IBM System z9 and eServer zSeries

z/VM V5.2 - Platform Update

Alan Altmark, IBM

Alan_Altmark@us.ibm.com

Trademarks

The following are trademarks of the International Business Machines Corporation in the United States and/or other countries. For a complete list of IBM Trademarks, see www.ibm.com/legal/copytrade.shtml: AS/400, DB2, e-business logo, ESCON, eServer, FICON, IBM, IBM Logo, iSeries, MVS, OS/390, pSeries, RS/6000, S/390, System z9, VM/ESA, VSE/ESA, WebSphere, xSeries, z/OS, zSeries, z/VM.

The following are trademarks or registered trademarks of other companies

Java and all Java-related trademarks and logos are trademarks of Sun Microsystems, Inc., in the United States and other countries.
LINUX is a registered trademark of Linux Torvalds in the United States and other countries.
UNIX is a registered trademark of The Open Group in the United States and other countries.
Microsoft, Windows and Windows NT are registered trademarks of Microsoft Corporation.
SET and Secure Electronic Transaction are trademarks owned by SET Secure Electronic Transaction LLC.
Intel is a registered trademark of Intel Corporation.
* All other products may be trademarks or registered trademarks of their respective companies.

NOTES:

Performance is in Internal Throughput Rate (ITR) ratio based on measurements and projections using standard IBM benchmarks in a controlled environment. The actual throughput that any user will experience will vary depending upon considerations such as the amount of multiprogramming in the user's job stream, the I/O configuration, the storage configuration, and the workload processed. Therefore, no assurance can be given that an individual user will achieve throughput improvements equivalent to the performance ratios stated here.

IBM hardware products are manufactured from new parts, or new and serviceable used parts. Regardless, our warranty terms apply.

All customer examples cited or described in this presentation are presented as illustrations of the manner in which some customers have used IBM products and the results they may have achieved. Actual environmental costs and performance characteristics will vary depending on individual customer configurations and conditions.

This publication was produced in the United States. IBM may not offer the products, services or features discussed in this document in other countries, and the information may be subject to change without notice. Consult your local IBM business contact for information on the product or services available in your area.

All statements regarding IBM's future direction and intent are subject to change or withdrawal without notice, and represent goals and objectives only.

Information about non-IBM products is obtained from the manufacturers of those products or their published announcements. IBM has not tested those products and cannot confirm the performance, compatibility, or any other claims related to non-IBM products. Questions on the capabilities of non-IBM products should be addressed to the suppliers of those products.

Prices subject to change without notice. Contact your IBM representative or Business Partner for the most current pricing in your geography.

References in this document to IBM products or services do not imply that IBM intends to make them available in every country.

Any proposed use of claims in this presentation outside of the United States must be reviewed by local IBM country counsel prior to such use.

The information could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publication. IBM may make improvements and/or changes in the product(s) and/or the program(s) described in this publication at any time without notice.

Any references in this information to non-IBM Web sites are provided for convenience only and do not in any manner serve as an endorsement of those Web sites. The materials at those Web sites are not part of the materials for this IBM product and use of those Web sites is at your own risk.

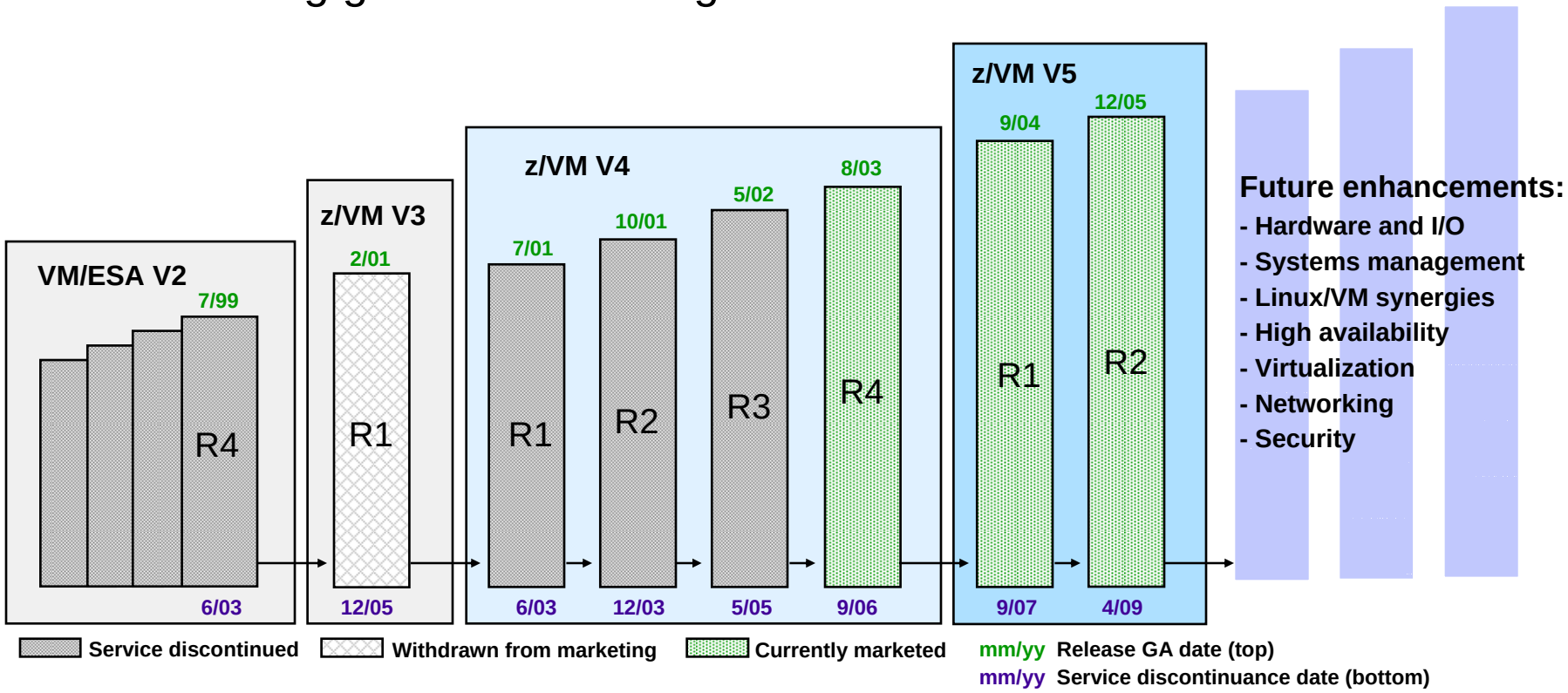
Topics

- **Recent VM Release History**
- **z/VM Version 5 Product Introduction**
- **z/VM Version 5 Release 2 Content Overview**
- **Futures Discussion**

Recent VM Release History

z/VM Version 5: High-Value Virtualization Technology

- ★Generating new business with Linux on zSeries
- ★Enabling growth for existing VM customers

