
Performance of the Dell PowerEdge R920 server with Intel Xeon E7 v2

This white paper illustrates the performance and power efficiency improvements of Dell™ PowerEdge™ R920 with the Intel® Xeon® processor E7-8800/4800/2800 v2 product families.



Solutions Performance Analysis

Dell | Enterprise Solutions Group



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Contents

Executive summary	4
Introduction.....	4
Key findings.....	4
R920 performance advantage.....	4
Methodology.....	5
Integer performance	6
Java server tests	8
Floating point performance.....	10
HPC performance tests	12
Memory subsystem performance.....	13
Workloads performance.....	14
Summary.....	15
Appendix A – Test configurations.....	16

Figures

Figure 1. Performance improvement running SPECint_rate_base2006	6
Figure 2. Performance improvement running SPECint_base2006	7
Figure 3. Performance improvement running SPECjbb2005	8
Figure 4. Performance improvement running SPECjbb2013.....	9
Figure 5. Performance improvement running SPECfp_rate_base2006	10
Figure 6. Performance improvement running SPECfp_base2006	11
Figure 7. Performance improvement running Linpack	12
Figure 8. Performance improvement running STREAM	13
Figure 9. Performance improvement running SAP-SD	14

Executive summary

Introduction

The Dell PowerEdge R920 server employs the new Intel Xeon processor E7 v2 product family, code-named "Ivy Bridge-EX". This family promises to double the performance, triple the memory capacity, and quadruple the I/O bandwidth of the previous generation Xeon E7-4800 family, code-named "Westmere-EX".

In order to show customers what the R920 brings to the table, Dell's Solutions Performance Analysis team ran a series of server industry-standard benchmarks on this new processor platform and then compared the results to those from the previous 11th generation PowerEdge R910, which used the older Intel Xeon processor E7-4800 product family,

Key findings

R920 performance advantage

The PowerEdge R920 is the most capable rack server Dell has ever produced for managing large databases and transaction-intensive workloads, all with enhanced system uptime, data integrity and hardware-based data protection features that business-critical and high-performance computing environments demand.

The R920 improves upon its immediate R910 predecessor on every compute and memory intensive performance metric tested; the performance advantage of R920 ranges from 76% to an astounding 367%.

Methodology

To highlight the performance improvement of the PowerEdge R920 over that of the R910, each was benchmarked in their highest available CPU/memory configuration. See Appendix A for the configuration details.

