

# z/VM V6.4: Customer Driven Release

## MVMUA January 10, 2017

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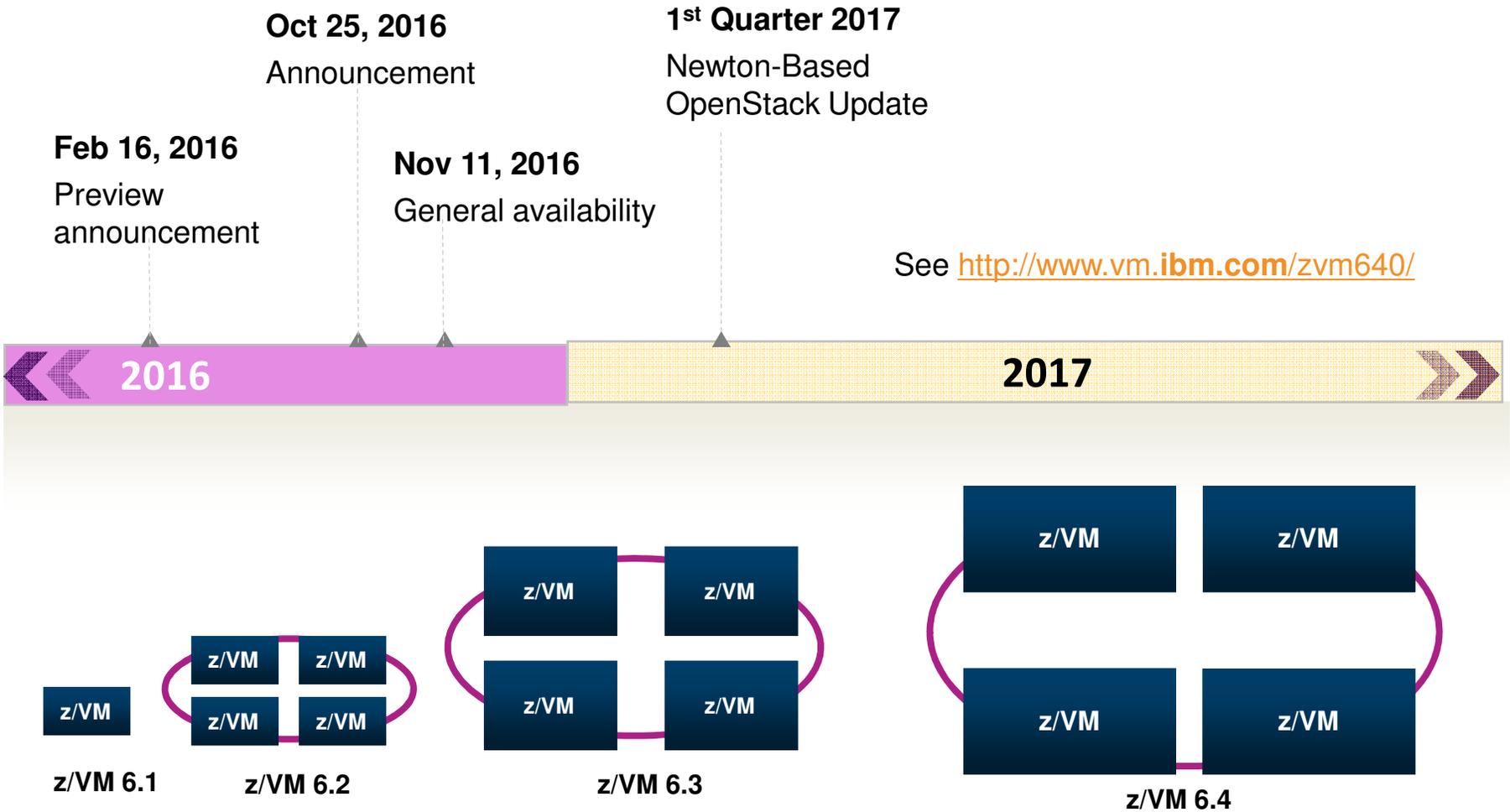
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## Abstract

This session will take a high level view of the new z/VM 6.4 release that became Generally Available on November 11, 2016. It was a release born from customer feedback and with that, each customer should find some significant value in the release. We'll discuss items such as HyperPAV for z/VM ECKD paging, 2TB real memory support, improved SCSI management, a new CMS Pipelines library, and much more.

