RAID Controller Performance Improvements in Dell PowerEdge 12th Generation Servers

A performance comparison between the Dell PERC H800 and PERC H810 using an OLTP workload

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Executive summary

The Dell™ PowerEdge™ 12th generation server lineup introduces the next generation PowerEdge Expandable RAID Controller (PERC) that provides a powerful and easy-to-manage enterprise RAID solution. Including many enhancements and new features, the PERC H810 adapter was redesigned with a faster dual core 800 MHz RAID-on-chip (ROC) processor and 1 GB DDR3 cache running at 1333 MT/s that boosts I/O performance compared to the previous generation. Paired with the Dell PowerVault™ MD1220 storage enclosure and newly improved 15K 6 Gb/s SAS drives, Dell's PERC H810 meets the demands of transaction-orientated applications that require high I/O storage performance.

Introduction

As enterprise Online Transaction Processing (OLTP) databases grow in size, increased rates of high random I/O are demanded from the server's storage solution. Database administrators often spread the database across a large number of spindles to improve transaction latencies during peak usage and also for data redundancy. Using Quest® Benchmark Factory® to simulate an OLTP transactional environment, similar to that of a stock brokerage house (TPC-E), this test report outlines the performance metrics including transactions per second (TPS), I/O per second (IOPs), and average database transaction latency of the new PERC H810 storage controller using the same amount of hard drives versus the previous generation.

Key results

OLTP database performance—transactions per second (TPS)

- The Dell PERC H810 can improve database transactional performance up to 38% compared to the Dell PERC H800.

Storage performance—I/O per second (IOPs)

- The Dell PERC H810 can improve random IOPs by up to 55% over the PERC H800.

Average response time—milliseconds

- The Dell PERC H810 can improve database transaction latency by up to 33% compared to the the PERC H800.

Test bed configuration

To carry out the performance testing, two similar server/storage configurations were prepared, one for the prior generation and another for the new generation. The PERC H810 configuration consisted of the new PowerEdge R720 server, PowerVault MD1220 storage enclosure, and 20 Toshiba MK3001GRRB 15K 6 Gb/s drives. For the previous generation, the PERC H800 was combined with the PowerEdge R710 server, PowerVault MD1220, and 20 Seagate ST9146852SS 15K 6GB/s drives. Table 1 lists the server storage configurations used for testing.

Table 1. Server/storage configuration

PERC controller	Server	PowerVault MD1220	Drive type/speed
PERC H810	PowerEdge R720	20 x 2.5" SAS hard drive configuration	SAS HDD 15K rpm—6 Gb (Toshiba MK3001GRRB)
PERC H800	PowerEdge R710	20 x 2.5" SAS hard drive configuration	SAS HDD 15K rpm—6 Gb (Seagate ST9146852SS)

Both PowerEdge servers were installed with Microsoft® Windows Server® 2008 R2 SP1 Enterprise Edition, Microsoft SQL Server® 2008 R2 SP1, and Benchmark Factory for databases 6.1.1. The database was built on the PowerVault MD1220 enclosure using a 16 drive RAID 10 and database log on a 4 drive RAID 10 virtual disk. Figure 1 and Figure 2 illustrate both configurations.