Integer performance

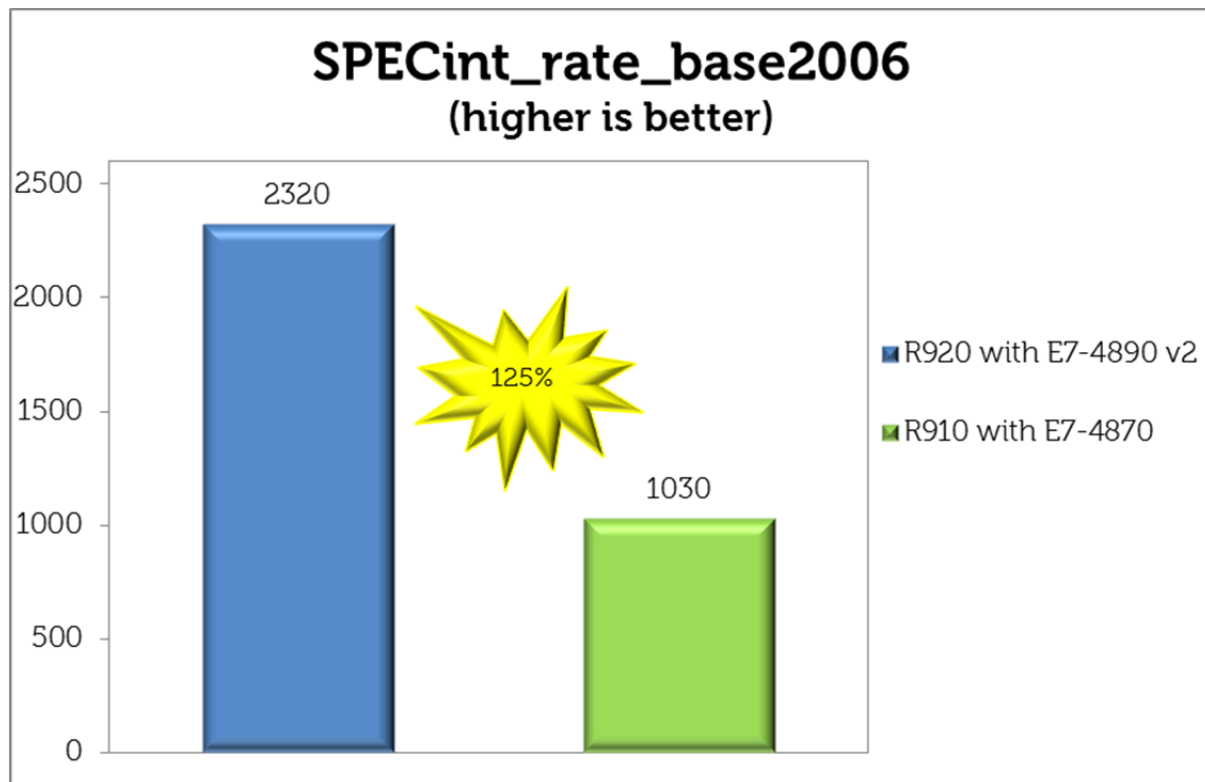
SPEC CPU2006 integer tests

The industry standard SPEC CPU2006 benchmark is [described on SPEC.org](http://www.spec.org) as:

CPU2006 is SPEC's next-generation, industry-standardized, CPU-intensive benchmark suite, stressing a system's processor, memory subsystem and compiler. SPEC designed CPU2006 to provide a comparative measure of compute-intensive performance across the widest practical range of hardware using workloads developed from real user applications.

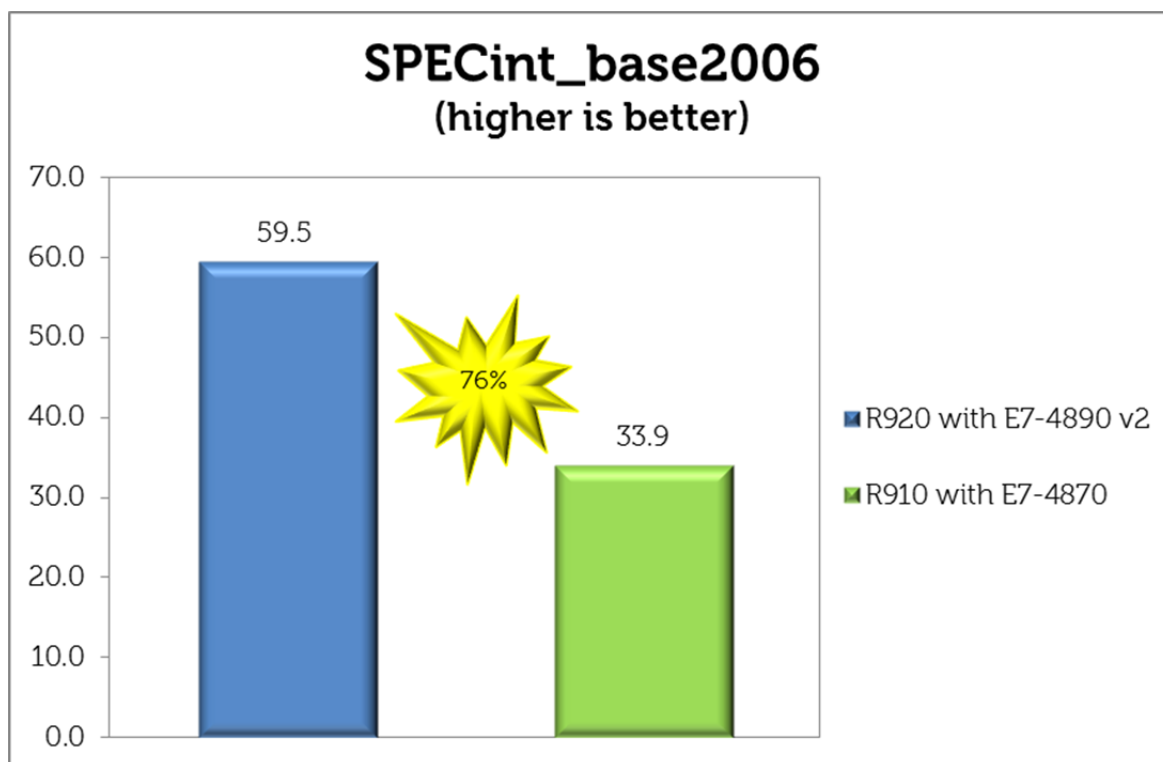
The integer portion of the benchmark is particularly good at measuring a server's ability to run general business applications. In Figure 1, we see the R920 outperforming the R910 on the SPECint_rate benchmark by 125%

Figure 1. Performance improvement running SPECint_rate_base2006



To illustrate the R920 and E7 v2 family's per-CPU core integer performance advantage; the SPECint_base_2006 benchmark runs but a single copy of each constituent worklet. Figure 2 illustrates the improvement over the R910 and its legacy E7 CPU.

