

A Bathwick Group  
white paper



A foundation for  
database simplification,  
consolidation and  
cost reduction



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Over the past decade the trend in infrastructure design has been towards *scale-out* architectures based on the x86 processor, where many machines are clustered together in order to create a *virtual mainframe*. In this paper we set out to challenge this approach and to demonstrate that modern mainframe technology represents a viable *scale-up* alternative to the current vogue for racks filled with blades, looking in particular at the way organisations can benefit in terms of improved agility, increased reliability and cost savings by consolidating Oracle databases onto IBM's zEnterprise and Enterprise Linux Servers (ELS).

The key to the zEnterprise proposition lies in the fact that it can be used as a *scale-out within* environment, providing a highly secure platform within which multiple independent workloads can be hosted.

## Key messages

- **Infrastructure complexity is killing IT and hurting the business**  
As our infrastructure becomes increasingly cluttered and complex, our ability to deliver on our promises to the business is becoming increasingly impaired
- **Consolidation and virtualisation is the only way to regain control of our infrastructure**  
Unless we take steps to consolidate the physical servers that we have we won't be able to deliver the infrastructure that the business requires
- **Under-utilised processors result in software licence wastage**  
The poor processor utilisation in the distributed environment, coupled with the lack of sub-capacity licensing models means that as much as 90% of your software licensing spend is simply wasted
- **zEnterprise offers a powerful platform for the consolidation of a wide range of workloads**  
IBM's zEnterprise provides a virtualisation environment that supports Linux, Java and traditional mainframe workloads all within the same machine
- **Consolidating workload onto the zEnterprise could help you deliver better performance, greater flexibility, and higher reliability while at the same time saving you money**  
The zEnterprise platform was expressly designed to provision, run and manage a mixture of workloads, and you might be surprised at the extent to which the platform makes economic sense even for relatively modest workloads
- **zEnterprise offers an alternative environment for running Oracle databases that could improve performance and flexibility while lowering cost**  
A number of organisations have already chosen to consolidate their Oracle databases onto either zEnterprise or the ELS
- **Running Oracle and Linux on zEnterprise is easier to do than many expect**  
Customers that have made the move to either consolidate Oracle or run virtual Linux servers on zEnterprise servers consistently report that once the transition is made, existing users can manage their applications using the same tools and processes they used before. The Oracle database has been supported on the mainframe since it was first released, and the administration tools and processes are common across mainframe and non-mainframe environments

## Call to action

- **If you are running ten or more Oracle instances you should look at the potential benefits of consolidating your Oracle databases onto zEnterprise**

By consolidating Oracle instances onto a single large machine you can gain significant benefits in terms of licensing costs, performance and management

- **If you are running 50 or more physical UNIX or Linux servers you should look at the potential benefits of consolidating your Linux workloads onto zEnterprise or ELS**

IBM's Enterprise Linux Server (ELS) brings the traditional power of the mainframe to the management of multiple virtual Linux machines, and the efficiency of IBM's virtualisation technology means that you will be able to run your server at levels of utilisation that are simply unheard of in the world of x86

- **As you continue to look forward in terms of how you plan to manage the evolution of your server infrastructure, don't forget that you have a choice**

There is a viable alternative to simply filling racks with blades that you know will never see consistent utilisation levels above 30%

- **Be ready to make the case for zEnterprise using proof of concept projects and rigorous TCO analysis**

Yes, for some of your colleagues the idea of consolidating onto "the mainframe" may seem counter-intuitive, but in many cases the facts, and their actual experience, will speak volumes

### Case Study : Transzap

Transzap is a SaaS provider that offers a software suite called Oildex which supports financial back-office transaction processing between energy companies.

"We have to be able to look our customer in the eye and assure him or her that our quality of service will be as good or better than the quality of service that can be provided to the organisation from their own IT infrastructure. The quality of service we provide to our customers has to exceed that of a Fortune 500 company." (Peter Flanagan, CEO, Transzap).

As a service provider, Transzap has to be able to offer the highest levels of availability to its customers, and be confident that it can scale its operations smoothly as the company grows. The company had begun to encounter reliability issues with its existing x86 distributed infrastructure. After two significant disruptions in service, Transzap took the decision to look for an infrastructure solution that would enable them to support current and future demand at levels of availability that its customers expect.

One of the options that the company looked at was IBM's System z platform, which seemed like a potential fit as the company already had experience of running its applications on Linux.

