

To: T10 Technical Committee
From: Rob Elliott, HP (elliott@hp.com)
Date: 12 March 2007
Subject: 07-124r0 SAS-2 Remove Messages Between State Machines annex

Revision history

Revision 0 (12 March 2007) First revision

Related documents

sas2r08 - Serial Attached SCSI - 2 (SAS-2) revision 8

Overview

The annex summarizing messages between state machine layers is almost always incomplete and/or incorrect, and thus has little value and should be removed.

Suggested changes to SAS-2

Introduction

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The standard is organized as follows:

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Normative Annex A (Jitter tolerance patterns) describes the jitter tolerance patterns.

Normative Annex B (Signal performance measurements) describes signal measurement techniques.

Informative Annex C (SAS to SAS phy reset sequence examples) provides additional phy reset sequence examples.

Informative Annex D (CRC) provides information and example implementations of the CRC algorithm.

Informative Annex E (SAS address hashing) provides information and example implementations of the hashing algorithm.

Informative Annex F (Scrambling) provides information and example implementations of the scrambling algorithm.

Informative Annex G (ATA architectural notes) describes ATA architectural differences from Serial ATA and Serial ATA II.

Informative Annex H (Minimum deletable primitive insertion rate summary) describes the minimum ALIGN and/or NOTIFY insertion rates for clock skew management and rate matching.

Informative Annex J (Expander device handling of connections) describes expander device behavior in a variety of connection examples.

Informative Annex K (Primitive encoding) lists the primitive encodings available for future versions of this standard.

~~Informative Annex L (Messages between state machines) contains a list of messages between state machines.~~

Informative Annex M (Discover process example implementation) provides an example implementation of the discover process.

Informative Annex N (SAS icons) defines the SAS icons.

4.3.1 State machine overview

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~~Annex L contains a list of messages between state machines.~~

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Annex L
(informative)

Messages between state machines

L.1 Messages between phy layer and other layers

Table L.1 lists the requests from the management application layer and the link layer to the phy layer.

Table L.1 — Requests from management application layer or link layer to phy layer

Phy layer	← Request →	Application layer or link layer
SP	Enter Partial	MA
	Enter Slumber	
	Exit Partial	
	Exit Slumber	
	Power on, hard reset, Management Reset, or Disable Phy	
SP_DWS	Power on, hard reset, Management Reset, or Disable Phy	MA
SP	Stop SNTT	SL_IR

Table L.2 lists the confirmations from the phy layer to the link layer.

Table L.2 — Confirmations from phy layer to link layer

Phy layer	— Confirmation →	Link layer
SP	Phy Layer Not Ready	XL (in expander phy)
	SATA Spinup Hold	
SP	Start SL_IR Receiver	SL_IR
	Phy Layer Not Ready	
	Phy Layer Ready (SAS)	
	Phy Layer Ready (SATA)	
SP_DWS receiver	Dword Received	SL_IR, SL, SSP, SMP, and XL receivers

L.2 Messages between link layer, port layer, and management application layer for all protocols

Table L.3 lists the requests between the link layer and the port layer for all protocols.

Table L.3 — Requests between link layer and port layer

Link layer	← Request →	Port layer
SL	Open Connection	PL
	Stop Arb	

Table L.4 lists the confirmations between the link layer and the port layer for all protocols.

