



# IBM z/VM V6.4 delivers industry-proven advanced virtualization capabilities to support the increasing demands of a hybrid cloud environment

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## At a glance

IBM z/VM V6.4 delivers:

- Support for up to 2 TB of memory that enables:
  - Higher levels of workload consolidation
  - Considerable growth in memory-intensive applications
  - Superior levels of elasticity for workload spikes
- Increased efficiency with HyperPAV paging that takes advantage of IBM<sup>(R)</sup> DS8000<sup>(R)</sup> features to increase the bandwidth for paging and allow for more efficient memory management of over-committed workloads
- Easier migration with enhanced upgrade-in-place infrastructure that provides an improved migration path from previous z/VM<sup>(R)</sup> releases
- Improved operations with ease-of-use enhancements requested by clients that include:
  - Querying service applied to the running hypervisor
  - Providing environment variables to allow programming automation, based on systems characteristics and client settings
  - Improved query capabilities for system shutdown
- Improved Small Computer System Interface (SCSI) support for guest attachment of disk and other peripherals, and hypervisor attachment of disk drives to z Systems<sup>™</sup> and LinuxONE systems to:
  - Increase efficiency by allowing an IBM FlashSystem<sup>(R)</sup> to be attached to z/VM for system use without the need for an IBM System Storage<sup>(R)</sup> SAN Volume Controller (SVC)
  - Enable ease of use with enhanced management for SCSI devices to provide information needed about device configuration characteristics
  - Allow concurrent code loads on the SVC, and devices incorporating SVC technology, without quiescing EDEVICE I/O
- Increased scalability by exploiting Guest Enhanced DAT to allow virtual machines to take advantage of large (1 MB) pages, decreasing the memory and overhead required to perform address translation
- Integration of new CMS Pipelines functionality, not previously incorporated within z/VM, that allows a much more inclusive set of tools for application developers
- Availability of IBM Wave for z/VM as an optional, priced feature

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## Overview

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z/VM V6.4 virtualization technology is designed to run hundreds to thousands of Linux™ servers on a single IBM z Systems™ or LinuxONE server with the highest degrees of efficiency and elasticity.

The ability of z/VM to support multiple machine images and architectures provides a highly flexible production and test environment for z Systems and LinuxONE operating systems to:

- Simplify migration from one release to another
- Facilitate the transition to newer applications
- Provide a test environment whenever one is needed
- Consolidate many systems onto one physical server

A fundamental strength of z/VM is the ability for virtual machines to share system resources with very high levels of resource utilization. z/VM V6.4 provides even greater levels of extreme scalability, security, and efficiency to create opportunities for cost savings, while providing a robust foundation for cognitive computing on z Systems and LinuxONE servers.

z/VM V6.4 provides support for the IBM z13™, IBM z13s, IBM LinuxONE Rockhopper™, IBM LinuxONE Emperor™, and zEnterprise® (196, 114, EC12, BC12) servers, as well as Red Hat, SUSE, and Ubuntu Linux distributions. Support for simultaneous multithreading (SMT) technology extends per-processor, core capacity growth beyond single-thread performance for Linux on z Systems running on an IBM Integrated Facility for Linux (IFL) specialty engine on a z13™, z13s, or LinuxONE server. z/VM multithreading technology support can enable additional price/performance benefits over previous hardware generations and can meet workload requirements transparently. Improvements made in the areas of reliability, availability, and serviceability allow low-end devices such as IBM Storwize® V7000, V840, and V9000 to be attached to a z/VM host, removing the need for a SAN Volume Controller.

z/VM V6.4 is a supported environment using IBM Dynamic Partition Manager for Linux-only systems with SCSI storage. This simplifies system administration tasks for a more positive experience by those with limited mainframe skills. IBM Wave Version 1 Release 2 (V1.2) is now included in z/VM V6.4 as a priced feature. It can greatly simplify the task of administering a z/VM environment.

z/VM V6.4 can help you extend the business value of IBM z Systems and IBM LinuxONE™ technology across the enterprise by integrating applications and data, while providing exceptional levels of availability, security, and operational ease. World-class virtualization technology offered by z/VM can provide the ability to host a large number of virtual servers running different operating systems on a z Systems server and LinuxONE.

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## Key prerequisites

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z/VM V6.4 requires one of the following z Systems servers:

- z13
- z13s
- LinuxONE Emperor
- LinuxONE Rockhopper
- IBM zEnterprise EC12
- IBM zEnterprise BC12

- IBM zEnterprise 196
- IBM zEnterprise 114

For any additional requirements, refer to the [Technical information](#) section.

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## Planned availability date

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November 11, 2016

Refer to the [Availability of national languages](#) section for national language availability.

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## Description

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**Efficiency and scalability.** The overall efficiency of the z/VM hypervisor has been enhanced with the following scalability improvements:

- **HyperPAV technology exploitation.** z/VM exploits the ability for an IBM DS8000 device to issue concurrent I/O requests to an ECKD™ paging volume. In HyperPAV mode, if the base volume is busy, z/VM selects a free alias device from a pool, binds the alias to the base device, and starts the I/O. When the I/O completes, the alias device is returned to the pool to be used for another I/O to the same logical subsystem (LSS).

The primary benefit of exploiting HyperPAV is to improve paging throughput during periods of high-volume disk I/O, which will increase the efficiency of the z/VM frame replenishment algorithm used to manage storage over-committed workloads. HyperPAV paging also enables the management of fewer and larger CPOWNER volumes. HyperPAV paging is exploited by the z/VM hypervisor for:

- The SYSRES volume, and volumes containing checkpoint and warm start data
  - Volumes used for paging, spooling, and the z/VM user directory
  - Minidisk pools, as defined by a guest's use of the MAPMDISK IDENTIFY macro
- **Guest large page support.** z/VM provides support for the Enhanced DAT facility that allows a guest to exploit large (1 MB) pages. A larger page size decreases the amount of guest memory needed for dynamic address translation (DAT) tables and also decreases the overhead required to perform address translation. In all cases, guest memory is mapped into 4 KB pages at the host level.

With guest large page support, Linux on z Systems, z/VSE<sup>(R)</sup>, and z/OS<sup>(R)</sup> virtual machines can benefit from reduced memory footprints and address translation times. This can decrease overhead and improve throughput.

- **Guest Transactional Execution (TX) support.** z/VM supports guest exploitation of the Transactional Execution (TX) facility on supported machines. The TX facility allows a program to issue multiple instructions that appear to operate atomically, offering an alternative to more costly mutual-exclusion mechanisms, such as software locks. This support can improve the efficiency and scalability of multithreaded software, such as Java™ or guest operating system functions.
- **Enhanced real memory and guest virtual memory support.** The maximum amount of real storage that z/VM exploits is increased from 1 TB to 2 TB. The maximum supported virtual memory for a single guest remains at 1 TB. When keeping the virtual to real over-commitment the same, doubling the real memory used results in doubling the active virtual memory that can be used effectively. This virtual memory can come from an increased number of virtual machines and/or larger virtual machines. This allows for greater leverage of white space.
- **Surplus CPU power distribution improvement.** Virtual machines that do not consume all of their entitled CPU power, as determined by their share setting, generate "surplus CPU power." This enhancement distributes the surplus to

other virtual machines in proportion to their share settings. This is managed independently for each processor type (General Purpose, IFL, z Integrated Information Processor (zIIP), and so on) across the virtual machines.

**System ease-of-use improvements.** Systems administrators can experience more effective management of a z/VM system by taking advantage of the following:

- **Dynamic Simultaneous Multithreading Level.** Support for Simultaneous Multithreading (SMT) is enhanced with the addition of the SET MULTITHREAD command. Once z/VM V6.4 has been IPLed with multithreading enabled in the system configuration file, this command can be used to nondisruptively switch between one and two activated threads per IFL core. Performance of a system and workload with one active thread per core is comparable to that of the same system and workload with multithreading disabled. Thus, the Dynamic SMT Level capability allows the benefit of multithreading to be evaluated for a workload without requiring an outage to enable or disable SMT. The SET MULTITHREAD command is allowed only when the system has been enabled for multithreading in the system configuration file, which can specify activating either one or two threads per core. It is not possible to revert to a non-SMT configuration without an IPL. SMT-enabled configurations are restricted to 32 cores even when operating in single-threaded mode due to the logical processor addressing limit. This satisfies the statement of direction made in Software Announcement [216-009](#), dated February 16, 2016.
- **Control Program environment variables.** This enhancement allows automation procedures to adapt more easily to changes in operating environments to help simplify the control and testing of a system setup. For example, an operator can indicate at IPL time that the system is running in a disaster recovery or test environment, which in turn enables automation routines to modify the devices used and alter the choice and sequence in which virtual machines are activated, as well as perform other environment-dependent functions.
- **Query Shutdown command.** The new QUERY SHUTDOWN command enables a z/VM system programmer or a guest virtual machine to determine whether a system shutdown is in progress and obtain additional information about the shutdown. This can help automate an orderly shutdown of the z/VM system and its virtual servers. This function can be of particular value to virtual machines that coordinate the shutdown of other virtual machines. The coordinating virtual machines would receive the signal that the system is shutting down, issue the new QUERY command to get additional information, and take the appropriate action for an orderly shutdown.
- **SCSI management queries.** This support provides enhancements to the commands for EDEVICES within z/VM. It improves the usability and problem diagnosis for EDEV-intensive environments and provides a clearer end-to-end view of the storage configuration. This simplifies the process of verifying that the storage configuration is consistent between z/VM and the disk storage subsystem.
- **SCSI reliability, availability, and serviceability enhancements.** The following updates are designed to further enhance the reliability of SCSI devices:
  - The CP missing interrupt handler is disabled for EDEVICES, allowing the SCSI driver to manage its outstanding requests in a more appropriate manner.
  - The SCSI driver is updated to provide additional path recovery.
  - Internal timer values are changed to enhance the interoperability between the SCSI driver and SAN Volume Controller (SVC) as well as devices incorporating SVC technology.
  - Debug facilities within the SCSI driver are enhanced, allowing IBM support teams to more quickly diagnose and debug issues in the field.
  - Guidelines for multipath configuration are provided for SVC and devices incorporating SVC technology to ensure path recovery is optimal.
  - Concurrent code loads on the SVC, and devices incorporating SVC technology, are now supported without quiescing EDEVICE I/O. This was previously restricted, and continues to be restricted on releases prior to V6.4.
- **CMS Pipelines.** CMS Pipelines functionality is modernized by adopting 20 years of development since the original Pipelines integration into z/VM. This upgrade

addresses client concerns with using downloaded code, includes fixes not previously integrated into the z/VM product, broadens the ecosystem, enables innovation for clients and ISVs, and includes additional functionality.

