TO: T10 Membership
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DATE: 9 July 2003
SUBJECT: T10/03-202r2, ADC Informative Annex: DTD Configuration Example

Revision 2:

Changes from 8 July 2003 meeting, 03-234r0 discussion item e:

- Changed the order of MODE SENSE commands to get the changeable mode parameters mask first.

- In the RMC LU descriptor, expanded the T10 vendor identifier to include the VENDOR SPECIFIC IDENTIFIER field and added an IEEE Extended identifier.

- Made world wide node and port names consistent with the RMC LU IEEE Extended identifier.

- Enabled the SMC logical unit.

Revision 1:

Changes from 30 June 2003 teleconference, 03-225r0 discussion item a:

- State that discovery and configuration is performed after power cycle or hard reset by automation device or DTD.

- Reorganize presentation of mode parameters.

- Remove block descriptor and use MODE SENSE (10) parameter format.

Revision 0:

- Initial rough draft.

This proposal is offered as a sample of the commands and data that would be exchanged between an automation application client and an ADC device server to configure the data transfer device for operation.

Annex A

(Informative)

Example of DTD Configuration

A.1 Introduction

One of the purposes of the Automation Drive Interface standards is to enable automation devices to discover and configure data transfer devices automatically, i.e., without manual configuration of the DTD before it is placed in the automation device. Because DTD configuration information is presented and modified in a standard manner, automation application clients can implement one

discovery and configuration process that will accommodate all compliant DTDs without need for DTD-specific changes.

Typical configuration information to be set includes:

- Target ID (e.g., SCSI ID or Fibre Channel Loop Identifier)

- Other transport-specific configuration items

- World wide names and other identifiers

- Autoload mode and other RMC-specific parameters

- Enabling or disabling of bridging

Configuration of all data transfer devices must be performed when the automation device performs a hard reset. Also, when a data transfer device performs a hard reset it must be configured. At that time, the automation application client will typically discover the DTD and if necessary modify its configuration prior to enabling its primary port(s). This ensures that the configuration is correct when the RMC device server is first accessed by application clients via the DTD primary port(s), thus avoiding confusing the application clients by changing the target port identifier or other parameters that they have already discovered.

While different DTDs may save different sets of parameters across power cycles and resets, the port enable (PE) field in the DTD primary port descriptors is the one that is required for the operation described above. When this bit is set to zero in the saved mode parameters, a power cycle or hard reset will leave the DTD primary ports disabled. The automation application client can then set the entire configuration and enable the DTD primary ports by setting the current mode parameters, which can be done with a single MODE SELECT command. In fact, if the DTD configuration is known to be acceptable, then this single command will be the only one necessary.

If the DTD detects that it is not connected to an automation device (by means beyond the scope of this standard), it may override a PE bit of zero and enable the port upon power on or hard reset. This will allow the DTD primary ports to operate when the DTD is in a standalone mode.

This annex presents a recommended sequence of commands for setting the DTD's configuration, and points out specific items to be configured.

A.2 Command Sequence

The recommended sequence of commands for the automation application client to issue to the DTD is shown in Table A.1. This process should be carried out anytime either the automation device or data transfer device performs a hard reset.

Table A.1 – Configuration command sequence

Command	LUN Addressed	Purpose
REPORT LUNS	0	Discover logical units supported by the DTD
INQUIRY	Each reported LUN	Determine type of each device server
TEST UNIT READY	ADC LUN	Clear Unit Attention conditions
MODE SENSE (10)	ADC LUN	Obtain changeable mode parameters
MODE SENSE (10)	ADC LUN	Obtain saved mode parameter values
MODE SELECT (10)	ADC LUN	Set saved mode parameter values

MODE SENSE (10)	ADC LUN	Obtain current mode parameter values
MODE SELECT (10)	ADC LUN	Set current mode parameter values

If the automation application client knows that the LUNs, device types, and saved mode page settings are correct, then the only necessary command will be the final MODE SELECT (10). The ten-byte forms of the MODE SENSE and MODE SELECT commands should be used because they are mandatory and will be available on all DTDs. The six-byte forms are optional and thus may not be supported.

