Licensed Program Specifications

IBM Information Management Software
Licensed Programming Specifications
Release: Version 11
Program Number 5635-A02

Information Management System (IMS™) Version 11 is a licensed program that operates under the IBM® z/OS® operating system. IMS includes an enterprise database server that provides hierarchical database management services and a strategic enterprise transaction server that provides data communications and transaction management services.

The IMS Version 11 Database Manager (IMS DB) provides database management for transaction managers such as IMS Version 11 Transaction Manager and Customer Information Control System (CICS®). The IMS Version 11 Database Manager processes concurrent database calls for a wide variety of applications.

Application programs access databases through IMS DB by using the IMS Universal drivers or Data Language/I (DL/I).

The IMS Version 11 Transaction Manager (IMS TM) provides a database-independent, transaction processing environment for database managers such as IMS Version 11 Database Manager and DB2 for z/OS.

The IMS Version 11 Transaction Manager:

- Manages an IMS TM terminal network.
- Stores and shares IMS message queues among multiple IMS TM systems, and routes messages between terminals and applications.
- Provides connectivity to other IMS TM subsystems and non-IMS TM subsystems.
- Provides connectivity and Web solutions by working with the IBM WebSphere® family of products.
- Schedules application programs to access IMS DB databases and DB2 for z/OS databases, and non-database files through the Generalized Sequential Access Method (GSAM).
- Provides system control facilities for system definition, restart, recovery, performance, and tuning.
- Runs continuously through the year, with no required shutdown for daylight saving time.

The IMS Version 11 Database Manager:

- Allows access to the data for multiple users from a single instance of the data.
- Controls concurrent access to the data to maintain integrity for all updates.
- Maintains only one instance of data while providing concurrent access to the data.
- Manages the physical location of the data. Application programs that access and manipulate the data do not need to know where the data resides.

Highlights of new functions

The following sections describe the new major functions of IMS Version 11.

IMS system (IMS Database Manager and IMS Transaction Manager) enhancements

This section describes the major enhancements for the overall IMS Version 11 system, including both the Database Manager (IMS DB) and the Transaction Manager (IMS TM).

ACB library enhancements

The Application Control Blocks library (ACBLIB) usability enhancements enable users to load the ACB members into 64-bit storage and, separately, create DFSMDA members for the dynamic allocation of the ACBLIB data sets.

/DIAGNOSE command enhancements

IMS Version 11 includes two new /DIAGNOSE command keywords and one new option that can help users streamline the problem determination process.

DFSPBxxx PROCLIB member change

IMS Version 11 always uses the Data Entry Database Resource Name hash routine (DBFLHSH0) for the routine that generates the

hash value used by IRLM. IMS ignores the value of the UHASH parameter of the DFSPBxxx PROCLIB member, even when the parameter is specified.

Dynamic abend dump formatting exit routine enhancement

IMS Version 11 dynamically installs its abend dump formatting exit routine; there is no need to install the DFSAFMD0 module as part of the IMS installation process. Registration of the abend dump formatting exit routine with the operating system is done automatically during IMS startup.

The abend dump formatting exit routine is registered dynamically only for IMS Version 11.

Extended Recovery Facility (XRF) enhancement

IMS no longer uses the DFSMS™ MULTACC parameter when opening an OLDS for an XRF-capable IMS.

IMS Interactive Dump Formatter enhancements

IMS Interactive Dump Formatter is enhanced in IMS Version 11 to allow the user to re-create the final part of an IMS log from the information that is available in an IMS dump, thus eliminating the need to request the final system log data set (SLDS) for diagnostic purposes.

The enhancements built into the IMS Interactive Dump Formatter in IMS Version 11 can build a log data set from the log records that reside in the dump's log buffers, potentially streamlining maintenance efforts.

IMS Installation Verification Program (IVP) enhancements

The IMS IVP is enhanced (through the service process) to support the Open Database enhancements and support the new BPE-based DBRC startup JCL.

The IVP dialogs are replaced when a new release of IMS is installed.

Knowledge-Based Log Analysis (KBLA) enhancements

IMS Version 11 provides two small enhancements to the Knowledge-based Log Analysis (KBLA) utilities. The first enhancement provides support for scrolling the KBLA ISPF panels, which facilitates access to the data entry fields, regardless of the screen size. The second enhancement enables multivolume KBLA output data set allocation. This enhancement can minimize the potential risk for exceeding the space allocated for an output data set, which might result in an abend.

RACF mixed-case password enhancement

IMS and IMS Connect are enhanced to handle mixed-case passwords in the same manner as the Resource Access Control Facility (RACF®) specification that pertains to mixed-case passwords.

IMS Version 9 is not capable of processing mixed-case passwords. IMS Version 10, as originally delivered, can process mixed-case passwords, but to enable this function, users must specify PSWDC=M for IMS and PSWDMC=Y for IMS Connect. The default values for IMS Version 10 are PSWDC=U (uppercase) and PSWDMC=N (not mixed-case).

The PSWDC and PSWDMC parameters are enhanced in IMS Version 11 (and IMS Version 10 with APAR/PTF PK80037/UK45982) with the 'R' specification, which means that IMS and IMS Connect will handle passwords in the same manner as RACF. In IMS Version 11, the 'R' specification is the default for both IMS and IMS Connect.

Syntax Checker enhancements

The Syntax Checker is updated for IMS Version 11 in the following ways:

- Support is added for the new IMS PROCLIB members that are delivered in IMS Version 11, such as CSLDCxxx and CSLDIxxx (for the new Open Database Manager (ODBM) address space) and the new BPE configuration member.
- A new **Display Keywords** option is added.
- The ability to insert a keyword at a user-specified line is added.
- A new **Edit** pull-down option is added.
- A new **Preferences** panel is added.
- The IMS PROCLIB member parameters that were supported in IMS Version 10 are updated to reflect the changes in IMS Version 11.

Type-2 command enhancements

IMS Version 11 introduces a number of new type-2 commands, which support the IMS strategy of moving towards using a single point of control (SPOC) application that issues type-2 commands through the Operations Manager (OM) API.

The new type-2 commands for IMS Version 11 support IMS TM and OTMA in the following ways:

- For IMS TM, the new QUERY commands extend the functionality of existing type-1 commands to logical terminal, node, user, and user ID resources in an IMSplex environment.
- For OTMA, the new type-2 commands enable monitoring of the messages in the OTMA send-then-commit (CM1) message queue and allow for dynamic modifications to IMS message routing.

User exit enhancements

User exit enhancements remove the need to stop and restart IMS so that it will recognize specific changed or new exit routines. A new REFRESH USEREXIT command, a new QUERY USEREXIT command (to query information about exit routines), and three new exit types (with sample exit routines) are available in this enhancement. These enhancements are delivered only through the IMS Version 11 service process.

Virtual Storage Constraint Relief enhancements

The IMS internal storage managing service, IMODULE, is updated to use 64-bit private storage, instead of 24-bit authorized private storage, for certain IMS functions.

IMS Database Manager enhancements

This section describes additional enhancements for the IMS Version 11 Database Manager (IMS DB).

Database quiesce enhancement

Database quiesce enables users to create a coordinated recovery point across an IMSplex without taking resources offline. Applications are given concurrent access to the resources instead of encountering an unavailable database. The resources that can use database quiesce are IMS Fast Path data entry databases (DEDBs), Fast Path areas, full-function databases, High Availability Large Databases (HALDBs), HALDB partitions, and database groups.

Users can use database quiesce to establish a *point of consistency* for a DEDB or a full-function database. The point of consistency is a time when no updates are pending for the database and the information that is stored on a direct access storage device (DASD) accurately reflects the current information that is stored in the database. When this point is reached, an image copy can be taken to later be used, if needed, to provide a quick method of recovering the database, database group, or area to such point.

Database reliability, availability, and serviceability enhancements

The three database reliability, availability, and serviceability enhancements are as follows:

APPC enhancement
If the LUMP or LUMC pools run out of storage, unpredictable results might occur. To address this situation, IMS Version 11 can automatically monitor LUMP or LUMC pool storage usage. If the either of the pools might run out of storage, IMS issues new messages (DFS1277W and DFS1278W) and tells APPC/MVS to reject all input for IMS. When an adequate amount of storage becomes available again, IMS issues message DFS1279I and tells APPC/MVS to resume input for IMS.

