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To: **T10 SAS Protocol Working Group**
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Subject: **SAS-1.1, ST_I (transport layer for SSP initiator ports) state machines**

Introduction

This proposal evolved from adding transport layer retries and the new protocol service, Terminate Data Transfer, to the SSP transport layer state machines. While including these elements, changes were made to simplify and clarify the description of these state machines. These changes include having all communication with the initiator's SCSI application layer be processed by the initiator frame router state machine, having a virtual initiator transport server state machine for each tag, and having the initiator transport server state machines be persistent between power cycles.

Having all communication with the SCSI application layer be processed by the initiator frame router state machine provides the ability for that state machine to maintain context for all tasks in process so that it can abort tasks as necessary. Having initiator transport servers for each tag provides the ability for one state machine to maintain context to process all elements of a task (e.g., COMMAND frame transmission, XFER_RDY reception, and data transfer). Having the initiator transport server state machines be persistent between power cycles simplified their description.

The attempt was made to have the description of the initiator transport layer state machines be as consistent as possible with the target transport layer state machines (see 04-137). This proposal is based on SAS1r05.

9.2.6.2 ST_I (transport layer for SSP initiator ports) state machines

9.2.6.2.1 ST_I state machines overview

The ST_I state machines are as follows:

a) ST_IFR (initiator frame router) state machine (see 9.2.6.2.2); and
b) ST_ITS (initiator transport server) state machines (see 9.2.6.2.3).

Figure 1 shows the ST_I state machines.