Table L.4 — Confirmations between link layer and port layer

Link layer	Confirmation	Port layer
SL	Open Failed (Bad Destination)	PL
	Open Failed (Connection Rate Not Supported)	
	Open Failed (Protocol Not Supported)	
	Open Failed (Zone Violation)	
	Open Failed (Reserved Abandon 1)	
	Open Failed (Reserved Abandon 2)	
	Open Failed (Reserved Abandon 3)	
	Open Failed (STP Resources Busy)	
	Open Failed (Wrong Destination)	
	Open Failed (No Destination)	
	Open Failed (Pathway Blocked)	
	Open Failed (Reserved Continue 0)	
	Open Failed (Reserved Continue 1)	
	Open Failed (Reserved Initialize 0)	
	Open Failed (Reserved Initialize 1)	
	Open Failed (Reserved Stop 0)	
	Open Failed (Reserved Stop 1)	
	Open Failed (Retry)	
	Open Failed (Break Received)	
	Open Failed (Port Layer Request)	
	Inbound Connection Rejected	
	Connection Opened (SSP, Source Opened)	
	Connection Opened (STP, Source Opened)	
	Connection Opened (SMP, Source Opened)	
	Connection Opened (SSP, Destination Opened)	
	Connection Opened (STP, Destination Opened)	
	Connection Opened (SMP, Destination Opened)	
	Connection Closed (Break Received)	
	Connection Closed (Normal)	
	Connection Closed (Close Timeout)	
	Connection Closed (Break Timeout)	

Table L.5 lists the requests from the management application layer to the link layer for all protocols:

Table L.5 — Requests from management application layer to link layer

Link layer	← Request →	Application layer
SL_IR	Tx HARD_RESET	MA
	Tx IDENTIFY Address Frame	
SL	Transmit Broadcast (type)	MA

Table L.6 lists the confirmations between the link layer and the expander function or management application layer for all protocols:

Table L.6 — Confirmations between link layer and port layer, link layer, or application layer

Link layer	— Confirmation →	Port layer, link layer, or application layer
SL	Change Received	MA
SL_IR	Phy Enabled	MA
	Phy Disabled	
	Address Frame Failed	
	HARD_RESET Transmitted	
	Identify Timeout	
	Identification Sequence Complete	
SL_IR	HARD_RESET Received	PL
	Phy Enabled	
	Phy Disabled	

L.3 Messages between link layer, port layer, and transport layer for SSP

Table L.7 lists the requests between the link layer, port layer, and SSP transport layer.

Table L.7 — Requests between link layer, port layer, and transport layer for SSP

Link layer	← Request →	Port layer	← Request →	Transport layer
SL		PL	Cancel	ST
	Accept_Reject Opens (Accept-SSP)		Accept_Reject Opens (Accept-SSP)	
	Accept_Reject Opens (Reject-SSP)		Accept_Reject Opens (Reject-SSP)	
SSP		PL	Transmit Frame (Interlocked)	ST
			Transmit Frame (Non-Interlocked)	
	Tx Frame (Balance Required)			
	Tx Frame (Balance Not Required)			
	Close Connection			

Table L.8 lists the confirmations from the port layer to the SSP transport layer.

Table L.8 — Confirmations from port layer to transport layer for SSP

Port layer	— Confirmation →	Transport layer
PL	HARD_RESET_Received	ST

Table L.9 lists the confirmations between the SL link layer, port layer, and SSP transport layer.

Table L.9 — Confirmations between SL link layer, port layer, and SSP transport layer (part 1 of 2)

Link layer	— Confirmation →	Port layer	— Confirmation →	Transport layer
SL	Open Failed (Port Layer Request)	PL	Transmission Status (Cancel-Acknowledge)	ST
SP	Open Failed (Bad Destination)	PL	Transmission Status (Bad-Destination)	ST
	Open Failed (Connection Rate Not Supported)		Transmission Status (Connection-Rate Not Supported)	
	Open Failed (Protocol Not Supported)		Transmission Status (Protocol Not Supported)	
	Open Failed (Zone Violation)		Transmission Status (Zone Violation)	
	Open Failed (Reserved Abandon-1)		Transmission Status (Reserved-Abandon-1)	
	Open Failed (Reserved Abandon-2)		Transmission Status (Reserved-Abandon-2)	
	Open Failed (Reserved Abandon-3)		Transmission Status (Reserved-Abandon-3)	
	Open Failed (STP Resources-Busy)		Transmission Status (STP Resources-Busy)	
Open Failed (Wrong Destination)	Transmission Status (Wrong-Destination)			

