Linux on IBM System z

The efficient and economic Linux platform

Highlights

- Efficient and economic infrastructure— inside a single IBM® System z® server

- Highly scalable and flexible—all system resources shared

- Highly secure and reliable—protecting your business

- The alternative to distributed infrastructures

An efficient IT approach

The explosive growth of mobile, big data, social media and cloud computing is driving IT demands. IT investments are shifted from infrastructure maintenance toward new projects that create business innovation and opportunities. IT organizations recognize the need to respond with increased agility to deliver new services while addressing cost, complexity, and risk. Operational efficiency has to be increased; the IT infrastructure has to be streamlined.

Linux on IBM System z provides an excellent solution—especially with the new IBM zEnterprise® BC12 (zBC12), the IBM zEnterprise EC12 (zEC12) and the new version of the z/VM®[1] virtualization software.

The proliferation of real and virtual servers on x86 or UNIX systems makes it difficult to fully utilize and effectively manage the IT assets. Linux on System z can provide significant advantages over these platforms, helping you control costs through its impressive scalability, service management, reliability and security capabilities.

This infrastructure can run up to hundreds of different workloads in parallel, provision them very flexible and share the system resources at extreme levels of utilization, providing load-balancing and efficient systems management that will help you achieve superior levels of service and improved operational efficiency.

Linux on System z is based on the common Linux kernel and has the same look and feel as every Linux. The differential advantages of Linux on System z are based on the unique combination of the System z server and the z/VM virtualization technologies, providing the uniquely powerful Linux on System z solution.

Linux on System z is ready to run data, mobile, security and cloud workloads, such as business intelligence and analytics with IBM Cognos® and IBM SPSS®, data warehousing and data serving with IBM InfoSphere®, IBM DB2®, IBM Informix® and Oracle Database, mobile workloads with IBM WebSphere® Portal or IBM Worklight®, email and collaboration with the IBM Lotus® suite, Enterprise Content- and Asset- and Business Process Management applications, as well as vendor applications such as SAP, and Java and WebSphere-based applications.

The Linux on System z supports cloud computing via the comprehensive cloud capabilities provided with the IBM Cloud and Smarter Infrastructure solutions, including IBM Tivoli® software, vendor software and the z/VM virtualization software that will be manageable with the OpenStack architecture based interfaces.

Linux on zEnterprise

Clients of all industries around the world are benefited from Linux on IBM System z and their key decision criteria have been the outstanding deployment capabilities, the unsurpassed qualities of service, and the opportunities for cost savings.

Many clients benefit from the values available with the new IBM zEnterprise BC12 (zBC12), IBM zEnterprise EC12 (zEC12), IBM zEnterprise 114 (z114) and the IBM zEnterprise 196 (z196):

- The increase in processor performance improves the cost ratio when consolidating and deploying new and existing workloads.
- The improved total system capacity for Linux allows to deploy more workloads and to grow inside the existing physical server.

- The Flash Express drives availability and performance for large amounts of temporary data.
- The increased capability of the internal network allows the fast communication between the many workloads on the same physical server.
- The processor chip, optimized to improve software performance e.g. for Java, DB2 and more.
- The improved qualities of service, e.g. the concurrent add/delete of I/O, the redundant array of independent memory (RAIM), the new multichip module design, the HiperSockets™ network traffic analyzer, high speed cryptography integrated as part of the chip and the Crypto Express4S cryptographic enhancements, helps to further improve the reliability of the business.
- The ability to run Linux workloads in an environment designed to run at sustained high processor utilization because of the designed offloading of network and disk I/O traffic through the server assist processors.
- The built in processor failover capabilities built into both memory and processor capabilities.

Besides running Linux on System z, with the zEnterprise Systems it is the possible to deploy an integrated hardware platform that brings System z and distributed technologies together in a hybrid approach. In that case, an IBM zEnterprise BladeCenter® Extension (zBX) is attached and works with the zBC12, zEC12, z196 or z114 to support the multiplatform environment.