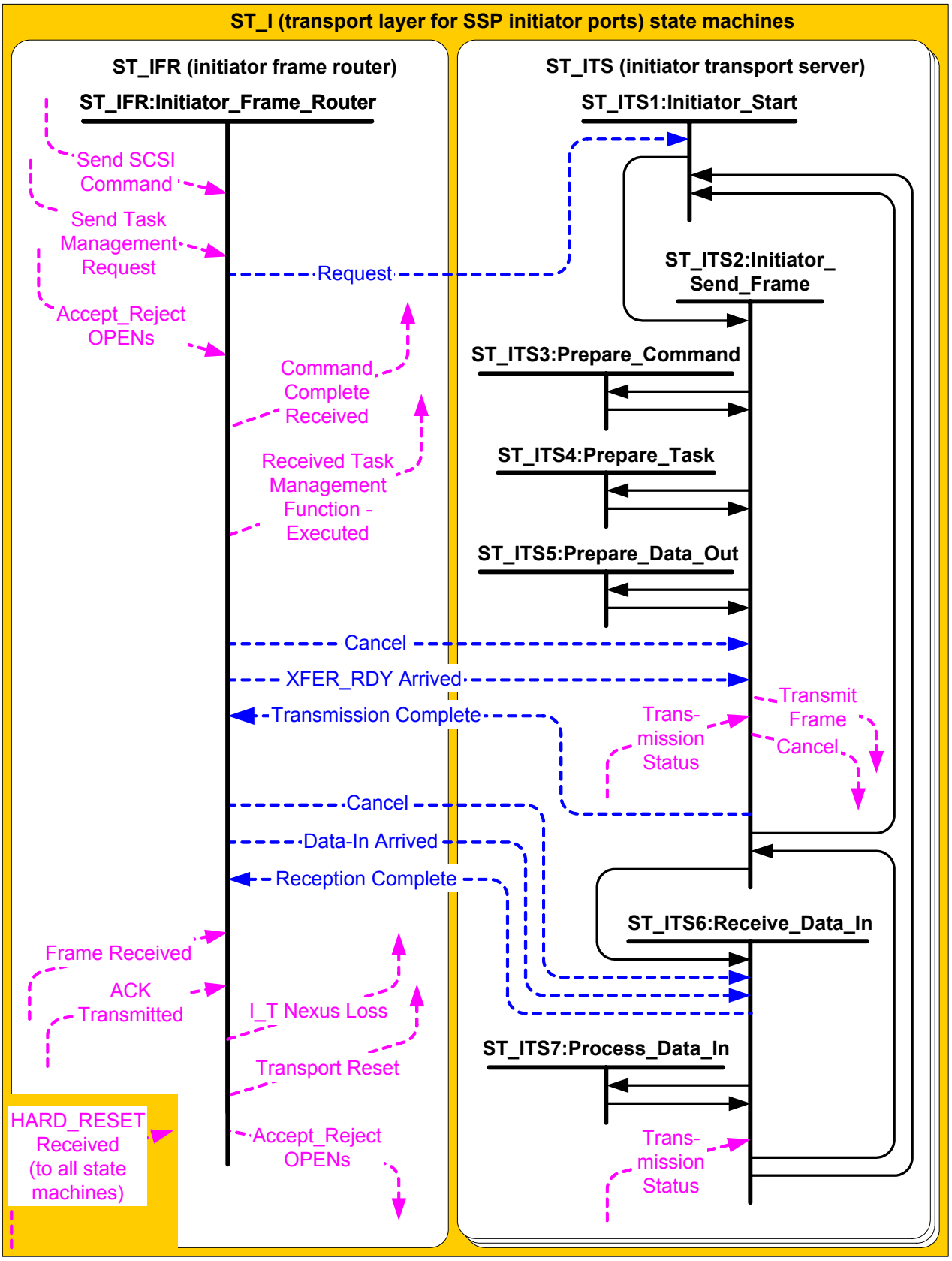

Figure 1 — ST_I (transport layer for SSP initiator ports) state machines

9.2.6.2.2 ST_IFR (initiator frame router) state machine

The ST_IFR state machine performs the following functions:

a) receives Send SCSI Command and Send Task Management transport protocol service requests from the SCSI application layer;
b) sends messages to the ST_ITS state machine;
c) receives messages from the ST_ITS state machine;
d) receives confirmations from the port layer;
e) sends transport protocol service confirmations to the SCSI application layer;
f) receives vendor specific requests from the SCSI application layer;
g) sends vendor specific confirmations to the SCSI application layer;
h) receives Accept_Reject OPENs requests from the SCSI application layer;
i) sends Accept_Reject OPENs requests to the port layer;
j) sends I_T Nexus Loss event notifications to the SCSI application layer; and
k) sends Transport Reset event notifications to the SCSI application layer.

This state machine consists of one state.

This state machine shall be started after power on.

If this state machine receives a Send SCSI Command transport protocol service request then this state machine shall send a Request (Send Command) message to the ST_ITS1:Initiator_Start state in an ST_ITS state machine that does not have an active task. A Request (Send Command) message shall include the following arguments:

a) the connection rate;
b) the initiator connection tag;
c) the destination SAS address;
d) the tag;
e) the logical unit number;
f) the enable first burst value;
g) the task attribute;
h) the additional CDB length;
i) the CDB; and
j) the additional CDB bytes.

If the message is a Request (Send Command) message for a data-out command and first burst is enabled (see 9.2.2.1), then the message shall also include the number of bytes for the first burst size as an argument.

If this state machine receives a Send Task Management Request transport protocol service request, then this state machine shall send a Request (Send Task) message to the ST_ITS1:Initiator_Start state in an ST_ITS state machine that does not have an active task. A Request (Send Task) message shall include the following arguments:

a) the connection rate;
b) the initiator connection tag;
c) the destination SAS address;
d) the setting for the retransmit bit;
e) the tag;
f) the logical unit number;
g) the task management function; and
h) the tag of task to be managed.

If this state machine receives a Frame Received (ACK/NAK Balanced) confirmation or Frame Received (ACK/NAK Not Balanced) confirmation, then this state machine shall check the frame type in the frame received as an argument with the confirmation (see table 97). If the confirmation was Frame Received (ACK/NAK Balanced) and the frame type is not XFER_RDY, RESPONSE, or DATA, then this state machine shall discard the frame. If the confirmation was Frame Received (ACK/NAK Not Balanced) and the frame type is not DATA, then this state machine shall discard the frame.