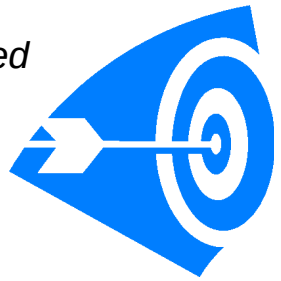


z/VM Version 4 Release Highlights

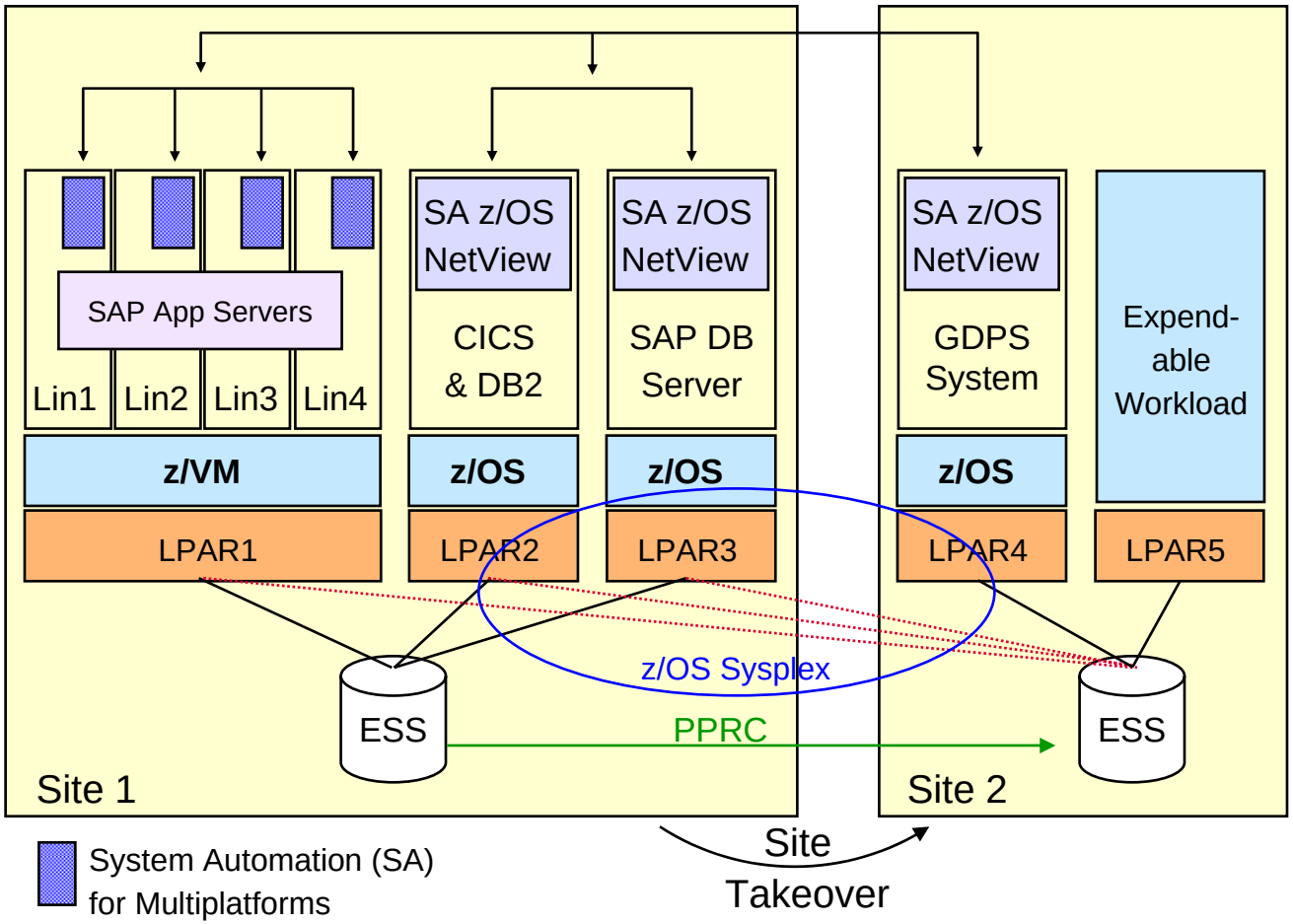
- **z/VM V4.1**
  - New pricing Ts&Cs
  - Support for IFL engines
  - Linux performance support
  - Express Install (for new users)
- **z/VM V4.2**
  - Guest LAN support
  - HiperSockets support
  - PCICC / PCICA Crypto support
  - Linux performance support
  - Guest support for CF Duplexing
- **z/VM V4.3**
  - Guest FCP support
  - Virtual Machine Resource Manager
  - Guest LAN enhancements
- **z/VM V4.3 (continued)**
  - IP Wizard and “ifconfig” for z/VM
  - Virtual network accounting
  - Automated shutdown signal
  - RACF feature
- **z/VM V4.4**
  - z990 exploitation support
  - Integrated 3270 console support
  - Guest support for SCSI IPL
  - QDIO adapter interrupt passthru
  - Guest LAN IPv6 support
  - Virtual IP switch
  - IEEE VLAN support
  - System management APIs
  - Performance Toolkit feature
  - HCD and HCM support

z/VM Version 5 Release 1 New Function Highlights
Including Post-GA Support Enhancements

- **Processor and device support**
  - IBM z990 and z890 support enhancements
  - Coupling Facility Control Code Level 14
  - FICON Express2
  - PCIX Crypto and Crypto Express2
  - Support for 24 CPUs
  - OSA-Express Integrated Console Controller support
  - CP/CMS support for SCSI disks and FCP LUN access control
  - DS8000 and DS6000 storage subsystems
  - TotalStorage 3592 tape subsystem
- **Server hosting support**
  - Dynamic virtual machine timeout
  - HyperSwap (GDPS PPRC Multiplatform Resiliency for zSeries)
- **Networking**
  - OSA-Express2 support
  - Enhanced OSA-Express connectivity
  - Layer 2 and 3 Virtual Switch support
  - RACF authorization support for Guest LANs and Virtual Switches
  - VM TCP/IP support for IPv6
- **Systems management**
  - Capacity on Demand enhancements
  - Additional Systems Management APIs
  - Performance Toolkit for VM enhancements
  - Service support enhancements
- **Ease-of-use**
  - New publication: *Getting Started with Linux on zSeries*



GDPS/PPRC Multiplatform Resiliency for zSeries

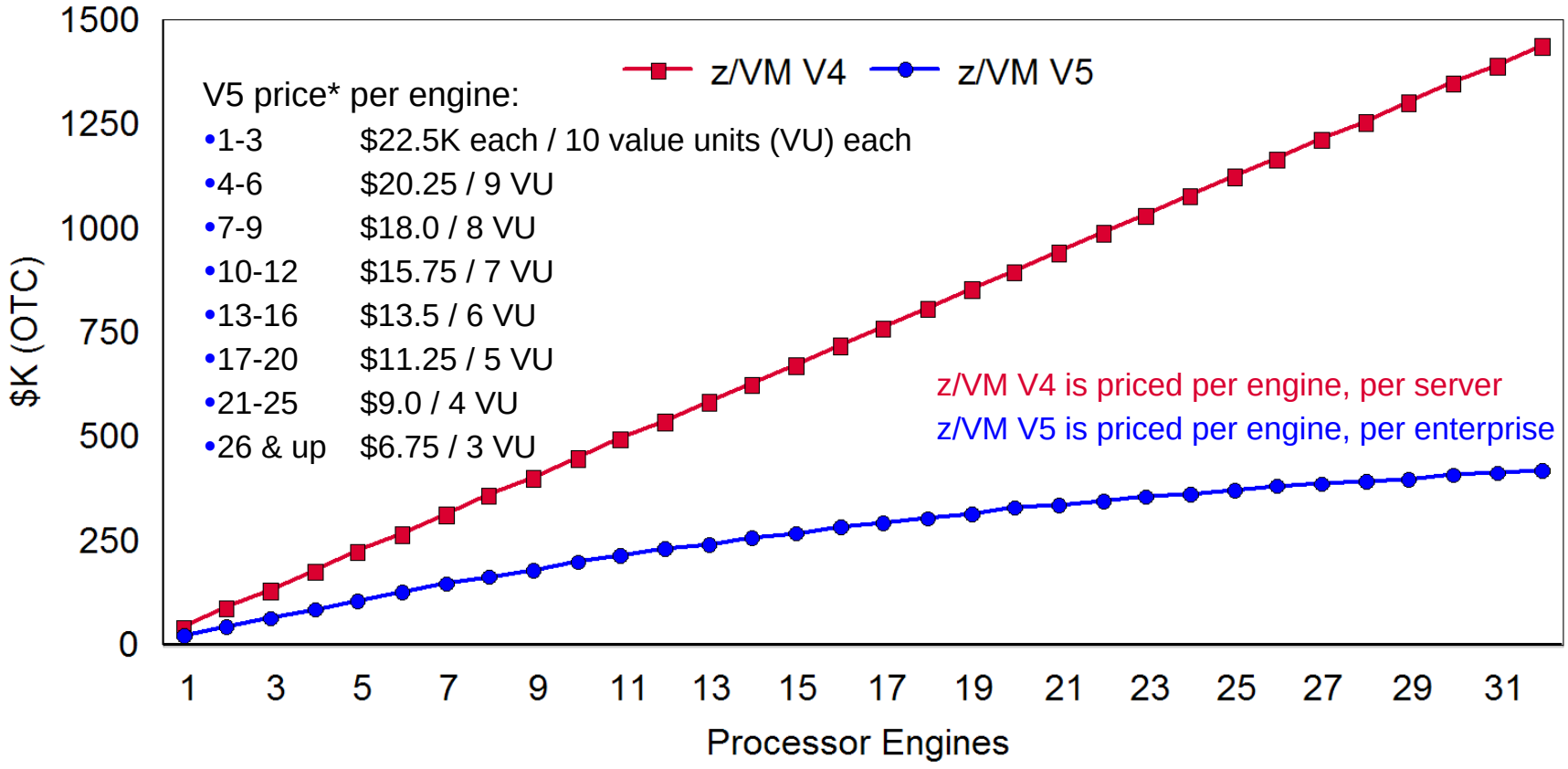


- Designed for customers with distributed applications
- SAP application server running on Linux for zSeries
- SAP DB server running on z/OS
- Coordinated near-continuous availability and DR solution for z/OS, Linux guests, and z/VM
- Uses z/VM HyperSwap function to switch to secondary disks
- Sysplex support allows for site recovery if needed

z/VM Version 5 Product Introduction

- **Runs on IBM System z9 (z9-109) and IBM eServer zSeries (z800, z900, z890, z990) processors and other equivalent servers**
  - The z/VM V5 Control Program requires 64-bit addressing (z/Architecture)
  - 64-bit and 31-bit (ESA/390) virtual machines are supported
- **Runs on Integrated Facility for Linux (IFL) processor engines as well as standard processor engines**
- **IPLA software product (5741-A05) with new, improved pricing Ts&Cs**
  - One-time charge license fee, priced on a per-engine basis
  - Price/engine decreases (on a tiered basis) as more engines are licensed
  - Engines can be aggregated across an enterprise for licensing purposes
  - Ordered via the System Delivery Option (SDO) (5741-A06)
- **Optional Software Subscription & Support (S&S) product (5741-SNS)**
  - Required to receive IBM support center services
  - Entitles customers to future z/VM releases and versions
  - Annual, renewable license charge
- **Includes priced features**
  - DirMaint, RACF/VM, Performance Toolkit for VM
  - Pre-installed, but disabled (license required; same pricing model as base)

