Maximum LBA Range Supported Proposal ATA8-ACS2

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Revision 654

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Document Status

Revision History		
Rev	**Date**	**Description**
0	December 1, 2008	1) Initial Revision
1	December 2, 2008	2) Changed Count definition to specify the number of logical blocks instead of the number of LBA Range Entries.
2	February 2, 2009	3) Updated based on feedback from December plenary. Added language for overlapped and non-sorted support. Added table to describe Trim Request Data
3	February 17, 2009	4) Updated with comments per February plenary (first review)
4	February 17, 2009	5) Updated revision 7.10.5 Error Outputs
5	March 4, 2009	6) Multiple changes based on February Plenary. Change ID DATA granularity from LBA Range Entries to number of 512-byte blocks of LBA Range Entries – for simplification purposes.
6	April 14, 2009	Changed count fiend of zero to be reserved. Editorials.

1 Introduction

ATA/ATAPI Command Set - 2 (ACS-2) defines the DATA SET MANAGEMENT 06h, DMA command and associated Trim function.

The DATA SET MANAGEMENT command defines a Count field that allows the host to specify the number of 512-byte ~~logical~~ blocks of LBA Range Entry to be transferred, where the minimum number of 512-byte ~~logical~~ blocks that can be specified is one and the maximum is 65,536 (Count == 0). The current DATA SET MANAGEMENT command provides no mechanism to limit this to a value that is appropriate to the specific implementation.

For some device implementations this inability to limit the number of host provided 512-byte blocks of LBA Range Entries could be problematic. As an example, some low cost implementations may not have enough local DRAM to store a 32MB set of LBA Range Entries.

2 Scope

This proposal introduces a mechanism for a device to indicate the maximum number of 512-byte blocks of LBA Range Entries that the host may specify for each invocation of the DATA SET MANAGEMENT command.

3 Overview

This proposal introduces a WORD in the IDENTIFY DEVICE data to indicate the maximum number of 512-byte blocks of LBA Range Entries that may be specified by the DATA SET MANAGEMENT command.

4 Changes to ACS-2

4.1 Definition of Terms

4.1.1 Invalid LBA: An LBA that is greater than the value reported in IDENTIFY DEVICE data words 100..103.

4.1.2 Invalid LBA Range: A range of LBAs that contains one or more invalid LBAs.

4.2 Changes to IDENTIFY DEVICE command

Table 30 — IDENTIFY DEVICE data changes:

(editor's note)[ACS-2 IDENTIFY DEVICE Word~~s~~ [**TBD1**]**~~..[TBD2]~~** is used ~~by the device during device enumeration~~ to indicate the maximum number of 512-byte blocks of LBA Ranges Entries supported by the DATASET MANAGEMENT command. The chosen IDENTIFY DEVICE word shall be augmented with the following description:]

Word	O M	S P	F V	Description
[**TBD 1**]**~~..[TBD 2]~~**	O	B	F	Maximum number of 512-byte blocks of LBA Range Entries (See 4.16.3.2) per DATA SET MANAGEMENT command ~~(DWord)~~.

Add the following sub-clause:

7.10.3.1 Change the count field definition to: number of 512-byte blocks of LBA Range Entries to be transferred. The value of zero is reserved.

7.16.7.XX Word~~s~~ [TBD1]~~..[TBD2]~~: Maximum number of 512-byte blocks of LBA Range Entries per DATA SET MANAGEMENT command

Words [**TBD1**]..[**TBD2**] contains the maximum number of 512-byte blocks of LBA Range Entries per DATA SET MANAGEMENT command that the ATA device shall accept.. A value of 0000 0000h indicates that the device is able to process 65 536 4 194 304 512-byte blocks of LBA Range Entries per DATA SET MANAGEMENT command.the maximum number of 512-byte blocks of LBA Range Entries is not specified.

If word 169 bit 0 is set to zero, the Trim function of the DATA SET MANAGEMENT command is not supported and words [**TBD1**]..[**TBD2**] are is undefinedreserved.

DCO – No changes. The Maximum number of 512-byte blocks of LBA Range Entries per DATA SET MANAGEMENT command is not changeable.

4.3 Changes to DATA SET MANAGEMENT – 06h, DMA command

The purpose of DATA SET MANAGEMENT command is for host to provide file system information for device optimization.

7.10 DATA SET MANAGEMENT - 06h, DMA

7.10.1 Feature Set

This 48-bit command is optional for devices that implement the General feature set.

7.10.2 Description

The purpose of the DATA SET MANAGEMENT command is for host to provide file system information for device optimization.

7.10.3 Inputs

7.10.3.1 Overview

Name	Description
Feature	**Bit** **Description** 15:1 Reserved 0 Trim – See 7.10.3.2
Count	Number of 512-byte blocks of LBA Range Entries to be transferred, 0000h indicates that 65 536 512-byte blocks are to be transferred. **Number of 512-byte blocks of LBA Range Entries to be transferred. The value of zero is reserved.**
LBA	Reserved
Device	**Bit** **Description** 7 Obsolete 6 Shall be set to one 5 Obsolete 4 Transport Dependent – See 6.2.12 3:0 Reserved

Command	7:0	06h

7.10.3.2 Trim

When Trim is set to one, the data in the logical blocks specified by the DATA SET MANAGEMENT command's output data shall meet the following requirements~~then~~:

a) if word 69 bit 14 of the IDENTIFY DEVICE data is set to one, then once a trimmed LBA has been read (e.g., a read command), the data in that logical block becomes determinate (i.e., all read commands to a logical block shall return the same data until a subsequent write command to that logical block successfully completes); or

b) if word 69 bit 14 of the IDENTIFY DEVICE data is cleared to zero, then the data read is indeterminate.

The data read from an LBA that has been trimmed shall not be retrieved from data that was previously received from an application client addressed to any other LBA.

Once a trimmed LBA has been written ~~(e.g~~(e.g., a write command or a SECURITY ERASE UNIT ~~command)~~command), the data in that logical block becomes determinate~~.~~ (i.e., the logical block contains the written data.).

Trim shall not add or remove LBAs from the NV Cache Pinned Set.

7.10.4 Normal Outputs

See table 112.

4.4 Error Outputs

7.10.5 Error Outputs

If trim is set to one and:

a. the device detects an invalid LBA Range entry; or

~~b. Count is zero and (IDENTIFY DEVICE data words [tbd1]..[tbd2] is greater than zero and less than 4 194 241); or~~

~~c.~~b. Count is greater than ~~zero and ((Count-1) * 64) is greater than~~ IDENTIFY DEVICE data word~~s~~ [TBD1]~~..[TBD2],~~

then the device shall return command aborted.

A device may Trim one or more LBA Range Entries before it returns command aborted . See T~~t~~able 125.

7.10.6 Output From the Host to the Device Data Structure

~~Trim Request Data is a list of one or more LBA Range Entries (see 4.17.3.2). If the range length is zero then the LBA Range Entry is not valid. The range entries may overlap and are not required to be sorted. See Table 44 for the Trim Request Data structure.~~

DATA SET MANAGEMENT Request Data is a list of one or more LBA Range Entries (see 4.17.3.2). If the ~~r~~Range ~~l~~Length of an LBA Range Entry is zero then the LBA Range Entry is not valid. If ~~When~~ Trim is set to one, ~~is specified,~~ then LBA ~~r~~Range ~~e~~Entries may overlap and are not required to be sorted. See Table 44 ~~for the DATA SET MANAGEMENT Request Data structure~~.~~.~~

[editor's note: Update 7.22.3.6 and other places as well]