If the frame type is correct relative to the confirmation, then this state machine may check that the hashed source SAS address matches the SAS address of the SAS port that transmitted the frame and that the hashed destination SAS address matches the SAS address of the SAS port that received the frame based on the connection information. If this state machine checks these SAS addresses, and they do not match, then this state machine shall discard the frame.

If the frame type is XFER_RDY or RESPONSE then this state machine shall check the length of the information unit. If the length of the information unit is not correct, then this state machine shall discard the frame.

If the frame type is correct relative to the confirmation, then this state machine shall check the tag. If the tag does not specify a valid ST_ITS state machine, then this state machine shall discard the frame and may send a vendor-specific confirmation to the SCSI application layer to cause the command using that tag to be aborted.

If the frame type is XFER_RDY and the tag is for a task with no write data, then this state machine shall:

a) discard the frame;
b) send a Command Complete Received transport protocol service confirmation with the Delivery Result argument set to Service Delivery or Target Failure - XFER_RDY Not Expected to the SCSI application layer; and
c) if there is an ST_ITS state machine for the tag, send a Cancel message to that state machine.

If the frame type is RESPONSE, and this state machine has received a RESPONSE frame for the I_T_L_Q nexus, then this state machine shall discard the frame.

If the frame type is RESPONSE, the items checked in the frame are correct, and this state machine has not received a RESPONSE frame for this I_T_L_Q nexus, then this state machine shall send a protocol service confirmation to the SCSI application layer based on the content of the DATAPRES and RESPONSE DATA fields. If the RESPONSE frame was for a command, then the delivery result and other arguments sent with the Command Complete Received protocol service confirmation are defined in 10.2.1.5. If the RESPONSE frame was for a task management request, then the delivery result and other arguments sent with the Received Task Management Function - Executed protocol service confirmation are defined in 10.2.1.12.

If the frame type is XFER_RDY and the items checked in the frame correct, then this state machine shall wait to receive an ACK Transmitted confirmation.

If this state machine receives an ACK Transmitted confirmation for an XFER_RDY frame, then this state machine shall send an XFER_RDY Arrived message to the ST_ITS6:Receive_Data_In state in the ST_ITS state machine specified by the tag. The message shall include the following arguments:

a) the retry data frames bit;
b) the retransmit bit;
c) the target port transfer tag; and
d) the information unit.

If the frame type is DATA and the items checked in the frame are correct, then this state machine shall send a Data-In Arrived message to the ST_ITS6:Receive_Data_In state in the ST_ITS state machine specified by the tag. The message shall include the following arguments:

a) the retransmit value;
b) the changing data pointers value;
c) the data offset; and
d) the information unit.

This state machine receives Transmission Complete messages and Reception Complete messages from the ST_ITS state machines that may result in this state machine sending one of the following to the SCSI application layer:

a) an I_T Nexus Loss event notification;
b) a Command Complete protocol service confirmation; or
c) a Received Task Management Function - Executed protocol service confirmation.

If this state receives a Transmission Complete (I_T Nexus Loss) from an ST_ITS state machine, then this state machine shall send an I_T Nexus Loss event notification to the SCSI application layer.

Table b defines other messages received from ST_ITS state machines that require a protocol service confirmation and the Delivery Result argument sent with the corresponding service confirmation that shall be sent upon receipt of the message.