This enhancement automatically turns on LUMP and LUMC pool storage monitoring if the storage limit for both pools is specified as greater than 8 MB. If the limit is set to 2 GB (the maximum) or one of the pools is less than 8 MB, the monitoring is disabled.

GSAM XRST with an empty GSAM output data set
IMS Version 11 is enhanced to take an appropriate action when an Extended Restart (XRST) command is accidentally pointed to an empty GSAM data set. Pointing to an empty GSAM data set on restart can result in an I/O error and possible data loss. GSAM XRST now checks to determine if the GSAM output data set to be repositioned is empty, and if the data set is empty, GSAM XRST issues an IMS abend 0102 with reason code C4C30001 to prevent I/O errors and possible data loss.

Update to IMS abend 0845
If abend U0845 occurs, a new message DFS0894E is issued. The message content includes both a unique reason code and a short explanation of the problem, to help with diagnosis.

DBRC enhancements

DBRC in IMS Version 11 provides the ability to run on Base Primitive Environment (BPE) and also provides new serviceability options for the RECON data sets.

The following list describes the enhancements to the Database Recovery Control (DBRC) function for IMS Version 11:

- DBRC now has the option of running on BPE, which gives DBRC additional functionality.
- Users can override the access security for non-production copies of the RECON data set.
- With the appropriate authorization, users can use the CLEANUP.RECON command to remove obsolete information from the RECON data set.

Fast Path enhancements

The enhancements to Fast Path in IMS Version 11 introduce a 64-bit buffer manager, new options to open Fast Path areas, and new serviceability options.

The Fast Path 64-bit buffer manager autonomically controls the number and size of Fast Path buffer pools, which eliminates the need for system programmers to manually set buffer pool specifications during system definition. It also places the buffer pools for DEDB databases above the bar in 64-bit storage, potentially reducing the usage of extended common storage area (ESCA).

Fast Path usability enhancements provide IMS Fast Path users with diagnostic information in the Extended Partition Specification Table (EPST) segment work area.

Integrated IMS Connect enhancements for IMS DB

The enhancements to IMS Connect for IMS DB include support for the new IMS DB Universal drivers, the new CSL Open Database Manager (ODBM), and the DRDA® communications protocol.

In IMS Version 11, IMS Connect is the TCP/IP path to both IMS DB and IMS TM. IMS Connect clients can access IMS DB by using the open standard Distributed Relational Database Architecture™ (DRDA) specification, which supports distributed data management (DDM) Architecture commands.

As part of the new Open Database enhancements, IMS Version 11 provides new Java™ drivers, called the IMS Universal drivers, which can be used to access data stored in IMS. IMS Connect supports the IMS Universal drivers by using the DRDA protocol. The IMS Universal drivers provide a means by which independent software vendors can build packages that access IMS data.

ODBA enhancements

The ODBA interface has a new command for IMS Version 11: CIMS CONNECT. A single CIMS CONNECT command can initialize the ODBA interface and enable connection to multiple IMS DB systems.

Before IMS Version 11, ODBA applications had to use the CIMS INIT command to initialize the ODBA interface to be able to connect to an IMS DB system. If the application wanted to connect to multiple IMS DB systems, it had to issue multiple CIMS INIT commands, one for each IMS DB system.

The CIMS CONNECT command can be enabled to work with IMS Version 9 and IMS Version 10 ODBA applications if users install the following APARs:

- For IMS Version 9: PK66020
- For IMS Version 10: PK66022

Open Database enhancements

Distributed Java application programs in TCP/IP environments can use new IMS Universal drivers in IMS Version 11 to access any database that is managed by IMS DB on any logical partition (LPAR) in an IMSplex. Other enhancements also enable Open Database Access (ODBA) application programs, user-written IMS Connect client application programs, and user-written Open Database Manager (ODBM) client application programs to access such databases.

IMS Version 11 provides a new ODBM address space that can be used by ODBA application programs to manage the ODBA interface.

SNAP call facility (DFSERA20) enhancement

The SNAP call facility (DFSERA20) dump header now identifies known calling routines instead of listing them as unknown (UNK). Additionally, supervisor call (SVC) dumps are now generated, as intended, if an abend or status code has been specified or if a known calling routine calls without specifying an abend or status code.

IMS Transaction Manager enhancements

This section describes additional enhancements for the IMS Version 11 Transaction Manager (IMS TM).

IMS callout function

IMS Version 11 supports the ability to use the new OTMA type-2 commands for OTMA descriptors, and provides support for synchronous callout messages to use the new timeout functions.

IMS Version 11:

- Allows for creating, updating, and queuing of OTMA descriptors dynamically by using type-2 commands. These OTMA descriptors can be used for both synchronous and asynchronous callout messages.
- Can detect an OTMA transaction pipe (Tpipe) hang situation (after waiting for a specified amount of time, as specified in OTMA configuration information) for synchronous callout messages in which the client application failed to respond with a positive or negative acknowledgment message (ACK or NAK). In this situation, IMS rejects the synchronous callout message (with no reroute) and issues message DFS3494E to the system console. After the timeout processing has finished, the rest of the synchronous callout messages on the Tpipe can continue to flow.

Integrated IMS Connect enhancements for IMS TM

The IMS Connect enhancements for IMS TM provide:

- The ability to specify a connection-level super member
- Additional information in the HWSP1410W message
- Enforcement of the single port requirement for Secure Sockets Layer (SSL) sockets
- An option for leaving a connection open after returning a user-defined message from an IMS Connect exit routine
- The ability to modify input messages from TCP/IP before they are submitted to IMS Connect
- An elimination of the requirement to use different IMS Connect ports for instances of distributed WebSphere applications
- The ability to pass a transaction expiration time to OTMA in the message prefix
- Support for the Open Database APIs

OTMA enhancements

The OTMA function in IMS Version 11 contains the following enhancements:

- CM0 ACK timeout support

  The new CM0 ACK timeout support allows for detection of a hang condition in an OTMA transaction pipe. The user can reroute commit mode 0 (commit-then-send) transactions to a timeout message queue so that the remainder of the I/O PCB output on the transaction pipe can continue to flow normally.
- New OTMA type-2 commands
  - Provide the ability to monitor the messages in the OTMA send-then-commit (CM1) message queue to help spot potential problems.
  - Allow a user to dynamically create, modify, and delete OTMA descriptor entries for ALT-PCB output messages, which eliminates the need to restart IMS if a destination routing definition is changed.

TM and MSC Message Routine and Control User exit routine (DFSMSCE0) enhancements

The affinity support in the TM and MSC Message Routine and Control User exit routine (DFSMSCE0) is enhanced for IMS Version 11 in the following ways:

- The DFSMSCE0 user exit can route APPC/OTMA synchronous messages to a back-end IMS when the z/OS Resource Recovery Services (RRS) or the APPC/OTMA Shared Queues support (AOS) are not active.
- The IMSID affinity field in the DFSMSCEP user parameter list is increased from 4 bytes to 8 bytes to support XRF.
- A new status display value is added to the QUERY TRAN command that displays if the transaction is registered for affinity (STATUS=LCLAFFIN).

A new program routing entry point is also added to the DFSMSCE0 user exit. This entry point is called when an application program GU call is issued. The exit routine can retrieve or update a user prefix in the message prefix area. No routing of the input message is allowed.

TM dynamic storage private buffer pool enhancement

IMS Version 11 includes a new Transaction Manager (TM) dynamic storage private buffer

pool, DYNP, for module dynamic storage. This new storage pool is used by OTMA and APPC for message processing.

IMS and DCC procedures are enhanced with a new DYNP parameter. This parameter enables users to specify a value for the upper expansion limit of the TM dynamic storage private buffer pool.

The /DISPLAY POOL command is enhanced so that a response displays the value for the upper expansion limit of the TM dynamic storage private buffer pool.

Transaction expiration enhancements

IMS Version 11 has the ability to interrogate an expiration time (if specified) that is associated with transactions and discard (not process) the transactions if the time specified has passed.

The expiration time is specified by the user in the TRANSACT macro, type-2 commands, or the OTMA message prefix. OTMA, IMS Connect, some type-2 commands, and the RDDS Extraction utility are enhanced to support the transaction expiration function.

Highlights of existing IMS functions

The following sections describe the major existing functions of both IMS DB and IMS TM.

