

INTERNATIONAL STANDARD

Information technology – Small computer system interface (SCSI) –
Part 224: Fibre Channel Protocol for SCSI, fourth version (FCP-4)

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**INFORMATION TECHNOLOGY –
SMALL COMPUTER SYSTEM INTERFACE (SCSI) –
Part 224: Fibre Channel Protocol, fourth version (FCP-4)**

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CDV	Report on voting
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Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2 except as indicated in 3.4.

A bilingual version of this publication may be issued at a later date.

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INTRODUCTION

The Small Computer System Interface (SCSI) command set is widely used and applicable to a wide variety of device types. The transmission of SCSI command set information across Fibre Channel links allows the large body of SCSI application and driver software to be successfully used in the high performance Fibre Channel environment.

This standard describes the protocol for transmitting SCSI commands, data, and status using Fibre Channel FC-FS-3 Exchanges and Information Units. Fibre Channel is a high speed serial architecture that allows either optical or electrical connections. The topologies supported by Fibre Channel include point-to-point, fabric switched, and arbitrated loop. All Fibre Channel connections use the same standard frame format and standard hierarchy of transmission units to transmit the Information Units that carry SCSI information.

This standard is divided into the following clauses:

Clause 1 is the scope of this standard.

Clause 2 enumerates the normative references that apply to this standard.

Clause 3 describes the terms, definitions, abbreviations, and conventions used in this standard.

Clause 4 provides an overview of the protocol for transmitting SCSI information over Fibre Channel.

Clause 5 describes the FC-FS-3 frame header.

Clause 6 describes the Basic Link Services and Extended Link Services used by the protocol for transmitting SCSI information over Fibre Channel.

Clause 7 describes the Name Server objects defined for FCP-4.

Clause 8 describes the FCP FC-4 Link Service definitions for the protocol for transmitting SCSI information over Fibre Channel.

Clause 9 describes the Information Units used to transfer SCSI commands, data, and status across a Fibre Channel connection.

Clause 10 defines the SCSI mode pages used by the protocol for transmitting SCSI information over Fibre Channel.

Clause 11 defines the timers used for FCP-4 operation and recovery.

Clause 12 defines the link error detection and error recovery procedures for FCP-4.

This standard has the following annexes:

Annex A is a normative description of the relationship between the services defined by SAM-5 and the corresponding functions defined by this standard.

Annex B is an informative annex that provides examples of the protocol for transmitting SCSI information over FCP.

Annex C is an informative annex providing examples of the FCP-4 error recovery mechanisms.

Annex D is an informative annex describing techniques for discovering FCP device capabilities.

Annex E is an informative annex providing examples of the content of ELSs used during FCP-4 recovery operations.

This standard is part of ISO/IEC 14476 (all parts) developed to facilitate the use of the SCSI command sets for many different types of devices across many different types of physical interconnects. The architectural model for the family of standards is ISO/IEC 14776-415, *Information technology - Small computer system interface (SCSI) - Part 415: SCSI architecture model - 5 (SAM-5)*.

INFORMATION TECHNOLOGY – SMALL COMPUTER SYSTEM INTERFACE (SCSI) – Part 224: Fibre Channel Protocol, fourth version (FCP-4)

1 Scope

This part of ISO/IEC 14776 defines a fourth version of the SCSI Fibre Channel Protocol (FCP). This standard is a mapping protocol for applying the SCSI command set to Fibre Channel. This standard defines how the Fibre Channel services and the defined Information Units (IUs) are used to perform the services defined by the SCSI Architecture Model - 5 (SAM-5). This fourth version includes additions and clarifications to the third version (ISO/IEC 14776-223:2008), removes information that is now contained in other standards, and describes additional error recovery capabilities for the Fibre Channel Protocol.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 14165-122, *Information technology - Fibre channel - Part 122: Arbitrated loop-2 (FC-AL-2)*

ISO/IEC 14776-415, *Information technology - Small computer system interface (SCSI) - Part 415: SCSI architecture model - 5 (SAM-5)*

ISO/IEC 14776-454, *Information technology - Small computer system interface (SCSI) - Part 454: SCSI Primary Commands - 4 (SPC-4)*

INCITS 463-2010, *Information Technology - Fibre Channel Generic Services - 6 (FC-GS-6)*

INCITS 470-2011, *Information Technology - Fibre Channel Framing and Signaling Interface - 3 (FC-FS-3)*

INCITS 477-2011, *Information Technology - Fibre Channel - Link Services - 2 (FC-LS-2)*

