IMS

Release Planning Guide

Version 9

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> **Note**
>
> Before using this information and the product that it supports, be sure to read the general information under "Notices" on page 185.

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About This Book

This book helps system programmers and database administrators plan for installing or migrating to IMS™ Version 9. The focus of this book is on what is new in IMS Version 9 and what you need to know to plan for this release.

This information is available as part of the Information Management Software for z/OS® Solutions Information Center. To view the information within the Information Management Software for z/OS Solutions Information Center, go to http://publib.boulder.ibm.com/infocenter/dzichelp/v2r2/index.jsp. This information is also available in PDF and BookManager® formats. To get the most current versions of the PDF and BookManager formats, go to the IMS Library page at www.ibm.com/software/data/ims/library.html.

As a convenience for customers who have several versions of IMS, this book also provides a summary of the enhancements made for IMS Version 7 and IMS Version 8. Read the Release Planning Guide for each of those versions for the details: *IMS Version 7: Release Planning Guide* (GC26-9437) and *IMS Version 8: Release Planning Guide* (GC27-1305).

Related Reading: When you install IMS, you will also need information in *IMS Version 9: Installation Volume 1: Installation Verification*, *IMS Version 9: Installation Volume 2: System Definition and Tailoring*, and the *IMS Version 9: Program Directory for Information Management System Transaction and Database Servers*.

With IMS Version 9, you can reorganize HALDB partitions online, either by using the integrated HALDB Online Reorganization function or by using an external product. In this information, the term *HALDB Online Reorganization* refers to the integrated HALDB Online Reorganization function that is part of IMS Version 9, unless otherwise indicated.

IMS Version 9 provides an integrated IMS Connect function, which offers a functional replacement for the IMS Connect tool (program number 5655-K52). In this information, the term *IMS Connect* refers to the integrated IMS Connect function that is part of IMS Version 9, unless otherwise indicated.

How to Use This Book

First, read the information in Part 1, "General Planning Information," on page 1 for an overview of the new functions and enhancements that are available in IMS Version 9, information about how these new functions might affect your installation, and general migration considerations. Part 1 contains:
- A summary of the enhancements and changes to IMS
- An overview of the hardware and software requirements
- A chapter on migrating to IMS Version 9
- A chapter that discusses coexistence issues between different versions of IMS
- A summary of changes to the IMS library for IMS Version 9
- A listing of the changed, new, and deleted messages and abends for IMS Version 9
- A listing of the new and changed log records for IMS Version 9
- A list of the IBM® IMS tools that work with IMS Version 9

Second, read the appropriate chapters in Part 2, "Planning for New Features and Enhancements," on page 97 for a more detailed description of the larger new functions and enhancements in IMS Version 9.

If you are migrating to IMS Version 9 from an earlier version of IMS, refer to Part 3, "Previously Available Features and Enhancements," on page 149 for an overview of the changes and enhancements to IMS for Version 7 and Version 8.

Prerequisite Knowledge

Before using this book, you should have knowledge of either IMS Database Manager (DB) or IMS Transaction Manager (TM). You should also understand basic IMS concepts, your installation's IMS system, and have general knowledge of the tasks involved in project planning.

IBM offers a wide variety of classroom and self-study courses to help you learn IMS. For a complete list of courses available, go to the IMS home page on the Web at www.ibm.com/ims and link to the Training and Certification page.

References to IMS Products and Versions

To make the text in this information easier to read, the version and release level of IMS has been abbreviated. Table 1 explains how these abbreviations are defined.

Table 1. References to IMS Products and Versions

Abbreviated Product Name	Refers to ...
IMS Version 6	IMS/ESA® Version 6
IMS TM Version 6	The IMS/ESA Transaction Manager feature of Version 6
IMS DB Version 6	The IMS/ESA Database Manager feature of Version 6
IMS TM Version 7	The IMS Transaction Manager feature of Version 7
IMS DB Version 7	The IMS Database Manager feature of Version 7
IMS TM Version 8	The IMS Transaction Manager feature of IMS Version 8
IMS DB Version 8	The IMS Database Manager feature of IMS Version 8
IMS TM Version 9	The IMS Transaction Manager feature of IMS Version 9
IMS DB Version 9	The IMS Database Manager feature of IMS Version 9

IBM Product Names Used in This Information

In this information, the licensed programs shown in Table 2 are referred to by their short names.

Table 2. Licensed Program Full Names and Short Names

Licensed program full name	Licensed program short name
IBM Application Recovery Tool for IMS and DB2®	Application Recovery Tool
IBM CICS® Transaction Server for OS/390®	CICS
IBM CICS Transaction Server for z/OS	CICS
IBM DB2 Universal Database™	DB2 Universal Database
IBM DB2 Universal Database for z/OS	DB2 UDB for z/OS

Table 2. Licensed Program Full Names and Short Names (continued)

Licensed program full name	Licensed program short name
IBM Enterprise COBOL for z/OS and OS/390	Enterprise COBOL
IBM Enterprise PL/I for z/OS and OS/390	Enterprise PL/I
IBM High Level Assembler for MVS™ & VM & VSE	High Level Assembler
IBM IMS Advanced ACB Generator	IMS Advanced ACB Generator
IBM IMS Batch Backout Manager	IMS Batch Backout Manager
IBM IMS Batch Terminal Simulator	IMS Batch Terminal Simulator
IBM IMS Buffer Pool Analyzer	IMS Buffer Pool Analyzer
IBM IMS Command Control Facility for z/OS	IMS Command Control Facility
IBM IMS Connect for z/OS	IMS Connect
IBM IMS Connector for Java™	IMS Connector for Java
IBM IMS Database Control Suite	IMS Database Control Suite
IBM IMS Database Recovery Facility for z/OS	IMS Database Recovery Facility
IBM IMS Database Repair Facility	IMS Database Repair Facility
IBM IMS DataPropagator™ for z/OS	IMS DataPropagator
IBM IMS DEDB Fast Recovery	IMS DEDB Fast Recovery
IBM IMS Extended Terminal Option Support	IMS ETO Support
IBM IMS Fast Path Basic Tools	IMS Fast Path Basic Tools
IBM IMS Fast Path Online Tools	IMS Fast Path Online Tools
IBM IMS Hardware Data Compression-Extended	IMS Hardware Data Compression-Extended
IBM IMS High Availability Large Database (HALDB) Conversion Aid for z/OS	IBM IMS HALDB Conversion Aid
IBM IMS High Performance Change Accumulation Utility for z/OS	IMS High Performance Change Accumulation Utility
IBM IMS High Performance Load for z/OS	IMS HP Load
IBM IMS High Performance Pointer Checker for OS/390	IMS HP Pointer Checker
IBM IMS High Performance Prefix Resolution for z/OS	IMS HP Prefix Resolution
IBM z/OS Language Environment	Language Environment
IBM Tivoli® NetView® for z/OS	Tivoli NetView for z/OS
IBM WebSphere® Application Server for z/OS and OS/390	WebSphere Application Server for z/OS
IBM WebSphere MQ for z/OS	WebSphere MQ
IBM WebSphere Studio Application Developer Integration Edition	WebSphere Studio
IBM z/OS	z/OS
IBM z/OS C/C++	C/C++

Accessibility

Both the IMS Version 9 product and its related documentation are accessible. For the details of this claim, see "Accessibility features for IMS" on page 66.

How to Send Your Comments

Your feedback is important in helping us provide the most accurate and highest quality information. If you have any comments about this or any other IMS information, you can take one of the following actions:

- Click the Feedback link located at the bottom of every page in the Information Management Software for z/OS Solutions Information Center. The information center can be found at publib.boulder.ibm.com/infocenter/dzichelp/index.jsp.

- Go to the IMS Library page at www.ibm.com/software/data/ims/library.html and click the Library Feedback link, where you can enter and submit comments.

- Send your comments by e-mail to imspubs@us.ibm.com. Be sure to include the title, the part number of the title, the version of IMS, and, if applicable, the specific location of the text on which you are commenting (for example, a page number in the PDF or a heading in the Information Center).

Summary of changes

This section describes the changes made for this book after it was originally published.

Changes for the Current Edition of This Book

This edition includes technical and editorial changes, including changes to the following sections or chapters:
- "DBRC Enhancements" on page 4
- "Integrated IMS Connect Support and Enhancements" on page 18
- "OTMA Enhancements" on page 13
- "Replacement of XRF USERVAR" on page 14

Changes for the Previous Edition of This Book

The second edition included technical and editorial changes, including changes to the following sections or chapters:
- "IMS Java SQL Enhancements" on page 10.
- "APPC Enhancements" on page 11.
- "Ending APPC/OTMA Conversations" on page 11.
- "Replacement of XRF USERVAR" on page 14.
- "OTMA Enhancements" on page 13.
- "Sharing TM Resources in an IMSplex with RM" on page 14.
- "IMS Application Menu" on page 16.
- "IMS Java Enhancements" on page 17.
- "Integrated IMS Connect Support and Enhancements" on page 18.
- "JBP Symbolic Checkpoint and Restart Enhancement" on page 19.
- "Removal of Restriction for Separate IMS.SDFSRESL Libraries" on page 21.
- Software Requirements for:
  - "IMS Java" on page 30
  - "IMS Java Remote Database Services" on page 31
  - "Integrated IMS Connect Support" on page 32
  - "IRLM" on page 32
  - "MNPS Replacement of XRF USERVAR" on page 33
  - "XML Enhancements" on page 33
  - "Small Programming Enhancements (SPEs)" on page 33
  - "Programming Languages Supported" on page 35
  - "Packaging for IMS Version 9" on page 35
- Migration considerations for:
  - "Data Entry Database Sequential Dependent Scan Utility Exit Routine (DBFUMSE1)" on page 42
  - "HALDB Online Change" on page 42
  - "IRLM 2.2" on page 43
  - "Integrated IMS Connect Support" on page 47
  - "IMS Java Enhancements" on page 47
  - "RACF Enhancements to Replace SMU" on page 48
  - "Removal of Restriction for Separate IMS.SDFSRESL Libraries" on page 50

Part 1. General Planning Information

This part provides an overview of the new functions and enhancements that are available with IMS Version 9, describes how these new functions might affect your installation, and provides general migration considerations. It also describes the IBM IMS tools that support IMS Version 9.

Chapter 1. Overview of IMS Version 9 Enhancements

This chapter introduces the enhancements made for IMS Version 9. These enhancements are presented in three sections:

The enhancements for IMS Version 9 are:

The larger enhancements are fully discussed in their own chapters in Part 2, "Planning for New Features and Enhancements," on page 97. The smaller enhancements are discussed only in this chapter.

IMS Database Manager Enhancements

This section describes the enhancements for the IMS Version 9 Database Manager.

"IMS System (DB and TM) Enhancements" on page 15 describes additional enhancements for the IMS Database Manager.

Database Parallel Open

IMS Version 8 added the parallel database processing enhancement (see "Parallel Database Processing Enhancement" on page 156) in which IMS uses multiple task control blocks (TCBs) to open and close full-function databases in parallel. IMS Version 9 adds a new control statement to the DFSVSMxx IMS.PROCLIB member to allow you to disable the default behavior so that IMS serializes database open processing under a single TCB. This control statement is NOPDBO.

DBRC Enhancements

The major DBRC enhancements for IMS Version 9 are:
- Command authorization for /RM commands
- Move DBRC modules above the 16 MB line
- Eliminate the DSPSLDRC part from DBRC
- Provide support for tape large block sizes
- Allow IMS to use an OLDS for restart when ERROR=CLOSE
- Check secondary WADS at restart
- DBRC Application Programming Interface (API)
- Enhancement to the INIT.PART command
- Enhancement to the CHANGE.DB command

Related Reading: The following sections provide an overview of the DBRC enhancements. For the details of the larger DBRC changes, see Chapter 9, "DBRC Enhancements," on page 99.

Command Authorization for /RM Commands

This enhancement extends the command authorization that is currently available for batch DBRC commands to the online (/RMxxxxxx) commands. Namely, you now have the ability to use a security product (such as RACF®), a security exit routine, or both, for /RMxxxxxx commands.

Move DBRC Modules Above the 16MB Line

This enhancement consists of moving two DBRC load modules (DSPCINT1 and DSPURX00) into private and common storage above the 16 MB line. This move further reduces the amount of common storage area (CSA) that IMS uses, thus increasing the amount of CSA that is available.

Eliminate the DSPSLDRC Part from DBRC

This enhancement is mostly an internal IMS code cleanup. Two similar DSECTs are combined. As of IMS Version 9, DBRC uses PRILOG RECON record mapping instead of PRISLD RECON record mapping.

Provide Support for Tape Large Block Sizes

This enhancement provides support for tape block sizes greater than 32 760 bytes for the output from the Database Image Copy utility (DFSUDMP0) and the Online Database Image Copy utility (DFSUICP0). There is a hardware dependency for this enhancement.

Allow IMS to Use an OLDS for Restart When ERROR=CLOSE

This enhancement allows IMS to restart using DBRC to tell IMS which log in an online log data set (OLDS) to read next, even if that OLDS is marked ERROR=CLOSE and might not yet be closed. This enhancement removes an internal error condition. You must still process the OLDS using the Log Recovery utility (DFSULTR0) before you can archive it or use it as input to any utility, as currently documented in the *IMS Version 9: Database Recovery Control (DBRC) Guide and Reference* and the *IMS Version 9: Operations Guide*.

This enhancement is also available for IMS Version 7 (PQ59736) and IMS Version 8 (PQ59737).

Check Secondary WADS at Restart

This enhancement causes IMS, during restart, to check the secondary WADS for additional information that might not be in the primary WADS.

DBRC Application Programming Interface (API)

The DBRC API is a release-independent, assembler macro interface to DBRC that customer-written application programs use to obtain services from DBRC. The application programs obtain these services by issuing DBRC API requests to IMS. IMS passes these requests to DBRC and returns the results to an area in storage where the application can retrieve them. The services available through the DBRC API are to:

- Initialize the API and start DBRC
- Obtain information that DBRC maintains in the RECON data sets
- Return buffer storage
- Shutdown DBRC and the API

INIT.PART Command Enhancement

The INIT.PART command is enhanced with two new keywords (MVDBDS | NOMVDBDS) that allow the partner M-V,Y DBDS records to be created in the RECON data set for HALDBs that are capable of running HALDB Online

Reorganization. The partner DBDS records are created usually created when a HALDB Online Reorganization is run for the first time. Using the `INIT.PART MVDBDS` command, you can create the partner DBDS records in the RECON data set without running a HALDB Online Reorganization process.

CHANGE.DB Command Enhancement

The `CHANGE.DB` command is enhanced with two new keywords (REORGI | NOREORGI) that provide a command interface for online reorganization products (other than HALDB Online Reorganization) to inform DBRC they are active to provide data integrity for full function databases. When the new intent to reorganize flag is set on in the RECON data set, authorization fails for other reorganization products, batch access, and online image copy.

External Subsystem Attach Facility Indoubt Notification

This enhancement provides the identity of indoubt IMS External Subsystem Attach Facility (ESAF) UOWs to an optional user exit routine (DFSFIDN0) during the recovery phase of an FDBR system or an emergency restart of an IMS system (including an XRF alternate subsystem), thus enabling you to resolve the indoubt UOW earlier than the restart of the IMS system.

As they scan their collections of IMS units of work for recovery, FDBR and IMS systems determine whether external-subsystem data was also changed as part of each unit of work. If so, they provide all of the following information to a user exit routine:

- The identity of this external-subsystem data
- The name of the external subsystem that was connected to the failed IMS
- The final resolution of the data

IMS calls the exit routine once for each indoubt ESAF unit of work. This is a synchronous call to the exit routine, so you should ensure that the exit routine does not impact the performance of the FDBR or the IMS system.

The FDBR or IMS system attempts to load the user exit routine from the concatenation of the IMS.SDFSRESL libraries. The name of the exit routine must be DFSFIDN0. If the exit routine does not exist in the IMS.SDFSRESL libraries, then FDBR ignores the data and an IMS subsystem retains it until a connection is made to the external subsystem.

Fast Path Enhancements

There are three major Fast Path enhancements for IMS Version 9:

- "Fast Path Area Open/Close Enhancements"
- "Fast Path Multiple Areas Shared VSO Structures" on page 7
- "Fast Path Serviceability and Usability" on page 7

Fast Path Area Open/Close Enhancements

These enhancements provide the ability to reopen DEDB areas automatically after IMS emergency restart or IRLM reconnect.

At the end of IMS emergency restart, all areas that were open when IMS failed are reopened if these enhancements are enabled. This reopen processing runs asynchronously with normal online activity. However, if an area is not yet reopened when an IMS application program requests access, it is reopened immediately, as in earlier releases of IMS. You enable this automatic reopen with a new parameter for the IMS procedure, FPOPN.

During IRLM reconnect, all areas that were started when IRLM failed are restarted if these enhancements are enabled. This restart processing runs asynchronously with IRLM reconnect and normal online activity. However, you can still use the /START AREA command to start an area immediately. You enable this automatic restart with a new IMS startup parameter, FPRLM.

IMS Fast Path uses up to 10 task control blocks (TCBs) to open, preopen, or close DEDB areas, thus processing each task in parallel.

Related Reading: For more information about these enhancements, see Chapter 10, "Fast Path Area Open/Close Enhancements," on page 103.

Fast Path Multiple Areas Shared VSO Structures

IMS Version 9 enhances the support for sharing VSO DEDB areas by allowing more than one VSO DEDB area in a coupling facility structure.

Multiple DEDB areas can share a single coupling facility structure. These structures are called *multi-area structures*. Because of this support, you do not need to define as many coupling facility structures as before.

This enhancement enables you to have more shared VSO DEDB areas while using fewer coupling facility structures.

Related Reading: For more information about this enhancement, see Chapter 11, "Fast Path Multiple Areas Shared VSO Structures," on page 107.

Fast Path Serviceability and Usability

IMS Version 9 provides the following Fast Path serviceability and usability enhancements:

* The IMS trace table now includes the Fast Path traces.

  The Fast Path table trace, FPTT, is similar to the DL/I table trace.
* The /START DB command now activates online forward recovery (OFR) for DEDBs on an RSR tracking system. You no longer need to start each area individually.

  You should change RSR tracking-system procedures to start DEDBs at the database level rather than the area level.
* SDEP CIs are now created by the DEDB Initialization utility (DBFUMIN0) using the shared-SDEP format.

  You cannot create IMS Version 5-format SDEP CIs. IMS Version 8 was the last version to support the IMS Version 5 format for SDEP CIs.
* Data spaces for VSO DEDB areas are now created when the VSO area is opened, rather than during IMS initialization.

  Data spaces are not allocated if VSO is not used.
* The /DISPLAY AREA command now displays the IMS ID of active Fast Path utility jobs.
* NBA values and OBA values for a dependent region are recorded in the X'5937' log record.
* The High-Speed DEDB Direct Reorganization utility now includes an optional STOPAFTERFAIL# control statement.

  This new control statement specifies the maximum number of UOWs that the utility skips because of lack of buffer space before the utility abnormally terminates. The default is 5.

- Fast Path EPST and EMHB traces are logged in X'6706' log records whenever a X'6706' log record is made after dependent region termination.
- Messages DFS2634I, DFS2635I, and DFS2636I now include the AREA name.

FDBR ECSA Relief for DEDBs

For IMS Version 9, IMS can obtain storage for DEDB buffer pools from the IMS private region rather than from ECSA.

For the ACTIVEIMSID control statement of the DFSFDRxx member of IMS.PROCLIB, you can specify an optional parameter FPBUFF=LOCAL that specifies that the control blocks for Fast Path DEDB processing should be obtained from the FDBR private region instead of from ECSA. This includes the DEDB common buffer pool as well as the SVSO buffer pools.

FDBR WTO Message

In IMS Version 8, when the IMS system that an FDBR system is tracking is not running, the FDBR system issued a write-to-operator-with-reply (WTOR) message that indicated that there was no active system; the reply required the operator to indicate what action to take.

For IMS Version 9, this message, DFS4172I, is a write-to-operator (WTO) message, with no reply required. The FDBR system waits for the MVS Cross-System Coupling Facility (XCF) Group exit routine to indicate a change in status of a member of the group. That is, the FDBR system waits for the active IMS system to rejoin the group.

HALDB Enhancements

IMS Version 9 provides two major enhancements for IMS High Availability Large Databases (HALDBs):
- "HALDB Specific Partition Initialization"
- "Integrated HALDB Online Reorganization Support"

HALDB Specific Partition Initialization

The HALDB specific partition initialization enhancement provides the ability to initialize specified HALDB partitions without first using DBRC `CHANGE.DB` commands to record INIT REQUIRED in the RECON data sets.

With IMS Version 8, the HALDB Specific Partition Initialization utility (DFSUPNT0) requires that a DBRC `CHANGE.DBDS` command be issued for any partitions that require initialization. When the utility executes, all of the partitions of the specified HALDB that are recorded in RECON as INIT REQUIRED are initialized. It is preferable to be able to run this utility and unconditionally initialize individual partitions without using DBRC commands. With IMS Version 8, all of the partitions that belong to a master database can be unconditionally initialized, but not individual partitions.

With IMS Version 9, you can initialize individual HALDB partitions without being authorized by RACF to update the RECON data sets.

Integrated HALDB Online Reorganization Support

The integrated HALDB Online Reorganization (OLR) function provides non-disruptive reorganization of HALDB PHDAM and PHIDAM partitions. HALDB Online Reorganization addresses the planned data outage time, that to date has constituted the largest amount of time that data was unavailable. HALDB

Online Reorganization also offers significant benefit toward reducing the cost of owning data, such as skills, personnel, and other costs. HALDB Online Reorganization provides continuous availability for the largest supported databases.

The online reorganization of a HALDB PHDAM or PHIDAM partition, upon command initiation, runs in the DLISAS address space. The dual data set, cursor-based, online reorganization function is performed non-disruptively. Concurrent IMS updates are allowed while small amounts of data are moved and reorganized.

HALDB Online Reorganization has extended the data definition and data set naming convention established for HALDB. One or more data set groups in a HALDB database use the characters A-thru-J in the DDNAMEs and data set names; the primary index for a PHIDAM database uses the character X in these names. This has been expanded by implementing the characters M-thru-V and Y for an alternate set of data sets.

IMS Version 9 also adds the following new type-2 commands:
- INITIATE OLREORG
- QUERY OLREORG
- TERMINATE OLREORG
- UPDATE OLREORG

Related Reading: For more information about this function, see Chapter 15, "Integrated HALDB Online Reorganization Support," on page 125.

IMS Database Recovery Facility Command Support

The IMS /RECOVER command starts the address space of the IMS Database Recovery Facility for z/OS tool, if the tool has been successfully installed. Otherwise, IMS sends a DFS4273I error message to the MTO. The /RECOVER command is a multi-segment command for this tool because of the additional keywords and parameters that might be required.

To use the Report Only Execution feature of the IMS Database Recovery Facility for z/OS, specify the VERIFY keyword on the /RECOVER START command. The VERIFY keyword returns a list of the log, change accumulation, and image copy data sets that are required to execute recovery for the associated recovery list. By using the VERIFY keyword, you can obtain a list of resources and perform setup before you run the recovery process. IMS does not delete the recovery list when you issue the /RECOVER START command with the VERIFY keyword, so the list can be reused by a subsequent /RECOVER START command.

Related Reading: For more information about using the IMS Database Recovery Facility for z/OS, see the *Database Recovery Facility for z/OS: User's Guide* (SC18-7016).

IMS Java Remote Database Services

IMS Version 9 provides IMS Java application programs distributed access to IMS databases through the IMS Java Remote Database Services. Your non-z/OS application programs can access IMS DB data over the Internet using a secure protocol with local or global transaction semantics and a standard application programming interface (API).

The IMS Java Remote Data Services allow you to deploy a client application program on a distributed WebSphere server that can access IMS DB data. The distributed WebSphere server can run on any platform, such as Linux or Windows.

Related Reading: For more information about this environment, see Chapter 13, "IMS Java Remote Database Services," on page 115.

IMS Java SQL Enhancements

For IMS Version 9, IMS Java JDBC support allows you to select all fields within an IMS segment. To select all fields in a segment, use the asterisk (*) operator in the SQL SELECT statement. For example, to retrieve all of the fields from the Model segment, use the following query:

```
SELECT * FROM DealershipDB.Model
```

To retrieve all of the fields from more than one segment, use the asterisk operator with the segment name. For example, to retrieve all of the fields from both the Dealer segment and the Model segment, use the following query:

```
SELECT Dealer.*, Model.*
FROM DealershipDB.Model
```

The following query also retrieves all of the fields from both the Dealer segment and the Model segment, but without using the asterisk operator:

```
SELECT Dealer.DealerNo, Dealer.DealerCity, Dealer.Zip, Dealer.Phone,
Model.ModelType, Model.Make, Model.Model, Model.Year, Model.MSRP, Model.Count
FROM DealershipDB.Model
```

IMS Type-2 Database Commands

IMS Version 9 adds new commands to allow users to issue commands for database resources in the IMS type-2 command format. These commands are routed to one or more IMSs in the IMSplex, and the output is consolidated with each response line encapsulated in XML tags.

IMS Version 9 adds the following new IMS type-2 commands:
- QUERY AREA
- QUERY DB
- UPDATE AREA
- UPDATE DATAGRP
- UPDATE DB

These commands allow you to manage database resources for the IMSplex environment and to use the IMS Operations Manager and Systems Management functions.

Related Reading: For more information about these commands, see Chapter 14, "IMS Type-2 Database Commands," on page 121.

XML Database Support

IMS Version 9 allows you to store and retrieve XML data in IMS databases using a predefined mapping between the elements and attributes of an XML document and the hierarchic structure of the IMS database. Using the XML database support provided by IMS Version 9, you can:
- Compose XML documents from data in existing IMS databases, including HDAM, HIDAM, HISAM, PHDAM, and PHIDAM databases.

- Store XML documents into new or existing IMS databases.

You can write IMS Java applications to compose and receive XML documents in all of the environments that are supported by IMS Java: IMS Java JMP or JBP application programs, CICS application programs, DB2 stored procedures, or enterprise applications that run on WebSphere Application Server or WebSphere Application Server for z/OS.

Related Reading: For more information about XML database support, see Chapter 18, "XML Database Support," on page 145.

IMS Transaction Manager Enhancements

This section describes the enhancements for the IMS Version 9 Transaction Manager.

"IMS System (DB and TM) Enhancements" on page 15 describes additional enhancements for the IMS Transaction Manager.

APPC Enhancements

IMS Version 9 adds a second timeout value parameter to the APPCIOT keyword of the DFSDCxxx member of IMS.PROCLIB. This new parameter specifies the number of minutes that an APPC conversation can be inactive since its last APPC call.

APPC/OTMA Enhancements

This section describes the IMS Version 9 enhancements for Advanced Program-to-Program Communications/Open Transaction Manager Access (APPC/OTMA).

Ending APPC/OTMA Conversations

Prior to IMS Version 9, there was no way to end an APPC/OTMA conversation. For non-APPC/OTMA conversations, you could use the /EXIT command to terminate conversations. IMS Version 9 adds the `LUNAME` and `TMEMBER TPIPE` keywords to the /EXIT command to allow you to terminate APPC/OTMA conversations. You can use the `/DISPLAY CONVERSATION` command to display the TMEMBER name for OTMA so that you can identify the conversations.

Restriction: The conversation IDs for APPC and OTMA must be unique within an IMS subsystem.

Synchronous APPC/OTMA Shared Queues Enablement

IMS Version 9 adds a parameter to the DFSDCxxx member of IMS.PROCLIB that specifies whether the APPC/OTMA shared queues enablement should be active. When the APPC/OTMA shared queues enablement is active, IMSplex users can execute transactions originated by APPC or OTMA on a back-end system. The parameter is AOS=.

ETO Enhancements

This section describes the IMS Version 9 enhancements for the Extended Terminal Option (ETO).

ETO Feature Checking

With IMS Version 9, IMS system definition no longer validates that the ETO feature has been installed. During IMS system definition, IMS ignores the first two sub-parameters that are specified on the ETOFEAT keyword of the IMSCTRL macro.

Instead, during initialization of the IMS Transaction Manager, IMS validates that the ETO feature is installed when you specify the ETO=Y startup parameter. If the feature is not installed, IMS issues a DFS3676I error message, followed by an ABENDU3476.

IMS builds ETO descriptors, if requested, during system definition. If you need to build ETO descriptors, run the LGEN first (Stage 1 and Stage 2). Then, run a standard CTLBLKS system definition and specify ETOFEAT=(,,ONLY).

LU 3 Devices with ETO

With IMS Version 9, the Initialization exit routine (DFSINTX0) has new parameters to allow an ETO logical unit type 3 (LU 3) device to log on to IMS as either a secondary LU type 1 (SLU 1) or a 3270 printer (3270P) device.

IMS Web Services Support

The IBM WebSphere family of products provide Web services support that enables you to publish existing IMS transactions, including MFS-based IMS transactions, to the Internet as Web services, and connect to IMS using Simple Object Access Protocol (SOAP) and Enterprise JavaBean (EJB) bindings.

Web services are language- and platform-independent network-accessible programs that provide application-to-application communication using the Internet. With the WebSphere Studio Application Developer Integration Edition Web services support, you can transform existing IMS application programs into Web services. These application programs can be written in C, COBOL, or they can be MFS-based. You deploy IMS Web services to a WebSphere Application Server.

Notify CQS Outage to Terminal Users

With IMS Version 9, if the CQS address space is unavailable, a static non-set-and-test-sequence-numbers (STSN) terminal that requires signon receives message DFS3649A, with RC=436, and the terminal session is terminated.

This change does not impact a static terminal that does not require signon, or a static STSN terminal. That is, the session persists even if the CQS address space is unavailable.

Optional EMHQ Structure for Shared Queues

Using IMS shared queues with IMS Fast Path installed, you are no longer required to allocate an Expedited Message Handler Queue (EMHQ) structure and its associated log structure data set, checkpoint data set, and structure recovery data set. Users who use only Fast Path DEDBs or local EMH processing in a shared queues environment do not use these resources and are no longer required to create and manage them.

Removing the EMHQ statement from the DFSSQxxx PROCLIB member disables Shared EMH processing. Remove this statement only if you do not plan to use shared EMH processing.

Before you disable EMHQ usage for an IMS system, ensure that the IMS system does not have any of its input or output messages on the EMHQ if the EMHQ structure is still in use in a shared queues group. If an IMS that has disabled the EMHQ still has its messages on the EMHQ, the associated output messages are either delivered or discarded, depending on the sysplex terminal resource definition for the input terminals. If an output message is discarded, IMS writes a X'67D0' Subtype 11 trace log record.

To disable shared EMH processing, perform the following actions:

1. Remove the EMHQ statement in the DFSSQxxx PROCLIB member.
2. In the CQSSLxxx PROCLIB member, delete the STRUCTURE statement for an EMHQ structure and its associated CQS checkpoint data set.
3. In the CQSSGxxx PROCLIB member, delete the STRUCTURE statement for an EMHQ structure, its associated overflow structure, structure recovery data sets, and CQS log.
4. Delete the STRUCTURE definition for the EMHQ structure in the CFRM policy.
5. Delete the LOGSTREAM definition for CQS log for the EMHQ structure in the MVS Logger Structure Definition policy.
6. Delete automation for any command that deals with EMHQ structure if it is present. For example, you can delete any CQS structure checkpoint commands for an EMHQ structure in IMS automation.
7. Restart IMS with a cold start using the /ERESTART COLDCOMM command for an emergency restart, or the /NRESTART CHECKPOINT 0 command for a full cold start.

If you change the usage of the shared EMHQ structures and do not perform a cold start of IMS data communications, IMS terminates warm or emergency restart with ABENDU0231 Subcode 8.

OTMA Enhancements

IMS Version 9 provides the following new functions for OTMA:

- OTMA clients can now set the ACEE security aging value for user IDs in the OTMA message prefix without requiring the client to reconnect to OTMA.
- The OTMT table-trace entries for the OTMA user exit routines OTMA Prerouting Exit Routine (DFSYPRX0) and OTMA Destination Resolution Exit Routine (DFSYDRU0) are now standardized.
- The DFSYPRX0 user exit routine for OTMA can set the OTMA destination TPIPE name.
- Values for the Z2 field of LLZZ input messages that are set by remote programs pass through untouched by OTMA. You can set these values using the OTMA Input/Output Edit exit routine (DFSYIOE0).
- OTMA can now be started by the /START OTMA command if OTMA=M is set in the IMS control region JCL or in the DFSPBxxx IMS.PROCLIB member. The /START OTMA command is not recovered during an emergency restart.

  If you choose not to set OTMA=M in the IMS control region JCL or DFSPBxxx PROCLIB member, you can issue the /START OTMA NOCHECK command to start OTMA. IMS considers this command as non-recoverable during an emergency restart.
- You can monitor the OTMA input message flow to prevent a OTMA message flood condition. The /START TMEMBER MEMBERNAMEINPUT MAX-CONCURRENT-INPUT-COUNT command can be used to set the maximum active input for a OTMA member.

After the maximum limit has been set, OTMA monitors the growth of the active input messages from a member, such as IMS Connect or WebSphere MQ. A DFS1988W warning message is sent to the console when a certain percentage of the input message limit is reached. When the maximum limit is reached, a DFS1989E error message is sent to the system console. Any subsequent OTMA input messages from the member are rejected with the NAK code '30'x until the flood condition is relieved.

The /DISPLAY command shows the "flood" status when the number of input messages reaches the maximum. The flood status is relieved and reset when either:

– The input messages have been processed and reduced to 50%, or less, of the maximum value.

– A /START TMEMBER input command is issued with a higher maximum value specified.

• OTMA introduces the super member concept for customers running with OTMA hold queue capable clients, such as IMS Connect. A super member is a special OTMA member that can be shared by a set of OTMA clients to handle the commit-then-send (CM0) asynchronous output messages.

With the super member feature enabled by the OTMA clients, the asynchronous messages are not queued in separate members for each of the OTMA clients, but are queued in a new, shared OTMA member (the super member). In this way, when the OTMA clients want to retrieve their asynchronous messages, each one of the OTMA clients in the Sysplex Distributor (SD) environment is able to reach the super member and hence, its asynchronous messages.

• OTMA hold queue capable clients can use the "reroute on NAK" and "purge on NAK" features for commit-then-send (CM0) I/O PCB output.

The reroute on NAK feature allows OTMA clients to reroute a CM0 I/O PCB output message to a differnt tpipe than the inputting tpipe when they NAK the CM0 IOPCB output.

The purge on NAK feature allows OTMA clients to dequeue an CM0 I/O PCB output message from the inputting clientid tpipe when they NAK the CM0 IOPCB output.

• OTMA hold queue capable clients can request that OTMA reroute I/O PCB output message from the inputting TPIPE to the user requested TPIPE for Send-Only input messages.

Replacement of XRF USERVAR

If you used the 3745 Controller for IMS XRF tracking of VTAM® terminals prior to migrating to IMS version 9, you can continue to use this controller. However, after VTAM discontinues support for the 3745 Controller, you must migrate from the traditional XRF tracking with the 3745 Controller to one of the following options:

• Use the Communication Controller for Linux® (CCL) for continued use of XRF.

• Migrate from XRF to VTAM Generic Resources (VGR). This option requires a parallel sysplex environment.

• Use IMS Multi-Node Persistent Sessions (MNPS) support for XRF that is provided in IMS Version 9 and later.

Recommendation: Use the CCL or VGR as a permanent replacement solution.

Sharing TM Resources in an IMSplex with RM

IMS Version 9 adds a new STM= keyword to the DFSDCxxx PROCLIB member. STM=YES (the default value) indicates that IMS is to share IMS Transaction

| Manager resources when a resource structure is being used by Resource Manager
| (RM) in an IMSplex. These resources include terminals, users, user IDs, LTERMs,
| MSNAMEs, and APPC descriptors. Including the STM=YES keyword is equivalent
| to prior-release IMS function, which enabled TM resource sharing automatically if
| a structure exists.

| STM=NO indicates that IMS is not to share IMS Transaction Manager resources
| when a resource structure is being used by RM in an IMSplex.

| The STM= keyword does not affect transactions (static and CPI-C) because IMS
| transactions are not considered IMS Transaction Manager resources. When you
| define a resource structure, transactions are shared in RM, regardless of what you
| specify for the STM= keyword.

XML Transaction Support

IBM WebSphere Studio Enterprise Edition Version 5 can generate XML converters
that allow IMS COBOL applications to transform and generate XML documents.
The IBM Enterprise COBOL and PL/I compilers provide a PARSE keyword that
allows new or modified COBOL or PL/I application programs to parse incoming
XML documents. IMS Java application programs can use the XML Toolkit for
OS/390 to parse XML documents.

You can send and receive XML documents in IMS transactions and process these
XML documents in IMS COBOL or PL/I application programs. An XML
transaction for IMS must have an EBCDIC transaction code.

IMS System (DB and TM) Enhancements

This section describes the major enhancements for the overall IMS Version 9
system, including both the Database Manager and the Transaction Manager.

CRC Registration

With IMS Version 9, during initialization of the IMS control region, IMS uses the
CRC= execution parameter to register the IMS command recognition character
(CRC) with the sysplex (if IMS is running in a sysplex) or with the z/OS system. If
the CRC is not unique, IMS issues message DFS1946W and continues with
initialization.

Thus, all IMS systems in the sysplex should have a unique CRC. With a unique
CRC, a console operator can issue IMS commands from any system in the sysplex
and z/OS will route it to the appropriate system for execution.

Fewer SNAP Dumps on Log

IMS now takes SVC dumps for some pseudoabends that caused IMS to log SNAP
dumps with associated buffer pools. By taking SVC dumps, IMS Version 9 reduces
the logging volume considerably in certain cases. You can use IPCS to view the
SVC dumps. For further information, see the *IMS Version 9: Diagnosis Guide and
Reference*.

Greater than 255 Transaction Classes

You can assign scheduling-class values for a transaction. These values allow you to
isolate, organize, or retrieve certain transactions based on the class value. Prior to
IMS Version 9, the maximum number of transaction-scheduling-class values was
255. The maximum value is now 999.

To take advantage of the maximum number of transaction-scheduling classes, specify the new value in the APPLCTN, TRANSACT, and IMSCTRL macros. You can also specify the new value in the DFSMPR and DFSJMP procedures.

For IMS CPI-C driven application programs, you can specify the new value for the transaction-scheduling class in the TP_Profile.

Use the /ASSIGN command to specify a new transaction-scheduling-class value. Use the /DISPLAY command to display the current transaction-scheduling-class value. The /PSTOP, /PURGE, QUERY, /START, /STOP, and UPDATE commands can also specify a transaction-scheduling-class value.

IMS Application Menu

The IMS Application Menu provides a common interface to IBM-supplied IMS applications that run on TSO and ISPF, such as the Single Point of Control (SPOC), the HALDB Partition Definition utility, the IMS Syntax Checker, the Installation Verification Program (IVP), and the IVP Export utility. Using the IMS Application Menu, you can start any of the ISPF applications by selecting the application and pressing the Enter key.

To provide access to the IMS Application Menu, include the IMS.SDFSEXEC data set in the SYSPROC DD concatenation.

To start the IMS Application Menu, you can either use a TSO command or an EXEC command:

- TSO %DFSAPPL HLQ(*myhlq*)
- EXEC 'IMS.SDFSEXEC(DFSAPPL)' 'HLQ(*myhlq*)'

The HLQ parameter is required for the first use of either command. If you do not specify it for subsequent uses, the command uses the most recently specified high-level qualifier.

The TSO command %DFSAPPL includes an optional keyword, ALTRESL=, that allows you to specify a list of data set names that contain load modules; these load modules are allocated using the ISPF LIBDEF service. You should include the IMS.SDFSRESL data set in this list of data set names. If you do not specify the ALTRESL= keyword, the IMS Application Menu uses the IMS.SDFSRESL data set as its default load module.

You can also add a link to the IMS Application Menu from your local ISPF option menu.

IMS Availability Enhancements

IMS Version 9 provides two major enhancements for availability:

z/OS Resource Manager Services

IMS dynamically installs its Resource Manager cleanup routine; you do not need to install the DFSMRCL0 module as part of the IMS installation. Registration of the IMS Resource Manager cleanup routine with the operating system is done automatically during IMS startup.

The Resource Manager is registered dynamically only for IMS Version 9 or later. If you use earlier IMS releases, or use both IMS Version 9 and earlier IMS releases, you must still install the DFSMRCL0 module as part of the IMS installation. The DFSMRCL0 module must be the highest version prior

to IMS Version 9. When all IMSs (control region and batch regions) are IMS Version 9 or later, you can remove DFSMRCL0 from SYS1.LPALIB and from the IEAVTRML CSECT of z/OS module IGC0001C. You must remove the name DFSMRCL0 from the IEAVTRML CSECT before you remove the module from SYS1.LPALIB. If the name is still in IEAVTRML but the module is not in SYS1.LPALIB, z/OS IPL will fail.

DBRC Type-4 SVC Dynamic Install

The Dynamic SVC (DFSUSVC0) utility dynamically updates the DBRC type-4 SVC module. Thus, you can apply maintenance to the DBRC type-4 SVC module without having to restart z/OS after each update.

Prior to IMS Version 9, only the IMS type-2 SVC module could be dynamically updated. Any updates to the DBRC type-4 SVC required restarting z/OS.

The IMS type-2 SVC and the DBRC type-4 SVC must be defined to z/OS before IMS starts. After you add the SVC definitions to IMS and restart z/OS, you can use the DFSUSVC0 utility to update the SVC routines without having to restart z/OS.

IMS /DIAGNOSE Command for Serviceability

IMS provides a new SNAP function for the /DIAGNOSE command. Using this function, you can take a snapshot of system resources at any time without impacting IMS operations. This function provides a non-intrusive alternative to a console dump.

IMS Version 9 adds the OPTION() keyword to the /DIAGNOSE command. This keyword allows you to choose the output storage location for the data captured by the command. You can route the captured storage information to either the OLDS or to the user-defined trace data sets. This keyword is optional, and by default the captured data is stored in the OLDS data set.

IMS records the snapshot information in the OLDS as type X'6701' log records. Output from the /DIAGNOSE command can then be transmitted directly to IBM Level 2 Support to improve IBM's response time in resolving potential problems.

IMS Enhanced Command Environment

IMS Version 9 provides the IMS Enhanced Command Environment, a simplified IMS configuration that does not require the Resource Manager. If you want to use the IMS type-2 command format, but do not need the Resource Manager, you can group your systems into a generic IMSplex and use the IMS Enhanced Command Environment. Examples of environments that can benefit from the IMS Enhanced Command Environment include:

- Standalone IMS subsystems
- IMS DBCTL subsystems that are involved in data sharing, but that do not use online change

Related Reading: For more information about this function, see Chapter 12, "IMS Enhanced Command Environment," on page 111.

IMS Java Enhancements

With IMS Version 9, a Java Message Processing (JMP) region or a Java Batch Processing (JBP) region can access DB2 UDB for z/OS tables using the DB2 Resource Recovery Services (RRS) attach facility. To enable DB2 access for JMP or

JBP regions, you must specify SSM= and RRS=Y during IMS system definition. Currently, IMS supports only one IMS-DB2 connection at a time for JMP and JBP regions.

