

z/Linux from a z/Perspective: *zeeing the Opportunities*

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- **Observations and Recommendations are the opinion of the author, and do not represent any official positions of Computer Associates**

A Little Bit About Me



- **System Programming since 1971**
- **Specialized in Programming Language**
 - **Assembler, PL/1, Fortran, Cobol, Algol, SNOBOL**
- **Specialized in Operating Systems**
 - **VS/1, VM/370, SVS, MVS, VM/HPO, MVS/XA, VM/XA, MVS/ESA, VM/ESA, OS/390, z/OS, z/VM**
- **Expertise in Mainframe Performance & Tuning**
- **Expertise in Hardware and Hardware Planning**
- **Expertise in Sysplex and Parallel Sysplex**
- **Expertise in Workload Manager**



Overview



- **Data Center Environments continue to grow and become more complex at a rapid pace**
- **z/Series Hardware and Associated Peripherals are challenging for most Customers**
- **Keeping Up with z/OS, z/VM, and z/VSE Technology is Time Consuming**
- **The number of IT professionals at most Customer Sites has NOT grown with the Environment**
- **Server Farms continue to grow and become more complex**
- **Interaction between the Enterprise Servers has greatly increased**

Overview



- **Adding New Environments to meet Strategic Business Needs is NO longer simple**
- **Adding New System Images may cause the Entire Environment to be unstable**
- **Creating D/R, Development, Q/A, Test, and Other Sandbox Environments may now be required to conform with Compliance initiatives**

Reality Check



“The Need for Mainframe Platforms to Support Server Environments will increase.”

“The Need for Server Environments to Support Mainframe Platforms will increase.”

“The Platforms and Environments will need to be integrated and simplified.”

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Topics to be Covered



- **Focus on Linux on z/VM**
- **Opportunities from the Distributed Server Perspective**
- **Opportunities from the Mainframe Perspective**
- **Issues**

