TCO COMPARISON: DELL POWEREDGE R815 VS. TWO HP PROLIANT DL380 G7s

1 Dell™ PowerEdge™ R815 server delivered
7% lower TCO
than 2 HP ProLiant DL380 G7 servers

Dell PowerEdge R815 server with
AMD Opteron™ processors Model 6174

2 HP ProLiant DL380 G7 servers
with Intel® Xeon® Processor X5670s

OUR FINDINGS

The Dell PowerEdge R815 server with AMD Opteron processors Model 6174 can provide an estimated lower total cost of ownership (TCO) over 3 years than two HP ProLiant DL380 G7 servers each with Intel Xeon Processor X5670s.[1] In Principled Technologies' tests in our labs, in a virtualized environment, the Dell PowerEdge R815 delivered higher DVD Store Version 2 results while consuming less active power than two HP ProLiant DL380 G7 servers.[2] The estimated lower power costs of the Dell PowerEdge R815, along with lower hardware and 3-year hardware support costs, can provide an estimated 3-year TCO advantage over the performance-equivalent two HP ProLiant DL380 G7 servers.[3]

OUR PROCESS

We used the open-source DVD Store Version 2 benchmark to provide a workload representative of many real-world database applications. With it, we measured the performance and power of the two servers, each of which was running Microsoft® Windows Server® 2008 R2 Enterprise Edition with Microsoft SQL Server® 2008 R2. Each server ran 48 virtual machines (VMs) using Hyper-V™. We calculated the 3-year TCO of the Dell PowerEdge R815 and of the two HP ProLiant DL380 G7 servers using energy cost estimates based on the power measurements in our labs, server and support prices from the Dell and HP Web sites, and our own cost estimates for provisioning, facilities, software, and server management.

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[1] Source: Based on testing conducted by Principled Technologies, Inc., comparing a Dell PowerEdge R815 with AMD Opteron processors Model 6174 (12 cores per processor package) and two HP ProLiant DL380 G7 servers each with Intel Xeon Processor X5670s (6 cores per processor package) and reported in "TCO comparison: Dell PowerEdge R815 vs. two HP ProLiant DL380 G7s," an August 2010 report commissioned by Dell Inc. For details, see http://principledtechnologies.com/clients/reports/Dell/PowerEdge_R815_vs_HP_TCO_0810.pdf.

[2] Ibid.

[3] Ibid.

PROJECT OVERVIEW

We tested the following servers and processors:

- Four-socket Dell PowerEdge R815 server with AMD Opteron processors Model 6174
- Two-socket HP ProLiant DL380 G7 server with Intel Xeon Processor X5670s

We estimated costs for a hypothetical enterprise planning to purchase either a single Dell PowerEdge R815 or a pair of HP ProLiant DL380 G7 servers. The Dell PowerEdge R815 delivered more than twice the performance of a single HP ProLiant DL380 G7 server in tests in our labs, which we describe in our companion report.[4] We therefore compare the costs of a single Dell PowerEdge R815 server and with the costs of two HP ProLiant DL380 G7 servers. The enterprise is seeking a solution that provides the lowest 3-year TCO and hopes to realize savings through lower power consumption, lower hardware costs, and lower data center costs. The analysis in this report considers both acquisition costs and 3-year operating costs of each server.

