Consolidating Legacy OLTP Application Servers with the Dell 12th Generation PowerEdge R720 Server

Luis Acosta

Solutions Performance Analysis Group

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Executive Summary

With the introduction of the Dell™ 12th generation server product line, customers have an opportunity to lower total cost of ownership (TCO) by consolidating their legacy database application servers. Reasons to consolidate database servers include: system underutilization, hardware/software end of life (EOL), reducing costs associated with power and cooling, or improving overall performance.

Dell strives to reduce the complexity of migrating from legacy database production environments to the latest generation hardware and software while maintaining application performance needs. The purpose of this document is to evaluate and highlight the performance benefits of consolidating legacy online transaction processing (OLTP) database applications running on Dell's 9th generation PowerEdge™ 2950 server onto Dell's 12th generation PowerEdge R720 server.

Introduction

OLTP database applications are characterized by processing a large numbers of concurrent transactions at a given time. For example, today's banking institutions provide online access to their customers where they can access account information, transfer funds, and pay bills. Online banking applications rely on processing thousands of transactions in a time-sensitive manner. The database server hosts where these transactions are processed require sufficient resources in terms of CPU, memory, and fast data access for results to be generated instantly. Legacy servers with lower performing CPUs and slower storage are no longer capable of servicing the increased demands within reasonable response time.

Dell's Solutions Performance Analysis team simulated an OLTP database workload to measure the performance of legacy and current generation PowerEdge server, storage, and software stack. This white paper provides customers with a performance comparison of a Microsoft SQL Server® database solution running on a legacy 9th generation Dell PowerEdge 2950 and Microsoft SQL 2005 to the new 12th generation Dell PowerEdge R720 server and Microsoft SQL 2012 RC1.

Test methodology

Quest's Benchmark Factory for Databases (BMF) is a database build and workload simulation tool that measures database performance. To test the performance, a 200GB database modeled after the industry-standard TPC-C benchmark was built on each of the solutions.

To characterize the legacy environment, we configured a PowerEdge 2950 connected to 2 Dell PowerVault™ MD1120 storage arrays, running Microsoft Windows® 2003 Server R2 x64, and Microsoft SQL Server 2005 Enterprise x64. Using the Quest's Benchmark Factory TPC-C workload profile, we populated the database with a scale factor of 3000. BMF simulates users issuing TPC-C like SQL transactions that exercise each database's storage sub-system with a random read and write I/O data access pattern in user increments of 250. During each database user simulation, BMF collected the total number of I/Os per second (IOPS), Average Query Response Time (AQRT), and CPU utilization. The test was stopped after the average query response time reached 2 seconds.

To characterize the R720 Solution environment, we configured a PowerEdge R720 server connected to 2 Dell PowerVault MD1220 storage arrays, running Microsoft Windows 2008 Server

R2 Enterprise, and Microsoft SQL Server 2012 RC1. Figure 1shows the test configuration topology for each of the tests.

