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Edition 1.0 2014-04

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Information technology – Small computer system interface (SCSI) – Part 251: USB Attached SCSI (UAS)

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INFORMATION TECHNOLOGY – SMALL COMPUTER SYSTEM INTERFACE (SCSI) –

Part 251: USB Attached SCSI (UAS)

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The list of all currently available parts of the ISO/IEC 14776 series, under the general title *Information technology – Small computer system interface (SCSI)*, can be found on the IEC web site.

This International Standard has been approved by vote of the member bodies, and the voting results may be obtained from the address given on the second title page.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

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INTRODUCTION

This International Standard standard encompasses the following:

Clause 1 describes the scope.
Clause 2 provides normative references for the entire standard.
Clause 3 provides definitions, abbreviations, and conventions used within the entire standard.
Clause 4 describes the model.
Clause 5 describes USB requirements.
Clause 6 describes transport requirements (e.g., IUs).
Clause 7 describes the SCSI Application Layer Transport Protocol Services.
Clause 8 describes device server error handling.

SCSI standards family

Figure 1 shows the relationship of this standard to the other standards and related projects in the SCSI family of standards as of the publication of this standard.

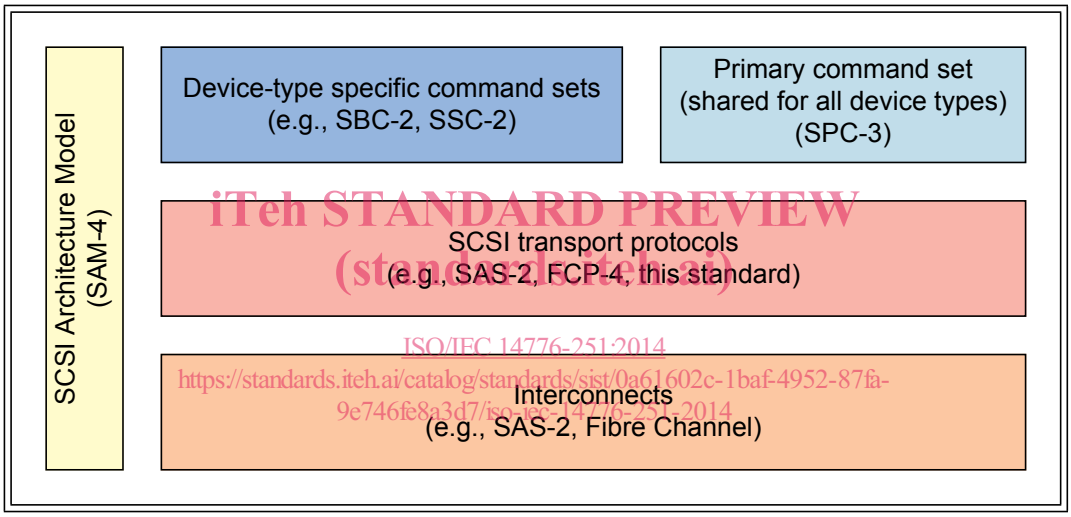

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Figure 1 — SCSI document structure

The SCSI document structure in figure 1 is intended to show the general applicability of the documents to one another. Figure 1 is not intended to imply a relationship such as a hierarchy, protocol stack, or system architecture.

SCSI Architecture Model: Defines the SCSI systems model, the functional partitioning of the SCSI standard set and requirements applicable to all SCSI implementations and implementation standards.

Device-Type Specific Command Sets: Implementation standards that define specific device types including a device model for each device type. These standards specify the required commands and behaviors that are specific to a given device type and prescribe the requirements to be followed by a SCSI initiator device when sending commands to a SCSI target device having the specific device type. The commands and behaviors for a specific device type may include by reference commands and behaviors that are shared by all SCSI devices.

Shared Command Set: An implementation standard that defines a model for all SCSI device types. This standard specifies the required commands and behavior that is common to all SCSI devices, regardless of device type, and prescribes the requirements to be followed by a SCSI initiator device when sending commands to any SCSI target device.

SCSI Transport Protocols: Implementation standards that define the requirements for exchanging information so that different SCSI devices are capable of communicating.

Interconnects: Implementation standards that define the communications mechanism employed by the SCSI transport protocols. These standards may describe the electrical and signaling requirements essential for SCSI devices to interoperate over a given interconnect. Interconnect standards may allow the interconnection of devices other than SCSI devices in ways that are outside the scope of this standard.

The term SCSI is used to refer to the family of standards described in this introduction.

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INFORMATION TECHNOLOGY – SMALL COMPUTER SYSTEM INTERFACE (SCSI) –

Part 251: USB Attached SCSI (UAS)

1 Scope

This part of ISO/IEC 14776 describes a SCSI transport protocol (see ISO/IEC 14776-414) for USB-2 and USB-3 with the following properties:

a) mechanism to send commands associated with any SCSI standard to a USB device;
b) complies with SCSI Architecture Model - 4 (e.g., autosense and command queuing); and
c) other capabilities.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 14776-414, *Information technology, Small Computer System Interface (SCSI) – Part 414: SCSI Architecture Model-4* (herein referred to as SAM-4) [1]

IEC 62680-1, *Universal serial bus interfaces for data and power – Part 1: Universal serial bus specification, revision 2.0* (herein referred to as USB-2)

ANSI INCITS 513-2004, *SCSI Primary Commands-4* (herein referred to as SPC-4) [T10/1731-D][2]

Universal Serial Bus 3.0 Specification Revision 1.0 (herein referred to as USB-3). November 12, 2008

Universal Serial Bus Mass Storage Class Specification Overview Rev 1.3 (herein referred to as MSC). September 5, 2008[3]

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3 Terms, definitions, symbols, abbreviations and conventions

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1.1
application client
object that is the source of SCSI commands

Note 1 to entry: See ISO/IEC 14776-414.