z/VM Version 5 Pricing



*U.S. prices as of July 26, 2005

z/VM Version 5 Pricing
Detailed Information

- **z/VM V5 uses a Value Unit pricing model**
  - z/VM V5 value units correspond to processor engines, not MIPS or MSUs
  - A single z/VM V5 value unit is priced at $2,250 (U.S. pricing as of 7/26/05)
  - Engines 1, 2, and 3 are priced at 10 value units each
  - Engines 4, 5, and 6 are priced at 9 value units each
  - Pricing continues on a tiered basis (see next chart)
- **z/VM Version 4 customers who have purchased Software Subscription and Support (S&S) are entitled to receive z/VM Version 5 at no charge**
  - No charge to run z/VM V5 on same number of V4-licensed engines
  - Subsequent S&S annual payments will be based on z/VM V5 pricing
  - Keep in mind z/VM Version 5 requires z/Architecture to operate
  - If the customer adds capacity (engines) after the migration, pricing for the added capacity will be based on the z/VM Version 5 pricing model
- **If z/VM V5 is licensed to run on an IFL engine, all IFLs must be counted to determine the z/VM V5 licensing fee**
- **If z/VM V5 is licensed to run on a standard engine, all standard engines must be counted to determine z/VM V5 licensing fee**

z/VM Version 5 Product Packaging Changes

- **DFSMS/VM is no longer *automatically* shipped with the base product**
  - It is now a no-charge feature and must be ordered via the SDO
- **3270 PC File Transfer product (5664-281) is *included* with base product**
  - Delivered with z/VM V5 as a sample program (with no support)
- **Restricted source feature and PL/X source *no longer ship* with z/VM V5**
  - Restricted source is a no-charge feature of z/VM V4
  - PL/X source is provided with the z/VM V4 installation media
  - Both will be available as no-charge downloads from IBM Resource Link for z/VM V5 customers (who register with Resource Link)
- **Tivoli Storage Manager for VM is *no longer pre-installed* with z/VM V5**
  - TSM for VM is packaged with the z/VM V4 system DDRs
  - Consider TSM for Linux on zSeries for future TSM server support
- **National Language features for ISPF have been *removed* from the SDO**
  - Features can be ordered using the standalone ordering process
- ***HCD/HCM upgraded to new level***
- ***z/VM Collection Kit publications available on DVD (supplied with order)***

z/VM V5.2-only items highlighted in ***blue***

Functions Removed from z/VM Version 5

- **RTM and PRF features (replaced by Performance Toolkit for VM)**
- **SPTAPE (use SPXTAPE to backup Spool files)**
- **V=R and V=F virtual machine support**
- **CMS support for Java and NetRexx programs**
- ***System Administration Facility***
- ***Support for Server-Requester Programming Interface (SRPI)***
- **Device support**
  - DASD/Controllers: 3370, 3375, 3380(1), Multiprise Internal Disk, 9332, 9335, 9336(2), 9340, 3830, 3880
  - Optical: 3995 Optical Dataserver
  - Tape/Controllers: 2440, 3420, 3422(3), 3424, 3430, 9348, 3803
  - Communications: all SDLC, BSC, and CETI ICAs, *3705, 3720, and 3725 Communication Controllers, 8232 LAN Channel Station*
  - Terminals: *2741 and TWX Terminal Model 33/35 (TTY) as virtual consoles*
  - Refer to the z/VM V5.2 GIM for a complete listing of devices supported

Notes:
(1) RAMAC-emulated 3380 models J and K and 3390 DASD configured for 3380-track-compatibility are supported
(2) 9336 is a supported device geometry for Virtual Disks in Storage and emulated SCSI LUNs
(3) OMA/2 CD-ROM emulating a 3422 is supported

z/VM V5.2-only items highlighted in ***blue***

z/VM Version 5 Product Installation Support

- **z/VM V5.2 can be installed on:**
  - 3390-formatted DASD volumes (Models 3 and 9)
  - FCP-attached SCSI disks: ESS 750, ESS 800, DS8000, DS6000, *DS4000*
- **Installation media options:**
  - DVD (the only option for installing z/VM V5 on SCSI disks)
  - 3590 and 3480 tape
  - *No CD-ROM support for z/VM V5.2*
- **System Residence (SYSRES) volume changes**
  - Spool and paging space removed from SYSRES
  - Located on separate installation volumes
- **Two installation methods available with z/VM V5**
  - Streamlined process ("Express Install") for new users
  - Traditional process for experienced systems programmers

z/VM V5.2-only items highlighted in ***blue***

z/VM Version 5 Release 2 New Function Highlights

Expanding IBM Mainframe Support for Virtual Server Hosting

- **Processor and device support**
  - IBM System z9
  - Dynamic LPAR naming support
  - Crypto Express2 Accelerator
  - SCSI disk I/O performance improvements
  - N_Port ID Virtualization support
  - DS8000 and DS6000 storage subsystems
  - DS4000 midrange disk systems
- **Server hosting support**
  - Enhanced z/VM support for large real memory configurations
  - Enhanced performance assists for z/VM guest images
  - z/VM Guest LAN and Virtual Switch sniffer support
- **Networking**
  - OSA-Express2 Open Systems Adapter for NCP support
  - New MPROUTE server for z/VM
  - z/VM SSL Server upgrade
- **Systems management**
  - Enhanced z/VM systems management
  - Simplified user administration: DirMaint and RACF coordination
  - Improved directory management performance
  - Performance Toolkit for VM support
  - Product service and installation enhancements

Time for a Change, but…

Data centers have become so fragile that administrators are fearful to touch the existing infrastructure, since any changes may set off a series of events that can bring a company to its knees. Consequently, many enterprises are restricted in deploying innovative applications that could potentially create competitive advantage.

—The Yankee Group. January 5, 2005

Source: The Yankee Group, “Considerable Savings Are Possible Using Grid Computing and Virtualization Technologies,” Research Notes, January 2005.

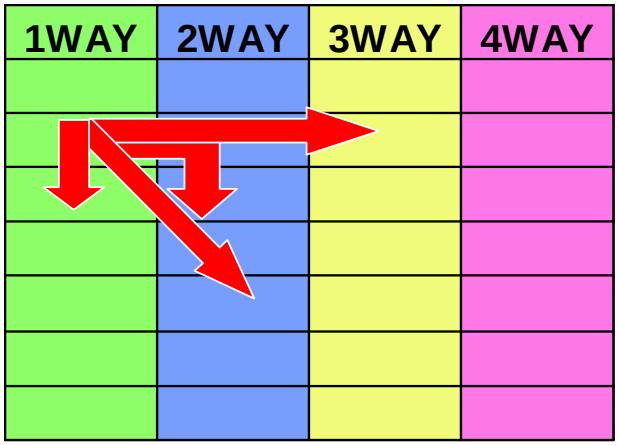
z/VM Release Support for IBM System z9

- **Support for the z9-109 will be included in the general availability release of z/VM V5.2 on December 16, 2005**
- **Compatibility support will be available for z/VM V5.1 and V4.4 coincident with availability of the z9-109 on September 16, 2005***
  - Required PTFs (APARs) for z/VM V5.1 and V4.4 compatibility support:
    - CP: VM63646, VM63722, VM63744
    - CMS (IOCP): VM63740
    - EREP: VM63743
    - HCD/HCM: VM63721
    - OSA/SF: OA11650
- **The following z/VM V5.2 support for the z9-109 is also available for z/VM V5.1 and V4.4:**
  - Multiple Logical Channel Subsystems support
  - Internal and external spanned channel support
  - Extended channel data measurement support
  - Support for configurations with up to 60 LPARs

* Planned availability for the z9-109 S54 is November 2005

z890 Capacity Setting Feature Codes

- **A new way to upgrade mainframe server capacity**
- **One MCM per model with 5 Processor Units (PUs)**
  - One PU is configured as a SAP (standard)
  - Four PUs available for characterization
- **IFLs, ICFs, zAAPs are configured at full speed**
- **Variable speed settings for standard CPs**
  - Up to four full-capacity processors, each with seven capacity settings
  - Upgrades can be horizontal, vertical, or diagonal to best fit your needs*
  - All upgrades are designed to be concurrent to hardware (no POR required)
  - Horizontal upgrades designed to be concurrent to Operating System (no re-IPL required)
  - Vertical and diagonal upgrades change CP speed
    - Designed to be concurrent with z/OS V1.4 or higher with PTF for APAR OA07510
    - Designed to be concurrent with z/VM V5.1 or higher for Linux and z/OS guests



* No mixing of standard CP capacity sizes in multi-engine machines; zAAPs cannot outnumber standard CPs

z890 Capacity Setting Feature Codes

1-WAY	2-WAY	3-WAY	4-WAY
110	210	310	410
120	220	320	420
130	230	330	430
140	240	340	440
150	250	350	450
160	260	360	460
170 – Full 1-way	270 – Full 2-way	370 – Full 3-way	470 – Full 4-way

