

Microsoft SQL Server 2014 performance comparison on PowerEdge R730 against legacy server

This technical white paper discusses performance characterization of SQL Server 2014 using Dell PowerEdge R730 vs Dell PowerEdge R710

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September 2014

Revisions

Date	Description
September 2014	Initial release

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Executive Summary

With every leap forward, technology brings in and offers a rich set of features and capabilities to the customers. The improving IT infrastructure helps customers improve business; achieve business results faster with reduced Total Cost of Ownership (TCO), and higher margins. Hence it is necessary to keep datacenters updated with IT infrastructure.

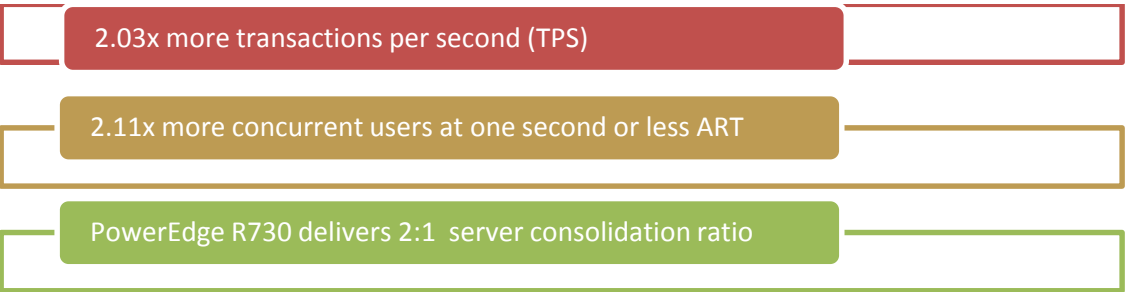
The Dell™ enterprise portfolio is evolving to incorporate better performing, more energy efficient, and more highly available products. With the introduction of Dell's latest 13th generation server product line, customers have an opportunity to improve business by consolidating distributed legacy environments.

Dell strives to simplify IT infrastructure by consolidating legacy production environments to reduce data center complexity while still meeting customers' needs. The tools and procedures described in this white paper can help administrators test, compare, validate, and implement the latest hardware and database solution bundles. Dell established these procedures and guidelines based on lab experiments and database workload simulations performed by the Dell Database Solutions Engineering team. The tools and procedures described in this document help customers to optimally run database workloads

Dell's Solution Engineering team conducted a performance study to showcase the performance gains of the new 13G PowerEdge R730 Server against the N-2 generation, Dell PowerEdge R710 Server.

This white paper demonstrates the performance gains of running Microsoft SQL Server 2014, OLTP database on a PowerEdge R730 Server against the PowerEdge R710 Server.

Table 1. Performance comparison of MS SQL Server 2014 on Dell PowerEdge R730 over R710 Server



1 Introduction

Dell 13th generation servers provide the robustness and reliability for a highly efficient database consolidation platform. Dell PowerEdge R730 is a 2 socket, 2U rack Server which supports up to 768 GB of memory and supports latest Intel® Xeon® processor E5 v3(Haswell-EP) product family.

This white paper studies the performance of running Microsoft SQL Server 2014 OLTP database workload on a Dell PowerEdge R730 server against the N-2 generation Dell PowerEdge R710 Server. At the backend the configuration uses Dell Compellent SC4020 storage to host the database files. It demonstrates that Dell PowerEdge R730 and Dell Compellent storage is capable of delivering the performance and scalability needed to run complex SQL Server workloads.

The key benefits of the performance study include:

- Increased transactions per second (TPS).
- Decreased average response times (ART).
- Scalable options to meet business demand.
- Server consolidation



2 Dell PowerEdge R730 overview

The Dell™ PowerEdge™ R730 is the latest two socket, 2U rack servers that are designed to run complex workloads using highly scalable memory, I/O capacity, and with flexible network options. The system supports the new Intel® Xeon® processor E5- 2600 v3 product family (Haswell-EP), up to 24 DIMMS, PCI Express® (PCIe) 3.0 enabled expansion slots, and a choice of NIC technologies.

