z/VM Platform Update

Advancing the Art of Virtualization with z/VM Version 5 Release 4

August 20, 2008

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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.

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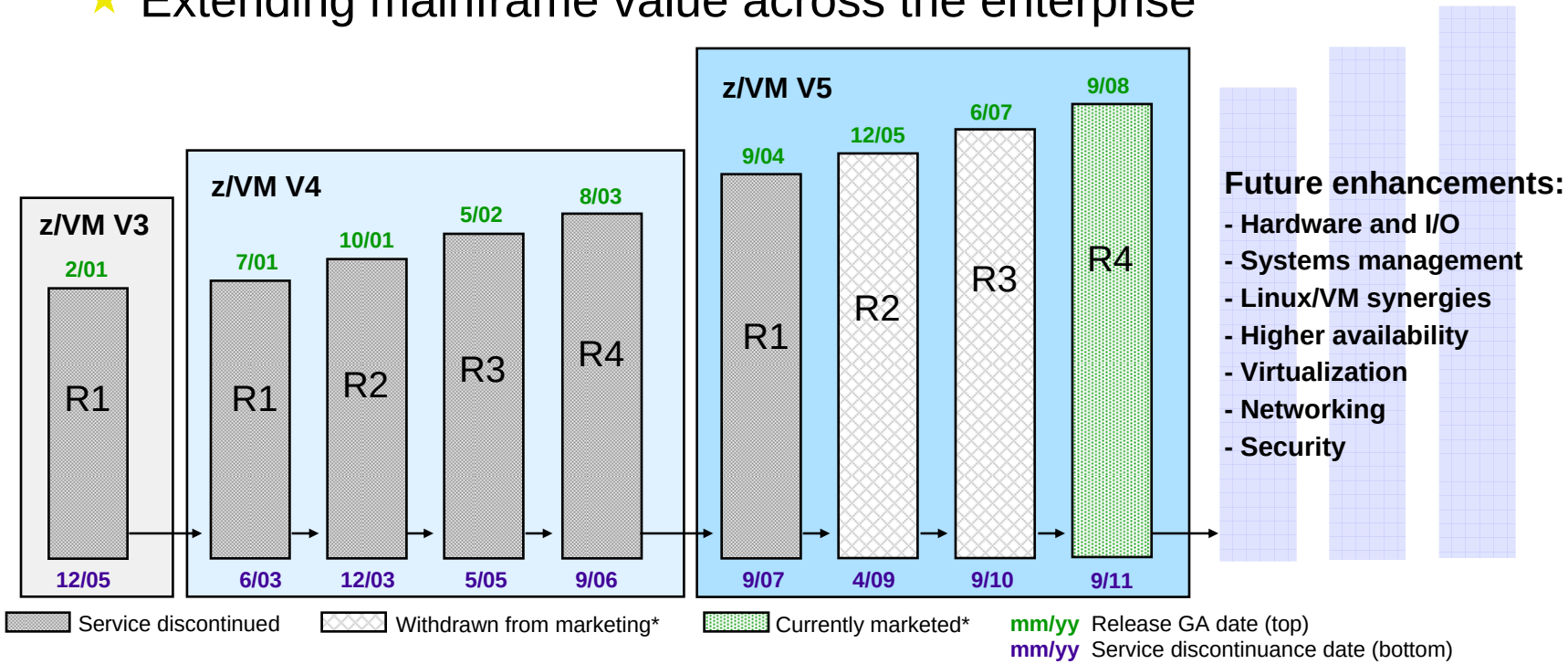
Topics

- **Key Linux and z/VM Product Releases from IBM**
- **z/VM Evaluation Edition Product Overview**
- **z/VM Version 5 Release 4 Functional Highlights**

z/VM Release History

z/VM Version 5: Robust Virtualization Technology

- ★ Offering new business solutions with Linux on System z
- ★ Extending mainframe value across the enterprise



IBM has received certification of z/VM V5.3 from the German Federal Office of Information Security (Bundesamt für Sicherheit in der Informationstechnik) for conformance to the Controlled Access and Labeled Security protection profiles (CAPP and LSPP) of the Common Criteria standard for IT security, ISO/IEC 15408, at Evaluation Assurance Level 4+ (EAL 4+).

While z/VM V5.4 has not been officially evaluated for conformance, it is designed to meet the same standards.

* As of September 8, 2008

z/VM Systems Management Products from IBM

- **IBM Operations Manager for z/VM**
  - Helps improve the monitoring and management of z/VM virtual machines by automating routine maintenance tasks
  - Enables users to automatically respond to predictable situations that require intervention
  - Assists with monitoring and problem determination by allowing authorized users to view and interact with live consoles of z/VM service machines or Linux guests
- **IBM Backup and Restore Manager for z/VM**
  - Provides z/VM system administrators and operators the ability to efficiently and effectively backup and restore files and data on z/VM systems
  - Can also backup and restore images of non-z/VM guest systems such as Linux
- **IBM Tape Manager for z/VM**
  - Manages and monitors tape resources; helps increase data availability and improve operator efficiency
  - Automates common daily tape operations and helps eliminate tedious, often error-prone, manual tasks
- **IBM Archive Manager for z/VM**
  - Addresses storage and data management concerns by allowing users to archive historical or other infrequently used data to increase data availability
  - Helps companies comply with data storage requirements mandated by fiscal or legal regulations and policies

IBM Operations Manager for z/VM V1.3

- **Announced June 10, 2008 – available since June 13, 2008**
- **New support:**
  - Improved automation capabilities with new spool monitoring functions
    - For example: automatically take action when spool area becomes 80% full
  - Enhanced productivity when searching for and viewing spool files
    - Using selection criteria like file size, creation date, and owner
  - Improved console message processing, including support for remote input such as syslogd() output from a Linux guest via TCP/IP
  - More granular security options, such as “read” versus “update” access to a live console
  - Process events triggered by the VM Event System Service (`*VMEVENT`)
    - Helps consolidate your z/VM automation in one place
  - Usability enhancements, including more detailed data in response to a status request and wildcard support for additional commands

Learn more at: **ibm.com**/software/sysmgmt/zvm/operations/index.html

Monitoring System z Virtual Linux Servers

Using IBM Tivoli OMEGAMON XE on z/VM and Linux V4.1.2

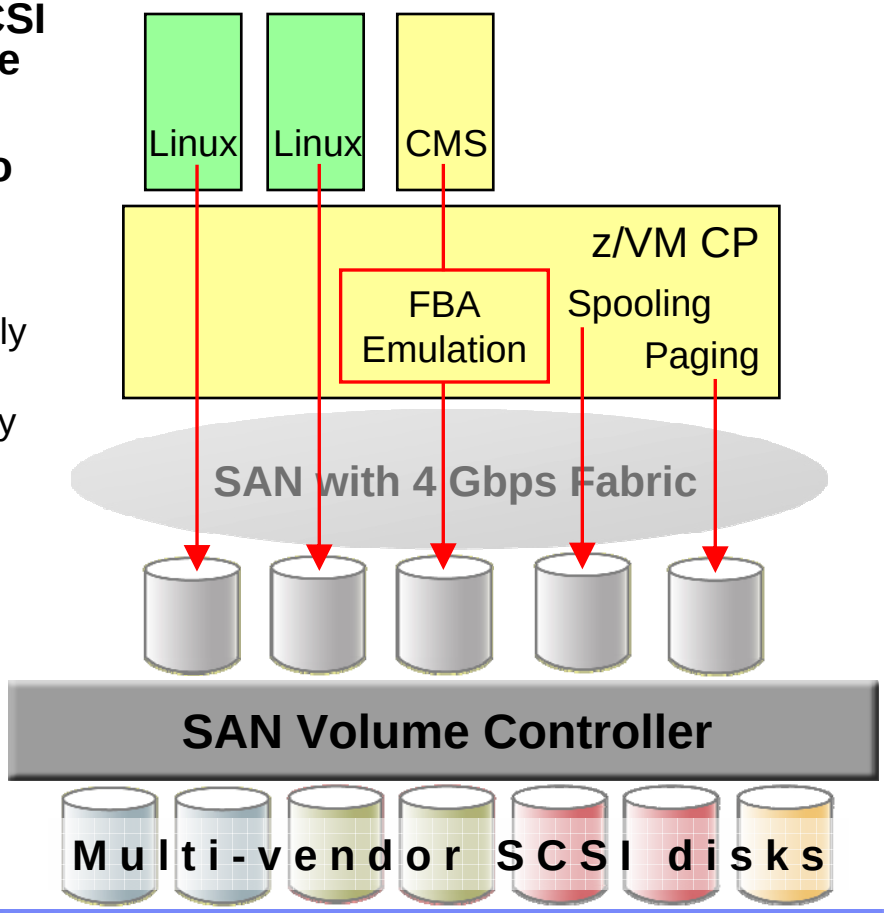
- **Combined product offering that monitors z/VM and Linux for System z**
- **Provides work spaces that display:**
  - Overall system health
  - Workload metrics for logged-in users
  - Individual device metrics
  - LPAR data
- **Provides composite views of Linux running on z/VM**
- **New function in V4.1.2:**
  - Additional monitoring to help identify bottlenecks in the I/O subsystem
  - Processor spin lock wait statistics

Learn more at: **ibm.com**/software/tivoli/products/omegamon-xe-zvm-linux

IBM System Storage SAN Volume Controller Software V4.3

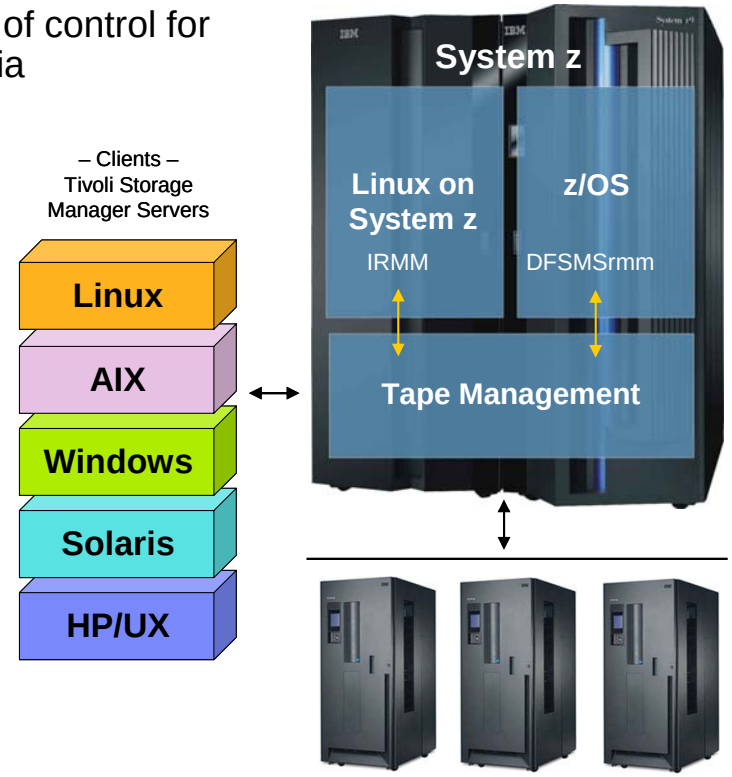
- **z/VM and Linux for System z support SAN Volume Controller (SVC) V4.3**
- **SVC allows z/VM and Linux to access SCSI storage from multiple vendors as a single pool of disk capacity**
- **z/VM FBA emulation allows CMS users to access SVC-managed disk space**
- **New function in SVC V4.3:**
  - Space-Efficient Virtual Disks use disk space only when data is written
  - Space-Efficient FlashCopy uses disk space only for changes between source and target data
  - Virtual Disk Mirroring helps improve availability for critical applications by storing two copies of a virtual disk on different disk systems
- **Supported in z/VM V5.3 and V5.4**
  - z/VM V5.2 support available with PTF for APAR VM64128