Figure 2. Performance improvement running SPECint_base2006



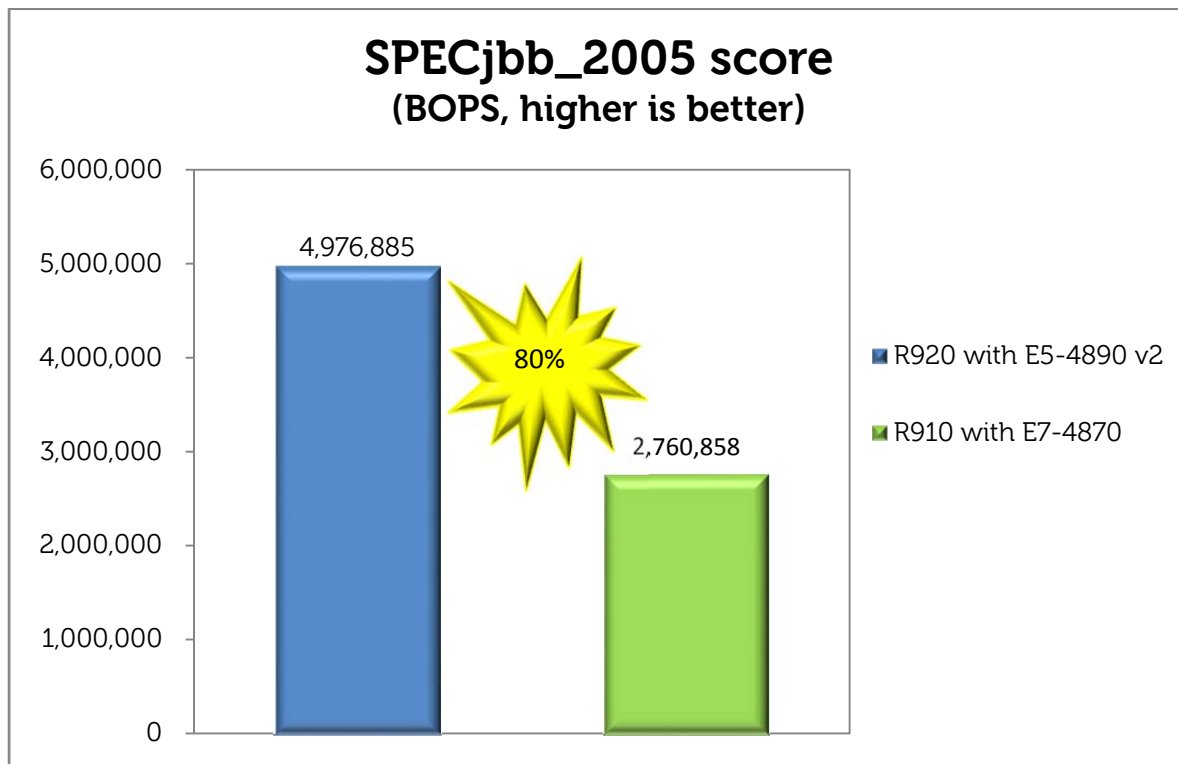
Java server tests

These benchmarks are designed to measure a server's ability to run general business apps. The legacy SPECjbb2005 one is [described on SPEC.org](https://www.spec.org/jbb2005/):

SPECjbb2005 (Java Server Benchmark) is SPEC's benchmark for evaluating the performance of server side Java. ... The benchmark exercises the implementations of the JVM (Java Virtual Machine), JIT (Just-In-Time) compiler, garbage collection, threads and some aspects of the operating system. It also measures the performance of CPUs, caches, memory hierarchy and the scalability of shared memory processors (SMPs).

As Figure 3 shows; the R920 scores 80% higher than the R910 on this metric.