Figure 1. PERC H810 storage configuration

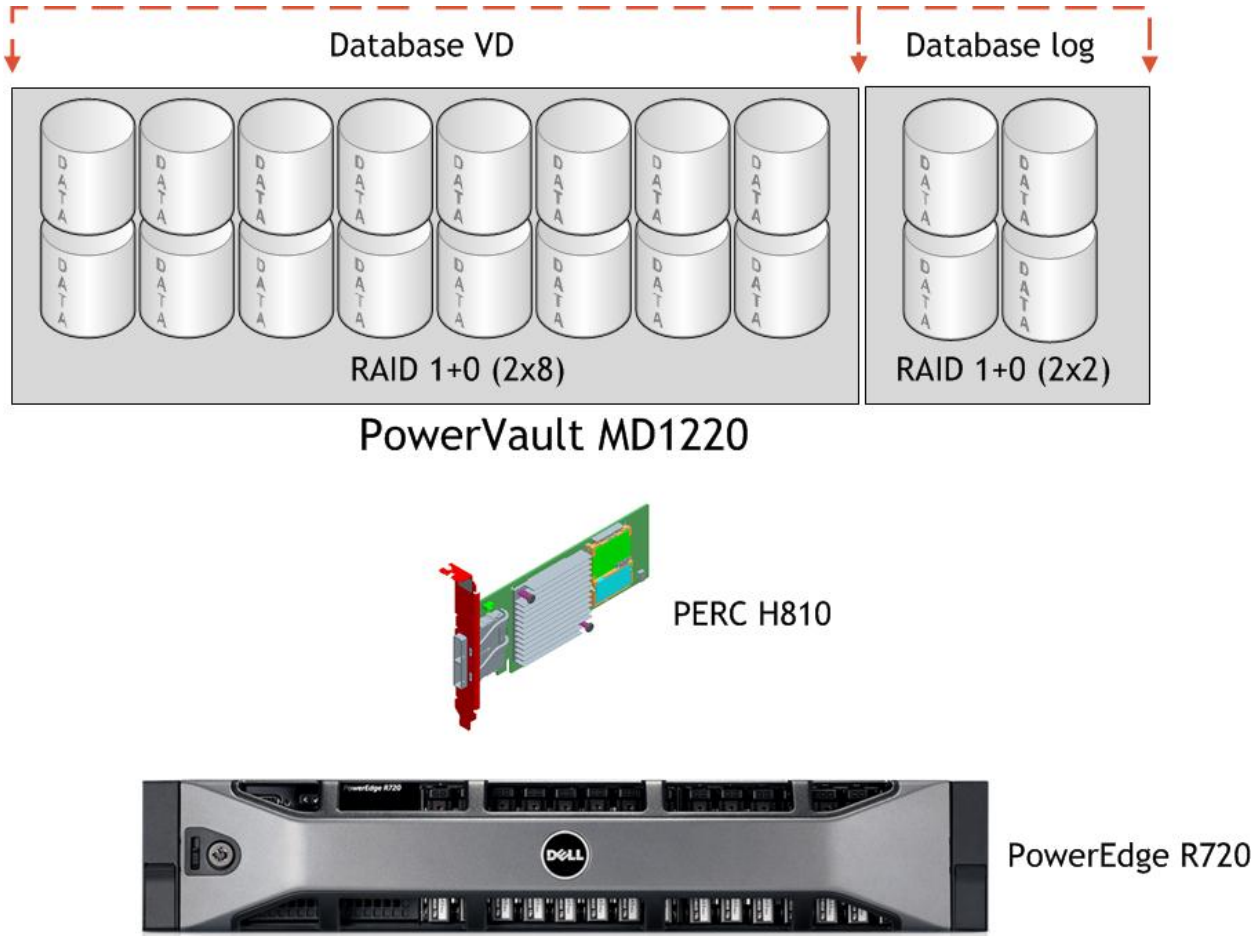
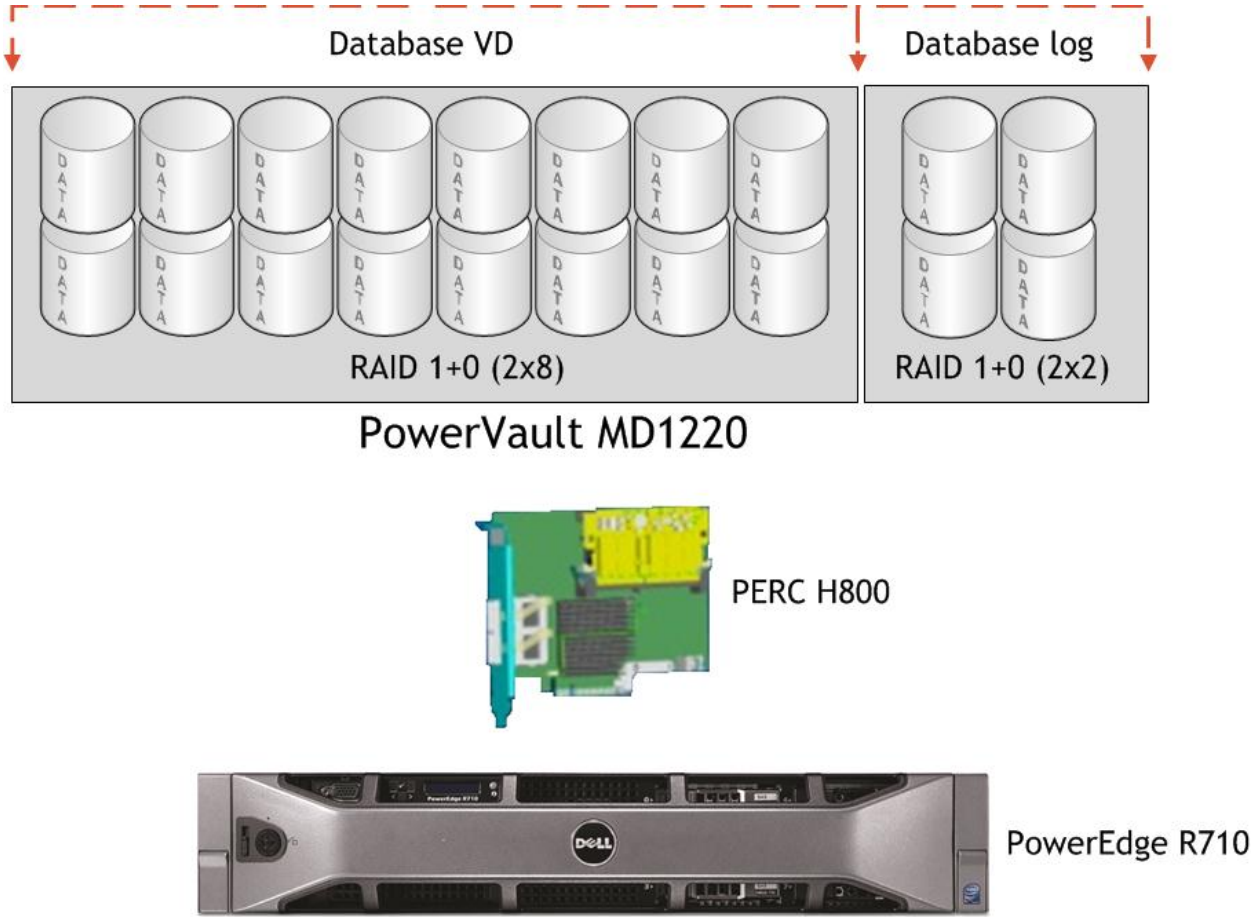


