

# T10/04-186 revision 1

Date: August 24, 2004

To: T10 Committee (SCSI)

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Subject: SPC-3: Standard Data Collection Trigger

## 1 Overview

Debugging a problem in a SCSI environment can be difficult when one part of the system (e.g., application client) detects an error when the failure is caused by a different part of the system (e.g., logical unit).

Most applications and logical units have some of error logging, but correlating the time of an application client event with the time of a logical unit log can be difficult.

Correlating the location of data in a log can be difficult. For example, the application client may complain about "scsi disk 0" while the logical unit only knows a about it's LUN.

In logical units recoverable errors typically generate minimal log information, while catastrophic errors often generate detailed engineering data. A problem that may be viewed as recoverable at the logical unit may cause a catastrophic failure at the application client. Also, there is no general way to automatically trigger collection of more detailed log data in a logical unit.

This proposal defines a way to pass error information to a logical unit. The information would not be used for any error recovery procedures, but would be used in to enhance debug. For example, the logical unit would add the information received from the application client to its existing error log. The error log could then be used to correlate an application client error with any errors internal to the logical unit. This doesn't replace the vendor specific methods for collecting and analyzing engineering data, but provides a vendor independent way of correlating error logs and provides a trigger mechanism for collecting additional log data.

## 2 Solution

## 3 Definitions, symbols, abbreviations, and conventions

### 3.1 Definitions

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**3.1.1 universal time (UT):** The time at longitude zero, colloquially known as Greenwich Mean Time. See <http://aa.usno.navy.mil/faq/docs/UT.html>.

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### 3.2 Acronyms

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UT      Universal Time (see 3.1.1)

## 4 Model common to all device types

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### 4.1 Application client logging

Application client logging is a method the application client may use to store application client detected error information to a logical unit in non-volatile storage. The information the application client sends to the logical

unit is appended to the logical units error log. The application client error information is recovered as part of the logical units logs by means outside the scope of this standard. The application clients error information is not used for any logical unit related error recovery.

A log that contains a mix of application client error information and logical unit error information may be used to correlate an application client error with any errors internal to the logical unit. This doesn't replace the vendor specific methods for collecting and analyzing engineering data, but provides a vendor independent way of correlating error logs.

Application clients should minimize the amount of error information that is requested to be logged in the logical units logs to prevent overflowing those logs.

## 4.2 WRITE BUFFER command

### 4.2.1 WRITE BUFFER command introduction

The WRITE BUFFER command (see table 1) is used in conjunction with the READ BUFFER command as a diagnostic function for testing logical unit memory in the target SCSI device and the integrity of the service delivery subsystem. Additional modes are provided for:

- a) downloading microcode:
- b) for downloading and saving microcode: and
- c) [Downloading application client logs](#).

**Table 1 — WRITE BUFFER command**

| Bit Byte | 7                     | 6 | 5 | 4    | 3 | 2 | 1 | 0     |  |
|----------|-----------------------|---|---|------|---|---|---|-------|--|
| 0        | OPERATION CODE (3Bh)  |   |   |      |   |   |   |       |  |
| 1        | Reserved              |   |   | MODE |   |   |   |       |  |
| 2        | BUFFER ID             |   |   |      |   |   |   |       |  |
| 3        | (MSB)                 |   |   |      |   |   |   |       |  |
| 4        | BUFFER OFFSET         |   |   |      |   |   |   |       |  |
| 5        |                       |   |   |      |   |   |   | (LSB) |  |
| 6        | (MSB)                 |   |   |      |   |   |   |       |  |
| 7        | PARAMETER LIST LENGTH |   |   |      |   |   |   |       |  |
| 8        |                       |   |   |      |   |   |   | (LSB) |  |
| 9        | CONTROL               |   |   |      |   |   |   |       |  |

This command shall not alter any medium of the logical unit when the data mode or the combined header and data mode is specified.

The function of this command and the meaning of fields within the CDB depend on the contents of the MODE field. The MODE field is defined in table 77.

**Table 2 — WRITE BUFFER MODE field**

| MODE                      | Description   | Implementation requirements |
|---------------------------|---|-----------------------------|
| 00h                       | Write combined header and data                          | Optional                    |
| 01h                       | Vendor specific   | Vendor specific             |
| 02h                       | Write data  | Optional                    |
| 04h                       | Download microcode                                      | Optional                    |
| 05h                       | Download microcode and save                             | Optional                    |
| 06h                       | Download microcode with offsets                         | Optional                    |
| 07h                       | Download microcode with offsets and save                | Optional                    |
| 0Ah                       | Echo buffer   | Optional                    |
| 1Ah                       | Enable expander communications protocol and Echo buffer | Optional                    |
| 1Bh                       | Disable expander communications protocol                | Optional                    |
| <a href="#">1Ch</a>       | <a href="#">Download application log</a>                | <a href="#">Optional</a>    |
| 03h                       | Reserved  |                             |
| 08h - 09h                 | Reserved  |                             |
| 0Bh - 19h                 | Reserved  |                             |
| <a href="#">1Dh</a> - 1Fh | Reserved  |                             |

NOTES

- 1 Modes 00h and 001h are not recommended.
- 2 When downloading microcode with buffer offsets, the WRITE BUFFER command mode should be 06h or 07h.

**4.2.2 Combined header and data mode (00h)**

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**4.2.3 Vendor specific mode (01h)**

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**4.2.4 Data mode (02h)**

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**4.2.5 Download microcode mode (04h)**

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**4.2.6 Download microcode and save mode (05h)**

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**4.2.7 Download microcode with offsets (06h)**

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#### 4.2.8 Download microcode with offsets and save mode (07h)

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#### 4.2.9 Write data to echo buffer (0Ah)

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#### 4.2.10 Enable expander communications protocol and Echo buffer (1Ah)

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#### 4.2.11 Disable expander communications protocol (1Bh)

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#### 4.2.12 Download application log (1Ch) (new section)

In this mode the device server transfers data from the application client and stores it in a log. The format of the log data is as specified in table 3. The BUFFER ID and BUFFER OFFSET fields are ignored in this mode.