IMS Version 9 adds the XPLINK= dependent region keyword for JMP regions and JBP regions. This keyword allows IMS Java dependent regions to use the IBM Language Environment® Extra Performance Linkage (XPLINK) runtime option.

If you use IBM SDK for z/OS, Java Technology Edition, Version 1.4.1 or later, you must specify XPLINK=Y for a JMP region or a JBP region. However, if you use Version 1.3.1 of the SDK, you should specify XPLINK=N or allow IMS to use XPLINK=N as the default.

Integrated IMS Connect Support and Enhancements

IMS Version 9 provides an integrated IMS Connect function that offers a functional replacement for the IMS Connect tool (program number 5655-K52). The integrated IMS Connect is included in the IMS System Services function modification identifier (FMID), HMK9900; the integrated IMS Connector for Java for z/OS is included with the IMS Java FMID, JMK9906; and the integrated IMS Connector for Java distributed can be downloaded from the IMS Web site: www.ibm.com/software/data/ims/.

The integrated IMS Connect support allows high performance communications with advanced security and transactional integrity between one or more TCP/IP or local (z/OS) clients, and one or more IMS subsystems. This support provides commands to manage the environment and assist with workload balancing. For a description of the IMS Connect product, see "IBM IMS Connect for z/OS, V2.2" on page 82 or www.ibm.com/software/data/db2imstools.

You can use the integrated IMS Connect support with the WebSphere Development Tooling and the IMS Connector for Java to ease the development of on demand business solutions that access IMS transactions. You can also use the integrated IMS Connect support with the IMS Control Center for a graphical user interface to control both IMS and DB2.

You can use the base function of the integrated IMS Connect function with terminals, applications, and data running under IMS Version 7, Version 8, or Version 9. However, Distributed Operations support, as well as the separately orderable IMS Connect 2.2 tool functionality (such as distributed two-phase commit support), is supported only for IMS Version 8 and IMS Version 9.

IBM continues to support the separately orderable IMS Connect tool for IMS Version 7, Version 8, and Version 9 use, thus easing IMS Connect tool migration to the new integrated IMS Connect function. Future enhancements to the IMS Connect functionality will be made available only with IMS Version 9 or later.

IMS Connect XML-to-COBOL Conversion Support
The integrated IMS Connect function can convert the XML data contained in an IMS SOAP Gateway input message into the COBOL data used by a COBOL IMS application program. The COBOL data in the corresponding output message is also converted from COBOL back to the XML data that IMS SOAP Gateway client expects.

The IMS Connect XML-to-COBOL conversion support enables IMS to accept IMS SOAP Gateway messages in an XML format without having to create or modify IMS application programs to support XML.

The IMS Connect XML-to-COBOL conversion support uses the HWSSOAP1 user message exit to identify the appropriate XML adapter and XML converter. IMS Connect calls the XML adapter, which serves as the interface to the XML converter. The XML converter is designed according to the COBOL copybook of the COBOL IMS application program that processes the IMS SOAP Gateway input messages. After the XML data has been converted to COBOL data, the input message is processed by the other IMS Connect user message exit and passed to OTMA.

For the technical details about the IMS Connect XML-to-COBOL conversion support, see the *IMS Version 9: IMS Connect Guide and Reference*.

IVP Enhancements

With IMS Version 9, the IMS Installation Verification Program (IVP) provides the following enhancements:

- IVP variables can be exported from previous IMS releases and imported into IMS Version 9 for easier migration. You use a new IVP utility, DFSIVPEX, to export the variables. Two new options have been added to the IVP variable gathering panel: IMP (import), which imports the variables into Version 9, and EXP (export), which exports Version 9 variables.
- A CQS sample is included in the CSL sample.
- A new IVP sample application that demonstrates the IMS Enhanced Command Environment.
- The IVP help text enhancements:
  - Help text customized for your environment using the variables defined in the variable-gathering phase.
  - Color added to help text to improve readability and to emphasize important information.
- Support for JES3 job classes is improved, and problems encountered by the IVP jobs that cannot run in a JES3 environment have been eliminated.
- SMS Storage Class and SMS Management Class parameters are available for allocating all data sets.
- A new and separate high-level-qualifier variable for VSAM data sets (IXUVSMHQ) is introduced.
- Additional steps have been added to the IVP to complete the setup of the IMS dump formatter and to provide examples of using the IMS dump formatter to process an IMS dump.

JBP Symbolic Checkpoint and Restart Enhancement

With IMS Version 9, Java batch processing (JBP) programs can use symbolic checkpoint and restart calls to restart the program after an abend. The JBP symbolic checkpoint and restart calls provide the same function as the IMS system service calls, CHKP (symbolic) and XRST.

This enhancement introduces new methods for the IMS Java IMSTransaction class to take a symbolic checkpoint and to restart the program from the last checkpoint. The primary new methods for this enhancement are:

- IMSTransaction().checkpoint()
- IMSTransaction().restart()

When a JBP application program starts, it must call the IMSTransaction().restart() method to notify IMS that symbolic checkpoint and restart is enabled for the application program. The application program makes

periodic calls to the IMSTransaction().checkpoint() method to take checkpoints. The program must issue a final commit before it ends. The IMSTransaction().checkpoint() method allows the application program to provide a *com.ibm.ims.application.SaveArea* object that contains one or more other application Java objects whose state is to be saved with the checkpoint.

If a restart is required for the application program, you can:
- Issue a call to the IMSTransaction().restart() method (similar to providing the ID to the XRST call in IMS).
- Include the ID on the CKPTID= parameter of the JBP region JCL.

The restart() method returns a *SaveArea* object that contains the application objects in the same order in which they were originally checkpointed.

Knowledge-Based Log Analysis

Interpreting and analyzing IMS log data can be time consuming, complex, and error prone. To ensure that the resulting records are pertinent to a particular IMS image or that they correspond to a particular time period (without gaps) requires detailed setup and research.

IMS Version 9 provides a set of new functions that greatly simplify the interpretation and analysis of IMS log data. These functions:
- Allow you to extract an interpreted version of IMS log records to produce easy-to-read output.
- Allow you to produce output that contains all related log records for a unit of work.
- Simplify JCL stream creation to help prevent JCL errors. The necessary control statements are created in a syntax-correct form, so that you can focus on diagnosis rather than on how to extract log records.
- Provide a simple, quick, and automated method to:
  - Sort a set of log data sets
  - Verify the completeness of a list of logs (created manually or by DBRC)
  - Sort the logs into the proper sequence by IMS image
  - Determine where log data sets might be missing in the sequence
  - Determine the number of missing records and the time range that is missing to help identify the missing logs
- Reduce problem turnaround time with IBM Support by reducing the number and the size of log data sets, and by ensuring the appropriateness of log data sets that are sent to Support.

Related Reading: For more information about these enhancements, see Chapter 16, "Knowledge-Based Log Analysis," on page 133.

RACF Enhancements to Replace SMU

IMS provides support for security features that are currently available through Security Maintenance utility (SMU) security, but were not available through the SAF interface. With these enhancements, you can convert completely to using RACF (or an equivalent product), and eliminate the use of SMU security.

Attention: IMS Version 9 is the last IMS release that will support SMU security.

The areas of SMU security that are replaced by SAF support include:

- Application Group Name (AGN) security.

  The IMS Version 9 security that replaces AGN is called Resource Access Security (RAS).
- Type-1 and type-2 Automated Operator Interface (AOI) security.
- Terminal security for Time-Controlled Operations (TCO).
- Multiple Systems Coupling (MSC) link receive security.
- `/LOCK` and `/UNLOCK` commands.

Signon verification security of SMU security is also replaced by these enhancements.

Related Reading: For more information about these enhancements, see Chapter 17, "RACF Enhancements to Replace SMU," on page 139.

Reducing Abends

Unnecessary Fast Path abends have been replaced with warning messages and the corresponding user requests are now aborted, which reduces the chance of terminating the control region.
- Message DFS0015I is issued for a GETMAIN failure rather than abend U0732 or abend U2484. This message lists which module issued the message and at what position in the module the message was issued.
- Message DFS0017I is issued for a GETMAIN failure rather than an S0C1 abend. IMS also writes a X'67D0' log record.
- Message DFS2633I is issued for a GETMAIN failure rather than an S0C3 abend.
- Message DFS0019I is issued for a GETMAIN failure rather than abend U3275.
- Message DFS0020I is issued for a GETMAIN failure rather than abend U3999.

Removal of Restriction for Separate IMS.SDFSRESL Libraries

With IMS Version 9, you do not need separate IMS.SDFSRESL libraries for system definition of any of the following environments:
- DB/DC
- DBCTL
- DCCTL
- Fast Path

Prior to IMS Version 9, these definitions had to reside in separate IMS.SDFSRESL (or RESLIB) libraries. With IMS Version 9, you can use separate IMS.SDFSRESL libraries or combine them, as needed for your environment.

To support the unique initialization of DFSVC000 for each defined IMS instance, IMS Version 9 introduces the following parameters for the IMS procedure, for the DFSPBxxx PROCLIB member, and for execution JCL:

DESC=n

       Specifies a message descriptor code for IMS system console messages. This value overrides the value specified in the IMSCTF or IMSCTRL system definition macros.

MCS=(x,y**)**

       Specifies the MVS routing code or codes for the IMS system console. This value overrides the value specified in the IMSCTF or IMSCTRL system definition macros.

SVC2=*nnn*

> Specifies the type-2 SVC numbers reserved for use by the IMS subsystem. The value can range from 200 to 255. This value overrides the value specified in the IMSCTF or IMSCTRL system definition macros.

For IMS batch and utility regions, IMS Version 9 adds support for the RGSUF=, PARM1=, and PARM2= parameters that are already available for online regions. There is no default value for RGSUF= in batch and utility regions. You cannot specify the following parameters for batch and utility regions using PARM1= or PARM2= JCL statements or in a DFSPBxxx member: MBR=, SPIE=, TEST=, EXCPVR=, RST=.

IMS Version 9 ignores the DBRC= keyword in the IMSCTRL macro during IMS system definition. For IMS batch and utilities regions, you can change the default value for the DBRC= keyword; see the migration information for "Removal of Restriction for Separate IMS.SDFSRESL Libraries" on page 50 for more information.

For batch and utility regions that do not use DBRC, a new module, DFSIDEF0, is required for these regions. This module contains the batch and utility region installation default for DBRC, and is optional for regions that already use DBRC. IMS provides a sample module for DFSIDEF0.

Support for IEBCOPY Parameters in the Online Change Copy Utility

With IMS Version 9, the IMS Online Change Copy utility (DFSUOCU0) supports the z/OS IEBCOPY utility parameters WORK, SIZE, and LIST. The IMS utility passes the values for these parameters to the IEBCOPY utility.

The WORK parameter specifies the number of bytes of virtual storage to request for a work area to hold directory entries, internal tables, and I/O buffers.

The SIZE parameter specifies the maximum number of bytes of virtual storage that IEBCOPY can use as a buffer.

The LIST parameter controls suppression of IEBCOPY utility IEB154I messages that are issued for each member that is successfully copied.

Syntax Checker Enhancements

The Syntax Checker provides an ISPF user interface that enables you to define, verify, and validate parameters and their values in IMS.PROCLIB members. IMS Version 9 Syntax Checker enhancements include:

- The DFSPBxxx members are updated to reflect the IMS Version 9 changes to the parameters.
- The Syntax Checker can process DFSDCxxx and DFSSQxxx members.
- The Syntax Checker can display the default values for parameters.
- You can interrupt the processing of the current member and begin processing a member pointed to by the current member.

The Syntax Checker assists with IMS release-to-release migrations by providing the ability to convert supported IMS.PROCLIB members from one release to the other.

The IMS IVP contains a Syntax Checker sample that presents a detailed example of using the Syntax Checker to migrate an IMS Version 8 DFSPBxxx PROCLIB member to an IMS Version 9 level. The Syntax Checker runs in a foreground ISPF environment only.

Tracing Enhancements

For IMS Version 9, the DL/I trace and the lock trace are both on by default. To deactivate either trace, use the /TRACE command.

| The only exception is for batch regions. The default for the | DL/I and LOCK
| traces is off.

Virtual Storage Constraint Relief Enhancements

| When IMS dynamically allocates full-function or Fast Path databases, z/OS creates
| the Data Set Association Blocks (DSABs) above the 16 MB line. Thus, if you
| allocate a large number of data sets, you can gain a substantial amount of storage
| in the low private storage area.

IMS Tools Enhancements

The IBM DB2 and IMS Tools are specifically designed to enhance the performance of IMS and DB2. These tools have been upgraded and enhanced to work with IMS Version 9.

Related Reading: For more information about these tools, see Chapter 8, "IBM IMS Tools Enhancements," on page 79. For complete information about these tools, go to www.ibm.com/software/data/db2imstools.

Chapter 2. Hardware and Software Requirements

This chapter gives the requirements for installing and activating IMS Version 9. It includes the following sections:

- "Hardware Requirements"
- "Software Requirements" on page 28
- "Packaging for IMS Version 9" on page 35
- "Programming Considerations" on page 36

Hardware Requirements

This section describes the hardware that is required by IMS Version 9.

Processors

IMS Version 9 executes on all IBM processors that are capable of running z/OS Version 1 Release 4 or later. IMS Version 9 can run on either 64-bit processors or 32-bit processors.

System Console

The console requirements of z/OS Version 1 Release 4 or later apply.

Tape Units

IMS supports IBM 3480 or later tape units for installation and maintenance.

The DBRC large tape block size support enhancement requires the large block interface on one of the following IBM tape devices, or equivalent products: 3480 Magnetic Tape Subsystem, 3490 and 3490F Tape Subsystem, or IBM TotalStorage® Enterprise Tape System 3590.

Direct Access Storage Devices

During the binding of the IMS control blocks load modules, both the binder work data set SYSUT1 (during the bind of the IMS VTAM control blocks load monitoring module) and IMS.SDFSRESL library must reside on a device that supports a record size of 18 KB or greater. For all other system libraries and working storage space, any device that is supported by the operating system is allowed.

For IMS database storage, any device that is supported by the operating system is allowed within the capabilities and restrictions of Basic Sequential Access Method (BSAM), Queued Sequential Access Method (QSAM), Overflow Sequential Access Method (OSAM), and Virtual Storage Access Method (VSAM).

The Database Image Copy 2 utility (DFSUDMT0) requires concurrent-copy capable DASD controllers.

Details about the DASD storage requirements for the following items are in the *IMS Version 9: Program Directory for Information Management System Transaction and Database Servers*:

- SMP/E system entries

- SMP/E data sets
- Target libraries
- Distribution libraries
- Install process
- Optional machine-readable material

Multiple Systems Coupling

When the physical link is channel-to-channel and is dedicated to IMS, the System/370™ channel-to-channel (CTC) adapter or a logical channel on the IBM 3088, ESCON®, or fiber channel connection (FICON®) is required.

Multiple Systems Coupling (MSC) FICON CTC support requires that at least one side of the MSC link be an IBM zSeries® machine with the FICON channel and FICON CTC microcode. The other side (IMS) can be any processor with a FICON channel.

Terminals Supported by IMS Version 9

Table 3 and Table 4 on page 27 list the terminals that are supported by IMS Version 9. Table 5 on page 27 lists the other equipment that is supported by IMS Version 9.

Table 3. Terminals Supported by IMS Version 9

Compatible Product	Contention Mode	Switched Mode	Polled Mode	Local Mode	SNA	Notes
SLU 1 (for example, 3230, 3232, 3262, 3287, 3767, 3268, 3770, 3770P, 3790 (type 2 batch & bulk print), 4700, 5280, 5550, S/32, S/34, S/38, 8100)					VTAM	1, 2
SLU 2 (for example, 3179, 3180, 3276, 3278, 3279, 3290, 3790 (3270 DSC feature), 3600 Admin PP, 4700, 5280, 5520, 5550, 8100, 8775, S/34, Display writer)					VTAM	1, 2
SLU P (for example, 3600, 3630, 3650, 3680, 3770PC, 3790, 4700, 4730, 4736, 5520, 8100, S/34, Series/1)					VTAM	1, 2, 3, 4
LU 6 (ISC)					VTAM	1, 2
LU 6.2					VTAM	2
NTO (for example, 33/35, TTY, 2740, 2741, 3101, 3232, 3767, S/23)					VTAM	1, 2

Key:

DSC	Data Stream Compatibility
ISC	Intersystem Communication
LU	Logical Unit
NTO	Network Terminal Option
PC	Personal Computer
PP	Program Product
SLU	Secondary Logical Unit
TTY	Teletypewriter equipment
VTAM	Virtual Telecommunications Access Method

Notes:

1. The IMS Message Format Service (MFS) is available for this device. MFS editing can be bypassed on a message-by-message basis. For more information on MFS editing, see *IMS Version 9: Application Programming: Transaction Manager*.
2. IMS Fast Path supports the use of compatible terminals.
3. Although IMS provides sample code for this terminal, additional user coding is required.
4. IMS provides no device-resident code for this device. Additional user coding is required to attach it to IMS.

Table 4. Terminals Supported by IMS Version 9, but Withdrawn from IBM Marketing

IMS-Supported Product	Compatible Product	Contention Mode	Switched Mode	Polled Mode	Local Mode	SNA	Notes
2740-1	3767 (2740 models only)	BTAM	BTAM	BTAM			1
2740-2				BTAM			1, 2
2741	CMCST	BTAM	BTAM				1, 5
2780		BTAM		BTAM			
3270			BTAM	B/V	B/V	VTAM	1, 2
Finance (3600)	4700					VTAM	1, 2, 3
System/3				BTAM			4
System/7		BTAM		BTAM			4

Key:

BTAM　　Basic Telecommunications Access Method

B/V　　BTAM or VTAM

CMCST　　Communicating Mag Card/Selectric Typewriter

VTAM　　Virtual Telecommunications Access Method

Notes:

1. The IMS Message Format Service (MFS) is available for this device. MFS editing can be bypassed on a message-by-message basis. For more information on MFS editing, see *IMS Version 9: Application Programming: Transaction Manager*.
2. IMS Fast Path supports the use of compatible terminals.
3. Although IMS provides sample code for this terminal, additional user coding is required.
4. IMS provides no device-resident code for this device. Additional user coding is required to attach it to IMS.
5. IBM does not provide error-detection capability for this device. Therefore, only inquiry-only transactions are allowed, even though the non-inquiry capability exists.

Table 5. Other Equipment Supported by IMS Version 9

IMS-Supported Product	Compatible Product	Contention Mode	Switched Mode	Polled Mode	Local Mode	SNA	Notes
System console					WTO(R)		
Card reader					BSAM		
Printer					BSAM		
Magnetic tape					BSAM		
DASD devices					BSAM		

Key:

BSAM　　Basic Sequential Access Method

DASD　　Direct Access Storage Device

WTO(R)　　MVS write-to-operator/write-to-operator-with-reply (WTO/WTOR) capability

Note: Refer to operating system descriptions for specific device types.

Sysplex Data Sharing

For data sharing in a sysplex environment (using internal resource lock manager (IRLM) Version 2.1, or later), the following is required:

- An IBM S/390® 9674 Coupling Facility level 9, or later
- One of the following devices, with its related hardware:
  - A 9037 Sysplex Timer®
  - An IBM S/390 9674 Coupling Facility
  - An IBM S/390 9672 Transaction Server
  - An IBM S/390 Parallel Enterprise Server™ or IBM eServer™ zSeries 900 (z900) processor

– A coupling facility (logical partition), if you are using multinode persistent session Rapid Network Reconnect, MADS I/O Timing, shared message queues, IRLM structures, cache structures, list structures, or log structures.

Shared Message Queues and Shared EMH Queues

For shared message queues and shared EMH queues in a sysplex environment, the following devices are required, along with their related hardware:

- An IBM S/390 9674 Coupling Facility level 9, or later
- An IBM S/390 9672 Transaction Server
- An IBM S/390 Parallel Enterprise Server or IBM eServer zSeries 900 (z900) processor

System-Managed Duplexing requires CF-to-CF links (such as HiperLink, ICB link, or IC link). For more information about System-Managed CF Structure Duplexing, see http://www-1.ibm.com/servers/eserver/zseries/library/techpapers/gm130103.html.

Shared VSO Coupling Facility Requirements

To use Coupling Facility System-Managed Rebuild, Auto Alter, and System-Managed Duplexing functions for Shared VSO functions, you must have a processor that supports these Coupling Facility functions and capabilities. A Coupling Facility level 9 is required for the Auto Alter function and a Coupling Facility level 11 is required for System-Managed Duplexing of VSO structures.

Remote Site Recovery

Remote Site Recovery (RSR) requires:

- A Sysplex Timer (if data sharing or if the workload is spread across multiple CPCs)
- A high bandwidth control unit (such as a 3172)
- At least one tape unit (3420, 3480, or 3490) at the tracking site

Coordinated Disaster Recovery support for IMS and DB2 requires that the DB2 logs reside on devices that support eXtended Remote Copy.

Software Requirements

This section describes the software requirements for IMS Version 9 and for the major enhancements for IMS Version 9.

Operating System Requirements

IMS Version 9 operates in the z/OS System Product (z/OS) Version 1 Release 4 operating-system environment, or subsequent versions, releases, and modification levels. IMS Version 9 can run on either 64-bit processors or 32-bit processors.

Related Reading: The z/OS service levels that are required for installation and execution are listed in the *IMS Version 9: Program Directory for Information Management System Transaction and Database Servers*.

Before you install IMS Version 9, check with your IBM Support Center or use either Information/Access or Service Link to see if there is additional preventive service planning (PSP) information that you need to be aware of.

IMS Version 9

IMS Version 9 operates in z/OS Version 1 Release 4 (or later) configurations, unless otherwise stated, and requires the following minimum version, release, or modification levels:

- z/OS Version 1 Release 4 (5694-A01)
  - DFSMS*
  - SMP/E*
  - JES2*
  - JES3*
  - TSO/E*

  Note: * These items are base elements of the z/OS operating environment that cannot be ordered separately.
  - IBM High-Level Assembler Toolkit (5696-234), a separately orderable feature of z/OS
  - RACF (available with the IBM SecureWay® Security Server for z/OS and OS/390 RACF product) or equivalent product, if security is used
  - ISPF Version 4 Release 2 (5655-042)
  - e-Network Communications Server for z/OS, if IMS Transaction Manager is used
- IRLM Version 2.1 or later (5655-DB2), if data sharing is used

IMS Version 9 also operates in a virtual machine (VM) under control of z/OS Version 1 Release 4. This environment is intended for use in a program development, testing, and non-XRF production environment.

Restriction: In a VM environment, be aware that:
- If you use BTAM binary synchronous terminals, expect communication line timeouts. Terminal timeouts are not limited to VM, but when they occur, they affect communication line recovery because polling is inconsistent when BTAM operates under VM.
- The Log Analysis utilities may yield inaccurate time-stamp oriented results.
- If you operate the IMS Version 9 Transaction Manager under VM for production purposes and have specific throughput or terminal response-time requirements, plan to benchmark under VM to ensure that the proposed configuration meets your performance needs.

System-Managed CF Structure Duplexing is recommended, though not required, for the Resource Manager structure.

To take full advantage of Sysplex-wide Resource Management, including Sysplex Terminal Management and Coordinated Online Change, and the Operations Manager, all systems in the IMSplex should use IMS Version 8 or IMS Version 9.

All systems that use APPC/OTMA Synchronous Shared Queues support should be IMS Version 8 or IMS Version 9 systems. IMS Version 8 systems should run under z/OS Version 1 Release 2, or later (with APAR OW50627 applied) for Multi-System Cascaded Transactions support. Resource Recovery Services (RRS) must also be active on all of these systems.

Coordinated Disaster Recovery support for IMS and DB2 requires the IMS Version 9 Remote Site Recovery (RSR) Recovery Level Tracking (RLT) feature.

IMS Control Center

The software requirements for using the IMS Control Center with IMS Version 9 are:

- DB2 Universal Database Version 8.2 or later
- IMS Connect Version 1.2 (with the following APARs applied: PQ62379, PQ69527, and PQ70216) or later
- IMS Version 9

The IMS Control Center also supports IMS Version 8.

For information about installing and using the IMS Control Center, go to the Information Management Software for z/OS Solutions Information Center on the Web at http://publib.boulder.ibm.com/infocenter/dzichelp/v2r2/index.jsp and click **IMS Version 9** in the Contents pane, then select **IMS Control Center**.

Data Sharing

For block-level data sharing, IRLM Version 2.1 or later is required. The IRLM is an independent component that is shipped with IMS Version 9. The IRLM must be defined as a z/OS subsystem. Block-level data sharing of full-function databases is supported between all in-service levels of IMS.

Database Recovery Utilities

The PTF needed for IMS Version 7 change accumulation migration to IMS Version 9 is UQ99327.

DBRC

IMS Version 9 DBRC requires that the Migration/Coexistence SPE be applied to the IMS Version 7 or IMS Version 8 DBRC:

- IMS Version 7: PQ72838
- IMS Version 8: PQ72840

IMS Java

IMS Java application support has the following requirements:

- IBM SDK for z/OS, Java 2 Technology Edition, Version 1.3.1 or later (5655-I56), with the Persistent Reusable Java Virtual Machine (JVM)

  Note: IMS Version 7 was the last release of IMS to support the High Performance Java (HPJ) compiler. Customers who use HPJ-compiled applications should migrate to the new Persistent Reusable JVM support.
- z/OS UNIX System Services (USS) available at runtime
- Hierarchic File System (HFS) on z/OS (for information on preparing HFS, see *z/OS UNIX System Services File System Interface Reference*)

JDBC access from IMS DB for DB2 UDB Stored Procedures requires DB2 Universal Database Server for z/OS and OS/390, Version 7 (5675-DB2) with APARs PQ46673 and PQ50443 applied, or later. You must also have the DB2 SQLJ/JDBC driver with APAR PQ48383 applied.

JDBC access to IMS DB for CICS applications requires CICS Transaction Server for z/OS Version 2.2 (5697-E93), or later.

JDBC access to IMS DB from WebSphere Application Server z/OS requires:
- IBM WebSphere Application Server for z/OS V5.0, or later. If you have WebSphere Application Server for z/OS V5.0.2, you must either install V5.0.2.1 or APAR PQ81944.
- z/OS Resource Recovery Services (RRS)

Support for interoperation between Java and COBOL or PL/I when running in a JMP or JBP region requires:
- IBM Enterprise COBOL for z/OS and OS/390 Version 3 Release 2, or later
- IBM Enterprise PL/I for z/OS and OS/390 Version 3 Release 1, or later

IMS Java and the DLIModel utility require Xalan-Java version 2.6.0 or later from the Apache Software Foundation (www.apache.org) XML Project (xml.apache.org), or equivalent code function. The Apache XML Project is a collaborative software development project that licenses open source software at no charge. The following open source files (or equivalent code function) are required by IMS Java and the DLIModel utility:

xercesImpl.jar
    XML parser that is required for IMS Java and the DLIModel utility

xalan.jar
    XSLT processor that is required for IMS Java to create XML and transform XML documents

xml-apis.jar
    XML APIs that are required for IMS Java and the DLIModel utility

IMS Java Remote Database Services

JDBC access to IMS DB from WebSphere Application Server (on a non-z/OS platform) requires:
- WebSphere Application Server for z/OS Version 5.0.2.3 or later. If you have WebSphere Application Server for z/OS V5.0.2, you must install either V5.0.2.1 or apply APAR PQ81944.
- WebSphere Application Server V5.0.2.2 with cumulative fixes that include PQ79485, or WebSphere Application Server V5.0.2.3 or later.
- z/OS Resource Recovery Services (RRS).

Recommendation: Use the Secure Sockets Layer (SSL) for your applications that use the IMS Java Remote Database Services.

To use IMS Java Remote Database Services to access IMS databases from applications that run on WebSphere Application Server in a non-z/OS environment, you must download IMS Java files from the IMS Java Web site. These downloaded files are required in addition to the files that are installed as part of the SMP/E installation of the IMS Java FMID. To download the required IMS Java files, go to the IMS Web site at www.ibm.com/ims and link to the IMS Java Web page for more information.

IMS Web Services Support

IMS Web Services Support requires:
- Service definition creation for MFS-based applications requires WebSphere Studio Application Developer Integration Edition Version 5.0 or later.
- Service definition deployment of IMS MFS WebServices support requires WebSphere Application Server Enterprise Edition Version 5.0 or later.

Integrated IMS Connect Support

In addition to the requirements for IMS Version 9, the integrated IMS Connect support has the following requirements:

- TCP/IP Version 1.4 or later.
- If you plan to use SSL (Secure Sockets Layer), z/OS Version 1.4 System SSL, a subcomponent of z/OS Cryptographic System Services. For information about z/OS encryption support available with the z/OS Cryptographic System Services SSL module, see *z/OS System Secure Sockets Layer Programming* .
- If you plan to use the IMS Connect with the IMS Control Center, DB2 UDB Version 8.2 or later (which contains the IMS Control Center) is required.
- If you plan to use the functions, purge not deliverable or reroute, the following IMS OTMA co-requisite APARs are required:
  - IMS Version 8 APAR PK00894 (PTF UK01649)
  - IMS Version 9 APAR PK00895 (PTF UK01650)
- If you plan to use the local option for client communications, there are additional software requirements for IMS Connect. See the *IMS Connector for Java User's Guide*, which is available at www.ibm.com/ims.
- If you plan to use the IMS Connect XML-to-COBOL conversion support, you must install the following prerequisites:
  - Apply IMS Version 9 APARs PK24912 and PK29938.
  - You must have the copybook for the COBOL IMS application program that processes the input messages from IMS SOAP Gateway.
  - You must increase the IMS Connect region size to accommodate the storage used by the XML converters. The XML converters run in a z/OS LE enclave in the IMS Connect region and use about 33 MB of storage.
  - You must have IMS SOAP Gateway Version 9.2 or above. You can download IMS SOAP Gateway online at www.ibm.com/ims.

IRLM

The following versions of the internal resource lock manager (IRLM) support IMS Version 9:

- IRLM 2.1 (5655-DB2)
- IRLM 2.2 (5625-DB2)

You can get IRLM 2.1 and IRLM 2.2 with IMS Version 9, depending on how you order IMS. Table 6 shows which product offerings include which version of IRLM.

Table 6. IRLM Versions Included with Various IBM Product Offerings

Product Offering	IRLM Version Included
CBPDO	Both IRLM 2.1 and IRLM 2.2. You can choose which version to install.
CustomPac	CustomPac is made up of three offerings: FunctionPac, ProductPac®, and SystemPac®. Which IRLM version you get with CustomPac depends on which offering you order.
FunctionPac	IRLM 2.2
ProductPac	Both IRLM 2.1 and IRLM 2.2. You can choose which version to install.
ServerPac	IRLM 2.2
Standalone	Both IRLM 2.1 and IRLM 2.2. You can choose which version to install.
SystemPac	IRLM 2.2

MNPS Replacement of XRF USERVAR

MNPS Forced Takeover support requires z/OS 1.6 or later.

RACF Enhancements to Replace SMU

RACF (or equivalent product) must include the following four new RACF security classes as default classes:

- IIMS - Program Specification Block (PSB)
- JIMS - Grouping class for PSB
- LIMS - Logical terminal (LTERM)
- MIMS - Grouping class for LTERM

If these RACF resource classes are not already included in the default list of classes for RACF, or if you want to use class names that are different from the default names, you need to define them in the resource class descriptor table (CDT).

XML Enhancements

XML Database Support requires:

- IMS Java Version 9
- IBM SDK for z/OS, Java 2 Technology Edition, Version 1.3.1 or later

IMS Java and the DLIModel utility require Xalan-Java version 2.6.0 or later from the Apache Software Foundation (www.apache.org) XML Project (xml.apache.org), or equivalent code function. The Apache XML Project is a collaborative software development project that licenses open source software at no charge. The following open source files (or equivalent code function) are required by IMS Java and the DLIModel utility:

xercesImpl.jar
XML parser that is required for IMS Java and the DLIModel utility
xalan.jar
XSLT processor that is required for IMS Java to create XML and transform XML documents
xml-apis.jar
XML APIs that are required for IMS Java and the DLIModel utility

XML Transaction Support requires:

- WebSphere Studio Enterprise Edition Version 5 or later
- Enterprise COBOL for z/OS and OS/390 Version 3.1 or later
- PL/I for z/OS and OS/390 Version 3.1 or later
- XML Toolkit for z/OS and OS/390 Version 1.5 or later

Small Programming Enhancements (SPEs)

The following SPEs are required for coexistence:

- DBRC SPEs for IMS Version 7 and IMS Version 8, to allow them to coexist with IMS Version 9:
  - IMS Version 7: PQ72838
  - IMS Version 8: PQ72840
- The OLR Coexistence SPE (APAR PQ78758) for IMS Version 8 systems that participate in data sharing with IMS Version 9 systems that allow HALDB online reorganization.

- APAR PQ58631 for IMS Version 7 systems that share OTMA messages with IMS Version 8 or IMS Version 9 systems.
- APAR PQ32932 for IMS Version 7 systems that share messages with IMS Version 8 or IMS Version 9 systems using MSC, QCF, or shared queues.

Sysplex Data Sharing

IMS sysplex data sharing (including data caching, shared SDEPs, and shared VSO DEDB areas) requires IRLM Version 2.1 or later.

CICS Subsystems Supported

IMS DB Version 9 can be connected (using the IMS Database Resource Adapter) to the following systems:
- CICS Transaction Server for z/OS Version 2.2 (5697-E93)
- CICS Transaction Server for OS/390 Version 1.3 (5655-147)
- User-written software

IMS TM Version 9 can be connected (using the appropriate TM interface) to the following systems:
- CICS Transaction Server for z/OS Version 2.2 (5697-E93)
- CICS Transaction Server for OS/390 Version 1.3 (5655-147)

DB2 Subsystems Supported

IMS TM Version 9 can be connected to any of the following DB2 products:
- DB2 UDB for z/OS Version 8 (5625-DB2)
- DB2 for z/OS and OS/390 Version 7 (5675-DB2)
- DB2 Universal Database for OS/390 Version 6 (5645-DB2)

IMS/DB2 Coordinated Disaster Recovery Support requires the IMS V9 Remote Site Recovery (RSR) feature, and requires the databases to be registered with Recovery Level Tracking (RLT).

Intersystem Communications Subsystems Supported

IMS TM Version 9 can be connected to the following products using ISC:
- IMS Version 9 (5655-J38)
- IMS Version 8 (5655-C56)
- IMS Version 7 (5655-B01)
- CICS Transaction Server for z/OS Version 2.2 (5697-E93)
- CICS Transaction Server for OS/390 Version 1.3 (5655-147)
- User-written software

Multiple Systems Coupling Subsystems Supported

IMS TM Version 9 can be connected to the following IMS products using MSC:
- IMS Version 9 (5655-J38)
- IMS Version 8 (5665-C56)
- IMS Version 7 (5665-B01)

Programming Language

IMS Version 9 is written in High Level Assembler Release 2, PL/X, C, C++, and Java JDK Version 1.3.

Programming Languages Supported

You can write IMS applications in the current versions of the following languages:
- ADA
- COBOL for OS/390 & VM
- Enterprise COBOL for z/OS and OS/390
- High Level Assembler for MVS & VM & VSE Version 1 Release 4.0
- IBM SDK for z/OS Java 2 Technology Edition, Version 1.3.1
- PL/I for z/OS and OS/390
- TSO/E REXX
- VS Pascal
- WebSphere Studio Site Developer Version 5.0
- z/OS C/C++

Requirement: The following languages require the IBM Language Environment for z/OS:

COBOL for OS/390 & VM

PL/I for z/OS and OS/390

Application Programs Supported

All application programs that are supported under IMS Version 7 and IMS Version 8 are still supported under IMS Version 9. In general, you should not have to recompile, reassemble, relink-edit, or rebind an IMS application program to run under IMS Version 9.

Requirement: IMS Version 7 was the last version to support HPJ-compiled application programs. If you use HPJ-compiled applications, you must migrate to the new JVM support.

Packaging for IMS Version 9

Table 7 lists the function modification identifiers (FMIDs) that make up IMS Version 9.

Table 7. FMIDs for IMS Version 9

FMID	Description
HMK9900	System Services
JMK9901	Database Manager
JMK9902	Transaction Manager
JMK9903	Extended Terminal Option (ETO)
JMK9904	Remote Site Recovery (RSR) Recovery Level Tracking
JMK9905	Remote Site Recovery (RSR) Database Level Tracking
JMK9906	IMS Java
HIR2102	IRLM 2.2

| The integrated IMS Connector for Java distributed function is not included in any
| of the IMS FMIDs, but can be downloaded from the IMS Web site:
| www.ibm.com/software/data/ims/.

Programming Considerations

The following sections list the programming considerations for installing IMS and
activating its functions.

IMS Version 9 is a complex product to install and prepare for execution. The
SMP/E install and the IVP processes are not performed as a single process. IBM
recommends that you perform the SMP/E install and go through the entire IVP
process, documented in *IMS Version 9: Installation Volume 1: Installation Verification*,
before proceeding with the migration and preparation of your own systems.

Table 8 lists the sample jobs that are shipped with IMS Version 9.

Table 8. Sample Installation Jobs Shipped with IMS Version 9

Job Name	Job Type	Description
DFSALA	SMP/E	Sample job to allocate and initialize a new SMP/E CSI data set (optional)
DFSALB	SMP/E	Sample job to allocate SMP/E data sets (recommended, but optional)
DFSRECV1	RECEIVE	Sample job to RECEIVE IMS System Services
DFSRECV2	RECEIVE	Sample job to RECEIVE IRLM 2.1
DFSRECV3	RECEIVE	Sample job to RECEIVE IMS Database Manager
DFSRECV4	RECEIVE	Sample job to RECEIVE IMS Transaction Manager
DFSRECV5	RECEIVE	Sample job to RECEIVE IMS Extended Terminal Option (ETO)
DFSRECV6	RECEIVE	Sample job to RECEIVE Recovery Level Tracking feature
DFSRECV7	RECEIVE	Sample job to RECEIVE Database Level Tracking feature
DFSRECV8	RECEIVE	Sample job to RECEIVE IMS Java
DFSRECV9	RECEIVE	Sample job to RECEIVE IRLM 2.2
DFSALLOC	ALLOCATE	Sample job to allocate target and distribution libraries
DFSJSMKD	MKDIR	Sample job to invoke the supplied DFSJMKDR EXEC to allocate HFS paths
DFSDDEF1	DDDEF	Sample job to define SMP/E DDDEFs for IMS
DFSDDEF2	DDDEF	Sample job to define SMP/E DDDEFs for IMS Java
DFSAPPLY	APPLY	Sample APPLY job
DFSACCEP	ACCEPT	Sample ACCEPT job

The IVP process provides materials that you can use as a guide for working with
your own IMS systems. The IVP process includes:

• Data set allocation

• Post-installation activities on target libraries

• SYSGEN activities

• SVC considerations

- Authorization considerations
- IMS system preparation activities
- IMS application preparation activities
- IMS system and application execution activities

System Considerations

There are no system considerations for IMS Version 9.

Special Considerations

There are no special considerations for IMS Version 9.

Chapter 3. Migration to IMS Version 9

This chapter describes general migration considerations for IMS Version 9 and migration considerations for specific new features and functions of IMS Version 9. It includes the following sections:

- "General Migration Considerations"
- "Specific Migration Considerations" on page 41
- "Fallback Considerations" on page 54

The objective of migration support is to enable an orderly migration from your current release of IMS to IMS Version 9.

A RECON upgrade batch command is provided to enable you to convert the recovery control data set from an IMS Version 7 or IMS Version 8 format to an IMS Version 9 format.

General Migration Considerations

The following list suggests general migration considerations for current IMS installations:

- Contact the IBM Support Center for current installation, migration, and problem resolution information, and ask for Preventive Service Planning (PSP) for IMS.
- Read the *IMS Version 9: Program Directory for Information Management System Transaction and Database Servers* for the most current hardware requirements, software requirements, and installation information.
- Review the service that has been applied to your current system. Determine if critical service has not been included in the new IMS release. If not, acquire the appropriate service for the new IMS release.
- Review the functions and enhancements for the IMS Version 9 release, as provided in this book.
- Review changes to:

    SMP/E, distribution, and system data sets

    System definition macros

    Log records

    Exit routines

    Cataloged procedures

    PROCLIB control statement members

    Utilities

    Operator commands

    Operating procedures

    Messages and abend codes

- Determine the availability of productivity aids.
- Prepare a migration plan.
- Prepare a fallback plan. See "Fallback Considerations" on page 54 for a sample list of items to consider when preparing a fallback plan.
- Apply coexistence PTFs to your existing system, including the DBRC coexistence SPE.

- Perform database recovery for any database data sets for which Extended Error Queue Elements (EEQEs) have been recorded in the DBRC Recovery Control (RECON) data set.
- Back up your system, including:
    Databases and areas
    RECON data sets
    SMP/E data sets, distribution, and target libraries

    Note: Examine Hardware Data Compression (HDC) dictionaries when you migrate to new release of IMS to determine if they incorporate IMS versions that are now out of service. While re-linking dictionaries is not required when migrating to a new version of IMS, a gradual refresh of these dictionaries to a current release is recommended.
- Validate your system definition source. You might want to merge the IVP source with your source.
- Install your new IMS system (including the pre-generation service).
- Install required service that was not included in the pre-generation service.
- Install any needed updates to IBM IMS and DB2 tools, aids, and related products.
- Upgrade the RECON data set.
- Build application control blocks (ACBGEN).

    Attention: Never use a higher level ACB library with a lower level IMS. You could cause an abend in the IMS control region, or you could destroy some or all of your databases. This is probably the most serious error that you could make during an IMS migration. Be careful in reviewing your fallback plan and JCL. Protect your ACB library with RACF (or an equivalent product), to make the ACB library impossible to use with the back-level IMS systems.
- Validate users' cataloged procedures.
- Validate user PROCLIB members.
- Validate, reassemble, and rebind exit routines and user modifications. Check your exit routines before reassembling.
- Validate, reassemble, and rebind user programs that process log records. Some log record formats have changed.
- Validate and update operating procedures (for example, recovery, backup, and restart).
- Check whether you need to adjust the XRST I/O area length and contents to allow for a longer checkpoint ID.
- If necessary, set the appropriate values for the HIOP, FPWP, EMHB, LUMP, LUMC, and AOIP parameters in the DFSPBxxx PROCLIB member to specify an upper limit on the amount of storage a pool can acquire. Specifying a limit is usually not desirable and should only be done after careful consideration. See *IMS Version 9: Installation Volume 2: System Definition and Tailoring* for more information about the DFSPBxxx member. You can also use the Syntax Checker to validate the values for the DFSPBxxx parameters.
- Consider the various execution parameters described in this book that can affect performance and migration.
- When using MSC to connect IMS systems with different releases, it is important to consider all message types (such as ISC, APPC, and OTMA) and the prefix sizes that accompany them.

    Recommendation: When message queue data sets are used, make the MSGQ LRECL and block sizes identical across all IMS MSC systems. A problem can

occur when an IMS system is migrated to a new release that has larger prefix sizes and new prefix segment types. Messages that are sent to an earlier release of IMS and that contain these new and larger prefixes might not fit the message queues of the earlier release of IMS. This can cause problems when formatting the message and delivering it to its destination, especially with MFS. For more information, refer to the RECLNG parameter of the MSGQUEUE macro and the "Message Prefix Size table" in *IMS Version 9: Installation Volume 2: System Definition and Tailoring*.