- **DirMaint™ RACF® Connector.** The DirMaint RACF Connector is modernized with a collection of functional enhancements that improve how z/VM security is handled in a managed environment. The Connector allows appropriate security policy changes to be passed directly to RACF. This allows a z/VM environment managed by IBM Wave or within an OpenStack environment to function properly with RACF installed on the system.
- **RACF automatic control of access list authority.** The ADDCREATOR and NOADDCREATOR options on the RACF SETROPTS command determine whether or not the creator of a RACF profile is automatically added to its access control list. This enhancement removes the need for manual intervention in RACF resource configuration and eliminates a point of potential human error from security policy management.
- **Performance Toolkit enhancements.** Performance Toolkit for VM function level 640 is enhanced to exploit z/Architecture<sup>®</sup> and its expanded set of instructions. Consequently, the PERFSVM virtual machine must run on z/Architecture CMS (z/CMS).
- **IBM Wave for z/VM (IBM Wave) optional feature.** IBM Wave is packaged with z/VM V6.4 as an optional feature but is not preinstalled and can be ordered through the System Delivery Offering (SDO). IBM Wave is a provisioning and productivity administrative solution that can significantly reduce the learning curve for administering and controlling z/VM and its Linux guests. At the same time, it can also increase the productivity of those who have a deep understanding of z/VM environments. IBM Wave intelligent visualization of the virtual server environment and physical infrastructure provides intuitive administration of physical servers, z/VM, Linux images running as z/VM guests, and other resources. With IBM Wave, you can rapidly gain insight into your entire virtualized infrastructure topology at a glance and also accelerate the path to a highly virtualized cloud infrastructure.

IBM Wave Release 2 further expands the capabilities by delivering increased support for Linux distributions and devices, reporting and auditing, as well as additional enterprise-grade security and performance enhancements. The following enhancements have been made available with service updates:

- Enhanced logging allows an IBM Wave administrator to satisfy corporate auditing needs by accessing a consolidated log of specified activities.
- Installation and operation of the IBM Wave server (IBM WAVESRV) are supported on Red Hat RHEL 7 and SUSE SLES 12 distributions.
- Dynamic CPU management enables virtual CPUs to be added dynamically to a guest's configuration, either temporarily or permanently, without requiring an outage that could disrupt their business.
- Canonical Ubuntu on IBM z Systems and LinuxONE is supported as a guest operating system that IBM Wave can provision and manage, giving clients greater freedom of choice in Linux distributions. This satisfies the statement of direction made in Software Announcement [216-009](#), dated February 16, 2016.
- Support for z/VM Single System Image is enhanced to automatically populate network configuration information and changes across the SSI cluster to help simplify administration.
- Performance is improved and the user interface is simplified through the use of more consistent terminology to facilitate the use of the Automatic Guest Classification facility to recognize guests for grouping purposes based on their characteristics.
- Dynamic memory management enables virtual memory to be added dynamically, either temporarily or permanently, to a guest's configuration, without requiring a disruptive outage.
- Disk storage management is improved to enable better planning for growth by allowing existing storage resources to be used to increase the size of a volume group rather than assuming that new resources must first be allocated.

- Security is improved by eliminating the need for IBM Wave service machines to have logon passwords, using LOGONBY capabilities, allowing authorized users to log on using their own passwords.
- Performance is improved by reducing overhead with IBM Wave detecting when a managed guest is idle and avoiding waking it up unnecessarily.
- **z/OS V2.2 equivalency.** The following z/VM facilities are upgraded to a level equivalent to z/OS V2.2:
  - **LDAP server and client utilities.** The updated z/VM support includes:
    - Paged and sorted search results
    - Group search limits
    - 64-bit DB2<sup>(R)</sup> support
    - SHA-2 and Salted SHA-2
    - Listening on INADDR\_ANY or in6addr\_any interfaces
    - Administrative group and roles
  - **MPROUTE server.** The updated z/VM support includes:
    - Deprecation of the OMPROUTE\_OPTIONS=hello\_hi environment variable
    - Processing inbound OSPF hello packets from neighbors at the highest priority, for the purpose of maintaining OSPF adjacencies
    - Modifications to avoid abends when formatting or parsing OSPF packet content
    - Enhancements to existing informational and debug messages, to provide more specific information when an IOCTL call fails
  - **System SSL and utilities.** The updated z/VM support includes:
    - Support for the current level of the System SSL and LDAP servers
    - GSKKMAN support for RFC 5280 certificates
  - **Program Management Binder.** The updated z/VM support includes:
    - Generalized alignment of the text elements and parts of a program
    - A new SYMTRACE option to provide new binder messages displaying a trace of progress of binder symbol resolution for a specific symbol
    - Updated support for Assembler J-cons
    - Various RAS items

**Hardware currency.** z/VM V6.4 incorporates the following improvements in hardware and architecture support:

- **IBM z13 (Driver D27) and z13s I/O support.** z/VM supports the following I/O architecture enhancements on the IBM z13 (Driver D27) and z13s:
  - **UID (user identifier) support for real PCI functions.** With the PTF for APAR VM65865, a UID can be assigned to a real PCI function to be able to more accurately indicate equivalent functions between different LPARs and for exploitation by guest operating systems, Linux in particular. z/VM supports dynamic I/O and guest use for the new PCIe UID support.
  - **Shared Memory Communications - Direct Memory Access (SMC-D).** This technology is the latest networking innovation for the IBM z13 family of processors. It provides support for fast, low-latency LPAR-to-LPAR TCP/IP traffic using the SMC-D software protocol over firmware-provided Internal Shared Memory (ISM) devices. Support for z/VM guest exploitation, SMC-D, and ISM are designed to use shared memory areas to provide low-latency, high-bandwidth, cross-LPAR connections for applications. This support is intended to provide application-transparent DMA communications to TCP endpoints for sockets-based connections. SMC-D is expected to provide substantial performance, throughput, response time, and CPU consumption benefits compared with standard TCP/IP communications over HiperSockets™. z/VM supports dynamic I/O and guest use of the new Internal Shared Memory (ISM) PCI function type. See the z/OS subset within the 2964DEVICE or

2965DEVICE Preventive Service Planning (PSP) bucket for z/OS service required in support of SMC-D connectivity.

**Installation, migration, and serviceability.** z/VM V6.4 includes enhanced functions and processes to improve the installation, migration, and serviceability of z/VM:

- **Enhanced upgrade in place.** The z/VM upgrade in place process allows upgrading an existing system to a new release of z/VM with minimal impact to the running system. The upgrade in place process has been extended to allow an upgrade from z/VM V6.2 or V6.3 to z/VM V6.4 and positions a system for upgrading to releases beyond z/VM V6.4. Upgrade in place is supported for a member of a z/VM SSI cluster as well as for a nonclustered z/VM system.
- **Determine installed service.** Enhancements to CP and VMSES/E enable you to determine if specific CP service is built into the CP nucleus of a running system. The new CPSERVICE option on the CP QUERY command allows queries based on APAR, PTF, or local modification identifiers.
- **3590 and 3592 tape not supported for the installation of z/VM V6.4.** z/VM V6.4 and the z/VM SDO Licensed Products are not available in 3590 or 3592 tape format. z/VM and the z/VM SDO Licensed Products are available on DVD and via electronic delivery. In addition, z/VM service for all releases will no longer be orderable in 3590 or 3592 tape format. This satisfies the statements of direction made in IBM Hardware Announcement [115-001](#), dated January 14, 2015.

**Additional enhancements and improvements.** z/VM V6.4 includes the following additional enhancements and improvements:

- **Domain Name System (DNS) IPv6 support.** z/VM TCP/IP supports DNS servers that have IPv6 addresses.
- **Encryption of TCPNJE connections.** RSCS TCPNJE traffic can be encrypted by directing the flow through an SSL server. The secure TCP/IP protocols that were previously implemented to support VMCF clients and servers are extended to IUCV clients and servers. Traffic that was previously unencrypted and potentially exposed to sniffers on a network can now be protected. This is especially important for TCPNJE environments, where NJE jobs can include user IDs and passwords.
- **Nondefault tape mode support.** This enhancement provides support for nondefault write formats (modes) on the IBM 3592 and IBM TS1120, TS1130, and TS1140. This extends the use and interoperability of cartridges between different tape hardware subsystems.
- **Resetting counters for a virtual switch.** This function provides the ability to clear certain counts that are displayed via the QUERY VSWITCH DETAILS command while the virtual switch remains active. The counts that can be cleared are: data, discarded, and errors. These counts can be cleared for the UPLINK port or the BRIDGEPORT.
- **SET DIALDROP command.** The new SET DIALDROP command establishes whether devices dialed to your virtual machine are dropped or stay connected when an implicit or explicit virtual machine reset occurs.
- **LOGON security improvement.** The CP LOGON command has been updated to prevent user ID enumeration without authenticating to the system. This means z/VM will no longer give an error message that indicates a user ID is valid and the password is not. This prevents unauthorized users from determining what might be a valid user ID. Also, many existing error messages will be presented only after a valid user ID and password or password phrase are provided.
- **Default TLS protocol settings changed.** When using the TLS/SSL Server to encrypt TCP/IP traffic, TLS 1.2 and TLS 1.1 are enabled by default. Older versions of the TLS and SSL protocols are disabled by default and require a configuration action to enable. Note that older protocols do not meet modern security requirements and are provided for legacy use only.
- **VLAN access security improvement.** When using an External Security Manager (ESM) to control a z/VM virtual switch, user access to the default VLAN ID is not permitted unless permission has been explicitly granted through appropriate ESM controls.

- **zManager support removed.** The IBM z™ Unified Resource Manager (zManager) is no longer supported by z/VM. The virtual switch types of IEDN and INMN have been removed from CP and TCP/IP commands and other externals.
- **SMAPI support.** The Systems Management API (SMAPI) interface has been updated with support for z/VM V6.4. These updates include support for specific new functionality, removal of deprecated function, and some long-desired minor functional updates and implementation changes. The following changes have been implemented in the service stream:
  - Support for SET MACHINE Z
  - Changes to address some security concerns
  - Removal of Ensemble data from and addition of some new information to SMSTATUS
  - Removal of support for Ensembles
  - Removal of code specific to the RPC server, last supported in z/VM 5.4
- **Expanded Storage (XSTORE) support removed.** IBM z13 and z13s are the last z Systems servers to support Expanded Storage (XSTORE). z/VM V6.4 does not support XSTORE for either host or guest use. This satisfies the statements of direction made in IBM Hardware Announcement [115-001](#), dated January 14, 2015.
- **Architecture level set (ALS).** z/VM V6.4 requires a new architecture level set (ALS) and supports only IBM zEnterprise 196 (z196) and IBM zEnterprise 114 (z114) and later servers. See the appropriate PSP bucket for the minimum microcode level (MCL) and any required updates. This satisfies the statement of direction made in IBM Software Announcement [216-009](#), dated February 16, 2016.
- **ESA/390 removal.** z/VM V6.4 enhancements enable hypervisor initialization and termination, the Stand-Alone Program Loader (SAPL), DDR, Stand-Alone Dump, and stand-alone utilities to run entirely in z/Architecture mode. The IBM z13 and z13s are planned to be the last z Systems servers to support running an operating system in ESA/390 architecture mode. All future systems will support only operating systems that run entirely in z/Architecture mode. Execution of architecture-conformant applications on CMS and GCS in ESA/390 architecture mode remains supported, so long as the application does not depend on more advanced functions such as dynamic address translation.

In addition, support has been added to z/VM to simulate a z/Architecture-only environment, by providing a virtual machine environment (MACHINE type Z) that is always in the z/Architecture architectural mode and cannot switch to ESA/390 mode. This can be useful for testing software in a z/Architecture-only environment, in advance of deploying software on a future z/Architecture-only machine.

The Directory Maintenance Facility (DirMaint) optional feature has been enhanced to handle z/Architecture-mode virtual machines.

