Accredited Standards Committee
X3, Information Processing Systems

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Ref Doc.: SSA-TL2 and SSA-S3P rev 2
Reply to: John Scheible

To: X3T10.1 Membership
From: John Scheible

Subject: AER reporting between ULP and TL2 layers

BACKGROUND

The services model for TL2 does not include a method of informing the ULP of asynchronous events that affect it, such as resets, web changes, Quiecses, etc.. Many of these events affect the ULP and need to be reported. The TL2 services model does not include such a service, nor have the interactions for many of these events been well documented. This proposal attempts to remedy this situation.

I am proposing two new services. REGISTER ULP is invoked by the ULP to register with the transport layer, and AER is invoked by the transport layer to report asynchronous events.

PROPOSAL

Make the following changes:

1)   Make the changes described in 96a136r2 to SSA-TL2 that~~which~~ were incorporated into SSA-S3P, but not SSA-TL2. These include GET LOGICAL PATH, GET TAG, AND FREE TAG.

2)   Table B.1 - Add two more lines, REGISTER ULP invoked by the protocol and executes in the transport layer and involves either the initiator or target; and AER invoked by the transport layer, runs in the protocol layer and involves either the target or initiator.

3)   Change the first paragraph under Table B.1 to "six" groups instead of five.

4)   Add a new group B.1.5 entitled "Other" and add the following paragraph:
     The REGISTER ULP service allows the ULP to register and specify its operation parameters to the transport layer. The AER service allows the transport layer to inform the ULP of asynchronous events.

5)   Add new sections to SSA-TL2 Annex B as shown on pages 2 and 3. Update the MASTER ALERT Handling sections to vaguely refer to notifying the ULP since the services model is informative.

6)   10.6.1 in SSA-TL2, after the second bullet b) - Add the following new bullet:
     c) Inform the ULP(s) if appropriate.

7)   Add new sections to SSA-S3P Annex D as shown on page 4.

B.4.13 REGISTER ULP

REGISTER ULP (Vendor Code, AER Mask || ULP Code, Return Code)

The REGISTER ULP service has two input parameters (Vendor Code and AER Mask) and two output parameters (ULP Code and Return Code).

The Register ULP service is invoked by the protocol layer when it is initialized. The protocol layer passes its Vendor Code that~~which~~ contains a single byte ULP code or a 4 byte protocol identifier (see 11.2.10), and an AER Mask that~~which~~ identifies the asynchronous events for which it wishes to be informed. The AER mask is a two byte construct consisting of a bit significant map to enable each asynchronous event (see Table B.4).

Table B.4 - AER Mask

Byte	Bit 7	6	5	4	3	2	1	Bit 0
MSB	AEE15	AEE14	AEE13	AEE12	AEE11	AEE10	AEE9	AEE8
LSB	AEE7	AEE6	AEE5	AEE4	AEE3	AEE2	AEE1	AEE0

The transport layer will return a single byte ULP Code that the protocol uses in its~~its~~ SMSs, and a Return Code. A Return Code value of FUNCTION SUCCESSFUL indicates proper registration of the protocol and validates ULP Code. A Return Code value of FUNCTION FAILED, indicates that the transport layer was unable to register the ULP because either too many vendor unique protocols are already assigned, or some other internal constraint, and the ULP Code is invalid.

When the transport layer completes a Register ULP service, the transport layer invokes the AER service with a meaning code of NEW DEVICE ADDED for each device in its Configuration table that supports the registered ULP. The transport layer then

~~When the REGISTER ULP service is~~ invokesd~~ to the transport layer, the transport layer will invoke~~ the Asynchronous Alert process with an ALERT CODE field value of SUPPORTED ULP LIST CHANGED.

B.4.14 AER

AER (AER Code, Device ID, Alert Code, Frame Data ||)

The AER service has four input parameters (AER Code, Device ID, Alert Code, and Frame Data) and no output parameters. The AER service is a high priority service and should take precedence over other services.

The AER service is invoked by the transport layer when a Total Reset is processed, certain Asynchronous Alerts are invoked, or certain Master Alerts are received; and the appropriate bit in the AER Mask (from the REGISTER ULP service) is set. The valid AER Code values are shown in Table B.5.

Table B.4 - AER Code values

AER Code value	AER Mask bit	Meaning
0	AEE0	LOCAL RESET PROCESSED
1	AEE1	TOTAL RESET PROCESSED
2	AEE2	reserved
3	AEE3	reserved
4	AEE4	NEW DEVICE ADDED
5	AEE5	DEVICE ACCESS LOST
6	AEE6	DEVICE PATH CHANGED
7	AEE7	reserved
8	AEE8	INVALID SMS
9	AEE9	ENVIRONMENTAL ERROR
10	AEE10	WARNING
11	AEE11	reserved
12	AEE12	reserved
13	AEE13	reserved
14	AEE14	reserved
15	AEE15	reserved

An AER Code parameter value of LOCAL RESET PROCESSED indicates that the transport layer has been reset by an internal Local Reset. A Local Reset is equivalent to a Total Reset, but is invoked from within the node rather than as a frame over the SSA interface. The Device ID, Alert Code and Frame Data parameters are not valid.

An AER Code parameter value of TOTAL RESET PROCESSED indicates that the transport layer has been reset by an internal Local Reset. The Device ID, Alert Code and Frame Data parameters are not valid. The receipt of an Absolute Reset will be treated like a power on situation, and both transport and protocol layers will be automatically reset.