2.1 Processors

PowerEdge R730 is powered by Intel® Xeon® E5-2600 V3 (Haswell-EP) product family offering ideal combination of performance, efficiency, and cost. These processors supports high bandwidth QuickPath Interconnects (QPI), which provide more bandwidth for inter process communication. This processor family requires DDR4 memory DIMMs. With two processors, the R730 can support up to 36 execution cores and 72 logical threads (with the Hyper-thread feature enabled).

2.2 Memory

More memory options are available than ever before in Dell PowerEdge R730 along with greater capacities, high frequencies, and more flexibility. At the time of market release, the R730 server supports up to 768GB of memory with 24 32G DIMMs and speeds up to 2133MT/s providing high performance for various applications. The table below provides more information about supported memory type and frequencies.

Feature	Details
DIMM Type	• RDIMM • LRDIMM
Transfer Speed	• 2133 MT/s • 1866 MT/s • 1600 MT/s • 1333 MT/s
Voltage	• 1.2V



3 Dell Compellent SC4020 Storage

Dell Compellent storage is based on the Fluid data architecture, powered by dynamic block architecture , and offers a true enterprise class virtualized storage that offers features beyond traditional storage capabilities. Dell Compellent is designed to be intelligent enough to take automated decisions in optimal data placement, across different class of hard drives.

The new SC4020 arrays combine the benefits of the proven Dell™ Fluid Data™ architecture, with resilient Dell hardware design to provide efficiency, quality and durability. Compared to the larger SC8000 array, the SC4020 offers all of the enterprise-class features of the SC8000, in a compact “all in one” format targeted for smaller and mid-sized deployments.

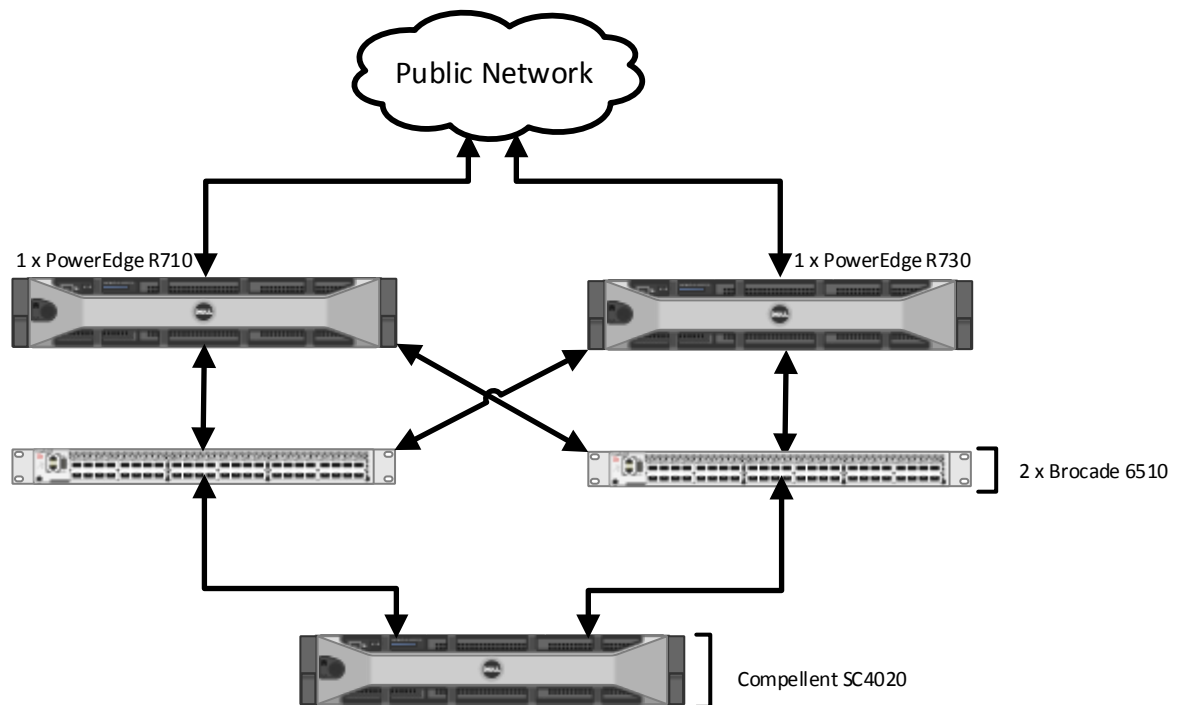


4 Test Configuration

The objective of the test is to compare the Microsoft SQL Server 2014 performance on Dell PowerEdge R730 to the new Dell PowerEdge R710 Server. In order to find the optimum performance numbers, the PowerEdge R710 server was configured to use the maximum supported processor configuration and the maximum supported memory.

