z/OS
Version 2 Release 3

Introduction and Release Guide

IBM

Note

Before using this information and the product it supports, read the information in "Notices" on page 123.

Contents

vii

How to send your comments to IBM

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Important: If your comment regards a technical question or problem, see instead "If you have a technical problem" on page ix.

Submit your feedback by using the appropriate method for your type of comment or question:

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    If your comment or question is about the IBM Knowledge Center functionality, for example search capabilities or how to arrange the browser view, send a detailed email to IBM Knowledge Center Support at ibmkc@us.ibm.com.

Feedback on the z/OS product documentation and content
    If your comment is about the information that is provided in the z/OS product documentation library, send a detailed email to mhvrcfs@us.ibm.com. We welcome any feedback that you have, including comments on the clarity, accuracy, or completeness of the information.

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- Your name, company/university/institution name, and email address
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- The section title of the specific information to which your comment relates
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z/OS information

This information explains how z/OS references information in other documents and on the web.

When possible, this information uses cross document links that go directly to the topic in reference using shortened versions of the document title. For complete titles and order numbers of the documents for all products that are part of z/OS, see *z/OS Information Roadmap*.

To find the complete z/OS library, go to IBM Knowledge Center (www.ibm.com/support/knowledgecenter/SSLTBW/welcome).

Summary of changes

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.

Summary of changes for z/OS V2R3 Introduction and Release Guide

The following changes are made for z/OS Version 2 Release 3 (V2R3).

New

- New system level functions to consider, such as new base elements, optional features, or interfaces are listed in "z/OS system-level new functions to consider" on page 23.
- BCP (MVS™) has new functions to consider. For details, see "BCP (MVS) new functions to consider" on page 26.
  - "Remote TSO/E Address Space Manager" on page 28, for APAR OA51597
  - "z/OS System Logger support for encrypted log stream data sets" on page 34
  - "Logstream staging datasets greater than 4GB" on page 34
  - "BCPii considerations" on page 26
  - "IBM Function Registry for z/OS considerations" on page 30
  - "Real Storage Manager (RSM) considerations" on page 31
- Communications Server has new functions to consider. For details, see "Communications Server new functions to consider" on page 38.
  - "Hardware support" on page 39
  - "Usability and skills" on page 40
  - "Scalability and performance" on page 41
  - "Systems management" on page 43
  - "Enhancing security" on page 43
  - "Application development" on page 48
- Cryptographic Services has new functions to consider. For details, see "Cryptographic Services new functions to consider" on page 53.
  - "ICSF: CCA service algorithm updates" on page 54
  - "ICSF: Cryptographic services enhancements" on page 54
  - "ICSF: Digital Signature Generate and Digital Signature Verify enhancements" on page 54
  - "ICSF: EMV simplification services" on page 54
  - "ICSF: Enhanced PKCS#11 Secret Key Encrypt and PKCS#11 Secret Key Decrypt" on page 55
  - "ICSF: Enhancements for Crypto Express5" on page 55
  - "ICSF: FIPS 140-2 certification of PKCS11" on page 55
  - "ICSF: Improved Key Lifecycle and Key Usage auditing" on page 56
  - "ICSF: Key Encryption Translate" on page 56
  - "ICSF: New ICSF_OPTIONS_CHECKS health check" on page 56
  - "ICSF: Operator commands" on page 56
  - "ICSF: Options Data Set Refresh function" on page 57

Changed

- Changed system level functions to consider are listed in "z/OS system-level new functions to consider" on page 23.

Deleted

All content that is not related to z/OS versions V2R3 or V2R2 was removed.

Summary of changes for z/OS Version 2 Release 2 (V2R2) as updated December 2015

The following changes are made for z/OS V2R2 as updated December 2015.

New

Summary of changes for z/OS V2R2 Introduction and Release Guide

The following changes are made for z/OS Version 2 Release 2 (V2R2).

New

- New system level functions to consider, such as new base elements, optional features, or interfaces are listed in "z/OS system-level new functions to consider" on page 23. The changes include z/OSMF, IBM Knowledge Center for z/OS (customer installation version), z/OS OpenSSH, new publications, and more.
- BCP (MVS) has new Consoles functions to consider. For details, see "Security enhancements for HMCS, SMCS, and MCS consoles" on page 28.
- BCP (MVS) has new generic tracker functions to consider. For details, see "Data persistence and simplified generic tracking services" on page 29.
- BCP (MVS) has new service aids functions to consider. For details, see "Deallocate LOGREC data sets without a system restart" on page 33.
- BCP (MVS) has new SMF functions to consider. For details, see "System Management Facility (SMF) considerations" on page 35.
- BCP (MVS) has new Sysplex functions to consider. For details, see "Cross-System Coupling Facility (XCF) enhancements for z/OS V2R2" on page 37.
- BCP (MVS) has new system logger functions to consider. For details, see "Allocate offload data sets" on page 35.
- Cryptographic Services has new functions to consider.
  - "Enable PKI Services to sign the Online Certificate Status Protocol (OCSP) responses" on page 59
  - "PKI Services 64 bit support" on page 59
  - "PKI Services support NxM authorization" on page 59
  - "System SSL: Cache session identification" on page 60
  - "System SSL: OCSP support and CRL updates" on page 60
- DFSMS has new functions to consider. For details, see "DFSMS new functions to consider" on page 61.
- Distributed File Service has new functions to consider for zFS:
  - "Improved monitoring of zFS performance" on page 73
  - "Providing support for 64-bit addressing (AMODE64) " on page 73
- Infoprint Server has new functions to consider. For details, see "Infoprint Server new functions to consider" on page 79.
- JES2 has new functions to consider. For details, see "JES2 new functions to consider" on page 85.
- JES3 has new functions to consider. For details, see "JES3 new functions to consider" on page 88.
- IBM Tivoli Directory Server for z/OS has new functions to consider.
  - "Replication of password policy operational attributes from read-only replica to supplier server" on page 77
  - "Dynamic group performance and scalability improvements" on page 78
  - "Activity log enhancements" on page 78
  - "Server compatibility level upgrade with no downtime" on page 78
- Language Environment has new functions to consider:
  - "Providing support for delayed debug" on page 91
- Resource Measurement Facility (RMF) new functions to consider:
  - "New features, functions, and support for z/OS V2R2" on page 97
- Security Server (RACF) new functions to consider:

- "Remote sharing enhancements to allow dynamic MAIN switching" on page 105
- "Remote sharing enhancements to deny inbound requests" on page 106
- "R_admin callable service enhancement to extract RACF remote sharing configuration data" on page 106
- "RACF Read-Only Auditor" on page 106
- "UNIX Search Authority" on page 107
- "RACF RACDCERT granular certificate administration support." on page 107
- "Network Authentication Services (NAS) support for Public Key Cryptography for Initial Authentication (PKINIT)" on page 107
- "RACF R_datalib enhancement" on page 107
- "Enhanced RACF password security" on page 108
- "RACF Health Checks" on page 108
- TSO/E has new functions to consider. For details, see "TSO/E new functions to consider" on page 109.
- z/OS UNIX has new functions to consider.
  - "Enhancements for the kernel and LFS: 64-bit addressing mode and above-the bar stack storage " on page 117
  - "Increased thread limit in the kernel with the KERNELSTACKS(ABOVE) parmlib option " on page 117
  - "Providing support for task-level security" on page 117

Changed

- Changed system level functions to consider are listed in "z/OS system-level new functions to consider" on page 23.
  - HTTP Server for z/OS
  - z/OS Softcopy Librarian is enhanced to manage and update the content for IBM Knowledge Center for z/OS.
- Changed optional feature descriptions for Infoprint Server are listed in Chapter 3, "z/OS optional features descriptions ," on page 17.

Deleted

All references to HTTP Server (powered by Domino) are removed from the z/OS library. For details, see *z/OS Migration*

Chapter 1. z/OS elements and features

z/OS base elements

z/OS provides function that is equivalent to the following elements. For the version and release numbers of those elements that also exist as separately orderable products, see *z/OS Planning for Installation*.

For an extra set of integrated features that is available on an optional basis, see .

The following base elements are included in z/OS:

- Alternate Library for REXX
- Base Control Program (BCP)
- BookManager® READ
- Bulk Data Transfer (BDT)
- Common Information Model (CIM)
- Communications Server
- Cryptographic Services (includes ICSF, OCSF Base, PKI Services, and System SSL)
- Distributed File Service
- DFSMSdfp
- EREP
- ESCON Director Support
- FFST
- GDDM (includes PCLK and OS/2 Link)
- Hardware Configuration Definition (HCD)
- High Level Assembler (HLASM)
- IBM HTTP Server - Powered by Apache (includes IBM HTTP Server NA Secure)
- IBM Knowledge Center for z/OS
- IBM Tivoli Directory Server for z/OS
- IBM z/OS Liberty Embedded
- ICKDSF
- Integrated Security Services (includes Enterprise Identity Mapping (EIM), Network Authentication Service, and Open Cryptographic Enhanced Plug-ins (OCEP))
- ISPF
- JES2
- Language Environment
- Library Server
- Metal C Runtime Library
- MICR/OCR Support
- Network File System
- OSA Support Facility
- OpenSSH
- Runtime Library Extensions

1

- SMP/E
- TIOC
- TSO/E
- Xvfb
- z/OS Font Collection
- z/OS Management Facility (z/OSMF)
- z/OS UNIX System Services
- 3270 PC File Transfer Program

z/OS optional features

Some optional features are not priced, but priced as well as unpriced features are included in z/OS integration-testing. All priced, host-based features are capable of being dynamically enabled or disabled. For the version and release levels of those features that also exist independently, see *z/OS Planning for Installation*.

The following is a list of z/OS optional features:

- BookManager BUILD
- Bulk Data Transfer (BDT) File-to-File
- Bulk Data Transfer (BDT) SNA NJE
- Communications Server Security Level 3
- DFSMSdss
- DFSMShsm
- DFSMSrmm
- DFSMStvs
- DFSORT
- GDDM-PGF
- GDDM-REXX
- High Level Assembler (HLASM) Toolkit
- Hardware Configuration Manager (HCM)
- Infoprint Server
- JES3
- RMF
- SDSF
- Security Server (includes RACF)
- XL C/C++
- zEnterprise® Data Compression (zEDC)
- z/OS Security Level 3 (includes OCSF Security Level 3, IBM Tivoli Directory Server for z/OS Security Level 3, Network Authentication Service Security Level 3, and System Secure Sockets Layer (SSL) Security Level 3)

Chapter 2. z/OS base elements descriptions

The following is a description of each base element in z/OS.

Alternate Library for REXX

Alternate Library for REXX enables users who do not have the REXX on IBM Z® library installed to run compiled REXX programs. It contains a language processor that transforms the compiled programs and runs them with the REXX interpreter, which is shipped as part of the z/OS operating system.

Software developers are no longer required to distribute the Alternate Library for REXX with their compiled REXX programs. Customers who have the REXX on IBM Z® Library installed will gain the performance benefits of running compiled REXX, while those customers who have the Alternate Library for REXX installed may still run the programs as interpreted.

By using the Alternate Library for REXX with z/OS, software developers gain the benefits of shipping compiled REXX programs without the source code:

- Maintenance of the program is simplified since the code can not be modified inadvertently.
- Compiled programs can be shipped in load module format, simplifying packaging and installation.
- The Alternate Library for REXX does not need to be shipped and installed with the software program.
- Maintenance of the Alternate Library for REXX is handled by the z/OS system administrator.

BCP (Base Control Program)

The backbone of the z/OS system is the Multiple Virtual Storage (MVS) Base Control Program with JES2 or JES3. These provide the essential services that make z/OS the system of choice when you need to process your workloads reliably, securely, with complete data integrity and without interruption.

Unicode support:

The Unicode Standard is the universal character encoding standard used for representation of text for computer processing; it provides the capacity to encode all of the characters used for the written languages of the world. z/OS Unicode support is based on Version 6.0 of the Unicode Standard, although lower versions are supported by some services. Review each individual service to see the Unicode Standard versions supported. z/OS Unicode Services supports the following services:

- Character conversion
- Case conversion
- Normalization
- Collation
- Stringprep
- Bidirectional transformation
- Conversion information service
- Dynamic locale service

Find summary and complete details about these services in *z/OS Unicode Services User's Guide and Reference*.

z/OS XML System Services:

z/OS XML System Services is an integrated component of the BCP. It is a system-level XML parser intended for use by system components, middleware, and applications that need a simple, efficient, non-validating XML parser. It provides a buffer-in, buffer-out processing model in which the document to parse is provided by the caller in one buffer; the z/OS XML System Services parser creates a parsed record stream in another buffer, also provided by the caller. Large documents can be processed by replenishing the input buffer with more data, and reusing the output buffer or specifying a new one when it is filled. z/OS XML System Services is invoked as a callable service and provides an assembler interface for callers to use. It is accessible from normal environments such as batch and z/OS Unix System Services, as well as from more esoteric environments such as SRB mode and cross-memory.

BookManager READ

BookManager READ allows you to use any online BookManager book that you can access. Using the BookManager panels, windows, and function keys, you can manage, display, and search online books quickly and easily.

BDT (Bulk Data Transfer)

Bulk Data Transfer (BDT) provides the base services that BDT File-to-File and BDT SNA NJE need to transfer data from one computer system to another.

Common Information Model (CIM)

The Common Information Model (CIM) is a standard data model for describing and accessing systems management data in heterogeneous environments. It allows system administrators or vendors to write applications (CIM monitoring clients) that measure system resources in a network with different operating systems and hardware. With z/OS CIM, it is possible to use the DMTF CIM open standard for systems managment which is also implemented on further major server platforms (for example, Linux on zSeries, Linux on xSeries, i5/OS, or AIX®).

z/OS CIM implements the CIM server which is based on the OpenPegasus open source project. A CIM client invokes the CIM server which, in turn, collects z/OS data from the system and returns it to the calling client. To get the z/OS data, the CIM server invokes a CIM provider which retrieves the data from z/OS system resources.

The metrics obtained by this new API are common across server platforms so you can use it to create end-to-end monitoring applications.

Communications Server

IP
IP (formerly known as IBM TCP/IP) is a set of industry standard protocols and applications that allow you to share data and computing resources with other computers, both IBM and non-IBM. UNIX applications use IP. By using IP commands at your workstation, you can perform tasks and communicate easily with a variety of other systems and workstations. IP allows you to perform tasks independent of the computer type. Some common uses of IP include: electronic mail, file transfer, remote logon, and the Internet.

IP CICS® Sockets
IP CICS Sockets, which is integrated into the base TCP/IP stack, provides the ability to use the generalized Application Programming Interface (API) and socket applications in COBOL, PL/I, and assembler.

IP IMS Sockets

IMS IP support, also integrated into the base TCP/IP stack, allows the development of peer-to-peer applications in which IMS and an IP-connected peer form a client/server relationship. Using this support, IMS can be either client or server.

This element consists of three parts:

- The Sockets Extended Application Programming Interface. Using this API, IMS message processing programs can communicate with remote IP-connected hosts using socket protocol.
- If IMS is acting as the server, the IMS Listener can be used to collect incoming transaction requests from remote IP-connected hosts and schedule IMS message processing programs to service these requests.
- The IBM Assist module provides support for the IMS application programmer who wishes to code IP client/server application programs using the IMS API. When used, this optional function intercepts IMS message queue calls and replaces them with socket calls.

SNA

Formerly known as VTAM®, Systems Network Architecture (SNA) is a network communication access method and provides Advanced Peer-to-Peer Networking (APPN). SNA is the interface between application programs in a host processor and other resources in an SNA network, and links peer users of the network. It establishes and terminates sessions between users of the network, forwarding session data to and from each session partner.

In addition to establishing and terminating sessions, it activates and deactivates resources under its control, including application programs and devices to which SNA is directly attached. SNA also maintains information on the network configuration, active sessions, and network conditions.

To help users control a network, SNA receives commands from an operator to perform network services. Through operator messages, the operator is kept informed about those services and about any network conditions.

Cryptographic Services

Cryptographic Services includes ICSF, PKI Services, OCSF, and System SSL, and provides cryptographic functions for data secrecy, data integrity, personal identification, digital signatures, and the management of cryptographic keys.

ICSF and PKI Services are provided through the combination of secure cryptographic hardware, the ICSF cryptographic API, and the ICSF administration interface. ICSF supports the Common Cryptographic Architecture (CCA), as well as the DES algorithm, RSA public key cryptography, and the Digital Signature Standard. Cryptographic services support a wide variety of applications with high performance, security, and availability.

Additional functions include:

- Trusted Key Entry—the key entry unit for master keys has been replaced by a secure channel version implemented on a workstation known as the Trusted Key Entry Workstation. The unit is an optional cost feature.
- Commercial Data Masking Facility supports privacy functions.
- Public Key API (PKA Support) provides additional formatting or message digest standards.
- Public Key Cryptography Standards #11 (PKCS #11)

Public Key Infrastructure Services (PKI Services) allows you to establish a PKI infrastructure and serve as a certificate authority for your internal and external users, issuing and administering digital certificates in accordance with your own organization's policies. You can use a PKI Services application to request and obtain certificates through their own Web browsers, while your authorized PKI administrators approve, modify, or reject these requests through their own Web browsers. The Web applications provided with PKI Services are customizable, and a programming exit is also included for advanced customization. The approval for certificate requests can be manual or automatic if additional authentication such as RACF

user IDs, is provided. You can issue certificates for different purposes, such as virtual private network (VPN) devices, smart cards, and secure e-mail, through different types of templates. PKI Services supports Public Key Infrastructure for X.509 version 3 (PKIX) and Common Data Security Architecture (CDSA) cryptographic standards.

The OCSF Architecture consists of a set of layered security services and associated programming interfaces designed to furnish an integrated set of information and communication security capabilities. Each layer builds on the more fundamental services of the layer directly below it.

These layers start with fundamental components such as cryptographic algorithms, random numbers, and unique identification information in the lower layers, and build up to digital certificates, key management and recovery mechanisms, and secure transaction protocols in higher layers. The OCSF Architecture is intended to be the multiplatform security architecture that is both horizontally broad and vertically robust.

System SSL supports the SSL V2.0, SSL V3.0, TLS (Transport Layer Security) V1.0, TLS V1.1, and TLS V1.2 protocols. TLS V1.2 is the latest version of the secure sockets layer protocol.

z/OS provides a set of SSL C/C++ callable application programming interfaces that, when used with the z/OS Sockets APIs, provide the functions required for applications to establish this secure sockets communications.

In addition to providing the API interfaces to exploit the Secure Sockets Layer and Transport Layer Security protocols, System SSL is also providing a suite of Certificate Management APIs. These APIs give the capability to create/manage your own certificate databases, utilize certificates stored in key database and key rings for purpose other than SSL and to build/process PKCS #7 standard messages.

Distributed File Service (DFS)

The Distributed File Service Server Message Block (SMB) support provides a server that makes Hierarchical File System (HFS) files and data sets available to SMB clients. Server Message Block (SMB) is a protocol for remote file/print access used by Windows clients. This protocol is also known as Common Internet File System. The data sets supported include sequential data sets (on DASD), partitioned data sets (PDS), partitioned data sets extended (PDSE), and Virtual Storage Access Method (VSAM) data sets. The data set support is usually referred to as Record File System (RFS) support. The SMB protocol is supported through the use of TCP/IP on z/OS. This communication protocol allows clients to access shared directory paths and shared printers. Personal Computer (PC) clients on the network use the file and print sharing functions that are included in their operating systems. Supported SMB clients include Microsoft Windows 7, Windows Vista, Windows XP, Windows Server 2003, Windows Terminal Server, and Linux. At the same time, these files can be shared with local z/OS UNIX System Services applications. In addition, Windows SMB clients can make remote print requests to z/OS printers that are connected to Infoprint Server for z/OS.

The Distributed File Service z/OS File System (zFS) support provides a Physical File System (PFS) that can be used in addition to the Hierarchical File System (HFS). zFS file systems contain files and directories that are accessed with the z/OS hierarchical file system file application programming interfaces. zFS file systems can be mounted into the z/OS UNIX hierarchy along with other local (or remote) file system types such as HFS, TFS, and NFS. zFS typically provides improved performance over HFS.

DFSMSdfp

DFSMSdfp provides the foundation for:

Storage management
DFSMSdfp includes ISMF, an interactive facility that lets you define and maintain policies to manage your storage resources. These policies help to improve the use of storage devices, and to increase levels of service for user data, with minimal effort required from users. SMS manages these policies for the operating system. You can also use the NaviQuest tool under ISMF to help you migrate to SMS, maintain your SMS configuration, and perform many testing, implementation, and reporting tasks in batch.

Tape mount management

SMS provides a means for implementing tape mount management, a methodology for improving tape usage and reducing tape costs. This methodology involves intercepting selected tape data set allocations through the SMS automatic class selection (ACS) process, and redirecting them to a DASD buffer. Once on DASD, these data sets can be migrated to a single tape or small set of tapes, thereby reducing the overhead associated with multiple tape mounts.

Data management

DFSMSdfp helps you store and catalog information on DASD, optical, and tape resources, so that it can be quickly identified and retrieved from the system. You can use the catalog search interface, now part of DFSMSdfp, to access the catalog.

Program management

DFSMSdfp combines programs into executable modules, prepares them to run on the operating system, stores them in libraries, and reads them into storage for execution.

Device management

DFSMSdfp is involved in defining your input and output devices to the system, and in controlling the operation of those devices in the z/OS environment.

Distributed data access

Distributed data access allows all authorized systems and users in a network to exploit the powerful features of system-managed storage, or automated storage management provided by DFSMS. DFSMSdfp uses the Distributed FileManager (DFM) to support remote access of z/OS data and storage resources from workstations, personal computers, or any other system on a SNA LU 6.2 network.

The z/OS UNIX System Services (z/OS UNIX) file system works in conjunction with z/OS UNIX to provide a full UNIX environment within the z/OS system. z/OS becomes a full-feature UNIX client or server when coupled with the z/OS Network File System (z/OS NFS). With the z/OS UNIX file system, z/OS programs can directly access UNIX data. When the z/OS NFS client and z/OS UNIX are used together, z/OS can act as a client and access data from any remote system, including another z/OS or UNIX system that is connected using a TCP/IP network served by a Network File System server.

Environmental Record Editing and Printing Program (EREP)

The Environmental Record Editing and Printing Program (EREP) edits and prints reports for the records placed in the error recording data set (ERDS), helping IBM service representatives fix problems.

ESCON Director Support

When your installation uses ESCON directors, the ESCON Director Device Support feature enables reporting of ESCON director device errors to z/OS.

FFST/MVS (First Failure Support Technology/MVS)

FFST/MVS provides immediate notification and first failure data capture for software events. FFST/MVS also incorporates its own technology by including software probes in its own code. When one of these probes is triggered, FFST/MVS issues a symptom string that describes the event.

FFST/MVS provides the following services for IBM products:

- Customized dumps
- Symptom strings
- Symptom records
- Messages
- Network notification

GDDM (includes PCLK and OS/2 LINK)

GDDM provides presentation services and device-driving capability. GDDM has a powerful application-programming interface for creating, displaying, and storing vector graphics, images and alphanumerics. GDDM drives displays, printers and plotters, and includes several utilities for end users. GDDM's excellence as a graphics program and device driver is recognized worldwide, and as a result it is used extensively as a graphics enabler by other licensed programs, including other elements of z/OS, such as BookManager.

HCD (Hardware Configuration Definition)

HCD is used to define both the operating system configuration and the processor hardware configuration for a system. Because HCD validates data when it is defined rather than when a device is accessed, inconsistencies can be corrected right away and unplanned system outages resulting from inconsistent definitions avoided. The defined configuration can be used to POR/IPL or dynamically reconfigure your system.

HLASM (High Level Assembler)

High Level Assembler integrates almost all functions of past assemblers. It also provides extensions and improvements including:

- Many new and expanded cross reference facilities and diagnostics that enable substantial savings in time and in human and machine resources, and support integration of HLASM into tool and development environments.

- Numerous language enhancements that improve the speed and accuracy of application development and the quality and reliability of the resulting code.

- Assembly-time options extensions and enhancements that allow increased flexibility and precision in controlling the processes you use to manage application development.

HLASM helps to maximize the productivity of application programmers by relieving them of many tedious and unproductive tasks that can now be done by the assembler itself and helps organizations avoid the necessity for converting existing -- and working -- applications from Assembler Language to other languages.

IBM HTTP Server - Powered by Apache

The IBM HTTP Server - Powered by Apache is a full-featured web server. This element was previously known as a base element of z/OS under the names Lotus® Domino® Go, the Internet Connection Secure Server (ICSS), and the Internet Connection Server (ICS).

Included in IBM HTTP Server - Powered by Apache is IBM HTTP Server North America (NA) Secure. With IBM HTTP Server - Powered by Apache, IBM HTTP Server NA Secure uses Secure Sockets Layer (SSL) to provide secure communications over an open communications network, such as the Internet. The HTTP server uses SSL to initiate a secure connection between the client and itself. The server then uses SSL to decrypt and encrypt all of the information in the client request and the server response.

IBM Tivoli Directory Server for z/OS (IBM TDS for z/OS)

The IBM Tivoli Directory Server for z/OS (IBM TDS for z/OS) provides secure access for applications and systems on the network to directory information held on z/OS using the Lightweight Directory Access Protocol (LDAP). This component consists of the LDAP server, LDAP client, and utilities.

ICKDSF (Device Support Facility)

ICKDSF enables you to perform functions needed for the installation and use of IBM DASD. You can also use it to perform service functions, error detection, and media maintenance.

Integrated Security Services

Integrated Security Services includes:

Enterprise Identity Mapping (EIM)
EIM is an architecture that serves as a security technology to make it easier to manage users in a cross-platform environment.

Network Authentication Service
Network Authentication Service, which is based on Kerberos Version 5, provides Kerberos security services. These services include native Kerberos application programming interface (API) functions, including the Generic Security Service application programming interface (GSS-API) functions defined in Internet RFC 2078, Generic Security Service Application Program Interface, Version 2 and Internet RFC 2744, Generic Security Service API Version 2: C-bindings. Network Authentication Service performs authentication as a trusted third-party authentication service by using conventional shared secret-key cryptography. Network Authentication Service provides a means of verifying the identities of principals, without relying on authentication by the host operating system, without basing trust on host addresses, without requiring physical security of all the hosts on the network, and under the assumption that packets traveling along the network can be read, modified, and inserted at will.

Open Cryptographic Services Facility (OCSF)
Open Cryptographic Services Facility (OCSF) is a derivative of the IBM Keyworks technology, which is an implementation of the Common Data Security Architecture (CDSA) for applications running in the UNIX Services environment. It is an extensible architecture that provides mechanisms to manage service provider security modules, which use cryptography as a computational base to build security protocols and security systems. Figure 1 shows the four basic layers of the OCSF: Application Domains, System Security Services, OCSF Framework, and Service Providers. The OCSF Framework is the core of this architecture. It provides a means for applications to directly access security services through the OCSF security application programming interface (API), or to indirectly access security services by way of layered security services and tools that are implemented over the OCSF API. The OCSF Framework manages the service provider security modules and directs application calls through the OCSF API to the selected service provider module that services the request. The OCSF API defines the interface for accessing security services. The OCSF service provider interface (OCSF SPI) defines the interface for service providers who develop plug-able security service products.

ISPF

ISPF provides facilities for all aspects of host-based software development.

- Programmers can use ISPF to develop and document batch and interactive programs.
- Data center administrators and system programmers can monitor and control program libraries, and communicate with MVS through TSO commands, CLISTs, or REXX EXECs.
- Terminal users can work with interactive applications called dialogs.
- Managers can prepare and print memos by using ISPF Edit and the Hardcopy utility.

ISPF has four major components:

Dialog Manager (DM)
The Dialog Manager (DM) provides services to dialogs and users. These services include:

- Display
- Variable services

- Input and output
- User and application profiles
- Table management
- System interface services
- Dialog testing and debugging aids

Program Development Facility (PDF)
The Program Development Facility (PDF) provides services to assist dialog or application developers. These include

- Edit and Browse functions
- A wide range of foreground and batch compilers
- Data set and catalog utilities
- TSO or CMS command interfaces
- Data set search and compare functions.

Software Configuration and Library Manager (SCLM)
The Software Configuration and Library Manager (SCLM) is a tool that automatically controls, maintains, and tracks all of the software components of the application throughout the development cycle.

Client/Server component
The Client/Server component provides users who have a workstation that runs Windows or UNIX with a Graphical User Interface to ISPF application panels.

JES2

JES2 accepts the submission of work for the BCP. Major JES2 functions and design features include:

- The interpretation of job control language (JCL) statements
- The disposition of output
- A single-system image
- The ability to run multiple copies of JES2 (poly-JES)
- JES2 WLM for Sysplex

JES2 differs from JES3 in two main processing areas:

- JES2 exercises independent control over its job processing functions. JES3 exercises centralized control. Each JES2 processor in a multi-processor environment controls its own job input, job scheduling, and job output processing.
- JES3 does pre-execution of job setup. JES2 does not do this.

Language Environment

Language Environment provides common services and language-specific routines in a single run-time environment. It ensures consistent and predictable results for your language applications, independent of the language they are written in.

Language Environment is the prerequisite run-time environment for applications generated with the following IBM compiler products:

- z/OS XL C/C++
- OS/390® C/C++
- C/C++ for MVS/ESA
- COBOL for OS/390 & VM

- COBOL for MVS & VM (formerly COBOL/370)
- Enterprise COBOL for z/OS
- Enterprise COBOL for z/OS and OS/390
- AD/Cycle C/370 Compiler
- Enterprise PL/I for z/OS
- Enterprise PL/I for z/OS and OS/390
- VisualAge® PL/I for OS/390
- PL/I for MVS & VM
- AD/Cycle PL/I for MVS & VM
- VisualAge for Java™, Enterprise Edition for OS/390
- VS FORTRAN and FORTRAN IV (in compatibility mode)

Language Environment supports the VS FORTRAN compiler's object/load module compatibility, which means FORTRAN load modules can be run under Language Environment and object code can be link-edited with Language Environment and run under it. Language Environment also provides a set of assembler macros for running assembler language routines.

Language Environment supports, but is not required for, an interactive debug tool for debugging applications in your native z/OS environment. The interactive IBM Debug Tool is available with the latest release of the PL/I compiler or this product can be ordered separately for use with the IBM XL C/C++, COBOL, and PL/I compilers on z/OS. For more information, see Debug Tool Utilities and Advanced Functions (www.ibm.com/software/awdtools/debugtool).

Some benefits are that you can:

- Mix old code with new code.
- Handle conditions, such as program checks or abends, in your COBOL programs without having to use assembler.
- Share common run-time services.
- Run applications that conform to the POSIX 1003.1 standard or the X/Open Single UNIX Specification, also known as UNIX 95 or XPG4.2.
- Access CICS and IMS transactions and data through a C, COBOL, or PL/I server from any client in your network.
- Perform interlanguage communication more efficiently.
- Manage storage dynamically for your C/C++, COBOL, and PL/I routines with a common storage manager.
- Access a rich set of math services.

Library Server

Library Server enables customers to provide entire libraries of documents on the World Wide Web. Customers are able to serve BookManager, PDF, or Eclipse plug-in document formats to web browsers connected to either the Internet or an intranet. The information is stored in a virtual library, which is composed of Book, PDF, plug-in, Collection, Shelve, Case, and information center formats.

MICR/OCR

MICR/OCR provides the device support code for the following devices:

- 1287/1288 - IBM Optical reader and page reader respectively
- 3540 - IBM Disk device
- 3886 - IBM Optical Character reader

- 3890 - IBM Magnetic Ink Reader
- 3895 - IBM Printer device

Metal C Runtime Library

The Metal C runtime library element provides a set of header files and functions for use with the XL C METAL compiler option.

The XL C METAL compiler option generates code that does not require access to the Language Environment support at run time. Instead, the METAL option provides C-language extensions that allow you to specify assembly statements that call system services directly. Using these language extensions, you can provide almost any assembly macro, and your own function prologs and epilogs, to be embedded in the generated HLASM source file. When you understand how the METAL-generated code uses MVS linkage conventions to interact with HLASM code, you can use this capability to write freestanding programs.

Prior to the introduction of Metal C runtime library, all z/OS XL C compiler-generated code required Language Environment. In addition to depending on the C runtime library functions that are available only with Language Environment, the generated code depended on the establishment of an overall execution context, including the heap storage and dynamic storage areas. These dependencies prohibit you from using the XL C compiler to generate code that runs in an environment where Language Environment did not exist.

Network File System (NFS)

The z/OS NFS server acts as an intermediary to read, write, create or delete z/OS UNIX files and MVS data sets that are maintained on a z/OS host system. The remote MVS data sets or z/OS UNIX files are mounted from the host processor to appear as local directories and files on the client system. This server makes the strengths of a z/OS host processor (storage management, high-performance disk storage, security, and centralized data) available to the client platforms.

The NFS uses the communication services provided by TCP/IP, a suite of protocols that includes the remote procedure call (RPC) and external data representation (XDR) protocols. RPC allows a program on one machine to start a procedure on another machine, as if the procedure is local. XDR resolves the differences in data representation of different machines. The NFS, then, can be used for file sharing between platforms and file serving (as a data repository).

Open Systems Adapter Support Facility (OSA/SF)

OSA/SF is an element that supports S/390® Open System Adapter (OSA-Express and OSA-2) hardware features to deliver connectivity via directly-attached local area clients using:

- Transmission Control Protocol/Internet Protocol (IP) network protocol
- Systems Network Architecture Application Peer-to-Peer Networking
- Internet Packet Exchange (IPX)

The OSA-2 features provide connection to Ethernet, Asynchronous Transfer Mode (ATM), Token Ring and Fiber Distributed Data Interface (FDDI) networks. OSA-Express provides connection to Ethernet networks supporting Fast Ethernet (FENET), 1000Base-T Ethernet and Gigabit, as well as Token Ring and ATM.

OSA/SF provides a user-friendly interface for monitoring and controlling the OSA features. Beginning in z/OS V1R4, OSA/SF introduces support for a Java-based GUI interface, continues support for the OSA-2 features, and continues to provide the OS/2-based GUI.

Run-Time Library Extensions

Run-Time Library Extensions delivers the following libraries and utilities to support existing programs:

Common Debug Architecture (CDA) Libraries
Introduced in z/OS V1R5, CDA provides a consistent format for debug information on z/OS. The CDA Libraries provide a set of APIs to access this information.

c89 Utility
This utility compiles, assembles, and binds z/OS UNIX System Services C/C++ and assembler applications.

UNIX System Laboratories (USL) Libraries
The USL I/O Stream Library provides the standard input and output capabilities for C++. The USL Complex Mathematics Library provides the facilities to manipulate complex numbers and to perform standard mathematical operations

Note: The UNIX System Laboratories (USL) I/O Stream Library and Complex Mathematics Library are still supported on z/OS. Although support for these classes is not being removed at this time, it is recommended that you migrate to the Standard C++ iostream and complex classes. This is especially important if you are migrating other USL streaming classes to Standard C++ Library streaming classes, because combining USL and Standard C++ Library streams in one application is not recommended. For more information about the Standard C++ I/O Stream Library, see *Standard C++ Library Reference*.