Abend search and notification

The IMS abend search and notification function enables IMS to send an e-mail or text message to a designated e-mail address to:

- Notify a group of contacts about an abnormal termination (abend)
- Provide additional information about the abend

The IMS abend search and notification function can also be used to research and retrieve links to information about abends, including IMS product documentation, technical notes in an IBM technical support database, and information in the preventive service planning (PSP) database.

Advanced Program-to-Program Communications for IMS (APPC/IMS)

APPC/IMS provides the ability to develop distributed and cooperative (client/server) IMS TM applications to communicate with programmable workstations and other systems by using APPC/MVS and the LU 6.2 protocol. IMS TM allows you to use the Common Programming Interface for Communications (CPI-C) or the IMS DL/I programming interface to communicate with logical unit (LU) 6.2 systems.

IMS TM supports network-qualified names for APPC/IMS environments. IMS MSC supports transactions from APPC/IMS subsystems. You can include IMS MFS message formats with APPC/IMS transactions.

Commands allowed from Logical Unit 6.2 devices and Open Transaction Manager Access

The `/LOCK` and `/UNLOCK` commands are supported with the DB, PGM, SYSTEM, and TRAN keywords from LU 6.2 devices and OTMA. The `/LOCK` and `/UNLOCK` commands with the LTERM and NODE keywords are not allowed from LU 6.2 devices and OTMA.

APPC local LU

An IMS system can include several Advanced Program-to-Program Communications (APPC) LUs, one of which is defined as the base LU. Before this enhancement, IMS always associated the base LU with inbound resources (such as transactions or commands) and passed this association to RACFfor security validation. With this enhancement, IMS associates the actual LU (also known as the *local LU*) that the inbound resources use for RACF security validation, whether it is the base LU or another LU.

This enhancement also allows IMS users to use the same LU for asynchronous outbound response messages. If an asynchronous inbound message comes into IMS from an LU other than the base LU, and the response is sent using the IOPCB (I/O program control block), the same LU that is used for the inbound message is used for the outbound message.

LU 6.2 device descriptor

LU 6.2 device descriptors, which are built during IMS initialization, reside in the DFS62DTx member of the IMS.PROCLIB data set. DFS62DTx has a new keyword, OUTBND, which identifies a local LU that can be used for outbound message processing.

Application control block generation

Both the Application Control Block (ACB) Maintenance utility and the block builder use storage above the 16 MB line when they generate their control blocks. The block builder dynamically builds the control blocks for programs that run in regions that are generated from the DLIBATCH procedure.

APPC/OTMA

Implicit APPC/OTMA messages can use shared queues for both asynchronous and synchronous transactions and you can input a message on any of the external interfaces to have that message distributed and executed on any IMS system within the sysplex.

Base Primitive Environment external trace

IMS provides the ability to write Base Primitive Environment (BPE) trace entries to an external data set, in addition to writing them to memory.

Common Queue Server

Common Queue Server (CQS) manages shared queues in a sysplex for multiple IMS TM subsystems. CQS receives, maintains, and distributes data objects from a shared queue on behalf of these IMS TM subsystems or clients.

Control Center for IMS

The Control Center for IMS provides a graphical interface for the Operations Manager through IMS Connect, which eases IMS operations. The Control Center for IMS provides a single user interface from which you can control both IMS and DB2 for z/OS.

The Control Center for IMS capability is integrated with the DB2 for z/OS administrative tools. The administrative tools include a Control Center for navigating IMSplex systems, wizards for creating the IMS IMSplex commands, and a results window for sorting and filtering single-image command results. The tools also include a Command Center for typing and executing both IMS type-1 and type-2 commands.

Command recognition character registration

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.

Therefore, 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 routes the command to the appropriate system for execution.

Data Communications Control

Data Communications Control (DCCTL) is an IMS TM operating environment that can connect to a database management subsystem other than the IMS Database Manager. With DCCTL, database management subsystems such as DB2 for z/OS can access IMS transaction management without a prerequisite for the IMS DB. DCCTL can provides a database-independent, transaction processing environment for DB2 for z/OS.

Data compression

IMS DB supports eServer™ zSeries® data compression hardware. This support provides storage (DASD) savings and improved transaction response time because hardware data compression uses fewer processor resources than software data compression, and because I/O operations are reduced for compressed data.

Data sharing

IMS DB can concurrently access and share databases with other IMS DB subsystems in database/data communications (DB/DC), Data Communication Control (DBCTL), or batch environments.

In a sysplex that includes a coupling facility and the IBM Internal Resource Lock Manager (IRLM) Version 2.2, IMS can share data at the block level among as many as 32 systems.

Lock management and serialization for multisystem data sharing is handled by IRLM Version 2.2 using a coupling facility.

You can use IMS multisystem data sharing regardless of whether IMS TM or CICS is your transaction manager.

Database Control

Database Control (DBCTL) is an IMS DB operating environment that consists of the IMS DB product connected to a transaction management subsystem other than the IMS Transaction Manager. With DBCTL, transaction management subsystems such as CICS can have online access to full-function databases and Fast Path DEDBs.

Database Recovery Control

Database Recovery Control (DBRC) helps to automate the recovery of databases by keeping track of the database image copies and logs that are needed for recovery. DBRC also helps ensure database integrity in a data-sharing or Remote Site Recovery (RSR) environment.

Additionally, DBRC commands are provided to aid in database administration with the RECON data set for high-availability large databases (HALDBs). By creating both a master template in a single editable file and the definitions that can be executed in batch.

The DBRC API is a release-independent, assembler macro interface to DBRC that user-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.

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

Users can enable DBRC interactions with a RECON data set to be processed in parallel. DBRC uses the Transactional VSAM (Virtual Storage Access Method) function of DFSMS to provide parallel processing of the RECON data set. Parallel processing of a RECON data set is available only in an IMSplex environment.

DIAGNOSE command for serviceability

IMS provides a 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.

Distributed syncpoint

Distributed Syncpoint support allows APPC and DCE/RPC (distributed computing environment/remote procedure call) application programs and DCE/RPC remote application programs to participate with IMS in protected conversations with coordinated resource updates. The z/OS Resource Recovery Services (RRS) manages the syncpoint process on behalf of the conversation participants: the application program and IMS acting as resource manager. Application programs can access and update resources of multiple participating resource managers.

Dynamic resource definition

Dynamic resource definition (DRD) enables you to dynamically create, update, query, and delete certain runtime resource definitions (databases, application programs, transactions, and Fast Path routing codes), without using the system definition or online change processes.

Enterprise Workload Management

Enterprise Workload Management (EWLM) support extends z/OS Workload Manager (WLM) to support heterogeneous and distributed systems, including IMS and CICS. Specifically for IMS, EWLM supports OTMA transactions that are entered from IMS TM Resource Adapter or a WebSphere MQ bridge.

Extended Markup Language

IBM has discontinued support for Enterprise Workload Manager™ (EWLM), so IMS can no longer offer this support. IBM is providing a transition for EWLM 2.1 customers to an IBM STG Lab Services based offering. This new offering is designed to provide enhanced capabilities over the EWLM 2.1 product. Customers can contact Darrell Hawkins (darrell.hawkins@us.ibm.com) for more information about this offering, pricing, terms, and conditions. In addition to this offering, IBM Tivoli® offers workload automation and monitoring solutions with the Tivoli Workload Automation Family of products, including Tivoli Dynamic Workload Broker and Tivoli Workload Scheduler, Tivoli Workload Scheduler for z/OS, and Tivoli Composite Application Manager for Response Time Tracking.

XML database support

You can store and retrieve XML data in IMS databases by 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, 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 use the DLIModel utility plug-in to generate XML schemas from IMS database definitions (DBDs) and program specification blocks (PSBs).

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

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. Application programs that use the Java API for IMS DB can use the XML Toolkit for z/OS 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.

Expedited Message Handler

The Expedited Message Handler (EMH) enable users to reset a static node or an ETO (Extended Terminal Option) dynamic user that is hung in Fast Path input response mode by using only a combination of the `/STOP` and `/START` commands. It also differentiates the output of the `/DISPLAY` command between the Fast Path input response mode status and the full-function input response mode status for static nodes and ETO dynamic users.

