



**MVS/Extended Architecture  
Data Facility Product Version 2:  
General Information**

Licensed  
Program





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Data Facility Product Version 2:  
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### **Fourth Edition (October 1986)**

This is a major revision of, and makes obsolete, GC26-4142-2.

This edition applies to Version 2 Release 3.0 of MVS/Extended Architecture Data Facility Product, Licensed Program 5665-XA2, and to any subsequent releases until otherwise indicated in new editions or technical newsletters.

The changes for this edition are summarized under the Appendix, "Summary of Enhancements for Version 2." Technical changes in the text are color highlighted. Editorial changes that have no technical significance are not noted.

Changes are made periodically to this publication; before using this publication in connection with the operation of IBM systems, consult the latest *IBM System/370, 30xx, and 4300 Processors Bibliography*, GC20-0001, for the editions that are applicable and current.

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# Preface

This manual is an introduction to the IBM MVS/Extended Architecture Data Facility Product Version 2 (MVS/XA DFP V2) licensed program (5665-XA2) and offers general information on how DFP can be used in an MVS/XA environment.

System programmers who are planning to install DFP can use this book, in conjunction with *Data Facility Product Version 2: Planning Guide*, to learn how DFP fits into the MVS/XA operating environment. In addition, anyone with a general background in programming and the use of operating systems can use this book to get an overview of DFP and its components.

The changes for this edition are summarized under the Appendix, "Summary of Enhancements for Version 2" on page 63. Technical changes in the text are color highlighted.

*Note:* Throughout this manual, the abbreviation DFP refers to MVS/Extended Architecture Data Facility Product Version 2, unless otherwise indicated.

## Organization

This publication contains the following sections:

- Chapter 1, "Overview of Data Facility Product," shows how DFP fits into the MVS/XA operating environment and what general tasks the DFP components perform.
- Chapter 2, "Program Management," describes the DFP components that prepare, store, and execute programs under MVS/XA.
- Chapter 3, "Device Management," describes the DFP components that define and manage devices under MVS/XA.
- Chapter 4, "Data Management," describes the DFP components that manage data and data sets under MVS/XA.
- Chapter 5, "Interactive Storage Management," describes how to manage data and storage interactively under MVS/XA with the interactive storage management facility.
- Chapter 6, "DFP and Extended Architecture," describes the specific features of DFP that support 31-bit addressing and other aspects of extended architecture.
- Chapter 7, "Operating Environment," defines the operating environment required to install and use DFP.

- Chapter 8, "Publications," lists the publications in the DFP and related libraries and gives a brief description of the contents of each manual. Refer to this chapter for the order numbers for these publications.
- Appendix, "Summary of Enhancements for Version 2," contains a summary of the enhancements for each release of MVS/XA DFP Version 2.
- "Glossary of Terms and Abbreviations" defines the terms and abbreviations used in this book.

# Contents

## **Chapter 1. Overview of Data Facility Product 1**

- How DFP Fits into the MVS/XA Operating System Environment 1
- What Is DFP? Tasks and Components 3
  - Program Management 3
  - Device Management 4
  - Data Management 4
  - Interactive Storage Management 6
- The Origins of MVS/XA DFP Version 2 6

## **Chapter 2. Program Management 9**

- Link-Editing Program Modules with the DFP Linkage Editor 10
  - Differences between the DFP and OS/VS2 MVS 3.8 Linkage Editors 10
- Reading Load Modules into Virtual Storage with Program Fetch 11
- Editing and Loading Modules with the DFP Loader 11
- Listing Module Information with the AMBLIST Service Aid 12
- Copying or Altering Load Modules with the IEBCOPY Utility 12
- Taking Checkpoints and Restarting Programs with Checkpoint/Restart 12

## **Chapter 3. Device Management 15**

- Installing New Devices 15
  - Devices Supported by MVS/XA 15
  - Defining Devices to MVS/XA 17
- Using Devices in DFP 17
  - Managing DASD 17
  - Managing Cache Devices 18
  - Managing Magnetic Tapes 18
  - Managing Printers 20

## **Chapter 4. Data Management 21**

- Managing Data and Data Sets 21
  - Data Set Administration 21
  - Catalog Administration 25
  - Indexed Volume Table of Contents (VTOC) 29
- Controlling Access to Data: Security 30
  - RACF Protection 30
  - Password Protection 31
  - Authorized Program Facility (APF) Protection 32
  - Cryptographic Protection 32

## **Chapter 5. Interactive Storage Management 33**

- Using ISMF 33
  - Performing Operations on DASD Data Sets 34

Displaying or Changing ISMF Parameters	38
Other Features of ISMF	38
Other Programs You Need to Use ISMF	39
National Language Support	39
<b>Chapter 6. DFP and Extended Architecture</b>	<b>41</b>
31-Bit Addressing	41
AMODE and RMODE: Hierarchy and Compatibility	41
Extended Architecture Channel and Device Support	42
Virtual Storage Constraint Relief	42
<b>Chapter 7. Operating Environment</b>	<b>45</b>
Machine Requirements	45
Programming Requirements	45
Programs Required to Create the MVS/XA Environment	45
Optional Programs in the MVS/XA Environment	46
Installing DFP	48
Product Packaging and Distribution	49
Service Agreements	49
System Generation Requirements	49
<b>Chapter 8. Publications</b>	<b>51</b>
New Publication for MVS/XA DFP Version 2 Release 3.0	51
MVS/XA DFP Version 2 Publications	53
Related Publications	58
MVS/Extended Architecture	58
Related Products	59
Storage Management Library	60
Storage Subsystem Library	61
<b>Appendix. Summary of Enhancements for Version 2</b>	<b>63</b>
Version 2 Release 3.0 Enhancements	63
Virtual Storage Constraint Relief	63
New Device Management Support	63
New Program and Data Management Support	64
New Publication	66
Version 2 Release 2.0 Enhancements	67
New Program and Data Management Support	67
New Publications	67
Version 2 Release 1.0 Enhancements	68
Virtual Storage Constraint Relief	68
New Device Support	68
New Program and Data Management Support	69
<b>Glossary of Terms and Abbreviations</b>	<b>73</b>
<b>Index</b>	<b>81</b>

## Figures

1. Typical MVS/XA Operating System 1
2. DFP Program Management Components 3
3. DFP Device Management Components 4
4. DFP Data Management Components 5
5. Origins of MVS/XA DFP Version 2 6
6. IBM Programs Not Supported by DFP 7
7. Preparing a Source Module for Execution 9
8. Module Portability between MVS 3.8 and DFP Linkage Editors 11
9. Common IBM I/O Devices Supported by MVS/XA 16
10. Commands Supported by IBM 3880 Storage Control 18
11. Integrated Catalog Facility Catalog Structure 26
12. ISMF Primary Option Menu 34
13. Page 1 of the Data Set Selection Entry Panel 35
14. Example of a Data Set List 36
15. Copying a Data Set in a Data Set List 37
16. Release Levels for Optional Licensed Programs 46



## Chapter 1

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# Overview of Data Facility Product

MVS/Extended Architecture (MVS/XA) is an IBM operating system environment that can help you solve resource problems caused by the rapid growth of data processing requirements and processor capabilities. For installations limited by the architectural constraints of previous MVS systems, MVS/XA provides extended virtual and real storage, channel access, and device support.

To establish an MVS/XA environment, you must have an IBM processor running in System/370 extended-architecture mode, and generate an MVS/XA operating system environment that includes the MVS/System Product JES3 Version 2 or JES2 Version 2 and MVS/Extended Architecture Data Facility Product (DFP) licensed programs. This chapter describes the role of DFP in MVS/XA.

### How DFP Fits into the MVS/XA Operating System Environment

A typical MVS/XA operating system environment includes several required and several optional licensed programs. Figure 1 shows the licensed programs that might be included in a typical MVS/XA operating system.

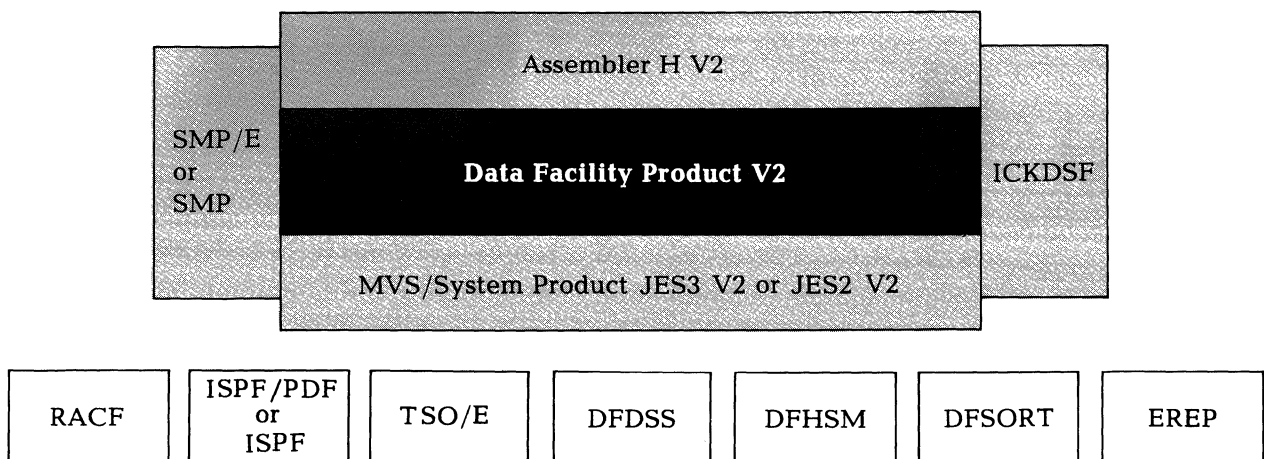


Figure 1. Typical MVS/XA Operating System

These licensed programs are described in alphabetic order below.

**Assembler H Version 2 (5668-962)**

Assembler H processes programs written in assembler language for use on the MVS/XA system. Version 2 of Assembler H is required to assemble certain system modules when DFP is installed and updated.

**Data Facility Data Set Services (DFDSS) Version 1 (5740-UT3) or Version 2 (5665-327)**

DFDSS copies, moves, dumps, and restores data sets and volumes for backup and recovery. It can be used to migrate data sets from one DASD device to another. For more information on DFDSS, see "Data Set Backup, Recovery, and Space Maintenance" on page 25.

**Data Facility Hierarchical Storage Manager (DFHSM) Version 1 (5740-XRB) or Version 2 (5665-329)**

DFHSM backs up, recovers, and manages space on volumes. For more information on DFHSM, see "Data Set Backup, Recovery, and Space Maintenance" on page 25.

**Data Facility Sort (DFSORT) (5740-SM1)**

DFSORT sorts and merges records in data sets.

**Device Support Facilities (ICKDSF) (5655-257)**

Device Support Facilities initializes DASD volumes and recovers data from defective tracks. It can also be used to migrate to indexed VTOCs; see "Migration to Indexed VTOCs with Device Support Facilities" on page 30.

**Environmental Recording, Editing, and Printing (EREP) Version 3 (5658-260)**

EREP helps to diagnose problems by reading, editing, and printing error and environmental records.

**Interactive System Productivity Facility (ISPF) Version 2.2 (5665-319)**

Dialog manager for interactive applications; required for ISMF.

**Interactive System Productivity Facility/Program Development Facility (ISPF/PDF) Version 2.2 (5665-317)**

Dialog manager for interactive applications with enhanced edit capabilities and facilities for aiding library management.

**MVS/System Product JES3 Version 2 (5665-291) or JES2 Version 2 (5740-XC6)**

MVS/SP controls the operating system, manages jobs, and establishes the base for extended architecture. Version 2 of MVS/SP contains distribution libraries required to install DFP.

**MVS/Extended Architecture Data Facility Product (MVS/XA DFP) Version 2 (5665-XA2)**

MVS/XA DFP, the subject of this manual, performs program, data, and device management in extended architecture. MVS/XA DFP is required with MVS/SP Version 2 to complete the MVS/XA operating system environment.

**Resource Access Control Facility (RACF) Version 1 (5740-XXH)**

RACF controls access to data processing resources. For more discussion of RACF, see "RACF Protection" on page 30.

**System Modification Program Extended (5665-949) (SMP/E) or System Modification Program (SMP) (5668-949)**

SMP controls software changes to modules and macros in the operating system, using a standard format and method that help to ensure system integrity. SMP/E or SMP is required to install DFP.

## Time Sharing Option Extensions (TSO/E) Version 1 Release 2, with the MVS/XA feature (5665-285)

TSO/E is the base for all TSO enhancements and provides improved interactive time sharing.

For information on the levels of these licensed programs required to install and use DFP, see "Programming Requirements" on page 45.

### What Is DFP? Tasks and Components

The DFP licensed program contains over 50 components designed to control data and external storage for large operating systems. DFP performs four main tasks in the MVS/XA environment: program management, device management, data management, and interactive storage management. The sections that follow discuss these tasks and illustrate some of the components of DFP that perform them. For more information on particular DFP components, see Chapter 8, "Publications" on page 51.

#### Program Management

**Program management** is the task of preparing programs for execution, storing the programs in load libraries, and reading them into virtual storage for execution. Although much of the program management in MVS/XA is done by MVS/SP and the Assembler, Data Facility Product components perform some of the steps necessary to create and run programs on the system.

Figure 2 shows the program management components of DFP.

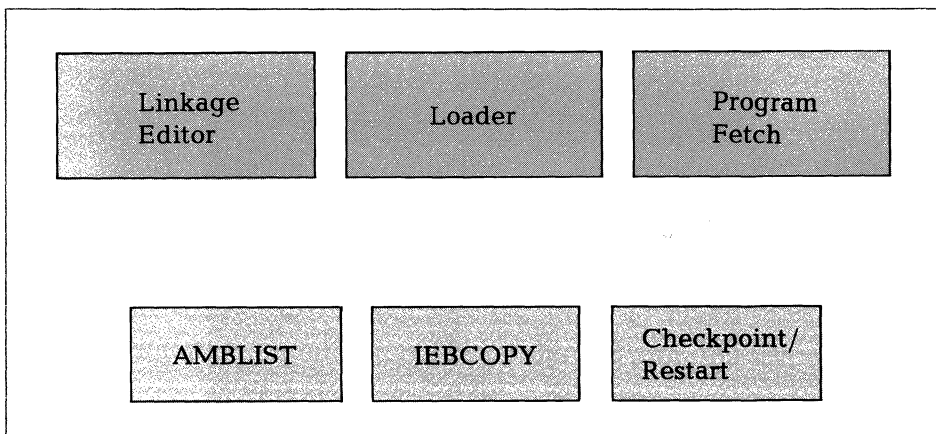


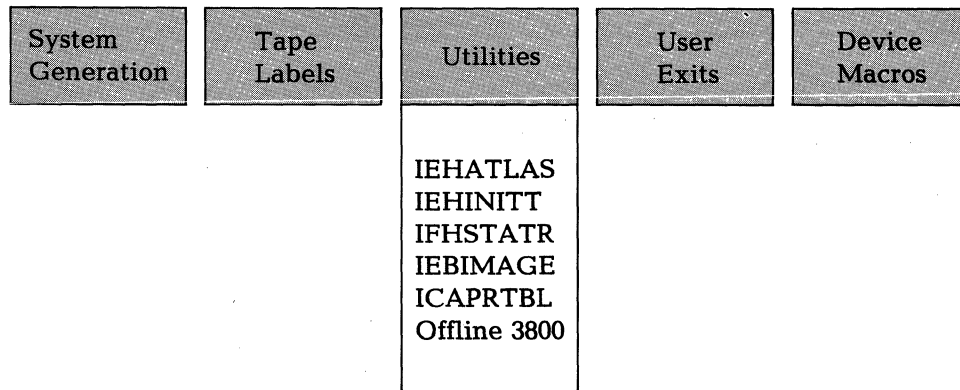
Figure 2. DFP Program Management Components

For a discussion of the individual components and the tasks they perform, see Chapter 2, "Program Management" on page 9.

## Device Management

**Device management** is the task of defining input and output devices to the operating system and using those devices. Although many programs other than DFP play important roles in device management (including MVS/SP), a few DFP components are specifically designed to define and manage devices in an MVS/XA environment.

Figure 3 shows the device management components of DFP.



**Figure 3. DFP Device Management Components**

For a discussion of the individual components and the tasks they perform, see Chapter 3, "Device Management" on page 15.

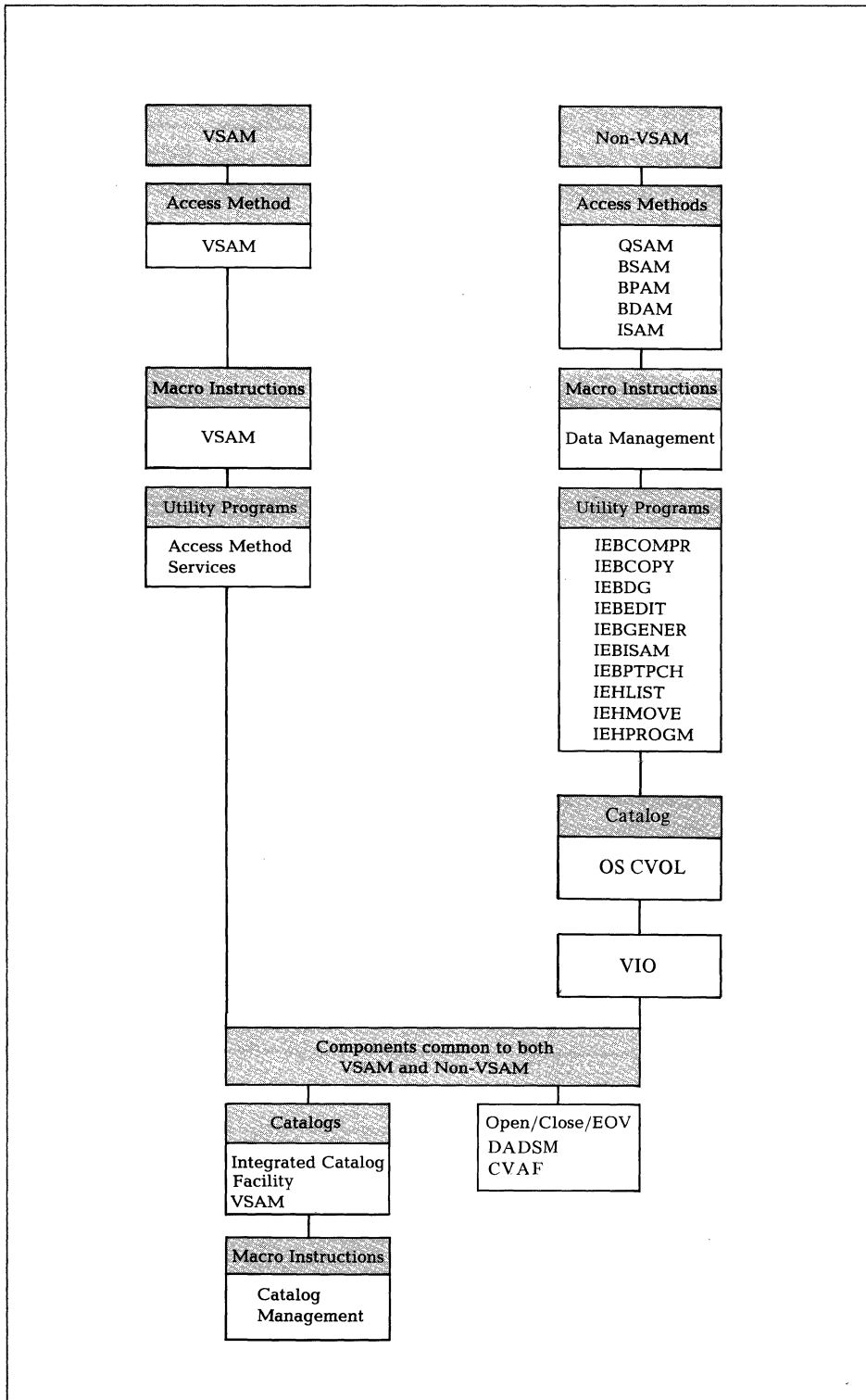
## Data Management

**Data management** is the task of systematically identifying, organizing, storing, and cataloging information so that it can be easily retrieved.

