To: T10 Technical Committee
From: Jim Jones, Quantum (jim.jones@quantum.com) and Rob Elliott, HP (elliott@hp.com)
Date: 11 August 2003
Subject: T10/03-229r1 SAS-1.1 Transport Layer Retries ladder diagrams

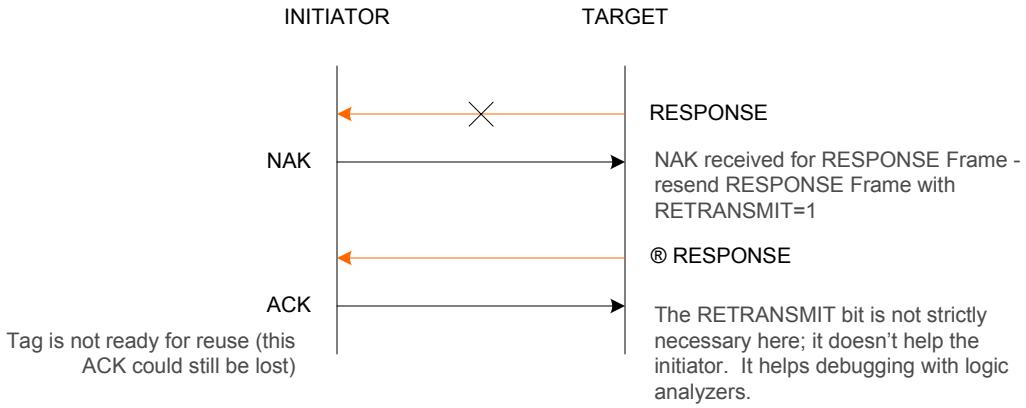
Revision History
Revision 1 (11 August 2003) second revision
Revision 0 (25 June 2003) first revision

Related Documents
sas-r05 - Serial Attached SCSI revision 5
03-186r2 - SAS-1.1 Transport Layer Retries

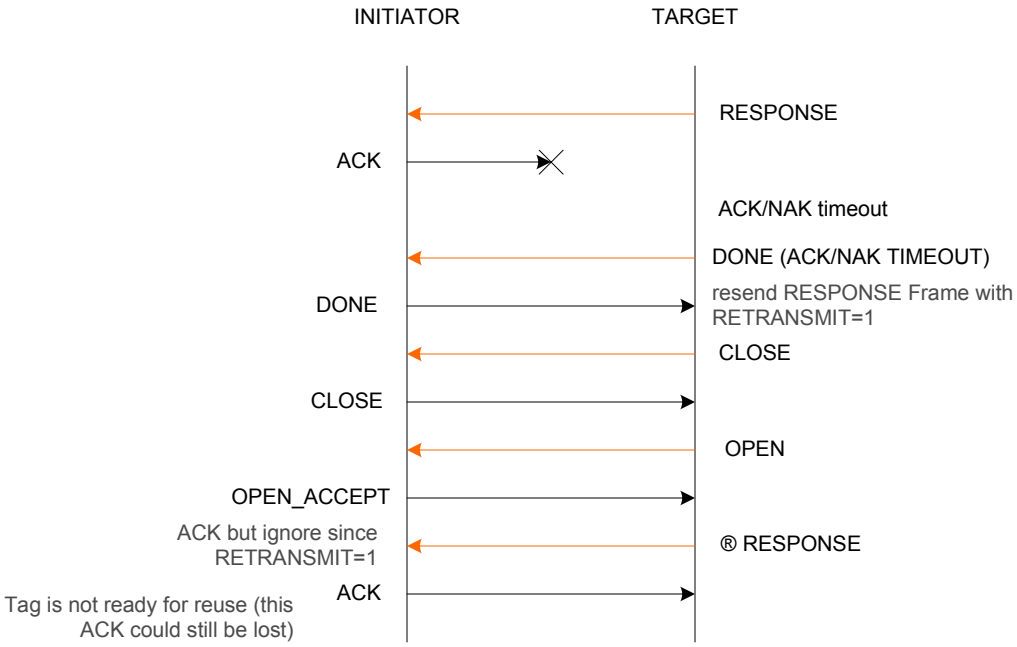
Overview
This presents ladder diagrams for all the error recovery cases in 03-186.

Conventions:
® DATA means resend the DATA frame
For certain frame types, the RETRANSMIT bit is set to 1 when retransmitting.

