Take Back Control of IT with z/VM® and Linux® on System z

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Linux on System z – take back control of your IT
A data center in a box – not a server farm

- Potentially lower cost of operations
  - Less servers
  - Fewer software licenses
  - Fewer resources to manage
  - Less energy, cooling and space

- Central point of management
- Increased resource utilization
- Fewer intrusion points
  - Tighter security
- Fewer points of failure
  - Greater availability

It’s simple
System z® and Linux provide a better, faster solution to IT complexity
Linux on IBM System z

*Linux + Virtualization + System z = SYNERGY*

**The legendary IBM mainframe – IBM System z**
- Legendary dependability
- Extremely security-rich, highly scalable
- Designed for multiple diverse workloads executing concurrently
- Proven high volume data acquisition and management

**The IBM mainframe virtualization capabilities – z/VM**
- Support for large real memory and 32 processors in a single partition
- Enhanced security and LDAP server/client
- Enhanced memory management for Linux guests
- Enhanced management functions for Linux

**Open standards operating system – Linux for System z**
- Reliable, stable, security-rich
- Available from multiple distributors
- Plentiful availability of skills administrators and developers
- Large selection of applications middleware and tooling from IBM, ISVs and Open Source
Why Linux on System z?
The reasons in 1999 are still valid today

1. Increased solutions through Linux application portfolio
2. Large number of highly skilled programmers familiar with Linux
3. Integrated business solutions
   - Data richness from System z
   - Web capability of Linux applications
4. Industrial strength environment
   - Flexibility and openness of Linux
   - Qualities of service of System z
5. Unique ability to easily consolidate a large number of servers
Reasons for running Linux on the mainframe

- Mainframe reliability is the top driver for running Linux on System z, followed by cost savings, z/VM® virtualization capabilities and application availability.
- The most important z/VM capabilities are rapid deployment of Linux virtual machines and high server consolidation ratio.

Source: 2009 IBM Market Intelligence
What System z brings to Linux

- The most reliable hardware platform available
- Centralized Linux systems can be easier to manage
- Designed to support mixed work loads
  - Allows consolidation while maintaining one server per application
  - Complete work load isolation
  - High speed inter-server connectivity
- Scalability
  - zEnterprise 196 scales to 80 configurable processors
  - zEnterprise 114 scales to 10 configurable processors
  - System z10 EC scales to 64 configurable processors
  - System z10 BC scales to 10 configurable processors
  - Dedicated I/O processors
    - Up to 14 (z196), up to 11 (z10 EC), or 2 (z10 BC and z114)
  - Hundreds to thousands of Linux virtual servers
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What is different about Linux on System z?

- **Access to System z specific hardware**
  - Crypto support – CPACF, CryptoExpress3
  - Traditional mainframe and Open I/O subsystems
    - IBM DS8000 Enterprise Storage Systems
    - IBM XIV Storage System and Storwize V7000
    - SAN Volume Controller for other storage
  - OSA-Express3 for very high speed communication between systems
  - HiperSockets for ultra-high speed communication between Linux images on the same machine

- **z/VM aware**
  - Enhanced performance
  - System management tools
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Value of Linux on System z

- **Reduced Total Cost of Ownership (TCO)**
  - Environmental savings – single footprint vs. hundreds of servers
  - Consolidation savings – less storage, less servers, less software licenses, less server management/support
- **Improved service level**
  - Systems management (single point of control)
  - Reliability, availability, security of System z
- **Speed to market**
  - Capacity-on-demand capability on System z
  - Dynamic allocation of on-line users, less than 10 seconds to add a new Linux server image using z/VM and IBM DS8000
System z – The ultimate virtualization resource

- **Utilization often (usually?) exceeds 90%**
  - Handles peak workload utilization of 100% without service level degradation

- **Massive consolidation platform**
  - Up to 60 logical partitions, 100s to 1000s of virtual servers under z/VM
  - Virtualization is built-in, not added-on
  - HiperSockets for memory-speed communication
  - Most sophisticated and complete hypervisor function available

- **Intelligent and autonomic management of diverse workloads and system resources based on business policies and workload performance objectives**
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z/VM – Extreme virtualization

- z/VM helps enterprises meet their growing demands for multi-system server solutions with a broad range of support for operating system environments
- Mature technology – VM/370 introduced in 1972
- Software Hypervisor integrated in hardware
  - Sharing of CPU, memory and I/O resources
  - Virtual network – virtual switches/routers
  - Virtual I/O (mini-disks, virtual cache, …)
- Easy management
  - Self-optimizing workload management
  - Deploy virtual servers in seconds
  - Highly granular resource sharing (<1%)
  - Add physical resources without taking system down, scale out to 1000s of virtual servers
  - Do more with less: More virtual servers per core, Share more physical resources across servers
  - Extensive virtual server life-cycle management
z/VM V6.1 is the base for all future z/VM enhancements

- This release implements a new Architecture Level Set available only on the IBM System z10 and zEnterprise servers, and future generations of System z servers
- Includes several enhancements, plus support for the IBM Systems Director VMControl cloning tool

Statements of Direction

- z/VM Single System Image
  - IBM intends to provide capabilities that permit multiple z/VM systems to collaborate in order to provide a single system image

- z/VM Live Guest Relocation
  - IBM intends to further strengthen single system image support by providing live guest relocation
The value of z/VM for Linux

- **Enhanced performance, growth and scalability**
  - Server consolidation enables horizontal growth
  - N-tier architecture on two tiers of hardware
  - Extensive support for sharing resources
  - Virtual networking
  - Effective isolation of Linux images, if required

