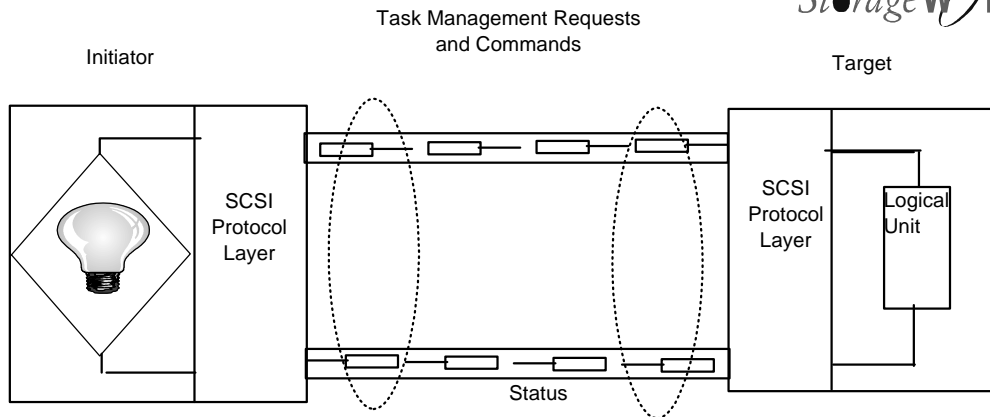


Exception Recovery Mechanism for Non- Interlocked, Full Duplex SCSI Channel Interconnects

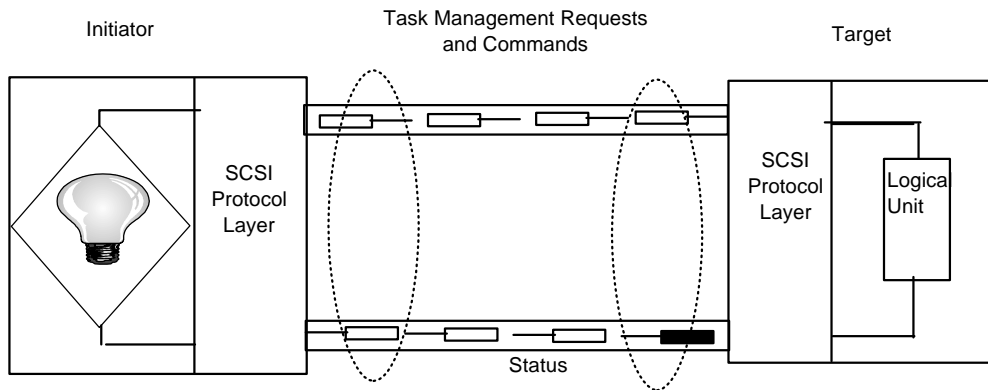
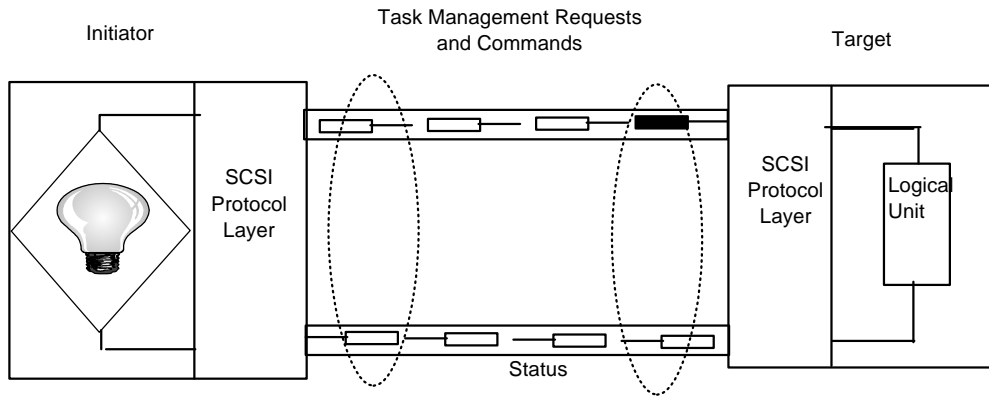
Charles Monia
Digital Equipment Corporation
January 9, 1996
X3T10/95-352R1



- 'Normal' case
 - What the application client sees:
 - Commands Pending
 - What the application client can't see:
 - Location of each command in the pipeline-- Waiting to be sent,-- In flight,-- In the task set,-- Being executed,-- Status in transit.
 - Initiator's protocol layer retains a list of pending commands in the order they were sent by the application clients.
 - A command is removed from the pending list:
 - When status is received,
 - When the command is aborted. by the application client.