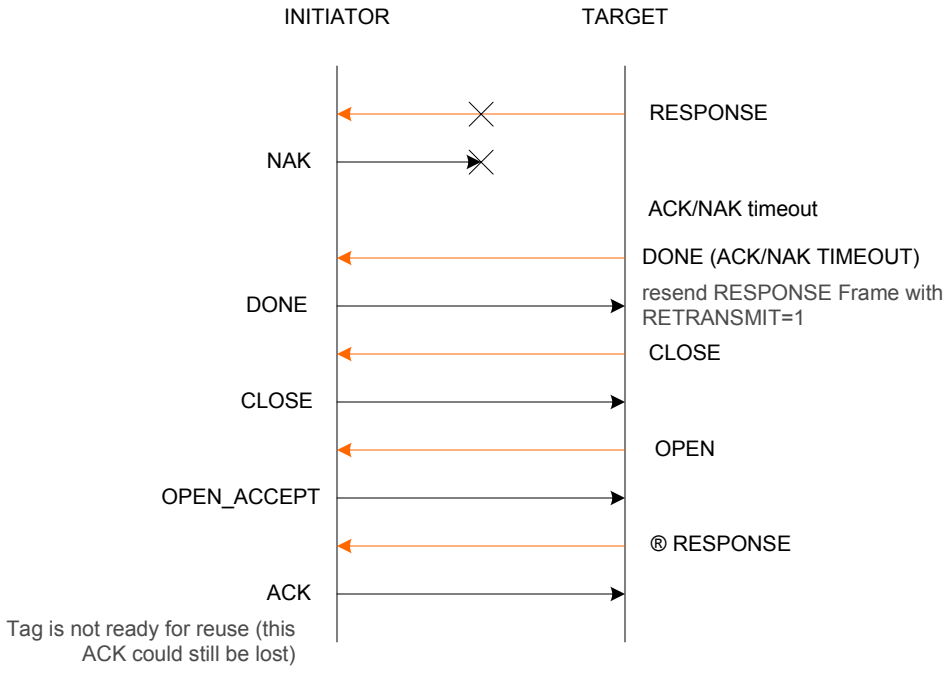
RESPONSE Frame NAK Received



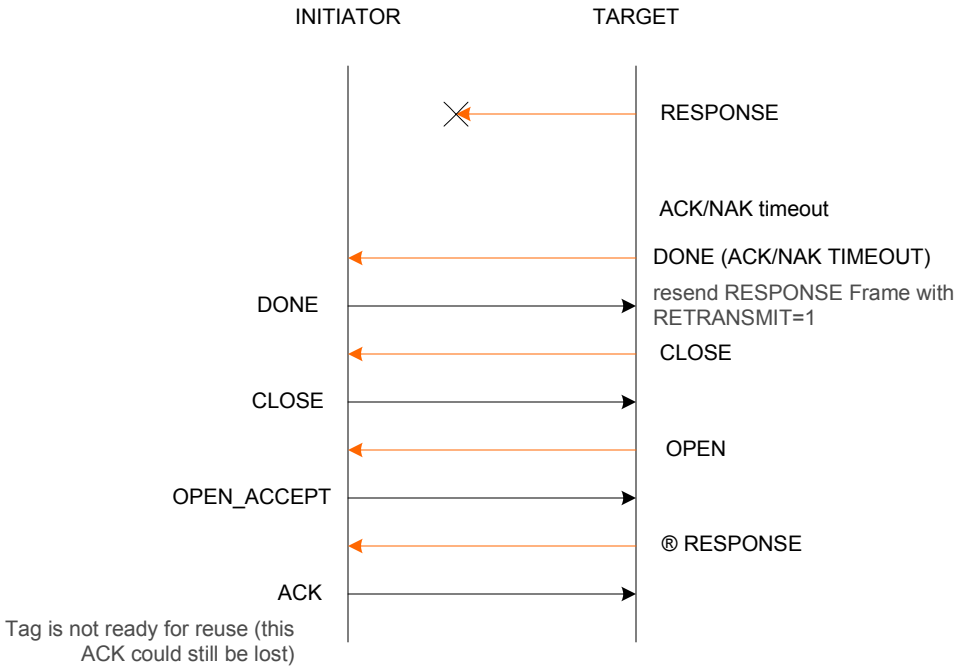
RESPONSE Frame ACK Lost



RESPONSE Frame NAK Lost

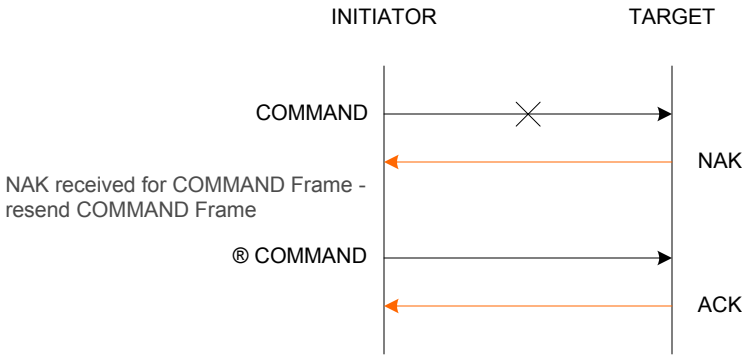


RESPONSE Frame Not Delivered



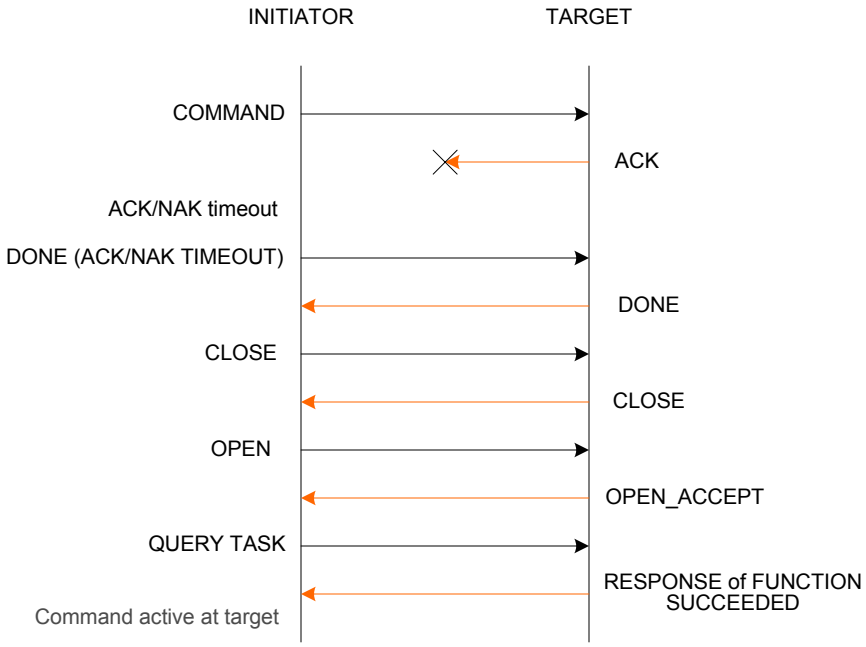
COMMAND Frame NAK Received

Same as in SAS-1



COMMAND Frame ACK lost (command running, but target hasn't sent a frame yet). If first burst is enabled, the initiator can start sending the first burst data after running query task, .

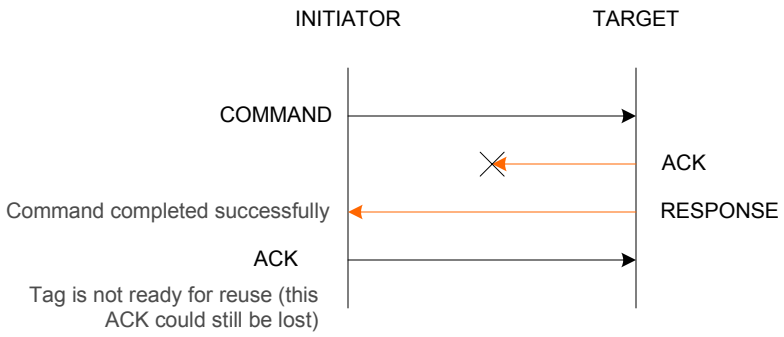
Same as in SAS-1

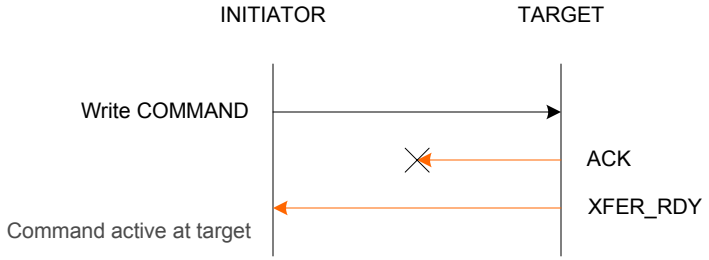


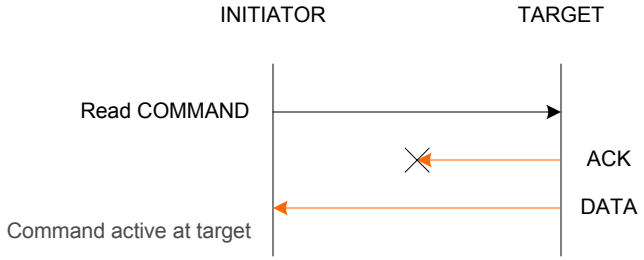
COMMAND Frame ACK Lost, target processes command returning RESPONSE, XFER_RDY, or DATA

The initiator still runs DONE (ACK/NAK Timeout) and has to participate in a new connection at some point.

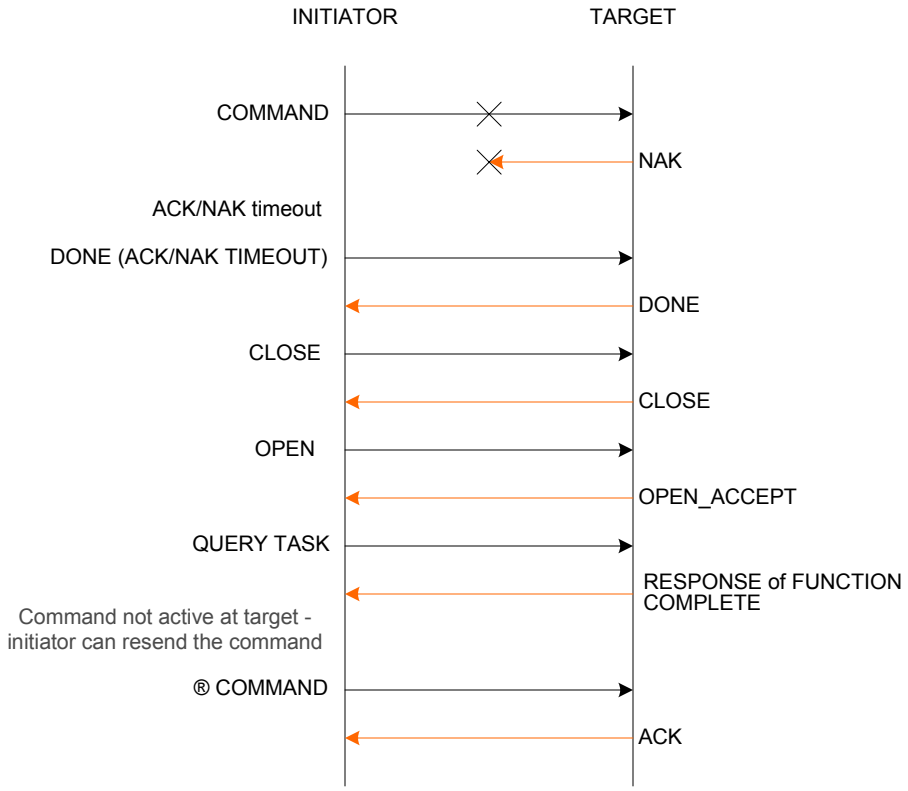
These pictures just show what the transport layer deals with.