Single Machine (2086), Single Model (A04)

z/VM Dynamic LPAR Naming Support

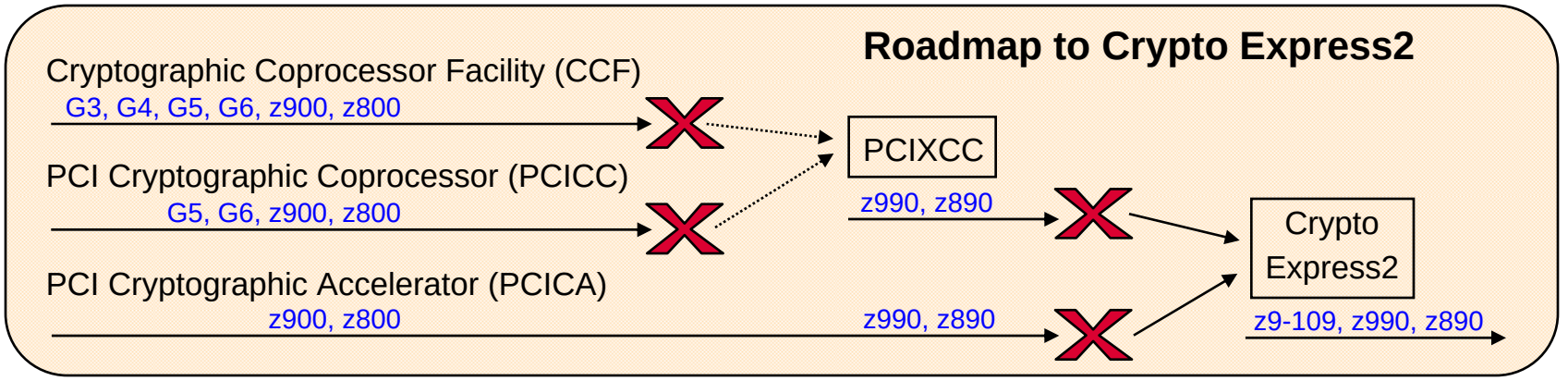
- **z/VM V5.2 provides the facilities to dynamically define and delete Logical Partitions (LPARs)**
  - Support is available using CP's dynamic I/O command interface and z/VM HCD/HCM support
- **Hardware support is available for System z9, z990, and z890 servers**
- **LPARs can be defined without real resource allocations and dynamically configured at a later time**
- **Capability allows customers to add meaningful LPAR names to a running configuration without requiring a Power-On Reset (POR)**

z/VM Support for IBM System z9
Crypto Express2 Accelerator

- **Crypto Express2 Coprocessor**
  - Shared-queue and dedicated-queue support for clear key cryptographic functions for Linux guests
  - Dedicated-queue support for clear-key and secure-key cryptographic functions for z/OS guests

New

- **Crypto Express2 Accelerator**
  - Designed to support clear-key RSA operations
  - Offloads compute-intensive RSA public-key and private-key cryptographic operations employed in the SSL protocol
  - Supported by z/VM V5.2 and also V5.1 with the PTF for APAR VM63646



z/VM Version 5 Support for FCP-Attached SCSI Disks

Integrate Your z/VM Systems with Storage Area Networks

- **z/VM V5.2 and V5.1 allow FCP-attached SCSI disks to be used for both system use (CP/CMS) and guest images**
- **SCSI disks are emulated as 9336 Model 20 FBA devices for system use**
  - Enables support for install, paging, spooling, directory services, minidisks
  - Guest systems supporting FBA can also use emulated SCSI disks
  - Emulation support currently limits usable disk space to nearly 1 TB for CP volumes and 381 GB for CMS and GCS
  - Paging, spooling, and directory space must reside in first 64 GB
- **Non-emulated SCSI disks can still be attached to virtual machines**
  - For boot and/or data operations
  - Requires SCSI support in guest operating system
- **Currently supported SCSI disks:**
  - IBM TotalStorage Enterprise Storage Server Models 750 and 800
  - IBM TotalStorage DS8000, DS6000, DS4000
  - Generic SCSI driver available for other disks
- **SCSI-only disk configurations are now possible with z/VM V5**

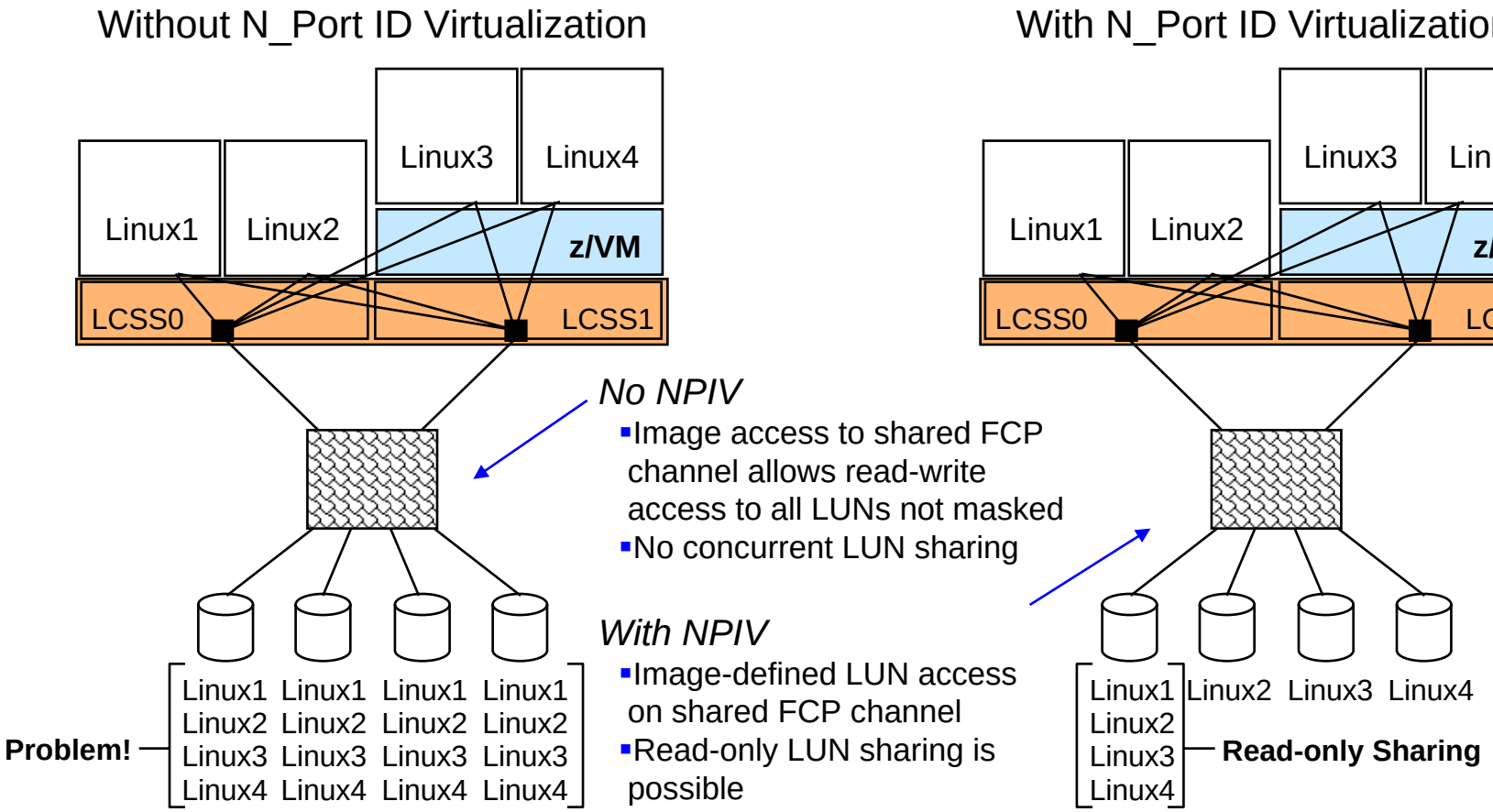
z/VM V5.2 Improved Performance of SCSI Disk I/O

- **QDIO efficiency improvements**
  - Chaining I/O requests allows more data to be moved with a single I/O request
  - Reduces fragmentation of large channel programs; decreases CP overhead
  - Significantly lowers number of I/O operations driven through the SCSI stack
- **Paging and spooling optimization**
  - No longer uses FBA emulation
  - SCSI commands are sent directly to the SCSI stack
- **Improved FBA emulation**
  - Reduces the number of I/O requests to the z/VM SCSI stack
  - Significantly improves performance for CMS and Linux SCSI I/O
  - I/O buffers are read more efficiently by CMS
  - FBA “padding function” is handled more efficiently: reduces time required to boot a Linux guest image
  - Improves I/O performance for SCSI format functions

z/VM Support for IBM System z9
N_Port ID Virtualization (NPIV)

- **FICON Express features on System z9 support FCP N_Port ID Virtualization**
- **NPIV complements zoning and LUN masking**
- **Multiple operating system images can now concurrently access the same or different SAN-attached devices (LUNs) via a single, shared FCP channel**
  - Can improve channel utilization
  - Less hardware required
  - Helps reduce the complexity of physical I/O connectivity
- **Supported by z/VM V5.2 and also z/VM V5.1 with the PTF for APAR VM63744**
- **Currently, z/VM V5 cannot be installed from DVD to SCSI disks when NPIV is enabled**
  - A future enhancement is planned to provide this capability in z/VM V5.2
- **IBM also intends to provide a future enhancement to z/VM V5.2 for NPIV such that guest operating systems and VM users can obtain virtual port names**

N_Port ID Virtualization (NPIV)



IBM TotalStorage DS6000 and DS8000
Advanced Disk Storage Solutions

- **DS6000 Series:**
  - Designed to provide exceptional price & performance in a modular package that redefines enterprise-class storage
    - 16 drives / 3U package; scalable from 4 to 224 drives; up to 67.2 TB
  - Shares advanced software features with ESS and DS8000

