SmarterComputing

Latest and Greatest Functions in z/VM

GSE 2014 – Session GS10

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Agenda

- Release Status and Information
- z/VM Version 6 Release 3
  - 2014 Enhancements
- Futures and Statements of Direction

Release Status and Information

z/VM Release Status Summary

UPDATE

z/VM	Level	GA	End of Service	End of Marketing	Minimum Processor Level	Security Level
Version 6	Release 3	7/2013	4/2017		IBM System z10®	EAL 4+[2] OSPP-LS
	Release 2	12/2011	12/2016[3]	7/2013	IBM System z10®	-
	Release 1	10/2009	4/2013	12/2011	IBM System z10®	EAL 4+ OSPP-LS
Version 5	Release 4	9/2008	12/2016[1]	3/2012	IBM eServer zSeries 800& 900 (z800, z900)	-
	Release 3	6/2007	9/2010	9/2010	z800, z900	EAL 4+ CAPP/LSPP

[1] Or later (Announced August 6, 2014)
[2] Targeted Security Level in V6.3 SOD
[3] Extended from original date (Announced February 4, 2014)

Marketed & Serviced
Serviced, but not Marketed
End of Service & Marketing

Extended support contracts are available.

z/VM Version 6
Security Certification Plans

- Common Criteria (ISO/IEC 15408)
  - z/VM V6.3 is **evaluation complete, waiting for certificate to be issued.**
  - z/VM V6.1 has been certified: BSI-DSZ-CC-0752
  - Evaluated to EAL 4+ for the Operating System Protection Profile (OSPP) with:
    - Virtualization extension (-VIRT)
    - Labeled Security extension (-LS)

- Federal Information Protection Standard (FIPS) 140-2
  - ***new***: z/VM V6.3 System SSL is FIPS 140-2 Validated(TM)
    - http://csrc.nist.gov/groups/STM/cmvp/documents/140-1/1401val2014.htm#2139
  - z/VM V6.1 System SSL is FIPS 140-2 Validated(TM)
    - http://csrc.nist.gov/groups/STM/cmvp/documents/140-1/1401val2012.htm#1735
  - Enablement requirements for certificate database and servers

- z/VM V6.2 is designed to conform to both Common Criteria and FIPS 140-2 evaluation requirements

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z/VM Service – Red Alert

- Memory corruption for guests with more than 4G of memory
  - z/VM 6.3 with APAR VM65538 / PTF UM34432 applied
  - Original PTF UM34308
  - Was not on an RSU

- Fixed by APAR VM65619 / PTF UM34432
  - Closed September 18, 2014
  - Currently not on an RSU, but is a candidate.

- To avoid the problem
  - Install VM65619/UM34432
  - Restrict guests to less than 4G

- http://www.vm.ibm.com/service/redalert/#VM65619

z/VM Version 6 Release 3

z/VM Version 6 Release 3
Making Room to Grow Your Business

July 23
Product announcement

July 26
Product General Availability

Feb 24
Announce additional support:

April 30
System SSL Cryptographic Module Receives FIPS 140-2 Certification

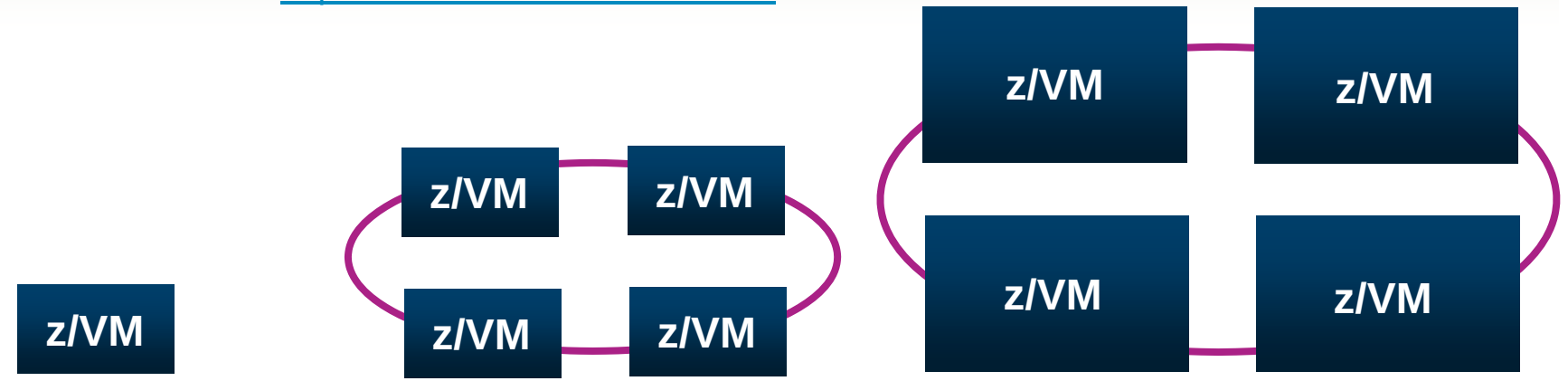
June 9
CPU pooling & Environment Information Interface Available

July 16
z/VM support for zEDC Express and 10GbE RoCE Express features Available

Aug 15
ILMT 9.01 support of CPU pooling Available

2013 | 2014

See http://www.vm.**ibm.com**/zvm630/



Reduce the number of z/VM systems you need to manage z/VM 6.3

- Expand z/VM systems constrained by memory up to four times (almost two times on the zBC12), thus increasing the number of Linux virtual servers in a single z/VM system
- Exploit HiperDispatch to improve processor efficiency, allowing more work to be done per IFL and therefore supporting more virtual servers per IFL, potentially requiring fewer systems for applicable workloads
- Expand the real memory used in a Single System Image Cluster up to 4 TB
  - z/VM 6.3 has the ability to fully utilize memory of a zBC12 at a maximum of 496 GB
- Exploit multiple subchannel sets in GDPS environment to place secondary Peer-to-Peer volumes in alternate subchannel set

Improved Memory Management Flexibility and Efficiency

- Benefits for z/VM systems of all memory sizes
- Prioritize virtual server use of real memory more effectively through enhanced memory reservation support
- Exploit improved management of memory on systems with diverse virtual server processor and memory use patterns
- Eliminate use of expanded storage for z/VM paging, allowing greater flexibility and avoiding some of the restrictions associated with expanded storage

Simplify z/VM Systems Management

- Managing z/VM virtual servers with xCAT (Extreme Cloud Administration Toolkit) is ready to go after z/VM V6R3 installation; nothing else needs to be installed
- Adopt a foundation to allow future extensions for open source systems management solutions, in particular through OpenStack® support
- Enable scalable support for the larger systems that z/VM V6R3 supports
- Safely migrate an existing z/VM V6R2 SSI Cluster to z/VM V6R3 in a step-wise approach, without having to shut down the cluster, using the new “Installation Upgrade In Place” capability

