z/OS

# DFSMSrmm Application Programming Interface

SC26-7403-05

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**Note**

Before using this information and the product it supports, be sure to read the general information under “Notices” on page 111.

**Sixth Edition, September, 2005**

This edition applies to Version 1 Release 7 of z/OS® (5694-A01), Version 1 Release 7 of z/OS.e (5655-G52), and to all subsequent releases and modifications until otherwise indicated in new editions.

This edition replaces SC26-7403-04.

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# Contents

# Figures

# Tables

# About this document

This document is intended for application programmers who use the DFSMSrmm™ application programming interface to obtain information about resources that are managed by DFSMSrmm.

Refer to:

- Chapter 1, “Using the DFSMSrmm Application Programming Interface,” on page 1 for information on the EDGXCI macro you use for communication between your application program and DFSMSrmm.
- Chapter 2, “Using the Object-Oriented DFSMSrmm Application Programming Interface Using C++,” on page 17 for information on using C++ and other high-level programming languages to write programs to obtain information about DFSMSrmm resources.
- Chapter 3, “Using the DFSMSrmm Application Programming Interface via Web Services,” on page 27 for information on using the DFSMSrmm application programming interface via Web services.
- Chapter 4, “Using the DFSMSrmm Application Programming Interface Using Assembler Language,” on page 37 for guidelines for using the application programming interface.
- Chapter 5, “Processing the Output Data in the Output Buffer,” on page 49 for information on the data that the DFSMSrmm application programming interface returns.

For information about accessibility features of z/OS and z/OS.e, for users who have a physical disability, see Appendix E, “Accessibility,” on page 109.

## Required product knowledge

To use this document effectively, you should be familiar with:

- The RMM TSO subcommand and operands
- Macros to communicate between programs

## Referenced documents

The following publications have additional information about DFSMSrmm:

| Publication Title | Order Number |
|---|---|
| *z/OS DFSMSrmm Diagnosis Guide* | GY27-7619 |
| *z/OS DFSMSrmm Guide and Reference* | SC26-7404 |
| *z/OS DFSMSrmm Implementation and Customization Guide* | SC26-7405 |
| *z/OS DFSMSrmm Reporting* | SC26-7406 |

This document also refers to the following publications:

| Publication Title | Order Number |
|---|---|
| *z/OS XL C/C++ User’s Guide* | SC09-4767 |
| *z/OS Migration* | GA22-7499 |
| *z/OS Summary of Message and Interface Changes* | SA22-7505 |

| Publication Title | Order Number |
|---|---|
| *z/OS MVS System Messages, Vol 1 (ABA-AOM)* | SA22-7631 |
| *z/OS MVS System Messages, Vol 2 (ARC-ASA)* | SA22-7632 |
| *z/OS MVS System Messages, Vol 3 (ASB-BPX)* | SA22-7633 |
| *z/OS MVS System Messages, Vol 4 (CBD-DMO)* | SA22-7634 |
| *z/OS MVS System Messages, Vol 5 (EDG-GFS)* | SA22-7635 |
| *z/OS MVS System Messages, Vol 6 (GOS-IEA)* | SA22-7636 |
| *z/OS MVS System Messages, Vol 7 (IEB-IEE)* | SA22-7637 |
| *z/OS MVS System Messages, Vol 8 (IEF-IGD)* | SA22-7638 |
| *z/OS MVS System Messages, Vol 9 (IGF-IWM)* | SA22-7639 |
| *z/OS MVS System Messages, Vol 10 (IXC-IZP)* | SA22-7640 |

## Accessing z/OS DFSMS documents on the Internet

In addition to making softcopy documents available on CD-ROM, IBM provides access to unlicensed z/OS softcopy documents on the Internet. To view, search, and print z/OS documents, go to the z/OS Internet Library:

`www.ibm.com/servers/eserver/zseries/zos/bkserv/`

## Using LookAt to look up message explanations

LookAt is an online facility that lets you look up explanations for most of the IBM® messages you encounter, as well as for some system abends and codes. Using LookAt to find information is faster than a conventional search because in most cases LookAt goes directly to the message explanation.

You can use LookAt from the following locations to find IBM message explanations for z/OS® elements and features, z/VM®, and VSE:

- The Internet. You can access IBM message explanations directly from the LookAt Web site at http://www.ibm.com/eserver/zseries/zos/bkserv/lookat/.
- Your z/OS TSO/E host system. You can install code on your z/OS or z/OS.e systems to access IBM message explanations, using LookAt from a TSO/E command line (for example, TSO/E prompt, ISPF, or z/OS UNIX® System Services running OMVS).
- Your Windows® workstation. You can install code to access IBM message explanations on the *z/OS Collection* (SK3T-4269), using LookAt from a Windows DOS command line.
- Your wireless handheld device. You can use the LookAt Mobile Edition with a handheld device that has wireless access and an Internet browser (for example, Internet Explorer for Pocket PCs, Blazer, or Eudora for Palm OS, or Opera for Linux handheld devices). Link to the LookAt Mobile Edition from the LookAt Web site.

You can obtain code to install LookAt on your host system or Windows workstation from a disk on your *z/OS Collection* (SK3T-4269), or from the LookAt Web site (click **Download**, and select the platform, release, collection, and location that suit your needs). More information is available in the LOOKAT.ME files available during the download process.

## Notational conventions

This section explains the notational conventions used in this document.

## How to read syntax diagrams

Throughout this library, diagrams are used to illustrate the programming syntax. Keyword parameters are parameters that follow the positional parameters. Unless otherwise stated, keyword parameters can be coded in any order. The following list tells you how to interpret the syntax diagrams:

- Read the diagrams from left-to-right, top-to-bottom, following the main path line. Each diagram begins on the left with double arrowheads and ends on the right with two arrowheads facing each other.

```
▶▶──┤ Syntax Diagram ├──────────────────────────────────────────▶◀
```

- If a diagram is longer than one line, each line to be continued ends with a single arrowhead and the next line begins with a single arrowhead.

```
▶▶──┬─LISTDATASET─┬──data_set_name──VOLUME(volume_serial)───────▶
    └─LD──────────┘

▶──┬──────────────────────────────────────────────────────┬─────▶◀
   │                     ┌─1──────────────────────────┐    │
   └─┬─FILESEQ─┬──(──┴─physical_file_sequence_number─┴──)─┘
     └─SEQ─────┘
```

- Required keywords and values appear on the main path line. You must code required keywords and values.

```
▶▶──REQUIRED_KEYWORD────────────────────────────────────────────▶◀
```

If several mutually exclusive required keywords or values exist, they are stacked vertically in alphanumeric order.

```
▶▶──┬─REQUIRED_KEYWORD_OR_VALUE_1─┬─────────────────────────────▶◀
    └─REQUIRED_KEYWORD_OR_VALUE_2─┘
```

- Optional keywords and values appear below the main path line. You can choose not to code optional keywords and values.

```
▶▶──┬─────────┬─────────────────────────────────────────────────▶◀
    └─KEYWORD─┘
```

If several mutually exclusive optional keywords or values exist, they are stacked vertically in alphanumeric order below the main path line.

```
▶▶──┬────────────────────┬──────────────────────────────────────▶◀
    ├─KEYWORD_OR_VALUE_1─┤
    └─KEYWORD_OR_VALUE_2─┘
```

- An arrow returning to the left above a keyword or value on the main path line means that the keyword or value can be repeated. The comma means that each keyword or value must be separated from the next by a comma.

```
      ┌─,──────────────┐
      ▼                │
►►────REPEATABLE_KEYWORD┴──────────────────────────────────────────────►◄
```

- An arrow returning to the left above a group of keywords or values means more than one can be selected, or a single one can be repeated.

```
►►──┬──────────────────────────────────┬───────────────────────────────►◄
    │  ┌─,──────────────────────────┐ │
    │  ▼                            │ │
    └──┬─REPEATABLE_KEYWORD_OR_VALUE_1─┬┴─┘
       └─REPEATABLE_KEYWORD_OR_VALUE_2─┘
```

- A word in all uppercase is a keyword or value you must spell exactly as shown. In this example, you must code ***KEYWORD***.

```
►►──KEYWORD────────────────────────────────────────────────────────────►◄
```

If a keyword or value can be abbreviated, the abbreviation is discussed in the text associated with the syntax diagram.

- If a diagram shows a character that is not alphanumeric (such as parentheses, periods, commas, and equal signs), you must code the character as part of the syntax. In this example, you must code ***KEYWORD=(001,0.001)***.

```
►►──KEYWORD=(001,0.001)────────────────────────────────────────────────►◄
```

- If a diagram shows a blank space, you must code the blank space as part of the syntax. In this example, you must code ***KEYWORD=(001 FIXED)***.

```
►►──KEYWORD=(001 FIXED)────────────────────────────────────────────────►◄
```

- Default keywords and values appear above the main path line. If you omit the keyword or value entirely, the default is used.

```
    ┌─DEFAULT─┐
►►──┼─────────┼────────────────────────────────────────────────────────►◄
    └─KEYWORD─┘
```

- A word in all lowercase italics is a *variable*. Where you see a variable in the syntax, you must replace it with one of its allowable names or values, as defined in the text.

```
               (1)
►►──variable──────────────────────────────────────────────────────────►◄
```

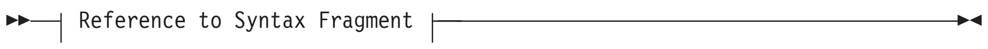
**Notes:**

1 An example of a syntax note.

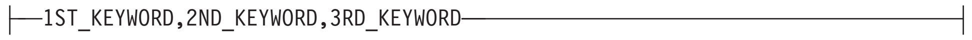
- References to syntax notes appear as numbers enclosed in parentheses above the line. Do not code the parentheses or the number.

```
►►──KEYWORD────────────────────────────────────────────────────────────►◄
```

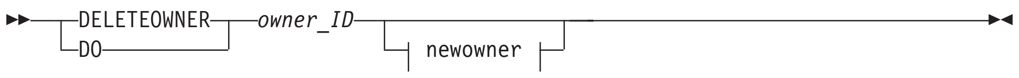
- Some diagrams contain *syntax fragments*, which serve to break up diagrams that are too long, too complex, or too repetitious. Syntax fragment names are in mixed case and are shown in the diagram and in the heading of the fragment. The fragment is placed below the main diagram.



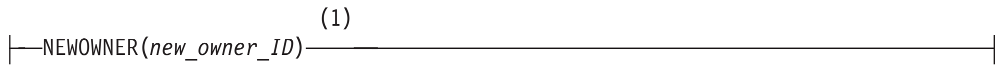
**Syntax Fragment:**



The following is an example of a syntax diagram.



**newowner**



**Notes:**

1 Must be specified if the owner owns one or more volumes.

The possible valid versions of the RMM DELETEOWNER command are:

```
RMM DELETEOWNER owner
RMM DO          owner
RMM DELETEOWNER owner NEWOWNER(new_owner)
RMM DO          owner NEWOWNER(new_owner)
```

## How to abbreviate commands and operands

The TSO abbreviation convention applies for all DFSMSrmm commands and operands. The TSO abbreviation convention requires you to specify as much of the command name or operand as is necessary to distinguish it from the other command names or operands.

Some DFSMSrmm keyword operands allow unique abbreviations. All unique abbreviations are shown in the command syntax diagrams.

## How to use continuation characters

The symbol **-** is used as the continuation character in this document. You can use either **-** or **+**.

| | |
|---|---|
| **-** | Do not ignore leading blanks on the continuation statement |
| **+** | Ignore leading blanks on the continuation statement |

## Delimiters

When you type a command, you must separate the command name from the first operand by one or more blanks. You must separate operands by one or more blanks or a comma. Do not use a semicolon as a delimiter because any character you enter after a semicolon is ignored.

## Character sets

To code job control statements, use characters from the character sets in Table 1. Table 2 lists the special characters that have syntactical functions in job control statements.

*Table 1. Character Sets*

| **Character Set** | **Contents** | |
|---|---|---|
| Alphanumeric | Alphabetic<br>Numeric | Capital A through Z<br>0 through 9 |
| National<br>(See note) | “At” sign<br>Dollar sign<br>Pound sign | @ (Characters that can be<br>$ represented by hexadecimal<br># values X'7C', X'5B', and X'7B') |
| Special | Comma<br>Period<br>Slash<br>Apostrophe<br>Left parenthesis<br>Right parenthesis<br>Asterisk<br>Ampersand<br>Plus sign<br>Hyphen<br>Equal sign<br>Blank | ,<br>.<br>/<br>'<br>(<br>)<br>*<br>&<br>+<br>-<br>= |
| EBCDIC text | EBCDIC printable character set | Characters that can be represented by hexadecimal X'40' through X'FE' |
| **Note:** The system recognizes the following hexadecimal representations of the U.S. National characters; @ as X'7C'; $ as X'5B'; and # as X'7B'. In countries other than the U.S., the U.S. National characters represented on terminal keyboards might generate a different hexadecimal representation and cause an error. For example, in some countries the $ character may generate a X'4A'. | | |

*Table 2. Special Characters Used in Syntax*

| **Character** | **Syntactical Function** |
|---|---|
| , | To separate parameters and subparameters |
| = | To separate a keyword from its value, for example, BURST=YES |
| ( ƀ ) | To enclose subparameter list or the member name of a PDS or PDSE |
| & | To identify a symbolic parameter, for example, &LIB |
| && | To identify a temporary data set name, for example, &&TEMPDS, and, to identify an in-stream or sysout data set name, for example, &&PAYOUT |
| . | To separate parts of a qualified data set name, for example, A.B.C., or parts of certain parameters or subparameters, for example, nodename.userid |
| * | To refer to an earlier statement, for example, OUTPUT=*.name, or, in certain statements, to indicate special functions: //label CNTL * //ddname DD * RESTART=* on the JOB statement |
| ’ | To enclose specified parameter values which contain special characters |
| (blank) | To delimit fields |

# Summary of Changes

This document contains terminology, maintenance, and editorial changes. Technical changes or additions to the text and illustrations are indicated by a vertical line to the left of the change.

You may notice changes in the style and structure of some content in this document--for example, headings that are more task-oriented, notes with headings that are more specific and clear in their intent, additional index entries for easier information retrieval, and procedures that have a different look and format. The changes are ongoing improvements to the consistency and retrievability of information in our documents.

## Summary of Changes for SC26-7403-05 z/OS Version 1 Release 7

This document contains information previously presented in *z/OS Version 1 Release 6 DFSMSrmm Application Programming Interface* (SC26-7403-04).

The following sections summarize the changes to that information.

### New Information

A new chapter has been added to describe how to use the DFSMSrmm application programming interface via Web services.

This edition includes new structured field introducers for DFSMSrmm for the update date and update time fields of the control data set control record.

### Changed Information

SYSALLDA devices have replaced SYSDA devices in the documentation.

## Summary of Changes for SC26-7403-04 z/OS Version 1 Release 6

This document contains information previously presented in *z/OS Version 1 Release 5 DFSMSrmm Application Programming Interface* (SC26-7403-03).

The following sections summarize the changes to that information.

### New Information

This edition includes new structured field introducers for DFSMSrmm client/server support and for DFSMSrmm support for IBM TotalStorage Enterprise Tape System 3592.

A new chapter has been added to describe how to use the DFSMSrmm application programming interface in the z/OS environment using high-level programming languages.

### Changed Information

Output examples have been updated to show the new structured field introducers.

## Summary of Changes for SC26-7403-03 z/OS Version 1 Release 5

This document contains information previously presented in *z/OS Version 1 Release 3 DFSMSrmm Application Programming Interface* (SC26-7403-02).

The following sections summarize the changes to that information.

### New Information

This edition includes new structured field introducers as part of these DFSMSrmm functions:

- DFSMSrmm file sequence greater than 9999
- DFSMSrmm data set expiration date support
- DFSMSrmm support for the IBM TotalStorage Enterprise Tape System 3592

### Changed Information

Output examples have been updated to show the new structured field introducers.

## Summary of Changes for SC26-7403-02 z/OS Version 1 Release 3

This document contains information previously presented in *z/OS Version 1 Release 3 DFSMSrmm Application Programming Interface* (SC26-7403-01).

The following sections summarize the changes to that information.

### New Information

This edition includes new structured field introducers as part of these DFSMSrmm functions:

- DFSMSrmm back up at anytime
- DFSMSrmm duplicate volume serial number
- DFSMSrmm command authorization by data set name
- DFSMSrmm IBM TotalStorage Enterprise Tape System 3590 Model H1*x*

### Changed Information

Output examples have been updated to show the new structured field introducers.

## Summary of Changes for SC26-7403-01 z/OS Version 1 Release 3

This document contains information previously presented in *z/OS Version 1 Release 1 DFSMSrmm Application Programming Interface* (SC26-7403-00).

The following sections summarize the changes to that information.

### New Information

This edition includes new structured field introducers as part of these DFSMSrmm functions:

- DFSMSrmm pooling control enhancements
- DFSMSrmm support for multiple systems and platforms
- DFSMSrmm bin management enhancements

## Changed Information

Output examples have been updated to show the new structured field introducers.

# Chapter 1. Using the DFSMSrmm Application Programming Interface

DFSMSrmm is a z/OS® feature. Use the DFSMSrmm application programming interface (API) to read, extract, and update data in the DFSMSrmm control data set. You can use the data to create reports or implement automation. For details on using C++ or Web services, see the following chapters:

- Chapter 2, "Using the Object-Oriented DFSMSrmm Application Programming Interface Using C++," on page 17
- Chapter 3, "Using the DFSMSrmm Application Programming Interface via Web Services," on page 27

Use macro EDGXCI as described in "EDGXCI: Calling the DFSMSrmm Interface" on page 3 to define a parameter list to call the DFSMSrmm application programming interface. Use macro EDGXCI to pass any supported RMM TSO subcommand to DFSMSrmm. See "Supported RMM TSO Subcommands" on page 2 for a list of supported RMM TSO subcommands. Figure 2 on page 13 is an example you can modify to communicate with the DFSMSrmm application programming interface.

Use macro EDGXSF as described in "EDGXSF: Structured Field Definitions" on page 100 to help you process the data that the DFSMSrmm application programming interface returns. The DFSMSrmm application programming interface returns data as structured fields in an output buffer that you define. Structured fields consist of these parts.

- A structured field introducer (SFI) that introduces the type of data, length, and characteristics of the data that the API returns,
- Data.

You can request that the API returns data in line format or field format as described in "Requesting SFI Data Format" on page 50. You can also request standard output or expanded output as described in "Requesting Types of Output" on page 54.

To use the DFSMSrmm application programming interface, you must have High Level Assembler installed on your system. *z/OS and z/OS.e Planning for Installation* provides information about the level of High Level Assembler required for DFSMS.

## Supported RMM TSO Subcommands

The DFSMSrmm API supports all the RMM TSO subcommands as shown in Table 3.

*Table 3. RMM TSO Subcommands*

| Group | Subcommand | Abbrev | Function |
|---|---|---|---|
| Add | ADDBIN | AB | Add bin number information |
| | ADDDATASET | AD | Add data set information |
| | ADDOWNER | AO | Add owner information |
| | ADDPRODUCT | AP | Add software product information |
| | ADDRACK | AR | Add shelf location information |
| | ADDVOLUME | AV | Add volume information |
| | ADDVRS | AS | Add a vital record specification |
| Change | CHANGEDATASET | CD | Change data set information |
| | CHANGEOWNER | CO | Change owner information |
| | CHANGEPRODUCT | CP | Change software product information |
| | CHANGEVOLUME | CV | Change volume information |
| Delete | DELETEBIN | DB | Delete bin number information |
| | DELETEDATASET | DD | Delete data set information |
| | DELETEOWNER | DO | Delete owner information |
| | DELETEPRODUCT | DP | Delete software product information |
| | DELETERACK | DR | Delete shelf location information |
| | DELETEVOLUME | DV | Release a volume and delete volume |
| | DELETEVRS | DS | Delete a vital record specification information |
| Get | GETVOLUME | GV | Request or assign a volume |
| List | LISTBIN | LB | Display bin number information |
| | LISTCONTROL | LC | Display PARMLIB options and control information |
| | LISTDATASET | LD | Display data set information |
| | LISTOWNER | LO | Display owner information |
| | LISTPRODUCT | LP | Display software product information |
| | LISTRACK | LR | Display shelf location information |
| | LISTVOLUME | LV | Display volume information |
| | LISTVRS | LS | Display vital record specification information |
| Search | SEARCHBIN | SB | Create a list of bin numbers |
| | SEARCHDATASET | SD | Create a list of data sets |
| | SEARCHPRODUCT | SP | Create a list of software products |
| | SEARCHRACK | SR | Create a list of rack numbers |
| | SEARCHVOLUME | SV | Create a list of volumes |
| | SEARCHVRS | SS | Create a list of vital record specifications |

Refer to *z/OS DFSMSrmm Guide and Reference* for details on these subcommands.

**Rule:** When you use the DFSMSrmm application programming interface, you must specify the subcommand as a single, continuous string of characters rather than as multiple input lines.

## Using the EDGXCI Macro

Follow these steps to obtain information from DFSMSrmm using the EDGXCI macro.

1. Use EDGXCI MF=(L,addr) to save space in your dynamic area for the parameter list.
2. Save the address of an output buffer that the application programming interface uses.
3. Load the DFSMSrmm API module, EDGXAPI, and then save the address of the module.
4. Create the subcommand that you want to process.
5. Use the EDGXCI macro to complete the parameter list and call the DFSMSrmm application programming interface.
6. Use EDGXCI with OPERATION=CONTINUE as needed to get more data for the current subcommand.
7. Use EDGXCI with OPERATION=RELEASE to free resources that are obtained by the DFSMSrmm API module.
8. Delete the EDGXAPI module that you loaded.

## EDGXCI: Calling the DFSMSrmm Interface

Use the EDGXCI macro in your application program (the caller) to:

- Define a parameter list.
- Set parameters in the list.
- Change parameters in the list.
- Call the DFSMSrmm application programming interface module, EDGXAPI.

### EDGXCI Environment

The requirements for the caller are:

| | |
|---|---|
| **Minimum authorization:** | Non-APF authorized, problem state and key (0-8). |
| **Dispatchable unit mode:** | Task |
| **Cross memory mode:** | PASN=HASN=SASN |
| **AMODE:** | 31-bit |
| **ASC mode:** | Primary |
| **Interrupt status:** | Enabled for I/O and external interrupts |
| **Locks:** | The caller must not be locked. |
| **Control parameters:** | Control parameters must be in the primary address space. |

### EDGXCI Programming Requirements

The caller must load the DFSMSrmm API module, EDGXAPI, prior to using the execute or standard form of EDGXCI. The caller must delete EDGXAPI when the DFSMSrmm API is no longer needed.

The caller should also use the EDGXSF macro to define the structured fields that are used in the output.

See Appendix C, “DFSMSrmm Application Programming Interface Mapping Macros,” on page 99 for a complete description of the EDGXCI and EDGXSF macros.

### EDGXCI Restrictions

The caller must not have functional recovery routines (FRRs) established.

### EDGXCI Input Register Information

Before issuing the EDGXCI macro, ensure that the following general purpose registers (GPRs) contain the specified information:

| Register | Contents |
|---|---|
| **13** | The address of a 72-byte standard save area in the primary address space |

Before issuing the EDGXCI macro, no information is needed in any access register (AR) unless the access register is used in register notation for a particular parameter or as a base register.

### EDGXCI Output Register Information

When control returns to the caller, the GPRs contain:

| Register | Contents |
|---|---|
| **0** | Reason code |
| **1** | Used as a work register by the system |
| **2-13** | Unchanged |
| **14** | Used as a work register by the system |
| **15** | Return code |

When control returns to the caller, the ARs contain:

| Register | Contents |
|---|---|
| **0-1** | Used as work registers by the system |
| **2-13** | Unchanged |
| **14-15** | Used as work registers by the system |

Some callers depend on register contents that remain the same before and after issuing a service. If the system changes the contents of registers on which the caller depends, the caller must save them before issuing the service, and restore them after the system returns control.

## EDGXCI Syntax

Figure 1 shows the syntax for the EDGXCI macro. You can use this macro to communicate with the DFSMSrmm application programming interface.

**EDGXCI Macro**

```
►►──┬──────┬──b──EDGXCI──b──APIADDR=apiaddr──────────────────────────────►
    └─name─┘

     ┌─,OPERATION=BEGIN─┐
►──┬─┴──────────────────┴─┤ parameters-1 ├─────────────┬─────────────────►
   ├─,OPERATION=CONTINUE─,OUTBUFADDR=outbufaddr─,TOKEN=token─┤
   ├─,OPERATION=RELEASE─,TOKEN=token─────────────────────────┤
   └─,OPERATION=ENDALL───────────────────────────────────────┘

                                              ┌─,PLISTVER=IMPLIED_VERSION─┐
►──┬─────────────────────┬──┬─────────────────────┬──┼───────────────────────────┼──►
   └─,RETCODE=retcode─┘  └─,RSNCODE=rsncode─┘  ├─,PLISTVER=MAX────────────┤
                                              └─,PLISTVER=0──────────────┘

   ┌─,MF=S────────────────────────────────────────┐
►──┼──────────────────────────────────────────────┼──────────────────────►◄
   │           (1)              ┌─,0D───┐         │
   ├─,MF=(L────────,list addr──┼───────┼──)──────┤
   │                            └─,attr─┘         │
   │                          ┌─,COMPLETE────┐    │
   ├─,MF=(E─,list addr────────┼──────────────┼─)──┤
   │                          │          (2) │    │
   │                          ┌─,COMPLETE────┐    │
   └─,MF=(M─,list addr────────┼──────────────┼─)──┘
                              │          (3) │
                              └─,NOCHECK─────┘
```

**parameters-1:**

```
├──,SUBCMDADDR=subcmdaddr──,OUTBUFADDR=outbufaddr────────────────────────►

     ┌─,OUTPUT=FIELDS─┐ ┌─,EXPAND=YES─┐
►──┬─┴────────────────┴─┼─────────────┼─┬──,TOKEN=token──────────────────┤
   │                    └─,EXPAND=NO──┘ │
   └─,OUTPUT=LINES──────────────────────┘
```

**Notes:**

1 Only the PLISTVER parameter can be coded with MF=L.

2 When NOCHECK is specified with MF=E, all parameters are optional and the system does not supply defaults for omitted optional parameters.

3 When NOCHECK is specified with MF=M, all parameters are optional and the system does not supply defaults for omitted optional parameters.

*Figure 1. EDGXCI Macro Syntax Diagram*

## EDGXCI Parameters

You can specify these parameters:

*name*
An optional symbol that starts in column 1. This is the name on the EDGXCI macro call. The name must conform to the rules for an ordinary assembler language symbol.

**APIADDR=***apiaddr*
A required input parameter that contains the address of the DFSMSrmm API load module. The calling program is responsible for loading the DFSMSrmm API load module, saving, and then using the returned load address. Use the MVS™ LOAD service to obtain the DFSMSrmm API address.

**To code:** Specify the RS-type address, or address in register (2)-(12), of a pointer field.

**,EXPAND=YES**
**,EXPAND=NO**
When OUTPUT=FIELDS and OPERATION=BEGIN are specified, EXPAND is an optional parameter that specifies whether to expand the number of returned data fields to be the same as for the corresponding list type of subcommand. The default is EXPAND=YES.

**,EXPAND=YES**
Specify to expand the number of data fields to be the same as the corresponding list type of subcommand.

**,EXPAND=NO**
Specify to not expand the number of data fields for the subcommand.

**,MF=S**
**,MF=(L,***list addr***)**
**,MF=(L,***list addr,attr***)**
**,MF=(L,***list addr***,0D)**
**,MF=(E,***list addr***)**
**,MF=(E,***list addr***,COMPLETE)**
**,MF=(E,***list addr***,NOCHECK)**
**,MF=(M,***list addr***)**
**,MF=(M,***list addr***,COMPLETE)**
**,MF=(M,***list addr***,NOCHECK)**
An optional input parameter that specifies the macro form.

Use MF=S to specify the standard form of the macro. This builds an inline parameter list and generates the macro invocation to transfer control to the service. MF=S is the default.

Use MF=L to specify the list form of the macro. Use the macro list form with the macro execute form for applications that require reentrant code. The list form defines an area of storage that the execute form uses to store the parameters. Only the PLISTVER parameter can be coded with the list form of the macro.

Use MF=E to specify the execute form of the macro. Use the execute form together with the list form of the macro for applications that require reentrant code. The execute form of the macro stores the parameters into the storage area defined by the list form and generates the macro invocation to transfer control to the service.

Use MF=M together with the list form and execute form of the macro for service routines that need to provide different options according to user-provided input.

Use the list form to define a storage area. Use the modify form to set the appropriate options. Then use the execute form to call the service.

**Recommendation:** Use the modify and execute forms of EDGXCI in the following order:

1. Use EDGXCI ...MF=(M,list-addr,COMPLETE) and specify all the required parameters and any appropriate optional parameters.
2. Use EDGXCI ...MF=(M,list-addr,NOCHECK) and specify the parameters that you want to change.
3. Use EDGXCI ...MF=(E,list-addr,NOCHECK) to execute the macro.

**,***list addr*

The name of a storage area to contain the parameters. For MF=S, MF=E, and MF=M, this can be an RS-type address or an address in register (1)-(12).

**,***attr*

An optional 1- to 60-character input string that you use to force boundary alignment of the parameter list. Use a value of X'0F' to force the parameter list to a word boundary or X'0D' to force the parameter list to a doubleword boundary. If you do not code *attr*, the system provides a value of X'0D'.

**,COMPLETE**

Specifies that the system should check for required parameters and supply defaults for omitted optional parameters.

**,NOCHECK**

Specifies that the system is not to check for required parameters and is not to supply defaults for omitted optional parameters.

**,OPERATION=BEGIN**
**,OPERATION=CONTINUE**
**,OPERATION=RELEASE**
**,OPERATION=ENDALL**

An optional parameter that describes the processing of the current subcommand. The default is OPERATION=BEGIN.

**,OPERATION=BEGIN**

Specify BEGIN to start a new subcommand.

**,OPERATION=CONTINUE**

Specify CONTINUE to continue the current subcommand.

**,OPERATION=RELEASE**

Specify when you want the token and all its associated resources to be released.

**,OPERATION=ENDALL**

Specify when you want to end all operations by releasing all tokens and all resources.

**,OUTBUFADDR=***outbufaddr*

When OPERATION=BEGIN is specified, OUTBUFADDR=*outbufaddr* is a required input parameter that contains the address of your output buffer, which is used for both data and messages. It must be at least 4096 bytes in length. The first four bytes of the buffer must contain the length of the buffer, including the four bytes of the length.

**To code:** Specify the RS-type address, or address in register (2)-(12), of a pointer field.

**,OUTBUFADDR=***outbufaddr*

When OPERATION=CONTINUE is specified, OUTBUFADDR=*outbufaddr* is a required input parameter that contains the address of your output buffer, which is used for both data and messages. It must be at least 4096 bytes in length. The first four bytes of the buffer must contain the length of the buffer, including the four bytes of the length.

**To code:** Specify the RS-type address, or address in register (2)-(12), of a pointer field.

**,OUTPUT=FIELDS**
**,OUTPUT=LINES**

When OPERATION=BEGIN is specified, OUTPUT is an optional parameter that specifies the format of the returned data. The default is OUTPUT=FIELDS.

**,OUTPUT=FIELDS**

Specify when you want data returned in field format.

**,OUTPUT=LINES**

Specify when you want data returned in line format. Search output is always returned in standard form when OUTPUT=LINES is specified.

**,PLISTVER=IMPLIED_VERSION**
**,PLISTVER=MAX**
**,PLISTVER=0**

An optional input parameter that specifies the version of the macro. PLISTVER determines which parameter list the system generates. PLISTVER is an optional input parameter on all forms of the macro, including the list form. Specify PLISTVER on all macro forms used for a request and with the same value on all of the macro forms. The PLISTVER values are:

- **IMPLIED_VERSION** which is the lowest version that allows all parameters specified on the request to be processed. If you omit the PLISTVER parameter, IMPLIED_VERSION is the default.
- **MAX** which allows you to change to the largest size currently possible. This size might grow from release to release and affect the amount of storage that your application program needs.

  **Recommendation:** If you can tolerate the size change, always specify PLISTVER=MAX on the list form of the macro. Specifying MAX ensures that the list-form parameter list is large enough to hold all the parameters you might specify on the execute form, when both are assembled with the same level of the system. In this way, MAX ensures that the parameter list does not overwrite nearby storage.
- **0**, if you use the currently available parameters.

**To code:** Specify one of the following:

- IMPLIED_VERSION
- MAX
- A decimal value of 0

**,RETCODE=***retcode*

An optional output parameter into which the return code is to be copied from GPR 15.

**To code:** Specify the RS-type address of a fullword field, or register (2)-(12).

**,RSNCODE=***rsncode*

An optional output parameter into which the reason code is to be copied from GPR 0.

