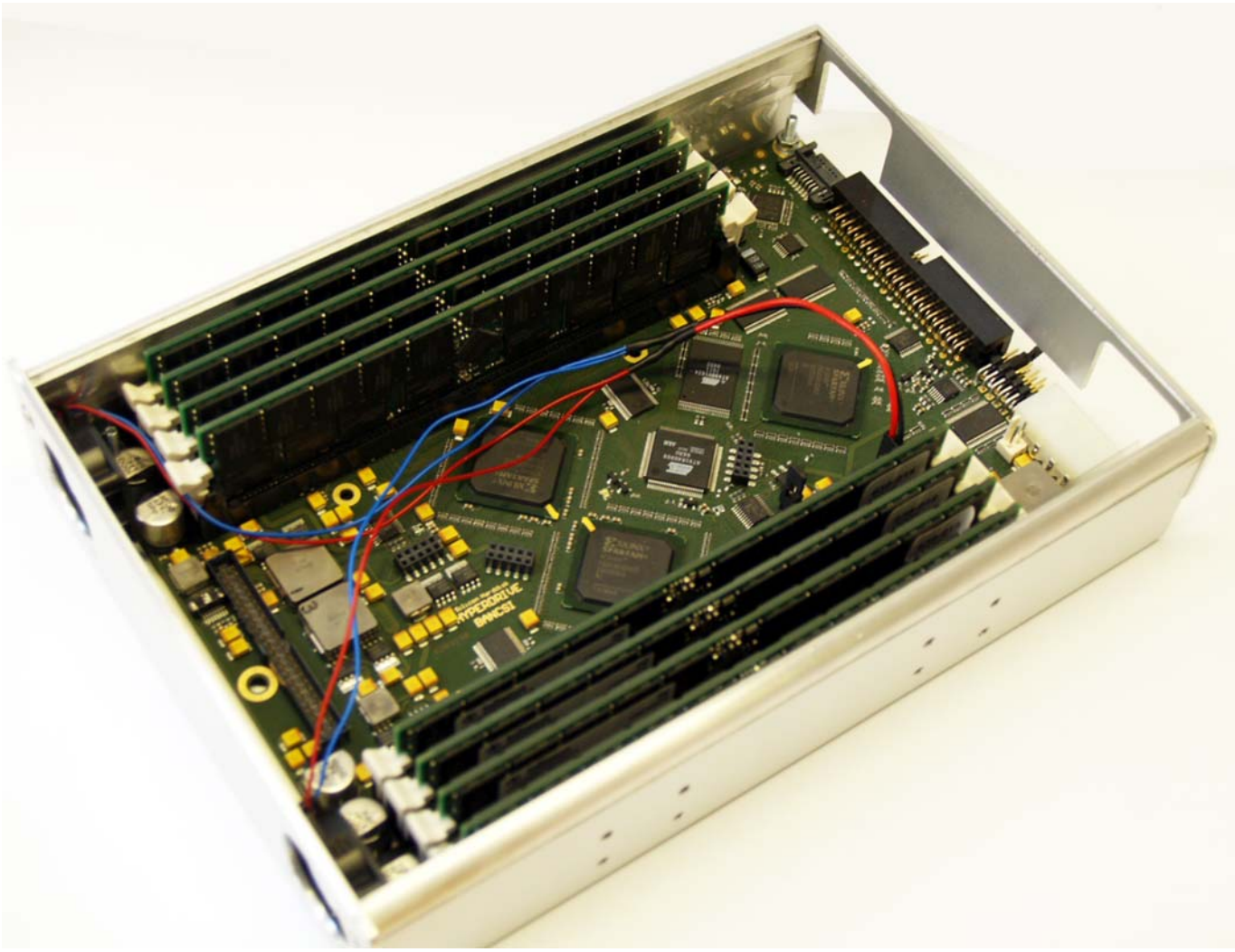
HyperOs Systems



HyperDrive 4

Specifications:
Connections - SATA 133 and PATA 133
Form factor - Standard 5.25" CD bay
RAM Requirements - Up to 8 x 1GB DDR1 sticks on the 8GB HyperDrive4 and up to 8 x 2GB DDR1 sticks on the 16GB HyperDrive4. All sticks should be standard ECC registered DDR1. The HyperDrive4 has 2 banks of 4 DDR slots, each bank must have the same total amount of RAM. All sticks in any one bank should be of equal size.

