Dell™ PowerEdge™ R810 server can deliver up to 74% lower TCO than the Sun™ SPARC™ Enterprise T5240 server*

PowerEdge R810 server
Dual intel® Xeon® Processor
X7560, 2.27 GHz
Red Hat® Enterprise Linux® 5.4

*Assumes a 42u rack filled with 21 Dell PowerEdge R810 rack servers, which are each 2u tall operated over 3 years, compared with a performance-equivalent configuration of 46 Sun SPARC Enterprise T5240 servers.

versus

Sun SPARC Enterprise T5240
Dual Sun UltraSPARC T2 Plus, 1.60 GHz

OUR FINDINGS

The latest, most powerful Dell PowerEdge servers provide better performance and lower total cost of ownership (TCO) than Sun SPARC Enterprise servers. In Principled Technologies' tests in our labs, the Dell PowerEdge R810 server delivered higher performance results than the publicly available benchmark scores of the Sun SPARC Enterprise T5240 servers. This better performance of the Dell servers, along with much lower hardware costs and lower annual costs, leads to a significant TCO advantage for the Dell solution.

OUR PROCESS

We used the industry-standard SPECjbb2005 benchmark to measure the performance and power usage of the Dell PowerEdge R810 server. We compared those results to publicly available SPECjbb2005 results and power measurements for the Sun server to identify performance-equivalent configurations of the two servers and estimate their energy costs. We calculated the 3-year TCO of those configurations using energy cost estimates, server prices from Dell and the Oracle Web site, and our own estimates of costs for migration, facilities, software, and server management.

PROJECT OVERVIEW

We estimated costs for a hypothetical enterprise migrating from end-of-life Sun SPARC servers running Oracle on Solaris. The enterprise wants a solution that meets performance goals and provides the lowest 3-year TCO and is considering either the latest, most powerful Dell PowerEdge servers or Sun SPARC Enterprise servers as the replacement. Expected benefits of this server replacement project also include savings in data center space and power consumption. The migration will involve acquiring hardware, upgrading to the Oracle 11G version, and, in the case of the Dell solution, changing both hardware architecture and operating systems.

For this analysis, we compared two dual-processor servers: the Dell PowerEdge R810 and the Sun SPARC Enterprise T5240. Our companion TCO report[1] compares two four-processor servers. This analysis considers performance, acquisition costs (including migration costs), and ongoing costs of the two solutions.

Figure 1 shows our estimate of 3-year TCO for performance-equivalent configurations of the two solutions, 21 Dell PowerEdge R810 servers[2] versus 46 Sun SPARC Enterprise T5240 servers.
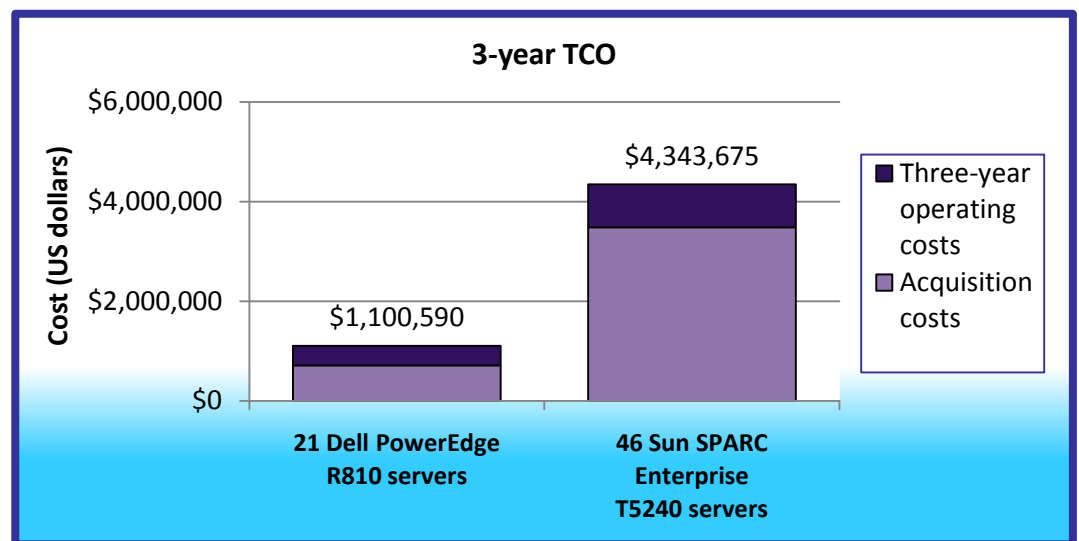

Figure 1: 3-year TCO for performance-equivalent configurations. Lower numbers are better.