Table L.9 — Confirmations between SL link layer, port layer, and SSP transport layer (part 2 of 2)

Link layer	— Confirmation →	Port layer	— Confirmation →	Transport layer
SP	Open Failed (No Destination)	PL	Transmission Status (No Destination) or Transmission Status (I_T Nexus Loss)	ST
	Open Failed (Pathway Blocked)		Transmission Status (I_T Nexus Loss)	
	Open Failed (Reserved Continue 0)			
	Open Failed (Reserved Continue 1)			
	Open Failed (Reserved Initialize 0)		Transmission Status (No Destination) or Transmission Status (I_T Nexus Loss)	
	Open Failed (Reserved Initialize 1)		Transmission Status (No Destination) or Transmission Status (I_T Nexus Loss)	
	Open Failed (Reserved Stop 0)		Transmission Status (I_T Nexus Loss)	
	Open Failed (Reserved Stop 1)		Transmission Status (I_T Nexus Loss)	
	Open Failed (Retry)			
SP	Open Failed (Open Timeout Occurred)	PL	Transmission Status (Open Timeout Occurred) or Transmission Status (I_T Nexus Loss)	ST
	Open Failed (Break Received)		Transmission Status (Break Received)	
	Connection Closed (any reason)		no confirmation or Transmission Status (Connection Lost Without ACK/NAK)	

Table L.10 lists the confirmations between the SSP link layer, port layer, and SSP transport layer.

Table L.10 — Confirmations between SSP link layer, port layer, and SSP transport layer

Link layer	— Confirmation →	Port layer	— Confirmation →	Transport layer
SSP	Frame Transmitted	PL	Transmission Status (Frame Transmitted)	ST
	ACK/NAK Timeout		Transmission Status (ACK/NAK Timeout)	
	Credit Timeout			
	DONE Transmitted			
	ACK Received		Transmission Status (ACK Received)	
	ACK Transmitted		ACK Transmitted	
	NAK Received		Transmission Status (NAK Received)	
	DONE Received			
	Frame Received (ACK/NAK Balanced)		Frame Received (ACK/NAK Balanced)	
	Frame Received (ACK/NAK Not Balanced)		Frame Received (ACK/NAK Not Balanced)	
		Transmission Status (No Phys In Port)		

~~L.4 Messages between link layer, port layer, and transport layer for SMP~~

Table L.11 lists the requests between the link layer, port layer, and SMP transport layer.

Table L.11 — Requests between SL/SMP link layer, port layer, and SMP transport layer

Link layer	← Request —	Port layer	← Request —	Transport layer
SL	Accept_Reject Opens (Accept SMP)	PL	Accept_Reject Opens (Accept SMP)	MT
	Accept_Reject Opens (Reject SMP)		Accept_Reject Opens (Reject SMP)	
SMP	Tx Frame	PL	Transmit Frame	MT
	SMP Transmit Break		SMP Transmit Break	

Table L.12 lists the confirmations between the link layer, port layer, and SMP transport layer:

Table L.12 — Confirmations between link layer, port layer, and SMP transport layer (part 1 of 2)

Link layer	— Confirmation →	Port layer	— Confirmation →	Transport layer
SMP	Frame Transmitted	PL	Transmission Status (Frame Transmitted)	MT
	Frame Received		Frame Received	
	Frame Received (SMP Failure)		Frame Received (SMP Failure)	
SL	Open Failed (Bad Destination)	PL	Transmission Status (Bad Destination)	MT
	Open Failed (Connection Rate Not Supported)		Transmission Status (Connection Rate Not Supported)	
	Open Failed (Protocol Not Supported)		Transmission Status (Protocol Not Supported)	
	Open Failed (Zone Violation)		Transmission Status (Zone Violation)	
	Open Failed (Reserved Abandon-1)		Transmission Status (Reserved Abandon-1)	
	Open Failed (Reserved Abandon-2)		Transmission Status (Reserved Abandon-2)	
	Open Failed (Reserved Abandon-3)		Transmission Status (Reserved Abandon-3)	
	Open Failed (STP Resources Busy)		Transmission Status (STP Resources Busy)	
Open Failed (Wrong Destination)	Transmission Status (Wrong Destination)			