Large Memory Support

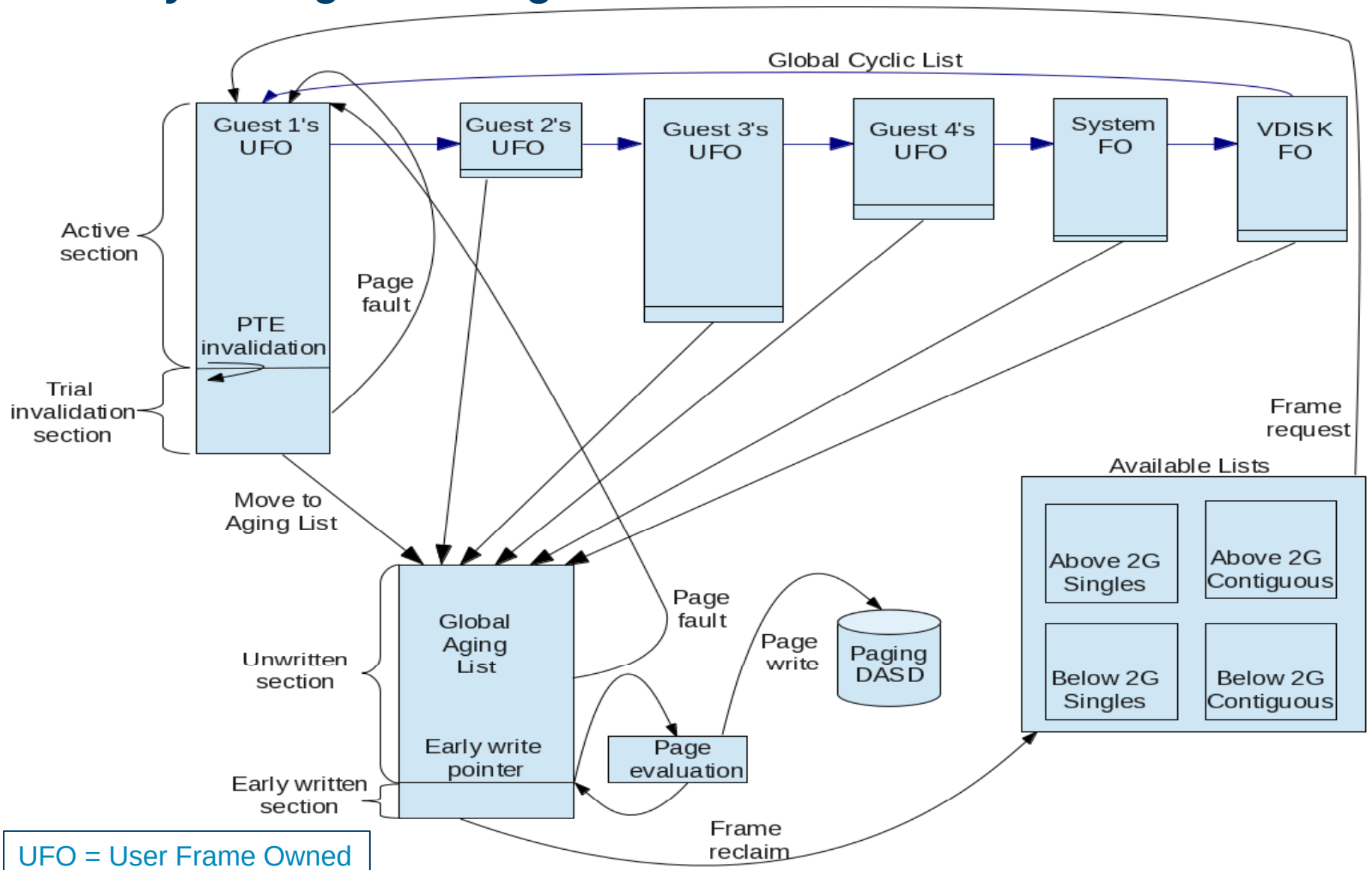
- Real memory limit raised from 256GB to **1 TB**
  - Proportionately increases total virtual memory based on tolerable overcommitment levels and workload dependencies
- Virtual machine memory limit remains unchanged at **1 TB**
- Paging DASD utilization and requirements change
  - Removed the need to double the paging space on DASD
  - Paging algorithm changes increase the need to have a properly configured paging subsystem
- Expanded Storage continues to be supported with a limit of **128 GB**
  - However, expanded storage is no longer recommended.

Large Memory Support (cont.)

- Reorder processing removed
  - Commands remain, but have no impact
  - Improves environment for running larger virtual machines

- Improved effectiveness of the CP SET RESERVE command
  - Stronger “glue” to hold reserved pages in memory
  - Support for reserving pages of NSS or DCSS
    - Example: Use with the Monitor Segment (MONDCSS)
  - Ability to limit the overall number of reserved pages for the system

Memory Management Algorithm Visualization



UFO = User Frame Owned

The “Sweet Spot” Workload

- Closer look at how the fairness and workloads may result in different results.
- Sweet Spot workload has four groups of virtual machines. Some benefit more than others, and some do not benefit.

	z/VM 6.2	z/VM 6.3	Delta	Pct. Delta
System External Throughput	0.0746	0.0968	0.0222	29.8%
User Group 1 ETR	0.0065	0.0128	0.0063	96.9%
User Group 2 ETR	0.0138	0.0236	0.0098	71.0%
User Group 3 ETR	0.0268	0.0264	-0.0004	-1.5%
User Group 4 ETR	0.0275	0.0341	0.0066	24.0%

Workload: The Apache Paging Workload

Our Linux-based workload called *Apache Paging* is built to page heavily to DASD almost no matter how much central or XSTORE we give it.

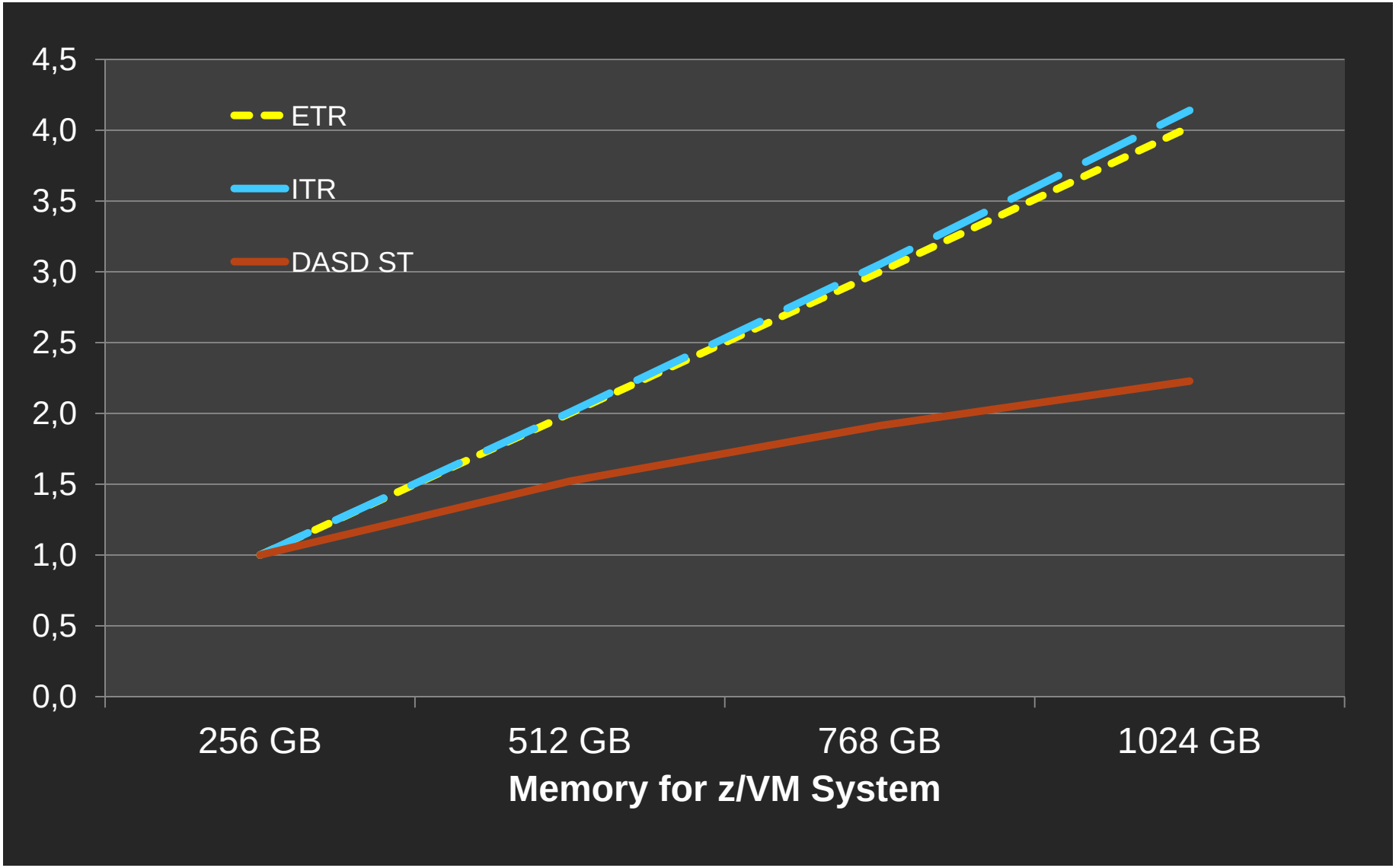
	z/VM 6.2	z/VM 6.3
Cstore (GB)	256	384
Xstore (GB)	128	0
External Throughput (ETR)	1.000	1.024
Internal Throughput (ITR)	1.000	1.017
Xstore paging / second	82489	0
DASD paging / second	33574	31376

This is an example of a workload where the limit comes from something large memory will not fix.