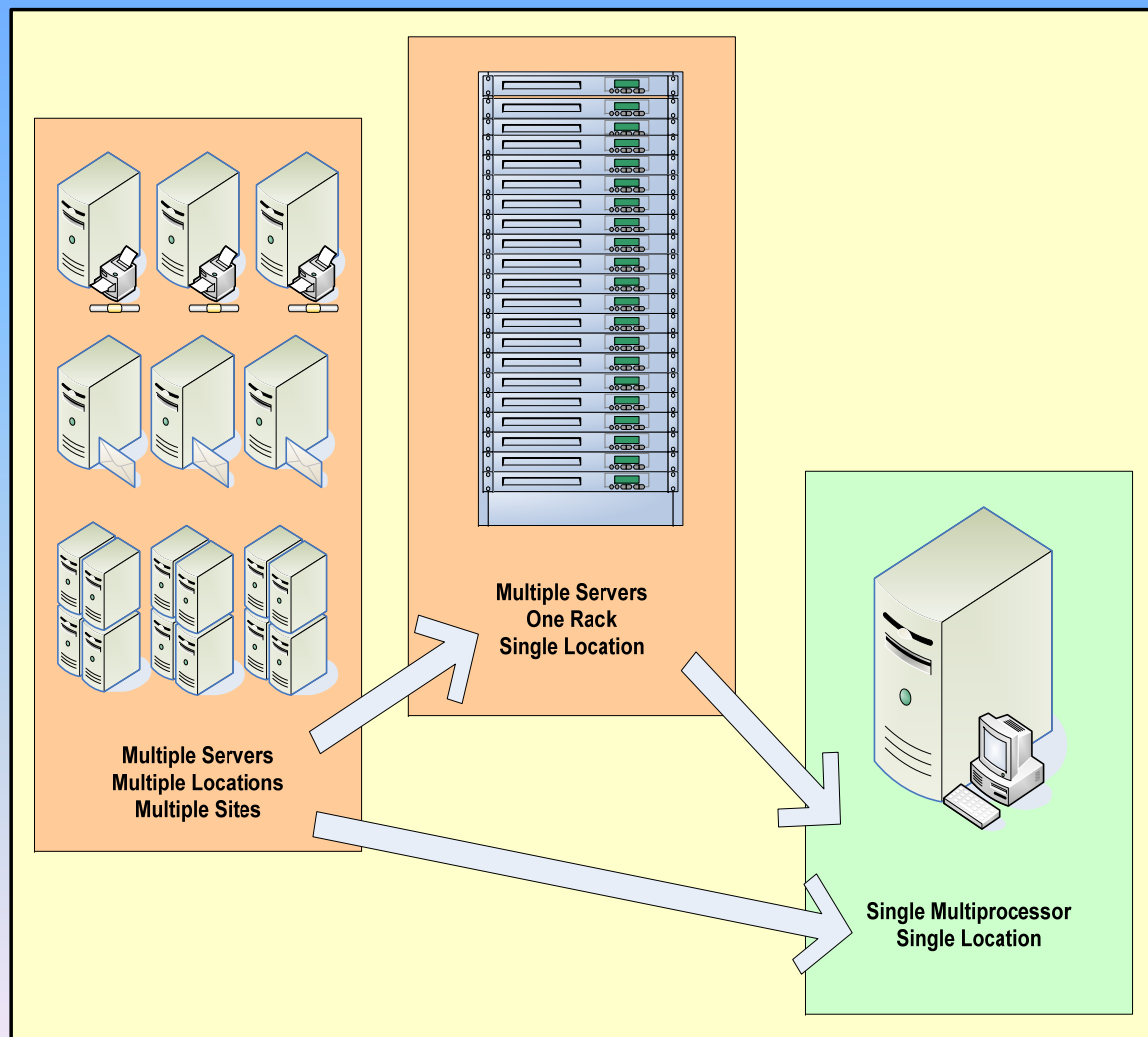


From the Distributed Server Perspective

Opportunity to Consolidate Workloads



- Hardware Consolidation
- Applications Consolidation
- Operations Consolidation



Types of Consolidation



- **Physical Workloads**
 - **Focus on Hardware and Potential Cost Savings**
 - **Migrate at the Operating System Level**
 - **Requires 1 Operating System Environment**
 - **No Changes to Applications**
 - **Potentially More Robust**
 - **Shorter Time to Implement**

Types of Consolidation

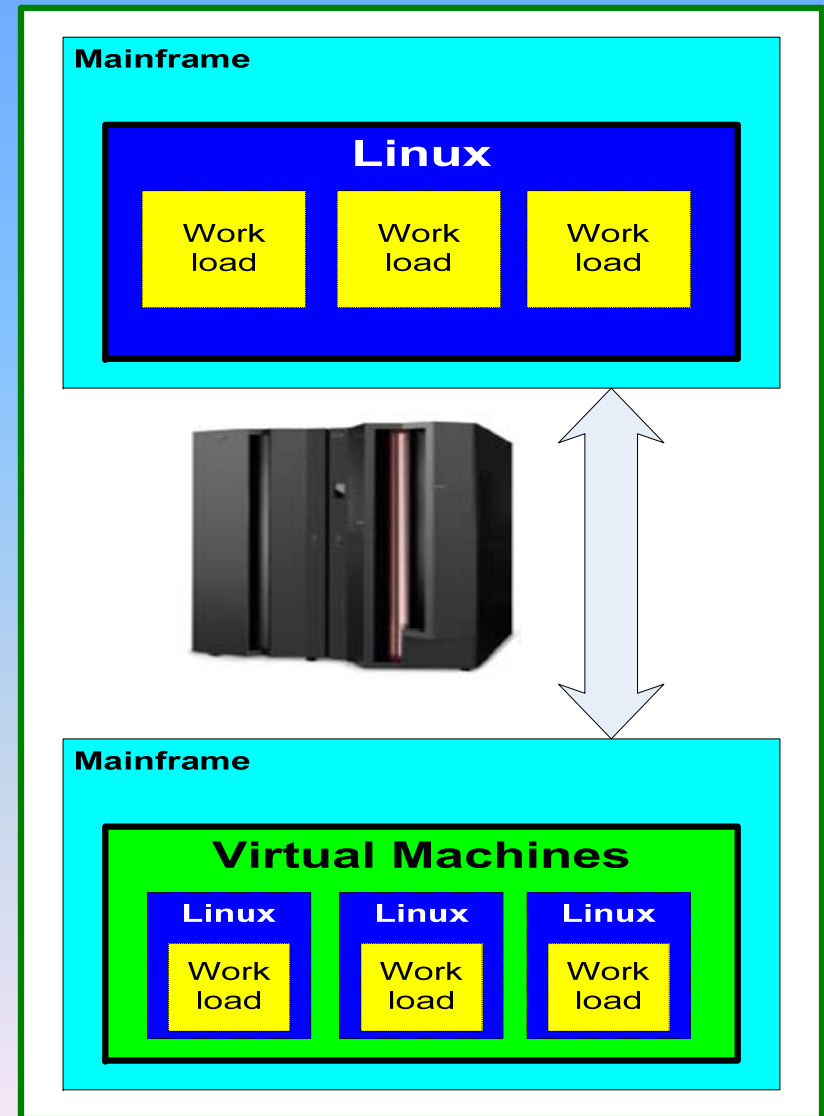


- **Logical Operations**
 - **Focus on Operational Processes**
 - **Migrate at the Application Level**
 - **Can Support More than 1 Operating System Environment**
 - **May need Changes to Applications**
 - **Potentially More Functional**
 - **Longer Time to Implement**