For example - (Bank A) 4x1GB and (Bank B) 2x2GB = 8GB total

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HyperDrive4 benefits and capabilities.

Librarian analogy.

A data storage device such as a Magnetic hard disk drive (HDD) or a Flash RAM solid state disk (SSD) or a Dynamic RAM solid state disk (SSD) is an electronic library. Its performance is defined by two parameters: Seek Time and Sustained Transfer Rate (STR). Its seek time is the speed of its librarian. Its sustained transfer rate is the number of books you can borrow per day.

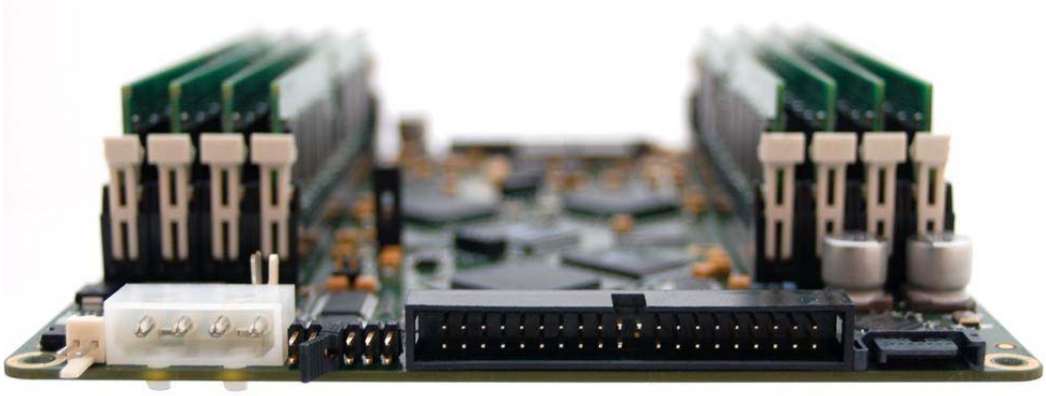
The best performing HDDs (10,000 rpm Western Digital Raptor for example) have a seek time of around 8 milliseconds and a STR of around 65MB per second. The H4 SSD has a seek time of 40 microseconds and a STR of 123MB per second. So its librarian is 200 times faster at finding books and you can borrow around twice as many books per day from its library.

Mechanics versus electronics.

The HDD stores its data on a magnetically coated glass rotating mechanical platter and the data is read by a mechanical arm with a pick-up head which swings to and fro over the disk. This is basically gramophone technology. The SDD, on the other hand, stores its data in DDR. Dynamic RAM is Random Access Memory so any bit of data can be accessed from any part of the library in around 40 microseconds. The platter of the Western Digital Raptor rotates at 10,000 rpm and is around 10 cm in diameter. So it has an edge speed of 52.36 metres per second or around 120 mph. For such a device to achieve the performance of the HyperDrive4 it would have to spin 200 times faster. It would therefore need to spin at 2,000,000 rpm, in which case it would have an edge speed of 10,472 metres per second or 24,000 miles per hour. This is over 31 times the speed of sound. It is faster than Mach 31! The escape velocity for the space shuttle to leave Earth's Gravitational field is a mere 22,000 mph!

All the processes in a modern PC are carried out in Megahertz and Gigahertz, but the mechanical hard drive is rotating at 167 Hertz (167 revolutions per second). It is therefore the last bottleneck in PC performance. There is a sense in which a modern PC is a ludicrously over-specified mechanical hard drive controller.

Windows operating systems (Microsoft) and hard drive manufacturers have had a lot of time to get the most out of the mechanical hard drive. And they have done a very good job. Windows nowadays typically has a 1GB Dynamic RAM workspace which it loads files into from the HDD and once the files are in memory the mechanical nature of the HDD is no longer an obstacle to performance. Furthermore the modern HDD has a solid state cache of between 2MB and 16MB (Megabytes, not Gigabytes) which, if carefully managed, can mimic SSD performance in certain limited circumstances.



