

IBM z/VM 7.3 delivers robust virtual infrastructure for containerized and noncontainerized workloads

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At a glance

IBM[®] z/VM[®], the leading platform virtualization product for IBM zSystems and IBM LinuxONE servers, will be updated in version 7.3 to provide:

- A doubling in the maximum size of a Single System Image (SSI) cluster from four members to eight, enabling clients to grow their SSI clusters to allow for more workload and reduce the proportion of capacity space required to accommodate planned system outages
- Enablement to allow Non-Volatile Memory Express (NVMe) solid-state drive (SSD) adapters to be accessed as one or more EDEVICES, taking advantage of the capacity and performance benefits these devices offer on LinuxONE
- A new Architecture Level Set (ALS) that requires one of the following IBM zSystems servers:
 - IBM z16™ (all models)
 - IBM LinuxONE Emperor 4 (all models)
 - IBM z15™ (all models)
 - IBM LinuxONE III (all models, including LinuxONE III Express)
 - IBM z14[®] (all models)
 - IBM LinuxONE Emperor II
 - IBM LinuxONE Rockhopper II
- Timely, client-driven functions previously delivered in the service stream of z/VM 7.2

For up-to-the-minute information about z/VM 7.3, see the [z/VM 7.3](#) web page.

For short videos providing guides on different z/VM related tasks, see the [z/VM: How to guides](#) YouTube channel.

Overview

z/VM 7.3 will provide IBM clients with a premier hypervisor on their modernization journey to hybrid cloud, hosting enterprise-class virtual servers to exploit the IBM zSystems and LinuxONE advantages in scalability, performance, high availability, and security.

The objective of z/VM 7.3 is to enhance the proof points supporting modernization efforts, specifically those associated with scalability and efficiency. z/VM is designed

to enable the deployment of Red Hat^(R) OpenShift^(R) Container Platform clusters and up to thousands of Linux^(R) servers on a single IBM zSystems or LinuxONE server.

While cloud computing has become the standard operating model for IT services, an IT infrastructure continues to be the foundation of every IT service. Realizing the benefits of the cloud operation model requires a strong virtualization technology such as z/VM that delivers availability, reliability, security features, and performance.

Virtualization is fundamental to delivering infrastructure as a service (IaaS), the basic building block for a cloud operations model. IBM continues to invest in z/VM technology to provide leading-edge virtualization capabilities. This progression can meet the needs of IT organizations to deliver the foundation for user satisfaction with both types of workloads:

- Cloud-native workloads based on Red Hat OpenShift Container Platform and IBM Cloud^(R) Paks or other container technologies
- Noncontainerized workloads, deployed using cloud and traditional operations models, from IBM such as IBM WebSphere^(R), open source such as MongoDB, or software from ISVs

z/VM, together with IBM Cloud Infrastructure Center, which helps to manage the lifecycle of virtual infrastructure, provides the foundation for private cloud on an IBM zSystems and LinuxONE server as part of a hybrid cloud approach.

For both noncontainerized and cloud native workloads, z/VM virtualization technology is designed to enable the deployment of more virtual servers in a single IBM zSystems or LinuxONE server than any other platform through legendary scalability, system management, and performance. z/VM supports the following guest operating systems: Linux, IBM z/OS^(R), IBM z/VSE^(R), IBM z/TPF, and z/VM itself, as well as Red Hat Enterprise Linux CoreOS as a part of the Red Hat OpenShift Container Platform. In addition, the z/VM hypervisor helps ensure continuous infrastructure availability by tightly integrating with IBM GDPS^(R) resiliency-focused offerings and Live Guest Relocation support.

With z/VM 7.3, IBM continues to deliver enhancements to its z/VM advanced virtualization technology on IBM zSystems and LinuxONE servers using the z/VM continuous delivery (CD) model. This CD model for new function offers clients timely support for new technology throughout the life of a z/VM product release using a delivery mechanism that is familiar to clients and time tested. The z/VM CD model allows schedule flexibility as IBM partners with the z/VM community in the design, development, and delivery of new functions that are not centered around a specific release date.

Key requirements

Operating environment

z/VM 7.3 supports the following IBM zSystems and LinuxONE servers:

- IBM z16 Model A01
- LinuxONE Emperor 4 Model LA1
- IBM z15 Models T01 and T02
- LinuxONE III Models LT1 and LT2, including LinuxONE Express
- IBM z14 Models M01, M02, M03, M04, M05, and ZR1
- LinuxONE Emperor II
- LinuxONE Rockhopper II

Planned availability date

September 16, 2022

Availability within a country is subject to local legal requirements.

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

Description

The following enhancements are included in z/VM 7.3:

- 8-member Single System Image (SSI) support increases the maximum size of an SSI cluster from four members to eight, enabling clients to grow their SSI clusters to allow for more workload and providing more flexibility to use live guest relocation (LGR) for nondisruptive upgrades and workload balancing.
- NVMe emulated device (EDEVICE) support enables NVMe devices connected through PCI Express (PCIe) adapters to be defined and managed as Fixed-Block Architecture (FBA) EDEVICES. As such, all host and guest FBA functions are supported except those that require stand-alone support such as Warm Start and Checkpoint. Linux guests exploiting EDEVICES defined on NVMe adapters are not eligible for LGR. NVMe Adapters are only available on LinuxONE servers.
- Up to 4 TB of memory per LPAR. This new function was delivered in the service stream of z/VM 7.2. With z/VM 7.3, a fully configured 8-member SSI can address up to 32 TB on a single IBM zSystems or LinuxONE server, or 32 TB across multiple servers along with up to 80 logical processors supported on each member.
- Dynamic Memory Downgrade was delivered in the z/VM 7.2 service stream and provides the added flexibility of moving real memory from one or more z/VM system images to one or more others running on the same physical server. This can help clients to nondisruptively align their hardware assets with shifting workload demands across their z/VM system images, whether they are in an SSI cluster or in separate z/VM LPARs. This may prove particularly useful when moving running virtual machines from one SSI member to another using LGR.
- New Architecture Level Set (ALS). z/VM 7.3 includes an ALS that requires an IBM z14 server and higher.
- External Security Manager interface enhancements. These interfaces have been enhanced to allow control of the CP DEFINE MDISK command. They are exploited by IBM RACF^(R)/VM and enable a z/VM security administrator to restrict and audit all means of creating a minidisk.
- The z/VM Language Environment^(R) runtime libraries have been upgraded to z/OS V2.5 equivalency.
- z/VM 7.3 has been enhanced to support 4-character time zone identifiers within the Control Program.
- z/VM now displays mnemonics for instructions in CP TRACE output regardless of whether the instruction is fully supported by the TRACE function.
- Select RACF utilities for database installation, maintenance, and operations along with select RACF reports are now allowed to run if the 490 disk was IPLed. In addition, the RACUT100, RACUT200, and RACFCONV utilities require the IPL of disk 490 to support reserve/release of the RACF database.
- z/VM V7.3 prohibits the sharing of RACF databases between z/VM and z/OS systems. While databases remain compatible, sharing between operating systems has long been discouraged due to distinct security and administrative requirements of each platform. z/VM V7.3 formally flags a RACF database as belonging either to z/VM or z/OS, and will reject its use if flagged as the latter. This satisfies the Statement of Direction announced in Software Announcement [JP20-0110](#), dated April 14, 2020.
- Centralized Service Management (CSM) usability enhancements have been made, providing:
 - QUERY processing for service levels now allows queries specific to individual components in a service level.
 - The addition of wildcard support to the SRVLVL QUERY command.
 - The ability to query CSM managed systems for current PUT2PROD status.