Extended Recovery Facility

Extended Recovery Facility (XRF) provides a local alternate IMS subsystem that monitors the status of an active IMS subsystem so that the alternate subsystem can take over the active subsystem's workload in the event of an outage. XRF can be used to minimize the impact to users of planned and unplanned IMS subsystem or z/OS system outages.

Extended Terminal Option

Extended Terminal Option (ETO) is a separately priced feature of IMS TM. It provides continuous availability by allowing changes to the IMS VTAM® terminal network to be made online, without the need for a planned outage for IMS system generation. ETO is designed to provide improved network and system security by controlling system access and message delivery for each user ID (which can be shared by more than one user) rather than for each terminal.

External Subsystem Attach Facility

External Subsystem Attach Facility (ESAF) allows other products to attach to IMS. It allows IMS application programs, running in IMS dependent regions, to access resources owned by the attached products, for example, DB2 for z/OS resources and IMS resources.

Fast Database Recovery

Using the Fast Database Recovery (FDBR) function, you can also restore database resources from a failed subsystem in a sysplex data-sharing environment more quickly. This function monitors another IMS DBCTL, or IMS DB/DC subsystem in the sysplex and, in the event of a problem, restores the databases that are locked by the failed system. Other IMS subsystems release the locks that are held by the failed system and allow processing to continue, which increases availability.

Fast Path features

Fast Path is a functional extension of IMS DB which shares the IMS TM facilities. Within a given application program, the user can select Fast Path to improve performance for simply structured databases, or the full function of IMS DB for complex databases.

Fast Path provides these facilities:

- Database management services that provide improved processing rates:

  - Data entry database (DEDB): a database organization consisting of root segments with as many as seven types of dependent segments, and using VSAM improved control interval processing
  - Main storage databases (MSDB): a root-segment-only database residing in main storage
- Data communication management services providing Expedited Message Handling (EMH) for selected transactions and communication to IMS transactions and terminals from Fast Path application programs.
- Database management services allowing access to both Fast Path and IMS databases from both Fast Path and IMS online application programs.

Front-end switching

IMS TM can be a front-end network manager connected to a back-end application processing subsystem, which can be either another IMS TM subsystem or a non-IMS TM subsystem. ISC (LU 6.1), LU 0, and LU 2 communications protocols are supported between the front-end and back-end subsystems.

Full-function databases

IMS full-function databases support complex data structures such as logical relationships and secondary indexes.

Global online change

Global online change allows non-disruptive changes to IMSplexes. Resources such as database definitions, transaction definitions, application definitions, MFS formats, and security definitions can be added, deleted, or changed without bringing down the IMSplex.

High-Availability Large Databases

The High-Availability Large Database (HALDB) function delivers enhancements to capacity, availability, manageability, and usability by enabling partitioning for IMS full function databases. HALDB supports as many as 1 001 partitions (each partition having a maximum capacity of 40 GB). Users can have over 40 terabytes of Overflow Sequential Access Method (OSAM) and Virtual Storage Access Method (VSAM) data sets.

HALDB support also allows a partition to be taken offline, changed, and brought back online independently. This support means that each partition can be individually unloaded and reloaded, and while offline, have a batch reorganization done to it. Or, the entire database can be taken offline and each partition can be reorganized in parallel, which speeds up the offline reorganization process.

HALDB partitions can be processed in parallel to reduce the total time required for batch workload or utility processing. Reorganized HALDBs are available for use after image copies are created because Prefix Resolution or Prefix Update utility processing is no longer required. A series of ISPF panels, with embedded help screens, provide an interface for creating and migrating databases.

Integrated HALDB Online Reorganization function support

The integrated HALDB Online Reorganization (OLR) function enables non-disruptive reorganizations of HALDB PHDAM and PHIDAM partitions. OLR addresses the planned data outage time, which has been the greatest amount of time that data was unavailable.

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 TSO SPOC, the HALDB Partition Definition utility, the IMS Syntax Checker, the 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.

IMS callout

IMS callout enables IMS applications that run in IMS dependent regions to interact with business logic that resides outside of the IMS environment by making asynchronous callout requests to external applications.

IMS Database Service Data Objects support

IMS Database Service Data Objects (SDO) support enables the service-oriented architecture (SOA) integration of IMS data so that language and database are independent of one another. IMS SDO support enables the distributed use of IMS data in a disconnected mode (holding no locks in the database).

IMS enhanced command environment

The IMS enhanced command environment (also known as a single-IMS IMSplex) 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:

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

IMS logger

While IMS is running, all information that is necessary to restart the system after a hardware or software failure is recorded in a system log data set. Users can change the number of log records that are produced between system checkpoints without needing to perform a system generation.

In an online environment, log records are stored on DASD, instead of being written to tape. Logging to DASD simplifies recovery of the IMS subsystem, reduces operator involvement, and improves system availability.

IMSplex

An IMS sysplex (known hereafter as an *IMSplex*) helps reduce the complexity of managing multiple IMS subsystems in a sysplex environment. 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 an S/390® sysplex environment
- Include an IMS Common Service Layer (CSL)

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 (Common Queue Sever - CQS)

Examples of IMSplexes are:

- A set of IMS control regions at the IMS Version 9 or IMS Version 10 or IMS Version 11 level, with or without a CSL, which are sharing data or sharing message queues
- A single IMS control region at the IMS Version 9 or IMS Version 10 or IMS Version 11 level with a CSL. For example, you might want to use type-2 commands that can only be issued through the OM API. This example still qualifies as an IMSplex because it is a set of IMS address spaces (IMS control, OM, RM, SCI, CQS) that work together.

The following sections describe the IMS functions that support IMSplexes.

Common Service Layer: The CSL's components (the OM, RM, and SCI) provide the infrastructure for an IMSplex. Each OM, RM, and SCI runs in a separate address space.

Operations Manager: The OM provides a single system image for system operations in an IMSplex. OM performs the following functions:

- 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 API for the automated control of commands to the IMSplex
- Provides user exits for command and response edit and command security reasons

Resource Manager: The Resource Manager (RM) helps manage resources that are shared by multiple IMS systems in an IMSplex. RM provides an infrastructure for managing global resources and coordinating processes across the IMSplex. RM maintains resource information by 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 SCI, IMSplex components can communicate with each other within a single z/OS image or from multiple z/OS images. Individual IMSplex members do not need to know where the other members are running. SCI is responsible for routing requests and messages between the IMS control regions, OMs, RMs, CQSs, and other IMSplex members in the IMSplex.

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. Before IMS Version 8, you had to perform online change to each 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 IMS systems in the IMSplex.

TSO Single Point of Control Application: One of the functions delivered with IMS is the ability to manage an IMSplex from a SPOC application. IMS delivers a TSO SPOC application. Using the ISPF-based 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

Sysplex terminal management

IMS TM uses the Resource Manager (RM) to maintain IMS resource information in a sysplex environment. By having the resource information available to other IMS subsystems 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

IMS SOA composite business application support

IMS SOA composite business application support provides the business integration process of integrating J2EE resources, services, and activities (for example, user interventions), based on Web services with the Business Process Execution Language (BPEL).

Integrated IMS Connect provides a new conversational option that the user can specify by setting the new conversational flag option flag that is defined in IMS TM Resource Adapter in the input message.

IMS solutions for Java development

Java application development support enables IMS applications to be written in Java and executed in IMS dependent regions. IBM VisualAge® and WebSphere workstation tools, as well as host tools, can be used for development and testing. Java applications have access to IMS message queues and databases through the use of the Java Class Libraries for IMS DB. The Java class libraries for IMS DB provide the ability to return IMS data to the stored procedure client encapsulated within a DB2 for z/OS result set.

Additionally, the JDBC interface through the IMS JDBC driver, can be used to access both IMS databases and DB2 for z/OS data.

The IMS solutions for Java development gives users and business partners the ability to provide integrated e-business application development for IMS.

IMS JDBC driver feature

IMS JDBC driver includes a feature that 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. To retrieve all the fields from more than one segment, use the asterisk operator with the segment name.

IMS remote database services for Java

Application programs that use the Java class libraries for IMS DB have distributed access to IMS databases through IMS Remote Database Services for Java. 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 API.

The IMS Remote Data Services for Java 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 WebSphere supported platform, such as Linux® or Windows®.