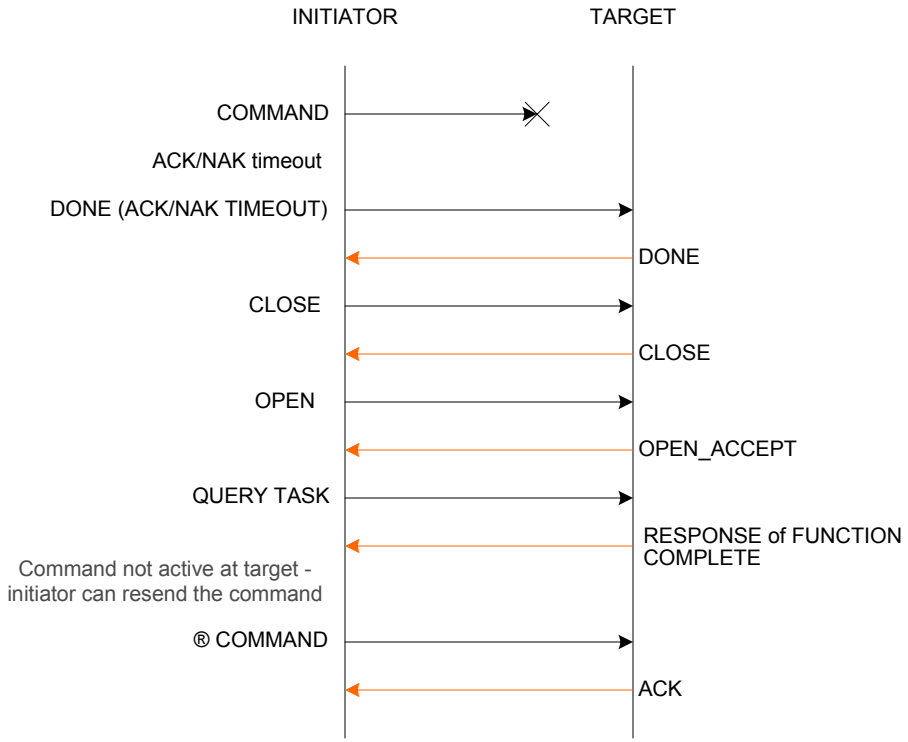




COMMAND Frame NAK Lost (command not running)

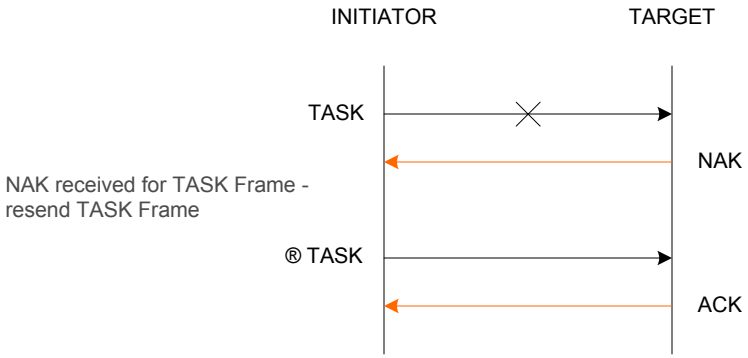


COMMAND Frame Not Delivered



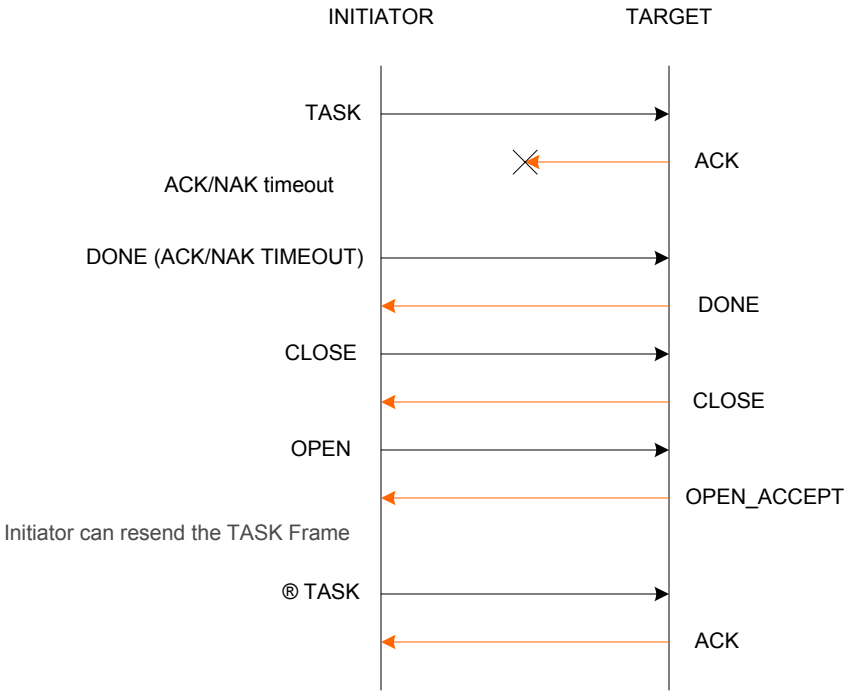
Task Frame NAK Received

Same as in SAS-1



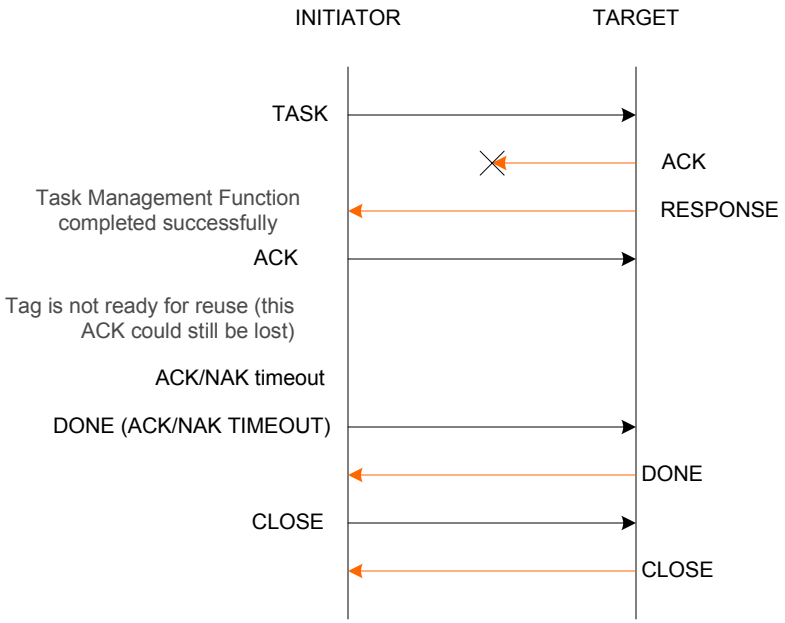
TASK Frame ACK lost - resend

Same as in SAS-1



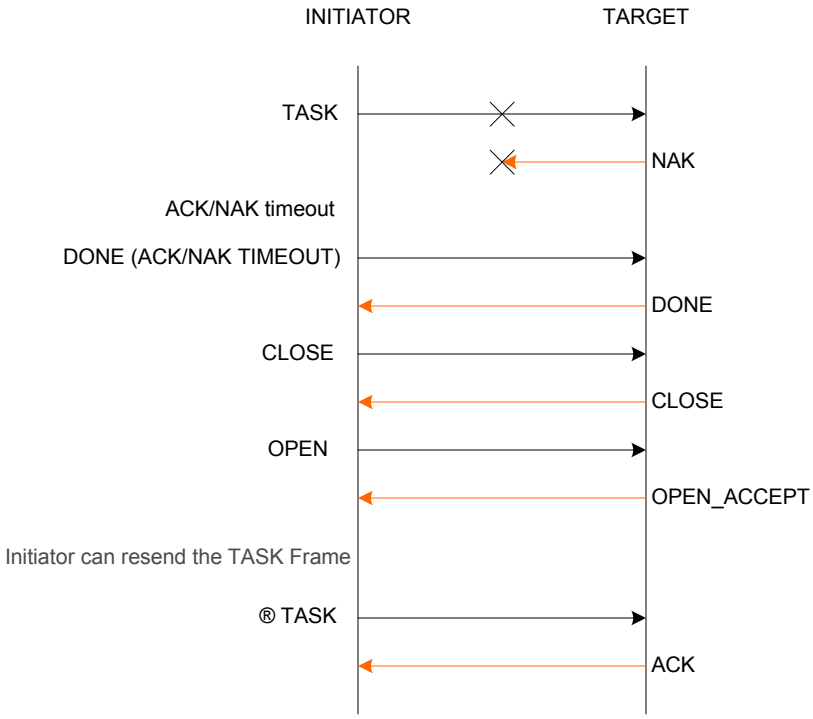
TASK Frame ACK Lost, target processes TASK Frame returning RESPONSE

The initiator still runs DONE (ACK/NAK Timeout).