- Additional details when querying local modifications.
- System default changes:
 - Default password for user directory

z/VM 7.3 provides the ability to select a default password when installing or upgrading a z/VM system.
 - ACCOUNT Statement in IBM-provided User Directory

The user directory shipped by IBM will include an ACCOUNT IBM statement for all guest definitions. For an upgrade-in-place installation, new guest definitions that are added to the current user directory will include an ACCOUNT IBM statement, but existing guest definitions will remain unchanged.
 - User Directory TODENABLE

Some capabilities that previously required OPTION TODENABLE in the user's directory definition will be standard for all users in z/VM 7.3. Specifically, all virtual machines on z/VM 7.3 will be able to alter their virtual time-of-day (TOD) clocks using the SET CLOCK instruction. In addition, class G users no longer need TODENABLE to set the virtual clock to a specified value using the 'SET VTOD' command with the DATE, TIME, and SYSTEM options. TODENABLE is still required for the FROMUSER and MSGPROC options of 'SET VTOD', which involve access to another virtual machine's clock.
 - Transport Layer Security (TLS) 1.1 disabled by default

Use of the TLS 1.1 protocol has been changed to be disabled by default unless explicitly enabled in the DCTPARMS file.
 - TCP/IP configuration statement changes

In z/VM 7.3, the NOUDPQUEUELIMIT option of the ASSORTEDPARMS statement is being replaced by a new UDPQUEUELIMIT configuration statement. This new statement will allow a numerical limit to be specified for the maximum number of incoming datagrams queued on a UDP port. The default limit is 20 datagrams. If 0 is specified, there will be no limit, which is the equivalent of NOUDPQUEUELIMIT. The NOUDPQUEUELIMIT option will still be accepted in z/VM 7.3, but UDPQUEUELIMIT takes precedence. In addition, the FOREIGNIPCONLIMIT default will be changed to a set value of 256 and will no longer be based on the initial TCBPOOLSIZE.
 - Host crypto polling default change

In z/VM 7.3, the default for the POLLING parameter of the CRYPTO configuration statement has changed to OFF. This eliminates the need for the host to poll cryptographic resources for replies that are ready to be delivered to the guest.
 - SCSI EDEVICE attribute handling when defining EDEVICES

In z/VM 7.3, when defining a SCSI EDEVICE with the SET EDEVICE command or configuration file statement, the actual device characteristics will be updated to the device attributes of the backing device when brought online and CP is able to identify the backing device. The specified attribute will be used when device attributes for the backing device cannot be determined. Subsequent queries of the EDEVICE will show the actual attribute in use rather than what was passed with the initial SET command or EDEVICE statement. The attribute will be ignored when modifying an existing EDEVICE with SET EDEVICE to add or remove paths.
 - Removal of CMSDESK support

The CMS CMSDESK, SET WORKSTATION, and QUERY WORKSTATION commands have been removed, along with many of the remaining CMS GUI references.
 - Change in location and size of the MONDCSS and PERFOUT saved segments

The default CP MONITOR MONDCSS saved segment starting virtual address has been changed to 1 GB and the size has been increased to 96 MB. The IBM Performance Toolkit PERFOUT saved segment starting virtual address has been

changed to 1120 MB, immediately following the new MONDCSS. The reasons for these changes include:

- Moving the segment starting locations addresses a problem with the Linux kdump configuration, which failed in a virtual machine with 1 GB of virtual memory that had attached one or both current versions of these segments.
- Increasing the size of the MONDCSS segment accommodates the increased volume of CP Monitor data produced and provides room for its future growth.

These changes will not affect existing versions of these segments; they must be re-created for the new defaults to take effect.

- Support for the IBM z16 Model A01 and LinuxONE Emperor 4 LA1 servers includes:
 - Guest enablement to exploit the following functions:
 - Imbedded Artificial Intelligence Acceleration is designed to reduce the overall time required to execute CPU operations for neural networking processing functions and help support real-time applications like fraud detection.
 - Compliance-ready Central Processor Assist for Cryptographic Functions (CPACF) counters support enables guests to track crypto compliance and instruction usage.
 - The Breaking Event Address Register (BEAR) enhancement facility improves the ability to debug wild branches.
 - Vector Packed Decimal Enhancements 2 delivers new instructions intended to provide performance improvements.
 - The Reset DAT Protection Facility provides a more efficient way to disable DAT protection, such as during copy-on-write or page change tracking operations.
 - Support for the Consolidated Boot Loader provides guest IPL from a SCSI LUN. **Note:** Guest IPL from SCSI, with or without the DUMP option, will now require a minimum guest virtual memory size of 768 MB.
 - The RoCE Express3 adapter allows guests to exploit Routable RoCE, Zero Touch RoCE, and SMC-R V2 support.
 - The Crypto Express8S (CEX8S) adapter is supported as a dedicated or shared resource. Dedicated guests will be able to take advantage of all functionality available with the CEX8S adapters, including assorted new enhancements and new Quantum Safe APIs.
 - Support for CPU and Core topology location information will be included in z/VM monitor data, providing a better picture of the system for diagnostic and tuning purposes.

This support is also available for z/VM 7.1 and 7.2 with the PTF for APAR VM66532.

- The following infrastructure support must be installed on all members within a z/VM SSI cluster before any member of the cluster is IPLed on an IBM z16 or LinuxONE Emperor 4 server:
 - z/VM 7.3: Base.
 - z/VM 7.2: The PTF for APAR VM66504 is required.
 - z/VM 7.1: The PTFs for APARs VM66206 and VM66504 are required.

For further information about z/VM support of the IBM z16 and LinuxONE Emperor 4 servers, see the [z/VM IBM z16 required service](#) web page and the IBM Support - Preventive Service Planning bucket [Upgrade 3931DEVICE, Subset 3931/ZVM](#).

For additional information about the IBM z16 capabilities, see the hardware announcements for these servers in the [Reference information](#) section.

- z/VM CD model

IBM will deliver most new z/VM 7.3 function as new function APARs in the service stream. When z/VM 7.3 becomes available, z/VM 7.2 will, with a few exceptions, receive only corrective service. Similarly, when a new release is introduced after z/VM 7.3, new function APARs will be delivered on that release and 7.3 will receive mostly corrective service only. For additional information about the z/VM CD model, see the z/VM 7.1 Software Announcement [JP18-0375](#), dated August 7, 2018.

The following available z/VM 7.2 enhancements will be in the base of z/VM 7.3, providing additional IBM z16 benefit for z/VM workloads:

- 4 TB Real Memory support. With the PTF for APAR VM66173, support for up to 4 TB of real memory will allow z/VM systems to address a full 4 TB of first-level (real) memory, doubling the previous supported limit of 2 TB.
- Dynamic Memory Downgrade support. With the PTF for APAR VM66271, Dynamic Memory Downgrade extends the real storage dynamic management characteristics of z/VM by allowing up to 50% of the real memory to be removed from a running z/VM system. A minimum hardware bundle level is required to avoid a possible downgrade stall. For additional details, see the [Dynamic Memory Downgrade information](#) web page.
- Improved LGR for shared crypto users. With the PTF for APAR VM66496, LGR for APVIRT shared crypto environments is enabled when the type of shared crypto resource on the source system does not match the type on the target system.
- z/Architecture^(R) Extended Configuration (z/XC) support. With the PTFs for APARs VM66201 (CP), VM66425 (CMS), and VM66489 (Performance Toolkit), CMS applications that run in IBM z/Architecture can use multiple address spaces. Programs can use z/Architecture instructions and registers, within the limits of z/CMS support, and can use VM data spaces in the same CMS session. IBM z16 requires z/CMS and z/XC support to be configured within guest virtual machines that exploit z/VM HCD support. In addition, when the PTF for IOCP APAR VM66549 is applied, z/CMS support is required to be configured on any IBM zSystems or LinuxONE server. IOCP support is in the base of z/VM 7.3 and requires z/CMS.
- Direct to Host Service Download support. With the PTF for APAR VM66540, z/VM 7.2 provides an optional way to download service to your z/VM system. A web interface is provided that simplifies the downloading of z/VM service ordered through IBM Shopz. The service files can now be transferred through a direct-to-host connection. The data is verified and unpacked during the transfer to the z/VM host system.

