

# ENDL TEXAS

Date: 17 January 2008  
 To: T10 Technical Committee  
 From: Ralph O. Weber  
 Subject: Error history cleanup

## Introduction

Several substantive problems were encountered during incorporation of 06-362r7 into SPC-4 r12. This proposal suggests resolutions for these problems.

## Revision History

- r0 Initial revision
- r1 Updated table and subclause numbers to match SPC-4 r12 (no change bars). Also made changes requested by Kevin Butt and Rob Elliott.
- r2 Updated as requested by the January CAP working group.

Changes between r1 and r2 are marked with change bars.

Unless otherwise indicated additions are shown in [blue](#), deletions in ~~red-strikethrough~~, and comments in [green](#).

## Proposed Changes in SPC-4 r12

### 3.1 Definitions

**3.1.h Error history I\_T nexus:** An I\_T nexus for which the device server has reserved access to the error history snapshot (see 3.1.i).

**3.1.i Error history snapshot:** The contents of the error history at a specific point in time. See 5.11.2.

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### 5.11.2 Retrieving error history with the READ BUFFER command

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To retrieve the complete error history, an application client uses one I\_T nexus to:

- 1) Create an error history snapshot if one does not already exist, establish the I\_T nexus as the error history I\_T nexus, and retrieve the error history directory by sending a READ BUFFER command (see 6.16.9.2) with:
  - A) The MODE field set to 1Ch (i.e., error history);
  - B) The BUFFER ID field set to one of the following:
    - a) If the error history I\_T nexus is expected to be valid:
      - A) 00h (i.e., return error history directory);
      - B) 01h (i.e., return error history directory and create new snapshot);

- b) If the application client has knowledge obtained by means outside the scope of this standard that the error history I\_T nexus is no longer valid:
    - A) 02h (i.e., return error history directory and establish new error history I\_T nexus); or
    - B) 03h (i.e., return error history directory, establish new error history I\_T nexus, and create new snapshot);
  - C) The BUFFER OFFSET field set to 000000h; and
  - D) The ALLOCATION LENGTH field set to at least 2 088 (i.e., large enough to transfer the complete error history directory);
- 2) Retrieve the error history. The application client uses a data-in buffer size that is a multiple of the offset boundary indicated in the READ BUFFER descriptor (see 6.16.5). For each buffer ID indicated in the error history directory in the range of 10h through EFh, the application client sends one or more READ BUFFER commands (see 6.16.9.3) as follows: with:
- ~~A) The MODE field set to 1Ch (i.e., return error history);~~
  - ~~B) The BUFFER ID field set to the buffer ID (i.e., an error history data buffer); and~~
  - ~~C) The ALLOCATION LENGTH field set to the size of the data-in buffer.~~
- ~~For the first READ BUFFER command for a particular buffer ID, the application client sets the BUFFER OFFSET field to 000000h. If the number of bytes returned does not equal the allocation length and the total number of bytes returned from the buffer ID does not equal the maximum available length indicated in the error history directory, there is more data in the buffer ID and the application client sends another READ BUFFER command with:~~
- ~~A) The MODE field set to 1Ch (i.e., error history);-~~
  - ~~B) The BUFFER ID field set to the buffer ID (i.e., an error history data buffer);~~
  - ~~C) The BUFFER OFFSET field set to the previous buffer offset plus the previous allocation length; and~~
  - ~~D) The ALLOCATION LENGTH field set to the size of the data-in buffer;~~
- 1) Send the first READ BUFFER command with:
    - a) The MODE field set to 1Ch (i.e., error history);
    - b) The BUFFER ID field set to the buffer ID (i.e., an error history data buffer);
    - c) The BUFFER OFFSET field set to 000000h; and
    - d) The ALLOCATION LENGTH field set to the size of the data-in buffer;
  - 2) Until the number of bytes returned by the previous READ BUFFER command does not equal the specified allocation length and/or the total number of bytes returned from the buffer ID equals the maximum available length indicated in the error history directory, send zero or more additional READ BUFFER commands with:
    - a) The MODE field set to 1Ch (i.e., error history);
    - b) The BUFFER ID field set to the buffer ID (i.e., an error history data buffer);
    - c) The BUFFER OFFSET field set to the previous buffer offset plus the previous allocation length; and
    - d) The ALLOCATION LENGTH field set to the size of the data-in buffer;
- and
- 3) Clear the error history I\_T nexus and, depending on the buffer ID, release the error history snapshot by sending a READ BUFFER command with:
- A) The MODE field set to 1Ch (i.e., error history); and
  - B) The BUFFER ID field set to:
    - a) FEh (i.e., clear error history I\_T nexus) (see 6.16.9.4); or
    - b) FFh (i.e., clear error history I\_T nexus and release snapshot) (see 6.16.9.5);
  - C) The BUFFER OFFSET field set to any value allowed by table 156 (e.g., 000000h); and
  - D) The ALLOCATION LENGTH field set to any value allowed for the chosen BUFFER ID field value (see 6.16.9.4 and 6.16.9.5) (e.g., 000000h).

