

z/VM
7.2

Migration Guide



Note:

Before you use this information and the product it supports, read the information in [“Notices” on page 275.](#)

This edition applies to version 7, release 2 of IBM z/VM (product number 5741-A09) and to all subsequent releases and modifications until otherwise indicated in new editions.

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Contents

- Tables..... xi**

- About This Document.....xiii**
 - Intended Audience..... xiii
 - Where to Find More Information.....xiii
 - Links to Other Documents and Websites..... xiii

- How to provide feedback to IBM..... xv**

- Summary of changes for z/VM: Migration Guide..... xvii**
 - GC24-6294-11, z/VM 7.2 (December 2023).....xvii
 - GC24-6294-11, z/VM 7.2 (September 2023)..... xvii
 - GC24-6294-11, z/VM 7.2 (September 2022)..... xvii
 - GC24-6294-11, z/VM 7.2 (May 2022)..... xvii
 - GC24-6294-10, z/VM 7.2 (December 2021).....xvii
 - GC24-6294-09, z/VM 7.2 (July 2021)..... xviii
 - GC24-6294-08, z/VM 7.2 (April 2021)..... xviii
 - GC24-6294-08, z/VM 7.2 (March 2021).....xviii
 - GC24-6294-07, z/VM 7.2 (December 2020).....xviii
 - GC24-6294-06, z/VM 7.2 (September 2020)..... xix
 - GC24-6294-05, z/VM 7.1 (January 2020)..... xx
 - GC24-6294-04, z/VM 7.1 (September 2019)..... xx
 - GC24-6294-03, z/VM 7.1 (June 2019)..... xx
 - GC24-6294-02, z/VM 7.1 (April 2019).....xx
 - GC24-6294-01, z/VM 7.1 (December 2018).....xxi
 - GC24-6294-00, z/VM 7.1.....xxi

- Chapter 1. Introduction..... 1**
 - z/VM Continuous Delivery Model.....1
 - New Function Variables..... 2
 - How Information about z/VM Changes Is Presented in This Document..... 2
 - Compatibility Terms..... 3

- Chapter 2. System Changes..... 5**
 - Product Packaging..... 5
 - [6.1] Changes to Documentation Provided with z/VM.....5
 - [6.1] German Files Discontinued.....5
 - [6.2] IBM z/VM Single System Image Feature.....5
 - [6.2] z/Architecture CMS..... 6
 - [6.2] Shipping IBM Systems Director Agents for Linux with z/VM Discontinued.....6
 - [6.3] xCAT Appliance Packaged with z/VM..... 6
 - [6.3] z/VM Collection..... 6
 - [6.4] z/VM Cloud Manager Appliance No Longer Available..... 6
 - [7.1] Integration of z/VM SSI for Continuous Operation..... 7
 - [7.1] OSA/SF Not Shipped with z/VM..... 7
 - [7.1] z/VM Messages and Help Files for Kanji Have Been Discontinued..... 7
 - [7.2] Removal of KANJI language files..... 7
- Installation, Migration, and Service.....7
 - [6.1] Changes to Predefined User Directory Entries.....7

[6.2] Changes to Predefined User Directory Entries.....	8
[6.2] INSTALL Utility Renamed to INSTTAPE.....	25
[6.2] CMS AUDITOR Utility Change.....	25
[6.2] High Level Assembler Not Required for RACF.....	25
[6.2] Options Removed from the VMFINS Command.....	25
[6.2] Change to the Linking Default of the VMFSETUP Command.....	25
[6.2] Service Changes to Support the SSI Environment.....	25
[6.2] Change to PPF File Used for Saved Segment Builds.....	26
[6.3] Changes to Predefined User Directory Entries.....	26
[6.3] ACIGROUP Keyword of RACF GLBLDSK Macro Changed to ACIGRP.....	29
[6.3] Installation Changes.....	29
[6.3] Relocation of Service-Level Production Status Table.....	29
[6.3] Service Enhancements.....	29
[6.3] SSI Cluster Cross-System Highest Release Level Program Handling.....	30
[6.3] ZVM \$PPF Override File Removed.....	30
[6.3] New LINKRr Option for the VMFSETUP Command.....	30
[6.4] Changes to Predefined User Directory Entries.....	30
[6.4] Determine Installed Service.....	34
[6.4] Installation Changes.....	34
[6.4] Enhanced Upgrade in Place.....	34
[6.4] 3590 and 3592 Tape Not Supported for the Installation of z/VM 6.4.....	34
[6.4] Improved upgrade installation planning information.....	34
[7.1] Installation and Migration Changes.....	34
[7.1] User Directory Modifications.....	35
[7.1] Changes to Predefined User Directory Entries.....	36
[7.1] VMSES/E MIGRATE Command Support Withdrawn.....	37
[7.1 APAR] Query RSCS Service Level.....	38
[7.2] Installation Changes.....	38
[7.2] Update to SERVICE command to report installed APARs and PTFs.....	38
[7.2] z/VM Centralized Service Management for non-SSI environments	39
[7.2] Product Parameter File Names.....	39
[7.2] Changes to predefined user directory entries.....	40
Support and Exploitation of Hardware and Architectures.....	41
[6.1] Architecture Level Set.....	41
[6.1] IBM System Storage Support.....	42
[6.1] Worldwide Port Name Prediction Tool.....	43
[6.1] IBM zEnterprise 196.....	43
[6.1] Crypto Express3.....	44
[6.1] Dynamic Emulated Device Path Control.....	44
[6.1] HyperSwap Improvements.....	44
[6.1] IBM Extended Address Volumes Support.....	44
[6.1] IBM XIV Storage Systems Direct Attachment Support.....	44
[6.1] Protected Key CPACF Support.....	45
[6.1] OSX and OSM Channel Path Identifiers.....	45
[6.1] XRC Time Stamping Support.....	45
[6.2] IBM zEnterprise 196 (Enhanced) and IBM zEnterprise 114.....	45
[6.2] ACCOUNT Utility Enhancement.....	46
[6.2] CPU-Measurement Counter Facility Host Support.....	46
[6.2] Crypto Terminology Change.....	46
[6.2] Cryptographic Coprocessor Facility (CCF) Support Removed.....	47
[6.2] Dynamic Discovery of FCP Disks.....	47
[6.2] ISFC Infrastructure Enhancements.....	47
[6.2] Real Device Mapping.....	47
[6.2] Shared Disk Enhancements.....	48
[6.2] FICON Express8S and OSA-Express4S.....	50
[6.2] Support for Gen 4 IBM System Storage TS1140 Tape Drive (3592 Model E07).....	50
[6.2] Guest Support for High Performance FICON for IBM Z.....	50
[6.3] IBM zEnterprise EC12 and IBM zEnterprise BC12.....	51

[6.3] Fibre Channel Protocol Data Router Support.....	52
[6.3] FICON DS8000 Series New Functions.....	52
[6.3] HiperSocket Completion Queue Guest Exploitation Support.....	53
[6.3] Multiple Subchannel Set Support for Mirrored DASD.....	53
[6.3] z/VM HiperDispatch.....	54
[6.3 APAR] Soft Fence and Query Host Access GDPS Enhancements.....	56
[6.3 APAR] PCIe Guest Direct Attach Support.....	56
[6.3 APAR] IBM z13 Support.....	58
[6.3 APAR] z13 Compatibility I/O Support.....	59
[6.3 APAR] Crypto Express5S and Enhanced Domain Support.....	60
[6.3] FICON Express16S Support.....	61
[6.3 APAR] Simultaneous Multithreading (SMT) Support.....	61
[6.3 APAR] Increased CPU Scalability.....	64
[6.3 APAR] Multi-Target PPRC Support.....	64
[6.3 APAR] Multithreading Prorated Core Time Support.....	64
[6.3 APAR] Support for IBM LinuxONE Systems.....	65
[6.3 APAR] IBM z13 (Driver D27) Compatibility and IBM z13s Support.....	65
[6.3 APAR] IBM Z Vector Facility (SIMD) Support.....	67
[6.4] Architecture Level Set (ALS).....	67
[6.4] ESA/390 Removal.....	67
[6.4] Guest Large Page Support.....	69
[6.4] SCSI Management Queries.....	69
[6.4] SCSI Reliability, Availability, and Serviceability (RAS) Enhancements.....	70
[6.4] Guest Transactional Execution (TX) Support.....	70
[6.4] IBM z13 (Driver D27) and z13s I/O Support.....	71
[6.4] Expanded Storage (XSTORE) Support Removed.....	71
[6.4] IBM Dynamic Partition Manager (DPM) Administrative Mode for Linux.....	73
[6.4 APAR] Concurrent I/O Support for IBM XIV Storage System.....	73
[6.4 APAR] z/VM Support for IBM z14.....	73
[6.4 APAR] Extended Address Volume Minidisk Support.....	76
[6.4 APAR] Processor Scalability Efficiency Improvements.....	76
[6.4 APAR] Alternate Subchannel Set Dynamic I/O Support.....	76
[6.4 APAR] Coupling over RoCE (CL5) Channel Path Support.....	76
[6.4 APAR] Guest Exploitation Support for the Instruction Execution Protection Facility.....	77
[6.4 APAR] Guest Exploitation Support for Pauseless Garbage Collection.....	77
[6.4 APAR] Encrypted Paging.....	77
[6.4 APAR] z-Thin Provisioning.....	78
[7.1] Architecture Level Set.....	78
[7.1] Foundational Support for Dynamic Memory Downgrade.....	79
[7.1] Foundational Support for More Than 64 Logical Processors.....	79
[7.1 APAR] Support for the IBM Adapter for NVMe.....	80
[7.1 APAR] Extended Address Volume (EAV) Paging Space Support.....	81
[7.1 APAR] Performance Toolkit Support for EAV Paging Space.....	81
[7.1 APAR] Support for 80 Logical Processors.....	81
[7.1 APAR] Performance Toolkit Support for 80 Logical Processors.....	82
[7.1 APAR] Removal of 1000-Member Limit for a Single Resource Pool.....	83
[7.1 APAR] IBM z15 (z15) and LinuxONE III Server Compatibility.....	83
[7.1 APAR] Dynamic Crypto.....	84
[7.1 APAR] System Recovery Boost.....	84
[7.1 APAR] z15 I/O Processor Compatibility.....	85
[7.2] Adjunct Virtual Machine Support.....	85
[7.2] Architecture Level Set (ALS).....	86
[7.2] xDisk Scalability.....	86
[7.2] MSS Multi-Target PPRC Exploitation.....	86
[7.2] HiperDispatch default unparking setting changed to UNPARKING MEDIUM.....	89
[7.2] System Recovery Boost enabled by default.....	89
[7.2 APAR] Performance Toolkit Support for Simultaneous Multithreading (SMT).....	89
[7.2 APAR] Guest HyperPAV Alias support for 1-End minidisks.....	90

[7.2 APAR] FlashCopy preserve mirror support.....	90
[7.2 APAR] VARY ON of real devices utilizing multi-processor support.....	90
[7.2 APAR] Non-fullpack minidisk High Performance FICON Support.....	90
[7.2 APAR] 4 TB Real Memory Support.....	90
[7.2 APAR] z/Architecture Extended Configuration (z/XC) support.....	91
[7.2 APAR] Performance Toolkit Support for z/XC-Mode Virtual Machines.....	92
[7.2 APAR] Dynamic Memory Downgrade (DMD) Enablement.....	92
[7.2 APAR] Performance Toolkit Support for Dynamic Memory Downgrade.....	93
[7.2 APAR] Improved Live Guest Relocation for Crypto Environments with Mixed Adapter Types...	93
[7.2 APAR] z/VM Support for IBM z16®	94
[7.2 APAR] Host Exploitation of Crypto Interruptions.....	95
Connectivity and Networking.....	95
[6.1] Prefetch Guest Data into Processor Cache.....	96
[6.1] SSL Server Enhancements.....	96
[6.1] SSL Server Upgrade and FIPS Support.....	96
[6.1] Support for IBM zEnterprise System Networks.....	96
[6.2] Additional IPv6 Support.....	97
[6.2] IPFORMAT Supports Conversion to PCAP Format.....	97
[6.2] LDAP Server Upgrade.....	97
[6.2] MPROUTE Enhancements.....	98
[6.2] Multiple Access Ports per Guest.....	98
[6.2] Query OSA Address Table.....	98
[6.2] SSL Server Upgrade and Implementation Changes.....	98
[6.2] TCP/IP Support Withdrawal.....	99
[6.2] Virtual Networking Support for an SSI Cluster.....	99
[6.2] *VMEVENT Enhancements.....	99
[6.2] Virtual Switch HiperSockets Bridge.....	99
[6.2] Client Certificate Validation for z/VM SSL Server.....	100
[6.3] Live Guest Relocation Support for Port Based Virtual Switches.....	100
[6.3] MPROUTE Enhancements.....	101
[6.3] SSL Server Upgrade and TLS 1.2 Support.....	101
[6.3] TCP/IP Support Withdrawal.....	101
[6.3] Virtual Switch Recovery and Stall Prevention.....	102
[6.3] Virtual Switch Support for Virtual Edge Port Aggregator (VEPA) Mode.....	102
[6.3] Duplicate IP Address Handling on a Virtual Switch.....	102
[6.3] Unified Resource Manager Support Withdrawn.....	103
[6.3 APAR] Additional SSL Server Enhancements.....	103
[6.3 APAR] z/VM 6.3 System SSL Cryptographic Module Receives FIPS 140-2 Certification.....	103
[6.3 APAR] Multi-VSwitch Link Aggregation Support.....	103
[6.3 APAR] System SSL Upgrade and AES GCM for the TLS/SSL Server.....	104
[6.3 APAR] Encryption of TCPNJE Connections.....	105
[6.4] z/VM System SSL and Utilities z/OS V2.2 Equivalency.....	105
[6.4] Client/Server TLS/SSL Support.....	105
[6.4] z/VM LDAP Server and Client Utilities z/OS V2.2 Equivalency.....	105
[6.4] LOGON Security Improvement.....	106
[6.4] z/VM MPROUTE Server z/OS V2.2 Equivalency.....	106
[6.4] Domain Name System (DNS) IPv6 Support.....	106
[6.4] VLAN Access Security Improvement.....	106
[6.4] Resetting Counters for a Virtual Switch.....	106
[6.4] SET DIALDROP Command.....	107
[6.4 APAR] Crypto Express APVIRT Support for z/VM TLS/SSL Server and LDAP/VM.....	107
[6.4 APAR] Distributed IUCV Enhancements.....	107
[6.4 APAR] NICDEF Security Controls.....	108
[6.4 APAR] Firewall Friendly FTP.....	109
[6.4 APAR] VSwitch Link Aggregation Load Balancing Enhancements.....	109
[6.4 APAR] z/VM 6.4 System SSL Cryptographic Module Receives FIPS 140-2 Certification.....	110
[7.1] FOREIGNIPCONLIMIT Default Value Change.....	110
[7.1] IMAP Support Removed.....	110

[7.1] Support Removed for IEEE 802.3 Ethernet Frame Types.....	110
[7.1 APAR] TLS/SSL Server Elliptic Curve Support.....	110
[7.1 APAR] TCP/IP Support for OSA-Express7S 25G.....	111
[7.1 APAR] Virtual Switch Priority Queuing Enhancements.....	111
[7.1 APAR] TLS Certificate Verification.....	113
[7.2] CLEAR TDISK Enabled by Default.....	113
[7.2 APAR] IPv6 Layer 2 Query Support.....	113
[7.2 APAR] VSwitch Bridge Port Enhancements.....	114
System Administration and Operation.....	114
[6.1] VMPRF Mode Not Supported by Performance Toolkit.....	114
[6.1] HMF/VM Not Supported.....	114
[6.1] Alternate Method for Hard Limiting of Scheduled System Resources.....	114
[6.1] Disabling the Guest Page Reordering Process.....	115
[6.1] Enhanced Contiguous Frame Coalescing.....	115
[6.1] Improved Page Release Serialization.....	115
[6.1] Performance Toolkit Enhancements.....	115
[6.1] Shutdown Signals Enhancement.....	115
[6.2] SSI Cluster Configuration and Management.....	115
[6.2] SSI Cluster User Identity and Configuration.....	116
[6.2] Cross-System Spool and CP Commands in an SSI Cluster.....	119
[6.2] Live Guest Relocation in an SSI Cluster.....	120
[6.2] ACIPARMS Enhancements.....	124
[6.2] DirMaint Enhancements.....	124
[6.2] ESM Access Control for Real Devices.....	125
[6.2] LIMITHARD Default Change.....	125
[6.2] Memory Constraint Relief.....	125
[6.2] Contiguous Page Replenishment Counters in Monitor.....	126
[6.2] MONITOR Changes.....	126
[6.2] Performance Toolkit Enhancements.....	126
[6.2] RACF Security Server Enhancements.....	127
[6.2] SECLABEL Support for SECUSER/OBSERVER Facilities.....	128
[6.2] Default Virtual Machine Type is now ESA.....	128
[6.2] STORBUF Default Change.....	128
[6.2] Changed XEDIT Default Case for Other File Types.....	128
[6.2] CMS File Pool Server Enhancements.....	128
[6.2] Utilities Moved from the MAINT 190 Minidisk.....	128
[6.2] Additional Performance Toolkit Enhancements.....	128
[6.3] Cross System Extensions (CSE) Support Removed.....	128
[6.3] HELPSEG and NLSAMENG Saved Segments No Longer Supplied with Base System.....	129
[6.3] IPL Changes for NSS in a Linux Dump.....	129
[6.3] Memory Management.....	129
[6.3] Performance Toolkit Enhancements.....	131
[6.3] User Class Restructure (UCR) Support Removed.....	131
[6.3] DASD Volume Real Device Address.....	132
[6.3 APAR] CPU Pooling Support.....	132
[6.3 APAR] Environment Information Interface.....	133
[6.3 APAR] Additional Performance Toolkit Enhancements.....	133
[6.3] z/VM 6.3 Achieves Common Criteria Certification.....	136
[6.3 APAR] Virtual Machine Logoff Time Reduction.....	136
[6.3 APAR] RACF Security Policy and Password Encryption Enhancements.....	136
[6.3 APAR] Relocating the SSI PDR without a Planned Outage.....	138
[6.4] DirMaint Support.....	138
[6.4] FlashSystem Support for FCP-Attached SCSI Disks.....	138
[6.4] zManager Support Removed.....	139
[6.4] Memory Scalability Efficiency Improvements.....	140
[6.4] Enhanced Real Memory and Guest Virtual Memory Support.....	140
[6.4] Dynamic Simultaneous Multithreading Level.....	140
[6.4] Query Shutdown Command.....	141

[6.4] Control Program Environment Variables.....	141
[6.4] Virtual Processor Management Improvement.....	142
[6.4] Surplus CPU Power Distribution Improvement.....	142
[6.4] RACF Automatic Control of Access List Authority.....	143
[6.4] HyperPAV Technology Exploitation.....	143
[6.4] Performance Toolkit Enhancements.....	144
[6.4] Performance Toolkit Changes in How Spin Lock Activity Is Reported.....	144
[6.4] Nondefault Tape Mode Support.....	145
[6.4] CMS Pipelines.....	145
[6.4] RACF ICHRCX02 Exit Disabled by Default.....	145
[6.4] Support for large HCD Dynamic I/O Activates.....	145
[6.4] IBM Virtualization Engine TS7700 Copy Export Support.....	145
[6.4] OpenStack Support for z/VM.....	146
[6.4 APAR] RACF Security Policy Enhancements.....	146
[6.4 APAR] z/VM HELP Quality Improvement.....	147
[6.4 APAR] High PR/SM LPAR Management Time Relief.....	154
[6.4 APAR] Enhanced Support for External Management of z/VM CPU Resources.....	155
[6.4 APAR] FCP Monitor Enhancements.....	156
[6.4 APAR] Performance Toolkit Support for HyperPAV Paging.....	157
[6.4 APAR] Support to Control the Enablement of Certain Security Modes in z/VM.....	157
[6.4] z/VM 6.4 Achieves Common Criteria Certification.....	158
[6.4 and 7.1 APAR] Support for UNRESPONSIVE_PROCESSOR_DETECTION.....	158
[7.1] IBM z/VM Cloud Connector.....	158
[7.1] IBM Cloud Infrastructure Center (5635-015).....	158
[7.1] QUERY BYUSER Support for Class B Users.....	158
[7.1] Dynamic ESM Protection Support for CPACCESS, CPTYPE, and CPVLOAD.....	159
[7.1] CP Commands Cleanup.....	159
[7.1 APAR] SMAPI ESM Authorization Support.....	159
[7.1 APAR] Virtual Console Output Routing Control.....	160
[7.1 APAR] Allow Device Range on DEFINE HYPERPAVALIAS and DEFINE PAVALIAS.....	160
[7.1 APAR] STHYI support for zCX containers.....	160
[7.1 APAR] Fast Minidisk Erase.....	161
[7.2] Removal of Obsolete Commands.....	161
[7.2] Removing PAGING63 IPL Parameter.....	161
[7.2] DirMaint Default Changes.....	161
[7.2 APAR] DirMaint Health Checker.....	162
[7.2 APAR] EDEVICE Optional LUN Specification.....	163
[7.2 APAR] CP QUERY DEVICES command.....	163
[7.2 APAR] Spool information enhancements.....	163
[7.2 APAR] EDEVICE Path Management Enhancements.....	163
[7.2 APAR] HELP File Enhancements.....	164
[7.2 APAR] DirMaint Performance Enhancements.....	172
[7.2 APAR] Increase crashkernel area size.....	172
Security.....	172
[7.1 APAR] PVM Secure Connectivity.....	172
[7.1 APAR] Multi-Factor Authentication for z/VM within the RACF server.....	173
[7.1 APAR] CP support for MFA.....	173
[7.2 APAR] Change TLS Server to IPL ZCMS.....	173
[7.2 APAR] TLS/SSL OCSP Support.....	173
[7.2 APAR] RACF Enhancements.....	174
[7.2 APAR] System SSL z/OS 2.3 Equivalence.....	174
[7.2 APAR] RACF MFA fixpack.....	174
[7.2 APAR] Query SSL GSKKMAN Certificates.....	174
Application Development and Deployment.....	174
[6.1] RPC-Based Systems Management APIs Not Supported.....	175
[6.1] LT MACRO Removed.....	175
[6.1] Enhanced Systems Management APIs.....	175
[6.1] Program Management Binder Upgrade.....	175

[6.2] Enhanced Systems Management APIs.....	175
[6.2] Language Environment Upgrade.....	176
[6.2] Program Management Binder Upgrade.....	176
[6.2] Storage Location X'C8' Now Used by CMS Initialization.....	176
[6.2] XL C/C++ Compiler Upgrade.....	176
[6.3] Enhanced Systems Management APIs.....	176
[6.3] Program Management Binder Upgrade.....	177
[6.3] Unified Resource Manager Support Withdrawn.....	177
[6.3 APAR] Systems Management API Support for Multi-VSwitch Link Aggregation.....	177
[6.4] z/VM Program Management Binder z/OS V2.2 Equivalency.....	177
[6.4 APAR] VMUDQ Macro Identifies SUBCONFIGs That Contain MDISKS.....	177
[6.4 APAR] Enhanced Systems Management APIs.....	178
[7.1] GDDMXD/VM Support Removed.....	178
[7.1] Change to the Default LOGONBY User ID.....	178
[7.2] Re-link-edit required for Reusable Server Kernel applications.....	178
[7.2 APAR] CP New Feature Interrogation API.....	178
[7.2 APAR] SMAPI Query Processors API.....	178
System Diagnosis.....	179
[6.2] VM Dump Tool Enhancements.....	179
[6.3] Enhanced Dump Support.....	179
[6.4 APAR] DUMP Processing Enhancements.....	180
[7.1] Improvements to the z/VM Dump Process.....	180
[7.1] Stand-Alone Dump to Tape Support Removed.....	180
[7.1 APAR] Additional Dump Processing Improvements.....	181
[7.2 APAR] Fast Dump Distiller.....	181
[7.2 APAR] Improve I/O Time for Dump Processing.....	181
[7.2 APAR] Preserve Partial Hard Abend Dump.....	181
Product Documentation.....	182
[6.1] Added Publications.....	182
[6.1] Deleted Publications.....	182
[6.1] Relocated Information.....	182
[6.1] Media Changes.....	182
[6.2] Relocated Information.....	182
[6.2] Media Changes.....	182
[6.3] Media Changes.....	182
[6.3] Procedures for Changing the Volume Labels and System Name of a Non-SSI z/VM System.....	183
[6.3] SAPL Information Moved.....	183
[6.4] New z/VM CMS Pipelines Documentation.....	183
[6.4] z/VM Collection and z/VM Omnibus PKIT Discontinued.....	183
[6.4] z/VM Adobe Indexed PDF Collection.....	183
[7.1] Continuous Delivery Capability for z/VM Documentation.....	184
[7.1] Deleted Publications.....	184
[7.2] IBM Knowledge Center is now IBM Documentation.....	184

Chapter 3. Changes to External Interfaces.....185

CP Changes.....	185
System Configuration Statements.....	185
User Directory Statements.....	192
CP Commands.....	194
CP Utilities.....	240
Dynamic I/O Return Codes.....	244
DIAGNOSE Codes.....	247
STHYI Instruction.....	250
Accounting Records.....	254
CP Macros.....	254
CP System Services.....	255
CP Environment Variables.....	256

VM Dump Tool.....	256
CMS Changes.....	257
General CMS Commands.....	257
CMS Utilities.....	259
XEDIT Subcommands.....	260
CMS Routines.....	261
CMS Macros.....	261
HELP Facility.....	262
Dump Viewing Facility Changes.....	271
GCS Changes.....	272
REXX/VM Changes.....	272
VMSES/E Changes.....	272
Notices.....	275
Trademarks.....	276
Terms and Conditions for Product Documentation.....	276
IBM Online Privacy Statement.....	277
Bibliography.....	279
Where to Get z/VM Information.....	279
z/VM Base Library.....	279
z/VM Facilities and Features.....	281
Prerequisite Products.....	282
Index.....	283

Tables

1. New Function Variables.....	2
2. Base \$PPF File Names.....	39
3. Directory types and system environments.....	117
4. Renamed Help Files for Some CP and CMS Subcommands.....	148
5.	164
6. Changes to System Configuration Statements.....	186
7. Changes to User Directory Statements.....	192
8. Changes to CP Commands.....	194
9. Changes to CP Utilities.....	240
10. Changes to Dynamic I/O Return Codes.....	244
11. Changes to DIAGNOSE Codes.....	247
12. Changes to Reserved DIAGNOSE Codes.....	249
13. Changes to the STHYI Instruction Function Code Response Buffers.....	250
14. Changes to Accounting Records.....	254
15. Changes to System Definition Macros.....	255
16. Changes to VM Data Space Macros.....	255
17. Changes to CP System Services.....	255
18. Changes to CP Environment Variables.....	256
19. Changes to VM Dump Tool Command, Subcommands, and Macros.....	256
20. Changes to General CMS Commands.....	258
21. Changes to CMS Utilities.....	259
22. Changes to XEDIT Subcommands.....	260
23. Changes to General CMS Callable Services.....	261

24. Changes to General CMS Macros and Subcommands.....	261
25. Changes to CMS Compatibility-Interface Macros.....	262
26. Added or Deleted HELP Components	262
27. Deleted HELP Files.....	263
28. Changes to Dump Viewing Facility Functions.....	272
29. Changes to GCS Commands and Macros.....	272
30. Changes to REXX/VM Instructions, Functions, and External Functions.....	272
31. Changes to VMSES/E Commands.....	272

About This Document

This document provides a history of significant changes to the z/VM product since z/VM V5.4, as delivered in new product releases and between-release small programming enhancements (SPEs) and New Function APARs.

Intended Audience

This document is intended for personnel who are responsible for planning and completing a system upgrade. This information could also be helpful to programmers who will be migrating applications to the new system.

Where to Find More Information

For information about changes in z/VM V5.4 and earlier releases, see *z/VM: Migration Guide*, GC24-6201-14.

For information about the current z/VM hardware and software requirements, see *z/VM: General Information*. For more information about z/VM functions, see the other books listed in the [“Bibliography” on page 279](#).

Links to Other Documents and Websites

The PDF version of this document contains links to other documents and websites. A link from this document to another document works only when both documents are in the same directory or database, and a link to a website works only if you have access to the Internet. A document link is to a specific edition. If a new edition of a linked document has been published since the publication of this document, the linked document might not be the latest edition.

How to provide feedback to IBM

We welcome any feedback that you have, including comments on the clarity, accuracy, or completeness of the information. See [How to send feedback to IBM](#) for additional information.

Summary of changes for z/VM: Migration Guide

This information includes terminology, maintenance, and editorial changes. Technical changes or additions to the text and illustrations for the current edition are indicated by a vertical line (|) to the left of the change.

GC24-6294-11, z/VM 7.2 (December 2023)

This edition includes terminology, maintenance, and editorial changes.

GC24-6294-11, z/VM 7.2 (September 2023)

This edition includes updates to support product changes provided or announced after the general availability of z/VM 7.2.

- **System Administration and Operation**
 - “[7.2 APAR] Increase crashkernel area size” on page 172

GC24-6294-11, z/VM 7.2 (September 2022)

This edition includes terminology, maintenance, and editorial changes.

GC24-6294-11, z/VM 7.2 (May 2022)

This edition includes updates to support product changes provided or announced after the general availability of z/VM 7.2.

- **Support and Exploitation of Hardware and Architectures**
 - “[7.2 APAR] z/VM Support for IBM z16[®]” on page 94
 - “[7.2 APAR] Host Exploitation of Crypto Interruptions” on page 95

GC24-6294-10, z/VM 7.2 (December 2021)

This edition includes updates to support product changes provided or announced after the general availability of z/VM 7.2.

- **Connectivity and Networking**
 - “[7.2 APAR] VSwitch Bridge Port Enhancements” on page 114
- **System Administration and Operation**
 - “[7.2 APAR] DirMaint Performance Enhancements” on page 172
- **Security**
 - “[7.2 APAR] Query SSL GSKKYMANT Certificates” on page 174
- **Application Development and Deployment**
 - “[7.2 APAR] SMAPI Query Processors API” on page 178
- **System Diagnosis**
 - “[7.2 APAR] Preserve Partial Hard Abend Dump” on page 181

GC24-6294-09, z/VM 7.2 (July 2021)

This edition includes updates to support product changes provided or announced after the general availability of z/VM 7.2.

- **Support and Exploitation of Hardware and Architectures**

- [“\[7.2 APAR\] Dynamic Memory Downgrade \(DMD\) Enablement” on page 92](#)
- [“\[7.2 APAR\] Performance Toolkit Support for Dynamic Memory Downgrade” on page 93](#)
- [“\[7.2 APAR\] Improved Live Guest Relocation for Crypto Environments with Mixed Adapter Types” on page 93](#)

- **Connectivity and Networking**

- [“\[7.2 APAR\] IPv6 Layer 2 Query Support” on page 113](#)

- **System Administration and Operation**

- [“\[7.2 APAR\] EDEVICE Path Management Enhancements” on page 163](#)
- [“\[7.2 APAR\] HELP File Enhancements” on page 164](#)

- **Security**

- [“\[7.2 APAR\] System SSL z/OS 2.3 Equivalence” on page 174](#)
- [“\[7.2 APAR\] RACF MFA fixpack” on page 174](#)

GC24-6294-08, z/VM 7.2 (April 2021)

This edition includes updates to support the following:

- **Product Documentation**

- [“\[7.2\] IBM Knowledge Center is now IBM Documentation” on page 184](#)

GC24-6294-08, z/VM 7.2 (March 2021)

This edition includes updates to support product changes provided or announced after the general availability of z/VM 7.2.

- **Support and Exploitation of Hardware and Architectures**

- [“\[7.2 APAR\] 4 TB Real Memory Support” on page 90](#)
- [“\[7.2 APAR\] z/Architecture Extended Configuration \(z/XC\) support” on page 91](#)
- [“\[7.2 APAR\] Performance Toolkit Support for z/XC-Mode Virtual Machines” on page 92](#)

- **System Administration and Operation**

- [“\[7.2 APAR\] Spool information enhancements” on page 163](#)

- **System Diagnosis**

- [“\[7.2 APAR\] Fast Dump Distiller” on page 181](#)
- [“\[7.2 APAR\] Improve I/O Time for Dump Processing” on page 181](#)

GC24-6294-07, z/VM 7.2 (December 2020)

This edition includes updates to support product changes provided or announced after the general availability of z/VM 7.2.

- **Support and Exploitation of Hardware and Architectures**

- [“\[7.2 APAR\] Performance Toolkit Support for Simultaneous Multithreading \(SMT\)” on page 89](#)
- [“\[7.2 APAR\] Guest HyperPAV Alias support for 1-End minidisks” on page 90](#)
- [“\[7.2 APAR\] FlashCopy preserve mirror support” on page 90](#)

- [“\[7.2 APAR\] VARY ON of real devices utilizing multi-processor support” on page 90](#)
- [“\[7.2 APAR\] Non-fullpack minidisk High Performance FICON Support” on page 90](#)
- **System Administration and Operation**
 - [“\[7.2 APAR\] DirMaint Health Checker” on page 162](#)
 - [“\[7.2 APAR\] EDEVICE Optional LUN Specification” on page 163](#)
 - [“\[7.2 APAR\] CP QUERY DEVICES command” on page 163](#)
- **Security**
 - [“\[7.2 APAR\] Change TLS Server to IPL ZCMS” on page 173](#)
 - [“\[7.2 APAR\] TLS/SSL OCSP Support” on page 173](#)
 - [“\[7.2 APAR\] RACF Enhancements” on page 174](#)
- **Application Development and Deployment**
 - [“\[7.2 APAR\] CP New Feature Interrogation API” on page 178](#)

GC24-6294-06, z/VM 7.2 (September 2020)

This edition includes changes to support the general availability of z/VM 7.2.

- **Product Packaging**
 - [“\[7.2\] Removal of KANJI language files” on page 7](#)
- **Installation, Migration, and Service**
 - [“\[7.2\] Installation Changes” on page 38](#)
 - [“\[7.2\] z/VM Centralized Service Management for non-SSI environments ” on page 39](#)
 - [“\[7.2\] Update to SERVICE command to report installed APARs and PTFs” on page 38](#)
 - [“\[7.2\] Product Parameter File Names” on page 39](#)
 - [“\[7.2\] Changes to predefined user directory entries” on page 40](#)
- **Support and Exploitation of Hardware and Architectures**
 - [“\[7.2\] Adjunct Virtual Machine Support” on page 85](#)
 - [“\[7.2\] Architecture Level Set \(ALS\)” on page 86](#)
 - [“\[7.2\] xDisk Scalability” on page 86](#)
 - [“\[7.2\] MSS Multi-Target PPRC Exploitation” on page 86](#)
 - [“Changed command responses” on page 87](#)
 - [“\[7.2\] HiperDispatch default unparking setting changed to UNPARKING MEDIUM” on page 89](#)
 - [“\[7.2\] System Recovery Boost enabled by default” on page 89](#)
 - [“\[7.2 APAR\] 4 TB Real Memory Support” on page 90](#)
- **Connectivity and Networking**
 - [“\[7.2\] CLEAR TDISK Enabled by Default” on page 113](#)
- **System Administration and Operation**
 - [“\[7.2\] Removal of Obsolete Commands” on page 161](#)
 - [“\[7.2\] Removing PAGING63 IPL Parameter” on page 161](#)
 - [“\[7.2\] DirMaint Default Changes” on page 161](#)
- **Application Development and Deployment**
 - [“\[7.2\] Re-link-edit required for Reusable Server Kernel applications” on page 178](#)
- **System Diagnosis**
 - [“\[6.4 and 7.1 APAR\] Support for UNRESPONSIVE_PROCESSOR_DETECTION” on page 158](#)

GC24-6294-05, z/VM 7.1 (January 2020)

This edition includes updates to support product changes provided or announced after the general availability of z/VM 7.1.

- **Support and Exploitation of Hardware and Architectures**

- [“Improved information about defining crypto resources to z/VM guests” on page 84](#)
- [“\[7.1 APAR\] z15 I/O Processor Compatibility” on page 85](#)

- **Connectivity and Networking**

- [“\[7.1 APAR\] TLS Certificate Verification” on page 113](#)

- **System Administration and Operation**

- [“\[7.1 APAR\] Multi-Factor Authentication for z/VM within the RACF server” on page 173](#)
- [“\[7.1 APAR\] CP support for MFA” on page 173](#)
- [“\[7.1 APAR\] STHYI support for zCX containers” on page 160](#)
- [“\[7.1 APAR\] Fast Minidisk Erase” on page 161](#)

- **Security**

- [“\[7.1 APAR\] PVM Secure Connectivity” on page 172](#)
- [“\[7.1 APAR\] Multi-Factor Authentication for z/VM within the RACF server” on page 173](#)
- [“\[7.1 APAR\] CP support for MFA” on page 173](#)

GC24-6294-04, z/VM 7.1 (September 2019)

This edition includes updates to support product changes provided or announced after the general availability of z/VM 7.1.

- **Support and Exploitation of Hardware and Architectures**

- [“\[7.1 APAR\] IBM z15 \(z15\) and LinuxONE III Server Compatibility” on page 83](#)
- [“\[7.1 APAR\] Dynamic Crypto” on page 84](#)
- [“\[7.1 APAR\] System Recovery Boost” on page 84](#)

GC24-6294-03, z/VM 7.1 (June 2019)

This edition includes updates to support product changes provided or announced after the general availability of z/VM 7.1.

- **Support and Exploitation of Hardware and Architectures**

- [“\[7.1 APAR\] Extended Address Volume \(EAV\) Paging Space Support” on page 81](#)
- [“\[7.1 APAR\] Performance Toolkit Support for EAV Paging Space” on page 81](#)
- [“\[7.1 APAR\] Support for 80 Logical Processors” on page 81](#)
- [“\[7.1 APAR\] Performance Toolkit Support for 80 Logical Processors” on page 82](#)
- [“\[7.1 APAR\] Removal of 1000-Member Limit for a Single Resource Pool” on page 83](#)

GC24-6294-02, z/VM 7.1 (April 2019)

This edition includes changes to support product changes provided or announced after the general availability of z/VM 7.1.

- **Connectivity and Networking**

- [“\[7.1 APAR\] TCP/IP Support for OSA-Express7S 25G” on page 111](#)
- [“\[7.1 APAR\] Virtual Switch Priority Queuing Enhancements” on page 111](#)

- **System Administration and Operation**

- [“\[7.1 APAR\] Virtual Console Output Routing Control”](#) on page 160
- [“\[7.1 APAR\] Allow Device Range on DEFINE HYPERPAVALIAS and DEFINE PAVALIAS”](#) on page 160

GC24-6294-01, z/VM 7.1 (December 2018)

This edition includes changes to support product changes provided or announced after the general availability of z/VM 7.1.

- **Installation, Migration, and Service**

- [“\[7.1 APAR\] Query RSCS Service Level”](#) on page 38

- **Support and Exploitation of Hardware and Architectures**

- [“\[7.1 APAR\] Support for the IBM Adapter for NVMe”](#) on page 80

- **Connectivity and Networking**

- [“\[7.1 APAR\] TLS/SSL Server Elliptic Curve Support”](#) on page 110

GC24-6294-00, z/VM 7.1

This edition includes changes to support the general availability of z/VM 7.1.

- **Delivery of New Functions, Enhancements, and Support**

- [“z/VM Continuous Delivery Model”](#) on page 1

- **Product Packaging**

- [“\[7.1\] Integration of z/VM SSI for Continuous Operation”](#) on page 7
- [“\[7.1\] OSA/SF Not Shipped with z/VM”](#) on page 7
- [“\[7.1\] z/VM Messages and Help Files for Kanji Have Been Discontinued”](#) on page 7

- **Installation, Migration, and Service**

- [“\[7.1\] Installation and Migration Changes”](#) on page 34
- [“\[7.1\] User Directory Modifications”](#) on page 35
- [“\[7.1\] Changes to Predefined User Directory Entries”](#) on page 36
- [“\[7.1\] VMSES/E MIGRATE Command Support Withdrawn”](#) on page 37

- **Support and Exploitation of Hardware and Architectures**

- [“\[7.1\] Architecture Level Set”](#) on page 78
- [“\[7.1\] Foundational Support for Dynamic Memory Downgrade”](#) on page 79
- [“\[7.1\] Foundational Support for More Than 64 Logical Processors”](#) on page 79

- **Connectivity and Networking**

- [“\[7.1\] IMAP Support Removed”](#) on page 110
- [“\[7.1\] Support Removed for IEEE 802.3 Ethernet Frame Types”](#) on page 110

- **System Administration and Operation**

- [“\[6.4\] z/VM 6.4 Achieves Common Criteria Certification”](#) on page 158
- [“\[7.1\] QUERY BYUSER Support for Class B Users”](#) on page 158
- [“\[7.1\] Dynamic ESM Protection Support for CPACCESS, CPTYPE, and CPVLOAD”](#) on page 159
- [“\[7.1\] CP Commands Cleanup”](#) on page 159
- [“\[7.1 APAR\] SMAPI ESM Authorization Support”](#) on page 159

- **Application Development and Deployment**

- [“\[7.1\] GDDMXD/VM Support Removed”](#) on page 178

- **System Diagnosis**

- [“\[7.1\] Improvements to the z/VM Dump Process” on page 180](#)
- [“\[7.1\] Stand-Alone Dump to Tape Support Removed” on page 180](#)
- [“\[7.1 APAR\] Additional Dump Processing Improvements” on page 181](#)

- **Product Documentation**

- [“\[7.1\] Continuous Delivery Capability for z/VM Documentation” on page 184](#)
- [“\[7.1\] Deleted Publications” on page 184](#)

Chapter 1. Introduction

Changes to the z/VM product include the addition of new functions, enhancements to existing functions, additional support, and removal of functions or support. The following topics explain how z/VM changes are delivered and how information about the changes is presented in this document.

z/VM Continuous Delivery Model

With z/VM 7.2, IBM continues to deliver product enhancements to its z/VM advanced virtualization technology on IBM Z and LinuxONE servers using the z/VM Continuous Delivery model. This model for new functions offers clients timely support for new technology throughout the life of a z/VM release using a delivery mechanism that is familiar to clients and time tested. Because the z/VM Continuous Delivery model is not centered around a release date, it allows schedule flexibility as IBM partners with the z/VM community in the design, development, and delivery of new functions.

With this model, IBM helps clients to benefit faster from new functions and capabilities with the z/VM product. This is how z/VM function and service are now delivered:

- IBM will deliver most new z/VM 7.2 functions as Small Programming Enhancements (SPEs) in the service stream. Following general availability of z/VM 7.2, z/VM 7.1 will, with a few exceptions, receive only corrective service. Similarly, when a new release is introduced after z/VM 7.2, SPEs will be delivered on that release going forward and 7.2 will receive mostly corrective service only.
- IBM now delivers z/VM releases on a fixed, 24-month cycle. These releases are a rollup of:
 - Previously-released New Function APARs
 - New function that is too disruptive or pervasive to ship in the z/VM service stream
 - Fixes that were shipped in the service stream of the earlier release
- IBM services each z/VM release until six months after the N+2 release is generally available.
- A z/VM release remains orderable for 18 months after the general availability of its follow-on release. This allows clients who are running older levels of z/VM the option of:
 - Moving to the most current release, to receive New Function APARs
 - Moving to the service-only release, to receive corrective service only

Clients are afforded the flexibility of moving from one service-only release to another, if they prefer not to receive new function in the service stream. For example, a z/VM 7.1 client has the option of moving to z/VM 7.2 up to 18 months after the general availability of z/VM 7.3. z/VM 7.1 will be orderable for 18 months after the general availability of z/VM 7.2. For ordering options, see your local IBM representative.

For planning purposes, z/VM 7.1 users receive corrective service six months after the general availability of z/VM 7.3. The planned release cycle for z/VM 7.x means z/VM 7.1 service support overlaps the planned availability of z/VM 7.3 by six months. The same applies for future N releases six months after the N+2 release is generally available.

To learn about the z/VM sponsor user program, see [IBM z/VM Sponsor User information \(https://www.vm.ibm.com/sponsor_user/\)](https://www.vm.ibm.com/sponsor_user/).

To learn about z/VM® continuous delivery and the proposed schedules, see [IBM: z/VM Continuous Delivery News \(https://www.vm.ibm.com/newfunction/\)](https://www.vm.ibm.com/newfunction/).

To be notified when new functions become available, see [IBM: z/VM New Function APARs for the z/VM Platform \(https://www.ibm.com/vm/service/vmfnfapar.html\)](https://www.ibm.com/vm/service/vmfnfapar.html).

New Function Variables

To get the most up-to-date list of (and more information about) CP environment variables that define new z/VM functions, go to:

IBM: z/VM New Function Variable List (<https://www.vm.ibm.com/newfunction/varlist.html>)

Table 1 on page 2 includes a list of variables that define new function APARs available with z/VM 7.2.

Table 1. New Function Variables

Variable	Version/release, APAR number
CP.FUNCTION.COPYSERVICES.FC_PRESERVE_MIRROR	7.2 [VM66433]
CP.FUNCTION.CRYPTO.INTERRUPTIONS	7.2 [VM66534]
CP.FUNCTION.CRYPTO.MIXED_APVIRT_LGR	7.2 [VM66496]
CP.FUNCTION.DASD.HYPERPAV_1_END	7.2 [VM66421]
CP.FUNCTION.DASD.MINIDISK.HPF.PHASE	7.2 [VM66450]
CP.FUNCTION.DASD.MP_VARY_ON	7.2 [VM66449]
CP.FUNCTION.DUMP.PRESERVE_PARTIAL	7.2 [VM66560]
CP.FUNCTION.DUMP.SPEEDUP	7.2 [VM66431]
CP.FUNCTION.EDEVICE.DEFINITION	7.2 [VM66420]
CP.FUNCTION.EDEVICE.PATH_MANAGEMENT	7.2 [VM66507]
CP.FUNCTION.QUERY.DEVICES	7.2 [VM66469]
CP.FUNCTION.SPOOL.EXTENSIONS	7.2 [VM66479]
CP.FUNCTION.VSWITCH.IPV6QUERY	7.2 [VM66485]
CP.FUNCTION.VSWITCH.NICDISTRIBUTION	7.2 [VM66557]
CP.FUNCTION.ZXC	7.2 [VM66201]
CP.LIMIT.MEMORY.REAL_TOTAL	7.2 [VM66173]
CP.LIMIT.MEMORY.RECLAIM	7.2 [VM66173]
CP.LIMIT.MEMORY.RECONFIG	7.2 [VM66271]

How Information about z/VM Changes Is Presented in This Document

Information about z/VM changes is presented two ways in this document:

- The topics in Chapter 2, “System Changes,” on page 5 describe significant changes to z/VM system functions. The information is organized according to the general functional areas where the changes have occurred, such as product packaging, installation and service, hardware and architecture support, connectivity and networking, and so on.
- The topics in Chapter 3, “Changes to External Interfaces,” on page 185 identify changes to specific external interfaces in the z/VM components. External interfaces are commands, routines, macros, DIAGNOSE codes, directory control statements, and so on. Each change is identified as either **upwardly compatible** or **incompatible**. (For definitions of these terms, see “Compatibility Terms” on page 3.) The information is organized by component, and within each component by interface type.

For each change, the release in which it occurred is indicated in brackets, like this: **[7.2]**. Within a section, changes are listed from oldest to newest.

Notes:

1. The indicated release is either:
 - The first release that included the change in the base product
 - The last release for which the change was available as a New Function APAR
2. Beginning with z/VM 6.3, a change provided as a New Function APAR is indicated like this:
 - In Chapter 2, the term **APAR** is included with the release in brackets. The APAR number is identified in the description.
 - In Chapter 3, the APAR number is included with the release in brackets.
3. A change might be superseded by another change, or support might be withdrawn, in a later release.
4. In Chapter 3, for types of changes that occur every release, such as responses from commands that query the level of the system, only the latest release is indicated.
5. Many descriptions of system changes include cross-references to other documents for more information about those functions. Over the course of product releases, the titles of some VM documents might have changed. In most cases, the cross-reference points to the *current* title of the appropriate document.

Compatibility Terms

In Chapter 3, “Changes to External Interfaces,” on page 185, the following terms are used to convey the degree of compatibility for each change:

Upwardly compatible

The syntax, function, or response of the external interface has been changed, but not significantly. Invocations and applications using the external interface on the new system in the same manner as on the current system should continue to execute unchanged.

Note: New function, if not exploited, is also upwardly compatible.

Incompatible

The syntax, function, or response of the external interface has been changed significantly. Some invocations and applications using the external interface on the new system in the same manner as on the current system might execute differently, incorrectly, or not at all.

Note: Depending on how you use the interface, a change identified as incompatible might be upwardly compatible for you.

Chapter 2. System Changes

These topics describe new functions, enhancements, and support that have been added to z/VM. Some topics identify functions and support that have been removed. For information about changes to specific external interfaces, see Chapter 3, “Changes to External Interfaces,” on page 185.

The system changes are described in the following major topics:

- [“Product Packaging” on page 5](#)
- [“Installation, Migration, and Service” on page 7](#)
- [“Support and Exploitation of Hardware and Architectures” on page 41](#)
- [“Connectivity and Networking” on page 95](#)
- [“System Administration and Operation” on page 114](#)
- [“Application Development and Deployment” on page 174](#)
- [“System Diagnosis” on page 179](#)
- [“Product Documentation” on page 182](#)

Product Packaging

These topics describe changes in what facilities are provided in the z/VM base product or offered as optional features, and how z/VM is distributed.

[6.1] Changes to Documentation Provided with z/VM

The *IBM Online Library: z/VM Collection* CD-ROM has been replaced by the *IBM Online Library: z/VM Collection* DVD, SK5T-9509. The DVD is provided with z/VM 6.1. The CD-ROM version has been discontinued.

The following printed documents are not provided with z/VM 6.1:

- *z/VM: Getting Started with Linux on System z*

The printed version of this document has been discontinued. PDF and BookManager® versions are still available from the same sources as other z/VM publications.

- *z/VM Summary for Automated Installation and Service (DVD Installation)*

This document has been discontinued (no longer published in any format).

- *z/VM Summary for Automated Installation and Service (Tape Installation)*

This document has been discontinued (no longer published in any format).

[6.1] German Files Discontinued

Translation of message repositories and HELP files into German has been discontinued. German files are not shipped with or available for z/VM 6.1. The z/VM installation procedures have been revised to remove the German option.

[6.2] IBM z/VM Single System Image Feature

The IBM® z/VM Single System Image Feature (VMSSI) is offered as an optional feature of z/VM 6.2. VMSSI enables the creation of z/VM single system image (SSI) clusters. A z/VM SSI cluster is a multisystem environment in which the z/VM member systems can be managed as a single resource pool and running Linux® guests can be relocated from one member to another. For information about the z/VM SSI environment and setting up z/VM SSI clusters, see *z/VM: CP Planning and Administration*.

VMSSI must be ordered through the z/VM System Delivery Offering (SDO). For information about the licensing requirements for VMSSI, see *z/VM: License Information*.

Various z/VM functions have been added or enhanced to support z/VM SSI clusters. Those additions and enhancements are described in the appropriate sections of this publication.

[6.2] z/Architecture CMS

z/Architecture[®] CMS (z/CMS), previously supplied as a sample program, is now a fully supported part of z/VM. z/CMS runs in IBM z/Architecture 31-bit addressing mode in an ESA or XA virtual machine and enables CMS programs to use z/Architecture instructions, including those that operate on 64-bit registers, while permitting existing ESA/390 architecture CMS programs to continue to function without change. Although z/CMS does not directly exploit storage above 2 GB, z/CMS can be IPLed in a virtual machine with more than 2 GB of storage, and programs running on z/CMS can specify the SUBPOOL='USERG' parameter on the CMSSTOR OBTAIN macro to allocate storage above 2 GB. For more information about z/CMS, see *z/VM: CMS Planning and Administration*.

The following functions have been updated:

- CMS QUERY CMSLEVEL command
- CMS SET CMS370AC command
- CMS CMSSTOR macro
- CMS DEFNUC macro
- REXX/VM STORAGE() function

[6.2] Shipping IBM Systems Director Agents for Linux with z/VM Discontinued

The z/VM Manageability Access Point (zMAP) Agent and Platform Agent for the IBM Systems Director Server for Linux on System z, previously shipped with z/VM 6.1, are not shipped with z/VM 6.2.

[6.3] xCAT Appliance Packaged with z/VM

The Extreme Cloud Administration Toolkit (xCAT) appliance is packaged with z/VM 6.3. xCAT is an open source scalable distributed computing management and provisioning tool that provides a unified interface for hardware control, discovery, and OS diskful/diskfree deployment. The toolkit can be used for the deployment and administration of Linux clusters. The toolkit is packaged and configured to be ready for use with no modification.

For more information, see *z/VM: Systems Management Application Programming*.

[6.3] z/VM Collection

The *IBM Online Library: z/VM Collection*, SK5T-9509, is no longer available as a physical DVD and is no longer supplied with the z/VM product.

[6.4] z/VM Cloud Manager Appliance No Longer Available

The z/VM Cloud Manager Appliance (CMA) DVD provided with z/VM 6.4 is no longer available, nor is the CMA code available for download from IBM Fix Central. The CMA is stabilized at the Newton level. The CMA will continue to be supported for security fixes and client-reported problems. However, no support for newer releases of OpenStack or functional enhancements are planned.

If you are interested in performing a new installation of the z/VM CMA, contact the IBM z/VM level 2 support team for the installation media or a digital download. IBM does not plan to ship OpenStack or xCAT support with the z/VM hypervisor once the CMA is discontinued from service.

[7.1] Integration of z/VM SSI for Continuous Operation

z/VM single system image (SSI) is included in the base of z/VM 7.1 at no additional cost. Previously, it was a priced feature of z/VM V6, and is withdrawn. Integrating and making SSI available at no charge is intended to help more clients reduce or shorten planned outages of their Linux workloads as they adopt the z/VM Continuous Delivery model for their z/VM systems. SSI includes live guest relocation and single system maintenance to give clients a mechanism to host Linux virtual server images without suffering interruptions as they apply updates to their z/VM systems.

Note: If you are upgrading or migrating your z/VM system to 7.1, SSI remains enabled within the system configuration for compatibility reasons. IBM recommends leaving the SSI state as enabled to allow moving back to the old z/VM level for any reason and to allow 7.1 to coexist in an SSI cluster with older z/VM levels.

For information about setting up SSI clusters, see *z/VM: CP Planning and Administration*.

[7.1] OSA/SF Not Shipped with z/VM

The Open Systems Adapter / Support Facility (OSA/SF) is no longer shipped with z/VM. To customize the modes of operation of OSA features, use OSA/SF on the Hardware Management Console (HMC). For more information, see *Open Systems Adapter/Support Facility on the Hardware Management Console* (https://www.ibm.com/docs/en/SSLTBW_2.1.0/com.ibm.zos.v2r1.ioa/ioa.htm).

[7.1] z/VM Messages and Help Files for Kanji Have Been Discontinued

z/VM no longer provides messages and help files translated into Japanese (KANJI). Mixed-case American English (AMENG) and uppercase American English (UCENG) are the only languages included in z/VM 7.1. Clients can still install other languages on their z/VM 7.1 system. With the general availability of z/VM 7.1, any new or updated messages delivered with z/VM 6.4 service will no longer be translated into Japanese Kanji.

[7.2] Removal of KANJI language files

All of the KANJI language file infrastructure has been removed from the base z/VM components.

Installation, Migration, and Service

These topics describe changes to the z/VM installation, migration, and service processes, procedures, and tools.

For more information about installation changes, see *z/VM: Installation Guide*. For more information about service changes, see *z/VM: Service Guide*.

[6.1] Changes to Predefined User Directory Entries

Added User IDs

Note: These user IDs are not included in the supplied 6.1 source directory. However, they are included in the source directory for 6.2 and later.

DTCENS1

Primary virtual switch controller for intraensemble data network (IEDN) or intranode management network (INMN)

DTCENS2

Backup virtual switch controller for IEDN or INMN

VSMGUARD

z/VM systems management worker server and error recovery server for ensemble support

VSMREQI6

z/VM systems management IPv6 server for ensemble support

VSMREQIM

z/VM systems management network request server for ensemble support

ZVMLXAPP

Management guest (type MG) server for ensemble support

Renamed User IDs

- 5VMDIR40 renamed to **6VMDIR10**.
- 5VMPTK40 renamed to **6VMPTK10**.
- 5VMRAC40 renamed to **6VMRAC10**.
- 5VMRSC40 renamed to **6VMRSC10**.
- 5VMTCP40 renamed to **6VMTCP10**.

Changed User Specifications

- MAINT
 - MDISK 405 statement removed.
 - Minidisk 3B2 increased to 300 cylinders 3390 or 432000 blocks FBA.
 - Minidisk 400 increased to 130 cylinders 3390 or 187200 blocks FBA.
- ZVMMAPLX
 - Privilege classes B and E removed (leaving only G).
 - Added the following statement:

```
CONSOLE 009 3215
```

- All z/VM systems management request servers and worker servers
 - Default and maximum storage increased to 128M 512M.
 - PARM AUTOOCR added to the IPL CMS statement.

Note: These changes are not included in the supplied 6.1 source directory. However, they are included in the 6.2 source directory.

[6.2] Changes to Predefined User Directory Entries

Deleted User IDs

- ADMSERV
- GCSXA
- NAMESRV
- NDBPMGR
- NDBSRV01
- SNALNKA
- SSLSERV
- TFTPDP
- VMKERB
- VSMERVE
- X25IPI

Renamed User IDs

- 5VMHCD40 renamed to **6VMHCD20**.
- 6VMDIR10 renamed to **6VMDIR20**.
- 6VMPTK10 renamed to **6VMPTK20**.
- 6VMRAC10 renamed to **6VMRAC20**.
- 6VMRSC10 renamed to **6VMRSC20**.
- 6VMTCP10 renamed to **6VMTCP20**.

Changed Virtual Machine Definitions

The virtual machine definitions for the following user IDs have been changed from single-configuration virtual machine definitions (USER definitions) to multiconfiguration virtual machine definitions (IDENTITY definitions). For more information about this new type of virtual machine definition, see “[6.2] SSI Cluster User Identity and Configuration” on page 116.

AUDITOR	LGLOPR	RACMAINT	VMSEVR
AUTOLOG1	LPSEVE	REXECD	VMSERVS
AUTOLOG2	MAINT	RSCS	VMSERVU
AVSVM	MIGMAINT	RSCSAUTH	VMUTIL
CBDIODSP	MONWRITE	RSCSDNS	VSMGUARD ¹
CMSBATCH	MROUTE	RXAGENT1	VSMPROXY
DHCPD	OPERATNS	SMTP	VSMREQIM ¹
DISKACNT	OPERATOR	SNMPD	VSMREQIN
DTCENS1 ¹	OPERSYMP	SNMPQE	VSMREQIU
DTCENS2 ¹	OP1	SNMPSUBA	VSMREQI6 ¹
DTCVSW1	OSADMIN1	SYSDUMP1	VSMWORK1
DTCVSW2	OSADMIN2	SYSMON	VSMWORK2
EREP	OSADMIN3	TCPIP	VSMWORK3
FTPSERVE	OSAMAINT	TCPMAINT	XCHANGE
GCS	OSASF	TSAFVM	ZVMLXAPP ¹
GSKADMIN	PERFSVM	UFTD	ZVMMAPLX
IMAP	PORTMAP	VMNFS	
IMAPAUTH	RACFSMF	VMRMADMN	
LDAPSRV	RACFVM	VMRMSVM	

Note on the table:

1

This user ID was added (defined) in z/VM 6.1 but was not included in the supplied source directory. However, the IDENTITY definition for this user ID is included in the z/VM 6.2 source directory.

Added User IDs

- **USER** definitions:

DATAMOV2

DirMaint DATAMOVE service machine for SSI cluster member 2

DATAMOV3

DirMaint DATAMOVE service machine for SSI cluster member 3

DATAMOV4

DirMaint DATAMOVE service machine for SSI cluster member 4

DIRMSAT2

DirMaint DIRMSAT service machine for SSI cluster member 2

DIRMSAT3

DirMaint DIRMSAT service machine for SSI cluster member 3

DIRMSAT4

DirMaint DIRMSAT service machine for SSI cluster member 4

MAINT620

Owns the system resources that are specific to z/VM 6.2, and is used (rather than MAINT) to service all z/VM and preinstalled products, features, and components for z/VM 6.2

PMAINT

Owns the system resources that will be common in an SSI cluster, such as the parm disk and the minidisks that contain the source directory, cross release utilities (such as CPFMTXA and DIRECTXA), VMSES/E system-level files, and the new VMPSFS file pool

VMSESRV

Server for the new VMPSFS file pool

6VMLEN20

Owns the Language Environment® disks

- **IDENTITY** definitions:

DTCSMAPI

SMAPI default TCP/IP stack

LOHCOST

SMAPI default database server

PERSMAPI

SMAPI default performance monitoring server

SSL

Base definition for the virtual machines in the SSL server pool

SSLDCSSM

SSL DCSS management agent server

VSMEVSRV

SMAPI default AF_EVNT server

ZVMLXTS

Provides an anchor for the Linux Terminal Server

Added Profiles

TCPSSLU

Defines the characteristics and configuration of the virtual machines in the SSL server pool

Changed User Specifications

- AUTOLOG1

- SUBCONFIG entries:

- Added links:

```
LINK MAINT 193 193 RR
LINK MAINT 19E 19E RR
```

- Increased MDISK 191 from 001 to 005 cylinders.

- AUTOLOG2

- IDENTITY entry:

- Increased storage from 4M 4M to 32M 32M.
- Changed class from BG to ABCDEG.
- Changed ACCOUNT from SYSTEMS to 9 SYSTEM.

- Changed IPL CMS PARM AUTOOCR to IPL 190.
- Added AUTOLOG OP1 MAINT.
- SUBCONFIG entries:
 - Added link:

```
LINK MAINT 0193 0193 RR
```

- AVSVM
 - Removed "64" from end of IDENTITY (formerly USER) statement.
- BLDCMS
 - Added link:

```
LINK MAINT 990 990 RR
```

- BLDNUC
 - Added link:

```
LINK MAINT 890 990 MW
```

- BLDRACTF
 - Changed links from:

```
LINK 6VMRAC20 590 490 MW
LINK 6VMRAC20 505 305 RR
```

to:

```
LINK RACMAINT 490 490 MW
LINK RACMAINT 305 305 RR
```

- BLDSEG
 - Added link:

```
LINK MAINT 19D 19D MR
```

- CBDIODSP
 - IDENTITY entry:
 - Deleted link:

```
LINK 6VMHCD20 400 400 RR
```

- SUBCONFIG entries:
 - Added MDISK 400 (moved from 6VMHCD20) and increased from 180 to 360 cylinders.

- DATAMOVE
 - Changed password from NOLOG to AUTOONLY.
 - Changed links from:

```
LINK 6VMDIR20 491 191 RR
LINK 6VMDIR20 492 192 RR
LINK 6VMDIR20 11F 11F RR
LINK 6VMDIR20 41F 21F RR
```

to:

```
LINK DIRMAINT 191 191 RR
LINK DIRMAINT 192 192 RR
```

```
LINK DIRMAINT 11F 11F RR
LINK DIRMAINT 21F 21F RR
```

- Added link:

```
LINK PMAINT 551 551 RR
```

- DHCPD

- SUBCONFIG entries:

- Changed links from:

```
LINK 6VMTCP20 491 491 RR
LINK 6VMTCP20 492 492 RR
```

to:

```
LINK TCPMAINT 491 491 RR
LINK TCPMAINT 492 492 RR
```

- DIRMAINT

- Changed password from NOLOG to AUTOONLY.
- Increased storage from 32M 64M to 128M 256M.
- Changed IUCV ANY to IUCV ALLOW.
- Added link:

```
LINK PMAINT 551 551 RR
```

- Increased MDISK 155 from 9 to 12 cylinders.
- Increased MDISK 1DB from 9 to 12 cylinders.
- Increased MDISK 1DF from 9 to 12 cylinders.
- Increased MDISK 1FA from 9 to 12 cylinders.
- Increased MDISK 2DB from 9 to 12 cylinders.
- Increased MDISK 2DF from 9 to 12 cylinders.
- Added MDISK 15D.

- DIRMSAT

- Changed password from NOLOG to AUTOONLY.
- Increased storage from 16M 16M to 128M 256M.
- Changed links from:

```
LINK 6VMDIR20 491 191 RR
LINK 6VMDIR20 492 192 RR
LINK 6VMDIR20 11F 11F RR
LINK 6VMDIR20 41F 21F RR
```

to:

```
LINK DIRMAINT 191 191 RR
LINK DIRMAINT 192 192 RR
LINK DIRMAINT 11F 11F RR
LINK DIRMAINT 21F 21F RR
```

- Added link:

```
LINK PMAINT 551 551 RR
```

- Increased MDISK 1FA from 9 to 12 cylinders.
- Added MDISK 1DE.

- DTCENS1

- SUBCONFIG entries:

- Changed links from:

```
LINK 6VMTCP20 491 491 RR
LINK 6VMTCP20 492 492 RR
```

to:

```
LINK TCPMAINT 491 491 RR
LINK TCPMAINT 492 492 RR
```

- DTCENS2

- SUBCONFIG entries:

- Changed links from:

```
LINK 6VMTCP20 491 491 RR
LINK 6VMTCP20 492 492 RR
```

to:

```
LINK TCPMAINT 491 491 RR
LINK TCPMAINT 492 492 RR
```

- DTCVSW1

- SUBCONFIG entries:

- Changed links from:

```
LINK 6VMTCP20 491 491 RR
LINK 6VMTCP20 492 492 RR
```

to:

```
LINK TCPMAINT 491 491 RR
LINK TCPMAINT 492 492 RR
```

- DTCVSW2

- SUBCONFIG entries:

- Changed links from:

```
LINK 6VMTCP20 491 491 RR
LINK 6VMTCP20 492 492 RR
```

to:

```
LINK TCPMAINT 491 491 RR
LINK TCPMAINT 492 492 RR
```

- FTPSERVE

- SUBCONFIG entries:

- Changed links from:

```
LINK 6VMTCP20 491 491 RR
LINK 6VMTCP20 492 492 RR
```

to:

```
LINK TCPMAINT 491 491 RR
LINK TCPMAINT 492 492 RR
```

- GSKADMIN

- SUBCONFIG entries:

- Changed links from:

```
LINK 6VMTCP20 491 491 RR
LINK 6VMTCP20 492 492 RR
```

to:

```
LINK TCPMAINT 491 491 RR
LINK TCPMAINT 492 492 RR
```

- IBMUSER

- Changed links from:

```
LINK 6VMRAC20 29E 29E RR
LINK 6VMRAC20 505 305 RR
LINK 6VMRAC20 191 192 RR
```

to:

```
LINK RACMAINT 29E 29E RR
LINK RACMAINT 305 505 RR
LINK RACMAINT 192 192 RR
LINK RACFVM 305 305 RR
```

- IMAP

- SUBCONFIG entries:

- Changed links from:

```
LINK 6VMTCP20 491 491 RR
LINK 6VMTCP20 492 492 RR
```

to:

```
LINK TCPMAINT 491 491 RR
LINK TCPMAINT 492 492 RR
```

- IMAPAUTH

- SUBCONFIG entries:

- Changed links from:

```
LINK 6VMTCP20 491 491 RR
LINK 6VMTCP20 492 492 RR
```

to:

```
LINK TCPMAINT 491 491 RR
LINK TCPMAINT 492 492 RR
```

- LDAPSRV

- SUBCONFIG entries:

- Changed links from:

```
LINK 6VMTCP20 491 491 RR
LINK 6VMTCP20 492 492 RR
```

to:

```
LINK TCPMAINT 491 491 RR
LINK TCPMAINT 492 492 RR
```

- LGLOPR

- SUBCONFIG entries:

- Deleted link:

```
LINK MAINT 194 194 RR
```

- LPSERVE

- SUBCONFIG entries:

- Changed links from:

```
LINK 6VMTCP20 491 491 RR
LINK 6VMTCP20 492 492 RR
```

to:

```
LINK TCPMAINT 491 491 RR
LINK TCPMAINT 492 492 RR
```

- MAINT

- IDENTITY entry:

- Removed MAINT from AUTOLOG statement.
- Added links:

```
LINK PMAINT 2CC 2CC MR
LINK PMAINT 551 551 RR
```

- Deleted MDISK 2CC. Minidisk has been split into PMAINT 2CC (10 cylinders) and MAINT620 4CC (10 cylinders).
- Moved the following minidisks to MAINT620 (and increased some sizes as indicated).

194 ¹	3A2	493 ⁶	5D2	6D2
201	3A4	500 ⁷	5E5 ⁸	7A2
2A2	3A6	51D	5E6	7A4
2A4	3B2 ³	5A2	6A2	7A6
2A6	3C2	5A4	6A4	7B2
2C2	3C4	5A6	6A6	7C2
2C4	3D2	5B2	6B2	7C4
2D2 ²	400 ⁴	5C2	6C2	7D2
319	490 ⁵	5C4	6C4	CF2

Notes on the table:

- 1 Increased from 333 to 360 cylinders.
- 2 Increased from 150 to 350 cylinders.
- 3 Increased from 300 to 375 cylinders.
- 4 Increased from 130 to 275 cylinders.
- 5 Increased from 107 to 214 cylinders.
- 6 Increased from 167 to 250 cylinders.
- 7 Increased from 600 to 900 cylinders.

8

Increased from 9 to 18 cylinders.

- Moved the following minidisks to 6VMLEN20:

- 49B
- 49E
- 4A2
- 4A4
- 4A6
- 4B2
- 4C2
- 4C4
- 4D2

- SUBCONFIG entries:

- Added links:

```
LINK MAINT620 194 194 RR
LINK MAINT620 201 201 RR
LINK MAINT620 2A2 2A2 RR
LINK MAINT620 2A4 2A4 RR
LINK MAINT620 2A6 2A6 RR
LINK MAINT620 2C4 2C4 RR
LINK MAINT620 2D2 2D2 RR
LINK MAINT620 490 490 RR
LINK MAINT620 493 493 RR
LINK MAINT620 51D 51D RR
LINK MAINT620 5E5 5E5 RR
LINK MAINT620 890 890 RR
LINK 6VMLEN20 49E 49E RR
```

- Increased MDISK 190 from 107 to 214 cylinders.
- Increased MDISK 193 from 167 to 500 cylinders.
- Increased MDISK 19D from 146 to 292 cylinders.
- Increased MDISK 19E from 250 to 500 cylinders.
- Increased MDISK 401 from 146 to 292 cylinders.
- Increased MDISK 402 from 146 to 292 cylinders.
- Added MDISK CFD.

• MIGMAINT

- SUBCONFIG entries:

- Added minidisks:

- MDISK 2222
- MDISK 24CC
- MDISK 2CF0

- Increased MDISK 191 from 10 to 175 cylinders.

- Added links:

```
LINK PMAINT 551 551 RR
LINK PMAINT 41D 41D RR
```

• MONWRITE

- SUBCONFIG entries:

- Increased MDISK 191 from 090 to 300 cylinders.

• MPROUTE

- IDENTITY entry:
 - Added IPL ZCMS statement.
- SUBCONFIG entries:
 - Changed links from:

```
LINK 6VMTCP20 491 491 RR
LINK 6VMTCP20 492 492 RR
```

to:

```
LINK TCPMAINT 491 491 RR
LINK TCPMAINT 492 492 RR
```

- OPERATNS
 - IDENTITY entry:
 - Increased storage from 32M 32M to 128M 128M.
 - Added OPTION DIAG88 statement.
 - Added NAMESAVE VSMDCSS statement.
 - SUBCONFIG entries:
 - Increased MDISK 191 from 015 to 100 cylinders.
- OP1
 - IDENTITY entry:
 - Removed OP1 from AUTOLOG statement.
- OSADMIN1
 - Changed storage from 16M 32M to 128M 256M.
- OSADMIN2
 - Changed storage from 16M 32M to 128M 256M.
- OSADMIN3
 - Changed storage from 16M 32M to 128M 256M.
- OSASF
 - Changed storage from 64M 64M to 128M 256M.
- PERFSVM
 - IDENTITY entry:
 - Increased storage from 64M 512M to 128M 512M.
 - Changed ACCOUNT from xxxx to XXXXX.
 - Changed IUCV statements from:

```
IUCV *IDENT FCXRES00 GLOBAL
IUCV *IDENT FCXSYSTEM GLOBAL
```

to:

```
IUCV *IDENT FCXC1R01 GLOBAL
IUCV *IDENT FCXC1S01 GLOBAL
IUCV *IDENT FCXC1R02 GLOBAL
IUCV *IDENT FCXC1S02 GLOBAL
IUCV *IDENT FCXC1R03 GLOBAL
IUCV *IDENT FCXC1S03 GLOBAL
IUCV *IDENT FCXC1R04 GLOBAL
IUCV *IDENT FCXC1S04 GLOBAL
```

- SUBCONFIG entries:

- Deleted links:

```
LINK 6VMPTK20 1CC 1CC RR
LINK 6VMPTK20 201 201 RR
```

- Added MDISK 1CC (moved from 6VMPTK20) and increased from 1 to 2 cylinders.
- Added MDISK 201 (moved from 6VMPTK20) and increased from 10 to 20 cylinders.

- PORTMAP

- SUBCONFIG entries:

- Changed links from:

```
LINK 6VMTCP20 491 491 RR
LINK 6VMTCP20 492 492 RR
```

to:

```
LINK TCPMAINT 491 491 RR
LINK TCPMAINT 492 492 RR
```

- RACFVM

- SUBCONFIG entries:

- Deleted links:

```
LINK 6VMRAC20 590 590 MR
LINK 6VMRAC20 505 505 MR
LINK RACMAINT 191 591 MR
```

- Increased MDISK 305 from 68 to 136 cylinders.
- Increased MDISK 490 from 38 to 70 cylinders.

- RACMAINT

- SUBCONFIG entries:

- Added links:

```
LINK 6VMRAC20 29E 29E RR
LINK 6VMRAC20 191 192 RR
```

- REXECD

- SUBCONFIG entries:

- Changed links from:

```
LINK 6VMTCP20 491 491 RR
LINK 6VMTCP20 492 492 RR
```

to:

```
LINK TCPMAINT 491 491 RR
LINK TCPMAINT 492 492 RR
```

- RSCS

- SUBCONFIG entries:

- Changed link from:

```
LINK 6VMRSC20 401 191 RR
```

to:

```
LINK RSCS 401 191 RR
```


- Added MDISK 401 (moved from 6VMRSC20) and increased from 9 to 18 cylinders.
- Added MDISK 403 (moved from 6VMRSC20) and increased from 3 to 6 cylinders.
- RSCSAUTH
 - SUBCONFIG entries:
 - Changed link from:


```
LINK 6VMRSC20 403 403 RR
```
 - to:


```
LINK RSCS 403 403 RR
```
- RSCSDNS
 - SUBCONFIG entries:
 - Changed link from:


```
LINK 6VMRSC20 403 403 RR
```
 - to:


```
LINK RSCS 403 403 RR
```
- RXAGENT1
 - SUBCONFIG entries:
 - Changed links from:


```
LINK 6VMTCP20 491 491 RR
LINK 6VMTCP20 492 492 RR
```
 - to:


```
LINK TCPMAINT 491 491 RR
LINK TCPMAINT 492 492 RR
```
- SMTP
 - SUBCONFIG entries:
 - Changed links from:


```
LINK 6VMTCP20 491 491 RR
LINK 6VMTCP20 492 492 RR
```
 - to:


```
LINK TCPMAINT 491 491 RR
LINK TCPMAINT 492 492 RR
```
- SNMPD
 - SUBCONFIG entries:
 - Changed links from:


```
LINK 6VMTCP20 491 491 RR
LINK 6VMTCP20 492 492 RR
```
 - to:


```
LINK TCPMAINT 491 491 RR
LINK TCPMAINT 492 492 RR
```
- SNMPQE

- SUBCONFIG entries:

- Changed links from:

```
LINK 6VMTCP20 491 491 RR
LINK 6VMTCP20 492 492 RR
```

to:

```
LINK TCPMAINT 491 491 RR
LINK TCPMAINT 492 492 RR
```

- SNMPSUBA

- SUBCONFIG entries:

- Changed links from:

```
LINK 6VMTCP20 491 491 RR
LINK 6VMTCP20 492 492 RR
```

to:

```
LINK TCPMAINT 491 491 RR
LINK TCPMAINT 492 492 RR
```

- SYSADMIN

- Changed links from:

```
LINK 6VMRAC20 29E 29E RR
LINK 6VMRAC20 505 505 RR
LINK 6VMRAC20 191 192 RR
```

to:

```
LINK RACMAINT 29E 29E RR
LINK RACMAINT 305 505 RR
LINK RACMAINT 192 192 RR
```

- TCPIP

- SUBCONFIG entries:

- Changed links from:

```
LINK 6VMTCP20 491 491 RR
LINK 6VMTCP20 492 492 RR
```

to:

```
LINK TCPMAINT 491 491 RR
LINK TCPMAINT 492 492 RR
```

- TCPMAINT

- SUBCONFIG entries:

- Added links:

```
LINK 6VMTCP20 491 491 RR
LINK 6VMTCP20 492 492 RR
```

- Increased MDISK 591 from 61 to 122 cylinders.
- Increased MDISK 592 from 70 to 140 cylinders.

- UFTD

- SUBCONFIG entries:

- Changed links from:

```
LINK 6VMTCP20 491 491 RR
LINK 6VMTCP20 492 492 RR
```

to:

```
LINK TCPMAINT 491 491 RR
LINK TCPMAINT 492 492 RR
```

- VMNFS

- SUBCONFIG entries:

- Changed links from:

```
LINK 6VMTCP20 491 491 RR
LINK 6VMTCP20 492 492 RR
```

to:

```
LINK TCPMAINT 491 491 RR
LINK TCPMAINT 492 492 RR
```

- VMSERVR

- IDENTITY entry:

- Changed IPL CMS to IPL 190.

- VMSERVS

- IDENTITY entry:

- Changed IPL CMS to IPL 190.

- SUBCONFIG entries:

- Deleted MDISKs 306, 307, 308, 309, 310, and 311.

- VMSERVU

- IDENTITY entry:

- Changed IPL CMS to IPL 190.

- VSMGUARD

- SUBCONFIG entries:

- Changed links from:

```
LINK MAINT CF1 CF1 MD
LINK MAINT CF2 CF2 MD
```

to:

```
LINK PMAINT CF0 CF0 MD
```

- Added link:

```
LINK PMAINT 551 551 RR
```

- VSMPROXY

- IDENTITY entry:

- Increased storage from 32M 32M to 128M 512M.

- Changed IPL CMS to IPL CMS PARM AUTOCHR.

- Removed IUUCV *VMEVENT statement.

- Added NAMESAVE VSMDCSS statement.

- VSMREQIM

Installation, Migration, and Service

- IDENTITY entry:
 - Removed IUCV *VMEVENT statement.
- VSMREQIN
 - IDENTITY entry:
 - Increased storage from 32M 32M to 128M 512M.
 - Changed IPL CMS to IPL CMS PARM AUTOOCR.
 - Added NAMESAVE VSMDCSS statement.
- VSMREQIU
 - IDENTITY entry:
 - Increased storage from 32M 32M to 128M 512M.
 - Changed IPL CMS to IPL CMS PARM AUTOOCR.
 - Added NAMESAVE VSMDCSS statement.
- VSMREQI6
 - IDENTITY entry:
 - Removed IUCV *VMEVENT statement.
- VSMWORK1
 - IDENTITY entry:
 - Increased storage from 64M 64M to 128M 512M.
 - Changed IPL CMS to IPL CMS PARM AUTOOCR.
 - Added DIAG88 to OPTION statement.
 - Added NAMESAVE VSMDCSS statement.

- SUBCONFIG entries:

- Changed links from:

```
LINK MAINT CF1 CF1 MD
LINK MAINT CF2 CF2 MD
```

to:

```
LINK PMAINT CF0 CF0 MD
```

- Added link:

```
LINK PMAINT 551 551 RR
```

- VSMWORK2
 - IDENTITY entry:
 - Increased storage from 64M 64M to 128M 512M.
 - Changed IPL CMS to IPL CMS PARM AUTOOCR.
 - Added DIAG88 to OPTION statement.
 - Added NAMESAVE VSMDCSS statement.

- SUBCONFIG entries:

- Changed links from:

```
LINK MAINT CF1 CF1 MD
LINK MAINT CF2 CF2 MD
```

to:

```
LINK PMAINT CF0 CF0 MD
```

- Added link:

```
LINK PMAINT 551 551 RR
```

- VSMWORK3

- IDENTITY entry:
 - Increased storage from 64M 64M to 128M 512M.
 - Changed IPL CMS to IPL CMS PARM AUTOOCR.
 - Added DIAG88 to OPTION statement.
 - Added NAMESAVE VSMDCSS statement.

- SUBCONFIG entries:

- Changed links from:

```
LINK MAINT CF1 CF1 MD
LINK MAINT CF2 CF2 MD
```

to:

```
LINK PMAINT CF0 CF0 MD
```

- Added link:

```
LINK PMAINT 551 551 RR
```

- XCHANGE

- SUBCONFIG entries:
 - Changed link from:

```
LINK 6VMRSC20 403 403 RR
```

to:

```
LINK RSCS 403 403 RR
```

- Added MDISK 191.

- ZVMLXAPP

- IDENTITY entry:
 - Changed password from AUTOONLY to ZVMLXAPP.
 - Changed LOADDEV statement from:

```
LOADDEV PORT 0 LUN 0 BOOT 0
```

to:

```
LOADDEV PORT 0
LOADDEV LUN 0
LOADDEV BOOT 0
```

- Removed statement:

```
SP00L 000E 1403 A
```

- 40SASF40

- Changed link from:

```
LINK 6VMTCP20 0492 0492 RR
```

to:

```
LINK TCPMAINT 0492 0492 RR
```

- 6VMDIR20

- Added link:

```
LINK PMAINT 551 551 RR
```

- Deleted MDISK 502.
- Increased MDISK 41F from 8 to 16 cylinders.
- Increased MDISK 491 from 15 to 30 cylinders.

