T10/06-332 revision 0

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To: T10 Committee (SCSI)

From: George Penokie (IBM)

Subject: SAS-2: PL_PM3 fixes

1 Overview

In reviewing some T10 reflector questions I came across 5 messages that should have been communicated from the PL_PM3:Connected state to the PL_OC3:Overall_Control state. These 5 messages are:

a) Transmission Status (ACK Received);
b) Transmission Status (NAK Received);
c) Transmission Status (ACK/NAK Timeout);
d) Transmission Status (Connection Lost Without ACK/NAK); and
e) Transmission Status (Frame Transmitted).

To fix this the following changes are proposed.

1.0.0.1 PL_PM3:Connected state

1.0.0.1.1 PL_PM3:Connected state description

If:

a) the protocol for the connection is SSP, the port is an SSP target port, the Disconnect-Reconnect mode page is implemented, and the MAXIMUM CONNECT TIME LIMIT field in the Disconnect-Reconnect mode page (see 10.2.7.1) is not set to zero;
b) the protocol for the connection is SMP and the port is an SMP target port; or
c) the protocol for the connection is STP, the port is an STP target port, and the STP MAXIMUM CONNECT TIME LIMIT field is not set to zero in the SMP REPORT GENERAL response (see 10.4.3.3),

then, upon entry into this state, this state shall:

a) create a Maximum Connect Time Limit timer;
b) initialize the Maximum Connect Time Limit timer as specified in table 123 (see 8.2.3.1); and
c) start the Maximum Connect Time Limit timer.

If:

a) the protocol for the connection is SSP, the port is an SSP initiator port, and the MAXIMUM CONNECT TIME LIMIT field in the Disconnect-Reconnect mode page (see 10.2.7.1) for the destination SSP target port is not set to zero; or
b) the protocol for the connection is STP, the port is an STP initiator port, and the STP MAXIMUM CONNECT TIME LIMIT field is not set to zero in the SMP REPORT GENERAL response (see 10.4.3.3) for the destination STP target port,

then, upon entry into this state, this state may:

a) create a Maximum Connect Time Limit timer;
b) initialize the Maximum Connect Time Limit timer as specified in table 123 (see 8.2.3.1); and
c) start the Maximum Connect Time Limit timer.

If:

a) the protocol for the connection is SSP, the port is an SSP target port, and the BUS INACTIVITY TIME LIMIT field in the Disconnect-Reconnect mode page (see 10.2.7.1) is set to a non-zero value; or
b) the protocol for the connection is STP, the port is an STP initiator port, and the STP BUS INACTIVITY TIME LIMIT field is not set to zero in the SMP REPORT GENERAL response for the destination STP target port,

then, upon entry into this state, this state shall:

a) create a Bus Inactivity Time Limit timer;
b) initialize the Bus Inactivity Time Limit timer as specified in table 123 (see 8.2.3.1); and
c) start the Bus Inactivity Time Limit timer.

If a Bus Inactivity Time Limit timer has been created and:

a) the connection is SSP or SMP and this state receives a Tx Frame message; or
b) the connection is STP and the phy is not both transmitting and receiving SATA_SYNC,

then this state shall:

a) stop the Bus Inactivity Time Limit timer, if it is running; and
b) initialize the Bus Inactivity Time Limit timer as specified in table 123 (see 8.2.3.1).

If this state receives a Tx Frame message, this state shall send a Tx Frame request to the link layer. The following arguments from the Tx Frame message shall be included with the Tx Frame request:

a) the frame to be transmitted; and
b) if this port is an SSP port, Balance Required or Balance Not Required.

For STP connections, this state connects the STP transport layer to the STP link layer.

If a Bus Inactivity Time Limit timer expires:

a) if the connection is SSP and there is no Tx Frame request outstanding (i.e., this state is not waiting for an ACK Received or NAK Received confirmation), then this state shall send a Close Connection request to the link layer;
b) if the connection is SSP and there is a Tx Frame request outstanding (i.e., this state is waiting for an ACK Received or NAK Received confirmation), then this state shall send a Close Connection request to the link layer after receiving an ACK Received or NAK Received confirmation; and
c) if the connection is STP, then this state shall send a Close Connection request to the link layer.

If a Maximum Connect Time Limit timer expires:

a) if the connection is SSP and there is no Tx Frame request outstanding (i.e., this state is not waiting for an ACK Received or NAK Received confirmation), then this state shall send a Close Connection request to the link layer;
b) if the connection is SSP and there is a Tx Frame request outstanding (i.e., this state is waiting for an ACK Received or NAK Received confirmation), then this state shall send a Close Connection request to the link layer after receiving an ACK Received or NAK Received confirmation;
c) if the connection is SMP, then this state shall send an SMP Transmit Break request to the link layer; and
d) if the connection is STP, then this state shall send a Close Connection request to the link layer after the phy is both transmitting and receiving SATA_SYNC.

