- Information is not always consistent
- Trend is clearly towards more and more information being available via “out-of-SAN” access:
 - More secure (if only by obscurity)
 - Often “almost but not quite” same information as in Inquiry and Mode Pages

And further.....

- iSCSI has additional method to get information - Text Command and Text Response
 - Multiple key:value pairs separated by ASCII NUL
 - Used for addressing, URLs, enabling Request To Transfer etc.
 - Equivalent to Process Login
 - Target processes each key separately
 - If not recognized, not echoed in Text Response
 - Easily add vendor-unique keys:
 - Prepend with reversed domain name (e.g. com.veritas.enablemode1:Yes)

Not User Friendly

- Existing SCSI Mode Page scheme is not very user-friendly
 - Each page has a different layout
 - Pages can be truncated – need to get exact transfer length (and networks don't always provide this)
 - No way to mask information
 - Have to do a read before write
 - “Return All Pages” is of almost no use
- Vendor unique extensions to SCSI are difficult & require completely new pages

Other schemes

- SNMP et al is good at reading data, but less good at real time control
- CIM is gaining in popularity, but a complete storage subsystem model in CIM is a daunting task:
 - Being addressed by several other groups
 - Not clear that the models will reach the depth of mode pages
- Meanwhile methods of status retrieval and control proliferate...
 - Added piecemeal with new transport support (as in iSCSI)

Need

- Need one storage status & control scheme that works over ALL existing transports and new ones
- Need something more easily extended than current SCSI page-based scheme
- Need single field “namespace” (if only to prevent confusion in multiple transport case)
- Eventually need separate secure Device Manager to handle mode pages and some other SCSI functions:
 - Authentication of access
 - Protect against changed configuration by application that should only be accessing data
 - Transaction basis (send, check, execute)

Proposal

- T10 defines a standard translation of SCSI Mode Pages and Inquiry Data to XML
- Why XML?
 - Self-describing, human-readable plain-text
 - Transport-neutral (works over LANs, also FC)
 - Can represent complex hierarchies
 - Each field can be read and set separately
 - Supports variable field length
 - Better field contents typing
 - Can indicate allowable ranges
 - Can use vendor-unique naming like iSCSI
 - Its key to the future of the Internet (i.e. there will be LOTS of tools)

Why XML (Contd)?

- Standards exist for:
 - Signing and encrypting XML docs
 - Displaying XML in browsers (style sheets)
 - Searching and transforming etc.
- “Get All” will finally be useful
 - All information can be retrieved in one operation and processed offline
 - Standard format for analyzer output?
- Format can infinitely extendable without page and bit constraints
 - But it’s not about minimizing interface bandwidth!
 - See the tutorial

Tutorial

- XML is like HTML, but with user-defined tag values
 - It's also simplified SGML
 - Much less tolerance for sloppy formatting than HTML
- Tags don't define display properties:
 - That's what style sheets (XSL or CSS) are for!
- Definition of tags used in an associated Document Type Definition (DTD) file
 - Allows XML document to be “parsed” for correct structures
 - Extension being proposed for values as well

Proposal

- Start with an XML representation of Inquiry & Mode Page information in SPC-2
- Possible to add new optional types of information for each field, e.g.:
 - Per Port **or** Per Initiator all Ports **or** Per Port per Initiator
 - Per LUN **or** 1 value all LUNs
 - Volatile **or** Non-Volatile across Resets **or** Non-Volatile across power cycles

Proposal

- Add an Epoch ID from Target
 - Number incremented by 1 each time a configuration change is made in a device
 - Quick check that SOMETHING has changed without having to check every bit
- Need a Transaction ID from Initiator
 - Tag to link response to a specific management request
 - Will eventually allow a full set of changes to be received, checked, “complied” and then activated