- **FlashSystem™ support for FCP-attached SCSI disks.** A z/VM storage administrator can use FlashSystem storage as a z/VM-system-attached DASD, attached to the host without the need for an intermediate SAN Volume Controller (SVC). Previously, while FlashSystem could be used by a Linux virtual machine without an SVC, an external or internal SVC was required to use it for z/VM system volumes, such as EDEVs, or for virtual machine minidisks. This enhancement removes that requirement.

**IBM OpenStack for z Systems.** OpenStack is an infrastructure as-a service (IaaS) cloud computing open source project, managed by the OpenStack Foundation. With the adoption of OpenStack as part of the IBM cloud strategy, virtual servers in the z/VM V6.4 for IBM z Systems and LinuxONE operating environments can be natively managed using OpenStack open cloud architecture-based interfaces. z/VM drivers provide OpenStack enablement for z/VM, and for z/VM virtual machines running Linux on z Systems and LinuxONE.

Open standards offer a common foundation and compatible interfaces for companies to augment computing resources at a moment's notice to meet changing client



demands, such as adding a new mobile application for a new group of clients to drive additional revenue. Open standards such as OpenStack help enterprises be more nimble and address major client concerns, like vendor lock-in, the need to hire expensive specialized experts, long application development cycles, and security challenges.

With the PTF for APAR VM65893, expected to be available first quarter 2017, the OpenStack Cloud Management Appliance (CMA) packaged with z/VM V6.4 will be enhanced to include the Newton level of OpenStack. Additional enhancements will include provisioning of Ubuntu guests, FlashCopy support for provisioning, and additional RAS and security support.

As announced in Withdrawal Announcement [916-094](#), dated June 7, 2016, IBM Cloud Manager with OpenStack for System z<sup>(R)</sup> has been withdrawn from marketing. The next evolution of z/VM cloud enablement technology is the OpenStack Liberty-based Cloud Management Appliance (CMA) and is available for z/VM V6.3 and V6.4. z/VM installations wanting to move forward with cloud-based solutions beyond Cloud Manager with OpenStack for z Systems, should utilize the cloud enablement support provided by the z/VM OpenStack Liberty-based CMA.

IBM intends to upgrade the z/VM OpenStack CMA to a new level approximately once per year. This new level of the CMA would be based on every other release of OpenStack. IBM intends to make the new CMA level available only on the most recent release of z/VM. After the CMA upgrade to a new level of OpenStack on a particular release of z/VM, the previous CMA level on that z/VM release will be supported only for another 6 months. During that 6 month period, the previous CMA level will receive only security fixes. Any functional bug fixes and enhancements will only be provided on the latest CMA level available on a z/VM release. After that 6 month period, no service will be provided for the previous CMA levels and users should upgrade to the latest CMA level.

For example, when the Newton level ships that will be only for z/VM V6.4 and there would not be an update for z/VM V6.3 for Newton. The Liberty level on z/VM V6.3 will continue to be supported until the end of service date for z/VM V6.3. On z/VM V6.4, when the Newton-based CMA becomes available, only security related fixes will be made available for Liberty and for only the next 6 months.

When a new release of z/VM is made available, IBM intends to freeze the level of the CMA available on the previous z/VM release. This frozen level of the CMA will receive only security fixes until service ends for that z/VM release.

**IBM Dynamic Partition Manager (DPM) administrative mode for Linux extended to z/VM V6.4.** Dynamic Partition Manager (DPM), provided with IBM z13 and LinuxONE servers, is extended to support z/VM V6.4 with SCSI storage attached with FCP channels. DPM does not support ECKD-attached DASD devices. DPM provides simplified hardware and virtual infrastructure management including integrated dynamic I/O management.

DPM provides simplified, consumable, and enhanced partition lifecycle and dynamic I/O management capabilities via the Hardware Management Console (HMC) to:

- Create and provision an environment, including the creation of new partitions, assignment of processors and memory, and configuration of I/O adapters (network, FCP storage, crypto, and accelerators)
- Manage the environment by modifying system resources without disrupting running workloads
- Monitor and troubleshoot the environment to identify the source of system failures, conditions, states, or events that may lead to workload degradation

A CPC can be configured in either Dynamic Partition Manager mode or PR/SM<sup>TM</sup> mode. The mode is enabled prior to the CPC power-on reset (POR). Dynamic Partition Manager mode requires two OSA-Express<sup>(R)</sup> 1000BASE-T Ethernet features for primary and backup connectivity (OSA-Express5S 1000BASE-T Ethernet #0417), along with associated cabling (HW for DPM #0016).

Versions of z/VM prior to V6.4 are not supported. There is no FICON<sup>(R)</sup> support in DPM at this time. Therefore, Single System Image (SSI) is not supported.

Dynamic Partition Manager (DPM) support of Linux running in a partition (LPAR) as well as on the KVM for IBM z Systems hypervisor was previously announced.

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### **Accessibility by people with disabilities**

A US Section 508 Voluntary Product Accessibility Template (VPAT) containing details on accessibility compliance can be found on the [IBM Accessibility](#) website.

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### **Engine-based Value Unit pricing**

Engine-based Value Unit pricing for z/VM V6.4 is designed to provide a decreasing price curve as hardware capacities and workload grow, which may help improve price/performance.

There may also be a price benefit when you grow your capacity. Additional capacity is not priced starting at the base with a higher price per unit. Instead, additional capacity is priced starting at the capacity (engines) on which z/VM V6.4 has already been installed.

Note: Value Units of a given product cannot be exchanged, interchanged, or aggregated with Value Units of another product.

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### **IPLA and Subscription and Support considerations**

A no-charge Subscription and Support registration record will be established for each designated machine where z/VM V6.4 is running. These no-charge Subscription and Support registration records will be linked to the billable Subscription and Support, and all billable Subscription and Support within the scope of the engine-based Value Units aggregation will be linked together.

Subscription and Support is an annual charge and should be kept at an annual term.

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## **Product positioning**

The z/VM hypervisor extends the capabilities of z Systems and LinuxONE environments from the standpoint of sharing hardware assets, virtualization facilities, and communication resources. Together with IBM Wave, the comprehensive administration solution for z/VM-based virtual Linux server environments, z/VM makes it easier to receive the maximum value from large-scale virtual server hosting on z Systems and LinuxONE. This includes software and personnel savings, operational efficiency, power savings, and optimal qualities of service. This virtualization technology is designed to enable organizations to run hundreds to thousands of Linux servers on a single mainframe, running with other z Systems operating systems, such as z/OS<sup>(R)</sup> and z/VSE<sup>(R)</sup>, or as a large-scale enterprise LinuxONE server solution.

z/VM and KVM for IBM z Systems can co-exist on IBM z Systems and LinuxONE, giving you choices for virtualization implementations.

With z/VM V6.4 and its Linux infrastructure, you can reduce the time between deciding on the acquisition of new servers and then implementing them because new servers can be easily deployed in a matter of minutes. With this powerful capability, you can launch new products and services without the exhaustive planning for, purchasing, installing, and configuring new hardware and software that can be associated with conventional discrete hardware servers. Development groups that need test environments that are built and rebuilt rapidly to enable them to efficiently deliver their projects, handling change management in the process, can also benefit from this unique advantage.

The following capabilities are several key strengths of z Systems or LinuxONE and z/VM:

- Virtualization capabilities can be more mature and robust than for other combinations of hardware and hypervisor.
- Single System Image (SSI) allows users to share all system resources with very high levels of resource utilization, extending the pool of resources that can be managed by administering multiple instances of z/VM as if they are one integrated system.
- Live guest relocation allows movement of a running Linux guest from one member of a Single System Image cluster to another without the need to shut down the server. This allows maintenance of the z/VM hypervisor without having to shut down Linux servers, extending availability functionality of z Systems and LinuxONE servers to the z/VM environment.
- z/VM virtual switch can make Linux networking simpler and reduce the physical resource requirements.
- Full volume backup of systems allows for complete disaster recovery when another data center is available.
- z/VM is easy to customize at the base installation level with only a relatively small number of configuration files. When z/VM is configured properly, longer periods of time between planned outages may be achieved.

Advanced virtualization features like multisystem virtualization and live guest relocation with z Systems, LinuxONE, z/VM, and Linux on z Systems or LinuxONE help to provide an efficient infrastructure for deploying private clouds to support workloads that scale both horizontally and vertically at a low total cost of ownership.

With the z/VM and z Systems or LinuxONE security-rich environment, your most valuable information can be protected, helping to reduce organizational and reputational risk. Designed to work with z Systems and LinuxONE, z/VM provides advanced security features that can deliver client value. The security certification of z/VM helps ensure the security of sensitive data and business transactions to allow you to run production servers side-by-side on the same server with test and development servers.

To help ensure data-at-rest stays safe and secure, z/VM supports the use of the IBM Full Disk Encryption (FDE) feature of the IBM DS8000. z/VM also supports the ability of guests to use encrypted tape.

The TCP/IP for z/VM TLS/SSL server is available to facilitate security-rich and private conversations between z/VM servers and external clients. With z/VM support for TLS 1.2 and SHA-2 hashing, a z/VM server can use the latest cryptographic protocols in a FIPS 140-2 compliant mode to communicate securely with a client without a change to the server itself.

z/VM makes the Crypto Express5S feature, a tamper-resistant cryptographic coprocessor, available to guests with either dedicated access for use in both secure-key or clear-key operations or shared access for clear-key operations. z/VM can virtualize z Systems cryptographic devices so they can be shared by many Linux systems and supports the z13 limit for greater than 16 domains for the Crypto Express5S feature. With shared access, z/VM can also balance the workload across multiple cryptographic devices. Should one device fail or be brought offline, z/VM can transparently shift Linux systems using that device to an alternate cryptographic device without user intervention.

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## Statement of general direction

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### **Stabilization of z/VM support for the IBM zEnterprise 196 (z196) family**

z/VM V6.4 is the last z/VM release planned to support the IBM Enterprise 196 (z196) or IBM zEnterprise 114 (z114) family of servers. Either an IBM zEnterprise EC12 (zEC12) or an IBM zEnterprise BC12 (zBC12) is planned as the required minimum

level of server for future z/VM releases. Refer to the IBM Support Portal for the most current support lifecycle information for z/VM.

### **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**

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

### **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).

### **Installation from 3390 Model 3 DASD**

z/VM V6.4 is planned to 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 on SCSI volumes will not be affected.

### **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**

IBM intends to evaluate z/VM V6.4 with the RACF<sup>(R)</sup> 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**

z/VM V6.4 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**

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)**

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

IBM's statements regarding its plans, directions, and intent are subject to change or withdrawal without notice at IBM's sole discretion. Information regarding potential future products is intended to outline our general product direction and it should not be relied on in making a purchasing decision. The information mentioned regarding potential future products is not a commitment, promise, or legal obligation to deliver any material, code, or functionality. Information about potential future products may not be incorporated into any contract. The development, release, and timing

of any future features or functionality described for our products remain at our sole discretion.

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## Reference information

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For information on z/VM V6.3, refer to Software Announcement [213-297](#), dated July 23, 2013.

