



## Optimising Linux on System z as part of a hybrid IT architecture

*Businesses need to ensure that their IT platforms are flexible enough to deal with their on-going needs, are capable of dealing with the peaks and troughs of cyclical loads, and are also being run at an optimised level when it comes to energy and resource consumption.*

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Despite misconceptions of the mainframe being old-fashioned or even dead, sales of both new systems and incremental MIPS continue to grow yearly, and an increasing number of organisations are seeing the business value that this platform provides. Linux on System z has opened up new opportunities for the mainframe – opportunities that any organisation looking at consolidation and energy efficiency, alongside flexibility, should consider. However, to achieve the full benefits offered by Linux on System z, the correct tooling must be put in place to manage, secure and optimise the environment.

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*In a world where business demands on IT are growing rapidly but IT budgets are often stable or shrinking, organisations need to implement IT strategies that reduce costs and increase overall value to the business. Hybrid computing can provide the flexible infrastructure for businesses to address these needs, and Linux on System z is proving to be a key platform within this infrastructure, enabling significant cost savings and business agility.*

<b>Reduced cost</b>	Consolidating to Linux on System z can significantly lower operational costs through increased utilisation and reduced energy consumption, floor space and staffing. A holistic approach to managing z/OS, z/VM, and Linux on System z, along with a distributed Intel environment, further increases opportunities for cost saving and business agility.
<b>Workload flexibility</b>	The rise of virtualisation enables the use of multiple platforms to best serve the needs of different business workloads. To optimise these heterogeneous computing environments, it is essential that organisations put in place the correct tools that can effectively manage the operations, provisioning, scheduling, security and performance of these workloads across multiple systems such as distributed platforms, z/OS, z/VM and Linux on System z.
<b>Server consolidation</b>	Linux on System z provides an environment where hundreds or thousands of workloads can be consolidated onto a single platform. Various workloads – from front-end desktops to full backend systems such as ERP and CRM, as well as Java-based functions within a cloud architecture – can all be run on Linux on System z. Consolidating to System z can improve performance of applications by moving them closer to the data source; for example, the use of application servers running under Linux on System z accessing DB2 on z/OS. Even where it is desired that the business logic is run on a distributed platform, Linux on System z can provide a strong foundation for managing the underlying database, providing high availability, along with robust transactional and back-up and restore capabilities. This enables organisations to leverage the proven reliability, availability and security of the mainframe.
<b>Centralisation of data</b>	With the consolidation of workloads comes the consolidation of information and data into a single environment. Even where Linux on System z is used within a distributed architecture, data can be aggregated and reported against more consistently. Information can be managed more securely and reported in a more efficient manner that avoids information silos and adds distinct value to the business.
<b>Business agility</b>	Today's world is highly dynamic, and businesses need the ability to respond rapidly. For many organisations, technology is becoming a constraint on business, rather than an enabler. By using Linux on System z and the mainframe as a central point within the compute architecture, organisations can achieve greater control of application performance, capacity planning and management of cyclical workloads. Comprehensive management tools can help organisations scale their Linux on System z environment quickly and reliably to accommodate business opportunities and growth.

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## Conclusions

With the introduction of IBM's multi-workload hybrid mainframe, zEnterprise, and the numerous technology advancements to System z, many organisations are seeing the platform in a new light. Where standardisation on an Intel-based platform may struggle to provide the scalability required to support business growth, Linux on System z can not only provide a platform for consolidation of workloads, but can also act as a central point to monitor and manage the rest of a hybrid environment in a manner that provides strong business value.



## Background

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For many, the mainframe is seen as yesterday's technology; a platform being used by old-fashioned organisations that just cannot move existing applications off a high-priced, proprietary platform. However, these same people are then surprised when actual mainframe usage figures show new installations and incremental growth. In fact, IBM is shipping more MIPS of mainframe capacity than ever before. Some of this is going towards traditional mainframe workloads but much more is going towards supporting brand new workloads based on Linux on System z. Designed to run mixed workloads at very high utilisation, IBM's z/VM virtualisation environment and Integrated Facilities for Linux (IFLs) enable open-standard Linux workloads to be hosted as 'guests' on a highly available, highly reliable, ultra secure platform – at significantly reduced costs. The introduction of the mixed-workload zEnterprise (a platform that provides a standard mainframe platform with built-in IBM Power and Intel capabilities) extends these benefits and has opened up the platform to new markets.