Resource Recovery Services Access for Java Message Processing or Java Batch Processing

A Java Message Processing (JMP) region or a Java Batch Processing (JBP) region can access DB2 for z/OS tables using the DB2® Resource Recovery Services (RRS) attach facility.

IMS support for XQuery

IMS support for XQuery is the implementation of an XQuery evaluation engine that is capable of running against standard IMS databases. IMS support for XQuery enhances XML visualizations that were established in IMS Version 9 and provides additional means by which to navigate through an IMS database by using an XML data model.

IMS Web services support

IMS provides Web services support that enables you to publish existing IMS transactions, including MFS-based IMS transactions, to the Internet as Web services, and to connect to IMS using 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. In a WebSphere or Rational-family development environment, you can transform existing IMS application programs into Web services. These application programs can be written in C, COBOL, Java, PL/I, or they can be MFS-based. You can deploy IMS Web services to a WebSphere Application Server.

Integrated IMS connect

IMS Connect provides high performance TCP/IP and local z/OS communications between one or more IMS Connect clients and one or more IMS systems. IMS Connect connects to IMS TM for transaction processing support through Open Transaction Manager Access (OTMA).

Installation Verification Program

The Installation Verification Program (IVP) is an ISPF dialog that is used to initially verify (test) the installation of IMS by using a sample IMS system.

Intersystem Communication

Intersystem Communication (ISC) enables communication between IMS TM and another subsystem (such as CICS), a user-written subsystem, or another IMS TM subsystem by using the LU 6.1 protocol.

JBP symbolic checkpoint and restart feature

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`.

Knowledge-based log analysis

KBLA provides functions for interpretation and analysis of IMS log data that:

- 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.
- Help prevent JCL errors during JCL stream creation. 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 to verify the completeness of a list of logs (created manually or by DBRC), to sort the logs into the proper sequence by IMS image, to determine where log data sets might be missing in the sequence, and to determine the number of missing records and the time range that is missing to help identify the missing logs.

Local online change

Local online change allows non-disruptive changes to the IMS subsystem. Resources such as database definitions, transaction definitions, application definitions, MFS formats, and security definitions can be added, deleted, or changed without bringing down the IMS subsystem.

Message Format Service

Message Format Service (MFS) allows application programs to handle logical messages, so they do not need to handle device-specific characteristics of input or output messages. MFS distributed presentation management (DPM) supports ISC and secondary logical units type P (SLU P) for a user-written program in a SLU P controller or in another subsystem connected with ISC. MFS DPM enables device-independent data streams to be transmitted between IMS and a remote program. MFS DPM also enables the application program to use a single data structure, regardless of the data source or destination.

Multiple Systems Coupling

Multiple Systems Coupling (MSC) permits message and transaction routing between two or more IMS TM subsystems in one or more z/OS systems or processors. Whether a transaction is processed on a local IMS TM subsystem or on a remote one is transparent to the user entering the transaction. So, MSC provides a single-system image to the user. MSC supports transactions (messages), responses, program-to-program switches, and fixed-length conversational scratch pad areas on two or more IMS systems.

Notify CQS outage to terminal users

If the CQS address space is unavailable, a static non-set-and-test-sequence-numbers (STSN) terminal that requires signon, receives the message DFS3649A with return code of 436, and then the terminal session is terminated.

Open Transaction Manager Access

IMS Open Transaction Manager Access (OTMA) is a client/server protocol for IMS transactions. In a client/server environment, the IMS Transaction Manager is the high-performance server, and with the OTMA feature you can attach many different z/OS client subsystems. An OTMA client acts as a gateway between IMS TM and a heterogeneous network. TCP/IP, RPC, WebSphere MQ, and IMS TM systems can be used across their appropriate platforms with each other, taking advantage of existing applications, data, and programmer skills. IMS also provides a callable interface for OTMA that allows access to IMS applications from other z/OS subsystems.

Rapid Network Reconnect

Rapid Network Reconnect (RNR) utilizes the facilities of VTAM's Multinode Persistent Session Services to improve system availability by allowing IMS TM to automatically reconnect terminal sessions following any kind of IMS failure and subsequent restart. RNR reduces network reconnect time after an IMS, z/OS, or VTAM, or CPC failure in a sysplex environment.

Remote Site Recovery

The Remote Site Recovery (RSR) feature lets you recover quickly from an interruption of computer services at an active site. The RSR feature allows you to maintain a geographically remote secondary IMS site that tracks the activity of the primary site and that can take over the active workload in the event of an outage. RSR maintains copies of all active resources at the remote site and shadows databases and remote logs.

RSR also provides coordinated disaster recovery for IMS and DB2 for z/OS.

Replacement of XRF USERVAR

If you used the 3745 Controller for IMS XRF tracking of VTAM terminals before migrating to IMS Version 9 or IMS Version 10, 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 use one of the following options:

- The Communication Controller for Linux (CCL).
- VTAM Generic Resources (VGR). This option requires a parallel sysplex environment.

Shared message queues and shared EMH queues

Using a z/OS coupling facility, IMS can store and share IMS message queues among multiple IMS TM systems. Incoming messages from one IMS TM in a sysplex can be placed on the shared queue by CQS for processing by any other IMS TM that has access to the shared queue. Using shared queues enables automatic workload balancing across all IMS subsystems in the sysplex, thus providing increased capacity and availability for the IMS system. Shared queues also provide an alternative to using MSC to transfer messages across a sysplex.

Asynchronous APPC/OTMA input messages can run on any IMS system in the shared queues group that is available for processing.

Coupling Facility duplexing support

IMS provides support for z/OS Coupling Facility (CF) duplexing function for IMS shared message queue structures and IMS Fast Path 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 CQS is currently running. CQS-managed rebuild is still needed to address CF failure, structure failure, or loss of connectivity.

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.

64-bit real support

For IMS I/O operations, above-the-bar 64-bit real storage is used for IMS page-fixed storage to free below-the-bar real storage.

Support for Data Facility Storage Management Facility constructs

Support for Data Facility Storage Management Facility (DFSMS) constructs makes installation easier for sites that use SMS-managed volumes. HALDB sample applications are also provided.

Sysplex serialized program management

Sysplex serialized program management allows users in a shared queues environment to prevent application programs that are defined as serial from being scheduled in parallel on another IMS system in an IMSplex.

Syntax Checker

The Syntax Checker is an IMS ISPF application that assists you in defining, verifying, maintaining, and validating parameters and their values in certain IMS 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, identifies new and obsolete parameters, and helps determine that parameter information is valid before either the initial IMS startup or an IMS restart.

Tracing features

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

Virtual storage constraint relief features

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 low storage in the low private storage area.

VTAM generic resource support

The installation can have Virtual Telecommunications Access Method (VTAM), instead of IMS, manage the generic resource affinity. This means that when any session outage occurs, whether a CPC, z/OS, VTAM, or IMS failure, a new terminal session can be immediately established with any available IMS system.

z/OS Automatic Restart Manager

The z/OS Automatic Restart Manager (ARM) restarts a subsystem or job, after a z/OS hardware or software failure. You can also use ARM to define restart groups. In addition, in the event of a z/OS hardware or software failure that requires you to move a subsystem from one z/OS system to another, ARM moves all the subsystems defined in the same restart group as a group to a remaining z/OS system. In IMS, the IMS control region is the only region restarted by ARM. IMS supports ARM in these environments: DB/DC, DCCTL, DBCTL, XRF, and FDBR.

DL/I, DBB, and IMS utilities are not supported.

z/OS UNIX System Services

IMS supports z/OS UNIX® System Services and the support services it provides. These services, when used with other select products, conform to approved standards or provide an implementation for appropriate draft standards.

For open access to IBM and non-IBM networks

Using z/OS UNIX System Services, current data and logic can be made available to heterogeneous clients by using a single set of standardized interfaces.

z/OS Workload Management

IMS supports z/OS Workload Management (WLM) which enables you to define the performance goals for transactions and the relative importance of transactions and address

spaces. Using your definitions, WLM decides how the resources that are controlled by z/OS are allocated.

After a transaction is scheduled by IMS, the z/OS WLM uses the performance goals that you define for each transaction to decide how much resources, such as processor cycles and storage, it should allocate to meet your goals. When contention for system resources occurs, the z/OS WLM uses the business importance assigned to the transaction to help decide which transactions get priority for the resources that are under the control of the z/OS WLM.

