

To: T10 Technical Committee  
 From: Rob Elliott, HP (elliott@hp.com)  
 Date: 7 July 2006  
 Subject: 06-323r0 SAM-4 SPC-4 et al Multiple service delivery subsystem editorial tweaks

### Revision history

Revision 0 (7 July 2006) First revision

### Related documents

sam4r06 - SCSI Architecture Model - 4 (SAM-4) revision 6  
 spc4r05a - SCSI Primary Commands - 4 (SPC-4) revision 5a  
 sbc3r05 - SCSI Block Commands - 3 (SBC-3) revision 5  
 ssc3r03 - SCSI Stream Commands - 3 (SSC-3) revision 3  
 smc3r02 - SCSI Media Changer Commands - 3 (SMC-3) revision 2  
 adc2r05 - Automation/Drive Interface Commands - 2 (ADC-2) revision 5  
 ses2r15 - SCSI Enclosure Services - 2 (SES-2) revision 15  
 sas2r04a - Serial Attached SCSI - 2 (SAS-2) revision 4a  
 fcp3r04- Fibre Channel Protocol - 3 (FCP-3) revision 4

### Overview

If a logical unit is in a target device with multiple target ports, those target ports could be in the same or different SCSI domains. SAM defines *service delivery subsystem* as a subset of *domain*. So, if the target ports are attached to different SCSI domains, then they are attached to different service delivery subsystems.

Several places in SPC-4 refer to a singular service delivery subsystem, using the phrase "the service delivery subsystem." In many cases, "a service delivery subsystem" would be more appropriate.

Other command sets and protocol standards need similar changes (often only to the definitions of "port"s).

### Suggested changes to SAM-4

The PDF file for sam4r06 doesn't allow selecting text, so specific changes are not listed.

The editor should inspect every instance of " service delivery subsystem" and change "the" to "a" as appropriate.

### Suggested changes to SPC-4

**3.1.32 Disconnect-Reconnect mode page:** A mode page that provides the application client the means to tune the performance of ~~the~~[a](#) service delivery subsystem. See 7.4.8.

**3.1.92 SCSI device:** A device that contains one or more SCSI ports that are [each](#) connected to a service delivery subsystem and supports a SCSI application protocol (see SAM-3).

**3.1.94 SCSI domain:** The interconnection of two or more SCSI devices and a service delivery subsystem. A detailed definition of a SCSI Domain may be found in SAM-3.

**3.1.96 SCSI initiator port:** A SCSI initiator device (see SAM-3) object [that](#) acts as the connection between application clients and ~~the~~[a](#) service delivery subsystem through which requests and responses are routed.

**3.1.97 SCSI port:** A port of a SCSI device that connects the application client, device server or task manager to ~~the~~[a](#) service delivery subsystem (see SAM-3).

**3.1.102 SCSI target port:** A SCSI target device (see SAM-3) object that acts as the connection between device servers and task managers and ~~the~~[a](#) service delivery subsystem through which requests and responses are routed.

**3.1.107 service delivery subsystem:** That part of a SCSI ~~I/O system~~[domain](#) that transmits service requests to a logical unit or SCSI target device and returns logical unit or SCSI target device responses to a SCSI initiator device. See SAM-3.

### **4.3.3 The variable length CDB formats**

... If the number of CDB bytes delivered by the service delivery subsystem is not sufficient to contain the number of bytes specified by the ADDITIONAL CDB LENGTH field, then the command shall be terminated with CHECK CONDITION status, with the sense key set to ILLEGAL REQUEST, and the additional sense code set to INVALID FIELD IN CDB.

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### 5.8.1 Target port group access overview

Logical units may be connected to ~~the~~[one or more](#) service delivery subsystems via multiple target ports (see SAM-3).

### 5.9.1 power conditions overview

No power condition shall affect the supply of any power required for proper operation of ~~the~~[a](#) service delivery subsystem.

### 6.14.1 READ BUFFER command introduction

The READ BUFFER command (see table 126) is used in conjunction with the WRITE BUFFER command as a diagnostic function for testing memory in the SCSI device and the integrity of ~~the~~[a](#) service delivery subsystem. This command shall not alter the medium.

### 6.26 REQUEST SENSE command

Examples of conditions that cause a REQUEST SENSE command to return a CHECK CONDITION status are:

- a) An invalid field value is detected in the CDB;
- b) The device server does not support the REQUEST SENSE command (see 4.3.1);
- c) An unrecovered error is detected by ~~the service delivery subsystem~~[a SCSI target port](#); or
- d) A malfunction prevents return of the sense data.