Figure 2. PERC H800 storage configuration



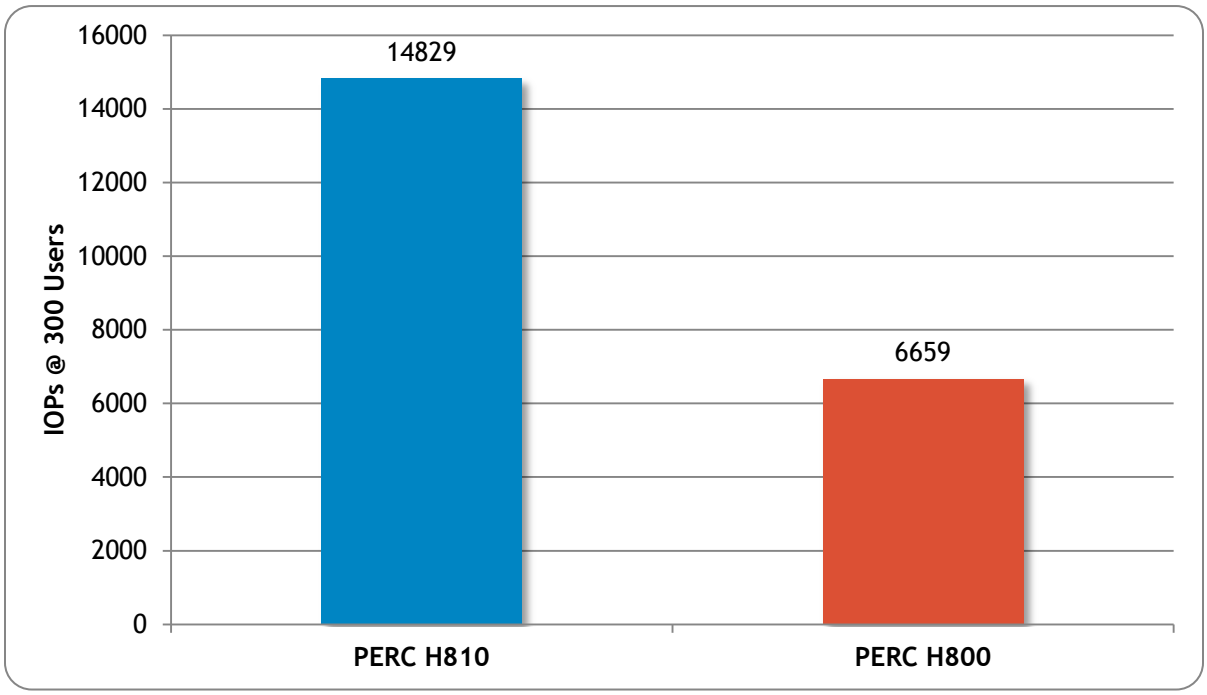
Test results

In order to simulate the I/O access patterns of an OLTP database application, Quest's Benchmark Factory for databases was used to simulate an increasing user load. The benchmark utility measured 3 key metrics: transactions per second, average transactional latency, and random I/O rate of the storage.