A.3 Configuration process steps

Once the automation application client has determined which logical unit has the ADC device server, it can then begin to determine the characteristics of the DTD. Automation firmware need make no assumptions about the type of media handled by the drive, the number and types of primary ports, identifiers reported by it, etc.

The configuration sequence is to determine which parameters are changeable, modify the saved parameters if necessary, and modify the current parameters if necessary. This description begins with the first MODE SENSE (10) command in the table above.

A.3.1 Determining changeable parameters

To obtain a mask denoting the changeable parameters, the automation application client should issue a MODE SENSE (10) command with the page control (PC) field set to Changeable Values (01b). While obtaining the mask is not the only way to determine which parameters are changeable, the alternative is to attempt to change parameters and have the device server reject the command for invalid parameter data. This trial-and-error process is less efficient than using the mask.

A.3.2 Obtaining saveable mode parameters

To obtain the current values of the relevant parameters, the automation application client should issue a MODE SENSE (10) command with the page control (PC) field set to Saved Values (11b). The data received must then be parsed to determine which parameters are supported. If none of these parameters need to be changed or if no parameters can be saved, then the automation application client can skip to clause A.3.4 below.

A.3.3 Saving mode parameters

Mode parameters are saved using the MODE SELECT (10) command with the save pages (SP) bit set to one. Different data transfer devices may allow saving of different parameters. It is recommended that at a minimum the port enable (PE) bit for each primary port be saveable. If these bits are set to zero and saved, then after subsequent hard resets the DTD primary port(s) will be disabled. this will permit the automation application client to configure the DTD before it can be accessed through its primary ports.

A.3.4 Obtaining current mode parameters

The automation application client can now set the DTD parameters to the values desired during normal operation. To obtain the current values of the relevant parameters, the automation application client should issue a MODE SENSE (10) command with the page control (PC) field set to Current Values (00b). The data received must then be parsed to determine which parameters are supported.

A.3.5 Setting operational parameter values

The second MODE SELECT (10) command will typically set all of the operational parameter values and enable the DTD's primary ports. It is done with the save pages (SP) field set to zero.

If the automation application client sets the OFFLINE field of the RMC logical unit descriptor to one in order to leave the device offline after the DTD primary ports are enabled, then an additional MODE SELECT (10) will be necessary to bring the device online.

A.4 Sample mode parameters

This clause presents a example of configuring the operational (changeable) parameters of a data transfer device. The DTD contains an SSC (tape) device server and two Fibre Channel ports. The values shown here are those set in clause A.3.5 above.

A.4.1 Mode parameter header and block descriptor

Bit Byte	7	6	5	4	3	2	1	0
0	(MSB)							
1			MODE DATA LENGTH (0000h)					(LSB)
2	MEDIUM TYPE (00h)							
3	DEVICE-SPECIFIC PARAMETER (00h)							
4	Reserved							LONGLBA (0)
5	Reserved							
6	(MSB)							
7			BLOCK DESCRIPTOR LENGTH (0000h)					(LSB)

A.4.2 Node descriptor subpage

Because the automation application client wishes to change the world wide node name, it sets the WORLD WIDE NODE NAME field to the new value (2000012300000000h) and the MNN field to 11b.

8	PS	SPF (1)		PAGE CODE (0Eh)				
9	SUBPAGE CODE (01h – Node descriptor subpage)							
10	(MSB)							
11			PAGE LENGTH (0Ch)					(LSB)
12	Reserved						MNN (11b)	
13	Reserved							
14	Reserved							
15	Reserved							
16	(MSB)							
			WORLD WIDE NODE NAME (2000012300000000h)					
23								(LSB)

A.4.3 DTD primary port descriptor subpage

This example DTD has two Fibre Channel ports, so the subpage contains two Service Delivery Port descriptors. There should be no changeable information in the sub page header.