We used the industry-standard SPECjbb2005 benchmark to identify performance-equivalent configurations of the two servers. We ran the benchmark to measure the performance of the Dell PowerEdge R810 server. We compared those results to publicly available SPECjbb2005 results for the Sun server. We divided the performance goal of the hypothetical enterprise by those results to determine the number of servers required to meet that goal.

The Standard Performance Evaluation Corp. (SPEC) created SPECjbb2005 to measure a server's Java performance. (Note: SPEC and SPECjbb2005 are trademarks of the Standard Performance Evaluation

---

[1] TCO comparison: Four-processor Dell and Sun servers http://www.principledtechnologies.com/clients/reports/Dell/R910_TCO.pdf
[2] We assume a 42u rack filled with 21 rack servers, which are each 2u tall.

Corporation.)[3] The benchmark's results portray the server's throughput in business operations per second or SPECjbb2005 bops. A higher number of SPECjbb2005 bops is better. Due to Sun licensing restrictions, we did not actually test SPECjbb2005 on the Sun SPARC Enterprise T5240. Instead, we used the highest posted result for the Sun system on SPEC's site (http://www.spec.org/osg/jbb2005/results/res2009q3/jbb2005-20090720-00753.html).

The Dell PowerEdge R810 Server achieved a score of 943,614 SPECjbb2005 bops, a 123.2 percent increase over the Sun SPARC Enterprise T5240 Server, which achieved a score of 422,782.[4]

Our hypothetical enterprise has as its goal a configuration that can attain a result of 19.3 million bops on the SPECjbb2005 test.[5] We divided that performance goal by the SPECjbb2005 results of the Dell PowerEdge R810 and Sun SPARC Enterprise T5240 servers, rounding up to the nearest whole server, to determine the number of servers of each type required
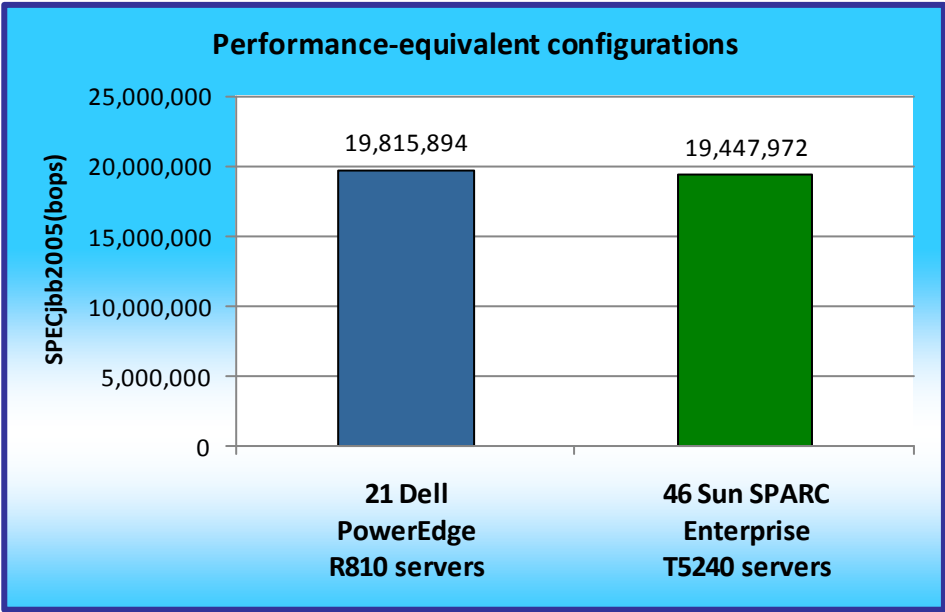