Transzap worked with IBM to conduct a formal total cost of ownership study. It concluded that a migration to System z would deliver high levels of reliability and availability while also saving the organisation money, notably on hardware costs and Oracle license fees.

## Introduction

For over a decade there has been a trend away from high-end servers towards clusters of x86 machines. This trend began at a time when high-end SMP servers were seen as prohibitively expensive, and it seemed that by linking a collection of x86 machines it should be possible to achieve the same levels of performance and reliability at much lower cost.

It is easy to see how this trend began. In the 1990's high-end servers were expensive and proprietary, when you bought a mainframe or mid-range server you were effectively committing yourself to a single operating system and a limited range of choices when it came to the software you could run on the platform.

But a lot has changed in the intervening years. IBM's mainframe family has undergone a huge transformation, and benefitted from billions of dollars of R&D investment since the 1990's. IBM's latest offering the, zEnterprise system and its more specialised cousin the ELS (Enterprise Linux Server), can securely host hundreds (thousands, even) of Linux servers. When using the zEnterprise system, these Linux servers can run alongside native mainframe applications like DB2 or Oracle which dramatically increases the speed of network communication between the virtual servers and the native applications.

## Infrastructure complexity is killing IT and hurting the business

When the concept of distributed computing began to emerge, it was driven by the belief that distributed computing offered an alternative that was;

- Cheaper
- Simpler
- Flexible
- Scalable

As time has passed, many organisations are now faced with a massive profusion of distributed servers running different versions of the same software, managed using different interfaces and running at highly variable levels of utilisation. The majority of these servers are running at typical utilisation levels of well below 20%, and average utilisation levels below 5% are common.

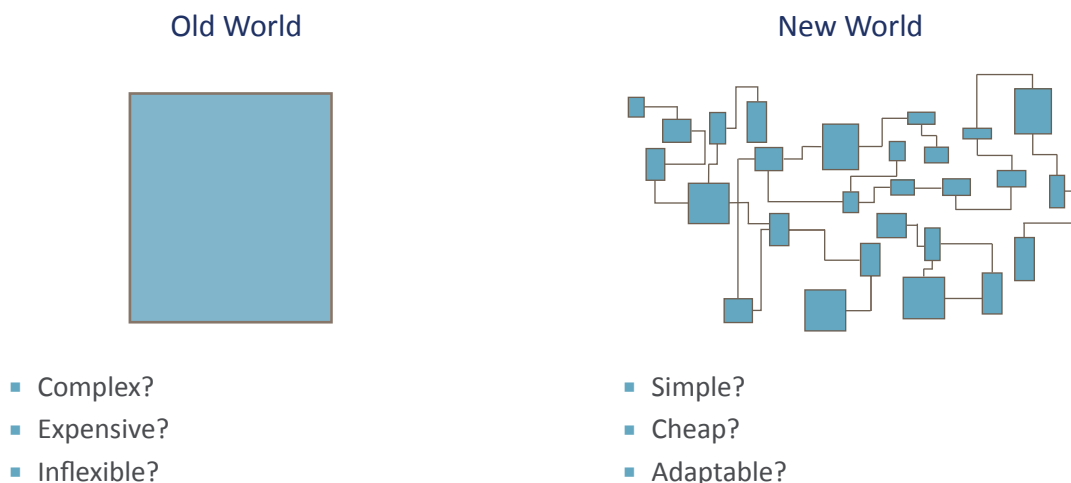


Figure 1. The old world of the mainframe vs the new world of distributed computing

## *It's time to revisit some of those earlier assumptions about the "old" and "new" worlds of computing*

The client-server revolution came about because it seemed to offer a simpler, cheaper and more flexible alternative to host-based computing. A quarter of a century later, we're living with the legacy of those expectations.

Over the past few years, virtualisation technology has "come to the rescue", promising to help organisations simplify and automate the management of their infrastructure. But in our experience, end-user organisations face major challenges when it comes to enjoying the promised benefits of virtualisation. On one hand we're seeing virtual server sprawl, where a failure in governance results in far more virtual servers being deployed than were ever anticipated. Secondly, we're seeing virtual server stall, where clients hit a wall (often when they've virtualised between 25 and 30 percent of the estate) at which point it becomes extremely difficult to continue virtualising the remainder of the estate.