24	PS	SPF (1)	PAGE CODE (0Eh)		
25	SUBPAGE CODE (02h – service delivery port descriptor subpage)				
26	(MSB)	PAGE LENGTH (20h)			
27					(LSB)

A.4.3.1   Port A port descriptor

The automation application client may wish to change a number of fields in each port descriptor. In this example, the ports are configured as follows:

- Point-to-point mode enabled (P2P = 1) but not required (TOPLOCK = 0)

- Loop ID 00h requested (FC-AL LOOP ID = 00h) but not required (RHA = 0)

- Speed set to 2 Gb/sec (SPEED = 001b) but negotiation to other speeds is allowed (SPDLOCK = 0)

- Port name set to 2001012300000000h (MPN = 11b)

- Port enabled (PE = 1)

28	RELATIVE TARGET PORT (01h)						
29	PORT TYPE (00h – Fibre Channel)						
30	(MSB)	ADDITIONAL DESCRIPTOR LENGTH (0Ch)					
31							(LSB)
32	P2P (1)	TOPLOCK (0)	RHA (0)	LIV (1)	MPN (11b)	Rsvd	PE (1)
33	Reserved			SPDLOCK (0)	SPEED (001b)		
34	Reserved						
35	Rsvd	FC-AL LOOP ID (00h)					
36	(MSB)	PORT NAME (2001012300000000h)					
43							(LSB)

A.4.3.2   Port B port descriptor

For this example, the parameters for port B are set the same as port A's, except that the port name is 2002012300000000h.

44	RELATIVE TARGET PORT (02h)
45	PORT TYPE (00h – Fibre Channel)

46	(MSB)						
47		ADDITIONAL DESCRIPTOR LENGTH (0Ch)					(LSB)
48	P2P (1)	TOPLOCK (0)	RHA (0)	LIV (1)	MPN (11b)	Rsvd	PE (1)
49	Reserved				SPDLOCK (0)	SPEED (001b)	
50	Reserved						
51	Rsvd	FC-AL LOOP ID (00h)					
52	(MSB)	PORT NAME (2002012300000000h)					
59							(LSB)

A.4.4 Logical unit descriptor subpage

The logical unit descriptor subpage will contain at least one logical unit descriptor. In this example, all three logical unit descriptors are present.

60	PS	SPF (1)	PAGE CODE (0Eh)
61	SUBPAGE CODE (03h – logical unit descriptor subpage)		
62	(MSB)	PAGE LENGTH (3Bh)	
63			(LSB)

A.4.3.3   RMC logical unit descriptor

If the automation application client wishes the RMC device server to appear on its primary interface ports, it must set the LOGICAL UNIT NUMBER field to the desired value and set the ENABLE field to one. Otherwise, it must set the ENABLE field to zero. Typically, the LUN will be 0000h and ENABLE will be 1. During normal operation, the OFFLINE bit will be 0.

This example is for a Stream (tape) device, so the DEVICE TYPE field contains 01h. Other parameters are:

- The LUN is not changed from that assigned by the manufacturer

- The modify logical unit descriptor (MLUD) field is set to 11b to indicate that some of the descriptor values have been changed

- The drive will be online when the DTD primary ports are enabled (OFFLINE = 0)

- The SSC device server is enabled (ENABLE = 1)

Note to ADC Editor: Is the name of the MLUD field above correct?

Other parameters are not described.

64	LOGICAL UNIT INDEX (00h)	
65	DEVICE TYPE (01h – Stream device)	
66	(MSB)	ADDITIONAL DESCRIPTOR LENGTH (27h)
67		(LSB)

68	(MSB)		LOGICAL UNIT NUMBER (0000h)			
69						(LSB)
70	MLUD (11b)		Reserved		OFFLINE (0)	ENABLE (1)
71	Reserved		AUH	SUHO	AMO	AUTOLOAD MODE
72	FUE	DRMODE	Reserved		DENOVR	WP
73	CURRENT DENSITY					
74	SELECT WRITE DENSITY					
75	Reserved					
76	Reserved					
77	Reserved					
78	Reserved					
79	Reserved					

A.4.3.3.1 T10 vendor identifier descriptor

Identification descriptors are part of the RMC logical unit descriptor. This example has the RMC device server being configured to report two identification descriptors, a T10 vendor identifier and a NAA identifier.

