



## Enmotus *FuzeDrive* Hybrid Storage Solution Provides Greater Than 5X the Performance of an all HDD Solution

Delivers Greater Real World OLTP Database Performance

5.75X Greater Transactions/Minute

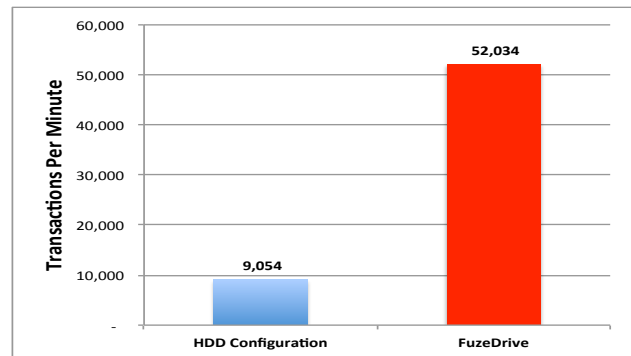
4.76X Greater Performance/Dollar

**FuzeDrive** is intelligent hybrid storage software that enables server based hybrid solutions using commodity hardware by “Fuzing” SSDs and hard drives into fully automated virtual hybrid storage. MicroTiering™ technology relocates active data to the SSD tier in real time, resulting in application performance characteristics of a pure SSD solution, leaving less frequently accessed data on slower media tiers. SSDs are treated as primary storage (not used as temporary cache), so the active data remains on the SSD permanently, or until displaced by more active data using a new innovative load-balancing algorithm. FuzeDrive operates entirely at sub-file level and unlike caching solutions, the SSDs capacity is added to the volume capacity and supports a broader range and size of SSDs.

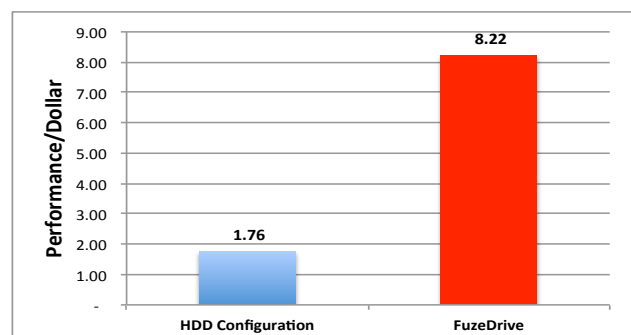
**The Challenge:** SQL Database workloads require powerful systems, but servers easily become bottlenecked by the back end storage as IT operations expand. Traditionally, this bottleneck is overcome by adding multiple high cost SAS hard drives. Replacing all of the hard drives with high performance SSDs, is both cost prohibitive and overkill in all but a few extreme cases.

**The solution:** a server based hybrid storage solution from **Enmotus!** The Enmotus *FuzeDrive*, coupled with SAS SSDs and HDDs in a hybrid storage configuration, provides SSD performance in OLTP workloads in real-world database tests as confirmed in lab testing. A comparison test using the identical

server showed that the *FuzeDrive* hybrid solution was able to process more than 5X the number of transactions as a traditional hard drive solution versus a traditional HDD RAID 10 based system.



Cost effective HDDs provide unlimited capacity to store your less frequently accessed data, resulting in high value system that provides performance at affordable cost points. The Enmotus solution was shown to deliver nearly 5X the performance/dollar of a pure hard drive solution. Independent scaling of SSD and HDD capacities allows user to tune performance and capacity to meet individual needs.





**Test Configuration:** The lab test compared the OLTP performance in a real world application between hard disk drives and the Enmotus FuzeDrive SSD/HDD Hybrid configuration. The testing was done on the same entry-level server with the only difference being the data drives being utilized. The hard drive only configuration used 6 Toshiba 450GB 10.5K 6G SAS drives configured in a RAID 10 for the data volume and single 1TB 7.2K HDD for the boot drive and the MySQL database logs.

The FuzeDrive Hybrid system used 2 Toshiba 200 G SSDs mirrored as Tier 0 “Fuzed” to 3 1TB 7.2K HDDs in a RAID5 configuration for the secondary tier, and the 1TB HDD for boot and MySQL database logs. Enmotus’ FuzeDrive Hybrid Storage Software was used to create a single Virtual Hybrid Drive, which appears to the operating system as a single drive. The FuzeDrive SW, with MicroTiering™ technology moves frequently accessed data to Tier 0 in real time, where it remains permanently or until displaced by more frequently accessed “Hot” data.

Dell/VMWare’s DVD Store2 software was used to simulate online ecommerce. DVD Store is a complete online e-commerce test application with a back end database component. MySQL was used in this study. The test configuration used a single PC client to generate the workload. The test reports results in Orders Per Minute, which shows how many customers the system can handle. The software also exercises relevant operations such as adding new customers, search for product, etc. For this test, a 60GB database was configured.

Item
Entry Server with Single processor and 8GB Memory
Win Server 2008 R2
Adaptec RAID Controller
SQL Server

	HDD Configuration	FuzeDrive
Boot Drive/ DB Log Files	1 TB Seagate 7200 RPM	1 TB Seagate 7200 RPM
Data Drives	6 450GB Toshiba 6G SAS HDD	2 200 GB Toshiba 6G SAS SSD 3 1TB Seagate 7.2K 6G SAS HDD
RAID Level	RAID 10 Striped Mirror	RAID 1 Mirror (SSD) RAID 5 (HDD)
Useable Capacity	1.35 TB	2.2 TB
Drive Cost	\$X	\$1.5X
Total System Cost	\$X	\$1.2X

Testing showed that the FuzeDrive solution was able to perform 5.75X more transactions each minute than the hard drive only solution. This is critical for any organization that needs to meet growing future needs or spikes in demand, which could stifle the hard drive only solution.

In addition, the FuzeDrive system is also extremely cost effective. While the overall system price was comparable to the all hard drive solution, and even had more useable capacity, the performance per dollar of the FuzeDrive system was nearly 5X greater than that of the all hard drive solution.

**Conclusion:** Enmotus’ FuzeDrive, coupled with Toshiba SSDs enabled a Hybrid storage solution with the performance characteristics of an SSD solution, but the capacity points of a

	Enmotus SSD Hybrid	All Hard Drive Configuration	Performance Improvement For Enmotus
Total OPM	52034	9054	5.75X
Performance/Dollar	8.22	1.76	4.67X

traditional HDD solution at a very affordable cost point. Automated real time tiering makes sure your system remains optimized, regardless of the application. A rich set of management tools along with advanced features such as manual pinning, provide IT managers with the flexibility to fine tune the system to any individual need.