# z/VM Version 6 Release 4

Designed for Clients of Today and Tomorrow



## IBM z/VM 6.4

- A release born from customer feedback
  - z Systems Business Leaders Council (zBLC)
  - SHARE dialogues
  - IBM internal T3s (Teach the Teacher)
  
- Prioritizations set by customers and adjusted by IBM resources and skills
  
- Two major areas:
  - Technical enhancements that continue to improve TCO and bring direct value
  - Improved quality of life for z/VM system programmers
  
- New Architecture Level Set (ALS)
  - z196 and z114 or newer
  - Drops z10 EC and BC support



## Value Areas of z/VM 6.4

- Improves scaling and TCO in a single footprint
  - More virtual machines in a single z/VM system
- Improves the management for large diverse workloads
  - Fair and accurate resource control
  - Guest exploitation of z Systems and LinuxONE hardware
- Shortens road to installation and migration
  - New customers
  - Existing customers
- Adds capabilities for automation and system programmer effectiveness
  - Scripting and automation frameworks
  - Problem determination
  - Self service cloud
- Enhances security framework
- Many other smaller enhancements to improve various aspects of supporting z/VM
  - Network
  - Performance
  - Systems Management



## TCO and Scaling Improvements

- z/VM continues to be able to support more virtual machines in a single footprint with reasonable service levels than any other solution
  - Major component to the TCO story
  - Capacity increases that do not result in additional support personnel
  
- Real memory support increased from 1 TB to 2 TB with same degree of overcommitment of real memory
  - Individual virtual machine limit remains at 1 TB
  
- Dynamic SMT added to change the number of active threads per core without a system outage
  - Potential capacity gains going from SMT-1 to SMT-2 (one to two threads per core) can now be achieved dynamically
  - Can go from SMT-2 to SMT-1 in rare case that it is not optimal for workload (response time concerns greater than capacity gains)
  - Requires running in SMT enabled, but can vary active threads per core



## Increased Paging Capability

- Memory overcommitment helps keep TCO values low. Paging effectively allows for better overcommitment ratios.
  
- z/VM paging to ECKD (DS8000) improved significantly
  - Use of HyperPAV allows:
    - Greater paging bandwidth with parallel I/O
    - Fewer, but larger page volumes
  - Use of High Performance Ficon (zHPF)
    - More efficient I/O processing for z/VM system I/O
  
- z/VM system volume usage (including paging) with FCP SCSI attached FlashSystems Storage Servers
  - Removes requirement for SAN Volume Controller (SVC) as intermediary for z/VM volumes; lowers latency and removes an expense



# Handling Diverse Workloads

- Various algorithms changed to remove large system effects and manage memory even more effectively
  - Better and more consistent performance
  
- Scheduler changes to further improve the accuracy and fairness of access to resources across various configurations
  - Removes surplus share problem seen on earlier releases
  - Eliminates eligible list to avoid complexity of tuning
  
- RAS improvements for FCP SCSI Disk environments
  - SCSI driver has additional path recovery
  - Concurrent SVC code loads supported
  - And much more
  
- New ability to free up paging disk space used (KEEPSLOT = NO)
  - Helpful in environments where memory overcommitment is low
  - Reduces the disk paging space used in a z/VM environment by trading off potential for additional paging I/O.



## Greater Guest Efficiencies

- Support for Guests to use Large Page (1 MB pages)
  - Allows guests to use the Enhanced DAT architecture
  - Reduces the amount of memory used for guest DAT structures and pathlength to manage that memory
  - z/VM continues to manage on a 4KB basis, retaining the full benefit of overcommitment
  
- Support for Guests to use Transactional Execution Facility (TX Facility)
  - Guests now informed that TX facility is available for use in z/VM environment
  - TX facility provides instructions that are an efficient alternative for synchronization
  - Performance improvement in processor requirements
  - Requires guest to be at supported level
  
- Support for Guests to use SIMD (Single Instruction Multiple Data)
  - Guests now informed SIMD is available for use in z/VM environment
  - Performance improvement in processor requirements
  - Requires guest to be at supported level
  - Requires z13, z13s, or LinuxONE
  - Also available on z/VM 6.3 with PTF UM34752



