

## Pliops Extreme Data Processor for Redis Real-Time Databases DRAM-Like Performance with SSD-Like Economics



### CHALLENGE

As databases continue to grow and the immediacy of storage and compute is essential to business operations, Redis has become the most popular in-memory NoSQL database. Due to its sub-millisecond latency and high throughput, Redis enables fast response times for workloads and applications like machine learning and real-time analytics. However, as database scale increases, the infrastructure costs of keeping large amounts of data in DRAM memory can become prohibitive.

Given the desire to use Redis for larger datasets, flash technology such as solid-state drives (SSDs) offers a potentially cost-effective option compared to DRAM. The challenge has been CPU-based software implementations struggle to efficiently store variable length data to fixed-length blocks required by SSDs. The result is read/write inefficiencies, resulting in high latency and inconsistent performance (IOPs)—ultimately reducing the value of Redis.

### SOLUTION

The Pliops Extreme Data Processor (XDP)—powered by AMD-Xilinx adaptive computing technology—utilizes an optimal approach to deploy Redis using SSDs. By managing variable-length data sets through innovative techniques and data structures, Pliops XDP stores data to SSDs at theoretical limits of read, write, and storage space—extending the life of SSD infrastructure and taking full advantage of storage capacity, all while using far fewer CPU resources.

The result is greater application performance, infrastructure reliability, storage capacity, and compute efficiency. By freeing up CPU cycles and improving the utilization of existing infrastructure, Pliops XDPs can reduce total cost of ownership (TCO) of an entire Redis deployment by up to 84 percent.

### HIGHLIGHTS

#### AMD-Xilinx Technology for High Performance at Low Latency

- > Achieves DRAM-like performance with sub-millisecond latency
- > Powered by the Xilinx Kintex UltraScale+ FPGA for adaptive hardware acceleration

#### 84% Reduced TCO by Freeing Up CPU and Leveraging Cost-Effective SSDs

- > Uses 90% fewer server CPUs compared to software-only solutions
- > Lowest \$/GB via flash technology, while extending SSD lifetime / usable capacity

#### Complete Solution Stack for Efficient Deployment

- > NVMe block interface and Key-Value API for compatibility with existing applications
- > One platform that's easy to deploy and scale, without software changes