Consolidation vs. Scalability



- Which is Better?
 - Native Linux
 - z/VM
- If Native, How many LPARs needed?
- If Native, how many Workloads per LPAR?
- With only 1 Very Large Workload, Native may be better
- With many Servers, z/VM may be better



Server Workloads

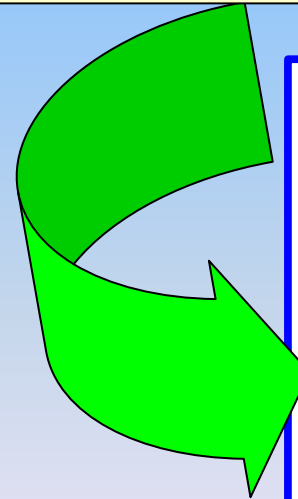
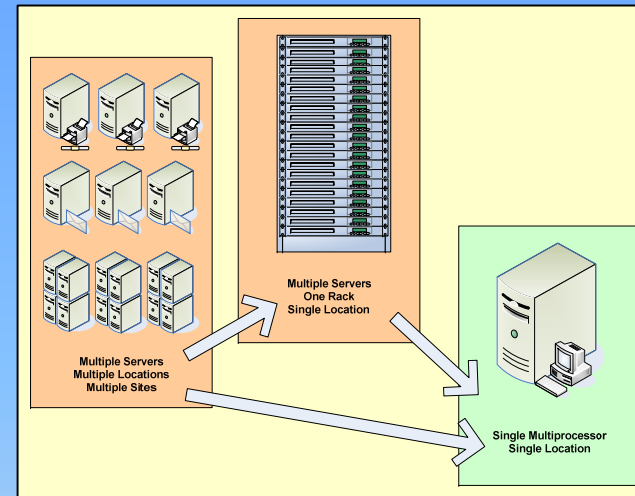


- **File Servers**
- **Printer Servers**
- **LAN Servers**
- **TN3270 Servers**
- **DNS Servers**
- **Security Servers**
- **Directory Servers**
- **Web Servers**
- **HTTP Servers**
- **HTTP Cache Servers**
- **Proxy Servers**
- **Firewall Servers**
- **Database Servers**
- **Application Servers**

Opportunity to Simplify Infrastructure



- Many Different Technologies and Platforms
- Many Different Operating Environments
- Many Different System Management Requirements
- **One Manageable Simplified Environment**



Ideal Mainframe Implementations



- **I/O Intensive Workloads**
- **Spiky Workloads (not predictable or varied)**
- **Small Consumer Workloads (Infrastructure)**
- **High Availability Applications**
- **Continuous Availability Environments (failover)**
- **Security Applications**
- **Quick Replicating Environments (< 10 sec)**
- **D/R Applications**
- **Large Database Applications**
- **Life Cycle Environments (Test, Dev, Q/A, Prod)**

Opportunity to Reduce Costs (TCO)