Large Memory Scaling Measurements

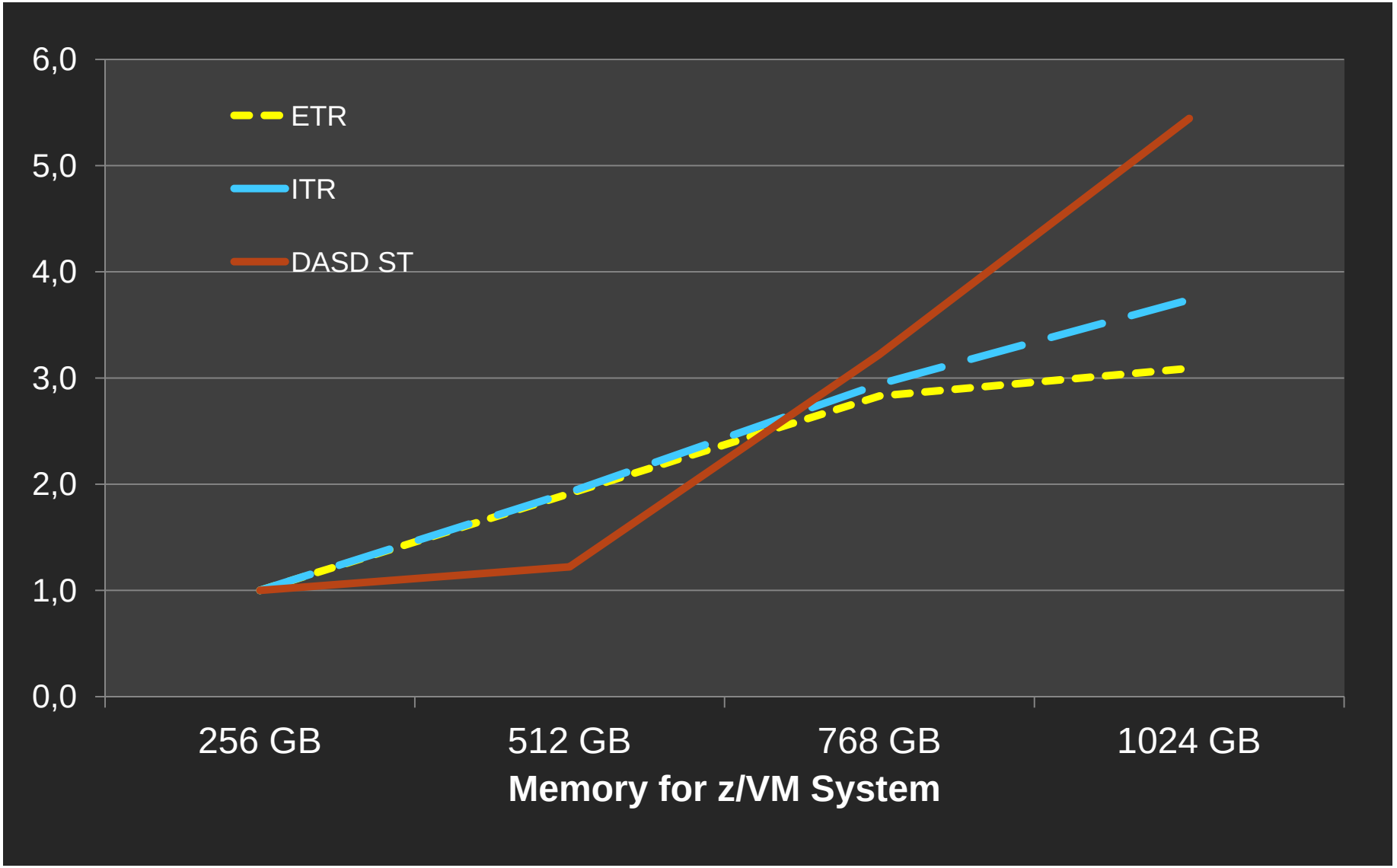
- Workloads
  - **VIRSTOR**
    - Test case system started with CMS boot strap with controls over memory reference patterns and processor usage.
    - Create workload similar to resource usage from customer Monwrite data
  - **Linux Apache Static Web serving**
- Measure and test levels of servers at peak usage for 256 GB in an overcommitted environment
- Scale up from there to 1 TB
  - All resources scaled up, though note that while additional DASD space was provided, it was on the same storage server.

VIRSTOR Workload in Scaling Overcommitted Environment



ETR = External Throughput; ITR = Internal Throughput; DASD ST = Paging DASD Service Time

Apache Workload in Scaling Overcommitted Environment



ETR = External Throughput; ITR = Internal Throughput; DASD ST = Paging DASD Service Time

Enhanced Dump Support

- Stand-alone Dump utility has been rewritten
  - Creates a CP hard abend format dump
  - Dump is written to ECKD™ or SCSI DASD
- Larger memory sizes supported, up to a maximum of 1 TB
  - Includes Stand-alone dump, hard abend dump, SNAPDUMP, DUMPLD2, and VM Dump Tool
- Performance improvements for hard abend dump
  - Reduces time to take a CP hard abend dump