Learn more at: **ibm.com**/storage/support/2145



IBM Integrated Removable Media Manager (IRMM) V1.1.1

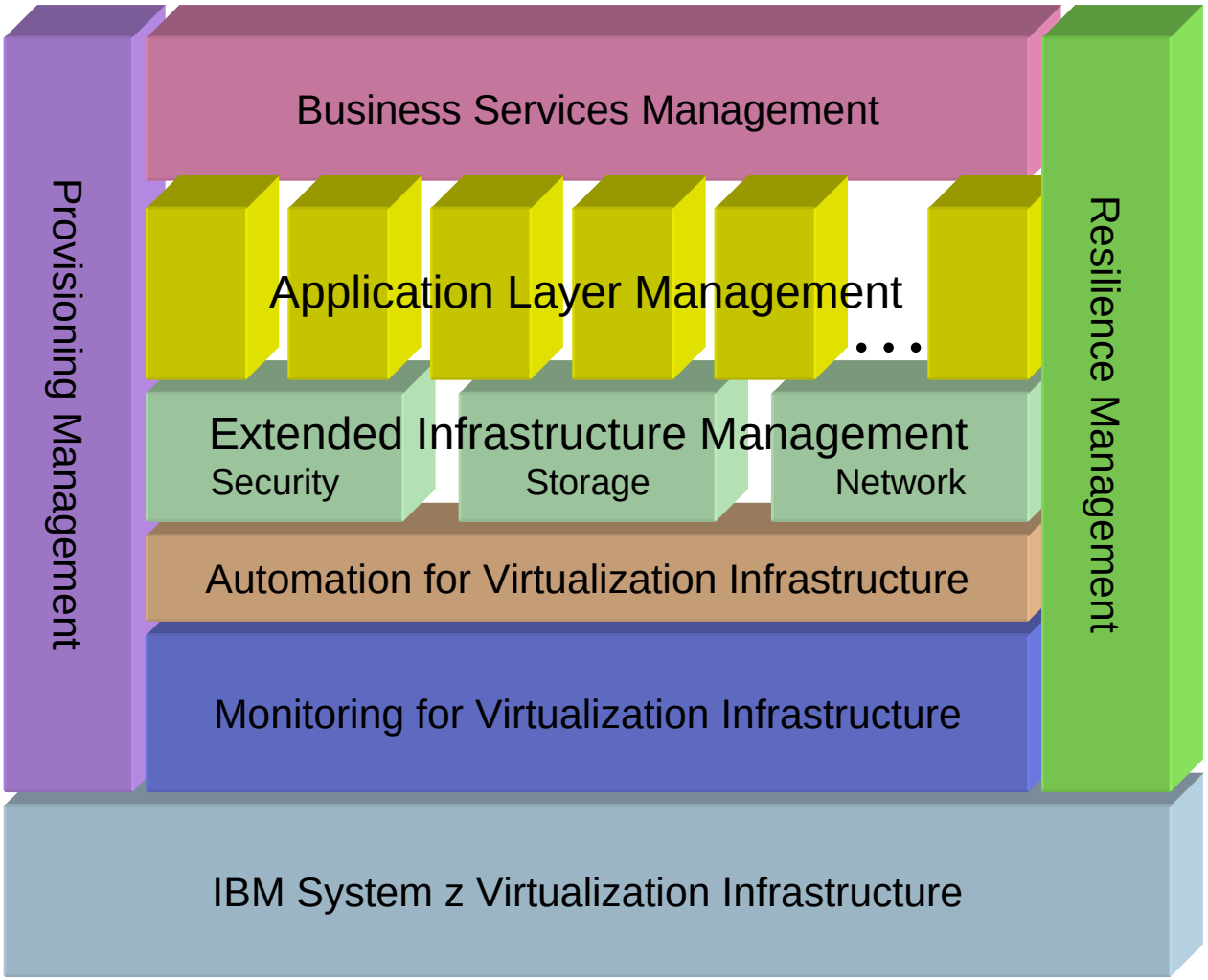
- **IRMM functional summary**
  - Complements products like SVC, IBM Tivoli Storage Manager, and IBM TotalStorage Productivity Center to provide storage virtualization and advanced storage management for open system removable media
  - Integrates with z/OS DFSMSrmm to offer a single point of control for managing mainframe and open system removable media
- **Announced August 5, 2008**
- **Planned availability: December 2008**
- **New function in IRMM V1.1.1:**
  - Enhanced synchronization with DFSMSrmm
    - Uses new DFSMSrmm information fields introduced with z/OS V1.10
    - Tomcat application server can be used to communicate with DFSMSrmm Web Service
  - Client support for x86 Linux servers running TSM
  - Support for latest generation of tape hardware
  - Support for generic SCSI tape libraries
  - IPv6 support



Learn more at: **ibm.com**/systems/z/os/linux/solutions/irmm

IBM Tivoli Virtualization Management for System z

Helping Clients Manage and Control Their Virtualized IT Infrastructure



IBM Tivoli Virtualization Management Portfolio for Linux on z/VM

IBM System z Virtualization Infrastructure
- IBM System z hardware (including LPAR hypervisor)
- IBM z/VM Version 5

Monitoring for Virtualization Infrastructure
- z/VM Virtual Machine Resource Manager (included with z/VM)
- IBM z/VM Performance Toolkit for VM (z/VM priced feature)
- IBM Director
- IBM Tivoli OMEGAMON XE on z/VM and Linux
- IBM Tivoli Monitoring
- IBM Tivoli Composite Application Manager for SOA
- IBM Tivoli Usage and Accounting Manager

Automation for Virtualization Infrastructure
- IBM Operations Manager for z/VM
- IBM Tivoli Enterprise Console
- IBM Tivoli Workload Scheduler

Provisioning Management
- IBM z/VM DirMaint (z/VM priced feature)
- z/VM Center task of IBM Director
- IBM Tivoli Provisioning Manager

Resiliency Management
- IBM Tivoli System Automation for Multiplatforms

Application Layer Management
- IBM Tivoli Application Dependency Discovery Manager
- IBM Tivoli OMEGAMON XE for Messaging
- IBM Tivoli Composite Application Manager for Response Time
- IBM Tivoli Composite Application Manager for Web Resources
- IBM Tivoli Composite Application Manager for Transactions
- IBM Tivoli License Compliance Manager

Extended Infrastructure Management *(Security)*
- IBM z/VM RACF Security Server (z/VM priced feature)
- IBM Tivoli zSecure
- IBM Tivoli Access Manager for e-business
- IBM Tivoli Access Manager for OS
- IBM Tivoli Federated Identity Manager
- IBM Tivoli Identity Manager
- IBM Directory Server
- IBM Directory Integrator
- IBM Tivoli Risk Manager

Extended Infrastructure Management *(Storage)*
- IBM SAN Volume Controller (SVC)
- IBM Tivoli Storage Manager
- IBM TotalStorage Productivity Center
- IBM Backup and Restore Manager for z/VM
- IBM Tape Manager for z/VM
- IBM Archive Manager for z/VM

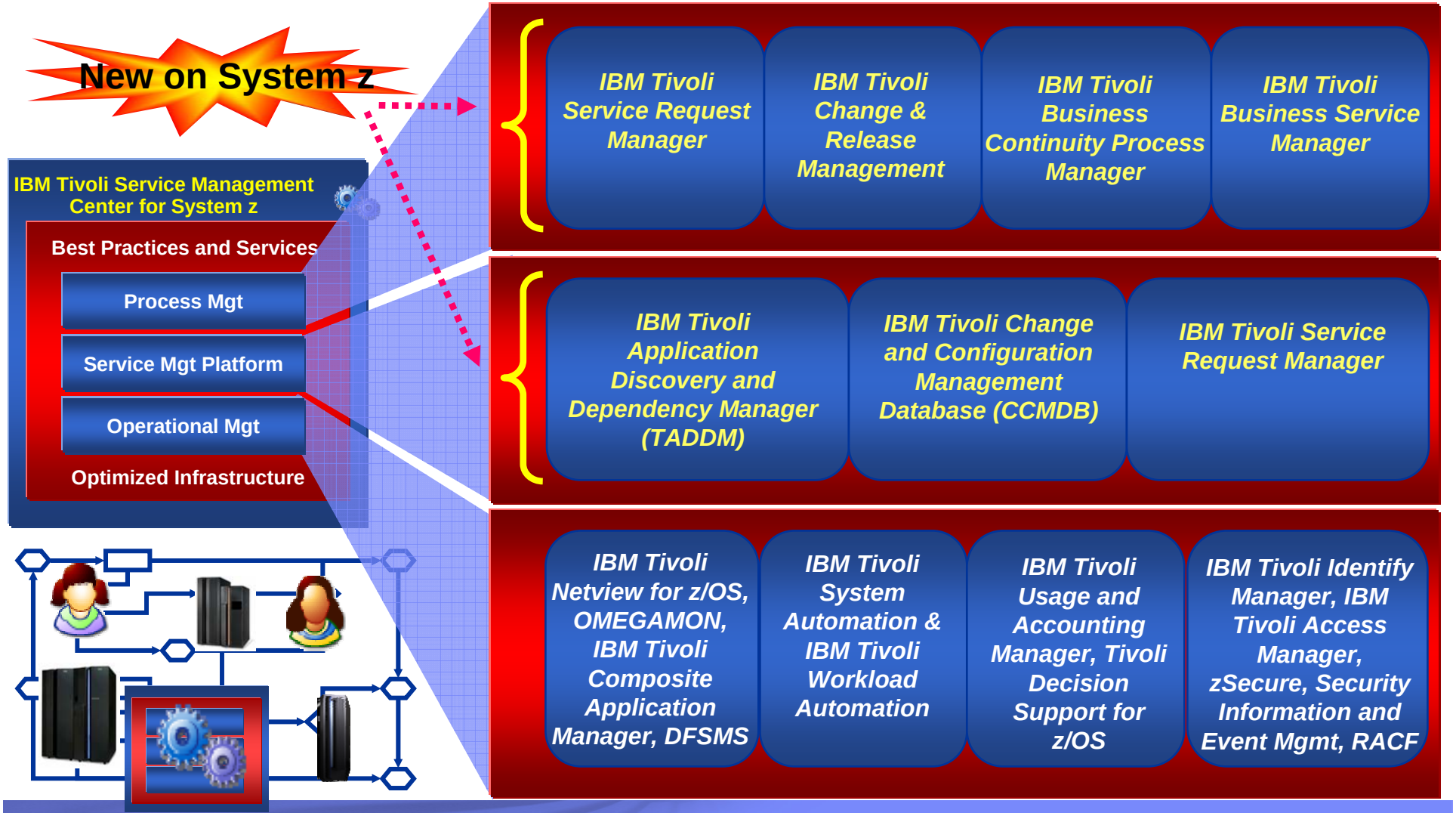
Extended Infrastructure Management *(Network)*
- IBM z/VM RSCS (z/VM priced feature)