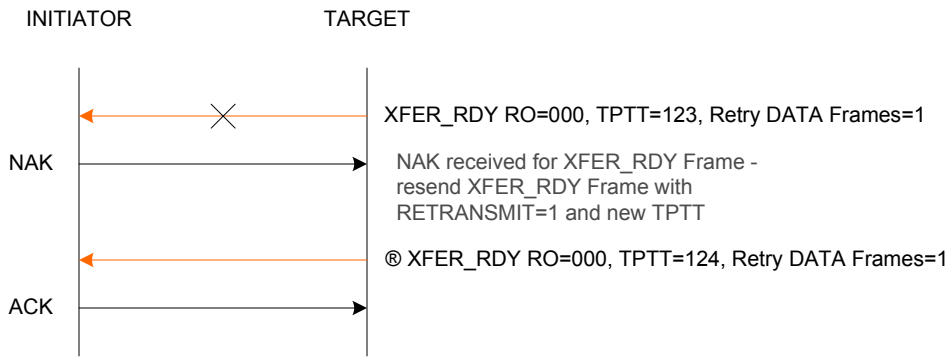


TASK Frame NAK Lost

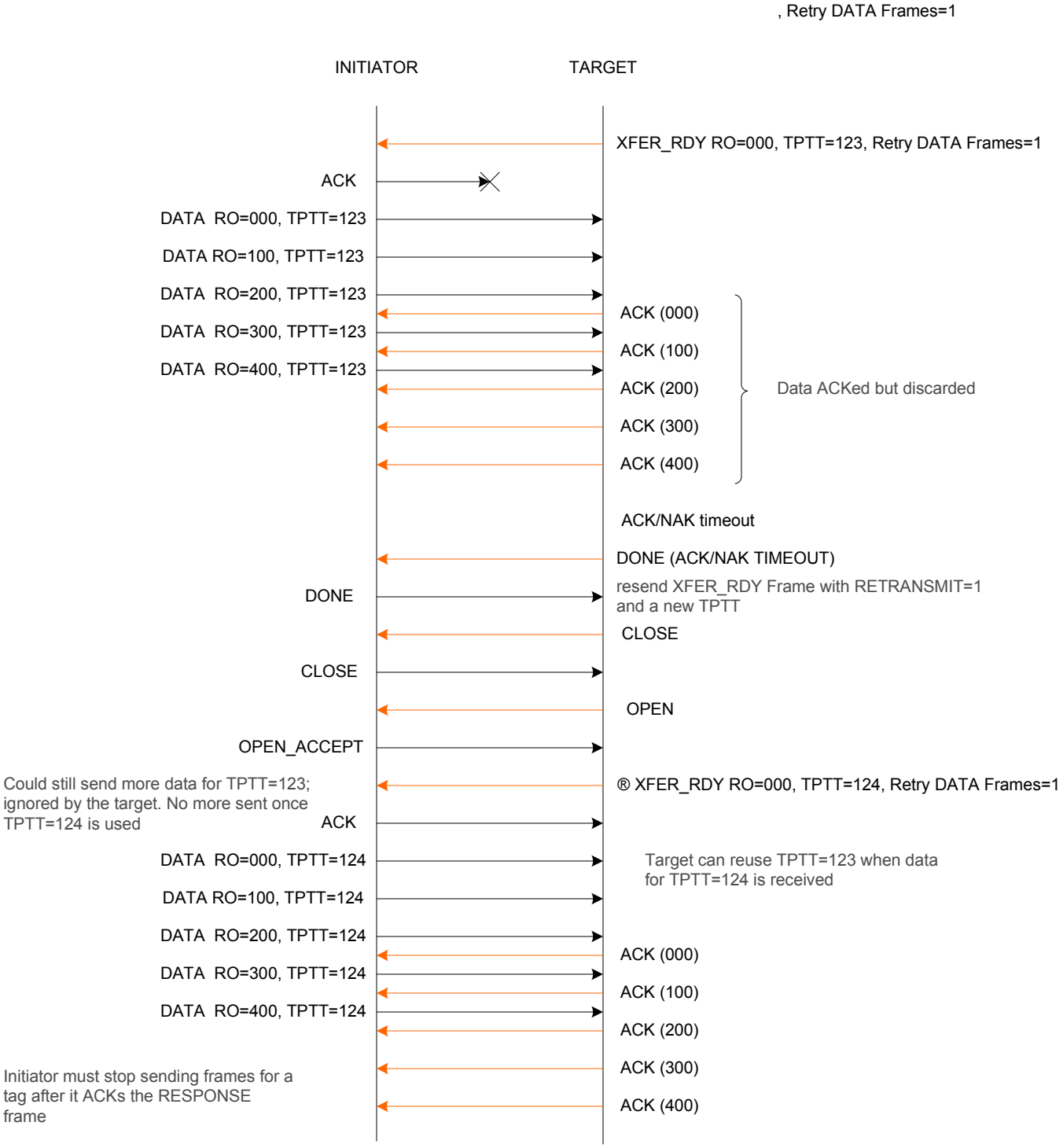
Same as in SAS-1



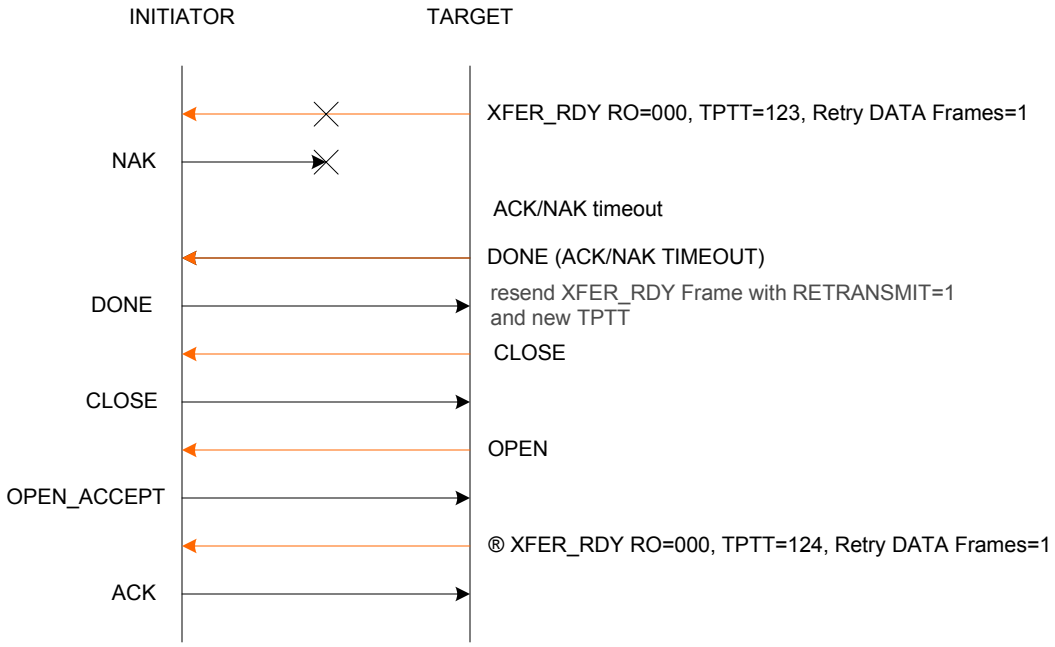
XFER_RDY Frame NAK Received
SAS-1.0: target aborts command



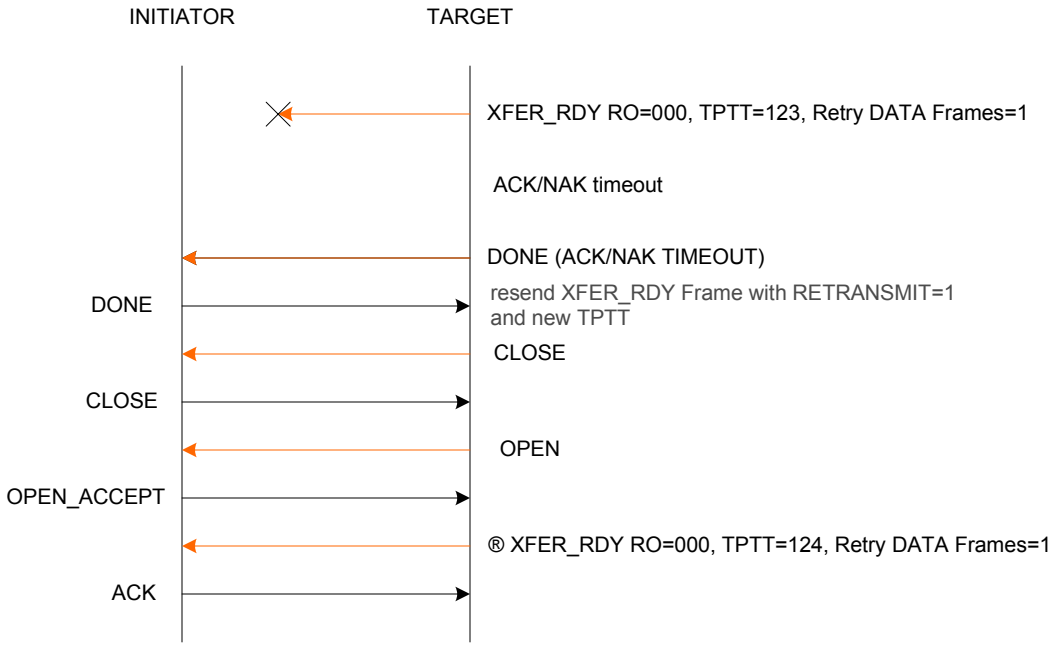
XFER_RDY Frame ACK Lost
SAS-1.0: target aborts command