Figure 2: Performance-equivalent configurations based on SPECjbb2005 results. Higher SPECjbb2005 bops results are better.

to meet the goal. As Figure 2 shows, a single rack of 21 Dell PowerEdge R810 servers can provide the equivalent performance of 46 Sun SPARC Enterprise T5240 servers. Figure 3 shows the system configuration overview for the Dell PowerEdge R810 and Sun SPARC Enterprise T5240 servers for which we quote benchmark scores. See the benchmark results report we previously cited for additional information on the Dell server configuration. The Sun SPARC server configuration matches the system description Sun Microsystems,

---

[3] For more information on the benchmark, see the SPEC Web site at http://www.spec.org and the SPECjbb2005 users' guide at http://www.spec.org/jbb2005/docs/UserGuide.html.
[4] At the time of writing this report, the Sun SPARC Enterprise server results were available on the SPEC Web site at the following location: http://www.spec.org/osg/jbb2005/results/res2009q3/jbb2005-20090810-00764.html. This link shows results for the Sun Microsystems, Inc. Sun SPARC Enterprise T5240: SPECjbb2005 bops = 422782, submitted in August, 2009, by Sun Microsystems, Inc.
[5] The performance goal would be based on the performance needed to replace the retiring servers. The bops goal we selected should be representative of a goal for a mid-sized enterprise. The ratio of servers—1 Dell PowerEdge R810 server vs. 2:23 Sun SPARC Enterprise T5240 servers—would be the same for any SPECjbb2005 bops performance goal we could have chosen.

Inc. included in the benchmark results for the SPECjbb2005 Sun SPARC benchmark score.[6]

Servers	Dell PowerEdge R810	Sun SPARC Enterprise T5240
Processors	2x Intel Xeon Processor X7560, 2.27 GHz	2x Sun UltraSPARC T2 Plus, 1.60 GHz
Memory	32 x 4GB PC3-8500 DDR3	16 x 4GB PC2-6400 DDR2
Hard disks	2 x 146GB, 15,000 RPM	1 x 146GB, SCSI
Operating system	Red Hat® Enterprise Linux® 5.4 (2.6.18-164.9.1.el5)	OpenSolaris 2009.06
Height in rack units (u)	2	2

Figure 3: System configuration overview for the two servers for the SPECjbb2005 benchmark results.

We use these configurations as the basis of the costs we included in the TCO calculations with one exception: we included the Solaris 10 operating system version for the Sun SPARC server, rather than the open-source OpenSolaris version we used in the benchmark tests. OpenSolaris, the open-source version of Solaris, targeted developers more than production environments. Deployment costs for the two products are the same, with OpenSolaris offering enterprise-grade support for the same price as Solaris 10 support. For these reasons, we used Solaris 10 as the operating system version for this analysis.

After we defined the solution configurations, we gathered price data and energy consumption data for the two servers.

Dell provided hardware and hardware support costs for the Dell PowerEdge R810 server, and we priced the Sun SPARC Enterprise T5240 server on the Oracle Web site. Figure 4 shows those costs. We include the cost of the server

