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To: X3T9.2 Committee (SCSI)

From: George Penokie (IBM)

Subject: SDA States and Types

### 1 Overview

The SCSI-3 Disk Array Model requires the definition of several new SCSI device types. This proposal lists all the new SCSI devices types that are required for the SCSI-3 Disk Array Model.

The SCSI-3 Disk Array Model also needs to define the state of SCSI devices. The state of a device is an indication of its current operating condition. The state information gives an application client the information required for to do configuration services to a SDA.

### 2 SCSI-3 Device Types

This proposal requests the following peripheral device type be added to the SCSI-3 peripheral device type table:

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+-----+
| Code | Description |
+-----+-----+
| 0Ch  | SCSI disk array device |
+-----+-----+

```

These changes would become part of the peripheral device type table in the SCC standard. The new peripheral device type table would appear as follows:

Table xx - Peripheral device type

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+-----+
| Code | Description |
+-----+-----+
| 00h  | Direct-access device (e.g. magnetic disk) |
| 01h  | Sequential-access device (e.g. magnetic tape) |
| 02h  | Printer device |
| 03h  | Processor device |
| 04h  | Write-once device (e.g. some optical disks) |
| 05h  | CD-ROM device |
| 06h  | Scanner device |
| 07h  | Optical memory device (e.g. some optical disks) |
| 08h  | Medium changer device (e.g. jukeboxes) |
| 09h  | Communications device |
| 0Ah-0Bh | Defined by ASC IT8 (Graphic arts pre-press devices) |
| 0Ch  | SCSI disk array device |
| 0Dh-1Eh | Reserved |
| 1Fh  | Unknown or no device type |
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### 3 Reporting of SCSI-3 Disk Array States

The reasons for reporting states depend on which logical unit is being addressed. The following sections describe the possible states for each of the addressable components within an SCSI Disk

Array.

### 3.1 SCSI Disk Array States (LUN 0)

The state of the SDA may be determined by using the same methods as any other SCSI device (e.g. TUR followed by Request Sense). However, more detailed state information may be obtained by issuing a state request to the base device address of the SDA.

All valid base device address states shall be reported within a single state request by setting the appropriate bit(s). If all the bits within the state information field are set to zero then the SDA is available.

The base device address of an SDA may report any of the following states under the listed conditions:

**Available** - The selected SDA is operational. This state is indicated when all the bits within the state information field are set to zero.

**Readying Bit** - The selected SDA is being initialized and access to the SDA is limited.

Note 1 The amount of access to the SDA during the readying state is vendor-specific. This state should be indicated if any of the logical units are in a state of readying.

**Present Bit** - The selected SDA is present but no other status is available.

**Non-Addressable Component Failure Bit** - Within the selected SDA a non-addressable part has failed. (e.g. power supply failure, LED failure, cache failure, etc. that are not defined as C-LUIs). More information on the failure may be available within the sense data from a Request Sense Command issued to base device address of the SDA.

**Abnormal Bit** - Within the selected SDA an addressable device (C-LUI, P-LUI, R-LUI, V-LUI, or S-LUI) is indicating a state other than available. To determine which device is indicating it is not available, issue a state request to each addressable device within the SDA.

### 3.2 Volume Set States

Only a single volume set state shall be reported within a single state request.

Note 2 The priority of reporting multiple volume set states is vendor-specific.

Volumes set may report any of the following states under the listed conditions:

**Not Available** - The selected V-LUI is capable of being supported but has not been configured.

**Readying** - The selected V-LUI is being initialized and access to the V-LUI is limited.

Note 3 The amount of access to the volume set during the readying state is vendor-specific. This state should be indicated if any of the logical units within the volume set are not ready.

**Available** - The selected V-LUI is fully operational.

**Rebuild** - One or more of the redundancy groups associated with the selected V-LUI is in the process of a rebuild operation. In this state data is not protected.

**Protected Rebuild** - One or more of the redundancy groups associated with the selected V-LUI is in the process of a rebuild operation. In this state all data is fully protected.

Recalculate - The selected V-LUI is in the process of a recalculate operation.