- **DS8000 Series:**
  - Designed to deliver massive scalability using IBM POWER5 processors
  - Up to 6 times the performance of a base ESS 800 for increased response time and usable capacity (up to 192 TB of storage) with 20% smaller footprint
  - Storage system LPARs in select DS8300 models allow two virtual storage systems within a single array (reducing price/megabyte)

- **z/VM support:**
  - z/VM V5.2 includes support for SCSI disk capacities nearing 1TB* for CP volumes and 381 GB for CMS and GCS volumes
  - z/VM V5.1 PTFs – *DS8000*: VM63534, VM63653, *DS6000*: VM63535, VM63653, *near-1 TB support*: VM63700, VM63664
  - z/VM V4.4 PTFs – *DS8000*: VM63534, VM63653, *DS6000*: VM63535, VM63653

* 2,147,483,640 512-byte blocks

z/VM Support for IBM TotalStorage DS4000 Series

Mid-range SCSI Disk Storage for z/VM Users

- **z/VM V5.2 SCSI disk support is extended to include support for the DS4000 mid-range disk system**
  - Formerly known as the FAStT product family
- **z/VM support includes the Redundant Disk Array Controller (RDAC) driver**
  - Provides multipath attachment with failover support
  - Designed to continue accessing storage on attached devices even if an element in the path (e.g., adapter, cable, switch) fails
- **Provides customers a lower-cost disk solution for z/VM system and guest data storage (and boot volumes)**

Understanding z/VM Support for SCSI Disks

- **Linux I/O to dedicated ECKD and dedicated SCSI disks can achieve roughly the same levels of performance**
- **z/VM ECKD I/O can achieve a higher level of performance than SCSI disk I/O**
  - Continue to use ECKD disks for CP/CMS I/O if it is an option
- **Increased pathlength of z/VM SCSI disk I/O can be offset**
  - Reduce over commitment of virtual-to-real memory (i.e., reduce paging)
  - Use minidisk cache for read-mostly I/O
  - FCP/SCSI channels are faster than ESCON/ECKD channels
  - Additional processor cycles will offset increased SCSI I/O pathlength
- **Sharing FBA-emulated SCSI disks among Linux images can offer disk and administrative savings**
  - Allows partitioning of SCSI disks using z/VM minidisk support (includes exploitation of minidisk cache support)
  - Allows use of tuning options like “Set Throttle” and “Set IOPriority”
  - Performance monitoring of emulated disks is functionally richer than dedicated SCSI disks
- **IBM TotalStorage DS6000 offers a low-cost ECKD option for z/VM data**

Enhanced z/VM Support for Large Real Memory

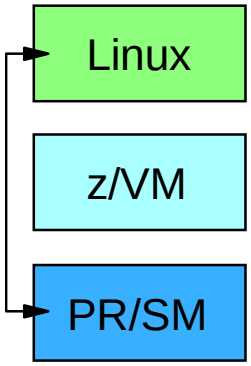
Constraint Relief for Memory-Intensive Virtual Server Environments

- **z/VM V5.2 Control Program (CP) offers improved performance and scalability for environments with high demand on storage below 2 GB**
  - I/O data can now be transferred from buffers located anywhere in memory
  - QDIO structures may now reside above the 2 GB address line
  - Most CP control blocks may now reside above the 2 GB address line
- **Storage above 2 GB address line is included in dumps**
  - CP hard and soft abend dumps and SNAPDUMPs
  - Standalone z/VM dumps or VMDUMPs of z/Architecture virtual machines
- **TCP/IP for z/VM exploitation of 64-bit Diagnose 98**
  - Enhanced QDIO device driver uses I/O buffers above 2 GB when possible
  - Helps reduce chance of server failure due to lack of buffer space
- **Block I/O (Diagnose 250) support**
  - Virtual machines can specify parameter addresses and I/O buffers above the 2 GB address line
  - IBM is working with its Linux distribution partners to exploit this function in future Linux on System z9 and zSeries distributions or service updates

Enhanced Performance Assists for z/VM Guests

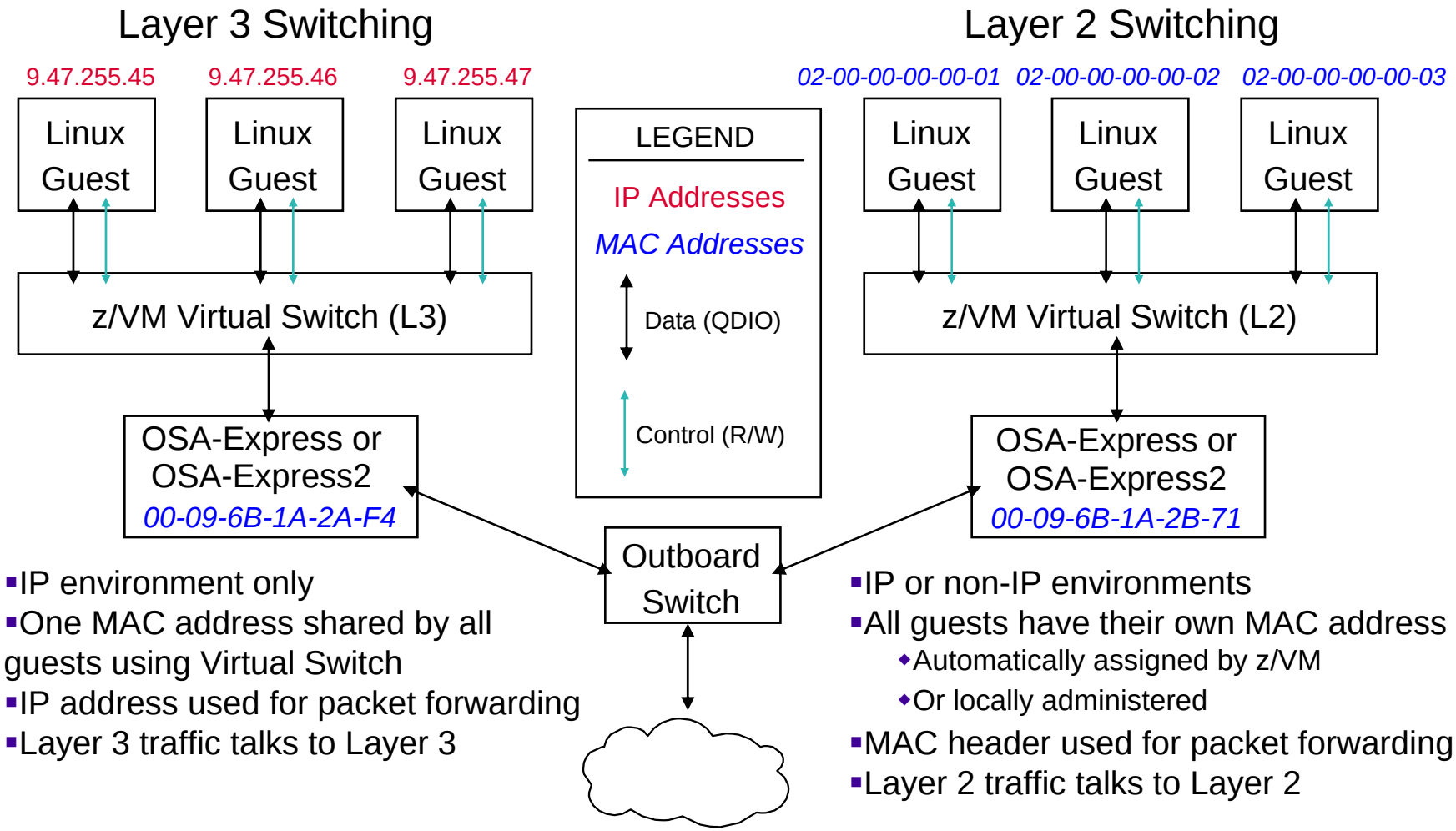
Improved Performance for Guest QDIO Operations

- **QDIO Enhanced Buffer-State Management (QEBSM)**
  - Two new machine instructions designed to help eliminate overhead of hypervisor interception
- **Host Page-Management Assist (HPMA)**
  - Interface to z/VM paging and storage management
  - Designed to allow hardware to assign, lock, and unlock page frames without hypervisor assistance
- **Assists are applicable to the following environments:**
  - First-level guests of z/VM V5.2
  - HiperSockets (CHPID type IQD)
  - All OSA features (CHPID type OSD)
  - All FICON features (CHPID type FCP)
- **Complements performance assists introduced in z/VM V4.4**
- **Hardware/firmware support available with z9-109, z990, and z890**



z/VM Virtual Switch Support

Layer 3 Compared to Layer 2 Switching

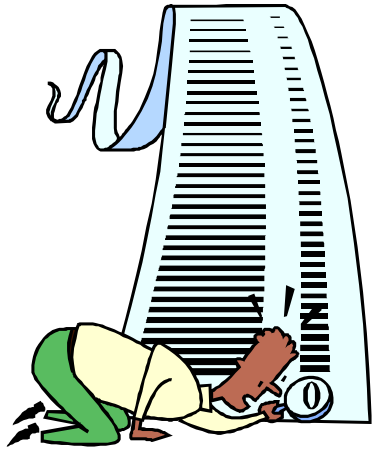


- IP environment only
- One MAC address shared by all guests using Virtual Switch
- IP address used for packet forwarding
- Layer 3 traffic talks to Layer 3