3.1.2
Bulk-in Endpoint Descriptor
USB Endpoint Descriptor with the BM ATTRIBUTES field set to 02h and bit 7 of the bEndPoint address field set to 1

---

1. ANSI INCITS 447-2008

2. planned as ISO/IEC 14776-454

   For more information on the current status of these documents, contact the INCITS Secretariat at 202-737-8888 (phone), 202-638-4922 (fax) or via E-mail at incits@itic.org. To obtain copies of these documents, contact Global Engineering at 15 Inverness Way, East Englewood, CO 80112-5704 at 303-792-2181 (phone), 800-854-7179 (phone), or 303-792-2192 (fax) or see http://www.incits.org.

3. For information on the current status of USB documents, see the USB Implementers Forum at http://www.usb.org.

3.1.3
Bulk-in pipe
pipe (see 3.1.9) used to transfer data and status from the UAS target port to the UAS initiator port

3.1.4
Bulk-out Endpoint Descriptor
USB Endpoint Descriptor with the BM ATTRIBUTES field set to 02h and bit 7 of the bEndPoint address field set to 0

3.1.5
Bulk-out pipe
pipe (see 3.1.9) used to transfer data and commands from the UAS initiator port to the UAS target port

3.1.6
default pipe
message pipe (see 3.1.9) created by the USB System Software to pass control and status information between the host and a USB device's endpoint zero (see USB-2)

3.1.7
Information Unit
IU
formatted collection of data that carries command, task management function, sense, response, read ready, or write ready information (see 6.2)

3.1.8
Logical Unit Number
LUN
64-bit identifier for a logical unit

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Note 1 to entry: See ISO/IEC 14776-414.

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3.1.9
pipe
logical abstraction using USB endpoints representing an association between a function (see USB-2 and USB-3) of a USB device and an application client

3.1.10
read data
data transferred to the SCSI application client's data-in buffer from the SCSI device server, as requested by the Send Data-In transport protocol service

3.1.11
service deliver subsystem
part of the USB I/O system which transmits information between the UAS initiator port and the UAS target port

EXAMPLE USB hubs, USB cables.

3.1.12
task manager
object that controls the sequencing of commands and processes task management functions

Note 1 to entry: See ISO/IEC 14776-414.

3.1.13
transaction packet
TP
header packet used to communicate information between a UAS target device and a UAS initiator device

Note 1 to entry: See Universal Serial Bus 3.0.

3.1.14
UAS domain
one UAS initiator port and one or more UAS target ports (see 4.4)

3.1.15
UAS initiator device
USB host that contains one or more UAS initiator ports

Note 1 to entry: For USB host, see Universal Serial Bus 2.0 and Universal Serial Bus 3.0.

3.1.16
UAS initiator port
USB host and USB host port components

Note 1 to entry: For USB host, see Universal Serial Bus 2.0.

Note 2 to entry: For USB host port components, see Universal Serial Bus 2.0 and Universal Serial Bus 3.0.

3.1.17
UAS target device
USB device that contains one or more UAS target ports that attach to a UAS initiator device

3.1.18
UAS target port
USB interface that contains two USB Bulk-in endpoints, two USB Bulk-out endpoints and the default USB control endpoint

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3.1.19
USB device
one or more USB interfaces and the default control endpoint

Note 1 to entry: See Universal Serial Bus 2.0 and Universal Serial Bus 3.0.

3.1.20
USB endpoint
collection of characteristics describing the USB device implementation of a pipe

Note 1 to entry: See 3.1.9, and Universal Serial Bus 2.0 and Universal Serial Bus 3.0.

3.1.21
USB interface
description of one or more USB endpoints

Note 1 to entry: See Universal Serial Bus 2.0 and Universal Serial Bus 3.0.

3.1.22
USB Packet
unit of data formatted for transmission over Super Speed USB or High Speed USB

3.1.23
write data
data transferred from the SCSI application client's data-out buffer to the SCSI device server, as requested by the Request Data-Out transport protocol service

3.2 Symbols and abbreviations

Abbreviation	Meaning
x	multiplication
/	division
≠ or NE	not equal
≤ or LE	less than or equal to
±	plus or minus
≈	approximately
+	add
-	subtract
< or LT	less than
= or EQ	equal
> or GT	greater than
≥ or GE	greater than or equal to
IU	Information Unit
LSB	Least significant bit
LUN	Logical unit number
MSB	Most significant bit
MSC	Mass Storage Class
SAM-4	SCSI Architecture Model-4
SCSI	Small Computer System Interface
SPC-4	SCSI Primary Commands-4
UAS	USB Attached SCSI (this standard)
USB	Universal Serial Bus (see USB-2 and USB-3)
USB-2	Universal Serial Bus Revision 2.0
USB-3	Universal Serial Bus 3.0 Revision 1.0

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3.3 Keywords

invalid

a keyword used to describe an illegal or unsupported bit, byte, word, field or code value; receipt by a device server of an invalid bit, byte, word, field or code value shall be reported as error

mandatory

a keyword indicating an item that is required to be implemented as defined in this standard

may

a keyword that indicates flexibility of choice with no implied preference

may not

a keyword that indicates flexibility of choice with no implied preference

obsolete

a keyword indicating that an item was defined in prior SCSI standards but has been removed from this standard

option, optional

keywords that describe features that are not required to be implemented by this standard; however, if any optional feature defined by this standard is implemented, then it shall be implemented as defined in this standard