Support discontinuances

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.

  VTAM Generic Resources (VGR) customers that are migrating Master Terminal Option (MTO) terminals from BTAM to VTAM might want to define the VTAM generic name on the EXEC parameter instead of using the `/START VGRS` command. MTO terminals are normally acquired automatically during IMS initialization when the VTAM ACB is opened. A `/START VGRS` command that specifies the GRSNAME parameter would fail because VTAM requires that no session be active when IMS joins the VGR group. This is not a problem when the generic name is specified on the EXEC statement because IMS coordinates with VTAM before the MTO terminals are acquired.
- The Terminal Routing exit (DFSCMTR0), the Input Message Routing exit (DFSNPRT0), the Link Receive exit (DFSCMLR0), and the Program Routing exit (DFSCMPR0).

  These exits have been removed from system definition processes and the online IMS code. You must use the IMS TM and MSC Message Routing and Control user exit (DFSMSCE0) as a replacement for the exits that are no longer supported.
- IMS Connect User Message Exit (HWSIMSO0 and HWSIMSO1).

  Customers using HWSIMSO0 and HWSIMSO1 should migrate to use the sample user message exits HWSSMPL0 and HWSSMPL1. IMS will issue a warning message and ignore HWSIMSO0 and HWSIMSO1 if you specify them in the HWSCFG configuration member.

IMS Version 10 is the last release to support the z/OS-based batch DLIModel utility. Customers using this function should migrate to the DLIModel utility plug-in.

The JCA 1.0 resource adapter, one of the Java connectors in the IMS DB distributed resource adapter, is stabilized and is no longer being enhanced. Users should switch to using the IMS Universal DB resource adapter that is delivered in IMS Version 11.

IBM has discontinued support for Enterprise Workload Manager (EWLM), so IMS can no longer offer this support. IBM is providing a transition for EWLM 2.1 customers to an IBM STG Lab Services based offering. This new offering is designed to provide enhanced capabilities over the EWLM 2.1 product. Customers can contact Darrell Hawkins (darrell.hawkins@us.ibm.com) for more information about this offering, pricing, terms, and conditions. In addition to this offering, IBM Tivoli offers workload automation and monitoring solutions with the Tivoli Workload Automation Family of products, including Tivoli Dynamic Workload Broker and Tivoli Workload Scheduler, Tivoli Workload Scheduler for z/OS, and Tivoli Composite Application Manager for Response Time Tracking.

IMS Version 10 is the final version of IMS in which the IMS product information is delivered in BookManager® format.

Softcopy publications

All IMS Version 11 publications are available in softcopy format (PDF) on the IMS Product Kit CD (SK5T-7375-00) and (PDF and XHTML) in the Information Management Software for z/OS Solutions Information Center, available at http://publib.boulder.ibm.com/infocenter/imzic.

The PDF books can be read online by using the Adobe® Reader.

Specified Operating Environment

Hardware requirements

This section describes the hardware that is required by IMS Version 11.

The processor that IMS Version 11 runs on must be:

- A z/Series machine running in z/Architecture® mode (ESA mode is not supported by IMS Version 11).
- Capable of running z/OS Version 1 Release 9 or later.
- A 64-bit processor.

For more information about the above processors, see System z® Hardware at ibm.com/systems/z/hardware/.

System console requirements

The console requirements of z/OS Version 1 Release 9 or later apply.

Tape unit requirements

IMS supports IBM 3480 and later tape units (or equivalent products) for installation and maintenance. IMS supports the tape block sizes greater than 32 760 bytes for the output of the Database Image Copy utility (DFSUDMP0) and Online Database Image Copy utility (DFSUICP0) utilities.

Coupling facility requirements

Sysplex data sharing (including data caching and VSO data sharing) with IRLM V2.2 requires a coupling facility level 9 or later. Shared queues and shared-EMH support also requires a coupling facility level 9 or later. System-Managed Duplexing requires a coupling facility level 12 or later, and bidirectional CF-to-CF links (such as HiperLink, ICB link, or IC link).

Direct access storage device requirements

During the binding of the IMS control blocks load modules (specifically during the bind of the IMS VTAM control blocks load monitoring module), both the binder work data set SYSUT1 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).

Also, the source and target data sets (databases and image copies) must reside on the same ESS or RVA hardware.

Restriction: IMS does not support VSAM Extended Addressability (EA).

The fast replication function of the Database Image Copy 2 utility (DFSUDMT0) requires DASD controllers that support either:

- The concurrent-copy feature of DFSMS
- The FlashCopy® feature of the IBM Enterprise Storage Server® (ESS)
- The SnapShot feature of the IBM RAMAC® Virtual Array (RVA) storage system

FlashCopy and SnapShot might require microcode from IBM to activate their functionality.

Details about the DASD storage requirements for the following items are in the *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

Large sequential data set support hardware requirements

No specific hardware is required for the large sequential data set support that was introduced in IMS Version 10, but to take advantage of this support, hardware that has more than 65 535 tracks must be used.

Multiple Systems Coupling hardware requirements

When the physical link is channel-to-channel (CTC) and is dedicated to IMS, Multiple Systems Coupling (MSC) requires the System/370™ CTC

adapter or a logical channel on the IBM 3088, ESCON®, or fiber channel connection (FICON®). MSC FICON CTC support requires that at least one IMS system be installed on an IBM zSeries machine with the FICON channel and FICON CTC microcode. The other side (IMS) can be any processor with a FICON channel.

Parallel RECON access hardware requirements

The parallel RECON access function requires a parallel sysplex environment and DFSMStvs. Therefore, parallel RECON access requires Coupling Facility (CF) hardware in the System z sysplex.

Remote Site Recovery hardware requirements

Remote Site Recovery (RSR) requires:

- A Sysplex Timer® (if either data sharing or workload is spread across multiple CPCs)
- A high-bandwidth control unit (such as a 3172)
- At least one tape unit 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 11 and for the major enhancements for IMS Version 11.

Operating system requirements

IMS Version 11 and its various functions have specific operating software requirements.

Before you install IMS Version 11, 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. The PSP upgrade name for IMS Version 11 is IMS1110.

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

IMS Version 11 base software requirements

The base IMS Version 11 system operates on z/OS Version 1 Release 9 (or later). Certain features and functions have additional software requirements.

IMS Version 11 operates on z/OS Version 1 Release 9 (or later) configurations, unless otherwise stated, and requires the following minimum version, release, or modification levels:

- z/OS Version 1 Release 9 (5694-A01) or later
  - IBM High-Level Assembler Toolkit (5696-234) Version 1 Release 5, a separately orderable feature of z/OS
  - RACF or an equivalent product, if security is used. RACF is available with the IBM SecureWay™ Security Server for z/OS (a separately orderable feature of z/OS) and the OS/390® RACF product.
- IRLM Version 2.2 or later (5655-DB2), if data sharing is used. IRLM Version 2.2 is delivered with IMS Version 11.

  When using multiple IMS systems of the *same release level* on the same z/OS system, you need only one IRLM. If two or more IMS systems share data at the block level, they must use the same IRLM.

  When using multiple IMS systems of *different release levels* on the same z/OS system, you can have one IRLM or you can choose to use two or more IRLM address spaces. If two or more IMS systems share data and are running on the same z/OS system, they should use the same IRLM.

  When using multiple IMS systems on *different z/OS systems for inter-processor block-level data sharing*, you must have one IRLM on each z/OS system.

IMS Version 11 also operates in a virtual machine (VM) under control of z/OS Version 1 Release 9. This environment is intended for use in a program development, testing, and non-XRF production environment.

Restriction: In a VM environment, be aware that:

- The Log Analysis utilities might yield inaccurate time-stamp results.
- If you operate the IMS Version 11 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 resource structure.

Coordinated Disaster Recovery support for IMS and DB2 requires the IMS Version 11 Remote Site Recovery (RSR) Recovery Level Tracking (RLT) feature.

Data sharing software requirements

For block-level data sharing, IRLM Version 2.2 or later is required. The IRLM is an independent component that is shipped with IMS Version 11. 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.

DBRC software requirements

If you plan to use the parallel RECON access function of Database Recovery Control (DBRC), you must configure IMS as an IMSplex and install z/OS DFSMS Transactional VSAM, a separately orderable feature of z/OS.