Figure 1. Hardware Configuration

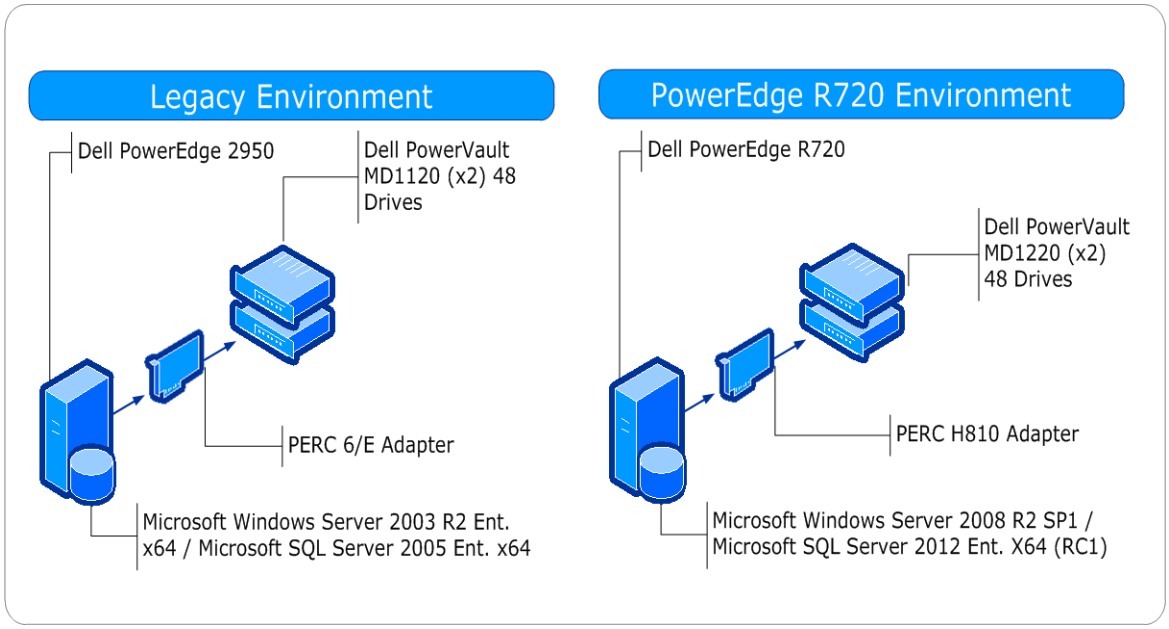
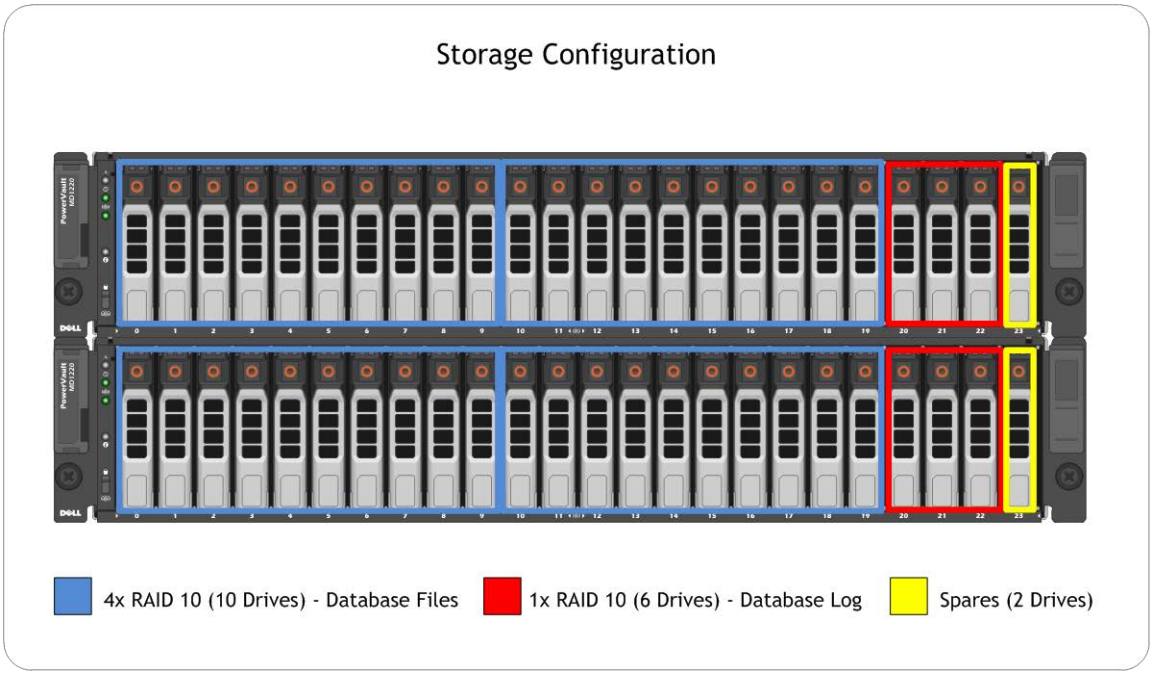


Figure 2 is a physical representation of the RAID configuration layout where the database was built.

