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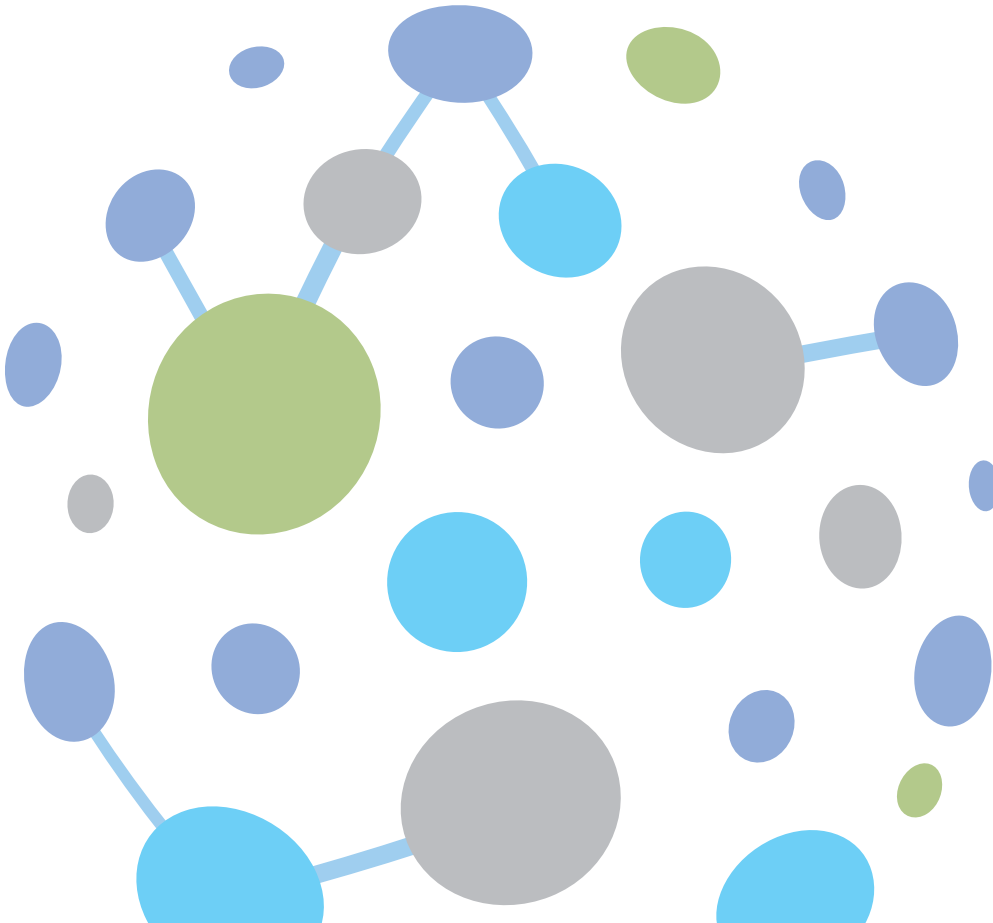
SAP Consolidation: Improving reliability, performance and agility



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Introduction

SAP is the world's leading ERP vendor, its software lies at the core of tens of thousands of organizations. This paper describes how a number of companies have chosen to make use of IBM's high-end server technology as a means to consolidate their SAP landscapes into a single environment, and the benefits in terms of reliability, performance, agility and cost-reduction they've gained by doing so. IBM's zEnterprise platform can be used either as a scale up platform (in which workload is all run on the same server machine) or at the heart of a scale-out environment in which workload can be partitioned between the scale-up server and an integrated blade environment in which AIX, Linux and Windows blades can be run and managed.

It isn't the goal of this paper to convince you that it makes sense for your organization to do the same thing, but to demonstrate that you have a choice when it comes to the evolution of your SAP infrastructure, and that for a growing number of organizations there are real advantages to running their core applications within a single integrated environment, rather than using rows of racks filled with x86 blades.