Clients can benefit from the hybrid approach of the zEnterprise by deploying one portion of a complete solution on Linux on System z and another portion on zBX. As well, a common management interface is provided by the IBM zEnterprise Unified Resource Manager to manage virtual servers running on z/VM and zBX. These benefits provide operational convenience when relocating applications from a zBX to Linux on System z as a result of application growth, closer consolidation requirements and/or a need for superior qualities of service.

Single server efficiency

Linux running on a single System z server together with z/VM virtualization software can do the job of many distributed servers scattered across the enterprise. That means that the virtualization capabilities in a single 3.16 square meters System z footprint can help to support up to hundreds of virtual Linux servers.

Linux workload deployment, including consolidation, on a System z server can result in a streamlined infrastructure with fewer components, less complexity, less management efforts and less software pricing. The deployment of up to 60 virtual Linux servers on one zEC12 core[2] is possible—an impressive improvement towards a lean infrastructure and operational efficiency.

A single IBM System z server doesn't require external networking to communicate between the virtual Linux servers. All of the Linux servers are in a single box, communicating via very fast internal I/O connections.

As well, IBM System z servers can run at utilization rates as high as 100 percent for extended periods of time.

When the IT infrastructure needs to be expanded, efficiency of this Linux platform is demonstrated in particular. The infrastructure can grow inside the existing System z server by adding system resources on the fly, without affecting the running environment. In addition, with the Capacity on Demand capability, you can activate inactive processors or memory units that are already installed on your system on a temporary or permanent basis. This follows the principle that you can access the resources that you need, when you need them, and paying for only the resources that you use.

Even in a single footprint, the System z server is designed to avoid or recover from failures to minimize business disruptions. High availability is realized through component reliability, redundancy, and design features that assist in providing fault avoidance and tolerance, as well as permitting concurrent maintenance and repair.

What an idea, you can run hundreds of virtual Linux images in parallel in a single, space-saving and highly energy-efficient footprint with the size of a refrigerator versus a full room of distributed servers.

Linux on System z provides a truly compact IT environment, it can be very efficient.

Highly scalable and flexible

The outstanding System z server capacity, fully exploited by the z/VM virtualization software, allows for the impressive horizontal and vertical scalability of the Linux on System z environment.

Up to 101 user-configurable Linux cores, running at 5.5 GHz, are available with the zEC12, and 62 percent more Linux capacity is available with a zBC12 compared to the predecessor model. All System z servers allow starting small and growing within a single server without the need to add more servers, cables and operational efforts required in a distributed environment.

You can assign your workload the capacity it need, enabling the consolidation of workload into one large workload instance, which is split onto multiple servers today.

z/VM offers the highest levels of resource sharing—including the over-commitment capabilities for processors and memory, cooperative memory management, I/O bandwidth, and system availability, resulting in nearly 100 percent utilization of the system resources nearly 100 percent of the time.

z/VM offers several data-in-memory techniques that further enhance the scalability and performance of memory-intensive workloads. For example, users can store Linux program

executables in a single z/VM memory location and share the executables with any or all of the hosted Linux systems, or in-memory emulated storage, called virtual disks, allows Linux systems to achieve memory-speed data transfers for read and write I/O operations.

z/VM support for the dynamic reconfiguration features of the System z servers allows the non-disruptive dynamic and flexible configuration of processors, channels, network adapters and memory to individual Linux servers, helping to increase availability.

Linux benefits from the remarkable virtualization capabilities of z/VM and System z servers, providing the scalability and flexibility to setup and manage a data center in a single box.

Efficient workload management

Designed to integrate and be efficient, the Linux on System z environment can run up to hundreds of mixed workloads in parallel.

This is supported by unmatched resource sharing of the System z servers, which can direct resources quickly and efficiently between applications, virtually and dynamically, whenever and wherever they are needed. This resource management is done according to user-defined and business-oriented policies.