If this state receives a Tx Frame message after sending a Close Connection request but before receiving a Connection Closed confirmation, then this state shall send a Retry Frame message to the PL_OC state machine.

If this state receives a Frame Received confirmation, then this state shall send a Frame Received confirmation to the transport layer. The confirmation shall include the arguments received with the confirmation (e.g., the frame).

If this state receives an ACK Transmitted confirmation, then this state shall send:

a) an ACK Transmitted confirmation to the transport layer including the tag of the frame that was ACKed; and
b) a Transmission Status (Frame Transmitted) message to the PL_OC state machine including the tag of the frame that was ACKed.

If this state receives a Frame Transmitted confirmation, then this state shall send a Transmission Status (Frame Transmitted) confirmation to the transport layer.

If this state receives an ACK Received confirmation, then this state shall send:

a) a Transmission Status (ACK Received) confirmation to the transport layer; and
b) a Transmission Status (ACK Received) message to the PL_OC state machine.

If this state receives a NAK Received confirmation, then this state shall send:

a) a Transmission Status (NAK Received) confirmation to the transport layer; and
b) a Transmission Status (NAK Received) message to the PL_OC state machine.

If this state receives an ACK/NAK Timeout confirmation, then this state shall send:

a) a Transmission Status (ACK/NAK Timeout) confirmation to the transport layer and
b) a Transmission Status (NAK/NAK Timeout) message to the PL_OC state machine.

If this state receives a Cancel message, then this state shall:

a) discard all Tx Frame requests for the specified tag;
b) send a Transmission Status (Cancel Acknowledge) confirmation to the transport layer including the destination SAS address and the tag as arguments; and
c) discard any subsequent confirmations for previous Tx Frame requests sent for the tag.

If this state receives a Close Connection message from the PL_OC state machine, then this state shall send a Close Connection request to the link layer.

If this state receives one of the following:

a) a Connection Closed (Normal) confirmation;
b) a Connection Closed (Close Timeout) confirmation;
c) a Connection Closed (Break Requested) confirmation;
d) a Connection Closed (Break Received) confirmation; or
e) a Connection Closed (Transition to Idle) confirmation,

then this state shall send a Connection Closed message to the PL_OC state machine including the argument received with the confirmation.

If this state receives a Connection Closed (Transition to Idle) confirmation after receiving:

a) a Connection Closed (Break Received) confirmation; or
b) a Connection Closed (Break Requested) confirmation,

then this state shall send a Transmission Status (Break Received) confirmation to the transport layer.

If this state receives a Connection Closed (Normal) confirmation, a Connection Closed (Transition to Idle) confirmation, or a Phy Disabled confirmation after sending a Transmission Status (Frame Transmitted) confirmation, but before this state receives an ACK Received or NAK Received confirmation, then this state shall send:

a) a Transmission Status (Connection Lost Without ACK/NAK) confirmation to the transport layer and
b) a Transmission Status (Connection Lost Without ACK/NAK) message to the PL_OC state machine.

If this state receives a Connection Closed (Normal) confirmation, a Connection Closed (Transition to Idle) confirmation, or a Phy Disabled confirmation after sending a Tx Frame request but before receiving a Frame Transmitted confirmation, then this state shall send a Retry Frame message to the PL_OC state machine.

If this state receives a Connection Closed confirmation during an SMP connection, this state shall send a Connection Closed confirmation to the transport layer.

If this state receives a Credit Timeout confirmation, then this state shall send a Retry Frame message to the PL_OC state machine.

A Retry Frame message shall include the following arguments from the Tx Frame message:

a) initiator port bit;
b) protocol;
c) connection rate;
d) initiator connection tag;

e) destination SAS address;
f) source SAS address; and
g) frame.

After this state receives a DONE Received (Normal) or DONE Received (Credit Blocked) confirmation, if it does not receive a Tx Frame message within 1 ms, then this state shall send a Disable Tx Frames message to the PL_OC state machine.

If this state receives a DONE Received (ACK/NAK Timeout) or DONE Transmitted confirmation, then this state shall send a Disable Tx Frames message to the PL_OC state machine.

If this state receives an SMP Transmit Break message, then this state shall send an SMP Transmit Break request to the link layer.

If this state receives a HARD_RESET Received confirmation, then this state machine shall terminate all operations.