Figure 2. RAID Configuration

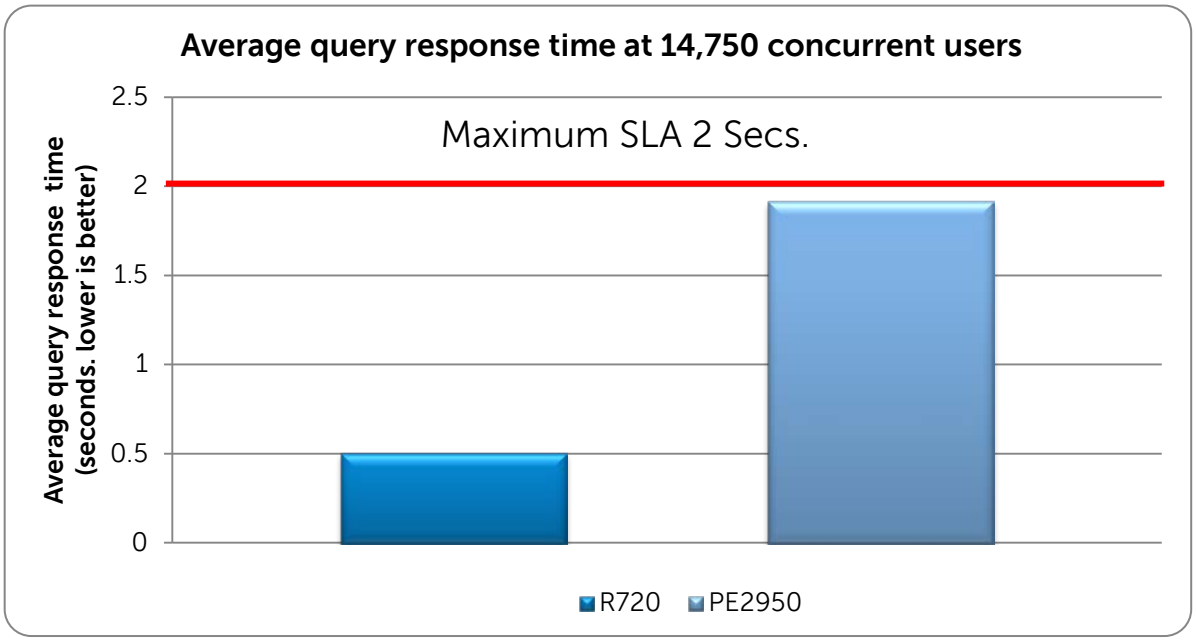


Test Results

Latency

Average Query Response Time (AQRT) is the time it takes for SQL Server to respond to the query. This metric establishes the performance criteria for our Service Level Agreement (SLA) of 2 seconds. At 14,750 concurrent users, the legacy environment met our maximum SLA of 2 seconds AQRT, while the R720 has an AQRT of just 508 milliseconds at the same user load. To put this into perspective, the R720 is able to respond to the same query nearly 4 times faster than the legacy environment. Figure 2 shows the AQRTs recorded during the tests.

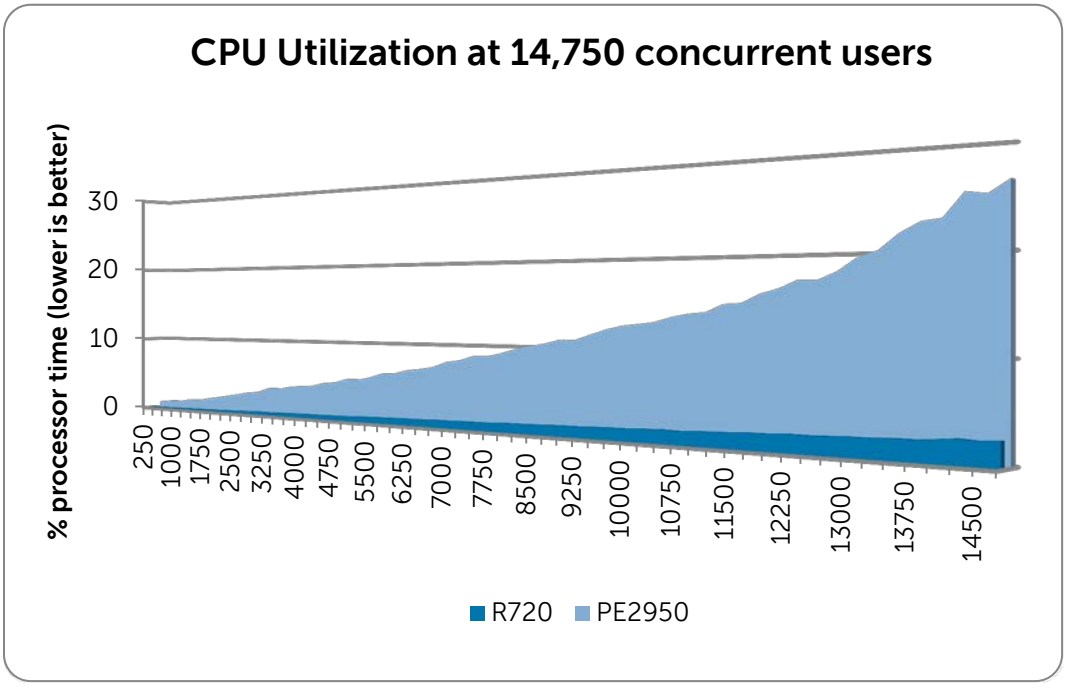
Figure 3. Database Latency



System Performance - CPU Utilization

Figure 4 shows the CPU utilization on both solutions while simulating 14,750 concurrent users. The R720 reached a maximum of 2.6 % CPU Utilization compared to the legacy environment, in which 26.5% CPU was utilized.