**To code:** Specify the RS-type address of a fullword field, or register (2)-(12).

**,SUBCMDADDR=***subcmdaddr*

When OPERATION=BEGIN is specified, SUBCMDADDR=*subcmdaddr* is a required input parameter that contains the address of the input subcommand. The subcommand consists of a halfword field followed by the subcommand text. The halfword field must contain the length of the subcommand, including both the halfword field and the subcommand text. The maximum value is 32 761.

**To code:** Specify the RS-type address, or address in register (2)-(12), of a pointer field.

**,TOKEN=***token*

When OPERATION=BEGIN is specified, TOKEN=*token* is a required input parameter of a 4-byte area. The DFSMSrmm API creates a token and obtains resources for it, or the DFSMSrmm API reuses the token and the resources.

TOKEN is required even when MF=(E,label,NOCHECK) is specified, unless OPERATION=ENDALL is also specified.

**To code:** Specify the RS-type address, or address in register (2)-(12), of a 4-character field.

**,TOKEN=***token*

When OPERATION=CONTINUE is specified, TOKEN=*token* is a required input parameter of a 4-byte area containing the token used to begin the subcommand. The DFSMSrmm API uses the resources for the token to continue the subcommand.

TOKEN is required even when MF=(E,label,NOCHECK) is specified, unless OPERATION=ENDALL is also specified.

**To code:** Specify the RS-type address, or address in register (2)-(12), of a 4-character field.

**,TOKEN=***token*

When OPERATION=RELEASE is specified, TOKEN=*token* is a required input parameter of a 4-byte area containing a token. The DFSMSrmm API releases the resources for the token, releases the token, and clears the 4-byte area.

TOKEN is required even when MF=(E,label,NOCHECK) is specified, unless OPERATION=ENDALL is also specified.

**To code:** Specify the RS-type address, or address in register (2)-(12), of a 4-character field.

## EDGXCI Return and Reason Codes

When the EDGXCI macro returns control to your application program:

- GPR 15 (and *retcode*, when you code RETCODE) contains a return code.
- GPR 0 (and *rsncode*, when you code RSNCODE) contains a reason code.

The EDGXCI macro returns the following types of return codes and reason codes:

- Return and reason codes that are associated with the processing of your subcommand. These return and reason codes are the same ones that DFSMSrmm returns when you issue a subcommand request. Refer to *z/OS DFSMSrmm Guide and Reference* for more information about these return and reason codes.

- Return codes and reason codes that are issued by the API. The API returns:
  - Return code 0 and reason code 0 when processing has completed successfully.
  - Return code 0 and reason code 4 when the output buffer is full and more information is available.
  - Any return code higher than 100 when an error has occurred.
- When you use the API with high-level programming languages, DFSMSrmm returns a return code and reason code and a message described in the related messages column in Table 4. When you use the standard API, DFSMSrmm does not return a message but you can look to the related message for guidance.

Table 4 identifies the decimal return and reason codes.

*Table 4. Return and Reason Codes for the EDGXCI Macro*

| Return Code | Reason Code | Meaning and Action | Related Message |
|---|---|---|---|
| 0 | — | **Meaning**: Success.<br><br>**Action**: Refer to the action provided with the specific reason code. | |
| 0 | 0 | **Meaning**: EDGXCI command is successfully completed.<br><br>**Action**: None required. | |
| 0 | 4 | **Meaning**: There is more output waiting to be given to you.<br><br>**Action**: After you have processed the output in your output buffer, use OPERATION=CONTINUE to get more output. | EDG3900I |
| 104 | — | **Meaning**: Program error. An exception condition has been encountered, but the operation you requested was completed. The output results might not be acceptable to you.<br><br>**Action**: Refer to the action provided with the specific reason code. | |
| 104 | 02 | **Meaning**: There is nothing to CONTINUE.<br><br>**Action**: None required. | EDG3901I |
| 108 | — | **Meaning**: Program error. An error condition has been encountered, and the operation you requested was not successfully completed.<br><br>**Action**: Refer to the action provided with the specific reason code. | |
| 108 | 02 | **Meaning**: Required token is missing.<br><br>**Action**: You need to use TOKEN=**token** | EDG3902E |
| 108 | 04 | **Meaning**: Required address of the input subcommand is missing.<br><br>**Action**: You need to use SUBCMDADDR=**subcmdaddr** | EDG3903E |
| 108 | 06 | **Meaning**: Required address of your output buffer is missing.<br><br>**Action**: Use OUTBUFADDR=**outbufaddr** to specify the parameter. | EDG3904E |

*Table 4. Return and Reason Codes for the EDGXCI Macro (continued)*

| Return Code | Reason Code | Meaning and Action | Related Message |
|---|---|---|---|
| 108 | 08 | **Meaning**: Your output buffer is less than 4096 bytes in size.<br><br>**Action**: Obtain storage and set its length. | EDG3905E |
| 108 | 10 | **Meaning**: Your output buffer is too small. The second word in your buffer contains the size you need.<br><br>**Action**: Obtain the correct amount of storage and set its length. | EDG3906E |
| 108 | 12 | **Meaning**: OPERATION parameter is invalid.<br><br>**Action**: Use OPERATION= to specify the parameter; check your program for incorrect modifying of the parameter list. | EDG3907E |
| 108 | 14 | **Meaning**: OUTPUT parameter is invalid.<br><br>**Action**: Use OUTPUT= to specify the parameter; check your program for incorrect modifying of the parameter list. | EDG3908E |
| 108 | 16 | **Meaning**: EXPAND parameter is invalid.<br><br>**Action**: Use EXPAND= to specify the parameter; check your program for incorrect modifying of the parameter list. | EDG3909E |
| 108 | 56 | **Meaning**: The token is already in use.<br><br>**Action**: Use TOKEN=**token** to specify a token that is not in use. | EDG3910E |
| 108 | 58 | **Meaning**: OUTPUT=FIELDS is not supported for the subcommand specified by SUBCMDADDR=**subcmdaddr**.<br><br>**Action**: Use OUTPUT=LINES or specify a different subcommand. | EDG3911E |
| 108 | 60 | **Meaning**: The length of the subcommand specified by SUBCMDADDR=**subcmdaddr** is too large.<br><br>**Action**: Use a smaller subcommand. | EDG3912E |
| 112 | — | **Meaning**: Environmental error. A limit, such as a storage limit, was exceeded. The operation you requested was not successfully completed.<br><br>**Action**: Refer to the action provided with the specific reason code. | |
| 112 | 02 | **Meaning**: Unable to obtain sufficient work area storage.<br><br>**Action**: Remove the cause of the short-on-storage condition or request a larger region size. Rerun your program. | EDG3913E |

Table 4. Return and Reason Codes for the EDGXCI Macro (continued)

| Return Code | Reason Code | Meaning and Action | Related Message |
|---|---|---|---|
| 116 | — | **Meaning**: System error. An error caused by the system, rather than your program, has been encountered. The operation you requested was not successfully completed.<br><br>**Action**: Refer to the action provided with the specific reason code. | |
| 116 | 02 | **Meaning**: DFSMSrmm is not installed.<br><br>**Action**: Ensure DFSMSrmm is installed and active before running your program. | EDG3914E |
| 116 | 04 | **Meaning**: A call to a system service has resulted in a non-zero return code. DFSMSrmm has placed the return code and the associated reason code as structured fields in your output buffer.<br><br>**Action**: Retry the subcommand after the cause of the error has been corrected or removed. | EDG3915E |
| 116 | 06 | **Meaning**: An abnormal end has occurred.<br><br>**Action**: Remove the cause of the abnormal end. Rerun your program. | EDG3916E |
| 120 | 02 | **Meaning**: Program error has occurred while you were using the high-level API.<br><br>**Action**: Refer to the action provided with the specific reason code. | EDG3918E |
| 120 | 04 | **Meaning**: The LOAD for program EDGXAPI failed.<br><br>**Action**: Correct the cause of the error and retry the command. | EDG3919E |

## EDGXCI Example

You can modify the example shown in Figure 2 on page 13 to:

- Obtain space for your output buffer in your work area in dynamic storage.
- Obtain space for the parameter list in your work area in dynamic storage.
- Specify subcommands that have the following format:
  - The subcommand is prefixed by a two-byte length.
  - The subcommand is specified as a single input string.
- Use addresses that are pointer fields.
- Reuse the same parameter list for many requests.
- Reuse your 4-byte token area by specifying TOKEN= on all EXECUTE forms of EDGXCI. Your 4-byte token area is updated on return from the DFSMSrmm API.
- Make the list form parameter list large enough for all the parameters you might specify by using PLISTVER=MAX on the execute form of the EDGXCI macro.

Macro continuation characters must be entered in column 72.

```
YOURPGM  CSECT
R0       EQU   0
R1       EQU   1
R3       EQU   3
R4       EQU   4
R9       EQU   9
R11      EQU   11
R12      EQU   12
R13      EQU   13
R15      EQU   15
*        ..
         USING *,R11
         USING WORKDS,R12
         LA    R13,REGSAVE        Point to register save area
*        ..
*        ..
         LA    R0,OUTBUFWK        Save the
         ST    R0,APIOUTB@           address of output buffer
```

*Figure 2. Communicating with the DFSMSrmm API (Part 1 of 3)*

```
*************************************************************
*       Load the API module                               **
*************************************************************
        LOAD  EP=EDGXAPI
        ST    R0,APIMOD@         Save API module address
*       ..
        XC    MYTOKEN,MYTOKEN    Ensure no token yet
        LA    R4,LISTV@          List volume subcmd address
        BAL   R9,BEGINCMD        Begin the command
*       ..
*************************************************************
*       Going to reuse the resources, instead of releasing**
*       resources obtained by the API for the 1st BEGIN   **
*************************************************************
        LA    R4,SEARCHD@        Search subcmd address
        BAL   R9,BEGINCMD        Begin the command
*       ..
        BAL   R9,MOREDATA        Get more data for search
*       ..
        BAL   R9,RELEASE         All done, release resources
*       ..
*************************************************************
*       Delete the API module                             **
*************************************************************
        DELETE EP=EDGXAPI
*       ..
*************************************************************
**      Call API to begin a new subcommand                **
*************************************************************
BEGINCMD DS    0H
CALL1    EDGXCI  MF=(E,MYPL),PLISTVER=MAX,                  X
               APIADDR=APIMOD@,OPERATION=BEGIN,             X
               TOKEN=MYTOKEN,                               X
               SUBCMDADDR=(R4),OUTBUFADDR=APIOUTB@
        BR    R9                 Return
*************************************************************
**      Call API to get more data for current subcommand  **
*************************************************************
MOREDATA DS    0H
CALL2    EDGXCI  MF=(E,MYPL,NOCHECK),PLISTVER=MAX,          X
               OPERATION=CONTINUE,TOKEN=MYTOKEN
        BR    R9                 Return
```

*Figure 2. Communicating with the DFSMSrmm API (Part 2 of 3)*

```
*************************************************************
**       Call API to release resource such as storage and  **
**             loaded modules.                             **
*************************************************************
RELEASE  DS    0H
REL1     EDGXCI  MF=(E,MYPL,NOCHECK),PLISTVER=MAX,           X
               OPERATION=RELEASE,TOKEN=MYTOKEN
         BR    R9                  Return
*************************************************************
**       SEARCH DATA SET SUBCOMMAND                        **
*************************************************************
SEARCHD  DS    0C
         DC    AL2(SEARCHDL)
         DC    C'SEARCHDATASET ....'
SEARCHDL EQU   *-SEARCHD
SEARCHD@ DC    A(SEARCHD)
*************************************************************
**       LISTVOLUME SUBCOMMAND                             **
*************************************************************
LISTV    DS    0C                  Listv command buffer
         DC    AL2(LISTVL)         Length of command
         DC    C'LISTVOLUME ....'
LISTVL   EQU   *-LISTV             Length of command
LISTV@   DC    A(LISTV)            Address of command
*        ..
*************************************************************
**       PROGRAM WORK AREA                                 **
*************************************************************
WORKDS   DSECT
APIOUTB@ DS    A                   Pointer to output buffer
APIMOD@  DS    A                   Address of the API module
REGSAVE  DS    18F                 Save area
MYTOKEN  DS    CL4                 Token from the API
*************************************************************
**       PARAMETER LIST DEFINITION                         **
*************************************************************
         EDGXCI MF=(L,MYPL,0D),PLISTVER=MAX PLIST area
         DS    0D
OUTBUFWK DS    CL4096              Output buffer area
*************************************************************
**       STRUCTURED FIELD DEFINITIONS                      **
*************************************************************
SFDEFDS  DSECT
         EDGXSF
         END
```

*Figure 2. Communicating with the DFSMSrmm API (Part 3 of 3)*

# Chapter 2. Using the Object-Oriented DFSMSrmm Application Programming Interface Using C++

**DFSMSrmm Samples Provided in SAMPLIB**

EDGHCLT is shipped in SAMPLIB. The sample code shows how to issue RMM subcommands by using the DFSMSrmm high-level language application programming interface classes and methods.

| **Requirement:** The dynamic link library (DLL) is compiled using the z/OS V1R6 C/C++ compiler. To compile your own program, you can use compiler versions up to and including the z/OS V1.R6 (ISO C/C++) level of the compiler. There is a known compatibility problem with C/C++ compiler versions for z/OS V1.R5 and z/OS V1.R6 (APAR PQ83172). If you use these versions, you need to use compiler option `-Wc,'namemangling(compat)'`

**Related reading:** For information about using the namemangling compiler option, see *z/OS XL C/C++ User's Guide*.

You can use C++ and other high-level programming languages to write programs to obtain information about DFSMSrmm resources. You use the same DFSMSrmm subcommand strings that you can use with the EDGXCI application programming interface. You can get output as structured field introducers or in Extensible Markup Language (XML). The XML output contains data and tags to define the data. DFSMSrmm provides a schema called rmmxml.xsd that contains the definitions for the XML. For XML output, DFSMSrmm converts the data to character in Unicode format as defined in the XML Schema file for the DFSMSrmm resources. See "Receiving Extensible Markup Language (XML) Output Data in the XML Output Buffer" on page 24.

To create your own program as shown in Figure 3 on page 18, you need access to the EDGXHCLU (header file) and the EDGXHCLL (definition side deck). The header file is necessary for the compile step and located in SYS1.MACLIB. The definition side deck is necessary for the bind step and is located in SYS1.SIEASID.

```
//COMPBIND  JOB (4378),'COMPILE BIND HCLT',MSGCLASS=H,MSGLEVEL=(1,1),
//          TIME=3,CLASS=A,REGION=0M,NOTIFY=&SYSUID
//*
//*********************************************************************
//*                                                                 ***
//*  COMPILE AND BIND A C++ API USERPROGRAM                         ***
//*                                                                 ***
//*********************************************************************
//*
//*********************************************************************
//* COMPILE STEP:                                                     *
//* SYSLIB : LIBRARIES for C++ CLASS DEFINITION FILES AS SOURCE CODE  *
//*          INCLUDED IN THE USER PROGRAM, RMM HLL API CLASS          *
//*          DEFINITION FILE IS EDGXHCLU IN SYS1.MACLIB               *
*
//*********************************************************************
//COMPILE  EXEC PGM=CBCDRVR,
//          PARM=('/CXX OPTFILE(DD:CPARMS)'),
//          REGION=80M
//CPARMS    DD  *
          XREF,OPTIMIZE,SOURCE,OBJ,MAR,
//SYSLIB    DD  DSN=SYS1.MACLIB,DISP=SHR
//          DD  DSN=CEE.SCEEH.H,DISP=SHR
//          DD  DSN=CEE.SCEEH.SYS.H,DISP=SHR
//SYSLIN    DD  DSN=&SYSUID.CPP.OBJ(EDGHCLT),DISP=SHR
//SYSIN     DD  DSN=&SYSUID.CPP.SOURCE(EDGHCLT),DISP=SHR
//*
//*********************************************************************
//* BIND STEP:                                                        *
//* COMPILED MODULE EDGXHCLT NEEDS TO BE CONCATENATED WITH DEFINITION *
//* SIDE DECK : SYS1.SIEASID(EDGXHCLL) SAME MEMBER NAME AS DLL        *
//*                                                                   *
//* SYSLMOD : OUTPUT DATASET (HLQ.CPP.LINKLIB)HAS TO BE PDSE FORMAT   *
//* SYSDEFSD : DEFINITION SIDE DECK IS CREATED ??                     *
//*********************************************************************
//BINDCPP  EXEC PGM=IEWL,REGION=1024K,
//          PARM='AMODE=31,MAP,RENT,DYNAM=DLL'
//SYSLIB    DD  DISP=SHR,DSN=CEE.SCEECPP
//          DD  DISP=SHR,DSN=CEE.SCEELKED
//SYSLMOD   DD  DISP=SHR,DSN=HLQ.CPP.LOAD
//SYSLIN    DD  DISP=SHR,DSN=&SYSUID.CPP.OBJ(EDGHCLT)
//          DD  DISP=SHR,DSN=SYS1.SIEASID(EDGXHCLL)
//          DD  DDNAME=SYSIN
//SYSDEFSD DD  DUMMY
//SYSPRINT DD  SYSOUT=*
//SYSIN     DD  *
    NAME EDGHCLT(R)  RC=0
//*
```

*Figure 3. Sample job control language (JCL) for Prelink Step*

Figure 4 on page 19 shows sample JCL that you can use to request information for the RMM LISTVOLUME subcommand.

```
//*-----------------------------------------------------------------*
//* JCL Example to use C/C++ HLLAPI submitting RMM LIST VOLUME command,*
//* using sample program EDGHCLT,                                    *
//* EDGHCLT needs access to DLL: SYS1.SIEALNKE(EDGXHCLL)             *
//* receiving SFI output (SFIFILE) and XML output (XMLFILE)          *
//*-----------------------------------------------------------------*
//SMPLAPI  EXEC PGM=EDGHCLT,PARM='"LISTVOLUME A00001"'
//STEPLIB  DD DISP=SHR,DSN=HLQ.CPP.LOAD
//XMLFILE  DD DISP=(NEW,CATLG),DSN=USERID.OUTPUT.XMLFILE,
//            UNIT=SYSALLDA,VOL=SER=RMMDSK,
//            SPACE=(CYL,(5,5)),DCB=(RECFM=VB,LRECL=1028,BLKSIZE=6144)
//SFIFILE  DD DISP=(NEW,CATLG),DSN=USERID.OUTPUT.SFIFILE,
//            UNIT=SYSALLDA,VOL=SER=RMMDSK,
//            SPACE=(CYL,(5,5)),DCB=(RECFM=VB,LRECL=1028,BLKSIZE=6144)
//SYSPRINT DD SYSOUT=*
```

*Figure 4. Sample JCL for requesting LISTVOLUME information*

You need to write the program using C++ using the DFSMSrmm API classes and DFSMSrmm API methods to establish the connection to DFSMSrmm, issue the DFSMSrmm subcommands, and receive the output. If you select SFI format for the output, DFSMSrmm returns the information in structured field formats with all the fields provided.

Figure 5 on page 20 shows sample code that you can modify to use the high-level application programming interface.

```
/*********************************************************************
*                                                                    *
*  Module Name:  EDGHCLT                                             *
*                                                                    *
*  Description:  SAMPLE CODE for USING C/C++ HIGH LEVEL API INTERFACE *
*                                                                    *
**********************************************************************
*                                                                    *
*  z/OS DFSMSrmm V1R7                                                *
*                                                                    *
* PROPRIETARY V3 STATEMENT                                           *
* Licensed Materials - Property of IBM                               *
* 5694-A01                                                           *
* (C) COPYRIGHT IBM CORP. 1993,2004                                  *
* END PROPRIETARY V3 STATEMENT                                       *
**********************************************************************
*                                                                    *
*  Function:                                                         *
*                                                                    *
*    This C++ Module is a sample program for the customer to use     *
*    the High Level Language C/C++ API                               *
*                                                                    *
**********************************************************************
*                                                                    *
* Change History                                                     *
*                                                                    *
* $LV=RMMV1R6,1R6,030707 BRB: Created High Level API Interface    @LVA*
* $01=OA07430,1R6,040430,BRB: Changes for C-Compiler V1R5         @01A*
*                                                                    *
*********************************************************************/
#include <unistd.h>
#include <stdlib.h>
#include <stdio.h>
#include <iostream.h>
#include "EDGXHCLU"

FILE* sfiFp;

/**************************************************************
 *  function to print SFI buffer into file                    *
 **************************************************************/
 void printSFItoFile(RmmInterface::t_outp* outputPtr)

 {
   int outputlen=outputPtr->header.out_used;
   char* p = outputPtr->outputBuffer;
   char  ch;
   int i,len = 0;
   int offset = 0;
   int l = 0;

   for (l=0; l < outputlen; l++)
   {
     len = (*p * 16) + *(p+1);

     if ( len == 0 ) break;

     fwrite(p,1,len,sfiFp);

     p = p + len;
   }
 }
```

*Figure 5. Sample Code for Using the High-Level Application Programming Interface (Part 1 of 3)*

```
/**************************************************************
* start main                                                  *
***************************************************************/
int main(int argc, char* argv[])
{
  long  rc = 0;
  FILE* xmlFp;
  RmmApi* pApi;
  RmmCommand* pCom;
  char* tsoCommand;
  tsoCommand = argv[1];

/**************************************************************
* get Output File names and open files                        *
***************************************************************/

  if ( (xmlFp = fopen("DD:XMLFILE","w")) == NULL )
  {
     printf("could not open %s\n","DD:XMLFILE");
     exit(0);
  }
  if ( (sfiFp = fopen("DD:SFIFILE","wb,type=record")) == NULL )
  {
     printf("could not open %s\n","DD:SFIFILE");
     exit(0);
  }

/***************************************************************
* create RmmApi object                                         *
****************************************************************/
  pApi = new RmmApi();
  printf(" \nAPI object created \n");

/***************************************************************
* open Api                                                     *
****************************************************************/
  if ( pApi->openApi() == 0 )
    {
     printf(" API Return Code : %d\n",pApi->getApiRC());
     printf(" API Reason Code : %d\n",pApi->getApiRS());
     printf(" API Message     : %s\n",pApi->getMessageText());
    }
  else
    {
     printf("Could not open API \n");
     exit(0);
    }
/***************************************************************
* create RmmCommand object                                     *
****************************************************************/

     pCom = new RmmCommand(pApi);
```

*Figure 5. Sample Code for Using the High-Level Application Programming Interface (Part 2 of 3)*

```
/******************************************************************
* processes a TSO command                                         *
******************************************************************/

   rc = pCom->issueCmd(tsoCommand);

   switch ( rc )
   {
     case 0 :
        printf("Return Code : %d\n",pCom->getApiRC());
        printf("Reason Code : %d\n",pCom->getApiRS());
        printf("Message     : %s\n",pCom->getMessageText());
        printSFItoFile((RmmInterface::t_outp*) pCom->getBufferSfi());
        fprintf(xmlFp,"%s\n",pCom->getBufferXml());
        break;

      case 1 :
        printf("Return Code : %d\n",pCom->getApiRC());
        printf("Reason Code : %d\n",pCom->getApiRS());
        printf("Message     : %s\n",pCom->getMessageText());
        printSFItoFile((RmmInterface::t_outp*) pCom->getBufferSfi());
        fprintf(xmlFp,"%s\n",pCom->getBufferXml());

        do
          {
          rc = pCom->getNextEntry();
          printSFItoFile((RmmInterface::t_outp*) pCom->getBufferSfi());
          fprintf(xmlFp,"%s\n",pCom->getBufferXml());
          }
        while (rc == 1);
        break;

      case -1:
        printf("Return Code : %d\n",pCom->getApiRC());
        printf("Reason Code : %d\n",pCom->getApiRS());
        printf("Message     : %s\n",pCom->getMessageText());
        break;

      default:
        printf("Return Code : %d\n",pCom->getApiRC());
        printf("Reason Code : %d\n",pCom->getApiRS());
        printf("Message     : %s\n",pCom->getMessageText());
   }

/****************************************************************
* destruction
****************************************************************/
  delete pCom;
  delete pApi;

  fclose(sfiFp);
  fclose(xmlFp);
  exit(0);

}                             /* end main */
```

*Figure 5. Sample Code for Using the High-Level Application Programming Interface (Part 3 of 3)*

## DFSMSrmm High Level Language API Classes

### C++ classes

Use the DFSMSrmm RmmApi class to prepare the environment for using the RmmCommand class to use the DFSMSrmm TSO subcommands with the API. You can also use the RmmTransaction class that makes use of the RmmApi and RmmCommand classes. All of these classes are defined in the DFSMSrmm header file EDGXHCLU.

*Table 5. DFSMSrmm API Command C++ Classes*

| Class | Description |
|---|---|
| RmmInterface | This is the superclass for DFSMSrmm processing. This class provides methods that are common to the classes RmmApi and RmmCommand. This class cannot be instantiated. |
| RmmApi | This class extends the RmmInterface class. Use this class to create an object to initiate a communication session with DFSMSrmm. You must create an instance of this class before you use class RmmCommand. This instance can be used to create one or more RmmCommand objects to enable you to run DFSMSrmm subcommands. You need one RmmApi object for each Multiple Virtual Storage (MVS) TCB under which DFSMSrmm runs. To end the communication session with DFSMSrmm and to no longer run subcommands, delete the RmmApi object. |
| RmmCommand | This class extends the RmmInterface class. Use this class to process a DFSMSrmm TSO subcommand. You must pass a reference to the RmmApi object when you instantiate an instance of this class. You can instantiate multiple instances of the RmmCommand class to process multiple commands in parallel. For example, you can use the output from a SEARCH command to issue LIST subcommands. |
| RmmTransaction | This class makes use of the RmmApi and RmmCommand classes. Instantiate an instance of this class, if you want to use the runCommandXml method. |

### Java class

If you want a Java application to access DFSMSrmm, use class RmmJApi.

*Table 6. DFSMSrmm API Command Java Class*

| Class | Description |
|---|---|
| RmmJApi | Instantiate an instance of this class to communicate with DFSMSrmm from a Java application. |

## DFSMSrmm API Methods

Use the DFSMSrmm API methods to retrieve and update information about DFSMSrmm-managed resources. The naming convention for the methods is ClassName.methodName.

*Table 7. DFSMSrmm API C++ Methods*

| Method | Description |
|---|---|
| RmmApi.openApi() | Use this method to check that DFSMSrmm is active and available to process commands. |
| RmmApi.closeApi() | Use this method when you no longer want to communicate with DFSMSrmm using this command session. |
| RmmCommand.issueCmd() | Use this method to issue a subcommand to DFSMSrmm. DFSMSrmm returns the subcommand return code and reason code. To access the output from the subcommand, use the getBufferSfi method or the getBufferXml method. |
| RmmCommand.getBufferSfi() | Use this method to obtain a string that contains the SFI output buffer from subcommand processing. Use this method after using the RmmCommand.issueCmd method and after using the RmmCommand.getNextEntry method. |

*Table 7. DFSMSrmm API C++ Methods (continued)*

| Method | Description |
|---|---|
| RmmCommand.getBufferXml() | Use this method to obtain a string that contains the XML output converted from the SFI output of subcommand processing. |
| RmmCommand.getNextEntry() | Use this method to retrieve information for the next entry when there is more than one resource to be returned. For example, SEARCH subcommands and LISTCONTROL subcommands can return more than one resource. |
| RmmInterface.getMessageText() | Use this method to obtain a string that contains the DFSMSrmm information or error message for the last command issued or the last getNextEntry method processing. |
| RmmInterface.getApiRc() | Use this method to obtain the return code from the last API request. Use the getMessageText method to retrieve the corresponding information or error message. See “EDGXCI Return and Reason Codes” on page 9 for information about message processing. |
| RmmInterface.getApiRs() | Use this method to obtain the reason code from the last API request. Use the getMessageText method to retrieve the corresponding information or error message. See “EDGXCI Return and Reason Codes” on page 9 for information about message processing. |
| RmmTransaction.runCommandXml() | Use this method to return a string containing the XML output converted from the SFI output of subcommand processing. It may also return error messages and return and reason codes for the command in the XML. |

## Java Method

*Table 8. DFSMSrmm API Java Method*

| Method | Description |
|---|---|
| RmmJApi.runCommandXml() | Use this method to return a string containing the XML output converted from the SFI output of subcommand processing. It may also return error messages and return and reason codes for the command in the XML. |

## Receiving Extensible Markup Language (XML) Output Data in the XML Output Buffer

Use the high-level language application programming interface to obtain output in XML format. The XML output may also return error messages and return and reason codes.

Figure 6 on page 25 shows an example that issues an RMM SEARCHRACK subcommand and writes the XML output into the file named XMLFILE.

You can work with the output data in XML format by writing the output into a file or by parsing the output directly. You can define this file in the JCL, which you use to issue the command.

The following example shows in C++ code how to:

- Issue a DFSMSrmm TSO subcommand by using the method issueCommand() .
- Use the method getBufferXml() to obtain access to the XML data.

```
FILE*  xmlFp;                                  /* declare file pointer */
RmmApi* pApi;                                  /* declare an Api object */
RmmCommand* pCom;                              /* declare a Command object */
pApi = new RmmApi();                           /* create an Api object */
pApi->openApi();                               /* open Api */
pCom = new RmmCommand(pApi);                   /* create a Command object */
pCom->issueCmd("SR RACK");                     /* issue a Command */
xmlFp = fopen("DD:XMLFILE","w")                /* open the file for writing */
fprintf(xmlFp,"%s",pCom->getBufferXml());      /* print the data into the file */
fclose(xmlFp);                                 /* close the file */
```

*Figure 6. C++ Code Example for Writing XML Output to a File*

Figure 7 shows the content of the file XMLFILE.

```
<?xml version="1.0" encoding="EBCDIC-CP-US" ?>
<document xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:noNamespaceSchemaLocation="/usr/lib/xml_schema/rmmxml.xsd">
<RACK>
<RCK>RACK  </RCK>
<VOL  xsi:nil="true"></VOL>
<RST>EMPTY</RST>
<LOC>SHELF</LOC>
<MEDN>3480</MEDN>
<PID>*</PID>
</RACK>
<INFO>
<RTNC>4</RTNC>
<RSNC>4</RSNC>
<MSGT>EDG3011I 1 ENTRY LISTED  </MSGT>
</INFO>
</document>
```

*Figure 7. XMLFILE Output File*

Most of the DFSMSrmm-produced XML tags use the SFI names described in Table 15 on page 82. For example, the XML tag for volume is <VOL> which corresponds to the SFI name VOL. The DFSMSrmm-produced XML tags that do not use the SFI names are the following tags.

- The XML tag <VOLINFO> for the volume resource group.
- The XML tag <VRSINFO > for the VRS resource group.
- The XML tags <JBN2>, <NME2>, <SCD2>, and <SCN2>, which represent the SFIs <2JBN>, <2NME>, <2SCD> and <2SCN>. XML does not allow tags to start with numeric characters.

The XML output structure is declared in the XML schema file RMMXML.XSD, that you find in your hierarchical file system (HFS) directory /usr/lib/xml_schema. The schema contains type definitions for all elements.

The XML data stream contains a Uniform Resource Identifier (URI) to reference the required schema. To change the schema location, use the XML parser setExternalnoNamespaceSchemaLocation method.

**Related Reading:** You can write your own application to parse the XML data by using the XML parser. IBM provides an XML parser and sample applications in the XML Toolkit for z/OS available at http://www.ibm.com/zseries/software/xml or from the IBM Software Delivery for System Modification Program Extended (SMP/E) installation.

# Chapter 3. Using the DFSMSrmm Application Programming Interface via Web Services

**DFSMSrmm Samples Provided**

A sample Java Web service application, rmmSampleWSClient.java, is located in your hierarchical file system (HFS) directory /usr/lpp/dfsms/rmm/. The sample code shows how the application programming interface can be used via Web service.

**Requirement:** C/C++ or any other high-level language is required to exploit the DFSMSrmm class library. An XML parser (such as the one available in the XML toolkit for z/OS) is required to process the XML output from the DFSMSrmm application programming interface. Also, Language Environment for z/OS is required in order to install the DFSMSrmm class library. WebSphere Application Server for z/OS V5.0.2 and later, or an equivalent, is required to host the DFSMSrmm Web service, and WebSphere Studio Application Developer 5.1 and later, or an equivalent, is required for implementation and development. The minimum requirement to do any changes is Java SDK.

You can write Java applications that run on any platform that can use the DFSMSrmm API classes to obtain information about DFSMSrmm resources. You use the same DFSMSrmm subcommand strings that you can use with the EDGXCI application programming interface. You get output in Extensible Markup Language (XML). If you receive the output from the DFSMSrmm application programming interface as XML output, you can use an XML parser to process the returned data, or you can package the XML in order to use it as the base for displaying information for the end user. See “Receiving Extensible Markup Language (XML) Output Data in the XML Output Buffer” on page 24 for additional information about XML output data.

