

z/VM and IBM System z ... your path to success



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What is z/VM?

The z/VM® hypervisor offers a base for customers who want to exploit IBM® virtualization technology on one of the industry's best-of-breed server environments, the IBM System z™ family. With System z virtualization, customers can easily create many virtual machines consisting of virtualized processor, communications, memory, networking, and I/O resources. Virtualization technology may help lower your total cost of ownership when deploying new enterprise application workloads. z/VM includes nearly 40 years of innovation and invention.

z/VM Version 5 Release 3 – Enhancements in scalability, security, and virtualization technology

- *Scalability and constraint relief enhancements*
 - *Support for larger Logical Partitions (LPARs) up to 256 GB of real storage (memory) and up to 8 TB¹ of total virtual memory in use by guests*
 - *Up to real 32 processors in a single z/VM image*
 - *Support for the Collaborative Memory Management Assist (CMMA) by which host and guest exchange information to optimize their use and management of memory*
 - *Enhanced memory utilization using Virtual Machine Resource Manager (VMRM) between z/VM and Linux® guests*
 - *Support for the Hyper Parallel Access Volume (HyperPAV) function of IBM System Storage™ DS8000™ series*
 - *Enhanced FlashCopy support allows:*
 - *Specification of up to 12 target minidisks*
 - *Determination of the status of FlashCopy requests*
 - *Exploitation of hardware asynchronous cache destage and discard*
 - *Support for the IBM System Storage SVC Storage Engine 2145 allows Linux on System z guests of z/VM V5 (all releases) to access IBM System Storage disk subsystems, including the DS4000™ series, and OEM SCSI disk devices supported by the SVC*
- *Virtualization technology and Linux enablement*
 - *New guest support for specialty processors, the IBM System z™ Application Assist Processors (zAAPs) and System z9™ Integrated Information Processors (zIIPs) including:*
 - *Simulation support - z/VM can create virtual specialty processors for virtual machines by dispatching the virtual specialty processors on real Central Processors (CPs) allowing users to assess the operational and CPU utilization implications of configuring a z/OS system with zIIP or zAAP processors without requiring the real specialty processor hardware*
 - *Virtualization support - z/VM can create virtual specialty processors for virtual machines by dispatching the virtual specialty processors on corresponding real specialty processors of the same type, which may help improve your total cost of ownership by allowing available zAAP and zIIP capacity not being used by z/OS LPARs to be allocated to a z/VM LPAR hosting z/OS guests running Java™ and DB2® workloads*
 - *Usability enhancements for the virtual switch (VSWITCH) and guest LAN environments including enhanced ease-of-use for Virtual LAN (VLAN) and promiscuous mode configuration changes*
 - *Guest use of Modified Indirect Data Address Words (MIDAWs) to allow more flexibility and performance in certain channel programs as an alternative to data-chained channel-command words (CCWs)*
 - *Guest access to the system ASCII console to facilitate recovery of the guest during an emergency*
 - *Additional enhancements to Small Computer System Interface (SCSI) disk support for Linux users*
 - *Secure Sockets Layer (SSL) server support for additional Linux distributions*

Note:¹ The actual amount of usable real and virtual memory is dependent on the amount of real memory in the z/VM logical partition, the hardware server model, firmware level, and configuration, and the number of guests and their workload characteristics.

- *Network virtualization*
 - *Enhanced ease-of-use for virtual networks*
 - *Enhanced failover support for IPv4 and IPv6 devices*
 - *Virtual IP Address (VIPA) support for IPv6*
 - *VSWITCH support for OSA-Express2 link aggregation for increased throughput and provides more seamless nondisruptive failover in the event that an OSA port in the group becomes unavailable*
- *Security enhancements*
 - *New LDAP server and associated client utilities*
 - *Enhanced system security with support for longer passwords (password phrases)*
 - *z/VM SSL server enhancements designed to help improve security*
 - *Tape data protection with support for encryption*
- *Systems management enhancements*
 - *Enhanced Systems Management API with sockets-based server and new functions to manage virtual machines*
 - *z/VM systems management functions to be performed from the HMC to manage guests without having to establish additional network connections and reducing complex configuration of the system*
 - *New function level for Directory Maintenance Facility (DirMaint™)*
 - *Enhancements to the Performance Toolkit for VM™*
 - *Enhanced guest configuration with a new COMMAND statement*
- *Installation, service, and packaging changes*
 - *Additional DVD installation options*
 - *RSCS repackaged as a priced, optional IPLA feature that can be licensed for IFL and standard processors*
 - *New RACF® Security Server for z/VM*

z/VM Version 5 Release 2 – Enhancements for Virtualization on System z

- *Virtualization technology and Linux enablement:*
 - *Enhanced exploitation of real memory beyond 2 GB*
 - *Enhanced performance of z/VM Control Program (CP) use of SCSI disk I/O*
 - *QDIO efficiency enhancements*
 - *Paging and spooling optimization*
 - *Enhanced FBA emulation, helping to reduce the number of I/O requests to the VM SCSI stack with:*
 - *CP's FBA emulation functions reading CMS I/O buffers more efficiently*
 - *More efficient FBA emulation handling Locate CCWs more efficiently*
 - *More efficient FBA emulation handling the FBA padding function more efficiently*
 - *Definition and operation of Fibre Channel Protocol (FCP)-attached SCSI disks with capacities of approximately 1 TB with the PTFs for APAR VM63700 (Dir-Maint) and VM63664 (DFSMS/VM™)*
 - *SSL server support for additional Linux distributions*
 - *Enhanced performance assist for cooperating z/VM guests using OSA-Express, FCP, and HiperSockets™*
 - *Enhanced systems management APIs for enhanced management of Linux and other guests*
- *Network virtualization and security:*
 - *Improved problem determination for guest LANs and virtual switches*
 - *Enhanced dynamic routing capabilities with new MPRoute server*
- *Technology exploitation:*
 - *Exploitation of selected features of the IBM System z9 Enterprise Class (z9 EC) and the System z9 Business Class (z9 BC):*

- Support for new instructions¹
 - Support for FICON® Express4 (4 Gbps FICON)
 - TCP/IP and guest LAN Support for HiperSockets using IPv6 protocol¹
 - Simplified VLAN management with support for Generic Attribute Registration Protocol (GARP) Virtual Local Area Network (VLAN) Registration Protocol (GVRP)¹
 - Crypto Express2 Accelerator for SSL acceleration
 - Support for OSA-Express2 OSN (OSA for NCP)
 - Enhanced FCP channel utilization and sharing among guests through N-Port ID virtualization (NPIV) support
 - Support for hardware capability to add and delete logical partition (LPAR) names
 - Support for hardware capability to provide up to 60 LPARs on the z9 EC and 30 on the z9 BC
 - Additional exploitation of IBM System Storage DS6000 and IBM System Storage DS8000 series¹
 - Support for Parallel Access Volumes (PAVs) as minidisks¹
 - Systems management:
 - Simplified user administration with the coordination of DirMaint and RACF changes
 - Enhanced DirMaint directory management performance
 - Performance Toolkit for VM to support updated control blocks, new monitor data, and enhanced ease-of-use¹
- Note: ¹ - Requires the PTF for APAR VM63952,
- VM63946 - EREP (V5.1, V5.2)
 - VM63744 - CP (V5.1)
 - VM63722 - CP (V5.1)
 - VM63921 - CMS IOCP (V5.1, V5.2)
 - OA15170 - OSA/SF (V5.1)
 - VM63952 - CP, CMS IOCP, TCP/IP, DirMaint, Performance Toolkit, HCD/HCM, and OSA/SF (V5.2)
- Note: The PTFs for APARs VM63721, VM63743, and CP (excluding VM63952 and VM63784) have been integrated into z/VM V5.2.
- (See z/VM Version 5.2 General Information – GC24-6095)
- z/VM Version 5 Release 1 – Enhancements for Virtualization Capabilities for Linux on System z**
- Engine-based Value Unit pricing and a reduced entry price compared to V4
 - Virtualization technology and Linux enablement:
 - Deployment of a Linux server farm on z/VM using only (SCSI) FCP attached disks
 - Enhanced performance of z/VM CP use of SCSI disk I/O reducing the number of I/O requests to the VM SCSI stack with the PTFs for APARs VM63725 and VM63534:
 - QDIO efficiency enhancements
 - More efficient FBA emulation for reading CMS I/O buffers
 - More efficient FBA emulation of Locate CCWs
 - Definition and operation of FCP-attached SCSI disks with capacities of nearly 1 TB with the PTFs for APARs VM63700 (DirMaint) and VM63664 (DFSMS/VM)
 - Reduced dependence on tape with installation from DVD
 - Capability to swap from faulty disks using the new HyperSwap™ command
 - Enhanced cryptographic performance with PCIX Cryptographic Coprocessor (PCIXCC) support for Linux on System z and z/OS® guests
- To support the z9 EC and z9 BC on z/VM V5.1, and V5.2, the PTFs for the following APARs are required
 - VM63646 - CP (V5.1)
 - VM63784 - CP (V5.1)
 - PK08444 - TCP/IP (V5.1)
 - VM63721 - HCD/HCM (V5.1)
 - VM63869 - HCD/HCM (V5.1)
 - VM63743 - EREP (V5.1)

