

# Comparison of Dell R730xD and HP ProLiant DL380 Servers

## INTRODUCTION

This paper provides a storage performance comparison of the Dell R730xD and the HP ProLiant DL380 servers. The basic testing methodology used for this comparison is to capture the number of IOPS. We used a few different workload simulations namely all READ and 30% Read/70% Write (representative of OLTP). This comparison demonstrated that the Dell's R730xD using SanDisk DAS Cache exhibited IO performance up to 6 times greater than that of the HP ProLiant DL380 with HPE SmartCache.

## OVERVIEW

SanDisk DAS Cache is a direct-attached storage (DAS) application acceleration solution that enables a solid-state-drive (SSD) to improve server utilization and increase workload performance by acting as a cache for frequently accessed "hot" data in a server. The cache software is installed on the server and works in conjunction with the host operation system. HPE SmartCache is a controller-based caching solution in a DAS environment to cache hot data. It consists of firmware that provides the caching feature within the Smart Array controllers.

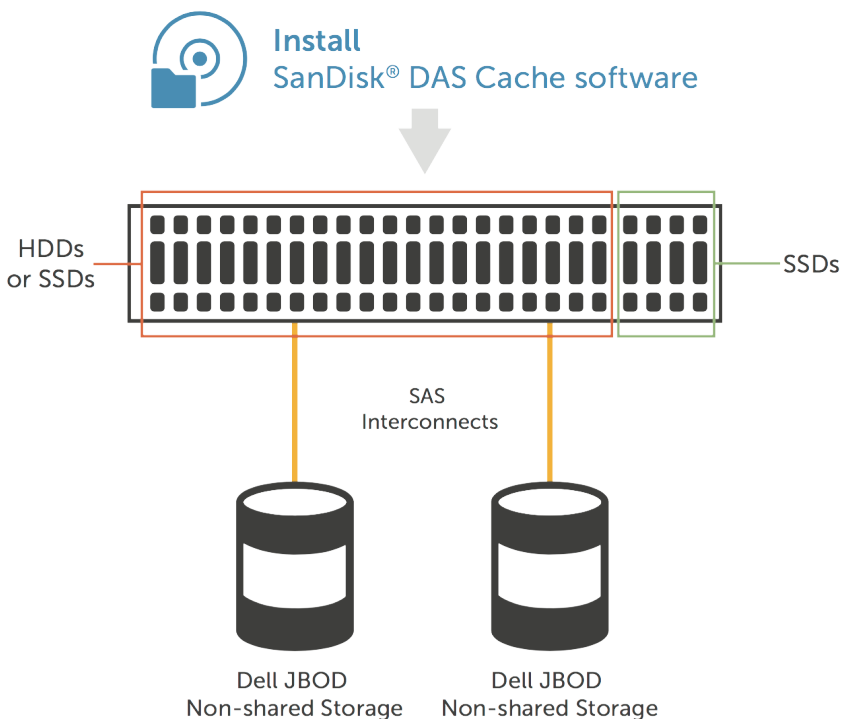


Fig 1. SanDisk DAS Cache

# METHODOLOGY

ProLiant Server

Direct attached storage

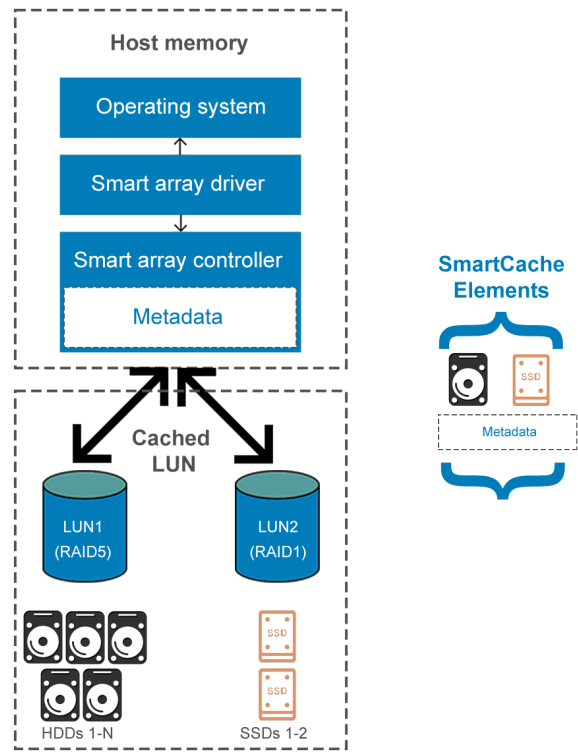


Fig 2. HPE SmartCache

4wardTech Inc conducted this performance test independently. A workload derived from the benchmark test was used to provide a 300GB storage to simulate OLTP workload. While the test focused on OLTP, 4wardTech also tested an all READ workload. IOMeter, I/O subsystem measurement and a characterization tool was used for testing the environments.

The tests were conducted multiple times to mitigate the negative effects of internal factors on system performance. First, the base tests were run on Dell R730xD and HP ProLiant DL380 using only hard-disk-drive (HDD) storage to serve as a baseline benchmark performance. Next, the same set of tests was run with DAS Cache installed on SAS SSDs on a Dell server and with HPE SmartCache on SAS SSDs on a HP server. Finally, the last set of tests were run with DAS Cache installed on NVMe PCIe SSDs on the Dell server to display the real power of the cache performance optimization for read-write intensive applications. Test for NVMe SSDs were not conducted on the HP server because Smart Cache does not support NVMe drives for caching.