### *Is scale-out really simpler than putting all of the workload onto one host?*

It isn't. A single host provides a single management interface, it internalises many of the components you need in order to support reliability and availability while in the distributed environment you have to actively double up on switches, network adapters and storage connections.

*"We hardly need to touch or reboot our Linux servers; we have far greater stability and dependability"*  
**Idaho Power Company**

Then the chances are you'll have to replicate much of this in order to provide a development and test environment.

The complexity inherent in distributed computing manifests itself in a number of ways. Firstly, it is getting harder to make commitments about reliability and availability when availability depends on an

intricate network of servers, network devices and middleware products, all of which need to be managed and configured, often using a variety of different tools and utilities.

### *Is scale out really less expensive?*

The cost of distributed computing has always been difficult to measure, while the big machines in the datacentre have always been subjected to minute scrutiny. Indeed, it's not uncommon for those big machines to pay more than their fair share for datacentre staff, floor-space and power/cooling; it's not uncommon for these costs to be allocated 100% to the mainframe, which now typically takes up only a couple of floor tiles in the corner of the datacentre.

If you want to compare the costs of scale-out with scale-up computing, you have to be sure that you're measuring costs accurately and allocating them appropriately.

One area where scale-up computing delivers very significant savings is in software license costs. Where software is licensed on a per core basis the analysis is pretty simple. If you're paying \$100 dollars to license a

*"The environment would have required 3-4 times the amount of money to replicate in other computing environments. Moving to Linux was the best thing we could do for our bottom line. We simply could not keep pace with continued growth if we had to continue purchasing more hardware and software licenses."*

**Idaho Power Company**

core that typically runs at 10% utilisation, you're paying seven times more for that software when compared to a core that typically runs at well over 70% utilisation. It's also worth noting that in the world of x86, sub-capacity licensing (where you pay on the basis that you're using only a fraction of a system) is still unheard of, whereas in the world of the mainframe it's an established practice.

### *Does scale-out really offer greater flexibility?*

Flexibility is often touted as a significant advantage of scale-out architectures, after all, if your application needs to scale-up, all you need to do is add another machine to the cluster or fire up another virtual machine.

*"We went from building a new Linux server in a couple of days, to just a couple of hours."*  
**Idaho Power Company**

But it's not always as simple as that in practice. First, you have to procure the hardware. Very few CFO's are content to approve expenditure for dozens of idle blades, so there's likely to be a procurement process. Next, you have to configure the server. Much of this can be automated of course, but in some instances

(particularly where it comes to clustered databases) manual intervention is still required in order to attach storage, and configure the machine for inclusion in the cluster.

On the other hand, technologies like IBM's zEnterprise and ELS can be shipped with stand-by capacity that can be brought online either permanently or temporarily when required through a simple on-line web-based interface.

In the new world, we're faced with the reality that our infrastructure is too complex, too costly and too inflexible. With each new server that is added to the environment things get worse.

### *As our infrastructure gets harder to manage it becomes more and more difficult to serve the needs of the business*

While there's no doubt that IT continues to offer organisations an opportunity to transform the way they do business, there are growing signs that business leaders are beginning to view the IT Department as a barrier to change rather than an enabler of it.

One of our clients, the CEO of a construction company, recently told us "In the old days, we'd be waiting for the machinery to arrive before we could begin construction, now we're waiting for the IT systems to be installed before we can start; and each day of delay eats away at our profits".

One of the drivers behind the adoption of Software as a Service (SaaS) by LOB managers is the belief that IT simply cannot deliver what they need in the time that they need it, or for a price that they're willing to pay. Smart IT shops should be moving quickly to support the full range of models, including Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and SaaS.

## *What does the business want from IT infrastructure?*

The business doesn't care all that much about how infrastructure is delivered. The business wants infrastructure that;

- Supports current business requirements in terms of reliability and performance
- Is capable of adapting to future business requirements promptly
- Does all of the above in the most cost effective way possible

We don't know of any business leaders that would say that they don't want better performance, flexibility and value for money when it comes to IT.

### **Case Study : Bank of New Zealand**

Like many large organisations, the Bank of New Zealand was running out of datacentre capacity and had to figure out how to make better use of the existing space, while maintaining tight control on costs. Additionally the bank also wanted to improve its disaster recovery provision. A further challenge was added by the fact that the bank has a corporate objective to become carbon neutral.