While an error history snapshot exists, the device server:

- a) Shall not modify the error history snapshot to reflect any changes to the error history;
- b) May or may not record events that it detects into the error history; and
- c) If it supports the WRITE BUFFER command download application client error history mode (see 6.38.14), shall record any application client error history received into the error history.

The device server shall clear the established error history I\_T nexus and not release the error history snapshot when:

- a) Upon processing of a READ BUFFER command on the error history I\_T nexus with:
  - A) The MODE field set to 1Ch (i.e., error history); and
  - B) The BUFFER ID field set to FEh (i.e., clear error history I\_T nexus) (see 6.16.9.4);
  - ~~C) The BUFFER OFFSET field set to 000000h; and {{Conflicts with table 156.}}~~
  - ~~D) The ALLOCATION LENGTH field set to 000000h; {{Conflicts with wording in 6.16.9.4.}}~~
- or
- b) An I\_T nexus loss occurs on the error history I\_T nexus.

The device server shall clear the established error history I\_T nexus and release the error history snapshot when:

- a) Upon processing of a READ BUFFER command using the same I\_T nexus that was used to establish the snapshot with:
  - A) The MODE field set to 1Ch (i.e., error history);
  - B) The BUFFER ID field set to FFh (i.e., clear error history I\_T nexus and release snapshot) (see 6.16.9.5);
  - ~~C) The BUFFER OFFSET field set to 000000h; and {{Conflicts with table 156.}}~~
  - ~~D) The ALLOCATION LENGTH field set to 000000h; {{Conflicts with wording in 6.16.9.5.}}~~
- b) A power on occurs;
- c) A hard reset occurs; or
- d) A logical unit reset occurs.

The device server shall not replace or release the error history snapshot while the error history I\_T nexus is established.

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#### 5.11.4 Clearing error history with the WRITE BUFFER command

An application client clears the portions of the error history that the device server allows to be cleared by sending a WRITE BUFFER command (see 6.38.14) with:

- a) The MODE field set to 1Ch (i.e., download error history);
- b) The BUFFER OFFSET field set to **any value allowed by 6.38.14 (e.g., 000000h)**;
- c) The PARAMETER LIST LENGTH field set to **at least 00001Ah; and**
- d) In the parameter list, the CLR bit set to one.; and
- e) All other fields in the parameter list **each set to zero as 6.38.14 allows.**

~~Clearing error history shall not affect the contents of the error history snapshot, if any, that has been created with the READ BUFFER command (see 5.11.2).~~

Clearing the error history shall not:

- a) Clear the error history I\_T nexus, if any, if it was created with the READ BUFFER command (see 5.11.2);
- or
- b) Release the error history snapshot, if any, if it was created with the READ BUFFER command (see 5.11.2).

### 6.16.9.1 Error history overview

... {{The following deleted text is covered by change in table 156 and the new paragraph that follows it.}}

~~The device server shall terminate the command with CHECK CONDITION status with the sense key set to ILLEGAL REQUEST and the additional sense code set to OPERATION IN PROGRESS if the following condition is detected:~~

- ~~a) an error history snapshot exists;~~
- ~~b) an error history I\_T nexus exists (i.e., the device server has reserved access to the error history snapshot for a particular I\_T nexus); and~~
- ~~c) the device server receives a READ BUFFER command with the MODE field set to 1Ch and the BUFFER ID field set to a value other than 02h or 03h from an I\_T nexus different than the error history I\_T nexus.~~

The BUFFER ID field (see table 156) specifies the action that the device server shall perform, and the parameter data, if any, that the device server shall return.

**Table 156 — Error history BUFFER ID field**

Code	Description	Buffer offset	Error history I_T nexus constrained	Reference
00h	Return error history directory	0000h	Yes	6.16.9.2
01h	Return error history directory and create new error history snapshot (see 3.1.i)	0000h	Yes	6.16.9.2
02h	Return error history directory and establish new error history I_T nexus (see 3.1.h)	0000h	No	6.16.9.2
03h	Return error history directory, establish new error history I_T nexus, and create new error history snapshot	0000h	No	6.16.9.2
04h - 0Fh	Reserved			
10h - EFh	Return error history	0000h - FFFFh	Yes	6.16.9.3
F0h - FDh	Reserved			
FEh	Clear error history I_T nexus	Ignored	Yes	6.16.9.4
FFh	Clear error history I_T nexus and release error history snapshot	Ignored	Yes	6.16.9.5

The command shall be terminated with CHECK CONDITION status with the sense key set to ILLEGAL REQUEST and the additional sense code set to OPERATION IN PROGRESS if the device server receives a READ BUFFER command:

- a) With the MODE field set to 1Ch;
- b) With the BUFFER ID field set to a value that table 156 shows as constrained by error history I\_T nexus;
- c) If an error history I\_T nexus exists and the command is received from an I\_T nexus that is different than I\_T nexus; and
- d) An error history snapshot exists.

