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To: T10 Committee (SCSI)

From: Roger Cummings (Symantec), Krithivas Ramamurthy (Intel), Drue Reeves (Dell) on behalf of the SNIA Management Protocol (MP) Technical Working Group (TWG)

Subject: T10/06-465r0 Alternative Proposal for Management Transport

Revision History

	(September 27, 2006)	1st SNIA Revision
	(October 23, 2006)	2nd SNIA Revision - Replaced reserved fields by Management Protocol specific. Genericized Management Protocol value allocation to SNIA. Added paragraph to Background regarding security features.
06-465r0	(October 24, 2006)	1st T10 Revision - corrected typos & code allocations

Background

On August 30, 2006, a T10 document (06-392r0) containing a proposal from the SNIA MP TWG was posted to the T10 web site. The document proposed that a method be defined in SPC-4 of allowing the representation of the Common Information Model in XML (CIM-XML, defined by the DMTF) protocol to be transported across a SCSI infrastructure, and gave a rationale for the need for the method and identified specific requirements. 06-392r0 suggested changes to the SECURITY PROTOCOL IN and SECURITY PROTOCOL OUT command definitions in SPC-4 Revision 6 to provide this method, and also include an additional glossary entry and a definition for a new Management well known Logical Unit.

06-392r0 was not discussed during the Commands, Architecture & Protocols (CAP) Working Group held on September 13 in Nashua, NH due to a lack of time. However a number of people privately expressed opinions during that week that this function would be better addressed by defining new MANAGEMENT PROTOCOL IN and MANAGEMENT PROTOCOL OUT commands rather than “overloading” the Security Protocol commands.

As a result, this alternative proposal has been prepared following that approach. This proposal is complete in that it identifies the requirements to be met, and a complete set of suggested changes to SPC-4 Revision 07a needed to meet those requirements. The rationale behind the proposal is however not repeated from 06-392r0 (now updated with an r1).

Either the changes contained in 06-392r1, or the changes contained in this document, would be acceptable to SNIA as they both meet all of the requirements identified below. The decision on which approach to follow is, of course, the purview of T10, and T10 alone.

Note that existing transports for CIM-XML provide authentication and access control features in addition to those contained and managed within the CIM schema itself. For the SCSI transport, it is expected that one or more of the security protocols transported via the SECURITY PROTOCOLS IN and SECURITY PROTOCOLS OUT commands would be utilized for that purpose.

Proposal

The document proposes that a method be defined in SPC-4 of allowing CIM-XML to be transported across a SCSI infrastructure. The specific requirements (repeated unaltered from 06-392r1) are:

a) Provide a method of sending up to 16 megabytes of arbitrary data from an Initiator to a Target;
b) Provide a method of sending up to 16 megabytes of arbitrary data from a Target to an Initiator;
c) Provide a method of allowing a Target to notify an Initiator of the completion of an “event”;
d) Provide a method by which an Initiator can discover that a Target supports a) thru c) above using the facilities provided by the FC-HBA API (INCITS 386:2004) or the later SM-HBA API.

Thus this alternative proposal specifically proposes:

1) Two new commands be defined, tentatively named MANAGEMENT PROTOCOL IN and MANAGEMENT PROTOCOL OUT. The approach taken in defining these new commands is to define new Service Actions of the MAINTENANCE IN and MAINTENANCE OUT commands defined in SCC-2;
2) A new MANAGEMENT PROTOCOL well known logical unit value be assigned. The new commands defined in 1) above will be defined as being addressed to this logical unit.

However SNIA will be pleased to utilize any method of meeting the four requirements identified at the beginning of this section.

Suggested Changes to SPC-4 Rev 07a

3.1 Definitions

3.1.x Storage Networking Industry Association (SNIA): An organization that develops and promotes standards for storage management and other storage-related functions, and which publishes standards via the INCITS Fast Track process. See http://www.snia.org.

6.XX MANAGEMENT PROTOCOL IN command

6.XX.1 MANAGEMENT PROTOCOL IN command description

The MANAGEMENT PROTOCOL IN command (see Table xx) is used to retrieve management protocol information (see 6.XX.2) or the results of one or more MANAGEMENT PROTOCOL OUT commands (see 6.YY).

Table 172 — MANAGEMENT PROTOCOL IN command

Bit / Byte	7	6	5	4	3	2	1	0
0	OPERATION CODE (A3h)							
1	Reserved			SERVICE ACTION (mmh)				
2	MANAGEMENT PROTOCOL							
3	MANAGEMENT PROTOCOL SPECIFIC							
4								
5	INC_512	MANAGEMENT PROTOCOL SPECIFIC						
6	(MSB)	ALLOCATION LENGTH						
9								(LSB)
10	MANAGEMENT PROTOCOL SPECIFIC							
11	CONTROL							

The ALLOCATION LENGTH field is defined in 4.3.4.6.

The MANAGEMENT PROTOCOL field (se table xx1) specifies which management protocol is being used.

