SOLUTION BRIEF

Pliops Extreme Data Processor for No Compromise RAID 5/6 Data Protection

CHALLENGE

Because many business operations are dependent on rapid access to large databases, enterprises are adopting NVMe SSD drives to increase application performance. However, traditional setups of storage infrastructure using RAID (Redundant Array of Independent Drives) have inherent inefficiencies in cost-effectively delivering high performance with high reliability. RAID 0 implementations provide high performance but no data protection, while RAID 10 delivers high reliability but at twice the cost. While RAID 5 is a proven method for hard disk arrays, it's not as effective for SSD arrays, where it can potentially decrease reliability. The ideal data protection solution must provide the benefits of hardware RAID 5 without the inherent limitations in performance, endurance, and capacity.

SOLUTION

The Pliops Extreme Data Processor (XDP)—powered by AMD-Xilinx adaptive computing technology— utilizes an optimal approach for SSD infrastructure. Pliops XDP overcomes storage inefficiencies to multiply the scalability of workloads and data capacity by delivering ultra-high performance Drive Failure Protection (DFP) and inline compression for NVMe SSD-based data-intensive applications. XDP's hardware acceleration frees the CPU from complex storage tasks resulting in greater infrastructure reliability, application performance, storage capacity, and compute efficiency.

HIGHLIGHTS

AMD-Xilinx Technology for Near-ASIC Performance with Sub-millisecond Latency

> Up to 10x higher performance vs. CPU-based software-based solutions

No Compromise Drive Failure Protection (RAID 5/6 style)

> Up to 5x faster drive rebuild and up to 23x better performance during rebuilds

Increase SSD Endurance

> Up to 7x higher SSD lifespan enables the use of high-capacity QLC drives

More Usable Storage Capacity

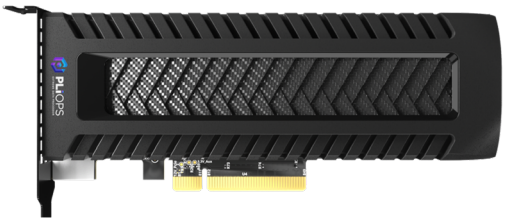
> Up to 6x more usable capacity for a substantial reduction in cost/terabyte

Easy to Deploy and scale

> No software changes or special hardware required

5X

Faster Drive Rebuilds vs. Hardware RAID 5



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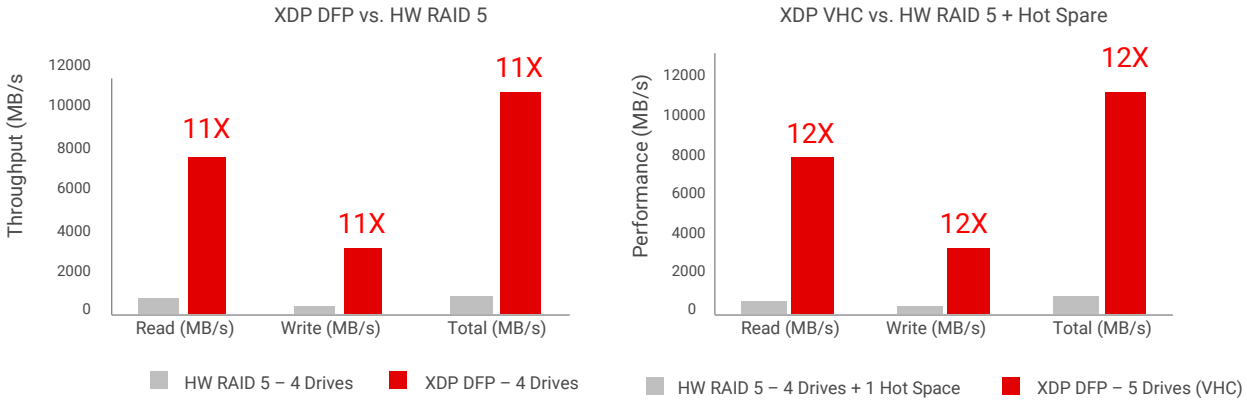
NO COMPROMISE DRIVE FAILURE PROTECTION – SUPERIOR THROUGHPUT PERFORMANCE

RAID 5 algorithms take a toll on write performance, especially for small random writes. To change a small amount of data within a stripe, traditional RAID 5 must also update the parity data. This requires a read-modify-write operation that has a big impact on write performance. Since XDP transforms all random writes into sequential ones, it eliminates this problem and significantly accelerates random read and random write workload performance vs. hardware RAID 5.