In DFP, data management is performed by many components working together. An **access method** defines the organization of the data in a data set and the technique by which the data is retrieved. **Macro instructions or commands** define data sets using specific access methods. **Utility programs** manipulate data and data sets to perform a variety of tasks. Finally, the **catalog** records the location of each data set so that it can be quickly retrieved.

Data management components also control DASD space, organize DASD volumes, control input and output, and control data security.

Figure 4 on page 5 shows the data management components of DFP.



**Figure 4. DFP Data Management Components**

For a discussion of the individual components and the tasks they perform, see Chapter 4, "Data Management" on page 21.

## **Interactive Storage Management**

**Interactive storage management** is the task of systematically managing data and storage interactively. This is a new task in DFP supported by the interactive storage management facility (ISMF).

For a discussion of interactive storage management, see Chapter 5, "Interactive Storage Management" on page 33.

## **The Origins of MVS/XA DFP Version 2**

Figure 5 shows the functions of DFP that were previously available to MVS users in the listed programs and licensed programs. All functions in MVS/XA DFP Version 1 have been incorporated in MVS/XA DFP Version 2.

<b>Previous Product</b>	<b>Functions now in DFP</b>
OS/VS2 MVS Release 3.8	All program management, some device management, and some data management
Data Facility Device Support (DFDS) Releases 1.0 through 1.6 (5740-AM7)	Indexed VTOC, alternate master catalog, CVAF, IBM 3375, 3380, 3800 Model 3 in Model 1 compatibility mode, 3880 Models 11 and 13 support
Data Facility Extended Function (DFEF) (5740-XYQ)	Integrated catalog facility catalogs, VSAM extensions, access method services enhancements
Sequential Access Method-Extended (SAM/E) (5740-AM3)	Functional extensions to SAM
Access Method Services Cryptographic Option (5740-AM8)	Data encryption and decryption
Offline IBM 3800 Utility (5748-UT2)	Support for offline 3800 Model 1
MVS/370 Data Facility Product (5665-295)	IBM 3430 Magnetic Tape Subsystem, 3262 Model 5 Line Printer, 4245 Line Printer, 4248 Printer
MVS/XA Data Facility Product Version 1 (5665-284)	All functions

**Figure 5. Origins of MVS/XA DFP Version 2**

The DFP licensed program repackages these functions, along with new programming support, prerequisite program service, and special device features (such as enhancements to the 3800). When DFP is installed, it will delete the licensed programs listed above if they are installed on your system, and replace their respective modules with DFP modules.

In addition to those listed above, there are several IBM programs that are not supported by DFP and do not function in an MVS/XA environment. If you do not already have MVS/XA DFP (Version 2 or Version 1) or MVS/370 DFP installed, these programs should be replaced with their suggested alternatives, as listed in Figure 6.

<b>Old Program</b>	<b>Function</b>	<b>Alternative</b>
Analysis Program-1 (AP-1)	Analyze DASD errors	Device Support Facilities
Direct Access Storage Dump Restore (DASDR)	Dump and restore DASD	Data Facility Data Set Services (DFDSS)
IBCDASDI utility	Initialize DASD	Device Support Facilities
IBCDMPRS utility	Dump and restore DASD in a stand-alone environment	Data Facility Data Set Services (DFDSS); restore functions only
IEHDASDR utility	Initialize DASD and dump or restore DASD	Device Support Facilities: DASD initialization  Data Facility Data Set Services (DFDSS): dump and restore functions

**Figure 6. IBM Programs Not Supported by DFP**

# Program Management

DFP program management components prepare programs to execute on the operating system. **Source modules**, which contain statements in a specific programming language, are processed by a language translator (such as the assembler) or a compiler. The output of the translator or compiler, called an **object module**, is the input for the DFP linkage editor. Either the linkage editor or the loader can turn an object module into a **load module**, ready to be executed. Figure 7 shows how modules are prepared for execution.

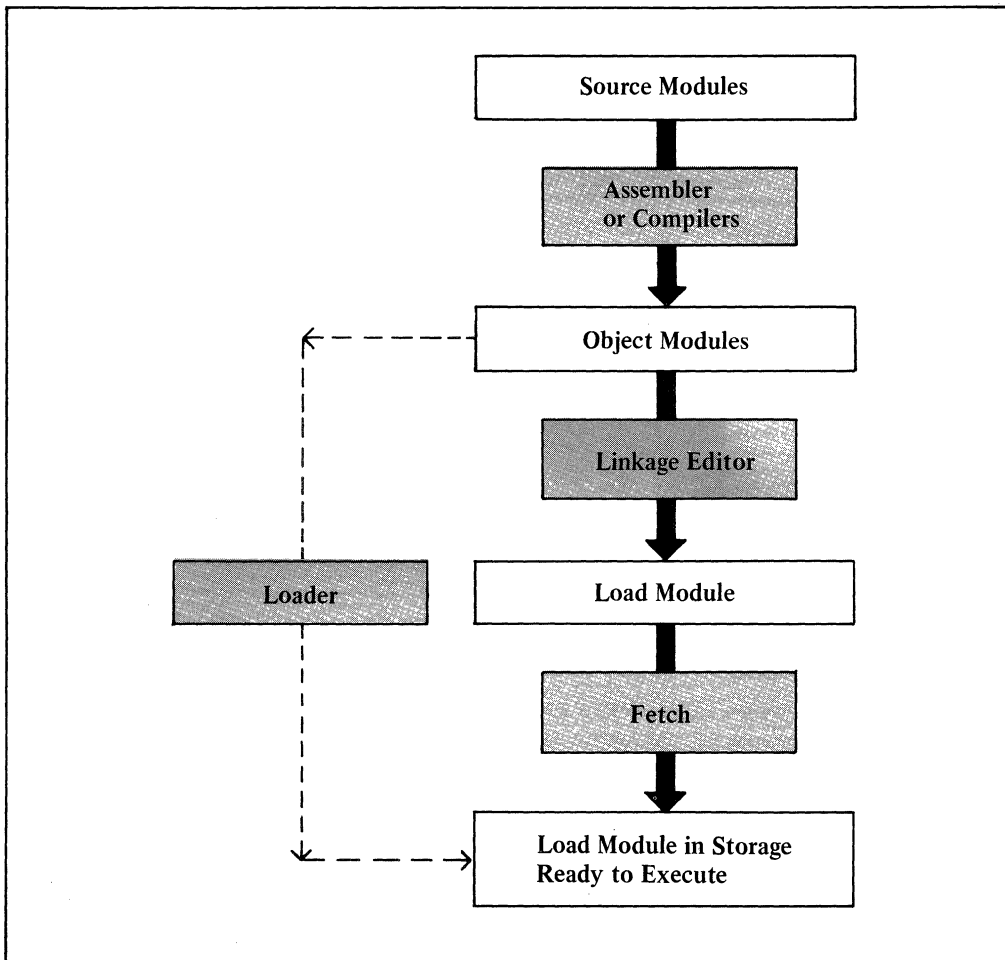


Figure 7. Preparing a Source Module for Execution



## Link-Editing Program Modules with the DFP Linkage Editor

The linkage editor combines and edits individual object or load modules to produce a single load module that can be brought into storage by program fetch for execution. This process is called **link-editing**. Program modules that have been assembled or compiled by one or more language translators (Assembler, ALGOL, BASIC, COBOL, FORTRAN, PASCAL, PL/I, or RPG) must be link-edited or loaded before the program can be executed.

As input, the DFP linkage editor accepts programs divided into multiple object modules and load modules. Linkage editor control statements specify how these modules are combined into one or more output load modules with contiguous virtual storage addresses. Each program module can be separately assembled or compiled, so that changes made to a program require only the changed modules to be recompiled or reassembled.

The linkage editor also assists in editing modules, creating overlay programs, and building system libraries. For details on using the linkage editor, see *Linkage Editor and Loader User's Guide*.

### ***Differences between the DFP and OS/VS2 MVS 3.8 Linkage Editors***

The DFP linkage editor is a functional replacement for the linkage editor program supplied with OS/VS2 MVS Release 3.8. In addition to the link-editing function described above, the DFP linkage editor:

- Accepts 24- and 31-bit addressing mode (AMODE) and residence mode (RMODE) specifications for programs running in an MVS/XA environment. AMODE and RMODE are discussed in "AMODE and RMODE: Hierarchy and Compatibility" on page 41.
- Inserts relocation dictionary (RLD) counts<sup>1</sup> into program library members to improve program fetch performance. (This can also be done by the IEBCOPY data set utility; see "Copying or Altering Load Modules with the IEBCOPY Utility" on page 12.)
- Processes read-only control section (RSECT) information for the nucleus.
- Eliminates the module overlay structure of the linkage editor for improved performance.
- Allows a maximum block size of 32760 bytes for load modules.

Modules that are link-edited in one operating system environment (OS/VS2 MVS or MVS/XA) are also accepted by the other system's linkage editor. OS/VS2 MVS modules link-edited by DFP are assigned default values for addressing and residence mode; DFP modules link-edited by OS/VS2 MVS have their mode and RSECT information ignored. Figure 8 on page 11 summarizes module portability between the OS/VS2 MVS 3.8 and MVS/XA DFP linkage editors.

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<sup>1</sup> The **relocation dictionary** is a set of records in a load module that contains information on relocatable address constants. An **RLD count** is the number of RLD records following a text record in the module.

<b>Module Type</b>	<b>MVS/XA DFP Linkage Editor</b>	<b>OS/VS2 MVS 3.8 Linkage Editor</b>
DFP object module with AMODE, RMODE, RSECTs	Accepted	Accepted, but mode and RSECT information ignored; not included in load module
MVS object module (with no AMODE, RMODE, RSECTs)	Accepted; default values AMODE=24, RMODE=24 assigned	Accepted
DFP load module with AMODE, RMODE, RSECTs	Accepted	Accepted, but mode and RSECT information ignored; not provided as output
MVS load module (with no AMODE, RMODE, RSECTs)	Accepted; default values AMODE=24, RMODE=24 assigned	Accepted

**Figure 8. Module Portability between MVS 3.8 and DFP Linkage Editors**

## Reading Load Modules into Virtual Storage with Program Fetch

Program fetch reads load modules into virtual storage and prepares them for execution. Any address constants in the load modules are relocated to point to the appropriate areas in virtual storage.

To support MVS/XA, DFP program fetch uses the RMODE attribute on a module to load programs and relocate address constants in both the 24- and 31-bit addressing range. Module portability between OS/VS2 MVS and DFP program fetch is the same as that for the linkage editors; see Figure 8.

## Editing and Loading Modules with the DFP Loader

The loader combines the basic editing and loading functions of the linkage editor and program fetch into one job step. It converts object modules into load modules in virtual storage, and passes control directly to the finished program upon completion. It cannot produce load modules for program libraries.

The loader is designed for high-performance loading of modules that do not require the special processing facilities of the linkage editor or program fetch (such as overlay processing). Because the loader can process a job in only one job step, certain modules that require only the MAP, LET, NCAL, SIZE, or TERM linkage editor options may be processed by the loader in order to reduce editing and loading time.

To support MVS/XA, the DFP loader can load programs and relocate address constants in both the 24- and 31-bit addressing range. Module portability

between the OS/VS2 MVS and DFP loaders is the same as that for the linkage editors; see Figure 8. For details on using the loader, see *Linkage Editor and Loader User's Guide*.

### **Listing Module Information with the AMBLIST Service Aid**

The AMBLIST service aid program prints formatted listings of modules and system storage areas to aid in problem diagnosis.

Listings of object or load modules include information on addressing and residence mode recorded in the external symbol dictionary or in the PDS directory entry. The AMODE for the main entry point, AMODEs for each alias entry point, and the RMODE for the load module are provided. RSECT information is included for nucleus load modules.

Listings of the modified link pack area (MLPA), fixed link pack area (FLPA), pageable link pack area (PLPA), and their extended areas in virtual storage can be made separately or together. For details on using AMBLIST, see *MVS/XA SPL: Service Aids*.

### **Copying or Altering Load Modules with the IEBCOPY Utility**

The IEBCOPY data set utility program can be used to copy, alter, and reblock load modules, or to alter load modules in place. If you copy load modules from a module library using the COPYMOD command, IEBCOPY rebuilds the text records, control records, and the relocation dictionary (RLD). Reblocking helps to maximize DASD track utilization and program fetch performance.

When altering load modules, IEBCOPY inserts new RLD counts in the PDS directory and in the control records. You can use IEBCOPY to correct RLD counts in load modules that have been reblocked by some other program, or link-edited by a previous version of the linkage editor that has inaccurate RLD counts.

IEBCOPY can also be used to load, unload, and copy partitioned data sets without reblocking; see "Data Management Utilities" on page 23. For more information on copying, reblocking, and altering load modules, see the IEBCOPY chapter in *Data Administration: Utilities*.

### **Taking Checkpoints and Restarting Programs with Checkpoint/Restart**

Checkpoint/Restart can be used to establish checkpoints during a program and to restart the job at a checkpoint or at the beginning of a job step.

A **checkpoint** is a designated point in the program at which information about the job is collected and recorded in a separate checkpoint data set. This information includes the contents of the program's virtual storage area and some related system control data. If the job fails, for example, or produces unusual output, the information in the checkpoint data set can be retrieved and the job restarted directly from this checkpoint.

MVS/XA allows you to restart a job automatically, with permission from the operator, or to defer the restart until the job is resubmitted. In either case, you can restart from the checkpoint or from the beginning of the failing job step, thus avoiding the time-consuming process of rerunning the entire job from the beginning.

For more information about checkpoint/restart, see *Checkpoint/Restart User's Guide*.

## Chapter 3

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# Device Management

DFP device management components define input and output devices to the operating system and help control the operation of these devices. For some devices supported by MVS/XA, DFP also provides programming support to help you use the standard and optional features of each device most effectively. This support often includes changes to data management as well as to device management components.

### Installing New Devices

As new devices are installed on the system, their names, characteristics, and addresses must be defined to the MVS configuration program, which takes the information that you provide for each device (in the form of input statements) and establishes an I/O configuration for your installation.

Most devices attached to the system operate in *full function* mode; that is, all features on the device are compatible with and usable on the operating system. Some devices also operate in *compatibility* mode, which allows you to simulate the function of another device or model. Compatibility mode causes the device to function as a different device of the same type, ignoring some or all of the additional features the device might have. For instance, a 3480 Magnetic Tape Subsystem can operate in compatibility mode as a 3420 Magnetic Tape Unit. This allows you to migrate between devices with minimum impact on your programs.

For information on devices supported by MVS/XA in full function and compatibility modes, see *Data Facility Product Version 2: Planning Guide*.

### Devices Supported by MVS/XA

Figure 9 on page 16 summarizes the most common IBM I/O devices supported by MVS/XA. If you have a question about support for a device not listed here, contact your IBM marketing representative.

Some devices may require a specific level of hardware maintenance in order to function on an MVS/XA system. Contact your IBM marketing representative for information on hardware maintenance levels.

In MVS/XA, an increase in the number of available unit control blocks (UCBs) means that MVS/XA can support up to 4096 attached devices. The hardware configuration of your processors and I/O devices will determine exactly how many devices you can attach to your system.

---

**DASD**

2305 Fixed Head Storage Model 2  
3330 Disk Storage Models 1, 2, 11<sup>2</sup>  
3333 Disk Storage and Control  
Models 1, 11  
3340 Direct Access Storage Facility  
3344 Direct Access Storage  
3350 Direct Access Storage  
3375 Direct Access Storage  
3380 Direct Access Storage

**Storage Control Unit**

3880 Storage Control Models 1, 2, 3, 4

**Cache Storage Control Unit**

3880 Storage Control Models 11, 13,  
21, 23

**Console**

2250 Display Unit Model 3  
3251 Display Station  
3277 Display Station Models 1, 2  
3278 Display Station Models 1, 2, 2A,  
3, 4  
3279 Color Display Station Models  
2A, 2B, 2C, 3A, 3B  
5080 High Function Graphics System

**Tape**

3420 Magnetic Tape Unit Models 3,  
4, 5, 6, 7, 8  
3422 Magnetic Tape Subsystem  
3430 Magnetic Tape Subsystem  
3480 Magnetic Tape Subsystem<sup>3</sup>

**Printer**

1403 Printer Models 2, 7, N1  
3203 Printer Model 5  
3211 Printer  
3262 Line Printer Model 5  
3284 Printer Models 1, 2  
3286 Printer Models 1, 2  
3800 Printing Subsystem Model 1  
3800 Printing Subsystem Model 3<sup>4</sup>  
4245 Line Printer  
4248 Printer

**Other**

2501 Card Reader Models B1, B2  
2540 Card Read Punch Models 1, 2  
3505 Card Reader  
3525 Card Punch  
3705 Communications Controller  
3838 Array Processor  
3848 Cryptographic Unit  
3851 Mass Storage Facility<sup>2</sup>  
3890 Document Processor

---

**Figure 9. Common IBM I/O Devices Supported by MVS/XA**

- 
- <sup>2</sup> Also includes the 3330V mass storage system virtual volume.
- <sup>3</sup> The 3480 Magnetic Tape Subsystem is supported both in full function and in 3420 compatibility modes.
- <sup>4</sup> The 3800 Printing Subsystem Model 3 is supported both in full function (all-points-addressable) and in compatibility mode.

## **Defining Devices to MVS/XA**

You define devices to MVS/XA by defining an I/O configuration through the MVS configuration program (MVSCP). Defining an I/O configuration to MVS/XA involves:

- Identifying the available I/O devices.
- Defining esoteric device groups and naming each group. This means specifying names to be used for groups of devices that have similar hardware characteristics (for example, TAPE for tape devices).
- Defining eligible device tables that contain the esoteric device group specifications. You can create several different eligible device tables for different groupings of devices to esoteric names.

The MVS configuration program provides much of the function that was provided in previous releases of MVS/XA Version 2 by the I/O device generation (ioggen) process and eligible device table generation (edtgen) process.

For more information on the MVS configuration program, see *MVS/XA MVS Configuration Program: Guide and Reference*.

## **Using Devices in DFP**

DFP provides programming support to help you best use the standard and optional features of your devices. Some DFP functions can be used with many different device types, but most apply specifically to one type or one family of devices. The sections that follow discuss the tasks that DFP can perform to support each device type.

### **Managing DASD**

The DFP programming support for DASD is described below. Some related programs and licensed programs that should be used to supplement DFP support are also discussed.

#### **Device Console Services**

Device Console Services provides commands to display the logical status of DASD devices. The newest of these, the DEVSERV command, tests all paths to a device and displays information about the logical status of each path on the system console. The operator can use this information to diagnose problems in the I/O subsystem. For more information on DASD console commands, see *Operations: System Commands*.

#### **IEHATLAS utility**

IEHATLAS assigns alternate tracks and recovers data when defective tracks are indicated. For more information on IEHATLAS, see *Data Administration: Utilities*.

#### **ATLAS macro**

The ATLAS macro assigns alternate tracks and recovers data when defective tracks are indicated. If you use the EXCP macro to execute channel programs, the ATLAS macro can assist in recovering data on damaged tracks. For more information on the ATLAS macro, see *System-Data Administration*.

**DEVTYPE macro**

The DEVTYPE macro requests information from the system about an I/O device, such as maximum block size, track length, and number of cylinders. For more information on the DEVTYPE macro, see *System-Data Administration*.

**TRKCALC macro**

The TRKCALC macro performs track capacity calculations for DASD. For more information on the TRKCALC macro, see *System-Data Administration*.