Key Messages

- **If your SAP environment is complex and heterogeneous, now is the time to consolidate**

  Simplifying your SAP infrastructure will help you manage performance, deliver better service and save money.

- **Consolidating SAP will improve the quality of your management information**

  Many organizations struggle to derive a single, accurate and up-to-date view of their business, because key business data is held in a range of different systems. Eletronuclear, a Brazilian electricity company, was able to reduce the time taken to complete month-end processing from 8 weeks to 5 days.

- **Consolidating SAP will make it easier for you to adapt in the face of business change**

  Over time, many organizations have seen their infrastructure become more and more complex. This growing complexity means that change becomes increasingly difficult to manage. Endress+Hauser saw a significant reduction in the time it takes to deploy new SAP application server instances.

- **Consolidating SAP will make it easier for you to deliver business continuity**

  If SAP lies at the heart of your business processes, then ensuring that it is resilient in the face of failure and that it can be recovered quickly if a major incident occurs is likely to be a significant priority. Banco Pastor was able to dramatically simplify and improve its disaster recovery capability.

Call to action

Baseline your SAP environment

If you haven't done so already, you should complete a comprehensive review of your SAP ecosystem looking specifically at costs (hardware, software, administration and maintenance), and resilience (scalability, reliability and availability) – You can't make accurate comparisons without a reliable baseline.

Make a commitment to consolidating and simplifying your SAP environment

As you begin the process of consolidation, you'll find that it becomes easier to make commitments to your business customers about service levels, it will be easier to scale your environment up (or down, as required by the business), and the overall burden of managing and maintaining your environment will fall.

Consider consolidating your SAP environment into a single resilient, high-performance environment

IBM's zEnterprise platform provides you with a choice, beyond simply relying on filling racks with blades. The zEnterprise platform supports both vertical and horizontal scaling within a highly integrated environment.

> Despite the ever-increasing workload and the addition of new SAP functionality in response to customer requests, we continue to require just eight employees to run the entire 6,000-user SAP landscape.
>
> Willi Lohmann, CEO, gkd-el

> We run about 40 percent of our DB2 workload on zIIPs which brings the licensing cost down by about 95 percent compared to an Intel or UNIX infrastructure. All of our Linux environments run on IFLs, which again deliver a very considerable cost saving.
>
> Mark Shackleford , VP Information Services, Baldor

> We resolved our issues of scalability, speed and cost. We have reduced our footprint by 10 times and minimized our overall business risks. The servers are based in two separate sites and provide us with the utmost security by ensuring that even if there is a natural disaster we can maintain high availability.
>
> Montserrat Torres, Computer Systems Manager, Banco Pastor

Getting to grips with your SAP infrastructure

The benefits of simplifying your SAP infrastructure are clear. You can improve the reliability and performance of your SAP estate, you can lower the costs associated with management and maintenance, and it is much easier to implement an effective disaster recovery process.

Many of the organizations that we speak to will admit that their infrastructure has become too complex, and most are taking steps to make it simpler, leaner and easier to manage.

In figure 1 we show a logical view of a high availability distributed SAP environment. The DBMS is clustered, for scalability and reliability. The application servers are scaled-out horizontally and the networks are bridged by pairs of routers (to provide redundancy). Within a large organization this model may be replicated a number of times for different divisions / geographies.

Environments like this are complex to manage, and can be very difficult to replicate. A number of the companies mentioned in this report, and many others that we've spoken to, express concern about their ability to quickly and effectively respond to new business requirements, or in the event of a major data center outage.

