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Server Consolidation for SAP ERP on IBM eX5 enterprise systems with Intel® Xeon® Processors:

Lowering Total Cost of Ownership

An Alinean White Paper

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EXECUTIVE SUMMARY

For many years computer processor performance improvements have been increasing at relatively steady rates indicative of Moore's Law first espoused in the mid 1960s. While this progression has not been purely linear, the recent introduction of the Intel® Xeon® 5600 Series and 7500 Series processors seem to deviate from this historic trend and offer significantly greater performance per dollar than previous generations of server processors. With support for six and eight cores per processor, the significant jump in performance and efficiency of these latest processors is causing many IT organizations to reexamine their historic server refresh cycles and consider replacing servers sooner than previously scheduled and to migrate from alternative server architectures to servers with these latest x86-based processors.

By replacing current servers with the latest generation of Intel Xeon processor based servers organizations are looking to reduce on-going expenses of their IT operations. In many cases these migration projects are able to reduce annual server related operating costs by up to 80% and pay for themselves in less than a year, based on the low costs of the server hardware. This paper reviews the business case a large chemical manufacturing organization recently put together for migrating their SAP ERP system from Sun SPARC based servers to the latest IBM System x eX5 enterprise systems.

The organization had recently acquired a smaller rival company and needed to integrate the information systems of the two organizations to achieve the improved efficiencies they desired from the acquisition. They were also interested in implementing SAP's Unicode multi-language support for international operations. These additional processing requirements drove the organization to investigate its upgrade options. The original server environment for the SAP ERP application consisted of a cluster of Sun Fire V490 servers for the application tier and a pair of Sun Fire V890 servers for the Oracle database tier. Going forward the organization evaluated a Sun SPARC upgrade option and an IBM System x migration option.

Financial Overview

Based on its financial assessment the organization determined that it could save 68% or $969,747 over the three year analysis period by migrating its SAP ERP system onto IBM System x servers compared to upgrading its current architecture with Sun SPARC servers. With superior price performance the IBM System x migration solution offered significant savings in hardware, software and energy costs. Compared to the original environment the IBM System x solution would lower annual operating costs by 82% per year saving $213,900 per year. The IBM System x migration project was expected to deliver a Return on Investment (ROI) of 189% comparing the total investment of $360,900 for server hardware and migration costs with the three year net benefits of $684,000. Table 1 shows the expected costs for the original environment and the two proposals over a three year analysis period.

Three Year TCO Comparison	Original Server Environment	Sun SPARC Upgrade	IBM System x Migration	IBM System x Savings vs. Sun SPARC Upgrade	
Number of Servers	15	2	2	0	0%
Server Hardware Costs	$356,103	$1,037,400	$172,900	$864,500	83%
Server Software Costs	$283,680	$190,080	$91,406	$98,674	52%
Upgrade / Migration Costs	$0	$146,000	$188,000	($42,000)	-29%
Energy Costs	$145,114	$57,441	$8,868	$48,573	85%
Total Three Year Costs	**$784,912**	**$1,430,923**	**$461,176**	**$969,747**	**68%**

Table 1: Three Year TCO Comparison Chart

SERVER UPGRADE CASE STUDY

Original Server Environment

The original production server environment consisted of ten Sun Fire V490 servers for the application tier and two Sun Fire V890 servers for the database tier. The Sun Fire v490 servers were each configured with four dual-core UltraSPARC IV+ processors and 24 gigabytes of memory. The Sun Fire V890 database servers each had eight dual-core UltraSPARC IV+ processors and 64 gigabytes of memory. In addition to the production servers the organization also had two Sun Fire V490 servers and one Sun Fire V890 server for test and development. The test and development servers were configured identically to the production servers. Table 2 below shows the original server configurations, original purchase prices and annual hardware maintenance costs per server.