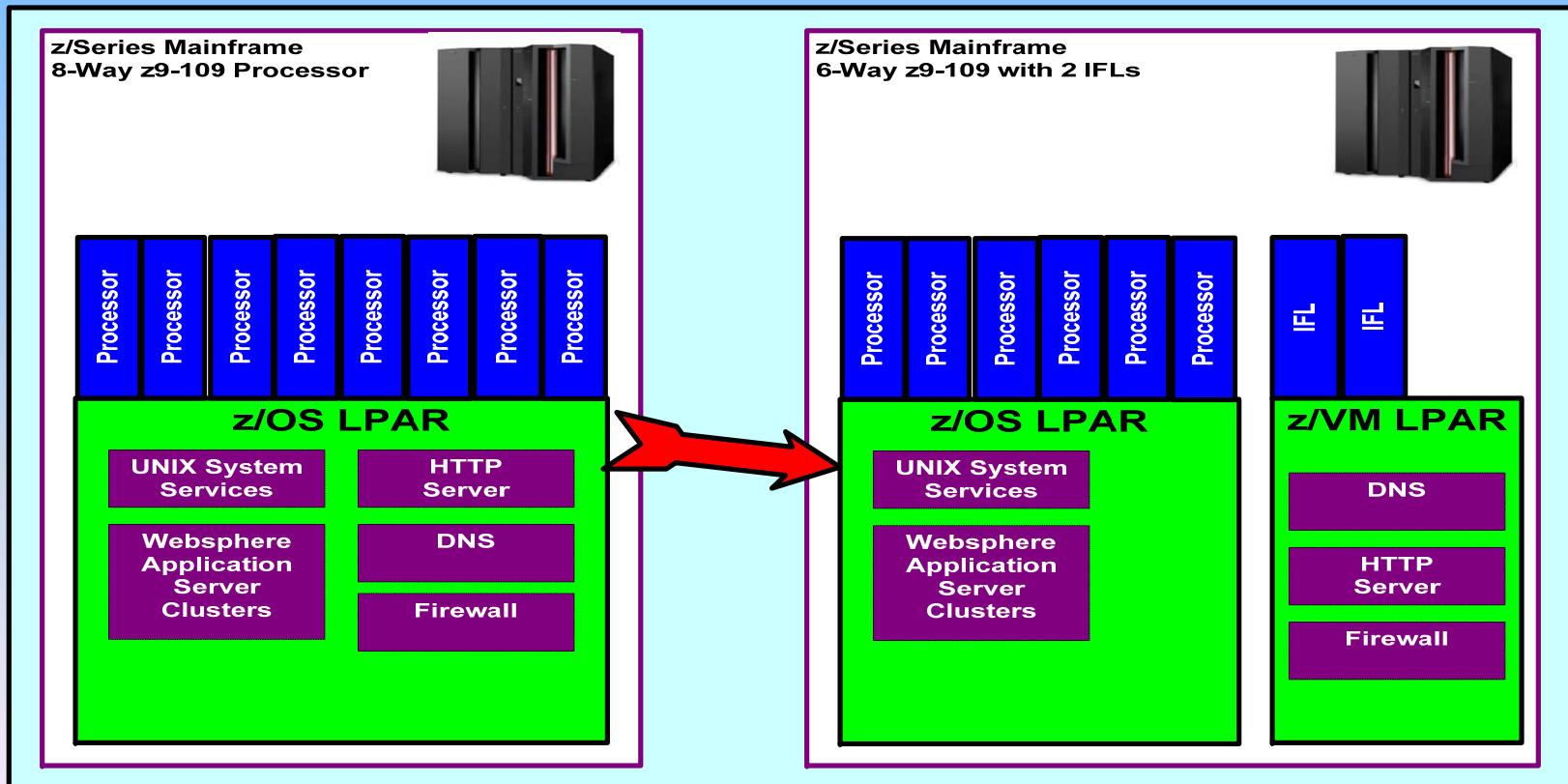


- **Environmental**
 - **Floor space**
 - **Power (UPS)**
 - **Cooling**
 - **Network**
- **Hardware**
 - **Storage**
 - **Physical Servers**
- **Software**
 - **Operating Systems**
 - **Applications**
 - **Licenses**
- **Administration**
 - **System Management**
 - **Support Staff**

Opportunity to Reduce License Charges



- With Enough USS Work moving to Linux, Processor MSU Rating may be reduced
- May be able to Avoid General Processor Upgrades for New Applications





From the Mainframe Perspective

Opportunities Available with Linux on z/VM



- **Large Number of Linux Applications**
- **Large Number of Linux Skilled Programmers (Applications, Systems)**
- **Integrated Business Solutions Possible between Linux on z/VM and z/OS**
- **Glass House Environment**
 - **Rich System Management Tools Available**
- **Ability to Easily Consolidate Many Distributed Servers**