- 6VMHCD20

- Added link:

```
LINK CBDIODSP 400 400 MR
```

- Moved MDISK 400 to CBDIODSP.

- 6VMPTK20

- Added links:

```
LINK PERFSVM 1CC 1CC MR  
LINK PERFSVM 201 201 MR
```

- Moved MDISK 1CC and MDISK 201 to PERFSVM.

- 6VMRAC20

- Increased MDISK 29E from 2 to 10 cylinders.
- Increased MDISK 590 from 38 to 70 cylinders.

- 6VMRSC20

- Added links:

```
LINK RSCS 401 401 MR  
LINK RSCS 403 403 MR
```

- Deleted MDISK 502.
- Moved MDISK 401 and MDISK 403 to RSCS.
- Added MDISK 493.

- 6VMTCP20

- Deleted links:

```
LINK ADMSERV 191 263 MR  
LINK NAMESRV 191 269 MR  
LINK NDBPMGR 191 26A MR  
LINK NDBSRV01 191 26B MR  
LINK SNALNKA 191 270 MR  
LINK SSLSERV 191 273 MR  
LINK TFTPDP 191 279 MR  
LINK VMKERB 191 27B MR  
LINK X25IPI 191 27D MR
```

- Added links:

```
LINK SSLDCSSM 191 263 MR  
LINK DTCENS1 191 269 MR  
LINK DTCENS2 191 26A MR
```

- Increased MDISK 2B2 from 115 to 150 cylinders.

- Increased MDISK 2D2 from 117 to 200 cylinders.

[6.2] INSTALL Utility Renamed to INSTTAPE

The CP utility INSTALL has been renamed to INSTTAPE. The TAPE operand has been removed, but the RECOVER option is still provided.

The INSTALL EXEC used during the z/VM 6.2 installation process is a new function that is used only during z/VM installation. It does not invoke the old INSTALL utility (now INSTTAPE) and it has no operands or options.

[6.2] CMS AUDITOR Utility Change

After you complete the customization of the CMS AUDITOR, you must uncomment the call to the AUDITOR EXEC in the AUDITOR user ID's PROFILE EXEC in order to start the AUDITOR utility.

[6.2] High Level Assembler Not Required for RACF

The IBM High Level Assembler is no longer required to reassemble CP replacement parts for the RACF® Security Server for z/VM.

[6.2] Options Removed from the VMFINS Command

The RESOURCE, DFNAME, DFTYPE, and DFMODE options have been removed from the VMFINS DELETE, VMFINS INSTALL, and VMFINS MIGRATE commands. The option NORESOURCE remains on these VMFINS commands and is the default. Also, the VMFINS DEFAULTS file has been updated to remove the options NORESOURCE, DFNAME, DFTYPE, and DFMODE.

[6.2] Change to the Linking Default of the VMFSETUP Command

The linking default of the VMFSETUP command has been changed from NOLINK to LINK.

[6.2] Service Changes to Support the SSI Environment

z/VM 6.2 includes the following service changes to support the SSI environment:

- The MAINT $_{vrm}$ user ID, where $_{vrm}$ is the version, release, and modification level of the z/VM system, must now be used rather than the MAINT user ID to service all z/VM and preinstalled products, features, and components.
- When a product is placed into production, files that you placed on a test disk are not automatically moved to a production disk. If you placed files on a test disk, you must manually copy those files to the production disk.
- When a product is placed into production, the DDR of MAINT 490 to MAINT 190 will now DDR only the RECOMP area where the CMS nucleus resides. Because of this, the 490 disk and the 190 disk must be the same size, and the size of the RECOMP area on the 490 disk must be the same as the size of the RECOMP area on the 190 disk.
- It is recommended that you do not save backup copies of the CLOAD MODULE on the MAINT CF3 parm disk. This disk will be erased when a product is placed into production. Instead, you should save backup copies of the CLOAD MODULE on the MAINT CF1 or the MAINT $_{vrm}$ CF2 disk.
- VMPSFS is a new IBM supplied file pool that is the z/VM product service file pool for products loaded into SFS.
- The operation of key VMSES/E commands (SERVICE, PUT2PROD, and VMFSUFIN) is now based on using the content of the VMSES/E 5E6 Test Build minidisk, instead of the 5E5 Build disk. Because of this change, the VMSES/E 5E6 minidisk must be accessed (by convention, at file mode B) before these commands are used for service and maintenance activity. An ACCESS command for this purpose is included in the PROFILE EXEC for the MAINT $_{vrm}$ user ID that is supplied with the system. This change

should be accounted for in any local changes or customization that pertain to the MAINTvrm user ID and its PROFILE EXEC.

[6.2] Change to PPF File Used for Saved Segment Builds

The CMS and Language Environment saved segments supplied with z/VM are now built using the SERVP2P PPF file instead of the ZVM PPF file.

[6.3] Changes to Predefined User Directory Entries

Deleted User IDs

- DHCPD (IDENTITY)
- LPSERVE (IDENTITY)

Added User IDs

- **IDENTITY** definitions:

XCAT

Supports the xCAT appliance packaged with z/VM.

ZHCP

Supports the xCAT appliance packaged with z/VM.

Renamed User IDs

- 6VMDIR20 changed to 6VMDIR30.
- 6VMPTK20 changed to 6VMPTK30.
- 6VMRAC20 changed to 6VMRAC30.
- 6VMRSC20 changed to 6VMRSC30.
- 6VMTCP20 changed to 6VMTCP30.
- MAINT620 changed to MAINT630.

Changed User Specifications

- All logon passwords that previously matched the user ID have been changed to WD5JU8QP.
- DIRMAINT
 - Added link:

```
LINK TCPMAINT 592 592 RR
```

- GSKADMIN
 - IDENTITY entry:
 - Storage changed to 64M 128M.
- LOHCOST
 - IDENTITY entry:
 - Deleted IPL and LOADDEV statements.
 - SUBCONFIG entries:
 - Added statements:

```
IPL 190 PARM AUTO CR  
LINK MAINT 0193 0193 RR  
LINK MAINT 0400 0400 RR
```


- MAINT

- IDENTITY entry:
 - Storage changed to 256M 1000M.
- SUBCONFIG entries:
 - Added statements:

```
LINK MAINT630 400 400 RR
MDISK 125 3390 000 END M01W02 MR
MDISK 126 3390 000 END M01W03 MR
```

- MAINT630

- Added links (if needed):

```
LINK MAINT 125 125 MR
LINK MAINT 126 126 MR
LINK PMAINT 141 141 MR
LINK PMAINT 142 142 MR
```

- Increased minidisk sizes (if used):
 - MDISK 194 increased to 400 cylinders.
 - MDISK 3B2 increased to 580 cylinders.
 - MDISK 3D2 increased to 500 cylinders.
 - MDISK 400 increased to 450 cylinders.
 - MDISK 500 increased to 1200 cylinders.
 - MDISK 5B2 increased to 075 cylinders.

- MIGMAINT

- IDENTITY entry:
 - Storage changed to 256M 1000M.
 - Added OPTION MAINTCCW statement.

- PMAINT

- Privilege classes changed to G only.

- SYSADMIN

- Added link:

```
LINK PMAINT 551 551 RR
```

- VMSERV

- MDISK 304 increased to 160 cylinders.
- MDISK 305 increased to 400 cylinders.

- VSMGUARD

- IDENTITY entry:
 - Logon password changed to AUTOONLY.
 - Added statements:

```
OPTION LNKNOPAS
NAMESAVE SMAPIOUT
```

- SUBCONFIG entries:

- Added minidisk:

```
MDISK A91 3390 0303 005 M01W01 MR ALL ALL ALL
```

- VSMWORK1

- IDENTITY entry:

- Logon password changed to AUTOONLY.
 - Added statements:

```
OPTION LNKNOPAS
NAMESAVE SMAPIOUT
```

- SUBCONFIG entries:

- Added minidisk:

```
MDISK A91 3390 3306 005 M01RES MR ALL ALL ALL
```

- VSMWORK2

- IDENTITY entry:

- Logon password changed to AUTOONLY.
 - Added statements:

```
OPTION LNKNOPAS
NAMESAVE SMAPIOUT
```

- SUBCONFIG entries:

- Added minidisk:

```
MDISK A91 3390 0168 005 M01W01 MR ALL ALL ALL
```

- VSMWORK3

- IDENTITY entry:

- Logon password changed to AUTOONLY.
 - Added statements:

```
OPTION LNKNOPAS
NAMESAVE SMAPIOUT
```

- SUBCONFIG entries:

- Added minidisk:

```
MDISK A91 3390 0198 005 M01W01 MR ALL ALL ALL
```

- 4OSASF40

- MDISK 2D2 increased to 180 cylinders.

- 6VMDIR30

- Links changed from:

```
LINK MAINT 51D 51D MR * VMSES/E software inventory disk
LINK MAINT 5E5 5E5 RR * VMSES/E code
```

to:

```
LINK MAINT630 51D 51D MR * VMSES/E software inventory disk
LINK MAINT630 5E5 5E5 RR * VMSES/E code
```

- 6VMPTK30

- MDISK 29D (if used) increased to 016 cylinders.
 - MDISK 2B2 (if used) increased to 012 cylinders.

- 6VMRAC30
 - Added minidisk:

```
MDISK 651 3390 2487 001 630RL1 MR READ WRITE MULTIPLE
```

- 6VMTCP30
 - Removed links:

```
LINK DHCPD 191 265 MR
LINK LPSERVE 191 267 MR
```

[6.3] ACIGROUP Keyword of RACF GLBLDSK Macro Changed to ACIGRP

The ACIGROUP keyword on the RACF GLBLDSK macro has been changed to ACIGRP to allow the use of Assembler XF. If you use the ACIGROUP keyword on the GLBLDSK macro you will need to change the keyword to ACIGRP. The GLBLDSK macro can be used in the HCPRWA and HCPRWAC CP parts.

[6.3] Installation Changes

The following changes and enhancements have been made to the installation procedure:

- Starting with z/VM 6.3, a new installation technique called upgrade installation is introduced. In a traditional installation, the new release is installed on a separate set of volumes, after which the users and data from the current running system are migrated to the system running the new release. In an upgrade installation, a new release system is installed as a second-level guest of the current release system that you wish to upgrade. The new level of code from the guest system is then moved to your current system with minimal impact to your current running system. This current running system can be a non-SSI system, the only member of a single-member SSI cluster, or any member of a multimember SSI cluster. In a multimember SSI cluster, you will upgrade one member at a time so that there is minimum impact to the other members.
- An upgrade installation is performed using a two-stage approach, with two separate sets of changes being defined and then made on your current system. The first set of changes, STAGE1, can be made to your current system without disrupting your normal system operation. After the STAGE1 changes are made, you must back up your current system before moving on to the disruptive STAGE2 changes. To perform the STAGE2 changes, you must stop all normal production work on your current system. In an SSI cluster environment, you can relocate production Linux workloads from your current system to other members of your cluster before performing STAGE2 activities.
- It is important to note that this procedure can only be used to upgrade from z/VM 6.2. If you wish to migrate from z/VM V5.4 or 6.1, you must use the traditional installation method to install a z/VM 6.3 system and then follow the migration procedures as documented both in this book and in the [z/VM: Installation Guide](#), as necessary.
- Installation messages are contained in the new IUGMES repository rather than the HCPMES repository. This means that as of z/VM 6.3, both existing and new installation messages have the IUG prefix.

[6.3] Relocation of Service-Level Production Status Table

The service-level production status table (*prodid* SRVPROD) has been moved from the system inventory disk (MAINTvrm 51D) to the production inventory disk (PMAINT 41D).

[6.3] Service Enhancements

z/VM 6.3 includes the following service enhancements:

- The VMVFIW EXEC has been updated to accommodate VMSES/E program-specific tracing output.
- Console data excluded from the SERVICE \$CONS file by the SERVICE EXEC is spooled to the reader as a file called SERVICE \$CONXCLD.

[6.3] SSI Cluster Cross-System Highest Release Level Program Handling

In an SSI cluster in which members have different levels of z/VM installed, certain programs that manage shared resources, such as DIRECTXA and DISKMAP, are required to be at the highest release level that is running in the cluster. These programs must be on all members in the cluster regardless of the release level running on each member. Handling the highest release level program is accomplished by having a common test/production build disk set, where programs that must be at the highest release level are shipped and maintained. These disks are on the common volume and are owned by the PMAINT user ID. When a z/VM release which supersedes all other releases running on the members in an SSI cluster is installed on a member of the cluster, the z/VM installation processing places these programs from the superseding release on the SSI system common disk, replacing all programs from the superseded release.

[6.3] ZVM \$PPF Override File Removed

The override product parameter file (PPF), ZVM \$PPF, which contained overrides to the base \$PPF file for each component, has been removed. SERVP2P \$PPF, which was introduced in z/VM V4.1, is the IBM-supplied override product parameter file which contains overrides to the base \$PPF file for each component.

[6.3] New LINKRr Option for the VMFSETUP Command

A new option for the VMFSETUP command, LINKRr, resolves any links specified in the :DCL section of the PPF using the CP LINK command, and acquires these disks with read-only status.

[6.4] Changes to Predefined User Directory Entries

Deleted User IDs

- DTCENS1 (IDENTITY)
- DTCENS2 (IDENTITY)
- VSMREQIM (IDENTITY)
- VSMPROXY (IDENTITY)
- XCAT (IDENTITY)
- ZHCP (IDENTITY)
- ZVMLXAPP (IDENTITY)

Added User IDs

- IDENTITY definitions:

DTCVSW3

Additional TCP/IP stack for a virtual switch controller.

DTCVSW4

Additional TCP/IP stack for a virtual switch controller.

OPNCLOUD

Cloud Manager Appliance (CMA) virtual machine, in which the xCAT Management Node (MN) server and the ZHCP server run.

Replaced (Renamed) User IDs

- 6VMDIR30 changed to 6VMDIR40.
- 6VMHCD20 changed to 6VMHCD40
- 6VMPTK30 changed to 6VMPTK40.

- 6VMRAC30 changed to 6VMRAC40.
- 6VMRSC30 changed to 6VMRSC40.
- 6VMTCP30 changed to 6VMTCP40.
- MAINT630 changed to MAINT640.

Changed User Specifications

Note: Links to renamed user IDs have been updated to specify the new names.

- BLDSEG

- Added statement:

```
LINK MAINT640 5E6 5E6 RR
```

- CBDIODSP

- Storage changed to 2G 2G

- DATAMOVE

- MDISK 1AA increased to 20 cylinders (28800 blocks).
- MDISK 2AA increased to 20 cylinders (28800 blocks).

- DIRMAINT

- MDISK 1AA increased to 20 cylinders (28800 blocks).
- MDISK 2AA increased to 20 cylinders (28800 blocks).

- DIRMSAT

- MDISK 1AA increased to 20 cylinders (28800 blocks).
- MDISK 2AA increased to 20 cylinders (28800 blocks).

- DTCVSW1

- IDENTITY entry:

- Storage changed to 128M 256M.
- Added SHARE RELATIVE 3000 statement.

- DTCVSW2

- IDENTITY entry:

- Storage changed to 128M 256M.
- Added SHARE RELATIVE 3000 statement.

- IBMUSER

- Storage changed to 128M 2G.

- LOHCOST

- IDENTITY entry:

- Deleted OPTION DEVINFO DEVMAINT LNKNOPAS DIAG88 statement.

- MAINT

- SUBCONFIG entries:

- Added statement:

```
LINK MAINT640 5E6 5E6 RR
```

- MAINT640

- MDISK 3B2 decreased to 620 cylinders (892800 blocks).

- MPROUTE
 - IDENTITY entry:
 - Storage changed to 64M 256M
- OPERATNS
 - IDENTITY entry:
 - Storage changed to 256M 512M.
- OPNCLOUD
 - IDENTITY entry:
 - Added statement:

```
OPTION LNKNOPAS
```
- PERFSVM
 - IDENTITY entry:
 - Storage changed to 512M 3G.
 - Changed IPL CMS PARM AUTOOCR to IPL ZCMS PARM AUTOOCR.
 - SUBCONFIG entries:
 - Added statement:

```
COMMAND DEFINE STORAGE CONFIG 0.512M 2G.2G
```
 - MDISK 201 increased to 40 cylinders (57600 blocks).
- PERSMAPI
 - IDENTITY entry:
 - Changed IPL CMS PARM AUTOOCR to IPL ZCMS PARM AUTOOCR.
- RACFSMF
 - IDENTITY entry:
 - Storage changed to 128M 2G.
 - SUBCONFIG entries:
 - Added statements:

```
LINK RACFVM 301 301 MR
LINK RACFVM 302 302 MR
```
- TCPMAINT
 - SUBCONFIG entries:
 - MDISK 591 increased to 160 cylinders (230400 blocks).
 - MDISK 592 increased to 240 cylinders (345600 blocks).
- VMSERV
 - MDISK 305 increased to 500 cylinders (720000 blocks).
 - MDISK 306 increased to 500 cylinders (720000 blocks).
 - MDISK 307 increased to 500 cylinders (720000 blocks).
 - MDISK 308 increased to 500 cylinders (720000 blocks).
 - MDISK 309 increased to 500 cylinders (720000 blocks).
 - MDISK 310 increased to 500 cylinders (720000 blocks).
 - MDISK 311 increased to 500 cylinders (720000 blocks).

- VSMGUARD
 - IDENTITY entry:
 - Deleted OPTION MAINTCCW DIAG88 statement.
 - SUBCONFIG entries:
 - Removed write and multiple-write passwords for MDISK A91.
- VSMWORK1
 - IDENTITY entry:
 - Deleted OPTION MAINTCCW statement.
 - SUBCONFIG entries:
 - Removed write and multiple-write passwords for MDISK A91.
- VSMWORK2
 - IDENTITY entry:
 - Deleted OPTION MAINTCCW statement.
 - SUBCONFIG entries:
 - Removed write and multiple-write passwords for MDISK A91.
- VSMWORK3
 - IDENTITY entry:
 - Deleted OPTION MAINTCCW statement.
 - SUBCONFIG entries:
 - Removed write and multiple-write passwords for MDISK A91.
- ZVMMAPLX
 - IDENTITY entry:
 - Changed password from MAINT to WD5JU8QP.
- 5684042J
 - MDISK 2D2 increased to 40 cylinders (57600 blocks).
- 6VMDIR40
 - MDISK 11F increased to 16 cylinders (23040 blocks)
 - MDISK 41F decreased to 8 cylinders (11520 blocks)
- 6VMHCD40
 - MDISK 2B2 increased to 200 cylinders (288000 blocks).
 - MDISK 2D2 increased to 750 cylinders (1080000 blocks).
 - MDISK 300 increased to 360 cylinders (518400 blocks).
- 6VMPTK40
 - MDISK 200 increased to 20 cylinders (28800 blocks).
- 6VMTCP40
 - Added links:


```
LINK DTCVSW3 191 269 MR
LINK DTCVSW4 191 26A MR
```
 - Deleted links:


```
LINK DTCENS1 191 269 MR
LINK DTCENS2 191 26A MR
```

- MDISK 491 increased to 80 cylinders (115200 blocks).
- MDISK 492 increased to 120 cylinders (172800 blocks).
- MDISK 2D2 increased to 500 cylinders (720000 blocks).

[6.4] Determine Installed Service

Enhancements to CP and VMSES/E enable you to determine if specific CP service is built into the CP nucleus of a running system. The new CPSERVICE option on the CP QUERY command allows queries based on APAR, PTF, or local modification identifiers.

The following CP monitor record has been added:

- Domain 1 Record 31 - MRMTRSRV - Service Configuration Sample Record

For more information, see [z/VM: CP Commands and Utilities Reference](#).

[6.4] Installation Changes

- Support is added for installation on the 3390 Model 27.
- If z/VM is installed to full pack minidisks, the minimum size is 3339 cylinders.

For more information, see:

- [z/VM: Installation Guide](#).

[6.4] Enhanced Upgrade in Place

The z/VM upgrade in place process allows upgrading an existing system to a new release of z/VM with minimal impact to the running system. The upgrade in place process has been extended to allow upgrades from z/VM 6.2 or 6.3 to z/VM 6.4 and positions a system for upgrading to releases beyond z/VM 6.4. Upgrade in place is supported for a member of a z/VM SSI cluster as well as for a nonclustered z/VM system.

For more information, see:

- [z/VM: Installation Guide](#).

[6.4] 3590 and 3592 Tape Not Supported for the Installation of z/VM 6.4

z/VM 6.4 and the z/VM SDO Licensed Products are not available in 3590 or 3592 tape format. z/VM and the z/VM SDO Licensed Products are available on DVD and through via electronic delivery. In addition, z/VM service for all releases will no longer be orderable in 3590 or 3592 tape format.

For more information, see [z/VM: Installation Guide](#).

[6.4] Improved upgrade installation planning information

The instructions for planning an upgrade installation and completing the installation worksheets have been improved. For more information, see [z/VM: Installation Guide](#).

[7.1] Installation and Migration Changes

Installation and migration changes for z/VM 7.1 include the following:

- The upgrade installation process allows you to upgrade from z/VM 6.4 to z/VM 7.1.
Upgrading to z/VM 7.1 from z/VM 6.2 or z/VM 6.3 is not supported.
- Installation of z/VM on 3390 Model 3 DASDs is no longer supported.

Storage devices supported for installation include:

- 3390 volumes with a minimum size of 10016 cylinders.

- SCSI volumes with a minimum size of 6 GB.
- Kanji (KANJI) is no longer supported as a system default language.
Mixed-case American English (AMENG) and uppercase English (UCENG) are supported as system default languages.
Instead of translated Kanji files, the repositories and help files for KANJI are shipped containing uppercase English files.
- OSA/SF is no longer shipped with z/VM.
- For non-SSI traditional installations, ownership information is no longer written on the M01S01 and M01P01 volumes.

For more information, see [z/VM: Installation Guide](#).

[7.1] User Directory Modifications

In response to modern threat models and password policies in a modern enterprise, and in accordance with guidelines offered by IBM for decades, the default user directory provided by IBM has been modified to transition IBM-provided virtual machines to have a password of either AUTOONLY or LBYONLY:

AUTOONLY

The virtual machine can only be autologged and run disconnected. It cannot be logged on by a user at a terminal.

LBYONLY

The virtual machine can be logged on only by a logon-by user listed on a LOGONBY statement in the directory entry for that virtual machine. The logon-by user issues the LOGON BY command with the logon-by user's own ID and password.

Additionally, a default logon-by virtual machine (IBMVM1) is provided to represent a person for logging on to these system user IDs. IBM recommends that this virtual machine's name and password be changed, and associated LOGONBY statements in the user directory be adjusted accordingly to match local security policy.

This change is pertinent only to a fresh installation of z/VM 7.1. If any previous automation is transferred to a fresh z/VM 7.1 system, be advised that LOGON requirements may have changed.

The following user IDs have a password of AUTOONLY.

DATAMOVE	DATAMOV2	DATAMOV3	DATAMOV4	DIRMAINT
DIRMSAT	DIRMSAT2	DIRMSAT3	DIRMSAT4	DTCSMAPI
GCS	LOHCOST	PERSMAPI	SSLDCSSM	VSMEVSRV
VSMGUARD	VSMREQIN	VSMREQIU	VSMREQI6	VSMWORK1
VSMWORK2	VSMWORK3			

The following user IDs have a password of LBYONLY.

CMSERVE	SSL00001	SSL00002	SSL00003	SSL00004
SSL00005	SYSMON	ZHPM	AUDITOR	AUTOLOG2
AVSVM	BLDCMS	BLDNUC	BLDRACF	BLDSEG
CMSBATCH	DISKACNT	DTCVSW1	DTCVSW2	DTCVSW3
DTCVSW4	EREP	FTPSEVE	GSKADMIN	LDAPSRV
LGLOPR	MAINT	MONWRITE	MROUTE	OPERATNS
OPERSYMP	PERFSVM	PORTMAP	REXECD	RSCS
RSCSAUTH	RSCSDNS	RXAGENT1	SMTP	SNMPD

SNMPQE	SNMPSUBA	SYSADMIN	TCPIP	TCPMAINT
TSAFVM	UFTD	VMNFS	VMRMADMN	VMRMSVM
VMSERVP	VMSERVR	VMSERVS	VMSERVU	VMUTIL
XCHANGE				

The following user IDs have a password of NOLOG (a user cannot log on).

ADM	BIN	DAEMON	DEFAULT	NOBODY
PMAINT	ROOT	SYSMAINT	SYS	7VMTCP10
SYSDUMP1	6VMLEN20			

The following user IDs have a default password when the system is installed, which should be changed in accordance with local security policy.

AUTOLOG1	CBDIODSP	CSMWORK	IBMUSER	IBMVM1
MAINTCSM	MAINT710	MIGMAINT	OPERATOR	OP1
RACFSMF	RACFVM	RACMAINT	5684042J	7VMDIR10
7VMHCD10	7VMPTK10	7VMRAC10	7VMRSC10	

For more information, see the default system information topic in [z/VM: Installation Guide](#).

[7.1] Changes to Predefined User Directory Entries

Deleted User IDs

- CMS1 (USER)
- IMAP (IDENTITY)
- IMAPAUTH (IDENTITY)
- OPNCLOUD (IDENTITY)
- OSADMIN1 (IDENTITY)
- OSADMIN2 (IDENTITY)
- OSADMIN3 (IDENTITY)
- OSAMAINT (IDENTITY)
- OSASF (IDENTITY)
- ZVMLXTS (IDENTITY)
- ZVMMAPLX (IDENTITY)
- 4OSASF40 (USER)

Added User IDs

CSMSERVE (IDENTITY)

Infrastructure for a future deliverable

CSMWORK (USER)

Infrastructure for a future deliverable

IBMVM1 (USER)

See “[7.1] User Directory Modifications” on page 35.

MAINTCSM (USER)

Infrastructure for a future deliverable

ZHPM (IDENTITY)

Infrastructure for a future deliverable

Replaced (Renamed) User IDs

- 6VMDIR40 changed to 7VMDIR10.
- 6VMHCD40 changed to 7VMHCD10.
- 6VMPTK40 changed to 7VMPTK10.
- 6VMRAC40 changed to 7VMRAC10.
- 6VMRSC40 changed to 7VMRSC10.
- 6VMTCP40 changed to 7VMTCP10.
- MAINT640 changed to MAINT710.

Changed User Specifications

Note: Links to renamed user IDs have been updated to specify the new names.

- CBDIODSP
 - MDISK 400 increased to 720 cylinders.
- GSKADMIN
 - IDENTITY entry:
 - Added CRYPTO APVIRT.
- LDAPSRV
 - IDENTITY entry:
 - Added CRYPTO APVIRT.
- MAINT710
 - Added 5BC minidisk.
- MONWRITE
 - IDENTITY entry:
 - Storage changed to 32M 64M.
- TCPSSLU
 - PROFILE entry:
 - Added CRYPTO APVIRT.
- 5684042J
 - MDISK 2D2 increased to 60 cylinders.
- 7VMDIR10
 - MDISK 2B1 increased to 15 cylinders.
 - MDISK 2B2 increased to 20 cylinders.

[7.1] VMSES/E MIGRATE Command Support Withdrawn

The VMSES/E MIGRATE command and related commands, first supplied with z/VM V5.2, are no longer provided or supported in z/VM 7.1. The upgrade installation process that was introduced with z/VM 6.3 can be used to upgrade supported z/VM levels to z/VM 7.1. The migration of customized data for components, features, or products from z/VM levels prior to those supported by the upgrade installation process for z/VM 7.1 now must be performed using locally developed procedures.

The following VMSES/E commands are no longer supported:

- MIGCLEAN
- MIGLINK
- MIGRATE
- MIGSETUP

The following VMSES/E system software inventory file is no longer supported:

- *prodid* MIGDvrm (the migration disk tables)

Various CP, TCP/IP, and VMSES/E messages are updated or deleted.

For more information, see:

- [z/VM: VMSES/E Introduction and Reference](#)
- [z/VM: Installation Guide](#)
- [z/VM: Other Components Messages and Codes](#)
- [z/VM: CP Messages and Codes](#)
- [z/VM: TCP/IP Messages and Codes](#)

[7.1 APAR] Query RSCS Service Level

With the PTF for APAR VM66174, RSCS provides a SERVICE operand on the QUERY SYSTEM command to get information about the service level of each module in the running RSCS system. This eliminates ambiguity on whether service was applied.

[7.2] Installation Changes

Installation changes for z/VM 7.2 include the following:

- The upgrade installation process allows you to:
 - Upgrade from z/VM 6.4 or 7.1 to z/VM 7.2.
 - Reuse the work system that was created while upgrading the first member of a multi-member SSI cluster to upgrade subsequent members.
- The packaging for installing z/VM from DVD is changed.

There is now a two-disc product package.

- The package for 3390 consists of the following:

DISC 1

z/VM Product Package for installation on 3390

DISC 2

z/VM Product Package for installation on 3390

- The package for SCSI consists of the following:

DISC 1

z/VM Product Package for installation on SCSI

DISC 2

z/VM Product Package for installation on SCSI

The z/VM installation RSU is included on Disc 2 of each package.

For more information, see [z/VM: Installation Guide](#).

[7.2] Update to SERVICE command to report installed APARs and PTFs

The STATUS operand of the VMSES/E SERVICE command has been enhanced to allow reporting of all of the APARs and PTFs installed for z/VM products and components that are included in your VM System

Software Inventory table (VM SYSSUF). For more information about the SERVICE command, see the [z/VM: VMSES/E Introduction and Reference](#).

[7.2] z/VM Centralized Service Management for non-SSI environments

z/VM Centralized Service Management provides support to deploy service to multiple systems, regardless of geographic location, from a centralized primary location that manages distinct levels of service for a select group of traditional z/VM systems. One system is designated as a principal system and uses the z/VM Shared File System (SFS) to manage service levels for a set of defined managed systems regardless of their geographic location. The principal system builds service levels using the new service management command, SERVMGR, and existing VMSES/E SERVICE commands. This centralized service process keeps track of available service levels and manages the files needed to supply a customer-defined service level to a managed system.

Attention:

Before you initialize z/VM Centralized Service Management, the PTF for APAR VM66428 *must* be:

1. Installed on the principal system and all remote systems in your z/VM Centralized Service Management environment
2. Applied to any customer-defined z/VM Centralized Service Management service level that is based on the BASE z/VM Centralized Service Management service level (the service level that incorporates the initial z/VM 720 RSU).

See the [z/VM: Service Guide](#) for more information.

[7.2] Product Parameter File Names

Table 2 on page 39 lists the base \$PPF file for each z/VM component, facility, and optional feature and indicates whether the file name has changed for z/VM 7.2.

Table 2. Base \$PPF File Names

Component, Facility, or Feature	File ID	Changed?
AVS	7VMAVS20 \$PPF	Yes
CMS	7VMCMS20 \$PPF	Yes
CP	7VMCPR20 \$PPF	Yes
DirMaint	7VMDIR20 \$PPF	Yes
Dump Viewing Facility	7VMDVF20 \$PPF	Yes
GCS	7VMGCS20 \$PPF	Yes
HCD/HCM	7VMHCD20 \$PPF	Yes
Language Environment	6VMLEN20 \$PPF	No
Performance Toolkit	7VMPTK20 \$PPF	Yes
RACF	7VMRAC20 \$PPF	Yes
REXX	7VMREX20 \$PPF	Yes
RSCS	7VMRSC20 \$PPF	Yes
TCP/IP	7VMTCP20 \$PPF	Yes
TSAF	7VMTSA20 \$PPF	Yes
VMSES/E	7VMSES20 \$PPF	Yes

[7.2] Changes to predefined user directory entries

Replaced (renamed) user IDs

- MAINT710 changed to MAINT720
- 7VMDIR10 changed to 7VMDIR20
- 7VMHCD10 changed to 7VMHCD20
- 7VMPTK10 changed to 7VMPTK20
- 7VMRAC10 changed to 7VMRAC20
- 7VMRSC10 changed to 7VMRSC20
- 7VMTCP10 changed to 7VMTCP20

Added user IDs

None.

Deleted user IDs

None.

Changed User Specifications

- Added minidisks:

- MAINT720 222
- MAINTCSM 1190
- MAINTCSM 1890
- MAINTCSM 1590

- Added links:

- USER BLDNUC:

```
LINK MAINT 193 193 RR
LINK MAINTCSM 1190 1190 RR
LINK MAINTCSM 1890 1890 RR
LINK MAINTCSM 1590 1590 RR
```

- Changed link mode:

- USER BLDNUC:

Changed link mode from MW to MR:

```
LINK MAINT 490 190 MR
LINK MAINT 890 990 MR
```

- USER BLDRACF:

Changed link mode from MW to MR:

```
LINK RACMAINT 490 490 MR
```

- Disk size changes:

- CBDIODSP 400: Changed from 720 to 940 cylinders.
- GSKADMIN 191: Changed from 2 to 4 cylinders.
- MAINT720 191: Changed from 175 to 200 cylinders.
- MAINT720 5BC: Changed from 2200 to 3000 cylinders.

- MAINT720 5E5: Changed from 18 to 40 cylinders.
- MAINT720 5E6: Changed from 9 to 20 cylinders.
- MAINT720 5B2: Changed from 75 to 125 cylinders.
- MAINT720 5D2: Changed from 30 to 50 cylinders.
- 7VMHCD20 2B2: Changed from 200 to 300 cylinders.
- 7VMHCD20 300: Changed from 360 to 470 cylinders.
- Removed the 401 (KANJI):
 - IDENTITY MAINT: Deleted the 401 minidisk.
 - Global: Deleted all links to the MAINT 401.
- Discontinuance of support for separately ordered EREP:
 - USER MAINT720: Does not ship a 201 minidisk.
 - IDENTITY MAINT: Deleted links to the 201.
 - IDENTITY EREP:

Changed from this:

```
LINK MAINT 201 201 RR
```

to this:

```
LINK MAINT 193 201 RR
```

Support and Exploitation of Hardware and Architectures

These topics describe z/VM support for, or exploitation of, new or enhanced hardware devices, facilities, and architectures.

Notes:

1. Some hardware z/VM support or exploitation might depend on hardware level or availability. See the sections on server support and device support in *z/VM: General Information*. For detailed information on hardware capabilities and requirements, refer to the appropriate hardware announcements and other hardware documentation.
2. This section also describes the z/VM simulation or emulation of certain hardware architectures and facilities. Other simulations and emulations might be described under [“Connectivity and Networking” on page 95](#).

[6.1] Architecture Level Set

z/VM version 6 requires a new architecture level set (ALS) and supports only the IBM System z10 Enterprise Class (z10 EC) and z10 Business Class (z10 BC) and new generations of IBM Z servers, such as the IBM zEnterprise® 196 (z196). Refer to the appropriate Preventive Service Planning (PSP) bucket for the minimum microcode level (MCL) and any required updates:

- DEVICE2097 for the z10 EC
- DEVICE2098 for the z10 BC
- DEVICE2817 for the z196

For specific server facilities required by z/VM 6.1, see [IBM: z/VM 6.1 Architecture Level Set \(https://www.vm.ibm.com/zvm610/architecture\)](https://www.vm.ibm.com/zvm610/architecture).

Documentation has been removed for the following CP commands, which no longer have any function:

- DEFINE CRYPTO
- DETACH CRYPTO

- DISPLAY CDX
- DUMP CDX
- SET CRYPTO
- STORE CDX

In the following CP interfaces, documentation has been removed for operands that no longer have any function:

- RDEVICE (Special Devices) system configuration statement
- CPU user directory statement
- CRYPTO user directory statement
- QUERY CRYPTO command
- QUERY VIRTUAL CRYPTO command
- SET RDEVICE (Special Devices) command

Documentation has been removed for the following TCP/IP server configuration statements, which no longer have any function:

- ATMARPSERVER statement
- ATMLIS statement
- ATMPVC statement
- DEVICE and LINK statements for ATM devices
- LINK statement for Token Ring Network or PC Network LCS
- LINK statement for FDDI LCS
- LINK statement for QDIOATM
- LINK statement for OSD Token Ring Network

In the following TCP/IP server configuration interfaces, documentation has been removed for operands that no longer have any function:

- DEVICE statement for LCS devices
- TRANSLATE statement
- IFCONFIG command

In the following systems management APIs, some parameters no longer have any function:

- Image_CPU_Define_DM
- Image_CPU_Query_DM

In the following DirMaint commands, documentation has been removed for operands that no longer have any function:

- CPU
- CRYPTO
- SETCPU

[6.1] IBM System Storage Support

z/VM 6.1 provides support for IBM Full Disk Encryption and Solid State Disk features of the IBM System Storage® DS8000®. The QUERY DASD DETAILS command now indicates when a DASD volume is an encrypted volume or when it is comprised of Solid State Drives.

With the PTF for APAR VM64657, DFSMS/VM provides services that enable a z/VSE® guest to manage resources of the IBM Virtualization Engine for the TS7720 configured without a physical tape library.

[6.1] Worldwide Port Name Prediction Tool

A worldwide port name (WWPN) prediction tool is now available from IBM Resource Link® to assist you with pre-planning of your Storage Area Network (SAN) environment prior to the installation of your System z10 server. This stand alone tool is designed to allow you to set up your SAN in advance, so that you can be up and running much faster once the server is installed. The tool assigns WWPNs to each virtual Fibre Channel Protocol (FCP) channel/port using the same WWPN assignment algorithms a system uses when assigning WWPNs for channels utilizing N_Port Identifier Virtualization (NPIV).

With the PTF for APAR VM64579, the Hardware Configuration Definition (HCD) facility of z/VM provides I/O device information from the input/output definition file (IODF) for input into the WWPN prediction tool. This PTF has been pre-applied to the HCD level that is included and preinstalled with z/VM 6.1.

For more information on setting up a SAN using the WWPN prediction tool, see the IBM Z Hardware Announcement dated April 28, 2009.

[6.1] IBM zEnterprise 196

z/VM 6.1 includes support that enables guests to exploit selected new features provided by the IBM zEnterprise 196 (z196) server. In addition, z/VM will recognize and report processing capability reduction due to customer-initiated power-saving mode or an autonomic response to environmental conditions and will reflect the change and its cause in monitor and accounting data streams. Supporting guests will also be notified of capability changes.

Note: The TRACE MC command will not provide output when the Enhanced-Monitor Facility is used and a monitor-event-counting operation is performed.

The following CP functions have been updated for this support:

- QUERY CAPABILITY command response includes information about machine capacity changes.
- Accounting record format for CPU capability (Record Type D) includes new fields.
- Monitor records include new fields:
 - Domain 0 (System) Record 19 - MRSYTSYG - Primary and Secondary CPU Capability (global):
 - Nominal CPU capability in the configuration
 - Domain 1 (Monitor) Record 4 - MRMTRSYS - System Configuration Data:
 - Capacity-Change Reason
 - Capacity-Adjustment Indication
 - Domain 1 (Monitor) Record 18 - MRMTRCCC - CPU Capability Change:
 - Nominal CPU capability in the configuration
 - Capacity-Change Reason
 - Capacity-Adjustment Indication

Guest support for the following z196 facilities is available transparently without any changes required. Trace, DISPLAY I, and VMDUMPTL INSTR support is not provided for these facilities.

- Floating-Point Extension Facility
- New general instructions
- Fast-BCR-Serialization Facility
- CMPSC Enhancement Facility
- Non-quiescing Key-Setting Facility
- Message-Security-Assist Extension 4

[6.1] Crypto Express3

z/VM 6.1 provides guest support for the new Crypto Express3 feature for the IBM System z10 and the IBM zEnterprise 196. The Crypto Express3 adapter, like the Crypto Express2, can be defined as either a coprocessor or as an accelerator and supports both encrypted key and clear key applications. The z/VM support is compatible with the guest support provided for the Crypto Express2 feature. In addition to the guest compatibility support, the QUERY CRYPTO APQS command has been enhanced to provide information about active users who have virtual crypto queues defined for sharing.

Responses for the following CP commands have been updated to include new AP types:

- QUERY CRYPTO
- QUERY VIRTUAL CRYPTO

The following CP monitor record has been updated to include the new types 8 and 9 when Crypto Express3 cards are installed:

- Domain 5 Record 10 - MRPRCAPM - Crypto Performance Measurement Data

[6.1] Dynamic Emulated Device Path Control

z/VM 6.1 provides the ability to add and remove paths from an emulated device (representing a real SCSI device) while the device is online and possibly in use. This is especially useful for making configuration changes for z/VM system volumes that cannot be varied offline while z/VM is running.

[6.1] HyperSwap Improvements

z/VM 6.1 provides finer control over z/VM's missing-interrupt automatic quiesce trigger. This support is enabled with new INCLUDE and EXCLUDE options on the HYPERSWAP command. For example, devices can be excluded from the trigger, or the trigger for a device can be made a multiple of the current z/VM MITIME setting.

[6.1] IBM Extended Address Volumes Support

The Extended Address Volumes (EAV) function on the IBM DS8000 adds support for ECKD volumes up to 262,668 cylinders. z/VM 6.1 provides support for ECKD volumes up to 262,688 cylinders for:

- Devices dedicated to guests
- Fullpack minidisks for guests that support EAV
- DDR
- FlashCopy® SE

CMS is enhanced to support volumes up to 65,520 ECKD cylinders for its own use, or about 45 GB of data. CP continues to support volumes up to 65,520 cylinders for its own use. The maximum size for FBA SCSI disks supported for use by CMS or GCS remains at 381 GB. IBM suggests that customers defining ECKD disks for use by CMS should set a practical limit of about 22 GB. If larger disks are defined, they should be limited to contain very few files, or the CMS file system might not be able to obtain enough virtual storage below 16 MB to format or access those disks. For more information, see the ACCESS command in [z/VM: CMS Commands and Utilities Reference](#).

[6.1] IBM XIV Storage Systems Direct Attachment Support

z/VM 6.1 supports the direct attachment of IBM XIV® Storage Systems for system use (such as paging, spooling, and IPL). This support eliminates the need for z/VM to access XIV devices through the IBM SAN Volume Controller (SVC) and provides the ability to define system and guest volumes as emulated devices on XIV devices.

The following CP functions have been updated:

- EDEVICE system configuration statement

- SET EDEVICE command

[6.1] Protected Key CPACF Support

z/VM 6.1 provides support to enable guest virtual machines to use the new encrypted key functions of the CP Assist for Cryptographic Function (CPACF) available on the IBM System z10 and IBM zEnterprise 196.

[6.1] OSX and OSM Channel Path Identifiers

z/VM 6.1 supports two new channel path ID (CHPID) types that have been added to support the private networks that interconnect the parts of the IBM zEnterprise System. These new CHPID types are based on the existing OSA-Express Direct (OSD) Ethernet CHPID:

- CHPID type OSX provides connectivity between the z196 and the intraensemble data network (IEDN) for application workloads.
- CHPID type OSM provides connectivity between the z196 and the intranode management network (INMN) for management related functions.

The following CP commands have been updated for this support:

- DEFINE
- DEFINE CHPID / PATH
- DEFINE CU
- QUERY CHPID
- QUERY FCP
- QUERY OSA
- VARY

The following CP monitor records have been updated for this support:

- Monitor Record Domain 0, Record 20 - Extended Channel Measurement Data supports new values for the OSX and OSM CHPIDs.
- Monitor Record Domain 1, Record 4 - System Configuration Data added a new field (MTRSYS_SYSENSBL) to indicate whether the system is in an ensemble.

The following dynamic I/O return codes have been modified for this support:

- Return code X'0119' - Adding a Channel Path
- Return code X'0105' - Adding an I/O Device

[6.1] XRC Time Stamping Support

z/VM exploits the Server Time Protocol (STP) facility to generate time stamps for guest and system DASD write I/O operations, allowing these I/O operations to be synchronized with those of other systems. This support allows data used by z/VM and its guests to be replicated asynchronously over long distances by IBM System Storage z/OS® Global Mirror (formerly known as Extended Remote Copy, or XRC).

The following CP command has been added:

- QUERY STP

The following CP commands have been updated:

- QUERY TIMEZONES
- SET TIMEZONE

[6.2] IBM zEnterprise 196 (Enhanced) and IBM zEnterprise 114

z/VM 6.2 supports the IBM zEnterprise 196 (z196) and the IBM zEnterprise 114 (z114) and enables guests to exploit selected new features.

System topology information (Store System Information (STSI) instruction 15.1.x) for the z196 and z114 (and the z10) is collected in the CP monitor records. If the STSI 15.1.x support is available (not available on second-level systems), a configuration monitor record is used to collect the initial system topology and an event monitor record is cut whenever periodic polling by CP sees the system topology as changed.

CP will also include the first 180 bytes of the Basic-machine configuration (STSI 1.1.1), which includes the hardware model number, in a configuration monitor record (D1R4) and an event monitor record (D1R18).

z196 and z114 Driver D93 provides a new physical-system-management time (SysMgmttime) value, which CP will provide in a monitor record (DOR17).

The following CP monitor records have been added:

- Domain 1 Record 26 - MRMTRTOP - System Topology Configuration
- Domain 5 Record 14 - MRPRCTOP - System Topology

The following CP monitor records have been updated:

- Domain 0 Record 17 - MRSYTCUM - Physical CPU Utilization Data for LPAR Management
- Domain 1 Record 4 - MRMTRSYS - System Configuration Data
- Domain 1 Record 18 - MRMTRCCC - CPU Capability Change

[6.2] ACCOUNT Utility Enhancement

The ACCOUNT utility has been enhanced with a new CPUCAP option that can create a CPU capability record based on CPU capability type 0D accounting records.

[6.2] CPU-Measurement Counter Facility Host Support

CP can collect counter data generated by the CPU-Measurement Counter Facility and include the counter data in the CP MONITOR data stream. Support for the CPU-Measurement Sampling Facility and virtualization of the CPU-Measurement Facility interfaces for guest use are not provided.

The MONITOR SAMPLE ENABLE PROCESSOR command is used to enable collection of CPU-Measurement Facility counter data. If the logical partition is authorized for the basic counter set and collection is enabled, whichever basic, problem-state, crypto-activity, or extended counter sets that are authorized are enabled and activated when MONITOR START is issued. When a monitor sample is collected, the counters will be extracted on each processor and recorded in a new Processor domain monitor record (Domain 5 Record 13). There are also updates to Domain 1 Record 14. If you do not want to collect CPU-Measurement Facility counter data, use MONITOR SAMPLE DISABLE PROCESSOR CPUMFC to disable it, or unauthorize basic counters in the partition's activation profile.

Counters can also be enabled (through MONITOR SAMPLE ENABLE) or disabled (through MONITOR SAMPLE DISABLE) while the monitor is active. Additionally, authorization for counter sets can be changed dynamically. z/VM recognizes and responds to these dynamic authorization changes.

When a processor is brought online by VARY PROCESSOR, its counters are enabled and activated if collection is enabled.

[6.2] Crypto Terminology Change

Crypto terminology in z/VM has changed to eliminate confusion over the use of the terms "queue" and "domain". Previously, both terms were used to refer to the same component of a crypto device. The responses for the QUERY CRYPTO and QUERY VIRTUAL CRYPTO commands that include the term "queue" have been changed to use the term "domain".

A new DOMAIN operand will be supported on the QUERY CRYPTO command. The existing APQS operand will continue to be supported as a synonym for domain to ease compatibility.

The response to QUERY CRYPTO DOMAIN (formerly QUERY CRYPTO APQS) now reports the hardware status, z/VM's use of the device, and the planned use of the device more clearly.

[6.2] Cryptographic Coprocessor Facility (CCF) Support Removed

The IBM Z servers supported by z/VM provide the following cryptographic hardware features: CP Assist for Cryptographic Function (CPACF), Crypto Express2 feature, and Crypto Express3 feature. Because the old Cryptographic Coprocessor Facility (CCF) and its predecessors are no longer available on these processors, CP support for old cryptographic hardware has been removed.

The following monitor records are no longer available:

- Domain 5 Record 6 - MRPRCCFN - Vary On Crypto Facility Event Data
- Domain 5 Record 7 - MRPRCCFF - Vary Off Crypto Facility Event Data

[6.2] Dynamic Discovery of FCP Disks

Dynamic discovery of FCP disks formalizes the SCSIDISC sample utility to be a fully supported z/VM tool. SCSIDISC provides CMS users with the ability to recognize any worldwide port numbers (WWPNs) and associated logical unit numbers (LUNs) accessible from some specified FCP subchannel. The use of this DASD in both emulated devices and directly attached FCP devices requires specific knowledge of the storage area networking topology. The SCSIDISC utility provides a means to analyze this topology with no prior knowledge of it.

The SCSIDISC utility has been added for this support.

[6.2] ISFC Infrastructure Enhancements

The Inter-System Facility for Communications (ISFC) SSI infrastructure provides tools that will be used for cross-system communication. This enhances the ISFC subsystem to improve the transport mechanism and provide convenient interfaces for exploitation by other subsystems with the CP nucleus.

The following command has been added for this support:

- QUERY ISFC

The following commands have been updated for this support:

- ACTIVATE ISLINK
- DEACTIVE CONV
- DEACTIVE ISLINK
- MONITOR EVENT
- MONITOR SAMPLE
- QUERY COLLECT
- QUERY ISLINK
- QUERY MONITOR
- SET CPTRACE

[6.2] Real Device Mapping

Real device mapping provides a means of identifying a device either by a customer-generated equivalency ID (EQID) or by a CP-generated EQID. This mapping is used to ensure virtual machines relocated by live guest relocation continue to use the same or equivalent devices following a relocation.

The following CP command has been added for this support:

- QUERY EQID

The following CP commands have been updated for this support:

- ATTACH
- DETACH
- QUERY EDEVICE

- QUERY (Real Device)
- SET EDEVICE
- SET RDEVICE (Advanced Function Printers)
- SET RDEVICE (Card Punches)
- SET RDEVICE (Card Readers)
- SET RDEVICE (Clear)
- SET RDEVICE (Communication Controllers)
- SET RDEVICE (DASD)
- SET RDEVICE (Graphic Display Devices)
- SET RDEVICE (Impact Printers)
- SET RDEVICE (Integrated Communication Adapters)
- SET RDEVICE (Special Devices)
- SET RDEVICE (Tape Units)
- SET RDEVICE (Terminals)
- SET RDEVICE (Unsupported Devices)
- SET RDEVICE (3800 Printers)
- VARY (Real Device)

The following CP configuration statements have been updated for this support:

- EDEVICE Statement
- RDEVICE Statement (Advanced Function Printers)
- RDEVICE Statement (Card Punches)
- RDEVICE Statement (Card Readers)
- RDEVICE Statement (Communication Controllers)
- RDEVICE Statement (DASD)
- RDEVICE Statement (Graphic Display Devices)
- RDEVICE Statement (Impact Printers)
- RDEVICE Statement (Special Devices)
- RDEVICE Statement (Tape Units)
- RDEVICE Statement (Terminals)
- RDEVICE Statement (Unsupported Devices)
- RDEVICE Statement (3800 Printers)

The following CP monitor records have been updated to add the device EQID:

- Domain 1 Record 6 - MRMTRDEV - Device Configuration Data
- Domain 6 Record 1 - MRIODVON - Vary On Device - Event Data

[6.2] Shared Disk Enhancements

The shared disk enhancements improve the support for sharing real DASD among z/VM images and simplifies the management of minidisk links and minidisk cache for minidisks shared by multiple images.

The following commands have been updated for this support:

- ATTACH
- CPACCESS
- DEFINE (General)
- DEFINE CPOWNED

- LINK
- QUERY COWNED
- QUERY LINKS
- QUERY MDCACHE
- QUERY MDISK
- QUERY SYSTEM
- RESET
- SET MDCACHE
- SET WRKALLEG

The following utility has been updated for this support:

- CPFMTXA

The following statements have been updated for this support:

- CP_OWNED configuration statement
- DASDOPT directory statement
- LINK directory statement
- MDISK directory statement
- REDEVICE configuration statement (DASD)

The following monitor records have been added:

- Domain 6 (I/O) Record 31 - MRIODMDE - Minidisk Activity
 - This record was added to indicate when the minidisk cache (MDC) setting has been changed automatically by CP.
- Domain 11 (SSI) Record 6 - MRSSIXLK - XDISK Serialization Sample
 - This record was added to indicate usage information for XDISK cross system serialization routines.
- Domain 11 (SSI) Record 7 - MRSSIXDI - XDISK Activity
 - This record was added to provide information about XDISK activity.

The following monitor records have been updated:

- Domain 0 Record 14 - MRSYTXSG - Expanded Storage Data (global)
 - SYTXSG_TCMCPURG - This field accumulates the number of times cache is purged due to a write link obtained in the SSI environment.
- Domain 4 Record 2 - MRUSELOF - User Logoff Data - Event Record

The following fields contain LINK, DETACH and WRKALLEG usage information in an SSI environment:

- USELOF_VMDLKTOT
- USELOF_VMDLKPLX
- USELOF_VMDLKTOD
- USELOF_VMDDTTOT
- USELOF_VMDDTPLX
- USELOF_VMDDTTOD
- USELOF_VMDWKTOT
- USELOF_VMDWKPLX
- USELOF_VMDWKTOD
- Domain 4 Record 3 - MRUSEACT - User Activity Data

The following fields contain LINK, DETACH and WRKALLEG usage information in an SSI environment:

- USEACT_VMDLKTOT
- USEACT_VMDLKPLX
- USEACT_VMDLKTOD
- USEACT_VMDDTTOT
- USEACT_VMDDTPLX
- USEACT_VMDDTTOD
- USEACT_VMDWKTOT
- USEACT_VMDWKPLX
- USEACT_VMDWKTOD

[6.2] FICON Express8S and OSA-Express4S

IBM has introduced a new I/O drawer and new form factor I/O cards for the z196 and z114 to support a direct Peripheral Component Interconnect Express Generation 2 (PCIe Gen2) infrastructure with increased capacity, granularity, and infrastructure bandwidth, as well as increased reliability, availability, and serviceability. z/VM 6.2 supports the following features:

- For the FICON/zHPF/FCP storage area network:
FICON® Express8S for single mode fiber (LX) and multimode fiber (SX) environments, with two channels per feature and two channel path identifiers (CHPIDs).
- For the 10 Gigabit Ethernet and Gigabit Ethernet local area network:
OSA-Express4S for single mode fiber (LX, LR) and multimode fiber (SX, LR) environments. The 10 GbE features have one port per feature and one CHPID. The GbE features have two ports per feature and one CHPID shared by the two ports.

[6.2] Support for Gen 4 IBM System Storage TS1140 Tape Drive (3592 Model E07)

z/VM supports the Gen 4 IBM System Storage TS1140 Tape Drive (machine type 3592, model E07).

The following CP commands have been updated:

- QUERY TAPES
- QUERY (Virtual Device)

In addition, DIAGNOSE code X'210' has been updated to support a new VRDCUNDV value for the 3592 E07. For more information, see [z/VM: CP Programming Services](#).

[6.2] Guest Support for High Performance FICON for IBM Z

With the PTF for APAR VM65041, z/VM 6.2 provides guest support for High Performance FICON for IBM Z® (zHPF). zHPF is a performance and reliability, availability, and serviceability (RAS) enhancement of the z/Architecture and the FICON channel architecture implemented in the zEnterprise 196, zEnterprise 114, and System z10® servers, and the System Storage DS8000 series.

Exploitation of zHPF by the FICON channel, the operating system, and the control unit is designed to help reduce the FICON channel overhead. When both the FICON channel and the control unit indicate support for zHPF, transport mode I/O (multiple commands per frame) is supported in addition to command mode I/O (one command per frame). The FICON Express8S, FICON Express8, FICON Express4, and FICON Express2 features support transport mode, and these features support the FICON architecture, FICON channel-to-channel (CTC), and the zHPF architecture simultaneously.

Use of zHPF requires the function to be installed on the machine (processor complex and channels) and the storage controller, and requires support in z/VM and the exploiting guest. For information about the specific hardware requirements for zHPF support, see [z/VM: General Information](#).

The following CP commands have been updated with new and changed responses:

- QUERY CHPID
- QUERY MDCACHE
- QUERY PATHS
- TRACE IO
- TRSOURCE
- VARY PATH

The following CP monitor record has been added for this support:

- Domain 6 Record 32 - MRIODHPF - zHPF Feature Change

The following CP monitor records have been updated for this support:

- Domain 0 Record 19 - MRSYTSYG - System Data
- Domain 0 Record 20 - MRSYTEPM - Extended Channel Path Measurement Data
- Domain 1 Record 4 - MRMTRSYS - System Configuration Data
- Domain 6 Record 3 - MRIODDEV - Device Activity

With the PTF for APAR VM65044, the z/VM 6.2 Performance Toolkit feature recognizes the new monitor record for High Performance FICON.

[6.3] IBM zEnterprise EC12 and IBM zEnterprise BC12

z/VM supports the IBM zEnterprise EC12 (zEC12) and the IBM zEnterprise BC12 (zBC12) and enables guests to exploit selected new features.

z/VM support for the zEC12 and zBC12 includes support for:

- **Local-TLB-Clearing Facility**

The Local-TLB-Clearing Facility provides guests running on z/VM the ability to use the IPTE or IDTE instructions with the Local-Clearing Control (LC) bit on. Guests that are able to meet the architecture requirements and change their IPTE/IDTE instructions might see performance improvements.

- **Crypto Express4S**

z/VM provides guest support for the Crypto Express4S feature, which is exclusive to the zEC12 and zBC12, for z/Architecture guests.

The Crypto Express4S can be configured in one of three ways using the Hardware Management Console (HMC) panels:

- 2877 IBM Common Cryptographic Architecture (CCA) coprocessor
- 2878 IBM Enterprise Public-Key Cryptography Standards (PKCS) #11 (EP11) coprocessor
- 2879 Accelerator

The new EP11 coprocessor is designed to provide open industry standard cryptographic services. It provides enhanced firmware capabilities that are designed to meet the rigorous FIPS 140-2 Level 4 and Common Criteria EAL 4+ certifications.

EP11 provides enhanced security qualities when using PKCS #11 functions. EP11 supports secure PKCS #11 keys that never leave the secure boundary of the coprocessor unencrypted. With EP11, keys can now be generated and securely wrapped under the EP11 Master Key, all within the bounds of the coprocessor.

z/Architecture guests can be authorized in the z/VM directory for shared or dedicated access to the Crypto Express4S. When Crypto Express4S is configured as an accelerator or a CCA coprocessor, z/VM supports the device for shared or dedicated use. When Crypto Express4S is configured as an EP11 coprocessor, z/VM supports the device for dedicated use only.

- **CPU-Measurement Counter Facility enhancement**

The CPU-Measurement Counter Facility has been expanded. Code was added to z/VM to support current variations of the new version numbers when collecting the counters and when putting them into the monitor record (Domain 5 Record 13).

- **New subchannel measurement block fields**

The Interrupt-Delay Time and I/O-Priority-Delay Time fields have been added to the subchannel measurement block.

- **OSA-Express5S**

OSA-Express5S is the next generation of devices in the OSA family, and is exclusive to the zEC12 and zBC12. It contains a technology update compared with the OSA-Express4S, with similar performance characteristics.

The following CP commands have been updated for this support:

- QUERY CRYPTO
- QUERY VIRTUAL CRYPTO

The following CP monitor records have been updated:

- Domain 5 Record 10 - MRPRCAPM - Crypto Performance Measurement Data
- Domain 5 Record 13 - MRPRCMFC - CPU-Measurement Facility Counters
- Domain 6 Record 3 - MRIODDEV - Device Activity
- Domain 6 Record 14 - MRIODMOF - Set subchannel measurement off - Event

The TCP/IP NETSTAT OSAINFO command has been updated to display information for the OSA-Express5S.

[6.3] Fibre Channel Protocol Data Router Support

z/VM FCP QEBSM support has been updated to support guest exploitation of the Data Router facility for direct memory access between an FCP device SCSI interface card and real memory.

The QUERY VIRTUAL FCP command has been updated for this support.

The following CP monitor record has been updated:

- Domain 1 Record 19 - MRMTRQDC - QDIO Device Configuration Record

[6.3] FICON DS8000 Series New Functions

z/VM supports the following functions on IBM System Storage DS8700 and later devices:

- Storage Controller Health Message

This new attention message will be generated from the hardware, one per corresponding Logical Storage System (LSS), to alert the operating system of a condition that in the past would have surfaced as a general Equipment Check. This message will give more details and is intended to reduce the number of false HyperSwap® events that have occurred with the less descriptive Equipment Check.

- Peer-to-Peer Remote Copy (PPRC) Summary Unit Check

When a PPRC suspend condition existed in the past, a corresponding state change interrupt would be presented to each affected DASD in the LSS. When there are a large number of DASD involved, the amount of processing, time, and memory needed by the operating system to process each state change interrupt can accumulate. For customers with large numbers of DASD, this state change processing can cause timeouts to occur in Geographically Dispersed Parallel Sysplex® (GDPS®) HyperSwap scenarios, because a PPRC suspend occurs on every DASD under HyperSwap control. To prevent these timeouts, a new Summary Unit Check has been created that gives only one interrupt per affected LSS.

This support is intended to reduce the amount of false HyperSwap events by GDPS and reduce the amount of processing required to handle PPRC suspend events, which previously came via state change interrupts. This is particularly useful for customers with large sets of DASD under GDPS PPRC control.

The following CP functions have been updated:

- CU system configuration statement
- QUERY CU command
- QUERY HYPERSWAP command

[6.3] HiperSocket Completion Queue Guest Exploitation Support

z/VM provides guest support for asynchronous HiperSockets data transmission provided by completion queues when deploying a HiperSockets network in a virtualized environment. Completion queues perform requests asynchronously to improve performance for peak workload intervals. IBM is working with its Linux distribution partners to include support in future Linux for IBM Z distribution releases.

The following CP monitor records have been updated:

- Domain 0 Record 20 - MRSYTEPM - Extended Channel Path Measurement Data (per channel)
- Domain 1 Record 19 - MRMTRQDC - QDIO Device Configuration
- Domain 6 Record 25 - MRIODQDA - QDIO Device Activation Event
- Domain 6 Record 26 - MRIODQDS - QDIO Device Activity Sample
- Domain 6 Record 27 - MRIODQDD - QDIO Device Deactivation Event

[6.3] Multiple Subchannel Set Support for Mirrored DASD

The multiple subchannel set support for mirrored DASD provides a subset of host support for the Multiple Subchannel Set (MSS) facility to allow using an alternate subchannel set for Peer-to-Peer Remote Copy (PPRC) secondary volumes.

The following CP command has been added for this support:

- QUERY MSS

The following CP commands have been updated for this support:

- HYPERSWAP
- QUERY DASD
- QUERY HYPERSWAP
- QUERY PATHS
- SET IPLPARMS
- SHUTDOWN
- VARY PATH
- VARY (Real Device)
- VARY SUBCHANNEL

The following CP utility has been updated for this support:

- SALIPL

The Stand-Alone Program Loader (SAPL) provides an expanded field on its main panel where a 5-digit device number for the minidisk on which the CP nucleus resides is displayed and can be specified. For more information about SAPL, see [z/VM: System Operation](#).

You should not use the Stand-Alone Program Loader Creation Utility (SALIPL) to install SAPL if you specify the DEVICE option on the SALIPL utility because you will lose the information from any DEVICE option that you specified using SALIPL. For this function, you must use the SALIPL utility under CMS.

Different values will now appear in monitor record fields for devices in subchannel sets other than zero.

The following monitor records all use RDEVSID to set the subchannel ID values that they contain. With MSS support, the first halfword of this value does not have to be X'0001' because other subchannel sets can be used:

Domain 1 (Monitor)

- Record 6 - MTRDEV - Device Configuration Data
- Record 8 - MTRPAG - Paging Configuration Data

Domain 2 (Scheduler)

- Record 1 - SCLRDB - Begin Read
- Record 2 - SCLRDC - Read Complete
- Record 3 - SCLWRR - Write Response

Domain 3 (Storage)

- Record 4 - STOASP - Auxiliary Storage Management (per exposure)
- Record 7 - STOATC - Page/Spool Area of a CP Volume
- Record 11 - STOASS - Auxiliary Shared Storage Management (per exposure)

Domain 6 (I/O)

- Record 1 - IODVON - Vary Device On
- Record 2 - IODVOF - Vary Device Off
- Record 3 - IODDEV - Device Activity
- Record 4 - IODCAD - Cache Activity Data
- Record 5 - IODATD - Attach Device
- Record 6 - IODDTD - Detach Device
- Record 7 - IODENB - Enable Terminal
- Record 8 - IODDSB - Disable Terminal
- Record 9 - IODATS - Attach Shared Device
- Record 11 - IODSON - Vary On Subchannel
- Record 12 - IODSOF - Vary Off Subchannel
- Record 13 - IODMON - Set Subchannel Measurement On
- Record 14 - IODMOF - Set Subchannel measurement Off
- Record 15 - IODDDV - Delete Device
- Record 16 - IODMDV - Modify Device
- Record 18 - IODTON - Set Throttle On
- Record 19 - IODTOF - Set Throttle Off
- Record 20 - IODSTC - State Change
- Record 21 - IODVSW - Virtual Switch Activity

Domain 7 (Seek)

- Record 1 - SEKSEK - Seek Data

[6.3] z/VM HiperDispatch

z/VM HiperDispatch is intended to improve efficiency in the use of CPU resources. This enhancement can help to improve performance and allow you to get more business value from your existing IBM Z servers, perhaps by consolidating z/VM workloads into fewer (larger) z/VM LPARs.

HiperDispatch improves CPU efficiency by causing the Control Program to run work in a manner that recognizes and exploits IBM Z machine topology to increase the effectiveness of physical machine memory cache. This includes:

- Requesting the LPAR hypervisor to handle the partition's logical processors in a manner that exploits physical machine topology

- Dispatching virtual servers in a manner that tends to reduce their movement within the partition's topology
- Dispatching multiprocessor virtual servers in a manner that tends to keep the server's virtual CPUs logically close to one another within the partition's topology

HiperDispatch can also improve CPU efficiency by automatically tuning the LPAR's use of its logical CPUs to try to reduce multiprocessor effects. This includes:

- Sensing and forecasting key indicators of workload intensity and of elevated multiprocessor effect
- Autonomically tuning the z/VM system to reduce multiprocessor effect when it is determined that HiperDispatch can help to improve CPU efficiency

The supported processors limit for z/VM 6.3 remains 32, but with improved multiprocessor efficiency.

Externals for HiperDispatch support include:

- Changes to the following CP commands:
 - DEDICATE
 - INDICATE LOAD
 - INDICATE QUEUES
 - QUERY PROCESSORS
 - QUERY SRM
 - SET CPTRACE
 - SET SRM
- A new configuration statement: SRM.
- A change to the meaning of NOLIMIT on the FEATURES MAXUSERS configuration statement.
- New or changed monitor records:
 - D0R2 - MRSYTPRP - Processor Data (Per Processor)
 - D0R16 - MRSYTCUP - CPU Utilization in a Logical Partition
 - D0R23 - MRSYTLCK - Formal Spin Lock Data
 - D0R24 - MRSYTSPT - Scheduler Activity (per processor type)
 - D1R4 - MRMTRSYS - System Configuration Data
 - D1R5 - MRMTRPRP - Processor Configuration
 - D1R16 - MRMTRSCH - Scheduler Settings
 - D2R7 - MRSCLSRM - SET SRM Changes
 - D4R2 - MRUSELOF - User Logoff event record
 - D4R3 - MRUSEACT - User Activity Data
 - D5R2 - MRPRCVOF - Vary Off Processor
 - D5R3 - MRPRCPRP - Processor Data
 - D5R15 - MRPRCDSV - Dispatch Vector Assignments (new event record)
 - D5R16 - MRPRCPUP - Park/Unpark Decision (new event record)
 - D5R17 - MRPRCRCD - Real CPU Data (per CPU) (new sample record)
 - D5R18 - MRPRCDHF - Dispatch Vector High Frequency Data (new sample record).
- A change to the VM Dump Tool CPUUSE macro.
- New trace table entries:
 - Input unpark mask - 3610
 - Switch master processor - 3611
 - Park processor - 3612

- Unpark processor - 3613
- SIGP instruction AE01 replaces AE00
- Time stamp trace entry FFFD replaces FFFE.

For more information, see [z/VM: CP Planning and Administration](#).

[6.3 APAR] Soft Fence and Query Host Access GDPS Enhancements

With the PTF for APAR VM65322, z/VM supports the new Soft Fence and Query Host Access DS8000 functions.

Soft Fence is designed to protect the integrity of a volume in the fence state by limiting most I/O operations directed to that volume. This function is exploited in GDPS and is used to fence the old primary volumes in the GDPS-managed consistency group during a HyperSwap scenario. GDPS automatically resets the fence state upon completion of a HyperSwap scenario. z/VM offers support to manually reset and query the soft fence state of a volume or the volumes on a given controller. Additionally, the Query Host Access function reports all LPARs that have established a path group ID on a volume, whether or not in the grouped state. z/VM now offers support to query the CPU serial number and LPAR ID associated with all LPARs that have established a path group ID to a volume.

The following CP command has been added for this support:

- SET DASD

The following CP commands have been updated for this support:

- QUERY CU
- QUERY DASD
- QUERY FENCES
- SET CU

[6.3 APAR] PCIe Guest Direct Attach Support

With the PTFS for APARs VM65417 (CP), VM65572 (CP TRACERED support), and PI20509 (TCP/IP), z/VM 6.3 guests will be allowed to dedicate PCIe adapters to their virtual machines.

z/OS V2.1 guests (with required PTFS) running under z/VM 6.3 can exploit the zEDC Express and 10GbE RoCE features. See the PSP bucket for specific details.

- zEDC Express feature

IBM zEnterprise Data Compression (zEDC) for z/OS V2.1 and the zEDC Express feature are designed to support a new data compression function to help provide high-performance, low-latency compression without significant CPU overhead. This can help to reduce disk usage, provide optimized cross-platform exchange of data, and provide higher write rates for SMF data.

- 10GbE RoCE Express feature

The term RoCE refers to Remote Direct Memory Access over Converged Ethernet. The 10 Gigabit Ethernet (10GbE) RoCE Express feature is designed to help reduce consumption of CPU resources for applications utilizing the TCP/IP stack (such as WebSphere® Application Server accessing a Db2® database). Use of the 10GbE RoCE Express feature is designed to help reduce network latency with memory-to-memory transfers utilizing Shared Memory Communications-Remote Direct Memory Access (SMC-R) in z/OS V2.1. It is transparent to applications and can be used for LPAR-to-LPAR communication on a single system or server-to-server communication in a multiple-CPC environment.

The minimum hardware requirement for the zEDC Express and 10GbE RoCE Express features is a zEnterprise EC12 or BC12 at Driver D15 with a minimum bundle level. See the PSP bucket for specific details.

For more information about guest support for PCIe functions, see [z/VM: CP Planning and Administration](#).

The following system configuration statements have been updated for this support:

- FEATURES
- STORAGE

The following CP commands have been added for this support:

- DEFINE PCIFUNCTION
- DELETE PCIFUNCTION
- DETACH PCIFUNCTION
- LOCATE RPCI
- LOCATE VPCI
- MODIFY PCIFUNCTION
- QUERY IOASSIST (The function of this command is similar to but different from the QUERY IOASSIST command that was removed in V5.1.)
- QUERY PCIFUNCTION
- QUERY VIRTUAL PCIFUNCTION
- SET IOASSIST (The function of this command is similar to but different from the SET IOASSIST command that was removed in V5.1.)
- VARY PCIFUNCTION

The following CP commands have been updated for this support:

- ATTACH
- DEFINE CHPID / PATH
- MONITOR
- QUERY CHPID
- QUERY FRAMES
- QUERY MONITOR
- QUERY TRFILES
- QUERY TRSOURCE
- RESET
- SET CPTRACE
- TRSOURCE ENABLE
- TRSOURCE ID
- VMRELOCATE

PCIFUNCT has been added to the list of restricted user IDs.

The following CP monitor records have been added for this support:

- Domain 1 Record 27 - MRMTRPCI - PCI function Configuration Data
- Domain 6 Record 36 - MRIODPAT - Attach PCI Function
- Domain 6 Record 37 - MRIODPDT - Detach PCI Function
- Domain 6 Record 38 - MRIODPEN - Guest Enables a PCI Function
- Domain 6 Record 39 - MRIODPAC - PCI Activity
- Domain 6 Record 40 - MRIODPDS - Guest Disables a PCI Function
- Domain 6 Record 41 - MRIODPER - PCI function error
- Domain 6 Record 42 - MRIODPAD - PCI function added to the system
- Domain 6 Record 43 - MRIODPDL - PCI function deleted from the system
- Domain 6 Record 44 - MRIODPMD - PCI function program controls modified
- Domain 6 Record 45 - MRIODPON - Real PCI function varied on

- Domain 6 Record 46 - MRIODPOF - Real PCI function varied offline

The following CP monitor records have been updated:

- Domain 0 Record 3 - MRSYTRSG - Real Storage Data (global)
- Domain 1 Record 4 - MRMTRSYS - System Configuration Data
- Domain 1 Record 7 - MRMTRMEM - Memory Configuration Data

The following DIAGNOSE code has been updated for this support:

- DIAGNOSE Code X'2AC'

Trace codes in the range 1200 - 123F have been added for this support. For more information about these trace codes, see [z/VM: Diagnosis Guide](#).

The following dynamic I/O return codes have been modified for adding, deleting, or changing a PCI function:

- 0106
- 0107
- 010A
- 010D
- 010F
- 0110
- 0112
- 011C
- 011D

[6.3 APAR] IBM z13 Support

With the PTF for APAR VM65577, z/VM provides support that will enable guests to exploit zEC12 function supported by z/VM on the IBM z13[®] (z13[®]). z/VM support for the z13 also includes support for:

- New hardware facilities

z/VM supports the following new hardware facilities transparently.

- Load/Store-on-condition Facility 2
- Load-and-Zero-Rightmost-Byte Facility
- Decimal-Floating Point Packed Conversion Facility
- Delay Facility

New facility bits have been defined that will be passed to a guest and can be tested to determine if a hardware facility is available. A guest can use the STFLE instruction to obtain the facilities list. These new facility bits are also incorporated into the live guest relocation domains support.

TRACE, DISPLAY I, and VMDUMPTL support for interpreting the new instructions associated with these facilities for display purposes is not included.

- Updates to monitor records for CPU-Measurement Counter Facility

The new Counter Second Version Number value (4) is supported, and appropriate counters are collected and stored in the CPU-Measurement Facility Counters monitor record (Domain 5 Record 13).

- CPU-Measurement Counter Facility enhancement

Host exploitation is provided for a new instruction to allow collection of multiple counters simultaneously, when the store-CPU-counter-multiple facility is installed. This is expected to reduce the overhead for collecting CPUMF data for z/VM monitor records. Guest support is not provided for the new store-CPU-counter-multiple facility or the new MT-CPU-timer-enhancement facility.

- New I/O related architectures

See “[6.3 APAR] z13 Compatibility I/O Support” on page 59.

- Crypto Express5S and enhanced domain support

See “[6.3 APAR] Crypto Express5S and Enhanced Domain Support” on page 60.

- FICON Express16S

See “[6.3] FICON Express16S Support” on page 61.

Note: The IBM zEnterprise Application Assist Processor (zAAP) CPU type is not supported on z13, either in real hardware or in the LPAR configuration. Similarly, z/VM will not allow guests to define this CPU type if the machine does not support it.

The following CP commands have been updated:

- DEFINE CPU
- QUERY CAPABILITY

A new CPU Capability continuation data (Type E) accounting record has been added.

The following monitor records have been updated:

- Domain 0 Record 19 - MRSYTSYG - System Data - will now report two values for capability.
- Domain 1 Record 4 - MRMTRSYS - System Configuration Data - will now report two values for capability.
- Domain 1 Record 18 - MRMTRCCC - CPU Capability Change - will now report two values for capability.
- Domain 5 Record 13 - MRPRCMFC - CPU-Measurement Facility Counters - will now be able to report a Counter Second Version Number value of 4.

For more information, see:

- [z/VM: CP Commands and Utilities Reference](#)
- [z/VM: CP Planning and Administration](#)

See the following additional z13 support:

- “[6.3 APAR] Simultaneous Multithreading (SMT) Support” on page 61
- “[6.3 APAR] Increased CPU Scalability” on page 64
- “[6.3 APAR] Multi-VSwitch Link Aggregation Support” on page 103

Support for the z13 also requires the PTFs for the following APARs. For more information, see the documentation for the product, feature, or function.

- APAR VM65495 provides EREP/VM support.
- APAR VM65568 provides IOCP support.
- APAR VM65489 provides HCD support.
- APAR VM64437 provides HCM support.
- APAR PM79901 provides HLASM support.
- APAR VM65527 provides Performance Toolkit support.

[6.3 APAR] z13 Compatibility I/O Support

With the PTF for APAR VM65577, z/VM supports new I/O related architectures and features of the z13, including:

- PCI function measurement block enhancements for the RDMA over Converged Ethernet (RoCE) adapter
- Dynamic I/O support for new channel path type CS5 (Coupling over PCIe)
- Dynamic I/O support for specifying virtual channel IDs (VCHIDs) for HiperSockets (IQD) channels

The following commands have been updated for this support:

- DEFINE CHPID/PATH

- DEFINE PCIFUNCTION
- QUERY CPUID
- VARY PCIFUNCTION

The following CP monitor records have been updated:

- Domain 0 Record 20 - MRSYTEPM - Extended Channel Path Measurement Data (per channel)
- Domain 1 Record 27 - MRMTRPCI - PCI Function Configuration Data
- Domain 6 Record 39 - MRIODPAC - PCI Activity
- Domain 6 Record 40 - MRIODPDS - Guest Disables a PCI Function
- Domain 6 Record 42 - MRIODPAD - PCI Function Added to the System
- Domain 6 Record 45 - MRIODPON - Real PCI Function Varied On

For more information, see:

- [z/VM: CP Commands and Utilities Reference](#)
- [z/VM: CP Messages and Codes](#)
- [z/VM: I/O Configuration](#)

[6.3 APAR] Crypto Express5S and Enhanced Domain Support

With the PTF for APAR VM65577, z/VM provides z/Architecture guest support for the Crypto Express5S feature, which is exclusive to the z13, and enhanced domain support for Crypto Express5S.

Crypto Express5S can be configured in one of three ways using the Hardware Management Console (HMC) panels:

- IBM Common Cryptographic Architecture (CCA) coprocessor
- IBM Enterprise Public Key Cryptography Standards (PKCS) #11 (EP11) coprocessor
- Accelerator

z/Architecture guests can be authorized in the z/VM directory for shared or dedicated access to the Crypto Express5S. When Crypto Express5S is configured as an accelerator or a CCA coprocessor, z/VM supports the device for shared or dedicated use. When Crypto Express5S is configured as an EP11 coprocessor, z/VM supports the device for dedicated use only.

In addition, z/VM supports enhanced domain support for the Crypto Express5S feature on the z13:

- z/VM supports an architected increase in the maximum number of crypto features, referred to as Adjunct Processors (APs), from 64 to 256, and an architected increase in the maximum number of domains per AP from 16 to 256.
- The z13 supports up to 16 APs, and up to 85 domains on each AP, with the Crypto Express5S feature.



Attention: This support provides a new version of DIRECTXA, which requires more directory space on the DASD volume that contains the object directory. An additional 60 bytes per user plus 2 pages for system use is required. The count of users should include each user defined with a USER, IDENTITY, or POOL statement.

With APAR VM65577 applied, z/VM supports Message-Security-Assist Extension 5 on zEC12 (Driver D15F) and later.

With the PTF for APAR VM65588, DirMaint supports enhanced domain support for the Crypto Express5S feature on z13.

The following configuration statement is new:

- CRYPTO APVIRTUAL

The following directory statement was updated:

- CRYPTO

The following commands have been updated for this support:

- QUERY CRYPTO
- QUERY VIRTUAL CRYPTO
- DIRMAINT CRYPTO

For more information, see:

- [z/VM: CP Commands and Utilities Reference](#)
- [z/VM: Directory Maintenance Facility Commands Reference](#)
- [z/VM: CP Planning and Administration](#)

[6.3] FICON Express16S Support

z/VM supports the FICON Express16S feature on z13. With the introduction of FICON Express16S on the z13, you now have additional growth opportunities for your storage area network (SAN). FICON Express16S supports a link data rate of 16 gigabits per second (Gbps) and autonegotiation to 4 or 8 Gbps for synergy with existing switches, directors, and storage devices. With support for native FICON, High Performance FICON for IBM Z (zHPF), and Fibre Channel Protocol (FCP), the z13 server enables you to position your SAN for even higher performance, helping you to prepare for an end-to-end 16 Gbps infrastructure to meet the increased bandwidth demands of your applications.

The new FICON Express16S channel will work with your existing fiber optic cabling environment, both single mode and multimode optical cables. The FICON Express16S feature running at end-to-end 16 Gbps link speeds will provide reduced latency for large read/write operations and increased bandwidth compared with the FICON Express8S feature.

[6.3 APAR] Simultaneous Multithreading (SMT) Support

Simultaneous multithreading (SMT) technology is available on IBM z13 and is supported by z/VM.

IBM z13 SMT support

Incremental throughput improvements are achieved on z13 partly because the new processor chip offers intelligently implemented 2-way simultaneous multithreading (SMT). SMT allows two active instruction streams per core, each dynamically sharing the core's execution resources. SMT will be available on IBM z13 for workloads running on the IBM Integrated Facility for Linux (IFL) and the IBM z Integrated Information Processor (zIIP).