Upon successful completion of a WRITE BUFFER command the data shall be appended to the logical units log.

The PARAMETER LIST LENGTH field specifies the maximum number of bytes that shall be transferred from the Data-Out Buffer to be stored in the log. If the PARAMETER LIST LENGTH field specifies a transfer in excess of the

logs capacity, the device server shall return CHECK CONDITION status and shall set the sense key to ILLEGAL REQUEST with an additional sense code of INVALID FIELD IN CDB.

**Table 3 — Log data format**

| Bit Byte | 7     | 6                            | 5 | 4 | 3        | 2 | 1 | 0     |
|----------|-------|------------------------------|---|---|----------|---|---|-------|
| 0        | (MSB) | VENDOR IDENTIFICATION        |   |   |          |   |   | (LSB) |
| 7        |       |                              |   |   |          |   |   |       |
| 8        | (MSB) | ERROR TYPE                   |   |   |          |   |   | (LSB) |
| 9        |       |                              |   |   |          |   |   |       |
| 10       |       | TIME STAMP                   |   |   |          |   |   |       |
| 17       |       |                              |   |   |          |   |   |       |
| 18       |       | Reserved                     |   |   | CODE SET |   |   |       |
| 19       |       | ERROR LOCATION FORMAT        |   |   |          |   |   |       |
| 20       |       | Reserved                     |   |   |          |   |   |       |
| 21       |       | Reserved                     |   |   |          |   |   |       |
| 22       | (MSB) | ERROR LOCATION LENGTH (24-m) |   |   |          |   |   | (LSB) |
| 23       |       |                              |   |   |          |   |   |       |
| 24       | (MSB) | VENDOR SPECIFIC LENGTH (n-m) |   |   |          |   |   | (LSB) |
| 25       |       |                              |   |   |          |   |   |       |
| 26       | (MSB) | ERROR LOCATION               |   |   |          |   |   | (LSB) |
| m        |       |                              |   |   |          |   |   |       |
| m+1      |       | VENDOR SPECIFIC              |   |   |          |   |   |       |
| n        |       |                              |   |   |          |   |   |       |

The VENDOR IDENTIFICATION field contains eight bytes of left-aligned ASCII data (see 4x.4x.1x) identifying the vendor of the product. The vendor identification shall be one assigned by INCITS. A list of assigned vendor identifications is in Annex Dx and on the T10 web site ([www.T10.org](http://www.T10.org)).

The ERROR TYPE field (see table 4) specifies the error detected by the application client.

**Table 4 — ERROR TYPE field values**

| Value         | Description   |
|---------------|---|
| 0000h         | No error specified by the application client            |
| 0001h         | An unknown error was detected by the application client |
| 0002h         | The application client detected corrupted data          |
| 0003h         | The application client detected a permanent error       |
| 0004h         | The application client detected an I_T nexus failure    |
| 0005h - 7FFFh | Reserved  |
| 8000h - FFFFh | Vendor specific   |

The TIME STAMP field is represented as a 64-bit unsigned fixed-point number in big-endian format. The time stamp is divided into two 32 bit fields (see table 5). They are the INTEGER field and the FRACTIONAL field.

**Table 5 — TIME STAMP field format**

| Bit Byte | 7           | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|-------------|---|---|---|---|---|---|---|
| 0        | (MSB)       |   |   |   |   |   |   |   |
| 5        | MILLISECOND |   |   |   |   |   |   |   |
| 6        | (LSB)       |   |   |   |   |   |   |   |
| 6        | Reserved    |   |   |   |   |   |   |   |
| 7        | Reserved    |   |   |   |   |   |   |   |

The **TIMESTAMP** field shall contain the number of milliseconds that have elapsed since midnight, 1 January 1970 UT (see 3.1.1). The application client shall set the **MILLISECOND** field to zero if it is not able to determine the UT of the log entry.

The **CODE SET** field specifies the code set used for the application client log information, as described in table 6. This field is intended to be an aid to software that displays the application client log information.

**Table 6 — Code set**

| Value   | Description   |
|---------|---|
| 0h      | Reserved  |
| 1h      | The application client log information is binary  |
| 2h      | The application client log information is ASCII graphic codes (i.e., code values 20h through 7Eh) |
| 3h      | The application client log information is ISO/IEC 10646-1 (UTF-8) codes                           |
| 4h - Fh | Reserved  |

The **ERROR LOCATION FORMAT** field specifies the format (see table 7) of the **ERROR LOCATION** field.

**Table 7 — ERROR LOCATION FORMAT field values**

| Value     | Description  |
|-----------|--|
| 00h       | No error specified by the application client   |
| 01h       | The <b>ERROR LOCATION</b> field specifies the LBA associated with the error information contained within the application log data. |
| 02h - 7Fh | Reserved   |
| 80h - FFh | Vendor specific  |

The **ERROR LOCATION LENGTH** field specifies the length of the **ERROR LOCATION** field. The **ERROR LOCATION LENGTH** field value shall be a multiple of four. An error location length value of zero indicates there is no error location information.

The **VENDOR SPECIFIC LENGTH** field specifies the length of the **VENDOR SPECIFIC** field. The **VENDOR SPECIFIC LENGTH** field value shall be a multiple of four. A vendor specific length value of zero indicates there is no vendor specific information.

The **ERROR LOCATION** field specifies the location at which the application client detected the error.

The **VENDOR SPECIFIC** field provides vendor specific information on the error.