- Consider other products that can be affected by migration.

  Any product that is dependent upon the format and contents of the IMS log or the RECON data sets is potentially affected.

  Examples: Examples of affected products or utilities are:
  - IMSASAP II
  - IMS Statistical Analysis utility
  - IMS Fast Path Log Analysis utility
  - IMS Log Transaction Analysis utility
  - IMS MSC Log Merge utility
  - CICS
  - Non-IBM products, including user modifications

IMS Version 9 contains modules that are built using SYSGEN *ALL*, and some modules that are not. So, running a SYSGEN *ALL* does not build the complete set of modules needed for IMS execution. As of IMS Version 8, DFSJCLIN, DFSJIDLT, and DFSJIRLT are no longer provided as jobs. Non-SYSGEN, DLT, and RLT parts are created during SMP/E APPLY processing. If you need to, you can also use the SMP/E GENERATE command to generate the JCL necessary to build the non-SYSGEN, DLT, and RLT parts.

Specific Migration Considerations

Specific information about product enhancements that were made for earlier releases of IMS might not be included in this book. When migrating to a more recent release of IMS, be sure to review the Release Planning Guides that span your specific migration path.

Related Reading: The release guides that are currently available are:

IMS Version 8: Release Planning Guide, GC27-1305

IMS Version 7: Release Planning Guide, GC26-9437

IMS/ESA Version 6: Release Planning Guide, GC26-8744

Migrating to IMS Version 9: DB

This section describes the IMS considerations for migrating from IMS Version 7 or IMS Version 8 Database Manager to IMS Version 9 Database Manager.

Database Parallel Open

There are no migration considerations for this enhancement.

Database Recovery Utilities

The IMS Version 9 Database Recovery (DFSURDB0) and Database Change Accumulation (DFSUCUM0) utilities accept as input log, image copy, and change accumulation data sets created by IMS Version 7 (with APAR PQ72838) or later.

Data Entry Database Sequential Dependent Scan Utility Exit Routine (DBFUMSE1)

The DEDB SDEP Scan utility exit routine is called using AMODE 31, regardless of which binder AMODE specification you set because the routine must be able to run in 31-bit addressing mode. See *IMS Version 9: Customization Guide* for more information about this routine.

ESAF Indoubt Notification

There are no migration considerations for this enhancement.

Fast Path Area Open/Close Enhancements

Review any automated-operations scripts that reopen DEDB areas after IMS or IRLM failures for possible changes or disable them.

Fast Path Multiple Areas Shared VSO Structures

There are no migration considerations for this enhancement.

Fast Path Serviceability and Usability

There are no migration considerations for these enhancements.

FDBR ECSA Relief for DEDBs

There are no migration considerations for this enhancement.

FDBR WTO Message

There are no migration considerations for this enhancement.

HALDB Online Change

IMS Version 9 introduces the following restrictions for IMS online change with HALDB partitions:

- During an ALL or MODBLKS system definition, you cannot redefine a database that is currently defined as a HALDB partition without a performing cold start of IMS. A cold start is required even if you delete the database online. That is, if you delete a HALDB partition, you cannot reuse that database name for any database that you plan to add during an ALL or MODBLKS online change without an IMS cold start.
- You cannot convert a database that is defined during an ALL or MODBLKS system definition into a HALDB partition without performing a cold start of IMS. A cold start is required even if you delete the database online. After the IMS cold start, you must redefine the database as a HALDB partition.

These restrictions do not apply for a HALDB master database.

HALDB Specific Partition Initialization

There are no migration considerations for this enhancement.

IMS Change Accumulation Preconditioning

You must install PTF PQ72838 on any IMS Version 7 system before you create change accumulation data sets that you will migrate for use with IMS Version 9. However, if you applied the IMS V8 Coexistence SPE (PQ54585) to an IMS Version 7 system, change accumulation records created by that system are already preconditioned. Likewise, no preconditioning is required for IMS Version 8 change accumulation records.

See the coexistence considerations for "Database Recovery Utilities" on page 55 for more information.

IMS Database Recovery Facility Command Support

There are no migration considerations for this enhancement.

IMS Java Remote Database Services

There are no migration considerations for this enhancement.

IMS Java SQL Enhancements

There are no migration considerations for these enhancements.

IMS Type-2 Database Commands

There are no migration considerations for this enhancement.

Integrated HALDB Online Reorganization Support

When migrating from an earlier release of IMS, use the `CHANGE.RECON UPGRADE` command to upgrade the RECON data set to an IMS Version 9 RECON data set. As part of RECON upgrade, DBRC marks existing HALDBs to indicate that they cannot be reorganized online using HALDB Online Reorganization. Use the `CHANGE.DB DBD(HALDB master) OLRCAP` command in IMS Version 9 to allow HALDB Online Reorganization.

Any new HALDBs that you define in the IMS Version 9 RECON data set are capable of being reorganized online by default.

Table 9 shows the IMS versions that can access HALDBs that are capable of being reorganized online.

Table 9. IMS Versions that Can Access HALDBs that Are Capable of Being Reorganized Online

IMS Version	Access to HALDB partitions that are capable of being reorganized online?
IMS Version 7	No
IMS Version 8	No
IMS Version 8 with the OLR Coexistence SPE	Yes
IMS Version 9	Yes

An IMS Version 8 subsystem can participate in full data sharing with any HALDB that is undergoing online reorganization if the IMS Version 8 subsystem has the OLR Coexistence SPE applied.

IRLM 2.2

You can run IRLM 2.2 with the same procedure that you use for IRLM 2.1 by changing the procedure to use the IRLM 2.2 RESLIB. None of the IRLM 2.1 parameters are rejected. However, the following execution parameters have changed for IRLM 2.2:

- PC=NO is ignored because IRLM 2.2 uses PC=YES as its default setting.
- The MAXCSA value is ignored because it applies only to the PC=NO environment.
- The MVS EXEC parameter MEMLIMIT has been added to the IRLM 2.2 startup procedure. The value for MEMLIMIT is set to 2 GB by default. IRLM 2.2 only accepts values of 2 GB or higher.
- The default for DEADLOK is (1,1).

VSAM Index Databases

As of z/OS 1.3 and later, when using IDCAMS to define VSAM index databases, IDCAMS might optimize the control interval size by changing the CISIZE value without issuing any warnings or messages. After such a change, when a batch IMS job or online region attempts to open the index database, an open failure might occur, resulting in message DFS0730I OPEN DATABASE ERROR REASON O,DC.

Recommendation: To avoid this situation, add two 32K VSAM buffers to your DFSVSMxx (online) and DFSVSAMP (batch) IMS.PROCLIB members . For example, VSRBF=32768,2. For a more detailed discussion of this issue, see INFOAPAR II13288.

XML Database Support

There are no migration considerations for this enhancement.

Migrating to IMS Version 9: DBRC

This section describes the considerations for migrating DBRC to an IMS Version 9 level.

Changes to the RECON Data Set

The following RECON records have changed for IMS Version 9:

- DSPDBHRC
- DSPDSHRC
- DSPPTNRC
- DSPRCNRC
- DSPSSRC

IMS Version 9 introduces a new RECON record, the RECON DMB table (DSPRDTRC). This new record is created when the DMB limit (32 767) has already been reached and the user registers a new database in the RECON data set. This type X'03' record is created by scanning the RECON data set and noting which DMB numbers are currently not in use. The first available DMB number, starting with 1, is the next DMB number assigned; this DMB number is included in the LAST REUSED DMB# field in the RECON header listing. Each time the user registers a new database in the RECON after this record exists, DBRC reads this record, and selects the first available DMB number, starting from the last reused DMB number.

The RECON DMB table is not included in a RECON listing. DBRC issues the new message DSP1100I when DBRC creates or refreshes the RECON DMB table in the RECON data set. An IMS Version 9 DBRC issues the new message DSP1102I when it attempts to register a database and 32 767 databases are already registered in the RECON data set. IMS issues message DSP1103I when DBRC cannot obtain a DBM number from the RECON DMB table.

Related Reading: For a detailed listing of the RECON data set content, see the *IMS Version 9: Database Recovery Control (DBRC) Guide and Reference*.

Upgrading the RECON Data Set

Requirement: You must apply the IMS Version 9 Coexistence SPE to all IMS Version 7 and IMS Version 8 systems before you attempt to upgrade the RECON data set.

To upgrade an IMS Version 7 or IMS Version 8 RECON data set, use the IMS Version 9 DBRC command utility, DSPURX00, to issue the `CHANGE.RECON UPGRADE` command. This command allows you to upgrade the RECON without shutting down all IMS activity. It also uses the DBRC I/O recovery algorithms to recover from any failures during upgrade, relieving you of the necessity of making a backup of the RECON data set before upgrade and restoring it in case of a failure.

To perform a concurrent RECON upgrade, two active RECON data sets, COPY1 and COPY2, must exist along with a spare data set.

Restriction: You must issue the `CHANGE.RECON UPGRADE` command from the DBRC command utility (DSPURX00). You cannot issue the command from an online IMS.

The MINVERS keyword of the `INIT.RECON` and `CHANGE.RECON` commands specifies the minimum version of IMS that can sign on to DBRC. When a RECON data set is migrated to an IMS Version 9 level, DBRC sets a default of MINVERS('7.1'). The value that is set for the minimum version is displayed in the `LIST.RECON` command output. When all systems that access the RECON data set are at an IMS Version 9 level, you can update the minimum version value by using the MINVERS keyword on the IMS Version 9 `CHANGE.RECON` command, for example `CHANGE.RECON MINVERS('9.1')`.

Note: The IMS Version 9 format for the MINVERS keyword includes a period. DBRC considers this a special character and requires it to be enclosed in single quotes. The format from earlier versions (71|81|91) is also accepted for compatibility.

After you set the MINVERS level for an IMS system, system signon fails for earlier versions of IMS.

Recommendation: When you create an IMS Version 9 RECON data set (using the `DEFINE CLUSTER` command), set the maximum record size to be, at most, equal to the CI size minus seven bytes and ensure that NONSPANNED is specified. For example, if the CI size was defined as 8192 bytes, then RECORDSIZE (4086,8185) is appropriate.

Related Reading: For details about how to migrate a RECON data set to an IMS Version 9 level and for more recommendations for using the `DEFINE CLUSTER` command, see the *IMS Version 9: Database Recovery Control (DBRC) Guide and Reference*.

DBRC Functions Not Supported
The batch RECON upgrade utility, DSPURU00, is no longer supported.

Migrating to IMS Version 9: TM
This section describes the IMS considerations for migrating from IMS Version 7 or IMS Version 8 Transaction Manager to IMS Version 9 Transaction Manager.

APPC Enhancements
There are no migration considerations for these enhancements.

Ending APPC/OTMA Conversations
The conversation IDs for APPC and OTMA must be unique within an IMS subsystem.

ETO Feature Checking

There are no migration considerations for this enhancement.

LU 3 Devices with ETO

There are no migration considerations for this enhancement.

MFS Web Services Support

There are no migration considerations for this enhancement.

Replacement of XRF USERVAR

If you used the 3745 Controller for IMS XRF tracking of VTAM terminals prior to migrating to IMS version 9, you can continue to use this controller. However, after VTAM discontinues support for the 3745 Controller, you must migrate from the traditional XRF tracking with the 3745 Controller to one of the following options:

- Use the Communication Controller for Linux (CCL) for continued use of XRF.
- Migrate from XRF to VTAM Generic Resources (VGR). This option requires a parallel sysplex environment.
- Use IMS Multi-Node Persistent Sessions (MNPS) support for XRF that is provided in IMS Version 9 and later.

Recommendation: Use the CCL or VGR as a permanent replacement solution.

Notify CQS Outage to Terminal Users

There are no migration considerations for this enhancement.

Optional EMHQ Structure for Shared Queues

You can disable shared EMHQ processing for all IMS subsystems or for one subsystem at a time.

OTMA Serviceability and Usability Enhancements

There are no migration considerations for these enhancements.

Sharing TM Resources in an IMSplex with RM

There are no migration considerations for this enhancement. The default value for the STM= keyword of the DFSDCxxx PROCLIB member (STM=YES) indicates that IMS is to share IMS Transaction Manager resources when a resource structure is being used by Resource Manager (RM) in an IMSplex.

XML Transaction Support

There are no migration considerations for this enhancement.

Migrating to IMS Version 9: System

BPE Migration

There are no migration considerations for BPE.

CQS Migration

CQS and any CQS clients on the z/OS image must be migrated at the same time.

CRC Registration

There are no migration considerations for this enhancement.

Fewer SNAP Dumps on Log

There are no migration considerations for this enhancement.

Greater than 255 Transaction Classes

To take advantage of the maximum number of transaction scheduling-classes, specify the new value in the APPLCTN, TRANSACT, and IMSCTRL macros. You can also specify the new value in the DFSMPR and DFSJMP procedures.

IMS Application Menu

There are no migration considerations for this enhancement.

IMS Availability Enhancements

The resource manager is registered dynamically only for IMS Version 9 or later. If you use earlier IMS releases, or use both IMS Version 9 and earlier IMS releases, you must still install the DFSMRCL0 module. When all IMSs (control region and batch regions) are IMS Version 9 or later, you can remove DFSMRCL0 from SYS1.LPALIB and from the IEAVTRML CSECT of z/OS module IGC0001C. You must remove the name DFSMRCL0 from the IEAVTRML CSECT before you remove the module from SYS1.LPALIB. If the name is still in IEAVTRML but the module is not in SYS1.LPALIB, z/OS IPL will fail.

The IMS type-2 SVC and the DBRC type-4 SVC must be defined to z/OS before IMS starts. After adding the SVC definitions to IMS and restarting z/OS, you can use the DFSUSVC0 utility to update the SVC routines without having to restart z/OS.

IMS /DIAGNOSE Command for Serviceability

There are no migration considerations for this enhancement.

IMS Enhanced Command Environment

If, after setting up the IMS enhanced command environment, you decide to migrate to an environment that requires the Resource Manager (RM), you must perform the following additional steps:

1. Update the DFSCGxxx PROCLIB member, as appropriate (for example, RMENV=Y)
2. Shut down IMS
3. Start the RM
4. Start the SCI and the OM
5. Restart IMS

IMS Java Enhancements

If you use IBM SDK for z/OS, Java Technology Edition, Version 1.4.1 or later, you must specify XPLINK=Y for a JMP region or a JBP region. However, if you use Version 1.3.1 of the SDK, you should specify XPLINK=N or allow IMS to use XPLINK=N as the default.

Integrated IMS Connect Support

There are no migration considerations for migrating from the IMS Connect product (program number 5655-K52) to the integrated IMS Connect support provided with IMS Version 9. However, if you have the IMS Connect product currently installed, and you plan to install IMS Version 9 into the same SMP/E zone as the IMS Connect product, the IMS Version 9 integrated IMS Connect support code will overwrite the IMS Connect product.

JBP Symbolic Checkpoint and Restart Enhancement

There are no migration considerations for this enhancement.

Knowledge-Based Log Analysis

There are no migration considerations for this enhancement.

RACF Enhancements to Replace SMU

IMS Version 9 is the last release that will support SMU security. After you migrate to using RACF (or equivalent product), the use of SMU security should no longer be required.

To migrate current SMU security implementations to RACF, the system programmer might need to perform some or all of the following tasks:

- Translate the current AGN definitions into RACF only definitions. Examples of AGN definitions and equivalent RACF definitions are described later in this section.
- Add the four new security classes with the prefixes I, J, L, and M to the installation-defined class descriptor table if the classes are not already defined as default classes in the class descriptor table that is supplied by IBM.
- Specify the new OPTIONS=SIGNON parameter on all applicable TYPE or TERMINAL system-definition macros, or specify the new SIGNON=ALL|SPECIFIC parameter in the DFSDCxxx PROCLIB member for static terminals that are currently defined through SMU as terminals that are required to sign on.
- Specify the new type-1 AOI definitions for the startup parameter AOI1= and on the system-definition TRANSACT macro for type-1 AOI and type-2 AOI.
- Change the TCO and AOI definitions to use the SAF and DFSCCMD0 exit routine for security.
- Define the new RAS parameters in the IMS system-definition SECURITY macro or the parameters on the existing parameter ISIS=.
- Change the MSC link receive security definitions to use SAF and the DFSCCMD0 exit routine for security.
- Change the use of passwords for the /LOCK and /UNLOCK commands to use SAF and the DFSCCMD0 exit routine.

Ensure that your RACF definitions for the VSAM catalog data sets include IMS so that IMS can extend data sets and update the catalog with the new extent information.

Specifying any valid value for RAS (RAS | RASRACF | RASEXIT | NORAS) in the SECURITY system definition macro overrides any specifications for AGN definitions. However, AGN definitions are retained if you do not specify a RAS value (IMS uses a default of NORAS). Specifying either ISIS=N or ISIS=0 results in no RAS security and no AGN security.

IMS Version 8 tolerates the new system definition keyword and parameters added in IMS Version 9. IMS Version 8 does not take any action when the Version 9 keywords or parameters are specified. The Version 9 keywords and parameters that IMS Version 8 tolerates are:

- The NORAS, RASRACF, RASEXIT, and RAS parameters of the TYPE= keyword for the SECURITY macro
- The NOSIGNON and SIGNON parameters for the OPTIONS= keyword of the TERMINAL macro
- The AOI= keyword for the TRANSACT macro
- The NOSIGNON and SIGNON parameters for the OPTIONS= keyword of the TYPE macro

You should be able to convert most of your existing SMU AGN definitions to use RACF resource group names. Figure 1 shows a set of AGN definitions with their associated RACF definitions. Figure 2 shows an equivalent set of definitions that use only RACF.

```
)( AGN IMSDGRP
   AGPSB DEBS
   AGPSB APOL1
   AGTRAN DEBSTRN1
   AGTRAN APOL12
   AGLTERM IMSUS02
   AGLTERM T3270LD

ADDUSER BMPUSER1 PASSWORD(BMPPW1)
RDEFINE AIMS IMSDGRP OWNER(IMSADMIN) UACC(NONE)
PERMIT IMSDGRP CLASS(AIMS) ID(BMPUSER1) ACCESS(READ)
SETROPTS CLASSACT(AIMS)
```

Figure 1. AGN Definitions for a BMP Region

```
ADDGROUP IMSDGRP OWNER(IMSADMIN)
RDEFINE JIMS RASPGRP ADDMEM(DEBS,APOL1) UACC(NONE)
PERMIT RASPGRP CLASS(JIMS) ID(IMSDGRP) ACCESS(READ)
RDEFINE GIMS RASTGRP ADDMEM(DEBSTRN1,APOL12) UACC(NONE)
PERMIT RASTGRP CLASS(GIMS) ID(IMSDGRP) ACCESS(READ)
RDEFINE MIMS RASLGRP ADDMEM(IMSUS02,T3270LD) UACC(NONE)
PERMIT RASLGRP CLASS(MIMS) ID(IMSDGRP) ACCESS(READ)
ADDUSER BMPUSER1 PASSWORD(BMPPW1)
CONNECT BMPUSER1 GROUP(IMSDGRP)
```

Figure 2. Equivalent RACF Definitions for a BMP Region

With AGN support, you can specify that a particular AGN name has access to all entities of a particular resource. Figure 3 shows how to specify this access using AGN definitions. To accomplish the equivalent definitions using RACF, you can use generic resource definitions. Figure 4 shows how to use RACF generic resource definitions to support AGTRAN=ALL and AGLTERM=ALL.

```
)( AGN IMSDGRP2
   AGTRAN ALL
   AGLTERM ALL
```

Figure 3. AGN Definitions for Access to All Entities of a Resource

```
ADDGROUP IMSDGRP2 OWNER(IMSADMIN)
RDEFINE TIMS ** UACC(NONE)
PERMIT ** CLASS(TIMS) ID(IMSDGRP2) ACCESS(READ)
RDEFINE LIMS ** UACC(NONE)
PERMIT ** CLASS(LIMS) ID(IMSDGRP2) ACCESS(READ)
ADDUSER BMPUSER2 PASSWORD(BMPPW2)
CONNECT BMPUSER2 GROUP(IMSDGRP2)
```

Figure 4. Equivalent RACF Definitions for Access to All Entities of a Resource

You can also use a combination of resource grouping and generic-resource definitions. Figure 5 on page 50 shows the AGN and associated RACF definitions for defining this combination. Figure 6 on page 50 shows the equivalent RACF definitions.

```
)( AGN IMSDGRP3
   AGTRAN DEBSTRN1
   AGTRAN CDEBTRN2
   AGLTERM ALL

ADDUSER MPPUSER3 PASSWORD(MPPPW3)
RDEFINE AIMS IMSDGRP3 OWNER(IMSADMIN) UACC(NONE)
PERMIT IMSDGRP3 CLASS(AIMS) ID(MPPUSER3) ACCESS(READ)
SETROPTS CLASSACT(AIMS)
```

Figure 5. AGN Definitions Combining Resource Grouping and Generic Resource Definitions

```
ADDGROUP IMSDGRP3 OWNER(IMSADMIN)
RDEFINE GIMS RASTGRP ADDMEM(DEBSTRN1,CDEBTRN2) UACC(NONE)
PERMIT RASTGRP CLASS(GIMS) ID(IMSDGRP3) ACCESS(READ)
RDEFINE LIMS ** UACC(NONE)
PERMIT ** CLASS(LIMS) ID(IMSDGRP3) ACCESS(READ)
ADDUSER MPPUSER3 PASSWORD(MPPPW3)
CONNECT MPPUSER3 GROUP(IMSDGRP3)
```

Figure 6. Equivalent RACF Definitions Combining Resource Grouping and Generic Resource Definitions

Reducing Abends

There are no migration considerations for this enhancement.

Removal of Restriction for Separate IMS.SDFSRESL Libraries

The DBRC= parameter of the IMSCTRL system definition macro is no longer processed. For compatibility, this parameter is ignored if you include it. However, if you do include the DBRC= parameter, IMS issues informational message G011. The internal default for this parameter for IMS Version 9 is DBRC=YES.

If you want to change the IMS default value for DBRC for batch or utility regions, you can use a new optional module, DFSIDEF0, to specify DBRC=NO or DBRC=FORCE. A sample DFSIDEF0 module is provided with IMS.

There are three ways to change the IMS default value of DBRC=YES:
- Assemble and bind the DFSIDEF0 module into the IMS execution library to change the IMS default value.
- Override the value in PROCLIB member DFSPBxxx.
- Override the value in JCL.

IMS Version 9 adds the RGSUF=, PARM1=, and PARM2= keywords to the DBBBATCH and DLIBATCH system-definition-created procedures.

RSR Migration

This section describes migration for IMS Remote Site Recovery (RSR).

Planning and Administration Tasks: The system programmer, system administrator, and the database administrator must carefully plan the migration of IMS systems that participate in RSR to IMS Version 9. A plan for orderly migration is essential to avoid loss of disaster recovery protection during the migration period.

RSR users must migrate from IMS Version 6, IMS Version 7, and IMS Version 8 to IMS Version 9 to take advantage of added IMS function. The migration path must be chosen very carefully for the IMS subsystems that are participating in RSR. Migration of any IMS system that participates in RSR includes all steps required to

move to the new level. For example, the following steps will lead to a successful migration from Version 6, Version 7, or Version 8 to IMS Version 9 in an RSR environment:

1. Migrate the tracking IMS and Transport Manager Subsystem (TMS) to the IMS Version 9 level.

2. Migrate the active site TMS that is running isolated log sender (ILS) to the IMS Version 9 level. This step must be completed before or during migration of the first active IMS. ILS should be stopped on all the other TMSs so that the tracking IMS does not attempt to establish conversations with a down-level ILS.

3. Migrate the rest of the active IMS subsystems and active site TMS systems to the IMS Version 9 level as necessary.

Pre-Version 9 Library Retention: All pre-IMS Version 9 libraries that are required for processing the pre-IMS Version 9 tracking log data sets must be retained until there is no possibility of using the pre-IMS Version 9 log data sets. If a tracking log data set must be recovered for any reason, it must be processed by the Log Recovery utility (DFSULTR0) from the same version of IMS. This means that even after a remote takeover, pre-IMS Version 9 libraries might have to be retained at the remote site, even if all active IMS subsystems have been upgraded to IMS Version 9.

Takeover Considerations: Active IMS systems must restart at the remote site after a remote takeover in order to access to tracking log data sets (for normal and emergency restart). The new active IMS system must run at the same level as the old active IMSs that created the log records that are used for restart processing.

Handling Error Situations: If the tracking IMS terminates abnormally while at the pre-IMS Version 9 level, perform an emergency restart at the pre-IMS Version 9 level and successfully shut down before you migrate to IMS Version 9. This allows the tracking IMS to create an RSR position data set to be used during cold start processing of the new IMS Version 9 RSR tracker to reestablish routing position on the various PRILOGs.

If a deallocate or close error message for the RSR position data set is issued by the IMS Version 6, IMS Version 7, or IMS Version 8 tracking IMS during shutdown, resolve the problem that is causing the error before you migrate the tracking IMS system to IMS Version 9. If the problem causes an error during RSR position data set allocation such that the tracking IMS is unable to find the position data set, you have the option to continue normal cold start processing. However, normal cold start processing will result in the tracking IMS processing only log data from new active IMSs, since it has no indication of where the previous tracking IMS stopped. You can restart the tracking IMS at the pre-IMS Version 9 level if a new RSR position data set needs to be created to alleviate this problem.

The following sequence of events illustrates what can happen if an active IMS spans the migration of a tracking IMS and an RSR position data set is not available:

1. Log data is received at the tracking site from an active IMS Version 6, IMS Version 7, or IMS Version 8 system before migrating the tracking IMS to IMS Version 9 (the active PRILOG is not closed).

2. The tracking IMS migrates to an IMS Version 9 level but the active IMS did not shut down (the PRILOG did not close in the active site RECON data sets).

3. Cold start of the IMS Version 9 tracker is unable to find the RSR position data set.

4. The user elects to continue cold start processing.

5. Log data is received from the active IMS with the same PRILOG start time as was processed by the previous release tracking IMS. This log data is not applied to any remote site database.

RSR Migration Path to IMS Version 9: Table 10 describes the actions that are necessary to migrate IMS and TMS from IMS Version 6, IMS Version 7, or IMS Version 8 to IMS Version 9. In Table 10:
- The "Steps" column shows the order in which you can migrate the components of the RSR complex (A = Active, R = Remote).
- The bold type in a table cell shows where the current changes are occurring.

Table 10. Supported Paths and Configurations for Migrating RSR to IMS Version 9

Steps		Active Site State			Remote Site State			Notes
A	R	IMS	TMS/ILS	RECON	IMS	TMS/ILS	RECON	
0	0	pre-V9	pre-V9	pre-V9	pre-V9	pre-V9	pre-V9	See note 1
1	1	pre-V9	pre-V9	**V9**	pre-V9	pre-V9	**V9**	See note 2
1	2	pre-V9	pre-V9	V9	**V9**	**V9**	V9	See note 3
2	2	pre-V9	**V9**	V9	V9	V9	V9	See note 4
3	2	**V9**	V9	V9	V9	V9	V9	See note 5

Notes:
1. (0,0) - This is the initial state. All subsystems at both the active and remote sites are running at the pre-V9 level.
2. (1,1) - Both RECONs are upgraded using the `CHANGE.RECON UPGRADE` command. It does not matter which site (active or remote) is run first. It only matters that both RECONs are upgraded before proceeding.
3. (1,2) - The tracking IMS and remote site TMS are migrated to IMS Version 9. These can be migrated separately, but to ensure integrity, simultaneous migration is preferred.
4. (2,2) - The active site TMS is migrated to IMS Version 9. This can be accomplished as part of the active IMS's migration to IMS Version 9. All non-IMS Version 9 isolated log senders (ILSs) must be stopped and ILS started on the IMS Version 9 TMS so that missing log data from the IMS Version 9 IMS can be sent to the tracking IMS.
5. (3,2) - The active IMS subsystems are migrated to IMS Version 9. Each IMS subsystem can be migrated independently.

Table 11 on page 59 shows the combinations of IMS systems and resources that are supported.

Alternatives: The alternatives to RSR migration and coexistence are:
- Require IMS users of the RSR function to migrate all systems that are participating in RSR to IMS Version 9 simultaneously.
- Disable the RSR function while active site systems migrate to IMS Version 9.

Interfaces: The interface between the log router and various other components has been changed to support multiple release log record handling. The components whose interfaces have changed are:
- Active site IMS logger
- Active system tracker

- DBRC
- DL/I tracker
- Fast Path tracker
- Isolated log sender

Program Dependencies: Migrating RSR to IMS Version 9 does not depend on any specific non-IMS software besides that which is required for Remote Site Recovery to operate.

Security Maintenance Utility (DFSISMP0)
If your SMU matrix definitions include CTRANS and TCOMMAND statements, you must rebuild your matrix blocks during IMS Version 9 migration.

Support for IEBCOPY Parameters in the Online Change Copy Utility
There are no migration considerations for this enhancement.

Synchronous APPC/OTMA Shared Queues Enablement
There are no migration considerations for this enhancement.

Syntax Checker Enhancements
The Syntax Checker assists with IMS release-to-release migrations by providing the ability to convert supported IMS.PROCLIB members from one release to the other. When you use the Syntax Checker to check parameters for earlier releases of IMS, you must verify that the correct release number is displayed.

Tracing Enhancements
There are no migration considerations for these enhancements.

VSCR Enhancements
There are no migration considerations for these enhancements.

Migrating to IMS Version 9: Installation Configuration Changes

The IVP enhancements do not affect release-to-release migration for IMS.

The IMS IVP is used during the tailoring and system definition of IMS and is used sporadically afterwards. The IVP dialogs are completely replaced when a new release of IMS is installed. However, migration is simpler because you can export and import IVP variables between releases.

Discontinuance of Support

IMS Version 9 is the last version of IMS that supports:
- Security Maintenance utility (SMU). Customers using SMU should migrate to the Resource Access Control Facility (RACF), or an equivalent product.
- Basic Telecommunications Access Method (BTAM). Customers using BTAM should migrate to use Virtual Telecommunications Access Method (VTAM) or Transmission Control Protocol/Internet Protocol (TCP/IP). User code or tools that are dependent on BTAM should migrate to VTAM or TCP/IP.

Fallback Considerations

IMS does not generally support downward compatibility in any major function between releases. However, consider the following list when preparing your migration fallback plan. This information is intended as a guide to understanding fallback inhibitors, and should not be considered complete:

- The ACB maintenance utility, ACBGEN, is required.
- For each IMS that you are migrating to a pre-Version 9 level, perform the following steps:
  1. Shut down that IMS.
  2. Install the version of IMS that you want.
  3. Run INITMOD to initialize the MODSTAT data set.
  4. Cold start the IMS.
- You can use the Queue Control Facility (QCF) to convert IMS Version 9 messages to IMS Version 8 or IMS Version 7 messages.

HALDB Online Reorganization Fallback Considerations

For IMS Version 8 subsystems with the OLR Coexistence SPE applied, full data sharing is allowed and no immediate action is necessary. However, if any M-V and Y DBDSs are active or online reorganization is active for any partitions, then you must run the IMS Version 9 utilities whenever processing those partitions. You will need to run offline reorganization for any partitions with M-V and Y DBDSs that are active or for any partitions with online reorganization that is active before falling back to use the IMS Version 8 utilities.

For IMS Version 8 subsystems without the OLR Coexistence SPE applied, and for IMS Version 7 subsystems, databases that are defined as not capable of being reorganized online are available and no action is required. Databases that are defined as capable of being reorganized are unavailable until both of the following actions are completed:

- Reorganize all partitions with the M-V and Y data sets active or online reorganization active using the IMS Version 9 offline reorganization utility. This leaves only the A-J and X data sets active.
- Change DBRC for the databases to reflect that they are not capable of being reorganized online using the IMS Version 9 command (`CHANGE.DB DBD(HALDB master) OLRNOCAP`).

If you must fall back to an earlier version of IMS, you must set DBRC for all HALDBs to OLRNOCAP.

Database Change Accumulation Utility Fallback Considerations

If you fall back from IMS Version 9 to IMS Version 8 or IMS Version 7 and you have change accumulation data sets created at the version 9 level, the logs in these data sets are not recoverable because the version 8 or version 7 Database Change Accumulation utility (DFSUCUM0) cannot process them. Invalidate the version 9 change accumulation data sets by running an image copy of the affected databases at the version 8 or version 7 level.

Chapter 4. Coexistence with IMS Version 9

This chapter describes coexistence and compatibility considerations for IMS Version 9 with earlier versions of IMS. It includes the following sections:

- "General Coexistence Considerations"
- "Restrictions for IMS Version 9 During Coexistence" on page 62
- "Compatibility" on page 62

General Coexistence Considerations

The following are general coexistence considerations for functional areas of IMS Version 9.

CQS

The following coexistence considerations exist for CQS:

- A particular version of IMS cannot register with a CQS from an earlier IMS version. For example, an IMS Version 9 can only register to an IMS Version 9 or later CQS.
- An IMS Version 8 can register with an IMS Version 9 CQS. The CQS in use should always be at the highest release level.
- User or vendor-written CQS clients that want to register with an IMS Version 9 CQS must be recompiled with the CQS macros delivered with IMS Version 8 or later.
- User or vendor-written CQS clients that are compiled with the IMS Version 9 CQS macros cannot register with a pre-version 9 CQS.
- A Version 7 CQS, a Version 8 CQS, and a Version 9 CQS can connect to the same coupling facility structure.
- A Version 7 CQS, a Version 8 CQS, and a Version 9 CQS can run on the same central processing complex (CPC).

Database Recovery Utilities

The database recovery utilities take three types of input: log, image copy, and change accumulation data sets. The method of processing for coexistence in the utility programs is to translate the records as they are read into the format of the current release for that record type. The IMS Version 9 Database Recovery (DFSURDB0) and Database Change Accumulation (DFSUCUM0) utilities have support for translating log, image copy, and change accumulation records only from IMS Version 7 and IMS Version 8.

For change accumulation records created by IMS Version 7, or earlier, to be usable by IMS Version 9, the records must have been created after you applied the coexistence SPE to the IMS Version 7 load libraries. For IMS Version 7, the coexistence SPE is APAR PQ72838 (PTF UQ82308). Because this restriction exists on carrying change accumulation files forward from IMS Version 7, there are several ways to handle the migration.

The installation of IMS Version 9 as an upgrade from IMS Version 7 requires a sequence of operations to achieve coexistence for the recovery and change accumulation utilities:

1. The coexistence SPE must be installed on the existing V7 system.
2. The change accumulation files must be conditioned to allow them to be used by IMS Version 9. This is done in one of three ways:
   - Make an image copy of the database subsequent to the installation of the SPE. This will invalidate all of the old CA data sets.
   - Run the change accumulation utility on IMS Version 7 with the appropriate SPE installed. If the SPE is installed before IMS Version 9 is used, most or all of the CA data sets might be processed and made valid for coexistence with IMS Version 9.
   - Use the `CHANGE.CA ... INVALID` command to directly invalidate each of the old CA data sets. This can be a long and tedious process, but might be necessary if neither choice 1 or 2 is effective before it is necessary to use IMS Version 9 utilities.

It is necessary to use the IMS Version 9 utilities whenever the input data for a DBDS contains log, image copy, or CA records created by the IMS Version 9 system. This is why the coexistence SPEs must be installed well before sharing or transfer of databases between IMS Version 9 and IMS Version 7.

DBRC

When an IMS Version 9 subsystem coexists with an earlier version of IMS, the authorization of the online DBRC commands is in effect only for the IMS Version 9 subsystem.

The highest DMB number that can be assigned to a new database that is registered to DBRC is currently 32 767. If the limit is reached by a Version 7 or Version 8 DBRC during the processing of an `INIT.DB` command, DBRC issues a new message, DSP1101I, and the command fails. However, a Version 9 DBRC can reassign and reuse currently unused DMB numbers.

DBRC issues message DSP1100I when it creates the DMB table in the RECON data set during the processing of an `INIT.DB` command. If 32 767 databases are already registered in the RECON, the `INIT.DB` command fails, and DBRC issues message DSP1102I.

DEDB multi-area structure names can exist for DEDBs in IMS Version 9. Any DEDB that uses a multi-area structure name cannot be used by a Version 7 or Version 8 DBRC, although these DEDBs can appear in RECON listings.

Small Programming Enhancements and Coexistence Support Code

Small programming enhancements (SPEs) are available for IMS Version 7 and IMS Version 8 that allow the coexistence of the Version 7 or Version 8 DBRC with DBRC for IMS Version 9. With the appropriate SPE applied, Version 9 DBRC and pre-Version 9 DBRCs can run properly with the same upgraded RECON data set. If the RECON data set has not been upgraded to IMS Version 9, the SPE has no effect. After the RECON data set has been upgraded, the SPE allows DBRC to convert records to the appropriate release format depending on whether the record is being written to or the record is being read from the RECON data set. The SPE does not, however, enable the downlevel DBRC for the new functions delivered with DBRC in IMS Version 9.

Restriction: After a RECON data set has been upgraded to the IMS Version 9 level, it is not accessible to any pre-IMS Version 9 system that does not have the DBRC Coexistence SPE applied.

The MINVERS keyword of the `INIT.RECON` and `CHANGE.RECON` commands specifies the minimum version of IMS that can sign on to DBRC. When a RECON data set is migrated to an IMS Version 9 level, IMS sets a default of MINVERS(7.1). The value that is set for the minimum version is displayed in the `LIST.RECON` command output. When all systems that access the RECON data set are at an IMS Version 9 level, you can reset the minimum version value by using the MINVERS keyword on the IMS Version 9 `CHANGE.RECON` command.

ETO Feature Checking

When performing system generation for an IMS Version 8 or earlier subsystem, IMS checks for installation of the ETO feature. For an IMS Version 9 subsystem, ETO feature checking occurs during the initialization phase of the Transaction Manager component.

Fast Path Multiple Areas Shared VSO Structures

For coexistence between IMS Version 9 and earlier versions of IMS:

- Ensure that previous versions of IMS do not attempt to access data that is in a multi-area structure. DBRC will not authorize a pre-V9 IMS system that attempts to access an area with the multi-area structure (MAS) option. However, you can issue a `LIST.DBDS` command from an IMS Version 7 or Version 8 subsystem, and the output shows Version 9 areas that use multi-area structures, although it does not show the MAS keyword in the listing.
- Apply coexistence APARs to any earlier versions of IMS.

IMS Control Center

The IMS Control Center does not work with IMS Version 7 because this version does not have the System Management enhancements.

IMSplex Enhancements

A pre-Version 8 IMSplex does not have the System Management functions that were delivered with IMS Version 8 and IMS Version 9. Any supported IMS system (Version 7 and later) can coexist in a Version 9 IMSplex. Only Version 8 and Version 9 IMSs have the ability to communicate with one another using the SCI and the ability to be managed by a single point of control (SPOC) application program. IMS Version 7 subsystems cannot use the System Management functions.

Integrated HALDB Online Reorganization Support

IMS Version 7 subsystems and IMS Version 8 subsystems (without the OLR Coexistence SPE applied) can access HALDBs that are not marked in the RECON data sets as capable of being reorganized online. You can develop new IMS applications that make use of HALDBs that can be reorganized online before you upgrade all IMS systems to IMS Version 9.

HALDBs that are marked as capable of running online reorganization are not known to an IMS Version 8 subsystem unless the IMS Version 8 OLR Coexistence SPE is applied, or to an IMS Version 7 subsystem. A HALDB that is defined as a partitioned secondary index (PSINDEX) database is always marked as not capable of running online reorganization (OLRNOCAP), and is known to pre-V9 IMS releases.

IMS Version 8 is allowed full data sharing with Version 9 HALDBs that are undergoing online reorganization if the IMS Version 8 OLR Coexistence SPE is applied.

Integrated IMS Connect Support

The integrated IMS Connect support that is provided with IMS Version 9:

- Can coexist with the IMS Connect 2.2 product, however, you cannot install the IMS Connect product in the same SMP/E zones as IMS Version 9.
- Supports connections to the following versions of IMS with the following APARs applied:

  IMS Version 7
  - PQ33929
  - PQ33996
  - PQ34229
  - PQ34542
  - PQ37322

  IMS Version 8
  - PQ59431
  - PQ63231

IRLM

You can use IRLM 2.2 with IRLM 2.1 in an IMS Version 9 environment, including a data-sharing environment. IRLM 2.2 can use storage above the 2 GB bar for 64-bit processors, but IRLM 2.2 can also run on 32-bit processors.

You can also use IRLM 2.2 with IMS Version 8 or IMS Version 7 using either 64-bit or 32-bit processors.

Multiple Systems Coupling

IMS Version 7 must have APAR PQ32932 (PTF UQ39013) applied if any of the following conditions are true:

- IMS Version 9 uses MSC to connect to an IMS Version 7 system
- IMS Version 9 messages are requeued to or from IMS Version 7 using the Queue Control Facility (QCF) product
- IMS Version 9 and IMS Version 7 systems are in the same shared queues group (SQG) in a shared-queues environment

IMS Version 9 supports exit routines that used the IMS Version 7 TM and MSC Message Routing and Control user exit routine (DFSMSCE0). IMS Version 9 also supports coexistence in an IMS MSC or shared queues network of mixed (but supported) IMS releases where some IMS Version 7 systems use the old MSC exit routines.

Related Reading: See the *IMS Version 9: Customization Guide* for information about the rules for calling the MSC exit routine (DFSMSCE0).

RACF Enhancements to Replace SMU

If an IMSplex contains IMS Version 9 and earlier IMS releases, you should specify the NORSCCC(MODBLKS) parameter in the DFSCGxxx PROCLIB member to disable the resource consistency checking for the MATRIX library. If your IMS Version 9 system is running without the use of SMU security, and the systems with earlier IMS releases are using SMU security in some way, the resource consistency check fails for the MATRIX library that is used by the earlier systems.

The new AOI parameter in the system-definition TRANSACT macro applies to type-1 AOI calls, such as CMD, and to type-2 AOI calls, such as ICMD. However, if you specify AOI=NO (or accept it as the default), transactions are still allowed to use type-2 AOI and issue the ICMD call.

Remote Site Recovery (RSR)

For coordinated disaster recovery for IMS and DB2, an IMS Version 9 RSR tracking subsystem with XRC tracking enabled can track logs from supported pre-Version 9 active systems that have the usual and customary DBRC Coexistence SPEs applied.

For regular RSR, IMS Version 9 RSR coexistence supports configurations in which:
- The tracking site Transport Manager Subsystem (TMS) is at the IMS Version 9 level and the active site is at IMS Version 6, Version 7, or Version 8 level.
- The active site RECON data sets are at the IMS Version 6, Version 7, or Version 8 level (with the Version 9 DBRC Coexistence SPE applied).
- The active TMS that is running ILS is at the IMS Version 6, Version 7, or Version 8 level.
- One or more active IMSs are at the IMS Version 6, Version 7, or Version 8 level.

Table 11 contains all the supported configurations of a simple set of subsystems in an RSR Global Service Group (GSG). Some unsupported configurations are not included because a prerequisite configuration also is not supported. Some unsupported configurations are included even though a prerequisite configuration is supported so that the reason for non-support can be explained.

