z/OS Introduction and Release Guide

Release 1

GA22-7502-00

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Note

Before using this information and the product it supports, be sure to read the general information under **Notices**

First Edition, March 2001

This is a major revision of, and obsoletes, GC28-1725-10.

This edition applies to Version 1 Release 1 of z/OS (5694-A01), and to all subsequent releases and modifications until otherwise indicated in new editions.

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Contents

About this Book

This book is an introduction to z/OS, the next generation of the OS/390 operating system. It explains the enhancements that make z/O the premier operating system, unmatched in the industry today. It also lists and describes the functional elements and features that together make up z/OS.

This book is also a release guide. That is, it will explain the new functional content of each succeeding release of z/OS.

Who Should Read this Book

This book is for people who are interested in using an advanced-technology, enterprise-wide server operating system enviro that is completely dedicated to supporting business goals. It helps anyone who needs a quick overview of the advances that z/OS offers above a beyond OS/390.

z/OS -- A New World, a New Operating System

The current information technology scene has never been more complex, more various, more exciting. The volume of computer workloads is growing at an astounding rate. And a new way of doing business has not only dramatically increased the volume but also drastically changed the types of workloads you need to process to stay competitive. It's an exciting world we live in, but excitement brings challenges, daunting ones. The first place you look to help you meet them is your enterprise computing operating system.

We introduce z/OS, the next generation of the OS/390 operating system. It addresses these challenges because it:

- Maximizes the power and effectiveness of your resources
- Helps you control the total cost of computing
- Simplifies the complexity of managing and using the biggest operating system the world has ever known.

Managing your resources effectively

Managing your resources effectively is crucial. There is something very wasteful about having one resource twiddling its thumbs in idleness, while another sweats icy bullets trying to keep up. We've done much over the years to give the system itself the responsibility to dynamically shift workload to where it can be most effectively be processed based on real-time conditions. With z/OS we deliver the Intelligent Resource Director. It's a new concept. Instead of assigning applications to a resource, it assigns resourcs to the application. It consists of three new functions. One enables the dynamic adjustment of processor resources across LPARs, the other allows you to manage the paths between the processor and the logical conrol units in your system. And the third enhances the flexibility of channel subsystem priority queueing.

A new concept in cost containment

z/OS also introduces a new concept in cost containment. The idea is that you pay only for what you need. The IBM License Manager (ILM) ILM is based on Version 2 of the X-Open Software License Manager (XSLM) standard from the Open Group. It provides assistance with software license management, and is the basis for WLC, which stands for Workload License Charges. Pay for software only on the basis of on how much work you expect it to handle, and thus you pay for what you request and how you configure your system.

Interfaces that minimize complexity

The more complex a system, the more the need for interfaces that minimize it. z/OS introduces the first in an initiative to make systems management a much easier task. msys for Setup is a new base element that offers a new approach for installing and configuring z/OS and the products that run on it. It consists of consistent interfaces and wizards. The idea is to use defaults and 'best practices' , have built-in algorithms, and offer real, usable, low-level answers to high-level questions.

The base for future system enhancements

z/OS is the next generation of the OS/390 operating system. With the new server, it provides the base for future system enhancements. Customers should be strongly encouraged to position themselves for this new technology.

Customers can install OS/390 Version 2 Release 10 now and upgrade to z/OS with the installation of the z/OS V1R1 Upgrade Package for OS/390 V2R10.

Dynamically manage resources

The Workload Manager is extended to work with PR/SM on the new server to dynamically expand resources that are available across LPARs. An LPAR cluster is the subset of the systems that are running as LPARS on the same CEC. Based on business goals, WLM can direct PR/SM to enable or disable CP capacity for an LPAR, without human intervention. This combination of WLM working with PR/SM on is called Intelligent Resource Director (IRD).

WLM will use IRD to monitor the performance of all the workloads and dynamically adjust physical processor and I/O resources across them without operator intervention. In this way, WLM will be able to expand and contract the partitions, and maximize throughput in all of them. In this example, as the e-commerce work in the first virtual server explodes, perhaps as the result of a marketing campaign it can expand while the test and development servers shrink.

The customer defines the business importance of the workload by goals (such as response time) for a transaction system or for a Web server. With the information on workload importance, the WLM can dynamically employ any of the elements within the scope of the IRD to best meet the throughput and response goals of the workloads, even in heavily used systems.

IRD assigns resources to the application; the application is not assigned to the resource. This capability of a system to dynamically direct resources to respond to the needs of individual components within the system is an evolutionary step. It enables the system to continuously allocate resources for different applications, and this helps to reduce the total cost of ownership of the system. IRD is made up of three parts which work together to help increase your business' productivity:

- LPAR CPU Management
- Dynamic Channel Path Management
- Channel Subsystem Priority Queuing

This powerful triad of functions can increase your productivity by putting your most business-critical work first. Systems Management is simplified through improvements to I/O configuration and workload management. Additionally, Channel Subsystem Priority Queueing and Dynamic Channel Path Management will benefit both the clustered environment and the single system customer, while LPAR CPU Management will benefit the sysplex customer. The three new functions are controlled by the Workload Manager of z/OS and are used together.

LPAR CPU Management:

LPAR CPU management allows dynamic adjustment of processor resources across partitions. You can specify goals in Workload Manager. WLM will then manage these sets of logical partitions to provide the processor resources needed for your work to meet its goals based on business importance. WLM dynamically adjusts the processor resource available to each partition as the workload mix changes in today's dynamic environments.