Accessibility by people with disabilities

Accessibility Compliance Reports (previously known as a VPAT) containing details on accessibility compliance to standards, including the Worldwide Consortium Web Content Accessibility Guidelines, European Standard EN 301 349, and US Section 508, can be found on the [Product Accessibility Reports](#) web page.

Engine-based Value Unit pricing

Engine-based Value Unit pricing for z/VM 7.3 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 7.3 has already been installed.

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

IPLA and Subscription and Support considerations

A no-charge Subscription and Support registration record will be established for each designated machine where z/VM 7.3 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.

Product positioning

z/VM is the leading platform virtualization product for IBM zSystems and LinuxONE servers and was built on and expanded from the fundamentals of virtualization to help optimize IT environments.

Virtualization is the entry point to build flexible and cost-effective environments for cloud and traditional operations models that can differentiate service delivery to provide an enhanced client experience. In essence, it can become a key control point in the service delivery value chain. The ultimate choice of hypervisor and its management capabilities heavily influences follow-on decisions about products that are selected to support implementations of cloud. The objective is to continue to provide a launching point with z/VM for a new technology base and a deployment and consolidation platform for Linux and Red Hat OpenShift.

The IBM objective is to expand the penetration of z/VM in the existing IBM zSystems install base and attract new clients to the platform with offerings such as LinuxONE. To accomplish this, z/VM 7.3 offers improvements that can help provide a competitive advantage or eliminate a competitive gap.

With z/VM, together with IBM Cloud Paks based on Red Hat OpenShift and additional container technologies based on Linux, IBM zSystems and LinuxONE provide a highly scalable, secure, and efficient on-premises private cloud infrastructure. z/VM also continues to provide these same capabilities for noncontainerized workloads in a traditional operations model.

z/VM 7.3 can help extend the business value of IBM zSystems and LinuxONE technology across the enterprise by integrating applications and data, while providing exceptional levels of availability, security, and operational ease. This applies not only to private cloud deployments of containerized and noncontainerized workloads, which can be part of a client's hybrid cloud approach, but also to world-class virtualization technology that is offered by z/VM, which can provide the ability to host large numbers of virtual servers running different operating systems on IBM zSystems and virtual Linux servers running on LinuxONE.

Typical workload scenarios are the new/additional deployment and large consolidation of:

- Cloud-native workloads based on Red Hat OpenShift and IBM Cloud Paks or other container technologies
- Noncontainerized workloads that require great throughput, such as IBM Db2^(R) Warehouse, IBM Db2 LUW, Oracle database, MongoDB, PostgreSQL, and others
- Noncontainerized applications deployments, such as those based on WebSphere, ISV applications like SAP, and others, including open source

Because virtualization is the entry point to a cloud operations model, the hypervisor choice that clients make heavily influences their implementations of cloud throughout the stack. The IBM strategic objective is to continue to offer IBM zSystems and LinuxONE servers as the core of trusted digital experiences, and together with z/VM as part of the IBM open hybrid cloud approach, as well as for large-scale Linux deployments. To accomplish this, IBM will continue to make

changes and improvements to z/VM that provide competitive advantages or eliminate competitive gaps.

To help ensure data-at-rest and in-flight stays safe and secure, z/VM supports the use of the IBM Full Disk Encryption (FDE) feature of the IBM DS8000^(R) and Endpoint Security of the IBM DS8900. z/VM also supports the ability of guests to use encrypted tape and supports encrypted paging. Ciphering will occur as data moves between active memory and a paging volume owned by the CP hypervisor. Encrypted paging can be enabled and disabled dynamically.

The TCP/IP for z/VM TLS/SSL server facilitates 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 industry-standard cryptographic protocols in a FIPS 140-2 compliant mode to communicate securely with a client without a change to the server itself.

z/VM enables Crypto Express features, which are tamper-resistant cryptographic coprocessors, 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 IBM zSystems cryptographic devices so they can be shared by many Linux systems and supports the IBM z16, z15, and z14 limit of more than 16 Crypto Express feature domains. 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 one without user intervention.

The z/VM environment is further extended with dynamic crypto support, enabling changes to the Adjunct Processor (AP) Cryptographic (crypto) environment on a z/VM system dynamically and allowing the addition, removal, or reassignment of crypto hardware to be less disruptive to the system and its guests.

Statement of general direction

Withdrawal of support for TCP/IP LAN Channel Station (LCS) devices

Many IBM zSystems clients continue to rely on Systems Network Architecture (SNA) applications for mission-critical workloads, and IBM has no plans to discontinue support of the SNA protocol, including the SNA APIs. However, as stated in Hardware Announcement [JG22-0001](#), dated April 5, 2022, IBM z16 is planned to be the last IBM zSystems server to support the OSE CHPID type, which enables the host to send and receive native SNA-format Ethernet frames using the OSA Express 1000Base-T adapters. IBM z/VM systems that rely on VTAM^(R) and utilize External Communications Adapter (XCA) major nodes as the transport should be updated to utilize Channel-to-Channel connections to z/OS so that Enterprise Extender or some other form of SNA-over-IP technology can be used. The OSE CHPID type also is used to provide LAN Channel Station (LCS) emulation. With its withdrawal, IBM intends z/VM 7.3 to be the last z/VM release to provide TCP/IP support for the LCS device driver.

z/CMS as the default CMS

The previous Statement of Direction that stated z/VM 7.3 was planned to be the last z/VM release to have ESA/390 CMS as the default, which was included in Software Announcement [JP22-0116](#), dated April 5, 2022, has been withdrawn. The release after z/VM 7.3 will continue to support ESA/390 CMS as the default. A future z/VM release will use z/CMS, renamed "CMS", as the default. ESA/390 CMS, renamed "CMS390", at that time is planned to be available for guests that are dependent on ESA/390 or 370 accommodation.

Stabilization of z/VM support for the IBM z14 family

z/VM 7.3 is the last z/VM release planned to support the z14 family, including IBM LinuxONE II. An IBM z15 family, including LinuxONE III, server will be the required

minimum level for future z/VM releases. See the [IBM Software Support Lifecycle Policy](#) website for the most current z/VM support lifecycle information.

Stabilization of ProxyArp support

IBM has no plans to include support for ProxyArp with any z/VM TCP/IP device drivers developed in the future.

Removal of DVD support

IBM intends to remove DVD as a medium to receive an order for the z/VM product or z/VM service in a future z/VM release. Electronic delivery, packaged as a .zip and an .ISO file, will be the only supported mechanism. Clients can copy the contents of an electronic image to a USB device by following instructions provided with their order. Only USB devices supported by the HMC can be used.

Statements by IBM regarding its plans, directions, and intent are subject to change or withdrawal without notice at the sole discretion of IBM. Information regarding potential future products is intended to outline general product direction and 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 IBM products remain at the sole discretion of IBM.

Reference information

For information about the z/VM 7.3 Preview, see Software Announcement [JP22-0116](#), dated April 5, 2022.

For information about z/VM 7.2, see:

- Software Announcement [JP20-0378](#), dated August 4, 2020
- Software Announcement [JP20-0110](#), dated April 14, 2020

For information about z/VM 7.1, see:

- Software Announcement [JP18-0636](#), dated October 16, 2018
- Software Announcement [JP18-0375](#), dated August 7, 2018
- Software Announcement [JP18-0179](#), dated April 10, 2018

For information about IBM Cloud Infrastructure Center, see:

- Preview Announcement [JP22-0331](#), dated August 23, 2022
- Software Announcement [JP22-0133](#), dated March 1, 2022
- Software Announcement [JP21-0329](#), dated August 3, 2021
- Software Announcement [JP21-0072](#), dated February 16, 2021
- Software Announcement [JP20-0467](#), dated October 6, 2020
- Software Announcement [JP20-0174](#), dated April 14, 2020
- Software Announcement [JP19-0639](#), dated December 3, 2019

For information about IBM z/VSE 6.2, see Software Announcement [JP20-0148](#), dated April 14, 2020.