Simplified Example

```
<?xml version="1.0" ?>  
<SCSIMLTransaction id=14567>  
<TransactionType>Response  
</TransactionType>  
<SCSIClass>Mode_Page  
<Epoch>987</Epoch>  
<Page>  
<PageName>Disconnect-  
reconnect</PageName>  
<Field>  
<Name>Data_Transfer_Disconnect_C  
ontrol</Name>  
<SizeBits>3</SizeinBits>
```

```
<Value Type="bin"> 011</Value>  
<Attr>PPI,1,NVPC </Attr>  
<SPCPageCode>02  
<SPCPageCode>  
<SPCName>DTDC  
</SPCName>  
<SPCStart>12/2</SPCStart>  
<SPCEnd>12/0</SPCEnd>  
</Field>  
.....  
</Page>  
</SCSIClass >  
</Transaction>
```

The Other Part

- Create a “Device Service” in the SAN (being done for FC-GS-4)
 - Accessed via a well-known address (like a Name Server)
 - Repository of SCSI Mode Sense and Inquiry Data for all attached storage devices
 - Note - many fabrics already poll for storage devices today to add their addresses to Name Server
- Management applications talk to the service, not the devices
 - Walled off from normal access paths
 - May even be able to provide information across Zones with this approach

Putting all of this together

- Multiple year project with at least four phases
- T11 & T10 parts, also get SNIA & IETF IP Storage Working Group involved
- Important to get the overall XML structure defined quickly
- Migration strategy incorporated
- Will this ever get incorporated in a single SCSI disk ?
 - Maybe, but that's not a key reason for doing this

Anticipated Phases

Phase	Features
1	<ul style="list-style-type: none"> a) Agree XML Format b) Create standard DTD, XSL
2	<ul style="list-style-type: none"> a) Define FC Device Service (read) b) Define TCP/IP access (read)
3	<ul style="list-style-type: none"> a) Add set access definition b) Add security (authentication)
4	<ul style="list-style-type: none"> a) Add new fields (not in SPC-2) b) Define In/Out Service Actions for XML command

Phase 1

- Agree the basic XML structure and the field names (in T10 TR?)
- Define the DTD and XSL
- Work with W3C to get a namespace established for storage devices
 - Allow multiple organizations to define fields and preserve unique names
- Ensure enough flexibility for future developments

Phase 2

- In parallel with Phase 1 work to get a “Device Service” definition which uses the XML representations (for read access only)
 - Defined in FC-GS-4
 - Defined for access across TCP/IP (LDAP, SOAP, Browser access etc.)
- Work with IETF IP Storage WG on establishing methods of storage management access over TCP/IP

Phase 3

- Extend the XML definition to support set capability
 - Possibly also add non-mode functionality that needs restricted access (e.g. format, prevent/allow medium removal)
- Incorporate security features:
 - Authentication using Public Key Infrastructure
 - Encryption
 - Can be made optional or mandatory

Phase 4

- Define new status and control parameters
 - Cannot be accessed via Inquiry, Mode Pages etc.
- Define new SCSI command to transport XML directly to & from the device
 - Could even just be service actions of an existing command

One SCSI Command

- One command, 2 Service Actions only required:
 - XML In
 - XML Out
- Allocation Length required only – everything else should be in XML
- Infinitely extendable
- Simple to add new fields (as long as the names do not conflict)
- Richer set of value types
- Clean way of supporting vendor unique information

Summary

- XML is flexible way of presenting mode page and status information
 - One field at a time approach
 - Useful even if it is only used as an output format by management tools
- SCSI MIB will likely include information that will be VERY difficult to represent in existing mode pages
 - Much simpler in XML
- Part of an overall approach along with SCSI MIB & CIM models

What's needed going forward

- Starting to work on the Device Service in GS-4 in T11
 - Should it be defined in terms of binary or XML mode pages ???
- Should the XML definition be a T10 project?
 - Separate project for the XML structure & DTD ?
 - Agreement that going forward mode page field names have to be unique?
 - Phase 4 Command in SPC at some point in the future