To: INCITS T10 Committee

From: Paul Entzel, Quantum

Date: 20 October 2003

Document: T10/03-322r2

Subject: Transport protocol service extensions for ADT.

1 Revision History

Revision 0:
Initial revision.

Revision 1:
Correct editorial issues identified at the 22 September 2003 working group conference call.

Revision 2:
Changes from discussion at the 20 October 2003 working group conference call and from an email from Michael Banther.

2 Related Documents

- ADT revision 7
- T10/286r1, SCSI Application Layer clause for ADT
- T10/295r1, Minutes: ADI Meeting (8-9 September 2003)

3 General

This proposal adds extensions to the transport protocol service functions defined in clause 8 of ADT. These functions are for use by an application client to control data transfers at the initiator port. This proposal also includes a new model sub-clause to describe how an application client in the execution of a SCSI task would use these functions.

4 Proposed changes to the model clause of ADT

Add the following sub-clause to clause 4 of ADT:

4.9 Transport protocol variations from SAM-2

The ADT transport protocol provides all of the services mandated by SAM-2. In addition to the mandatory protocol services, ADT provides several extensions for the initiator port. This sub-clause provides an overview of these extensions. See clause 8 for details.

One of the intended uses for the ADT transport protocol involves bridging SCSI traffic from the primary interface of the data transfer device to the automation device. To facilitate this function, the data transfer device contains both a device server and an application client (Bridging Manager) from the perspective of SAM-2 (See ADC). The extensions of the ADT protocol services allow this bridging function to be provided within a device with limited resources dedicated to this feature.

SAM-2 requires that an initiator that invokes the Execute Command remote procedure call have available the data and buffer space required to transfer all of the data associated with the command. The extensions of the ADT protocol services allow the application client to invoke the Execute Command remote procedure call with only part of the data or buffer space available, then invoke the additional protocol services functions to transfer the remaining data.

An application client that does not wish to make use of the transport protocol service extensions should set the Data-In Buffer Size and Data-Out Buffer Size argument to the Execute Command remote procedure call per SAM-2, and ignore the Data-In Received and Data-Out Delivered confirmations from the transport protocol layer.

An application client that does wish to make use of the transport protocol service extensions may set the Data-In Buffer Size and/or the Data-Out Buffer Size arguments to the Execute Command remote procedure call to a value less than the total amount of data required by the command. The transport layer shall assert the Data-In Received indication when all of the data requested by the Data-In Buffer Size has been transferred. The transport layer shall assert the Data-Out Delivered confirmation when all of the data indicated by the Data-Out Buffer Size has been transferred.

An application client shall invoke the Send Data-Out transport protocol service after receiving the Data-Out Delivered confirmation if there is more data to be sent to the device server. An application client shall not invoke the Send Data-Out transport protocol service for an I_T_L_Q nexus after it has invoked the Send Data-Out transport protocol service for that I_T_L_Q nexus until it receives a Data-Out Delivered confirmation for that I_T_L_Q nexus. An application client shall invoke the Send Data-Out transport protocol service after performing the Execute Command remote procedure call if there is data to be sent to the device server and the Data-Out Buffer Size argument in the Execute Command remote procedure call was set to zero. An application client shall not invoke the Send Data-Out transport protocol service for a given I_T_L_Q nexus if the Data-Out Buffer Size argument in the Execute Command remote procedure call for that I_T_L_Q nexus was non-zero until it receives a Data-Out Delivered confirmation for that I_T_L_Q nexus.

An application client shall invoke the Receive Data-In transport protocol service after receiving the Data-In Received confirmation if there is more data expected from the device server. An application client shall not invoke the Receive Data-In transport protocol service for an I_T_L_Q nexus after it has invoked the Receive Data-In transport protocol service for that I_T_L_Q nexus until it receives a Data-In Received confirmation for that I_T_L_Q nexus. An application client shall invoke the Receive Data-In transport protocol service after performing the Execute Command remote procedure call if there is data expected from the device server and the Data-In Buffer Size argument in the Execute Command remote procedure call was set to zero. An application client shall not invoke the Receive Data-In transport protocol service for a given I_T_L_Q nexus if the Data-In Buffer Size argument in the Execute Command remote procedure call for that I_T_L_Q nexus was non-zero, until it receives a Data-In Received confirmation for that I_T_L_Q Nexus.

An application client shall not invoke the Send Data-Out or Receive Data-In transport protocol services for an I_T_L_Q nexus after it has received a Command Complete Received confirmation or after it has invoked a task management protocol service that aborts the task associated with the I_T_L_Q nexus.

An ADT transport layer shall not invoke the Data-In Received or Data-Out Delivered transport protocol service for an I_T_L_Q nexus after asserting the Command Complete Received confirmation for that I_T_L_Q nexus.

Proposed changes to the application layer clause of ADT
Add the following text and table to subclause 8.1 after Table 25:

Table 26 describes the transport protocol services provided by ADT that are extensions of the services required by SAM-2. See subclause 4.2.9 for details of the use of these transport protocol services.