Using Web services, the DFSMSrmm application programming interface appears to the application as a local application programming interface even though it is running on another system. The infrastructure to support the use of Web services must be implemented and available on both the application system and the target z/OS system running DFSMSrmm. The infrastructure to support Web services on the target z/OS system is provided by WebSphere Application Server. You can use an equivalent product, but additional customization and programming may be required by you. You can use WebSphere Studio Application Developer to develop applications that use the DFSMSrmm application programming interface via Web services.

The DFSMSrmm application programming interface Web service is shipped as an Enterprise ARchive (EAR) file called rmmapi.ear and is located in your hierarchical file system (HFS) directory /usr/lpp/dfsms/rmm/. This EAR file contains all the elements needed to implement and use the Web service. To install the DFSMSrmm Web service, use the WebSphere Install Application. You can use either the graphical user interface or the command line tool for the installment and customization of your WebSphere environment. To develop a client application that uses the DFSMSrmm Web service, either import the EAR file into your project using WebSphere Studio Application Developer and use the definitions and codes it contains for your application, or use the sample client application shipped with

DFSMSrmm. After your application is written, modify the installation or environment-dependent information in the EAR file so you can implement the Web service in your environment.

The Java class, RmmJApi.class, is the core part of the DFSMSrmm Web services. You can use it to access DFSMSrmm from inside z/OS, too. Packaged in rmmjapi.jar, located in your hierarchical file system (HFS) directory /usr/lpp/dfsms/rmm/, it is available to access the DFSMSrmm application programming interface locally from a Java program. RmmJApi.class supports the method RmmJApi.runCommandXml. See “DFSMSrmm High Level Language API Classes” on page 23 for additional information.

When you use the runCommandXML method to run a search command, it is possible to encounter a memory size limitation problem. A default limit of one megabyte is set for the returned data. This equals roughly 500 volumes (one volume resulting in about 2 kilobytes of data). If you are requesting a larger number of resources to be returned, you will reach this limit. The returned XML string ends after a complete resource, and message EDG3921I is added to the string. This message explains system status. Additionally, return code 4 and reason code 10 are added to enable you to correctly handle the returned data. You can narrow the search request by using one or more of the operands on the search subcommand, such as LIMIT or OWNER, or try to adjust the default limit (see *z/OS DFSMSrmm Implementation and Customization Guide* for additional information). The possible maximum limit depends on your environment. Check your JVM (Java Virtual Machine) and TCPIP settings..

To further help with memory usage and to reduce the amount of data returned from the Web service, you can use GZIPInputStream to zip the command string and then you can use GZIPOutputStream to convert the returned output back to a string. See rmmSampleWSClient.java for a coding example.

You may want to publish your DFSMSrmm application programming interface Web service in a UDDI registry. The sample client comes without UDDI support. It is your task to publish the Web service to an UDDI registry and to implement the code for the discovery of the service. You can also write your application so that it does not need to dynamically discover where the Web service is located, or you can use a local or more general UDDI registry to discover the system that provides the Web service you need. If the services that the DFSMSrmm application programming interface Web service provides are specific only to your local system, it is recommended that you use a UDDI registry that is local to your system.

## Sample Java Web Service Client

The sample client application contains the following:

- Some general methods to handle the Web Service endpoint and create a call.
- A client-side method to access the Web Service method runCommandXML() communicating via byte arrays.
- A client-side method to access the Web Service method runCommandXML() communicating via strings arrays.
- A main program that:
  – Handles the passed command line parameters.
  – Zips the TSO subcommand to a byte array.
  – Creates a client object.
  – Sets the end point.

- Calls the Web service.
- Unzips the results and writes to a file.
- For reference, there is code that shows how to pass both commands and data as strings.

For information on how to use the DFSMSrmm Web service sample client, see the *z/OS DFSMSrmm Implementation and Customization Guide*.

```
/**********************************************************************
*                                                                     *
*  Module Name:  EDGSJWS1                                             *
*                                                                     *
*  Description:  sample client                                        *
*                                                                     *
***********************************************************************
*                                                                     *
*  z/OS DFSMSrmm V1R7                                                 *
*                                                                     *
* PROPRIETARY V3 STATEMENT                                            *
* Licensed Materials - Property of IBM                                *
* "Restricted Materials of IBM"                                       *
* 5694-A01                                                            *
* (C) Copyright IBM Corp. 1992,  2005                                 *
* Status = HDZ11K0                                                    *
* END PROPRIETARY V3 STATEMENT                                        *
***********************************************************************
*                                                                     *
*  Function:                                                          *
*                                                                     *
*    This module demonstrates how the RMM WebServices                 *
*    can be used from a Java client program                           *
*                                                                     *
**********************************************************************/
/**********************************************************************
*                                                                     *
* Change History                                                      *
*                                                                     *
* $LY=RMMV1R7,1R7,040613 BRB: Created Sample Client               @LYA*
*                                                                     *
**********************************************************************/

import java.net.*;
import java.io.*;
import java.util.*;
import java.util.zip.*;
import org.w3c.dom.*;
import org.apache.soap.*;
import org.apache.soap.encoding.*;
import org.apache.soap.encoding.soapenc.*;
import org.apache.soap.rpc.*;
import org.apache.soap.util.xml.*;
import org.apache.soap.messaging.*;
```

*Figure 8. Sample Java Web service client (Part 1 of 7)*

```
/**********************************************************************
 *                                                                    *
 *   sample client for use of RMM WebServices                         *
 *                                                                    *
 *                                                                    *
 **********************************************************************/
public class rmmSampleWSClient
{

  /********************************************************************
   * variable declarations                                            *
   *               - set stringURL to your default server IP address *
   ********************************************************************/
   private Call call = createCall();
   private URL url = null;
   private String stringURL = "";

  /********************************************************************
   * methods to handle the WebService Endpoint                        *
   ********************************************************************/
   public synchronized void setEndPoint(URL url)
   {
     this.url = url;
   }

   private URL getURL() throws MalformedURLException
   {
     if (url == null && stringURL != null && stringURL.length() > 0)
     {
       url = new URL(stringURL);
     }
     return url;
   }


  /********************************************************************
   * method to create a Call                                          *
   ********************************************************************/
   private static Call createCall()
   {
     Call call = new Call();
     SOAPMappingRegistry smr = call.getSOAPMappingRegistry();
     return call;
   }
```

*Figure 8. Sample Java Web service client (Part 2 of 7)*

```
/*******************************************************************
 *                                                                 *
 * client side method to access WebServices "runCommandXml"        *
 *                                                                 *
 *            using BYTE ARRAYS                                    *
 *                                                                 *
 *******************************************************************/
 public synchronized byte[] runCommandXml(byte[] b_cmd) throws Exception
 {
   String targetObjectURI = "urn:RmmJApi";
   String SOAPActionURI = "";

   if( getURL() == null )
   {
     throw new SOAPException(Constants.FAULT_CODE_CLIENT,
     "A URL must be specified via RmmJApiProxy.setEndPoint(URL).");
   }

   call.setMethodName("runCommandXml");
   call.setEncodingStyleURI(Constants.NS_URI_SOAP_ENC);
   call.setTargetObjectURI(targetObjectURI);
   Vector params = new Vector();
   Parameter b_cmdParam =
           new Parameter("b_cmd", byte[].class, b_cmd, Constants.NS_URI_SOAP_ENC);
   params.addElement(b_cmdParam);
   call.setParams(params);

   Response resp = call.invoke(getURL(), SOAPActionURI);

   if ( resp.generatedFault() )
   {
     Fault fault = resp.getFault();
     call.setFullTargetObjectURI(targetObjectURI);
     throw new SOAPException(fault.getFaultCode(), fault.getFaultString());
   }
   else
   {
     Parameter refValue = resp.getReturnValue();
     return ((byte[])refValue.getValue());
   }
 }
```

*Figure 8. Sample Java Web service client (Part 3 of 7)*

```
/*******************************************************************
 *                                                                 *
 * client side method to access WebServices "runCommandXml"        *
 *                                                                 *
 *             using STRINGS                                       *
 *                                                                 *
 *******************************************************************/
 public synchronized java.lang.String runCommandXml(java.lang.String cmd) throws Exception
 {
   String targetObjectURI = "urn:RmmJApi";
   String SOAPActionURI = "";

   if( getURL() == null )
   {
     throw new SOAPException(Constants.FAULT_CODE_CLIENT,
     "A URL must be specified via RmmJApiProxy.setEndPoint(URL).");
   }

   call.setMethodName("runCommandXml");
   call.setEncodingStyleURI(Constants.NS_URI_SOAP_ENC);
   call.setTargetObjectURI(targetObjectURI);
   Vector params = new Vector();
   Parameter cmdParam =
       new Parameter("cmd", java.lang.String.class, cmd, Constants.NS_URI_SOAP_ENC);
   params.addElement(cmdParam);
   call.setParams(params);

   Response resp = call.invoke(getURL(), SOAPActionURI);

   if (resp.generatedFault())
   {
     Fault fault = resp.getFault();
     call.setFullTargetObjectURI(targetObjectURI);
     throw new SOAPException(fault.getFaultCode(), fault.getFaultString());
   }
   else
   {
     Parameter refValue = resp.getReturnValue();
     return ((java.lang.String)refValue.getValue());
   }
 }
```

*Figure 8. Sample Java Web service client (Part 4 of 7)*

|

```
/*******************************************************************
 *                                                                 *
 *           main                                                  *
 *                                                                 *
 *******************************************************************/
 public static void main(String[] args)
 {
  /****************************************************************
   *                                                              *
   * get server IP address, TSO subcommand and file name          *
   * passed as command line parameter                             *
   *                                                              *
   ****************************************************************/
   if ( args.length != 3 )
   {
     System.out.println("you need to pass IP address (plus port), a TSO subcommand and
                         a file name !");
     System.out.println("example :\n java rmmSampleWSClient 9.10.111.122:9080 \"LISTCONTROL
                         ALL\" data.txt");
     System.exit(0);
   }

   String ipA = args[0];
   String cmd = args[1];
   String outputfile = args[2];
   byte[] b_cmd = null;


  /****************************************************************
   *                                                              *
   * zip TSO subcommand string to a byte array                    *
   *                                                              *
   ****************************************************************/
   try
   {
     ByteArrayOutputStream baos = new ByteArrayOutputStream();
     DataOutputStream out =
                     new DataOutputStream(new GZIPOutputStream(baos));
     out.writeBytes(cmd);
     out.close();
     b_cmd = baos.toByteArray();
   }
   catch (Exception e)
   {
     System.out.println(e);
     System.exit(1);
   }
```

*Figure 8. Sample Java Web service client (Part 5 of 7)*

|

```
try
{
 /***************************************************************
  * create a client object                                      *
  ***************************************************************/
  rmmSampleWSClient sClient = new rmmSampleWSClient();

 /***************************************************************
  * set the EndPoint (location of the WebService)               *
  ***************************************************************/
  URL ePoint = new URL("http://" + ipA + "/RmmJApi/servlet/rpcrouter");
  sClient.setEndPoint(ePoint);

 /***************************************************************
  *                                                             *
  * call WebService                                             *
  *                    - input  : TSO subcommand as BYTE[]      *
  *                    - output : RMM data as BYTE[]            *
  *                               is unzipped to a file         *
  *                                                             *
  ***************************************************************/

  ByteArrayInputStream bais =
               new ByteArrayInputStream(sClient.runCommandXml(b_cmd));
  BufferedReader d = new BufferedReader(
                         new InputStreamReader(
                             new GZIPInputStream(bais),"UTF-8"));
  bais.close();

 /***************************************************************
  * write results to file                                       *
  ***************************************************************/
  try
  {
    FileOutputStream fos = new FileOutputStream(outputfile);
    Writer wr = new OutputStreamWriter(fos);
    String l = "";

    while ( (l = d.readLine()) != null)
    {
      l = l + "\n";
      wr.write(l);
    }

    wr.close();
    fos.close();

  }
  catch (IOException e)
  {
    System.err.println("I/O Exception :" + e);
    System.exit(1);
  }
```

*Figure 8. Sample Java Web service client (Part 6 of 7)*

```
        /*****************************************************************
         * FOR REFERENCE                                                 *
         * call WebService                                               *
         *                     - input  : TSO subcommand as STRING       *
         *                     - output : RMM data as STRING             *
         *                                is written to a file           *
         *                                                               *
         *****************************************************************
         try
         {
           FileOutputStream fos = new FileOutputStream(outputfile);
           Writer wr = new OutputStreamWriter(fos);
           wr.write(sClient.runCommandXml(cmd));
           wr.close();
           fos.close();
         }
         catch (IOException e)
         {
           System.err.println("I/O Exception : " + e);
           System.exit(1);
         }


         *****************************************************************
         * end the program                                               *
         *****************************************************************/
         System.out.println("File " + outputfile + " written");
         System.exit(0);

       }
      /*******************************************************************
       * catch and display a possible exception                          *
       *******************************************************************/
       catch (Exception e)
       {
         System.out.println(e);
         System.exit(1);
       }
     }

   }
```

*Figure 8. Sample Java Web service client (Part 7 of 7)*

## Using Persistence and Parallel Processing

The Web service uses a stateless session bean and enables a single command to be run and the output returned in a single request. The method RmmJApi.runCommandXml enables a command to be run by a single method call. See Table 8 on page 24 for additional information.

Each caller of the Web service can use a different bean in WebSphere, and this enables multiple commands to be run in sequence and also in parallel. By customizing implementation options, you can enable WebSphere to instantiate a stateless session bean to support the DFSMSrmm Web service and to retain the session bean for use by any Web service requests. You can also limit how many instances of the bean can be running at one time.

## Defining How and When Authentication is Done

Authentication is not done by the DFSMSrmm Web service. You must use the capabilities provided by WebSphere Application Server to define how and when authentication is done. All DFSMSrmm subcommands issued via the DFSMSrmm application programming interface from within WebSphere uses the RACF ACEE to perform authorization checking before the subcommand is processed. Therefore, ensure that the authentication performed via WebSphere causes a valid ACEE to be created and that ACEE represents a valid RACF userid in the z/OS environment. At a minimum, ensure that WebSphere is configured to:

- Perform basic authentication.
- Ensure that the extension and binding files for both client and server requests and responding security settings match.
- Provide your chosen authentication method.

# Chapter 4. Using the DFSMSrmm Application Programming Interface Using Assembler Language

Use the following general programming guidelines to help you write your application program.

## Obtaining Resources

When you begin a new subcommand request and provide a token which is set to all zeros, the DFSMSrmm API obtains a new set of resources. When you begin a new subcommand request and reuse a valid, nonzero token, DFSMSrmm reuses resources associated with the token.

To use resources most efficiently, consider the following items.

- Use a different output buffer for each RMM TSO subcommand request. Reuse an output buffer to begin a new subcommand request only when there is nothing in the buffer that you need.
- Allocate a sufficient number of token areas, and parameters lists.
- Use the correct token when continuing a RMM TSO subcommand or when releasing a particular set of resources.
- Reuse a token to begin a new RMM TSO subcommand only when you no longer need the information obtained from the previous request.
- Reuse the resources associated with the token, especially when you are processing hundreds or thousands of subcommands.

## Specifying TSO Subcommand Input in the EDGXCI Macro

To obtain information from the DFSMSrmm control data set, specify a DFSMSrmm TSO subcommand as a single input line without the RMM command, as shown in Figure 9.

```
AV MLV001 STATUS(MASTER) EXPDT(98001) OWNER(IBMUSER) OWNERACCESS(UPDATE) RACK(ML0001)
```

*Figure 9. Example of Specifying the DFSMSrmm API Subcommand*

Do not specify it as an RMM command with multiple input lines, as shown in Figure 10.

```
RMM  AV MLV001 STATUS(MASTER) EXPDT(98001) OWNER(IBMUSER)-
        OWNERACCESS(UPDATE) RACK(ML0001)
```

*Figure 10. Example of Specifying the RMM TSO Subcommand*

In addition, specify subcommands using fully specified subcommand operands and their values. Avoid abbreviating the subcommands or operands because they can change when new subcommand operands and values are added.

## Using the CONTINUE Operation in the EDGXCI Macro

Use the EDGXCI OPERATION=CONTINUE parameter in your application program to ensure that you obtain all the available data. When you use OPERATION=CONTINUE, you might not receive more output data or you might receive only messages in your output buffer.

The DFSMSrmm API can return control back to your application program before returning all the data you expect because:

- There is no more room in the output buffer for the additional data.
- The API stops after returning data for a single resource when you issue a request that uses a SEARCH command and the OUTPUT=FIELDS parameter.
- There is no more data to return to your application program.

The DFSMSrmm API issues return codes and reason codes indicating the results of processing when you specify OPERATION=CONTINUE. Write your application program to check the return codes and reason codes that the DFSMSrmm API returns to your application program.

*Table 9. Return Codes and Reason Codes Issued when You Specify OPERATION=CONTINUE*

| Return Code | Reason Code | Processing |
|---|---|---|
| 0 | 0 | DFSMSrmm issues this return code and reason code in response to a search type subcommand. DFSMSrmm will not return any more records because there are no more records to return or because the search limit has been reached. |
| 0 | 4 | DFSMSrmm issues this return code and reason code when you issue requests specifying the LISTCONTROL subcommand and there are more records to return. Specify the OPERATION=CONTINUE to obtain more records. |
| 4 | 2 | DFSMSrmm issues this return code and reason code in response to a SEARCH type subcommand. The DFSMSrmm API issues these codes when the search limit you set for a DFSMSrmm subcommand has been reached but there might be more records to return. |
| 4 | 4 | DFSMSrmm issues this return code and reason code in response to a search type subcommand. The DFSMSrmm API issues these codes when the search processing indicates fewer records returned than were requested. |
| 4 | 8 | DFSMSrmm issues this return code and reason code in response to a search type subcommand. The DFSMSrmm API issues these codes when no entry meets then search criteria during search processing. |

See “Controlling Output from List and Search Type Requests” on page 74 for an example of the interaction between the size of an output buffer, the amount of output data the API returns, and the LIMIT value you set.

## Using Parameter Lists to Pass Information to the DFSMSrmm API

You can write your application program to include the following processing:

- Serially or concurrently process subcommands.
- Use single parameter lists or multiple parameter lists for each subcommand. For example, your application program can use one parameter list for a SEARCH type of subcommand and another parameter list for a CHANGE type of subcommand.
- Reuse resources (tokens).

You can use variations of parameter lists and tokens in your application program to meet your application requirements.

*Table 10. Types of Parameter Lists*

| Variation | Guidelines | Reference |
|---|---|---|
| Single parameter list and a single token area | • Only one subcommand request can be active at a time.<br>• An active subcommand request must be completed before beginning another subcommand request. | "Coding a Single Parameter List, Single Token Area" on page 40 |
| Single parameter list and multiple token area | • More than one subcommand request can be active at a time.<br>• Only one subcommand request can be processed at any given time. | "Coding a Single Parameter List, Multiple Token Areas" on page 42 |
| Multiple parameter lists with a single token area | • Only one subcommand can be active at a time.<br>• Different parameter lists can be used for the following tasks:<br>– Begin subcommand requests.<br>– Continue subcommand requests.<br>– Release resources.<br>• Starting a new subcommand request ends any previous subcommand request. | "Coding Multiple Parameter List, Single Token Area" on page 44. |

*Table 10. Types of Parameter Lists (continued)*

| Variation | Guidelines | Reference |
|---|---|---|
| Multiple parameter lists and multiple token area | • More than one subcommand request can be active at a time.<br>• More than one active subcommand request can be processed at a time.<br>• Different parameter lists can be used to:<br>– Begin subcommand requests.<br>– Continue subcommand requests.<br>– Release resources. | "Coding Multiple Parameter List, Multiple Token Areas" on page 45 |

For illustrative purposes, the examples in the sections that follow use inline code segments with shortened code lines.

## Coding a Single Parameter List, Single Token Area

Figure 11 on page 41 is an example of how your application program can use a single parameter list and a single token area. The example includes a BEGIN, CONTINUE, and RELEASE for each subcommand request because you are not reusing resources. You need a new token for the second subcommand request because you are not reusing any resources and need a separate token for each request.

```
******************************************
** Start the first subcommand
******************************************
  XC    TOKENA,TOKENA           No resources/token yet
  LA    R4,SUBCMD1              Point to 1st subcommand
  EDGXCI  MF=(E,PLIST),PLISTVER=MAX,                   X
        APIADDR=APIMOD@,OPERATION=BEGIN,               X
        TOKEN=TOKENA,                                  X
        SUBCMDADDR=(R4),OUTBUFADDR=(R3)
  ...******************************************
** Continue the subcommand
******************************************
  EDGXCI  MF=(E,PLIST),PLISTVER=MAX,                   X
        APIADDR=APIMOD@,OPERATION=CONTINUE,            X
        TOKEN=TOKENA,                                  X
        OUTBUFADDR=(R3)
  ...
******************************************
** Done with the subcommand, release
******************************************
  EDGXCI  MF=(E,PLIST),PLISTVER=MAX,                   X
        APIADDR=APIMOD@,OPERATION=RELEASE,             X
        TOKEN=TOKENA
  ...
******************************************
** Start the second subcommand
******************************************
  LA    R4,SUBCMD2              Point to 2nd subcommand
  EDGXCI  MF=(E,PLIST),PLISTVER=MAX,                   X
        APIADDR=APIMOD@,OPERATION=BEGIN,               X
        TOKEN=TOKENA,                                  X
        SUBCMDADDR=(R4),OUTBUFADDR=(R3)
  ...
******************************************
** Continue the subcommand
******************************************
  EDGXCI  MF=(E,PLIST),PLISTVER=MAX,                   X
        APIADDR=APIMOD@,OPERATION=CONTINUE,            X
        TOKEN=TOKENA,                                  X
        OUTBUFADDR=(R3)
  ...
******************************************
** Done with the subcommand, release
******************************************
  EDGXCI  MF=(E,PLIST),PLISTVER=MAX,                   X
        APIADDR=APIMOD@,OPERATION=RELEASE,             X
        TOKEN=TOKENA
```

*Figure 11. Single Parameter List, Single Token Area*

The example includes the OPERATION=RELEASE parameter. When you use OPERATION=RELEASE, DFSMSrmm releases work areas that contain data and pointers for the subcommand. You must obtain resources for the next subcommand request. You might improve performance by deleting the OPERATION=RELEASE for the first subcommand. Then when you begin the second subcommand, the DFSMSrmm API module reuses resources, such as work areas, that it obtained for the first subcommand. Reusing resources can reduce processing overhead associated with releasing and obtaining resources.

If you do not use OPERATION=RELEASE, when the second subcommand request starts, all data and pointers for the first subcommand are overwritten.

For OPERATION=RELEASE, you do not specify SUBCMDADDR or OUTBUFADDR. For OPERATION=CONTINUE, you do not specify SUBCMDADDR.

## Coding a Single Parameter List, Multiple Token Areas

This variation allows you to continue a previous subcommand after you have started another. You might need to use multiple token areas when your application program is designed to support a sequence of subcommand requests like the one that follows:

1. Use a SEARCHVOLUME subcommand to request volume information. For example:

   ```
   SEARCHVOLUME OWNER(userid) LIMIT(*)
   ```
2. Use a SEARCHDATASET subcommand to obtain data set information. For example:

   ```
   SEARCHDATASET VOLUME(volser) LIMIT(*)
   ```
3. Repeat subcommands until all information for all data sets is obtained and passed back to your user.

Figure 12 shows how you can use a single parameter list and multiple tokens to identify work areas. The multiple token areas allow the flexibility of continuing a previous subcommand after starting another subcommand. Use the token you obtained from the previous subcommand when you want to continue that subcommand.

```
*******************************************
** Start the first subcommand
*******************************************
  XC    TOKEN1,TOKEN1            No resources/token yet
  LA    R4,SUBCMD1               Point to 1st subcommand
  EDGXCI  MF=(E,PLIST),PLISTVER=MAX,                     X
        APIADDR=APIMOD@,OPERATION=BEGIN,                 X
        TOKEN=TOKEN1,                                    X
        SUBCMDADDR=(R4),OUTBUFADDR=(R3)
  ...
*******************************************
** Start the second subcommand
*******************************************
  XC    TOKEN2,TOKEN2            No resources/token yet
  LA    R4,SUBCMD2               Point to 2nd subcommand
  EDGXCI  MF=(E,PLIST),PLISTVER=MAX,                     X
        APIADDR=APIMOD@,OPERATION=BEGIN,                 X
        TOKEN=TOKEN2,                                    X
        SUBCMDADDR=(R4),OUTBUFADDR=(R3)
  ...
```

*Figure 12. Single Parameter List, Multiple Token Areas (Part 1 of 2)*

```
*******************************************
** Continue the second subcommand
*******************************************
  EDGXCI  MF=(E,PLIST),PLISTVER=MAX,                X
        APIADDR=APIMOD@,OPERATION=CONTINUE,         X
        TOKEN=TOKEN2,                               X
        OUTBUFADDR=(R3)
  ...
*******************************************
** Continue the first subcommand
*******************************************
  EDGXCI  MF=(E,PLIST),PLISTVER=MAX,                X
        APIADDR=APIMOD@,OPERATION=CONTINUE,         X
        TOKEN=TOKEN1,                               X
        OUTBUFADDR=(R3)
  ...
*******************************************
** Release resources for the first subcommand
*******************************************
  EDGXCI  MF=(E,PLIST),PLISTVER=MAX,                X
        APIADDR=APIMOD@,OPERATION=RELEASE,          X
        TOKEN=TOKEN1
  ...
*******************************************
** Release resources for the second subcommand
*******************************************
  EDGXCI  MF=(E,PLIST),PLISTVER=MAX,                X
        APIADDR=APIMOD@,OPERATION=RELEASE,          X
        TOKEN=TOKEN2
```

*Figure 12. Single Parameter List, Multiple Token Areas (Part 2 of 2)*

Figure 12 on page 42 shows how you can reuse resources. When your application program is finished with the first subcommand request, it can reuse the first token to begin a third request. When that token is reused to begin a new subcommand request, you cannot continue the previous request associated with that token.

In Figure 12 on page 42, the same output buffers are used for all subcommand requests. As a result, all of the output data in the output buffer must be processed before another request can be started or continued. To avoid this situation, you might write your application program to use multiple output buffers instead of a single output buffer.

Figure 12 on page 42 shows multiple releases using the OPERATION=RELEASE parameter. Instead of using multiple releases, you can specify the OPERATION=ENDALL once to free all resources associated with all tokens. See Figure 13 for an example of this method.

**Note:** You do not specify the TOKEN parameter when you use OPERATION=ENDALL. Your application program, however, is responsible for setting all tokens to zeros to prevent them from being reused.

```
*******************************************
** Release all resources
*******************************************
  EDGXCI  MF=(E,PLIST),PLISTVER=MAX,                X
        APIADDR=APIMOD@,OPERATION=ENDALL
```

*Figure 13. Releasing All Resources*

Your application program might encounter a resource constraint condition like short-on-storage before it issues the OPERATION=ENDALL.

## Coding Multiple Parameter List, Single Token Area

Figure 14 shows how you can use multiple parameter lists and a single token area. With a single token area, you cannot continue the first subcommand request, even though there are multiple parameter lists. The variation in Figure 14 prevents you from continuing the first subcommand after you begin the second subcommand.

```
******************************************
** Start the first subcommand
******************************************
  XC    TOKENA,TOKENA            No resources/token yet
  LA    R4,SUBCMD1               Point to 1st subcommand
  EDGXCI  MF=(E,BEGINPL),PLISTVER=MAX,                   X
        APIADDR=APIMOD@,OPERATION=BEGIN,                 X
        TOKEN=TOKENA,                                    X
        SUBCMDADDR=(R4),OUTBUFADDR=(R3)
  ...
******************************************
** Continue the subcommand
******************************************
  EDGXCI  MF=(E,CONTPL),PLISTVER=MAX,                    X
        APIADDR=APIMOD@,OPERATION=CONTINUE,              X
        TOKEN=TOKENA,                                    X
        OUTBUFADDR=(R3)
  ...
******************************************
** Done with the subcommand, release
******************************************
  EDGXCI  MF=(E,RELPL),PLISTVER=MAX,                     X
        APIADDR=APIMOD@,OPERATION=RELEASE,               X
        TOKEN=TOKENA
  ...
******************************************
** Start the second subcommand
******************************************
  LA    R4,SUBCMD2               Point to 2nd subcommand
  EDGXCI  MF=(E,BEGINPL),PLISTVER=MAX,                   X
        APIADDR=APIMOD@,OPERATION=BEGIN,                 X
        TOKEN=TOKENA,                                    X
        SUBCMDADDR=(R4),OUTBUFADDR=(R3)
******************************************
** Continue the subcommand
******************************************
  EDGXCI  MF=(E,CONTPL),PLISTVER=MAX,                    X
        APIADDR=APIMOD@,OPERATION=CONTINUE,              X
        TOKEN=TOKENA,                                    X
        OUTBUFADDR=(R3)
  ...
******************************************
** Done with the subcommand, release
******************************************
  EDGXCI  MF=(E,RELPL),PLISTVER=MAX,                     X
        APIADDR=APIMOD@,OPERATION=RELEASE,               X
        TOKEN=TOKENA
```

*Figure 14. Multiple Parameter Lists, Single Token Area*

## Coding Multiple Parameter List, Multiple Token Areas

This variation lends itself to processing in re-entrant code where subroutines can be created for commonly used code. Figure 15 shows how the same subroutines can be used to issue and process multiple subcommand requests with each having its own token and output buffer area.

```
*******************************************
** Start the first subcommand
*******************************************
  XC    TOKENA,TOKENA            No resources/token yet
  LA    R2,TOKENA                Point to 1st token
  LA    R3,OUTBUF1               Point to 1st buffer
  LA    R4,SUBCMD1               Point to 1st subcommand
  BAS   R9,BEGRTN                Issue command
  ...
*******************************************
** Start the second subcommand
*******************************************
  LA    R2,TOKENB                Point to 2nd token
  LA    R3,OUTBUF2               Point to 2nd buffer
  LA    R4,SUBCMD2               Point to 2nd subcommand
  BAS   R9,BEGRTN                Issue command
  ...
```

*Figure 15. Multiple Parameter Lists, Multiple Token Area (Part 1 of 2)*

```
      *******************************************
      ** Continue the 2nd subcommand
      *******************************************
        LA    R2,TOKENB                Point to 2nd token
        BAS   R9,CONRTN                Continue 2nd cmd
        ...
      *******************************************
      ** Continue the 1st subcommand
      *******************************************
        LA    R2,TOKENA                Point to 1st token
        BAS   R9,CONRTN                Continue 1st cmd
        ...
      *******************************************
      ** Done with the subcommands, release
      *******************************************
        LA    R2,TOKENA                Point to 1st token
        BAS   R9,RELTRN                Release 1st token
        ...
        LA    R2,TOKENB                Point to 2nd token
        BAS   R9,RELTRN                Release 2nd token
        ...
BEGRTN  EQU   *
        EDGXCI  MF=(E,BEGINPL),PLISTVER=MAX,                   X
              APIADDR=APIMOD@,OPERATION=BEGIN,                 X
              TOKEN=(R2),                                      X
              SUBCMDADDR=(R4),OUTBUFADDR=(R3)
        BR    R9
        ...
CONRTN  EQU   *
      *******************************************
      ** Continue the subcommand
      *******************************************
        EDGXCI  MF=(E,CONTPL),PLISTVER=MAX,                    X
              APIADDR=APIMOD@,OPERATION=CONTINUE,              X
              TOKEN=(R2),                                      X
              OUTBUFADDR=(R3)
        BR    R9
        ...
RELRTN  EQU   *
      *******************************************
      ** Done with the subcommand, release
      *******************************************
        EDGXCI  MF=(E,RELPL),PLISTVER=MAX,                     X
              APIADDR=APIMOD@,OPERATION=RELEASE,               X
              TOKEN=(R2)
        BR    R9
```

*Figure 15. Multiple Parameter Lists, Multiple Token Area (Part 2 of 2)*

## Specifying the Option to Free a Resource

You can free a resource when you no longer need to use it by performing one of the following actions:

- Use the OPERATION=RELEASE and TOKEN=*token* parameters to free all resources associated with the specified token as shown in Figure 16 on page 47.

```
***************************************************
** Done with the subcommand, setup release parmlist
***************************************************
  EDGXCI  MF=(M,RELPL,NOCHECK),PLISTVER=MAX,            X
        APIADDR=APIMOD@,OPERATION=RELEASE

***************************************************
** Call the DFSMSrmm API
***************************************************
  EDGXCI  MF=(E,RELPL,NOCHECK),TOKEN=TOKENA
```

*Figure 16. TOKEN= Specified on EDGXCI*

Specifying TOKEN=TOKENA on the EXECUTE form of EDGXCI causes the 4-byte TOKENA area to be set to all zeros upon return from freeing the token.