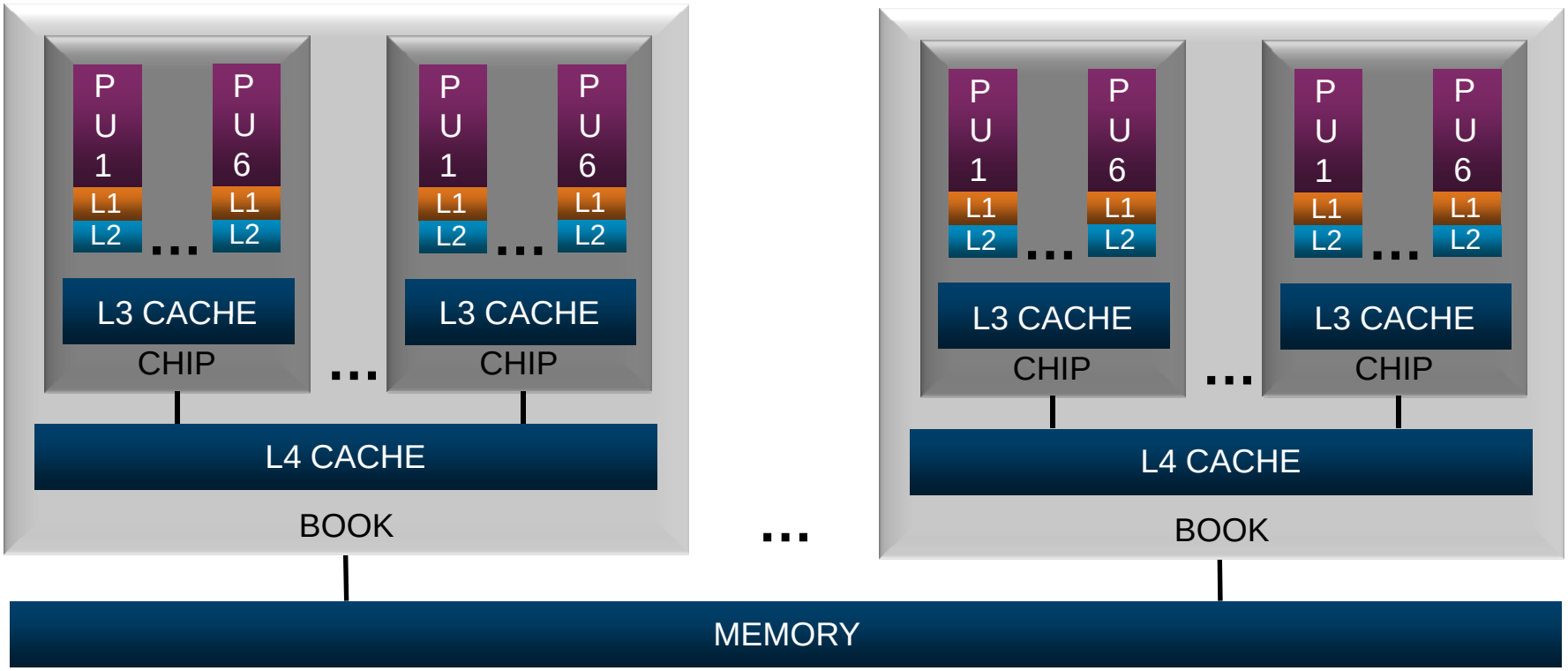
HiperDispatch

- Improved processor efficiency
  - Better n-way curves
    - Supported processor limit of 32 remains unchanged
  - Better use of processor cache to take advantage of cache-rich system design of more recent machines

- Two components:
  - Dispatching affinity
  - Vertical CPU management

HiperDispatch – Dispatching Affinity

- Processor cache structures become increasingly complex and critical to performance
- Goal is to re-dispatch work close (in terms of topology) to where it last ran



HiperDispatch – Dispatching Affinity

- Dispatcher is aware of the cache and memory topology
  - Dispatch virtual CPU near where its data may be in cache based on where the virtual CPU was last dispatched
- Better use of cache can reduce the execution time of a set of related instructions
- z/VM 6.2 and earlier uses “soft” affinity to dispatch virtual CPUs
  - No awareness of chip or book

HiperDispatch – Vertical CPU Management

- Today's “horizontal” management distributes the LPAR weight evenly across the logical processors of the z/VM LPAR
- “Vertical” management attempts to minimize the number of logical processors, allowing LPAR to similarly manage logical CPUs

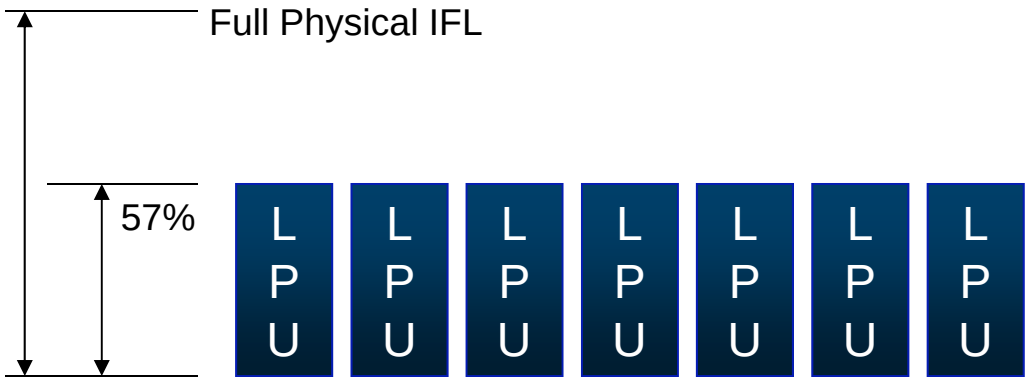
Example:

- Ten Physical IFLs, seven logical IFLs, weight of 400 out of 1000
  - Each logical IFL (LPU) entitled to 57% of an IFL
- When CEC is constrained, the LPAR’s entitlement is reduced to four IFLs, so seven is more than required
- z/VM and LPAR will cooperate
  - z/VM will concentrate the workload on a smaller number of logical processors
  - LPAR will redistribute the partition weight to give a greater portion to this smaller number of logical processors (~100% of four CPUs)

Horizontal vs. Vertical CPU Management

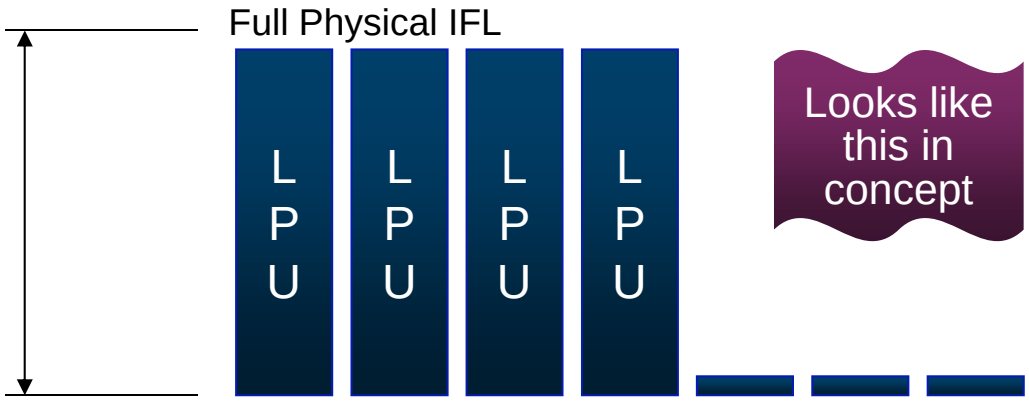
Horizontal:

- The logical processors are all created/treated equally.
- z/VM dispatches work evenly across the seven logical processors

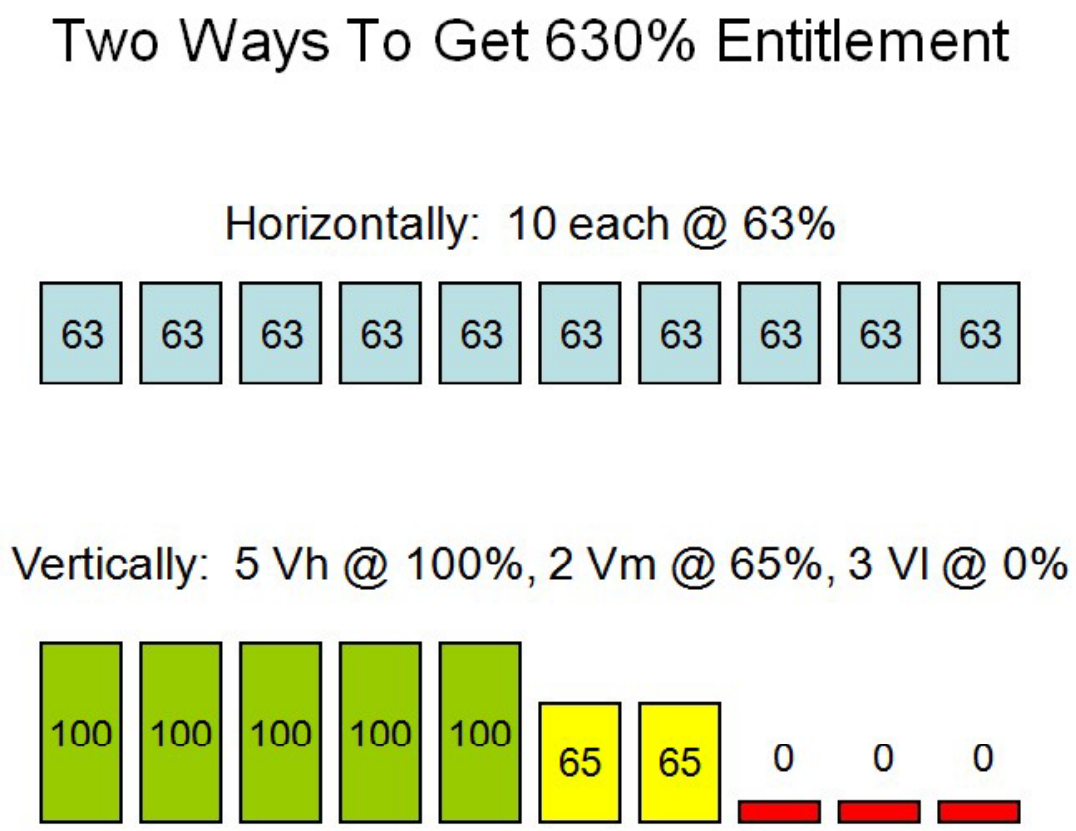


Vertical:

- The logical processors are skewed to where some get greater share of the weight.
- z/VM dispatches work accordingly to the heavier weighted workload.