Opportunities Available with Linux on z/VM

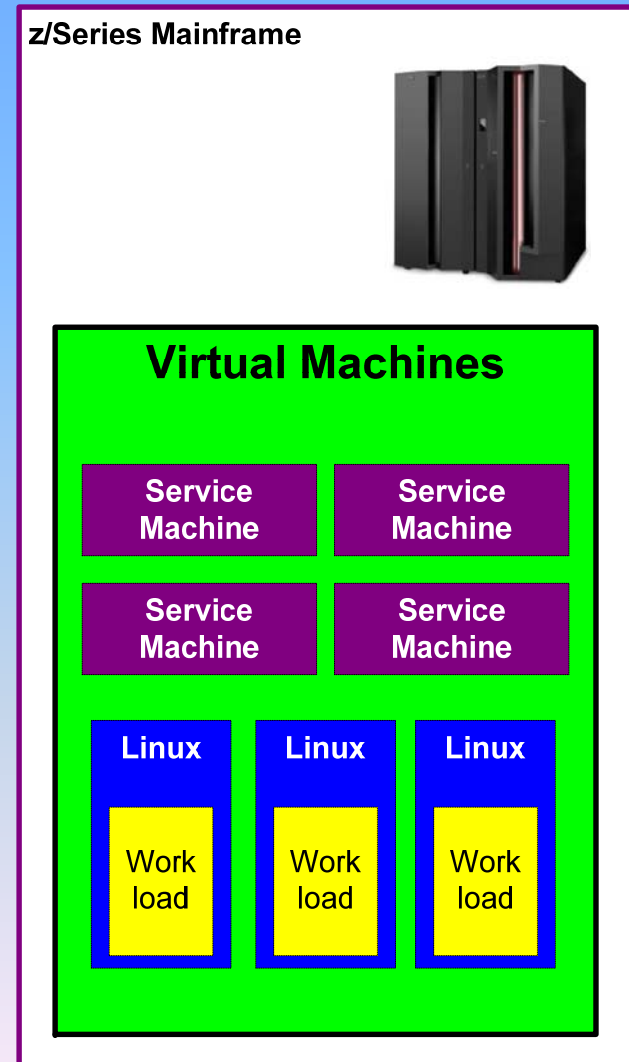


- **Highly Reliable Environment**
 - **z/Series has Redundant Processors and Memory**
- **Centralized Linux Systems are Easier to Manage (Automation, Backup, D/R)**
- **Hundreds of Linux Virtual Guests are possible**
- **Specific z/Series Hardware is Available (Crypto, OSA, Shared Tape Libraries, ECKD or SCSI DASD, HiperSockets)**

Opportunity to Consolidate Workloads on z/VM



- **Primary Reason: Share Resources with many Guests**
 - **Add/Change/Delete Guests when Needed**
 - **Each Guest Can be Sized as Needed**
 - **Common Chargeback can be reported on Each Guest**



Limitations of z/VM



- **Physical Limitations of Hardware Still Exists**
 - **Share Processors**
 - **Shared Storage**
 - **Share I/O**
- **z/VM itself creates some Overhead**
 - **V5.2 eliminates some of this**
- **Over-commitment of Resources may lead to Performance Challenges**
- **CPU-Intensive Workloads may still be better in a Native Environment**

Opportunity to Replace NCP Controllers

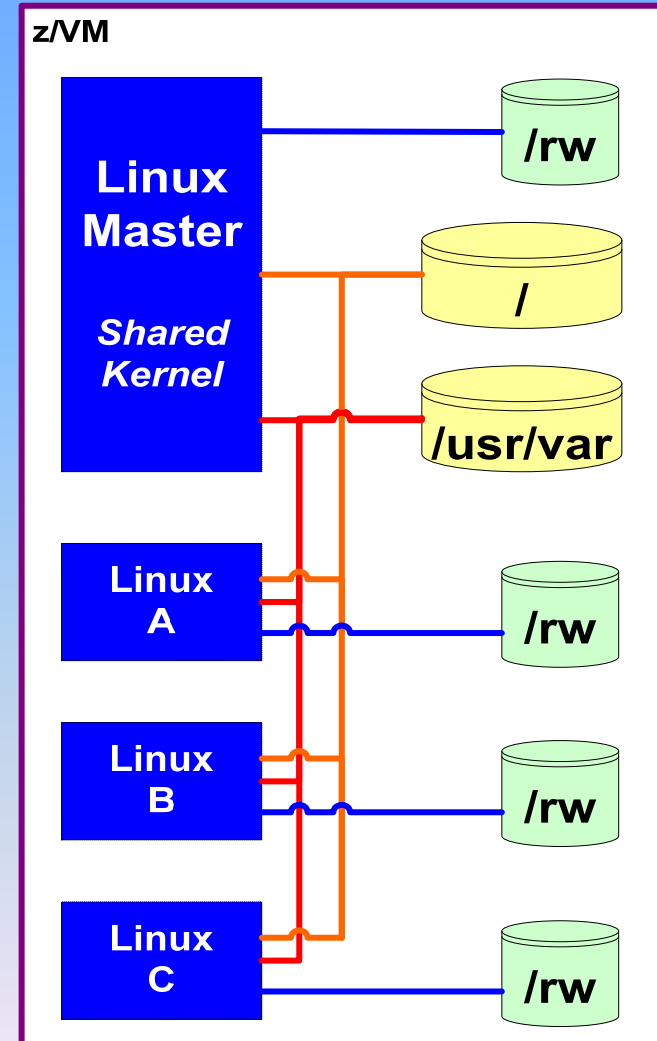


- **Some large Customers Still Run SNA and SNI Communications**
- **Some have Implemented SNA encapsulated over IP**
- **3745/3746 TP Controllers are no longer Available**
- **Communication Controller for Linux on zSeries can provide an Alternative for SNA, SNI, EP, BSC, X.25, and TN3270, without the 37xx Hardware**