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Editor's Note 1: that seems leftover from SAM before the multiport changes were made, when the port was considered part of the service delivery subsystem. The service delivery subsystem doesn't detect anything on its own.

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### 6.36.1 WRITE BUFFER command introduction

The WRITE BUFFER command (see table 195) is used in conjunction with the READ BUFFER command as a diagnostic function for testing logical unit memory in the SCSI target device and the integrity of ~~the~~[a](#) service delivery subsystem. ...

### 7.2.3 Buffer Over-Run/Under-Run log page

The PARAMETER CODE field for buffer over-run/under-run counters contains a 16-bit value comprised of eight reserved bits, a COUNT BASIS field (see table 216), a CAUSE field (see table 217), and a TYPE bit. These are concatenated to determine the value of the parameter code for that log parameter. (E.g., a counter for parameter code value of 0023h specifies a count basis of 001b, a cause of 0001b, and a type of 1b. This counter is incremented once per command that experiences an over-run due to ~~the~~[a](#) service delivery subsystem being busy.)

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**Table 1 — CAUSE field**

Code	Description
0h	Undefined
1h	Service delivery subsystem busy
2h	Transfer rate too slow
3h - Fh	Reserved

### 7.2.12.2 General Statistics and Performance log page

The NUMBER OF LOGICAL BLOCKS RECEIVED BY A TARGET PORT field contains the number of logical blocks received ~~from the service delivery subsystem~~ by a SCSI target port for ~~the device server of~~ the logical unit as a result of write commands (see 7.2.12.1).

The NUMBER OF LOGICAL BLOCKS TRANSMITTED BY A TARGET PORT field contains the number of logical blocks ~~delivered to the service delivery subsystem by~~ transmitted by a SCSI target port for ~~the device server of~~ the logical unit as a result of read commands (see 7.2.12.1).

### 7.12.2.3 Group Statistics and Performance (n) log page

The GROUP N NUMBER OF LOGICAL BLOCKS RECEIVED BY A TARGET PORT field contains the number of logical blocks received ~~from the service delivery subsystem~~ by a SCSI target port for ~~the device server of~~ the logical unit as a result of write commands (see 1.1.2.1).

The GROUP N NUMBER OF LOGICAL BLOCKS TRANSMITTED BY A TARGET PORT field contains the number of logical blocks ~~delivered to the service delivery subsystem by~~ transmitted by a SCSI target port for ~~the device server of~~ the logical unit as a result of read commands (see 1.1.2.1).

### 7.4.8 Disconnect-Reconnect mode page

The Disconnect-Reconnect mode page (see table 278) provides the application client the means to tune the performance of ~~the~~ thea service delivery subsystem.

#### 8.3.1.5.1.1 Summary of enrollment states

- c) Pending-enrolled: The state for an enrolled initiator port following:
  - A) Events ~~in the service delivery subsystem~~ described in 8.3.1.12; or
  - B) Successful completion of an ACCESS CONTROL OUT command with MANAGE ACL service action from any initiator port with the FLUSH bit set to one (see 8.3.3.2).

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[Editor's Note 2: Those events seems to be power cycles, hard reset, and logical unit reset \(see table below\). Power cycles and logical unit resets are not related to the service delivery subsystem.](#)

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#### 8.3.1.5.1.3 Enrolled state

NOTE 66 - This standard does not preclude implicit enrollments through mechanisms in ~~the~~ thea service delivery subsystem. Such mechanisms should perform implicit enrollments after identification by TransportID and should fail in the case where there are ACL conflicts as described in 8.3.1.5.2.

#### 8.3.1.8.2.2 The override lockout timer

Maintaining a non-zero override lockout timer value may be accomplished without knowing the management identifier key or transporting the management identifier key on ~~the~~ thea service delivery subsystem.

#### 8.3.1.12 Access controls information persistence and memory usage requirements

If a SCSI target device supports access controls, then the SCSI target device shall contain an access controls coordinator that shall maintain the following information in nonvolatile memory:

- a) Whether access controls are enabled or disabled; and
- b) The access controls data that table 365 and table 366 require to persistent across power cycles, hard resets, and logical unit resets.

If the access control coordinator's nonvolatile memory is not ready and the access controls coordinator is unable to determine that access controls are disabled, then the device servers for all logical units shall terminate all commands except INQUIRY and REQUEST SENSE commands with CHECK CONDITION status, with the sense key set to NOT READY, and the additional sense code set as described in table 192 (see 6.34).

Following an I\_T nexus loss, a previously enrolled initiator port shall be placed in the pending-enrolled state, if that initiator port was associated with the lost I\_T nexus. Following a logical unit reset, all previously enrolled initiator ports shall be placed in the pending-enrolled state.