Storage performance—I/O per second (IOPS)

With 300 users simultaneously querying the database, the Dell PERC H810 storage solution achieved an average of 14,829 IOPS while the PERC H800 storage solution achieved 6,659 IOPS. This is an improvement of 55% from the PERC H810 over the PERC H800. Figure 3 illustrates these results.

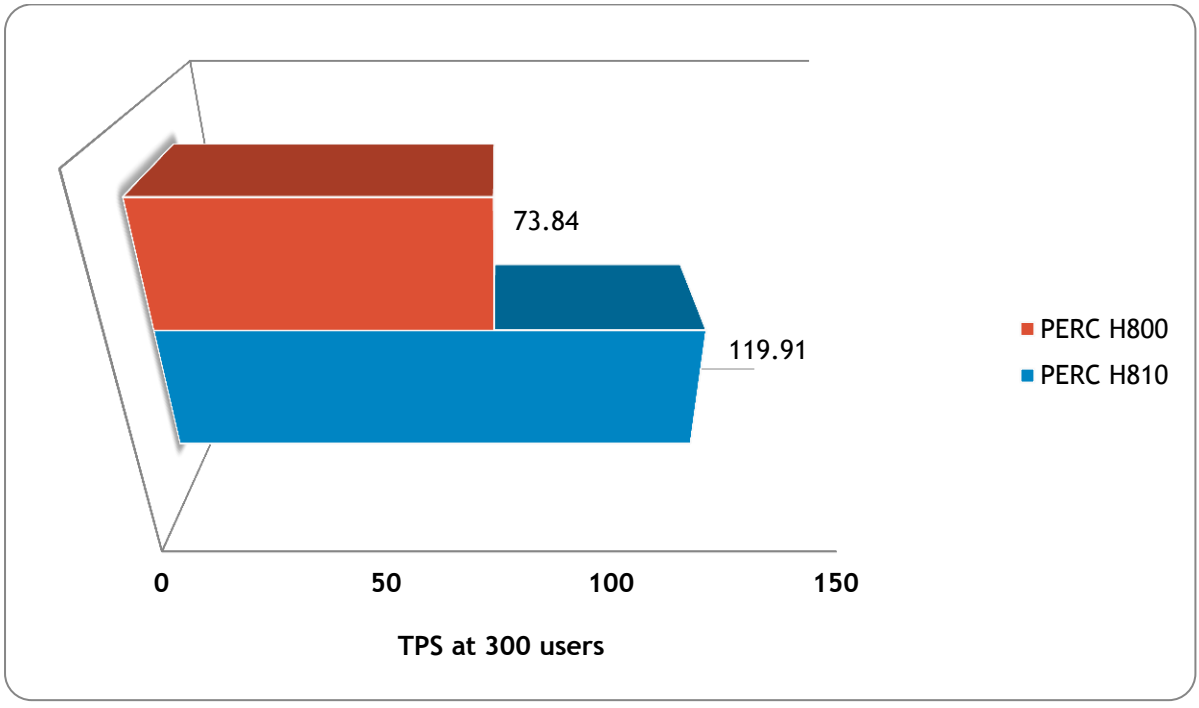
Figure 3. Storage performance—IOPs



Database performance—transactions per second (TPS)

The PERC H800 measured 73 transactions per second, while the PERC H810 processed 119 transactions per second, a 38% improvement. Figure 4 shows the database performance achieved for both storage controllers.