Figure 1 shows our estimate of 3-year TCO for performance-equivalent configurations, a single Dell PowerEdge R815 server and a pair of HP ProLiant DL380 G7 servers. The Dell PowerEdge R815 can deliver up to an estimated 11.7 percent lower TCO in the first year and up to an estimated 7.3 percent lower 3-year TCO than the two HP ProLiant DL380 G7s, an estimated savings of up to $18,037 over 3 years.[5]
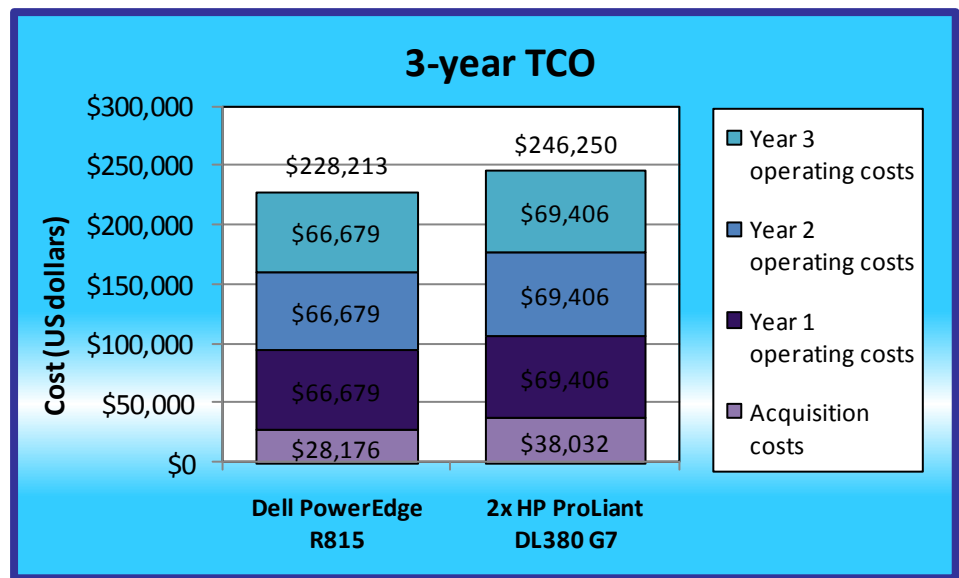

Figure 1: The 3-year TCO for the test servers. Lower numbers are better.

[4] Source: Principled Technologies, Inc., "Virtualized database performance comparison: Dell PowerEdge R815 vs. two HP ProLiant DL380 G7s," an August 2010 report commissioned by Dell Inc.

[5] Source: Based on testing conducted by Principled Technologies, Inc., comparing a Dell PowerEdge R815 with AMD Opteron processors Model 6174 (12 cores per processor package) and two HP ProLiant DL380 G7 servers each with Intel Xeon Processor X5670s (6 cores per processor package) and reported in "TCO comparison: Dell PowerEdge R815 vs. two HP ProLiant DL380 G7s," an August 2010 report commissioned by Dell Inc. For details, see http://principledtechnologies.com/clients/reports/Dell/PowerEdge_R815_vs_HP_TCO_0810.pdf.

We used the open-source DVD Store Version 2 (DS2) benchmark to measure the database performance of the two servers to verify that the configurations provided equivalent performance. DS2 uses a results metric of orders per minute (OPM).

As Figure 2 shows, we estimate that the single Dell PowerEdge R815 would deliver performance nearly equal to two HP ProLiant DL380 G7s in our testing. Based on DVD Store Version 2 (DS2) testing, the Dell PowerEdge R815 achieved a score of 418,103 Orders Per Minute, up to an 11.9 percent increase over the two HP ProLiant DL380 G7 servers' projected