# Getting Up and Running

- Upgrade In Place – For existing z/VM 6.2 and 6.3 customers
  - Allows moving to z/VM 6.4 from existing systems rather than a new install
  - Support for vendor products, local mods, and backing out if necessary
  - See Install Guide for details
  
- Dynamic Partition Manager (DPM) – For new customers
  - Support added to allow z/VM 6.4 logical partitions to be configured through new DPM interface rather than traditional PR/SM
  - I/O configuration much easier than older IOCDS approach
  - Limited to FCP SCSI only, no FICON at this time
    - No Single System Image Cluster or Live Guest Relocation
  - Must be at recent level of DPM (Driver 27 Bundle S31)



# Frameworks for Automation



- CP Environment Variables
  - Allows z/VM meta data to be managed in a structured way
    - Variables set by system programmers
    - Variables read by programs for scripting
  - Replaces homegrown approaches for passing information around, and adds control to the environment
  - One special variable can be set on the IPL screen
    - Example: set as to whether Production, Test DR, or Actual DR
  
- New information available on z/VM Shutdown processing
  - Better determination of what is shutting down
  - Allows more robust automation to gracefully shutdown the z/VM system and virtual machines
  
- Significant upgrade to CMS Pipelines
  - Objective is to make available, with the product, many of the advances made to Pipelines since it was last updated in the product
  - Lots of new function
  - Avoids customers having to download and install on their own
  - Renews commitment to this powerful programming environment of Pipelines

# Problem Determination Aids

- New CP command to determine which PTFs or Local Mods are in the running z/VM system
  - Data is also provided in the z/VM monitor data stream
  
- New information on disk configurations
  - CP QUERY commands extended for both ECKD and EDEVs
    - Serial numbers, geometry information, features, etc.
    - Some data provided as ‘block of hex’ for vendor specific interpretation
  - New IOEXPLOR exec to format new information and make readable
    - Applies to IBM devices
  
- New command EXPLORE FCP allows for testing
  - ADD: adds FCP subchannel and WWPN to list of devices to be tested
  - START: activates FCP subchannels and opens WWPN ports in list of SCSI devices to be tested
  - Aids in problem determination when setting up FCP devices



## Enhanced Security Items

- VLAN access security improvement
  - With an ESM, user access to the default VLAN ID not permitted unless permissions has been granted explicitly through the ESM
  
- Default TLS protocol settings changed when using TLS/SSL Server
  - TLS 1.2 and TLS 1.1 are enabled by default, older versions disabled by default
  
- DirMaint to RACF Connector
  - Modernizes the Connector with a collection of functional enhancements
  - Brings processing in line with modern z/VM practices
  - Allows better passing of directory information to RACF
  - Facilitates proper security policy in environment managed by IBM Wave for z/VM or OpenStack
  
