Linux on IBM @server zSeries with z/VM

The rise of Linux in the IT world – from an interesting academic exercise to a platform for hosting enterprise applications – is changing the way enterprises think about their computing model. Linux on the IBM @server® zSeries® can provide new opportunities for server consolidation and cost savings.

IBM @server zSeries servers

Succeeding in this new world of business on demand requires an infrastructure that provides optimal performance, real-time responsiveness, application flexibility, power, and virtualization, all with easy-to-use management. At the heart of this infrastructure is IBM @server zSeries, the enterprise class platform optimized for integration and designed to handle the transaction and data of an on demand world.

IBM zSeries servers include the zSeries 990 (z990), 900 (z900), 890 (z890), and 800 (z800), and two Linux mainframe solutions, the IBM @server Integrated Platform for e-business on zSeries and the IBM @server zSeries Offering for Linux.

The z990 server includes 4 models, with a variety of features that provide outstanding granularity. The 32-way configuration offers up to three times the processing power of the z900 Model 216 server when properly configured. Each of the 32 processor units can be configured as a central processor (CP), Integrated Facility for Linux (IFL), Integrated Coupling Facility (ICF), zSeries Application Assist Processor (zAAP), and an additional System Assist Processor (SAP). In addition, 4 Logical Channel SubSystems (LCSSs) allow up to 256 I/O channels per LCSS, up to 1024 I/O channels total, and up to 30 logical partitions (LPARs) when properly configured.

The z890 consists of one model with up to 28 capacity settings (4-way configuration with 7 settings) to provide flexibility and granular growth. The z890 is up to 2.1 times the total capacity of the largest z800, up to 2 LCSS's, uo to 512 I/O channels, and 30 LPARs (except on the entry server). Each of the 4 processors units can be configured as a CP, IFL, ICF, zAAP, and an additional SAP.

The z800 family provides the key functional characteristics of the z900 that deliver excellent price/performance, for those requiring zSeries functionality with total capacity less than that of the z900.

zSeries servers can be configured in numerous ways to offer unparalleled flexibility to speed deployment of e-business on demand™ solutions. zSeries servers are based on IBM z/Architecture™, which supports a new standard of performance, capacity, and integration by expanding on the balanced system approach of the S/390® architecture. The features that help provide this balance include:

- Virtually unlimited 64-bit addressing capability, providing extra capacity for unpredictable workloads and growing enterprise applications.
- High performance Gigabit Ethernet features - one of the first in the industry capable of achieving line speeds of one gigabit per second.
- An improved I/O subsystem to complement the zSeries' increased number of processors and larger main memory. High-speed interconnects, HiperSockets™, let TCP/IP traffic travel between images at memory speed, rather than network speed. The result is ultra high-speed communications allowing greater integration between traditional and Web applications to help maximize on demand effectiveness.
- Virtual Local Area Network (VLAN) support for all of the OSA-Express features when configured in QDIO mode for the Linux environment. A VLAN is a logical grouping that allows end users to communicate as if they were physically connected to a single LAN, independent of the physical configuration of the network.
- zSeries Fibre Channel Protocol (FCP) channel enhances Linux environments to allow access through a fibre-channel fabric to storage devices connected to industry-standard Small Computer System Interface (SCSI) controllers. This function allows you to customize a zSeries FICON™ or FICON Express™ feature as an FCP channel.

Always on

zSeries servers delivers a high level of application availability required in today's global networked environment. Even in a single footprint, zSeries servers are designed to avoid or recover from failures to minimize business disruptions.

High availability is realized through very high component reliability, redundancy, and design features that assist in providing fault avoidance and tolerance as well as permitting concurrent maintenance and repair. Enhanced Dynamic Memory Sparing, ESCON® Port Sparing, Concurrent Service for I/O Cards and Auto-Switch over for the Service Elements are built-in functions that aid in reducing planned and unplanned outages.

Another aspect of availability is nondisruptive growth, in most cases, enabled in the zSeries by IBM Capacity Upgrade on Demand. zSeries servers have the capability to add server capacity and virtual servers nondisruptively and to install FICON, ESCON, and OSA-Express ATM, Gigabit, Fast Ethernet, and Token-Ring cards without bringing the system down. The upgrade can be initiated by customers over the Internet on select servers.

Helping control costs with virtualization and server consolidation

One zSeries server running z/VM® V5 may be able to do the job of many distributed servers scattered across the enterprise by hosting a variety of other IBM operating platforms such as Linux, z/OS®, z/OS.e (z800/z890), OS/390®, z/VM, VM/ESA®, VSE/ESA™, and TPF. With the availability of commercial Linux distributions for zSeries, the combination of zSeries and z/VM can address workload consolidation issues faced by many large enterprises while benefiting from greater availability, scalability, security and reliability. zSeries with z/VM provides flexibility and management characteristics that can make it possible for you to satisfy the on demand marketplace by deploying new Linux servers in minutes. The complexity of maintaining large numbers of distributed servers can be relieved with a single discrete zSeries server, and helping to reduce costs by requiring less floor space and power. Simplification of the network by using HiperSockets may provide savings and reduce cabling, hubs, switches, and routers, as well as helping to reduce maintenance effort. For many companies, critical enterprise data and applications are entrusted to zSeries servers. Running Linux on zSeries can enhance the value of your applications and data by allowing your Linux applications to communicate with your zSeries applications and access your critical data where it resides, helping to improve responsiveness and reduce unnecessary duplication of data. With the portability of Linux, applications may be moved quickly and easily to whatever IBM platform is most appropriate. The capacity of zSeries servers makes it an ideal platform to help simplify your operation and reduce your costs by consolidating the number of servers in your

business and z/VM offers advanced technology to help achieve these results.