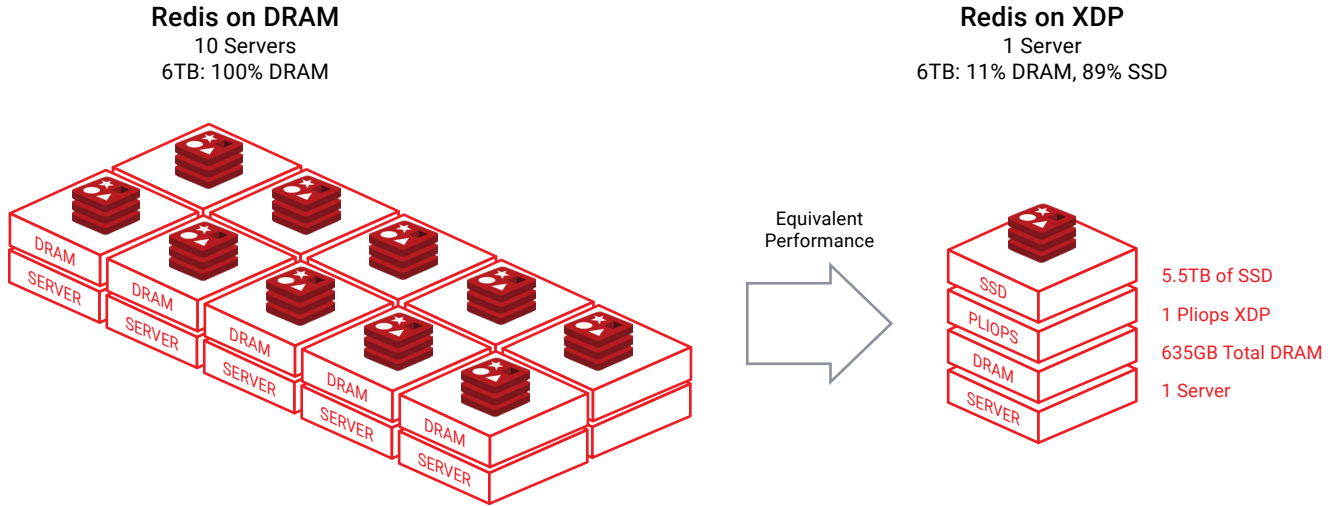
# 84%

Reduced TCO vs. CPU Implementations

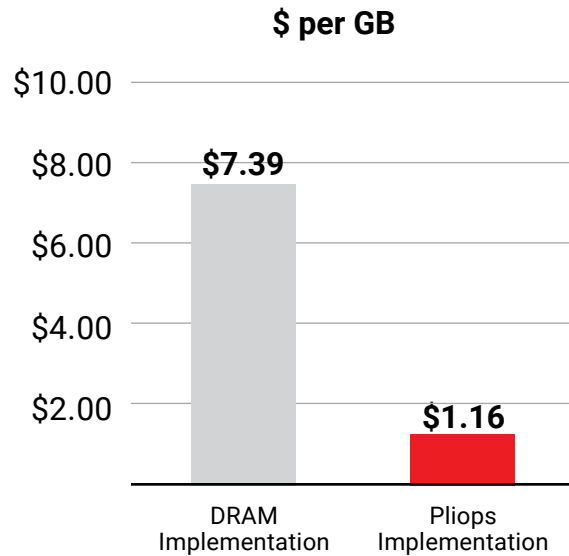
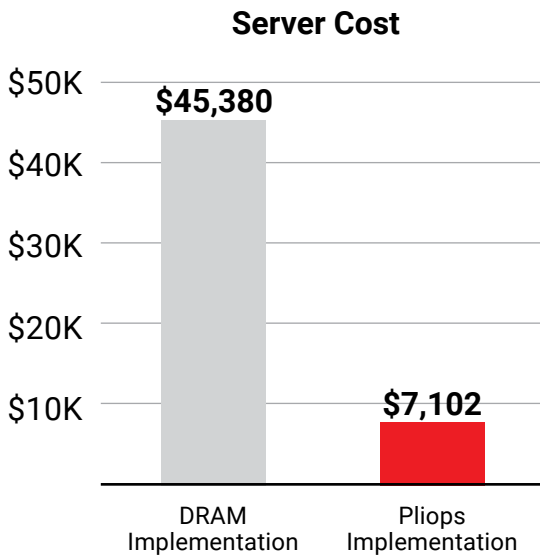
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### 84% Lower Total Cost of Ownership

By leveraging Pliops XDP with SSDs in Redis deployments, companies can counter the rising cost of infrastructure as data processing needs grow. For example, consider an implementation that requires 1 million IOPs (input/output operations per second) to access 6TB of Redis data at 1ms average latency. Redis on DRAM would typically require 10 servers with approximately 635GB of data in each server. In contrast, Redis on XDP will achieve virtually identical performance with just one server.



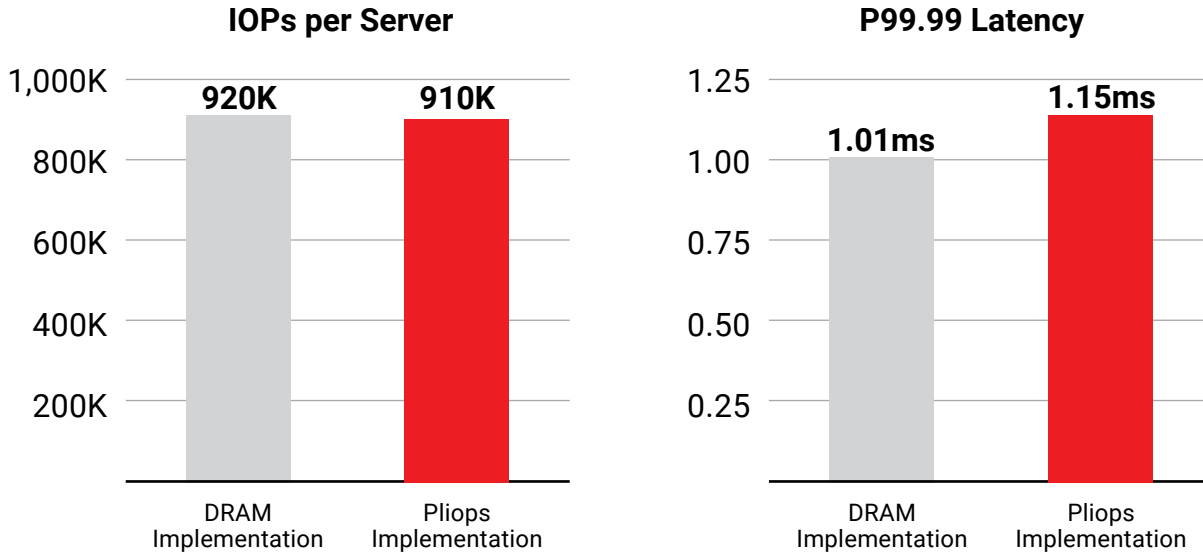
Redis on XDP dramatically reduces CapEx and OpEx by minimizing server count, SSD count, power, and cooling requirements—delivering an overall TCO reduction of **84 percent**.