Fast Path software requirements

The Fast Path 64-bit buffer manager requires a minimum of 2.1 GB of 64-bit storage. Also, if the FP 64-bit buffer manager is used on systems that are being tracked by a Fast Database Recovery (FDBR) address space, the DFSDF keyword must be specified on the FDR procedure.

When executing IMS Version 11 on z/OS V1R9, the Fast Path 64-bit buffer manager uses 64-bit private storage. When executing IMS Version 11 on z/OS V1R10, the Fast Path 64-bit buffer manager uses 64-bit common storage.

HALDB Index/ILDS Rebuild utility free space function software requirements

The HALDB Index/ILDS Rebuild utility (DFSPREC0) requires four 2 GB data spaces to store and sort the rebuilt indirect list entries (ILEs) before reloading them into the ILDS.

IMS callout function software requirements

One of the following components is required to support the IMS callout function: IMS SOAP Gateway Version 10.1 or later (5655-R04), IMS TM Resource Adapter Version 10.3 or later, or user-written IMS Connect clients (TCP/IP applications).

IMS Control Center software requirements

The software requirements for using the IMS Control Center are listed in the Information Management Software for z/OS Solutions Information Center on the Web at http://publib.boulder.ibm.com/infocenter/imzic.

The IMS Control Center is included in the DB2 9 Client of IBM DB2 V9.1 for Linux, UNIX, and Windows.

The IMS Control Center also supports IMS Version 9 and IMS Version 10.

Integrated IMS Connect software requirements

IMS Connect has software requirements that are in addition to the base IMS product.

The software requirements for IMS Connect are as follows:

- TCP/IP Version 1.4 or later.
- If you want to implement security, Resource Access Control Facility (RACF) Version 1.9.2 or later, or an equivalent product.
- If you plan to use the local option for client communications, there are additional software requirements. See IMS TM Resource Adapter in the Information Management Software for z/OS Solutions Information Center at http://publib.boulder.ibm.com/infocenter/imzic.
- If you plan to use the IMS Connect IMSplex support for connecting an IMS Control Center to an IMSplex, see the software requirements for using the IMS Control Center in the Information Management Software for z/OS Solutions Information Center at http://publib.boulder.ibm.com/infocenter/imzic.
- If you plan to use Secure Sockets Layer (SSL), z/OS System SSL, a sub-component of z/OS Cryptographic System Services, is required. 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* (SC24-5901).
- If you want to support the IMS Universal drivers or a user-written DRDA source server, an IMS Common Service Layer is required, including the Open Database Manager, the Operations Manager, and the Structured Call Interface.
- IMS Connect must have z/OS UNIX System Services superuser privileges.

Integrated IMS Connect XML Adapter support

IMS Version 11 Integrated Connect XML Adapter support, used with the IMS Enterprise Suite SOAP Gateway, requires Rational® Developer for System z V7.5.

IMS MFS Web Solutions software requirements

The software requirements for the IMS MFS Web Solutions are the same as for the IMS TM Resource Adapter.

For all the information pertaining to the IMS MFS Web Solutions, go to http://www.ibm.com/software/data/ims/toolkit/mfswebsupport/.

IMS TM Resource Adapter software requirements

The software requirements for the IMS TM Resource Adapter are listed on the product Web site.

Go to IMS TM Resource Adapter (http://www.ibm.com/software/data/ims/ims/components/tm-resource-adapter.html) for a complete list of the software requirements.

Java application program support in IMS Version 11

The following sections describe the software requirements for Java applications that run in or access IMS Version 11.

Software requirements for Java applications that access IMS databases

IMS Version 11 requires software to support Java application programs that access IMS databases.

IMS Version 11 requires the following software:

- z/OS UNIX System Services available at run time.
- Hierarchic File System (HFS) on z/OS. For information about preparing HFS, see *z/OS UNIX System Services File System Interface Reference* (SA22-7808).

The support for XML documents in IMS Version 11 requires IBM 31-bit SDK for z/OS, Java 2 Technology Edition, Version 5 (JDK 5.0).

IMS provides two generations of Java drivers and resource adapters: the IMS Universal drivers, the most recent generation (delivered with IMS Version 11), and the drivers and resource adapters provided by the classic Java APIs for IMS (delivered with IMS Version 10 and earlier, but still supported in IMS Version 11).

Software requirements for Java application programs that use the IMS Universal drivers: The IMS Universal drivers that Java application programs can use to access IMS data have runtime software requirements.

The IMS Universal drivers have the following runtime software requirements:

- Java Development Kit (JDK) 5.0 or later
- One or more of the following conditional requirements:
  - For CICS applications, CICS Transaction Server for z/OS Version 3.1 (5655-M15) or later
  - For DB2 for z/OS stored procedures:
    - DB2 for z/OS Version 9.1 (5635-DB2).
    - DB2 UDB for z/OS Version 8 (5625-DB2) or later.

      To support Java application programs that access DB2 UDB for z/OS Version 8 subsystems from JMP or JBP regions, you must apply APAR/PTF PQ74629/UQ77540 to the DB2 subsystem.
  - For WebSphere applications, WebSphere Application Server for z/OS or WebSphere Application Server for distributed platforms, Version 6.1 (program number 5655-I35) or later
- RACF or equivalent product
- Java programs that run in JMP and JBP regions require Java Development Kit (JDK) 6.0 or later

Software requirements for Java applications that use the classic Java APIs for IMS: Java applications that access IMS databases by using the classic Java APIs for IMS have specific software requirements, depending on the environment in which the application runs.

JMP and JBP address spaces: Java application programs that run in JMP or JBP regions require the IBM 31-bit SDK for z/OS, Java 2 Technology Edition, Version 5 or later.

Support for interoperation between Java and COBOL or PL/I when running in a JMP or JBP region requires the object-oriented syntax for Java interoperability that is in IBM Enterprise COBOL for z/OS and OS/390 Version 3 Release 2 (program number 5655-G53) or later.

Java application programs that access DB2 for z/OS subsystems from JMP or JBP regions require that APAR/PTF PQ74629/UQ77540 be applied to the DB2 for z/OS subsystem.

WebSphere Application Server environment: Java application programs that provide JDBC access to IMS DB from WebSphere Application Server for z/OS require the following software:

- WebSphere Application Server for z/OS Version 6.0 (program number 5655-I35) or later
- WebSphere Application Server for z/OS Version 6.1.04 (program number 5655-I35) for 64-bit runtime support
- z/OS Resource Recovery Services (RRS)
- RACF or an equivalent security product
- The IMS Open Database Access (ODBA) component
- The IMS Database Resource Adapter (DRA) component

To access IMS databases from WebSphere Application Server from a non-z/OS environment, you must:

- Install WebSphere Application Server for z/OS Version 6.0 or later on the same logical partition (LPAR) as IMS.
- Configure WebSphere Application Server for z/OS Version 6.0 or later, as well as WebSphere Application Server on the non-z/OS environment.
- Download the IMS distributed database resource adapter from the IMS JDBC Connector 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 JDBC Connector on demand Java features. Go to the IMS Web site at www.ibm.com/ims and link to the IMS JDBC Connector Web page for more information.

CICS environment: Java application programs that provide JDBC access to IMS DB from a CICS environment require the following software:

- CICS Transaction Server for z/OS Version 3.1 (5655-M15) or later and JDK 1.4.2 or later
- CICS Transaction Server for z/OS Version 3.2 (5655-M15) or later and JDK 1.4.2 or later
- CICS Transaction Server for z/OS Version 3.2 (5655-M15) or later (with APAR PK59577 applied) and JDK 5.0 or later
- The IMS DRA component installed in the CICS environment

DB2 for z/OS environment: Java application programs that provide JDBC access from IMS DB for DB2 for z/OS stored procedures require the following software:

- DB2 UDB for z/OS Version 8 (5625-DB2) with APAR/PTF PQ74629/UQ77540 or later, with the DB2 SQLJ/JDBC driver
- JDK 1.4.2 or later for DB2 UDB for z/OS Version 8 (5625-DB2), before applying APARPTF PK14609/UK10979
- JDK 5.0 or later for DB2 UDB for z/OS Version 8 (5625-DB2), after applying APARPTF PK14609/UK10979 (recommended)
- The IMS Open Database Access (ODBA) component installed in the DB2 for z/OS environment
- The IMS DRA component installed in the DB2 for z/OS environment

Software requirements for Java applications that access IMS transactions

Go to the home page of the IMS TM Resource Adapter (http://www.ibm.com/software/data/ims/ims/components/tm-resource-adapter.html) for a list of these software requirements.

