



z/VM Version 4 Release 4



Highlights

- ***Virtualization enhancements to help improve performance, may help reduce overhead, and enhance networking for Linux and other guests***
- ***Exploitation of new IBM @server[®] zSeries[®] 990 facilities, including improved scalability and I/O capacity***
- ***Systems management improvements to virtual machine controls, performance monitoring, and performance reporting***

Building successful virtual enterprises

The e-business revolution has created a new world, where success is determined by speed-to-market and customer focus. Achieving it depends upon building virtual enterprises that can deliver high levels of customer value, true application flexibility, exceptional performance, end-to-end integration and simplified management. With industry-leading virtualization technology from IBM, z/VM[®] is a key player in providing this infrastructure.

IBM @server

IBM @server brand offers a range of servers designed to be integrated into a robust, flexible infrastructure. This revolutionary brand responds to the unprecedented demands by providing extremely high levels of performance and scalability.

IBM @server zSeries

The IBM @server zSeries is the enterprise-class platform optimized for the integration of business applications. The zSeries, with self-configuring and self-healing attributes, provides new and unique functions and features to meet the challenges of e-business on demand[™]. zSeries servers provide reliability, security, scalability and availability.

z/VM Version 4 (V4)

z/VM V4 is the follow-on product for VM/ESA[®] and z/VM Version 3 (V3). V4 offers a wide variety of features and functions for exploiting the zSeries and IBM S/390[®] servers. It opens new and exciting opportunities for thousands of customers who have built enterprise-wide automation and infrastructure enhancements on the VM platform in support of their applications, database systems and e-business on demand solutions. A large number of Linux server images can be consolidated on a single zSeries or S/390 server with z/VM, and far more than can be supported by other modes of operation. These Linux images can be deployed on standard processor engines or Integrated Facility for Linux (IFL) processor features with z/VM V4.

z/VM V4 supports the IBM @server zSeries 990 (z990), 900 (z900), and 800 (z800), S/390 Multiprise[®] 3000, and S/390 Parallel Enterprise Server[™]

Generation 5 and 6. Current VM/ESA and z/VM V3 customers can maintain their existing VM environments on the latest technology, while preparing for growth on zSeries.

With virtualization technology as its foundation, z/VM continues to provide new function and technology exploitation on the mainframe that enables you to virtualize processor, communication, memory, storage, I/O, and networking resources with the potential to help reduce the need to plan for, purchase, and install hardware to support new workloads. V4 offers an ideal platform for consolidating select UNIX®, Microsoft® Windows®, and Linux workloads on a single physical zSeries server as well as hosting other zSeries operating systems, including z/OS®, z/OS.e, OS/390®, VSE/ESA™, TPF, VM/ESA, and z/VM as guests. While benefiting from the reliability, scalability, security, availability, and serviceability characteristics of zSeries servers, using Linux as a guest of z/VM allows you to run tens to hundreds of Linux images. z/VM has made important advances in autonomic computing technology, providing you with capabilities that help enable self-healing, self-configuring, self-optimizing, self-protecting and cross-platform management.

z/Architecture™ (64-bit) mode

Exploitation of z/Architecture by z/VM helps enable z/OS and z/OS.e customers to develop and test their 64-bit applications in a guest environment before placing them into production. Linux customers can exploit 64-bit support under z/VM for development, test and production. This reduces the need to invest in separate, standalone configurations. z/VM reduces storage constraints by eliminating the 2 GB central storage limitation, providing extra capacity for increasing business demands and growing back-office applications within a single machine image.

z/VM V4.4 Virtualization Technology

Enables Linux and other Guests

With z/VM and the IBM Integrated Facility for Linux (IFL), a low-cost, flexible environment is created to test and develop on Linux while running Linux production applications on the z990, z900, z800, Multiprise 3000, S/390 Parallel Enterprise Server Generation 5 and 6, or equivalent servers. z/VM V4 support for IFL processor features is designed to run Linux workloads without necessarily increasing the IBM software charges for z/OS, z/OS.e, OS/390, z/VM, VSE/ESA, or TPF operating systems and applications running on standard engines of the z990, z900, z800, and S/390 servers in other logical partitions.