For information about the IBM z16, see Hardware Announcement [JG22-0001](#), dated April 5, 2022.

For information about the IBM z15, see:

- Hardware Announcement [JG20-0008](#), dated April 14, 2020

- Hardware Announcement [JG20-0017](#), dated January 14, 2020
- Hardware Announcement [JG19-0109](#), dated November 26, 2019
- Hardware Announcement [JG19-0039](#), dated September 12, 2019

For information about the LinuxONE Emperor 4, see Hardware Announcement [JG22-0002](#), dated September 13, 2022.

For information about the LinuxONE III, see:

- Hardware Announcement [JG20-0018](#), dated April 14, 2020
- Hardware Announcement [JG20-0017](#), dated January 14, 2020
- Hardware Announcement [JG19-0017](#), dated September 12, 2019

For information about the IBM z14 Model ZR1, see Hardware Announcement [JG18-0022](#), dated April 10, 2018.

For information about the LinuxONE Rockhopper II, see Hardware Announcement [JG18-0025](#), dated April 10, 2018.

For information about the IBM z14, see:

- Hardware Announcement [JG17-0125](#), dated November 28, 2017
- Hardware Announcement [JG17-0065](#), dated July 17, 2017

For information about the LinuxONE Emperor II, see:

- Hardware Announcement [JG17-0125](#), dated November 28, 2017
- Hardware Announcement [JG17-0090](#), dated September 12, 2017

Availability of national languages

z/VM 7.3 offers National Language translation for message repositories, help files, and other panels or files depending on the function translated.

Description	Availability date	Language
DFSMS/VM Feature	September 16, 2022	Japanese Kanji

To receive the translated help files for DFSMS/VM in Kanji, you must order the no-charge optional feature using the z/VM 7.3 System Delivery Option (SDO). You will also receive the base DFSMS/VM feature when ordering the DFSMS/VM Kanji feature.

Messages will no longer be translated into Japanese Kanji.

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

Program number

Program number	VRM	Program name
5741-A09	7.3.0	z/VM
5741-A10	7.1.0	z/VM SDO
5741-SNS	1.1.0	z/VM Subscription & Support

z/VM 7.3

Program ID number	Subscription and Support PID number
5741-A09	5741-SNS

Education support

IBM offers classroom training, virtual learning, conferences, certification, course roadmaps, and more for z/VM. See the [VM and Related Product Education](#) web page for:

- Additional VM and related product education
- Live virtual classes that are available for z/VM
- Specific z/VM events

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

Offering Information

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

Publications

Documentation supplied with z/VM

The following documentation is supplied with z/VM 7.3:

- *z/VM 7.3 Agreements and License Information* on DVD (LCD7-7073)
- One printed copy of the *z/VM: Installation Guide* (GC24-6292)
- z/VM help files (included in the z/VM system image)

The [z/VM General Information](#) manual (GC24-6286) is available.

z/VM 7.3 documentation will be available in [IBM Documentation](#) and in the [z/VM Library Overview](#) on September 16, 2022.

z/VM Library Overview

The [z/VM Library Overview](#) will be available on September 16, 2022, to provide links to additional sources of z/VM information, such as:

- z/VM 7.3 Library, a new web page providing PDF files
- z/VM Adobe™ Indexed PDF Collection
- z/VM program directories
- z/VM data areas, control blocks, and monitor records
- IBM Redbook publications
- White papers, consultant reports, and performance reports
- Product briefs and brochures
- Reference guides
- Journals, bulletins, and newsletters

Services

IBM Consulting™

As transformation continues across every industry, businesses need a single partner to map their enterprise-wide business strategy and technology infrastructure. IBM Consulting is the business partner to help accelerate change across an organization. IBM specialists can help businesses succeed through finding collaborative ways of working that forge connections across people, technologies, and partner

ecosystems. IBM Consulting brings together the business expertise and an ecosystem of technologies that help solve some of the biggest problems faced by organizations. With methods that get results faster, an integrated approach that is grounded in an open and flexible hybrid cloud architecture, and incorporating technology from IBM Research^(R) and IBM Watson^(R) AI, IBM Consulting enables businesses to lead change with confidence and deliver continuous improvement across a business and its bottom line.

For additional information, see the [IBM Consulting](#) website.

IBM Technology Support Services (TSS)

TSS helps organizations plan, deploy, support, operate and refresh the foundation for their hybrid cloud and enterprise IT data centers. Deep expertise in IBM Systems, open source and third-party vendors, streamlined processes and advanced technologies such as AI, enable organizations to protect their infrastructure investment and consistently maintain high availability for mission-critical workloads across the product lifecycle.

IBM Technology Services, formerly known as IBM Systems Lab Services, is part of TSS. Technology Services offers a wide range of infrastructure services for IBM Power^(R) servers, IBM Storage systems, IBM zSystems, IBM LinuxONE, Red Hat and open source software. Technology Services has a global presence and can deploy consultants online or onsite. Consultants have deep technical expertise, valuable tools, and successful methodologies. Technology Services is designed to help organizations solve business challenges, gain new skills, and apply best practices.

For more information about our the IBM infrastructure support and services, see the [Technology Lifecycle Services for your hybrid cloud infrastructure](#) web page.

IBM Expert Labs

Expert Labs can help clients accelerate their projects and optimize value by leveraging their deep technical skills and knowledge. With more than 20 years of industry experience, these specialists know how to overcome the biggest challenges to deliver business results that can have an immediate impact.

Expert Labs' deep alignment with IBM product development allows for a strategic advantage as they are often the first in line to get access to new products, features, and early visibility into roadmaps. This connection with the development enables them to deliver First of a Kind implementations to address unique needs or expand a client's business with a flexible approach that works best for their organization.

For additional information, see the [IBM Expert Labs](#) website.

IBM Security^(R) Expert Labs

With extensive consultative expertise on IBM Security software solutions, Security Expert Labs helps clients and partners modernize the security of their applications, data, and workforce. With an extensive portfolio of consulting and learning services, Expert Labs provides project-based and premier support service subscriptions.

These services can help clients deploy and integrate IBM Security software, extend their team resources, and help guide and accelerate successful hybrid cloud solutions, including critical strategies such as zero trust. Remote and on-premises software deployment assistance is available for IBM Cloud Pak^(R) for Security, IBM Security QRadar^(R)/QRoC, IBM Security SOAR/Resilient^(R), IBM i2, IBM Security Verify, IBM Security Guardium^(R), and IBM Security MaaS360^(R).

For more information, contact Security Expert Labs at sel@us.ibm.com.

For additional information, see the [IBM Security Expert Labs](#) website.

Technical information

Specified operating environment

Hardware requirements

z/VM 7.3 requires an Architecture Level Set (ALS) that requires one of the following IBM zSystems or IBM LinuxONE servers, or higher:

- IBM z16 Model A01
- LinuxONE Emperor 4 Model LA1
- IBM z15 Models T01 and T02
- LinuxONE III Models LT1 and LT2
- IBM z14 Models M01, M02, M03, M04, M05, and ZR1
- LinuxONE Emperor II
- LinuxONE Rockhopper II

See the [z/VM 7.3 Architecture Level Set](#) web page for the current ALS.

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

- [Upgrade 3931DEVICE, Subset 3931/ZVM](#), for IBM z16 Model A01 and LinuxONE Emperor 4 Model LA1
- [Upgrade 8561DEVICE, Subset 8561/ZVM](#), for IBM z15 T01 and LinuxONE III LT1
- [Upgrade 8562DEVICE, Subset 8562/ZVM](#), for IBM z15 Model T02 and LinuxONE III LT2
- [Upgrade 3906DEVICE, Subset 3906/ZVM](#), for IBM z14 and LinuxONE Emperor II
- [Upgrade 3907DEVICE, Subset 3907/ZVM](#), for IBM z14 Model ZR1 and LinuxONE Rockhopper II

For further information, see the appendix of the [z/VM General Information](#) manual (GC24-6286) on the [z/VM Library Overview](#) website.