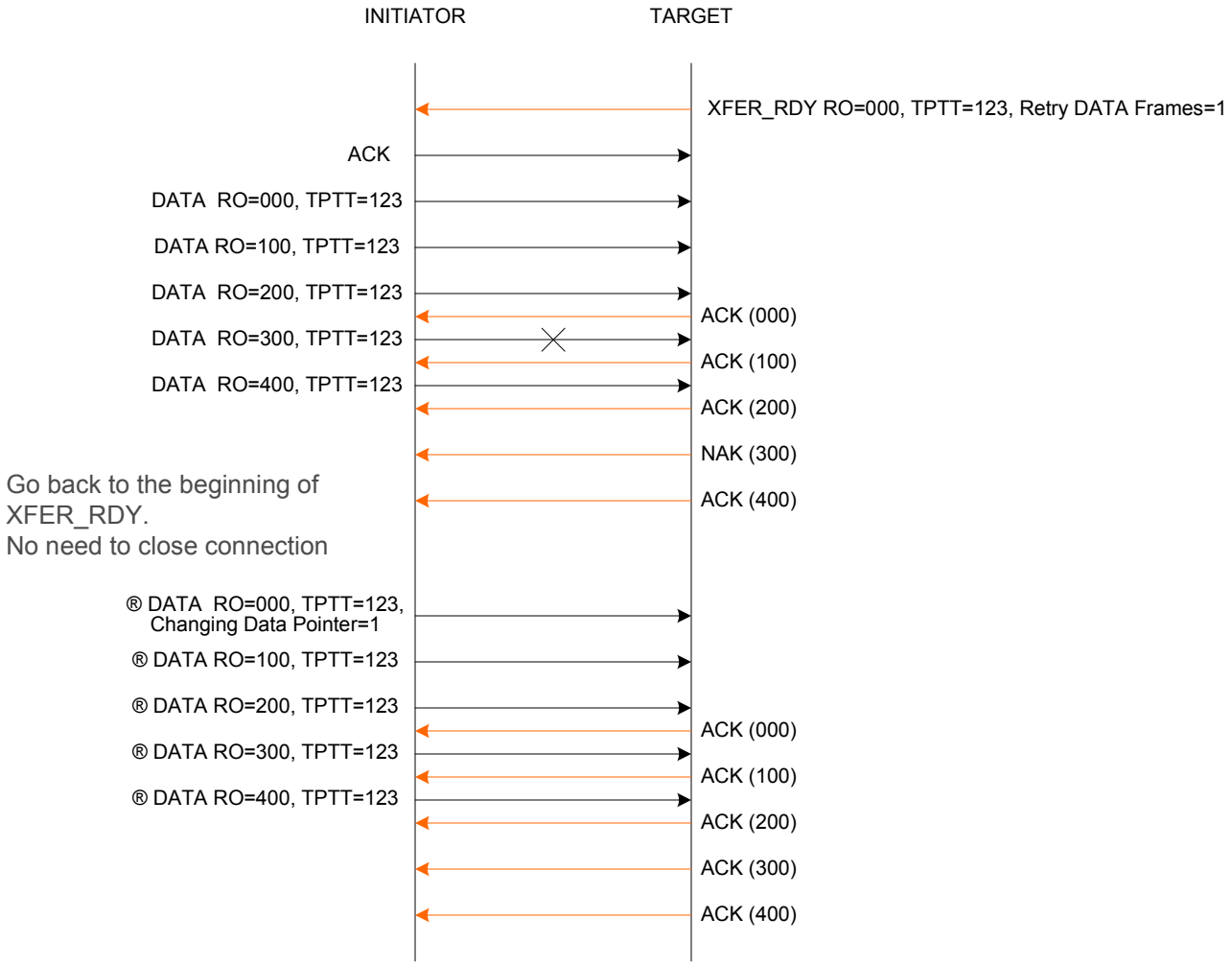
XFER_RDY Frame NAK Lost



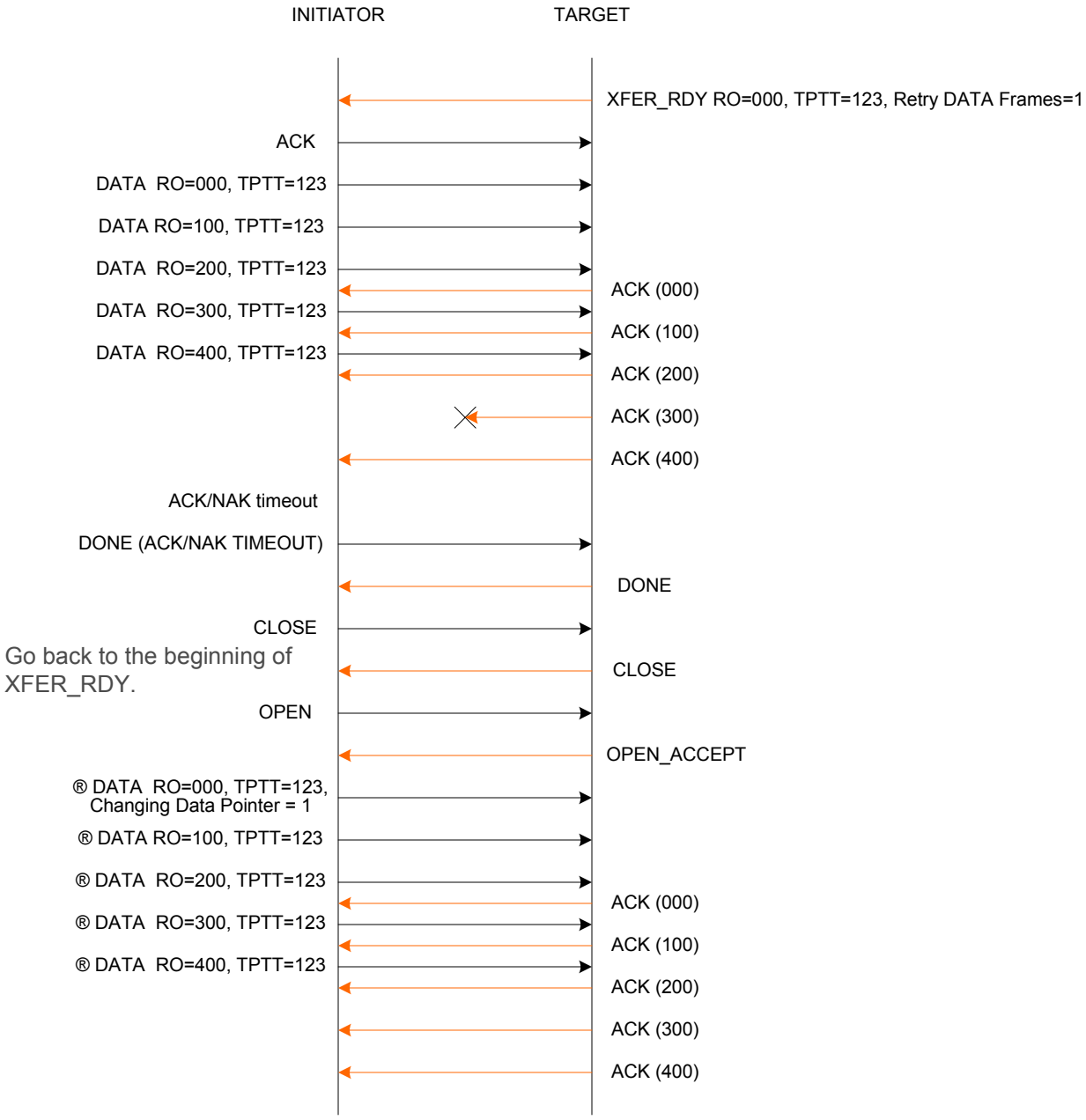
XFER_RDY Frame Not Delivered



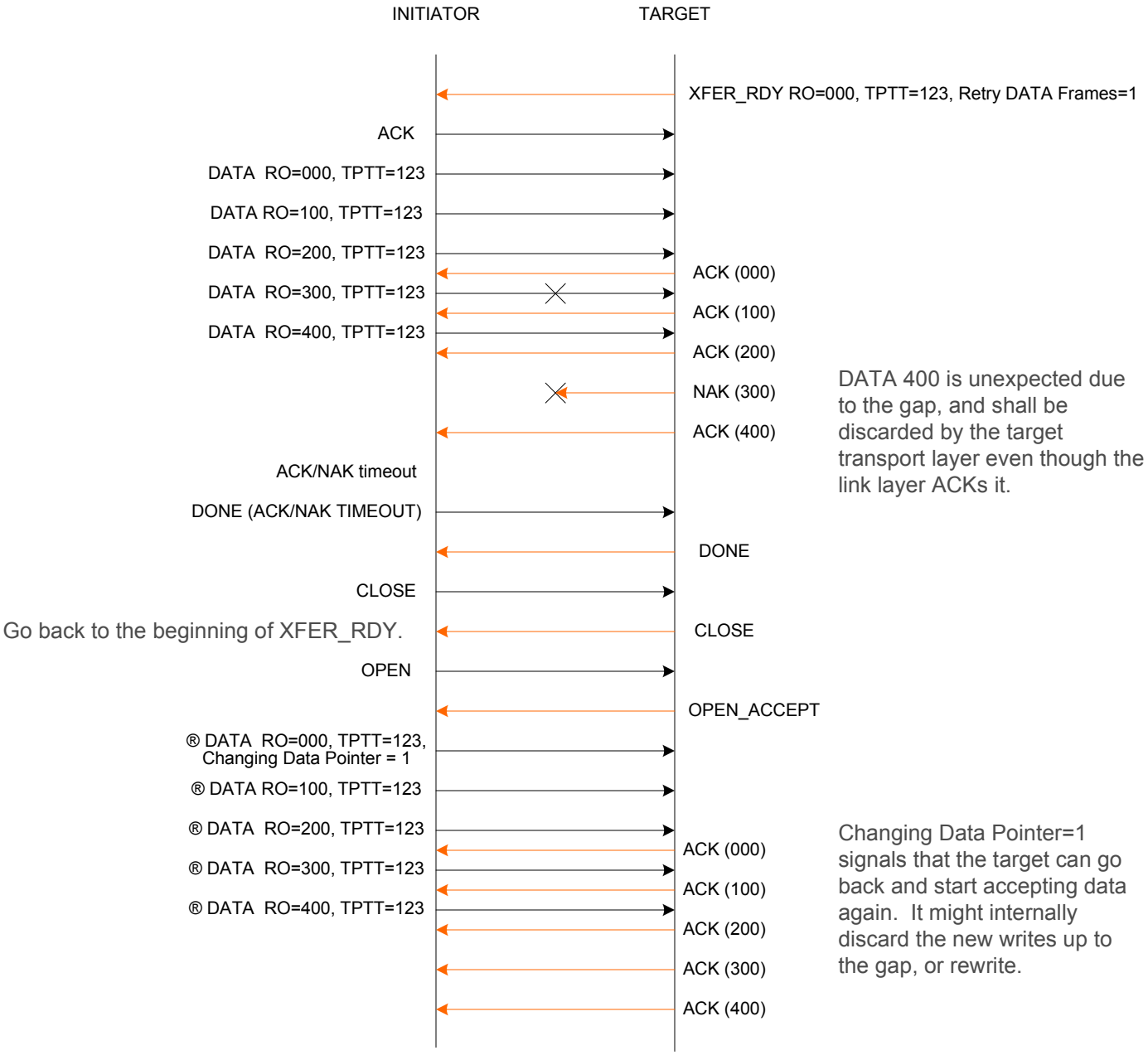
