

To: T10 Technical Committee
From: Robert Sheffield, Intel (robert.l.sheffield@intel.com)
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Subject: 04-357r1 SAS-1.1: Another Port Selector Detection Gap

Revision history

Revision 0 (28 October 2004) First revision

Revision 1 (10 November 2004) Editorial changes from November SAS Protocol WG

Related documents

sas1.1-r06 - Serial Attached SCSI 1.1 revision 6

Overview

There is a problem with the method used to detect when a SATA port selector is no longer present in the SP state machine. The intent was to detect the presence or absence of a COMWAKE sent by a port selector in response to the COMINIT. The assumption was that transmission of COMINIT would complete before the port selector sent the COMWAKE response. But there's a timing problem. The port selector may detect COMINIT after only the 4th IDLE/Burst pair of the COMINIT, but the SP state machine still has two more IDLE/Burst pairs to transmit, and the Negation time to complete before taking the transition from SP0 to SP1. That's a total of 2080 OOB. If the port selector immediately responds with COMWAKE after the 4th IDLE/Burst pair of the COMINIT, the SP state machine may detect COMWAKE Received after the 4th IDLE/Burst pair of the COMWAKE signal, which requires as little as 1280 OOB. So, assuming the turnaround latency of the Port Selector, plus round-trip propagation time is less than 800 OOB (about 500 nS), the SP state machine could detect the COMWAKE reply from the port selector before completing transmission of COMINIT and taking the transition from SP0 to SP1.

The description of SP0 says that if the COMWAKE is detected, the ATTACHED SATA PORT SELECTOR bit will be set (if it isn't already). So it's possible to enter SP1 with the bit already set in response to the COMINIT sent in SP0. It was the assumption in SP1 that if a port selector were present, a COMWAKE would be received in SP1 in response to the COMINIT sent in SP0, and the absence of a COMWAKE detected in SP1 would indicate the non-existence of the port selector. But it's possible (even likely) that the COMWAKE will be detected before the transition from SP0 to SP1, and another COMWAKE wouldn't normally be expected. This would then cause SP1 to erroneously clear the ATTACHED SATA PORT SELECTOR bit.

The proposed solution is summarized as follows:

- a) The SP state machine shall maintain a state machine variable, COMWAKE_Received (distinct from the COMWAKE detected message).
- b) A COMWAKE Detected message received in SP0 or SP1 shall set COMWAKE_Received to 1.
- c) Any transition to SP0 shall set COMWAKE_Received to 0.
- d) The transition from SP1 to SP0 shall check if COMWAKE_Received is 0 or 1 (prior to the transition). If it is zero and the ATTACHED SATA PORT SELECTOR bit is 1, the transition shall clear the ATTACHED SATA PORT SELECTOR bit.

This proposal also includes an editorial change to Figure 85 - SP (phy layer) state machine - OOB sequence states to remove a duplicate incoming message, COMWAKE detected, in SP4:OOB_COMSAS.

Suggested changes**6.8.1 SP state machine overview**

<text omitted>

The SP state machine shall start in the SP0:OOB_COMINIT state after:

- a) a power on;
- b) a hard reset; or
- c) receiving a Management Reset request from the management layer (e.g., from the SMP PHYCONTROL function in an expander device).

The SP state machine shall maintain a state machine variable, MgmtReset, to indicate whether SP0:OOB_COMINIT was last entered due to a Management Reset, or a defined transition from another state (see 6.8.3.2.1). If SP0:OOB_COMINIT was last entered due to a Management Reset, it shall set MgmtReset to one. If SP0:OOB_COMINIT was last entered by a defined transition from another state, it shall set MgmtReset to zero. MgmtReset shall be set to zero by any transition out of SP7:OOB_AwaitCOMSAS.

If the phy supports attachment to a SATA device (i.e., the phy is attached to an STP/SATA bridge), and supports attachment to a SATA port selector, the SP state machine shall maintain a state machine variable, COMWAKE_Received, to indicate whether a COMWAKE detected message was received in SP0:OOB_COMINIT or SP1:OOB_AwaitCOMX since the last time SP0:OOB_COMINIT was entered. A COMWAKE Detected message received in SP0:OOB_COMINIT or SP1:OOB_AwaitCOMX shall set COMWAKE_Received to a value of one. Any transition to SP0:OOB_COMINIT shall set COMWAKE_Received to zero.