Multiple Linux systems on a zSeries server can be easily managed with z/VM. Linux server images can share physical resources as well as programs and data, and internal high-speed communications. z/VM V5 supports IFLs, a hardware feature available on the z990, z900, z890, and z800 are processors exclusively for Linux workloads. With IFLs, processing power can be purchased exclusively for Linux workloads with no effect on the processor model designation and without necessarily increasing IBM software charges on the standard processor engines.

Linux for zSeries supports the IBM z/Architecture (64-bit) on zSeries servers.

z/VM Exploits new technology

z/VM V5 is the product of more than 35 years of innovation and refinement, which can provide users with the ability to respond to rapidly changing market requirements more quickly and easily than with discrete single hardware servers. Unlike distributed hardware-based solutions, virtualization technology allows customers to virtualize processor, communications, storage, I/O, and networking resources to help reduce the need to duplicate hardware, programming and data resources.

Contrasted with a discrete server implementation, z/VM-based and zSeries server solutions are designed to provide significant savings which may help lower your Total Cost of Ownership (TCO) for deploying new business and enterprise application workloads on a mainframe.

z/VM delivers support for hardware technologies such as FICON channels, high-speed communication adapters and advanced storage solutions. z/VM also takes advantage of 64-bit real and virtual memory on zSeries servers. z/VM, supporting multiple Linux guests, offers an ideal platform for consolidating select UNIX®, Microsoft® Windows®, and Linux workloads on a single physical zSeries server.

z/VM V5.1 extends zSeries on demand capabilities with virtualization technology in support of Linux and other guests by:

- Improving the scheduler to help increase the number of Linux and other guest virtual machines that can be managed concurrently
- Enhancing the Virtual Machine Resource Manager (VMRM) to provide the infrastructure to allow support of more extensive workloads and systems resource management features
- Installing from DVD to IBM TotalStorage® Enterprise Storage Server® (ESS) SCSI disks or 3390 DASD
- IPLing from SCSI disks attached to FCP channels for Linux and other guest operating systems when z/VM is running on a server equipped with the SCSI IPL Feature Enabler
- Deploying a Linux server farm on z/VM using only SCSI FCP disks
- Enabling coordinated near-continuous availability and disaster recovery for Linux guests with HyperSwap support and a GDPS solution
- Clear-key RSA functions of the IBM PCI Cryptographic Accelerator (PCICA) and the IBM PCI Cryptographic Coprocessor (PCICC) and (PCIXCC) features of the z990 and z890
- Performance Toolkit for VM™ to process Linux and SCSI performance data
- Providing functions that may be called by client applications to allocate and manage resources for guests running in z/VM virtual machines (virtual images)

For additional security, RACF® is available as an optional feature of z/VM and works with the existing system features of z/VM to help provide improved data security for an installation.

Running Linux as a guest of z/VM helps enable you to run tens to hundreds of Linux images while benefiting from the reliability, availability, scalability, security and serviceability characteristics of zSeries servers. At the same time, it allows you to exploit the exceptional capabilities of z/VM virtualization technology.

Putting it all together: Packaged Solutions from IBM

The **IBM @server Integrated Platform for e-business on zSeries** solution builds an e-business infrastructure on Linux on zSeries by combining existing key components of zSeries hardware, software and maintenance, and Linux SupportLine. Also available is the **IBM @server zSeries Offering for Linux**, a dedicated Linux mainframe solution that delivers key infrastructure elements of a world-class Linux environment in one attractively priced package. These offerings provide excellent price/performance and extraordinary flexibility to deploy your Linux solutions.

Free access to a Linux Environment

IBM has established a Linux environment to deliver virtual Linux servers to developers to port, test and develop new software technologies for the zSeries platforms. Using the impressive *virtualization* capability of the z/VM hypervisor, you won't be just another user; you can be your own superuser.

For registration procedures and terms of service for the Linux Community Development System, go to:
ibm.com/eserver/zseries/os/linux/lcds/

Additional opportunities for Independent Software Vendors (ISVs) to test drive the Linux experience are the Linux for zSeries TestDrive offerings. There are no-charge programs and fee-based offerings. PartnerWorld® for Developer members who qualify for enterprise server benefits are eligible to participate in the Linux for zSeries Test Drive offerings. For more information, visit:

ibm.com/servers/enable/site/testdrive/zseries

For more information:

- IBM @server zSeries:
  ibm.com/eserver/zseries/
- z/VM:
  ibm.com/eserver/zseries/zvm/
- Linux on zSeries:
  ibm.com/eserver/zseries/linux/