For example, you might have several different Web servers. One might process order entries, another might process order status entries, and a third might provide product details for online shopping. If these three web servers were placed on

separate, you might find that the demand on the three servers varies. It is possible that in early in the holiday season the server providing the product details is more heavily used than the other two servers. Later in the season, the server handling orders might be more heavily used. As the holiday approaches people might begin checking the status of their orders, making the server providing the status entries the most heavily used. You might find that you have sufficient CPU power across all the servers, but not necessarily when or where you need it.

With LPAR clustering, you can consolidate multiple servers on one server, each with its own partition. As CPU demand grows, PR/SM will distribute the available CPU power where it is needed. With the addition of LPAR CPU Management, Workload Manager can direct PR/SM in its distribution of CPU in order to ensure consideration of work goals based on business importance. By distributing resources in this manner, it is more likely that all three servers will achieve their goals. If unexpected demand is so high that achieving the goals is not possible, WLM can assure that the work with the highest business importance gets the most resource.

Dynamic Channel Path Management (DCM)

Dynamic Channel Path Management combines server strengths and software flexibility. You can now manage the path between the processor and the DASD logical control units in your system. Rather than moving a workload to a resource, DCM allows the system to move resources to your workload, responding to peaks in demand for I/O channel bandwidth. DCM enables the system to respond to channel requirements as they occur by moving additional channels to DASD logical control units when they are needed.

Workload Manager and IOS together help to manage the I/O bandwidth. You can define managed channels that are not related to a specific control unit. As they are needed, these managed channels can move among control units with the help of Workload Manager. This is how DCM provides some leeway with the requirement for greater than 256 channels. I/O Queuing reports are updated to show both the static and managed channels assigned to a logical control unit during a reported interval.

For example, in an environment where an installation normally requires four channels to several control units, but occasionally needs as many as six, system programmers must currently define all six channels to each control unit that may require them. With DCM, the system programmer need only define the four channels to the control units, and indicate that DCM may add an additional two. As the control unit becomes more heavily used, DCM may assign channels from a pool of managed channels, identified by the system programmer, to the control unit. If the work shifts to other control units DCM will unassign them from lesser utilized control units and assign them to what are now the more heavily used ones. This helps reduce the requirement for greater than 256 channels.

Note: Dynamic Channel Path Management initially supports ESCON switch-connected DASD.

Channel Subsystem Priority Queuing

Priority queuing is not a new concept to enterprise operating systems. Channel Subsystem Priority Queuing extends the classic strengths of I/O priority queuing by addressing other challenges that are not currently handled by existing I/O priority schemes. If multiple OS/390 images running on the same CEC tried to access the same I/O devices, the channel had no awareness if requests from one LPAR were all lower priority than requests from another LPAR. Now, with Channel Subsystem Priority Queuing, when I/O requests originate from multiple LPARs the channel subsystem will honor the I/O priority as established by WLM. WLM ensures that all systems in a sysplex use a consistent I/O Priority assignment in order to ensure that higher priority work is handled first.

It is this fact that allows the I/O priority queuing function of the Enterprise Storage Server (SHARK) to ensure the most important I/O access to a device is always handled first. Now when an I/O request needs to wait (within a single z/OS image, a CEC's channel, or the control unit), the priority to use in queuing the request is based consistently on the customer's workload goals. This provides optimal management of workloads and resources.

Note: Channel System Priority Queuing is implemented initially for Parallel OEMI and ESCON channels.

Pay only for what you need

With z/OS, IBM provides a new software pricing model that uses the IBM License Manager (ILM). ILM allows vendors to enable their products for licensed software management by customers and is the basic tool IBM will use to implement Workload License Charges (WLC). ILM is based on Version 2 of the X-Open Software License Manager (XSLM) standard from The Open Group, which defines a software license use management system.

IBM License Manager

ILM provides value in two primary areas:

- Assistance with software product license management
- Technical basis for Workload License Charges

ILM keeps track of what products are licensed to a particular machine (passive license management) and manages the use of those products based on its understanding of the terms and conditions associated with that license (active license management).

ILM uses License certificates to represent an established product license between a customer and a software vendor. When a certificate is supplied by IBM for a product, ILM can use the certificate for passive license management. If the product has been modified to call the license manager, active license management can be performed.

IBM will use ILM as a customer-managed tool, which means you can change certain characteristics of a product license agreement directly and the changes take effect immediately. This eliminates the overhead and delay introduced when updates must be made through interactions with the owning software company. The ILM Management Tool is used to change license certificate values, to perform tasks such as enabling or disabling priced optional features, discontinuing products, changing the serial number or model type of the machine to which a product is licensed, and increasing or decreasing a defined capacity (the portion of the machine on which you want to run a product). With ILM running on a the new server, z/OS optional priced features are enabled and disabled after the initial product shipment, by updating the features' certificates using the ILM Management Tool.

RMF will report CPU resource consumption within a logical partition (LPAR) in terms of MSUs (millions of service units) and the corresponding LPAR MSU defined capacity. This will help you understand how much of the defined capacity an LPAR is consuming.

Using LPARs as virtual servers

This support gives S/390 Independent Software Vendors the option of licensing their software to a logical partition, and thus an additional method of implementing sub-CEC pricing. Effective with the new server and z/OS Version 1 Release 1, enhancements to logical partition (LPAR) support will enable an LPAR to behave like a virtual server to the products and programs that are running in that LPAR.