Figure 3. Performance improvement running SPECjbb2005

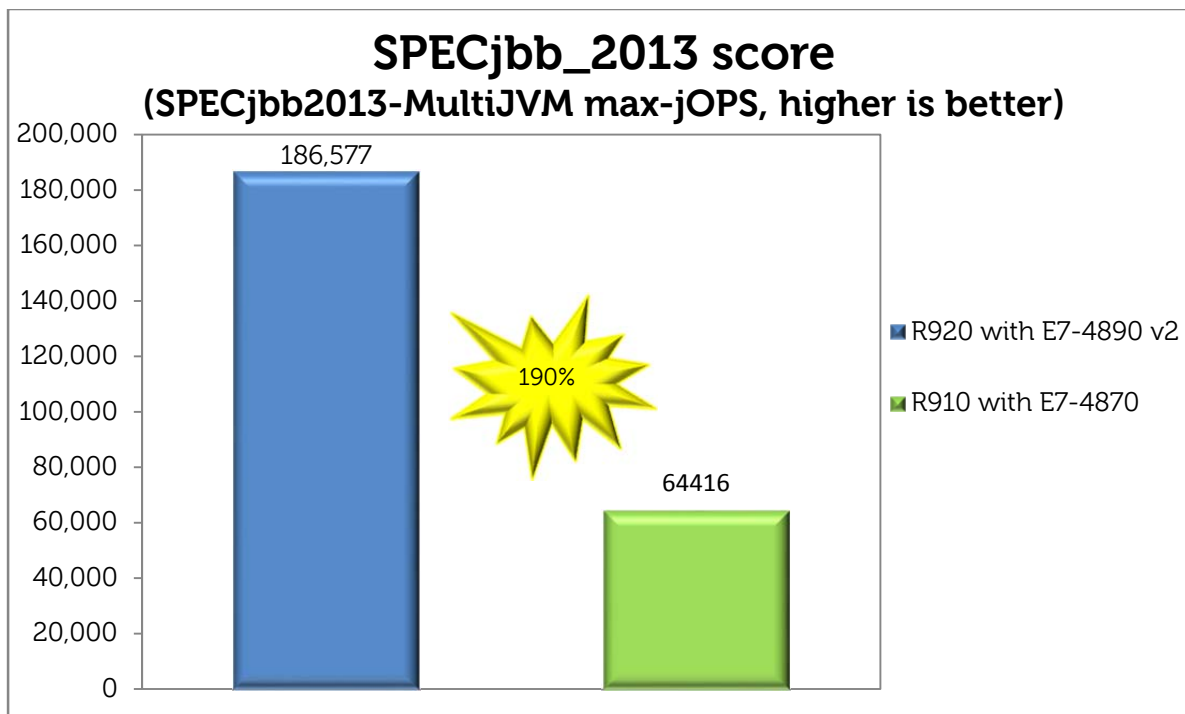


SPECjbb2005 was retired on October 1, 2013, for the newer SPECjbb2013 benchmark, which is [described as follows](#):

A usage model based on a worldwide supermarket company with an IT infrastructure that handles a mix of point-of-sale requests, online purchases and data-mining operations.

As Figure 4 shows, the performance improvement with SPECjbb2013 is 190%.

