

Summary of T10 Activities to ISO/IEC SC 25 / WG 4

John Lohmeyer, Chair T10 Technical Committee
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T10's principal physical interface work is the Serial Attached SCSI (SAS). The SAS architecture leverages Serial ATA (SATA). SAS uses a drive connector that is compatible with the SATA drive connector. Subsystem vendors can develop products that use either kind of disk drive: SATA for cost-sensitive applications and SAS for enterprise-class applications that need the highest reliability and highest performance storage devices available.

The SAS architecture uses serial point-to-point links with circuit switches (called expanders) to provide fan-out to a large number of storage devices. The SAS expanders are relatively inexpensive because they do not attempt to store and forward packets. Instead, a full-duplex connection is established between the source device and destination device; then packets are routed through the connection with minimal FIFO buffering. SAS expanders can also be used with SATA drives to greatly increase the number of SATA drives accessible on a computer system.

While SAS can support thousands of devices, it is intended for applications that require at most 10s of meters of distance, typically called "attached storage".

The first ANSI SAS standard was published in 2003 (ANSI INCITS.376-2003) and SAS-1.1 (ANSI INCITS.417-2006) was published in June 2006. Both of these standards support 1.5 Gbit/sec and 3.0 Gbit/sec signaling rates. Multiple connections between two devices may be simultaneously used to increase throughput. These are called wide links. The main enhancements in SAS-1.1 were transport-layer retries to better support tape devices and a new compact connector option.

Over the last three years, T10 has been actively defining SAS-2, which defines a 6 Gbit/sec signaling rate, while continuing to support the lower signaling rates. SAS-2 also defines a zoning mechanism and a bandwidth aggregation mechanism. SAS-2 is resolving T10 letter ballot comments and should be forwarded to INCITS for public review late this year.

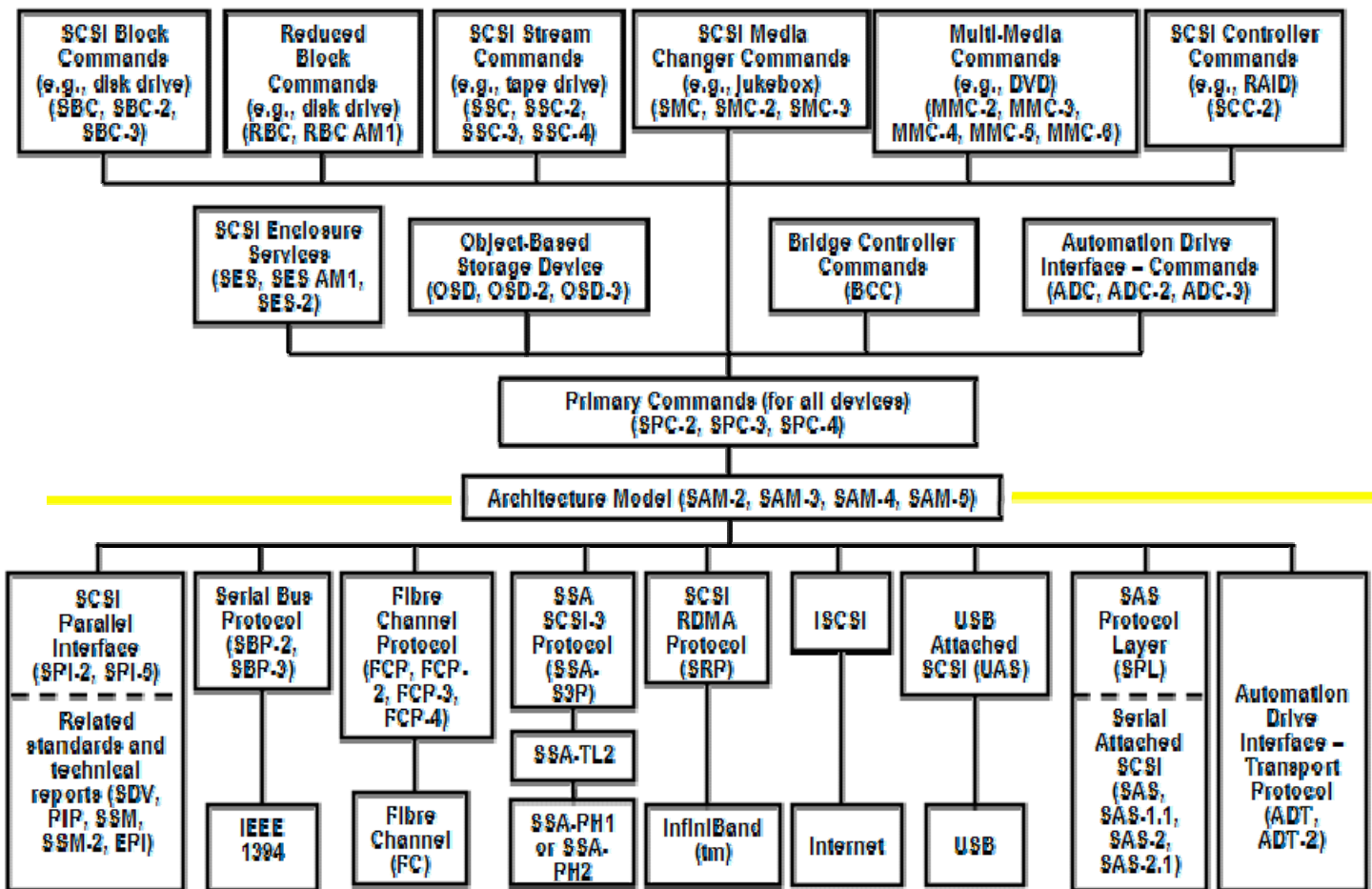
Two new projects have been approved to advance SAS technology upon approval of SAS-2. The physical layer project, SAS-2.1, will consider the addition of active cable support, enhanced connector interfaces (e.g., 8-wide), and interface power management. The SAS Protocol Layer (SPL) project will consider enhancements to reduce congestion in the SAS topology and interface power management.

