

T10/07-403 Revision 1

Date: January 3, 2008

To: T10 Committee

From Brad Besmer, LSI

Subject: SAS-2 Add SMP Report General Open Response While Configuring

Overview

There currently exists expanders that do not conform to SAS 2.0 specified Self Configuration expander device rules. This causes problems in real-world use cases. The rule that is not being conformed to is in section 4.7.2:

While the CONFIGURING bit is set to one, the expander device shall return OPEN_REJECT (RETRY) for any connection requests that would otherwise have resulted in OPEN_REJECT (NO DESTINATION) (see 4.6.6.3)

The problem that can occur is during a device insertion, a initiator device may discover the device presence and attempt to open connection to the device prior to one or more self-configuring devices completing the route-table programming to that device, thereby leading to an OPEN_REJECT(NO DESTINATION).

The proposed change is to add a new bit to Report General to indicate if the expander device is following this rule, so the initiator device can react to this mal-conformed device appropriately.

Additionally, this bit needs to be in the SAS 1.1-defined Report General Response so SAS 1.1 initiators can react appropriately, hence the reason why this is not added to the end of the response.

10.4.3.3 REPORT GENERAL function

The REPORT GENERAL function returns general information about the SAS device (e.g., a SAS device contained in an expander device). This SMP function shall be implemented by all management device servers.

Table 317 defines the request format.

Table 317 — REPORT GENERAL request

| Byte\Bit | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
|----------|----------------------|-----|---|---|---|---|---|-------|--|
| 0 | SMP FRAME TYPE (40h) | | | | | | | | |
| 1 | FUNCTION (00h) | | | | | | | | |
| 2 | Reserved | | | | | | | | |
| 3 | REQUEST LENGTH (00h) | | | | | | | | |
| 4 | (MSB) | CRC | | | | | | | |
| 7 | | | | | | | | (LSB) | |

The SMP FRAME TYPE field shall be set to 40h.

The FUNCTION field shall be set to 00h.

The REQUEST LENGTH field shall be set to 00h.

The CRC field is defined in 10.4.3.1.

Table 318 defines the response format.

Table 318 — REPORT GENERAL response (part 1 of 2)

| Byte\Bit | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|------------------------------|--------------------------------|-------------|---|---------------------------------------|--|-------------------------------------|-------|
| 0 | SMP FRAME TYPE (41h) | | | | | | | |
| 1 | FUNCTION (00h) | | | | | | | |
| 2 | FUNCTION RESULT | | | | | | | |
| 3 | RESPONSE LENGTH (10h) | | | | | | | |
| 4 | (MSB) | EXPANDER CHANGE COUNT | | | | | | (LSB) |
| 5 | | | | | | | | |
| 6 | (MSB) | EXPANDER ROUTE INDEXES | | | | | | (LSB) |
| 7 | | | | | | | | |
| 8 | Reserved | | | | | | | |
| 9 | NUMBER OF PHYS | | | | | | | |
| 10 | TABLE TO TABLE SUPPORTED | Reserved | | OPEN RESPONSE WHILE CONFIGURING | CONFIGURES OTHERS | CONFIGURING | EXTERNALLY CONFIGURABLE ROUTE TABLE | |
| 11 | Reserved | | | | | | | |
| 12 | ENCLOSURE LOGICAL IDENTIFIER | | | | | | | |
| 19 | | | | | | | | |
| 20 | Reserved | | | | | | | |
| 29 | | | | | | | | |
| 30 | (MSB) | STP BUS INACTIVITY TIME LIMIT | | | | | | (LSB) |
| 31 | | | | | | | | |
| 32 | (MSB) | STP MAXIMUM CONNECT TIME LIMIT | | | | | | (LSB) |
| 33 | | | | | | | | |
| 34 | (MSB) | STP SMP I_T NEXUS LOSS TIME | | | | | | (LSB) |
| 35 | | | | | | | | |
| 36 | NUMBER OF ZONE GROUPS | Reserved | ZONE LOCKED | PHYSICAL PRESENCE SUPPORTED | PHYSICAL PRESENCE ASSERTED | ZONING SUPPORTED | ZONING ENABLED | |
| 37 | Reserved | | SAVING | SAVING ZONE MANAGER PASSWORD SUPPORTED | SAVING ZONE PHY INFORMATION SUPPORTED | SAVING ZONE PERMISSION TABLE SUPPORTED | SAVING ZONING ENABLED SUPPORTED | |