IBM announced two new offerings for IBM Blockchain to enable clients to begin building the next generation of business applications. For additional information on IBM Blockchain, refer to Software Announcements:

- [216-491](#), dated October 18, 2016
- [216-485](#), dated October 18, 2016

For information about the IBM z Systems servers, refer to:

- IBM z13 Hardware Announcements [116-002](#), dated February 16, 2016, and [115-001](#), dated January 14, 2015
- IBM z13s Hardware Announcement [116-002](#), dated February 16, 2016
- IBM zEnterprise EC12 Hardware Announcements [113-119](#), dated July 23, 2013, and [112-155](#), dated August 28, 2012.
- IBM zEnterprise BC12 Hardware Announcement [113-121](#), dated July 23, 2013

For additional z Systems server information, refer to the Reference information section in the z/VM V6.3 Software Announcement [213-297](#), dated July 23, 2013.

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## Availability of national languages

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Translation information, if available, can be found at the [Translation Reports](#) website.

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## Program number

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Program number	VRM	Program name
5741-A07	6.4.0	z/VM Version 6
5741-A08	6.4.0	z/VM Version 6 SDO
5741-SNS	1.1.0	z/VM Subscription & Support

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## Business Partner information

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If you are a Direct Reseller - System Reseller acquiring products from IBM, you may link directly to Business Partner information for this announcement. A PartnerWorld ID and password are required (use IBMid).

[BP Attachment for Announcement Letter 216-075](#)

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## Education support

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IBM Training offers classroom training, e-learning, conferences, certification, course roadmaps, and more. These publicly held or privately available courses are focused on z/VM and Linux for z Systems. IBM Training also provides on-site training with customized content and course materials for small or large groups.

The z/VM and Linux course catalog includes:

- ZV02G - **z/VM Introduction and Concepts** (3 days)
- ZV10G - **z/VM and Linux Connectivity and Management** (3.5 days)
- ZV06G - **Installing, Configuring and Servicing z/VM for Linux Guests** (5 days)
- MZ062 - **Installing, Configuring and Servicing z/VM for Linux Guests** (Instructor-led Online (ILO) - 5 days)
- ZV20G - **z/VM RACF and DirMaint™ Implementation** (4.5 days)

The Linux course catalog includes:

- ZL12G - **Linux Basics - A System z<sup>(R)</sup> Perspective** (2 days)
- ZL10G - **Linux Implementation for System z** (3 days)
- ZL15G - **Advanced Solutions for Linux on System z** (4 days)

Private offerings of these classes and customized education may also be requested from IBM.

For information on these courses or additional z/VM and Linux education:

- Contact your local IBM IT Education Services (ITES)
- Call IBM Training at 800-IBM-TEACH (426-8322) for catalogs, schedules, and enrollments
- See the [IBM Training and Skills](#) website

### Technical conferences

IBM Training offers public and private z/VM classes and annual technical conferences in Europe (in the first half of the year) and in the United States (in the second half of the year).

The following z Systems technical conferences, featuring z/OS, z/VM, and Linux on z Systems, are planned for 2016:

- IBM Technical University in Baltimore, MD - November 2 - 4, 2016
- IBM Technical University in Austin, TX - November 14 - 16, 2016

For more information about all IBM events, see the [IBM Training and Skills](#) website.

See the [z/VM](#) website for specific z/VM events.

See the [z/VM](#) website for live virtual classes available for z/VM, Linux, and z/VSE.

See the [z/VM](#) website for additional VM and related product education.

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## Offering Information

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Product information is available on the [IBM Offering Information](#) website.

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## Publications

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### Documentation supplied with z/VM

The following documentation is supplied with z/VM V6.4:

- One copy of the *z/VM V6.4 Agreements and License Information* DVD, LC27-5378
- One printed copy of the *z/VM: Installation Guide*, GC24-6246
- z/VM help files (included in the z/VM system image)

z/VM V6.4 documentation will be available in [IBM Knowledge Center](#) on November 11, 2016. You can search for products and terms, and you can change the search scope and filter to search all of IBM Knowledge Center, a set of product versions, or just within a single version.

### **IBM Online Library: z/VM Collection**

The *IBM Online Library: z/VM Collection*, SK5T-7054, includes product information libraries for z/VM and current IBM licensed programs that run on z/VM. The z/VM Collection is available as a downloadable .zip file that can be obtained from the IBM Publications Center.

### **z/VM Internet Library**

The [z/VM Internet Library](#) provides links to additional sources of z/VM information that include:

- z/VM program directories
- z/VM data areas, control blocks, and monitor records
- IBM Redbooks<sup>®</sup> publications
- White papers, consultant reports, and performance reports
- Data sheets and brochures
- Reference guides
- Journals, bulletins, and newsletters

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## **Services**

### **Software Services**

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IBM Software Services has the breadth, depth, and reach to manage your services needs. You can leverage the deep technical skills of our lab-based Software Services team and the business consulting, project management, and infrastructure expertise of our IBM Global Services team. Also, we extend our IBM Software Services reach through IBM Business Partners to provide an extensive portfolio of capabilities. Together, we provide the global reach, intellectual capital, industry insight, and technology leadership to support a wide range of critical business needs.

To learn more about IBM Software Services or to contact a Software Services sales specialist, go to the [IBM Software Services](#) website.

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## **Technical information**

### **Specified operating environment**

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#### **Hardware requirements**

z/VM V6.4 requires a new architecture level set (ALS) that is available on the:

- z13
- z13s
- LinuxONE Emperor
- LinuxONE Rockhopper
- zEnterprise EC12
- zEnterprise BC12
- zEnterprise 196
- zEnterprise 114

See the z/VM website for the current [ALS](#).

Prior to installing, refer to the following Preventive Service Planning (PSP) buckets for the minimum MCL level and any required updates or PTFs:

- [Upgrade 2964DEVICE, Subset 2964/ZVM](#) for the z13 and LinuxONE Emperor
- [Upgrade 2965DEVICE, Subset 2965/ZVM](#) for the z13s and LinuxONE Rockhopper
- [Upgrade 2827DEVICE, Subset 2827/ZVM](#) for the zEnterprise EC12 (zEC12)
- [Upgrade 2828DEVICE, Subset 2828/ZVM](#) for the zEnterprise BC12 (zBC12)
- [Upgrade 2817DEVICE, Subset 2817/ZVM](#) for the zEnterprise 196 (z196)
- [Upgrade 2818DEVICE, Subset 2818/ZVM](#) for the zEnterprise 114 (z114)

Refer to the appendix of the *z/VM General Information* manual for more information.

## **Software requirements**

### **Prerequisite requirements**

PTFs for the following APARs are required for the z/VM base components in V6.2. These APARs provide support for maintaining the highest level of common parts in a mixed release z/VM Single System Image.

- VM65317
- VM65318
- VM65319
- VM65320

The PTFs for the following APARs are required to be applied to z/VM V6.2 or V6.3 in support of z/VM V6.4 as follows:

- APAR VM65748 is required for z/VM V6.3 to support a z/VM V6.4 guest that exploits HyperPAV paging.
- APAR VM65846 is required to provide infrastructure support in z/VM V6.2, V6.3, and V6.4 for a future IBM z Systems server that satisfies the removal of support for ESA/390 architecture mode that was announced as a statement of direction in Hardware Announcement [115-001](#), dated January 14, 2015. It must also be installed on all the members of an SSI cluster before any member will be running on the new server.
- APAR VM65867 is required for z/VM V6.2 and V6.3 in an SSI cluster which includes z/VM V6.4.
- APAR VM65207 must be applied to z/VM V6.2 or z/VM V6.3 when z/VM V6.4 is a guest of either release and will host a SET MACHINE Z guest.

The prerequisite no-charge products, **EREP** and **ICKDSF**, are preinstalled on the base product system deliverable.

When ordering z/VM V6.4, you must already be licensed for EREP (5654-260) and ICKDSF (5684-042) or a separate order must be placed for each of these products to establish a license.

PTFs for APARs are required to operate with z/VM V6.4:

- EREP VM (5654-260) V3.5.0.
  - The following PTFs have been applied to the z/VM system deliverable:
    - PTF for APAR VM63624 provides the necessary function to support the DS8000.
    - PTF for APAR VM64807 provides support for the z196 server.
    - PTF for APAR VM64928 provides support for the z114 server.
    - PTF for APAR VM65130 provides support for the zEC12 server.



- PTF for APAR VM65279 provides support for IBM zBC12.
- PTF for APAR VM65495 provides support for IBM z13.
- PTF for APAR VM65704 provides support for IBM z13s.
- Device Support Facilities - ICKDSF VM (5684-042) V1.17.0. Any fixes requested for ICKDSF should specify the PTF number of the VMSES/E formatted update. VMSES/E installable PTFs have the release number H14. 'H' indicates Release 17 of ICKDSF and '14' indicates VMSES/E format. The following PTFs have been applied to the z/VM V6.4 system deliverable:
  - PTF for APAR PQ84848 provides the necessary function for ICKDSF to support large FBA devices.
  - PTFs for APARs PQ96706 and PQ95319 provide the necessary function for ICKDSF to support the DS8000 storage devices.
  - PTF for APAR PQ87899 provides enablement for CP volume ownership function which is required by z/VM V6.2.
  - PTF for APAR PI46151 provides zArchitecture IPL support.

Refer to the **Preinstalled products and features** section for additional information on ordering EREP and ICKDSF.

### **OSA and Open Systems Adapter/Support Facility (OSA/SF) program requirements**

OSA/SF V4.4.0 is provided with and supported on z/VM and can be accessed by a CMS user ID, a REXX EXEC, or a Java™-based graphical user interface (GUI). The GUI needs access to the Java 1.4 runtime and help on the workstation.

Access at the OSA/SF GUI requires the following communications protocols:

- For TCP/IP communication:
  - TCP/IP for z/VM on the host
  - TCP/IP on the workstation

To support an OSA in TCP/IP Passthru mode in a z/VM V6.4 environment, OSA/SF requires TCP/IP for z/VM V6.4. OSA/SF support is required in this mode only if access to one of the OSA's ports is being shared by more than one host program.

### **Optional product/feature requirements**

- DFSMS/VM requirements
  - ISPF V3.2.0 (5684-043) or a subsequent release for DFSMS/VM use. ISPF is not required if you are using only the Removable Media Services (RMS) support of DFSMS.
  - DirMaint Facility optional feature of z/VM V6.4 if the minidisk management function is needed.
  - RACF Security Server for z/VM optional feature of z/VM V6.4 or its equivalent if a security product is needed for authorization.
  - Tivoli<sup>(R)</sup> Storage Manager Extended Edition for z/OS and z/VM V5.2 (5698-A11), Tivoli Storage Manager for z/OS and z/VM V5.2 (5698-A13), or Tivoli Storage Manager for VM (5697-TS9) and Language Environment<sup>(R)</sup> component supplied with z/VM if Migration Level 2 (ML2) function of DFSMS/VM is used.

Note: Program numbers 5698-A11 and 5698-A13 were withdrawn from marketing on January 21, 2005, and service support was discontinued on April 30, 2007.

For current information regarding the discontinuance of service, refer to the [z/VM Licensed Program \(LP\) Migration Matrix](#).

Note: Program number 5697-TS9 was withdrawn from marketing on March 7, 2005, and service was discontinued on March 31, 2006.