> "The failure of our old solution would translate into a lot of work for our IT teams. We would need to transport servers to our backup locations, then carry out some complex configurations before migrating the data and booting up again. Equally, it wasn't clear that we would have full vendor support…
>
> Aribert Starnell, Endress+Hauser

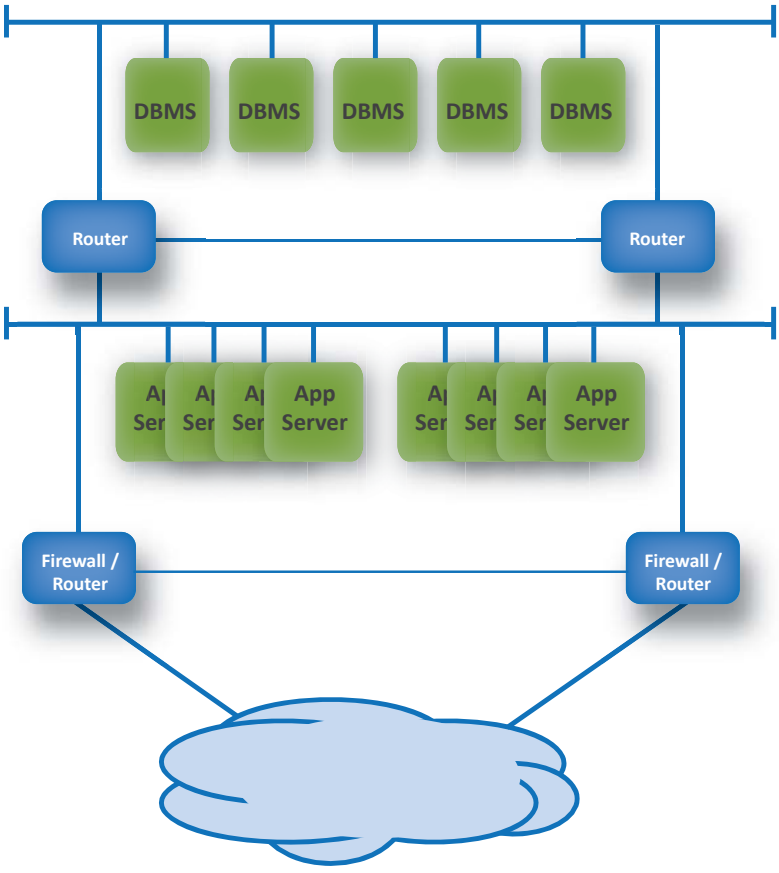

Figure 1. Typical high availability distributed SAP landscape

In most cases, scaling this architecture involves a lot more than simply adding another blade, as the blade has to be configured, properly connected to the relevant storage, and then added to the pool.

The administration burden associated with a distributed SAP ecosystem can be difficult to quantify, as staffing, facilities, and hardware costs are hidden within different divisional budgets. When software upgrades need to be performed the process can take an extended period of time, and consume a considerable amount of resources.

One of the key "moments of truth" for many clients comes when they do a detailed analysis of the cost of running their existing environment.

Consolidation and virtualization is the only way to regain control of your infrastructure

Consolidation and virtualization aren't just technical initiatives; they're business initiatives as well. Consolidation and virtualization offer IT a way to provide the business with the infrastructure that it needs today and positions it well to deliver the infrastructure that the business will need tomorrow.

Server consolidation and virtualization offers a number of advantages;

- It enables organizations to make better use of modern multi-core processors.
- It reduces the number of physical servers that need to be managed and maintained.
- It reduces the cost of managing individual workloads freeing up OPEX budget to put back into the business.
- It improves overall system reliability by reducing the amount of manual administration (a major factor in system reliability) required.
- It might free up sufficient space in your data center to enable you to avoid or delay a costly expansion.

IBM's zEnterprise server offers a powerful platform for the consolidation of SAP applications as well as a wide range of other workloads

Scale-out virtualization technologies, like VMware, promise all of the benefits of consolidation, and it is clear that scale-out virtualization does help in each of these areas. But there remain a number of basic limitations that can't be overcome by stringing a collection of blades together and virtualizing them using a technology like VMware;

- Scale out virtualization still only enables you to bring utilization up to around 50%
- Some applications (and database clusters often fall into this category) require direct connections to storage that cannot be provisioned automatically
- Software licensing remains complex and (in many cases) costly
- I/O intensive workloads like databases tend to encounter bottlenecks when virtualized within an x86 environment

The zEnterprise platform allows you to combine both scale-up and scale-out within a single environment

The zEnterprise platform can be used on its own, as a scale up platform, or in conjunction with the zEnterprise BladeCenter Extension which provides a highly integrated blade environment that connects directly to the zEnterprise machine via a private high-speed network.

