To: T10 Technical Committee
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Subject: T10/02-193r0 SES-2 INVOP for Threshold In page

Revision History
Revision 0 (28 June 2002) first revision

Related Documents
ses2r00 - SCSI Enclosure Services - 2 revision 00

Overview
The Invalid Operation Requested (INVOP) bits in the Enclosure Status diagnostic page (6.1.3) and Array Status diagnostic page (6.1.10) are both used to report errors in various control pages.

The current INVOP definition says it is only set for Enclosure Control and Array Control diagnostic page problems, but other text indicates it is set for other control pages. The latter is intended.

The Threshold Out/In and String Out/In pages are often accessed with a write-read sequence. To verify no error occurred, however, the Enclosure Status or Array Status page also needs to be read. The Threshold In page should include its own INVOP bit to remove this requirement. Unfortunately, there are no reserved bits in the String In page that can be used.

Suggested Changes
All uses of "invop" and "invalid op" and "invalid field error" and "4.4" are excerpted...

4.4 Invalid field errors
Any invalid fields included in the CDB or parameters of a SEND DIAGNOSTIC command and any invalid fields in the CDB of a RECEIVE DIAGNOSTIC RESULTS command shall be detected by the device server in an enclosure services device. An enclosure services device shall analyze these parameters before performing the requested operations and, if there is an error, the command shall be terminated with a CHECK CONDITION status. The sense key shall be set to ILLEGAL REQUEST and the additional sense code shall identify the location of the invalid fields, CDB, or parameter data.

The device server in a non-enclosure services device does not have the capability of analyzing the validity of the CDB and the parameters. Instead, the device server shall pass the parameters through to the enclosure services process without testing the validity of the parameters and shall return GOOD status. For errors in any diagnostic page other than the Threshold In diagnostic page, The invalid op the Invalid Operation Requested bit (INVOP) (see 6.1.4) shall be set in the next Enclosure Status diagnostic page or Array Status diagnostic page returned to any initiator. For errors in the Threshold Out diagnostic page, the Invalid Operation Requested bit (INVOP) (see 6.1.8) shall be set in the next Threshold In diagnostic page returned to any initiator.No other indication of the invalid data shall be given.

6.1.2 Configuration diagnostic page
The Configuration diagnostic page returns a list of elements in an enclosure. This page shall be implemented if the device supports enclosure services and does not use the Short Enclosure Status diagnostic page. The element list shall include all elements with defined element status or controls and may list any other elements in the enclosure. The Configuration diagnostic page provides enclosure descriptor information and parameters. The Configuration diagnostic page optionally provides descriptive text that applications clients may use to identify elements in more detail. The Configuration diagnostic page shall be read by the RECEIVE DIAGNOSTIC RESULTS command. If a PAGE CODE of 01h is transmitted using a SEND DIAGNOSTIC command, the command shall be treated as having an invalid field error (see 4.4).

6.1.3 Enclosure Control diagnostic page
...

The GENERATION CODE field shall have the value expected to be found in the GENERATION CODE field of the Configuration diagnostic page (see 6.1.2). To prevent the misinterpretation of the OVERALL CONTROL and ELEMENT CONTROL fields, the enclosure services process shall verify that the value of the GENERATION CODE field matches the generation code value known by the enclosure services process. If there is a mismatch, the application client shall be notified ~~that the GENERATION CODE field is invalid by the mechanisms described in 4.4~~of an invalid field error (see 4.4) and the enclosure services process shall ignore the remainder of the Enclosure Control diagnostic page.

6.1.4 Enclosure Status diagnostic page
The Enclosure Status diagnostic page returns status information for each of the elements identified by the Configuration diagnostic page. In addition, an OVERALL STATUS field is provided to collect information about the collection of elements of the same type defined by each TYPE DESCRIPTOR HEADER. The information provides the status about many functions within the addressed enclosure.

...

The INVOP, INFO, NON-CRIT, CRIT, and UNRECOV bits are mandatory. The bits may be read with an allocation length greater than ~~1~~ one and may be examined by an enclosure polling procedure to determine if events have occurred that require reading the complete page. The bits are set independently and may be set in any combination. The bits may be set by either the enclosure services process or with the Enclosure Control diagnostic page.

The Invalid Operation Requested bit (INVOP) shall be set to one if an invalid field error (see 4.4) has occurred (e.g., an Enclosure Control diagnostic page or an Array Control diagnostic page with an invalid format has previously been transmitted to the enclosure services process and an application client has not already been informed of the error). For enclosure service devices, the INVOP bit shall be set one time in the first Enclosure Status diagnostic page or Array Status diagnostic page read by the same initiator that transmitted the invalid control page. If the application client was notified by a CHECK CONDITION when the SEND DIAGNOSTIC command transmitted the invalid control page, the INVOP bit shall not be set. Enclosure services processes that are accessed through another device type shall set the INVOP bit one time in the first enclosure status or Array Status diagnostic page read by any application client.

6.1.5 Help Text diagnostic page
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The Help Text diagnostic page shall be read by the RECEIVE DIAGNOSTIC RESULTS command. If a PAGE CODE of 03h is transmitted using a SEND DIAGNOSTIC command, the command shall be treated as having an invalid field error (see 4.4).