Opportunity to Share Linux Environments



- Establish Life-Cycle Environments (Test, Dev, Q/A, Prod, D/R)
- Facilitate Maintenance to 100s of Servers
- Establish Application Groups (Server Farms)
- Facilitate Standard Software Environment



Opportunity to Share Resources



- **Each Distributed Server Typically is Configured with its own Resources**
 - **Memory, DASD, Tape, Network**
- **In Large Mainframe Environments, Resources are Shared among all Images (Sysplex, Monoplex, Site, GDPS)**
 - **Memory (Coupling Facilities, DASD, Tape, Network)**
 - **Tape Devices (Libraries) can be automatically shared between z/OS, z/VM, and Linux Guests**

Opportunity to Share Resources

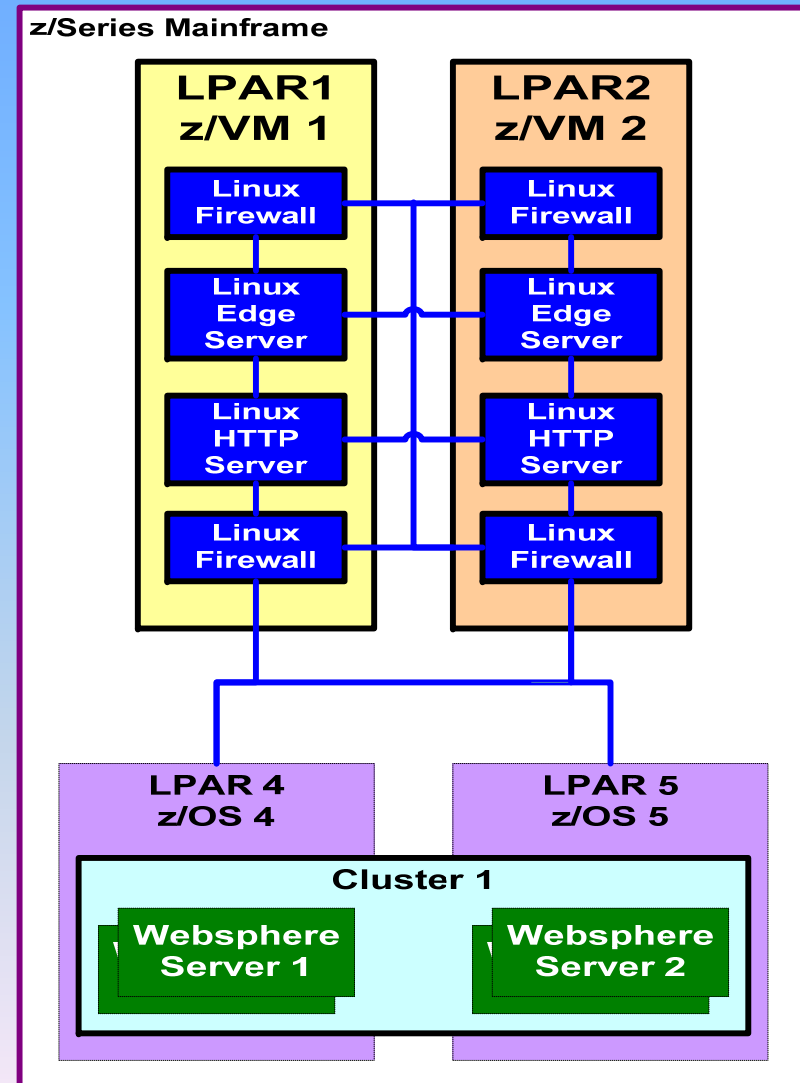


- **In z/Series Hardware, Integrated Coupling Facilities, Integrated Coupling Links, and HyperSockets help eliminate real Hardware (I/O Elimination)**
- **In z/VM Virtual Networking Simplifies the Hardware Environment, eliminating real Hardware**
 - **Virtual CTCs, Virtual Switches, Virtual LANs**
- **In z/VM I/O Avoidance is accomplished with Virtual Disks (in Storage) and Mini-Disk Caching (MDC)**