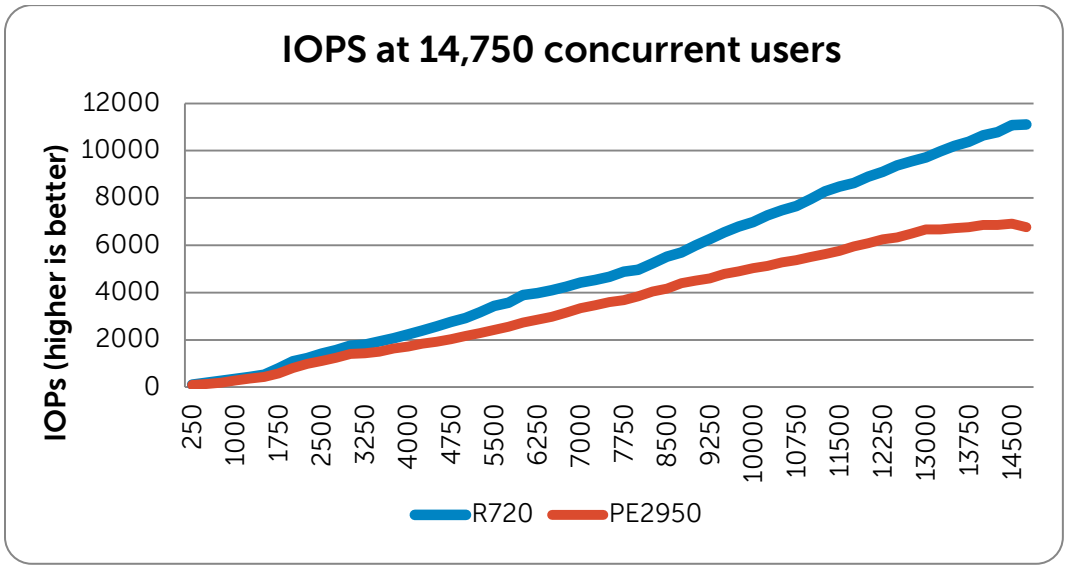
Figure 4. CPU Utilization



Storage Performance - I/Os per second (IOPS)

When measuring a storage system's performance, Input/Output operations per second (IOPS) is the most commonly used metric. The legacy environment achieved an average of 6,760 IOPS while the PowerEdge R720 was able to achieve 11,110 IOPS: a 60% improvement. Figure 5 illustrates these results.