Spare in Use - Within the selected V-LUI a spare is being used. In this state all data is still fully protected.

Partially Exposed - Within the selected V-LUI one or more logical unit(s) have failed. In this state all data is still fully protected.

Exposed - Within the selected V-LUI data is not protected. In this state all data is still valid.

Data Lost - Within the selected V-LUI data has been lost.

Broken - The selected V-LUI is capable of being supported but it has failed.

Not Supported - The SDA is not capable of supporting a volume set on the selected V-LUI.

### **3.3 Redundancy Group States**

Only a single redundancy group state shall be reported within a single state request.

Note 4 The priority of reporting multiple redundancy group states is vendor-specific.

Redundancy groups may report any of the following states under the listed conditions:

Not Available - The selected redundancy group is capable of being supported but has not been configured.

Available - The selected redundancy group is fully configured.

Present - The selected redundancy group is present but no other status is available.

Rebuild - The selected redundancy group is in the process of a rebuild operation. In this state the protected space is not protected.

Protected Rebuild - The selected redundancy group is in the process of a rebuild operation. In this state the protected space is fully protected.

Recalculate - The selected redundancy group is in the process of a recalculate operation.

Partially Exposed - Within the selected R-LUI one or more logical unit(s) have failed. In this state the protected space is fully protected.

Exposed - Within the selected redundancy group data is not protected. In this state the protected space is not protected.

Invalidated Protected Space - Within the selected redundancy group data has been lost. In this state the protected space is no longer intact.

Not Supported - The SDA is not capable of supporting a redundancy group on the selected R-LUI.

### **3.4 P-LUI/P-extent States**

State information may be obtained by issuing a state request to the Base Device. However, more state information may be available using the same methods as any other SCSI device(e.g. TUR followed by Request Sense).

Only a single P-LUI/P-extent state shall be reported within a single state request.

Note 5 The priority of reporting multiple P-LUI/P-extent states is vendor-specific.

P-LUIs and P-extents may report any of the following states under the listed conditions:

Not Available - The selected P-LUI or P-extent is capable of being supported but no device is connected.

Readying - The selected P-LUI or P-extent is being initialized and access to the P-LUI or P-extent is limited.

Available - The selected P-LUI or P-extent is fully operational.

Present - The selected P-LUI or P-extent is present but no other status is available.

Broken - The selected P-LUI or P-extent is capable of being supported but it has failed.

Not Supported - The SDA is not capable of supporting a device on the selected P-LUI or P-extent.

### 3.5 Spare States

Only a single spare state shall be reported within a single state request.

Note 6 The priority of reporting multiple spare states is vendor-specific.

Spare may report any of the following states under the listed conditions:

Not Available - The selected spare is capable of being supported but has not been configured.

Available - The selected spare is fully operational.

Present - The selected spare is present but no other status is available.

Spare in Use - The selected spare is being used. In this state all data is still fully protected.

Broken - The selected spare is capable of being supported but it has failed.

Not Supported - The SDA is not capable of supporting a spare on the selected S-LUI.

### 3.6 C-LUI States

Only a single C-LUI shall be reported within a single state request.

Note 7 The priority of reporting multiple component states is vendor-specific.

Components (C-LUI) may report any of the following states under the listed conditions:

Not Available - The selected C-LUI is capable of being supported but no component is present.

Readying - The selected C-LUI is being initialized and access to the C-LUI is limited.

Available - The selected C-LUI is fully operational.

Present - The selected C-LUI is present but no other status is available.

Broken - The selected C-LUI is capable of being supported but it has failed.

Not Supported - The SDA is not capable of supporting a component on the selected C-LUI.

DACL - The selected C-LUI contains a DACL. This state shall not be reported unless the report command allows the reporting of multiple states.

ITTU - The SDA executing the report command considers the listed C-LUI to contain the primary DACL function. This state shall not be reported unless the report command allows the reporting of multiple states.