SMP/E

SMP/E is a tool for installing and maintaining software, and for managing the inventory of software that has been installed. SMP/E provides a consistent and reliable method for installing and upgrading the software in a z/OS system.

Time Sharing Option/Extensions (TSO/E)

TSO Extensions is a base interactive interface that provides non-DP professionals, end users, system and application programmers, and administrators with an extensive set of commands, services, facilities and programming languages to do productive work on z/OS, and helps to ease systems management. TSO/E is an integral part of z/OS, and serves as a platform for other elements, such as BookManager READ/MVS, HCD, and ISPF.

Terminal Input Output Controller (TIOC)

TIOC is the interface between TSO and VTAM. It allows TSO to communicate with the terminal hardware.

z/OS Font Collection

The z/OS Font Collection consists of character sets, coded fonts, and Advanced Function Presentation (AFP) code pages for printing documents. The z/OS Font Collection includes these fonts:

• AFP outline fonts

• AFP raster fonts, including a complete set of IBM expanded core fonts and a set of Math, PI, and Sonoran 240-pel raster fonts

• TrueType and OpenType fonts, including a prebuilt resource access table (RAT) that can be used for AFP printing

z/OS Management Facility (z/OSMF)

IBM z/OS Management Facility (z/OSMF) provides system management functions in a task-oriented, web browser-based user interface with integrated user assistance, so that you can more easily manage the day-to-day operations and administration of your mainframe z/OS systems. By streamlining some traditional tasks and automating others, z/OSMF can help to simplify some areas of z/OS system management.

z/OSMF provides a framework for managing various aspects of a z/OS system through a web browser interface.

z/OSMF provides you with a single point of control for:

- Viewing, defining, and updating policies that affect system behavior
- Monitoring the performance of the systems in your enterprise
- Managing your z/OS software
- Performing problem data management tasks
- Consolidating your z/OS management tools.

z/OSMF allows you to communicate with the z/OS system through a web browser, so you can access and manage your z/OS system from anywhere. Multiple users can log into z/OSMF using different computers, different browsers, or multiple instances of the same browser.

Find more information about z/OSMF in *IBM z/OS Management Facility Configuration Guide*.

z/OS OpenSSH

z/OS OpenSSH is a port of Open Source Software release OpenSSH 6.4p1 and provides secure encryption for both remote login and file transfer.

z/OS OpenSSH includes the following utilities:

- `ssh`, a z/OS client program for logging into a z/OS shell. It can also be used to log into other platform's UNIX shells. It is an alternative to `rlogin`.
- `scp` for copying files between networks. It is an alternative to `rcp`.
- `sftp` for file transfers over an encrypted `ssh` transport. It is an interactive file transfer program similar to `ftp`.
- `sshd`, a daemon program for `ssh` that listens for connections from clients. The z/OS OpenSSH implementation of `sshd` supports both SSH protocol versions 1 and 2 simultaneously.

  The default `sshd` configuration only runs protocol version 2.

Other basic utilities such as `ssh-add`, `ssh-agent`, `ssh-keysign`, `ssh-keyscan`, `ssh-keygen` and `sftp-server` are also included.

To ensure secure encrypted communications, OpenSSH uses ciphers such as AES, Blowfish and 3DES.

z/OS OpenSSH provides the following z/OS extensions:

- System Authorization Facility (SAF) key ring. z/OS OpenSSH can be configured to allow z/OS OpenSSH keys to be stored in SAF key rings.
- Multilevel security. It is a security policy that allows the classification of data and users based on a system of hierarchical security levels combined with a system of non-hierarchical security categories.
- System Management Facility (SMF). z/OS OpenSSH can be configured to collect SMF Type 119 records for both the client and the server.
- Hardware Crypto Support. OpenSSH can be configured to choose Integrated Cryptographic Service Facility (ICSF) callable service for implementing the applicable SSH session ciphers and HMACs.

z/OS UNIX System Services (X/Open UNIX 95 functions)

z/OS UNIX System Services Application Services (Shell, Utilities, and Debugger)

Shell and Utilities provides the standard command interface familiar to interactive UNIX users. z/OS includes all of the commands and utilities specified in the X/Open Company's Single UNIX Specification, also known as UNIX 95 or XPG4.2. This feature will allow your UNIX programmers and other users to interact with z/OS as a UNIX system without necessarily having to learn the z/OS command language or other interactive interfaces. The z/OS UNIX Services Debugger provides a set of commands that allow a C language program to be debugged interactively. The command set is familiar to many UNIX users.

z/OS UNIX System Services Kernel

These services add the world of open UNIX-based computing to the z/OS operating system. With Language Environment, they support industry standards for C programming, shell and utilities, client/ server applications, and the majority of the standards for thread management and the X/Open Single UNIX Specification. Application developers and interactive users using these interfaces can exploit the capabilities of z/OS without having to understand z/OS itself. The combination of open computing and z/OS allows the transparent exchange of data, easy portability of applications, cross-network management of data and applications, and the exploitation of traditional MVS system strengths in an open environment.

z/OS Xvfb

Xvfb is an X server that can run on machines with no display hardware and no physical input devices. It emulates a dumb frame buffer using virtual memory. X server and other command-line options are available for use with Xvfb.

3270 PC File Transfer Program

This program transfers files from the host to the workstation for off-line data manipulation or transfers local data for storage on the host.

Chapter 3. z/OS optional features descriptions

The following is a description of each optional feature in z/OS.

BookManager BUILD

BookManager BUILD lets you create your own online books from files marked up with:

- GML (Generalized Markup Language) Starter Set
- IBM Publishing Systems BookMaster®

Instead of preparing the files for a printer, BookManager BUILD takes the files and produces a single file that contains the text and artwork for an online book.

Books built with BookManager BUILD can be read with any of the BookManager READ or Library Server products, such as:

- BookManager READ/MVS, which is part of the z/OS base
- IBM Softcopy Reader
- IBM Library Server, which is part of the z/OS base

Bulk Data Transfer (BDT) File-to-File

The BDT File-to-File element allows users at one z/OS system in a SNA network to copy data sets to or from another z/OS system in the network.

Bulk Data Transfer (BDT) SNA NJE

The BDT JES3 SNA NJE element allows users with the JES3 element to transmit jobs, output (SYSOUT), commands, and messages from one computer system to another within a SNA network.

Communications Server Security Level 3

This feature provides authentication and security services in an IP network environment. It provides support for packet filtering, tunnels, and network address translation (NAT), which enables secure communication over private and public networks. It uses the Triple DES (TDES) and AES encryption algorithms, and it includes SSL/TLS with TDES and AES, SNMPv3 with TDES, and IPSec with TDES and AES.

DFSMS Features (DFSMSdss, DFSMShsm, DFSMSrmm, and DFSMStvs)

There are four DFSMS features:

DFSMSdss
DFSMSdss is a DASD data and space management tool. DFSMSdss can be used to copy and move data sets between volumes; dump and restore data sets, entire volumes, or tracks; convert data sets and volumes to and from SMS management; compress partitioned data sets; release unused space in data sets; and consolidate free space and data sets on volumes.

DFSMShsm
DFSMShsm is a DASD storage management and productivity tool for managing low-activity and inactive data. It improves DASD use by automatically managing space and data availability in a

storage hierarchy. Working with SMS, DFSMShsm performs space management and availability management of data sets as directed by their management class attributes.

DFSMSrmm

DFSMSrmm allows you to manage your removable media as one enterprise-wide library across systems. DFSMSrmm manages your installation's tape volumes and the data sets on those volumes. DFSMSrmm manages all tape media, such as cartridge system tapes and 3420 reels, as well as other removable media you define to it. For example, DFSMSrmm can record the shelf location for optical disks and track their vital record status; it does not manage the objects on optical disks.

DFSMStvs

DFSMS Transactional VSAM Services, an optional feature, enables running batch jobs concurrently with CICS online transactions to allow updates to the shared VSAM data sets. Multiple batch jobs and online transactions can be run against the same VSAM data sets. DFSMStvs ensures data integrity for concurrent batch updates while CICS provides it for online updates.

DFSORT

DFSORT is IBM's high performance sort, merge, copy, analysis and reporting product for z/OS. This high-speed, flexible data processing tool provides fast and efficient sorting, merging, copying, reporting and analysis of business information, as well as versatile data manipulation at the record, field and bit level.

DFSORT is designed to optimize the efficiency and speed with which operations are completed through synergy with processor, device, and system features (for example, memory objects, hiperspace, data space, striping, compression, extended addressing, DASD and tape device architecture, processor memory, processor cache, and so on) and other products (for example, The SAS System**, COBOL, PL/I, IDCAMS BLDINDEX, and so on).

DFSORT includes the high-performance ICEGENER facility, the versatile ICETOOL utility, multiple output and reporting capability with the powerful OUTFIL feature, the time-saving ability to use Symbols for fields and constants in DFSORT and ICETOOL statements, and much more.

For more information on DFSORT, visit the DFSORT Web site.

GDDM-PGF

GDDM-PGF (Presentation Graphics Facility), a set of programs for creating presentation material in a variety of styles, provides:

Interactive Chart Utility

The Interactive Chart Utility (ICU), an easy-to-use end-user program for creating business charts.

Vector Symbol Editor

The (VSE), a means of creating and modifying symbols for use with the ICU or other GDDM functions.

An application programming interface

An application programming interface that enables programs to call either the ICU or a set of presentation-graphics routines for chart creation.

Online Presentation Services (OPS)

GDDM-PGF now incorporates an enhanced presentation-producing capability, Online Presentation Services (OPS). GDDM-OPS provides a command interface, which is simple and easy to use, yet which is also powerful enough to allow the very concise creation of high-quality presentations. These can then be used from displays (perhaps using the built-in automatic scrolling feature), or can be saved for printing or plotting.

Typical applications of GDDM-OPS are:

- Public presentations using a video monitor or projector
- Educational sessions for private or public display
- Scrollable interactive presentations of business charts

- Production of high-quality foils.

GDDM-REXX

GDDM-REXX/MVS is a productivity tool that enables programmers to prototype GDDM applications and to create small routines and utility programs quickly and easily.

Hardware Configuration Manager (HCM)

Hardware Configuration Manager (HCM) is a PWS-based client/server interface to z/OS Hardware Configuration Definition (HCD). It combines the logical and physical aspects of z/OS hardware configuration management. In addition to defining the logical connections (accomplished via HCD), you can also manage the physical aspects of your configuration. For example, you can effectively manage the flexibility offered by the ESCON infrastructure.

All updates are done with HCM's intuitive graphical user interface, and all changes are written into the IODF and fully validated for accuracy and completeness by HCD, avoiding unplanned system outages that are due to incorrect definitions.

High Level Assembler Toolkit

This toolkit provides a powerful set of capabilities to improve application development, debugging, and recovery.

The Toolkit provides six components:

- A disassembler which converts binary machine language to assembler language source statements.
- A flexible source-code analysis and cross-referencing tool to help determine variable and macro usage, analyze high-level control flows, and locate specific uses of arbitrary strings of characters in single or multiple modules.
- A workstation-based program analysis tool that displays control-flow graphs and source-code views within single programs or across entire application modules.
- A powerful and sophisticated low-level symbolic debugger for applications written in assembler and other compiled languages. It handles programs using 24, 31, and 64-bit addressing. (It does not support debugging privileged or supervisor-state code.)
- A rich set of macro instructions that implement a complete menu of the most widely used structured-programming constructs (IF/ELSE/ELSEIF, DO/ITERATE/ASMLEAVE, CASE, SEARCH, SELECT/WHEN/OTHRWISE, etc.). These macros simplify and clarify coding, and help eliminate errors in writing additional labels and branch instructions.
- A versatile file searching and comparison tool (*SuperC*) that scans or compares single file or groups of files with an extensive set of selection and rejection criteria.

IBM Knowledge Center for z/OS

IBM Knowledge Center is the IBM strategic platform for delivering technical content. z/OS V2R2 includes IBM Knowledge Center for z/OS, which is an SMP/E packaging of the customer installable version of IBM Knowledge Center for use on the z/OS platform. The customer installable version uses an enhanced version of search technology that is available in IBM information centers.

- IBM Knowledge Center for z/OS provides the ability to display, navigate and search content in a manner similar to IBM Knowledge Center on **ibm.com**.
- IBM Knowledge Center for z/OS serves IBM product publication content to web browser clients from the z/OS server system

- Content can be manually added to and maintained in IBM Knowledge Center for z/OS zFS repositories using information in the IBM Knowledge Center for z/OS Configuration and User Guide, SC27-6805.
- Content can be automatically added to and maintained in IBM Knowledge Center for z/OS zFS repositories using the enhanced SoftCopy Librarian V5 tool
- By adding and maintaining content, IBM Knowledge Center for z/OS can be made to serve product publications for many different IBM products

Use IBM Knowledge Center for z/OS to create your own enterprise document repository for local use. IBM Knowledge Center for z/OS is especially valuable for:

- Enterprises with no Internet access either for security reasons or as a valuable backup when Internet access is disrupted
- Personalizing or controlling the content of an enterprise library

The z/OS Softcopy Librarian, available as a download, is enhanced to make it easy to manage and update the content for IBM Knowledge Center for z/OS.

IBM Library Server continues as an element of z/OS to provide the ability to use BookManager and PDF files.

Infoprint Server

Infoprint Server consists of several components that support printing on a z/OS system:

Print Interface
This component accepts print requests from z/OS UNIX System Services and remote systems in your IP network. It allocates output data sets on the JES2 or JES3 spool for printing.

NetSpool
This component receives print output from VTAM applications and allocates output data sets on the JES2 or JES3 spool for printing.

Transform Manager
This component calls separate IBM transform products to transform data to and from Advanced Function Presentation (AFP) format. For example, IBM transform products can transform PCL, PDF, PostScript, SAP R/3, and Xerox data to AFP format, and can transform AFP data to PCL, PDF, and PostScript format.

IP PrintWay
This component sends output data from the JES2 or JES3 spool to remote printers or print servers in your IP or SNA network. IP PrintWay can also send output data to email destinations. You can run IP PrintWay in basic or extended mode. In extended mode, IP PrintWay provides better performance, improved usability, and more function.

Printer Inventory
This component provides a single set of printer definitions that all the components of Infoprint Server use. The Printer Inventory also contains printer customization information that Print Services Facility (PSF) for z/OS uses.

Infoprint Central
This component is a web application that lets help desk operators and other authorized users work with print jobs on the JES spool, printers controlled by IP PrintWay extended mode or PSF, NetSpool logical units, and job selection rules. It also lets users see Infoprint Server system status and printer definitions in the Printer Inventory.

Infoprint Port Monitor for Windows
This component sends documents and job attributes from Windows systems to Infoprint Server for printing on any printers that are defined in the Infoprint Server Printer Inventory.

JES3

You might choose to enable JES3 as an alternative to the base JES2 element. It also accepts the submission of work for the BCP. Major JES3 functions and design features include:

- The interpretation of job control language (JCL) statements
- The disposition of output
- A single system image
- Workload balancing
- Deadline scheduling
- Dependent job control
- Control flexibility

JES3 differs from JES2 in two main processing areas:

- JES3 exercises centralized control over its job processing functions. JES2 exercises independent control. With JES3, a single, global processor controls job, device, and workflow for all processors in a multi-processor environment.
- JES3 does pre-execution of job setup. JES2 does not do this.

RMF (Resource Measurement Facility)

RMF is the window on z/OS resource usage. It gathers information at sysplex, single-system or address-space level, and provides reports at any system in a sysplex. The user can choose between reports about activities and delays, and can focus on storage, I/O or processor data. A wide range of options allows selection of the relevant information, including the attainment of Workload Manager goals.

The RMF monitors present snap-shot and short-term reports real-time in ISPF dialogs with on-line help, and you can have the results printed if you wish. The RMF Postprocessor provides long-term reports for detailed analysis of historical data gathered by RMF. These reports can be printed or displayed.

In addition to host-based reporting functions in RMF, there are other components available that offer reporting capabilities at the workstation. The RMF PM Java Edition provides an interface between the workstation and the z/OS sysplex through a TCP/IP connection that gives you the flexibility to create unique scenarios to monitor the performance of your sysplex. The Spreadsheet Reporter, running on your Windows workstation, gives you the ability to extract reports from RMF Postprocessor output to convert them into a common spreadsheet format and allows your spreadsheet application to use the RMF data. This function enables you to integrate RMF data into your business process. It also means you can easily produce presentation graphics which illustrate performance analysis results.

SDSF (System Display and Search Facility)

SDSF provides you with information to monitor, manage and control your z/OS system. SDSF provides an easy and efficient way to control job processing (hold, release, cancel and purge jobs) and to control devices (such as printers, lines and initiators). It allows you to monitor jobs while they are running and browse output without printing it. You can also browse the system log, including the sysplex-wide operations log. SDSF provides sort, filter, arrange, search, and print functions to help you locate and organize information. Single-character commands eliminate the need to learn and remember complex system commands. You can easily change characteristics of an object, such as a job or node, by typing over a displayed value. An optional action bar and pop-up windows make it easy to find and use SDSF functions. You can establish security for SDSF using SDSF's own security parameters, or with IBM's standard interface, SAF (System Authorization Facility). You can access SDSF function through REXX execs or Java programs.

SDSF provides complete online help and an interactive tutorial.

Security Server

The Security Server includes:

Resource Access Control Facility (RACF)
RACF provides a strong security base that enables the Security Server element of z/OS to incorporate additional components that aid in securing your system as you make your business data and applications accessible by your intranet, extranets, or the Internet.

XL C/C++

This language-centered XL C/C++ application development environment on the z/OS platform includes a C compiler, a C++ compiler, and C/C++ application development utilities. This feature exploits the C/C++ runtime environment and library of runtime services available with the Language Environment and Run-Time Library Extensions elements of z/OS.

z/OS Security Level 3

z/OS Security Level 3 includes IBM Tivoli Directory Server for z/OS Security Level 3 (new in z/OS V1R8; replaces LDAP Security Level 3), Network Authentication Service Security Level 3, OCSF Security Level 3, and System Secure Sockets Layer (SSL) Security Level 3.

Chapter 4. What is new in z/OS (V2R2 - V2R3)

The following major enhancements were introduced in z/OS V2R3 and V2R2. Some enhancements require customization actions before you can use them. This information helps ensure that you can locate the documents that describe the customization actions.

Note: The document lists for each function are not exhaustive and generally omit links to purely reference books for items that include system messages, system codes, and data areas.

Elements and features with no enhancements in V2R3

Usage information for the following z/OS elements and features was not updated for z/OS V2R3:

- Alternate Library for REXX
- BDT
- BDT File-to-File
- BDT SNA NJE
- BookManager BUILD
- BookManager READ
- EREP
- ESCON Director Support
- FFST
- GDDM
- GDDM-PGF
- GDDM-REXX
- High Level Assembler (HLASM)
- High Level Assembler (HLASM) Toolkit
- IBM HTTP Server - Powered by Apache
- MICR/OCR
- OSA/SF
- TIOC
- 3270 PC File Transfer Program

IBM z/OS Liberty Embedded is a new base element in z/OS V2R3. IBM z/OS Liberty Embedded provides a copy of the IBM Liberty server stack for sharing between z/OS elements, so no usage information is provided here.

z/OS system-level new functions to consider

This information describes z/OS system-level enhancements in V2R3 and V2R2.

z/OS OpenSSH: base element

Description:
z/OS V2R2 includes z/OS OpenSSH, a base element which provides secure encryption for both remote login and file transfer.

Introduced
z/OS V2R2

Reference information:

- "z/OS OpenSSH" on page 14
- *z/OS OpenSSH User's Guide*

IBM Knowledge Center for z/OS: optional feature

Description:
z/OS V2R2 includes an SMP/E installable version of IBM Knowledge Center for z/OS. IBM Knowledge Center is the strategic framework for publishing all IBM product documentation on the Internet.

Introduced
z/OS V2R2

Reference information:

- "IBM Knowledge Center for z/OS" on page 19
- *IBM Knowledge Center for z/OS Configuration and User Guide*

Component-specific diagnosis information

Description:
There are several new topics containing component specific diagnosis information for z/OS including JES and XCF.

Introduced
z/OS V2R2

Reference information:
See the topic about "Diagnosing component specific problems" in *z/OS Problem Management*.

z/OS Font Collection: base element

Description:
z/OS Font Collection is a comprehensive set of fonts for IBM products that were traditionally ordered separately. The fonts include selected object fonts, AFP, and IBM Infoprint fonts. z/OS Font Collection is updated with these enhancements:

- AFP raster fonts from these IBM products:

  - APL2 Fonts, Version 1 Release 1 (5771-ADB)
  - Data1 Fonts, Version 1. Release 1 (5771-ADA)
  - Sonoran Sans Serif Font, Version 1 Release 1 (5771-ABB)
  - Sonoran Sans Serif Condensed Font, Version 1 Release 1 (5771-AFL)
  - Sonoran Sans Serif Expanded Font, Version 1 Release 1 (5771-AFN)
  - Sonoran Sans Serif Headliner Font, Version 1 Release 1 (5771-ADX)
  - Sonoran Serif Font, Version 1 Release 1 (5771-ABA)
  - Sonoran Serif Headliner Font, Version 1 Release 1 (5771-ADW)
- Version 8.2 of WorldType fonts

When change was introduced:
z/OS V2R3

Reference information:

- *z/OS Font Collection*.
- *z/OS Migration*

z/OS Client Web Enablement Toolkit

This topic describes new function in the z/OS Client Web Enablement Toolkit.

HTTP streaming support for the z/OS Client Web Enablement Toolkit

Description:
The z/OS Client Web Enablement Toolkit adds new streaming send and receive functionality to support the sending of very large request and response bodies. Instead of the current requirement to have all data sent from and received into a single contiguous buffer, the streaming support allows an application to stage its sending and receiving into multiple buffers. This allows toolkit applications to send and receive a virtually unlimited amount of data. New optional streaming exits (streaming send and streaming receive) can be set to enable the streaming method of processing outgoing and incoming data. For both exits, the toolkit takes an input of buffers from the exit, sends from or receives into these buffers, and then drives the exit again to potentially receive new buffers for it to process until all the data has been processed. All languages except REXX are supported.

When change was introduced:
z/OS V2R3.

Reference information:
z/OS MVS Programming: Callable Services for High-Level Languages

REXX support for the z/OS Client Web Enablement Toolkit

Description:
Starting in z/OS V2.2 and available in z/OS V2.1 with service updates, IBM introduces the z/OS Client Web Enablement Toolkit, which provides a high function, secure, web client using HTTP(S) and JSON. Built into the base of z/OS, the toolkit provides an easy-to-use, lightweight solution for applications looking to more easily participate as a client of a web services enabled application. It provides a built-in z/OS HTTP(S) protocol enabler by using interfaces similar in nature to other industry-standard APIs, and a z/OS JSON parser to parse JSON text coming from any source with more functions to build new or add to existing JSON text. Programs running as batch jobs, started procedures or almost any type of address space on a z/OS system now have native APIs that they can use in a similar manner to any standard z/OS APIs provided by the OS to access web services. Programming languages that are supported include C/C++, COBOL, PL/I, Assembler language and now REXX.

When change was introduced:
z/OS V2R2.

Reference information:
z/OS MVS Programming: Callable Services for High-Level Languages

New REXX host command environments

Description:
IBM now makes the leveraging of REST APIs in z/OS applications even easier by extending the Client Web Enablement toolkit support to the REXX programming language. IBM now introduces new REXX host command environments, HWTJSON and HWTHTTP to allow REXX applications to easily direct their requests to the toolkit using an easy-to-use, made-for-REXX interface. REXX applications running in TSO/E, System REXX, z/OS UNIX, or ISV-provided REXX environments are supported.

When change was introduced:
z/OS V2R2.

Reference information:
z/OS MVS Programming: Callable Services for High-Level Languages

z/OS Client Web Enablement Toolkit

Description:
Applications running in traditional z/OS environments can choose to play the client role of a RESTful web application and initiate a request to a web server residing on z/OS or any other platform supporting web applications. In z/OS Version Release 2, the new z/OS Client Web Enablement toolkit enables these applications to more easily participate in this client/server space by providing a built-in:

- z/OS JSON parser to parse JSON text coming from any source and the ability to build new JSON text or add to existing JSON text.

- z/OS HTTP/HTTPS protocol enabler using interfaces similar in nature to other industry-standard APIs.

The intention of the toolkit is to enable traditional z/OS programs apart from a Java Virtual Machine (JVM) environment to have easy access to these types of services. Programs running as a batch job, as a started procedure or running in almost any address space on a z/OS system now have APIs that they can utilize in a similar manner to any standard z/OS APIs provided by the operating system. Furthermore, programs can invoke these APIs in the programming language of their choice. C/C++, COBOL, PL/I, and Assembler languages are fully supported.

When change was introduced:
z/OS V2R2.

Reference information:
z/OS MVS Programming: Callable Services for High-Level Languages

BCP (MVS) new functions to consider

This topic describes the new features and function in the base control program (BCP), also called MVS.

Allocation considerations

This topic describes new function for allocation and supervisor in z/OS.

Data set optimization configuration

Description:
The new parmlib member IEFOPZxx contains statements that define the data set optimization configuration, and specifies which members are to be processed (optimized). For example, this could provide a list of pairings of an old COBOL load library and the intended new load libraries (one for each desired architecture level).

The IEFOPZ system parameter is added. The SET IEFOPZ and DISPLAY IEFOPZ commands are added. The IEFOPZQ (query) service is added.

When change was introduced:
z/OS V2R2 with APAR OA47689 (PTF UA90982).

Reference information:

- *z/OS MVS Initialization and Tuning Reference*
- *z/OS MVS System Commands*
- *z/OS MVS System Management Facilities (SMF)*
- *z/OS MVS Programming: Authorized Assembler Services Reference EDT-IXG*.

BCPii considerations

The following BCPii function is new in z/OS V2R3:

- **z/OS BCPii performance improvements:** The z/OS BCPii HWIQUERY and HWILIST services have been enhanced to process capacity record and activation profile requests in a more efficient manner when the target CPC is at the IBM z13 GA2 level or later. This results in significantly faster response times for these two services when targeting the newer hardware levels. The functionality is available in z/OS V2.3, and in both z/OS V2.2 and z/OS V2.1 with a service update.

- **New z/OS BCPii HWICMD2 service:** The existing HWICMD service has been enhanced with the introduction of the new HWICMD2 service. HWICMD2 has a new version number parameter that allows the caller to indicate to BCPii which command parameter mapping it should use to process the command request. The LOAD, SCSILOAD, and SCSIDUMP commands have been enhanced to have a new version of the command parameters to allow for 5-character IPL device addresses. This enhancement also enables future enhancements to specific commands to either accept additional

parameters or to change the sizes of its parameters. The functionality is available in z/OS V2.3, and in both z/OS V2.2 and z/OS V2.1 with a service update.

- **z/OS BCPii support for larger data returned from SE:** z/OS BCPii has been updated to allow the receipt of larger amounts of data coming from the SE, alleviating buffer storage shortages that can arise when querying hardware attributes that return significant amounts of data. Even large data, such as the engineering change / MCL information attribute (HWI_EC_MCL_INFO), will no longer experience problems on the HWIQUERY service. The functionality is available in z/OS V2.3, and in both z/OS V2.2 and z/OS V2.1 with a service update.

- **z/OS BCPii support for absolute capping for a single LPAR:** The z/OS BCPii HWIQUERY and HWISET services have been updated to support LPAR absolute capping attributes, which are supported when targeting a CPC at the zEC12 GA2 level or later. The new image and image activation profile attributes allow an LPAR's absolute capping status (enablement or disablement) as well as the LPAR's absolute capping value (maximum usage capacity) to be both queried and set for every processor type. The functionality is available in z/OS V2.3, and in both z/OS V2.2 and z/OS V2.1 with a service update.

- **z/OS BCPii support for absolute capping for an LPAR group:** The z/OS BCPii HWIQUERY and HWISET services have been updated to support absolute capping attributes for an LPAR group, which are supported when targeting a CPC at the z13 GA2 level or later. The new image attributes allow an LPAR group's absolute capping status (enablement or disablement) as well as the LPAR group's absolute capping value (maximum usage capacity) to be both queried and set for every processor type.

- **z/OS BCPii support for Dynamic CPC name change:** z/OS BCPii exploits a new enhancement in the firmware on zEC12 and z13 CPCs to allow an installation to dynamically change the name of the CPC in the HMC network while BCPii has active connections to that CPC. When BCPii detects that either the local CPC has changed its name or that a request going to a remote CPC no longer is targeting the same physical machine, BCPii terminates all connections associated with the affected CPC and broadcasts a name change ENF event to notify all parties on the local image that the CPC name change has occurred.

- **New z/OS BCPii HWISET2 service:** The existing HWISET service has been enhanced with the introduction of the new HWISET2 service to allow for multiple attributes to be set on a single API call. This support can provide quicker adjustments to multiple attributes in the hardware configuration, helping to reduce periods of potential configuration inconsistency when setting a single attribute at a time. An additional benefit of this support is having a "two-phase commit" like behavior where either all changes or none of the changes are made when targeting a CPC at the z13 GA2 level or later.

The following BCPii function is new in z/OS V2R2:

- **BCPii logging of "write" actions in SMF:** In z/OS Version 2 Release 2, z/OS BCPii now logs all successful HWISET and HWICMD API invocations in a new SMF record type. Both of these z/OS BCPii-supplied APIs can perform potentially disruptive actions to a CPC or image, or alter the configuration with updates to an activation profile. The logging of these actions now allows an installation to determine: which applications are making these changes; what the actual changes were; and the user ID associated with the execution of this application. An easy-to-use SMF formatter job is also provided to allow a customized SMF report to be generated without the need to compile a program.

- **z/OS Client Web Enablement Toolkit adds REXX support:** Starting in z/OS V2.2 and available in z/OS V2.1 by way of service updates, IBM introduced the z/OS Client Web Enablement Toolkit, which provides a high function, secure, web client using HTTP(S) and JSON. Built into the base of z/OS, the toolkit provides an easy-to-use, lightweight solution for applications looking to more easily participate as a client of a web services enabled application. It provides a built-in z/OS HTTP(S) protocol enabler using interfaces similar in nature to other industry-standard APIs, and a z/OS JSON parser to parse JSON text coming from any source with more functions to build new or add to existing JSON text. Programs running as batch jobs, started procedures or almost any type of address space on a z/OS system now have original APIs that they can use in a similar manner to any standard z/OS APIs provided by the OS to access web services. Programming languages that are supported include C/C++, COBOL, PL/I, Assembler language and now REXX.

- **New REXX Host Command Environments:** IBM makes the using of REST APIs in z/OS applications even easier by extending the Client Web Enablement toolkit support to the REXX programming language. IBM introduces two new REXX host command environments, HWTJSON and HWTHTTP, to allow REXX applications to easily direct their requests to the toolkit using an easy-to-use "made-for-

REXX" interface. REXX applications running in TSO/E, System REXX, z/OS UNIX, or ISV-provided REXX environments are supported.

When change was introduced: z/OS V2R2 or V2R3, as indicated in the preceding paragraphs.

Reference information: *z/OS MVS Programming: Callable Services for High-Level Languages*.

CEA considerations

The following Common Event Adapter (CEA) function is new in z/OS V2R3.

Remote TSO/E Address Space Manager

Description: A calling application can create and log in to a TSO/E address space on a different system in the sysplex (a remote system). This support allows users of z/OSMF ISPF plug-in and exploiters of the TSO/E address space manager (TSOASMgr) services to create TSO/E address spaces on another system in the sysplex. The TSOASMGR services use XCF to perform communications between the caller and the remote TSO/E address space.

This support, Version 2, allows the caller to work with any system in the sysplex. This support differs from the prior version (Version 1) of TSOASMGR services, which allowed sessions to be created only on the system on which the function was invoked (the local system).

Applications that use the version 1 support work directly with z/OS UNIX queues to implement message queuing. The Version 2 support uses CEA for message queuing. This function requires the use of the new APIs to perform queue functions.

To use the new functions to access other systems in the sysplex, the application must be modified or created to use the new version (version 2) of the APIs. With this change, message passing is done through CEA APIs and no longer directly with z/OS UNIX queues.

When change was introduced: z/OS V2R3

Reference information:

- *z/OS MVS Programming: Callable Services for High-Level Languages*
- *z/OS MVS System Messages, Vol 4 (CBD-DMO)*

Consoles considerations

This topic describes new consoles function in z/OS.

Shared consoles support removal

Description: In z/OS V2R1, the statement of direction was updated to indicate that z/OS V2R2 would be the last system level to support shared mode for consoles. The concept of shared mode is eliminated from z/OS V2R3. IPL parameters and command syntax no longer accept shared or distributed mode. For compatibility, the options are ignored with a message indicating they are no longer supported.

When change was introduced: z/OS V2R3.

Reference information:

- *z/OS MVS System Commands*
- *z/OS MVS Initialization and Tuning Reference*
- *z/OS MVS Diagnosis: Reference*
- *z/OS MVS System Messages, Vol 6 (GOS-IEA)*
- *z/OS MVS Planning: Operations*

Security enhancements for HMCS, SMCS, and MCS consoles

Description: The following two new console security enhancements are provided:

- The ability to have a user automatically logged off from a console due to inactivity is introduced. A system programmer is able to specify in parmlib member CONSOLxx a timeout value (in minutes) that applies to HMCS, SMCS, or MCS consoles in the system. The consoles are automatically logged off when the timeout intervals are exceeded without any operator input. It is possible to set a specific value for each console. The console's timeout value can be dynamically altered using a VARY CN() command.

  Note: The timeout value is associated with a console name, not the user ID for the LOGON command.

- The ability to have a user concurrently logged on to multiple consoles in the sysplex at one time. This is accomplished by the security administrator defining a security profile, MVS.MULTIPLE.LOGON.CHECK, in the OPERCMDS class. If the profile does not exist, a user ID may only be logged on to one operator console. When the profile exists, an authorized user ID may be concurrently logged on to multiple operator consoles.

  Note: This profile affects all user IDs on the system, not any specific user ID.

When change was introduced: z/OS V2R2.

Reference information:

- *z/OS MVS System Commands*
- *z/OS MVS Initialization and Tuning Reference*
- *z/OS MVS Diagnosis: Reference*

Generic Tracker considerations

The following enhancements are made to Generic Tracker considerations.

Data persistence and simplified generic tracking services

Description:
You can now use the generic tracker service GTZTRACK to provide persisted records of tracked events in new SMF type 125 records. With this function, you can retrieve historical information about tracked events whenever needed. Additionally, new REXX query interface GTZLQRY simplifies the use of generic tracking services.

Release introduced
z/OS V2R2

Reference information:

> *z/OS MVS Programming: Assembler Services Reference ABE-HSP*
> *z/OS MVS Data Areas* in the z/OS Internet library (www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosInternetLibrary)
> *z/OS MVS Diagnosis: Tools and Service Aids*
> *z/OS MVS Initialization and Tuning Guide*
> *z/OS MVS System Commands*
> *z/OS MVS System Management Facilities (SMF)*
> *z/OS MVS System Messages, Vol 6 (GOS-IEA)*
> *z/OS Summary of Message and Interface Changes*

Global Resource Serialization (GRS)

The following enhancements are made to Global Resource Serialization (GRS) considerations.