Figure 4. Performance improvement running SPECjbb2013

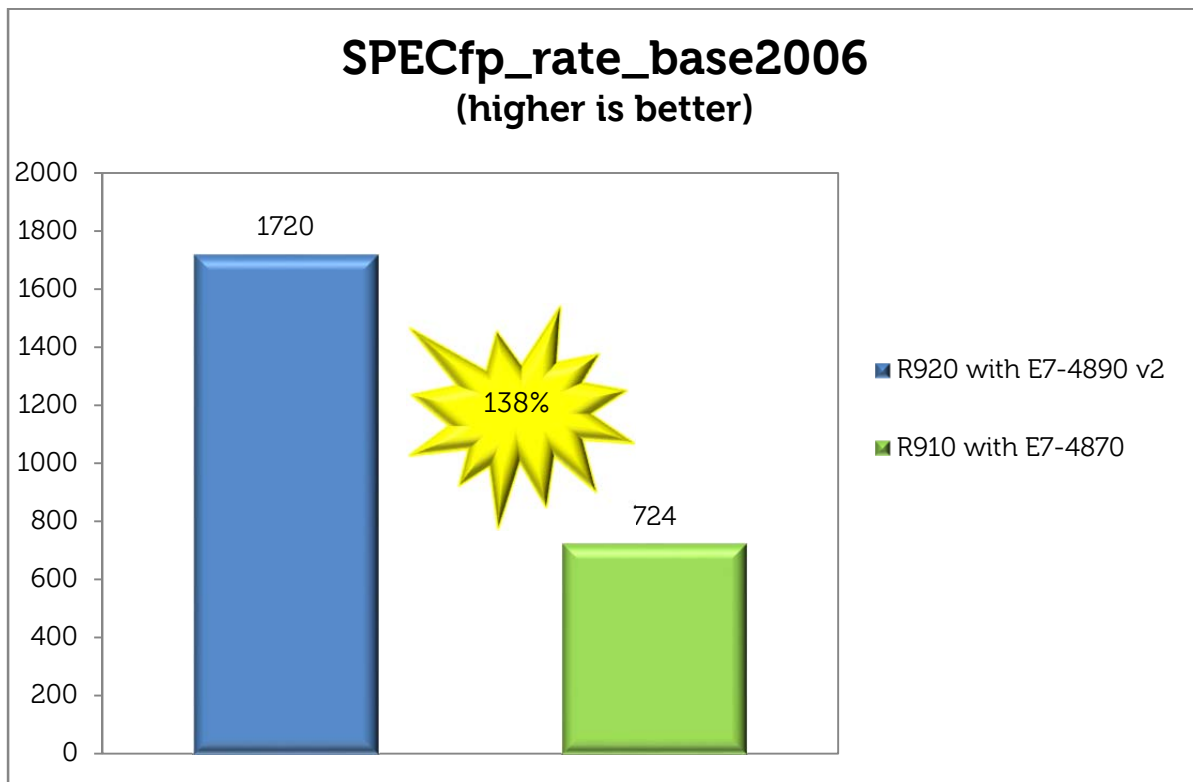


Floating point performance

SPEC CPU2006 floating point tests

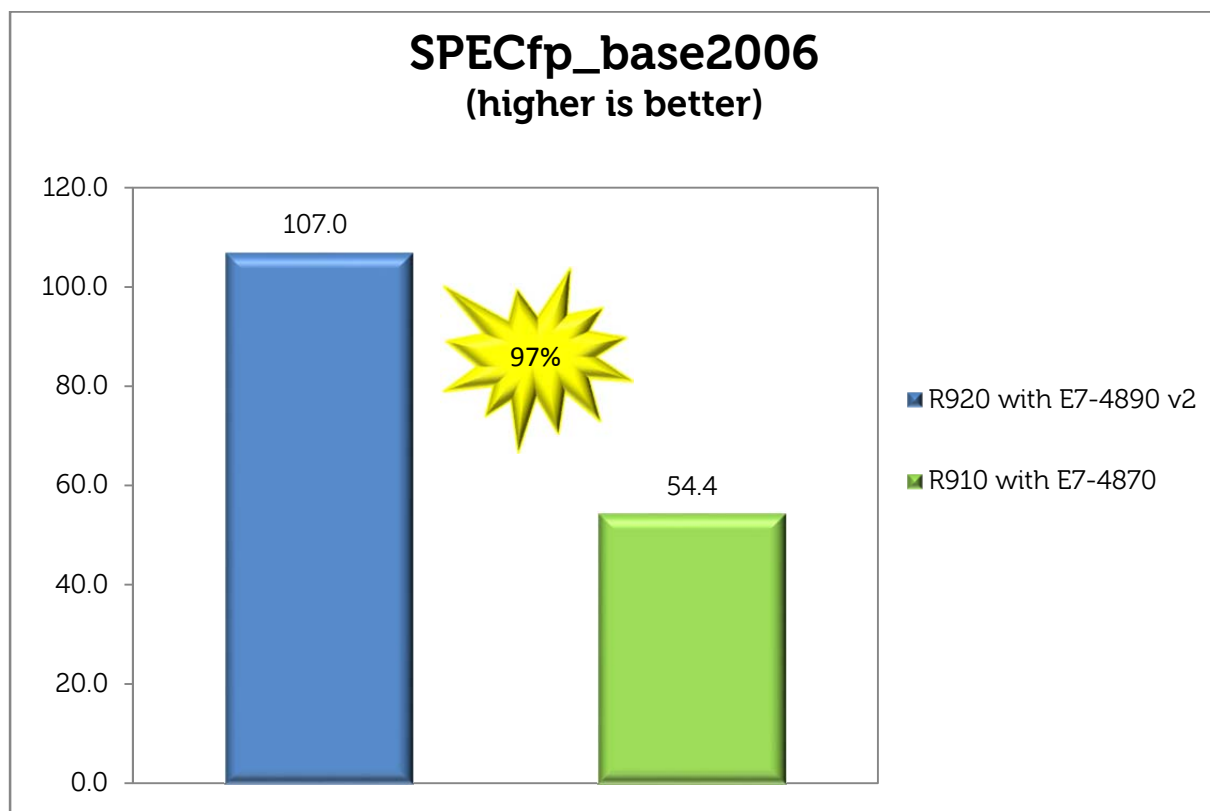
Floating point performance is important to those running science, simulations and HPC workloads. SPEC CPU2006 contains a suite of floating point tests which when in "rate" (multithreaded) mode. The R920 shows a 138% performance improvement over the R910 as seen in Figure 5.