The simple set of configurations in Table 11 assumes:
- A single active IMS
- A single Transport Manager Subsystem (TMS) that is running the Isolated Log Transport
- A single set of active site RECON data sets
- A single tracking IMS
- A single remote site TMS
- A single set of remote site RECON data sets

Table 11 also describes valid and invalid RSR coexistence configurations. The following notation is used to denote the state of the subsystems and RECON data sets in this table:
- pre-V9 = IMS Version 6, Version 7, or Version 8
- pre-V9 + SPE = IMS Version 6, Version 7, or Version 8 with the DBRC Coexistence SPE applied
- V9 = IMS Version 9

Table 11. Valid RSR Coexistence Subsystem Configurations and Migration Progression

Active Site State			Remote Site State			
IMS	TMS/ILS	RECON	IMS	TMS	RECON	Notes
pre-V9	pre-V9	pre-V9	pre-V9	pre-V9	pre-V9	Supported
pre-V9 + SPE	pre-V9	pre-V9	pre-V9	pre-V9	pre-V9	Supported
pre-V9 + SPE	V9	V9	pre-V9	pre-V9	pre-V9	Supported

Table 11. Valid RSR Coexistence Subsystem Configurations and Migration Progression (continued)

Active Site State			Remote Site State			
IMS	TMS/ILS	RECON	IMS	TMS	RECON	Notes
pre-V9	V9	pre-V9	pre-V9	pre-V9	pre-V9	Not supported. The local TMS/ILS cannot be migrated to IMS Version 9 if the RECON data sets have not been upgraded to IMS Version 9.
pre-V9 + SPE	pre-V9 + SPE	pre-V9	pre-V9	pre-V9	pre-V9	Supported
V9	pre-V9 + SPE	pre-V9	pre-V9	pre-V9	pre-V9	Not supported. The RECON data sets must be upgraded prior to running any IMS at the IMS Version 9 level. The active IMS cannot be at the IMS Version 9 level if the local site TMS that is running ILS is not at the same level. The local site IMS cannot be at a later level than the remote IMS.
pre-V9 + SPE	pre-V9 + SPE	V9	pre-V9	pre-V9	pre-V9	Supported
pre-V9	V9	V9	pre-V9	pre-V9	pre-V9	Not supported. The local site TMS that is running ILS cannot be at the IMS Version 9 level if the tracking IMS is at the pre-Version 9 level. The active IMS also cannot be at the IMS Version 9 level.
V9	V9	V9	pre-V9	pre-V9	pre-V9	Not supported. The local site TMS that is running ILS and the active IMS cannot be at the IMS Version 9 level if the tracking IMS is at the pre-Version 9 level. The active IMS also cannot be at the IMS Version 9 level.
pre-V9	pre-V9	pre-V9	pre-V9 + SPE	pre-V9	pre-V9	Supported
pre-V9 + SPE	pre-V9	pre-V9	pre-V9 + SPE	pre-V9	pre-V9	Supported
pre-V9 + SPE	pre-V9 + SPE	pre-V9	pre-V9 + SPE	pre-V9	pre-V9	Supported
V9	pre-V9 + SPE	V9	pre-V9 + SPE	pre-V9	pre-V9	Not supported. An active IMS cannot be at the IMS Version 9 level if the tracking IMS is not at the IMS Version 9 level. The active site TMS that is running ILS also cannot be at the pre-Version 9 level or at the pre-Version 9 + SPE level. [1]
pre-V9	pre-V9 + SPE	pre-V9	pre-V9 + SPE	pre-V9	pre-V9	Supported [1]
pre-V9 + SPE	pre-V9 + SPE	pre-V9	pre-V9 + SPE	pre-V9	pre-V9	Supported [1]
pre-V9 + SPE	pre-V9 + SPE	V9	pre-V9 + SPE	pre-V9	pre-V9	Supported [1]
pre-V9 + SPE	pre-V9 + SPE	V9	V9	pre-V9	pre-V9	Not supported. The tracking IMS cannot be at the IMS Version 9 level if the remote site RECON data sets are not upgraded to IMS Version 9. [1] [2]

Table 11. Valid RSR Coexistence Subsystem Configurations and Migration Progression (continued)

Active Site State			Remote Site State			
IMS	TMS/ILS	RECON	IMS	TMS	RECON	Notes
pre-V9 + SPE	pre-V9 + SPE	V9	pre-V9 + SPE	pre-V9 + SPE	V9	Supported
V9	pre-V9 + SPE	V9	pre-V9 + SPE	pre-V9 + SPE	V9	Not supported. The active IMS cannot be at the IMS Version 9 level if neither the tracking IMS nor the active site TMS that is running ILS is not at the IMS Version 9 level.
pre-V9 + SPE	pre-V9 + SPE	V9	V9	V9	V9	Supported
V9	pre-V9 + SPE	V9	V9	V9	V9	Not supported. The active IMS cannot be at the IMS Version 9 level if the active site TMS that is running ILS is not at the IMS Version 9 level.
pre-V9 + SPE	V9	V9	V9	V9	V9	Supported
V9	V9	V9	V9	V9	V9	Supported

Shared Message Queues

Instances of IMS Version 8 and IMS Version 9 can share an IMS message queue in an IMSplex.

Syntax Checker

The IMS Version 9 Syntax Checker can exist on the same systems as earlier releases. In fact, you can use it to check the supported parameters of IMS Version 7 and IMS Version 8. Be sure that the release number shown is correct when you use the Syntax Checker to check the parameters of earlier releases.

Sysplex Terminal Management

Different versions of IMS can coexist in an IMSplex and can use VTAM Generic Resources. While message integrity is maintained in this scenario, the operating characteristics of the IMS components at the Version 8 and Version 9 level are different from the IMS Version 7 subsystems, especially with respect to recoverable status of resources. The status is kept locally for the Version 7 IMSs. For the Version 8 and Version 9 IMSs, the resource status could be kept both locally and in a resource structure that is managed by the RM.

Recommendation: If you specify STM=YES in the DFSDCxxx PROCLIB member, do not mix IMS Version 7 with IMS Version 8 or Version 9 in the same VTAM Generic Resource group. You can mix IMS Version 8 and Version 9 in the same VTAM Generic Resource group.

TSO SPOC Application

The TSO SPOC application does not work with IMS Version 7 because this version does not have the System Management enhancements.

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1. The remote site TMS can also be at the IMS Version 6, IMS Version 7, or IMS Version 8 level.

2. Regardless of the configuration of the active site subsystems and the RECON data sets, this state is not supported.

Utilities

Data sets created on an IMS Version 9 system by any of the following utilities can only be used as input for recovery by the IMS Version 9 Database Recovery utility (DFSURDB0):

- Database Change Accumulation utility (DFSUCUM0)
- Database Image Copy utility (DFSUDMP0)
- Database Image Copy 2 utility (DFSUDMT0)
- HISAM Reorganization Unload utility (DFSURUL0)

Data sets created by these IMS Version 9 utilities cannot be used by any pre-Version 9 utilities.

The IMS Version 9 Database Change Accumulation utility and Database Recovery utility will accept Image Copy and Change Accumulation data sets, and also log data sets created by IMS Version 8 or IMS Version 7. See "Database Recovery Utilities" on page 55 for more information.

Recommendation: Use DBRC with all IMS Version 9 Database Change Accumulation and Database Recovery jobs, especially during migration and coexistence.

Restriction: Other utility programs (such as Log Merge and Log Analysis) function properly only when they process data that was created by an IMS subsystem or batch application program that is at the same release level as the utility program. If you do not follow this restriction, the results are unpredictable and the output is unreliable.

Restrictions for IMS Version 9 During Coexistence

There are no general restrictions during IMS Version 9 coexistence.

Compatibility

IMS Version 9 is compatible with previous versions, allowing existing applications and data to be used without change. Migration and coexistence support is provided for IMS Version 7 and IMS Version 8 with IMS Version 9.

IMS Version 7 Compatibility Considerations

Java Applications

A Java application can use the IMS Version 9 Java dependent region support or the High Performance Java (HPJ) support that is provided in IMS Version 7, but not both. HPJ is not supported in IMS Version 9.

IMS Version 8 Compatibility Considerations

There are no IMS Version 8 compatibility considerations for IMS Version 9.

General Compatibility Considerations

Some general compatibility considerations are:

- A new ACBGEN is required for all existing PSBs and DBDs.
- An all-system generation and a cold start are required for online systems (DBCTL, DB/DC, DCCTL). All data sets must be formatted when IMS is initialized the first time.

- When installing multiple copies of IMS systems at different release levels in the same processor, previous supported releases of IMS can use the latest IMS SVCs.
- IMS Version 9 DFSMRCL0 and DFSAFMD0 are downwardly compatible for any supported IMS release within the same z/OS system.
- The Offline Dump Formatter from IMS Version 9, IMS Version 8, or IMS Version 7 works without making any changes, provided proper formatter libraries are used.
- The MFS format library is a required data set whether MFS is used or not, except for DBCTL systems.
- **Utilities and Logs**

  You might need to make changes to programs that process the log because some log records that are created by database changes have been modified.

  The only IMS Version 9 utilities that accept logs from Version 7 or Version 8 are:
  - The Database Change Accumulation Utility (DFSUCUM0)
  - The Database Recovery Utility (DFSURDB0)
- **Extended Checkpoint**

  Restriction: You cannot use extended checkpoint to restart applications across different releases of IMS.
- The OLCSTAT data set (used for Coordinated Online Change) is not compatible with Version 7 IMSs.

Chapter 5. Summary of Changes to the IMS Publications

This chapter describe the changes to the IMS publications for IMS Version 9 from previous versions. It includes the following sections:

- "Library Changes for IMS Version 9"
- "Library Changes for IMS Version 8" on page 67
- "IMS Publication Packaging" on page 67

Library Changes for IMS Version 9

Changes to the IMS Library for IMS Version 9 include the addition of one title, a change of one title, organizational changes, and a major terminology change. Changes are indicated by a vertical bar (|) to the left of the changed text.

The IMS Version 9 information is now available in the Information Management Software for z/OS Solutions Information Center, which is available at publib.boulder.ibm.com/infocenter/dzichelp/index.jsp. The Information Management Software for z/OS Solutions Information Center provides a graphical user interface for centralized access to the product information for IMS, IMS Tools, DB2 Universal Database (UDB) for z/OS, DB2 Tools, and DB2 Query Management Facility (QMF™).

New and Revised Titles

The following list details the major changes to the IMS Version 9 library:

- *IMS Version 9: IMS Connect Guide and Reference*

  The library includes new information: *IMS Version 9: IMS Connect Guide and Reference*. This information is available in softcopy format only, as part of the Information Management Software for z/OS Solutions Information Center, and in PDF and BookManager formats.

  IMS Version 9 provides an integrated IMS Connect function, which offers a functional replacement for the IMS Connect tool (program number 5655-K52). In this information, the term *IMS Connect* refers to the integrated IMS Connect function that is part of IMS Version 9, unless otherwise indicated.

- The information formerly titled *IMS Version 8: IMS Java User's Guide* is now titled *IMS Version 9: IMS Java Guide and Reference*. This information is available in softcopy format only, as part of the Information Management Software for z/OS Solutions Information Center, and in PDF and BookManager formats.

- To complement the IMS Version 9 library, a retail book, *An Introduction to IMS* by Dean H. Meltz, Rick Long, Mark Harrington, Robert Hain, and Geoff Nicholls (ISBN # 0-13-185671-5), is available from IBM Press. Go to the IMS Web site at www.ibm.com/ims for details.

Organizational Changes

Organization changes to the IMS Version 9 library include changes to:

- *IMS Version 9: Customization Guide*
- *IMS Version 9: IMS Java Guide and Reference*
- *IMS Version 9: Messages and Codes, Volume 1*
- *IMS Version 9: Utilities Reference: System*

A new appendix has been added to the *IMS Version 9: Customization Guide* that describes the contents of the ADFSSMPL (also known as SDFSSMPL) data set.

The chapter titled "DLIModel Utility" has moved from *IMS Version 9: IMS Java Guide and Reference* to *IMS Version 9: Utilities Reference: System*.

The DLIModel utility messages that were in *IMS Version 9: IMS Java Guide and Reference* have moved to *IMS Version 9: Messages and Codes, Volume 1*.

Terminology Changes

IMS Version 9 introduces new terminology for IMS commands:

type-1 command
> A command, generally preceded by a leading slash character, that can be entered from any valid IMS command source. In IMS Version 8, these commands were called *classic* commands.

type-2 command
> A command that is entered only through the OM API. Type-2 commands are more flexible than type-2 commands and can have a broader scope. In IMS Version 8, these commands were called *IMSplex* commands or *enhanced* commands.

Accessibility features for IMS

Accessibility features help a user who has a physical disability, such as restricted mobility or limited vision, to use information technology products successfully.

Accessibility features

The following list includes the major accessibility features in IMS. These features support:

- Keyboard-only operation.
- Interfaces that are commonly used by screen readers.

Note: The Information Management Software for z/OS Solutions Information Center, which is available at publib.boulder.ibm.com/infocenter/dzichelp/index.jsp, and its related publications are accessibility-enabled for the IBM Home Page Reader. You can operate all features using the keyboard instead of the mouse.

Keyboard navigation

You can access the information center and IMS ISPF panel functions by using a keyboard or keyboard shortcut keys.

You can find information about navigating the information center using a keyboard in the information center home at publib.boulder.ibm.com/infocenter/dzichelp/index.jsp.

For information about navigating the IMS ISPF panels using TSO/E or ISPF, refer to the *z/OS V1R1.0 TSO/E Primer*, the *z/OS V1R5.0 TSO/E User's Guide*, and the *z/OS V1R5.0 ISPF User's Guide, Volume 1*. These guides describe how to navigate each interface, including the use of keyboard shortcuts or function keys (PF keys). Each guide includes the default settings for the PF keys and explains how to modify their functions.

IBM and accessibility

See the *IBM Human Ability and Accessibility Center* at www.ibm.com/able for more information about the commitment that IBM has to accessibility.

Library Changes for IMS Version 8

The IMS Version 8 library was updated and differs from the IMS Version 7 library in these major respects:

- *IMS Version 8: Common Service Layer Guide and Reference*, SC17-7816

  The Version 8 library included a new book: *IMS Version 8: Common Service Layer Guide and Reference*, SC27-1293 (CSL). As a new book, the CSL was available only in PDF and BookManager softcopy on the product kit (LK3T-7092) and on the Web at www.ibm.com/ims.

- The book formerly titled *IMS Version 7: Common Queue Server and Base Primitive Environment Guide and Reference* was divided into two books in the IMS Version 8 library:
  - *IMS Version 8: Base Primitive Environment Guide and Reference*, SC27-1290
  - *IMS Version 8: Common Queue Server Guide and Reference*, SC27-1292

- The book formerly titled *IMS Version 7: Installation Volume 1: Installation and Verification* was changed to *IMS Version 8: Installation Volume 1: Installation Verification*, GC27-1297. All installation information is now in the IMS Program Directory.

- *IMS Version 7: Sample Operating Procedures*

  As of IMS Version 8, this book is no longer produced for the IMS library. You can find IMS Version 6 and IMS Version 7 releases of this book on the Web at www.ibm.com/ims.

Organizational changes to the IMS Version 8 library included changes to:

- *IMS Version 8: Application Programming: Database Manager*, SC27-1286
- *IMS Version 8: Application Programming: Transaction Manager*, SC27-1289
- *IMS Version 8: Messages and Codes, Volume 1*, GC27-1301

The chapter titled "DL/I Return and Reason Codes" was moved from the *IMS Version 8: Application Programming: Database Manager*, SC27-1286 and *IMS Version 8: Application Programming: Transaction Manager*, SC27-1289 to *IMS Version 8: Messages and Codes, Volume 1*, GC27-1301.

The chapter titled "DL/I Status Codes" now appears only in *IMS Version 8: Messages and Codes, Volume 1*, GC27-1301.

The chapter titled "MFS Language Utility" was moved from *IMS Version 8: Application Programming: Transaction Manager*, SC27-1289, to *IMS Version 8: Utilities Reference: Database and Transaction Manager*, SC27-1308.

IMS Publication Packaging

When you order IMS Database Manager or IMS Transaction Manager, you get one copy of each of the following IMS publications as part of the order:

- *IMS Version 9: Installation Volume 1: Installation Verification*
- *IMS Version 9: Installation Volume 2: System Definition and Tailoring*
- *IMS Version 9: Licensed Program Specifications*

- *IMS Version 9: Program Directory for Information Management System Transaction and Database Servers*
- *IMS Version 9: Release Planning Guide*
- *IMS Version 9 Softcopy Library* (a CD-ROM that contains all of the IMS books in PDF and BookManager formats)

You can also order additional copies of these publications or copies of any of the other IMS publications using the feature codes listed in Table 12. Or you can download any of the IMS publications in softcopy format (PDF and BookManager) from the Web for free: go to the IMS Library page at www.ibm.com/software/data/ims/library.html. However, the licensed IMS books require that you provide a valid IMS license or customer number before you can download them. All of the unlicensed IMS books are also available as part of the Information Management Software for z/OS Solutions Information Center, available at http://publib.boulder.ibm.com/infocenter/dzichelp/v2r2/index.jsp.

Some of the IMS books are not available in hardcopy format from IBM, but are available only in softcopy format (PDF, BookManager, or as part of the Information Center). The following books are available only in softcopy format:
- *IMS Version 9: Base Primitive Environment Guide and Reference*
- *IMS Version 9: Common Queue Server Guide and Reference*
- *IMS Version 9: Common Service Layer Guide and Reference*
- *IMS Version 9: IMS Java Guide and Reference*

The IMS Version 9 hardcopy library has different feature codes than those of IMS Version 8 or IMS Version 7. Table 12 shows the feature codes for the IMS Version 9 publications.

Table 12. Feature Codes for IMS Version 9 Publications

Feature Code	Book Title
8295	*IMS Version 9: Administration Guide: Database Manager*
8296	*IMS Version 9: Administration Guide: System*
8297	*IMS Version 9: Administration Guide: Transaction Manager*
8298	*IMS Version 9: Application Programming: Database Manager*
8299	*IMS Version 9: Application Programming: Design Guide*
8323	*IMS Version 9: Application Programming: EXEC DLI Commands for CICS and IMS*
8305	*IMS Version 9: Application Programming: Transaction Manager*
8307	*IMS Version 9: Command Reference*
8308	*IMS Version 9: Customization Guide*
8324	*IMS Version 9: Database Recovery Control (DBRC) Guide and Reference*
8309	*IMS Version 9: Diagnosis Guide and Reference*
8331	*IMS Version 9 Fact Sheet*
8310	*IMS Version 9: Failure Analysis Structure Tables (FAST) for Dump Analysis*
8311	*IMS Version 9: Installation Volume 1: Installation Verification*
8312	*IMS Version 9: Installation Volume 2: System Definition and Tailoring*
8313	*IMS Version 9: Licensed Program Specifications*
8314	*IMS Version 9: Master Index and Glossary*

Table 12. Feature Codes for IMS Version 9 Publications (continued)

Feature Code	Book Title
8316	*IMS Version 9: Messages and Codes, Volume 1*
8315	*IMS Version 9: Messages and Codes, Volume 2*
8317	*IMS Version 9: Open Transaction Manager Access Guide and Reference*
8318	*IMS Version 9: Operations Guide*
8319	*IMS Version 9: Release Planning Guide*
8320	*IMS Version 9: Summary of Operator Commands*
8321	*IMS Version 9: Utilities Reference: Database and Transaction Manager*
8322	*IMS Version 9: Utilities Reference: System*
8326	*IMS Version 9 Softcopy Library*
8325	Licensed Bill of Forms (LBOF): IMS Version 9 Hardcopy and Softcopy Library

Related Reading: For complete details of the feature codes for the IMS product, see the *IMS Version 9: Program Directory for Information Management System Transaction and Database Servers*.

Chapter 6. New, Changed, and Deleted Messages and Abends

This topic lists new, changed, and deleted messages and codes for IMS Version 9. It does not include messages or codes that were added or modified as a result of technical changes to previous IMS releases.

The following topics provide a list of changes, additions, and deletions for this release.

In this topic:
- "New Messages and Abends"
- "Changed Messages and Abends" on page 73
- "Deleted Messages and Abends" on page 75

New Messages and Abends

The user abend codes listed in Table 13 were added to IMS Version 9.

Table 13. New User Abends for IMS Version 9

0369	3056	3476	3477
0455	3315		
1780			

The BPE messages that were added to IMS Version 9 are listed in Table 14.

Table 14. New BPE Messages for IMS Version 9

BPE0042E

The CQS messages that were added to IMS Version 9 are listed in Table 15 (read top-to-bottom left-to-right).

Table 15. New CQS Messages for IMS Version 9

CQS0116I	CQS0351I

The CSL messages that were added to IMS Version 9 are listed in Table 16 (read top-to-bottom left-to-right).

Table 16. New CSL Messages for IMS Version 9

CSL3116E	CSLN083E	CSLN110I	CSLN113E
CSL3117E	CSLN084E	CSLN111I	CSLN114I
CSL3119E	CSLN089E	CSLN112E	CSLN115E
CSLM080I	CSLN105E		
CSLN050E	CSLN107I		
	CSLN108I		
	CSLN109I		

The DFS messages that were added to IMS Version 9 are listed in Table 17 on page 72 (read top-to-bottom left-to-right).

Table 17. New DFS Messages for IMS Version 9

DFSI938I	DFS671I	DFS2852I	DFS3674W
DFSI939I	DFS0671W	DFS2853A	DFS3675I
DFSI998I	DFS672I	DFS2856W	DFS3689W
DFSI999I	DFS674I	DFS2857E	DFS3715I
DFSIX090	DFS675I	DFS2858E	DFS3719I
DFSIX091	DFS0725I	DFS2859I	DFS4033I
DFSIX092	DFS736	DFS2933I	DFS4034I
DFSIX093	DFS0763I	DFS2970I	DFS4035A
DFSIX094	DFS0796I	DFS2971W	DFS4037A
DFSIX095	DFS987I	DFS2972E	DFS4039A
DFSIX096	DFS1926W	DFS2973W	DFS4041I
DFSIX097	DFS1946W	DFS2974I	DFS4273I*
DFSIX098	DFS1987I	DFS2990E	DFS4301E
DFSIX100	DFS1988W	DFS2991E	DFS4302E
DFSIX101	DFS1989E	DFS2992E	DFS4303E
DFSIX102	DFS2002I	DFS2993E	DFS4304E
DFSIX103	DFS2166	DFS2994E	DFS4306E
DFSIX104	DFS2224I	DFS2995E	DFS4307E
DFSIX105	DFS2262	DFS2996E	DFS4308E
DFSIX106	DFS2263I	DFS2997E	DFS4309E
DFS0015I	DFS2265I	DFS2998E	DFS4310E
DFS135	DFS2266I	DFS3067A	DFS4311E
DFS0300I	DFS2267I	DFS3280W	DFS4312E
DFS0406A	DFS2268I	DFS3282W	DFS4313E
DFS541	DFS2269I	DFS3286I	DFS4314E
DFS0548E	DFS2285I	DFS3486	DFS4315E
DFS561E	DFS2286I		
DFS0767I	DFS2287I		
	DFS2299A		
	DFS2383E		
	DFS22407W		
	DFS2575I		
	DFS2645I		
	DFS2732E		
	DFS2744E		
	DFS2851I		

The DSP messages that were added to IMS Version 9 are listed in Table 18 (read top-to-bottom left-to-right).

Table 18. New DSP Messages for IMS Version 9

DSP0197I	DSP0832I	DSP1106A	DSPM137W
DSP0198I	DSP0833I	DSP1107E	DSPM138I
DSP0199I	DSP0834I	DSP1108I	DSPM139I
DSP0292I	DSP0835I	DSP1109I	DSPM140I
DSP0293I	DSP1018I	DSP1110I	DSPM141W
DSP0294I	DSP1045E	DSP1112E	DSPM142I
DSP0295I	DSP1077I	DSP1203A	DSPM143I
DSP0830I	DSP1078I	DSP1204A	DSPM144W
DSP0831I	DSP1079I	DSP2851I	DSPM145I
	DSP1080I	DSP2852I	
	DSP1103I	DSPM130W	
	DSP1104I	DSPM131W	
		DSPM132W	
		DSPM133W	
		DSPM134W	
		DSPM135W	
		DSPM136W	

The DHB messages that were added to IMS Version 9 are listed in the "DLIModel Utility Messages" topic in *IMS Version 9: Messages and Codes, Volume 1*.

Changed Messages and Abends

The following messages and codes (read top-to-bottom left-to-right) were changed for IMS Version 9. An asterisk (*) indicates that the message text was changed.

The IMS user abends that were changed for IMS Version 9 are listed in Table 19 (read top-to-bottom left-to-right).

Table 19. IMS User Abends Changed for IMS Version 9

0107	0437	0853	3047
0142	0457	0857	3049
0166	0729	1022	3051
0253	0777	2801	3055
	0830	3000	3310
	0851	3303	3325
	0852		

The AREA, BPE, and CQS messages that were changed for IMS Version 9 are listed in Table 20 (read top-to-bottom left-to-right).

Table 20. AREA, BPE, and CQS Messages Changed for IMS Version 9

BPE0003E	CQS0034A*
BPE0006I	CQS0350W*
	CQS0263E

The CSL messages that were changed for IMS Version 9 are listed in Table 21 (read from top-to-bottom, left-to-right).

Table 21. CSL Messages Changed for IMS Version 9

CSL3000E	CSL3011W	CSL3111E

The DFS messages that were changed for IMS Version 9 are listed in Table 22 on page 74 (read top-to-bottom left-to-right).

Table 22. DFS Messages Changed for IMS Version 9

DFS030I	DFS0832I	DFS3144A	DFS4020I
DFS044A	DFS0841I	DFS3306	DFS4030A*
DFS047A	DFS1269E	DFS3430I	DFS4045A
DFS074	DFS1283E	DFS3498W	DFS4172E
DFS132	DFS1886I*	DFS3600I	DFS4260I*
DFS168I*	DFS1982I*	DFS3603I	DFS4261I
DFS227A	DFS1987I	DFS3613I	DFS4262I
DFS286I	DFS2027I	DFS3649A	DFS4266I
DFS391I	DFS2065I	DFS3676I*	DFS4270I
DFS0415W	DFS2207I*	DFS3691W*	DFS4279I
DFS0451I	DFS2397E	DFS3702I*	DFS4285I*
DFS0463	DFS2449I	DFS3709A	DFS4447E
DFS0488I	DFS2450I	DFS3776A*	DFS4451I
DFS554A	DFS2466W	DFS3777A*	
DFS563I	DFS2473I	DFS3777I*	
DFS621W	DFS2574I	DFS3779A*	
DFS627W	DFS2634I	DFS3779E*	
DFS686W	DFS2635I	DFS3784I*	
DFS0725I	DFS2636I	DFS3824	
DFS824I*	DFS2637I	DFS3847	
DFS825I	DFS2649I	DFS3892	
	DFS2708W		
	DFS2835I		
	DFS2844E		
	DFS2854		
	DFS2916I		
	DFS2929A		
	DFS2930I		
	DFS2941W		
	DFS2971W		
	DFS2972E		
	DFS2991E		

The DSP messages that were changed for IMS Version 9 are listed in Table 23 (read top-to-bottom left-to-right).

Table 23. DSP, DXR, and G Messages Changed for IMS Version 9

DSP0002W	*DSP1157A	*G170	*G1209
DSP0309I	DSPM098W		*G1210
DSP0141I	G002		G1211
DSP0144I	G011		
*DSP0175I	G052		
DSP0204I	G112		
DSP0222I			
*DSP0230I			
DSP0271I			
DSP0805I			
DSP0833I			
DSP1088A			

The DHB messages that were changed for IMS Version 9 are listed in the "DLIModel Utility Messages" topic in *IMS Version 9: Messages and Codes, Volume 1*.

Deleted Messages and Abends

The IMS user abends that were deleted from IMS Version 9 are listed in Table 24 (read top-to-bottom left-to-right).

Table 24. IMS User Abends Deleted for IMS Version 9

0650
3309

The messages that were deleted from IMS Version 9 are listed in Table 25 (read top-to-bottom left-to-right).

Table 25. Messages Deleted for IMS Version 9

DFS650I	DFS4265I	DFS4269I	DFS4281I
DFS745I	DFS4266I	DFS4274I	DFS4282I
DFS1927E	DFS4267I	DFS4275I	DFS4284I
DFS2465I	DFS4268I	DFS4276I	DFS4289
DFS3309A			
DFS4184E			
DFS4232I			
DFS4263I			
DFS4264I			

Chapter 7. IMS Version 9 Log Record Changes

The following log record types are new or were changed for IMS Version 9:

X'01', X'03', X'07', X'08', X'0A'
X'10'
X'20', X'21', X'22', X'25', X'27', X'29'
X'4001', X'4007', X'45', X'49'
X'50', X'53', X'55', X'57', X'5922', X'5937', X'5950', X'59FF'
X'6701', X'6706', X'6710'

The Fast Path log records are included in ILOGREC if you use `ILOGREC RECID=ALL`. For a specific Fast Path log record, use `ILOGREC RECID=59`*nn*. The old Fast Path log record macros are still available, for example DBFLGSYN and DBFLSRT.

Related Reading: For details about the DSECT names associated with these log records and descriptions of why the log record was issued, see the table in the "Log Records" section of the "System Service Aids" chapter in the *IMS Version 9: Diagnosis Guide and Reference*.

Chapter 8. IBM IMS Tools Enhancements

The IBM DB2 and IMS Tools are upgraded and enhanced to work with IMS Version 9. The tools are categorized into the following sections, which contain the highlights of each tool:

- "Database Administration"
- "Application Management" on page 82
- "Performance Management" on page 84
- "Recovery Management" on page 86
- "Information Integration Management" on page 88
- "Utilities Management" on page 90
- "TM Management" on page 93
- "Miscellaneous IMS Tools" on page 95

<u>Related Reading:</u> For complete information about these tools, go to: www.ibm.com/software/data/db2imstools

Database Administration

The following sections describe the IBM IMS database administration tools.

IBM Data Encryption for IMS and DB2 Databases, V1

The IBM Data Encryption for IMS and DB2 Databases tool:

- Provides user-customizable, pre-coded, exit routines for encryption of IMS and DB2 data.
- Conforms to the existing OS/390 and z/OS security model and is implemented using standard IMS and DB2 exit routines.
- Exploits zSeries and S/390 Crypto Hardware features, which results in low overhead encryption and decryption.
- Uses the ANSI Data Encryption Algorithm (DEA), which is also known as the U.S. National Institute of Science and Technology (NIST) Data Encryption Standard (DES) algorithm.
- Works at the IMS segment level, and can be customized at that level. For DB2, encryption and decryption is customizable at the table level.

Program number: 5799-GWD

IBM IMS Database Repair Facility for z/OS, V1.2

The IBM IMS Database Repair Facility for z/OS:

- Interactively repairs VSAM- and OSAM-organized IMS databases that contain pointer or data errors.
- Performs repairs quickly, thereby reducing the amount of time that the affected database is taken offline.
- Supports IMS Fast Path DEDB databases.
- Features VSAM and OSAM pointer repair, pointer navigation, a backout safety feature, and an ISPF front end.
- Runs in interactive mode, in which you can view entire blocks of data of individual IMS segments and you can navigate to other segments. Any changes made are tracked and can be undone.

| • Runs in batch mode, in which you can dump blocks from the data set or submit changes to the block data.

Program number: 5655-E03

IBM IMS Hardware Data Compression - Extended for z/OS, V2.2

The IBM IMS Hardware Data Compression - Extended for z/OS tool:

- Replaces and extends the dictionary creation and Segment Edit/Compression Exit routine creation utilities of IMS.
- Provides HDC enhanced analysis capability, including extended reporting and multiple input sources.
- Offers dictionary archival and evaluation services.
- Supports compression of HDAM, HIDAM, HISAM, and Fast Path databases.

Program number: 5655-E02

IBM IMS High Availability Large Database (HALDB) Conversion and Maintenance Aid for z/OS, V2

The IBM IMS High Availability Large Database (HALDB) Conversion and Maintenance Aid for z/OS:

- Guides DBAs through HALDB conversions with ease.
- Performs index pointer healing.
- Speeds the conversion process with partition modeling.
- Enables conversion with minimal manual intervention.
- Requires no HALDB experience and little IMS expertise.
- Creates DBD and DBRC definitions as well as the conversion JCL.
| • Provides additional conversion options such as Initial HALDB Load assistance and Status Code 'BA' Aid.
| • Includes a Partition Maintenance Aid that supports split partitions, DBRC functions for HALDB, creation of backup and recovery JCL, and generation of reorganization utilities.

Program number: 5655-K47

IBM IMS Library Integrity Utilities for z/OS, V1

The IBM IMS Library Integrity Utilities for z/OS:

| • Includes and replaces all of the features and functions of the IMS Library Management Utilities:
| – Managing IMS ACB, PSB, and DBD libraries
| – DBD/PSB/ACB Compare, DBD/PSB/ACB Reversal, and DBD/PSB/ACB Mapper and IMS Advanced ACB Generator
| – Providing a high-speed generation process that greatly reduces the time needed to process large volumes of IMS ACBs
| – Reporting information in a tabular form
| – Checking results from your desktop and ensuring that all PSBs and DBDs were processed as expected
| • Includes an Integrity Checker to help prevent system outages caused by databases corrupted by using wrong DBD.

- Includes a Consistency Checker function to ensure that all the necessary definitions have been created for a database.

Program number: 5655-I42

IBM IMS Online Reorganization for z/OS, V1

The IBM IMS Online Reorganization for z/OS tool:
- Enables reorganization of IMS full function databases with a short outage (a short period of time called *takeover time*).
- Reorganizes databases to shadow data sets, captures the changes during this period, and applies them to the reorganized shadow data sets.
- Requires databases and their data sets to be registered with DBRC.
- Reorganizes HISAM, HIDAM, HDAM, and SHISAM databases, and recreates their associated index data sets.
- Reorganizes PHIDAM and PHDAM databases as single partitions.
- Makes selected DBD changes during the reorganization process that are automatically propagated to the participating online systems without the need of launching an online change.
- Allows predefinition of the period when takeover time may occur.
- Automatically creates the shadow data sets: SMS allocation uses the same SMS constructs; Non-SMS allocation uses the same volume serial, and user predefinition.
- Supports a user exit during reload that can be called to process any changes.

Program number: 5655-H57

IBM IMS Parameter Manager for z/OS, V1

The IBM IMS Parameter Manager for z/OS tool:
- Enables IMS administrators to control the specification and maintenance of IMS parameter library members.
- Simplifies parameter management and provides increased levels of parameter control.
- Supports the 19 startup parameter members in an IMS system startup.
- Allows parameter specification by ISPF dialog panels or the integrated ISPF editor.
- Contains extensive online help and parameter descriptions.
- Provides parameter syntax and value checking, and automatic parameter statement construction.
- Provides a view of active (current) parameter members by IMS system.
- Enables the creation of a "back-up" member immediately prior to applying changes.
- Automatically collects previous version histories for altered parameter members.
- Includes facilities to assist with IMS software version migration.

Program number: 5655-L69

IBM IMS Sequential Randomizer Generator for OS/390, V1

The IBM IMS Sequential Randomizer Generator for OS/390:

- Creates a randomizer that enables the user to access HDAM and DEDB database segments either directly or sequentially.
- Allows access to HDAM and DEDB databases in logical key sequence without sacrificing their efficient direct access capabilities.
- Optimizes the distribution of database records by adjusting the randomizing module if the number of synonyms or the control interval (CI) or block utilization exceeds the user-specified value.

Program number: 5655-E11

Application Management

The following sections describe the IBM IMS application management tools.

IMS Batch Backout Manager for z/OS, V1

The IMS Batch Backout Manager for z/OS:
- Helps automate the normally manual task of backing out database updates after an IMS batch application failure.
- Reduces the downtime associated with an application failure and improves database availability.
- Provides automation of the batch backout process after specific application abends.
- Dynamically handles log close and allocation.
- Forces allocation of batch SLDSs for jobs with no logs allocated (either by specific or by generic job name).

Program number: 5697-H75

IBM IMS Batch Terminal Simulator for z/OS, V3

The IBM IMS Batch Terminal Simulator for z/OS:
- Provides a comprehensive way to test and check IMS application program logic, IMS application interfaces, teleprocessing activity, 3270 format control blocks, and database activity.
- Simulates the operation of IMS applications in TSO and batch environments.
- Operates transparently to the applications, requiring no changes to IMS code, control blocks, libraries, or application load modules.
- Accesses DL/I and DB2 databases from TSO terminals.
- Provides a stable online system in test and production environments to execute applications properly before they are put online.
- Provides audit reporting and Java language support.

Program number: 5655-J57

IBM IMS Connect for z/OS, V2.2

The IBM IMS Connect for z/OS tool:
- Supports communications with IMS between one or more TCP/IP clients and one or more IMS systems.
- Supports SMP installability; dump and trace formatting enhancements for increased serviceability; user exit routines, command improvement, and asynchronous output support for enhanced usability.

- Provides Unicode support, enabling a Unicode application to send data to an IMS host application, such as a Java application that is running in IMS.
- Provides ACK/NAK required notification support without additional testing of data received.
- Reduces the design and coding effort of a client application by including the full message length preceding the output message to the client.
- Uses the VisualAge® for Java IMS Connector for Java to create Java applications that can access IMS transactions from WebSphere Application Servers for z/OS and OS/390.
- Offers WebSphere Adapter support with the addition of the IMS Connector for Java J2EE Runtime support.
- Supports two-phase commit for distributed environments across TCP/IP, providing for a WebSphere Application Server in a non-OS/390, non-z/OS, environment to connect to IMS through IMS Connect (with IMS and IMS Connect initially in the same LPAR).
- Provides enhanced security items such as, Secure Sockets Layer (SSL), the capability to control the security environment, and "trusted user" support.
- Provides Message Format Services (MFS) Web Services support to enable IMS customers to publish existing MFS-based IMS applications on the Internet as Web Services.
- Includes command enhancements for ease of manageability.
- Contains Commit Mode 0 / Persistent Socket to improve performance.
- Supports IMS Connect Extensions for z/OS, V1.1, to enhance performance and availability reporting.
- Has cancel timer support to enhance usability.
- IMS Connector for Java also adds Commit Mode 0 / Persistent Socket for improved performance, socket timeout for enhanced usability, and retry to broaden availability.

Program number: 5655-K52

IBM IMS Connect Extensions for z/OS, V1

The IBM IMS Connect Extensions for z/OS, V1:
- Enhance the basic capabilities of the IMS Connect for z/OS, V2.2, tool.
- Provide performance monitoring capabilities by creating and collecting performance and accounting information for IMS Connect activities.
- Provide enhanced services for user exit routines: Dynamic exit reload without interruption of IMS Connect execution, and adding or removing exits without interruption of IMS Connect execution.
- Include flexible resource definitions for the grouping of resource types, such as data store and transactions.
- Have expanded control of client input messages, which includes dynamic routing of messages to multiple data stores, and includes dynamic resource controls.
- Allow external control of IMS Connect Extension by the ISPF console.
- Include security items, such as a special RACF class for client access control, USERID SAF profile caching, refreshing of SAF profiles by command, and verifying client access to IMS Connect resources.

- Contain performance monitoring extensions that provide performance measurements and basic reporting, with more extensive reporting being provided by the IBM IMS Performance Analyzer for z/OS tool.

Program number: 5655-K48

IBM IMS Message Format Services Reversal Utilities for z/OS, V1

The IBM IMS Message Format Services Reversal Utilities for z/OS:
- Include the MFS Reversal and MFS Compare utilities in the package.
- Convert Message Format Services MID, MOD, DIF, and DOF control blocks back into Message Format Services utility control statements.
- Help you recover the source and compare deltas if you lose your MFS source library or suspect a difference between the generated control blocks and the source.
- Provide useful summary reports of the IMS FORMAT library that show the relationships among the members.

Program number: 5655-F45

IBM IMS Program Restart Facility for OS/390, V2

The IBM IMS Program Restart Facility for OS/390:
- Automatically assigns the most recent checkpoint ID to jobs that are restarted because of an earlier abnormal termination.
- Forces an extended restart to occur for all jobs that require restart.
- Helps prevent corruption resulting from restarting an abended job without specifying a restart checkpoint ID.
- Saves costly and time-consuming database recoveries caused by manual restart errors.
- Reduces the risk of data being unavailable or becoming corrupt.

Program number: 5655-E14

Performance Management

The following sections describe the IBM IMS performance management tools.

IBM IMS Buffer Pool Analyzer for z/OS, V1

The IMS Buffer Pool Analyzer for z/OS tool:
- Provides modeling facilities to assist with making informed decisions about the addition of buffers to an existing pool, or sizing requirements for a new buffer pool.
- Helps you determine the impact of buffer pool changes before they are made to take the guess work out of the process.
- Analyzes IMS database buffer pools (OSAM and VSAM) to provide statistical analysis of the impact of changes that affect the buffer pools.
- Provides I/O rates and buffering requirements for a specific database.
- Allows for better allocation of real memory resources.
- Identifies databases that most heavily use each database subpool.

- Performs "what if" scenario analysis, such as identifying the impact of splitting a specific database into a new buffer pool.
- Determines the performance effects for a given buffer pool when you add or reduce the number of buffer pools.

Program number: 5697-H77

IBM IMS Network Compression Facility for z/OS, V1

The IMS Network Compression Facility for z/OS:

- Replaces the IMS Data Stream Tuner, and provides support for IMS Version 6, IMS Version 7, and IMS Version 8, and adds several new features and functionality improvements.
- Provides several new options for compression of 3270 data streams:
  – Compresses all repeated characters, not just spaces, nulls, asterisks, and dashes
  – Allows 3270 Field Merge, blank elimination, and elimination of non-display fields
  – Eliminates redundant 3270 Set Buffer Address (SBA) commands
- Makes installation easier by eliminating the need for the XCM address space and subsystem, and for SYS1.PARMLIB updates, except APF authorization of one data set.
- Includes a utility to convert current options to the new PROCLIB member format.
- Improves flexibility by allowing cross-MVS system inquiries and updates to Network Compression Facility information and options.

Program number: 5655-E41

IBM IMS Performance Analyzer for z/OS, V3.3

The IBM IMS Performance Analyzer for z/OS tool:

- Provides comprehensive reporting for the IMS Log and IMS Monitor, and for IMS Connect Extensions for z/OS event collection.
- Contains a New Dashboard report that provides a quick overview of critical system performance indicators.
- Includes a new BMP Checkpoint report that measures batch checkpoint frequency that can impact online performance and system restartability.
- Generates the Transaction History File that collects detailed transaction performance data and exports it into DB2.
- Provides additional information to aid in the interpretation of reports.
- Provides a wide variety of reports that can help shorten transaction response times and increase resource availability.
- Offers automatic DBRC log selection of the required SLDS log files to simplify report requests.
- Produces IMS Log and Monitor reports to "health check" your system.
- Enhanced DBCTL reporting.
- Provides Log reports: Transaction Statistics, System Checkpoint, and Deadlock.
- Provides ISPF dialog interface enhancements to manage IMS system and sysplex definitions, and tailor and submit report requests.
- Comprehensive reporting for the Fast Path Monitor including DEDB, BALG/EMH, Fast Path Buffer, OTHREAD, and VSO.

- Complements IMS Problem Investigator for z/OS (5655-K50) in the investigation of IMS performance related problems.