Figure 2 shows the way the environment in figure 1 could be consolidated onto a single scale-up machine. It's immediately obvious that this approach is less complex, but what about the other factors (reliability, scalability, performance and cost)?

Reliability

Whereas in scale-out environments reliability is delivered by introducing redundant components across the system (and then managing and maintaining them) key components within the zEnterprise server (network switches, power supplies, even CPU's) are duplicated as part of the basic fabric of the server itself. These redundant components don't need to be managed or monitored separately as they are simply a part of a single managed environment.

Disaster recovery is also greatly simplified, as the number of hardware components that need to be duplicated is significantly lower. Additionally the platform supports shared data stores, advanced application and transaction failure tracking and consolidated disaster recovery and management tools that make zero data loss recovery not only achievable, but verifiable through periodic testing.

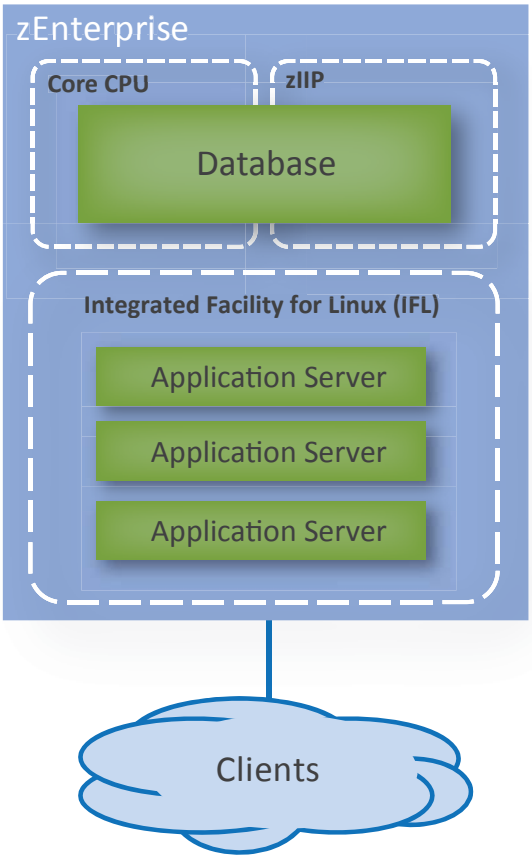

Figure 2. SAP consolidation on to zEnterprise

Scalability

The virtualization support that ships with the platform means that new instances of servers can be provisioned quickly, and whereas on virtualized Intel environments best practice mandates that processor utilization is capped at around 50%, zEnterprise processors typically run at well over 80% utilization with many running at utilization levels in excess of 95%.

On-demand scalability can be provided via Capacity on-demand, which allows additional processors to be shipped with the server that can then be activated (then subsequently deactivated) as processing requirements demand.

Performance

With the database and application servers running on the same machine, network connections between the database and the application servers are virtualized, the latency associated with a round-trip between the database and the application server (which may involve network traffic passing through a number of switches and routers) is almost eliminated. This can have a dramatic impact on application performance, as most application servers spend a large proportion of their time "waiting" for data to arrive from the database. One user (Gkd-el – see case study below) saw average SAP dialog response times fall from 570 to 190 milliseconds as a result of consolidating on zEnterprise.

Cost

A number of the clients mentioned in this report have seen significant cost savings, in terms of facilities (floor space, heating, cooling and electricity), staff costs, software license fees and hardware. For example, Baldor Electric (see case study below) saw a cost reduction of nearly 95% in terms of their database licensing costs when comparing zEnterprise with Intel or UNIX.