Table 318 — REPORT GENERAL response (part 2 of 2)

| Byte\Bit | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|--------------------------|---|---|---|---|---|---|-------|
| 38 | (MSB) | MAXIMUM NUMBER OF ROUTED SAS ADDRESSES | | | | | | (LSB) |
| 39 | | | | | | | | (LSB) |
| 40 | | ACTIVE ZONE MANAGER SAS ADDRESS | | | | | | |
| 47 | | | | | | | | |
| 48 | (MSB) | ZONE LOCK INACTIVITY TIME LIMIT | | | | | | (LSB) |
| 49 | | | | | | | | (LSB) |
| 50 | | Reserved | | | | | | |
| 51 | | | | | | | | |
| 52 | | Reserved | | | | | | |
| 53 | | FIRST ENCLOSURE CONNECTOR ELEMENT INDEX | | | | | | |
| 54 | | NUMBER OF ENCLOSURE CONNECTOR ELEMENT INDEXES | | | | | | |
| 55 | | Reserved | | | | | | |
| 56 | REDUCED FUNCTIONALITY | Reserved | | | | | | |
| 57 | | TIME TO REDUCED FUNCTIONALITY | | | | | | |
| 58 | | INITIAL TIME TO REDUCED FUNCTIONALITY | | | | | | |
| 59 | | MAXIMUM REDUCED FUNCTIONALITY TIME | | | | | | |
| 60 | (MSB) | LAST SELF-CONFIGURATION STATUS DESCRIPTOR INDEX | | | | | | (LSB) |
| 61 | | | | | | | | (LSB) |
| 62 | (MSB) | MAXIMUM NUMBER OF STORED SELF-CONFIGURATION STATUS DESCRIPTORS | | | | | | (LSB) |
| 63 | | | | | | | | (LSB) |
| 64 | (MSB) | LAST PHY EVENT LIST DESCRIPTOR INDEX | | | | | | (LSB) |
| 65 | | | | | | | | (LSB) |
| 66 | (MSB) | MAXIMUM NUMBER OF STORED PHY EVENT LIST DESCRIPTORS | | | | | | (LSB) |
| 67 | | | | | | | | (LSB) |
| 68 | (MSB) | CRC | | | | | | (LSB) |
| 71 | | | | | | | | (LSB) |

The SMP FRAME TYPE field shall be set to 41h.

The FUNCTION field shall be set to 00h.

The FUNCTION RESULT field is defined in 10.4.3.2.

The RESPONSE LENGTH field shall be set to 10h. For compatibility with previous versions of this standard, a RESPONSE LENGTH field set to 00h indicates that there are 6 dwords before the CRC field.

The EXPANDER CHANGE COUNT field counts the number of Broadcast (Change)s originated by an expander device (see 7.11). Management device servers in expander devices shall support this field. Management device servers in other device types (e.g., end devices) shall set this field to 0000h. This field shall be set to at least 0001h at power on. If the expander device has originated Broadcast (Change) for any reason described in 7.11 since transmitting any SMP response frame containing an EXPANDER CHANGE COUNT field, it shall increment this field at least once from the value in the previous REPORT GENERAL response. It shall not increment this field when forwarding a Broadcast (Change). This field shall wrap to at least 0001h after the maximum value (i.e., FFFFh) has been reached.