Engine-based pricing for z/VM V4 and the optional features allow customers to exploit zSeries and S/390 servers more cost effectively than a discrete server implementation. With engine-based pricing, customers pay a one-time software license charge (OTC) for each processor engine. This can be for standard processor engines or IFL processor features. Traditional operating systems such as z/OS, z/OS.e, OS/390, TPF, VSE/ESA, z/VM V3.1, or VM/ESA are not supported nor can they operate on IFL processor features. Only Linux workloads in an LPAR or Linux guests of z/VM V4 can operate on the IFL processor feature.

z/VM provides the capability to account for the use of system resources by virtual machines, including those running Linux. Accounting records are produced that track a virtual machine's use of processor, paging, I/O, and virtual network resources, including virtual channel-to-channel adapters (CTCAs), inter-user communication vehicles (IUCV) or advanced program-to-program (APPC) connections, and virtual (Guest LAN) network interface cards (NICs).

z/VM V4.4 extends its virtualization technology in support of Linux and other guests while providing some enhancements that help enable z/VM

OS/390, TPF, VSE/ESA, z/VM V3.1, or VM/ESA are not supported nor can they operate on IFL processor features. Only Linux workloads in an LPAR or Linux guests of z/VM V4 can operate on the IFL processor feature.

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z/VM V4.4 extends its virtualization technology in support of Linux and other guests while providing some enhancements that help enable z/VM to be self-optimized and self-managed with:

- *Improvements to the Control Program (CP) scheduler increase the number of Linux and other guest virtual machines that can be managed concurrently.*
- *Functions that may be called by applications to allocate and manage resources for guests running in z/VM virtual machines (virtual images). The systems management application programming interfaces (APIs) are*

designed so that applications can be written by customers or solution providers to help administrators, especially those who lack in-depth VM knowledge, manage large numbers of virtual images running in a single z/VM system.

- *Enhancements to the Virtual Machine Resource Manager (VMRM) to provide the infrastructure necessary to support more extensive workload and systems resource management features by providing:*
 - *data monitoring, showing actual workload achievement*
 - *capabilities to dynamically change users in workloads, workload characteristics, and goals in the VMRM configuration file without manually stopping the server*
 - *more flexibility using the VMRM configuration file when managing multiple users*
 - *reliability and performance improvements of the VMRM service virtual machine's monitor data handling*
 - *serviceability enhancements including improved messages, log file entries, and new server options*
- *IPLing from Small Computer System Interface (SCSI) disks attached to Fibre Channel Protocol (FCP) channels for Linux and other guest operating systems that contain required support when z/VM is running on a z990, z900, or z800 server equipped with the SCSI IPL Feature Enabler.*

- *Providing virtual FICON™ CTCA devices for guest operating systems enhances previous virtual-CTCA capabilities by adding the FICON protocol as an option for guest operating systems. Guests use virtual CTCAs to communicate among themselves within a single z/VM system image, without the need for real FICON CTCAs.*
- *Supporting real and virtual integrated 3270 console devices. Real support enables this device, provided through the Hardware Management Console (HMC), to be used as the z/VM system operator console. Virtual support enables testing of guest operating systems and utilities such as the Stand-Alone Program Loader (SAPL) and DASD Dump Restore (DDR) that support the integrated 3270 console device.*
- *The z/VM virtual Coupling Facility (CF) support, which was made available in VM/ESA V2.3, has been enhanced to allow VM/ESA or z/VM systems to run as second-level (or higher) guests while simulating complete OS/390 and/or z/OS coupled sysplexes. This allows the testing of an OS/390 or z/OS Parallel Sysplex environment at any guest level.*
- *Delivering the Performance Toolkit for VM™ to process Linux performance data obtained from the Resource Management Facility (RMF) Linux performance gather, rmfpms. Linux performance data obtained from RMF*

can be viewed and printed similar to the way VM data is viewed and presented.