- Enhanced security with Crypto Express2 guest support for Linux on System z and z/OS
- New systems management API implemented using Version 2 (V2) of the RPC server
- Network virtualization and security:
 - Enhanced network recovery with virtual switch failover support
 - More flexible data transfer with virtual switch exploitation of Layer 2 support for OSA-Express and OSA-Express2 with the PTFs for APARs VM63538 and PQ97436
 - Enhanced authorization for z/VM guest LANs and virtual switches
- Technology exploitation:
 - Support for the z9 EC and z9 BC with the PTFs for APARs VM63646, VM63721, VM63784, PK08444, VM63869, VM63743, VM63946, VM63744, VM63722, VM63921, and OA15170
 - Crypto Express2 Accelerator for SSL acceleration with the PTF for APAR VM63646
 - Support for OSA-Express2 OSN (OSA for NCP)
 - Enhanced FCP channel utilization and sharing among guests through NPIV with the PTF for APAR VM63744
 - Support for hardware capability to provide for up to 60 LPARs on the z9 EC and 30 on the z9 BC
 - Simplified VLAN management with support for GVRP with the PTFs for APARs VM63784 and PK08444
 - Support for the IBM eServer™ zSeries 990 (z990) and zSeries 890 (z890)
 - Greater scalability with up to four Logical Channel SubSystems (LCSSs) on the z990 and up to two on the z890
 - Transparent sharing of spanned internal and external channels across LCSSs
 - Support for the Open Systems Adapter
 - OSA-Express Integrated Console Controller
- Support for OSA-Express2 GbE and 10 GbE
- Support for an increase in the number of TCP/IP stacks to provide additional connections to help enable more virtual machines to be connected to an external network with the PTFs for APARs VM63524 and PQ914215
- Additional security for SCSI devices in a z/VM environment with Linux guests through support of FCP LUN access control with the PTF for APAR VM63328
- Support for up to 24 processors per z/VM image on a z990 server
- Enhancements to Capacity Upgrade on Demand
- Support for FICON Express2 that can double the channel capacity and help increase performance
- Support for FICON Express4 (4 Gbps FICON)
- Support for the DS8000 Series with the PTF for APAR VM63534
- Support for the DS6000 Series with the PTF for APAR VM63535
- Support for use of SCSI disks that support FBA disks of approximately 1 TB (2,147,483,640 512-byte blocks) for CP volumes and approximately 381 GB for CMS and GCS volumes with PTFs for APARs VM63700 (DirMaint) and VM63644 (DFSMS/VM)
- Capability to route IPv6 packets and develop IPv6 applications
- Systems management:
 - Enhanced Performance Toolkit for VM
 - Functional equivalence to the Performance Reporting Facility (PRF)
 - New reports for Linux and for SCSI FCP disks
 - Support for application monitor records for Novell SUSE Linux Enterprise Server (SLES) 9 with the PTF for APAR VM63580

(See z/VM Version 5.1 General Information – GC24-6095)

A solution that builds on z/VM hypervisor strengths

- *Virtualization technology*
- *Guest operating system support*
- *Extensive connectivity options*
- *Linux server consolidation platform*
- *CMS interactive support*
- *Server support*
- *Client/server workstation synergy*
- *Open distributed computing*
- *Ideal Web serving platform*
- *Wide range of environments and applications*

For a complete list of publications available, refer to the z/VM Web site at:

ibm.com/zseries/zvm/library/

z/VM supports a wide range of industry standards

- *Networking protocols and connections, languages, programming and graphical user interfaces (GUI)*
- *POSIX support*
- *FICON and SCSI support*

z/VM manages the enterprise

- *Dynamic system configuration capabilities help reduce planned and unplanned outages*
- *DFSMS/VM provides automated data management for Shared File System (SFS), POSIX Byte File System (BFS) files, and minidisk restructuring*
 - *Provides interfaces for Tivoli Storage Manager™ (TSM) tape library usage*
 - *Allows VSE/ESA™ or z/VSE™ guest access to automated tape libraries containing 3480, 3490, 3590, and 3592 devices*
 - *Support for approximately 1 TB SCSI disks with the PTF for APAR VM63664*
 - *Multi-user tape support with the PTF for APAR VM63746*

- *Tape encryption support for z/VSE guest with the PTF for APAR VM64062*

z/VM embraces the latest technology

z/VM Version 5 Release 3 provides:

- *Support for larger LPARs up to 256 GB of real memory and up to 8 TB of total virtual memory in use by guests*
- *Support for up to 32 real processors in a single z/VM image*
- *Support for the Collaborative Memory Management Assist (CMMA), by which by host and guest exchange information to optimize their use and management of memory*
- *Support for the HyperPAV function of IBM System Storage DS8000 series*
- *Enhanced FlashCopy support that allows :*
 - *Specification of up to 12 target minidisks*
 - *Determination of the status of FlashCopy requests*
 - *Exploit hardware asynchronous cache destage and discard*
- *Support for the IBM System Storage SVC Storage Engine 2145*
- *New guest support for specialty processors, the System z zAAPs and System z9 zIIPs:*
 - *Simulation support - z/VM can create virtual specialty processors for virtual machines by dispatching the virtual processors on real Central Processors (CPs), allowing users to assess the operational and CPU-utilization implications of configuring a z/OS system with zIIP or zAAP processors without requiring the real specialty processor hardware*
 - *Virtualization support - z/VM can create virtual specialty processors for virtual machines by dispatching the virtual processors on corresponding real specialty processors of the same type, which may help improve your total cost of ownership by allowing available zAAP and zIIP capacity that is not being used by z/OS*

LPARs to be allocated to a z/VM LPAR hosting z/OS guests running Java and DB2 workloads

- *Guest use of MIDAWs*
- *z/VM systems management functions to be performed from the HMC to manage guests without having to establish additional network connections and reducing complex configuration of the system*
- *Guest access to the system ASCII console to facilitate recovery of the guest during an emergency*
- *Additional enhancements of SCSI disk support for Linux users*
- *VSWITCH support for OSA-Express2 link aggregation for increased throughput and providing more seamless nondisruptive failover in the event that an OSA port in the group becomes unavailable*
- *Enhanced failover support for IPv4 and IPv6 devices*
- *VIPA support for IPv6*
- *New LDAP server and associated client utilities*
- *Enhanced system security with support for longer passwords (password phrases)*
- *Tape data protection with support for encryption*

z/VM Version 5 Release 2 provided:

- *Enhanced exploitation of real memory beyond 2 GB*
- *Enhanced performance assist for cooperating z/VM guests using OSA-Express, FCP, and HiperSockets*
- *Definition and operation of FCP-attached SCSI disks with capacities of approximately 1 TB with the PTFs for APARs VM63700 and VM63664*
- *Exploitation of selected features of the z9 EC and z9 BC*
 - *Support for new instructions¹*
 - *Support for FICON Express4 (4 Gbps FICON)*
 - *TCP/IP and guest LAN Support for HiperSockets using IPv6 protocol¹*
 - *Simplified VLAN management with support for GVRP[®]*

- *Crypto Express2 Accelerator for SSL acceleration*
- *Support for OSA-Express2 OSN (OSA for NCP)*
- *Enhanced FCP channel utilization and sharing among guests through NPIV support*
- *Support for hardware capability to add and delete LPAR names*
- *Support for hardware capability to provide up to 60 LPARs on the z9 EC and 30 on the z9 BC*
- *Additional exploitation of the IBM DS6000 and DS8000 series¹*
- *Support for Parallel Access Volumes (PAVs) as minidisks¹*

Notes: ¹ - Requires the PTF for APAR VM63952

z/VM Version 5 Release 1 provided:

- *Deployment of a Linux server farm on z/VM using only FCP-attached SCSI disks*
- *Definition and operation of FCP-attached SCSI disks with capacities of nearly 1 TB with the PTFs for APARs VM63700 (DirMaint) and VM63664 (DFSMS/VM)*
- *Reduced dependence on tape with installation from DVD*
- *Enhanced availability by swapping from faulty disks using the new HyperSwap command*
- *Enhanced cryptographic performance with PCIXCC support for Linux and z/OS guests*
- *Enhanced security with Crypto Express2 guest support for Linux on System z and z/OS*
- *Enhanced network recovery with virtual switch failover support*
- *Systems management APIs implemented using Version 2 (V2) of the RPC server*
- *Support for the z9 EC and z9 BC with the PTFs for APARs VM63646, VM63721, VM63869, VM63743, VM63946, VM63744, VM63722, VM63921, and OA15170*
 - *Crypto Express2 Accelerator for SSL acceleration with the PTF for APAR VM63646*

- Support for OSA-Express2 OSN (OSA for NCP) with the PTF for APAR VM63722
 - Enhanced FCP channel utilization and sharing among guests through NPIV support with the PTF for APAR VM63744
 - Support for hardware capability to add and delete LPAR names
 - Support for hardware capability to provide up to 60 LPARs on the z9 EC and 30 on the z9 BC
 - Simplified VLAN management with support for GVRP with the PTFs for VM63784 and PK08444
 - Support for the z990 and z890:
 - Up to four LCSSs on the z990 and up to two on the z890
 - Transparent sharing of spanned internal and external channels across LCSSs
 - Support for the OSA-Express Integrated Console Controller
 - More flexible data transfer with virtual switch exploitation of layer 2 support for OSA-Express and OSA-Express2 with the PTFs for APARs VM63538 and PQ97436
 - Support for OSA-Express2 GbE and 10 GbE
 - Support the increase in the number of TCP/IP stacks with the PTFs for APARs VM63524 and PQ91421
 - Provides additional connections to help enable more virtual machines to be connected to an external network with the PTFs for APARs VM63524 and PQ91421
 - Support for FICON Express2 that can double the channel capacity and help increase performance
 - Support for up to 24 processors per z/VM image on a z990 server
 - Enhancements to Capacity Upgrade on Demand
 - Use of SCSI disks by guests that support FBA disks up to 361 GB in size, without requiring their own SCSI support
 - Support for the IBM DS8000 series with the PTF for APAR VM63534
 - Support for the IBM DS6000 series with the PTF for APAR VM63535
 - Capability to route IPv6 packets and develop IPv6 applications
- z/VM provides support for running Parallel Sysplex system environments**
- z/OS, and z/OS.e Parallel Sysplex® system environments as z/VM guests
 - Virtual Coupling Facility (CF) support:
 - Helps provide faster deployment of new Parallel Sysplex systems through testing with virtual sysplexes
 - Does not require or support real hardware coupling facilities and coupling links
 - Support Coupling Facility duplexing with System z
 - Allows z/VM systems hosting sysplexes to run as second-level (or higher) guests
 - Help reduce risk in running new applications for z/OS or z/OS.e releases
 - Helps reduce problems in scheduling test and production time
 - Helps reduce training expense and risk to production operations through operator training with virtual configurations
 - Provides additional options for disaster recovery
 - z/VM V5 supports the Parallel Sysplex guest environment on all models of the IBM z9 EC, z9 BC, z990, z900, z890, and z800 servers.

z/VM encompasses many uses

- Flexible, cost-effective guest environments
- Well-suited for on demand business
- Consolidation of select UNIX® and Linux workloads onto a single physical hardware server
- Data and application serving for Internet/intranet users
- Rich application development environment

z/VM for On Demand Business

- Access to enterprise data and applications through TCP/IP NFS
- Enterprise Web serving through IBM Business Partner products working cooperatively with z/VM
- Reusable Server Kernel (RSK) for vendors and application programmers to write multithreaded server programs

VM installation and service tools

- Virtual Machine Serviceability Enhancements Staged/Extended (VMSES/E) available for:
 - Installation of z/VM, IBM Licensed Products, and vendor products in VMSES/E format
 - Allows the service disks of the z/VM components to reside in SFS
 - Application of z/VM service
 - CORrective service (COR)
 - Recommended Service Upgrades (RSU)
- z/VM installation and service available on CD-ROM (except with V5.2 and later)
- Installation available on 3590-formatted tapes and DVD on V5.2 and later
- Order z/VM products and service using ShopzSeries
 - Internet delivery of z/VM SDO licensed products

To learn more about ShopzSeries:

ibm.com/software/ShopzSeries/

CMS application multitasking

- Applications can be divided to handle work in parallel
- Application throughput can be improved
- POSIX exploits CMS multitasking
- CMS Pipelines support the use of CMS multitasking

CMS Pipelines

- Programmer productivity tool for simple creation of powerful, reusable REXX and Assembler programs and Common Gateway Interface (CGI) scripts for Web servers

Data-in-memory exploitation

- Virtual disk in memory provides fast access to data in memory
- Minidisk cache boosts performance with cache in main and/or expanded storage (memory)
- VM Data Spaces allow applications in virtual machines to create additional VM data spaces of 2 GB, up to 2 TB total

Callable Services Library (CSL)

- Enhanced application development productivity
- REXX and other high-level languages can use z/VM services, such as requesting Shared File System functions
- Interfaces to use VM data spaces
- Interfaces to POSIX functions for CMS users and applications

CMS Binder/Loader for z/VM

- Enhanced application affinity between CMS, z/OS, or z/OS.e
- The CMS binder
 - Creates and utilizes data spaces if the user is authorized
 - Converts object or load modules, or program objects, into a program object and stores the program object in a partitioned data set extended (PDSE) program library
 - Converts object or load modules, or program objects, into a load module and stores the load module in a partitioned data set (PDS) program library
 - Converts object or load modules, or program objects, into an executable program in virtual memory and executes the program
- The CMS loader
 - Increases the services of the program fetch component by adding support for loading program objects
 - Reads both program objects and load modules into virtual storage and prepares them for execution

VMLINK

- User productivity enhancer for linking minidisks and SFS directories
- Rewritten for enhanced serviceability in z/VM