Each software operating system or hypervisor has the ability to intelligently drive SMT in a way that is best for its unique requirements. z/OS SMT management consistently drives the cores to high thread density, in an effort to reduce SMT variability and deliver repeatable performance across varying CPU utilization, thus providing more predictable SMT capacity. z/VM SMT management optimizes throughput by spreading a workload over the available cores until it demands the additional SMT capacity.

z13 z/VM SMT support

With the PTFs for APARs VM65586 and VM65696, z/VM provides host exploitation support for SMT on z13, which will enable z/VM to dispatch work on up to two threads (logical CPUs) of an IFL processor core. z/VM multithreading support is enabled only for IFL processors in a LINUX only mode or z/VM mode logical partition.

z/VM exploitation of SMT enables z/VM on z13 to dispatch work on an individual thread of a core, allowing a core to be shared by multiple guest CPUs or z/VM Control Program tasks. This can result in increased work throughput per core from more efficient use of shared core resources. For a performance analysis on how SMT benefited z/VM workloads, see [IBM: VM Performance Resources \(https://www.ibm.com/vm/perf/\)](https://www.ibm.com/vm/perf/).

Simultaneous multithreading support is available on a z/VM system only if the facility is installed on the hardware and enabled on the z/VM system with the MULTITHREADING system configuration statement. The MULTITHREADING statement is optional, and multithreading is disabled if the statement is omitted.

z/VM enablement of multithreading requires that z/VM is configured to run with the HiperDispatch vertical polarization mode enabled and with the dispatcher work distribution mode set for reshuffle. Once enabled, multithreading cannot be disabled without a re-IPL. Dedication of virtual CPUs to z/VM processors is not supported with multithreading because it is not allowed when HiperDispatch vertical polarization mode is active.

z/VM host multithreading exploitation support does not virtualize threads for guest exploitation. However, Linux guests might benefit from the host support because the first level z/VM system is able to get higher throughput from the multithreaded IFL cores. Existing distributions of Linux for IBM Z can benefit from SMT exploitation in a z/VM host.

Stand-alone dump support for SMT requires APARs VM65676 and VM65677.

Performance Toolkit support for SMT requires APAR VM65529. See “[6.3 APAR] Additional Performance Toolkit Enhancements” on page 133.

Note: z/VM CPU pools provide a mechanism for limiting the CPU resources consumed by a group of virtual machines to a specific capacity. In an environment without SMT, these capacities are enforced in terms of a number of cores. In an SMT environment, these capacities are enforced in terms of a number of threads. Consequently, it might be necessary to increase the capacities of CPU pools, in order to provide adequate resource to CPU pool members.

Three Measures of CPU Time When Multithreading Is Enabled

z/VM host exploitation support for SMT provides three measures of CPU time when multithreading is enabled, because the hardware CPU timer is no longer an indication of core utilization. These three measures of CPU time are described below and are reported by accounting records and monitor records.

Raw Time

This is a measure of the CPU time each virtual CPU spent dispatched on a thread, and is the CPU timer information provided directly by the hardware. When all cores have only one thread, this is an accurate measure of CPU time used by the task running on the single-threaded core. When multithreading is enabled, and some cores are running with more than one thread, the CPU Timer is no longer a direct indication of physical core consumption, so you might want one of the other times.

MT-1 Equivalent Time

This is a measure of effective capacity, taking into account the multithreading benefit. The CPU time charged approximates the time that would have been spent if the workload had been run with multithreading disabled; that is, with all core resources available to one thread. The effect is to "discount" the time charged to compensate for the slowdown induced by the activity on other threads in the core.

Prorated Core Time

This is a measure of core utilization regardless of the multithreading benefit. Time is charged by dividing the time the core was dispatched evenly among the threads dispatched in that interval. Under this method, the total time charged to all guests equals the total time the logical cores of the z/VM partition were dispatched. This method is consistent with cost recovery for core-based software licensing.

Notes:

1. When a user is running on a system where multithreading is not installed or not enabled, MT-1 equivalent time and prorated core time consumed will be identical to raw time.
2. The PTF for APAR VM65680 is required for prorated core time fields to be populated.

Changes to z/VM Interfaces

The following CP interfaces have been added:

- MULTITHREADING system configuration statement
- INDICATE MULTITHREAD command
- QUERY MULTITHREAD command
- VARY CORE command
- Virtual Machine Resource Usage 2 (Type F) accounting record
- Trace ID 3615 (Results of CPU Quiesce)
- Monitor record Domain 5 Record 20 - MRPRCMFM - MT CPUMF Counters

The following CP interfaces have been updated:

- SRM system configuration statement
- INDICATE LOAD command
- INDICATE USER command
- LOGOFF command
- MONITOR SAMPLE command
- QUERY TIME command
- QUERY PROCESSORS command
- SET CPTRACE command
- SET SRM command
- VARY PROCESSOR command
- Virtual Machine Resource Usage (Type 1) accounting record
- Store Hypervisor Information (STHYI) instruction
- Trace ID 3612 (Enter Parked Wait State)
- VM Dump Tool CPUUSE macro
- VM Dump Tool HCQGSPL function
- Monitor records:
 - Domain 0 Record 2 - MRSYTPRP - Processor Data (per processor)
 - Domain 0 Record 15 - MRSYTCUG - Logical CPU Utilization Data (global)
 - Domain 0 Record 16 - MRSYTCUP - CPU Utilization in a Logical Partition
 - Domain 0 Record 17 - MRSYTCUM - Physical CPU Utilization Data for LPAR Management
 - Domain 0 Record 19 - MRSYTSYG - System Data (global)
 - Domain 0 Record 23 - MRSYTLCK - Formal Spin Lock Data (global)
 - Domain 1 Record 4 - MRMTRSYS - System Configuration Data
 - Domain 1 Record 5 - MRMTRPRP - Processor Configuration Data (per processor)
 - Domain 1 Record 16 - MRMTRSCH - Scheduler Settings - Sample Record
 - Domain 1 Record 18 - MRMTRCCC - CPU Capability Change
 - Domain 2 Record 4 - MRSCLADL - Add User To Dispatch List - Event Record
 - Domain 2 Record 5 - MRSCLDDL - Drop User From Dispatch List - Event Record
 - Domain 2 Record 7 - MRSCLSRM - SET SRM Changes - Event Record
 - Domain 2 Record 13 - MRSCLALL - Add VMDBK to the limit list - Event Record
 - Domain 2 Record 14 - MRSCLDLL - Drop VMDBK from the limit list - Event Record
 - Domain 4 Record 2 - MRUSELOF - User Logoff Data - Event Record
 - Domain 4 Record 3 - MRUSEACT - User Activity Data
 - Domain 4 Record 9 - MRUSEATE - User Activity data at Transaction End - Event Record
 - Domain 5 Record 1 - MRPRCVON - Vary On Processor - Event Data

- Domain 5 Record 2 - MRPRCVOF - Vary Off Processor - Event Data
- Domain 5 Record 11 - MRPRCINS - Instruction Counts (per processor)
- Domain 5 Record 13 - MRPRCMFC - CPU-Measurement Facility Counters
- Domain 5 Record 16 - MRPRCPUP - Park/Unpark Decision (Event)
- Domain 5 Record 17 - MRPRCRCD - Real CPU Data (per CPU) (Sample)
- Domain 5 Record 19 - MRPRCCPU - CPU Pool Utilization (Sample)

For more information, see:

- [z/VM: CP Commands and Utilities Reference](#)
- [z/VM: CP Planning and Administration](#)
- [z/VM: CP Programming Services](#)

[6.3 APAR] Increased CPU Scalability

With the PTFs for APARs VM65586 and VM65696, z/VM will support up to 64 logical processors on z13:

- 64 cores with multithreading disabled
- 32 cores (up to 2 threads per core) with multithreading enabled

z/VM continues to support up to 32 logical processors on prior machines.

The following CP monitor records have been updated:

- Domain 0 Record 23 - MRSYTLCK - Formal Spin Lock Data (global)
- Domain 3 Record 1 - MRSTORSG - Real Storage Management (global)
- Domain 3 Record 2 - MRSTORSP - Real Storage Activity (per processor)

[6.3 APAR] Multi-Target PPRC Support

With the PTFs for APARs VM65544 and VM65674, z/VM provides support for the Multi-Target Peer-to-Peer Remote Copy (PPRC) storage feature. This support exploits multiple PPRC secondary volumes (targets) for an associated primary volume when configured in default subchannel set 0. z/VM's alternate subchannel set support is tolerated with this new function, but z/VM does not support a multi-target secondary in the alternate subchannel set at this time.

The following CP commands have been updated for this support:

- HYPERSWAP
- QUERY DASD
- QUERY HYPERSWAP

Device Support Facilities (ICKDSF) APAR PM99490 is required to support Multi-Target PPRC DASD.

[6.3 APAR] Multithreading Prorated Core Time Support

When the PTF for APAR VM65680 is applied and multithreading is enabled, CP provides support for multithreading prorated core time. Prorated core time is a method that provides reports and caps based on core utilization regardless of the multithreading benefit, which might be used as a means of distributing charges for subcapacity based products that are based on core capacity. Time is charged by dividing the time the core was dispatched evenly among the threads dispatched in that interval. Under this method, the total time charged to all guests equals the total time the logical cores of the z/VM partition were dispatched. Prorated core time is calculated for all users only when multithreading is enabled, and used in the limiting calculations of CPU pools and guests with individual LIMITHARD shares.

With this support, the prorated core time fields that were added to accounting records and monitor records for multithreading support will now be populated with data when multithreading is enabled.

The following CP interfaces have been updated:

- DEFINE CPUPOOL command
- QUERY CPUPOOL command
- SET CPUPOOL command
- SET SHARE command
- Virtual Machine Resource Usage 2 (Type F) accounting record
- Store hypervisor information (STHYI) instruction
- Monitor records:
 - Domain 2 Record 13 - MRSCALL - Add VMDBK to the limit list - Event Record
 - Domain 2 Record 14 - MRSCDLL - Drop VMDBK from the limit list - Event Record
 - Domain 5 Record 19 - MRPRCCPU - CPU Pool Utilization (Sample)

For more information, see:

- [z/VM: CP Commands and Utilities Reference](#)
- [z/VM: CP Planning and Administration](#)
- [z/VM: CP Programming Services](#)

[6.3 APAR] Support for IBM LinuxONE Systems

With the PTF for APAR VM65716, z/VM 6.3 can be selected as the hypervisor for IBM LinuxONE systems:

- IBM LinuxONE Emperor (based on the IBM z13 server)
- IBM LinuxONE Rockhopper (based on the IBM z13s™ server)

Additional z/VM and other APARs might be required to support these servers. For more information, see the server support table in [z/VM: General Information](#).

[6.3 APAR] IBM z13 (Driver D27) Compatibility and IBM z13s Support

With the PTF for APAR VM65716, z/VM provides support for z/VM 6.3 and 6.2 guests to exploit z/VM supported z13 functions on the z13 (Driver D27) and the IBM z13s®.

This APAR also provides support for the following additional functions on z13 (Driver D27) and z13s™:

- **LPAR enhancement to provide group physical capacity limit enforcement**

Processor Resource/System Manager (PR/SM) and the Hardware Management tool have been enhanced to support an option to limit the amount of physical processor capacity consumed by a group of logical partitions (LPARs) when a processor unit (PU) is defined as a general purpose processor (CP) or an Integrated Facility for Linux (IFL) shared across a set of LPARs.

This enhancement is designed to provide a group physical capacity limit enforced as an absolute (versus relative) limit; it is not affected by changes to the logical or physical configuration of the system. This group physical capacity limit can be specified in units of CPs or IFLs.

The z/VM support includes use of this information in functions that exploit or report processor capacity information for the purpose of adapting to its use. In z/VM publications this function might also be referred to as LPAR group absolute capacity capping.

- **LPAR enhancement for dynamic memory management**

Processor Resource/Systems Manager (PR/SM) has been enhanced to support more flexibility as to how additional physical memory is dynamically added to a logical partition. Rather than attempting to fully populate a logical partition's reserved storage element when it is initially configured online, the operating system in the partition can request a single storage increment be attached (and subsequently can request additional increments if desired). This allows a more gradual, flexible addition of memory to the partition as needed over time.

- **Shared Memory Communications - Direct Memory Access (SMC-D)**

This technology is the latest networking innovation for the IBM z13 family of processors. It provides support for fast, low-latency LPAR-to-LPAR TCP/IP traffic using SMC-D software protocol over firmware-provided Internal Shared Memory (ISM) devices. Supported for z/VM 6.3 guest exploitation, SMC-D and ISM are designed to use shared memory areas to provide low-latency, high-bandwidth, cross-LPAR connections for applications. This support is intended to provide application-transparent DMA communications to TCP endpoints for sockets-based connections. SMC-D is expected to provide substantial performance, throughput, response time, and CPU consumption benefits compared with standard TCP/IP communications over HiperSockets. z/VM supports dynamic I/O and guest usage of the new Internal Shared Memory (ISM) PCI function type.

See the z/OS subset within the 2964DEVICE or 2965DEVICE preventive service planning (PSP) bucket for z/OS service required in support of SMC-D connectivity.

• **Regional Crypto Enablement (RCE)**

z/VM supports z/OS guest exploitation of IBM Regional Crypto Enablement (RCE) adapters. IBM will enable geo-specific cryptographic support that will be supplied by approved vendors. The RCE support will reserve the I/O slots for the vendor-supplied cryptographic cards. Clients will need to directly contact the approved vendor for purchasing information.

Note: RCE support also requires the PTF for APAR VM65577.

The following dynamic I/O return code has been added for adding, deleting, and changing a PCI function:

- 0321

The following CP interfaces have been updated:

- DEFINE PCIFUNCTION command
- Store hypervisor information (STHYI) instruction

The partition section of the function code X'0000' response buffer is updated to include information about the LPAR group absolute capacity caps if defined.

- Monitor records:
 - Domain 0 Record 16 - MRSYTCUP - CPU Utilization in a Logical Partition, updated to report the LPAR group name and associated per CPU type LPAR Group Absolute Capacity Value.
 - Domain 0 Record 23 - MRSYTLCK - Formal Spin Lock Data (global), updated to include DSVBK lock statistics.
 - Domain 1 Record 4 - MRMTRSYS - System Configuration Data, updated to include the STSI 1.2.2 CPU speeds.
 - Domain 1 Record 18 - MRMTRCCC - CPU Capability Change, updated to include the STSI 1.2.2 CPU speeds.
 - Domain 1 Record 27 - MRMTRPCI - PCI function Configuration Data.
 - Domain 5 Record 9 - MRPRCAPC - Crypto Performance Counters, updated to include the crypto delay times and the minimum and maximum sleep times.
 - Domain 5 Record 16 - MRPRCPUP - Park/Unpark Decision (Event), updated to report the per CPU type LPAR Group Absolute Capacity Value.
 - Domain 6 Record 39 - MRIODPAC - PCI Activity.
 - Domain 6 Record 40 - MRIODPDS - Guest Disables a PCI Function.
 - Domain 6 Record 42 - MRIODPAD - PCI function added to the system.
 - Domain 6 Record 45 - MRIODPON - Real PCI function varied on.

For more information, see:

- [z/VM: CP Commands and Utilities Reference](#)
- [z/VM: CP Programming Services](#)
- [z/VM: I/O Configuration](#)

Support for z13 (Driver D27) and z13s also requires the PTFs for the following APARs (in addition to the base z13 support APARs listed under “[6.3 APAR] IBM z13 Support” on page 58). For more information, see the documentation for the product, feature, or function.

- APAR VM65704 provides EREP/VM support.
- APAR VM65736 provides IOCP support, including support for LinuxONE.
- APAR VM65729 provides VMHCD support, including support for LinuxONE.
- APAR VM64844 provides VMHCM support, including support for LinuxONE..
- APAR VM65698 provides Performance Toolkit support for SMC-D.

[6.3 APAR] IBM Z Vector Facility (SIMD) Support

With the PTF for APAR VM65733, z/VM enables guests to exploit the Vector Facility for z/Architecture. The Vector Facility instructions provide a powerful framework for development of new Business Analytics workloads, porting numerically intensive workloads from other platforms, and accelerating Business Analytics workloads on IBM z13.

This support enables guest use of Vector Facility instructions and the 128-bit vector registers used by these instructions. This support also enables command access to the additional floating-point (AFP) registers without requiring prior guest program use. As a result, a request to display or dump all floating-point registers (DISPLAY Y or DUMP Y) will always output 16 registers.

The documentation for the following commands has been updated for this support:

- DISPLAY
- DISPLAY (Registers)
- DUMP (Registers)
- SAVESYS
- STORE (Registers)
- STORE STATUS
- VMDUMP

The following CP monitor records have been updated:

- Domain 1 Record 15 - MRMTRUSR - Logged on User
- Domain 4 Record 2 - MRUSELOF - User Logoff Data - Event Record
- Domain 4 Record 3 - MRUSEACT - User Activity Data
- Domain 4 Record 9 - MRUSEATE - User Activity data at Transaction End - Event Record

For more information, see:

- [z/VM: CP Commands and Utilities Reference](#)
- [z/VM: CP Messages and Codes](#)

[6.4] Architecture Level Set (ALS)

z/VM 6.4 requires a new architecture level set (ALS) and supports only IBM zEnterprise 196 (z196) and IBM zEnterprise 114 (z114) and later servers. See the appropriate Preventive Service Planning (PSP) bucket for the minimum microcode level (MCL) and any required updates. See the server support information in [z/VM: General Information](#).

Specific server facilities might also be required. See [IBM: z/VM 7.1 Architecture Level Set \(https://www.ibm.com/vm/zvm710/architecture\)](https://www.ibm.com/vm/zvm710/architecture).

[6.4] ESA/390 Removal

z/VM 6.4 enhancements enable hypervisor initialization and termination and the Stand-Alone Program Loader (SAPL), DASD Dump Restore (DDR), and Stand-Alone Dump utilities to run entirely in z/

Architecture mode. The IBM z13 and z13s are planned to be the last IBM Z servers to support running an operating system in ESA/390 architecture mode. All future systems will support only operating systems that run entirely in z/Architecture mode. On those future systems, ESA/390 logical partition mode will be renamed to General logical partition mode.

Execution of architecture-conformant applications on CMS and GCS in ESA/390 architecture mode remains supported, as long as the application does not depend on more advanced functions such as dynamic address translation.

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

You should reinstall the SAPL, DDR, and Stand-Alone Dump utilities so your system is ready to run on a z/Architecture-only machine. Also note that IPLable installation DVDs from previous releases will not IPL on z/Architecture-only machines.

The following directory statements have been updated:

- GLOBALOPTS
- MACHINE

The following CP commands have been updated:

- DEFINE CPU
- DEFSYS
- INDICATE USER
- IPL
- LOGON
- QUERY NSS
- QUERY PROCESSORS
- QUERY SET
- QUERY VCONFIG
- SAVESYS
- SET MACHINE
- SET VCONFIG
- SET 370ACCOM
- XAUTOLOG

The following CP utilities have been updated:

- DDR
- SALIPL
- SDINST

The following DIAGNOSE code has been updated:

- X'84'

The following monitor records have been updated:

- Domain 1 Record 1 - MRMTREPR - Event Profile
- Domain 4 Record 1 - MRUSELON - User Logon - Event Record
- Domain 4 Record 2 - MRUSELOF - User Logoff Data - Event Record
- Domain 4 Record 3 - MRUSEACT - User Activity Data
- Domain 4 Record 9 - MRUSEATE - User Activity Data at Transaction End - Event Record

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

ICKDSF support for z/Architecture-only servers requires APAR PI46151.

For more information, see:

- [z/VM: CP Commands and Utilities Reference](#)
- [z/VM: CP Planning and Administration](#)
- [z/VM: CP Programming Services](#)

[6.3 APAR] ESA/390 Removal Support Available for z/VM 6.3

With the PTF for APAR VM65856, the 6.3 CP hypervisor (CPLOAD), Stand-Alone Program Loader (SAPL) utility, and DASD Dump Restore (DDR) utility are enhanced to run entirely in z/Architecture mode.

With the PTFs for APARs VM65921 (CP) and VM65922 (CMS), the 6.3 Stand-Alone Dump utility is enhanced to run entirely in z/Architecture mode.

Note: These 6.3 APARs do not include support for defining Z mode virtual machines.

You should regenerate and install the updated CPLOAD module and reinstall SAPL, DDR, and Stand-Alone Dump so your system is ready to run on a z/Architecture-only machine. Also note that IPLable installation DVDs from 6.3 and previous releases will not IPL on z/Architecture-only machines.

[6.4] Guest Large Page Support

z/VM provides support for the enhanced-DAT facility, which allows a guest to exploit large (1 MB) pages. A larger page size decreases the amount of guest memory needed for dynamic address translation (DAT) tables and also decreases the overhead required to perform address translation. In all cases, guest memory is mapped into 4 KB pages at the host level.

With guest large page support, Linux on IBM Z, z/VSE, and z/OS virtual machines can benefit from reduced memory footprints and address translation times. This can decrease overhead and improve throughput.

The CP TRACE *mnemonic1* command has been updated with the new PFMF mnemonic.

The following monitor record has been updated:

- Domain 5 Record 11 - MRPRCINS - Instruction Counts (per processor)

[6.4] SCSI Management Queries

This support provides enhancements to the commands for EDEVICES within z/VM. It improves the usability and problem diagnosis for EDEV-intensive environments and provides a clearer end-to-end view of the storage configuration. This simplifies the process of verifying that the storage configuration is consistent between z/VM and the disk storage subsystem.

The following CP command has been added for this support:

- EXPLORE FCP

The following CP commands have been updated:

- QUERY DASD
- QUERY EDEVICE
- VARY (Real Device)

The following CP utility has been added for this support:

- IOEXPLOR

For more information, see:

- [z/VM: CP Commands and Utilities Reference](#)
- [z/VM: CP Messages and Codes](#)

[6.4] SCSI Reliability, Availability, and Serviceability (RAS) Enhancements

The following updates are designed to further enhance the reliability of SCSI devices:

- The CP missing interrupt handler is disabled for EDEVICES, allowing the SCSI driver to manage its outstanding requests in a more appropriate manner.
- The SCSI driver is updated to provide additional path recovery.
- Internal timer values are changed to enhance the interoperability between the SCSI driver and SAN Volume Controller (SVC) as well as between devices incorporating SVC technology.
- Debug facilities within the SCSI driver are enhanced, allowing IBM support teams to more quickly diagnose and debug issues in the field.
- Guidelines for multipath configuration are provided for SVC and devices incorporating SVC technology to ensure that path recovery is optimal.
- Concurrent code loads on the SVC and devices incorporating SVC technology is now supported without quiescing EDEVICE I/O. This was previously restricted, and continues to be restricted on releases prior to z/VM 6.4.

The following CP functions have been updated for this support:

- The following CP commands have been updated:
 - SET CPTRACE
 - SET EDEVICE
 - SET MITIME
- The EDEVICE configuration statement has been updated.
- The following new trace codes have been added to the CP trace table: 2891, 28A1, 28A2, 2C91, 2CA1, 2CB1, and 6026–6030.
- The following trace codes have been deleted in the CP trace table: 2890, 28A0, 2C90, 2CA0 and 2CB0.

For more information, see:

- [z/VM: CP Commands and Utilities Reference](#)
- [z/VM: CP Planning and Administration](#)
- [z/VM: CP Messages and Codes](#)
- [z/VM: Diagnosis Guide](#)

[6.4] Guest Transactional Execution (TX) Support

z/VM supports guest exploitation of the Transactional Execution (TX) facility on supported machines. The TX facility allows a program to issue multiple instructions that appear to operate atomically, offering an alternative to more costly mutual-exclusion mechanisms, such as software locks. This support can improve the efficiency and scalability of multithreaded software, such as Java™ or guest operating system functions.

Note: The following instructions are restricted from use within transactions:

- Store Hypervisor Information (STHYI)
- Inter-User Communications Vehicle (IUCV)
- DIAGNOSE

The following CP commands have been updated:

- TRACE
- QUERY TRACE

- SET CPTRACE
- TRSOURCE

The following CP trace codes have been added: 8B00, 8B01, 8B02, 9A01.

For more information, see:

- [z/VM: CP Commands and Utilities Reference](#)
- [z/VM: CP Messages and Codes](#)
- [z/VM: CP Programming Services](#)
- [z/VM: Virtual Machine Operation](#)
- [z/VM: Diagnosis Guide](#).

[6.4] IBM z13 (Driver D27) and z13s I/O Support

z/VM compatibility support for the IBM z13 (driver D27) and z13s includes support for the user-defined identifier (UID) field for PCI functions. A UID can be assigned to a real PCI function to be able to more accurately indicate equivalent functions between different LPARs and for exploitation by guest operating systems, Linux in particular. z/VM supports dynamic I/O and guest use for the new PCIe UID support.

The following CP commands have been added for this support:

- QUERY IO_OPT
- SET IO_OPT

The following CP commands have been updated for this support:

- ATTACH
- DEFINE PCIFUNCTION
- QUERY PCIFUNCTION

Additional program requirements for UID support:

- CP support on 6.2, 6.3, and 6.4 requires APAR VM65865.
- HCD support on 6.2, 6.3, and 6.4 requires APAR VM65827.
- HCM support on 6.2, 6.3, and 6.4 requires APAR VM65201.
- IOCP support on 6.2 and 6.3 requires APAR VM65817. (IOCP support is included in the 6.4 base.)

For more information, see:

- [z/VM: CP Commands and Utilities Reference](#)
- [z/VM: CP Messages and Codes](#)
- [z/VM: I/O Configuration](#)

[6.4] Expanded Storage (XSTORE) Support Removed

IBM z13 and z13s are the last IBM Z servers to support expanded storage (XSTORE). z/VM 6.4 does not support XSTORE for either host or guest usage.

The XSTORE user directory statement is supported for compatibility only. The statement has no function and has been removed from the documentation. If a directory entry includes the XSTORE statement, message HCP1401I will be issued when the guest logs on to state that XSTORE is not supported.

The following CP commands have been removed:

- DETACH XSTORE
- QUERY VIRTUAL XSTORE
- QUERY XSTORE
- RETAIN XSTORE

The following CP commands have been updated:

- ATTACH
- DETACH
- INDICATE LOAD
- INDICATE NSS
- INDICATE PAGING
- INDICATE SPACES
- INDICATE USER
- LOGOFF
- LOGON
- MONITOR SAMPLE
- QUERY MDCACHE
- QUERY RESERVED
- QUERY SRM
- QUERY VIRTUAL ALL
- SET CPTRACE
- SET MDCACHE
- SET SRM
- VMRELOCATE

The following DirMaint operand has been removed:

- XSTORE

The following DirMaint messages have been removed:

- DVH3261I
- DVH3324E

The following DIAGNOSE code has been updated:

- DIAGNOSE Code X'84' - Directory Update-in-Place

The XSTORE operation is supported for compatibility only; the operation has no function.

The following CP monitor records are no longer available:

- Domain 0 Record 5 - MRSYTXSP - Expanded Storage Data (per processor)
- Domain 1 Record 17 - MRMTRXSG - Expanded Storage Data
- Domain 3 Record 9 - MRSTOXSG - Expanded Storage Data
- Domain 3 Record 10 - MRSTOXSU - Expanded Storage Data (per user)

The following CP monitor records have been changed:

- Domain 0 Record 14 - MRSYTXSG - Minidisk Cache
- Domain 1 Record 16 - MRMTRSCH - Scheduler Settings - Sample Record
- Domain 2 Record 4 - MRSCLADL - Add User To Dispatch List - Event Record
- Domain 2 Record 5 - MRSCLDDL - Drop User From Dispatch List - Event Record
- Domain 2 Record 6 - MRSCLAEL - Add User To Eligible List - Event Record
- Domain 2 Record 7 - MRSCLSRM - SET SRM Changes - Event Record
- Domain 3 Record 3 - MRSTOSHR - Shared Storage Management (per NSS or DCSS)
- Domain 3 Record 14 - MRSTOASI - Address Space Information Record
- Domain 3 Record 16 - MRSTOSHD - NSS/DCSS/SSP Removed From Storage

- Domain 4 Record 2 - MRUSELOF - User Logoff Data - Event Record
- Domain 4 Record 3 - MRUSEACT - User Activity Data
- Domain 4 Record 9 - MRUSEATE - User Activity Data at Transaction End - Event Record

[6.4] IBM Dynamic Partition Manager (DPM) Administrative Mode for Linux

Dynamic Partition Manager (DPM), provided with IBM z13 and later and LinuxONE servers, supports Linux running on z/VM 6.4 or later with FCP SCSI or FICON ECKD storage.

A CPC can be configured in either DPM mode or PR/SM mode. The mode is enabled prior to the CPC power-on reset (POR).

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

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

DPM mode requires two OSA-Express5S or later 1000BASE-T Ethernet adapters for primary and backup connectivity. See the IBM z14 exception letter in Resource Link and the 3906DEVICE and 3907DEVICE PSP buckets for details on the driver D32 bundle providing FICON ECKD support.

[6.4 APAR] Concurrent I/O Support for IBM XIV Storage System

With the PTF for APAR VM65929, the z/VM SCSI container enables multiple I/O requests to be issued concurrently to EDEVICES backed by IBM XIV System Storage hardware, which may improve performance. This support particularly benefits EDEVICE paging I/O or volumes containing multiple minidisks.

[6.4 APAR] z/VM Support for IBM z14

With the PTF for APAR VM65942, z/VM 6.4 provides support that enables guests to exploit function supported by z/VM on IBM z14™ (z14), which includes:

- **z/Architecture support**

The z/VM Stand-Alone Program Loader (SAPL) utility, DASD Dump Restore (DDR), and the Stand-Alone Dump utility have been enhanced to run entirely in z/Architecture mode. z/Architecture support for the SAPL and DDR utilities is in the base of z/VM 6.4 and provided for z/VM 6.3 with the available PTF for APAR VM65856. z/Architecture support for the Stand-Alone Dump utility is in the base of z/VM 6.4 and provided for z/VM 6.3 with the available PTFs for APARs VM65921 and VM65922.

- **New hardware facilities**

z/VM enables guest use of new instructions and capabilities available on IBM z14, including the following facilities:

- Miscellaneous-Instruction-Extensions Facility 2
- Vector Enhancements Facility 1
- Vector Packed Decimal Facility
- Message-Security-Assist Extensions 6, 7, and 8

Note: TRACE, DISPLAY I, and VMDUMPTL display support for interpreting the new instructions associated with these facilities is not provided.

- **ESA/390-compatibility mode for guests**

IBM z14 does not support the full ESA/390 architectural mode. However, IBM z14 does provide ESA/390-compatibility mode, a hybrid architectural mode that supports a subset of ESA/390 needed to

run CMS and GCS and their applications, but lacks more advanced functions needed for full function ESA/390 operating systems.

Specifically, ESA/390-compatibility mode does not provide dynamic address translation (DAT), access-register translation (ART), address-space-number (ASN) translation, branch tracing, and related instructions and functions. Use of ART to access VM Data Spaces in XC virtual machines remains supported. Facilities, instructions, controls, and modes defined only in z/Architecture may or may not be fenced off in ESA/390-compatibility mode; attempted use of these gives unpredictable results.

When an ESA or XA virtual machine logs on, it will be put into either full ESA/390 mode or ESA/390-compatibility mode depending on the level of ESA/390 capability available in the machine where the virtual machine is logged on or in the virtual machine's relocation domain.

The PTF for APAR VM65976 provides infrastructure support for ESA/390-compatibility mode within z/VM 6.2, 6.3, and 6.4, and must be installed on all members of an SSI cluster before any z/VM 6.3 or 6.4 member of the cluster is run on an IBM z14 server.

- **Support for the Crypto Express6S**

z/VM support for the new Crypto Express6S (CEX6S) adapter is included for both shared and dedicated guest use. As with the prior crypto adapter support, the CEX6S adapter can be configured as an accelerator or as an IBM Common Cryptographic Architecture (CCA) coprocessor for shared or dedicated use by z/Architecture guests. When the CEX6S adapter is configured as an IBM Enterprise Public-Key Cryptography Standards (PKCS) #11 (EP11) coprocessor, the domains on the adapter can be dedicated to z/Architecture guests, but not shared.

With Crypto Express6S support and support for the new and enhanced CPACF functions, z/VM 6.3 and 6.4 provide the prerequisite IBM z14 encryption support to enable exploitation by guests in support of pervasive encryption of data in flight and at rest.

- **Crypto clear key ECC operations**

Clear key Elliptic Curve Cryptographic (ECC) operations are supported for guests enrolled in the z/VM-managed shared-crypto queue (APVIRT). The shared-crypto queue must be configured with CCA coprocessor domains in order for the function to be virtualized for guest use.

- **Dynamic I/O support**

Dynamic I/O support is provided for managing the configuration of OSA-Express6S OSD CHPIDs, FICON Express16S+ FC and FCP CHPIDs, and Regional Crypto Enablement (RCE), zHyperLink Express, and RoCE Express2 adapters.

The PTF for APAR VM65865 provides dynamic I/O support for the Coupling Express Long Reach (CE LR) adapter in z/VM 6.3 and 6.4 and is applicable to z13, z13s, and z14.

- **RoCE Express2 support**

Guest exploitation support for RoCE Express2 allows the adapters to be brought online and attached to supporting guests for exploitation.

- **Improved memory management efficiency**

The IBM z14 processor design allows greater concurrency in address translation. This improvement may increase z/VM workloads' performance compared with z13, particularly when z/VM is configured to exploit multithreading.

This z/VM support also provides instruction simulation counters by virtual CPU in the z/VM monitor data.

The following configuration statement has been updated:

- CRYPTO

The following directory statements have been updated:

- CRYPTO
- MACHINE

The following CP commands have been updated:

- DEFINE
- DEFINE DEVICE / IODEVICE
- DEFINE PCIFUNCTION
- DELETE DEVICE / IODEVICE
- LOGON
- MODIFY DEVICE / IODEVICE
- QUERY CRYPTO
- QUERY PCIFUNCTION
- QUERY SET
- QUERY VIRTUAL CRYPTO
- SET MACHINE
- XAUTOLOG

The following CP monitor records have been updated:

- Domain 0 Record 15 - MRSYTCUG - Logical Partition Configuration
- Domain 0 Record 16 - MRSYTCUP - CPU Utilization in a Logical Partition
- Domain 0 Record 17 - MRSYTCUM - Physical CPU Utilization Data for LPAR Management
- Domain 1 Record 4 - MRMTRSYS - System Configuration Data
- Domain 1 Record 27 - MRMTRPCI - PCI function Configuration Data
- Domain 4 Record 2 - MRUSELOF - User Logoff Data - Event Record
- Domain 4 Record 3 - MRUSEACT - User Activity Data
- Domain 5 Record 10 - MRPRCAPM - Crypto Performance Measurement Data
- Domain 5 Record 16 - MRPRCPUP - Park/Unpark Decision (Event)
- Domain 6 Record 42 - MRIODPAD - PCI function added to the system
- Domain 6 Record 45 - MRIODPON - Real PCI function varied on

With the PTF for APAR PI73016, the TCP/IP stack and the NETSTAT OSAINFO command are updated to support OSA-Express6S adapters.

Support for the IBM z14 also requires the following APARs. For more information, see the documentation for the product, feature, or function.

- APAR PI46151 provides ICKDSF support.
- APAR VM65952 provides EREP/VM support.
- APAR VM65843 provides HCD support.
- APAR VM65266 provides HCM support.
- APAR VM65939 provides IOCP support.
- APARs PI62275 and PI65715 provide HLASM support.

For more information, see:

- [z/VM: CP Planning and Administration](#)
- [z/VM: CP Commands and Utilities Reference](#)

Installing z/VM on IBM z14

z/VM 6.4 can be installed directly on a z14 with an image obtained from IBM after August 25, 2017. The PTF for APAR VM65942 must be applied immediately after installing z/VM 6.4. The PTFs for APARs VM65942 and VM65639 are required to support the z14 Model ZR1 and LinuxONE Rockhopper II servers.



Attention: If you are upgrading to a z14, z14 Model ZR1, LinuxONE Emperor II, or LinuxONE Rockhopper II, you must upgrade the Stand Alone Program Loader (SAPL), or else you will not be able to IPL z/VM.

[6.4 APAR] Extended Address Volume Minidisk Support

With the PTFs for APARs VM65943 (CP), VM65945 (CMS), and PI85943 (ICKDSF), enhanced extended address volume (EAV) support for 3390-A DASD devices supporting 28-bit cylinder addresses is provided. This support allows non-fullpack minidisks to reside anywhere on the volume, including beyond the current restriction of the 64 KB cylinder boundary (0-65519), and up to the 1 TB limit currently supported.

If a guest virtual machine with an EAV minidisk defined above cylinder 65520 is relocated within an SSI cluster, the destination system must have EAV support installed; otherwise, the relocation will fail.

[6.4 APAR] Processor Scalability Efficiency Improvements

With the PTF for APAR VM65988, the z/VM hypervisor is enhanced to manage its spinlocks more efficiently and thereby reduce system overhead. This enhancement will contribute to improved performance and throughput, and thereby help to improve overall system capacity by allowing additional work to be performed. While most workload configurations will benefit to some extent, the improvements are greatest for workloads using large numbers of logical CPUs. The shared-exclusive spinlock manager was replaced with a more cache-efficient design providing greater scalability for the Scheduler Lock (SRMSLOCK). SRMSLOCK reporting in Monitor DOR23 MRSYTLCK was corrected to include time spinning in HCPDSP's internal spin loop that was previously unreported. The support is available on all hardware supported by z/VM 6.4, including IBM z14. However, the design for some spinlocks take advantage of efficiencies unique to the z14.

The following CP monitor record was added:

- Domain 5 Record 22 - MRPRCSXL - Shared-Exclusive Spin Lock Utilization (per-processor)

Under-reporting of scheduler lock spin time was corrected by including the informal spin time in the dispatcher in the lock statistics reported in the following updated monitor records:

- Domain 0 Record 2 - MRSYTPRP - Processor data (Per Processor):

SYTPRP_PFXSPINT includes the informal spin time.

YTPRP_PFXSPINC includes the count of informal spins.

- Domain 0 Record 10 - MRSYTSCG - Scheduler Activity

SYTSCG_CALSLKTM includes the informal spin time.

SYTSCG_CALSLKCT includes the count of informal spins.

- Domain 0 Record 23 - MRSYTLCK - Formal Spin Lock Data

SYTLCK_CALSTIME includes the informal spin time.

SYTLCK_CALSSCNT includes the count of informal spins.

As a result reduced spinlock overhead from the shared-exclusive spinlock manager improvements may appear to reduce system overhead that was not previously reported as spinlock spin time.

[6.4 APAR] Alternate Subchannel Set Dynamic I/O Support

With the PTF for APAR VM65942, z/VM 6.4 provides dynamic I/O commands within the z/VM hypervisor for supporting define, modify, and delete of a device within either the default or alternate subchannel set. HCD support is currently not available.

[6.4 APAR] Coupling over RoCE (CL5) Channel Path Support

With the PTF for APAR VM65865, z/VM 6.3 and 6.4 provide dynamic I/O support for the new Coupling over RoCE (CL5) channel path type, which is associated with the Coupling Express Long Reach (CE LR)

adapter. CE LR is a two port adapter for the IBM z13, z13s, and z14 that provides long distance coupling connectivity.

The following CP commands have been updated for this support:

- DEFINE CHPID/PATH
- QUERY CHPID

For more information, see *z/VM: CP Commands and Utilities Reference*.

Support for the CL5 CHPID also requires the following APARs:

- HCD support requires APAR VM65849.
- HCM support requires APAR VM65208.
- IOCP support requires APAR VM65880.

[6.4 APAR] Guest Exploitation Support for the Instruction Execution Protection Facility

With the PTF for APAR VM65986, z/VM 6.4 provides support for guest exploitation of the IBM z14 Instruction Execution Protection facility. This facility provides functionality to help improve the security of programs running on IBM Z by allowing virtual memory elements to be identified as containing only data. If an attempt is made to fetch an instruction from an address in such an element, or if an address in such an element is the target of an execute-type instruction, a Protection Exception will occur. The support and use of the Instruction Execution Protection facility can prevent erroneously or maliciously modified data in a program stack from being executed on the guest.

[6.4 APAR] Guest Exploitation Support for Pauseless Garbage Collection

With the PTF for APAR VM65987, z/VM 6.4 provides support for guest exploitation of the IBM z14 Guarded Storage facility. This hardware feature is aimed at reducing pause times in systems with automated memory management, for example a Java virtual machine's garbage collector. Pause times are phases during which application execution is suspended to avoid potential data integrity issues, which can have a negative effect on an application's response time. The Guarded Storage facility can be used to detect when application threads make reference to potentially stale data, allowing invocation of a handler to resolve and update such references. As a result, the pause time associated with these phases will be significantly reduced, leading to more consistent application response time.

[6.4 APAR] Encrypted Paging

With the PTF for APAR VM65993, Encrypted Paging improves z/VM system security by exploiting IBM z14 hardware to encrypt guest page data. Ciphering occurs as data moves from active memory onto a paging volume owned by CP (that is, ECKD and SCSI devices). This makes customer data defensible from an attack and from a breach of volumes, even in cases where a system administrator has unintended access to those volumes.

Encryption is limited to guest pages (in primary host address spaces and z/VM data spaces) and virtual-disk-in-storage (VDISK) pages written by the CP paging subsystem to paging extents (or when paging space has been exhausted, to spool extents). This includes pages on a NSS/DCSS that has been loaded. Encrypted Paging requires that the TRNG facility of CPACF (hardware feature 3863) of the IBM z14™ be enabled for the system.

The following types of pages, also written by the CP paging subsystem, are not encrypted:

- spool files
- directory pages
- minidisk data to a mapped minidisk pool (established via the MAPMDISK interface)
- minidisk cache pages
- CP page tables (PGMBKs).

Encrypted Paging is available starting with z14 hardware. It is not supported on earlier machines.

The following CP commands are new:

- QUERY ENCRYPT
- SET ENCRYPT

The following system configuration statement is new:

- ENCRYPT

The following CP monitor record was added:

- Domain 1 Record 34 - MRMTRENC - Encrypted Service Event

The following CP monitor records have been updated:

- Domain 1 Record 4 - MRMTRSYS - System Configuration Setting
- Domain 3 Record 2 - MRSTORSP - Real Storage Activity Per Processor

[6.4 APAR] z-Thin Provisioning

With the PTFs for APARs VM66098 and VM66108, z/VM provides host recognition and guest exploitation support for Extent Space Efficient (ESE) thin provisioned volumes. The restriction that CPOWNED volumes cannot be defined on thin provisioned volumes has been removed.

The following CP command has been added for this support:

- RELSPACE

The following CP commands have been updated for this support:

- FLASHCOPY ESTABLISH
- FLASHCOPY WITHDRAW
- QUERY DASD

The following CP utility has been updated for this support:

- IOEXPLOR

The following CP monitor records have been updated:

- Domain 1 Record 6 - MRMTRDEV - Device Configuration Data
- Domain 6 Record 1 - MRIODVON - Vary On Device - Event Data
- Domain 6 Record 3 - MRIODDEV - Device Activity

For more information, see:

- [z/VM: CP Commands and Utilities Reference](#)
- [z/VM: CP Planning and Administration](#)
- [z/VM: CP Messages and Codes](#)

[7.1] Architecture Level Set

z/VM 7.1 requires a new architecture level set (ALS) and supports only IBM zEnterprise EC12 (zEC12) and IBM zEnterprise BC12 (zBC12) and later servers. See the appropriate Preventive Service Planning (PSP) bucket for the minimum microcode level (MCL) and any required updates. See the server support information in [z/VM: General Information](#).

Specific server facilities might also be required. See [IBM: z/VM 7.1 Architecture Level Set \(https://www.ibm.com/vm/zvm710/architecture\)](https://www.ibm.com/vm/zvm710/architecture).

[7.1] Foundational Support for Dynamic Memory Downgrade

Foundational support is provided for a future z/VM deliverable to increase flexibility in managing z/VM configurations by enabling real storage to be removed from a z/VM LPAR without requiring an outage. This support will complement existing functionality to add real storage to an active z/VM system.

The following CP command has been updated:

- SET STORAGE includes the new PERMANENT operand.

For more information, see:

- [z/VM: CP Commands and Utilities Reference](#)
- [z/VM: CP Messages and Codes](#)

[7.1] Foundational Support for More Than 64 Logical Processors

Foundational support is provided for a future z/VM deliverable that will increase the number of supported logical processors beyond the current limit of 64. This will allow clients to run a z/VM LPAR with more than 64 cores in an SMT1 environment or more than 32 cores in an SMT2 environment to accommodate workload growth demands.

Support for dedicating processors to guests is disabled.

The following CP commands are updated:

- DEFINE CPU
- INDICATE LOAD
- INDICATE USER
- QUERY PROCESSORS
- QUERY SHARE
- QUERY SRM
- QUERY SXSPAGES
- QUERY VIRTUAL CPUS
- SET SHARE
- SET SRM
- SET TRACEFRAMES
- VARY CORE
- VARY PROCESSOR
- VMRELOCATE

The following CP commands are deleted:

- DEDICATE
- UNDEDICATE

The following CP utility is updated:

- TRACERED

The following statement is updated:

- CPU directory statement

The following CP functions are updated:

- DIAGNOSE code X'70' - Time-of-Day Clock Accounting Interface
- DIAGNOSE code X'2FC' - Obtain Certain Guest Performance Data
- Store Hypervisor Information (STHYI) instruction

Various messages are updated or deleted. Various abends are deleted.

The following CP monitor records are updated:

- Domain 0 Record 10 - MRSYTSCG - Scheduler Activity (global)
- Domain 0 Record 23 - MRSYTLCK - Formal Spin Lock Data (global)
- Domain 1 Record 5 - MRMTRPRP - Processor Configuration (per processor)
- Domain 5 Record 3 - MRPRCPRP - Processor Data (per processor)
- Domain 5 Record 15 - MRPRCDSV - Dispatch Vector Assignments (Event)
- Domain 5 Record 16 - MRPRCPUP - Park/Unpark Decision (Event)
- Domain 5 Record 17 - MRPRCRCD - Real CPU Data (per CPU) (Sample)
- Domain 5 Record 18 - MRPRCDHF - Dispatch Vector High Frequency Data (Sample)

The following SMAPI routines are updated:

- Image_CPU_Define_DM
- Image_CPU_Query_DM
- Image_Definition_Create_DM
- Image_Definition_Query_DM
- Image_Definition_Update_DM

The following DirMaint command is updated:

- SETCPU

For more information, see:

- [z/VM: CP Commands and Utilities Reference](#)
- [z/VM: CP Messages and Codes](#)
- [z/VM: CP Planning and Administration](#)
- [z/VM: CP Programming Services](#)
- [z/VM: Directory Maintenance Facility Commands Reference](#)

[7.1 APAR] Support for the IBM Adapter for NVMe

With the PTF for APAR VM66180, z/VM 7.1 provides dynamic I/O and guest enablement support for the IBM Adapter for NVMe on the Emperor II and Rockhopper II servers with driver D36. This feature supports the NVMe (non-volatile memory express) communications protocol by allowing a client-procured SSD (solid-state drive) storage device to be directly connected to the I/O subsystem through an IBM PCIe adapter.

- Dynamic I/O

The ability to dynamically define the NVMe PCIe adapter type.

- Guest Exploitation

The ability of guest exploitation of NVMe PCI functions by allowing CP to identify these functions and allowing them to be brought online and attached to guests.

The ability to query and track NVMe PCI functions via the QUERY PCIF command, QUERY VIRTUAL PCIF command, and monitor data by updating these areas to recognize this new function type that are associated with them.

The following CP command has been updated:

- DEFINE PCIFUNCTION

The responses for the following CP commands have been updated:

- QUERY PCIFUNCTION

- QUERY VIRTUAL PCIFUNCTION

The following CP monitor records have been updated:

- Domain 1 Record 27 - MRMTRPCI - PCI function Configuration Data
- Domain 6 Record 42 - MRIODPAD - PCI function added to the system
- Domain 6 Record 45 - MRIODPON - Real PCI function varied on

For more information, see:

- [z/VM: CP Commands and Utilities Reference](#)
- [z/VM: Performance](#)

[7.1 APAR] Extended Address Volume (EAV) Paging Space Support

With the available PTF for APARs VM66263 and VM66297, z/VM supports paging space that is located anywhere on Extended Address Volumes, allowing clients to define sufficient paging capacity for z/VM partitions with large memory sizes while reducing the burden of managing a larger number of smaller paging devices. As systems continue to grow, the need for paging space has increased. This z/VM support allows allocation and use of paging space on ECKD devices above cylinder 65520 up to the 1TB (1,182,006 cylinder) limit.

The following CP commands and utilities have been updated (see [Table 8 on page 194](#) and [Table 9 on page 240](#)):

- ATTACH
- CPFMTXA

The description of the following SMAPI API has been updated:

- System_Page_Utilization_Query

The following CP monitor records have been updated:

- Domain 0 Record 6 - MRSYTASG - Auxiliary Storage (Global)
- Domain 1 Record 8 - MRMTRPAG - Paging Configuration Data
- Domain 3 Record 4 - MRSTOASP - Auxiliary Storage Management (per Exposure)
- Domain 3 Record 7 - MRSTOATC - Page/Spool Area of a CP Volume

The PTF for APAR VM66297 provides SMAPI help file updates.

For more information, see:

- [z/VM: CP Commands and Utilities Reference](#)
- [z/VM: CP Planning and Administration](#)
- [z/VM: Systems Management Application Programming](#)
- [z/VM: CP Messages and Codes](#)
- [z/VM: Performance](#)

[7.1 APAR] Performance Toolkit Support for EAV Paging Space

With the PTF for APAR VM66293, Performance Toolkit for z/VM displays data for paging space on CP-owned extended address volumes (EAVs).

No screen layout changes have been introduced with the support for EAV paging.

[7.1 APAR] Support for 80 Logical Processors

With the available PTF for APARs VM66265 and VM66296, z/VM supports 80 logical processors on IBM z14[®] and IBM z15[™], relieving the previous limitation of 64 logical processors per LPAR. This will allow clients to run more workload on z/VM by increasing the number of supported logical processors, which is

especially important when multithreading is enabled. From a client's perspective, this will allow defining more logical processors for running workload on each LPAR, possibly requiring fewer LPARs to support the same workload.

This support increases the limit to 40 cores when simultaneous multithreading (SMT) support is enabled, or to 80 cores when SMT is disabled.

The following CP commands have been updated:

- QUERY PROCESSORS
- SET SRM
- VARY CORE
- VARY PROCESSOR

The following CP utility has been updated:

- TRACERED

The following CP configuration statement has been updated:

- MULTITHREADING

The following CP trace codes have been added: 3616, 3617, and 3651.

The following CP trace codes have been removed: 3614, 3615, and 3650.

The PTF for APAR VM66296 provides StandAlone Dump support.

For more information, see:

- [z/VM: CP Commands and Utilities Reference](#)
- [z/VM: CP Planning and Administration](#)
- [z/VM: CP Messages and Codes](#)
- [z/VM: Diagnosis Guide](#)

[7.1 APAR] Performance Toolkit Support for 80 Logical Processors

With the PTF for APAR VM66292, Performance Toolkit for z/VM can report on up to 80 logical processors. Customers can monitor LPARs with up to 80 logical processors defined. Performance data screens display all logical processor IDs and core IDs in hexadecimal format rather than the previous decimal format.

The following performance data screens, their descriptions, or both, are updated:

- FCX100, CPU Load and Transactions Screen - CPU
- FCX126, LPAR Load Screen - LPAR
- FCX144, Processor Log Screen - PROCLOG
- FCX174, User Transaction Details Screen - UTRANDET
- FCX180, System Configuration Screen - SYSCONF
- FCX232, I/O Processor Log Screen - IOPROCLG
- FCX239, Processor Summary Log Screen - PROCSUM
- FCX287, System Topology Machine Organization Screen - TOPOLOG
- FCX298, Logical Core Organization Log Screen - PUORGLOG
- FCX299, Processor Unit (Core and Threads) Configuration Log Screen - PUCFGLOG
- FCX300, Dispatch Vector Configuration Change Log Screen - DSVCLG
- FCX301, Dispatch Vector Activity Screen - DSVBKACT
- FCX303, DSVBK Steals per Processor Log Screen - DSVSLOG
- FCX304, Processor Log Screen - PRCLOG

For more information, see:

- [z/VM: Performance Toolkit Reference](#)

[7.1 APAR] Removal of 1000-Member Limit for a Single Resource Pool

With the PTF for APAR VM65786, the previous limit of 1000 members in a single resource pool has been removed.

[7.1 APAR] IBM z15 (z15) and LinuxONE III Server Compatibility

With the PTFs for APAR VM66248, VM66321, and VM66325, z/VM's IBM z15™ (z15) and LinuxONE III Server Compatibility support allows guests of z/VM to use these facilities:

- Miscellaneous-Instruction-Extensions Facility 3
- Vector Enhancements Facility 2
- Vector Packed Decimal Enhancement Facility
- Synchronous execution support for on-chip data compression, deflate-conversion
- Message-Security-Assist Extension 9
- Crypto Express7S adapter shared and dedicated guest support

The PTF for APAR VM66206 provides infrastructure support in z/VM 6.4 and 7.1 for the z15 server, and z/VM Dynamic Crypto support, which must be installed on all the members of an SSI cluster before any member will be running on the z15 server.

In addition, the PTF for APAR VM65976 provides infrastructure support for ESA/390-compatibility mode within z/VM 6.4, and must be installed on all members of an SSI cluster before any z/VM 6.4 member of the cluster is run on an IBM z15 or LinuxONE III server.

With the available PTF for APAR PI99085, the z/VM 6.4 and 7.1 TCP/IP stack and NETSTAT OSAINFO command have been updated to provide support for:

- OSA-Express7s GbE
- OSA-Express7S 10GbE
- OSA-Express7S 25GbE
- OSA-Express7s 1000BASE-T

The following CP commands have been updated (see [Table 8 on page 194](#)):

- QUERY CRYPTO command
- QUERY VIRTUAL CRYPTO command
- SET SVC76 command

The following system configuration statement has been updated:

- [CRYPTO APVIRTUAL Statement](#)

The following directory statement has been updated:

- [CRYPTO Directory Statement](#)

The following CP monitor records have been updated:

- D1R4 MRMTRSYS: Added field MTRSYS_MAXPU.
- D1R15 MRMTRUSR: Added CPNC and CPVC.
- D4R2 MRUSELOF: Added new simulation counts.
- D4R3 MRUSEACT: Added new simulation counts.
- D4R9 MRUSEATE: Added CPNC and CPVC.
- D5R20 MRPRCMFM: Updated CSVN value.

In addition, support is added for installation of z/VM 6.4 and 7.1 using a USB flash drive.

[7.1 APAR] Dynamic Crypto

With the PTF for APAR VM66266, z/VM's Crypto support will enable dynamic changes to the cryptographic (crypto) environment on a z/VM system.

The Dynamic Crypto support allows the addition or removal of Crypto Express adapters, as well as maintenance and repair of these adapters, to be less disruptive to the system and virtual machine's running on the system. It will also allow the flexibility to change crypto resources between dedicated and shared use.

The following new commands are provided as an interface to make these changes without requiring an IPL of z/VM or an IPL of the virtual machine.

- [DEFINE CRYPTO](#)
- [DETACH CRYPTO](#)
- [VARY CRYPTO](#)

The following CP commands have been updated.

- [ATTACH](#)
- [QUERY CRYPTO](#)
- [QUERY VIRTUAL CRYPTO](#)

The following CP trace codes have been added:

- 3800
- 3801
- 3802

For more information, see:

- [z/VM: CP Commands and Utilities Reference](#)
- [z/VM: CP Messages and Codes](#)

Improved information about defining crypto resources to z/VM guests

A new chapter has been added to [z/VM: CP Planning and Administration](#) to provide improved information about how to define crypto resources to z/VM guests. See [Crypto Planning and Management](#) for more information.

[7.1 APAR] System Recovery Boost

With the PTF for VM66283, the System Recovery Boost feature on the z15 Models T01 and T02 server allows z/VM to boost general-purpose processors running as subcapacity to full capacity for up to 60 minutes during z/VM system initialization and workload bring-up; and up to 30 minutes during workload quiesce and system shutdown, and during system abend processing.

z/VM support primarily benefits the z/VSE and z/TPF guest environments.

The FEATURES system configuration file statement has been updated.



Warning: When enabling or disabling System Recovery Boost in the z/VM SYSTEM CONFIG file, it is recommended to add a separate FEATURES statement on a new line rather than include RECOVERY_BOOST on an existing FEATURES line. This will avoid issues with existing FEATURES statements when IPLing CPLOAD MODULES that do not include System Recovery Boost support.

The following CP messages are new: HCP65221 and HCP6523E.

The following CP monitor record has been updated: Domain 0 Record 16 - MRSYTCUP - CPU Utilization in a Logical Partition

For more information, see:

- [z/VM: CP Planning and Administration](#)
- [z/VM: CP Messages and Codes](#)
- [z/VM: Performance](#)

[7.1 APAR] z15 I/O Processor Compatibility

With the PTF for APAR VM66242, z/VM provides support for IBM Fibre Channel Endpoint Security between an IBM z15 or LinuxONE III and the DS8000, by providing the following:

- Query the encryption status of target worldwide port names (WWPNs) associated with a Fibre Channel Protocol (FCP) device via the QUERY FCP command.
- Query the encryption and authentication capability of a channel path via the QUERY PATHS command.
- Track encryption state changes by recognizing Store Event Information channel report data and creating an event monitor record for each state change.

IBM Fibre Channel Endpoint Security requires a minimum driver D41C bundle level. For further details, see [IBM Support - Preventive Service Planning buckets, Upgrade 8561DEVICE, Subset 8561/ZVM](#) (https://www.ibm.com/support/docview.wss?uid=isg1_8561DEVICE_8561-ZVM).

The following CP commands have been updated (as shown in [Table 8 on page 194](#)):

- QUERY FCP
- QUERY PATHS

The following new monitor record has been added:

D6R53 MRIODSEC

Store Event Information channel reports indicating encryption state changes.

For more information, see:

- [z/VM: CP Commands and Utilities Reference](#)
- [z/VM: CP Messages and Codes](#)
- [z/VM: Performance](#)

[7.2] Adjunct Virtual Machine Support

z/VM 7.2 has been updated to support adjunct virtual machines. An adjunct is a second virtual machine configuration running under your userid, distinct from the configuration created when your userid is logged on or autologged (called the principal configuration). Each configuration has its own virtual CPU(s), virtual storage (memory), and virtual devices, and can IPL a different instance of an operating system. The adjunct is intended to run CMS, to give you access to CMS files and tools, for example, to aid in debugging the operating system in the principal configuration while keeping the principal's operating system intact.

The following CP commands have been added:

- [ADJUNCT](#)
- [QUERY ADJUNCT](#)
- [SET ADJUNCTS](#)

The following CP commands have been updated:

- [CPACCESS](#)
- [CPU](#)
- [DEFINE](#)
- [DEFINE MDISK](#)
- [LINK](#)
- [LOGON](#)
- [QUERY LINKS](#)

- QUERY VIRTUAL CPUS

The following system configuration statement has been updated:

- FEATURES Statement

The following directory statement has been added:

- ADJUNCT

For more information, see:

- z/VM: CP Commands and Utilities Reference
- z/VM: CP Planning and Administration
- z/VM: VM Dump Tool

[7.2] Architecture Level Set (ALS)

z/VM 7.2 requires a new architecture level set (ALS) and supports only IBM z13 (z13), IBM z13s (z13s), IBM LinuxONE Emperor and Rockhopper, and later servers. See the appropriate Preventive Service Planning (PSP) bucket for the minimum microcode level (MCL) and any required updates. See the server support information in z/VM: General Information.

Specific server facilities might also be required. See IBM: z/VM 7.2 Architecture Level Set (<https://www.ibm.com/vm/zvm720/architecture>).

[7.2] xDisk Scalability

xDisk Scalability improves the algorithm used for handling distributed lock contention in a z/VM SSI cluster. The new algorithm prevents a user from "starving" the rest of the cluster when that user causes a lot of cross-system disk locking; for example, by issuing excessive LINK or DETACH commands.

The following monitor records have been changed:

- D1R4 - MRMTRSYS - System Configuration Data
- D11R6 - MRSSIXLK - XDISK Serialization Sample
- D11R7 - MRSSIXDI - XDISK Activity Sample

[7.2] MSS Multi-Target PPRC Exploitation

z/VM supports now up to four subchannel sets that reflect the actual hardware configuration and are commonly used in a MSS Multi-Target PPRC environment. Logically z/VM groups all recognized devices into two device groups, with one being the active configuration and the other being the stand-by configuration. Most z/VM commands support only 4-digit device numbers and can refer only to devices in the active configuration. Support has been expanded to handle the real subchannel sets and 5-digit device numbers where the leading fifth digit reflects the hardware subchannel number.

The following CP commands have been updated:

- DELETE EDEVICE
- DELETE RDEVICE
- HYPERSWAP
- LOCATE RDEV
- QUERY CHPID
- QUERY DASD
- QUERY EDEVICE
- QUERY EQID
- QUERY HYPERSWAP
- QUERY MSS

- [QUERY PATHS](#)
- [QUERY \(Real Device\)](#)
- [SET EDEVICE](#)
- [SET RDEVICE DASD](#)
- [VARY PATH](#)
- [VARY \(Real Device\)](#)
- [VARY SUBCHANNEL](#)

The following CP utilities have been updated:

- [CPSYNTAX](#)
- [IOEXPLOR](#)
- [SALIPL](#)

The following system configuration statements have been updated:

- [EDEVICE Statement](#)
- [RDEVICE Statement](#)

The following VM Dump Tool subcommand has been updated:

- [RDEVBK](#)

SMAPI does not explicitly support five-digit device numbers supported either in previous z/VM releases or in the additional support for MSS Multi-Target PPRC added in 7.2. Caution is recommended when using SMAPI APIs that return information on device numbers.

For more information, see:

- [z/VM: CP Commands and Utilities Reference](#)
- [z/VM: CP Planning and Administration](#)
- [z/VM: System Operation](#)
- [z/VM: VM Dump Tool](#)

Changed command responses

With the support of up to four subchannel sets (0-3), known as multiple subchannel sets (MSS), the following command responses were changed to facilitate a fifth digit. These changes take effect even on non-exploiting installations and independently of specifying five-digit device numbers on commands with the new support added.

- [QUERY EDEV / QUERY EDEV ALL / QUERY EDEV DETAILS](#)

Response changed from this:

```
EDEV 1234 TYPE FBA ATTRIBUTES 2107
```

to this:

```
EDEV 1234 TYPE FBA ATTRIBUTES 2107
```

- [QUERY EQID FOR](#)

Response changed from this:

```
0777: EQID = 44444444
```

to this:

```
0777: EQID = 44444444
```

- [QUERY EQID](#)

Response changed from this:

```
Devices for 44444444:  
0777 00888
```

to this:

```
Devices for 44444444:  
00777 00888
```

- DELETE RDEVICE

Response changed from this:

```
RDEV 0311 deleted
```

to this:

```
RDEV 0311 deleted
```

- SET RDEVICE

Response changed from this:

```
HCPZRP6722I Created RDEV for device 4711.  
HCPZRP6722I Characteristics of device 4711 were set as requested.
```

to this:

```
HCPZRP6722I Created RDEV for device 4711.  
HCPZRP6722I Characteristics of device 4711 were set as requested.
```

- QUERY (Real Device) / QUERY DASD

Response changed from this:

```
DASD 0191 CP SYSTEM KAH191 1.
```

to this:

```
DASD 0191 CP SYSTEM KAH191 1.
```

- LOCATE RDEV

Response changed from this:

Dev	RDEV	CPVOL	VEXBK	RSPBK	SPFBK
0192	011916A8	*	*	*	*

to this:

Dev	RDEV	CPVOL	VEXBK	RSPBK	SPFBK
0192	0188B6A8	*	*	*	*

- VARY ON/OFFLINE PATH

All related command responses (such as "path does not exist," "conflicting device information," "not operational," "reserve pending," and others) that include a real device number are extended with a leading blank to also eventually host a fifth digit.

For example:

– This response changed from this:

```
Path 90 is already online for device 0191
```

to this:

```
Path 90 is already online for device 0191
```

- This response changed from this:

```
Path 93 is not varied offline from device 0191 because it is the last path to the device.
```

to this:

```
Path 93 is not varied offline from device 0191 because it is the last path to the device.
```

[7.2] HiperDispatch default unparking setting changed to UNPARKING MEDIUM

The HiperDispatch default unparking model has changed from LARGE to MEDIUM. This reduces the tendency to use vertical-low (VL) logical cores and thereby has the potential to reduce the overhead induced in the PR/SM hypervisor and improve the use of processor cache.

If desired, the default can be changed to LARGE by using this system configuration file statement:

- [SRM Statement](#)

For more information, see:

- [z/VM: CP Planning and Administration](#)

[7.2] System Recovery Boost enabled by default

System Recovery Boost has been enabled by default, allowing z/VM to automatically take advantage of boosting sub-capacity processors to full capacity for a limited duration during startup and shutdown when running on the IBM z15 Models T01 and T02 with sub-capacity processors.

For more information, see:

- [z/VM: CP Planning and Administration](#)
- [z/VM: CP Messages and Codes](#)
- [z/VM: Performance](#)

[7.2 APAR] Performance Toolkit Support for Simultaneous Multithreading (SMT)

With the PTF for APAR VM66215, z/VM provides new reports within the Performance Toolkit feature in support of SMT. New reports display SMT metrics for each core in a partition and for each core type. Reports also display the three views of user processor time: raw time, MT-1 equivalent time, and prorated core time. These reports provide assistance in understanding processor usage and efficiency.

With this support, Performance Toolkit includes the following new performance data screens and associated commands:

- FCX331, SMT Metrics Per Core Type Log - MTCTYPLG
- FCX332, SMT Metrics Per Core Log - MTCORELG
- FCX333, User Processor Time Screen - USRPRCTM
- FCX334, User Processor Time Log Screen - USRTMLOG

This support includes updates to the following performance data screens:

- FCX124, Performance Data Selection Menu - MONITOR, MENU
- FCX154, System Settings Screen - SYSSET
- FCX173, Benchmark Log Selection Menu Screen - BENCHMRK
- FCX180, System Configuration Screen - SYSCONF

- FCX234, Processor Configuration Log Screen - PROCCONF
- FCX236, Processor Load and Configuration Logs Menu - PROCMENU
- FCX325, CPU Activity Menu - CPUMENU

For more information, see [z/VM: Performance Toolkit Reference](#).

[7.2 APAR] Guest HyperPAV Alias support for 1-End minidisks

With the PTF for APAR VM66421, clients can define and associate virtual HyperPAV alias devices with base minidisks that are defined with the MDISK directory statement from real cylinder 1 to END. The requirement to include real cylinder 0 is eliminated.

For more information, see:

- [z/VM: CP Planning and Administration](#)
- [z/VM: CP Commands and Utilities Reference](#)

[7.2 APAR] FlashCopy preserve mirror support

With the PTF for APAR VM66433, new PRESERVEMIRROR operands for z/VM FlashCopy commands allow FlashCopy relationships between PPRC primary devices without affecting the PPRC status of the target devices. This particularly avoids PPRC suspend and duplex pending conditions that are associated with the target device of the FlashCopy.

The following CP commands have been updated:

```
FLASHCOPY vdev  
FLASHCOPY ESTABLISH
```

For more information, see:

- [z/VM: CP Commands and Utilities Reference](#)

[7.2 APAR] VARY ON of real devices utilizing multi-processor support

With the PTF for APAR VM66449, the VARY ON *rdev* command can use any processor to complete its work. This significantly improves the response time when a large number of real devices are being varied online via a single command and is of particular benefit to GDPS environments.

[7.2 APAR] Non-fullpack minidisk High Performance FICON Support

With the PTF for APAR VM66450, z/VM guests can exploit High Performance FICON (HPF) on non-fullpack minidisks.

[7.2 APAR] 4 TB Real Memory Support

z/VM APAR VM66173 delivers support for up to 4 TB of real memory, allowing z/VM systems to address a full 4 TB of first-level (real) memory, doubling the previous supported limit of 2 TB. With advanced memory management capabilities available in the z/VM product, clients now have the ability to run workloads that exceed 4 TB of virtual memory across all hosted guest systems, depending on workload characteristics. In conjunction with z/VM support for 80 processors, IBM Z and LinuxOne servers can now host even more work in a single z/VM partition, or across multiple z/VM partitions on one system. APAR VM66173 also delivers various system command updates, such as automatic STANDBY memory for guests and an enhancement to the CP DEFINE STORAGE command.

With automatic STANDBY memory for guests, a system administrator can code a more generic DEFINE STORAGE command that does not need to be updated every time the guest's directory entry storage size changes.

Changes include the following:

- The following CP commands have been updated:

- DEFINE STORAGE
- QUERY STORAGE
- SET PAGING
- SET STORAGE
- The following CP utility has been updated: CPSYNTAX
- The following statement has been added to the system configuration file: PAGING
- The following system configuration statements have been updated: FEATURES, STORAGE
- The following IPL parameter has been updated: STORE=
- The following CP monitor records are new:
 - Domain 1 Record 36 - MRMTRAZN - Available Zone Information
 - Domain 3 Record 22 - MRSTORST - Central Storage Add or Remove Started
 - Domain 3 Record 23 - MRSTOREM - Central Storage Removed from Real Memory
 - Domain 3 Record 24 - MRSTORCP - Reconfigurable Storage Converted to Permanent Storage
 - Domain 3 Record 25 - MRSTOAZN - Available Zone Information (Global)

The following CP monitor records have been updated:

- Domain 0 Record 6 - MRSYTASG - Auxiliary Storage (Global)
- Domain 1 Record 7 - MRMTRMEM - Memory Configuration Data
- Domain 3 Record 1 - MRSTORSG - Real Storage Management (Global)
- Domain 3 Record 2 - MRSTORSP - Real Storage Activity (Per Processor)
- Domain 3 Record 21 - MRSTOADD - Central Storage Added to Real Memory

For more information, see:

- [z/VM: CP Commands and Utilities Reference](#)
- [z/VM: CP Planning and Administration](#)
- [z/VM: CP Messages and Codes](#)
- [z/VM: Performance](#)
- [z/VM: System Operation](#)
- [z/VM: Virtual Machine Operation](#)

[7.2 APAR] z/Architecture Extended Configuration (z/XC) support

With the PTFs for APARs VM66201 (CP) and VM66425 (CMS), z/Architecture Extended Configuration (z/XC) support is added. CMS applications that run in z/Architecture can use multiple address spaces. A z/XC guest can use VM data spaces with z/Architecture in the same way that an ESA/XC guest can use VM data spaces with Enterprise Systems Architecture. z/Architecture CMS (z/CMS) can use VM data spaces to access Shared File System (SFS) Directory Control (DIRCONTROL) directories. 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. For more information, see [z/VM: z/Architecture Extended Configuration \(z/XC\) Principles of Operation](#).

The following CP commands are affected:

- DEFINE DIAGNOSE
- DEFSYS
- DISPLAY
- DUMP
- IPL
- LOGON

- QUERY NSS
- QUERY SET
- SAVESYS
- SET MACHINE
- SET PAGEX
- SET VTODX
- SET 370ACCOM
- STORE
- STORE (Guest Storage - ESA/XC, z/XC)
- STORE PSW
- STORE PSWA
- STORE PSWG
- STORE Registers
- TRACE
- TRACE GG
- TRACE STORE (ESA/390, z/Architecture)
- TRACE STORE (ESA/XC, zXC)
- VMDUMP
- XAUTOLOG
- SDINST

Updated monitor records:

- Domain 1 Record 15 (MRMTRUSR - Logged on User)
- Domain 4 Record 1 (MRUSELON - User Logon)
- Domain 4 Record 2 (MRUSELOF - User Logoff)
- Domain 4 Record 3 (MRUSEACT - User Activity)
- Domain 4 Record 9 (MRUSEATE - User Activity Data at Transaction End)

[7.2 APAR] Performance Toolkit Support for z/XC-Mode Virtual Machines

With the PTF for APAR VM66489, Performance Toolkit for z/VM can detect when a virtual machine is operating in z/Architecture mode or z/Architecture Extended Configuration (z/XC) mode. When z/Architecture mode or z/XC mode is detected, it is identified appropriately in reports that include a field identifying the architecture mode in which a virtual machine is running.

This support includes updates to the following performance data reports:

- FCX112, User Resource Usage
- FCX115, User Resource Details
- FCX162, User Resource Usage Log
- FCX226, User Configuration

For more information, see [z/VM: Performance Toolkit Reference](#).

[7.2 APAR] Dynamic Memory Downgrade (DMD) Enablement

With the PTF for APAR VM66271, z/VM 7.2 provides support for the dynamic downgrading of memory. *Dynamic memory downgrade (DMD)*, also known as *memory reclamation* or *storage reclamation*, extends the real storage dynamic management characteristics of z/VM to include removing up to 50% of the real storage from a running z/VM system.

This support allows a system administrator to take real memory offline from a z/VM partition, making it available to other partitions in the central processor complex (CPC). The removal is dynamic; no re-IPLing of the z/VM image is required to accomplish the change in the memory configuration. Only memory that is configured as reconfigurable can be removed without an IPL.

Memory reclamation by a first-level z/VM system can be performed on the IBM z14 (or later) family of servers (or equivalent).

Changes include the following:

- The following CP commands have been updated:
 - SET RESERVED
 - SET STORAGE
- The following system configuration statement has been updated:
 - STORAGE

For related z/VM 7.2 documentation updates, see:

- [z/VM: CP Commands and Utilities Reference](#)
- [z/VM: CP Planning and Administration](#)
- [z/VM: CP Messages and Codes](#)

For more information about dynamic memory downgrade, including recommended hardware service levels, see: [z/VM Memory Management \(https://www.vm.ibm.com/memman/\)](https://www.vm.ibm.com/memman/).

[7.2 APAR] Performance Toolkit Support for Dynamic Memory Downgrade

With the PTF for APAR VM66285, Performance Toolkit for z/VM provides support for CP Dynamic Memory Downgrade, which enables dynamic reconfiguration of permanent and reconfigurable memory. This support updates existing Performance Toolkit reports to include:

- The amount of current configured permanent memory
- The amount of current configured reconfigurable memory
- The storage increment size
- The PAGING warning threshold
- Additional system status entries that indicate dynamic changes to the system memory configuration

This support includes updates to the following performance data reports:

- FCX103, Storage Utilization
- FCX180, System Configuration. In addition, the total DPA size field has been removed.

For more information, see [z/VM: Performance Toolkit Reference](#).

[7.2 APAR] Improved Live Guest Relocation for Crypto Environments with Mixed Adapter Types

With the PTF for APAR VM66496, Live Guest Relocation (LGR) for APVIRT crypto users is supported even when the type of the shared crypto resource on the source system does not match the type on the target system. QUERY VIRTUAL CRYPTO on any system in a relocation domain reports the lowest level of crypto express adapter that is available in the shared pools of all systems in a relocation domain. APVIRT crypto users can issue the QUERY VIRTUAL CRYPTO command to determine the level of functions that can be used to enable relocation between systems in the relocation domain without using the FORCE ARCHITECTURE option.

For more information, see Live Guest Relocation of APVIRT Virtual Machines in [z/VM: CP Planning and Administration](#) and [QUERY VIRTUAL CRYPTO](#) in [z/VM: CP Commands and Utilities Reference](#).

[7.2 APAR] z/VM Support for IBM z16®

With the PTFs for APAR VM66532, z/VM 7.1 and 7.2 provide support to enable guests to exploit function on IBM z16®. The following support is included:

- Embedded Artificial Intelligence Acceleration, which is designed to yield the following benefits:
 - Reduce the overall time that is required for CPU operations for neural-networking processing functions.
 - Help support applications like fraud detection.
- Compliance-ready CP Assist for Cryptographic Function (CPACF) Counters support, which provides a means for guests to track crypto compliance and instruction usage.
- Breaking-event-address register (BEAR) enhancement facility, which facilitates the debug of wild branches.
- Vector Packed Decimal Enhancements 2, which delivers new instructions that are intended to provide performance improvements.
- Reset DAT protection facility, which provides a more efficient way to disable DAT protection, such as during copy-on-write or page-change tracking operations.
- Consolidated Boot Loader, which provides guest IPL from a SCSI LUN. Guest IPL from SCSI, with or without the DUMP option, now requires a minimum guest virtual memory size of 768 MB.
- RoCE Express3 adapter, which allows guests to exploit Routable RoCE, Zero Touch RoCE, and SMC-R V2 support.
- The Crypto Express8S (CEX8S) adapter, supported as a dedicated or shared resource. Dedicated guests are able to take advantage of all functions available with the CEX8S adapters, including assorted new enhancements and use of Quantum-Safe APIs. The QUERY CRYPTO and QUERY VIRTUAL CRYPTO commands now report crypto adapters that are configured in EP11 mode with the 'P' suffix instead of the 'S' suffix.

The PTFs for APAR VM66532 also support CPU/Core topology location information that is included in z/VM monitor data, which provides a better picture of the system for diagnostic purposes.

The following Infrastructure support must be installed on all members within a z/VM Single System Image (SSI) cluster before any member of the cluster is IPLed on IBM z16®:

- z/VM 7.2 with the PTF for APAR VM66504
- z/VM 7.1 with the PTFs for APARs VM66206 and VM66504

The following CP commands are updated:

- DEFINE PCIFUNCTION
- DUMP (Registers)
- QUERY CRYPTO
- QUERY VIRTUAL CRYPTO
- QUERY VIRTUAL PCIFUNCTION
- STORE STATUS
- TRACE mnemonic1

For more information, see [“CP Commands” on page 194](#) and [z/VM: CP Commands and Utilities Reference](#).

The following system configuration statement is updated:

- CRYPTO APVIRTUAL Statement

For more information, see [“System Configuration Statements” on page 185](#) and [z/VM: CP Planning and Administration](#).

The following directory statement is updated:

- CRYPTO Directory Statement

For more information, see [“User Directory Statements”](#) on page 192 and [z/VM: CP Planning and Administration](#).

The following z/VM Dump Tool subcommand is updated:

- [REGISTER Subcommand](#)

The following z/VM Dump Tool subcommand is new:

- [BREG Subcommand](#)

For more information, see [z/VM: VM Dump Tool](#) and [“VM Dump Tool”](#) on page 256.

The following trace code is added:

- 8300 - Document the inclusion of BEAR

For more information, see [Trace Table Codes](#) in [z/VM: Diagnosis Guide](#).

The following CP monitor records are updated:

- Domain 0 Record 16 - MRSYTCUP - CPU Utilization Data in a Logical Partition
- Domain 0 Record 17 - MRSYTCUM - Physical CPU Utilization Data
- Domain 4 Record 2 - MRUSELOF - User Logoff
- Domain 4 Record 3 - MRUSEACT - User Activity
- Domain 5 Record 10 - MRPRCAPM - Crypto Performance Measurement Data
- Domain 5 Record 13 - MRPRCMFC - CPU Measurement Facility
- Domain 5 Record 20 - MRPRCMFM - MT CPUMF Counters

[7.2 APAR] Host Exploitation of Crypto Interruptions

With the PTF for APAR VM66534, z/VM V7.2 supports host crypto-interruption exploitation for APVIRT cryptographic guests. The support eliminates the need for the host to poll cryptographic resources for replies that are ready to be delivered to the guest.

The following CP environment variable is new:

- CP.FUNCTION.CRYPTO.INTERRUPTIONS

The following CP command is updated:

- [QUERY CRYPTO](#)

The following CP command is new:

- [SET CRYPTO](#)

For more information, see [“CP Commands”](#) on page 194 and [z/VM: CP Commands and Utilities Reference](#).

The following system configuration statement is updated:

- [CRYPTO APVIRTUAL Statement](#)

For more information, see [“System Configuration Statements”](#) on page 185 and [z/VM: CP Planning and Administration](#).

The following CP monitor record is updated:

- Domain 5 Record 9 - MRPRCAPC - Crypto Performance Counters

Connectivity and Networking

These topics describe changes that can affect how z/VM systems, applications, and guest operating systems communicate with each other.

Note: For information about z/VM support for hardware connectivity facilities, see [“Support and Exploitation of Hardware and Architectures”](#) on page 41.

[6.1] Prefetch Guest Data into Processor Cache

Guest LAN and virtual switch support has been updated in z/VM 6.1 to use cache prefetch capabilities that are exclusive to the IBM System z10 servers and later in order to give the hardware hints about likely memory access patterns. This enables the hardware to prefetch data into the processor cache so that the processor does not have to wait for data to be moved from main memory. Avoidance of a "cache miss" might help improve the performance of heavy guest-to-guest streaming workloads.

[6.1] SSL Server Enhancements

z/VM provides enhancements to the z/VM SSL server that improve the ability to provide concurrent secure connectivity by increasing the server's overall capacity and decreasing the amount of system resources the server requires:

- A new threading model has been implemented to improve the handling of multiple worker threads.
- Support for multiple SSL servers allows for a pool of SSL servers to work in conjunction with a single TCP/IP stack.

For more information, see [*z/VM: TCP/IP Planning and Customization*](#).

[6.1] SSL Server Upgrade and FIPS Support

The z/VM SSL server is upgraded to use z/OS V1.11 System SSL technology and is enhanced with support for the Federal Information Protection Standard (FIPS) 140-2. FIPS is a government required procedure for authenticating the security of a certificate database that requires signing of the database and using separate cipher suites for traffic encryption and decryption.

For more information, see:

- [*z/VM: TCP/IP Planning and Customization*](#)
- [*z/VM: TCP/IP User's Guide*](#).

[6.1] Support for IBM zEnterprise System Networks

z/VM enables access to the IBM zEnterprise System intraensemble data network (IEDN) and intranode management network (INMN) through z/VM's real and virtual networking capabilities. As a result, the deployment and management of z/VM network topology is integrated into the zEnterprise environment and can be managed by the IBM z Unified Resource Manager.

The QUERY NIC command is new for this support.