Business Services Management
- IBM Tivoli Business Service Manager
- IBM Tivoli Service Request Manager
- IBM Change and Configuration Management Database (CCMDB)

For specific releases, refer to Tivoli Platform Support Matrix at: **ibm.com**/software/sysmgmt/products/support/Tivoli_Supported_Platforms.html

IBM Tivoli Service Management Center for System z

Enabling clients to strategically use their System z as an integrated, enterprise-wide hub for the efficient management of business and IT services



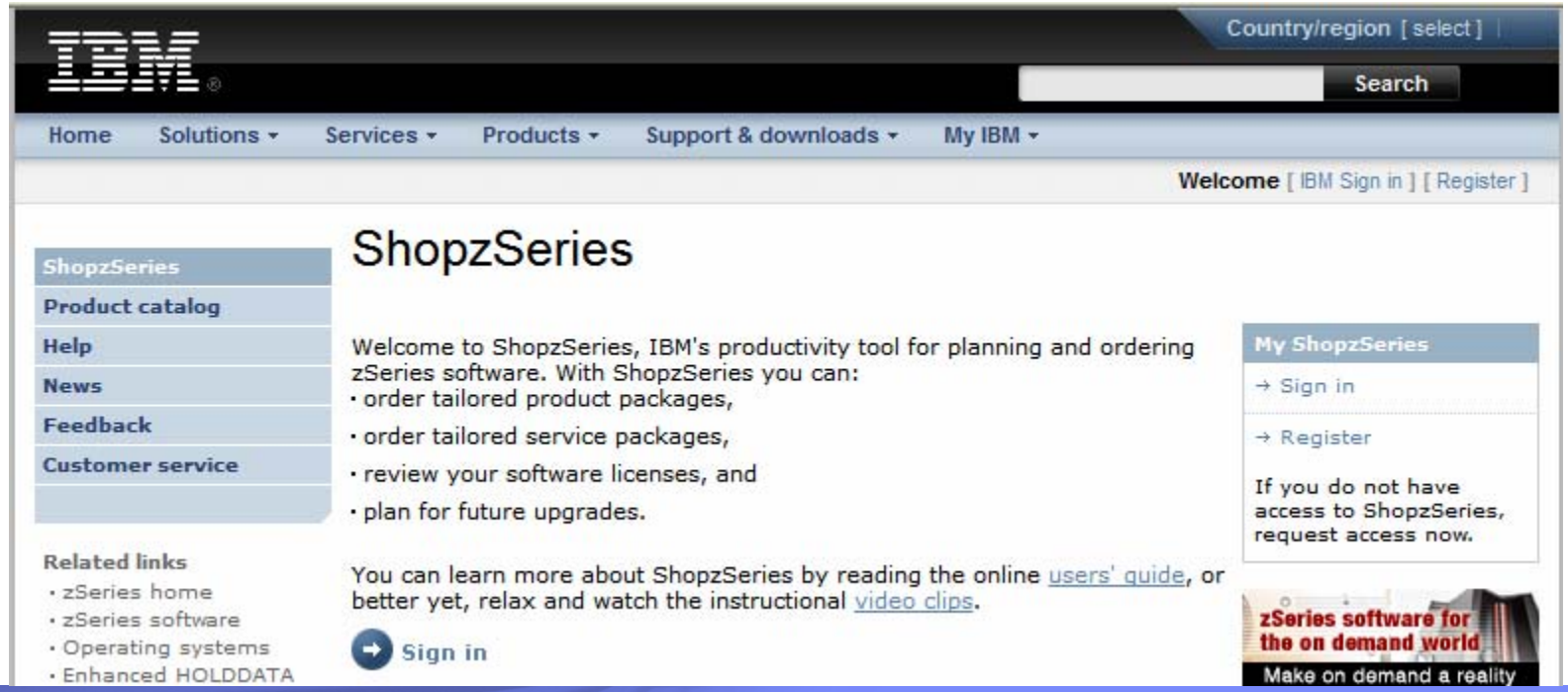
z/VM Evaluation Edition for IBM System z10

- **No-charge copy of z/VM V5.3 that allows System z10 users to familiarize themselves with z/VM virtualization technology**
  - Delivered as a ready-to-run program executable
- **Suitable to evaluate proof-of-concepts, effectiveness, robustness, and other capabilities of z/VM**
  - Can execute on IFLs or general-purpose CPUs
- **Includes ICKDSF, DirMaint and Performance Toolkit**
  - Does not include features or products such as: RSCS, RACF Security Server, EREP, HCD/HCM, OSA/SF
- **Not intended for production use**
  - Configuration support only facilitates a trial execution environment
  - IBM service support is not offered for z/VM Evaluation Edition
- **Question-and-answer support available via e-mail**
  - Send questions to zvmdemo@us.ibm.com

Learn more at: www.vm.ibm.com/eval

z/VM V5 Now Available for Download at ShopzSeries

- **Base z/VM operating system and features can now be ordered *and* delivered electronically via ShopzSeries**
- **Learn more at:**
  - ibm.com/software/ShopzSeries
  - www.vm.ibm.com/buy/edelivery
- **Other z/VM V5.4 product media options include DVD and 3590/3592 tape**



z/VM Version 5 Release 4 New Function Highlights

Announce August 5, 2008 – Available September 12, 2008

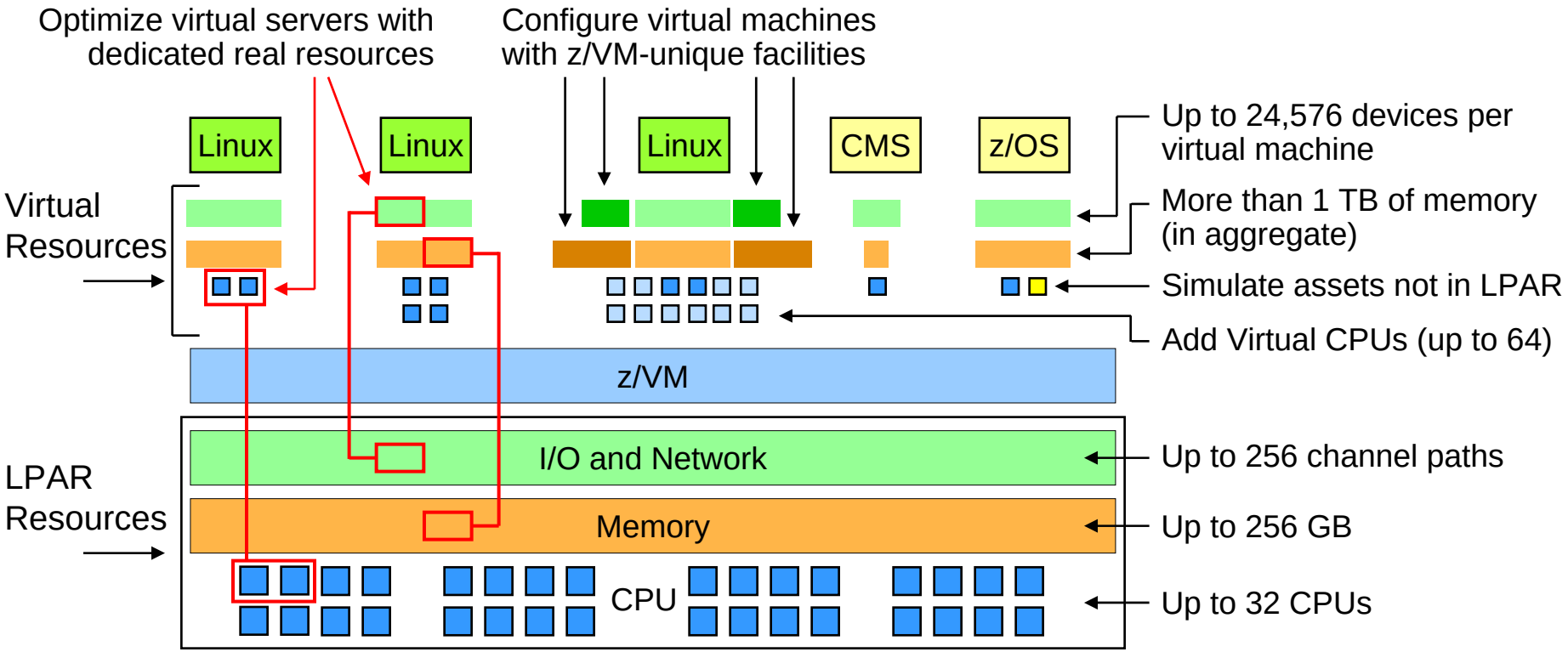
- **Processor support**
  - System z10 processor instruction exploitation
  - DAT table performance enhancements
  - Dynamic LPAR memory upgrade
- **Virtualization support**
  - Dynamic virtual machine memory upgrade
  - z/VM-mode LPAR support
  - Virtual CPU SHARE redistribution
  - DCSS addressability above 2 GB
  - Guest FCP dump
  - OSA-Express3 Four-Port Connectivity
  - Virtual Switch networking management
- **Networking**
  - z/VM TELNET IPv6 support
  - Path MTU discovery
  - TCP/IP OSD Layer 2 support
- **Security**
  - LDAP upgrade
  - RACF change logging and password/phrase enveloping
  - SSL server re-host
- **Systems management**
  - z/VM system management API enhancements
  - Linux-on-z/VM installation using the Hardware Management Console (HMC)
  - Service and installation improvements
  - Performance Toolkit and DirMaint support enhancements
  - LE, C/C++, and Binder upgrades
  - System SHUTDOWN verification
- **Withdrawn**
  - 3480 tapes no longer supported as product distribution media

Refer to announcement letter: 208-249 (US), AP08-0242 (AP), A08-1178 (CAN), ZP08-0349 (EMEA)

z/VM V5.4 – An Exceptional Virtualization Platform

z/VM can massively scale a virtual server environment with a mix of virtual and real resources for each virtual machine

- With exceptional levels of performance, availability, and security
- Virtual and real assets can be non-disruptively added when needed