This new technology gives running applications the ability to query the following new information:

- a guaranteed unique identifier assigned to the logical partition
- the capacity of the logical partition as determined by the configuration of the LPAR

While actual processor usage within the logical partition expands and contracts based on workload demands, WLM ensures that the average usage over a rolling four-hour period never exceeds the capacity defined by the customer.

Easier configuration of your system

z/OS starts a major ease-of-manageability initiative with the introduction of Managed System Infrastructure for Setup (msys for Setup) as a new base element. msys for Setup offers a new approach for installing and configuring z/OS and products running on z/OS, that result in major productivity improvements.

msys for Setup allows for the usage of consistent interfaces with wizard-like configuration dialogs. These new dialogs reduce the skill requirements for setting up products, freeing up scarce and valuable personnel for other tasks.

msys for Setup builds upon the Web-based wizard technology that has been introduced in a number of areas. msys for Setup employs the same easy, interview style as the wizards for defining the customization parameters. Workstation-based dialogs are used to guide the user step-by-step through the tasks required for installation and configuration. Instead of asking the user to specify hundreds of configuration parameters, the dialogs use defaults and best practices values whenever possible and derive low-level values from answers to high-level questions. msys for Setup significantly extends the wizard approach via integrated host processing. msys for Setup uses a discovery mechanism to understand the current system configuration. As a result, you do not have to re-type information the system already knows. After the configuration parameters have been specified, msys for Setup can automatically update the system configuration directly. The user can see in detail what the changes will be before they are made.

msys for Setup offers the opportunity for more productivity improvements and faster deployment of z/OS technology in support of growing e-business requirements. Prior to z/OS, you needed to:

- Manually update a number of system resources
- Concern yourself with multiple different interfaces and the associated syntax
- Calculate formulas
- Decide how to set each value
- Check validity after the configuration completed
- Read large amounts of (possibly scattered) documentation

With msys for Setup:

- Updates to the system are done automatically
- The system takes care of the syntax and interfaces
- The system does the calculations
- Fewer decisions are required (defaults are used if appropriate)
- Validity of a configuration is checked by the system
- Online help is just a mouse-click away

msys for Setup is exploited by Parallel Sysplex in z/OS Version 1 Release 1. msys for Setup makes setting up a Parallel Sysplex resource sharing environment much quicker and easier by defining and implementing the required:

- Policies
- Parmlib specifications
- Security settings

This initial delivery focuses on Resource Sharing configurations, including support for Intelligent Resource Director, XCF signalling and Global Resource Serialization

Star. Furthermore, msys for Setup introduces the notion of an LDAP-based z/OS Management Directory that will become the central repository for all configuration data. The z/OS Management Directory supplies the system configuration information to z/OS itself as well as to management applications via a consistent interface. Customization dialogs store the configuration parameters in the management directory. After the configuration is completed, the Update System Configuration task reads the update request in the management directory and executes them automatically. msys for Setup functions give you control of what is happening and allows you to optionally back up the current msys configuration so that you can go back to the last valid configuration. In addition, msys for Setup allows you to undo the execution of the updates requests. Additional information on using msys functions is available upon the availability of z/OS.

Simplify your work - SNA Master Console Support (SNA MCS)

Console support is being streamlined to simplify service configuration. You no longer need separate server for your console support. Channel-attached, binary synchronous terminal control units (3174s) are no longer required to do console function. Instead, you can get your console support through SNA and/or TCP/IP. Elimination of this step in the service configuration reduces the total server cost of setting up a new z/OS image.

Note: The new IBM 2074 Console Support Controller provides for the consolidation of 3174s and is available now.

Visit the following sites:

- z/OS Web site:

  http://www.ibm.com/servers/eservers/zseries/z/OS/

- General Announce Q & A

  http://ibm.com/servers/eserver/zseries/faq/

General Migration Considerations

As the components of z/OS are integrated into a single package with compatible service levels, you must install and migrate to a z/OS release in its entirety before entering into production on that release. For the JES2 or JES3 component, the migration can be staged to remain compatible with other systems. For information on JES levels that are supported with z/OS Version 1 Release 1, refer to *z/OS Planning for Installation* (GA22-7504).

For customers running OS/390 Version 2 Release 10, you can upgrade to z/OS Version 1 Release 1 with the installation of the z/OS Version 1 Release 1 Upgrade Package for OS/390 Version 2 Release 10. This upgrade package provides an easy migration path to z/OS Version 1 Release 1 functionality. Non-OS/390 Version 2 Release 10 customers can order z/OS Version 1 Release 1 via Customized Offerings (ServerPac, SystemPac, and CBPDO) for a complete system.

You must perform the *usual* release-to-release migration activities for any element you install. The publication, *z/OS Planning for Installation* (GA22-7504), can help you plan for migration actions that might be required. This publication provides a set of migration tables that help indicate the release you are migrating from and the release you are planning to migrate to. There is also an interactive edition of this publication called *z/OS Release 1 Installation Planning Assistant*.

IBM in-service middleware products that run on an IBM S/390 model 9672 Generation 5 or Generation 6 server under OS/390 Version 2 Release 9 as of October 3, 2000 will also operate and be supported on the new enterprise server under OS/390 Version 2 Release 10 and z/OS Version 1 Release 1.

Note that starting with z/OS V1R1:

- On a processor that supports z/Architecture (a zSeries server), z/OS runs in z/Architecture mode. Running in ESA/390 mode on a zSeries server violates the Terms and Conditions for running z/OS on a zSeries server.
- On other processors, z/OS runs in ESA/390 mode.