Performance-equivalent configurations

	OPM
Dell PowerEdge R815	418,103
2x HP ProLiant DL380 G7	373,538
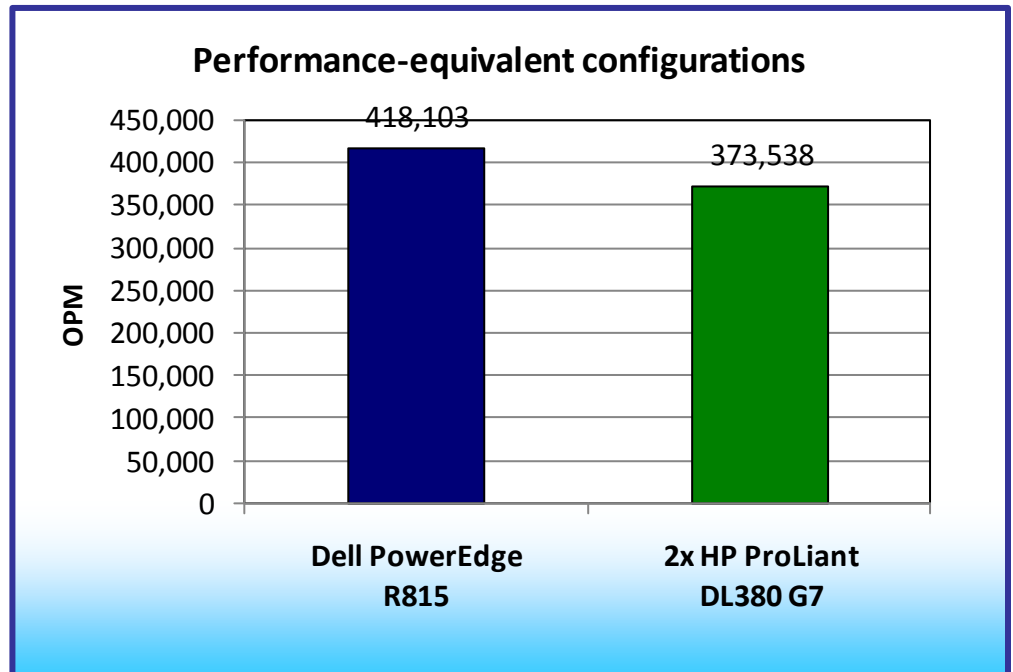
Figure 2: Performance-equivalent configurations based on DS2 OPM results. Higher OPM results are better.

combined score of 373,538 Orders Per Minute.[6] We estimate the score for the two-server configuration by doubling the score of the single server we tested.

We set up each server as we show in Figure 3. We stored the databases on external storage, using the same storage arrays in tests with both servers. We do not include the costs for storage in this analysis.

Figure 3 shows the system configuration overview for the two servers. We base the costs we include in the TCO calculations on these configurations. Detailed configuration information about the servers is available in our companion performance report.[7]

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[6] Source: Based on testing conducted by Principled Technologies, Inc., comparing a Dell PowerEdge R815 with AMD Opteron processors Model 6174 (12 cores per processor package) and two HP ProLiant DL380 G7 servers each with Intel Xeon Processor X5670s (6 cores per processor package) and reported in "TCO comparison: Dell PowerEdge R815 vs. two HP ProLiant DL380 G7s," an August 2010 report commissioned by Dell Inc. For details, see http://principledtechnologies.com/clients/reports/Dell/PowerEdge_R815_vs_HP_TCO_0810.pdf.

[7] Source: Principled Technologies, Inc., "Virtualized database performance comparison: Dell PowerEdge R815 vs. two HP ProLiant DL380 G7s," an August 2010 report commissioned by Dell Inc.

System configuration	Dell PowerEdge R815	HP ProLiant DL380 G7
CPU	AMD	Intel
CPU speed (GHz)	2.20	2.93
Number of processor packages	4	2
Number of cores per processor package	12	6
Number of hardware threads per core	1	2
Memory type	PC3-10600R	PC3-10600R
Total memory (GB)	256	256
Number of VMs	48	24
Number of DB per instance (1 instance per VM)	1	1
DB size (GB)	2.5	2.5

Figure 3: Key specifications of the two servers.