Table L.12 — Confirmations between link layer, port layer, and SMP transport layer (part 2 of 2)

Link layer	— Confirmation →	Port layer	— Confirmation →	Transport layer
SL	Open Failed (No Destination)	PL	Transmission Status (No Destination) or Transmission Status (I_T Nexus Loss)	MT
	Open Failed (Pathway Blocked)		Transmission Status (I_T Nexus Loss)	
	Open Failed (Reserved Continue 0)			
	Open Failed (Reserved Continue 1)			
	Open Failed (Reserved Initialize 0)		Transmission Status (No Destination) or Transmission Status (I_T Nexus Loss)	
	Open Failed (Reserved Initialize 1)		Transmission Status (No Destination) or Transmission Status (I_T Nexus Loss)	
	Open Failed (Reserved Stop 0)		Transmission Status (I_T Nexus Loss)	
	Open Failed (Reserved Stop 1)		Transmission Status (I_T Nexus Loss)	
	Open Failed (Retry)			
SL	Open Failed (Open Timeout Occurred)	PL	Transmission Status (Open Timeout Occurred)	MT
	Open Failed (Break Received)		Transmission Status (Break Received)	
	Connection Closed (any reason)		Connection Closed	

L.5 Messages from transport layer to application layer for SSP

Table L.13 lists the requests and responses from the SCSI application layer to the SSP transport layer.

Table L.13 — Requests and responses from SCSI application layer to SSP transport layer

Transport layer	← Request or response →	Application layer
ST_I (SSP initiator port)	Send SCSI Command	SA (SCSI initiator device)
	Send Task Management Request	
	Accept_Reject OPENs (Accept SSP)	
	Accept_Reject OPENs (Reject SSP)	
ST_T (SSP target port)	Send Command Complete	SA (SCSI target device)
	Task Management Function Executed	
	Send Data In	
	Receive Data Out	
	Accept_Reject OPENs (Accept SSP)	
	Accept_Reject OPENs (Reject SSP)	

Table L.14 lists the confirmations and indications from the SSP transport layer to the SCSI application layer.

Table L.14 — Confirmations and indications from SSP transport layer to SCSI application layer

Transport layer	→ Confirmation or indication ←	Application layer
ST_I (SSP initiator port)	Command Complete Received	SA (SCSI initiator device)
	Received Task Management Function Executed	
	Nexus Loss	
	Transport Reset	
ST_T (SSP target port)	SCSI Command Received	SA (SCSI target device)
	Task Management Request Received	
	Data In Delivered	
	Data Out Received	
	Nexus Loss	
	Transport Reset	

L.6 Messages from transport layer to application layer for SMP

Table L.15 lists the requests from the management application layer to the SMP transport layer.

Table L.15 — Requests from management application layer to SMP transport layer

Transport layer	← Request →	Application layer
MT_IP (SMP initiator port)	Send SMP Function Request	MA (SAS initiator device)
MT_TP (SMP target port)	Send SMP Response	MA (SAS target device)
	Accept_Reject OPENS (Accept SMP)	
	Accept_Reject OPENS (Reject SMP)	

Table L.16 lists the confirmations from the SMP transport layer to the management application layer.

Table L.16 — Confirmations from SMP transport layer to management application layer

Transport layer	→ Confirmation ←	Application layer
MT_IP (SMP initiator port)	Open Failed	MA (SAS initiator device)
	SMP Frame Receive Timeout	
	SMP Frame Transmit Receive Failure	
	Received SMP Function Complete	
MT_TP (SMP target port)	SMP Function Received	MA (SAS target device)
	SMP Connection Closed	