The SP state machine sends the following messages to the SP_DWS state machine (see 6.9):

- a) Start DWS; and
- b) Stop DWS.

The SP state machine receives the following messages from the SP_DWS state machine:

- a) DWS Lost; and
- b) DWS Reset.

<text omitted>

Upon entry into this state, this state shall:

- a) send a Transmit COMINIT message to the SP transmitter;
- b) send a Stop DWS message to the SP_DWS state machine; and
- c) send a Phy Layer Not Ready confirmation to the link layer.

This state machine waits for receipt of a COMINIT Transmitted message and/or a COMINIT Detected message.

Entry into this state due to power on shall set the ATTACHED SATA PORT SELECTOR bit to zero in the DISCOVER response, and shall set the COMWAKE Received state machine variable to zero.

~~If this state receives a COMWAKE Detected message and the phy supports attachment to a SATA device (i.e., the phy is attached to an STP/SATA bridge), supports attachment to a SATA port selector, and the value of the ATTACHED SATA PORT SELECTOR bit is zero in the DISCOVER response, it shall set the ATTACHED SATA PORT SELECTOR bit in the DISCOVER response to one and send a SATA Port Selector Change confirmation to the link layer.~~

If the phy supports attachment to a SATA device (i.e., the phy is attached to an STP/SATA bridge), supports attachment to a SATA port selector, and this state receives a COMWAKE Detected message it shall set the state machine variable COMWAKE Received to one, and if the value of the ATTACHED SATA PORT SELECTOR bit in the DISCOVER response is zero, it shall

- a) set the ATTACHED SATA PORT SELECTOR bit in the DISCOVER response to one and
- b) send a SATA Port Selector Change confirmation to the link layer.

State machine variable MgmtReset shall be set to one if this state is entered due to a Management Reset request or SMP Reset request. MgmtReset shall be set to zero if this state is entered due to a power on, a hard reset, DWS Lost message received, or COMINIT received.

6.8.3.3 SP1:OOB_AwaitCOMX state

6.8.3.3.1 State description

Upon entry into this state, the Hot-Plug Timeout timer shall be initialized and started if this phy is:

- a) an expander phy; or
- b) an initiator phy or target phy implementing the Hot-Plug Timeout timer.

~~If this state receives COMWAKE Detected message and the phy supports attachment to a SATA device (i.e., the phy is attached to an STP/SATA bridge), supports attachment to a SATA port selector, and~~ If the phy supports attachment to a SATA device (i.e., the phy is attached to an STP/SATA bridge), supports attachment to a SATA port selector, and this state receives a COMWAKE Detected message it shall set the state machine variable COMWAKE Received to one; and then if the value of the ATTACHED SATA PORT SELECTOR bit is zero in the DISCOVER response, it shall

- a) set the ATTACHED SATA PORT SELECTOR bit in the DISCOVER response to one and
- b) send a SATA Port Selector Change confirmation to the link layer.

6.8.3.3.2 Transition SP1:OOB_AwaitCOMX to SP0:OOB_COMINIT

This transition shall occur if the Hot-Plug Timeout timer expires.

If the phy supports attachment to a SATA device (i.e., the phy is attached to an STP/SATA bridge); and supports attachment to a SATA port selector, and the value of the ATTACHED SATA PORT SELECTOR bit was one in the DISCOVER response upon entry to this state, and no COMWAKE detected message was received while in this state, the state machine ~~this transition shall test the value of the COMWAKE Recieved state machine variable prior to the transition. If COMWAKE Received is zero and the ATTACHED SATA PORT SELECTOR bit in the DISCOVER response is one, this transition~~ shall set the ATTACHED SATA PORT SELECTOR bit in the DISCOVER response to zero and shall send a SATA Port Selector Change confirmation to the link layer.