Program number: 5655-E15

IBM IMS Performance Monitor for z/OS, V1

The IBM IMS Performance Monitor for z/OS:
- Provides real-time status monitoring and alerts for an active IMS subsystem.
- Detects active IMS subsystems when they are started and any IMS subsystems that may subsequently become active.
- Allows multiple IMS subsystems to be viewed from a single monitoring station, and these subsystems may be logically grouped as desired (for example, data sharing groups and shared queues groups).
- Reports as much information as possible to help isolate or point to problem areas that include sysplex functions.
- Features general IMS information such as release levels, configurations, and system startup parameters.
- Allows user-specified thresholds for setting alerts.
- Provides current IMS resource information to assist in tuning.

Program number: 5655-G50

IMS Problem Investigator for z/OS, V1

The IMS Problem Investigator for z/OS tool:
- Provides an enhanced level of problem-determination services for IMS TM and IMS DB systems.
- Includes navigation aids, formatted and personalized reporting, and investigative procedures for IMS log, trace, and other data.
- Offers powerful automated features to help reduce the amount of time required to identify and analyze defects or other events of interest in the IMS log.
- Accesses services by an ISPF dialog or a batch reporting utility.

Program number: 5655-K50

Recovery Management

The following sections describe the IBM IMS recovery management tools.

Application Recovery Tool for IMS and DB2 Databases, V1.2

The Application Recovery Tool for IMS and DB2 Databases:
- Includes enhancements for IMS applications.
- Supports HALDB (High Availability Large Databases) by adding a HALDB (Y|N) parameter to all IMS-related functions.
- Supports IMS sysplex data sharing.
- Adds the new member IMSDSGS to the PARMLIB.

Program number: 5697-F56

IMS Database Recovery Facility for z/OS, V2

The IMS Database Recovery Facility for z/OS:

- Is a high performance, state of the art database recovery product supporting all recoverable IMS databases.
- Provides a high performance tool for recovering IMS database data sets and Fast Path areas.
- Works in an online environment, with a single pass of input data.
- Speeds recovery by applying database changes to multiple data sets simultaneously.
- Increases database availability by reducing recovery time.
- Provides recovery to any prior point in time through a time stamp recovery function.
- Is a follow-on version of the IMS Online Recovery Service for z/OS tool (5655-E50), containing all the features and functions of that product, and adding several key features, such as:
  - IMS Database Recovery Facility initiation by submitting an MVS batch job
  - Batch invocation of the IMS Database Recovery Facility that does not require an active IMS region
  - Online invocation of the IMS Database Recovery Facility that does not use IMS region resources to update the database
  - Reading multiple image copy data sets and writing multiple database data sets in parallel
  - Use of DFSORT™ to order the input log records in several concurrent processes and apply changes in a single pass of the database
  - Analysis of recovery execution and provision of a formatted report summarizing inputs, outputs, and processing
  - Generation of a setup report/list without running the recovery process
  - Reporting of all open units of work that contain updates not applied in a Point-in-Time recovery
  - Parallel and concurrent processing to provide dramatic gains in performance

Program number: 5655-I44

IBM IMS DEDB Fast Recovery for z/OS, V2.2

The IBM IMS DEDB Fast Recovery for z/OS tool:
- Assists in the operation and maintenance of data integrity of IMS databases.
- Is designed as a fast alternative to emergency restart (ERE) failure recovery.
- Corrects online log data sets (OLDSs) by invalidating logging for transactions that did not reach the synch point.
- Significantly reduces the amount of time needed to recover DEDBs after an IMS failure.
- Generates the JCL for the MSDB Dump Recovery utility to be processed before an IMS cold start for MSDB (main storage database) recovery.
- Shortens the recovery time of an unscheduled IMS cold start while maintaining the integrity of the IMS databases.
- Supports multiple IMS releases from a single Load Library.

Program number: 5655-E32

IBM IMS High Performance Image Copy for z/OS, V3.2

The IBM IMS High Performance Image Copy for z/OS tool:

- Helps you process and manage image copies more efficiently.
- Enables you to run the image copy function with the hash checking of the IMS High Performance Pointer Checker for z/OS tool, V2 under the control of the IMS Parallel Reorganization for z/OS tool, V3.
- Reduces the run-time of the reorganization process for an IMS full-function database.
- Allows accuracy checking of an image copy and supports processes in parallel within an IMS Parallel Reorganization.
- Contains a new optional parameter for controlling the secondary image-copy data set.
- Supports dynamic allocation for the specification of SMS classes for new output image-copy data sets.
- Provides a Creation Image Copy function that creates new copies from IMS standard image copy data sets, ICE compressed image copy data sets, IMS Online Image Copy data sets, and IMS Image Copy 2 data sets, while simultaneously creating up to seven copies from the original data set.

Program number: 5655-K96

IBM IMS High Performance Change Accumulation for z/OS, V1.2

The IMS High Performance Change Accumulation for z/OS tool:

- Replaces the IMS Parallel Change Accumulation tool, supports IMS Versions 6, 7, and 8, and adds numerous new features and functional improvements.
- Improves operations by triggering a single job through the internal reader, without the need to submit the JCL manually. The job functions as a multitask address space, ensuring parallel streaming of both input and output data.
- Eliminates the need for the XCM address space and subsystem for easier installation.
- Processes input data (from RLDSs) and output data (new CAs) in parallel to ensure that elapsed execution time is as short as possible; also provides the option for users to control the number of parallel processes.
- Provides ISPF interfaces that allow for customization, setup, and execution, and Batch interfaces for operations.
- Supports DBRC.
- Provides processing report improvements that consolidate the status of associated address spaces into a single report and extends diagnostic capabilities with new error report messaging.
- Supports an extended batch interface that makes it easier to run automated job scheduling facilities.

Program number: 5655-F59

Information Integration Management

The following sections describe the IBM IMS Information Integration management tools.

IBM IMS DataPropagator for z/OS, V3

The IBM IMS DataPropagator for z/OS tool:

- Supports WebSphere MQ-based, asynchronous near real-time propagation that allows:
  - The Capture Component to capture IMS database changes performed by IMS Batch, IMS BMP, and IMS TM application programs
  - The Apply Component to transform the IMS database changes into relational format and apply them to DB2 tables on the same or on different systems from the IMS databases
  - The transmission of the database changes from the Capture to the Target Component through the recoverable, buffered, and queued asynchronous messaging services of WebSphere MQ
- Reduces elapsed time between the IMS database updates and the DB2 table updates to as little as a few seconds.
- Supports point-in-time propagation, allowing the content of the DB2 target tables to reflect clearly identified logical points in time of the IMS source databases, for example, the logical end of a business day.
- Exploits the well established, high-performance, reliable queued messaging services of WebSphere MQ and allows enterprises to leverage their WebSphere MQ and MQSeries® administration and operations skills.
- Improves performance by transmitting multiple IMS database changes within the same WebSphere MQ message, by compressing WebSphere MQ message data, and by exploiting the caching services of the Virtual Lookaside Facility (VLF) of z/OS.

Program number: 5655-E52

IBM DB2 Information Integrator Classic Event Publisher for IMS, V8.2

The IBM DB2 Information Integrator Classic Event Publisher for IMS tool:

- Provides easy linking of data events with business processes.
- Captures database changes in IMS by reading the recovery log, formatting the changes into XML messages, and publishing them to WebSphere MQ.
- Delivers changes to extract, transform, and load (ETL) tools or custom-built processes for updating operational data stores or data warehouses, minimizing bandwidth requirements, and keeping target databases more closely in synch.

Program number: 5655-M38

IBM DB2 Information Integrator Classic Event Publisher for VSAM, V8.2

The IBM DB2 Information Integrator Classic Event Publisher for VSAM tool:

- Provides easy linking of data events with business processes.
- Captures database changes in VSAM by reading the recovery log, formatting the changes into XML messages, and publishing them to WebSphere MQ.
- Delivers changes to extract, transform, and load (ETL) tools or custom-built processes for updating operational data stores or data warehouses, minimizing bandwidth requirements, and keeping target databases more closely in synch.

Program number: 5655-M35

Utilities Management

The following sections describe the IBM IMS utilities management tools. These tools are grouped into the following categories:

- "Fast Path Utilities Management"
- "Full-Function Utilities Management" on page 91
- "Administration Utilities Management" on page 93

Fast Path Utilities Management

The following sections describe the IBM IMS utilities management tools for Fast Path databases.

IBM IMS Fast Path Basic Tools for z/OS, V1.2

The IBM IMS Fast Path Basic Tools for z/OS:

- Analyze, maintain, tune, and migrate IMS Fast Path DEDB databases without bringing up an IMS online system environment.
- Include DEDB Pointer Checker, DEDB Tuning Aid, and DEDB Unload/Reload utilities.
- Provide the new control statement parameter ACCESS=FAST in the DEDB Unload utility to support high performance read access to the DEDB area data set by using DFSMS Media Manager interfaces.
- Feature a new DEDB Reload utility that allows you to produce image copies for reloaded DEDB areas and provide automatic notification of them to DBRC.

Program number: 5655-E30

IBM IMS Fast Path Online Tools for z/OS, V2

The IBM IMS Fast Path Online Tools for z/OS:

- Extend IMS Fast Path Basic Tools to an online IMS environment.
- Include the DEDB Online Pointer Checker tool and the DEDB Online Data Extract tool.
- Boost system availability by allowing you to perform a variety of key functions without having to take your IMS database offline.
- Use the Fast Path Online Area Extender tool to expand the size of DEDB areas online, which results in 24x7 availability of an IMS Fast Path DEDB area.

Program number: 5655-F78

IBM IMS High Performance Fast Path Utilities for z/OS, V2

The IBM IMS High Performance Fast Path Utilities for z/OS:

- Provides all the features and functions available in the IMS Fast Path Basic Tools for z/OS, V1.2, and the IMS Fast Path Online Tool for z/OS, V2.
- Contains the new High Performance Fast Path Reorganization Tool component which:
  - Determines utility use based on control state
  - Supports dynamic allocation of databases and Sort work data sets
  - Provides support for making DEDBs available to IMS after reloading
  - Allows a single SYSIN DD statement
  - Supports multiple area data sets
  - Provides SYSIN: Non-positional control statement

Program number: 5655-K94

Full-Function Utilities Management

The following sections describe the IBM IMS utilities management tools for full-function databases.

IBM IMS High Performance Load for z/OS, V2

The IBM IMS High Performance Load for z/OS tool:

- Provides a high performance database reloading capability for IMS full-function databases.
- Supports IMS Parallel Reorganization for z/OS V3 capabilities, such as image copy creation during database reorganization.
- Supports reorganization reload of HALDB partitions, including online-reorganization-capable HALDB partitions of IMS V9.
- Supports various formats of the unloaded data sets.
- Includes the Physical Sequence Sort for Reload (PSSR) utility.
- Gives you the option to load compressed data that was previously unloaded by IBM IMS High Performance Unload for OS/390 in a compressed format.
- Accepts multiple standard formats for load data sets.
- Provides JCL statement compatibility with IMS High Performance Load V1 JCL streams without modification.

Program number: 5655-M26

IBM IMS High Performance Unload for OS/390, V1

The IBM IMS High Performance Unload for OS/390 tool:

- Provides an API that enables application programs to leverage the tool's high performance retrieval techniques efficiently.
- Allows you to unload broken data sets.
- Gives you the option to unload compressed data without decompression overhead.
- Provides multiple standard formats for unload data sets.
- Includes a variety of statistical reports for improved tuning.

Program number: 5655-E06

IBM IMS High Performance Prefix Resolution for z/OS, V3

The IBM IMS High Performance Prefix Resolution for z/OS tool:

- Enables you to resolve and update prefixes of IMS databases involved in logical relationships as a single job step.
- Uses the HPPRPIPE data transfer service to eliminate the intermediate Work File 2 (WF2) and Work File 3 (WF3) data sets.
- Helps you avoid much of the I/O, tape handling, and DASD requirements that are often associated with prefix resolution and prefix update.
- Executes the prefix resolution and prefix update functions as replacements for the IMS Prefix Resolution and IMS Prefix Update utilities.
- Supports IMS Parallel Reorganization for z/OS, V3 single job step execution of database reorganization, prefix resolution, and prefix update tasks.

Program number: 5655-M27

IBM IMS High Performance Pointer Checker for z/OS, V2

The IBM IMS High Performance Pointer Checker for z/OS:

- Enables you to analyze corrupt databases quickly and reduce the amount of time spent to diagnose and repair them.
- Generates reports that facilitate system tuning, report space utilization, and detect and report problems in primary and secondary indexes.
- Provides the ability to set several new thresholds, including available extents, CA and CI splits, and database and data set last extents.
- Has significant improvements in performance to Full Checking capabilities: improved usability with simplified setup and operation; parallel processing of databases; and improved reporting.

Program number: 5655-K53

IBM IMS Index Builder for z/OS, V2.3

The IBM IMS Index Builder for z/OS:

- Offers several features that improve overall performance and enhance ease of use.
- Builds or rebuilds primary and secondary indexes quickly.
- Allows the user to specify an optional output file where records that are needed for prefix resolution can be split off and written as they are read in.
- Eliminates the need to image copy indexes.
- Provides an ISPF front end for easy JCL generation.
- Creates a separate address space for sorting index records.
- Recognizes index records that have duplicate keys and writes the duplicate keys to a SYSOUT data set.
- Supports building IMS HALDB primary indexes.

Program number: 5655-E24

IBM IMS Parallel Reorganization for z/OS, V3

The IBM IMS Parallel Reorganization for z/OS tool:

- Provides infrastructure to integrate IBM IMS tools for database reorganization and to operate them in a single job step.
- Improves administrative productivity for reorganizing IMS full-function databases.
- Drives IMS HP Unload for z/OS, IMS HP Load for z/OS, V2, IMS Index Builder for z/OS, V2.3, IMS HP Image Copy for z/OS, V3.2, IMS HP Pointer Checker for z/OS, V2, and IMS HP Prefix Resolution for z/OS, V3.
- Executes the image copy task with optional hash pointer checking in a parallel reorganization job step, concurrently with the unload, reload, and index builder steps.
- Executes the prefix resolution and update task in a parallel reorganization job step for a database that has internal logical relationships.
- Supports the IMSDALIB DD statement used for specifying the library of dynamic allocation members.
- Provides optional deletion of the old database data sets at successful completion of parallel reorganization.
- Supports parallel reorganization of HISAM and SHISAM databases.
- Supports parallel reorganization of HALDB partitions, including online-reorganization-capable HALDB partitions of IMS V9.

> - Provides JCL statement compatibility with IMS Parallel Reorganization, V2, JCL streams without modification.
>
> Program number: 5655-M28

Administration Utilities Management

The following sections describe the IBM IMS utilities management tools for IMS administration.

IBM IMS Database Control Suite for z/OS, V3

The IBM IMS Database Control Suite for z/OS:

- Provides a day-to-day IMS database environment management tool for DBAs, system programmers, and application support specialists.
- Enables you to collect and build on the data that is required to generate job control language (JCL) for database backup/recovery/reorganization management using IMS Base Utilities and IBM High Performance Tools.
- Provides an ISPF interface for the IMS Library Integrity Utilities.
- Includes a simplified user interface; reduction and consolidation of the number of data sets, ISPF panels, and process steps; and more flexibility for local standards.
- Automates tedious manual IMS maintenance functions to make database management easier.
- Is a functional replacement for the IMS DBICF (Database Integrity Control Facility) tool.
- Provides improved usability and productivity because the build process, during which JCL skeletons for utilities are built, is no longer required.
- Provides improved product panels and panel navigation; field level help for all help panels; and fuller integration with DBRC terminology.

Program number: 5655-L08

TM Management

The following sections describe the IBM IMS TM management tools.

IBM IMS Command Control Facility for z/OS, V1

The IBM IMS Command Control Facility for z/OS:

- Issues commands for DBCTL, DCCTL, or DB/DC regions.
- Issues IMS commands from a batch utility or from a TSO session from an ISPF interface by an ISPF interface.
- Ensures successful processing of database START, STOP, DBR, and DBD commands.
- Processes IMS commands across all regions in a sysplex using the batch command processor.
- Synchronizes online change and database commands across all regions in a sysplex using the batch command processor.

Program number: 5655-F40

IBM IMS Extended Terminal Option Support for z/OS, V2.2

The IBM IMS Extended Terminal Option Support for z/OS tool:

- Provides a front-end to the IMS Extended Terminal Option (ETO) feature.

- Offers capabilities to help manage, implement, customize, and exploit the benefits of ETO in your systems environment to manage resources effectively.
- Supports tailoring of all parts of ETO, including sign-on processing.
- Lets you set global options for the entire user community and override options for specific terminals or user IDs.
- Allows LTERM names that start with a numeric value.
- Supports multiple versions of IMS.
- Extends shared queues support to issue SYSTEMS level ENQ for all LTERM names that are associated with a user at sign-on.
- Offers SLU type P support and SLU 1 console support that allow you to supply a variety of options on an LU-by-LU basis (for example, Logmode, Logon Description, ASOT, ALOT).

Program number: 5655-L61

IBM IMS High Performance System Generation (SYSGEN) Tools for z/OS, V1

The IBM IMS High Performance System Generation (SYSGEN) Tools for z/OS:

- Include Fast System Generation (SYSGEN), Merge Clone, and System Generation (SYSGEN) Compare.
- Perform IMS SYSGENs for application resource changes (transactions, programs, databases, and route codes) in a single-step batch job or online.
- Reduce the time needed to perform IMS SYSGENs for application resource changes (transactions, programs, databases, and route codes) and consume far less CPU time.
- Create and maintain IMSplex SYSGEN configurations.

Program number: 5655-F43

IMS Multi-Dialog Manager for z/OS, V1

The IMS Multi-Dialog Manager for z/OS:

- Enables your IMS users to more quickly change between IMS sessions.
- Improves the usability of your IMS online system and the productivity of your users.
- Complements the existing IMS support for conversational transactions by managing the process of holding and resuming conversations for the end user.

Program number: 5697-H91

IBM IMS Queue Control Facility for z/OS, V2

The IBM IMS Queue Control Facility (QCF) for z/OS:

- Manages IMS message queues in both shared and non-shared queue environments.
- Allows greater flexibility in configuration, and additional support of sysplex environments.
- Implements improved security using the SAF/RACF security interface, which is accepted as a standard for security authorization.

- Uses information maintained by IMS Database Recovery Control (DBRC) that automates several previously manual functions in the areas of Automatic Checkpoint Location, Automatic Log Selection, and Cold Queue Recovery for IMS/SMQ.
- Provides support for the INCLUDE and EXCLUDE statements of the LOAD function.
- Allows message re-queueing between different LTERMs.
- Accepts multiple line commands in the Display Destination panels.
- Conforms to user installation standards for execution libraries.
- Provides improved product customization and documentation.

Program number: 5697-I08

IBM IMS Workload Router for z/OS, V2.4

The IBM IMS Workload Router for z/OS tool:
- Works with IMS TM to provide transparent routing or balancing of a transaction workload among two or more IBM systems.
- Uses IMS Multiple Systems Coupling (MSC).
- Is adaptable to a variety of system configurations.

Program number: 5697-B87

Miscellaneous IMS Tools

The following older IMS tools also support IMS Version 9:
- IMS ADF, Version 2
- IMS Data Refresher, Version 1.1.1
- OS/VS DB/DC Data Dictionary, Version 6

Part 2. Planning for New Features and Enhancements

This part provides detailed introductions for the larger new functions and enhancements that are available with IMS Version 9.

Chapter 9. DBRC Enhancements

This chapter describes the IMS Version 9 enhancements for Database Recovery Control (DBRC). It includes the following sections:

- "Overview"
- "Planning and Administrative Tasks" on page 100
- "User Tasks" on page 100

Overview

IMS Version 9 provides the following enhancements for DBRC:

- Command authorization that is currently available for batch DBRC commands is now also available to the online (/RM) commands. Specifically, you now have the ability to use a security product (such as RACF), a security exit routine, or both.
- Two DBRC load modules (DSPCINT1 and DSPURX00) are now in private and common storage above the 16MB line. This move further reduces the amount of common storage area (CSA) that IMS uses, thus increasing the amount of CSA that is available.
- DBRC uses PRILOG RECON record mapping instead of PRISLD RECON record mapping.
- DBRC provides support for tape block sizes greater than 32 760 bytes for the output from the Database Image Copy utility (DFSUDMP0) and the Online Database Image Copy utility (DFSUICP0). This support improves the performance for these utilities and the database recoveries that use the large block sizes.
- DBRC can inform IMS during restart which log in an online log data set (OLDS) to read next, even if that OLDS is marked ERROR=CLOSE and might not yet be closed. You must still process the OLDS using the Log Recovery utility (DFSULTR0) before you can archive the OLDS or use it as input to any utility.
- During a restart, IMS checks the secondary WADS for additional information that might not be in the primary WADS.
- DBRC provides an API that is a release-independent, assembler macro interface to DBRC that customer-written application programs use to obtain services from DBRC.

Related Reading: See the *IMS Version 9: Database Recovery Control (DBRC) Guide and Reference* for more information about these enhancements.

Concepts

The DBRC enhancements do not introduce new concepts for IMS Version 9.

Requirements

The DBRC tape large block size support enhancement requires the large block interface on one of the following IBM tape devices, or equivalent products: 3480 Magnetic Tape Subsystem, 3490 and 3490F Tape Subsystem, or IBM TotalStorage Enterprise Tape System 3590.

In order to write a program that uses the DBRC API, you must have a working knowledge of:

- Assembler language programming
- z/OS, and the services that it supplies
- IMS
- DBRC

Restrictions

Image copies created with block sizes larger than 32 760 bytes cannot be used by earlier versions of IMS. However, you can use IMS Version 9 recovery utilities during migration of earlier versions of IMS to process image copies that are created with block sizes larger than 32 760 bytes.

The functions that are provided by the DBRC API are limited to initializing the API (and DBRC), querying DBRC for information that is in the RECON data sets, querying DBRC about the status of the RECON data sets, releasing buffer storage, and terminating the API.

The DBRC API works only with IMS Version 9.

Planning and Administrative Tasks

For the Command Authorization for /RM Commands enhancement, security administrators might need to:
- Define or modify resource profiles to protect all DBRC commands
- Decide which user, users, group, groups, or terminals should have access to the security profiles, and grant that access

For the Eliminate the DSPSLDRC Part from DBRC enhancement, you should evaluate existing JCL or programs that access the RECON data set. You might need to make changes to the JCL because the DSPSLDRC member has been removed from IMS. You can use the DSECTs in DSPLOGRC for the PRISLD, SECSLD, PRITSLDS, and SECTSLDS records. In previous releases, the DSECTs in the DSPSLDRC member were used for these records. The DSPLOGRC member is in the ADFSMAC and SDFSMAC libraries.

To take advantage of the Support for Tape Large Block Sizes enhancement, you need to plan for hardware installation and change BLKSIZE specifications in JCL.

If you have in-house procedures that include a step for running the Log Recovery utility (DFSULTR0) as part of an IMS emergency restart to close the previous OLDS, this step can be moved in the order of those procedures because IMS can now restart without closing that OLDS. However, you must still run the DFSULTR0 utility to archive that OLDS.

User Tasks

This section describes changes to IMS system definition and tailoring, operations, application programming, customization, utilities, and diagnosis.

Coding for System Definition and Tailoring

The DBRC enhancements do not introduce changes for IMS system definition or tailoring for IMS Version 9.

Operating

The IMS /RM commands now require command authorization.

System programmers and database administrators might want to use the DBRC API to access information that is contained in the RECON data sets. In order to do so, they must write an application that issues the DBRC requests.

Coding Application Programs

IMS application programmers and system programmers might want to use the DBRC API to access information that is contained in the RECON data sets. In order to do so, they must write an application that issues the DBRC requests.

Coding Exit Routines

The Command Authorization for /RM Commands enhancement might require the writing of or modifying of a user-provided DBRC Command Authorization Exit routine (DSPDCAX0) because this exit routine now applies to online DBRC commands as well as batch DBRC commands.

Using Utilities

The Support for Tape Large Block Sizes enhancement provides the ability for batch image copies to be written to devices that support block sizes greater than 32 760 bytes. These image copies are created by the Database Image Copy utility (DFSUDMP0). You must have the hardware in place to use this support. Set a block size of zero or do not override the DCB in the JCL.

The Allow IMS to Use an OLDS for Restart When ERROR=CLOSE enhancement removes a step from the recovery process for an OLDS data set that is marked as needing to be closed during IMS emergency restart. IMS can now restart without requiring this OLDS to be closed. However, you must still run the Log Recovery utility (DFSULTR0) before the OLDS can be archived or used as input to any utility.

Using Diagnostic Tools

The DSECTs for the PRISLD, SECSLD, PRITSLDS, and SECTSLDS records are in the DSPLOGRC member of the ADFSMAC and SDFSMAC libraries. In previous releases, these DSECTs were in the DSPSLDRC member.

There are new messages and abend codes for the Support for Tape Large Block Sizes enhancement.

There are new return and reason codes for the DBRC API enhancement.

Chapter 10. Fast Path Area Open/Close Enhancements

This chapter describes the IMS Version 9 enhancements for opening or closing Fast Path areas. It includes the following sections:

- "Overview"
- "Planning and Administrative Tasks" on page 104
- "User Tasks" on page 104

Overview

IMS Version 9 offers the ability for IMS to reopen DEDB areas automatically after IMS warm or emergency restart or IRLM reconnect.

During or after an IMS emergency restart, IMS can reopen all areas that were open at the time of the previous shutdown, if these enhancements are enabled. You enable this automatic reopen with a new parameter for the IMS procedure, FPOPN. Values for this parameter allow you to specify that:

- During restart, IMS reopens areas that are registered with DBRC to be preopened.
- After restart, IMS reopens areas that were open at the time of shutdown or failure.
- After restart, IMS reopens areas that are registered with DBRC to be preopened.
- IMS disables preopen processing for all areas.

The reopen and preopen processing runs asynchronously with normal online activity. However, if an area is not yet reopened when an IMS application program requests access, it is reopened immediately as in earlier releases of IMS.

After an IRLM failure, IMS stops all DEDB areas and waits for IRLM to reconnect. Previous releases of IMS did not restart or reopen these areas automatically when IMS reconnected to IRLM, IMS operators had to issue the /START AREA commands. IMS Version 9 allows you to specify that IMS should automatically restart the areas after the reconnect. You enable this automatic restart with a new parameter for the IMS procedure, FPRLM. Values for this parameter allow you to specify that:

- After reconnect, IMS restarts and reopens areas that are registered with DBRC to be preopened.
- After reconnect, IMS restarts areas that were stopped because of the IRLM failure.
- After reconnect, IMS restarts and reopens areas that were stopped because of the IRLM failure.
- IMS waits for the /START AREA command, as in previous IMS releases.

The restart and reopen processing runs asynchronously with IRLM reconnect and normal online activity. However, you can still use the /START AREA command to start an area immediately.

IMS Fast Path uses up to 10 task control blocks (TCBs) to open, preopen, or close DEDB areas, thus parallelizing the processing for each task.

Concepts

The Fast Path Area Open/Close enhancements do not introduce new concepts for IMS Version 9.

Requirements

The Fast Path Area Open/Close enhancements do not introduce new requirements for IMS Version 9.

Restrictions

The Fast Path Area Open/Close enhancements do not introduce new restrictions for IMS Version 9.

Planning and Administrative Tasks

To take advantage of the ability to reopen areas during IMS restart or IRLM reconnect, you must include the new FPOPN or FPRLM keywords in the IMS procedure.

The database administrator should understand how IMS processes DEDB areas that are automatically reopened or restarted, and how this processing can affect IMS restart.

If you currently have automated-operations scripts to reopen and restart areas after a restart or reconnection, you should reevaluate those scripts and possibly disable them.

User Tasks

This section describes changes to IMS system definition and tailoring, operations, application programming, customization, utilities, and diagnosis.

Coding for System Definition and Tailoring

The following parameters are new for the IMS procedure:

FPOPN
Specifies whether to reopen DEDB areas automatically during IMS restart.

FPRLM
Specifies whether to restart DEDB areas automatically during IRLM reconnect.

Operating

If preopen, reopen, or restart is executing when the user initiates a shutdown for IMS (/CHE FREEZE) or an IRLM disconnect, the current preopen, reopen, or restart process is terminated and the requested shutdown process is initiated.

Coding Application Programs

The Fast Path Area Open/Close enhancements do not introduce new or changed APIs for IMS Version 9.

Coding Exit Routines

The Fast Path Area Open/Close enhancements do not introduce new or changed exit routines for IMS Version 9.

Using Utilities

The Fast Path Area Open/Close enhancements do not introduce new or changed utilities for IMS Version 9.

Using Diagnostic Tools

There are new and changed messages for these enhancements.

Chapter 11. Fast Path Multiple Areas Shared VSO Structures

This chapter describes the IMS Version 9 enhancements for shared Virtual Storage Option (VSO) data-entry database (DEDB) areas. It includes the following sections:
- "Overview"
- "Planning and Administrative Tasks"
- "User Tasks" on page 108

Overview

IMS Version 9 enhances the support for sharing VSO DEDB areas by allowing more than one VSO DEDB area in a coupling facility structure. Thus, you can have more shared VSO DEDB areas while using fewer coupling facility structures.

Concepts

In a data-sharing environment, a *multi-area structure* is a coupling-facility structure that contains more than one VSO DEDB area. A *single-area structure* is a coupling-facility structure that contains only one VSO DEDB area.

In a data-sharing environment, IMS makes a *logical association* between a VSO DEDB area and a multi-area structure when an XES connection exists between IMS and the structure.

Requirements

The enhancements for shared VSO DEDB areas do not introduce new requirements for IMS Version 9.

Restrictions

IMS does not support IMS-managed duplexing of multi-area structures. Multi-area structures must be duplexed using system-managed CF structure duplexing.

Planning and Administrative Tasks

To plan for the enhancements for shared VSO DEDB areas, perform the following tasks:

1. Determine the number and size of areas in a multi-area structure and allocate enough space for the structure.
2. Analyze buffer requirements for the private buffer pools that are associated with the multi-area structures.
3. Review, and possibly change, structure-failure recovery procedures to include recovery for all areas in multi-area structures.
4. Possibly implement a new naming convention for multi-area structures.
5. Plan for system-managed CF structure duplexing of multi-area structures.

Because areas within a single structure can be associated, stopped, recovered, or unloaded at different times, IMS maintains the connection to the coupling facility from the time that the first area is opened until the last area is unloaded or stopped. An IMS disconnects from a structure when it is no longer sharing any of

the areas in the structure. An IMS disassociates an area from a structure if the IMS is still sharing other areas in the structure.

All areas in the same structure must have the same characteristics. The first area that is opened determines the characteristics of the structure, including the CI size. All areas opened in a structure must have the same CI size.

When a VSO DEDB area is preloaded in a multi-area structure, IMS does not check the size of a structure to see if there is enough room for the entire root addressable part. If there is not enough room in the structure for all of the preloaded CIs, existing CIs in the structure are reclaimed to make room for the new CIs. When there are no more CIs to reclaim, the preload process stops because the structure is full.

When you define multi-area structures in the CFRM policy, allocate enough space for all of the areas that will share the structure. The structure size should be the sum of all of the areas' storage requirements.

To monitor the number of CIs that are loaded for each area in a multi-area structure, use the /DISPLAY FPVIRTUAL command.

User Tasks

This section describes changes to IMS system definition and tailoring, operations, application programming, customization, utilities, and diagnosis.

Coding for System Definition and Tailoring

Multi-area structures use private buffer pools as do single-area structures. Private buffer pools are defined by control statements in the DFSVSMxx IMS.PROCLIB member. Specifying a structure name in the control statement instead of an area or DBD name allows all areas that share the structure to use the private buffer pool. No other areas use the pool.

Definition of the area-specific, database-specific, and generic buffer pools is unchanged by the enhancements for shared VSO DEDB areas.

To identify buffer pools for multi-area structures, the DFSVSMxx IMS.PROCLIB member includes a new keyword, DEDBMAS. The format for this keyword is:

DEDBMAS=(poolname,cisize,pbuf,sbuf,maxbuf,LKASID,strname)

See *IMS Version 9: Installation Volume 2: System Definition and Tailoring* for more information about this keyword.

Operating

When a multi-area structure fails, IMS stops all areas in the structure globally and marks the areas as recovery needed.

IMS also stops all of the areas in a multi-area structure when IMS loses connectivity to the structure. The XES connection remains as a failed-persistent connection. You can restart these areas after restoring connectivity.

For a read error, the IMS subsystem with the error stops all of the areas in the structure and disconnects the structure. The XES connection remains as a failed-persistent connection.

For a write error, IMS deletes the CI with the error and writes it to DASD. Then, the IMS subsystem with the error stops all of the areas in the structure and disconnects the structure. The XES connection remains as a failed-persistent connection.

Use standard database recovery procedures to recover the areas.

The following commands are changed to support shared VSO DEDB areas:

INIT.DBDS

IMS Version 9 introduces two new keywords: MAS and NOMAS. These keywords specify whether a shared VSO area resides in a multi-area coupling facility structure. If you specify MAS, you cannot also specify a second coupling facility structure (CFSTR2), because structure duplexing (by IMS) is not supported for multi-area structures. NOMAS is the default.

For multiple areas to share a coupling facility structure, use the CFSTR1 keyword to name the shared structure for each area. The lookaside keywords (LKASID or NOLKASID) are ignored for multi-area structures. Instead, IMS determines the lookaside options from the private buffer pool definition in the IMS.PROCLIB member DFSVSMxx.

CHANGE.DB

For IMS Version 9, if you change a VSO DEDB from share level 2 or 3 to share level 0 or 1, the MAS keyword setting is reset to NOMAS.

CHANGE.DBDS

IMS Version 9 introduces two new keywords: MAS and NOMAS. These keywords specify whether a shared VSO area resides in a multi-area coupling facility structure.

You can only specify the MAS keyword for DEDBs that are defined as share level 2 or 3 and that are either already specified as VSO or include the VSO keyword on the CHANGE.DBDS command.

If an area is registered with DBRC using a multi-area structure, DBRC rejects a CHANGE.DBDS command that specifies the CFSTR2 keyword.

The lookaside keywords (LKASID or NOLKASID) are ignored for multi-area structures.

/DBRECOVERY AREA

For a structure with only one area (either a single-area structure or a multi-area structure with one area) with no other IMSs sharing the area, the /DBR AREA command takes the area out of VSO and deletes the structure.

For a structure with multiple areas and no other IMSs sharing the area, the /DBR AREA command takes the area out of VSO and deletes the CIs for the stopped area from the structure.

When other IMSs are sharing an area, the /DBR AREA command disassociates the area from the structure for the IMS that issues the command. The area remains available in VSO to other IMSs.

/DISPLAY FPVIRTUAL

This command lists each area in multi-area structures individually with its own statistics.

This command also includes a new column that displays the total number of CIs in the root addressable part. This number is the total number of CIs loaded into the structure if the entire area was preloaded.

/DISPLAY POOL FPDB

This command returns pool names that are 16 bytes long to handle the multi-area naming convention.

LIST.DBDS

This command displays MAS or NOMAS for Fast Path areas at the end of the line displaying CFSTR1, CFSTR2, and LKASID | NOLKASID.

If you issue this command from an IMS Version 7 or Version 8 subsystem, the output shows Version 9 areas that use multi-area structures, although it does not show the MAS keyword in the listing. However, you cannot change the area from the pre-V9 subsystem (you receive message DSP0079I).

/STOP AREA

For a structure with only one area (either a single-area structure or a multi-area structure with one area) with no other IMSs sharing the area, the /STOP AREA command takes the area out of VSO and deletes the structure.

For a structure with multiple areas and no other IMSs sharing the area, the /STOP AREA command takes the area out of VSO and deletes the CIs for the stopped area from the structure.

When other IMSs are sharing an area, the /STOP AREA command disassociates the area from the structure for the IMS that issues the command. The area remains available in VSO to other IMSs.

/VUNLOAD AREA

For a structure with only one area (either a single-area structure or a multi-area structure with one area) with no other IMSs sharing the area, the /VUNLOAD AREA command takes the area out of VSO and deletes the structure. The IMS that issues the command notifies other IMSs that are sharing the area to disconnect from the structure.

For a structure with multiple areas, the /VUNLOAD AREA command takes the area out of VSO, but does not delete the structure. The IMS that issues the command disassociates the area and deletes its CIs from the structure. The IMS that issues the command notifies other IMSs that are sharing the area to disassociate the area or disconnect from the structure.

Coding Application Programs

The enhancements for shared VSO DEDB areas do not introduce changes to IMS application programming for IMS Version 9.

Coding Exit Routines

The enhancements for shared VSO DEDB areas do not introduce changes to IMS exit routines for IMS Version 9.

Using Utilities

The enhancements for shared VSO DEDB areas do not introduce changes to IMS utilities for IMS Version 9.

Using Diagnostic Tools

There are new and changed messages for shared VSO DEDB areas.

Chapter 12. IMS Enhanced Command Environment

This chapter describes the IMS Version 9 Enhanced Command Environment. It includes the following sections:

- "Overview"
- "Planning and Administrative Tasks" on page 112
- "User Tasks" on page 113

Overview

IMS Version 8 introduced the Common Service Layer (CSL), with its address-space managers: Resource Manager (RM), Operations Manager (OM), and Structured Call Interface (SCI). IMS Version 8 also introduced IMS type-2 commands; these commands could be issued only through the Operations Manager API.

The CSL environment is complex for customers who do not require a sysplex or data-sharing environment. The IMS Enhanced Command Environment provides a simplified IMS configuration that does not require the Resource Manager. If you want to use the IMS type-2 command format, but do not need the Resource Manager, you can group your systems into a generic IMSplex and use the IMS Enhanced Command Environment. Examples of environments that can benefit from the IMS Enhanced Command Environment include:

- Standalone IMS subsystems
- IMS DBCTL subsystems that are involved in data sharing, but that do not use online change

Figure 7 compares the IMS command environments that are provided by IMS Version 8 with those provided by IMS Version 9. With IMS Version 8, you must use RM, but with IMS Version 9, you do not need to use RM for some environments.
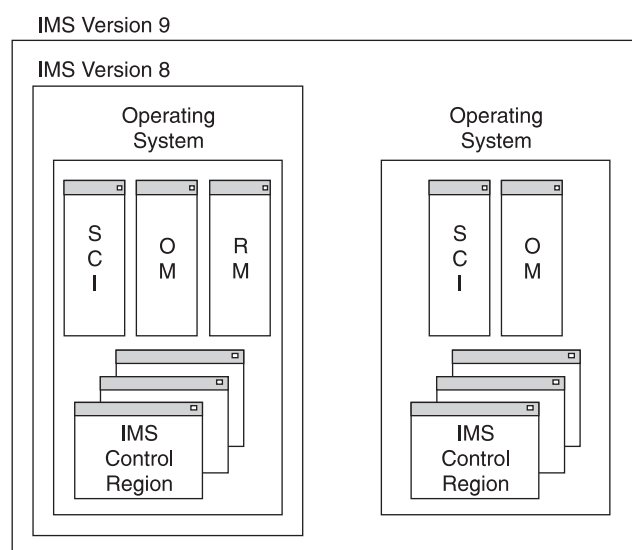

Figure 7. Comparison of IMS Command Environment with RM and without RM

Concepts

For IMS Version 8, an IMSplex is defined as one or more IMS address spaces (control, manager, or server) that work together as a unit. Typically, but not always, these address spaces:

- Share either databases or resources or message queues (or any combination)
- Run in an S/390 sysplex environment
- Include an IMS Common Service Layer (CSL)

Address spaces that can participate in the IMSplex include:

- Control region address spaces
- IMS manager address spaces (OM, RM, SCI)
- IMS server address spaces (CQS)
- TSO Single Point of Control (SPOC)
- IMS Connect
- User automation programs
- Vendor-supplied tools

Not all of these address spaces can process IMS commands.

For IMS Version 9, an IMSplex can also be defined as one standalone IMS system on one LPAR, grouped with a Common Service Layer (including Operations Manager and the Structured Call Interface as the minimum configuration) to enable Operations Manager services such as type-2 commands issued through the OM API (for example, TSO Single Point of Control, or IMS Control Center).

Requirements

The IMS Enhanced Command Environment does not introduce new requirements for IMS Version 9.

Restrictions

The IMS Enhanced Command Environment does not introduce new restrictions for IMS Version 9.

Planning and Administrative Tasks

If you currently operate standalone IMS systems, or an IMS data-sharing environment that does not share IMS queues, you can use the IMS Enhanced Command Environment to take advantage of the IMS type-2 commands. You must add Operations Manager and the Structured Call Interface to the LPAR on which IMS runs. For a sysplex, you must have one SCI for each LPAR, and at least one OM for the sysplex. Each address space must use the same IMSplex name.

IMS systems that are defined without an RM (RMENV=N) cannot share the OLCSTAT data set.

During XRF takeover processing, the alternate XRF system ignores the entry in the OLCSTAT data set for the XRF active system. After the alternate system becomes active, you must use the Global Online Change utility (DFSUOLC0) to delete the IMS entry for the previous active IMS before you can issue the INIT OLC command. If the entry is not deleted, the command results in errors.

For IMS systems that are defined without an RM (RMENV=N), terminal management is the same as it is for IMS systems running in local mode only.

User Tasks

This section describes changes to IMS system definition and tailoring, operations, application programming, customization, utilities, and diagnosis.

Coding for System Definition and Tailoring

The DFSCGxxx PROCLIB member defines IMS's use of the Common Service Layer. IMS Version 9 adds the following parameters to the DFSCGxxx PROCLIB member:

- RMENV

  Specifies whether IMS will use RM services. The default is RMENV=Y.

- OMPROC

  Specifies the name of the PROCLIB member that contains the procedure for the OM address space.

- SCIPROC

  Specifies the name of the PROCLIB member that contains the procedure for the SCI address space.

To use the IMS Enhanced Command Environment, you must specify the IMSPLEX parameter in the DFSCGxxx member. This parameter specifies the name of the IMSplex that OM, SCI, and the IMS control regions join. This IMSplex is simply a grouping of all address spaces that are managed by one or more OMs.

Operating

Using the IMS Enhanced Command Environment, the IMS control region can optionally start the SCI and OM address spaces.

For an IMSplex that is running without an RM (with CSL global parameters RMENV=N and OLC=GLOBAL), you must ensure that another IMS subsystem does not attempt to use the OLCSTAT data set from the IMS subsystem that is running without RM:

- For an IMS environment that uses RM, when an IMS subsystem attempts to use the OLCSTAT data set from another IMS subsystem, or if the OLCSTAT data set utility (DFSUOLC0) attempts to initialize the data set for another IMSplex member, IMS adds an additional IMS entry to the OLCSTAT data set.

- When an IMS system that does not use RM attempts an online change using the INIT OLC or TERM OLC commands, IMS rejects the command. You must delete the IMS entries in the OLCSTAT data set that belong to other IMS systems using the Global Online Change utility (DFSUOLC0) before you can reissue the INIT OLC or TERM OLC commands.

The following IMS type-2 commands are changed to support the IMS Enhanced Command Environment:

- INIT OLC
- QUERY MEMBER
- QUERY OLC
- TERM OLC

Coding Application Programs

The IMS Enhanced Command Environment does not introduce changes for IMS application programs for IMS Version 9.