It is felt by many people that consolidation should only be considered across a distributed, Intel-based platform. With many Intel servers running at less than 10% utilisation, consolidation can drive these utilisation rates up to 50 or 60%, lowering the number of servers required by up to 80%. However, a mainframe running Linux on System z can run at utilisation levels above 80% - and the system is engineered for virtualisation and consolidation, using far less space and energy than an equivalent Intel platform. As part of a data centre rationalisation, virtualisation and consolidation exercise, the use of Linux on System z should not be overlooked, even by those who have never considered the use of a mainframe before.

However, for the vast majority, there will remain a need for an Intel-based platform. The use of a mainframe should never be an 'either-or' choice; decisions need to be based on what workloads will perform best – on a risk, cost and business value basis – on which underlying platform. Therefore, a 'hybrid' platform will result – one where the mainframe will need to co-exist alongside a distributed world. However, neither platform should be managed in isolation – tools will be required that can manage the total environment, from the hardware through the software stacks, ensuring that application availability, performance and manageability are all provided for.

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There are numerous performance, reliability and cost saving benefits of consolidating to Linux on System z. The objective of this document is to look at the different types of workloads best suited for consolidation to Linux on System z, strategies to leverage a holistic management approach, and cross-platform solutions to ensure these workloads operate at an optimal level to fully exploit the potential cost and scalability benefits of the platform.

### Benefits of consolidating to Linux on System z

Below is a brief summary of where Quocirca sees organisations now choosing Linux on System z as part of their hybrid computing platform to reduce operational costs and support business growth.

- **Hardware consolidation.** Linux on System z provides a high-utilisation platform for server consolidation. Many distributed scale-out platforms are running at under 10% utilisation and even highly-virtualised distributed platforms tend to run at only 50–60% utilisation; whereas mainframes generally run at greater than 80% utilisation rates. Moving workloads onto the mainframe saves energy and space, as hundreds of distributed servers can be removed from the equation, leading to direct cost benefits.
- **Software consolidation.** IFL specialty engines, designed to add additional processing capacity exclusively for Linux workloads running on System z, can provide significant price/performance benefits for customers consolidating workloads to Linux on System z. The IFL incurs only a one-time charge — as opposed to on-going monthly license fees. Additionally, IFL pricing does not count in the normal MIPS-derived software licensing framework. Since many applications are priced on a per-core basis, these IFL pricing structures can provide massive savings on mainframe licencing costs. Even at a pure operating system level, the move to Linux on System z servers, hosted on z/VM, can save hundreds of thousands of dollars compared to



commercial licenses for thousands of Intel-based Windows servers, and consolidating high-cost, per-core licensed enterprise applications to Linux on System z can provide additional savings of similar levels.

- **Reduced staff.** It is generally estimated that one sysadmin can support between 100 and 150 servers in a distributed environment. Quocirca's research shows that the majority of large organisations are running several thousand servers, requiring dozens of sysadmins, along with other technical support staff. Consolidating workloads to Linux on System z can result in fewer sysadmins and technical staff needed to support the environment, significantly lowering personnel costs.
- **Resource sharing and scalability.** z/VM provides an optimised virtual host environment for Linux server consolidation and scalability. The hypervisor is built-in, not added on, and provides a 'share everything' infrastructure for maximum utilisation of resources including CPU, I/O, memory and networks. z/VM enables new Linux guests to be quickly and easily provisioned and de-provisioned to provide the scalability needed for changing business needs. In addition, IBM's HiperSocket technology provides secure, high-speed communication between Linux images and traditional mainframe applications and databases.
- **Greater systems availability.** The mainframe is a proven platform for high availability. Moving workloads onto the platform can reduce downtime for the business, providing a level of business continuity that is difficult to put a value on – until an existing Intel-based system fails, in which case the costs become apparent very rapidly. As organisations have become more dependent on IT, the need for high availability and business continuity has grown.
- **Reduced space and energy consumption.** Ensuring that a distributed environment provides high availability often leads to the need for an 'N+M' architecture – over-engineering the number of components (servers, storage systems, network equipment) used so that the failure of any single item will not compromise availability. This leads to more servers being in play and lower overall utilisation, which results in higher licensing and energy costs. In addition, more IT equipment requires more floor space – which could lead to the need for a new data centre being built. Consolidating suitable workloads to Linux on System z can significantly reduce energy consumption and prevent costly data centre expansion.
- **Information security.** For decades, the mainframe has been the platform of choice for organisations that need high levels of data and information security. The use of the mainframe as a central security controller for user access to the services available consolidates security management into one place, reducing security issues that can be introduced through a multi-point security approach.