**Device Support Facilities (5655-257)**

Device Support Facilities initializes DASD volumes and recovers from problems caused by defective tracks. Although not technically part of DFP, the Device Support Facilities program is an important related tool for DASD management. For more information, see *Device Support Facilities User's Guide and Reference*.

**DASD Migration Aid (5668-002)**

DASD Migration Aid assists in migrating between unlike DASD device types. Although not technically part of DFP, DASD Migration Aid is an important related tool for DASD management. For more information, see *DASD Migration Aid General Information*.

***Managing Cache Devices***

The DFP programming support for cache devices is described below.

**LISTDATA, BINDDATA, SETCACHE access method services commands**

These commands control the caching and paging subsystems for the IBM 3880 Storage Control Models 11, 13, 21, and 23. Some commands are not supported for some models. Figure 10 lists the commands supported by each model.

Command	Model 11	Model 21	Model 13	Model 23
BINDDATA	No	No	Yes	No
LISTDATA	Yes	Yes	Yes	Yes
SETCACHE	No	Yes	Yes	Yes

Figure 10. Commands Supported by IBM 3880 Storage Control

***Managing Magnetic Tapes***

The DFP programming support for magnetic tape devices is described below.

**IBM standard and nonstandard tape label support**

This support processes magnetic tape labels on tape volumes. For more information, see *Magnetic Tape Labels and File Structure Administration*.



### **ISO/ANSI/FIPS magnetic tape label and file structure support**

ISO/ANSI/FIPS support processes magnetic tape labels and files that comply with international, American, and federal tape standards,<sup>5</sup> as interpreted by IBM in March 1983. For more information on ISO/ANSI/FIPS tape support, see *Magnetic Tape Labels and File Structure Administration*.

### **IEHINITT utility**

IEHINITT writes IBM standard or American National Standard labels on tape volumes. (The American National Standard labels are written to conform to the ISO/ANSI/FIPS standards described on page 19.) For more information on IEHINITT, see *Data Administration: Utilities*.

### **IFHSTATR utility**

IFHSTATR formats and prints information about tape volume errors from type 21 SMF records. For more information on IFHSTATR, see *Data Administration: Utilities*.

### **MSGDISP, SYNCDEV, NOTE and POINT macros**

These macros control operation of the IBM 3480 Magnetic Tape Subsystem. The MSGDISP macro displays program messages on the 3480. The SYNCDEV macro controls data synchronization; the NOTE and POINT macros control high-speed searching. For more information on these macros, see *Data Administration: Macro Instruction Reference*.

### **DEVTYPE macro**

The DEVTYPE macro requests information from the system about an I/O device, such as maximum block size. For more information on the DEVTYPE macro, see *System-Data Administration*.

### **Device Console Services**

Device Console Services provides commands to display the logical status of tape devices. The newest of these, the DEVSERV command, tests all paths to a device and displays information about the logical status of each path on the system console. The operator can use this information to diagnose problems in the I/O subsystem. For more information on console commands, see *Operations: System Commands*.

### **Tape Open/EOV user exit routines**

DFHSM uses these routines to supplement the existing data control block (DCB) user exit routines for tape volumes. A user exit from the DCB can indicate if a specific volume rather than a scratch volume should be mounted when extending to another tape. Another user exit can check or bypass volume security for the specific tape volume. For more information on these DCB exit routines, see *Data Administration Guide*.

### **Improved tape block count checking**

Block count checking compares the number of tape blocks calculated by the tape subsystem with the number of blocks calculated by DFP, and detects discrepancies between the two. Block counts are checked when tapes are both read and written in order to improve tape reliability. All magnetic tape devices that use block identifiers (such as the 3480) will have their block counts checked.

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<sup>5</sup> International Organization for Standardization (ISO) 1001-1979, level 4; American National Standards Institute (ANSI) X3.27-1978, level 4; and Federal Information Processing Standard (FIPS) 79.

## **Managing Printers**

The DFP programming support for printers is described below.

### **IEBIMAGE utility**

IEBIMAGE maintains certain printer modules for the IBM 3800 (Model 1 and Model 3), 4248, and 3262 Model 5 printers. IEBIMAGE creates and maintains forms control buffer modules, copy modification modules, character arrangement table modules, graphic character modification modules, and library character set modules. For more information on IEBIMAGE, see *Data Administration: Utilities*.

### **Offline IBM 3800 utility**

The offline IBM 3800 utility creates tapes that can be read offline to MVS by an IBM 3800 Printing Subsystem Model 1 that has the tape-to-printing-subsystem feature. For more information, see *Offline IBM 3800 Utility*.

### **ICAPRTBL utility**

ICAPRTBL maintains UCS and FCB buffers on IBM 3203 Model 5 or 3211 printers. Although ICAPRTBL does not run under MVS/XA, it can be used for stand-alone buffer loading in preparation for using these printers on an MVS/XA system. For more information on ICAPRTBL, see *Data Administration: Utilities*.

### **IGGUCSIT macro**

The IGGUCSIT macro creates UCS image tables in SYS1.IMAGELIB for the IBM 4245, 4248, and 3262 Model 5 printers. For more information on the IGGUCSIT macro, see *System - Data Administration*.

### **SETPRT macro**

The SETPRT macro sets or changes character set images for the IBM 1403, 3203, 3211, 3262 Model 5, 3800, 4245, and 4248 printers. SETPRT loads UCS images (for printers that do not load their own images) and FCB images from the system image library (SYS1.IMAGELIB) into UCS and FCB buffers, and verifies that the correct image was loaded. SETPRT can also retrieve 3800 modules from SYS1.IMAGELIB or a user-specified library. For more information on SETPRT, see *Data Administration: Macro Instruction Reference*.

## Chapter 4

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# Data Management

DFP data management components are designed to handle the complex organization and storage of data in an environment with large real and virtual storage capabilities. Because data management (or data administration) is the largest function of DFP, most of the DFP components are discussed in this chapter.

Data management components perform two main tasks: managing data and data sets, and controlling access to data.

### Managing Data and Data Sets

An access method defines the organization of the data in a data set and the technique by which the data will be stored and retrieved. DFP access methods have their own data set structures to organize data, macro instructions to define data sets, and utility programs to manipulate data sets.

To manage the storage and placement of data sets, DFP uses a catalog and a volume table of contents (VTOC). The catalog records the location of each data set so that it can be quickly retrieved; the VTOC lists the data sets that reside on a specific volume, along with information about the location and size of each data set.

### *Data Set Administration*

DFP supports several access methods for organizing and accessing data. Virtual storage, indexed sequential, sequential, partitioned and direct access methods create different types of data sets and use different techniques for accessing and storing data.

#### **Virtual Storage Access Method (VSAM)**

VSAM arranges records by an index key or by relative byte addressing. Data organized by VSAM is cataloged for easy retrieval, and is stored in one of four types of data sets.

**Key-sequenced data sets** contain records in order by a key field, and can be accessed by this key or by a relative byte address. **Entry-sequenced data sets** contain records in the order in which they were entered, and can be accessed by relative byte address only. **Relative record data sets** contain records in order by relative record number, and can be accessed only by this number. **Linear data sets** contain data that can be accessed as byte-addressable strings in virtual storage; they contain none of the control

information that other VSAM data sets hold. Linear data sets must be cataloged in an integrated catalog facility catalog. All other VSAM data sets must be cataloged in an integrated catalog facility or VSAM catalog. Catalogs are discussed in "Catalog Administration" on page 25.

In MVS/XA, VSAM allows you to create buffers, user exits, shared resource pools, and some control blocks in virtual storage above 16 megabytes. Your program must run in 31-bit addressing mode to access these areas above 16 megabytes. (Addressing mode is described in "AMODE and RMODE: Hierarchy and Compatibility" on page 41.) Detailed information on running in 31-bit addressing mode is provided in *VSAM Administration Guide*.

### **Indexed Sequential Access Method (ISAM)**

ISAM arranges records in sequence by key fields, and retrieves records by key. The structure of multilevel indexes in ISAM is similar to that of VSAM.

ISAM is supported by DFP only for compatibility with other IBM operating systems; you should plan to convert all ISAM data sets to VSAM data sets.

### **Queued Sequential Access Method (QSAM)**

QSAM arranges records sequentially in the order in which they are entered. Records are blocked with other records and are written as they fill selected buffers. QSAM anticipates the need for records based on their order, and, in order to improve performance, reads these records into storage before they are requested. This is called *queued* access.

QSAM includes the buffer scheduling functions and enhanced performance originally provided with SAM-E in OS/VS2 MVS.

### **Basic Sequential Access Method (BSAM)**

BSAM arranges records sequentially in the order in which they are entered. Records are stored in physical blocks and retrieved as requested. This is called *basic* access.

BSAM includes the buffer scheduling functions and enhanced performance originally provided with SAM-E in OS/VS2 MVS.

### **Basic Partitioned Access Method (BPAM)**

BPAM arranges records as members of partitioned data sets on DASD. A partitioned data set (PDS) includes a directory that relates member names to locations on the DASD volume; the PDS directory is used to retrieve individual members. BPAM uses BSAM to perform all of its input and output other than manipulation of the PDS directory.

### **Basic Direct Access Method (BDAM)**

BDAM arranges records in any sequence your program indicates, and retrieves records by actual or relative address. If you don't know the exact location of a record, you can specify a starting point within the data set where a search for the record will begin.

### **Data Management Macro Instructions**

You can use macro instructions to create and maintain all the data set types described above. Macro instructions control data set creation, input and output, and data security.

The DFP data management macro instructions are described in *Data Administration: Macro Instruction Reference*. VSAM macro instructions are described in *VSAM Administration: Macro Instruction Reference*.

## Data Management Utilities

A series of data management utility programs can create and maintain data sets.

- **Access method services (IDCAMS)** is the utility program used to create and maintain VSAM data sets. Some of the tasks that access method services can perform are listed below.
  - Defining VSAM data sets
  - Defining and building alternate indexes
  - Backing up and restoring VSAM data sets
  - Copying VSAM data sets
  - Printing the contents of VSAM data sets
  - Deleting VSAM data sets
  - Examining the structural consistency of VSAM key-sequenced data sets
- **IEBCOMPR** compares logical records in sequential or partitioned data sets, usually to verify the accuracy of backup copies.
- **IEBCOPY** copies, compresses, and merges partitioned data sets, and loads and unloads data to a sequential data set (tape or DASD). IEBCOPY can also be used to alter, copy, and reblock load modules; see "Copying or Altering Load Modules with the IEBCOPY Utility" on page 12.
- **IEBDG** creates a pattern of test data for aid in debugging programs.
- **IEBEDIT** edits jobs and job steps into a single output data set.
- **IEBGENER** copies records from a sequential data set or converts sequential data sets to partitioned. IEBGENER can also expand existing partitioned data sets, reblock data sets, and edit data sets.
- **IEBISAM** creates, copies, backs up, and prints ISAM data sets.
- **IEBTPCH** punches or prints records from sequential or partitioned data sets.
- **IEBUPDTE** changes source language statements in sequential or partitioned data sets. IEBUPDTE can create and update program libraries, and change data set organization between sequential and partitioned.
- **IEHLIST** lists entries in OS CVOLs, partitioned data set directories, or volume tables of contents (VTOCs).
- **IEHMOVE** moves or copies collections of operating system data. IEHMOVE can move or copy data sets, OS CVOLs, and volumes.
- **IEHPROGM** builds and maintains system control data. IEHPROGM can scratch or rename data sets; create and maintain OS CVOL entries, indexes, and aliases; create and maintain a generation data group index; and maintain data set passwords.

For more information on the data management utilities, see *Data Administration: Utilities*. Access method services commands are described in *Integrated Catalog Administration: Access Method Services Reference* or *VSAM Catalog Administration: Access Method Services Reference*.

### Open/Close/End-of-Volume

DFP access methods can process data only when it has been identified and located by the operating system. The open, close, and end-of-volume components establish an environment where access methods can read data into buffers and return it to the correct location in auxiliary storage.

The open function mounts the correct DASD or tape volume and creates a link between the system, the access method, and your program when the volume is ready for processing. When processing is complete, the close function demounts

the volume and disconnects the link between the system, the access method, and your program.

If an output data set on a direct access device runs out of allocated space during processing, the end-of-volume function uses direct access device storage management (DADSM) to allocate additional space. (DADSM is described under "System Data Administration.") For both tape and DASD, end-of-volume can automatically switch to the next volume of a multivolume data set, and can verify any additional volumes to be mounted.

### **Virtual I/O Data Sets**

Temporary data sets can be handled by a function called virtual input/output (VIO). When temporary data sets defined with a VIO UNITNAME are needed by your program, they are dynamically allocated in 4K-byte physical blocks on the system's paging data sets. VIO stores an image of the tracks in virtual storage.

The advantage of virtual I/O data sets is that they eliminate some of the data management and I/O device overhead usually associated with temporary data sets. VIO uses DASD space more efficiently, and, because the I/O is handled by the paging mechanism of the system, it can be balanced with other I/O operations.

VIO allows you to create and access I/O buffers above 16 megabytes if your program runs in 31-bit addressing mode. Virtual indirect data addressing words (IDAWs) are used to access these buffers; user programs must use the EXCP access technique.

VIO data sets can be used with the BPAM, BSAM, QSAM, BDAM, and EXCP access methods. Recovery processing is consistent with other kinds of temporary data sets, but VIO data sets are not eligible for deferred restart. (For a definition of the types of restart, see "Taking Checkpoints and Restarting Programs with Checkpoint/Restart" on page 12.)

### **System Data Administration**

When the normal data management functions are insufficient for a specific task, there are several DFP components that can modify and extend the data management capabilities of the operating system. Because most of their functions can be used only by authorized programs, these components are sometimes grouped under the term *system data administration*.

Direct access device storage management (DADSM) is used to control space allocation and deallocation on DASD. DADSM is available to manage all DASD space except that under the control of the VSAM (not integrated catalog facility) catalog. DADSM also provides exit routines to help an installation control space allocation and enforce installation standards for good storage management.

The execute channel program (EXCP) access technique is used to establish your own system for organizing, storing, and retrieving data. EXCP allows you to tailor your data organization based on device characteristics, but such tailoring produces device type dependencies that may prevent the program from working in a future environment.

For more information on the advanced data administration functions available in DFP, see *System-Data Administration*.

## Data Set Backup, Recovery, and Space Maintenance

Two IBM licensed programs can be used to help manage data in an MVS/XA environment. Data Facility Data Set Services (DFDSS) allows you to copy, move, dump and restore data sets and volumes for backup and recovery. To help you determine when volumes or data sets can be compressed and the unused space recovered, DFDSS can also assist in analyzing space fragmentation on DASD volumes.

Data Facility Hierarchical Storage Manager (DFHSM) allows you to migrate data sets to different levels of storage according to how frequently they are needed. DFHSM can also assist in backing up, recovering, and managing space on DASD volumes.

For more information on DFDSS, see *Data Facility Data Set Services: General Information*. For more information on DFHSM, see *Data Facility Hierarchical Storage Manager: General Information*.

## Catalog Administration

A catalog records the location of each data set on the system so that data sets can be quickly retrieved. Multiple user catalogs contain information about the data sets owned by a user or a volume; a single master catalog contains entries used to locate each user catalog.

DFP supports three types of catalogs, which can coexist on the same MVS/XA system: integrated catalog facility catalogs, VSAM catalogs, and OS CVOLs.

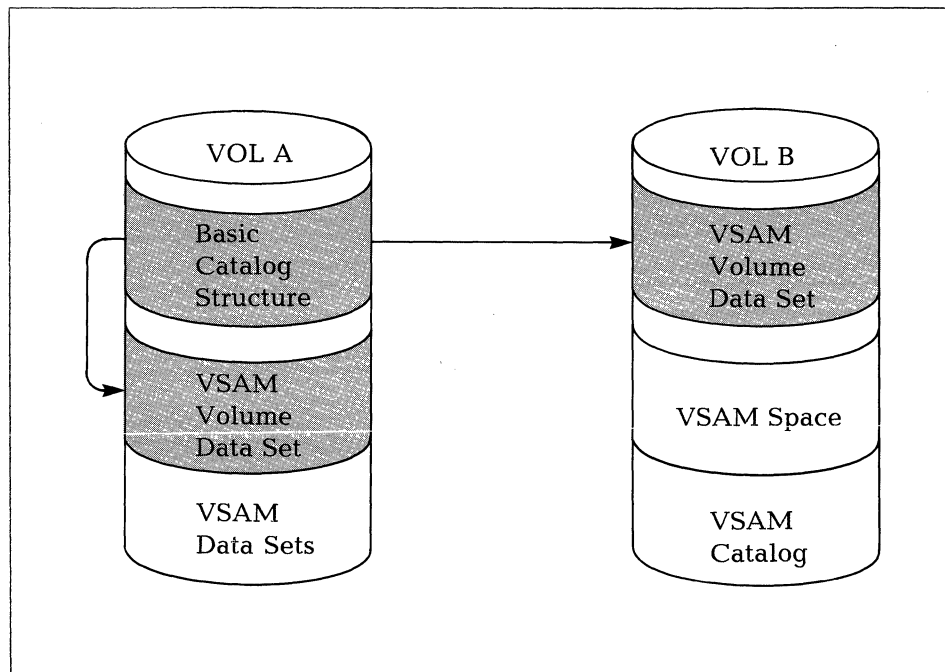
### Integrated Catalog Facility Catalog

The integrated catalog facility catalog is a functional replacement for VSAM master and user catalogs, and OS CVOLs. Integrated catalog facility catalogs feature improvements over VSAM catalogs in reliability, recovery, performance, usability, and DASD space management. You can convert existing VSAM catalogs or OS CVOLs to integrated catalog facility catalogs with minimum impact on your application programs.

An integrated catalog facility catalog consists of two types of components: the **basic catalog structure (BCS)**, which contains information about VSAM and non-VSAM data sets, and at least one **VSAM volume data set (VVDS)**, which contains information about VSAM data sets only. Figure 11 on page 26 shows the relationship between the BCS and the VVDSs in an integrated catalog facility catalog.

**Basic Catalog Structure (BCS):** The BCS is a VSAM key-sequenced data set. It contains volume, data set security, ownership, and other information for VSAM and non-VSAM data sets. It resides on a single volume and contains pointers to related VVDSs on its own or other volumes. (A BCS may also point to a volume containing only non-VSAM and generation data group data sets; in this case, the information about these data sets is considered to be in the BCS itself, and no separate VVDS is required.)

Unlike VSAM catalogs, integrated catalog facility catalogs do not own the volumes of their cataloged data sets. VSAM data sets on a single volume can be cataloged in as many as 36 different BCSs; however, if you use multiple BCSs per volume, backup and recovery procedures for these data sets can be highly complex.



**Figure 11. Integrated Catalog Facility Catalog Structure**

**VSAM Volume Data Set (VVDS):** The VVDS is a VSAM entry-sequenced data set. It contains the characteristics of all integrated catalog facility cataloged VSAM data sets that reside on that volume, and the names of the associated BCSs (as many as 36). All these BCSs can use this VVDS to gather information about the VSAM data sets on this volume; a VVDS exists on each volume that contains VSAM data sets cataloged in integrated catalog facility catalogs. Information in the VVDS is updated each time a VSAM data set on the volume is opened or closed.

Because the VVDS resides on the same volume as the VSAM data sets it describes, you can periodically copy the contents of the volume for backup and recovery and still be assured that the information in the VVDS is synchronized with the contents of the data sets.

### **VSAM Catalog**

VSAM catalogs are structured like VSAM key-sequenced data sets, with data and index components. They contain entries for all cataloged VSAM data sets stored on DASD volumes.

VSAM catalogs are supported by DFP only for compatibility with other IBM operating systems; you should plan to convert all VSAM catalogs to integrated catalog facility catalogs. VSAM catalogs are described in *Catalog Administration Guide*.