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

Figure 4 shows the cost for the server hardware and 3-year hardware support, which we obtained from the Dell and HP Web sites on July 30, 2010. The Dell PowerEdge R815 cost includes the one server and 3-year ProSupport for IT 4HR 7x24 Onsite: Non-Mission Critical. The
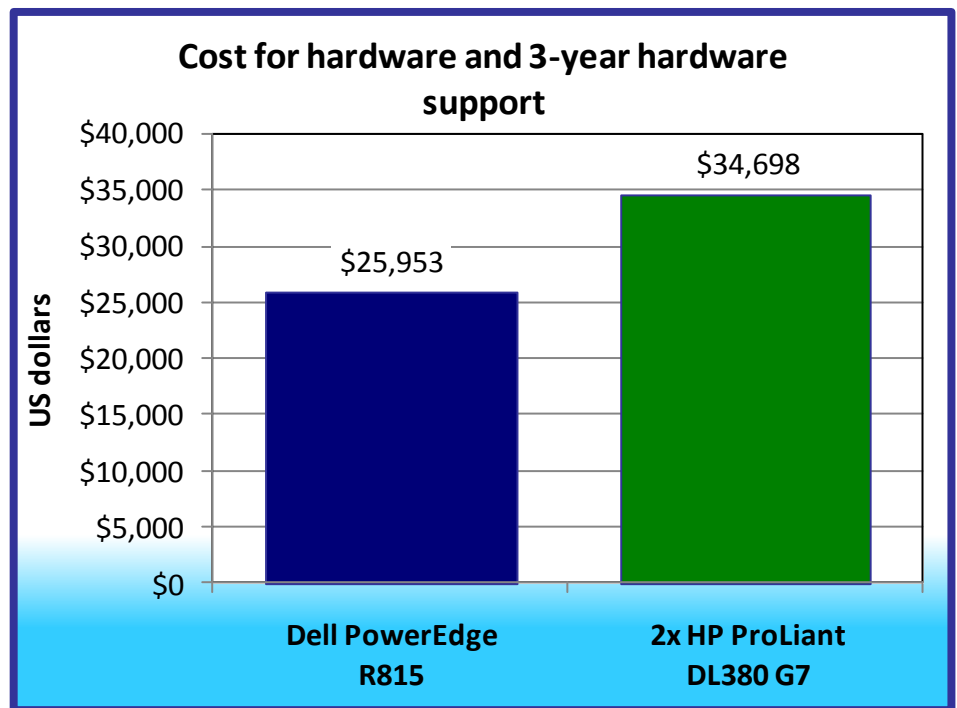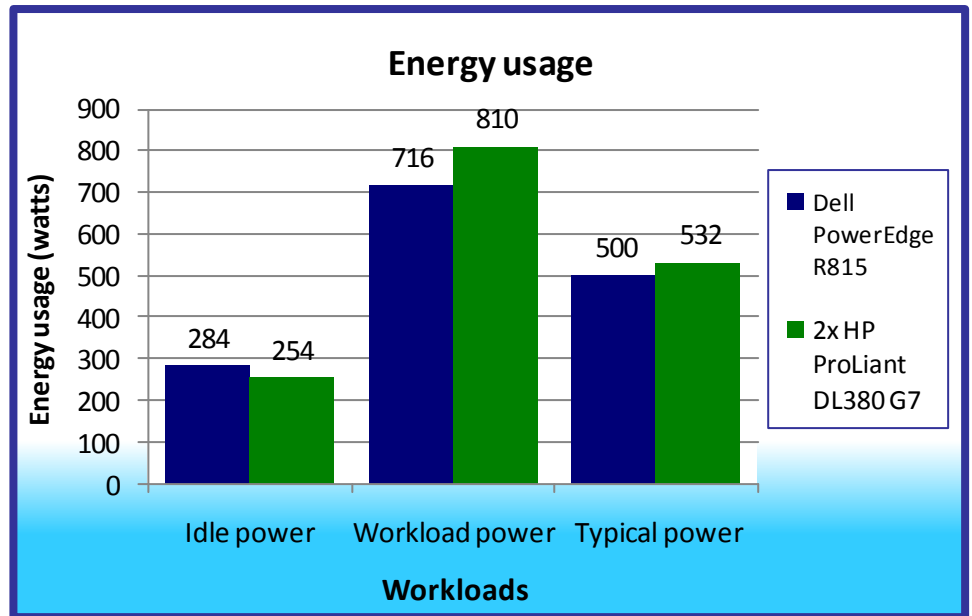

Figure 4: Hardware and 3-year hardware support costs for the two solutions.

price for the HP ProLiant DL380 G7s includes the two servers and HP Care Pack, 3 Years, 4-hour 24x7. The Dell PowerEdge R815 server costs 25.2 percent less than two HP ProLiant DL380 G7 servers. We use list price for all prices in this analysis.