Figure 5. Performance improvement running SPECfp_rate_base2006



SPECfp_base2006 runs a single copy of each floating point math workload to highlight the E7 v2 processor family architecture improvements on a core for core level. In Figure 6 we see the R920's 97% performance uplift over the R910.

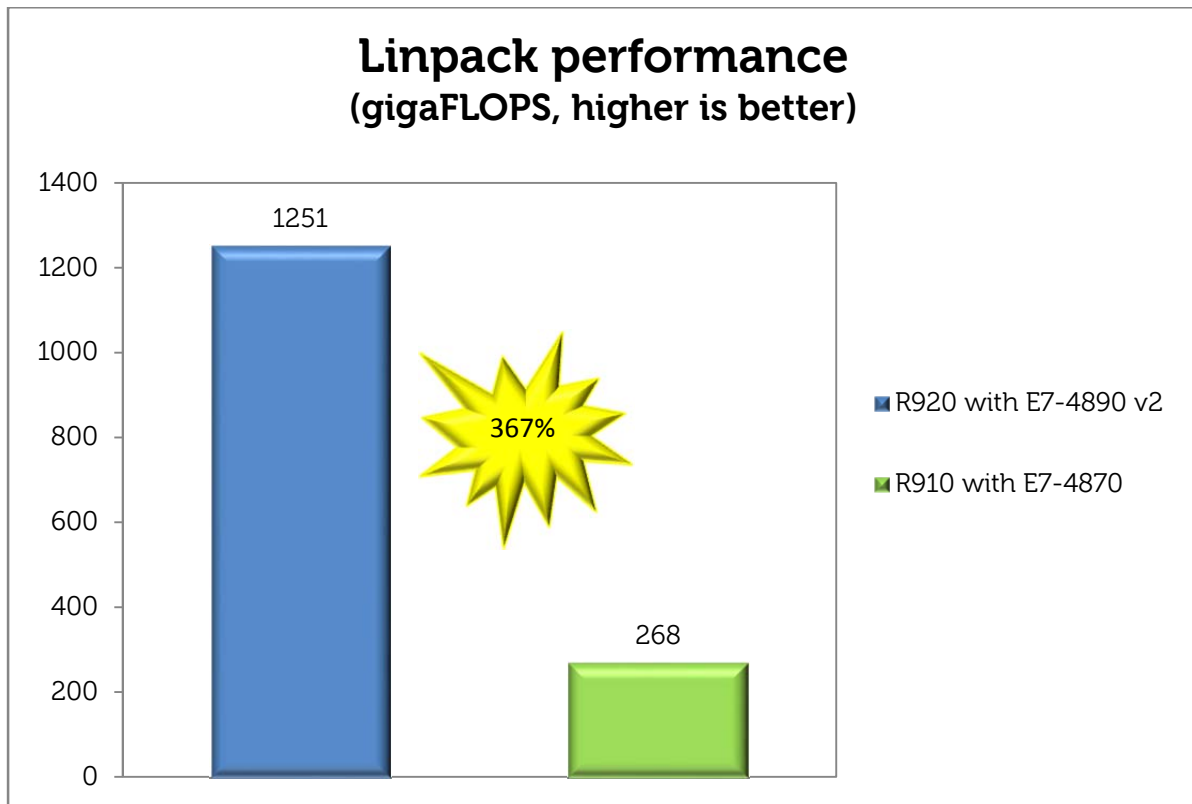
Figure 6. Performance improvement running SPECfp_base2006



HPC performance tests

The [Linpack benchmark](#) is an industry standard for measuring a system's floating point processing power by solving simultaneous linear equations. R920 and E7 v2 processors with AVX support shows an astounding 367% performance improvement over the R910 as seen in Figure 7.