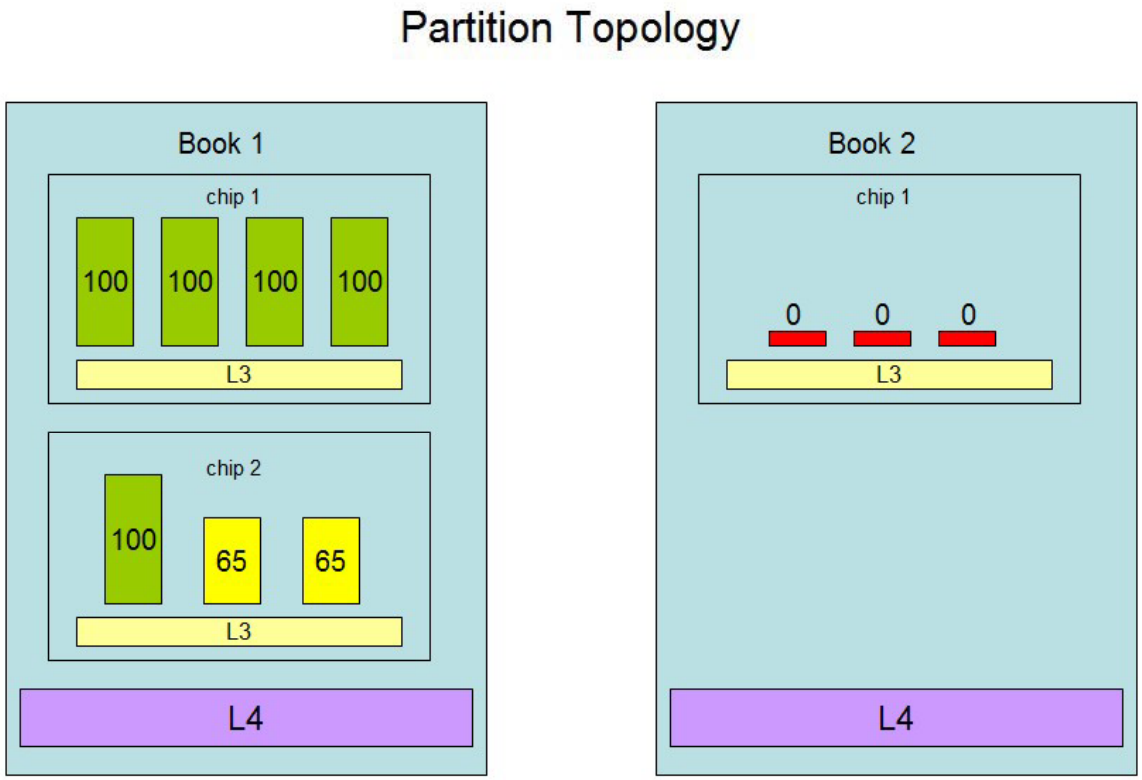
IBM System z: Horizontal and Vertical Partitions



In vertical partitions:

- Entitlement is distributed unequally among LPUs.
- The unentitled LPUs are useful only when other partitions are not using their entitlements.
- PR/SM tries very hard not to move Vh LPUs.
- PR/SM tries very hard to put the Vh LPUs close to one another.
- Partition consumes its XPF on its Vm and Vl LPUs.

IBM System z: The Partition Knows Its Placement



In vertical partitions:

- Sense your placement
- Run work smartly in light of your placement
- Sense unentitled power
- Use LPUs smartly in light of unentitled power

Notice PR/SM has given this partition a "quiet place" to do its work, provided the partition runs its work on its Vh LPUs.

Technology Exploitation

- Fibre Channel Protocol Data Router Support
  - FCP QEBSM support enhanced for guest support use of FCP Data Router
- FICON DS8000 Series New Functions
  - Storage Controller Health message
    - New attention message from hardware providing more details for conditions in past reflected as Equipment Check.
    - Intended to reduce the number of false HyperSwap® events.
  - Peer-to-Peer Remote Copy (PPRC) Summary Unit Check
    - Replaces a series of state change interrupts for individual DASD volumes with a single interrupt per LSS
    - Intended to avoid timeouts in GDPS environments that resulted from the time to process a large number of state change interrupts.
    - Satisfies a SOD from October 12, 2011
- Multiple Subchannel Set (MSS) support for mirrored DASD
  - Support to use MSS facility to allow use of an alternate subchannel set for Peer-to-Peer Remote Copy (PPRC) secondary volumes.
  - Satisfies a SOD from October 12, 2011

z/VM 6.3 and GDPS Support

- z/VM 6.3 alternate subchannel set support
  - GDPS V3.10 prereqs the PM71447 New Function: GDPS/PPRC XDR MSS1 Support APAR
- z/VM 6.3 FICON DS8000 Series new function (DS8K synergy initiative)
  - GDPS/PPRC V3.8, V3.9, & V3.10 and prereqs the PM44141 New Function: GDPS/PPRC XDR PPRCSUM and Storage Controller Health Message APAR, and DS8K R6.2 u-code.
- Cannot mix new MSS support in an SSI environment with older z/VM systems.
- See http://www-03.ibm.com/systems/z/advantages/gdps/whatsnew.html for details.
- See GDPS PSP buckets for required service (z/OS, Linux, and z/VM)
  - Remember to check for required service for systems that share the GDPS environment.

Environment	3.8	3.9	3.10
z/VM 6.3 w/ MSS 1	No	No	Yes[1]
z/VM 6.3 DS8K Synergy	Yes[1]	Yes[1]	Yes[1]
z/VM 6.3 SSI + LGR	No	No	Yes[1]

1 – with appropriate service – Check Bucket

Virtual Networking Improvements

- Live Guest Relocation support for port-based virtual switches built on existing support:
  - Allow relocation of port-based interface
  - Prevent relocation of an interface that will be unable to establish proper network connectivity
  - Adjust the destination virtual switch configuration, when possible, by inheriting virtual switch authorization from the origin
- MPROUTE server upgraded to z/OS V1.13 OMPROUTE functional equivalency
- Support for OSA-Express5S devices
- Virtual Switch recovery and stall prevention
  - New SET VSWITCH UPLINK SWITCHOVER command
  - Change from current device to one of the configured backup devices

Security Enhancements

- Crypto Express4S
  - Guest support for Crypto Express4S which is a feature available on zEC12 and zBC12
  - Can be configured in one of three ways:
    - IBM Common Cryptographic Architecture (CCA) Coprocessor mode
    - IBM CCA Accelerator mode
    - IBM Enterprise Public Key Cryptographic Standards (PKCS) #11 (EP11) coprocessor
- SSL Server Upgrade
  - System SSL update to z/OS V1.13 equivalency
  - Client certificate validation
  - Includes support for:
    - Transport Layer Security (TLS) protocol, Version 1.2
    - SHA2 certificate support
    - TLS Protocol Selection
  - IPv6 support for SSL-enabled Telnet, FTP, and SMTP

Installation Upgrade in Place Enhancement

- Upgrade an existing z/VM 6.2 system to z/VM 6.3 with minimal impact to the current running system.
  - Fewer manual steps such as directory merging and new virtual machine creation

- Upgrade Approach:
  - Install new release as temporary second level system
  - Move new level of z/VM to current system
  - For SSI Cluster, start with single member of the cluster on new level