Coding Exit Routines

You cannot use the Command Authorization exit routine (DFSCCMD0) to secure IMS type-2 commands; it can secure IMS type-1 commands only. You can use the OM Security exit routine to secure IMS type-1 and type-2 commands that are issued through the OM API. The OM performs IMS type-2 command security checking, based on the CMDSEC parameter in the OM JCL or the OM PROCLIB member (CSLOIxxx).

The OM Security exit routine now includes the names of IMS members to which a command is routed.

Using Utilities

The IMS Enhanced Command Environment does not introduce changes for IMS utilities for IMS Version 9.

Using Diagnostic Tools

There are changed messages for the IMS Enhanced Command Environment.

Chapter 13. IMS Java Remote Database Services

This chapter describes the IMS Version 9 enhancements for IMS Java Remote
Database Services. It includes the following sections:

- "Overview"
- "Planning and Administrative Tasks" on page 118
- "User Tasks" on page 118

Overview

IMS Version 9 provides IMS Java application programs distributed access to IMS
databases through the IMS Java Remote Database Services. Your non-z/OS
application programs can access IMS DB data over the Internet using a secure
protocol with local or global transaction semantics and a standard application
programming interface (API).

The IMS Java Remote Database Services allow you to deploy a client application
program on a WebSphere Application Server for distributed environments that can
access IMS DB data. This server can run on any platform that is supported by
WebSphere Application Server.

The IMS Java Remote Database Services use a logical three-tier client/server
architecture:

- Server tier: The J2EE Enterprise JavaBean (EJB) on z/OS that accesses IMS DB
  data using the IMS Open Database Access (ODBA) interface.

  This EJB runs in WebSphere Application Server for z/OS, and accepts requests
  from the middle tier, processes the requests (including access to IMS databases),
  and returns the results to the middle tier.

  This EJB is a stateful session bean, that is, it maintains a conversational state
  with the middle-tier client. One instance of this EJB is created for each client
  connection (not each application). Thus, the server-tier EJB can support local
  transaction semantics, that is, it can commit or roll back transactions for each
  connection, rather than globally for all applications.

- Middle tier: The resource adapter that runs on the distributed J2EE server and
  provides access to the server tier. This resource adapter contains a type-3 JDBC
  driver, packaged as a J2EE Connector Architecture (JCA) resource adapter. This
  adapter is called the *IMS distributed JDBC resource adapter*.

  This resource adapter can run in any WebSphere server, typically in a non-z/OS
  environment, and handles the network communication between the client tier
  and the server tier.

- Client tier: Your application program that uses IMS DB data. This program is an
  enterprise application.

  Your application program uses the JDBC 2.0 API to access IMS data from one or
  more IMS databases. Because your application program uses the IMS distributed
  JDBC resource adapter as its JDBC driver, it does not need to manage network
  communications or any of the IMS resources.

In practice, the client tier and middle tier typically run on the same system. The
client-tier application communicates with the EJB at the middle tier, and

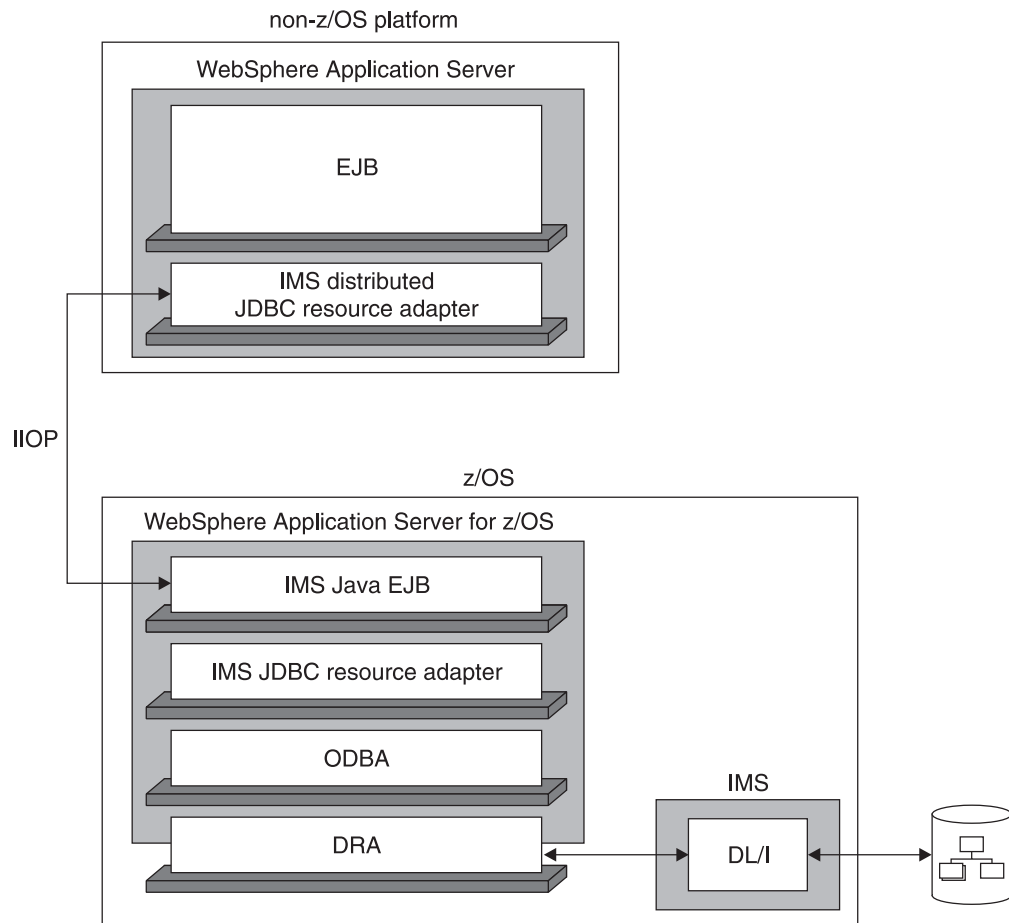communication with the server tier is transparent to the client tier. Figure 8 shows a typical configuration.

Figure 8. Distributed Access to IMS Data Using IMS Java Remote Database Services

Network traffic is minimized in this environment because information is grouped together and sent in batches rather than sent individually on an as-needed basis. This grouping avoids the need to serialize large Java objects.

Full transaction and security semantics are guaranteed in this environment because the J2EE application servers on both the distributed and z/OS platforms use the Internet Inter-ORB Protocol (IIOP) over a Secure Sockets Layer (SSL) connection. Database integrity is maintained in this environment by z/OS Resource Recovery Services (RRS), which acts as the synch-point coordinator for two-phase commit processing.

The IMS Java Remote Database Services provide two types of transaction semantics, global and local:

Global transaction semantics
    The entire client application program (EJB) operates in one transaction context, or unit of work. All work that is done by the application is committed or rolled back in one operation, and the commit or rollback affects all database activity that is completed by the application. The distributed WebSphere Application Server is the coordinator for global transactions.

Local transaction semantics

Each database connection operates in its own transaction context, or unit of work. Work for each connection is committed or rolled back independently of other connections. The WebSphere Application Server for z/OS is the coordinator for local transactions.

IMS ODBA does not support the creation of connections using a user ID and password, but requires an already verified Access Control Environment Element (ACEE) for the execution thread. The IMS JDBC resource adapter uses Sync-To-Thread processing in WebSphere Application Server for z/OS, which means that the application server places an ACEE on the thread of execution so that ODBA can use it.

The IMS Java Remote Database Services manage the creation and termination of the IMS ODBA environment.

Concepts

An *Enterprise JavaBean* (EJB) is a transactional, distributed object applications-based, server-side software component that provides remote services for clients that are distributed throughout a network. EJBs typically run in a J2EE server, such as WebSphere Application Server.

The *Internet Inter-ORB Protocol* (IIOP) is a communication protocol that allows application components that are written in C++, Smalltalk, and other Common Object Request Broker Architecture (CORBA) supported languages to communicate with components running on the Java platform.

The *IMS distributed JDBC resource adapter* is the JDBC driver that your client applications use to access IMS data.

The *IMS JDBC resource adapter* is the package of IMS Java class libraries that the IMS Java Remote Database Services provide for distributed IMS Java application programs.

The *Java Naming and Directory Interface* (JNDI) is an application programming interface (API) that provides naming and directory functionality to application programs written using the Java programming language. Naming functionality is the means by which names are associated with objects; objects are found based on their names. A directory service associates names with objects, and also allows such objects to have attributes that can be used in searches.

JDBC is an API that allows you to access tabular data using the Java programming language. IMS Java allows you to use JDBC to access hierarchical IMS data using JDBC SQL queries.

Requirements

In addition to the requirements for IMS Java, IMS Java Remote Database Services also require:

- WebSphere Application Server for z/OS Version 5.0.2.3 or later. If you have WebSphere Application Server for z/OS V5.0.2, you must install either V5.0.2.1 or apply APAR PQ81944.
- WebSphere Application Server V5.0.2.2 with cumulative fixes that include PQ79485, or WebSphere Application Server V5.0.2.3 or later.
- z/OS Resource Recovery Services (RRS).

Recommendation: Use the Secure Sockets Layer (SSL) for your applications that use the IMS Java Remote Database Services.

To use IMS Java Remote Database Services to access IMS databases from applications that run on WebSphere Application Server in a non-z/OS environment, you must download IMS Java files from the IMS Java Web site. These downloaded files are required in addition to the files that are installed as part of the SMP/E installation of the IMS Java FMID. To download the required IMS Java files, go to the IMS Web site at www.ibm.com/ims and link to the IMS Java Web page for more information.

The IMS DB subsystem and the programs that comprise the server tier must all run in the same logical partition (LPAR).

The server-tier EJB must run in WebSphere Application Server for z/OS, Version 5 or later. The middle-tier EJB can run in any WebSphere server.

Restrictions

The IMS Java Remote Database Services do not introduce new restrictions for IMS Version 9.

Planning and Administrative Tasks

To set up the server-tier EJB:

1. Install the imsjava91.rar file and configure the custom service. This step is already done for the IMS JDBC resource adapter.

   If this step has already been done for non-distributed WebSphere z/OS access, you do not need to do it again when enabling distributed support.

2. Deploy the RemoteDataServices.ear file. This file contains the EJB that handles requests from the client. The EJB has a pre-defined JNDI lookup name that the IMS distributed JDBC resource adapter can access.

3. Deploy an instance of a generic J2C Connection Factory (DataSource object) with a specific JNDI name so that the EJB on the server side can look it up. You do not specify a DRA name or database view name; they are set during execution based on the client-side DataSource that is deployed.

To set up the middle-tier EJB:

1. Install the RemoteDataServices.rar file. This file contains the IMS distributed JDBC resource adapter.

2. Deploy an instance of a J2C Connection Factory (DataSource object). This class contains values for the IMS DRA name, DLIDatabaseView subclass name, IIOP port number, and host name.

The client application program that uses the distributed JDBC resource adapter to access IMS must be deployed with run-as identity (a property of the EJB) set to System. This is required by WebSphere Application Server on the distributed platform to interoperate with WebSphere Application Server on z/OS. Therefore, you should restrict access to the client application.

User Tasks

This section describes changes to IMS system definition and tailoring, operations, application programming, customization, utilities, and diagnosis.

Coding for System Definition and Tailoring

IMS Java Remote Database Services do not introduce new or changed macros or procedures for IMS Version 9.

Operating

IMS Java Remote Database Services do not introduce new or changed operational procedures for IMS Version 9.

Coding Application Programs

IMS Java Remote Database Services do not introduce new or changed APIs for IMS Version 9.

Your client application program uses the standard JDBC 2.0 API to generate SQL queries for accessing IMS data.

Coding Exit Routines

IMS Java Remote Database Services do not introduce new or changed exit routines for IMS Version 9.

Using Utilities

IMS Java Remote Database Services do not introduce new or changed utilities for IMS Version 9.

You use the DLIModel utility to generate the IMS Java metadata.

Using Diagnostic Tools

IMS Java Remote Database Services do not introduce new or changed messages or abend codes for IMS Version 9.

Chapter 14. IMS Type-2 Database Commands

This chapter describes the IMS Version 9 enhancements for IMS type-2 database commands. It includes the following sections:

- "Overview"
- "Planning and Administrative Tasks"
- "User Tasks"

Overview

IMS Version 9 adds new commands to allow you to issue commands for database resources in the IMS type-2 command format. These commands are routed to one or more IMS subsystems in the IMSplex, and the output is consolidated, with each response line encapsulated in XML tags.

Concepts

The IMS type-2 database commands do not introduce new concepts for IMS Version 9.

Requirements

The IMS type-2 database commands do not introduce new requirements for IMS Version 9.

Restrictions

The IMS type-2 database commands can be specified using the IMS Operations Manager API only.

Planning and Administrative Tasks

To use the IMS type-2 database commands, you must set up and define the Common Service Layer for IMS, including the Operations Manager. These commands can also be issued from the IMS Enhanced Command Environment.

The security that is available for OM commands include SAF (RACF) and the OM security exit routine. You can use either or both to secure IMS type-2 commands.

User Tasks

This section describes changes to IMS system definition and tailoring, operations, application programming, customization, utilities, and diagnosis.

Coding for System Definition and Tailoring

The IMS type-2 database commands do not introduce changes for IMS system definition or tailoring for IMS Version 9.

Operating

An operator can use either IMS type-1 commands or the new IMS type-2 database commands to set or query status of database or area resources for one or more IMS subsystems in an IMSplex.

IMS Version 9 adds the following new IMS type-2 commands:

- QUERY AREA

  This command allows you to display information about DEDB areas, such as status and control intervals. It also displays the DEDB name and area data set information.

  There are IMS type-1 commands that perform similar functions as the QUERY AREA command:

QUERY AREA Command	Similar IMS Type-1 Command
QUERY AREA	/DIS AREA *area1...arean* | ALL
QUERY AREA	/DIS STATUS AREA

- QUERY DB

  This command allows you to display information about databases.

  There are IMS type-1 commands that perform similar functions as the QUERY DB command:

QUERY DB Command	Similar IMS Type-1 Command
QUERY DB	/DIS DB *dbname1...dbnamen* | ALL
QUERY DB	/DIS STATUS DB

- UPDATE AREA

  This command allows you to change the status of area resources.

  There are IMS type-1 commands that perform similar functions as the UPDATE AREA command:

UPDATE AREA Command	Similar IMS Type-1 Command
UPDATE AREA NAME(*name*) STOP(ACCESS)	/DBR AREA *areaname* NOFEOV
UPDATE AREA NAME(*name*) START(ACCESS)	/START AREA *areaname*
UPDATE AREA NAME(*name*) STOP(SCHD)	/STOP AREA *areaname*

- UPDATE DATAGRP

  This command allows you to change the status of the members of a data group.

  There are IMS type-1 commands that perform similar functions as the UPDATE DATAGRP command:

UPDATE DATAGRP Command	Similar IMS Type-1 Command
UPDATE DATAGRP NAME(*name*) STOP(ACCESS)	/DBR DATAGRP *datagrpname* NOFEOV
UPDATE DATAGRP NAME(*name*) START(ACCESS)	/START DATAGRP *datagrpname*
UPDATE DATAGRP NAME(*name*) STOP(SCHD)	/STOP DATAGRP *datagrpname*

- UPDATE DB

  This command allows you to change the status of database resources: to make a database available, take it offline, stop scheduling, stop updates, lock, and unlock a database.

  There are IMS type-1 commands that perform similar functions as the UPDATE DB command:

UPDATE DB Command	Similar IMS Type-1 Command
UPDATE DB NAME(*name*) STOP(UPDATES)	/DBD DB *dbname* NOFEOV

UPDATE DB Command	Similar IMS Type-1 Command
UPDATE DB NAME(*name*) STOP(ACCESS)	/DBR DB *dbname* NOFEOV
UPDATE DB NAME(*name*) START(ACCESS)	/START DB *dbname*
UPDATE DB NAME(*name*) STOP(SCHD)	/STOP DB *dbname*
UPDATE DB NAME(*name*) SET(LOCK(ON))	/LOCK DB *dbname*
UPDATE DB NAME(*name*) SET(LOCK(OFF))	/UNLOCK DB *dbname*

Coding Application Programs

The IMS type-2 database commands do not introduce changes for IMS application programs for IMS Version 9.

Coding Exit Routines

The IMS type-2 database commands do not introduce changes for IMS exit routines for IMS Version 9.

Using Utilities

The IMS type-2 database commands do not introduce changes for IMS utilities for IMS Version 9.

Using Diagnostic Tools

There are changed messages for the IMS type-2 database commands.

Chapter 15. Integrated HALDB Online Reorganization Support

This chapter describes the IMS Version 9 Integrated Online Reorganization (OLR) function for High Availability Large Database (HALDB) partitions. It includes the following sections:

- "Overview"
- "Planning and Administrative Tasks" on page 129
- "User Tasks" on page 130

Overview

The integrated HALDB Online Reorganization (OLR) function provides non-disruptive reorganization of HALDB Partitioned Hierarchical Direct Access Method (PHDAM) and Partitioned Hierarchical Indexed Direct Access Method (PHIDAM) partitions.

The online reorganization of a HALDB PHDAM or PHIDAM partition runs in the DLISAS address space. IMS performs a non-disruptive database reorganization using a pair of data sets. Concurrent IMS updates are allowed as small amounts of data are moved and reorganized.

HALDB Online Reorganization has extended the data definition and data set naming convention established for HALDB. One or more data set groups in a HALDB database use the characters A-thru-J in the DDNAME statements and data set names; the primary index for a PHIDAM database uses the character X in these names. This naming convention has been expanded for IMS Version 9 by implementing the characters M-thru-V (and Y) for an alternate (or paired) set of data sets.

Before online reorganization starts, there is a single active set of data sets for the HALDB partition: either the A-thru-J (and X) set, or the M-thru-V (and Y) set. The data sets in the other, inactive, set contain no useful information. In fact, one or more of these data sets need not even exist before the reorganization is started.

An ownership relationship between the initiating IMS subsystem and the online reorganization process is established during initialization and is recorded in the partition database record in the RECON data set. After ownership of an online reorganization is established, no other IMS subsystems are allowed to obtain ownership. Ownership can be released by this IMS prior to the end of initialization or prior to the completion of the online reorganization; then another IMS can obtain ownership and finish the online reorganization.

When the entire initialization process (including the validation or possible automatic creation of the output data sets) is complete, the active set of data sets is treated as the input set, and the inactive set becomes the output set. At the end of this initialization process, the online reorganization of the HALDB partition is recorded in the RECON data set with a *cursor-active* status (ONLINE REORG ACTIVE=YES).

When the *cursor-active* status is recorded, and until this reorganization completes or until a batch reorganization reload is done, the HALDB partition is comprised of both the A-thru-J (and X) set of data sets *and* the M-thru-V (and Y) set of data sets.

During this time, the HALDB partition cannot be accessed unless both sets of data sets are physically available. Database records are then copied from the input to the output data sets in multiple units of reorganization. During the reorganization, IMS application programs can make database changes to the parts of the input data sets that have not yet been copied to the output data sets, as well as to parts of the output data sets to which data have already been copied.

Figure 9 illustrates the conceptual relationship between the database records in the input and output data sets at a point during the reorganization.
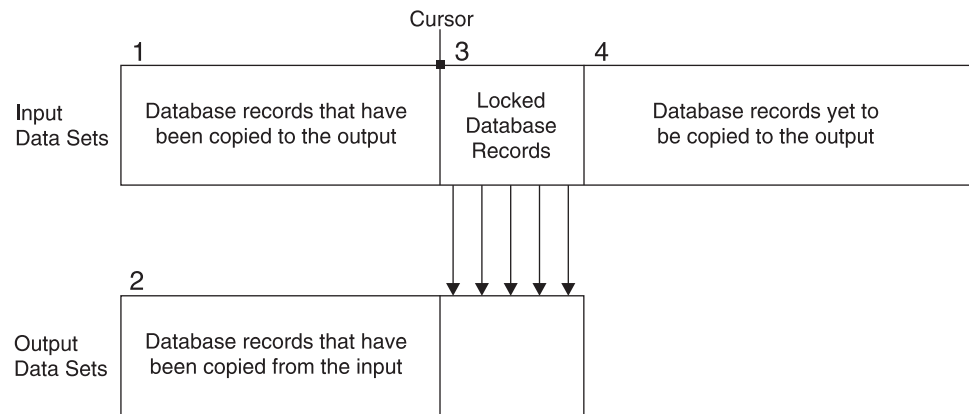
Figure 9. Relationship between DB records in the Input and Output Data Sets at a Point During Reorganization

Consider the database records for the entire HALDB partition to be ordered from left to right in four categories:
1. Those records that have already been copied to the output data sets
2. Those records that have been copied from the input data sets and reorganized
3. Those records that are currently being copied and reorganized
4. Those records that are not yet copied from the input data sets

A *cursor* marks which records are still in the input data set. As the copying proceeds, this cursor moves forward through the database (from left to right in the diagram).

IMS application programs can read, update, insert, or delete any of the database records that are not in the area in Figure 9 that are labeled "Locked Database Records". Changes made to the database records that are still to be copied are eventually copied to the output data sets. Changes made to the database records that have already been copied are made only to the output data sets.

For concurrently running applications, IMS determines whether to expect a particular database record to be in either the input or the output data sets based on whether the record is either before or after the cursor. The way that IMS retrieves the data from a HALDB partition that is being reorganized is completely transparent to an application program accessing the database.

All database changes are logged, including those database records that are copied from the input to the output data sets.

After all database records have been copied, the output data sets become the active set, and the input data sets become the inactive set, and might be used as the

output in a subsequent reorganization. Unless you perform an initial load or a batch reorganization reload, successive online reorganizations for the HALDB partition then alternate between the two sets of data sets.

This reorganization process does not support data definitional changes. That is, it provides only reclustering and space distribution advantages.

You can use IMS type-1 or type-2 commands to start and stop an online reorganization of a HALDB partition. IMS type-2 commands use the Operations Manager (OM) Application Programming Interface (API). An IMS Common Service Layer, which includes Operations Manager and Structured Call Interface (SCI), is required for type-2 command usage.

You can initiate an online reorganization only for HALDBs that are defined in the RECON data set as online-reorganization capable.

The following fields have been added to the RECON data set listing:
- A field that indicates whether the HALDB can be reorganized online
- A field that indicates that online reorganization is processing
- The SSID of the IMS that is currently performing an online reorganization
- A field that indicates which set of DBDSs is active for the partition and that the M-thru-V data sets exist
- Counters for committing online reorganization changes at the RSR tracking site

The HALDB master and partition DB records contain a new field that indicates whether the HALDB can be reorganized online.

IMS defines the M-thru-V (and Y) DBDS records in the RECON data set with the same attributes as the corresponding A-thru-J (and X) DBDS records. However, in addition to DD and data set names, the M-thru-V data sets include a DSID field. The DSID of the M-thru-V data sets is the same as that of the corresponding A-thru-J data sets but with its X'80' bit on. DBRC ignores this bit when it generates a list of the RECON data set so that each DBDS lists the name of its partner DBDS, if one exists.

The change accumulation group for the A-thru-J (and X) DBDSs includes the M-thru-V (and Y) DBDSs. The M-thru-V (and Y) DBDSs are added to each DBDS group where the A-thru-J (and X) DBDSs are found.

The REORG record for a HALDB partition DBDS contains new information (stop time) for HALDB Online Reorganization. For an offline reorganization, a database must have been taken offline with a /DBR command. So, only the start time of the reorganization is necessary. For an online reorganization, the database is online and the duration of the process is important. The stop time of the reorganization is now recorded in the REORG record along with the new indicator showing that this is an online reorganization and whether the online reorganization can be used as input to recovery.

A REORG record is recorded for both the A-thru-J (and X) DBDS and the M-thru-V (and Y) DBDS. The REORG record for the DBDS that was the output data set indicates that it can be used as input for recovery. The REORG record for the DBDS that was the input data set indicates that it cannot be used for recovery after online reorganization has completed.

Concepts

Active data is data that is still to be copied from the input data sets and data that has already been copied to the output data sets.

The *active set of data sets* are the data sets that contain data that is available to IMS applications.

A *cursor* indicates which data resides in the input or output reorganization data sets.

The *cursor-active status* is the status in the RECON data sets that tells DBRC that a HALDB partition has two sets of data sets, the input and the output.

Inactive data is the data in the input data sets that has already been copied to the output data sets.

The *inactive set of data sets* are the data sets that contain data that is unavailable or obsolete.

Input data sets contain data that has not yet been reorganized. These data sets include active data that can be accessed by IMS applications and inactive data that cannot be accessed by IMS applications.

Output data sets contain data that has been reorganized.

A *unit of reorganization* is one or more HALDB database records (root segment and all of its dependent segments) that are reorganized within the same commit scope.

Requirements

HALDB Online Reorganization does not introduce new requirements for IMS Version 9.

Restrictions

HALDB Online Reorganization introduces the following restrictions for IMS Version 9:

- You can initiate an online reorganization only for HALDBs that are defined in the RECON data set as online-reorganization capable.
- IMS does not start online reorganization and automatically create the output data sets for non-SMS-managed, multi-volume data sets. However, IMS can use a multi-volume output data if it exists before you issue the INIT OLR command.
- HALDB Online Reorganization runs only in an LSO=S environment. IMS rejects attempts to initiate online reorganization in an LSO=Y environment.
- The reorganization process does not support data definitional changes. That is, it provides only reclustering and space distribution advantages.
- You cannot use the following commands for HALDB partitions that are being reorganized using HALDB Online Reorganization:
  - /START DB
  - /DBRECOVERY DB
  - /DBDUMP DB
  - /STOP DB
  - UPDATE DB START(ACCESS)
  - UPDATE DB STOP(ACCESS | SCHD | UPDATES)

If you issue one of these commands during online reorganization, IMS issues message DFS0488I and the named DL/I partition is not processed by the command.

- You cannot start online reorganization for a particular partition if online reorganization is already running for that partition. However, another IMS can take over the reorganization if it is terminated; that is, when no IMS ID is assigned to the partition.
- Image copy is not allowed if online reorganization is in cursor-active status.
- For batch backout, you must use a DLI region type to backout in-flight online reorganization work.
- Extended Restart Facility (XRF) alternate systems and Remote Site Recovery (RSR) tracking systems cannot perform online reorganization for HALDB partitions.

Planning and Administrative Tasks

You can use the HALDB Partition Definition utility to manage HALDB partitions that are registered as online-reorganization capable.

You do not need to take an image copy of a partition's DBDS to successfully complete an online reorganization because all reorganization changes are logged. However, taking an image copy can reduce recovery time.

An online reorganization's speed and impact on the system depends mainly on available system resources, current system usage, and the value of the RATE keyword of the INITIATE OLREORG and UPDATE OLREORG commands. The amount of updates to the IMS log and system contention can also affect the speed at which an online reorganization runs.

Online reorganization of a partition generates X'50' database change log records for all of the data in the partition. Including logging overhead, reorganization of a 2-gigabyte partition generates more than 2 gigabytes of log data. Thus, reorganizing multiple partitions in parallel could generate sufficient log data to impact normal transaction processing, and certainly affect the rate of OLDS log switches and archiving.

Before an IMS shutdown checkpoint, IMS suspends all active HALDB online reorganization tasks. IMS resumes these tasks automatically after the next restart.

During IMS restart after an abnormal termination, IMS dynamically backs out the new output data set to the last sync point for all HALDB Online Reorganization tasks that were active when IMS abended. IMS performs the dynamic backout for HALDB Online Reorganization in the same way that it does for online programs. IMS resumes the online reorganization tasks automatically after the next restart.

When an XRF takeover occurs, IMS dynamically backs out the new output data set to the last sync point for all HALDB Online Reorganization tasks that are active at the time of the takeover. The new active IMS subsystem resumes the online reorganization tasks that were in progress at the time of the takeover. Conversely, in the case of FDBR, HALDB Online Reorganization does not automatically resume when FDBR terminates.

During RSR takeover, IMS stops any partitions that are undergoing online reorganization. After rebuilding the primary index and indirect list data sets, you can restart the online reorganization.

Tracking RECON data sets do not record ownership of the HALDB Online Reorganization. The RECON data sets at the tracking site reflect the current status of the covered databases. Counters track outstanding online reorganizations that have been recorded in the RECON data set at the tracking site but not yet applied to the databases.

For partitions that are undergoing online reorganizations, if you manually change data set characteristics at the active site, you must make the same changes at the tracking site.

User Tasks

This section describes changes to IMS system definition and tailoring, operations, application programming, customization, utilities, and diagnosis.

Coding for System Definition and Tailoring

HALDB Online Reorganization does not introduce changes for IMS system definition or tailoring for IMS Version 9.

Operating

The following DBRC commands are changed to support HALDB Online Reorganization:
- CHANGE.DB
- GENJCL.IC
- GENJCL.OIC
- GENJCL.RECOV
- INIT.DB
- NOTIFY.IC
- NOTIFY.REORG
- NOTIFY.UIC

The following commands are changed to support HALDB Online Reorganization:
- /DISPLAY DB

    This command displays OLR status for databases and partitions that have OLR in progress locally. It cannot be issued on an XRF alternate system or an RSR tracking system.
- QUERY DB

    This command shows OLR status for all partitions with OLR in progress. No rate information is returned.

The following new commands have been introduced for HALDB Online Reorganization:
- /DISPLAY DB OLR

    Use this command to display status information about active online reorganizations.
- INITIATE OLREORG

    Use this IMS type-1 or type-2 command to initiate or resume online reorganization.
- QUERY OLREORG

Use this IMS type-2 command to display status information about online reorganizations.

- UPDATE OLREORG

  Use this IMS type-1 or type-2 command to change the rate or old input data set delete option for an online reorganization that is in progress.

- TERMINATE OLREORG

  Use this IMS type-1 or type-2 command to stop one or more online reorganizations.

You can issue these commands from the OM API or from terminals, AOI applications, EMCS consoles, and APPC/OTMA programs. They are also passed to the AOI user exit routines and logged to the secondary master terminal.

The INITIATE OLREORG and UPDATE OLREORG commands include a RATE keyword that controls how fast the online reorganization runs. You can set the rate to allow the online reorganization to run as fast as possible (depending on system resources, system contention, logging waits, and so on) with no intentional delays, or you can define an intentional delay to cause the reorganization to run more slowly to help minimize overall system contention.

Coding Application Programs

If IMS application programs use the changed RECON records, these programs might need to be modified.

Coding Exit Routines

HALDB Online Reorganization does not introduce changes for IMS exit routines for IMS Version 9.

Using Utilities

You can run the offline reorganization utilities only if online reorganization is not currently running or was terminated. Successful completion of an offline reorganization results in the active data sets' being reset to A-thru-J, and the online reorganization status, along with its IMS identifier, being reset. The REORG records for the incomplete online reorganization are deleted.

The Change Accumulation utility (DFSUCUM0) accumulates changes for HALDB partition A-thru-J data sets and for M-thru-V data sets. You use a DB0 control statement to indicate whether the utility should accumulate changes or purge changes before online reorganization starts. Specify a purge time that is equal to the online reorganization start time in the control statement.

CA header records (type-25 records) might be created for corresponding A-thru-J and M-thru-V data sets if the online reorganization checkpoint has not yet completed at the time of the CA.

The Image Copy utilities (DFSUDMP0, DFSUDMT0, and DFSUICP0) copy the HALDB partition A-thru-J data sets or M-thru-V data sets, depending on which are active. Image Copy inputs are unchanged, except that you no longer need to add a DD statement for the input data set in the JCL when copying HALDB partition data sets because the data sets are dynamically allocated.

You cannot take an image copy of a DBDS while online reorganization is in cursor-active status. The utility fails in this case, and IMS issues an error message for each request to copy HALDB partition A-thru-J data sets or M-thru-V data sets.

Until an image copy has been made for an output data set, the DBRC GENJCL.CA command treats beginning of the reorganization (as defined in the RECON data set) as though it were the most recent image copy, and causes changes to the output data set to be accumulated from that point. Similarly, the GENJCL.RECOV command prepares recovery of an output data set from this point even though no physical image copy exists.

When it is necessary to cold start an IMS system, run the Log Recovery utility (DFSULTR0) with the option to list the PSBs that require backout. The Log Recovery utility lists online reorganization dynamic PSBs if there is in-flight reorganization work that requires backout. You then need to run the Batch Backout utility (DFSBBO00) for each of the listed PSB names. The Batch Backout utility recognizes that the named PSB is from an online reorganization because the PSB begins with a numeric character (which is not allowed for defined PSBs).

Using Diagnostic Tools

HALDB Online Reorganization adds a set of OLR event log records (X'29'). These log records reflect the progress of an online reorganization.

The following log records are changed:
- Database open and close log records (X'20' and X'21')
- Data set extension records (X'27')
- Database change log record (X'5050')
- CI/CA and space management record (X'53')

These log records include the DDSID to identify whether the records apply to the A-thru-J (and X) data sets or to the M-thru-V (and Y) data sets.

Information about HALDB Online Reorganization is added to the following RECON records:
- DBDS record
- HALDB master record
- HALDB partition record
- REORG record

There are new and changed messages and abend codes for HALDB Online Reorganization.

Chapter 16. Knowledge-Based Log Analysis

This chapter describes the IMS Version 9 enhancements for knowledge-based log analysis. It includes the following sections:

- "Overview"
- "Planning and Administrative Tasks" on page 137
- "User Tasks" on page 137

Overview

IMS Version 9 provides enhanced log-formatting routines that help you examine and display data from IMS log data sets:

- The Knowledge-Based Formatting Print routine (DFSKBLAK) provides a clear, simple description of each event represented by a log record, including the meaning of the various fields and flags. It does not display null fields.

- The Knowledge-Based Summary Formatting Print routine (DFSKBLAS) prints and displays the header and description of a log record, but not the record itself. This information can be useful when you need to have a general understanding of the log records associated with a particular resource.

- The Knowledge-Based Basic Formatting Print routine (DFSKBLA3) is similar in function to the Record Format and Print Module (DFSERA30), but its output also provides a brief description of the log record identifier (or log record type). This information can be useful if you are unfamiliar with the record types present in an IMS log. The Knowledge-Based Basic Formatting Print routine also interprets the prefix fields for the IMS type X'01' and type X'03' log records.

The enhanced log formatting routines perform basic knowledge-based log record analysis by returning all meaningful log records that contain the indicated search criteria. The search criteria can include: a specific unit of work (UOW), recovery token, LTERM name, node name, transaction name, or program name. When you use dynamic search, the knowledge-based log analysis enhances the search to include criteria that you did not explicitly request, but that was "discovered" during the search process.

With knowledge-based log analysis, IMS Version 9 provides the following new functions for log analysis and diagnosis:

DBCTL Transaction Analysis Utility (DFSKDBC0)
> The DBCTL Transaction Analysis utility (DFSKDBC0) performs the functions of both the Log Transaction Analysis utility (DFSILTA0) and the Fast Path Log Analysis utility (DBFULTA0). The DBCTL Transaction Analysis utility also performs a sort of the data. The DBCTL Transaction Analysis utility uses the X'07' and X'5937' log records or the X'5938' log record to gather statistics.

Deadlock Trace Record Analysis Utility (DFSKTDL0)
> The Deadlock Trace Record Analysis utility is used to format and summarize data extracted from X'67FF' pseudoabend records for database-related deadlocks. These records are identified by a four-character requester identification that indicates a pseudoabend condition, and an eight-character element identification that indicates deadlock.

The Deadlock Trace Record Analysis utility processes the logical deadlock events and the individual deadlocks to produce reports that:

- Provide details about the deadlock. The details can be sorted by the DMB, IMSID, and PSBs that are involved in the deadlock.
- Show the hierarchy of the participants in the deadlocks (relative to the victim in each deadlock).
- Summarize the deadlock activity, including deadlocks by:
  - Hour
  - DBMS
  - State
  - Lock type
  - DBD
  - PSB
  - Lock name
  - RBA

IMS Records User Data Scrub Utility (DFSKSCR0)

The IMS Records User Data Scrub utility (DFSKSCR0) performs a scan of all of the IMS logs. The utility deletes those record parts that might contain sensitive or confidential customer business transaction information, in particular, X'01', X'03', X'4002', X'50', X'5901', X'5903', X'5950', and X'67'. The deletion does not compromise the integrity or the content of the vital IMS system data. This scrub is useful when you must send IMS log data to an outside organization for analysis.

IRLM Lock Trace Analysis Utilities (DFSKLTA0, DFSKLTB0, DFSKLTC0)

IRLM Lock Trace Analysis consists of three programs (DFSKLTA0, DFSKLTB0, and DFSKLTC0) that run serially to perform IRLM Lock Trace Analysis. DFSKLTA0 is run first to create the control file of global data management block (DMB) numbers and their respective database names. DFSKLTB0 is then used to create the lock wait detail and summary records. DFSKLTC0 formats and prints the information and creates the optional output data set.

The IRLM Lock Trace Analysis utilities can be useful in finding database or application issues that impact transaction response times by causing frequent and long lock waits.

You can save the report to a data set, which you can then sort using either the knowledge-based log analysis ISPF tools or an editor's SORT command. The IRLM Lock Trace Analysis panel provides some pre-defined sort options, such as Sorted by Database Name and Sorted by RBA.

Log Record Processing Rate Analysis Utility (DFSKRSR0)

The Log Record Processing Rate Analysis utility (DFSKRSR0) is used to generate reports that summarize the volume of log data that is being generated by an IMS subsystem. The volume of log data is expressed in number of records per second and number of bytes per second. The detailed log record processing rate data is broken down by log record type, and by subtype within record type, if requested.

The Log Record Processing Rate Analysis utility can be used to:

- Determine the size of log data sets or archiving frequency
- Track data volume for Remote Site Recovery (RSR)

Selection criteria for the DFSKRSR0 trace table entries can include:

- Log record type

- Subtypes within log record types
- Time range data
- Log sequence number ranges
- Number of records to be processed or skipped

Log Summary Utility (DFSKSUM0)

The Log Summary utility (DFSKSUM0) can create a summary of the content of the log data sets, characteristics of the IMS system that produced the log data (when statistical log records are present), and some statistical information related to transactions, programs, and databases. The Log Summary utility also includes the following information:

- Input IMS logs used for the utility execution
- IMSID
- First and last Log Sequence Number (LSN) in the log
- Time stamp (UTC) and local time of the first and last log record
- Difference between UTC and local time (HHMM format)
- Elapsed time on selected logs
- Total number of log records in the log data set
- Presence of internal trace record, system restarts, dump log record, and system checkpoint
- Number of log records present for each record ID
- Statistics related to individual transactions, programs, and databases
- Gaps in the log

MSC Link Performance Formatting Utility (DFSKMSC0)

The MSC Link Performance Formatting utility (DFSKMSC0) uses the IMS MSC link trace log records to provide information about link response times, which can be used to help isolate performance problems with MSC links. You can specify either of the following types of analysis:

Detail The Detail Selection routine (DFSKBST0) produces a report that contains the individual response times in milliseconds of every send data and receive data for each MSC link that is traced.

Summary

The Summary Selection routine (DFSKMSCD) produces a report that contains the average response time in milliseconds of the total number of send data and receive data values for each link trace.

The enhanced log formatting routines produce formatted output only if the IMS input logs contain X'6701' records generated using the /TRACE SET ON LINK*link#* command.

RECON Query of Log Data Set Names Utility (DFSKARC0)

The RECON Query of Log Data Set Names utility (DFSKARC0) analyzes the RECON data sets to find appropriate log data set names. Based on the control statements that you provide, it can determine the following information:

- Data set names for OLDS, SLDS, or PRILOG data sets
- The names for the primary or secondary log data sets
- The volume serial numbers for these data sets

The logs can be selected by any or all of the following parameters:

- Starting date and time
- Ending date and time

- SYSID

Information from the RECON data sets can be extracted from either of the following places:
- The RECON data sets themselves, when available on the system that executed DFSKARC0
- A pre-existing report generated by the DBRC LIST.LOG command

Statistic Log Record Analysis Utility (DFSKDVS0)

The Statistic Log Record Analysis utility (DFSKDVS0) processes the X'45' log records that are generated at each IMS checkpoint and formats a report that is a verbal description and interpretation for all of the fields contained in the X'45' log record, including its subcodes. This information can be used to look for bottlenecks within the IMS system or to detect trends in internal resource usage that can help to determine if tuning is necessary. You must use the /CHECKPOINT STATISTICS command to ensure that the X'45' log record contains the information required for this enhanced formatting.

Trace Record Extract Utility (DFSKXTR0)

The need for information for problem diagnostics or accumulation of statistics drives trace table logging, which often generates a large number of records. The Trace Record Extract utility (DFSKXTR0) reads an IMS log data set (OLDS or SLDS) or trace data set (DFSTRAxx) to produce a subset of information that meets specific selection criteria.

Unlike DFSERA10, which searches entire log records for specific strings, DFSKXTR0 searches individual trace table entries using selection criteria. Trace table entries are relatively small, 32- or 64-byte entries. Although the data in the entries can vary depending on what is specifically being traced, the structure is a constant eight words of data.

Search criteria is entered as a paired specification identifying the word, half word, or byte to be examined, and the associated data value. Optionally, the entire log record containing the matching trace table entries can be extracted as well.

After searching the trace table entries, DFSKTXR0 stores the entries that match selection criteria into new log records. These new log records can subsequently be passed to the DFSERA60 exit routine for formatting.

Selection criteria for the trace table entries can include:
- Trace table IDs
- Character string searches at the trace entry level
- Specific words, half words or bytes in the trace entries
- Time range data
- Entire log records to be matched
- Number of records during processing
- Mode of SCAN to read the log records without actual processing

Concepts

Knowledge-based log analysis does not introduce new concepts for IMS Version 9.

Requirements

Knowledge-based log analysis does not introduce new requirements for IMS Version 9.

Restrictions

All knowledge-based log analysis functions expect and process only IMS log data sets (OLDS, SLDS, and RSDS) or IMS trace data sets (identified by the DFSTRA01 and DFSTRA02 DD names in the IMS procedure).

Even though Common Queue Server (CQS) log records have a different format than IMS log records, the knowledge-based log analysis functions can process these log records (select the **CQS Log Selection** option from the Subcomponent Log Filtering panel).

Planning and Administrative Tasks

After you install the knowledge-based log analysis functions, you can customize your own knowledge-based log analysis environment (use the Define KBLA Environment panel). You can customize any of the following data-set information:

- The name of the IMS.SDFSRESL data set
- The names of the RECON data sets
- Space-related parameters for output data sets
- JOB statements for the generated JCL
- Output routing

You can also pre-verify that input data sets exist.

User Tasks

This section describes changes to IMS system definition and tailoring, operations, application programming, customization, utilities, and diagnosis.

Coding for System Definition and Tailoring

Knowledge-based log analysis does not introduce new or changed procedures or macros for IMS Version 9.

You establish the knowledge-based log analysis environment during IMS IVP using the Define KBLA Environment panel.

Operating

You can run the enhanced log formatting routines either through the knowledge-based log analysis ISPF interface or the File Select and Formatting Print utility (DFSERA10). The new log formatting routines are available in the IMS.SDFSRESL library.

Coding an Application Program

Knowledge-based log analysis does not introduce new or changed APIs for IMS Version 9.