With corresponding function available in Linux on zSeries and S/390, z/VM V4.4 can provide:

- *The attachment of SCSI devices to guest Linux images using FCP channels on zSeries processors*
- *Enhanced page-fault handling*
- *Clear-key RSA functions of the IBM PCI Cryptographic Coprocessor (PCICC) or the IBM PCI Cryptographic Accelerator (PCICA)*

Exploiting New Technology

z/VM provides a highly-flexible test and production environment for enterprises deploying the latest business solutions. Enterprises that require multi-system server solutions will find that z/VM helps them meet the demands of their businesses and IT infrastructures with a broad range of support for such operating system environments as z/OS, z/OS.e, OS/390, TPF, VSE/ESA, CMS, and Linux for zSeries and S/390. The ability to support multiple machine images and architectures enables z/VM to run multiple production and test versions of zSeries and S/390 operating systems, all on the same system.

z/VM can help simplify migration from one release to another, facilitate the transition to newer applications, provide a test system whenever one is needed, and consolidate several systems onto one physical machine. z/VM can also be used to enable access to the latest storage and processor architectures for systems that lack such support. New technological enhancements in z/VM V4.4 are designed to provide:

- *Exploitation of the zSeries 990 server is designed to:*
 - *Extend Dynamic-I/O configuration support to allow channel paths, control units, and devices to be dynamically added, changed, and deleted in multiple Logical Channel SubSystem (LCSS) environments when z/VM V4.4 is running on a z990 server with the necessary hardware support*
 - *Transparent sharing of HiperSockets™ channels across multiple Logical Channel SubSystems*
 - *Support for extended I/O-measurement facilities for improved capacity planning and I/O performance measurement*
 - *Handle I/O-configuration definition and dynamic-I/O configuration for 30 LPARs,*

The z990 server is supported in compatibility mode by z/VM V3.1, V4.2, and V4.3.

- *Support for the zSeries capability to cascade two FICON directors within a Fibre Channel fabric. z/VM and its guests can take advantage of this enhanced and simplified connectivity, which is particularly useful in disaster recovery and business continuity procedures.*
- *Support for the IBM TotalStorage® Enterprise Storage Server™ (ESS) FlashCopy® V2 is designed to enable business continuance solutions with the delivery of new FlashCopy functions and enhancements. FlashCopy V2 is designed to help improve business efficiency, along with FlashCopy performance improvements designed to help minimize operational disruption.*
- *Support for the IBM ESS Peer-to-Peer Remote Copy Extended Distance (PPRC-XD) function designed to copy full volumes of data in non-synchronous mode extending the distance, well beyond the 103 km supported with PPRC synchronous mode. PPRC-XD is suitable for data migration, backup, and disaster recovery procedures. z/VM V4.4 is also designed to support PPRC Version 2 (V2) for guest operating systems, designed to offer an Asynchronous Cascading solution providing a complete, consistent, and coherent copy of data at a remote site.*
- *Support for the new TotalStorage Enterprise Tape Controller 3592 Model J0 and TotalStorage Enterprise Tape*

Drive 3592 Model J1A designed to provide new levels of performance and attachment capabilities for S/390 and zSeries customers. The 3592 Model J70 can also be used to attach IBM 3590 tape drives.