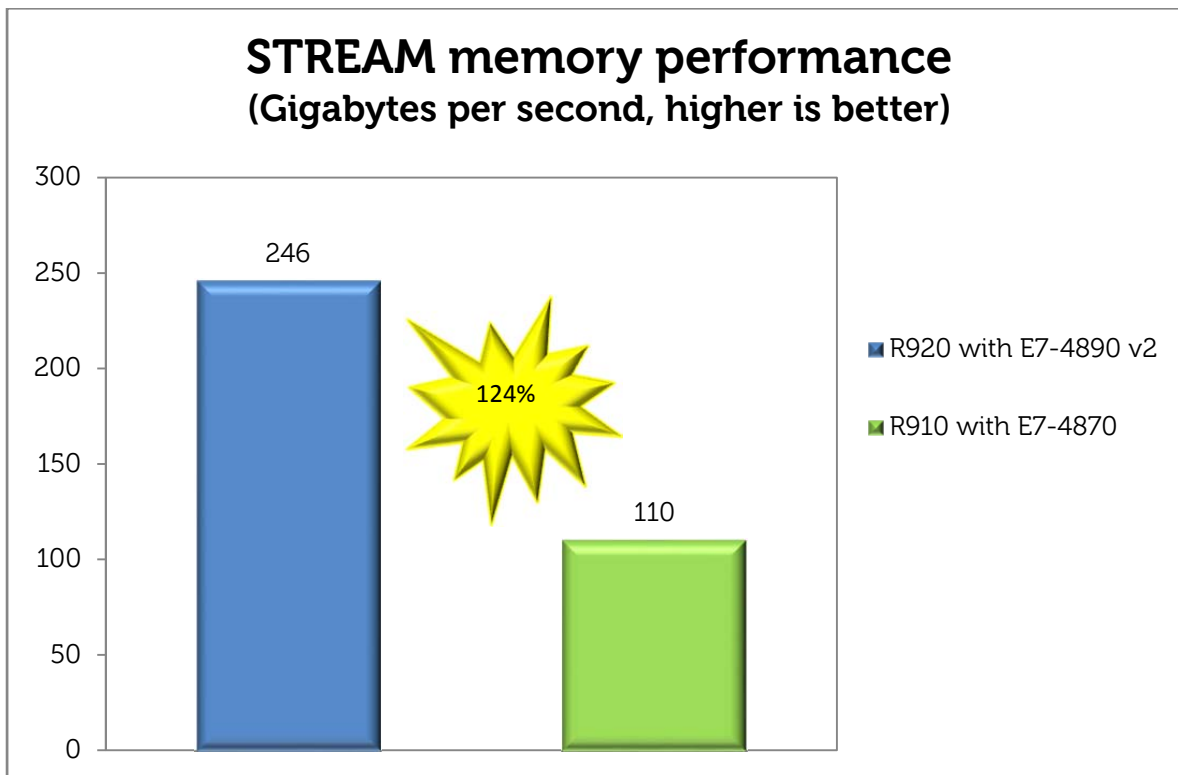
Figure 7. Performance improvement running Linpack



Memory subsystem performance

Many workloads benefit from greater memory bandwidth. The [STREAM benchmark](#) is the high performance computer industry standard for measuring the sustainable memory bandwidth. In Figure 9, the R920 shows a 124% improvement over the R910.

