Marvell HyperDuo for 6Gb/s SATA Controllers

Automated SSD/HDD Tiering: 80% SSD Performance at 1/3 the Cost

OVERVIEW

Marvell® is the market leader for SATA embedded controller products and the first-to-market with an end-to-end 6Gb/s SATA solution stack – from 6Gb/s SATA host controllers to 6Gb/s target hard disk drive (HDD) and solid state drive (SSD) controllers. Marvell works closely with industry leaders in such markets as PC motherboards, home NAS, set-top boxes, SSD/HDD drives and consumer SATA host bus adaptors (HBAs). Marvell's revolutionary HyperDuo technology will help enable pervasive, mass-market SSD adoption.

Marvell® HyperDuo offers a breakthrough embedded technology for new-generation 6Gb/s SATA controllers, starting with the Marvell 88SE9130. Based on years of research and patent-pending software and hardware, HyperDuo enables 80 percent of the performance of a solid state drive (SSD) at one-third the cost. Configured with one hard drive and one SSD, HyperDuo uses intelligent algorithms to automatically migrate hot data to the SSD, while enabling all data to be safely stored on a larger capacity SATA HDD.

THE PROBLEM TODAY

The storage market landscape is rapidly changing. Previous generation 3Gb/s SATA technology is quickly giving way to 6Gb/s SATA. By 2010, several disk drive vendors, such as Western Digital® and Seagate®, have launched 6Gb/s SATA HDDs, while memory vendors such as Micron® have launched 6Gb/s SATA SSDs. In the consumer desktop market, SATA motherboard leaders, such as ASUS® and Gigabyte®, have launched 6Gb/s SATA motherboards as well.

But a fundamental challenge exists. While 6Gb/s SATA storage technologies are rapidly becoming available, SSD technology is still relatively expensive for consumers. Storing all consumer data on SSDs is impractical due to cost, and using a hybrid approach of manually combining an HDD and SSD (eg. as a boot device) doesn't offer a true solution for achieving consistent application acceleration for performance-sensitive applications such as gaming, video and rich media or I/O intensive programs.

HDD	SDD
Cheap but slow	Fast but expensive

THE SOLUTION: MARVELL HYPERDUO TECHNOLOGY

Marvell HyperDuo technology is the answer. By embedding automated tiering technology into the chipset that goes into the world's leading motherboards, home network attached storage (NAS),set-top boxes and desktop HBAs, HyperDuo enables immediate performance value from day one. User applications, such as Microsoft® Office and Media Player, Adobe® Creative Suites, Apple® iTunes, Internet browsers, and "hot" accessed OS-related files will automatically be pinned to the SSD for improved system performance. No need for consumers to do any manual copying that is often error-prone and requires tedious monitoring. And no additional costs or complexity are incurred from buying add-on software. Best of all, because Marvell is the market leader in 6Gb/s SATA technology from host-to-target, consumers can be rest assured that HyperDuo embedded technology works flawlessly with the world's leading 6Gb/s HDDs and SSDs.

	HDD	SDD	HyperDuo
• **Capacity**	High	Low	High
• **Performance**	Slow	High	High
• **Cost**	Low	High	Lower

Fig 1. Marvell HyperDuo avoids compromise. Low cost, high storage capacity, and blazing performance

HyperDuo enables two modes: Safe Mode and Capacity Mode. Safe Mode provides optimal data protection by mirroring data from the SSD to the hard disk for maximum resiliency. Capacity Mode augments SSD and HDD capacity for the most cost-effective configuration. Both modes automatically identify LBA ranges across both the SSD and HDD so that the user experience is exactly the same. By allowing consumers to view the same single drive volume (eg. Data (D:)) as they do today, HyperDuo requires no behavioral changes by consumers to maximize simplicity and eliminates user error.