- IP or non-IP environments
- All guests have their own MAC address
  - Automatically assigned by z/VM
  - Or locally administered
- MAC header used for packet forwarding
- Layer 2 traffic talks to Layer 2

z/VM Guest LAN and Virtual Switch Sniffer Support

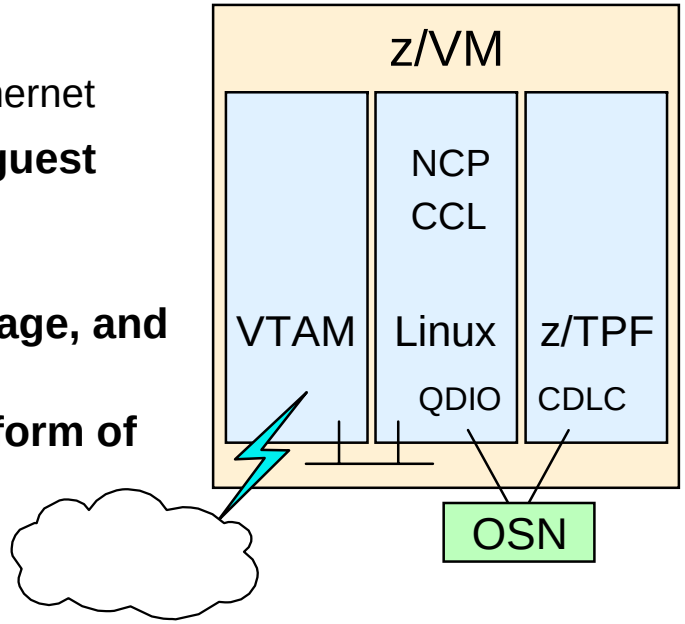
- **LAN sniffer captures network traffic on a z/VM Guest LAN or Virtual Switch**
- **Useful for resolving virtual networking problems**
  - Authorization for use is under the control of the system administrator, not users or guest images
- **Linux tracing capabilities:**
  - Authorized Linux guest can use CP commands (or the Linux device driver, when available) to put the guest NIC in “promiscuous mode”
  - Network traffic can be traced, recorded, & analyzed using existing Linux tools
  - Collected data can be printed or written to disk using tools such as tcpdump
- **Native z/VM tracing capabilities:**
  - Network traffic can be traced, recorded, & analyzed using z/VM facilities
  - Only authorized to users with Class C privileges
  - CP TRSOURCE command has been enhanced to trace and record data
  - New IPFORMAT tool can analyze data to determine cause of problems
- **RACF for z/VM feature provides ability to control promiscuous mode authorizations for Guest LANs and Virtual Switches**
- **IBM is working with its distributions partners to provide this function in future Linux on System z9 and zSeries distributions or service updates**



OSA-Express2 Open Systems Adapter for NCP

New CHPID Type OSN

- **Designed to help eliminate dependencies on hardware**
  - 3745/3746, ESCON, Token-Ring
- **Provides support for IBM Communications Controller for Linux (CCL)**
- **Appears to operating systems as an ESCON-attached channel connected to a 3745 device type**
- **Communication traffic can flow from LPAR to LPAR**
- **OSN support is exclusive to IBM System z9**
  - Requires OSA-Express2 Gigabit or 1000BASE-T Ethernet
- **z/VM support enables VTAM on z/VM and other guest images to access OSA-Express CDLC channels**
  - Support available in z/VM V5.2 and V5.1
- **Allows system administrators to configure, manage, and operate their CCL NCPs just like real 374x NCPs**
- **Can help eliminate the requirement to have any form of external medium (and all related hardware) for communications between the host operating system and the CCL image**



New MPROUTE Server for z/VM
Enhanced Dynamic Routing Support

- **OMPROUTE V1.7 module has been ported from z/OS to z/VM V5.2**
- **New MPROUTE server includes support for:**
  - IPv6 dynamic routing including RIPng and OSPF
  - IPv4 OSPF authentication using MD5 (cryptographic authentication)
  - Improved IPv4 VIPA support
  - Receiving RIPv1 and RIPv2 on same link
  - Up to 16 equal cost paths to a single destination
- **ROUTED server will be removed from a future release of z/VM**
- **Utility (RTD2MPR EXEC) is supplied to assist in migration from ROUTED to MPROUTE**
- **Support benefits include:**
  - Additional supported protocols
  - Greater efficiency may be achieved within an IP network
  - Manual network routing table updates may be reduced or eliminated

z/VM SSL Server Upgrade

Support for More-Current Linux Distributions

- **z/VM V5.2 SSL server supports the following Linux distributions:**
  - SUSE SLES8 (31-bit)
  - SUSE SLES9 (31- and 64-bit)
  - Red Hat Enterprise Linux AS V3 (31- and 64-bit)
  - Red Hat Enterprise Linux AS V4 (31- and 64-bit)

- **Additional support in upgraded server:**
  - Industry-standard encryption algorithms, including DES, triple-DES, RC2, and RC4 with keys up to 128 bits in length; hashes provided by SHA-1 and MDS
  - Certificate activation and removal without server shutdown/restart
    - Add or deactivate a certificate while SSL-secured sessions are active
  - Federal Information Processing Standard (FIPS) 140-2 support
    - FIPS 140-2 support allows connections to be restricted to those that employ FIPS-approved cipher suites

Enhanced z/VM Systems Management Functions
For Allocating and Managing Guest Resources

- **z/VM V5.2 implements Version 3 (V3) of the systems management server**
  - z/VM V4.4 and V5.1 functions continue to operate with the new V3 server
  - API support enables solution providers to more easily help administrators manage a large number of virtual images running on a z/VM system
- **New APIs provided for the following systems management functions:**
  - Creating/updating the LOADDEV directory statement for a virtual machine
  - Responding to queries of a virtual machine's LOADDEV settings
  - Obtaining the time when a virtual image was activated
  - Scanning (searching) the directory for a specified pattern
  - Defining Local Tags by the directory manager
- **Enhancements to existing APIs:**
  - Support for larger disk block sizes when creating disks and defining disk space on virtual image volumes
  - Capability to create persistent Virtual Switch definitions
  - New definition parameters for Virtual Switch APIs
- **Requires a directory manager**
  - IBM DirMaint FL510 supports the new/enhanced APIs

Simplified User Administration Support
Coordination of DirMaint and RACF Changes

- **z/VM V5.2 can integrate the directory management functions of DirMaint with the security management functions of RACF**
  - DirMaint can be configured to notify RACF whenever important changes are made to user definitions and the resources they own
- **Functions that are coordinated by DirMaint with RACF include:**
  - User creation, deletion, and changes
  - Password management
  - POSIX segment management
  - Access Control Interface (ACI) group management
  - Profile creation and deletion for selected VM functions
- **Benefits:**
  - Reduces the administration effort and skills needed to deploy and manage users and their resources when DirMaint and RACF are used together
  - Eliminates the need to manually define and manage z/VM resources in RACF
  - Helps reduce the chance of incomplete or incorrect RACF configuration data

Improved Directory Management Performance

Beneficial for z/VM Systems with Large User Directories

- **Performance improvement in DIRECTXA with exploitation by the z/VM V5.2 DirMaint feature**
- **Changes made to the z/VM user directory using DirMaint should be processed faster than previous z/VM releases**
  - New function allows a change to the directory without requiring reprocessing of the entire directory
  - Directory updates complete in less time
- **Performance benefit depends on the type of directory changes being made and the size of the z/VM directory**
  - The larger the directory size, the more beneficial the performance improvement

Performance Toolkit for VM Enhancements

- **Performance Toolkit for VM was introduced in z/VM V4.4**
  - Priced z/VM feature; derivative of the FCON/ESA program (5788-LGA)
  - A performance reporting tool for the z/VM system and guest images
    - Realtime and historical reporting
    - Offers threshold monitoring and user loop detection
    - Can monitor remote z/VM systems
    - Results can be viewed graphically with a web browser
- **Replaces RTM and PRF**
  - z/VM V4 RTM and PRF customers with current S&S subscriptions are entitled to a no-charge upgrade to the Performance Toolkit for VM
- **z/VM V5.2 support enhancements:**
  - Handle changes to offsets in CP control blocks
  - Handle fields removed in CP control blocks
  - New System Execution Space report
  - New System Storage reporting
  - Eliminate Detailed User Storage report
  - Expand QDIO report based on new Monitor data

z/VM Service and Installation Support Enhancements

- **Further automation of the local modification process**
  - New capability to rework local mods and provide support for local service
- **Simplified migration of pre-installed z/VM products**
  - Allows disks associated with the pre-installed products on your first-level z/VM V5.1 system to be made available to your second-level z/VM V5.2 system
  - Transfers the following file types to your second-level system:
    - Customized files
    - Local modifications
    - Service
    - User-created files residing on selected disks

New Book in the z/VM Version 5 Product Library

"Getting Started with Linux on zSeries"

- **Introduced with z/VM V5.1; intended for new z/VM users**
- **Provides an explanation of z/VM basics, including how to configure and use z/VM functions and facilities**
- **Focus is on creating and managing Linux virtual machines**
- **Subject material includes:**
  - Configuring, administering, and servicing a z/VM system
  - Configuring TCP/IP for z/VM
  - Creating and cloning Linux virtual machines
  - Setting up basic system automation
  - Monitoring performance and capacity
  - Diagnosing z/VM and Linux problems