Exception (ACA not implemented)

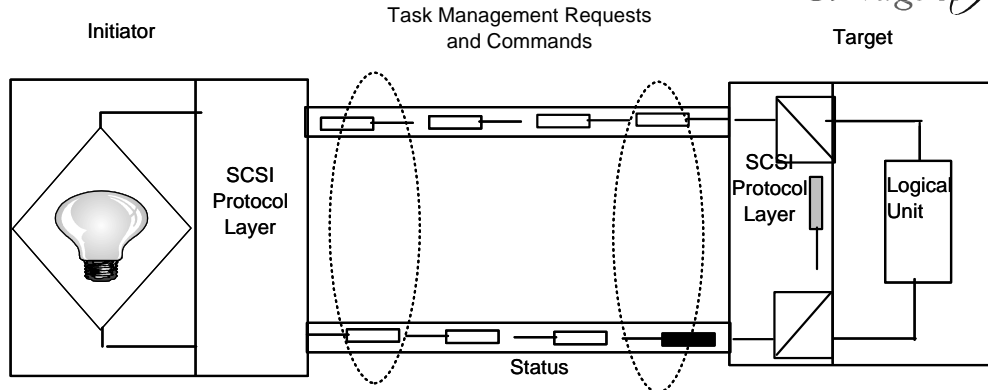
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- Scenario
 - Command completes with exception status
 - Logical unit continues to receive and execute commands
- What the application client sees:
 - Normal status
- What the application client can't see
 - Exception status in transit

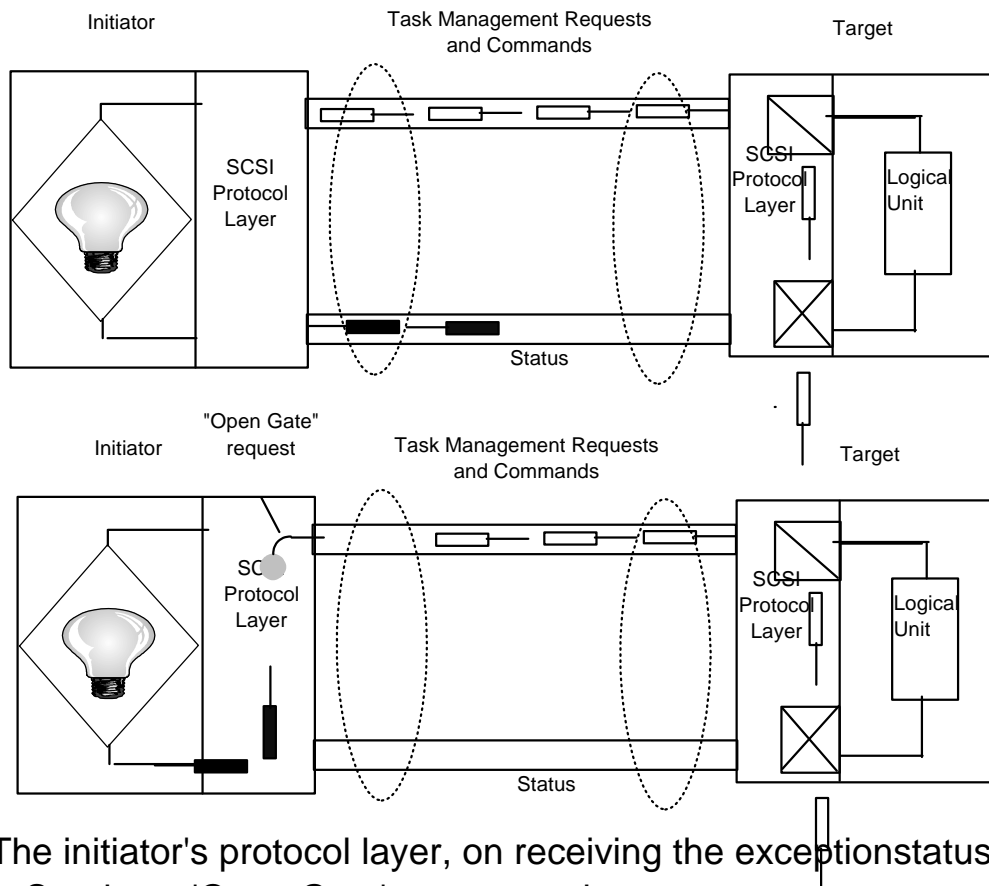
Generic Exception Recovery (ACA not implemented)