6.1.7 Threshold Out diagnostic page
…
The GENERATION CODE field shall have the value expected to be found in the GENERATION CODE field of the Configuration diagnostic page (see 6.1.2). To prevent the misinterpretation of the OVERALL THRESHOLD and ELEMENT THRESHOLD fields, the enclosure services process shall verify that the value of the GENERATION CODE field matches the generation code value known by the enclosure services process. If there is a mismatch, the application client shall be notified ~~that the GENERATION CODE field is invalid by the mechanisms described in 4.4~~of an invalid field error (see 4.4) and the enclosure services process shall ignore the remainder of the Threshold Out diagnostic page.
…

6.1.8 Threshold In page
…

Table 13 – Format of Threshold In diagnostic page

Bits Bytes	7	6	5	4	3	2	1	0
0	PAGE CODE (05h)							

1	Rsvd	Rsvd	Rsvd	INVOP	Rsvd	Rsvd	Rsvd	Rsvd
2	(MSB)							
3			PAGE LENGTH (n-3)					(LSB)
...			...					

…

The Invalid Operation Requested bit (INVOP) shall be set if a Threshold Out diagnostic page with an invalid format has previously been transmitted to the enclosure services process and an application client has not already been informed of the error. For enclosure service devices, the INVOP bit shall be set one time in the first Threshold In diagnostic page read by the same initiator that transmitted the invalid control page. If the application client was notified by a CHECK CONDITION when the SEND DIAGNOSTIC command transmitted the invalid Threshold Out diagnostic page, the INVOP bit shall not be set. Enclosure services processes that are accessed through another device type shall set the INVOP bit one time in the first Threshold In page read by any application client.

6.1.10 Array Control diagnostic page
...
The GENERATION CODE field shall have the value expected to be found in the GENERATION CODE field of the Configuration diagnostic page (see 6.1.2). To prevent the misinterpretation of the OVERALL CONTROL and ELEMENT CONTROL fields, the enclosure services process shall verify that the value of the GENERATION CODE field matches the generation code value known by the enclosure services process. If there is a mismatch, the application client shall be notified that the GENERATION CODE field is invalid by the mechanisms described in 4.4of an invalid field error (see 4.4) and the enclosure services process shall ignore the remainder of the Array Control diagnostic page.

6.1.11 Array Status diagnostic page
The optional Array Status diagnostic page returns the array elements for the devices resident in the enclosure.

The INVOP, INFO, NON-CRIT, CRIT, and UNRECOV bits are implemented as in the Enclosure Status diagnostic page, described in 6.1.4.

6.1.12 Element Descriptor diagnostic page
The Element Descriptor diagnostic page returns a list of variable length fields, one for each element in the Enclosure Status diagnostic page. The fields return vendor specific descriptive text for each element. The Element Descriptor diagnostic page shall be read by the RECEIVE DIAGNOSTIC RESULTS command. If a PAGE CODE of 07h is transmitted using a SEND DIAGNOSTIC command, the command shall be treated as having an invalid field error (see 4.4).

7 Element definitions
7.2 Formats for status and control fields
7.2.2 Format for all control fields
…
The CONTROL INFORMATION field is defined for each element type in 7.3. Control information containing conflicting bits may cause unpredictable behavior or may cause the enclosure services process to set the INVOP bit to the application client. (Seereport an invalid field error (see 4.4.).

7.3.16 Language element
The format of the CONTROL INFORMATION field for a language element is defined in table 59.
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The LANGUAGE CODE field requests the language and character encoding to be used in all fields that specify the capability of being modified by the language element. The enclosure should provide external indications in the requested language. The LANGUAGE CODE field shall contain either 0000h or the two-letter lowercase symbols defined by ISO 639 to indicate which language is requested. The two-letter codes shall be expressed as US-ASCII characters as defined by ISO

8859-1. If the LANGUAGE CODE field has a value of 0000h, the language shall be the default of English, using the US-ASCII character set. If the two characters contain the ISO 639 two-letter code for a language that is supported by the enclosure services process, the glyphs transmitted by the enclosure services process shall be encoded using the Unicode standard, UCS-2 canonical form. If the LANGUAGE CODE field contains a value other than 0000h or the two-letter code of a language supported by the enclosure services process, the default of English with the US-ASCII character set shall be used and an invalid ~~operation indication~~field error shall be presented ~~as described in~~(see 4.4).

A.6 String Out diagnostic page using sub-enclosure identifiers
When sub-enclosure accessing is used, the String Out diagnostic page transmitted to the primary sub-enclosure includes the VENDOR SPECIFIC field required for the single sub-enclosure specified by the sub-enclosure identifier.
...
The SUB-ENCLOSURE IDENTIFIER field specifies a vendor specific identifier for the sub- enclosure to which the application client wants the VENDOR SPECIFIC field sent. The SUB-ENCLOSURE IDENTIFIER value shall match a SUB-ENCLOSURE IDENTIFIER value found in the Configuration diagnostic page, or the enclosure services process shall report an invalid field error ~~using one of the methods described in 4.4~~(see 4.4).