...

**6.16.9.2 Error history directory**

If:

- a) there is no error history I\_T nexus;
- b) the BUFFER ID field is set to 00h or 01h and the I\_T nexus performing the READ BUFFER command is the error history I\_T nexus; or
- c) the BUFFER ID field is set to 02h or 03h;

then the device server shall:

- a) if an error history snapshot does not already exist, create an error history snapshot of the error history;
- b) if an error history snapshot already exists and the BUFFER ID field is set to 00h or 02h, preserve the error history snapshot;
- c) if an error history snapshot already exists and the BUFFER ID field is set to 01h or 03h, discard the error history snapshot and create another error history snapshot of the error history;
- d) set the error history I\_T nexus to the I\_T nexus being used for the READ BUFFER command; and
- e) return an error history directory (see table 157) indicating the error history that is available for retrieval and is stored in the error history snapshot.

Whenever allowed by established error history I\_T nexus constraints (see 6.16.9.1), if any, all error history device server actions return an error history directory (see table 157). Some error history device server actions also discard the existing error history snapshot (see 3.1.i) and create a new error history snapshot (see table x1).

**Table x1 — Summary of error history directory device server actions**

BUFFER ID field	Establish new error history I_T nexus (see 3.1.h)	Error history snapshot (see 3.1.i)	
		Preserved (if exists)	Created
00h	No <sup>a</sup>	Yes	No <sup>b</sup>
01h	No <sup>a</sup>	No	Yes
02h	Yes	Yes	No <sup>b</sup>
03h	Yes	No	Yes

<sup>a</sup> If no error history I\_T nexus is established, a new one is established.  
<sup>b</sup> If no error history snapshot exists, a new one is created.

~~If an error history snapshot already exists, the device server shall not consider this an error.~~

The error history directory is defined in table 157.

**Table 157 — Error history directory {{no changes in this table}}**

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### 6.16.9.3 Error history data buffer

~~The~~ Unless an error is encountered, the device server shall return parameter data that contains error history in a vendor specific format from the error history snapshot from the specified buffer at the specified buffer offset. ~~if all of the following are true:~~

- ~~a) the I\_T nexus performing the READ BUFFER command is the error history I\_T nexus;~~
- ~~b) the BUFFER ID field is set to a value in the range of 10h to EFh that is indicated as supported in the error history directory (see 6.16.9.2); and~~
- ~~c) the BUFFER OFFSET field is set to a valid value.~~

If the device server receives a READ BUFFER command with the MODE field set to 1Ch from the established error history I\_T nexus and the BUFFER ID field is set to a value that the error history directory (see 6.16.9.2) shows as not supported, 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.

If the value in the BUFFER OFFSET field is not supported, 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.

The amount of error history in the specified buffer shall be less than or equal to the number of bytes indicated by the MAXIMUM AVAILABLE LENGTH field in the error history directory (see 6.16.9.2).

### 6.16.9.4 Clear error history I\_T nexus

~~{{Deletions in this subclause are covered by the changes in 6.16.9.1.}}~~

If the BUFFER ID field is set to FEh ~~and the READ BUFFER command is received on the error history I\_T nexus,~~ ~~then~~ the device server shall:

- a) Clear the error history I\_T nexus, if any; and
- b) Not transfer any data.

~~If no error history I\_T nexus is established, the device server shall not consider this an error.~~

### 6.16.9.5 Clear error history I\_T nexus and release snapshot

~~{{Deletions in this subclause are covered by the changes in 6.16.9.1.}}~~

If the BUFFER ID field is set to FFh ~~and the READ BUFFER command is received on the error history I\_T nexus,~~ ~~then~~ the device server shall:

- a) Clear the error history I\_T nexus, if any,
- b) Release the error history snapshot, if any; and
- c) Not transfer any data.

~~If no error history I\_T nexus is established, the device server shall not consider this an error.~~

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### 6.38.14 Download application client error history mode (1Ch)

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A If the CLR\_SUP bit is set to one in the error history directory parameter data (see 6.16.9.2), a CLR bit set to one specifies that the device server shall:

- a) Clear the portions of the error history that the device server allows to be cleared; and
- b) ~~Clear the error history I\_T nexus, if any; {{Conflicts with 5.11.4.}}~~
- c) ~~Release the error history snapshot, if any; and {{Conflicts with 5.11.4.}}~~
- d) Ignore any application client error history specified in the parameter list.

~~A CLR bit set to zero specifies that the device server shall not ignore the CLR bit.~~

If the CLR\_SUP bit is set to one in the error history directory parameter data, a CLR bit set to zero specifies that the device server shall:

- a) Not clear the error history; and
- b) Process all application client error history specified in the parameter list.

If the CLR\_SUP bit is set to zero in the error history directory parameter data, the device server shall ignore the CLR bit.