- RSCS TCPNJE traffic can be encrypted



# OpenStack in z/VM 6.4 & Futures

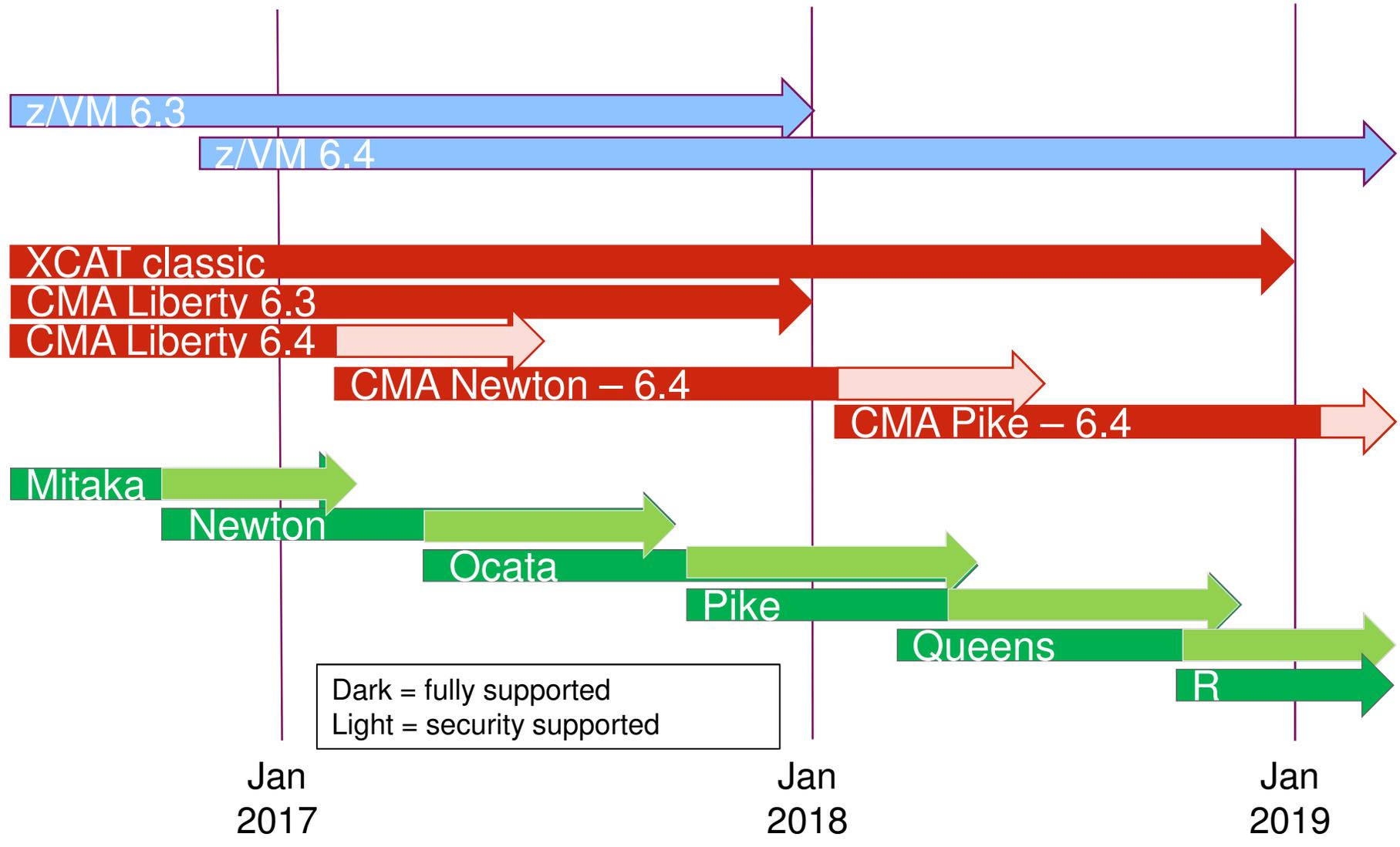


- In z/VM 6.4 GA
  - Virtual machine name changed from XCAT to OPNCLOUD
  - Switches to using straight editing of the DMSSIC\* COPY files instead of LOCALMOD process
  
- In 1st Quarter 2017 – the Newton level of OpenStack in CMA (APAR VM65893)
  - Support for deploying/managing Ubuntu guests via OpenStack and xCAT
  - Develop xCAT zHCP fully in the open
  - Enhance our Continuous Integration system with publicly available logs
  - Enable use of IUCV to communicate between the zHCP and guests as an alternative to SSH, which eliminates many key exchange issues
  - Enhancements for logging
  - Install simplification
    - xCAT GUI for the Installation Verification Program
    - Config wizard (similar to the ipwizard tool) for configuring the DMSSIC\* COPY files
    - SMAPI/DirMaint config exec
  - Removal of the chef client

# Cloud Management Appliance Service Model

- IBM intends to go to a new level of OpenStack for its CMA approximately once a year
  - Skip some levels of OpenStack
- IBM intends to make the new level of OpenStack for its CMA only available on the most recent release of z/VM
- When a new level of CMA (OpenStack) is made available, the old level will stay in service for an additional 6 months for security patches
- For example:
  - When the OpenStack Newton-based CMA becomes available, it will be on z/VM 6.4 only, not z/VM 6.3
  - At that time, on z/VM 6.4, Liberty-based CMA will only receive security patches, and only for 6 months
  - The Liberty-base CMA on z/VM 6.3 will continue to be supported until the End of Service for the z/VM 6.3 release

# Release Plans: z/VM, CMA, and Community



## Other Enhancements to Highlight

- Ability to reset counters for a Virtual Switch
  - Clear counts for data, discarded, and error
  - Makes it easier to recognize conditions
  