- TCP/IP for z/VM V6.4 to access the IBM Tape Library Dataserver for processors capable of 3490/3490E tape I/O, but incapable of Tape Library Data Server control.
- RSCS FL640 feature for remote operations.
- IBM Compiler for REXX/370 (5695-013) and IBM Library for REXX/370 (5695-014), if the compiled REXX installation-wide exit or a compiled ACS REXX exit is desired.
- Hardware Configuration Definition (HCD) and Hardware Configuration Manager (HCM) requirements
  - The PTF for HCD APAR VM65827 provides dynamic I/O support for PCIe UUID.
  - The PTF for HCM APAR VM65201 provides dynamic I/O support for PCIe UUID.
- IBM High Level Assembler (5696-234) requirements
  - High Level Assembler V1.5.0, or later, is required to:
    - Create a new DMSTRT for system languages (NLS)
    - Create image libraries for system printers (FCBs)
    - Create GCS application segments (CONTENTS macro)
    - Access major CMS application interfaces (CMSCALL)
    - Access most CP application interfaces (DIAGNOSE)
    - Use the AVS tuning control module (AGWTUN)
    - Use RAS tools (such as MDCHECK, FS2SFSER, AFTCHAIN, PRINTBLK, and PRINTFST)
    - Use the API for data compression
    - Use the CMS Pipelines Assemble macros interface
    - Assemble exit routines for DirMaint and RSCS
    - Customize Language Environment or compile assembler routines used in mixed-language user applications
    - Assemble applications that exploit the IEEE Floating Point hardware facility
    - Add devices that cannot be sensed (updating HCPRIO ASSEMBLE)
    - Perform local modifications to modules written in assembler language
    - Assemble any CP modules
    - Assemble exit routines for CP
  - The High Level Assembler requires the PTF for APAR PM49761 to support the zEC12 instruction set.
  - The PTF for APAR PK97799 provided support for zEnterprise 196 and 114.
  - The High Level Assembler V1.6 contains the support for the System z10<sup>(R)</sup> instruction set and was made available on July 11, 2008. For additional information about the High Level Assembler V1.6, refer to Software Announcement [208-145](#), dated June 24, 2008.
  - The PTF for APAR PM49761 provides support for instructions provided with the zEC12 and zBC12 servers.
  - The PTF for APAR PM79901 provides support for instructions provided with the z13 and z13s servers.

Note: An equivalent product may be used in place of the High Level Assembler.

- Language Environment requires High Level Assembler V1.5.0, or later to customize Language Environment options.
- POSIX requirements
  - Developing POSIX applications requires C/C++ for z/VM V1.1 or XL C/C++ for z/VM V1.2 or V1.3 (5654-A22).
- RSCS networking FL640 requirements
  - To communicate with users in an SNA network requires ACF/VTAM<sup>(R)</sup> for VM/ESA, V4.2 (5654-010).
  - To communicate within an IP network requires TCP/IP for z/VM FL640.

- Group Control Subsystem (GCS) must be configured and activated.
- Shared-DASD complex requirements
 

In a shared-DASD complex, a single Directory Maintenance Facility (DirMaint) server with a single source directory can manage the object directory on up to 32 z/VM systems, if the DirMaint executable code disks and source directory disk are shared among all the systems. The following is required to support the shared-DASD complex:
- DirMaint, Function Level 640 (FL640)
 

Within the shared-DASD complex, all z/VM systems must be running the same DirMaint FL640 service level. Therefore, you must be licensed for the DirMaint FL640 feature on any z/VM V6.4 system in the complex.

### **OSA and Open Systems Adapter/Support Facility (OSA/SF) program requirements**

OSA/SF V4.4.0 is provided with and supported on z/VM and can be accessed by a CMS user ID, a REXX EXEC, or a Java-based graphical user interface (GUI). The GUI needs access to the Java 1.4 runtime and help on the workstation.

Access at the OSA/SF GUI requires the following communications protocols:

- For TCP/IP communication:
  - TCP/IP for z/VM on the host
  - TCP/IP on the workstation

To support an OSA in TCP/IP Passthru mode in a z/VM V6.4 environment, OSA/SF requires TCP/IP for z/VM V6.4. OSA/SF support is required in this mode only if access to one of the OSA's ports is being shared by more than one host program.

The following PTFs have been applied to the z/VM V6.4 system deliverable:

- The PTF for APAR OA15170 provides the necessary function to display information for OSN features on the z10™ and support for Layer 2.
- The PTF for APAR OA37060 is required for OSA/SF to support OSA Express4S on zEnterprise 196 and 114.
- The PTFs for APARs OA37060 and OA38418 provide support for the OSA-Express4S on the zEC12 and later servers.

### **TCP/IP for z/VM V6.4 program requirements**

TCP/IP for z/VM V6.4 has the following additional program requirements:

- If a primary or secondary domain name server (not a caching-only name server) or the network database server is to be run:
  - IBM DB2<sup>(R)</sup> Server for VSE & VM V7.1 (5697-F42), or later
- If programs are developed in C:
  - IBM C for VM/ESA V3.1 (5654-033), C/C++ for z/VM V1.1 or XL C/C++ for z/VM V1.2 or V1.3 (5654-A22)
- If programs are developed in Pascal:
  - IBM VS Pascal V1.2 (5668-767) Compiler and Library

### **Linux on z Systems**

In order to operate Linux on z Systems as a guest of z/VM, a Linux on z Systems distribution must be obtained from a Linux Distribution Partner.

See the [IBM Technical Support for Linux](#) website for specific function and for the most current information on Linux distributions.

See the [IBM Linux Operating System on z Systems](#) website for additional Linux on z Systems information.

The program's specifications and specified operating environment information may be found in documentation accompanying the program, if available, such as a readme file, or other information published by IBM, such as an announcement letter. Documentation and other program content may be supplied only in the English language.

### **Limitations**

- z/VM V6.4 operates only on z13, z13s, and zEnterprise servers.
- Linux and OpenSolaris are the only guest operating systems z/VM will support on IFL processors (other than z/VM V4, V5, and V6 themselves).

Additional information can be found in the usage restrictions section of the [Terms and conditions](#) of this announcement. See also the [License Information documents](#) found on the IBM Software License Agreement website.

### **Performance considerations**

System performance depends on the hardware resources allocated to z/VM V6.4 and on the level of activity within each Linux image.

z/VM performance information is available on the [z/VM](#) website.

For assistance in understanding the performance implications for a particular situation, contact your IBM representative or your IBM Business Partner.

### **User group requirements**

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This announcement satisfies or partially satisfies requirements from one or more of the worldwide user group communities:

- z/VM RACF SETROPTS command needs ADDCREATOR/NOADDCREATOR option
- Clear ERRORS and DROPPED PACKETS fields on QUERY VSWITCH DETAILS command while VSWITCH remains active
- z/VM support:
  - Paging to Parallel Access Volumes (PAV)
  - Large pages for z/OS guests under z/VM
  - More than 1 TB of real memory
  - Ship z/VM installation media as a .iso image
- CMS Pipelines:
  - Stage to read TRF files
  - Facility to constrain multi-threading
  - STARSYS stage should accept input
  - SPEC conversion of 8-byte integers
  - Stage for deblocking HTTP responses
  - Lookup stage to free unused storage
  - REPLACE and ONCE options for LOOKUP stage
  - Provide bitwise selection filters
  - Support for address spaces
  - Support for abbreviations
  - LISTFILE-like pattern matching support
  - Non-numeric comparison capability for SPEC stage
  - Encoding functions

- Raw disk I/O device driver support

## Planning information

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### **Customer responsibilities**

#### **z/VM V6.4 Subscription and Support (S&S)**

To order z/VM V6.4, you must use the SDO, program number 5741-A08. The z/VM base system, any ordered optional z/VM features, and any ordered SDO licensed products will be delivered as part of the z/VM SDO.

If you desire the level of service provided under the IBM ICA license agreement with z Systems and z/VM licensed products, you are strongly encouraged to order the program number for z/VM S&S (5741-SNS). This program number provides enhanced support that includes telephone assistance (voice support for defects during normal business hours) and access to updates, releases, and versions of the program for as long as support is in effect. z/VM S&S will be automatically added to your order. If you do not desire the S&S license for z/VM and/or the optional features of DirMaint, RSCS, RACF Security Server, VMSSI, IBM Wave, or the Performance Toolkit feature, you must take specific action to decline this support.

To host Linux guests of z/VM V6, you must also obtain a Linux distribution for z Systems. See the [IBM Technical Support for Linux](#) website for information on those Linux distributor partners that have a marketing relationship with IBM.

#### **Licensed products packaged with z/VM V6.4**

With the availability of z/VM V6.4, the following priced, optional products or features are automatically shipped on the z/VM V6.4 base product media. All features, except for the IBM Wave feature, are preinstalled:

- DirMaint FL640 feature
- RSCS FL640 feature
- RACF Security Server FL640 feature
- Single System Image FL640 feature (VMSSI)
- IBM Wave feature (not preinstalled)
- Performance Toolkit for VM FL640 feature

For more information on these products or features, refer to the **Preinstalled products and features** section.

These products or features must be enabled before using. If you choose to enable them, you must have a license for the product or the feature.

If you do not have a license for DirMaint, RSCS, RACF, VMSSI, IBM Wave, or the Performance Toolkit for VM feature, you may establish one by placing an order for the optional features. You will receive a Memo to Users for the optional feature or program product. The Memo to Users includes the instructions for enabling use of the products.

For other IBM licensed products or products from independent software vendors (ISVs), you should review the following support documents:

- [Independent software vendor products](#) available for z/VM
- [IBM licensed programs](#) available for z/VM

#### **High Level Assembler (5696-234)**

The High Level Assembler (5696-234) or an equivalent product is required for z/VM to change exit routines or perform local modifications for an IBM VM product or vendor product.

The High Level Assembler is available for use with Linux on z Systems on IFL processors as a programming request for price quotation (PRPQ). A PRPQ must be submitted to purchase the High Level Assembler for z/VM and Linux on z Systems (5799-TCQ) and for its annual Subscription and Support (5799-TCR).

### **Packaging**

The z/VM V6.4 product package is distributed with the following:

- License Information document (LI) on DVD (LC27-5378).
- If ordering to install using DVD:
  - Basic machine-readable material on one DVD for installation to SCSI disk.
  - Basic machine-readable material on one DVD for installation to 3390 DASD.
  - Basic machine-readable material for z/VM Cloud Manager Appliance V6.4 -- Liberty on one DVD for installation to SCSI disk and 3390 DASD.
  - RSU DVD containing required service.

Note: The DVD format is a binary image format.

- If ordering to install from electronic delivery:
  - Binaries from DVD for installation of z/VM to SCSI disk, provided in a compressed file.
  - Binaries from DVD for installation of z/VM to 3390 DASD, provided in a compressed file.
  - Binaries from DVD for installation of z/VM Cloud Manager Appliance V6.4 -- Liberty to SCSI disk, provided in a compressed file.
  - Binaries from DVD for installation of z/VM Cloud Manager Appliance V6.4 -- Liberty to 3390 DASD, provided in a compressed file.
  - RSU DVD containing required service, provided in a compressed file.

Note: Electronic delivery provided as binary images from DVD is provided as compressed files. In addition to providing compressed files, the electronic delivery also provides a .iso image for each of the deliverables.

- One *IBM Online Library: z/VM Collection*
- Publications - *z/VM: Installation Guide* (GC24-6246)

Note: *IBM Online Library: z/VM Collection* is no longer shipped with z/VM orders, but is available from the z/VM website.

### **Restricted source and PL/X source**

The restricted source and the PL/X source are not orderable or shipped with z/VM V6. Both are available as no-charge downloads from [IBM Resource Link<sup>\(R\)</sup>](#).