- **A PDF version of the book is available at: ibm.com**/zseries/zvm

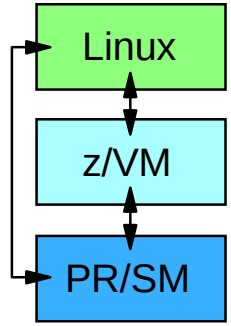
Statements of Direction

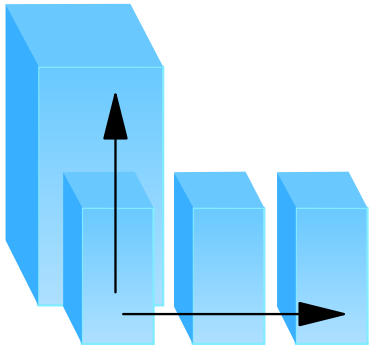
- IBM intends to provide future enhancements to z/VM supporting the following System z9 functions:
  - System and guest exploitation of HiperSockets supporting the IPv6 protocol
  - Improved memory management between z/VM and Linux for System z9 and zSeries
  - Simplified networking administration and management of VLANs with support for GARP VLAN Registration Protocol (GVRP) using OSA-Express2
  - Capability to allow guest operating systems and z/VM users to query virtual port names when using N_Port ID Virtualization
- IBM intends to evaluate z/VM V5.2, with the RACF for VM optional feature, for conformance to the Controlled Access Protection Profile (CAPP) and Labeled Security Protection Profile (LSPP) of the Common Criteria standard for IT security, ISO/IEC 15408, at Evaluation Assurance Level 4 (EAL4). This represents a higher level of assurance than is provided by z/VM V5.1.
- IBM intends to provide IBM Director support for Linux on System z9 and zSeries, extending IBM virtualization technology leadership with the exploitation of system management and virtual server deployment functions based on the Common Information Model (CIM) standard. IBM Director is a key component of the IBM Virtualization Engine.
- IBM intends to provide exploitation of the IBM TotalStorage Parallel Access Volume (PAV) feature for z/VM system data and guest data residing on VM minidisks in a future release of z/VM.
- IBM plans to remove the ROUTED and BOOTP servers from a future release of z/VM. z/VM V5.2 is planned to be the last release in which these servers will be available.

Note: All statements regarding IBM's plans, directions, and intent are subject to change or withdrawal without notice. Any reliance on this Statement of Direction is at the relying party's sole risk and will not create any liability or obligation for IBM.

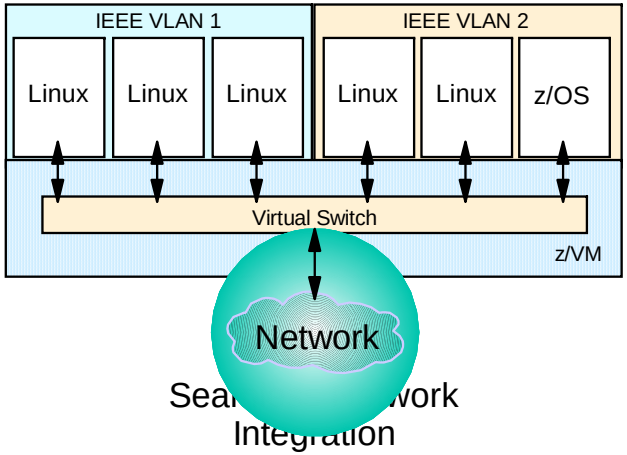
z/VM Vision and Investment Strategy

- **Make z/VM virtualization technology pervasive on zSeries**
  - Improved performance, scalability, operational ease of use
  - Complementary investments in LPAR (PR/SM) and z/VM
- **Deliver platform solutions that exploit Linux and z/VM synergies**
  - On demand scale up and scale out
  - Seamless network integration
  - Optimize resource sharing
  - Autonomic resource adjustments

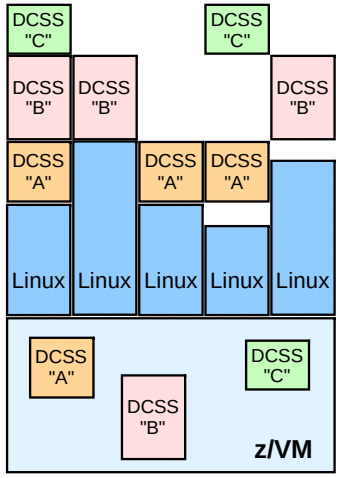




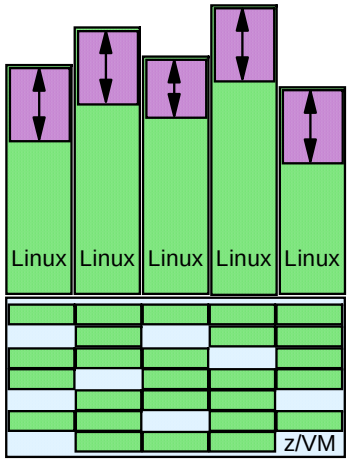
On demand Scale Up and Scale Out



Seamless Network Integration



Optimized Resource Sharing

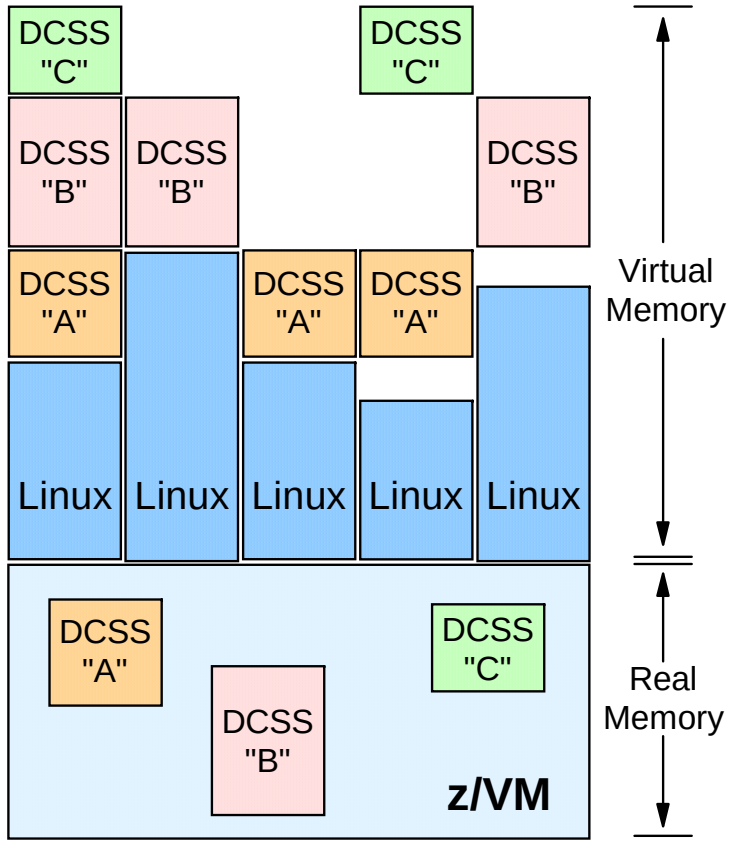


Autonomic Resource Adjustments

Linux and z/VM Technology Exploitation

Linux Exploitation of z/VM Discontiguous Saved Segments (DCSS)

- **DCSS support is a z/VM exclusive**
  - Share a single, real memory location among multiple virtual machines
  - High-performance data access
  - Can reduce real memory utilization
- **Many exploitation opportunities**
- **Example: Execute-in-place File System**
  - A file system is placed into a DCSS
  - The DCSS is mapped into guest images (DCSS memory location can reside outside the defined virtual machine configuration)
  - Access to file system is at memory speeds
  - Executables are invoked directly out of the file system (no data movement required)
  - Avoids duplication of virtual memory and data stored on disks
  - Enables throughput benefits for Linux guest images and overall system performance and scalability



Linux and z/VM Technology Exploitation

Collaborative Memory Management

- Problem scenario: virtual memory utilization far exceeds real memory availability
- z/VM Control Program paging operations become excessive
- Overall system performance and guest throughput suffers