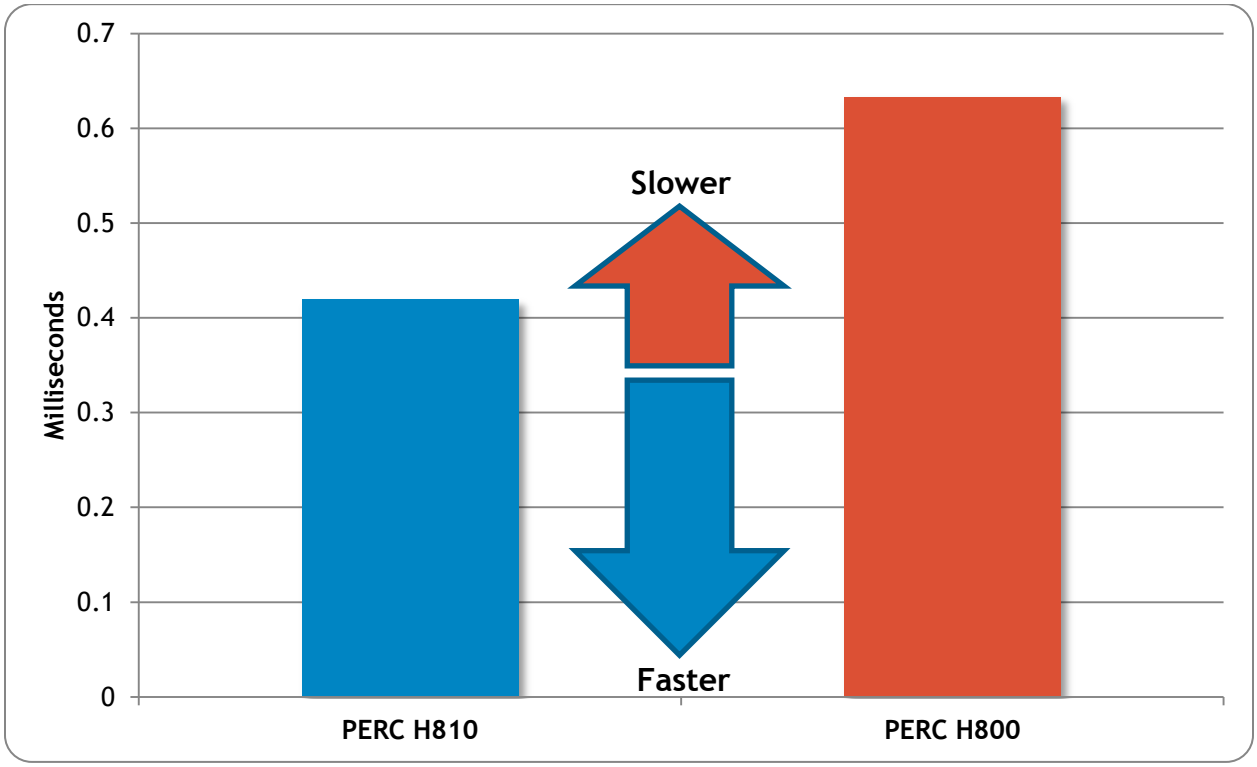
Figure 4. Database performance—TPS



Database performance—average latency

At a 300-user load, the PERC H810 achieved an average response time of .41ms, while the PERC H800 was .63ms. This translates into an overall 33% reduction in database transaction latency. Figure 5 compares the latencies recorded while the benchmark simulated the activity of 300 users.

Figure 5. Database performance—Average response time



Conclusion

Enterprise OLTP database applications are traditionally limited by the storage solution they are built upon. With rotating media, random I/O performance can suffer as user load increases due to seek times associated with accessing data that resides on a random location on disk. Hardware RAID controllers, along with faster rotating media, can improve the performance capabilities of database applications.

The intent of this report was to measure the OLTP database performance improvements of the previous-generation PERC H800 compared to the new PERC H810 with matching generational 15K drives. The PERC H810, redesigned with a dual-core RAID on chip (ROC) PowerPC 800MHz processor, standard 1GB of write cache, and with improved 15k SAS drives, are key features that improve OLTP database performance—generation over generation. Performance measurements clearly show that new PERC H810 adapter provides an improvement that OLTP database applications can enjoy.

Appendix A: Configurations tested

Platform	PowerEdge R710	PowerEdge R720
Operating System	Windows 2008 R2 SP1	
Processor Model	2 x Intel® Xeon® X5677	2 x Intel Xeon E5-2690
Processor Frequency	3467 MHz	2900 MHz
Memory Details	8 x 8GB 2Rx4 LV RDIMMs	8 x 8GB 2Rx4 LV RDIMMs
Memory Frequency	1333 MT/s	1333 MT/s
Internal Storage	2 x 2.5" 146GB 15k RPM SAS (RAID 1) Seagate ST9146852SS Firmware HT64	
Internal RAID Controller	PERC H700 Firmware 12.10.2-0004 Driver Version 4.31.01.64	PERC H710P Firmware 21.0.1-0132 Driver Version 5.01.112.64
External RAID Controller	PERC H800 Firmware 12.10.2-0004 Driver Version 4.31.01.64	PERC H810 Firmware 21.0.1-0132 Driver Version 5.01.112.64
BIOS	6.1.0	1.0.0
iDRAC	1.80.00 (Build 17)	1.00.00 (Build 53)
Lifecycle Controller	1.4.0.445	1.5.0.671
External Storage	**PowerVault MD1220**	
Hard Drives	20 x 2.5" 146 15k RPM SAS Seagate ST9146852SS Firmware HT64	20 x 2.5" 300GB 15k RPM SAS Toshiba MK3001GRRB Firmware DB02