As shown in the figure 1, the test setup consist of one Dell PowerEdge R730 and one Dell PowerEdge R710 server connected to brocade 6510 SAN switches using two dual port 8Gbps Qlogic adaptors and Compellent SC4020 at the backend. Testing on both the servers was performed one at a time.

Figure 1: Test configuration of PowerEdge R730 vs PowerEdge R710



The table here describes the technical specification of PowerEdge R730 and R710 servers

Table 1 Test Environment specification

Component	PowerEdge R730	PowerEdge R710
Server	Dell PowerEdge R730	Dell PowerEdge R710
Processors	2xIntel Xeon CPU E5-2697 V3 14 Cores each	2x Intel Xeon CPU X5675 6 Cores each
Processor Frequency	2.60GHz	3.07GHz
Total number of Cores	28	12
Host bus adapters	2 x dual-port QLogic® QLE2562 8Gb Fibre Channel	2 x dual-port QLogic® QLE2562 8Gb Fibre Channel
Memory	16x16G DIMMs Total 256 GB Operating at 2133 MHz	18x8G DIMMs Total 144 GB Operating at 800 MHz
Storage for OS deployment	A RAID1 Volume using two 300G 10,000 RPM drives for Operating System deployment	A RAID1 Volume using two 300G 10,000 RPM drives for Operating System deployment
Storage for SQL Server database files	2x 500 GB Data Files 1x 200 GB Log files 1x 200 GB TempDB	2x 500 GB Data Files 1x 200 GB Log files 1x 200 GB TempDB
Operating System	Windows 2012 R2 Datacenter Edition	Windows 2012 R2 Datacenter Edition
Database	SQL Server 2014 Enterprise Edition Build Version 12.0.2000.8	SQL Server 2014 Enterprise Edition Build Version 12.0.2000.8
Database Size	500 GB	500GB
WorkLoad	OLTP	OLTP
Benchmarking	TPC-C using Dell Quest benchmark factory	TPC-C using Dell Quest benchmark factory



5 Test Methodology

This section describes the test methodology while running for both the configurations.

The objective behind the test exercise is to show how Dell PowerEdge R730 can deliver better performance as compared to Dell PowerEdge R710.

Dell Quest Benchmark Factory¹ for databases was used to simulate a real TPC-C style workload. Several benchmark tests were conducted in the Dell Solutions lab simulating a production online transaction processing (OLTP) database. The steps below provide a detailed understanding of the tests performed during the performance study.

Following is a brief of the steps carried out for the performance verification

- OLTP TPC-C real time workload is simulated using Dell Quest Benchmark tool, with a 5500 scale that results in 500 GB data being populated.
- In the Benchmark factory tool, 1/50th keying value was used to stress the database. Keying Time creates a delay before a transaction executes, simulating activities such as data entry that a user performs before executing the transaction.
- Benchmarking is performed on the SQL Server 2014 , deployed on Dell PowerEdge R710 Server
- The databases were stress tested with incremental concurrent database user load test , till the server hits the threshold mark of ~90% processor utilization.