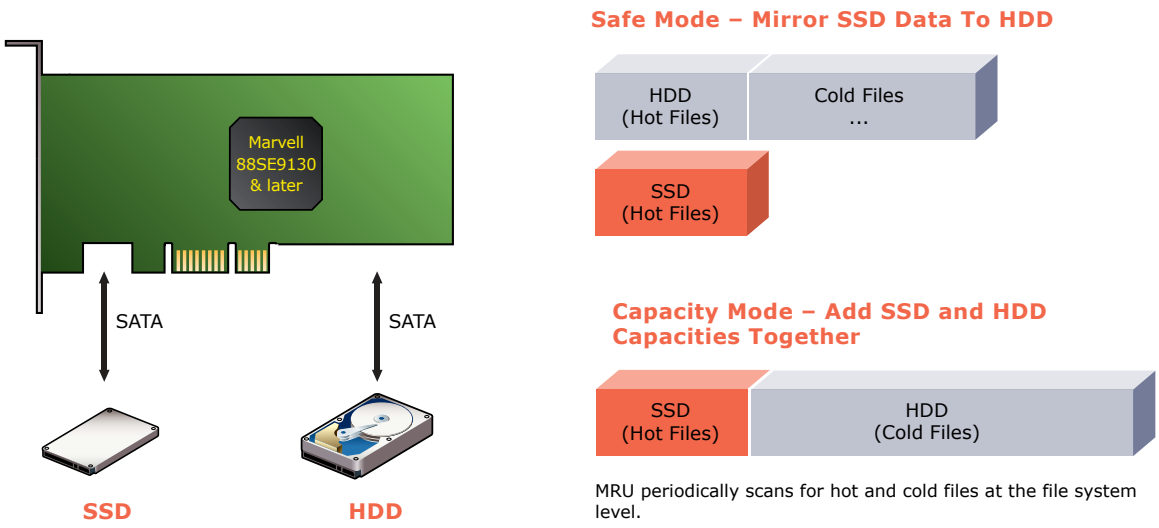

Fig 2. Marvell HyperDuo can be configured in Safe or Capacity modes for maximum user flexibility

HyperDuo also offers a graphical user interface (GUI) utility to enable fine-grained control of what files and directories are stored in the SSD. Power users can view file directories that the HyperDuo deems as hot data and decide whether to move it to the SSD or keep the data on the slower hard drive. For novice users, HyperDuo performs automatic background updates to periodically monitor hot file directories, with minimal CPU overhead.

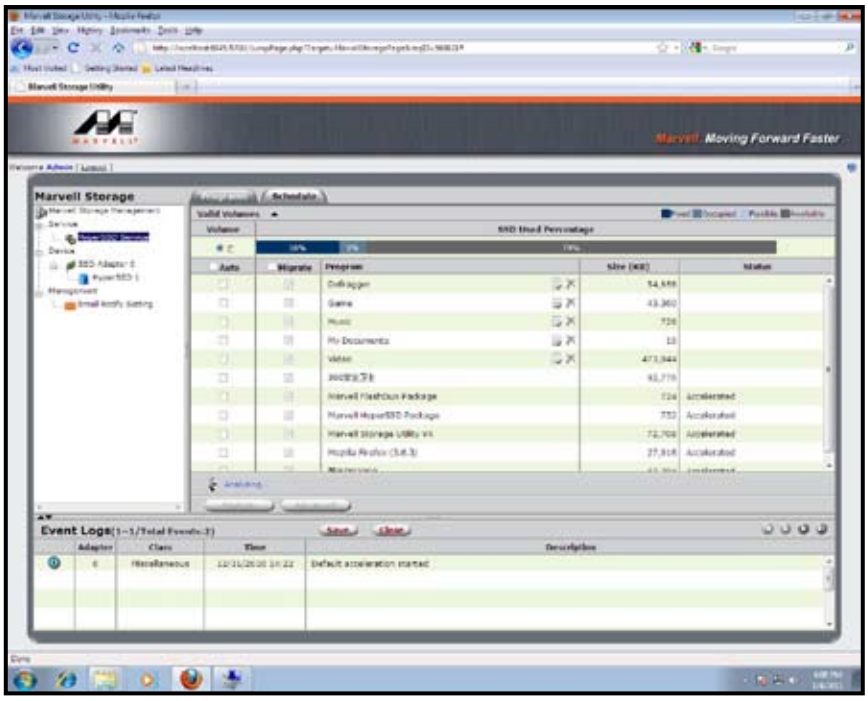

Fig 3. Powerful, highly intuitive graphical interface makes HyperDuo simple and manageable

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FEATURE HIGHLIGHTS

- Price/Performance: 80% of SSD performance (PCMark) at 1/3 the cost
- RAID: 0/1 hardware RAID running on ARM-based CPU
- Modes: Safe Mode (Mirrored Protection), Capacity Mode (Cost-Optimized)
- GUI: Flexible, intuitive administration console for power users

PERFORMANCE BENCHMARKS

HyperDuo has undergone rigorous performance testing with various HDD and SSD capacities and vendor brands. Below are benchmark results based on industry-standard PCMark test measurements.