Systems Management

Improvements in systems management, some of which help provide self-configuring, self-managing, and self-optimization facilities in z/VM V4.4 include:

- **Hardware Configuration Manager (HCM) and Hardware Configuration Definition (HCD) components to create and manage your I/O configuration.** This new support provides a comprehensive, easy-to-use I/O configuration-management environment similar to that available with z/OS.
- **Performance Toolkit for VM that provides enhanced capabilities for a z/VM systems programmer, operator, or performance analyst to monitor and report performance data.** The toolkit is an optional, per-engine-priced feature derived from the FCON/ESA program (5788-LGA), providing:
 - full-screen mode system console operation and management of multiple z/VM systems
 - post-processing of Performance Toolkit for VM history files and of VM monitor data captured by the MONWRITE utility

– viewing of performance monitor data using either Web browsers or PC-based 3270 emulator graphics

The toolkit also provides the capability to monitor TCP/IP for z/VM as well as to process Linux performance data.

Application Enablement

The new C/C++ for z/VM compiler (5654-A22) which executes on CMS helps enable customers to increase programming productivity through state-of-the-art application development tools and exploit the latest in software development technology. This new compiler allows C/C++ programs to be compiled and executed on CMS and creates portability between z/VM and z/OS C/C++ programs. C/C++ source files can be read from a CMS minidisk, the SFS, or the Byte File System (BFS) and output can be written to any of these file systems. C/C++ will only execute on z/VM V4.4 and can only be licensed to operate on standard processor engines. Applications compiled with the C/C++ compiler will run on standard processor engines or IFL processor features.

In order to support the C/C++ for z/VM compiler, the Language Environment® has been updated to the level shipped with z/OS V1.4 and is integrated into the base of z/VM V4.4.

Performance Management Tools

In addition to the Performance Toolkit for VM, other software performance tools are available in z/VM V4 that can help you with workload balancing, problem diagnosis, and performance analysis:

• **RealTime Monitor (RTM)**

With the RTM optional, per-engine-priced feature of z/VM V4, you can obtain an immediate view of current z/VM system performance. Use RTM for short-term monitoring, analysis and problem solving. RTM can help simplify performance analysis and the installation management of z/VM environments.

• **Performance Reporting Facility (PRF)**

PRF is an optional, per-engine priced feature of z/VM V4 that helps simplify performance analysis and resource management on your z/VM system. It analyzes your system's monitor data and produces performance reports and history files, including:

- System resource utilization, transaction response time, and throughput
- Resource utilization by user
- DASD activity and channel utilization

• **Performance Analysis Facility/VM (VMPAF)**

VMPAF is a separately orderable licensed program product for z/VM that is used to statistically correlate and chart system performance problems,

tuning information, and trend analysis. VMPAF does this by analyzing the relationships between variables from PRF, monitor and other data sources to determine which subsystems are most affecting current system performance. Using interactive graphics, VMPAF gives you a quick, clear picture of these relationships. VMPAF cannot be licensed for IFL processor features.

Directory Management

The Directory Maintenance Facility (DirMaint™) is an optional, per-engine-priced feature of z/VM V4. DirMaint is designed to provide efficient and highly secure interactive facilities for maintaining your VM system directory. Directory management is simplified by the DirMaint command interface and automated facilities. DirMaint provides a command corresponding to every VM directory statement, including Cross System Extensions (CSE) cluster directory statements. DirMaint's error checking helps to determine that only valid changes are made to the directory and that only authorized personnel are able to make changes.

Security Management

RACF® for z/VM is available as an optional, per-engine priced feature of z/VM V4 and may be licensed for IFL processor features. RACF for z/VM works with the existing system features of z/VM to provide improved data

security for an installation. RACF for z/VM 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*
- *Transparency to end users*

Networking with z/VM

TCP/IP for z/VM is the link that brings the power and resources of your zSeries or S/390 server to the Internet while helping to increase the return on your e-business investment.

TCP/IP for z/VM, formerly a priced, optional feature of VM/ESA and z/VM Version 3, is included at no charge in z/VM V4.

TCP/IP for z/VM delivers expanded Internet/intranet access, improved e-business performance and extended function. Performance of the TCP/IP stack was enhanced by redesigning algorithms to help reduce path lengths, recoding procedures to optimize high-use paths, identifying and implementing performance improvement items, and adding virtual multiprocessing capabilities.

