To: T10 Technical Committee
From: Rob Elliott, HP (elliott@hp.com)
Date: 11 December 2005
Subject: 06-020r0 SAT Clarify error handling for PIO data-in commands

Revision history
Revision 0 (11 December 2005) First revision

Related documents
sat-r07 - SCSI to ATA Translation (SAT) revision 7
d1700r2 - ATA Attachment - 8 Architecture Model (ATA8-AAM) revision 2
d1699r2 - ATA Attachment - 8 ATA/ATAPI Command Set (ATA8-ACS) revision 2

Overview
Commands using the PIO data-in protocol like IDENTIFY DEVICE return status before they return the last DRQ data block. This means that errors that occur during the final DRQ data block might go unreported (depending on the nature of the error, the design of the HBA, and many other things). These commands are usually designed to include some sort of checksum field so the application can verify that the data is correct. Since SATLs use data from some of these commands for things like determining write cache status, SAT should state that SATLs must check the checksum, if any, before using any data from a PIO data-in command.

The PIO data-in commands defined in ATA8-ACS are: READ SECTOR(S) [EXT], READ MULTIPLE [EXT], READ STREAM EXT, READ LOG EXT, CFA TRANSLATE SECTOR, IDENTIFY PACKET DEVICE, SMART READ DATA, SMART READ LOG, DEVICE CONFIGURATION IDENTIFY, READ BUFFER, and IDENTIFY DEVICE.

SAT-2 could go into more detail about defining how the SATL should respond if an error happens - e.g., retry a fixed or programmable number of times.

Suggested changes
5.3 Handling errors in ATA ~~multi-command sequences~~commands

~~Emulation of several SCSI commands involves issuing multiple ATA commands to the attached ATA device. Errors may be reported by any of these ATA commands.~~

~~Unless otherwise specified in the subclause describing the translation for a particular SCSI command, when an error is returned by an ATA device processing a given ATA command that is part of a series of commands required to emulate the behavior of a SCSI command, the SATL shall terminate processing of the SCSI command and return CHECK CONDITION status and additional sense data as specified in Clause 11.~~

When a SCSI command is translated into one or more ATA commands and one of the ATA command completes with an error (see the Error argument in ATA8-AAM and ATA8-ACS), the SATL shall terminate processing of the SCSI command and report the error as described in Clause 11.

When interpreting data from an ATA command, the SATL shall only use the data if no error was reported for the command (see the Error argument in ATA8-AAM and ATA8-ACS). ATA commands using the PIO data-in command protocol (see ATA8-AAM) return status before all the data is transferred, so the command status does not reflect all possible errors that might occur. When interpreting data from such a command, the SATL shall only use the data if the integrity word, checksum byte, or other such field is correct:

a) when interpreting IDENTIFY DEVICE data and IDENTIFY PACKET DEVICE data (see ATA8-ACS), the SATL shall only use the data if the integrity word (word 255) is correct; and
b) when interpreting SMART READ DATA data (see ATA8-ACS), the SATL shall only use the data if the data structure checksum byte (byte 511) is correct.

Editor's Note 1: Those are the only PIO data-in commands currently used by a SATL. READ SECTOR(S) [EXT] and READ MULTIPLE [EXT] are used when translating read commands, but they provide no checksum to validate. READ LOG EXT must be used to implement NCQ error handling, but SAT doesn't mention it yet.
