

Re: Origin of hard drive parameters

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- *From:* Ian Graeme Hilt <ihilt@xxxxxxxxxxxxxxxx>
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On Monday 11 September 2006 2:42 am, jdow wrote:

From: "Ian Graeme Hilt" <ihilt@xxxxxxxxxxxxxxxx>

May I point out that I was not interested in CHS alone. My focus was the origin of the hard drives parameters i.e. geometry, which is the subject of > discussion. From this discussion and other sources I have learned that CHS, > as you say, is arbitrary when referring to modern drives. To be specific, drives adhering to ATA/ATAPI Specification 6 and later. ATA/ATAPI Spec. 5 and earlier used CHS mode for representing hard drive capacity. The reason I am > interested in this topic is partially because of my "idle curiosity". I'm the type of person interested in the challenge of answering questions. The questions, "How does the BIOS automatically detect correct values for hard disks?" and, "Where is this information stored?" have been stuck in my head > for at least 6 months. No amount of searching the web provided me with satisfactory results. I tried a few tests of my own, all of which failed to > answer my questions. So, I decided to appeal to the FreeBSD-questions mailing list. Mainly because I have found useful answers to other questions here. The other part of my reason is that one of my coworkers thought this information was stored on the platters of the hard drive. I thought differently but I could not _prove_ it.

Good reason. And the information is indeed stored on the platters of the hard disks in a place you cannot read directly.

How do you know this is true?

It is easier for me to refer to SCSI than to ATA. With SCSI the operating code for the disk is stored on the disk. What comes up at first is enough SCSI to say "I'm a disk; and, I'm not ready." When you issue ReadCapacity, Mode Sense, and Inquiry commands you are accessing data stored on the same reserved sectors as the disk's operating code. Special diagnostic commands allow the operating code to be modified. The "Mode Select"

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command allows you to reconfigure the disk's geometry. This takes effect after you next low level format the drive if you have no other intervening commands. This allows you to alter the spare blocks and cylinders on the disk as well as configure most other operating parameters. These are stored where operating systems normally cannot see them with normal read/write commands.

So your coworker is correct, it is stored on the drive

Actually, he was arguing this information was stored on the platters of the hard drive. I was arguing it could be stored in a chip on the hard drive which I'm thinking of as the CMOS for a motherboard.

and barring nvram on the drive it is stored on the actual platters.

This is exactly my point. There is cause for reasonable doubt that it isn't stored on the platters.

As for storing it – read block zero of the disk.
Be DAMN careful not to WRITE to block zero. And if you DO write to block zero at about the time I quit doing such low level stuff and moved to other things there were several SCSI hard disk manufacturers using code that had a defect such that if you wrote more than one disk block starting at block 0 the whole disk was toast until you did a fresh low level format on it. One sincerely hopes THAT defect is gone these days.)

{O.O} Joanne

Reading through ATA/ATAPI –7 has helped me rephrase my questions into one: When the command READ NATIVE MAX ADDRESS is issued to the device, from where is this information returned?

It may be cached somewhere for quick returns.

Yes, but it also may be stored in the hard drive's CMOS.

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There are tools for tuning disk performance for both ATA and SCSI disks that can alter the operating parameters. Some options read OS cached values. Others dig down and issue the 'standard' query commands and read the actual values off the disk. The disk is the final arbiter, in modern terms. When doing the configuration utility that became arguably the most popular one for the Amiga I ran across some small number of hard disks that returned off by 1 values for size. (Micropolis was one offender at one time.) And I also ran across drives delivered with only the first few megabytes formatted. So I built into the configuration utility an actual search for the last readable block. I used the lesser of that value and the value the drive declared to Read Capacity commands. At least the formats it generated were safe. (I think it was either Maxtor or CDC/Seagate that had the partially formatted drives escape from their factory.)

It is possible the the factory settings for the capacity of a hard drive are stored in a chip, which I'm calling CMOS, on the circuit board attached to the hard drive. This information is then modified and saved to an inaccessible portion of the hard drive's platters or to another area of the hard drive's CMOS using the ATA command SET MAX ADDRESS, SET MAX ADDRESS EXT for 48 bit mode, or similar command. Then when the command IDENTIFY DEVICE is sent to the drive, it reports a smaller size to the caller.

I hope this answers questions enough so that the next question is more obvious. (And in retrospect – the drive is the only thing that knows the precise formatting parameters. So it is quite logical that the original source for the size data is the drive itself. This is not always, in my experience, a constant for all revisions of the same model of drive.)

{^_^} Joanne

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~ Ian Graeme Hilt

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