## OS Control Volume (CVOL)

An OS CVOL is a DASD volume that contains an index that is part of the system's catalog. CVOLs themselves are cataloged in the master catalog as non-VSAM data sets.

OS CVOLs are supported by DFP only for compatibility with other IBM operating systems; you should plan to convert all OS CVOLs to integrated catalog facility catalogs. OS CVOLs are described in *Catalog Administration Guide*.

### Access Method Services Tasks for Catalogs

Access method services, the utility program used to create and maintain VSAM data sets, can also be used to create and maintain integrated catalog facility and VSAM catalogs. Access method services can:

- Create catalogs
- Convert catalogs
- Define catalog entries
- Alter catalogs
- Diagnose catalog errors
- Delete catalog entries
- Copy or merge catalog entries
- Back up catalogs
- List the entries in a catalog
- Examine the structural consistency of a catalog

For information on how to use the access method services commands for catalogs, see *Catalog Administration Guide*. For reference information on the commands and their parameters, see *Integrated Catalog Administration: Access Method Services Reference* or *VSAM Catalog Administration: Access Method Services Reference*.

### Catalog Backup and Recovery

Access method services commands are available to copy an integrated catalog facility or VSAM catalog for backup and retrieve the backup copy for recovery.

Furthermore, an integrated catalog facility catalog can be recovered with minimal impact on the surrounding subsystems. In particular, subsystems like IMS/VS and CICS/VS that are oriented to an integrated catalog facility catalog do not have to be quiesced or terminated when the catalog needs to be recovered. DFP automatically reorients the subsystems to the catalog after recovery.

Integrated catalog facility catalogs can be locked during the recovery period. This permits restricted access to the catalog so that recovery personnel can update the recovered catalog to the point of failure or to validate it while it remains inaccessible to other users. To do this, you must have RACF, a RACF-equivalent product, or code an MVS router exit routine.

For further information on catalog backup and recovery, see *Catalog Administration Guide*.

## Catalog Management Macro Instructions

You can use the DFP catalog management macro instructions to create and manipulate entries in integrated catalog facility catalogs, VSAM catalogs, and OS CVOLs. There are macros available to:

- Retrieve information from catalogs
- Catalog non-VSAM data sets in catalogs
- Modify the contents of OS CVOLs

Catalog management macros are described in *Catalog Administration Guide*.

## Migration from VSAM Catalogs or OS CVOLs

Most installations depend on the availability of catalog facilities to run production job streams and to support online users. Modifying these facilities to use integrated catalog facility catalogs requires thorough planning, beginning with an analysis of the way catalogs are currently used in your installation.

Changing the catalog environment may involve revising naming conventions and catalog administration responsibilities. New procedures for catalog backup and recovery may be needed, and some users' job streams might be affected.

The extent of the change depends on the current status of the catalogs on your system. In a well-designed and carefully controlled catalog environment, replacing existing catalogs with integrated catalog facility catalogs should be straightforward and have little impact on the installation. However, if your current operating environment requires special catalog access or format (for example, if your user programs modify OS CVOLs), migration may take longer.

You can use the access method services command CNVTCAT to convert VSAM or OS CVOL catalogs to integrated catalog facility catalogs. Catalogs can be converted as single units, or each data set's catalog entry can be converted individually.

If you plan to share integrated catalog facility catalogs across multiple operating systems, all systems must have integrated catalog facility support installed (from either the MVS/XA DFP Version 1, MVS/XA DFP Version 2, MVS/370 DFP, or DFEF licensed programs).

During the migration process, you may have a master catalog that contains entries for VSAM and integrated catalog facility user catalogs and OS CVOLs. This allows you to convert existing catalogs to integrated catalog facility catalogs gradually, without a severe impact on your installation's processing.

Note that, if you have already converted OS CVOLs and VSAM catalogs to integrated catalog facility catalogs with DFEF, MVS/370 DFP, or MVS/XA DFP Version 1, you need not repeat the conversion process when MVS/XA DFP Version 2 is installed.

For more information on planning for conversion to integrated catalog facility catalogs, see *Data Facility Product Version 2: Planning Guide*.

## ***Indexed Volume Table of Contents (VTOC)***

A volume table of contents (VTOC) is made up of data set control blocks (DSCBs). These DSCBs describe the type and location of data sets on a DASD volume. To locate a data set by name, DFP must read each DSCB in the VTOC until it determines the location of the data set. This requires search commands that occupy a channel and control unit during the entire search; channel use time increases as the number of data sets on the volume increases.

An indexed VTOC is a combination of VTOC and index. The index, a special data set that resides on the same volume as the VTOC, contains an entry for each data set on the volume, and a pointer to the DSCB in the VTOC that describes that data set. The index allows direct access to the correct DSCB, avoiding lengthy sequential searches of the VTOC. An index also manages free space information so that the number of I/O operations needed to obtain or release space on the volume is reduced.

For more information on the structure of the VTOC and its index, see *System-Data Administration*.

### **Creating a VTOC index**

You can use the Device Support Facilities program to create a VTOC with or without an index when a volume is initialized. It is also possible to build an index for an existing VTOC. For information on creating a VTOC and an index, see *Device Support Facilities User's Guide and Reference*.

### **Accessing the VTOC**

The common VTOC access facility (CVAF) is used by DFP to access both indexed and nonindexed VTOCs. You can use CVAF to read or write information in the VTOC index, to determine whether the VTOC on a mounted volume is indexed, or to read and write DSCBs.

You can also use the EXCP access technique, or the SAM or DADSM interfaces for user exit routines to access the VTOC. If you already have programs that use these methods to access nonindexed VTOCs, you can continue to use them for indexed VTOCs. However, any programs that use information from the format-5 DSCB will find that this information is now stored in the VTOC index. These programs should use CVAF to obtain this information from the index.

A VTOC and its index may be protected from unauthorized access as any other sequential data set, using the Resource Access Control Facility (RACF) or passwords. For information on protecting resources, see "Controlling Access to Data: Security" on page 30.

### **Listing the Contents of the VTOC**

You can list the contents of an indexed or nonindexed VTOC with the IEHLIST utility program. For indexed VTOCs, IEHLIST also retrieves space information from the space maps in the index. IEHLIST is described in *Data Administration: Utilities*.

You can also list the contents of the VTOC index by the same method you would use to print any other sequential data set (for example, the IEBPTPCH utility program).

## Migration to Indexed VTOCs with Device Support Facilities

You can use Device Support Facilities to build an index for an existing VTOC and convert it to indexed VTOC format, as long as the VTOC begins on record 1 of a track. Because this procedure must be done for each volume, you can select the volumes that you want to convert to indexed VTOCs and then convert them at your own pace.

## VTOC Compatibility Between Systems

MVS/XA DFP Version 1, MVS/XA DFP Version 2, MVS/370 DFP, and OS/VS2 MVS with DFDS support both nonindexed and indexed VTOCs. DOS, OS/VS1, SVS, and OS/VS2 MVS systems that do not have indexed VTOC support accept indexed VTOCs, but you must use Device Support Facilities to convert these VTOCs to a nonindexed format. If you decide to return the VTOC to a system that supports the index, you must re-create the index using Device Support Facilities, in order to ensure data integrity on the volume.

## Controlling Access to Data: Security

Security is the ability to protect data processing resources from unauthorized access, alteration, or destruction. DFP supports four methods of controlling access to sensitive data:

- Resource Access Control Facility (RACF) protection
- Password protection
- Authorized Program Facility (APF) protection
- Access Method Services Cryptographic Option protection

### ***RACF Protection***

The IBM Resource Access Control Facility (RACF) licensed program (5740-XXH) controls access to data processing resources. RACF should be used in place of or in addition to the standard DFP password protection (see "Password Protection" on page 31). When RACF protection is applied to a data set that is password protected, password protection is bypassed and access is controlled solely through the RACF authorization mechanism.

RACF retains information about users, resources, and access authorities in profiles stored in a special RACF data set. **Discrete profiles** contain security information about a single data set, user, or resource. **Generic profiles** contain security information about multiple data sets, users, or resources that may have similar characteristics and therefore require a similar level of protection.

With RACF Version 1 Release 5 or later, the DFP components DADSM, open/close/EOV, checkpoint/restart, IEHMOVE, and the integrated catalog facility automatically check all data sets on DASD for generic and discrete profiles to verify access authority. (This is sometimes referred to as *RACF always-call*, because RACF is always called to verify access to a data set.) For VSAM data sets, DFP checks only the profile for the cluster in order to authorize access to any of the cluster's components. Although you may have discrete profiles defined for the data and index components of your data set, these component profiles are not checked by DFP; if the cluster does not have a separate profile, the individual components are considered unprotected.

With RACF Version 1 Release 7, erase-on-scratch can be controlled by RACF options and data set profiles for both non-VSAM data sets and integrated catalog facility cataloged VSAM data sets. Erase-on-scratch prevents unauthorized access to sensitive DASD data through the automatic erasure of residual data by DADSM partial release and scratch processing. Open/close/end-of-volume support for RACF 1.7 enhancements includes protecting tape data sets, nonlabeled (NL) tapes, and tapes using bypass label processing (BLP). This support provides protection for both DASD and tape data sets under the same generic profile.

For more information on RACF protection, see *RACF General Information*.

### **Password Protection**

You can also use the password protection capabilities of DFP data management to control access to confidential data in a data set. Data such as payroll information, sales forecasts, and security clearances might require special security precautions; if such data sets are password protected, only individuals who provide the correct password can view or change the data.

#### **Password Protection for VSAM Data Sets**

Access method services can protect VSAM data sets against unauthorized use and loss of data. Separate passwords can protect a data set and a catalog entry for a data set, so that different users can be authorized to alter different attributes. Catalogs can be protected with several levels of passwords to authorize such tasks as defining, altering, or deleting entries.

The levels of access method services password protection are:

- |                       |   |
|-----------------------|---|
| <b>Full access</b>    | This is the master password, allowing you to perform all operations on a VSAM data set and on its catalog entry.  |
| <b>Control access</b> | This password allows you to access VSAM control intervals.  |
| <b>Update access</b>  | This password allows you to insert, retrieve, update, or delete records in a VSAM data set. It does not allow you to alter passwords or other security information. |
| <b>Read access</b>    | This read-only password allows you to read the data set and its catalog record (except for password information), but not to alter any of the data.                 |

Access method services password protection is described in *VSAM Administration Guide*.

#### **Password Protection for Non-VSAM Data Sets**

Job control language (JCL) specifications can protect non-VSAM data sets against unauthorized use and loss of data. You can specify the following options in the LABEL field of a DD statement for the data set. (These parameters are described in more detail in *MVS/XA JCL Reference*.)

- |                 |   |
|-----------------|---|
| <b>PASSWORD</b> | Indicates that you must specify the correct password in order to access the data set.   |
| <b>NOPWREAD</b> | Indicates that anyone can read the information in the data set, but you must specify the password in order to change or delete records. |

The passwords for non-VSAM data sets are stored in a data set called PASSWORD (which should be password protected itself) on the system residence volume. For each data set that is to be protected, you must add a record to this PASSWORD data set that contains the security password you have defined. Data sets on DASD are automatically protected when you use the IEHPROGM utility, the PROTECT macro, or the TSO PROTECT command to enter a password for them in the PASSWORD data set. You are not required to specify the password protection in JCL for these data sets.

For a description of IEHPROGM, see *Data Administration: Utilities*. For more information on the PROTECT macro, see *System-Data Administration*.

### ***Authorized Program Facility (APF) Protection***

The authorized program facility (APF) limits the use of sensitive system services and resources to authorized system and user programs. Some DFP functions (such as the access method services command CNVTCAT) are stored in authorized libraries and can be used only by programs that have the proper level of APF authorization.

For more information on APF authorization, see *MVS/XA System Macros and Facilities*.

### ***Cryptographic Protection***

The cryptographic option of access method services can help to protect sensitive data that is stored offline. Data can be encrypted using the access method services REPRO command with the ENCIPHER option; the data remains encrypted until the REPRO command with the DECIPHER option is used to decipher the data with the correct key.

If you want to use the cryptographic protection of access method services, you must have the IBM Programmed Cryptographic Facility (5740-XY5) or the Cryptographic Unit Support (5740-XY6) licensed program (with its prerequisite hardware) installed on your system. The Programmed Cryptographic Facility method of enciphering data conforms to the Data Encryption Standard (DES) of the United States National Bureau of Standards.

For more information on protecting offline data with the cryptographic option of access method services, see *VSAM Administration Guide*.

## Chapter 5

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# Interactive Storage Management

The interactive storage management facility (ISMF) helps you analyze and manage both data and DASD storage interactively. ISMF is an ISPF application that is designed to use the space management and backup/recovery functions provided by Data Facility Hierarchical Storage Manager (DFHSM) and Data Facility Data Set Services (DFDSS).

As an ISPF application, ISMF has a structure that is modeled after ISPF. ISMF is menu-driven with fast paths for many of its functions; it can be used successfully by both experienced and inexperienced users.

### Using ISMF

You can start a dialog with ISMF by selecting the ISMF option on the ISPF primary option menu. You can also start an ISMF dialog by invoking a TSO/E command procedure. In response, ISMF displays its primary option menu as shown in Figure 12 on page 34.

```

                                ISMF PRIMARY OPTION MENU
ENTER SELECTION OR COMMAND ====>

SELECT ONE OF THE FOLLOWING:

0  ISMF PROFILE                - Change ISMF user profile
1  DATA SET APPLICATION       - Perform data set functions
X  EXIT                        - Terminate ISMF

USE HELP COMMAND FOR HELP; USE END COMMAND TO EXIT.
```

**Figure 12. ISMF Primary Option Menu**

As directed by the menu, you can perform operations on data sets. In addition, you can change profile data that controls things such as error logging or JOB statement information.

### ***Performing Operations on DASD Data Sets***

The way you perform data set operations with ISMF is to build a list of DASD data sets, tailor the list as appropriate, and then specify what actions you want performed on the data sets in the list.

The list-building process begins when you select the data set application on the primary option menu. Figure 13 shows what is displayed in response to that selection. The figure shows the first page of the data set selection entry panel; it also shows an example of a response you might make to the prompts in the panel.



```
                                DATA SET SELECTION ENTRY PANEL                                Page 1 of 3
COMMAND ==>

TO GENERATE A DATA SET LIST, SPECIFY:

DATA SET NAME   ==> **
                                                         (fully or partially qualified)

SELECT SOURCE OF GENERATED LIST ==> 2      (1 or 2)

1 GENERATE LIST FROM VTOC
  VOLUME SERIAL NUMBER ==>                (fully or partially specified)

2 GENERATE LIST FROM CATALOG
  CATALOG NAME   ==>
  CATALOG PASSWORD ==>                    (if password protected)
  VOLUME SERIAL NUMBER ==>                (fully or partially specified)
  ACQUIRE DATA FROM VOLUME ==> Y      (Y or N)
  ACQUIRE DATA IF DFHSM MIGRATED ==> N (Y or N)

USE ENTER TO PERFORM SELECTION; USE DOWN COMMAND TO VIEW NEXT SELECTION PANEL;
USE HELP COMMAND FOR HELP; USE END COMMAND TO EXIT.
```

**Figure 13. Page 1 of the Data Set Selection Entry Panel**

Notice that you can qualify which data sets to list. The \*\* in the DATA SET NAME field directs ISMF to list all data sets whose first-level qualifier is your user identification.

Notice too that you can direct ISMF to generate the data set list from the VTOC, from catalogs, or both. The 2 in the SELECT SOURCE OF GENERATED LIST field directs ISMF to generate the list from catalogs. The Y in the ACQUIRE DATA FROM VOLUME field directs ISMF to supplement the data set list with information in the VTOC about the listed data sets (for example, expiration dates for non-VSAM data sets in the list).

You can further limit the list by specifying other selection criteria. For example, you can limit the selection to data sets created after a specified date or having a specified record format.

Figure 14 is an example of a data set list. There are more columns than can be displayed on the screen at any one time. The other columns contain more information about the data sets in the list. This information includes: the organization and record format of the data set; the volume(s) and device(s) each data set is stored on; and the data set's creation, expiration, and last reference dates.

DATA SET LIST						
COMMAND ==>			SCROLL ==> PAGE			
			Entries 1-5 of 5			
ENTER LINE OPERATORS BELOW:			Data Columns 3-7 of 21			
LINE	DATA SET NAME	ALLOC	ALLOC	% NOT	NUM	ALLOC
OPERATOR		SPACE	USED	USED	EXT	UNIT
---(1)---	----- (2)-----	--(3)--	--(4)--	-(5)-	(6)	-(7)-
	USER4.CLIST.CLIST	47	47	0	1	TRK
	USER4.DFP220.DGTTLIB	47	47	0	1	TRK
	USER4.ISPFILE	47	47	0	1	TRK
	USER4.ISPPROF	94	94	0	1	TRK
	USER4.SPFLOG1.LIST	375	0	100	1	BLK
-----	-----	BOTTOM	OF	DATA	-----	----

USE HELP COMMAND FOR HELP; USE END COMMAND TO EXIT.

**Figure 14. Example of a Data Set List**

ISMF allows you to tailor the list in preparation for operations on the data sets. For instance, you can sort the list entries based on information in any of the columns in the list. You can also:

- Filter the list entries based on the information in any of the columns on the list (this displays a subset of the list entries)
- Hide individual list entries or multiple entries
- Show hidden entries
- Display a list you have generated without having to go through the selection process again

To move through the list, you use ISMF scrolling commands such as LEFT, RIGHT, UP, and DOWN.

After you select the data sets (and do any tailoring), you can request that space management or backup and recovery operations be performed on individual entries or against all the entries in the list. For example, by specifying the COPY line operator as shown in Figure 15 on page 37, you can copy a specific data set named in the list. Subsequent panels prompt for further information, such as a target volume for the copy. If the request is accepted, ISMF will submit a background DFDSS job to do the actual data set copying or, by request, it will save the job in a data set.

```

                                DATA SET LIST
COMMAND ==>                                SCROLL ==> PAGE
                                           Entries 1-5 of 5
ENTER LINE OPERATORS BELOW:                Data Columns 3-7 of 21

  LINE          ALLOC  ALLOC  % NOT  NUM  ALLOC
  OPERATOR      SPACE  USED   USED  EXT  UNIT
  --- (1) ---  --- (2) ---  --- (3) ---  --- (4) ---  --- (5) ---  --- (6) ---  --- (7) ---
                USER4.CLIST.CLIST          47      47      0      1      TRK
                USER4.DFP220.DGTTLIB        47      47      0      1      TRK
                USER4.ISPFILE                47      47      0      1      TRK
COPY           USER4.ISPPROF                 94      94      0      1      TRK
                USER4.SPFPLOG1.LIST         375      0     100      1      BLK
  -----  -----  -----  -----  -----  -----  -----
                BOTTOM OF DATA

USE HELP COMMAND FOR HELP; USE END COMMAND TO EXIT.

```

**Figure 15. Copying a Data Set in a Data Set List**

Other DASD data set operations you can request through ISMF are:

- Compress unused space in partitioned data sets
- Condense data sets to reduce the number of extents
- Release unused space in data sets
- Delete data sets and their catalog entries
- Delete backup versions of data sets
- Dump data sets
- Back up data sets
- Control the number of backup versions kept for data sets
- Control the frequency of backup
- Migrate and recall data sets
- Recover backup versions of data sets
- Restore dumped data sets
- Browse an individual data set or member
- Edit an individual data set or member
- Invoke a TSO CLIST against a data set
- Save a copy of the list and use ISPF file tailoring services against the saved list

## ***Displaying or Changing ISMF Parameters***

One of the selections in the ISMF primary option menu refers to the ISMF profile. You can choose the profile option to display and change many of the parameters that control the way ISMF works. For instance, you can use it to change JOB statement or DFDSS EXEC statement information for ISMF-generated jobs. In addition, you can use the profile option to control error logging, tracing, and error recovery procedures.