If you are not registered with Resource Link, you will be required to register for a user ID and password. You must also be licensed for z/VM V6.4 and entitlement will be verified when you request the source code. After approval, you will receive instructions describing how to download the code.

### **Security, auditability, and control**

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The announced program uses the security and auditability features inherent in the virtual machine and the System/370, ESA/370, and ESA/390 architectures, and z/Architecture<sup>(R)</sup>. The security and auditability of z/VM V6 are the same as for ESA/390 and z/Architecture.

The client is responsible for evaluation, selection, and implementation of security features, administrative procedures, and appropriate controls in application systems and communication facilities.

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## Ordering information

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### Order z/VM SDO through the internet

Shopz provides an easy way to plan and order z Systems software upgrades, including z/VM. Using Shopz, you can quickly generate orders for z/VM and the licensed products available in the SDO. Additionally, Shopz helps ensure your order is technically correct (that is, ensures any corequisite or prerequisite or incompatibility conditions are resolved to ensure timely order placement and processing). Shopz is available worldwide. You can also contact your IBM representative or IBM Business Partner to handle your order using the traditional IBM ordering process. For more details and availability, visit the [Shopz](#) website.

The z/VM V6.4 base operating system and SDO licensed products are eligible for internet delivery using the Shopz website and are planned to be available at the general availability of z/VM V6.4.

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### Charge metric

#### Pricing metric description

The products and features in this announcement have one pricing metric - Value Units based on the number of processors. Value Unit pricing with a decreasing one-time charge (OTC) price per engine, subject to the tiers as documented in Value Unit Exhibit VUE021, is available for the z/VM V6.4 optional features of DirMaint, RSCS, RACF, VMSSI, IBM Wave, and the Performance Toolkit for VM for S&S entitlements at initial order of z/VM V6 or its features. Value Units of a given product cannot be exchanged, interchanged, or aggregated with Value Units of another product.

Engine-based Value Unit pricing of z/VM V6 is different than MSU-based Value Unit pricing, which is available on other IBM software products.

Program name	Program number	Charge unit description
z/VM V6	5741-A07	Value Units
DirMaint Feature	5741-A07	Value Units
RSCS Feature	5741-A07	Value Units
RACF Security Server Feature	5741-A07	Value Units
Performance Toolkit for VM Feature	5741-A07	Value Units
VMSSI Feature	5741-A07	Value Units
IBM Wave Feature	5741-A07	Value Units
Performance Toolkit for VM Feature	5741-A07	Value Units

Value Unit pricing for the z/VM V6.4 S&S and its optional, priced features provides a lower price per processor as more Value Units are licensed with z/VM V6 and the optional, priced features. Clients may aggregate the capacity for all the processors running z/VM V6 and the optional, priced features across the enterprise to achieve a more economical price. There may also be a price benefit when clients increase their capacity. Additional capacity is not priced starting at the base with a flat price per unit. Instead, additional capacity is priced starting at the capacity on which z/VM V6 has already been installed, which may result in a lower unit price for the z/VM V6.4 S&S and the optional, priced features.

Engine-based Value Unit pricing is designed to provide a lower entry price and a decreasing price curve as hardware capacities and workload grow, which may help improve price/performance. Engine-based Value Unit pricing is different than MSU-based Value Unit pricing, which is available on other IBM software products. Value Unit pricing may help clients:

- Add capacity and workload with an incremental and improved price

- Manage software costs better
- Aggregate licenses acquired across machines that are part of their enterprise

If the client purchased an S&S contract for the z/VM V4 or V5 optional features of DirMaint, RACF Security Server, RACF for z/VM, RSCS, and the Performance Toolkit for VM, the client is entitled to a no-charge upgrade to those same optional features on z/VM V6.4.

If the client purchased IBM Wave (5648-AE1) as a stand-alone offering and purchased an S&S contract for IBM Wave (5648-AE2), they are entitled to a no-charge upgrade to the IBM Wave feature packaged with z/VM V6.4.

### Translation from Processor to Value Units

The total number of engine-based Value Units is calculated according to the following example.

If the client has installed six processors and will be operating z/VM V6.4 on all six processors, the applicable Value Units would be:

$$(3 * 10) + (3 * 9) = 57 \text{ Value Units}$$

The following z/VM V6.4 products and optional features and their associated Subscription and Support (S&S) have a charge of Engine-Based Value Units:

IPLA program number	S&S program number	Program description
5741-A07	5741-SNS	z/VM V6.4
5741-A07	5741-SNS	RSCS Feature
5741-A07	5741-SNS	RACF Security Server Feature
5741-A07	5741-SNS	DirMaint Feature
5741-A07	5741-SNS	VMSSI Feature
5741-A07	5741-SNS	IBM Wave Feature
5741-A07	5741-SNS	Performance Toolkit for VM Feature

The products in this announcement are available with IBM Software On/Off Capacity on Demand (On/Off CoD). If clients are running On/Off CoD on their IBM servers, they can also pay for z/VM V6.4 on a processor per-day basis during their peak periods.

### Value Unit

Value Unit (VU) is a unit of measure by which the Program can be licensed. Value Unit entitlements are based on the number of units of a specific designated measure used or managed by the Program. Licensee must obtain sufficient entitlements for the number of Value Units required for Licensee's environment for the designated measure specified in the Value Unit Exhibit (VUE) provided below. Value Unit entitlements are specific to the Program and may not be exchanged, interchanged, or aggregated with Value Unit entitlements of another Program. The designated measure for the purpose of Value Unit calculation is Engines. An Engine is a central processor (CP) or a specialty processor, such as an Integrated Facility for Linux (IFL) processor, configured for use on a z Systems server. If the Program is used on any CP Engine on a System z server, Licensee must acquire entitlements sufficient to cover all CP Engines on that System z server. If the Program is used on any IFL Engine on a z Systems server, Licensee must acquire entitlements sufficient to cover all IFL Engines on that z Systems server.

### Basic license

#### Licensing for z/VM V6.4



IPLA program number	SDO program number	S&S program number	Program description
5741-A07	5741-A08	5741-SNS	z/VM V6
5741-A07	5741-A08	5741-SNS	RSCS Feature
5741-A07	5741-A08	5741-SNS	RACF Security Server Feature
5741-A07	5741-A08	5741-SNS	DirMaint Feature
5741-A07	5741-A08	5741-SNS	Performance Toolkit for VM Feature
5741-A07	5741-A08	5741-SNS	Single System Image Feature
5741-A07	5741-A08	5741-SNS	IBM Wave Feature

The program number, 5741-A07, is used for licensing z/VM V6. You must specify the number of engine-based Value Units for the number of processors required as calculated by the Workload Pricer tool, WL Pricer.

When ordering z/VM V6.4 to operate on standard processors (CPs) for a single server within the enterprise, you must specify Value Units equal to the Value Units to cover the number of standard processors (CPs) on your server.

For a single server in an enterprise, the number of Value Units ordered for any optional feature to operate on standard processors must be equal to the number of Value Units ordered for the base z/VM V6 product operating on standard processors.

When ordering z/VM V6.4 to operate on IFL processors for a single server within the enterprise, you must specify Value Units equal to the Value Units to cover the number of IFL processors on your server.

For a single server in an enterprise, the number of Value Units ordered for any optional feature to operate on IFL processors must be equal to the number of Value Units ordered for the base z/VM V6 product operating on IFL processors.

The optional features DirMaint, RSCS, RACF, VMSSI, and the Performance Toolkit for VM are preinstalled on the base system media. Ordering these features establishes a license for entitlement purposes and will ship a Memo to Users for the optional features ordered. If you intend to use DirMaint, RSCS, RACF, VMSSI, IBM Wave, or the Performance Toolkit for VM, now or at a later date, you must establish a license for billing.

The Performance Toolkit for VM feature is considered a program update for the RTM and PRF features as defined in the IBM International Agreement for Acquisition of Support. Therefore, any existing z/VM V4 clients with licenses for the RTM or PRF features who have also purchased S&S for either the RTM or PRF feature are entitled to receive a no-charge upgrade for the Performance Toolkit for VM feature when ordering z/VM V6.4.

The IBM Wave feature, packaged with z/VM V6.4, is considered a program update for the IBM Wave licensed product (5648-AE1), as defined in the IBM International Agreement for Acquisition of Support. Current licensees of the IPLA program, IBM Wave, with active S&S (5648-AE2) are eligible to convert to the IBM Wave feature of z/VM V6.4. All IBM Wave program entitlements being converted must be terminated. In some cases the IPLA program, IBM Wave entitlements may not be the same as the IBM Wave feature of z/VM entitlements. For example, if the client has 100 Value Units entitlement of the IPLA program, IBM Wave, and is converting up to 90 Value Units of entitlements to the IBM Wave feature of z/VM V6.4, the client must terminate all 100 Value Units of entitlements of IBM Wave. Current licensees of the IPLA program, IBM Wave, converting to the IBM Wave feature of z/VM V6.4 should contact their IBM representative. Clients with a lapsed S&S for IBM Wave must reinstate their S&S to be eligible for this no-charge conversion. Consult your IBM representative if you have any questions.

### **z/VM V6.4 (5741-A07) Basic License**

Entitlement identifier	Description	License option/Pricing metric
S015HSV	z/VM V6	Use-based OTC, Per Value Unit
S015HST	DirMaint Feature	Use-based OTC, Per Value Unit
S015HSX	RSCS Feature	Use-based OTC, Per Value Unit
S015HSZ	RACF Feature	Use-based OTC, Per Value Unit
S016SX7	z/VM Single System Image Feature	Use-based OTC, Per Value Unit
S01839C	IBM Wave Feature	Use-based OTC, Per Value Unit
S015HSW	Performance Toolkit for VM Feature	Use-based OTC, Per Value Unit

#### **z/VM V6.4 Base SDO (5741-A08) - S015HTF**

Orderable supply ID	Language	Distribution medium
S016VLK	US English	DVD

#### **Optional features of z/VM V6.4 SDO (5741-A08)**

The orderable supply IDs for z/VM V6.4 SDO (5741-A08) optional features are available on DVD in US English.

Entitlement identifier	Orderable supply ID	Feature description
S015HT7	S016VL4	DirMaint Feature
S015HTD	S016VLC	RSCS Feature
S015HTC	S016VL8	RACF Feature
S016SX7	S016VLF	z/VM Single System Image Feature
S01839C	S01839B	IBM Wave Feature
S015HTB	S016VL7	Performance Toolkit for VM Feature

#### **z/VM Subscription and Support (5741-SNS)**

Entitlement identifier	Description	License option/Pricing metric
S0111PX	z/VM	Basic ASC, per Value Unit SW S&S
		No charge, decline SW S&S
		No-charge, SW S&S Registration
S0111R1	DirMaint Feature	Basic ASC, per Value Unit SW S&S
		No charge, decline SW S&S
		No-charge, SW S&S Registration
S013T6B	RSCS Feature	Basic ASC, per Value Unit SW S&S
		No charge, decline SW S&S
		No-charge, SW S&S Registration
S0111R0	RACF Feature	Basic ASC, per Value Unit SW S&S
		No charge, decline SW S&S
		No-charge, SW S&S Registration

Entitlement identifier	Description	License option/Pricing metric
S016VRV	VMSSI Feature	Basic ASC, per Value Unit SW S&S
		No charge, decline SW S&S
S018397	IBM Wave Feature	No-charge, SW S&S Registration
		Basic ASC, per Value Unit SW S&S
S0111PZ	Performance Toolkit for VM Feature	No charge, decline SW S&S
		No-charge, SW S&S Registration
		Basic ASC, per Value Unit SW S&S
		No charge, decline SW S&S
		No-charge, SW S&S Registration

The features are for the stand-alone product and not for ordering.