Table xx1 — MANAGEMENT PROTOCOL field in MANAGEMENT PROTOCOL IN command

Code	Description	Reference
00h	Management protocol information	6.xx.2
01h - mFh	Reserved	
n0h - n5h	Defined by the SNIA	3.1.x
n6h - EFh	Reserved	
F0h - FFh	Vendor Specific	

The contents of the MANAGEMENT PROTOCOL SPECIFIC fields depend on the protocol specified by the MANAGEMENT PROTOCOL field (see table xx1).

A 512 increment (INC_512) bit set to one specifies that the ALLOCATION LENGTH field (see 4.3.4.6) expresses the maximum number of bytes available to receive data in increments of 512 bytes (e.g., a value of one means 512 bytes, two means 1 024 bytes, etc.). Pad bytes may or may not be appended to meet this length. Pad bytes shall have a value of 00h. An INC_512 bit set to zero specifies that the ALLOCATION LENGTH field expresses the number of bytes to be transferred.

Indications of data overrun or underrun and the mechanism, if any, for processing retries depend on the protocol specified by the MANAGEMENT PROTOCOL field (see table xx1).

Any association between a previous MANAGEMENT PROTOCOL OUT command and the data transferred by a MANAGEMENT PROTOCOL IN command depends on the protocol specified by the MANAGEMENT PROTOCOL field (see table xx1). If the device server has no data to transfer (e.g., the results for any previous MANAGEMENT PROTOCOL OUT commands are not yet available), the device server may transfer data indicating it has no other data to transfer.

The format of the data transferred depends on the protocol specified by the MANAGEMENT PROTOCOL field (see table xx1).

The device server shall retain data resulting from a MANAGEMENT PROTOCOL OUT command, if any, until one of the following events is processed:

a) Transfer of the data via a MANAGEMENT PROTOCOL IN command from the same I_T_L nexus as defined by the protocol specified by the MANAGEMENT PROTOCOL field (see table xx1);
b) Logical unit reset (See SAM-4); or
c) I_T nexus loss (See SAM-4) associated with the I_T nexus that sent the MANAGEMENT PROTOCOL OUT command.

If the data is lost due to one of these events the application client may send a new MANAGEMENT PROTOCOL OUT command to retry the operation.

6.xx.2 Management protocol information description

6.xx.2.1 Overview

The purpose of the management protocol information management protocol (i.e., the MANAGEMENT PROTOCOL field set to 00h in a MANAGEMENT PROTOCOL IN command) is to transfer management protocol related information from the logical unit. A MANAGEMENT PROTOCOL IN command in which the MANAGEMENT PROTOCOL field is set to 00h is not associated with an previous MANAGEMENT PROTOCOL OUT command and shall be processed without regard for whether a MANAGEMENT PROTOCOL OUT command has been processed.

If the MANAGEMENT PROTOCOL IN command is supported, the MANAGEMENT PROTOCOL value of 00h shall be supported as defined in this standard.

6.xx.2.2 CDB description

When the MANAGEMENT PROTOCOL field is set to 00h in a MANAGEMENT PROTOCOL IN command, the MANAGEMENT PROTOCOL SPECIFIC field (see table xx2) contains a single numeric value as defined in 3.5.

Table xx2 — MANAGEMENT PROTOCOL SPECIFIC field for MANAGEMENT PROTOCOL IN protocol 00h

Code	Description	Support	Reference
0000h	Supported management protocol list	Mandatory	6.xx.2.3
0001h - FFFFh	Reserved		

All other CDB fields for MANAGEMENT PROTOCOL IN command shall meet the requirements stated in 6.xx.1.

Each time a MANAGEMENT PROTOCOL IN command with the MANAGEMENT PROTOCOL field set to 00h is received, the device server shall transfer the data defined 6.xx.2 starting with byte 0.

6.xx.2.3 Supported management protocols list description

If the MANAGEMENT PROTOCOL field is set to 00h and the MANAGEMENT PROTOCOL SPECIFIC field is set to 0000h in a MANAGEMENT PROTOCOL IN command, the parameter data shall have the format shown in table xx3.

Table xx3 — Supported management protocols MANAGEMENT PROTOCOL IN parameter data

Bit / Byte	7	6	5	4	3	2	1	0
0	Reserved							
5								
6	(MSB)	SUPPORTED MANAGEMENT PROTOCOL LIST LENGTH						
7	(m-7)							(LSB)
Supported management protocol list								
8	SUPPORTED MANAGEMENT PROTOCOL (first) (00h)							
	. . .							
m	SUPPORTED MANAGEMENT PROTOCOL (last)							
m+1	Pad bytes (optional)							
n								

The SUPPORTED MANAGEMENT PROTOCOL LIST LENGTH field indicates the total length, in bytes, of the supported management protocol list that follows.

Each SUPPORTED MANAGEMENT PROTOCOL field in the supported management protocols list shall contain one of the management protocol values supported by the logical unit. The values shall be listed in ascending order starting with 00h.

The total data length shall conform to the ALLOCATION LENGTH field requirements (see 6.xx.1). Pad bytes may be appended to meet this length. Pad bytes shall have a value of 00h.