Release Migrations

As previously described in the OS/390 Version 2 Release 10 availability announcement, IBM is converging on a consistent migration and coexistence policy, effective with migrations starting from z/OS Version 1 Release 1. This consistent migration and coexistence policy is based on the current coexistence policy of four consecutive releases.

When you migrate from z/OS Version 1 Release 1 (or from any subsequent release), the release you migrate to is required to be within four consecutive releases to be fully supported. That is, migration forward and backward should be made within four consecutive releases. This applies to release migrations for:

- Single system configurations
- Individual systems within a multisystem configuration
- Cases where a simultaneous IPL is used to migrate all systems in a multisystem configuration at the same time.

Refer to the Coexistence section for additional considerations that apply to multisystem configurations.

You should take this into account to ensure that you are appropriately positioned for future software migrations. Since each release can normally be ordered for only a six month window, it is very important that you order the required releases while they are available.

Coexistence

As was true for OS/390, z/OS continues to give you optimum compatibility and flexibility as you migrate systems in a multisystem configuration by allowing up to four consecutive releases to coexist. Coexistence considerations apply to multisystem configurations in which there is resource sharing. This includes non-Parallel Sysplex and Parallel Sysplex multisystem configurations.

Coexistence allows systems within a multisystem configuration to be upgraded to a new release level of the operating system one system at a time. This is contingent on the fact that the release you are migrating to is within three releases of the lowest release running in your multisystem configuration (for a total of up to four consecutive releases). Four releases is the general migration and coexistence policy that should be assumed for future z/OS releases, except where special provisions have been provided. See the following for a description of these special provisions.

OS/390 Version 2 Release 10 and z/OS Version 1 Release 1 will be treated as a single coexistence level, rather than two coexistence levels. This is due to the unique characteristics of z/OS Version 1 Release 1 and the z/OS Version 1 Release 1 Upgrade Package for OS/390 Version 2 Release 10, which can be installed on OS/390 Version 2 Release 10.

Note: This special treatment only applies to OS/390 Version 2 Release 10 and z/OS Version 1 Release 1.

This means that in addition to the already announced special provision, which provides coexistence support between OS/390 Version 2 Release 6 and OS/390 Version 2 Release 10. OS/390 Version 2 Release 6 can coexist with z/OS Release 1. Moreover, this special treatment of OS/390 Version 2 Release 10 and z/OS Version 1 Release 1 as a single coexistence level also extends the coexistence of specific other OS/390 and z/OS releases as well.

z/OS - List of Base Elements

z/OS provides function 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. An additional set of integrated features is available on an optional basis. (See the next section.)

System Services

- DFSMSdfp
- EREP
- ESCON Director Support
- High Level Assembler (HLASM)
- ICKDSF
- ISPF
- JES2
- MICR/OCR Support
- Bulk Data Transfer (BDT)
- Base Control Program (BCP)
- TSO/E
- 3270 PC File Transfer Program
- FFST
- TIOC
- ILM
- msys for Setup

Systems Management Services

- HCD
- Cryptographic Services (includes ICSF)
- SMP/E
- Tivoli Management Framework

Application Enablement Services

- DCE Application Support
- Encina Toolkit Executive
- GDDM (includes PCLK and OS/2 Link)
- Language Environment
- SOMobjects Runtime Library
- C/C++ IBM Open Class Library

- Text Search

UNIX System Services (X/Open UNIX 95 functions)

- z/OS UNIX System Services Application Services (Shell, Utilities,
- z/OS UNIX System Services (included in the BCP)

Distributed Computing Services

- DCE Base Services (OSF DCE level 1.1)
- Distributed File Service (OSF DCE 1.2.2 level)
- Network File System

Communications Server

- IP (formerly TCP/IP)
- SNA (includes AnyNet) (formerly VTAM)

LAN Services

- LANRES
- LAN Server
- OSA Support Facility

Network Computing Services

- BookManager BookServer
- IBM HTTP Server

Softcopy Services

- BookManager READ

z/OS - List of 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. The only exception is VisualLift for MVS, VSE, VM, which is shipped on a diskette. For the version and release levels of those features that also exist independently, see z/OS Planning for Installation.

System Services

- JES3
- Bulk Data Transfer (BDT) File-to-File
- Bulk Data Transfer (BDT) SNA NJE

SecureWay Security Server

- SecureWay Security Server (RACF, DCE Security Server at OSF DCE level 1.1, LDAP Server, Firewall Technologies, and OCEP)
- Security Server LDAP Server DES

Systems Management Services

- DFSMSdss
- DSMSrmm
- DFSMShsm
- HCM
- OCSF Security Level 3
- RMF
- SDSF
- System Secure Sockets Layer (SSL) Security Level 3

Application Enablement Services

- C/C++ with Debug Tool
- C/C++ without Debug Tool
- DFSORT
- GDDM-PGF
- GDDM-REXX
- High Level Assembler (HLASM) Toolkit
- SOMobjects Application Development Environment

Distributed Computing Services

- DCE User Data Privacy (DES and CDMF) - OSF DCE 1.1 level
- DCE User Data Privacy (CDMF) - OSF DCE 1.1 level
- Infoprint Server for z/OS (includes z/OS Print Interface, Windows 95/NT client, IP PrintWay, NetSpool)

Communications Server

- Communications Server Security Level 1
- Communications Server Security Level 2
- Communications Server Security Level 3
- Communications Server Network Print Facility (NPF)

Network Computing Services

- IBM HTTP Server NA Secure

Softcopy Services

- BookManager BUILD

Description of Base Elements

To help you understand the general function of an element or feature, these descriptions are categorized by functional groups.