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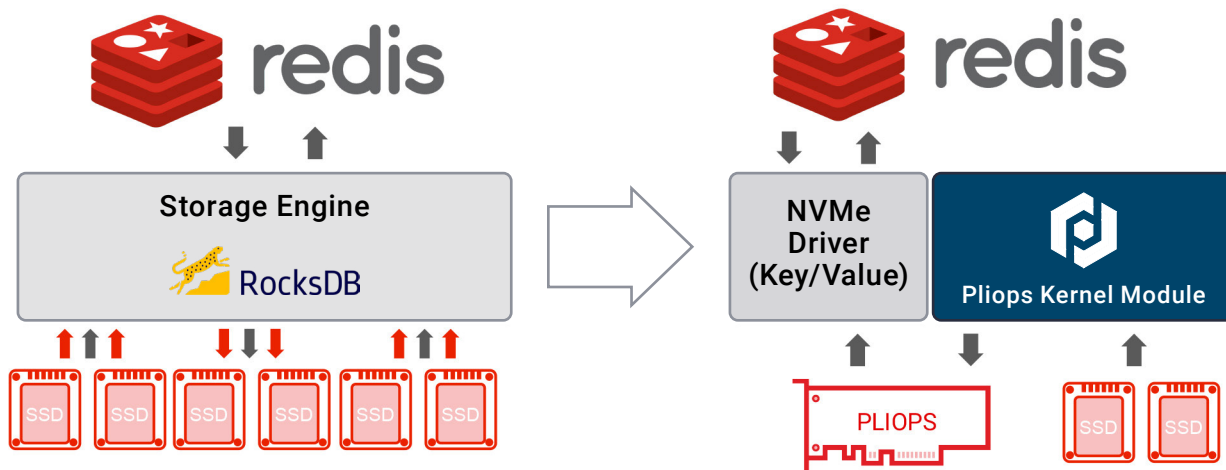
## Uniformly High Performance at Low Latency

Unlike past attempts to use SSDs to reduce DRAM usage for in-memory databases, Pliops XDP does not rely on workload locality or specific hot/cold access patterns to achieve these results. In the use case shown below, a uniform access pattern was used with nearly 90% of the IOs delivered by Pliops-accelerated SSDs. This means a Redis service can be confidently deployed on Pliops, knowing that your users will have a uniformly high-performance experience.



## Solution Stack / API for Efficient Deployment

Pliops XDP can use standard NVMe block interface for maximum compatibility with most business applications. A key-value based NVMe interface is recommended for compatibility with RocksDB-like indexing stores. Along with the flexibility of AMD-Xilinx adaptive computing technology, the choice of NVMe interfaces leads to a single solution that works for all workloads and can be deployed at scale to reduce cost up to 5x.



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### SPECIFICATIONS

PLATFORM FEATURES	
Performance	3.2 IOPS RR   1.2M IOPS RW   30GB/s SR   6.4GB/s SW
SSD Support	PCIe Gen 3/4/5   NVMe   NVMe-oF   SAS
SSD Types	TLC SSD   QLC SSD
Capacity	128TB of user data on 128TB of physical disk with parity protection
In-line Transparent Compression	<ul style="list-style-type: none"> <li>&gt; Lossless data compression reduces drive space by up to 50% or more over software-based compression</li> <li>&gt; Configurable volumes, compression, overhead, and drive fill rate expand user capacity up to 6x</li> </ul>
Key-Value Storage Engine	<ul style="list-style-type: none"> <li>&gt; Key-value API bypasses legacy storage stack for greater performance acceleration</li> <li>&gt; Sorted data is compressed and packed then written 100% sequential to SSD</li> <li>&gt; Indexing overhead requires two bytes per object for up to 32x lower DRAM footprint vs. other solutions</li> </ul>
RAID / Drive Failure Protection	<ul style="list-style-type: none"> <li>&gt; Multiple single-drive failures with ultra-fast rebuilds</li> <li>&gt; No loss in capacity from parity storage</li> <li>&gt; Enables use of high-capacity TLC &amp; QLC SSDs and mitigates blast radius concerns</li> </ul>
Encryption	<ul style="list-style-type: none"> <li>&gt; The encryption and decryption process is supported</li> <li>&gt; No performance degradation and data transfer is not slowed down</li> </ul>
Host API	<ul style="list-style-type: none"> <li>&gt; Std block</li> <li>&gt; KV library API</li> </ul>
OS Support	All Linux variants

### TAKE THE NEXT STEP

Learn about Pliops Extreme Data Processor (XDP) at [www.pliops/product](http://www.pliops/product)  
Request a demo at [www.pliops.com/request-a-demo](http://www.pliops.com/request-a-demo)

**Pliops Extreme Data Processor**  
Powered by Xilinx Kintex  
UltraScale+ FPGA



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