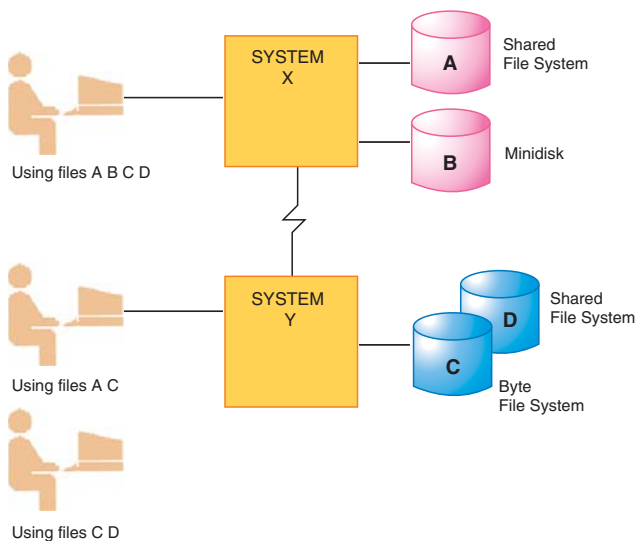
ibm.com/eserver/zseries/zvm

VM Data Spaces are designed to:

- Offer capabilities unique to System z family
- Provide high speed transfer and data access between virtual machines, helping to improve throughput and response times
- Allow applications to address multiple 2 GB data spaces
- Support data sharing between a server and multiple users
- Provide an application programming interface and Callable Services Library routines, exploited by DB2® for VSE and VM, SFS and FORTRAN to help
 - Enable customers and vendors to develop applications using VM Data Spaces
 - Make development process easier

z/VM Shared File System (SFS) is designed to:

- Allow read/write sharing at the file level
 - Provide sharing within one system or across multiple systems
 - Provides file security through authorization mechanism
- Improve performance
 - Utilizes minidisk caching in main or expanded storage memory
 - Exploits VM Data Spaces



- *Improve usage of disk storage devices*
 - *Store data stored in file pools*
 - *Provides logical vs. physical allocation of data blocks*
 - *Makes unused blocks available to any user of file pool*
- *Improve productivity*
 - *Organizes files in hierarchical directories*
 - *Supports aliases for file names*
 - *Provides single application interface via CSL routines for SFS and minidisk data*
- *Simplify system administration*
 - *Provides file pool backup and file-level restore*
 - *Provides dynamic expansion of file space for users*
 - *Provides dynamic expansion of DASD to file pool*
 - *Allocates file pool DASD space vs. individual minidisks*
 - *Allow the same administration tools to be used for POSIX hierarchical byte file system files*
- *Use Coordinated Resource Recovery*
 - *Coordinates updates to multiple file pools*
 - *More easily developed distributed applications, with system coordination of data integrity*
- *Enable access to distributed data*
 - *Transparent access to remote data*
- *Allow CMS users and applications to access the POSIX hierarchical byte file system*
- *Shuts down automatically when the z/VM Control Program (CP) is shutdown*

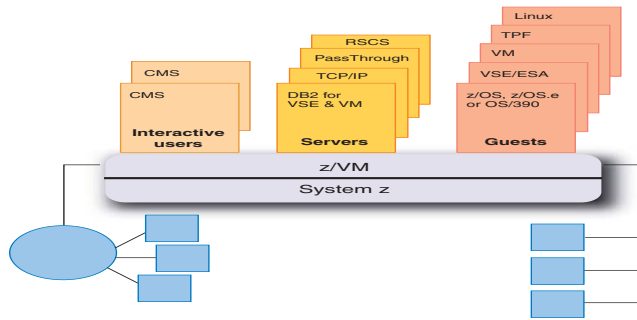
DFSMS/VM is designed to:

- *Provide automated space management*
 - *Space management for Shared File and Byte File System files*
 - *Migration, recall and expiration of active and inactive data*
 - *Archive/restore of SFS files to tape with Tivoli Storage Manager*
- *Provide a high-performance data mover*
 - *Enables fast migration to new storage devices*
 - *Near 1 TB SCSI disk support*
- *Include Interactive Storage Management Facility (ISMF)*
 - *Provides consistent interface for VM, z/OS or z/OS.e storage administrators*
 - *Assists in managing minidisk data*
- *Manage IBM TotalStorage Virtual Tape Server (VTS) 3494 tape libraries containing 3480, 3490, 3590, and 3592 drives*
 - *Includes support for Write Once Read Many (WORM) data cartridges*
- *Provide the capability for a tape-librarian product to communicate with an automated tape library*
- *Provide ATL access for VSE guests*
- *Provide multi-user attach support allowing z/VM to be installed from 3490 tapes residing in an ATL (requires the PTF for APAR VM63746)*
- *Provide tape encryption support for z/VSE guests with the PTF for VM64062*
- *Be orderable as a no-charge feature with the z/VM V5 SDO*

ibm.com/eserver/zseries/zvm/related/dfsms/

Guest Operating System Support

The z/VM hypervisor concurrently supports many different virtual machines, each running its own operating environment (“guest” operating system) with security and isolation features.



Linux on System z potential guest benefits

- Consolidation of Linux workloads on a single physical hardware server
 - Allows multiple Linux images on a z/VM system running IFLs processors without affecting IBM software charges for existing System z standard processors in the same hardware server
- Enhanced exploitation of real memory beyond 2 GB
- Support for the Collaborative Memory Management Assist (CMMA), by which host and guest exchange information to optimize their use and management of memory
- Enhanced memory utilization using VMRM between z/VM and Linux
- Shared disk resources creating a server farm within a single machine
- More Linux images operating concurrently with reduced contention on the VM scheduler lock for better performance
- High-performance networking among virtual machines
- Enhanced operation and support for additional Linux distributions with upgraded SSI server
- Support for OSA-Express2 OSN (OSA for NCP)
- Enhanced performance assists for cooperating z/VM guests using OSA-Express, FCP, and HiperSockets
- Enhanced problem determination for guest LANs and virtual switches
- VSWITCH support for IEEE 802.3ad link aggregation and failover support
- Guest support for dedicated QDIO devices (HiperSockets, OSA-Express, and FCP channels)
- Attachment of SCSI devices using the System z FCP feature of all FICON Express adapters
 - Point-to-Point Fibre Channel links
 - Dynamically-determined preferred paths for emulated FBA devices (EDEVICs) on SCSI disks in an IBM System Storage DS6000
 - Faster formatting of EDEVICs on SCSI disks
 - Display of additional SCSI device characteristics
 - Guest IPL from SCSI FCP disks on servers equipped with the SCSI IPL Feature Enabler
 - Deploy a Linux server farm on z/VM using only SCSI FCP disks
 - Enhanced performance of z/VM Control Program (CP) use of SCSI disk I/O
 - Enhanced FCP channel utilization and sharing among guests with NPIV support
- Support for the IBM System Storage SVC Storage Engine 2145 allows Linux on System z guests of z/VM V5 (all releases) to access IBM System Storage disk subsystems, including the DS4000 series, and OEM SCSI disk devices supported by the SVC. SCSI disk devices supported as emulated FBA devices for use by CP and guest operating systems is provided for z/VM V5.3 and z/VM V5.2 (with the PTF for APAR VM64128).
- z/VM HyperSwap function to help provide a coordinated near-continuous availability and disaster recovery solution for distributed applications, such as WebSphere®, that can span z/OS images running natively and Linux guests running under z/VM
- Publication for deploying Linux on System z with z/VM
- Performance Toolkit enhancements to add new high-level Linux reports and monitor records
- Simplified systems management using facilities provided by z/VM
- Systems management API for client applications to allocate and manage resources for virtual machines
- z/VM systems management functions to be performed from the HMC to manage guests without having to

establish additional network connections and reducing complex configuration of the system