Opportunity to Architect High Availability e-business Environments



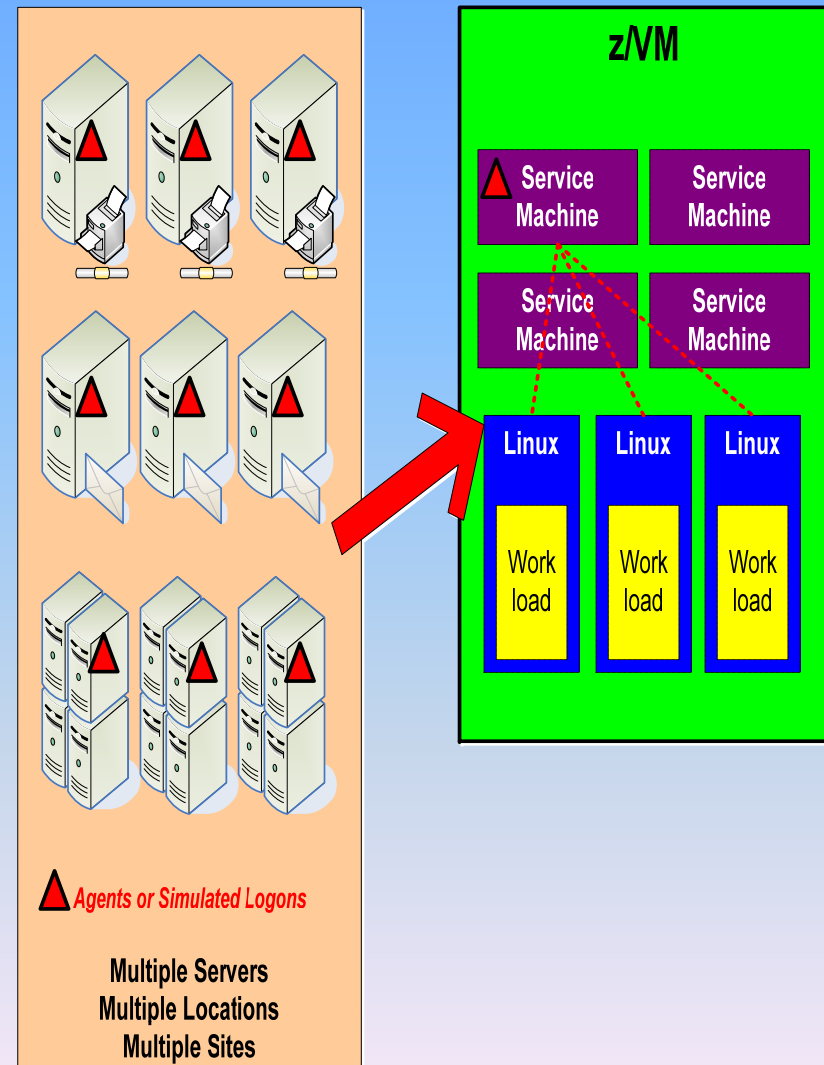
- z/OS has the capabilities to provide Scalable WAS Servers
- Normally, ancillary Servers reside on z/OS
- Moving them to non-z/OS provides High Availability



Opportunity to Implement Automation



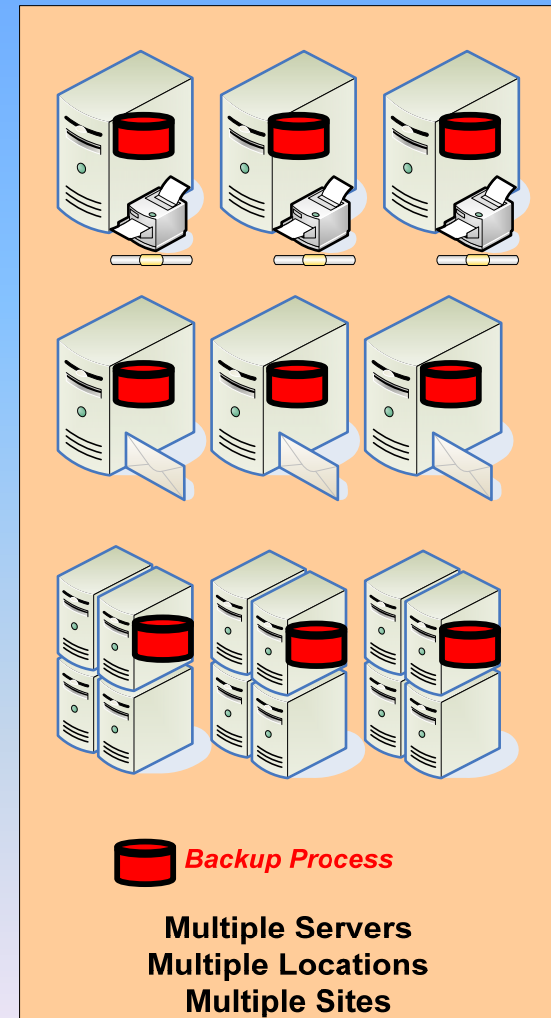
- For Distributed Servers, Agents or Log Scrapers needed on each
- Many Linux Virtual Guests route their Messages to a single Service Machine
- Only 1 Automation Product is Necessary
- May also Interface with the Automation on the z/OS Environments
- May also Interface with Scheduling Processes on z/VM and z/OS