TOKEN=*token* is required even when you specify MF=(E,label,NOCHECK), unless you also specify OPERATION=ENDALL. Specifying TOKEN=*token* causes the 4-byte token area to be updated upon return from the DFSMSrmm API. The token is set to all zeros by the EDGXCI macro expansion.

- Specify the OPERATION=ENDALL parameter to free all resources associated with all tokens, as shown in Figure 17.

  **Rule:** You are responsible for setting applicable tokens to all zeros when you specify OPERATION=ENDALL.
- Your application program ends (end-of-task occurs).

## Specifying the Option to Release a Resource

To release a resource, you must have access to the tokens associated with the resources that you want to release. If you no longer have access to the tokens or you have set the tokens to all zeros before you use OPERATION=RELEASE, there are only two ways that resources can be freed:

- Your application program specifies OPERATION=ENDALL to free all resources associated with all tokens.
- Your application program ends (end-of-task occurs).

In Figure 17, the OPERATION=ENDALL parameter is specified and TOKEN is not required.

```
***************************************************
** Done with the subcommand, setup endall parmlist
***************************************************
  EDGXCI  MF=(M,RELPL,NOCHECK),PLISTVER=MAX,            X
        APIADDR=APIMOD@

***************************************************
** Call the DFSMSrmm API
***************************************************
  EDGXCI  MF=(E,RELPL,NOCHECK),OPERATION=ENDALL
```

*Figure 17. TOKEN= Not Specified on EDGXCI*

# Chapter 5. Processing the Output Data in the Output Buffer

The DFSMSrmm application programming interface returns data in the output buffer you define. The data is in the following format:

- A four-byte length field into which your application program sets the total size of the output buffer.
- A four-byte length field that is used by DFSMSrmm when your output buffer is too small.
- A four-byte length field that contains the total size of all the output including the bytes of the length field.
- Structured fields which consist of structured field introducers (SFI) and data.
  - An SFI is a structure that separates one line or field of output data from another. SFIs are described in "Description of Structured Fields."
  - Data in line format or field format.

Use the EDGXSF macro described in "EDGXSF: Structured Field Definitions" on page 100 to map the output buffer header and the structured field introducers. EDGXSF also defines values used in the output fields. Do not hardcode the offsets because they might change in the future.

The DFSMSrmm API returns various types of output to your application program:

- Return and reason codes in registers from DFSMSrmm and the DFSMSrmm API.
- Return and reason codes from system services in structured fields.
- List header lines as formatted lines in structured fields.
- Messages as formatted lines or as message variables in structured fields.
- Report output data as formatted lines or as unformatted fields in structured fields.

The DFSMSrmm API does not return output data in the output buffer for every subcommand you issue using the API. See "SFIs for Output Data for Subcommands" on page 60 for information on each subcommand and the possible output data that the API returns as structured fields in your output buffer.

## Description of Structured Fields

A structured field consists of:

- A Structured Field Introducer (SFI)
- Data that follows the SFI as described below:

| **Part** | **Description** |
|---|---|
| **SFI** | Structured Field Introducer. A structure with a minimum size of 8 bytes in the following format: |

| **Byte count** | **Description** |
|---|---|
| **2** | Two-byte length. The length includes the length of the SFI (8 bytes) and the length of the data following the SFI. |
| **3** | Three-byte SFI identifier (ID) |
| **1** | One-byte SFI type modifier |
| **1** | One-byte (reserved) |
| **1** | One-byte data-type identifier |

**Data** Data following the SFI which can contain actual data, no data, binary zeros, or blank data.

See Appendix A, “Structured Field Introducers,” on page 79 for descriptions of the SFIs that the DFSMSrmm API returns.

Structured fields can appear in any order. Write your application so it skips over any structured field it is not prepared to handle. This makes your application program less sensitive to changes like enhancements to DFSMSrmm that introduce new or different structured fields and sequences. You can update your application program when it is convenient to do so rather than being forced to do so because your application program no longer works.

In the examples that follow, <SFI>data denotes a Structured Field Introducer (SFI) that is followed by data. In the examples, the term “SFI” is replaced with its descriptive name, for example: <data-set-name>. There is no association between the length of a particular SFI and its descriptive name.

## Requesting SFI Data Format

You determine if the DFSMSrmm API returns line format or field format data to your application program. Line format contains fixed text and variable data that are formatted into lines. Line format is suitable for displaying at a terminal or for printing. Field format data consists only of SFIs and variable data.

You can request that the data be returned in line format when you specify the EDGXCI macro OUTPUT=LINES parameter. You can request that the data be returned in field format by specifying the OUTPUT=FIELDS parameter.

When you specify the EDGXCI macro OUTPUT=LINES parameter, the DFSMSrmm API returns the output lines in the same format as information returned by the DFSMSrmm RMM TSO subcommand.

In the examples that follow, assume that

```
A00001: RMMUSER.TSO.COMMAND1.
```

is only one data set on the volume

### Requesting Line Format

Figure 18 on page 51 is an example of the line format data that the DFSMSrmm API returns when you specify the OUTPUT=LINES parameter. In the example, the request specifies the RMM TSO subcommand LISTDATASET RMMUSER.TSO.COMMAND1 VOLUME(A00001). The request might produce the output that is shown in Figure 18 on page 51. The value for `<line>` is the SFI for each line and is followed by the data returned from specifying the RMM LISTDATASET subcommand.

```
<Begin DATASET Group>
  <line>Data set name = RMMUSER.TSO.COMMAND1
  <line>Volume        = A00001               Physical file sequence number = 1
  <line>Owner         = RMMUSER                          Data set sequence = 0
  <line>Create date   = 11/15/2001 Create time = 04:32:14 System ID         = EZU34
  <line>Expiration date       = 2003/02/16 Original Expir. Date  = 2003/10/27
  <line>Block size            = 80        Block count           = 10
  <line>Percent of volume     = 0         Total block count     = 0
  <line>Logical Record Length = 8         Record Format         = FB
  <line>Date last written     =           Date last read        = 11/15/2001
  <line>Job name              = RMMUSERJ  Last job name         = RMMUSERJ
  <line>Step name             = READ2     Last step name        = READ2
  <line>Program name          =           Last program name     = IEBGENER
  <line>DD name               = SYSUT1    Last DD name          = SYSUT1
  <line>Device number         = 0590      Last Device number    = 0590
  <line>Management class      =           VRS management value  =
  <line>Storage group         =           VRS retention date    =
  <line>Storage class         =           VRS retained          = NO
  <line>Data class            =           ABEND while open      = NO
  <line>                                  Catalog status        = UNKNOWN
  <line>Primary VRS details:
  <line>       Name           =
  <line>       Job name       =           Type                  =
  <line>       Subchain NAME  =           Subchain start date   =
  <line>Secondary VRS details:
  <line>       Value or class =
  <line>       Job name       =
  <line>       Subchain NAME  =           Subchain start date   =
  <line> Security Class   =           Description   =
 <End DATASET group>
```

*Figure 18. Example of List Type of Output Using OUTPUT=LINES*

## Requesting Field Format

Figure 19 on page 52 is an example of the field format data that the DFSMSrmm API returns when you specify the OUTPUT=FIELDS parameter. Your request specifying LISTDATASET FIELD.TEST VOLUME(VOL001) subcommand might also produce the output shown in Figure 19 on page 52.

```
<Begin DATASET group>
  <DSN  - data set name           : 44 , character:         >
  <CJBN - job name                : 8  , character:         >
  <VOL  - volume serial           : 6  , character:         >
  <OWN  - owner                   : 8  , character:         >
  <DSEQ - data set sequence       : 4  , bin(31):           >
  <DEV  - device number (address)  : 4  , hexadecimal:       >
  <FILE - physical file sequence   : 4  , bin(31):           >
  <CDTJ - create date             : 4  , packed decimal:    >
  <CTM  - create time             : 4  , packed decimal:    >
  <SYS  - SMF system id           : 8  , character:         >
  <BLKS - block size              : 4  , bin(31):           >
  <BLKC - block count             : 4  , bin(31):           >
  <LRCL - logical record length    : 4  , bin(31):           >
  <RCFM - record format           : 4  , character:         >
  <DC   - data class              : 8  , character:         >
  <DLWJ - date last written       : 4  , packed decimal:    >
  <DLRJ - date last read          : 4  , packed decimal:    >
  <STEP - step name               : 8  , character:         >
  <DD   - dd name                 : 8  , character:         >
  <MC   - management class        : 8  , character:         >
  <SG   - storage group name      : 8  , character:         >
  <SC   - storage class           : 8  , character:         >
  <VMV  - VRS management value    : 8  , character:         >
  <RTDJ - retention date          : 4  , packed decimal:    >
  <VTYP - Primary VRS type        : 1  , bin(8):            >
  <VJBN - Primary VRS jobn        : 8  , character:         >
  <VNME - Primary VRS name        : 44 , character:         >
  <VSCN - Primary VRS subchain name: 8  , character:         >
  <VSCD - Primary VRS subchain date: 4  , packed decimal:    >
  <VRSR - VRS retained            : 1  , bin(8):            >
  <NME  - security class name     : 8  , character:         >
  <CLS  - sec class description   : 32 , character:         >
  <ABND - Abend while open        : 1  , bin(8):            >
  <CTLG - Catalog status          : 1  , bin(8):            >
  <2JBN - Secondary VRS jobnme mask: 8  , character:         >
  <2NME - Secondary VRS mask      : 8  , character:         >
  <2SCN - Second. VRS subchain name: 8  , character:         >
  <2SCD - Second. VRS subchain date: 4  , packed decimal:    >
  <BLKT - Total block count       : 4  , bin(31):           >
  <CPGM - Creating program name   : 8  , character:         >
  <LPGM - Last used program name   : 8  , character:         >
  <LJOB - Last used job           : 8  , character:         >
  <LSTP - Last used step name     : 8  , character:         >
  <LDD  - Last used DD name       : 8  , character:         >
  <LDEV - Last drive              : 4  , character:         >
  <DPCT - Percent of volume       : 1  , bin(8):            >
  <XDTJ - Expiration Date         : 4  , packed decimal     >
  <OXDJ - Original Expiration Date : 4 ,  packed decimal     >
<End DATASET group>
```

*Figure 19. Example of Output Using OUTPUT=FIELDS*

Figure 19:

- Shows begin and end group SFIs. In this example, <Begin DATASET Group> and <End DATASET Group>.
- Includes descriptive names used to identify SFIs. The SFI identifies the data type; and the long character <...> strings do not represent the actual size of the SFIs, which are only 8 bytes in length.
- Can appear to have no data. This is because structured fields can
  - Have no data (SFI only, as in this example), binary zeros, or blank characters.
  - Be omitted if they have no data.

- Shows that structured fields can be order independent. For example, VOL in Figure 34 on page 66 occurs before OWN for LISTDATASET while OWN occurs before VOL for LISTPRODUCT in Figure 36 on page 67.
- Shows that structured fields might not be in the same order as their corresponding positions in any line-format output.
- Shows variable-length fields.

Refer to Appendix D, “Hexadecimal Example of an Output Buffer,” on page 105 for an example of an output buffer in hexadecimal representation.

## Requesting Types of Output

The DFSMSrmm API can produce standard output and expanded output depending on the values you specify for the OUTPUT and EXPAND parameters as described in “EDGXCI Parameters” on page 6.

The examples shown in “Requesting Standard Output” and “Requesting Expanded Output”:

- Assume that there is only one data set on volume VOL001: OWNERONE.FIELD.TEST.
- Use SFI data type descriptions, such as DSN for data set name.
- Show maximum length values, without the term “bytes”.
- Show the data type, such as character.

## Requesting Standard Output

When you specify EXPAND=NO, your request specifying the SEARCHDATASET VOLUME(VOL001) subcommand might produce the output that is shown in Figure 20.

```
<Begin DATASET group>
  <DSN  - data set name  : 44 , character:      >OWNERONE.FIELD.TEST
  <VOL  - volume serial  : 6  , character:      >VOL001
  <OWN  - owner          : 8  , character:      >OWNERONE
  <CDTJ - create date    : 4  , packed decimal: >x'1997117C'
  <CTM  - create time    : 4  , packed decimal: >x'0815270C'
  <FILE - phys file seq  : 4  , bin(31):        >x'00000001'
<End DATASET group>
```

*Figure 20. Example of Search Type of Output Using EXPAND=NO*

Refer to Appendix D, “Hexadecimal Example of an Output Buffer,” on page 105 for a hexadecimal representation and discussion of the contents of the output buffer shown in Figure 20.

## Requesting Expanded Output

The DFSMSrmm API can provide expanded output for the DFSMSrmm TSO RMM SEARCHDATASET, SEARCHPRODUCT, SEARCHVOLUME, and SEARCHVRS subcommands when you specify OUTPUT=FIELDS and EXPAND=YES or use the default EXPAND=YES in your application program.

The DFSMSrmm API does not provide expanded data for the DFSMSrmm TSO RMM SEARCHBIN or SEARCHRACK subcommands.

When you specify OUTPUT=FIELDS and EXPAND=YES, your SEARCHDATASET VOLUME(VOL001) subcommand might produce the output that is shown in Figure 21 on page 55.

```
<Begin DATASET Group>
  <DSN  - data set name        : 44 , character:      >OWNERONE.FIELD.TEST
  <CJBN - job name             : 8  , character:      >TESTAPI
  <VOL  - volume serial        : 6  , character:      >VOL001
  <OWN  - owner                : 8  , character:      >OWNERONE
  <DSEQ - data set sequence    : 4  , bin(31):        >x'00000001'
  <DEV  - device number        : 4  , bin(31):        >0BE0
  <FILE - physical file seq    : 4  , bin(31):        >x'00000001'
  <CDTJ - create date          : 4  , packed decimal: >x'1997117C'
  <CTM  - create time          : 4  , packed decimal: >x'0741290C'
  <SYS  - SMF system id        : 8  , character:      >9021
  <BLKS - block size           : 4  , bin(31):        >x'00000050'
  <BLKC - block count          : 4  , bin(31):        >x'00000005'
  <LRCL - logical rcd length   : 4  , bin(31):        >x'00000050'
  <RCFM - record format        : 4  , character:      >FB
  <DC   - data class           : 8  , character:      >DCCLS1
  <DLWJ - date last written    : 4  , packed decimal: >
  <DLRJ - date last read       : 4  , packed decimal: >1997117F
  <STEP - step name            : 8  , character:      >STEP01
  <DD   - dd name              : 8  , character:      >OUTPUT
  <MC   - management class     : 8  , character:      >
  <SG   - storage group        : 8  , character:      >STG0S
  <SC   - storage class        : 8  , character:      >SCFAST
  <VMV  - VRS value            : 8  , character:      >
  <RTDJ - VRS retention date   : 4  , packed decimal: >
  <VTYP - Primary VRS type     : 1  , bin(8):         >1
  <VJBN - Primary VRS jobn     : 8  , character:      >TEST*
  <VNME - Primary VRS name     : 44 , character:      >TESTA.**
  <VSCN - Primary VRS s-chain n.: 8  , character:      >VRS1
  <VSCD - Primary VRS s-chain d.: 4  , packed decimal: >1997/230
  <VRSR - VRS retained         : 1  , bin(8):         >1
  <NME  - security class       : 8  , character:      >
  <CLS  - secl description     : 32 , character:      >
  <ABND - Abend while open     : 1  , bin(8):         >0
  <CTLG - Catalog status       : 1  , bin(8):         >0
  <2JBN - Seco. VRS jobname mask: 8  , character:      >
  <2NME - Secondary VRS mask    : 8  , character:      >MV*
  <2SCN - Second. VRS s-chain n.: 8  , character:      >M2
  <2SCD - Second. VRS s-chain d.: 4  , packed decimal: >1997/241
  <BLKT - Total block count     : 4  , bin(31):           >
  <CPGM - Creating program name : 8  , character:         >
  <LPGM - Last used program name: 8  , character:         >
  <LJOB - Last used job         : 8  , character:         >
  <LSTP - Last used step name   : 8  , character:         >
  <LDD  - Last used DD name     : 8  , character:         >
  <LDEV - Last drive            : 4  , character:         >
  <DPCT - Percent of volume     : 1  , bin(8):            >
  <XDTJ (SFI - Expiration Date) : 4  , packed decimal     >
  <OXDJ (SFI - Original Expiration Date) : 4 ,  packed decimal>
<End DATASET Group  >
```

*Figure 21. Example of Search Type of Output Using OUTPUT=FIELDS, EXPAND=YES*

## Accessing Return and Reason Codes

DFSMSrmm returns return codes and reason codes to your application program in the general purpose registers and also as data in your output buffer as follows:

- Return codes and reason codes issued as a result of processing of your subcommand request. Refer to *z/OS DFSMSrmm Guide and Reference* for information about these codes.

- Return codes and reason codes associated with the API itself. These are the return codes and reason codes listed in "EDGXCI Return and Reason Codes" on page 9 for macro EDGXCI.
- Return and reason codes from system services. DFSMSrmm uses various system services, such as catalog services, to process the subcommands from your application program. When DFSMSrmm receives a non-zero return code from a system service, the DFSMSrmm API places the return code and associated reason code in your output buffer as structured fields, along with a name to identify the service. See "System Return and Reason Code SFIs" on page 58 for more information.

## Accessing Messages and Message Variables

The DFSMSrmm API can return messages and message variables in your output buffer. Figure 22 show how messages are returned in line format when you specify the OUTPUT=LINES parameter and field format when you specify the OUTPUT=FIELDS parameter.

```
  <message line>message text
  <message line>message text

or

  <Begin MESSAGE group>
    <message number  >number
    <message variable>variable
  <End MESSAGE group>
  <Begin MESSAGE group>
    <message number  >number
    <message variable>variable
  <End MESSAGE group>
```

*Figure 22. Message and Message Variable Structured Fields. Message and Message Variable Structured Fields*

Refer to "Messages and Message Variables SFIs" on page 59 for information about which messages can be placed in your output buffer.

## Interpreting Date Format and Time Format

DFSMSrmm dates are in packed decimal format: yyyydddC, where yyyyddd is a Julian date and C is a standard packed-decimal sign character. The date formats used are returned in internal format and can be interpreted as follows:

- Interpret 9999366 as PERMANENT retention date format.
- Interpret 9999365 as PERMANENT retention date format.
- Interpret 9800000 as WHILECATLG retention date format.
- Interpret 98ccccc as CYCL/ccccc retention date format.
- Interpret 0000098 as CATRETPD retention date format.
- Interpret yyyyddd as yyyy/mm/dd, yyyy/dd/mm, mm/dd/yyyy, dd/mm/yyyy, dd/yyyy/mm, mm/yyyy/dd.

DFSMSrmm also returns time in packed decimal format: hhmmsstC, where hhmmsst is the time in hours, minutes, seconds, and tenths of seconds and C is a standard packed-decimal sign character.

## Identifying Structured Field Introducers

A structured field introducer (SFI) is a structure that identifies one line or field of output data from another. The DFSMSrmm API returns these types of SFIs in your output buffer:

- SFIs that begin and end a resource group as described in "Begin and End Resource Groups."
- SFIs that introduce a single line of output data as described in:
  - "System Return and Reason Code SFIs" on page 58
  - "Messages and Message Variables SFIs" on page 59
  - "ADD-Type of Subcommands" on page 60
  - "CHANGE-Type of Subcommands" on page 61
  - "DELETE-Type of Subcommands" on page 61
  - "GETVOLUME Subcommand" on page 61
  - "LIST-Type of Subcommands" on page 62
  - "SEARCH-Type of Subcommands" on page 70

The following notation indicates an SFI:

```
<xxxx - descriptive name      : data length, data type :  >
```

where "xxxx" is a character type of mnemonic. In your application program, you need to use the 3-byte or 4-byte hexadecimal identifiers for Structured Field Introducers.

Appendix A, "Structured Field Introducers," on page 79 describes all the structured fields that the DFSMSrmm API can return to your application program.

Appendix B, "Structured Field Introducers by Subcommand," on page 97 shows all of the Structured Field Introducers by subcommand.

The DFSMSrmm API does not return information for all subcommands. For example, the DFSMSrmm API does not produce structured fields for a successful ADDBIN subcommand request.

## Begin and End Resource Groups

In the previous examples, you saw that output structured fields were grouped by a pair of unique Structured Field Introducers as shown in Figure 23.

```
<Begin DATASET group>
  <..        >data set name
  <..        >volume id
<End DATASET group>
```

*Figure 23. Begin and End Resource Group SFI Sequence*

The begin and end resource group SFIs identify when output for a particular resource, such as a data set, begins and ends. The pairs of Begin and End Resource Group SFIs are shown in Figure 24 on page 58.

```
  <Begin BIN group>       <End BIN group>
  <Begin CONTROL group>   <End CONTROL group>
  <Begin DATASET group>   <End DATASET group>
  <Begin MESSAGE group>   <End MESSAGE group>
  <Begin OWNER group>     <End OWNER group>
  <Begin PRODUCT group>   <End PRODUCT group>
  <Begin RACK group>      <End RACK group>
  <Begin VOLUME group>    <End VOLUME group>
  <Begin VRS group>       <End VRS group>
```

*Figure 24. Begin and End Resource Group SFI Pairs*

In addition to identifying the beginning and ending of output for a particular resource, the Begin and End Resource Group SFIs shown in Figure 25 are used to differentiate one subgroup of data from another in the output the DFSMSrmm API returns for the LISTCONTROL, LISTVOLUME, and SEARCHVOLUME subcommands.

```
  <Begin ACCESS group>   <End ACCESS group>
  <Begin ACTIONS group>  <End ACTIONS group>
  <Begin CNTL group>     <End CNTL group>
  <Begin LOCDEF group>   <End LOCDEF group>
  <Begin MNTMSG group>   <End MNTMSG group>
  <Begin MOVES group>    <End MOVES group>
  <Begin OPTION group>   <End OPTION group>
  <Begin REJECT group>   <End REJECT group>
  <Begin SECCLS group>   <End SECCLS group>
  <Begin STATS group>    <End STATS group>
  <Begin STORE group>    <End STORE group>
  <Begin VLPOOL group>   <End VLPOOL group>
  <Begin VOL group>      <End VOL group>
```

*Figure 25. Begin and End Resource Group SFI Pairs for Subgroups*

Groups and subgroups, such as MESSAGE and SECCLS, are repeated as often as necessary to differentiate resources.

## System Return and Reason Code SFIs

When DFSMSrmm receives a non-zero return code from a system service, the system return code and associated reason code are put into your output buffer as shown in Figure 26. DFSMSrmm issues return code 116 and reason code 06 when an error like this occurs.

```
<Begin SYSRETC group>
  <SVCN - service name            : 16 , character:         >
  <RTNC - return code             : 4  , bin(31):           >
  <RSNC - reason code             : 4  , bin(31):           >
<End SYSRETC group>
```

*Figure 26. System Return and Reason Codes*

The DFSMSrmm API returns the same SFIs for both line format and field format.

## Messages and Message Variables SFIs

When messages or message variables are returned to you as output data, they are put into your output buffer as structured fields as shown in Figure 27.

```
    <MSGL - message line            : nn , character:         >
    <MSGL - message line            : nn , character:         >

or

  <Begin MESSAGE group>
    <MSGN - message number          : 8  , character:         >
    <xxx  - variable>
  <End MESSAGE group>
  <Begin MESSAGE group>
    <MSGN - message number          : 8  , character:         >
    <xxx  - variable>
  <End MESSAGE group>
```

*Figure 27. SFIs for Messages and Message Variables*

When you specify OUTPUT=LINES, messages issued by DFSMSrmm are placed in your output buffer using the LINE SFI.

When you specify OUTPUT=FIELDS, only the messages listed in Table 11 are placed in your output buffer. These messages, some of which are issued only in conjunction with a subcommand parameter such as POOL or COUNT, are included in the output because they contain data and codes that can be especially useful to your application. Your application program should use the return and reason codes that it receives rather than messages to determine whether or not the subcommand request was successful.

Table 11 lists:

- The Structured Field Introducers that follow the <MSGN> SFI
- The applicable subcommands
- A non-inclusive list of the return codes (RC) and reason codes (RSN).

*Table 11. Message Related SFIs*

| Message | SFI ID(s) | Subcommand(s) | RC | RSN(s) |
|---|---|---|---|---|
| EDG3010 | ENTN | All SEARCH subcommands when no (0) entry is returned | 4 | 8 |
| EDG3011 | ENTN | All SEARCH subcommands when 1 entry returned | 0 4 | 0 2 and 4 |
| EDG3012 | ENTN | All SEARCH subcommands when > 1 entry returned | 0 4 | 0 2 and 4 |
| EDG3013 | VOL | AV | 12 | many |
| EDG3014 | CNT | AV | 12 | many |
| EDG3015 | OWN VOL | GV | 0 | 0 |
| EDG3016 | RCK | AV CV | 0 | 0 |
| EDG3017 | RCK | AB AR | 12 | 18 68 70 |
| EDG3018 | CNT | AB AR | 12 | 18 68 70 |

Table 11. Message Related SFIs (continued)

| Message | SFI ID(s) | Subcommand(s) | RC | RSN(s) |
|---|---|---|---|---|
| EDG3019 | RCK | DB DR | 12 | many |
| EDG3020 | CNT | DB DR | 12 | many |
| EDG3277 | FRC FRS | AV CV | 12 | 122 |
| EDG3278 | CSG | AV CV | 12 | 124 |
| EDG3288 | FRC FRS VOL | CV DV | 12 | 132 |
| EDG3289 | FRC FRS | CV | 12 | 134 |
| EDG3292 | CLIB | AV CV | 12 | 140 |
| EDG3301 | FRC FRS | AV CV GV | 12 | 152 |
| EDG3310 | CLIB | CV DV | 12 | 170 |
| EDG3311 | FRC FRS | AV CV DV | 12 | 172 |
| EDG3314 | MEDN | CV | 12 | 176 |
| EDG3328 | KEYF KEYT TYPF TYPT | SD SV | 4 | 12 |

For a detailed explanation of these messages, see *z/OS MVS System Messages, Vol 5 (EDG-GFS)*. For a description of messages, use LookAt, described in “Using LookAt to look up message explanations” on page xii. For DFSMSrmm return and reason codes, see *z/OS DFSMSrmm Guide and Reference*.

## SFIs for Output Data for Subcommands

When you specify OUTPUT=LINES, the DFSMSrmm API returns output data, except for system return and reason codes, as formatted lines in structured fields. The structured fields are introduced by the <LINE> and <MSGL> Structured Field Introducers as shown in Figure 28. DFSMSrmm places system return codes and reason codes in your output buffer as described in “System Return and Reason Code SFIs” on page 58.

```
<Begin resource group>
  <LINE - Formatted output line   : nn , character:      >
  <LINE - Formatted output line   : nn , character:      >
  <MSGL - Formatted output message: nn , character:      >
  <MSGL - Formatted output message: nn , character:      >
<End resource group>
```

Figure 28. Formatted Lines

When you specify OUTPUT=FIELDS, the DFSMSrmm API returns output data as unformatted data in structured fields.

## ADD-Type of Subcommands

The DFSMSrmm ADD-type of subcommands are: ADDBIN, ADDDATASET, ADDOWNER, ADDPRODUCT, ADDRACK, ADDVOLUME, and ADDVRS. You use these subcommands to add information to the DFSMSrmm control data set.

The DFSMSrmm API returns information under the following conditions:

- You specify the ADDVOLUME subcommand with the POOL operand. The DFSMSrmm API returns the rack number that is assigned to the volume in the format as shown in Figure 29 on page 61.

- An error occurs for specific return and reason code combinations described in “Messages and Message Variables SFIs” on page 59 and “SFIs for Return and Reason Codes” on page 80.

```
<Begin VOLUME group>
  <Begin MESSAGE group>
    <MSGN - message number           : 8  , character:         >
    <RCK  - rack or bin number       : 6  , character:         >
  <End MESSAGE group>
<End VOLUME group>
```

*Figure 29. SFIs for ADDVOLUME with OUTPUT=FIELDS*

## CHANGE-Type of Subcommands

The DFSMSrmm CHANGE-type of subcommands are: CHANGEDATASET, CHANGEOWNER, CHANGEPRODUCT,and CHANGEVOLUME. You use these subcommands to change information in the DFSMSrmm control data set.

The DFSMSrmm API returns information when:

- You specify the CHANGEVOLUME subcommand with the POOL operand. The DFSMSrmm API returns the rack number that is assigned to the volume in the format as shown in Figure 30.
- When an error occurs for specific return and reason code combinations described in “Messages and Message Variables SFIs” on page 59 and “SFIs for Return and Reason Codes” on page 80.

```
<Begin VOLUME group>
  <Begin MESSAGE group>
    <MSGN - message number           : 8  , character:         >
    <RCK  - rack or bin number       : 6  , character:         >
  <End MESSAGE group>
<End VOLUME group>
```

*Figure 30. SFIs for CHANGEVOLUME with OUTPUT=FIELDS*

## DELETE-Type of Subcommands

The DFSMSrmm DELETE-type of subcommands are: DELETEBIN, DELETEDATASET, DELETEOWNER, DELETEPRODUCT, DELETERACK, DELETEVOLUME, and DELETEVRS. You use these subcommands to delete information from the DFSMSrmm control data set.

The DFSMSrmm API returns information when an error occurs for specific return and reason code combinations described in “Messages and Message Variables SFIs” on page 59 and “SFIs for Return and Reason Codes” on page 80.

## GETVOLUME Subcommand

You use the RMM GETVOLUME subcommand to obtain a volume from DFSMSrmm.

The DFSMSrmm API returns information when:

- The GETVOLUME request was successful. The DFSMSrmm API returns volume information and owner information as shown in Figure 31 on page 62.

- When an error occurs, and then only for specific return and reason code combinations described in “Messages and Message Variables SFIs” on page 59 and “SFIs for Return and Reason Codes” on page 80.

```
<Begin VOLUME group>
  <Begin MESSAGE group>
    <MSGN - message number           : 8  , character:         >
    <VOL  - volume serial            : 6  , character:         >
    <OWN  - owner                    : 8  , character:         >
  <End MESSAGE group>
<End VOLUME group>
```

*Figure 31. SFIs for GETVOLUME with OUTPUT=FIELDS*

## LIST-Type of Subcommands

The DFSMSrmm LIST-type of subcommands are: LISTBIN, LISTCONTROL, LISTDATASET, LISTOWNER, LISTPRODUCT, LISTRACK, LISTVOLUME, and LISTVRS. You use these subcommands to obtain information from the DFSMSrmm control data set about a single resource.