TCP/IP for z/VM can support tens of thousands of users and communicate with multi-vendor systems within your enterprise via the intranet or with external systems via the Internet.

TCP/IP for z/VM allows users to send messages, transfer files, share printers, and access remote resources across a broad range of systems from multiple vendors. TCP/IP for z/VM offers an extensive set of client/server applications, programming interfaces and connectivity options, plus the data integrity and performance required within a communications network.

TCP/IP is designed to support the z/Architecture HiperSockets function for high-speed communication among virtual machines and logical partitions within the same zSeries server. The HiperSockets function allows virtual machines and logical partitions to communicate internally over the memory bus using the internal-queued-direct (IQD) channel type in the z990, z900, and z800. TCP/IP broadcast support is provided for the HiperSockets environment when utilizing Internet Protocol version 4 (IPv4) with z/VM V4.4. Applications that use the broadcast function can now propagate frames to all TCP/IP applications.

The z990 server is designed to include an important performance enhance-

ment that virtualizes adapter interruptions and can be used with V=V guests (pageable guests) on z/VM V4.4. With the enhancement of the TCP/IP stack in z/VM V4.4 to use adapter interruptions for OSA-Express channels, TCP/IP for VM can benefit from this performance assist for both HiperSockets and OSA-Express adapters.

z/VM V4.4 exploits the IEEE Virtual Local Area Network (VLAN) technology to ease the administration of logical groups of users so that they can communicate as if they were on the same physical LAN. VLANs help increase traffic flow and may help reduce overhead to allow the organization of networks by traffic patterns rather than by physical location. To support VLAN, z/VM V4.4 provides:

- *Enhancements to TCP/IP for z/VM to enable membership in a VLAN for OSA-Express QDIO and HiperSockets adapters that support IEEE 802.1q*
- *Enhancements to z/VM virtual QDIO and HiperSockets network interface to support VLAN frame tagging as described in IEEE 802.1q*
- *Management and control of VLAN identifiers (VIDs) that can be used by guest virtual machines*

The Guest LAN support provided in z/VM V4.2 simulates the HiperSockets function for communication among virtual machines without the

need for real IQD channels, much as VM simulates channel-to-channel adapters for communication among virtual machines without the need for ESCON®, FICON or other real channel-to-channel connections. With the Guest LAN capability, customers with S/390 servers can gain the benefits of HiperSockets communication among the virtual machines within a VM image, since no real IQD channels are required. Guest LANs can now be defined to function as OSA-Express Queued Direct I/O (QDIO) transport media, in addition to HiperSockets media. The addition of QDIO simulation allows the virtualization of a QDIO LAN environment and provides support for the broadcast capability that is part of QDIO architecture. As with z/VM HiperSockets simulation, no real hardware is required to support OSA-Express QDIO simulation.

z/VM V4.4 further enhances its virtualization technology by providing the capability to deploy virtual IP switches in the Guest LAN environment. The z/VM virtual switch eliminates the need for virtual machines acting as routers to provide IPv4 connectivity to a physical LAN through an OSA-Express adapter. Virtual routers consume valuable processor cycles and require additional copying of the data being transported. The virtual-switch function helps alleviate this problem and

also provides centralized network configuration and control. These controls allow the z/VM Guest LAN administrator to more easily grant and revoke access to the network and to manage the configuration of VLAN segments.

z/VM-based TCP/IP servers and clients can now exploit Gigabit Ethernet, Fast Ethernet, 1000BASE-T Ethernet, Token-Ring, and ATM networks through the OSA-Express Adapter using QDIO. QDIO can improve performance through a highly efficient data transfer architecture that can reduce TCP/IP path lengths. Data can be directly exchanged with an I/O device without using traditional I/O instructions. Using QDIO can help an application achieve the full performance potential of a high-speed network.