The following functions have been updated:

- System configuration statements:
 - DEFINE VSWITCH
 - MODIFY LAN
 - MODIFY VSWITCH
 - VMLAN
- User directory statements:
 - NICDEF
- CP commands:
 - COUPLE
 - DEFINE NIC
 - DEFINE VSWITCH
 - QUERY CONTROLLER
 - QUERY LAN

- QUERY VIRTUAL NIC
- QUERY VMLAN
- QUERY VSWITCH
- SET LAN
- SET NIC
- SET VMLAN
- SET VSWITCH
- DIAGNOSE codes:
 - X'26C'
- CP monitor records:
 - Domain 1 Record 19 - MRMTRQDC - QDIO Device Configuration
 - Domain 6 Record 23 - MRIODVSR - Virtual Switch Recovery
 - Domain 6 Record 25 - MRIODQDA - QDIO Device Activation
 - Domain 6 Record 27 - MRIODQDD - QDIO Device Deactivation
 - Domain 8 Record 1 - MRVNDSSES - Virtual NIC Session Activity
 - Domain 8 Record 2 - MRVNDLSU - Virtual NIC Link Up
 - Domain 8 Record 3 - MRVNDLSD - Virtual NIC Link Down
- TCP/IP configuration statements:
 - VSWITCH CONTROLLER
- TCP/IP commands:
 - NETSTAT

[6.2] Additional IPv6 Support

Support for IPv6 has been included in:

- z/VM TCP/IP FTP client and server
- z/VM TCP/IP SMTP client and server



Attention: If you are using SMTP assembler exits, you need to modify those exits to work with the updated SMTP. Because the address fields have been expanded, the offset of the return code field in the parameter list has changed. For more information, see [z/VM: TCP/IP Programmer's Reference](#).

- CMS NOTE and SENDFILE commands

[6.2] IPFORMAT Supports Conversion to PCAP Format

TRSOURCE traces of both TYPE GT and TYPE LAN can now be exported to the popular PCAP format. For details see the description of the new FORMAT option for IPFORMAT in [z/VM: TCP/IP Diagnosis Guide](#).

[6.2] LDAP Server Upgrade

The LDAP server and utilities have been upgraded to a level equivalent to z/OS 1.12, which includes the following new functions:

- Enhanced replication
- CDBM backend
- Access to RACF resource profiles
- Password policy
- Binding with SDBM using password policy

- Using access control
- Schema updates
- Salted SHA
- Activity log enhancements
- LDAPEXOP utility.

[6.2] MPROUTE Enhancements

The MPROUTE server has been enhanced and upgraded from z/OS level 1.8 to z/OS level 1.12. The following functions have changed:

- MPROUTE now supports RFC 4191 and RFC 5175.
- The MPROUTE configuration file now supports INCLUDE statements.
- MPROUTE now reports and helps prevent futile neighbor state loops.
- The SMSG command has been updated to include DELETED, ACTIVATE, and SUSPEND keywords.
- The ROUTERADV statement now includes a PREFERENCE value that determines whether router advertisements are sent with a HIGH, MEDIUM, or LOW preference value.
- The NETSTAT CONFIG command now includes the ROUTERADV option. The NETSTAT GATE command and the NETSTAT CONFIG HELP command now include new output fields.
- Numeric interface names containing a decimal point (for example, 123.456) are no longer allowed when using MPROUTE.

For more information, see [z/VM: TCP/IP Planning and Customization](#) and [z/VM: TCP/IP User's Guide](#).

[6.2] Multiple Access Ports per Guest

This support allows a z/VM guest to have multiple unique access ports connected to the same virtual switch (VSWITCH) instance, where each access port has its own attributes (promiscuous and OSDSIM authority) and VLAN ID. This support also provides a way to associate guest NICs and VSWITCH ports, and allows specific ports to be designated for use. These changes better facilitate the use of SNMP to monitor VSWITCH status because up-front mapping of systems to virtual switch ports now is possible, and more closely resembles techniques that can be applied to physical switches.

In addition, support for multiple access ports per guest can help reduce system administrative complexity, because servers no longer need to be configured to provide connectivity to multiple VLANs, and z/VM guests no longer must be configured to be VLAN aware. By allowing multiple unique access ports for a guest, these configuration requirements are eased, because the guest is not aware of the VLANs (tagging is performed by the virtual switch). This support can also reduce the potential for configuration errors that result in servers being unable to communicate on a LAN segment.

[6.2] Query OSA Address Table

This support provides TCP/IP with the capability to display the content of the OSA Address Table (OAT) via the QDIO interface for both OSA cards and VSWITCH controllers. The NETSTAT command now includes the OSAINFO option. See [z/VM: TCP/IP User's Guide](#).

[6.2] SSL Server Upgrade and Implementation Changes

The z/VM SSL server is upgraded to use z/OS V1.12 System SSL technology. In addition, only a multiple SSL server "pool" is defined as part of the z/VM version 6 release 2 System Deliverable. A single SSL server (SSLSERV) no longer is provided. However, continued use of a single-instance server still is possible, and remains supported.

For more information, see:

- [z/VM: TCP/IP Planning and Customization](#)
- [z/VM: TCP/IP User's Guide](#).

[6.2] TCP/IP Support Withdrawal

The following functions have been removed from TCP/IP for z/VM, Level 620:

- z/VM Kerberos servers (VMKERB and ADMSERV)

The Kerberos protocol is no longer supported.

- z/VM Domain Name System server (NAMESRV)

The Domain Name System (DNS) protocol is still supported using non-z/VM servers.

Information about these z/VM servers has been removed from the z/VM 6.2 publications, and the corresponding HELP files have been removed from the z/VM HELP Facility. (For a list of the deleted HELP files, see [“HELP Facility”](#) on page 262.)

This satisfies the statement of direction made in the Software Announcements dated August 5, 2008, July 7, 2009, October 20, 2009, and July 22, 2010.

[6.2] Virtual Networking Support for an SSI Cluster

This support extends the virtual switch's existing layer 2 MAC service to coordinate MAC address assignments with all active members of an SSI cluster. The following existing and new functional areas have been modified or added by SSI support:

- Existing assigned MAC table logic.
- New SSI cluster *NETWORK Communication Manager.
- Add MAC address protection to SSI cluster.
- Network Device Equivalency Determination for Live Guest Relocation.

[6.2] *VMEVENT Enhancements

This support provides the ability for the *VMEVENT system service to indicate asynchronous completion of networking commands (such as DEFINE VSWITCH, SET VSWITCH, and SET PORT GROUP), thereby allowing subsequent commands to be issued successfully. A new class (Class 4, for networking events) has been added to *VMEVENT. See [z/VM: CP Programming Services](#).

[6.2] Virtual Switch HiperSockets Bridge

With the PTFs for APARs VM65042 and PM46988, the z/VM virtual switch is enhanced to transparently bridge a guest virtual machine network connection on a HiperSockets LAN segment. This bridge allows a single HiperSockets guest virtual machine network connection to also directly communicate with the following:

- Other guest virtual machines on the z/VM virtual switch
- External network hosts through the virtual switch OSA UPLINK port.

The following system configuration statements have been updated for this support:

- DEFINE VSWITCH
- MODIFY VSWITCH

The following CP commands have been updated for this support:

- DEFINE CHPID
- DEFINE VSWITCH
- DETACH
- QUERY CONTROLLER
- QUERY OSA
- QUERY VSWITCH

- SET CPTRACE
- SET NIC
- SET PORT GROUP
- SET VMLAN
- SET VSWITCH

The following TCP/IP functions have been updated for this support:

- TCPIP server VSWITCH CONTROLLER configuration statement
- NETSTAT DEVLINKS command

The following DIAGNOSE code has been updated for this support:

- DIAGNOSE Code X'26C'

The following monitor records have been added for this support:

- Domain 6 Record 33 - MRIODBPA - Virtual Switch Bridge Port Activation
- Domain 6 Record 34 - MRIODBPD - Virtual Switch Bridge Port Deactivation
- Domain 6 Record 35 - MRIODBPS - Virtual Switch Bridge Port Activity

The following monitor records have been updated for this support:

- Domain 8 Record 1 - MRVNDSSES - Virtual NIC Session Activity
- Domain 8 Record 2 - MRVNDLSU - Virtual NIC Guest Link State - Link Up
- Domain 8 Record 3 - MRVNDLSD - Virtual NIC Guest Link State - Link Down

The following trace codes have been added for this support:

- 7402 - Virtual Switch Bridge Port Outbound Transfer
- 7403 - Virtual Switch Bridge Port Completion Event
- 7404 - Virtual Switch Bridge Port Inbound Transfer

[6.2] Client Certificate Validation for z/VM SSL Server

With the PTF for APAR PM52716, the z/VM SSL server is enhanced to accommodate client certificate validation as part of handshaking for dynamic SSL connections. This provides a means for Transport Layer Security (TLS) handshaking to incorporate mutual authentication of certificates before the establishment of a secure connection.

z/VM 6.2 with APAR PM52716 is designed to meet the Common Criteria certification of z/VM 6.1. For more information, see [IBM z/VM Security and Integrity Resources \(https://www.ibm.com/vm/security\)](https://www.ibm.com/vm/security).

The following z/VM TCP/IP functions have been updated for this support:

- New CLIENTCERTCHECK option on the INTERNALCLIENTPARMS configuration statement for the TCPIP server
- Client Cert Check added to the Internal Client Settings in the response for the NETSTAT CONFIG PARM command

For more information, see:

- [*z/VM: TCP/IP Planning and Customization*](#)
- [*z/VM: TCP/IP User's Guide*](#)

[6.3] Live Guest Relocation Support for Port Based Virtual Switches

This support builds on the existing live guest relocation framework to:

- Allow relocation of a port based interface
- Prevent relocation of an interface that will clearly be unable to establish network connectivity

- Adjust the destination virtual switch configuration (when possible) by inheriting virtual switch authorization from the origin.

The support adds the checks that are needed to safely relocate a guest with a port based virtual switch interface. Eligibility tests are performed before relocation to determine if the destination network is equivalent.

The support improves the preexisting base network eligibility test by testing other attributes that would prevent the guest from establishing connectivity. Without the improved checks, if you accidentally mislabel two networks as equivalent, a guest might be relocated to the destination node but find it impossible to establish network connectivity, and the reason for the loss of connectivity might not be clear.

[6.3] MPROUTE Enhancements

The MPROUTE server has been enhanced and upgraded from z/OS level 1.12 to z/OS level 1.13.

[6.3] SSL Server Upgrade and TLS 1.2 Support

The z/VM SSL server has been upgraded to z/OS V1.13 equivalency. This upgrade includes support for Transport Layer Security (TLS) protocol, version 1.2, which provides support for SHA-256 certificates. A new PROTOCOL operand on the VMSSL command allows the system administrator to enable and disable SSL and TLS protocols for cryptographic use in the operation of the SSL server.

The z/VM SSL server also has been enhanced to support secure IPv6 SSL connections. The following servers and clients have added support for secure IPv6 connections:

- TELNET server and client
- FTP server and client
- SMTP server

Furthermore, NETSTAT IDENT SSL and SSLADMIN have been enhanced to display secure IPv6 connections.

For more information, see:

- [z/VM: TCP/IP User's Guide](#)
- [z/VM: TCP/IP Planning and Customization](#)

[6.3] TCP/IP Support Withdrawal

The following functions have been removed from TCP/IP for z/VM, Level 630:

- A220 and CLAW device drivers.
- z/VM Dynamic Host Configuration Protocol Daemon (DHCPD)

The DHCP Daemon is no longer supported.

- z/VM Line Printer Daemon (LPD)

The Line Printer Daemon (LPD) protocol is still supported using non-z/VM LPD servers, and LPD related tools are still shipped for this purpose. An LPD link driver is still provided in the z/VM RSCS feature.

Information about these unsupported z/VM servers has been removed from the z/VM 6.3 publications, and the corresponding HELP files have been removed from the z/VM HELP Facility. (For a list of the deleted HELP files, see [“HELP Facility”](#) on page 262.)

Any customer who chooses to continue using an unsupported server will need to copy the appropriate server/class definitions from IBM DTCPARMS to their system/node ID DTCPARMS file and maintain them there.

[6.3] Virtual Switch Recovery and Stall Prevention

A new SET VSWITCH UPLINK SWITCHOVER command provides a fast mechanism to switch an uplink port's network connection from its current device to one of its configured backup devices. The use of this new command is less disruptive to virtual switch external network connectivity when there is a need to apply service to an OSA-Express feature.

Additionally, support is added to automatically enable or disable the z/VM Missing Interruption Handler (MIH) function for an OSA-Express or HiperSockets read, write, and data uplink device. MIH is used to detect and recover (failover) from network connectivity problems due to unresponsive or broken hardware.

The following CP command has been updated for this support:

- SET VSWITCH

The following DIAGNOSE code has been updated for this support:

- DIAGNOSE Code X'26C'

The following monitor record has been updated for this support:

- Domain 6 Record 22 - MRIODVSF - Virtual Switch Failover

[6.3] Virtual Switch Support for Virtual Edge Port Aggregator (VEPA) Mode

Virtual Edge Port Aggregator (VEPA) is part of the IEEE 802.1Qbg standardization effort and is designed to reduce the complexities associated with highly virtualized deployments such as hypervisor virtual switches bridging many virtual machines. VEPA provides the capability to take all virtual machine traffic sent by the server and send it to an adjacent network switch.

The following commands have been updated for this support:

- SET VSWITCH
- QUERY VSWITCH
- QUERY CONTROLLER
- NETSTAT OSAINFO

The following configuration statement is changed:

- MODIFY VSWITCH

The following monitor records have been updated:

- D6R21 - MRIODVSW - Virtual Switch Activity
- D6R22 - MRIODVSF - Virtual Switch Failure
- D6R35 - MRIODBPS - Virtual Switch Bridge Port Activity

The following diagnose codes are changed:

- Diagnose x'26C' - Access Certain System Information, Subcode x'10'
- Diagnose x'26C' - Access Certain System Information, Subcode x'20'
- Diagnose x'26C' - Access Certain System Information, Subcode x'24'

[6.3] Duplicate IP Address Handling on a Virtual Switch

The IP (Layer 3) virtual switch has been updated with a change in the way a duplicate IP address is handled. When a guest coupled to an IP virtual switch registers its IP address, the virtual switch will forward this setting to the Uplink for registration with the OSA-Express. The OSA-Express will verify that the same IP address is not already registered on the LAN segment. If it is, the OSA-Express rejects the request.

Prior to z/VM 6.3, the virtual switch marked this IP address as "Local", and the guest IP address was reachable only on the local simulated LAN segment. In z/VM 6.3, the IP virtual switch now disables the IP address and marks it as "Conflict". The guest IP address will no longer be reachable by guests on the simulated LAN segment.

This change allows the configuration problem to be highlighted more quickly. In the event that an existing configuration has been configured with a duplicate IP address for local connectivity within the virtual switch LAN, a unique IP address should be assigned, or the virtual switch should be configured without an Uplink port.

[6.3] Unified Resource Manager Support Withdrawn

The IBM z Unified Resource Manager, first supported in z/VM 6.1, is no longer supported in z/VM 6.3. Therefore z/VM 6.3 cannot participate as a member of an ensemble.

[6.3 APAR] Additional SSL Server Enhancements

With the PTF for APAR PM93363, the z/VM SSL server has been upgraded to enforce configurations that meet specific cryptographic standards. This includes continued support for FIPS 140-2 compliance as well as support for NIST SP 800-131A configurations, which mandates a minimum size of 2048 bits for asymmetric keys.

For more information, see *z/VM: TCP/IP Planning and Customization*.

[6.3 APAR] z/VM 6.3 System SSL Cryptographic Module Receives FIPS 140-2 Certification

With the PTF for APAR PI04999, the z/VM 6.3 System SSL module has been validated as conforming to the Federal Information Processing Standard (FIPS) 140-2. This industry-recognized cryptographic standard mandates modern digital key sizes and integrity checking for SSL and TLS operations. z/VM 6.3 System SSL is used by both the z/VM LDAP Server and z/VM SSL-TLS Server. This satisfied the statement of direction made in the IBM Software Announcement dated July 23, 2013.

[6.3 APAR] Multi-VSwitch Link Aggregation Support

With the PTFs for APARs VM65583 and PI21053, z/VM provides support for Multi-VSwitch Link Aggregation on the IBM z13. This support allows a port group of OSA-Express features (OSA-Express4S or later) to span multiple virtual switches within a single z/VM system or between multiple z/VM systems. Sharing a Link Aggregation Port Group (LAG) with multiple virtual switches increases optimization and utilization of the OSA-Express when handling larger traffic loads. Higher adapter utilization protects customer investments, which is increasingly important as 10 Gigabit deployments become more prevalent. With this support, a port group is no longer required to be dedicated to a single virtual switch.

Systems management API support for Multi-VSwitch Link Aggregation requires APAR VM65670. See “[6.3 APAR] Systems Management API Support for Multi-VSwitch Link Aggregation” on page 177.

Performance Toolkit support for Multi-VSwitch Link Aggregation requires APAR VM65528. See “[6.3 APAR] Additional Performance Toolkit Enhancements” on page 133.

The following configuration statements have been updated for this support:

- DEFINE VSWITCH
- MODIFY PORT

The following CP commands have been updated for this support:

- ATTACH
- COUPLE
- DEFINE VSWITCH
- DETACH VSWITCH

- QUERY CONTROLLER
- QUERY OSA
- QUERY PORT
- QUERY (Real Device)
- QUERY VMLAN
- QUERY VSWITCH
- SET CPTRACE
- SET PORT GROUP
- SET VMLAN
- SET VSWITCH

The following monitor record has been added:

- Domain 8 Record 4 - MRVNDGLB - Global Virtual Switch Activity

The following monitor records have been updated:

- Domain 6 Record 21 - MRIODVSW - Virtual Switch Activity
- Domain 6 Record 23 - MRIODVSR - Virtual Switch Recovery
- Domain 6 Record 33 - MRIODBPA - Virtual Switch Bridge Port Activation
- Domain 8 Record 1 - MRVNDSES - Virtual NIC Session Activity
- Domain 8 Record 2 - MRVNDLSU - Virtual NIC Guest Link State - Link Up
- Domain 8 Record 3 - MRVNDLSD - Virtual NIC Guest Link State - Link Down

The following diagnose code has been updated:

- DIAGNOSE Code X'26C' - Access Certain System Information

The following CP System Service has been updated:

- *VMEVENT - new Class 4 records

For more information, see:

- [z/VM: Connectivity](#)
- [z/VM: CP Commands and Utilities Reference](#)
- [z/VM: CP Planning and Administration](#)
- [z/VM: CP Programming Services](#)

[6.3 APAR] System SSL Upgrade and AES GCM for the TLS/SSL Server

With the PTFs for APARs PI40702 (TCP/IP and System SSL), VM65717 (CMS), and VM65718 (Language Environment), the z/VM System SSL cryptographic module is upgraded to z/OS V2.1 equivalency. This upgrade includes support for AES Galois/Counter Mode (GCM). These ciphers are available only when using TLS 1.2 in the TLS/SSL Server. Updates have also been made to the TLS/SSL Server's MODE NIST-800-131a to allow for DSA certificates of key length 2048.

Additionally, changes have been made to the default protocol levels and cipher suites presented by the TLS/SSL Server on initialization. SSLv3 is no longer enabled by default. NULL, RC4, and EXPORT ciphers are disabled by default. These mechanisms are available for legacy purposes only, and their use is not encouraged for production environments. They can be re-enabled using the PROTOCOL or ENABLE operands.

Finally, the GSKKYMANN application has been enhanced to add support for Elliptic Curve Cryptography (ECC) certificates and keys. ECC support for the TLS/SSL Server and LDAP Server is planned for a future release.

For more information, see:

- [z/VM: TCP/IP Planning and Customization](#)
- [z/VM: TCP/IP User's Guide](#)

[6.3 APAR] Encryption of TCPNJE Connections

With the PTFs for APARs VM65788 and PI56474, RSCS TCPNJE traffic can be encrypted by directing the flow through an SSL server. The secure TCP/IP protocols that were previously implemented to support VMCF clients and servers are extended to IUCV clients and servers. Traffic that was previously unencrypted and potentially exposed to sniffers on a network can now be protected. This is especially important for TCPNJE environments, where NJE jobs can include user IDs and passwords.

For more information, see:

- [z/VM: RSCS Networking Operation and Use](#)
- [z/VM: RSCS Networking Planning and Configuration](#)
- [z/VM: RSCS Networking Messages and Codes](#)
- [z/VM: TCP/IP Programmer's Reference](#)

[6.4] z/VM System SSL and Utilities z/OS V2.2 Equivalency

The z/VM 6.4 System SSL cryptographic library has been upgraded to z/OS V2.2 equivalence for the TLS/SSL and LDAP servers. This includes AES_GCM support previously provided via PTF to 6.3. Additionally, GSKKYMAN can now support RFC 5280 certificates. For more information, see [z/VM: TCP/IP User's Guide](#).

The TLS/SSL Server defaults have also been updated so that TLS 1.1 and TLS 1.2 are enabled by default, and all other protocol levels are disabled. These changes, along with a shift in which cipher suites are enabled by default, represent a more aggressive cryptographic security policy for IBM z/VM. Be advised that the change prevents communication between 6.4 and 6.3 unless TLS/SSL Server configuration changes are made on one or both sides of the connection.

Additionally, the following new features were added to the TLS/SSL Server:

- Cipher management: an ENABLE operand to restore cipher suites which are disabled by default.
- Compatibility: A PKCS #12 file of type .P12 can now be used in place of a certificate database file (.KDB) in configuring certificate support.

For more information about the new defaults and new features, see [z/VM: TCP/IP Planning and Customization](#).

[6.4] Client/Server TLS/SSL Support

With the PTF for APAR VM65892, new ioctl() commands are added to allow clients and servers that communicate through the TCP/IP stack to have their data flow through the TLS/SSL server. The new ioctls are supported for C programs as well as assembler programs which use IUCV.

For more information, see [z/VM: TCP/IP Programmer's Reference](#)

[6.4] z/VM LDAP Server and Client Utilities z/OS V2.2 Equivalency

The z/VM LDAP server and utilities are upgraded to a level equivalent to z/OS V2.2. The updated z/VM support includes:

- Paged or sorted search results
- Group search limits
- 64-bit Db2 support
- SHA-2 and Salted SHA-2
- Listening on INADDR_ANY or in6addr_any interfaces
- Administrative group and roles

For more information, see:

- [z/VM: TCP/IP Planning and Customization](#)
- [z/VM: TCP/IP LDAP Administration Guide](#)
- [z/VM: TCP/IP User's Guide](#)
- [z/VM: TCP/IP Programmer's Reference](#)
- [z/VM: TCP/IP Messages and Codes](#)

[6.4] LOGON Security Improvement

The CP LOGON command has been updated to prevent user ID enumeration without authenticating to the system. This means that z/VM will no longer give an error message that indicates a user ID is valid and the password is not. This prevents unauthorized users from determining what might be a valid user ID. Also, many existing error messages will be presented only after a valid user ID and password or password phrase are provided.

For more information, see [z/VM: CP Commands and Utilities Reference](#).

[6.4] z/VM MPROUTE Server z/OS V2.2 Equivalency

The z/VM MPROUTE server is upgraded to a level equivalent to z/OS V2.2. The updated z/VM support includes:

- Deprecation of the OMPROUTE_OPTIONS=hello_hi environment variable
- Processing inbound OSPF hello packets from neighbors at the highest priority, for the purpose of maintaining OSPF adjacencies
- Modifications to avoid abends when formatting or parsing OSPF packet content
- Enhancements to existing informational and debug messages, to provide more specific information when an IOCTL call fails

For more information, see [z/VM: TCP/IP Planning and Customization](#).

[6.4] Domain Name System (DNS) IPv6 Support

z/VM TCP/IP supports DNS servers that have IPv6 addresses.

For more information, see:

- [z/VM: TCP/IP User's Guide](#)
- [z/VM: TCP/IP Planning and Customization](#)
- [z/VM: TCP/IP Programmer's Reference](#)

[6.4] VLAN Access Security Improvement

When using an External Security Manager (ESM) to control a z/VM virtual switch, user access to the default VLAN ID is not permitted unless permission has been explicitly granted through appropriate ESM controls. See [“CP System Services” on page 255](#) for more details.

For more information, see:

- [z/VM: CP Programming Services](#)
- [z/VM: RACF Security Server Security Administrator's Guide](#)

[6.4] Resetting Counters for a Virtual Switch

This function provides the ability to clear certain counts that are displayed via the QUERY VSWITCH DETAILS command while the virtual switch remains active. The counts that can be cleared are: data, discarded, and errors. These counts can be cleared for the UPLINK port or the BRIDGEPort.

The following CP commands have been updated:

- QUERY PORT
- QUERY VIRTUAL NIC
- QUERY VSWITCH
- SET VSWITCH

For more information, see [z/VM: CP Commands and Utilities Reference](#).

[6.4] SET DIALDROP Command

This support provides the ability to control whether devices DIALED to a virtual machine are dropped or stay connected when an implicit or explicit virtual machine reset occurs via the SET DIALDROP command.

The following CP command has been added for this support:

- SET DIALDROP

The following CP command has been updated for this support:

- QUERY SET

For more information, see [z/VM: CP Commands and Utilities Reference](#).

[6.4 APAR] Crypto Express APVIRT Support for z/VM TLS/SSL Server and LDAP/VM

With the PTF for APAR PI72106, the z/VM System SSL cryptographic library is updated to offload cryptographic operations to Crypto Express hardware associated with your IBM Z or LinuxONE hardware, which may improve performance. This support is intended for clear-key RSA operations. To enable this support, add the CRYPTO APVIRTUAL statement to the pertinent service virtual machine entries in the z/VM user directory.

For more information, see "Configuring the LDAP Server" and "Configuring the SSL Server" in [z/VM: TCP/IP Planning and Customization](#).

[6.4 APAR] Distributed IUCV Enhancements

With the PTF for APAR VM65872, the rules for Distributed IUCV CONNECT in a single system image (SSI) environment are revised.

This support changes the rules for IUCV CONNECT with DISTRIBUTE IUCV NO:

- IUCV CONNECT to USERID=*userid* with no target node previously failed if the invoker was a multiconfiguration virtual machine (IDENTITY) user. This is now allowed when *userid* is a single-configuration user in the SSI cluster. This fails if *userid* is an IDENTITY user because *userid* without a node does not uniquely identify the instance of the IDENTITY user in the cluster.
- IUCV CONNECT to USERID=*userid* TARGET=*nodeid* previously failed if *userid* or the invoker was an IDENTITY user. This is now allowed because *nodeid* provides the information needed to identify the target user.

This support also changes the rules for IUCV CONNECT with DISTRIBUTE IUCV TOLERATE or YES:

- IUCV CONNECT to USERID=*userid* with no target node previously failed if the invoker was a multiconfiguration (IDENTITY) user. This was an unintended side effect of the code that restricted IDENTITY users from connecting to a single-configuration user who might not be able to automatically connect back. This is now corrected, so an IDENTITY user can initiate the IUCV CONNECT to a single-configuration user.

This support also makes it easier for an administrator to change the Distributed IUCV policy for an SSI cluster. Previously, the Distributed IUCV policy within an active SSI cluster could be changed only by shutting down all members at the same time. As this new support is applied to each system, it will be possible for that member to join the cluster regardless of its Distributed IUCV configuration.

The following CP interfaces have been updated:

- DISTRIBUTE IUCV system configuration statement
- IUCV macro CONNECT function

[6.4 APAR] NICDEF Security Controls

With the PTF for APAR VM65925, the NICDEF user directory statement is enhanced to provide a set of new operands referred to as Directory Network Authorization (DNA). With DNA, a system administrator can configure and consolidate a virtual NIC device and its network properties in a centralized location -- the z/VM user directory.

Operational differences between PORTBASED and USERBASED VSwitches have been eliminated with this support. A system administrator has the option to manage a VSwitch by user, by port number, or using a combination of the two methods. While the management of USERBASED and PORTBASED VSWITCHes is simplified, Live Guest Relocation of a guest connected to a VSwitch still requires the destination system to have a VSwitch with a PORTBASED or USERBASED designation matching that of the source system.

The following statements have been updated:

- DEFINE VSWITCH configuration statement
- MODIFY VSWITCH configuration statement
- VMLAN configuration statement
- NICDEF directory statement

The following CP commands have been updated:

- COUPLE
- DEFINE VSWITCH
- LOGON
- QUERY LAN
- QUERY VMLAN
- QUERY VSWITCH
- SET VMLAN
- SET VSWITCH
- VMRELOCATE

The following diagnose code has been updated:

- DIAGNOSE Code X'26C' - Access Certain System Information

With the PTF for APAR VM65926, the Directory Maintenance Facility (DIRMAINT) NICDEF command is updated to provide new options:

- PORTNUMBER *portnum*
- PORTTYPE ACCESS|TRUNK
- VLAN *vidset*
- PROMISCUOUS|NOPROMISCUOUS

With the PTF for APAR VM65931, RACF and RPIDIRCT have been updated to support NICDEF enhancements.

For more information, see:

- [z/VM: CP Planning and Administration](#)
- [z/VM: CP Commands and Utilities Reference](#)
- [z/VM: CP Messages and Codes](#)
- [z/VM: Connectivity](#)

- [z/VM: Directory Maintenance Facility Commands Reference](#)
- [z/VM: Directory Maintenance Facility Messages](#)
- [z/VM: Directory Maintenance Facility Tailoring and Administration Guide](#)
- [z/VM: RACF Security Server Security Administrator's Guide](#)

[6.4 APAR] Firewall Friendly FTP

With the PTF for APAR PI80912, the z/VM TCP/IP FTP client is configured to determine the party initially responsible for initiating data connections, improve compliance with RFC 2428, and reflect the active/passive FTP mode and the EPSV4 setting.

The following FTP subcommands have been updated:

- LOCSITE
- LOCSTAT
- PASSIVE
- SENDPORT

The following FTP DATA file statement has been added:

- FWFRIENDLY

The following FTP DATA file statement has been updated:

- EPSV4

The following unnumbered message has been added:

- FWFRIENDLY

For more information, see:

- [z/VM: TCP/IP User's Guide](#)
- [z/VM: TCP/IP Messages and Codes](#)

[6.4 APAR] VSwitch Link Aggregation Load Balancing Enhancements

With the PTF for APAR VM65918, z/VM support for exclusive and Multi-VSwitch Link Aggregation configurations is enhanced to improve load balancing to leverage both horizontal and vertical growth in single and cross virtual switch networking configurations.

The following configuration statement has been updated for this support:

- MODIFY PORT

The following CP commands have been updated for this support:

- DEFINE VSWITCH
- QUERY PORT
- QUERY VMLAN
- SET PORT GROUP

The following monitor records have been updated:

- Domain 6 Record 21 - MRIODVSW - Virtual Switch Activity
- Domain 8 Record 1 - MRVNDSSES - Virtual NIC Session Activity

The following diagnose code has been updated:

- DIAGNOSE Code X'26C' - Access Certain System Information

For more information, see:

- [z/VM: Connectivity](#)

- [z/VM: CP Commands and Utilities Reference](#)
- [z/VM: CP Planning and Administration](#)
- [z/VM: CP Programming Services](#)

[6.4 APAR] z/VM 6.4 System SSL Cryptographic Module Receives FIPS 140-2 Certification

With the PTF for APARs PI99134 and RSU6401, the z/VM 6.4 System SSL module has been validated as conforming to the Federal Information Processing Standard (FIPS) 140-2. This industry-recognized cryptographic standard mandates modern digital key sizes and integrity checking for SSL and TLS operations. z/VM 6.4 System SSL is used by both the z/VM LDAP Server and z/VM SSL-TLS Server. This satisfied the statement of direction made in the IBM Software Announcement dated October 20, 2016.

[7.1] FOREIGNIPCONLIMIT Default Value Change

In z/VM 7.1, the default value of the FOREIGNIPCONLIMIT configuration statement is changed from 100% to 10% of the TCB pool size. Review the FOREIGNIPCONLIMIT statement to determine the appropriate value for your installation.

To change this value without having to restart TCP/IP, enter:

```
NETSTAT OBEY FOREIGNIPCONLIMIT xx
```

where xx is 0 (no limit), a whole number, or a percentage of the TCB pool size.

To make the change permanent, add the FOREIGNIPCONLIMIT statement to the TCP/IP configuration file so that the value is changed when the TCP/IP stack is restarted.

For more information, see [z/VM: TCP/IP Planning and Customization](#).

[7.1] IMAP Support Removed

The z/VM Internet Message Access Protocol (IMAP) server is no longer supported. The interfaces and associated documentation have been removed.

[7.1] Support Removed for IEEE 802.3 Ethernet Frame Types

For the z/VM Virtual Switch, 802.3 Ethernet frame formats were removed from CP initiated Layer 2 ARP communications. CP will support only Ethernet II (DIX) frame formats for ARPs and any other initiated communications. This will not prevent guests of z/VM from using 802.3 Ethernet frame formats.

For the TCP/IP server, all TCP/IP initiated ARP requests for OSD devices will use Ethernet II (DIX) frame format. LCS devices will continue to support 802.3 and DIX frame formats.

[7.1 APAR] TLS/SSL Server Elliptic Curve Support

With the PTF for APAR PI99184, z/VM 7.1 provides stronger security ciphers for the TLS/SSL server. This support introduces elliptic curve cryptography, a faster and more secure mechanism for asymmetric encryption than standard RSA or DSS algorithms.

The following changes have been made as a result of this support:

- In the [z/VM: TCP/IP User's Guide](#):
 - The description of the IDENTIFY operand of the NETSTAT command is updated to include additional information about the new and deprecated cipher suites.
 - The format of the cipher details displayed by the NETSTAT IDENTIFY SSL command is updated.
- In [z/VM: TCP/IP Planning and Customization](#):

- The format of the values displayed in the Cipher Details column of the SSLADMIN QUERY SESSIONS command is updated.
- The SSLADMIN QUERY STATUS DETAILS command is updated to include additional information about the new and existing cipher suites.
- The VMSSL command is updated as follows:
 - Under the EXEMPT operand, the list of cipher suites disabled by default is updated.
 - Under the ENABLE operand, the table of SSLV3 and TLS cipher suite values is updated.
- In the *z/VM: TCP/IP Programmer's Reference*:
 - The CipherDetails operand of the TcpSStatus procedure includes the new and deprecated cipher suites.
 - The cipher details listed under the SecStatus C structure include additional information related to the new cipher suites.
- In *z/VM: Performance*:
 - The SSL server monitor record includes new sample data fields that track the elliptical curve key lengths.

[7.1 APAR] TCP/IP Support for OSA-Express7S 25G

With the PTF for APAR PI99085, z/VM 7.1 provides support for the new OSA-Express7S 25G adapter, which is available with the IBM z14 with Driver 36 bundle 17a or higher. The OSA-Express7S 25G adapter, which provides direct connections to clients on local area networks (LANs), features a new OSA generation and a new port speed of 25 Gb.

The following changes have been made as a result of this support:

- For OSD devices, TCP/IP now supports 25 Gigabit Ethernet.

For more information, see:

- *z/VM: Connectivity*
- *z/VM: TCP/IP Planning and Customization*

- CP message HCP2832E has been updated.

For more information, see *z/VM: CP Messages and Codes*.

- TCP/IP server message DTCOSD392E has been updated.

For more information, see *z/VM: TCP/IP Messages and Codes*.

[7.1 APAR] Virtual Switch Priority Queuing Enhancements

With the PTF for APAR VM66219, z/VM support is enhanced to improve data transmission from a virtual NIC to a physical network via the virtual switch uplink port. Internal virtual switch data transmission is changed from a first-in, first-out (FIFO) order to a four-level priority queuing scheme. By default, the virtual switch will distinguish between virtual switch and virtual NIC transmissions to the physical network. Virtual switch transmissions required to manage an uplink port or virtual NIC are sent to the physical network ahead of any virtual NIC transmissions. This will insure virtual switch management is always maintained during high bandwidth uplink port usage.

Virtual switch support is added to exploit OSA-Express feature's priority queuing capabilities. By turning on Virtual Switch Priority Queuing, instead of activating a single QDIO output queue on the uplink port, the z/VM virtual switch will establish four QDIO output queues for outbound data transmissions. The four QDIO output queues provide four independent interfaces to the OSA-Express feature, one for each priority. The highest priority queue (Queue 0) is used by the z/VM virtual switch to provide switch management communications and the other three priorities (Queues 1-3) may be configured by a system administrator to prioritize outbound transmissions to the physical network for virtual NICs connected to the virtual switch.

The following CP commands have been updated (see [Table 8 on page 194](#)):

- DEFINE CHPID / PATH
- DEFINE VSWITCH
- QUERY CONTROLLER
- QUERY LAN
- QUERY VIRTUAL NIC
- QUERY VSWITCH
- SET VMLAN
- SET VSWITCH
- VMRELOCATE

The following CP directory statement has been updated (see [Table 7 on page 192](#)):

- NICDEF

The following CP configuration statements have been updated (see [Table 6 on page 186](#)):

- DEFINE VSWITCH
- MODIFY VSWITCH
- VMLAN

The following CP diagnosis code has been updated (see [Table 11 on page 247](#)):

- Diagnosis Code X'26C' - Access Certain System Information

The following CP monitor records have been updated:

- Domain 6 Record 21 - MRIODVSW - Virtual Switch Activity
- Domain 6 Record 22 - MRIODVSF - Virtual Switch Failure
- Domain 6 Record 23 - MRIODVSR - Virtual Switch Recovery
- Domain 6 Record 33 - MRIODBPA - Virtual Switch Bridge Port Activation
- Domain 6 Record 34 - MRIODBPD - Virtual Switch Bridge Port Deactivation
- Domain 8 Record 1 - MRVNDSSES - Virtual NIC Session Activity
- Domain 8 Record 2 - MRVNDLSU - Virtual NIC Guest Link State - Link Up
- Domain 8 Record 3 - MRVNDLSD - Virtual NIC Guest Link State - Link Down

With the PTF for APAR PH04703, the TCP/IP server has also been updated in support of Virtual Switch Priority Queuing.

With the PTF for APAR VM66223, the Directory Maintenance Facility (DirMaint) NICDEF command has been updated:

New option:

PQUPLINKTX *priority*

Deleted options:

IEDN

INMN

For more information, see:

- [z/VM: CP Commands and Utilities Reference](#)
- [z/VM: CP Planning and Administration](#)
- [z/VM: Connectivity](#)
- [z/VM: CP Programming Services](#)
- [z/VM: CP Messages and Codes](#)

- [z/VM: Performance](#)
- [z/VM: Directory Maintenance Facility Commands Reference](#)

[7.1 APAR] TLS Certificate Verification

With the PTFs for APARs PH18435 (TCP/IP), VM66348 (CMS), and VM66349 (LE), the TCP/IP TLS/SSL server has been enhanced to allow authentication of client certificates, host name validation, and extraction of fields from a certificate.

Client certificate authentication support allows a server to verify a client by examining the certificate it presents, to ensure that it has been signed by a certificate authority the server trusts and that it has not expired. The client authentication support that was previously added to dynamically secured Telnet connections has been expanded to the z/VM FTP and SMTP servers. Additionally, the PORT statement in the TCPIP configuration file has been updated to allow client certificate authentication for statically secured connections.

Host name validation support allows a client to verify the identity of a server by passing a string containing a host name, domain name, or IP address on the handshake request. The string is compared to fields in the server certificate. If the string is not contained in the server certificate, the client may decide to fail the handshake.

In addition to this support, new APIs extract fields from a client or server certificate.

For additional information and availability details, see [IBM: z/VM Continuous Delivery News \(https://www.vm.ibm.com/newfunction/\)](https://www.vm.ibm.com/newfunction/).

[7.2] CLEAR TDISK Enabled by Default

TDISK clearing default has changed to enabled. The default can be turned off with the FEATURES DISABLE CLEAR_TDISK configuration statement. This change will cause any residual data that might be otherwise left on a temporary disk after use to be purged by default, enabling z/VM to be more in line with modern security guidelines.

The following system configuration statement has been updated:

- [FEATURES Statement](#)

For more information, see:

- [z/VM: CP Planning and Administration](#)

[7.2 APAR] IPv6 Layer 2 Query Support

With the PTF for APAR VM66485, z/VM 7.2 provides support to collect and report IPv6 addresses for Layer 2 VSwitches. IPv6 addresses for Layer 2 VSwitches are displayed by the QUERY VSWITCH and QUERY VIRTUAL NIC commands and by DIAG '26C'. In addition, the VSwitch Unicast IP table structure is changed from a linked list to a hash table to allow for more efficient table searches.

The following CP commands are updated:

- QUERY LAN
- QUERY VIRTUAL NIC
- QUERY VSWITCH

The following CP Diagnose codes have been updated:

- Diagnose x'26C'
- Diagnose x'2A8'

For more information, see:

- [“CP Commands” on page 194](#)
- [“DIAGNOSE Codes for Customer Use” on page 247](#)

- [z/VM: CP Commands and Utilities Reference](#)

[7.2 APAR] VSwitch Bridge Port Enhancements

With the PTF for APAR VM66557, z/VM 7.2 adds a new NICDISTRIBUTION option to the VSwitch HiperSockets Bridge. When activated, the option enables the Bridge to distinguish and manage separately the traffic that is generated by various HiperSockets connections that are on the same HiperSockets CHPID. Traffic that exits the Bridge Port to an OSA link aggregation group is more evenly distributed across the entire port group. Activation of the new option also enables the VSwitch to extract IPv4 and IPv6 address assignments for display in the QUERY VSWITCH command, monitor records, and DIAGNOSE code X'26C'.

The following CP commands are updated:

- [QUERY VSWITCH](#) in [z/VM: CP Commands and Utilities Reference](#)
- [SET VSWITCH](#) in [z/VM: CP Commands and Utilities Reference](#)

The following configuration statement is updated:

- [MODIFY VSWITCH Statement](#) in [z/VM: CP Planning and Administration](#)

The following monitor records are updated:

- Domain 8 Record 1 - MRVNDSES - Virtual NIC Session Activity
- Domain 6 Record 35 - MRIODBPS - Virtual Switch Bridge Port Activity

The following diagnose code is updated:

- DIAGNOSE Code X'26C' - Access Certain System Information
 - [Subcode X'00000020'](#) - Return Virtual Switch Information in [z/VM: CP Programming Services](#)
 - [Subcode X'00000024'](#) - Return Virtual Port, Virtual NIC or HiperSockets Logical Port Information in [z/VM: CP Programming Services](#)

The following CP environment variable definition is new:

- CP.FUNCTION.VSWITCH.NICDISTRIBUTION

System Administration and Operation

These topics describe changes that can affect how you manage the administration and operation of z/VM and guest operating systems.

Note: Enhancements in TCP/IP administration are described under [“Connectivity and Networking”](#) on page 95.

[6.1] VMPRF Mode Not Supported by Performance Toolkit

VMPRF mode, which provided compatibility with the report file specifications of the VM Performance Reporting Facility (5684-073), is not supported by the Performance Toolkit for z/VM 6.1. All reports must now follow the current Performance Toolkit specifications.

[6.1] HMF/VM Not Supported

Host Management Facilities/VM (HMF/VM), V1.1 (5684-157), is not supported on z/VM 6.1. Use the IBM Operations Manager for z/VM, V1.3.0 (5697-J10).

[6.1] Alternate Method for Hard Limiting of Scheduled System Resources

z/VM supports the CP scheduler enforcing hard limiting of scheduled system resources using a new consumption method. The LIMITHARD setting only affects users with absolute maximum shares defined with the LIMITHARD option on their SHARE setting. See the SET SRM LIMITHARD command for details on setting the method that the CP scheduler will use to enforce the limit on a guest's CPU usage.

The following CP commands have been updated for this support:

- QUERY SRM
- SET SHARE
- SET SRM

The following user directory statement has been updated for this support:

- SHARE statement

[6.1] Disabling the Guest Page Reordering Process

The SET REORDER and QUERY REORDER commands are added. SET REORDER allows you to disable the guest page reordering process for the entire z/VM system or for specific virtual machines, helping to improve performance for guests with large memory footprints.

[6.1] Enhanced Contiguous Frame Coalescing

The contiguous frame coalescing algorithms have been enhanced to increase the probability of z/VM finding multiple adjacent frames of real memory, helping to increase system throughput.

[6.1] Improved Page Release Serialization

The z/VM page release serialization process has been improved to help reduce system overhead and increase guest throughput.

[6.1] Performance Toolkit Enhancements

The Performance Toolkit includes updated reports containing the following new information:

- Capacity-Change Reason and Capacity-Adjustment Indication values
- Ensemble membership
- Server Time Protocol (STP) Facility Configuration values
- Virtual NIC types, including IEDN and INMN
- Reorder settings for virtual machines

For more information, see:

- [z/VM: Performance Toolkit Guide](#)
- [z/VM: Performance Toolkit Reference](#).

[6.1] Shutdown Signals Enhancement

The SET SHUTSIGNAL command is added, which allows a guest that is enabled for shutdown signals to temporarily disable from receiving shutdown signals and later to re-enable for shutdown signals. The QUERY SIGNALS command can be used to determine whether a user is currently enabled to receive shutdown signals.

[6.2] SSI Cluster Configuration and Management

Functions have been added to define a z/VM single system image (SSI) cluster and its configuration, and to manage an active z/VM SSI cluster. Managing an active SSI cluster includes coordinating the process of a member joining and leaving the cluster, maintaining each member's view of the operational mode of the cluster ("SSI mode"), and maintaining each member's state with regard to the cluster.

The following functions have been added:

- SSI system configuration statement
- BEGIN and END system configuration statements

- REPAIR IPL parameter
- QUERY SSI command
- SET SSI command
- FORMSSI utility
- DIAGNOSE code X'2CC'

The following functions have been updated:

- SYSTEM_IDENTIFIER system configuration statement
- SYSTEM_IDENTIFIER_DEFAULT system configuration statement
- CPSYNTAX utility
- SET CPTRACE command
- *VMEVENT system service (new Class 2 and Class 3)

A new CP monitor domain, Domain 11 - SSI, and new monitor records have been added:

- Domain 11 Record 1 - MRSSISCS - State Change Synchronization Activity
- Domain 11 Record 2 - MRSSISMI - State/Mode Information
- Domain 11 Record 3 - MRSSISCH - State Change Event
- Domain 11 Record 4 - MRSSISLT - Slot Definition
- Domain 11 Record 6 - MRSSIXLK - XDISK Serialization Activity
- Domain 11 Record 7 - MRSSIXDI - XDISK Activity

Note: To use the functions that define and maintain an SSI cluster, the IBM z/VM Single System Image Feature (VMSSI) must be licensed and enabled. See [“\[6.2\] IBM z/VM Single System Image Feature” on page 5](#).

[6.2] SSI Cluster User Identity and Configuration

The z/VM 6.2 user directory is arranged to facilitate the deployment of SSI clusters and differs significantly from the directory for a pre-6.2 release. The changes include a new type of virtual machine definition (which includes new directory statements), changes to the layout of the system minidisks, and changes to the MAINT user ID.

New Type of Virtual Machine Definition

Two types of virtual machine definitions are now supported in the z/VM directory:

Single-configuration virtual machine definition

This is the traditional type of definition, which begins with a USER statement and consists of the user entry and any included profile entry. In a z/VM SSI cluster, a user ID defined this way can log on to any member of the cluster, but only one member at a time.

As before, this type of definition is intended for general users and virtual machines that support guests.

Multiconfiguration virtual machine definition

This type of definition begins with an IDENTITY statement and consists of the identity entry, the associated subconfiguration entries, and any included profile entry. When included in the common source directory for a z/VM SSI cluster, a multiconfiguration virtual machine definition can be configured to define multiple virtual machine instances, which enables the user ID to be logged on concurrently and independently to multiple members of the cluster. Each of these virtual machine instances can have a different configuration from the others.

A subconfiguration entry begins with a SUBCONFIG statement that corresponds to a BUILD statement in the identity entry that specifies a member of the SSI cluster. Directory statements that apply to the virtual machine instance on any member of the cluster are included in the identity entry. Directory

statements that apply only to the virtual machine instance on a specific member of the cluster are included in the subconfiguration entry for that member.

This type of virtual machine definition is intended for system support user IDs, service virtual machines, and servers. The definitions for many IBM-supplied user IDs (such as MAINT, OPERATOR, and TCPIP) have been changed to multiconfiguration virtual machine definitions. For a list of these user IDs, see [Changed virtual machine definitions](#).

In a non-SSI environment, a multiconfiguration virtual machine definition is configured for a single system (that is, the definition includes at most one BUILD statement and the corresponding subconfiguration entry) and is equivalent to a single-configuration virtual machine definition.

The z/VM source directory can be one of the following types:

SSI-enabled

A source directory that has the SSI option specified on the DIRECTORY statement and includes IDENTITY, BUILD, and SUBCONFIG statements. This type of source directory is created when a z/VM SSI cluster is installed using one of the SSI installation procedures documented in [z/VM: Installation Guide](#) and is shared by the members of the SSI cluster. (Each cluster member creates its own object directory.) An SSI-enabled source directory can contain single-configuration virtual machine definitions and multiconfiguration virtual machine definitions.

SSI-ready

A source directory that does not have the SSI option specified on the DIRECTORY statement but includes IDENTITY, BUILD, and SUBCONFIG statements. This type of source directory is created when a single z/VM system is installed using one of the non-SSI installation procedures documented in [z/VM: Installation Guide](#). An SSI-ready source directory can contain single-configuration virtual machine definitions and multiconfiguration virtual machine definitions, but each multiconfiguration virtual machine definition can define only one virtual machine instance.

Non-SSI

A source directory that does not have the SSI option specified on the DIRECTORY statement and does not include any IDENTITY, BUILD, or SUBCONFIG statements. Although this type of source directory is supported, it is not supplied with z/VM or created by any of the z/VM installation procedures.

SYSAFFIN statements are not supported in an SSI-enabled or SSI-ready directory. If you have a CSE complex, you should convert it to an SSI cluster. For information about a possible conversion approach, see [z/VM: CP Planning and Administration](#).

Table 3 on page 117 shows which directory types are compatible with specific system environments.

z/VM release and environment	Object directory derived from this source directory type		
	Non-SSI	SSI-ready	SSI-enabled
Prior to 6.2	Y	Y	Not supported
6.2 (or later), no SSI cluster defined	Y	Y	Error
6.2 (or later) in a single-member SSI cluster	Y	Y	Y
6.2 (or later) in a multimember SSI cluster	Error	Error	Y

Notes:

- "Error" means CP will not bring object directories derived from this type of source directory online.
- "Not supported" means this environment is not supported because in older z/VM releases CP does not know how to use this directory format. In older z/VM releases, CP can bring the directory online, but cannot support multiconfiguration virtual machine definitions.

New System Minidisk Layout

The z/VM 6.2 installation DASD volumes (for an SSI installation or a non-SSI installation) are divided into three groups: common, release-specific, and system-specific. The system configuration file and source directory are located on the common volume. In an SSI cluster, the common volume is truly common, and is shared by all the members of the cluster. Likewise, in an SSI cluster there is one set of release-specific volumes for each release level in the cluster.

Corresponding to the new installation DASD structure, the layout of the system minidisks has been changed. Some new minidisks have been defined, some minidisks have been dropped, some minidisks are now owned by different user IDs, and some minidisks have been relocated to different volumes. See “[6.2] Changes to Predefined User Directory Entries” on page 8.



Attention: It is important for future migrations and for the service tools that you preserve the volume layouts as defined by the z/VM installation process.

Changes to the MAINT User ID

System resources owned by the MAINT user ID in pre-6.2 releases are now divided between MAINT and two new user IDs, PMAINT and MAINT $_{vrm}$. These user IDs have the following roles:

PMAINT

Owns the resources that will be common in an SSI cluster, such as the parm disk and the minidisks that contain the source directory files, VMSES/E system-level files, and the new VMPSFS file pool. The system configuration file has been moved to the new PMAINT CF0 minidisk. The CP utilities CPFMTXA, DIRECTXA, and DISKMAP, and the CMS utility DIRMAP have been moved from the MAINT 190 minidisk to the new cross release utilities minidisk (PMAINT 551). PMAINT is defined by a single-configuration virtual machine definition.

MAINT $_{vrm}$

Owns the resources that are specific to a z/VM release. For example, MAINT620 own the resources specific to z/VM 6.2. MAINT $_{vrm}$, rather than MAINT, must now be used to service all z/VM and preinstalled products, features, and components for the $_{vrm}$ release. MAINT $_{vrm}$ is defined by a single-configuration virtual machine definition. In an SSI cluster that includes z/VM systems at multiple release levels, the directory will include a MAINT $_{vrm}$ user ID for each release.

MAINT

Owns the resources that are specific to each system. MAINT is defined by a multiconfiguration virtual machine definition and therefore can have concurrent logon instances on the members of the SSI cluster. Most minidisks formerly owned by MAINT have been moved to either MAINT $_{vrm}$ or PMAINT, and MAINT now has links to those minidisks. See “[6.2] Changes to Predefined User Directory Entries” on page 8.

New and Changed Externals

The following directory statements have been added:

- BUILD
- IDENTITY
- SUBCONFIG
- VMRELOCATE

The following directory statements have been changed:

- DIRECTORY
- LOAD

The following functions have been changed:

- DISKMAP command
- DIRECTXA utility
- DIRMAP utility (CMS)

- VMUDQ macro
- DIAGNOSE code X'3C'
- DIAGNOSE code X'84'
- DIAGNOSE code X'25C'

The following monitor records have changed:

- Monitor record Domain 1 Record 15 - MRMTRUSR - Logged on User

A new byte (MTRUSR_VMDLOGFG) is added to the end of the record that includes MTRUSR_VMDIDENT, where VMDIDENT is the name of flag in the VMDBK field VMDLOGFG that indicates the user is a multiconfiguration virtual machine.

- Monitor record Domain 4 Record 1 - MRUSELON - User Logon Data

A new byte as defined for MRMTRUSR is added.

Note: To use the functions that define and maintain an SSI cluster, the IBM z/VM Single System Image Feature (VMSSI) must be licensed and enabled. See “[6.2] IBM z/VM Single System Image Feature” on page 5.

[6.2] Cross-System Spool and CP Commands in an SSI Cluster

Cross-system spool enables the CP spooling functions on each member of an SSI cluster to create, manage, and share spool files cooperatively with the other members and enables spool files to be shared among the members. Each member creates spool files only on its own spool volumes, but has access to the spool volumes owned by the other members.

Users (defined by USER definitions) have a single logical view of all their spool files. Users can log on to any member of the cluster and access all of their spool files, regardless of the member on which the files were created. (For a spool file to be accessible, the member on which it was created must be joined to the cluster.) Users can manipulate their spool files in the same ways as on a non-SSI system.

Cross-system support for the single console image facility (SCIF) allows the secondary user and primary user to be logged on to different members of the SSI cluster. Likewise, cross-system support for the observer function allows the observer and the observed user to be logged on to different members of the SSI cluster. The following commands have been updated for this support:

- QUERY OBSERVER
- QUERY SECUSER
- SEND
- SET OBSERVER
- SET SECUSER

The following CP commands have also been updated for SSI cluster support:

- FREE LOGON
- HOLD LOGON

Some CP commands are enabled for cluster use through existing AT *sysname* operands, which allow you to specify the target member. Examples are MESSAGE (MSG), MSGNOH, and SMSG.

The new AT command can be used to remotely issue most privileged CP commands (that is, not class G or class ANY) on other active members of the SSI cluster. Some CP commands have operational requirements when issued via the AT command:

- The following commands have required operands when issued via the AT command. The target user ID (or some other value) must be explicitly specified. The target cannot default to the command issuer or *.
- CPXH
- DEFINE LAN
- DETACH LAN

- DETACH SYSASCII
 - DETACH XSTORE
 - INDICATE SPACES
 - INDICATE USER
 - QUERY BYUSER
 - QUERY CFLINKS
 - QUERY CPUAFFINITY
 - QUERY IUCV
 - QUERY MAXSPOOL
 - QUERY MEMASSIST
 - QUERY OBSERVER
 - QUERY PRIVCLASS
 - QUERY QIOASSIST
 - QUERY SECUSER
 - QUERY STGEXEMPT
 - RESET RESERVE MDISK
 - SET CPUAFFINITY
 - SET LAN
 - SET MEMASSIST
 - SET QIOASSIST
 - TRSAVE
- The following commands have options that cannot be used when issued via the AT command:
 - RESET (*vdev* option)
 - INDICATE SPACES (*spaceid* option if it does not include an explicit user ID)
 - The following commands have an existing AT option that is not allowed when issued via the AT command:
 - INDICATE LOAD
 - MESSAGE
 - MSGNOH
 - QUERY NAMES
 - QUERY USERID
 - SMSG
 - WARNING
 - The CP command when preceded by the logical-line-end symbol (for example, #CP) cannot be issued via the AT command. If the CP command without the logical-line-end symbol is issued via the AT command, it will not cause any virtual machine on the target system to enter the CP environment. However, the CP command can still be used to preface other CP commands when issued via the AT command.

[6.2] Live Guest Relocation in an SSI Cluster

Changes have been implemented to provide the ability for a running Linux guest to be moved transparently from one z/VM system to another within an SSI cluster, a process known as live guest relocation.

The following functions have been added:

- RELOCATION_DOMAIN system configuration statement

- VMRELOCATE directory statement
- DEFINE RELODOMAIN command
- QUERY CHPIDV command
- QUERY RELODOMAIN command
- QUERY VIRTUAL CHPID command
- QUERY VMRELOCATE command
- SET VMRELOCATE command
- VMRELOCATE command

The following functions have been changed:

- GLOBALOPTS system configuration statement
- OPTION directory statement
- ATTACH command
- CPHX command
- DEFINE STORAGE command
- DEFINE (Virtual Disk in Storage) command
- DETACH (Virtual Device) command
- DISPLAY command
- DUMP command
- FORCE command
- HOLD LOGON command
- IPL command
- LOCK command
- LOGOFF command
- QUERY SPACES command
- SET CPTRACE command
- SET LKFACR command
- SET RESERVED command
- SET VDISK command
- STORE command
- SYSTEM command
- UNLOCK command
- IMAGELIB utility

The following CP monitor records are added or changed:

Domain 0 Record 3: Replace field SYTRSG_SYSRVPG (cardinal count of reserved pages) with SYTRSG_RSARVPG (the reserved page counter is being moved from the SYSCM to the RSMBK).

Domain 0 Record 7: Add field SYTSHS_QDGRELOC to contain the sum of VDISK blocks reserved for relocations in progress.

Domain 0 Record 8: Add two fullword counters to this record. These are counts of the number of relocations in-flight: one count of incoming and another of outgoing relocations.

Domain 1 Record 15: Add a field that contains the name of the last system from which this virtual machine was relocated and also a field with the name of the system on which this virtual machine originally logged on.

Domain 2 Record 11 I/O priority change event record: Add a flag indicating that this event occurred because of a K relocation and cut one of these records on the destination system during the relocation if the effective I/O Priority values are different on the destination than the source.

Domain 4 Record 1: Add a flag indicating that this event occurred because of a relocation.

Domain 4 Record 2: Add a flag indicating that this event occurred because of a relocation.

Domain 4 Record 3: The following changes are made to this record

- Add an indication that this is the first record since a relocation occurred (both a flag and a timestamp of the end of the relocation).
- Add a field that contains the name of the user's relocation domain.
- Add a field that contains the domain member bit mask.
- Add a flag that indicates if CP is currently showing to the guest a virtual architecture that is not identical to the architecture of the member on which it is running.

Domain 4 Record 4: Add an indication that this is the first record since a relocation occurred (both a flag and a timestamp of the end of the relocation).

Domain 4 Record 11 New Relocation Start event record: Contains the following fields in the source system record:

- Userid of VMRELOCATE command issuer
- Userid of relocation target
- Source system name
- Destination system name
- Flag with relocation information (source or destination system indication)
- Flag with command options
 - FORCE ARCHITECTURE specified (yes or no)
 - FORCE DOMAIN specified (yes or no)
 - FORCE STORAGE specified (yes or no)
 - SYNCH or ASYNCH specified
 - MAXTOTAL time specified
 - MAXQUIESCE time specified
 - IMMEDIATE specified
- Flag with SET VMRELOCATE settings
 - VMRELOCATE set on or off -
- MAXTOTAL time value used
- MAXQUIESCE time value used
- Timestamp of start of relocation

Domain 4 Record 12 New Relocation End event record. Contains the following fields in both the source system and destination system records except as otherwise indicated:

- Userid of VMRELOCATE command issuer
- Userid of relocation target
- Source system name
- Destination system name
- Flag with relocation information
 - Source or destination system indication
 - CPU affinity suppression setting after the relocation – Indication of whether the CPU affinity suppression was changed as a result of the relocation

- Flag with command options
 - FORCE ARCHITECTURE specified (yes or no)
 - FORCE DOMAIN specified (yes or no)
 - FORCE STORAGE specified (yes or no)
 - SYNCH or ASYNCH specified
 - MAXTOTAL time specified
 - MAXQUIESCE time specified
 - IMMEDIATE specified
- Flag with SET VMRELOCATE settings
 - Does guest have VMRELOCATE set on or off
- MAXTOTAL time value used
- MAXQUIESCE time value used
- Reason code (decimal) for end of relocation
 - 0: completed successfully
 - 1: canceled by VMRELOCATE CANCEL command
 - 2: canceled by CPHX command
 - 3: canceled due to lost ISFC connection
 - 4: canceled due to MAXTOTAL time limit exceeded
 - 5: canceled due to MAXQUIESCE time limit exceeded
 - 6: canceled due to eligibility violation
 - 7: canceled due to virtual machine action
 - 8: canceled due to an internal processing error
 - 9: canceled because the CP exit rejected the command
 - 11: canceled because the CP exit gave a return code that is not valid
 - 12: canceled because the destination system detected an error
- Number of storage passes made
- Number of pages transferred on pass 1
- Average number of pages transferred during passes 2 through n-2; this field is zero when the relocation is IMMEDIATE.
- Number of pages transferred on pass n-1 (next to last pass)
- Number of pages transferred on pass n (the last pass)
- Number of virtual devices transferred
- Number of active I/Os encountered
- Number of non-QDIO type I/Os cleared
- Number of QDIO type I/Os cleared
- Timestamp of start of the relocation
- Timestamp of completion of the initial connection to the destination system
- Timestamp of completion of eligibility checks
- Timestamp of completion of initial virtual machine creation on the destination system
- Timestamp of completion of initial address space creation
- Timestamp of completion of virtual machine memory transfer prior to virtual machine quiesce (source only)
- Timestamp of completion of FCP I/O delay (source only)

- Timestamp of completion of stopping the virtual machine
- Timestamp of completion of I/O relocation
- Timestamp of completion of virtual machine state relocation
- Timestamp of completion of final VSIM eligibility checks
- Timestamp of completion of final STMGT eligibility checks
- Timestamp of completion of next-to-last memory pass (source only)
- Timestamp of completion of last memory pass
- Timestamp of completion of final I/O eligibility checks
- Timestamp of completion of virtual machine restart on destination
- Timestamp of completion of virtual machine 'logoff' (source only)
- The number of frames reserved by the virtual machine on the source system
- The number of frames reserved by the virtual machine on the destination system

Domain 8 Record 1: Add an indication that this is the first record since a relocation occurred (both a flag and a timestamp of the end of the relocation).

Domain 10 Record 1 (APPLMON event record): When a virtual machine that used diagnose x'DC' to start up APPLMON data collection is relocated, it may be necessary to give a configuration event record. This will be done if there was an outstanding configuration record on the source system and if the APPLMON monitoring has been started for this virtual machine and a user is connected to *MONITOR.

Domain 10 Record 2 (APPLMON sample record) A new flag called APLSDT_RELO1 will be set the first time this record is returned after a relocation.

Note: To use the functions that define and maintain an SSI cluster, the IBM z/VM Single System Image Feature (VMSSI) must be licensed and enabled. See “[6.2] IBM z/VM Single System Image Feature” on page 5.

[6.2] ACIPARMS Enhancements

In the access control interface (ACI) to an external security manager (ESM), the ACIPARMS control block has been changed. The following ACIPARMS parameter lists have been updated:

- LOGOFF
- LOGON

The following ACIPARMS parameter list has been added:

- VMRELOCATE

[6.2] DirMaint Enhancements

The Directory Maintenance Facility (DirMaint), function level 620, includes the following enhancements to support SSI clusters:

- Several DirMaint commands have been updated to support new IDENTITY and SUBCONFIG directory entries and the new BUILD directory statement.
- DIRM ADD command has been updated for cloning SUBCONFIG entries. In support of this, a new :SSI_VOLUMES. section has been added to the EXTENT CONTROL file.
- DIRM DIRECTORY command has been updated to add, change or delete the SSI option and additional volume labels.
- DIRM GLOBALOPTS, OPTION and SETOPTN commands have been updated to add, delete, alter or query the new CHPIDVIRTUALIZATION option.
- New DIRM SSI command has been added to prepare a source directory for use within an SSI cluster.
- New DIRM UNDOSSI command has been added to reverse changes made to a source directory by the DIRM SSI command.

- New DIRM VMRELOCATE command has been added to support the new VMRELOCATE directory statement in a user or profile entry.
- New support has been added for the satellite server machines to act as a spool file bridge for commands to and responses from the DIRMAINT machine for users on remote nodes to the DIRMAINT machine in an SSI environment.

Note: To use the functions that define and maintain an SSI cluster, the IBM z/VM Single System Image Feature (VMSSI) must be licensed and enabled. See “[6.2] IBM z/VM Single System Image Feature” on page 5.

For more information, see:

- [z/VM: Directory Maintenance Facility Commands Reference](#)
- [z/VM: Directory Maintenance Facility Messages](#)
- [z/VM: Directory Maintenance Facility Tailoring and Administration Guide](#).

[6.2] ESM Access Control for Real Devices

This provides the changes to CP and RACF to enable discretionary and mandatory access controls of real devices.

The following commands have been updated for this support:

- ATTACH
- GIVE

[6.2] LIMITHARD Default Change

The default for the SET SRM LIMITHARD option has been changed to CONSUMPTION. In most workloads, the CONSUMPTION method will give more accurate results than DEADLINE.

[6.2] Memory Constraint Relief

Frame allocation management has improved system memory scalability and decreased memory and processor constraints for larger memory sizes. Monitor record domain 3 record 1 is changed in the following ways:

- Flags are added to indicate:
 - Pageable pages may be allocated above 2 GB.
 - Pageable pages may be allocated below 2 GB.
 - Demand Scans may be done for pageable pages above 2 GB.
 - Demand Scans may be done for pageable pages below 2 GB.
 - The decision on how to allocate pageable pages will no longer change.
- A fullword that equals the turnover rate multiplier before any minimum/maximum is applied for memory less than 2 GB (RSATURNRB).
- A fullword that equals the current turnover rate multiplier for memory less than 2 GB (RSATURN0).
- A fullword that equals the current turnover rate multiplier for memory greater than 2 GB (RSATURNG).
- A fullword that equals the current count of deferred frame request that are waiting for an available frame that can be located only above 2 GB (RSADefCTA2G).
- A fullword that equals the cumulative count of times HCPPTGRD attempted to redrive tasks waiting for an available frame that can be located anywhere (RSARDaANY).
- A fullword that equals the cumulative count of individual task redrives performed by HCPPTGRD for an available frame that can be located anywhere (RSARDtANY).
- A fullword that equals the cumulative count of times HCPPTGRD attempted to redrive tasks waiting for an available frame that can be located only above 2 GB (RSARDaA2G).

- A fullword that equals the cumulative count of individual task redrives performed by HCPPTGRD for an available frame that can be located only above 2 GB (RSARDtA2G).

[6.2] Contiguous Page Replenishment Counters in Monitor

The results of an unsuccessful search for contiguous pages to steal are now recorded in monitor record domain 3 record 1:

- A fullword that equals the cumulative count of times demand scan could not satisfy the need for contiguous frames below 2 GB (RSADSCCO).
- A fullword that equals the cumulative count of times demand scan could not satisfy the need for contiguous frames above 2 GB (RSADSCCG).
- A fullword that equals the cumulative count of times demand scan quit pass 1 of PGMBK steal early due to a paging overrun (RSAPGMQ1).
- A fullword that equals the cumulative count of times demand scan quit pass 2 of PGMBK steal early due to a paging overrun (RSAPGMQ2).
- A fullword that equals the cumulative count of times demand scan quit emergency pass of PGMBK steal early due to a paging overrun (RSAPGMQE).

In addition, the following fields are now contained in monitor record domain 3 record 2:

- A fullword that equals the cumulative count of times demand scan completed after pass 1 of PGMBK steal (PLSPPGM1).
- A fullword that equals the cumulative count of times demand scan completed after pass 2 of PGMBK steal (PLSPPGM2).
- A fullword that equals the cumulative count of times demand scan completed after emergency pass of PGMBK steal (PLSPPGME).

[6.2] MONITOR Changes

The size of the default MONITOR MONDCSS segment shipped with z/VM has been increased from 16 MB to 64 MB. In addition, the default size of the MONITOR SAMPLE CONFIG area has been increased from 241 pages to 4096 pages.

If your MONITOR MONDCSS segment is too small, you will receive the following error message when you try to connect using the *MONITOR system service and the MONWRITE utility:

```
HCPMOW6270E MONWRITE severed the IUCV connection, reason code 2C
HCPMOW6267I MONITOR writer connection to *MONITOR ended
```

If you receive this message, you will need to increase the size of your MONDCSS segment. For more information, see [z/VM: Performance](#) and the MONITOR command in [z/VM: CP Commands and Utilities Reference](#).

[6.2] Performance Toolkit Enhancements

The Performance Toolkit includes new and updated reports containing the following information:

- SSI cluster data
- CPU-Measurement Facility host counters
- Channel subsystem ID values
- Memory constraint relief values
- Multiple access ports per guest values
- Capacity-Change Reason and Capacity-Adjustment Indication values
- Ensemble membership and ID values
- Server Time Protocol (STP) Facility Configuration values

- Virtual NIC types, including IEDN and INMN
- Reorder settings for virtual machines
- New commands: FCONTROL EMERGENC and FCONTROL DUMPID

The source COPY files defining extended trend record layouts are now shipped with the product in FCXGPI MACLIB. The details of these records and are no longer documented in [z/VM: Performance Toolkit Reference](#), although the records are still listed there.

In addition, previously the MONWRITE module was generated to load at storage location X'20000', which would prevent other programs generated at the same storage location from being executed if called using the EXEC exit support on the MONWRITE command. The MONWRITE module is now generated as relocatable, increasing the flexibility and usability of its EXEC exit support by allowing these additional programs to execute.

For more information, see:

- [z/VM: Performance Toolkit Guide](#)
- [z/VM: Performance Toolkit Reference](#)
- [z/VM: Performance](#).

[6.2] RACF Security Server Enhancements

RACF Security Server enhancements include support for z/VM SSI clusters and support for protected user IDs.

RACF Support for z/VM SSI Clusters

RACF is enhanced to support z/VM SSI clusters by presenting z/VM guests with a common and consistent security image across up to four nodes in an SSI cluster. All participating systems will share the RACF database.

The following commands are updated to automatically propagate to all RACF servers running in the same SSI cluster as the issuing system:

- RVARV
- SETEVENT REFRESH
- SETROPTS (all except SETROPTS LIST)

Note: To use the functions that define and maintain an SSI cluster, the IBM z/VM Single System Image Feature (VMSSI) must be licensed and enabled. See “[6.2] IBM z/VM Single System Image Feature” on page 5.

For more information, see:

- [z/VM: RACF Security Server Command Language Reference](#)
- [z/VM: RACF Security Server Messages and Codes](#)
- [z/VM: RACF Security Server System Programmer's Guide](#)

RACF Support for Protected User IDs

Protected user IDs are protected from being used to log on to the system and from being revoked through inactivity or unsuccessful attempts to access the system using incorrect passwords and password phrases. The LISTUSER RACF command output is modified to include a new PROTECTED attribute.

The following RACF commands are modified to include new NOPASSWORD and NOPHRASE attributes:

- ADDUSER
- ALTUSER

See [z/VM: RACF Security Server Security Administrator's Guide](#) for more information.

[6.2] SECLABEL Support for SECUSER/OBSERVER Facilities

This provides the changes to CP and RACF to enable use of SECUSER/OBSERVER facilities when mandatory access controls (security labels) are active.

The following commands have been updated for this support:

- QUERY OBSERVER
- QUERY SECUSER
- SEND
- SET OBSERVER
- SET SECUSER

[6.2] Default Virtual Machine Type is now ESA

If you omit the MACHINE statement when you code a virtual machine definition, the user's virtual machine mode is defined by the mode specified by the GLOBALOPTS directory control statement. If no mode is specified in the GLOBALOPTS directory statement, the default mode will be ESA.

[6.2] STORBUF Default Change

The initial (default) percentage values for SET SRM STORBUF, which partition pageable storage for users with different transaction classes, have been changed to 300%, 250%, and 200%. (The previous defaults were 125%, 105%, and 95%.)

[6.2] Changed XEDIT Default Case for Other File Types

XEDIT supplies default settings, such as case, for files with special file types. See the list of file type defaults in *z/VM: XEDIT Commands and Macros Reference*. For files with other (not listed) file types, the XEDIT default case has been changed from uppercase to mixed case.

[6.2] CMS File Pool Server Enhancements

A new file pool server startup parameter has been added that allows the scope of a file pool to be limited to the members of an SSI cluster.

[6.2] Utilities Moved from the MAINT 190 Minidisk

Files CPFMTXA EXEC, DIRECTXA MODULE, DISKMAP EXEC, and DIRMAP MODULE have been moved from the CMS system disk (MAINT 190) to the cross release utilities disk (PMAINT 551). The new FORMSSI MODULE is also located on this disk. The PMAINT 551 disk must be accessed to run the CP utilities CPFMTXA, DIRECTXA, DISKMAP, and FORMSSI, and the CMS utility DIRMAP.

[6.2] Additional Performance Toolkit Enhancements

With the PTF for APAR VM65044, the Performance Toolkit recognizes the following new monitor records:

- Domain 6 Record 32 - MRIODHPF - zHPF Feature Change
- Domain 6 Record 33 - MRIODBPA - Virtual Switch Bridge Port Activation
- Domain 6 Record 34 - MRIODBPD - Virtual Switch Bridge Port Deactivation
- Domain 6 Record 35 - MRIODBPS - Virtual Switch Bridge Port Activity.

The performance data screen FCX155 (MONDATA) has been updated to include the new monitor records.

[6.3] Cross System Extensions (CSE) Support Removed

Support for the cross system extensions (CSE) environment has been removed. z/VM single system image (SSI) clusters provide the new technology for clustering z/VM systems.

The cross-system link (XLINK) function that was included in CSE is still supported for non-SSI systems, and "CSE" is still used in some function and object names, command responses, and messages related to XLINK. For information about cross-system link, see [z/VM: CP Planning and Administration](#).

The following CP functions have been removed:

- XSPPOOL_SYSTEM configuration statement
- XSPPOOL_TRACE configuration statement
- XSPPOOL_XLIST_INPUT configuration statement
- XSPPOOL_XLIST_OUTPUT configuration statement
- XSPPOOL QUERY command
- XSPPOOL QUERY SHARE command
- XSPPOOL REMOVE command
- XSPPOOL SYNC command
- XSPPOOL UNLOCK command
- XSPPOOL XLIST command
- XSPPOOL XLISTADD command
- XSPPOOL XLISTDEL command

The following CP macros are no longer available for customer use:

- CSESYS macro
- CSETRACE macro
- CSEUSER macro

The following CP functions have been updated:

- CP_OWNED configuration statement
- DEFINE CPOWNED command

The following reserved DIAGNOSE code has been disabled:

- DIAGNOSE code X'F0'

[6.3] HELPSEG and NLSAMENG Saved Segments No Longer Supplied with Base System

The HELPSEG and NLS American English (NLSAMENG) saved segments are no longer supplied with the z/VM base system. American English is the default language for all the z/VM components, so removing the NLSAMENG saved segment does not cause any loss of function. For preinstalled z/VM products, components, and features that placed data in these segments, the VMSES/E build lists that pertain to these segments are still provided. Similarly, the respective \$PPF file part handler references necessary for building these segments have also been maintained, though in bypassed (inactive) form.

See [z/VM: Saved Segments Planning and Administration](#) for more information should you decide to define and build these segments for your system.

[6.3] IPL Changes for NSS in a Linux Dump

A new option on the IPL command, NSSDATA, preserves the contents of a named saved system (NSS), if one is in use, in guest memory. This enhancement allows standalone dump tools, such as those used with the Linux operating system, to include the contents of the NSS in a standalone dump.

[6.3] Memory Management

The z/VM memory management algorithms are redesigned to enable support for real memory up to 1 TB. These enhancements are intended to improve efficiency for the overcommitment of virtual to real

memory for guests and to improve performance. Some benefits of these memory management changes are:

- Improved efficiency in the management of memory over-commitment.
- Less need to use multiple LPARs by supporting more virtual machines in a single image and larger virtual machines in a single image, reducing system management complexity.

Preparing for the increased memory scalability of z/VM 6.3 will depend on your current hardware configuration for memory and CPUs. Depending on the workload you plan to run, you might need to add capacity to take full advantage of the 1 TB support provided with z/VM 6.3. This might mean adding memory and CPUs to your existing configuration, adding books or drawers to your system, or reconfiguring XSTORE and DASD paging space.

- To assist with planning for z/VM 6.3, additional information can be found at [z/VM 6.3 Resources \(https://www.ibm.com/vm/zvm630\)](https://www.ibm.com/vm/zvm630).
- For XSTORE and DASD configuration guidelines, see [IBM: VM Performance Resources \(https://www.ibm.com/vm/perf/\)](https://www.ibm.com/vm/perf/).
- For guidelines on calculating the required paging space, see [*z/VM: CP Planning and Administration*](#).

Two new commands are added:

- SET AGELIST
- QUERY AGELIST

The following commands are updated:

- DEFSEG
- DEFSYS
- INDICATE LOAD
- INDICATE NSS
- INDICATE SPACES
- INDICATE USER
- QUERY REORDER
- QUERY RESERVED
- SET CPTRACE
- SET REORDER
- SET RESERVED

The following configuration statements are added:

- STORAGE AGELIST
- STORAGE RESERVED SYSMAX

The following monitor records are changed:

- D0R3 - MRSYTRSG - Real Storage Data (global)
- D0R4 - MRSYTRSP - Real Storage Data (per processor)
- D0R6 - MRSYTASG - Auxiliary Storage (global)
- D0R7 - MRSYTSHS - Shared Storage Data
- D0R23 - MRSYTLCK - Formal Spin Lock Data (global)
- D1R15 - MRMTRUSR - Logged on User
- D2R4 - MRSCLADL - Add User To Dispatch List - Event Record
- D2R5 - MRSCLDDL - Drop User From Dispatch List - Event Record
- D2R6 - MRSCLAEL - Add User To Eligible List - Event Record
- D2R8 - MRSCLSTP - System Timer Pop - Event Record

- D3R1 - MRSTORSG - Real Storage Management (global)
- D3R2 - MRSTORSP - Real Storage Activity (per processor)
- D3R3 - MRSTOSHR - Shared Storage Management (per NSS or DCSS)
- D3R14 - MRSTOASI - Address Space Information Record
- D3R15 - MRSTOSHL - NSS/DCSS/SSP Loaded into Storage
- D3R16 - MRSTOSHD - NSS/DCSS/SSP Removed From Storage
- D4R2 - MRUSELOF - User Logoff Data - Event Record
- D4R3 - MRUSEACT - User Activity Data
- D4R9 - MRUSEATE - User Activity data at Transaction End - Event Record

The following CP trace codes have been removed: 4005, 4006, 4007, and 4008.

[6.3] Performance Toolkit Enhancements

The Performance Toolkit includes new and updated reports containing the following information:

- CP Memory Scalability
- HiperDispatch
- Support for High Performance Ficon
- Support for HiperSockets Bridge
- Support for Live Guest Relocation

Support for the following monitor records have been added:

- Domain 3 Record 22 - MRSTOFRP - Frame Replenishment
- Domain 5 Record 15 - MRPRCDSV - Dispatch Vector Assignments (Event)
- Domain 5 Record 16 - MRPRCPUP - Park/Unpark Decision (Event)
- Domain 5 Record 17 - MRPRCRCD - Real CPU Data (per CPU) (Sample)
- Domain 5 Record 18 - MRPRCDHF - Dispatch Vector High Frequency Data (Sample)

For more information, see:

- [z/VM: Performance Toolkit Guide](#)
- [z/VM: Performance Toolkit Reference](#)
- [z/VM: Performance](#).

Support for rmfpm's Stabilized

The Performance Toolkit can process Linux performance data obtained from the Resource Management Facility (RMF) Linux performance gatherer, rmfpm's. Performance Toolkit support for rmfpm's has been stabilized and might cease to function as the underlying Linux systems evolve. Support for the Linux rmfpm's agent has been withdrawn and no new copies of it are available for installation. If you have rmfpm's installed on an existing Linux image, it should continue to run on that image unsupported. There is no guarantee that a current rmfpm's installation will run on future Linux image installations.

[6.3] User Class Restructure (UCR) Support Removed

Support for the user class restructure (UCR) function and the OVERRIDE utility have been removed. Privilege classes for CP commands, DIAGNOSE codes, and other CP functions can be redefined by using MODIFY system configuration statements and MODIFY commands.

If any UCR files exist on the system, the contents of those files will not be processed by CP. However, CP will check for the existence of such files during system initialization and issue a message if any are found.

The following CP utility has been removed:

- OVERRIDE

The following CP utility has been updated:

- CVTOVRID

The following CP commands have been updated:

- LOCATE CMDBK
- PURGE UCR
- QUERY CPCMDS
- QUERY UCR

The following system configuration statements have been updated:

- MODIFY COMMAND / CMD statement
- MODIFY DIAGNOSE statement
- MODIFY PRIV_CLASS statement

The following directory statements have been updated:

- CLASS statement
- IDENTITY statement
- USER statement

The following DIAGNOSE code has been removed:

- X'C4'

[6.3] DASD Volume Real Device Address

The real device address can be specified for a DASD volume to be included in the CP-owned list or the user volume list. An RDEV option has been added to the CP_OWNED system configuration statement, and there is a new USER_VOLUME_RDEV system configuration statement.