The information shown in table 365 shall be maintained by the access controls coordinator.

**Table 2 — Mandatory access controls resources**

Information description	Size (in bits)	Persistent Across Power Cycles, Hard Resets, and Logical Unit Resets
...	...	...

### **Suggested changes to SBC-3**

The PDF file for sbc3r06 doesn't allow selecting text, so specific changes are not listed.

The editor should inspect every instance of " service delivery subsystem" and change "the" to "a" as appropriate.

### **Suggested changes to SSC-3**

**3.1.58 SCSI initiator port:** A SCSI initiator device object that acts as the connection between application clients and ~~the~~[a](#) service delivery subsystem through which requests, indications, responses, and confirmations are routed. In all cases when this term is used it refers to a SCSI initiator port or a SCSI target/initiator port operating as a SCSI initiator port.

**3.1.59 SCSI port:** A SCSI device resident object that connects the application client, device server or task manager to ~~the~~[a](#) service delivery subsystem through which requests and responses are routed. SCSI port is synonymous with port. A SCSI port is one of: a SCSI initiator port, a SCSI target port, or a SCSI target/initiator port.

**3.1.61 SCSI target port:** A SCSI target device object that contains a task router and acts as the connection between device servers and task managers and ~~the~~[a](#) service delivery subsystem through which indications and responses are routed. When this term is used it refers to a SCSI target port or a SCSI target/initiator port operating as a SCSI target port.

**3.1.66 service delivery subsystem:** That part of an SCSI ~~I/O-system~~[domain](#) that transmits service requests to a logical unit or SCSI target device and returns logical unit or SCSI target device responses to a SCSI initiator device. A detailed definition of a service delivery subsystem may be found in SAM-3.

### **Suggested changes to SMC-3**

**3.1.26 SCSI initiator port:** A SCSI initiator device object that acts as the connection between application clients and ~~the~~[a](#) service delivery subsystem through which requests and responses are routed. A detailed definition of SCSI target port may be found in SAM-2.

**3.1.28 SCSI target port:** A SCSI target device object that acts as the connection between device servers and task managers and ~~the~~[a](#) service delivery subsystem through which requests and responses are routed. A detailed definition of SCSI target port may be found in SAM-2.

**3.1.30 service delivery subsystem:** That part of a SCSI ~~I/O-system~~[domain](#) that transmits service requests to a logical unit and returns logical unit responses to an application client. A detailed definition of a service delivery subsystem may be found in SAM-2.

### **5.2.1 Elements overview**

A media changer has an address space separate and distinct from the physical address space of a SCSI-~~3~~ service delivery subsystem.

### **Suggested changes to ADC-2**

**3.1.35 SCSI initiator port:** A SCSI initiator device object acts as the connection between application clients and [thea](#) service delivery subsystem through which requests and responses are routed (see SAM-3).

**3.1.37 SCSI target port:** A SCSI target device object that contains a task router and acts as the connection between device servers and task managers and [thea](#) service delivery subsystem through which requests and responses are routed (see SAM-3).

#### **Suggested changes to SES-2**

**3.1.25 SCSI initiator port:** A SCSI initiator device object acts as the connection between application clients and [thea](#) service delivery subsystem through which requests and responses are routed. See SAM-3.

**3.1.27 SCSI target port:** A SCSI target device object that contains a task router and acts as the connection between device servers and task managers and [thea](#) service delivery subsystem through which requests and responses are routed. See SAM-3.

#### **Suggested changes to SAS-2**

**3.1.12 ATA domain:** An I/O system consisting of an ATA host and one or more ATA devices that communicate with one another by means of a service delivery subsystem.

**3.1.66 expander device:** A device that is part of [thea](#) service delivery subsystem and facilitates communication between SAS devices. See 4.1.5.

**3.1.68 expander phy:** A phy in an expander device that interfaces to a service delivery subsystem.

**3.1.69 expander port:** An expander device object that interfaces to [thea](#) service delivery subsystem and to SAS ports in other devices. See 4.6.2.

**3.1.175 SAS phy:** A phy in a SAS device that interfaces to a service delivery subsystem.

**3.1.183 SATA device port:** An ATA device object that interfaces to [thea](#) service delivery subsystem with SATA (analogous to a SCSI target port).

**3.1.185 SATA host port:** An ATA host object that interfaces to [thea](#) service delivery subsystem with SATA (analogous to a SCSI initiator port).

**3.1.186 SATA phy:** A phy in a SATA device or SATA port selector that interfaces to a service delivery subsystem (analogous to a SAS phy).

**3.1.190 SCSI device:** A device that contains one or more SCSI ports that are connected to a service delivery subsystem and supports a SCSI application protocol. See SAM-3.