GRS EQDQ Monitor support and QScan enhancements

Description: With the introduction of GRS SMF 87 Monitoring for ENQs and DEQs, Global Resource Serialization (GRS) now has an option for monitoring ENQ and DEQ requests that produces less overhead than the ISGAUDIT EQDQ monitor. GRS now has its own SMF record type, 87, which was introduced in D-type APAR OA42221 to record generic, global QScans. Further granularity of both ENQ/DEQ and QScan SMF 87 monitoring is provided through new parmlib member GRSMONxx, and the monitoring of STEP

level resources, a functionality that was lost with ISGAUDIT, has returned. Incremental performance benefits are realized for Star mode Global Queue Scans (GQSCAN and ISGQUERY macros).

When change was introduced: z/OS V2R2.

Reference information:

- *z/OS MVS Planning: Global Resource Serialization*
- *z/OS MVS Initialization and Tuning Reference*
- *z/OS MVS System Messages, Vol 9 (IGF-IWM)*
- *z/OS MVS System Commands*

IBM Function Registry for z/OS considerations

This topic describes new function for IBM Function Registry for z/OS.

Using and registering functions with the IBM Function Registry for z/OS

Description:

IBM Function Registry for z/OS provides a simple way to find and enable functions on a z/OS system. A function is anything provided by IBM or a vendor within any z/OS product (such as, for IBM, XCF or CICS). For example, a function registered with the IBM Function Registry for z/OS could be representing a particular service or an operational mode a product offers.

The IBM Function Registry for z/OS provides:

- Information about registered functions, such as whether a function is available on the system, whether it has been enabled, whether it has been used, and optionally, how often it has been used.
- Ways to enable and disable registered functions within a product. For example, users might want to disable new registered functions shipped in the service stream.

Note that the IBM Function Registry for z/OS is simply a repository of information about functions. It is not a legal instrument, nor is it related to usage rates, or licensing.

Release introduced:
z/OS V2R3.

Reference information:

- If you are using the IBM Function Registry for z/OS to find functions, get information about functions, or enable and disable functions, see the topic on using IBM Function Registry for z/OS in *z/OS MVS Programming: Authorized Assembler Services Guide*.
- If you want to register your function with the IBM Function Registry for z/OS, see the topic on registering functions in the IBM Function Registry for z/OS in *z/OS MVS Programming: Authorized Assembler Services Guide*.

IBM Health Checker for z/OS considerations

This topic describes new function for IBM Health Checker for z/OS.

Sharing HZSPRMxx parmlib member between systems and applying statements conditionally

Description:
New WHEN statement allows you to specify statements conditionally in the HZSPRMxx parmlib library, to be applied depending on the particular system configuration. If the conditions specified in the WHEN statement are met, the statement or statements within are applied as appropriate for the type of statement. This allows you to share an HZSPRMxx parmlib member between many systems in a sysplex, even if you need to specify particular conditions for some systems.

Release introduced:
z/OS V2R2.

Reference information:

- *IBM Health Checker for z/OS User's Guide*

IOS considerations

This topic describes new function for Input/Output Supervisor in z/OS.

SuperPAV dynamic alias management

Description:
SuperPAV is an extension of the HyperPAV architecture and implements multiple logical subsystems (LSS) within an alias management group (AMG). With SuperPAV, when a new I/O request occurs and there are no alias PAV devices available in the alias pool for the base PAV device's LSS, z/OS attempts to use an alias PAV device from another LSS within the AMG subgroup.

SuperPAV may provide some relief for systems that experience I/O queue time (IOSQ) during periods of peak I/O load. When a small number of aliases have been defined in an LSS, it is possible that during a heavy I/O period, no aliases might be available. z/OS may then check peer LSS alias pools to borrow an alias to start I/O requests that previously would have been left queued because no aliases were available.

Release introduced:
z/OS V2R2 with APAR OA49090 applied.

Reference information:

- *z/OS HCD Planning*
- *z/OS MVS Initialization and Tuning Reference*
- *z/OS MVS System Commands*
- *z/OS MVS Programming: Authorized Assembler Services Reference EDT-IXG*

Program Management (Binder) Considerations

Description: In z/OS V2R2, Program Management has the following enhancements:

- A new binder C/C++ API DLL is provided which supports Language Environment conforming AMODE 64 programs.
- Program Management now provides support for J-con (length constant) RLDs for defining the length of individual parts and pseudoregisters (PR) in GOFF objects. This support is for an RLD built with a Reference Type of R-Length and Referent Type Part. This is supported by the High Level Assembler as in APAR PI07812. In addition to identifying them in the binder SYSPRINT output, AMBLIST is also enhanced to decode and display such RLDs.
- The following RAS items are also added:
  - TSO LINK and LOADGO support to accept the LISTPRIV=INFORM option.
  - Several functional enhancements to the ADDALIAS API, for both creating new and preserving existing aliases.
  - Displaying the ESD RMODE for load module CSECTs in AMBLIST output.

When change was introduced: z/OS V2R2.

Reference information:

- *z/OS MVS Program Management: User's Guide and Reference*
- *z/OS MVS Program Management: Advanced Facilities*
- *z/OS MVS Diagnosis: Tools and Service Aids*

Real Storage Manager (RSM) considerations

This information describes new RSM features and functions in z/OS.

Frame management enhancements

Description:
Before z/OS V2R3, real memory was carved into various pools of different frame sizes (4 KB frames, quad frames, 1 MB pageable, and fixed frames, and 2 GB frames) and frame types (preferred frames, and reconfigurable frames). With a few exceptions, requests for a certain frame size/type could use real memory from other frame sizes/types when the primary frame size/type was depleted. As more frame sizes/types were introduced, this frame management system became complex. With z/OS V2R3, the system no longer designates pools of real memory for most frame sizes (2 GB pages is the exception). There is now just one pool that supports all frame size requests (minus 2 GB pages). With this frame management system, a larger pool of real memory can be used for whatever frame size the current workload demands.

As a result of these frame management changes:

- The LFAREA INCLUDE1MAFC(NO) specification in IEASYSxx is no longer applicable. Since there is no designated pool of real memory created as a result of a 1 M LFAREA specification, all real storage is always included in the available frame count (RCEAFC). The INCLUDE1MAFC keyword is still parsed, but effectively ignored.
- The number of available pageable 1 MB frames in the system is no longer limited to approximately one-eighth of real memory above the 2 GB bar. There is no longer a designated pool of real memory for pageable 1 MB frames. As such, the number of pageable 1 MB frames available is only limited to the amount of available real memory installed on the system (minus any defined 2 GB frames and reconfigurable frames).

When change was introduced:
z/OS V2R3

Reference information:

- *z/OS MVS Initialization and Tuning Reference*.
- *z/OS MVS Initialization and Tuning Guide*.
- *z/OS MVS System Messages, Vol 6 (GOS-IEA)*.

IARV64 PAGEFIX / PAGEUNFIX enhancement

Description:
The IARV64 service is used to request 64-bit storage. Using the PAGEFRAMESIZE keyword, users can request that the storage is backed with pageable 1 MB frames, if available. Before z/OS V2R3, when backed with pageable 1 MB frames, certain IARV64 PAGEFIX invocations can result in demotion of the pageable 1 MB frame into 256 pageable 4 KB frames.

This can occur when:

- The starting address of the data to be acted on is not on a megabyte boundary (RANGLIST, VSA).
- The number of 4 K frames to be acted on is not a multiple of 256 (RANGLIST, NUMPAGES).

With z/OS V2R3, these restrictions no longer apply. IARV64 PAGEFIX requests against storage backed with pageable 1 MB frames no longer causes demotions in the above scenarios. In addition, IARV64 PAGEUNFIX requests that do not start on a megabyte boundary or do not specify a multiple of 256 4 K frames are supported.

Note: This is the 64-bit follow-on of the PGSER FIX/FREE enhancement that is introduced in z/OS V2R2. The z/OS V2R2 enhancement addressed 31-bit address space storage backed with pageable 1 MB frames. It allowed PGSER FIX/FREE requests that do not start on a megabyte boundary or do not specify a length in megabyte multiples to be processed without resulting in the demotion of the pageable 1 MB frame.

When change was introduced:
z/OS V2R3

Reference information:

- *z/OS MVS Programming: Authorized Assembler Services Reference EDT-IXG*.

Service aids considerations

The following enhancements are made to service aids.

Manage large SDUMPS

Description:
SDUMPs are continually getting larger, and the critical nature of SDUMP is continually increasing. So, the component trace (CTRACE) service that provides a method for MVS components to collect data about problem events now supports SDUMP. The inclusion of SDUMP in CTRACE assists with diagnosing and debugging SDUMP problems and helps to significantly reduce the amount of time that is required to resolve them.

The following specific enhancements are provided to handle the larger storage capacity:

- Larger SUMDUMP buffer
- SDUMP CTRACE facility
- New SDATA options to limit high virtual common storage in SVC dumps

Release introduced
z/OS V2R2

Reference information:

z/OS MVS Diagnosis: Tools and Service Aids
z/OS MVS System Messages, Vol 6 (GOS-IEA)
z/OS Summary of Message and Interface Changes

Deallocate LOGREC data sets without a system restart

Description:
You can now deallocate LOGREC data sets without restarting the system. This new function provides you with the ability to discontinue the use of a particular LOGREC data set when you switch to either a log stream or a different LOGREC data set. Use the updated SETLOGRC command to deallocate a LOGREC data set that is in use and specify a new data set name.

Release introduced
z/OS V2R2

Reference information:

z/OS MVS Initialization and Tuning Reference
z/OS MVS System Commands
z/OS Summary of Message and Interface Changes
z/OS MVS Diagnosis: Tools and Service Aids
z/OS MVS Installation Exits
z/OS MVS System Messages, Vol 8 (IEF-IGD)

Supervisor considerations

This topic describes new function for allocation and supervisor in z/OS.

Pause on Pause Element Tokens (PETs)

IEAVPME2 is a callable service that can be used to pause on one or more multiple PETs. IEA4PME2 is the 64-bit mode (AMODE 64) version of the callable service and the addresses in the parameter list are 64 bits long. There are also updates to the IEAVAPE and IEAVAPE2 callable services.

Description:

When change was introduced:
> z/OS V2R2.

Reference information:

- *z/OS MVS Programming: Authorized Assembler Services Reference EDT-IXG*
- *z/OS MVS Programming: Assembler Services Reference IAR-XCT*

System logger considerations

The following enhancements are made to system logger.

z/OS System Logger support for encrypted log stream data sets

Description:
> An enhancement to the System Logger component is planned to allow data set level encryption for log stream data sets. Log stream data level encryption is established when system logger creates a new log stream data set using new specifications in either a DFSMS data class definition for extended format type, or through RACF data set profiles.

Release introduced
> z/OS V2R3

Reference information:

> *z/OS MVS Setting Up a Sysplex*
> *z/OS MVS System Messages, Vol 10 (IXC-IZP)*
> *z/OS Summary of Message and Interface Changes*

Logstream staging datasets greater than 4GB

Description:
> System Logger allows logstream staging datasets to be allocated greater than 4GB in size in z/OS Version 2 Release 3. The new allowable maximum staging dataset size is 16TB - for example, 16384GB or 17,592,186,044,416 bytes.

> Allowing larger logstream dataset sizes, provides for greater scalability in the higher availability and recoverability logstream configuration. Installations can get an improved tuned log data flow through their logstreams.

Release introduced
> z/OS V2R3

Reference information:

> *z/OS MVS Setting Up a Sysplex*
> *z/OS Migration*
> *z/OS MVS Programming: Assembler Services Guide*
> *z/OS MVS Programming: Assembler Services Reference IAR-XCT*
> *z/OS MVS System Commands*
> *z/OS MVS System Messages, Vol 10 (IXC-IZP)*
> *z/OS Summary of Message and Interface Changes*

Prevent access to LOGR couple data sets

Description:
> System logger requires the use of the LOGR couple data set (CDS) to perform its operations. However, certain sysplex configurations can benefit from a z/OS system that does not maintain any access to the primary or alternative LOGR CDSs. An example of such a system is the K-systems controlling systems in an IBM GDPS®/PPRC, GDPS/MTMM environment. For these situations, logger provides for a SYS1.PARMLIB option that you can specify during a restart of a z/OS image. The option directs system logger and cross-system coupling facility (XCF) to not maintain any access to the LOGR CDSs on that z/OS image.

Release introduced

z/OS V2R2

Reference information:

z/OS MVS Setting Up a Sysplex

z/OS MVS Initialization and Tuning Reference

z/OS MVS System Commands

z/OS MVS System Messages, Vol 10 (IXC-IZP)

z/OS Summary of Message and Interface Changes

Allocate offload data sets

Description:

You can now allocate offload data sets for log streams before moving log data from the interim or primary storage to DASD. Obtaining offload data sets in advance helps to significantly reduce or completely avoid delays that might result from DASD space issues that are encountered when offloading log stream data. Another benefit is to provide a warning if the offload processing for the log streams encounters a DASD allocation inhibitor. The warning provides the installation with enough time to remedy any resource issues before any outage conditions arise.

Release introduced

z/OS V2R2

Reference information:

z/OS MVS Setting Up a Sysplex

z/OS Migration

z/OS MVS Programming: Assembler Services Guide

z/OS MVS Programming: Assembler Services Reference IAR-XCT

z/OS MVS Diagnosis: Reference

z/OS MVS Initialization and Tuning Reference

z/OS MVS System Commands

z/OS MVS System Messages, Vol 10 (IXC-IZP)

z/OS Summary of Message and Interface Changes

System Management Facility (SMF) considerations

This topic describes new System Management Facility (SMF) functions in z/OS.

Improving region management

Description:

In V2R2, improved region management is supported in JCL. REGIONX is a new JCL keyword available for the JOB and EXEC statements. It allows the JCL coder to explicitly request exact below-the-line and above-the-line storage amounts.

To support improved region management by the installation, a new parmlib member, SMFLIMxx, was introduced to establish rules for setting REGION and MEMLIMIT values, or for canceling the job step. This parmlib member can be used as a replacement for several functions of the IEFUSI exit.

The DISPLAY SMFLIM command displays the in-storage copy of the SMF limit rules, and the SET command updates the in-storage copy of the SMF limit rules.

Release introduced

z/OS V2R2 with APAR OA47062.

Reference information:

- *z/OS MVS Initialization and Tuning Reference*
- *z/OS MVS System Commands*
- *z/OS MVS Installation Exits*.

Digital signatures for SMF records

Description:
To enable the detection of unauthorized alterations to recorded SMF data, digital signatures for SMF records can now be written to log streams. This provides a more trusted repository for the auditing records that are created by a number of z/OS system components, including RACF.

Release introduced
z/OS V2R2

Reference information:
z/OS MVS System Management Facilities (SMF)

Unicode considerations

This topic describes new Unicode function in z/OS.

- **INITCAP case conversion** - INITCAP case conversion support is now available in z/OS V2R3.
- **Unicode standard 9.0** - Unicode standard 9.0 support is now available in z/OS V2R3.

When change was introduced: z/OS V2R3.

Reference information:

- *z/OS Unicode Services User's Guide and Reference*

WLM considerations

This topic describes new WLM functions in z/OS:

WLM considerations for V2R2

This topic describes new WLM functions in z/OS V2R2:

- **API to make OPT parameters available to monitoring products like RMF and Omegamon**: Provides a new WLM service to provide to make the IEAOPT*xx* parameters available to z/OS monitoring products like RMF and Omegamon.
- **Health Based Routing**: An enhancement to dynamic workload routing, it focuses on further reducing installation impact due to middleware server health issues. The goal is to mask the impact of a component that appears "sick but not dead" by rerouting work to a healthy back end server.
- **Server Management enhancements for large real storage**: Fix large real storage problems in SRM and WLM algorithms. The RSM group currently runs large real storage tests.
- **Mobile pricing**: The ability to classify transactions so that they can benefit from mobile application pricing.

XES/XCF considerations

This topic describes new XES and Cross-System Coupling Facility (XCF) functions in z/OS.

Cross-System Coupling Facility (XCF) enhancements for z/OS V2R3

Description: XCF/XES improvements in z/OS V2R3 include:

- **Encryption of coupling facility structure user data:** XES provides support to secure customer information by encrypting customer data while it is being transferred to and from the coupling facility (CF) and while it resides in the coupling facility.

  - Use new ENCRYPT administrative data utility parameter to control the desired encryption state for each CF structure in the CFRM policy.
  - Use new parameter ENCRYPTKEY on the SETXCF MODIFY command to change encryption keys for CF structures.
  - Use new parameters on the DISPLAY XCF to filter structures by encryption state.

– Use new check XCF_CF_STR_ENCRYPT to verify that structure data in an allocated structure is consistent with the effective ENCRYPT parameter and cryptographic encryption key for the structure (when the structure data is encrypted) in the CFRM policy.

For more information, see the section on encrypting coupling facility structure data in *z/OS MVS Setting Up a Sysplex*.

When change was introduced: z/OS V2R3.

Cross-System Coupling Facility (XCF) enhancements for z/OS V2R2

Description: XCF improvements in in z/OS V2R2 include:

- **List services enhancements:** XES List services IXLLIST, IXLLSTE, and IXLLSTC are updated to return both the current in-use number of entries and current in-use elements for a specific list. READ, WRITE, MOVE, and DELETE (IXLLIST and IXLLSTE) and READ_LCONTROLS, MONITOR_LIST, and MONITOR_KEYRANGE requests return both in-use entry and in-use element counts in the List Services Answer Area (IXLYLAA macro). For more information, see *z/OS MVS Programming: Sysplex Services Guide*.

  When change was introduced: z/OS V2R2.

- **Transport Class simplification (Member Isolation):** The XCF member monitors are enhanced to detect ill-behaved members accumulating a large backlog of signals impeding the ability of XCF to send and receive messages on behalf of other XCF group members. When this condition is detected, XCF will "message isolate" the ill-behaved member and not send messages to that member until the backlog of signals is reduced to a reasonable level. The XCF Message-Out service (IXCMSGO, IXCMSGOX) will delay or reject messages targeted to a member that is "message isolated". For more information, see

  When change was introduced: z/OS V2R2.

- **IXCQUERY enhancements:** The IXCQUERY query service is modified to provide function to return information for couple data sets and policy information contained in the couple data sets, if policy data exists. For more information, see *z/OS MVS Programming: Sysplex Services Reference*.

  When change was introduced: z/OS V2R2.

- **CFSite enhancements:** The structure definition in the CFRM policy allows for the specification of a preference list which specifies an ordered list of coupling facility names from which the system is to choose when allocating a structure in a coupling facility. The system attempts to allocate the structure in the first coupling facility in the preference list that meets a specified allocation criteria.

  To help with defining the preference list, especially across duplexed structures, a new keyword is introduced to the CFRM policy for structure definitions. An additional parameter is introduced that indicates how coupling facilities should be chosen based on their specified site for the structure or structures that should be duplexed.

  The DISPLAY XCF and IXCQUERY commands are updated. For more information, see z/OS MVS System Commands. The CFRM Policy Utility, IXCMIAPU, is updated. For more information, see *z/OS MVS Setting Up a Sysplex*.

  When change was introduced: z/OS V2R2.

- **Gain ownership enhancements:** This support will remove prompts for system messages IXC501A and IXC560A to avoid human interaction and prevent an error leading to a sysplex outage. A new keyword, CFRMTAKEOVERCF, is added to the COUPLExx parmlib member. The default is CFRMTAKEOVERCF(NO) and changes the behavior from previous releases. The previous behavior can be achieved by specifying CFRMTAKEOVERCF(PROMPT). For more information, see *z/OS MVS Initialization and Tuning Reference*.

  When change was introduced: z/OS V2R2.

- **64Bit VSCR Support:** Common storage is becoming constrained below the 2GB bar. XES, in support of Virtual Storage Constraint Relief (VSCR) in z/OS V2R2, implements the next step in reducing the usage of 31-bit common storage below 2GB. This support also includes RAS items to assist in providing better analysis for problem determination. For more information on the HVCOMMON system parameter, see *z/OS MVS Initialization and Tuning Reference*.

In support of VSCR, select XES common storage control blocks are moved to 64-bit common storage above the 2GB bar.

In support of Serviceability, XES provides enhancements to XES IPCS component trace reports. For more information on requesting SYSXES component tracing reports, see *z/OS MVS Diagnosis: Tools and Service Aids*.

When change was introduced: z/OS V2R2.

Capacity Provisioning new functions to consider

This topic describes new Capacity Provisioning functions in z/OS.

Capacity Provisioning considerations for V2R2

This topic describes new Capacity Provisioning functions in z/OS V2R2:

- **Utilization based Provisioning**: This enhancement allows for capacity provisioning based on the current CPC utilization. Using the total physical CPC utilization as a trigger allows for faster and more proactive provisioning of temporary processor capacity when the utilization is getting closer to 100%. The trade off is that there may be unimportant workloads or system and configuration errors driving up CPU consumption and cause unwanted provisioning of CPU resources. However, there are certain environments where either the WLM set up is not sufficiently tuned to build a reliable Capacity Provisioning policy around WLM service classes or the PI based provisioning is not fast enough to meet the requirements for aggressive CPU provisioning.

  For the provisioning based on CPC utilization the CP policy is extended with a new condition type for utilization conditions in addition to the existing workload and time conditions. Utilization conditions are specified for the CPC wide physical processor utilization, broken down by CPU type.

Common Information Model new functions to consider

Common Information Model (CIM) has no new function that is listed here.

Communications Server new functions to consider

The following section covers Communications Server function by type and support considerations.

Support considerations

Description: z/OS Communications Server includes the following enhancement for support considerations.

- **Support considerations in V2R3** - Support for the following functions is discontinued.
  - Several TCP/IP device drivers:
    - FDDI and Token Ring (LCS with LINKs FDDI and IBMTR)
    - Token Ring (MPCIPA with LINK IPAQTR)
    - Ethernet and FDDI (MPCOSA with LINKs OSAENET and OSAFDDI)

    You must migrate from these device types to later types, such as OSA-Express QDIO and HiperSockets.

    Note: Support for SNA device drivers is not affected.
  - The Trivial File Transfer Protocol function. Anyone using this function should use an alternate file transfer protocol.
  - Simple Mail Transport Protocol Network Job Entry (SMTPD NJE) mail transport

- Sendmail mail transport
- Several migration health checks:
  - ZOSMIGV2R2_NEXT_CS_LEGACYDEVICE
  - ZOSMIGV2R2_NEXT_CS_TFTP
  - CSAPP_SMTPD_MAIL_RELAY
  - ZOSMIGV2R2_NEXT_CS_SENDMAILCLIEN
  - ZOSMIGV2R2_NEXT_CS_SENDMAILDAEMN
  - ZOSMIGV2R2_NEXT_CS_SENDMAILMSA
  - ZOSMIGV2R2_NEXT_CS_SENDMAILMTA
  - ZOSMIGV2R2_NEXT_CS_SMTPDDAEMON
  - ZOSMIGV2R2_NEXT_CS_SMTPDMTA

  When change was introduced: z/OS V2R3

- **Support considerations in V2R2** - Support for the following functions is discontinued.
  - Several TCP/IP device drivers
    - Asynchronous Transfer Mode (ATM)
    - Common Link Access To Workstation (CLAW)
    - HYPERChannel
    - Channel Data Link Control (CDLC)
    - SNALINK (both LU0 and LU6.2)
    - X.25

    Note: Support for SNA device drivers is not affected.
  - GATEWAY profile statement

  When change was introduced: z/OS V2R2

Reference information: See the following topic in *z/OS Communications Server: New Function Summary* for detailed descriptions that include any applicable restrictions, dependencies, and steps on using the functions:

- *Support considerations in V2R3*
- *Support considerations in V2R2*

Hardware support

Description: z/OS Communications Server includes the following enhancements for hardware:

- **Communications Server support for OSA-Express7S 25 GbE features** - z/OS V2R3 Communications Server is enhanced to support the OSA-Express7S feature with 25 GbE bandwidth.

  When change was introduced: z/OS V2R3 with the PTFs for APARs PI95703 and OA55256

- **Communications Server support for 25 GbE RoCE Express2 features** - z/OS Communications Server V2R3 is enhanced to support IBM 25 GbE RoCE Express2 features.

  When change was introduced: z/OS V2R3

- **Shared Memory Communications - Direct Memory Access** - Significant performance improvements are provided for TCP protocol workloads that are deployed on the same IBM Z® CPC. This solution uses Shared Memory Communications - Direct Memory Access (SMC-D) for TCP connections to local peers which also support this function.

  Incompatibilities: This function does not support IPAQENET and IPAQIDIO interfaces that are defined by using the DEVICE, LINK, and HOME statements. Convert your IPAQENET and IPAQIDIO definitions to use the INTERFACE statement to enable this support.

Dependencies:

– This function requires an IBM z13® GA2 level of hardware.

– This function requires at least one Internal Shared Memory (ISM) device that is configured in the Hardware Configuration Definition (HCD).

When change was introduced: z/OS V2R3 and with the PTFs for APARs OA48411 and PI45028 for z/OS V2R2

- **Communications Server support for RoCE Express2 features** - z/OS Communications Server extends the Shared Memory Communications over Remote Direct Memory Access (SMC-R) function to support the next generation IBM 10 GbE RoCE Express2® feature. The IBM 10 GbE RoCE Express2® feature allows TCP/IP stacks on different LPARs within the same central processor complex (CPC) to leverage the power of these state-of-the-art adapters to optimize network connectivity for mission critical workloads by using Shared Memory Communications technology.

Incompatibilities: This function does not support IPAQENET interfaces that are defined by using the DEVICE, LINK, and HOME statements. Convert your IPAQENET definitions to use the INTERFACE statement to enable this support.

Dependencies: This function requires the IBM z14 or later systems.

When change was introduced: z/OS V2R3 and with the PTFs for APARs OA51950 and PI75200 for z/OS V2R2 and with the PTF for APAR OA51949

Reference information: See the following topics in *z/OS Communications Server: New Function Summary* for detailed descriptions that include any applicable restrictions, dependencies, and steps on using the functions:

- *Communications Server support for OSA-Express7S 25 GbE features*
- *Communications Server support for 25 GbE RoCE Express2 features*
- *Shared Memory Communications - Direct Memory Access*
- *Communications Server support for OSA Express6S*
- *Communications Server support for RoCE Express2 features*

Usability and skills

z/OS Communications Server includes the following enhancements for usability and skills:

- **HiperSockets Converged Interface support** - z/OS Communications Server provides HiperSockets Converged Interface (HSCI) solution to support the z/VM bridge environment. With this solution, a Linux guest can connect to z/OS via Layer 2 HiperSockets and to the external network by using a single IP interface. This support also significantly improves HiperSockets usability by dynamically provisioning and activating a HiperSockets interface when an OSD interface is activated for the same physical network ID (PNetID). With this support, the TCP/IP stack only sees the OSD interface. This design approach greatly reduces the network administration costs as HiperSockets interfaces no longer are required to be configured, operated, or managed in z/OS Communications Server. This solution allows a single IP interface (OSD) to provide access to the external Ethernet LAN and transparent access to HiperSockets for LPAR to LPAR communications within the central processor complex (CPC). This solution also eliminates the need to reconfigure z/OS HiperSockets interfaces when moving a z/OS instance from one CPC to another. The HSCI is also referred to as an IQDC interface.

Incompatibilities:

– This function does not support IPAQENET interfaces that are defined by using the DEVICE, LINK, and HOME statements. Convert your IPAQENET definitions to use the INTERFACE statement to enable this support.

– This function also requires the virtual MAC (VMAC) operand be specified on your IPAQENET interfaces to request OSA-generated VMACs.

Dependencies:

– This function minimally requires a zEnterprise EC12 (zEC12).

– This function requires an Internal Queued Direct I/O (IQD) channel path ID (CHPID) configured with the external bridge function.

When change was introduced: z/OS V2R3 with the PTFs for APARs PI83372 and OA53198

- **z/OS Configuration Assistant for Communications Server support for import of TCP/IP configuration** - The Configuration Assistant for z/OS® Communications Server includes TCP/IP technology, with which you can create and manage TCP/IP profiles. You can import your current TCP/IP stack profiles into the Configuration Assistant, to help you transition to using the Configuration Assistant for your TCP/IP profile management.

  Dependencies: z/OSMF is required to be installed and running in your network, with the Configuration Assistant for z/OS Communications Server plug-in installed.

  When change was introduced: z/OS V2R3 and with the PTFs for Configuration Assistant APAR PI66143 and TCP/IP APAR PI63449 for z/OS V2R2

- **Enhanced wildcard support for jobnames on PORT and PORTRANGE statements** - The wildcard support is enhanced for the jobname parameter on the PORT and PORTRANGE TCP/IP configuration statements. Asterisks can be used in any position to indicate zero or more unspecified characters. The question mark can be used in any position to indicate a single unspecified character.

  When change was introduced: z/OS V2R3

Reference information: See the following topics in *z/OS Communications Server: New Function Summary* for detailed descriptions that include any applicable restrictions, dependencies, and steps on using the functions:

- *HiperSockets Converged Interface support*
- *z/OS Configuration Assistant for Communications Server support for import of TCP/IP configuration*
- *Enhanced wildcard support for jobnames on PORT and PORTRANGE statements*

Scalability and performance

z/OS Communications Server includes the following enhancements for scalability and performance:

- **IWQ support for IPSec** - z/OS Communications Server is enhanced to support inbound workload queueing for IPSec workloads for OSA-Express in QDIO mode. Inbound workload queueing uses multiple input queues for each QDIO data device (subchannel device) to improve TCP/IP stack scalability and general network optimization. To implement the performance improvements for IPSec workloads, enable inbound workload queueing to process IPSec, EE, sysplex distributor, and streaming bulk data traffic all concurrently with other types of inbound QDIO traffic. When you enable these improvements for a QDIO interface, inbound IPSec, EE, sysplex distributor, and streaming bulk data traffic are each processed on their own ancillary input queue (AIQ). All other inbound traffic is processed on the primary input queue.

  Incompatibilities: This function does not support IPAQENET interfaces that are defined by using the DEVICE, LINK, and HOME statements. Convert your IPAQENET definitions to use the INTERFACE statement to enable this support.

  Dependencies:

  – This function is limited to OSA-Express6S Ethernet features or later in QDIO mode running on IBM z14™. For more information about the QDIO inbound workload queueing function and the OSA-Express features that support it, see "QDIO inbound workload queueing" in z/OS Communications Server: IP Configuration Guide. See the 3906DEVICE or 3907DEVICE Preventive Service Planning (PSP) bucket for more information.

  – This function is supported only for interfaces that are configured to use a virtual MAC (VMAC) address.

  When change was introduced: z/OS V2R3 with the PTF for APAR PI77649

- **Improved control over default VTAM VIT options** - Two levels of operator control are provided for managing VTAM Internal Trace (VIT) internal mode record collection:
  - You can use "Full VIT control" to control the use of all VIT options, at any time, using VTAM start options or the MODIFY TRACE and MODIFY NOTRACE commands. This includes the ability to disable all internal mode VIT recording. The DISPLAY TRACE command always displays the current settings of all VIT options.
  - You can use "Base VIT control" to allow VTAM to enforce that certain VIT options (API, CIO, MSG, NRM, PIU and SSCP) remain active at all times. The DISPLAY TRACE command displays the settings of these VIT options only if you have explicitly enabled the options, otherwise the settings are not displayed. This is the default behavior, and this was the only level of VIT control provided originally.

  Restriction: The two levels of VIT control apply to internal mode recording only. External mode recording of VIT records is unchanged regardless of the level of VIT control used for internal mode recording.

  When change was introduced: z/OS V2R3 and with the PTF for APAR OA50271 for z/OS V2R2

- **Sysplex-wide security associations (SWSA) scalability improvement** - Sysplex-wide security associations (SWSA) scalability is improved by increasing the number of lists that can be configured for the EZBDVIPA coupling facility structure. In previous releases, the EZBDVIPA structure had a fixed number of lists (2048 lists). With this enhancement, the number of lists in the EZBDVIPA structure can be configured with up to 16,384 lists. This allows more IPSec security associations to be distributed and taken over.

  Restriction:
  - All VTAMs in a sysplex or a VTAM subplex must be at z/OS V2R3 or later before the number of lists for an EZBDVIPA structure can be increased above 2048 lists.
  - The number of lists that are configured for an EZBDVIPA structure must be the same for all VTAMs in a sysplex or a VTAM subplex. If the configured number of lists is different, the actual number of lists is unpredictable. IPSec distribution and takeover data can be inaccessible to some TCP/IP stacks in the sysplex or VTAM subplex, potentially resulting in errors.

  When change was introduced: z/OS V2R3

Reference information: See the following topics in *z/OS Communications Server: New Function Summary* for detailed descriptions that include any applicable restrictions, dependencies, and steps on using the functions:

- *IWQ support for IPSec*
- *Improved control over default VTAM VIT options*
- *Sysplex-wide security associations (SWSA) scalability improvement*

Availability

Description: z/OS Communications Server includes the following enhancements for availability and business resilience:

- **Activating Trace Resolver without restarting applications** - The Resolver CTRACE TRACERES option is provided to collect Trace Resolver output as Resolver CTRACE records. You can use the Resolver CTRACE TRACERES option to dynamically enable or disable collection of Trace Resolver output for one or more applications without stopping and then restarting the application. You can also use the Resolver CTRACE TRACERES option to trace Resolver activity in address spaces that have multiple tasks or address spaces that generate many Resolver API calls. You can use **IPCS CTRACE** subcommand processing to view the formatted component trace data from a dump, or from an external ctrace data set.

  When change was introduced: z/OS V2R2

- **Reordering of cached resolver results** - Cache support for the system resolver is enhanced. You can configure the resolver to enable reordering of a cached list of IP addresses that is returned in response

to a host name resolution request. You can also disable the reordering function on a system-wide basis, or on an individual application basis.

When change was introduced: z/OS V2R2

Reference information: See the following topics in *z/OS Communications Server: New Function Summary* for detailed descriptions that include any applicable restrictions, dependencies, and steps on using the functions:

- *Activating Trace Resolver without restarting applications*
- *Reordering of cached resolver results*

Systems management

Description: z/OS Communications Server includes the following enhancements for systems management:

- **Communications Server support for enhanced system symbols** - The use of MVS system symbols is enhanced to support the underscore character as a valid character in symbol names and to support longer symbol substitution values.

When change was introduced: z/OS V2R3

Reference information: See the following topics in *z/OS Communications Server: New Function Summary* for detailed descriptions that include any applicable restrictions, dependencies, and steps on using the functions:

- *Communications Server support for enhanced system symbols*

Enhancing security

z/OS Communications Server includes the following security enhancements:

- **IBM zERT Network Analyzer** - IBM zERT (z/OS Encryption Readiness Technology) Network Analyzer is a web-based graphical user interface that z/OS network security administrators can use to analyze and report on data reported in zERT Summary records.

  Dependency:

  - You must have installed z/OSMF V2R3 APAR PH03137 to use IBM zERT Network Analyzer.
  - The IBM zERT Network Analyzer task requires either Db2 11 for z/OS or Db2 12 for z/OS.