TCP/IP for z/VM includes support for File Transfer Protocol (FTP) and Trivial File Transfer Protocol (TFTP). FTP and TFTP clients running on z/VM or other systems can access files residing anywhere on the Internet. z/VM provides FTP support for access to the VM Shared File System (SFS), Byte File System (BFS) and minidisk file system, as well as TFTP support for the BFS.

The multi-protocol dynamic routing server (MPROUTE) implements Open Shortest Path First (OSPF) and Routing Information Protocol (RIP), providing a powerful alternative to TCP/IP static

routing. When properly configured, a VM host running the MPROUTE server can become an active OSPF or RIP network router, providing network access to z/VM virtual networks. By using MPROUTE, greater efficiency may be achieved within an IP network and manual network routing table updates are reduced or eliminated.

Virtual IP Addressing (VIPA) can increase the reliability and availability of TCP/IP in the event of a network or interface failure. With VIPA, hardware link fault tolerance is supplied for both inbound and outbound TCP/IP communications on z/VM, which can provide automatic recovery of hard link failures and network traffic splitting.

IP Multicasting provides a more efficient means of transmitting the same data or messages to multiple users. A set of recipients can be selected and only one copy of the data is sent to the group. TCP/IP for z/VM supports transmitting in this manner, helping you save valuable network resources and users' time.

TCP/IP for z/VM provides numerous self-protection functions. A Secure Sockets Layer (SSL) server is available to facilitate highly secure and private conversations between z/VM servers and external clients. With z/VM support for SSL, a VM server can communicate with a secure client without a change to the server itself.

The SSL server supplied with z/VM supports 40-bit, 56-bit and 128-bit encryption/decryption services, and requires a copy of Linux on zSeries to run. The upgraded SSL server in z/VM V4.4 provides appropriate Red Hat Package Manager (RPM) packages for the SuSE Linux Enterprise Server (SLES) 7 (kernel version 2.4.7), SLES 8 powered by UnitedLinux (kernel version 2.4.19), or TurboLinux Enterprise Server (TLES) 8 powered by UnitedLinux distributions. Security of the TCP/IP stack has been improved to help prevent additional types of Denial of Service (DoS) attacks including: Smurf, Fraggle, Ping-o-Death, Kiss of Death (KOD), KOX, Blat, SynFlood, Stream, and R4P3D. The overall security and auditability of the TCP/IP for z/VM stack and the integrity of the z/VM system have been improved by providing better controls, monitoring, and defaults which include:

- *Logging all TCP/IP administrative commands, including NETSTAT, OBEY-FILE, and IFCONFIG, that alter, or attempt to alter, the active IP or CP configuration*
- *Changing the defaults of the Restrict-LowPorts and VarSubnetting operands on the AssortedParms statement*

A configuration wizard, IPWIZARD, automates the connection of a newly installed z/VM system to a TCP/IP-based network. This easy-to-use tool helps the z/VM installer provide IP

configuration information such as host and domain names, IP addresses, and subnet masks. This tool also generates an initial z/VM TCP/IP configuration and verifies that connectivity to the network has been established.

Once the initial IP network configuration has been created, a dynamic TCP/IP configuration tool, IFCONFIG, is available that can eliminate the need to learn the statement syntax of the z/VM TCP/IP server configuration file. This additional tool can optionally generate configuration statements for incorporation into the configuration file so that the changes may be made permanent.

The Network File Server (NFS) V3 Server allows applications and users from heterogeneous systems to access files stored in the VM Byte File System (BFS), Shared File System (SFS) and CMS minidisk file system. NFS support on z/VM is a natural extension of VM file systems and enables Internet-based heterogeneous systems to use the enormous DASD resources available on z/VM. Additionally, NFS permits z/VM to be a centralized, transparent file server for PC servers and workstations.