- Provides a backup to support backing out in extreme cases

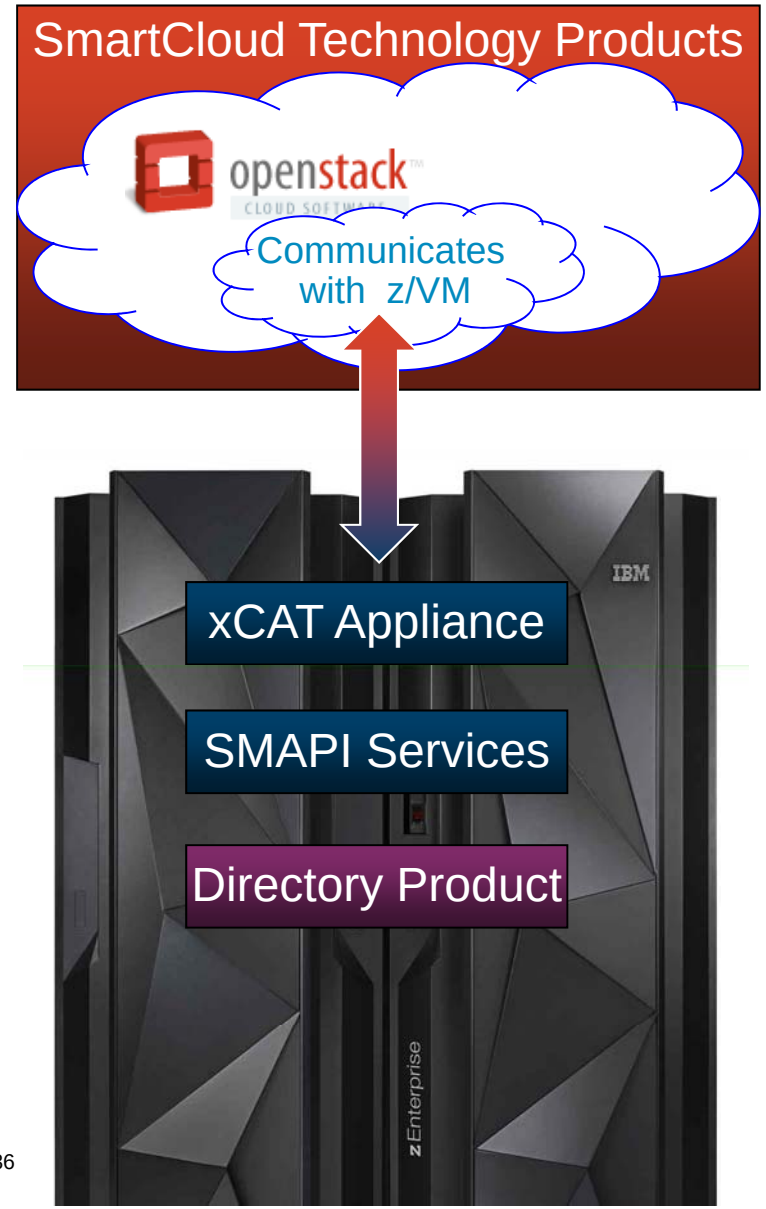
- Support for local modifications

z/VM 6.3 Withdraws Cross System Extensions (CSE) Support

- Satisfies a previous Statement of Direction
- The z/VM Single System Image (VMSSI) feature replaces the functions provided by CSE:
  - Logon once in the cluster, with exceptions
  - Cross-system MESSAGE and QUERY commands
  - Shared spool
  - Shared source directory
- VMSSI has additional value such as autonomic minidisk cache management and a single point of maintenance
- XLINK shared disk support is **not** affected.

Change from SoD

The OpenStack Food Chain



- **Top Half of the Solution:**
  - An IBM SmartCloud Technology product or other vendor product will include the OpenStack support.
  - Portions of that OpenStack support will know z/VM (i.e. code that connects and understands how to talk to z/VM).
- **Bottom Half of the Solution:**
  - Rest APIs are used to communicate with the OpenStack code from the top half.
  - The xCAT Appliance utilizes new and existing Systems Management APIs (SMAPI) to interact with the z/VM system
  - SMAPI can interact with additional optional products or features (e.g. a directory manager).

Product with OpenStack Support

z/VM 6.3 Product

Optional Product or Feature

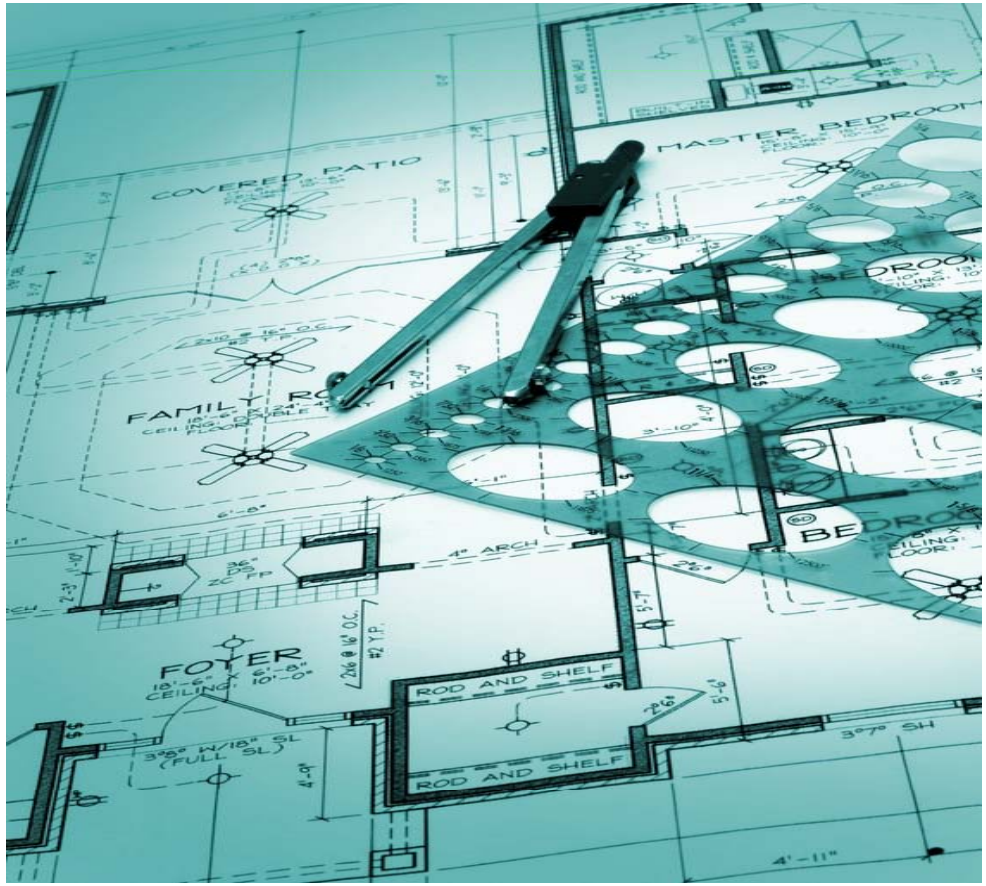
z/VM System Management – Related Products

- **Operations Manager for z/VM V1.5**
  - Facilitates automated operations
  - Monitor, view, and interact with consoles without logging on to service machines or Linux guests
  - Take actions based on service machine console messages and other system events
  - Schedule events for immediate execution or on a regular schedule
- **OMEGAMON® XE on z/VM and Linux V4.3**
  - Performance monitoring of z/VM and Linux guests
  - Part of the OMEGAMON and IBM Tivoli Monitoring infrastructure, including Tivoli Enterprise Portal
  - Uses IBM Performance Toolkit for VM as its data source
- **Backup and Restore Manager for z/VM V1.2**
  - Backup and restore file level data for CMS minidisks and Shared File System
  - Backup and restore images of Linux guests and/or z/VM volumes
    - Use Tivoli Storage Manager for file level backup and restore of Linux data
- **Tape Manager for z/VM V1.3**
  - Manage tapes: retention, access control, data security erase
  - Manage devices: share with other z/VM and non-z/VM systems
  - Manage mount requests for ATL, VTS, and manual mount devices
    - Supports IBM, EMC, and Oracle STK libraries
    - TS7700 needs firmware update is available as code level 8.21.0.165 (EC: M13120 / PN: 2727271 & 2727272 (DVD1&2.))
- **Archive Manager for z/VM V1.1**
  - Users and administrators manage disk space more efficiently and effectively
  - Archive infrequently used or large files to tape or other disk
- **zSecure™ Manager for RACF z/VM V1.11.1**
  - Automate complex, time consuming z/VM security management tasks
  - Quickly identify and prevent problems in RACF
  - Create comprehensive audit trails