[6.3 APAR] CPU Pooling Support

With the PTF for APAR VM65418, z/VM 6.3 allows you to define new entities called CPU pools. CPU pooling provides the ability to define a limit on the amount of CPU resources (in terms of real CP or IFL processors) that a group of z/VM guests are allowed to consume in aggregate. A CPU pool has a name and an associated capacity. For example, a CPU pool named GEORGE could be defined with a capacity of 1.5 IFL processors. One or more virtual machines can be assigned to a CPU pool (a virtual machine can be assigned to one CPU pool at a time) and have their aggregate CPU consumption limited to the pool's capacity. This support allows you to cap CPU utilization for sets of guests to better balance overall resource usage, for example to limit CPU charges based on what a set of guests is allowed to use.

Two types of CPU resource limits can be set for the group of users in a CPU pool:

- The group can be capped by the LIMITHARD method currently supported for individual users. (Individual user limits are set using the SET SHARE command, while group limits are set using the new DEFINE CPUPOOL and SET CPUPOOL commands.) This method caps the CPU pool to a specific percentage of the shared logical IFL or CP processors currently varied online. The group's allocation changes whenever the number of shared processors of the appropriate type changes due to actions like varying processors online or offline, or dedicating or undedicating processors.
- The group can be capped by the new CAPACITY method, which sets an amount of processor power equivalent to a specific number of real IFL or CP processors as the limit for the group. This method caps the CPU pool to an absolute amount of processor resource, and the group's allocation is unaffected by changes in the number of online shared processors (unless the number falls below the limit for the group).

In a single system image (SSI) cluster, a guest assigned to a CPU pool can be relocated to another cluster member if a compatible CPU pool (with the same name and the same type of CPU being limited) exists on the destination member. Capacity limits are set and enforced independently on each cluster member.

For more information about using CPU pools, see [z/VM: Performance](#).

The following CP commands have been added:

- DEFINE CPUPOOL
- DELETE CPUPOOL
- SET CPUPOOL
- QUERY CPUPOOL
- SCHEDULE

The following CP monitor records have been added:

- D1R28 - MRMTRCPC - CPU Pool Configuration
- D1R29 - MRMTRCPD - CPU Pool Definition - Event Record
- D4R13 - MRUSECPC - CPU Pool Change - Event Record
- D5R19 - MRPRCCPU - CPU Pool Utilization (Sample)

The following CP monitor records have been updated:

- D1R15 - MRMTRUSR - Logged On User
- D2R13 - MRSCALL - Add VMDBK to the limit list - Event Record
- D2R14 - MRSCDLL - Drop VMDBK from the limit list - Event Record
- D4R3 - MRUSEACT - User Activity Data

[6.3 APAR] Environment Information Interface

With the PTF for APAR VM65419, z/VM 6.3 supports the new Store Hypervisor Information (STHYI) instruction, which can be used to access certain system information, including current CPU resources available at the machine, logical partition, hypervisor, and guest levels, as well as any caps (such as CPU pools) that restrict the guest's use of these resources. This new interface, available to the guest in problem state, can be exploited by application tools that need to understand the configuration of the application used by z/VM guest operating systems. The applications need to understand what is deployed and the amount of capacity available to be consumed by those applications.

For more information about the STHYI instruction, see [z/VM: CP Programming Services](#).

The following CP monitor record has been updated:

- D5R11 - MRPRCINS - Instruction Counts (per processor)

[6.3 APAR] Additional Performance Toolkit Enhancements

With the PTF for APAR VM65357, the Performance Toolkit supports the following new screens and associated commands:

- FCX288, Multiprocessor User Activity Log Screen – USRMPLOG
- FCX315, Multiprocessor User Wait States Log Screen – USTMPLOG

With the PTF for APAR VM65399, the Performance Toolkit supports the following new screens and associated commands:

- FCX310, PCI Function Menu Screen – PCIMENU
- FCX311, PCI Function Configuration Screen – PCICONF
- FCX312, PCI Function Activity Screen – PCIACT
- FCX313, PCI Function Activity Log Screen – PCILOG

- FCX314, Pinned Storage Log Screen – PINLOG
- FCX316, Subpool Storage Log Screen – SUBPLOG

Support for the following new CP monitor records has been added:

- D1R27 - MRMTRPCI – PCI function Configuration Data
- D6R36 - MRIODPAT – Attach PCI Function
- D6R37 - MRIODPDT – Detach PCI Function
- D6R38 - MRIODPEN – Guest Enables a PCI Function
- D6R39 - MRIODPAC – PCI Activity
- D6R40 - MRIODPDS – Guest Disables a PCI Function
- D6R41 - MRIODPER – PCI function error
- D6R42 - MRIODPAD – PCI function added to the system
- D6R43 - MRIODPDL – PCI function deleted from the system
- D6R44 - MRIODPMD – PCI function program controls modified
- D6R45 - MRIODPON – Real PCI function varied on
- D6R46 - MRIODPOF – Real PCI function varied offline

With the PTF for APAR VM65527, the Performance Toolkit provides support for new and updated reports for the z13 server:

- FCX310, PCI Function Menu Screen – PCIMENU
- FCX311, PCI Function Configuration Screen – PCICONF
- FCX312, PCI Function Activity Screen, Format 0 – PCIACT
- FCX313, PCI Function Activity Log Screen, Format 0 – PCILOG
- FCX318, PCI Function Activity Screen, Format 1 – PCIACT ROCE
- FCX319, PCI Function Activity Log Screen, Format 1 – PCILOG
- FCX320, PCI Function Activity Screen, Format 2 – PCIACT ZEDC
- FCX321, PCI Function Activity Log Screen, Format 2 – PCILOG

With the PTF for APAR VM65528, the Performance Toolkit provides new and updated reports to support Multi-VSwitch Link Aggregation:

- FCX266, General Virtual Switch Description Screen – GVSWITCH
- FCX317, Global networking object activity – GLONACT

With the PTF for APAR VM65529, the Performance Toolkit provides new and updated reports to support simultaneous multithreading (SMT):

- FCX154, System Settings Screen – SYSSET
- FCX155, Monitor Data Statistics Screen – MONDATA
- FCX180, System Configuration Screen – SYSCONF
- FCX234, Processor Configuration Log Screen – PROCCONF
- FCX239, Processor Summary Log Screen – PROCSUM
- FCX265, Spin Lock Log Screen – LOCKLOG
- FCX268, General Virtual Network Device Description Screen – GVNIC
- FCX269, Virtual Network Device Activity Screen – VNIC
- FCX287, System Topology Machine Organization Screen – TOPOLOG
- FCX298, Logical PU Organization Log Screen – PUORGLOG
- FCX302, Real CPU Utilization Log Screen – PHYSLOG
- FCX303, DSVBK Steals per Processor Log Screen – DSVSLOG

- FCX304, Processor Log Screen – PRCLOG
- FCX306, Logical Partition Share Screen – LSHARACT

With the PTF for APAR VM65656, the Performance Toolkit supports using CMS pipelines as monitor data input to the MONSCAN/BATCH operation. This enhancement will allow Performance Toolkit to process multiple mondata files at one time, and the files may be packed.

With the PTF for APAR VM65697, the Performance Toolkit provides new and updated reports to support CPU pooling:

- FCX124, Performance Data Selection Menu Screen – MONITOR, MENU
- FCX126, LPAR Load Screen – LPAR
- FCX202, LPAR Load Log Screen – LPARLOG
- FCX226, User Configuration Screen – UCONF
- FCX306, Logical Partition Share Screen – LSHARACT
- FCX308, CPU Pool Configuration Screen – CPLCONF
- FCX309, CPU Pool Activity Screen – CPLACT
- FCX324, CPU Pool Menu Screen – CPLMENU

With the PTF for APAR VM65698, the Performance Toolkit provides new and updated reports to support guest usage of virtual PCIe functions:

- FCX310, PCI Function Menu Screen – PCIMENU
- FCX322, PCI Function Activity, Format 3 – PCIACT ISM
- FCX323, PCI Function Activity Log, Format 3 – PCILOG *pcifunc*

With the PTF for APAR VM65699, the Performance Toolkit implements improvements to the following reports:

- FCX103, Storage Utilization Screen – STORAGE
- FCX114, User Wait States Screen – USTAT / USTATG
- FCX126, LPAR Load Screen – LPAR
- FCX135, User Wait State Log Screen – USTLOG
- FCX179, System Facilities Log Screen – SYSLOG
- FCX180, System Configuration Screen – SYSCONF
- FCX202, LPAR Load Log Screen – LPARLOG
- FCX215, FICON Channel Load Screen – FCHANNEL
- FCX234, Processor Configuration Log Screen – PROCCONF
- FCX287, System Topology Machine Organization Screen – TOPOLOG
- FCX292, User Page Utilization Data Screen – UPGUTL
- FCX298, Logical PU Organization Log Screen – PUORGLOG
- FCX302, Real CPU Utilization Log Screen – PHYSLOG
- FCX306, Logical Partition Share Screen – LSHARACT
- FCX307, Logical Partition Logs Menu Screen – LPARLOGM
- FCX315, Multiprocessor User Wait States Log Screen – USTMPLOG *userid*

For more information, see:

- [*z/VM: Performance Toolkit Guide*](#)
- [*z/VM: Performance Toolkit Reference*](#)

[6.3] z/VM 6.3 Achieves Common Criteria Certification

All certification activities for z/VM 6.3 are complete. The certifying body issued its certification on March 30, 2015. z/VM 6.3, with the SSI and RACF Security Server features enabled, has been certified to conform to the Operating System Protection Profile (OSPP) with Virtualization (-VIRT) and Labeled Security (-LS) extensions of the Common Criteria standard for IT security, ISO/IEC 15408, at Evaluation Assurance Level 4 (EAL4+). For more information about this announcement, see [IBM z/VM Security and Integrity Resources \(https://www.ibm.com/vm/security\)](https://www.ibm.com/vm/security).

[6.3 APAR] Virtual Machine Logoff Time Reduction

The PTF for APAR VM64770 reduces the time to perform a virtual machine logoff or other system-reset-clear operation in a storage overcommitted environment by providing a read ahead function to batch PGMBK reads from DASD asynchronously from the main storage releasing thread. This parallelism makes the algorithm more efficient, although the observed benefit is still dependent on system constraints, specifically:

- The availability of contiguous pairs of frames for reading in the PGMBKs.
- Any paging backlog. If the read queue has built up on the target volume(s), it will inhibit the effectiveness of the read ahead task.

[6.3 APAR] RACF Security Policy and Password Encryption Enhancements

With the PTF for APAR VM65719, the z/VM RACF Security Server feature supports the following security policy and password encryption enhancements:

- Security policy enhancements

- Minimum password or password phrase change interval

The SETROPTS PASSWORD command has the capability of setting a minimum number of days that must pass between a user's password or password phrase changes.

- ALTUSER Revoke/Resume date management

New NOREVOKE and NORESUME keywords for the ALTUSER and CONNECT commands will provide better revoke/resume date management. The NOREVOKE and NORESUME keywords can be used to clear the revoke and resume dates rather than clearing them with the REVOKE and RESUME keywords. Also, LISTUSER and LISTGRP are changed to always display the revoke and resume dates if present, and LISTGRP is changed to display the group's creation date, which is already present in the group profile, but not currently shown.

- RACUT200 Database Verification utility to perform a reserve/release

The RACUT200 Database Verification utility has been modified to perform a reserve on the RACF database minidisk prior to executing any of its functions and to perform a release on the RACF database minidisk prior to exiting.

- New information from DIAGNOSE X'A0' subcode X'50'

New RACF configuration information has been added for retrieval from subcode X'50':

- SMF CPUID
- SMF current disk
- SMF current disk owner
- SMF data file name

Note: This enhancement is provided by the PTF for APAR VM65498.

- Help desk support

The following new FACILITY class resources have been added to allow delegation of authority to non-security administrator users, such as help desk personnel, to reset passwords and password phrases and list user information.

- IRR.PASSWORD.RESET
- IRR.PWRESET.OWNER
- IRR.PWRESET.TREE
- IRR.PWRESET.EXCLUDE
- IRR.LISTUSER
- IRR.LU.OWNER
- IRR.LU.TREE
- IRR.LU.EXCLUDE
- Password encryption enhancements
 - New password encryption algorithm

A new KDFAES (key derivation function with advanced encryption standard) password encryption algorithm can be specified on the SETROPTS command. The KDFAES algorithm is more secure than the default DES algorithm, but is computationally more intensive, by design. If KDFAES is active, a new PWCONVERT keyword on the ALTUSER command can be used to convert legacy-format passwords and password history entries to KDFAES format.
 - Special characters in passwords

A new SPECIALCHARS option on the SETROPTS command allows the use of 14 additional special characters in passwords and password phrases. New password syntax rule content-keywords SPECIAL and MIXEDALL have been added to the SETROPTS command, and the meaning of the NOVOWEL content-keyword has been extended to include special characters. MIXEDALL can be used to force the use of special characters in passwords. The additional password characters are:

```
. < + | & ! * - % _ > ? : =
```
 - Expire password support

The ALTUSER command can be used to mark a user's existing password or password phrase as expired without specifying a new password or phrase. This can be useful to force users to change passwords as soon as possible after a change in password policy, such as the implementation of a new syntax rule. It can also be useful to evenly distribute password change dates across a user population.
 - Password history cleanup

A new PWCLEAN keyword on the ALTUSER command can be used to clean up residual entries in a user's password and password phrase history resulting from lowering the SETROPTS PASSWORD(HISTORY(nn)) value.

The following z/VM RACF commands have been updated:

- ALTUSER (Alter User Profile)
- CONNECT (Connect User to Group)
- LISTGRP (List Group Profile)
- LISTUSR (List User Profile)
- PASSWORD or PHRASE (Special User Password or Password Phrase)
- SETROPTS (Set RACF Options)

For more information, see:

- [z/VM: RACF Security Server Command Language Reference](#)
- [z/VM: RACF Security Server Macros and Interfaces](#)
- [z/VM: RACF Security Server Security Administrator's Guide](#)
- [z/VM: RACF Security Server System Programmer's Guide](#)

[6.3 APAR] Relocating the SSI PDR without a Planned Outage

The PTF for APAR VM65712 adds support for the new PDRVOLUME operand on the SET SSI command, which allows you to relocate the z/VM single system image (SSI) persistent data record (PDR) to another DASD volume without a planned outage. The FORMSSI utility has been updated to display the replacement volume ID.

The following CP interface has been added:

- Monitor record Domain 11 Record 8 - MRSSIPDR - SSI PDR volume change

The following CP interfaces have been updated:

- SET SSI command
- FORMSSI utility

For more information, see:

- [z/VM: CP Commands and Utilities Reference](#)
- [z/VM: CP Planning and Administration](#)

[6.4] DirMaint Support

The Directory Maintenance Facility (DirMaint), function level 640, includes the following changes:

- DIRM GLOBALOPTS, MACHINE, and SETMACH commands have been updated to allow the definition of a z/Architecture-only virtual machine (MACHINE Z).
- New exits and configuration data specifications are added to the interface between DirMaint and RACF/VM for link and NICDEF creation and deletion, allowing for further coordination of CP and RACF privileges, and discrete resource profile creation and deletion.
- The XSTORE operand of the DIRMAINT command has been removed due to the removal of Expanded Storage (XSTORE) support.
- DirMaint messages DVH3261I and DVH3324E have been removed due to the removal of Expanded Storage (XSTORE) support.

For more information, see:

- [z/VM: Directory Maintenance Facility Commands Reference](#)
- [z/VM: Directory Maintenance Facility Messages](#)
- [z/VM: Directory Maintenance Facility Tailoring and Administration Guide](#).

[6.4] FlashSystem Support for FCP-Attached SCSI Disks

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

A new FLASH operand is added to the following:

- SET EDEVICE command
- EDVICE configuration file statement

In addition:

- The QUERY EDVICE command has been enhanced to display information about emulated FLASH devices.
- The systems management System_EQID_Query API has been updated.

The following monitor record has been updated:

- Domain 1 Record 6 - MRMTRDEV - Device Configuration Data

For more information, see:

- [z/VM: CP Commands and Utilities Reference](#)
- [z/VM: CP Planning and Administration](#)
- [z/VM: Systems Management Application Programming](#).

[6.4] zManager Support Removed

The IBM z Unified Resource Manager (zManager) is no longer supported by z/VM. The virtual switch types of IEDN and INMN have been removed from CP and TCP/IP commands and other externals.

The following CP configuration statements have been updated:

- DEFINE VSWITCH
- MODIFY VSWITCH

The following CP user directory statement has been updated:

- NICDEF

The following CP commands have been updated:

- COUPLE
- DEFINE NIC
- DEFINE VSWITCH
- QUERY CONTROLLER
- QUERY LAN
- QUERY OSA
- QUERY VIRTUAL NIC
- QUERY VMLAN
- QUERY VSWITCH
- SET NIC
- SET VMLAN
- SET VSWITCH

The following diagnose code has been updated:

- DIAGNOSE Code X'26C' - Access Certain System Information

The following have been changed to general purpose vswitch controllers:

- DTCENS1 - has been renamed to DTCVSW3
- DTCENS2 - has been renamed to DTCVSW4

All VSWITCH controllers now have share 3000 relative.

The following TCP/IP configuration statements have been updated:

- DEVICE and LINK statements for OSD devices
- PERMIT
- VSWITCH CONTROLLER

The following TCP/IP commands have been updated:

- IFCONFIG
- NETSTAT CONFIG
- NETSTAT DEVLINKS

The following CP monitor records have been updated:

- Domain 1 Record 4 - MRMTRSYS - System Configuration Data
- Domain 1 Record 19 - MRMTRQDC - QDIO Device Configuration
- Domain 6 Record 23 - MRIODVSR - Virtual Switch Recovery
- Domain 6 Record 25 - MRIODQDA - QDIO Device Activation Event
- Domain 6 Record 27 - MRIODQDD - QDIO Device Deactivation Event
- Domain 8 Record 1 - MRVNDSES - Virtual NIC Session Activity
- Domain 8 Record 2 - MRVNDLSU - Virtual NIC Guest Link State - Link Up
- Domain 8 Record 3 - MRVNDLSD - Virtual NIC Guest Link State - Link Down

For more information, see:

- [z/VM: CP Commands and Utilities Reference](#)
- [z/VM: CP Planning and Administration](#)
- [z/VM: CP Programming Services](#)
- [z/VM: TCP/IP Planning and Customization](#)
- [z/VM: TCP/IP User's Guide](#)

[6.4] Memory Scalability Efficiency Improvements

Improvements to memory management algorithms provide a basis for future enhancements that can increase the performance of workloads that experience available list spin lock contention.

[6.4] Enhanced Real Memory and Guest Virtual Memory Support

The maximum amount of real storage (memory) that z/VM exploits is increased from 1 TB to 2 TB. The maximum supported virtual memory for a single guest remains at 1 TB. When keeping the virtual to real overcommitment the same, doubling the real memory used results in doubling the active virtual memory that can be used effectively. This virtual memory can come from an increased number of virtual machines and/or larger virtual machines. This allows for greater leverage of white space.

[6.4] Dynamic Simultaneous Multithreading Level

Support for simultaneous multithreading (SMT) is enhanced with the addition of the SET MULTITHREAD command. Once z/VM 6.4 has been IPLed with multithreading enabled in the system configuration file, this command can be used to nondisruptively switch between one and two activated threads per IFL core. Performance of a system and workload with one active thread per core is comparable to that of the same system and workload with multithreading disabled. Thus, the dynamic SMT level capability allows the benefit of multithreading to be evaluated for a workload without requiring an outage to enable or disable SMT.

The SET MULTITHREAD command is allowed only when the system has been enabled for multithreading in the system configuration file, which can specify activating either one or two threads per core. It is not possible to revert to a non-SMT configuration without an IPL. SMT-enabled configurations are restricted to 32 cores even when operating in single-threaded mode due to the logical processor addressing limit.

z/VM supports more than one thread per core for only IFLs. Although the command allows a request of two threads per core for the other CPU types, z/VM will not use more than one thread per core for those CPU types.

- The following new CP command was added for this support:
 - SET MULTITHREAD
- The following CP commands have been updated for this support:
 - INDICATE MULTITHREAD

- QUERY MULTITHREAD
- SET CPTRACE
- VARY CORE
- The MULTITHREADING configuration statement has been updated.
- New CP trace code has been added:
 - Threading level change - 3614
- The following new monitor record has been added:
 - Domain 5 Record 21 - MRPRCSMT - SMT Configuration Change Event
- The following monitor records have been updated:
 - Domain 0 Record 2 - MRSYTPRP - Processor data (per processor)
 - Domain 1 Record 4 - MRMTRSYS - System Configuration Data
 - Domain 5 Record 1 - MRPRCVON - Vary On Processor
 - Domain 5 Record 2 - MRPRCVOF - Vary Off Processor
 - Domain 5 Record 20 - MRPRCMFM - MT CPUMF Counters

For more information, see

- [z/VM: CP Commands and Utilities Reference](#)
- [z/VM: CP Messages and Codes](#)
- [z/VM: CP Planning and Administration](#)
- [z/VM: Diagnosis Guide](#)

[6.4] Query Shutdown Command

The new QUERY SHUTDOWN command enables a z/VM system programmer or a guest virtual machine to determine whether a system shutdown is in progress and obtain additional information about the shutdown. This can help automate an orderly shutdown of the z/VM system and its virtual servers. This function can be of particular value to virtual machines that coordinate the shutdown of other virtual machines. The coordinating virtual machines would receive the signal that the system is shutting down, issue the new QUERY command to get additional information, and take the appropriate action for an orderly shutdown.

The following CP command has been added:

- QUERY SHUTDOWN

The following CP commands have been updated for this support:

- FORCE
- QUERY SHUTDOWNTIME
- QUERY SIGNALS
- SHUTDOWN
- SIGNAL

For more information, see:

- [z/VM: CP Commands and Utilities Reference](#)
- [z/VM: CP Messages and Codes](#).

[6.4] Control Program Environment Variables

With this support, system programmers and Class B virtual machines can set system-wide environment variables. Any Class G virtual machine on the system can query the values of these variables.

This enhancement allows automation procedures to adapt more easily to changes in operating environments to help simplify the control and testing of a system setup. For example, an operator can indicate at IPL time that the system is running in a disaster recovery or test environment, which in turn enables automation routines to modify the devices used and alter the choice and sequence in which virtual machines are activated, as well as perform other environment-dependent functions.

The following CP commands have been added for this support:

- QUERY VARIABLE
- SET VARIABLE

The following CP command has been updated:

- SET IPLPARMS

The following CP utility has been updated:

- CPSYNTAX

The following CP configuration statement has been added:

- SET VARIABLE

The following IPL parameter has been added:

- IPLVAR=*value*

For more information, see:

- [z/VM: CP Commands and Utilities Reference](#)
- [z/VM: CP Messages and Codes](#)
- [z/VM: CP Planning and Administration](#)
- [z/VM: System Operation](#).

[6.4] Virtual Processor Management Improvement

CP's virtual processor management has been improved so that no user stays in the eligible list more than an instant before being added to the dispatch list. Therefore some functions intended to improve performance by managing the eligible list are now less meaningful.

The following CP functions are affected:

- QUICKDSP user directory option
- INDICATE ACTIVE command
- INDICATE LOAD command
- INDICATE QUEUES command
- SET QUICKDSP command
- SET SRM command

[6.4] Surplus CPU Power Distribution Improvement

Virtual machines that do not consume all of their entitled CPU power, as determined by their share setting, generate "surplus CPU power". This enhancement distributes the surplus to other virtual machines in proportion to their share setting. This is managed independently for each processor type (General Purpose, IFL, zIIP, and so on) across the virtual machines.

The following CP monitor records have been updated:

- Domain 2 Record 4 - MRSCLADL - Add User to Dispatch List
- Domain 2 Record 5 - MRSCLDDL - Drop User from Dispatch List
- Domain 2 Record 6 - MRSCLAEL - Add User to Eligible List
- Domain 2 Record 13 - MRSCLALL - Add VMDBK to the Limit List

- Domain 2 Record 14 - MRSCLDLL - Drop User from the Limit List

[6.4] RACF Automatic Control of Access List Authority

The ADDCREATOR and NOADDCREATOR options on the RACF SETROPTS command determine whether or not the creator of a RACF profile is automatically added to its access control list. This enhancement removes the need for manual intervention in RACF resource configuration and eliminates a point of potential human error from security policy management.

For more information, see:

- [z/VM: RACF Security Server Command Language Reference](#)
- [z/VM: RACF Security Server Security Administrator's Guide](#)

[6.4] HyperPAV Technology Exploitation

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

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

HyperPAV paging is exploited by the z/VM hypervisor for:

- The SYSRES volume, and volumes containing checkpoint and warm start data
- Volumes used for paging, spooling, and the z/VM user directory
- Minidisk pools, as defined by a guest's use of the MAPMDISK IDENTIFY macro



Attention: If you intend to exploit HyperPAV paging from z/VM 6.4 running as a guest of z/VM 6.3, you need to apply the PTF for APAR VM65748 to the z/VM 6.3 first level system.

The following CP commands have been added for this support:

- QUERY PAGING
- SET PAGING

The following CP commands have been updated:

- ATTACH
- QUERY AGELIST
- QUERY CU
- SET AGELIST
- SET CU
- SET IPLPARMS

The following CP configuration statements have been updated:

- CU
- FEATURES
- STORAGE AGELIST

The following monitor records are changed:

- D0R23 - MRSYTLCK - Formal Spin Lock Data
- D1R7 - MRMTRMEM - Memory Configuration Data
- D1R20 - MRMTRHPP - HyperPAV Pool Definition

- D3R4 - MRSTOASP - Auxiliary Storage Management
- D3R11 - MRSTOASS - Auxiliary Shared Storage Management
- D6R3 - MRIODDEV - Device Activity
- D6R28 - MRIODHPP - HyperPAV Pool Activity
- D6R32 - MRIODHPF - Indicates an HPF Feature Change

For more information, see:

- [z/VM: CP Commands and Utilities Reference](#)
- [z/VM: CP Messages and Codes](#)
- [z/VM: CP Planning and Administration](#)
- [z/VM: System Operation](#).

[6.4] Performance Toolkit Enhancements

Performance Toolkit for z/VM is enhanced to exploit z/Architecture 64-bit addressing mode and its expanded set of instructions. Consequently, the PERFSVM virtual machine must run on z/Architecture CMS (z/CMS). Any virtual machine running the Performance Toolkit module must also be using z/CMS.

Performance Toolkit also exploits virtual storage above the 2 GB line, or High Memory Area (HMA), for its temporary data areas, especially for print buffers, thus freeing the conventional virtual storage that resides below the 2 GB line.

The following command is new:

- FCONTROL HMA

The following command is updated:

- FCONTROL LIMIT

Various messages have been added or updated.

For more information, see:

- [z/VM: Performance Toolkit Guide](#)
- [z/VM: Performance Toolkit Reference](#).

[6.4] Performance Toolkit Changes in How Spin Lock Activity Is Reported

Starting in z/VM 6.3, the number of spin locks reported in monitor record DOR23 MRSYTLCK began growing. This caused large LOCKLOG reports and also increased the memory Performance Toolkit needed to do a reduction. To provide relief, IBM replaced the log-style LOCKLOG report with an activity-style report called LOCKACT. The LOCKACT report shows mean lock behavior. If interval-to-interval lock statistics are needed, you can generate an INTERIM LOCKACT report.

When z/VM 6.4 Performance Toolkit reduces data from a z/VM 6.4 or later system, it can produce only the LOCKACT and INTERIM LOCKACT reports. When z/VM 6.4 Performance Toolkit reduces data from a pre-6.4 system, it can produce LOCKLOG, LOCKACT, and INTERIM LOCKACT reports.

The following commands are new:

- CPUMENU
- LOCKACT

The following command is updated:

- LOCKLOG

For more information, see:

- [z/VM: Performance Toolkit Guide](#)
- [z/VM: Performance Toolkit Reference](#).

[6.4] Nondefault Tape Mode Support

The z/VM Tape Products Architecture (TPA) provides additional options to further specify MODE settings for IBM System Storage 3592 TS1120 (E05), TS1130 (E06), and TS1140 (E07) Tape Drives. This support provides flexibility in setting the Write format for a tape device. This extends the use and interoperability of cartridges between different tape hardware subsystems.

The following CP command has been updated for this support:

- ATTACH

The following CP utility has been updated for this support:

- DDR

For more information, see:

- [z/VM: CP Commands and Utilities Reference](#)
- [z/VM: CP Messages and Codes](#)

[6.4] CMS Pipelines

CMS Pipelines functionality is modernized by adopting 20 years of development since the original Pipelines integration into z/VM. This upgrade addresses client concerns with using downloaded code, includes fixes not previously integrated into the z/VM product, broadens the ecosystem, enables innovation for clients and ISVs, and includes additional functionality.

In general, applications created in earlier z/VM releases that use CMS Pipelines as specified will continue to run without any change to the application. For additional migration information, see [z/VM: CMS Pipelines User's Guide and Reference](#). This new CMS Pipelines publication is based on [CMS/TSO Pipelines: Author's Edition](#), SL26-0018, and replaces both of the previous z/VM CMS Pipelines publications.

All of the CMS Pipelines HELP files have been replaced with files that correspond to the new publication. CMS Pipelines messages and HELP files are no longer translated into Japanese (KANJI).

[6.4] RACF ICHRCX02 Exit Disabled by Default

IBM recommends that the ICHRCX02 RACROUTE REQUEST=AUTH postprocessing exit be disabled, however prior to this release it has been shipped enabled. From this release onwards the exit will be shipped disabled.

[6.4] Support for large HCD Dynamic I/O Activates

CP no longer relies on obtaining a large contiguous area of memory to handle Dynamic I/O Activate requests from HCD. This eliminates the risk of receiving HCD message CBDD824 CONFIGURATION CHANGE TOO LARGE FOR CP TO HANDLE, in most cases. In addition, the default size of the VM HCD virtual machine has been increased to 2 GB, the maximum allowed for an XC mode virtual machine. This gives HCD the maximum amount of virtual memory possible for use in handling large Dynamic I/O Activates.

[6.4] IBM Virtualization Engine TS7700 Copy Export Support

APAR VM65789 provides support within the Removable Media Services (RMS) component of DFSMS/VM for the IBM Virtualization Engine TS7700 Copy Export functionality. This function allows a copy of selected logical volumes written to the TS7700 to be removed and taken offsite for disaster recovery purposes. The benefits of volume stacking, which places many logical volumes on a physical volume, are retained with this function. In addition, since the data being exported is a copy of the logical volume, the logical volume data remains accessible by the production host systems.

For more information, see [z/VM: DFSMS/VM Removable Media Services](#).

[6.4] OpenStack Support for z/VM

As announced in the Software Announcement dated October 10, 2017, the z/VM 6.4 Cloud Manager Appliance (CMA) is no longer available when ordering z/VM and will not be available on z/VM 7.1. The CMA has been stabilized at the OpenStack Newton level. The CMA will continue to be supported for security fixes and client-reported problems. However, no support for newer releases of OpenStack or functional enhancements are planned.

The IBM z/VM Cloud Connector is a development toolkit for managing z/VM host and virtual machines. It provides a set of RESTful APIs to operate z/VM resources. Upper layer cloud management solutions can consume these RESTful APIs directly to manage z/VM. For additional information, see [IBM: z/VM Cloud Connector Maintenance \(https://www.vm.ibm.com/sysman/cloudcon.html\)](https://www.vm.ibm.com/sysman/cloudcon.html).

[6.4 APAR] RACF Security Policy Enhancements

With the PTFs for APARs VM65930 and VM65982, the z/VM RACF Security Server feature supports the following security policy enhancements:

- Read-Only Auditor (ROAUDIT)

This new user role allows many of the common auditing tasks to be performed without the ability to modify settings or manipulate audit logs.

- XAUTOLOG..ON control

This enhancement introduces new security policy requirements for the ON operand of the CP XAUTOLOG command. Currently, the ON operand acts similarly to a LOGON..THERE function, whereby a privileged user can initiate a connection between an existing rdev (terminal window) and a virtual machine. The security controls will disallow this by default, unless appropriate PERMITs have been granted to the console's resource profile.



Attention: The introduction of the XAUTOLOG..ON control will cause the CP XAUTOLOG ON command to fail under all circumstances in installations where RACF/VM is enabled, until some RACF configuration is performed. Customers desiring XAUTOLOG..ON to continue to work as it currently does need to enable generic command processing and create a generic VMCMD resource profile named XAUTOLOG.ON.** that has universal READ access. For example:

```
RDEFINE VMCMD XAUTOLOG.ON.** UACC(READ)
```

- List the current VMXEVENT profile

This enhancement updates the SETEVENT LIST command to provide an authorized user with the names of the VMXEVENT profiles activated and in use by RACF.

Note: The PTF for APAR VM65923 provides infrastructure support in z/VM 6.2, 6.3, and 6.4 and must be installed on all members of an SSI cluster before any 6.4 member is running with the PTF for APAR VM65930.

The following z/VM RACF commands have been updated:

- ADDUSER (Add User Profile)
- ALTUSER (Alter User Profile)
- LDIRECT (List SFS Directory Profile)
- LFILE (List SFS File Profile)
- LISTDSD (List Data Set Profile)
- LISTGRP (List Group Profile)
- LISTUSER (List User Profile)
- RLIST (List General Resource Profile)
- SEARCH (Search RACF Database)

- SETEVENT (Set z/VM Events)
- SETROPTS (Set RACF Options)
- SRDIR (Obtain a List of SFS Directory Profiles)
- SRFIL (Obtain a List of SFS File Profiles)

For more information, see:

- [z/VM: RACF Security Server Auditor's Guide](#)
- [z/VM: RACF Security Server Command Language Reference](#)
- [z/VM: RACF Security Server Macros and Interfaces](#)
- [z/VM: RACF Security Server Security Administrator's Guide](#)
- [z/VM: RACF Security Server System Programmer's Guide](#)
- [z/VM: Security Server RACROUTE Macro Reference](#)

The following CP command has been updated:

- XAUTOLOG

For more information, see:

- [z/VM: CP Commands and Utilities Reference](#)

[6.4 APAR] z/VM HELP Quality Improvement

With the PTFs for APARs VM66028 and VM66029, along with the PTF for VM66053 (a VMSES/E required if-req), new HELP components are defined and the help files for some CP and CMS commands are renamed, so the HELP commands used to display those help files are more logical and consistent with the commands used to display similar help files.

The major operands (subcommands) of some CP and CMS commands are documented as separate commands with two-word names, such as DEFINE ALIAS. The HELP command syntax supports only single-word command names, so HELP components are defined for these subcommands. A HELP component is a group of help files with a common HELPxxxx file type that uses the first four letters of the HELP component name, which is usually the name of the parent command, and the file name is the subcommand name. For example, the HELP component for the DEFINE subcommands is DEFINE, and the file ID of the help file for the DEFINE ALIAS command is ALIAS HELPDEFI.

To display the help file for a subcommand, enter:

```
help HELP_component_name command_name
```

This syntax allows you to enter a help request for a subcommand that is logical because it simulates the two-word command name, for example:

```
help define alias
```

The help files for some CP and CMS subcommands are defined in the general CP and CMS HELP components, so the file type is HELPCP or HELPCMS, which does not identify the command, and the subcommand is identified only by the file name. To display the help file for one of these subcommands, you need to know what the file name is. For example, the file ID of the help file for the ASSOCIATE EXIT subcommand is ASSOEX HELPCP, so the command to display the help file is:

```
help cp assoex
```

This HELP enhancement removes those subcommand help files from the CP and CMS HELP components and defines new components for them. New (renamed) help files are provided that enable you to issue more logical HELP commands to display them, like the commands used to display the help files for other CP and CMS subcommands. For example, the command to display the new help file for the ASSOCIATE EXIT subcommand is:

```
help associate exit
```

New and updated menus and abbreviation files are also included.

Table 4 on page 148 shows the affected commands. The table shows the new HELP components (same name as the parent command), the file IDs of the new (renamed) help files for the subcommands within those HELP components, and the resulting improved (more logical) HELP commands used to display the help files.

Notes:

1. The HELP command is not changed.
2. The file IDs of the help files for the parent commands are not changed. Those help files are still included within the CP and CMS components. For example, the help file for the CP ASSOCIATE command is ASSOCIAT HELPCP and can be displayed with the following command:

```
help cp associate
```

3. Because a help file on the system cannot be renamed via service, a new (renamed) help file and a revised version of the old help file are provided. The old file is provided for compatibility, and has been revised to contain only a statement that the file is obsolete and a link to the new file. The old files are deprecated and will be removed from the help database in the next z/VM release.

<i>Table 4. Renamed Help Files for Some CP and CMS Subcommands</i>			
Command [Component]	Subcommand	Help File ID	Command Used to Display Help File
CP ASSOCIATE [ASSOCIATE]	EXIT	Old: ASSOEX HELPCP New: EXIT HELPASSO	Old: help cp assoex New: help associate exit
	MESSAGES	Old: ASSOMSGS HELPCP New: MESSAGES HELPASSO	Old: help cp assomsgs New: help associate messages
CP DEACTIVE [DEACTIVE]	CONV	Old: CONV HELPCP New: CONV HELPDEAC	Old: help cp conv New: help deactivate conv
	ISLINK	Old: ISLINK HELPCP New: ISLINK HELPDEAC	Old: help cp islink New: help deactivate islink
CP DRAIN [DRAIN]	(Disk)	Old: DRAINDIS HELPCP New: DISK HELPDRAI	Old: help cp draindis New: help drain disk
	UR	Old: DRAINUR HELPCP New: UR HELPDRAI	Old: help cp drainur New: help drain ur

Table 4. Renamed Help Files for Some CP and CMS Subcommands (continued)

Command [Component]	Subcommand	Help File ID	Command Used to Display Help File
CP FLASHCOPY [FLASHCOPY]	BACKGNDCOPY	Old: FLASHBND HELPCP New: BACKGNDC HELPFLAS	Old: help cp flashbnd New: help flashcopy backgndcopy
	ESTABLISH	Old: FLASHEST HELPCP New: ESTABLIS HELPFLAS	Old: help cp flashest New: help flashcopy establish
	RESYNC	Old: FLASHRES HELPCP New: RESYNC HELPFLAS	Old: help cp flashres New: help flashcopy resync
	TGTWRITE	Old: FLASHTGT HELPCP New: TGTWRITE HELPFLAS	Old: help cp flashtgt New: help flashcopy tgtwrite
	WITHDRAW	Old: FLASHWIT HELPCP New: WITHDRAW HELPFLAS	Old: help cp flashwit New: help flashcopy withdraw
CP FREE [FREE]	LOGON	Old: FREELOGN HELPCP New: LOGON HELPFREE	Old: help cp freeogn New: help free logon
	PRINTER	Old: FREEPRIN HELPCP New: PRINTER HELPFREE	Old: help cp freeprin New: help free printer
CP GIVE [GIVE]	(Real Device)	Old: GIVRDEV HELPCP New: RDEV HELPGIVE	Old: help cp givrdev New: help give real
	(Virtual Device)	Old: GIVVDEV HELPCP New: VDEV HELPGIVE	Old: help cp givvdev New: help give virtual
CP HOLD [HOLD]	LOGON	Old: HOLDLOGN HELPCP New: LOGON HELPHOLD	Old: help cp holdlogn New: help hold logon
	PRINTER	Old: HOLDPRT HELPCP New: PRINTER HELPHOLD	Old: help cp holdprt New: help hold printer
CP START [START]	(Disk)	Old: STARTDIS HELPCP New: DISK HELPSTAR	Old: help cp startdis New: help start disk
	UR	Old: STARTUR HELPCP New: UR HELPSTAR	Old: help cp startur New: help start ur

<i>Table 4. Renamed Help Files for Some CP and CMS Subcommands (continued)</i>			
Command [Component]	Subcommand	Help File ID	Command Used to Display Help File
CP VARY [VARY]	CHPID	Old: VARYCHPI HELPCP New: CHPID HELPVARY	Old: help cp varychpi New: help vary chpid
	CORE	Old: VARYCORE HELPCP New: CORE HELPVARY	Old: help cp varycore New: help vary core
	PATH	Old: VARYPATH HELPCP New: PATH HELPVARY	Old: help cp varypath New: help vary path
	PCIFUNCTION	Old: VARYPCIF HELPCP New: PCIFUNCT HELPVARY	Old: help cp varypcif New: help vary pcifunction
	PROCESSOR	Old: VARYPROC HELPCP New: PROCCSO HELPVARY	Old: help cp varyproc New: help vary processor
	(Real Device)	Old: VARYRDEV HELPCP New: RDEV HELPVARY	Old: help cp varyrdev New: help vary real
	SUBCHANNEL	Old: VARYSUBC HELPCP New: SUBCHANN HELPVARY	Old: help cp varysubc New: help vary subchannel
CMS CREATE [CREATE]	ALIAS	Old: ALIAS HELPCMS New: ALIAS HELPCREA	Old: help cms alias New: help create alias
	DIRECTORY	Old: DIRECTOR HELPCMS New: DIRECTOR HELPCREA	Old: help cms directory New: help create directory
	FILE	Old: FILE HELPCMS New: FILE HELPCREA	Old: help cms file New: help create file
	LOCK	Old: LOCK HELPCMS New: LOCK HELPCREA	Old: help cms lock New: help create lock
	NAMEDEF	Old: NAMEDEF HELPCMS New: NAMEDEF HELPCREA	Old: help cms namedef New: help create namedef
CMS DELETE [DELETE ¹]	LOCK	Old: DLOCK HELPCMS New: LOCK HELPDELE	Old: help cms dlock New: help delete lock
	NAMEDEF	Old: DNAMEDEF HELPCMS New: NAMEDEF HELPDELE	Old: help cms dnamedef New: help delete namedef

Table 4. Renamed Help Files for Some CP and CMS Subcommands (continued)

Command [Component]	Subcommand	Help File ID	Command Used to Display Help File
CMS SEGMENT [SEGMENT]	ASSIGN	Old: SASSIGN HELPCMS New: ASSIGN HELPSEGM	Old: help cms sassign New: help segment assign
	LOAD	Old: SLOAD HELPCMS New: LOAD HELPSEGM	Old: help cms sload New: help segment load
	PURGE	Old: SPURGE HELPCMS New: PURGE HELPSEGM	Old: help cms spurge New: help segment purge
	RELEASE	Old: SRELEASE HELPCMS New: RELEASE HELPSEGM	Old: help cms srelease New: help segment release
	RESERVE	Old: SRESERVE HELPCMS New: RESERVE HELPSEGM	Old: help cms sreserve New: help segment reserve
<p>¹ The CMS DELETE subcommands have been added to the existing DELETE component (formerly CP only). Help files for CP DELETE subcommands and CMS DELETE subcommands can be displayed by specifying the following command:</p> <pre>help delete <i>command_name</i></pre>			

The following lists identify all of the help files that have been added or updated for this support.

- New CP help files
 - For the ASSOCIATE subcommands:
 - ASSOCIAT HELPMENU
 - ASSOCIAT HELPABBR
 - EXIT HELPASSO
 - MESSAGES HELPASSO
 - For the DEACTIVE subcommands:
 - DEACTIVE HELPMENU
 - DEACTIVE HELPABBR
 - CONV HELPDEAC
 - ISLINK HELPDEAC
 - For the DRAIN subcommands:
 - DRAIN HELPMENU
 - DRAIN HELPABBR
 - DISK HELPDRAI
 - UR HELPDRAI
 - For the FLASHCOPY subcommands:
 - FLASHCOP HELPMENU
 - FLASHCOP HELPABBR
 - BACKGNDC HELPFLAS

Administration and Operation

- ESTABLIS HELPFLAS
- RESYNC HELPFLAS
- TGTWRITE HELPFLAS
- WITHDRAW HELPFLAS
- For the FREE subcommands:
 - FREE HELPMENU
 - FREE HELPABBR
 - LOGON HELPFREE
 - PRINTER HELPFREE
- For the GIVE subcommands:
 - GIVE HELPMENU
 - GIVE HELPABBR
 - RDEV HELPGIVE
 - VDEV HELPGIVE
- For the HOLD subcommands:
 - HOLD HELPMENU
 - HOLD HELPABBR
 - LOGON HELPHOLD
 - PRINTER HELPHOLD
- For the MESSAGE commands:
 - MESSAGE HELPMENU
- For the START subcommands:
 - START HELPMENU
 - START HELPABBR
 - DISK HELPSTAR
 - UR HELPSTAR
- For the VARY subcommands:
 - VARY HELPMENU
 - VARY HELPABBR
 - CHPID HELPVARY
 - CORE HELPVARY
 - PATH HELPVARY
 - PCIFUNCT HELPVARY
 - PROCESSO HELPVARY
 - RDEV HELPVARY
 - SUBCHANN HELPVARY
- Updated CP help files
 - ASSOCIAT HELPCP
 - CP HELPMENU
 - CP HELPABBR
 - DEACTIVE HELPCP
 - DELETE HELPCP

- DELETE HELPMENU
- DELETE HELPABBR
- DRAIN HELPCP
- FLASHCOP HELPCP
- FREE HELPCP
- GIVE HELPCP
- HOLD HELPCP
- MESSAGE HELPCP
- START HELPCP
- VARY HELPCP
- Updated (deprecated) CP help files
 - ASSOEX HELPCP
 - ASSOMSGS HELPCP
 - CONV HELPCP
 - DRAINDIS HELPCP
 - DRAINUR HELPCP
 - FLASHBND HELPCP
 - FLASHEST HELPCP
 - FLASHRES HELPCP
 - FLASHTGT HELPCP
 - FLASHWIT HELPCP
 - FREELOGN HELPCP
 - FREEPRIN HELPCP
 - GIVRDEV HELPCP
 - GIVVDEV HELPCP
 - HOLDLOGN HELPCP
 - HOLDPRT HELPCP
 - ISLINK HELPCP
 - STARTDIS HELPCP
 - STARTUR HELPCP
 - VARYCHPI HELPCP
 - VARYCORE HELPCP
 - VARYPATH HELPCP
 - VARYPCIF HELPCP
 - VARYPROC HELPCP
 - VARYRDEV HELPCP
 - VARYSUBC HELPCP
- New CMS help files
 - For the CREATE subcommands:
 - CREATE HELPMENU
 - CREATE HELPABBR
 - ALIAS HELPCREA
 - DIRECTOR HELPCREA

- FILE HELPCREA
- LOCK HELPCREA
- NAMEDEF HELPCREA
- For the DELETE subcommands:
 - LOCK HELPDELE
 - NAMEDEF HELPDELE
- For the SEGMENT subcommands:
 - SEGMENT HELPMENU
 - SEGMENT HELPABBR
 - ASSIGN HELPSEGM
 - LOAD HELPSEGM
 - PURGE HELPSEGM
 - RELEASE HELPSEGM
 - RESERVE HELPSEGM
- Updated CMS help files
 - CMS HELPMENU
 - CREATE HELPCMS
 - DELETE HELPCMS
 - HELP HELPCMS
 - MENUS HELPMENU
 - SEGMENT HELPCMS
- Updated (deprecated) CMS help files
 - ALIAS HELPCMS
 - DIRECTOR HELPCMS
 - DLOCK HELPCMS
 - DNAMEDEF HELPCMS
 - FILE HELPCMS
 - LOCK HELPCMS
 - NAMEDEF HELPCMS
 - SASSIGN HELPCMS
 - SLOAD HELPCMS
 - SPURGE HELPCMS
 - SRELEASE HELPCMS
 - SRESERVE HELPCMS

[6.4 APAR] High PR/SM LPAR Management Time Relief

With the PTF for APAR VM66063, z/VM provides support for two new processor unparking heuristics. System administrators can now dynamically change the heuristic that is used to unpark vertical-low logical cores. In addition, administrators can now specify that when the LPAR's Global Performance Data Control setting is set to ON, vertical-low cores should always be parked.

The following configuration statement has been updated for this support:

- SRM

The following CP commands have been updated for this support:

- QUERY SRM
- SET SRM

The following monitor records have been updated for this support:

- Domain 2 Record 7 - MRSCLSRM - SET SRM Changes - Event Record
- Domain 5 Record 16 - MRPRCPUP - Park/Unpark Decision (Event)

For more information, see:

- [z/VM: CP Commands and Utilities Reference](#)
- [z/VM: CP Planning and Administration](#)

[6.4 APAR] Enhanced Support for External Management of z/VM CPU Resources

With the PTF for APAR VM66105, z/VM enhances the capability for external performance management tools to control access to CPU resources to achieve workload goals.

A terminology change is associated with this support: CPU pools are now called resource pools. Accordingly, the CP CPU pool commands are superseded by enhanced resource pool commands:

- DEFINE RESPOOL supersedes DEFINE CPUPOOL and has new operands.
- DELETE RESPOOL supersedes DELETE CPUPOOL.
- QUERY RESPOOL supersedes QUERY CPUPOOL and provides additional data in the response..
- SET RESPOOL supersedes SET CPUPOOL and has new operands.

For compatibility with prior releases, CPUPOOL is accepted as a synonym for RESPOOL.

Additional changes are included in the resource pool support:

- The CPU capacity limit for a resource pool can be specified in hundredths.
- NOLIMIT can be specified when a resource pool is defined or changed, which prevents the enforcement of limiting for the pool.
- A maximum of 1000 users can be assigned to a resource pool with the SCHEDULE command. Previously there was no limit.

The Store Hypervisor Information (STHYI) instruction is updated.

- New function codes are added to access hypervisor, resource pool, and guest information:

X'0001'

Hypervisor Environment Information

X'0002'

Guest List

X'0003'

Designated Guest Information

X'0004'

Resource Pool List

X'0005'

Designated Resource Pool Information

X'0006'

Resource Pool Member List

- The hypervisor section of the response buffer for function code X'0000' includes two new masks to indicate which function codes are supported by the hypervisor and which of those function codes the guest is authorized to use.
- Additional return codes are defined for the new function codes:

X'08'

Not authorized for the function code

X'0C'

Missing or invalid name

X'10'

Specified name is unknown

X'14'

Response buffer is too small

New options are added to the OPTION user directory statement:

STHYI-UTIL

Authorizes the virtual machine to invoke STHYI function code X'0001'.

STHYI-GUEST

Authorizes the virtual machine to invoke STHYI function codes X'0002' and X'0003'.

STHYI-RESPOOL

Authorizes the virtual machine to invoke STHYI function codes X'0004', X'0005', and X'0006'.

The following CP monitor records are updated:

- Domain 1 Record 1 - MRMTREPR - Event Profile
- Domain 5 Record 19 - MRPRCCPU - Resource Pool Utilization (Sample)

The CP MONITOR EVENT command is enhanced with a new COMMAND operand to create a synthetic COMMAND domain. If MONITOR EVENT ENABLE COMMAND is in effect, records for events produced by commands are collected whether or not event recording is enabled for those domains. These COMMAND event records are identified in the list of CP monitor records in *z/VM: Performance*. The response for the QUERY MONITOR EVENT command is enhanced to report whether the COMMAND domain is enabled or disabled.

The VM Event system service (*VMEVENT) includes two new class 0 event types:

26

Operating system type

27

Virtual system reset

DirMaint support for the new user directory options requires the PTF for APAR VM66109. The OPTION and SETOPTN operands of the DIRMAINT command support new keywords STHYI-UTIL, STHYI-GUEST, and STHYI-RESPOOL.

For more information, see:

- [z/VM: CP Commands and Utilities Reference](#)
- [z/VM: CP Programming Services](#)
- [z/VM: CP Planning and Administration](#)
- [z/VM: Performance](#)
- [z/VM: Directory Maintenance Facility Commands Reference](#)

[6.4 APAR] FCP Monitor Enhancements

With the PTF for APAR VM66095, z/VM provides information related to the usage of FCP devices (subchannels) and CHPIDs (physical channels) for EDEVICE activity. Clients can use this information to determine if their existing EDEVICE configuration is optimal or should be changed for better performance.

The information is provided via the following new monitor records:

- Domain 1 Record 32 - MRMTRCHC - CHPID in use by EDEVICES - Configuration Record
- Domain 1 Record 33 - MRMTRFCC - FCP device in use by EDEVICES - Configuration Record

- Domain 6 Record 47 - MRIODCHA - CHPID in use for EDEVICE activity - Event Record
- Domain 6 Record 48 - MRIODCHD - CHPID no longer in use for EDEVICE activity - Event Record
- Domain 6 Record 49 - MRIODCHS - EDEVICE CHPID activity - Sample Record
- Domain 6 Record 50 - MRIODFCS - FCP device activity - Sample Record
- Domain 6 Record 51 - MRIODFCA - FCP device in use by online EDEVICES - Event Record
- Domain 6 Record 52 - MRIODFCD - FCP device no longer in use for EDEVICE activity - Event Record

[6.4 APAR] Performance Toolkit Support for HyperPAV Paging

With the PTF for APAR VM66085, Performance Toolkit provides the following:

- The ability to monitor HyperPAV behavior
- New pooling reports - HyperPAV Alias Activity and HyperPAV Share Activity - to help with the tuning of the z/VM HyperPAV paging subsystem
- New volume reports - DASD Volume Performance and DASD Volume Performance Log - to help in evaluating the effect that aliases have on a volume's performance.

This support includes the following new screens and associated commands:

- FCX327, HyperPAV Alias Activity Screen - HPALIAS
- FCX328, HyperPAV Share Activity Screen - HPSHARE
- FCX329, DASD Volume Performance Screen - VOLUME
- FCX330, DASD Volume Performance Log Screen - VOLLOG

This support includes the following updated screens and associated commands:

- FCX103, Storage Utilization Screen - STORAGE
- FCX108, General I/O Device Screen - DEVICE or DEVICE DASD
- FCX109, CP-Owned Device Screen - DEVICE COWNED
- FCX168, General I/O Device Data Log Screen - DEVLOG
- FCX170, COWNED Device Log Screen - COWNLOG
- FCX173, Benchmark Log Selection Menu Screen - BENCHMRK
- FCX176, Cached Control Units Screen - CTLUNIT
- FCX177, Cache Extended Functions Screen - CACHEXT
- FCX185, I/O Configuration Changes Screen - IOCHANGE
- FCX282, HPF I/O Device Screen - DEVICE HPF
- FCX283, HPF I/O Device Performance Log Screen - HPFLOG
- FCX284, I/O Device Data Selection Menu Screen - DEVMENU
- FCX297, Age List Log Screen - AGELLOG

For more information, see:

- [z/VM: Performance Toolkit Guide](#)
- [z/VM: Performance Toolkit Reference](#).

[6.4 APAR] Support to Control the Enablement of Certain Security Modes in z/VM

With the PTFs for APARs VM65414 and VM65615, z/VM provides support to control the enablement of certain security modes in z/VM.

The following CP commands have been added:

- QUERY CPPROTECT

- SET CPPROTECT

APARs VM65414 and VM65615 replace 6.4 APAR VM65396, which provided security protections through CP commands SET SPECEX and QUERY SPECEX. With APARs VM65414 and VM65615 those commands have been deprecated, and their functionality provided and extended via the SET CPPROTECT and QUERY CPPROTECT commands. The SET SPECEX and QUERY SPECEX commands are not included or supported on z/VM 7.1.



Attention: The sense of the protection setting is inverted between the SPECEX and CPPROTECT commands. That is, an OFF setting for SPECEX corresponds to an ON setting for CPPROTECT MODE2, and vice versa.

[6.4] z/VM 6.4 Achieves Common Criteria Certification

z/VM 6.4, with the SSI and RACF Security Server features enabled, has been certified to conform to the Operating System Protection Profile (OSPP) with Virtualization (-VIRT) and Labeled Security (-LS) extensions of the Common Criteria standard for IT security, ISO/IEC 15408, at Evaluation Assurance Level 4 (EAL4+). See [Certification Report "IBM z/VM 6.4"](http://www.commoncriteriaportal.org/files/epfiles/cr_zvmv6r4_v1.0_en.pdf) (www.commoncriteriaportal.org/files/epfiles/cr_zvmv6r4_v1.0_en.pdf).

z/VM 7.1 is designed to meet the same Common Criteria certification as achieved for z/VM 6.4.

[6.4 and 7.1 APAR] Support for UNRESPONSIVE_PROCESSOR_DETECTION

Included in the 7.2 base, and with the z/VM 6.4 and 7.1 PTFs for APAR VM65971, a mechanism was added to allow non-master processors to detect an unresponsive master processor. If an unresponsive master processor is detected, an MCW002 abend dump is generated.

The UNRESPONSIVE_PROCESSOR_DETECTION operand is available on the FEATURES statement in the system configuration file to provide a way to disable the detection of unresponsive processors on second level test systems. See [FEATURES Statement in z/VM: CP Planning and Administration](#).

[7.1] IBM z/VM Cloud Connector

The IBM z/VM Cloud Connector is a development toolkit that manages z/VM host and virtual machines. It provides a set of RESTful APIs to operate z/VM resources. Upper layer system management solutions can consume these RESTful APIs directly to manage z/VM. For additional information, see [IBM: z/VM Cloud Connector Maintenance](https://www.vm.ibm.com/sysman/cloudcon.html) (<https://www.vm.ibm.com/sysman/cloudcon.html>).

[7.1] IBM Cloud Infrastructure Center (5635-015)

IBM Cloud® Infrastructure Center is an infrastructure management offering, built on OpenStack compatible APIs, that provides on-premises cloud deployments of z/VM Linux virtual machines on the IBM Z and LinuxONE platforms and the integration to higher-level cloud automation tools, such as IBM Cloud Automation Manager or VMware vRealize Automation/Orchestration.

Cloud Infrastructure Center provides a consistent, industry-standard user experience to define, instantiate, and manage the lifecycle of virtual infrastructure, deployment of images (operating system and applications), and policies to maximize resource utilization. It is built to require no specific platform skills from the user and minimal platform skills from the administrator to accelerate cloud deployments.

For additional information, see [IBM Cloud Infrastructure Center](https://www.ibm.com/products/cloud-infrastructure-center) (<https://www.ibm.com/products/cloud-infrastructure-center>).

[7.1] QUERY BYUSER Support for Class B Users

This support provides users with privilege class B the ability to issue the QUERY BYUSER command for other users, similarly to the function granted by privilege class E.

The following CP command has been updated:

- QUERY BYUSER

The following diagnose code has been updated:

- DIAGNOSE Code X'26C' - Access Certain System Information

For more information, see:

- [z/VM: CP Commands and Utilities Reference](#)
- [z/VM: CP Programming Services](#)
- [z/VM: Directory Maintenance Facility Messages](#)

[7.1] Dynamic ESM Protection Support for CPACCESS, CPTYPE, and CPVLOAD

Dynamic external security manager (ESM) protection support for the CPACCESS, CPTYPE, and CPVLOAD commands enables these commands to use the current dynamic command protection setting of the LINK command when validating the required LINK authorizations, and ensures the ESM will be called only when it is configured to handle LINK authorization requests.

The following CP commands have been updated:

- CPACCESS
- CPTYPE
- CPVLOAD

For more information, see [z/VM: CP Commands and Utilities Reference](#).

[7.1] CP Commands Cleanup

Although the following CP commands were removed in previous z/VM releases, they could still appear in the output of the COMMANDS SET or COMMANDS QUERY command. Also, issuing these deleted commands did not provide a consistent system response.

QUERY CHANNEL	SET CPASSIST
QUERY CPASSIST	SET FAVORED
QUERY DISPLAY	SET ISAM
QUERY PRIORITY	SET MINWS
QUERY QDROP	SET NOTRANS
QUERY SASSIST	SET PRIORITY
QUERY SPMODE	SET QDROP
QUERY S370E	SET SASSIST
QUERY VMSAVE	SET STBYPASS
QUERY VRFREE	SET STMULTI
QUERY V=R	SET SVCACCL
SET ACNT	SET S370E
SET AFFINITY	SET VMSAVE
SET ASSIST	SET 370E
SET CCWTRAN	

The commands have been removed from the COMMANDS SET and COMMANDS QUERY output. Issuing any of these deleted commands now results in the following error message and corresponding return code. Some commands that returned a 0 return code will now return a nonzero return code.

```
HCP003E Invalid option - option
```

[7.1 APAR] SMAPI ESM Authorization Support

With the PTF for APAR VM66167, z/VM 7.1 SMAPI provides the following ESM interaction:

- When an ESM is present, programs can use the ESM for all SMAPI authorization decisions at the same granularity used with SMAPI's existing authorization mechanism. The ESM will log the decision (or not) based on its active policy, without SMAPI's knowledge or intervention.
- When an ESM defers its authorization decision to SMAPI, one of the following actions will be taken based on a configuration option:
 - SMAPI's authorization decision will use the existing SMAPI authorization process. SMAPI will call the ESM to log the decision in the ESM-managed security log. SMAPI has no knowledge if the ESM audit logging is enabled or disabled.
 - SMAPI will treat the request as unauthorized.

Properties in the DMSSICNF COPY file control the ESM authorization setting. If you are migrating from a release prior to z/VM 7.1, the contents of your DMSSICNF COPY file will include duplicates of properties found in the IBMCNF COPY file. You can remove from DMSSICNF COPY any properties that are also found in IBMCNF COPY.

For more information, see:

- [z/VM: Systems Management Application Programming](#)
- [z/VM: CMS Macros and Functions Reference](#)
- [z/VM: RACF Security Server Security Administrator's Guide](#)

[7.1 APAR] Virtual Console Output Routing Control

With the PTF for APAR VM65715, z/VM 7.1 provides privilege class G users a new TERMINAL command option, PRECEDENCE, to control guest console routing. This option is used to determine whether a guest application can consume its virtual console output via IUCV (*MSG or *MSGALL) when it has a secondary user.

The following CP commands have been updated:

- QUERY TERMINAL
- TERMINAL

For more information, see:

- [z/VM: CP Commands and Utilities Reference](#)

[7.1 APAR] Allow Device Range on DEFINE HYPERPAVALIAS and DEFINE PAVALIAS

With the PTF for APAR VM66249, z/VM 7.1 provides privilege class G users the ability to create multiple virtual alias devices for guest PAV and HyperPAV base devices by allowing a range of device numbers on a single DEFINE command.

Note: The AS operand is accepted before the *vdev*.

The following CP commands have been updated:

- DEFINE
- DEFINE HYPERPAVALIAS
- DEFINE PAVALIAS

For more information, see:

- [z/VM: CP Commands and Utilities Reference](#)

[7.1 APAR] STHYI support for zCX containers

With the PTF for APAR VM66329, z/VM 7.1 provides enhancements to the STHYI instruction to report zIIP processor type configuration information in support of z/OS zCX containers.

The following instruction has been updated:

- [“STHYI Instruction” on page 250](#)

For more information, see:

- [z/VM: CP Programming Services](#)

[7.1 APAR] Fast Minidisk Erase

With the PTFs for APARs VM66288 (CP), VM65784 (DirMaint), and PH14249 (ICKDSF), the CPFMTXA utility is enhanced to erase data on minidisks more quickly, and the Directory Maintenance Facility (DirMaint) is enhanced to use this new support in CPFMTXA. This can be especially beneficial when DirMaint is used to delete a user ID and its minidisks.

The CP utility CPFMTXA has been updated (see [Table 9 on page 240](#)):

For more information, see:

- [z/VM: CP Commands and Utilities Reference](#)
- [z/VM: CP Messages and Codes](#)

[7.2] Removal of Obsolete Commands

The following CP commands have been deleted:

- CPTRAP
- QUERY CPTRAP

[7.2] Removing PAGING63 IPL Parameter

The PAGING63 IPL parameter is removed since this IPL parameter blocks use of newer paging technologies (for example, Encrypted, EAV, HyperPAV, and HPF Paging) and has not been recommended for use since z/VM 6.4.

The following CP commands have been updated:

- QUERY PAGING
- SET ENCRYPT
- SET IPLPARMS
- SET PAGING

The following system configuration statement has been updated:

- ENCRYPT

The following monitor records have been updated:

- MRMTRMEM: MTRMEM_SYSPG63 changed to "Reserved and unavailable"
- MRMTRSYS: MTRSYS_ENCPG63 changed to "Reserved and unavailable"
- MRSTORSG: STORSG_SYSPG63 changed to "Reserved and unavailable"

For more information, see:

- [z/VM: CP Commands and Utilities Reference](#)
- [z/VM: CP Planning and Administration](#)

[7.2] DirMaint Default Changes

The Directory Maintenance Facility (DirMaint), function level 720, has a default value of NO for the NEEDPASS_RESPECT configuration statement. When the value is NO, DirMaint does not prompt for passwords. For compatibility, NEEDPASS_RESPECT can be set to YES. Specifying YES indicates to DirMaint that password prompting should occur based on the user's DIRM NEEDPASS command setting.

User applications written to send passwords when issuing DirMaint commands may need to be updated to remove the password being passed. In addition, when NEEDPASS_RESPECT is set to NO, the ALLOW_ASUSER_NOPASS_FROM configuration settings are no longer necessary and are ignored. All users can enter DirMaint commands without password prompting.

In addition, DirMaint function level 720 uses two configuration properties to control how quickly requests handled by DirMaint are processed. The default values for these properties are changed in the CONFIG SAMPDVH file, which is copied to the CONFIG DATADVH file during the upgrade process. If your installation previously specified different values for these properties, consider removing them and accepting the new defaults. Specifically:

- The default for DVHWAIT_BATCH_INTERVAL is decreased to 0 seconds (00:00) from 1 second (00:01). This property causes DirMaint to wait the specified number of seconds before processing the next request. Setting this value to 0 seconds increases the throughput of the DirMaint servers.
- The default for DVHWAIT_CLUSTER_INTERVAL is decreased to 1 second (00:01) from 15 seconds (00:15). This property specifies the amount of time the DirMaint server waits after it has detected that the source directory is currently in use by one or more satellite servers. The recommended DirMaint configuration of ONLINE_VIA_DELTA and the use of DIAGNOSE code X'84' for directory update-in-place reduce the need for a large wait interval. The lowered value increases the throughput of DirMaint servers in an SSI environment.

APAR VM66044 is included with DirMaint function level 720. With this support, the DirMaint server uses the RACF command to communicate with RACF for most RACF commands, and uses the RAC command for the RVARY, SETR, SETROPTS, and SETEVENT commands. By default, the RACF command is given universal read access. If the RACF profile is being controlled in the VMCMD class, you must allow DIRMAINT to use the command. The procedure is documented in the section "Enabling DirMaint to Access the RACF Profile in the VMCMD Class" in *z/VM: Directory Maintenance Facility Tailoring and Administration Guide*.

For more information, see:

- [z/VM: Directory Maintenance Facility Commands Reference](#)
- [z/VM: Directory Maintenance Facility Messages](#)
- [z/VM: Directory Maintenance Facility Tailoring and Administration Guide](#).

[7.2 APAR] DirMaint Health Checker

With the PTF for APAR VM66175, the Directory Maintenance Facility (DirMaint), function level 720, provides an automated set of procedures to validate the configuration and health of the DirMaint servers on a daily basis and on demand. The tests are orchestrated by the DirMaint server and run on the DIRMAINT, DATAMOVE, and SATELLITE servers. Installation support personnel is notified of the results of the tests.

The DirMaint configuration files control whether the tests are automatically run. Defaults are provided that automatically run the tests once a day as the result of DirMaint New Day processing (driven by the DVHNDAY exec). The installation may specify the following:

- whom to contact with the results of the tests
- whether to send the results: always, on a significant warning/error, or on any warning
- which DirMaint servers to test
- which tests to run
- modifications to individual test parameters in order to change defaults

In addition to being automatically run, the health checker can be invoked by the new IVP command. If submitted to the DirMaint machine, the health checker will check the health of the DirMaint server and any configured DATAMOVE and SATELLITE servers. The command can also be invoked from the console of a DATAMOVE or SATELLITE server to only check the health of that server.

The following DirMaint subcommands are updated:

DATAMOVE
SATELLITE

The following DirMaint subcommand is added:

IVP

For more information, see:

- [z/VM: Directory Maintenance Facility Commands Reference](#)
- [z/VM: Directory Maintenance Facility Messages](#)
- [z/VM: Directory Maintenance Facility Tailoring and Administration Guide](#).
- [z/VM: Getting Started with Linux on IBM Z](#).

[7.2 APAR] EDEVICE Optional LUN Specification

With the PTF for APAR VM66420, the LUN operand on the SET EDEVICE command and the EDEVICE system configuration statement is optional after the first path is established.

The following CP commands have been updated:

SET EDEVICE

The following system configuration statement has been updated:

EDEVICE

For more information, see:

- [z/VM: CP Planning and Administration](#)
- [z/VM: CP Commands and Utilities Reference](#)

[7.2 APAR] CP QUERY DEVICES command

With the PTF for APAR VM66469, the new CP QUERY DEVICES command displays device setting information. The command reports real device settings that are established by the DEVICES configuration statement and the SET DEVICES command. The objective of the CP QUERY DEVICES command is to allow clients to confirm that device settings are as intended.

The following CP commands have been updated:

QUERY

For more information, see:

- [z/VM: CP Commands and Utilities Reference](#)

[7.2 APAR] Spool information enhancements

With the PTF for APAR VM66479, z/VM enhances spool subsystem interfaces to provide additional information. These extensions to the existing interfaces allow clients to manage spool files and volumes more effectively. This support enables spool management software, such as the IBM Operations Manager for z/VM, to facilitate client DASD migration and backup activities.

This support includes changes to the following:

- DIAGNOSE Code X'D8' — Read Spool File Blocks on System Queues
- The Spool System Service (*SPL).

For more information, see [z/VM: CP Programming Services](#).

[7.2 APAR] EDEVICE Path Management Enhancements

With the PTF for APAR VM66507, z/VM 7.2 improves the following aspects of EDEVICE path management:

- Path selection
- Path state tracking
- Path health checking

Updates to the following commands enable the user to display and clear detailed information associated with individual path activity:

- QUERY EDEVICE
- SET EDEVICE

The following CP monitor record has been updated:

- Domain 6 Record 24 - MRIODSZI - SCSI Device Activity

For more information, see:

- “CP Commands” on page 194
- [z/VM: CP Commands and Utilities Reference](#)

[7.2 APAR] HELP File Enhancements

With the PTFs for APARs VM66511 (CP), VM66512 (CMS), and VM66513 (VMSES), the z/VM Help facility adds information for CP User Directory Statements and for CP System Configuration Statements previously documented only in *z/VM: CP Planning and Administration*. HELP files of type HELPDIRE are added to support the new DIRECTORY HELP component. HELP files of type HELPSYSC are added to support the new SYSCONFIG HELP component.

The following HELP files are added:

File name	File type	Description
DIRECTOR	HELPAABR	Abbreviations and synonyms for user directory statements file names
SYSCONFI	HELPAABR	Abbreviations and synonyms for system configuration statements file names
DIRECTOR	HELPCP	Overview of the user directory files
SYSCONFI	HELPCP	Overview of the system configuration files
ACCOUNT	HELPDIRE	ACCOUNT directory statement
ACIGROUP	HELPDIRE	ACIGROUP directory statement
ADJUNCT	HELPDIRE	ADJUNCT directory statement
APPCPASS	HELPDIRE	APPCPASS directory statement
BUILD	HELPDIRE	BUILD directory statement
CATEGORI	HELPDIRE	A list of directory statements by category
CLASS	HELPDIRE	CLASS directory statement
COMMAND	HELPDIRE	COMMAND directory statement
CONSOLE	HELPDIRE	CONSOLE directory statement

<i>Table 5. (continued)</i>		
File name	File type	Description
CPU	HELPDIRE	CPU directory statement
CRYPTO	HELPDIRE	CRYPTO directory statement
D8ONECMD	HELPDIRE	D8ONECMD directory statement
DASDOPT	HELPDIRE	DASDOPT directory statement
DATEFORM	HELPDIRE	DATEFORMAT directory statement
DEDICATE	HELPDIRE	DEDICATE directory statement
DIRECTOR	HELPDIRE	DIRECTORY directory statement
GLOBALDE	HELPDIRE	GLOBALDEFS directory statement
GLOBALOP	HELPDIRE	GLOBALOPTS directory statement
IDENTITY	HELPDIRE	IDENTITY directory statement
INCLUDE	HELPDIRE	INCLUDE directory statement
IOPRIORI	HELPDIRE	IOPRIORITY directory statement
IPL	HELPDIRE	IPL directory statement
IUCV	HELPDIRE	IUCV directory statement
LINK	HELPDIRE	LINK directory statement
LOAD	HELPDIRE	LOAD directory statement
LOADDEV	HELPDIRE	LOADDEV directory statement
LOGONBY	HELPDIRE	LOGONBY directory statement
MACHINE	HELPDIRE	MACHINE directory statement
MAXSTORA	HELPDIRE	MAXSTORAGE directory statement
MDISK	HELPDIRE	MDISK directory statement
MINIOPT	HELPDIRE	MINIOPT directory statement
NAMESAVE	HELPDIRE	NAMESAVE directory statement
NICDEF	HELPDIRE	NICDEF directory statement
NOPDATA	HELPDIRE	NOPDATA directory statement
OPTION	HELPDIRE	OPTION directory statement
POOL	HELPDIRE	POOL directory statement
POSIXGLI	HELPDIRE	POSIXGLIST directory statement
POSIXGRO	HELPDIRE	POSIXGROUP directory statement
POSIXINF	HELPDIRE	POSIXINFO directory statement
POSIXOPT	HELPDIRE	POSIXOPT directory statement

<i>Table 5. (continued)</i>		
File name	File type	Description
PROFILE	HELPDIRE	PROFILE directory statement
SCREEN	HELPDIRE	SCREEN directory statement
SHARE	HELPDIRE	SHARE directory statement
SPECIAL	HELPDIRE	SPECIAL directory statement
SPOOL	HELPDIRE	SPOOL directory statement
SPOOLFIL	HELPDIRE	SPOOLFILE directory statement
STDEVOPT	HELPDIRE	STDEVOPT directory statement
STORAGE	HELPDIRE	STORAGE directory statement
SUBCONFI	HELPDIRE	SUBCONFIG directory statement
SYSAFFIN	HELPDIRE	SYSAFFIN directory statement
USER	HELPDIRE	USER directory statement
VMRELOCA	HELPDIRE	VMRELOCATE directory statement
XAUTOLOG	HELPDIRE	AUTOLOG and XAUTOLOG directory statements
XCONFACC	HELPDIRE	XCONFIG ACCESSLIST directory statement
XCONFADD	HELPDIRE	XCONFIG ADDRSPACE directory statement
XCONFIG	HELPDIRE	XCONFIG directory statement
DIRECTOR	HELPMENU	Menu of directory statements topics
SYSCASSO	HELPMENU	Menu of ASSOCIATE system configuration statements
SYSCDEFI	HELPMENU	Menu of DEFINE system configuration statements
SYSCDISA	HELPMENU	Menu of DISABLE system configuration statements
SYSCENAB	HELPMENU	Menu of ENABLE system configuration statements
SYSCMODI	HELPMENU	Menu of MODIFY system configuration statements
SYSCONFI	HELPMENU	Menu of system configuration statements
SYSCRDEV	HELPMENU	Menu of RDEVICE system configuration statements
SYSCSET	HELPMENU	Menu of SET system configuration statements

Table 5. (continued)

File name	File type	Description
SYSCSYST	HELPMENU	Menu of SYSTEM system configuration statements
SYSCUSER	HELPMENU	Menu of USER system configuration statements
SYSCXLIN	HELPMENU	Menu of XLINK system configuration statements
ACTIVISL	HELPSYSC	ACTIVATE ISLINK system configuration statement
ALTEROPE	HELPSYSC	ALTERNATE_OPERATORS system configuration statement
ASSOCEXI	HELPSYSC	ASSOCIATE EXIT system configuration statement
ASSOCMES	HELPSYSC	ASSOCIATE MESSAGES system configuration statement
BEGINEND	HELPSYSC	BEGIN and END system configuration statements
CHARADEF	HELPSYSC	CHARACTER_DEFAULTS system configuration statement
CPACCESS	HELPSYSC	CP_ACCESS system configuration statement
CPADDONI	HELPSYSC	CP_ADDON_INITIALIZE_ROUTINES system configuration statement
CPOWNED	HELPSYSC	CP_OWNED system configuration statement
CPXLOAD	HELPSYSC	CPXLOAD system configuration statement
CRYPTAPV	HELPSYSC	CRYPTO APVIRTUAL system configuration statement
CU	HELPSYSC	CU system configuration statement
DEFINALI	HELPSYSC	DEFINE ALIAS system configuration statement
DEFINCOM	HELPSYSC	DEFINE COMMAND system configuration statement
DEFINDIA	HELPSYSC	DEFINE DIAGNOSE system configuration statement
DEFINEXI	HELPSYSC	DEFINE EXIT system configuration statement
DEFINLAN	HELPSYSC	DEFINE LAN system configuration statement

<i>Table 5. (continued)</i>		
File name	File type	Description
DEFINVSU	HELPSYSC	DEFINE VSWITCH system configuration statement
DEVICES	HELPSYSC	DEVICES system configuration statement
DISABCOM	HELPSYSC	DISABLE COMMAND system configuration statement
DISABDIA	HELPSYSC	DISABLE DIAGNOSE system configuration statement
DISABEXI	HELPSYSC	DISABLE EXITS system configuration statement
DISTRIBU	HELPSYSC	DISTRIBUTE system configuration statement
DRAIN	HELPSYSC	DRAIN system configuration statement
EDEVICE	HELPSYSC	EDEVICE system configuration statement
EMERGMES	HELPSYSC	EMERGENCY_MESSAGE_CONSOLES system configuration statement
ENABLCOM	HELPSYSC	ENABLE COMMAND system configuration statement
ENABLDIA	HELPSYSC	ENABLE DIAGNOSE system configuration statement
ENABLEXI	HELPSYSC	ENABLE EXITS system configuration statement
ENCRYPAG	HELPSYSC	ENCRYPT system configuration statement
ENFORBYV	HELPSYSC	ENFORCE_BY_VOLID system configuration statement
EQUATE	HELPSYSC	EQUATE system configuration statement
EXTERSYN	HELPSYSC	EXTERNAL_SYNTAX system configuration statement
FEATURES	HELPSYSC	FEATURES system configuration statement
FORMDEFA	HELPSYSC	FORM_DEFAULT system configuration statement
HOTIORAT	HELPSYSC	HOT_IO_RATE system configuration statement
IMBED	HELPSYSC	IMBED system configuration statement

<i>Table 5. (continued)</i>		
File name	File type	Description
INITMITI	HELPSYSC	INIT_MITIME system configuration statement
IODF	HELPSYSC	IODF system configuration statement
JOURNALI	HELPSYSC	JOURNALING system configuration statement
LOGOCONF	HELPSYSC	LOGO_CONFIG system configuration statement
MODIFCOM	HELPSYSC	MODIFY COMMAND system configuration statement
MODIFDIA	HELPSYSC	MODIFY DIAGNOSE system configuration statement
MODIFEXI	HELPSYSC	MODIFY EXIT system configuration statement
MODIFLAN	HELPSYSC	MODIFY LAN system configuration statement
MODIFPOR	HELPSYSC	MODIFY PORT system configuration statement
MODIFPRI	HELPSYSC	MODIFY PRIV_CLASSES system configuration statement
MODIFVSW	HELPSYSC	MODIFY VSWITCH system configuration statement
MULTITHR	HELPSYSC	MULTITHREADING system configuration statement
OPERACON	HELPSYSC	OPERATOR_CONSOLES system configuration statement
PAGING	HELPSYSC	PAGING system configuration statement
PRINTTIT	HELPSYSC	PRINTER_TITLE system configuration statement
PRIVCLAS	HELPSYSC	PRIV_CLASSES system configuration statement
PRODUCT	HELPSYSC	PRODUCT system configuration statement
RDEVI327	HELPSYSC	RDEVICE system configuration statement for graphic display devices
RDEVI37X	HELPSYSC	RDEVICE system configuration statement for communication controllers
RDEVI380	HELPSYSC	RDEVICE system configuration statement for 3800 printers

<i>Table 5. (continued)</i>		
File name	File type	Description
RDEVIAFP	HELPSYSC	RDEVICE system configuration statement for advanced function printers
RDEVICE	HELPSYSC	RDEVICE system configuration statement
RDEVICOM	HELPSYSC	RDEVICE system configuration statement for special devices
RDEVIDAS	HELPSYSC	RDEVICE system configuration statement for DASD
RDEVIPRT	HELPSYSC	RDEVICE system configuration statement for impact printers
RDEVIPUN	HELPSYSC	RDEVICE system configuration statement for card punches
RDEVIRDR	HELPSYSC	RDEVICE system configuration statement for card readers
RDEVITAP	HELPSYSC	RDEVICE system configuration statement for tape units
RDEVITER	HELPSYSC	RDEVICE system configuration statement for terminals
RDEVIUNS	HELPSYSC	RDEVICE system configuration statement for unsupported devices
RECQUAL	HELPSYSC	Record qualifiers that can be specified on system configuration statement
RELOCDOM	HELPSYSC	RELOCATION_DOMAIN system configuration statement
SAY	HELPSYSC	SAY system configuration statement
SETSHUTD	HELPSYSC	SET SHUTDOWNTIME system configuration statement
SETSIGNA	HELPSYSC	SET SIGNAL system configuration statement
SETVARIA	HELPSYSC	SET VARIABLE system configuration statement
SRM	HELPSYSC	SRM system configuration statement
SSI	HELPSYSC	SSI system configuration statement
START	HELPSYSC	START system configuration statement
STORAGE	HELPSYSC	STORAGE system configuration statement

<i>Table 5. (continued)</i>		
File name	File type	Description
SYSTEALI	HELPSYSC	SYSTEM_ALIAS system configuration statement
SYSTEMDAT	HELPSYSC	SYSTEM_DATEFORMAT system configuration statement
SYSTEIDD	HELPSYSC	SYSTEM_IDENTIFIER system configuration statement
SYSTEIDE	HELPSYSC	SYSTEM_IDENTIFIER_DEFAULT system configuration statement
SYSTEMRES	HELPSYSC	SYSTEM_RESIDENCE system configuration statement
SYSTEMUSE	HELPSYSC	SYSTEM_USERIDS system configuration statement
THROTTLE	HELPSYSC	THROTTLE system configuration statement
TIMEZBOU	HELPSYSC	TIMEZONE_BOUNDARY system configuration statement
TIMEZDEF	HELPSYSC	TIMEZONE_DEFINITION system configuration statement
TOLERCON	HELPSYSC	TOLERATE_CONFIG_ERRORS system configuration statement
TRANSTAB	HELPSYSC	TRANSLATE_TABLE system configuration statement
USERDEFA	HELPSYSC	USER_DEFAULTS system configuration statement
USERFORM	HELPSYSC	USERFORM system configuration statement
USERVOLE	HELPSYSC	USER_VOLUME_EXCLUDE system configuration statement
USERVOLI	HELPSYSC	USER_VOLUME_INCLUDE system configuration statement
USERVOLL	HELPSYSC	USER_VOLUME_LIST system configuration statement
USERVOLR	HELPSYSC	USER_VOLUME_RDEV system configuration statement
VMLAN	HELPSYSC	VMLAN system configuration statement
XLINKDEV	HELPSYSC	XLINK_DEVICE_DEFAULTS system configuration statement
XLINKSYE	HELPSYSC	XLINK_SYSTEM_EXCLUDE system configuration statement
XLINKSYI	HELPSYSC	XLINK_SYSTEM_INCLUDE system configuration statement

<i>Table 5. (continued)</i>		
File name	File type	Description
XLINKVOE	HELPSYSC	XLINK_VOLUME_EXCLUDE system configuration statement
XLINKVOI	HELPSYSC	XLINK_VOLUME_INCLUDE system configuration statement

[7.2 APAR] DirMaint Performance Enhancements

The PTF for APAR VM66298 provides enhancements to DirMaint that are intended to improve the performance of the DirMaint servers and enhance the automated IVP (installation verification program) to problems.