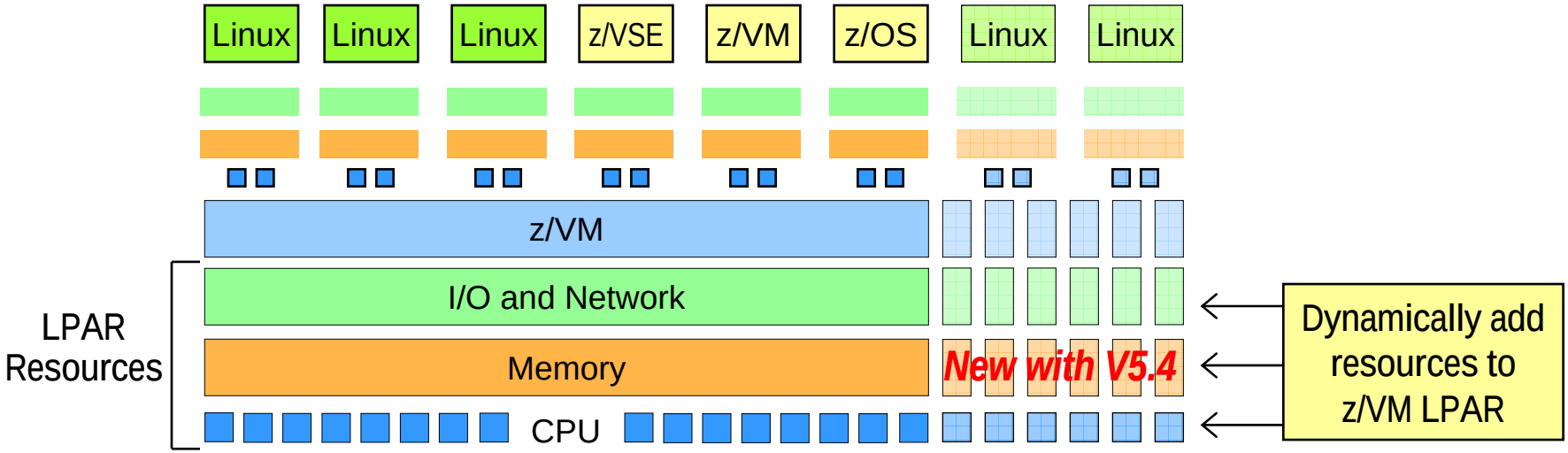
Processor Support

- **System z10 processor instructions**
  - Execute-Extensions facility
    - Execute Relative long (EXRL)
  - General-Instruction-Extension Facility
    - 71 new instructions
    - 4 new instruction formats
    - 7-character mnemonics
  - Parsing-Enhancement Facility
    - Translate and Test Extended, Translate and Test Reverse Extended
- **DAT table performance enhancements**
  - z/VM Control Program now supports full width of 64-bit Control Registers
  - Allows upper-level DAT tables (Region and Segment tables) to reside above the 2 GB address line in host real memory
  - Offers opportunity for improved performance and scalability
    - Particularly for large main memory and large virtual memory configurations

z/VM Dynamic Memory Upgrade

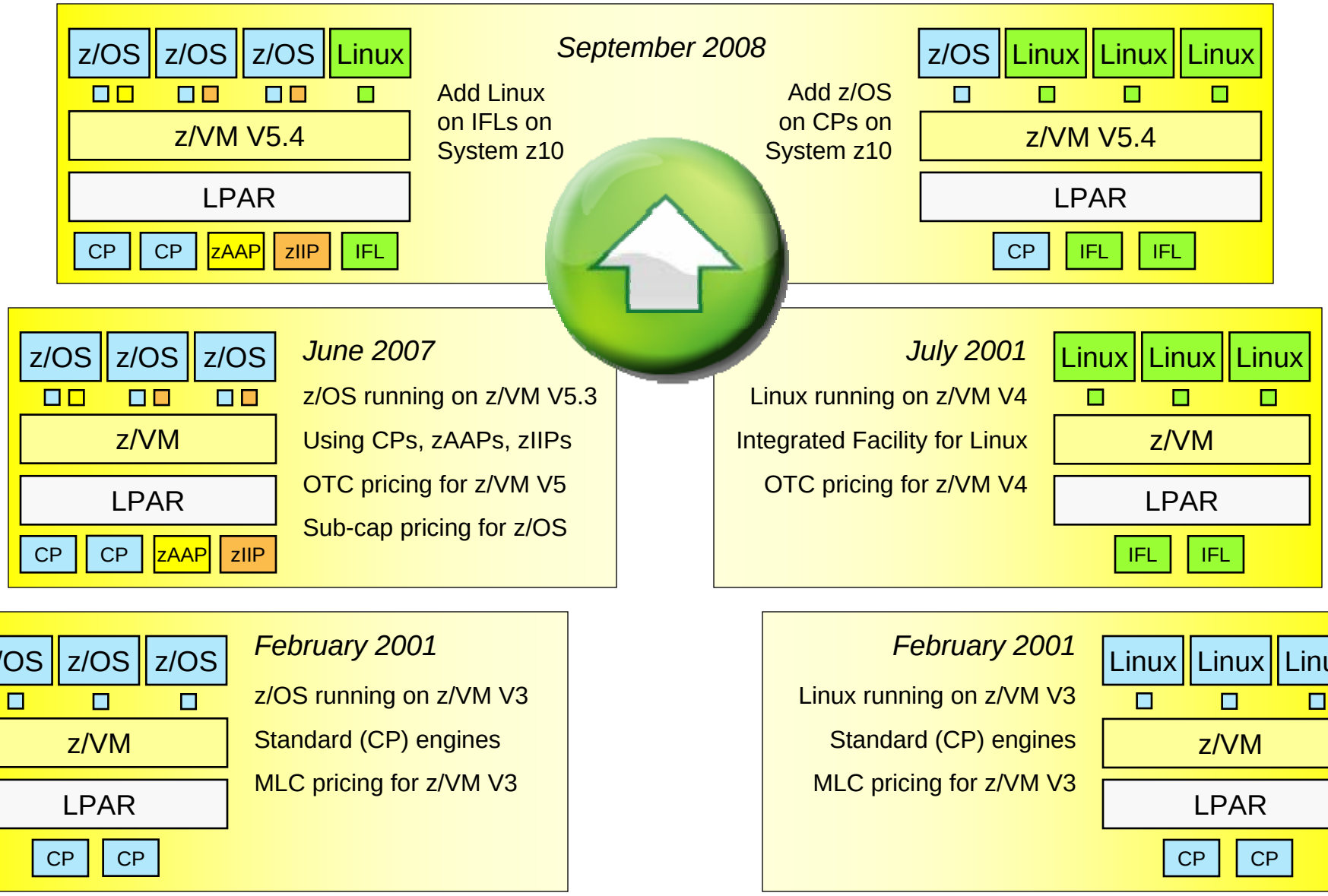
New z/VM V5.4 Function Enhances System Availability

- **Users can non-disruptively add memory to a z/VM *LPAR***
  - Additional memory can come from: *a)* unused available memory, *b)* concurrent memory upgrade, or *c)* an LPAR that can release memory
  - Memory *cannot* be non-disruptively removed from a z/VM LPAR
- **z/VM virtualizes this hardware support for *guest machines***
  - Currently, only z/OS and z/VM support this capability in a virtual machine environment
- **Complements ability to dynamically add CPU, I/O, and networking resources**



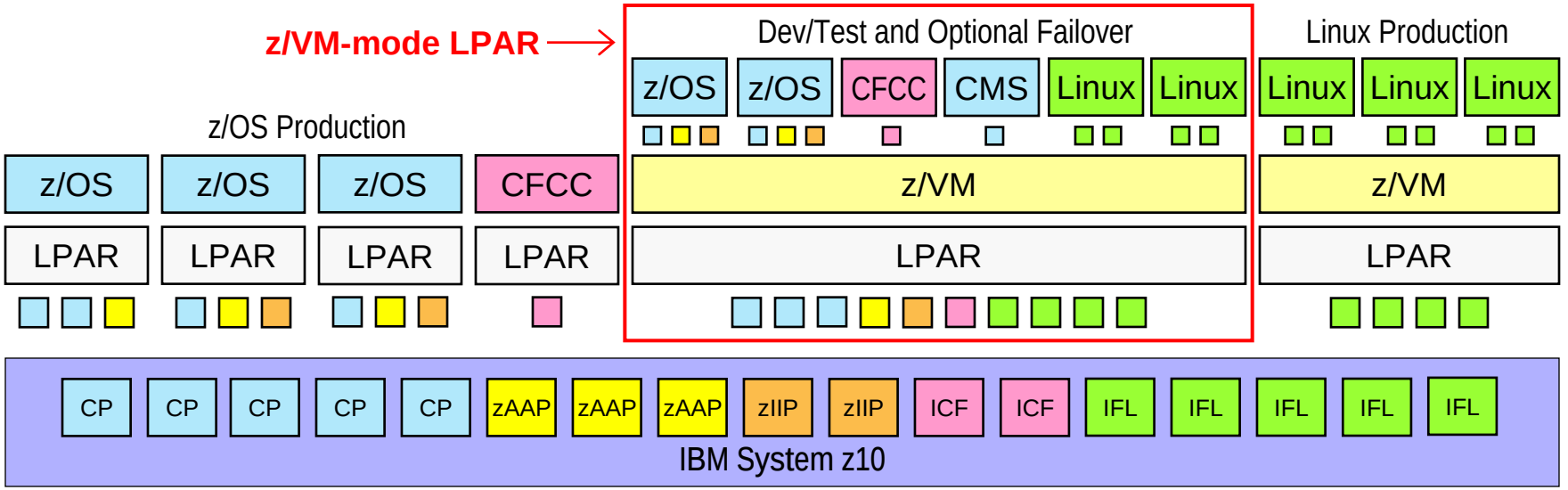
Smart economics: non-disruptively scale your z/VM environment by adding hardware assets that can be shared with every virtual server

z/VM and Specialty Engine Support



z/VM-Mode LPAR Support for IBM System z10

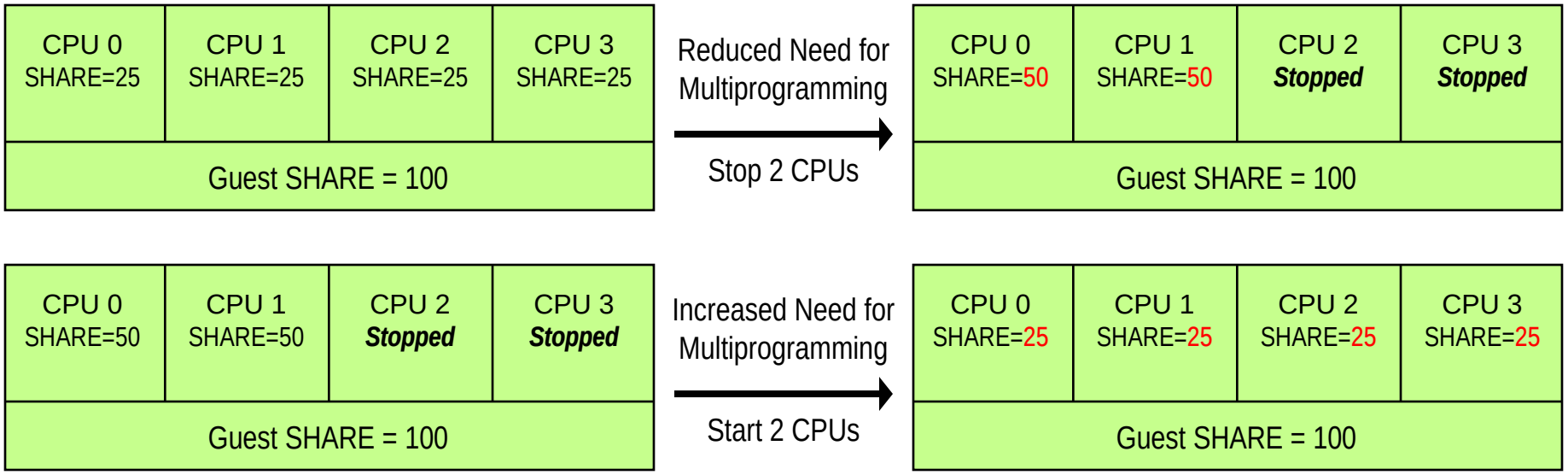
- **New LPAR type for IBM System z10: *z/VM-mode***
  - Allows z/VM V5.4 users to configure all CPU types in a z10 LPAR
- **Offers added flexibility for hosting mainframe workloads**
  - Add *IFLs* to an existing standard-engine z/VM LPAR to host Linux workloads
  - Add *CPs* to an existing IFL z/VM LPAR to host z/OS, z/VSE, or traditional CMS workloads
  - Add *zAAPs* and *zIIPs* to host eligible z/OS specialty-engine processing
  - Test integrated Linux and z/OS solutions in the same LPAR
- **No change to software licensing**
  - Software continues to be licensed according to CPU type