Open Database software requirements

The Open Database enhancements require that IMS be configured as an IMSplex and also requires IMS Connect.

If the IMS Universal drivers will be used in managed mode, an application development environment is required, such as IBM Rational Developer for System z Version 7.1.0 or later.

The software requirements for application programs that use the IMS Universal drivers and the other IMS solutions for Java development are described in "Java application program support in IMS Version 11" on page 20.

Replacing SMU security

IMS Version 9 is the last release that supports the Security Maintenance Utility (SMU). If you used SMU security, you must migrate to RACF or an equivalent product.

RACF (or equivalent product) must include the following four 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 must define them in the resource class descriptor table (CDT).

Sysplex serialized program management

The sysplex serialized program management function requires that a Resource Manager be active with a resource structure defined. This requirement n means that you need a Common Service Layer installed.

The sysplex serialized program management function has the following software requirements:

- The following Common Service Layer components: Operations Manager, Structured Call Interface, and Resource Manager
- A resource structure defined in a coupling facility
- Shared message queues

Sysplex data sharing

IMS sysplex data sharing (including data caching, shared SDEPs, and shared VSO DEDB areas) requires IRLM Version 2.2 or later.

Type-2 command software requirements

To issue type-2 commands to IMS, you must configure IMS with a Common Service Layer (CSL) that contains at least the following two CSL components; an OM and a Structured Call Interface (SCI). Some type-2 commands also require a Resource Manager (RM) and might require a resource structure. Type-2 commands associated with the Open Database enhancements require an Open Database Manager (ODBM).

Type-2 commands must be issued from an automated operator application program, such as the TSO single point of control (SPOC) application that is shipped with IMS. IMS offers two interfaces that such application programs can use to communicate with IMS: the Operations Manager (OM) application programming interface (API) and the REXX™ SPOC API.

By definition, one or more IMS system with a CSL is an IMSplex. Therefore, to issue type-2 commands, IMS must be configured as an IMSplex, even if only a single IMS is involved. A single IMS configured as an IMSplex is also called an enhanced command environment.

For an overview of IMS configurations (also called environments), see *IMS Version 11 System Administration*.

For information about configuring IMS, see *IMS Version 11 Installation* or *IMS Version 11 System Definition*.

CICS subsystems supported

CICS Transaction Server for z/OS Version 3.1 (5655-M15) or later can connect to either the IMS Version 11 Database Manager (DB) or, using the appropriate TM interface, the IMS Version 11 Transaction Manager.

DB2 for z/OS subsystems supported

The IMS Version 11 Transaction Manager can be connected to any of the following DB2 for z/OS products:

- DB2 for z/OS Version 9.1 (5635-DB2).
- DB2 UDB for z/OS Version 8 (5625-DB2) or later.

  To support Java application programs that access DB2 UDB for z/OS Version 8 subsystems from JMP or JBP regions, you must apply APAR/PTF PQ74629/UQ77540 to the DB2 subsystem.

IMS/DB2 Coordinated Disaster Recovery Support requires the IMS Version 11 Remote Site Recovery (RSR) feature, and requires the databases to be registered with Recovery Level Tracking (RLT).

Intersystem communications subsystems supported

The IMS Version 11 Transaction Manager can be connected to the following products by using ISC:

- IMS Version 11 (5635-A02)
- IMS Version 10 (5635-A01)
- IMS Version 9 (5655-J38)
- CICS Transaction Server for z/OS Version 3.1 (5655-M15) or later
- User-written software

Multiple systems coupling subsystems supported

The IMS Version 11 Transaction Manager can be connected to the following IMS products by using MSC:

- IMS Version 11 (5635-A02)
- IMS Version 10 (5635-A01)
- IMS Version 9 (5655-J38)

Programming languages

IMS Version 11 is written in High Level Assembler Release 5, PL/X, C, C++, and JDK Version 5.

Programming languages supported

You can write IMS applications in the currently supported 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 or higher
- Java, using the IBM 31-bit SDK for z/OS, Java 2 Technology Edition, V5
- 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

There is no change in IMS Version 11 that affects your ability to run OS/VS COBOL programs. OS/VS COBOL programs will not run under CICS Transaction Server for z/OS Version 3.1. This restriction is specific to that version of CICS. It does not apply to IMS.

The restrictions that pertain to OS/VS COBOL II are as follows:

- The OS/VS COBOL runtime library is no longer supported. Therefore, you should use the Language Environment for z/OS runtime instead. This includes code that will run in IMS dependent regions.
- The OS/VS COBOL compiler is no longer supported. If you must alter and recompile any OS/VS COBOL programs, you must use a supported COBOL compiler and make the appropriate changes to conform to the COBOL 74 standard. This includes IMS programs.

Notice that these restrictions have nothing to do with IMS. They reflect the fact that technical support for the OS/VS COBOL compiler and runtimes is no longer available, so you should no longer be using them. Existing OS/VS COBOL programs can run in z/OS regions (include IMS regions) that are using the new LE COBOL runtime.

For information about running OS/VS COBOL programs with the LE COBOL runtimes, see the *COBOL for OS/390 & VM V2R2 Compiler and Run-time Migration Guide*, GC26-4764.

Application programs supported

All application programs that are supported under IMS Version 9 and IMS Version 10 are still supported under IMS Version 11. In general, you should not have to recompile, reassemble, or rebind an IMS application program to run under IMS Version 11.

Compatibility

IMS Version 11 can coexist with previous versions, allowing existing applications and data to be used without change. Migration and coexistence support is provided for IMS Version 9 and IMS Version 10.

Some general coexistence considerations are:

- Certain functions of IMS Version 11 can coexist with IMS Version 9 and IMS Version 10, with the appropriate coexistence APARs applied.
- You must build new application control blocks (ACBs) for all existing program specification blocks (PSBs) and database definitions (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.
- If you are installing multiple copies of IMS systems at different release levels in the same processor, the latest version of the IMS SVCs must be used by all IMS systems.
- The IMS dump formatting module (DFSAFMD0) installed in the host z/OS system must be from the most recent IMS release. The Offline Dump Formatter from IMS Version 11, IMS Version 10, or IMS Version 9 works without modification, if the appropriate formatter libraries are used.
- IMS Version 8 uses the IMS module DFSMRCL0 in the host z/OS system as a static resource cleanup module.

  IMS Version 9, IMS Version 10, and IMS Version 11 use a dynamic resource cleanup module (DFSMRC20). You do not need to install the static resource cleanup module (DFSMRCL0) on the host z/OS system for any of these versions.

  DFSMRCL0 is still shipped in IMS Version 9, IMS Version 10, and IMS Version 11 as a safety

precaution, in case you still have the DFSMRCL0 zap installed in IEAVTRML and LPA pointing to the IMS SDFSRESL data set directly. The DFSMRCL0 module is available to ensure that z/OS can find it at IPL.

Recommendation: Do not uninstall DFSMRCL0 from releases of IMS earlier than IMS Version 9 until both of the following conditions are true:

- Your migration to IMS Version 9 or later is complete.
- There is no possibility that you will run an earlier version of IMS.

DFSMRCL0 and the dynamic resource cleanup module (DFSMRC20) can coexist on the same system.

- For DB/DC and DCCTL online systems, the MFS format library data set is required, whether MFS is used or not. DBCTL systems do not require an MFS format library.
- Utilities and Logs

  You might need to change programs that process the log because some log records that are created by database changes have been modified.
- **Extended Checkpoint**

  Restriction: You cannot use extended checkpoint to restart applications across different releases of IMS.

Licensed program materials availability

This licensed program is available with source licensed program materials for some modules designated as "RESTRICTED MATERIALS OF IBM". In addition, some modules are available without source licensed program materials. The modules are available in object code. The remaining modules are available with source licensed program materials.

The source licensed program materials are available as optional materials. They are written in Assembler and PL/I.

Supplemental terms

Designated machine identification

Designated Machine Identification Required: Yes.

Testing period

- Basic License: Two months
- DSLO License: Not applicable.

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