Another significant T10 activity related to SAS is a project to map SCSI commands to ATA commands, called SCSI / ATA Translation (SAT). This is a software layer standard that will enable operating systems to use their SCSI protocol stack with SATA disks in a standard way. SAT was approved by ANSI in 2007. T10 has approved the follow-on SAT-2 project and is resolving letter ballot comments. SAT-2 should be forwarded to INCITS for public review late this year.

A SAT-3 project was recently approved and is targeted to consider ATA security feature sets, ATA ACS-2 feature sets, facilitate use of SATA port selectors and SATA port multipliers, and reporting ATA host capabilities/control through a mode page (e.g., NCQ Control).

T10 also spends significant effort on the SCSI architecture, protocols, and command sets. Almost all modern I/O interfaces, including SCSI, SAS, Fibre Channel, SSA, IEEE 1394, USB, iSCSI, and ATAPI (ATA) use these standards.

The Figure below shows the relationship of these standards. With the exception of IEEE 1394, Fibre Channel, InfiniBand (tm), iSCSI, and the Internet, all of the standards shown are assigned to T10. A detailed status summary is included, below.



SCSI Standards Architecture

(See <http://www.t10.org> for the latest SCSI Standards Architecture diagram and the latest project status summary.)

T10 Technical Committee Project Status Summary (October 1, 2008)
(See the abbreviation key at the end)