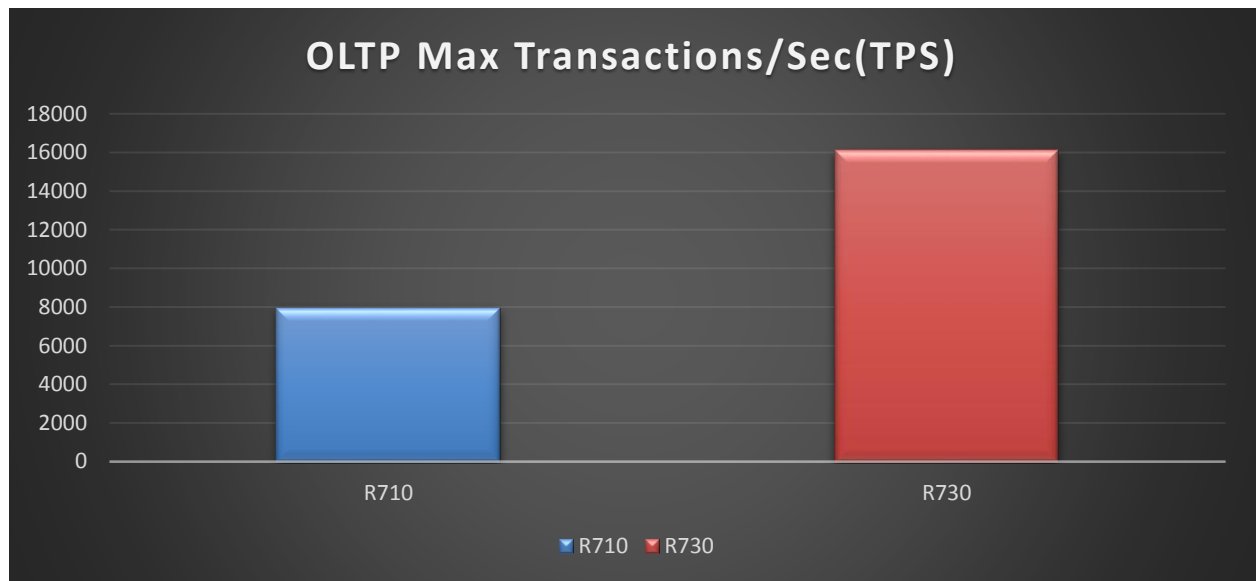
The above steps were repeated on the PowerEdge R730 server. During the tests it was made sure that there are no bottlenecks from the storage and network infrastructure.

6 Performance Results and Analysis

This section presents the performance results and analysis of both R730 and R710 solutions .

6.1 OLTP Transactions Per Second

Figure 2: OLTP Transactions Per Second



As seen in the above figure, the PowerEdge R710 server delivers the maximum TPS of 7927. For the same disk configuration with the latest processors, the new PowerEdge R730 server provides a significant number of 16100 TPS. The PowerEdge R710 configuration cannot be scaled due to the processor limitation, which result in lesser number of TPS.

The PowerEdge R730 provides a maximum TPS of 16100, which is 2.03x more compared to the R710.

6.2 User Load

Figure 3: User Load at One Second SLA

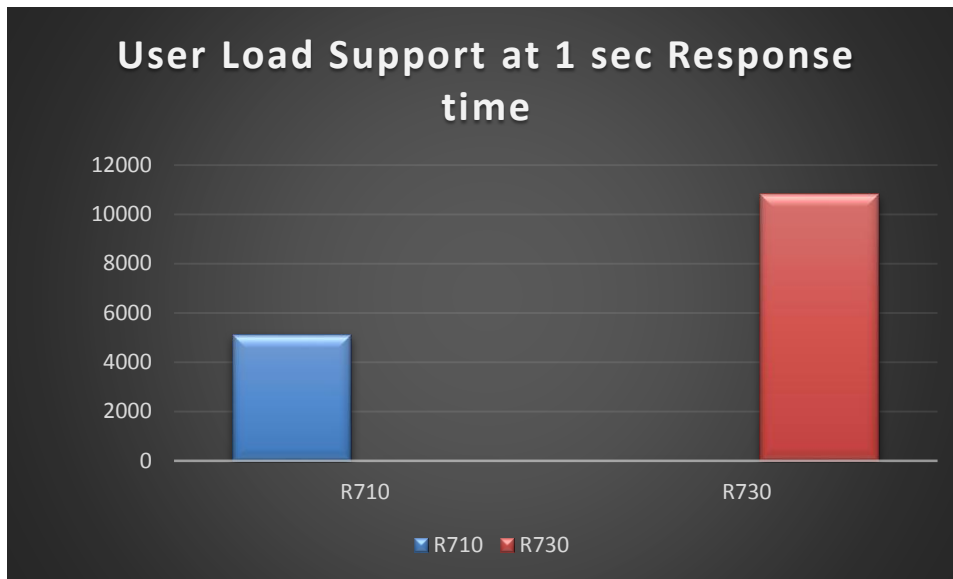


Figure 3 shows a comparison of user load for PowerEdge R730 and PowerEdge R710. The figure displays the maximum user load that the two solutions are able to deliver while keeping the response time at one second SLA. The PowerEdge R710 user load scales up to 5100 users and the PowerEdge R730 system scales up to 10800 users.

