

Date: May 20, 2002

To: T10 Committee (SCSI)

From: George Penokie (IBM/Tivoli)

Subject: SAS Identification state machine

1 Overview

This proposal defines the SAS identification state machine.

1.1 Identification sequence description

1.1.1 Overview

The identification sequence contains several state machines that run in parallel to control the flow of dwords on a link that are associated with the identification sequence (see figure 1). The identification sequence (IS) state machines are as follows:

- a) SAS phy receiver (R state machine);
- b) Originate IDENTIFY address frame (OIA state machine);
- c) SAS phy transmitter (T state machine);
- d) Frame receive (FR state machine); and
- e) IDENTIFY control (IC state machine).

All the state machines within the identification sequence shall begin on an indication of an enable identification sequence from the XXX:xxx state of the xx state machine.

If a state machine consists of multiple states the initial state is as indicated in state machine description in this subclause.

The R state machine's function is to receive primitives and frames from the link and indicate to other IS state machines the receipt of those dwords. The R state machine contains the IS_R1:Receive state (see xxxx).

The OIA state machine's function is to transmit an IDENTIFY address frame. The OIA state machine contains the following states:

- a) Initial state: IS_OIA1:IDENTIFY_idle (see xxxx); and
- b) IS_OIA2:Indicate_frame_tx (see xxxx).

The T state machine's function is to transmit primitives and frames to the link and indicate to other state machines the transmission of those dwords. The T state machine contains the IS_T1:Transmit state (see xxxx).

The FR state machine's function is to receive an IDENTIFY address frame and indicating the successful or unsuccessful receipt of the IDENTIFY address frame. The FR state machine contains the IS_FR1:Frame_receive state (see xxxx).

The IC state machine's function is to ensure an IDENTIFY address frame has been received and transmitted before indicating the identify sequence has completed. The IC state machine contains the IS_IC1:IDENTIFY_wait state (see xxxx).

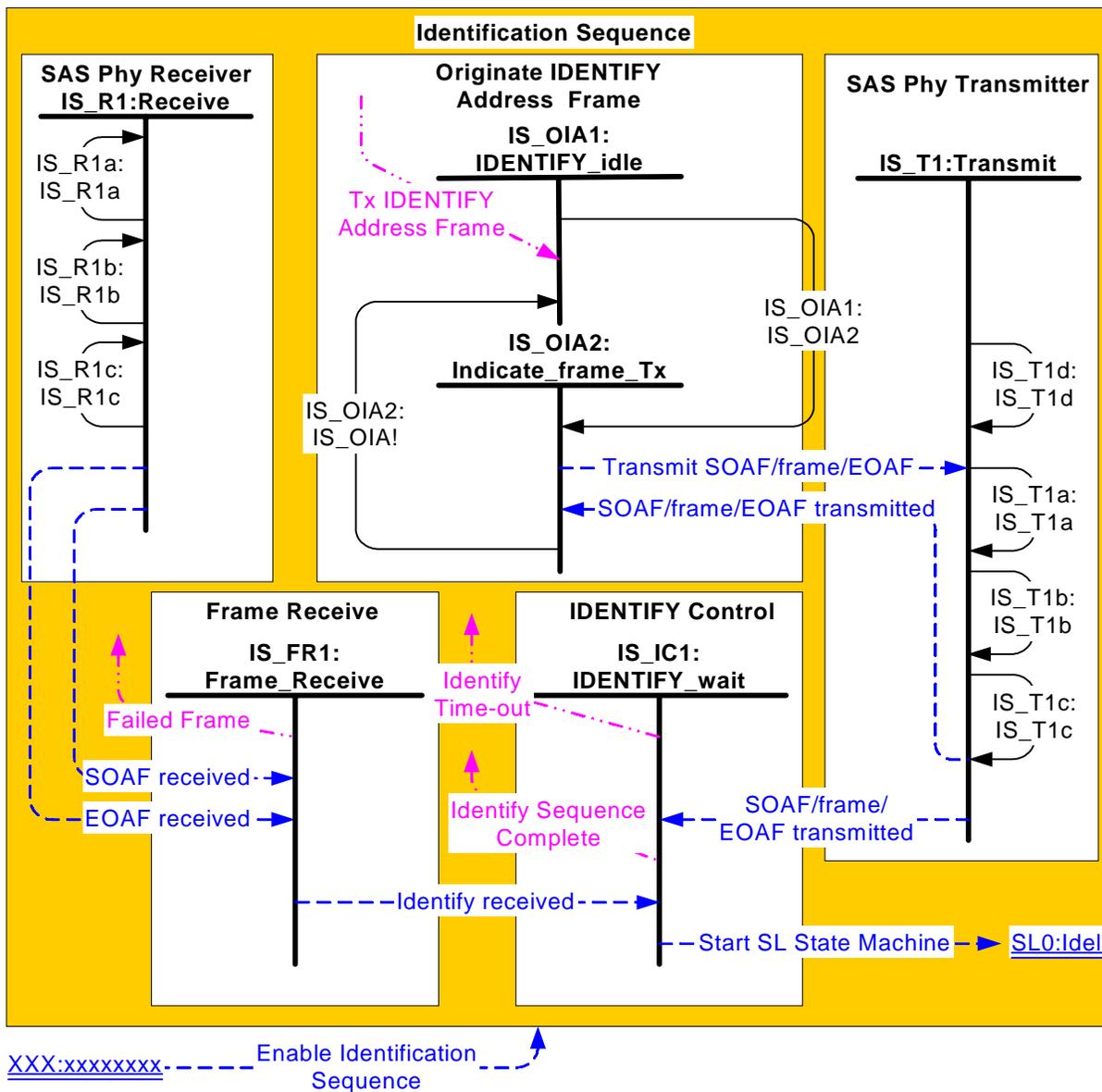


Figure 1 — Identification sequence state machine

1.1.2 IS_R1:Receive state

1.1.2.1 IS_R1:Receive state description

The receive state receives frames and primitives from the link.