System Services

DFSMSdfp

FSMSdfp 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 MVS/ESA 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/MVS. DFSMSdfp uses the Distributed FileManager (DFM) to support remote access of MVS 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 MVS system. MVS 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, MVS programs can directly access UNIX data. When the z/OS NFS client and z/OS UNIX are used together, MVS can act as a client and access data from any remote system, including another MVS or UNIX system that is connected using a TCP/IP network served by a Network File System server.

Environmental Record Editing and Printing Program MVS (EREP MVS) R3.5

EREP edits and prints reports for the records placed in the error recording data set (ERDS) by the error recovery program (ERP) of the operating system. It helps IBM service representatives maintain customer data processing installations, because the service representative can analyze information in the EREP reports to determine if a problem exists, what the problem is, and where the problem is located.

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.

High Level Assembler (HLASM)

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 resou rces, 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.

Device Support Facility (ICKDSF)

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.

ISPF

SPF consists of four major components; Dialog Manager (DM), Program Development Facility (PDF), Software Configuration Library Manager (SCLM), and Client/Server (C/S).

- DM -- Provides services to dialogs and end-users for creating and using elements, such as functions, panel definitions, message definitions, tables, file-tailoring skeletons, and dialog variables.
- DF -- Provides editing, compiling, and library management services to assist the dialog or application developer.
- SCLM -- Provides services to application developers to manage their application development libraries.
- C/S -- Allows you to run ISPF on a programmable workstation, and to display the panels using the display function of your workstation operating system.

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:

- ES2 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.

MICR/OCR Support

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

Bulk Data Transfer (BDT)

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.

Base Control Program (BCP)

The backbone of the z/OS system is the MVS Basic 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.

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.

The 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.

First Failure Support Technology/MVS (FFST/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

Terminal Input Output Controller (TIOC)

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

ILM

See the description of z/OS V1R1 functions in the first part of this book for a description of this element.

msys for Setup

See the description of z/OS V1R1 functions in the first part of this book for a description of this element.

Systems Management Services

Hardware Configuration Definition (HCD)

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.

Cryptographic Services (includes ICSF)

Cryptographic Services provide cryptographic functions for data secrecy, data integrity, personal identification, digital signatures, and the management of cryptographic keys. It includes ICSF. These functions are provided through the combination of secure cryptographic hardware, the ICSF cryptographic API, and the ICSF administration interface. The cryptographic services support a wide variety of applications with high performance, security, and availability. ICSF supports the Common Cryptographic Architecture (CCA), as well as the DES algorithm, RSA p ublic key cryptography, and the Digital Signature Standard.

Additional functions are:

- Trusted Key Entry

  The key entry unit for master keyes 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

  This supports privacy functions.

- Public Key API (PKA Support)

  This support provides additional formatting or message digest standards.

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 an z/OS system.

Tivoli Management Framework

The Tivoli Management Framework contains the Tivoli Management Agent for z/OS, which enables z/OS to be managed by the Tivoli Framework-based applications that support z/OS, such as Tivoli User Administration for z/OS and Tivoli Security Management for z/OS.

Application Enablement Services

DCE Application Support

This function of z/OS provides distributed application support.

- Inbound transactional RPC

  This support allows customers to develop and run DCE-based distributed transaction processing applications, which include IMS, on the z/OS platform. This support interfaces with Encina Toolkit Executive for two-phase commit, IMS OTMA for IMS support, and RRS for z/OS recovery services. TRPC promotes use of network computing by supporting Encina clients on a variety of platforms, including the internet.

- C Data Type Support

  This provides IDL compiler support for certain C Data types, in addition to the current COBOL data type support. This item expands the Application Support capabilities of DCE to include additional data types.

Encina Toolkit Executive

Provides a set of tools for developing client components of distributed transactional applications. It also allows ephemeral (non-recoverable) client applications to be written.

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.

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 C/C++
- COBOL for MVS and VM
- C/C++ for MVS/ESA
- COBOL for z/OS and VM
- AD/Cycle C/370
- PL/I for MVS and VM
- SAA AD/Cycle PL/I MVS and VM
- IBM VisualAge for Java, Enterprise Edition for z/OS

- VS FORTRAN and FORTRAN IV (in compatibility mode)

Language Environment supports the VS Fortran and Fortran IV Compilers' 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, and supports debugging of applications using the IBM Debug Tool stand-alone or in conjunction with the IBM VisualAge remote debugger.

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.

  And Language Environment has support for Year 2000 using a 'sliding window' approach.

SOMobjects Runtime Library (RTL)

The SOMobjects runtime library is a set of functions for creating objects and invoking methods on them. SOMobjects applications can use the same object-oriented classes even when the applications are written in different programming languages. SOMobjects applications require the SOMobjects runtime library.

C/C++ IBM Open Class Library

C/C++ IBM Open Class Library is a comprehensive set of C/C++ class libraries that is used to develop applications. Retroactive to z/OS Version 1 Release 3, this component of the C/C++ optional feature is licensed with the base operating system and can be used without enabling the C/C++ feature (C/C++ with Debug Tool or C/C++ without Debug Tool). Applications are not required to license the C/C++ feature of z/OS for access to the dynamic link libraries (DLLs), and you are not required to use the DLL Rename Utility to package and redistribute DLLs with the applications.