The performance enhancements improve the throughput of DirMaint requests in the environment where DirMaint is managing multiple z/VM systems using satellite servers by doing the following:

- Reducing the types of requests that require DirMaint servers to obtain the intersystem locking disk for serialization of changes to the source directory. Commands that do not change source-directory-related files no longer obtain the lock. This reduces the possibility of delays in updating the object directories due to either DirMaint or the satellite servers requiring the lock while the other server requires it.
- Improving throughput of requests that require the DirMaint server to interact with the satellite servers or DATAMOVE servers. Responses from satellite and DATAMOVE servers are given priority over new requests from non-DirMaint servers.

Enhancements to the automated IVP are intended to prevent future problems, detect current problems, or reduce the complexity of interacting with DirMaint to perform debugging operations. New tests have been added to verify that the following are true:

- DirMaint and satellite servers are configured for UPDATE_IN_PLACE
- Non-informational messages have not been generated by the server within the last 24 hours
- Server termination messages (DVHxxx2194T or DVHxxx3895t) have not been generated by the server within the last 24 hours
- DATAMOVE machines do not own disks that are related to previously failed or canceled work units

[7.2 APAR] Increase crashkernel area size

With the PTFs for APAR VM66677, z/VM 7.2 and 7.3 increase the size of crashkernel area allocated by stand-alone dump programs in preparation for a future enhancement.

The following CP messages are updated:

- HCP955W
- HCP4523W
- HCP8641E

The minimum real memory size required to IPL z/VM as a first-level system is 512 MB. See the SDINST entry in [Table 9 on page 240](#).

Security

These topics describe changes in security features of z/VM.

[7.1 APAR] PVM Secure Connectivity

With the PTF for APAR VM66331, VM/Pass-Through Facility (PVM) Version 2 Release 1.1 is updated to support secure connectivity via TCP/IP. PVM TCPIP links can communicate securely when configured with

an x.509 digital certificate that will be used to encrypt/decrypt all data flowing over the link using TLS protocols.

Traffic that was previously unencrypted and potentially exposed to sniffers on a network can now be protected. This is especially important when data being transferred includes user IDs and passwords.

For more information, see [VM/Pass-Through Facility: TCP/IP Line Driver Support](#).

[7.1 APAR] Multi-Factor Authentication for z/VM within the RACF server

With the PTF for APAR VM66338, Multi-Factor Authentication (MFA) within RACF provides for the establishment of a user's identity by utilizing more than one type of authentication. This provides greater security by allowing for an additional form of proof in the event that one token (for example, a password) becomes compromised. Previously, authentication of identity during the logon process could be met only by using a password or passphrase. MFA enables support for an external service to authenticate tokens that have been generated after a successful multi-factor authentication.

To be notified when this function becomes available, see [IBM: z/VM Continuous Delivery News \(https://www.vm.ibm.com/newfunction/\)](https://www.vm.ibm.com/newfunction/).

[7.1 APAR] CP support for MFA

With the PTF for APAR VM66324, z/VM provides the necessary CP support to enable multi-factor authentication in external security managers (ESMs).

The following CP command has been updated:

- LOGON

For more information, see:

- [Table 8 on page 194](#)
- [z/VM: CP Commands and Utilities Reference](#)

[7.2 APAR] Change TLS Server to IPL ZCMS

The PTF for z/VM 7.2 APAR PH24751 is the ordering mechanism for the Federal Information Processing Standard (FIPS) 140-2 validated level of z/VM System SSL. As part of this PTF, IBM recommends that any application using System SSL (such as the TLS server or the z/VM LDAP server) be updated to IPL ZCMS instead of CMS.

For more information, see [z/VM: TCP/IP Planning and Customization](#).

[7.2 APAR] TLS/SSL OCSP Support

With the PTF for APAR PH28216, z/VM provides general peer certificate cross-checking against an external source, through the Online Certificate Status Protocol (OCSP) and CRL (Certificate Revocation List) Distribution Point (CDP) mechanisms that are part of the z/VM System SSL Cryptographic library, when the peer certificate is built with the extensions for CDP and OCSP. OCSP was codified in RFC 6960 and CDP was documented as part of RFC 5280.

Updated support includes:

- Addition of the OCSPParms tag to DTCPARMS
- Refactoring of the VMSSL information, based on the :Parms. tag.

For information about these and other changes made as a result of this support, see:

- [z/VM: TCP/IP Planning and Customization](#)
- [z/VM: TCP/IP Messages and Codes](#)

[7.2 APAR] RACF Enhancements

With the PTFs for APARs VM66459, VM66460, and VM66214, RACF has been enhanced as follows:

- The RACF command enhancements enable the RACF command processor to perform remote command execution inside an SSI cluster. This allows clients to use the SETROPTS, SETEVENT, and RVARY commands the same way as they are currently supported by the RAC command. This enhancement closes the gap for automation solutions which are required to execute RACF commands while also receiving commands through SMSG (such as the DirMaint-RACF interface).
- A new SMF record exit, ICHRSWX1, is called after SMF records have been written to disk. This exit can then be used to relay SMF records to other guests. Critical SMF records can be dynamically monitored and, if necessary, specific actions can be taken.

For more information, see:

- [z/VM: RACF Security Server System Programmer's Guide](#)
- [z/VM: RACF Security Server Command Language Reference](#)

[7.2 APAR] System SSL z/OS 2.3 Equivalence

With the PTFs for APAR PH33088, the z/VM 7.1 and 7.2 System SSL cryptographic libraries are upgraded to z/OS 2.3 equivalence.

For more information, see:

- [z/VM: TCP/IP User's Guide](#)
- [z/VM: TCP/IP Planning and Customization](#)

[7.2 APAR] RACF MFA fixpack

The PTF for APAR VM66528 provides resolution to the following MFA support issues within the RACF server:

- RACF termination on an IUCV communication error with the TCP/IP stack when using MFA
- Clarification of RACF MFA error messages

[7.2 APAR] Query SSL GSKKMAN Certificates

With the PTFs for APARs PH40080 (TCP/IP), VM66561 (CMS), and VM66581 (VMSES/E), z/VM provides support in TCP/IP for querying certificates within a specific GSKKMAN certificate database. The query lists certificate labels and displays certain attributes of the certificates.

Changes include the following:

- The following TCP/IP command has been added to provide a front-end interface to the GSKKMAN utility for querying SSL certificates:
 - [CERTMGR Command](#) (in [z/VM: TCP/IP User's Guide](#))
- The following CMS command has been updated to set the default database for querying SSL certificates from the GSKADMIN user ID:
 - [DEFAULTS command](#) (in [z/VM: CMS Commands and Utilities Reference](#))

For additional related z/VM 7.2 documentation updates, see:

- [z/VM: TCP/IP Messages and Codes](#)
- [z/VM: TCP/IP Planning and Customization](#)

Application Development and Deployment

These topics describe changes that can affect how you develop and deploy applications on z/VM.

[6.1] RPC-Based Systems Management APIs Not Supported

With z/VM 6.1, IBM has withdrawn support for the RPC-based systems management APIs. Only the sockets-based systems management APIs are supported. For information about the sockets-based APIs, see [z/VM: Systems Management Application Programming](#).

[6.1] LT MACRO Removed

The LT MACRO, which was replaced by the DMSLT MACRO in z/VM V5.2, has been removed from DMSGPI MACLIB.

[6.1] Enhanced Systems Management APIs

The z/VM systems management APIs are enhanced to enable the IBM z Unified Resource Manager to manage the z/VM hypervisor and the virtual servers it supports. The enhancements provide new and updated APIs and function in the following functional areas:

- System configuration file management
- User directory management
- Disk management
- Network management
- Discontiguous saved segment (DCSS) management
- Guest facilities management
- Directory parsing
- API function level interrogation

For more information, see [z/VM: Systems Management Application Programming](#).

[6.1] Program Management Binder Upgrade

The Program Management Binder for CMS has been upgraded to the level shipped with z/OS V1.11 MVS™ Program Management. The following functions have changed:

- The COMPAT option of the BIND command now includes two new suboptions, ZOSV1R10 and ZOSV1R11.
- The IEWPARMS DDNAME file can be used to set Binder options.
- The Binder includes a new C/C++ API.

For more information, see [z/VM: Program Management Binder for CMS](#).

[6.2] Enhanced Systems Management APIs

The z/VM systems management APIs are enhanced to support single system image (SSI) clusters and other new functionality in z/VM 6.2, and to support Unified Resource Manager enhancements provided with z196 Drivers D86 and D93. The z/VM systems management enhancements include new and updated APIs in the following functional areas:

- Single System Image Management
- Platform Performance Management
- Availability Management
- Energy Management
- Network Virtualization Management
- Hypervisor Virtualization Management
- Virtual Server Management
- Storage Virtualization Management

- Directory Management

For more information, see [z/VM: Systems Management Application Programming](#).

[6.2] Language Environment Upgrade

The z/VM Language Environment runtime libraries have been upgraded to z/OS V1.12 equivalency. See [z/VM: Language Environment User's Guide](#) for more information.

[6.2] Program Management Binder Upgrade

The program management binder for CMS has been upgraded to the z/OS V1.12 level. The following functions have changed:

- The COMPAT option of the BIND command now includes a new suboption: ZOSV1R12.
- The RMODE option of the BIND command now includes several new suboptions.

For more information, see [z/VM: Program Management Binder for CMS](#).

[6.2] Storage Location X'C8' Now Used by CMS Initialization

CMS initialization is now using the STFL instruction, which stores at location X'C8' a list of bits detailing hardware facilities. If a user application assumes the space at X'C8' is available and attempts to use it, that application might fail now that CMS is storing data there.

[6.2] XL C/C++ Compiler Upgrade

IBM XL C/C++ for z/VM, V1.3, is a z/VM-enabled version of the z/OS V1.12 XL C/C++ compiler. For more information, see [XL C/C++ for z/VM: User's Guide, SC09-7625](#).

[6.3] Enhanced Systems Management APIs

In z/VM 6.3, new APIs are added to perform the following functions:

- Obtain DASD read and write byte counts for SCSI EDEV and ECKD volumes owned by z/VM, and for which the control units have information.
- Obtain a list of the system devices assigned a device equivalency ID.
- Query the status of directory manager locks in effect for a specific virtual image.
- Query the links to an image's MDISK.
- Create, change, remove and obtain information about a network interface configuration for the z/VM TCP/IP stack.
- Query the status of directory manager locks in effect for a specific profile.
- Capture data to assist with identification and resolution of a problem with the SMAPI servers. (Note that both an API and a stand-alone EXEC are provided for this purpose.)
- Obtain information about a CP instance, including time, storage, system levels, IPL time, system generation time, language, CPU ID, and CPU capability information, and more.
- Obtain information about the z/VM paging space defined on the system.
- Gather hypervisor performance data, including available/used, processor number, total processor percentages, and optional detailed CPU information for all visible LPARs on the CEC, and query, set and stop the monitor rate and interval values.
- Query the status of an APAR, PTF, or RSU for a zVM component.
- Systematically end all system function.
- Obtain information about the z/VM spool space defined on the system.

Additional enhancements include:

- The LOHCOST Data Base, used to cache directory and meta data, is now available for use in all SMAPI installations.
- A new First Failure Data Capture tool (both an API version and a stand-alone version) are added for gathering information to assist in problem determination.

For more information, see [z/VM: Systems Management Application Programming](#).

[6.3] Program Management Binder Upgrade

The Program Management Binder for CMS has been upgraded to z/OS V1.13 equivalency. The following functions have changed:

- COMPAT option of the BIND command includes a new ZOSV1R13 parameter.
- STRIPSEC option of the BIND command includes a new PRIV parameter.
- Support for RLD conditional sequential resolution.

[6.3] Unified Resource Manager Support Withdrawn

The IBM z Unified Resource Manager, first supported in z/VM 6.1, is no longer supported in z/VM 6.3. Therefore z/VM 6.3 cannot participate as a member of an ensemble.

[6.3 APAR] Systems Management API Support for Multi-VSwitch Link Aggregation

With the PTF for APAR VM65670, the z/VM systems management API provides support for Multi-VSwitch Link Aggregation. The following APIs have been updated:

- Virtual_Network_Vswitch_Create_Extended
- Virtual_Network_Vswitch_Query_Extended
- Virtual_Network_Vswitch_Set_Extended

For more information about Multi-VSwitch Link Aggregation, see “[6.3 APAR] Multi-VSwitch Link Aggregation Support” on page 103. For information about the updated APIs, see [z/VM: Systems Management Application Programming](#).

[6.4] z/VM Program Management Binder z/OS V2.2 Equivalency

The Program Management Binder for CMS is upgraded to a level equivalent to z/OS V2.2. The updated z/VM support includes:

- Generalized alignment of the text elements and parts of a program
- A new SYMTRACE option to provide new binder messages displaying a trace of progress of binder symbol resolution for a specific symbol
- Updated support for Assembler J-cons
- Various reliability, availability, and serviceability (RAS) items

The following functions have changed:

- COMPAT option of the BIND command includes a new ZOSV2R1 parameter.
- SYMTRACE option of the BIND command is new.
- ALIGN control statement is new.

For more information, see [z/VM: Program Management Binder for CMS](#).

[6.4 APAR] VMUDQ Macro Identifies SUBCONFIGs That Contain MDISKs

With the PTF for APAR VM65877, the VMUDQ macro is enhanced to support identifying the IDs of SUBCONFIGs that contain MDISK definitions in an SSI-enabled or SSI-ready directory.

[6.4 APAR] Enhanced Systems Management APIs

With the PTF for APAR VM66120, new APIs are added to perform the following functions:

- Pause a running virtual machine and restart a paused virtual machine.
- Obtain virtual machine performance data.
- Manage the reader files of a virtual machine.
- Query the reader files of a virtual machine.
- SMSTATUS is automatically executed, and notification is sent to the system operator for specific error conditions.

For more information, see [z/VM: Systems Management Application Programming](#).

[7.1] GDDMXD/VM Support Removed

The z/VM Graphical Data Display Manager (GDDM) interface to the X Window System (GDDMXD/VM) is no longer supported. The interfaces and associated documentation have been removed.

[7.1] Change to the Default LOGONBY User ID

z/VM is changing from the default WD5JU8QP password for 50+ users to a LOGONBY model. This change introduces IBMVM1 as the default LOGONBY user ID for these 50+ users. This allows you to change one password and effectively change the access for all of these 50+ users. Note that this affects any SMAPI call via INET/INET6 servers – which use either AF_INET (IPv4) or AF_INET6 (IPv6) family sockets to connect with clients -- that use MAINT as the authorized user, because by default MAINT no longer has a password. Requests submitted with MAINT as the authorized user are not affected if the SMAPI call is submitted via IUCV.

For more information, see [z/VM: Systems Management Application Programming](#).

[7.2] Re-link-edit required for Reusable Server Kernel applications

If you have any Reusable Server Kernel (RSK) applications, you must re-link-edit them after you install z/VM 7.2 to ensure that they will work correctly.

For information about link-editing RSK applications, see [z/VM: Reusable Server Kernel Programmer's Guide and Reference](#).

[7.2 APAR] CP New Feature Interrogation API

With the PTF for APAR VM66439, a new API is provided to interrogate whether a named capability is present in the running CP system. This enhancement simplifies scripting and automation written by customers and vendors sensitive to the function level of CP. It facilitates adaptation of vendor products to varying CP code levels.

The following CP command has been updated:

```
QUERY VARIABLE
```

For more information, see:

- [z/VM: CP Commands and Utilities Reference](#)
- [IBM: z/VM New Function Variable List \(https://www.ibm.com/vm/newfunction/varlist.html\)](https://www.ibm.com/vm/newfunction/varlist.html)

[7.2 APAR] SMAPI Query Processors API

With the PTF for APAR VM66568, a new Systems Management API (SMAPI) provides information about the real processors available on a z/VM system.

The following API has been added: [System_Processor_Query](#) in [z/VM: Systems Management Application Programming](#).

System Diagnosis

These topics describe changes that can affect how you diagnose problems on z/VM.

[6.2] VM Dump Tool Enhancements

The following support is added to the VM Dump Tool:

- The TRACE subcommand will now support Function Related trace tables in addition to the standard CP trace table.
 - Related changes have also been made to the VMDTQRY command.
- A new macro, FRT2MAIN, has been added for Function Related trace tables.

For more information, see [z/VM: VM Dump Tool](#).

[6.3] Enhanced Dump Support

z/VM dump capabilities have been enhanced:

- The stand-alone dump utility has been rewritten. The new stand-alone dump creates a CP hard abend format dump, which is usually much smaller than a storage dump, and the dump is written to either ECKD or SCSI DASD.
- Larger memory sizes are supported, up to a maximum of 1 TB. The support includes stand-alone dump, hard abend dump, SNAPDUMP, DUMPLD2, and VM Dump Tool.
- Hard abend dump processing has been enhanced by writing out more than one page of the CP Frame Table per I/O. The CP Frame Table accounts for a significant portion of the dump on large storage systems. Compared with the previous version, on a system with the same amount of real storage and using the same DASD devices, the amount of time to create a hard abend dump or SNAPDUMP will decrease.

There are new recommendations on how much space to allow for dumps. See [z/VM: CP Planning and Administration](#).



Attention: The PTF for APAR VM65126 ("FIXES TO FCP DUMP SIMULATION") is required on first level systems where the new stand-alone dump program (SDINST) is going to be used to dump second level systems. The PTF is included on V540 RSU1202, V610 RSU1301, and V620 RSU1202. It is important for the first level system to have this fix, or various abends or incorrect operation of the new stand-alone dump program could occur.

The following utility is added for this support:

- SDINST

The following commands are updated for this support:

- CP DEFINE CPOWNED command
- CP SET DUMP command
- VM Dump Tool FRAMES command

A new DASD operand is added:

- DUMPLD2

The following configuration statement is changed:

- CP_OWNED

The following monitor record is changed:

- D1R7 - MRMTRMEM - Monitor Domain - Memory Configuration data

[6.4 APAR] DUMP Processing Enhancements

With the PTF for APAR VM65989, the amount of time it takes for z/VM to write a hardabend or snap dump to 3390 DASD may be reduced. The improvements were achieved via changes to the I/O channel program used to write central memory to z/VM spool space located on 3390 DASD.

The SNAPDUMP command has been changed to omit PGMBKs from the dump by default. PGMBKs are the CP structures used to define the virtual storage used by users on the system. In many cases, excluding PGMBKs results in a large reduction in dump size. An optional PGMBKS operand is added to allow PGMBKs to be included in the dump if desired.

For more information, see:

- [z/VM: CP Commands and Utilities Reference](#)

[7.1] Improvements to the z/VM Dump Process

Dump processing has been enhanced to reduce the time and space required to create, process, and transmit hardabend and snap dumps. The two largest dump components, the CP frame table and user PGMBKs, have been omitted for the majority of abends but can be included when using the SET DUMP or SNAPDUMP command. Excluding these components results in dumps that are considerably smaller, thus requiring less space in both the system SPOOL and CMS file system. Support to write hardabend and snap dumps to tape has been removed.

The following CP commands have been updated:

- QUERY ALL
- QUERY DUMP
- QUERY Real Device
- QUERY TAPES
- SET DUMP
- SNAPDUMP
- VMDUMPTL
- DUMPLOAD utility

Also see “[7.1 APAR] Additional Dump Processing Improvements” on page 181.

For more information, see:

- [z/VM: CP Commands and Utilities Reference](#)
- [z/VM: CP Planning and Administration](#)
- [z/VM: CP Messages and Codes](#)
- [z/VM: Diagnosis Guide](#)
- [z/VM: System Operation](#)
- [z/VM: VM Dump Tool](#)

[7.1] Stand-Alone Dump to Tape Support Removed

Tape is no longer supported as a media option for stand-alone dumps.

The following utilities have been updated:

- DUMPLOAD utility
- DUMPLD2
- XLINK FORMAT

The following utility has been deleted:

- HCPSADMP

Various messages associated with stand-alone dumps have been deleted.

For more information, see:

- [z/VM: CP Commands and Utilities Reference](#)
- [z/VM: CP Planning and Administration](#)
- [z/VM: CP Messages and Codes](#)
- [z/VM: Diagnosis Guide](#)
- [z/VM: VM Dump Tool](#)

[7.1 APAR] Additional Dump Processing Improvements

With the PTF for APAR VM66176, additional dump processing improvements are implemented to reduce the CPU time spent deciding what storage to include in a hard abend or snap dump.

[7.2 APAR] Fast Dump Distiller

With the PTF for APAR VM66430, clients can distill a hard abend or snap dump to create an abridged dump, which can be submitted to IBM customer support for diagnosis. The abridged dump alleviates the problems and delays that can occur when submitting a large hard abend dump or snap dump to IBM. The original dump remains available as a spool file and can be loaded into a CMS file for transmission to IBM later, if necessary.

The following CP utility has been updated: DUMpload.

For more information, see:

- [z/VM: CP Commands and Utilities Reference](#)
- [z/VM: CP Messages and Codes](#)

[7.2 APAR] Improve I/O Time for Dump Processing

With the PTF for APAR VM66431, z/VM exploits IBM Z High Performance FICON I/O technology (zHPF), when available, during the process of writing CP hard abend and snap dumps to CP dump/spool space. This reduces the amount of time a system is unavailable while a dump is being taken, before the system is re-IPLed. It shortens unplanned outages on systems with large amounts of real memory.

[7.2 APAR] Preserve Partial Hard Abend Dump

With the PTF for APAR VM66560, z/VM preserves partial dumps that are caused when an IPL of the partition ends the dump process before the dump completes. Previously, partial dumps that were ended by an IPL of the partition were not preserved after the IPL.

Documentation for the following CP utilities is updated:

- DUMpload. For more information, see [DUMpload](#) in [z/VM: CP Commands and Utilities Reference](#).
- DUMPLD2. For more information, see [DUMPLD2](#) in [z/VM: CP Commands and Utilities Reference](#).

Documentation for the following z/VM Dump Tool is updated:

- DUMPTYPE. For more information, see [DUMPTYPE Subcommand](#) in [z/VM: VM Dump Tool](#).

The following CP messages are updated:

- HCP8243I
- HCP8169I
- HCQ004E

The following CP messages are new:

- HCP9270E

- HCQ167E
- HCQ168W

For more information about CP messages, see *z/VM: CP Messages and Codes*.

Product Documentation

These topics describe changes to the format, location, or availability of the z/VM product documentation. For information about which z/VM publications have been updated for the new release, see [z/VM: General Information](#).

[6.1] Added Publications

The following publications have been added to the z/VM library:

- *System z®: Open Systems Adapter-Express Integrated Console Controller 3215 Support*, SA23-2247
- *System z10: Open Systems Adapter-Express3 Integrated Console Controller Dual-Port User's Guide*, SA23-2266

[6.1] Deleted Publications

The following z/VM publications have been discontinued:

- *z/VM Summary for Automated Installation and Service (DVD Installation)*, GA76-0406
- *z/VM Summary for Automated Installation and Service (DVD Installation)*, GA76-0407
- *IBM Online Library: z/VM Collection (CD-ROM version)*, SK2T-2067. This CD-ROM has been replaced by *IBM Online Library: z/VM Collection on DVD*, SK5T-7054.

[6.1] Relocated Information

The GSKKYMAN and GSKTRACE commands have been moved from *z/VM: TCP/IP LDAP Administration Guide* to *z/VM: TCP/IP User's Guide*.

[6.1] Media Changes

The following publications are no longer available as printed books:

- *z/VM: CMS Primer*
- *z/VM: Getting Started with Linux on System z*

These publications are still available in IBM BookManager and Adobe PDF formats.

[6.2] Relocated Information

LDAP client reason codes and return codes have been moved from *z/VM: TCP/IP LDAP Administration Guide* to *z/VM: TCP/IP Messages and Codes*.

[6.2] Media Changes

The program directories for the z/VM base product and its facilities, features, and prerequisite IBM products are no longer provided in printed form with the z/VM product. These publications are provided online in PDF files at [IBM z/VM 7.2 Program Directories \(https://www.ibm.com/vm/progdir\)](https://www.ibm.com/vm/progdir).

[6.3] Media Changes

License information for z/VM 6.3 is provided on a DVD supplied with the z/VM product:

- *z/VM 6.3 Agreements and License Information*, LC27-5378-00

The DVD includes the following documents:

- International Program License Agreement (PDF)
- *z/VM: License Information* (PDF)
- International Agreement for the Acquisition of Software Maintenance (PDF)
- Third-party notices (notices.htm)

Note: If these notices are updated between editions of the DVD, an updated notices.txt file is provided on the MAINT 193 disk.

[6.3] Procedures for Changing the Volume Labels and System Name of a Non-SSI z/VM System

New procedures are provided for performing the following tasks:

- Using DDR or FlashCopy to create a new z/VM system from an existing non-SSI z/VM system.
- Changing the DASD volume labels of the new z/VM system.
- Changing the system name of the new z/VM system.

See *z/VM: CP Planning and Administration*.

[6.3] SAPL Information Moved

Information about using the Stand-Alone Program Loader (SAPL) and passing IPL parameters has been moved from *z/VM: CP Planning and Administration* to *z/VM: System Operation*.

[6.4] New z/VM CMS Pipelines Documentation

To support the upgraded z/VM CMS Pipelines, the new *z/VM: CMS Pipelines User's Guide and Reference*, SC24-6252, replaces the following publications:

- *z/VM: CMS Pipelines Reference*, SC24-6169
- *z/VM: CMS Pipelines User's Guide*, SC24-6170

CMS Pipelines HELP files have been replaced with files derived from the new publication.

[6.4] z/VM Collection and z/VM Omnibus PKIT Discontinued

The *IBM Online Library: z/VM Collection* and the *IBM Online Library: z/VM Omnibus PKIT* have been discontinued. The final edition of the z/VM Collection was SK5T-7054-12, December 2016, and the final edition of the Omnibus PKIT was SK5T-9509-01, September 2017.

[6.4] z/VM Adobe Indexed PDF Collection

The *z/VM Adobe Indexed PDF Collection* is designed to provide users with an offline way to search the z/VM library. The collection contains PDF files for all the publications in the z/VM library, an HTML index listing the titles, and an Adobe Acrobat full text search index for the entire collection. Using the search index, you can perform a comprehensive search across all the PDFs delivered in the collection. To read and search the PDF files, all you need is the Adobe Acrobat Reader. Search results are displayed in context by publication title to help users who are familiar with the library to find the information they want more quickly.

Starting with z/VM 6.4, a Collection will be created for each new z/VM release. The Collection for the latest z/VM release will be regularly refreshed to include new editions of publications updated for New Function APARs.

The Collection is available as a zip file that you can download from [IBM: z/VM Internet Library \(https://www.ibm.com/vm/library\)](https://www.ibm.com/vm/library) or [IBM Publications Center \(https://www.ibm.com/e-business/linkweb/publications/servlet/pbi.wss\)](https://www.ibm.com/e-business/linkweb/publications/servlet/pbi.wss). (In the IBM Publications Center, use the publications search function to locate the file.)

- *z/VM V6R4 Adobe Indexed PDF Collection*, SC27-9086

- *z/VM V7R1 Adobe Indexed PDF Collection, SC27-9087*

[7.1] Continuous Delivery Capability for z/VM Documentation

IBM has enabled the z/VM documentation for Continuous Delivery capability, to update topics in IBM Documentation and publications in PDF format as the need arises.

Links to z/VM 7.x PDFs are provided in [IBM Documentation - z/VM \(https://www.ibm.com/docs/en/zvm\)](https://www.ibm.com/docs/en/zvm). (z/VM 7.x PDFs are not provided in the IBM Publications Center.)

- The PDF file name has the format `xxxxx_v7ry`, where `xxxxx` is the publication (title) ID and `y` is the release number. The file name will remain constant for the duration of the release, regardless of how many times the publication is updated.
 - PDF files are easily replaced with new editions on the web page.
 - PDF links (which link to the file name) are preserved when the target publications are updated with new editions.
- The publications have new order numbers for 7.x. The publication edition is identified by the order number suffix (starting with -00 for the 7.1 GA publications).

This web page provides the latest edition of each z/VM 7.x publication. For previous editions, see [IBM: z/VM Internet Library \(https://www.ibm.com/vm/library\)](https://www.ibm.com/vm/library).

- The date when a PDF file was last updated is indicated on the web page and in the edition notice of the publication.

[7.1] Deleted Publications

The following publications have been deleted from the z/VM 7.1 library:

- *z/VM: Enabling z/VM for OpenStack (Support for OpenStack Newton Release), SC24-6253*
- *z/VM: Glossary, GC24-6195*

[7.2] IBM Knowledge Center is now IBM Documentation

All IBM product documentation now resides in [IBM Documentation \(IBM Docs\)](https://www.ibm.com/docs):

<https://www.ibm.com/docs>

- To take a quick look at some of the features of **IBM Docs**, click on the black **Guided tour** button to the right of the **Search in IBM Documentation** field on the [IBM Docs welcome page \(https://www.ibm.com/docs\)](https://www.ibm.com/docs).
- To search for a product, click on the black **View all products in IBM Documentation** button on the [IBM Docs welcome page](https://www.ibm.com/docs). This takes you to the [IBM Documentation products page](https://www.ibm.com/docs/en/products):

<https://www.ibm.com/docs/en/products>

Type the product name in the **Filter within the product catalog** field (or click on the first letter of the product name in the menu below that) and then click on the product name shown in the search results.

- You can find the z/VM 7.2 documentation here:

<https://www.ibm.com/docs/en/zvm/7.2>

To display the table of contents, click on the right arrow (➤) in the lower-left corner.

Previously, IBM Knowledge Center (<https://www.ibm.com/support/knowledgecenter>) was the repository for all IBM product documentation. For supported products, the IBM Knowledge Center URLs are redirected to the corresponding IBM Documentation URLs permanently.

Chapter 3. Changes to External Interfaces

These topics identify changes to specific external interfaces in the z/VM components (except Language Environment). External interfaces are commands, routines, macros, DIAGNOSE codes, directory control statements, and so on. If an external interface has changed, you might need to change the way that you use it. Each change is identified as either **upwardly compatible** or **incompatible**. For definitions of these terms, see [“Compatibility Terms”](#) on page 3.

Changes to external interfaces are identified in the following major topics:

- [“CP Changes”](#) on page 185
- [“CMS Changes”](#) on page 257
- [“Dump Viewing Facility Changes”](#) on page 271
- [“GCS Changes”](#) on page 272
- [“REXX/VM Changes”](#) on page 272
- [“VMSES/E Changes”](#) on page 272

Notes:

1. There are no changes to AVS or TSAF external interfaces.
2. For information about changes to Language Environment, see [z/VM: Language Environment User's Guide](#).

CP Changes

Changes to CP interfaces are identified in the following topics:

- [“System Configuration Statements”](#) on page 185
- [“User Directory Statements”](#) on page 192
- [“CP Commands”](#) on page 194
- [“CP Utilities”](#) on page 240
- [“Dynamic I/O Return Codes”](#) on page 244
- [“DIAGNOSE Codes”](#) on page 247
- [“CP Macros”](#) on page 254
- [“CP System Services”](#) on page 255
- [“VM Dump Tool”](#) on page 256

For information about changes to CP monitor records, see [z/VM Data Areas, Control Blocks, and Monitor Records](#) (<https://www.vm.ibm.com/pubs/ctlblk.html>).

System Configuration Statements



Warning: Care should be taken when adding new operands to existing statements in the system configuration file. When a statement is processed by a CLOAD module that does not include support for the new operands on the statement, an error message is displayed and the entire statement will be ignored. This will cause features and settings that were previously in effect on your system to no longer be in effect. Backing out to a previous CLOAD module or running a mixed-release / mixed-service level SSI cluster are situations where an older CLOAD module may be used. To avoid issues caused by an existing statement being ignored, code each new operand on a separate statement until it is supported by all releases of CP that will use this system configuration file. Also, ensure the new statement is within a "TOLERATE_CONFIG_ERRORS YES" section of the file if you wish to avoid being prompted during CP initialization.

Table 6 on page 186 lists system configuration statements that have changed. For additional information, see *z/VM: CP Planning and Administration*.

Table 6. Changes to System Configuration Statements

Statement	Changes
BEGIN / END	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New statements. These statements are not valid on any prior release. When IPLing a prior release, the release displays a message that the BEGIN or END statement is not a valid system configuration file statement. Every statement inside the BEGIN block is then always processed as though it was not inside a BEGIN block. This processing could cause the system configuration to be different than what was intended. Do not use these new statements until you are sure that you will never revert to a release that does not support them.
CP_OWNED	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.3] OWN and SHARED operands are ignored in all environments. CSE is no longer supported. The undocumented function of the SHARED operand to turn off minidisk caching for the specified volume is no longer supported. To turn off minidisk caching for a volume being shared through cross-system link (XLINK), which is still supported for non-SSI systems, specify SHARED YES on the RDEVICE configuration statement for the device. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] OWN and SHARED operands are ignored when configured for an SSI cluster. • [6.3] New recommendations for allocating space for dumps. • [6.3] New operand: RDEV <i>rdev</i>.
CRYPTO APVIRTUAL	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3 VM65577] New statement for specifying APs and domains for shared crypto use. • [6.4 VM65942] Supports new AP types for Crypto Express6S: CEX6A, CEX6C, and CEX6S. • [7.1 VM66248] Supports new AP types for Crypto Express7S: CEX7A, CEX7C, and CEX7S. • [7.2 VM66532] Supports new AP types for Crypto Express8S: CEX8A, CEX8C, and CEX8P. • [7.2 VM66534] New operand POLLING, which controls whether crypto polling is on or off.
CU	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3] New operand: NOPPRCSN. • [6.4] New operands, usage notes, and example: ALIAS, MDISK_SHARE, PAGING_SHARE.

Table 6. Changes to System Configuration Statements (continued)

Statement	Changes
DEFINE VSWITCH	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.1] New default value for NATIVE <i>natvid</i> option is 1. • [6.4] Removed operands: IEDN, INMN. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.1] New operands: TYPE, NOUPLINK, VLAN AWARE, NATIVE NONE. • [6.2] New operands: PORTBASED, USERBASED. • [6.2] New operands: BRIDGEPORT, UPLINK. • [6.2] New example for BRIDGEPORT. • [6.3 VM65583] New operands: IVL, GLOBAL, LOCAL. • [6.4 VM65925] Operational differences between USERBASED and PORTBASED VSwitches have been eliminated, although the specific designation might be significant for a relocation within an SSI cluster. • [7.1 VM66219] New operand: PRIQUEUEING.
DEVICES	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.1] New operand: SENSED_BUT_OFFLINE.
DISTRIBUTE	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4 VM65872] MAXIMUM can be specified with IUCV NO (meaningful only within an SSI cluster). • [6.4 VM65872] Message HCP3012I (replacing HCP3012E) is issued at IPL if another member of the SSI cluster is configured with a different Distribute IUCV policy (or a different MAXIMUM buffer size) than the local node.
EDEVICE	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.1] New operand: XIV. • [6.2] New operands: EQID, NOEQID. • [6.2] New responses for device equivalency ID (EQID) operand. • [6.1] New operand: SENSED_BUT_OFFLINE. • [7.2] <i>edev</i> operand updated to support 4- and 5-digit hexadecimal numbers. • [7.2 VM66420] <i>LUN</i> operand optional after specified on the first path.
ENCRYPT	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [7.2] Remove IPL parameter: PAGING63.

Table 6. Changes to System Configuration Statements (continued)


Statement	Changes
FEATURES	<p> Warning: Care should be taken when adding new features to existing FEATURES statement in the system configuration file. For details, see “System Configuration Statements” on page 185.</p> <p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.4] Code for the PASSWORDS_ON_CMDS operand has been changed to implement the default "No" values documented in <i>z/VM: CP Planning and Administration</i>. The IBM-provided system configuration file will no longer include a statement specifying any PASSWORDS_ON_CMDS values as "Yes". • [7.2] Updated operand: RECOVERY_BOOST. The default has changed to ENABLE. • [7.2] Updated options on the ENABLE and DISABLE operands: CLEAR_TDISK. The default has changed to ON to enable automatic clearing. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.1] New options on the ENABLE and DISABLE operands: STP_TIMESTAMPING, STP_TIMEZONE, STP_TZ, XRC_OPTIONAL, XRC_TEST. • [6.3] NOLIMIT operand now means that the system-defined limit of 99,999 logged on users is the maximum number allowed. • [6.4] New ENABLE and DISABLE operands: PAGING_ALIAS, PAGING_HPF. • [6.4 and 7.1 VM65971] New ENABLE and DISABLE operand: UNRESPONSIVE_PROCESSOR_DETECTION. • [7.1 VM66283] New ENABLE and DISABLE operand: RECOVERY_BOOST • [7.2] New option ADJUNCTs for DISABLE and ENABLE operands. The default is to enable the Adjuncts feature. • [7.2 VM66173] Added recommendation to use the new PAGING features statement instead of using the PAGING_ALIAS and PAGING_HPF features statements.
IPL	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.2 VM66173] New operand: STORE=INITIAL. Updated operand: STORE=nnnn updated to specify the amount of permanent storage to initialize.
MODIFY COMMAND / CMD	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.3] UCR and OVERRIDE information has been removed. UCR spool files and the OVERRIDE utility are no longer supported.
MODIFY DIAGNOSE	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.3] UCR and OVERRIDE information has been removed. UCR spool files and the OVERRIDE utility are no longer supported.
MODIFY LAN	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.1] New operand: MACPROTECT.

Table 6. Changes to System Configuration Statements (continued)

Statement	Changes
MODIFY PORT	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3 VM65583] New operands: EXCLUSIVE, SHARED. • [6.4 VM65918] New operands: LOADBALANCING COLLABORATIVE, LOADBALANCING INDEPENDENT. • [6.4 VM65918] Updated operand: INTERVAL.
MODIFY PRIV_CLASSES	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.3] UCR and OVERRIDE information has been removed. UCR spool files and the OVERRIDE utility are no longer supported.
MODIFY VSWITCH	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.4] Removed operand: OSDSIM. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.1] New operands: OSDSIM, UPLINK, NIC, MACPROTECT. • [6.2] New operands: PORTNUMBER and VLANID. • [6.2] New operands: PATHMTUDISCOVERY. BRIDGEPORT BUFFERS. • [6.3] New operand: VEPA. • [6.4 VM65925] Updated operands: GRANT, PORTTYPE, NIC, PORTNUMBER, VLANID. • [6.4 VM65925] Updated usage notes. • [7.1 VM66219] New operand: PQUPLINKTX. • [7.2 VM66557] New operand: NICDISTRIBUTION.
MULTITHREADING	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3 VM65586, VM65696] New statement for defining the multithreading characteristics of the system. • [6.4] Updated usage note to include multithreading information. • [7.1 VM66265] Updated usage notes with logical processors changes.
RDEVICE (Advanced Function Printers)	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New operands: EQID, NOEQID.
RDEVICE (Card Punches)	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New operands: EQID, NOEQID.
RDEVICE (Card Readers)	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New operands: EQID, NOEQID.
RDEVICE (Communication Controllers)	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New operands: EQID, NOEQID.
RDEVICE (DASD)	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New operands: EQID, NOEQID. • [7.2] <i>rdev</i>, <i>rdev1-rdev2</i> updated to support 4- and 5-digit hexadecimal numbers.

Table 6. Changes to System Configuration Statements (continued)

Statement	Changes
RDEVICE (Graphic Display Devices)	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New operands: EQID, NOEQID.
RDEVICE (Impact Printers)	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New operands: EQID, NOEQID.
RDEVICE (Special Devices)	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.1] LAN_ADAPTER device type has no function; documentation removed. <p>Upwardly Compatible:</p> <ul style="list-style-type: none"> • [6.2] New operands: EQID, NOEQID.
RDEVICE (Tape Units)	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New operands: EQID, NOEQID.
RDEVICE (Terminals)	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New operands: EQID, NOEQID.
RDEVICE (Unsupported Devices)	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New operands: EQID, NOEQID. • [6.3] Operands DPS=Yes and RESERVE_RELEASE=Yes are the defaults.
RDEVICE (3800 Printers)	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New operands: EQID, NOEQID.
RELOCATION_DOMAIN	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New statement. This statement is not valid on any prior release. When IPLing a prior release, the release displays a message that the RELOCATION_DOMAIN statement is not a valid system configuration file statement.
SET VARIABLE	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4] New statement for defining and setting an environment variable that is accessible to every class G user on the system.
SRM	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [7.2] The HiperDispatch default unparking setting is now UNPARKING MEDIUM. If desired, the default can be changed to LARGE by using this statement. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3] New statement for setting up the HiperDispatch environment. • [6.3 VM65586, VM65696] Horizontal polarization and the rebalance algorithm are not compatible with multithreading, and multithreading will not be enabled if either is requested. • [6.4 VM66063] New operands and associated usage notes: EXCESSUSE NONE, EXCESSUSE TYPE NONE, UNPARKING.

Table 6. Changes to System Configuration Statements (continued)

Statement	Changes
STORAGE	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3] New operands: AGELIST, SIZE, EARLYWRITES, RESERVED SYSMAX, EDEVICE. • [6.3 VM65417] New operands: IOAT, LOCKING. • [6.4] New AGELIST operand: KEEPSLOT. • [7.2 VM66173] New operands: AFTER_RESTART, AFTER_SHUTDOWN_REIPL, PERMANENT, RECONFIGURABLE. • [7.2 VM66271] Updated operand: RECONFIGURABLE. Allows up to 50% of real memory to be reconfigurable storage.
SYSTEM_IDENTIFIER	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New operands: LPAR, &LPARNAME. These operands are not valid on any prior release. When IPLing a prior release, the LPAR keyword does not display any error message because the keyword is used as the processor model. Use of the &LPARNAME operand displays an error message indicating that &LPARNAME is not a valid system identifier. In either case, the system identifier is not set as expected. This situation might cause various problems, especially if the system identifier is used as a record qualifier or on an EQUATE statement, causing the system configuration to be different than what was intended. Do not use these new operands until you are sure that you will never revert to a release that does not support them.
USER_VOLUME_RDEV	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3] New statement for specifying a user DASD volume at a specific real device number.
VMLAN	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.1] New operands: MACPROTECT, USERPREFIX. • [6.4] Message deleted: HCP3026E. • [6.4 VM65925] New operand: DNA DISABLE ENABLE. • [7.1 VM66219] Updated operand: DNA DISABLE.
XLINK_DEVICE_DEFAULTS	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.1] The maximum number of cylinders on the 3390-9 device is 65520.
XLINK_SYSTEM_INCLUDE	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4] New AVAILABLE operand to reserve a slot.
XLINK_VOLUME_INCLUDE	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.1] The maximum number of cylinders on the 3390-9 device is 65520.
XSPPOOL_SYSTEM	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.3] Removed. CSE is no longer supported.

Table 6. Changes to System Configuration Statements (continued)

Statement	Changes
XSPPOOL_TRACE	INCOMPATIBLE: <ul style="list-style-type: none"> • [6.3] Removed. CSE is no longer supported.
XSPPOOL_XLIST_INPUT	INCOMPATIBLE: <ul style="list-style-type: none"> • [6.3] Removed. CSE is no longer supported.
XSPPOOL_XLIST_OUTPUT	INCOMPATIBLE: <ul style="list-style-type: none"> • [6.3] Removed. CSE is no longer supported.

User Directory Statements

Table 7 on page 192 lists user directory statements that have changed. For additional information, see *z/VM: CP Planning and Administration*.

Table 7. Changes to User Directory Statements

Statement	Changes
ACCOUNT	Upwardly compatible: <ul style="list-style-type: none"> • [6.2] When using multiconfiguration virtual machines in an SSI cluster, the ACCOUNT statement(s) within the IDENTITY definition define which account numbers can be used by the multiconfiguration virtual machines. The ACCOUNT statement cannot be specified within a SUBCONFIG definition. To assign different account numbers to SUBCONFIG definitions, the COMMAND statement with the SET ACCOUNT command must be used.
CLASS	INCOMPATIBLE: <ul style="list-style-type: none"> • [6.3] UCR and OVERRIDE information has been removed. UCR spool files and the OVERRIDE utility are no longer supported.
CPU	INCOMPATIBLE: <ul style="list-style-type: none"> • [6.1] CRYPTO operand accepted for compatibility, but provides no function; documentation removed. • [7.1] DEDICATE and NODEDICATE operands accepted for compatibility, but provide no function; documentation removed.
CRYPTO	INCOMPATIBLE: <ul style="list-style-type: none"> • [6.1] CSU, KEYENTRY, MODIFY, and SPECIAL operands accepted for compatibility but provide no function; documentation removed. Upwardly compatible: <ul style="list-style-type: none"> • [6.3 VM65577] Information added to APDEDICATED and DOMAIN operands. • [6.4 VM65942] Supports crypto resources that are defined on a Crypto Express6S. • [7.1 VM66248] Supports crypto resources that are defined on a Crypto Express7S. • [7.2 VM66532] Supports crypto resources that are defined on a Crypto Express8S.

Table 7. Changes to User Directory Statements (continued)

Statement	Changes
DIRECTORY	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New option: SSI; if used, <i>altdev</i>, EDIT, and system affinity operands are not allowed. • [6.2] Information added to explain how DIRECTXA handles tokens.
GLOBALOPTS	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New operand: CHPIDVirtualization • [6.4] New value for the MACHINE operand: Z.
IDENTITY	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.3] UCR and OVERRIDE information has been removed. UCR spool files and the OVERRIDE utility are no longer supported.
LOAD	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New I (IDENTITY) and S (SUBCONFIG) operands. • [6.2] Information added to explain how DIRECTXA handles tokens.
LOADDEV	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] Information added to explain how DIRECTXA handles tokens.
MACHINE	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4] New virtual machine type: Z. • [6.4 VM65942] When logged on, an ESA or XA virtual machine may be put into ESA/390-compatibility mode instead of full ESA/390 mode.
MDISK	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] Information added to explain how DIRECTXA handles tokens.
NICDEF	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.1] New TYPE operands: IEDN, INMN. • [6.4] IEDN and INMN operands accepted for compatibility but IEDN and INMN nics will not be defined; documentation removed. • [6.4 VM65925] New operands: PORTNUMBER, PORTTYPE, VLAN, PROMISCUOUS and NOPROMISCUOUS. • [7.1 VM66219] New operand: PQUPLINKTX.
OPTION	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.1] New operand: LXAPP. • [6.2] New operand: CHPIDVirtualization. • [6.4] QUICKDSP function now less meaningful because virtual processor management improvements mean no users stay in the eligible list more than an instant. • [6.4 VM66105] New operands: STHYI-UTIL, STHYI-GUEST, STHYI-RESPool.
SHARE	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.1] LIMITHARD description updated.

Table 7. Changes to User Directory Statements (continued)

Statement	Changes
SPECIAL	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] Information added to explain how DIRECTXA handles tokens.
SPOOL	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] Added clarification for how DIRECTXA handles tokens.
SYSAFFIN	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] SYSAFFIN specifications are not allowed when an SSI directory is being processed.
USER	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.2] SYSTEMMP not allowed as a user ID. • [6.2] The number for the <i>pri</i> option must be from 0 to 99. • [6.3] UCR and OVERRIDE information has been removed. UCR spool files and the OVERRIDE utility are no longer supported.
XSTORE	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4] Supported for compatibility only; this statement has no function. Expanded storage (XSTORE) is not supported for host or guest use. If a directory entry includes the XSTORE statement, message HCP1401I will be issued when the guest logs on to state that XSTORE is not supported.

CP Commands

Table 8 on page 194 lists CP commands that have changed. For additional information, see [z/VM: CP Commands and Utilities Reference](#).

Table 8. Changes to CP Commands

Command	Changes
ACTIVATE ISLINK	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New operand: NODE <i>nodeid</i>. • [6.2] Ignored operand: BUFFERS. Message HCP2722I is issued if the BUFFERS option is specified on the ACTIVATE ISLINK command. For compatibility reasons the option may be specified, but a default value of 16 is always used for the link device. If the link device is connecting to a system earlier than z/VM 6.2, change the ACTIVATE ISLINK command on that system to specify BUFFERS 16, or to use the default value of BUFFERS 16. • [6.2] New message: HCP2745E. Updated messages: HCP2702I, HCP2704I, HCP2706I.
ASSOCIATE	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4 VM66029] Renamed help files for subcommands. See “[6.4 APAR] z/VM HELP Quality Improvement” on page 147.

Table 8. Changes to CP Commands (continued)

Command	Changes
ATTACH	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.4] XSTORE/XSTORAGE operands and associated responses removed. Expanded storage (XSTORE) is not supported. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.1] New message: HCP6430E. • [6.2] New operand: EQID. • [6.2] New messages: HCP048E, HCP125E, HCP130E, HCP1128E, HCP1156I, HCP6643E, HCP6644E, HCP6645E, HCP6863E. • [6.3 VM65417] New operand: PCIFUNCTION. • [6.3 VM65417] New message variations: HCP021E, HCP022E, HCP040E. • [6.3 VM65417] Updated messages: HCP046E, HCP120E, HCP122E, HCP6790I. • [6.3 VM65583] New message: HCP3173E. • [6.4] New message: HCP1168E. • [6.4] New option for dedicated tape device: CPMS • [6.4] New message variation: HCP1128E. • [7.1 VM66263] Updated usage note. Updated messages: HCP138E and HCP139E. • [7.1 VM66266] New operand: CRYPTO. • [7.2 VM66173] Updated usage note.
COUPLE	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.1] Updated message: HCP2790E. New messages: HCP3018E, HCP3019I, and HCP3025I. • [6.2] New operand: PORTNUMBER. • [6.2] Updated messages: HCP2788E and HCP6011E. New messages: HCP3034E, HCP3041E, HCP3042E, HCP3043E, and HCP3044E. • [6.2] New response. • [6.3 VM65583] New message: HCP3171E. • [6.4] Updated messages: HCP1982I, HCP2790E. • [6.4] Removed messages: HCP3018E, HCP3019E, HCP3025E. • [6.4 VM65925] New operands: <i>cfgowner</i> and <i>cfgname</i>. • [6.4 VM65925] Updated operand: PORTNUMBER. • [6.4 VM65925] Updated Usage Notes and Responses. • [6.4 VM65925] Updated messages: HCP3034E, HCP3043E, HCP3046E, HCP6011E.

Table 8. Changes to CP Commands (continued)

Command	Changes
CPACCESS	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New messages: HCP6640E, HCP6645E, HCP6648I. • [6.2] Updated messages: HCP101E, HCP102E, HCP103E, HCP104E, HCP105E, HCP106E. • [7.2] Updated messages: HCP101E, HCP102E, HCP103E, HCP104E, HCP105E, HCP106E.
CPHX	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] If executed with the AT command, <i>userid</i> is required. • [6.2] Additional functions that CPHX can stop: VMDUMP and VMRELOCATE commands, DIAGNOSE code X'94'. • [6.2] Updated message: HCP6790I. • [6.3] Additional function that CPHX can stop: DELETE EDEVICE. • [6.3] Updated message: HCP6790I.
CPU	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.2] New operand * in support of adjunct support. • [7.2] Updated usage note and responses in support of adjunct support.
DEACTIVE (in general)	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4 VM66029] Renamed help files for subcommands. See “[6.4 APAR] z/VM HELP Quality Improvement” on page 147.
DEACTIVE CONV	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] Updated to allow DEACTIVATE as the command name.
DEACTIVE ISLINK	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] Extended to accept more than one device. • [6.2] Updated to allow DEACTIVATE as the command name. • [6.2] New operand: NODE <i>nodeid</i>. • [6.2] New message: HCP2746E. Updated messages: HCP2706I, HCP2720E, HCP2738E.
DEDICATE	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [7.1] This command has been removed.

Table 8. Changes to CP Commands (continued)

Command	Changes
DEFINE (in general)	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.1] CRYPTO operand has no function; documentation removed. • Also see specific DEFINE commands listed below. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.1] New message variation: HCP1006E. • [6.1] New message: HCP6430E. • [6.2] Updated messages: HCP101E, HCP102E, HCP103E, HCP104E, HCP105E, HCP106E. • [6.3 VM65418] New operand: CPUPOOL. • [6.3 VM65417] New operand: PCIFUNCTION. • [6.3 VM65417] New message variation: HCP1006E. • [6.4 VM65942] New message: HCP6296E. New message variation: HCP1006E. • [6.4 VM66105] New operand: RESPOOL. • [7.1 VM66249] New message variations: HCP6706E. • Also see specific DEFINE commands listed below. • [7.1 VM66266] New operand: CRYPTO.
DEFINE CHPID / PATH	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.1] New operands: OSA_DIRECT_EXPRESS_IEDN, OSX, OSA_DIRECT_EXPRESS_INMN, OSM. • [6.2] New IQD options. • [6.3 VM65417] New IQD and OSD option: NETID. • [6.4] New CHPID type options: COUPLING_OVER_PCIE and CS5. • [6.4 VM65865] New CHPID type options: COUPLING_OVER_ROCE and CL5.
DEFINE CPOWNER	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.3] OWN and SHARED operands are ignored in all environments. CSE is no longer supported. The undocumented function of the SHARED operand to turn off minidisk caching for the specified volume is no longer supported. If OWN or SHARED is specified, message HCP6634I is issued. To turn off minidisk caching for a volume being shared through cross-system link (XLINK), which is still supported for non-SSI systems, specify SHARED YES on the RDEVICE configuration statement for the device, or specify RDEV OFF for the device on the SET MDCACHE command. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] OWN and SHARED operands ignored when configured for an SSI cluster. • [6.3] New usage note.

Table 8. Changes to CP Commands (continued)

Command	Changes
DEFINE CPU	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.3 VM65577] CPU type ZAAP not supported on z13. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3 VM65418] New message: HCP6849E. • [6.4] New VCONFIG mode GENERAL supports the same CPU types as ESA390 mode. • [7.1] Removed message: HCP1468E.
DEFINE CPUPOOL	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3 VM65680] When multithreading is enabled, prorated core time is used in the limiting calculation for the CPU pool. When multithreading is not enabled, raw CPU time is used instead. • [6.4 VM66105] Superseded by DEFINE RESPOOL.
DEFINE CRYPTO	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.1] Command has no function; documentation removed. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.1 VM66266] Command updated and documentation added.
DEFINE DEVICE / IODEVICE	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4 VM65942] New operand: SS <i>nn</i>. New response.
DEFINE DIAGNOSE	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.2 VM66201] The command supports z/XC virtual machines.
DEFINE HYPERPAVALIAS	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.1 VM66249] New operand: AS. New variable: <i>vdev1-vdev2</i>.
DEFINE LAN	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] This command will not automatically grant access to SYSTEM for a SYSTEM owned restricted LAN. • [6.2] If executed with the AT command, the OWNERID <i>ownerid</i> or OWNERID SYSTEM operands are required.
DEFINE MDISK	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.2] Updated messages: HCP101E, HCP102E, HCP103E, HCP104E, HCP105E, HCP106E.
DEFINE NIC	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.4] Removed operands: IEDN, INMN. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.1] New TYPE operands: IEDN, INMN. Updated message: HCP2797E. • [6.2] New variations for message HCP2797E. • [6.4] Updated message: HCP2797E.

Table 8. Changes to CP Commands (continued)

Command	Changes
DEFINE PAVALIAS	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.1 VM66249] New operand: AS. New variable: <i>vdev1-vdev2</i>.
DEFINE PCIFUNCTION	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3 VM65577] New operand: TYPE. • [6.3 VM65577] New message: HCP6873E. • [6.3 VM65716] New operand: ISM. • [6.4] New operand: UID. • [6.4 VM65942] New TYPE operands: RCE, HYL PORT, ROC2 PORT. Updated operand: VFN. • [7.2 VM66532] Usage note is updated to indicate support for RoCE Express 3 PCI functions.
DEFINE RESPOOL / CPUPOOL	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4 VM66105] Supersedes DEFINE CPUPOOL. <ul style="list-style-type: none"> – CPUPOOL is accepted as a synonym for RESPOOL. – New operands: CPU, STORAGE, NOLIMIT. – CPU capacity limit can be specified in hundredths. – CPU pool changed to resource pool in messages. – New variations of message HCP1001E.
DEFINE STORAGE	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.2 VM66173] New operands: INCREMENT, INITIAL, MAXIMUM, STANDBY REMAINDER. Updated operands: AS, RESERVED, STANDBY <i>size</i>, <i>size</i>. New and updated usage notes and responses. Updated messages: HCP094E, HCP099E.
DEFINE TIMEZONE	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.1] New message: HCP987E.

Table 8. Changes to CP Commands (continued)

Command	Changes
DEFINE VSWITCH	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.1] New default value for NATIVE <i>natvid</i> option is 1. • [6.4] Removed operands: IEDN, INMN. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.1] New operands: TYPE, NOUPLINK, VLAN AWARE, NATIVE NONE. • [6.1] New message: HCP3024E. Updated messages: HCP2832E, HCP2838I. • [6.2] New operands: PORTBASED, USERBASED. • [6.2] New operands: BRIDGEPORT, UPLINK. • [6.2] New BRIDGEPORT example. • [6.2] New messages: HCP2838I, HCP3045E. • [6.3 VM65583] New operands: IVL, GLOBAL, LOCAL. • [6.3 VM65583] New messages: HCP3160E, HCP3161E, HCP3167E, HCP3170E, HCP3173E, HCP3186E, HCP3196E, HCP3221E. Updated message: HCP2782E. • [6.4] Removed message: HCP3024E. • [6.4 VM65925] Updated operands: PORTBASED, USERBASED. • [6.4 VM65918] New message variation: HCP3199E. • [7.1 VM66219] New operand: PRIQUEUING. • [7.1 VM66219] New message: HCP3230I. Updated message: HCP2838I.
DEFSEG	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3] A new DCSS with the same name as an existing DCSS does not inherit a reserved storage setting for the old version.
DEFSYS	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.3] A new NSS with the same name as an existing NSS does not inherit a reserved storage setting for the old version. • [6.4] New MACHMODE value Z. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.2 VM66201] The command supports z/XC virtual machines.
DELETE (in general)	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3 VM65418] New operand: CPUPOOL. • [6.3 VM65417] New operand: PCIFUNCTION. • [6.4 VM66105] New operand: RESPOOL.
DELETE CPUPOOL	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4 VM66105] Superseded by DELETE RESPOOL.
DELETE DEVICE / IODEVICE	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4 VM65942] New operand: SS <i>nn</i>. Updated response. New message variation: HCP1006E.

Table 8. Changes to CP Commands (continued)

Command	Changes
DELETE EDEVICE	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.2] <i>rdev</i>, <i>rdev1-rdev2</i> updated to support 4- and 5-digit hexadecimal numbers. Added message HCP009E.
DELETE RDEVICE	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.2] <i>rdev</i>, <i>rdev1-rdev2</i> updated to support 4- and 5-digit hexadecimal numbers. Added message HCP009E.
DELETE RESPOOL / CPUPOOL	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4 VM66105] Supersedes DELETE CPUPOOL. <ul style="list-style-type: none"> – CPUPOOL is accepted as a synonym for RESPOOL. – CPU pool changed to resource pool in messages. – New variations of message HCP1001E.
DETACH (in general)	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.1] CRYPTO operand has no function; documentation removed. • [6.2] Removed message: HCP660E. • [6.4] Removed operand: XSTORE. Expanded storage (XSTORE) is not supported. • [6.4] Removed message: HCP1402I. • Also see specific DETACH commands listed below. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New messages: HCP2793E, HCP3049E. • [6.3 VM65417] New operand: PCIFUNCTION. • [6.4] Modified message: HCP1401I. • [7.1] Removed messages: HCP890E, HCP892E. • Also see specific DETACH commands listed below. • [7.1 VM66266] New operand: CRYPTO.
DETACH CFLINK	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.2] Class A authorization removed. Class B and G authorizations are valid.
DETACH CRYPTO	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.1] Command has no function; documentation removed. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.1 VM66266] Command updated and documentation added.
DETACH (Real Device)	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New operand: EQID. • [6.2] New messages: HCP048E, HCP135E.

Table 8. Changes to CP Commands (continued)

Command	Changes
DETACH LAN	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] If executed with the AT command, the OWNERID <i>ownerid</i> or OWNERID SYSTEM operands are required.
DETACH SYSASCII	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] If executed with the AT command, the <i>userid</i> operand is required.
DETACH (Virtual Device)	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New message: HCP1809E.
DETACH VSWITCH	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3 VM65583] New message: HCP3166E.
DETACH XSTORE	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.4] Command removed. Expanded storage (XSTORE) is not supported.
DISPLAY (in general)	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.1] CDX operand has no function; documentation removed. • Also see specific DISPLAY commands listed below. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3 VM65733] Removed messages: HCP6153E, HCP6154E. • Also see specific DISPLAY commands listed below. • [7.2 VM66201] Updated message: HCP6150E. • Also see specific DISPLAY commands listed below.
DISPLAY CDX	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.1] Command has no function; documentation removed.
DISPLAY (Guest Storage - ESA/XC, z/XC)	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.2 VM66201] The command supports z/XC virtual machines.
DISPLAY (Registers)	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3 VM65733] Updated operands: <i>Yreg1</i>, FPC, and END. The Vector Facility for z/Architecture support enables access to the additional floating-point (AFP) registers without requiring prior guest program use. • [7.2 VM66201] The command supports z/XC virtual machines.
DISPLAY PSW	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.2 VM66201] The command supports z/XC virtual machines.
DISPLAY PSWG	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.2 VM66201] The command supports z/XC virtual machines.
DRAIN	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4 VM66029] Renamed help files for subcommands. See “[6.4 APAR] z/VM HELP Quality Improvement” on page 147.

Table 8. Changes to CP Commands (continued)

Command	Changes
DUMP (in general)	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.1] CDX operand has no function; documentation removed. • Also see specific DUMP commands listed below. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.2 VM66201] Updated message: HCP6150E.
DUMP CDX	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.1] Command has no function; documentation removed.
DUMP ESA/XC Storage	See DUMP (Guest Storage - ESA/XC. z/XC)
DUMP (Guest Storage - ESA/XC, z/XC)	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.2 VM66201] The command supports z/XC virtual machines.
DUMP PSW	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.2 VM66201] The command supports z/XC virtual machines.
DUMP PSWG	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.2 VM66201] The command supports z/XC virtual machines.
DUMP (Registers)	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3 VM65733] Updated operands: Yreg1, FPC, and END. The Vector Facility for z/Architecture support enables access to the additional floating-point (AFP) registers without requiring prior guest program use. • [7.2 VM66201] The command supports z/XC virtual machines. • [7.2 VM66532] The command supports the new BEAR operand.
FLASHCOPY	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] Message variation change: HCP3201E. • [6.2] New message variation: HCP3201E. • [6.4 VM66029] Renamed help files for subcommands. See “[6.4 APAR] z/VM HELP Quality Improvement” on page 147. • [7.2 VM66433] New operands: PRESERVEMIRROR, NOPRESERVEMIRROR. New message: HCP2471E. New message variation: HCP3201E.
FLASHCOPY ESTABLISH	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4 VM66098] Updated usage note. • [7.2 VM66433] New operands: PRESERVEMIRROR, NOPRESERVEMIRROR. New message: HCP2471E. New message variation: HCP3201E.
FLASHCOPY WITHDRAW	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4 VM66098] Updated operand: RELEASE

Table 8. Changes to CP Commands (continued)

Command	Changes
FORCE	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New message HCP1801E. • [6.4] New usage note. New message: HCP2118I.
FREE (in general)	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4 VM66029] Renamed help files for subcommands. See “[6.4 APAR] z/VM HELP Quality Improvement” on page 147.
FREE LOGON	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] When issued on a member of an SSI cluster for a user ID that is defined as a single-configuration virtual machine, the command is propagated to all the other members of the cluster. If the user ID is defined as a multiconfiguration virtual machine, the command is not propagated across the SSI cluster.
GIVE	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New messages: HCP1128E and HCP1156I. • [6.4 VM66029] Renamed help files for subcommands. See “[6.4 APAR] z/VM HELP Quality Improvement” on page 147.
HOLD (in general)	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4 VM66029] Renamed help files for subcommands. See “[6.4 APAR] z/VM HELP Quality Improvement” on page 147.
HOLD LOGON	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] When issued on a member of an SSI cluster for a user ID that is defined as a single-configuration virtual machine, the command is propagated to all the other members of the cluster. If the user ID is defined as a multiconfiguration virtual machine, the command is not propagated across the SSI cluster.
HYPERSWAP	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.1] New operands: INCLUDE, EXCLUDE. • [6.1] New messages: HCP6428I, HCP6429E. • [6.3] Real device number description updated for a 5-digit device value in the alternate subchannel set. • [6.3] New option: PDNUM <i>extent</i>. • [6.3] New response for HYPERSWAP QUIESCE or RESUME. • [6.3 VM65544] Multi-Target PPRC devices must be specified in a single subchannel set. • [6.3 VM65674] New SWAP options NONE and OFFSEC for varying off additional Multi-Target PPRC secondary devices. • [7.2] <i>rdev</i>, <i>rdev.numDevs</i>, and <i>sourceRdev</i> updated to support 4- and 5-digit hexadecimal numbers.

Table 8. Changes to CP Commands (continued)

Command	Changes
INDICATE (in general)	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New messages. • [6.3 VM65586, VM65696] New MULTITHREAD operand to display core utilization information when multithreading is enabled. • Also see specific INDICATE commands listed below.
INDICATE ACTIVE	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4] Virtual processor management improvements mean no users stay in the eligible list more than an instant, so users are rarely shown to be in the eligible list, and the count of users in the eligible list is usually 0.
INDICATE LOAD	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.3] The steal percentage is removed from the command response. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] AT option not allowed when issued via the AT command. • [6.2] New message: HCP1142E. • [6.3] The Class E response is updated to include a polarization indication for each logical CPU. Additionally, the meaning of the CPU utilization for each logical CPU is updated to reflect the percentage of a real CPU that was consumed. Previously, its meaning was the percentage of resources made available to the logical CPU that were consumed. <p>Also, the average CPU utilization value that is displayed in the Class G and Class E responses is updated accordingly. This value now represents an average value of the portion of a real CPU that each logical CPU was able to consume.</p> <ul style="list-style-type: none"> • [6.4] Virtual processor management improvements mean no users stay in the eligible list more than an instant, so users are rarely shown to be in the eligible list, and the count of users in the eligible list is usually 0. • [6.4] XSTORE information not included in response. Expanded storage (XSTORE) is not supported. • [7.1] The responses are updated to display a 4-digit processor count. Also, references to dedicated processors are removed.
INDICATE MULTITHREAD	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4] New response to indicate configuration change.
INDICATE NSS	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3] The command response is updated to include the count of instantiated pages. • [6.4] XSTORE always displayed as dashes in response. Expanded storage (XSTORE) is not supported.

Table 8. Changes to CP Commands (continued)

Command	Changes
INDICATE PAGING	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] Responses changed to expand the number of pages the user has in XSTORE and on DASD. • [6.4] XSTORE always displayed as dashes in response. Expanded storage (XSTORE) is not supported.
INDICATE QUEUES	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.3] Response is changed from two users per line to one user per line. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3] The affinity indication for a VMDBK in the INDICATE QUEUES EXP response is no longer displayed. • [6.4] Virtual processor management improvements mean no users stay in the eligible list more than an instant, so users are rarely shown to be in the eligible list.
INDICATE SPACES	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.1] Usage note added about user counts greater than 999999. • [6.2] If executed with the AT command, either a user ID or an address space ID (that includes a specific user ID) is required. • [6.3] Response indicates the number of instantiated pages for the address space. • [6.4] XSTORE always displayed as dashes in response. Expanded storage (XSTORE) is not supported.
INDICATE USER	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.1] Usage note added about user counts greater than 999999. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] If executed with the AT command, either SYSTEM or <i>userid</i> is required. • [6.3] The command response is updated to include the count of instantiated pages. • [6.3 VM65586, VM65696] If multithreading is enabled, virtual processor time and total processor time are reported as MT-1 equivalent time. • [6.4] Response updated to identify MACH=Z; expanded response updated to identify VCONFIG: MODE=GENERAL. • [6.4] XSTORE always displayed as dashes in response. Expanded storage (XSTORE) is not supported.
IPL	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3] New operand: NSSDATA. • [6.4] If the virtual machine architecture mode on completion of the NSS IPL differs from that at SAVESYS, the PSW is converted to the appropriate format (that is, from a 64-bit ESA/390 or ESA/XC PSW to a 128-bit z/Architecture PSW, or vice versa). • [7.2 VM66201] The command supports z/XC virtual machines.

Table 8. Changes to CP Commands (continued)

Command	Changes
LINK	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.2] If a requested link has extents that overlap or match an existing link, and either virtual reserve/release or simulated working allegiance is specified for one or both of the minidisks, the link request might now be rejected with message HCP6640E. For more information, see the usage notes on the LINK command in z/VM: CP Commands and Utilities Reference. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New messages: HCP6640E, HCP6645E, HCP6648I. • [7.2] Updated messages: HCP101E, HCP102E, HCP103E, HCP104E, HCP105E, HCP106E. • [7.2] New forms of responses that include ADJUNCT support.
LOCATE (in general)	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • See specific LOCATE commands listed below. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3 VM65417] New operands: RPCI, VPCI. • Also see specific LOCATE commands listed below.
LOCATE CMDBK	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.3] UCR spool files and the OVERRIDE utility are no longer supported.
LOCATE RDEV	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.2] <i>rdev</i>, <i>rdev1-rdev2</i> updated to support 4- and 5-digit hexadecimal numbers.
LOGOFF	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3 VM65586, VM65696] If multithreading is enabled, virtual processor time and total processor time are reported as MT-1 equivalent time. • [6.4] XSTORE information not displayed in response. Expanded storage (XSTORE) is not supported.

Table 8. Changes to CP Commands (continued)

Command	Changes
LOGON / LOGIN	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.4] New and changed variations for message HCP050E. Change in timing when message HCP053E is issued during logon processing. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New message variation: HCP054E. • [6.4] New MACHINE mode: Z. • [6.4] New message variation: HCP1512E. • [6.4] XSTORE information not displayed in response. Expanded storage (XSTORE) is not supported. • [6.4] Modified message: HCP1401I. • [6.4] Removed messages: HCP1108E, HCP1400I. • [6.4 VM65925] New message: HCP3224I. • [6.4 VM65942] An ESA or XA virtual machine may be put into ESA/390-compatibility mode instead of full ESA/390 mode. • [7.1] Removed messages: HCP890E, HCP892E. • [7.1 VM66324] New operand: FALLBack. • [7.2] Updated messages: HCP101E, HCP102E, HCP103E, HCP104E, HCP105E, HCP106E. • [7.2 VM66201] The command supports z/XC virtual machines.
MESSAGE (in general)	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] AT option not allowed when issued via the AT command. • [6.2] New message: HCP1142E. • [6.4 VM66029] New menu file. See “[6.4 APAR] z/VM HELP Quality Improvement” on page 147.
MESSAGE (User)	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] Responses updated.
MODIFY (in general)	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3 VM65417] New operand: PCIFUNCTION. • Also see specific MODIFY commands listed below.
MODIFY DEVICE / IODEVICE	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4 VM65942] New operand: SS <i>nn</i>. New message variation: HCP1006E.
MONITOR (in general)	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3 VM65417] New class: PCIF. • [6.3 VM65417] New message variations: HCP6240I, HCP6241I. • Also see specific MONITOR commands listed below.

Table 8. Changes to CP Commands (continued)

Command	Changes
MONITOR EVENT	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New operand: ISFC. • [6.2] New operand: SSI. • [6.4 VM66105] New operand: COMMAND.
MONITOR SAMPLE	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New operand: ISFC. • [6.2] New operand: CPUMFC • [6.2] If the basic counter set in the CPU-Measurement Facility is not authorized, message HCP6263I is issued for CP MONITOR SAMPLE ENABLE PROCESSOR and CP MONITOR SAMPLE ENABLE ALL. • [6.2] Default size for sample configuration records when sample monitoring is started is increased from 241 pages to 4096 pages. • [6.2] New operand: SSI. • [6.3 VM65586, VM65696] CPUMFC operand does not control collection of CPU-Measurement counter sets for the Simultaneous Multi-Threading (SMT) facility. • [6.4] No data collected for expanded storage. Expanded storage (XSTORE) is not supported.
MSGNOH	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] AT option not allowed when issued via the AT command. • [6.2] New message: HCP1142E.
PURGE UCR	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.3] New usage note. UCR spool files and the OVERRIDE utility are no longer supported.

Table 8. Changes to CP Commands (continued)

Command	Changes
QUERY (in general)	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.1] New operand and associated response: REORDER. • [6.1] New operand and associated response: STP. • [6.2] New operands and associated responses: CHPIDV, EQID, ISFC, RELODOMAIN, SSI, VIRTUAL CHPID, VMRELOCATE. • [6.3] New operands and associated responses: AGELIST, MSS. • [6.3 VM65418] New operand: CPUPOOL. • [6.3 VM65417] New operands: IOASSIST, PCIFUNCTION, VIRTUAL PCIFUNCTION. <p>Note: The function of the new IOASSIST operand is similar to but different from the IOASSIST operand that was removed in V5.1.</p> <ul style="list-style-type: none"> • [6.3 VM65586, VM65696] New MULTITHREAD operand to show multithreading status and various thread information. • [6.4] New operands and associated responses: CPSERVICE, PAGING, SHUTDOWN, VARIABLE. • [6.4 VM65993] New operand and associated responses: ENCRYPT. • [6.4 VM65414] New operand and associated responses: CPPROTECT. • [6.4 VM66105] New operand and associated responses: RESPOOL. • [7.2 VM66469] New operand and associated responses: DEVICES. <p>• Also see specific QUERY commands listed below.</p>
QUERY AGELIST	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4] New response to indicate whether the auxiliary storage address (ASA) to which a page is written during frame replenishment remains allocated to that page.
QUERY ALL	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.1] Responses no longer show a tape assigned as a system dump device.
QUERY BYUSER	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] If executed with the AT command, there is no default and <i>userid</i> is required. • [7.1] Added support for class B users.
QUERY CAPABILITY	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.1] Additional response information for nominal CPU capability and capacity changes. • [6.3 VM65577] CPU capability numbers in the response can be integers or decimal fractions. If the number is too large or too small to display, "OVERFLOW" or "UNDERFLO" is displayed.
QUERY CFLINKS	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] If executed with the AT command, the NAME <i>msgprocid</i> operands are required.

Table 8. Changes to CP Commands (continued)

Command	Changes
QUERY CHPID	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [7.2] Output includes an extra blank when the query response contains a 4-digit device. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.1] Updated response for IEDN and INMN. • [6.2] New responses for the TYPE operand to indicate a zHPF channel. • [6.3 VM65417] New operand: NETID. • [6.3 VM65417] New message variation: HCP1006E. • [6.4] New response for the TYPE operand to indicate a coupling over PCIe (CS5) channel. • [6.4 VM65865] New response for the TYPE operand to indicate a coupling over RoCE (CL5) channel. • [7.2] New operand and associated responses: SS.
QUERY COLLECT	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New responses.
QUERY CONTROLLER	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.1] The response displays the ensemble capability for an internal controller. • [6.2] Response displays HiperSockets Bridge Port capability and status. • [6.3] The response includes VEPA information and indicates if the controlled device is an active device for a virtual switch. • [6.3] Message HCP2832E is added. • [6.3 VM65583] Updated example to show SHARED_LINKAGG. • [6.4] Capabilities NO_ENSEMBLE and NO_INMN always displayed in the response. • [7.1 VM66219] New operand: PRIQUEUING. • [7.1 VM66219] Removed NO_ENSEMBLE and NO_INMN.
QUERY CPLEVEL	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.2] Response contains changed values for the new product level.
QUERY CPOWNER	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New response for SSI.
QUERY CPUAFFINITY	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] If executed with the AT command, the <i>userid</i> operand is required.
QUERY CPUPOOL	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3 VM65680] Response displays CPU pool limits in cores instead of CPUs. • [6.4 VM66105] Superseded by QUERY RESPOOL

Table 8. Changes to CP Commands (continued)

Command	Changes
QUERY CRYPTO	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.1] DOMAINS and CAMQS operands have no function; documentation removed. • [6.1] Many responses removed or changed. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.1] Response revised with new AP types: CEX3A (Crypto Express3 Accelerator) and CEX3C (Crypto Express3 Coprocessor). • [6.1] New USERS parameter and response. • [6.2] Operand changed from APQS to DOMAINS. • [6.2] Responses updated for DOMAINS operand and two-digit domain values. • [6.3] Response updated with new AP types for Crypto Express4S: CEX4A (accelerator), CEX4C (IBM CCA coprocessor), and CEX4S (neither of the other modes; used for IBM EP11 coprocessor). • [6.3 VM65577] Response updated with new AP types for Crypto Express5S: CEX5A, CEX5C, and CEX5S. • [6.3 VM65577] Responses updated for three-digit AP and domain numbers. • [6.3 VM65942] Response updated with new AP types for Crypto Express6S: CEX6A, CEX6C, and CEX6S. • [7.1 VM66248] Response updated with new AP types for Crypto Express7S: CEX7A, CEX7C, and CEX7S. • [7.1 VM66266] Usage notes, responses, descriptions updated for Dynamic Crypto support. • [7.2 VM66532] Response is updated with new AP types for Crypto Express8S: CEX8A, CEX8C, CEX8P. • [7.2 VM66534] New operand APVIRTual POLLing and associated responses.
QUERY CU	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3] New operand and associated responses: PPRCSN. • [6.3 VM65322] New operand and associated responses and messages: FENCED. • [6.4] New operand and associated response: ALIAS_SHARE.

Table 8. Changes to CP Commands (continued)

Command	Changes
QUERY DASD	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3] Real device number description updated for a 5-digit device value in the alternate subchannel set. • [6.3] Responses updated to include the device subchannel set number. • [6.3 VM65322] Response for QUERY DASD DETAILS will include Soft Fence and Query Host Access information if supported on the device. • [6.3 VM65544] Response for QUERY DASD DETAILS will indicate if the volume is a Multi-Target PPRC primary device. • [6.4] New operand and associated response and messages: CHARACTERISTICS. Responses updated to include the serial number. • [6.4 VM66098] Responses for QUERY DASD DETAILS have been updated to include active subchannel set and extent space efficient. • [7.2] <i>rdev</i>, <i>rdev1-rdev2</i> updated to support 4- and 5-digit hexadecimal numbers.
QUERY DUMP	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [7.1] This command no longer supports the XF operand. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.1] Responses have been updated to show the new FRMTBL and PGMBKS settings.
QUERY EDEVICE	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [7.2] Output includes an extra blank when the query response contains a 4-digit device. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] Two responses updated for device equivalency ID (EQID). • [6.3] Response for DETAILS updated to include STATUS condition. • [6.3] New operand: STORAGE; new response about the pools of reserved storage. • [6.4] New response showing the FLASH attribute. • [6.4] New operands and associated responses and messages: INQUIRY, PAGE. New usage note. Responses updated to include the serial number. • [7.2] <i>rdev</i>, <i>rdev1-rdev2</i> updated to support 4- and 5-digit hexadecimal numbers. • [7.2 VM66507] New operand and associated usage notes and response: PATHINFO.
QUERY EQID	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [7.2] Output includes an extra blank when the query response contains a 4-digit device. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.2] <i>rdev</i>, <i>rdev1-rdev2</i> updated to support 4- and 5-digit hexadecimal numbers. Added message HCP009E.