Case Study - gkd-el

gkd-el manages the entire IT infrastructure for the city of Gelsenkirchen, a city in Germany with almost 300,000 inhabitants. It also provides some managed application services for the city of Herne and for several other non-commercial customers.

The service level agreements that gkd-el must support promise sub-second response times for its customers' key SAP applications. As the SAP workload increased, gkd-el became concerned that it would fail to meet its service level commitments, so the company conducted a review of its infrastructure and chose to base its SAP infrastructure on an IBM System z10 server.

"*Continuous availability is an important issue for us: we need to be available 24x7 because one of our clients is the local police force. The IBM platform enables us to achieve these high-availability objectives while simultaneously reducing our operational costs.*" Willi Lohmann, CEO, gkd-el

After completing the migration, average SAP dialog response times have fallen from 570 to 190 milliseconds, while overall SAP throughput has grown by 270%. At the same time, the total cost of ownership of the new platform is 30% lower than previously and gkd-el reports that it is able to respond more quickly, and economically, to requests for new SAP application servers and test environments.

"*Despite the ever-increasing workload and the addition of new SAP functionality in response to customer requests, we continue to require just eight employees to run the entire 6,000-user SAP landscape.*" Willi Lohmann, CEO, gkd-el

The number of servers running on the platform continues to grow, currently all of the organization's SAP application servers, the central print-server and a geo-information system have been deployed to the platform.

zEnterprise: A platform for consolidation

The zEnterprise platform builds on IBM's five decades of mainframe experience to deliver an environment that can run both traditional mainframe workloads, as well as the latest technologies like Java and Linux within the same machine.

The server itself supports the addition of specialized, lower cost processors that can be used to run Linux and to offload workloads like Java, and some database processing tasks from the main processors. So, in the example shown in figure 2, the database processing would be split between a core CPU and a special purpose processor (zIIP) that allows a significant proportion of the database workload to be offloaded onto a lower cost processor.

The application server instances would be deployed to IFL (Integrated Facility for Linux) processors that act as on-board hosts for Linux virtual machines.

Launched in 2010 the zEnterprise platform introduced a number of innovations including the fastest ever server CPU (running at 5.2Ghz) and RAIM (redundant array of independent memory) which significantly improves the reliability of system memory by providing the same level of fault tolerance to RAM that RAID does for disk storage.

Combining scale up and scale out within a single environment

One of the most significant recent developments in IBM's high-end server technology was the introduction of the zEnterprise BladeCenter Extension (zBX).

The zEnterprise can be attached to a zBX, which provides housing for up to 112 Power blades, running AIX or xSeries blades (running Linux or Windows). The zBX can also host IBM's Datapower appliance and integrate with IBM DB2 Analytics Accelerator both of which can be used to boost database query performance.

The zBX is connected to the zEnterprise machine via two private network connections: a 10Gb Ethernet connection is used by the applications to provide high-speed connectivity, and a second management network (running at 1Gb/s) is used by the machine's management software to control the different hardware devices within the system.