Write DATA Frame NAK Received



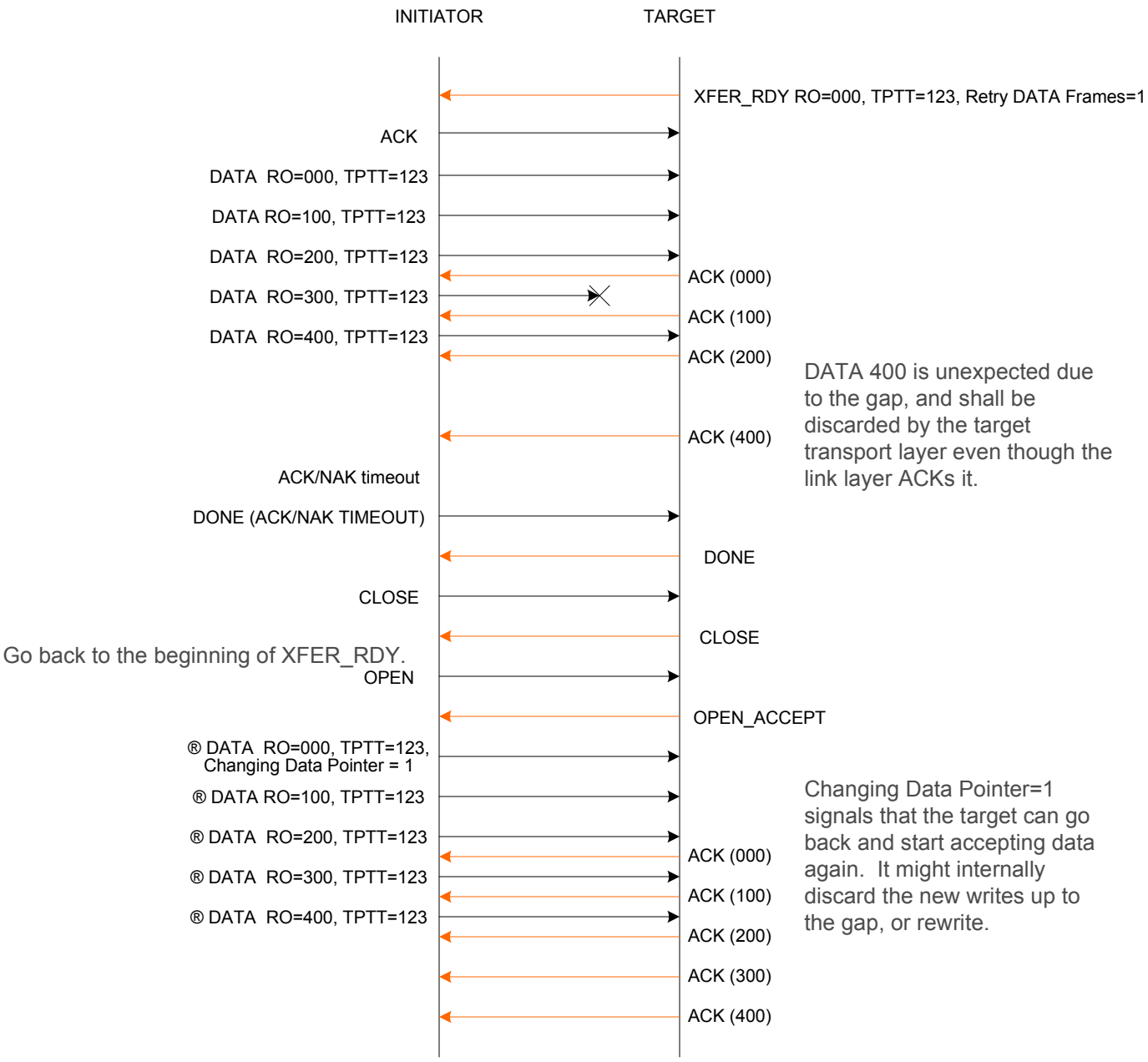
Write DATA Frame ACK Lost



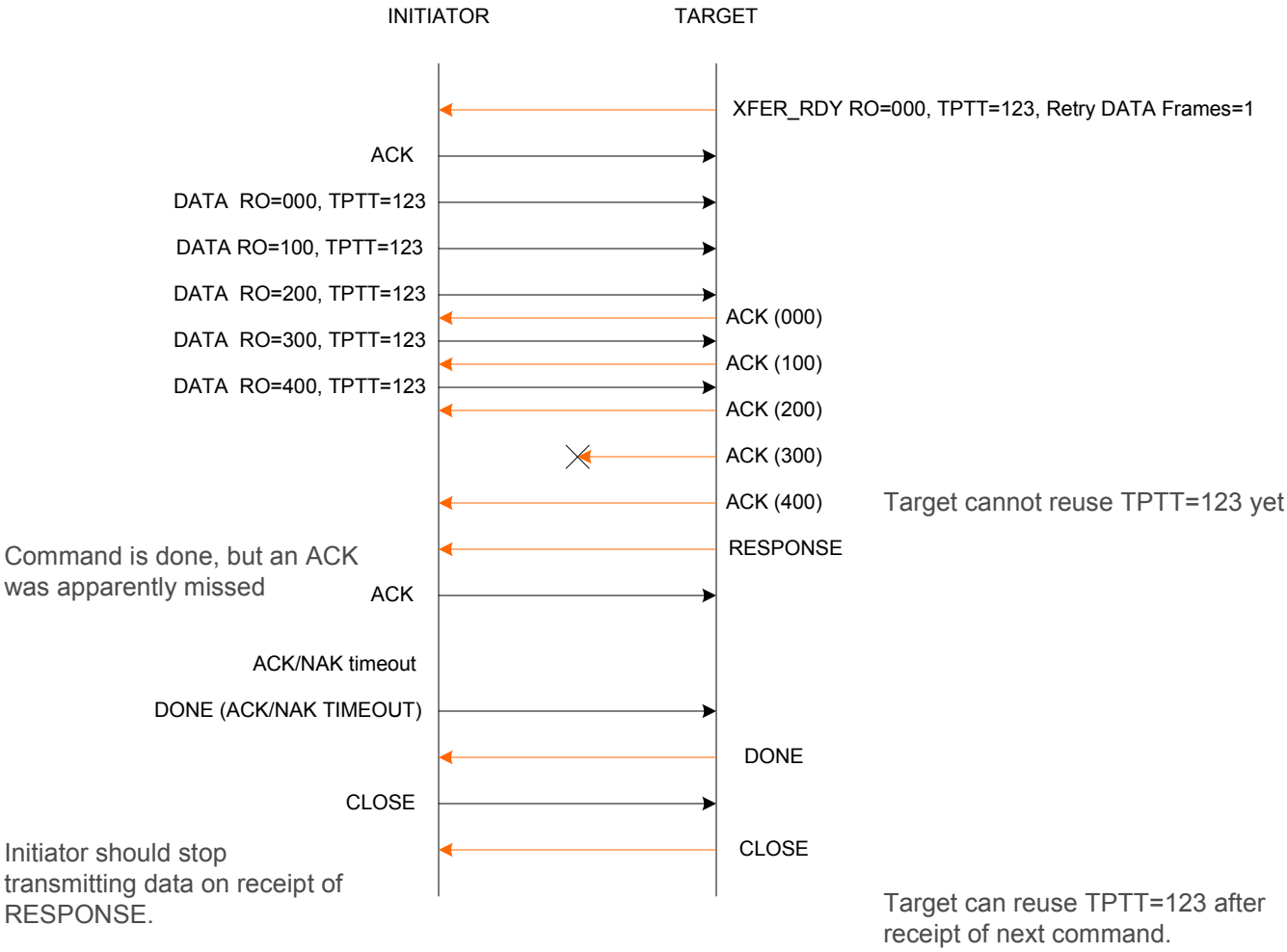
Write DATA Frame NAK Lost