Figure 1 compares XDP to hardware RAID 5 in both 4 and 5 drive configurations using a 70/30 random read/write workload at a 16K block size. In the configuration with four drives, XDP delivers up to an 11x boost in performance. XDP performance is even higher at up to 12x in five-drive Virtual Hot Capacity (VHC) mode. With VHC, XDP utilizes the 5th drive, whereas with hardware RAID 5, the drive is a hot spare used only when a rebuild is needed.

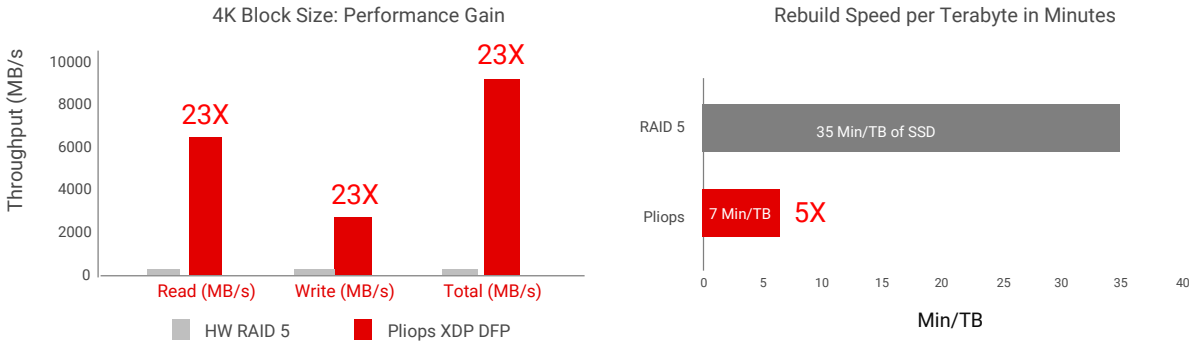
Figure 1: XDP Performance benefits for TLC SSDs in Four and Five-Drive configurations



RAPID REBUILDS WITH HIGH QUALITY OF SERVICE

If a drive fails in a traditional RAID 5 array configuration, the data is rebuilt from the parity data on the remaining drives. While in rebuild mode, there is a tradeoff between the performance of host I/O activities and the rebuild rate. Host I/O performance degrades significantly when the array is rebuilding the data. As a result, it's crucial to rebuild the data as quickly as possible and to minimize the performance impact. Figure 2 shows XDP's dramatic performance and QoS benefits during a rebuild: 23x higher throughput and 5x faster rebuilds than hardware RAID 5. The net result is user impact is minimized, enabling organizations to improve customer satisfaction. The speed of XDP during a rebuild also allows the use of high-capacity SSDs, making it easier to keep up with ongoing data growth.

Figure 2: XDP QoS and Rebuild Speed Benefits



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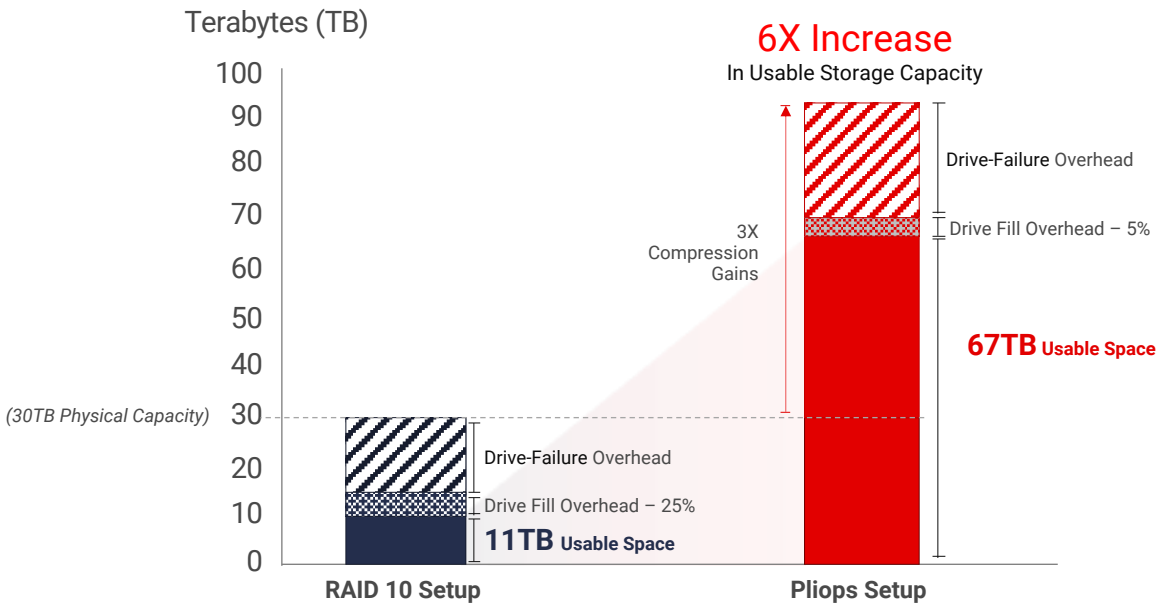
CAPACITY EXPANSION LOWERS COST/TERABYTE