**3.1.191 SCSI domain:** An I/O system consisting of a set of SCSI devices that communicate with one another by means of a service delivery subsystem. See SAM-3.

**3.1.193 SCSI initiator port:** A SCSI initiator device object that acts as the connection between application clients and [thea](#) service delivery subsystem through which indications and responses are routed. See SAM-3.

**3.1.196 SCSI target port:** A SCSI target device object that contains a task router and acts as the connection between device servers and task managers and [thea](#) service delivery subsystem through which requests and confirmations are routed. See SAM-3.

**3.1.205 service delivery subsystem:** The part of a SCSI I/O system that transmits information between a SCSI initiator port and a SCSI target port, or the part of an ATA I/O system that transmits information between an ATA host and an ATA device, or the part of a SAS I/O system that transmits information between a SAS initiator port and a SAS target port.

**3.1.211 SMP initiator port:** A SAS initiator device object in a SAS domain that interfaces to [thea](#) service delivery subsystem with SMP.

**3.1.215 SMP target port:** A SAS target device object in a SAS domain that interfaces to [thea](#) service delivery subsystem with SMP.

**3.1.230 STP initiator port:** A SAS initiator device object in a SAS domain that interfaces to [thea](#) service delivery subsystem with STP.

**3.1.235 STP target port:** A SAS target device object in a SAS domain that interfaces to [thea](#) service delivery subsystem with STP.

**3.1.267 zoned portion of a service delivery subsystem (ZPSDS):** A group of expander devices that cooperate to control access between phys. The ZPSDS may include all or part of a service delivery subsystem. See 4.8.

#### 4.1.1 Architecture overview

A SAS domain (see 4.1.7) contains one or more SAS devices and a service delivery subsystem. A SAS domain may be a SCSI domain (see SAM-3).

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The service delivery subsystem (see 4.1.6) in a SAS domain may contain expander devices (see 4.1.5).

#### 4.1.2 Physical links and phys

Phys are contained in ports (see 4.1.3). Phys interface to [thea](#) service delivery subsystem (see 4.1.6).

#### 4.1.5 Expander devices (edge expander devices and fanout expander devices)

Expander devices are part of [thea](#) service delivery subsystem and facilitate communication between multiple SAS devices. Expander devices contain two or more external expander ports.

#### 4.1.6 Service delivery subsystem

The service delivery subsystem is either:

- a) a set of physical links between a SAS initiator port and a SAS target port; or
- b) a set of physical links and expander devices, supporting more than two SAS ports.

See 4.1.8 for rules on constructing service delivery subsystems from multiple expander devices.

#### 4.1.8.1 Expander device topology overview

More than one expander device may be part of a service delivery subsystem.

#### 10.2.7.1.1 Disconnect-Reconnect mode page overview

The Disconnect-Reconnect mode page (see SPC-3) provides the application client the means to tune the performance of [thea](#) service delivery subsystem.

### Suggested changes to FCP-4

**3.1.56 SCSI initiator port:** A SCSI initiator device object that acts as the connection between application clients and [thea](#) service delivery subsystem through which requests, indications, responses, and confirmations are routed (see SAM-3). In all cases when this term is used it refers to an initiator port or a SCSI target/initiator port operating as a SCSI initiator port. In this standard, the term SCSI initiator port also refers to an FCP\_Port using the Fibre Channel protocol to perform the SCSI initiator port functions defined by SAM-3.

**3.1.57 SCSI target port:** A SCSI target device object that contains a task router and acts as the connection between device servers and task managers and [thea](#) service delivery subsystem through which indications and responses are routed (see SAM-3). In this standard, the term SCSI target port also refers to an FCP\_Port using the Fibre Channel protocol to perform the SCSI target port functions defined by SAM-3.

## 4.2 FCP I/O operations

An application client begins an FCP I/O operation when it invokes a Send SCSI Command SCSI transport protocol service request or a Send Task Management Request SCSI transport protocol service request (see SAM-3). The Send SCSI Command SCSI transport protocol service request conveys a single request or a list of linked requests from the application client to [thea FCP](#) service delivery subsystem. Each request contains all the information necessary for the processing of one SCSI command or task management function, including the local storage address and characteristics of data to be transferred by the SCSI command. The Fibre Channel Protocol then performs the following actions using FC-FS-2 services to perform the SCSI command or task management function. The processing of the individual steps of the protocol is consistent with the SCSI architectural model as defined by SAM-3.

### 10.2.1 Overview and format of Disconnect-Reconnect mode page for FCP

The Disconnect-Reconnect mode page (see table 26) allows the application client to modify the behavior of ~~the~~ service delivery subsystem.