We based energy cost calculations for the TCO analysis on the amount of power the servers used during DS2 benchmark runs. Workload power results measure power consumption when the server is running at peak performance. The idle power workload results show power consumption when the server is booted

but not running a benchmark workload. We averaged the workload power and idle power results to create an estimate of typical power usage

that we use to project energy costs.

Figure 5 shows our energy usage estimates. The Dell PowerEdge R815 can use up to an estimated 6.0 percent less power than the two HP ProLiant DL380 G7 servers in typical power usage, which can result in proportionately lower energy costs.[8] The TCO calculations for the two server configurations consider acquisition costs,

Energy usage

Figure 5: Energy usage, in watts, for the test servers running three different workloads. Lower numbers are better.

including the hardware and hardware support costs as well as the costs of provisioning the server. They also include ongoing costs over a projected 3-year lifespan of the solution for energy, facilities, software and software support, and server administration.

WHAT WE FOUND
TCO results

Figure 6 details the results of our TCO analysis of the two server configurations. The Dell PowerEdge R815 can provide up to an estimated 7.3 percent lower 3-year TCO compared to the pair of HP ProLiant DL380 G7 servers.[9] Acquisition costs, which include purchase costs plus estimated provisioning costs, for the Dell PowerEdge R815 can be estimated up to 25.9 percent lower and 3-year operating costs can be estimated up to 3.9 percent lower than for the two HP ProLiant DL380 G7s.[10]

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[8] Source: Based on testing conducted by Principled Technologies, Inc., comparing a Dell PowerEdge R815 with AMD Opteron processors Model 6174 (12 cores per processor package) and two HP ProLiant DL380 G7 servers each with Intel Xeon Processor X5670s (6 cores per processor package) and reported in "TCO comparison: Dell PowerEdge R815 vs. two HP ProLiant DL380 G7s," an August 2010 report commissioned by Dell Inc. For details, see http://principledtechnologies.com/clients/reports/Dell/PowerEdge_R815_vs_HP_TCO_0810.pdf.
[9] *Ibid.*
[10] *Ibid.*

Costs	Dell PowerEdge R815	2x HP ProLiant DL380 G7	Percentage savings with the Dell PowerEdge R815
Acquisition costs (hardware, hardware support, and provisioning)	$28,176	$38,032	25.9%
3-year operating costs (energy, data center, software and software support, and server administration)	$200,037	$208,218	3.9%
Total	**$228,213**	**$246,250**	**7.3%**

Figure 6: TCO for the Dell PowerEdge R815 and the two HP ProLiant DL380 G7 servers. Lower costs are better. Higher percentage savings are better.

The single Dell PowerEdge R815 delivers an estimated 3-year TCO advantage because it has lower hardware, facilities, and energy costs than a performance-equivalent pair of HP ProLiant DL380 G7 servers.

Hardware and hardware support costs

The Dell PowerEdge R815 costs $25,953 for hardware, including 3-year ProSupport 4HR 7x24 Onsite Non-Mission Critical, compared to $34,698 for the pair of HP ProLiant DL380 G7 servers and HP Care Pack, 3 Years, 4-hour 24x7.

Facilities cost savings

The single 2u Dell PowerEdge R815 can save on data center costs because it requires half the data center space of the 4u of the two HP ProLiant DL380 G7 servers. The single Dell PowerEdge R815 server requires half the data center ports, and therefore half the port costs of the two HP ProLiant DL380 G7 servers.

Energy costs

The Dell PowerEdge R815 saves on energy costs because it uses less energy than two HP ProLiant DL380 G7 servers. We estimate that, under typical load, the Dell PowerEdge R815 uses 500 watts versus 532 watts for the two HP ProLiant DL380 G7s.

HOW WE CALCULATED TCO

Acquisition costs

Acquisition costs include server purchase costs, 3-year hardware support costs, and provisioning costs.