XDP's in-line hardware accelerated compression implements multiple parallel ZSTD engines to prevent bottlenecks, freeing the CPU from this burden. Figure 4 shows how XDP's compression, minimal drive failure protection overhead, and near-full drive utilization (95%) expand usable capacity by up to 6x vs. RAID 10. Starting with the same 30TB of storage, usable capacity goes from 11TB with RAID 10 to 67TB with Pliops XDP. The 6x increase in usable capacity delivers a substantial reduction in the cost/terabyte. With several petabytes deployed at the data center level, the increased capacity can translate to several millions of dollars in savings.

Figure 4: Up to 6X More Usable Storage Capacity with Pliops XDP



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SPECIFICATION

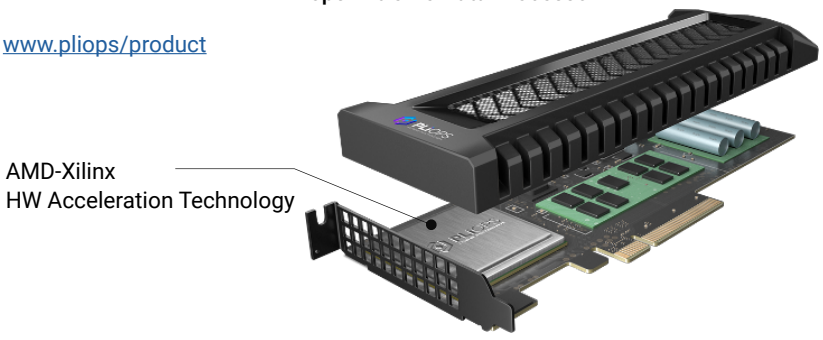
PLATFORM FEATURES	
Performance	3.2 IOPS Read | 1.2M IOPS Read/Write | 30GB/s SR | 6.4GB/s SW
SSD Interfaces	PCIe Gen4 | NVMe | NVMe-oF | SAS
SSD Types	TLC SSD | QLC SSD | ZNS SSD | Intel® Optane
Capacity	128TB of data on 64TB of protected SSDs
In-line Transparent Compression	> Lossless data compression reduces drive space by up to 50% or more over software-based compression > Configurable volumes, compression, overhead, and drive fill rate expand user capacity up to 6x
Key-Value Storage Engine	> Key-value API bypasses legacy storage stack for greater performance acceleration > Sorted data is compressed and packed then written 100% sequential to SSD > Indexing overhead requires two bytes per object for up to 32x lower DRAM footprint vs. other solutions
RAID / Drive Failure Protection	> Multiple single-drive failures with ultra-fast rebuilds > No loss in capacity from parity storage > Enables use of high-capacity TLC & QLC SSDs and mitigates blast radius concerns
Encryption	> The encryption and decryption process is supported > No performance degradation and data transfer is not slowed down
Host API	> Std block > KV library API
OS Support	All Linux variants

TAKE THE NEXT STEP

> Learn about Pliops Extreme Data Processor (XDP) at www.pliops/product

> Request a demo at www.pliops.com/request-a-demo

Pliops Extreme Data Processor



Corporate Headquarters
Xilinx, Inc.
2100 Logic Drive
San Jose, CA 95124
USA
Tel: 408-559-7778
www.xilinx.com

Xilinx Europe
Xilinx Europe
Bianconi Avenue
Citywest Business Campus
Saggart, County Dublin
Ireland
Tel: +353-1-464-0311
www.xilinx.com

Japan
Xilinx K.K.
Art Village Osaki Central Tower 4F
1-2-2 Osaki, Shinagawa-ku
Tokyo 141-0032 Japan
Tel: +81-3-6744-7777
japan.xilinx.com

Asia Pacific Pte. Ltd.
Xilinx, Asia Pacific
5 Changi Business Park
Singapore 486040
Tel: +65-6407-3000
www.xilinx.com

India
Xilinx India Technology Services Pvt. Ltd.
Block A, B, C, 8th & 13th floors,
Meenakshi Tech Park, Survey No. 39
Gachibowli(V), Seri Lingampally (M),
Hyderabad -500 084
Tel: +91-40-6721-4747
www.xilinx.com

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