  When change was introduced: z/OS Management Facility (z/OSMF) V2R3 with the PTF for APAR PH03137

- **z/OS Encryption Readiness Technology (zERT) aggregation** - z/OS Communications Server introduced a new function called z/OS Encryption Readiness Technology (zERT). With zERT, the TCP/IP stack acts as a focal point in collecting and reporting the cryptographic security attributes of IPv4 and IPv6 application traffic that is protected using the TLS/SSL, SSH, and IPSec cryptographic network security protocols. The collected connection level data is written to SMF in SMF 119 subtype 11 records. In certain environments, the volume of SMF 119 subtype 11 records can be large. z/OS V2R3 Communications Server provides the zERT aggregation function. The zERT aggregation function provides an alternative SMF view of the collected security session data. This alternate view is written in the form of new SMF 119 subtype 12 records that summarize the use of security sessions by many application connections over time and which are written at the end of each SMF interval. This alternate view condenses the volume of SMF record data while still providing all the critical security information.

  Restrictions:

  The following restrictions apply to both zERT discovery and zERT aggregation functions.

  zERT collects information for TCP and Enterprise Extender (EE) connections. Information is not collected for non-EE UDP traffic or traffic using other IP protocols.

  zERT collects cryptographic security attributes for the TLS, SSL, SSH, and IPSec protocols. No other cryptographic security protocols are supported.

The following z/OS cryptographic protocol providers are fully enabled for zERT: z/OS Communications Server IPSec and AT-TLS, z/OS Cryptographic Services System SSL, and z/OS OpenSSH. Detailed security attribute data is available for connections using these protocol providers. Other TLS, SSL, and SSH implementations running on z/OS are monitored through stream observation only. A limited amount of security attribute data is available for these connections.

For information on the specific cases where security attribute data is limited or unavailable, see *zERT discovery limitations* in *z/OS Communications Server: IP Configuration Guide*.

Dependency: To properly monitor IBM Sterling Connect:Direct traffic when it is protected through SecurePlus TLS/SSL support, apply Connect:Direct APAR PI77316.

When change was introduced: z/OS V2R3 with the PTF for APAR PI83362

- **TN3270E Telnet server ELF support for MFA** - The TN3270 Telnet server Express Logon Feature (ELF) is extended to support IBM Multi-Factor Authentication (MFA) for z/OS. With this support, TN3270 clients can experience the same single sign-on behavior that is already offered by the PassTicket-based ELF, but now via an MFA token that is assigned by a SAF-compliant external security manager like IBM Security Server RACF. With the new EXPRESSLOGONMFA parameter in the TN3270E Telnet server profile, ELF attempts to authenticate clients by using their X.509 client certificate through MFA. If no MFA token is available for the user, the authentication fails (although ELF can also be configured to revert back to PassTicket authentication in certain cases where MFA authentication is unsuccessful).

  Dependencies:
  - IBM Security Server RACF APAR OA53002
  - IBM Multi-Factor Authentication for z/OS APAR PI86470 and PI93341

  When change was introduced: z/OS V2R3 with the PTFs for APAR PI85185, RACF APAR OA53002, and IBM MFA for z/OS APARs PI86470 and PI93341

- **AT-TLS currency with system SSL** - Application Transparent TLS (AT-TLS) is enhanced to support the following features provided by System SSL.

  - Support for NIST SP800-131A (key length transition recommendations). Add support for higher security strengths (larger key sizes) as defined in NIST SP800-131A, which allows a more secure FIPS 140-2 implementation.
  - Support for NIST SP800-52A Revision 1 (TLS implementation guidelines) which adds new certificate processing controls.
  - Support for several RFCs governing OCSP (RFC 6066, RFC 6277, RFC 6960 and RFC 6961)
  - Support for RFCs regarding Suite B Profile clarifications (RFCs 6460 and 5759)
  - Support for Signaling Cipher Suite Values (SCSV) to protect against protocol downgrade attacks (RFC 7507).

  When change was introduced: z/OS V2R3

- **z/OS Encryption Readiness Technology (zERT)** - z/OS Encryption Readiness Technology (zERT) is a new capability provided by the z/OS V2R3 Communications Server. With zERT, the TCP/IP stack acts as a focal point in collecting and reporting the cryptographic security attributes of IPv4 and IPv6 application traffic that is protected using the TLS/SSL, SSH and IPSec cryptographic network security protocols. The collected connection level data is written to SMF in new SMF 119 subtype 11 records for analysis.

  Restrictions:

  zERT collects cryptographic security attributes for TCP and Enterprise Extender (EE) connections. Information is not collected for non-EE UDP traffic or traffic that uses other IP protocols.

  zERT collects cryptographic security attributes for the TLS, SSL, SSH, and IPSec protocols. No other cryptographic security protocols are supported.

  The following z/OS cryptographic protocol providers are fully enabled for zERT: z/OS Communications Server IPSec and AT-TLS, z/OS Cryptographic Services System SSL, and z/OS OpenSSH. Detailed security attribute data is available for connections using these protocol providers. Other TLS, SSL, and

SSH implementations running on z/OS are monitored through stream observation only. A limited amount of security attribute data is available for these connections.

For information on the specific cases where security attribute data is limited or unavailable, see *zERT discovery limitations* in *z/OS Communications Server: IP Configuration Guide*.

Dependency: To properly monitor IBM Sterling Connect:Direct traffic when it is protected through SecurePlus TLS/SSL support, apply Connect:Direct APAR PI77316.

When change was introduced: z/OS V2R3

- **IBM Health Checker for z/OS FTP ANONYMOUS JES** - A new IBM Health Checker for z/OS application health check is provided to help determine whether your FTP server allows anonymous users to submit jobs. When ANONYMOUS is enabled, it is recommended that ANONYMOUSLEVEL be set to 3 and ANONYMOUSFILETYPEJES be set to FALSE. Otherwise, anonymous users can submit jobs to run on the system.

  Dependency: You must start the IBM Health Checker for z/OS to use the new application health check.

  When change was introduced: z/OS V2R3 and with the PTF for APAR PI47637 and OA49668 for z/OS V2R2.

- **IBM Health Checker for z/OS MVRSHD RHOSTS DATA** - A new IBM Health Checker for z/OS application health check is provided to help determine whether your MVRSHD server is active and whether RSH clients are using RHOSTS.DATA datasets for authentication. The MVRSHD server supports the RSH and REXEC protocols which transfer user ID and password information in the clear. There is also the potential of weak authentication for RSH clients using RHOSTS.DATA datasets. This authentication method allows remote command execution without requiring the RSH client to supply a password.

  Dependency: You must start the IBM Health Checker for z/OS to use the new application health check.

  When change was introduced: z/OS V2R3 and with the PTF for TCP/IP APAR PI51640 and SNA APAR OA50122 for z/OS V2R2.

- **IBM Health Checker for z/OS SNMP agent public community name** - A new IBM Health Checker for z/OS application health check is provided to help determine whether your SNMP agent is configured with a community name of public. Because the SNMP community name of public is a well-known name, it should not be used with community-based security due to security considerations.

  Dependency: You must start the IBM Health Checker for z/OS to use the new application health check.

  When change was introduced: z/OS V2R3 and with the PTF for APAR PI51640 and OA50122 for z/OS V2R2.

- **IBM Health Checker for z/OS SMTPD MAIL RELAY** - A new IBM Health Checker for z/OS application health check is provided to help determine whether your SMTP server is configured as a mail relay. Specifying the INBOUNDOPENLIMIT statement to a valid non-zero value or allowing it to default to the value of 256 causes the SMTP server to open a listening port and implicitly become exploitable by remote users as a mail relay.

  Dependency: You must start the IBM Health Checker for z/OS to use the new application health check.

  When change was introduced: z/OS V2R2 with the PTFs for APAR PI51640 and APAR OA50122. The IBM Health Checker for z/OS SMTPD MAIL RELAY is removed in z/OS V2R3.

- **SMF 119 TCP connection termination record (subtype 2) enhanced to provide IP filter information** - IP filter information is provided in the SMF 119 TCP connection termination record (subtype 2). The name of the IP filter rules associated with inbound and outbound traffic for a connection are included in a new section of the record, if IP filtering is being done for a connection. The data is also available through the SYSTCPCN real-time network monitoring interface (NMI).

  Restrictions:

  The IP filter section is included if IP filtering is active and an IP filter rule applies to the traffic. The IP filter section is not included for intra-host connections because IP filtering is not done for those connections.

The filter rule information reflects the IP filter rules in place at the time that the connection is terminated. If IP filter policy changes while a connection is active, only the names of the IP filter rules in place at the time of the termination are included.

Dependency:

SMF configuration option TCPTERM must be configured on the SMFCONFIG TCP/IP profile statement for the SMF 119 TCP connection termination record (subtype 2) to be generated.

The TCPCONNSERVICE parameter must be configured on the NETMONITOR TCP/IP profile statement for the SMF 119 TCP connection termination data to be available through the SYSTCPCN real-time NMI interface.

When change was introduced: z/OS V2R3 and with the PTF for APAR PI69920 for z/OS V2R2

- **VTAM 3270 intrusion detection services** - 3270 data stream intrusion detection services (IDS) is enabled to detect and act on violations of the 3270 data stream protocol. The 3270 IDS function monitors all 3270 data streams for primary logical units (PLUs) that are connected to the z/OS VTAM instance. Specific types of 3270 sessions can be exempted from IDS monitoring at the VTAM or application major node level if IDS monitoring is not needed for those sessions.

  The 3270 IDS function monitors 3270 data streams for any attempt to write past the end of input fields or to modify protected fields. When these types of events are detected, appropriate actions are taken according to the VTAM configuration. The possible actions include logging the event, tracing the relevant inbound and outbound PIUs for later analysis, notifying the PLU of the event with a sense code, and even terminating the SNA session.

  When change was introduced: z/OS V2R3 and with the PTF for APAR OA49911 for z/OS V2R2.

- **AT-TLS enablement for DCAS** - The Digital Certificate Access Server (DCAS) is enhanced to use Application Transparent Transport Layer Security (AT-TLS). To use TLSv1.2 to secure the connection, you must define AT-TLS policies for the DCAS. The Configuration Assistant for z/OS Communications Server provides a default AT-TLS policy to simplify defining the AT-TLS policy for DCAS.

  Migrate to AT-TLS to allow the DCAS to use the latest support for SSL/TLS. Configuring TLS/SSL by using the DCAS configuration file is supported, but such support is deprecated and will no longer be enhanced.

  Dependency: The Policy Agent must be active.

  When change was introduced: z/OS V2R2.

- **Network security enhancements for SNMP** - The SNMP Agent, the z/OS UNIX **snmp** command, and the SNMP manager API are enhanced to support the Advanced Encryption Standard (AES) 128-bit cipher algorithm as an SNMPv3 privacy protocol for encryption. The AES 128-bit cipher algorithm is a stronger encryption protocol than the current Data Encryption Standard (DES) 56-bit algorithm. AES is a symmetric cipher algorithm that the National Institute of Standards (NIST) selects to replace DES. RFC 3826, *The Advanced Encryption Standard (AES) Cipher Algorithm in the SNMP User-based Security Model (USM),* specifies that Cipher Feedback Mode (CFB) mode is to be used with AES encryption. See *Related protocol specifications* in *z/OS Communications Server: New Function Summary* for information about accessing RFCs.

  Dependency: To use AES 128-bit encryption, the z/OS Integrated Cryptographic Services Facility (ICSF) must be configured and started.

  When change was introduced: z/OS V2R2.

- **TLS security enhancements for Policy Agent** - Centralized Policy Agent is enabled to support TLSv1.1 and TLSv1.2 with a new set of TLSv1.2 2-byte specific ciphers. In addition, the import services between the Policy Agent and IBM Configuration Assistant for z/OS Communications Server allow user-defined AT-TLS policies to create a secure SSL connection.

  When change was introduced: z/OS V2R2.

- **TLS security enhancements for sendmail** - z/OS UNIX sendmail is enabled to support TLSv1.1 and TLSv1.2 with a new set of TLSv1.2 2-byte specific ciphers.

When change was introduced: z/OS V2R2.

- **TCPIP profile IP security filter enhancements** - The default IP filters as defined in the TCP/IP profile data set are enhanced to support traffic direction specifications, address ranges, port ranges, ranges on relevant type and code values, and MIPv6 and Opaque protocol types.

When change was introduced: z/OS V2R2

- **AT-TLS certificate processing enhancements** - Application Transparent TLS (AT-TLS) is enhanced to support the following features that System SSL provides.

  – RFC 5280 PKIX certificate and CRL profile. With this support, you can perform certificate validation according to RFC 5280.

  – Enhanced certificate revocation capabilities:

    - Retrieval of revocation information through the Online Certificate Status Protocol (OCSP)

    - Retrieval of Certificate Revocation Lists (CRLs) over HTTP

    - More flexible processing of CRLs through LDAP

When change was introduced: z/OS V2R2

- **Simplified access permissions to ICSF cryptographic functions for IPSec** - In prior releases, network applications that are sending or receiving IPSec protected traffic were required to be permitted to certain SAF resource profiles in the CSFSERV class when protection of the ICSF cryptographic operations was requested. The requirement is to be eliminated. You are no longer required to permit all network applications that are sending or receiving IPSec protected traffic to the relevant SAF resources in the CSFSERV class. Only the user ID that is associated with the TCP/IP stack must be permitted to the SAF resource profiles.

When change was introduced: z/OS V2R2

- **TLS session reuse support for FTP and AT-TLS applications (AT-TLS)** - The SIOCTTLSCTL ioctl system call is enhanced to perform the following actions:

  – AT-TLS applications can retrieve the session ID for the secure socket.

  – AT-TLS applications can request that a session is reused on a socket by retrieving and setting the session token.

When change was introduced: z/OS V2R2

- **TLS session reuse support for FTP and AT-TLS applications (FTP)** - FTP is enhanced to support SSL session reuse. When using native SSL or AT-TLS, z/OS FTP supports reusing the SSL session ID of the control connection or a previous data connection on the subsequent data connections within an FTP session without port binding.

When change was introduced: z/OS V2R2

Reference information: See the following topics in *z/OS Communications Server: New Function Summary* for detailed descriptions that include any applicable restrictions, dependencies, and steps on using the functions:

- *IBM zERT Network Analyzer*
- *z/OS Encryption Readiness Technology (zERT) aggregation*
- *TN3270E Telnet server ELF support for MFA*
- *AT-TLS currency with system SSL*
- *z/OS Encryption Readiness Technology (zERT)*
- *IBM Health Checker for z/OS FTP ANONYMOUS JES*
- *IBM Health Checker for z/OS MVRSHD RHOSTS DATA*
- *IBM Health Checker for z/OS SNMP agent public community name*
- *IBM Health Checker for z/OS SMTPD MAIL RELAY*
- *SMF 119 TCP connection termination record (subtype 2) enhanced to provide IP filter information*

- *VTAM 3270 intrusion detection services*
- *AT-TLS enablement for DCAS*
- *Network security enhancements for SNMP*
- *TLS security enhancements for Policy Agent*
- *TLS security enhancements for sendmail*
- *TCPIP profile IP security filter enhancements*
- *AT-TLS certificate processing enhancements*
- *Simplified access permissions to ICSF cryptographic functions for IPSec*
- *TLS session reuse support for FTP and AT-TLS applications (AT-TLS)*
- *TLS session reuse support for FTP and AT-TLS applications (FTP)*

Application development

z/OS Communications Server includes the following enhancements for application, middleware, and workload enablement:

- **Code page enhancements for CSSMTP** - z/OS V2R3 Communications Server is enhanced to support multi-byte character sets with the Communications Server SMTP (CSSMTP) application. This enhancement allows migration from SMTPD to CSSMTP for customers that use multi-byte character set code pages, and provides improved code page support for characters in the mail subject line.

   When change was introduced: z/OS V2R3 with the PTF for APAR PI93278

- **CSSMTP customizable ATSIGN character for mail addresses** - The Communications Server SMTP (CSSMTP) application is enabled to recognize a different character as the industry standard at sign (@) symbol in a mail address. The specified character is recognized as the at sign symbol only in the SMTP commands and headers in mail messages. This enhancement simplifies migration from SMTPD to CSSMTP for customers that use a code page other than the default IBM-1047 and that have modified mail generation programs to generate mail addresses with an at sign character other than @.

   When change was introduced: z/OS V2R3 and with the PTF for APAR PI52704 for z/OS V2R2

- **Improved CSSMTP code page compatibility with target servers** - z/OS V2R3 Communications Server enables the Communications Server SMTP (CSSMTP) application to use a code page other than the standard ISO8859-1 code page to send mail messages to a target server. With this support, CSSMTP can send mail messages with special characters, such as the Euro sign (€), embedded in the body of the mail message in the code page expected by the mail server.

   Restriction: The commands and headers of a mail message are first translated to code page IBM-1047 and then to the code page that is configured for the target server. Characters in the headers might not be translated correctly.

   When change was introduced: z/OS V2R3 and with the PTF for APAR PI73909 for z/OS V2R2

- **Improved CSSMTP TLS compatibility with mail servers** - The Communications Server SMTP (CSSMTP) application is enabled to optionally send an EHLO command after a successful TLS negotiation. RFC 3207 (SMTP Service Extension for Secure SMTP over Transport Layer Security) specifies that sending an EHLO command is optional for a SMTP client after a successful TLS negotiation. However, some SMTP servers require an EHLO command after a successful TLS negotiation. To accommodate these servers, a configuration option is provided to enable the sending of an EHLO command after a successful TLS negotiation.

   When change was introduced: z/OS V2R3 and with the PTF for APAR PI56614 for z/OS V2R2.

- **sendmail to CSSMTP bridge** - z/OS V2R3 Communications Server removes support for z/OS UNIX sendmail. The z/OS sendmail to CSSMTP bridge (sendmail bridge) is provided to emulate sendmail so that z/OS UNIX users can still use the sendmail command to send the mail message. The sendmail bridge parses input options from the command line, reads the mail message from the UNIX System Services file, and processes the mail message. The input mail message is updated by adding SMTP commands and SMTP headers if there is no header specified in the input mail message. The updated

mail message is transmitted to the JES spool data set for the Communications Server SMTP (CSSMTP) application to process.

When change was introduced: z/OS V2R3 and with the PTF for APAR PI71175 for z/OS V2R2

- **Communications Server support for 8 character TSO User IDs** - z/OS V2R3 Communications Server is enhanced to support a maximum TSO/E user ID size of eight characters.

When change was introduced: z/OS V2R3

- **IPv6 getaddrinfo() API standards compliance** - The z/OS Resolver GetAddrInfo API is enhanced. The new enhancement allows the Resolver to return both IPv4 and IPv6 addresses when the following settings are true:

  – AF_UNSPEC is specified for ai_family type.
  – AI_ALL flag is not specified.
  – IPv6 is enabled on the z/OS system.

When change was introduced: z/OS V2R3

- **CSSMTP migration enablement** - A new z/OS Health Checker for z/OS migration health checks to help determine whether you are using any of the following functions on the system:

  – sendmail client
  – sendmail daemon
  – sendmail mail submission agent (sendmail MSA)
  – sendmail mail transfer agent (sendmail MTA)
  – SMPTD daemon
  – SMTPD mail transfer agent (SMPTD MTA)

Support for these functions is removed in z/OS V2R3.

When change was introduced: z/OS V2R2. These health checks are removed in z/OS V2R3.

- **CICS transaction tracking support for CICS TCP/IP IBM Listener** - The CICS Sockets Listener is enhanced to provide to CICS the IP addresses and port numbers of the local and remote session partners for use by the CICS Explorer® or Session Monitor.

Restriction: CICS Transaction Server must be V4R2 or higher.

Dependency: CICS Transaction Server V4R2 or V5R1 must be active.

When change was introduced: z/OS V2R2

- **CSSMTP SMTP command editing option** - The Communications Server Simple Mail Transfer Protocol (CSSMTP) can be configured to remove the trailing nulls from SMTP Commands (**EHLO**, **HELO**, **STARTTLS**, **FROM**, **RCPT**, and **DATA**).

When change was introduced: z/OS V2R2

Reference information: See the following topics in *z/OS Communications Server: New Function Summary* for detailed descriptions that include any applicable restrictions, dependencies, and steps on using the functions:

- *Code page enhancements for CSSMTP*
- *CSSMTP customizable ATSIGN character for mail addresses*
- *Improved CSSMTP code page compatibility with target servers*
- *Improved CSSMTP TLS compatibility with mail servers*
- *sendmail to CSSMTP bridge*
- *Communications Server support for 8 character TSO User IDs*
- *IPv6 getaddrinfo() API standards compliance*
- *CSSMTP migration enablement*

- *CICS transaction tracking support for CICS TCP/IP IBM Listener*
- *CSSMTP SMTP command editing option*

Simplification

Description: z/OS Communications Server includes the following enhancements for simplification:

- **IBM Health Checker for TFTP daemon** - A new Health Checker for z/OS migration health check is provided to help determine whether you are using the Trivial File Transfer Protocol daemon (TFTPD). Support for the TFTPD is removed in z/OS V2R3.

  Dependency: You must start the IBM Health Checker for z/OS to use the new migration health check.

  When change was introduced: z/OS V2R2 with the PTF for TCP/IP APAR PI61806 and SNA APAR OA50445.

- **IBM Health Checker for additional z/OS legacy device types** - A new migration health check is provided to use with the IBM Health Checker for z/OS function. The new migration health check determines whether you are using legacy device type configuration statements in your TCP/IP profile.

  DEVICE and LINK profile statements for the following TCP/IP legacy device types are not supported in z/OS V2R3.

  – FDDI and Token Ring (LCS with LINKs FDDI and IBMTR)

  – Token Ring (MPCIPA with LINK IPAQTR)

  – Ethernet and FDDI (MPCOSA with LINKs OSAENET and OSAFDDI)

  When the TCP/IP stack processes a legacy device type profile statement, it issues message EZZ0717I. See this message, and the associated profile processing messages, for information about the profile data set that contains the statements.

  Dependency: You must start the IBM Health Checker for z/OS to use the new migration health check.

  When change was introduced: z/OS V2R2 with the PTF for TCP/IP APAR PI49962 and SNA APAR OA49071.

- **Removed support for the GATEWAY statement in the TCP/IP profile** - The GATEWAY profile statement cannot be used to configure IPv4 static routes to the TCP/IP stack. You can use the BEGINROUTES profile statement to configure your IPv4 static routes. The BEGINROUTES statement provides more functionality than the GATEWAY statement and the statement syntax is easier to use.

  When change was introduced: z/OS V2R2

Reference information: See the following topics in *z/OS Communications Server: New Function Summary* for detailed descriptions that include any applicable restrictions, dependencies, and steps on using the functions:

- *IBM Health Checker for TFTP daemon*
- *IBM Health Checker for additional z/OS legacy device types*
- *Removed support for the GATEWAY statement in the TCP/IP profile*

Economics and platform efficiency

Description: z/OS Communications Server includes the following enhancements for economics and platform efficiency:

- **Shared Memory Communications over RDMA adapter (RoCE) virtualization** - This function extends the Shared Memory Communications over Remote Direct Memory Access (SMC-R) function to allow TCP/IP stacks on different LPARs within the same central processor complex (CPC) to share the same physical IBM 10 GbE RoCE Express® feature.

  Restriction:

- – Each TCP/IP stack that shares the same physical 10 GbE RoCE Express feature must use a unique function ID (FID) and virtual function number (VFN) to represent the feature. Define the FID and VFN values in the Hardware Configuration Definition (HCD).

Dependencies:

- – This function requires IBM z13® (z13) or later systems.
- – This function requires at least one IBM 10 GbE RoCE Express feature configured in the HCD with a FID and a VFN value.

When change was introduced: z/OS V2R2.

- **SMC Applicability Tool (SMCAT)** - The Shared Memory Communications (SMC) Applicability Tool (SMCAT) provides the ability to monitor and evaluate a TCP/IP network. You can use the evaluation to determine the applicability of SMC (over Remote Direct Memory Access (SMC-R) or using Direct Memory Access (SMC-D)) to your network environment. You do not need to enable the SMC function on any system, or enable any 10 GbE RoCE Express features, to use the SMC Applicability Tool.

  SMCAT can be used to monitor a TCP/IP stack for a set of configured destination IP addresses or subnets, and provide a report in the TCP/IP stack job log. The report provides details of the amount of TCP workload that can potentially use SMC if SMC is available.

  When change was introduced: z/OS V2R2.

- **VIPAROUTE fragmentation avoidance** - A TCP/IP profile GLOBALCONFIG parameter, ADJUSTDVIPAMSS to adjust the TCP Maximum Segment Size (MSS) is added. Sysplex Distributor traffic that is routed by using VIPAROUTE adds a Generic Routing Encapsulation (GRE) header to the packet. Thus, the packet might be fragmented from the distributor to the target stack. The new function takes the GRE header into account when specifying the MSS value. It eliminates fragmentation by the distributor that would have been caused by the addition of the GRE header.

  When change was introduced: z/OS V2R2.

- **Enhanced Enterprise Extender scalability** - The scalability of Enterprise Extender connections is improved. The overall performance is improved when there are large numbers of Enterprise Extender connections.

  When change was introduced: z/OS V2R2

- **Enhanced IKED Scalability** - Internet Key Exchange daemon (IKED) scalability is improved. Performance is improved when large numbers of IKE peers attempt to negotiate IPSec SAs with z/OS IKED concurrently. The IkeSyslogLevel configuration parameter in iked.conf is updated and a thread identifier that precedes every IKED message written through syslogd is included.

  When change was introduced: z/OS V2R2

- **Increase single stack DVIPA limit to 4096** - The limit of total DVIPAs on a single stack is increased from 1024 to 4096. This allows more than 1024 application instance DVIPAs that are defined by VIPARANGE to be defined on a single TCP/IP stack.

  Restriction: The number of DVIPAs that are defined through VIPADEFINE and VIPABACKUP configuration statements is still limited to 1024.

  When change was introduced: z/OS V2R2

- **Shared Memory Communications over RDMA enhancements** - A maximum transmission unit (MTU) value of 4096 is supported and autonomics performance for Shared Memory Communications over Remote Direct Memory Access (SMC-R) is enhanced.

  Previously, MTU values of 1024 and 2048 were supported. z/OS V2R2 Communications Server supports a new MTU value of 4096 for SMC-R.

  If you set the MTU size to 4096, you must also enable jumbo frames on all switches in the network path for all peer hosts.

  SMC-R autonomics provides the following performance enhancements:

  - – SMCGLOBAL AUTOCACHE

You can configure the TCP/IP stack to maintain statistics related to failed attempts to use SMC-R communications to specific destination IP addresses. When appropriate, the TCP/IP stack will direct future connections to those destination IP addresses to use TCP protocols instead of SMC-R, avoiding the overhead of unproductive attempts to establish an SMC-R link. This option is enabled by default.

– SMCGLOBAL AUTOSMC

You can configure the TCP/IP to analyze incoming TCP connections and dynamically determine whether SMC-R is beneficial to use for the connection. You can use this monitoring function to influence whether TCP connections to a particular server (port) use SMC-R, and to ensure that TCP connections use the most appropriate communications protocol (TCP or SMC-R). This option is enabled by default.

When change was introduced: z/OS V2R2

- **TCP autonomic tuning enhancements** - The following enhancements are made to automatically tune resources that are related to TCP connections. The enhancements are based on real-time data and can improve overall performance of TCP connections.

  – Dynamic Right-Sizing (DRS) and Outbound Right-Sizing (ORS) autonomics

  DRS and ORS are z/OS Communications Server optimizations that improve overall performance for certain high latency streaming workloads. z/OS Communications Server V2R2 lifts restrictions on which workloads and applications are eligible for each optimization and makes each optimization more sensitive to connection and CSM ECSA storage conditions. In addition, TCP/IP can stop and restart the DRS optimization dynamically for each connection based on the current system or application responsiveness.

  – Delayed transmission of acknowledgment autonomics

  z/OS Communications Server delays the transmission of acknowledgments on a TCP connection based on user configuration settings. z/OS Communications Server V2R2 provides autonomic capability to monitor the effectiveness of delaying the transmission of acknowledgments on a connection and a listener level. In addition, TCP/IP can stop and restart the delaying transmission of acknowledgments for each connection based on workload and application characteristics.

  – Fast Retransmit, Fast Recovery (FRR) autonomics

  z/OS Communications Server V2R2 extends the detection of out-of-order packets to lost packets during FRR recovery. When FRR recovery processing completes and no lost packets are detected , TCP/IP restores the transmission rates that were allowed before FRR recovery processing.

  When change was introduced: z/OS V2R2

- **64-bit enablement of the TCP/IP stack, strategic DLCs, and CSM** - The TCP/IP stack and the DLCs for OSA-Express in QDIO mode, HiperSockets, and RoCE-Express are enabled to fully use 64-bit virtual memory. These components run in AMODE64 and use virtual memory above the 2 GB bar, which significantly reduces the usage of data space, ECSA and private virtual storage below the 2 GB bar. The z/OS V2R2 TCP/IP stack 64-bit virtual memory support also improves networking scalability because TCP/IP's usage of data space, ECSA, and private virtual storage is not significantly affected by the scale of networking activity.

  In the following use cases, the z/OS V2R2 TCP/IP stack 64-bit virtual memory support might not provide the same level of performance as previous releases provide:

  – **31-bit network connectivity:**

  Communications Server software that is related to OSA-Express in QDIO mode, HiperSockets, and RoCE-Express is updated to fully use 64-bit virtual memory. All other types of TCP/IP network connectivity, for example XCF, MPCPTP, LCS, or CTC, are 31-bit types and are updated to provide 64-bit stack compatibility. These drivers do not provide 64-bit exploitation. When you use the 31-bit types of network connectivity, your network performance and CPU cost might not be as efficient as it was in previous releases because extra data copies might be required.

When 31-bit network connectivity is used for network traffic patterns going through z/OS, the impact might be more significant. Examples of these patterns include standard IP forwarding that is enabled by using IPCONFIG DATAGRAMFWD and sysplex distributor forwarding.

Tip: Use VIPAROUTE over OSA-Express QDIO or HiperSockets for sysplex distributor forwarding to avoid using 31-bit network connectivity.

The impact is based on the characteristics of your specific workloads such as message size and patterns, and environment. This is primarily an issue for streaming or bulk workloads.

– **Enterprise Extender (EE) support when 31-bit network connectivity is used:**

The z/OS Communications Server SNA (APPN) support for EE does not fully use 64-bit virtual memory. EE outbound processing is not affected. However, if inbound processing is connected to the network that uses 31-bit connectivity types, an extra copy of the inbound data might be required.

Result: When you use OSA-Express in QDIO mode or HiperSockets for inbound EE processing, no additional data copies are required compared to V2R1.

Tip: OSA-Express Inbound Workload Queueing (IWQ) support optimizes EE inbound traffic and further reduces the copies that are required.

– **Application socket APIs using CSM:**

Applications that use socket API semantics using Communications Storage Manager (CSM) managed memory can pass CSM data space or ECSA memory directly across the sockets API by using the UNIX System Services srx_np (BPX1SRX, BPX4SRX) callable services. The callable services continue to be supported without semantic changes. These services allowed data copies within the stack to be minimized, which reduces the stack send and receive processing cost.

With the V2R2 64-bit virtual memory support, the performance benefits of the services are diminished. When you use the callable services, the TCP/IP stack copies the data between CSM buffers to 64-bit memory. The performance characteristics are similar to the sockets API with memory buffers provided by applications. In V2R2, you can continue to use applications that use the srx_np (BPX1SRX/BPX4SRX) services. Do not use these services for new applications.

When change was introduced: z/OS V2R2

Reference information: See the following topics in *z/OS Communications Server: New Function Summary* for detailed descriptions that include any applicable restrictions, dependencies, and steps on using the functions:

- *Shared Memory Communications over RDMA adapter (RoCE) virtualization*
- *SMC Applicability Tool (SMCAT)*
- *VIPAROUTE fragmentation avoidance*
- *Enhanced Enterprise Extender scalability*
- *Enhanced IKED Scalability*
- *Increase single stack DVIPA limit to 4096*
- *Shared Memory Communications over RDMA enhancements*
- *TCP autonomic tuning enhancements*
- *64-bit enablement of the TCP/IP stack, strategic DLCs, and CSM*

Cryptographic Services new functions to consider

This topic describes new Cryptographic Services functions in z/OS.

ICSF

This topic describes new ICSF function in z/OS.

ICSF: CCA service algorithm updates

Description: ICSF provides these additional Common Cryptographic Architecture (CCA) support:

- Support for the RSAES-OAEP format for the PKA Decrypt and PKA Encrypt callable services.
- Support in the Key Generate callable service for the CIPHER, DATAC, and DATAM key types in the OP, IM, or EX key forms.
- Operational Key Load support for HMAC keys loaded from the TKE workstation.
- Limiting length of Master key verification patterns displayed on the ICSF Hardware Status panel.
- Access control point offsets displayed on the Domain Role panel.

When change was introduced: PTFs for APAR OA47781, rolled into the base of Cryptographic Support for z/OS V1R13 - z/OS V2R2 web deliverable (HCR77B1), and z/OS V2R3.

Reference information:

> *z/OS Cryptographic Services ICSF Administrator's Guide*
> *z/OS Cryptographic Services ICSF Application Programmer's Guide*
> *z/OS Cryptographic Services ICSF System Programmer's Guide*

ICSF: Cryptographic services enhancements

Description: ICSF provides these cryptographic services enhancements:

- Support for a new key check value using CMAC algorithm for Key Test2 (CSNBKYT2).
- Support for AES Galois/Counter mode encryption for Symmetric Algorithm Encipher (CSNBSAE) and Symmetric Algorithm Decipher (CSNBSAD) services.
- Support for a new key derivation algorithm for EC Diffie-Hellman (CSNDEDH) service.
- Support for a new Encrypted PIN Translate Enhanced (CSNBPTRE) callable service to support PAN that is encrypted using format preserving encryption.

This support requires a minimum microcode level (MCL) for Crypto Express5S coprocessors on IBM z13 and later processors.

When change was introduced: PTF for APAR OA49064, rolled into the base of Cryptographic Support for V2R1 - z/OS V2R2 web deliverable (HCR77C0), and z/OS V2R3.

Reference information:

> *z/OS Cryptographic Services ICSF Administrator's Guide*
> *z/OS Cryptographic Services ICSF Application Programmer's Guide*
> *z/OS Cryptographic Services ICSF System Programmer's Guide*

ICSF: Digital Signature Generate and Digital Signature Verify enhancements

Description: The Digital Signature Generate (CSNDDSG) and Digital Signature Verify (CSNDDSV) callable services have been enhanced to take as input the message to be signed or verified as well as the prehashed message that is already supported.

When change was introduced: Cryptographic Support for z/OS V2R1 - z/OS V2R2 web deliverable (HCR77C0) and z/OS V2R3.

Reference information:

> *z/OS Cryptographic Services ICSF Application Programmer's Guide*

ICSF: EMV simplification services

Description: ICSF provides new callable services that simplify EMV payment processing:

- Derive ICC MK (CSNBDCM and CSNEDCM).
- Derive Session Key (CSNBDSK and CSNEDSK).
- EMV Scripting Service (CSNBESC and CSNEESC).

- EMV Transaction (ARQC/ARPC) Service (CSNBEAC and CSNEEAC).
- EMV Verification Functions (CSNBEVF and CSNEEVF).
- Generate Issuer MK (CSNBGIM and CSNEGIM).

When change was introduced: PTFs for APAR OA47016, rolled into the base of Cryptographic Support for z/OS V1R13 - z/OS V2R2 web deliverable (HCR77B1), and z/OS V2R3.