Table b — Arguments sent with confirmations based on messages received

Message received from ST_ITS state machine	Protocol service confirmation and Delivery Result argument sent to the SCSI application layer
Transmission Complete (Command Delivered)	Command Complete Received (Task Complete)
Transmission Complete (Data-Out Delivered)	Command Complete Received (Task Complete)
Transmission Complete (Command Failed, Connection Failed)	Command Complete Received (Service Delivery or Target Failure - Connection Failed)
Transmission Complete (Command Failed, NAK Received)	Command Complete Received (Service Delivery or Target Failure - NAK Received)
Transmission Complete (Task Delivered)	Received Task Management Function - Executed with the service response argument based on the content of the corresponding RESPONSE frame (see 10.2.1.12)
Transmission Complete (Task Failed, Connection Failed)	Received Task Management Function - Executed (Service Delivery or Target Failure - Connection Failed)
Transmission Complete (Task Failed, NAK Received)	Received Task Management Function - Executed (Service Delivery or Target Failure - NAK Received)
Transmission Complete (XFER_RDY Incorrect Write Data Length)	Command Complete Received (Service Delivery or Target Failure - XFER_RDY Incorrect Write Data Length)
Transmission Complete (XFER_RDY Requested Offset Error)	Command Complete Received (Service Delivery or Target Failure - XFER_RDY Requested Offset Error)
Reception Complete (Data-In Received)	Command Complete Received (Task Complete)
Reception Complete (Data Offset Error)	Command Complete Received (Service Delivery or Target Failure - DATA Offset Error)
Reception Complete (Too Much Read Data)	Command Complete Received (Service Delivery or Target Failure - DATA Too Much Read Data)
Reception Complete (Incorrect Data Length)	Command Complete Received (Service Delivery or Target Failure - DATA Incorrect Data Length)
Reception Complete (Command Failed, Connection Failed)	Command Complete Received (Service Delivery or Target Failure - Connection Failed)

A protocol service confirmation shall include the tag as an argument.

If this state machine receives an Accept_Reject OPENs (Accept SSP) or Accept_Reject OPENs (Reject SSP) request, then this state machine shall send a corresponding Accept_Reject OPENs request to the port layer.

If this state machine receives a HARD_RESET Received confirmation, then this state machine shall send a Transport Reset event notification to the SCSI application layer.

This state machine may receive vendor specific requests from the SCSI application layer that cause this state machine to send Cancel messages to ST_ITS state machines.

9.2.6.2.3 ST_ITS (initiator transport server) state machine

9.2.6.2.3.1 ST_ITS state machine overview

The ST_ITS state machine performs the following functions:

a) receives and processes messages from the ST_IFR state machine;
b) sends messages to the ST_IFR state machine;
c) sends request to the port layer regarding frame transmission;
d) receives confirmations from the port layer regarding frame transmission; and
e) receives HARD_RESET Received confirmations from the port layer.

This state machine consists of the following states:

a) ST_ITS1:Initiator_Start state (see 9.2.6.2.3.2) (initial state);
b) ST_ITS2:Initiator_Send_Frame state (see 9.2.6.2.3.3);
c) ST_ISF3:Prepare_Command state (see 9.2.6.2.3.4);
d) ST_ITS4:Prepare_Task state (see 9.2.6.2.3.5);
e) ST_ITS5:Prepare_Data_Out state (see 9.2.6.2.3.6);
f) ST_ITS6:Receive_Data_In state (see 9.2.6.2.3.7); and
g) ST_ITS7:Process_Data_In state (see 9.2.6.2.3.8).

All ST_ITS state machines shall be started in the ST_ITS1:Initiator_Start state after power on. There shall be one ST_ITS state machine for each possible task or task management function for the SAS initiator port.

If transport layer retries are enabled, this state machine shall retain the data offset for the last DATA frame transmitted for which ACK/NAK Balance was achieved (i.e., when the number of DATA frames sent matches the number of ACK Received confirmations received) for use as the restart point in case of a retry.

If this state machine receives a HARD_RESET Received confirmation, then this state machine shall transition to the ST_ITS1:Initiator_Start state.

9.2.6.2.3.2 ST_ITS1:Initiator_Start state

9.2.6.2.3.2.1 State description

This state is the initial state of an ST_ITS state machine.

9.2.6.2.3.2.2 Transition ST_ITS1:Initiator_Start to ST_ITS2:Initiator_Send_Frame

This transition shall occur after this state receives a Request message from the ST_IFR state machine.