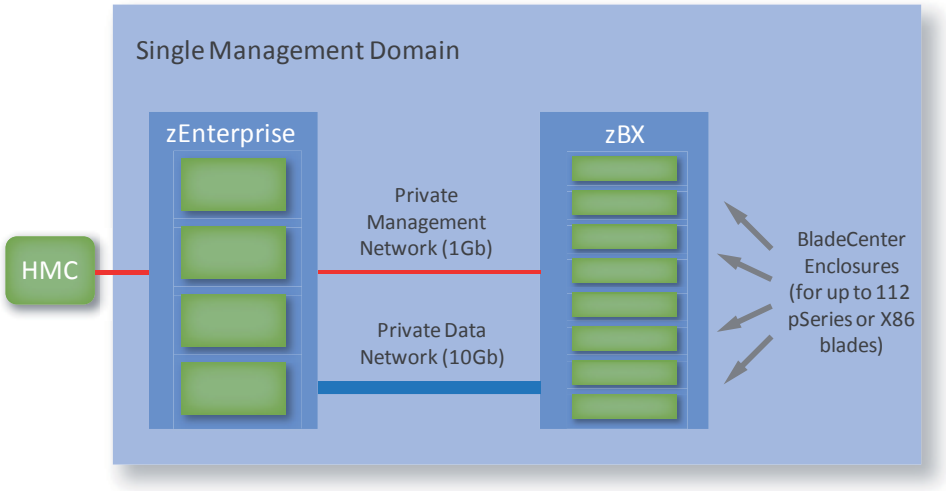

Figure 3. zEnterprise logical architecture

Case Study - Banco Pastor

Banco Pastor is among the top ten banking groups in Spain. The company employs over 4000 staff, in 650 branch offices (10 of which are distributed across the rest of Europe, the USA and Latin America). The bank provides a range of services in the domains of commercial/corporate banking, treasury and capital markets, and retail internet and telephone banking.

The bank's human resources applications were a complex combination of heavily customized applications with different components supporting the different HR functions (like payroll, vacation management and training for example). These existing applications were costly and complex to modify, and the bank was struggling to adapt the applications in the face of changing legislation.

"*We had major problems with our previous system. It was slow, hard to maintain, costly and seriously limited in terms of growth.*" Montserrat Torres, Computer Systems Manager, Banco Pastor

The bank embarked on a project to identify alternatives to their existing system, placing adaptability, cost and capacity for growth at the heart of the evaluation criteria.

"*We did not just want to fix the problem, we wanted an optimal solution in terms of cost and management, and wanted a system that was fast, robust and scalable.*" Montserrat Torres, Computer Systems Manager, Banco Pastor

As a result of the bank's evaluation process, the decision was to select SAP's Human Capital Management solution, and to run it on IBM's System z server platform.

While the old solution required 21 separate server machines, the new system runs on only two, and these machines also host the bank's Lotus Domino, and Notes servers.

"*We resolved our issues of scalability, speed and cost. We have reduced our footprint by 10 times and minimized our overall business risks. The servers are based in two separate sites and provide us with the utmost security by ensuring that even if there is a natural disaster we can maintain high availability.*" Montserrat Torres, Computer Systems Manager, Banco Pastor

The bank also reports major cost savings on database license fees by consolidating all of the databases onto DB2 running on the System z servers.

The new solution also brings benefits to employees, by dramatically simplifying the process of handling HR requests and information updates, many of which are handled automatically via an employee web-portal. The bank estimates that the delivery of the portal has helped to reduce the effort required to complete many processes by 30% and some by as much as 70%.

"*The combined IBM and SAP solution means that we have reduced the workload for two departments and simplified the administration tasks for our employees. We have made significant savings in our IT infrastructure, and the solution provides us with a highly scalable and robust environment that reduces our overall business risks. We are very happy with the results.*" Montserrat Torres, Computer Systems Manager, Banco Pastor

The blades housed within the zBX are managed, along with the zEnterprise server itself, via a single management component called the IBM zEnterprise Unified Resource Manager (Unified Resource Manager) via the Hardware Management Console (HMC). The Unified Resource Manager adds features to blade technology management that have traditionally been the sole preserve of the IBM's high-end servers. The management component automatically discovers new hardware, manages and monitors running hardware, and supports running upgrades to software and firmware.

The zBX is built with levels of hardware redundancy comparable to the zEnterprise itself, so key components like power supplies, power distribution units, network switches and fans are all shipped with at least one additional or redundant component.

Up to 8 zEnterprise nodes may be combined into a zEnterprise ensemble and managed as a single integrated set of virtual resources. In addition, System z Workload Management (WLM) – allows for automated resource management based on goals and policies across integrated SAP business processes, helping to ensure that key services are prioritized in line with any service levels that are in place.