- *Handling of unexpected workload growth by the quick addition of Linux virtual machines as needed*
- *Enhanced device support, such as virtual disks and peer-to-peer remote copy for Linux systems*
- *More flexible data transfer with virtual switch exploitation of Layer 2 support for OSA-Express and OSA-Express2*
- *Increased number of TCP/IP stacks*
- *With corresponding function from Linux on System z, Linux guest virtual machines may benefit from:*
 - *Enhanced page-fault handling*
 - *Guest support for the IBM PCI Cryptographic Coprocessor (PCICC) or the IBM PCI Cryptographic Accelerator (PCICA)*
 - *Dedicated-queue and shared-queue support for clear-key cryptographic functions*
 - *Guest support for the PCIX Cryptographic Coprocessor (PCIXCC) feature*
 - *Dedicated-queue and shared-queue support for clear-key cryptographic functions*
 - *Guest support for the Crypto Express2 feature (coprocessor and accelerator)*
 - *Dedicated-queue and shared-queue support for clear-key cryptographic functions*
- *Enhanced disk-access performance with minidisk cache*
- *Facilities to back up all Linux data providing a single backup solution for all Linux servers*
- *Strong tracing, diagnostic and debugging facilities*
- *Access to a large number of Linux applications*

z/VSE and VSE/ESA potential guest benefits

- *A state-of-the-art platform for combining the best of VSE core applications with new workloads that exploit Linux on System z*
- *Outstanding operational flexibility, simplicity, and productivity:*
 - *Multiple specialized VSE guests for test, development, and release-to-release transition*

- *Multiple production VSE guests for system simplicity*
- *Integration of VSE and Linux guests for server consolidation and new workloads, including WebSphere Application Server*
- *Improved performance with:*
 - *Virtual disk-in-memory exploitation, for example, shared lock file*
 - *Minidisk caching in expanded and main storage (memory)*
 - *DB2 for VSE & VM data sharing for enhanced performance*
 - *IBM TotalStorage Virtual Tape Server 3494 automated tape library access*

z/OS and z/OS.e potential guest benefits

- *Parallel Sysplex support for guests within a single VM image*
 - *Virtual Coupling Facility support to allow z/VM systems to run as first or second-level, or higher guests while simulating complete z/OS and/or z/OS.e coupled sysplexes*
- *Testing environment for deploying applications on simulated zAAP and zIIP specialty processors*
- *Testing environment for deploying applications on real zAAP and zIIP specialty processors*
- *Modified Indirect Data Address Words (MIDAWs) to allow more flexibility and performance in certain channel programs as an alternative to data-chained channel-command words*
- *z/VM HyperSwap function to help provide a coordinated near-continuous availability and disaster recovery solution for distributed applications, such as WebSphere, that can span z/OS images running natively and Linux guests running under z/VM*
- *Guest support for the PCICA feature*
 - *Dedicated-queue support for clear-key cryptographic functions*
- *Guest support for the PCICC feature*
 - *Dedicated-queue support for clear-key and secure-key cryptographic functions*

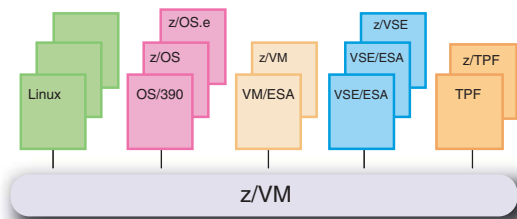
Performance

- Guest support for the PCIXCC feature
 - Dedicated-queue support for clear-key and secure-key cryptographic functions
- Guest support for the Crypto Express2 feature (coprocessor and accelerator)
 - Dedicated-queue support for clear-key and secure-key cryptographic functions
 - Guest support for Parallel Access Volumes (PAVs)

Support for z/Architecture and ESA/390-mode operating systems

- Performance assist support
 - Adapter interruption performance assist for QDIO¹
 - QDIO Enhanced Buffer State Management (QEBSM) and Host Page Management Assist (HPMA)²
- Potential for hundreds to thousands of guests for migration, testing, production, and development
- Virtual device support
- Shared and dedicated resources
- Memory-management assist
- Debugging and trace facilities for guest systems
- 64-bit guest operating systems including z/OS, z/OS.e, z/VSE and Linux on System z

Notes:



1) This performance assist is available only on the z9 EC, z9 BC, z990, and z890.

2) QEBSM and HPMA are supported by z/VM V5.2 and later releases and are exclusive to the z9 EC and z9 BC.

Note: z/OS.e is available only in LPAR mode on the z9 BC, z890 or z800 and must run in a logical partition, either alone or as a guest of z/VM. You may not run z/OS as a guest of a z/VM system in which z/OS.e is also a guest per licensing agreements of z/OS.e.

z/VM offers many features that can help improve performance. A number of these features work by keeping frequently used data in memory, thus significantly reducing repeated I/O for the same data. The reduction in I/O can result in faster response times, improved processor efficiency and reduced load on the I/O subsystem. Minidisk caching and virtual disk in storage are two examples of the use of data-in-memory techniques in z/VM.

The degree of benefit varies with the frequency of system workload I/O that applies to these techniques, data-reference patterns, disk configuration, memory availability, and other factors.

To learn more about z/VM performance:

ibm.com/eserver/zseries/zvm/perf/

Connectivity Options

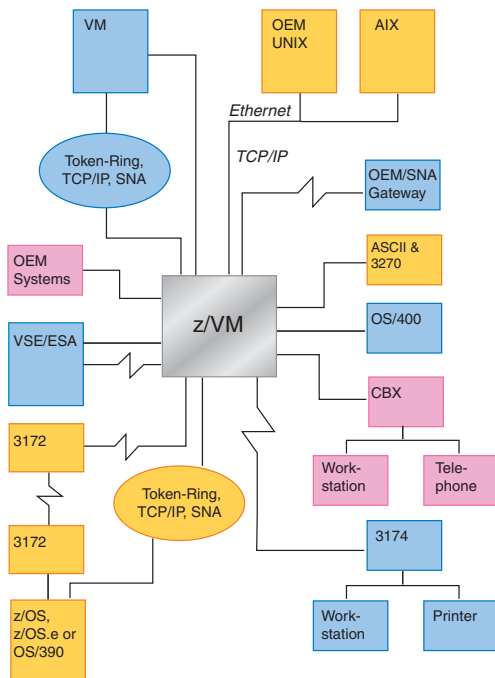
Networking options

z/VM provides a wide range of networking and connectivity options and adheres to many of the industry standards, enabling communications across distributed heterogeneous environments. Examples include:

- SNA
- BSC
- TCP/IP
- X.25
- Token-Ring
- Ethernet (GbE, 10 GbE, and 1000BASE-T)
- X-Windows
- Network File Systems
- Simple Mail Transfer Protocol
- IP Multicast
- X.400 mail exchange protocol
- NJE

Network management

- SNA and TCP/IP networks



Communication Products

TCP/IP for z/VM V5.3 (Level 530)

- All functions available in TCP/IP for z/VM for z/VM V5.2 plus:
 - z/VM SSL server support for additional Red Hat and Novell SUSE Linux distributions
 - Enhanced ease-of-use for virtual networks
 - Enhanced failover support for IPv4 and IPv6 devices
 - Virtual IP Address (VIPA) support for IPv6
 - New LDAP server and associated client utilities
 - Enhanced security with the z/VM SSL server

Note: Operates with z/VM V5.3

TCP/IP for z/VM V5.2 (Level 520)

- All functions available in TCP/IP for z/VM for z/VM V5.1 plus:
 - SSL server support for Red Hat and additional SUSE Linux distributions
 - Enhanced problem determination for guest LANs and virtual switches
 - Enhanced dynamic routing capabilities with a new MPRoute server
 - TCP/IP and guest LAN Support for HiperSockets using IPv6 protocol with the PTF for APAR VM63952
 - Simplified VLAN management with support for GVRP with the PTF for APAR VM63952

Note: Operates with z/VM V5.2

TCP/IP for z/VM V5.1 (Level 510)