## **Other Features of ISMF**

Other important features of ISMF include:

- Online help — There is online help information for each ISMF panel and an index for all the help panels.
- Prompts — ISMF messages prompt you to supply correct information on entry panels and warn you when you have made an error.
- Fast paths — Entry panels are primed with the last-used values; defaults can be used for many fields.
- Customization — ISMF can be customized to fit the needs of the individual installation, or of the users within an organization. For example, the format and text of panels can be changed and help information can be modified.
- Split screen support — Like ISPF, ISMF supports split screen mode. With split screen you can run two independent dialogs at one time (ISPF, ISMF, or both). If you use 3290 terminals, you can run up to four dialogs at a time.
- Program function key control — ISMF allows you to display the program function (PF) keys at the bottom of each screen. You can also customize the key settings to suit your own needs.
- Logging — ISMF uses the ISPF log to record errors and successful completion of tasks.
- Authorization — ISMF functions can be restricted using the program control feature of RACF 1.7.
- Virtual storage constraint relief — ISMF code and data reside at an address above 16 megabytes.

## Other Programs You Need to Use ISMF

To use ISMF, you must have the following licensed programs installed on your system:

- Interactive System Productivity Facility (ISPF) Version 2 (5665-319)
- Time Sharing Option Extensions (TSO/E) Version 1 (5665-285)

To make full use of ISMF's storage management and authorization functions, and the ISPF edit and browse functions, you need:

- Interactive System Productivity Facility/Program Development Facility (ISPF/PDF) Version 2 (5665-317)
- Data Facility Hierarchical Storage Manager (DFHSM) Version 2 (5665-329)
- Data Facility Data Set Services (DFDSS) Version 2 (5665-327)
- Resource Access Control Facility (RACF) Version 1 (5740-XXH)

Figure 16 on page 46 lists the minimum release levels required for these programs.

For more information on how to use ISMF, see:

- *Interactive Storage Management Facility User's Guide*
- *Interactive Storage Management Facility Customization Guide* – with the availability of MVS/XA DFP Version 2 Release 3.0, this publication will be replaced by *Data Facility Product Version 2: Customization*.
- *Interactive Storage Management Facility Diagnosis Guide*

## National Language Support

For ISMF static displays with English text for data displays and input, DFP supports Japanese language characters.

## Chapter 6

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# DFP and Extended Architecture

MVS/XA DFP is designed to support and enhance the extended addressing, storage, and channel support provided by MVS/System Product Version 2. Many DFP components have been modified to exploit the addressing and storage capabilities of extended architecture.

### 31-Bit Addressing

In MVS/XA, your programs can address up to 2 gigabytes (2,147,483,648 bytes) of virtual storage instead of the 16 megabytes supported by MVS/370. Special attributes on each program define what areas of storage the program can address and where in virtual storage it should reside. MVS/XA supports the use of 24-bit and 31-bit addressing.

For detailed information on addressing modes, see the publication *MVS/XA 31-Bit Addressing*.

### **AMODE and RMODE: Hierarchy and Compatibility**

Every program that executes under MVS/XA has at least two extended architecture addressing attributes: **addressing mode (AMODE)**, and **residence mode (RMODE)**.

The AMODE for a program is the addressing mode in which the program receives control. This is usually the mode in which the program executes, although a program can switch modes and can have different AMODEs for different entry points within a load module. AMODE defines the area of virtual storage that the program can address (up to 16 megabytes, or up to 2 gigabytes).

The RMODE for a program indicates where in virtual storage the program can reside (either below 16 megabytes, or anywhere in virtual storage). A program can have only one RMODE value.

The possible values of AMODE and RMODE are:

```
AMODE=24, AMODE=31, AMODE=ANY
RMODE=24, RMODE=ANY
```

Note that some combinations of AMODE and RMODE are invalid; for more information, see *MVS/XA Conversion Notebook*.

MVS/XA assigns default values of AMODE=24, RMODE=24 to any program that does not specify addressing or residence mode. To override the defaults, you can specify AMODE and RMODE by the following methods:

- Assembler H Version 2 AMODE and RMODE instructions (or comparable instructions to a language compiler)
- AMODE and RMODE parameters in the job control language (EXEC statement) of a linkage editor job step
- Linkage editor MODE control statement
- TSO commands LINK or LOADGO

Each specification in this list overrides the specifications above it. For example, an AMODE value specified in the EXEC statement of the linkage editor job step would override any AMODE value specified in the Assembler language source code.

For more information on specifying AMODE and RMODE, see the following publications:

- *Assembler H Version 2 Application Programming: Language Reference*
- *Linkage Editor and Loader User's Guide*
- *MVS/XA TSO Command Language Reference*

## **Extended Architecture Channel and Device Support**

The DFP components that handle I/O processing and device support have been modified to support the following changes under extended architecture:

- As many as 256 channel paths, with up to 8 paths per device and no affinity between path and processor;
- As many as 4096 devices supported by the system, with 8 access paths each;
- Dynamic path reconnection for 3380 devices; and
- Channel path selection and management.

## **Virtual Storage Constraint Relief**

Because virtual storage in MVS/XA has a layout different from that of MVS/370, most system storage areas below 16 megabytes have extended areas located above 16 megabytes. DFP uses many of these extended areas to store system programs, buffers, and control blocks, leaving more space below 16 megabytes for user programs. This concept is often called *virtual storage constraint relief*.

The DFP components that have moved some modules into extended virtual storage and into new areas of storage below 16 megabytes are described below.

### **VSAM**

VSAM record management, open, close, and end-of-volume modules have been moved from the MVS link pack area (LPA) to the MVS/XA extended link pack area (ELPA). No changes to your programs are required. In addition, you can request that VSAM control blocks, I/O buffers, and parameter lists be allowed to reside above 16 megabytes. Various data management macro instructions in your programs may have to be changed to use VSAM control blocks, I/O buffers, and parameter lists above 16

megabytes. For guidance in using VSAM control blocks, I/O buffers, and parameter lists above 16 megabytes, see *VSAM Administration Guide*. For reference information on VSAM macro instructions, see *VSAM Administration: Macro Instruction Reference*.

### **Open/Close/End-Of-Volume**

Open, close, and end-of-volume parameter lists may now reside at an address above 16 megabytes. Various data management macro instructions in your programs may have to be changed to use parameter lists above 16 megabytes. For guidance in using open, close, and end-of-volume parameter lists above 16 megabytes, see *Data Administration Guide*. For reference information on macro instructions, see *Data Administration: Macro Instruction Reference*.

### **DADSM**

DADSM modules have been moved from the MVS link pack area (LPA) to the MVS/XA extended link pack area (ELPA). No changes to your programs are required. In addition, DADSM parameters, parameter lists, and installation exits may reside above 16 megabytes. See *Data Facility Product: Customization* for information on the DADSM installation exits.

### **Common VTOC Access Facility (CVAF)**

CVAF modules have been moved from the MVS link pack area (LPA) to the MVS/XA extended link pack area (ELPA). No changes to your programs are required. In addition, CVAF parameters and parameter lists may reside above 16 megabytes.

### **Checkpoint/Restart**

Checkpoint/restart modules have been moved from the MVS LPA to the MVS/XA ELPA. No changes to your programs are required.

### **Catalog Management**

Most of the catalog management modules and control blocks have been moved from the common service area (CSA) and LPA to a new catalog address space (CAS). Any programs that rely on tracing catalog control block chains and pointers in the CSA and LPA must be updated to address the new catalog address space. No other changes to programs using external interfaces are required.

### **Program Fetch**

Program fetch modules have been moved from the MVS nucleus to the MVS/XA extended nucleus. No changes to your programs are required.

### **Error Recovery Procedures (ERPs)**

ERP modules have been moved from the MVS LPA to the MVS/XA ELPA. No changes to your programs are required.

### **Media Manager**

Media manager modules have been moved from the MVS LPA to the MVS/XA ELPA. No changes to your programs are required.



## Chapter 7

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# Operating Environment

This chapter discusses the operating environment required for DFP. MVS/XA DFP Version 2 replaces MVS/XA DFP Version 1.

### Machine Requirements

A working MVS/XA operating system requires at least one processing unit, printer, console, and system input device, in addition to adequate DASD and tape devices for storage. MVS/XA DFP will operate on any IBM processor or processor complex running in System/370 extended-architecture mode.

If you use the IBM 3800 Printing Subsystem Model 1 tape-to-printing-subsystem feature with the offline IBM 3800 utility program, you need a tape device that can handle tapes with a minimum of seven tracks.

### Programming Requirements

In the MVS/XA environment, DFP has several prerequisite licensed programs for installation. Optional licensed programs may also be installed in preparation for DFP; this section discusses both the required and optional programs.

#### *Programs Required to Create the MVS/XA Environment*

The following licensed programs and their prerequisites are required to install MVS/XA DFP Version 2 Release 3.0:

- A base MVS system of OS/VS2 MVS Release 3.8 (5752-VS2), MVS/370 DFP (5665-295), MVS/XA DFP Version 1 (5665-284), or MVS/XA DFP Version 2 (5665-XA2)
- Assembler H Version 2 Release 1.0 (5668-962)
- System Modification Program Extended (5665-949) or System Modification Program Release 4.27 (5668-949)

MVS/System Product JES3 Version 2 Release 2 (5665-291) or MVS/System Product JES2 Version 2 Release 2 (5740-XC6) is required to complete the MVS/XA operating environment.

Later levels of these programs may be used if available. For information on installing these programs, see their respective program directories.

### ***Optional Programs in the MVS/XA Environment***

The licensed programs listed in Figure 16 are optional in an MVS/XA environment. If you choose to use these programs under MVS/XA, they must meet the minimum release level indicated in order to execute in extended architecture mode.

<b>Licensed Program</b>	<b>Product No.</b>	<b>Rel.</b>	<b>Notes</b>
Advanced Communications Function for TCAM (ACF/TCAM) Version 2	5735-RC3	4.0	Access method for telecommunications
Advanced Communications Function for VTAM (ACF/VTAM) Version 2	5665-280	1.0	Access method for telecommunications
Advanced Communications Function for VTAM (ACF/VTAM) Version 3	5665-289	1.0	Access method for telecommunications
BTAM/System Product (BTAM/SP)	5665-279	1.0	Access method for telecommunications
Cryptographic Unit Support	5740-XY6	1.0	For data encryption by the IBM 3848 Cryptographic Unit
Customer Information Control System (CICS/VS) Version 1	5740-XX1	6.0	For data control and terminal-oriented transaction programming
Data Facility Data Set Services (DFDSS) Version 1	5740-UT3	2.1	For backup, recovery, and DASD migration
Data Facility Data Set Services (DFDSS) Version 2	5665-329	1.0	For backup, recovery, and DASD migration
		2.0	Required to access DFDSS data set functions through ISMF

**Figure 16 (Part 1 of 3). Release Levels for Optional Licensed Programs**

Licensed Program	Product No.	Rel.	Notes
Data Facility Hierarchical Storage Manager (DFHSM) Version 2	5665-329	1.0	For data set backup, recovery, and migration
		2.1	Required to access DFHSM functions through ISMF
Data Facility Sort (DFSORT)	5740-SM1	5.0	For sorting and merging files
Device Support Facilities (ICKDSF)	5655-257	6.0	For DASD initialization and track recovery
		7.0 8.0	Release 7.0 (with associated PTF) or Release 8.0 required for the 3380 Models AD4, BD4, AE4, and BE4
Environmental Recording, Editing, and Printing (EREP) Version 3	5658-260	1.2	For error analysis and recording, and for the 3380 Models AD4, BD4, AE4, and BE4
Hierarchical Storage Manager (HSM) Version 1	5740-XRB	3.1	For data set migration
IBM DATABASE2(DB2)	5740-XYR	1.0	Data base system for data sharing
Information Management System/Virtual Storage (IMS/VS) Version 1	5740-XX2	2.0	Data base system for data sharing; compatibility feature required for MVS/XA
Information Management System/Virtual Storage (IMS/VS) Version 2	5665-332	1.0	Data base system for data sharing
Interactive System Productivity Facility (ISPF) Version 2	5665-319	2.2	Dialog manager for interactive applications; required for ISMF
Interactive System Productivity Facility/Program Development Facility (ISPF/PDF) Version 2	5665-317	2.2	Required for edit and browse features of ISMF

**Figure 16 (Part 2 of 3). Release Levels for Optional Licensed Programs**

Licensed Program	Product No.	Rel.	Notes
Print Services Facility	5665-275	1.0	Required for full function 3800 Model 3
Programmed Cryptographic Facility	5740-XY5	1.0	For data encryption using a programmed algorithm
Resource Access Control Facility (RACF) Version 1	5740-XXH	5.0	For RACF always call and generic profile support
		7.0	For erase-on-scratch, tape data set protection, and authorization features for ISMF
Resource Measurement Facility (RMF) Version 3	5665-274	1.0	For monitoring system performance and capacity
TSO Extensions (TSO/E) Version 1	5665-285	2.0	For improved interactive time sharing with MVS/XA and for ISMF functions.
		2.1	Required for running ISPF tables above the 16 Mb line

**Figure 16 (Part 3 of 3). Release Levels for Optional Licensed Programs**

## Installing DFP

To install MVS/XA DFP, use System Modification Program Extended (SMP/E) (5665-949) or System Modification Program (SMP) Release 4.27 (5668-949) to incorporate new programs and service into your system libraries. If the required programs and release levels are not currently present on your system, install these programs before beginning the DFP installation.

If your system has MVS/XA DFP Version 1 or MVS/370 DFP Version 1 installed, you can use the DFP Version 1 linkage editor to install DFP Version 2. Otherwise, you must take the Version 2 linkage editor from the DFP product tape and install it separately, before installing any of the other DFP modules.

For details on how to install DFP, see the program directory shipped with MVS/XA DFP Version 2. Information on planning for DFP installation is provided in *Data Facility Product Version 2: Planning Guide*.

## ***Product Packaging and Distribution***

MVS/XA DFP is distributed in sequentially numbered program releases. A *version* contains new functions or components and is usually distributed with a new product number. A *release* generally replaces all existing program code; a *modification* replaces only those modules that have been changed. For example, the number 2.3.0 for DFP indicates Version 2, Release 3, Modification Level 0.

DFP Version 2 is distributed as two standard-labeled 9-track tapes (1600 or 6250 bits per inch), which replace your distribution libraries and certain previously-installed licensed programs. You may, optionally, order the DFP source code (except for object-code-only components) on unlabeled magnetic tapes (1600 or 6250 bpi) or on an IBM magnetic tape cartridge that is compatible with the IBM 3480 Magnetic Tape Device.

As part of the distribution package, each DFP license holder receives the program tapes; the program directory; two documents from the DFP library: the *Licensed Program Specifications*, which describes the warranty for the licensed program, and the *Installation: System Generation* manual, which describes how to generate an MVS/XA system; and one document from the Storage Management Library: the *Storage Management Reader's Guide*, which lists and briefly describes the publications in the DFP library as well as other publications pertinent to storage management. All other manuals in the DFP library (except for restricted information) are shipped in a separate package from the IBM Distribution Center. Restricted information can be ordered separately by MVS/XA DFP license holders as feature number 7040.

## ***Service Agreements***

DFP is a licensed program supported by the IBM Central Service, IBM Support Center, and local program support organizations. For information on the service agreement for DFP, consult your IBM marketing representative.

## ***System Generation Requirements***

If you do not already have MVS/XA DFP Version 1 installed, you must perform a system generation. The system generation process (sysgen) combines modules from the IBM-supplied distribution libraries with your own installation's routines and stores them in appropriate system libraries.

A sysgen is performed in two stages:

- Stage I assembles macros that define system libraries and devices, and expands them into a job stream.
- Stage II uses the Stage I job stream to link-edit and copy modules into the new system libraries.

If you use SMP/E to install MVS/XA DFP Version 2, you need only perform Stage I of a sysgen. If you use SMP Release 4.27 or later to install MVS/XA Version 2, you must perform Stage I and Stage II of a sysgen.

If you are migrating from MVS/XA DFP Version 1 or Version 2, you need not perform a sysgen; however, you need to execute the MVS configuration program to install new devices on the system.

For information on how to perform a system generation, see *Installation: System Generation*. For information on how to use the MVS configuration program, see *MVS/XA MVS Configuration Program: Guide and Reference*.

## Chapter 8

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# Publications

The DFP library contains detailed information on the subjects discussed in this book. The tables below are organized by general tasks. For each manual, the table shows the title, order number, and a brief description of the book's contents.

The MVS/XA DFP Version 2 library is based on the library previously published for MVS/XA DFP Version 1 and for OS/VS2 MVS. For a summary of changes made to these books for MVS/XA DFP Version 2, see the introduction to *Data Facility Product Version 2: Master Index*.

Manuals for DFP are shipped to MVS/XA DFP Version 2 license holders in a package from the IBM Distribution Center. The *Licensed Program Specifications, Installation: System Generation*, and *Storage Management Reader's Guide* publications are shipped with the DFP program tapes and program directory as part of the distribution package. Additional copies of all manuals (except for restricted materials) can be ordered from the IBM Distribution Center or from your local IBM branch office. Restricted logic and diagnosis manuals are available only to MVS/XA DFP license holders, and can be ordered separately as feature number 7040. Microfiche can be ordered separately as feature number 7050.

*Note:* Information specific to MVS/XA DFP Version 2 Release 3.0 will not appear in these publications until MVS/XA DFP Version 2 Release 3.0 is available.

### New Publication for MVS/XA DFP Version 2 Release 3.0

The publication *MVS/XA Data Facility Product Version 2: Customization* is new for MVS/XA DFP Version 2 Release 3.0 and can be ordered when MVS/XA DFP Version 2 Release 3.0 is available. This publication describes how to enhance or extend DFP. For example, it describes how to tailor ISMF panels or add DADSM exit routines. It consolidates and extends the customization information that was previously in various MVS/XA DFP Version 2 publications.

With the availability of *Data Facility Product Version 2: Customization*, the MVS/XA DFP Version 2 publication *Interactive Storage Management Facility Customization* (GC26-4267) will no longer be available.

In addition, the following MVS/XA DFP Version 2 publications continue to be available but will no longer contain customization information:

- *Data Administration Guide* (GC26-4140)

- *System-Data Administration* (GC26-4149)
- *VSAM Administration Guide* (GC26-4151)
- *Magnetic Tape Labels and File Structure Administration* (GC26-4145)



## MVS/XA DFP Version 2 Publications

<b>MVS/XA Publication</b>	<b>Order No.</b>	<b>Description of Contents</b>
<b>Evaluation and Information Retrieval</b>		
<i>Data Facility Product: Version 2: General Information</i>	GC26-4142	Overview of DFP and its requirements
<i>Data Facility Product: Version 2: Licensed Program Specifications</i>	GC26-4144	Warranty for DFP
<i>Data Facility Product: Version 2: Master Index</i>	GC26-4146	Index to subjects in DFP manuals
<b>Planning</b>		
<i>Data Facility Product: Version 2: Planning Guide</i>	GC26-4147	Planning for installation, integrated catalog facility catalogs, indexed VTOCs
<b>Installation</b>		
<i>Installation: System Generation</i>	GC26-4148	Generating an MVS/XA system
<b>Customization</b>		
<i>Data Facility Product Version 2: Customization<sup>6</sup></i>		Information pertinent to enhancing or extending DFP
<b>Administration: Program Management</b>		
<i>Linkage Editor and Loader User's Guide</i>	GC26-4143	Link-editing and loading programs
<i>Checkpoint/Restart User's Guide</i>	GC26-4139	Taking checkpoints and restarting programs
<b>Administration: Device Management</b>		
<i>Magnetic Tape Labels and File Structure Administration</i>	GC26-4145	Using magnetic tape labels
<i>Offline IBM 3800 Utility</i>	SH20-9138	Using the 3800 Model 1 offline

<sup>6</sup> This publication will be made available with the availability of MVS/XA DFP Version 2 Release 3.0.