Server hardware and operating system costs including 3-year support costs

$68,989

$25,565

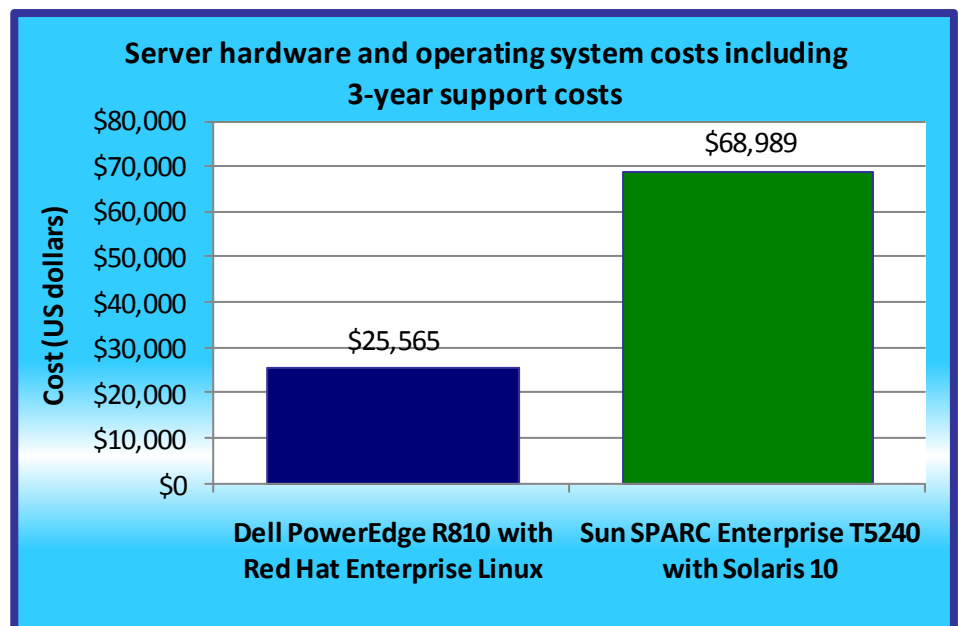Dell PowerEdge R810 with Red Hat Enterprise Linux

Sun SPARC Enterprise T5240 with Solaris 10

Figure 4: Hardware, operating system, and 3-year hardware and operating system support costs for one server of each model.

hardware, on-site hardware installation, the operating system, and 3-year support for hardware and operating

[6] http://www.spec.org/osg/jbb2005/results/res2009q3/jbb2005-20090810-00764.html

system. Price for the Sun SPARC Enterprise T5240 includes the server, Solaris 10 operating system, and Warranty Upgrade to 3-Year Gold Support + 7X24 On-Site Support. Price for the Dell PowerEdge R810 includes the server, 3 -year ProSupport for IT 4HR 7x24 Onsite: Non-Mission Critical, and 3-year costs for a standard subscription for Red Hat Enterprise Linux Advanced Platform.

We used energy measurements during SPECJbb2005 benchmark runs as the basis for energy cost calculations we used in the TCO analysis. We measured power to the Dell PowerEdge R810 server during the SPECjbb2005 benchmark runs. We used the Sun SPARC Enterprise T5240 Server - Power Calculator[7] on the

Oracle Web site as the source for the energy consumption estimates for the Sun SPARC Enterprise T5240 server. That calculator estimates energy usage based on SPECjbb2005 workloads. We selected the 100 percent workload and idle workload measurements for a server we configured
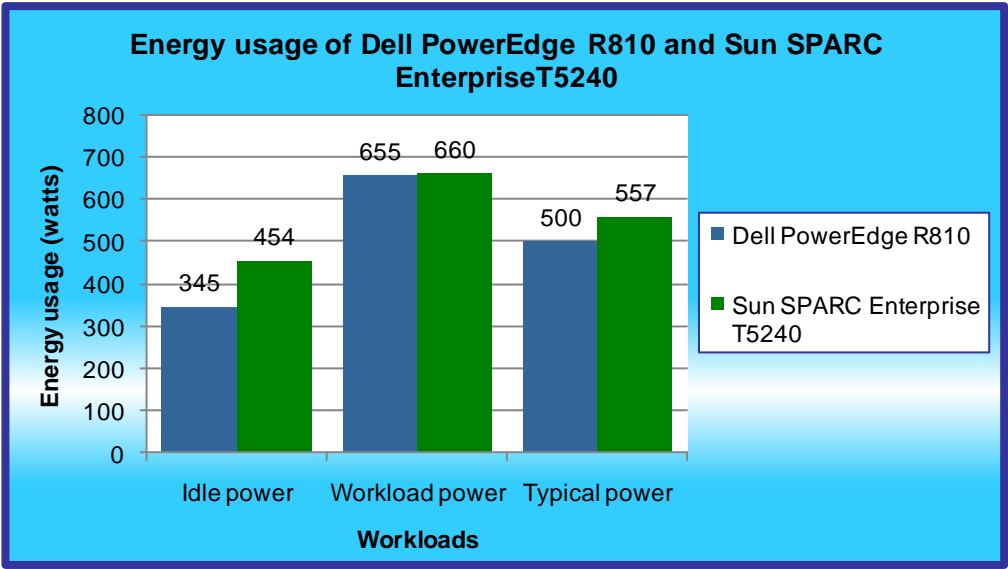