- **Increased productivity**
  - Development and testing
  - Production support

- **Improved operations**
  - Backup and recovery
  - Command and control
Linux on z/VM: Flexible, efficient growth

- Clients can start small with Linux on System z and non-disruptively grow their environment as business dictates
- Users can dynamically add CPUs, memory, I/O adapters, devices, and network cards to a running z/VM LPAR
- z/VM virtualizes this capability for guest machines

Smart economics: non-disruptively scale the z/VM environment by adding hardware assets that can be shared with every virtual server
Maximizing Utilization of Resources

- Up to 100% server utilization compared to 10-20% distributed server utilization\(^1\)
- Shared everything infrastructure through hardware allows for maximum utilization of resources
  - CPU, Memory, Network, Adapters, Cryptography, Devices

Moderate distributed servers

Typically single application per physical server

Multiple applications on one physical System z server

\(^1\) Source: gomainframe.com Joe Clabby
Built-in IBM System z security for distributed workloads

*Reducing risk – protecting businesses*

- **Protect from intrusion**
  - z/VM Integrity Statement

- **Protect data**
  - Built in encryption accelerators in every server
  - FIPS-140-20 Level 4 certified encryption co-processors for highly secure encryption

- **Ensure privacy**
  - Access to all resources is controlled by an integrated central security manager

- **Protect virtual servers**
  - The only servers with EAL5 Common Criteria Certification for partitioning

- **Respond to compliance regulations**
  - Up to 70% in security audit savings
IBM Enterprise Linux Server

Industry-leading virtualization

Overview

- The IBM® Enterprise Linux Server is a proven server consolidation platform that helps you control costs while improving virtual server availability, workload management, and energy efficiency.

- With the virtualization capabilities of the Enterprise Linux Server, your business can consolidate applications and servers, share system resources at extreme levels of utilization, and provide a more flexible and dynamic IT infrastructure that will help you achieve superior levels of service and greater control in managing the growth of your business.
IBM Enterprise Linux Server

*Industry-leading virtualization*

- Highlights
  - A highly scalable and flexible virtual infrastructure inside a single IBM server
  - The ability to share all system resources with all virtual servers with unmatched levels of efficiency and security
  - Business continuance and disaster recovery that help minimize your expenses
  - The ability to grow your virtual server workload “on demand” by adding resources to a running environment without disruption
  - A solution that helps you achieve a quick return on investment without sacrificing enterprise-class qualities of service
  - The ability to deploy and manage a large scale-out virtual server environment on the industry’s best scale-up, share-everything system architecture
Linux on System z
Client adoption continues to drive success

- The momentum continues:
  - Shipped IFL engine volumes increased 34% from YTD 4Q09 to YTD 4Q10
  - Installed IFL MIPS increased 6% from 3Q10 to 4Q10
  - Installed IFL MIPS increased 35% from 4Q09 to 4Q10
- 32% of System z customers have IFLs installed
- Linux represents 19% of the System z install base capacity (MIPS)
- 64 of the top 100 System z clients are running Linux on the mainframe
- > 3,000 applications are available for Linux on System z
Many factors influence platform selection, making it difficult to present a simple selection matrix.

Some factors are specific to each business, others are common to all and can be generalized.

| Problem Size | Time Horizon | ISV Support | Nonfunctional Requirements | Strategic Direction and Standards | Power, cooling, floor space constraints | TCO Model | Skills | Politics | Technology Adoption Level | Deployment Model | Platform Architecture | UNIX | x86 | System z |
Customers leveraging scale up and scale out technologies to simplify and integrate their on demand operating environment

As one solution option:
- Large SMP and Rack Optimized servers integrated with Linux, Java and Grid technologies can enable this transformation
Ideal scale-out implementations

- Clustered workloads
- Distributed computing applications
- Infrastructure applications
- Small database
- Processor and memory intensive workloads

Scale Out
Rack Optimized

Scale Up
Large SMP

Virtualization

Application Servers
Terminal Serving
Infrastructure
Collaboration Servers
SSL Appliances
Web Services
E-Commerce Applications
Deep Computing Clusters
File/Print Servers
DNS Servers
Web Servers
Transaction Servers
Security & Directory Services
Application Servers
File/Print Servers
Application Servers

Virtualization
Ideal scale-up implementations

- High performance transaction processing
- I/O intensive workloads
- Large database serving
- High resiliency and security
- Unpredictable and highly variable workload spikes
- Low utilization infrastructure applications
- Rapid provisioning and re-provisioning
Selecting an application

- **Performance on System z CPUs is comparable to CPUs on other platforms of similar speed**
  - CPU speed is not the entire story – it’s in the architecture!
  - Architecture designed for multiple or consolidated workloads
  - System z has definite advantage with applications that have mixed CPU and I/O

- **System z and z/VM provide excellent virtualization capabilities**
  - Look for applications that are on lower utilized servers
  - Development and Test are good choices to start

- **Good planning is essential**

- **IBM can:**
  - Perform sizing estimates
  - Assist with planning and initial installation needs
Where to deploy – System z or “distributed”

**Technical Considerations**

- **System z** \(\leftrightarrow\) “distributed”
  - **Quality of Service**
  - **Speed of deployment**
    - Instances 2 - n
  - **Data Intensity**
  - **Compute Intensity**

**Other Considerations**

- **Application availability**
  - Certification of solution on hardware/software platform
- **Workload Management**
- **Manageability and scaling characteristics**
  - Especially database and web serving
  - Proximity of data to application
  - The best network is one with no wires!
Linux distributors

- **Novell SUSE Linux Enterprise**
  - [http://novell.com/mainframe/](http://novell.com/mainframe/)

- **Red Hat Enterprise Linux**
Thanks!

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