Software requirements

Prerequisite requirements

Single System Image (SSI) cluster infrastructure support requirements:

- Prerequisite service must be installed on all members within an SSI cluster before any member of the cluster can be IPLed on an IBM z16 or LinuxONE Emperor 4 server:
 - z/VM 7.3: Base.
 - z/VM 7.2: The PTF for APAR VM66504 is required.
 - z/VM 7.1: The PTFs for APARs VM66504 and VM66206 are required.
- Prerequisite service must be installed on all members within an SSI cluster before any member of the cluster is IPLed on an IBM z15 or LinuxONE III Emperor or Rockhopper server:
 - z/VM 7.3: Base.
 - z/VM 7.2: Base.
 - z/VM 7.1: The PTF for APAR VM66206 is required.

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

When ordering z/VM 7.3, you must either be licensed for EREP (5654-260) and ICKDSF (5684-042) or place a separate order for each of these products to establish a license.

The following PTFs for APARs are required to operate with z/VM 7.3:

- EREP VM (5654-260) 3.5.0.
 - No APARs are required. The EREP/VM product is no longer preinstalled with z/VM; however, you still must be licensed for EREP. EREP functional executables are preinstalled and delivered as part of the z/VM 7.3 product and serviced through the CP component, simplifying the process for applying EREP service.
- Device Support Facilities - ICKDSF VM (5684-042) 1.17.0. 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 7.3 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 6.2.
 - PTF for APAR PI46151 provides z/Architecture^(R) IPL support.
 - PTF for APAR PI85943 provides EAV minidisk support.
 - PTF for APAR PH14249 provides a parameter to the **CPVOLUME** command to suppress progress messages.

See the **Preinstalled products and features** topic in the [Basic license](#) section for additional information about ordering EREP and ICKDSF.

Optional product-feature requirements

- DFSMS/VM requirements:
 - ISPF 3.2.0 (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 7.3 if the minidisk management function is needed.
 - RACF^(R) Security Server for z/VM optional feature of z/VM 7.3 or its equivalent if a security product is needed for authorization.
 - Tivoli^(R) Storage Manager Extended Edition for z/OS and z/VM 5.2 (5698-A11), Tivoli Storage Manager for z/OS and z/VM 5.2 (5698-A13), or Tivoli Storage Manager for VM (5697-TS9) and Language Environment^(R), which are supplied with z/VM if Migration Level 2 (ML2) function of DFSMS/VM is used.

Note: Effective January 21, 2005, program numbers 5698-A11 and 5698-A13 were withdrawn from marketing. Effective April 30, 2007, service support was discontinued.
 - TCP/IP for z/VM 7.3 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 FL730 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 following PTFs were applied to the z/VM 7.3 system deliverable:
 - 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.

- HCD support requires:
 - APAR VM66445 for IBM z16 Model A01
 - APAR VM66554 for LinuxONE Emperor 4 Model LA1
 - APAR VM66239 for IBM z15 Model T01
 - APAR VM66318 for LinuxONE III Model LT1
 - APAR VM66307 for IBM z15 Model T02
 - APAR VM66347 for LinuxONE III Model LT2
 - APAR VM65843 for IBM z14
 - APARs VM65843 and VM66009 for LinuxONE Emperor II
 - APAR VM66015 for IBM z14 ZR1
 - APAR VM66016 for LinuxONE Rockhopper II
- HCM support for IBM z16 Model A01 and LinuxONE Emperor 4 requires APAR VM66371.
- HCM support for IBM z15 Models T01 and T02, LinuxONE III Models LT1 and LT2, IBM z14 Models M01, M02, M03, M04, and M05, LinuxONE Emperor II, z14 Model ZR1, and LinuxONE Rockhopper II requires APAR VM65266, VM65598, and VM65208.
- IBM High Level Assembler (5696-234) requirements:
 - High Level Assembler 1.6 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 reliability, availability, and serviceability (RAS) tools, such as MDCHECK, FS2SFSE, 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 PTF for APARs PI62275 and PI65715 provide support for the IBM z14 instruction set.
 - The PTF for APAR PH00902 provides support for the IBM z15 instruction set.
 - The PTF for APAR PH39324 provides support for the IBM z16 instruction set.
 - The PTF for APAR PM79901 provides support for instructions provided with the IBM z13^(R) and z13s^(R) servers.

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

- Language Environment requires High Level Assembler 1.6 to customize Language Environment options.
- POSIX requirements:
 - Developing POSIX applications requires C/C++ for z/VM 1.1 or XL C/C++ for z/VM 1.2 or 1.3 (5654-A22).
- RSCS networking FL730 requirements:

- To communicate with users in an SNA network requires ACF/VTAM for VM/ESA, 4.2 (5654-010).
- To communicate within an IP network requires TCP/IP for z/VM FL720.
- Group Control Subsystem (GCS) must be configured and activated.
- Shared-DASD complex requirements:

In a shared-DASD complex, a single DirMaint server with a single source directory can manage the object directory on up to 56 z/VM systems if the DirMaint executable code disks and source directory disk are shared among all the systems. DirMaint, Function Level 730 (FL730) is required to support the shared-DASD complex. Within the shared-DASD complex, all z/VM systems must be running the same DirMaint FL730 service level. Therefore, you must be licensed for the DirMaint FL730 feature on any z/VM 7.3 system in the complex.

TCP/IP for z/VM 7.3 program requirements

TCP/IP for z/VM 7.3 has the following additional program requirements:

- If programs are developed in C:
 - IBM C for VM/ESA 3.1 (5654-033), C/C++ for z/VM 1.1, or XL C/C++ for z/VM 1.2 or 1.3 (5654-A22)
- If programs are developed in Pascal:
 - IBM VS Pascal 1.2 (5668-767) Compiler and Library

Linux on IBM Z[®]

To operate Linux on IBM Z as a guest of z/VM, a Linux on IBM distribution must be obtained from a Linux Distribution Partner.

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

Companion products

The following products or services could be purchased with this product.

When clients purchase z/VM 7, they should consider the following IBM solutions to help in the administration of their z/VM systems. These products are separately licensed by IBM under the IPLA.

IBM Cloud Infrastructure Center (5635-015)

Organizations worldwide have turned to the agility of hybrid cloud solutions to facilitate their digital transformation journeys for all types of containerized and noncontainerized workloads.

The IBM hybrid cloud approach leverages the Red Hat OpenShift Container Platform, and IT organizations are shifting workloads to a hybrid cloud architecture that blends an on-premises infrastructure with private and public cloud models.

IBM also provides infrastructure management solutions in support of the infrastructure-as-a-service (IaaS) cloud computing service.

Cloud Infrastructure Center is an IaaS solution that meets the demands of a hybrid cloud approach, helping with automation capabilities and an easy integration into an enterprise hybrid cloud approach. It is based on industry standards and leverages common skills for cloud management.

Cloud Infrastructure Center provides a ready-to-use solution for the following:

- Management of the cloud infrastructure, including on-premises deployments of z/VM and Red Hat KVM-based Linux virtual machines on IBM zSystems and LinuxONE

- Support to help simplify and automate Red Hat OpenShift cluster deployments
- Deployment of images of multiple Linux operating systems for noncontainerized workloads from IBM, including IBM WebSphere Application Server, open source, such as MongoDB, or other ISV software
- Integration with enterprise cloud management tools to provision and orchestrate cloud workloads, using Red Hat OpenStack-compatible APIs

Cloud Infrastructure Center is part of the IBM hybrid cloud solution portfolio for IBM zSystems and LinuxONE and is designed to require little or no training for users to manage virtual infrastructures. It has the same usage and skill requirements as similar IaaS offerings on other platforms. Cloud administrators who integrate IBM zSystems and LinuxONE into the enterprise hybrid cloud approach through the APIs of Cloud Infrastructure Center do not need to possess specific IBM zSystems or LinuxONE skills.