Virtual CPU SHARE Redistribution

Dynamic Virtual Processor Management

- **Allows z/VM guests to expand or contract the number of virtual processors it uses without affecting the overall CPU capacity it is allowed to consume**
  - Guests can dynamically optimize their multiprogramming capacity based on workload demand
  - Starting and stopping virtual CPUs does not affect the total amount of CPU capacity the guest is authorized to use
  - Linux CPU hotplug daemon starts and stops virtual CPUs based on Linux Load Average value
- **Helps enhance the overall efficiency of a Linux-on-z/VM environment**



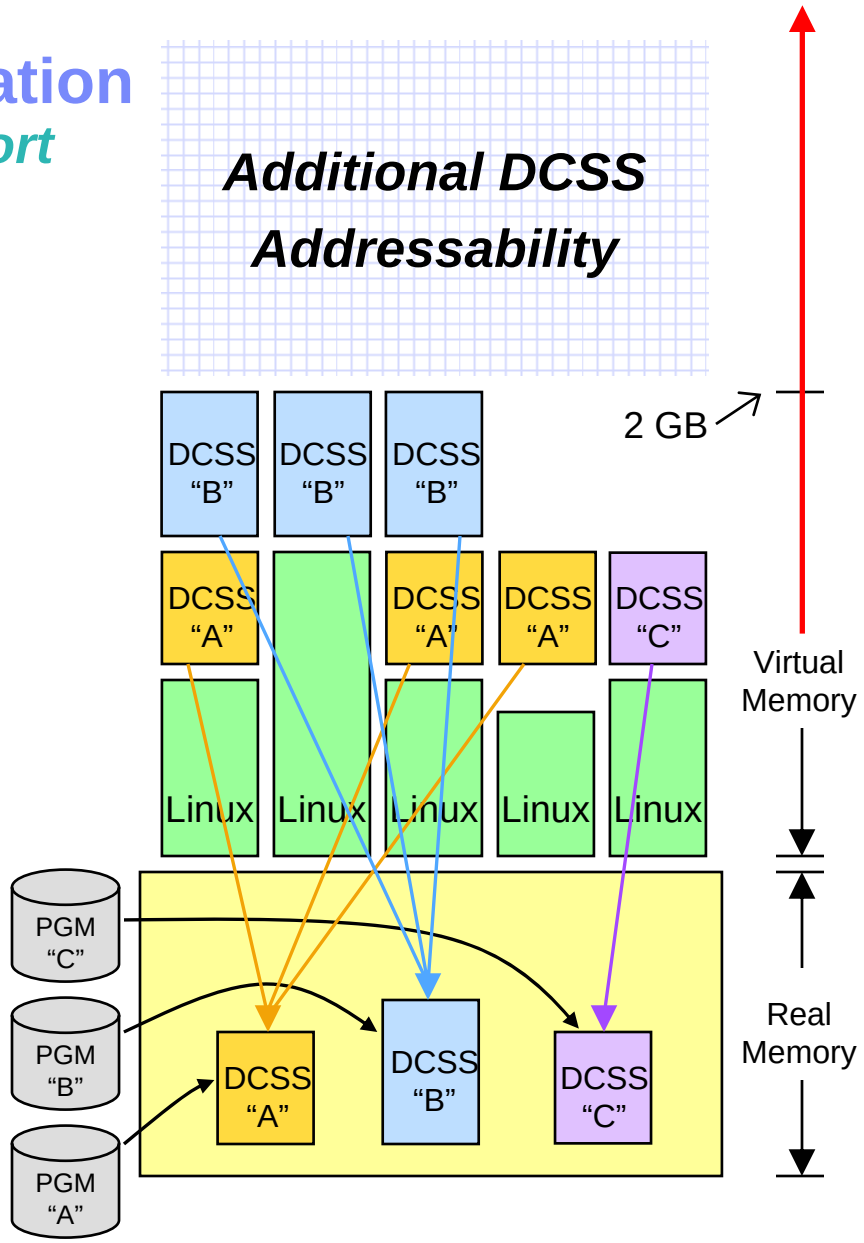
Note: Overall CPU capacity for a guest system can be dynamically adjusted using the SHARE setting

Extreme Linux-on-z/VM Virtualization

Linux Exploitation of z/VM DCSS Support

- Discontinguous Saved Segments (DCSS)
  - Share a single, real memory location among multiple virtual machines
  - Can reduce real memory utilization
- Linux exploitation: shared program executables
  - Program executables are stored in an execute-in-place file system, then loaded into a DCSS
  - DCSS memory locations 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
  - Helps enhance overall system performance and scalability
- **z/VM V5.4 support enhancements:**
  - Segments can reside above 2 GB address line
  - Enables even greater system scalability
  - New addressing limit is 512 GB

Note: Maximum size of a single DCSS is 2047 MB



Guest FCP Dump Support

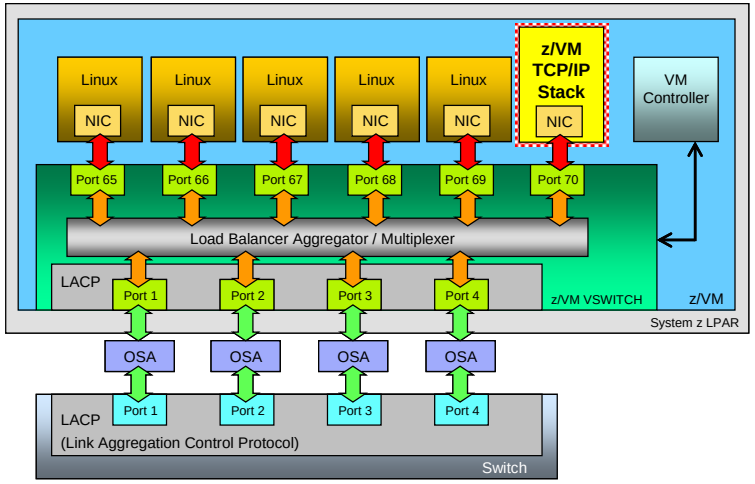
- **Provides the capability to dump Linux guests to FCP-attached SCSI disks**
- **Compared to VMDUMP, or dumping to ECKD disks, this new capability may provide the following advantages:**
  - More guest virtual memory can be dumped because SCSI disks can be larger than ECKD disks
  - Dumping on SCSI disks avoids the need to convert a VMDUMP into Linux tool format
  - The same SCSI dump mechanism can be used when running Linux in a logical partition and in a z/VM virtual machine
- **Works cooperatively with SCSI Linux system dumper and can be used to generate system dumps viewable with Linux dump analysis tools “crash” and “lcrash”**

OSA-Express3 Four-Port Connectivity

- **System z10 OSA-Express3 support**
- **Multiple ports per adapter on one CHPID**
  - Provides more physical connectivity to service the network
  - Reduces the number of required resources such as CPU cycles, I/O slots, I/O cages, and CHPIDs to define and manage
  - OSA-Express3 GbE is designed for bandwidth-hungry applications: double the port density, reduced latency, and improved throughput
    - Up to 45% reduction in latency compared to OSA-Express2 GbE
- **Allows port number to be specified for Virtual Switch and QDIO Guest LAN**
- **Supported in z/VM V5.4 base product**
  - Support for z/VM V5.2 and V5.3 is available via PTFs for APARs VM64277 and PK50120