Figure 5. Input/Output Operations Per Second



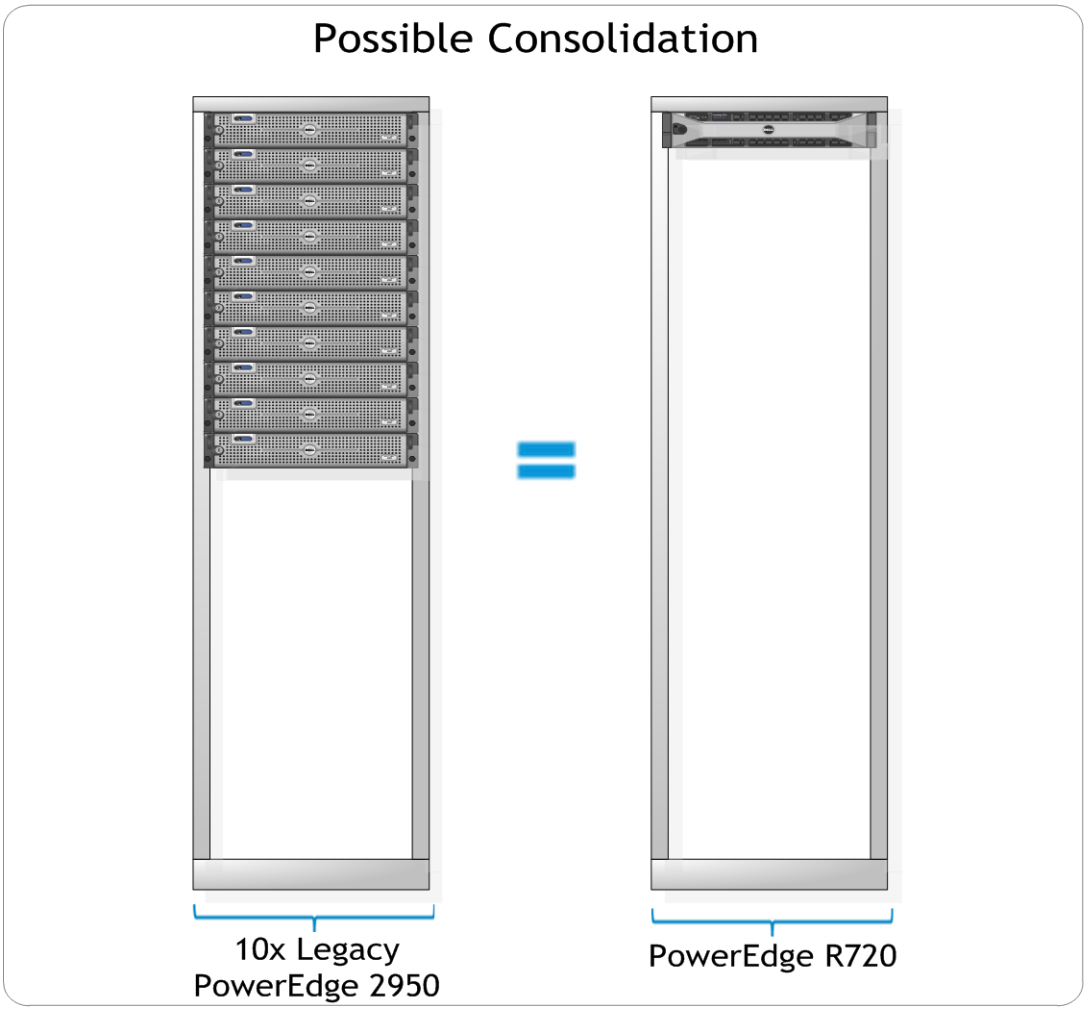
Consolidation Improvement factor

After reviewing the results, we can conclude that a PowerEdge R720 server running Microsoft SQL Server 2012 can process OLTP queries nearly **4x faster** when compared to a legacy server running Microsoft SQL Server 2005 while maintaining an SLA of 2 seconds.

The R720 at 26% utilization is able to handle the OLTP workload of 10 Legacy PowerEdge 2950 Servers, a **10:1 Consolidation at 26% Utilization**.

The R720 paired with two PowerVault MD1220(s) can do **60% more IOPs** than the legacy PowerEdge 2950 / 2x PowerVault MD1120 solution.

Figure 6. Consolidation Scenario



Conclusion

A consolidation project is not a simple task. The customer needs careful planning to predict the performance capacity requirements of the new platform. The focus of this white paper is to encourage organizations to consolidate legacy database environments on Dell's PowerEdge 12G servers. Based on the results, we can conclude that a 12th Generation PowerEdge R720 server populated with two eight-core CPUs would be able to consolidate the workload of a ten-node legacy environment, provided that the system is not constrained by the storage subsystem, network bandwidth, or memory resources. Customers running Microsoft SQL environments on legacy servers and storage can follow the guidelines and procedures outlined here to consolidate or upgrade their existing solution into fewer, faster, and more energy efficient solutions.

Appendix - test configuration

Table 1 describes the software and hardware configuration that was used throughout testing on both the simulated legacy production environment and the 12G test environment.

Table 1. System Configuration

Component	Legacy environment	PowerEdge R720 environment
System	PowerEdge 2950 III	PowerEdge R720
Processor	Two Intel Xeon X5460, 3.16 GHz quad core	Two Intel Xeon E5-2670, 2.70 GHz eight core
Memory	64 GB DDR2 (8 GB DIMMs)	64 GB DDR3 (8 GB DIMMs)
Internal Disks	Two 73 GB 2.5” 15K SAS	Two 300 GB 2.5" 15K SAS
Network	Broadcom BCM5708C NetXtreme II	Broadcom BCM5720 NetXtreme II
External Storage	2x PowerVault MD1120 48 x 73 GB 2.5" 15K SAS	2x PowerVault MD1220 48 x 146 GB 2.5" 15K SAS
RAID Controller	PERC 6/E	PERC H810
OS	Windows 2003 R2 Ent. x64	Windows 2008 R2 SP1
Database System	Microsoft SQL 2005 Ent. x64	Microsoft SQL 2012 Ent. x64 (RC1)
Workload	Quest Benchmark Factory TPCC workload • Scale factor: 3000 • User connections: 250 – 18000	