Cloud Infrastructure Center follows a continuous delivery support model.

For additional information, see the [IBM Cloud Infrastructure Center](#) website.

IBM Infrastructure Suite for z/VM and Linux 2.2.0 (5698-K01)

Organizations that have expanded their businesses using virtualization technology with Linux on IBM Z now can have one solution that provides them with multiple tools to monitor, automate, and back up and recover their entire z/VM and Linux on IBM Z environment. With IBM Infrastructure Suite for z/VM and Linux, they can simplify and automate z/VM management with tools designed to drive productivity and reduce complexity.

Infrastructure Suite for z/VM and Linux 2.2.0 includes:

- IBM Tivoli OMEGAMON^(R) XE on z/VM and Linux 4.3
- IBM Spectrum^(R) Protect Extended Edition 8.1
- IBM Operations Manager for z/VM 1.6
- IBM Backup and Restore Manager for z/VM 1.3
- IBM Tape Manager for z/VM 1.3 (optional)
- IBM Cloud Infrastructure Center 1.5 (optional)

Infrastructure Suite for z/VM and Linux 2.2.0 is designed to provide the following benefits:

- More effective performance monitoring by including z/VM and Linux data in customized views and historical data
- Faster problem identification from alert generation and automatic recovery
- Extensive console logging for z/VM and Linux virtual machines
- Backup and recovery for z/VM and Linux environments
- Tape management for real and virtual tape environments
- Management of Linux on IBM Z or LinuxONE virtual servers as part of both traditional and cloud infrastructure environment

For additional information, see the [IBM Infrastructure Suite for z/VM and Linux](#) website.

IBM Backup and Restore Manager for z/VM (5697-J06)

Backup and Restore Manager for z/VM is designed to give z/VM system administrators and operators the capability to efficiently and effectively preserve and restore files, minidisks, and DASD volumes on z/VM systems, as well as minidisks and volumes for guest operating systems, such as Linux on IBM Z. Source files and data can be CMS and non-CMS format, and the target media can be disk, physical tape, or virtual tape. Completing the solution is IBM Spectrum Protect, which provides file-level backup and recovery for Linux guests.

Together, Backup and Restore Manager and Spectrum Protect support all backup and restore operations for a z/VM system with Linux guests:

- File-level backup and restore of z/VM data, to provide fast recovery from operational issues
- File-level backup and restore of Linux data that is provided by Spectrum Protect
- Image-level backup and restore of z/VM and Linux data on minidisk or full volumes, to enable users to restore a z/VM volume or a Linux guest in a few simple steps

For additional information, see the [IBM Backup and Restore Manager for z/VM](#) website.

IBM Tape Manager for z/VM (5697-J08)

Tape Manager for z/VM is designed to give z/VM system administrators and operators the capability to manage, monitor, and protect physical and virtual tape resources on z/VM systems. By helping to automate common daily tape operations and eliminate tedious, often error-prone manual steps, Tape Manager can help increase data availability and improve administrator productivity.

For additional information, see the [IBM Tape Manager for z/VM](#) website.

IBM Operations Manager for z/VM (5697-J10)

Operations Manager for z/VM is designed to help improve the operational monitoring and automation of z/VM systems and virtual machines, which includes guests such as Linux on IBM Z. By enabling the automation of routine maintenance tasks and automatic response to predictable situations that require intervention, Operations Manager enables z/VM system programmers and administrators to devote their time to other critical tasks.

For additional information, see the [IBM Operations Manager for z/VM](#) website.

IBM Archive Manager for z/VM (5697-J05)

Archive Manager for z/VM is designed to address storage and data management concerns by enabling clients to archive historical or other infrequently used data to help increase data availability or to comply with business requirements mandated by fiscal or legal regulations and policies.

For additional information, see the [IBM Archive Manager for z/VM](#) website.

IBM Tivoli OMEGAMON XE on z/VM and Linux (5698-A36)

Tivoli OMEGAMON XE on z/VM and Linux is designed to help improve the performance monitoring and management of z/VM systems and virtual machines, which includes guests such as Linux on IBM Z. It delivers a wide range of performance metrics that are related to z/VM and Linux instances that run as z/VM guests. The Linux workloads reveal how they are performing and affecting z/VM and one another, including those in an SSI.

Tivoli OMEGAMON XE on z/VM and Linux enable clients to compare Linux operations side by side with detailed performance metrics from other important systems. Active and passive monitoring of Linux guest systems are available. Dynamic Workspace Linking can help clients to navigate between Tivoli Enterprise Portal workspaces more easily. Historical data capture and reporting can assist in problem determination and capacity planning.

For additional information, see the [IBM Tivoli OMEGAMON XE on z/VM and Linux](#) website.

Limitations

- z/VM 7.3 operates only on:

- IBM z16 Model A01
- LinuxONE Emperor 4 Model LA1
- IBM z15 Models T01 and T02
- LinuxONE III Models LT1 and LT2
- IBM z14 Models M01, M02, M03, M04, M05, and ZR1
- LinuxONE Emperor II
- LinuxONE Rockhopper II
- Linux and OpenSolaris are the only guest operating systems z/VM will support on IFL processors (other than z/VM 4, 5, 6, and 7 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 that are allocated to z/VM 7.3 and on the level of activity within each Linux image.

z/VM performance information will be available on the [VM Performance Resources](#) web page by September 16, 2022.

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

IBM Support

[IBM Support](#) is your gateway to technical support tools and resources that are designed to help you save time and simplify support. IBM Support can help you find answers to questions, download fixes, troubleshoot, submit and track problem cases, and build skills. Learn and stay informed about the transformation of IBM Support, including new tools, new processes, and new capabilities, by going to the [IBM Support Insider](#).

Additional IBM support

IBM Client Engineering for Systems

Client Engineering for Systems is a framework for accelerating digital transformation. It helps you generate innovative ideas and equips you with the practices, technologies, and expertise to turn those ideas into business value in weeks. When you work with Client Engineering for Systems, you bring pain points into focus. You empower your team to take manageable risks, adopt leading technologies, speed up solution development, and measure the value of everything you do. Client Engineering for Systems has experts and services to address a broad array of use cases, including capabilities for business transformation, hybrid cloud, analytics and AI, infrastructure systems, security, and more. Contact Client Engineering for Systems at sysgarage@ibm.com.

Planning information

Client responsibilities

z/VM 7.3 Subscription and Support (S&S)

To order z/VM 7.3, you must use the SDO, program number 5741-A10. The z/VM base system, any ordered optional z/VM features, and any ordered SDO licensed products are delivered as part of the z/VM SDO.

If you want the level of service provided under the IBM ICA license agreement with IBM zSystems 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 or the optional features of DirMaint, RSCS, RACF Security Server, or the Performance Toolkit feature, you must take specific action to decline this support.

To host Linux guests, you must obtain a Linux distribution for IBM zSystems. See the [Linux on IBM Z](#) website for information about the IBM Linux distributor partners.

Licensed products packaged with z/VM 7.3

With the availability of z/VM 7.3, the following priced, optional products or features are automatically shipped on the z/VM 7.3 base product media. All features are preinstalled, including:

- DirMaint FL730
- RSCS FL730
- RACF Security Server FL730
- Performance Toolkit for VM FL730

For more information about these products or features, see the **Preinstalled products and features** topic in the [Basic license](#) 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 Security Server, or the Performance Toolkit for VM, 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 products from independent software vendors (ISVs), see the [Non-IBM Solution Developer Information for z/VM](#) web page.

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 IBM Z 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 IBM Z (5799-TCQ) and for its annual Subscription and Support (5799-TCR).

Packaging

The z/VM 7.3 product package is distributed with the following:

- License Information document (LI) on DVD (LCD7-7073)
- 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
 - 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 are provided in a compressed file.

