To: INCITS T10 Committee
From: Susan Gray, Quantum
Date: February 23, 2004
Document Number: T10/04-056r2
Subject: ADT Link service error recovery

1 Revision History

Revision 2:
Updated the error recovery tables. Incorporate input from February 23, 2004 teleconference.

Revision 1:
Incorporate input from February 9, 2004 teleconference.

Revision 0:
Initial proposal

2 Discussion

The current error recovery section does not address error recovery of link service frames. The following table summarizes the intended recovery procedures for each frame type and port state. "Corrupted" errors become retryable errors and are not listed in the table. Symbol framing errors don't relate to frames and always have the same recovery procedure and therefore are not listed in the table.

Legend: retryable (sender detected error) protocol – should never happen
resource limitation recoverable (only possible for non-link service frames)

none: no error recovery method is currently defined
impossible: can't happen
illegal: not valid to send the frame type in the corresponding state

Transmitter error recovery

Frame State	Port Login	Port Logout	NOP	Pause	Initiate Recovery	Other frame types
P0 Initial	Illegal (port login is always sent from p1 login)	Transition to T1 Resend None None Impossible	Transition to T1 Resend None None Impossible	Illegal	Illegal	Illegal
P1 Login	Initiate new login exchange – transition to P1 None None Impossible	Transition to T1 Resend None None Impossible	Transition to T1 Resend None None Impossible	Illegal	Illegal	Illegal
P2 Logged-in / TS Active	Illegal	Transition to T1 Resend None None Impossible	Transition to T1 Resend None None Impossible	None None None Impossible	N/A None None Impossible	Transition to T1 Resend None None Transition to T1 Resend
P2 Logged-in / TS Paused	Illegal	Illegal	Illegal	Illegal	Illegal	Illegal

P4 Logged Out	Illegal	Illegal	Illegal	Illegal	Illegal	Illegal
T1 Initiate Recovery	Illegal	None None None Impossible	None None None Impossible	None None None Impossible	Resend Resend Resend Impossible	Illegal
T2 Retry Initiate Recovery	Illegal	None None None Impossible	None None None Impossible	None None None Impossible	Abort open exchanges & initiate Login exchange with default params (AOE = 1) “ “ Impossible	Illegal

Receiver error recovery

Frame State	Port Login	Port Logout	NOP	Pause	Initiate Recovery	Other frame types
P0 Initial	Nak w/ PR 0 Nak w/ PR 0 Nak w/ PR 0	Nak w/ PR 0 Nak w/ PR 0 Nak w/ PR 0	Nak w/ PR 0 Nak w/ PR 0 Nak w/ PR 0	Nak w/ PR 0 Nak w/ PR 0 Nak w/ PR 0	Nak w/ PR 0 Nak w/ PR 0 Nak w/ PR 0	Nak w/ PR 0 Nak w/ PR 0 Nak w/ PR 0
P1 Login	Nak w/ PR 0 – Transition to N1 Nak w/ PR 0 Transition to N1 Nak w/ PR 0 Transition to N1	Nak w/ PR 0 Nak w/ PR 0 Nak w/ PR 0	Nak w/ PR 0 Nak w/ PR 0 Nak w/ PR 0	Nak w/ PR 0 Nak w/ PR 0 Nak w/ PR 0	Nak w/ PR 0 Nak w/ PR 0 Nak w/ PR 0	Nak w/ PR 0 Nak w/ PR 0 Nak w/ PR 0
P2 Logged-in / T0 Active	Nak w/ PR 0 Nak w/ PR 0 Nak w/ PR 0	Nak w/ PR 0 Nak w/ PR 0 Nak w/ PR 0	Nak w/ PR 0 Nak w/ PR 0 Nak w/ PR 0	Nak w/ PR 0 Nak w/ PR 0 Nak w/ PR 0	Nak w/ PR 0 Nak w/ PR 0 Nak w/ PR 0	Nak w/ PR 0 Nak w/ PR 0 Nak w/ PR 1 Transition to R1
P2 Logged-in / T1 Paused	Nak w/ PR 0 Nak w/ PR 0 Nak w/ PR 0	Nak w/ PR 0 Nak w/ PR 0 Nak w/ PR 0	Nak w/ PR 0 Nak w/ PR 0 Nak w/ PR 0	Nak w/ PR 0 Nak w/ PR 0 Nak w/ PR 0	Nak w/ PR 0 Nak w/ PR 0 Nak w/ PR 0	Nak w/ PR 0 Nak w/ PR 0 Nak w/ PR 1 Transition to R1
P4 Logged Out	Nak w/ PR 0 Nak w/ PR 0 Nak w/ PR 0	Nak w/ PR 0 Nak w/ PR 0 Nak w/ PR 0	Nak w/ PR 0 Nak w/ PR 0 Nak w/ PR 0	Nak w/ PR 0 Nak w/ PR 0 Nak w/ PR 0	Nak w/ PR 0 Nak w/ PR 0 Nak w/ PR 0	Nak w/ PR 0 Nak w/ PR 0 Nak w/ PR 1 Transition to R1
R1 Pending Recovery	Nak w/ PR 0 Nak w/ PR 0 Nak w/ PR 0	Nak w/ PR 0 Nak w/ PR 0 Nak w/ PR 0	Nak w/ PR 0 Nak w/ PR 0 Nak w/ PR 0	Nak w/ PR 0 Nak w/ PR 0 Nak w/ PR 0	Nak w/ PR 0 Nak w/ PR 0 Nak w/ PR 0	Nak w/ PR 0 Nak w/ PR 0 Nak w/ PR 1
R2 Recovering	Nak w/ PR 0 Nak w/ PR 0 Nak w/ PR 0	Nak w/ PR 0 Nak w/ PR 0 Nak w/ PR 0	Nak w/ PR 0 Nak w/ PR 0 Nak w/ PR 0	Nak w/ PR 0 Nak w/ PR 0 Nak w/ PR 0	Nak w/ PR 0 Nak w/ PR 0 Nak w/ PR 0	Nak w/ PR 0 Nak w/ PR 0 Nak w/ PR 1