Opportunity to Implement Disaster Recovery



- Routine Point-in-Time Backups must be performed on all Distributed Servers
- On z/VM, all Backups can be created by a Single Service Machine
- Full Volume Backups can be created
- GDPS-like Process for z/VM enables Hot Backup to a Recovery Site
 - All Servers can be recovered at one time



Opportunity to Implement Performance Monitoring and Reporting



- On Distributed Servers, Individual Agents, SNMP, or Simulated Logons are needed to collect Alerts or Performance Data
- On z/Series Hardware, Alerts from: z/VM Virtual Guests, the Linux Applications, the Linux OS, and z/OS may be collected and processed together
- Types of Alerts:
 - Availability
 - Critical Errors
 - File System
- Types of Data
 - z/VM Processors, Storage, I/O
 - z/VM Utilization
 - Linux Processes
 - Linux CPU Utilization (Kernel, User, Processes)
 - Linux Memory Utilization and Activity (Shared, Buffered, Cache)
 - Linux Network Activity
 - Linux File System Utilization



Issues

The Cons of z/Linux on the Mainframe



- **Potential for Increased Education and Training Costs (z/VM, Linux)**
- **Potential for Steep Learning Curve for Support and Operations Staff**
- **Potential for Requiring New Software from New Vendors**
- **Potential for Requiring New Maintenance Practices**
- **Potential for Unloading Server Hardware and Peripherals**

Summary



- We've talked about some interesting aspects of implementing Servers in our familiar Mainframe Environment
- More Topics to talk about:
 - Migration Process
 - Porting Applications
 - Testing
 - Sizing
 - Capacity Planning
 - Successes
 - Challenges

References



- ***Linux Platform Options- Selecting Linux on zSeries***, Share in Anaheim, Session 9202, February 2005, Jim Elliott, IBM Canada
- ***Server Consolidation with Linux for zSeries***, Redbook, 2002, Erich Amrehn, Joachim Jordan, Frank Kirschner, Bill Reeder
- ***Linux for zSeries Information Update***, Share in Anaheim, Session 9256, February 2005, J.D. Ross, Jeff George
- ***Implementing Linux on IBM eserver zSeries and S/390: Best Practices***, October 2004, Jason C. Horton
- ***Performance Considerations for Linux Guests of z/VM***, Share in Anaheim, March 2005, Bill Bitner
- ***Linux on IBM zSeries and S/390: High Availability for z/VM and Linux***, Redbook, 2002, Erich Amerehn, Ronald Anniss, Bernhard Duerbegerm Ruchar Plasun, U. Sager
- ***Sizing Linux servers on zSeries***, CMG- Italy, May 2003, Arturo Calandrino, IBM Italy
- ***Linux on zSeries Performance Tools***, Share in Anaheim, Session 2592/9302, February 2005, Oliver Benke, IBM Germany
- ***Monitoring and Understanding Performance on Linux for zSeries & S/390***, zSeries Technical Conference in Miami, Session L85, October 2002, Joachim Schmalzried, IBM Germany
- ***Replacing Windows Servers with Linux***, zSeries Expo in Miami, Session L08, November 2004, Mark Post, IGS

Other Presentations



- ***New Age Performance Monitoring***
- ***New Age Autonomic Computing: Linking Performance Monitors and Automation Solutions***
- ***New Age Sysplex: Expanding the Boundaries***
- ***How's That Work? Focus on WLM Batch Workloads***
- ***How's That Work? Focus on WLM STC Workloads***
- ***How's That Work? Focus on WLM Transaction Workloads***
- ***How's That Work? Focus on WLM Database Workloads***
- ***What's New: Focus on z/Technologies***
- ***WLM: After Goal Mode, the Yellow Brick Road Didn't Lead to Emerald City***
- ***The z/Approach for Setting Up a z/OS Operating Environment***

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Thank You!

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