The DFSMSrmm API returns output data for LIST type of subcommands as structured fields when you specify OUTPUT=FIELDS. The Structured Field Introducers for each type of LIST subcommand are found in:

- “LISTBIN SFIs”
- “LISTCONTROL SFIs” on page 63
- “LISTDATASET SFIs” on page 66
- “LISTOWNER SFIs” on page 67
- “LISTPRODUCT SFIs” on page 67
- “LISTRACK SFIs” on page 67
- “LISTVOLUME SFIs” on page 68
- “LISTVRS SFIs” on page 70

## LISTBIN SFIs

The SFIs produced for the LISTBIN subcommand with OUTPUT=FIELDS are shown in Figure 32.

```
<Begin RACK or BIN group>
  <RCK  - rack or bin number       : 6  , character:         >
  <VOL  - volume serial            : 6  , character:         >
  <RST  - rack or bin status       : 1  , bin(8):            >
  <LOC  - location                 : 6  , character:         >
  <MEDN - media name               : 8  , character:         >
  <MIV  - moving-in volume         : 6  , character:         >
  <MOV  - moving-out volume        : 6  , character:         >
  <OVOL - old volume               : 6  , character:         >
<End RACK or BIN Group>
```

*Figure 32. SFIs for LISTBIN with OUTPUT=FIELDS*

## LISTCONTROL SFIs

The SFIs produced for the LISTCONTROL subcommand with OUTPUT=FIELDS are shown in Figure 33.

```
<Begin CONTROL group>
  <Begin CNTL group>
    <MTP  - CDS type               : 1  , bin(8):           >
    <MDTJ - CDS create date        : 4  , packed decimal:   >
    <MTM  - CDS create time        : 4  , packed decimal:   >
|   <UDTJ - CDS last update date   : 4  , packed decimal:   >
|   <UTM  - CDS last update time   : 4  , packed decimal:   >
    <JRNU - journal percentage used  : 2  , bin(15):          >
    <JRNF - JOURNALFULL parmlib value: 2  , bin(15):          >
    <JRNS - Journal status           : 2  , bin(15):          >

    <BDTJ - last CDS backup date     : 4  , packed decimal:   >
    <BTM  - last CDS backup time     : 4  , packed decimal:   >
    <JBDT - last journal backup date : 4  , packed decimal:   >
    <JBTM - last Journal backup time : 4  , packed decimal:   >

    <XDTJ - expiration date          : 4  , packed decimal:   >
    <XTM  - last inven mgmt exp time : 4  , packed decimal:   >
    <RDTJ - last CDS extract date    : 4  , packed decimal:   >
    <RTM  - last CDS extract time    : 4  , packed decimal:   >
    <DDTJ - last store update date   : 4  , packed decimal:   >
    <DTM  - last store update time   : 4  , packed decimal:   >
    <SOSJ - last XPROC start date    : 4  , packed decimal:   >
    <SOST - last XPROC start time    : 4  , packed decimal:   >
    <VDTJ - last VRSEL date          : 4  , packed decimal:   >
    <VTM  - last VRSEL time          : 4  , packed decimal:   >
    <LRK  - # LIBRARY rack numbers   : 4  , bin(31):          >
    <FRK  - free rack numbers in lib : 4  , bin(31):          >
    <LBN  - bin numbers in LOCAL     : 4  , bin(31):          >
    <FLB  - free bin numbers in LOCAL: 4  , bin(31):          >
    <DBN  - bin numbers in DISTANT   : 4  , bin(31):          >
    <FDB  - free bins in DISTANT loc : 4  , bin(31):          >
    <RBN  - # bin numbers in REMOTE  : 4  , bin(31):          >
    <FRB  - free bin nums in REMOTE  : 4  , bin(31):          >
    <CACT - control active functions : 1  , bit(8):           >
    <CSDT - Catalog Synchronize date : 4  , packed decimal:   >
    <CSTM - Catalog Synchronize time : 4  , packed decimal:   >
    <FCSP - Catalog Sync in progress : 1  , bin(8):           >
    <CSVE - Stacked volume enabled   : 1  , bin(8):           >
    <X100 - EDGUX100 exit status     : 1  , bin(8):           >
    <X200 - EDGUX200 exit status     : 1  , bin(8):           >
    <EBIN - extended bin enable statu: 1  , bin(8):           >
    <CDSU - CDS percentage used      : 2  , bin(15):          >
    <CSHN - Client/Server host name  : 63 , character         >
    <CSIP - Client/Server IP address : 15 , character         >
<End CNTL group>
```

*Figure 33. SFIs for LISTCONTROL with OUTPUT=FIELDS (Part 1 of 3)*

```
  <Begin OPTION group>
    <OPM  - operating mode           : 1  , bin(8):           >
    <DRP  - default retention period : 4  , bin(31):          >
    <MRP  - maximum retention period : 4  , bin(31):          >
    <CRP  - CATRETPD retention period: 4  , bin(31):          >
    <MDS  - CDS data set name        : 44 , character:        >
    <JDS  - journal name             : 44 , character:        >
    <JRNF - JOURNALFULL parmlib value: 2  , bin(15):          >
    <CATS - CATSYSID value           : 1  , bin(8):           >
    <SOSP - scratch procedure name   : 8  , character:        >
    <BKPP - backup procedure name    : 8  , character:        >
    <IPL  - data check reqd in IPL   : 1  , bin(8):           >
    <DTE  - installation date format : 1  , bin(8):           >
    <RCF  - installation RACF support: 1  , bin(8):           >
    <AUD  - SMF audit record number  : 2  , bin(15):          >
    <SSM  - SMF security rcd number  : 2  , bin(15):          >
    <CDS  - control data set ID      : 8  , character:        >
    <SLM  - MAXHOLD value            : 2  , bin(15):          >
    <LCT  - default lines per page   : 2  , bin(15):          >
    <SID  - RMM system ID            : 8  , character:        >
    <BLP  - BLP option               : 1  , bin(8):           >
    <NOT  - Notify  option           : 1  , bin(8):           >
    <UNC  - uncatalog option         : 1  , bin(8):           >
    <VRJ  - VRS job name             : 1  , bin(8):           >
    <MSGF - case of message text     : 1  , bin(8):           >
    <MOP  - master overwrite         : 1  , bin(8):           >
    <ACCT - accounting source        : 1  , bin(8):           >
    <VCHG - VRSCHANGE value          : 1  , bin(8):           >
    <VRSL - VRSEL value              : 1  , bin(8):           >
    <PSFX - parmlib member suffix    : 2  , character:        >
    <VACT - VRSMIN action            : 1  , bin(8):           >
    <VMIN - VRSMIN count value       : 4  , bin(31):          >
    <DSPD - Disposition DD name      : 8  , character:        >
    <DSPM - Disposition message prefi: 8  , character:        >
    <RTBY - Retain by                : 1  , bin(8):           >
    <MVBY - Move by                  : 1  , bin(8):           >
    <PDA  - PDA state                : 1  , bin(8):           >
    <PDAC - PDA block count          : 1  , bin(8):           >
    <PDAS - PDA block size           : 1  , bin(8):           >
    <PDAL - PDA log state            : 1  , bin(8):           >
    <TVXP - Extradays retention      : 1  , bit(8):           >
    <SMP  - System-managed tape purge: 1  , bin(8):           >
    <SMU  - System-managed tape updat: 1  , bin(8):           >
    <ACS  - SMS ACS support enabled  : 1  , bin(8):           >
    <PACS - PRE ACS support enabled  : 1  , bin(8):           >
    <RUB  - reuse bin at             : 1  , bin(8):           >
    <CMDD - Command Auth DSN         : 1  , bin(8):           >
    <CMDO - Command Auth owner       : 1  , bin(8):           >
    <MEDN - media name               : 8  , character:        >
    <LCTK - Local Task               : 4  , bin(31):          >
    <SSTY - Subsystem Type           : 1  , bit(8):           >
    <SRHN - Server Host Name         : 63 , character:        >
    <SRIP - Server IP Address        : 15 , character:        >
    <SRPN - Server Port Number       : 4  , bin(31):          >
    <SRTK - Server Task              : 4  , bin(31):          >
<End OPTION group>
<Begin SECCLS group>
    <SEC  - security class number    : 1  , bin(8):           >
    <NME  - security class name      : 8  , character:        >
    <SCST - sec class status         : 1  , bit(8):           >
    <CLS  - sec class description    : 32 , character:        >
<End SECCLS group>
```

*Figure 33. SFIs for LISTCONTROL with OUTPUT=FIELDS (Part 2 of 3)*

```
  <Begin VLPOOL group>
    <PID  - pool prefix              : 6  , character:         >
    <PSN  - pool definition system ID: 8  , character:         >
    <PRF  - pool definition RACF opt : 1  , bin(8):            >
    <PTP  - pool definition pool type: 1  , bin(8):            >
    <XDC  - expiration date check    : 1  , bin(8):            >
    <ACT  - Action on Release        : 1  , bit(8):            >
    <SCRM - Scratch Mode             : 1  , bin(8):            >
    <PLN  - pool name                : 8  , character:         >
    <MEDN - media name               : 8  , character:         >
    <PDS  - pool description         : 40 , character:         >
    <MOP  - Master Overwrite         : 1  , bin(8):            >
  <End VLPOOL group>
  <Begin MNTMSG group>
    <MID  - mount message ID         : 12 , character:         >
    <SMI  - offset, message ID (msg) : 2  , bin(15):           >
    <OVL  - offset to volume serial  : 2  , bin(15):           >
    <OPL  - offset to rack num/poolid: 2  , bin(15):           >
  <End MNTMSG group>
  <Begin REJECT group>
    <GRK  - generic rack number      : 6  , character:         >
    <TAC  - reject prefix type       : 1  , bin(8):            >
  <End REJECT group>
  <Begin LOCDEF group>
    <LDDF - location definition exist: 1  , bin(8):            >
    <LDLC - location name            : 8  , character:         >
    <LDMT - location mgmt type       : 1  , bin(8):            >
    <LDLT - location type            : 1  , bin(8):            >
    <LDPR - location priority        : 4  , bin(31):           >
    <LDMN - location media name      : 8  , character:         >
  <End LOCDEF group>
  <Begin ACTIONS group>
    <ACT  - actions on release       : 1  , bit(8):            >
    <AST  - action status            : 1  , bit(8):            >
  <End ACTIONS group>
  <Begin MOVES group>
    <MFR  - source location name     : 8  , character:         >
    <MST  - move status              : 1  , bin(8):            >
    <MTO  - target location name     : 8  , character:         >
    <MTY  - move type                : 1  , bin(8):            >
  <End MOVES group>
<End CONTROL group>
```

*Figure 33. SFIs for LISTCONTROL with OUTPUT=FIELDS (Part 3 of 3)*

When there is no information for a subgroup, such as MOVES, for the LISTCONTROL subcommand, the DFSMSrmm API returns all of the SFIs in the subgroup with no data. For example, when there are no outstanding volume actions, the DFSMSrmm API returns the MOVES subgroup (MFR, MST, MTO and MTY) with no data.

When DFSMSrmm cannot return all the output data for the LISTCONTROL subcommands in your output buffer, you must specify OPERATION=CONTINUE after processing your output buffer to obtain the rest of the LISTCONTROL output data.

**Related Reading:** See “Using the CONTINUE Operation in the EDGXCI Macro” on page 38 for additional information.

## LISTDATASET SFIs

The SFIs produced for the LISTDATASET subcommand with OUTPUT=FIELDS are shown in Figure 34.

```
<Begin DATASET group>
  <DSN  - data set name           : 44 , character:        >
  <CJBN - job name                : 8  , character:        >
  <VOL  - volume serial           : 6  , character:        >
  <OWN  - owner                   : 8  , character:        >
  <DSEQ - data set sequence       : 4  , bin(31):          >
  <DEV  - Device Number           : 4  , character         >
  <FILE - physical file sequence  : 4  , bin(31):          >
  <CDTJ - create date             : 4  , packed decimal:   >
  <CTM  - create time             : 4  , packed decimal:   >
  <SYS  - SMF system id           : 8  , character:        >
  <BLKS - block size              : 4  , bin(31):          >
  <BLKC - block count             : 4  , bin(31):          >
  <LRCL - logical record length   : 4  , bin(31):          >
  <RCFM - record format           : 4  , character:        >
  <DC   - data class              : 8  , character:        >
  <DLWJ - date last written       : 4  , packed decimal:   >
  <DLRJ - date last read          : 4  , packed decimal:   >
  <STEP - step name               : 8  , character:        >
  <DD   - dd name                 : 8  , character:        >
  <MC   - management class        : 8  , character:        >
  <SG   - storage group name      : 8  , character:        >
  <SC   - storage class           : 8  , character:        >
  <VMV  - VRS management value    : 8  , character:        >
  <RTDJ - retention date          : 4  , packed decimal:   >
  <VTYP - Primary VRS type        : 1  , bin(8):           >
  <VJBN - Primary VRS jobn        : 8  , character:        >
  <VNME - Primary VRS name        : 44 , character:        >
  <VSCN - Primary VRS subchain name: 8  , character:        >
  <VSCD - Primary VRS subchain date: 4  , packed decimal:   >
  <VRSR - VRS retained            : 1  , bin(8):           >
  <NME  - security class name     : 8  , character:        >
  <CLS  - sec class description   : 32 , character:        >
  <ABND - Abend while open        : 1  , bin(8):           >
  <CTLG - Catalog status          : 1  , bin(8):           >
  <2JBN - Secondary VRS jobnme mask: 8  , character:        >
  <2NME - Secondary VRS mask      : 8  , character:        >
  <2SCN - Second. VRS subchain name: 8  , character:        >
  <2SCD - Second. VRS subchain date: 4  , packed decimal:   >
  <BLKT - Total block count       : 4  , bin(31):          >
  <CPGM - Creating program name   : 8  , character:        >
  <LPGM - Last used program name  : 8  , character:        >
  <LJOB - Last used job           : 8  , character:        >
  <LSTP - Last used step name     : 8  , character:        >
  <LDD  - Last used DD name       : 8  , character:        >
  <LDEV - Last drive              : 4  , character:        >
  <DPCT - Percent of volume       : 1  , bin(8):           >
  <XDTJ - Expiration Date         : 4  , packed decimal    >
  <OXDJ - Original Expiration Date : 4 ,  packed decimal    >
<End DATASET group>
```

*Figure 34. SFIs for LISTDATASET with OUTPUT=FIELDS*

## LISTOWNER SFIs

The SFIs produced for the LISTOWNER subcommand with OUTPUT=FIELDS are shown in Figure 35.

```
<Begin OWNER group>
  <OWN  - owner                   : 8  , character:         >
  <SUR  - owner's surname         : 20 , character:         >
  <FOR  - owner's forename        : 20 , character:         >
  <DPT  - owner's department      : 40 , character:         >
  <ADL  - address line            : 40 , character:         >
  <ADL  - address line            : 40 , character:         >
  <ADL  - address line            : 40 , character:         >
  <ITL  - owner's internal tel num : 8  , character:         >
  <ETL  - owner's external tele num: 20 , character:         >
  <EMU  - owner's user ID         : 8  , character:         >
  <EMN  - owner's node            : 8  , character:         >
  <VLN  - number of volumes       : 4  , bin(31):           >
<End OWNER group>
```

*Figure 35. SFIs for LISTOWNER with OUTPUT=FIELDS*

## LISTPRODUCT SFIs

The SFIs produced for the LISTPRODUCT subcommand with OUTPUT=FIELDS are shown in Figure 36.

```
<Begin PRODUCT group>
  <PNUM - software product number  : 8  , character:         >
  <VER  - software product version : 6  , character:         >
  <OWN  - owner                    : 8  , character:         >
  <PNME - product software name    : 30 , character:         >
  <PDSC - product description      : 32 , character:         >
  <VOL  - volume serial            : 6  , character:         >
  <RCK  - rack or bin number       : 6  , character:         >
  <FCD  - product feature code     : 4  , character:         >
  <VLN  - number of volumes        : 4  , bin(31):           >
<End PRODUCT group>
```

*Figure 36. SFIs for LISTPRODUCT with OUTPUT=FIELDS*

## LISTRACK SFIs

The SFIs produced for the LISTRACK subcommand with OUTPUT=FIELDS are shown in Figure 37.

```
<Begin RACK or BIN group>
  <RCK  - rack or bin number       : 6  , character:         >
  <VOL  - volume serial            : 6  , character:         >
  <RST  - rack or bin status       : 1  , bin(8):            >
  <LOC  - location                 : 8  , character:         >
  <MEDN - media name               : 8  , character:         >
  <PID  - pool prefix              : 6  , character:         >
<End RACK or BIN Group>
```

*Figure 37. SFIs for LISTRACK with OUTPUT=FIELDS*

## LISTVOLUME SFIs

The SFIs produced for the LISTVOLUME subcommand with OUTPUT=FIELDS are shown in Figure 38.

```
<Begin VOLUME group>
  <Begin VOL group>
    <VOL  - volume serial            : 6  , character:         >
    <RCK  - rack or bin number       : 6  , character:         >
    <OWN  - owner                    : 8  , character:         >
    <CJBN - job name                 : 8  , character:         >
    <CDTJ - create date              : 4  , packed decimal:    >
    <CTM  - create time              : 4  , packed decimal:    >
    <ADTJ - assigned date            : 4  , packed decimal:    >
    <ATM  - assigned time            : 4  , packed decimal:    >
    <XDTJ - expiration date          : 4  , packed decimal:    >
    <OXDJ - original expiration date : 4  , packed decimal:    >
    <RTDJ - retention date           : 4  , packed decimal:    >
    <DSN  - data set name            : 44 , character:         >
    <VST  - volume status            : 1  , bit(8):            >
    <OCE  - volume info recorded OCE : 1  , bin(8):            >
    <AVL  - volume availability      : 1  , bit(8):            >
    <LBL  - volume label type        : 1  , bit(8):            >
    <DEN  - media density            : 1  , bin(8):            >
    <MEDT - media type               : 1  , bin(8):            >
    <MEDR - media recording format   : 1  , bin(8):            >
    <MEDC - media compaction         : 1  , bin(8):            >
    <MEDA - media special attributes : 1  , bin(8):            >
    <ACT  - actions on release       : 1  , bit(8):            >
    <PEND - actions pending          : 1  , bit(8):            >
    <SG   - storage group name       : 8  , character:         >
    <LOAN - loan location            : 8  , character:         >
    <ACN  - account number           : 40 , character:         >
    <DESC - volume description       : 30 , character:         >
    <NME  - security class name      : 8  , character:         >
    <CLS  - sec class description    : 32 , character:         >
    <VRSI - Scratch Immediate        : 1  , bit(8):            >
    <VRXI - Expiration date ignore   : 1  , bit(8):            >
    <VOLT - Volume Type              : 1  , bit(8):            >
    <LVC  - Current label version    : 1  , bit(8):            >
    <LVN  - Required label version   : 1  , bit(8):            >
    <RBYS - Retain by set            : 1  , bit(8):            >
    <STVC - Stacked volume count     : 4  , bin(31):           >
    <SYS  - SMF System ID            : 8  , character:         >
    <DSYS - Creation System ID1stfile: 8  , character:         >
    <VOL1 - VOL1 label volser        : 6  , character:         >
    <WWID - World wide ID            : 24 , character:         >
    <VNDR - Vendor                   : 8  , character:         >

  <End VOL group>
  <Begin ACCESS group>
    <OAC  - owner access             : 1  , bin(8):            >
    <VAC  - volume access            : 1  , bin(8):            >
    <LCID - last change user id      : 8  , character:         >
    <VM   - VM use                   : 1  , bin(8):            >
    <MVS  - MVS use                  : 1  , bin(8):            >
    <UID  - user id                  : 8  , character:         >
  <End ACCESS group>
```

*Figure 38. SFIs for LISTVOLUME with OUTPUT=FIELDS (Part 1 of 2)*

```
  <Begin STAT group>
    <DSC  - data set count           : 4  , bin(31):          >
    <DSR  - data set recording       : 1  , bin(8):           >
    <USEM - volume usage (kb)        : 4  , bin(31):          >
    <USEC - volume use count         : 4  , bin(31):          >
    <DLRJ - date last read           : 4  , packed decimal:   >
    <DLWJ - date last written        : 4  , packed decimal:   >
    <LDEV - last drive               : 4  , character:        >
    <SEQ  - volume sequence          : 4  , fixed(31):        >
    <MEDN - media name               : 8  , character:        >
    <PVL  - previous volume          : 6  , character:        >
    <NVL  - next volume              : 6  , character:        >
    <PNUM - software product number  : 8  , character:        >
    <VER  - software product version : 6  , character:        >
    <FCD  - product feature code     : 4  , character:        >
    <TRD  - temporary read errors    : 4  , bin(31):          >
    <TWT  - temporary write errors   : 4  , bin(31):          >
    <PRD  - permanent read errors    : 4  , bin(31):          >
    <PWT  - permanent write errors   : 4  , bin(31):          >
    <VCAP - volume capacity          : 4  , bin(31):          >
    <VPCT - volume percent full      : 1  , bin(8):           >
    <VWMC - Volume Write Mount Count : 1  , bin(31):          >
  <End STAT group>
  <Begin STORE group>
    <LOC  - location                 : 8  , character:        >
    <LOCT - location type            : 1  , bin(8):           >
    <DEST - destination              : 8  , character:        >
    <DSTT - destination type         : 1  , bin(8):           >
    <INTR - volume intransit status  : 1  , bin(8):           >
    <HLOC - home location            : 8  , character:        >
    <HLOT - home location type       : 1  , bin(8):           >
    <OLOC - old location             : 8  , character:        >
    <OLOT - old location type        : 1  , bin(8):           >
    <NLOC - required location        : 8  , character:        >
    <NLOT - required location type   : 1  , bin(8):           >
    <SDTJ - movement tracking date   : 4  , packed decimal:   >
    <MOVM - move mode                : 1  , bin(8):           >
    <BIN  - bin number               : 6  , character:        >
    <BMN  - bin number media name    : 8  , character:        >
    <OBN  - old bin number           : 6  , character:        >
    <OBMN - old bin number media name: 8  , character:        >
    <CTNR - Container                :16  , character:        >
    <DBIN - destination bin number   : 6  , character:        >
    <DBMN - destination bin media nam: 8  , character:        >
  <End STORE group>
<End VOLUME group>
```

*Figure 38. SFIs for LISTVOLUME with OUTPUT=FIELDS (Part 2 of 2)*

## LISTVRS SFIs

The SFIs produced for the LISTVRS subcommand with OUTPUT=FIELDS are shown in Figure 39.

```
<Begin VRS group>
  <VRS  - vital rcd specification  : 44 , character:         >
  <TYP  - VRS type                 : 1  , bit(8):            >
  <VJBN - Primary VRS job name     : 8  , character:         >
  <VRC  - vital record count       : 2  , bin(31):           >
  <RET  - retention type           : 3  , bin(8):            >
  <VDD  - VRS delay days           : 2  , bin(15):           >
  <LOC  - location                 : 8  , character:         >
  <SC1  - VRS store number         : 4  , bin(31):           >
  <PRTY - priority                 : 4  , bin(31):           >
  <NVRS - next VRS name            : 8  , character:         >
  <OWN  - owner                    : 8  , character:         >
  <DESC - volume or vrs description: 30 , character:         >
  <DDTJ - delete date              : 4  , packed decimal:    >
  <VANX - Next VRS Type            : 1  , bit(8):            >
  <VRSI - Scratch Immediate        : 1  , bit(8):            >
  <VRXI - Expiration date ignore   : 1  , bit(8):            >
<End VRS group>
```

*Figure 39. SFIs for LISTVRS with OUTPUT=FIELDS*

## SEARCH-Type of Subcommands

The DFSMSrmm SEARCH-type of subcommands are: SEARCHBIN, SEARCHDATASET, SEARCHPRODUCT, SEARCHRACK, SEARCHVOLUME, and SEARCHVRS. You use these subcommands to obtain information from the DFSMSrmm control data set about resources defined to DFSMSrmm.

When you specify OUTPUT=FIELDS, the DFSMSrmm API returns data for all SEARCH type of subcommands as structured fields. DFSMSrmm returns the output data for a single resource in your output buffer each time you call the API. You must specify OPERATION=CONTINUE after processing your output buffer to obtain the output data for the next resource. Continue to call the DFSMSrmm API until the output data for all matching resources has been returned.

**Related Reading:** See “Using the CONTINUE Operation in the EDGXCI Macro” on page 38 for additional information.

The DFSMSrmm API returns expanded output data for the RMM TSO SEARCHDATASET, SEARCHPRODUCT, SEARCHVOLUME, and SEARCHVRS subcommands when you also specify the EXPAND=YES parameter.

## SEARCHBIN SFIs

Figure 40 shows the output that DFSMSrmm returns when you specify the SEARCHBIN subcommand and the EDGXCI macro OUTPUT=FIELDS and EXPAND=NO parameters.

```
<Begin RACK or BIN group>
  <RCK  - rack or bin number       : 6  , character:         >
  <VOL  - volume serial            : 6  , character:         >
  <RST  - rack or bin status       : 1  , bin(8):            >
  <LOC  - location                 : 8  , character:         >
  <MEDN - media name               : 8  , character:         >
  <MIV  - moving-in volume         : 6  , character:         >
  <MOV  - moving-out volume        : 6  , character:         >
  <OVOL - old volume               : 6  , character:         >
<End RACK or BIN Group>
```

*Figure 40. SFIs for SEARCHBIN with OUTPUT=FIELDS,EXPAND=NO*

## SEARCHDATASET SFIs

Figure 41 shows the output DFSMSrmm returns when you specify the SEARCHDATASET subcommand and the EDGXCI macro OUTPUT=FIELDS and EXPAND=NO parameters.

The expanded output that DFSMSrmm returns when you specify the SEARCHDATASET subcommand with the OUTPUT=FIELDS and EXPAND=YES parameters is the same as shown in “LISTDATASET SFIs” on page 66 for LISTDATASET.

```
<Begin DATASET group>
  <DSN  - data set name            : 44 , character:         >
  <VOL  - volume serial            : 6  , character:         >
  <OWN  - owner                    : 8  , character:         >
  <CDTJ - create date              : 4  , packed decimal:    >
  <CTM  - create time              : 4  , packed decimal:    >
  <FILE - physical file sequence   : 4  , bin(31):           >
  <XDTJ - Expiration Date          : 4  , packed decimal     >
  <OXDJ - Original Expiration Date : 4 ,  packed decimal     >
<End DATASET group>
```

*Figure 41. SFIs for SEARCHDATASET with OUTPUT=FIELDS,EXPAND=NO*

## SEARCHPRODUCT SFIs

Figure 42 on page 72 shows the output DFSMSrmm returns when you specify the SEARCHPRODUCT subcommand and the EDGXCI macro OUTPUT=FIELDS and EXPAND=NO parameters.

The expanded output that DFSMSrmm returns when you specify the SEARCHPRODUCT subcommand with the OUTPUT=FIELDS and EXPAND=YES parameters is the same as shown in “LISTPRODUCT SFIs” on page 67 for LISTPRODUCT.

```
<Begin PRODUCT group>
  <PNUM - software product number  : 8  , character:         >
  <VER  - software product version : 6  , character:         >
  <PNME - product software name    : 30 , character:         >
  <FCD  - product feature code     : 4  , character:         >
  <VLN  - number of volumes        : 4  , bin(31):           >
  <VOL  - volume serial            : 6  , character:         >
<End PRODUCT group>
```

*Figure 42. SFIs for SEARCHPRODUCT with OUTPUT=FIELDS,EXPAND=NO*

## SEARCHRACK SFIs

Figure 43 shows the output DFSMSrmm returns when you specify the SEARCHRACK subcommand and the EDGXCI macro OUTPUT=FIELDS and EXPAND=NO parameters.

```
<Begin RACK or BIN group>
  <RCK  - rack or bin number       : 6  , character:         >
  <VOL  - volume serial            : 6  , character:         >
  <RST  - rack or bin status       : 1  , bin(8):            >
  <LOC  - location                 : 8  , character:         >
  <MEDN - media name               : 8  , character:         >
  <PID  - pool prefix              : 6  , character:         >
<End RACK or BIN Group>
```

*Figure 43. SFIs for SEARCHRACK with OUTPUT=FIELDS,EXPAND=NO*

## SEARCHVOLUME SFIs

Figure 44 on page 73 shows the output DFSMSrmm returns when you specify the SEARCHVOLUME subcommand and the EDGXCI macro OUTPUT=FIELDS and EXPAND=NO parameters.

The expanded output that DFSMSrmm returns when you specify the SEARCHVOLUME subcommand with the OUTPUT=FIELDS and EXPAND=YES parameters is the same as shown in “LISTVOLUME SFIs” on page 68 for LISTVOLUME.

```
<Begin VOLUME group>
  <VOL  - volume serial           : 6  , character:        >
  <OWN  - owner                   : 8  , character:        >
  <RCK  - rack or bin number      : 6  , character:        >
  <ADTJ - assigned date           : 4  , packed decimal:   >
  <XDTJ - expiration date         : 4  , packed decimal:   >
  <RTDJ - retention date          : 4  , packed decimal:   >
  <LOC  - location                : 8  , character:        >
  <INTR - volume intransit status : 1  , bin(8):           >
  <HLOC - home location           : 8  , character:        >
  <DSC  - data set count          : 4  , bin(31):          >
  <VST  - volume status           : 1  , bit(8):           >
  <AVL  - volume availability     : 1  , bit(8):           >
  <LBL  - volume label            : 1  , bit(8):           >
  <MEDT - media type              : 1  , bin(8):           >
  <MEDR - media recording format  : 1  , bin(8):           >
  <MEDC - media compaction        : 1  , bin(8):           >
  <MEDA - media special attributes : 1  , bin(8):          >
  <PEND - actions pending         : 1  , bit(8):           >
  <LOAN - loan location           : 8  , character:        >
  <DEST - destination             : 8  , character:        >
  <DSR  - data set recording      : 1  , bin(8)            >
  <SEQ  - volume sequence         : 4  , bin(31):          >
  <MEDN - media name              : 8  , character:        >
  <LVC  - Current label version   : 1  , bit(8):           >
  <LVN  - Required label version  : 1  , bit(8):           >
<End VOLUME group>
```

*Figure 44. SFIs for SEARCHVOLUME with OUTPUT=FIELDS,EXPAND=NO*

## SEARCHVRS SFIs

Figure 45 shows the output DFSMSrmm returns when you specify the SEARCHVRS subcommand and the EDGXCI macro OUTPUT=FIELDS and EXPAND=NO parameters.

The expanded output that DFSMSrmm returns when you specify the SEARCHVRS subcommand with the OUTPUT=FIELDS and EXPAND=YES parameters is the same as shown in “LISTVRS SFIs” on page 70 for LISTVRS.

```
<Begin VRS group>
  <VRS  - vital rcd specification  : 44 , character:        >
  <TYP  - VRS type                 : 1  , bit(8):           >
  <VJBN - Primary VRS job name     : 8  , character:        >
  <RET  - retention type           : 3  , bin(8):           >
  <LOC  - location                 : 8  , character:        >
  <PRTY - priority                 : 4  , bin(31):          >
  <NVRS - next VRS name            : 8  , character:        >
  <OWN  - owner                    : 8  , character:        >
  <DDTJ - delete date              : 4  , packed decimal:   >
  <VANX - Next VRS Type            : 1  , bit(8):           >
  <VRSI - Scratch Immediate        : 1  , bit(8):           >
  <VRXI - Expiration date ignore   : 1  , bit(8):           >
<End VRS group>
```

*Figure 45. SFIs for SEARCHVRS with OUTPUT=FIELDS,EXPAND=NO*

## Controlling Output from List and Search Type Requests

The DFSMSrmm API returns information for a SEARCH type of subcommand or for a LISTCONTROL subcommand based on these factors:

- Whether you want line format or field format data.
- The size of your output buffer.
- The amount of output data.
- The LIMIT operand value used for a SEARCH type of subcommand.

## Limiting the Search for a Request

Use the LIMIT keyword on SEARCH type of subcommands to limit the number of entries DFSMSrmm returns. To conserve use of system resources, such as dynamic storage, DFSMSrmm suspends a search operation after the number of entries matches the limit value you specify or the default limit value.

When you issue an RMM TSO Search type of subcommand, you can use the LIMIT operand to limit the number of entries returned. DFSMSrmm ends the search because the limit you set is reached or all available entries have been returned.

For an application program, the DFSMSrmm API causes DFSMSrmm to resume the search. LIMIT does not limit the total number of entries that the DFSMSrmm API returns to your application program and you cannot use LIMIT to end the subcommand before you have received all of the entries for a subcommand. Instead, you can specify OPERATION=CONTINUE regardless of whether limit has been reached, or begin a new command, or use EDGXCI OPERATION=RELEASE.

## Output Buffer Examples

The examples in this section illustrate the following:

- SEARCH type subcommands (and LISTCONTROL) might require your application program to use one or more OPERATION=CONTINUE calls to the DFSMSrmm API to receive all of the search results.
- Your application program should expect to receive more than one set of return and reason codes. In the example, DFSMSrmm issued a different set of codes for each output buffer:
  - Return code 0, reason code 4.
  - Return code 4, reason code 2.
  - Return code 4, reason code 4.

  Depending on the subcommand that you specify, the search criteria that you specify (fully or partially qualified names), and whether you specify a LIMIT value or LIMIT(*), DFSMSrmm can also issue the following return codes and reason codes.
  - Return code 0, reason code 0.
  - Return code 4, reason code 8.

  For more information about the return codes and reason codes that the API returns, see Table 9 on page 38.
- Header lines for search lists are placed at the beginning of the first output buffer of each set of buffers: The first output buffer after OPERATION=BEGIN, and the first output buffer after OPERATION=CONTINUE in response to the return code 4 and reason code 2.
- Messages issued by DFSMSrmm and that are placed in your output buffers are introduced by <MSGL> SFIs rather than <LINE> SFIs.

- The number of output data lines that are placed in your buffer is dependent upon the interaction of the following:
  - The total number of searched records (entries).
  - The size of your output buffer.
  - The LIMIT value used for the search.

Figure 46, Figure 47 on page 76, and Figure 48 on page 76 display the contents of the output buffers when:

- Your application program issues an OPERATION=BEGIN, OUTPUT=LINES for a SEARCHRACK RACK(*) LIMIT(90) subcommand.
- Your application program is using a minimum size (4096 bytes) output buffer.
- There are 130 records in the RMM inventory.

## First Output Buffer

The DFSMSrmm API issues return code 0 and reason code 4 and returns control to your application program. Your output buffer contains 78 structured fields.

In Figure 46:

- The group begins with the <Begin RACK or BIN group>.
- The structured fields between the Begin and End RACK group SFIs are all introduced by a <LINE> SFI.
- The first two lines after the Begin RACK group are the header lines for the list of RACK entries.
- The group ends with the <End RACK or BIN group>.