So for general everyday PC operations such as word documents, emails, spread sheets, small databases, websites etc, there is no real processing time advantage to be gained from the HyperDrive4. However there is a real advantage to the user in everyday situations because program starting latency is vastly reduced. So the PC feels 'instant'. For example Photoshop opens in 3 seconds on the HyperDrive4 rather than 7/8 seconds on a Western Digital Raptor (currently the fastest hard drive on the market). Also surfing the internet on broadband feels faster on a HyperDrive4 because, for example, Windows XP checks thousands of cookies and temporary files as it surfs, so the HyperDrive4 seek time advantage does make a difference in this circumstance.

So in general everyday computing, the performance advantage of the HyperDrive4 is that it halves the time the user takes to click around the desktop, since the whole machine has a vastly reduced latency to starting any new operation. This is halving, not CPU processing time but human time, real worker time - your time! Benchmarks do not generally measure this.

However there are certain specific applications where the HyperDrive4 performance differential is monumental. We list them below...

*On Line Transaction Processing, day trading, real time financial transactions etc.
*Large database operations
*Photograph, image and video processing
*High fidelity audio processing (sound studios etc)
*High resolution graphics games
*Networks with several people accessing the same data at the same time

Real world examples of this are medical scanner image processing, flight simulators, finger print analysis, searching massive email databases for security purposes etc.

The FBI has ordered the HyperDrive4 for testing with its project Carnivore for example. The British Police enquired about it for finger print recognition. Quantum 3D wanted to order 2,000 for flight simulators but they needed them before we finished designing the HyperDrive4. Siemens in Germany have enquired about several thousand units for body scanners. If medical scanners used HyperDrives they could process images more quickly and perhaps double patient throughput.

Simple PC test results

Process	Raptor	Raptor on Rocket RAID 2230	2 Raptors NVRAID0	2 Raptors on Rocket RAID 2230	4 Raptors NVRAID0	HD4
Boot XP from splash screen to Desktop (XP learns)	5-8s	11-13s	6s	11-13s	6s	3s
Make a Copy of a 1GB file on the Desktop	42s	29-32s	42s	29-32s	28s	17s
Rereference Windows Registry using Winmove	15s	14s	14s	14s	14s	7s
Sort a 12 million record file with Access	280s	246s	189s	200s	183s	140s
Search all the files in an XP Officesystem	4½s	4½s	4½s	4½s	4½s	1½- 2s
Resize an image to max resolution in Photoshop 7	280s	264s	195s	192s	137s	79s
Search through a large website in FrontPage	15s	15s	15s	15s	15s	15s
Compare two 2 million record files with Access	75s	75s	75s	75s	75s	75s
Open an image in Photoshop 7 (XP learns)	6-9s	6-8s	6-8s	6-8s	6-8s	3½s

[1] XP learns to open applications and to start up more quickly with time by caching files and repositioning files on the Hard Disk. But this is dependent upon repeating the same operation regularly.

[2] Larger Photoshop and Database operations would show a larger performance gap between the Raptors and the H4.

[3] The PC used had an Athlon 64 3200 Intelahertz with nForce chipset and 6.53 drivers. Epox 9npa ultra mobo. This is around 18 months out of date. The faster the PC the more the differential between silicon and the hard disk. So the greater need there is for an H4.

The H4 opens files and copies files at around 2.5 times the speed of a Raptor. So it gives the single user around a 250% real world performance improvement. The really massive real world performance improvements occur in circumstances which are very seek time dependent. For example…

[1] When several users need to access the same data storage device. The HyperDrive4 can serve 200 people in the time it takes a hard disk drive to serve one person. This is because the magnetic arm on a hard disk drive cannot be in 200 places at once. But in the time it takes that arm to file one more file (8 milliseconds) the HyperDrive4 can find 200 more files.

[2] When one user needs to carry out

[3] When we are waiting in real time for a computational process to take place. In this circumstance even a doubling of performance can have a huge psychological and economic effect.

Other advantages of the HyperDrive4.

[1] It is potentially silent. The present version has two ultra-quiet small fans for cooling. But we are designing a completely silent version for the future.

[2] It is more reliable than a Hard disk drive having no moving parts. And it is more tolerant to shock and vibration.

[3] It is user expandable as memory modules increase in capacity. We can tweak the firmware to make the present HyperDrive4 into a 32GB or a 64GB device as 4GB and 8GB DDR sticks become available.