	HDD	HyperDuo	SSD
	Seagate® 320GB	80GB SSD + 320GB HDD	Intel® 80GB
• **PCMARK**	4602	25428	31443

	HDD	HyperDuo	SSD
	Western Digital® 6G 1TB	256GB SSD + 1TB HDD	Micron 6G 256GB
• **PCMARK**	5580	25675	28179

Table 1. PCMark Benchmarks Comparing HDD Only vs. SSD Only vs. Marvell HyperDuo

	Capacity	Storage Cost	Performance
• **Option 1: SSD Only**	320GB SSD	$800+ (100% baseline)	31443 (100% baseline)
• **Option 2: HyperDuo**	80GB + 320GB = 400GB	$250 (31%)	25428 (80.9%)
• **Option 3: HDD Only**	320GB HDD	$50 (6%)	4602 (14.6%)

Table 2. Marvell HyperDuo Achieves Near-SSD Performance At 1/3 the Cost

CONCLUSION

Marvell HyperDuo will usher in a new era by enabling truly cost-effective SSD performance. Unlike custom add-on software that adds cost and complexity, the HyperDuo technology is built-in to the Marvell system-on-a-chip starting with the Marvell 88SE9130. As opposed to manual tuning, where consumers have to tediously keep on top of what data is hot or cold and where it's stored, HyperDuo is fully automated. Users see the same Windows environment (eg. D: drive) that they experience today. Any desktop motherboard, home NAS, set-top device or SATA HBA with the Marvell 88SE9130 ASIC will offer this automated SSD acceleration technology "built-in" from day one. Because it is embedded, consumers will automatically get the benefits of SSD acceleration and automated tiering without any added complexity or risk.

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TECHNICAL SPECIFICATIONS

• Part Number	HyperDuo technology is embedded in Marvell 6Gb/s SATA controllers, starting with the Marvell 88SE9130 controller
• Chip-Level Requirements	Only Marvell 88SE9130 is currently supported. Future Marvell SATA controllers are expected to support HyperDuo technology
• Platform Requirements	Any hardware system or platform using 88SE9130 is capable of leveraging HyperDuo, including the following platforms: • Desktop motherboards • Home NAS (Network Attached Storage) • Consumer set-top boxes, DVRs and gaming consoles • Consumer PCIe HBAs (Host Bus Adapters)
• Storage Hardware	Any SATA-based hard disk drive (HDD) or solid state drive (SSD) is supported. Marvell recommends 6Gb/s SATA HDDs and SSDs for maximum performance, but HyperDuo technology will also work with older 3Gb/s SATA HDDs and SSDs. The following is a sample list of supported storage hardware (not comprehensive): • Western Digital® • Micron® • Seagate® • Toshiba® • Hitachi® • Samsung®
• OS Support	• Microsoft® Windows® XP • Windows Vista • Windows 7 Note: Inbox drivers enable users to take advantage of OS commands like TRIM to extend the life of SSDs for maximum durability.
• RAID Support	• RAID 0 • RAID 1
• User Configurations	• Safe Mode: Automated mirroring from SSD to HDD for maximum protection • Capacity Mode: SSD capacity augments the hard drive to optimize cost efficiency
• Administration Console	Marvell provides a Graphical User Interface (GUI) via Marvell's Storage administration console. This provides a simple, highly intuitive interface for power and flexibility: • Power users can view the file directories that HyperDuo recommends pinning to the SSD and decide whether to select or deselect each item. Users can also set and configure the scheduled frequency of running HyperDuo. • For mainstream users, Marvell recommends enabling HyperDuo to automatically migrate hot files and directories from HDD to SSD.

THE MARVELL ADVANTAGE: Marvell chipsets come with complete reference designs which include board layout designs, software, manufacturing diagnostic tools, documentation, and other items to assist customers with product evaluation and production. Marvell's worldwide field application engineers collaborate closely with end customers to develop and deliver new leading-edge products for quick time-to-market. Marvell utilizes world-leading semiconductor foundry and packaging services to reliably deliver high-volume and low-cost total solutions.

ABOUT MARVELL: Marvell is a leader in storage, communications, and consumer silicon solutions. Marvell's diverse product portfolio includes switching, transceiver, communications controller, processor, wireless, power management, and storage solutions that power the entire communications infrastructure, including enterprise, metro, home, storage, and digital entertainment solutions. For more information, visit our Web site at www.marvell.com.

MARVELL®

Marvell Semiconductor, Inc.
5488 Marvell Lane
Santa Clara, CA 95054
Phone 408.222.2500
www.marvell.com

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