The T10 vendor identifier contains ASCII graphic codes (CODE SET of 2h). It is composed of an eight-character blank-padded vendor identification for a mythical vendor, Rmbaf, and a vendor specific identifier composed of the product identifier "A-12" concatenated with the serial number "60-6924". Because this identifier is not associated with a particular SCSI transport protocol, the PROTOCOL IDENTIFIER field and the protocol identifier valid (PIV) bit are both zero.

80	PROTOCOL IDENTIFIER (0h)		CODE SET (2h)
81	PIV (0)	Rsvd	ASSOCIATION (0h)	IDENTIFIER TYPE (1h)
82	Reserved		
83	IDENTIFIER LENGTH (17h)		
84			
	VENDOR IDENTIFICATION ("RMBAF ")		
91			
92			
93	VENDOR SPECIFIC IDENTIFIER ("A-1260-6924")		
94			

A.4.3.3.2 IEEE extended identifier descriptor

The second identifier is binary (CODE SET of 1h) and has a type of NAA (3h) with an name address authority (NAA) value of IEEE Extended (2h). The IEEE COMPANY ID of 0123h is arbitrarily chosen for this example and may or may not correspond to an actual company's ID. The VENDOR SPECIFIC IDENTIFIER A value is 400h and the VENDOR SPECIFIC IDENTIFIER B value is zero.

95	PROTOCOL IDENTIFIER (0h)		CODE SET (1h)
96	PIV (0)	Rsvd	ASSOCIATION (0h)	IDENTIFIER TYPE (3h)
97	Reserved		

98	IDENTIFIER LENGTH (08h)		
99	NAA (2h)	(MSB)	
100	VENDOR SPECIFIC IDENTIFIER A (400h)		(LSB)
101	(MSB)		
102	IEEE COMPANY ID (0123h)		(LSB)
103	(MSB)		
	VENDOR SPECIFIC IDENTIFIER B (00000000h)		
106			(LSB)

Because the new length of the VENDOR SPECIFIC IDENTIFIER field may vary from that in the descriptor reported in response to the MODE SENSE commands, the ADC device server must parse the data provided by the MODE SELECT commands to determine where each identifier and subsequent descriptors are located in the data.

A.4.3.4   SMC logical unit descriptor

This DTD supports ADI bridging (*insert reference*), so the mode data includes a Medium Changer logical unit descriptor with a logical unit index of one. Because the automation application client wishes to enable bridging, it sets the LOGICAL UNIT NUMBER field to one and the ENABLE field to one.

If multiple logical units are enabled for reporting on the primary ports, then the ADC device server must ensure that their logical unit numbers are different. If the LUN field in the RMC descriptor is the same as that for another logical unit and both of their ENABLE bits are one, then the ADC device server will report an invalid field in the parameter data, with sense data indicating the LUN field in a descriptor other than that for the RMC logical unit.

107	LOGICAL UNIT INDEX (01h)		
108	DEVICE TYPE (08h – Medium Changer device)		
109	(MSB)		
110	ADDITIONAL DESCRIPTOR LENGTH (0004h)		(LSB)
111	(MSB)		
112	LOGICAL UNIT NUMBER (0001h)		(LSB)
113	Reserved		ENABLE (1)
114	Reserved		

A.4.3.5   ADC logical unit descriptor

This DTD reports the ADC device server at logical unit index two. Because the automation application client does not wish the ADC device server to appear on the DTD primary ports, it sets the ENABLE field to zero.

115	LOGICAL UNIT INDEX (02h)		
116	DEVICE TYPE (12h – Automation Drive device)		
117	(MSB)		
118	ADDITIONAL DESCRIPTOR LENGTH (0004h)		(LSB)
119	(MSB)	LOGICAL UNIT NUMBER	

8

120		(LSB)
121	Reserved	ENABLE (0)
122	Reserved	