Proof of concept – SAP Consolidation with zEnterprise and zBX

IBM staff in Montpellier (France) recently conducted a proof of concept (PoC) project for a major European energy distributor. The client is projecting that it will need to be able to perform over 30 million billing transactions per year using SAP for Utilities. The purpose of the PoC project was to determine the best way to support the client's very high throughput requirements.

The success of the project depended on the ability of the system to support the billing requirements for up to 30 million customers and to process 150,000 bills per hour.

IBM chose to deploy a single zEnterprise server (running DB2) connected to a zBX hosting Power7 blades (to run the SAP application servers and utility software).

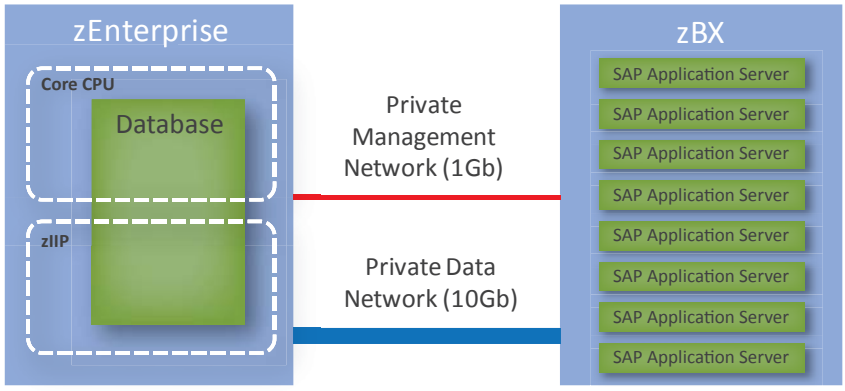

Figure 4. zEnterprise and zBX as a consolidation platform for SAP

A logical view of the PoC environment is shown above. The DB2 database was deployed on the zEnterprise server (using a combination of core processors and ZiiP processors), while the SAP application servers were deployed across 8 Power7 blades running within the zBX.

The final solution was shown to be capable of processing nearly three times the required 150,000 bills per hour (426,000) with further scaling only limited by the fact the SAP IS-U application handles a maximum of 200 parallel billing jobs.

Case Study - Baldor Electric

The Baldor Electric Company manufactures a range of electric motors, drives and generators. The company is headquartered in Arkansas in the USA, with 50 sales offices and warehouses in the USA, and 26 internationally.

After an acquisition, Baldor added another 200 servers with differing configurations and operating systems to its environment. Not only did this additional complexity represent greater cost, it also threatened the IT organization's ability to deliver a high quality of service.

"*Availability is a key issue for Baldor, and during our regular recovery tests we discovered that the complexity of the infrastructure was making it very difficult to maintain the levels of service our users require.*" Mark Shackleford , VP Information Services, Baldor

After examining the alternatives, Baldor decided to base its SAP environment on IBM's System z platform. The server has 6 central processors for general purpose workloads as well as three z Integrated Information Processors (zIIPs), which are used to offload database work load from the main processors, and 16 Integrated Facility for Linux (IFL) processors which provide a virtualization environment for Linux servers.

"*One of the great things about System z is the ability to reduce costs by deploying specialty engines," comments Mark Shackelford. "We run about 40 percent of our DB2 workload on zIIPs which brings the licensing cost down by about 95 percent compared to an Intel or UNIX infrastructure. All of our Linux environments run on IFLs, which again deliver a very considerable cost saving.*" Mark Shackleford , VP Information Services, Baldor

The new platform is being used as the consolidation platform for the applications that were previously running on the infrastructure that the company inherited as a result of the acquisition. The migration to SAP on System z is already complete for Baldor's U.S. operations and those in Germany, China, Mexico and Canada. The company is now in the process of consolidating 10 remaining plants to the platform. So far the consolidation project has resulted in a reduction of their infrastructure related electricity costs by 50% and the freeing up of close to 3000 sq. ft of data center floor-space which has now been converted to offices.