Figure 5: Server energy usage estimates based on SPECjbb2005 results.

similarly to the one for which we report SPECjbb2005 results. The 100 percent workload results measure power consumption when the server is running with 100 percent CPU utilization. The idle workload measurement shows power consumption when the server is booted but not running a benchmark workload. We averaged the 100 percent workload and idle workload results to create an estimate of typical power usage that we used to project energy costs. Figure 5 shows our energy usage estimates. We estimate that the Dell PowerEdge R810 server uses 10 percent less power than the Sun SPARC Enterprise T5240 in typical usage, resulting in proportionately lower energy costs.

We estimated TCO for the two solutions. The TCO calculations for the two solutions consider acquisition costs including initial hardware and OS costs as well as database software purchases and the costs

---

[7] Using the calculator at http://www.sun.com/calc/servers/coolthreads/t5240 and selected results for 100% workload and idle workload for a Sun SPARC Enterprise T5240 server with 2 CPUs,16x4GB DIMMS, and one hard disk drive.

of training and migration. They also include ongoing costs over a projected 3-year lifespan of the solution for power, cooling, facilities, hardware and software support, and server administration.

In addition to the TCO analysis for the performance-equivalent configurations, we did a second analysis in which we ignored performance and compared TCO of a rack full of 21 servers of each model. In both analyses, the Dell PowerEdge R810 solution showed a considerable TCO advantage.

WHAT WE FOUND

Figure 6 details the results of our TCO analysis for performance-equivalent configurations of the two solutions. The Dell PowerEdge R810 solution provides over 74 percent lower 3-year TCO. We found that 21 Dell PowerEdge R810 servers are up to 79 percent lower in acquisition cost compared to the 46 SUN SPARC Enterprise T5240 servers. Further, 21 Dell PowerEdge R810 servers deliver up to 55 percent lower TCO 3-year operating costs than the 46 SUN SPARC Enterprise T5240 servers.

	21 Dell PowerEdge R810 servers	46 Sun SPARC Enterprise T5240 servers	Percentage savings with Dell PowerEdge R810 solution
Acquisition costs	$713,266	$3,481,727	79.5%
3-year operating costs	$387,324	$861,948	55.1%
Total	$1,100,590	$4,343,675	74.7%

Figure 6: TCO for configurations that provide performance equivalent to that of a rack of 21 Dell PowerEdge R810 servers. Lower cost is better. Higher percentage savings are better.

The Dell PowerEdge R810 solution delivers an estimated TCO advantage because it requires fewer servers filling less data center space to deliver equivalent performance and because each server costs less and has a lower estimated energy cost than a Sun SPARC Enterprise T5240 server. The following are the key areas of savings:

Consolidation. The hypothetical enterprise can meet its performance goal with either 21 Dell PowerEdge R810 servers or 46 Sun SPARC Enterprise T5240 servers.

Hardware and OS costs. Each Dell PowerEdge R810 server costs $25,565 for hardware including 3-year ProSupport 4HR 7x24 Onsite Non-Mission Critical, the Red Hat Enterprise Linux operating system, and 3-year costs for a standard subscription for Red Hat Enterprise Linux Advanced Platform, compared to $68,989 for the Sun SPARC Enterprise T5240 server, Solaris 10 operating system, and Warranty Upgrade to 3-Year Gold Support + 7x24 Onsite Support. The cost difference is even more significant for the performance-equivalent

quantities in this analysis: $536,865 for the 21 servers in the Dell PowerEdge R810 solution versus $3,173,494 for the 46 servers in the Sun SPARC Enterprise T5240 solution. See Figure 8 for more details on acquisition costs for the two solutions.

Data center cost savings. The Dell servers can save on data center costs because they require less data center space. The 21 Dell PowerEdge R810 servers fill one 42u rack while the 46 Sun SPARC Enterprise T5240 servers require 2.2 racks.