- All functions available in TCP/IP for z/VM Level 440 plus:
 - Enhanced virtual switch support to provide failover support which can provide less disruptive recovery from some common network failures
 - More flexible data transfer with virtual switch exploitation of Layer 2 support for OSA-Express and OSA-Express2 with the PTFs for APARs VM63538 and PQ97436

- Support the increase in the number of TCP/IP stacks with the PTFs for APARs VM63524 and PQ91421 to provide additional connections to enable more virtual machines to be connected to an external network
- Enhanced authorization capabilities for z/VM guest LANs and virtual switches by RACF or any External Security Manager that supports this new authorization function.
- IPv6 support to allow the z/VM TCP/IP stack to be configured for IPv6 networks connected through OSA-Express and OSA-Express2 operating in QDIO mode
- Simplified VLAN management with support for GVRP with the PTFs for APARs VM63784 and PK08444

Note: Operates with z/VM V5.1

(See z/VM TCP/IP User's Guide – SC24-6127)

To learn more about TCP/IP for z/VM:

ibm.com/eserver/zseries/zvm/related/tcpip

ACF/VTAM Version 4 Release 2 for VM/ESA

- Enhanced growth and constraint relief
- Increased number of users connected to a single VTAM® image
- Larger, more functional, less complex networks
- APPN® capability
- Low End Networking (LEN) communications to all nodes
- Better interconnection with multivendor networks
- Increased performance for on-line transaction processing
- Enhanced client/server access
- More flexible access to applications and resources across multiple platforms

(See VTAM V4.2 for VM/ESA Release Guide – GC31-8089)

ibm.com/software/network/vtam

RSCS FL530 optional feature of z/VM (V5.3 only)

- All functions available with RSCS Version 3 Release 2 plus:
 - Repackaged as a priced, optional IPLA feature for operation on IFL and standard processors
 - Dynamic command authorization support eliminating the need to re-cycle RSCS when changing system and link authorizations

ibm.com/eserver/zseries/zvm/related/rscs

RSCS Version 3 Release 2 (V5.1 and V5.2)

- Provides unsolicited File Transfer (UFT) client and daemon support
- Processes NJE data traffic over TCP/IP, SNA, Bisynchronous, or directly-attached systems (CTCA, ESCON® and FICON)
- Provides print support to TCP/IP printer daemon in text and PostScript format
- Supports ASCII printers attached to protocol converters or by TCP/IP connection
- Enables RSCS server to be the z/VM daemon to the TCP/IP world
- Enables the z/VM printer daemon to access any printer attached directly or indirectly to the NJE or TCP/IP network
- Provides API interface to code your own device drivers for RSCS
- Is easy to customize, maintain and use

(See VM RSCS General Information Guide – GH24-5218)

ibm.com/eserver/zseries/zvm/related/rscs

VM/Pass-Through Facility Version 2

- *Multisession support for CMS and dialed users*
- *Auto sign-on support*
- *FICON Express4, FICON Express2, FICON, ESCON, TCP/IP, APPC, IUCV, CTCA, 3088, Binary-synchronous connectivity options*
- *Gateway access to SNA network*
- *Connectivity to other VM, z/OS, z/OS.e, VSE, z/VSE and AIX® systems*
- *Automated session operations*
- *Transparent, seamless solutions for end-users*
- *Sharing a single session among multiple workstations*
- *Help with low-cost workstation support for VSE guest virtual machines*
- *Screen-capture capabilities*
- *Direct support for SDLC terminal control units*
- *Cross-system IUCV support provides communications path for applications on separate VM systems to use IUCV protocols*

(See VM/Pass-Through Facility Users Guide – SC24-5555)

ibm.com/eserver/zseries/zvm/related/pvm

VM has multiple offerings that enable the end user to transform business data into timely and accurate business decisions.

DB2 Server for VSE & VM

- *Can help improve productivity with Stored Procedures*
- *Exploits DRDA® 2 in application server for accessibility to data on local or remote systems*
- *DB2 access over a TCP/IP network from DRDA requesters*
- *Increased database availability with Incremental Archive*
- *Optional QMF™ and QMF for Microsoft® Windows® features*
- *Enables database switching*
- *Allows multiple read-only users access to all data*
- *Provides VM database access from VSE system*
- *Recovery of databases at the table and storage pool level*
- *Supports VM Data Spaces*
- *Optional database administration feature*

(See DB2 Server for VSE & VM Overview – GC09-2995)

ibm.com/software/data/db2/vse-vm/

Query Management Facility (QMF) Feature

- *Provides easy-to-use workstation GUI interfaces*
- *Powerful query and report writer for DB2 data*
- *Client/server capabilities for the workstation environment*
- *Processes both relational and non-relational data*
- *Connect to DB2 for Linux on System z as an application server*

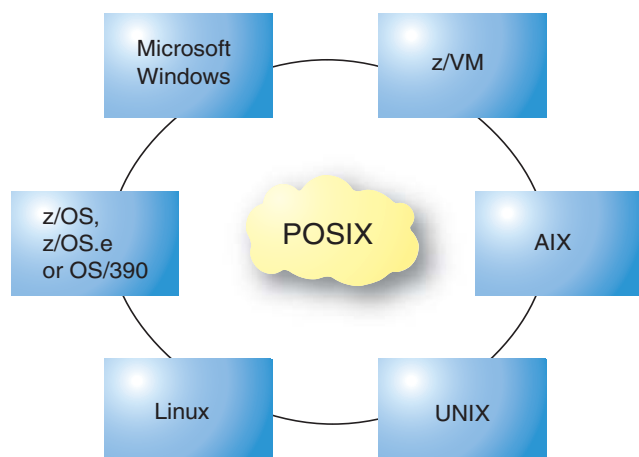
(See Using QMF 7.2 – SC27-0716, and QMF 7.2 Reference Guide – SC27-0715)

ibm.com/software/data/qmf/

POSIX standards

- *Extend portability and provides standards-based application-development services*
- *Define basic operating-system interfaces and behavior*
- *POSIX 1003.1c threads – Provide a general set of services for developing multitasking server applications that support multiple, concurrent execution streams*
 - *POSIX 1003.1c*
 - *POSIX 1003.1 and POSIX 1003.1a*
 - *POSIX 1003.2 – Shell and Utilities*
- *POSIX hierarchical byte file system support by CMS and SFS enables access by heterogeneous systems across LANs and WANs*

(See z/VM OpenExtensions Users Guide — SC24-6108)



Notes:

- 1) *The OpenExtensions Shell and Utilities is packaged with z/VM at no additional charge*

Performance Toolkit for VM FL530 optional feature of z/VM

Provides enhanced capabilities for a z/VM systems programmer, operator, or analyst to monitor and report performance data:

- Full-screen-mode system-console operation
- Management of multiple z/VM systems (local or remote)
- Post-processing of Performance Toolkit for VM history files and of VM monitor data captured by the MONWRITE utility
- Performance monitoring
- Viewing of performance monitor data using either Web browsers or PC-based 3270 emulator graphics
- TCP/IP performance reporting
- Processing of Linux performance data obtained from RMF™ which can be viewed and printed similar to the way VM data is viewed and presented
- Reporting for Linux and SCSI FCP disks
- Performance Toolkit server does not have to be shut down and restarted when adding new VM systems within the enterprise for performance-data retrieval
- Support for passphrases when accessing the Performance Toolkit's Web interface
- Change the service process for the Performance Toolkit from a full-part replacement MODULE to service by individual object parts, reducing the size of the service deliverable
- New or updated displays and reports to support new V5.3 functions
- Functional equivalence to PRF and RTM