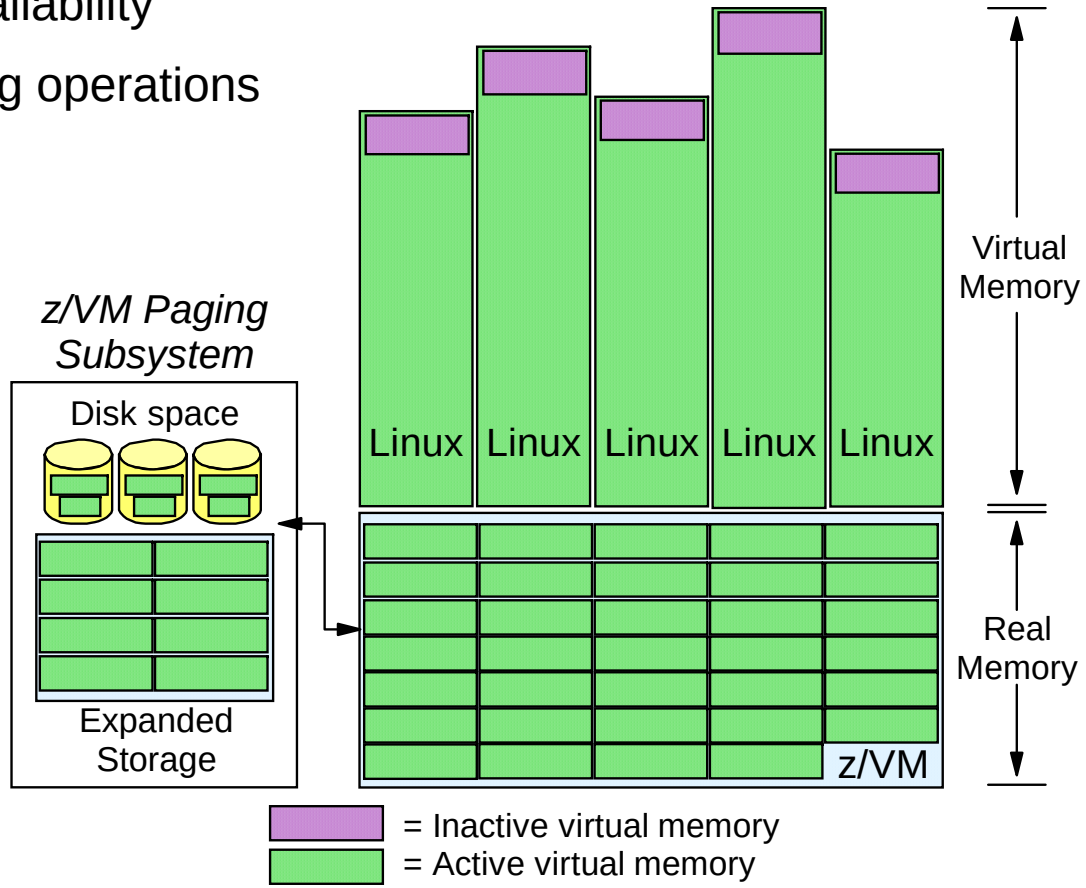


Chart 1 of 2

Linux and z/VM Technology Exploitation

Collaborative Memory Management

- Solution: real memory constraint detected and Linux images signaled to reduce virtual memory consumption
- Linux memory pages are released
- Demand on real memory and z/VM paging subsystem is reduced
- Overall system performance and guest image throughput improves

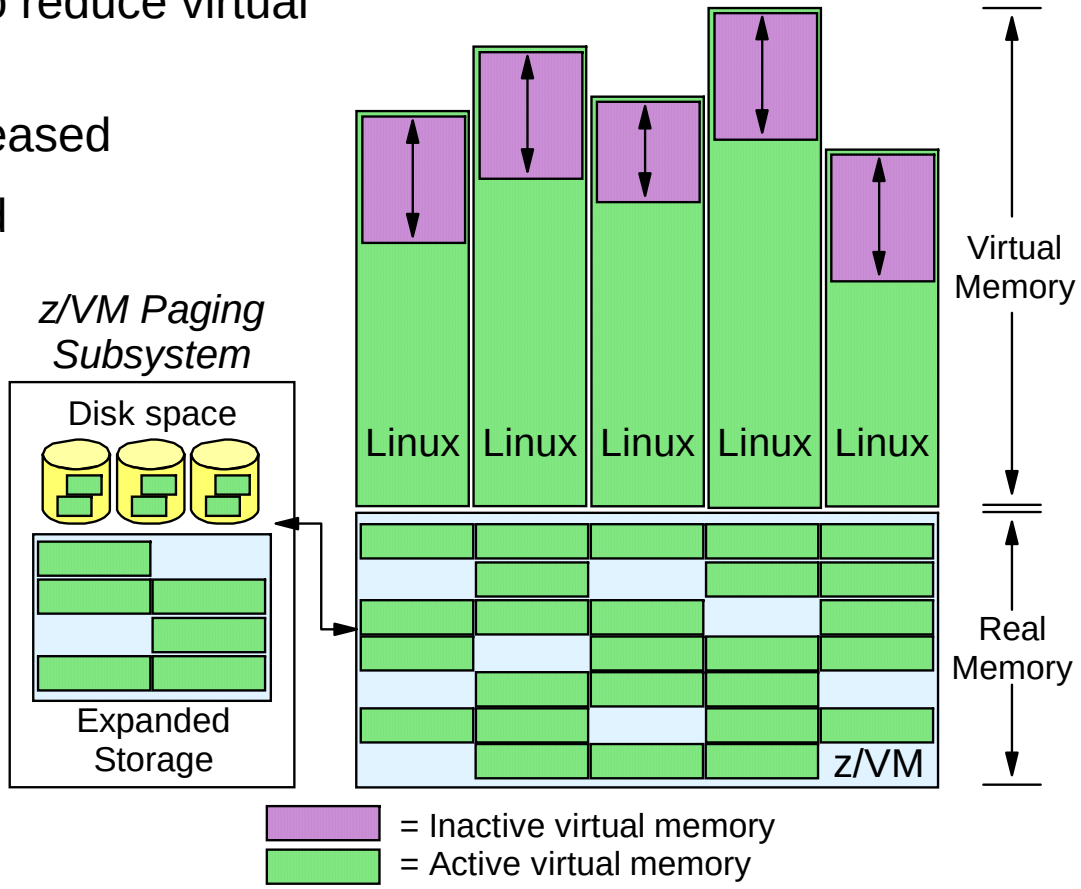
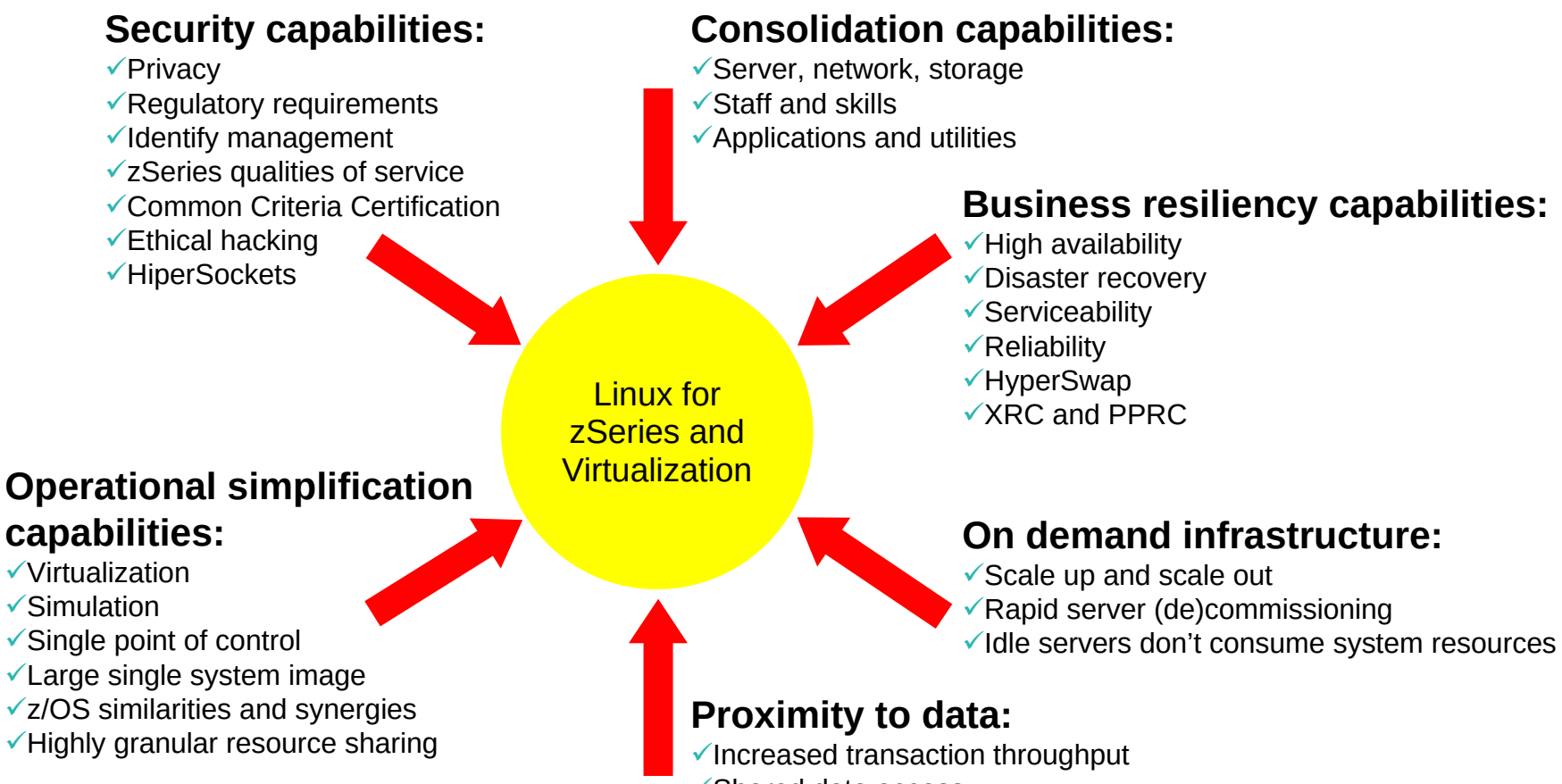


Chart 2 of 2

Linux and z/VM on System z9 and zSeries

Providing Unmatched Value Propositions for Linux Workloads



Thank you

For more information, please contact

Alan Altmark
Alan_Altmark@us.ibm.com
+1 607 429 3323

ibm.com/zSeries