Server Function	Server Type	Servers	(Chips/Cores) per Server	Purchase Price	Annual Support
Application Tier	Sun Fire V490 (UltraSPARC IV+)	10	(4/8)	$60,300	$6,633
Database Tier	Sun Fire V890 (UltraSPARC IV+)	2	(8/16)	$118,500	$13,035
Test & Development	Sun Fire V490 (UltraSPARC IV+)	2	(4/8)	$60,300	$6,633
Test & Development	Sun Fire V890 (UltraSPARC IV+)	1	(8/16)	$118,500	$13,035
Total All Servers		**15**	**(72/144)**	**$1,079,100**	**$118,701**

Table 2: Original server configurations

Sun SPARC M8000 Upgrade

For the Sun SPARC upgrade the organization planned on purchasing two Sun SPARC Enterprise M8000 servers. The Sun M8000 servers would each be configured with sixteen quad-core SPARC64 VII processors and 256 gigabytes of memory. The servers would be configured in a cluster for high availability and leverage the Solaris Containers technology in Solaris 10 for virtualization. By running multiple virtual machines on each of the servers the organization would host the application and database tiers on the same servers, as well as the test and development functions. Each of the Sun M8000 servers would cost $390,000 for a total purchase cost of $780,000 for both servers.

IBM System x Migration

For the IBM System x migration option the organization would replace all of the existing Sun Fire servers with two IBM System x3850 X5 servers configured in a high availability cluster. Each of the IBM System x3850 X5 servers would be configured with four eight-core Intel Xeon X7560 processors and 256 GB of memory. The organization would use VMware vSphere to run multiple virtual machines on these two servers. The virtual machines would support the application and database tiers as well as isolated test and development functions. The IBM System x3850 X5 servers were priced at $65,000 each for a total purchase cost of $130,000. Table 3 shows the configurations, purchase prices and annual hardware support costs for the various options.

Server Hardware Costs	Original Server Environment	Sun SPARC Upgrade	IBM System x Migration
Total Servers	15	2	2
Total Processors – (chips / cores)	(72 / 144)	(32 / 128)	(8 / 64)
Purchase Price per Server		$390,000	$65,000
Total Server Purchase Costs		**$780,000**	**$130,00**
Annual Server Hardware Maintenance Costs	$118,701	$85,800	$14,300
Total Three Year Server Hardware Costs	**$356,103***	**$1,037,400**	**$172,900**

Table 3: Proposed server configurations

*Note: The three year costs for the original environment only includes annual hardware maintenance, since the purchase costs for these servers was considered a sunk cost and not included in the analysis.

With the relatively low purchase price of the IBM System x servers, the organization could almost pay for these new servers with the savings from a single year of hardware maintenance cost of the current servers.

Price Performance Comparison

Based on benchmark results and the costs for the servers the IBM System x solution provided a clear price performance advantage over the Sun SPARC configurations. While the new Sun SPARC M8000 servers delivered similar performance compared to the original Sun SPARC servers, the new IBM System x3850 X5 servers provided over seven times greater performance per dollar. Chart 4 shows the relative price performance comparison for the three configurations.