(See z/VM: Performance Toolkit for VM - SC24-6136 for V5)

ibm.com/eserver/zseries/zvm/perf/toolkit

Directory Maintenance (DirMaint) FL530 optional feature of z/VM V5.3

- *Reduces indefinite wait times when a DATAMOVE machine cannot access all required resources for a DASD management function*
- *Provides a security-rich interactive facility for maintaining the system directory*
- *Simplified user administration with the coordination of DirMaint and RACF changes with z/VM V5.2 and later*
- *Enhanced directory management performance with z/VM V5.2 and later*
- *Provides distributed administration*
- *Provides commands and exits to support new functions*
- *Supports Systems Management APIs*
- *Supports the Shared File System*
- *Enables VMSES/E installation and service*

(See DirMaint Facility Tailoring and Administration Guide — SC24-6135)

ibm.com/eserver/zseries/zvm/related/dirmaint

Resource Access Control Facility (RACF) Security Server FL530 optional feature (z/VM V5.3 only)

- *Includes function of the RACF for z/VM optional feature plus:*
- *Interoperates with the new z/VM V5.3 TCP/IP LDAP server*
- *Supports mixed-case passwords and passwords that are longer than eight characters, called password phrases (also known as passphrases)*
- *Release-specific priced, optional feature, operating only with z/VM V5.3*

(See z/VM: RACF Security Server General User's Guide — SC24-6146)

RACF for z/VM optional feature (z/VM V5.1 and V5.2)

RACF helps meet the need for security by providing:

- *Flexible control of access to protected resources*
- *Protection of installation-defined resources*
- *Ability to store information for other products*
- *Choice of centralized or decentralized control of profiles*
- *Designed to provide transparency to end users*

Note: Operates on V5.1 and V5.2

(See RACF General Information — GC28-0722)

ibm.com/eserver/zseries/zos/racf/vm.html

CMS Utilities Feature (CUF)

- *Integrated into z/VM Version 4 at no additional charge*
- *Complements the CMS interactive support*
- *Can increase the productivity of your local operations*
 - *Provides tools and services that simplify and enhance the operation of CP and CMS environments for end users and application developers*
 - *Provides fully-supported commands, EXECs and applications that would otherwise need to be created locally*
 - *ACCOUNT updates to recognize specialty processors*

ibm.com/eserver/zseries/zvm/related/cuf

Host Management Facilities/VM

- Monitors subsystems and applications to help reduce outages
- Coordinates and simplifies performance analysis
- Enables increased console automation
- Manages local and remote systems
- Enables automation of subsystem and application management
- Enables VMSES/E installation and service

(See Host Management Facilities/VM General Information Manual – SC24-5612)

ibm.com/eserver/zseries/zvm/related/hmf

Additional Product Information

For additional information on the many z/VM technology-related products from IBM and independent software vendors, visit the z/VM Web site at:

ibm.com/eserver/zseries/zvm/products/

Partitioning Options

Virtual	Logical
Number of Images	
Many	15 - 60 ¹
Performance	
– Adapter-interruption performance assist for QDIO ³ - high performance for V=V guests using QDIO (HiperSockets, OSA-Express, and FCP)	
– QDIO performance assists ⁴ (QEBSM, and HPMA - high performance for V=V guests using QDIO (HiperSockets, OSA-Express, and FCP)	
Resources	
– Dedicated or shared processors, memory and devices	– Dedicated or shared processor
– Virtual devices	– Dynamic memory reconfiguration
	– Dedicated channels, CUs and devices ²

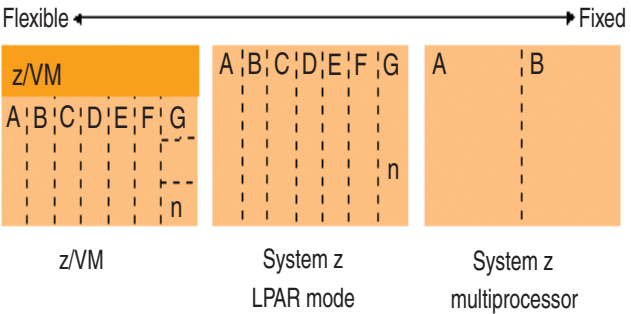
Support Requirements

Hardware and Software	Hardware
-----------------------	----------

Reliability

Hardware and Software	Hardware
-----------------------	----------

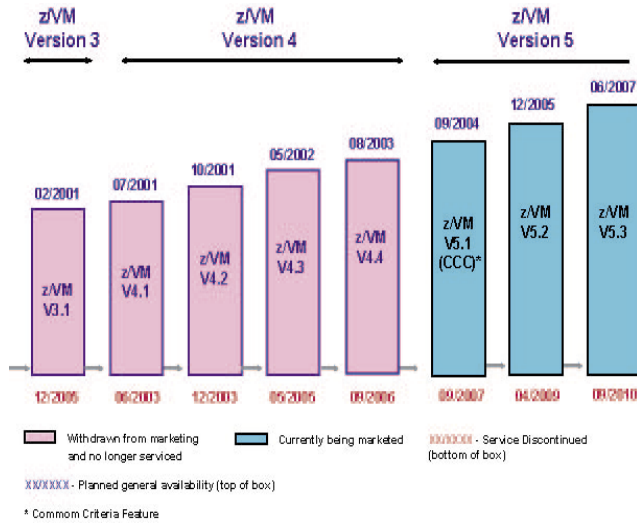
1. Server-dependent (up to 15 on z900 and z800, up to 30 on the z9 BC, z990 or z890, and up to 60 on the z9 EC servers.
2. Channels (except parallel) may be shared on System z and S/390 servers using the Multiple Image Facility (MIF).
3. Adapter-interruption performance assist is available only on z9 EC, z9 BC, z990, and z890 servers;
4. QEBSM and HPMA are available only on z9 EC and z9 BC servers.



VM Evolution

- z/VM Version 5 supports the z9 EC, z9 BC, z990, z890, z900, and z800 (standard, IFL zAAP, and zIIP processors) in z/Architecture mode.

Note: For information on versions of VM prior to z/VM V5, refer to the z/VM Reference Guide GM13-0137.



VM Operating System Comparison

VM Function	z/VM V4 ²⁴	z/VM V5
Function		
Shared File System	•	•
Callable Services Library	•	•
Cross Systems Extensions	•	•
Virtual disk in memory	•	•
Enhanced minidisk cache	•	•
370 accommodation	•	•
CP Exit Facility	•	•
Parallel Sysplex simulation	•	•
Coupling Facility duplexing ³	•	•
HiperSockets ³	•	•
IPv6 HiperSockets ^{7,8}	-	•
GVRP Support ^{6,8}	-	•
Guest LAN ³	•	•
Guest LAN Sniffer ⁷	-	•
MPRoute Server ⁷	-	•
Shared tape for guests ⁴	•	•
Accounting enhancements	•	•
Systems management APIs ⁵	•	•
HMC integrated systems management ⁹	-	•
VMRM enhancements ⁵	•	•
Virtual LAN ⁵	•	•
Virtual (VSWITCH) ⁵	•	•
VSwitch support for link aggregation ⁹	-	•
HCM and HCD ⁵	•	•
MQ Interface Client	•	•
PCIX Cryptographic Coprocessor ⁶	-	•
Crypto Express2 ⁶	-	•
LDAP server and client utilities ⁹	-	•
Password phrases (Passphrases) ⁹	-	•
Dynamic Virtual Machine Timeout ⁶	-	•
VMRM enhancements for memory management of Linux guests ⁹	-	•
CMMA ⁹	-	•
Guest ASCII console ⁹	-	•
Enhanced virtual network management providing SNMP data ⁹	-	•
Enhanced failover support for IPv4 and IPv6 devices ⁹	-	•
VIPA support for IPv6 ⁹	-	•
Storage Relief below 2 GB ⁷	-	•
LPARs up to 256 GB ⁹	-	•
Up to 32 real processors per LPAR ⁹	-	•
Central Storage (Memory)		
32 GB (z890 and z800)	•	•
64 GB (z900)	•	•
64 GB (z9 BC)	•	•
256 GB (z990)	•	•
512 GB (z9 EC) ⁵	•	•
Expanded Storage (Memory)		
Paging	•	•
Guest	•	•
VM Data Spaces	•	•
Virtual Machine Size		
256 GB ¹	•	•
1 TB ^{9,25}	-	•