Reference information:

>   *z/OS Cryptographic Services ICSF Overview*
>   *z/OS Cryptographic Services ICSF Administrator's Guide*
>   *z/OS Cryptographic Services ICSF Application Programmer's Guide*
>   *z/OS Cryptographic Services ICSF System Programmer's Guide*

ICSF: Enhanced PKCS#11 Secret Key Encrypt and PKCS#11 Secret Key Decrypt

Description: Enhancement to PKCS#11 Secret Key Encrypt (CSFPSKE) and PKCS#11 Secret Key Decrypt (CSFPSKD) callable services to support clear key AES ciphertext stealing, specifically CS1.

When change was introduced: Cryptographic Support for z/OS V2R1 - z/OS V2R2 web deliverable (HCR77C0) and z/OS V2R3.

Reference information:

>   *z/OS Cryptographic Services ICSF Application Programmer's Guide*
>   *z/OS Cryptographic Services ICSF Writing PKCS #11 Applications*

ICSF: Enhancements for Crypto Express5

Description: ICSF exploits new algorithm support and extends existing support for asymmetric algorithms as well as:

- The Digital Signature Generate (CSNDDSG), Digital Signature Verify (CSNDDSV), and PKA Key Token Build (CSNDPKB) callable services support RSA-PSS Signatures to provide higher assurance and stronger signature support.
- The PKA Key Generate (CSNDPKG) and PKA Key Token Build (CSNDPKB) callable services support selectable public exponents in the generation of RSA private/public key pairs.

This support requires a minimum microcode level (MCL) for Crypto Express5S coprocessors on IBM z13 and later processors.

When change was introduced: Cryptographic Support for z/OS V2R1 - z/OS V2R2 web deliverable (HCR77C0) and z/OS V2R3.

Reference information:

>   *z/OS Cryptographic Services ICSF Overview*
>   *z/OS Cryptographic Services ICSF Administrator's Guide*
>   *z/OS Cryptographic Services ICSF Application Programmer's Guide*

ICSF: FIPS 140-2 certification of PKCS11

Description: ICSF added four new callable services which allows SSL to exploit ICSF's FIPS compliant PKCS#11 services for RSA operations. Rather than specifying a handle to an existing PKCS#11 key object, these services accept ASN.1 clear key structures. The new services are:

- PKCS #11 Private key structure decrypt (CSFPPD2 and CSFPPD26).
- PKCS #11 Private key structure sign (CSFPPS2 and CSFPPS26).
- PKCS #11 Public key structure encrypt (CSFPPE2 and CSFPPE26).
- PKCS #11 Public key structure verify (CSFPPV2 and CSFPPV26).

When change was introduced: PTFs for APAR OA50113 and rolled into the base of Cryptographic Support for z/OS V2R1 - z/OS V2R2 web deliverable (HCR77C0) and z/OS V2R3.

Reference information:

z/OS Cryptographic Services ICSF Administrator's Guide
z/OS Cryptographic Services ICSF Application Programmer's Guide
z/OS Cryptographic Services ICSF System Programmer's Guide
z/OS Cryptographic Services ICSF Writing PKCS #11 Applications

ICSF: Improved Key Lifecycle and Key Usage auditing

Description: ICSF has improved Key Lifecycle and Key Usage auditing to assist with audit compliance and understanding of the state of keys within an environment.

When change was introduced: Cryptographic Support for z/OS V2R1 - z/OS V2R2 web deliverable (HCR77C0) and z/OS V2R3.

Reference information:

z/OS Cryptographic Services ICSF System Programmer's Guide
z/OS Cryptographic Services ICSF Messages

ICSF: Key Encryption Translate

Description: ICSF provides new callable service Key Encryption Translate (CSNBKET). The CSNBKET service changes the method of encryption of DES key material.

When change was introduced: PTFs for APAR OA49443, rolled into the base of Cryptographic Support for V2R1 - z/OS V2R2 web deliverable (HCR77C0), and z/OS V2R3.

Reference information:

z/OS Cryptographic Services ICSF Administrator's Guide
z/OS Cryptographic Services ICSF Application Programmer's Guide
z/OS Cryptographic Services ICSF System Programmer's Guide

ICSF: New ICSF_OPTIONS_CHECKS health check

Description: ICSF added a new health check, ICSF_OPTIONS_CHECKS, to verify that certain ICSF options are set to the expected values during initialization.

When change was introduced: PTFs for APAR OA48452, rolled into the base of Cryptographic Support for V2R1 - z/OS V2R2 web deliverable (HCR77C0), and z/OS V2R3.

Reference information:

z/OS Cryptographic Services ICSF Administrator's Guide
z/OS Cryptographic Services ICSF Messages

ICSF: Operator commands

Description: New operator commands with Parallel Sysplex wide scope, if needed, that can be used to perform certain cryptographic administrative functions:

- Activating, deactivating, and restarting cryptographic coprocessors.
- Displaying status for available cryptographic devices.
- Displaying information about active key data sets (KDSs).

When change was introduced: Cryptographic Support for z/OS V1R3 - z/OS V2R2 (HCR77B1) and z/OS V2R3.

Reference information:

z/OS Cryptographic Services ICSF Administrator's Guide
z/OS Cryptographic Services ICSF System Programmer's Guide

ICSF: Options Data Set Refresh function

Description: Use the Options Data Set Refresh function through the SETICSF command or the ICSF Multi-Purpose service (CSFMPS) to remove the need for restarting ICSF and prevent outages.

When change was introduced: Cryptographic Support for z/OS V2R1 - z/OS V2R2 web deliverable (HCR77C0) and z/OS V2R3.

Reference information:

> *z/OS Cryptographic Services ICSF Administrator's Guide*
> *z/OS Cryptographic Services ICSF Application Programmer's Guide*
> *z/OS Cryptographic Services ICSF System Programmer's Guide*
> *z/OS Cryptographic Services ICSF Messages*

ICSF: Regional crypto enablement

Description: ICSF can communicate with network attached cryptographic hardware as long as that hardware adheres to the IBM Enterprise PKCS#11 (EP11) interface specification and can be authenticated by an IBM supplied certificate. ICSF added support for Chinese specific encryption and hashing algorithms SM2, SM3, and SM4.

This support requires a vendor based hardware solution as associated with feature code (0901) Regional Crypto Enablement (RCE) and associated software from the vendor.

When change was introduced: PTF for APAR OA49069, rolled into the base of Cryptographic Support for V2R1 - z/OS V2R2 web deliverable (HCR77C0), and z/OS V2R3.

Reference information:

> *z/OS Cryptographic Services ICSF Overview*
> *z/OS Cryptographic Services ICSF Administrator's Guide*
> *z/OS Cryptographic Services ICSF Application Programmer's Guide*
> *z/OS Cryptographic Services ICSF System Programmer's Guide*
> *z/OS Cryptographic Services ICSF Messages*
> *z/OS Cryptographic Services ICSF Writing PKCS #11 Applications*

ICSF: Support for German Banking Industry defined PIN processing functions

Description: ICSF provided additional Common Cryptographic Architecture (CCA) support for German Banking Industry defined PIN processing functions. These functions include three types of AES key derivation as well as AES Secure Messaging Keys, which can be used in AES-based EMV transactions. This support requires a minimum microcode level (MCL) for Crypto Express4S and Crypto Express5S coprocessors on EC12 and later processors.

When change was introduced: PTFs for APAR OA46466, rolled into the base of Cryptographic Support for z/OS V1R13 - z/OS V2R2 web deliverable (HCR77B1), and z/OS V2R3.

Reference information:

> *z/OS Cryptographic Services ICSF Administrator's Guide*
> *z/OS Cryptographic Services ICSF Application Programmer's Guide*

ICSF: Support for secure key tokens in Field Level Encipher and Field Level Decipher

Description: ICSF allows encrypted key tokens that are not stored in the CKDS to be specified for the key identifier parameter of the Field Level Encipher (CSNBFLE and CSNEFLE) and Field Level Decipher (CSNBFLD and CSNEFLD) callable services.

When change was introduced: PTF for APAR OA51102 and z/OS V2R3.

Reference information:

> *z/OS Cryptographic Services ICSF Overview*
> *z/OS Cryptographic Services ICSF Administrator's Guide*

z/OS Cryptographic Services ICSF Application Programmer's Guide
z/OS Cryptographic Services ICSF System Programmer's Guide

ICSF: Unsupported key detection

Description: ICSF provides two ways to easily identify unsupported keys:

- The ICSF Health Check, ICSF_UNSUPPORTED_CCA_KEYS, displays a list of records in the active CKDS and PKDS that are no longer supported.
- The Key Data Set List (CSFKDSL) callable service provides an option that generates a list of records in the active key data sets of keys that are no longer supported.

When change was introduced: Cryptographic Support for z/OS V2R1 - z/OS V2R2 web deliverable (HCR77C0) and z/OS V2R3.

Reference information:

z/OS Cryptographic Services ICSF Administrator's Guide
z/OS Cryptographic Services ICSF Application Programmer's Guide
z/OS Cryptographic Services ICSF System Programmer's Guide

PKI Services

This topic describes new PKI Services function in z/OS.

PKI Services SCEP usability

Description: Enables the client name of the preregistration record to be retained in the SCEP request and SCEP certificate.

When change was introduced: z/OS V2R3

Reference information:

z/OS Cryptographic Services PKI Services Guide and Reference

PKI Services FIPS support

Description: Enables PKI Services to operate in the FIPS level specified.

When change was introduced: z/OS V2R3

Reference information:

z/OS Cryptographic Services PKI Services Guide and Reference

PKI Services Liberty support

Description: Enables PKI Services to run on WebSphere® Liberty.

When change was introduced: z/OS V2R3

Reference information:

z/OS Cryptographic Services PKI Services Guide and Reference

PKI Services DB2 Optimization

Description: Enables PKI Services to shut down or to stay on to wait for DB2's availability to resume its functions.

When change was introduced: z/OS V2R3

Reference information:

z/OS Cryptographic Services PKI Services Guide and Reference

Enable PKI Services to sign the Online Certificate Status Protocol (OCSP) responses

Description: Enables PKI Services to sign the Online Certificate Status Protocol (OCSP) response with the client specified signing algorithm in the required manner.

When change was introduced: z/OS V2R2

Reference information:

> *z/OS Security Server RACF Callable Services*
> *z/OS Cryptographic Services PKI Services Guide and Reference*

PKI Services 64 bit support

Description: Enable PKI services in 64 bit mode.

When change was introduced: z/OS V2R2

Reference information:

> *z/OS Security Server RACF Data Areas* in the z/OS Internet library (www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosInternetLibrary)
> *z/OS Security Server RACF Callable Services*
> *z/OS Cryptographic Services PKI Services Guide and Reference*

PKI Services support NxM authorization

Description: PKI Services is enhanced to support multiple number of administrators to approve certificate requests.

When change was introduced: z/OS V2R2

Reference information:

> *z/OS Security Server RACF Macros and Interfaces*
> *z/OS Security Server RACF Data Areas* in the z/OS Internet library (www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosInternetLibrary)
> *z/OS Security Server RACF Callable Services*
> *z/OS Cryptographic Services PKI Services Guide and Reference*

System SSL

This topic describes new System SSL function in z/OS.

System SSL: FIPS enforcement

Description: System SSL provides FIPS 140-2 security levels that can be specified by the application to enforce different cryptographic strengths.

When change was introduced: z/OS V2R3

Reference information: z/OS Cryptographic Services System SSL Programming

> *z/OS Cryptographic Services System SSL Programming*

System SSL: GSKIT V4 CMS certificate store

Description: System SSL supports certificates and certificate keys that are stored in GSKIT V4 CMS certificate stores. A GSKIT V4 CMS certificate store is used by System SSL as a means to identify certificates and certificate keys to be used when establishing a SSL/TLS secure connection.

When change was introduced: z/OS V2R3

Reference information: z/OS Cryptographic Services System SSL Programming

> *z/OS Cryptographic Services System SSL Programming*

System SSL: Server Key Label List

Description: System SSL allows multiple certificates to be specified for use by a server when the server is negotiating secure connections. This ability allows a server to be able to negotiate with a wide range of clients with varying SSL capabilities that might require more than one type of certificate to be used.

When change was introduced: z/OS V2R3

Reference information: z/OS Cryptographic Services System SSL Programming

> *z/OS Cryptographic Services System SSL Programming*

System SSL: Standards Currency

Description: System SSL supports RFC 5759, RFC 6277, RFC 6460, RFC 6818, RFC 6960, RFC 6961, and RFC 7507 to keep current with the standards:

- GSK_SUITE_B_PROFILE is updated to support the setting of the 128MIN and 192MIN profiles.
- GSK_SERVER_FALLBACK_SCSV is a new attribute type and environment variable that allows server applications the ability to accept the Signaling Cipher Suite Value (SCSV) when included in the client's cipher list.
- GSK_OCSP_RESPONSE_SIGALG_PAIRS specifies a signature algorithm pairs list in preference order that can be used by the OCSP responder to sign the OCSP response.
- GSK_SERVER_OCSP_STAPLING is a new environment variable and attribute type that is supported in the gsk_attribute_set_enum() routine, which allows the server application the ability to specify support for the 'Certificate Status Request' or 'Multiple Certificate Status Request' extensions.
- GSK_TLSEXT_SERVER_OCSP_STAPLING is a new enum type that is supported in the gsk_attribute_get_enum() routine to determine whether the 'Certificate Status Request' or 'Multiple Certificate Status Request' extension was negotiated on the connection.
- GSK_SERVER_OCSP_STAPLING_CERTSTATUS is a new enum type that is supported in the gsk_attribute_get_enum() to query if the server sent a CertificateStatus message.

When change was introduced: z/OS V2R3

Reference information: z/OS Cryptographic Services System SSL Programming

> *z/OS Cryptographic Services System SSL Programming*

System SSL: Cache session identification

Description: System SSL clients and servers can specify a particular cached session ID to be used on an upcoming secure SSL/TLS connection by using the GSK_SID_VALUE and GSK_PEER_ID attribute identifiers.

When change was introduced: z/OS V2R2

Reference information:

> *z/OS Cryptographic Services System SSL Programming*

System SSL: OCSP support and CRL updates

Description: System SSL is enhanced to:

- Support retrieval of certificate revocation lists (CRLs) through HTTP URLs specified in the certificate's CRL Distribution Points extension.
- Have more flexible processing of CRLs from a LDAP directory.
- Support retrieval of revocation information through the online certificate status protocol (OCSP). OCSP is defined in RFC 2560.

When change was introduced: z/OS V2R2

Reference information:

> *z/OS Cryptographic Services System SSL Programming*

DFSMS new functions to consider

This topic describes new DFSMS functions in z/OS.

DFSMS device support new functions

This topic describes new DFSMS device support functions in z/OS.

DFSMS device support enhancements for z/OS V2R3

DFSMS device support provides the following enhancement:

Access to Read-only DASD devices

DFSMS provides read-only access to data sets on DASD devices that have been defined as read-only using HCD.

For more information about accessing data sets on read-only devices, including the types of data sets and access methods supported, see *z/OS DFSMS Using Data Sets*.

Applications might need to provide specific keywords when allocating and opening data sets on read-only devices. For details, see information about the DALROAC and DALROA2 text units in *z/OS MVS Programming: Authorized Assembler Services Guide*, the ROACCESS keyword on the JCL DD statement in *z/OS MVS JCL Reference*, and the CONCURRENTRW keyword in the DCBE at OPEN.

The DEVTYPE macro will return the read-only device attributes in the copy of the UCBTYP field. The programmer should consult the IECDUCBD macro to define the three new bits returned by DEVTYPE.

Advanced Copy Services new functions

This topic describes new Advanced Copy Services functions in z/OS.

Advanced Copy Services enhancements for z/OS V2R3

z/OS V2R3 adds the following Advanced Copy Services enhancement:

- Support for extent space efficient volumes. Extent space efficient volumes, also commonly called thin provisioned volumes, have no physical space allocated to them until the first write is done to the volume. Physical space is allocated on demand to the volume in extents, directly from the extent pool where the volume is defined, rather than on a track by track basis from a space efficient repository. This improves the performance of space efficient volumes. Extent space efficient volumes are not limited to being FlashCopy targets, and their FlashCopy relationships are not limited to NOCOPY. No special keywords are required to create FlashCopy or PPRC relationships with extent space efficient volumes.

Advanced Copy Services enhancements for z/OS V2R2

z/OS V2R2 adds the following Advanced Copy Services enhancement:

- The XRECOVER command now accepts CHECK and FORCE parameters, to control XRECOVER enhanced checking.

DADSM/CVAF new functions

This topic describes new DADSM/CVAF functions in z/OS.

DADSM/CVAF enhancements for z/OS V2R3

- A new CVAFDIR ACCESS=WRITE parameter checks to insure the caller did not accidentally change fields that could corrupt the VTOC or cause the Index to be disabled.

Validate=(YES,NO) performs a comparison of the existing Data Set Control Blocks (DSCBs) with the ones passed by the caller, prior to updating the VTOC.

You can use VALIDATE=YES with CVAFDIR ACCESS=WRITE to ensure essential fields in the DSCB are not being modified. Refer to *z/OS DFSMSdfp Advanced Services* for more information.

DADSM/CVAF enhancements for z/OS V2R2

SMS provides the following enhancements:

- A new parameter with the OBTAIN macro allows the caller to specify that if the resource is not available, the I/O read should not queue on the resource and wait. For more information, refer to Reading DSCBs from the VTOC Using OBTAIN in *z/OS DFSMSdfp Advanced Services*.

DFSMS catalog new functions

This topic describes new DFSMS catalog functions in z/OS.

DFSMS catalog enhancements for z/OS V2R3

DFSMS provides the following enhancements:

Catalog enhancements

- **IDCAMS small enhancements:** The DEFINE CLUSTER command has a new zFS parameter, which specifies that the cluster being defined is for linear data, and the linear data set is a Unix Z file system. When zFS is specified, the linear data set is defined as extended addressable. LISTCAT will display ZFS 8 9 when the data set in LINEAR and zFS indicator flag is on, or when the zFS initialized flag is on.

DFSMS catalog enhancements for z/OS V2R2

The catalog component of DFSMS provides the following enhancements:

- **DUMPON support for catalog front end modules**: When you request CAS dynamic dumping with the MODIFY CATALOG,DUMPON command, you can now specify modules involved in catalog front end processing. For more information, refer to MODIFY CATALOG in *z/OS DFSMS Managing Catalogs*.
- **GDGSCRATCH parmlib variable**: The new GDGSCRATCH(YES|NO) parmlib variable provides the ability to specify whether the default should be SCRATCH or NOSCRATCH when defining a base GDG. See "DEFINE GENERATIONDATAGROUP" in *z/OS DFSMS Access Method Services Commands*.

  The MODIFY CATALOG,REPORT command is enhanced to indicate whether the GDGSCRATCH feature is enabled or disabled.
- **Extended format for generation data groups (GDGs)**: The new EXTENDED parameter of the IDCAMS DEFINE GDG command allows a new GDG to contain up to 999 generation data sets (GDSes). The previous GDS limit of 255 GDSes still applies for existing GDGs, and for new GDGs that do not specify the new extended format. For extended format GDGs, the LIMIT parameter of the IDCAMS DEFINE GDG command and the IDCAMS ALTER LIMIT command are enhanced to let you set a new GDS limit of up to 999. See "DEFINE GENERATIONDATAGROUP" and "ALTER" in *z/OS DFSMS Access Method Services Commands*.
- **Restore a user catalog to any volume**: You can now logically restore a user catalog to any volume with the same device type as the volume from which it was dumped. Previously, you could restore only to the same volume. Physically restoring a user catalog is not changed — it must be done to the same volume as the volume from which the user catalog was dumped. For more information, refer to Restoring integrated catalog facility catalogs in *z/OS DFSMSdss Storage Administration*.
- **Catalog attributes health check**: This enhancement is designed to inspect all the catalogs currently defined in the user's environment for shareoptions and DASD status and report any inconsistencies between the two. The CATALOG_ATTRIBUTE_CHECK will notify the system programmer of any inconsistent catalog(s) in their environment. The notification will be done in the form of a report in the message buffer using SDSF. The system programmer can decide to redefine or alter the inconsistent catalog(s) with the correct shareoptions at a convenient time. For more information, refer to *z/OS MVS System Messages, Vol 9 (IGF-IWM)* and *IBM Health Checker for z/OS User's Guide*.
- **IDCAMS VERIFY RECOVER ENHANCEMENT**: This enhancement will now allow for 3 ways to run the VERIFY command:
  - IDCAMS VERIFY: Original way as it is now where IDCAMS opens the data set for output and then issues the VERIFY macro with no options and then closes the data set.

- IDCAMS VERIFY RECOVER: Currently the RECOVER option causes VSAM Record Management VERIFY to back out or complete any interrupted CA reclaim in addition to regular IDCAMS VERIFY functions. There will be no change to this way of running VERIFY.

- EXAMINE/IDCAMS VERIFY RECOVER: This will be a new enhancement that is functional only when EXAMINE and VERIFY RECOVER are run in the same IDCAMS job step. EXAMINE has been enhanced to pass the error information that it finds (such as index CI#, data CI#, error type, and so forth) to VERIFY. As long as there is no concurrent access on the data set, VERIFY will attempt to repair any errors that it can.

- **IDCAMS small enhancements**: There are multiple small enhancements in IDCAMS:

  - A new parameter has been introduced to allow the user to control adding the TSO user id as a prefix when running LISTCAT as a TSO command. This new parameter is PREFIX/NOPREFIX.

  - A new option "CIMODE" has been introduced in the PRINT command and REPRO command to process data sets using CI level processing. This will allow the PRINT and REPRO commands to be able to read a broken VSAM ESDS dataset and extract the good records from it.

- **IDCAMS RAS enhancements**: There are multiple RAS enhancements in IDCAMS:

  - **IDCAMSPARM(TEST) enhancement**: AMS commands use system adapters UGPOOL, UGSPACE, UGSPC16 to obtain core storage for command processing. Some of the commands such as PARM(TEST) have 31 bit support but still perform below the line, because those system adapters use a macro version of getmain/freemain (MF) that does not actually obtain the storage above the line as expected even though "LOC=ANY" is specified on the call of getmain.

  - **REPROMERGECAT output enhancement**: IDCAMS will provide new optional keywords, MESSAGELEVE(ALL|SHORT) for REPRO MERGECAT. These options will provide existing or condensed output listings. ALL is the default.

- **CSI Enhancements**: This enhancement includes new CSI fields. For more information, refer to Sample Z Entry Request Output in *z/OS DFSMS Managing Catalogs*.

- **Catalog modify command security enhancements**: This enhancement will allow the MODIFY command for Catalog to separate authorization for those sub-commands which provide reporting capabilities from those sub-commands which alter the catalog environment. This is achieved by defining a new RACF Resource for the OPERCMDS class and permitting selected users with READ or UPDATE access.

- **New option for GDG management - PURGE**: This enhancement adds a new PURGE option to the DEFINE and ALTER commands. Additionally, it adds a new LISTCST field to print the PURGE option. The PURGE option is valid only when the SCRATCH option is specified. It will override expiration dates when deleting generation data sets (GDSes). If not specified, the default is NOPURGE, but this can be overridden by the new GDGPURGE parmlib variable.

DFSMSdfp utility new functions

This topic describes new DFSMSdfp utility catalog functions in z/OS.

DFSMSdss new functions

This topic describes new DFSMSdss functions in z/OS.

DFSMSdss enhancements for z/OS V2R3

z/OS V2R3 introduces the following enhancements for DFSMSdss:

- New keywords on the DUMP command let you backup DASD data to an object storage cloud. See the section on backing up data sets, and descriptions of the CLOUD, CLOUDCREDENTIALS, CONTAINER, OBJECTPREFIX, and DEBUG keywords for the DUMP command, in *z/OS DFSMSdss Storage Administration*.

- New and updated keywords on the RESTORE command let you restore backed up DASD data from an object storage cloud. See the section on restoring data sets, and descriptions of the CLOUD,

CLOUDCREDENTIALS, CONTAINER, OBJECTPREFIX, and DEBUG keywords for the RESTORE command in *z/OS DFSMSdss Storage Administration*.

- The new SPACEREL command is added, allowing you to release physical space associated with free space extents on specified extent space efficient (ESE) volumes.
- The maximum number of data sets that can potentially reside in a logical data set backup is increased, from 131,070 to 2,147,483,392. For more information, see *z/OS DFSMS Using the New Functions*.
- A reason code has been added to message ADR383W, to identify specific causes for a data set not being selected and specific actions to be taken.

DFSMShsm new functions

This topic describes new DFSMShsm functions in z/OS.

DFSMShsm enhancements for z/OS V2R3

DFSMShsm provides the following enhancements:

- **DFSMS UNIX file backup**

  APAR OA52703 provides DFSMS backup of UNIX files. This support gives you the ability to perform availability management of your z/OS UNIX files using DFSMSdss and DFSMShsm command.

- **Common recover queue (CVQ) enhancements**

  With this enhancement, storage administrators have the ability to distribute the processing of volume restores (RECOVER *, FRRECOV COPYPOOL, and FRRECOV TOVOLUME with FROMDUMP) to all DFSMShsm tape resources available in a group of DFSMShsm hosts. New parameters on the SETSYS COMMONQUEUE command define the common recover group and its members (hosts) in the HSMplex. The HOLD, RELEASE, QUERY, CANCEL, and ALTERPRI commands all now support this function. XCF system facilities are used to provide this support. Message simplification supports a host running a common recover queue.

- **Message simplification**

  To simplify the analysis of fast replication errors during FRBACKUP, FRRECOV COPYPOOL and copy pool auto dump, and FRRECOV TOVOLUME FROMDUMP, DFSMShsm now collects all related DFSMShsm and DFSMSdss messages and records them in a unique fast replication message data set. (These messages continue to be recorded in their respective logs.) You can choose and control this option with the new MESSAGEDATASET(YES|NO HLQ(*hlq*)) parameters on the SETSYS FASTREPLICATION command.

  For more information, refer to SETSYS command in *z/OS DFSMShsm Storage Administration*.

  On the FRBACKUP and FRRECOV COPYPOOL commands, use a MESSAGEDATASET parameter to specify the date and time used in the message data set name. The message simplification function supports distributed tape processing, common dump queue, and common recover queue processing.

  MESSAGEDATASET is an optional parameter that allows you to specify the date and time used in the name of the fast replication command message data set. Specifying the date and time ensures that you can identify the message data set that corresponds with the FRRECOV request. If you don't specify the date and time with the MESSAGEDATASET parameter, DFSMShsm uses the date and time when the message data set name is generated.

  For more information, refer to the FRRECOV command in *z/OS DFSMShsm Storage Administration*.

DFSMShsm enhancements for z/OS V2R2

DFSMShsm provides the following enhancements:

- **Storage tiers enhancements**: The DFSMShsm MIGRATE command is enhanced to support processing of one or more storage groups, and both class transitions and data set moving at the volume level, storage group level, and data set level.
- **Distributed tape processing enhancements**: Administrators can distribute the processing of dump copies (FRBACKUP DUMP, BACKVOL DUMP, auto-dump) to all DFSMShsm tape resources available in a group of DFSMShsm hosts.

- **Message simplification**: To simplify the analysis of fast replication errors for FRBACKUP and FRRECOV COPYPOOL requests, DFSMShsm now collects all related DFSMShsm and DFSMSdss messages and records them in a unique fast replication message data set. Control this option with the SETSYS FASTREPLICATION command. For more information, see that command descriptions in *z/OS DFSMShsm Storage Administration*.

DFSMSrmm new functions

This topic describes new DFSMSrmm functions in z/OS.

DFSMSrmm enhancements for z/OS V2R3

The functional enhancements available with z/OS V2R3 DFSMSrmm provide you with these benefits:

- **DFSMSrmm operational enhancements**

  - *Specify expiration time for added volumes and data sets:* The ADDDATASET, ADDVOLUME, and GETVOLUME subcommands have been enhanced to enable the user to specify the time (in *hhmmss* format) that should be used, in addition to the date, when deciding when to expire volumes and data sets.

  - *Specify that an added data set not expire while cataloged:* A new WHILECATALOG option has been added to the EDGRMMxx parmlib member OPTION command and to the ADDDATASET TSO subcommand to enable the user to specify either that:

    - the added dataset will be kept as long as it is cataloged. If the dataset is uncataloged, it will still be kept if the expiration date has not been reached yet.

    - the added dataset will be kept as long as it is cataloged, but no later than the expiration date.

DFSMSrmm enhancements for z/OS V2R2

The functional enhancements available with z/OS V2R2 DFSMSrmm provide you with these benefits:

- **DFSMSrmm operational enhancements**

  - *Specify expiration time for volumes and data sets:* DFSMSrmm now specifies an expiration time, in addition to an expiration date, for volumes and data sets, thus allowing greater control of exactly when a volume or data set is to expire.

    The expiration time will be set to the current time whenever RETPD is used in the JCL, as a default, or in ADDDATASET, ADDVOLUME, CHANGEDATASET, or CHANGEVOLUME subcommands. When EXPDT is used instead of RETPD (in JCL or on a DFSMSrmm subcommand), the expiration time will be set to midnight.

    In addition, the CHANGEDATASET and CHANGEVOLUME commands have been enhanced to enable the user to specify the time (in *hhmmss* format) that should be used, in addition to the date, when deciding when to expire volumes and data sets.

    The ability to specify both the expiration time and date will be helpful to customers using the EXPDT retention method. For example, you might have data sets created shortly before midnight with a default retention period of one day. This new function will allow you to ensure these data sets do not expire in a few minutes and are kept at least for 24 hours.

  - *Search volumes and data sets by date/time ranges:* The SEARCHDATASET and SEARCHVOLUME commands have been enhanced to enable the user to specify the time (in *hhmmss* format) in addition to the date when searching for volumes and data sets by the creation date.

    The ability to select records by both the creation time and date will be helpful to customers using the EXPDT retention method. For example, the daily night batch processing might create tapes starting from 8 PM and until 5 AM on the next day. This new function will allow you to assign the same expiration date to all of these volumes, even though they were created on different calendar days.

  - *Specify that a data set not expire while cataloged:* A new WHILECATALOG option has been added to the EDGRMMxx parmlib member OPTION command and to the CHANGEDATASET TSO subcommand to enable the user to specify either that:

- the dataset will be kept as long as it is cataloged. If the dataset is uncataloged, it will still be kept if the expiration date has not been reached yet.
- the dataset will be kept as long as it is cataloged, but no later than the expiration date.

DFSMStvs new functions

This topic describes new DFSMStvs functions in z/OS.

DFSMStvs enhancements for z/OS V2R3

DFSMStvs provides the following enhancement:

Automatic commit support
DFSMStvs provides a new parameter on the JCL EXEC statement that you can use to enable the automatic issuing of commit points on behalf of a batch application. The TVSAMCOM parameter lets you specify how many updates (an exact number or a range of numbers) should occur before a commit point is issued. You can also specify a default value for this parameter in the IGDSMS*xx* member of SYS1.PARMLIB.

For more information about using automatic commit, including the types of batch jobs that are good candidates for it, see *z/OS DFSMStvs Planning and Operating Guide*.

DFSMS Object Access Method (OAM) new functions to consider

This topic describes new DFSMS Object Access Method (OAM) functions in z/OS.

Object Access Method (OAM) enhancements for z/OS V2R3

z/OS DFSMS V2R3 provides the following enhancements to the Object Access Method (OAM):

- The LIBRARY DISPDRV command is enhanced with new MOUNTED and MOUNTED,ALL parameters to optionally display:

  - Status information for volumes that are mounted in the TS7700 Virtualization Engine for a specified composite or distributed library. Information pertaining to the distributed library that owns the device for the mount as well as distributed library information associated with the primary and the secondary tape volume cache (TVC) is displayed.

  - For a distributed library in a TS7700 Virtualization Engine, additional drives that are not owned by the specified distributed library can be displayed using MOUNTED,ALL. The additional drives are displayed if the distributed library specified is the primary or secondary TVC for the mounted volume. This option can be useful when a distributed library is going into service and can be used to determine if the specified distributed library is associated with a mount request from another distributed library.

  This support was introduced with APAR OA47487 (z/OS V1R13 and above).

  For more information, refer to *z/OS DFSMS OAM Planning, Installation, and Storage Administration Guide for Tape Libraries*.

Object Access Method (OAM) enhancements for z/OS V2R2

z/OS DFSMS V2R2 provides the following enhancements to the Object Access Method (OAM):

- **System-managed tape enhancements for the TS7700:** Enhancements for Release 3.2 of the TS7700 Virtualization Engine, which include a new tape attach feature for the TS7720, as well as support for 496 devices per distributed library. Support for the added devices also involves doubling the number of allowed subsystems on a scratch allocation request from 253 to 506 and a new DEVSUP*xx* PARMLIB option (GREATER_253). For more information, refer to *z/OS DFSMS OAM Planning, Installation, and Storage Administration Guide for Tape Libraries*.

- The OSREQ application programming interface now allows OAM applications to provide object data buffers in 64-bit addressable virtual storage above the 2G "bar" when storing object data using the OSREQ STORE function or when retrieving object data using the OSREQ RETRIEVE function. These buffers can be used for objects from 1 byte to 2000M for all destinations in the OAM storage hierarchy:

DB2 (4K, 32K, LOB), file system, tape, and optical (with the existing restriction of a maximum object size of 256M for optical); this includes the source system handling in OAMplex configurations for objects less than or equal to 50M for optical writes and reads and tape reads that are routed to another system in the OAMplex. The ability to use 64-bit addressable virtual storage buffers above the 2G "bar" on the OSREQ application programming interface can provide virtual storage constraint relief for OAM applications that have difficulty acquiring sufficient virtual storage within a 2G address space.

This new functionality can be used as an alternative to:

– Storing an object up to 2000M in parts with the OSREQ store sequence functions (STOREBEG/STOREPRT/STOREEND) where multiple OSREQ API invocations are required and the maximum size for each part is limited by the practical amount of virtual storage available below the 2G "bar" for each STOREPRT API invocation

– Retrieving an object (or a partial object) with OSREQ RETRIEVE where multiple OSREQ API invocations are required and the maximum size for each retrieve request is limited to 256M

Therefore, this new functionality could also improve the efficiency of the interactions with OAM through the OSREQ application programming interface, because only a single OSREQ API invocation is needed to store an object up to 2000M in size or to retrieve an object up to 2000M in size.

This new functionality includes:

– TSO/E OSREQ command processor changes for STORE and RETRIEVE functions
– OSREQ macro changes for the STORE and RETRIEVE functions and associated new reason codes
– CBROSR2 sample program changes in support of the OSREQ macro changes.

Notes:

1. The OSREQ application programming interface remains AMODE 31.
2. The maximum possible OAM object size remains unchanged at 2000M.

Open/Close/End of Volume new functions

This topic describes new Open/Close/End of Volume functions in z/OS.

Open/Close/End of Volume enhancements for z/OS V2R2

Open/Close/End of Volume provides the following enhancements:

• DEVSUP*xx* enhancements: In previous releases, a subset of DEVSUP*xx* keywords were reset to their default values whenever a member was processed, unless the values were explicitly set in the member. Starting in V2R2, the current values of all keywords are preserved when a DEVSUP*xx* member is processed, unless the member explicitly specifies new values.