Table - 26 Extended remote procedure call mapping

Remote procedure call	Type of transport protocol service	Transport protocol service interaction	Transport protocol service	I/T	ADT implementation
Execute Command	Data Transfer	Request	Send Data-Out	I	SCSI Data IU
		Confirmation	Data-Out Delivered	I	Positive acknowledgement of the last SCSI Data IU
		Request	Receive Data-In	I	SCSI Transfer Ready IU
		Confirmation	Data-In Received	I	Positive acknowledgement of the last SCSI Data IU containing data to satisfy the SCSI Transfer Ready IU

Add the following sub-clauses to sub-clause 8.2:

8.2.9 Send Data-Out transport protocol service

An application client uses the Send Data-Out transport protocol services to request that an ADT initiator port transmit data to a target port using one or more SCSI Data IUs.

Send Data-Out (IN (I_T_L_x Nexus, Application Client Buffer, Device Server Buffer Offset, Request Byte Count))

An application client shall only call Send Data-Out( ) during a write or bi-directional command.

An application client shall not call Send Data-Out( ) for a given I_T_L_Q nexus after it has received an Command Complete Received confirmation for that I_T_L_Q nexus (e.g., a SCSI Response IU has been received for that I_T_L_Q nexus) or called a task management function that terminates that task (e.g., an ABORT TASK).

Table A shows how the arguments to the Send Data-Out transport protocol service are used.

Table A – Send Data-On transport layer protocol service arguments

Argument	ADT Implementation
I_T_L_x nexus	Used to set the X_ORIGIN and EXCHANGE ID fields in the frame(s) header.
Application Client Buffer	Pointer to a buffer where the data is located.
Device Server Buffer Offset	Used to set the BUFFER OFFSET field in the first SCSI Data IU. The transport layer may use more than one SCSI Data IU to transmit the data. If it does, the BUFFER OFFSET field in each subsequent SCSI Data IU shall be set adjusted by the number of bytes in the previous SCSI Data IU.
Request Byte Count	Total number of bytes to transmit. If multiple SCSI Data IUs are used to transmit the data, the total bytes transmitted shall equal the Request Byte Count value.

8.2.10 Data-Out Delivered transport protocol service

An ADT Initiator port uses the Data-Out Delivered transport protocol service to notify an application client of the results of transmitting the data associated with a Send Data-Out transport protocol service.

Data-Out Delivered (IN (I_T_L_x Nexus))

Table B shows how the arguments to the Data-Out Delivered transport protocol service are determined.

Table B – Data-Out Delivered transport layer protocol service arguments

Argument	ADT Implementation
I_T_L_x nexus	I_T_L_Q nexus value passed to the Send Data-Out transport layer protocol service request that initiated the transfer.

8.2.11 Receive Data-In transport protocol service

An application client uses the Receive Data-In transport protocol service to request that an ADT Initiator port transmit a SCSI Transfer Ready IU.

Receive Data-In (IN (I_T_L_x Nexus, Device Server Buffer Offset, Request Byte Count, Application Client Buffer))

An application client shall only call Receive Data-In( ) during a read or bi-directional command.

An application client shall not call Receive Data-In( ) for a given I_T_L_Q nexus until it receives a Data-In Received( ) confirmation for a previous Receive Data-In( ) call (i.e., no SCSI Transfer Ready IU until all read SCSI Data IUs for the previous SCSI Transfer Ready IU have completed, if any, and has provided link layer acknowledgement for all of the previous SCSI Data IUs for that I_T_L_Q nexus).

Table C shows how the arguments to the Receive Data-In transport protocol service are used.

Table C – Receive Data-In transport layer protocol service arguments

Argument	ADT Implementation
I_T_L_x nexus	Used to set the X_ORIGIN and EXCHANGE ID fields in the SCSI Transfer Ready IU frame header.
Device Server Buffer Offset	Used to set the BUFFER OFFSET field in the SCSI Transfer Ready IU.
Request Byte Count	Used to set the BURST LENGTH field in the SCSI Transfer Ready IU.
Application Client Buffer	The buffer in the application client to which data is to be transferred.

8.2.12 Data-In Received transport protocol service

An ADT initiator port uses the Data-In Received transport protocol service to notify an application client of the result of the request to receive data initiated by a call to Receive Data-In transport layer protocol service request.

Data-In Received (IN (I_T_L_x Nexus))

An ADT initiator port shall notify an application client that has called the Receive Data-In transport protocol service using the Data-In Received confirmation when the number of bytes received matches the Bytes Received parameter or when a SCSI Response IU for the I_T_L_x Nexus is received. If a SCSI Response IU for the I_T_L_x Nexus is received after Receive Data-In( ) has been called but before Data-In Received( ) has been called, the initiator port shall call Data-In Received( ) before it calls Command Complete Received( )

Table D shows how the arguments to the Data-In Received transport protocol service are determined.

Table D – Data-In Received transport layer protocol service arguments

Argument	ADT Implementation
I_T_L_x nexus	I_T_L_x nexus value passed to the Receive Data-Out transport layer protocol service request that initiated the transfer.