<b>MVS/XA Publication</b>	<b>Order No.</b>	<b>Description of Contents</b>
<i>Programming Support for the IBM 3505 Card Reader and the IBM 3525 Card Punch</i>	GC21-5097	Using the 3505 and 3525 devices
<b>Administration: Data Management</b>		
<i>Data Administration Guide</i>	GC26-4140	Using QSAM, BSAM, BDAM, BPAM, and ISAM to manage data
<i>Data Administration: Macro Instruction Reference</i>	GC26-4141	Using data management macro instructions for QSAM, BSAM, BDAM, BPAM, and ISAM
<i>VSAM Administration Guide</i>	GC26-4151	Using VSAM to manage VSAM data sets
<i>VSAM Administration: Macro Instruction Reference</i>	GC26-4152	Using VSAM macro instructions for VSAM data sets
<i>Catalog Administration Guide</i>	GC26-4138	Using integrated catalog facility catalogs, VSAM catalogs, and OS CVOLs
<i>Integrated Catalog Administration: Access Method Services Reference</i>	GC26-4135	Using access method services commands for integrated catalog facility catalogs
<i>Integrated Catalog Administration: Access Method Services Reference Summary</i>	GX26-3724	Summary of access method services commands for integrated catalog facility catalogs
<i>VSAM Catalog Administration: Access Method Services Reference</i>	GC26-4136	Using access method services commands for VSAM catalogs
<i>Data Administration: Utilities</i>	GC26-4150	Using DFP utility programs for program, device, and data management
<i>System—Data Administration</i>	GC26-4149	Extending DFP data management capabilities

<b>MVS/XA Publication</b>	<b>Order No.</b>	<b>Description of Contents</b>
<b>Administration: Interactive Storage Management</b>		
<i>Interactive Storage Management Facility User's Guide</i>	GC26-4266	Using the interactive storage management facility to analyze and manage data and processing resources to meet planned processing goals
<i>Interactive Storage Management Facility Customization Guide<sup>7</sup></i>	GC26-4267	Procedures to tailor interactive storage management facility panels, messages, and skeletons.
<b>Messages</b>		
<i>Message Library: System Messages, Volumes 1 and 2</i>	GC28-1376 and GC28-1377	All MVS/XA messages, including DFP messages
<b>Diagnosis (Restricted Materials)</b>		
<i>Catalog Diagnosis Guide</i>	LY26-3955	Building a keyword string to diagnose catalog failures
<i>Catalog Diagnosis Reference</i>	LY26-3956	Reference information on catalog modules and procedures
<i>Media Manager Diagnosis Guide and Reference</i>	LY26-3965	Building a keyword string to diagnose media manager failures; reference information on media manager modules and procedures
<i>DADSM and Common VTOC Access Facility Diagnosis Guide</i>	LY26-3960	Building a keyword string to diagnose DADSM and CVAF failures
<i>DADSM Diagnosis Reference</i>	LY26-3961	Reference information on DADSM modules and procedures
<i>Common VTOC Access Facility Diagnosis Reference</i>	LY26-3958	Reference information on CVAF modules and procedures

<sup>7</sup> This publication will be replaced by *Data Facility Product Version 2: Customization* when MVS/XA DFP Version 2 Release 3.0 is made available.

<b>MVS/XA Publication</b>	<b>Order No.</b>	<b>Description of Contents</b>
<i>Data Facility Product: Common Services Diagnosis Guide</i>	LY26-3959	Reference information on common services modules and procedures
<i>Interactive Storage Management Facility Diagnosis Guide</i>	LY26-3906	Procedures to diagnose interactive storage management facility failures
<b>Logic (Restricted Materials)</b>		
<i>Access Method Services Logic, Volumes 1 and 2</i>	LY26-3953 and LY26-3997	Logic information for access method services
<i>BDAM Logic</i>	LY26-3893	Logic information for the BDAM access method
<i>Checkpoint/Restart Supervisor Call Logic</i>	LY26-3957	Logic information for checkpoint/restart
<i>CVOL Processor Logic</i>	LY26-3895	Logic information for the OS CVOL processor

<b>MVS/XA Publication</b>	<b>Order No.</b>	<b>Description of Contents</b>
<i>ISAM Logic</i>	LY26-3894	Logic information for the ISAM access method
<i>Linkage Editor Logic</i>	LY26-3963	Logic information for the linkage editor
<i>Loader Logic</i>	LY26-3901	Logic information for the loader
<i>Open/Close/EOV Logic</i>	LY26-3966	Logic information for open, close, and end-of-volume functions
<i>SAM Logic</i>	LY26-3967	Logic information for the SAM access method
<i>Utilities Logic</i>	LY26-3968	Logic information for the DFP utility programs
<i>VIO Logic</i>	LY26-3900	Logic information for virtual input/output
<i>VSAM Logic</i>	LY26-3970	Logic information for the VSAM access method
<i>Offline IBM 3800 Utility Logic</i>	LY20-8058	Logic information for the offline 3800 utility program
<b>Microfiche (Restricted Materials)<sup>8</sup></b>		
<i>Data Facility Product: Version 2: Module Listings</i>	LJB6-0166	Information on DFP modules
<i>Data Facility Product: Version 2: Data Areas</i>	LJB6-0167	Information on DFP control blocks and data areas
<i>Data Facility Product: Version 2: Cross-Reference Listings</i>	LJB6-0168	Cross-reference listing for DFP modules and messages

<sup>8</sup> No microfiche will be available for the following components of DFP; these components are object-code only:

- DFP common services
- Device console services
- Interactive storage management facility

## Related Publications

These publications are not part of the DFP library, but may be helpful for information on MVS/XA and related products.

### *MVS/Extended Architecture*

<b>Publication</b>	<b>Order No.</b>	<b>Description of Contents</b>
<i>MVS/XA MVS Configuration Program: Guide and Reference</i> <sup>9</sup>		Describes how to use the MVS configuration program to define devices to MVS/XA
<i>MVS/XA Conversion Notebook</i>	GC28-1143	Converting from MVS to MVS/XA
<i>MVS/XA JCL User's Guide</i>	GC28-1351	Guidance in using MVS/XA job control language
<i>MVS/XA JCL Reference</i>	GC28-1352	Reference information for MVS/XA job control language
<i>MVS/XA Operations: System Commands</i>	GC28-1206	Commands to control devices
<i>MVS/XA SPL: Service Aids</i>	GC28-1159	Using AMBLIST and other service aids
<i>MVS/XA System Macros and Facilities, Volumes 1 and 2</i>	GC28-1150 GC28-1151	Coding macros and facilities for user-written system extensions, including APF authorization
<i>MVS/XA TSO Command Language Reference</i>	GC28-0646 (with supplement GD23-0259)	Using TSO commands, including LINK and LOADGO
<i>MVS/XA 31-bit Addressing</i>	GC28-1158	Using 31-bit addressing in programs

<sup>9</sup> This publication will be available with the availability of MVS/SP JES3 Version 2 Release 2 and MVS/SP JES2 Version 2 Release 2.

## Related Products

<b>Publication</b>	<b>Order No.</b>	<b>Description of Contents</b>
<i>Assembler H Version 2 General Information</i>	GC26-4035	Overview of Assembler H V2 and its requirements
<i>Assembler H Version 2 Application Programming: Language Reference</i>	GC26-4037	Using Assembler H commands to write application programs
<i>DASD Migration Aid: General Information</i>	GC26-3972	Using DASD Migration Aid to migrate between DASD devices
<i>Data Facility Data Set Services: General Information</i>	GC26-4123	Overview of DFDSS and its requirements
<i>Data Facility Data Set Services: User's Guide and Reference</i>	SC26-4125	Using DFDSS to copy, move, dump and restore data sets and volumes
<i>Data Facility Hierarchical Storage Manager: General Information</i>	GH35-0092	Overview of DFHSM Version 2 and its requirements
<i>Device Support Facilities User's Guide and Reference</i>	GC35-0033	Initializing DASD volumes, recovering from track errors
<i>EREP User's Guide and Reference</i>	GC28-1378	Using EREP to record, edit, and print error records
<i>Interactive System Productivity Facility (ISPF) and ISPF/Program Development Facility Version 2 Release 2 General Information MVS</i>	GC34-4041	Overview of ISPF, ISPF/PDF, and their requirements
<i>MVS/SP Version 2 General Information</i>	GC28-1118	Overview of MVS/SP Version 2 and its requirements
<i>MVS/SP Version 2 Release 2 General Information</i>	GC28-1500	Overview of MVS/SP Version 2 Release 2 and its requirements
<i>RACF General Information</i>	GC28-0722	Overview of RACF and its requirements

## ***Storage Management Library***

The Storage Management Library (SML) provides guidance in establishing storage management practices, and in moving toward system-managed storage.

The Storage Management Library is designed to work in concert with the libraries that document the various storage-related hardware and software products. The SML does not replace these other publications, but provides a framework for determining when information in another library is relevant to a particular task.

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<b>Publication</b>	<b>Order No.</b>	<b>Description of Contents</b>
<i>MVS/Extended Architecture Storage Management Library: Focus on Storage Management</i>	GC26-4260	Introduction to efficient storage management.
<i>MVS/Extended Architecture Storage Management Library: Leading an Effective Storage Administration Group</i>	GC26-4261	Setting up a storage administration group and planning for system-managed storage
<i>MVS/Extended Architecture Storage Management Library: Configuring Storage Subsystems</i>	GC26-4262	Evaluating current hardware configurations, developing capacity plans, and configuring hardware for desired performance, availability, and space utilization
<i>MVS/Extended Architecture Storage Management Library: Managing Data Sets</i>	GC26-4263	Communicating with user groups, managing active and inactive data sets, managing catalogs and control data sets, establishing and enforcing data set policies and providing data set security
<i>MVS/Extended Architecture Storage Management Library: Managing Storage Pools</i>	GC26-4264	Determining storage requirements for groups of data sets, designing storage pools making the transition to pooled storage, maintaining and monitoring the effectiveness of storage pools
<i>MVS/Extended Architecture Storage Management Library: Storage Management Reader's Guide</i>	GC26-4265	Listing of titles, order numbers, and brief descriptions of publications in DFP as well as in other licensed programs pertinent to storage management

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## **Storage Subsystem Library**

The Storage Subsystem Library provides comprehensive hardware and software information about storage management for specific storage devices: magnetic tape, DASD, and storage control units (with or without cache). Storage Subsystem Library manuals are shipped to all customers who order that device (and may also be ordered separately). The following lists some of the manuals in the Storage Subsystem Library. For other manuals, see your IBM representative or your local IBM branch office.

<b>Publication</b>	<b>Order No.</b>	<b>Description of Contents</b>
<b>Magnetic Tape</b>		
<i>IBM 3480 Magnetic Tape Subsystem: Planning and Migration Guide</i>	GC35-0098	Planning for, migrating to, and installing the 3480
<i>IBM 3480 Magnetic Tape Subsystem: User's Guide</i>	GC35-0099	Using programming support for the 3480
<b>DASD</b>		
<i>IBM 3380 Direct Access Storage General Information</i>	GC26-4193	Overview of all IBM 3380 Models
<i>IBM 3380 Direct Access Storage: Migration</i>	GC26-4197	Migrating to 3380 devices
<i>IBM 3380 Direct Access Storage: Planning and Use</i>	GC26-4208	Planning for 3380 devices
<b>Storage Control Unit</b>		
<i>3880 Storage Control Models 1, 2, 3 and 4 Description Manual</i>	GA26-2661	Introduction and reference
<i>Introduction to 3880 Storage Control Model 11</i>	GA32-0060	Introduction to the Model 11
<i>Introduction to 3880 Storage Control Model 13</i>	GA32-0062	Introduction to the Model 13
<i>Introduction to 3880 Storage Control Model 21</i>	GA32-0080	Introduction to the Model 21
<i>Introduction to 3880 Storage Control Model 23</i>	GA32-0082	Introduction to the Model 23

## Appendix

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# Summary of Enhancements for Version 2

This appendix summarizes enhancements to MVS/XA DFP Version 2. The most current release is listed first, with previous releases included as a history of enhancements for Version 2.

## Version 2 Release 3.0 Enhancements

### *Virtual Storage Constraint Relief*

To exploit the enhanced capabilities of extended architecture and to optimize use of virtual storage, several components of DFP have been modified and moved to alternate areas in virtual storage.

#### **VSAM**

VSAM open, close, and end-of-volume modules have been moved from the MVS LPA to the MVS/XA ELPA. This frees approximately 207K bytes of virtual storage below 16 megabytes. No changes to your programs are required. In addition, VSAM control blocks, I/O buffers, and parameter lists may now reside above 16 megabytes. Various data management macro instructions in your programs may have to be changed to use VSAM control blocks, I/O buffers, and parameter lists above 16 megabytes.

#### **Open/Close/End-of-Volume**

Open, close, and end-of-volume parameter lists may now reside at an address above 16 megabytes. Various data management macro instructions in your programs may have to be changed to use parameter lists above 16 megabytes.

#### **DADSM**

DADSM modules have been moved from the MVS LPA to the MVS/XA ELPA. This frees approximately 118K bytes of virtual storage below 16 megabytes. In addition, DADSM will support parameters, parameter lists, and installation exits that reside above 16 megabytes. No changes to your programs are required.

## ***New Device Management Support***

### **Changes in the Way an I/O Configuration Is Defined**

Devices are defined to MVS/XA through the MVS configuration program (MVSCP). The MVS configuration program provides much of the function that was provided in previous releases of MVS/XA Version 2 by the I/O device generation (iogen) process and the eligible device table generation (edtgen) process. Iogen and edtgen are no longer supported.

## ***New Program and Data Management Support***

### **Enhanced Integrated Catalog Facility Catalog Recovery**

A user session no longer has to be terminated if the user is oriented to an integrated catalog facility catalog that has been recovered. This means that subsystems like IMS/VS and CICS/VS oriented to an integrated catalog facility catalog no longer have to be quiesced or terminated. DFP will automatically reorient the user after the catalog is recovered.

Integrated catalog facility catalogs can be locked during the recovery period. This permits restricted access to the catalog so that recovery personnel can update the recovered catalog to the point of failure or to validate it while it remains inaccessible to other users.

### **Integrated Catalog Facility Export Enhancements**

When an integrated catalog facility catalog is "exported" (that is, written to a portable data set via an EXPORT access method services command), any aliases defined for the catalog are exported with the catalog. When the catalog is "imported" (that is, defined and loaded from a portable data set via an access method services IMPORT command), the user can indicate whether the exported aliases are to be processed for the catalog. If the ALIAS keyword is specified for either an empty or a non-existent catalog, aliases are defined (unless a duplicate alias is encountered). Otherwise, the aliases are not defined, but listed.

In addition, a new System Management Facilities (SMF) record type (type 36) will be written every time an integrated catalog facility catalog has been successfully exported. The record contains information about the event (for instance, catalog name, date and time of export, and portable data set name). This information helps users to determine what backup copies are available to restore an integrated catalog facility catalog, what information to specify for the import job, or what activity has occurred since the export.

### **Simplified Concatenation Rules**

Up until now users were allowed to concatenate certain types of data sets with different block sizes as long as two conditions were true: (1) the other data set attributes were alike, and (2) the data set with the largest block size was first. Now the order of the data sets is immaterial (though the attributes other than blocksize must still be alike). This change applies to partitioned data sets; it also applies to sequential data sets that are DASD resident, that are accessed by QSAM, and that use buffers created by the system.

## **VSAM LSR Pools for Data Components and Index Components**

VSAM users are now able to build separate local shared resource (LSR) pools for the data component and index component of key-sequenced data sets. Up to now, a user could build as many as 16 resource pools in one address space; for key-sequenced data sets, the data component and the index component shared the buffers of a resource pool. Now, however, a user can build as many as 16 resource pools for the data component buffers and separately 16 resource pools for the index component buffers.

## **Greater Than 1635 DD Statements**

MVS/XA users are now allowed to code as many as 3273 DD statements for a job step; the previous limit was 1635 per job step. Underlying this change is an expansion of the task input/output table (TIOT) from 32K to 64K bytes. Because the TIOT has been expanded, various fields in a number of DFP control blocks have been changed. DCBTIOT, ACBTIOT, AMBTIOT, and DXWTIOT are all two-byte fields that contain offsets into the TIOT. These fields are now treated as unsigned 16-bit fields instead of signed halfword fields. Halfword instructions (such as LH, AH, and SH) that are currently used to access these TIOT related fields may have to be changed.

## **Extended Access of Job File Control Block Information**

The retrieval area for information extracted from a job file control block (JFCB) can now be allocated at an address above 16 megabytes. A user can request this by issuing an RDJFCB macro with a special exit list code. This same request can be used to retrieve information from the job file control block extension (JFCBX) — this gives users a way of retrieving information about data sets that are allocated on more than five volumes. Furthermore, the operation will retrieve JFCBs for all data sets that are concatenated together.

## **Linear Data Sets**

A linear data set is a new type of VSAM data set. It contains data but no control information. A linear data set can be accessed as a byte-addressable string in virtual storage.

Users of IBM DATABASE 2 (DB2) may want to convert DB2 tablespaces (which consist of VSAM entry-sequenced data sets) to linear data sets. This will allow the use of the access method services utility as well as DB2 utilities.

## **Data Set Expiration Beyond 1999**

The maximum expiration date for an object cataloged in an integrated catalog facility catalog (including a catalog itself) has been increased. In addition, the maximum expiration date that can be specified for DASD and tape data sets has been increased. Up to now the maximum expiration date that could be specified was the last day of the year 1999. Now the maximum expiration date is the last day of the year 2155. Users now also have the option of indicating that the object should never be scratched.

## **VSAM Alternate Index Synchronization**

This change applies to key-sequenced or entry-sequenced data sets defined with an attribute of UPGRADE. VSAM updates the alternate index of these data sets every time a base record is inserted, erased, or updated. If an upgrade is interrupted (for instance, because of a machine or program error), the alternate index may not reflect the status of the base data set. For instance, the user may have inserted a record that caused a control interval split. A way to correct this situation is to reinsert the record (and have the upgrade proceed normally).

However up until now, VSAM would prevent this reinsertion if UNIQUEKEY was specified for the alternate index and the record to be reinserted already had a pointer in the alternate index.

For MVS/XA DFP 2.3.0, VSAM has been changed to allow the reinsertion even if UNIQUEKEY was specified.

#### **VSAM Improved Read Integrity**

Currently, if a user shares a data set with share options (2 3), the data set may be shared by any number of users for read processing and by one user for write processing. Furthermore, the user is responsible for read and write integrity. The following situation may occur if such a data set is key-sequenced and does not share resources with other data sets (that is, NSR is specified in the ACB). If user A inserts a new record into the data set and then user B attempts to read a record in the data set via a key, a VSAM direct search may not be able to find the record. That's because the insert may have caused a CA/CI split and the index pointers that VSAM uses for user B may be inaccurate (at least temporarily). Since the resources are not shared, user A and user B have their own copies of data and index buffers. Thus an update to user A's index pointers may not be reflected in user B's index pointers because of the CA/CI split.

For MVS/XA DFP 2.3.0, VSAM has been changed so that it will now try another search for the keyed record. If it still can't find the record, the user will get return code 8 and the request parameter list (RPL) will indicate reason code 16 — "record not found."

#### **DADSM LSPACE Macro**

A macro is now available for callers of the DADSM volume space summary information function (SVC 78). The new LSPACE macro supports a parameter list, the return of additional information, a new information format, and addresses above 16 megabytes. The macro also continues support for all existing LSPACE functions. For further information, see *System-Data Administration*.

