

# Intel® Solid-State Drive Data Center P3700 Series NVMe Hybrid Storage Performance

Hybrid Storage Performance Gains for IOPS and Bandwidth  
Utilizing Colfax Servers and Enmotus FuzeDrive™ Software

## NVMe Hybrid Storage Accelerates Reads and Writes

NVMe is the optimal interface for PCIe based SSDs. Faster processors have outpaced the ability for SATA drives and the AHCI interface to keep up. In order to meet the demands of today's enterprise data needs, NVMe was developed from the ground up to take advantage of the requirements of data rich applications.

A general purpose Linux Server can easily be upgraded into a high performance hybrid storage server by adding Intel® SSD DC P3700 Series NVMe flash ([Intel.com/SSD](http://Intel.com/SSD)) storage along with Enmotus' hybrid storage software. The solution provides several magnitudes better performance compared to an all hard drive solution, but best of all, it provides the full performance of NVMe flash for both reads and writes as well as the capacity of a hard drive solution.

Colfax International testing has demonstrated that their Enterprise Storage Servers, enabled with Enmotus' FuzeDrive™ Server Storage Hybridization software technology, provide superior performance for both IOPS and bandwidth applications. The testing, which was conducted utilizing Colfax's CX4160S-XS6 rack mount server, compared the performance of an all hard drive configuration to a NVMe Flash/HDD hybrid storage configuration.

Testing was conducted using the FIO benchmark. The Hard Drive (HDD) testing utilized a 36TB volume in an 8 drive RAID6 configuration. The FuzeDrive hybrid volume utilized the same 36TB RAID 6 volume with a 1.6TB Intel® SSD DC P3700 Series NVMe flash adapter "Fuzed" to the hard drive, for a total useable volume capacity of 37.6 TB.

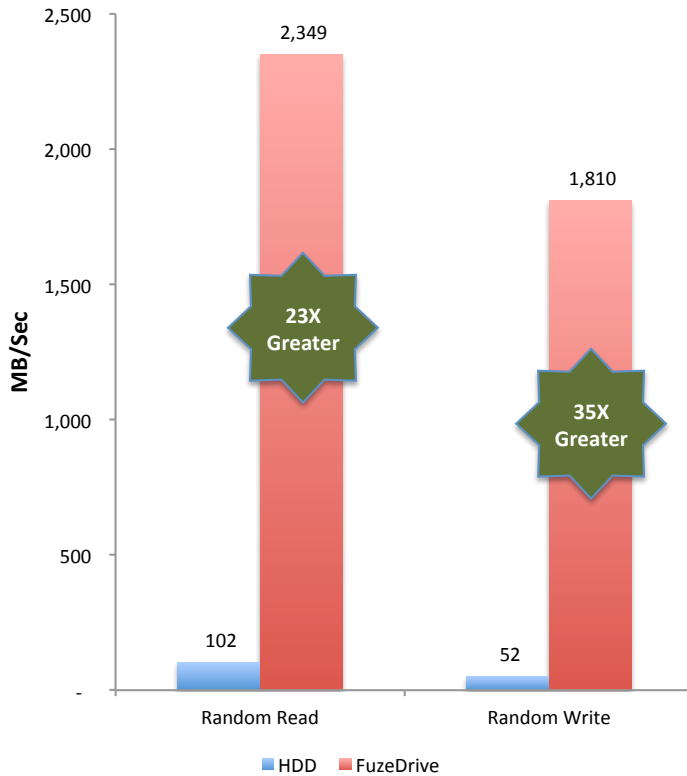


### IO Performance:

The FuzeDrive NVMe Hybrid solution provides 262X more random read IOs than all hard drives, but still provides the capacity of the hard drive solution. In fact, unlike caching, the capacity of the NVMe flash is additive to the volume and becomes the primary storage for hot data.

Both reads and writes occur at the speed of the flash tier.

The testing showed that the FuzeDrive NVMe hybrid solution provides 260X the performance of the all hard drive configuration.



**Bandwidth Performance:**

The FuzeDrive NVMe solution provides superior read and write bandwidth performance as well as IOPS. Testing showed the FuzeDrive solution provided over 2.3 GB/Sec of bandwidth, which was 23X greater than the all hard drive solution, and random write bandwidth was 35X greater than the hard drive solution.

**Summary:**

The results show that a general purpose Linux server can be transformed into a high performance hybrid storage solution using the Enmotus FuzeDrive Server hybridization software and NVMe flash storage. The solution provides the full read and write performance of the NVMe flash for both IO intensive applications as well as bandwidth intensive applications. This makes it uniquely suitable for latency sensitive applications such as databases as well as high bandwidth applications such as content delivery and video postproduction. The end result is a storage solution with the performance characteristics of the flash storage media and the storage capacity of hard disk drives.

## About Colfax International

Colfax International is a global provider of customized workstations, servers, clusters, storage and personal supercomputing solutions. Founded in 1987, Colfax International is based in Sunnyvale, California and is privately held. For more information, please visit <http://www.colfax-intl.com/nd/solutions/enmotus-fuzedrive.aspx>

## About Enmotus

Enmotus develops innovative software defined storage acceleration solutions for next generation data center, web scale servers and professional workstation applications. Our intelligent hybrid storage software solution, FuzeDrive, enables vendor agnostic hybrid storage pooled solutions using any standard block storage device, including NVMe, PCIe SSD and SAS/SATA storage devices, presenting them as a real-time automated tiered devices within Windows or Linux based operating systems. FuzeDrive implements a rich set of device management tools that allow users to see at a glance data activity, fast tier media or file distribution across tiered devices and manually pin files to any tier. For more information, please visit [www.enmotus.com](http://www.enmotus.com).

### Test Configuration

Server	Colfax CX4160S-XS6
CPU	Intel® Xeon® processor E5-2630 V3 2.4 GHz
Memory	16384 MB 2133 MHZ DDR4
I/O Controller	LSI MegaRaid 9361-8I
Software	
OS	Centos 7.0 loaded on standalone SSD
Hybrid Storage	FuzeDrive Server 1.0
Test Suite	FIO 2.1.7
HDD Configuration	
HDD	8 Seagate 6TB 12 Gb/s SAS
RAID	RAID 6
Useable Capacity	36TB
Hybrid Configuration	
HDD (Slow Tier)	8 Seagate 6TB 12 Gb/s SAS
RAID	RAID 6
SSD (Fast Tier)	Intel® SSD DC P3700 Series 1.6 TB NVMe Flash Drive
Useable Capacity	37.6 TB