ADT Revision 10 currently includes the following error recovery subclauses:

4.7 link layer error recovery

4.7.1 Error detection
4.7.1.1 Error detection overview
4.7.1.2 Error detection by the frame sender
4.7.1.3 Error detection by the frame receiver

4.7.2 Error recovery for non link service frames
4.7.2.1 (place holder for Port Login recovery)
4.7.2.2 Retryable error

4.7.2.3 Corrupted frame
4.7.2.4 Protocol error
4.7.2.5 Resource limitation
4.7.2.6 Recoverable error
4.7.2.7 Error recovery for symbol framing errors

3 Proposed changes

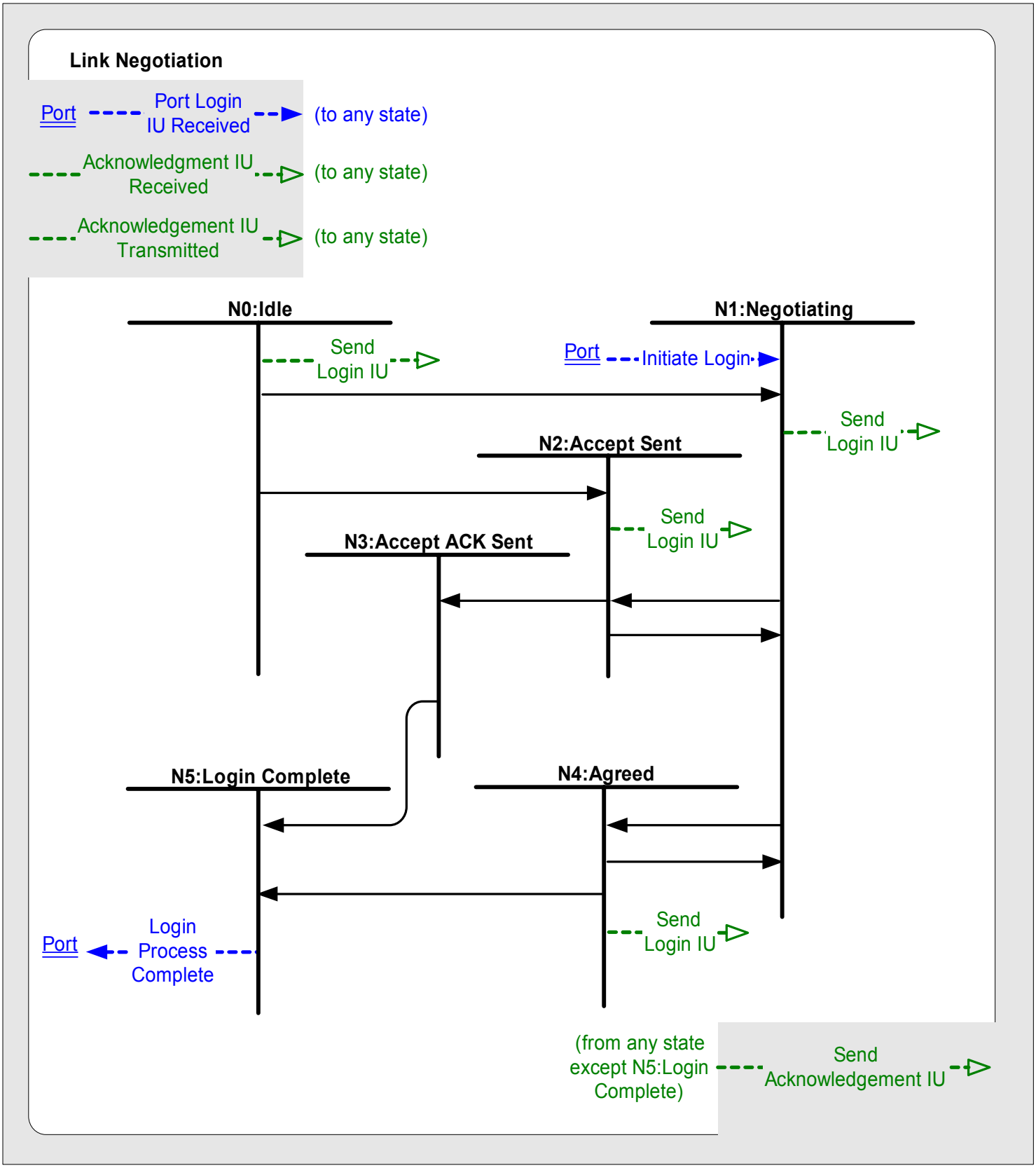
Add N5:Login complete state to handle the successful completion of the login process and allows N0:Idle to be used for error cases.

Globally change N4:Complete to N4:Agreed

4.3.3.1
add

f) N5:Login Complete

replace existing Figure 5 Link Negotiation state diagram with the following diagram



4.3.3.3.1 State Description (N0:Idle)

The N0:Idle state waits for the port to receive a Port Login IU.

4.3.3.3.2 Transition N0:Idle to N1:Negotiating

This transition shall occur when a Port Login IU Received message is received and the parameters within the Port Login IU are unacceptable.

4.3.3.3.3 Transition N0:Idle to N2:Accept Sent

If the received Port Login IU has the ACCEPT bit is set to zero and the parameters are acceptable, the port shall send a Port Login IU with the parameters unchanged and the ACCEPT bit set to one and transition to N2:Accept Sent.