#### ***New Publication***

The publication *MVS/XA Data Facility Product Version 2: Customization* consolidates and extends the customization information that was previously in various MVS/XA DFP Version 2 publications. For further information, see "New Publication for MVS/XA DFP Version 2 Release 3.0" on page 51.

## **Version 2 Release 2.0 Enhancements**

### ***New Program and Data Management Support***

DFP Version 2 Release 2.0 includes the following enhancements to existing program and data management support.

#### **Interactive Storage Management Facility (ISMF)**

The interactive storage management facility (ISMF) is an application running under the Interactive System Productivity Facility (ISPF) Release 2.2 licensed program. Using ISMF panels, you can analyze, manage, and report on DASD storage interactively.

#### **CVAF Filter (CVAFFILT)**

The common VTOC access facility (CVAF) has been extended to support the retrieval of sets of DSCBs from a DASD VTOC into buffers provided by the caller. DSCBs will be returned in format 1, 2, 3 order (as they are chained in the VTOC) for each of the qualifying data sets. The caller may request DSCBs by the specification of a single filter key (partially qualified data set name) or a list of fully qualified data set names.

#### **Additional Block Sizes for Integrated Catalog Facility Catalogs**

Block sizes from 512 bytes up to 32K bytes are now supported for integrated catalog facility catalogs and integrated catalog facility cataloged VSAM data sets. This change offers better utilization of available DASD space.

Integrated catalog facility catalogs and integrated catalog facility cataloged VSAM data sets with these newly supported block sizes can be processed (but not created) by MVS/370 DFP Version 1 Release 1.1 users, MVS/XA DFP Version 1 Release 1.2 users, or MVS/XA DFP Version 2 Release 1.0 users provided that the corresponding PTF is installed.

### ***New Publications***

The Storage Management Library (SML) described in "Storage Management Library" on page 60 provides information on storage management procedures.

## **Version 2 Release 1.0 Enhancements**

### ***Virtual Storage Constraint Relief***

To exploit the enhanced capabilities of extended architecture and to optimize use of virtual storage, several components of DFP have been modified and moved to alternate areas in virtual storage.

#### **Catalog Management**

Most of the catalog management modules and control blocks have been moved from the common service area (CSA) and LPA to a new catalog address space (CAS). This frees approximately 400K bytes of virtual storage (plus 20K bytes per open integrated catalog facility catalog) below 16 megabytes for additional user programs and catalogs.

Any programs that rely on tracing catalog control block chains and pointers in the CSA and LPA must be updated to address the new catalog address space. No other changes to programs using external interfaces are required.

#### **CVAF**

The common VTOC access facility (CVAF) modules have been moved from the MVS LPA to the MVS/XA ELPA, saving approximately 70K bytes of virtual storage below 16 megabytes. No changes to your programs are required.

#### **Checkpoint/Restart**

The checkpoint/restart modules have been moved from the MVS LPA to the MVS/XA ELPA, saving approximately 70K bytes of virtual storage below 16 megabytes. No changes to your programs are required.

### ***New Device Support***

DFP supports several new I/O devices in Version 2 Release 1.0.

#### **3380 Direct Access Storage Models AD4, BD4, AE4, and BE4**

The IBM 3380 Direct Access Storage Models AD4, BD4, AE4, and BE4 are high-speed, large capacity DASD devices designed to provide high reliability online storage. DASD error recovery procedures, error messages, and the DEVTYPE macro have been modified to support these new models of the 3380.

#### **3880 Storage Control Model 21**

The IBM 3880 Storage Control Model 21 is a high-performance storage control device that can be attached to a 3350 to form a cached DASD subsystem. The access method services commands LISTDATA and SETCACHE have been modified to support subsystem counters and status reporting, binding, and setting subsystem mode for the Model 21.

#### **3880 Storage Control Model 23**

The IBM 3880 Storage Control Model 23 is a high-performance storage control device that can be attached to a 3380 (including Models AD4, BD4, AE4, and BE4) to form a cached DASD subsystem. The access method services commands LISTDATA and SETCACHE have been modified to support subsystem counters and status reporting, binding, and setting subsystem mode for the Model 23.

### **3422 Magnetic Tape Subsystem**

The IBM 3422 Magnetic Tape Subsystem is a 10-1/2-inch reel, intermediate performance, 1/2-inch tape subsystem.

### **3430 Magnetic Tape Subsystem**

The IBM 3430 Magnetic Tape Subsystem is a member of the 3400 series of 1/2-inch tape units. The tape media used are the same as for the IBM 3420 Magnetic Tape Unit.

### **4245 Printer**

The IBM 4245 Printer is a 3211-compatible printer that uses band technology to print up to 2000 lines per minute. Universal character set (UCS) images for the 4245 are stored in read-only storage within the printer itself; names of UCS images are stored in a UCS image table, located in SYS1.IMAGELIB. DFP provides a method to access and update entries in the UCS image table. Error recovery procedures and messages have been updated to support the 4245.

### **4248 Printer**

The IBM 4248 Printer is a 3211-compatible printer that uses band technology to print at 2200, 3000, or 3600 lines per minute. The 4248 can also produce dual horizontal copies at the same time. Universal character set (UCS) images for the 4248 are stored in read-only storage within the printer itself; names of UCS images are stored in a UCS image table, located in SYS1.IMAGELIB. DFP provides a method to access and update entries in the UCS image table.

Error recovery procedures, messages, and the SETPRT macro have been updated to support the 4248. In addition, the IEBIMAGE utility can be used to define a forms control buffer (FCB) in a new format for use on the 4248 or 3262 Model 5 printers.

### **3262 Model 5 Printer**

The IBM 3262 Model 5 Printer is a 3211-compatible printer that uses band technology to print at 2000 lines per minute. Universal character set (UCS) images for the 3262 Model 5 are stored in read-only storage within the printer itself; names of UCS images are stored in the 4248 UCS image table, located in SYS1.IMAGELIB. DFP provides a method to access and update entries in the UCS image table.

DFP support for the 3262 Model 5 is the same as support for the 4248. (During system generation, the 3262 Model 5 must be specified as a 4248 printer.) The IEBIMAGE utility can be used to define a forms control buffer (FCB) in a new format for use on the 4248 or 3262 Model 5 printers.

## ***New Program and Data Management Support***

DFP Version 2 Release 1.0 includes several enhancements to existing program and data management support.

### **DADSM Enhancements**

DADSM has been modified to provide a new PARTREL macro, and a new function in its REALLOC macro (see also "Erase-on-Scratch Security Enhancement" on page 70). The new PARTREL macro may be used to request the release of allocated unused space from a sequential or partitioned data set. For volumes with indexed VTOCs, the modified REALLOC macro may be used to request the allocation of space for a data set with up to 16 absolute extents.



Support is also included for the absolute allocation of ISAM data sets and unmovable data sets.

#### **VSAM JRNAD User Exit Enhancements**

Enhancements to the VSAM JRNAD user exit allow you to cancel a request that would cause a control interval or control area split.

#### **VSAM VERIFY Macro Enhancement**

A new parameter, ACTION=REFRESH, has been added to the VSAM VERIFY macro. REFRESH indicates that VSAM control blocks should be updated from information in the catalog after verifying the high-used relative byte address (RBA).

#### **Device Console Services Enhancement**

A new command, DEVSERV, has been added to the set of console display commands. DEVSERV tests all paths to a device and displays information about the logical status of each path on the system console. The operator can use this information to diagnose problems in the I/O subsystem.

#### **IEBCOPY Reblocking Enhancement**

The IEBCOPY utility program has been enhanced:

- To allow reblocking of overlay modules
- To increase the maximum output block size for load modules to 32760 bytes

#### **Linkage Editor Block Size Enhancement**

The linkage editor produces a maximum record size of 32760 bytes for improved DASD space utilization.

#### **Improved Tape Block Count Checking**

DFP provides tape block count checking for all magnetic tape devices that use block identifiers (such as the 3480). In order to improve tape reliability, the number of tape blocks calculated by the tape subsystem is compared to the number of blocks calculated by DFP when tapes are both read and written.

#### **Access Method Services EXAMINE Command**

The new access method services EXAMINE command allows users to collect and analyze information on the structural consistency of VSAM key-sequenced data set clusters and integrated catalog facility catalogs.

#### **Erase-on-Scratch Security Enhancement**

Erase-on-scratch provides a significant enhancement to MVS data security by preventing unauthorized access to sensitive DASD data through the automatic erasure of residual data by DADSM partial release and scratch processing. With the installation of RACF Version 1, Release 7, erase-on-scratch can be controlled by RACF options and data set profiles for both non-VSAM data sets and integrated catalog facility cataloged VSAM data sets.

#### **EXPORT and IMPORT by CIMODE**

Access Method Services EXPORT command parameters provide a method of requesting exporting by control interval (CIMODE) for entry sequenced data set base cluster data records.

### **ISO/ANSI/FIPS Version 3 Label Conversion Using the WTOR Installation Exit**

A method is now provided to convert non-Version 3 tape labels automatically to Version 3 tape labels, using the WTOR installation exit.

### **RACF 1.7 Tape Data Set Protection**

O/C/EOV support for RACF 1.7 enhancements includes protecting tape data sets and nonlabeled (NL) tapes, and using bypass label processing (BLP). This support provides protection for both DASD and tape data sets under the same generic profile.

### **3480 Label Processing**

The high speed search function extends a data set on an IBM 3480 tape volume. This function quickly positions the volume at the end of the requested data set. Similarly, the high speed search function positions the volume at the beginning of a data set. During O/C/EOV tape label processing, I/O time has been decreased by avoiding unnecessary tape reversals.

# Glossary of Terms and Abbreviations

The following terms and abbreviations are defined as they are used in this book and in other books in the DFP library. If you do not find the term you are looking for, refer to the index or to *IBM Vocabulary for Data Processing, Telecommunications, and Office Systems*, GC20-1699.

## A

**access method.** A technique for organizing and moving data between main storage and input/output devices.

**access method services.** A multifunction utility program that defines and maintains VSAM data sets and integrated catalog facility or VSAM catalogs.

**addressing mode (AMODE).** The attribute of an entry point in a load module that identifies the addressing range in virtual storage which the module is permitted to address.

**alternate index.** An ordered collection of records, each consisting of a key and one or more pointers. An alternate index is used by VSAM to sequence and locate the records of a key-sequenced or entry-sequenced VSAM data set.

**always call.** See *RACF always call*.

**AMBLIST.** A service aid program used to print formatted listings of modules and system storage areas to aid in problem diagnosis.

**American National Standards Institute (ANSI).** An organization which establishes voluntary industry standards for information processing, particularly

for control characters and magnetic tape labels.

**AMODE.** See *addressing mode*.

**ANSI.** See *American National Standards Institute*.

**APF.** See *authorized program facility*.

**authorized program facility (APF).** A system facility that permits the identification of programs that are authorized to use restricted functions.

**auxiliary storage.** Data storage other than the memory of a processing unit; usually used to refer to DASD, tape, or mass storage system volumes.

## B

**basic catalog structure (BCS).** The name of the catalog structure in the integrated catalog facility environment. An integrated catalog facility catalog consists of a BCS and its related VSAM volume data sets (VVDSs).

**basic direct access method (BDAM).** An access method used to directly retrieve or update particular blocks of a data set on DASD.

**basic partitioned access method (BPAM).** An access method that can be applied to create program libraries on DASD for convenient storage and retrieval of programs.

**basic sequential access method (BSAM).** An access method for storing or retrieving data blocks in a continuous sequence, using either a sequential access or a direct access device.

**BCS.** See *basic catalog structure*.

**BDAM.** See *basic direct access method*.

**block count.** The number of data blocks on a magnetic tape volume.

**block size.** The number of records, words, or characters in a block of data; usually specified in bytes.

**BPAM.** See *basic partitioned access method*.

**bpi.** Bits per inch.

**BSAM.** See *basic sequential access method*.

## C

**cache.** In a storage controller, a high-speed storage buffer that is continually updated to contain recently accessed contents of DASD storage. Its purpose is to reduce access time.

**CAS.** See *catalog address space*.

**catalog address space (CAS).** A separate address space in virtual storage that contains catalog management modules and control blocks.

**CESD.** See *composite external symbol dictionary*.

**channel program.** One or more channel command words that control a specific sequence of data channel operations.

**checkpoint.** A designated point in a program where information about the job is collected and recorded in a separate checkpoint data set.

**cluster.** A data component and an index component in a VSAM key-sequenced data set; or a data component alone in a VSAM entry-sequenced data set.

**common service area (CSA).** A part of the common area of virtual storage that contains data areas addressable by all address spaces.

**common VTOC access facility (CVAF).** A DFP component used to retrieve information from indexed and nonindexed VTOCs.

**composite external symbol dictionary (CESD).** Control information associated with a load module that identifies the external symbols in the module.

**control section (CSECT).** That part of a program specified as a relocatable unit, all elements of which are loaded into adjoining storage locations for execution.

**control volume (CVOL).** See *OS control volume*.

**CSA.** See *common service area*.

**CSECT.** See *control section*.

**CVAF.** See *common VTOC access facility*.

**CVOL.** See *OS control volume*.

## D

**DADSM.** See *direct access device space management*.

**DASD.** See *direct access storage device*.

**data control block (DCB).** A control block used by access method routines in storing and retrieving data.

**Data Facility Data Set Services (DFDSS).** An IBM licensed program used to copy, move, dump and restore data sets and volumes.

**Data Facility Hierarchical Storage Manager (DFHSM).** An IBM licensed program used to back up, recover, and manage volumes.

**Data Facility Product (DFP).** An IBM licensed program used to manage programs, devices, and data in an MVS operating environment.

**data management.** The task of systematically identifying, organizing, storing, and cataloging data in an operating system.

**data set control block (DSCB).** A control block containing a label for a data set in direct access storage.

**DCB.** See *data control block*.

**device management.** The task of defining input and output devices to the operating system, and then controlling the operation of these devices.

**Device Support Facilities (ICKDSF).** An IBM system control program used to initialize DASD and to recover from DASD errors caused by defective tracks.

**DFDSS.** See *Data Facility Data Set Services*.

**DFHSM.** See *Data Facility Hierarchical Storage Manager*.

**DFP.** See *Data Facility Product*.

**direct access device space management (DADSM).** A DFP component used to control space allocation and deallocation on DASD.

**direct access storage device (DASD).** A storage device in which the access time is effectively independent of the location of the data.

**discrete profile.** A RACF profile that contains security information about a single data set, user, or resource.

**distribution libraries (DLIBs).** IBM-supplied partitioned data sets delivered on tape, containing single components or parts of components that the user restores to disk for subsequent inclusion in a new operating system.

**DSCB.** See *data set control block*.

## E

**EDT.** See *eligible device table*.

**edtgen.** See *eligible device table generation*

**eligible device table (EDT).** A table that maps unit names to sets of physical devices on the operating system.

**eligible device table generation (edtgen).** A type of system generation that formerly could be performed on an existing operating system to modify the eligible device table. Edtgen is no longer supported; its function has been replaced by the MVS configuration program. See also *MVS configuration program*.

**ELPA.** See *extended link pack area*.

**entry-sequenced data set (ESDS).** A VSAM data set whose records are retrieved and stored by addressed access. New records are added at the end of the data set.

**EPLPA.** See *extended pageable link pack area*.

**erase-on-scratch.** The physical erasure of data on a DASD data set when the data set is deleted (scratched).

**ESDS.** See *entry-sequenced data set*.

**extended link pack area (ELPA).** The extension of the link pack area that resides above 16 megabytes in virtual storage. See also *link pack area*.

**extended pageable link pack area (EPLPA).** The extension of the pageable link pack area that resides above 16 megabytes in virtual storage. See also *pageable link pack area*.

**external symbol dictionary.** See *composite external symbol dictionary*.

## F

**FCB.** See *forms control buffer*.

**Federal Information Processing Standard (FIPS).** An organization which establishes voluntary industry standards for federal information processing, particularly for magnetic tape labels.

**FIPS.** See *Federal Information Processing Standard*.

**fixed link pack area (FLPA).** A fixed area of virtual storage containing reenterable routines that are loaded at IPL time and exist for the duration of that IPL.

**FLPA.** See *fixed link pack area*.

**forms control buffer (FCB).** A buffer for controlling the vertical format of printed output.

## G

**generation data set.** One of a collection of historically related non-VSAM data sets; the collection of these data sets is known as a *generation data group*.

**generic profile.** A RACF profile that contains security information about multiple data sets, users, or resources that may have similar characteristics and require a similar level of protection.

**gigabyte.** 1,073,741,824 bytes.

**H**

**HSM.** See *Data Facility Hierarchical Storage Manager*.

**I**

**ICKDSF.** See *Device Support Facilities*.

**indexed sequential access method (ISAM).** An access method that retrieves or updates blocks of data using an index to locate the data set.

**integrated catalog facility.** The name of the catalog in DFP that is a functional replacement for OS CVOLs and VSAM catalogs.

**interactive storage management facility (ISMF).** A DFP facility which analyzes and manages both data and storage interactively.

**International Organization for Standardization (ISO).** An organization which establishes voluntary industry standards for international information processing, particularly for magnetic tape labels.

**I/O device generation (iogen).** A type of system generation that formerly could be performed on an existing operating system to add or delete I/O devices, change device group names, or change console specifications. Iogen is no longer supported; its function has been replaced by the MVS configuration program. See also *MVS configuration program*.

**iogen.** See *I/O device generation*.

**IPL.** Initial program load; the initialization procedure used to start an operating system.

**ISAM.** See *indexed sequential access method*.

**ISMF.** See *interactive storage management facility*.

**ISO.** See *International Organization for Standardization*.

**ISO/ANSI/FIPS.** When referring to magnetic tape labels and file structure, any tape which conforms to the standards established in ISO 1001-1979 level 4, ANSI X3.27-1978 level 4, and FIPS 79.

Tapes meeting these standards are sometimes called *Version 3 tapes*.

**J**

**JCL.** See *job control language*.

**JES.** See *Job Entry Subsystem*.

**job control language (JCL).** A problem-oriented language used to express statements in a job that identify the job or describe its requirements to an operating system.

**Job Entry Subsystem (JES).** A system facility for spooling, job queueing, and managing input and output. The two types of job entry subsystems in MVS are JES2 and JES3.

**K**

**Kb.** Kilobyte; when referring to storage capacity, two to the tenth power; 1024 bytes.

**key-sequenced data set (KSDS).** A VSAM data set whose records are loaded in key sequence and controlled by an index.

**KSDS.** See *key-sequenced data set*.

**L**

**library.** A partitioned data set containing a related collection of named members.

**linear data set.** A VSAM data set that contains data but contains no control information. A linear data set can be accessed as a byte-addressable string in virtual storage.

**link-edit.** To create a loadable computer program using the linkage editor to process object and load modules.

**link pack area (LPA).** An area of virtual storage containing reenterable routines that are loaded at IPL time and can be used concurrently by all tasks in the system.

**load module.** The output of the linkage editor; a program in a format ready to load into virtual storage for execution.

**local shared resources (LSR).** An option for sharing I/O buffers, I/O-related control blocks, and channel programs among VSAM data sets in a resource pool that serves one partition or address space.

**LPA.** See *link pack area*.

**LSR.** See *local shared resources*.

## M

**MLPA.** See *modified link pack area*.

**modified link pack area (MLPA).** An area of virtual storage containing reenterable routines from the SYS1.LINKLIB, SYS1.SVCLIB, or SYS1.LPALIB system data sets that are to be part of the pageable extension of the link pack area during the current IPL. See also *link pack area*.

**MVS configuration program.** A program that is used to define I/O configurations to MVS/XA. MVSCP replaces the I/O definition functions of iogen and edtgen. See also *eligible device table generation* and *I/O device generation*.

**MVS/Extended Architecture (MVS/XA).** An MVS operating system environment that supports 31-bit real and virtual storage addressing, increasing the size of addressable real and virtual storage from 16 megabytes to 2 gigabytes.