Energy costs. The Dell PowerEdge R810 solution saves on energy costs, not only because it requires fewer servers, but also because each server uses less energy than a Sun SPARC Enterprise T5240 server. We estimate that under typical load the Dell PowerEdge R810 server uses 500 watts versus 557 watts for the Sun SPARC Enterprise T5240 server.

Figure 7 details the results of our TCO analysis for a single rack of 21 servers of each of the two solutions. The Dell PowerEdge R810 provides nearly 45 percent lower 3-year TCO. It delivers a TCO advantage because of the higher purchase price and energy consumption of the Sun SPARC Enterprise T5240 servers.

	21 Dell PowerEdge R810 servers	21 Sun SPARC Enterprise T5240 servers	Percentage savings with Dell PowerEdge R810 solution
Acquisition costs	$713,266	$1,589,508	55.1%
3-year operating costs	$387,324	$393,498	1.6%
Total	$1,100,590	$1,983,006	44.5%

Figure 7: TCO for 21 servers of each solution. Lower cost is better. Higher percentage savings are better.

HOW WE CALCULATED TCO
Acquisition costs

Acquisition costs include server purchase costs, 3-year hardware support costs, operating system (OS) costs, Oracle database costs, training costs, and the costs of planning and carrying out the migration.

- **Server hardware and 3-year support cost.** Dell provided prices for the Dell server hardware and hardware support. We went to the Oracle Web site to look up purchase prices for the Sun hardware and support and for the Oracle database software. We include list prices without discounts for both solutions. We include costs for the Sun SPARC Enterprise T5240-4P Warranty Upgrade to 3-Year Gold Support + 7X24 On-Site Support. This package includes Solaris 10 support. Dell support is 3-Year ProSupport for IT 4HR 7x24 Onsite: Non Mission Critical.
- **Operating system cost.** Solaris operating system costs are included with the hardware and support pricing for the Sun SPARC Enterprise T5240 server. For comparability, we include 3-year

costs for Red Hat Enterprise Linux Advanced Platform standard subscription, which we priced on the Red Hat Web site, in the acquisition costs rather than as annual costs.

- **Oracle licenses.** Oracle Standard Edition One is $2,900 per processor for a 3-year term
- **Administrator training, solution planning, and migration costs.** We used our own estimates for training, planning, and migration, and relied on our own lab experience of setting up and installing software on Dell and Sun servers.
    - **Administrator training.** We assume that the current server administrator has experience in both Red Hat and Solaris. We include 44 hours of self-training for the administrator for the new hardware, OS, and new Oracle database version. We calculate staff costs based on an annual loaded administrator cost of $100,000. We include this charge once for each procurement of up to 40 servers.
    - **Solution planning.** We include 42 hours for planning and procurement for the Dell solution and 8 hours for the Sun SPARC solution. The Dell solution requires more time because it is a one-time change of hardware and OS technologies. We include this cost for the first server for each administrator. For subsequent servers we include 75 percent of that planning time.
    - **Migration.** We include 17 hours for migration tasks for the Dell solution and 13 hours for the Sun SPARC solution, which has the OS preinstalled. We include this cost for the first server for each administrator. For subsequent servers we include 75 percent of that time.

Figure 8 presents the acquisition costs we considered in this analysis.

	21 Dell PowerEdge R810 servers	21 Sun SPARC Enterprise T5240 servers	46 Sun SPARC Enterprise T5240 servers
Hardware and OS costs, including 3-year support	$536,865	$1,448,769	$3,173,494
Total Oracle software and licenses -per server using per processor, 3-year license	$121,800	$121,800	$266,800
Training, planning, and migration tasks	$54,601	$18,939	$41,433
Total	$713,266	$1,589,508	$3,481,727

Figure 8: Acquisition costs for the two solutions. Lower costs are better. Higher savings are better.