- Systems Management APIs (SMAPI) updated with support for z/VM 6.4
  
- New SET DIALDROP command establishes whether devices dialed to your virtual machine are dropped or stay connected when a virtual machine reset occurs
  
- Following upgraded to a level equivalent to z/OS 2.2:
  - LDAP server and client utilities
  - MPROUTE
  - System SSL and utilities
  - Program Management Binder

## Priced Feature Highlights

- Performance Toolkit for z/VM now runs in z/CMS
  - Allows exploitation of z/Architecture instructions and more memory
  
- IBM Wave as a priced feature of z/VM 6.4
  - To facilitate ordering of IBM Wave, it can be ordered as a feature of z/VM when ordering z/VM 6.4
  - Install media will be same as separate product, but included with z/VM order
  - Service calls will continue to be handled by the IBM Wave service team
  - PTFs will be shipped as IBM Wave service and not included in z/VM service stream or RSU
  - IBM Wave will still be available via
    - Separate product
    - Part of the IBM Infrastructure Suite for z/VM and Linux
  - More information about IBM Wave:  
<http://www-03.ibm.com/systems/z/solutions/virtualization/wave/>

## z/VM 6.4 Supported Hardware

- Following z Systems servers:
  - z13
  - z13s
  - LinuxONE Emperor
  - LinuxONE Rockhopper
  - IBM zEnterprise EC12
  - IBM zEnterprise BC12
  - IBM zEnterprise 196
  - IBM zEnterprise 114
  
- Electronic and DVD install
  - No tapes

## z/VM Release Status Summary

z/VM Level	GA	End of Service	End of Marketing	Minimum Processor Level	Maximum Processor Level	Security Level
6.4	11/2016			IBM System z196 & z114®	-	
6.3	7/2013	12/2017 <sup>[1]</sup>	11/2016	IBM System z10®	-	EAL 4+ OSPP-LS
6.2	12/2011	6/2017 <sup>[2]</sup>	7/2013	IBM System z10®	z13	-
5.4	9/2008	12/2017 <sup>[3]</sup>	3/2012	IBM eServer zSeries 800& 900	zEC12	-

<sup>[1]</sup> Announced February 3, 2015

<sup>[2]</sup> Announced February 2, 2016

<sup>[3]</sup> Announced August 2, 2016

## Statements of Direction

July 23, 2013

January 14, 2015

February 16, 2016

October 25, 2016

- Subset of IBM Statements of General Direction that are most important to the z/VM environment. See announcement materials for additional statements.
- Subject to change or withdrawal without notice, representing IBM goals and objectives only.

## Removal of ESA/390 Architecture Mode

January 14, 2015

**The IBM z13 will be the last z Systems server to support running an operating system in ESA/390 architecture mode;** all future systems will only support operating systems running in z/Architecture mode. This applies to operating systems running native on PR/SM as well as operating systems running as second level guests. IBM operating systems that run in ESA/390 mode are either no longer in service or only currently available with extended service contracts, and they will not be usable on systems beyond IBM z13. However, all 24-bit and 31-bit problem-state application programs originally written to run on the ESA/390 architecture will be unaffected by this change.

- While a hardware statement, there are potentially changes required for z/VM.
- Note implication of older operating systems.

## Stabilization of z/VM 6.2 Support

January 14, 2015

The IBM z13 server family is planned to be the last z Systems server supported by z/VM V6.2 and the last z systems server that will be supported where z/VM V6.2 is running as a guest (second level). This is in conjunction with the statement of direction that the IBM z13 server family will be the last to support ESA/390 architecture mode, which z/VM V6.2 requires. z/VM V6.2 will continue to be supported until December 31, 2016, as announced in Withdrawal Announcement [914-012](#), dated February 04, 2014.

- z/VM 6.2 will be supported until July 2017 (February 2016 announcement extended it to July 2017 from this original December 2016).
- There will **not** be z/VM 6.2 support for the next server family.
- Similar to the statement of direction with z/VM 5.4 not supported on z13.

## Removal of Support for IEEE 802.3 Ethernet Frame Types

October 25, 2016 Announcement

### **Removal of support for IEEE 802.3 Ethernet frame types:**

z/VM V6.4 is planned to be the last z/VM release to support IEEE 802.3 Ethernet frame types. All future z/VM releases are planned to support DIX Version 2 (DIX V2) exclusively. This includes the z/VM Virtual Switch (VSwitch) and the z/VM TCP/IP server.