- **Server hardware and 3-year support cost.** We went to the Dell and HP Web sites to look up purchase prices for the hardware and support. We include list prices without discounts for both solutions.
- **Provisioning costs.** We used our own estimates for planning time, and relied on our own lab experience of setting up and installing software on these servers. We estimate that each server

requires 40 hours setup time for the first server and add 20 hours for the second HP ProLiant DL380 G7 server.

Figure 7 presents the acquisition costs we considered in this analysis.

Acquisition costs	Dell PowerEdge R815	2x HP ProLiant DL380 G7	Percentage Dell win
Hardware cost (hardware purchase and 3-year hardware support)	$25,953	$34,698	25.2%
Provisioning cost (administrator time to acquire and set up server)	$2,223	$3,334	33.3%
Total	**$28,176**	**$38,032**	**25.9%**

Figure 7: Acquisition costs for the two server configurations. Lower costs are better. Higher savings are better.

Operating costs

Operating costs include operating system, database software, and Microsoft software assurance agreements, prorated rack space and port costs, energy costs for powering and cooling the servers, and labor costs for the server administrator. Figure 8 shows our estimates of the operating costs for the two solutions over 3 years.

Operating costs	Dell PowerEdge R815	2x HP ProLiant DL380 G7	Percentage Dell win
Software costs (Microsoft Windows Server 2008 R2 and Microsoft Windows SQL Server 2008 R2)	$63,144	$63,144	0.0%
Facilities costs (rack space and port costs)	$173	$346	50.0%
Energy costs (power and cooling)	$862	$916	5.9%
Management costs (labor for server administration)	$2,500	$5,000	50.0%
Total	$**66,679**	**$69,406**	**3.9%**

Figure 8: Three-year operating costs for the two server configurations. Lower costs are better. Higher savings are better.

Although both servers have the same costs for software and administration, the Dell PowerEdge R815 presents slight savings in operating costs. Software costs are the same because both configurations have the same number of processors and VMs, the two factors that determine license counts for Microsoft Windows Server 2008 R2 and Microsoft SQL Server 2008 R2. The Dell PowerEdge R815 saves on operating costs because it uses less energy, takes up less rack space, and requires less server administration time.

SUMMARY

We calculated the TCO for a hypothetical large-scale enterprise that plans to purchase either a single Dell PowerEdge R815 server or a pair of HP ProLiant DL380 G7 servers for an active OLTP environment running under Windows Server 2008 R2 and SQL Server 2008 R2. We used each server's performance running the DVD

Store Version 2 benchmark to determine the number of HP ProLiant DL380 G7 servers in the performance-equivalent configuration and then calculated the cost of the two solutions.

The Dell PowerEdge R815 had a lower acquisition cost and lower annual costs than the performance-equivalent HP ProLiant DL380 G7 solution. The savings were due to the following key factors:

- The Dell PowerEdge R815 costs 25.2 percent less for hardware and hardware support.
- The Dell PowerEdge R815 uses less than half of the data center space: 2u vs. 4u and requires half as many data center ports.
- The Dell PowerEdge R815 requires half as much management time, which we allocate on a per-server basis.
- The Dell PowerEdge R815 uses 6.0 percent less power: 500 watts vs. 532 watts for a typical workload.[11]

We calculate that a Dell PowerEdge R815 saves almost $9,856 in acquisition costs and almost $8,181 in operating costs over 3 years compared to the cost of the performance-equivalent two HP ProLiant DL380 G7s. As a result of these savings, in this analysis, the Dell PowerEdge R815 delivers 11.7 percent lower TCO in the first year and 7.3 percent lower 3-year TCO.

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[11] The average of idle power usage and power usage under peak load running the DVD Store Version 2 benchmark.

APPENDIX A – ASSUMPTIONS

We used the DVD Store Version 2 benchmark to identify performance-equivalent configurations of the two servers and calculated TCO for those configurations.