Proj Name	BSR Number	Proj Number	Status	Next Action	Target Date	Dist. in Mailing	Rev.	PL/Editor
P R O J E C T P R O P O S A L S								
OSD-3		____-D	At INCITS	Aprv project	Sep 08		__	Ralph Weber
D E V E L O P M E N T								
ADC-3		1895-D	in development	to INCITS	Jan 09	2008_5	00d	Suhler / Stone
ADT-2		1742-D	in development	to INCITS	Sep 08	2008_5	05d	Suhler / Stone
MMC-6		1836-D	in development	to INCITS	Nov 08	2008_4	02	Bill McFerrin
SPL		2124-D	in development	to INCITS	Jan 10		__	George Penokie
SAT-3		2126-D	in development	to INCITS	Jan 10		__	Mark Overby
SAM-5		2104-D	in development	to INCITS	Jan 10	2008_6	00	George Penokie
SBC-3		1799-D	in development	to INCITS	Nov 08	2008_5	16	Mark Evans
SMC-3		1730-D	in development	to INCITS	Nov 08	2008_5	12	Ballard / Snelder
SPC-4		1731-D	in development	to INCITS	Nov 09	2008_5	16	Ralph Weber
SSC-4		2123-D	in development	to INCITS	May 11		__	Dave Peterson
SAS-2.1		2125-D	in development	to INCITS	Jan 10		__	Alvin Cox
UAS		2095-D	in development	to INCITS	Jul 09	2008_4	01	Curtis Stevens
T 1 0 A P P R O V A L								
FCP-4		1828-D	At T10 LB	Close LB	16 Oct 08	2008_5	01	Dave Peterson
OSD-2		1729-D	res T10 LB cmnts	to INCITS	Nov 08	2008_4	04	Ralph Weber
SAT-2		1826-D	res T10 LB cmnts	to INCITS	Nov 08	2008_5	06	Mark Overby
SSC-3		1611-D	res T10 LB cmnts	to INCITS	Sep 08	2008_2	04a	Dave Peterson
SAS-2		1760-D	Res T10 LB cmnts	to INCITS	Nov 08	2008_6	14e	Rob Elliott
I N C I T S A P P R O V A L								
SAM-4	INCITS 447	1683-D	at INCITS mgt review	INCITS aprv1	Oct 08	2008_3	14	George Penokie
SES-2	INCITS 448	1559-D	at INCITS mgt review	INCITS aprv1	Oct 08	2008_3	20	Rob Elliott
P U B L I C A T I O N								
P U B L I S H E D								
ADC	INCITS 403	1558-D	INCITS 403-2005	5 yr review	2010	2004_6	07	Suhler / Wideman
ADC-2	INCITS 441	1741-D	INCITS 441-2008	5 yr review	2013	2007_4	08	Suhler / Entzel
ADT	INCITS 406	1557-D	INCITS 406-2005	5 yr review	2010	2004_6	14	Suhler / Entzel
SCSI3 FCP	INCITS 269	0993-M	INCITS 269-1996 [R2006]	5 yr review	2011	1995_3	12	Bob Snively
FCP-3	INCITS 416	1560-D	INCITS 416-2006	5 yr review	2010	2005_5	04	David Peterson
MMC-2	INCITS 333	1228-M	INCITS 333-2000 [R2005]	5 yr review	2010	1999_4	11a	McFerrin / Roberts
MMC-3	INCITS 360	1363-D	INCITS 360-2002 [R2007]	5 yr review	2012	2001_6	10g	Bill McFerrin
MMC-4	INCITS 401	1545-D	INCITS 401-2005	5 yr review	2010	2005_3	05a	Bill McFerrin
MMC-5	INCITS 430	1675-D	INCITS 430-2007	5 yr review	2012	2006_6	04	Bill McFerrin
OSD	INCITS 400	1355-D	INCITS 400-2004	5 yr review	2009	2004_5	10	Ralph Weber
RBC	INCITS 330	1240-M	INCITS 330-2000 [R2006]	5 yr review	2011	1999_4	10a	McLean / Roberts
RBC AM1	INCITS 330/AM1	1240-M	INCITS 330-2000/AM1-2003	5yr reaffirm	2008	2003_3	01	Ron Roberts
SAT	INCITS 431	1711-D	INCITS 431-2007	5 yr review	2012	2006_5	09	Johnson / Sheffield
SAM-2	INCITS 366	1157-D	INCITS 366-2003	5yr reaffirm	2008	2002_5	24	Ralph Weber
SAM-3	INCITS 402	1561-D	INCITS 402-2005	5 yr review	2010	2004_5	14	Ralph Weber
SBC-2	INCITS 405	1417-D	INCITS 405-2005	5 yr review	2010	2004_6	16	Rob Elliott
SCC-2	INCITS 318	1225-M	INCITS 318-1998 [R2003]	5yr reaffirm	2008	1997_5	04	George Penokie
SDV	INCITS TR-28	1378-DT	INCITS TR-28-2002	5 yr review	2007	2001_6	08b	Lohmeyer / Gibbons
SES	INCITS 305	1212-M	INCITS 305-1998 [R2003]	5yr reaffirm	2008	1998_1	08b	Bob Snively