In addition, beginning in V2R2, multiple DEVSUP*xx* members can be specified on a single SET DEVSUP command invocation, by specifying their two-digit member suffixes separated by commas.

• **Dynamic exits for Open/Close/End of Volume**: This enhancement provides dynamic versions of the following Open/Close/End of Volume tape installation exits, which can be changed and put into effect without an IPL. In previous releases, these exits required an IPL for changes to go into effect.

– Volume mount -- dynamic version is OCE_VOLUMEMOUNT
– File start – dynamic version is OCE_FILESTART
– File validate – dynamic version is OCE_FILEVALIDATE
– File end – dynamic version is OCE_FILEEND
– Label anomaly – dynamic version is OCE_LABELANOMALY.

For more information, see the "Tape label processing installation exits" topic in *z/OS DFSMS Installation Exits*.

• **Controlling synchronization of files written to tape**: the new NUMFILES keyword on the SYNC parameter of the DCBE macro provides for potential performance improvements and improved recovery by letting you specify how many files should be written to tape volumes by a given job, before a

synchronization occurs. For more information, see the DCBE section of *DFSMS Macro Instructions for Data Sets*.

SMS new functions

This topic describes new SMS functions in z/OS.

SMS enhancements for z/OS V2R3

SMS provides the following enhancements:

SMS support for zHyperlink storage class granularity

DFSMS supports the ability to specify whether data sets associated with a storage class are eligible to use zHyperLinks for reading and writing. zHyperlinks can dramatically reduce latency by interconnecting the z14 Central processor complex directly to the I/O bays in the IBM DS8880. This can improve application response time, without significant application changes. For more information, see the section "Defining use of zHyperlinks," in *z/OS DFSMSdfp Storage Administration*.

SMS support for object storage clouds

DFSMS supports the backup and retrieval of DASD data in object storage clouds, using DS8000 storage hardware. ISMF panel options allow you to define a cloud construct to DFSMS, which you can then specify on DFSMSdss and DFSMShsm commands to perform data backups and retrievals. For more information, see Defining clouds.

SMS enhancements for z/OS V2R2

SMS provides the following enhancements:

- **Storage group space alert messages**: SMS provides new alert thresholds for pool storage groups, based on total space and track-managed space. For more information about the attributes, refer to the topic about Values for defining a pool storage group in *z/OS DFSMSdfp Storage Administration*.
- **User-defined ACS read-only variable**: SMS provides the ability to specify user-defined values for use with ACS routines. You use a new parameter in the IGDSMS*xx* member of PARMLIB, USER_ACSVAR. The values for USER_ACSVAR are saved when SMS is started and, during ACS processing, are passed to the ACS routines in the form of a new ACS read-only variable, &USER_ACSVAR. You can alter the values with the SETSMS command. For details on the IGDSMS*xx* member of PARMLIB, refer to IGDSMS*xx* in *z/OS MVS Initialization and Tuning Reference*.
- **Enhancements to SMS space constraint relief**:
  - New parameter in the data class that indicates whether space reduction on guaranteed space allocation is permitted or not
  - Support for the space reduction function on non-striped guaranteed space allocations when allocating a new data set or extending an existing data set to a new volume
  - Allocation of the largest possible space that satisfies the percentage specified in the parameter, Reduce Space Up to (%), during space reduction processing for both guaranteed space and non-guaranteed space allocation requests
  - New SMS message when the Dynamic Volume Count (DVC) function is invoked.

  For more information, refer to the topic about Specifying attributes to handle space constraints during allocation in *z/OS DFSMSdfp Storage Administration*.
- **SMS RAS enhancements**:
  - SMS issues a RESERVE with the resource name, IGDCDSXS, to serialize the access to SMS control data sets, ACDS and COMMDS.
  - SMS issues IGD030I messages indicating a syntax error when parameters, SELECT and DESELECT, specified in the SMS PARMLIB member extended to a third line.

 – ACS messages IGD01012I and IGD01015I are enhanced to include the data set name and the storage group name for problem diagnosis. SMS trace entries that are related to these events are also enhanced.

 – Prior to V2R2, SMS issued message IGD17800I when the specified volume(s) for a guaranteed space request or the volume provided by AMS for an AIX define can not be found in the eligible storage group list. The storage group(s) searched by SMS is not externalized to the user. To improve problem diagnosis, message IGD17800I is enhanced to display the storage group(s) that are searched.

 – The RETENTION LIMIT value in the Management Class limits the use of retention period and expiration date. Data sets that are assigned with a RETENTION LIMIT value of zero days specified in their Management Class are immediately expired with an IGD17364I message issued to the job log. This has caught some users by surprise, and they needed to recover these data sets. To facilitate this task, this item will also externalize IGD17364I to the hardcopy log. This allows the user to identify these expired data sets by searching for the IGD17364I messages in the hardcopy log. Prior to V2R2, the user may need to go through the joblogs to identify these data sets.

DFSMS VSAM new functions

This topic describes new DFSMS VSAM functions in z/OS.

VSAM and VSAM RLS enhancements for z/OS V2R3

z/OS V2R3 introduces the following enhancements for VSAM and VSAM RLS:

• Data set statistics block (DSSB) above the bar for VSAM data sets: In V2R3, the DSSB resides in 64-bit storage ("above the 2G bar") for VSAM data sets. This change provides virtual storage constraint relief.

VSAM and VSAM RLS enhancements for z/OS V2R2

z/OS V2R2 introduces the following enhancements for VSAM and VSAM RLS:

• VSAM dynamic buffer addition – LSR buffering is enhanced with a function called VSAM dynamic buffer addition, which adds buffers if no buffer is available for a given VSAM request.

• Feedback code added to message IDA9999I – when the VSAM Auto Dump function attempts but fails to capture a dump, message IDA9999I is issued with new information including a feedback code indicating the VSAM error and the job name.

• VSAM RLS locking at the control area (CA) level, rather than the data set level. This improves the performance of serialization for the following:

 – VSAM key-sequenced data sets (KSDS): control interval (CI) split, CI reclaim, and spanned record processing

 – Variable-length relative record data sets (VRRDS): CI split and CI reclaim processing.

• VSAM chained I/O for spanned records – for spanned records with NSR, if there are enough extra buffers defined for the data set, VSAM attempts to write all segments of the entire spanned record out to DASD with one single I/O (chained I/O), to improve integrity and I/O performance. For more information, see "Acquiring Buffers" in *z/OS DFSMS Using Data Sets*.

DFSMS data set encryption new functions

This topic describes new functions in DFSMS related to DASD data set level encryption in z/OS.

DFSMS data set encryption enhancements for z/OS V2R3

z/OS DFSMS introduces pervasive encryption of data at rest for extended format data sets accessed through access methods without requiring application changes. z/OS data set encryption through RACF command and SMS policies can be used to identify the data sets or groups of data sets that require encryption.

You can protect viewing the data in the clear based on SAF access to the key label that is associated with the data set used by the access methods to encrypt and decrypt the data. The data set owner specifies an

encryption key label, which refers to an AES 256-bit encryption key that exists in the ICSF key repository (CKDS).

z/OS DFSMS data set encryption can be used to encrypt the following types of data sets:

- Sequential extended format data sets that are accessed through BSAM and QSAM.
- VSAM extended format data sets (KSDS, ESDS, RRDS, VRRDS, LDS) that are accessed through base VSAM and VSAM/RLS.

To create an encrypted data set, you must assign a key label to the data set when it is first allocated (that is, when the data set is created). A key label can be specified through any the following methods:

- RACF data set profile
- JCL, dynamic allocation, TSO ALLOCATE, IDCAMS DEFINE
- SMS data class

Encrypted data sets must be SMS-managed extended format; they can be in compressed format, also.

DFSMSdss and DFSMShsm support backup and migration of encrypted data sets while preserving the data in encrypted form. You can identify data sets that are encrypted through interfaces, such as LISTCAT, IEHLIST LISTVTOC, ISMF, SMF, and DCOLLECT.

Using the z/OS data set encryption enhancementsFor an overview of restrictions, dependencies, and steps on using the new function, see the following publications:

Note: When change was introduced: z/OS V2R3 (Also V2R2 with APAR OA50569)

References:

z/OS DFSMS Using the New Functions

z/OS DFSMS Access Method Services Commands

z/OS DFSMSdfp Storage Administration

z/OS DFSMSdss Storage Administration

z/OS DFSMShsm Storage Administration

DFSORT new functions to consider

This topic describes new DFSORT functions in z/OS.

High Performance FICON (HPF) exploitation

Description: A program that invokes DFSORT, ICETOOL or ICEGENER will now be able to exploit the High Performance Ficon (zHPF) hardware. When zHPF is available, DFSORT SORT or MERGE applications will use BSAM for SORTIN, SORTOUT, and OUTFIL data sets.

When change was introduced: z/OS V2R2

Reference information: *z/OS DFSORT Application Programming Guide*

Date functions

Description: Two new date functions to calculate the week number of a given date and Age as date duration are added.

- WEEKNUM function converts a given Julian/Gregorian date to number of week. There are 2 versions of this function, the standard USA format and the ISO format.
- WEEKNUM=USA function returns an integer in the range of 1 to 54 that represents the week of the year. The week starts with Sunday, and January 1 is always in the first week.

- WEEKNUM=ISO function returns an integer in the range of 1 to 53 that represents the week of the year. The week starts with Monday and includes 7 days. Week 1 is the first week of the year to contain a Thursday, which is equivalent to the first week containing January 4.
- AGE function returns a date duration that specifies the number of years, months, and days between an input date and current date.
- Age=YMD produces an 8-byte result which has duration in years (0-9999), months (00-12), and days (00-31).
- Age=YM produces a 6-byte result which has duration in years (0-9999), months (00-12).
- Age=YD produces a 7-byte result which has duration in years (0-9999), days (00-366).

When change was introduced: z/OS V2R2

Reference information: *z/OS DFSORT Application Programming Guide*

Distributed File Service new functions to consider

zFS File Snapshot

Description:
You can create a point-in-time snapshot (or copy) of a file in a z/OS file system and allow subsequent read requests from that snapshot along with concurrent reads and writes to the actual file on-disk. When a snapshot is created, backup programs can also request information from the file, which will help determine whether the file was changed since the last backup.

Release introduced:
V2R3, with APAR OA56145

Reference information:
z/OS Distributed File Service zFS Administration

Identifying SMB-exported file systems

Description:
Because z/OS V2R3 is planned to be the last release to support the DFS/SMB functionality, the ZOSMIGV2R3_NEXT_USS_SMB_DETECTED health check was made available. It provides a list of SMB-exported file systems.

Release introduced:
z/OS V2R3 with APAR OA56251.

Reference information:
IBM Health Checker for z/OS User's Guide

Repairing mounted zFS file systems

Description:
File systems no longer need to be unmounted in order to be salvaged. Use the new `zfsadm salvage` command to salvage them while they are still mounted.

Release introduced:
V2R3

Reference information:
z/OS Distributed File Service zFS Administration

Shrinking zFS aggregates

Description:
The size of a zFS aggregate can be reduced by using the new `zfsadm shrink` command to release space from the associated VSAM data set.

Release introduced:
V2R3

Reference information:
z/OS Distributed File Service zFS Administration

Encrypting and compressing zFS file system data

Description:
zFS has added support for encrypting file system data using the DFSMS access method encryption. Support has also been added to compress file system data using the zEDC compression method. New file systems can be defined and formatted so that any data added to them are automatically encrypted, compressed, or both. Existing file systems can have their data encrypted or compressed with the new **zfsadm encrypt** and **zfsadm compress** commands.

Release introduced:
V2R3

Reference information:
z/OS Distributed File Service zFS Administration

Enhanced mounting of VSAM linear data sets

Description:
VSAM linear data sets that are created with the **zfsadm define** command no longer need to be formatted before they are mounted.

Release introduced:
V2R3

Reference information:
z/OS Distributed File Service zFS Administration

Controlling zFs ownership by using automove options

Description:
zFS ownership movement of sysplex-aware read/write file systems can be controlled by using the automove mount option to identify the systems that are eligible to become zFS owners.

Release introduced:
V2R2 with APAR OA49516 applied

Reference information:
z/OS Distributed File Service zFS Administration

Dynamically changing attributes that were assigned when a file system is first mounted

Description:
Users can dynamically change aggregate attributes that were assigned during mount processing, such as AGGRFULL and AGGRGROW, without having to unmount and remount the file system.

Release introduced:
z/OS V2R3

Reference information:
z/OS Distributed File Service zFS Administration

SMF support for zFS

Description:
System Management Facilities (SMF) can be used to collect and record file system events, performance data, and per-file system statistics for zFS.

Release introduced:
z/OS V2R3

Reference information:

   z/OS Distributed File Service zFS Administration

Providing support for 64-bit addressing (AMODE64)

Description: To enhance performance, the z/OS kernel supports 64-bit addressing (AMODE64). zFS can now be run in the z/OS UNIX address space (OMVS), which provides additional performance enhancements.

When change was introduced: z/OS V2R2.

Reference information:

- *z/OS Distributed File Service zFS Administration*

Improved monitoring of zFS performance

Description: To allow for the monitoring of zFS performance over longer periods of time, zFS performance counters were changed from 4 bytes to 8. Information about file systems is more detailed and can be obtained more quickly with the introduction of a new API and commands. Various new sysplex-related performance reports are also available.

When change was introduced: z/OS V2R2.

Reference information:

- *z/OS Distributed File Service zFS Administration*

HCD new functions to consider

New function for Hardware Configuration Definition (HCD).

Hardware support

Description: HCD supports the new chpid type - CL5

A new coupling link for extended distances (Coupling Express LR) is supported as new chpid type called CL5.

The new adapter card (based on the RoCE adapter) is a mixture of a HCA (host communication adapter) and a 'normal' chpid. It is defined by a combination of PCHID and PORT attribute.

When change was introduced: z/OS V2R2.

Reference Information:

- *z/OS HCD User's Guide*

Processor support

Description: HCD supports the IBM z13 processor family with CL5 support:

- processor types 2964-N30, -N63, -N96, -NC6, -NE1 (new support level H161231)
- processor types 2965-N10 and N20 (support level H161231)

When change was introduced: z/OS V2R2.

Reference Information:

- *z/OS HCD User's Guide*

PCIe UID support

Description: To provide the ability to enable/disable UID-checking for a logical partition a new attribute (UID) for PCIe functions is introduced and works in combination with the new partition attribute

(uniqueness flag). A function has a unique UID if there is no other PCIe function accessible by the same partition that has the same UID defined.

When change was introduced: z/OS V2R2.

Reference Information:

- *z/OS HCD User's Guide*

Processor support

Description: HCD supports the IBM z13 processor family with UID support:

- processor types 2964-N30, -N63, -N96, -NC6, -NE1 (new support level H160930)
- processor types 2964-L30, L63, -L96, -LC6, -LE1 (supported level H160930)
- processor types 2965-N10 and N20 (support level H160930)
- processor types 2965-L10 and L20 (support level H160930)

When change was introduced: z/OS V2R2.

Reference Information:

- *z/OS HCD User's Guide*

Support of new PCIe functions

Description: Two new PCIe function types are supported - ISM and RCE.

1. An ISM (Internal Shared Memory) network adapter allows a virtual PCIe function requiring a unique VCHID with up to 255 virtual function Ids. The ISM network adapter allows one PNETID to be specified which has to be identical for all virtual functions of a VCHID.
2. An RCE (Regional Crypto Enablement) function is used for all IBM approved vendor crypto adapters.

When change was introduced: z/OS V2R2.

Reference Information:

- *z/OS HCD User's Guide*

PCIe enhancement

Description: The definition of PCIe functions for virtual functions of an adapter is now easier because 'Add PCIe function' offers a new field 'Number of virtual function' which helps to define multiple functions for one CHID at a time by incrementing the Virtual Function ID.

When change was introduced: z/OS V2R2.

Reference Information:

- *z/OS HCD User's Guide*

Validation enhancement

Description: At Build production time it is checked if for those PCIe functions using PNETIDs a channel path exists which is accessing at least one identical LPAR and has the same PNETID defined. Chpids and PCIe functions requiring a VCHID (currently CHPIDs of type IQD and functions of type ISM) now require a processor unique PNETID.

When change was introduced: z/OS V2R2.

Reference Information:

- *z/OS HCD User's Guide*

Processor support

Description: HCD supports the IBM z13 processor family:

- processor types 2964-N30, -N63, -N96, -NC6, -NE1 (new support level H160310)
- processor types 2964-L30, -L63, -L96, -LC6, -LE1 (support level H160310)
- processor types 2965-N10 and N20 (support level H160310)
- processor types 2965-L10 and L20 (support level H160310).

When change was introduced: z/OS V2R2.

Reference Information:

- *z/OS HCD User's Guide*

HCM new functions to consider

New function for Hardware Configuration Manager (HCM).

PCIe function enhancement

Description:HCM supports a new attribute for PCIe function called PCIe UID, which is combination with a new partition attribute called UID uniqueness checking flag.

HCM supports creating multiple-PCIe function in one step.

When change was introduced: z/OS V2R2.

Reference Information:

- *z/OS and z/VM HCM User's Guide*

Partition enhancement

Description: HCM supports a new attribute for partition on the appropriate processor called UID uniqueness checking flag.

- To partitions with UID=NO, meaning that UID checking for the partition is disabled. You can assign PCIe functions with any UID value, even duplicated ones. Specifying a UID for these PCIe functions is optional.
- To partitions with UID=YES, meaning that UID checking for the partition is enabled. You can assign only PCIe functions that have a UID defined and all UIDs need to be unique in the scope of that partition.
- For a processor, you can have a mix of partitions with and without UID checking.

When change was introduced: z/OS V2R2.

Reference Information:

- *z/OS and z/VM HCM User's Guide*

Processors support

Description: HCM supports a new support level for the IBM z13 processor family (processor types 2964-N30, -N63, -N96, -NC9, -NE1) and a new processor family (processor types 2965-N10, -N20).

When change was introduced: z/OS V2R2.

Reference Information:

- *z/OS and z/VM HCM User's Guide*

PCIe function enhancement

Description: Two new PCIe function types ISM and RCE are supported on the new support level for the z13 processor family and the new processor family. The PCIe functions of type ISM require a virtual function number and a virtual channel ID (VCHID) instead of PCHID, and allow only 1 PNET ID for its external physical network assignments.

When change was introduced: z/OS V2R2.

Reference Information:

- *z/OS and z/VM HCM User's Guide*

LinuxONE support

Description: HCM supports a new support level for the existing processor type 2964 (the supported models are: L30, L63, L96, LC9, LE1) and a new support level for the new processor type 2695 (the supported models are L10, L20).

When change was introduced: z/OS V2R2.

Reference Information:

- *z/OS and z/VM HCM User's Guide*

IBM Tivoli Directory Server for z/OS new functions to consider

MFA Support

Description: Multi-factor Authentication (MFA) is a new feature of RACF. The SDBM backend of the LDAP server provides an interface to RACF so that RACF profiles can be managed remotely through LDAP protocols. This line item provides MFA support for SDBM. It includes the following three capabilities:

- Allows users to input MFA credentials to RACF through an LDAP simple bind.
- Allows a RACF administrator to alter, search, or compare MFA data in a user profile through SDBM.
- Allows a RACF administrator to add, alter, search, or compare MFA policy data in a resource profile through SDBM.

When change was introduced: z/OS V2R3

Reference information:

> *z/OS IBM Tivoli Directory Server Administration and Use for z/OS*
> *z/OS IBM Tivoli Directory Server Messages and Codes for z/OS*

Health Checks

Description: The objective of the IBM Health Checker for z/OS is to identify potential problems before they impact availability or cause outages. LDAP users will benefit from a z/OS Health Check that notifies them if they deploy large directories in a TDBM backend. This line item delivers a TDBM health check to notify users when DB2® REORG or RUNSTATS utilities should be run to avoid performance issues.

When change was introduced: z/OS V2R3

Reference information:

> *z/OS IBM Tivoli Directory Server Administration and Use for z/OS*
> *z/OS IBM Tivoli Directory Server Messages and Codes for z/OS*

FIPS Compliant

Description: This line item provides improved security capability in secure sockets communication within the LDAP server. Cryptographic Services System SSL augmented FIPS support to enable the specification

of a security strength level when FIPS mode is enabled. FIPS mode enablement is required when LDAP client and server communications are over an SSL/TLS protected TCP/IP socket connection.

When change was introduced: z/OS V2R3

Reference information:

> *z/OS IBM Tivoli Directory Server Administration and Use for z/OS*
> *z/OS IBM Tivoli Directory Server Client Programming for z/OS*
> *z/OS IBM Tivoli Directory Server Messages and Codes for z/OS*

Multi-Row Fetch

Description: This line item provides a performance enhancement to the LDAP server. A new configuration file option is included to enable the specification of a fetch size value in the retrieval of data from the TDBM database.

When change was introduced: z/OS V2R3

Reference information:

> *z/OS IBM Tivoli Directory Server Administration and Use for z/OS*

Support DB2 partitioning by Growth for ITDS TDBM and GDBM database

Description: This line item provides support for DB2 partitioning by Growth for TDBM and GDBM databases. A partition-by-growth table space is useful for those table spaces whose tables do not have a suitable partitioning key, but are expected to exceed the 64 GB limit that has been in place for simple or segmented table space. A partition-by-growth (PBG) table space can grow up to 128 TB.

When change was introduced: z/OS V2R3

Reference information:

> *z/OS IBM Tivoli Directory Server Administration and Use for z/OS*
> *z/OS IBM Tivoli Directory Server Messages and Codes for z/OS*

Prevent visibility of sensitive data in debug trace

Description: It provides a new approach to prevent the potential disclosure of sensitive data. With the appropriate security controls in place, a new console command allows these sensitive trace points to be enabled if the data is needed for diagnostic purposes.

When change was introduced: z/OS V2R3

Reference information:

> *z/OS IBM Tivoli Directory Server Administration and Use for z/OS*
> *z/OS IBM Tivoli Directory Server Messages and Codes for z/OS*

Replication of password policy operational attributes from read-only replica to supplier server

Description: Read-only replica password policy replication support provides consistent replication updates of password policy operational attributes on all servers when they are updated in a read-only server in a replication topology. As a result, this new feature reduces the opportunity for circumvention of password policies while it ensures functional equivalence across Tivoli Directory Server distributed and z/OS. A new attribute, **ibm-slapdReplicateSecurityAttributes**, is added to cn=replication, cn=configuration for it to enable this feature.

When change was introduced: z/OS V2R2

Reference information:

> *z/OS IBM Tivoli Directory Server Administration and Use for z/OS*

z/OS IBM Tivoli Directory Server Messages and Codes for z/OS

Dynamic group performance and scalability improvements

Description: The support for dynamic groups is redesigned to improve performance when determining a user's groups. Scalability is improved, allowing administrators to define a large number of dynamic groups without experiencing performance issues.

This improvement is automatically enabled. No configuration task is necessary.

When change was introduced: z/OS V2R2

Reference information:

z/OS IBM Tivoli Directory Server Administration and Use for z/OS

Activity log enhancements

Description: z/OS Tivoli Directory Server provides the following enhancements to activity logging:

- Additional client events are now logged. This includes connect, disconnect, abandon requests, and unknown requests.
- Additional data is provided in existing log records. This includes attribute names in add requests, attribute names, and modification operation type in modify requests, and message ID in all request records.
- Improved consistency between the data that is captured in activity logging and SMF auditing.
- Versioning of the activity log record contents to avoid compatibility and migration issues when functional enhancements change the data contents of the activity log.
- Additional configuration options, eliminating the need to use environment variables to control some of the configuration options.

When change was introduced: z/OS V2R2

Reference information:

z/OS IBM Tivoli Directory Server Administration and Use for z/OS
z/OS IBM Tivoli Directory Server Messages and Codes for z/OS

Server compatibility level upgrade with no downtime

Description: This support allows improved availability when migrating new function across a sysplex. To update the **serverCompatLevel** or backends in a sysplex group without LDAP service outage, a run mode (transition mode) is now added. The LDAP instance can now be started in transition mode and continue to be operational while others are updated and recycled. In transition mode, the server can be started successfully with the updated **serverCompatLevel** or backends configurations. Transition mode is a temporary work mode that is used during sysplex level configuration updates.

When change was introduced: z/OS V2R2

Reference information:

z/OS IBM Tivoli Directory Server Administration and Use for z/OS
z/OS IBM Tivoli Directory Server Messages and Codes for z/OS

ICKDSF new functions to consider

This topic describes new functions in ICKDSF.

SPID fencing

Description: ICKDSF adds a SPID parameter to the CONTROL command, which lets you clear the SPID fenced state for a device or devices.

When change was introduced: z/OS V2R2

Reference information: *Device Support Facilities (ICKDSF) User's Guide and Reference*.

Infoprint Server new functions to consider

This topic describes z/OS Infoprint Server enhancements.

Dynamic tracing

The Infoprint Server trace facility now adjusts trace parameters dynamically while the daemon is running.

Description:
As an option, the trace facility for Infoprint Server can use cross-system coupling facility (XCF) signaling to adjust trace parameters dynamically while the target daemon is running. The dynamic trace facility uses new trace fields in the ISPF System Configuration panel or new PIDU attributes instead of environment variables to start or stop tracing for Infoprint Server daemons. With dynamic tracing, users do not need to change environment variables and then stop and restart one or more Infoprint Server daemons.

When change was introduced:
z/OS V2R3.

Reference information:

- *z/OS Infoprint Server Customization*
- *z/OS Infoprint Server Messages and Diagnosis*
- *z/OS Infoprint Server Operation and Administration*

IP PrintWay backup printer capability

You can now use IP PrintWay extended mode to define printer definitions for backup printers.

Description:
The print administrator can use IP PrintWay extended mode to define a backup printer in case a print failure occurs on the primary printer. The backup printer is defined in ISPF printer definition panels or PIDU.

When change was introduced:
z/OS V2R3.

Reference information:

- *z/OS Infoprint Server Customization*
- *z/OS Infoprint Server Operation and Administration*
- *z/OS Infoprint Server User's Guide*

Infoprint Central enhancements

The Infoprint Central user interface has been updated with usability and accessibility enhancements.

Infoprint Central enhancements for V2R3

Description:
The Infoprint Central user interface is updated with these enhancements in V2R3:

- The user interface now includes support for Microsoft Edge 25 or later.
- You can now search for up to eight FORMS names on the Work with Print Jobs page.

When change was introduced:
z/OS V2R3.

Reference information:

- *z/OS Infoprint Server Operation and Administration*

Infoprint Central enhancements for V2R2

Description:
The Infoprint Central user interface is updated with these enhancements in V2R2:

- The user interface is redesigned to follow IBM accessibility and usability standards, and now includes support for Mozilla Firefox.
- The IBM HTTP Server powered by Domino that Infoprint Central previously used is replaced with the IBM HTTP Server - Powered by Apache.
- You can now display TSO output jobs in the list of print jobs from a search. This function is available when the **Operating mode** field is set to z/OS 2.2 on the ISPF System Configuration panel.
- The System Status page now displays a table with the component, XCF member name, job name, system, and state when the **Operating mode** field is set to z/OS 2.2.
- Job selection rules are now accessed from the menu bar rather than the System Status page.

When change was introduced:
z/OS V2R2.

Reference information:

- *z/OS Infoprint Server Customization*
- *z/OS Infoprint Server Operation and Administration*

Sendmail to CSSMTP bridge

IP PrintWay now uses the sendmail to Communications Server SMTP (CSSMTP) bridge that z/OS V2R3 provides.

Description:
The sendmail program that IP PrintWay used is now replaced with a sendmail bridge that uses Communications Server SMTP (CSSMTP) as the mail transport. Programming changes are not required; however, the sendmail bridge does not support these functions:

- Email delivery to local TSO and UNIX System Services mailboxes.
- The –m option on the **lp** command.

Also, only a limited number of options are supported by the AOPMAILER_OPTIONS environment variable that the sendmail bridge uses.

When change was introduced:
z/OS V2R3.

Reference information:

- *z/OS Infoprint Server Customization*
- *z/OS Infoprint Server Messages and Diagnosis*
- *z/OS Infoprint Server Operation and Administration*
- *z/OS Infoprint Server User's Guide*

TSO/E 8-character user IDs

Description:
Infoprint Server now supports 8-character TSO/E user IDs.

When change was introduced:
z/OS V2R3.

Serviceability enhancements

Infoprint Server now supports a data element that lets you decide whether new product functions are activated during or after installation.

Description:
To minimize migration actions when a new z/OS release is installed, Infoprint Server now supports a data element that lets you decide whether new product functions are activated during or after installation. You can set the **Operating mode** field on the ISPF System Configuration panel or the **ipsmode** attribute in the PIDU command to the product function level that you want Infoprint Server to operate with.

When change was introduced:
z/OS V2R2.

Reference information:

- *z/OS Infoprint Server Customization*
- *z/OS Infoprint Server Operation and Administration*

Start and stop Infoprint Server daemons

z/OS Infoprint Server gives you the ability to start and stop individual daemons on a single processor.

Description:
Infoprint Server runs as multiple daemons on a single processor with a master daemon that starts and stops the other daemons as necessary. Infoprint Server now gives you the ability to start and stop individual daemons on a single processor when the **Operating mode** field is set to z/OS 2.2.

When change was introduced:
z/OS V2R2.

Reference information:

- *z/OS Infoprint Server Customization*
- *z/OS Infoprint Server Operation and Administration*

TSO/E command for controlling printers

Infoprint Server now supports a TSO/E command, AOPCMND, that can start and stop IP PrintWay extended mode printers from TSO.

Description:
Infoprint Central was previously the primary method that is used to start and stop Infoprint Server printers. Infoprint Server now supports a TSO/E command, AOPCMND, that can start and stop IP PrintWay extended mode printers from TSO.

Some advantages of using the TSO/E AOPCMND command are:

- You can control IP PrintWay extended mode printers without implementing the Infoprint Central component that runs under the IBM HTTP Server - Powered by Apache.
- You can migrate from a non-IBM print application to Infoprint Server.

When change was introduced:
z/OS V2R2.

Reference information:

- *z/OS Infoprint Server Customization*
- *z/OS Infoprint Server Operation and Administration*

Variable inline email message

You can now use Infoprint Server to customize email messages with personalized inline text.

Description:
You can now use Infoprint Server to customize email messages with personalized inline text.

Some advantages of using a variable inline email message are:

- By using an existing text job attribute, such as **name-text**, you can include a text string at the beginning of each email before an inline message. For example, if `name-text="Mr. Jones"`, then `Mr. Jones` is included on the first line in the email.
- You can also now specify the existing **mail_inline_message** printer attribute as a job attribute so you can send a unique message for the job.

When change was introduced:
z/OS V2R2.

Reference information:
See *z/OS Infoprint Server User's Guide*.

Integrated Security Services new functions to consider

For Security Services, see "Security Server (RACF) new functions to consider" on page 104. Also see "Cryptographic Services new functions to consider" on page 53.

ISPF new functions to consider

TSO 8-character user ID enhancement

Description:
This enhancement provides ISPF support for the expansion of the TSO user ID from a maximum of 7 characters to a maximum of 8 characters. User ID and prefix values that are up to 8 characters in length are supported.

Introduced:
z/OS V2R3

Reference information:

- See the topic about "Member list display panel fields" in *z/OS ISPF User's Guide Vol I*.
- See the topics about "General ISPF Settings Panels" and "Miscellaneous settings" in *z/OS ISPF Planning and Customizing*.
- See the topics about the "LMMADD, LMMDISP, LMMFIND, LMMREP, and LMMSTATS services" in *z/OS ISPF Services Guide*.
- See the topic about "ISPF statistics entry in a PDS directory" in *z/OS ISPF Dialog Developer's Guide and Reference*.

Extended statistics usability enhancement

Description:
This enhancement provides automatic generation of PDS member extended statistics when at least one of the line count values for the member exceeds 65535. Non-extended statistics are automatically generated when none of the line count values for the member exceed 65535. The ability to request extended statistics for a member is removed.

Introduced:
z/OS V2R3

Reference information:

- See the topics about "ISPF member statistics" and "Member list display panel fields" in *z/OS ISPF User's Guide Vol I*.
- See the topic about "Edit site-wide profile customizations" in *z/OS ISPF Planning and Customizing*.
- See the topic about "STATS—Generate Library Statistics" in *z/OS ISPF Edit and Edit Macros*.

- See the topics about the "LMMADD, LMMDISP, LMMFIND, LMMREP, and LMMSTATS services" in *z/OS ISPF Services Guide*.

EDIF and VIIF services enhancement to support an edit line command table

Description:
The name of a line command table can now be provided on calls to the EDIF and VIIF services.

Introduced:
z/OS V2R2

Reference information:
See the topics about "EDIF—Edit interface" and "VIIF—View interface" in *z/OS ISPF Services Guide*.

Browse enhancement to display the RDW of variable records

Description:
This enhancement introduces a new browse command to allow the record descriptor word (RDW) to be displayed for variable length records.

Introduced:
z/OS V2R2

Reference information:
See the topic about "DISPLAY—control the display" in *z/OS ISPF User's Guide Vol II*.

Browse enhancement to increase the record number limit

Description:
This enhancement increases the number of records that Browse can process beyond 99,999,999.

Introduced:
z/OS V2R2

Reference information:
See the topic about "LOCATE—locate lines" in *z/OS ISPF User's Guide Vol II*.

See the topic about "BRIF—Browse interface" in *z/OS ISPF Services Guide*.

Global configuration option to define a default line command table

Description:
This enhancement provides a configuration table option to define a global line command table that is active when a line command table is not otherwise specified.

Introduced:
z/OS V2R2

Reference information:
See the topic about "Edit-related settings" in *z/OS ISPF Planning and Customizing*.

DTL compiler enhancement to use the system variable ZISPFRC

Description:
This enhancement allows the DTL compiler to influence JCL step return codes by using the ZISPFRC variable.

Introduced:
z/OS V2R2

Reference information:
See the topic about "Conversion Utility Syntax" in *z/OS ISPF Dialog Tag Language Guide and Reference*.

Global configuration option to disable the editor PACK operation

Description:
This enhancement provides a configuration table option to disable the PACK operation used by the editor. Any currently packed data is unpacked if saved. PACK is disabled from having any effect with the COPY and MOVE services.

Introduced:
z/OS V2R2

Reference information:
See the topic about "Edit-related settings" in *z/OS ISPF Planning and Customizing*.

ISPSTART command enhancement to support an initial command stack on the OPT parameter

Description:
This enhancement allows an initial command stack variable to be specified on the OPT parameter of the ISPSTART command. ZSTART is supported as a default variable, and BASIC is supported as an override of a defined ZSTART variable.

Introduced:
z/OS V2R2

Reference information:
See the topic about "Syntax for issuing the ISPSTART command" in *z/OS ISPF Dialog Developer's Guide and Reference*.

CONTROL service enhancement for left and right scroll commands

Description:
This enhancement provides a service to request that the left and right scroll commands are not processed by ISPF and instead are passed through to the dialog for processing.

Introduced:
z/OS V2R2

Reference information:

- See the topic about "CONTROL services" in *z/OS ISPF Dialog Developer's Guide and Reference*.
- See the topic about "CONTROL—set processing modes" in *z/OS ISPF Services Guide*.

Interactive ISPF Gateway

Description:
This enhancement provides a new ISPF gateway that supports interactive communication and manages the TSO/E sessions using z/OS CEA TSO/E address space services.