6.yy MANAGEMENT PROTOCOL OUT command

The MANAGEMENT PROTOCOL OUT command (see table yy1) is used to send data to the logical unit. The data sent specifies one or more operations to be performed by the logical unit. The format and function of the operations depends on the contents of the MANAGEMENT PROTOCOL field (see table yy2). Depending on the protocol specified by the MANAGEMENT PROTOCOL field, the application client may use the MANAGEMENT PROTOCOL IN command (see 6.xx) to retrieve data derived from these operations.

Table yy1 — MANAGEMENT PROTOCOL OUT command

Bit / Byte	7	6	5	4	3	2	1	0
0	OPERATION CODE (A4h)							
1	Reserved			SERVICE ACTION (nnh)				
2	MANAGEMENT PROTOCOL							
3	MANAGEMENT PROTOCOL SPECIFIC							
4								
5	INC_512	MANAGEMENT PROTOCOL SPECIFIC						
6	(MSB)	TRANSFER LENGTH						
9								(LSB)
10	MANAGEMENT PROTOCOL SPECIFIC							
11	CONTROL							

The MANAGEMENT PROTOCOL field (see table 2) specifies which management protocol is being used.

Table yy2 — MANAGEMENT PROTOCOL field in MANAGEMENT PROTOCOL OUT command

Code	Description	Reference
00h - mFh	Reserved	3.1.x
n0h - n5h	Defined by the SNIA	
n6h - EFh	Reserved	
F0h - FFh	Vendor Specific	

The contents of the MANAGEMENT PROTOCOL SPECIFIC fields depend on the protocol specified by the MANAGEMENT PROTOCOL field (see table yy2).

A 512 increment (INC_512) bit set to one specifies that the TRANSFER LENGTH field (see 4.3.4.4) expresses the number of bytes to be transferred in increments of 512 bytes (e.g., a value of one means 512 bytes, two means 1 024 bytes, etc.). Pad bytes shall be appended as needed to meet this requirement. Pad bytes shall have a value of 00h. A INC_512 bit set to zero specifies that the TRANSFER LENGTH field indicates the number of bytes to be transferred.

Any association between a MANAGEMENT PROTOCOL OUT command and a subsequent MANAGEMENT PROTOCOL IN command depends on the protocol specified by the MANAGEMENT PROTOCOL field (see table yy2). Each protocol shall define whether:

a) The device server shall complete the command with GOOD status as soon as it determines the data has been correctly received. An indication that the data has been processed is obtained by sending a MANAGEMENT PROTOCOL IN command and receiving the results in the associated data transfer; or

b) The device server shall complete the command with GOOD status only after the data has been successfully processed and an associated MANAGEMENT PROTOCOL IN command is not required.

The format of the data transferred depends on the protocol specified by the MANAGEMENT PROTOCOL field (see table yy2)

8 Well known logical units

8.1 Model for well known logical units

Well known logical units are addressed using the well known logical unit addressing method of extended logical unit addressing (see SAM-4). Each well known logical unit has a well known logical unit number (W-LUN) as shown in table 368.

Table 368 — Well known logical unit numbers

W-LUN	Description	Reference
00h	Reserved	
01h	REPORT LUNS well known logical unit	8.2
02h	ACCESS CONTROLS well known logical unit	8.3
03h	TARGET LOG PAGES well known logical unit	8.4
04h	SECURITY PROTOCOL well known logical unit	8.5
05h	MANAGEMENT PROTOCOL well known logical unit	8.6
06h-FFh	Reserved	

If a well known logical unit is supported within a SCSI target device, then that logical unit shall support all the commands defined for it.

Access to well known logical units shall not be affected by access controls.

The SCSI target device name of the well known logical unit may be determined by issuing an INQUIRY command (see 6.4) requesting the Device Identification VPD page (see 7.6.3).

All well known logical units shall support the INQUIRY command's Device Identification VPD page as specified in 7.6.3.2.2.

8.6 MANAGEMENT PROTOCOL well known logical unit

The MANAGEMENT PROTOCOL well known logical unit shall only process the commands listed in table 424. If a command is received by the MANAGEMENT PROTOCOL well known logical unit that is not listed in table 424, then the command shall be terminated with CHECK CONDITION status, with the sense key set to ILLEGAL REQUEST, and the additional sense code set to INVALID COMMAND OPERATION CODE.

Table 424 — Commands for the MANAGEMENT PROTOCOL well known logical unit

Command name	Operation code	Type	Reference
INQUIRY	12h	M	6.4
REQUEST SENSE	03h	M	6.26
TEST UNIT READY	00h	M	6.30
MANAGEMENT PROTOCOL IN	A3h/mmh [a]	M	6.XX
MANAGEMENT PROTOCOL OUT	A4h/nnh [a]	M	6.YY

Key: M = Command implementation is mandatory.

[a] This command is defined by a combination of operation code and service action. The operation code value is shown preceding the slash and the service action value is shown after the slash.