9.2.6.2.3.3 ST_ITS2:Initiator_Send_Frame state

9.2.6.2.3.3.1 State description

If this state is entered from the ST_ITS3:Prepare_Command state for transmission of a COMMAND frame, then this state shall send a Transmit Frame (Interlocked) request to the port layer.

If this state is entered from the ST_ITS6:Receive_Data_In state, and the vendor specific number of retries has not been reached for the COMMAND frame, then this state shall send a Transmit Frame (Interlocked) request to the port layer.

If this state is entered from the ST_ITS4:Prepare_Task state for transmission of an TASK frame, then this state shall send a Transmit Frame (Interlocked) request to the port layer.

If this state is entered from the ST_ITS7:Prepare_Data_Out state for transmission of a DATA frame, then this state shall send a Transmit Frame (Non-Interlocked) request to the port layer if:

a) this state has received an XFER_RDY Arrived message; or
b) first burst is enabled and this state has received a Transmission Status (Frame Transmitted) confirmation and a Transmission Status (ACK Received) confirmation for the COMMAND frame.

A Transmit Frame request shall include the SSP frame and the following to be used for any OPEN address frame:

a) the initiator port bit set to one;
c) the protocol set to SSP;
d) the connection rate;
e) the initiator connection tag;
f) the destination SAS address; and
g) the source SAS address set to the SAS address of the SSP initiator port.

After sending a Transmit Frame request this state shall wait for a Transmission Status confirmation.

If the confirmation is Transmission Status (I_T Nexus Loss), then this state shall send a Transmission Complete (I_T Nexus Loss) message to the ST_IFR state machine. This state shall include the tag as an argument.

If this state machine receives a confirmation that is not Transmission Status (Frame Transmitted) or Transmission Status (I_T Nexus Loss) (see table 93), then this state shall send a Transmission Complete (Connection Failed) message to the ST_IFR state machine. The message shall include the following arguments:

a) any argument received with the Transmission Status confirmation; and
b) the tag.

If the confirmation is Transmission Status (Frame Transmitted) and the Transmit Frame request was for a TASK frame or a DATA frame where the number of data bytes that have been transmitted equal the request byte count, then this state shall wait to receive one of the following confirmations:

a) Transmission Status (ACK Received);
b) Transmission Status (NAK Received);
c) Transmission Status (ACK/NAK Timeout); or
d) Transmission Status (Connection Lost Without ACK/NAK).

NOTE 1 - If the number of data bytes that have been transmitted for the Send SCSI Command or Send Task Management transport protocol service request are fewer than the number of bytes in the service request, then this state may send additional Transmit Frame requests for DATA frames for the protocol service request before receiving a Transmission Status (ACK Received), Transmission Status (NAK Received), Transmission Status (ACK/NAK Timeout), or Transmission Status (Connection Lost Without ACK/NAK) confirmation for Transmit Frame requests for previous DATA frames sent for the I_T_L_Q nexus.

If the confirmation is Transmission Status (NAK Received), the frame was a COMMAND frame, and the vendor specific number of retries has not been reached, then this state shall send another Transmit Frame (Interlocked) request for the COMMAND frame to the port layer. The vendor specific number of retries should be greater than or equal to one.

Table c defines the confirmations received from the port layer after a Transmission Status (Frame Transmitted) and the message that shall be sent by this state to the ST_IFR state machine upon receipt of the confirmation based on the conditions under which the confirmation was received.

Table c — Messages sent to the ST_IFR state machine based on port layer confirmations