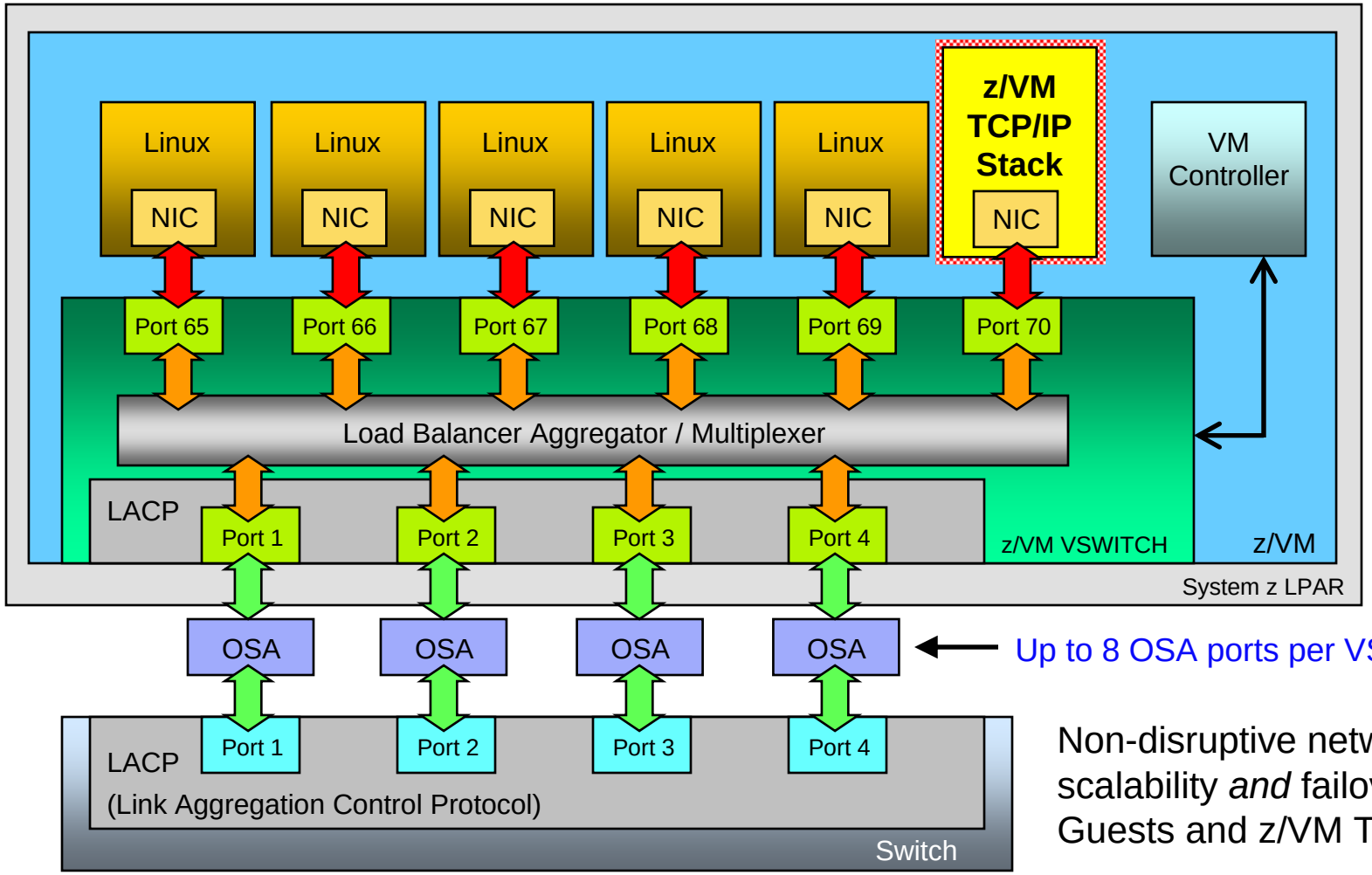
z/VM TCP/IP Support Enhancements

- **TELNET IPv6 support**
  - z/VM V5.4 provides an IPv6-capable TELNET client and server
- **Path MTU discovery**
  - Allows a TCP/IP server to determine the Maximum Transmission Unit (MTU) for a given IPv4 or IPv6 connection
  - Helps optimize network throughput by reducing unnecessary fragmentation of large datagrams
- **OSA-Express QDIO Layer 2 Support**
  - z/VM TCP/IP can now use a Layer 2 connection on an OSA-Express adapter
  - Enables consolidation with Linux guests on a single Layer 2 virtual switch
  - Increases bandwidth and availability for the z/VM TCP/IP stack



z/VM Virtual Switch Link Aggregation

With z/VM TCP/IP Stack Connectivity Support in z/VM V5.4



Non-disruptive networking scalability *and* failover for Guests and z/VM TCP/IP.

z/VM Virtual Switch Support
Networking Management Enhancements

- **`QUERY LAN` and `QUERY VSWITCH` command enhancements**
  - Network administrators can simplify output from these commands by requesting information about specific ports only
- **`SET VSWITCH` and `MODIFY VSWITCH` command enhancements**
  - Detailed transmission counters can be turned on for a VLAN-aware virtual switch
- **New `SNMPTRAP` command**
  - Provides an easy way to generate traps using CMS
  - Previously offered as a sample program; fully supported in z/VM V5.4

z/VM Security Enhancements

- **LDAP server upgrade**
  - Upgraded to the z/OS 1.10 level of IBM Tivoli Directory Server
- **RACF change logging and password / phrase enveloping**
  - Enables user, group, and password synchronization between z/VM and z/OS using IBM Tivoli Directory Integrator
  - Provides RACF change logging in LDAP
- **SSL server re-host**
  - The z/VM SSL server now operates in a CMS environment and no longer requires a Linux distribution
  - Simplifies installation, service, and release-to-release migration
  - New functions include:
    - New encryption/decryption engine – uses z/OS 1.10 SSL technology
    - New certificate management services – renewal, signing, exportation
    - Network-free SSL server administration
  - Requires PTF for APAR PK65850 (planned availability December 2008)

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

- **z/VM Systems Management Application Programming Interface (API)**
  - Programming interfaces that enable platform provisioning applications like IBM Director to create and manage a large number of virtual system images running on z/VM
  - z/VM V5.4 offers improved processing speed, enhanced error recovery, and increased scalability of the Systems Management API via use of shared queues instead of files
- **New APIs include support to:**
  - Grant users access to a virtual LAN and determine which users have been authorized
  - Add, query, and delete virtual processors in a virtual image's configuration or directory
  - Manage profile directory entries
  - Accept and validate password phrases
  - Query the level of the Systems Management API to determine what functions are available
  - Allow a sort ordinal to be defined for local tags in directory entries
- **Enhancements to existing functions include:**
  - Allow creation (and deletion) of virtual network LANs to be either persistent or temporary
  - Increase the length of a virtual image's local tag to 1024 characters

z/VM Integrated Systems Management
Using the System z Hardware Management Console (HMC)

Included in z/VM V5.4

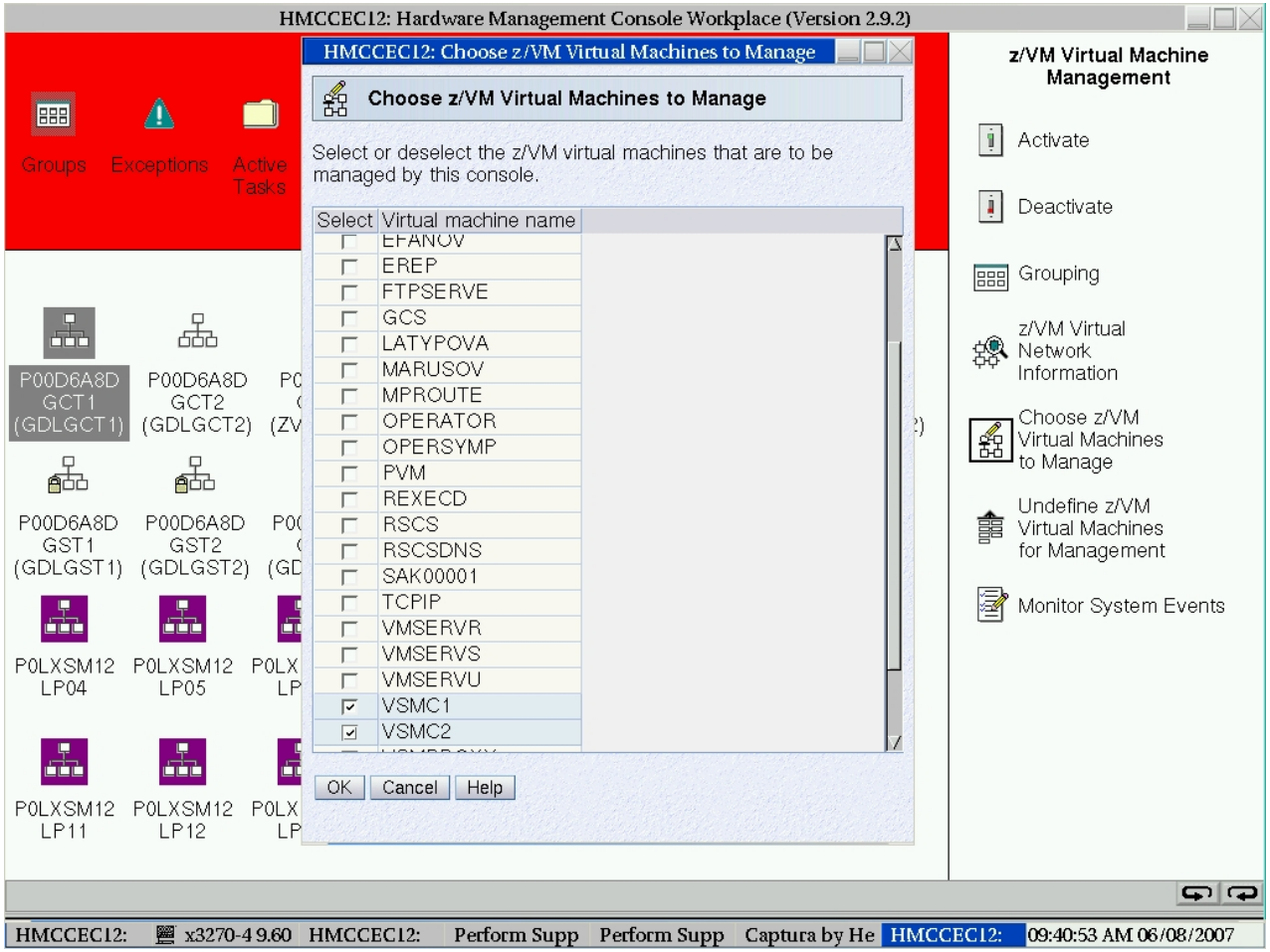
- Allows basic z/VM functions to be performed from HMC
- Network connection not required
- Uses SCLP hardware interface to access z/VM systems management APIs

Supported operations:

- View z/VM guests
- Activate z/VM guests
- Deactivate z/VM guests
- Display guest configuration and status