The orderable supply IDs for z/VM Subscription and Support (5741-SNS) are available in US English and are support for 5741-A07.

Entitlement identifier	Orderable supply ID	Feature description
S0111HH	S0111HJ	z/VM V6.4 3390 Sys DDR
S0111HK	S0111HL	z/VM V6.4 DVD Sys Image
S0111H7	S0111H8	DirMaint Feature
S013T6C	S013T6D	RSCS Feature
S0111HC	S0111HD	RACF Security Server Feature
S016VKN	S016VKT	Single System Image Feature
S018397	S018396	IBM Wave Feature
S0111HF	S0111HG	Performance Toolkit for VM Feature
S0111H9	S0111HB	DFSMS/VM Feature

### Ordering z/VM V6.4 using the SDO

Orders for z/VM V6.4 will be accepted beginning October 25, 2016. When placing an order, if you wish to have that order fulfilled with z/VM V6.4, you will need to specify a customer requested arrival date (CRAD) of November 11, 2016, or later. Orders for V6.4 may not be scheduled to ship prior to November 11, 2016. z/VM V6.3 and its priced, optional features of SSI, RSCS, DirMaint, RACF, and the Performance Toolkit for VM will be withdrawn from marketing on November 11, 2016, and will be supported until December 31, 2017.

Orders for z/VM V6.4 and the optional features must use the z/VM V6.4 SDO packaged offering, program number 5741-A08. The z/VM base system, any ordered optional z/VM features, and any ordered SDO licensed products will be delivered as part of the z/VM SDO.

You must specify the desired distribution medium.

With the ordering of z/VM V6.4, you will receive a system deliverable DVD or electronic media image containing the program code for z/VM V6.4, an IPLA and LID on DVD, a DVD with z/VM Cloud Manager Appliance V6.4 -- Liberty, and one copy of each publication available for z/VM V6.4 as listed in the [Packaging](#) section of this announcement.

## Examples

- Example 1 - You currently do not have z/VM V6 licensed for any z Systems server within your enterprise. Your engine-based Value Units for licensing 5741-A07 are 0.

If you will be running z/VM V6 (running Linux for z Systems) on a single server having **two** IFL processors and no standard processors (CPs), the capacity to be licensed in engine-based Value Units would be  $(2 * 10)$  or **20** resulting in a total of 20 Value Units of 5741-A07.

- Example 2 - You currently are licensed for and running z/VM V6 on a single z Systems server with **two** IFL processors and no standard processors (CPs). Your engine-based Value Units for 5741-A07 are 20.

If you will be adding **two** IFL processors to this z Systems server, the additional z/VM V6 licensing capacity to be specified in engine-based Value Units would be  $(1 * 10) + (1 * 9)$  or **19** resulting in a total of 39 Value Units of 5741-A07.

- Example 3 - You currently are running z/VM V6 on the IFL processors of a single z Systems server having **six** standard processors (CPs) and **three** IFL processors (running Linux for z Systems). Note that z/VM V6 is not running on any of the standard processors (CPs). Your engine-based Value Units for 5741-A07 are 30.

If you will be adding **two** standard processors (CPs) and **four** IFL processors to this z Systems server, the additional z/VM V6 capacity to be specified in engine-based Value Units would be  $(3 * 9) + (1 * 8)$  or **35** resulting in a total of 65 Value Units of 5741-A07.

- Example 4 - You currently do not have z/VM V6 licensed for any z Systems server within your enterprise. Your engine-based Value Units for licensing 5741-A07 are 0.

If you will be licensing and running z/VM V6 on the IFL processors of a z Systems server having **two** IFLs, and on another z Systems server within your enterprise you will license and run z/VM V6 on both processor types of a z Systems server having **one** standard processor and **two** IFL processors, the z/VM V6 license capacity to be specified in engine-based Value Units would be  $(3 * 10) + (2 * 9)$  or **48** resulting in a total of 48 Value Units due to aggregating the licenses within the enterprise.

## Support for z/VM V6.4

### Program Name: z/VM Subscription and Support

### Program Number: 5741-SNS

Support for z/VM V6 is provided and licensed under the IBM International Agreement for Acquisition of Support (Z125-6011).

This 5741-SNS order establishes entitlement records as well as support for z/VM V6.4 or the optional features. If a 5741-SNS order is declined, you will only be entitled to support under the basic warranty for z/VM V6.4 (5741-A07).

The z/VM S&S provides:

- Corrections that fix substantial deviations of unmodified products from the then-current code, publications, and informal documentation (that is, release notes and memos).
- Software product updates that are improvements, extensions, and other changes IBM, at its discretion, deems to be reasonable.
- Recommended Service Updates (RSUs), new versions, and new releases at no additional charge.
- Technical support:
  - A reasonable amount of remote assistance via telephone, mail, facsimile (fax), or email to address suspected IBM program defects, where available, during

normal IBM business hours from Monday through Friday, except local holidays. Exceptions from normal IBM business hours are Severity 1 (high impact) problems. Support for high impact suspected IBM defects is available 24 hours a day, 7 days a week.

- Temporary fixes for problems (where known), where they exist.

On-site (local) support, although available, is provided as part of the IBM portfolio of fee-based services.

z/VM S&S annual support charges, based on the number of Value Units specified, will be automatically added to your order. If you do not desire the S&S license for z/VM and/or the optional features of DirMaint, RSCS, RACF, VMSSI, IBM Wave, or the Performance Toolkit for VM feature, you must take specific action to decline this support.

A no-charge S&S registration record will be established on each designated machine where z/VM V6 and the priced, optional features of DirMaint, RSCS, RACF, VMSSI, IBM Wave, and the Performance Toolkit for VM feature are running. These no-charge S&S registration records will be linked to the billable S&S and all billable S&S within the scope of the engine-based Value Units aggregation will be linked together.

Within the scope of an enterprise aggregation, the number of Value Units ordered for the S&S license(s) must equal the number of Value Units ordered for the OTC license(s).

### **National language translation**

When you order z/VM V6.4, the national language translation files for message repositories, help files, and other panels or files are included with the system.

The following components or features are supported by z/VM V6.4 in the following languages:

- Japanese Kanji - CP, CMS (including CMS Utilities), REXX

The DirMaint feature provides national language translation for DirMaint messages in Kanji and is automatically included with this feature.

To receive the translated help files for DFSMS/VM in Kanji, you must order the no-charge optional DFSMS/VM feature using the z/VM V6 SDO.

### **z/VM V6.4 SDO optional licensed products**

**Program Name: z/VM V6.4 SDO**

**Program Number: 5741-A08**

The following table provides the orderable supply features for the optional licensed products with z/VM V6.4. These optional products may be ordered for delivery on DVD, as well as internet delivery from Shopz.

Note: There is no media delivered for the preinstalled base product options. Preinstalled base product options require a license. Enablement instructions for these options are provided when these supply features (DirMaint, RSCS, RACF, VMSSI, and Performance Toolkit for VM) are ordered.

### **Orderable supply feature numbers for 5741-A08**

The orderable supply IDs for the z/VM V6.4 SDO (5741-A08) are available on DVD in US English.

<b>Orderable supply</b>	<b>Description</b>
S016VLK	5741-A07 System Image
S016VL4	5741-A07 DirMaint
S016VLC	5741-A07 RSCS
S016VL8	5741-A07 RACF Security Server

Orderable supply	Description
S016VL7	5741-A07 Performance Toolkit for VM
S016VLG	5741-A07 VMSSI
S016VL5	5741-A07 z/VM Collection Kit
S01788T	5741-A07 DFSMS/VM Feature
S0183C1	5741-A07 IBM Wave Feature (Not preinstalled)
S017823	5684-042 ICKDSF SES/E
S017824	5686-065 ACF/VTAM SUITE
S017825	5654-010 ACF/VTAM- VM
S017826	5654-260 EREP VM
S017B3W	5668-801 GDDM IMD V2
S017B3V	5668-723 GDDM IVU V1
S017B3T	5668-812 GDDM PGF V2
S017B3S	5684-168 GDDM/VM V3
S017827	5695-013 REXX/370 Compiler
S017828	5695-014 REXX/370 Library
S017829	5696-234 HLASM V1.6
S01782B	5696-234 HLASM V1.6 Toolkit
S01782C	5654-A22 XL C/C++ for z/VM
S01782D	5654-A23 Debug Tool
S01782F	5655-T13 zSecure™ Manager for RACF
S01782G	5697-F42 DB2 Client for VM
S01728H	5697-F42 DB2 Control Center
S01782J	5697-F42 DB2 Data Res
S01782K	5697-F42 DB2 RXSQL VM
S01782V	5697-F42 DB2 Server for VM
S01782L	5697-F42 QMF™ for VM
S01782M	5697-J05 Archive Manager z/VM
S01782N	5697-J06 Backup/Restore
S01782P	5697-J08 Tape Manager
S01782R	5697-J10 Operations Manager
S01782S	5698-A36 OMEGAMON <sup>(R)</sup> XE
S01782T	5684-043 ISPF V3
S01788S	5684-123 ISPF/PDF V3

### Preinstalled products and features

- **EREP and ICKDSF**

The prerequisite no-charge products EREP (5654-260) and ICKDSF (5684-042) are preinstalled on the base product system deliverable. If you intend to use EREP or ICKDSF now or at a later date, you must establish a license for billing and shipment of publications by placing an order for each of these products. Because the product code is already preinstalled, your order should indicate that shipment of media should be suppressed for these products. This can be accomplished by including the Delivery Option feature number 3471 (Ship Documentation Only), which designates the shipment of publications only.

- **Language Environment**

Language Environment is integrated into the base of z/VM V6.4, at the same level as was packaged with z/VM V6.2.

- **HCD and HCM**

HCD and HCM provides a comprehensive I/O configuration management environment, similar to that available with the z/OS operating system. HCD and HCM is delivered preinstalled into the base of z/VM V6.4, enabled for use, and is available at no additional charge.

- **OpenExtensions Shell and Utilities**

OpenExtensions Shell and Utilities is included in z/VM V6.4 with no licensing or billing requirements.

- **CMS Utilities**

CMS Utilities is included in z/VM V6.4 at no additional charge.

- **OSA Support Facility (OSA/SF)**

**OSA/SF** (V4.4.0) is a host-based tool supporting OSA-2 and OSA-Express<sup>(R)</sup> features and is included in z/VM V6.4 later, with no licensing or billing requirements.

- **TCP/IP for z/VM and NFS**

The TCP/IP base and the Network File System (NFS) feature of TCP/IP are delivered preinstalled, enabled for use, and are available at no additional charge.

- **DirMaint, RSCS, RACF Security Server, VMSSI, IBM Wave, and the Performance Toolkit for VM feature** priced optional features for z/VM V6.4

DirMaint, RSCS, RACF Security Server, VMSSI, and the Performance Toolkit for VM feature are preinstalled in a disabled state.

IBM Wave is packaged with z/VM V6.4 as an optional feature but it is not preinstalled. Obtaining service for IBM Wave remains unchanged and continues to be available from Fix Central on the [IBM Support Portal](#).