- Binaries from DVD for installation of z/VM to 3390 DASD are provided in a compressed file.
- RSU DVD containing required service is provided in a compressed file.

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

- Publications: *z/VM: Installation Guide* (GC24-6246)

Restricted source and PL/X source

The restricted source and the PL/X source are not orderable or shipped with z/VM 7. Both are available as no-charge downloads from the [IBM Resource Link[®]](#) website.

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 7.3 and entitlement will be verified when you request the source code. After approval, you will receive instructions describing how to download the code.

Direct client support

For technical support or assistance, contact your IBM representative or go to the [IBM Support](#) website.

Security, auditability, and control

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. The security and auditability of z/VM 7 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.

Ordering information

Consult your IBM representative or IBM Business Partner.

Value Unit exhibit VUE021

Engine-based Value Units for a specified number of engines are determined by the following table:

Level	Engines minimum	Engines maximum	Value Units per engine
From 1 to 3	1	3	10
From 4 to 6	4	6	9
From 7 to 9	7	9	8
From 10 to 12	10	12	7
From 13 to 16	13	16	6
From 17 to 20	17	20	5
From 21 to 25	21	25	4
For more than 25	26	+	3

Charge metric

Pricing metric description

The products and features in this announcement have one pricing metric - Value Units based on the number of processors. This engine-based 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 also available for the z/VM 7.3 optional features of DirMaint, RSCS, RACF Security Server, and the Performance Toolkit for VM for S&S entitlements at initial order of z/VM 7 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 7 is different than MSU-based Value Unit pricing, which is available for other IBM software products.

Program name	Program number	Charge unit description
z/VM 7	5741-A09	Value Units
DirMaint Feature	5741-A09	Value Units
RSCS Feature	5741-A09	Value Units
RACF Security Server Feature	5741-A09	Value Units
Performance Toolkit for VM Feature	5741-A09	Value Units

Value Unit pricing for the z/VM 7.3 S&S and the optional, priced features provides a lower price per processor as more Value Units are licensed with z/VM 7 and the optional, priced features. A client may aggregate the capacity for all the processors running z/VM 7 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 7 has already been installed, which may result in a lower unit price for the z/VM 7.3 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 from MSU-based Value Unit pricing, which is available for 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 has a current S&S contract for the z/VM optional features DirMaint, RACF Security Server, RSCS, or Performance Toolkit for VM, they are entitled to a no-charge upgrade to those same optional features on z/VM 7.3.

Translation from Processor to Value Units

The following is an example calculation of total number of engine-based Value Units.

If the client has installed six processors and will be operating z/VM 7.3 on all six processors, the applicable Value Units would be:

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

The following z/VM 7.3 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-A09	5741-SNS	z/VM 7.3
5741-A09	5741-SNS	RSCS Feature
5741-A09	5741-SNS	RACF Security Server Feature
5741-A09	5741-SNS	DirMaint Feature
5741-A09	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 7.3 on a processor per-day basis during their peak periods.

For details, see the [License Information](#) document.

Basic license

Licensing for z/VM 7.3

IPLA program number	SDO program number	S&S program number	Program description
5741-A09	5741-A10	5741-SNS	z/VM 7 System Image DVD
5741-A09	5741-A10	5741-SNS	RSCS Feature for z/VM 7.3
5741-A09	5741-A10	5741-SNS	RACF Security Server Feature
5741-A09	5741-A10	5741-SNS	DirMaint Facility Feature
5741-A09	5741-A10	5741-SNS	Performance Toolkit for z/VM

The program number 5741-A09 is used for licensing z/VM 7. 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 7.3 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 that are ordered for any optional feature to operate on standard processors must be equal to the number of Value Units that are ordered for the base z/VM 7 product operating on standard processors.

When ordering z/VM 7.3 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 that are 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 7 product operating on IFL processors.

The optional features DirMaint, RSCS, RACF Security Server, 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 Security Server, or the Performance Toolkit for VM, now or later, you must establish a license for billing.

z/VM 7.3 (5741-A09) Basic License

Entitlement identifier	Description	License option/Pricing metric
S018CL6	z/VM 7 System Image DVD	Use-Based License One-Time Charge Value Units
Orderable supply ID	Language	
S018MWT	US English	
Entitlement identifier	Description	License option/Pricing metric
S018CL2	DirMaint Facility Feature	Use-Based License One-Time Charge Value Units

Orderable supply ID	Language	
S018MWX	US English	
Entitlement identifier	Description	License option/Pricing metric
S018CL5	RSCS Feature for z/VM 7.3	Use-Based License One-Time Charge Value Units
Orderable supply ID	Language	
S018MWW	US English	
Entitlement identifier	Description	License option/Pricing metric
S018CL4	RACF Security Server for z/VM	Use-Based License One-Time Charge Value Units
Orderable supply ID	Language	
S018MX0	US English	
Entitlement identifier	Description	License option/Pricing metric
S018CL3	Performance Toolkit for z/VM	Use-Based License One-Time Charge Value Units
Orderable supply ID	Language	
S018MWV	US English	
Entitlement identifier	Description	License option/Pricing metric
S018CL6	DFSMS for z/VM Primary	Use-Based License One-Time Charge Value Units
Orderable supply ID	Language	
S018MWZ	US English	

Deliverables are supplied in US English only.

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
		Decline SW S&S, No Charge
		SW S&S Registration, No Charge
Orderable supply ID	Language	
S0111HL	US English	
Entitlement identifier	Description	License option/Pricing metric
S0111R1	DirMaint Facility Feature	Basic ASC, per Value Unit SW S&S
		Decline SW S&S, No Charge
		SW S&S Registration, No Charge
Orderable supply ID	Language	
S0111H8	US English	
Entitlement identifier	Description	License option/Pricing metric
S013T6B	RSCS Feature for z/VM 7.3	Basic ASC, per Value Unit SW S&S
		Decline SW S&S, No Charge
		SW S&S Registration, No Charge
Orderable supply ID	Language	
S013T6D	US English	

Entitlement identifier	Description	License option/Pricing metric
S0111R0	RACF Security Server for z/VM	Basic ASC, per Value Unit SW S&S
		Decline SW S&S, No Charge
		SW S&S Registration, No Charge
Orderable supply ID	Language	
S0111HD	US English	
Entitlement identifier	Description	License option/Pricing metric
S0111PZ	Performance Toolkit for VM	Basic ASC, per Value Unit SW S&S
		Multi-Version Measurement S&S, No Charge
		SW S&S Registration, No Charge
Orderable supply ID	Language	
S0111HG	US English	

z/VM 7.2 ordering information

z/VM 7.2 is still available for ordering after the availability of z/VM 7.3. To order z/VM 7.2, see the ordering information in Software Announcement [JP20-0378](#), dated August 4, 2020.

Ordering z/VM 7.3 using the SDO

Starting September 13, 2022, price proposal information is available for z/VM 7.3. Orders for the z/VM 7.3 SDO can be placed beginning on the SDO order activation date of September 13, 2022, and the availability date will be September 16, 2020, or later. If you wish to have that order fulfilled with z/VM 7.3, you will need to specify a customer requested arrival date (CRAD) of September 16, 2022, or later. Orders for version 7.3 may not be scheduled to ship before September 16, 2022, and must be ordered using the z/VM 7.3 SDO packaged offering (5741-A10). 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.

IBM recommends internet delivery. However, if you still require physical media, you can choose DVD.

With the ordering of z/VM 7.3, you will receive a system deliverable DVD or electronic media image containing the program code for z/VM 7.3, an IPLA and License Information Document (LID) one copy of each publication available for z/VM 7.3 as listed in the [Packaging](#) section of this announcement.

Examples

- Example 1. You currently do not have z/VM 7 licensed for any IBM zSystems server within your enterprise. Your engine-based Value Units for licensing z/VM 7.3 (5741-A09) are 0.