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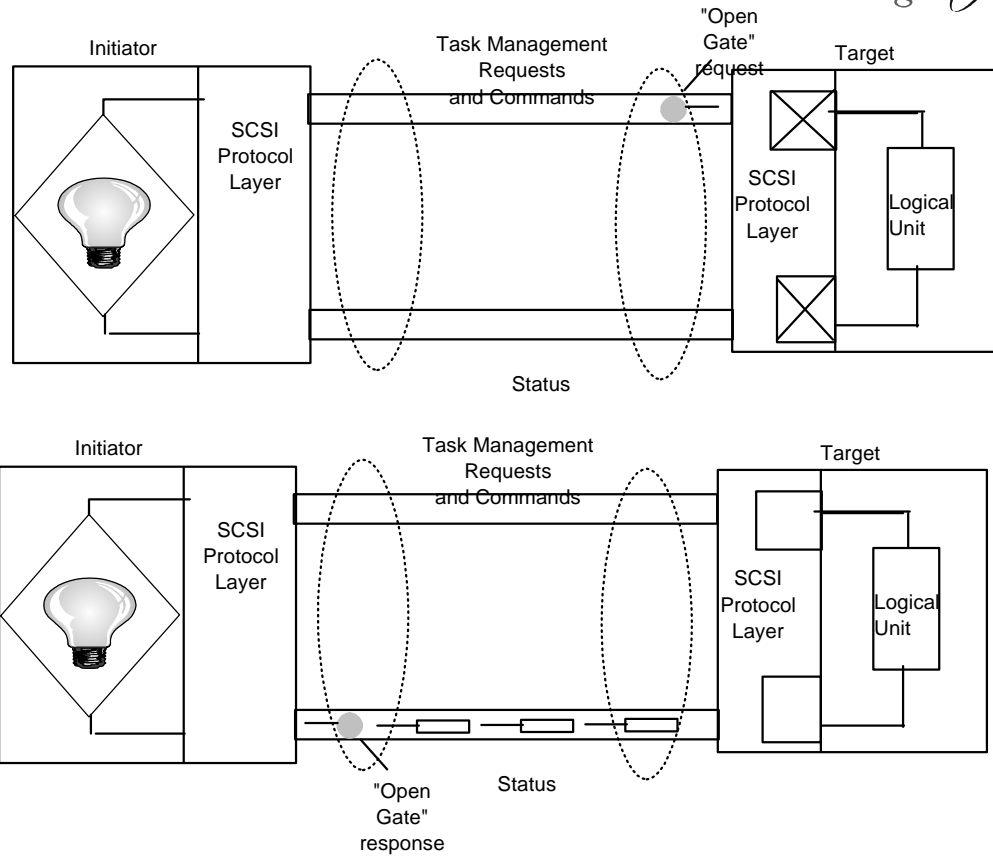


- Based on CAM error recovery model.
- For each Initiator-logical unit pair the target's protocol layer implements command and status 'gates'.
- The gates are closed whenever an exception status is sent to the initiator.
- While the gates are closed:
 - The target suspends the return of status from the logical unit to the faulted initiator.
 - The next incoming command from the faulted initiator is returned by the target's protocol layer.
 - Subsequent incoming commands from the faulted initiator are discarded.
 - Commands to other logical units or from other initiators are unaffected.

digital



- The initiator's protocol layer, on receiving the exception status:
 - Sends an 'Open Gate' request to the target.
 - Forwards the exception status to the application client.
 - Stops sending commands to the faulted LUN.
- On receiving the 'returned command', all pending commands between it and the 'Open Gate' request are marked by the protocol layer for resend.



- Open Gate requests are handled totally within the protocol layers.
- The exception condition is not affected by the Open Gate request. e.g., Contingent Allegiance (if set) remains in effect.

- What the Application client sees:
 - Behavior is identical to parallel SCSI.
 - Command Queue frozen as for CAM.
 - No out-of-order command execution.
 - Contingent Allegiance
 - Sense data automatically preserved.
 - Application Client interface for manipulating the queue of unsend SCSI commands is implementation-specific but protocol independent.
- What the application client doesn't see:
 - "Open Gate" request and response.
 - "Returned command".
 - Management of 'pending command list' by protocol layer.

- Changes required
 - SAM
 - Specify CAM-like behavior for pending commands when an exception occurs.
 - Protocol Standards
 - Specify required behavior for SAM compliance.
- Issues:
 - LUN behavior for RESERVATION CONFLICT, TASK SET FULL and BUSY statuses is not fully defined and needs to be addressed.