### Adjusting mainframe misconceptions

From Quocirca's viewpoint, many of the perceptions around the mainframe also come from out-dated viewpoints. It is important to look at these so as to be able to view the mainframe as it now is.

- **Mainframes support more than just home-grown applications.** When the mainframe was first introduced, the independent software vendor (ISV) ecosystem was immature, so organisations using mainframes needed large numbers of developers turning out Cobol code to support certain business functions. With Linux on System z, the market is opened up to a massive ecosystem of both commercial ISVs and independent coders. Free, open-source software (FOSS) and commercial, off-the-shelf software (COSS) are available to meet nearly any application or functional need. Even where coding is required, the use of modern development systems, such as Eclipse, in conjunction with project portfolio management tools, such as CA Clarity PPM, means that code development is no longer arcane nor removed from the activities of coders in the Intel-based environments.
- **The mainframe is no longer a silo.** As the use of distributed computing grew, the mainframe became a platform for specific workloads, and tended to operate outside of what was happening in the distributed world. As the importance of IT also grew in an organisation, techniques were developed to try and bring the two very dissimilar worlds together, through the use of enterprise application integration (EAI) and then through enterprise service buses (ESBs) and other middleware approaches. Now, however, the use of Linux on System z, along with standardised database, middleware and messaging systems, means that the mainframe can operate as a complete peer to the distributed environment, with integrated information flows in both directions.



- **Managing the mainframe is now easier and less costly.** The mainframe has historically been perceived as being difficult to manage. Systems management tools were removed from application management tools, and the system administrator function was viewed as mysterious and irreplaceable. However, today's mainframe environment has advanced management tools available that not only simplify the management of the mainframe, but also enable it to be done within the context of the greater IT estate. As Linux on System z and virtualisation usage grows, the use of advanced automation in provisioning and managing workloads is also growing. The mainframe is no longer difficult to manage.
- **Adding more resource to the mainframe is easier and less expensive.** The advent of zIIP, zAAP and IFL specialty engines has meant that adding more resource to a mainframe is easy, and even adding more core MIPS is a relatively simple task. The mainframe is no longer a monolithic 'black box' that is designed and engineered to provide specific resources – it is now a highly flexible and extendable platform.

Altogether, the mainframe is in good health and an increasing number of workloads can be migrated to the platform. However, it is not a universal panacea, and the position of Linux on System z within an overall hybrid IT architecture has to be carefully planned, and the correct tooling needs to be put in place to ensure that the overall end-user experience and business benefits are optimised.

The first step is to look at what business processes are in place and where to allocate workloads to optimise performance of those processes.

## Allocating workloads to optimise business performance

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Historically, applications have been all-inclusive, containing all the functionality required to perform a given business function such as customer relationship management (CRM) or enterprise resource planning (ERP). Organisations often find themselves paying for duplicate functionality as well as many unused capabilities. These overlapping applications come with more than a licence price; they also require maintenance and hardware resources as well as the associated energy and space costs.

There is now a move towards more granular application components aimed at facilitating business tasks. By getting the granularity correct, composite applications can be built very rapidly through aggregating technical functions that support and facilitate dynamic business processes, providing increased flexibility and speed of response to the business itself. However, this requires a far more manageable environment than many organisations currently have. Taking a more granular approach to computing has multiple benefits:

- Functions can be reused across many different processes
- Business processes can be supported in a far more flexible manner by swapping functions in and out as needed
- Maintenance can be carried out more quickly, without requiring the complete shutdown of an application or impacting business operations.