We made the following assumptions in creating the TCO estimates in this report, which we organize by cost category following a list of general assumptions.

General assumptions

- 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.
- We include list prices with no discounts for all prices. We used list prices for all purchase costs because discounts vary by buyer and by vendor; this approach provides the most level playing field possible for our comparison. Costs do not include taxes or shipping costs.
- We do not include the costs of the external storage arrays or the cables and switches used to connect the servers to the storage in this analysis. In our tests, the two servers used the same storage arrays. We assume the hypothetical enterprise in this analysis either has the storage arrays in house already or is acquiring them in a separate procurement.

Acquisition costs

- We assume the current server administrator has experience in both Microsoft Windows Server 2008 R2 and Microsoft SQL Server 2008 R2 and does not require additional training on these software packages. We therefore do not include administrator training in the costs.
- The administrator or other similarly compensated staff requires 40 hours for planning, procurement, and setting up the first server of either solution and half that time for the second server. We include costs for that time in our provisioning cost estimate.
- The target enterprise prefers 3-year support including 7x24 on-site support with 4-hour response time.
- Our support prices for the Dell PowerEdge R815 include non-mission critical support available 24 hours a day and 7 days a week with a 4-hour response time. Dell offers a higher-cost mission-critical support that provides additional coverage. The Dell non-mission critical support is a closer match to the support with 24-hour-a-day, 7-day-a-week service with a 4-hour response time that is available from HP. Under these agreements, the vendor, not the data center staff, does the majority of hardware maintenance. We did not include any additional maintenance costs.

Software costs

- Both server configurations would run Microsoft Windows Server 2008 R2 Datacenter Edition operating system. We include costs for a license plus annual software assurance costs for each processor. We selected the Datacenter edition because it offered savings over the Enterprise edition, which would have required one license for each set of 4 VMs. Software costs were the same for the two servers with either edition. Note that we used Microsoft Windows Server 2008 R2 Enterprise Edition in our testing.
- We use Microsoft SQL Server 2008 R2 Enterprise Edition for the database costs in this example. We include costs for a license plus annual software assurance costs for each of the four VMs. For this

package, the Enterprise edition, licensed per server, saved over the Datacenter edition licensed per processor. Software costs were the same for the two servers with either edition.

- The enterprise has per-device or per-user client access licenses costs for which are not included in this analysis.

Facilities costs

Facilities costs include rack costs that reflect rack footprint, including clearances and port costs.

We made the following assumptions about facilities costs:

- The data center fills racks to capacity and has adequate power and cooling capacity for those full racks.
- Data center Ethernet port costs average $129 per port per year for the switch hardware and hardware support.
- The data center costs $910 per rack per year for data center space. We based this on a cost of $65 per square foot per year for data center space and an average of 14 square feet per rack, including both the space the rack occupies and the necessary clearances around it.

Energy costs

We made the following assumptions about energy costs:

- The hardware is busy one-half of the time and idle the remaining time, and it runs all day, every day. We average the active and idle power usage measurements to get a power usage value to use in the power cost calculations.
- For each dollar the business spends on electricity for server power, it spends an additional dollar on power to cool the server and to power auxiliary equipment.[12] Data centers may have different proportions of these costs because cooling efficiency and technology, rack densities, and other factors affect cooling costs.
- The data center costs for power and cooling are $0.0986 per KwH.[13] We base this estimate on the Department of Energy's data on average commercial charges for April 2010.

Management costs

- Average annual loaded server administrator cost is $100,000.
- Each system administrator supports 40 servers of either solution.
- 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.
- We do not include costs for management software.

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[12] Estimating Total Power Consumption by Servers in the U.S. and the World, Jonathan G. Koomey, PhD, February 15, 2007
http://enterprise.amd.com/Downloads/svrpwruseecompletefinal.pdf
[13] Source: National commercial average for April 2010 as reported in http://www.eia.doe.gov/cneaf/electricity/epm/table5_6_a.html

ABOUT PRINCIPLED TECHNOLOGIES

Principled Technologies, Inc.
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