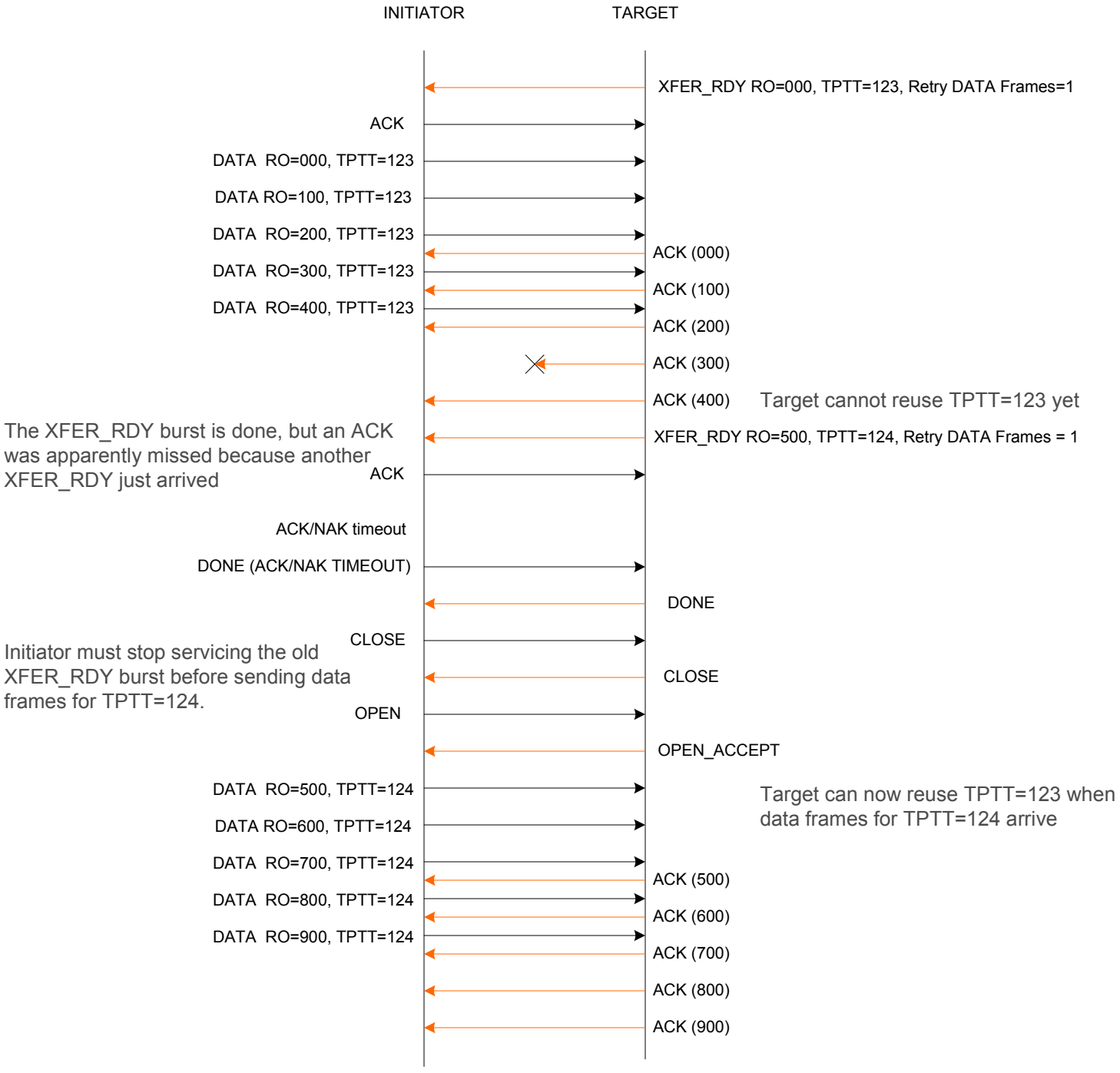
Write DATA Frame Not Delivered



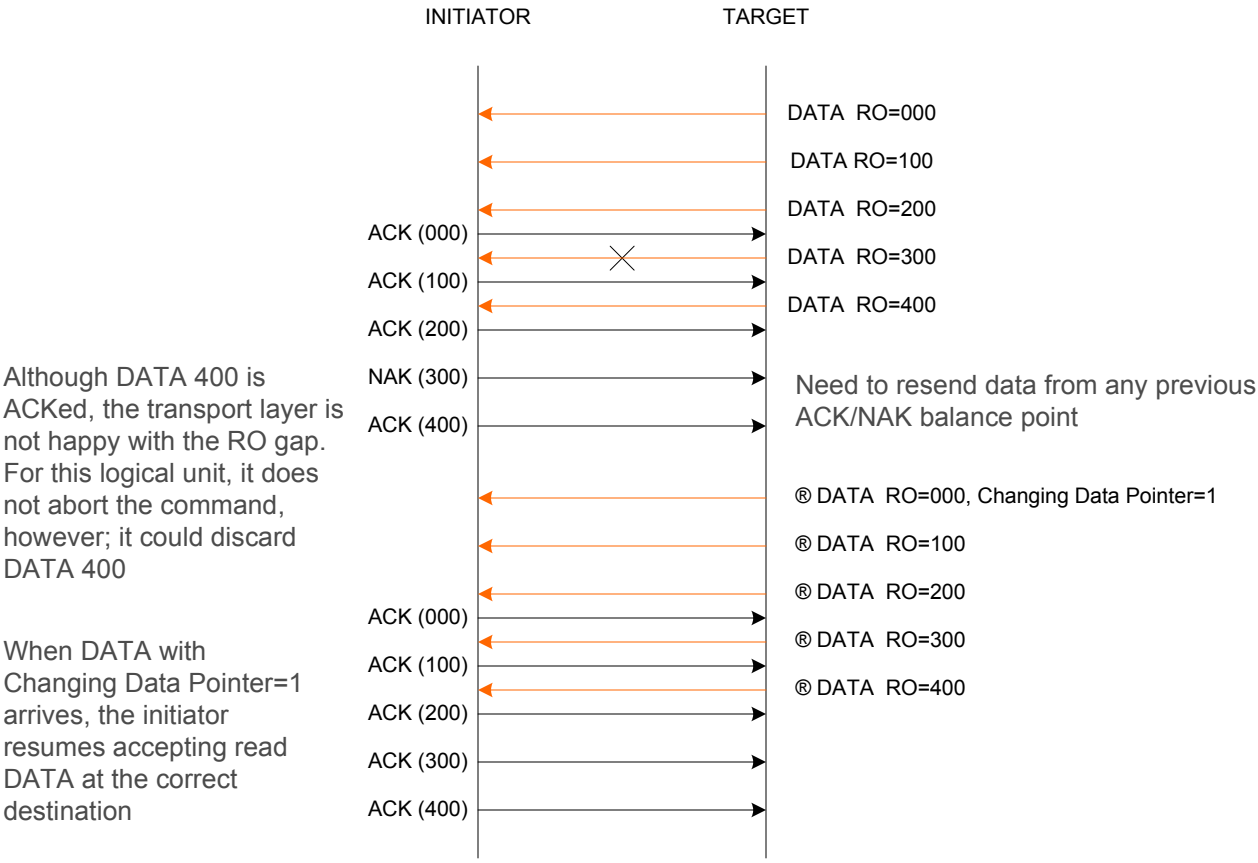
Write DATA Frame ACK Lost crossing RESPONSE