Coding an Exit Routine

Knowledge-based log analysis introduces the following new exit routines for IMS Version 9: KBLA Log Formatting Modules (DFSKBLA3, DFSKBLA7, DFSKBLA8, DFSKBLA9, DFSKBLAK, and DFSKBLAS). These exit routines are based on the File Select and Formatting Print utility (DFSERA10).

Using a Utility

Knowledge-based log analysis introduces the following new utilities for IMS Version 9:

- DBCTL Transaction Analysis utility (DFSKDBC0)
- Deadlock Trace Record Analysis utility (DFSKTDL0)
- IMS Records User Data Scrub utility (DFSKSCR0)
- IRLM Lock Trace Analysis utilities (DFSKLTA0, DFSKLTB0, DFSKLTC0)
- Log Record Processing Rate Analysis utility (DFSKRSR0)
- Log Summary utility (DFSKSUM0)
- MSC Link Performance Formatting utility (DFSKMSC0)
- RECON Query of Log Data Set Names utility (DFSKARC0)
- Statistic Log Record Analysis utility (DFSKDVS0)
- Trace Record Extract utility (DFSKXTR0)

The new log formatting routines are available in the IMS.SDFSRESL library. You can issue them using the KBLA ISPF interface or you can use DFSERA10 JCL (using the EXITR= parameter).

Using a Diagnostic Tool

There are new messages for the knowledge-based log analysis environment.

Chapter 17. RACF Enhancements to Replace SMU

This chapter describes the IMS Version 9 RACF enhancements that replace the Security Maintenance utility (SMU). It includes the following sections:

- "Overview"
- "Planning and Administrative Tasks" on page 140
- "User Tasks" on page 141

Overview

IMS provides support for security features that are currently available through Security Maintenance utility (SMU) security, but were not available through the SAF interface. With these enhancements, you can convert completely to using RACF (or an equivalent product), and eliminate the use of SMU security.

Attention: IMS Version 9 is the last IMS release that will support SMU security.

The areas of SMU security that are replaced by SAF support include:

- Application Group Name (AGN) security.

  The IMS Version 9 security that replaces AGN is called Resource Access Security (RAS). RAS enables you to provide security protection by using either RACF, a new user exit routine, or both. The IMS resources that RAS security protects include transactions, PSBs, and LTERMs. The specific set of resources protected for each dependent region type is the same set of resources protected by the existing AGN support.

- Type-1 and type-2 Automated Operator Interface (AOI) security.

  With IMS Version 9, the AOI type-1 CMD call and AOI type-2 ICMD call can use SAF (RACF or equivalent product) and the Command Authorization exit routine (DFSCCMD0) for command security. You can also specify whether a particular transaction is allowed to issue the type-1 or type-2 AOI command calls.

- Terminal security for TCO.

  With IMS Version 9, you do not need to use SMU security to authorize commands from static terminals, including the TCO input LTERM DFSTCFI. Instead, you can call RACF (or an equivalent product) and the Command Authorization exit routine (DFSCCMD0), if it exists. To sign on a user ID to IMS, you can add a `/SIGN ON` command at the beginning of the TCO script and a `/SIGN OFF` command at the end. Any subsequent commands are checked by RACF (if requested) to determine if the signed-on user is authorized to issue the commands. The commands are then passed to the DFSCCMD0 exit routine.

  IMS uses the TCO CNT Edit exit routine (DFSTCNT0) to determine authorization for loading TCO scripts. IMS uses this exit routine instead of the Message Switching (Input) Edit exit routine (DFSCNTE0) when the message switch destination is DFSTCF. IMS does not use SMU security or RACF to determine authorization for loading TCO scripts.

Signon verification security of SMU security is also replaced by these enhancements. With IMS Version 9, you can specify signon-verification security for a VTAM or BTAM terminal during IMS system definition (in the TYPE and TERMINAL macros or the DFSDCxxx PROCLIB member).

Concepts

Resource Access Security (RAS) is the use of RACF (or an equivalent product) to limit the IMS resources that can be used by application programs and utilities executing in dependent regions.

Requirements

To use the enhancements described in this chapter, RACF must include the following four new RACF security classes as default classes:

- IIMS - Program Specification Block (PSB)
- JIMS - Grouping class for PSB
- LIMS - Logical terminal (LTERM)
- MIMS - Grouping class for LTERM

If these RACF resource classes are not already included in the default list of classes for RACF, or if you want to use class names that are different from the default names, you need to define them in the resource class descriptor table (CDT). To define a new resource class, run the RACF resource class macro, ICHERCDE. The procedure for adding classes to the class descriptor table is described in "Adding Installation-Defined Classes" in the *z/OS V1R4.0 Security Server RACF: System Programmer's Guide*.

Restrictions

You cannot use both AGN security and the new RAS security. If you specify both types of security, RAS is used.

Planning and Administrative Tasks

With IMS Version 9, you can authorize the following resources to be used by dependent regions:

- BMP regions
    - Transaction codes
    - PSBs
    - Logical terminals or transaction codes for OUT= specification
- MPP regions
    - Transaction codes
- IFP regions
    - PSBs
- JMP regions
    - Transaction codes
- JBP regions
    - PSBs
    - Logical terminals or transaction codes for OUT= specification

To control the application programs that are authorized to use a dependent region, group them under an application group name (AGN). The JCL that starts up a dependent region stipulates which group of application programs are eligible to be scheduled, if the AGN is known to the control region. Further validation restricts that region's use to PSBs, transaction codes, or LTERM names associated with the AGN.

An alternative to using AGN security is to use RAS security. By using definitions in RACF or equivalent product, you can use RAS security to control which IMS resources are used by each dependent region.

During MSC Link Receive processing, IMS no longer calls the SAF interface (RACF or an equivalent product) and Transaction Authorization exit routine (DFSCTRN0) before calling the TM and MSC Message Routing and Control user exit routine (DFSMSCE0).

User Tasks

This section describes changes to IMS system definition and tailoring, operations, application programming, customization, utilities, and diagnosis.

Coding for System Definition and Tailoring

The DFSDCxxx PROCLIB member has the following new initialization parameters:

- LOCKSEC

    This parameter allows you to specify that while processing /LOCK and /UNLOCK commands, IMS should call the SAF interface (RACF or an equivalent product) and associated user exit routines after the optional SMU calls. If the resource is not defined to RACF, or is defined and is authorized to the user, the command is processed. If the resource is defined to RACF but is not authorized for use, the command is rejected.

- MSCSEC

    This parameter allows you to specify the type of security for MSC link receive processing. You can specify transaction security checking for:

    – Link Receive directed routing
    – Link Receive non-directed routing
    – Link Receive directed routing and non-directed routing
    – No Link Receive security checking

    You can also specify how the security checking should be done: with RACF, with the Transaction Authorization user exit routine (DFSCTRN0), or both. When RACF is used, the check can be based upon the MSNAME, the CTL address space security, or the user ID of the inputting terminal. This second value can be overridden by the TM and MSC Message Routing and Control user exit routine (DFSMSCE0).

- SIGNON

    This parameter allows you to request that all static terminals be required to sign on.

IMS Version 9 provides a new execution parameter, TCORACF, to indicate whether RACF should be called to perform an authorization check of commands from a TCO script. Because the TCORACF specification is not included in an IMS checkpoint record, you can change the TCORACF value each time IMS restarts.

IMS Version 9 provides a new execution parameter, AOI1, to indicate which security product or tool (if any) is used for authorization of commands for type-1 AOI, and the level of security. You can choose from RACF, DFSCCMD0, SMU, and no authorization-security checking. Because the AOI1 specification is not included in an IMS checkpoint record, you can change the AOI1 value each time IMS restarts.

The following parameters and commands apply only to SMU support for type-1 AOI security:

- The TRANCMD= parameter of the SECURITY macro.
- The AOI1=S execution parameter.
- The `TRANCMDS|NOTRANCMDS` keywords for the `/NRE` or `/ERE COLDSYS` commands.

Specifying `TRANCMDS` for the restart command causes IMS to use SMU for type-1 AOI security, and overrides a value of TRANCMD=NO from system definition and any value for the AOI1= execution parameter. Specifying `NOTRANCMDS` for the restart command results in no type-1 AOI security, unless you specify TRANCMD=FORCE during system definition and that system definition specification is not overridden by the AOI1= execution parameter.

The TRANSACT macro includes a new parameter, AOI, to specify whether a particular transaction is allowed to issue the AOI command (CMD) calls, and how the authorization is to be done. Prior to IMS Version 9, this information was derived during IMS restart from the SMU tables. You can modify this specification by an online change for a transaction. The new AOI parameter also applies to type-2 AOI calls, such as ICMD. However, if AOI1=N is specified or defaulted to, transactions are still allowed to use type-2 AOI and issue the ICMD call.

With the AOI parameter, you can also specify two other types of authorization checking:

- Authorization checking that is based on which transactions can issue a particular command

  In this case, IMS commands (or the first three characters of the command) are defined as RACF user IDs. Transactions are defined as profiles in the TIMS class, and for each transaction, which commands it can issue.

- Authorization checking that is based on which commands can be issued by a particular transaction

  In this case, IMS transactions are defined as RACF user IDs. The commands (or the first three characters of the commands) are defined as profiles under the CIMS class, and for each command, the transactions that can issue it.

Security for type-1 AOI is initially defined during IMS system definition. The default value for the AOI1= execution parameter comes from the system definition setting. The values for the AOI1 execution parameter and the AOI parameter of the TRANSACT macro have the following interactions:

AOI1=S
> IMS uses SMU for AOI security:
> - IMS ignores a value of AOI=YES in the TRANSACT macro.
> - IMS uses values AOI=TRAN or AOI=CMD in the TRANSACT macro.

AOI1=R|C|A
> IMS does not use SMU for AOI security:
> - IMS uses all valid values for AOI= in the TRANSACT macro.

AOI1=N
> IMS does not use SMU for AOI security:
> - IMS ignores a value of AOI=YES in the TRANSACT macro.
> - IMS uses values AOI=TRAN or AOI=CMD in the TRANSACT macro.

Operating

For the `/LOCK LTERM|DATABASE|PROGRAM|TRAN` command and the `/UNLOCK LTERM|DATABASE|PROGRAM|TRAN` command, you can specify password security for the resource. The resources are defined to RACF in the LIMS, PIMS, IIMS, and TIMS classes.

Authorization errors with SMU generate IMS messages DFS066 or DFS067. Authorization errors with RACF generate different messages, such as ICH408I. Be sure to evaluate automated operations that process these authorization errors.

Coding Application Programs

The RACF enhancements to replace SMU do not introduce any changes for IMS application programs.

Coding Exit Routines

The user exit routine DFSISIS0 has been renamed in IMS Version 9 from the Resource Access Security exit routine to the Application Group Name (AGN) Security exit routine. Although DFSISIS0 has been renamed, its functionality remains the same.

IMS Version 9 includes a new user exit routine, called the Resource Access Security exit routine (DFSRAS00), to provide authorization of IMS resources to IMS dependent regions. This new exit routine is a replacement for the AGN support that is currently available with SMU security. However, this exit routine is not a direct replacement for the DFSISIS0 user exit routine.

The Resource Access Security exit routine is called after calling the SAF interface (RACF or equivalent product) to directly authorize the user to the actual IMS resources (transaction, PSB, or output LTERM name). The SAF call and user exit routine call is made based upon the specification of the parameters on the system definition SECURITY macro or the startup parameter ISIS. This new user exit routine is available for the DB/DC, DCCTL, and DBCTL environments, and does not support Callable Services.

The following additional data is passed to the TM and MSC Message Routing and Control user exit routine (DFSMSCE0): user ID, group name, and userid indicator.

During MSC Link Receive processing, the DFSMSCE0 exit routine controls the level of authorization checking:
* Authorization by MSNAME

  The ACEE is dynamically created for first authorization, then is reused.
* Authorization by CTL address space security
* Authorization by user ID of inputting terminal

  The ACEE is dynamically created and deleted for each authorization.
* Authorization by user exit routine (DFSCTRN0)
* No security authorization checking

If no DFSMSCE0 user exit routine exists, or no response is returned from the routine, authorization by the CTL address space security is the default.

Using Utilities

The RACF enhancements to replace SMU do not introduce any changes for IMS utilities.

Using Diagnostic Tools

There are new and changed messages and abend codes for the RACF enhancements to replace SMU.

Chapter 18. XML Database Support

This chapter describes the IMS Version 9 enhancements for XML database support. It includes the following sections:

- "Overview"
- "Planning and Administrative Tasks" on page 146
- "User Tasks" on page 147

Overview

IMS Version 9 allows you to store and retrieve XML data in IMS databases using a predefined mapping between the elements and attributes of an XML document and the hierarchic structure of the IMS database. Using the XML DB support provided by IMS Version 9, you can:

- Compose XML documents from data in existing IMS databases, including HDAM, HIDAM, HISAM, PHDAM, and PHIDAM databases.

  This composition allows you to support different types of transactions and data sharing, for example, business-to-business transactions and intra-organizational sharing of data.

- Store XML documents into new or existing IMS databases.

  You can store the XML documents in three different modes:

  Decomposed
  > The XML document is parsed using a schema, and element data and attributes are stored in fields in segments as normal IMS data.
  >
  > This mode is appropriate for "data-centric" documents, where you must process the data in the document as normal IMS data.

  Intact
  > The entire XML document is stored, with all of its tags and other XML syntax unchanged, in a single IMS segment.
  >
  > This mode is appropriate for "document-centric" documents, where you do not need to process the data in the document as normal IMS data, but you want to store the document centrally with the benefits and security provided by IMS.

  Mixed
  > Selected parts of an otherwise decomposed document are stored intact.

IMS Version 9 XML database support is provided as an extension to IMS Java. This support allows users to write Java applications to compose and receive XML documents in all of the environments that are supported by IMS Java: IMS Java JMP or JBP application programs, CICS application programs, DB2 stored procedures, or enterprise applications that run on WebSphere Application Server or WebSphere Application Server for z/OS.

XML database support allows you to use the XML Schema Definition Language to create an XML Schema that:

- Describes the mapping between a valid XML document and the underlying hierarchic IMS database.
- Describes the full set of valid incoming and outgoing XML documents.

You can automatically create the XML Schema that represents a given IMS database view (defined by a PSB, PCB, and its referenced DBDs) using the IMS Java DLIModel utility.

Concepts

The *eXtensible Markup Language* (XML) is a standardized, self-describing markup language for documents that contain structured or semi-structured information. XML is comprised of a set of tags (called *elements*) that are used to describe information in Unicode or EBCDIC text and organize that information hierarchically. XML technologies are used in the exchange and storage of application data, and to organize text-based documents.

A *root element segment* is the IMS database segment that corresponds to the root element of an XML document. This segment and its child segments are the source of the data for the target XML document. The root element segment need not be the root segment of the database.

An *XML Schema* defines a class of XML documents to express a shared vocabulary for these documents. The schema provides the means for defining the structure, content, and semantics of an XML document. The term *instance document* is often used to describe an XML document that conforms to a particular schema.

Requirements

IMS Version 9 XML database support requires:

- IMS Java Version 9
- IBM Software Development Kit (SDK) for z/OS, Java 2 Technology Edition, Version 1.3.1 or later

IMS Java and the DLIModel utility require Xalan-Java version 2.6.0 or later from the Apache Software Foundation (www.apache.org) XML Project (xml.apache.org), or equivalent code function. The Apache XML Project is a collaborative software development project that licenses open source software at no charge. The following open source files (or equivalent code function) are required by IMS Java and the DLIModel utility:

xercesImpl.jar
> XML parser that is required for IMS Java and the DLIModel utility

xalan.jar
> XSLT processor that is required for IMS Java to create XML and transform XML documents

xml-apis.jar
> XML APIs that are required for IMS Java and the DLIModel utility

IMS Version 9 XML database support does not require any changes to IMS databases.

Restrictions

IMS Version 9 XML database support does not allow you to define your own user-defined types (UDTs) or user-defined functions (UDFs) to process XML data. You use the APIs provided by IMS Java, including the support for character large objects (CLOBs) and the UDFs provided for processing XML data.

Planning and Administrative Tasks

To use XML database support for either retrieval or storage of XML documents:

- Run the IMS Java DLIModel utility to prepare the necessary schemas and databases.
- Run an IMS Java application program, running as a JMP or JBP, that retrieves or stores the XML documents using the JDBC API extensions.

User Tasks

This section describes changes to IMS system definition and tailoring, operations, application programming, customization, utilities, and diagnosis.

Coding for System Definition and Tailoring

XML database support does not introduce new or changed macros or procedures for IMS Version 9.

Operating

XML database support does not introduce new or changed operational procedures for IMS Version 9.

Coding Application Programs

XML database support for IMS Version 9 extends the existing SQL and JDBC interface of IMS Java to include support for character large objects (CLOBs) and user-defined functions (UDFs).

XML database support adds the following new API calls:

retrieveXML()

Retrieves an XML document from an IMS database. The required argument for this call is the desired IMS root segment, which must be in the path from the current segment. Mapping is controlled by the XML schema.

An application program issues a JDBC SELECT statement to retrieve an XML document from the database. The SELECT statement must identify the XML root element segment.

storeXML()

Inserts the specified XML document into an IMS database at the current position in the database. The document is inserted starting at a root element segment. Mapping is controlled by the XML schema.

An application program issues a JDBC INSERT statement to store an XML document into the database. When an XML document is inserted, a new root element segment is created and added to the database together with its family of segments to store the entire XML document.

Before you can insert an XML document in a database, you must establish the position within the database (unless the root element segment is also the database root segment). Use the WHERE clause of the INSERT statement to establish position in the database based on the parent of the XML root element.

Depending upon information in the XML Schema, the document is stored decomposed, intact, or mixed. If the document requires a key, it can be supplied by the XML Schema or by the application program.

To delete an XML document in a database, an application program deletes the root element segment of the document. There is no new API call for deletion.

You cannot directly update parts of an existing XML document in a database. To update a document, you must retrieve the XML document, modify it, delete the root segment of the XML document in the database, and then reinsert the modified XML document back into the database.

Coding Exit Routines

XML database support does not introduce new or changed exit routines for IMS Version 9.

Using Utilities

Use the IMS Java DLIModel utility to generate an XML schema that corresponds to an existing IMS database view. The utility can generate an XML schema that matches the provided PCB. The inputs are the same as those required to generate an IMS Java metadata class. The outputs can include zero or more XML schemas (one for each PCB in the parsed PSB) and an IMS Java metadata *.java* file that represents the PSB.

Using Diagnostic Tools

There are no new or changed messages or abend codes for XML database support.

Part 3. Previously Available Features and Enhancements

This part describes the functions and features that are available with IMS Version 8 and IMS Version 7.

Chapter 19. Overview of IMS Version 8 Enhancements

This chapter introduces the enhancements made to IMS Version 8. It includes the following sections:

- "IMS Database Enhancements"
- "IMS Transaction Manager Enhancements" on page 156
- "IMS System (TM and DB) Enhancements" on page 158
- "IMS Installation Configuration Enhancements" on page 164
- "Performance Considerations" on page 164
- "IMS Tools Enhancements" on page 164

Related Reading: For complete information about the changes and enhancements to IMS Version 8, see the *IMS Version 8: Release Planning Guide*.

IMS Database Enhancements

This section describes the major IMS Version 8 enhancements to the IMS Database Manager.

Batch Resource Recovery Service Support

Batch programs can now use the operating system's Resource Recovery Services (RRS) to manage 2-phase commit processing. This support is extended to both IMS DB and DB2 batch programs. This enhancement was provided in IMS Version 7 via the service process.

As a result of this support, these batch programs can use the MQSeries product with coordinated commit processing. In addition, this support is being utilized by the IMS DataPropagator for asynchronous, near-real time, IMS-to-DB2 propagation.

Related Reading: For more information about the IMS DataPropagator, see *IMS DataPropagator: An Introduction* or go to the following Web address:

www.ibm.com/software/data/db2imstools/imstools/imsdprop.html

CSA/VS Relief

In order to relieve common storage area (CSA) and virtual storage (VS) constraints, IMS Version 8 is using less private and common storage below the 16 MB line. The system PSTs (Partition Specification Tables) and other IMS blocks have been moved to private and common storage above the 16 MB line.

Database Image Copy 2 Enhancements

The Database Image Copy 2 (DFSUDMT0) utility has been enhanced to be able to:

- Image copy multiple DBDSs during a single running of the utility. The image copies are taken in parallel, thus decreasing the amount of time it takes to perform an image copy.
- Accept the specification of database group names.
- Create multiple image copies in the same output data set.
- Increase performance through the use of the new OPTIMIZE option.
- Issue an image copy complete notification by group or database name.

The Database Image Copy 2 enhancements are being delivered through the service process.

Benefits

The Database Image Copy 2 enhancements can help simplify operations when taking image copies. If clean image copies of all DBDSs in a database or DB group are being taken, you can stop (/DBR) the database or DB group, run one image copy job to copy all of the DBDSs in the database or group, then start (/START) the data base or DB group when the utility indicates that all image copies are logically complete.

DBRC Enhancements

There are seven major DBRC enhancements for IMS Version 8:

- 16 megabyte recovery control (RECON) data set record size
- Automatic RECON loss notification
- Batch DBRC command authorization support
- DBRC HALDB commands
- Elimination of several DBRC/IMS abends
- Prilog compression enhancement
- Maximum number of members allowed in CA groups and DBDS groups has been changed

16 MB RECON Record Size

Prior to IMS Version 8, the record size for RECON data sets was limited by the type of DASD the RECONs were defined on and was limited to a maximum of approximately 800 kilobytes. As of IMS Version 8, DBRC sets the record size to 16 megabytes.

Automatic RECON Loss Notification

When an I/O error occurs on a RECON data set and a spare data set is available, the instance of DBRC that noticed the error copies the good RECON to the spare, activates the spare, and deallocates the original RECON data set. Prior to IMS Version 8, the other DBRC instances would not be informed of the reconfiguration of the RECONs until their next access to the RECONs. They would continue to hold allocation to the original (discarded) RECON. The original RECON could not be deleted and redefined until all DBRC instances deallocated it. This potentially could take a long time.

As of IMS Version 8, the first DBRC automatically notifies the other DBRCs about the reconfiguration and the discarded RECON gets deallocated. The RECON can then be deleted and redefined as the spare.

Batch DBRC Command Authorization Support

When a DBRC command is issued, DBRC verifies that the user is authorized to issue the command and make changes to the RECON data. Prior to IMS Version 8, any user who was authorized to access the data in the RECON data set had the authority to manipulate the data in the RECON.

As of IMS Version 8, you can use RACF (or an equivalent product), a user-written exit, or both to control who is authorized to manipulate (using DBRC commands) the data in the RECON. With this enhancement, DBRC verifies whether or not a user is authorized to issue the batch DBRC command by checking the user authorization of the command resource that is associated with the batch DBRC command.

DBRC HALDB Commands

Prior to this enhancement, the only way to change or delete High Availability Large Databases (HALDBs) was to use the HALDB Partition Database utility. Now you can perform the following tasks using DBRC commands:

- Change the attributes of a HALDB (`CHANGE.DB`).
- Change a partition's attributes (`CHANGE.PART`).
- Create a HALDB using high key values even when the DBD was generated with a partition selection exit module name.
- Delete a partition (`DELETE.PART`).
- Delete a HALDB (`DELETE.DB`).
- List additional information about a HALDB partition (`LIST.RECON`).

Related Reading: For the details of this enhancement, see the *IMS Version 8: DBRC Guide and Reference*.

Elimination of DBRC/IMS Abends

There are three areas that used to cause abends that no longer do so:

- Deallocation processing

  DBRC will not abend during deallocation processing if the ALLOC record is not found or if the ALLOC record already has a deallocation time. Instead of the abend, error messages will be issued, a dump is taken, and the status for the database area is set to "Prohibit further authorization".

- Authorization processing

  DBRC will no longer abend if the SUBSYS record becomes larger than the RECON physical record size. With the support of RECON records up to 16 megabytes in size, the SUBSYS record is written as multiple RECON record segments.

- Database I/O error

  DBRC will no longer abend if the recording of an extended error queue element (EEQE) causes the database data set record to exceed the RECON physical record size because of record segmenting.

PRILOG Compression Enhancement

The efficiency of PRILOG record compression has been increased. Compression will now be attempted more frequently than was the case prior to IMS Version 8. Compression will be attempted whenever an online log data set (OLDS) archive job is run. For Remote Site Recovery (RSR), this is when the tracking log data set is opened.

Benefits

The IMS Version 8 DBRC enhancements provide more flexibility and efficiency while providing greater integrity.

- Now that DBRC is not constrained by the defined maximum record size of the RECON data set, the availability of IMS is increased by virtually eliminating the potential for outages caused by the PRILOG record growing too large.
- The RECON loss notification enhancement allows you to recover more quickly from a RECON failure.
- The new batch DBRC command authorization support helps you protect the integrity of the information stored in the RECON data set. This support controls the authorization of batch DBRC commands used to change the information in the RECON.

- By eliminating some DBRC/IMS abends, your IMS system can have increased availability.

Fast Database Recovery Enhancement

The Fast Database Recovery (FDBR) function of IMS Version 8 has been enhanced so that the FDBR region will wait for the active IMS (rather than abend) if FDBR queries the XCF and finds that the active IMS has not yet joined. The system operator will now have a choice in this instance; either to RETRY after the active IMS is started, or to CANCEL, which will terminate the FDBR region.

Fast Path Enhancements

Fast Path has been enhanced for IMS Version 8 as follows:

- Shared VSO has been enhanced to provide:
  - System-managed rebuild of a VSO structure.
  - Automatic altering of a VSO structure size.
  - System-managed duplexing of VSO structures.
- DEDBs can now have up to 2048 areas.
- DEDBs can now be defined as "non-recoverable" in DBRC.

Benefits

Shared VSO Benefits

- System-Managed Rebuild

  System-Managed Rebuild of a VSO structure allows you to migrate a VSO structure from one coupling facility to another for planned reconfiguration without taking the VSO structure offline. When multiple structures reside in a coupling facility, a single `SETXCF START,REBUILD,CFNAME=cfname` command can be used to migrate all structures from one coupling facility to another. This eases system manageability; for example, by migrating every structure in a single command instead of taking each individual VSO structure offline using a `/VUNLOAD` command and migrating other non-VSO structures using a different command (such as a `SETXCF` command).

- Automatic Altering of Structure Size

  Automatic altering of structure size support allows OS/390 to dynamically expand or contract the size of a structure. With Auto Alter support, OS/390 expands or contracts structure allocation based on actual storage usage in a coupling facility. For example, OS/390 can dynamically contract the size of a VSO structure with the PRELOAD option when there is free space and you explicitly request `ALLOWAUTOALTER(YES)` for the structure in a CFRM policy. Any unused storage for a PRELOAD VSO structure is wasted if it is not reclaimed.

- System-Managed Duplexing

  System-Managed Duplexing allows you to have dual VSO structure support without defining both primary and secondary structures to DBRC and in CFRM; rather, only the primary structure is defined. Duplexing operation is transparent with the exception of requesting duplex mode in a CFRM policy and allocating additional resources for a secondary structure instance.

DEDB Area Enhancement Benefits

With the 240 area restriction for DEDBs removed, you can enjoy greater storage capacity in each DEDB. The greater number of areas available can also lead to greater design flexibility.

Non-Recoverable DEDBs Benefits

By defining DEDBs as non-recoverable, you can improve online performance because the logging and checkpointing of the data associated with these DEDBs is suppressed.

HALDB Single Partition Enhancement

This enhancement enables utilities and applications to process or access a single partition while not affecting any other partition in the HALDB. This controlled access is achieved by the use of a new data definition (DD) statement (with a ddname of DFSHALDB) in the JCL of the batch job, the Batch Message Processing (BMP) dependent region, or the Java Batch Message Processing (JBP) dependent region.

Related Reading: For more information about the DFSHALDB DD statement, see the *IMS Version 8: Installation Volume 2: System Definition and Tailoring*.

Java Enhancements

IMS DB has been enhanced in the areas of Java standards, JDBC access to IMS data, and Java tooling.

Java Standards

IMS provides support for the new Java standards as they evolve. JDBC 2.0 enhancements include support for Updatable ResultSet and limited reverse cursors. SQL enhancements to IMS DB data includes support for aggregate functions (MIN, MAX, and so forth) and scalars.

JDBC Access

JDBC access to IMS DB data is provided for Java applications running in OS/390 WebSphere Application Server, CICS Transaction Server/390, and DB2 for OS/390 Java stored procedures applications. This access is in addition to the access available from IMS TM Java applications that run in the new JMP or JBP regions.

Java Tooling

IMS introduces a new utility called DLIModel, which automatically constructs the required IMS Java "metadata class" from PSB and DBD source. In IMS Version 7, the user was responsible for creating this class manually. The utility allows information on additional fields, long Java-style names, and data types to be supplied from user-coded control statements, and from XMI descriptions (or both) of COBOL copybook members. The utility can produce XMI descriptions of databases that conform to the Object Management Group's Common Warehouse Metamodel 1.1. This new utility eases development of Java applications and JDBC access to IMS DB.

ODBA Security Enhancement

Now you can secure any program specification block (PSB) on an APSB call from an Open Database Access (ODBA) application program using the OS/390 System Authorization Facility (SAF). If you use RACF, you must use RACF 1.9.2 or later to gain the benefits of APSB SAF security.

To support this enhancement, a new parameter (ODBASE=) has been added to the DBC and IMS procedures.

Related Reading: For more information about this enhancement, see the security section in the *IMS Version 8: Administration Guide: System*. For complete information about the ODBASE= parameter, see the *IMS Version 8: Installation Volume 2: System Definition and Tailoring*.

Parallel Database Processing Enhancement

Prior to IMS Version 8, IMS DB performed database authorization, allocation, and open and close processing in a serial manner. IMS DB now performs these tasks using multiple OS/390 threads. For systems with a large number of databases, this enhancement can reduce the amount of time required to reopen the databases after an outage and return the system to a steady state, thus increasing system availability.

This function is provided as part of the IMS DB base and is totally controlled by IMS.

Remote Site Recovery Enhancement

The IMS Remote Site Recovery (RSR) function has been enhanced to provide coordinated disaster recovery for IMS and DB2.

Other Database Manager Enhancements

Please see "IMS System (TM and DB) Enhancements" on page 158 for additional enhancements to the IMS Database Manager.

IMS Transaction Manager Enhancements

This section describes the major IMS Version 8 enhancements to the IMS Transaction Manager.

APPC/IMS Enhancements

APPC/IMS has been enhanced in the following ways:
- A new parameter (CPUTIME) has been added to the TP Profile data set (which is maintained by the operating system) to specify the number of CPU seconds that a CPI-C program is allowed to run before being terminated. This limits the time that resources are locked up due to a possible error in the program causing it to loop endlessly.
- The /START and /DELETE commands have been enhanced to allow you to define (or delete) LU 6.2 descriptors to IMS while it is running.
- The /CHANGE command has been enhanced to allow you to change the outbound LU using the new OUTBND keyword.

Benefits
The STIMER support for CPI-C transactions helps prevent looping programs so that the resources are not tied up.

Every LU defined for the IMS can serve as the outbound LU instead of only having the APPC BASE LU.

APPC/OTMA Enhancements

Prior to IMS Version 8, only the front-end IMS system could process implicit APPC synchronous messages or OTMA Send-then-commit (CM1) messages.

For IMS Version 8, the previously mentioned restriction has been eliminated. In addition:

- The `/DISPLAY ACTIVE` command now shows the status of the APPC/OTMA shared-queue enablement.
- New MSC and RRS trace tables have been added to help in diagnosing problems.

The APPC/OTMA enhancements are being delivered through the service process.

Benefits

Customers want the ability to input a message on any of the external interfaces and have that message distributed and executed on any IMS system within the sysplex. In order to achieve this, both asynchronous and synchronous transactions need the ability to use shared queues. The shared queue enablement for asynchronous transactions is already supported. This enhancement extends that support to synchronous transactions.

Coupling Facility Duplexing Support

IMS is providing support for z/OS Coupling Facility (CF) Duplexing function for IMS Shared Message Queue structures and IMS Fast Path Expedited Message Handler (EMH) structures. When CF Duplexing is enabled, z/OS creates a duplex copy of the structure for failure recovery. If the IMS Shared Queues structure or the EMH structure fails or if a connection to the structure is lost, z/OS switches to the unaffected structure instance without the overhead of a structure rebuild.

CF Duplexing also enables System-Managed Rebuild. z/OS does the structure rebuild for a planned reconfiguration (that does the structure copy) even if no IMS Common Queue Server (CQS) is currently running. IMS CQS-managed rebuild is still needed to address Coupling Facility failure, structure failure, or loss of connectivity.

Related Reading: For the details of this enhancement, see the *IMS Version 8: Common Queue Server Guide and Reference*.

Java Enhancements

IMS TM has been enhanced in the areas of Java standards and new Java dependent regions.

Java Standards

IMS provides support for the new Java standards as they evolve. JDBC 2.0 enhancements include support for Updatable ResultSet and limited reverse cursors. SQL enhancements to IMS DB data includes support for aggregate functions (MIN, MAX, and so forth) and scalars.

Java Dependent Regions

The Java dependent regions enhancement introduces two new dependent regions where message-driven and non-message-driven IMS Java applications can run. These new regions use the new IBM technology for Persistent Reusable Java Virtual Machines (JVM) to speed up the processing of Java applications and provide a serially reusable JVM that can be reset to a known state between transactions.

JDBC Access to IMS Data

JDBC access to IMS DB data is provided for Java applications running in CICS Transaction Server/390, and DB2 for OS/390 Java stored procedures applications. This access is in addition to the access available from IMS TM Java applications that run in the new JMP or JBP regions.

OTMA Enhancement

The OTMA Input/Output Edit Exit (DFSYIOE0) has been enhanced to work better with shared queues and the MQSeries product. For more information, see the *IMS Version 8: Customization Guide*.

Sysplex Terminal Management Enhancements

For IMS Version 8, IMS TM has been enhanced to use the new Resource Manager (RM) to maintain IMS resource information in a sysplex environment. By having the resource information available to other IMSs in the sysplex, the following is achievable:

- Resume work for VTAM terminals and users if their local IMS fails.
- Eliminate VTAM Generic Resources terminal affinities.
- Provide resource type consistency.
- Provide name uniqueness.
- Provide global callable services for node, LTERM, and user resources.

Other Transaction Manager Enhancements

Please see "IMS System (TM and DB) Enhancements" for additional enhancements to the IMS Transaction Manager.

IMS System (TM and DB) Enhancements

This section describes the major IMS Version 8 enhancements to the IMS system (TM and DB).

Dynamic LE Runtime Parameters Enhancement

This enhancement allows you to dynamically update Language Environment (LE) runtime parameters for an IMS application. By having this ability, it is also easier to use the Debug tool for application testing. LE parameters can be changed without requiring CEEROPT and CEEUOTP to be changed, reassembled, and rebound.

Command and Keyword Enhancements

For IMS Version 8, there are enhancements to existing commands and keywords as well as new commands and keywords. Most of the changes are a result of the introduction of the IMS Version 8 IMSplex (including a Common Service Layer). In an IMSplex, the format, behavior, and responses to certain IMS commands have changed. Some IMS commands are no longer recoverable, others are no longer supported. These changes have ramifications for operators and automated operator application programs.

Related Reading: For complete information about the changed and new commands and keywords, see the *IMS Version 8: Command Reference* and the *IMS Version 8: DBRC Guide and Reference*.

Execution Parameter Enhancements

Related Reading: Complete information on the execution parameters can be found in the *IMS Version 8: Installation Volume 2: System Definition and Tailoring*.

IVP Enhancements

The following list describes the enhancements to the IMS Version 8 Installation Verification Program (IVP) dialog.

- SMP/E installation processing has been removed from the IVP dialog. The complete SMP/E installation information is contained in the *Program Directory for Information Management System Version 8*. This change was made as a result of the packaging and installation changes made to IMS Version 8. To support the removal of the installation processing:
  - The IVP was renamed. In IMS Version 7, this dialog was known as the INSTALL/IVP dialog.
  - The following jobs were removed from the install process; DFSIVJ01, DFSIVJ02, and DFSIVJ03.
  - The SMP/E ("B") jobs were removed from the dialog.
  - The IVP panels and online help have been updated to reflect the removal of the SMP/E processing from the dialog.
- The IVP includes a new application that verifies the installation of the Common Service Layer and the installation of the TSO SPOC application. The new sample application are the IVP "O" steps. These steps verify and demonstrate:
  - Samples of the IMS.PROCLIB members for OM, RM, and SCI
  - Starting and stopping OM, RM, and SCI
  - Starting and using the TSO SPOC application
- The IVP is providing a new sample application that demonstrates using the Syntax Checker. This new application is the IVP "E" step. This sample demonstrates using the Syntax Checker to migrate an IMS Version 7 DFSPBxxx PROCLIB member to IMS Version 8.
- The IVP includes a Fast Path option on sample applications. You can now include or exclude Fast Path in the IVP sample applications.
- The IVP now includes HALDB samples for IMS DB/DC and DBCTL.

RACF Abend Suppression Enhancement

The RACF abend suppression enhancement prevents a RACF 483-4C ABEND from causing the abnormal termination of an IMS system. This event can occur during a user sign-on (or equivalent request) where there is an invalid index block in the RACF database. Now, when this invalid block exists, a sign-on request fails with a message and a new reason code, rather than terminating IMS. This enhancement improves the availability and serviceability of the IMS system.

System Management Enhancements

As IMS systems are joined together into sharing groups (sharing databases, resources, or message queues) in a sysplex environment, system management becomes more complex. Prior to IMS Version 8, the IMSs that were in sharing groups had to be managed individually. IMS Version 8 builds upon the idea of an IMS Sysplex (known hereafter as an IMSplex) to help reduce the complexity of managing multiple IMSs in a sysplex environment.

Definition: An IMSplex is one or more IMS address spaces (control, manager, or server) that work together as a unit. Typically (but not always), these address spaces:
- Share either databases or resources or message queues (or any combination)
- Run in a S/390 Parallel Sysplex® environment
- Include an IMS Common Service Layer (CSL - new for IMS Version 8)

The address spaces that can participate in the IMSplex are:
- Control region address spaces
- IMS manager address spaces (Operations Manager (OM), Resource Manager (RM), Structured Call Interface (SCI))
- IMS server address spaces (CQS)

Examples: Examples of IMSplexes are:
- A set of IMS control regions at the V6 or V7 or V8 level without a CSL that are sharing data or sharing message queues
- A set of IMS control regions at the V8 level with a CSL that are sharing data or sharing message queues
- A single IMS control region at the V8 level with a CSL (for example, you might want the CSL for commands or the new DBRC function). This still qualifies as an IMSplex because it is a set of IMS address spaces (IMS control, CQS, SCI, OM, RM) working together.

To support IMSplexes, a number of IMS functions have been enhanced and a number of new functions have been added.
- The Base Primitive Environment (BPE) has been enhanced
- The Common Queue Server (CQS) has been enhanced
- A new component, the Common Service Layer (CSL), is introduced consisting of the following three subcomponents:
  - Operations Manager (OM)
  - Resource Manager (RM)
  - Structured Call Interface (SCI)
- A TSO-based single point of control (SPOC) application program is shipped with IMS Version 8
- The IMS terminal management function of IMS TM has been enhanced
- A new coordinated online change function (of the Resource Manager) has been added to coordinate global online change activities of all the IMSs in the IMSplex

The following sections briefly describe the enhancements that support the new IMSplexes.

BPE Enhancements

The BPE functional enhancements support the new OM, RM, and SCI components. These enhancements include:
- Four new fields in the standard BPE user exit parameter list (BPEUXPL)
- Two new BPE-owned user exits
- A new optional keyword, STATINTV, in the BPE configuration PROCLIB member
- A new BPE-owned trace table type "HASH"
- A new optional keyword, COMP, in the EXITDEF statement in the BPE exit list PROCLIB member

- Externalizing the contents of the existing CQS log record type X'60C0'
- A new BPE command, `DISPLAY VERSION`, which displays the version number of both the IMS component and the BPE

In addition to the functional enhancements for IMS Version 8, the BPE information is now in a separate book from that of CQS information. For IMS Version 8, you will find all the information pertaining to BPE in the *IMS Version 8: Base Primitive Environment Guide and Reference*.

CQS Enhancements

In addition to the functional enhancements for IMS Version 8, the CQS information is now in a separate book from that of BPE information. For IMS Version 8, you will find all the information pertaining to CQS in the *IMS Version 8: Common Queue Server Guide and Reference*.

The CQS enhancements support the Resource Manager (RM), a new address space introduced in IMS Version 8. RM uses the CQS to access a new Coupling Facility list structure called a resource structure. The resource structure is optional and when used, it contains global resource information for uniquely named resources.

The CQS enhancements that support resource management include:
- Coupling Facility ENTRYKEY list structures for containing resources.
- One new request (CQSUPD) and five modified requests to access resources on a resource structure.
- CQS already supports Structure Alter for queue structures. For IMS Version 8, CQS supports resource structures and these new resource structures support the Structure Alter function.
- Structure Rebuild, a process that copies the contents of a resource structure to a new structure.
- Structure Duplexing, which provides resource structure backup.
- Structure Repopulation, a process by which CQS clients repopulate a failed resource structure.
- CQS's exploitation of OS/390's structure full monitoring capability, which helps you avoid a structure full condition.

Common Service Layer

The Common Service Layer (CSL) is new for IMS Version 8. The CSL's components (the OM, RM, and SCI) provide the infrastructure for an IMS Version 8 IMSplex. Each of OM, RM, and SCI runs in separate address space.

Operations Manager: The Operations Manager (OM) provides a single system image for system operations in an IMS Version 8 IMSplex. The OM:
- Routes IMS commands to IMSplex members that are registered to process those commands
- Consolidates command responses from individual IMSplex members into a single response for presentation to the command originator
- Provides an application programming interface (API) for the automated control of commands to the IMSplex
- Provides user exits for command and response edit and for command security reasons

Resource Manager: The Resource Manager (RM) helps manage resources that are shared by multiple IMS systems in an IMSplex. The RM provides an infrastructure

for managing global resources and coordinating processes across the IMSplex. The RM maintains resource information using a resource structure on a coupling facility.

Structured Call Interface: The Structured Call Interface (SCI) is the part of the CSL that provides the communications infrastructure of the IMSplex. Using the SCI, IMSplex components can communicate with each other within a single OS/390 image or from multiple OS/390 images. Individual IMSplex members do not need to know where the other members are running. The SCI is responsible for routing requests and messages between the IMS control regions, OMs, RMs, CQSs, and other IMSplex members in the IMSplex.

Control Center for IMS

The Control Center for IMS provides another graphical interface for the new Operations Manager through IMS Connect, easing IMS operations. The Control Center provides a single user interface from which you can control both IMS and DB2. The IMS Control Center capability is integrated with the DB2 Universal Database (UDB) administrative tools for Fix Pack 1.

The administrative tools include a Control Center for navigating IMSplex systems, wizards for creating the new IMS Version 8 IMSplex commands, and a results window for sorting and filtering single-image command results. The tools also include a Command Center for typing and issuing both IMSplex commands and the old operations commands. IMS Connect is being enhanced (through the service process) to allow the Control Center for IMS to communicate with the IMS Version 8 Operations Manager.