Pricing is based on engine-based Value Units, and the features can be licensed on IFL and standard processor processors. If you intend to use any one of these features, now or at a later date, you must establish a license for billing and shipment of publications. Enablement instructions are provided in the Memo to Users provided with each feature to allow enablement of the feature for use on your system. A license is established by placing an order for the feature.

## On/Off CoD

z/VM V6.4 is eligible for On/Off CoD with a temporary use charge calculated based on processor-per-day use.

### z/VM V6.4 (5741-A07) Temporary Use Charge

Entitlement identifier	Description	License option/Pricing metric
S015HSV	z/VM V6	On/Off CoD, Per Processor-day TUC
S015HST	DirMaint Feature	On/Off CoD, Per Processor-day TUC
S015HSX	RSCS Feature	On/Off CoD, Per Processor-day TUC
S015HSZ	RACF Feature	On/Off CoD, Per Processor-day TUC
S016SX7	VM Single System Image Feature	On/Off CoD, Per Processor-day TUC
S01839C	Wave for z/VM	On/Off CoD, Per Processor-day TUC
S015HSW	Performance Toolkit for VM Feature	On/Off CoD, Per Processor-day TUC

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## Terms and conditions

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The information provided in this announcement letter is for reference and convenience purposes only. The terms and conditions that govern any transaction with IBM are contained in the applicable contract documents such as the IBM International Program License Agreement, IBM International Passport Advantage<sup>(R)</sup> Agreement, and IBM Agreement for Acquisition of Software Maintenance.

## **Licensing**

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IBM International Program License Agreement including the License Information document and Proof of Entitlement (PoE) govern your use of the program. PoEs are required for all authorized use.

## **Agreement for Acquisition of Software Maintenance**

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The following agreement applies for Software Subscription and Support (Software Maintenance) and does not require customer signatures:

- IBM Agreement for Acquisition of Software Maintenance (Z125-6011)

These programs are licensed under the IBM Program License Agreement (IPLA) and the associated Agreement for Acquisition of Software Maintenance, which provide for support with ongoing access to releases and versions of the program. These programs have a one-time license charge for use of the program and an annual renewable charge for the enhanced support that includes telephone assistance (voice support for defects during normal business hours), as well as access to updates, releases, and versions of the program as long as support is in effect. IBM z Systems Operational Support Services - SoftwareXcel is an option if you desire added services.

## **License Information number**

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L-KDAS-ACQPG5

See the [License Information documents](#) page on the IBM Software License Agreement website for more information.

## **Limited warranty applies**

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Yes

## **Limited warranty**

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IBM warrants that when the program is used in the specified operating environment, it will conform to its specifications. The warranty applies only to the unmodified portion of the program. IBM does not warrant uninterrupted or error-free operation of the program or that IBM will correct all program defects. You are responsible for the results obtained from the use of the program.

IBM provides you with access to IBM databases containing information on known program defects, defect corrections, restrictions, and bypasses at no additional charge. For further information, see the [IBM Software Support Handbook](#).

IBM will maintain this information for at least one year after the original licensee acquires the program (warranty period).

## **Program support**

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Enhanced support, called Subscription and Support, includes telephone assistance, as well as access to updates, releases, and versions of the program as long as support is in effect. You will be notified of discontinuance of support with 12 months' notice.

## **Money-back guarantee**

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If for any reason you are dissatisfied with the program and you are the original licensee, you may obtain a refund of the amount you paid for it, if within 30 days of your invoice date you return the program and its PoE to the party from whom you



obtained it. If you downloaded the program, you may contact the party from whom you acquired it for instructions on how to obtain the refund.

For clarification, note that for programs acquired under any of IBM's On/Off Capacity on Demand (On/Off CoD) software offerings, this term does not apply since these offerings apply to programs already acquired and in use by you.

### **Volume orders (IVO)**

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No

### **Passport Advantage applies**

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No

### **Usage restriction**

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Yes

- z/VM Version 6 Release 4 operates on the z13, z13s, zEnterprise EC12, BC12, 196, and 114. The Program requires hardware that implements the IBM 64-bit z/Architecture in order to execute properly and therefore Licensee is not authorized to install or use this Program on any machine that does not properly implement 64-bit z/Architecture. For information about specific z/VM machine requirements and programming requirements, see the *z/VM: General Information* manual, GC24-6193.
- Licensee's entitlement is for only the quantity of engine-based Value Units licensed. These engine-based Value Units can be for either standard processors (CPs) or Integrated Facility for Linux (IFL) processors.
- z/VM may run on IFL processors only if, on the IFL processors, z/VM is being used exclusively to run (1) Linux or OpenSolaris workloads and (2), if required, z/VM applications in support of those Linux or OpenSolaris workloads.
- When ordering z/VM Version 6 Release 4 to operate on standard processors (CPs) for a single server within the enterprise, Licensee must specify Value Units equal to the Value Units to cover the number of standard processors (CPs) on Licensee's server.
- For a single server in an enterprise, the number of Value Units ordered for any optional feature to operate on standard processors must be equal to the number of Value Units ordered for the base z/VM V6 product operating on standard processors.
- When ordering z/VM Version 6 Release 4 to operate on IFL processors for a single server within the enterprise, Licensee must specify Value Units equal to the Value Units to cover the number of IFL processors on Licensee's server.
- For a single server in an enterprise, the number of Value Units ordered for any optional feature to operate on IFL processors must be equal to the number of Value Units ordered for the base z/VM V6 product operating on IFL processors.
- If Licensee is running z/VM Version 6 Release 4 in an LPAR specified as "z/VM-mode" that is configured with both IFL processors and standard processors (CPs) and Licensee intends to run software licensed under the IBM Customer Agreement (ICA) in a virtual machine in that LPAR, that virtual machine must be configured to execute only on standard processors (CPs).
- Licensee may only transfer the Program to another party, in connection with Licensee's transfer of the machine on which Licensee is entitled to operate the Program (referred to as a "Limited Transfer"), provided that any such Limited Transfer of the Program requires Licensee to transfer Licensee's rights and obligations under the Agreement to the transferee and therefore terminates Licensee's authorization to continue to use the Program. When the machine and the Program are transferred, Licensee must either provide a printed copy of the Agreement or, if electronic licensing is used for the Program, take the necessary actions that will require electronic acceptance of the Agreement by the transferee prior to the transferee's first use of the Program.

## **Software Subscription and Support applies**

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Yes. During the Software Subscription and Support period, for the unmodified portion of a program, and to the extent problems can be recreated in the specified operating environment, IBM will provide the following:

- Defect correction information, a restriction, or a bypass.
- Program updates: Periodic releases of collections of code corrections, fixes, functional enhancements and new versions and releases to the program and documentation.
- Technical assistance: A reasonable amount of remote assistance by telephone or electronically to address suspected program defects. Technical assistance is available from the IBM support center in the organization's geography.

Additional details regarding technical assistance, which includes IBM contact information, are provided in the [IBM Software Support Handbook](#).

Software Subscription and Support does not include assistance for:

- The design and development of applications
- Your use of programs in other than their specified operating environment
- Failures caused by products for which IBM is not responsible under the IBM Agreement for Acquisition of Software Maintenance

Software Subscription and Support is provided only if the program is within its support timeframe as specified in the Software Support Lifecycle policy for the program.

For operating system software, the revised IBM Operational Support Services - SoftwareXcel offering will provide support for those operating systems and associated products that are not available with the Software Subscription and Support (Software Maintenance) offering.

This will ensure total support coverage for your enterprise needs, including IBM and selected non-IBM products. For complete lists of products supported under both the current and revised offering, go to the [Supported product list](#) website.

## **IBM Operational Support Services - SoftwareXcel**

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Yes

## **System i Software Maintenance applies**

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No

## **Variable charges apply**

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No

## **Educational allowance available**

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Yes. A 15% education allowance applies to qualified education institution customers.

## **Products eligible for single version charging**

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SVC is applicable only when running on standard processors and the maximum time for which it applies is 12 months.

The SVC offering is valid only while both the predecessor product and the replacement product are:

- Both running on the same CPU

- Licensed under the same IBM customer number
- In the process of being migrated from the older product to the newer one by the customer
- Providing the same function

**Note:** When the SVC offering meets these requirements, you must order the appropriate number of Value Units for z/VM V6.4 to be eligible.

Replaced program		Replacement program	
Program number	Program name	Program number	Program name
5654-A17	z/VM Version 3	5741-A07	z/VM V6.4
5654-030	VM/ESA Version 2	5741-A07	z/VM V6.4
5684-112	VM/ESA Version 1	5741-A07	z/VM V6.4
5664-167	VM/SP	5741-A07	z/VM V6.4
5664-173	VM/SP HPO	5741-A07	z/VM V6.4
5664-301	VM/IS Base (Core)	5741-A07	z/VM V6.4
5664-308	VM/XA SP	5741-A07	z/VM V6.4
5735-FAL	TCP/IP Version 2	5741-A07	z/VM V6.4
5798-FAL	TCP/IP Version 1	5741-A07	z/VM V6.4
5796-PNA	VM Realtime Monitor	5741-A07	z/VM V6.4
5664-191	VMMAP	5741-A07	z/VM V6.4
5798-DWD	RealTime Monitor VM/ESA	5741-A07	z/VM V6.4
5684-073	VMPRF	5741-A07	z/VM V6.4
5748-XE4	DirMaint	5741-A07	z/VM V6.4
5740-XXH	RACF	5741-A07	z/VM V6.4
5664-188	RSCS V2	5741-A07	z/VM V6.4
5684-096	RSCS V3	5741-A07	z/VM V6.4
5688-198	Language Environment/370	5741-A07	z/VM V6.4
5706-116	DFSMS/VM	5741-A07	z/VM V6.4
5668-911	OS/PL/I V2 Library	5741-A07	z/VM V6.4
5734-LM4	OS PL/I Resident Library	5741-A07	z/VM V6.4
5734-LM5	OS PL/I Transient Library	5741-A07	z/VM V6.4
5688-022	VS COBOL II Library Only	5741-A07	z/VM V6.4
5668-940	VS COBOL II Library Only	5741-A07	z/VM V6.4
5740-LM1	OS/VS COBOL Library Only	5741-A07	z/VM V6.4
5688-039	C/370™ Library	5741-A07	z/VM V6.4

### On/Off CoD

To be eligible for On/Off CoD pricing, you must be enabled for temporary capacity on the corresponding hardware, and the required contract, Attachment for IBM z Systems On/Off Capacity on Demand (Z125-7883), must be signed prior to use.

### Statement of good security practices

IT system security involves protecting systems and information through prevention, detection, and response to improper access from within and outside your enterprise. Improper access can result in information being altered, destroyed, or misappropriated or can result in misuse of your systems to attack others. Without a comprehensive approach to security, no IT system or product should be considered

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**Important:** IBM does not warrant that any systems, products, or services are immune from, or will make your enterprise immune from, the malicious or illegal conduct of any party.

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## Prices

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Registered external customers and IBM Business Partners can access [IBMLink](#) for charges.

For software prices, select "Look up IBM System z software prices (ESWPrice)" under "Prices." Specify "Price type," "Search type," and "Search value," then click "Search."

Note: Enter program number in the "Search value."

You can also contact your local IBM representative or IBM Business Partner for the applicable charges.

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