SES AM1	INCITS 305/AM1	1212-M	INCITS 305-1998/AM1-2000 [R2003]	5yr reaffirm 2008	2000_4	01	Rob Elliott
EPI	INCITS TR-23	1143-TR	INCITS TR-23-1998		1998_4	16	Bill Ham
FCP-2	INCITS 350	1144-D	INCITS 350-2003	5yr reaffirm 2008	2002_6	08	Dave Peterson
SMC-2	INCITS 382	1383-D	INCITS 382-2004	5 yr review 2009	2004_1	07	Erich Oetting
SPI-2	INCITS 302	1142-M	INCITS 302-1998 [R2003]	5yr reaffirm 2008	1998_3	20b	Ham/Penokie
SPI-5	INCITS 367	1525-D	INCITS 367-2003	5yr reaffirm 2008	2003_1	06	George Penokie
PIP	INCITS 368	1439-D	INCITS 368-2003	5yr reaffirm 2008	2003_1	04	Zane Daggett / Bill Ham
SPC-2	INCITS 351	1236-D	Replaced w ISO/IEC 14776-452:2005	none	2001_4	20	Ralph Weber
SPC-3	INCITS 408	1416-D	INCITS 408-2005	5 yr review 2010	2005_3	23	Ralph Weber
SRP	INCITS 365	1415-D	INCITS 365-2002 [R2007]	5 yr review 2012	2002_4	16a	Cris Simpson
SSM-2	INCITS 369	1514-D	INCITS 369-2003	5yr reaffirm 2008	2003_1	05a	Aloisi / Manildi
SSC-2	INCITS 380	1434-D	INCITS 380-2003	5yr reaffirm 2008	2003_4	09	Dave Peterson
S2TIB1		0375-T	Pub by Global	(none)	1995_1	E	George Penokie
S2TIB2		0375-T	Pub by Global	(none)	1995_1	E	
SCSI CAM	INCITS 232	0792-M	INCITS 232-1996 [R2006]	5 yr review 2011	1995_3	12b	Bill Dallas
SCSI3 SBC	INCITS 306	0996-M	INCITS 306-1998 [R2003]	5yr reaffirm 2008	1997_6	08c	open
SCSI3 SMC	INCITS 314	0999-M	INCITS 314-1998 [R2003]	5yr reaffirm 2008	1998_1	10a	Erich Oetting
SCSI3 SSC	INCITS 335	0997-M	INCITS 335-2000 [R2006]	5 yr review 2011	2000_1	22	Dave Peterson
SAS	INCITS 376	1562-D	at 1PR to w/draw	at INCITS 26 Nov 07	2003_4	05	Rob Elliott
SAS-1.1	INCITS 417	1601-D	INCITS 417-2006	5 yr review 2010	2005_5	10	Rob Elliott
SBP-2	INCITS 325	1155-M	INCITS 325-1998 [R2003]	5yr reaffirm 2008	1998_2	04	McLean/Johansson
SBP-3	INCITS 375	1467-D	INCITS 375-2004	5 yr review 2009	2003_5	05	Peter Johansson
SCSI-2	INCITS 131	0375-M	INCITS 131-1994 [R2004]	5 yr review 2009		10L	Larry Lamers
SSA-PH1	INCITS 293	1145-M	INCITS 293-1996 [R2006]	5 yr review 2011	1996_4	09c	Ham/Scheible
SSA-PH2	INCITS 307	1146-M	INCITS 307-1997 [R2007]	5 yr review 2012	1997_2	05b	Ham/Scheible
SSA-S2P	INCITS 294	1121-M	INCITS 294-1996 [R2006]	5 yr review 2011	1996_4	07b	John Scheible
SSA-S3P	INCITS 309	1051-M	INCITS 309-1997 [R2007]	5 yr review 2012	1997_2	05b	John Scheible
SSA-TL1	INCITS 295	0989-M	INCITS 295-1996 [R2006]	5 yr review 2011	1996_4	10b	John Scheible
SSA-TL2	INCITS 308	1147-M	INCITS 308-1997 [R2007]	5 yr review 2012	1997_2	05b	John Scheible

T10 Technical Committee Project Status Summary Abbreviation Key:

X3 = Obsolete name for INCITS	comp = completion	cur = current
NCITS = Obsolete name for INCITS	res = resolve/resolving	rev = revision
INCITS = InterNational Committee for Information Technology Standards	LB = Letter Ballot	# = number
OMC = Operational Management Committee	pub = published	ng = negative
BSR = Board of Standards Review (of ANSI)	apr1 = approval	prep = preparation
WG4 = Working Group 4 of ISO/IEC JTC 1/SC 25	apr = approve	cmnts = comments
ISO = International Standards Organization	dev = development	prj = project
MgtRev= INCITS management review	SD3 = Project Proposal	fwd = forward
1PR = 1st Public Review	T10 = T10 Technical Committee	doc = document
2PR = 2nd Public Review	.1 = T10.1 Task Group (obsolete)	TG = Task Group
TBD = To Be Determined	CD = Committee Draft (ISO)	rec = recommend
	DIS = Draft International Stnd	reaf = reaffirm
	NP = New Project	w/dw = withdraw
	IS = International Standard	rvis = revise
	A/I = ANSI/ISO/IEC (joint standard)	