The z/VM NFS client gives CMS users and applications transparent access to data on remote systems that run NFS servers, including z/OS, z/OS.e, OS/390, Microsoft Windows,

AIX®, UNIX, Linux, and VM. Mounting remote data on the BFS structure in a single virtual machine allows access by an NFS client.

The Simple Mail Transfer Protocol (SMTP) server, which includes TCP/IP mail services, is integrated with CMS mail functions. This can deliver a consistent method of mail and file transfer for TCP/IP and CMS users. The SMTP server provides service extension support, including accepting and forwarding of MIME-formatted messages.

The Internet Message Access Protocol (IMAP) Server, added in z/VM V4.3, provides support for an IMAP Version 4 Revision 1 (IMAP4rev1) mail server that runs on z/VM. This support allows you to utilize the strengths of z/VM (reliability, availability, and security) for storing and serving electronic mail while allowing any IMAP4rev1 client to access and manipulate mail messages using the IMAP protocol as defined by RFC 2060. In z/VM V4.4, an IMAP user authentication exit has been added that removes prior userid and password length restrictions and helps eliminate the need for every IMAP client to have a VM userid and password. Authentication is handled by a user-written exit routine, providing greater flexibility for choosing authentication methods.

Access to 3270-based applications from UNIX and other systems is available with the Telnet TN3270 support provided by TCP/IP for z/VM. The VM SSL server along with an SSL-enabled Telnet client, such as IBM Personal Communications, can be used to determine the security and privacy of telnet session data as it travels over the Internet/intranet.

Users or applications can execute a command on a remote host and receive results based upon TCP/IP remote execution protocol (REXEC) and support from z/VM.

TCP/IP for z/VM allows you to print data from your z/VM system on remote printers in your TCP/IP network. It also delivers enterprise-wide network printer support with line printer router (LPR), line printer daemon (LPD), and TN3270E printer attachment. VM LPR, LPD, and TN3270E print support has been incorporated into the RSCS print server. Users can specify if they want their remote print data to be processed for delivery by either TCP/IP or RSCS.

z/VM provides network management support with Simple Network Management Protocol (SNMP).

Interoperability of applications

Message Queuing (MQ) is a popular method for applications to interface with one another across heterogeneous systems. MQ communication requires the client API support on the communicating platforms and a message queue manager (MQ server) somewhere on the network. The MQ server facilitates communication between applications without requiring them to actually connect to one another. The MQSeries® Client code is supplied with z/VM, therefore VM-based applications can interact over the Internet with other WebSphere® MQ and MQSeries enabled applications and servers.

Statement of Direction

IBM plans to take the following actions in the future:

- *IBM intends to support greater than 16 processors in a single image of z/VM on future releases. This support is planned to increase the scale of a single z/VM image by taking advantage of the increased number of processors available on a z990 server.*
- *Future releases of z/VM will impose an Architectural Level Set (ALS) requiring z/Architecture. Consequently, those future releases of z/VM are planned to operate on only zSeries 800, 900, and 990, or equivalent servers and future zSeries servers.*



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- *IBM intends for z/VM V4.4 or later to provide support for up to 60 logical partitions (LPARs) with corresponding support on a z990 or future server.*
- *IBM intends for z/VM V4.4 or later to support four Logical Channel SubSystems with a maximum of 256 channels supported per image with corresponding support on a z990 or future server.*
- *IBM intends to provide z/VM guest support for the PCI-X Cryptographic Coprocessor (PCIXCC) adapter.*
- *It is planned that future performance management enhancements will be made primarily to the Performance Toolkit for VM. z/VM V4.4 is planned to be the last release in which the RTM and PRF features will be available with z/VM. Both the RTM and PRF features are planned to be withdrawn from marketing in a future z/VM release.*

For more information

To learn more about z/VM V4.4, visit the following Web site: **ibm.com/eserver/zseries/zvm/**

To learn more about the IBM @server zSeries and S/390, contact your IBM marketing representative, IBM Business Partner, or visit: **ibm.com/eserver/zseries**