

Flash Memory in Hybrid Hard Disk Drives, a Beneficial Symbiosis

Key Points:

- Several hard disk drive companies announced the formation of the Hybrid Hard Disk Drive Alliance to promote the use of hard disk drives with nonvolatile flash memory cache on the drive
- The flash memory acts as both a nonvolatile write cache and to hold some of the operating system for faster boot times and faster power-down recovery
- Hybrid hard disk drives for write cache and faster boot times are supported by the new Microsoft Vista operating system
- Hybrid hard disk drives represent a useful symbiosis of two storage technologies to provide the advantages of high capacity hard disk drives and power savings and faster boot up times of flash memory

Analysis:

On January 4, 2007 Hitachi, Samsung, Seagate Technology and Toshiba announced the formation of the Hybrid Storage Alliance. The first presentation and exhibit by the new alliance was at the 2007 Storage Visions Conference on January 6 and 7. Hybrid hard disk drives combine a nonvolatile flash memory in the circuit board of a hard disk drive. The flash memory can serve two uses in a Microsoft Vista computer.

The first use is to provide a write cache. A write cache aggregates information that is to be written on a hard disk drive so that the disk drive need not be turned on to write the information on magnetic disks as often as would be required if there was no nonvolatile cache memory. This results in lower power usage by the hard disk drive and can save battery life on a notebook computer. Estimated power savings for the hard disk drive is as high as 50% with about a 12% savings in overall laptop power usage due to the much higher power required for other laptop components, particularly the display.

The second use of hybrid drive technology is to allow faster boot-up and resume times for Vista OS computers. In order to provide this performance improvement a portion of the flash memory cache is reserved to store a portion of the operating system that is required to begin the OS reboot or to resume when the computer resumes from a power saving mode. In either case the portions of OS resident in the flash cache allows starting operation faster than for the hard disk drive alone.

Hybrid hard disk drives are being introduced for laptop computers in 2007 along with the launch of Microsoft's Vista operating system. Because of the additional cost of flash memory HDD manufacturers will probably limit the flash cache to less than 256 MB for some time to come and they plan to use single level cell flash (SLC) memory rather than multi level cell (MLC). Hybrid hard disk drives show how flash memory and hard disk drives can be combined to provide a cost-effective solution to common mobile computer issues. I consider it likely that hybrid hard disk drives might be used for other hard disk drive applications as well, in particular mobile CE devices.