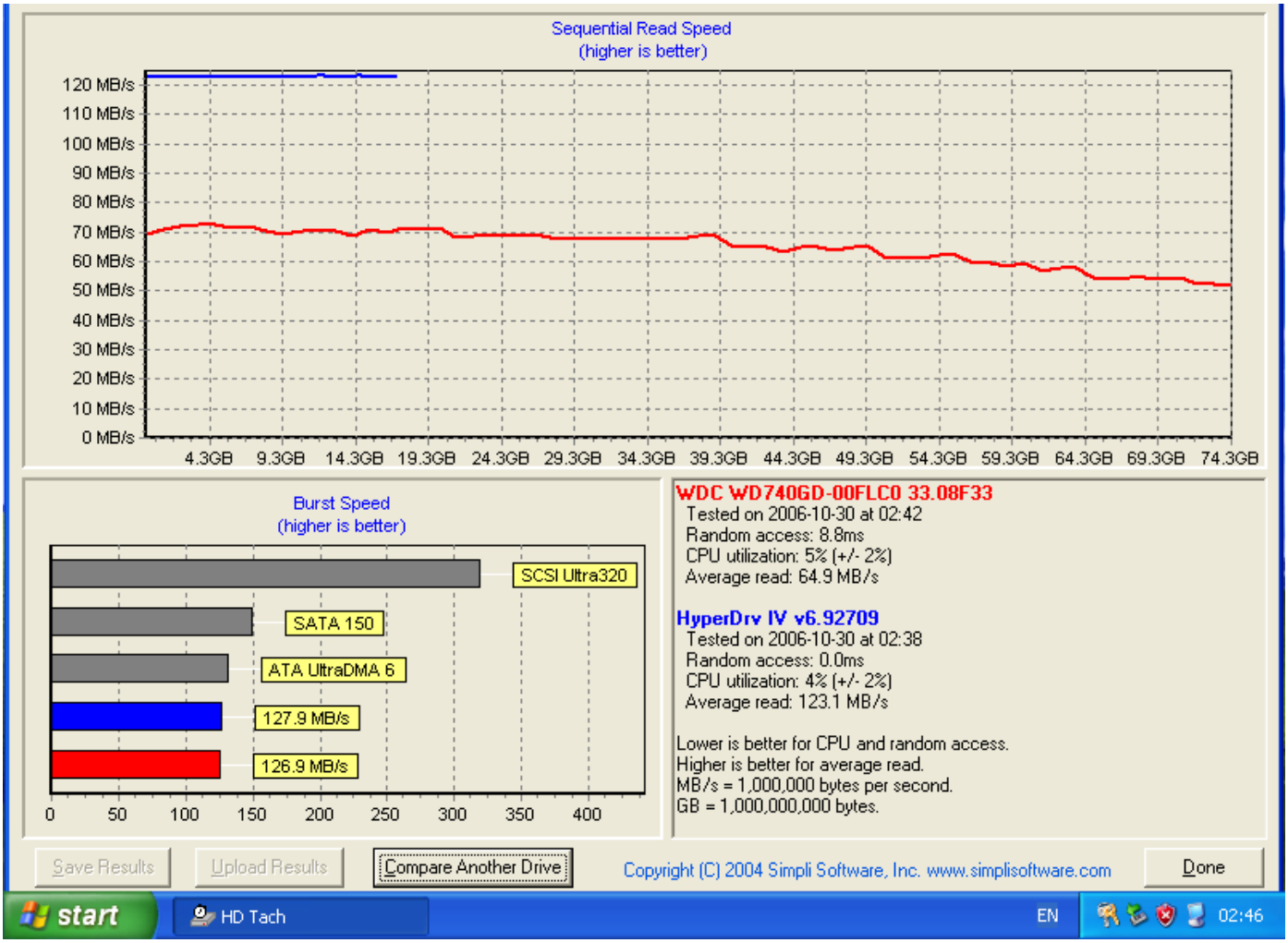
[4] Being random access devices, HyperDrive4's do not need to be defragmented. Their performance does not degrade with time!

Servers/RAID.

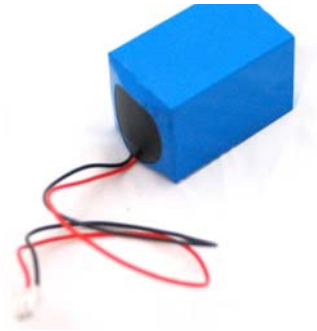
The HyperDrive can be used in a RAID array just like any other hard drive.

Advanced test results.