Introduced:
z/OS V2R2

Reference information:
See the topic about "Interactive ISPF Gateway" in *z/OS ISPF Planning and Customizing*.

Enhancements for using the ISPF Gateway with IBM HTTP Server - Powered by Apache

Description:
The IBM HTTP server powered by Domino is no longer provided after z/OS V2R1. Support is provided for running the gateway under the IBM HTTP Server - Powered by Apache.

Introduced:
z/OS V2R2

Reference information:
See the topic about "Customizing the gateway calling environment" in *z/OS ISPF Planning and Customizing*.

z/OS UNIX file system support in ISPF

Description:
This enhancement adds to ISPF 3.17 support that is similar to what is provided under the ISHELL File_Systems menu. This includes the ability to mount a z/OS UNIX file system, display and work with the mounted file systems, create a zFS data set, and display and work with attached zFS aggregates.

Introduced:
z/OS V2R2

Reference information:
See the topic about "z/OS UNIX Mounted File Systems" in *z/OS ISPF User's Guide Vol II*.

Remove BookManager/Build from ISPF z/OS Applications menu

Description:
The BookManager/Build product is no longer delivered by IBM after z/OS V2R1. This product was accessed through ISPF Primary Option 13.1.

Introduced:
z/OS V2R2

Removal of extraneous commands from the ISPF TSO command table

Description:
The COPY, FORM, FORMAT, LIST, MERGE, and PASCALVS commands are removed from the ISPF TSO command table.

Introduced:
z/OS V2R2

JES2 new functions to consider

This topic describes new JES2 functions in z/OS.

JES2 email support

Description: JES2 now accepts an email address instead of a user name in JCL for jobs and job groups. JES2 also now allows email as additional delivery method for job notification messages and messages that are sent by the Notify user message service. In addition, JES2 now accepts password phrases for user authentication in JCL for jobs and job groups.

When change was introduced: z/OS V2R3

Reference information:

z/OS JES2 Commands.
z/OS JES2 Initialization and Tuning Guide.
z/OS JES2 Initialization and Tuning Reference.
z/OS JES2 Messages.
z/OS MVS JCL Reference.

JCL Simplification

Description: JES2 is adding support for longer character DLM= and two new JCL symbols, &SYSJOBNM and &SYSJOBID. The length is increased from 2 characters to at least 8 characters.

When change was introduced: z/OS V2R3

Reference information:

z/OS JES Application Programming.
z/OS MVS JCL Reference.

Dynamic groups added

Description: JES2 is adding support for dynamic groups by using the SCHEDULE card. This support provides the ability to run a job before or after another job.

When change was introduced: z/OS V2R3

Reference information:

z/OS MVS JCL Reference.

Managing JES2 resources

Description: JES2 is expanding how it manages some of its resources that an installation might need to run workloads on its systems, specifically, tracking use of resources. JES2 is also adding support for a privileged user to have access to resources during a shortage so actions can be taken to resolve the shortage.

When change was introduced: z/OS V2R3

Reference information:

z/OS JES2 Commands.
z/OS JES2 Messages.

JES3 JECL support

Description: JES2 is adding more JECL support to reduce the JECL conversion needed to run jobs originally coded for the JES3 environment in a JES2 environment. This support also helps to identify the use of JES2 and JES3 JECL statements by using the jobname.

When change was introduced: z/OS V2R3

Reference information:

z/OS JES2 Messages.

JES2 growth and job limits

JES2 increases the limit of the number of jobs that can be resident on SPOOL.

Description:
The JES2 limit for the number of jobs that can be resident on SPOOL has increased and accordingly job queue elements (JQEs), job output element (JOEs) and block extension reuse tables (BERTs) have new size limits:

JQE = 1,000,000
JOE = 2,500,000
BERT = 2,500,000

To take advantage of the full-function level of z/OS V2R2 JES2, you must use the new z22 mode on the **$ACTIVATE** command.

When change was introduced:
z/OS V2R2.

Reference information:

- *z/OS Migration*
- *z/OS Summary of Message and Interface Changes*
- *z/OS JES2 Installation Exits*.
- *z/OS JES2 Commands*.
- *z/OS JES2 Initialization and Tuning Guide*.
- *z/OS MVS Using the Subsystem Interface*.

- *z/OS JES2 Messages*.

JES2 updates the job execution control interface

JES2 adds function to make it easier to write JCL jobs that run in a specific order without the need for an external job scheduling package. Though not intended to replace job scheduler, this function simplifies breaking down large complex multistep jobs into multiple jobs that can eventually be placed under the control of a job scheduler. It is also intended to ease applications that can analyze JCL while it is being submitted and break down the steps into separate, dependent jobs. This function helps users that are running both JES3 and JES2 by providing similar functions as the JES3 dependent job control (DJC) in the JES2 environment.

Description:
JES2 Job execution controls (JEC) provide similar functions as the JES3 dependent job control (DJC) in the JES2 environment to simplify the decomposing of a multistep batch job into multiple single-step jobs. This function helps increase parallel execution of job steps and because of that improves the batch processing window. To use JEC, the new z22 mode must be set on the **$ACTIVATE** command.

When change was introduced:
z/OS V2R2.

Reference information:

- *z/OS JES2 Commands*.
- *z/OS JES2 Initialization and Tuning Guide*.
- *z/OS JES2 Messages*.
- *z/OS MVS JCL Reference*.
- *z/OS MVS Using the Subsystem Interface*.
- *Network Job Entry (NJE) Formats and Protocols*.

JES2 deadline scheduling

JES2 provides functions to hold jobs until a specified time and to make jobs more likely to start running by a specified time.

Description:
JES2 adds support for the new SCHEDULE JCL statement with parameters **HOLDUNTL** and **STARTBY**. Use **HOLDUNTL** to hold the job until the specified time. Use **STARTBY** to move the job forward in the queue (increasing its priority, if needed) to make it more likely to start by the specified time.

When change was introduced:
z/OS V2R2.

Reference information:

- *z/OS JES2 Commands*.
- *z/OS JES2 Initialization and Tuning Guide*.
- *z/OS MVS JCL Reference*.
- *z/OS MVS Using the Subsystem Interface*.
- *Network Job Entry (NJE) Formats and Protocols*.

JES2 adds step completion code

JES2 adds a step completion code and records data in the EVENTLOG data set.

Description:
JES2 adds a step completion code to enable applications to access information about the return codes of every job step. To do so JES2 added a new internal data set that contains information about the execution of each step that is associated with a job. To ease access for an application developer or

the installation to extract the SMF records for a job, JES2 provides the data set and recording capabilities along with the ability to suppress SMF data in the EVENTLOG data set.

To control the volume of data collection, commands **$D JOBDEF** and **$T JOBDEF** support a new parameter **SUP_EVENTLOG_SMF** that indicates whether EVENTLOG SMF data can be suppressed. **SUP_EVENTLOG_SMF** defaults to NO.

When change was introduced:
z/OS V2R2.

Reference information:

- *z/OS JES2 Commands*.
- *z/OS JES2 Initialization and Tuning Guide*.
- *z/OS JES Application Programming*.

JES3 new functions to consider

This topic describes new JES3 functions in z/OS.

JES3 support for 8-character TSO/E user IDs

Description: JES3 supports the use of 8-character TSO/E user IDs. In prior releases, TSO/E has been limited to 7-character user IDs.

When change was introduced: z/OS V2R3

Reference information:

z/OS JES3 Messages
z/OS MVS JCL Reference.

JES3 Common JCL

Description: JES3 supports the PROCLIB keyword for the JCLLIB statement so you can specify the JES3 concatenation to be used for a job, and supports the MERGE and DDNAME keywords of the OUTPUT statement.

When change was introduced: z/OS V2R2.

Reference information:

z/OS JES3 Commands
z/OS JES3 Initialization and Tuning Guide
z/OS JES3 Initialization and Tuning Reference
z/OS JES3 Messages
z/OS MVS JCL Reference.

JES3 Data set integrity

Description: JES3 adds protection against JES3 data sets being manipulated or deleted while JES3 is using them by adding new function that interrogates the DSI/NODSI setting for JES3 and JES3 C/I FSS and propagating the setting to all dynamic allocations.

When change was introduced: z/OS V2R2.

Reference information:

z/OS JES3 Initialization and Tuning Guide
IBM Health Checker for z/OS User's Guide.

JES3 JECL Tracking

Description: JES3 adds support to use the z/OS Generic Tracker to help identify JES3 JECL statements. This supports migration from JES3 to JES2 by helping to write non-specific JES JCL.

When change was introduced: z/OS V2R2.

Reference information:

z/OS JES3 Diagnosis
z/OS MVS Diagnosis: Tools and Service Aids
z/OS MVS JCL Reference.

JES3 Output disposition (OUTDISP)

Description: JES3 adds support for the output disposition (OUTDISP) parameter of the JCL OUTPUT statement making managing output data sets easier.

When change was introduced: z/OS V2R2.

Reference information:

z/OS JES3 Commands
z/OS JES3 Customization
z/OS JES3 Diagnosis
z/OS JES3 Initialization and Tuning Guide
z/OS JES3 Initialization and Tuning Reference
z/OS JES3 Messages
z/OS MVS Programming: Assembler Services Guide
z/OS MVS JCL User's Guide
z/OS MVS JCL Reference
Network Job Entry (NJE) Formats and Protocols.

JES3 Scaling of workloads

Description: JES3 adds support for a larger number of job spool files and additional functional enhancements needing additional job-specific data on spool.

When change was introduced: z/OS V2R2.

Reference information:

z/OS JES3 Commands
z/OS JES3 Customization
z/OS JES3 Diagnosis
z/OS JES3 Diagnosis Reference
z/OS JES3 Initialization and Tuning Reference
z/OS JES3 Messages
IBM Health Checker for z/OS User's Guide.

JES3 Symbolics

Description: JES3 adds support for symbol processing which allows JCL and system symbols to be accessible during job execution. This makes JCL and system symbols easier to use in multiple environments.

When change was introduced: z/OS V2R2.

Reference information:

z/OS JES3 Commands
z/OS JES3 Diagnosis

> *z/OS JES3 Diagnosis Reference*
> *z/OS JES3 Messages*
> *z/OS MVS System Codes*.

Language Environment new functions to consider

This topic describes new Language Environment functions in z/OS.

Japanese New Era support

Description:
Previously, the Japanese era was Heisei. As of 1 May 2019, the era is Reiwa. Updates were made to the set of date and time services that support the Japanese calendaring scheme.

Release introduced:
z/OS V2R3 with the PTF for APAR PH05611 applied.

Reference information:
z/OS Language Environment Programming Reference

Year 2038/2040 support

Description:
Support was added for POSIX time values beyond year 2038 and z/OS time-of-day values beyond year 2042.

Release introduced:
z/OS V2R3

Reference information:
z/OS Language Environment Debugging Guide

z/OS Language Environment Vendor Interfaces

z/OS XL C/C++ Runtime Library Reference

Detecting buffer overflows

Description:
Stack guards now enhance the security of Language Environment programs by aiding in the detection of buffer overflows and preventing them from causing program misbehavior or from becoming serious security vulnerabilities.

Release introduced:
z/OS V2R3

Reference information:
z/OS Language Environment Programming Guide

z/OS Language Environment Debugging Guide

z/OS Language Environment Programming Guide for 64-bit Virtual Addressing Mode

z/OS Language Environment Vendor Interfaces

z/OS XL C/C++ Programming Guide

64-bit support for Enterprise PL/I

Description:
Previously, Language Environment did not provide 64-bit support for Enterprise PL/I. In V2R3, this support is provided with new 64-bit compiler writer interfaces (CWIs) and 64-bit event handlers. (64-bit support for Enterprise PL/I is provided in V2R2 with appropriate service level.)

Release introduced:
z/OS V2R3

Recording information for an active condition

Description: Previously, the condition information block (CIB) did not allow the recording of the data set name of a dump that was gathered for a condition. In V2R2, information for an active condition can be recorded so that the information can be retrieved later from the CIB.

When change was introduced: z/OS V2R2.

Reference information:

- *z/OS Language Environment Programming Reference*
- *z/OS Language Environment Debugging Guide*

Providing support for delayed debug

Description: In V2R2, Language Environment, with the z/OS XL C/C++ compiler, provides support to allow a programmer to delay the start of the debugger until a C language function of interest receives control.

When change was introduced: z/OS V2R2.

Reference information:

- *z/OS Language Environment Debugging Guide*
- *z/OS Language Environment Vendor Interfaces*

Metal C Runtime Library new functions to consider

This topic describes new Metal C Runtime Library functions in z/OS.

Prefix data block

Description:

The Metal C compiler sets two new flags and adds two new optional fields in the prefix data block. The flag on bit 2 in Flag Set 4 indicates the presence of the optional field that contains the offset of the end of current CSECT. The flag on bit 3 in Flag Set 4 indicates the presence of the optional field that contains the offset of the debug data block.

Release introduced:

z/OS V2R3

Reference information:

z/OS Metal C Programming Guide and Reference

Debug data block

Description:

A new debug data block is added for each CSECT, which can be used to check whether the debug side file matches the object file. The debug data block contains the debug data block signature, size of the debug data block, reserved bytes, MD5 signature, Metal C source file name, and debug side file name.

Release introduced:

z/OS V2R3

Reference information:

z/OS Metal C Programming Guide and Reference

Metal C function descriptors

Description:

You can declare a function pointer with the new `__fdptr` keyword so that this function pointer points to a Metal C function descriptor. Metal C function descriptors can point to and call functions with their own set of associated data for the particular program or invocation.

Release introduced:
z/OS V2R3

Reference information:
z/OS Metal C Programming Guide and Reference

Library Server new functions to consider

This topic describes new Library Server functions in z/OS.

IBM Knowledge Center for z/OS

Description:
z/OS V2R2 includes an SMP/E installable version of IBM Knowledge Center for z/OS. Softcopy Librarian, available as a download, is enhanced to make it easy to manage and update the Knowledge Center document content in a z/OS repository for IBM Knowledge Center for z/OS.

Use IBM Knowledge Center for z/OS to perform IBM Knowledge Center functions using your own local document repository, which is especially valuable for:

• Security reasons for enterprises with no Internet access

• As a valuable backup for enterprises when Internet access is disrupted

• Personalizing or controlling the content of an enterprise library

IBM Library Server continues as an element of z/OS to manage BookManager and PDF files.

Introduced
z/OS V2R2.

Reference information:

• Download IBM Softcopy Librarian (www.ibm.com/support/docview.wss?uid=swg27018846).

• *z/OS Planning for Installation*

• *z/OS Migration*

NFS new functions to consider

This topic describes new Network File System (NFS) functions in z/OS.

chkloop site attribute

Description: This site attribute enables/disables NFS Error Client Loop Detection Facility and sets the values of the site attributes LOOPTHRESHOLD(x) and TIMETHRESHOLD(y).

When change was introduced: z/OS V2R3

Reference information: *z/OS Network File System Guide and Reference*

loopthreshold site attribute

Description: This site attribute detects a loop situation, identifies the remote system causing the loop and issues series of GFSA1036E console error messages.

When change was introduced: z/OS V2R3

Reference information: *z/OS Network File System Guide and Reference*

enhmaplower attribute

Description: This attribute maps PDS/PDSE member names to upper case when received from the client in an NFS request in lower case.

When change was introduced: z/OS V2R3

Reference information: *z/OS Network File System Guide and Reference*

exportchk operand

Description: This **modify** command operand checks the Exports file about export and checklist values without rebuilding the new export list.

When change was introduced: z/OS V2R3

Reference information: *z/OS Network File System Guide and Reference*

z/OS NFS Client AMODE64 or LP64

Description: This relieves the 2GB client address space constraints, improves scalability and complies with larger and wider data flow from end-to-end.

When change was introduced: z/OS V2R2

Reference information: *z/OS Network File System Guide and Reference*

z/OS NFS Client mount option for UNSTABLE NFSv4 write

Description: This prevents z/OS NFS Client from running out of memory, without impacting NFS Server sides performance.

When change was introduced: z/OS V2R2

Reference information: *z/OS Network File System Guide and Reference*

Cache for UID/GID name mapping

Description: This improves performance of NFS version 4 by UID/GID caching thus reducing number of RACF calls.

When change was introduced: z/OS V2R2

Reference information: *z/OS Network File System Guide and Reference*

z/OS NFS BPXMTEXT support

Description: The BPXMTEXT command tool customers rely on to diagnose problems by displaying reason codes with error messages now also supports z/OS NFS reason codes.

When change was introduced: z/OS V2R2

Reference information: *z/OS Network File System Guide and Reference*

z/OS NFS Server Ctrace without MODESET SVT

Description: This improves z/OS NFS Server performance when some Ctrace options, including the option "ALL", are enabled.

When change was introduced: z/OS V2R2

Reference information: *z/OS Network File System Guide and Reference*

z/OS NFS Server persistent filehandle

Description: "alias" is now supported with z/OS NFS Exports List. This reduces filehandle recovery instances requiring customers intervention.

When change was introduced: z/OS V2R2

Reference information: *z/OS Network File System Guide and Reference*

z/OS NFS crosscheck Site Attribute vs Checklist

Description: z/OS NFS Server now detects and warns about conflicting checklist entries between site attribute and export list.

When change was introduced: z/OS V2R2

Reference information: *z/OS Network File System Guide and Reference*

Add timestamp to error logs and capability to retain latest error log data

Description: z/OS NFS is improved to retain latest error log data by start writing to the oldest error log. Timestamp is added to error logs assisting problem analysis.

When change was introduced: z/OS V2R2

Reference information: *z/OS Network File System Guide and Reference*

Display NFS version 4 domain

Description: z/OS NFS Server now returns the default domain from z/OS TCPIP when nfsv4domain site attribute is not specified.

When change was introduced: z/OS V2R2

Reference information: *z/OS Network File System Guide and Reference*

CONSOLEMSGS operand

Description: This operand specifies the number of messages for NFS operator commands: LIST=MOUNTS, LIST=DSNAMES, LISTLOCK will print on the console. It does not impact on console output of other NFS operator commands including VERSION=ALL.

When change was introduced: z/OS V2R2

Reference information: *z/OS Network File System Guide and Reference*

Ctrace buffer size

Description: This operand provides the ability to dynamically change Ctrace buffer sizes.

When change was introduced: z/OS V2R2

Reference information: *z/OS Network File System Guide and Reference*

Resource Measurement Facility (RMF) new functions to consider

The following topic provides an overview of the new features, functions, and support for Resource Measurement Facility (RMF) that are available in z/OS V2R3 and V2R2.

New features, functions, and support for z/OS V2R3

Resource Measurement Facility (RMF) provides these new features, functions, and support in z/OS V2R3.

Enhanced Crypto Hardware Activity report

RMF has enhanced the Postprocessor Crypto Hardware Activity report to provide activity measurements from the Crypto Express6S (CEX6) card configured in one of these ways:

- Cryptographic CCA coprocessor

- Cryptographic PKCS11 coprocessor
- Cryptographic accelerator

When change was introduced: z/OS V2R3 (Also V2R2 with APAR OA50693)

Reference information:

See *z/OS RMF Report Analysis* for a description of this report.

See *z/OS MVS System Management Facilities (SMF)* for a description of the enhanced SMF record 70-2.

RMF support for monitoring and reporting of 2 GB memory frames

RMF support for the gathering and reporting of performance measurements collected for usage of 2 GB memory frames.

To expoit 2 GB memory frames, the Enhanced DAT Facility 2 (EDAT-2) must be available.

RMF has enhanced the following reports:

- Postprocessor Paging Activity report
- Postprocessor Virtual Storage Activity report
- Monitor III STORM Report

Following SMF records have been changed:

- SMF 70 to 79, RMF Product section.
- SMF 71, Paging Data section
- SMF 78 subtype 2, Virtual Storage Private Area Data section

New overview conditions have been added based on SMF record 71.

When change was introduced: z/OS V2R3 (Also V2R2 with APAR OA48913)

Reference information:

See *z/OS RMF Report Analysis* for a description of the reports.

See *z/OS MVS System Management Facilities (SMF)* for a description of the enhanced SMF record types 71 and 78.

Enhanced reporting of device numbers

In IBM zHyperWrite environments, RMF reports on PPRC Primary as well as on PPRC Secondary devices, which are configured for control unit based mirroring and software mirroring. In order to allow users to distinguish device addresses of PPRC Primary devices from those of PPRC Secondary devices, RMF displays 5-digit device numbers in most of the RMF device reports. The first digit of the device number represents the ID of the subchannel that the physically configured device is set to.

When change was introduced: z/OS V2R3

Reference information:

See *z/OS RMF User's Guide*.

See *z/OS RMF Programmer's Guide*.

See *z/OS RMF Report Analysis*.

See *z/OS MVS System Management Facilities (SMF)*.

RMF Synchronous I/O Link Support

RMF has enhanced its monitoring and reporting capabilities to cover zSynchronous I/O environments. It now gathers and provides performance data on synchronous data transfers to and from storage controllers via PCIE Synchronous I/O links and reports on the response times and data transfer rates of DASD devices actively performing synchronous I/O requests.

When change was introduced: z/OS V2R3 (Also V2R1 and V2R2 with APAR OA50755)

Reference information:

See *z/OS RMF Report Analysis* for a description of the affected reports.

See *z/OS MVS System Management Facilities (SMF)* for a description of the enhanced SMF records 74-1 and 74-9.

RMF SMF for CF Encryption Metrics

RMF has been enhanced to gather the Coupling Facility structure related metrics and to capture the metrics in SMF74 subtype 4 records. By providing the Coupling Facility read / write statistics in SMF 74 subtype 4 records, zBNA tooling can be used to predict the overhead of CF encryption and decryption, prior to actually turning on CF encryption.

When change was introduced: z/OS V2R3 (Also V2R2 with HRM77A0 SPE OA52003.)

Reference information:

See *z/OS RMF Report Analysis* for a description of the affected reports.

See *z/OS RMF Programmer's Guide*.

See *z/OS MVS System Management Facilities (SMF)* for a description of the enhanced SMF records 74-4.

RMF reporting enhancements for z14

RMF has been enhanced to ensure correct monitoring and reporting of new z14 hardware features:

- Multi-Threading support for SAPs,
- IBM Virtual Flash Memory support, and
- RoCE Express 2 support.

When change was introduced: z/OS V2R3 (Also V2R2 with APARs OA50761, OA50762, OA51913 and V2R1 with APARs OA50762, OA51913 and V1R13 with APAR OA51913)

Reference information:

See *z/OS RMF Report Analysis* for a description of the affected reports.

See *z/OS MVS System Management Facilities (SMF)* for a description of the enhanced SMF records 74-10 and 74-9.

RMF support for new WLM Policy attributes

RMF is enhanced with the introduction of WLM Specialty Engines Containment (also known as "HonorPriority by Service Class") and Memory Capping.

The following RMF reports are enhanced:

- Postprocessor WLMGL report.
- Monitor II ASD/ASDJ report.
- Monitor III Group report.
- Monitor III RG report.

The following SMF records are changed:

- SMF 72 subtype 3:

    Workload Manager Control section.
    Resource Group Data section

- SMF 72 subtype 4:

    Swap Reason Data section

- SMF 79 subtype 1:

    ASD and ASDJ Data section
- SMF 79 subtype 2:

    ARD and ARDJ Data section

The Monitor III Reporter Table ERBSUMT3 is enhanced.

When change was introduced: z/OS V2R3 RMF, z/OS V2R2 RMF, and z/OS V2R1 RMF with APAR OA50760.

Reference information:

See *z/OS RMF Programmer's Guide*.

See *z/OS RMF Report Analysis* for a description of the affected reports.

See *z/OS MVS System Management Facilities (SMF)* for the revised SMF 72-3 record.

RMF support for WLM Shorter Response Time Goals

RMF is enhanced to report on the changed WLM definition of performance goals for service classes. For service class periods with an average response time goal or a response time goal with percentile, the lowest goal which can be specified changes from 15 milliseconds to one millisecond, allowing to specify meaningful goal values for very fast running transactions.

RMF provides these shorter response time goals together with more precise transaction times in Monitor I and III, Postprocessor Reporting, in the Distributed Data Server and the Spreadsheet Reporter:

In detail:

- Extend SMF record type 72 subtype 3 (Workload Activity) to provide transaction elapsed and execution times in microseconds.
- Extend SMF record type 72 subtype 4 (Storage Data) to provide transaction execution and queued times in microseconds.
- Adapt the Postprocessor Workload Activity (WLMGL) reporting to present the response time goal, transaction times, and response time distributions with higher precision to reflect actual response times lower than one millisecond.
- Adapt the Monitor III SYSINFO, SYSRTD, SYSSUM, SYSWKM, and GROUP reports to display response time goals and actual response times with higher precision, i.e. in milliseconds.

When change was introduced: z/OS V2R3 RMF.

Reference information:

See *z/OS RMF User's Guide*.

See *z/OS RMF Programmer's Guide*.

See *z/OS RMF Report Analysis* for a description of the affected reports.

See *z/OS MVS System Management Facilities (SMF)* for the revised SMF 72-3 record.

New features, functions, and support for z/OS V2R2

Resource Measurement Facility (RMF) provides these new features, functions, and support in z/OS V2R2.

RMF support for asynchronous coupling facility structure duplexing

RMF now provides support for asynchronous coupling facility structure duplexing, which is a new Sysplex Services for Data Sharing (XES) protocol introduced as a performance enhancement for duplexed lock structures. This support includes enhancements to:

- Postprocessor Coupling Facility Activity report
- SMF record type 74 subtype 4

When change was introduced: APAR OA49148

Reference information:

See *z/OS RMF Report Analysis* for a description of the updated report.

See *z/OS RMF User's Guide* for a description of the new overview conditions.

See *z/OS MVS System Management Facilities (SMF)* for a description of the updated SMF record type 74.

RMF support for SuperPAV

RMF now provides support for SuperPAV, which is an extension of the HyperPAV architecture. This support includes enhancements to:

- Postprocessor I/O Queuing Activity report
- I/O Queuing Overview statements
- SMF record type 74 subtype 1
- SMF record type 78 subtype 3

When change was introduced: APAR OA49415

Reference information:

See *z/OS RMF Report Analysis* for a description of the updated report.

See *z/OS RMF User's Guide* for a description of the new overview statements.

See *z/OS MVS System Management Facilities (SMF)* for a description of the updated SMF records type 74 and 78.

RMF support for Converged Enhanced Ethernet (CEE) based coupling links

RMF now provides support for a new parallel sysplex coupling link for extended distance linkage in IBM z13. The new CHPID is called Coupling Express 10Gbe LR; its type is CL5. This support includes enhancements to:

- Postprocessor Coupling Facility Activity report
- Monitor III Coupling Facility Systems report
- SMF record type 74 subtype 4

When change was introduced: APAR OA48959

Reference information:

See *z/OS RMF Report Analysis* for a description of the updated reports.

See *z/OS MVS System Management Facilities (SMF)* for a description of the updated SMF records type 74.

RMF support for Shared Memory Communications-Direct Memory Access

RMF now provides support for the IBM z13 feature Shared Memory Communications – Direct Access Method (SMC – D), which is a communications protocol that exploits internal shared memory (ISM) virtual adapters for improved LPAR to LPAR communications. This support includes enhancements to:

- Monitor III Channel Path Activity report
- Postprocessor Channel Path Activity report
- Postprocessor PCIE Activity report
- Monitor III PCIE Activity report
- SMF records types 73 and 74

When change was introduced: APAR OA49113

Reference information:

See *z/OS RMF Report Analysis* for a description of the updated reports.

See *z/OS MVS System Management Facilities (SMF)* for a description of the updated SMF records types 73 and 74.

RMF support for mobile transactions

To simplify tracking of mobile workload consumption, z/OS Workload Management (WLM) introduces Workload Containers for Mobile Pricing measurements. These workload containers allow WLM administrators to classify transactions in the WLM service definition for specific subsystems (such as CICS or IMS) with a new attribute, called "Reporting Attribute", which can take any of these values:

- NONE for normal transactions. This is the default.
- MOBILE for mobile transactions.
- CATEGORYA for a first general purpose subset of transactions.
- CATEGORYB for a second general purpose subset of transactions.

WLM then gathers and accumulates the following CPU times:

- Transaction service units consumed on general purpose processors.
- Transaction service units consumed on specialty processors.
- Transaction service units consumed on general purpose processors, that were eligible for offload to specialty processors.

The CPU times are reported for all transactions and for transaction classified with the reporting attribute category:

- MOBILE
- CATEGORYA
- CATEGORYB

The WLM support is applicable to a wide range of workloads, including CICS or IMS work, as well as enclave work, such as Distributed Data Facility (DDF) or Websphere. The new measurements for all transactions and for transactions classified with the reporting attribute MOBILE, CATEGORYA, and CATEGORYB are gathered by RMF Monitor I and stored in SMF record type 72 subtype 3 in the Service/Report Class Period Data Section. The RMF Postprocessor Workload Activity XML and text reports are enabled to provide the new measurements. Additionally, system-wide aggregated normalized transaction service units consumption in MSU are available for the reporting categories MOBILE, CATEGORYA, and CATEGORYB, which are gathered by RMF Monitor I and stored in SMF record type 70 subtype 1 in the CPU Control Section. New Postprocessor overview conditions are added for the new measurements.

When change was introduced: APAR OA48466

Reference information:

- See *z/OS RMF Report Analysis* for a description of new and updated reports.
- See *z/OS MVS System Management Facilities (SMF)* for a description of the updated SMF record type 70 subtype 1 and SMF record type 72 subtype 3.

New or updated Monitor I, Monitor III, and Postprocessor reports for hardware group capping limits

z/OS RMF support for hardware group capping limits includes:

- RMF Monitor I collects the hardware group name in the PR/SM Partition Data Section and the hardware group capping limits in the PR/SM Logical Processor Data Section of SMF record 70 subtype 1.
- The RMF Postprocessor is enhanced to report all existing hardware groups and their capping limits.
- RMF Monitor III collects the hardware group name and the hardware group capping limits and exposes them in the RMF Distributed Data Server for exploiters like the RMF CIM Provider and z/OSMF.

When change was introduced: APAR OA48688

Reference information:

See *z/OS RMF Report Analysis* for a description of new and updated reports.

See *z/OS RMF User's Guide* for a description of the new condition names for CPU Activity - Conditions Based on SMF Record Type 70–1.

See *z/OS MVS System Management Facilities (SMF)* for a description of the updated SMF record type 70 subtype 1.

RMF support for absolute MSU capping value for LPARs

z/OS Workload Management (WLM) now provides an absolute MSU capping value for LPARs that enables the definition of an LPAR capping limit that is permanently in effect and does not change when the system configuration changes.

RMF supports this capping mechanism by adding the absolute MSU capping value to Monitor I, II and III reports, RMF Postprocessor CPU Activity report, the RMF Distributed Data Server, and SMF type 70 records.

When change was introduced: APAR OA48688

Reference information:

See *z/OS RMF Report Analysis* for a description of the updated reports.

See *z/OS MVS System Management Facilities (SMF)* for a description of the updated SMF record type 70 subtype 1.

New Monitor III and Postprocessor reports for storage class memory (SCM)

RMF enhances Monitor III and Postprocessor to support storage class memory (SCM) provided by Flash Express. These enhancements include:

- A new Monitor III Storage Class Memory (SCM) Report for SCM to allow short-term performance analysis.
- A new Postprocessor Storage Class Memory (SCM) Report for SCM for long-term overview analysis.
- A new SC data gathering option that can be used to control Monitor III data collection of storage class memory (SCM) activity
- A new subtype 10 for SMF record type 74.

When change was introduced: z/OS V2R2

Reference information:

See *z/OS RMF Report Analysis* for a description of new reports.

See *z/OS RMF User's Guide* for a description of the new storage class memory (SCM) data gathering option.

See *z/OS MVS System Management Facilities (SMF)* for a description of the new SMF records 74-10.

New Monitor III report for PCIe and hardware accelerators

RMF enhances Monitor III to support Peripheral Component Interconnect Express (PCIe) and hardware accelerators. These enhancements include:

- A new Monitor III PCIE Activity Report for PCIe and hardware accelerators to allow short-term performance analysis.
- A new PCIE | NOPCIE data gathering option that can be used to control Monitor III data collection of PCIE and hardware accelerator activity

When change was introduced: z/OS V2R2

Reference information:

See *z/OS RMF Report Analysis* for a description of new Monitor III PCIE report.

See *z/OS RMF User's Guide* for a description of the new PCIE | NOPCIE data gathering option.

RMF support for Shared Pageable Large Pages

Shared Pageable Large Pages is a virtual storage concept to allow large pages in high virtual storage (64-bit storage) be shared between address spaces. In support of Shared Pageable Large Pages, RMF has enhanced these reports:

- RMF Monitor I Paging Activity Report (PAGING)
- RMF Monitor I Virtual Storage Activity Report (VSTOR)
- RMF Monitor III STORM Report
- RMF Monitor III STORF Report

New overview conditions are provided for the Postprocessor, based on the enhanced SMF record 71.

When change was introduced: z/OS V2R2

Reference information:

See *z/OS RMF Report Analysis* for a description of the reports.

See *z/OS MVS System Management Facilities (SMF)* for a description of the enhanced SMF record type 71.

Monitor III Job USAGE Report

This new report is provided as a complement to the existing Monitor III Job Delay Report. It displays the GQSCAN usage statistics on a job level, together with some key metrics related to performance from the CPU, I/O, and storage areas.

When change was introduced: z/OS V2R2

Reference information:

See *z/OS RMF Report Analysis* for a description of this reports

RMF support for multithreading

If enabled, multithreading uses CPU resources more efficiently when a unit of work (thread) running on a core encounters a cache miss. When one thread takes a cache miss and can no longer make progress, the core will be able to switch to running a different thread that is ready to execute.

When change was introduced: z/OS V2R2

Reference information:

See *z/OS MVS System Management Facilities (SMF)* for a description of the updated SMF records 70, 71, and 72.

See *z/OS RMF Report Analysis* for a description of changes to:

> CPC - Tabular report data table ERBCPCT3
> Fields in the CPC report header
> SYSINFO - Tabular report data table ERBSYST3
> Fields in the SYSINFO report header
> ERBCPCDB - CPC data control block
> ERBCPUG3 - Processor data control block
> ERBOPDG3 - OMVS process data table
> IBMz_CEC
> IBMz_ComputerSystem

See *z/OS RMF Report Analysis* for a description of changes to:

> CPU Activity - SMF record type 70-1

Workload Activity - SMF record type 72-3

RMF support for real storage configurations of up to 4 TB in a single LPAR

RMF has enhanced SMF records 71 and 75 to enable the Paging Activity (PAGING) and Page Data Set Activity (PAGESP) reports to support real storage configurations of up to 4 TB in a single LPAR.

When change was introduced: z/OS V2R2

Reference information:

See *z/OS MVS System Management Facilities (SMF)* for a description of the updated SMF records 71 and 75.

See *z/OS RMF Report Analysis* for a description of the PAGING and PAGESP reports.

RMF support for zHPF Extended Distance 2 Feature

RMF enhances Monitor I to support reporting on zHPF Extended Distance 2 Feature. The I/O Queuing configuration data sections of SMF record 78 subtype 3 and SMF record 79 subtype 14 are extended to provide the new transport-mode related performance counters. The new performance measurements are provided in new RMF Postprocessor Overview conditions.