## Removal of Support for the IMAP Server

October 25, 2016 Announcement

### **Removal of support for the IMAP server**

z/VM V6.4 is planned to be the last z/VM release to support IMAP.

# Removal of Support for Certain TCP/IP Functions

October 25, 2016 Announcement

## **Removal of support for certain TCP/IP functions**

z/VM V6.4 is planned to be the last z/VM release to support the Graphics Data Display Manager Interface for X Window System (GDDMXD/VM).

## Install to 3390 Model 3 DASD

October 25, 2016 Announcement

### **Install to 3390 Model 3 DASD**

z/VM V6.4 will be the last release to allow installation using Model 3 3390 DASD (Direct Access Storage Device) volumes. Future z/VM releases will support 3390 installation using only model 9 or model 27 DASD. Installation onto SCSI volumes will not be affected.

## **FIPS Certification of z/VM V6.4**

October 25, 2016 Announcement

### **FIPS Certification of z/VM V6.4**

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 V6.4.

## Security Evaluation of z/VM V6.4

October 25, 2016 Announcement

### Security Evaluation of z/VM V6.4

IBM intends to evaluate z/VM V6.4 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+).

## Removal of support for virtual machines with dedicated processors

October 25, 2016 Announcement

**Removal of support for virtual machines with dedicated processors**  
z/VM 6.4 is planned to be the last z/VM release to support dedication of logical to virtual processors via the CP DEDICATE command or with the DEDICATE option on the CPU user directory statement. z/VM running in a logical partition with dedicated processors will continue to be supported.

## Removal of IBM Wave support for SLES 10

October 25, 2016 Announcement

### **Removal of support for virtual machines with dedicated processors**

In a future deliverable, IBM intends to remove IBM Wave support for the administration of guests that are running the SUSE Linux Enterprise Server (SLES) 10 Linux distribution.

## Removal of IBM Wave support for second extended filesystem (Ext2)

October 25, 2016 Announcement

### **Removal of IBM Wave support for second extended filesystem (Ext2)**

In a future deliverable, IBM intends to remove IBM Wave support for the administration of Linux guest file systems that use Ext2.

## Completed Statements of Direction

Statement of Direction	From Announce Letter
z/VM Support for Single Instruction Multiple Data (SIMD)	January 2015
Enhanced RACF® password encryption algorithm for z/VM	January 2015
KVM Offering for z Systems	January 2015
GDPS/PPRC Multiplatform Resiliency Capability	January 2015
Security Evaluation of z/VM 6.3	July 2013
FIPS 140-2 Validation of z/VM 6.3	July 2013
Support of 10 GbE RoCE Express Feature	July 2013
Support of zEDC Express Feature	July 2013
Stabilization of z/VM 5.4 Support	July 2013

- Requires support from hardware and/or guests operating systems as appropriate
- Refer to [www.vm.ibm.com](http://www.vm.ibm.com) or [www.vm.ibm.com/security](http://www.vm.ibm.com/security) for more information