Table 8. Changes to CP Commands (continued)

Command	Changes
QUERY FCP	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.1] New WWPN operand and responses. • [7.1 VM66242] New ENCRYPTION_STATUS operand. Two new responses. Updated message: HCP6004E.
QUERY FENCES	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3 VM65322] Response indicates if the soft fence state exists for the specified device.
QUERY FRAMES	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3 VM65417] Responses have been added to provide more details for output. • [7.2 VM66173] Additional information returned in responses. Updated usage note.
QUERY HSA	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.2] Command removed. This function is not supported.
QUERY HYPERSWAP	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [7.2] Output includes an extra blank when the query response contains a 4-digit device. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.1] Updated response for automatic quiesce. • [6.3] New operand and associated response: CAPABILITIES. • [6.3] Real device number can be 5 digits if the device is in the alternate subchannel set. • [6.3 VM65544] New CAPABILITIES response token MT to indicate support for Multi-Target PPRC DASD. • [6.3 VM65674] New CAPABILITIES response token OFFSEC to indicate support for OFFSEC operand on HYPERSWAP command. • [7.2] <i>rdev</i>, <i>rdev.numDevs</i> updated to support 4- and 5-digit hexadecimal numbers. Updated response 3.
QUERY IOASSIST	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3 VM65417] A new QUERY IOASSIST command has been added whose function is similar to but different from the command that was removed in V5.1.
QUERY ISLINK	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New operand: NODE <i>nodeid</i>. • [6.2] New message variation: HCP2720E.
QUERY IUCV	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] If executed with the AT command, the <i>userid</i> or <i>*syserv</i> operand is required.

Table 8. Changes to CP Commands (continued)

Command	Changes
QUERY LAN	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.4] Removed operands and associated responses: IEDN, INMN. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.1] The response displays ensemble MAC prefix and MACPROTECT settings. • [6.1] New messages: HCP003E, HCP2783E. • [6.2] Port number added to the response. • [6.4 VM65925] Updated Purpose; operands, ACCESSLIST and PROMISCUOUS; and response. • [7.1 VM66219] Updated Purpose and operand descriptions. • [7.1 VM66219] Updated examples to show PQUPLINKTX. • [7.2 VM66485] Updated examples to show Unicast IP address count.
QUERY LINKS	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New message: HCP6638I. • [6.2] New response for SSI. • [7.2] Updated response to show ADJUNCT.
QUERY LPARS	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.1] New operands: CPCname, NETworkname. • [6.1] New responses for CPCname and NETworkname.
QUERY MAXSPOOL	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] If executed with the AT command, the SYSTEM or <i>userid</i> operand is required.
QUERY MDCACHE	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.4] XSTORE information removed from response. Expanded storage (XSTORE) is not supported. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] Response updated for SSI. • [6.2] New response to indicate if caching was disabled by transport mode I/O.
QUERY MDISK	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New operand: RESERVED. • [6.2] New responses for SSI.
QUERY MEMASSIST	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] If executed with the AT command, the <i>userid</i> operand is required.

Table 8. Changes to CP Commands (continued)

Command	Changes
QUERY MONITOR	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] Updated example: The command is extended to show the status of monitoring for the ISFC domain. • [6.2] When PROCESSOR is enabled for SAMPLE, the command displays either CPUMFC or NOCPUMFC. • [6.2] Updated example and responses for SSI. • [6.3 VM65417] Updated example and responses for PCIF. • [6.4 VM66105] Updated response for QUERY MONITOR EVENT to indicate whether the COMMAND domain is enabled or disabled.
QUERY MSS	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.2] Updated usage notes and responses.
QUERY MULTITHREAD	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4] New INITIAL operand and associated response. • [6.4] New message HCP6513I to indicate configuration is in transition.
QUERY NAMES	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] AT option not allowed when issued via the AT command. • [6.2] Example added for SSI. • [6.2] Responses updated for SSI. • [6.2] New message: HCP1142E.
QUERY NSS	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4] Response updated to identify MACHMODE Z. • [7.2 VM66201] The command supports z/XC virtual machines.
QUERY OBSERVER	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New message: HCP1149E. • [6.2] If executed with the AT command, the <i>userid</i> or ALL operand is required.
QUERY OSA	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.4] Removed operand: ENSEMBLE. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.1] New TYPE operand: ENSEMBLE. • [6.1] Updated responses. • [6.2] Updated responses for ENSEMBLE and HIPERSOCKETS to indicate bridge-capable devices. • [6.3 VM65583] New operand: SYSTEM.
QUERY PAGING	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [7.2] Removed IPL parameter: PAGING63. • [7.2 VM66173] New and updated usage notes. New information returned in responses.

Table 8. Changes to CP Commands (continued)

Command	Changes
QUERY PATHS	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [7.2] Output includes an extra blank when the query response contains a 4-digit device. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] Updated response to indicate whether the channel paths are enabled for transport mode I/O. • [6.3] Real device number description updated for a 5-digit device value in the alternate subchannel set. • [7.1 VM66242] Updated response to identify the channel paths are enabled for encryption and authentication. • [7.2] <i>rdev</i>, <i>rdev1-rdev2</i> updated to support 4- and 5-digit hexadecimal numbers.
QUERY PCIFUNCTION	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4] Updated response to include UID field for PCI function. • [6.4 VM65942] Updated response to include PORT field for PCI function. • [7.1 VM66180] Updated response to include NVME in the TYPE field. • [7.2 VM66532] Updated response to include RoCE Express 3 adapter.
QUERY PORT	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3] The response indicates if the controlled device is an active device for a virtual switch. • [6.3 VM65583] New operand: GROUP <i>groupname.instance</i>. • [6.3 VM65583] New and updated examples to show EXCLUSIVE. • [6.3 VM65583] Updated response to include new GROUP <i>groupname[.instance]</i> format. New response for when DETAILS are requested for a shared port group. • [6.3 VM65583] New message: HCP3185I. • [6.4] New responses displaying COUNTERS CLEAR information. • [6.4 VM65918] New and updated examples to show LOADBALANCING.
QUERY PRIVCLASS	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] If issued with the AT command, there is no default and <i>userid</i> is required.

Table 8. Changes to CP Commands (continued)

Command	Changes
QUERY PROCESSORS	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3] New operand: TOPOLOGY. • [6.3] New response information. • [6.3 VM65577] Responses do not include ZAAP because CPU type ZAAP is not supported on z13 and later processors. • [6.3 VM65586, VM65696] If multithreading is enabled, response includes core information. • [6.4] Expanded response updated to identify partition mode General. • [7.1] Displayed processor address increased to 4 digits. Also, references to dedicated processors removed from response. • [7.1 VM66265] Updated usage notes.
QUERY QIOASSIST	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] If issued with the AT command, the <i>userid</i> operand is required.
QUERY (Real Device)	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [7.2] Output includes an extra blank when the query response contains a 4-digit device. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] Response with ID includes the device equivalency ID (EQID). • [6.3 VM65583] Updated response for Open Systems Adapter Devices to include new status. • [7.1] Responses no longer show a tape assigned as a system dump device. • [7.2] <i>rdev</i>, <i>rdev1-rdev2</i> updated to support 4- and 5-digit hexadecimal numbers.
QUERY REORDER	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.3] The reorder process is no longer supported. The command is retained for compatibility, but the response always indicates that reorder is OFF.
QUERY RESERVED	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.3] Responses have new formats and include new information. • [6.3] Message removed: HCP007E. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3] New operands and associated responses: DCSS, NSS, SPOOLID, SYSMAX, USER.

Table 8. Changes to CP Commands (continued)

Command	Changes
QUERY RESPOOL / CPUPOOL	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.4 VM66105] New response content and format. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4 VM66105] Supersedes QUERY CPUPOOL. <ul style="list-style-type: none"> – CPUPOOL is accepted as a synonym for RESPOOL. – CPU pool changed to resource pool in messages. – New variations of message HCP1001E.
QUERY SECUSER	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] If issued with the AT command, the ALL or <i>userid</i> operand is required. • [6.2] New message: HCP1149E.
QUERY SET	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3 VM65417] IOASSIST OFF removed from response. • [6.4] Response updated to identify MACHINE type Z. • [6.4] Response updated to include DIALDROP status. • [6.4 VM65942] An ESA or XA virtual machine may be running in ESA/390-compatibility mode instead of full ESA/390 mode. • [7.2 VM66201] The command supports z/XC virtual machines.
QUERY SHARE	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.1] References to dedicated processors removed from response.
QUERY SHUTDOWNTIME	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.4] The minimum abbreviation for SHUTDOWNTIME is changed from SHUTDOWN to SHUTDOWNT. The output of QUERY SHUTDOWNT is unchanged. • [6.4] The help file for QUERY SHUTDOWNTIME is changed from SHUTDOWN HELCPQU to SHUTDOWNT HELPCPQU. Help file SHUTDOWN HELPCPQU is now used for the QUERY SHUTDOWN command. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4] Command syntax variation QUERY SHUTDOWN TIME returns the same information.
QUERY SIGNALS	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4] Response can specify SYSTEM as the issuer to indicate a signal from the hardware.

Table 8. Changes to CP Commands (continued)

Command	Changes
QUERY SRM	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.4] XSTORE operand removed. Expanded storage (XSTORE) is not supported. • [6.4] New message: HCP1401I. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.1] New operand and associated response: LIMITHARD. • [6.3] New operands and associated responses to display HiperDispatch settings: CPUPAD, DSPWDMETHOD, EXCESSUSE, POLARIZATION. • [6.3] Response for MAXWSS can include a larger PAGES value. • [6.4] XSTORE always displayed as dashes in ALL response. • [6.4 VM66063] New operand and associated response: UNPARKING. Updated responses. • [7.1] Responses are updated to display the expanded 5-digit CPUAD setting.
QUERY STGEXEMPT	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] If issued with the AT command, the <i>userid</i> or ALL operand is required.
QUERY STORAGE	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.2 VM66173] New operands: IPL, RECONFIGURATION. New and updated usage notes and responses. New message: HCP003E. Messages HCP100E and HCP263E are no longer applicable.
QUERY SXSPAGES	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.1] New usage note: Trace pages associated with trace frames are in system execution space (SXS) and backed by a below-2GB-frame.
QUERY SXSSTORAGE	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.2 VM66173] New information returned in response. Updated usage note.
QUERY SYSTEM	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] In an SSI cluster where real DASD are shared among the members, QUERY SYSTEM will display only the user IDs of users on the local member.
QUERY TAPES	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New response when the DETAILS option is chosen, showing the current tape block position and relative position (for the 3592 Model E07 and higher). • [7.1] Responses no longer show a tape assigned as a system dump device.
QUERY TERMINAL	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.1 VM65715] New operands: PRECEDENCE SECUSER and PRECEDENCE STARMSG.

Table 8. Changes to CP Commands (continued)

Command	Changes
QUERY TIME	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3 VM65586, VM65696] If multithreading is enabled, virtual processor time and total processor time are reported as MT-1 equivalent time.
QUERY TIMEZONES	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.1] Response changed to list only the time zones provided by STP as well as the default GMT/UTC when in an STP environment that derives timezone information from the STP server.
QUERY TRACE	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4] Response changed to indicate transactional execution trace status.
QUERY TRFILES	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3 VM65417] Updated response with a new FILETYPE: PCI.
QUERY TRSOURCE	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3 VM65417] New operand: TYPE PCI. • [6.3 VM65417] New responses for traces of type PCI.
QUERY USERID	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New operand: AT *. • [6.2] AT option not allowed when issued via the AT command. • [6.2] New responses for SSI. • [6.2] New messages: HCP045E, HCP361E, HCP1142E, HCP2971I. • [6.2] New message variation: HCP2970E.
QUERY USERS	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] AT operand information updated for SSI. • [6.2] Responses updated for SSI. • [6.2] New messages: HCP2970E, HCP2971I. • [6.3] Response 1 updated to increase the value for the number of users to 6 digits.
QUERY VARIABLE	<p>Responses can change when variables are added or changed.</p> <p>For a list of new function variables, see “New Function Variables” on page 2 and z/VM New Function Variable List.</p> <p>For a list of changed function variables, see “CP Environment Variables” on page 256.</p>
QUERY VCONFIG	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4] Response updated to identify MODE = GENERAL.

Table 8. Changes to CP Commands (continued)

Command	Changes
QUERY VIRTUAL ALL	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.2] Removed messages: HCP662I, HCP1705I. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4] XSTORE included in response for compatibility and always displayed as dashes. Expanded storage (XSTORE) is not supported.
QUERY VIRTUAL CPUS	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.1] References to dedicated virtual CPUs are removed. • [7.2] New operand: ADJUNCT.
QUERY VIRTUAL CRYPTO	<p>INCOMPATIBLE</p> <ul style="list-style-type: none"> • [6.2] Removed message: HCP1705I. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.1] Revised response: PCICC, PCICA, and PCIXCC removed as possible values for AP type. • [6.1] Removed message: HCP662I. • [6.1] Responses are revised with new AP types: CEX3A (Crypto Express3 Accelerator) and CEX3C (Crypto Express3 Coprocessor). • [6.2] Responses are updated for two-digit domain values. • [6.3] Responses are updated with new AP types for Crypto Express4S: CEX4A (accelerator), CEX4C (IBM CCA coprocessor), and CEX4S (neither of the other modes; used for IBM EP11 coprocessor). • [6.3 VM65577] Responses are updated with new AP types for Crypto Express5S: CEX5A, CEX5C, and CEX5S. • [6.3 VM65577] Responses are updated for three-digit AP and domain numbers. • [6.3 VM65942] Responses are updated with new AP types for Crypto Express6S: CEX6A, CEX6C, and CEX6S. • [7.1 VM66248] Responses are updated with new AP types for Crypto Express7S: CEX7A, CEX7C, and CEX7S. • [7.1 VM66266] Responses are updated for dynamic crypto support. • [7.2 VM66496] Responses add virtual crypto adapter number and type. • [7.2 VM66532] Responses are updated with new AP types for Crypto Express8S: CEX8A, CEX8C, and CEX8P.
QUERY (Virtual Device)	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New response when the DETAILS option is chosen, showing the current tape block position and relative position (for the 3592 Model E07 and higher).
QUERY VIRTUAL FCP	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3] Response contains new DATA ROUTER ELIGIBLE and DATA ROUTER ACTIVE information.

Table 8. Changes to CP Commands (continued)

Command	Changes
QUERY VIRTUAL NIC	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.1] The response includes new TYPEs. • [6.2] The response includes additional data. • [6.3] New flag value in response: conflict. • [6.4] New responses displaying COUNTERS CLEAR information. • [6.4] Adapter types IEDN and INMN will not be displayed because they are not supported. • [7.1 VM66219] Updated operand: DETAILS. • [7.1 VM66219] New operand: PQUPLINKTX. • [7.2 VM66485] Example updated to display IPv6 addresses for Layer 2 NICs under Unicast MAC Addresses.
QUERY VIRTUAL PCIFUNCTION	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.1 VM66180] Updated response to include NVME in the TYPE field. • [7.2 VM66532] Updated response to include RoCE Express 3 adapter.
QUERY VIRTUAL XSTORE	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.4] Command removed. Expanded storage is not supported.
QUERY VMLAN	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.4] Updated example and response to remove VMLAN Unified Resource Manager. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.1] Response includes ensemble information. • [6.3 VM65583] Updated example and response to show IVL membership. • [6.4 VM65925] Updated example and response to show Directory Network Authorization (DNA). • [6.4 VM65918] Updated example to show latest service.

Table 8. Changes to CP Commands (continued)

Command	Changes
QUERY VSWITCH	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.4] Removed operands: IEDN, INMN, OSDSIM. • [6.4] Updated response. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.1] The response includes new VSWITCH types, the UPLINK port, VLAN default and NATIVE indications, MACPROTECT, and OSDSIM. • [6.2] The response includes additional data. • [6.2] Updated operand descriptions, response and examples. • [6.3] The response includes VEPA information and indicates if the controlled device is an active device for a virtual switch. • [6.3] New flag value in response: conflict. • [6.3 VM65583] New TYPE operand: IVL. • [6.3 VM65583] New example for the IVL virtual switch. Updated examples and responses. • [6.3 VM65583] New message: HCP3185I. • [6.4] New responses displaying COUNTERS CLEAR information. • [6.4 VM65925] Updated operands: ACCESSLIST PORTNUMBER. • [7.1 VM66219] New operands: PRIQUEUING and PQUPLINKTX. Updated operand: DETAILS. • [7.2 VM66485] Examples were updated to show Unicast IP address count and IPv6 addresses under Unicast MAC addresses for Layer 2 VSwitches. Response was updated to show Unicast IP address count for Layer 2 and Layer 3 VSwitches. • [7.2 VM66557] Responses contain new information in the Bridge Port section to display the NIC distribution setting and optionally packet counters when NIC distribution is ON. The general Bridgeport attributes (MFS, Buffer Limits, Trace Pages and NIC distribution) are displayed for Inactive and Standby Bridgeports.
QUERY XSTORE	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.4] Command removed. Expanded storage is not supported.
RESET	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New operands: MDISK, Userid. • [6.2] RESET <i>vdev</i> cannot be issued via the AT command. • [6.2] USERID <i>userid</i> option is required if RESET RESERVE MDISK is issued via the AT command. • [6.2] New response for RESERVE. • [6.2] New messages: HCP006E, HCP020E, HCP045E. • [6.3 VM65417] New operand: PCIFUNCTION. • [6.3 VM65417] New response for PCI. • [6.3 VM65417] New message variations: HCP022E, HCP040E.

Table 8. Changes to CP Commands (continued)

Command	Changes
RETAIN XSTORE	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.4] Command removed. Expanded storage is not supported.
SAVESYS	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3 VM65733] New usage note: The SAVESYS command does not save vector registers. • [6.4] New message variation: HCP1368E. • [7.2 VM66201] The command supports z/XC virtual machines. Updated message: HCP1368.
SCHEDULE	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.4 VM66105] Resource pool is limited to 1000 members. New message: HCP3159E. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4 VM66105] CPU pool changed to resource pool in messages.
SEND	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New operand: AT • [6.2] New messages: HCP068E, HCP1149E, HCP2970E, HCP2971I.
SET (in general)	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.1] CRYPTO operand has no function; documentation removed. • Also see specific SET commands listed below. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.1] New operand: REORDER. • [6.1] New operand: SHUTSIGNAL. • [6.2] New operands: SSI, VMRELOCATE. • [6.3] New operand: AGELIST. • [6.3 VM65418] New operand: CPUPOOL. • [6.3 VM65417] New operand: IOASSIST. <p>Note: The function of the new IOASSIST operand is similar to but different from the IOASSIST operand that was removed in z/VM 5.1.</p> <ul style="list-style-type: none"> • [6.4] New operand and associated responses: PAGING. • [6.4] New operand: VARIABLE. • [6.4 VM65993] New operand and associated responses: ENCRYPT. • [6.4 VM65414] New operand and associated responses: CPPROTECT. • [6.4 VM66105] New operand and associated responses: RESPOOL. • [7.2 VM66534] The CRYPTO operand is reinstated. • Also see specific SET commands listed below.

Table 8. Changes to CP Commands (continued)

Command	Changes
SET AGELIST	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4] New operand and associated response: KEEPSLOT. New and revised usage notes. • [7.2 VM66173] New usage note. Message HCP094E is no longer applicable.
SET CPTRACE	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.3] Trace codes removed: 4005, 4006, 4007, 4008. • [6.3] Trace code for SIGP changed from AE00 to AE01. • [6.3] Trace code for Time Stamp changed from FFFE to FFFD. • [6.4] Trace code 4107 removed. Expanded storage (XSTORE) is not supported. • [6.4] Trace codes removed: 2890, 28A0, 2C90, 2CA0 and 2CB0. • [6.4] Unused trace codes 8600 and 8700 were removed. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New trace codes. • [6.2] New VNET trace codes: 7402, 7403, 7404. • [6.3] New SVC trace codes: 3610, 3611, 3612, 3613. • [6.3 VM65417] New PCI trace codes: 1200-120C, 1211-1213, 1230-1237 and 123A-123D. • [6.3 VM65586, VM65696] New SVC trace code: 3615. • [6.3 VM65583] New VNET trace codes: 7405, 7406, 7407. • [6.4] New CALLRET trace codes: 2891, 28A1, 28A2, 2C91, 2CA1, 2CB1. • [6.4] New RUNU trace codes: 8B00, 8B01, 8B02, 9A01. • [6.4] New CONTAINR trace codes: 6026, 6027, 6028, 6029, 6030. • [6.4] New SVC trace code: 3614.
SET CPUAFFINITY	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] If issued with the AT command, the <i>userid</i> operand is required. • [6.3 VM65418] New message: HCP1473E.
SET CPUPOOL	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3 VM65680] When multithreading is enabled, prorated core time is used in the limiting calculation for the CPU pool. When multithreading is not enabled, raw CPU time is used instead. • [6.4 VM66105] Superseded by SET RESPOOL.
SET CRYPTO	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.1] Command has no function; documentation removed. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.2 VM66534] The command is reinstated. The command controls whether crypto polling is on or off. New message: HCP1713E.

Table 8. Changes to CP Commands (continued)

Command	Changes
SET CU	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3 VM65322] New operand and associated response and messages: UNFENCE. • [6.4] New operands, usage notes, and example: ALIAS, MDISK_SHARE, PAGING_SHARE.
SET DUMP	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.2] This command no longer supports 3424 or 9348 tape drives. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New message: HCP144E. • [6.3] Maximum number of DASD real device numbers increased to 32. • [7.1] New operands and associated responses: FRMTBL and PGMBKS. • [7.1] Messages removed: HCP1105E, HCP1107E, HCP1851E, HCP1917E.
SET EDEVICE	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.1] New operand: XIV. • [6.2] New operands: EQID, NOEQID. • [6.2] New responses for device equivalency ID (EQID). • [6.2] New message: HCP048E. • [6.2] Descriptions updated for 1750, 2105, 2107, and 2145 devices. • [6.4] New operand: FLASH. • [6.4] Usage note added for SCSI devices. • [7.2] <i>edev</i> updated to support 4- and 5-digit hexadecimal numbers. • [7.2 VM66420] <i>LUN</i> operand optional after specified on the first path. New message variation: HCP8703E. • [7.2 VM66507] New operand: PATHINFO.
SET ENCRYPT	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [7.2] Removed IPL parameter: PAGING63.
SET IOASSIST	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3 VM65417] A new SET IOASSIST command has been added with function that is similar to but different from the command that was removed in z/VM 5.1.

Table 8. Changes to CP Commands (continued)

Command	Changes
SET IPLPARMS	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [7.2] Removed IPL parameter: PAGING63 (usage note updated). <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New conditional IPL parameters: <i>selector:value(IPL_parameter_substring)</i> • [6.2] New message variations: HCP6770E. • [6.4] New IPL parameter: PAGING63. • [6.4] New IPL parameter: IPLVAR=<i>value</i> • [6.4] New message variation: HCP6770E.
SET LAN	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.1] New MACPROTECT operand. • [6.2] If executed with the AT command, the OWNERID <i>ownerid</i> or OWNERID SYSTEM operands are required.
SET MACHINE	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4] New Z operand and associated response. • [6.4] New message variation: HCP1016E. • [6.4 VM65942] An ESA or XA virtual machine may be put into ESA/390-compatibility mode instead of full ESA/390 mode. • [7.2 VM66201] The command supports z/XC virtual machines.
SET MDCACHE	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.4] XSTORE operand and associated response removed. Expanded storage (XSTORE) is not supported. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New message: HCP6630E. • [6.2] Up to 2 MB of real storage can be used for minidisk caching.
SET MITIME	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4] Command has no effect on EDEVICES. • [6.4] New message: HCP287I.
SET MEMASSIST	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] If issued with the AT command, the ALL or <i>userid</i> operand is required.
SET NIC	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.1] New MACPROTECT operands. Updated message: HCP2850E • [6.2] New variations for message HCP2850E. • [6.2] MACPROTECT description updated. • [6.4] Removed usage note. • [6.4] Removed message: HCP2850E.

Table 8. Changes to CP Commands (continued)

Command	Changes
SET OBSERVER	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New messages: HCP6768I, HCP1149E.
SET PAGEX	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.2 VM66201] The command supports z/XC virtual machines.
SET PAGING	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [7.2] Removed IPL parameter: PAGING63. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.2 VM66173] New operand: WARNING. Updated operands: ALIAS, HPF. New usage notes. Updated response. Updated message: HCP1137E.
SET PORT GROUP	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New message variation: HCP2838I. • [6.3] New message variation: HCP2838I. • [6.3 VM65583] New operands: EXCLUSIVE, SHARED. • [6.3 VM65583] New messages: HCP3162E, HCP3167E, HCP3173E, HCP3178I, HCP3180E, HCP3183E, HCP3184E, HCP3186E, HCP3194I, HCP3197E, HCP3198E, HCP3200E, HCP3220E. • [6.4 VM65918] New operands: LOADBALANCING COLLABORATIVE, LOADBALANCING INDEPENDENT. • [6.4 VM65918] Updated operand description: INTERVAL. • [6.4 VM65918] New messages: HCP3223E, HCP3225E.
SET QIOASSIST	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] If issued with the AT command, the ALL or <i>userid</i> operand is required.
SET QUICKDSP	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4] Function now less meaningful because virtual processor management improvements mean no users stay in the eligible list more than an instant.
SET RDEVICE Advanced Function Printers	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New operands: EQID, NOEQID. • [6.2] New message: HCP048E.
SET RDEVICE Card Punches	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New operands: EQID, NOEQID. • [6.2] New message: HCP048E.
SET RDEVICE Card Readers	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New operands: EQID, NOEQID. • [6.2] New message: HCP048E.

Table 8. Changes to CP Commands (continued)

Command	Changes
SET RDEVICE Communication Controllers	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New operands: EQID, NOEQID. • [6.2] New message: HCP048E.
SET RDEVICE DASD	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New operands: EQID, NOEQID. • [6.2] New message: HCP048E. • [7.2] <i>rdev</i>, <i>rdev1-rdev2</i> updated to support 4- and 5-digit hexadecimal numbers.
SET RDEVICE Graphic Display Devices	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New operands: EQID, NOEQID. • [6.2] New message: HCP048E.
SET RDEVICE Impact Printers	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New operands: EQID, NOEQID. • [6.2] New message: HCP048E.
SET RDEVICE Integrated Communication Adapters	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New operands: EQID, NOEQID. • [6.2] New message: HCP048E.
SET RDEVICE Special Devices	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.1] LAN_ADAPTER operand has no function; documentation removed. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New operands: EQID, NOEQID. • [6.2] New message: HCP048E.
SET RDEVICE Tape Units	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New operands: EQID, NOEQID. • [6.2] New message: HCP048E.
SET RDEVICE Terminals	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New operands: EQID, NOEQID. • [6.2] New message: HCP048E.
SET RDEVICE Unsupported Devices	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New operands: EQID, NOEQID. • [6.2] New message: HCP048E. • [6.2] Descriptions updated for DPS and RESERVE_RELEASE operands.
SET RDEVICE 3800 Printers	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New operands: EQID, NOEQID. • [6.2] New message: HCP048E.

Table 8. Changes to CP Commands (continued)

Command	Changes
SET REORDER	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.3] The reorder process is no longer supported. Reorder is always OFF. The command is retained for compatibility, but issuing SET REORDER ON results in message HCP6005E.
SET RESERVED	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.3] Responses have new formats and include new information. • [6.3] Removed messages: HCP026E, HCP2266E, HCP2267E. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3] New operands and associated responses: DCSS, NSS, SPOOLID, SYSMAX, USER, <i>storsize</i>. • [6.3] New guidelines for defining reserved storage. • [7.2 VM66271] New recommendation regarding use of operand SYSMAX when a system has reconfigurable storage.
SET RESPOOL / CPUPOOL	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4 VM66105] Supersedes SET CPUPOOL. <ul style="list-style-type: none"> – CPUPOOL is accepted as a synonym for RESPOOL. – New operands: CPU, STORAGE, NOLIMIT. – CPU capacity limit can be specified in hundredths. – CPU pool changed to resource pool in messages. – New variations of message HCP1001E.
SET SECUSER	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New messages: HCP1149E, HCP6768I.
SET SHARE	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.1] LIMITHARD description updated. • [6.3 VM65680] When multithreading is enabled, prorated core time is used in the consumption limiting calculation for a virtual machine being consumption limited. When multithreading is not enabled, raw CPU time is used instead. • [7.1] Reference to dedicated processors removed from response.

Table 8. Changes to CP Commands (continued)

Command	Changes
SET SRM	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.2] LIMITHARD default changed from DEADLINE to CONSUMPTION. • [6.4] XSTORE operand and associated response removed. Expanded storage (XSTORE) is not supported. • [6.4] New message: HCP1401I. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.1] New operand and associated response: LIMITHARD. • [6.2] New default STORBUF percentage values. • [6.3] New operands and associated responses: CPUPAD, DSPWDMETHOD, EXCESSUSE, POLARIZATION. • [6.3 VM65418] New message: HCP1054E. • [6.3 VM65586, VM65696] New message variations: HCP1050E. • [6.4] DSPBUF, LDUBUF, and STORBUF functions now less meaningful because virtual processor management improvements mean no users stay in the eligible list more than an instant. • [6.4 VM66063] New operand and associated response: UNPARKING. New operands: EXCESSUSE NONE, EXCESSUSE TYPE NONE. New usage notes. • [7.1] CPUPAD operand setting and response expanded to 5 digits. Message HCP1050E removed. • [7.1 VM66265] Updated operand: CPUPAD.
SET SSI	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3] New operand: FORCE. • [6.3] Updated message: HCP1664E. • [6.3 VM65712] New operand: PDRVOLUME. • [6.3 VM65712] New messages: HCP1630I, HCP1631I, HCP1640E.
SET STORAGE	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New message: HCP1133I. • [7.1] New operand: PERMANENT • [7.2 VM66173] New HALT and RECONFIGURABLE operands and associated options. New usage notes and responses. New messages: HCP2580I, HCP2581I, HCP2582I, HCP2583I, HCP2584I, HCP2585E, HCP2586E, HCP2587E, HCP2588E, HCP2590E, HCP2591E, HCP2592I, HCP2593E, HCP2593I, HCP2594I, HCP2598E, HCP2599E. Updated messages: HCP025E, HCP100E, HCP1133I, HCP2579E. Deleted messages: HCP1134I, HCP1135E. • [7.2 VM66271] Updated operand size (and related message HCP2585E) to allow up to 50% of real memory to be reconfigurable storage.

Table 8. Changes to CP Commands (continued)

Command	Changes
SET SVC76	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.1 VM66248] New usage note: Linux does not use SVC76 to record hardware errors. Therefore, if the guest has explicitly identified itself to z/VM as running Linux, then the setting of this command is ignored and it is treated as if the setting is always VM.
SET TIMEZONE	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.1] New message: HCP0987E.
SET TRACEFRAMES	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.1] New usage note: Trace pages associated with trace frames are in system execution space (SXS) and backed by a below-2GB-frame.
SET VCONFIG	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4] New operand and associated response: GENERAL.
SET VMLAN	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.4] Removed operand: ENSEMBLE. • [6.4] Removed messages: HCP3013E, HCP3014E, HCP3015E, HCP3026E, HCP3027E, HCP3028E, HCP3029E, HCP3030E, HCP3035E, HCP3038E. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.1] New operands: MACPROTECT and ENSEMBLE. New messages: HCP3013E, HCP3014E, HCP3015E. • [6.2] New messages: HCP3027E, HCP3028E, HCP3029E, HCP3030E, HCP3035E, HCP3038E, HCP6645E. • [6.2] MACPROTECT description updated. • [6.3 VM65583] New operand: TRACESIZE. • [6.3 VM65583] New message: HCP3195E. • [6.4 VM65925] New operand: DNA DISABLE ENABLE. • [7.1 VM66219] Updated operand: DNA DISABLE.

Table 8. Changes to CP Commands (continued)

Command	Changes
SET VSWITCH	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.2] Message HCP2798I removed. • [6.4] Removed operand: OSDSIM. • [6.4] Removed messages: HCP3020E, HCP3021E, HCP3022E (some variations). <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.1] New operands: OSDSIM, UPLINK, NIC, MACPROTECT. • [6.1] New messages: HCP3021E, HCP3022E. Updated messages: HCP2832E, HCP2838I, HCP2850E. • [6.2] New operands: PORTNUMBER and VLANID. • [6.2] Updated messages: HCP2846E and HCP3022E. New messages: HCP3031I, HCP3032I, HCP3033E, HCP3036E, HCP3037E, HCP3039I, and HCP3040I. • [6.2] New operands: BRIDGEPORT, PATHMTUDISCOVERY. • [6.2] New messages: HCP2838I, HCP3022E, HCP3045E, HCP3049E, HCP6706E. • [6.3] New operands: SWITCHOVER, VEPA. • [6.3] Updated message: HCP2838I. • [6.3] New message variations: HCP3022E. • [6.3 VM65583] New operand: TRACESIZE. • [6.3 VM65583] New option: IVLPORT with operands: VLAN, PING, HEARTBEAT, RESET. • [6.3 VM65583] New messages: HCP3160E, HCP3161E, HCP3163E, HCP3166E, HCP3167E, HCP3170E, HCP3173E, HCP3174I, HCP3186E, HCP3195E, HCP3196E, HCP3199E, HCP3221E. Updated messages: HCP2846E, HCP3022E. • [6.4] New option COUNTERS CLEAR with operands UPLINK, BRIDGEport, ALL, DATA, DISCARDEd, ERRORs. • [7.1 VM66219] New operands: PRIQUEUING and PQUPLINKTX. • [7.1 VM66219] Updated messages: HCP2838I and HCP3022E. • [7.2 VM66557] New operand NICDISTRIBUTION.
SET VSWITCH (continued)	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4 VM65925] Updated operands: GRANT, REVOKE, PORTNUMBER, VLANID and Uplink NIC. • [6.4 VM65925] Updated Usage Notes and Examples. • [6.4 VM65925] New message: HCP3046E. • [6.4 VM65925] Updated message: HCP3022E. • [6.4 VM65925] Removed messages: HCP3036E and HCP3037E.
SET VTODX	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.2 VM66201] The command supports z/XC virtual machines. Removed message: HCP6152E.

Table 8. Changes to CP Commands (continued)

Command	Changes
SET WRKALLEG	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New message: HCP6645E.
SET 370ACCOM	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4] If MACHINE Z guest issues SET 370ACCOM ON, the command is rejected with error message HCP2632E. • [7.2 VM66201] The command supports z/XC virtual machines. Updated message: HCP2632E.
SHUTDOWN	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New message: HCP6028E. • [6.2] New message: HCP959I. • [6.2] Updated messages: HCP961W and HCP9277I. • [6.3] New operand: NOCKPT. • [6.4] New usage notes. New messages: HCP2116I, HCP2117I.
SIGNAL	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4] New usage note. New messages: HCP2118I.
SNAPDUMP	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4 VM65989] New operand: PGMBKS. Updated usage note. New messages: HCP002E, HCP026E. • [7.1] New operand: FRMTBL. • [7.1] Message HCP9269E removed.
START	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4 VM66029] Renamed help files for subcommands. See “[6.4 APAR] z/VM HELP Quality Improvement” on page 147.
STORE (in general)	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.1] CDX operand has no function; documentation removed. • [6.2] Removed message: HCP645E. • Also see specific STORE commands listed below. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.1] Removed message: HCP1702E. • [7.2 VM66201] Updated message: HCP6150E. • Also see specific STORE commands listed below.
STORE CDX	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.1] Command has no function; documentation removed.
STORE (Guest Storage - ESA/XC, z/XC)	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.2 VM66201] The command supports z/XC virtual machines.

Table 8. Changes to CP Commands (continued)

Command	Changes
STORE PSW	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.2 VM66201] The command supports z/XC virtual machines.
STORE PSWA	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.2 VM66201] The command supports z/XC virtual machines.
STORE PSWG	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.2 VM66201] The command supports z/XC virtual machines.
STORE (Registers)	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3 VM65733] Updated operand: <i>Yreg1</i>. The Vector Facility for z/Architecture support enables access to the additional floating-point (AFP) registers without requiring prior guest program use. • [6.3 VM65733] Removed messages: HCP6153E, HCP6154E. • [7.2 VM66201] The command supports z/XC virtual machines.
STORE STATUS	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3 VM65733] Updated note. The extended save area address is used if it is provided. • [7.2 VM66532] The breaking-event-address register (BEAR) is stored at decimal address 4920 for a z/Architecture mode guest.
TERMINAL	New operand: PRECEDENCE.
TRACE (in general)	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4] New TXSUSPEND and NOTXSUSPEND operands. • [6.4] New messages: HCP2106I, HCP2107E. • [7.2 VM66201] The command supports z/XC virtual machines. Updated messages: HCP6150E and HCP6159E. • Also see specific TRACE commands listed below.
TRACE <i>mnemonic1</i>	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4] New mnemonic: PFMF. • [7.2 VM66532] New mnemonics: LPSWEY, RDP.
TRACE GG	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.2 VM66201] The command supports z/XC virtual machines.
TRACE IO	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] The default IODATA for each CCW is 64. • [6.2] New and changed responses.
TRACE STORE (ESA/390, z/Architecture)	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.2 VM66201] The command supports z/XC virtual machines.
TRACE STORE (ESA/XC, z/XC)	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.2 VM66201] The command supports z/XC virtual machines.

Table 8. Changes to CP Commands (continued)

Command	Changes
TRSAVE	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] If issued with the AT command, the TO <i>userid</i> operands are required.
TRSOURCE	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3 VM65417] New message variation: HCP371I.
TRSOURCE ID	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.2] Default value for IODATA changed from 0 bytes to 64 bytes. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3 VM65417] New trace type: PCI.
UNDEDICATE	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [7.1] This command has been removed.
VARY (in general)	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • See specific VARY commands listed below. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3 VM65417] New operand: PCIFUNCTION. • [6.3 VM65586, VM65696] New CORE operand for adding or removing a core when multithreading is enabled. • [6.4 VM66029] Renamed help files for subcommands. See “[6.4 APAR] z/VM HELP Quality Improvement” on page 147. • Also see specific VARY commands listed below. • [7.1 VM66266] New operand: CRYPTO.
VARY CORE	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [7.1] A processor cannot be dedicated to a user. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4] Updated Purpose to include information on multithreading. • [7.1] Processor address range updated to 0000-003F. • [7.1 VM66265] Processor address range updated to 0000-004F.
VARY PATH	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New response to indicate incompatible paths (due to incompatible zHPF feature) cannot be varied online logically without specifying the FORCE option. • [6.3] Real device number description updated for a 5-digit device value in the alternate subchannel set. • [7.2] <i>rdev</i>, <i>rdev1-rdev2</i> updated to support 4- and 5-digit hexadecimal numbers.
VARY PCIFUNCTION	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3 VM65577] New message: HCP1167E

Table 8. Changes to CP Commands (continued)

Command	Changes
VARY PROCESSOR	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.3 VM65586, VM65696] This command is not valid when multithreading is enabled; use VARY CORE instead. • [6.3 VM65586, VM65696] New message: HCP1321E. • [7.1] A processor cannot be dedicated to a user. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • Processor address range updated to 0000-003F. • [7.1 VM66265] Processor address range updated to 0000-004F.
VARY (Real Device)	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.1] New message: HCP6294I. • [6.2] New message: HCP6627I. • [6.3] Real device number description updated for a 5-digit device value in the alternate subchannel set. • [6.3] New message: HCP6295I. • [6.4] Removed message: HCP6294I. • [6.4] New message variation: HCP8701I. • [7.2] <i>rdev</i>, <i>rdev1-rdev2</i> updated to support 4- and 5-digit hexadecimal numbers. New message: HCP6297E.
VARY SUBCHANNEL	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3] Real device number description updated for a 5-digit device value in the alternate subchannel set. • [7.2] <i>rdev</i>, <i>rdev1-rdev2</i> updated to support 4- and 5-digit hexadecimal numbers. New message: HCP009E.
VMDUMP	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] Execution can be halted with the CPHX or FORCE command. • [6.2] New message: HCP6790I. • [6.3 VM65733] New usage note: The VMDUMP command does not dump vector registers. • [7.2 VM66201] The command supports z/XC virtual machines. Updated message: HCP6150E.

Table 8. Changes to CP Commands (continued)

Command	Changes
VMRELOCATE	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3] New message HCP3150I. New message variations for HCP1982I. • [6.3 VM65417] New message: HCP1161I. • [6.3 VM65418] New message: HCP1961I. • [6.3 VM65733] New message: HCP1987I. • [6.4] Removed messages: HCP1962I, HCP3150I. • [6.4 VM65925] New message variation: HCP1982I. • [7.1] Removed message: HCP1967I. • [7.1 VM66219] Updated message: HCP1982I. • [7.2] New message: HCP1965I. • [7.2 VM66496] New usage note.
WARNING	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] AT option not allowed when issued via the AT command. • [6.2] New message: HCP1142E.
XAUTOLOG	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4] New MACHINE mode: Z. • [6.4] New message variation: HCP1512E. • [6.4 VM65982] Updated usage note. • [6.4 VM65942] An ESA or XA virtual machine may be put into ESA/390-compatibility mode instead of full ESA/390 mode. • [7.2 VM66201] The command supports z/XC virtual machines.
XSPool QUERY	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.3] Removed. CSE is no longer supported.
XSPool QUERY SHARE	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.3] Removed. CSE is no longer supported.
XSPool REMOVE	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.3] Removed. CSE is no longer supported.
XSPool SYNC	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.3] Removed. CSE is no longer supported.
XSPool UNLOCK	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.3] Removed. CSE is no longer supported.
XSPool XLIST	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.3] Removed. CSE is no longer supported.
XSPool XLISTADD	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.3] Removed. CSE is no longer supported.

Table 8. Changes to CP Commands (continued)

Command	Changes
XSPool XLISTDEL	INCOMPATIBLE: <ul style="list-style-type: none"> • [6.3] Removed. CSE is no longer supported.

CP Utilities

Table 9 on page 240 lists CP utilities that have changed. For additional information see [z/VM: CP Commands and Utilities Reference](#).

Table 9. Changes to CP Utilities

Utility	Changes
CPFMTXA	INCOMPATIBLE: <ul style="list-style-type: none"> • [6.2] CPFMTXA EXEC moved from MAINT 190 to PMAINT 551. • [7.2 VM66677] The user running the SDINST utility must have at least 512 MB of storage, not 256 MB. Upwardly compatible: <ul style="list-style-type: none"> • [6.2] New messages: HCP6628E, HCP6632E, HCP6633E, HCP6639E. • [6.2] New OWNER operand and options. • [7.1 VM66263] Operand descriptions updated indicating seven decimal digits are supported; updated usage notes. • [7.1 VM66288] New ERASE and NOMSG operands, and new messages HCP6211E, HCP6212E, HCP6213E, and HCP8612E. The NOMSG operand requires ICKDSF APAR PH14249.
CPSYNTAX	Upwardly compatible: <ul style="list-style-type: none"> • [6.2] New LPAR operand and enhancements added to support the new system configuration file statements SSI, BEGIN, and END. • [6.4] New message: HCP2149E. • [6.4] New message variations: HCP1001E, HCP2768E, HCP6706E. • [7.2] New message: HCP6706E. • [7.2 VM66173] New message: HCP2585E.
DDR	INCOMPATIBLE: <ul style="list-style-type: none"> • [6.2] Previously, a response or message was issued when the input device for a COPY or RESTORE function was larger than the output device, even if the data being copied or restored was a subset. Now, a response or message is issued when the input device is larger than the output device only if the ALL operand was specified on the COPY or RESTORE function statement. Upwardly compatible: <ul style="list-style-type: none"> • [6.4] New message: HCP9037W. • [6.4] New MODE option values: EFMT1, EFMT2, EFMT3 and EFMT4.

Table 9. Changes to CP Utilities (continued)

Utility	Changes
DIRECTXA	<p data-bbox="597 237 800 268">INCOMPATIBLE:</p> <ul data-bbox="597 285 1430 485" style="list-style-type: none"> <li data-bbox="597 285 1409 317">• [6.2] DIRECTXA MODULE moved from MAINT 190 to PMAINT 551. <li data-bbox="597 327 1430 485">• [6.3 VM65577] New version of DIRECTXA requires more directory space on the DASD volume that contains the object directory. An additional 60 bytes per user plus 2 pages for system use is required. The count of users should include each user defined with a USER, IDENTITY, or POOL statement. <p data-bbox="597 506 873 537">Upwardly compatible:</p> <ul data-bbox="597 554 1466 1333" style="list-style-type: none"> <li data-bbox="597 554 1398 617">• [6.2] SYSAFNID is not allowed if the SSI option is specified on the DIRECTORY statement in the user directory being processed. <li data-bbox="597 627 1382 753">• [6.2] New messages: HCP495E, HCP496E, HCP497E, HCP498E, HCP499E, HCP664E, HCP665E, HCP666E, HCP667E, HCP668E, HCP669I, HCP670E, HCP671E, HCP672E, HCP675E, HCP676E, HCP796E, HCP797E, and HCP1799E. <li data-bbox="597 764 1430 1016">• [6.2] Changed messages: HCP481E, HCP751E, HCP752E, HCP753E, HCP754E, HCP755E, HCP758E, HCP772E, HCP773E, HCP776E, HCP777E, HCP783I, HCP786I, HCP789E, HCP790E, HCP791E, HCP792E, HCP795E, HCP798E, HCP1755E, HCP1757E, HCP1758E, HCP1759E, HCP1760E, HCP1762E, HCP1764E, HCP1766E, HCP1770E, HCP1771E, HCP1772E, HCP1776E, HCP1785E, HCP1796E, HCP1798E, HCP1879E, HCP1880E, HCP1882E, HCP2826E, and HCP2829E. <li data-bbox="597 1026 1377 1058">• [6.2] Deleted messages: HCP781E, HCP1761E, and HCP1881E. <li data-bbox="597 1068 1466 1163">• [6.2] Return code 4 is issued if an attempt is made to update the real user directory with an SSI-enabled or not-SSI-enabled source directory that is not valid in the current system configuration. <li data-bbox="597 1173 1333 1205">• [6.2] Updated formula for computing storage for a directory. <li data-bbox="597 1215 1390 1247">• [6.2] Response contains changed value for the new release level. <li data-bbox="597 1257 1175 1289">• [6.4 VM65925] Updated message: HCP1882E. <li data-bbox="597 1299 1175 1331">• [7.1 VM66219] Updated message: HCP1882E.

Table 9. Changes to CP Utilities (continued)

Utility	Changes
DISKMAP	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.2] DISKMAP EXEC moved from MAINT 190 to PMAINT 551. • [6.2] Output file record length has been changed from 80 characters to 100 characters to accommodate columns for new SUBCONFIG and MEMBER information. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] From an authorization perspective, the USERID value specifies the user ID to which the MDISK belongs. For multiconfiguration virtual machines, the MDISKS can be defined within either the IDENTITY or SUBCONFIG stanzas. In both cases the USERID value specifies the name from the IDENTITY statement. If the SUBCONFIG statement is not referenced by any BUILD statement, the USERID value contains a value of *NOUSER!. • [6.2] The SUBCONFIG value in the output is blank unless the MDISK was defined within a SUBCONFIG stanza. • [6.2] The MEMBER value in the output is blank unless the MDISK was defined within a SUBCONFIG stanza. The value displayed is the system ID from the BUILD statement. If there is no corresponding BUILD statement, this value is blank.
DUMPLD2	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [7.1] The TAPE operand has been removed. Various messages related to dumping to tape have been removed. • [7.2] Updated so that if the dump spool file is processed, it will be in USER HOLD after DUMPLD2 completes. In the past, the final HOLD status of the file was dependent on the KEEP setting of the spool file. This update makes the behavior of DUMPLD2 consistent with that of DUMpload. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.1] New message: HCP8247E. • [6.3] New operand: DASD. • [7.2 VM66560] New and updated message variations: HCP8243I.
DUMpload	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [7.1] The TAPE operand has been removed. Various messages related to dumping to tape have been removed. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] PRINT/NOPRINT operand description updated. • [7.2 VM66430] New option: DISTILL. New messages: HCP8186I, HCP8187I, and HCP8188I. • [7.2 VM66560] New message variation: HCP8169I
FORMSSI	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3 VM65712] Updated messages: HCP6609E, HCP6619I. • [6.3 VM65712] New message: HCP6620E.

Table 9. Changes to CP Utilities (continued)

Utility	Changes
HCPLDR	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.2] Response contains changed value for the new release level.
HCPSADMP	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.2] Support to IPL from device types 3350, 3375, 9345, 3424 and 9348 has been removed. Supported IPL device types are 3380 and 3390 DASD and 3480, 3490, and 3590 tape. <p>Also, support to dump to device types 3424 and 9348 has been removed. Supported dump device types are 3480, 3490, and 3590 tape.</p> <ul style="list-style-type: none"> • [7.1] Utility removed. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4] HCPSADMP cannot be run in a Z mode virtual machine. • [6.4] New message: HCP8208E.
INSTALL	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.2] Renamed to INSTTAPE. TAPE operand removed.
IOEXPLOR	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4 VM66098] Updated responses to include Extent Space Efficient (ESE) volumes. • [7.2] <i>rdev</i>, <i>rdev1-rdev2</i> updated to support 4- and 5-digit hexadecimal numbers.
MONWRITE	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.1] Added usage note about CLOSE restriction. • [7.2] <i>bdny</i> operand description updated. Added usage note about <i>bdny</i> interval.
MOVE2SFS	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] This utility requires an operand and has no default.
OVERRIDE	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.3] This utility has been removed. UCR spool files and the OVERRIDE utility are no longer supported. Use the MODIFY statement or command to change command privilege classes.
SALIPL	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3] New DEVICE option which can have a 5-digit device address. • [6.3] New message: HCP021E. • [6.3 VM65577] New message: HCP9061W. • [6.4] Default ORIGIN in z/Architecture-only environment is X'2000'. • [6.4] New message: HCP9037W. • [7.2] <i>rdev</i> updated to support 4- and 5-digit hexadecimal numbers.

Table 9. Changes to CP Utilities (continued)

Utility	Changes
SDINST	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.4] The user running the SDINST utility must have at least 256 MB of storage, not 128 MB. • [7.2 VM66677] The user running the SDINST utility must have at least 512 MB of storage, not 256 MB. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4] Renamed image files for the new release: SADU64, SSPK64, SSPI64, SSPP64. • [6.4] New message: HCP8639E. • [7.1] Renamed image files for the new release: SADU71, SSPK71, SSPJ71, SSPP71. • [7.2] Renamed image files for the new release: SADU72, SSPK72, SSPJ72, SSPP72. • [7.2 VM66201] Updated message: HCP8648E.
TRACERED	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.1] SELECT operand: The processor address range for the CPU keyword is updated to: X'0000' to X'003F'. • [7.1 VM66265] The processor address range for the CPU keyword is updated to: X'0000' to X'004F'.

Dynamic I/O Return Codes

Table 10 on page 244 lists dynamic I/O return codes that have changed. For additional information, see [z/VM: I/O Configuration](#).

Table 10. Changes to Dynamic I/O Return Codes

Return Code	Changes
0106	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3 VM65417] Issued if you tried to add a PCI function, but you specified one that is already defined in the I/O configuration.

Table 10. Changes to Dynamic I/O Return Codes (continued)

Return Code	Changes
0107	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3 VM65417] Issued if one of the following occurred: <ul style="list-style-type: none"> – You tried to define or change a PCI function but one or more of the logical partitions that you specified is not currently defined in the active I/O configuration. – You tried to add a PCI function or change an existing one by adding access to one or more logical partitions, and one or more logical partitions were defined in the initial access list that were not defined in the access list. – You tried to change an existing PCI function by deleting one or more logical partitions from the access list, but one or more logical partitions do not have access to the PCI function. – You tried to add a nonshared PCI function or change an existing nonshared PCI function by adding access to one or more logical partitions, and more than one logical partition was specified as having initial access.
010A	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3 VM65417] Issued if you tried to change or delete an existing PCI function, but the PCI function you specified is not defined in the I/O configuration.
010D	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3 VM65417] Issued if your machine model does not support the dynamic I/O configuration change that you requested.
010F	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3 VM65417] Issued if you tried to delete a PCI function or you tried to change a PCI function by deleting one or more logical partition's access to it, and the PCI function is currently configured to one or more of those logical partitions. The system's attempt to deconfigure the PCI function from one or more logical partitions was unsuccessful.
0110	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3 VM65417] Issued if one of the following occurred: <ul style="list-style-type: none"> – The machine could not get access to certain resources required to make the requested configuration change. – The processor was temporarily unable to make the requested configuration change. – You issued a MODIFY PCIFUNCTION command to request conditional deletion of access by one or more logical partitions from the specified PCI function. However, the PCI function is currently configured to one or more of those logical partitions.

Table 10. Changes to Dynamic I/O Return Codes (continued)

Return Code	Changes
0112	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3 VM65417] Issued if one of the following occurred: <ul style="list-style-type: none"> – The specified PCI function, if added to your configuration, would exceed the maximum number of PCI functions that can be configured to your machine. – The value of the specified PCI function ID exceeds the maximum value supported by your machine. – The value of the specified virtual function number (VFN) would exceed the maximum value supported by your machine.
011C	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3 VM65417] Issued if the specified physical channel identifier (PCHID) is not a valid PCHID in your configuration • [6.3 VM65577] Issued if the specified physical channel identifier (PCHID) is not a valid PCHID in your configuration or was not specified when required.
011D	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3 VM65417] Issued if you tried to add a PCI function to your configuration, but the specified physical channel identifier (PCHID) or PCHID/Virtual Function Number (VFN) combination is already defined in your configuration.
012C	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3 VM65577] Issued if the specified virtual channel identifier (VCHID) is not a valid VCHID in your configuration or was not specified when required.
012D	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3 VM65577] Issued if the specified virtual channel identifier (VCHID) is a valid VCHID but has already been used in your configuration.
0320	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3 VM65577] Issued if the specified network identifiers (NETID) are not the same value as those already defined for another virtual function which is defined on the same PCHID. • [6.4 VM65942] Issued if you tried to add a PCI function and specified a PORT and a NETID, but existing PCI functions of the same type already exist for the corresponding port with a different NETID value.
0321	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3 VM65716] Issued if the network identifiers (NETID) value was specified for an ISM PCI function and the value was already used for another ISM PCHID. • [6.4] UID checking is enabled and the given UID value has already been used by another PCI function in the configuration or was not specified. • [6.4 VM65942] Issued if you tried to add a PCI function of TYPE ISM with a NETID, but the NETID is already associated with another ISM PCI function in your configuration.

Table 10. Changes to Dynamic I/O Return Codes (continued)

Return Code	Changes
0322	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4 VM65942] Issued if you tried to add a PCI function and specified a UID. UID checking is enabled for the system and the UID value failed the checking rules.
0323	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4 VM65942] Issued if you tried to add a PCI function and specified a PORT that was invalid.

DIAGNOSE Codes

Changes to DIAGNOSE codes are identified in the following topics:

- [“DIAGNOSE Codes for Customer Use” on page 247](#)
- [“Reserved DIAGNOSE Codes” on page 249](#)

DIAGNOSE Codes for Customer Use

Table 11 on page 247 lists DIAGNOSE codes for customer use that have changed. For additional information, see [z/VM: CP Programming Services](#).

Table 11. Changes to DIAGNOSE Codes

Code	Changes
X'00' Storage Extended Identification Code	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.2] Licensed program bit map field of the extended-identification code bit map contains a changed value for the new product level. • [7.2] Release information field of the extended-identification code bit map contains the new release level.

Table 11. Changes to DIAGNOSE Codes (continued)

Code	Changes
X'3C' Activate z/VM CP Directory	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] Condition code 2 means the DASD address specified in the volume label was invalid. The volume label and allocation map should be restored to the values that existed prior to the update. • [6.2] Condition code 3 means a fatal I/O error occurred when z/VM attempted to read the CP directory. The volume label and allocation map should be restored to the values that existed prior to the update. • Cause of a specification exception: If Rx is unchanged: The update is not for the current online directory volume and the issuer of the DIAGNOSE X'3C' does not have the appropriate privilege class. If Rx=0: The update is for the current online directory volume and one or more of the following is true: <ul style="list-style-type: none"> – The issuer of the DIAGNOSE X'3C' does not have the appropriate privilege class. – The new directory is not SSI-enabled, which is not valid in the current system configuration. – The new directory is SSI-enabled, which is not valid in the current system configuration. Rx should be tested, and if it is zero, the volume label and allocation map should be restored by the function that issued the DIAGNOSE X'3C' to the values that existed prior to the update.
X'84' Directory Update-in-Place	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] Updated for IDENTITY and SUBCONFIG IDs. • [6.2] SHARE operation removed. • [6.4] New virtual machine type for MACHINE operation: Z. • [6.4] XSTORE operation is supported for compatibility only; the operation has no function. Expanded storage (XSTORE) is not supported.
X'94' VMDUMP and Symptom Record Service	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] Execution can be halted with the CPHX or FORCE command.
X'D8' Read Spool File Blocks on System Queues	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.2 VM66479] <ul style="list-style-type: none"> – DIAGNOSE code X'D8' is now able to return a bitmap indicating which CP-owned volumes contain at least one page of a designated spool file. – The input parameter list includes a new field: DD8PBMSZ, which is the size of a guest buffer area, in doublewords, to hold the bitmap. – The system data queue is added as an option to the DD8PTYPE field.

Table 11. Changes to DIAGNOSE Codes (continued)

Code	Changes
X'FC' Channel Path Reconfiguration Interface	Incompatible: <ul style="list-style-type: none"> • [6.2] This DIAGNOSE code is no longer supported.
X'26C' Access Certain System Information	Upwardly compatible: <ul style="list-style-type: none"> • [6.1] Support for IBM zEnterprise System Networks. The following subcodes were updated with ensemble information: X'00000008', X'00000010', X'00000018', X'00000020', X'00000024', X'00000030'. • [6.2] Single System Image support. Updated subcodes: X'00000008', X'00000018', X'00000020', and X'00000030'. • [6.2] Virtual Switch HiperSockets Bridge support. Updated subcodes: X'00000010', X'00000020', and X'00000024'. • [6.3 VM65583] Multi-VSwitch Link Aggregation Support. Updated subcodes: X'00000008' and X'00000020'. • [6.4 VM65925] NICDEF Security Controls support. Updated subcode: X'00000020'. • [6.4 VM65918] Multi-VSwitch Link Aggregation enhancements. Updates to Version definitions table. Updated subcode: X'00000020'. Privilege class change for subcode: X'00000024'. • [7.1] Updated privilege class to add support for class B users. • [7.1 VM66219] Virtual Switch Priority Queuing support. Updated subcodes: X'00000010', X'00000020', and X'00000024'. • [7.2 VM66485] IPv6 Layer 2 Query Support. Updated subcode X'00000024' to return IPv6 addresses for Layer 2 guests. • [7.2 VM66557] Updated subcodes X'00000020' and X'00000024' to include NIC distribution information.
X'2FC' Obtain Certain Guest Performance Data	Upwardly compatible: <ul style="list-style-type: none"> • [7.1] Bit 28 of guest flags field in the response changed to reserved.

Reserved DIAGNOSE Codes

Table 12 on page 249 lists reserved DIAGNOSE codes that have changed. For additional information, see [z/VM: CP Programming Services](#).

Note: These DIAGNOSE codes are not supported as Programming Interfaces for customers.

Table 12. Changes to Reserved DIAGNOSE Codes

Code	Changes
X'C4' Handle Class Override Data for UCR file	INCOMPATIBLE: <ul style="list-style-type: none"> • [6.3] This DIAGNOSE code is no longer supported.

Table 12. Changes to Reserved DIAGNOSE Codes (continued)

Code	Changes
X'F0' CSE Communication	INCOMPATIBLE: <ul style="list-style-type: none"> • [6.3] Disabled. CSE is no longer supported. All subcodes will return CC=1 with caller's RC=24. No data is returned.
X'2AC' HCD Dynamic I/O	Upwardly compatible: <ul style="list-style-type: none"> • [6.3] PCIe Guest Direct Attach Support. Updated condition code and return code description: RC64 - PCI function is not offline. • [6.4] Updated condition code 1 and return code 8 description to include: RC2 - CHPID type is unknown.

STHYI Instruction

Table 13 on page 250 identifies fields in the STHYI instruction function code response buffers that have changed. For additional information, see [z/VM: CP Programming Services](#).

Table 13. Changes to the STHYI Instruction Function Code Response Buffers

Response Buffer	Changes
X'0000' CPU Capacity Machine Section	Upwardly compatible: <ul style="list-style-type: none"> • [6.3 VM66329] STHYI support for z/OS zCX containers: <ul style="list-style-type: none"> – INFMVAL1 will contain flag x'08' (INFMZIIPV) to indicate zIIP configuration information is reported. – New INFMSZIIP and INFMDZIIP fields report the number of shared and dedicated zIIP cores on the machine.

Table 13. Changes to the STHYI Instruction Function Code Response Buffers (continued)

Response Buffer	Changes
X'0000' CPU Capacity Partition Section	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3 VM65586, VM65696] Support for multithreading: <ul style="list-style-type: none"> – INFPFLG1 field will contain X'80' flag to indicate multithreading is enabled. – INFPSCPS, INFPDCPS, INFPSIFL, and INFPDIFL fields contain count of cores when multithreading is enabled. – INFPWBCP, INFPABCP, INFPWBIF, and INFPABIF fields indicate capped capacity in cores. • [6.3 VM65716] Support for LPAR group absolute capacity capping: <ul style="list-style-type: none"> – INFPVAL1 field will contain X'08' flag to indicate LPAR group absolute capacity capping is enabled. – INFPLGNM field contains the LPAR group name when LPAR group absolute capacity capping is enabled. – INFPLGCP field contains absolute capacity value for CP CPU type when LPAR group absolute capacity capping is enabled. – INFPLGIF field contains absolute capacity value for IFL CPU type when LPAR group absolute capacity capping is enabled. • [7.1 VM66329] STHYI support for z/OS zCX containers: <ul style="list-style-type: none"> – INFPVAL1 will contain flag x'02' (INFPZIIPV) to indicate zIIP configuration information is reported. – New INFPSZIIP and INFPDZIIP fields report the number of shared and dedicated logical zIIP cores available to the partition. – New INFPWBZIIP field contains the capacity cap for zIIP CPU type when the partition is capped at its entitlement. – New NFPABZIIP field contains the capacity cap when an absolute capacity cap is in place for the partition for the zIIP CPU type. – New INFPLGZIIP field contains absolute capacity value for zIIP CPU type when LPAR group absolute capacity capping is enabled.

Table 13. Changes to the STHYI Instruction Function Code Response Buffers (continued)

Response Buffer	Changes
X'0000' CPU Capacity Hypervisor Section	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3 VM65586, VM65696] Support for multithreading: <ul style="list-style-type: none"> – New INFYCPT field indicates threads in use per CP core (valid only when multithreading is enabled). – New INFYIFLT field indicates threads in use per IFL core (valid only when multithreading is enabled). – INFYSCPS, INFYDCPS, INFYSIFL, and INFYDIFL fields contain count of cores when multithreading is enabled. • [6.3 VM65680] If INFYFLG1 field X'40' flag is on, LIMITHARD caps use prorated core time for capping. If flag is off, raw CPU time is used. • [6.4 VM66105] Enhanced support for external management of z/VM CPU resources: <ul style="list-style-type: none"> – INFYINSF field contains a mask of installed function codes. – INFYAUTF field contains a mask of authorized function codes. • [7.1] Fields INFYDCPS and INFYDIFL: Deprecated on z/VM 7.1.0. • [7.1 VM66329] STHYI support for z/OS zCX containers: <ul style="list-style-type: none"> – INFYVAL1 will contain flag x'80' (INFYZIIPV) to indicate zIIP configuration information is reported. – INFYTYPE has new values of x'02' (INFYTKVM) and x'03'(INFYTZCX) defined for use by KVM and zCX hypervisors. – New INFYSZIIP field reports the number of zIIP cores shared by non-dedicated zIIP-dispatched virtual CPUs of this hypervisor. – New INFYZIIPT field will report the number of threads in use per zIIP core. z/VM does not support multithreaded zIIP cores so this number will always be reported as 1.

Table 13. Changes to the STHYI Instruction Function Code Response Buffers (continued)

Response Buffer	Changes
X'0000' CPU Capacity Guest Section	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3 VM65586, VM65696] Support for multithreading: <ul style="list-style-type: none"> – INFGFLG1 field can specify new flags: X'08' indicates virtual CPs are thread dispatched; X'04' indicates virtual IFLs are thread dispatched. – INFGPCC, INFGIFCC, INFGPCCC, and INFGPICC fields indicate capped capacity in cores. • [7.1] Fields INFGDCPS and INFGDIFL: Deprecated on z/VM 7.1.0. • [7.1 VM66329] STHYI support for z/OS zCX containers: <ul style="list-style-type: none"> – INFGFLG1 has new flags of x'02' (INFGZIIPH) to indicate that the zIIP dispatch type has a LIMITHARD cap, and x'01' (INFGVZIIPT) to indicate whether virtual zIIP CPUs are thread dispatched. – INFGVAL1 will contain flag x'80' (INFGZIIPV) to indicate zIIP configuration information is reported. – INFGPFLG has new flags of x'04' (INFGPZLH) to indicate that the resource pool has a LIMITHARD cap for zIIPs and x'02' (INFGPZPC) to indicate that the resource pool has a CAPACITY cap for zIIPs. – New INFGSZIIP field reports the number of guest virtual zIIPs. – New INFGZIIPDT field to indicate the virtual zIIP dispatch type. – New INFGZIIPCC field reports the capped capacity for zIIP-dispatched vCPUs. – New INFGPZCC field reports the resource pool capped capacity for virtual zIIPs.
X'0001' Hypervisor Environment Information	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4 VM66105] Returns hypervisor environment information including current CPU resources and utilization information available at the machine, logical partition, hypervisor, and guest levels.
X'0002' Guest List	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4 VM66105] Returns a list of logged on guests.
X'0003' Designated Guest Information	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4 VM66105] Returns guest CPU resource information useful to an authorized application performing CPU performance monitoring and management.
X'0004' Resource Pool List	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4 VM66105] Returns a list of defined resource pools.
X'0005' Designated Resource Pool Information	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4 VM66105] Returns a resource pool description for the specified resource pool.
X'0006' Resource Pool Member List	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4 VM66105] Returns a list of resource pool members for the specified resource pool.

Accounting Records

Table 14 on page 254 lists accounting records that have changed. For additional information, see [z/VM: CP Planning and Administration](#).

Table 14. Changes to Accounting Records

Accounting Record	Changes
Virtual Machine Resource Usage (Type 1)	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3 VM65586, VM65696] When multithreading is enabled on the system, the column 33-36 and 37-40 fields contain the MT-1 equivalent time and a type F record is generated. • [6.3 VM65586, VM65696] Column 67, formerly reserved, reports the number of threads on the Real CPU on which the virtual CPU was dispatched. When multithreading is enabled, additional data is reported on a type F record. • [7.2] Column 79 updated for record pertaining to adjunct configuration.
Dedicated Devices (Type 2)	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.2] Column 79 updated for record pertaining to adjunct configuration.
Temporary Disk Space (Type 3)	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.2] Column 79 updated for record pertaining to adjunct configuration.
Virtual Disk in Storage Space (Type B)	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.2] Column 79 updated for record pertaining to adjunct configuration.
Network Data Transmissions (Type C)	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.2] Column 79 updated for record pertaining to adjunct configuration.
CPU Capability (Type D)	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.1] New fields: Nominal CPU capability, Capacity-Change Reason, Capacity-Adjustment Indication. • [6.3 VM65577] CPU Capability data is continued on the type E record.
CPU Capability continuation data (Type E)	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3 VM65577] New record produced at the same time as the type D record to report more detailed CPU capability data.
Virtual Machine Resource Usage 2 (Type F)	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3 VM65586, VM65696] New record that is a continuation of the type 1 record. When multithreading is enabled on the system, a single type F record is produced for each virtual CPU for which one or two type 1 records (for primary and secondary CPU types) are produced. • [6.3 VM65680] When multithreading is enabled, prorated core times are calculated and reported for every virtual machine. • [7.2] Column 79 updated for record pertaining to adjunct configuration.

CP Macros

Changes to CP macros are identified in the following topics:

- [“System Definition Macros” on page 255](#)

- [“VM Data Space Macros” on page 255](#)

System Definition Macros

Table 15 on page 255 lists System Definition macros that have changed.

Table 15. Changes to System Definition Macros

Macro	Changes
CSESYS	INCOMPATIBLE: <ul style="list-style-type: none"> • [6.3] Not available for customer use. CSE is no longer supported.
CSETRACE	INCOMPATIBLE: <ul style="list-style-type: none"> • [6.3] Not available for customer use. CSE is no longer supported.
CSEUSER	INCOMPATIBLE: <ul style="list-style-type: none"> • [6.3] Not available for customer use. CSE is no longer supported.
SYSCPVOL	INCOMPATIBLE: <ul style="list-style-type: none"> • [6.3] OWN and SHARED keywords are ignored. CSE is no longer supported.

VM Data Space Macros

Table 16 on page 255 lists VM data space macros that have changed. For additional information, see [z/VM: CP Programming Services](#).

Table 16. Changes to VM Data Space Macros

Macro	Changes
VMUDQ	Upwardly compatible: <ul style="list-style-type: none"> • [6.2] MDISK parameter list has an additional field for MDISK definitions that are defined for the specified SSI member. • [6.4 VM65877] A flag can be set in the LSTMDISK parameter list to return SUBCONFIG information rather than the system name.

CP System Services

Table 17 on page 255 lists CP system services that have changed. For more information, see [z/VM: CP Programming Services](#).

Table 17. Changes to CP System Services

System Service	Changes
*RPI Access Verification System Service	INCOMPATIBLE: <ul style="list-style-type: none"> • [6.4] CP denies access to default VLAN ID when ACILVDL contains 'X'FFFF' for a VLAN-aware virtual switch. Upwardly compatible: <ul style="list-style-type: none"> • [6.2] The ACIPARMS control block has been updated. In the ACIPARMS parameter lists, the LOGOFF and LOGON commands have been updated, and a new parameter list has been added for VMRELOCATE.

Table 17. Changes to CP System Services (continued)

System Service	Changes
*SPL Spool System Service	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.2 VM66479] The SPGQUEUE field of the parameter list (SPGBK) can be set to a new value, SPGSDF, to designate that the System Data File (NSS/DCSS, UCR, IMG, NLS, and TRF files) queue is to be processed via the generic *SPL interface.
*VMEVENT VM Event System Service	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] A new class is added: Class 4, for Asynchronous VSWITCH events. • [6.3 VM65583] New Class 4 Types added for Multi-VSwitch Link Aggregation Support. • [6.4 VM66105] New Class 0 Types.

CP Environment Variables

Table 18 on page 256 lists CP environment variables that have been changed.

Note: To get the most current list of (and more information about) these variables, go to:

IBM: z/VM New Function Variable List (<https://www.vm.ibm.com/newfunction/varlist.html>)

Table 18. Changes to CP Environment Variables

Environment Variable	Changes
CP.LIMIT.MEMORY.RECONFIG	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.2 VM66271] The value of this environment variable has changed from 0 to 50.

VM Dump Tool

Table 19 on page 256 lists VM Dump Tool functions that have changed. For additional information, see [z/VM: VM Dump Tool](#).

Table 19. Changes to VM Dump Tool Command, Subcommands, and Macros

Function	Changes
BREG subcommand	<ul style="list-style-type: none"> • [7.2 VM66532] New BREG subcommand.
CPUUSE macro	<ul style="list-style-type: none"> • [6.3] New output for a parked processor is "CPU XXXX Parked." • [6.3 VM65586, VM65696] When multithreading is enabled, output includes CPU type and core ID. • [6.3 VM65586, VM65696] New message: HCQ163E.
DUMPTYPE subcommand	<ul style="list-style-type: none"> • [7.2 VM66560] New response for the case that the dump contains no CP storage. <p>New messages: HCQ167E, HCQ168W.</p> <p>Updated message: HCQ004E; new error code added.</p>

Table 19. Changes to VM Dump Tool Command, Subcommands, and Macros (continued)

Function	Changes
FRAMES subcommand	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3] The page count fields on all output lines have been changed from 8 digits to 10 digits. • [7.1] Output changed to show a hard abend dump with a correlation table.
FRMAVL macro	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3] Numeric digits increased to 20.
HCQGSPL function	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3 VM65586, VM65696] New NOMSG option prevents the display of messages from HCQGSPL.
RDEVBK subcommand	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.2] <i>devnum</i> updated to support 4- and 5-digit hexadecimal numbers.
REGISTER subcommand	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • • [7.2] The response includes the breaking-event-address register (BEAR).
TRACE subcommand	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New operands: FRToken <i>token</i> and FRName <i>name</i>.
TWOGFRM macro	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3] Numeric digits increased to 20.
VMDTQRY subcommand	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New operand: FRTrace. Updated examples.

CMS Changes

Changes to CMS interfaces are identified in the following topics:

- [“General CMS Commands” on page 257](#)
- [“CMS Utilities” on page 259](#)
- [“XEDIT Subcommands” on page 260](#)
- [“CMS Routines” on page 261](#)
- [“CMS Macros” on page 261](#)
- [“HELP Facility” on page 262](#)

For information about changes to CMS monitor records, see [z/VM Data Areas, Control Blocks, and Monitor Records \(https://www.vm.ibm.com/pubs/ctlblk.html\)](#).

General CMS Commands

Table 20 on page 258 lists general CMS commands that have changed. For additional information, see [z/VM: CMS Commands and Utilities Reference](#).

Table 20. Changes to General CMS Commands

Command	Changes
CREATE (in general)	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4 VM66028] Renamed help files for subcommands. See “[6.4 APAR] z/VM HELP Quality Improvement” on page 147.
DEFAULTS	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4] FOR option default number of records for the PEEK command changed from 200 to 25000. • [7.2 VM66561] New option that can be used with DEFAULTS: CERTMGR.
DELETE	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4 VM66028, VM66029] Renamed help files for subcommands. See “[6.4 APAR] z/VM HELP Quality Improvement” on page 147.
HELP	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.1] HELP components removed: HMF, HMFQUERY, HMFSET. • [6.3] HELP components removed: DHCPD, LPD, XSPOOL. • [7.1] GLOSSARY operand removed. • [7.1] HELP components removed: GDDMXD, GLOSSARY, IMAPADM. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.1] HELP components added: NSINTER, NSLOOKUP. • [6.4] HELP components added. See “[6.4 APAR] z/VM HELP Quality Improvement” on page 147.
NAMES	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] Updated the Node and List options for an IPv6 address.
NOTE	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] Updated the <i>name</i> operand
PEEK	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4] Default number of records displayed for PEEK has been changed from 200 to 25000.
PIPE	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4] CMS Pipelines has been upgraded and offers new function and capabilities. In general, applications created in earlier z/VM releases that use CMS Pipelines as specified will continue to run without any change to the application. For additional migration information, see <i>z/VM: CMS Pipelines User's Guide and Reference</i>. This new CMS Pipelines publication is based on <i>CMS/TSO Pipelines: Author's Edition</i>, SL26-0018, and replaces both of the previous z/VM CMS Pipelines publications.

Table 20. Changes to General CMS Commands (continued)

Command	Changes
QUERY CMSLEVEL	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] Response includes added information and indicates when z/CMS is running in the virtual machine. • [7.2] Response contains changed value for the new CMS level.
QUERY CMSREL	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.2] Response contains changed value for the new release level.
SEGMENT	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4 VM66028] Renamed help files for subcommands. See “[6.4 APAR] z/VM HELP Quality Improvement” on page 147.
SENDFILE	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] Description updated for <i>node</i>.
SET CMS370AC	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New message: DMS2632E.
VMLINK	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.2] The PUSH option is ignored when DETACH, RELEASE, or NOKEEP is specified. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New variables: .AS, .LS.
XEDIT	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.2] For files with file types other than the special file types recognized by the editor, the default case has been changed from uppercase to mixed case.

CMS Utilities

Table 21 on page 259 lists CMS utilities that have changed. For additional information, see [z/VM: CMS Commands and Utilities Reference](#).

Table 21. Changes to CMS Utilities

Utility	Changes
ACCOUNT	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New operand: CPUCAP. • [6.2] New messages: DMS2265E, DMS2266I. • [6.2] Message variation: DMS2263E.
AUDITOR	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] When using AUDITOR for the first time, uncomment the call to the AUDITOR EXEC.

Table 21. Changes to CMS Utilities (continued)

Utility	Changes
DIRMAP	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.2] DIRMAP MODULE moved from MAINT 190 to PMAINT 551. • [6.2] Output file record length has been changed from 80 characters to 100 characters to accommodate columns for new SUBCONFIG and MEMBER information. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] From an authorization perspective, the Ownerid value specifies the user ID to which the MDISK belongs. For multi-configuration virtual machines, the MDISKs can be defined within either the IDENTITY or SUBCONFIG stanzas. In both cases the Ownerid value specifies the name from the IDENTITY statement. If the SUBCONFIG statement is not referenced by any BUILD statement, the Ownerid value does not contain a valid value. • [6.2] The SUBCONFIG value in the output is blank unless the MDISK was defined within a SUBCONFIG definition. • [6.2] The MEMBER value in the output is * unless the MDISK was defined within a SUBCONFIG definition. The value displayed is the system ID from the BUILD statement. If there is no corresponding BUILD statement the value is *NOUSER!. • [6.2] If a LINK statement specifies an IDENTITY as a user ID and a Vaddr that is defined in multiple SUBCONFIG stanzas referenced by the IDENTITY's BUILD statements, then the LINK is shown for every possible match. • [6.2] If the LINK statement is defined within a SUBCONFIG stanza, then the link is not associated with MDISKs or LINKs that are defined following SUBCONFIG statements defined for different systems. • [6.2] If END is specified as the length of a minidisk, the ending cylinder for that disk is determined by the other minidisks defined for that device. If END is the only length used for that device, DIRMAP will use the lowest cylinder length for that device type.
SYSWATCH	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.1] Privilege class E required when monitoring PAGE and SPOOL allocation data from the CP INDICATE LOAD command.

XEDIT Subcommands

Table 22 on page 260 lists XEDIT subcommands that have changed. For additional information, see [z/VM: XEDIT Commands and Macros Reference](#).

Table 22. Changes to XEDIT Subcommands

Subcommand	Changes
LOAD	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.2] For files with file types other than the special file types recognized by the editor, the default case has been changed from uppercase to mixed case.

Table 22. Changes to XEDIT Subcommands (continued)

Subcommand	Changes
XEDIT	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.2] For files with file types other than the special file types recognized by the editor, the default case has been changed from uppercase to mixed case.

CMS Routines

Changes to CMS routines are identified in the following topics:

- [“General CMS Callable Services” on page 261](#)
- [“Systems Management Routines” on page 261](#)

General CMS Callable Services

Table 23 on page 261 lists general CMS callable services that have changed. For additional information, see [z/VM: CMS Callable Services Reference](#), unless otherwise indicated.

Table 23. Changes to General CMS Callable Services

Routine	Changes
DMSQEFL	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.2] Changed values returned for the <i>cp_level</i> and <i>cms_level</i> parameters.
DMSQSFL	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.2] Changed value returned for the <i>server_level</i> parameter.

Systems Management Routines

In z/VM 6.1 and later, only the sockets-based systems management APIs are supported. The RPC-based systems management APIs are not supported.

CMS Macros

Changes to CMS macros are identified in the following topics:

- [“General CMS Macros and Subcommands” on page 261](#)
- [“CMS Compatibility-Interface Macros” on page 262](#)

General CMS Macros and Subcommands

Table 24 on page 261 lists general CMS macros and subcommands that have changed. For additional information, see [z/VM: CMS Macros and Functions Reference](#).

Table 24. Changes to General CMS Macros and Subcommands

Macro or Subcommand	Changes
CMSSTOR macro	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New USERG subpool can be specified by a program running in a z/CMS virtual machine to obtain or release storage above 2 GB. • [6.2] New return code 12 on CMSSTOR OBTAIN.

Table 24. Changes to General CMS Macros and Subcommands (continued)

Macro or Subcommand	Changes
DMSQEFL macro	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.2] Changed value returned for the new CMS level.

CMS Compatibility-Interface Macros

Table 25 on page 262 lists CMS compatibility-interface macros that have changed.

Table 25. Changes to CMS Compatibility-Interface Macros

Macro	Changes
DEFNUC	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] DEFNUC macro for the z/CMS nucleus is contained in the DMSZNGP file. IBM-supplied DEFNUC responses for z/CMS nucleus generation are identical to responses for ESA/390 CMS nucleus generation except: <ul style="list-style-type: none"> – SYSNAME=ZCMS – IPLADDR=990 – Default version identification constructed for VERSION= is: <pre>z/CMS Vv.r.m yyyy-mm-dd hh:mm</pre> – Default output file heading constructed for INSTID= is: <pre>z/Architecture CMS</pre> • [7.2] Default IPL heading entry contains the new release level. <p>For additional information, see z/VM: CMS Planning and Administration.</p>

HELP Facility

Table 26 on page 262 identifies HELP components (HELPxxxx file types) that have been added or deleted in each release.

Table 27 on page 263 lists HELP files that have been deleted in each release. If a specific file name is not identified, all files with the specified file type have been deleted.

Notes:

1. Files for a new HELP component might conflict with local help files with identical file IDs.
2. Files identified as deleted are removed from the new z/VM release but are not automatically removed from your system if you overlay your current help files with the new set. You need to remove them manually.

Table 26. Added or Deleted HELP Components

HELP Component	File Type	Change
NSINTER	HELPN SIN	[6.1] Added for TCP/IP NSLOOKUP command interactive session subcommands.
NSLOOKUP	HELPN SLO	[6.1] Added for TCP/IP NSLOOKUP command subcommands.
DHCPD	HELPDHCP	[6.3] Deleted (support withdrawn for TCP/IP DHCP server).
LPD	HELPLPD	[6.3] Deleted (support withdrawn for TCP/IP LPD server).