Text Search

Text Search consists of two components: the IBM Text Search Engine and the NetQuestion Solution for a single Web server.

The Text Search Engine is an advanced search engine. The most important components are client/server handling, linguistic support for different languages, and queue mechanisms. Free-text searching, Boolean logic, and fuzzy searches are supported. The search results can be ranked by relevance.

The NetQuestion Solution is a ready-to-run text search solution based on the Text Search Engine. It provides a full-text search service for documents stored on the z/OS operating system. The search service can be accessed through TCP/IP-connected workstations using an HTML browser.

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.

Distributed Computing Services

Distributed Computing Environment (DCE) Base Services (OSF DCE Level 1.1)

The DCE Services provides the strengths of a distributed computing environment:

- Transparency of data and logic
- Distributed, consistent directory service
- Security for both clients and servers integrated in execution path
- Scalability of distributed applications
- Interoperability and portability.

DCE Services supports the following:

- Remote Procedure Call (RPC) lets calls between programs running on different platforms appear as local procedure calls to the programmer.
- Directory Services allows resources to be found anywhere in an enterprise without the need to know local names.
- Security Services solves security problems common in a distributed environment by handling identification and certification of users, clients, servers, and systems.
- Distributed Time Services synchronizes clocks running on different nodes.

All components supported are based on the Open Software Foundation (OSF) DCE level 1.2.1. The DCE Base Services support clients and servers that run on IP and SNA networks.

Distributed File Service

The Distributed File Service provides DFS support which is the Distributing Computing Environment (DCE) distributed file service component. As developed by the Open Group Open Systems Foundation (OSF), DCE and DFS join heterogeneous systems to provide secure read/write access to file data stored on the system or on another DCE system. DFS joins file systems on different systems into a single, global file system accessible by a large number of users. DFS file servers export file data for access by DFS clients running on the same or remote DCE system. DFS clients and servers communication uses DCE RPC protocols and DCE security. DFS provides a uniform file name space for users on heterogeneous systems; client caching for improved performance; transparent file locations to enable file data replication and movement between DCE systems which result in high availability and scalability. A DFS server on z/OS can export DFS LFS, HFS, Sequential, VSAM and PDS(/E) data for access by DFS clients. HFS, Sequential, VSAM and PDS(/E) data exported by a DFS server can be shared with local z/OS users and applications.

Network File System (NFS)

z/OS NFS acts as a file server to workstations, personal computers, or other authorized systems in a IP network. It also provides an MVS client. It enables client users to remotely access MVS data sets or z/OS UNIX Services files from any system on a IP network that uses client software for the SUN Network File System protocol. The remote data sets or files are mounted from the mainframe to appear as local directories and files on the client system.

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. 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. UNIX applications use IP. Some common uses of IP include:

- Electronic Mail

- File Transfer
- Remote Logon
- Internet

IP CICS Sockets

IP CICS Sockets (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 (integrated into the base TCP/IP stack) allows the development of peer-to-peer applications in which IMS and a 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 (includes AnyNet)

Formerly known as VTAM, SNA is a network communication access method (Systems Network Architecture) and Advanced Peer-to-Peer Networking (APPN). It provides 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, Network Control Programs (NCPs) and the devices they control, and devices to which SNA is directly attached. SNAalso 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. It keeps the operator informed about those services, as well as about network conditions, through operator messages.

AnyNet

AnyNet implements the multiprotocol transport networking (MPTN) architecture. AnyNet enables application program types to communicate without change over different transport networks and across interconnected networks.

The AnyNet SNA over IP function enables SNA application programs to communicate over a IP network. SNA over IP provides support for dependent logical unit communications, such as printers and emulators, if the host is defined as a dependent LU server and dependent LU requester support is enabled at the workstation. In addition, SNA over IP supports all LU types, including LU 6.2, and supports concurrent sessions over the IP network to LUs in different SNA networks.

The AnyNet Sockets over SNA function enables application programs that use the C socket API to communicate over SNA networks with other application programs that also use the C socket interface.

AnyNet provides the UNIX application environment quick and easy access to the vast resources of the SNA/APPN network and all of the security and reliability that goes along with SNA/APPN. This support means that applications written to the sockets interface can dynamically and simultaneously communicate across either SNA/APPN, IP or both networks.

LAN Services

LANRES

LANRES integrates NetWare LANs and System/390 environments. LANRES extends and expands data availability. NetWare workstation users benefit from workstation response and interworkstation communication on the LAN and from a powerful System/390 computing environment. With LANRES a single NetWare server can communicate with a VM, MVS, and OS/400 host proces sor at the same time.

LANRES lets:

- Host users administer multiple NetWare servers
- Host users and NetWare workstation users print documents or data on printers located anywhere in your site
- Host users manage NetWare files and directories
- NetWare workstation users store data on host direct access storage devices (DASD)

LAN Server

LAN Server for MVS enables LAN workstation users to store and share data and applications in a central location on a System/390 which allows the large storage capacity of a System/390 to relieve the capacity constraints of workstation-based servers.

LAN Server uses host disk storage to provide file sharing services to workstation users on local area networks (LANs). The LANs can be either OS/2 LAN Server

environments or IP environments using Network File System (DFSMS/MVS NFS) services.