The impressive capabilities to automate service management consists of many functions and products, such as the z/VM Single System Image feature allows to cluster z/VM images, or the z/VM Virtual Machine Resource Manager, which are working together to provide the tools for systems administrators to help keep the Linux-based services running at the most optimal level and utilizing resources efficiently.

In addition, IBM Systems Director and IBM zEnterprise Unified Resource Manager are supporting the configuration, monitoring and government of workloads that are deployed across zEnterprise assets.

Highly secure and reliable

The IBM System z is the world's only servers with the highest level of hardware security certification, Common Criteria Evaluation Assurance Level 5 (EAL5). Its ability to isolate and protect each Linux environment allows running many production systems concurrently on the same server with test and development systems. This can help to improve resource utilization and offer significant operational efficiency as well.

System z server elements have always had an internal redundancy, and all of these redundant elements can be switched automatically in the event of a failure. As a result, it is possible to make fixes or changes to any element that is down without stopping the machine from working and interrupting access by the customers.

z/VM virtualization software provides high security levels as well. z/VM provides Live Guest Relocation that helps to non-disruptively move system resources when performing z/VM or hardware maintenance.

z/VM can virtualize System z cryptographic devices so they can be shared by many Linux systems. z/VM can balance the workload across multiple cryptographic devices, and should one device fail or be brought offline, z/VM can transparently shift Linux systems using that device to use an alternate cryptographic device without user intervention.

Linux workloads on System z are evolving to a higher level of security and quality.

Economic IT infrastructure

Linux on System z provides an economic IT infrastructure. Workload deployment and consolidation with Linux on System z can provide enormous opportunities for cost saving.

The key areas of potential cost savings are:

- **Software acquisition and licenses costs**
  A single System z processor can run a mass of Linux applications, and Linux software is usually priced on a per-processor basis. Running software on fewer processors can result in fewer licenses and support costs.

  Since the software costs are the same for a low-utilized core or a well-utilized core, the high resource utilization of System z servers also contributes to the software savings. With Linux on System z you get more benefit from your software license.

- **Operational management and maintenance costs**
  The single server solution provides a cost advantage in regard to operational management and maintenance as well. Fewer servers mean less server maintenance, less cables and switches, less efforts. Physical and virtual resources can be dynamically shared or reconfigured, helping to simplify the demands placed upon your IT staff.

  The centralized management, for example with the z/VM Single System Image feature, and the autonomic computing capabilities of the Linux on System z environment can help reduce the errors and minimize workload-balancing tasks that otherwise can consume IT staff hours.

- **Floor space and energy costs**
  Fewer servers and networks can require less floor space and can mean savings not only in acquisition costs, but even more important in heating, air conditioning and electricity costs.

The modular design, efficient dense packaging, high efficiency power supplies, and resource sharing and industry-leading virtualization - all this contributes to the energy and space efficiency of System z servers.

Companies can reduce their carbon footprint by leveraging the energy-efficient, single server solution.

- **Security and business continuity costs**
  The System z servers are the most secure commercial servers available, built using groundbreaking technology you can trust. Powerful encryption will ensure your data, and therefore your business, is protected 24/7. Linux on System z allows running workloads with the highest security requirements, supporting acceleration of and access to complex cryptographic algorithms available with the cryptographic hardware.

  The suite of the System z built-in features can rapidly respond to, or even anticipate, threats to system health, helping to prevent costly system downtime. As well, multiple disaster recovery solutions are available, such as copying volumes or mirroring disk volumes within one site or between two sites.

Linux running on System z is expected to provide great economics, operational efficiency, reliability and security. Linux on System z provides a uniquely powerful infrastructure that helps you achieve a quick return on investment without sacrificing enterprise-class qualities of service.

The real alternative for an efficient and economical IT infrastructure.

For more information

To learn more about Linux on IBM System z, please contact your IBM representative or IBM Business Partner, or visit:
ibm.com/systems/z/linux