If you will be running z/VM 7 (running Linux for IBM Z) on a single server having 2 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-A09.
- Example 2. You currently are licensed for and running z/VM 7 on a single IBM zSystems server with two IFL processors and no standard processors (CPs). Your engine-based Value Units for 5741-A09 are 20.

If you will be adding 2 IFL processors to this IBM zSystems server, the additional z/VM 7 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-A09.

- Example 3. You currently are running z/VM 7 on the IFL processors of a single IBM zSystems server having six standard processors (CPs) and three IFL processors (running Linux for IBM Z). Note that z/VM 7 is not running on any of the standard processors (CPs). Your engine-based Value Units for 5741-A09 are 30.

If you will be adding 2 standard processors (CPs) and 4 IFL processors to this IBM zSystems server, the additional z/VM 7 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-A09.

- Example 4. You currently do not have z/VM 7 licensed for any IBM zSystems server within your enterprise. Your engine-based Value Units for licensing 5741-A09 are 0.

If you will be licensing and running z/VM 7 on the IFL processors of a IBM zSystems server having 2 IFLs, and on another IBM zSystems server within your enterprise you will license and run z/VM 7 on both processor types of a IBM zSystems server having 1 standard processor and 2 IFL processors, the z/VM 7 license capacity to be specified in engine-based Value Units would be $(3 * 10) + (2 * 9)$ or 48 that results in a total of 48 Value Units due to aggregating the licenses within the enterprise.

Support for z/VM 7.3

Program name: z/VM Subscription and Support

Program number: 5741-SNS

Support for z/VM 7 is provided and licensed under the IBM International Agreement for Acquisition of Support (Z125-6011).

This 5741-SNS order establishes entitlement records and also support for z/VM 7.3 for the optional features. If a 5741-SNS order is declined, you will only be entitled to support under the basic warranty for z/VM 7.3 (5741-A09).

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, 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 7 and the priced, optional features of DirMaint, RSCS, RACF, 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 must equal the number of Value Units ordered for the OTC license(s).

National language translation

When you order z/VM 7.3, the national language translation files for message repositories, help files, and other panels or files are included with the system. Messages will no longer be translated into Japanese Kanji. Languages included are American English and uppercase English.

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 7 SDO.

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 7.3 and is based off the z/OS V2.5 level.

- **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 7.3, enabled for use, and is available at no additional charge.

- **OpenExtensions Shell and Utilities**

OpenExtensions Shell and Utilities is included in z/VM 7.3 with no licensing or billing requirements.

- **CMS Utilities**

CMS Utilities is included in z/VM 7.3 at no additional charge.

- **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, and the Performance Toolkit for VM priced optional features for z/VM 7.3**

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

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

z/VM 7.3 (5741-A09) Temporary Use Charge

Entitlement Identifier	Description	License option/Pricing metric
S018CL6	z/VM 7 System Image DVD	On/Off CoD, Temporary Use Charge Processor Day(s)
S018CL2	DirMaint Facility Feature	On/Off CoD, Temporary Use Charge Processor Day(s)
S018CL5	RSCS Feature for z/VM 7.3	On/Off CoD, Temporary Use Charge Processor Day(s)
S018CL4	RACF Security Server for z/VM/	On/Off CoD, Temporary Use Charge Processor Day(s)
S018CL3	Performance Toolkit for z/VM	On/Off CoD, Temporary Use Charge Processor Day(s)

z/VM 7.2 ordering information

z/VM 7.2 is still available for ordering after the availability of z/VM 7.3. To order z/VM 7.2, see the ordering information in Software Announcement [JP20-0378](#), dated August 4, 2020.

Customized offerings

Program deliverables are shipped only through the System Delivery Offering (SDO).

These customized offerings are offered for internet delivery. For more details on Internet delivery, see the [User's guide Internet delivery](#) web page.

IBM recommends internet delivery. However, if you still require physical media, you can choose DVD.

Many programs can be ordered in the SDO on their SDO Order Activation date.

Shopz and CFSW will determine the eligibility based on product requisite checking. For more details on the CBPDO, ServerPac, and SDO, see the [User's guide Product orders](#) web page.

Production of software product orders will begin on the planned availability date.

Terms and conditions

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^(R) Agreement, and the IBM Agreement for Acquisition of Software Maintenance.

Licensing

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.

Software Maintenance

The following agreement applies for Software Subscription and Support Software Maintenance):

- IBM Agreement for Acquisition of Software Maintenance (JNTC-6011)
- IBM Agreement for Acquisition of Software Maintenance (IAAS305 or others)
- Exhibit for IBM Agreement for Acquisition of Software Maintenance (IAAS400)

These programs are licensed under the IBM International 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.

License Information number

Program number	License Information document title	License Information document number
5741-A09	z/VM 7.3	L-GFOD-BZTKZY

Follow-on releases, if any, may have updated terms. See the [License Information documents](#) website for more information.

Limited warranty applies

Yes

Limited warranty

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 about known program defects, defect corrections, restrictions, and bypasses at no additional charge. For further information, see the [IBM Support Guide](#).

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

Program technical support

Continuous delivery (CD) support

Technical support of a program product version or release will be available for a minimum of two years from the planned availability date, as long as your Subscription and Support is in effect.

This technical support allows you to obtain assistance (by telephone or electronic means) from IBM for product-specific, task-oriented questions regarding the installation and operation of the program product. Software Subscription and Support also provides you with access to versions, releases, and updates (CD releases, Long Term Support Releases or fixes) of the program.

You will be notified, through an announcement letter, of discontinuance of support with 12 months' notice.

If you require additional technical support from IBM, including an extension of support beyond the discontinuance date, contact your IBM representative or IBM Business Partner. This extension may be available for a fee.

For additional information about the CD support lifecycle policy, see the [IBM Continuous Delivery Support Lifecycle Policy](#) web page.

For additional information about the IBM Software Support Lifecycle Policies, see the [Standard and enhanced IBM support lifecycle policies](#) website.

Money-back guarantee

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)

No

Passport Advantage applies

No

Usage restrictions

Yes

This offering is subject to usage restrictions.

For any usage restrictions, see the [License Information](#) document.

Software Subscription and Support applies

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 Support Guide](#).

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.

Variable charges apply

No

Educational allowance available

Not applicable.

Sub-capacity pricing terms and conditions

To be eligible for sub-capacity pricing, the machine on which the eligible products are installed and running must be eligible for sub-capacity pricing terms and conditions. Software can be priced at less than full machine capacity for eligible products. Sub-capacity pricing for eligible products is based on the current program pricing methodology, but the number of processors will be determined based on the sum of processors for all partitions where the program is defined (used). To obtain pricing at less than full machine capacity for eligible products, you are required to:

- Install and use, when available, the [IBM License Metric Tool \(ILMT\)](#), which installs with eligible IBM programs.
- Install available updates to the operating system and eligible products such that license use can be accurately managed.
- Determine if the use of sub-capacity pricing results in a reduced requirement for entitlements; you can reallocate the entitlement difference by distributing entitlements across a larger or different set of systems, or reserve them for future growth. There will be no refunds for these freed up entitlements. Subscription, Software Maintenance and support volumes, and entitlements for existing contracts will continue at the same levels as the acquired licenses.

Sub-capacity utilization determination

Sub-capacity pricing for the z/VM operating environment is available to clients running z/VM. Software pricing at less than full machine capacity can provide more flexibility and improved cost of computing as clients manage the volatility and growth of new workloads.

For details on z/VM sub-capacity, see Software Announcement [JP17-0336](#), dated July 17, 2017.

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 System z On/Off Capacity on Demand (JNTC-7883), must be signed prior to use.

Statement of good security practices

IT system security involves protecting systems and information through intrusion 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 completely secure and no single product or security measure can be completely effective in preventing improper access. IBM systems and products are designed to be part of a regulatory compliant, comprehensive security approach, which

will necessarily involve additional operational procedures, and may require other systems, products, or services to be most effective.

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.

Prices

For all local charges, contact your IBM representative.

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