Table 26. Added or Deleted HELP Components (continued)

HELP Component	File Type	Change
MROUTINE	HELPMROU	[6.3] Deleted (not supported).
XSPool	HELPMXPO	[6.3] Deleted (support withdrawn for CSE).
ASSOCIATE	HELMPASSO	[6.4 VM66029] Added for CP ASSOCIATE command subcommands.
CREATE	HELPCREA	[6.4 VM66028] Added for CMS CREATE command subcommands.
DEACTIVE	HELPDEAC	[6.4 VM66029] Added for CP DEACTIVE command subcommands.
DELETE	HELPDELE	[6.4 VM66029] Expanded to include both CP DELETE and CMS DELETE command subcommands.
DRAIN	HELPDRAI	[6.4 VM66029] Added for CP DRAIN command subcommands.
FLASHCOPY	HELPFLAS	[6.4 VM66029] Added for CP FLASHCOPY command subcommands.
FREE	HELPMFREE	[6.4 VM66029] Added for CP FREE command subcommands.
GIVE	HELPMGIVE	[6.4 VM66029] Added for CP GIVE command subcommands.
HOLD	HELPHOLD	[6.4 VM66029] Added for CP HOLD command subcommands.
SEGMENT	HELPSEGM	[6.4 VM66028] Added for CMS SEGMENT command subcommands.
START	HELPSTAR	[6.4 VM66029] Added for CP START command subcommands.
VARY	HELPMVARY	[6.4 VM66029] Added for CP VARY command subcommands.
GDDMXD	HELPMGDDM	[7.1] Deleted (support removed for TCP/IP GDDMXD/VM interface).
GLOSSARY	HELPMGLOS	[7.1] Deleted (z/VM glossary publication and help file discontinued).
IMAPADM	HELPMIMAP	[7.1] Deleted (support removed for TCP/IP IMAP server).
DIRECTORY	HELPMDIRE	[7.2 VM66511 (CP), VM66512 (CMS), VM66513 (VMSES)] Added for user directory statements.
SYSCONFIG	HELPMSYSC	[7.2 VM66511 (CP), VM66512 (CMS), VM66513 (VMSES)] Added for system configuration statements.

Table 27. Deleted HELP Files

File Name	File Type	Release/Reason
CRYPTO	HELPMCPSE	[6.1] Function not supported.
CRYPTO	HELPMDEFI	[6.1] Function not supported.
CRYPTO	HELPMDETA	[6.1] Function not supported.
CRYPTO	HELPMDISP	[6.1] Function not supported.
CRYPTO	HELPMDUMP	[6.1] Function not supported.
CRYPTO	HELPMSTOR	[6.1] Function not supported.
HMF	HELPMMENU	[6.1] HMF/VM not supported.

Table 27. Deleted HELP Files (continued)

File Name	File Type	Release/Reason
HMFQUERY	HELPMENU	[6.1] HMF/VM not supported.
HMFSET	HELPMENU	[6.1] HMF/VM not supported.
PRODUCTS	HELPMENU	[6.1]
HCP2468E	HELPMMSG	[6.1]
HCP9051W	HELPMMSG	[6.1]
DNS	HELPABBR	[6.2] Function not supported.
HSA	HELPCPQU	[6.2] Command removed.
CLOSECON	HELPDNS	[6.2] Function not supported.
COMMIT	HELPDNS	[6.2] Function not supported.
DUMP	HELPDNS	[6.2] Function not supported.
FLIPTABL	HELPDNS	[6.2] Function not supported.
HELP	HELPDNS	[6.2] Function not supported.
HINTS	HELPDNS	[6.2] Function not supported.
LEVEL	HELPDNS	[6.2] Function not supported.
LIST	HELPDNS	[6.2] Function not supported.
PURGE	HELPDNS	[6.2] Function not supported.
REFRESH	HELPDNS	[6.2] Function not supported.
STATS	HELPDNS	[6.2] Function not supported.
STORAGE	HELPDNS	[6.2] Function not supported.
TRACE	HELPDNS	[6.2] Function not supported.
VMDUMP	HELPDNS	[6.2] Function not supported.
CPERTFTP	HELPCFX	[6.2] Function not supported.
FPERTFTP	HELPCFX	[6.2] Function not supported.
DNS	HELPMENU	[6.2] Function not supported.
DVH3297	HELPMMSG	[6.2]
DVH3299	HELPMMSG	[6.2]
DVH3300	HELPMMSG	[6.2]
DVH3367	HELPMMSG	[6.2]
DVH3368	HELPMMSG	[6.2]
DVH3392	HELPMMSG	[6.2]
FCX080E	HELPMMSG	[6.2]
FCX352E	HELPMMSG	[6.2]
FCX650I	HELPMMSG	[6.2]
FCX651I	HELPMMSG	[6.2]

Table 27. Deleted HELP Files (continued)

File Name	File Type	Release/Reason
FCX652I	HELPMSG	[6.2]
FCX653I	HELPMSG	[6.2]
FCX654I	HELPMSG	[6.2]
FCX655I	HELPMSG	[6.2]
FCX659I	HELPMSG	[6.2]
FCX660E	HELPMSG	[6.2]
HCP645E	HELPMSG	[6.2] Function not supported.
HCP659E	HELPMSG	[6.2] Function not supported.
HCP660E	HELPMSG	[6.2] Function not supported.
HCP661E	HELPMSG	[6.2] Function not supported.
HCP662I	HELPMSG	[6.2] Function not supported.
HCP663E	HELPMSG	[6.2] Function not supported.
HCP781E	HELPMSG	[6.2]
HCP1702E	HELPMSG	[6.2] Function not supported.
HCP1705I	HELPMSG	[6.2] Function not supported.
HCP1706I	HELPMSG	[6.2] Function not supported.
HCP1707I	HELPMSG	[6.2] Function not supported.
HCP1708I	HELPMSG	[6.2] Function not supported.
HCP1709E	HELPMSG	[6.2] Function not supported.
HCP1710E	HELPMSG	[6.2] Function not supported.
HCP1711I	HELPMSG	[6.2] Function not supported.
HCP1712I	HELPMSG	[6.2] Function not supported.
HCP1713I	HELPMSG	[6.2] Function not supported.
HCP1716E	HELPMSG	[6.2] Function not supported.
HCP1761I	HELPMSG	[6.2]
HCP1881E	HELPMSG	[6.2]
HCP2723E	HELPMSG	[6.2]
HCP2744E	HELPMSG	[6.2]
HCP6423E	HELPMSG	[6.2]
HCQ039E	HELPMSG	[6.2]
HCQ200I	HELPMSG	[6.2]
HCQ401I	HELPMSG	[6.2]
IRM038E	HELPMSG	[6.2]
XSP001	HELPMSG	[6.2] Function not supported.

Table 27. Deleted HELP Files (continued)

File Name	File Type	Release/Reason
XSP100	HELPMMSG	[6.2] Function not supported.
XSP101	HELPMMSG	[6.2] Function not supported.
XSP102	HELPMMSG	[6.2] Function not supported.
XSP110	HELPMMSG	[6.2] Function not supported.
XSP111	HELPMMSG	[6.2] Function not supported.
XSP112	HELPMMSG	[6.2] Function not supported.
XSP113	HELPMMSG	[6.2] Function not supported.
XSP114	HELPMMSG	[6.2] Function not supported.
XSP115	HELPMMSG	[6.2] Function not supported.
XSP116	HELPMMSG	[6.2] Function not supported.
DNSADM	HELPTASK	[6.2] Function not supported.
KERBADM	HELPTASK	[6.2] Function not supported.
KERBEROS	HELPTASK	[6.2] Function not supported.
EXT_SRVT	HELPTCPI	[6.2] Function not supported.
KADMIN	HELPTCPI	[6.2] Function not supported.
KDB_DEST	HELPTCPI	[6.2] Function not supported.
KDB_EDIT	HELPTCPI	[6.2] Function not supported.
KDB_INIT	HELPTCPI	[6.2] Function not supported.
KDB_UTIL	HELPTCPI	[6.2] Function not supported.
KDESTROY	HELPTCPI	[6.2] Function not supported.
KINIT	HELPTCPI	[6.2] Function not supported.
KLIST	HELPTCPI	[6.2] Function not supported.
KPASSWD	HELPTCPI	[6.2] Function not supported.
KSTASH	HELPTCPI	[6.2] Function not supported.
NSMAIN	HELPTCPI	[6.2] Function not supported.
GATHER	HELXPXPO	[6.2] Function not supported.
DHCPD	HELPABBR	[6.3] Support withdrawn for TCP/IP DHCP server.
LPD	HELPABBR	[6.3] Support withdrawn for TCP/IP LPD server.
MROUTINE	HELPABBR	[6.3] Not supported.
XSPPOOL	HELPABBR	[6.3] Support withdrawn for CSE.
CLUSTER	HELPCPQU	[6.3] Not used.
CLUSTER	HELPCPSE	[6.3] Not used.
OVERRIDE	HELPCP	[6.3] Support withdrawn for user class restructure (UCR).
XSPPOOL	HELPCP	[6.3] Support withdrawn for CSE.

Table 27. Deleted HELP Files (continued)

File Name	File Type	Release/Reason
<i>fn</i>	HELDPHCP	[6.3] Support withdrawn for TCP/IP DHCP server.
CP	HELPLPD	[6.3] Support withdrawn for TCP/IP LPD server.
DHCPD	HELPMENU	[6.3] Support withdrawn for TCP/IP DHCP server.
LPD	HELPMENU	[6.3] Support withdrawn for TCP/IP LPD server.
MROUTINE	HELPMENU	[6.3] Not supported.
XSPool	HELPMENU	[6.3] Support withdrawn for CSE.
<i>fn</i>	HELPMROU	[6.3] Not supported.
DMS159T	HELPMMSG	[6.3] Not used.
DMS160T	HELPMMSG	[6.3] Not used.
DMS161T	HELPMMSG	[6.3] Not used.
DMS260T	HELPMMSG	[6.3] Not used.
DMS340E	HELPMMSG	[6.3] Not used.
DMS625S	HELPMMSG	[6.3] Not used.
DMS717I	HELPMMSG	[6.3] Not used.
DMS789E	HELPMMSG	[6.3] Not used.
DMS902T	HELPMMSG	[6.3] Not used.
DMS1077S	HELPMMSG	[6.3] Not used.
DMS1136W	HELPMMSG	[6.3] Not used.
DMS1407I	HELPMMSG	[6.3] Not used.
DMS2017I	HELPMMSG	[6.3] Not used.
DMS2017S	HELPMMSG	[6.3] Not used.
DMS2245I	HELPMMSG	[6.3] Not used.
DMS2413W	HELPMMSG	[6.3] Not used.
DMS2803S	HELPMMSG	[6.3] Not used.
HCP1800E	HELPMMSG	[6.3] Not used.
HCP8300s-8499s	HELPMMSG	[6.3] Installation messages now have format IUG####s.
HCP9154E	HELPMMSG	[6.3] Not used.
DHCP	HELPTASK	[6.3] Support withdrawn for TCP/IP DHCP server.
LPDADM	HELPTASK	[6.3] Support withdrawn for TCP/IP LPD server.
DHCPD	HELPTCPI	[6.3] Support withdrawn for TCP/IP DHCP server.
LPD	HELPTCPI	[6.3] Support withdrawn for TCP/IP LPD server.
<i>fn</i>	HELXPSP0	[6.3] Support withdrawn for CSE.
DVH3261I	HELPMMSG	[6.4] Expanded storage (XSTORE) support removed.
DVH3324E	HELPMMSG	[6.4] Expanded storage (XSTORE) support removed.

Table 27. Deleted HELP Files (continued)

File Name	File Type	Release/Reason
HCP1108E	HELPMSG	[6.4] Expanded storage (XSTORE) support removed.
HCP1400I	HELPMSG	[6.4] Expanded storage (XSTORE) support removed.
HCP1402I	HELPMSG	[6.4] Expanded storage (XSTORE) support removed.
HCP1403E	HELPMSG	[6.4] Expanded storage (XSTORE) support removed.
HCP1703I	HELPMSG	[6.4] Not used.
HCP1704I	HELPMSG	[6.4] Not used.
HCP1962I	HELPMSG	[6.4] Expanded storage (XSTORE) support removed.
HCP2266E	HELPMSG	[6.4] Not used.
HCP2267E	HELPMSG	[6.4] Not used.
HCP3013E	HELPMSG	[6.4] Ensembles/zManager support removed.
HCP3014E	HELPMSG	[6.4] Ensembles/zManager support removed.
HCP3015E	HELPMSG	[6.4] Ensembles/zManager support removed.
HCP3016I	HELPMSG	[6.4] Ensembles/zManager support removed.
HCP3017I	HELPMSG	[6.4] Ensembles/zManager support removed.
HCP3018E	HELPMSG	[6.4] Ensembles/zManager support removed.
HCP3019I	HELPMSG	[6.4] Ensembles/zManager support removed.
HCP3020E	HELPMSG	[6.4] Ensembles/zManager support removed.
HCP3021E	HELPMSG	[6.4] Ensembles/zManager support removed.
HCP3024E	HELPMSG	[6.4] Ensembles/zManager support removed.
HCP3025E	HELPMSG	[6.4] Ensembles/zManager support removed.
HCP3026E	HELPMSG	[6.4] Ensembles/zManager support removed.
HCP3027E	HELPMSG	[6.4] Ensembles/zManager support removed.
HCP3028E	HELPMSG	[6.4] Ensembles/zManager support removed.
HCP3029E	HELPMSG	[6.4] Ensembles/zManager support removed.
HCP3030E	HELPMSG	[6.4] Ensembles/zManager support removed.
HCP3035E	HELPMSG	[6.4] Ensembles/zManager support removed.
HCP3038E	HELPMSG	[6.4] Ensembles/zManager support removed.
HCP3172I	HELPMSG	[6.4] Not used.
HCP3179E	HELPMSG	[6.4] Not used.
HCP3182I	HELPMSG	[6.4] Not used.
HCP3186I	HELPMSG	[6.4] Not used.
HCP6153E	HELPMSG	[6.4] Not used.
HCP6154E	HELPMSG	[6.4] Not used.
HCP6254I	HELPMSG	[6.4] Not used.

Table 27. Deleted HELP Files (continued)

File Name	File Type	Release/Reason
HCP6294I	HELPMMSG	[6.4] Ensembles/zManager support removed.
HCP6625I	HELPMMSG	[6.4] Not used.
HCP6872I	HELPMMSG	[6.4] Expanded storage (XSTORE) support removed.
HCP9111I	HELPMMSG	[6.4] Expanded storage (XSTORE) support removed.
HCP9153E	HELPMMSG	[6.4] Not used.
VSM1000E	HELPMMSG	[6.4] Ensembles/zManager support removed.
VSM1001E	HELPMMSG	[6.4] Ensembles/zManager support removed.
VSM1002E	HELPMMSG	[6.4] Ensembles/zManager support removed.
VSM1003E	HELPMMSG	[6.4] Ensembles/zManager support removed.
VSM1004E	HELPMMSG	[6.4] Ensembles/zManager support removed.
VSM1005W	HELPMMSG	[6.4] Ensembles/zManager support removed.
VSM1006E	HELPMMSG	[6.4] Ensembles/zManager support removed.
VSM1007E	HELPMMSG	[6.4] Ensembles/zManager support removed.
VSM1008W	HELPMMSG	[6.4] Ensembles/zManager support removed.
VSM1009E	HELPMMSG	[6.4] Ensembles/zManager support removed.
VSM1010W	HELPMMSG	[6.4] Ensembles/zManager support removed.
VSM1011E	HELPMMSG	[6.4] Ensembles/zManager support removed.
VSM1012E	HELPMMSG	[6.4] Ensembles/zManager support removed.
GDDMXD	HELPABBR	[7.1] Support removed for TCP/IP GDDMXD/VM interface.
IMAPADM	HELPABBR	[7.1] Support removed for TCP/IP IMAP server.
VMFSIM	HELPABBR	[7.1]
CONFIGUR	HELPCMS	[7.1] CMA not supported.
LIBRARY	HELPCMS	[7.1] Discontinued.
DVDPRIME	HELPCP	[7.1]
EXPLOFCP	HELPCP	[7.1] Replaced by EXPLORE HELPCP.
HCPSADMP	HELPCP	[7.1] Not supported.
INSTTAPE	HELPCP	[7.1] Tape support removed.
PAVALIAS	HELPCP	[7.1] Replaced by PAVALIAS HELPDEFI.
SPECEX	HELPCPQU	[7.1] Command not supported.
SPECEX	HELPCPSE	[7.1] Command not supported.
<i>fn</i>	HELPGDDM	[7.1] Support removed for TCP/IP GDDMXD/VM interface.
GLOSSARY	HELPGLOS	[7.1] <i>z/VM Glossary</i> publication discontinued.
<i>fn</i>	HELPIMAP	[7.1] Support removed for TCP/IP IMAP server.
GDDMXD	HELPMENU	[7.1] Support removed for TCP/IP GDDMXD/VM interface.

Table 27. Deleted HELP Files (continued)

File Name	File Type	Release/Reason
IMAPADM	HELPMENU	[7.1] Support removed for TCP/IP IMAP server.
ALL	HELPMESS	[7.1]
USER	HELPMESS	[7.1]
DMSxxxxx	HELPMMSG	[7.1] Deleted messages: DMS2970E, DMS2971E, DMS2972E, DMS2973E, DMS2974E, DMS2975E, DMS2976E, DMS2977E, DMS2978I, DMS2979E, DMS2980E, DMS2981E, DMS2982E, DMS2983R, DMS2984E, DMS2985E, DMS2986E
HCPxxxxx	HELPMMSG	[7.1] Deleted messages: HCP958E, HCP958W, HCP997W, HCP998W, HCP999W, HCP1057I, HCP1605E, HCP1719I, HCP1851E, HCP8157A, HCP8159A, HCP8166E, HCP8172E, HCP8173E, HCP8174E, HCP8176E, HCP8200W, HCP8201W, HCP8202W, HCP8203W, HCP8204W, HCP8205W, HCP8206W, HCP8207W, HCP8208E, HCP9013W, HCP9017W, HCP9018W, HCP9019W, HCP9061W, HCP9269E
ITNxxxxx	HELPMMSG	[7.1] Deleted messages: ITN2000E, ITN2000I, ITN2001I, ITN2002I, ITN2003I, ITN2004I, ITN2005I, ITN2006I, ITN2006W, ITN2007I, ITN2007W, ITN2008E, ITN2010E, ITN2011E, ITN2011W, ITN2012E, ITN2013E, ITN2014E, ITN2015E, ITN2016E, ITN2017I, ITN2017W, ITN2018E, ITN2019W, ITN2020E, ITN2021E, ITN2022I, ITN2023E, ITN2024E, ITN2025E, ITN2026E, ITN2027E, ITN2050E
IUGxxxxx	HELPMMSG	[7.1] Deleted messages: IUG8305E, IUG8306R, IUG8308R, IUG8309R, IUG8313E, IUG8360I, IUG8366E, IUG8367E, IUG8368E, IUG8370E, IUG8372R, IUG8373E, IUG8378R, IUG8379E, IUG8381I, IUG8382E, IUG8383R, IUG8386E, IUG8387E, IUG8388I, IUG8389W, IUG8390I, IUG8395E, IUG8397R, IUG8428I, IUG8433I, IUG8434I, IUG8435E, IUG8439E, IUG8441I, IUG8442E, IUG8448E, IUG8464R, IUG8497E
CMSSIGSU	HELPOROU	[7.1] Replaced by CMSSIGSE HELPOROU.
GDDMX	HELPTASK	[7.1] Support removed for TCP/IP GDDMXD/VM interface.
IMAP	HELPTASK	[7.1] Support removed for TCP/IP IMAP server.
MSOCKETS	HELPTASK	[7.1] Replaced by SMAPI HELPTASK.
GDDMXD	HELPTCPI	[7.1] Support removed for TCP/IP GDDMXD/VM interface.
IMAPMAIN	HELPTCPI	[7.1] Support removed for TCP/IP IMAP server.
ITNVTSTR	HELPMVSE	[7.1]
ASSOEX	HELPCP	[7.2] Obsolete command removed.
ASSOMSGS	HELPCP	[7.2] Obsolete command removed.
CONV	HELPCP	[7.2] Obsolete command removed.
CPTRAP	HELPCP	[7.2] Obsolete command removed.
DRAINDIS	HELPCP	[7.2] Obsolete command removed.
DRAINUR	HELPCP	[7.2] Obsolete command removed.

Table 27. Deleted HELP Files (continued)

File Name	File Type	Release/Reason
FLASHBND	HELPCP	[7.2] Obsolete command removed.
FLASHEST	HELPCP	[7.2] Obsolete command removed.
FLASHRES	HELPCP	[7.2] Obsolete command removed.
FLASHTGT	HELPCP	[7.2] Obsolete command removed.
FLASHWIT	HELPCP	[7.2] Obsolete command removed.
FREELOGN	HELPCP	[7.2] Obsolete command removed.
FREEPRIN	HELPCP	[7.2] Obsolete command removed.
GIVRDEV	HELPCP	[7.2] Obsolete command removed.
GIVVDEV	HELPCP	[7.2] Obsolete command removed.
HOLDLOGN	HELPCP	[7.2] Obsolete command removed.
HOLDPRT	HELPCP	[7.2] Obsolete command removed.
ISLINK	HELPCP	[7.2] Obsolete command removed.
QUERY CPTRAP	HELPCP	[7.2] Obsolete command removed.
STARTDIS	HELPCP	[7.2] Obsolete command removed.
STARTUR	HELPCP	[7.2] Obsolete command removed.
VARYCHPI	HELPCP	[7.2] Obsolete command removed.
VARYCORE	HELPCP	[7.2] Obsolete command removed.
VARYPATH	HELPCP	[7.2] Obsolete command removed.
VARYPCIF	HELPCP	[7.2] Obsolete command removed.
VARYPROC	HELPCP	[7.2] Obsolete command removed.
VARYRDEV	HELPCP	[7.2] Obsolete command removed.
VARYSUBC	HELPCP	[7.2] Obsolete command removed.
HCP1137E	HELPMMSG	[7.2] Remove IPL parameter: PAGING63.
HCP1139I	HELPMMSG	[7.2] Remove IPL parameter: PAGING63.
HCP1395W	HELPMMSG	[7.2] Remove IPL parameter: PAGING63.
HCP6006E	HELPMMSG	[7.2] Obsolete message removed.
HCP6090I	HELPMMSG	[7.2] Obsolete message removed.
HCP6296E	HELPMMSG	[7.2] MSS Multi-Target PPRC Exploitation.
HCP8152E	HELPMMSG	[7.2] Obsolete message removed.

Dump Viewing Facility Changes

Table 28 on page 272 lists Dump Viewing Facility functions that have changed. For additional information, see *z/VM: Dump Viewing Facility*.

Table 28. Changes to Dump Viewing Facility Functions

Function	Changes
DUMPSCAN	Upwardly compatible: <ul style="list-style-type: none"> • [7.2] Header record indicates new release level.

GCS Changes

Table 29 on page 272 lists GCS commands and macros that have changed. For additional information, see [z/VM: Group Control System](#).

Table 29. Changes to GCS Commands and Macros

Interface	Changes
GCSLEVEL macro	Upwardly compatible: <ul style="list-style-type: none"> • [7.2] Contains new equates for new release levels.
QUERY GCSLEVEL command	Upwardly compatible: <ul style="list-style-type: none"> • [7.2] Response contains changed values for the new release.

REXX/VM Changes

Table 30 on page 272 lists REXX/VM instructions, functions, and external functions that have changed. For additional information, see [z/VM: REXX/VM Reference](#).

Table 30. Changes to REXX/VM Instructions, Functions, and External Functions

Interface	Changes
DIAGRC	Upwardly compatible: <ul style="list-style-type: none"> • [7.1] Maximum amount of data returned for DIAG(00) has been increased to 200 bytes. • [7.2] DIAG(A0) - Obtain ACI Information: ESM Product Information - and DIAGRC(A0) added.
STORAGE	Upwardly compatible: <ul style="list-style-type: none"> • [6.2] Accepts 16-digit hexadecimal address, allowing a program running in z/CMS to inspect and modify storage above 2 GB.

VMSES/E Changes

Table 31 on page 272 lists VMSES/E commands that have changed. For more information, see [z/VM: VMSES/E Introduction and Reference](#).

Table 31. Changes to VMSES/E Commands

Command	Changes
PRODUTL	INCOMPATIBLE: <ul style="list-style-type: none"> • [6.2] This command, previously called TCP2PROD EXEC, has been renamed PRODUTL EXEC.

Table 31. Changes to VMSES/E Commands (continued)

Command	Changes
PUT2PROD	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New operands: SAVECMS and SEGMENTS. • [7.2] Updated SEGMENTS operand and description. Updated message: VMF1218W.
SERVICE	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.2] New operands: ALLAPARS, ALLPTFS. New options: NOLOG and PPF. New usage note about the SERVICE STATUS command. Return code 5 is issued if service that affects core VMSES/E components is identified. New message: VMF1238I.
VMFBDNUC	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.4] New messages: VMF2251I, VMF2252I, VMF2253E, VMF2253W, VMF2254W, VMF2255W, VMF2256W.
VMFINS DELETE	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.2] Deleted options: RESOURCE, DFNAME, DFTYPE, DFMODE.
VMFINS INSTALL	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.2] Deleted options: RESOURCE, DFNAME, DFTYPE, DFMODE.
VMFINS MIGRATE	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.2] Deleted options: RESOURCE, DFNAME, DFTYPE, DFMODE. • [7.1] Command removed.
VMFSETUP	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.2] Default changed from NOLINK to LINK. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.3] New option: LINKRr.
VMFSUFIN	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.2] Return code 5 is issued if service that affects core VMSES/E components is identified.
VMFUPDAT	<p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [6.2] New option: SYSPINV.
VMFVIEW	<p>INCOMPATIBLE:</p> <ul style="list-style-type: none"> • [6.3] Default PF2 and PK14 key assignments have been changed. <p>Upwardly compatible:</p> <ul style="list-style-type: none"> • [7.2] New operands: \$CSMAGT, \$CSMCMG, and CSM.

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Bibliography

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The current z/VM product documentation is available in [IBM Documentation - z/VM \(https://www.ibm.com/docs/en/zvm\)](https://www.ibm.com/docs/en/zvm).

z/VM Base Library

Overview

- [z/VM: License Information, GI13-4377](#)
- [z/VM: General Information, GC24-6286](#)

Installation, Migration, and Service

- [z/VM: Installation Guide, GC24-6292](#)
- [z/VM: Migration Guide, GC24-6294](#)
- [z/VM: Service Guide, GC24-6325](#)
- [z/VM: VMSES/E Introduction and Reference, GC24-6336](#)

Planning and Administration

- [z/VM: CMS File Pool Planning, Administration, and Operation, SC24-6261](#)
- [z/VM: CMS Planning and Administration, SC24-6264](#)
- [z/VM: Connectivity, SC24-6267](#)
- [z/VM: CP Planning and Administration, SC24-6271](#)
- [z/VM: Getting Started with Linux on IBM Z, SC24-6287](#)
- [z/VM: Group Control System, SC24-6289](#)
- [z/VM: I/O Configuration, SC24-6291](#)
- [z/VM: Running Guest Operating Systems, SC24-6321](#)
- [z/VM: Saved Segments Planning and Administration, SC24-6322](#)
- [z/VM: Secure Configuration Guide, SC24-6323](#)
- [z/VM: TCP/IP LDAP Administration Guide, SC24-6329](#)
- [z/VM: TCP/IP Planning and Customization, SC24-6331](#)
- [z/OS and z/VM: Hardware Configuration Manager User's Guide \(https://www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosv2r4sc342670/\\$file/eequ100_v2r4.pdf\)](https://www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosv2r4sc342670/$file/eequ100_v2r4.pdf), SC34-2670

Customization and Tuning

- [z/VM: CP Exit Customization, SC24-6269](#)
- [z/VM: Performance, SC24-6301](#)

Operation and Use

- [z/VM: CMS Commands and Utilities Reference, SC24-6260](#)

- *z/VM: CMS Primer*, SC24-6265
- *z/VM: CMS User's Guide*, SC24-6266
- *z/VM: CP Commands and Utilities Reference*, SC24-6268
- *z/VM: System Operation*, SC24-6326
- *z/VM: TCP/IP User's Guide*, SC24-6333
- *z/VM: Virtual Machine Operation*, SC24-6334
- *z/VM: XEDIT Commands and Macros Reference*, SC24-6337
- *z/VM: XEDIT User's Guide*, SC24-6338

Application Programming

- *z/VM: CMS Application Development Guide*, SC24-6256
- *z/VM: CMS Application Development Guide for Assembler*, SC24-6257
- *z/VM: CMS Application Multitasking*, SC24-6258
- *z/VM: CMS Callable Services Reference*, SC24-6259
- *z/VM: CMS Macros and Functions Reference*, SC24-6262
- *z/VM: CMS Pipelines User's Guide and Reference*, SC24-6252
- *z/VM: CP Programming Services*, SC24-6272
- *z/VM: CPI Communications User's Guide*, SC24-6273
- *z/VM: ESA/XC Principles of Operation*, SC24-6285
- *z/VM: Language Environment User's Guide*, SC24-6293
- *z/VM: OpenExtensions Advanced Application Programming Tools*, SC24-6295
- *z/VM: OpenExtensions Callable Services Reference*, SC24-6296
- *z/VM: OpenExtensions Commands Reference*, SC24-6297
- *z/VM: OpenExtensions POSIX Conformance Document*, GC24-6298
- *z/VM: OpenExtensions User's Guide*, SC24-6299
- *z/VM: Program Management Binder for CMS*, SC24-6304
- *z/VM: Reusable Server Kernel Programmer's Guide and Reference*, SC24-6313
- *z/VM: REXX/VM Reference*, SC24-6314
- *z/VM: REXX/VM User's Guide*, SC24-6315
- *z/VM: Systems Management Application Programming*, SC24-6327
- *z/VM: TCP/IP Programmer's Reference*, SC24-6332
- *z/VM: z/Architecture Extended Configuration (z/XC) Principles of Operation*, SC27-4940
- *CPI Communications Reference*, SC26-4399
- *Common Programming Interface Resource Recovery Reference*, SC31-6821
- *z/OS: IBM Tivoli Directory Server Plug-in Reference for z/OS* ([https://www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosv2r4sa760169/\\$file/glpa300_v2r4.pdf](https://www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosv2r4sa760169/$file/glpa300_v2r4.pdf)), SA76-0169
- *z/OS: Language Environment Concepts Guide* ([https://www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosv2r4sa380687/\\$file/ceea800_v2r4.pdf](https://www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosv2r4sa380687/$file/ceea800_v2r4.pdf)), SA38-0687
- *z/OS: Language Environment Debugging Guide* ([https://www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosv2r4ga320908/\\$file/ceea100_v2r4.pdf](https://www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosv2r4ga320908/$file/ceea100_v2r4.pdf)), GA32-0908
- *z/OS: Language Environment Programming Guide* ([https://www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosv2r4sa380682/\\$file/ceea200_v2r4.pdf](https://www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosv2r4sa380682/$file/ceea200_v2r4.pdf)), SA38-0682
- *z/OS: Language Environment Programming Reference* ([https://www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosv2r4sa380683/\\$file/ceea300_v2r4.pdf](https://www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosv2r4sa380683/$file/ceea300_v2r4.pdf)), SA38-0683

- [z/OS: Language Environment Runtime Messages \(https://www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosv2r4sa380686/\\$file/ceea900_v2r4.pdf\)](https://www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosv2r4sa380686/$file/ceea900_v2r4.pdf), SA38-0686
- [z/OS: Language Environment Writing Interlanguage Communication Applications \(https://www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosv2r4sa380684/\\$file/ceea400_v2r4.pdf\)](https://www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosv2r4sa380684/$file/ceea400_v2r4.pdf), SA38-0684
- [z/OS: MVS Program Management Advanced Facilities \(https://www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosv2r4sa231392/\\$file/ieab200_v2r4.pdf\)](https://www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosv2r4sa231392/$file/ieab200_v2r4.pdf), SA23-1392
- [z/OS: MVS Program Management User's Guide and Reference \(https://www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosv2r4sa231393/\\$file/ieab100_v2r4.pdf\)](https://www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosv2r4sa231393/$file/ieab100_v2r4.pdf), SA23-1393

Diagnosis

- [z/VM: CMS and REXX/VM Messages and Codes](#), GC24-6255
- [z/VM: CP Messages and Codes](#), GC24-6270
- [z/VM: Diagnosis Guide](#), GC24-6280
- [z/VM: Dump Viewing Facility](#), GC24-6284
- [z/VM: Other Components Messages and Codes](#), GC24-6300
- [z/VM: TCP/IP Diagnosis Guide](#), GC24-6328
- [z/VM: TCP/IP Messages and Codes](#), GC24-6330
- [z/VM: VM Dump Tool](#), GC24-6335
- [z/OS and z/VM: Hardware Configuration Definition Messages \(https://www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosv2r4sc342668/\\$file/cbdm100_v2r4.pdf\)](https://www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosv2r4sc342668/$file/cbdm100_v2r4.pdf), SC34-2668

z/VM Facilities and Features

Data Facility Storage Management Subsystem for VM

- [z/VM: DFSMS/VM Customization](#), SC24-6274
- [z/VM: DFSMS/VM Diagnosis Guide](#), GC24-6275
- [z/VM: DFSMS/VM Messages and Codes](#), GC24-6276
- [z/VM: DFSMS/VM Planning Guide](#), SC24-6277
- [z/VM: DFSMS/VM Removable Media Services](#), SC24-6278
- [z/VM: DFSMS/VM Storage Administration](#), SC24-6279

Directory Maintenance Facility for z/VM

- [z/VM: Directory Maintenance Facility Commands Reference](#), SC24-6281
- [z/VM: Directory Maintenance Facility Messages](#), GC24-6282
- [z/VM: Directory Maintenance Facility Tailoring and Administration Guide](#), SC24-6283

Open Systems Adapter

- [Open Systems Adapter-Express Customer's Guide and Reference \(https://www.ibm.com/support/pages/node/6019492\)](https://www.ibm.com/support/pages/node/6019492), SA22-7935
- [Open Systems Adapter-Express Integrated Console Controller User's Guide \(https://www.ibm.com/support/pages/node/6019810\)](https://www.ibm.com/support/pages/node/6019810), SC27-9003
- [Open Systems Adapter-Express Integrated Console Controller 3215 Support \(https://www.ibm.com/docs/en/SSLTBW_2.1.0/com.ibm.zos.v2r1.ioa/ioa.htm\)](https://www.ibm.com/docs/en/SSLTBW_2.1.0/com.ibm.zos.v2r1.ioa/ioa.htm), SA23-2247
- [Open Systems Adapter/Support Facility on the Hardware Management Console \(https://www.ibm.com/docs/en/SSLTBW_2.1.0/com.ibm.zos.v2r1.ioa/ioa.htm\)](https://www.ibm.com/docs/en/SSLTBW_2.1.0/com.ibm.zos.v2r1.ioa/ioa.htm), SC14-7580

Performance Toolkit for z/VM

- [z/VM: Performance Toolkit Guide](#), SC24-6302
- [z/VM: Performance Toolkit Reference](#), SC24-6303

RACF Security Server for z/VM

- [z/VM: RACF Security Server Auditor's Guide](#), SC24-6305
- [z/VM: RACF Security Server Command Language Reference](#), SC24-6306
- [z/VM: RACF Security Server Diagnosis Guide](#), GC24-6307
- [z/VM: RACF Security Server General User's Guide](#), SC24-6308
- [z/VM: RACF Security Server Macros and Interfaces](#), SC24-6309
- [z/VM: RACF Security Server Messages and Codes](#), GC24-6310
- [z/VM: RACF Security Server Security Administrator's Guide](#), SC24-6311
- [z/VM: RACF Security Server System Programmer's Guide](#), SC24-6312
- [z/VM: Security Server RACROUTE Macro Reference](#), SC24-6324

Remote Spooling Communications Subsystem Networking for z/VM

- [z/VM: RSCS Networking Diagnosis](#), GC24-6316
- [z/VM: RSCS Networking Exit Customization](#), SC24-6317
- [z/VM: RSCS Networking Messages and Codes](#), GC24-6318
- [z/VM: RSCS Networking Operation and Use](#), SC24-6319
- [z/VM: RSCS Networking Planning and Configuration](#), SC24-6320
- [z/OS: Network Job Entry \(NJE\) Formats and Protocols \(\[https://www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosv2r4sa320988/\\\$file/hasa600_v2r4.pdf\]\(https://www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosv2r4sa320988/\$file/hasa600_v2r4.pdf\)\)](#), SA32-0988

Prerequisite Products

Device Support Facilities

- [Device Support Facilities \(ICKDSF\): User's Guide and Reference \(\[https://www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosv2r4gc350033/\\\$file/ickug00_v2r4.pdf\]\(https://www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosv2r4gc350033/\$file/ickug00_v2r4.pdf\)\)](#), GC35-0033

Environmental Record Editing and Printing Program

- [Environmental Record Editing and Printing Program \(EREPP\): Reference \(\[https://www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosv2r4gc350152/\\\$file/ifc2000_v2r4.pdf\]\(https://www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosv2r4gc350152/\$file/ifc2000_v2r4.pdf\)\)](#), GC35-0152
- [Environmental Record Editing and Printing Program \(EREPP\): User's Guide \(\[https://www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosv2r4gc350151/\\\$file/ifc1000_v2r4.pdf\]\(https://www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosv2r4gc350151/\$file/ifc1000_v2r4.pdf\)\)](#), GC35-0151

Index

Special Characters

*RPI system service [255](#)
*SPL system service [256](#)
*VMEVENT enhancements [99](#)
*VMEVENT system service [256](#)
\$PPF file names (7.2) [39](#)

Numerics

3590 and 3592 tape not supported for installation (6.4) [34](#)
3592 Model E07 [50](#)
4 TB real memory support [90](#)

A

Access Verification System Service [255](#)
ACCOUNT directory statement [192](#)
ACCOUNT utility [46](#), [259](#)
accounting records [254](#)
ACIGRP keyword
 GLBLDSK macro [29](#)
ACIPARMS enhancements (6.2) [124](#)
ACTIVATE ISLINK command [194](#)
added publications (6.1) [182](#)
adjunct virtual machine support [85](#)
administration, changes related to [114](#)
Adobe Indexed PDF Collection [183](#)
AES GCM for the TLS/SSL Server [104](#)
allow device range on DEFINE HYPERPAVALIAS and DEFINE PAVALIAS [160](#)
alternate subchannel set dynamic I/O support [76](#)
API
 CP New Feature Interrogation [178](#)
appliances
 xCAT [6](#)
application development and deployment, changes related to [174](#)
architecture level set [41](#)
architecture level set (ALS) for 6.4 [67](#)
architecture level set (ALS) for 7.1 [78](#)
architecture level set (ALS) for 7.2 [86](#)
ASSOCIATE command [194](#)
ATTACH command [195](#)
AUDITOR utility [259](#)
AVS external interfaces [185](#)

B

BEGIN / END system configuration statements [186](#)
Binder upgrade (6.1) [175](#)
Binder upgrade (6.2) [176](#)
binder upgrade (6.3) [177](#)

C

callable services, CMS, general [261](#)
change TLS server to IPL ZCMS (7.2) [173](#)
changed command responses [87](#)
changes in z/VM 7.2
 increased CPU scalability [64](#)
CHPID OSM [45](#)
CHPID OSX [45](#)
CLASS directory statement [192](#)
CLEAR TDISK enabled by default [113](#)
Client/Server TLS/SSL support (6.4) [105](#)
Cloud Connector [158](#)
Cloud Infrastructure Center [158](#)
CMA no longer available [6](#)
CMS AUDITOR utility [25](#)
CMS Binder upgrade (6.1) [175](#)
CMS Binder upgrade (6.2) [176](#)
CMS callable services, general [261](#)
CMS commands [257](#)
CMS compatibility-interface macros [262](#)
CMS external interfaces [257](#)
CMS file pool server Enhancements (6.2) [128](#)
CMS macro subcommands [261](#)
CMS macros [261](#)
CMS macros, general [261](#)
CMS monitor records [257](#)
CMS Pipelines (6.4) [145](#)
CMS Pipelines documentation (6.4) [183](#)
CMS routines [261](#)
CMS utilities [259](#)
CMS, z/Architecture [6](#)
CMSSTOR macro [261](#)
command responses, changed [87](#)
commands, Dump Viewing Facility [271](#)
commands, GCS [272](#)
commands, general CMS [257](#)
commands, VM Dump Tool [256](#)
commands, VMSES/E [272](#)
Common Criteria certification [136](#)
Common Criteria Certification (6.4) [158](#)
connectivity, virtual [95](#)
contiguous frame coalescing, enhanced [115](#)
contiguous page replenishment counters [126](#)
continuous delivery capability for z/VM documentation [184](#)
Continuous Delivery model [1](#)
COUPLE command [195](#)
CP commands [194](#)
CP commands cleanup [159](#)
CP environment variables
 for new functions [2](#)
CP environment variables (6.4) [141](#)
CP external interfaces [185](#)
CP macros [254](#)
CP monitor records [185](#)
CP New Feature Interrogation API [178](#)
CP QUERY DEVICES command [163](#)

[CP support for MFA 173](#)
[CP system services 255](#)
[CP utilities 240](#)
[CP_OWNED system configuration statement 186](#)
[CP.FUNCTION.COPYSERVICES.FC_PRESERVE_MIRROR 2](#)
[CP.FUNCTION.CRYPTO.INTERRUPTIONS 2](#)
[CP.FUNCTION.CRYPTO.MIXED_APVIRT_LGR 2](#)
[CP.FUNCTION.DASD.HYPERPAV_1_END 2](#)
[CP.FUNCTION.DASD.MINIDISK.HPF.PHASE 2](#)
[CP.FUNCTION.DASD.MP_VARY_ON 2](#)
[CP.FUNCTION.DUMP.PRESERVE_PARTIAL 2](#)
[CP.FUNCTION.DUMP.SPEEDUP 2](#)
[CP.FUNCTION.EDEVICE.DEFINITION 2](#)
[CP.FUNCTION.EDEVICE.PATH_MANAGEMENT 2](#)
[CP.FUNCTION.QUERY.DEVICES 2](#)
[CP.FUNCTION.SPOOL.EXTENSIONS 2](#)
[CP.FUNCTION.VSWITCH.IPV6QUERY 2](#)
[CP.FUNCTION.VSWITCH.NICDISTRIBUTION 2](#)
[CP.FUNCTION.ZXC 2](#)
[CP.LIMIT.MEMORY.REAL_TOTAL 2](#)
[CP.LIMIT.MEMORY.RECLAIM 2](#)
[CP.LIMIT.MEMORY.RECONFIG 2, 256](#)
[CPACCESS command 196](#)
[CPACF, protected key 45](#)
[CPFMTXA utility 240](#)
[CPHX command 196](#)
[CPSYNTAX utility 240](#)
[CPU command 196](#)
[CPU directory statement 192](#)
[CPU pooling support 132](#)
[CPU resource management 155](#)
[CPU-Measurement Counter Facility enhancement 51](#)
[CPU-Measurement Counter Facility, host support for 46](#)
[crashkernel area size 172](#)
[CREATE command 258](#)
[cross system extensions \(CSE\) support removed 128](#)
[cross-system spool in SSI cluster 119](#)
[crypto](#)

- [LGR with mixed adapter types 93](#)

[CRYPTO APVIRTUAL system configuration statement 186](#)
[CRYPTO directory statement 192](#)
[Crypto Express APVIRT support for TLS/SSL and LDAP 107](#)
[Crypto Express3 44](#)
[Crypto Express4S 51](#)
[Crypto Express5S 60](#)
[crypto terminology change 46](#)
[Cryptographic Coprocessor Facility \(CCF\), support removed for 47](#)
[CSE support removed 128](#)
[CSESYS macro 255](#)
[CSETRACE macro 255](#)
[CSEUSER macro 255](#)
[CU system configuration statement 186](#)

D

[DASD volume real device address 132](#)
[data space macros 255](#)
[DDR utility 240](#)
[DEACTIVE command 196](#)
[DEACTIVE CONV command 196](#)
[DEACTIVE ISLINK command 196](#)
[DEDICATE command 196](#)
[DEFAULTS command 258](#)

[DEFINE CHPID / PATH command 197](#)
[DEFINE command 197](#)
[DEFINE CPOWNED command 197](#)
[DEFINE CPU command 198](#)
[DEFINE CPUPOOL command superseded by DEFINE RESPOOL command 198](#)
[DEFINE CRYPTO command 198](#)
[DEFINE DEVICE / IODEVICE command 198](#)
[DEFINE DIAGNOSE command 198](#)
[DEFINE HYPERPAVALIAS command 198](#)
[DEFINE LAN command 198](#)
[DEFINE MDISK command 198](#)
[DEFINE NIC command 198](#)
[DEFINE PAVALIAS command 199](#)
[DEFINE PCIFUNCTION command 199](#)
[DEFINE RESPOOL / CPUPOOL command 199](#)
[DEFINE STORAGE command 199](#)
[DEFINE TIMEZONE command 199](#)
[DEFINE VSWITCH command 200](#)
[DEFINE VSWITCH system configuration statement 187](#)
[DEFNUC macro 262](#)
[DEFSEG command 200](#)
[DEFSYS command 200](#)
[DELETE command \(CMS\) 258](#)
[DELETE command \(CP\) 200](#)
[DELETE CPUPOOL command superseded by DELETE RESPOOL command 200](#)
[DELETE DEVICE / IODEVICE command 200](#)
[DELETE EDEVICE command 201](#)
[DELETE RDEVICE command 201](#)
[DELETE RESPOOL / CPUPOOL command 201](#)
[deleted publications \(6.1\) 182](#)
[deleted publications \(7.1\) 184](#)
[DETACH \(Real Device\) command 201](#)
[DETACH \(Virtual Device\) command 202](#)
[DETACH CFLINK command 201](#)
[DETACH command 201](#)
[DETACH CRYPTO command 201](#)
[DETACH LAN command 202](#)
[DETACH SYSASCII command 202](#)
[DETACH VSWITCH command 202](#)
[DETACH XSTORE command 202](#)
[determine installed service 34](#)
[DEVICES system configuration statement 187](#)
[DIAGNOSE code X'00' 247](#)
[DIAGNOSE code X'26C' 249](#)
[DIAGNOSE code X'2AC' 250](#)
[DIAGNOSE code X'2FC' 249](#)
[DIAGNOSE code X'3C' 248](#)
[DIAGNOSE code X'84' 248](#)
[DIAGNOSE code X'94' 248](#)
[DIAGNOSE code X'C4' 249](#)
[DIAGNOSE code X'D8' 248](#)
[DIAGNOSE code X'F0' 250](#)
[DIAGNOSE code X'FC' 249](#)
[DIAGNOSE codes 247](#)
[DIAGNOSE codes \(reserved\) 249](#)
[diagnosis, changes related to 179](#)
[DIAGRC function 272](#)
[DIRECTORY directory statement 193](#)
[directory entries, predefined, changes to \(6.1\) 7](#)
[directory entries, predefined, changes to \(6.2\) 8](#)
[directory entries, predefined, changes to \(6.3\) 26](#)
[directory entries, predefined, changes to \(6.4\) 30](#)

- directory entries, predefined, changes to (7.1) [36](#)
- directory entries, predefined, changes to (7.2) [40](#)
- directory HELP files [164](#)
- directory modifications (7.1) [35](#)
- directory statements [192](#)
- DIRECTXA utility [241](#)
- DirMaint default changes (7.2) [161](#)
- DirMaint enhancements (6.2) [124](#)
- DirMaint enhancements (6.4) [138](#)
- DirMaint enhancements (V7.2) [162](#)
- DirMaint performance enhancements [172](#)
- DIRMAP utility [260](#)
- DISKMAP utility [242](#)
- DISPLAY (Guest Storage - ESA/XC, z/XC) command [202](#)
- DISPLAY (Registers) command [202](#)
- DISPLAY CDX command [202](#)
- DISPLAY command [202](#)
- DISPLAY PSW command [202](#)
- DISPLAY PSWG command [202](#)
- DISTRIBUTE system configuration statement [187](#)
- Distributed IUCV enhancements (6.4) [107](#)
- DMSQEFL macro [262](#)
- DMSQEFL routine [261](#)
- DMSQSFSL routine [261](#)
- DNS IPv6 support (6.4) [106](#)
- DNS server, z/VM native (NAMESRV), removed [99](#)
- documentation changes [182](#)
- documentation provided with z/VM, changes to (6.1) [5](#)
- DRAIN command [202](#)
- DS8000 support (6.3) [56](#)
- DUMP (Guest Storage - ESA/XC, z/XC) command [203](#)
- DUMP (Registers) command [203](#)
- DUMP CDX command [203](#)
- DUMP command [203](#)
- DUMP ESA/XC Storage command [203](#)
- DUMP processing enhancements [180](#)
- dump processing improvements [180](#)
- dump processing improvements (7.1 APAR) [181](#)
- dump processing, improving I/O time for [181](#)
- DUMP PSW command [203](#)
- DUMP PSWG command [203](#)
- dump support, enhanced (6.3) [179](#)
- Dump Tool functions [256](#)
- Dump Viewing Facility external interfaces [271](#)
- DUMPLD2 utility [242](#)
- DUMpload utility [242](#)
- DUMPSCAN command [272](#)
- duplicate IP address handling on virtual switch [102](#)
- dynamic crypto [84](#)
- dynamic EDEVICE path control [44](#)
- dynamic ESM protection support for CPACCESS, CPTYPE, and CPVLOAD [159](#)
- Dynamic Host Configuration Protocol Daemon (DHCPD) support withdrawn [101](#)
- dynamic I/O return codes [244](#)
- dynamic I/O support for alternate subchannel set [76](#)
- dynamic memory downgrade (DMD) enablement [92](#)
- dynamic memory downgrade, foundational support for [79](#)
- dynamic memory management [65](#)
- Dynamic Partition Manager (DPM) administrative mode for Linux [73](#)
- dynamic simultaneous multithreading level (6.4) [140](#)

E

- EDEVICE Optional LUN Specification [163](#)
- EDEVICE path control, dynamic [44](#)
- EDEVICE path management [163](#)
- EDEVICE system configuration statement [187](#)
- ENCRYPT system configuration statement [187](#)
- Encrypted Paging [77](#)
- encryption of TCPNJE connections (6.3) [105](#)
- enhanced domain support [60](#)
- environment information interface [133](#)
- environment variables
 - for new functions [2](#)
- EP11 coprocessor [51](#)
- ESA/390 removal [67](#)
- ESA/390 removal in 6.3 [69](#)
- ESM access control for real devices [125](#)
- expanded storage support removed [71](#)
- exploitation of HPF on non-fullpack minidisks [90](#)
- Extended Address Volume Minidisk support [76](#)
- Extended Address Volume Paging Support [81](#)
- Extended Address Volumes (EAV) [44](#)
- Extended Remote Copy (XRC) [45](#)

F

- Fast Dump Distiller [181](#)
- fast minidisk erase [161](#)
- FCP disks, dynamic discovery of [47](#)
- FCP monitor enhancements (6.4) [156](#)
- FEATURES system configuration statement [158](#), [188](#)
- Fibre Channel Protocol Data Router [52](#)
- FICON DS8000 Series new functions (6.3) [52](#)
- FICON Express16S support [61](#)
- FICON Express8S [50](#)
- FIPS 140-2 certification [103](#), [110](#)
- FIPS 140-2 compliance (6.3) [103](#)
- FIPS support [96](#)
- Firewall Friendly FTP (6.4) [109](#)
- FlashCopy
 - PRESERVE MIRROR [90](#)
- FLASHCOPY command [203](#)
- FLASHCOPY ESTABLISH command [203](#)
- FlashCopy preserve mirror support [90](#)
- FLASHCOPY WITHDRAW command [203](#)
- FlashSystem support for FCP-attached SCSI disks [138](#)
- FORCE command [204](#)
- FOREIGNIPCONLIMIT default value change [110](#)
- FORMSSI utility [242](#)
- FRAMES subcommand, VM Dump Tool [257](#)
- FREE command [204](#)
- FREE LOGON command [204](#)
- FRMAVL macro, VM Dump Tool [257](#)

G

- GCS commands and macros [272](#)
- GCSLEVEL macro [272](#)
- GDDMXD/VM support removed [178](#)
- GDPS enhancements (6.3) [56](#)
- German files discontinued [5](#)
- GIVE command [204](#)
- GLBLDSK macro

GLBLDSK macro (*continued*)
ACIGRP keyword [29](#)
GLOBALOPTS directory statement [193](#)
Guarded Storage facility [77](#)
guest exploitation of HPF on non-fullpack minidisks [90](#)
Guest HyperPAV Alias support for 1-End mdisk [90](#)
guest large page support [69](#)
guest page reordering process, disabling [115](#)
guest Transactional Execution (TX) support [70](#)
guest virtual memory support (6.4) [140](#)

H

hard limiting of scheduled system resources, enhanced [114](#)
hardware support, changes related to [41](#)
HCD Dynamic I/O Activates, large [145](#)
HCPLDR utility [243](#)
HCPSADMP utility [243](#)
HCQGSPL function, VM Dump Tool [257](#)
HELP command [258](#)
HELP components added or deleted [262](#), [263](#)
HELP Facility components [262](#)
HELP file enhancements [164](#)
HELP files deleted [263–271](#)
help files not translated (7.1) [7](#)
HELP quality improvement [147](#)
HELPSEG saved segment [129](#)
High Level Assembler (6.2) [25](#)
High Performance FICON for IBM Z (zHPF) [50](#)
High Performance FICON, exploitation of [90](#)
high PR/SM LPAR management time relief (6.4) [154](#)
HiperDispatch default unparking setting [89](#)
HiperSockets completion queue guest exploitation [53](#)
HMF/VM not supported [114](#)
HOLD command [204](#)
HOLD LOGON command [204](#)
Host exploitation of crypto interruptions [95](#)
HPF on non-fullpack minidisks [90](#)
HyperPAV
Alias support for 1-End mdisk [90](#)
HyperPAV paging
Performance Toolkit support for [157](#)
HyperPAV technology exploitation (6.4) [143](#)
HYPERSWAP command [204](#)
HYPERSWAP command, enhanced [44](#)

I

IBM Adapter for NVMe [80](#)
IBM Docs [184](#)
IBM Documentation [184](#)
IBM Knowledge Center [184](#)
IBM LinuxONE support [65](#)
IBM System Storage support (6.1) [42](#)
IBM z/VM Single System Image Feature (VMSSI) [5](#)
IBM z13 (Driver D27) and z13s I/O Support (6.4) [71](#)
IBM z14 support [73](#)
IDENTITY directory statement [193](#)
IEEE 802.3 Ethernet frame types, support removed for [110](#)
IMAP support removed [110](#)
improving I/O time for dump processing [181](#)
incompatible change, definition of [3](#)
increase crashkernel area size [172](#)

INDICATE ACTIVE command [205](#)
INDICATE command [205](#)
INDICATE LOAD command [205](#)
INDICATE MULTITHREAD command [205](#)
INDICATE NSS command [205](#)
INDICATE PAGING command [206](#)
INDICATE QUEUES command [206](#)
INDICATE SPACES command [206](#)
INDICATE USER command [206](#)
INSTALL utility now INSTTAPE [243](#)
installation changes (6.3) [29](#)
installation changes (6.4) [34](#)
installation changes (7.1) [34](#)
installation changes (7.2) [38](#)
installation, changes related to [7](#)
Instruction Execution Protection facility [77](#)
INSTTAPE utility [25](#)
IOEXPLOR utility [243](#)
IPFORMAT supports conversion to PCAP format [97](#)
IPL command [206](#)
IPv6 Layer 2 Query Support [113](#)
IPv6 support (6.2) [97](#)
IPv6 support, SSL (6.3) [101](#)
ISFC infrastructure enhancements [47](#)

K

KANJI language files, removal of [7](#)
Kerberos, support withdrawn for [99](#)

L

Language Environment external interfaces [185](#)
Language Environment upgrade (6.2) [176](#)
language files, removal of KANJI [7](#)
large memory dump support [179](#)
large page support for guests [69](#)
LDAP server upgrade (6.2) [97](#)
LDAP server upgrade (6.4) [105](#)
LDAP server, Crypto Express APVIRT support for [107](#)
LGR for mixed-level crypto [93](#)
LIMITHARD default change [125](#)
LIMITHARD support [114](#)
Line Printer Daemon (LPD) support withdrawn [101](#)
LINK command [207](#)
LINKRr option for VMFSETUP command [30](#)
live guest relocation [120](#)
live guest relocation support for port based virtual switches [100](#)
LOAD directory statement [193](#)
LOAD subcommand (XEDIT) [260](#)
LOADDEV directory statement [193](#)
Local-TLB-Clearing Facility [51](#)
LOCATE CMDDBK command [207](#)
LOCATE command [207](#)
LOCATE RDEV command [207](#)
logical processors, foundational support for more than 64 [79](#)
LOGOFF command [207](#)
LOGON / LOGIN command [208](#)
logon security improvement (6.4) [106](#)
LOGONBY user ID [178](#)
LPAR group absolute capacity capping [65](#)
LT MACRO removed [175](#)

LUN

Optional specification for EDEVICE [163](#)

M

MACHINE directory statement [193](#)
macros, CMS [261](#)
macros, CP [254](#)
macros, GCS [272](#)
MAINT 190, utilities moved from [128](#)
MDISK directory statement [193](#)
media changes (6.1) [182](#)
media changes (6.2) [182](#)
media changes (6.3) [182](#)
memory constraint relief (6.2) [125](#)
memory management [129](#)
memory scalability efficiency improvements [140](#)
MESSAGE (User) command [208](#)
MESSAGE command [208](#)
messages not translated (7.1) [7](#)
MFA, CP support for [173](#)
migration changes (7.1) [34](#)
mirrored DASD, multiple subchannel set support for [53](#)
mixed-level crypto
 live guest relocation [93](#)
MODIFY command [208](#)
MODIFY COMMAND / CMD system configuration statement [188](#)
MODIFY DEVICE / IODEVICE command [208](#)
MODIFY DIAGNOSE system configuration statement [188](#)
MODIFY LAN system configuration statement [188](#)
MODIFY PORT system configuration statement [189](#)
MODIFY PRIV_CLASSES system configuration statement [189](#)
MODIFY VSWITCH system configuration statement [189](#)
MONITOR changes (6.2) [126](#)
MONITOR command [208](#)
MONITOR EVENT command [209](#)
MONITOR SAMPLE command [209](#)
MONWRITE utility [243](#)
MOVE2SFS utility [243](#)
moved information (6.1) [182](#)
moved information (6.2) [182](#)
MPROUTE enhancements (6.2) [98](#)
MPROUTE enhancements (6.3) [101](#)
MPROUTE server upgrade (6.4) [106](#)
MSGNOH command [209](#)
MSS Multi-Target PPRC Exploitation [86](#)
Multi-Factor authentication [173](#)
Multi-Target PPRC support [64](#)
Multi-VSwitch Link Aggregation support (6.3) [103](#)
Multi-VSwitch Link Aggregation, SMAPI support for [177](#)
multiple access ports per guest [98](#)
Multiple Subchannel Set (MSS) facility, support for mirrored DASD [53](#)
multithreading prorated core time support [64](#)
multithreading support [61](#)
MULTITHREADING system configuration statement [189](#)

N

NAMES command [258](#)
NAMESRV native DNS server, removed [99](#)
networking, changes related to [95](#)

new function variables [2](#)
new or changed in z/VM 7.2
 increased CPU scalability [64](#)
NICDEF directory statement [193](#)
NICDEF Security Controls (6.4) [108](#)
NIST SP 800-131A configurations [103](#)
NLSAMENG saved segment [129](#)
non-fullpack minidisks, exploitation of HPF on [90](#)
nondefault tape mode support (6.4) [145](#)
NOTE command [258](#)
notices file [183](#)
NSS in Linux dump [129](#)
NVMe adapter [80](#)

O

observer in SSI cluster [119](#)
OpenStack support (6.4) [146](#)
operation, changes related to [114](#)
OPTION directory statement [193](#)
Optional LUN Specification for EDEVICE [163](#)
OSA Address Table (OAT), querying [98](#)
OSA-Express4S [50](#)
OSA-Express5S [52](#)
OSA/SF not shipped with z/VM (7.1) [7](#)
OSM channel path ID [45](#)
OSX channel path ID [45](#)
override product parameter file changed to SERVP2P \$PPF [30](#)
OVERRIDE utility [243](#)
OVERRIDE utility support removed [131](#)

P

packaging, changes related to [5](#)
page release serialization, improved [115](#)
path management, EDEVICE [163](#)
pauseless garbage collection [77](#)
PCAP format for TRSOURCE traces [97](#)
PCI type ISM [65](#)
PCIe Guest Direct Attach [56](#)
PDF Collection [183](#)
PDR, relocate [138](#)
PEEK command [258](#)
performance management [155](#)
Performance Toolkit enhancements (6.1) [115](#)
Performance Toolkit enhancements (6.2) [126](#), [128](#)
Performance Toolkit enhancements (6.3 APAR) [133](#)
Performance Toolkit enhancements (6.3) [131](#)
Performance Toolkit enhancements (6.4) [144](#)
Performance Toolkit spin lock reporting (6.4) [144](#)
Performance Toolkit support for 80 logical processors [82](#)
Performance Toolkit support for dynamic memory downgrade [93](#)
Performance Toolkit support for EAV paging space [81](#)
Performance Toolkit support for simultaneous multithreading (SMT) (7.2) [89](#)
Performance Toolkit support for z/XC-mode virtual machines [92](#)
PIPE command [258](#)
Pipelines (6.4) [145](#)
PMAINT 551 (SSI cluster common disk) [128](#)

port based virtual switch, live guest relocation support for [100](#)
PPF file for saved segment builds, changed [26](#)
PPF file names (7.2) [39](#)
prefetch guest data into processor cache [96](#)
Preserve Partial Hard Abend Dump [181](#)
PRESERVMIRROR [90](#)
processor scalability efficiency improvements (6.4) [76](#)
PRODUTL EXEC [272](#)
program management binder equivalency (6.4) [177](#)
Program Management Binder upgrade (6.1) [175](#)
Program Management Binder upgrade (6.2) [176](#)
program management binder upgrade (6.3) [177](#)
program release level handling in SSI cluster [30](#)
protected key CPACF [45](#)
protected user IDs, RACF support for [127](#)
publications added (6.1) [182](#)
publications deleted (6.1) [182](#)
publications deleted (7.1) [184](#)
PURGE UCR command [209](#)
PUT2PROD EXEC [273](#)
PVM Secure Connectivity [172](#)

Q

QUERY (Real Device) command [218](#)
QUERY (Virtual Device) command [222](#)
QUERY AGELIST command [210](#)
QUERY ALL command [210](#)
QUERY BYUSER command [210](#)
QUERY BYUSER support for class B users [158](#)
QUERY CAPABILITY command [210](#)
QUERY CFLINKS command [210](#)
QUERY CHPID command [211](#)
QUERY CMSLEVEL command [259](#)
QUERY CMSREL command [259](#)
QUERY COLLECT command [211](#)
QUERY command [210](#)
QUERY CONTROLLER command [211](#)
QUERY CPLEVEL command [211](#)
QUERY CPOWNER command [211](#)
QUERY CPUAFFINITY command [211](#)
QUERY CPUPOOL command superseded by QUERY
RESPOOL command [211](#)
QUERY CRYPTO command [212](#)
QUERY CU command [212](#)
QUERY DASD command [213](#)
QUERY DUMP command [213](#)
QUERY EDEVICE command [213](#)
QUERY EQID command [213](#)
QUERY FCP command [214](#)
QUERY FENCES command [214](#)
QUERY FRAMES command [214](#)
QUERY GCSLEVEL command [272](#)
Query Host Access [56](#)
QUERY HSA command [214](#)
QUERY HYPERSWAP command [214](#)
QUERY IOASSIST command [214](#)
QUERY ISLINK command [214](#)
QUERY IUUCV command [214](#)
QUERY LAN command [215](#)
QUERY LINKS command [215](#)
QUERY LPARS command [215](#)
QUERY MAXSPOOL command [215](#)

QUERY MDCACHE command [215](#)
QUERY MDISK command [215](#)
QUERY MEMASSIST command [215](#)
QUERY MONITOR command [216](#)
QUERY MSS command [216](#)
QUERY MULTITHREAD command [216](#)
QUERY NAMES command [216](#)
QUERY NSS command [216](#)
QUERY OBSERVER command [216](#)
QUERY OSA command [216](#)
QUERY PAGING command [216](#)
QUERY PATHS command [217](#)
QUERY PCIFUNCTION command [217](#)
QUERY PORT command [217](#)
QUERY PRIVCLASS command [217](#)
QUERY PROCESSORS command [218](#)
QUERY QIOASSIST command [218](#)
QUERY REORDER command [218](#)
QUERY RESERVED command [218](#)
QUERY RESPOOL / CPUPOOL command [219](#)
query RSCS service level [38](#)
QUERY SECUSER command [219](#)
QUERY SET command [219](#)
QUERY SHARE command [219](#)
Query Shutdown command (6.4) [141](#)
QUERY SHUTDOWNTIME command [219](#)
QUERY SIGNALS command [219](#)
QUERY SRM command [220](#)
Query SSL GSKKMAN Certificates (7.2) [174](#)
QUERY STGEXEMPT command [220](#)
QUERY STORAGE command [220](#)
QUERY SXSPAGES command [220](#)
QUERY SXSSTORAGE command [220](#)
QUERY SYSTEM command [220](#)
QUERY TAPES command [220](#)
QUERY TERMINAL command [220](#)
QUERY TIME command [221](#)
QUERY TIMEZONES command [221](#)
QUERY TRACE command [221](#)
QUERY TRFILES command [221](#)
QUERY TRSOURCE command [221](#)
QUERY USERID command [221](#)
QUERY USERS command [221](#)
QUERY VARIABLE command [221](#)
QUERY VCONFIG command [221](#)
QUERY VIRTUAL ALL command [222](#)
QUERY VIRTUAL CPUS command [222](#)
QUERY VIRTUAL CRYPTO command [222](#)
QUERY VIRTUAL FCP command [222](#)
QUERY VIRTUAL NIC command [223](#)
QUERY VIRTUAL PCIFUNCTION command [223](#)
QUERY VIRTUAL XSTORE command [223](#)
QUERY VMLAN command [223](#)
QUERY VSWITCH command [224](#)
QUERY XSTORE command [224](#)

R

RACF access list authority, automatic control of [143](#)
RACF enhancements (6.2) [127](#)
RACF enhancements (V7.2) [174](#)
RACF ICHRCX02 exit disabled by default (6.4) [145](#)
RACF MFA fixpack [174](#)
RACF password encryption enhancements [136](#)

RACF security policy enhancements [136](#), [146](#)
 RDEVBK subcommand, VM Dump Tool [257](#)
 RDEVICE (3800 Printers) system configuration statement [190](#)
 RDEVICE (Advanced Function Printer)s system configuration statement [189](#)
 RDEVICE (Card Punches) system configuration statement [189](#)
 RDEVICE (Card Readers) system configuration statement [189](#)
 RDEVICE (Communication Controllers) system configuration statement [189](#)
 RDEVICE (DASD) system configuration statement [189](#)
 RDEVICE (Graphic Display Devices) system configuration statement [190](#)
 RDEVICE (Impact Printers) system configuration statement [190](#)
 RDEVICE (Special Devices) system configuration statement [190](#)
 RDEVICE (Tape Units) system configuration statement [190](#)
 RDEVICE (Terminals) system configuration statement [190](#)
 RDEVICE (Unsupported Devices) system configuration statement [190](#)
 real device mapping [47](#)
 real memory support (6.4) [140](#)
 Regional Crypto Enablement (RCE) support [66](#)
 REGISTER subcommand, VM Dump Tool [257](#)
 relocate SSI PDR [138](#)
 relocated information (6.1) [182](#)
 relocated information (6.2) [182](#)
 relocated information (6.3) [183](#)
 RELOCATION_DOMAIN system configuration statements [190](#)
 removal of 1000-member limit for a single resource pool [83](#)
 removal of KANJI language files [7](#)
 removing of PAGING63 IPL Parameter [161](#)
 reserved DIAGNOSE codes [249](#)
 RESET command [224](#)
 resetting counters for virtual switch [106](#)
 resource pools [155](#)
 RETAIN XSTORE command [225](#)
 REXX/VM instructions and functions [272](#)
 rmfpm support stabilized [131](#)
 RPC-based systems management APIs not supported [175](#)
 RSK applications [178](#)

S

SALIPL utility [243](#)
 saved segment builds, changed PPF file for [26](#)
 SAVESYS command [225](#)
 SCHEDULE command [225](#)
 SCSI management queries (6.4) [69](#)
 SCSI RAS enhancements [70](#)
 SDINST utility [244](#)
 SECLABEL support for SECUSER and OBSERVER commands [128](#)
 security modes, control enablement of [157](#)
 security, changes related to [172](#)
 SEGMENT command [259](#)
 SEND command [225](#)
 SENDFILE command [259](#)
 Server Time Protocol (STP) facility [45](#)
 service changes (6.2) [25](#)

service enhancements (6.3) [29](#)
 SERVICE EXEC [273](#)
 service-level production status table, relocation of [29](#)
 service, changes related to [7](#)
 SET 370ACCOM command [235](#)
 SET AGELIST command [226](#)
 SET CMS370AC command [259](#)
 SET command (CP) [225](#)
 SET CPTRACE command [226](#)
 SET CPUAFFINITY command [226](#)
 SET CPUPOOL command superseded by SET RESPOOL command [226](#)
 SET CRYPTO command [226](#)
 SET CU command [227](#)
 SET DIALDROP command (6.4) [107](#)
 SET DUMP command [227](#)
 SET EDEVICE command [227](#)
 SET ENCRYPT command [227](#)
 SET IOASSIST command [227](#)
 SET IPLPARMS command [228](#)
 SET LAN command [228](#)
 SET MACHINE command [228](#)
 SET MDCACHE command [228](#)
 SET MEMASSIST command [228](#)
 SET MITIME command [228](#)
 SET NIC command [228](#)
 SET OBSERVER command [229](#)
 SET PAGEX command [229](#)
 SET PAGING command [229](#)
 SET PORT GROUP command [229](#)
 SET QIOASSIST command [229](#)
 SET QUICKDSP command [229](#)
 SET RDEVICE 3800 Printers command [230](#)
 SET RDEVICE Advanced Function Printers command [229](#)
 SET RDEVICE Card Punches command [229](#)
 SET RDEVICE Card Readers command [229](#)
 SET RDEVICE Communication Controllers command [230](#)
 SET RDEVICE DASD command [230](#)
 SET RDEVICE Graphic Display Devices command [230](#)
 SET RDEVICE Impact Printers command [230](#)
 SET RDEVICE Integrated Communication Adapters command [230](#)
 SET RDEVICE Special Devices command [230](#)
 SET RDEVICE Tape Units command [230](#)
 SET RDEVICE Terminals command [230](#)
 SET RDEVICE Unsupported Devices command [230](#)
 SET REORDER command [231](#)
 SET RESERVED command [231](#)
 SET RESPOOL / CPUPOOL command [231](#)
 SET SECUSER command [231](#)
 SET SHARE command [231](#)
 SET SRM command [232](#)
 SET SSI command [232](#)
 SET STORAGE command [232](#)
 SET SVC76 command [233](#)
 SET TIMEZONE command [233](#)
 SET TRACEFRAMES command [233](#)
 SET VARIABLE system configuration statement [190](#)
 SET VCONFIG command [233](#)
 SET VMLAN command [233](#)
 SET VSWITCH command [234](#)
 SET VTOD command [234](#)
 SET WRKALLEG command [235](#)
 SHARE directory statement [193](#)

- shared disk enhancements [48](#)
- Shared Memory Communications - Direct Memory Access (SMC-D) support [65](#)
- SHUTDOWN command [235](#)
- shutdown signals enhancement [115](#)
- SIGNAL command [235](#)
- SIMD support [67](#)
- simultaneous multithreading (SMT) support [61](#)
- single console image facility (SCIF) in SSI cluster [119](#)
- single system image (SSI) support, z/VM
 - CP commands [119](#)
 - cross-system spool [119](#)
 - DirMaint support [124](#)
 - IBM z/VM Single System Image Feature (VMSSI) [5](#)
 - ISFC infrastructure enhancements [47](#)
 - live guest relocation [120](#)
 - observer [119](#)
 - RACF support [127](#)
 - shared disk enhancements [48](#)
 - single console image facility (SCIF) [119](#)
 - SSI cluster configuration and management [115](#)
 - user identity and configuration [116](#)
 - virtual networking [99](#)
- SMAPI ESM authorization [159](#)
- SMAPI Query Processors API [178](#)
- SMAPI support for Multi-VSwitch Link Aggregation [177](#)
- SMT [61](#)
- SNAPDUMP command [235](#)
- Soft Fence [56](#)
- SPECIAL directory statement [194](#)
- SPOOL directory statement [194](#)
- spool information enhancements [163](#)
- Spool System Service [256](#)
- SRM system configuration statement [190](#)
- SSI cluster common disk (PMAINT 551) [128](#)
- SSI cluster program release level handling [30](#)
- SSI integrated in z/VM base [7](#)
- SSI PDR, relocate [138](#)
- SSL IPv6 support [101](#)
- SSL server enhancements (6.1) [96](#)
- SSL server upgrade [96](#)
- SSL server upgrade (6.2) [98](#)
- SSL server, Crypto Express APVIRT support for [107](#)
- stall prevention, virtual switch [102](#)
- stand-alone dump to tape support removed [180](#)
- START command [235](#)
- STFL instruction [176](#)
- STHYI instruction [250](#)
- STHYI support for zCX [160](#)
- STORAGE function [272](#)
- STORAGE system configuration statement [191](#)
- STORBUF default [128](#)
- STORE (Guest Storage - ESA/XC, z/XC) command [235](#)
- STORE (Registers) command [236](#)
- STORE CDX command [235](#)
- STORE command [235](#)
- STORE PSW command [236](#)
- STORE PSWA command [236](#)
- STORE PSWG command [236](#)
- STORE STATUS command [236](#)
- Support for 80 Logical Processors [81](#)
- support for UNRESPONSIVE_PROCESSOR_DETECTION [158](#)
- surplus CPU power distribution improvement [142](#)
- SYSAFFIN directory statement [194](#)

- SYSCPVOL macro [255](#)
- system configuration HELP files [164](#)
- system configuration statements [185](#)
- system definition macros [255](#)
- system diagnosis, changes related to [179](#)
- System Recovery Boost [84, 89](#)
- System SSL z/OS 2.1 equivalency [104](#)
- System SSL z/OS 2.2 (6.4) [105](#)
- System SSL z/OS 2.3 equivalence (7.2) [174](#)
- SYSTEM_IDENTIFIER system configuration statement [191](#)
- systems management APIs, enhanced (6.1) [175](#)
- systems management APIs, enhanced (6.2) [175](#)
- systems management APIs, enhanced (6.3) [176](#)
- systems management APIs, enhanced (6.4) [178](#)
- systems management routines [261](#)
- SYSWATCH utility [260](#)

T

- TCP/IP support for OSA-Express7S [111](#)
- TCP/IP support withdrawn (6.2) [99](#)
- TCP/IP support withdrawn (6.3) [101](#)
- TERMINAL command [236](#)
- TLS 1.2 support [101](#)
- TLS certificate verification [113](#)
- TLS server, Crypto Express APVIRT support for [107](#)
- TLS/SSL OCSP support (7.2) [173](#)
- TLS/SSL server elliptic curve support [110](#)
- TRACE command [236](#)
- TRACE GG command [236](#)
- TRACE IO command [236](#)
- TRACE mnemonic1 command [236](#)
- TRACE STORE (ESA/390, z/Architecture) command [236](#)
- TRACE STORE (ESA/XC, z/XC) command [236](#)
- TRACE subcommand, VM Dump Tool [257](#)
- TRACERED utility [244](#)
- TRSAVE command [237](#)
- TRSOURCE command [237](#)
- TRSOURCE ID command [237](#)
- TS7700 Copy Export support [145](#)
- TSAF external interfaces [185](#)
- TWOGFRM macro, VM Dump Tool [257](#)
- TX support [70](#)

U

- UNDEDICATE command [237](#)
- Unified Resource Manager support withdrawn [103, 177](#)
- unparking setting of HiperDispatch [89](#)
- UNRESPONSIVE_PROCESSOR_DETECTION, support for [158](#)
- update to SERVICE command to report installed APARs and PTFs (7.2) [38](#)
- upgrade in place enhancements (6.4) [34](#)
- upwardly compatible change, definition of [3](#)
- user class restructure (UCR) support removed [131](#)
- user directory entries, predefined, changes to (6.1) [7](#)
- user directory entries, predefined, changes to (6.2) [8](#)
- user directory entries, predefined, changes to (6.3) [26](#)
- user directory entries, predefined, changes to (6.4) [30](#)
- user directory entries, predefined, changes to (7.1) [36](#)
- user directory entries, predefined, changes to (7.2) [40](#)
- user directory HELP files [164](#)
- user directory modifications 7.1 [35](#)

USER directory statement [194](#)
user directory statements [192](#)
USER_VOLUME_RDEV system configuration statement [191](#)
utilities moved from MAINT 190 [128](#)
utilities, CMS [259](#)
utilities, CP [240](#)

V

variables
 for new functions [2](#)
VARY (Real Device) command [238](#)
VARY command [237](#)
VARY CORE [237](#)
VARY ON of real devices utilizing multi-processor support [90](#)
VARY PATH command [237](#)
VARY PCIFUNCTION command [237](#)
VARY PROCESSOR command [238](#)
VARY SUBCHANNEL command [238](#)
Vector Facility for z/Architecture support [67](#)
VEPA support [102](#)
virtual console output routing control [160](#)
virtual machine logoff time reduction [136](#)
virtual machine type, default [128](#)
virtual switch HiperSockets bridge [99](#)
Virtual Switch priority queuing [111](#)
virtual switch recovery [102](#)
virtual switch stall prevention [102](#)
virtual switch support for VEPA mode [102](#)
virtual switch, duplicate IP address handling [102](#)
Virtualization Engine TS7700 Copy Export support [145](#)
VLAN access security improvement (6.4) [106](#)
VM data space macros [255](#)
VM Dump Tool enhancements (6.2) [179](#)
VM Dump Tool functions [256](#)
VMDTQRY subcommand, VM Dump Tool [257](#)
VMDUMP command [238](#)
VMFBDNUC EXEC [273](#)
VMFINS Command (6.2) [25](#)
VMFINS DELETE command [273](#)
VMFINS INSTALL command [273](#)
VMFINS MIGRATE command [273](#)
VMFSETUP Command (6.2) [25](#)
VMFSETUP EXEC [273](#)
VMFSUFIN EXEC [273](#)
VMFUPDAT EXEC [273](#)
VMFVIEW EXEC [273](#)
VMLAN system configuration statement [191](#)
VMLINK command [259](#)
VMPRF mode removed [114](#)
VMSES/E commands [272](#)
VMSES/E external interfaces [272](#)
VMSES/E MIGRATE command support withdrawn (7.1) [37](#)
VMSSI (IBM z/VM Single System Image Feature) [5](#)
VMUDQ macro [255](#)
VMUDQ macro enhancement (6.4) [177](#)
VSwitch Bridge Port Enhancements (7.2) [114](#)
VSwitch Link Aggregation Load Balancing enhancements (6.4) [109](#)

W

WARNING command [239](#)

worldwide port name (WWPN) prediction tool, support for [43](#)

X

XAUTOLOG command [239](#)
xCAT appliance packaged with z/VM 6.3 [6](#)
xDisk scalability [86](#)
XEDIT command [259](#)
XEDIT default case for other file types [128](#)
XEDIT subcommand (XEDIT) [261](#)
XEDIT subcommands [260](#)
XIV Storage System, concurrent I/O support [73](#)
XIV Storage Systems, direct attachment of [44](#)
XL C/C++ compiler upgrade (6.2) [176](#)
XLINK_DEVICE_DEFAULTS system configuration statement [191](#)
XLINK_SYSTEM_INCLUDE system configuration statement [191](#)
XLINK_VOLUME_INCLUDE system configuration statement [191](#)
XRC time stamping [45](#)
XSPOOL QUERY command [239](#)
XSPOOL QUERY SHARE command [239](#)
XSPOOL REMOVE command [239](#)
XSPOOL SYNC command [239](#)
XSPOOL UNLOCK command [239](#)
XSPOOL XLIST command [239](#)
XSPOOL XLISTADD command [239](#)
XSPOOL XLISTDEL command [240](#)
XSPOOL_SYSTEM system configuration statement [191](#)
XSPOOL_TRACE system configuration statement [192](#)
XSPOOL_XLIST_INPUT system configuration statement [192](#)
XSPOOL_XLIST_OUTPUT system configuration statement [192](#)
XSTORE directory statement [194](#)
XSTORE support removed [71](#)

Z

z-Thin Provisioning (6.4) [78](#)
z/Architecture CMS [6](#)
z/Architecture Extended Configuration (z/XC) [91](#)
z/VM Adobe Indexed PDF Collection [183](#)
z/VM Centralized Service Management for non-SSI environments (7.2) [39](#)
z/VM Collection [6](#), [183](#)
z/VM Continuous Delivery model [1](#)
z/VM HiperDispatch [54](#)
z/VM Omnibus PKIT [183](#)
z/VM single system image (SSI) support
 CP commands [119](#)
 cross-system spool [119](#)
 DirMaint support [124](#)
 IBM z/VM Single System Image Feature (VMSSI) [5](#)
 ISFC infrastructure enhancements [47](#)
 live guest relocation [120](#)
 observer [119](#)
 RACF support [127](#)
 shared disk enhancements [48](#)
 single console image facility (SCIF) [119](#)
 SSI cluster configuration and management [115](#)
 user identity and configuration [116](#)
 virtual networking [99](#)

z/VM support for IBM z16® (7.2) [94](#)
z13 [58](#)
z13 (Driver D27) compatibility support [65](#)
z13 compatibility I/O support [59](#)
z13s support [65](#)
z15 I/O processor compatibility [85](#)
zCX, STHYI support for [160](#)
zEnterprise 114 [45](#)
zEnterprise 196 [43](#), [45](#)
zEnterprise BC12 [51](#)
zEnterprise EC12 [51](#)
zManager support removed (6.4) [139](#)
zMAP [6](#)
ZVM \$PPF removed [30](#)



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