Confirmation received from the port layer	Conditions under which confirmation was received	Message sent to ST_IFR
Transmission Status (ACK Received	a) the Transmit Frame request was for a COMMAND frame; and b) there is no data to transfer for the command.	Transmission Complete (Command Delivered)
Transmission Status (ACK Received)	the Transmit Frame request was for a TASK frame	Transmission Complete (Task Delivered)
Transmission Status (ACK Received)	a) the Transmit Frame request was for a DATA frame; b) the number of data bytes transmitted equal the request byte count; and c) this state has received a Transmission Status (ACK Received) confirmation for each DATA frame transmitted for the request	Transmission Complete (Data-Out Delivered)
Transmission Status (ACK/NAK Timeout), or Transmission Status (Connection Lost Without ACK/NAK)	the Transmit Frame request was for a COMMAND Frame	Transmission Complete (Command Failed, Connection Failed)
Transmission Status (NAK Received)	a) the Transmit Frame request was for a COMMAND frame; and b) the vendor specific number of retries has been reached	Transmission Complete (Command Failed, NAK Received)
Transmission Status (ACK/NAK Timeout) or Transmission Status (Connection Lost Without ACK/NAK)	the Transmit Frame request was for a TASK Frame	Transmission Complete (Task Failed, Connection Failed)
Transmission Status (NAK Received)	a) the Transmit Frame request was for a TASK frame; and b) the vendor specific number of retries has been reached	Transmission Complete (Task Failed, NAK Received)
Transmission Status (NAK Received)	a) the Transmit Frame request was for an DATA frame; and b) the vendor specific number of retries has been reached	Transmission Complete (Data Failed, NAK Received)
Transmission Status (ACK/NAK Timeout) or Transmission Status (Connection Lost Without ACK/NAK)	a) the Transmit Frame request was for an DATA frame; and b) the vendor specific number of retries has been reached	Transmission Complete (Data Failed, Connection Failed)

NOTE 2 - after this state sends a Transmission Complete (Command Failed, Connection Failed) for a data-out operation and first burst is not enabled, this state waits to receive an XFER_RDY Arrived message or a Cancel message from the ST_IFR state machine. The Cancel message results from a vendor specific request from the SCSI application layer after the SCSI application layer has used a task management function to determine that the SAS target port did not receive the COMMAND frame.

If this state receives a Cancel message from the ST_IFR state machine, and this state has received confirmations for all Transmit Frame requests sent to the port layer, then this state shall send a Transmission Complete (Cancel Acknowledged) message to the ST_IFR state machine.

If this state receives a Cancel message from the ST_IFR state machine, and this state has not received confirmations for all Transmit Frame requests sent to the port layer, then this state shall send a Cancel request to the port layer. This state may also send a Cancel request to the port layer to cancel a previous Transmit Frame request. A Cancel request shall include the following arguments:

a) the destination SAS address; and
b) the tag.

If this state receives a Transmission Status (Cancel Acknowledged) confirmation, then this state shall send a Transmission Complete (Cancel Acknowledged) message to the ST_IFR state machine.

If this state receives an XFER_RDY Arrived message, and the write data length is zero or exceeds the amount of data remaining to be transferred for the data-out command, then this state shall send a Transmission Complete (XFER_RDY Incorrect Write Data Length) message to the ST_IPR state machine.

If this state machine receives an XFER_RDY Arrived message and the requested offset is not expected, then this state shall send a Transmission Complete (XFER_RDY Requested Offset Error) message to the ST_IPR state machine.

9.2.6.2.3.3.3 Transition ST_ITS2:Initiator_Send_Frame to ST_ITS1:Initiator_Start

This transition shall occur after this state has sent one of the following to the ST_IFR state machine:

a) a Transmission Complete (Command Delivered) message;
b) a Transmission Complete (Command Failed, NAK Received) message and the vendor specific number of retries for the COMMAND frame has been reached;
c) a Transmission Complete (Command Failed, Connection failed) message and the command was for a non-data operation;
d) any Transmission Complete message for a TASK or DATA frame; or
e) a Transmission Complete (Cancel Acknowledged).

9.2.6.2.3.3.6 Transition ST_ITS2:Initiator_Send_Frame to ST_ITS3:Prepare_Command

This transition shall occur after this state:

a) receives a Request (Send Command) message; or
b) sends a Transmission Complete (Command Failed, NAK Received) message to the ST_IFR state machine and the vendor specific number of retries for the COMMAND frame has not been reached. The number of retries for a COMMAND frame should be greater than or equal to one.