**MVS/SP.** See *MVS/System Product*.

**MVS/System Product (MVS/SP).** An IBM licensed program used to control the MVS operating system and establish a base for an MVS/XA or MVS/370 environment.

**MVS/XA.** See *MVS/Extended Architecture*.

**MVS/370.** An MVS operating system environment that supports 24-bit real and virtual storage addressing, based on the OS/VS2 MVS operating system environment.

## O

**object module.** A module that is the output of an assembler or compiler and is input to the linkage editor.

**OS control volume (CVOL).** A volume that contains one or more indexes of the catalog.

**OS/VS2 MVS.** An MVS operating system that was the predecessor to MVS/XA.

**overlay program.** A program in which certain control sections can use the same storage locations at different times during execution.

## P

**pageable link pack area (PLPA).** An area of virtual storage containing SVC routines, access methods, and other read-only system and user programs that can be shared among users of the system. See also *link pack area*.

**paging.** A technique in which blocks of data, or "pages," are moved back and forth between main storage and auxiliary storage. Paging is the implementation of the virtual storage concept.

**partitioned data set (PDS).** A data set in DASD storage that is divided into partitions, called *members*, each of which can contain a program, part of a program, or data. See also *library*.

**PDS.** See *partitioned data set*.

**PDS directory.** A set of records in a PDS used to relate member names to addresses on the DASD volume.

**PLPA.** See *pageable link pack area*.

**program management.** The task of preparing programs for execution, storing the programs in load libraries, and executing them on the operating system.

**program temporary fix (PTF).** A temporary solution or bypass of a problem diagnosed by IBM field engineering as a result of a defect in a current, unaltered release of a program or licensed program. PTFs are

distributed on tape to program license holders.

**PTF.** See *program temporary fix*.

## Q

**QSAM.** See *queued sequential access method*.

**queued sequential access method (QSAM).** An extended version of the basic sequential access method (BSAM). Input data blocks awaiting processing or output data blocks awaiting transfer to auxiliary storage are queued on the system to minimize delays in I/O operations.

## R

**RACF.** See *Resource Access Control Facility*.

**RACF always call.** A term for the procedure used by DFP to check all data sets automatically for discrete or generic RACF profiles to verify access authority.

**read-only control section (RSECT).** A control section (CSECT) in the nucleus that can be read but not altered.

**relative record data set (RRDS).** A VSAM data set whose records are loaded into fixed-length slots.

**relocation dictionary (RLD).** A set of records in an object or load module that identifies all addresses that must be adjusted when the module is relocated in virtual storage.

**residence mode (RMODE).** The attribute of a load module that identifies where in virtual storage the program will reside (above or below 16 megabytes).

**Resource Access Control Facility (RACF).** An IBM licensed program that provides access control by identifying and verifying users to the system. RACF authorizes access to DASD data sets, logs unauthorized access attempts, and logs accesses to protected data sets.

**RLD.** See *relocation dictionary*.

**RLD count.** The number of RLD records in a load module that follow the text block which the RLD count references. See also *RLD record*.

**RLD record.** A record in a relocation dictionary that contains information on relocatable address constants for that object or load module. See also *relocation dictionary*.

**RMODE.** See *residence mode*.

**RRDS.** See *relative record data set*.

**RSECT.** See *read-only control section*.

## S

**SAM.** See *sequential access method*.

**sequential access method (SAM).** An access method for storing or retrieving data blocks in a continuous sequence, using either a sequential access or a direct access device.

**SMF.** See *system management facilities*.

**SMP.** See *System Modification Program*.

**SMP/E.** See *System Modification Program Extended*.

**source module.** A module containing the source statements which will be input to a language translator or compiler.

**sysgen.** See *system generation*.

**system generation (sysgen).** The process of creating an operating system customized to the needs of a data processing installation.

**system management facilities (SMF).** Programs used to gather, measure, and record information about system actions and performance.

**System Modification Program (SMP).** An IBM licensed program used to make software changes to modules and macros in the operating system.

**System Modification Program Extended (SMP/E).** An IBM licensed program used to make software changes to modules and macros in the operating system. SMP/E is an extended and enhanced version of SMP.



**U**

**UCB.** See *unit control block*.

**UCS.** See *universal character set*.

**unit control block (UCB).** A control block in storage that describes the characteristics of a particular I/O device on the operating system.

**universal character set (UCS).** A printer feature that permits the use of a variety of character arrays. Character sets used for these printers are called *UCS images*.

**V**

**version 3.** Any magnetic tape conforming to ISO/ANSI/FIPS standards. See *ISO/ANSI/FIPS*.

**VIO.** See *virtual input/output*.

**virtual input/output (VIO).** A facility that pages data into and out of external page storage.

**virtual storage access method (VSAM).** An access method for direct or sequential processing of fixed and variable length records on DASD.

**virtual storage constraint relief (VSCR).** The use of extended areas in virtual storage to store system programs, buffers, and control blocks, leaving more space below 16 megabytes for user programs.

**volume table of contents (VTOC).** A table on a DASD device that describes each data set on the volume.

**VSAM.** See *virtual storage access method*.

**VSAM volume data set (VVDS).** A data set that describes the characteristics of VSAM data sets residing on a given volume; part of an integrated catalog facility catalog. See also *basic catalog structure*.

**VSCR.** See *virtual storage constraint relief*.

**VTOC.** See *volume table of contents*.

**VVDS.** See *VSAM volume data set*.

# Index

## A

- access method services 27
  - catalog commands 27
  - password protection 31
  - security enhancement 30, 31, 70
- Access Method Services Cryptographic Option 6, 32
- access methods
  - defined 4
  - general description 21
- ACF/TCAM (Advanced Communications Function for TCAM)
  - required level for Data Facility Product 46
- ACF/VTAM (Advanced Communications Function for VTAM)
  - required level for Data Facility Product 46
- addressing mode
  - See AMODE
- alternate index
  - building 23
  - defining 23
- AMBLIST utility 12
- AMODE (addressing mode) 41
- ANSI
  - See ISO/ANSI/FIPS tape labels
- AP-1 program 7
- APF (authorized program facility) 32
- Assembler H Version 2
  - description 2
  - required level for Data Facility Product 45
- ATLAS macro 17
- authorized program facility
  - See APF

## B

- basic access technique 22
- basic catalog structure
  - See BCS
- basic direct access method
  - See BDAM
- basic partitioned access method
  - See BPAM
- basic sequential access method
  - See BSAM
- BCS (basic catalog structure) 25

- BDAM (basic direct access method) 22
- BINDDATA command 18
- block count checking 19
- BPAM (basic partitioned access method) 22
- BSAM (basic sequential access method) 22
- BTAM/SP (BTAM/System Product)
  - required level for Data Facility Product 46

## C

- cache
  - commands for 18
- CAS (catalog address space) 43
- catalog management 68
- catalog, integrated catalog facility
  - block sizes, VSAM 67
  - structure 25
- catalog, OS CVOL
  - description 27
  - migration to integrated catalog facility 28
- catalog, VSAM
  - description 26
  - migration to integrated catalog facility 28
- catalogs
  - altering 27
  - backing up 27
  - catalog address space 43
  - compatibility 28
  - converting 27
  - copying entries 27
  - creating 27
  - defining 27
  - deleting entries 27
  - diagnosing 27
  - examining 27
  - listing entries 27
  - macro instructions 28
  - migration to integrated catalog facility 28
  - VSCR (virtual storage constraint relief) 43
- channel support 42
- character support for ISMF panels 39
- checkpoint
  - definition 12
- checkpoint/restart
  - description 12

VSCR (virtual storage constraint relief) 43, 68  
 CICS/VS (Customer Information Control System/Virtual Storage)  
   required level for Data Facility Product 46  
 close  
   See open/close/EOV  
 common VTOC access facility  
   See CVAF  
 compatibility mode 15  
 control volume  
   See OS CVOL  
 Cryptographic Unit Support  
   required level for Data Facility Product 46  
 CVAF (common VTOC access facility) 68  
   description 29  
   VSCR (virtual storage constraint relief) 43  
 CVAF Filter 67

**D**

DADSM (direct access device storage management)  
   description 24  
   enhancements 69  
   user exit interfaces 29  
 DASD Migration Aid  
   description 18  
 DASDR program 7  
 data administration  
   See data management  
 Data Facility Data Set Services  
   See DFDSS  
 Data Facility Extended Function  
   See DFEF  
 Data Facility Hierarchical Storage Manager  
   See DFHSM  
 Data Facility Product  
   See DFP  
 data management  
   authorized functions 24  
   DFP components 4  
   macro instructions 22  
   overview 4, 21  
   utility programs 23  
 data set expiration 65  
 DATABASE2 (DB2) 47, 65  
 DB2 47, 65  
 DD statements (more than 1635 allowed) 65  
 device console services 17, 19, 70  
 device management

cache 18  
 DASD 17  
 DFP components 4  
 magnetic tape 18  
 overview 4, 15  
 printers 20  
 Device Support Facilities  
   description 2, 18  
   required level for Data Facility Product 47  
   substitute for AP-1 7  
   substitute for IBCDASDI 7  
   substitute for IEHDASDR 7  
   used to create a VTOC index 29, 30  
   used to migrate to indexed VTOCs 30  
 devices  
   defining 17  
   in compatibility mode 15  
   in full function mode 15  
   installing 15  
   supported by MVS/XA 15  
 DEVTYPE macro 18, 19  
 DFDS (Data Facility Device Support)  
   as a base for Data Facility Product 6  
 DFDSS (Data Facility Data Set Services)  
   description 2  
   for backup and recovery 25  
   required level for Data Facility Product 46  
   requirement for interactive storage management facility 39  
   substitute for DASDR 7  
   substitute for IBCDMPRS 7  
   substitute for IEHDASDR 7  
 DFEF (Data Facility Extended Function)  
   as a base for Data Facility Product 6  
 DFHSM (Data Facility Hierarchical Storage Manager)  
   description 2  
   for backup and recovery 25  
   required level for Data Facility Product 47  
   requirement for interactive storage management facility 39  
 DFP (Data Facility Product) 61  
   channel support 42  
   components 3  
   distribution method 49  
   extended architecture support 41  
   in MVS/XA 1  
   installing 48  
   machine requirements 45  
   operating environment 45  
   optional programs 46  
   origins 6  
   overview 1  
   packaging 49  
   programming requirements 45  
   programs not supported 7

- publications 51
- service agreement 49
- sysgen requirements 49
- Version 1 as a base for Version 2 45
- Version 2 enhancements 63
- VSCR (virtual storage constraint relief) 42
- 31-bit addressing 41
- DFSORT
  - description 2
  - required level for Data Facility Product 47
- direct access device storage management
  - See DADSM
- Direct Access Storage Dump Restore
  - See DASDR program
- discrete profiles 30
- DSCB (data set control block) 29

## E

- edtgen (eligible device table generation) 17, 75
- enciphering data 32
- end-of-volume
  - See open/close/EOV
- entry-sequenced data set 21
- EOV
  - See open/close/EOV
- erase-on-scratch 70
- EREP (Environmental Recording, Editing, and Printing)
  - description 2
  - required level for Data Facility Product 47
- ERP (error recovery procedure)
  - virtual storage constraint relief 43
- EXAMINE command 70
- EXCP access method 24, 29
- exit routine
  - open/EOV user exit for nonspecific tape mount requests 19
  - open/EOV user exit for security verification 19
- EXPORT command
  - by control interval 70

## F

- fetch
  - See program fetch
- FIPS
  - See ISO/ANSI/FIPS tape labels
- full function mode 15

## G

- generic profiles 30

## H

- Hierarchical Storage Manager
  - See DFHSM

## I

- I/O device generation 17
- IBCDASDI program 7
- IBCDMPRS program 7
- IBM DATABASE2 (DB2) 47, 65
- ICAPRTBL program 20
- ICKDSF
  - See Device Support Facilities
- IEBCOMPR program 23
- IEBCOPY program 23
  - altering load modules 12
  - copying load modules 12
- IEBDG program 23
- IEBEDIT program 23
- IEBGENER program 23
- IEBIMAGE program 20
- IEBISAM program 23
- IEBPTPCH program 23
- IEBUPDTE program 23
- IEHATLAS program 17
- IEHDASDR program 7
- IEHINITT program 19
- IEHLIST program
  - description 23
  - to list the contents of a VTOC 29
- IEHMOVE program 23
- IEHPROGM program
  - description 23
  - to update PASSWORD data set 31
- IFHSTATR program 19
- IGGUCSIT macro 20
- IMPORT command
  - by control interval 70
- IMS/VS
  - required level for Data Facility Product 47
- indexed sequential access method
  - See ISAM
- installing Data Facility Product 48
- integrated catalog facility 25, 67
- interactive storage management

- description 33-39
- DFP components 6
- overview 6
- interactive storage management facility (ISMF)
  - See interactive storage management
- iogen 17, 76
- ISAM (indexed sequential access method) 22
- ISMF (interactive storage management facility) 67
  - See also interactive storage management
- ISO/ANSI/FIPS tape labels 19, 71
  - RACF 1.7 tape data set protection 71
- ISPF (Interactive System Productivity Facility)
  - description 2
  - required level for ISMF 47
  - requirement for interactive storage management facility 39
- ISPF/PDF
  - description 2
  - required level for ISMF 47
  - requirement for interactive storage management facility 39

## J

- JCL (job control language)
  - password protection 31
- JFCB 65
- JFCBE 65
- job control language (JCL)
  - See JCL
- job file control block (JFCB) 65
- job file control block extension (JFCBE) 65
- JRNAD exit 70

## K

- key-sequenced data set 21

## L

- labels
  - magnetic tape 18
- linear data set 22
- linkage editor 10
  - differences between DFP and OS/VS2 MVS 3.8 10

- module portability 10
  - used to install Data Facility Product 48
- LISTDATA command 18
- load module
  - definition 9
- loader 11
  - module portability 11

## M

- macros
  - catalog management 28
  - data management 22
  - definition 4
- magnetic tape
  - labels 18
- media manager
  - VSCR (virtual storage constraint relief) 43
- migration
  - to indexed VTOCs 30
  - to integrated catalog facility catalogs 28
- MSGDISP macro 19
- MVS configuration program (MVSCP)
  - description 17
- MVS/SP
  - See MVS/System Product
- MVS/System Product
  - description 2
  - required level for Data Facility Product 45
- MVS/XA
  - related programs 1
  - supported devices 15

## N

- national language support for ISMF panels 39
- new program and data management support 67
- NOTE macro 19

## O

- object module
  - definition 9
- Offline IBM 3800 Utility 6, 20
- open/close/EOV 23, 71
- operating environment 45

OS CVOL 27  
OS/VS2 MVS  
as a base for Data Facility Product 6,  
45

**P**

partitioned data set  
directory 22  
PARTREL macro 69  
PASSWORD data set 31  
password protection 31  
non-VSAM data sets 31  
VSAM data sets 31  
POINT macro 19  
prerequisite programs 39  
program fetch  
module portability 11  
VSCR (virtual storage constraint  
relief) 43  
program management  
DFP components 3  
overview 3, 9  
Programmed Cryptographic Facility  
required level for Data Facility  
Product 48  
PSF (Print Services Facility)  
required level for Data Facility  
Product 48  
publications 51-61

**Q**

QSAM (queued sequential access  
method) 22  
queued access technique 22  
queued sequential access method 22

**R**

RACF (Resource Access Control Facility)  
always call 30  
description 2, 30  
discrete profiles 30  
generic profiles 30  
protection 30  
required level for Data Facility  
Product 48  
requirement for interactive storage  
management facility 39  
tape data set protection 30  
REALLOC macro 69

relative record data set 21  
relocation dictionary  
See RLD  
residence mode  
See RMODE  
Resource Access Control Facility  
See RACF  
restart  
from checkpoint 12  
RLD (relocation dictionary)  
definition 10  
RLD counts  
definition 10  
RMF  
required level for Data Facility  
Product 48  
RMODE (residence mode) 41

**S**

SAM-E (Sequential Access Method  
Extended)  
as a base for Data Facility Product 6  
security  
APF protection 32  
cryptographic protection 32  
password protection 31  
non-VSAM 31  
VSAM 31  
RACF protection 30  
Sequential Access Method Extended  
See SAM-E  
SETCACHE command 18  
SETPRT macro 20  
SMP (System Modification Program)  
description 2  
required level for Data Facility  
Product 45  
used to install Data Facility  
Product 48  
SMP/E  
See SMP  
Sort/Merge  
See DFSORT  
source module  
definition 9  
storage management library 60  
storage subsystem library 61  
SYNCDEV macro 19  
sysgen  
requirements for Data Facility  
Product 49  
system data administration 24  
system generation  
See sysgen  
System Modification Program  
See SMP

## T

tablespace (conversion to linear data set) 65  
tape block count checking 70  
tape open/EOV user exit routines 19  
temporary data set 24  
Time Sharing Option Extensions  
  See TSO/E  
TRKCALC macro 18  
TSO/E (Time Sharing Option Extensions)  
  description 2  
  required level for Data Facility Product 48  
  requirement for interactive storage management facility 39

## U

UCS image table  
  maintaining 20  
utility programs  
  data management 23  
  definition 4

## V

VERIFY macro 70  
VIO data set 24  
virtual I/O 24  
virtual storage access method  
  See VSAM  
virtual storage constraint relief  
  See VSCR  
volume table of contents  
  See VTOC  
VSAM (virtual storage access method)  
  data set structure 21  
  JRNAD user exit enhancements 70  
  macros 22  
  VERIFY macro enhancement 70  
  VSCR (virtual storage constraint relief) 42, 43, 63  
VSAM catalog 26  
VSAM data set  
  access method services commands for 23  
  backing up 23  
  block sizes 67  
  building an alternate index for 23  
  copying 23  
  defining 23  
  deleting 23

  examining 23  
  printing 23  
  restoring 23  
  security 30, 31  
VSAM volume data set  
  See VVDS  
VSCR (virtual storage constraint relief)  
  catalog 43  
  catalog management 68  
  checkpoint/restart 43, 68  
  CVAF 43, 68  
  ERP 43  
  media manager 43  
  program fetch 43  
  VSAM 42, 43, 63  
VTOC (volume table of contents)  
  accessing 29  
  compatibility 30  
  creating index for 29  
  listing the 29  
  migration to indexed 30  
VTOC index  
  how to list 29  
  how to protect 29  
VVDS (VSAM volume data set) 26

## W

WTOR Installation Exit 71

## Numerics

31-bit addressing mode 41  
3203 printer  
  ICAPRTBL program 20  
3211 printer  
  ICAPRTBL program 20  
3262 Model 5 printer 68, 69  
  maintaining UCS image tables 20  
  using IEBIMAGE for 20  
3380 direct access storage models AD4, BD4, AE4, and BE4 68  
3380 Models AD4, BD4, AE4, and BE4 68  
3380 Storage Control Model 21 68  
3380 Storage Control Model 23 68  
3420 Magnetic Tape Subsystem  
  operated in compatibility mode 15  
3422 Magnetic Tape Subsystem 68  
3430 Magnetic Tape Subsystem 68, 69  
3480 Magnetic Tape Subsystem  
  block count checking 19  
  label processing 71  
  macro instructions 19  
  operated in compatibility mode 15

3800 Printer  
  offline utility 6, 20  
  tape-to-printing-subsystem  
    feature 45  
    using IEBIMAGE for 20  
3800 Printing Subsystem Model 3  
  using IEBIMAGE for 20  
3880 Storage Control Model 11  
  commands for 18  
3880 Storage Control Model 13  
  commands for 18  
3880 Storage Control Model 21 68  
  commands for 18  
3880 Storage Control Model 23 68  
  commands for 18  
4245 printer 68, 69  
  maintaining UCS image tables 20  
4248 printer 68, 69  
  maintaining UCS image tables 20  
  using IEBIMAGE for 20





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