VM Function	z/VM V4 ²⁴	z/VM V5
I/O		
FICON/ESCON I/O	•	•
FICON CTCA ³	•	•
FICON Express2	•	•
FICON Express4	•	•
Parallel Access Volumes (PAVs) as minidisks ⁵	-	•
Virtual FICON CTCA ⁵	•	•
Cascaded FICON Directors ⁵	•	•
Guest use of FCP ⁴	•	•
Guest use of emulated SCSI FCP disks ⁵	-	•
CP use of SCSI FCP disks ²²	-	•
N-Port Identifier Virtualization ²³	•	•
Guest use of MIDAWs ⁹	-	•
Logical Channel SubSystems ⁵	•	•
HyperSwap ⁶	-	•
OSA-Express OSN ⁷	-	•
Guest Operating System		
S/370™ architecture	•	•
370-XA architecture	•	•
ESA/390 architecture	•	•
z/Architecture	•	•
Performance Assists		
I/O Assist ^{2,20}	•	•
Adapter interruption performance assist for QDIOAssist ^{5,21}	•	•
QEBSM and HPMA ^{7,21}	-	•
Systems Supported		
G5/G6 Servers [#]	•	-
zSeries 800/890/900/990 Servers [#]	•	•
System z9 EC/z9 BC ⁵	•	•
IFLs	•	•
zAAPs ⁹	-	•
zIIPs ⁹	-	•

Legend

- 1 Pageable guests only
- 2 The sum of memory for each of the preferred guests plus the memory required for the VM Control Program cannot exceed 2 GB
- 3 Supported on z/VM V4.2 and later
- 4 Supported on z/VM V4.3 and later
- 5 Supported on z/VM V4.4 and later
- 6 Supported on z/VM V5.1 and later
- 7 Supported on z/VM V5.2 and later
- 8 Requires PTF for VM63952 on z/VM V5.2
- 9 Supported on z/VM V5.3 and later
- 20 I/O - assist is not available when z/VM is running in a logical partition. z/VM must be run in a logical partition on the z890, z990, z9 EC and z9 BC.
- 21 Adapter-interruption performance assist is available only on z9 EC, z9 BC, z990, and z890 servers; QEBSM and HPMA are available only on z9 EC and z9 BC
- 22 For installation, IPL, and operation of z/VM V5
- 23 z/VM V4.4, and V5 enables guest use of NPIV when FCP subchannels are dedicated to a guest. V5 provides for CP use of NPIV
- 24 Withdrawn from Marketing effective 3/31/06 (Discontinuance of Service 9/2006)
- 25 Supported on the z9 EC and z9 BC
- Supported
- Not applicable
- # No 370-mode execution

VM Feature Comparison

VM Function	z/VM V4 ²¹	z/VM V5
REXX Sockets	•	•
31-bit CMS	•	•
CMS Pipelines	•	•
CMS multitasking	•	•
Reusable Server Kernel	•	•
POSIX	•	•
DCE	-	-
Binder/Loader	•	•
NFS Client	•	•
APPC	•	•
Shared File System	•	•
VM Data spaces	•	•
Common SFS and minidisk interface	•	•
POSIX Byte File System	•	•
Automated SFS shutdown ⁵	•	•
DFSMS/VM		
Fast data mover	•	•
Space management by policy	•	•
Automated tape library support	•	•
Operational Enhancements		
Simplified system configuration	•	•
Alternate nucleus	•	•
Fast warm start	•	•
Fast spool backup (SPXTAPE)	•	•
GVRP support ^{6,8}	-	•
IPv6 HiperSockets ^{7,8}	-	•
Improved VMRM enhancements for memory management for Linux guests ^{7,9}	-	•
Support for CMMA ⁹		
Dynamic system configuration	•	•
Enhanced timer management ⁴	•	•
Virtual Machine accounting enhancements ⁴	•	•
Systems management APIs ⁵	•	•
HCD and HCM ⁵	•	•
HMC integrated systems management ⁹	-	•
VM Resource Manager ⁴	•	•
Automated shutdown ⁴	•	•
Installation from DVD	-	•
Guest ASCII console ⁹	-	•
Password phrases (Passphrases) ⁹	-	•
Dynamic LPAR addition/deletion	•	•
DirMaint performance improvement ⁷	-	•
Coordinated DirMaint/RACF changes ⁷	-	•
Serviceability enhancements	•	•
VMSES/E	•	•
ShopzSeries	•	•
ESCON Architecture	•	•
FICON Architecture	•	•
Fibre Channel Protocol⁴	•	•
Device Support		
FBA DASD	•	•
TotalStorage ESS	•	•
System Storage DS4000	-	•
System Storage DS6000	•	•
System Storage DS8000	•	•
System Storage FlashCopy V2 ³	•	•
System Storage PPRC V2 ^{3,20}	•	•
Parallel Access Volumes (PAVs) as minidisks ^{7,8}	-	•
HyperPAV ⁹	-	•
SVC Storage Engine 2145	-	•
RAMAC® DASD Subsystem	•	•

VM Function	z/VM V4 ²¹	z/VM V5
RAMAC Array Sub System	•	•
3390 DASD	•	•
3990 Model 6 MPLF Support	•	•
9340 DASD Subsystem	•	•
3494 Tape Library Subsystem	•	•
3495 Tape Library Dataserver	•	•
3590 Tape Drive	•	•
3592 Tape Controller (J70)/ Drive (J1A) ^{4,5}	•	•
9348 Tape	•	-
3995 Optical Library Dataserver	•	-
Minidisk Cache	•	•
OSA-2	•	•
OSA-Express		
1000BASE-T Ethernet	•	•
Gigabit Ethernet (GbE)	•	•
Token-Ring ³	•	•
Layer 2	-	•
OSA-Express2		
1000BASE-T Ethernet	•	•
Gigabit Ethernet	•	•
10 GbE	•	•
Layer 2	-	•
Up to 640 TCP/IP Stacks	-	•
OSA for NCP ⁷	-	•
System Management Products		
HMF	•	•
VMPAF ²²	•	-
PRF Feature ²¹	•	-
RTM Feature ²¹	•	-
Performance Toolkit for VM ⁵	•	•
DirMaint 1.5	-	-
DirMaint Feature	•	•
RACF for VM 1.10	-	-
RACF Feature ^{4,10}	•	•
RACF Security Server FL530 Feature ⁹	-	•
Communications		
RSCS FL530 feature ⁹	-	•
RSCS V3.2.2 ¹⁰	•	•
ACF/VTAM V4.2	•	•
TCP/IP for z/VM ²	•	•
VM Passthrough Facility (PVM)	•	•
Additional Features		
OSA/SF	•	•
Shell & Utilities ¹	•	•
CMS Utilities ²	•	•

Legend

- ¹ Integrated in z/VM
- ² Integrated in z/VM V4 and later
- ³ Supported on z/VM V4.2 and later
- ⁴ Supported on z/VM V4.3 and later
- ⁵ Supported on z/VM V4.4 and later
- ⁶ Supported on z/VM V5.1 and later
- ⁷ Supported on z/VM V5.2 and later
- ⁸ Requires PTF for VM63952 for z/VM V5.2
- ⁹ Supported on z/VM V5.3 and later
- ¹⁰ Not supported on z/VM V5.3
- ²⁰ Guest use only
- ²¹ Withdrawn from Marketing effective 3/31/06 (Discontinuance of Service 09/2006)
- ²² Withdrawn from Marketing effective 3/05/07 (Discontinuance of Service planned for 05/2008)
- Supported
- Not applicable



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