4.3.3.6.2 Transition N3:Accept ACK Sent to N5:Login Complete

When the ACK IU has finished transmitting, the port shall set its operating parameters to the negotiated values and transition to N5:Login Complete.

4.3.3.7.2 Transition N4:Agreed to N5:Login Complete

After receiving an ACK IU for the Port Login IU it sent, the port shall set its operating parameters to the negotiated values and transition to N5:Login Complete.

4.3.3.8 N5:Login Complete state

4.3.3.8.1 State description

A port enters this state when both ports have sent and received a Port Login IU with the ACCEPT bit set to one. Upon entry into this state, a Login Process Complete message shall be sent to the port state machine.

4.7.2 Error recovery ~~for non link service frames~~

4.7.2.1 Error recovery for Login IUs

If an error is detected on a Port Login IU, the receiver port shall transition to P1:Login, sub state N0:Idle and the transmitter port shall restart the negotiation process. This is accomplished by transitioning to N1:Negotiating and initiating a[0] new login exchange using default operating parameters.

4.7.2.7 Error recovery for symbol framing errors

After detecting four or more symbol framing errors without the receipt of a frame, a port shall abort all exchanges, set the operating parameters of the interface to default settings, transition to P1:Login and initiate a Port Login exchange with the AOE bit set to one.