9.2.6.2.3.3.3 Transition ST_ITS2:Initiator_Send_Frame to ST_ITS4:Prepare_Task

This transition shall occur after this state receives:

a) a Request (Send Task message); or
b) a Transmission Status (NAK Received) message for a TASK frame and the vendor specific number of retries for the TASK frame has not been reached. The number of retries for a TASK frame should be greater than or equal to one.

9.2.6.2.3.3.3 Transition ST_ITS2:Initiator_Send_Frame to ST_ITS5:Prepare_Data_Out

This transition shall occur after this state receives:

a) a Transmission Status (Frame Transmitted) confirmation for a COMMAND frame for a data-out operation and first burst is enabled;
b) an XFER_RDY Arrived message;

NOTE 3 - this transition occurs even if this state has not received a Transmission Status (ACK Received) for the COMMAND frame for the data-out operation.

c) a Transmission Status (Frame Transmitted) confirmation for a Transmit Frame (Non-Interlocked) request if the number of data bytes that has been transmitted for the request is less than the first burst size or the write data length specified in the XFER_RDY; or
d) a Transmission Status (Frame Transmitted) confirmation and a confirmation other than Transmission Status (ACK Received) for a DATA frame for which a Delivery Failure message was not sent to the ST_IPR state machine (i.e., in order to retry transmitting the frame).

9.2.6.2.3.3.5 Transition ST_ITS2:Initiator_Send_Frame to ST_ITS6:Receive_Data_In

This transition shall occur after this state receives a Transmission Status (Frame Transmitted) confirmation for a COMMAND frame for a data-in operation.

NOTE 4 - this transition occurs even if this state has not received a Transmission Status (ACK Received) for the COMMAND frame for the data-in operation.

9.2.6.2.3.4 ST_ISF3:Prepare_Command state

9.2.6.2.3.4.1 State description

This state shall construct a COMMAND frame. This state shall include the following values received with the Request (Send Command) message in the frame:

a) frame type;
b) hashed destination SAS address;
c) hashed source SAS address;
d) logical unit number;
e) tag;
f) task attribute;
g) additional CDB length;
h) CDB; and
i) additional CDB bytes; and
j) number of fill bytes.

9.2.6.2.3.4.2 Transition ST_ITS3:Prepare_Command to ST_ITS2:Initiator_Send_Frame

This transition shall occur after this state constructs a COMMAND frame.

9.2.6.2.3.5 ST_ITS4:Prepare_Task state

9.2.6.2.3.5.1 State description

This state shall construct a TASK frame. This state shall include the following values received with the Request (Send Task) message in the frame:

a) frame type;
b) hashed destination SAS address;
c) hashed source SAS address;
d) logical unit number;
e) tag;
f) task management function;
g) tag of task to be managed;
h) retransmit bit; and
i) number of fill bytes.

9.2.6.2.3.5.2 Transition ST_ITS4:Prepare_Task to ST_ITS2:Initiator_Send_Frame

This transition shall occur after this state constructs a TASK frame.

9.2.6.2.3.6 ST_ITS5:Prepare_Data_Out state

9.2.6.2.3.6.1 State description

This state shall construct a DATA frame. This state shall include the following values in the frame. These values were either received with the Request (Send Command) message (i.e., if first burst is enabled) or with an XFER_RDY Arrived message:

a) tag;
b) target port transfer tag;
c) data offset; and
d) data.

This state shall generate and include the following values in the frame:

a) frame type;
b) hashed destination SAS address;
c) hashed source SAS address;
d) retransmit bit set to zero;
e) number of fill bytes; and
f) fill bytes.

If this is the first DATA frame constructed by this state, then this state shall set the changing data pointer bit to zero.

If this state is entered after the ST_ISF1:Send_Frame state receives a Transmission Status (Frame Transmitted) confirmation for a DATA frame and that state has only received confirmations of Transmission Status (Frame Transmitted) and Transmission Status (ACK Received), then this state shall set the changing data pointer bit to zero and shall set the data offset field to the value in the data offset field in the previous DATA frame plus the number of bytes in the previous DATA information unit.