As a result of receiving an SOAF from the link the receive state shall indicate using the SOAF received parameter that an SOAF was received to the IDENTIFY_wait state.

As a result of receiving an EOAF from the link the receive state shall indicate using the EOAF received parameter that an EOAF was received to the IDENTIFY_wait state.

1.1.2.2 Transition IS_R1a:IS_R1a (Receive:Receive)

The IS_R1a:IS_R1a transition shall occur every time an SOAF is received on the link.

1.1.2.3 Transition IS_R1b:IS_R1b (Receive:Receive)

The IS_R1b:IS_R1b transition shall occur every time an dword associated with a frame is received on the link.

1.1.2.4 Transition IS_R1c:IS_R1c (Receive:Receive)

The IS_R1c:IS_R1c transition shall occur every time an EOAF is received on the link.

1.1.3 IS_OIA1:IDENTIFY_idle state

1.1.3.1 IS_OIA1:IDENTIFY_idle state description

The IDENTIFY_idle state shall only transition to the indicate_frame_tx states on a request from the port layer to transmit an IDENTIFY address frame.

1.1.3.2 Transition IS_OIA1:IS_OIA2 (IDENTIFY_idle:Indicate_frame_tx)

The IS_OIA1:IS_OIA2 transition shall occur when the port layer requests using the tx IDENTIFY address frame parameter that an IDENTIFY address frame is to be transmitted

1.1.4 IS_OIA2:Indicate_frame_tx state

1.1.4.1 IS_OIA2:Indicate_frame_tx state description

The indicate_frame_tx state indicates to the transmit state using the transmit SOAF/frame/EOAF parameter that an IDENTIFY address frame be transmitted on the link.

1.1.4.2 Transition IS_OIA2:IS_OIA1 (Indicate_frame_tx:IDENTIFY_idle)

The IS_OIA2:IS_OIA1 transition shall occur after the SOAF/frame/EOAF transmitted parameter is received from the transmit state.

1.1.5 IS_T1:Transmit state

1.1.5.1 IS_T1:Transmit state description

The transmit state requests the link to transmit an SOAF/frame/EOAF when the indicate_frame_tx state using the transmit SOAF/frame/EOAF parameter indicates an IDENTIFY address frame be transmitted.

In the absence of any transmit requests the transmit state shall transmit idle dwords and ALIGNs on the link as necessary.

On an indication that a SOAF/frame/EOAF is to be transmitted the transmit state shall transmit an SOAF in the dword before the first dword of the frame and an EOAF in first dword after the last dword of the frame. If during the transmission of a frame an indication that a primitive is to be transmitted occurs the transmit state may transmit the indicated primitive by inserting the primitive between the frames' dwords.

The transmit state shall indicate using the SOAF/frame/EOAF transmitted parameter to the indicate_frame_tx state each time an EOAF is transmitted.

1.1.5.2 Transition IS_T1a:IS_T1a (Transmit:Transmit)

The IS_T1a:IS_T1a transition shall occur every time an SOAF is transmitted on the link.

1.1.5.3 Transition IS_T1b:IS_T1b (Transmit:Transmit)

The IS_T1b:IS_T1b transition shall occur every time a dword associated with a frame is transmitted on the link.

1.1.5.4 Transition IS_T1c:IS_T1c (Transmit:Transmit)

The IS_T1c:IS_T1c transition shall occur every time an EOAF is transmitted on the link.

1.1.5.5 Transition IS_T1d:IS_T1d (Transmit:Transmit)

The IS_T1d:IS_T1d transition shall occur every time an idle is transmitted on the link.

1.1.6 IS_RF1:IDENTIFY_wait state**1.1.6.1 IS_RF1:IDENTIFY_wait state description**

The IDENTIFY_wait state checks the IDENTIFY address frame and determines if the IDENTIFY address frame was successfully received (e.g., no CRC error).

If the IDENTIFY address frame is received with a CRC error the IDENTIFY_wait state shall send a confirmation to the port layer using the failed frame parameter that an IDENTIFY address frame receive error occurred.

1.1.7 IS_IC1:IDENTIFY_wait state**1.1.7.1 IDENTIFY_wait state description**

The IDENTIFY_wait state ensures that an IDENTIFY address frame has been received and transmitted on the link before indicating to the SL0:Idle state it may accept connection requests from the port layer. The IDENTIFY address frame may be transmitted and received on the link in any order.

After the IDENTIFY_wait state receives an SOAF/frame/EOAF transmitted parameter from the transmit state it shall initialize a receive identify time-out timer to one millisecond. If an identify received parameter from the receive state is indicated from the IDENTIFY_wait state before the identify time-out timer is exceeded the IDENTIFY_wait state shall:

- a) send a confirmation to the port layer using the identify sequence complete parameter that the identify sequence has completed; and
- b) indicate to the SL0:idle state (see xxxx) using the start SL state machine parameter that the SL state machine may accept connection requests from the port layer.

If the identify time-out timer is exceeded before an identify received parameter from the receive state is indicated the IDENTIFY_wait state shall send a confirmation to the port layer using the identify time-out parameter that an identify time-out occurred.