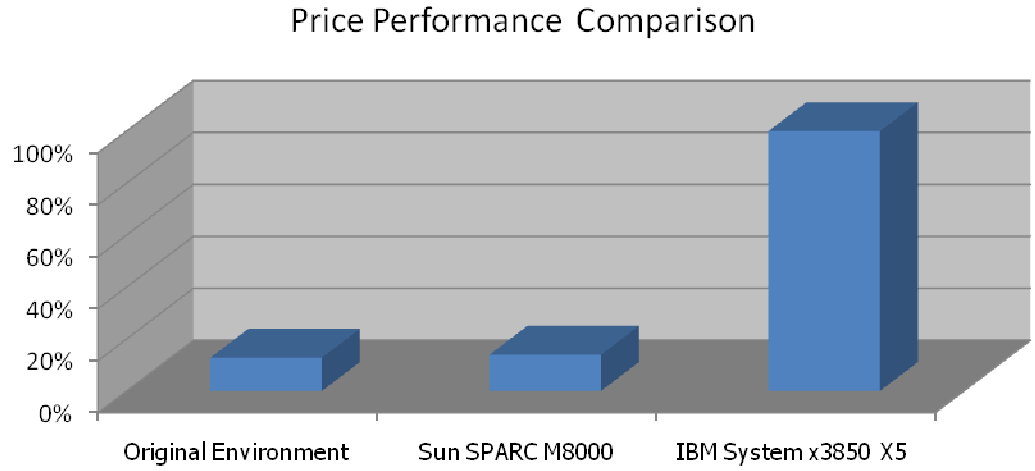

Chart 4: Relative price / performance comparison between server options

Software Licensing and Support Costs

Although the difference in hardware costs between the Sun/Oracle and IBM solutions was significant, the organization assessed all relevant costs including software in its analysis. Since the SAP ERP software was priced on a per user basis, it would be the same cost for both upgrade options, so it was not included in the analysis. The evaluation of the software costs focused on those components which were dependent on the hardware configurations, which included the operating system and virtualization software licenses and support.

Sun SPARC Software Configuration

The organization would run Solaris 10 on the Sun SPARC Enterprise M8000 servers, and would purchase Oracle Premier Support for the Solaris operating system for an annual cost of $31,680 per server. The Solaris Containers virtualization capability is included with Solaris 10 at no additional cost.

IBM System x Software Configuration

For the IBM System x configuration the organization would run the Red Hat Linux operating system. Premium support for Red Hat Linux is priced at $2,499 per processor (socket). With the eight-core Intel Xeon 7560 processors the IBM System x3850 X5 servers only required four licenses per server for a total annual cost of $19,992 for both servers.

The IBM System x configuration also required VMware vSphere virtualization software. The VMware vSphere software was priced at $2,245 per socket for a total software license cost of $17,960. Table 5 shows the software license costs and total annual software support costs for all three configurations.

Server Software Costs	Original Server Environment	Sun SPARC Upgrade	IBM System x Migration
Total Servers	15	2	2
Total Processors (chips / cores)	(72 / 144)	(32 / 128)	(8 / 64)
Annual Operating System Support Costs	$94,560	$63,360	$19,992
VMware vSphere License Costs	$0	$0	$17,960
Annual VMware vSphere Support Costs	$0	$0	$4,490
Total Software License Costs	$0	$0	$17,960
Annual Software Support Costs	$94,560	$63,360	$24,482
Total Three Year Software Costs	**$283,680**	**$190,080**	**$91,406**

Table 5: Three Year Software License and Support Cost Comparison

Systems Administration and Operations Labor Costs

Typically server consolidation or upgrade projects impact systems administration and operations labor requirements. In this case the organization did not anticipate any differences in the administration effort needed for the different hardware configurations. Since these on-going operational costs were expected to be the same for the upgrade options they were not included in the financial analysis.

Datacenter and Environmental (Green) Impact

The organization was excited that the IBM System x migration effort would ease space and power constraints on the current datacenter. Over the past several years new customer service and decision support applications had required additional storage devices which were pushing the capacity of the datacenter.

Each of the new IBM System x3850 X5 servers would only require four Us of space in a standard rack and consume on average 704 Watts of power. Replacing the current Sun Fire servers with the IBM System x servers would free up two full racks of space in the datacenter and reduce energy consumption for the SAP servers by 94%, saving over $45,000 per year. The Sun SPARC Enterprise M8000 servers, however, would each require an entire rack and consume six and half times as much energy as the IBM System x servers, or approximately 4560 Watts each.

Table 6 shows the annual energy requirements for the original configuration and the two proposals.

Annual Energy Consumption	Original Server Environment	Sun SPARC Upgrade	IBM System x Migration
Number of Servers	15	2	2
Average Power Consumption per Server (Watts)	1,536	4,560	704
Total Power Consumption (Watts)	28,800	11,400	1,760
Annual Operating Hours	8766	8766	8766
Data Center PUE Factor*	2.5	2.5	2.5
Annual Power Consumption (kWatts)	**504,922**	**199,865**	**30,856**
Average Price per kWh	$0.0958	$0.0958	$0.0958
Annual Power and Cooling Costs	**$48,371**	**$19,147**	**$2,956**
Average CO2 Emissions (lbs/kWatt)	1.341	1.341	1.341
Annual CO2 Emissions (tons)	**339**	**134**	**21**

Table 6: Annual Energy Consumption and Cost Comparison

* PUE – Power Usage Effectiveness is the measure of energy required by the data center as a whole for each unit of energy delivered to servers. This measure includes cooling and other data center equipment.