The HyperDrive4 seek time, as measured by H2BenchW, is 40 microseconds. Whereas the Raptor could only manage 8.9 milliseconds, which is over 200 times slower. HD Tach (version 3.0.1.0) shows the following results. The HyperDrive4 is in blue and the Western Digital Raptor is in red. The Sequential read times 123.1 MB per second (HyperDrive) and 64.9 MB per second (Raptor) are the speed at which the devices can continuously give or receive data. (HD Tach gives a seek time of 0.0ms for the HyperDrive instead of 0.04ms, because its seek time is too fast to be measured in tenths of a millisecond.



Volatility.



The HyperDrive4 has several methods of retaining data in the event of a PC power down or an electricity supply power outage. It has its own DC power supply. So when the PC is turned off it will not lose its data. Our own software HyperOs 2007 has a scheduled backup facility which can make a live backup of the HyperDrive4 (it backs up the Windows system which is presently running!) to a hard drive Partition automatically when scheduled. Then, in the event of a power cut, we supply a Boot CDROM which fires up the PC and sector copies the hard drive Partition back to the HyperDrive4 in minutes. In addition to this the HyperDrive4 goes into sleep mode when it loses main power. And it has a backup battery connector for a small or large backup battery which can power it for 5 hours (5 Amp Hours) to 10 hours (10 Amp Hours). In addition to this the HyperDrive4 has a laptop HDD connector for an internal laptop drive. The laptop drive is mounted with 4 pillars which screw into the drive and snap into the HyperDrive4 PCB. If a laptop drive is in place then the HyperDrive4 will automatically copy its data to the portable HDD in the event of a power outage using the backup battery. Then when power is reconnected it will automatically copy the data back onto the HyperDrive4.

HyperDrive IV launch November 2006

Competitors.

[1] Gigabyte make the IRAM PCI card with a SATA BUS. This can only take 4GB of DDR and needs motherboard drivers. So it is not a true hard drive alternative. It only works with certain motherboards and uses up 2 PCI slots. It freezes with Intel's IOMETER benchmark on nForce4 motherboards. However it is cheap at around £120 if you just want to increase your system RAM.

[2] Texas Instruments make a 16GB Fibre Channel Interface 19" Rack mounted storage device for $32,000.

[3] Curtis make the Nitro drive. Which costs around $1,000 per Gigabyte and squeezes into a 3.5" HDD form factor, but uses the old SCSI BUS and has an STR that is only as fast as a Raptor since it uses an outdated interface between the SCSI BUS and the DRAM controller.

Road map.

The HyperDrive4 loaded with 16GB of RAM presently costs around £2,000, the price of a flat screen when they first came out. It is at the beginning of its life cycle, and it will follow the normal technology price curve (along with the RAM). It can also presently utilise the full bandwidth of SATA 133 and will be able to continue this trend though all larger bandwidths as they become available, whilst the poor old mechanical hard drive will never be able to improve on around 65 MB per second STR which is essentially ATA65. When you purchase an ATA133 HDD, you are buying an ATA65 device. The next stage in technical development is SATA2 and DDR2 but no release dates are available until sometime next year.

XP Start up time on H4 versus WD Raptor....

Windows XP SP2 with MSOffice and Photoshop installed has a start up time from the XP Splash screen to the desktop, (using EPOX 9NPA Ultra Mobo and 6.53 nforce4 drivers and fast recognition CD ROM and SATA WD Raptor and latest 18th April 2006 Mobo BIOS) of 2.5 seconds on the H4 and 8 seconds on the WD Raptor.

Windows Registry access on H4 versus WD Raptor...

Running 'Winmove', a HyperOs program that rereferences the Windows registry when Windows is moved to a new drive letter, takes 7 seconds on the H4 and 15 seconds on the WD Raptor.

Conclusion.

The H4 gives a real world performance boost of 200%-400% in circumstances where XP is unable to use the Hard Disk Cache or system memory for a process. It gives a 200%-400% performance boost in the startup time of XP itself and of its applications. So it also saves a lot of user time, the time that you spend clicking around the desktop setting things up. To put this in a proper perpective, if you go out and spend an extra £400 on a faster CPU, the result will be a performance increase of perhaps 15%. Whereas if you purchase an H4 for £599, the result will be an almost instant PC. Every process will be as fast as if it was cached on your Hard Disk and run in system RAM.