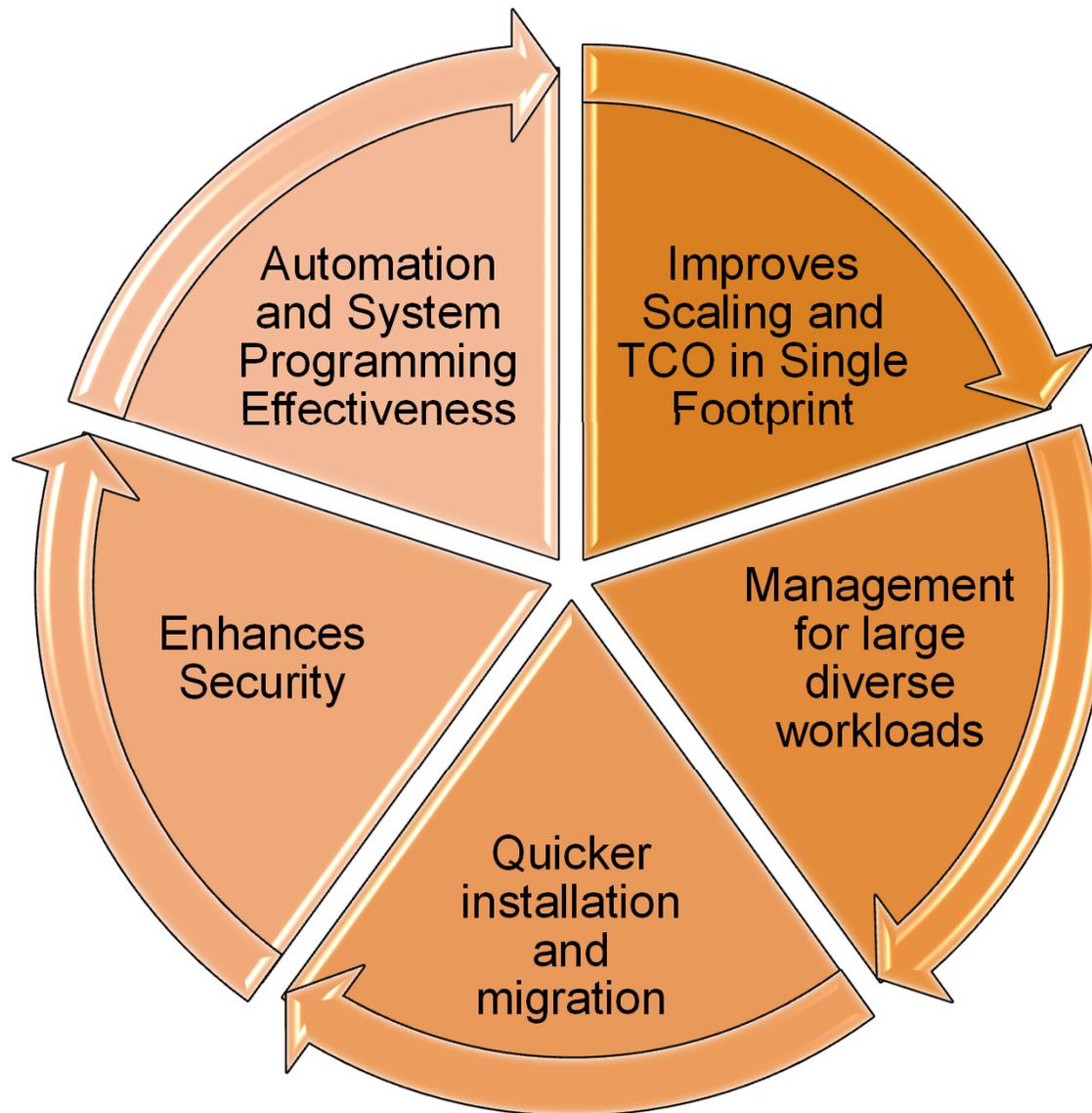
## Completed Statements of Direction

Statement of Direction	From Announce Letter
Product Delivery of z/VM on DVD/Electronic Only	January 2015
Dynamically Managed Thread Activation Levels	February 2016
Stabilization of z/VM Support for the z10 Server Family	February 2016
Removal of Support for Expanded Storage	January 2015
Withdrawal of Support for Expanded Storage	July 2013

- Requires support from hardware and/or guests operating systems as appropriate
- Refer to [www.vm.ibm.com](http://www.vm.ibm.com) or [www.vm.ibm.com/security](http://www.vm.ibm.com/security) for more information

# Summary

# z/VM 6.4



## How do you know what to expect in z/VM 6.4?

- New VMREVIEW utility on z/VM download page
  - Run on existing z/VM 5.4, 6.1, 6.2, or 6.3 systems
  - Will highlight:
    - Things that should be changed prior to going to z/VM 6.4
    - Value that could be gained by going to z/VM 6.4
    - Other interesting things in regard to this environment being on z/VM 6.4
  - Envision this being a work in progress
    - Interested in feedback for other things it should do
  
- Started as an extra project by some of the newer members of the z/VM team
  
- <http://www.vm.ibm.com/perf/tips/vmreview.html>

# VMREVIEW Output

```

C - GDLMV7 - [40 x 132]
File Edit View Communication Actions Window Help
Lines 1 - 35 of 61
Most of your virtual machines are not staying in the dispatch list.

Total:      0340
Dispatched: 0032
Percent:    0.09%

In 6.4.0 there are scheduler changes to include share settings of all
virtual machines.

-----
It appears you have no active users on the Eligible list. The Eligible
list is going away in 6.4.0

-----
It appears you have a lot of small volumes for paging:

-----
Press PF7 to scroll up and PF8 to scroll down.
Any other PFkey will exit

====>
15:11:39                                     Enter a command or press a PF or PA ke

MÁ C 39/008
Connected to remote server/host GDLMV7.endicott.ibm.com using port 23
    
```