In 2007 the bank took the decision to consolidate all of its core systems (including its Internet banking and bank teller functions as well as core backend data) onto Red Hat Enterprise Linux 5 running under z/VM on the mainframe.

Over the course of the migration the bank consolidated 131 SUN SPARC servers onto the mainframe, which now serves as a host for Oracle, IBM WebSphere, custom Java and Linux workloads.

"Deploying IBM mainframes with Red Hat Enterprise Linux to address our carbon footprint and cost saving concerns was a very big deal, especially at the senior management level. It provided us with the opportunity to take a very serious leap into Linux, and that was exciting for everyone in IT and beyond," (Lyle Johnston, Infrastructure Architect, Bank of New Zealand)

As a result the bank was able to reduce its front-end systems datacentre footprint by 30%.

In addition the bank has reduced its front-end power consumption by nearly 40% and has recorded a 33% reduction in heat output and a 39% reduction in carbon dioxide emissions for the migrated systems. The bank also states that they have been able to reduce the time it takes to deploy a new environment from days to minutes, and now only requires a single administrator to manage 100 virtual servers.



## Consolidation and virtualisation is the only way to regain control of our infrastructure

Consolidation and virtualisation aren't just technical initiatives; they're business initiatives as well. Consolidation and virtualisation 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 virtualisation offers a number of advantages;

- It enables organisations 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 datacentre to enable you to avoid or delay a costly expansion

## zEnterprise offers a powerful platform for the consolidation of a wide range of workloads

Scale-out virtualisation technologies, like VMware, promise these benefits, and it is clear that scale-out virtualisation 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 virtualising them using a technology like VMware;

- Scale out virtualisation still only enables you to bring utilisation 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 virtualised within an x86 environment

Best x86 practice currently limits the number of virtual machines / core to around 3 and recommends that server utilisation should never exceed 50%, so if you were consolidating 100 Linux servers you'd still be looking at purchasing 10 relatively high-end blades or server machines. These factors limit the effectiveness of x86-based virtualisation in comparison with zEnterprise or ELS servers, where the target utilisation is typically well over 70% and the number of virtual machines regularly exceeds 30 per processor core.

	Single x86 Server	X86 Virtualisation Host	zEnterprise/ELS Host
<b>Typical CPU utilisation</b>	<20%	<50%	>70%
<b>Workloads / Core</b>	1	3	30 - 50

### Case Study: Nationwide Insurance

Nationwide Insurance is one of the United States' leading insurance companies, and over time the organisation has built up a hybrid IT environment that spans mainframe assets, Unix servers and Windows machines. The continued growth of the company's server estate led to it running out of space in its existing datacentre facilities so the company had to begin considering the acquisition, or building, of a new datacentre. Rather than spend many millions of dollars establishing a new datacentre the company adopted a strategy centred on consolidating its existing assets, and providing a platform that would support continued growth.

*"We were facing the same problems that any company our size has to deal with," says Buzz Woeckener, manager of Linux for Nationwide. "We were running out of floor space, cooling and electricity, and our servers were drastically underutilized."*

Nationwide decided to build what is in effect a Linux cloud using two System z mainframe machines. These servers provide a reliable, secure and cost effective hosting environment for the organisation's Linux workloads. By creating what is in effect a private cloud environment, the company expects to save \$15million dollars over three years. Meanwhile the ability of IT to respond to business demand has been significantly improved, new servers can now be brought on-line in minutes and new capacity can be added when required.

Other key benefits cited by Nationwide include:

- Environmental costs (power, cooling and floor space )reduced by 80 percent
- Web hosting costs reduced by 50 percent
- Hardware maintenance and support costs reduced by 50%
- More effective software licencing, and simplified server provisioning.

On this basis, zEnterprise promises up to 50 times more performance per core than a standalone server, and up to 15 times more than a virtual server. It's also worth remembering that Oracle supports sub-capacity pricing on zEnterprise CPU's.

### zEnterprise offers an alternative environment for running Oracle databases that could improve performance, reliability, and flexibility while lowering cost

The consolidation of Oracle databases instances onto zEnterprise, or the Enterprise Linux server, delivers a number of key benefits.

Firstly, in terms of performance, the fact that multiple instances are running on the same machines means that communication between instances takes place at bus speed, rather than network speed, and much of the latency inherent in network infrastructure is eliminated.