Finally, from an environmental perspective, the reduction in energy consumption for power and cooling would result in a decrease of approximately 318 tons of CO2 per year, or the equivalent of eliminating the emissions of 53 cars per year. (On average cars produce 6 tons of CO2 per year.)

Upgrade / Migration Costs

At first the organization was concerned about the added project risk and migration costs of changing server platforms. Since the SAP ERP system was crucial for several key operational functions, the organization could not tolerate significant downtime during the upgrade or as a result of changing technologies. Regardless of the financial analysis, the organization would not move forward with switching platforms unless they were convinced that the migration would be successful. When the organization met with the IBM Migration Factory team these concerns were addressed. The organization was impressed with the number of mission critical SAP ERP implementations running on IBM System x platforms and the successful track record of the IBM team for migrating and upgrading SAP environments.

The IBM migration effort was expected to take a total of twelve weeks for planning, system installation, application migration and system validation. The organization budgeted $128,000 for external professional services fees and expenses, and an additional $60,000 for internal labor to assist with the effort. The organization calculated the costs for the Sun SPARC upgrade at roughly three fourths of the cost for the IBM migration proposal. The Sun SPARC upgrade option was expected to cost $96,000 for external services and expenses and $50,000 for internal labor to install the new servers and perform the SAP Unicode upgrade.

Conclusion

While steady improvements in the performance of server technology have lead to regular periodic hardware upgrades, the dramatic improvement in the performance of the latest generation of Intel Xeon processors featured in the IBM System x servers should cause organizations to investigate accelerating server replacements. As illustrated in this customer case study, migrating to the latest IBM System x3850 X5 servers allowed this organization to lower annual operating costs by a significant 80%, leading to substantial savings of $684,000 over a three year analysis period.

The majority of the savings came from reduced hardware and software maintenance costs. In this example the organization was able to purchase new highly efficient IBM System x servers for almost what it was paying for annual maintenance on its current servers. The most impressive savings on a percentage basis came from reducing energy consumption. The new IBM System x servers were able to address an increased workload over the original server environment while cutting power consumption by 94%, helping to extend the useful life of the current datacenter.

In addition to the financial comparison presented in this paper, the technical experience of the IBM Migration Factory team played a large role in convincing the organization that the migration would be preformed successfully with minimal project or business risk.

Explore for Yourself

As illustrated in this case study, the latest IBM System x servers powered with the latest Intel Xeon processors offer tremendous opportunity for reducing energy consumption, shrinking your data center footprint and lowering operational costs. Alinean has developed an easy to use Server Consolidation TCO Calculator that will allow you to explore these potential savings for your unique environment. Learn how you can achieve similar benefits with a payback in a little as nine months. Get your customized report at: http://www-03.ibm.com/systems/migratetoibm/whyibm/campaigns/sconevaltool1.html

About Alinean

Since 1994, the Alinean team has been the pioneering builder of tools to help quantify and improve the ROI and TCO of IT investments. Alinean was named for the Spanish word for "Align", matching the Alinean mission as the leading developer of analytical tools to help IT vendors, consultants and IT executives align IT investments with business strategies.

The Alinean team has over a decade of experience in the practical development and application of ROI and TCO methodologies, models and tools to optimizing IT investment decision making. In 1994, the Alinean team formed Interpose, the original pioneers of ROI tools, developing analytical software for over 50 major IT vendors and consulting companies worldwide, and creating the industry standard TCO Manager and TCO Analyst software. Interpose was sold to Gartner in 1998, where the team continued their developments and marketing of ROI and TCO software tools. The original team reunited to form Alinean in 2001, once again becoming the leading pioneers and developers of ROI sales and analytical tools. Current customers include leading IT solution providers such as HP, IBM, Dell, Intel, Symantec, NetIQ, EMC, SAP, Oracle, SBC, and Microsoft, as well as leading consultancies and Global 1000 companies.

Additional information about Alinean and helpful ROI educational resources can be found at http://www.alinean.com.