When change was introduced: z/OS V2R2

Reference information:

See *z/OS RMF User's Guide* for a description of the new RMF Postprocessor Overview conditions.

See *z/OS MVS System Management Facilities (SMF)* for a description of the updated SMF records 78-3 and 79-14.

RMF support for new CHPID type CS5

RMF has enhanced the RMF Postprocessor CF Activity report (Subchannel Activity section and CF to CF Activity section) and the Monitor III CFSYS Report to provide extended path attributes, which include latency and degraded mode, for the CS5 CHPID type when the enhanced-reporting-of-channel-path-characteristics (ERCPC) facility is active. Physical information, such as how the CHPID maps to a physical link, adapter and port information, and the CHPID's SAP affinity, are also provided for the new CS5 CHPID type.

Data related to CHPID type CS5 is stored in SMF record 74-4.

When change was introduced: z/OS V2R2

Reference information:

See *z/OS RMF Report Analysis* for a description of these reports.

See *z/OS MVS System Management Facilities (SMF)* for a description of the updated SMF record 74-4.

Enhanced Crypto Hardware Activity report

RMF has enhanced the Postprocessor Crypto Hardware Activity report to provide activity measurements from the Crypto Express5S (CEX5) card configured in one of these ways:

- Cryptographic CCA coprocessor
- Cryptographic PKCS11 coprocessor
- Cryptographic accelerator

In addition, new ICSF service measurements are provided for:

- RSA (Ron Rivest, Adi Shamir and Leonard Adleman) Digital Signature Generate and Verify callable services
- ECC (Elliptic Curve Cryptography) Digital Signature Generate and Verify callable services

- AES (Advanced Encryption Standard) MAC (Message Authentication Code) Generate and Verify callable services
- FPE (Format Preserving Encryption) Encipher, Decipher and Translate callable services

New overview conditions are provided for the Postprocessor, based on the enhanced SMF record 70-2.

When change was introduced: z/OS V2R2

Reference information:

See *z/OS RMF Report Analysis* for a description of this report.

See *z/OS MVS System Management Facilities (SMF)* for a description of the enhanced SMF record 70-2.

Run-Time Library Extensions new functions to consider

There are no new functions for Run-Time Library Extensions in the last z/OS releases.

SDSF new functions to consider

This topic describes new SDSF functions in z/OS.

New job detail panels

Description: New panels show devices and memory used by a job, and reasons that a job might be delayed.

When change was introduced: z/OS V2R2

Reference information: *z/OS SDSF Operation and Customization*

Job step panel

Description: A new panel shows the steps for a job.

When change was introduced: z/OS V2R2

Reference information: *z/OS SDSF Operation and Customization*

Job group and dependency panels

Description: New panels exploit enhancements in JES2 related to job execution control. The new Job Group panel lets you display information about JES2 job groups, or execution zones, which are created when JCL is submitted that describes a relationship between a set of jobs. The new Job Dependency panel lets you view:

- For a selected job group, all of the dependencies within the group
- For a selected job:
  - Jobs that it is dependent on
  - Jobs that have dependencies on it.

When change was introduced: z/OS V2R2

Reference information: *z/OS SDSF Operation and Customization*

SDSF REXX enhancements

Description: SDSF adds several enhancements to its support for REXX:

- A new RGEN command generates a REXX exec for the current panel and displays it with ISPF Edit. The exec includes ISFEXEC and ISFACT statements for accessing the panel, and special variables as appropriate, such as those for filtering.

- You can now invoke a REXX exec with the % action character, when SDSF is running under ISPF. This allows you to create a customized action character that performs a desired function against a row on a tabular panel.
- A new COMPACT option on the ISFACT, ISFEXEC, and ISFGET commands causes data for an entire row to be returned in a new SDSFROW stem variable, rather than in a separate stem variable for each column.
- When you access a panel with an action character, you can use new special variables that use a prefix to ensure that the variables are unique.

When change was introduced: z/OS V2R2

Reference information: *z/OS SDSF Operation and Customization*

System command enhancements

Description: Using the System Command Extension pop-up, you can now assign system commands to groups and add comments to describe them. New pop-ups, filtering and sorting help you work with saved commands. The number of commands saved in the ISPF profile is increased, and if you allocate ISPF table library ISFTABL, the number is increased further.

When change was introduced: z/OS V2R2

Reference information: *z/OS SDSF Operation and Customization*

Saving and printing tabular data

Description: The SNAPSHOT command lets you display the data that is displayed on a tabular panel (such as DA or ST) with Browse or Edit. You might then print the data or copy it to a data set.

When change was introduced: z/OS V2R2

Reference information: *z/OS SDSF Operation and Customization*

Action characters and overtypeable fields from the command line

Description: You can issue action characters against rows on a tabular panel from the command line, and overtype the values in columns from the command line. This provides a quick alternative to typing action characters in the NP column or overtyping columns in the table.

When change was introduced: z/OS V2R2

Reference information: *z/OS SDSF Operation and Customization*

IBM z Integrated Information Processor (zIIP) exploitation

Description: SDSF now allows some processing to be performed on a zIIP if one has been configured.

When change was introduced: z/OS V2R2

Reference information: *z/OS SDSF Operation and Customization*

HASPINDX removal

Description: The HASPINDX data set is no longer used. Previously, SDSF used it to manage SYSLOG data sets that were created on z/OS systems prior to z/OS V1R11.

When change was introduced: z/OS V2R2

Reference information: *z/OS SDSF Operation and Customization*

Security Server (RACF) new functions to consider

This topic describes new Security Server (RACF) functions in z/OS.

RACF Parmlib support

Description: A new parmlib member, IRRPRMxx, is introduced. The IRRPRMxx parmlib member contains data for the RACF data set name table, range table, and sysplex communications options. Use an IRRPRMxx member to specify statements that describe the RACF data set name table and the range table, that were previously defined by ICHRDSNT and ICHRRNG.

When change was introduced: z/OS V2R3

Reference information:

> *z/OS Security Server RACF System Programmer's Guide*
> *z/OS Security Server RACF Callable Services*
> *z/OS Security Server RACF Command Language Reference*
> *z/OS Security Server RACF Messages and Codes*
> *z/OS Security Server RACF Security Administrator's Guide*
> *z/OS MVS Initialization and Tuning Reference*

RACF ODM classes support

Description: RACF is enhanced to include three new general resource classes: HBRADMIN, HBRCONN, and HBRCMD in support of the IBM Operational Decision Manager (ODM) for z/OS.

When change was introduced: z/OS V2R3

Reference information:

> *z/OS Security Server RACF Macros and Interfaces*
> *z/OS Security Server RACF System Programmer's Guide*
> *z/OS Security Server RACF Security Administrator's Guide*
> *z/OS Security Server RACF Command Language Reference*

RACF CICS Auditing support

Description: RACF is enhanced to support the ICSF logging of CICS client identity on RACROUTE REQUEST=FASTAUTH calls for the CSFSERV, CSFKEYS, and XCSFKEY classes.

When change was introduced: z/OS V2R3

Reference information:

> *z/OS Security Server RACF Macros and Interfaces*
> *z/OS Security Server RACROUTE Macro Reference*
> *z/OS Security Server RACF Auditor's Guide*

Remote sharing enhancements to allow dynamic MAIN switching

Description: RACF allows the dynamic assignment of a new MAIN system in an RRSF Multisystem Node (MSN) with a vastly simplified procedure which replaces an extremely complicated 11-step process that is only intended for long-term configuration changes. In contrast, the new function may be employed in situations such as a scheduled maintenance window, an increased workload, or an unexpected outage, on the current MAIN system.

When change was introduced: z/OS V2R2

Reference information:

> *z/OS Security Server RACF System Programmer's Guide*
> *z/OS Security Server RACF Macros and Interfaces*
> *z/OS Security Server RACF Command Language Reference*
> *z/OS Security Server RACF Messages and Codes*
> *z/OS Security Server RACF Security Administrator's Guide*

z/OS Security Server RACF Data Areas in the z/OS Internet library (www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosInternetLibrary)

z/OS Security Server RACF Callable Services

Remote sharing enhancements to deny inbound requests

Description: RACF Remote Sharing Facility (RRSF) is enhanced to support a one-way RRSF connection that is completely under the control of the denying system.

When change was introduced: z/OS V2R2

Reference information:

z/OS Security Server RACF System Programmer's Guide
z/OS Security Server RACF Macros and Interfaces
z/OS Security Server RACF Command Language Reference
z/OS Security Server RACF Messages and Codes
z/OS Security Server RACF Security Administrator's Guide
z/OS Security Server RACF Data Areas in the z/OS Internet library (www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosInternetLibrary)
z/OS Security Server RACF Callable Services

R_admin callable service enhancement to extract RACF remote sharing configuration data

Description: A new programming interface provides RRSF configuration and operational information. Apart from the benefit of being able to report on RRSF without parsing command output, it may also facilitate the automation of MAIN switches.

When change was introduced: z/OS V2R2

Reference information:

z/OS Security Server RACF System Programmer's Guide
z/OS Security Server RACF Macros and Interfaces
z/OS Security Server RACF Command Language Reference
z/OS Security Server RACF Messages and Codes
z/OS Security Server RACF Security Administrator's Guide
z/OS Security Server RACF Data Areas in the z/OS Internet library (www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosInternetLibrary)
z/OS Security Server RACF Callable Services

RACF Read-Only Auditor

Description: RACF enhances the ADDUSER and ALTUSER commands to enable the user with AUDITOR in a READ-ONLY mode with the new ROAUDIT attribute.

When change was introduced: z/OS V2R2

Reference information:

z/OS Security Server RACF System Programmer's Guide
z/OS Security Server RACF Macros and Interfaces
z/OS Security Server RACF Command Language Reference
z/OS Security Server RACF Messages and Codes
z/OS Security Server RACF Security Administrator's Guide
z/OS Security Server RACF Auditor's Guide
z/OS Security Server RACF Diagnosis Guide
z/OS Security Server RACF Data Areas in the z/OS Internet library (www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosInternetLibrary)

z/OS Security Server RACROUTE Macro Reference
z/OS Security Server RACF Callable Services
z/OS Cryptographic Services PKI Services Guide and Reference

UNIX Search Authority

Description: RACF is enhanced to enable and simplify z/OS UNIX administration and to grant UNIX administrators the authority to read or search directories containing the files to be administered without granting more authority than necessary.

When change was introduced: z/OS V2R2

Reference information:

z/OS Security Server RACF System Programmer's Guide
z/OS Security Server RACF Macros and Interfaces
z/OS Security Server RACF Command Language Reference
z/OS Security Server RACF Messages and Codes
z/OS Security Server RACF Security Administrator's Guide
z/OS Security Server RACF Auditor's Guide
z/OS Security Server RACF Data Areas in the z/OS Internet library (www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosInternetLibrary)
z/OS Security Server RACROUTE Macro Reference
z/OS Security Server RACF Callable Services
z/OS UNIX System Services Planning

RACF RACDCERT granular certificate administration support.

Description: The RACF RACDCERT command is enhanced to provide granular certificate administration support through the RDATALIB classes.

When change was introduced: z/OS V2R2

Reference information:

z/OS Security Server RACF Command Language Reference
z/OS Security Server RACF Security Administrator's Guide

Network Authentication Services (NAS) support for Public Key Cryptography for Initial Authentication (PKINIT)

Description: Network Authentication Services is enabled to support the integration of public key cryptography onto the initial authentication exchange for a ticket-granting-ticket

When change was introduced: z/OS V2R2

Reference information:

z/OS Integrated Security Services Network Authentication Service Administration
z/OS Integrated Security Services Network Authentication Service Programming

RACF R_datalib enhancement

Description: R_datalib callable service is enhanced to manage certificates and key rings in RACF through similar to the functions that the RACDCERT commands provide.

When change was introduced: z/OS V2R2

Reference information:

z/OS Security Server RACF Macros and Interfaces
z/OS Security Server RACF Security Administrator's Guide
z/OS Security Server RACF Diagnosis Guide

z/OS Security Server RACF Data Areas in the z/OS Internet library (www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosInternetLibrary)

z/OS Security Server RACF Callable Services

Enhanced RACF password security

Description: RACF password syntax rules are enhanced to support additional special characters.

When change was introduced: z/OS V2R2

Reference information:

z/OS Security Server RACF General User's Guide

z/OS Security Server RACF Macros and Interfaces

z/OS Security Server RACF Command Language Reference

z/OS Security Server RACF Security Administrator's Guide

z/OS Security Server RACF Diagnosis Guide

z/OS Security Server RACF Data Areas in the z/OS Internet library (www.ibm.com/servers/resourcelink/svc00100.nsf/pages/zosInternetLibrary)

z/OS Security Server RACF Callable Services

RACF Health Checks

Description: Four new RACF health checks (RACF_CSFSERV_ACTIVE, RACF_CSFKEYS_ACTIVE, RACF_PASSWORD_CONTROLS, and RACF_ENCRYPTION_ALGORITHM) and updates to RACF_SENSITIVE_RESOURCES are introduced to verify that system administrator's have the best possible security configuration for their z/OS environment.

When change was introduced: z/OS V2R2

Reference information:

z/OS Security Server RACF Messages and Codes
IBM Health Checker for z/OS User's Guide

SMP/E new functions to consider

GIMUNZIP enhancements

Description: The GIMUNZIP file extraction service routine is used to extract the data sets, files, and directories from the archive files in GIMZIP packages. Previously, new sequential and partitioned data sets created by GIMUNZIP were always catalogued, and new data sets could not be allocated using specified storage, management, or data classes. With APAR IO23270, GIMUNZIP is extended to support creating new, uncataloged, data sets, and when allocating new data sets, to use optional storage class, data class, and management class specifications. In addition, a work volume and device unit may be used for temporary data set allocations when extracting partitioned and VSAM data sets.

When change was introduced: APAR IO23270.

Reference information:

SMP/E for z/OS Messages, Codes, and Diagnosis
SMP/E for z/OS Commands
SMP/E for z/OS Reference
SMP/E for z/OS User's Guide

Support for HTTPS downloads

Description: SMP/E supports secure and encrypted download operations using HTTPS (HTTP over SSL).

When change was introduced: APAR IO20858.

Reference information:

SMP/E for z/OS Messages, Codes, and Diagnosis
SMP/E for z/OS Commands
SMP/E for z/OS Reference
SMP/E for z/OS User's Guide

TSO/E new functions to consider

This topic describes new TSO/E functions in z/OS.

8 character user ID

Description: TSO/E has been limited to 7-character user IDs. This line item provides TSO/E to now have the use of 8-character user IDs.

When change was introduced: z/OS V2R3

Reference information:

z/OS TSO/E Administration
z/OS TSO/E Command Reference
z/OS TSO/E Customization
z/OS TSO/E Messages
z/OS TSO/E Primer
z/OS TSO/E Programming Services
z/OS TSO/E REXX Reference
z/OS TSO/E System Programming Command Reference
z/OS TSO/E User's Guide

TSO/E Support for JES2 Resiliency

Description: JES2 now provides an emergency subsystem that can access reserved JES2 resources to react to resource shortage problems. For TSO/E, the LOGON and SUBMIT commands are updated to allow the specification of the subsystem name to be routed to an emergency subsystem.

When change was introduced: z/OS V2R3

Reference information:

z/OS TSO/E Command Reference
z/OS TSO/E Messages

TSO/E OPERSEWAIT default change

Description: The default of the OPERSEWAIT keyword on the SEND statement in PARMLIB member IKJTSOxx is changed from ON to OFF. When the default is applied to an Operator SEND, the system will no longer wait (while potentially holding critical system resources) to complete the send if not all recipients have an available VTAM buffer.

When change was introduced: z/OS V2R2

Reference information:

z/OS TSO/E System Programming Command Reference
z/OS TSO/E Customization
z/OS TSO/E Messages
z/OS MVS Initialization and Tuning Reference

XL C/C++ new functions to consider

This topic describes new XL C/C++ functions in z/OS.

New and changed compiler options

Description:
The following compiler options or suboptions are new or changed in z/OS V2R3:

- AGGREGATE(OFFSETDEC | OFFSETHEX)
- ARCHITECTURE
- DEBUG(NOFILE)
- INFO(STP | NOSTP)
- STACKPROTECT | NOSTACKPROTECT
- TARGET(zOSV2R3)
- TUNE

Release introduced:
z/OS V2R3

Description:
The following compiler options or suboptions are new or changed in z/OS V2R2:

- ARCHITECTURE
- CHECKNEW
- DSAUSER
- LANGLVL(NULLPTR)
- TARGET(zOSV2R2)
- TUNE
- VECTOR(AUTOSIMD | NOAUTOSIMD | TYPE | NOTYPE)

Release introduced:
z/OS V2R2

New LEGACY option for the DSECT Utility

Description:
The default option is changed to NOLEGACY, which makes the output match the output of the DSECT utility that is generated by HLASM.

Release introduced:
z/OS V2R3

Reference information:

- *z/OS XL C/C++ User's Guide*

New SOS info utility

Description:
You can use the SOS info utility to decode Saved Options String (SOS) information from an executable file and produce a list of compiler options that were used to control the code generation of a program.

Release introduced:
z/OS V2R3

Reference information:

- *z/OS XL C/C++ User's Guide*

Updates to CDAHLASM and as utilities

Description:
The CDAHLASM and as utilities get the MD5 signature from the debug data block if the block exists and puts the signature in the debug side file. In addition, if the CDAHLASM and as utilities have the write permission to the assembly file, they will update the assembly file by replacing the debug side file name in the debug data block with the user provided name or a default debug side file name.

Release introduced:
z/OS V2R3

Reference information:

- *z/OS XL C/C++ User's Guide*

New nullptr keyword

Description: The new keyword `nullptr` is introduced as a null pointer constant for C++. The `nullptr` constant can be distinguished from integer 0 for overloaded functions. You can use the LANGLVL(NULLPTR) option to enable the support for this keyword.

When change was introduced: z/OS V2R2

Reference information:

- *z/OS XL C/C++ Language Reference*

Enhanced vector programming support

Description:
The vector programming support is enhanced in the following aspects to take advantage of the Vector Facility for z/Architecture.

Vector data types
The `vector float` data type is supported under ARCH(12).

Operators
Operators are extended to support the `vector float` data type. Use of certain vector data types with some operators is deprecated. These vector data types are still accepted as operands of these operators, but their usage is discouraged.

Vector built-in functions

The following vector built-in functions are added:

- `vec_bperm_u128`: Vector Bit Permute
- `vec_double`: Vector Convert from long long to double
- `vec_doublee`: Vector Convert from float (even elements) to double
- `vec_eqv`: Vector XNOR
- `vec_floate`: Vector Convert from double to float (even elements)
- `vec_load_len_r`: Vector Load Rightmost with Length
- `vec_msum_u128`: Vector Multiply Sum Logical
- `vec_nand`: Vector NAND
- `vec_nmadd`: Vector Negative Multiply Add
- `vec_nmsub`: Vector Negative Multiply Subtract
- `vec_orc`: Vector OR with Complement
- `vec_rint`: Vector Round to Integer
- `vec_signed`: Vector Convert double to signed long long
- `vec_store_len_r`: Vector Store Rightmost with Length
- `vec_unsigned`: Vector Convert double to unsigned long long

- `vec_xl`: Vector Load
- `vec_xst`: Vector Store

Some vector built-in functions are extended to support the `vector float` data type, or other data types at a minimum ARCH level of 11 or higher.

Use of certain vector data types with some operators is deprecated. These vector data types are still accepted as operands of these operators, but their usage is discouraged.

Some vector built-in functions are deprecated. You can still use these vector built-in functions at a minimum ARCH level of 11, but their usage is discouraged.

Release introduced:
z/OS XL C/C++ V2R3

Reference information:

- *z/OS XL C/C++ Programming Guide*

z/OS OpenSSH new functions to consider

This topic describes new z/OS OpenSSH functions in z/OS.

Support for Kerberos through General Security Service - API

Description: Support is provided for Kerberos through General Security Service - API (GSS-API) authentication and key exchange. New GSS-API options are available in ssh_config and sshd_config.

When change was introduced: z/OS V2R2.

Reference information:

- *z/OS OpenSSH User's Guide*

zEnterprise Data Compression implementation

Description: Previously, z/OS OpenSSH used the open source zlib compression library version 1.2.3. In z/OS V2R2, z/OS OpenSSH now uses the zEnterprise Data Compression zlib. A new zEDCCompression option is available in zos_ssh_config, zos_ssh_user_config, and zos_sshd_config.

When change was introduced: z/OS V2R2.

Reference information:

- *z/OS OpenSSH User's Guide*

Support for FIPS 140-2 mode

Description: Support was added to meet FIPS 140-2 specifications. New options added to zos_ssh_config, zos_ssh_user_config, and zos_sshd_config.

When change was introduced: z/OS V2R2.

Reference information:

- *z/OS OpenSSH User's Guide*

z/OS Management Facility (z/OSMF)

This topic describes new z/OSMF functions in z/OS.

z/OSMF enabled during IPL

Description:
In z/OS V2R3, the base element z/OSMF is started by default at system IPL. This behavior, which is referred to as *z/OSMF autostart*, means that z/OSMF is available for use as soon as the system is up.

Related to this support are the following enhancements:

- Statements and keywords are added to the z/OSMF parmlib member, IZUPRMxx.
- Parameters are added to the z/OSMF started procedure, IZUSVR1.
- System parameter IZU= is added to the IEASYSxx parmlib member. Use the IZU= parameter to identify one or more IZUPRMxx parmlib members to be used for your z/OSMF configuration.

With z/OSMF autostart, it is no longer necessary for your installation to explicitly start the z/OSMF server after each system IPL, whether through automation or commands entered manually at the operations console.

Authorized programs can use the event notification facility (ENF) to determine whether the z/OSMF server is up or down.

Release introduced:
z/OS V2R3.

Reference information:

- *z/OS Migration*.
- *IBM z/OS Management Facility Configuration Guide*

z/OSMF Sysplex Management task

Description:
The z/OSMF Sysplex Management task displays sysplex resources and their relationships. You can work with sysplex resources using graphic and table views. Topology and physical views show resources such as sysplexes, systems, coupling facilities, CPCs, and couple data sets. You can view physical connections between systems and coupling facilities, including channel path identifiers (CHPIDs) and ports.

Release introduced:
z/OS V2R3.

Reference information:

- *IBM z/OS Management Facility Configuration Guide*
- z/OSMF online help.

z/OSMF z/OS Operator Consoles

Description:
The z/OSMF z/OS Operator Consoles task provides function to work with z/OS consoles. You can issue system commands and view system messages. You can search and filter the messages, and lock the console. A summary provides a graphic view of system message activity, with colors that reflect the colors of the messages that are displayed in the console.

Release introduced:
z/OS V2R3.

Reference information:

- *IBM z/OS Management Facility Configuration Guide*
- z/OSMF online help.

z/OS UNIX System Services new functions to consider

This topic describes new z/OS UNIX functions in z/OS.

Maintaining a single configuration file across the sysplex

Description:
In V2R3, a new directory, `/global`, is available in the sysplex root and can be used to store and maintain a single copy of a configuration file that can be referenced by all members of the sysplex. Prior to V2R3, individual copies of the same configuration file had to be maintained in each member of the sysplex.

Release introduced:
z/OS V2R3.

Reference information:
z/OS UNIX System Services Planning

z/OS Migration

Migrating HFS file systems to zFS file systems

Description:
Support has been added for migrating in-use HFS file systems to zFS.

Release introduced:
V2R3.

Reference information:
z/OS UNIX System Services Command Reference

z/OS UNIX System Services Planning

Support for z/OS UNIX syscall exits

Description:
Pre-system call and post-system call exit routines can be enabled for select z/OS UNIX callable services.

Release introduced:
V2R3

Reference information:
z/OS UNIX System Services Programming: Assembler Callable Services Reference

z/OS UNIX System Services Planning

z/OS MVS Initialization and Tuning Reference

Mounting and unmounting file systems with the SETUID option

Description:
If a nonprivileged user has UPDATE access to the SUPERUSER.FILESYS.USERMOUNT resource in the UNIXPRIV class, the user can mount and unmount file systems with the SETUID option.

Release introduced:
V2R3

Reference information:
z/OS UNIX System Services Planning

Checking for unsecure services that are configured for the inetd daemon

Description:
A new health check, USS_INETD_UNSECURE_SERVICES, provides a report on unsecure services that are configured for the inetd daemon.

Release introduced:
V2R3

Reference information:
z/OS UNIX System Services Planning

IBM Health Checker for z/OS User's Guide

Debugging enhancements for dbx

Description:
dbx can debug applications whose debug information was merged into the NOLOAD section of the executable file if the application was compiled with options -Wc,DEBUG(NOFILE) or -qdebug=nofile.

Release introduced:
V2R3

Reference information:
z/OS UNIX System Services Programming Tools

Reporting CPU time in microseconds

Description:
The getthent() callable service (BPX1GTH/BPX4GTH) returns CPU usage in microseconds.

Release introduced:
V2R2 APAR OA49485

Reference information:
z/OS UNIX System Services Programming: Assembler Callable Services Reference

z/OS Using REXX and z/OS UNIX System Services

Automatically unmounting unused version root file systems in a shared file system

Description:
Version file systems in a shared file system that are no longer being used can be automatically unmounted.

Release introduced:
z/OS V2R3

Reference information:
z/OS UNIX System Services Planning

Displaying lines before or after matching lines

Description:
The **grep**, **fgrep**, and **egrep** commands have been enhanced so that users can specify the number of lines to be displayed either before or after the matching lines.

Release introduced:
z/OS V2R3

Reference information:
z/OS UNIX System Services Command Reference

Year 2038/2042 support

Description:
Support was added for POSIX time values beyond year 2038 and z/OS time-of-day values beyond year 2042.

Release introduced:
z/OS V2R3

Reference information:
z/OS UNIX System Services Programming: Assembler Callable Services Reference

Invoking pthread_security_np() without a password or superuser authority

Description:
If a user has UPDATE access to the BPX.DAEMON resource, the user can now invoke the pthread_security_np() service without a password or superuser authority.

Release introduced:
V2R2 APAR OA50425

Reference information:
z/OS UNIX System Services Programming: Assembler Callable Services Reference

Updated monitoring of the current usage of private below-the-bar storage

Description:
The USS_KERNEL_PVTSTG_THRESHOLD health check now supports dynamic severity check parameters when KERNELSTACKS(BELOW) is specified.

Release introduced:
z/OS V2R2, with APAR OA50127 installed.

Reference information:
IBM Health Checker for z/OS User's Guide

Enhancements to the logger shell command

Description:
You can use the **logger** shell command to send messages that are longer than 126 characters. Messages can also be sent to the syslogd daemon.

Release introduced:
z/OS V2R3

Reference information:
z/OS UNIX System Services Command Reference

Assigning default umask values to all z/OS UNIX users

Description:
The new UMASK statement of the BPXPRMxx parmlib member can be used to assign a default umask value for all z/OS UNIX users. It lists the disallowed permission settings of files and directories that are created by users or processes.

Release introduced:
z/OS V2R2, with APAR OA51000 installed.

Reference information:
z/OS MVS Initialization and Tuning Reference

Enhancements for the kernel and LFS: 64-bit addressing mode and above-the bar stack storage

Description: Previously, the kernel and LFS ran in 31-bit addressing mode. In V2R2, the kernel and LFS run in 64-bit addressing mode, and the LFS also accommodates PFSes that run in 64-bit addressing mode. To alleviate storage constraints, above-the-bar stack storage for space-switched services that are used by the kernel and LFS is supported.

When change was introduced: z/OS V2R2.

Reference information:

- *z/OS UNIX System Services File System Interface Reference*
- *z/OS MVS System Commands*
- *z/OS MVS System Messages, Vol 3 (ASB-BPX)*

Increased thread limit in the kernel with the KERNELSTACKS(ABOVE) parmlib option

Description: Previously, the limit of the number of threads that could be run in the kernel was approximately 32,000. In V2R2, the limit is higher, depending on services that are used and the additional storage that those services require. The D OMVS,ST system command option displays the maximum number of threads that can be created and run in the kernel.

When change was introduced: z/OS V2R2.

Reference information:

- *z/OS MVS Initialization and Tuning Reference*
- *IBM Health Checker for z/OS User's Guide*
- *z/OS MVS System Messages, Vol 3 (ASB-BPX)*
- *z/OS MVS System Commands*
- *z/OS UNIX System Services Messages and Codes*

Providing support for task-level security

Description: Previously, when checking ownership of process information, the w_getpsent() callable service did not support a thread-level security environment because it was defined as a process-level service. In V2R2, a new environment variable is provided that enables the w_getpsent() callable service to use the thread-level identity that is created by the pthread_security_np() service.

When change was introduced: z/OS V2R2.

Reference information:

- *z/OS UNIX System Services Programming: Assembler Callable Services Reference*

Appendix A. Accessibility

Accessible publications for this product are offered through IBM Knowledge Center (www.ibm.com/support/knowledgecenter/SSLTBW/welcome).

If you experience difficulty with the accessibility of any z/OS information, send a detailed email message to mhvrcfs@us.ibm.com.

Accessibility features

Accessibility features help users who have physical disabilities such as restricted mobility or limited vision use software products successfully. The accessibility features in z/OS can help users do the following tasks:

- Run assistive technology such as screen readers and screen magnifier software.
- Operate specific or equivalent features by using the keyboard.
- Customize display attributes such as color, contrast, and font size.

Consult assistive technologies

Assistive technology products such as screen readers function with the user interfaces found in z/OS. Consult the product information for the specific assistive technology product that is used to access z/OS interfaces.

Keyboard navigation of the user interface

You can access z/OS user interfaces with TSO/E or ISPF. The following information describes how to use TSO/E and ISPF, including the use of keyboard shortcuts and function keys (PF keys). Each guide includes the default settings for the PF keys.

- *z/OS TSO/E Primer*
- *z/OS TSO/E User's Guide*
- *z/OS ISPF User's Guide Vol I*

Dotted decimal syntax diagrams

Syntax diagrams are provided in dotted decimal format for users who access IBM Knowledge Center with a screen reader. In dotted decimal format, each syntax element is written on a separate line. If two or more syntax elements are always present together (or always absent together), they can appear on the same line because they are considered a single compound syntax element.

Each line starts with a dotted decimal number; for example, 3 or 3.1 or 3.1.1. To hear these numbers correctly, make sure that the screen reader is set to read out punctuation. All the syntax elements that have the same dotted decimal number (for example, all the syntax elements that have the number 3.1) are mutually exclusive alternatives. If you hear the lines 3.1 USERID and 3.1 SYSTEMID, your syntax can include either USERID or SYSTEMID, but not both.

The dotted decimal numbering level denotes the level of nesting. For example, if a syntax element with dotted decimal number 3 is followed by a series of syntax elements with dotted decimal number 3.1, all the syntax elements numbered 3.1 are subordinate to the syntax element numbered 3.

Certain words and symbols are used next to the dotted decimal numbers to add information about the syntax elements. Occasionally, these words and symbols might occur at the beginning of the element itself. For ease of identification, if the word or symbol is a part of the syntax element, it is preceded by the backslash (\) character. The * symbol is placed next to a dotted decimal number to indicate that the syntax element repeats. For example, syntax element *FILE with dotted decimal number 3 is given the format 3 * FILE. Format 3* FILE indicates that syntax element FILE repeats. Format 3* * FILE indicates that syntax element * FILE repeats.

Characters such as commas, which are used to separate a string of syntax elements, are shown in the syntax just before the items they separate. These characters can appear on the same line as each item, or on a separate line with the same dotted decimal number as the relevant items. The line can also show another symbol to provide information about the syntax elements. For example, the lines 5.1*, 5.1 LASTRUN, and 5.1 DELETE mean that if you use more than one of the LASTRUN and DELETE syntax elements, the elements must be separated by a comma. If no separator is given, assume that you use a blank to separate each syntax element.

If a syntax element is preceded by the % symbol, it indicates a reference that is defined elsewhere. The string that follows the % symbol is the name of a syntax fragment rather than a literal. For example, the line 2.1 %OP1 means that you must refer to separate syntax fragment OP1.

The following symbols are used next to the dotted decimal numbers.

? indicates an optional syntax element
The question mark (?) symbol indicates an optional syntax element. A dotted decimal number followed by the question mark symbol (?) indicates that all the syntax elements with a corresponding dotted decimal number, and any subordinate syntax elements, are optional. If there is only one syntax element with a dotted decimal number, the ? symbol is displayed on the same line as the syntax element, (for example 5? NOTIFY). If there is more than one syntax element with a dotted decimal number, the ? symbol is displayed on a line by itself, followed by the syntax elements that are optional. For example, if you hear the lines 5 ?, 5 NOTIFY, and 5 UPDATE, you know that the syntax elements NOTIFY and UPDATE are optional. That is, you can choose one or none of them. The ? symbol is equivalent to a bypass line in a railroad diagram.

! indicates a default syntax element
The exclamation mark (!) symbol indicates a default syntax element. A dotted decimal number followed by the ! symbol and a syntax element indicate that the syntax element is the default option for all syntax elements that share the same dotted decimal number. Only one of the syntax elements that share the dotted decimal number can specify the ! symbol. For example, if you hear the lines 2? FILE, 2.1! (KEEP), and 2.1 (DELETE), you know that (KEEP) is the default option for the FILE keyword. In the example, if you include the FILE keyword, but do not specify an option, the default option KEEP is applied. A default option also applies to the next higher dotted decimal number. In this example, if the FILE keyword is omitted, the default FILE(KEEP) is used. However, if you hear the lines 2? FILE, 2.1, 2.1.1! (KEEP), and 2.1.1 (DELETE), the default option KEEP applies only to the next higher dotted decimal number, 2.1 (which does not have an associated keyword), and does not apply to 2? FILE. Nothing is used if the keyword FILE is omitted.

* indicates an optional syntax element that is repeatable
The asterisk or glyph (*) symbol indicates a syntax element that can be repeated zero or more times. A dotted decimal number followed by the * symbol indicates that this syntax element can be used zero or more times; that is, it is optional and can be repeated. For example, if you hear the line 5.1* data area, you know that you can include one data area, more than one data area, or no data area. If you hear the lines 3* , 3 HOST, 3 STATE, you know that you can include HOST, STATE, both together, or nothing.

Notes:

1. If a dotted decimal number has an asterisk (*) next to it and there is only one item with that dotted decimal number, you can repeat that same item more than once.

2. If a dotted decimal number has an asterisk next to it and several items have that dotted decimal number, you can use more than one item from the list, but you cannot use the items more than once each. In the previous example, you can write HOST STATE, but you cannot write HOST HOST.

3. The * symbol is equivalent to a loopback line in a railroad syntax diagram.

+ indicates a syntax element that must be included

The plus (+) symbol indicates a syntax element that must be included at least once. A dotted decimal number followed by the + symbol indicates that the syntax element must be included one or more times. That is, it must be included at least once and can be repeated. For example, if you hear the line `6.1+ data area`, you must include at least one data area. If you hear the lines `2+`, `2 HOST`, and `2 STATE`, you know that you must include `HOST`, `STATE`, or both. Similar to the * symbol, the + symbol can repeat a particular item if it is the only item with that dotted decimal number. The + symbol, like the * symbol, is equivalent to a loopback line in a railroad syntax diagram.

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Index

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