The hardware and operating system costs for the Dell PowerEdge R810 solution are almost 63 percent lower than the Sun SPARC Enterprise T5240 server in the 21-server configuration and 83 percent lower for the performance-equivalent configuration. Oracle costs are the same for the two solutions in the 21-server configuration, with each server requiring two licenses for two processors. In the performance-equivalent comparison, the 21 Dell PowerEdge servers save almost 55 percent in Oracle license costs compared to the 46 Sun SPARC Enterprise servers. The Dell PowerEdge R810 solution requires more staff time for the migration than does the Sun SPARC Enterprise T5240 solution because the Dell solution changes both hardware and

operating system technology from the older Sun SPARC servers the enterprise is retiring, requiring more administrator training, migration planning time, and migration execution time. These additional costs are much lower than the savings in hardware and operating system. Total acquisition costs for the Dell PowerEdge R810 solution are over 55 percent lower for the 21-server configuration and almost 80 percent lower for the performance-equivalent configuration compared to the Sun SPARC Enterprise T5240 solution.

Operating costs

Operating costs include software support, energy costs for powering and cooling the servers, and labor costs for the server administrator. We included the operating system support costs in the acquisition costs. Database software support covers annual support for the Oracle Standard edition. Power costs are based on a utility rate of $0.0973 KwH and we assume equal costs to power and cool the servers. Figure 9 shows the annual operating costs for the two solutions over 3 years.

	21 Dell PowerEdge R810 servers	21 Sun SPARC Enterprise T5240 servers	46 Sun SPARC Enterprise T5240 servers
Database software support	$160,776	$160,776	$352,176
Power and cooling	$53,676	$59,850	$131,100
Data center costs	$15,372	$15,372	$33,672
Server administration	$157,500	$157,500	$345,000
Total	$387,324	$393,498	$861,948

Figure 9: Annual operating costs for the two solutions over 3 years. Lower numbers are better.

In this comparison of costs for 21 servers of each solution, the two solutions differ in cost in only one of the four annual costs categories, energy costs. Oracle software acquisition costs and support costs are the same for the two solutions, which both have two processors and so require two Oracle Standard Edition licenses. We estimate the same number of servers per administrator for the two solutions, making server administration costs the same for the two solutions. The data center costs for the two solutions would be similar because they take up the same rack space and would use the same number of Ethernet ports. However, the Dell PowerEdge R810 solution saves on energy costs because the servers consume less energy while running a typical workload. The 21-server Dell PowerEdge R810 solution saves over the performance-equivalent configuration of the Sun SPARC Enterprise T5240 solution saves on all of these costs areas because the fewer servers require less data center space, fewer administrators, fewer Oracle licenses, and less energy.

SUMMARY

We calculated the TCO for a hypothetical large-scale enterprise that plans to migrate from legacy servers to a either a Dell PowerEdgeR810 server or a Sun SPARC Enterprise T5240 server for an active OLTP environment running under Oracle.

We used each server's performance running SPECjbb2005 benchmark to size the solutions and then calculated the cost of that size solution.

The Dell PowerEdge R810 solution had a lower acquisition cost and lower annual costs than the performance-equivalent Sun SPARC Enterprise T5240 solution. The savings were due to the following key factors:

- Dell PowerEdge R810 servers cost 83 percent less for hardware and operating system.
- The Dell PowerEdge R810 solution uses less than half of the data center space: a single rack vs. over two racks.
- The Dell PowerEdge R810 server uses 10 percent less power: 500 watts vs. 557 watts for a typical workload.[8]
- The Dell PowerEdge R810 solution requires less than half as much server administration time to manage fewer than half as many servers.

As a result of these savings, we calculate that, for the migration scenario in this report, the single rack of 21 Dell PowerEdge R810 servers saves almost 2.8 million dollars in acquisition costs and almost $475,000 dollars in operating costs over 3 years compared to the cost of the performance-equivalent Sun SPARC Enterprise T5240 solution. As a result of these savings, in this analysis the Dell PowerEdge R810 solution delivers over 74 percent lower 3-year total cost of ownership.

We also did a cost comparison that left out performance equivalency and looked at the costs of same-sized configurations of the two models, a full rack of 21 2u servers of each. In that comparison, the 21 Dell PowerEdge R810 servers had higher performance, lower acquisition cost, and because of their lower energy costs, lower annual costs than the 21 Sun SPARC Enterprise T5240 solution. Those savings can amount to nearly 45 percent over 3 years.