## Test Configuration

Test	Summary	Dell R730xD Server	HP ProLiant DL380 Server
Backend HDD Storage (Baseline)	Baseline Measurement of non-accelerated, direct attached storage	5x 1TB HDD in RAID-5 configuration	5x 1TB HDD in RAID-5 configuration
SAS SSD in read-write mode (Cache Size: 300GB)	Performance Measurement of accelerated backend using SAS SSD in conjunction with HDD Cache: (300 GB) 80% of workload	5x 1TB HDD in RAID-5 configuration  2x SAS 480GB Samsung SSD in RAID-1 configuration	5x 1TB HDD in RAID-5 configuration  2x SAS 480GB Samsung SSD in RAID-1 configuration
NVMe PCIe SSD in read-write mode (Cache Size: 300GB)	Performance Measurement of accelerated backend using NVMe PCIe SSD in conjunction with HDD Cache: (300 GB) 80% of workload	5x 1TB HDD in RAID-5 configuration  2x 400GB Samsung NVMe in Software RAID configuration	Does not support NVMe PCIe SSD

## System Configuration

	Dell PowerEdge R730xD (13 Generation)	HP ProLiant DL380 (9 Generation)
Server	CPU: x86-64 -- Intel Xeon CPU E5-2620 v3 @2.40GHz Memory: 32GB DDR4	CPU: x86-64 -- Intel Xeon CPU E5-2620 v3 @2.40GHz Memory: 32GB DDR4
Operation System / Software	Windows 2012 R2 SP1  SanDisk DAS Cache v1.4	Windows 2012 R2 SP1  HPE SmartCache
Storage / Cache	5x 1TB HDD in RAID-5 configuration 2x SAS 480GB Samsung SSD in RAID-1 configuration 2x 400GB Samsung NVMe in Software RAID configuration	5x 1TB HDD in RAID-5 configuration 2x SAS 480GB Samsung SSD in RAID-1 configuration
Benchmark	OLTP simulated read-write workload 300GB database size 4 concurrent IOMETER workers with 32 Q-Depth	OLTP simulated read-write workload 300GB database size 4 concurrent IOMETER workers with 32 Q-Depth

# PERFORMANCE TEST RESULTS

The performance tests were conducted on two different systems using five HDDs, each with the same configuration, and SSD devices with different configurations.

Each experiment was performed with different random read (RR) sizes – 4KB and 8KB. Random read is a disk access pattern where small (4K or 8K) blocks of data are read from random locations on the surface of the device being tested. For each RR size, the tests were classified into distinct percentages of read and write operations: 100% Read operations and 70% Read, 30% Write operations. These various settings were configured using IOMeter that simulated the scenario.

All tests were conducted five times for each server with different RR sizes and Read-Write operation percentage categories. Firstly, the tests were run on a Dell and HP server consisting of HDDs only, without any caching solutions, to establish the baseline performance. The second tests were run with SanDisk DAS cache installed on a Dell server and HPE SmartCache on an HP server with SAS SSD in conjunction with HDDs. The final sets of tests were run with SanDisk DAS Cache and NVMe PCIe SSD configured on a Dell server. These final tests were not run on the HP server due to non-availability of SmartCache with NVMe PCIe SSDs. The accelerated performance tests were run for 900 seconds (15 minutes), providing sufficient time for the cache to give accurate results.

## Performance Measurements – IOPS (Inputs/Outputs per second)

Server Test Configuration	4KB RR 100% Read	4KB RR 70% Read 30% Write	8KB RR 100% Read	8KB RR 70% Read 30% Write
Dell R730xD (Baseline)	1,650	974	1,540	1,040
HP ProLiant DL380	1,370	628	1,322	630
Dell R730xD with DAS Cache	138,884	66,483	98,368	56,641
HP ProLiant DL380 with SmartCache	41,273	33,534	35,984	39,396
Dell R730xD with DAS Cache & NVMe PCIe SSD	264,750	158,157	257,150	104,490

## Performance Measurements – CPU Utilization (%)

Server Test Configuration	4KB RR 100% Read	4KB RR 70% Read 30% Write	8KB RR 100% Read	8KB RR 70% Read 30% Write
Dell R730xD (Baseline)	0.4%	0.28%	0.42%	0.3%
HP ProLiant DL380	0.8%	0.5%	0.8%	0.5%
Dell R730xD with DAS Cache	13%	8.8%	11.34%	7.83%
HP ProLiant DL380 with SmartCache	6%	6%	5%	5%
Dell R730xD with DAS Cache & NVMe PCIe SSD	16%	10.1%	16%	5.78%

# CONCLUSIONS AND RECOMMENDATIONS

The performance test results demonstrate the increased performance in using SanDisk DAS cache with SAS and NVMe PCIe SSDs on a Dell R730xD server compared to HPE SmartCache with SAS SSDs on a HP ProLiant DL380. For OLTP simulation R730xD shows that the number of IOPS are 3 times higher with SanDisk DAS Cache using SAS SSDs as Cache media and 6 times higher with NVMe PCIe SSDs as Cache media over HPE's SmartCache. The higher CPU utilization rates using NVMe PCIe SSDs & DAS Cache is an indicator of more IOPS and demonstrates the ability of utilizing the CPU more efficiently.

This shows the Dell R730xD to be a powerful platform with scalable storage options that can potentially translate into significant performance improvements for your business and computing needs by:

- reducing database I/O response times
- increasing client support
- cutting hardware costs
- improving user experience
- maximizing ROI

## ABOUT 4WARDTECH INC



*4WardTech provides technical consulting, program management support, and robust information technology services to commercial and government entities. 4WardTech is a certified Service-Disabled Veteran-Owned (SDVOSB) business.*

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