z/VM V5.3 also supported

- Requires PTFs for APARs VM64233 and VM64234



IBM Director for Linux on System z V5.20

With z/VM Center and Software Distribution Premium Edition

IBM Director Base Functions

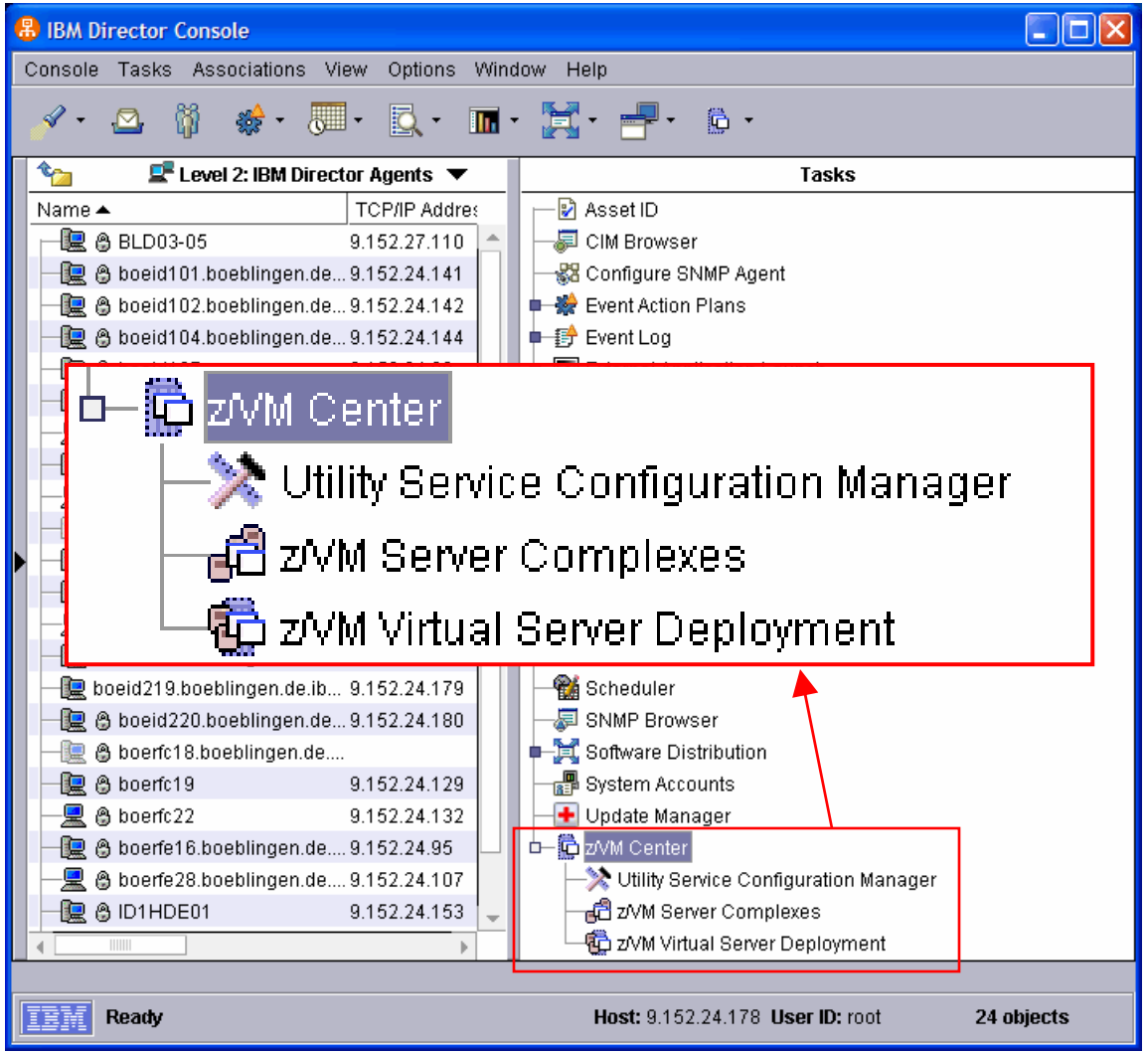
- Discovery
- Group Management
- Inventory
- Basic Resource Monitor
- Event Action Plan (EAP)
- Process Management
- Remote Session
- File Transfer
- Network Configuration
- Software Distribution
- SNMP Browser

z/VM Center

- Utility Service Configuration Manager
- z/VM Virtual Server Deployment
- z/VM Server Complexes

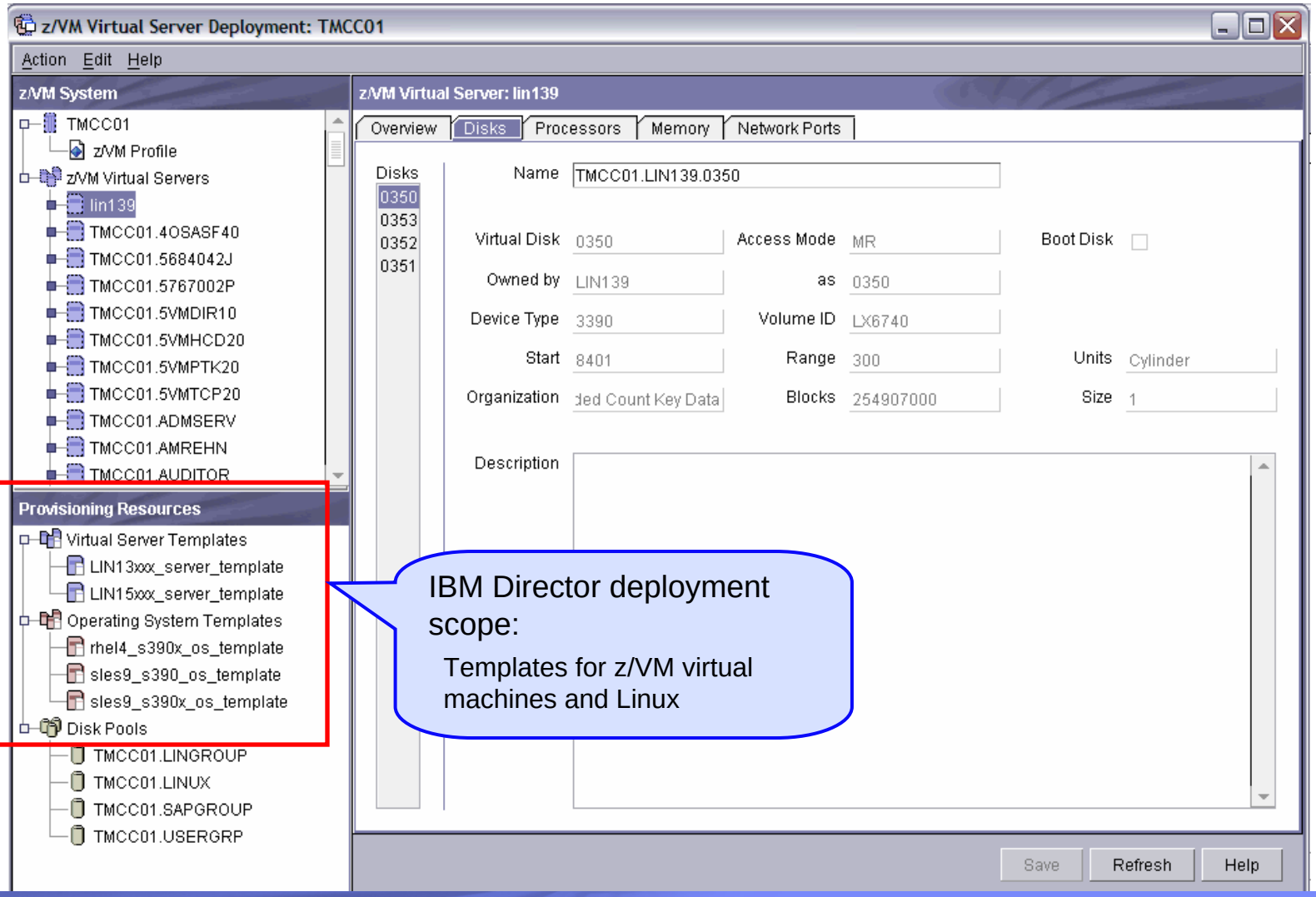
Software Distribution Premium Edition

- Software package distribution



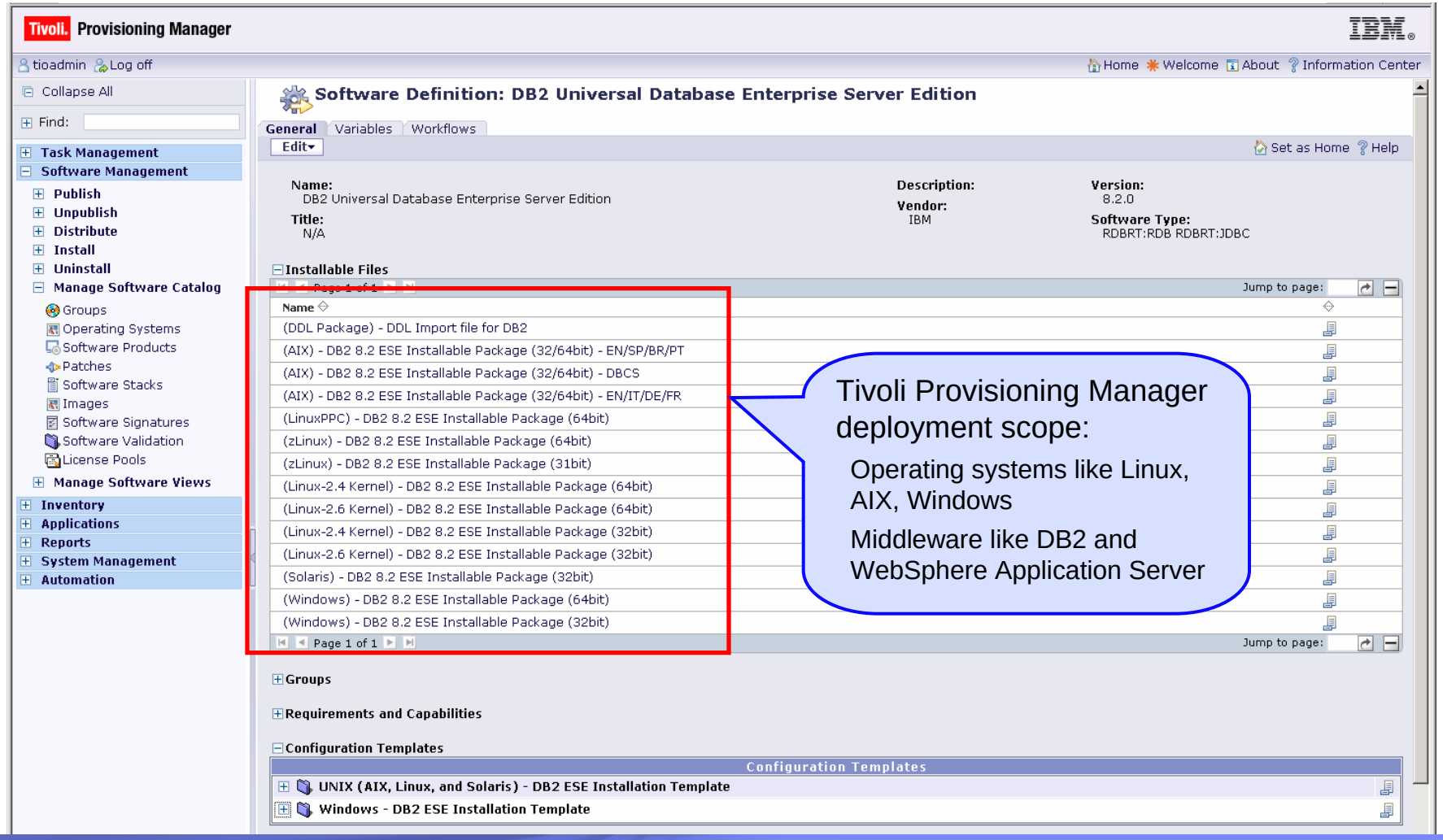
Provisioning Linux Virtual Machines on System z

Using IBM Director for Linux on System z with z/VM Center



Provisioning Software in System z Virtual Linux Servers

Using IBM Tivoli Provisioning Manager



z/VM Installation and Service Enhancements

- **Linux-on-z/VM installation using the Hardware Management Console (HMC)**
  - Eliminates the need to find an FTP or NFS server with mainframe connectivity in order to install Linux
  - Both z/VM and Linux can be installed in a virtual machine from the HMC DVD drive
  - z/VM FTP server supports new `/../HMC:` path to access HMC
- **Improved installation logging (e.g., console logs saved at end of each exec)**
- **LOCALMOD exec enhanced to support a list of parts to modify**
- **SERVICE exec enhanced to support a list of products to build**
- **Allow changing default labels for attached DASD**
- **Document USER DIRECT migration procedures**
- **Procedure to upload contents of z/VM installation DVD**