The DFSMSrmm API returns code 0 and reason code 4 when there is more output data. Specify the EDGXCI macro OPERATION=CONTINUE parameter to continue the subcommand request..

```
<Begin RACK or BIN group>
  <LINE>Rack    Medianame  Volume  Status    Location
  <LINE>------  ---------  ------  --------  --------
  <LINE>020610  CART3480   020610  IN USE    SHELF
  <LINE>020742  CART3480   020742  IN USE    SHELF
  <LINE>021042  CART3480   021042  IN USE    SHELF
    ...
    ...
  <LINE>030311  CART3480   030311  IN USE    SHELF
  <LINE>030318  CART3480   030318  IN USE    SHELF
<End RACK or BIN group>
```

*Figure 46. CONTINUE Example, First Output Buffer*

## Second Output Buffer

After processing the OPERATION=CONTINUE parameter, the DFSMSrmm API continues processing. The DFSMSrmm API issues return code 4 and reason code 2, returns control to your application program. Your output buffer contains 20 structured fields.

```
<Begin RACK or BIN group>
  <LINE>031086  CART3480   031086  IN USE    SHELF
  <LINE>031568  CART3480   031568  IN USE    SHELF
  <LINE>031599  CART3480   031599  IN USE    TRON
    ...
    ...
  <LINE>032848  CART3480   032848  IN USE    SHELF
  <LINE>032898  CART3480   032898  IN USE    SHELF
  <MSGL>EDG3203I SEARCH COMPLETE - MORE ENTRIES MAY EXIST
  <MSGL>EDG3012I 90         ENTRIES LISTED
<End RACK or BIN group>
```

*Figure 47. CONTINUE Example, Second Output Buffer*

In Figure 47:

- There are no header lines in the second output buffer.
- There are only 16 output data lines (the LINE SFIs).
- The last output data line is followed by two message lines introduced by the <MSGL> SFI.

The DFSMSrmm API returns control to your application program even though there is room in the output buffer for more data. This is because the LIMIT value of 90 was reached as indicated by the second message line.

The return code 4 and reason code 2 indicate that more entries might exist. When you use OPERATION=CONTINUE, one of the following is likely to occur:

- When there are more entries, your application program receives control back with more output data in your output buffer.
- When there are no other entries, your application program receives control back with a buffer that is empty or that contains only messages.

## Third (Last) Output Buffer

After the second OPERATION=CONTINUE, control is returned to your application program with return code 4 and reason code 4, and your output buffer contains 45 structured fields.

```
<Begin RACK or BIN group>
  <LINE>Rack    Medianame  Volume  Status    Location
  <LINE>------  ---------  ------  --------  --------
  <LINE>032935  CART3480   032935  IN USE    SHELF
  <LINE>032941  CART3480   032941  IN USE    SHELF
  <LINE>032946  CART3480   032946  IN USE    SHELF
    ...
    ...
  <LINE>070692  CART3480   070692  IN USE    SHELF
  <LINE>070693  CART3480   070693  IN USE    SHELF
  <MSGL>EDG3012I 40         ENTRIES LISTED
<End RACK or BIN group>
```

*Figure 48. CONTINUE Example, Third (Last) Output Buffer*

In Figure 48 on page 76:

- The first two lines after the Begin RACK group are the header lines that you saw in the first output buffer. This is the output for a second search that the DFSMSrmm API started when you specified OPERATION=CONTINUE in response to the return code 4 and reason code 2.
- The last output data line in your output buffer is followed by a single message line.
- The return code 4 and reason code 4 indicate that the subcommand was ended before the LIMIT value was reached.
- The total number of entries given to your application program in the three output buffers is 130: 74 in the first, 16 in the second, and 40 in the last output buffer.

# Appendix A. Structured Field Introducers

This section defines the Structured Field Introducers used by the DFSMSrmm API to identify fields in API output.

## SFI Format

All Structured Field Introducers (SFIs) have the following format:

| Bytes | Description |
|---|---|
| **0-1** | 2-byte length: SFI length plus data length |
| **2-4** | 3-byte identifier: SFI ID (hexadecimal) |
| **5** | 1-byte type modifier: Type of SFI<br>• 0 = 8-byte, fixed-length SFI |
| **6** | 1-byte (Reserved) |
| **7** | 1-byte data type: Type of data, if any, that follows the SFI<br>• 0=Undefined (no data)<br>• 1=Character (fixed-length)<br>• 2=Bit(8) (1-byte flag, multiple bits can be on)<br>• 3=Binary(8) (1-byte (hex) value)<br>• 4=Binary(15) (2-byte (hex) value)<br>• 5=Binary(31) (4-byte (hex) value)<br>• 6=Reserved<br>• 7=Character (variable-length)<br>• 8=Reserved<br>• 9=(4 bytes) Packed decimal Julian date: yyyydddC<br>• A=(4 bytes) Packed decimal time format: hhmmsstC |

## Structured Field Lengths

All structured fields have a minimum length of 8 bytes (for the Structured Field Introducer). The length can be fixed-length or variable-length.

- **Fixed-length**:

  The structured field has one of two length values: 8 when there is no data or the defined maximum length. For example, if the length is defined as X'000C' (decimal 12) for a particular structured field, the length in the SFI has a value of either X'0008' (no data) or X'000C' (data length = 4).
- **Variable-length**:

  The structured field can have a length that varies from 8 (no data) up to maximum stated size. For example, because a data set name varies from 1 to 44 characters in length, the length value in an SFI for a data set name can be X'0008' (no data), or it can vary from X'0009' to X'0034' (9 to 52 decimal).

## SFIs for Begin and End Resource Groups

Begin and End Resource Group SFIs identify when the output for a particular resource begins and ends. Begin and End Resource groups can be used to identify subgroups within a group. The Begin and End Resource groups are never followed by data. Table 12 shows SFIs that identify Begin and End resource groups.

*Table 12. Begin and End Group Structured Field Introducers*

| Begin - End IDs | Resource Group |
|---|---|
| X'021000' - X'021080' | ACCESS - within VOLUME |
| X'022000' - X'022080' | ACTIONS - within CONTROL |
| X'024000' - X'024080' | CNTL - within CONTROL |
| X'025000' - X'025080' | CONTROL |
| X'026000' - X'026080' | DATASET |
| X'027000' - X'027080' | LOCDEF - within CONTROL |
| X'028000' - X'028080' | MESSAGE |
| X'029000' - X'029080' | MNTMSG - within CONTROL |
| X'02A000' - X'02A080' | MOVES - within CONTROL |
| X'02B000' - X'02B080' | OPTION - within CONTROL |
| X'02C000' - X'02C080' | OWNER |
| X'02D000' - X'02D080' | PRODUCT |
| X'02E000' - X'02E080' | RACK or BIN |
| X'02F000' - X'02F080' | REJECT - within CONTROL |
| X'030000' - X'030080' | SECCLS - within CONTROL |
| X'031000' - X'031080' | SECLVL - within CONTROL |
| X'032000' - X'032080' | STAT - within VOLUME |
| X'033000' - X'033080' | STORE - within VOLUME |
| X'034000' - X'034080' | SYSRETC |
| X'035000' - X'035080' | VLPOOL - within CONTROL |
| X'036000' - X'036080' | VOL - within VOLUME |
| X'037000' - X'037080' | VOLUME |
| X'038000' - X'038080' | VRS |

## SFIs for Return and Reason Codes

The SFIs shown in Table 13 on page 81 provide return codes and reason codes in your output buffer.

The DFSMSrmm API issues the return and reason code SFIs only when the subcommand fails. Each return and reason code pair is grouped within the SYSRETC group. The FRC and FRS SFIs are used for return and reason codes that are returned from OAM. The RSNC and RTNC SFIs are used for return and reason codes that are from another system service.

When the DFSMSrmm API builds a SYSRETC group for an error reported by a system service, look for additional information that is available from system messages in places like the operator terminal, SYSTSPRT, job log, and SYSLOG data set.

Subcommands are described using standard DFSMSrmm abbreviations. For example, AV is for ADDVOLUME as shown in Table 3 on page 2. The SFI values are enclosed in single quotes (') to signify that they are 8-byte hexidecimal values. Two spaces are included in the IDs for readability.

*Table 13. Reason and Return Code SFIs*

| SFI Number | SFI Name | SFI Length | SFI Data Type | Data Description | Subcommand |
|---|---|---|---|---|---|
| X'400000' | FRC | 12 | Binary(31) | Function return code | AV CV DV GV |
| X'401000' | FRS | 12 | Binary(31) | Function reason code | AV CV DV GV |
| X'402000' | RSNC | 12 | Binary(31) | Reason code | Any subcommand |
| X'403000' | RTNC | 12 | Binary(31) | Return code | Any subcommand |
| X'404000' | SVCN | 16 | Character (variable length) | Service name | Any subcommand |

## SFIs for Messages and Message Variables

The SFIs described in Table 14 introduce messages and message variables that the DFSMSrmm API places in your output buffer:

- MSGL is used when OUTPUT=LINES.
- MSGN and ENTN are used when OUTPUT=FIELDS.
- The SFI definitions are enclosed in single quotes (') to signify that they are 8-byte values and the two spaces are inserted for readability.

The MSGN and ENTN SFIs are always grouped within the MESSAGE group. The MSGL SFIs are grouped within the MESSAGE group when the DFSMSrmm API is unable to determine which subcommand type the message is for. One or more SFIs other than ENTN might follow MSGN as described in “Messages and Message Variables SFIs” on page 59.

*Table 14. Message SFIs*

| SFI Number | SFI Name | SFI Length | SFI Data Type | Data Description | Subcommand |
|---|---|---|---|---|---|
| X'051000' | MSGL | 259 | Character (variable length) | Message line | Any subcommand |
| X'052000' | MSGN | 16 | Character (fixed length) | Message number ID | As previously defined |
| X'053000' | ENTN | 12 | Binary(31) | Number of entries Min 0, Max 10-digit | As previously defined |
| X'054000' | KEYF | 65 | Character (variable length) | Key from | SD SV |
| X'054200' | KEYT | 65 | Character (variable length) | Key to | SD SV |
| X'055000' | TYPF | 16 | Character (variable length) | VOLUME or DATASET | SD SV |
| X'055200' | TYPT | 16 | Character (variable length) | VOLUME or DATASET | SD SV |

## SFIs for Subcommand Output Data

The SFIs described in Table 15 introduce subcommand output data in your output buffer. These SFIs are always grouped within a pair of Begin and End Resource group SFIs.

The following notation is used:

- Subcommands are described using standard DFSMSrmm abbreviations. For example, LV is for LISTVOLUME and SS is for SEARCHVRS as described in Table 3 on page 2.
- The (e) following a search type of subcommand abbreviation means the expanded output is available if you specify EXPAND=YES. The absence of (e) means the SFI is used for both EXPAND=NO and EXPAND=YES.
- The range of two-byte and four-byte numbers is denoted by the minimum expected value and the maximum number of digits the number is expected to have. For example: “Min 1, Max 4-digit” means the minimum expected value of the number is one and the maximum expected number of digits in the number is four.
- The SFI definitions are enclosed in single quotes (’) to signify that they are 8-byte values and the two spaces are inserted for readability. Bit data (flags) values are also enclosed in single quotes.

*Table 15. Command SFIs*

| SFI Number | SFI Name | SFI Length | SFI Data Type | Data Description | Subcommand |
|---|---|---|---|---|---|
| X'800500' | ABND | 9 | Binary(8) | Abend while open 0=NO 1=YES | LD SD(e) |
| X'800800' | ACCT | 9 | Binary(8) | Accounting source 0=JOB 1=STEP | LC |
| X'801000' | ACN | 48 | Character (variable length) | Account number | LV SV(e) |
| X'801800' | ACS | 9 | Binary(8) | SMSACS 0=NO 1=YES | LC |
| X'802000' | ACT | 9 | Bit(8) | Actions on release ’80’=SCRATCH ’40’=REPLACE ’20’=INIT ’10’=ERASE ’08’=RETURN ’04’=NOTIFY For LC VLPOOL X'00', X'04' | LC LV SV(e) |
| X'803001' | ADL | 48 | Character (variable length) | Address line. The SFI is incremented by one for each ADL line that is found. (X'803001' - X'803003') | LO |
| X'804000' | ADTJ | 12 | Packed decimal Julian date format | Assigned date | LV SV |
| X'805000' | AST | 9 | Bit(8) | Action status ’80’=PENDING ’40’=CONFIRMED ’20’=COMPLETE ’10’=UNKNOWN | LC |
| X'806000' | ATM | 12 | Packed decimal time format | Assigned time | LV SV(e) |
| X'807000' | AUD | 10 | Binary(15) | SMF audit record number: 128-255 | LC |

*Table 15. Command SFIs (continued)*

| SFI Number | SFI Name | SFI Length | SFI Data Type | Data Description | Subcommand |
|---|---|---|---|---|---|
| X'808000' | AVL | 9 | Bit(8) | Volume availability ’40’=PENDING_RELEASE ’20’=VITAL_RECORD ’08’=ON_LOAN ’04’=OPEN | LV SV |
| X'809000' | BDTJ | 12 | Packed decimal Julian date format | Last control data set backup date | LC |
| X'80A000' | BIN | 14 | Character (fixed length) | 6-character alphanumeric bin number | LV SV(e) |
| X'80B000' | BKPP | 16 | Character (Variable length) | Backup procedure name | LC |
| X'80C000' | BLKC | 12 | Binary(31) | Block count | LD SD(e) |
| X'80D000' | BLKS | 12 | Binary(31) | Block size | LD SD(e) |
| X'80D030' | BLKT | 12 | Binary(31) | Total block count | LD SD(e) |
| X'80E000' | BLP | 9 | Binary(8) | BLP option: 0=RMM 1=NORMM | LC |
| X'80F000' | BMN | 16 | Character (variable length) | Bin number media name | LV SV(e) |
| X'810000' | BTM | 12 | Packed decimal time format | Last control data set backup time | LC |
| X'811000' | CACT | 9 | Bit(8) | Control active functions ’80’=BACKUP ’40’=RESTORE ’20’=VERIFY ’10’=EXPROC ’08’=EXTRACT ’04’=DSTORE ’02’=VRSEL | LC |
| X'811800' | CATS | 9 | Binary(8) | CATSYSID value 0=SET 1=NOTSET 2=* | LC |
| X'812000' | CDS | 16 | Character (variable length) | Control data set identifier | LC |
| X'812A00' | CDSU | 10 | Binary(15) | Control data set percentage used | LC |
| X'813000' | CDTJ | 12 | Packed decimal Julian date format | Create date | LD LV SD SV(e) |
| X'814000' | CJBN | 16 | Character (variable length) | Job name | LD LV SD(e) SV(e) |
| X'815000' | CLIB | 16 | Character (variable length) | Current library name | AV CV DV |
| X'816000' | CLS | 40 | Character (variable length) | Security class description | LC LD LV SD(e) SV(e) |
| X'816900' | CMDD | 9 | Binary(8) | Command Authorization - based on DSN: 0=No 1=Yes | LC |
| X'8169A0' | CMDO | 9 | Binary(8) | Command Authorization - based on owner: 0=No 1=Yes | LC |
| X'817000' | CNT | 12 | Binary(31) | Bin, rack, or volume count: Min 0, Max 5-digit | AB AR AV DB DR |
| X'817820' | CPGM | 16 | Character (fixed length) | Creating program name | LD SD(e) |
| X'818000' | CRP | 12 | Binary(31) | CATRETPD retention period: Min 0, Max 4-digit | LC |
| X'818800' | CSDT | 12 | Packed decimal Julian date | Catalog synchronize date | LC |

*Table 15. Command SFIs (continued)*

| SFI Number | SFI Name | SFI Length | SFI Data Type | Data Description | Subcommand |
|---|---|---|---|---|---|
| X'819000' | CSG | 16 | Character (variable length) | Current storage group name | AV CV |
| X'819200' | CSHN | 71 | Character (variable length) | Client/server host name 1-to-63 alphanumeric characters including hyphen, period, and blank | LC |
| X'819250' | CSIP | 23 | Character (variable length) | Client IP address 1-to-15 numeric characters including period and blank | LC |
| X'819400' | CSTM | 12 | Packed decimal time date | Catalog synchronize time | LC |
| X'819600' | CSVE | 9 | Binary(8) | Stacked volume enable status:<br>0=None<br>1=Enabled<br>2=Disabled<br>3=Mixed | LC |
| X'819800' | CTLG | 9 | Binary(8) | Catalog status:<br>0=UNKNOWN<br>1=NO<br>2=YES | LD SD(e) |
| X'81A000' | CTM | 12 | Packed decimal time format | Create time | LD LV SD SV(e) |
| X'81A300' | CTNR | 24 | Character (variable length) | In container | LV STORE |
| X'81A600' | DBIN | 14 | Character (fixed length) | Numeric: 0–999999 or 6 alphanumeric character destination bin number | LV |
| X'81A700' | DBMN | 16 | Character (fixed length) | 8 character destination bin media name | LV |
| X'81B000' | DBN | 12 | Binary(31) | Bin numbers in DISTANT location: Min 0, Max 6-digit | LC |
| X'81C000' | DC | 16 | Character (variable length) | Data class name | LD SD(e) |
| X'81D000' | DD | 16 | Character (variable length) | DD name | LD SD(e) |
| X'81E000' | DDTJ | 12 | Packed decimal Julian date format | Delete date or last store update date | LC LS SS |
| X'81F000' | DEN | 9 | Binary(8) | Media density:<br>0=UNDEFINED<br>1=1600<br>2=6250<br>3=3480<br>4=COMPACT | LV SV(e) |
| X'820000' | DESC | 38 | Character (variable length) | Volume or VRS description | LS LV SS(e) SV(e) |
| X'821000' | DEST | 16 | Character (variable length) | Destination name | LV SV |
| X'822000' | DEV | 12 | Character (fixed length) | Device number | LD SD(e) |
| X'823000' | DLRJ | 12 | Packed decimal Julian date format | Date last referenced/read | LD LV SD(e) SV(e) |
| X'824000' | DLWJ | 12 | Packed decimal Julian date format | Date last written | LD LV SD(e) SV(e) |
| X'825000' | DNM | 52 | Character (variable length) | Data set name mask | LC |

*Table 15. Command SFIs (continued)*

| SFI Number | SFI Name | SFI Length | SFI Data Type | Data Description | Subcommand |
|---|---|---|---|---|---|
| X'825E00' | DPCT | 9 | Binary(8) | Percent of volume | LD SD(e) |
| X'826000' | DPT | 48 | Character (variable length) | Owner's department | LO |
| X'827000' | DRP | 12 | Binary(31) | Default retention period: Min 0, Max 4-digit | LC |
| X'828000' | DSC | 12 | Binary(31) | Data set count: Min 0, Max 4-digit | LV SV |
| X'829000' | DSEQ | 12 | Binary(31) | Data set sequence: Min 0, Max 4-digit | LD SD(e) |
| X'82A000' | DSN | 52 | Character (variable length) | Data set name | LD LV SD SV(e) |
| X'82A500' | DSPD | 16 | Character (variable length) | Disposition DD name | LC |
| X'82AA00' | DSPM | 16 | Character (variable length) | Disposition message prefix | LC |
| X'82B000' | DSR | 9 | Binary(8) | Data set recording: 0=NO 1=YES | LV SV |
| X'82B200' | DSTT | 9 | Binary(8) | Destination type 0=SHELF 1=STORE_BUILTIN 2=MANUAL 3=AUTO 4=STORE_BINS 5=STORE_NOBINS | LV |
| X'82BB00' | DSYS | 16 | Character (variable length) | Creating system ID | LV, SV(e) |
| X'82C000' | DTE | 9 | Binary(8) | Installation date format: 1=A 2=E 3=I 4=J | LC |
| X'82D000' | DTM | 12 | Packed decimal time format | Last store update run time | LC |
| X'82D500' | EBIN | 9 | Binary(8) | Extended bin enable status 0=DISABLED 1=ENABLED | LC |
| X'82E000' | EMN | 16 | Character (variable length) | Owner's node | LO |
| X'82F000' | EMU | 16 | Character (variable length) | Owner's user ID | LO |
| X'830000' | ETL | 28 | Character (variable length) | Telephone number | LO |
| X'831000' | FCD | 12 | Character (variable length) | Feature code | LP LV SP SV(e) |
| X'831800' | FCSP | 9 | Binary(8) | Catalog synchronize in progress: 0=NO 1=YES | LC |
| X'832000' | FDB | 12 | Binary(31) | Free bins in DISTANT location Min 0, Max 6-digit | LC |
| X'833000' | FILE | 12 | Binary(31) | Physical file sequence Min 1, Max 4-digit | LD SD |

*Table 15. Command SFIs (continued)*

| SFI Number | SFI Name | SFI Length | SFI Data Type | Data Description | Subcommand |
|---|---|---|---|---|---|
| X'834000' | FLB | 12 | Binary(31) | Free bin numbers in LOCAL location:<br>Min 0, Max 6-digit | LC |
| X'835000' | FOR | 28 | Character (variable length) | Owner's forename | LO |
| X'836000' | FRB | 12 | Binary(31) | Free bin numbers in REMOTE location:<br>Min 0, Max 6-digit | LC |
| X'837000' | FRK | 12 | Binary(31) | Free rack numbers in library:<br>Min 0, Max 10-digit | LC |
| X'838000' | GRK | 14 | Character (fixed length) | Generic rack number = reject prefix | LC |
| X'839000' | HLOC | 16 | Character (variable length) | Home location | LV SV |
| X'839200' | HLOT | 9 | Binary(8) | Home location type<br>0=SHELF<br>1=STORE_BUILTIN<br>2=MANUAL<br>3=AUTO<br>4=STORE_BINS<br>5=STORE_NOBINS | LV |
| X'83A000' | INTR | 9 | Binary(8) | Volume intransit status:<br>0=NO 1=YES | LV SV |
| X'83B000' | IPL | 9 | Binary(8) | Date check required on IPL:<br>0=NO 1=YES | LC |
| X'83C000' | ITL | 16 | Character (variable length) | Telephone number | LO |
| X'83CA00' | JBDT | 12 | Packed decimal Julian date | Last Journal Backup Date | LC |
| X'83CB00' | JBTM | 12 | Packed decimal time format | Last Journal Backup Time | LC |
| X'83D000' | JDS | 52 | Character (variable length) | Journal name | LC |
| X'83E000' | JRNF | 10 | Binary(15) | JOURNALFULL parmlib value:<br>0 - 99 | LC |
| X'83EA00' | JRNS | 9 | Binary(8) | Journal status:<br>0=Disabled<br>1=Enabled<br>2=Locked | LC |
| X'83F000' | JRNU | 10 | Binary(15) | Journal percentage used:<br>0 - 100 | LC |
| X'840000' | LBL | 9 | Bit(8) | Volume label type:<br>'20'=NL<br>'10'=AL<br>'08'=SL<br>'02'=BLP<br>'01'=UL | LV SV |
| X'841000' | LBN | 12 | Binary(31) | Bin numbers in LOCAL location Min 0, Max 6-digit | LC |
| X'842000' | LCID | 16 | Last change user ID | Character (variable length) | LV SV(e) |
| X'843000' | LCT | 10 | Binary(15) | Default lines per page Min 10, Max 3-digit | LC |
| X'843100' | LCTK | 12 | Binary (31) | Local tasks binary value | LC |

*Table 15. Command SFIs (continued)*

| SFI Number | SFI Name | SFI Length | SFI Data Type | Data Description | Subcommand |
|---|---|---|---|---|---|
| X'844000' | LDDF | 9 | Binary(8) | Location definition exists: 0=NO 1=YES | LC |
| X'843B00' | LDD | 16 | Character (fixed length) | Last used DD name | LD SD(e) |
| X'845000' | LDEV | 16 | Character (fixed length) | Last drive | LD SD(e) LV SV(e) |
| X'846000' | LDLC | 16 | Character (variable length) | Location name | LC |
| X'847000' | LDLT | 9 | Binary(8) | Location type:<br>0=SHELF<br>1=AUTO<br>2=MANUAL<br>3=STORE | LC |
| X'848000' | LDMN | 16 | Character (variable length) | Location media name | LC |
| X'849000' | LDMT | 9 | Binary(8) | Location management type:<br>0=UNDEFINED<br>1=BIN<br>2=NOBINS | LC |
| X'84A000' | LDPR | 12 | Binary(31) | Location priority:<br>Min 0,<br>Max 4-digit | LC |
| X'84B000' | LINE | 264 | Character (variable length) | Output data line | All list and search subcommands |
| X'84B420' | LJOB | 16 | Character (fixed length) | Last used job name | LD SD(e) |
| X'84C000' | LOAN | 16 | Character (fixed length) | Loan location | LV SV |
| X'84D000' | LOC | 16 | Character (variable length) | Location | LB LR LS LV SB SR SS SV |
| X'84E000' | LOCT | 9 | Binary(8) | Location type<br>0=SHELF<br>1=STORE_BUILTIN<br>2=MANUAL<br>3=AUTO<br>4=STORE_BINS<br>5=STORE_NOBINS<br>6=IN_CONTAINER | LV SV(e) |
| X'84E760' | LPGM | 16 | Character (fixed length) | Last used program name | LD SD(e) |
| X'84F000' | LRCL | 12 | Binary(31) | Logical record length:<br>Min 0,<br>Max 5-digit | LD SD(e) |
| X'850000' | LRK | 12 | Binary(31) | Library rack numbers:<br>Min 0,<br>Max 10-digit | LC |
| X'850370' | LSTP | 16 | Character (variable length) | Last used step name | LD SD(e) |
| X'850500' | LVC | 9 | Binary(8) | Current label version:<br>0=No version specified<br>1=Label version 1<br>3=Label version 3<br>4=Label version 4 | LV SV |
| X'850A00' | LVN | 9 | Binary(8) | Required label version:<br>0=No version specified<br>3=Label version 3<br>4=Label version 4 | LV SV |
| X'851000' | MC | 16 | Character (variable length) | Management class | LD SD(e) |

*Table 15. Command SFIs (continued)*

| SFI Number | SFI Name | SFI Length | SFI Data Type | Data Description | Subcommand |
|---|---|---|---|---|---|
| X'852000' | MDS | 52 | Character (variable length) | Control data set name | LC |
| X'853000' | MDTJ | 12 | Packed decimal Julian date format | Control data set create date | LC |
| X'854000' | MEDA | 9 | Binary(8) | Media special attributes: 0=NONE 1=RDCOMPAT | LV SV |
| X'855000' | MEDC | 9 | Binary(8) | Media compaction 0=UNDEFINED 1=NO 2=YES | LV SV |
| X'856000' | MEDN | 16 | Character (variable length) | Media name | CV LC LB LR LV SB SR SV |
| X'857000' | MEDR | 9 | Binary(8) | Recording technology: 0=NON-CARTRIDGE 1=18TRK 2=36TRK 3=128TRK 4=256TRK 5=384TRK 6=EFMT1 | LV SV |
| X'858000' | MEDT | 9 | Binary(8) | Media type: 0=UNDEFINED 1=CST 2=ECCST 3=HPCT 4=EHPCT 5=ETC/MEDIA5 6=EWTC/MEDIA6 7=EETC/MEDIA7 8=EEWTC/MEDIA8 | LV SV |
| X'859000' | MFR | 16 | Character (variable length) | Source location name | LC |
| X'85A000' | MID | 20 | Character (variable length) | Mount message ID | LC |
| X'85A500' | MIV | 14 | Character (fixed length) | Moving-in volume | LB SB |
| X'85A900' | MOV | 14 | Character (fixed length) | Moving-out volume | LB SB |
| X'85B000' | MOVM | 9 | Binary(8) | Move mode: 0=AUTO 1=MANUAL | LV SV(e) |
| X'85C000' | MOP | 9 | Binary(8) | Master overwrite: 1=ADD 2=LAST 3=MATCH 4=USER | LC |
| X'85D000' | MRP | 12 | Binary(31) | Maximum retention period: Min 0, Max 4-digit -1 (negative) means unlimited retention. | LC |
| X'85E000' | MSGF | 9 | Binary(8) | Message text case: 0=MIXED 1=UPPER | LC |
| X'85F000' | MST | 9 | Binary(8) | Move status: 0=UNKNOWN 1=PENDING 2=CONFIRMED 3=COMPLETE | LC |
| X'860000' | MTM | 12 | Packed decimal time format | Control data set create time | LC |

Table 15. Command SFIs (continued)

| SFI Number | SFI Name | SFI Length | SFI Data Type | Data Description | Subcommand |
|---|---|---|---|---|---|
| X'861000' | MTO | 16 | Character (variable length) | Target location name, installation defined name, SHELF, or SMS library name | LC |
| X'862000' | MTP | 9 | Binary(8) | Control data set type: 0=MASTER | LC |
| X'862800' | MTY | 9 | Binary(8) | Move type: 0=NOTRTS 1=RTS | LC |
| X'862B00' | MVBY | 9 | Binary(8) | Move by: 0=VOLUME 1=SET | LC |
| X'863000' | MVS | 9 | Binary(8) | MVS use 0=NO 1=YES | LV SV(e) |
| X'865000' | NLOC | 16 | Character (variable length) | Required location | LV SV(e) |
| X'865200' | NLOT | 9 | Binary(8) | Required location type 0=SHELF 1=STORE_BUILTIN 2=MANUAL 3=AUTO 4=STORE_BINS 5=STORE_NOBINS | LV |
| X'866000' | NME | 16 | Character (variable length) | Security class name | LC LD LV SD(e) SV(e) |
| X'866800' | NOT | 9 | Binary(8) | User notification: 0=NO 1=YES | LC |
| X'867000' | NVL | 14 | Character (fixed length) | Next volume serial | LV SV(e) |
| X'868000' | NVRS | 16 | Character (variable length) | Next VRS name | LS SS |
| X'869000' | OAC | 9 | Binary(8) | Owner access 0=READ 1=UPDATE 2=ALTER | LV SV(e) |
| X'86A000' | OBMN | 16 | Character (variable length) | Old bin number media name | LV SV(e) |
| X'86B000' | OBN | 14 | Character (fixed length) | Old bin number | LV SV(e) |
| X'86B800' | OCE | 9 | Binary(8) | Volume information recorded at O/C/EOV 0=NO 1=YES | LV SV(e) |
| X'86C000' | OLOC | 16 | Character (variable length) | Old location | LV SV(e) |
| X'86C200' | OLOT | 9 | Binary(8) | Old location type 0=SHELF 1=STORE_BUILTIN 2=MANUAL 3=AUTO 4=STORE_BINS 5=STORE_NOBINS 6=IN_CONTAINER | LV |
| X'86D000' | OPL | 10 | Binary(15) | Position of rack number or pool ID Min 1, Max 3-digit | LC Position in the message. |
| X'86E000' | OPM | 9 | Binary(8) | Operating mode 1=M 2=R 3=W 4=P | LC |

*Table 15. Command SFIs (continued)*

| SFI Number | SFI Name | SFI Length | SFI Data Type | Data Description | Subcommand |
|---|---|---|---|---|---|
| X'86F000' | OVL | 10 | Binary(15) | Position of volume serial number: Min 1, Max 3-digit | LC Position in the message. |
| X'86F500' | OVOL | 14 | Character (fixed length) | Old volume | LB SB |
| X'870000' | OWN | 16 | Character (variable length) | Owner | GV LD LO LP LS LV SD(e) SP SS SV |
| X'871000' | OXDJ | 12 | Packed decimal Julian date format | Original expiration date | LD LV SD SV(e) |
| X'871800' | PACS | 9 | Binary(8) | PREACS<br>0=NO<br>1=YES | LC |
| X'871E00' | PDA | 9 | Binary(8) | PDA state:<br>0=Off<br>1=On<br>2=None | LC |
| X'871E10' | PDAC | 9 | Binary(8) | PDA block count: Numeric 2-255 | LC |
| X'871E30' | PDAL | 9 | Binary(8) | PDA log state:<br>0=Off<br>1=On | LC |
| X'871E90' | PDAS | 9 | Binary(8) | PDA block size: Numeric 1-31 | LC |
| X'872000' | PDS | 48 | Character (variable length) | Pool description | LC |
| X'873000' | PDSC | 40 | Character (variable length) | Product description | LP SP(e) |
| X'874000' | PEND | 9 | Bit(8) | Actions pending:<br>'80'=SCRATCH<br>'40'=REPLACE<br>'20'=INIT<br>'10'=ERASE<br>'08'=RETURN<br>'04'=NOTIFY | LV SV |
| X'875000' | PID | 14 | Character (variable length) | Pool prefix | LC LR SR |
| X'876000' | PLN | 16 | Character (variable length) | Pool name | LC |
| X'877000' | PNME | 38 | Character (variable length) | Software product name | LP SP |
| X'878000' | PNUM | 16 | Character (variable length) | Software product number | LP LV SP SV(e) |
| X'879000' | PRD | 12 | Binary(31) | Permanent read errors: Min 0, Max 5-digit | LV SV(e) |
| X'87A000' | PRF | 9 | Binary(8) | Pool definition RACF® (A component of the Security Server for z/OS) option:<br>0=NO<br>1=YES | LC |
| X'87B000' | PRTY | 12 | Binary(31) | Priority: Min 0, Max 4-digit | LS SS |
| X'87C000' | PSFX | 10 | Character (fixed length) | Parmlib member suffix | LC |
| X'87D000' | PSN | 16 | Character (variable length) | Pool definition system ID | LC |
| X'87E000' | PTP | 9 | Binary(8) | Pool definition pool type: 0=SCRATCH 1=RACK | LC |
| X'87F000' | PVL | 14 | Character (fixed length) | Previous volume: 1 - 6 character | LV SV(e) |