February 24, 2014 Announcements

Enhancing the Foundation for Virtualization

- Release for Announcement – zBX and zEnterprise System Enhancements
  - February 24, 2014
- Software Enhancements
  - CPU Pooling
  - Environment Information Interface
- Hardware Support
  - 10GbE RoCE Express Feature
  - zEDC Express Feature



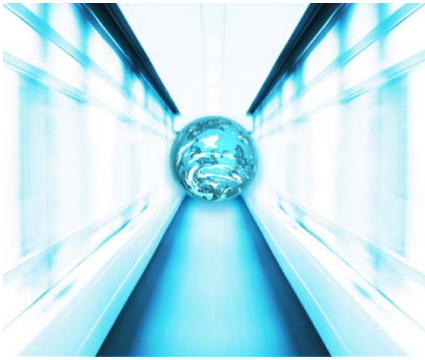
CPU Pooling

- Fine-grained CPU limiting for a group of virtual machines
- Define one or more pools in which a limit of CPU resources is set.
- Two flavors of limits:
  - LIMITHARD - Percentage of system
  - CAPACITY – Number of CPUs
- Coexists with individual limit shares
  - More restrictive limit applies
- Support Details
  - z/VM 6.3 with APAR VM65418 - Available

Environment Information Interface

- New interface allow guest to capture execution environment
  - Configuration and Capacity information
  - Various Levels:
    - Machine, logical partition, hypervisor, virtual machine
- New problem state instruction Store Hypervisor Information (STHYI)
- Includes support for CPU Pooling enhancement
- Foundation for future software licensing tools
  - IBM License Metric Tool 9.0.1updated August 2014- http://ibm.biz/cpupoolilmt
  - Greater flexibility for IBM Passport Advantage produces
- Support details:
  - z/VM 6.3 with APAR VM65419 – Available

10GbE RoCE Express Feature



- Support for RDMA over Converged Ethernet for guests
- Based on new hypervisor PCIe support
- Designed to support z/OS's Shared Memory Communications-Remote Direct Memory Access (SMC-R) in z/OS V2.1
- Support details:
  - IBM zEC12 or zBC12 with appropriate updates – see support buckets
  - z/VM 6.3 with APAR VM65417 – Available
    - System Config option – disabled by default.
    - You need to have required millicode fixes applied prior to enabling in system config
  - z/OS 1.12, z/OS 1.13, z/OS 2.1 with APAR OA43256
  - Fulfills 2013 Statement of Direction

zEDC Express Feature

- Guest support for zEDC Express Feature
- High performance, low CPU consumption compression
- Possible disk utilization reduction

- Support details:
  - IBM zEC12 or zBC12 with appropriate updates – see support buckets
  - z/VM 6.3 with APAR VM65417 – Available
    - System Config option – disabled by default.
    - You need to have required millicode fixes applied prior to enabling in system config
  - z/OS 1.12, z/OS 1.13, z/OS 2.1 with APAR OA43256
  - z/OS 1.12, z/OS 1.13, z/OS 2.1 with APAR OA44482
  - Fulfills 2013 Statement of Direction

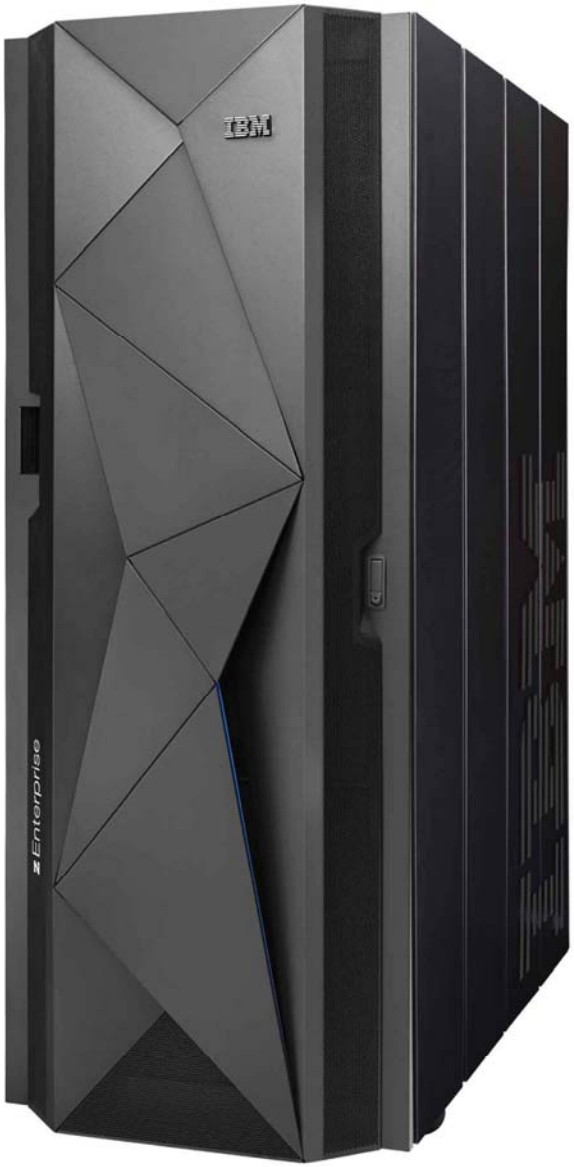
Hardware Support

Support for IBM zEnterprise EC12

- **Updates for z/VM 6.2, 6.1, and 5.4**
  - VM65007 CP
  - VM65131 IOCP
  - VM65046 Performance Toolkit for VM™
  - VM65047 HCD
  - VM64747 HCM (z196 support: 6.1 and 5.4 only)
  - VM65130 EREP
  - OA38418 OSA/SF for OSA-Express4S
  - PM49761 High Level Assembler (new instructions)
- **PSP Bucket**
  - Upgrade **2827DEVICE**
  - Subset **2827/ZVM**
  - Subset **2827/ZOS** for ICSF service to support EP11 when running as a guest

Support for IBM zEnterprise BC12

- **Updates for z/VM 6.3, 6.2 and 5.4**
  - VM65239: VMHCD support
  - VM65236: VMHCM support
  - VM65279: EREP support
  - VM65278: IOCP support
  - VM65360: SYSEVENT QVS support
    - VM65356: SYSEVENT QVS support (pre-req to VM65360)
- **Update for z/VM 6.2 and in base of z/VM 6.3**
  - PM83966: TCP/IP support
- **PSP Bucket**
  - Upgrade: **2828DEVICE**
  - Subset: **2828/ZVM**



z/VM Disk Storage Support

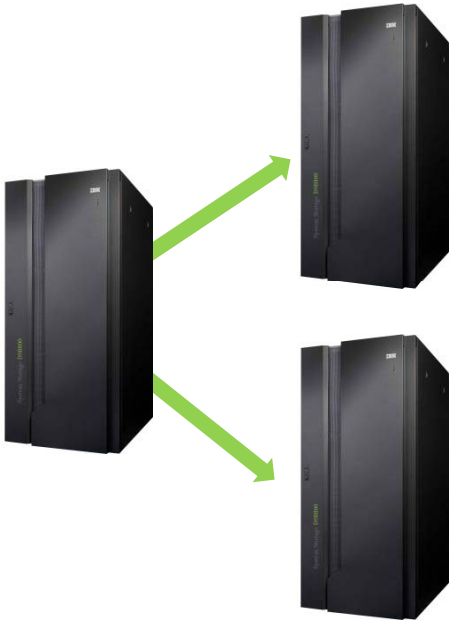
- z/VM 6.3 supports
  - DS8000® Series (FCP or FICON®)
  - DS6000® Series (FICON)
  - XIV (FCP)
  - IBM San Volume Controller (FCP)
  - IBM Storwize® V7000 (FCP)
    - See **ibm.com**/support/docview.wss?uid=ssg1S1003703#_zvm
  - IBM FlashSystem when behind an SVC (FCP)
  - As well as many of the older storage devices

- The IBM System Storage® Interoperation Center (SSIC) support page:
  - **ibm.com**/systems/support/storage/ssic/interoperability.wss

Multiple Target Peer-to-Peer Remote Copy Support

- Multiple Target Peer-to-Peer Remote copy (MT-PPRC) Support
  - Allows two PPRC relationships on a single primary volume.