Write DATA Frame ACK Lost crossing XFER_RDY



Read DATA Frame NAK Received

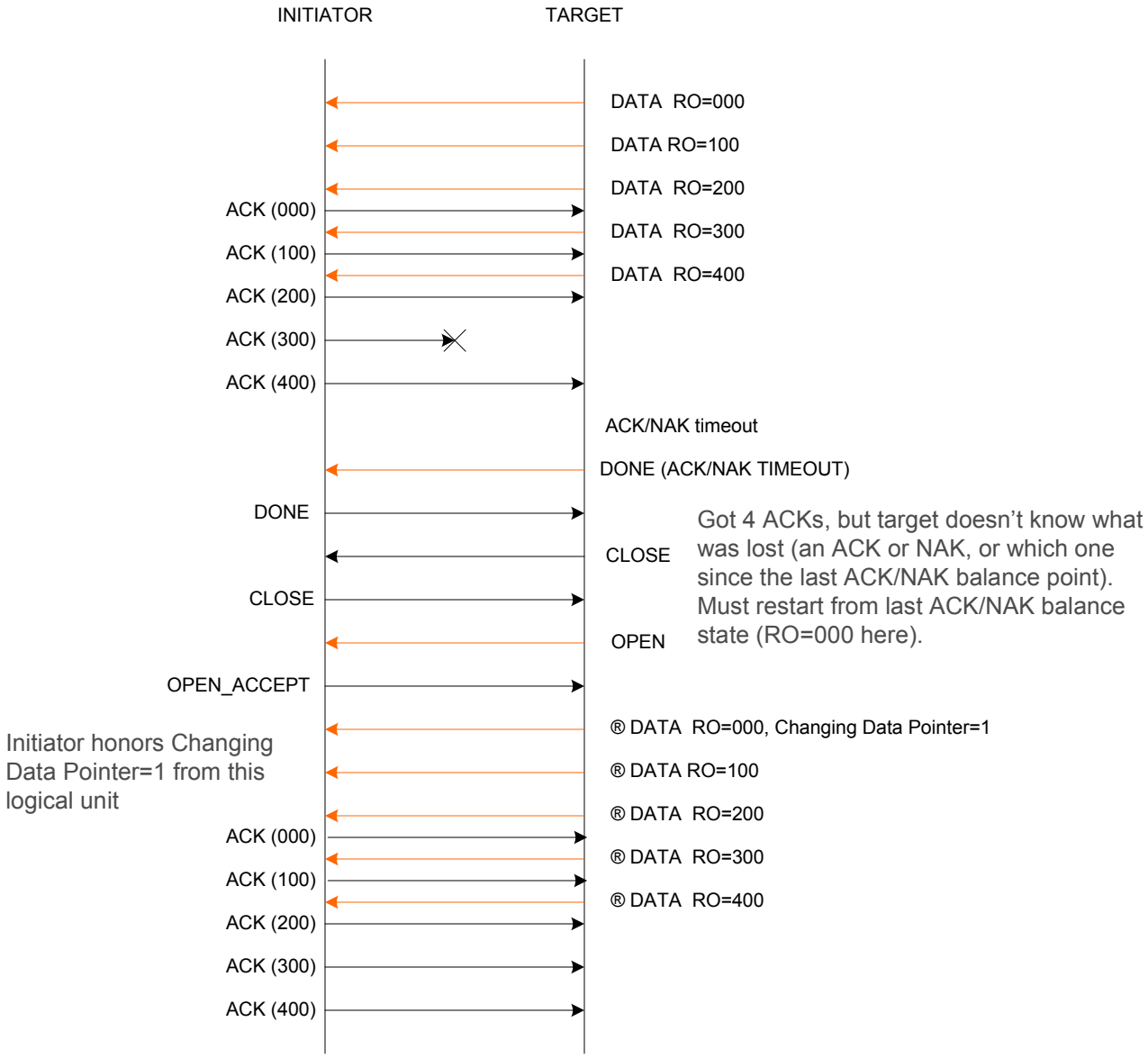


Although DATA 400 is ACKed, the transport layer is not happy with the RO gap. For this logical unit, it does not abort the command, however; it could discard DATA 400

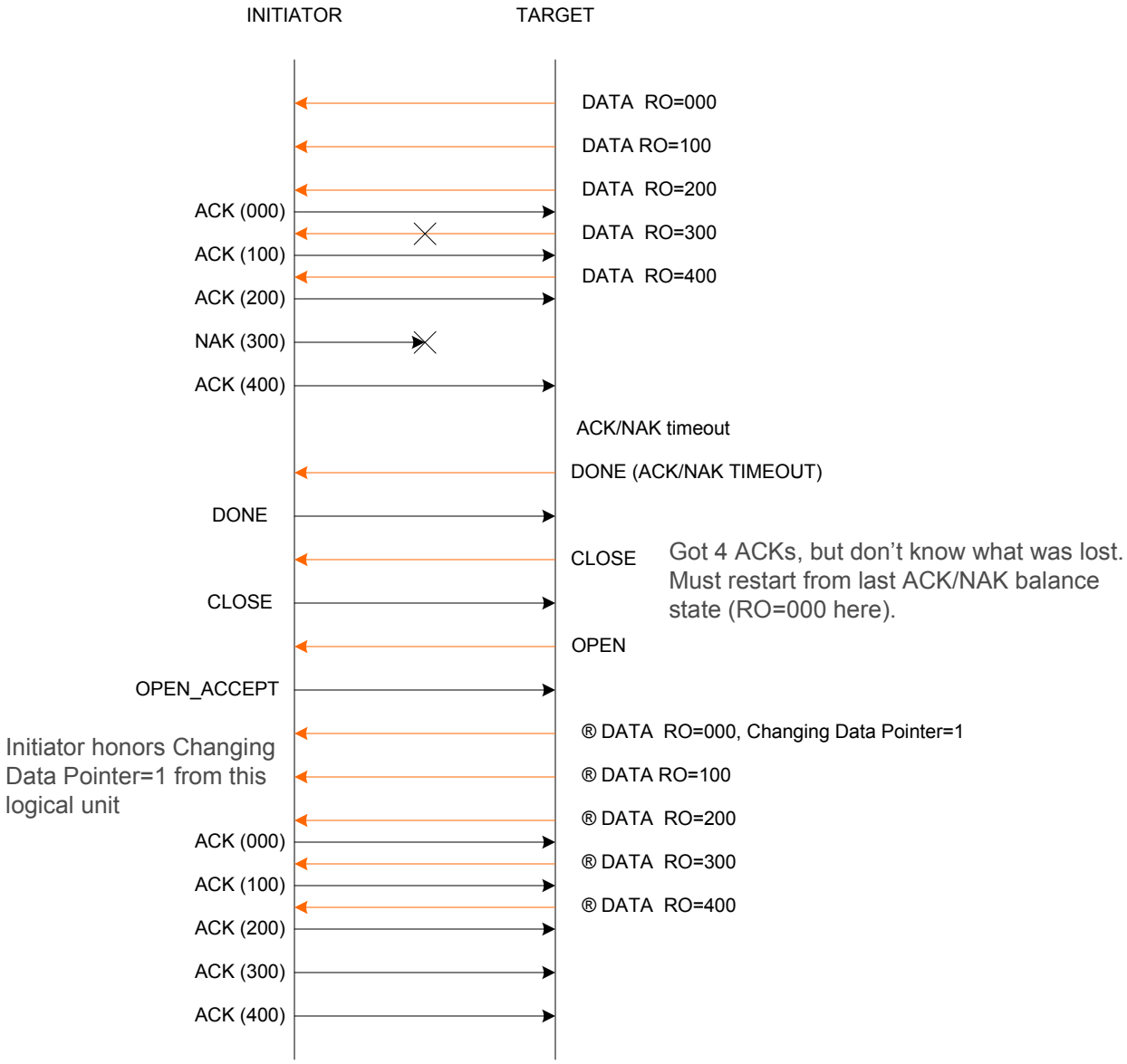
Need to resend data from any previous ACK/NAK balance point

When DATA with Changing Data Pointer=1 arrives, the initiator resumes accepting read DATA at the correct destination

Read DATA Frame ACK Lost



Read DATA Frame NAK Lost



Read DATA Frame Not Delivered