*Table 15. Command SFIs (continued)*

| SFI Number | SFI Name | SFI Length | SFI Data Type | Data Description | Subcommand |
|---|---|---|---|---|---|
| X'880000' | PWT | 12 | Binary(31) | Permanent write errors: Min 0, Max 5-digit | LV SV(e) |
| X'881000' | RBN | 12 | Binary(31) | Number of bin numbers in REMOTE location: Min 0, Max 6-digit | LC |
| X'881200' | RBYS | 9 | Binary(8) | Retain by set:<br>0=NO<br>1=YES | LV SV(e) |
| X'882000' | RCF | 9 | Binary(8) | Installation RACF support:<br>1=N<br>2=P<br>3=A | LC |
| X'883000' | RCFM | 12 | Character (variable length) | RECFM | LD SD(e) |
| X'884000' | RCK | 14 | Character (fixed length) | Rack or bin number | AB AR AV CV DB DR LB LP LR LV SB SP(e) SR SV |
| X'886000' | RDTJ | 12 | Packed decimal Julian date format | Last control data set extract date | LC |
| X'888000' | RET | 11 | Binary(8) | Retention type:<br>1st byte:<br>1=RETAIN WHILE CATALOGED<br>2nd byte:<br>1=RETAIN UNTIL EXPIRED<br>3rd byte:<br>1=CYCLES<br>2=DAYS<br>3=REFDAYS<br>4=VOLUMES<br>5=EXTRA DAYS<br>6=BY DAYS CYCLE | LS SS |
| X'88A000' | RST | 9 | Binary(8) | Rack or bin status<br>0=EMPTY<br>1=FREE<br>2=INUSE | LB LR SB SR |
| X'88B900' | RTBY | 9 | Binary(8) | Retain by: 0=VOLUME<br>1=SET | LC |
| X'88C000' | RTDJ | 12 | Packed decimal Julian date format | Retention date | LD LV SD(e) SV |
| X'88E000' | RTM | 12 | Packed decimal time format | Last control data set extract time | LC |
| X'88E500' | RUB | 9 | Binary(8) | Reuse bin at<br>0=CONFIRMMOVE<br>1=STARTMOVE | LC |
| X'890000' | SC | 16 | Character (variable length) | Storage class name | LD SD(e) |
| X'891000' | SCRM | 9 | Binary(8) | Binary value 0=Auto<br>1=manual | LC |
| X'892000' | SCST | 9 | Bit(8) | Security class status<br>'80'=SMF<br>'40'=MSGOPT<br>'20'=ERASE | LC |
| X'894000' | SC1 | 12 | Binary(31) | Storenumber Min 1, Max 5-digit | LS SS(e) |

Table 15. Command SFIs *(continued)*

| SFI Number | SFI Name | SFI Length | SFI Data Type | Data Description | Subcommand |
|---|---|---|---|---|---|
| X'895000' | SDTJ | 12 | Packed decimal Julian date format | Movement tracking date | LV SV(e) |
| X'896000' | SEC | 9 | Binary(8) | Security class number Min 0, Max 255 | LC |
| X'898000' | SEQ | 12 | Binary(31) | Volume sequence Min 1, Max 4-digit | LV |
| X'89A000' | SG | 16 | Character (variable length) | Storage group name | LD LV SD(e) SV(e) |
| X'89B000' | SID | 16 | Character (variable length) | DFSMSrmm system ID | LC |
| X'89C000' | SLM | 10 | Binary(15) | MAXHOLD value Min 10, Max 500 | LC |
| X'89E000' | SMI' | 10 | Binary(15) | Offset to message ID Min 0, Max 3-digit | LC |
| X'89E210' | SMP | 9 | Binary(8) | System-managed tape purge:<br>0=NO<br>1=YES<br>2=ASIS | LC |
| X'89E220' | SMU | 9 | Bit(8) | System-managed tape update:<br>20=Command<br>40=Scratch<br>80=Exits<br>N/A | LC |
| X'89F000' | SOSJ | 12 | Packed decimal Julian date format | Last expiration processing start date | LC |
| X'8A0000' | SOSP | 16 | Character (variable length) | Scratch procedure name | LC |
| X'8A1000' | SOST | 12 | Packed decimal time format | Last expiration processing start time | LC |
| X'8A1A00' | SRHN | 71 | Character (variable length) | Server host name 1-to-63 alphanumeric characters including hyphen, period, and blank | LC |
| X'8A1A30' | SRIP | 23 | Character (variable length) | Server IP address 1-to-15 numeric characters including period and blank | LC |
| X'8A1A50' | SRPN | 12 | Binary (31) | Server number binary value | LC |
| X'8A1AF0' | SRTK | 12 | Binary (31) | Server tasks binary value | LC |
| X'8A2000' | SSM | 10 | Binary(15) | SMF security record number 128-255 = record number | LC |
| X'8A2500' | SSTY | 9 | Binary (8) | Subsystem type<br>0=Standard system<br>1=Client system<br>2=Server system | LC |
| X'8A3000' | STEP | 16 | Character (variable length) | Step name | LD SD(e) |
| X'8A3800' | STVC | 12 | Binary(31) | Count of volumes stacked on a stacked volume | LV VOL SV(e) |
| X'8A4000' | SUR | 28 | Character (variable length) | Surname | LO |
| X'8A5000' | SYS | 16 | Character (variable length) | SMF System ID | LD SD(e) |

*Table 15. Command SFIs (continued)*

| SFI Number | SFI Name | SFI Length | SFI Data Type | Data Description | Subcommand |
|---|---|---|---|---|---|
| X'8A6000' | TAC | 9 | Binary(8) | Reject type 0=ANYUSE 1=OUTPUT | LC |
| X'8A7000' | TRD | 12 | Binary(31) | Temporary read errors Min 0, Max 5-digit | LV SV(e) |
| X'8A7900' | TVXP | 9 | Binary(8) | Extradays retention: 0=RELEASE 1=EXPIRE 2=NONE | LC |
| X'8A8000' | TWT | 12 | Binary(31) | Temporary write errors: Min 0, Max 5-digit | LV SV(e) |
| X'8A9000' | TYP | 9 | Bit(8) | VRS type: '80'=GDG '40'=PSEUDGDG '20'=DSNAME '10'=VOLUME '08'=NAME | LS SS(e) |
| X'8AA000' | UDTJ | 12 | Packed decimal Julian date format | Late update date | LC |
| X'8AB001' | UID | 16 | Character (variable length) | User ID. The SFI is incremented by one for each UID that is found. (X'8AB001'-X'8AB00C') | LV SV(e) |
| X'8AC000' | UNC | 9 | Binary(8) | Uncatalog option: 0=N 1=Y 2=S | LC |
| X'8AD000' | USEC | 12 | Binary(31) | Volume use count: Min 0, Max 5-digit | LV SV(e) |
| X'8AE000' | USEM | 12 | Binary(31) | Volume usage (KB): Min 0, Max 10-digit | LV SV(e) |
| X'8AE800' | UTM | 12 | Packed decimal time format | Late update time | LC |
| X'8AF001' | VAC | 9 | Binary(8) | Volume access: 0=NONE 1=READ 2=UPDATE | LV SV(e) |
| X'8B0000' | VACT | 9 | Binary(8) | VRSMIN action: 0=FAIL 1=INFO 2=WARN | LC |
| X'8B0800' | VANX | 9' | Binary(8) | Next VRS type: 0=Undefined 1=Next 2=And | LS SS |
| X'8B0B00' | VCAP | 12 | Binary(31) | Volume capacity | LV SV(e) |
| X'8B1000' | VCHG | 9 | Binary(8) | VRSCHANGE value: 0=INFO 1=VERIFY | LC |
| X'8B2000' | VDD | 10 | Binary(15) | VRS delay days: Min 0, Max 99 | LS SS(e) |
| X'8B3000' | VDTJ | 12 | Packed decimal time format | Last inventory management processing date | LC |
| X'8B4000' | VER | 14 | Character (variable length) | Software produce version, release, modification **vvrrmm** | LP LV SP SV(e) |
| X'8B5000' | VJBN | 16 | Character (variable length) | Primary VRS job name | LD LS SD(e) SS |
| X'8B6000' | VLN | 12 | Binary(31) | Number of volumes: Min 0, Max 3-digit | LO LP SP |

*Table 15. Command SFIs (continued)*

| SFI Number | SFI Name | SFI Length | SFI Data Type | Data Description | Subcommand |
|---|---|---|---|---|---|
| X'8B7000' | VM | 9 | Binary(31) | VM use: 0=NO 1=YES | LV SV(e) |
| X'8B8000' | VMIN | 12 | Binary(31) | VRSMIN count value: Min 0, Max 6-digit | LC |
| X'8B9000' | VMV | 16 | Character (variable length) | VRS management value | LD SD(e) |
| X'8B9100' | VWMC | 12 | Binary(31) | Volume write mount count | LV, SV(e) |
| X'8B9E00' | VNDR | 16 | Character (8) | Vendor information | LV, SV(e) |
| X'8BA000' | VNME | 52 | Character (variable length) | Primary VRS name | LD SD(e) |
| X'8BC000' | VOL | 14 | Character (fixed length) | 1 - 6 characters volume serial | AV CV GV LB LD LP LR LV SB SD SP SR SV |
| X'8BC200' | VOLT | 9 | Binary(8) | Volume type: 0=PHYSICAL 1=LOGICAL 2=STACKED | LV VOL |
| X'8BCD00' | VOL1 | 14 | Character (fixed length) | VOL1 label volume serial number | LV SV(e) |
| X'8BC300' | VPCT | 9 | Binary(8) | Volume percent full | LV SV(e) |
| X'8BD000' | VRC | 12 | Binary(31) | Vital record count: Min 1, Max 5-digit | LS SS(e) |
| X'8BE000' | VRJ | 9 | Binary(8) | VRS job name: 1 or 2 | LC |
| X'8BF000' | VRS | 52 | Character (variable length) | Vital record specification name | LS SS |
| X'8BF500' | VRSI | 9 | Binary(8) | Release action scratch immediate: 0=NO 1=YES | LS LV SS SV(e) |
| X'8BFA00' | VRSL | 9 | Binary(8) | VRSEL value: 0=OLD, 1=NEW | LC |
| X'8C0000' | VRSR | 9 | Binary(8) | VRS retained status: 0=NO 1=YES | LD SD(e) |
| X'8C0800' | VRXI | 9 | Binary(8) | Expiration date ignore: 0=NO 1=YES | LV LS SS SV(e) |
| X'8C1000' | VSCD | 12 | Packed decimal Julian date format | Primary VRS subchain start date | LD SD(e) |
| X'8C1800' | VSCN | 16 | Character (variable length) | Primary VRS subchain name | LD SD(e) |
| X'8C2000' | VST | 9 | Bit(8) | Volume status: ’80’=MASTER ’40’=SCRATCH ’20’=USER ’10’=INIT ’08’=ENTRY | LV SV |
| X'8C3000' | VTM | 12 | Packed decimal time format | Last inventory management VRS time | LC |
| X'8C4000' | VTYP | 9 | Binary(8) | Matching VRS type: 0=UNDEFINED 1=DATASET 2=SMSMC 3=VRSMV 4=DSNMV 5=DSNMC | LD SD(e) |
| X'8C4500' | WWID | 32 | Character (24) | World-wide identifier | LV, SV (e) |
| X'8C5000' | XDC | 9 | Binary(8) | Expiration date check: 0=NO 1=YES 2=OPERATOR | LC |

*Table 15. Command SFIs (continued)*

| SFI Number | SFI Name | SFI Length | SFI Data Type | Data Description | Subcommand |
|---|---|---|---|---|---|
| X'8C6000' | XDTJ | 12 | Packed decimal Julian date format | Expiration date | LC LD LV SD SV |
| X'8C7000' | XTM | 12 | Packed decimal time format | Last inventory management expiration time | LC |
| X'8C7800' | X100 | 9 | Binary(8) | EDGUX100 installation exit status: 0=No exit 1=Enabled 2=Disabled | LC |
| X'8C7801' | X200 | 9 | Binary(8) | EDGUX200 installation exit status: 0=No exit 1=Enabled 2=Disabled | LC |
| X'8C8000' | 2JBN | 16 | Character (variable length) | Secondary VRS jobname mask | LD SD(e) |
| X'8C9000' | 2NME | 16 | Character (variable length) | Secondary VRS mask | LD SD(e) |
| X'8CA000' | 2SCD | 12 | Packed decimal Julian date format | Secondary VRS subchain start date | LD SD(e) |
| X'8CB000' | 2SCN | 16 | Character (variable length) | Secondary VRS subchain name | LD SD(e) |

# Appendix B. Structured Field Introducers by Subcommand

Table 16 lists the structured field introducers by DFSMSrmm TSO subcommand.

The RMM SEARCHDATASET, RMM SEARCHPRODUCT, RMM SEARCHVOLUME, and RMM SEARCHVRS subcommands return different sets of SFIs depending on if you specify the EDGXCI macro EXPAND=YES or EXPAND=NO parameter. When you specify the EXPAND=YES parameter, these subcommands return the same information as their corresponding RMM LIST subcommands: RMM LISTDATASET, RMM LISTPRODUCT, RMM LISTVOLUME, and RMM LISTVRS.

*Table 16. Structured Field Introducers by Subcommand*

| Subcommand | Structured Field Introducers |
|---|---|
| ADDBIN | CNT ENTN MSGL MSGN RCK RSNC RTNC SVCN |
| ADDDATASET | ENTN MSGL MSGN RSNC RTNC SVCN |
| ADDOWNER | ENTN MSGL MSGN RSNC RTNC SVCN |
| ADDPRODUCT | ENTN MSGL MSGN RSNC RTNC SVCN |
| ADDRACK | CNT ENTN MSGL MSGN RCK RSNC RTNC SVCN |
| ADDVOLUME | CLIB CNT CSG ENTN FRC FRS MSGL MSGN RCK RSNC RTNC SVCN VOL |
| ADDVRS | ENTN MSGL MSGN RSNC RTNC SVCN |
| CHANGEDATASET | ENTN MSGL MSGN RSNC RTNC SVCN |
| CHANGEOWNER | ENTN MSGL MSGN RSNC RTNC SVCN |
| CHANGEPRODUCT | ENTN MSGL MSGN RSNC RTNC SVCN |
| CHANGEVOLUME | CLIB CSG ENTN FRC FRS MEDN MSGL MSGN RCK RSNC RTNC SVCN |
| DELETEBIN | CNT ENTN MSGL MSGN RCK RSNC RTNC SVCN |
| DELETEDATASET | ENTN MSGL MSGN RSNC RTNC SVCN |
| DELETEOWNER | ENTN MSGL MSGN RSNC RTNC SVCN |
| DELETEPRODUCT | ENTN MSGL MSGN RSNC RTNC SVCN |
| DELETERACK | CNT ENTN MSGL MSGN RCK RSNC RTNC SVCN |
| DELETEVOLUME | CLIB ENTN FRC FRS MSGL MSGN RSNC RTNC SVCN |
| DELETEVRS | ENTN MSGL MSGN RSNC RTNC SVCN |
| GETVOLUME | ENTN FRC FRS MSGL MSGN OWN RSNC RTNC SVCN VOL |
| LISTBIN | ENTN LINE LOC MIV MOV MEDN MSGL MSGN OVOL RCK RSNC RST RTNC SVCN VOL |
| LISTCONTROL | ACCT ACS ACT AST AUD BDTJ BKPP BLP BTM CACT CATS CDS CDSU CLS CMDD CMDO CRP CSDT CSHN CSIP CSTM CSVE DBN DDTJ DNM DRP DSPD DSPM DTE DTM EBIN ENTN FCSP FDB FLB FRB FRK GRK IPL JBDT JBTM JDS JRNF JRNS JRNU LBN LCT LCTK LDDF LDLC LDLT LDMN LDMT LDPR LINE LOCT LRK MDS MDTJ MEDN MFR MID MOP MRP MSGF MSGL MSGN MST MTM MTO MTP MTY MVBY NME NOT OPL OPM OVL PACS PDA PDAC PDAL PDAS PDS PID PLN PRF PSFX PSN PTP RBN RCF RDTJ RSNC RTBY RTM RTNC RUB SCRM SCST SEC SID SLM SMI SMP SMU SOSJ SOSP SOST SRHN SRIP SRPN SRTK SSM SSTY SVCN TAC TVXP UDTJ UNC UTM VACT VCHG VDTJ VMV VRJ VRSL VTM V1 XDC XDTJ XTM X100 X200 |

*Table 16. Structured Field Introducers by Subcommand (continued)*

| **Subcommand** | **Structured Field Introducers** |
|---|---|
| LISTDATASET | ABND BLKC BLKS BLKT CDTJ CJBN CLS CPGM CTLG CTM DC DD DEV DLRJ DLWJDPCT DSEQ DSN ENTN FILE LINE LPGM LRCL MC MSGL MSGN NME OWN OXDJ RCFM RSNC RTDJ RTNC SC SG STEP SVCN SYS VJBN VNME VOL VRSR VSCD VSCN VTYP XDTJ 2JBN 2NME 2SCD 2SCN |
| LISTOWNER | ADL DPT EMN EMU ENTN ETL FOR ITL LINE MSGL MSGN OWN RSNC RTNC SUR SVCN VLN |
| LISTPRODUCT | ENTN FCD LINE MSGL MSGN OWN PDSC PNME PNUM RCK RSNC RTNC SVCN VER VLN VOL |
| LISTRACK | ENTN LINE LOC MEDN MSGL MSGN PID RCK RSNC RST RTNC SVCN VOL |
| LISTVOLUME | ACN ACT ADTJ ATM AVL BIN BMN CDTJ CJBN CLS CTM CTNR DBIN DBMN DEN DESC DEST DLRJ DLWJ DSC DSN DSR DSTT ENTN FCD HLOC HLOT INTR LBL LCID LDEV LINE LOAN LOC LOCT LVC LVN MEDA MEDC MEDN MEDR MEDT MOVM MSGL MSGN MVS NLOC NLOT NME NVL OAC OBMN OBN OCE OLOC OLOT OWN OXDJ PEND PNUM PRD PVL PWT RBYS RCK RSNC RTDJ RTNC SDTJ SEQ SG STVC SVCN TRD TWT UID01...UID12 USEC USEM VAC VCAP VER VM VMIN VNDR VOL VOLT VOL1 VPCT VRSI VRXI VST VWMC WWID XDTJ |
| LISTVRS | DESC DDTJ ENTN LINE LOC MSGL MSGN NVRS OWN PRTY RET RSNC RTNC SC1 SVCN TYP VANX VDD VJBN VRC VRS VRSI VRXI |
| SEARCHBIN | ENTN LINE LOC MEDN MIV MOV MSGL MSGN OVOL RCK RSNC RST RTNC SVCN VOL |
| SEARCHDATASET | CDTJ CTM DSN ENTN FILE KEYF KEYT LINE MSGL MSGN OWN OXDJ RSNC RTNC SVCN VOL XDTJ |
| SEARCHDATASET(EXPAND=YES) | The same SFIs as the LISTDATASET subcommand. |
| SEARCHPRODUCT | ENTN FCD LINE MSGL MSGN OWN PNME PNUM RSNC RTNC SVCN VER VLN VOL |
| SEARCHPRODUCT(EXPAND=YES) | The same SFIs as the LISTPRODUCT subcommand. |
| SEARCHRACK | ENTN LINE LOC MEDN MSGL MSGN PID RCK RSNC RST RTNC SVCN VOL |
| SEARCHVOLUME | ADTJ AVL DESC DSC DSR ENTN HLOC INTR KEYF KEYT LBL LINE LOAN LOC LVC LVN MEDA MEDC MEDN MEDR MEDT MSGL MSGN OWN PEND RCK RSNC RTDJ RTNC SEQ SVCN TYPF TYPT VOL VST XDTJ |
| SEARCHVOLUME(EXPAND=YES) | The same SFIs as the LISTVOLUME subcommand. |
| SEARCHVRS | DDTJ ENTN LINE LOC MSGL MSGN NVRS OWN PRTY RET RSNC RTNC SVCN VANX VJBN VRS VRSI VRXI |
| SEARCHVRS(EXPAND=YES) | The same SFIs as the LISTVRS subcommand. |

# Appendix C. DFSMSrmm Application Programming Interface Mapping Macros

DFSMSrmm API macros can be used to generate mappings: This section discusses:

- The parameter list generated by the list form of the EDGXCI macro as shown in Figure 49 “EDGXCI: Parameter List”
- The structured field definitions generated by the EDGXSF macro as shown in “EDGXSF: Structured Field Definitions” on page 100

## EDGXCI: Parameter List

The mapping of the parameter list, which is generated by the list form of the EDGXCI macro, is a Product-sensitive Programming Interface.

The EDGXCI mapping macro is provided for information only. Although the fields and values of the parameter list are shown here, your application program should not directly access and modify the parameter list. Always use macro EDGXCI.

```
MYPL     DS    0D                ++ EDGXCI PARM LIST
MYPL_XVERSION DS XL1             ++ INPUT XVERSION
MYPL_XOPERATION DS XL1           ++  XOPERATION
MYPL_XOPERATION_BEGIN EQU 0      ++ XOPERATION.BEGIN KEYWORD
MYPL_XOPERATION_CONTINUE EQU 1   ++ XOPERATION.CONTINUE KEYWORD
MYPL_XOPERATION_RELEASE EQU 2    ++ XOPERATION.RELEASE KEYWORD
MYPL_XOPERATION_ENDALL EQU 3     ++ XOPERATION.ENDALL KEYWORD
MYPL_XOUTPUT DS XL1              ++  XOUTPUT
MYPL_XOUTPUT_LINES EQU 0         ++ XOUTPUT.LINES KEYWORD
MYPL_XOUTPUT_FIELDS EQU 1        ++ XOUTPUT.FIELDS KEYWORD
MYPL_XEXPAND DS XL1              ++  XEXPAND
MYPL_XEXPAND_YES EQU 0           ++ XEXPAND.YES KEYWORD
MYPL_XEXPAND_NO EQU 1            ++ XEXPAND.NO KEYWORD
MYPL_XAPIADDR DS A               ++   XAPIADDR
MYPL_XOUTBUFADDR DS A            ++   XOUTBUFADDR
MYPL_XSUBCMDADDR DS A            ++   XSUBCMDADDR
MYPL_XTOKEN DS CL4               ++   XTOKEN
MYPL_XRSV0001 DS CL8             ++ RESERVED  XRSV0001
MYPL_XRSV0002 DS CL4             ++ RESERVED  XRSV0002
MYPL_XRSV0003 DS CL8             ++ RESERVED  XRSV0003
MYPLL    EQU   *-MYPL            ++ LENGTH OF PLIST
```

*Figure 49. Mapping of the Parameter List Using the List Form of EDGXCI*

## EDGXSF: Structured Field Definitions

Use macro EDGXSF in your application program to define the data that the DFSMSrmm API returns in your output buffer. This section includes:

- "EDGXSF Parameters"
- "EDGXSF Mapping" on page 101
- "EDGXSF Labeling Conventions" on page 101

## EDGXSF Parameters

The EDGXSF parameters are:

**DSECT=YES**
**DSECT=NO**
An optional parameter that specifies whether a DSECT statement is generated. The default is DSECT=YES.

**DSECT=YES**
Indicates that a DSECT statement should be generated.

**DSECT=NO**
Indicates that a DSECT statement should not be generated.

**,LIST=YES**
**,LIST=NO**
An optional parameter that specifies whether the macro expansion is printed. The default is LIST=YES.

**,LIST=YES**
Indicates to print the expansion.

**,LIST=NO**
Indicates do not print the expansion.

**,TITLE=YES**
**,TITLE=NO**
An optional parameter that specifies whether the macro title is printed. The default is TITLE=YES.

**,TITLE=YES**
Indicates to print the title.

**,TITLE=NO**
Indicates do not print the title

## EDGXSF Mapping

Always use macro EDGXSF to determine the exact labels used to define the DFSMSrmm SFIs. Figure 50 shows the dummy control section and the data types that define the generic mapping for the SFIs defined in Appendix A, "Structured Field Introducers," on page 79.

```
         EDGXSF
*
* ******************************************************************
* *    Output Buffer
* ******************************************************************
*
XSF_OUTBUF           DSECT    Output Buffer
XSF_OUTBUF_BUFLNG    DS       1FL4    Buffer Length
XSF_OUTBUF_RQDLNG    DS       1FL4    Required Buffer Length
XSF_OUTBUF_DATALNG   DS       1FL4    Length of Output Data
XSF_OUTBUF_FIELDS    DS       0C      Start of Structured Fields
*
* ******************************************************************
* *    Structured Field Introducers for Structured Fields
* ******************************************************************
*
XSF_SFI         DSECT           Structured Field Introducers
XSF_SFI_LENGTH  DS   1FL2      Length
XSF_SFI_ID      DS   1CL0003   ID (identifier)
                ORG  XSF_SFI_ID
XSF_SFI_IDVAL   DS   1CL0002   ID (Identifier Value)
XSF_SFI_IDQUAL  DS   1CL0001   ID (Identifier Qualifier)
XSF_SFI_TYPE    DS   1FL1      Type
                DS   1CL0001   Reserved
XSF_SFI_DTYPE   DS   1FL1      Data type
XSF_SFI_LEN     EQU  *-XSF_SFI
XSF_SFI_DATA    DS   0C        Start of Data
*
* ********************************************************************
* *    Data Types (XSF_SFI_DTYPE)                                   **
* ********************************************************************
*
XSF_SFI_DTYPE_UNDEF     EQU  X'00' Undefined data
XSF_SFI_DTYPE_CHAR_FIX  EQU  X'01' n-byte character
XSF_SFI_DTYPE_BITFLAG   EQU  X'02' 1-byte bit flag byte (8 bits)
XSF_SFI_DTYPE_BIN8      EQU  X'03' 1-byte (hex) value
XSF_SFI_DTYPE_BIN15     EQU  X'04' 2-byte hex value
XSF_SFI_DTYPE_BIN31     EQU  X'05' 4-byte hex value
XSF_SFI_DTYPE_CHAR_VAR  EQU  X'07' Variable length character
XSF_SFI_DTYPE_JDATE     EQU  X'09' 4-byte packed decimal date yyyydddC
XSF_SFI_DTYPE_TIME      EQU  X'0A' 4-byte packed decimal time hhmmsstC
*
```

*Figure 50. Mapping: Output Buffer and Structured Field Introducers*

## EDGXSF Labeling Conventions

This section includes the labeling conventions used in macro EDGXSF. The conventions are provided to assist you until such time as you are able to obtain macro EDGXSF.

### Labeling: Begin and End Resource Groups

Resource groups, except for VOL and VRS, are defined using the following format:

- XSF_SFI_ID_xxxx and XSF_xxxx_LENGTH
- XSF_SFI_ID_Exxxx and XSF_Exxxx_LENGTH

Figure 51 shows the ACCESS resource group.

```
* *******************************************************************
* **   Begin and End ACCESS                                       **
* *******************************************************************
XSF_SFI_ID_ACCESS  EQU X'021000'
XSF_ACCESS_LENGTH  EQU X'0008'
*
XSF_SFI_ID_EACCESS EQU X'021080'
XSF_EACCESS_LENGTH EQU X'0008'
```

*Figure 51. Mapping of the Begin and End ACCESS Group*

The VOL and VRS groups are defined using the following format:

- XSF_SFI_ID_xxx and XSF_xxxGRP_LENGTH
- XSF_SFI_ID_Exxx and XSF_ExxxGRP_LENGTH

Figure 52 shows an example of the VOL resource group.

```
* *******************************************************************
* **   Begin and End VOL                                          **
* *******************************************************************
XSF_SFI_ID_VOL     EQU X'036000'
XSF_VOLGRP_LENGTH  EQU X'0008'

XSF_SFI_ID_EVOL    EQU X'036080'
XSF_EVOLGRP_LENGTH EQU X'0008'
```

*Figure 52. Mapping of the Begin and End VOL Group*

## Labeling: SFIs that Introduce Data

SFIs introduce data and are defined using the following format:

- XSF_SFI_xxxx_ID
- XSF_xxxx_LENGTH
- XSF_xxxx_DTYPE

Figure 53 shows an example of the ATM SFI.

```
* *******************************************************************
XSF_SFI_ATM_ID EQU X'806000' Assigned Time
XSF_ATM_LENGTH EQU X'000C'
XSF_ATM_DTYPE  EQU X'0A'
* *******************************************************************
```

*Figure 53. Mapping of the ATM SFI*

## Labeling: Flags

Output data for some SFIs are defined as bit flags using the following format: XSF_xxxx_FLAG_name.

Figure 54 on page 103 shows an example of the ACT SFI.

```
* ********************************************************************
XSF_SFI_ACT_ID EQU X'802000' Actions on Release
XSF_ACT_LENGTH EQU X'0009'
XSF_ACT_DTYPE  EQU X'02'
*
XSF_ACT_FLAG_SCRATCH EQU X'80'
XSF_ACT_FLAG_REPLACE EQU X'40'
XSF_ACT_FLAG_INIT    EQU X'20'
XSF_ACT_FLAG_ERASE   EQU X'10'
XSF_ACT_FLAG_RETURN  EQU X'08'
XSF_ACT_FLAG_NOTIFY  EQU X'04'
* ********************************************************************
```

*Figure 54. Mapping of the ACT SFI*

## Labeling: Bin(8) Data

Output data for some SFIs are defined as one-byte binary numbers using the following format: XSF_xxxx_DATA_name.

Figure 55 shows an example of the LOCT SFI.

```
* ********************************************************************
XSF_SFI_LOCT_ID EQU X'84E000' Location Type
XSF_LOCT_LENGTH EQU X'0009'
XSF_LOCT_DTYPE  EQU X'03'
*
XSF_LOCT_DATA_SHELF               EQU X'00'
XSF_LOCT_DATA_STORE_BUILTIN_BINS  EQU X'01'
XSF_LOCT_DATA_MANUAL              EQU X'02'
XSF_LOCT_DATA_AUTO                EQU X'03'
XSF_LOCT_DATA_STORE_BINS          EQU X'04'
XSF_LOCT_DATA_STORE_NOBINS        EQU X'05'
XSF_LOCT_DATA_INCTNR              EQU X'06'
* ********************************************************************
```

*Figure 55. Mapping of the LOCT SFI*

## Unlabeled Data

The following output data types are unlabeled:

- Fixed-length and variable-length character data
- Two-byte binary values
- Four-byte binary values
- Dates
- Times

# Appendix D. Hexadecimal Example of an Output Buffer

This appendix provides an example and discussion of a hexadecimal representation of the contents of an output buffer for a SEARCHDATASET subcommand request. You can modify this example for use in your installation.

## Hexadecimal Representation of an Output Buffer

Figure 56 is a hexadecimal representation of the contents in an output buffer that might be produced for the SEARCHDATASET VOLUME(VOL001) subcommand shown in “Requesting Standard Output” on page 54. The following format is used:

- Relative buffer address shown as 2-byte values.
- Buffer contents are shown in groups of 8-bytes.

```
0000 0000100000000000 0000007100080260 00000000001B82A0 00000007D6E6D5C5
0020 D9D6D5C54BC6C9C5 D3C44BE3C5E2E300 0E8BC000000001E5 D6D3F0F0F1001087
0040 0000000007D6E6D5 C5D9D6D5C5000C81 3000000009199711 7C000C81A0000000
0060 0A0815270C000C83 3000000005000000 0100080260800000 0000000000000000
0080 0000000000000000 0000000000000000 0000000000000000 0000000000000000

0FFC 0000000000000000 0000000000000000 0000000000000000 0000000000000000
0FFE 0000000000000000 0000000000000000 0000000000000000 0000000000000000
```

*Figure 56. Hexadecimal Representation of the Contents of an Output Buffer*

## Description of the Contents of an Output Buffer

The first line of the output buffer shown in Figure 56 shows:

```
0000 0000100000000000 0000007100080260 00000000001B82A0 00000007D6E6D5C5
```

- Three 4-byte length fields:

  00001000

  This is the length you specified for the output buffer.

  00000000

  This means that the output buffer is large enough. When the buffer length is too small, DFSMSrmm sets this field with the size of the buffer needed. DFSMSrmm also returns return code 108 and reason code 10.

  00000071

  This is the total size of the data in the output buffer, including the length of this field. You can use this data length to determine when there is no more data to process.

- Eight structured fields:

  0008026000000000

  This is the Begin DATASET group SFI, which begins at offset x’000C’ into the output buffer. Use this SFI to confirm that you are processing a DATASET SFI. When you do not want to process a group of structured fields, scan to the end of the group by looking for the corresponding End SFI, such as, the End DATASET group SFI in this example.