NOTE 1 - Application clients that use the EXPANDER CHANGE COUNT field should read it often enough to ensure that it does not increment a multiple of 65 535 times between reading the field in an expander device compliant with this standard or a multiple of 65 536 times between reading the field in an expander device compliant with previous versions of this standard.

NOTE 2 - Management device servers in expander devices compliant with previous versions of this standard may return an EXPANDER CHANGE COUNT field set to 0000h.

NOTE 3 - The originated Broadcast (Change) count is also reported in the REPORT BROADCAST response (see 10.4.3.8).

The EXPANDER ROUTE INDEXES field indicates the maximum number of expander route indexes per phy for the expander device (see 4.6.7.3). Management device servers in externally configurable expander devices containing phy-based expander route tables shall support this field. Management device servers in other device types (e.g., end devices, externally configurable expander devices with expander-based expander route tables, and self-configuring expander devices) shall set the EXPANDER ROUTE INDEXES field to zero. Not all phys in an externally configurable expander device are required to support the maximum number indicated by this field.

The NUMBER OF PHYS field indicates the number of phys in the device, including any virtual phys and any vacant phys.

A TABLE TO TABLE SUPPORTED bit set to one indicates the expander device is a self-configuring expander device that supports its table routing phys being attached to table routing phys in other expander devices. The TABLE TO TABLE SUPPORTED bit shall only be set to one if the EXTERNALLY CONFIGURABLE ROUTE TABLE bit is set to zero. A TABLE TO TABLE SUPPORTED bit set to zero indicates the expander device is not a self-configuring expander device that supports its table routing phys being attached to table routing phys in other expander devices.

[A OPEN RESPONSE WHILE CONFIGURING bit set to one indicates that the expander device returns OPEN_REJECT\(RETRY\) for any connection requests that would otherwise have resulted in OPEN_REJECT\(NO_DESTINATION\) while the CONFIGURING bit is set to one \(see 4.7.2\). A OPEN RESPONSE WHILE CONFIGURING BIT set to zero indicates the expander device does not return OPEN_REJECT\(RETRY\) in that case. Self-configuring expander devices compliant with this standard shall set the OPEN RESPONSE WHILE CONFIGURING bit to one.](#)

A CONFIGURES OTHERS bit set to one indicates that the expander device is a self-configuring expander device that performs the configuration subprocess defined in 4.8. A CONFIGURES OTHERS bit set to zero indicates the expander device may or may not perform the configuration subprocess. Self-configuring expander devices compliant with this standard shall set the CONFIGURES OTHERS bit to one.

NOTE 4 - If the CONFIGURES OTHERS bit is set to zero, the expander device may configure all externally configurable expander devices in the SAS domain.

A CONFIGURING bit set to one indicates that either:

- a) the management device server is in a self-configuring expander device, the self-configuring expander device's management application client is currently performing the discover process (see 4.7), and it has identified at least one change to its expander routing table; or

- b) the zoning expander device is locked and the zoning expander shadow values differ from the zoning expander active values.

A CONFIGURING bit set to zero indicates that the management device server is not in a self-configuring expander device currently performing the discover process and changing its expander routing table. Changes in this bit from one to zero result in a Broadcast (Change) being originated (see 7.11). Management device servers in self-configuring expander devices shall support this bit. Management device servers in externally configurable expander devices and in other device types shall set the CONFIGURING bit to zero.

An EXTERNALLY CONFIGURABLE ROUTE TABLE bit set to one indicates that the management device server is in an externally configurable expander device that has a phy-based expander route table that is required to be configured with the SMP CONFIGURE ROUTE INFORMATION function (see 4.6.7.3). An EXTERNALLY CONFIGURABLE ROUTE TABLE bit set to zero indicates that the management device server is not in an externally configurable expander device (e.g., it is in an end device, in a self-configuring expander device, or in an expander device with no phys with table routing attributes).