This granular approach also increases the flexibility of where workloads can be placed to gain the best support from underlying platforms – for example, some workloads may be better suited to remain on an Intel-based platform, while others would benefit strongly by being consolidated to Linux on System z. Some workloads may have cyclical requirements, where running on smaller distributed scale-out servers some of the time makes sense, but for certain





periods of time it would make more sense to move these workloads over to the mainframe so that they can make use of the flexibility and performance gains of such a platform. However, such an approach is predicated on the right tools being in place to monitor the workloads and the hardware resources, make decisions based on events and carry out complex actions in an automated manner. This will ensure that the performance of individual functions and the overall composite application is optimised to meet the changing needs of the business.

### Facilitating business agility through hybrid computing

IT has become a business enabler, and is central to the competitive capabilities of an organisation. Systems are used not only internally but also across a complex value chain of suppliers, customers, consultants, contractors and external stakeholders such as those requiring proof of compliance. Businesses are realising that an application focus is constraining them and that IT needs to support a far more flexible, business-process driven model. To facilitate this increased business agility, IT organisations are realising that a flexible, integrated and fully managed hybrid computing environment is the way forward.

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Linux on System z offers much for an organisation that is looking at server consolidation and moving to a hybrid computing architecture to support flexible workloads. Organisations need to understand what platform will run their application components most effectively and at the lowest overall cost. For example, it may be possible to break the application down into the business logic and the database component – and, in many cases, it may be more effective at a cost and performance level to move the database to Linux on System z. In addition, existing Java-based application components can be easily ported onto a Linux on System z environment, providing the business with the additional availability, security and manageability of running the applications on such a platform. For those looking at moving towards a more functional, component-based platform, new functions also can be built to support composite applications directly on the Linux on System z platform.

### Workloads best suited for Linux on System z

In addition to on-line transactional processing (OLTP) workloads traditionally run on the mainframe, Quocirca is now seeing the following workloads being moved to Linux on System z:

- **Linux-based desktops.** The ability to run thousands of desktops directly on Linux on System z means that they can be accessed via devices used by a person in any location with connection to the server. Information can be secured and reported on with far greater effectiveness. The elasticity of the z/VM and Linux on System z environment ensures that utilisation rates remain high while performance is maintained. Security can be managed directly through the mainframe itself, protecting corporate intellectual property.
- **Enterprise applications.** Many enterprise resource planning (ERP), customer relationship management (CRM) and supply chain management (SCM) applications are now available on Linux on System z. With many of these being based on per-core licences, the savings gained by consolidating to Linux on System z can be considerable, while the high availability of the platform will also minimise downtime to the business.
- **Java workloads.** Java has become pervasive as a means of providing functional components, and yet organisations are identifying problems with areas such as memory management and resource scavenging. Moving these workloads to Linux on System z means that tools can be applied to better manage such workloads and provide greater overall performance. Many Java workloads are cyclical and, as such, need to be provisioned and de-provisioned on a regular basis. Linux on System z, running under z/VM, provides an excellent platform for such elasticity, with resource management being a core function of the platform.
- **Database workloads.** Even where the business logic has to be left on the distributed environment (for example, with Windows-based workloads), as mentioned earlier, it can be more cost-effective to move the database component to Linux on System z. Here, proven operations, performance management and disaster recovery tools can be applied against the database to ensure optimum performance and protection of the database.



- **Middleware systems.** Moving the main components of middleware systems, such as IBM WebSphere or Oracle WebLogic, to Linux on System z enables better overall management and higher levels of security of these systems.
- **Communication and collaboration systems.** The need for email, instant messaging, video conferencing, wikis and other social networking capabilities is still growing. Point solutions and uncontrolled use of public systems to run these applications can open up all sorts of security and manageability issues. Consolidating to Linux on System z can provide a highly scalable and manageable environment for these workloads.
- **Management software.** The mainframe is an excellent platform for different types of management tools, from basic systems management through security and application performance management. Such tools have evolved to be able to work transparently with equivalent tools in a distributed environment, with the mainframe either being the centre of the whole management environment, or working as a feed into a more distributed systems management platform.
- **Analysis and reporting.** Linux on System z supports many applications and tools that enable complex event processing and data analysis, as well as the ability to provide business reports in a dynamic and effective manner. Centralising such tools onto Linux on System z offers a more effective approach to managing information, particularly in support of governance and regulatory compliance (GRC) requirements.