If this state is entered after the ST_ISF1:Send_Frame state receives a Transmission Status (Frame Transmitted) confirmation and a confirmation other than Transmission Status (ACK Received) for a DATA frame for which a Delivery Failure message was not sent to the ST_IPR state machine (i.e., in order to retry transmitting the frame), then this state shall set the changing data pointer bit in the frame to one and shall set the data offset field to a data offset value associated with a previous ACK/NAK balance.

9.2.6.2.3.6.2 Transition ST_ITS5:Prepare_Data_Out to ST_ITS2:Intiator_Send_Frame

This transition shall occur after this state constructs a DATA frame.

9.2.6.2.3.7 ST_ITS6:Receive_Data_In state

9.2.6.2.3.7.1 State description

If this state receives a Data-In Arrived message from the ST_IFR state machine, then this state shall verify the DATA frame received with the message as follows:

1) check the data offset. If the data offset was not expected (i.e., the CHANGING DATA POINTER bit is set to one and the value in the DATA OFFSET field is not set to a data offset associated with a previous ACK/NAK balance, or the CHANGING DATA POINTER bit is set to zero and the value in the DATA OFFSET field is not set to the value in the DATA OFFSET FIELD in the previous DATA information unit plus the number of bytes in that information unit), then this state shall send a Reception Complete (Data Offset Error) message to the ST_IFR state machine;
2) check the length of the data. If the length of the data is greater than that indicated by the COMMAND frame, then this state shall send a Reception Complete (Too Much Read Data) message to the ST_IFR state machine;
3) check the length of the data. If the length of the data is zero, then this state shall send a Reception Complete (Incorrect Data Length) message to the ST_IFR state machine.

If this state receives Transmission Status (ACK/NAK Timeout) or Transmission Status (Connection Lost Without ACK/NAK), then this state shall send a Reception Complete (Command Failed, Connection Failed) to the ST_IFR state machine.

NOTE 5 - after this state sends a Reception Complete (Command Failed, Connection Failed), this state waits to receive a Data-In Arrived message or a Cancel message from the ST_IFR state machine. The Cancel message results from a vendor specific request from the SCSI application layer after the SCSI application layer has used a task management function to determine that the SAS target port did not receive the COMMAND frame.

If this state is entered from the ST_ITS7:Process_Data_In state and number of bytes moved for the data in command equals the request byte count, then this state shall send a Reception Complete (Data-In Received) message to the ST_TFR state machine.

If this state receives a Cancel message from the ST_IFR state machine, then this state shall send a Reception Complete (Cancel Acknowledged) message to the ST_IFR state machine.

A Reception Complete message shall include the tag as an argument.

9.2.6.2.3.7.2 Transition ST_ITS6:Receive_Data_In to ST_ITS1:Initiator_Start

This transition shall occur after this state sends one of the following to the ST_IFR state machine:

a) a Reception Complete (Data-In Received) message;
b) a Reception Complete (Data Offset Error) message;
c) a Reception Complete (Too Much Read Data) message;
d) a Reception Complete (Incorrect Data Length) message; or
e) a Reception Complete (Cancel Acknowledged) message.

9.2.6.2.3.7.6 Transition ST_ITS6:Receive_Data_In to ST_ITS2:Initiator_Send_Frame

This transition shall occur after this state receives a Transmission Status (NAK Received) confirmation for a COMMAND frame for a data-in operation.

9.2.6.2.3.7.7 Transition ST_ITS6:Receive_Data_In to ST_ITS7:Process_Data_In

This transition shall occur after this state receives and verifies a Data-In Arrived message.

9.2.6.2.3.8 ST_ITS7:Process_Data_In state

9.2.6.2.3.8.1 State description

This state shall process the data received with the Data-In Arrived message.

9.2.6.2.3.8.2 Transition ST_ITS7:Process_Data_In to ST_ITS6:Receive_Data_In

This transition shall occur after this state has processed the data received in a Data-In Arrived message.