INCITS 540, *Information Technology - Fibre Channel - Non-Volatile Memory Express (FC-NVMe)*

INCITS 544, *Information technology - Fibre Channel - Single-Byte Command Code Sets Mapping Protocol - 6 (FC-SB-6)*

INCITS TR-49-2012, *INCITS Technical Report For Information Technology - Fibre Channel - Device Attach - 2 (FC-DA-2)*

SFF document SFF-8067, *40-pin SCA-2 Connector w/Bidirectional ESI*¹

1. SFF specifications are available from the SNIA SFF Technology Affiliate (see <http://www.snia.org/sff>).

3 Terms, definitions, abbreviations and conventions

3.1 Terms and definitions

3.1.1

acknowledged class

class of service that acknowledges transfers

Note 1 to entry: An example of an acknowledged class is class 2.

Note 2 to entry: See FC-FS-3.

3.1.2

address identifier

address value used to identify the source (S_ID) or destination (D_ID) of a frame

Note 1 to entry: See FC-FS-3.

3.1.3

application client

object that is the source of SCSI commands and task management function requests

Note 1 to entry: See SAM-5.

3.1.4

application client buffer offset

offset in bytes from the beginning of the application client's buffer (i.e., data-in or data-out) to the location for the transfer of the first byte of a data delivery service request

Note 1 to entry: See SAM-5.

3.1.5

command

request describing a unit of work to be performed by a device server

Note 1 to entry: See SAM-5.

3.1.6

command descriptor block

CDB

structure used to communicate a command from an application client to a device server

Note 1 to entry: See SAM-5.

3.1.7

command identifier

numerical identifier of a command

Note 1 to entry: See Annex A and SAM-5.

3.1.8

data buffer size

upper limit on the amount of data (i.e., data-in or data-out) to be transferred by the command

Note 1 to entry: See SAM-5.

3.1.9

Data frame

FC-4 Device_Data frame, FC-4 Video_Data frame, or Link_Data frame

Note 1 to entry: See FC-FS-3.

3.1.10

data overlay

random buffer access capability where data is transmitted using the same application client buffer offset more than one time during the set of delivery actions performed by a single command

Note 1 to entry: See 6.3.3, 6.3.4, and 9.4.

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[ISO/IEC 14776-224:2019](https://standards.iteh.ai/catalog/standards/sist/94b73fae-79ff-4054-9da3-4953d35b810f/iso-iec-14776-224-2019)

<https://standards.iteh.ai/catalog/standards/sist/94b73fae-79ff-4054-9da3-4953d35b810f/iso-iec-14776-224-2019>

3.1.11

Destination_Identifier

D_ID

address identifier used to indicate the destination of the transmitted frame

Note 1 to entry: See FC-FS-3.

3.1.12

device server

object within the logical unit that processes SCSI commands and enforces the rules for task management

Note 1 to entry: See SAM-5.

3.1.13

discard

remove a frame or Sequence from the destination buffer without making use of the frame or Sequence and without notifying upper layers of the receipt of the frame or Sequence

Note 1 to entry: See FC-FS-3.

3.1.14

Exchange

basic mechanism that transfers information consisting of one or more related non-concurrent Sequences that may flow in the same or opposite directions

Note 1 to entry: The Exchange is identified by an Originator Exchange_ID (OX_ID) and a Responder Exchange_ID (RX_ID).

Note 2 to entry: See FC-FS-3.

3.1.15

FCP device

device containing one or more FCP_Ports operating as an initiator FCP_Port and/or a target FCP_Port

3.1.16

FCP Exchange

SCSI I/O operation for the Fibre Channel FC-2 layer

Note 1 to entry: The SCSI I/O operation for Fibre Channel is contained in a Fibre Channel Exchange.

Note 2 to entry: See FC-FS-3 and 4.1.

3.1.17

FCP I/O operation

SCSI I/O operation for the Fibre Channel FC-4 layer, as defined in this standard

3.1.18

FCP_Port

Nx_Port that supports the SCSI Fibre Channel Protocol

3.1.19

fully qualified Exchange identifier

FQXID

set of addresses and values used to uniquely identify an FCP I/O operation

Note 1 to entry: See 4.16.

3.1.20

image pair

originating and responding processes related by a Process Login operation

Note 1 to entry: For the Fibre Channel Protocol, the image pair is composed of one initiator FCP_Port and one target FCP_Port.

Note 2 to entry: See FC-LS-2.

3.1.21

I_T nexus loss

condition resulting from the events defined by SAM-5 in which the SCSI device performs the I_T nexus loss operations described in SAM-5, SPC-4, and this standard

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