The ENCLOSURE LOGICAL IDENTIFIER field identifies the enclosure, if any, in which the device is located, and is defined in SES-2. The ENCLOSURE LOGICAL IDENTIFIER field shall be set to the same value reported by the enclosure services process, if any, for the enclosure. An ENCLOSURE LOGICAL IDENTIFIER field set to zero indicates no enclosure information is available.

The STP BUS INACTIVITY TIME LIMIT field indicates the bus inactivity time limit for STP connections, which is set by the CONFIGURE GENERAL function (see 10.4.3.17).

The STP MAXIMUM CONNECT TIME LIMIT field indicates the maximum connect time limit for STP connections, which is set by the CONFIGURE GENERAL function (see 10.4.3.17).

The STP SMP I_T NEXUS LOSS TIME field indicates the time that an STP target port and an SMP initiator port retry certain connection requests which is set by the CONFIGURE GENERAL function (see 10.4.3.17).

[Editor's Note 1: That should be a "minimum" time](#)

The number of zone groups field indicates the number of zone groups (e.g., the number of entries in the zone group permission table) supported by the expander device and is defined in table 319.

Table 319 — NUMBER OF ZONE GROUPS field

| Code | Description |
|------------|-----------------|
| 00b | 128 zone groups |
| 01b | 256 zone groups |
| All others | Reserved |

A ZONE LOCKED bit set to one indicates that the zoning expander device is locked (see 4.9.6.2). A ZONE LOCKED bit set to zero indicates that the zoning expander device is not locked.

A PHYSICAL PRESENCE SUPPORTED bit set to one indicates that the expander device supports physical presence as a mechanism for allowing locking from phys in zone groups without access to zone group 2. A PHYSICAL PRESENCE SUPPORTED bit set to zero indicates that the expander device does not support physical presence as a mechanism for allowing locking.

A PHYSICAL PRESENCE ASSERTED bit set to one indicates that the expander device is currently detecting physical presence. A PHYSICAL PRESENCE ASSERTED bit set to zero indicates that the expander device is not currently detecting physical presence. The PHYSICAL PRESENCE ASSERTED bit shall be set to zero if the PHYSICAL PRESENCE SUPPORTED bit is set to zero.

A ZONING SUPPORTED bit set to one indicates that zoning is supported by the expander device (i.e., it is a zoning expander device). A ZONING SUPPORTED bit set to zero indicates that zoning is not supported by the expander device.

A ZONING ENABLED bit set to one indicates that zoning is enabled in the expander device. A ZONING ENABLED bit set to zero indicates that zoning is disabled in the expander device. The ZONING ENABLED bit shall be set to zero if the ZONING SUPPORTED bit is set to zero.

A SAVING bit set to one indicates that the management device server is currently saving zoning values to non-volatile storage and may return a function result of BUSY for zone management functions that access saved zoning values. A SAVING bit set to zero indicates that the management device server is not currently saving zoning values to non-volatile storage.

A SAVING ZONE MANAGER PASSWORD SUPPORTED bit set to one indicates that saving the zone manager password is supported. A SAVING ZONE MANAGER PASSWORD SUPPORTED bit set to zero indicates that saving the zone manager password is not supported.

A SAVING ZONE PHY INFORMATION SUPPORTED bit set to one indicates that saving the zone phy information is supported. A SAVING ZONE PHY INFORMATION SUPPORTED bit set to zero indicates that saving the zone phy information is not supported.

A SAVING ZONE PERMISSION TABLE SUPPORTED bit set to one indicates that saving the zone permission table is supported. A SAVING ZONE PERMISSION TABLE SUPPORTED bit set to zero indicates that saving the zone permission table is not supported.

A SAVING ZONING ENABLE SUPPORTED bit set to one indicates that saving the ZONING ENABLED bit is supported. A SAVING ZONING ENABLE SUPPORTED bit set to zero indicates that saving the ZONING ENABLED bit is not supported.