---

[8] The average of idle power usage and power usage under a 100 percent load running the SPECjbb2005 benchmark. We used the power configurator on the Oracle Web site for estimates for the Sun SPARC server and our own measurements of power consumption during benchmark runs on the Dell PowerEdge server.

APPENDIX A – ASSUMPTIONS

We made the following assumptions in creating the TCO estimates in this report:

- The Dell PowerEdge R810 servers would run Red Hat Enterprise Linux Advanced Platform and the enterprise would pay the standard subscription rate. Sun SPARC Enterprise T5240 servers would run Solaris 10 operating system.
- We include list prices with no discounts for all prices.
- Simplifying assumptions include assuming all prices for ongoing costs such as power, data center space, data center ports, and administrator salaries stay the same for the 3-year timeframe of the analysis.
- The target enterprise prefers 3-year support including 7x24 on-site support with 4-hour response time.
- We use Oracle 11G database for the database costs in this example. The Oracle database software price is per processor for a 3-year license. The database costs for the quad-processor servers in this analysis are the same for this and any other database software that is priced on a per processor basis.
- The current server administrator has experience in both Red Hat Enterprise Linux and Solaris and does not require formal training for a RHEL migration.
- The administrator for the Dell PowerEdge R810 solution requires 44 hours of self-training for the new hardware, OS, and new Oracle database version. We include this cost once for each administrator.
- The administrator or other similarly compensated staff require 42 hours for planning and procurement for the Dell PowerEdge R810 solution and 8 hours for the Sun SPARC Enterprise T5240 solution. The Dell solution requires more time because it is a one-time change of hardware and OS technologies. We charge this cost to the first server.
- The administrator or other similarly compensated staff requires 17 hours to migrate the first Dell server and 13 hours for the first Sun Server. Costs are lower for the Sun server because the OS is factory installed on the server.
- Subsequent servers require 44 hours each for training, planning, and migration for the Dell solution and 16 hours for the Sun solution. We include more time for the Dell solution because it involves significant changes in both hardware and OS technologies from the end-of-life Sun Solaris solution it would replace. Times for subsequent servers are lower because we assume additional efficiencies with quantities.
- Average annual loaded server administrator cost is $100,000.
- Each system administrator supports 40 servers of either solution.
- We use the SPECjbb2005 benchmark to estimate the performance differences of the servers and project performance to multiple servers from the single server results.
- Average utility rate is $0.09730 center per KwH.[9]
- It costs the same to power and to cool a server.
- Data center space costs $910 per rack, or $22 per u, for a 42u rack.
- Data center Ethernet port costs average $50 per port per year.
  We include server administrators but not database administrators. The number of database administrators would be the same for the two solutions, because the two solutions support the same database workload.

---

[9] Source: National commercial average for December 2009 as reported in http://www.eia.doe.gov/cneaf/electricity/epm/table5_6_a.html

ABOUT PRINCIPLED TECHNOLOGIES

Principled Technologies, Inc.
1007 Slater Road, Suite 250
Durham, NC, 27703
www.principledtechnologies.com

We provide industry-leading technology assessment and fact-based marketing services. We bring to every assignment extensive experience with and expertise in all aspects of technology testing and analysis, from researching new technologies, to developing new methodologies, to testing with existing and new tools.

When the assessment is complete, we know how to present the results to a broad range of target audiences. We provide our clients with the materials they need, from market-focused data to use in their own collateral to custom sales aids, such as test reports, performance assessments, and white papers. Every document reflects the results of our trusted independent analysis.

We provide customized services that focus on our clients' individual requirements. Whether the technology involves hardware, software, Web sites, or services, we offer the experience, expertise, and tools to help our clients assess how it will fare against its competition, its performance, its market readiness, and its quality and reliability.

Our founders, Mark L. Van Name and Bill Catchings, have worked together in technology assessment for over 20 years. As journalists, they published over a thousand articles on a wide array of technology subjects. They created and led the Ziff-Davis Benchmark Operation, which developed such industry-standard benchmarks as Ziff Davis Media's Winstone and WebBench. They founded and led eTesting Labs, and after the acquisition of that company by Lionbridge Technologies were the head and CTO of VeriTest.