PowerEdge R730 delivered 2.11x more user load compared to the PowerEdge R710 configuration at 1 sec SLA.

6.3 Processor Utilization

Figure 4: Processor Utilization

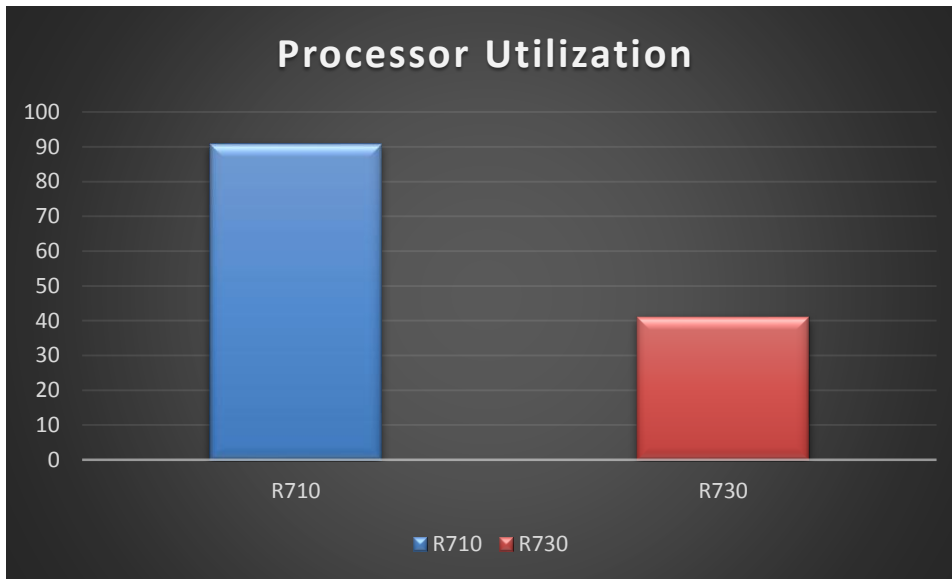


Figure 4 displays the processor utilization comparison for the PowerEdge R730 when compared to the PowerEdge R710 configuration.

As displayed in the above figure the processor utilization for the PowerEdge R710 configuration at the MAX TPS is 90%, for the same user load with the new Dell PowerEdge R730 the observed processor utilization is 41%.

Dell PowerEdge R730 improved the processor utilization by 2.21x when compared to the Dell PowerEdge R710 Server.

Conclusion

The goal of this study is to compare the performance characterization of the newly launched Dell PowerEdge R730 server from the N-2 generation Dell PowerEdge R710 using a Microsoft SQL server 2014 OLTP database workload.

The PowerEdge R730 with the latest processors is the dual-socket platform of choice for maximum performance and scalability, with additional processing cores and a higher capacity for memory support. Based on the performance study analysis the PowerEdge R730, with latest processors provides considerable performance improvements over legacy R710 server.

Key takeaway are:

- Runs 2 times more transactions per second (TPS)
- Runs 2.11 times more concurrent users at one second or less Average Response Time
- Achieve 2:1 server consolidation ratio



A Server Configuration Profile

Dell iDRAC8 with Lifecycle Controller provides the ability to generate a human readable snapshot of server configuration using the configuration XML feature. This single file contains all BIOS, iDRAC, LC, Network, and Storage settings. With some editing, this file can be captured from one server and applied to other servers, even across different server models.

Configuration XML operations are performed via both RACADM and WS-MAN commands and can be directed to or from network shares (NFS / CIFS).

The Microsoft SQL Server 2014 performance comparison on PowerEdge R730 against legacy server *whitepaper* also provides a server configuration profile (xml) to directly import the Dell Engineered configuration into Dell servers.

The configuration profile can be downloaded [here](#)