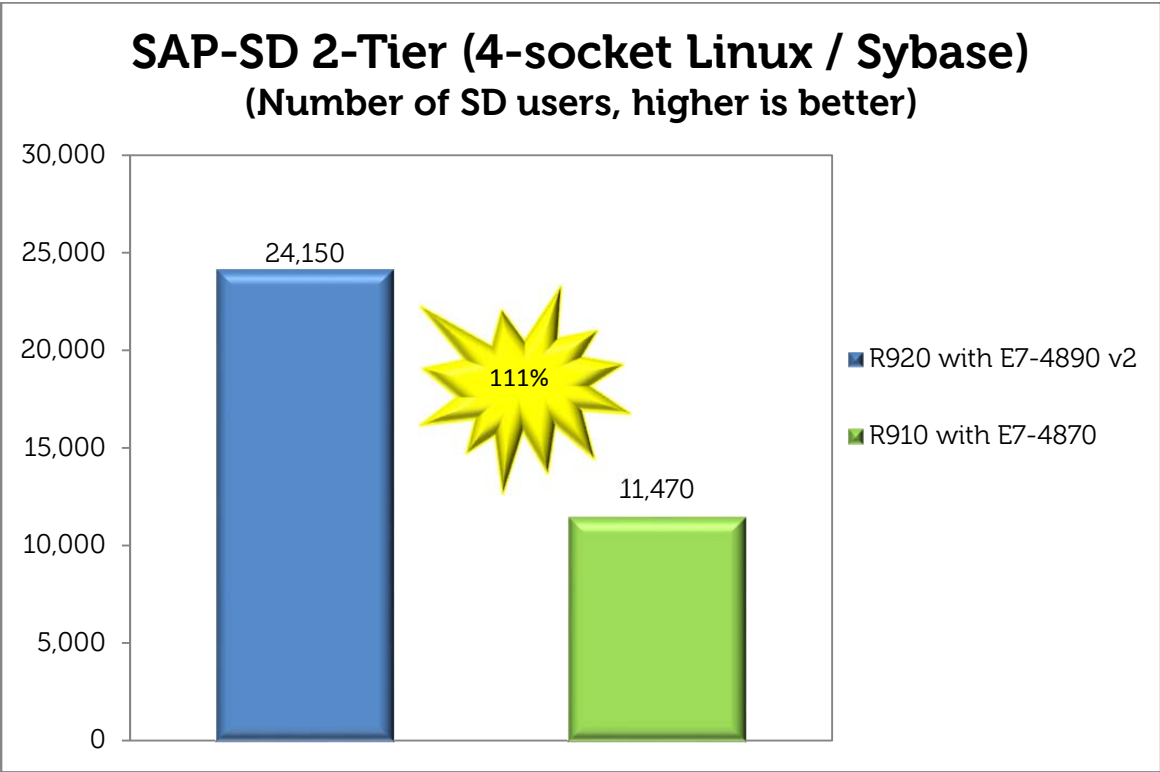
Figure 8. Performance improvement running STREAM



Workloads performance

The SAP SD two-tier workload has been developed by SAP and its partners to determine both hardware and database performance of SAP applications and components. The benchmark itself is a simulation of the SAP Sales & Distribution scenario. This simulation is carried out by multiple clients (companies) with users making orders concurrently for a sustained period of time with a predetermined set number of users. The ability to sustain a maximum number of users working concurrently while delivering sub-second average response times from the server is the metric quoted by the benchmark. In this case, we are specifically looking at the user count as a measurement of throughput. Figure 9 shows the R920's vast improvement over the R910 on this benchmark.

Figure 9. Performance improvement running SAP-SD



The R920's score of 24,150 benchmark users is a world record score for this benchmark on the Linux operating system.

Summary

The results of this white paper highlight the massive increase in performance available with the PowerEdge R920 compared to its predecessor. At Intel's [Xeon E7 v2 CPU family launch](#), the R920 captured four key world record benchmark results amongst the major enterprise server vendors.

Integer compute performance is up 125% over the previous generation, and floating-point compute in Linpack is up by an eye-popping 376%. The system level SAP-SD 2-tier benchmark saw an impressive 111% improvement. With its capacity for 60 processor cores and 6TB of memory, the PowerEdge R920's computation throughput and scalability potential make it a compelling choice for real-time, mission-critical workloads and legacy server upgrades and consolidation.

The R920 is available for purchase now.

Appendix A — Test configurations

Table 1. Benchmark summary

Benchmark	R920 E7 v2 CPU model	R920 score	R910 E7 v1 CPU model	R910 score	R920 advantage
SPECint_rate_base2006	E7-4890 v2	2320	E7-4870	1030	125%
SPECint_base2006	E7-8891 v2	59.5	E7-4870	33.9	76%
SPECfp_rate_base2006	E7-4890 v2	1720	E7-4870	724	138%
SPECfp_base2006	E7-8891 v2	107.0	E7-4870	54.4	97%
STREAM (GB/s)	E7-4890 v2	246	E7-4870	110	124%
Linpack (GFlops)	E7-4890 v2	1251	X7560	268	367%
SPECjbb2005 (BOPS)	E7-4890 v2	4,976,885	E7-4870	2,760,858	80%
SPECjbb2013 (max-jOPS)	E7-4890 v2	186,577	E7-4870	64,416	190%
SAP (#SD users)	E7-4890 v2	24,150	E7-4870	11,470	111%