To: T10 Technical Committee
From: Rob Elliott, HP (elliott@hp.com)
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Subject: T10/03-268r0 SAS-1.1 BROADCAST (CHANGE) on virtual phy enable and disable

Revision History
Revision 0 (28 July 2003) first revision

Related Documents
sas1r00 - Serial Attached SCSI 1.1 revision 0

Overview
1. When a virtual phy is disabled, the SAS address of the "attached" internal SAS port is no longer accessible. Initiators in the domain need to be notified of this to remove the address from their lists and to remove the address from routing tables in expanders.

Similarly, when a virtual phy is enabled, a new SAS address appears in the SAS domain that needs to be discovered and entered into routing tables.

In SAS-1, the description of the DISABLE function mentions "stop...received dwords" which could imply loss of dword synchronization, but this is not very clear.

In SAS-1.1, it should be clear that BROADCAST (CHANGE) is generated when virtual phys are enabled and disabled.

2. BROADCAST (CHANGE) should not be sent on just "loss of dword synchronization." It should be sent only on loss of dword synchronization that results in the SP state machine rerunning the link reset sequence (i.e. SP15 and SP22 transitioning to SP0 after receiving a COMINIT, receiving a DWS Lost message that does not result in a new Start DWS message, or receiving a DWS Reset message). The SAS address(es) behind the phy are still addressable why the SP_DWS state machine is trying to reacquire dword sync.

3. A few other editorial tweaks. The SATA spinup hold and self-configuring expander reasons were not mentioned in 7.11 and there was no "home" for the self-configuring expander reason. The lists in 10.4.3.3 and 10.4.3.5 should just exclude the forwarding reason rather than list all the non-forwarding reasons described in 7.11.

Suggested Changes
4.6.5 Broadcast primitive processor (BPP)
The BPP receives broadcast primitive requests from each expander phy and requests transmission of those requests on all expander ports except the expander port from which the broadcast primitive request was received.

In a self-configuring expander device (see 4.1.5), the BPP requests transmission of a BROADCAST (CHANGE) when it completes configuration (see 10.4.3.3).

4.6.6.5 BPP interface
Table 14 describes the requests from an expander phy to the BPP.

Table 14 — Expander phy to BPP requests

Message	Description
Broadcast Event Notify (Phy Not Ready)	Request to transmit a BROADCAST (CHANGE) on all other ports because an expander phy's lost dword synchronization (see 6.7)XL state machine transitioned from the SP15:SAS_PHY_Ready or SP22:SATA_PHY_Ready state to the SP0:OOB_COMINIT state (see 6.7) or a virtual phy has been disabled (see 10.4.3.10). See 7.11.

Broadcast Event Notify (SATA Spinup Hold)	Request to transmit a BROADCAST (CHANGE) on all other ports because the SATA spinup hold state has been reached (see 6.7 and 6.9). See 7.11.
Broadcast Event Notify (Identification Sequence Complete)	Request to transmit a BROADCAST (CHANGE) on all other ports because an expander phy has completed the identification sequence (see 7.9) or a virtual phy has been enabled (see 10.4.3.10). See 7.11.

7.11 SAS domain changes

After power on or receiving BROADCAST (CHANGE), an application client in each SAS initiator port should scan the SAS domain using the discover process (see 4.6.7.4) to search for SAS initiator devices, SAS target devices, and expander devices.

The expander device shall transmit BROADCAST (CHANGE) from at least one phy in each expander port other than the expander port that is the cause for transmitting BROADCAST (CHANGE).

Expander devices shall transmit BROADCAST (CHANGE) for the following reasons:

a) after an expander phy's has lost dword synchronization XL state machine transitions from the SP15:SAS_PHY_Ready or SP22:SATA_PHY_Ready state to the SP0:OOB_COMINIT state (see 6.7);

> NOTE: this occurs when the expander phy is reset or disabled with the SMP PHY CONTROL function (see 10.4.3.10) as well as when dword synchronization is unexpectedly lost);

x) after a virtual phy has been disabled (see 10.4.3.10);

x) after the SATA spinup hold state has been reached (see 6.9);

b) after the link reset sequence completes (see 7.9); and

x) after a virtual phy has been enabled (see 10.4.3.10);

x) after a self-configuring expander device has completed configuration and has changed its CONFIGURING bit from one to zero in the SMP REPORT GENERAL function (see 10.4.3.3); and

c) after the expander device receives BROADCAST (CHANGE).

BROADCAST (CHANGE) may be sent by SAS initiator ports to force other SAS initiator ports and expander ports to re-run the discover process, but should not be sent by SAS target ports.

A SAS initiator port that detects BROADCAST (CHANGE) shall follow the SAS initiator device rules (see 7.9.2) to discover the topology.

A fanout expander device that detects BROADCAST (CHANGE) shall follow the fanout device rules (see 7.9.3) to discover the topology.

An edge expander device that detects BROADCAST (CHANGE) shall follow the edge device rules (see 7.9.4).

See 10.4.3.3 for details on counting BROADCAST (CHANGE) generation in an expander device.

10.4.3.3 REPORT GENERAL function

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The EXPANDER CHANGE COUNT field counts the number of BROADCAST (CHANGE)s originated by an expander device (see 7.11). Expander devices shall support this field. Other device types shall not support this field. This field shall be set to zero at power on. The expander device shall increment this field at least once when it transmits a BROADCAST (CHANGE) for one of the following reasons:

a) after an expander phy has lost dword synchronization and restarted the link reset sequence (see 6.7);

b) after the link reset sequence completes on an expander phy; or

~~c) after a self-configuring expander device has completed configuration and has changed its CONFIGURING bit from one to zero.~~ any reason other than forwarding a BROADCAST (CHANGE) (see 7.11).

The expander device need not increment this field again unless a REPORT GENERAL response is transmitted. This field shall not be incremented when forwarding a BROADCAST (CHANGE) from another expander device. The EXPANDER CHANGE COUNT field shall wrap to zero after the maximum value (i.e., FFFFh) has been reached.

10.4.3.5 DISCOVER function

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The PHY CHANGE COUNT field counts the number of BROADCAST (CHANGE)s originated by an expander phy.

Expander devices shall support this field. Other device types shall not support this field. This field shall be set to zero at power on. The expander device shall increment this field at least once when it transmits a BROADCAST (CHANGE) for ~~one of the following reasons:~~

~~a) after the expander phy has lost dword synchronization and restarted the link reset sequence (see 6.7); or~~

~~b) after the link reset sequence completes on the expander phy~~ any reason originating from the expander phy other than forwarding a BROADCAST (CHANGE) (see 7.11).

The expander device need not increment the PHY CHANGE COUNT field again unless a DISCOVER response is transmitted. This field shall not be incremented when forwarding a BROADCAST (CHANGE) from another expander device. The PHY CHANGE COUNT field shall wrap to zero after the maximum value (i.e., FFh) has been reached.