The zEnterprise platform benefits from over 40 years of reliability R&D, so that today much of the redundancy that needs to be hand crafted in a distributed environment is simply embedded within the platform.

The virtualisation capability of the zEnterprise platform, coupled with the ability to turn capacity on (and off) on demand, offers a great deal of flexibility when it comes to the addition of new functionality or the need to cater for short term spikes in demand.

For us, the most startling benefit reported by a number of customers is the dramatic savings that can be achieved in licence costs by consolidating workload onto zEnterprise. Some clients have reported savings in Oracle license costs in excess of 90%.

## Running Oracle and Linux on zEnterprise is easier to do than many expect

As a final point, it's important to remember that the idea of running Oracle on mainframe hardware isn't startling or new.

Despite being fierce competitors in many areas, IBM and Oracle have a long-standing partnership when it comes to deploying the Oracle database on the mainframe. The first release of Oracle was written for the mainframe and since then, the Oracle database and applications like PeopleSoft and Seibel has been fully certified and supported on the platform. For zEnterprise the database itself is managed and administered in the same way as it would be in a distributed environment using Oracle Enterprise Manager, which means that existing DBAs don't require any additional skills or training.

### Case Study: Idaho Power Company

The Idaho Power Company provides electricity in southern Idaho and eastern Oregon. In the course of the company's on-going efforts to deliver the highest levels of service to its customers and staff, the company began the process of consolidating its infrastructure. The company chose use the combination of Novell's SUSE Linux enterprise server and IBM's System z mainframe platform as a consolidation platform for Oracle and Linux workloads.

The project began with an engagement with Novell Consulting with support from both IBM and Oracle. In the first phase 30 physical servers were consolidated onto the mainframe, resulting in a significant saving in server costs and Oracle license charges.

Today the company runs a number of its core applications on the platform supporting back office functions (payroll and tax accounting, for example), as well as mission critical applications supporting service continuity. The company's test and development environment runs on the same platform which reduces the cost and time taken to bring new applications into production.

The company reports improved levels of reliability, greater agility and a significant cost saving in terms of hardware, administration and software license fees.

## Summary

The goal of this paper isn't to persuade everybody that the mainframe is the best choice in every case, but to make the point that the mainframe is a viable option in many cases. Just as the last decade has seen tremendous developments in the power and performance of x86 processors, it has also seen a dramatic improvement in the performance, flexibility and price of the mainframe platform.

As the trend towards cloud-computing and the management of virtual servers as a pool of resources continues, organisations need to be aware that there is an alternative to filling your datacentres with blades, and that some organisations have been able to achieve significant cost savings, improved performance and higher levels of reliability by choosing the mainframe platform as a platform for server consolidation.

If you are running more than 50 Linux servers, or have an Oracle cluster with more than 10 nodes you should, at the very least, be prepared to consider System z or the Enterprise Linux server as a "scale out within" alternative to deploying cabinets crammed with blades.

## About The Bathwick Group

The Bathwick Group is a research-based consulting company that helps clients address their most pressing needs in strategic planning, go-to-market planning and execution, and IT infrastructure effectiveness:

### CONSULTING

- **Bathwick Engage** A rapid collaborative consulting service combining external experts and IP protection mechanisms to expedite solutions to major corporate challenges
- **Enterprise IT strategy** Planning and contract support for enterprise IT leaders; productivity and infrastructure agility benchmarking and best practice
- **IT vendor strategy and marketing** Customer analysis and deep research for IT vendors targeting mid-market and enterprise markets
- **Sustainability strategy** Modelling and benchmarking for organisations wishing to embed sustainable practices and mitigate strategic risks

### RESEARCH AND BENCHMARKING

- **Research Platform** A flexible software platform for organisations to deploy their own surveys and benchmarks, both internal (e.g. employee surveys), or external (e.g. market intelligence)
- **Media Platform** A research platform for online media customers, providing an engagement environment to encourage reader registration and generate new revenues

### SALES ENABLEMENT

- **The Customer Insight Platform** A software platform that supports deployment of sales guidance, customer assessments, marketing collaterals, ROI tools, etc. direct to a seller's laptop for online and offline operation; for both direct and channel sales support.

The Bathwick Group also includes the *ThinkAgain Partnership LLP*, a global collaborative research network, which brings together academics, writers, business and political leaders to generate new insights into business productivity and performance, geo-political and environmental issues.

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