Linux on System z has considerably broadened the workloads that are suitable for placing on the mainframe and should definitely be evaluated when defining a hybrid computing architecture. When assessing workload placement, organisations should consider utilising management tools to gather detailed performance data from each of the candidate platforms – whether they be Intel-based servers, z/OS or Linux on System z – to compare performance and identify the best platform to provision given workloads. Benchmarking in this fashion should include multiple workloads in order to truly evaluate cost, performance and utilisation of the various platforms.



## Case Study

### ***Global Manufacturing Company Consolidates SAP to Linux on System z – Significantly Reducing TCO***

A key growth strategy implemented by many corporations is to acquire companies in markets similar to their own. This often creates challenges related to streamlining business processes, systems and other resources. To address these challenges, a global manufacturing company implemented the complete suite of SAP finance, payroll and logistics solutions – enabling it to standardise business process flows and more quickly merge operations across companies. For many years, it ran its applications on a distributed IT environment including UNIX and Windows servers, as well as mainframes. In this distributed architecture, it found that it had to constantly add more servers, as well as more administrators and managers, in order to scale its computing capacity. Also, as acquisitions took place, it found that it kept inheriting more and more distributed servers as well as more and more people to manage those servers. The organisation re-evaluated its IT strategy, and chose to migrate its numerous UNIX servers to Linux on System z. This enabled the organisation to greatly reduce overall costs, including software costs as well as corresponding staff management costs. Consolidating to Linux on System z also enabled it to increase utilisation of the IT environment, resulting in additional savings in operational costs through:

- Reducing electric costs by 40%
- Reducing air conditioning costs by 50%
- Reducing required data centre floor space by over 80%

As a result, this manufacturing organisation has driven down its IT costs to less than 1% of revenue, compared to an industry average of approximately three per cent. In addition to these significant cost savings, it has also experienced 31% improvement in application response time after migrating SAP from UNIX servers to Linux on System z.

This case study illustrates the importance of evaluating all factors related to operational efficiency when assessing true total cost of application ownership (TCO). In addition to the upfront cost of hardware and software, operational costs such as power, cooling and floor space need to be taken into consideration, as well as the less tangible (and often overlooked) cost savings provided by proven system availability and business continuity. This manufacturing company shows how a centralised mainframe-based strategy, leveraging Linux on System z, can provide not only significant cost savings, but also the scalability needed for business growth – with optimum reliability, availability and security.





# Tooling a hybrid architecture for business benefit

A key to ensuring that IT is operating efficiently and supporting the needs of the business is making sure the correct system management tools are in place – this is an imperative when it comes to operating a hybrid architecture across multiple platforms, such as z/OS, Linux on System z and Intel-based servers.

There are numerous vendors that offer tools for managing the mainframe, as well as vendors that specialise in tooling for distributed platforms. However, when it comes to managing a hybrid environment, organisations should evaluate vendors and tools that support multiple platforms and have the ability to integrate system management functions such as operations, security and performance. This provides full visibility of what is happening across the entire enterprise and, in particular when consolidating workloads to Linux on System z, it is valuable to have the flexibility of managing the Linux servers from both a distributed and mainframe perspective, enabling the ability to leverage existing investments and resources.

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Quocirca recommends that buyers look for the following integrated capabilities when assessing solutions to manage their Linux on System z environment as part of a hybrid computing architecture:

- **Performance management.** Although the mainframe is a high-performance platform, interactions with distributed systems across networks can have unforeseen impacts on overall performance. Managing application performance and optimising end-to-end response time is key to meeting service level agreements (SLAs). Each stage of a function's performance needs to be monitored and measured, and tools need to be in place to advise on how performance can be remediated or enhanced, as well as identify the root cause of problems. These tools should also provide the ability to track resource usage should an organisation wish to use departmental chargeback or just report back usage patterns into the business; perform capacity planning; and enforce budget limits. This cannot be done on a per-platform basis – it has to be across all systems in place. Some additional capabilities to look for when selecting a Linux on System z performance management solution are:
  - **Low overhead.** Performance management solutions should utilise the lowest possible overhead, so as not to create the exact problem they are trying to resolve. Avoid solutions that are recommended to run *only* when problems occur, as they do not provide the full benefits of trend analysis and problem prevention.
  - **Data accuracy.** Linux on System z performance solutions should capture detailed data from each individual Linux server to provide the most accurate information possible for performance optimisation and cost chargeback.
- **Disaster recovery.** The systems, applications and data contained on an organisation's IT environment are the very lifeblood of that organisation. The ability to efficiently back-up the entire environment, as well as quickly restore those back-ups at a granular level in the event of a system corruption, item failure or critical facility disaster, is essential. The mainframe is known for its disaster recovery (DR) strengths, and implementing Linux on System z back-up and restore tools that leverage this existing DR infrastructure will reduce operational costs and provide maximum protection of Linux workloads.
- **z/VM management.** z/VM enables consolidation of many virtual Linux instances onto a single environment, providing greater systems utilisation, efficiency and resource sharing. Running Linux on System z under z/VM also makes it much easier and faster to create multiple Linux images and manage them effectively. Tools should be used to manage the underlying z/VM environment and, as more Linux servers are



allocated, management becomes even more critical. By automating tasks and maximising machine, staff, tape and storage resources, z/VM tools can control costs and provide more efficient system performance.

- **Automated provisioning.** It is a waste of resources to run functions just on the off chance that the business may want to use them. Today's systems can be managed such that functions are provisioned as required – and de-provisioned after use, optimising resource usage across the total IT system. However, where a hybrid environment is being used, it is also necessary to ensure that each workload is provisioned to the right platform. Tools should be used to understand the various system components required to execute a business function on the fly, and then help determine where that function should run. Linux on System z and z/VM management tools can help ensure that flexibility is maintained while resources are optimised by enabling new virtual Linux servers to be deployed quickly and easily.
- **Workload management.** Businesses are changing rapidly and, as such, organisations need the ability to quickly and easily define and manage complex multi-platform workloads from a business process perspective. Integrated cross-platform solutions provide the ability to visualise, automate and optimise application workloads across the enterprise from a single console, while also maintaining the granularity and depth of information needed to manage and resolve issues. Tools should be used to automate job schedules and trigger events, as well as dynamically manage workloads based on prioritised critical paths, to meet SLAs with real-time information.
- **Security management.** Organisations need to enable flexible system access while enforcing rigid safeguards to secure the IT environment. Tools should be used to monitor and secure the Linux on System z and z/VM environment as well as enable auditing and controlled sharing of data and resources.
- **Resource management.** Few functions or applications have continuous resource requirements. CPU, storage, networking and input/output (I/O) requirements change as the number of users and transaction volumes change. Cross-platform operations and capacity management tools can:
  - Ensure that the correct amount of resources is available at all times
  - Balance resource needs across the total IT environment
  - Enable workloads to be offloaded to lower tier resources, as appropriate, during low-usage or non-priority times.
- **A service catalogue.** To enable the IT department to move away from taking requests from users for applications to be made available to them, it is far better to provide a system where the users can provision themselves automatically through a portal. What is made available to them should be controlled through the use of enterprise directories, using security policies applied by individual and role. An organisation's choice of service catalogue should be capable of including those services available on the mainframe alongside those in the distributed arena.

Linux on System z tools are available that not only simplify the management of the platform, but also enable it to be managed within the context of the greater IT estate. As Linux on System z and virtualisation usage grow, provisioning and management tools are becoming more advanced. The mainframe is no longer difficult to manage. It is an agile environment that provides the reliability, security and availability necessary to run the most critical of enterprise workloads.



## Conclusions

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The mainframe is not dead, nor is it dying. The platform has been completely modernised, and the advent of Linux on System z, as a fully supported and managed platform, has opened up the mainframe to new workloads and to new customers. In a world where business requirements are highly dynamic and there is increasing focus on cost reduction and IT efficiency, the mainframe can provide an effective environment, not only to support critical business workloads but also to orchestrate and manage the wider distributed environment.

It is hoped that this report shows how varying workloads – ranging from entire enterprise applications to Java-based components – can be ported to Linux on System z to provide distinct business value with lower risk and lower cost.