Coordinated Online Change

One of the complexities of running multiple IMS systems in an IMSplex is managing online change processing for all those IMS systems. Prior to IMS Version 8, you had to perform online change to each individual IMS in the IMSplex. An important part of managing an IMSplex from a single point of control is to be able to coordinate global online change processing among all the IMSs in the IMSplex. This enhancement allows you to do just that.

The Coordinated Online Change enhancements are being delivered through the service process.

Local Online Change

In addition to providing the new Coordinated Online Change function, the System Management enhancements affect local online change as well. Some of these effects are:

- When you perform a local online change and have IMS Version 8 running with a CSL (and a resource structure is defined), changes to resources will occur in RM as well as the local IMS.
- The new QUERY MEMBER command can show local online change status.

Related Reading: For complete information about the QUERY MEMBER command, see the *IMS Version 8: Command Reference*.

Syntax Checker

The Syntax Checker is a new IMS ISPF application that assists you in defining and maintaining the IMS DFSPBxxx PROCLIB members. It checks the validity of parameters and their values based on what version of IMS you run it on. In addition, it provides detailed help text at the parameter level and identifies new

and obsolete parameters. The Syntax Checker assures the parameter information is valid prior to either the initial IMS startup or a restart of IMS.

TSO Single Point of Control Application

One of the new functions delivered with IMS Version 8 is the ability to manage a group of IMSs (an IMSplex) from a single point of control (SPOC) application. With IMS Version 8, IBM is delivering a TSO SPOC application. Using the TSO SPOC application, you can:

- Issue commands to all the IMSplex components
- Display consolidated responses from those commands
- Send a message (using the /BROADCAST command) to an IMS terminal that is connected to any IMS in the IMSplex

Terminal Management Enhancements

As mentioned in "Sysplex Terminal Management Enhancements" on page 158, IMS TM has been enhanced to use the new Resource Manager (RM) to maintain IMS resource information in a sysplex environment. By having the resource information available to other IMSs in the sysplex (the IMSplex), the following is achievable:

- Resume work for VTAM terminals and users if their local IMS fails
- Eliminate VTAM Generic Resources terminal affinities
- Provide resource type consistency
- Provide name uniqueness
- Provide global callable services for node, LTERM, and user resources

Transaction Trace Enhancement

This enhancement provides you with the ability to trace a transaction (an IMS TM unit of work) through multiple subsystems, which, in turn, helps with diagnosing problems. IMS Version 8 works with the transaction trace facility of the operating system to enable this function. This function requires OS/390 APAR number OW50696.

The trace points provided are
- IMS entry
- IMS exit
- DL/I entry
- DL/I exit

Use a Workload Manager (WLM) Classify command to determine whether or not a particular unit of work is eligible for tracing. If specified, a transaction trace token is passed along in the message prefix, which affects logging. To accommodate the token, the IMS message prefix size has been increased by 8 bytes.

The steps involved in tracing a transaction are:
1. Start the transaction trace with a filter using the OS/390 TRACE command.
2. Run the transactions.
3. Stop the transaction trace and dump the data space.
4. Use IPCS to view the transaction trace records.

Related Reading: For more information about tracing IMS transactions, see *OS/390 MVS Diagnosis: Tools and Service Aids*.

IMS Installation Configuration Enhancements

The following list describes the major IMS Version 8 installation and configuration enhancements:

- SMP/E jobs were removed from the IVP dialog.
- SMP/E RECEIVE, APPLY, and ACCEPT processing is now used for installing IMS and processing service.
- DFSJCLIN, DFSJIDLT, and DFSJIRLT are no longer provided as jobs.
- Changes were made to packaging of non-required user exits.
- There are new target library for ++SRC elements.
- Macro names changed.

Performance Considerations

When you implement an IMS Version 8 IMSplex (with a Common Service Layer), the configuration that you choose can affect performance. For the best performance, IBM recommends one RM, OM, and SCI for every IMS in the IMSplex. If you use less (for example, only one RM for the IMSplex), performance could be affected.

IMS Tools Enhancements

IBM Data Management tools are specifically designed to enhance the performance of IMS and DB2. These tools have been upgraded and enhanced in order to work with IMS Version 8.

Related Reading: For complete information about these tools, go to the following Web address:

www.ibm.com/software/data/db2imstools

Chapter 20. Overview of IMS Version 7 Enhancements

This chapter lists the changes and enhancements made to IMS Version 7. It includes the following sections:

- "IMS Database Enhancements"
- "IMS Transaction Manager Enhancements" on page 166
- "IMS Installation Configuration Enhancements" on page 169
- "IMS DBRC Enhancements" on page 170
- "IMS System (TM and DB) Enhancements" on page 172
- "IMS Version 7 Small Enhancements" on page 173
- "Performance Considerations" on page 182

<u>Related Reading:</u> For complete information about the changes and enhancements to IMS Version 7, see the *IMS Version 7: Release Planning Guide*.

IMS Database Enhancements

This section describes the major IMS Version 7 database changes.

High Availability Large Database (HALDB)

Prior to IMS Version 7, DL/I databases are limited in size because segments of the same type must be in the same data set with the maximum data set size limited to 4 GB for VSAM and 8 GB for OSAM. HALDB allows DL/I databases to grow much larger. A HALDB is a partitioned DL/I database. Partitioning a database allows the use of smaller elements that are easier to manage. Multiple partitions decrease the amount of unavailable data if a partition fails or is taken offline.

HALDB allows the grouping of DL/I database records into sets of partitions that are treated as a single database while permitting functions to be performed independently for each partition. Each HALDB partition has the same capacity limit as a DL/I non-HALDB database. Like a DL/I non-HALDB database each partition may consist of up to 10 data sets, however the number of data sets selected will then apply to all the partitions in that HALDB. This allows a large amount of data to be contained in a single partition.

Benefits
This section describes the benefits of the HALDB enhancement.

HALDB provides:

Capacity increase	Each partition can be equivalent in size to one DL/I non-HALDB database and one HALDB can support up to 1001 partitions.
Availability increase	Partition independence leaves more data available because a particular partition can be taken offline while the rest of the partitions in the HALDB remain available.
Manageability	Smaller sections of the database are easier to manage.
Usability	Reorganized databases can be immediately usable

after image copies have been created because neither Prefix Resolution or Prefix Update utility processing is required. The ISPF-based HALDB Partition Definition utility processing simplifies partition definition.

IMS Monitor Enhancements

Benefits

This section describes the benefits of the IMS Monitor enhancements.

You can use the IMS Monitor to generate reports that describe the activity of a particular IMS system in detail and in summary, over a particular period of time for many performance-related measurements. These reports can include information on buffer pool activity, latch usage, region activity, system IWAIT activity, communications activity, and database activity, including Fast Path. Together these reports provide the information necessary for a precise understanding of how the IMS system performed during the monitoring period – the transactions it was running, and how its resources were being utilized – so that you can tune IMS for improved performance. In addition, handling of IMSMON's BLKSIZE and BUFNO attributes are substantially improved.

IMS Transaction Manager Enhancements

This section describes the major IMS Version 7 transaction manager changes.

CQS Enhancements

The CQS enhancements include the following support:
- Multiple client support to allow customers to better utilize a single CQS address space.
- An optional time stamp parameter is provided for the CQSBRWSE and CQSREAD requests to allow a client to obtain the time stamp that indicates when a data object was placed on a queue. A parameter is also provided for the CQSPUT request to allow a client to specify a time stamp when placing a data object on a queue.
- Run-time parameter support for these request macros:
    CQSDISC
    CQSMOVE
    CQSPUT
    CQSREAD
    CQSRECVR
- A parameter for the CQSQUERY FUNC=QTYPE request to allow a client to obtain information about all or some of the objects on the cold queue.
- A STRSTAT function for the CQSQUERY request to allow a CQS client to obtain structure statistics without coding a user exit routine.
- A modification that enables CQS to keep structure checkpoint statistics.
- A parameter for the CQSBRWSE FUNC=BROWSE,QTYPE=COLD request to allow a client to obtain the original client queue name when browsing the cold queue.
- A parameter for the CQSBRWSE FUNC=BROWSE,QTYPE=COLD request to optionally return the locking client ID.

Benefits

This section describes the benefits of the CQS enhancements.

- Multiple client support allows customers who have multiple clients on the same central processor complex (CPC) to use the same CQS address space. CQS allows up to 32 different clients to use a single CQS address space to access one or more coupling facility structures.

- An additional optional time stamp parameter on the CQSBRWSE and CQSREAD requests allows a client to obtain the time stamp that indicates when a data object was placed on a queue. Adding the parameter to the CQSPUT request allows a client to specify a time stamp that might be different from the current time being used when placing an object on a queue.

- Additional run-time parameter support makes it easier for a developer of a CQS client to code CQS requests. A single invocation of the macro can be coded instead of coding a separate macro for each possible parameter value.

- A new parameter added to the CQSQUERY FUNC=QTYPE request allows a client to obtain information about some or all of the objects on the cold queue.

- A new STRSTAT function added to the CQSQUERY request allows a CQS client to obtain structure statistics without coding a user exit routine.

- Adding a new parameter to the CQSBRWSE FUNC=BROWSE,QTYPE=COLD request allows a client to obtain the original client queue name when browsing the cold queue.

- Adding a new parameter to the CQSBRWSE FUNC=BROWSE,QTYPE=COLD request allows a client to obtain the client ID that originally read the data object.

Java Virtual Machine (JVM) Dependent Regions

IMS TM now provides a standalone JVM environment in which a Java application can run. This enhancement adds two new types of IMS TM dependent regions:

- A JMP region type for message-driven Java applications. This new region is similar to an MPP region except that you can schedule only a JVM application in this region.

- A JBP region type for non-message-driven Java applications. It is similar to a non-message-driven BMP region except that you can schedule only a JVM application in this region.

TM and MSC Message Routing and Control User Exit Enhancements

The TM and MSC Message Routing and Control User Exit enhancements affect these IMS components:

- Multiple Systems Coupling (MSC)
- Data Communications (DC)
- Advanced Program to Program Communication (APPC)
- Open Transaction Management Access (OTMA)
- Queue Manager (QMGR)
- Message Requeuer (MRQ)

Benefits

This section describes the benefits of the TM and MSC Message Routing and Control User Exit enhancements.

The TM and MSC Message Routing and Control User Exit enhancements provide these benefits:

- A considerable improvement to the functionality and ease of use of the MSC exits, giving you the maximum routing control that IMS/MSC can tolerate.
- The MSC Exits:
  - DFSNPRT0- Input Message Routing
  - DFSCMLR0/DFSCMLR1- Link Receive
  - DFSCMPR0- Program Routing

  have been combined into a common TM and MSC Message Routing and Control user exit module named DFSMSCE0. This was done to make MSC coding and maintenance easier and to reduce the number of MSC exit modules.
- A consistent set of routing capabilities are supported across all the exit entry points (or functions). Support is provided for routing all types of messages across these three points of control:
  - Terminal/Message Input
  - MSC Link Input
  - Application Program Output
- In the new user exit a common parameter list interface, and linkage interface to the various entry points (or functions) are provided.
- The capability is provided for the exit to append an optional user prefix segment to MSC messages for use by the MSC exits to communicate and control user customized routing needs.
- New entry points (functions) are provided: such as control at IMS initialization, control of messages in an MSC intermediate system, and application program inserts to a non-modifiable PCB. All the entry points (functions) are optional through a user-coded vector table at the beginning of the common exit module.
- The continued operation of the old exit routines (DFSCMTR0, DFSNPRT0, DFSCMLR0/DFSCMLR1, DFSCMPR0) is allowed. They continue to function on prior supported releases of IMS (such as IMS 6.1 and below). The new exit (DFSMSCE0) operates in IMS 7.1 and above. Both the old and new exits operate in an MSC network with IMSs of different releases.
- MSC routing exit serviceability is enhanced to log routing errors and footprints in the message to indicate which exits rerouted the message.

Rapid Network Reconnect

Rapid Network Reconnect support is initialized and activated based on two new IMS execution parameters:

- Rapid Network Reconnect to select the option and establish an IMS system default level of support for the terminal definitions.
- PSTIMER to define the maximum time for session persistence following an IMS or ACF/VTAM failure.

Note: RNR is not supported on a system configured with XRF and will result in a warning message that execution will continue with RNR disabled.

Benefits
This section describes the benefits of the Rapid Network Reconnect enhancement.

The Rapid Network Reconnect design provides the following performance improvements:

- Improved performance for ACF/VTAM persistent session tracking

  RNR allows ACF/VTAM supported terminals to be defined with either session initiation or termination level of persistence or an active session send or receive

level of persistence. The IMS network is defined to use only session initiate or terminate tracking (RNR=ARNR or NRNR). This represents a significant savings in ACF/VTAM coupling facility storage and access associated with full session tracking for a transparent level of session reconnect.

- Improved IMS termination time for unplanned outages

IMS termination is serialized with ACF/VTAM CLOSE ACB processing. Previously, the ACB close process was serialized with termination of all active sessions associated with the ACB. Using ACF/VTAM persistent session support, all sessions remain active allowing immediate closure of the ACB which can result in significant performance improvement for the termination time of IMS.

RNR supports additional definition for sessions that should not persist or those that should automatically reconnect after failure and restart. In support of faster termination of the ACB, RNR defers the session termination for these terminals until IMS restarts. The IMS scheduled session CLSDSTs overlap with the end of the subsequent IMS restart process where system load is minimal.

- Minimized performance impact to IMS

Use of RNR results in some performance degradation. Using either the NRNR or ARNR option minimizes performance degradation.

IMS Installation Configuration Enhancements

This section describes the major IMS Version 7 installation configuration changes.

IVP Enhancements

The IVP Enhancements provide the following:
- Support for ISPF/PDF CUA® 89
- Support for DFSMS constructs: management class, data class, and storage class

Support for the interactive system productivity facility (ISPF) or program development facility (PDF) common user access (CUA) 89 changes the style of the panels that Install/IVP displays. The panels have the same look and feel as panels for other IBM products.

Support for Data Facility Storage Management Subsystem (DFSMS) constructs allows jobs that allocate data sets to use DFSMS classes instead of specifying volume id, block size, and other allocation values.

Support for ISPF/PDF CUA 89

The IMS Install/IVP application displays information using ISPF panels. Occasionally, line mode messages are produced.

The ISPF panels follow the design guidelines for the "Text Subset of the Graphical Model" as specified in "CUA Basic Interface Design Guide."

In summary, these are the CUA requirement guidelines:
- The process sequence must be *object-action*. Users select an object, and then select an action to apply to that object.
- The presentation includes panels and pop-up panels that support the following:
  - An action bar
  - A panel title
  - A work area

- A message area
- A command area
- A function key area

Benefits

This section describes the benefits of the IVP enhancements.

The IVP enhancements provide these benefits:

- Changes to the Install/IVP panels ensure that they conform to CUA standards.
- Additional support for DFSMS constructs makes installation easier for sites that use SMS-managed volumes.

Packaging Enhancements

These are the packaging modifications:

- IMS macro libraries have been consolidated.

  Except for optional price features (ETO, RLT, and DLT), macros from all features have been moved into base System Services.

  IMS macro libraries GENLIB, GENLIBA, GENLIBB are combined into a single distribution macro library ADFSMAC. The corresponding macro target library is SDFSMAC.

- IMS source libraries have been consolidated.

  The IMS source libraries DBSOURCE, SVSOURCE, and TMSOURCE have been combined into a single source distribution library: ADFSSRC.

- OS/390 data sets follow a naming standard.

  This enhancement changed the IMS distribution and target library names to follow the OS/390 data set naming standard. IMS uses ADFS for the data set name prefix of the IMS distribution libraries and SDFS for the data set name prefix of the IMS target libraries.

- Concept-14 macros have been removed from the IMS macro library.

  Concept-14 macros are assembler macros that provide structured programming construct. Since High Level Assembler provides more current versions of these macros, IMS now uses the concept-14 macros supplied by HLASM.

Benefits

This section describes the benefits of the Packaging enhancements.

By following the OS/390 naming convention, IMS data sets are now consistent with other OS/390 products.

Combining the data sets, especially having a single macro library, improves the serviceability and maintainability of IMS.

IMS DBRC Enhancements

This section describes the major Version 7 IMS DBRC changes.

DBRC Concurrent RECON Upgrade

When a new release of IMS is installed, the new release must be able to access existing RECON data that was created by a previous release. Prior to this enhancement, all IMS activity needed to be shut down to upgrade the RECON to a new release. This enhancement allows you to migrate to the new release of IMS without shutting down all IMS activity to upgrade the RECON data sets.

Benefits

This section describes the benefits of the DBRC Concurrent RECON Upgrade enhancement.

With concurrent upgrade support, users with DBRC Version 6 can upgrade the RECON without stopping pre-V7.1 subsystems while those subsystems are accessing the RECON.

DBRC Image Copy GENMAX

Previously, when DBRC found it necessary (because of the recovery period specification) to retain more ICs than the user's GENMAX setting specified, it would increase GENMAX on its own, and it didn't restore the original value when the excess of ICs was gone. With this enhancement, GENMAX does not change unless you change it (with `CHANGE.DBDS` command). If GENMAX is lowered using the `CHANGE.DBDS` command, the new GENMAX value is recorded regardless of whether the oldest image copies cannot be deleted because they are within the recovery period.

Benefits

This section describes the benefits of the DBRC Image Copy GENMAX enhancement.

GENMAX remains where you set it.

DBRC Support for PROCOPT=L|LS

Previously, the processing options (PROCOPT) on a data set declared in a PCB could be used in associated application programs. To load a database, PROCOPT=L or PROCOPT=LS is used. Changes made to a database were not logged while the database was being loaded. To recover this database, you needed to have taken an image copy after the database was loaded.

Benefits

This section describes the benefits of the DBRC Support for PROCOPT=L | LS enhancement.

Enhancements to Large RECON Record Support

Previously, installations that ran continuously operating online systems could experience DBRC and IMS abends when PRILOG or SSYS records exceeded the RECORDSIZE that was specified when the RECON data set was created. DBRC provided a warning when a PRILOG record was about to exceed the RECORDSIZE; however, you might have still been required to shut down the online system. DBRC provided no warning when a SSYS record was about to exceed the RECORDSIZE.

Benefits

This section describes the benefits of the Enhancements to Large RECON Record Support.

These enhancements provide an expanded set of warning messages about a record's size. Users can tailor the issuing of the warnings to suit their operating environment and avoid having to shut down the system.

DBRC Serviceability Enhancements

IMS DBRC serviceability has improved significantly by providing the following support:

- Improved ABENDU2480 error information and new message `DSP0300I` with enhanced error information.

  The new message provides information that is immediately useful to the system programmer and the IBM Support Center during diagnosis of an error. This message makes `DSP0307I` obsolete.

- The `LIST.DBDSGRP` command allows you to limit the listing of DBDSGRP records to those that contain at least one of a list of members that you specify.

- Improved DBRC trace information.

  The `CHANGE.RECON` command now includes a TRACEOPT parameter that allows you (under the direction of the IBM Support Center) to select expanded DBRC trace options.

  DBRC now provides reformatted internal and external traces.

- Enhanced message DSP0008I

  This message provides additional diagnostic information to identify the RECON record involved in a failure.

Benefits

This section describes the benefits of the DBRC Serviceability enhancements.

These serviceability enhancements help resolve IMS DBRC problems more quickly, decreasing system down time.

IMS System (TM and DB) Enhancements

This section describes the major IMS Version 7 system (TM and DB) changes.

BPE Enhancements

The BPE enhancements provide the following support:

- Command support for BPE as part of the overall IMS product architecture strategy to provide base services support in all new modular unit address space

- TRACETABLE commands to provide tracing level control similar to that available in the IMS address space

- USEREXIT commands to facilitate the 7-by-24 requirements of customers

Benefits

This section describes the benefits of the Base Primitive Environment (BPE) enhancements.

- Providing command support for BPE allows IMS components that are built using BPE services to define their own commands and command processing routines. It also provides support of BPE-owned commands that relate to BPE trace tables and user exits.

- Adding TRACETABLE commands improves service and diagnostics for address spaces that use BPE.

- Adding USEREXIT commands allows customers to make updates to their user exits for BPE-managed address spaces without restarting the address space.

MADS I/O Timing

Without the MADS I/O Timing enhancement, users experience excessively long wait times while an I/O request completes. This enhancement is designed to reduce wait times. When a RAMAC® disk array performs internal recovery processing, an IMS Fast Path transaction must wait until the recovery completes before the results of the I/O are returned. The time required for recovery completion can vary from a few seconds to a few minutes. This long wait time is referred to here as *long busy*.

After defining a LIST structure to the coupling facility and adding the MADSIOT keyword to the DFSVSMxx PROCLIB member, the long busy handling function is invoked when you start IMS. When the long busy handling function is suspended, you can restart it by issuing the /STA MADSIOT command. This enhancement introduces the /DIS AREA MADSIOT and/DIS AREA `areaname` commands.

Benefits

This section describes the benefits of the Multiple Area Data Sets (MADS) I/O Timing enhancement.

The MADS I/O Timing enhancement provides reduction of wait times for completion of I/O requests.

IMS Version 7 Small Enhancements

IMS Transaction Manager Small Enhancements

Associated Print Support

Associated printing is a technique used in a shared-queues environment for directing application program printer output to a specific printer node name. Printing requests cause application programs to queue data to different printers. Printer sign-on and signoff are required to change the user queue.

The associated printer does not receive an enqueued message from an application if the following conditions exist:
- The application resides in the backend of IMS
- The IMS backend is not configured to automatically logon the associated printer
- The IMS backend is separate from the frontend of IMS where the associated printer resides

This enhancement provides automatic logon of the associated printer so the message that is enqueued by an application running in a backend IMS system is delivered.

Benefits: This section describes the benefits of the Associated Print Support enhancement.

This enhancement ensures that print requests that originate from application programs residing on an IMS backend are received by the specified associated printer, which then delivers the message.

Deferred ACB Open

A new system option is provided that delays the queuing of VTAM logon requests until IMS is ready to accept logons. This change delays opening the VTAM ACB

until after the /START DC command processes. With the use of the new option, VTAM logon requests are rejected by VTAM until the processing of the /START DC command.

Benefits: This section describes the benefits of the Deferred ACB Open enhancement.

If you want the VTAM ACB open to be delayed until the /START DC command is processed you can now have the system programmer specify VACBOPN=DELAY in the DFSDCxxx member of IMS.PROCLIB.

ETO Enhancements

The previous limitations of ETO (autologon processing and LTERM assignment) are described below.

Pre-Version 7 Autologon Limitations

Previously, IMS autologon processing had the following limitations:
* Autologon parameters could not be changed for an existing user.
* Logging onto dynamic terminals interactively (/OPNDST or remote logon) temporarily disabled the autologon capability for that terminal.
* Autologon was not initiated immediately for associated print users who already had messages queued during sign-on of the interactive user.

Pre-Version 7 /ASSIGN Command Limitations

This enhancement improves autologon and printer support, reducing the need for operator intervention and monitoring.

In a static terminal environment, LTERMs are easily moved from one node to another by using the /ASSIGN command. This allows output to be sent to a working terminal when the original terminal is unavailable. Because static terminals are not deleted, these assignment changes are retained when session and IMS restart until the operator assigns the LTERM back to the original terminal.

In a dynamic terminal environment, it is more difficult to move LTERMs between terminals when a terminal is unavailable because:
* LTERMs cannot be assigned to nonexistent users.
* LTERM assignment changes are lost when the user and LTERM are deleted.

Benefits: This section describes the benefits of the ETO enhancements.

Enhancements to autologon processing include:
* Allowing autologon parameters to be changed dynamically for a user through the /CHANGE command
* Improving compatibility with printers that were started interactively
* Improving compatibility with associate printers

Enhancements to LTERM assignment processing include:
* Retaining LTERM assignment changes across session and IMS restarts
* Allowing dynamic creation of the target user on an /ASSIGN command

The benefit associated with the ETO descriptor limit increase is that customers will no longer experience an error message when the previous limit of 50 records is reached.

IVP Small Enhancements

These enhancements include the following changes:
- IMS/IVP service dependencies with IRLM have been removed.
- A SMP/E utility entry for link edits has been added.
- IVP sample jobs for year 2000 support have been updated.
- IVP sample jobs now add modules to the LPA correctly.
- The PDF keyword on INSTALL/IVP startup Clist has been deactivated.
- Support for Online Recovery Service (ORS) has been added.
- All letters are now required to be upper case in IMS/IVP jobs.
- CBIPO has been replaced by ServerPac.
- BYPASS(HOLDERROR(HIPER)) has been added to install/IVP steps that involve installing FMIDS.
- Inventory part problem in sample steps has been resolved.
- Recovery help text for Job IV_E204J has been clarified.
- A warning has been added to help text for Job IV_B502T.
- A DL/I partitioning example has been added.
- The Packaging enhancement's new data set naming standard is supported.

Benefits: This section describes the benefits of the IVP small enhancements.

Incorporating these small enhancements makes installation and maintenance of the product easier and reduces errors in the installation process.

MRQ Migration Fallback

This enhancement ensures that IMS and the Message Requeuer (MRQ) correctly process messages across supported IMS releases. Supported IMS releases are:
- IMS Version 6
- IMS Version 7

The supported MRQ release is Version 3.

Note: Version 2 continues to support IMS Version 5.

The MRQ Migration Fallback enhancement adds support to IMS Versions 5.1, 6.1, 7.1, and to MRQ Version 3 to manage the following items across supported IMS releases:
- Message queues
- Migrate and fallback messages

Migration messages are messages that are requeued from a lower IMS release to a higher one. Fallback messages are messages that are requeued from a higher IMS release to a lower one.

In addition, a number of limitations associated with processing messages with extended prefix segments are eliminated. Eliminating these restrictions ensures that internal message prefix information is not lost as messages are requeued by the MRQ or are sent as messages by IMS across releases. For example, message prefix

information is not lost when messages are sent to another IMS through the multiple system coupling feature (MSC) or shared message queues.

Benefits: This section describes the benefits of the MRQ Fallback enhancement.

MRQ Fallback enhancement ensures that migrate and fallback messages are requeued appropriately. It also ensures that internal message prefix information is not lost when messages are requeued or sent across IMS releases.

RACF PassTicket Support for VGR in an IMSplex

Benefits: This section describes the benefits of the RACF PassTicket Support for VGR in an IMSplex enhancement.

The user now has the ability to specify the APPLID to IMS to use for the call to RACF during sign-on. Since this ID can be specified as the same for all IMS systems in an IMSplex, the PassTicket creator can create a PassTicket that works on whichever IMS the terminal is routed to.

SLUP/ Finance Session Cold Termination

IMS starts a FINANCE or SLUP (SNA STSN) session *cold* the first time after an IMS cold start. All subsequent sessions for the same LU name are restarted *warm* until the next IMS cold start.

ETO allows dynamic creation of terminal and user control blocks at session cold start and does not delete them until the next IMS cold start. If a session requests parameters that are invalid, IMS creates a set of blocks that can never successfully get into session, these are *dead* blocks. The blocks remain in the system and are recovered after IMS checkpoints. After a number of invalid ETO requests, associated storage and IMS checkpoint or restart time for the dead blocks can become significant.

The /CHANGE command is extended to allow forced reset of FINANCE and SLUP terminal status to cold. No execution parameters, system definition or ETO descriptor changes for terminals are necessary. The command supports resetting the status for static system and ETO defined FINANCE and SLUP terminals.

Benefits: This section describes the benefits of the SLUP/FINANCE Session Cold Termination enhancement.

SLUP/FINANCE Session Cold Termination support allows ETO generated control blocks for FINANCE and SLUP terminals to be deleted during the IMS checkpoint process. RNR provides:
*   Significant performance improvements for IMS checkpoints and restarts
*   Significant reduction in storage requirements

Suppress SLU2 Negative Response

IMS protocols used for input from 327x hardware and follow-on emulation products result in a terminal PROG726 and keyboard lock response. This response is due to an SNA deviation implemented with the 327x DFT architecture. The suppressed SLU2 negative response provides an option to use modified SNA primary ERP protocols on SLU2 to prevent the PROG check and keyboard lock.

The SNA defined exception response that proceeds a primary ERP message is a planned and clearly-defined indication of an error. Some emulation packages or

associated customer applications could be sensitive to output data versus exception response as an indication of COMMIT versus ABORT by the host application.

A new IMS execution option, SLU2=EXR | NOEXR, is defined for the DFSDCxxx PROCLIB member. This option allows the installation to specify whether all IMS defined SLU2 terminals should be treated as though they are with, or without, DFT architecture. No SYSGEN or ETO descriptor changes are necessary since the option is IMS system wide. SLU2=EXR is the default and execution is unchanged from previous releases. SLU2=NOEXR suppresses the SNA exception response that proceeds an IMS error message. This prevents the terminal PROG check, keyboard lock, and allows IMS to send the DFSxxxx error message.

Benefits: This section describes the benefits of the Suppress SLU2 Negative Response enhancement.

The SLU2 terminal can choose not to receive a PROG check, have the keyboard lock, and allow IMS to send the DFSxxxx error message.

TM Serviceability

TM Serviceability is a collection of the following small enhancements:
- /DISP APPC command
- Use ATBVERS to Determine APPC/MVS Version
- APPC/OTMA User Message Control Error Exit Serviceability
- Shared DC, Writing Additional Trace Records

Benefits: This section describes the benefits of the TM Serviceability enhancements.

The TM Serviceability small enhancements make it easier to maintain and debug an IMS DC system.

USERID Clarification

An indicator is provided in the I/O PCB and to the response to the INQY call that can be tested by an IMS application program to determine whether the USERID field is a valid user ID. Additionally, a number of user exit interfaces are changed to provide a similar indication for the USERID field currently provided in the exit interface.

A new parameter is provided for the response to the INQY call with the ENVIRON subfunction, and for the input to the Build Security Environment user exit (DFSBSEX0). This parameter is the user ID for the dependent region address space. There are certain instances when security authorization calls can be done based upon the authority provided to this user ID. See the section on Authorizing Resource Use in a Dependent Region in the *IMS Administration Guide: System* for more information on when the user ID of the address space is used.

Benefits: This section describes the benefits of the USERID Clarification enhancement.

A method is provided to allow IMS application programs to determine if the USERID field is an LTERM name, and thereby know whether the user was signed on at the time that the transaction was entered.

The USERID value is also passed to several user exits. These exits often need to know whether the USERID value passed to the exit is a valid user ID.

VGR Affinity Management

IMS now provides an execution option that allows VTAM management of non-LU6.1 (ISC) generic resource affinities. This option applies to all non-ISC terminals when it is selected.

When the VTAM affinity management option is selected, IMS ensures that related non-ISC status conditions (such as conversation) response modes are reset at signoff or logoff for all types of session terminations or before the next logon or sign-on for IMS outages.

Benefits: This section describes the benefits of the VGR Affinity Management enhancement.

IMS Database Small Enhancements

ACB Enhancements

The ACB enhancements suppress automatic PSB rebuild when replacing DBDs with changes that do not affect PSBs. This enhancement also increases the maximum number of SENSEGs and PCBs allowed in a PSB. A PSB can now contain a maximum of 30,000 SENSEGs, a maximum of 1000 PCBs.

Benefits: This section describes the benefits of the ACB enhancements.

When parts of DBDs are changed that do not affect PSBs, the PSBs that use these DBDs are not automatically generated. This bypass reduces the time required for an ACBGEN and improves performance.

ACBGEN Time/Version for DEDBs

The ACBGEN Time/Version for DEDBs enhancement causes ACBGEN to append a time and version eye catcher to Data Entry Database (DEDB) and Main Storage Database (MSDB) blocks as they are placed or replaced in ACBLIB. This support for Fast Path databases is the same as that already provided for full-function databases.

Benefits: This section describes the benefits of the ACBGEN Time/Version for DEDBs enhancement.

Having time stamp and IMS version and release information included in the ACBs for DEDBs and MSDBs can assist system programmers in determining the causes of IMS database problems.

Fast Path I/O Toleration

The Fast Path I/O Toleration enhancement creates I/O toleration support for write errors in Fast Path databases.

Benefits: This section describes the benefits of the Fast Path I/O Toleration enhancement.

Improved database availability results from the implementation of the Fast Path I/O Toleration enhancement. Previously, a DEDB area data set that incurred more than ten write errors closed and was inaccessible by applications until after recovery was complete. CIs, for which write errors occur, now remain available for access and update by the subsystem which encountered the write errors.

Logger Area Enhancements

Previously, when IMS was in dual logging mode and one OLDS from each pair of OLDS failed, IMS reverted to single logging mode. The message issued when batch backout log verification failed did not indicate which data set or volume was in error and what was expected in its place. Also, the Batch Backout utility didn't support the DBRC CHECK17 option on log verification.

The Logger Area Changes enhancements:

- Provides the user with two action options if only two good pairs of OLDSs (in a dual logging mode setup) fail. The user can continue in degraded (single logging mode) or terminate. The choice is defined by the new option DEGRADE=YES/NO.
- Expands the error message that indicates that batch backout log verification has failed, which data set or volume is in error, and what was expected.
- Updates the Batch Backout utility to support the DBRC CHECK17 option on log verification.

Benefits: This section describes the benefits of the Logger Area Changes enhancement.

Users receive a more informative error message when batch backout log verification fails, and have the ability to select how IMS reacts to the loss of all pairs of OLDS in a dual logging environment. Also, batch backout will now support the DBRC CHECK17 option on log verification.

SDEP Scan Expands Compressed Data

SDEP Scan Expands Compressed Data enhancement (hereafter referred to as the SDEP Scan enhancement) improves IMS Fast Path database utilities so that compressed SDEP components can be processed in any environment.

Benefits: This section describes the benefits of the SDEP Scan Expands Compressed Data enhancement.

Because IMS lacked the function introduced by the SDEP Scan enhancement, IMS users bought and installed a product from a third party vendor to provide Scan utility support. The SDEP Scan enhancement extends the current IMS compression capability to the Fast Path Scan utility so that IMS no longer requires a third party product to expand the compressed SDEP segments.

IMS System (TM and DB) Small Enhancements

Displaying the IMS System Parameters

Benefits: This section describes the benefits of the Displaying the IMS System Parameters enhancement.

Users can now easily determine the parameter values used in the initialization of the control region for debugging purposes. Also, having the information in a message, rather than having to search for the information, enhances ease-of-use for the operator.

IMS ESAF Deadlock SNAP Record

Previously, when a DB2 deadlock was detected by the External Subsystem Attach Facility's (ESAF) message handler (module DFSESPR0) no deadlock report was generated in the X'67FF' SNAP record to identify the problem. Instead, DB2 simply

passed a return code to IMS, which then abended the application, making it
difficult and time-consuming to locate the source of the deadlock.

This enhancement improves upon the existing functionality by making it easier to
identify the source of the deadlock.

Benefits: This section describes the benefits of the IMS ESAF Deadlock SNAP
Record enhancement.

With the implementation of this enhancement, the IMS ESAF request handler
(module DFSESPR0) directs the IMS ILOG macro to log an *exceptional condition*
(X'67FF') SNAP trace record whenever it detects a deadlock condition.
Considerable time is therefore saved in identifying deadlock participants.

IMS ESAF Trace Enhancement

Previously, both the IMS External Subsystem Attach Facility (ESAF) trace and the
IMS Monitor trace were required to perform ESAF problem analysis. It was very
difficult (if not impossible) to determine which trace entries were associated with a
unit of work (UOW) in the IMS log.

This enhancement improves upon the existing functionality.

Benefits: This section describes the benefits of the IMS ESAF Trace enhancement.

With the implementation of this enhancement, ESAF trace contains all of the
information that is required to determine what problems occurred, and trace
entries are identifiable by the UOW recovery token. This enhancement to ESAF
traces includes the following:
* Writes a trace entry after an event, such as sign-on, has occurred
* Increases the ESAF trace entry size from 8 to 16 words in preparation for sysplex
  tracing
* Modifies trace records to include additional information
* Writes new trace entries

Queue Space Exit

Previously, when a user's conversational program inserted a message to a stopped
destination, the Queue Space Notification (QSN) exit routine (DFSQSPC0) could
not determine that the destination was stopped. A *stopped destination* was a stopped
conversational transaction or LTERM. As a result, messages were not delivered to
the destination and they stacked up in the queue. In severe situations, stacked
messages caused system failure by tying up system resources.

This enhancement informs the QSN exit routine that the destination is stopped,
which then determines whether or not to continue inserting messages. If the
insertion of messages stops, IMS passes a status of A7 to the user's conversation
application.

Benefits: This section describes the benefits of the Queue Space Exit
enhancement.

By informing the QSN exit routine that a destination is stopped, stacked messages
can be prevented, thus system resources are not tied up with undeliverable
messages. Application developers can also modify the QSN exit routine with their
own criteria defining when to continue and when to stop inserting messages to a
stopped destination.

RSR Migration/Coexistence

This enhancement enables the Remote Site Recovery function to process log data generated by all supported releases of IMS that also support RSR.

The RSR Migration/Coexistence enhancement consists of improvements to the following IMS components:

- Isolated Log Sender (ILS)
- Log Router
- Logger
- Full Function Database Tracker
- Fast Path Database Tracker

IMS users of the RSR function are now able to maintain disaster recovery function while migrating the systems participating in RSR to the Version 7 level. In particular, the RSR tracking IMS operating at the Version 7 level is now able to process log data that is created by active site IMS systems even if they run at pre-Version 7 levels. In addition, the gap fill process is also able to process log data that is created by active site IMS systems operating at pre-Version 7 levels. Finally, tracking site migration activities are non-disruptive to active site operation.

Benefits: This section describes the benefits of the RSR Migration/Coexistence enhancement.

RSR Migration/Coexistence affects changes in IMS Systems, DL/I and IMS Fast Path. It allows IMS users of the Remote Site Recovery function to migrate IMS systems participating in RSR to V7.1 without unnecessary service interruption. Additionally, breaks in disaster recovery protection are minimized throughout the migration process.

Shared EMH Follow-On

IMS/ESA Version 6 introduced shared Expedited Message Handler (EMH) processing in a sysplex environment. The Shared EMH Follow-on enhancement provides usability and performance enhancements to shared EMH processing.

Benefits: This section describes the benefits of the Shared EMH Follow-On enhancement.

The Shared EMH Follow-on enhancement improves efficiency in locating control blocks when many inflight messages exist.

Specifying CPLOG as an IMS Execution Parameter

Benefits: This section describes the benefits of the Specifying CPLOG as an IMS Execution Parameter enhancement.

Spool Enhancements

Spool enhancements address two existing problems: performance degradation and inability to auto-schedule prints of data sets in a sysplex environment:

Performance Improvement

> IMS allowed users to browse the spool data set (using TSO) as the data set was being written to by IMS. An end of file (EOF) mark after each message was written to delineate the end of the current data. The EOF marks were

overwritten by each write of a new record. The spool data sets were written to using the BSAM access method and the EOF marks were written by issuing a `Close Type=T` macro.

However, issuing `Close Type=T` results in extra writes, which can cause severe performance degradation. In some cases, up to seven I/Os were written to update a single record.

This enhancement significantly reduces the number of I/Os and thus improves performance.

Auto-Scheduling Prints of Data Sets

When using cloned IMS systems in a sysplex environment and the print utility had been auto-scheduled to print a spool data set that had filled up or switched, IMS generated the same spool print utility job name for each IMS. This prevented an IMS from auto-scheduling prints of spool data sets.

This enhancement allows variables to be specified through the *IMSWT=nnnnn* parameter that will be appended to the spool print job name that is auto scheduled. As a result, the job name will be unique.

Benefits: This section describes the benefits of the Spool enhancements.

Performance Improvement
Previously, spool support might have caused severe performance degradation in some cases. This enhancement significantly reduces the number of I/Os and thus improves the performance of the spool line.

Auto Scheduling Prints of Data Sets
As a result of this enhancement, auto-schedule spool print jobs in a cloned IMS SYSGEN in a sysplex environment have unique names and will therefore print.

Performance Considerations

This section describes the performance improvements and performance degradation that might occur as a result of changes to IMS Version 7.

Performance Improvements

* Improved performance for ACF/VTAM persistent session tracking

  Rapid Network Reconnect (RNR) allows ACF/VTAM supported terminals to be defined with either session initiation or termination level of persistence or an active session send or receive level of persistence. The IMS network is defined to use only session initiate or terminate tracking (RNR=ARNR or NRNR). This represents a significant savings in ACF/VTAM coupling facility storage and access associated with full session tracking for a transparent level of session reconnect.

* Improved IMS termination time for unplanned outages

  IMS termination is serialized with ACF/VTAM CLOSE ACB processing. Currently the ACB close process is serialized with termination of all active sessions associated with the ACB. Using ACF/VTAM persistent session support, all sessions remain active, thus allowing immediate close of the ACB which might result in significant performance improvement for the termination time of IMS.

  RNR supports additional definition for sessions that should not persist or automatically reconnect across failure and restart. In support of faster termination of the ACB, RNR defers the session termination for these terminals

until IMS restarts. The IMS scheduled session CLSDST(s) will overlap with the end of the subsequent IMS restart process where system load is minimal.

- Minimized performance impact to IMS

  Use of RNR will result in some performance degradation. This degradation is minimized when using either the NRNR or ARNR option.

- The time required for recovery of database data sets and areas under Online Recovery Service should be less than under existing IMS recovery procedures for the following reasons:

  - Log data sets recording log records during active allocation of the database data sets and areas undergoing recovery are read in parallel.
  - Multiple database data sets and areas are recovered simultaneously.
  - Shared database data sets and areas do not require a change accumulation step prior to running Online Recovery Service.

  Your experience will differ depending on your execution environment. The improvement in performance depends on the number of log data sets required for recovery, the number of tape drives and physical data paths made available to RCV; to read data sets, and the number of database data sets and areas being recovered.

- The elimination of change accumulation activity during normal operating hours can be beneficial to the performance of normal IMS activity as the resources normally required for change accumulation are made available for other uses.

- When parts of DBDs are changed that do not affect PSBs, the PSBs that use these DBDs are not automatically generated. This bypass reduces the time required for an ACBGEN and improves performance.

- The Shared EMH Follow-on enhancement improves efficiency in locating control blocks when many inflight messages exist, thereby providing usability and performance enhancements to shared EMH processing.

- This version of IMS significantly reduces the number of I/Os performed by spool support, thereby improving the performance of the spool line.

- Asynchronous messages from OTMA or APPC and system availability to process these messages will have a positive performance impact. This is because of workload balancing since asynchronous messages from OTMA or APPC can be distributed and run on any of the IMS systems with in the shared queues group.

- By reducing contention between batch and online DBRC systems for the RECON, system performance is improved. Batch jobs are now queued on a new resource name, rather than on the RECON resource name queue.

  Having two queues provides the online IMS DBRC a better opportunity to get the RECON data sets because it only contends with one batch job at a time, while all the batch jobs contend for the new resource queue.

- Enhancements to large RECON record support provides an expanded system of warning messages about a record's size. You can tailor issuing the warnings to suit your operating environment and avoid having to shut down your system.

- IMS performance when the MONITOR is ON with constraints (for example, it is limited to a subset of all databases or regions) will typically be somewhat improved as compared to when no constraints are in effect.

Performance Degradation

- IMS performance when the Monitor is ON will typically (without constraints or with limited constraints) be somewhat degraded in comparison to when the Monitor is OFF. The degree of degradation will vary to some extent with the scope of the monitoring being done.

- Use of RNR will result in some performance degradation. This degradation is minimized when using either the NRNR or ARNR option.

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