- IBM DS8870 systems
  - Microcode level 7.4 required
  - Announced October 6, 2014
  - Planned availability December 5, 2014



- Device Support Facilities (ICKDSF)
  - APAR PM99490

- z/VM Support
  - APAR VM65544
  - Primary in subchannel set 0
  - Does not support a multiple target secondary in the alternate subchannel set
  - APAR **must** be applied prior to storage server upgrade to microcode level 7.4
    - APAR is required even if not exploiting new function
    - Watch for Red Alert

z/VM Tape Storage Support

- z/VM 6.3 Supports:
  - 3494 Virtual Tape Server (VTS) Library
  - TS3500 (3584) Tape Library
  - Virtualization Engine TS7700 (7720,7740) Tape Library
  - TS3400 Tape Auto-Stacker
  - Emulated 3490 Tape Subsystems
  - 3590, 3592, TS1120, TS1130, & TS1140 Enterprise Tape Subsystems

- z/VM provides CP native support for FICON only
  - FCP attachment supported by Linux guests via FCP subchannels
  - FICON supported by Linux for stand-alone tape only; no FICON library support

- The IBM System Storage® Interoperation Center (SSIC) support page:
  - **ibm.com**/systems/support/storage/ssic/interoperability.wss

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Enterprise Cloud System- Offering Components

- **Server:**
  - –IBM zEnterprise® EC12 **or** IBM zEnterprise BC12 (zEC12, zBC12)
- **Storage:**
  - –IBM DS8870 **or** Storwize® V7000
- **Software:**
  - –z/VM® 6.3 with following features:
    - Directory Maintenance (DirMaint™) Feature
    - Resource Access Control Facility (RACF®)
    - Performance Toolkit for VM™ Feature
    - Single System Image (SSI) Feature – (Requires ECKD DASD)
  - –IBM Wave for z/VM
  - –Cloud Management Suite:
    - OMEGAMON® XE on z/VM and Linux
    - Tivoli Storage Manager
    - SmartCloud Orchestrator
  - –Operations Manager for z/VM
  - –Backup and Restore Manager for z/VM

Statements of Direction

July 23, 2013

Subject to change or withdrawal without notice, representing IBM goals and objectives only.

Security Evaluation of z/VM 6.3

IBM intends to evaluate z/VM V6.3 with the RACF Security Server feature, including labeled security, for conformance to the Operating System Protection Profile (OSPP) of the Common Criteria standard for IT security, ISO/IEC 15408, at Evaluation Assurance Level 4 (EAL4+).

- We continue the practice of taking every other release through certification.
- Evaluation is with inclusion of RACF Security Server optional feature.
- See http://www.vm.ibm.com/security/ for current z/VM Security information.

FIPS Certification of z/VM 6.3

IBM intends to pursue an evaluation of the Federal Information Processing Standard (FIPS) 140-2 using National Institute of Standards and Technology's (NIST) Cryptographic Module Validation Program (CMVP) for the System SSL implementation utilized by z/VM V6.3.

- Federal Information Protection Standard (FIPS) 140-2
  - Target z/VM 6.3 System SSL is FIPS 140-2 Validated*
  - Enablement requirements for certificate database and servers
    - http://csrc.nist.gov/groups/STM/cmvp/documents/140-1/1401val2012.htm#1735

- See http://www.vm.ibm.com/security/ for current z/VM Security information.

A Certification Mark of NIST, which does not imply product endorsement by NIST, the U.S. or Canadian Governments.

Support of the 10GbE RoCE Express Feature

In a future z/VM deliverable IBM plans to offer support for guest exploitation of the 10GbE RoCE Express feature (#0411) on the IBM zEnterprise EC12 and IBM zEnterprise BC12 systems. This is to allow guests to utilize Remote Direct Memory Access over Converged Ethernet (RoCE) for optimized networking.

- RoCE is high bandwidth, low latency link layer protocol
- Guest support for devices dedicated to z/VM guests that support RoCE
- Requires 10GbE RoCE Express feature on either the IBM zEC12 or IBM zBC12

Support of the zEDC Express Feature

In a future z/VM deliverable IBM plans to offer z/VM support for guest exploitation of the IBM zEnterprise Data Compression (zEDC) Express feature (#0420) on the IBM zEnterprise EC12 and IBM zEnterprise BC12 systems.

- New data compression hardware feature to improve ability to do compression by offloading to zEDC
- Support is planned for guest usage
- Requires zEDC Express feature on either the IBM zEC12 or IBM zBC12

Stabilization of z/VM 5.4 Support

The IBM zEnterprise EC12 and IBM zEnterprise BC12 are planned to be the last System z servers supported by z/VM V5.4 and the last System z servers that will support z/VM V5.4 running as a guest (second level). z/VM V5.4 will continue to be supported until December 31, 2014, or until the IBM System z9® Enterprise Class (z9 EC) and IBM System z9 Business Class (z9BC) are withdrawn from support, whichever is later. Refer to Withdrawal Announcement 912-144, (RFA56762) dated August 7, 2012.

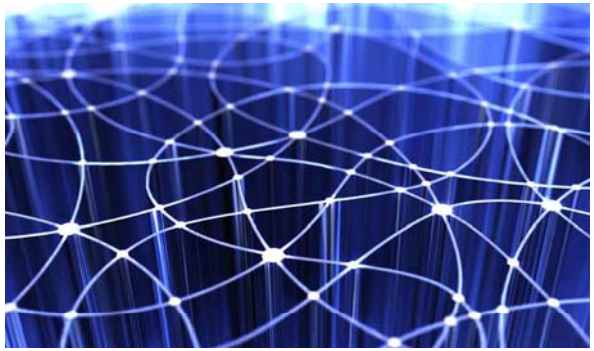
- While support will continue to the later date of December 31, 2014 or until the z9 processors are withdrawn from future, support for new function and processors is being stabilized. *Note August 2014 announcement has extended this End of Service date to December 31, 2016.*
- z/VM 5.4 will not be supported on processors after the zEC12 and zBC12.
  - This includes running as a guest of a supported z/VM Version 6 release.
- Plan now to avoid a migration which would involve both hardware and software at the same time.

Withdrawal of Support for Expanded Storage

z/VM 6.3 will be the last release to support expanded storage (XSTOR) as part of the paging configuration. With the enhanced memory management support added in z/VM V6.3, expanded storage is no longer recommended as part of the paging configuration. z/VM can run efficiently in a configuration using only central storage

- In z/VM 6.3, it is recommended to configure all processor memory as central storage.
  - Support remains to use expanded storage in z/VM 6.3, but is suggested for use only in special cases.

Summary



Leadership

z/VM continues to provide additional value to the platform as the strategic virtualization solution for System z.

Innovation

z/VM 6.2 introduced horizontal scalability and guest mobility through SSI Clustering and Live Guest Relocation with RAS in the forefront of the design. z/VM 6.3 continues the innovation with improved algorithms for memory and processor management.

Growth

z/VM 6.3 increases the vertical scalability and efficiency to complement the horizontal scaling introduced in z/VM 6.2, because we know our customers' systems continue to grow.