The keys to an effective hybrid architecture are in determining where a specific workload is best served and putting in place the appropriate tools to manage the total environment. These tools should help provision workloads, monitor and manage application performance, optimise operations, and secure the environment. On top of this, these tools should provide business continuity by ensuring high availability of data and information, alongside solid backup and restore capabilities. With a proven track record in the most demanding of environments, the mainframe should be considered as a natural hub for dealing with these needs.

As tools have matured on the mainframe, its proven strengths are expanding to broader markets – the highly focused and in-depth skills historically required to manage the mainframe have been simplified by the tools now available on the platform. Through the use of ‘single panes of glass’ administration systems, technical staff, and even line of business personnel, are able to centrally manage the environment and remediate problems across the architecture. As such, the mainframe becomes a key and cost-effective component of the overall hybrid environment, adding significant value through enhanced security, reliability and availability.



## About CA, Inc.

CA Technologies is a global information technology (IT) management software company, helping companies manage IT in all environments — mainframe, distributed, virtualised and cloud — to become more productive and better compete, innovate and grow their businesses. They apply decades of experience and innovation to develop and deliver software that integrates with other solutions to make a company's technology investments more valuable.

CA Technologies makes it possible for organisations to efficiently and securely take advantage of new technologies while managing existing ones. As computing environments become more complex, CA software simplifies IT management. Organisations can see, manage and secure data, information and IT assets regardless of the physical or virtualised platform, hardware or operating system, across on-premise and cloud-based environments. CA Technologies solutions automate critical and time-consuming processes to improve the cost and quality of services. As a result, organisations can reduce costs and risks, improve IT services and sharpen their competitive edge.

Serving customers in virtually every country in the world, CA Technologies works with the majority of the Forbes Global 2000, as well as government organisations and thousands of companies in diverse industries worldwide.

### *CA Management for Linux on System z*

CA Technologies offers a portfolio of comprehensive, integrated management solutions for Linux on System z that provide the scalability needed to grow the business and reduce the time, cost and risk of consolidating workloads to Linux on System z. Increase IT efficiency and maximise ROI with a holistic enterprise view of Linux on System z operations, performance, security and data protection. [CA Management for Linux on System z](#) includes products such as CA VM:Manager Suite, Velocity zVPS Performance Suite and UPSTREAM for Linux on System z.



#### REPORT NOTE:

This report has been written independently by Quocirca Ltd to provide an overview of the issues facing organisations seeking to maximise the effectiveness of today's dynamic workforce.

The report draws on Quocirca's extensive knowledge of the technology and business arenas, and provides advice on the approach that organisations should take to create a more effective and efficient environment for future growth.

## About Quocirca

Quocirca is a primary research and analysis company specialising in the business impact of information technology and communications (ITC). With world-wide, native language reach, Quocirca provides in-depth insights into the views of buyers and influencers in large, mid-sized and small organisations. Its analyst team is made up of real-world practitioners with first-hand experience of ITC delivery who continuously research and track the industry and its real usage in the markets.

Through researching perceptions, Quocirca uncovers the real hurdles to technology adoption – the personal and political aspects of an organisation's environment and the pressures of the need for demonstrable business value in any implementation. This capability to uncover and report back on the end-user perceptions in the market enables Quocirca to provide advice on the realities of technology adoption, not the promises.

Quocirca research is always pragmatic, business orientated and conducted in the context of the bigger picture. ITC has the ability to transform businesses and the processes that drive them, but often fails to do so. Quocirca's mission is to help organisations improve their success rate in process enablement through better levels of understanding and the adoption of the correct technologies at the correct time.

Quocirca has a pro-active primary research programme, regularly surveying users, purchasers and resellers of ITC products and services on emerging, evolving and maturing technologies. Over time, Quocirca has built a picture of long term investment trends, providing invaluable information for the whole of the ITC community.

Quocirca works with global and local providers of ITC products and services to help them deliver on the promise that ITC holds for business. Quocirca's clients include Oracle, Microsoft, IBM, CA Technologies, O2, T-Mobile, HP, Xerox, EMC, Symantec and Cisco, along with other large and medium-sized vendors, service providers and more specialist firms.

Details of Quocirca's work and the services it offers can be found at <http://www.quocirca.com>