Performance Toolkit for VM Enhancements

- **The Performance Toolkit for VM feature is a performance and reporting tool for the z/VM system and its guest images**
  - Real time 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
- **z/VM V5.4 enhancements:**
  - New data to support dynamic memory upgrade
  - Ability to create a customized banner for the web interface
    - Displays for 5 seconds after initial banner page and before the logon screen
- **IBM Tivoli OMEGAMON XE for z/VM and Linux requires the Performance Toolkit for data collection**

Directory Maintenance (DirMaint) Enhancements

- **The DirMaint feature helps manage a z/VM system user directory**
  - Directory entries can be dynamically added, deleted, or altered using DirMaint commands
  - DirMaint provides automated validation and extent allocation routines to reduce the chance of operator error
- **Key z/VM V5.4 enhancements:**
  - Authentication and setting of External Security Manager password phrases
    - Enables DirMaint use with directory entries that have an ESM-controlled password phrase – function not available in prior z/VM release
  - Automatic communications with the z/VM RACF server are now configurable
    - New `USE_RACF` option allows users to turn automatic communication with RACF on or off for specific exits
  - DirMaint now uses `IUCV SMSG` to receive command requests
    - More reliable communication mechanism ensures DirMaint will not miss commands when communicating with RACF

z/VM Programming Language Enhancements

- **Language Environment (LE) Upgrade**
  - The integrated LE runtime libraries have been updated to the z/OS 1.9 level
  - The z/VM Binder code has also been updated to the z/OS 1.9 level
  - Provides necessary support for new C/C++ compiler
- **C/C++ Compiler Upgrade**

New IBM XL C/C++ for z/VM V1.2 (requires z/VM V5.4)

  - Matches the z/OS 1.9 level of C/C++
  - Part of family of C and C++ compilers that supports all major IBM platforms
    - Same code base makes source-level portability easier than ever before
- **IBM High Level Assembler for z/OS, z/VM and z/VSE V1.6**
  - Offers improved programmer productivity and application reliability
  - Includes new feature for Linux on System z – licensed for standard CPUs
    - PRPQs *5799-TCQ* and *5799-TCR* should be ordered to execute HLASM on IFLs

z/VM Statements of Direction – August 5, 2008

- IBM intends to enhance z/VM FlashCopy capabilities to support the FlashCopy SE function of the IBM DS8000 with the PTF for APAR VM64449 in fourth quarter 2008.
  - FlashCopy SE offers a space-efficient snapshot capability that reduces the storage capacity needed for point-in-time copies.
  - This function is especially useful for short-lived testing or backups, such as flash to intermediate volume for backup to tape.
- TCP/IP functions: IBM intends to withdraw support in a future z/VM release for the Kerberos Authentication System.
- MMC (Mainframe to Micro Channel) card: IBM intends to withdraw support in a future z/VM release for the MMC card, which enabled communication between the PS/2 (PWSCS) and VM (PWSCF or ISFC).

Note: All statements regarding IBM's plans, directions, and intent are subject to change or withdrawal without notice, and represent goals and objectives only.

Questions?

The future runs on System z

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Backup Material

z/VM Evaluation Edition for IBM System z10
Technical Information

- **DVD-RAM containing z/VM 5.3 Evaluation Edition – also available via Web download**
  - Boot loader
  - z/VM 5.3 nucleus
  - RAMdisk – one-pack system
    - DirMaint feature
    - Performance Toolkit for VM feature
- **Mount on HMC and IPL**
  - Requires 3GB or larger logical partition on System z10
  - Automatic customization script invocation
- **Save customizations on DVD**
  - New guest definitions
  - Additional DASD allocations
  - System configuration

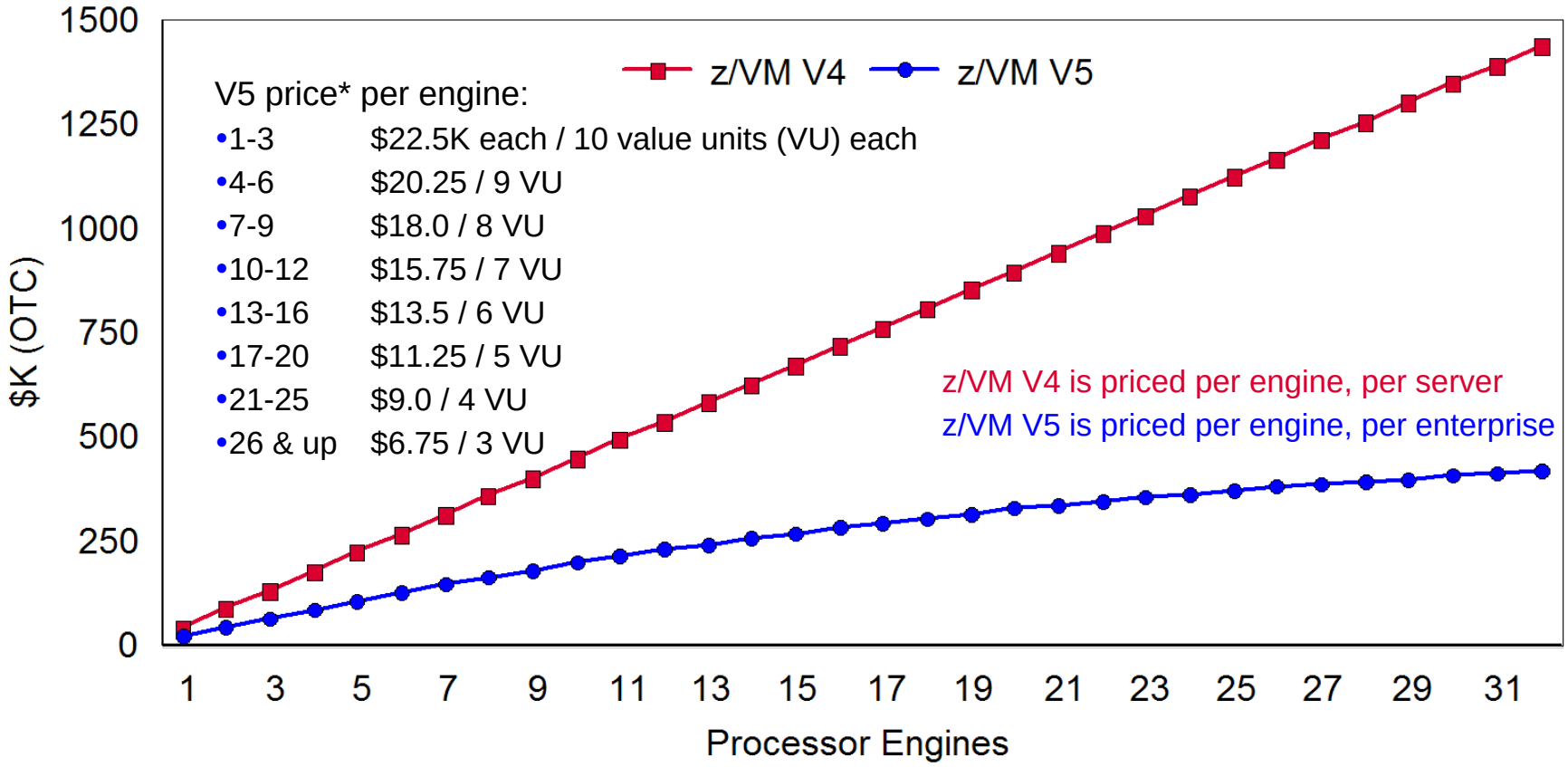
z/VM Service Updates – 1H 2008
Including Support for IBM System z10 Enterprise Class

- **Improved memory management – may benefit paging operations for large-memory workload environments** (via PTF for APAR VM64349)
- **Guest exploitation of z10 EC at a System z9 level of functionality**
  - Support for execute-extensions facility (via PTF for APAR VM64180)
  - Support for IOP subchannel recovery (via PTF for VM64242)
- **Exploitation of select z10 EC functions**
  - Dynamic I/O configuration support to define, modify, and query a Coupling-over-InfiniBand (CIB) CHPID when z/VM V5.3 is the controlling system LPAR for I/O
  - Processors can be dynamically added/removed to/from a z/VM LPAR in reserve without preplanning (via PTFs for APARs VM64249, VM64323, and VM64389)
  - TCP/IP and Virtual Switch performance gains from use of 10 GbE OSA-Express3
- **Support for Logical Volume Expansion – can help simplify disk management by allowing dynamic increase of DS8000 volume size to accommodate application data growth** (via PTFs for APARs VM64305 and VM64354)
- **New port isolation security mechanism – provides ability to restrict guest-to-guest communications within a Virtual Switch** (via PTF for APAR VM64281)
- **Encryption Re-Key support – provides the capability to update a previously encrypted tape cartridge with a new set of Key Encryption information** (via PTF for APAR VM64260)

z/VM V5.4 Product Information

- **Runs on IBM System z10 (z10 EC), IBM System z9 (z9 EC and z9 BC) and IBM eServer zSeries (z800, z900, z890, z990) systems**
  - The z/VM V5.4 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 engines as well as standard (CP) processors**
  - zIIP and zAAP specialty processors are supported for z/OS guest use
  - ICF processors are supported for Coupling Facility Control Code (CFCC) guest images
- **IPLA software product (5741-A05)**
  - One-time charge license fee, priced on a per-engine basis (CP and IFL engines only)
  - 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)**
  - Annual, renewable license charge; required to receive IBM support center services
  - Entitles customers to future z/VM releases and versions
- **Includes priced features**
  - DirMaint, RACF Security Server, Performance Toolkit for VM, RSCS
  - Pre-installed, but disabled (license required; same pricing model as base product)

z/VM Version 5 Pricing



*U.S. prices as of 1 July 2008

z/VM Version 5 Pricing
Detailed Information

- **z/VM V5 uses a Value Unit pricing model**
  - z/VM V5 value units correspond to the number of processors, not MIPS or MSUs
  - A single z/VM V5 value unit is priced at $2,250 (U.S. pricing as of 1 July 2008)
  - Processors 1, 2, and 3 are priced at 10 value units each
  - Processors 4, 5, and 6 are priced at 9 value units each
  - Pricing continues on a tiered basis
- **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 processors
  - 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 processor, all standard processors must be counted to determine z/VM V5 licensing fee**

IBM Director for Linux on System z V5.20

- **New product announced November 14, 2006**
  - Program number 5648-DR1
  - Available since January 12, 2007 for z/VM V5.2 and V5.3
- **IBM Director V5.20 replaces the IBM Director V5.10 base function in the *IBM Virtualization Engine and Infrastructure Services for Linux on System z9 and zSeries* product**
- **Includes two optional, priced features**
  - IBM Director z/VM Center
  - IBM Director Software Distribution Premium Edition
- **Other features still required from *IBM Virtualization Engine and Infrastructure Services for Linux on System z9 and zSeries* include:**
  - IBM Virtualization Engine Enterprise Workload Manager for Managing AIX, i5/OS, z/OS, Linux, and HP-UX Servers, V2.1
  - IBM Virtualization Engine Enterprise Workload Manager for Managing Solaris and Windows Servers, V2.1
  - IBM Resource Dependency Service, V2.1

Learn more at: **ibm.com**/systems/management/director

Linux and z/VM on System z

Business Value Propositions for Linux Workloads