Some benefits are:

- LAN Server provides complete workstation file system services on a host system.
- Workstation users accustomed to working with file servers do not need to learn new interfaces to use LAN Server.
- LAN Server allows file sharing across multiple LANs. Workstation users on widely scattered LANs can share files on a host.
- Workstation users on OS/2 LANs can share files with DFSMS/MVS Network File System users on IP networks, and vice versa.
- LAN Server supports multiple connectivity options (including ESCON), so it can be used in a wide variety of application environments.
- While LAN Server is running, administrators can control and monitor access to the workstation files stored on the host.
- Administrators can back up and restore workstation-format files using an ADSTAR Distributed Storage Manager (ADSM) server. Administrators can copy selected files, directories, or disks to backup storage managed by one of these servers.

Open Systems Adapter Support Facility (OSA/SF)

OSA/SF is a base, non-exclusive 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 and OSA Express features connect to Ethernet, Fast Ethernet (FENET), and Asynchronous Transfer Mode (ATM) networks. OSA-Express also connects to Gigabit Ethernet, while OSA-2 supports Fiber Distributed Data Interface (FDDI) and token-ring connection. OSA/SF provides a user-friendly interface for monitoring and controlling the OSA features. OSA/SF Version 2 introduces support for a new Windows-based GUI interface as well as support for the new OSA-Express features. OSA/SF Version 2 continues support for the OSA-2 features and continues to provide the OS/2-based GUI.

Network Computing Services

IBM HTTP Server

The IBM HTTP Server provides for scaleable, high performance webserving for critical e-business applications. It is exclusive to z/OS. 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). In order to have secure communication, one of the following optional features must be

installed: IBM HTTP Server Export Secure, IBM HTTP Server France Secure, IBM HTTP Server NA Secure.

BookManager BookServer

BookManager BookServer for the World Wide Web enables customers to provide entire libraries of documents via the World Wide Web. This element is an z/OS version of the BookServer product available on OS/2. Customers are able to serve BookManager books to HTML browsers connected to either the Internet or an intranet. The information is stored in a virtual library, which is composed of books, bookshelves, and collections.

Softcopy Services

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.

Description of Optional Features

To help you understand the general function of an element or features, these descriptions are categorized by a functional group.

System Services

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.

Bulk Data Transfer (BDT) File-to-File

The BDT File-to-File element allows users at one z/OSsystem 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.

SecureWay Security Server

SecureWay Security Server (RACF, DCE Security Server at the OSF DCE level 1.1, LDAP Server, Firewall Technologies, OCEP)

The Security Server combines the traditional benefits of RACF with the Open Software Foundation DCE level 1.1. This means that you get:

- Flexible control of access to protected resources
- Protection of installation-defined resources

- Ability to store information for other products
- Choice of centralized or decentralized control of security pro files
- An ISPF panel interface
- Transparency to end users
- Exits for installation-written security routines

The DCE feature integrates the Open Software Foundation Distributed Computing Environment technologies with the base MVS/ESA operating system.

The interoperation of OSF DCE and RACF enables DCE application servers in an MVS/ESA environment to use the RACF security functions when called from DCE-based server applications. These functions include the access control and auditing mechanisms provided by RACF.

z/OS also includes Open Cryptographic Enhanced Plug-ins (OCEP). OCEP is intended to be used with the framework provided by the Open Cryptographic Services Facility (OCSF). OCEP provides two service provider modules; one for data library services and the other for a trust policy manager. These service provider modules enable applications to use z/OS Security Server (RACF), or an equivalent product, to provide security functions for digital certificates and key rings.

Security Server LDAP Server DES

This feature provides cryptographic protection above what is provided by the LDAP Server in the Security Server. It contains DES/TDES function.

Systems Management Services

System Secure Sockets Layer (SSL) Security Level 3

System SSL support provides privacy between a client and a server through use of the SSL protocol and greater--than--40-bit user data cryptography. The base element Cryptographic Services alone, without this feature, provides only 40-bit user data cryptography. With limited exceptions, this feature may not be exported from the United States and Canada.

Resource Measurement Facility (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.

With the RMF Spreadsheet Converter, you can download reports from the screen, or from RMF data sets in MVS, to spreadsheets at a workstation, and perform your own detailed analyses, using one of several familiar spreadsheet products.

In addition to host-based reporting functions in RMF, there are other components available that offer reporting capabilities at the workstation. Performance Monitoring of z/OS (PM of z/OS) provides an interface between the OS/2 workstation and the z/OS sysplex that gives you the flexibility to create unique scenarios to monitor the performance of your system. You can collect real-time data in graphic and text mode, combine data from different collection types, or even from different applications, and group resources together. The RMF Spreadsheet Reporter is a workstation interface based on Windows 95 or Windows NT for analyzing RMF data with Lotus 1-2-3 and Excel spreadsheets. This function enables you to integrate RMF data into your business processes. It also means you can easily produce presentation graphics which illustrate performance analysis results.

HCM

The z/OS Hardware Configuration Manager 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.

DFSMS Features (DFSMSdss, DFSMShsm, DFSMSrmm)

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 on volumes. 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. With DFSMSrmm, you can manage your removable media as one enterprise-wide library across systems that can share DASD. 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.

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 th e 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).

SDSF provides complete online help and an interactive tutorial. In addition, ISPF users can view online documentation directly from SDSF, using the BookManager Read/MVS product.