# VMREVIEW highlights considerations

```
C - GDLMV7 - [40 x 132]
File Edit View Communication Actions Window Help

It appears you have a lot of small volumes for paging:
2722, 2721, 2720, 271F, 271E, 271D, 271C, 271B, 271A, 2719, 2718,
2717, 2716, 2715, 2714, 2713, 2712, 2711, 2710, 270F, 270E, 270D,
270C, 270B, 270A, 2709, 2708, 2707, 2706, 2705, 2704, 2703, 2702,
2701, 2700, are all less than 18000
Lines 35 - 61 of 61
Columns 1 - 129 of 132

With HyperPAV support for paging which is added in 6.4.0 you will not need so many small paging volumes

It does not appear that you have SCSI EDEVS. In 6.4.0 there are new SCSI
Management Queries.

It appears you are not currently using tapes. Just as a note:
In 6.4.0 tapes can no longer be used for installation and service.

Your machine is capable of multi-threading yet it appears to
be disabled.
6.4.0 supports dynamic SMT. You should consider enabling it.

It appears you have at least one VSwitch. A new feature of 6.4.0 is the
addition of a reset_counters function.

Your system currently has 40G of storage configured.
Please be aware that 6.4.0 increases the storage limit to 2TB.

-----
Press PF7 to scroll up and PF8 to scroll down.
Any other PFkey will exit

====>
15:13:02 Enter a command or press a PF or PA key

MÁ C 39/008
```

# VMREVIEW Utility Team

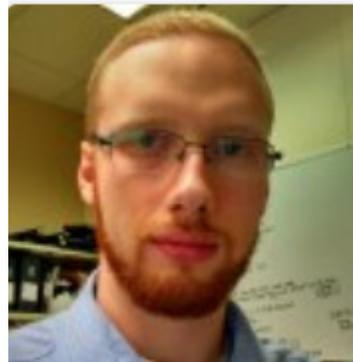


Walter  
Church IV

**NJIT**  
BS Computer  
Engineering

CP Development  
• Memory Mgmt

IBM: 17 Months



Jacob  
Gagnon

**Binghamton Univ**  
BS Computer  
Engineering

CP Development  
• Scheduler  
• Timer Support

IBM: 18 Months

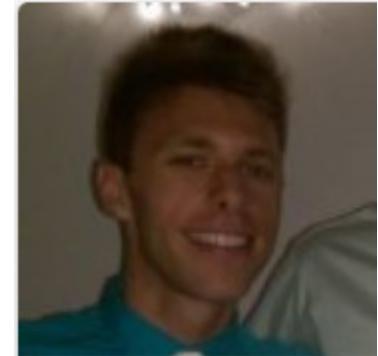


Kevin  
Meeks

**SUNY Potsdam**  
BS Computer  
Science

z/VM Service  
• CMS/SMAPI  
• DirMaint

IBM: 18 Months



Vasili  
Papastrat

**Binghamton Univ**  
MS Computer  
Science

z/VM System Test  
• Performance  
Toolkit

IBM: 6 Months

# Today's Panel



**Walter  
Church IV**

**Jacob  
Gagnon**

**Kevin  
Meeks**

**Lauren  
Maietti**

**Stephanie  
Rivero**

**NJIT**  
BS Computer  
Engineering

**Binghamton Univ**  
BS Computer  
Engineering

**SUNY Potsdam**  
BS Computer  
Science

**Binghamton Univ**  
BS Electrical  
Engineering

**Lehigh University**  
BS Computer  
Science & Business

CP Development  
• Memory Mgmt

CP Development  
• Scheduler  
• Timer Support

z/VM Service  
• CMS/SMAPI  
• DirMaint

CP Development  
• Cache Nest/  
Locks

CP Development  
• Memory Mgmt

IBM: 18 Months

IBM: 19 Months

IBM: 19 Months

IBM: 6 Months

IBM: 11 Months