The MAXIMUM NUMBER OF ROUTED SAS ADDRESSES field indicates the number of routed SAS addresses in an expander-based expander route table (see 4.6.7.3 and 4.9.3.4). Management device servers in expander devices containing expander-based expander route tables shall support this field. Management device servers in other device types (e.g., end devices and expander devices with phy-based expander route tables) shall set this field to 0000h.

The ACTIVE ZONE MANAGER SAS ADDRESS field indicates the SAS address of the zone manager that last locked the zoning expander device. If the zoning expander device is currently being configured by a vendor-specific sideband method then the ACTIVE ZONE MANAGER SAS ADDRESS field shall be set to zero. This field shall be set to zero at power on.

The ZONE LOCK INACTIVITY TIME LIMIT field indicates the minimum time between any SMP ZONE LOCK requests, SMP zone configuration function requests, or SMP ZONE ACTIVATE requests from the active zone manager that the locked expander device allows and is set in the SMP ZONE LOCK request (see 10.4.3.20).

The FIRST ENCLOSURE CONNECTOR ELEMENT INDEX field indicates the lowest CONNECTOR ELEMENT INDEX field of all the expander phys in all the expander devices in the enclosure that have CONNECTOR TYPE fields set to 20h through 2Fh (i.e., an internal connector to an end device) in their SMP DISCOVER responses.

The NUMBER OF ENCLOSURE CONNECTOR ELEMENT INDEXES field indicates the number of expander phys in all the expander devices in the enclosure that have CONNECTOR TYPE fields set to 20h through 2Fh (i.e., an internal connector to an end device) in their SMP DISCOVER responses.

NOTE 5 - The NUMBER OF ENCLOSURE CONNECTOR ELEMENT INDEXES field assumes that all internal connectors to end devices are assigned to a contiguous range of CONNECTOR ELEMENT INDEX field values.

A REDUCED FUNCTIONALITY bit set to one indicates that:

- a) the expander device is scheduled to reduce its functionality (see 4.6.8) in the time indicated in the TIME TO REDUCED FUNCTIONALITY field; or
- b) that the expander device is currently operating with reduced functionality (see 4.6.8).

A REDUCED FUNCTIONALITY bit set to zero indicates the expander device is not scheduled to reduce functionality and that the contents of the TIME TO REDUCED FUNCTIONALITY field shall be ignored.

If the REDUCED FUNCTIONALITY bit set to one, then the TIME TO REDUCED FUNCTIONALITY field indicates the time, in 100 ms increments, remaining until the expander device is scheduled to reduce functionality. The expander device starts the reduced functionality delay timer after originating a Broadcast (Expander) (see 4.6.8).

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The INITIAL TIME TO REDUCED FUNCTIONALITY field indicates the minimum period of time, in 100 ms increments, that an expander device waits from originating a Broadcast (Expander) to reducing functionality. The expander device should set the default value for the INITIAL TIME TO REDUCED FUNCTIONALITY field to at least 2 000 ms (i.e., 14h).

The MAXIMUM REDUCED FUNCTIONALITY TIME field indicates the maximum time, in seconds, that the expander device responds with OPEN_REJECT (RETRY) to connection requests that map to an expander phy or an SMP target port that is not accessible during expander device reduced functionality. This timer starts after the reduced functionality delay timer expires.

The LAST SELF-CONFIGURATION STATUS DESCRIPTOR INDEX field is defined in the REPORT SELF-CONFIGURATION STATUS response (see 10.4.3.5).

The MAXIMUM NUMBER OF STORED SELF-CONFIGURATION STATUS DESCRIPTORS field indicates the maximum number of self-configuration status descriptors (see 10.4.3.5.4) that the management device server supports.

The LAST PHY EVENT LIST DESCRIPTOR INDEX field is defined in the REPORT PHY EVENT LIST response (see 10.4.3.15).

The MAXIMUM NUMBER OF STORED PHY EVENT LIST DESCRIPTORS field indicates the maximum number of phy event list descriptors (see 10.4.3.13.4) that the management device server supports.

The CRC field is defined in 10.4.3.2.