Application Enablement Services

DFSORT

DFSORT is IBM's world class sorting product and an optional feature of z/OS. It provides you with the ability to do faster and easier sorting, merging, copying, reporting and analysis of your business information, as well as versatile data handling at the record, field and bit level. DFSORT R13 exploits both hardware functions and software features to optimize overall performance. Designed for speed and efficiency, DFSORT R13 includes numerous performance, data reporting and analysis, National Language Support, and YEAR 2000 features.

Performance features are:

- Dynamic Hipersorting which manages the use of expanded storage by all of the DFSORT R13 Hipersorting applications in the system.
- Dataspace sorting which can reduce CPU time, elapsed time, and EXCP counts for sorting applications.
- DFSORT's Performance Booster for the SAS System,which can help you reduce your CPU time for your SAS sorting applications.
- Dynamic Storage Adjustment (DSA) which allows DFSORT to automatically use more storage when doing so will improve performance.
- Large storage limits (2000MB) and large work data set limits (100) which can increase the amount of data that DFSORT can sort at one time, as well as improve performance.
- OUTFIL which can:
  - Slash your CPU time, elapsed time, and EXCP counts by doing multiple output from a single pass over the input data set
  - Alow you to partition your data, enabling you to take advantage of the parallel processing and data in memory capabilities of BatchPipes/MVS

Data Reporting and Analysis

DFSORT's ICETOOL utility provides flexible and easy to use data reporting and analysis features. You can create reports quickly with ICETOOL. ICETOOL does most of the work for you like calculating column widths and spacing, and determining the placement of titles, section headings, statistics and so on.

OUTFIL provides powerful productivity aids and reporting features that allow you to produce complex reports where you control the exact placement of titles, section headings, statistics and so on.

National Language Support

DFSORT's National Language Support provides the ability to sort and merge data according to a defined country or cultural specification, with DFSORT correctly collating and comparing your data according to your national and cultural needs.

GDDM-PGF

GDDM-PGF is an optional feature of z/OS. GDDM-PGF (Presentation Graphics Facility) is a set of programs for creating presentation material in a variety of styles. It provides:

- The Interactive Chart Utility (ICU), an easy-to-use end-user program for creating business charts
- The Vector Symbol Editor (VSE), a means of creating and modifying symbols for use with the ICU or other GDDM functions
- An application programming interface that enables programs to call either the ICU or a set of presentation-graphics routines for chart creation.
- 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.

C/C++ with/without Debug Tool

This language-centered C/C++ application development environment on the z/OS platform includes a C compiler, a C++ compiler, class libraries, and some C/C++ application development utilities. This feature exploits the C/C++ runtime environment and library of runtime services available with the Language Environment element of z/OS. There are actually two features. One includes a debug tool and one does not.

The C/C++ IBM Open Class Library component of the C/C++optional feature is licensed with the z/OS base operating system and can be used without enabling the optional feature.

High Level Assembler Toolkit

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

SOMobjects Application Development Environment (ADE)

SOMobjects is a technology that allows applications written in different programming languages to use the same object-oriented class libraries. Installations that use SOMobjects can extend or replace those class libraries without requiring changes to, or recompiling of, existing applications. The ADE provides a SOM compiler and source code for the SOM kernel (root) classes, Interface Repository Framework, and Emitter Framework. Distributed SOMobjects provides the ability to distribute objects and object processing to other systems in your enterprise. SOMobjects is CORBA 2.0 compliant.

Distributed Computing Services

Infoprint Server for z/OS

The Infoprint Server for z/OS consists of several components that support printing on an z/OS system:

- z/OS Print Interface

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

- Windows 95/NT Client

  This component contains and Advanced Function Presentation (AFP) printer driver, an AFP Viewer plug-in, and an z/OS Port Monitor.

- IP Printway

  This component transmits output data sets from the JES2 or JES3 spool to remote printers in a IP network.

- NetSpool

  This component intercepts print output from VTAM applications and allocates output data sets on the JES2 or JES3 spool for printing on local or remote printers.

Communications Server

Communications Server Security Level 1, 2, and 3

The three levels of this feature provide 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. Level 1 provides the least stringent security. It provides SLL RC2/RC4, and includes function previously found in IP Security-CDMF and TCP/IP Kerberos Non-DES. Level 2 provides the next level of security, using the DES algorithm, and including SSL DES and SNMPv3 56-bit. It includes function previously provided in IP Security-DES/CDMF and TCP/IP Kerberos DES. The highest level of security is provided by Level 3. It uses the DES algorithm and it includes SSL triple DES (TDES), SNMPv3 56-bit, and IPSec TDES.

Communications Server Network Print Facility (NPF)

The Network Print Facility (NPF) provides an enhanced printing function that reroutes print data to the IP network.

Network Computing Services

IBM HTTP Server NA Secure

Selection of any of these features gives you an integrated Web Application Server, which:

- Provides a repository of home pages
- Serves requests from Web browsers
- Stores text created with HTML
- Stores images, sound, and video clips
- Uses the z/OS Security Server for robust security, including Secure Sockets Layer (SSL) and Proxy Authentication
- Acts as a proxy server
- Provides interface to other z/OS applications
- Provides a Comon Gateway Interface (CGI), allowing acces to DB2, IMS, and CIC transactions and data
- Offers secure sockets layer (SSL) and secure hypertext transfer protocol (S-HTTP) functions

Softcopy Services

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 BookServer products, such as:

- BookManager READ/MVS, which is part of the z/OS base
- BookManager READ/VM
- BookManager READ/2
- BookManager READ/6000
- BookManager READ for Windows
- BookManager READ/DOS
- BookManager BookServer

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