An AER Code parameter value of NEW DEVICE ADDED indicates that the transport layer has detected that a new device the supports the ULP has been added to the Web. The Device ID parameter is the new Device's 8 byte Unique ID. The Alert Code and Frame Data parameters are not valid.

An AER Code parameter value of DEVICE ACCESS LOST indicates that the transport layer has lost all paths to a device the supports the ULP. The Device ID parameter is the lost Device's 8 byte Unique ID. The Alert Code and Frame Data parameters are not valid.

An AER Code parameter value of DEVICE PATH CHANGED indicates that the transport layer has detected that the path has changed to a device the supports the ULP has changed. The Device ID parameter is the Device's 8 byte Unique ID. The Alert Code and Frame Data parameters are not valid.

An AER Code value of INVALID SMS indicates that the transport layer has received a MASTER ALERT SMS with an ALERT CODE value of UNKNOWN SMS, SMS TOO SHORT, or INVALID FIELD. The Device ID parameter is the Device's 8 byte Unique ID who detected the error. The Alert Code parameter is the ALERT CODE value from the MASTER ALERT SMS. The Frame Data parameter contains the FRAME DATA field from the MASTER ALERT SMS.

An AER Code value of ENVIRONMENTAL ERROR indicates that the transport layer has invoked an Asynchronous Alert or received a MASTER ALERT SMS with an ALERT CODE value of POWER FAULT or CRITICAL FAN FAILURE. The Device ID parameter is 8 byte Unique ID of the device thatwhich detected the error. The Alert Code parameter is the ALERT CODE value from the Asynchronous Alert or MASTER ALERT SMS. The Frame Data parameter is not valid.

An AER Code value of WARNING indicates that the transport layer has invoked an Asynchronous Alert or received a MASTER ALERT SMS with an ALERT CODE value of REDUNDANT FAN FAILURE, FAILURE PREDICTION THRESHOLD EXCEEDED, or ALARM THRESHOLD EXCEEDED. The Device ID parameter is 8 byte Unique ID of the device thatwhich detected the error. The Alert Code parameter is the ALERT CODE value from the Asynchronous Alert or MASTER ALERT SMS. The Frame Data parameter is not valid.

D.2.9 REGISTER ULP

REGISTER ULP (Vendor Code, AER Mask || ULP Code, Return Code)

When the protocol layer is initialized, it invokes the REGISTER ULP service to the transport layer specifying its Vendor Code and AER Mask (see SSA-TL2). The ULP Code value returned is used in the ULP CODE field of the protocol SMSs. For SSA-S3P, the Vendor Code parameter is 83h, and the returned ULP Code parameter is 83h.

D.2.10 AER

AER (AER Code, Device ID, Alert Code, Frame Data ||)

When the protocol layer receives the AER service (see SSA-TL2), the protocol layer will perform the recovery specified in the following paragraphs.

An AER Code parameter value of LOCAL RESET PROCESSED causes the protocol layer to restart or re-issue any outstanding I/O processes. If the CONFIRM bit was set in the SCSI COMMAND SMS, the protocol may issue a CONFIRM STATUS SMS with a COMPLETE bit cleared, to verify that the device received the command, and to restart it if necessary. If the CONFIRM STATUS SMS generates an Asynchronous Alert with an alert code value of UNEXPECTED SMS, then the protocol layer re-issues the command. If the confirm bit was cleared then the protocol should issue an ABORT TASK SMS and reissue the command.

An AER Code parameter value of TOTAL RESET PROCESSED causes the protocol layer to restart or re-issue any outstanding I/O processes. If the CONFIRM bit was set in the SCSI COMMAND SMS, the protocol may issue a CONFIRM STATUS SMS with a COMPLETE bit cleared, to verify that the device received the command, and to restart it if necessary. If the CONFIRM STATUS SMS generates an Asynchronous Alert with an alert code value of UNEXPECTED SMS, then the protocol layer re-issues the command. If the confirm bit was cleared then the protocol should issue an ABORT TASK SMS and reissue the command.

An AER Code parameter value of NEW DEVICE ADDED clauses the protocol layer to add the device ~~ID~~ indicated by the Device ID parameter to its internal device data structures and alert the Application client as to the existence of the device.

An AER Code parameter value of DEVICE ACCESS LOST causes the protocol layer to remove the device ID indicated by the Device ID parameter from its internal device data structures and~~or~~ alert the Application client as to the removal of the device.

An AER Code parameter value of DEVICE PATH CHANGED causes the protocol layer to restart or re-issue any outstanding I/O processes. If the CONFIRM bit was set in the SCSI COMMAND SMS, the protocol may issue a CONFIRM STATUS SMS with a COMPLETE bit cleared, to verify that the device received the command, and to restart it if necessary. If the CONFIRM STATUS SMS generates an Asynchronous Alert with an alert code value of UNEXPECTED SMS, then the protocol layer re-issues the command. If the confirm bit was cleared then the protocol should issue an ABORT TASK SMS and reissue the command.

An AER Code value of INVALID SMS causes the protocol layer to perform implementation specific recovery procedures, if any, to reissue the SMS specified in the Frame Data parameter if sent by the protocol layer.

An AER Code value of ENVIRONMENTAL ERROR causes the protocol layer to perform implementation specific recovery procedures, if any, to handle the environmental error specified by the Alert Code parameter.

An AER Code value of WARNING causes the protocol layer to perform implementation specific recovery procedures, if any, to handle the warning specified by the Alert Code parameter.

Sincerely,

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