Conclusion

If your business relies on SAP, it's essential that you ensure that your SAP infrastructure delivers reliability and flexibility, ideally at the lowest cost possible. While recently it has been conventional wisdom to rely on horizontal scaling using racks of blades and technologies like VMware to deliver SAP, it's important to note that you now have a choice when it comes to consolidating and simplifying your infrastructure. IBM's zEnterprise platform offers you a choice, and has proven to be the right choice for a number of organizations.

About this Paper

This paper was sponsored by IBM, but the views contained within it are Bathwick's. We value our independence, and it is our policy never to write papers for clients unless we are permitted to retain full editorial control.

All of the case studies referenced in this paper have been verified both by IBM and Bathwick, and where necessary we have interviewed the clients concerned.

If you have any questions regarding the content of this paper, please feel free to contact its author, Gary Barnett by emailing him: gary@bathwick.com.

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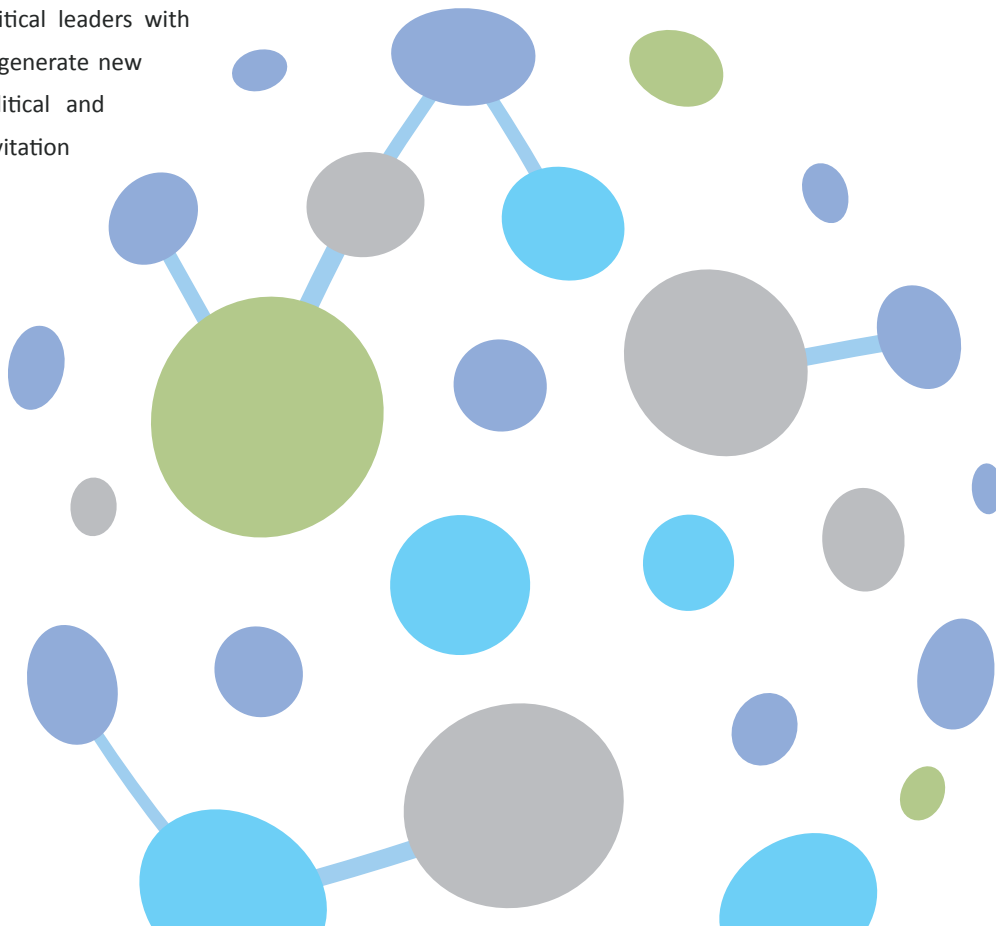

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