The first and second lines of the output buffer shown in Figure 56 on page 105 show:

```
0000 0000100000000000 0000007100080260 00000000001B82A0 00000007D6E6D5C5
0020 D9D6D5C54BC6C9C5 D3C44BE3C5E2E300 0E8BC000000001E5 D6D3F0F0F1001087
```

- Data Set Name structured field

  001B82A000000007 D6E6D5C5D9D6D5C54BC6C9C5D3C44BE3C5E2E3

  This is the Data Set Name structured field, which begins at offset x'0014' into the output buffer. The structured field consists of the 8-byte DSN SFI and, in this example, the 19-byte data set name (OWNERONE.FIELD.TEST). The length of the structured field is 27 bytes (8 plus 19) as shown by the x'001B' value at the beginning of the field.

- Volume Serial structured field

  000E8BC000000001 E5D6D3F0F0F1

  This is the Volume Serial structured field, which begins at offset x'002F' into the output buffer. The structured field consists of the 8-byte VOL SFI and the 6-byte volume serial (VOL001).

The second and third lines of the output buffer shown in Figure 56 on page 105 show:

```
0020 D9D6D5C54BC6C9C5 D3C44BE3C5E2E300 0E8BC000000001E5 D6D3F0F0F1001087
0040 0000000007D6E6D5 C5D9D6D5C5000C81 3000000009199711 7C000C81A0000000
```

- Owner structured field

  0010870000000007 D6E6D5C5D9D6D5C5

  This is the Owner structured field, which begins at offset x'003D' into the output buffer. The structured field consists of the 8-byte OWN SFI and the 8-byte owner (OWNERONE).

- Create Date structured field

  000C813000000009 1997117C

  This is the Create Date structured field, which begins at offset x'004D' into the output buffer. The structured field consists of the 8-byte CDTJ SFI and the 4-byte packed-decimal date (x'1997117C').

The third and fourth lines of the output buffer shown in Figure 56 on page 105 show:

```
0040 0000000007D6E6D5 C5D9D6D5C5000C81 3000000009199711 7C000C81A0000000
0060 0A0815270C000C83 3000000005000000 0100080260800000 0000000000000000
```

- Create Time structured field

  000C81A00000000A 0815270C

  This is the Create Time structured field, which begins at offset x'0059' into the output buffer. The structured field consists of the 8-byte CTM SFI and the 4-byte packed-decimal time (x'0815270C').

- Physical File Sequence structured field

  000C833000000005 00000001

  This is the Physical File Sequence structured field, which begins at offset x'0065' into the output buffer. The structured field consists of the 8-byte FILE SFI and the 4-byte binary sequence number (x'00000001').

- End DATASET group SFI

  0008026080000000

  This is the End DATASET group SFI, which begins at offset x'0071' into the output buffer.

## Processing the Contents of an Output Buffer

To process the contents of an output buffer, consider using the following guidelines:

1. Base the XSF_OUTBUF definition in macro EDGXSF as shown in Figure 57 on the address of the output buffer you are interested in.

```
XSF_OUTBUF          DSECT    Output Buffer
XSF_OUTBUF_BUFLNG   DS       1FL4    Buffer Length
XSF_OUTBUF_RQDLNG   DS       1FL4    Required Buffer Length
XSF_OUTBUF_DATALNG  DS       1FL4    Length of Output Data
XSF_OUTBUF_FIELDS   DS       0C      Start of Structured Fields
```

*Figure 57. Output Buffer Definition*

2. Base the XSF_SFI definition in macro EDGXSF as shown in Figure 58 on the address of XSF_OUTBUF_FIELDS.

```
XSF_SFI        DSECT          Structured Field Introducers
XSF_SFI_LENGTH DS   1FL2      Length
XSF_SFI_ID     DS   1CL0003   ID (identifier)
               ORG  XSF_SFI_ID
XSF_SFI_IDVAL  DS   1CL0002   ID (Identifier Value)
XSF_SFI_IDQUAL DS   1CL0001   ID (Identifier Qualifier)
XSF_SFI_TYPE   DS   1FL1      Type
               DS   1CL0001   Reserved
XSF_SFI_DTYPE  DS   1FL1      Data type
XSF_SFI_LEN    EQU  *-XSF_SFI
XSF_SFI_DATA   DS   0C        Start of Data
```

*Figure 58. SFI Definition*

3. Find the type of structured field you are processing by using the two-byte structured field identifier at XSF_SFI_IDVAL. The values of XSF_SFI_IDQUAL for ADL, address line SFI, and UID, User ID SFI, described in Appendix A, "Structured Field Introducers," on page 79 are not constant values.
4. Move to the next structured field by adding the length at XSF_SFI_LENGTH to the XSF_SFI pointer.
5. Verify that you have reached the end of the valid data in the output buffer by using the length of the output data at XSF_OUTBUF_DATALNG.
6. Determine the type of data you are processing, by using the value in XSF_SFI_DTYPE.
7. Obtain the length of the data that starts at XSF_SFI_DATA, by subtracting XSF_SFI_LEN from the structured field length at XSF_SFI_LENGTH. in the output buffer.
8. Move to the end of the SFI by adjusting the pointer. In this example, when your pointer is at offset x'00000071' into the output buffer, there are two indicators that you are done with the contents of the buffer:
   - You are looking at the End DATASET group SFI.
   - Adjusting the XSF_SFI pointer by the length of this SFI (8 bytes) points you past the last byte of data in the buffer.
9. Repeat these steps to process each structured field.

In the examples shown in Figure 57 and Figure 58:

- Adding the length of the data (x'00000071') at XSF_OUTBUF_DATALNG to the address of XSF_OUTBUF_DATALNG results in the address just beyond the last byte of data in the output buffer. You might find this a useful double-check to ensure that you are looking at valid data.

- Your XSF_SFI pointer is at the first structured field in the output buffer (offset 000C in the buffer), and the SFI identifier value at XSF_SFI_IDVAL (0260) tells you that the SFI is a Begin DATASET group. To move to the next structured field, add XSF_SFI_LENGTH (0008) to your pointer.
- Your XSF_SFI pointer is now at the second structured field in the output buffer (offset 0014 in the buffer); XSF_SFI_IDVAL (82A0) identifies the SFI as DSN (Data Set Name); and XSF_SFI_LENGTH (001B) minus XSF_SFI_LEN (8) gives you a length of 19 bytes for the data set name. The type of data is variable-length character because the data type at XSF_SFI_DTYPE equals XSF_SFI_DTYPE_CHAR_VAR.

  One method to process SFIs is to use an SFI lookup table containing ID values and addresses of corresponding processing routines. Another method is to use the XSF_SFI_DTYPE: Call an appropriate data-type routine with the address of the SFI or SFI data and the address of an output area as inputs.

  After you finish processing this structured field, update the XSF_SFI pointer to the next structured field.

# Appendix E. Accessibility

Accessibility features help a user who has a physical disability, such as restricted mobility or limited vision, to use software products successfully. The major accessibility features in z/OS enable users to:

- Use assistive technologies such as screen readers and screen magnifier software
- Operate specific or equivalent features using only the keyboard
- Customize display attributes such as color, contrast, and font size

## Using assistive technologies

Assistive technology products, such as screen readers, function with the user interfaces found in z/OS. Consult the assistive technology documentation for specific information when using such products to access z/OS interfaces.

## Keyboard navigation of the user interface

Users can access z/OS user interfaces using TSO/E or ISPF. Refer to *z/OS TSO/E Primer*, *z/OS TSO/E User's Guide*, and *z/OS ISPF User's Guide Vol I* for information about accessing TSO/E and ISPF interfaces. These guides describe how to use TSO/E and ISPF, including the use of keyboard shortcuts or function keys (PF keys). Each guide includes the default settings for the PF keys and explains how to modify their functions.

## z/OS information

z/OS information is accessible using screen readers with the BookServer/Library Server versions of z/OS books in the Internet library at:

`www.ibm.com/servers/eserver/zseries/zos/bkserv/`

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## Programming interface information

This publication documents intended Programming Interfaces that allow the customer to write programs to obtain the services of DFSMSrmm.

## Trademarks

# Glossary

This glossary defines technical terms and abbreviations used in DFSMS documentation. If you do not find the term you are looking for, refer to the index of the appropriate DFSMS manual or view the *Glossary of Computing Terms* located at:

http://www.ibm.com/ibm/terminology/

This glossary includes terms and definitions from:

- The *American National Standard Dictionary for Information Systems*, ANSI X3.172-1990, copyright 1990 by the American National Standards Institute (ANSI). Copies may be purchased from the American National Standards Institute, 11 West 42nd Street, New York, New York 10036. Definitions are identified by the symbol (A) after the definition.
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- The *IBM Dictionary of Computing*, New York: McGraw-Hill, 1994.

The following cross-reference is used in this glossary:

**See:** This refers the reader to (a) a related term, (b) a term that is the expanded form of an abbreviation or acronym, or (c) a synonym or more preferred term.

## A

**abend.** Abnormal end of task.

| **ACEE.** Accessor environment element.

**AL.** American National Standards Label.

**AMODE.** Addressing mode.

**ANDVRS.** An RMM ADDVRS TSO subcommand operand. See also*Using AND*.

**ANSI.** American National Standards Institute.

**APAR.** Authorized program analysis report.

**API.** Application Programming interface.

**ASA.** American Standards Association.

**assigned date.** The date that the volume is assigned to the current owner. Assigned date is not meaningful for a scratch volume.

**AUL.** ANSI and user header or trailer label.

**automated tape library data server.** A device consisting of robotic components, cartridge storage areas, tape subsystems, and controlling hardware and software, together with the set of tape volumes that reside in the library and can be mounted on the library tape drives. Contrast with *manual tape library*. See also *tape library*.

**automatic cartridge loader.** An optional feature of the 3480 Magnetic Tape Subsystem that allows preloading of multiple tape cartridges. This feature is standard in the 3490 Magnetic Tape Subsystem.

**automatic recording.** In DFSMSrmm, the process of recording information about a volume and the data sets on the volume in the DFSMSrmm control data set at open or close time.

**availability.** For a storage subsystem, the degree to which a data set or object can be accessed when requested by a user.

## B

**backup.** The process of creating a copy of a data set or object to be used in case of accidental loss.

**basic catalog structure (BCS).** The name of the catalog structure in the catalog environment.

| **basic format.** The format of a data set that has a data
| set name type (DSNTYPE) of BASIC. A basic format
| data set is a sequential data set that is specified to be
| neither large format nor extended format. The size of a
| basic format data set cannot exceed 65 535 tracks on
| each volume.

**BCS.** Basic catalog structure.

**bin number.** The specific shelf location where a volume resides in a storage location; equivalent to a rack number in the removable media library. See also *shelf location*.

**BLP.** Bypass label processing.

**BTLS.** Basic Tape Library Support.

**built-in storage location.** One of the Removable Media Manager defined storage locations: LOCAL, DISTANT, and REMOTE.

## C

**cache fast write.** A storage control capability in which the data is written directly to cache without using nonvolatile storage. Cache fast write is useful for temporary data or data that is readily recreated, such as the sort work files created by DFSORT. Contrast with *DASD fast write.*

**cartridge eject.** For an IBM Total Storage Enterprise Automated Tape Library (3494), IBM TotalStorage Enterprise Automated Tape Library (3495), or a manual tape library, the act of physically removing a tape cartridge, usually under robot control, by placing it in an output station. The software logically removes the cartridge by deleting or updating the tape volume record in the tape configuration database. For a manual tape library, the act of logically removing a tape cartridge from the manual tape library by deleting or updating the tape volume record in the tape configuration database.

**cartridge entry.** For either an IBM Total Storage Enterprise Automated Tape Library (3494), IBM TotalStorage Enterprise Automated Tape Library (3495), or a manual tape library, the process of logically adding a tape cartridge to the library by creating or updating the tape volume record in the tape configuration database. The cartridge entry process includes the assignment of the cartridge to scratch or private category in the library.

**Cartridge System Tape.** The base tape cartridge media used with 3480 or 3490 Magnetic Tape Subsystems. Contrast with *Enhanced Capacity Cartridge System Tape*.

| **CDS.** Control data set.

**cell.** A single cartridge location within an automated tape library dataserver. See also *rack number.*

| **CIM.** Common Information Model.

| **CIMOM.** Common Information Model Object Manager.

| **CIM provider.** A piece of code, such as a plugin for
| the CIMOM, that links to the DFSMSrmm application
| programming interface to obtain information about
| DFSMSrmm resources.

**circular file.** A type of file that appends data until full. Then, starting at the beginning of the file, subsequent incoming data overwrites the data already there.

| **classpath.** The name of a Windows-environment variable that contains the names and paths of required Java libraries.

**client.** (1) A user. (2) A consumer of resources or services. (3) A functional unit that receives shared services from a server. (4) A system that is dependent on a server to provide it with programs or access to programs. (5) On a network, the computer requesting services or data from another computer.

**client-server.** (1) In TCP/IP, the model of interaction in distributed data processing in which a program at one site sends a request to a program at another site and waits for a response. The requesting program is called a client; the answering program is called a server. (2) A model of computer interaction in which a server provides resources for other systems on a network, and a client accesses those resources. See also *client, client-server relationship, server*.

**client-server relationship.** Any process that provides resources to other processes on a network is a *server*. Any process that employs these resources is a *client*. A machine can run client and server processes at the same time.

**command line.** On a display screen, a display line usually at the bottom of the screen in which only commands can be entered.

**concurrent copy.** A function to increase the accessibility of data by enabling you to make a consistent backup or copy of data concurrent with the usual application program processing.

**confirmation panel.** A DFSMSrmm panel that lets you tell DFSMSrmm to continue or stop a delete or release action. You specify whether or not you want to confirm delete or release requests in your dialog user options.

**container.** A receptacle in which one or more exported logical volumes can be stored. A stacked volume containing one or more logical volumes and residing outside a virtual tape server library is considered to be the container for those volumes.

**container volume.** See *container*.

**control data set.** A VSAM key-sequenced data set that contains the complete inventory of your removable media library, as well as the movement and retention policies you define. In the control data set DFSMSrmm records all changes made to the inventory, such as adding or deleting volumes.

**control data set ID.** A one-to-eight character identifier for the DFSMSrmm control data set used to ensure that, in a multi-system, multi-complex environment, the correct management functions are performed.

**convenience input.** The process of adding a small number of tape cartridges to the IBM TotalStorage Enterprise Automated Tape Library (3494) and the IBM TotalStorage Enterprise Automated Tape Library (3495) without interrupting operations, by inserting the cartridges directly into cells in a convenience input station.

**convenience input/output station.** A transfer station with combined tape cartridge input and output functions in the IBM TotalStorage Enterprise Automated Tape Libraries (3494) only.

**convenience output.** The process of removing a small number of tape cartridges from the IBM TotalStorage Enterprise Automated Tape Library (3494) or the IBM TotalStorage Enterprise Automated Tape Library (3495) without interrupting operations, by removing the cartridges directly from cells in a convenience input station.

**convenience output station.** A transfer station, used by the operator to remove tape cartridges from the automated tape library dataserver, which is accessible from outside the enclosure area.

**conversion.** In DFSMSrmm, the process of moving your removable media library inventory from another media management system to DFSMSrmm. DFSMSrmm manages the inventory and policies once you have converted it.

**create date.** Create date for a data set is the date that the data set is written to tape. Create date can also be the date a data set was read if it was created before DFSMSrmm is in use. Create date is updated each time a data set is replaced and not extended. Create date for volumes and other resources defined to DFSMSrmm is the date the resource is defined to DFSMSrmm or the date specified on the command as the create date.

## D

**DASD.** Direct access storage device.

**DASD fast write.** An extended function of some models of the IBM 3990 Storage Control in which data is written concurrently to cache and nonvolatile storage and automatically scheduled for destaging to DASD. Both copies are retained in the storage control until the data is completely written to the DASD, providing data integrity equivalent to writing directly to the DASD. Use of DASD fast write for system-managed data sets is controlled by storage class attributes to improve performance. See also *dynamic cache management*. Contrast with *cache fast write*.

**DASD volume.** A DASD space identified by a common label and accessed by a set of related addresses. See also *volume, primary storage, migration level 1, migration level 2*.

**data column.** A vertical arrangement of identical data items, used on list panels to display an attribute, characteristic, or value of one or more objects.

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

**data entry panel.** A panel in which the user communicates with the system by filling in one or more fields.

**Data Facility Storage Management Subsystem (DFSMS).** An operating environment that helps automate and centralize the management of storage. To manage storage, SMS provides the storage administrator with control over data class, storage class, management class, storage group, and automatic class selection routine definitions.

**Data Facility Sort.** An IBM licensed program that is a high-speed data processing utility. DFSORT provides an efficient and flexible way to handle sorting, merging, and copying operations, as well as providing versatile data manipulation at the record, field, and bit level.

**DCB.** Data control block.

**device.** This term is used interchangeably with unit. You mount a tape on a unit or device, such as a 3490.

**DFSMS environment.** An environment that helps automate and centralize the management of storage. This is achieved through a combination of hardware, software, and policies. In the DFSMS environment for MVS, this function is provided by DFSMS, DFSORT, and RACF. See also *system-managed storage*.

**DFSMSdfp.** A DFSMS functional component or base element of z/OS, that provides functions for storage management, data management, program management, device management, and distributed data access.

**DFSMSdss.** A DFSMS functional component or base element of z/OS, used to copy, move, dump, and restore data sets and volumes.

**DFSMShsm.** A DFSMS functional component or base element of z/OS, used for backing up and recovering data, and managing space on volumes in the storage hierarchy.

**DFSMShsm-managed volume.** (1) A primary storage volume, which is defined to DFSMShsm but which does not belong to a storage group. (2) A volume in a storage group, which is using DFSMShsm automatic dump, migration, or backup services. Contrast with *system-managed volume, DFSMSrmm-managed volume*.

**DFSMShsm-owned volume.** A storage volume on which DFSMShsm stores backup versions, dump copies, or migrated data sets.

**DFSMSrmm.** A DFSMS functional component or base element of z/OS, that manages removable media.

**DFSMSrmm control data set.** See *control data set*.

**DFSMSrmm-managed volume.** A tape volume that is defined to DFSMSrmm. Contrast with *system-managed volume, DFSMShsm-managed volume*.

**disaster recovery.** A procedure for copying and storing an installation's essential business data in a secure location, and for recovering that data in the event of a catastrophic problem. Compare with *vital records*.

**DISTANT.** A DFSMSrmm built-in storage location ID. See *built-in storage location*.

**DNS.** Domain Name System.

**Domain Name System.** In the Internet suite of protocols, the distributed database system used to map domain names to IP addresses.

**dual copy.** A high availability function made possible by nonvolatile storage in some models of the IBM 3990 Storage Control. Dual copy maintains two functionally identical copies of designated DASD volumes in the logical 3990 subsystem, and automatically updates both copies every time a write operation is issued to the dual copy logical volume.

**dump class.** A set of characteristics that describes how volume dumps are managed by DFSMShsm.

**duplexing.** The process of writing two sets of identical records in order to create a second copy of data.

**dynamic cache management.** A function that automatically determines which data sets will be cached based on the 3990 subsystem load, the characteristics of the data set, and the performance requirements defined by the storage administrator.

## E

| **EAR.** (1) Enterprise Application Repository. (2)
| Enterprise ARchive.

| **EETC.** IBM TotalStorage Economy Enterprise Tape
| Cartridge.

| **EEWTC.** IBM TotalStorage Economy WORM
| Enterprise Tape Cartridge.

**EHPCT.** Extended High Performance Cartridge Tape.

**eject.** The process used to remove a tape volume from a system-managed library. For an automated tape library dataserver, the volume is removed from its cell location and moved to the output station. For a manual tape library, the volume is not moved, but the tape configuration database is updated to show that the volume no longer resides in the manual tape library.

**empty bin.** A bin that can accept a volume.

**Enhanced Capacity Cartridge System Tape.** Cartridge system tape with increased capacity that can only be used with 3490E Magnetic Tape Subsystems. Contrast with *Cartridge System Tape*.

**entry panel.** See *data entry panel*.

**EREP.** Environmental Record Editing and Printing program.

| **ETC.** IBM TotalStorage Enterprise Tape Cartridge.

| **EWTC.** IBM TotalStorage WORM Enterprise Tape
| Cartridge.

**expanded output.** The output produced by the DFSMSrmm application programming interface when you specify OUTPUT=FIELDS and EXPAND=YES. For those subcommands for which expanded output applies, your application program receives more variable data than for standard output.

**expiration.** The process by which data sets and volumes are identified as available for reuse. In DFSMSrmm, all volumes have an expiration date or retention period set for them either by vital record specification policy, by user-specified JCL when writing a data set to the volume, or by an installation default. When a volume reaches its expiration date or retention period, it becomes eligible for release.

**expiration date.** The date at which a file is no longer protected against automatic deletion by the system.

**expiration processing.** The process of inventory management that ensures expired volumes are released and carries out required release actions on those volumes.

**export.** The operation to remove one or more logical volumes from a virtual tape server library. First, the list of logical volumes to export must be written on an export list volume and then, the export operation itself must be initiated.

**exported logical volume.** A logical volume that has gone through the export process and now resides on a stacked volume outside a virtual tape server library.

**export list volume.** A virtual tape server logical volume containing the list of logical volumes to export.

**extended bin support.** Enhanced options for managing shelf locations in a storage location including optimized use of the number of bins.

**extended extract data set file.** A data set created using the DFSMSrmm EDGJRPT exec. The records within the data set combine data set and volume information into single records.

**extended record.** A record in the DFSMSrmm extract data set that is mapped by the EDGXREXT mapping macro. The record contains both data set and volume information.

**external label.** A label attached to the outside of a tape cartridge that is to be stored in an IBM 3494 Tape Library Dataserver or IBM 3495 Tape Library Dataserver. The label might contain the DFSMSrmm rack number of the tape volume.

**extract data set.** A data set that you use to generate reports.

**extract data set record.** A record in an extract data set that is mapped by a DFSMSrmm mapping macro.

## F

**field format.** Field format is where the output consists of Structured Field Introducers and variable data rather than output in line format.

**filtering.** The process of selecting data sets based on specified criteria. These criteria consist of fully or partially-qualified data set names or of certain data set characteristics.

**FIPS.** Federal Information Processing Standard.

**FMID.** Function modification identifier.

**FRR.** Functional recovery routines.

## G

**generation data group (GDG).** A collection of data sets kept in chronological order. Each data set is a generation data set.

**generation data set (GDS).** One generation of a generation data group.

**generation number.** The number of a generation within a generation data group. A zero represents the most current generation of the group, a negative integer (-1) represents an older generation and, a positive integer (+1) represents a new generation that has not yet been cataloged.

**GDG.** Generation data group.

**GDS.** Generation data set.

**giga (G).** The information-industry meaning depends upon the context:

1. G = 1 073 741 824($2^{30}$) for real and virtual storage.
2. G = 1 000 000 000 for disk storage capacity (for example, a 4 GB fixed disk).
3. G = 1 000 000 000 for transmission rates.

**global resource serialization (GRS).** A component of z/OS used for serializing use of system resources and for converting hardware reserves on DASD volumes to data set enqueues.

**GPR.** General purpose register.

**GRS.** Global resource serialization.

**grouping.** When creating a report, grouping sorts report output contents into separate groups (and separate pages) based upon field contents.

**guaranteed space.** A storage class attribute indicating the space is to be preallocated when a data set is created. If you specify explicit volume serial numbers, SMS honors them. If space to satisfy the allocation is not available on the user-specified volumes, the allocation fails.

## H

**hardware configuration definition (HCD).** An interactive interface in MVS that enables an installation to define hardware configurations from a single point of control.

**HCD.** Hardware configuration definition.

**high-capacity input station.** A transfer station, used by the operator to add tape cartridges to the IBM TotalStorage Enterprise Automated Tape Library (3494) or the IBM TotalStorage Enterprise Automated Tape Library (3495), which is inside the enclosure area.

**high capacity output station.** A transfer station, used by the operator to remove tape cartridges from the automated tape library dataserver, which is inside the enclosure area.

**home.** See *home location*.

**home location.** For DFSMSrmm, the place where DFSMSrmm normally returns a volume when the volume is no longer retained by vital records processing.

**HPCT.** High Performance Cartridge Tape.

## I

**ICETOOL.** The DFSORT multipurpose data processing and reporting utility.

**ID.** Identifier.

**IDRC.** Improved data recording capability.

**import.** The operation to enter previously exported logical volumes residing on a stacked volume into a virtual tape server library. First, the list of logical volumes to import must be written on an import list volume and the stacked volumes must be entered, and then, the import operation itself must be initiated.

**import list volume.** A virtual tape server logical volume containing the list of logical volumes to import. This list can contain individual logical volumes to import and/or it can contain a list of stacked volumes in which all logical volumes on the stacked volume are imported.

**imported logical volume.** An exported logical volume that has gone through the import process and can be referenced as a tape volume within a virtual tape server library. An imported logical volume originates from a stacked volume that went through the export process.

**improved data recording capability (IDRC).** A recording mode that can increase the effective cartridge data capacity and the effective data rate when enabled and used. IDRC is always enabled on the 3490E Magnetic Tape Subsystem.

**installation defined storage location.** A storage location defined using the LOCDEF command in the EDGRMMxx parmlib member.

**Interactive Storage Management Facility (ISMF).** The interactive interface of DFSMS that allows users and storage administrators access to the storage management functions.

**Interactive Problem Control System (IPCS).** A system facility that allows interactive problem analysis.

**Interactive System Productivity Facility (ISPF).** An IBM licensed program used to develop, test, and run interactive, panel-driven dialogs.

**internal label.** The internal label for standard label tapes is recorded in the VOL1 header label, magnetically recorded on the tape media.

**Internet Protocol (IP).** The TCP/IP layer between the higher-level host-to-host protocol and the local network protocols. IP uses local area network protocols to carry packets in the form of diagrams to the next gateway or destination host.

**in transit.** A volume state where a volume must be moved from one location to another and DFSMSrmm believes that the move has started, but has not yet received confirmation that the move is complete. For a volume moving from a system-managed library, the move starts when the volume is ejected.

**inuse bin.** A bin that is occupied by a volume and into which no volume can be assigned.

**inventory management.** The regular tasks that need to be performed to maintain the control data set. See also *expiration processing*, *storage location management processing*, and *vital record processing*.

**IP address.** The unique 32-bit address that specifies the location of each device or workstation in the Internet. For example, 9.67.97.103 is an IP address.

**IPCS.** Interactive Problem Control System.

**IPL.** Initial program load.

**ISPF.** Interactive System Productivity Facility.

**ISMF.** Interactive Storage Management Facility.

**ISO.** International Organization for Standardization.

## J

**JCL.** Job control language.

**JES2.** Job entry subsystem 2.

**JES3.** Job entry subsystem 3.

**JFCB.** Job file control block.

**journal.** A sequential data set that contains a chronological record of changes made to the DFSMSrmm control data set. You use the journal when you need to reconstruct the DFSMSrmm control data
| set. DFSMSrmm supports large format sequential data
| sets for the journal.

## K

**keyword.** A predefined word that is used as an identifier.

**kilo (K).** The information-industry meaning depends upon the context:

1. K = 1024($2^{10}$) for real and virtual storage.
2. K = 1000 for disk storage capacity (for example, a 4 KB fixed disk).
3. K = 1000 for transmission rates.

## L

| **large format.** The format of a data set that has a data
| set name type (DSNTYPE) of LARGE. A large format
| data set has the same characteristics as a sequential
| (non-extended format) data set, but its size on each
| volume can exceed 65 535 tracks. There is no minimum
| size requirement for a large format data set.

**Library Control System.** The Object Access Method component that controls optical and tape library operations and maintains configuration information.

**line format.** Line format is where text and variable data are formatted into lines suitable for displaying at a terminal or printing as printed documentation.

**LOCAL.** A DFSMSrmm built-in storage location ID. See *built-in storage location*.

**location name.** A name given to a place for removable media that DFSMSrmm manages. A location name can be the name of a system-managed library, a storage location name, or the location *SHELF*, identifying shelf space outside a system-managed library or storage locations.

**logical volume.** Logical volumes have a many-to-one association with physical tape media and are used indirectly by MVS applications. They reside in a Virtual Tape Server or on exported stacked volumes. Applications can access the data on these volumes only when they reside in a Virtual Tape Server which makes the data available via its tape volume cache or after the data has been copied to a physical volume through the use of special utilities.

**low-on-scratch management.** The process by which DFSMSrmm replenishes scratch volumes in a system-managed library when it detects that there are not enough available scratch volumes.

**LSR.** Local shared resource.

## M

**management class.** (1) A named collection of management attributes describing the retention and backup characteristics for a group of data sets, or for a group of objects in an object storage hierarchy. For objects, the described characteristics also include class transition. (2) In DFSMSrmm, if assigned by ACS routine to system-managed tape volumes, management class can be used to identify a DFSMSrmm vital record specification.

**manual cartridge entry processing.** The process by which a volume is added to the tape configuration database when it is added to a manual tape library. DFSMSrmm can initiate this process.

**manual mode.** An operational mode where DFSMSrmm runs without recording volume usage or validating volumes. The DFSMSrmm TSO commands, ISPF dialog, and inventory management functions are all available in manual mode.

**manual tape library.** An installation-defined set of stand-alone tape drives and the set of tape volumes that can be mounted on those drives.

**master system.** The MVS system where the master DFSMSrmm control data set resides.

**master volume.** A private volume that contains data that is available for write processing based on the DFSMSrmm EDGRMMxx parmlib MASTEROVERWRITE operand.

**media format.** The type of volume, recording format and techniques used to create the data on the volume.

**media library.** Removable media library.

**media management system.** A program that helps you manage removable media. DFSMSrmm is a media management system.

**media name.** An up to 8 character value that describes the shape or type of removable media stored in a storage location. Examples of media name are: SQUARE, ROUND, CARTRDGE, 3480.

**media type.** A value that specifies the volume's media type. Media type can be specified as *, CST, ECCST,
| HPCT, EHPCT, ETC, EWTC, EETC or EEWTC.

**MEDIA 1.** Cartridge system tape.

**MEDIA 2.** Enhanced capacity cartridge system tape.

**MEDIA 3.** High performance cartridge tape.

**MEDIA 4.** Extended high performance cartridge tape

**MEDIA 5.** IBM TotalStorage Enterprise Tape Cartridge.

**MEDIA 6.** IBM TotalStorage Enterprise WORM Tape Cartridge.

**MEDIA 7.** IBM TotalStorage Enterprise Economy Tape Cartridge.

**MEDIA 8.** IBM TotalStorage Enterprise Economy WORM Tape Cartridge.

**mega (M).** The information-industry meaning depends upon the context:

1. M = 1 048 576($2^{20}$) for real and virtual storage.
2. M = 1 000 000 for disk storage capacity (for example, a 4 MB fixed disk).
3. M = 1 000 000 for transmission rates.

**migration.** The process of moving unused data to lower cost storage in order to make space for high-availability data. If you wish to use the data set, it must be recalled. See also *migration level 1, migration level 2*.

**migration level 1.** DFSMShsm-owned DASD volumes that contain data sets migrated from primary storage volumes. The data can be compressed. See also *storage hierarchy*. Contrast with *primary storage, migration level 2*.

**migration level 2.** DFSMShsm-owned tape or DASD volumes that contain data sets migrated from primary storage volumes or from migration level 1 volumes. The data can be compressed. See also *storage hierarchy*. Contrast with *primary storage, migration level 1*.

| **MOF.** Managed Object Format.

**moving-in volume.** A volume for which a move into a bin has been started, but not yet confirmed.

**moving-out volume.** A volume for which a move out of a bin has been started, but not yet confirmed.

**MVS image.** A single occurrence of the MVS/ESA operating system that has the ability to process work.

## N

**name vital record specification.** A vital record specification used to define additional retention and movement policy information for data sets or volumes.

**NEXTVRS.** An RMM ADDVRS TSO subcommand operand. See also *Using Next*.

**NL.** No label.

**nonscratch volume.** A volume that is not scratch, which means it has valid or unexpired data on it. Contrast with *scratch*.

**NSL.** Nonstandard label.

## O

**OAM.** Object access method.

**object.** A named byte stream having no specific format or record orientation.

**object access method (OAM).** An access method that provides storage, retrieval, and storage hierarchy management for objects and provides storage and retrieval management for tape volumes contained in system-managed libraries.

**OPC/ESA.** Operations Planning and Control/Enterprise Systems Architecture.

**optical volume.** Storage space on an optical disk, identified by a volume label. See also *volume*.

**optical disk.** A disk that uses laser technology for data storage and retrieval.

**option line.** Command line.

**owner.** In DFSMSrmm, a person or group of persons defined as a DFSMSrmm user owning volumes. An owner is defined to DFSMSrmm through an owner ID.

**owner ID.** In DFSMSrmm, an identifier for DFSMSrmm users who own volumes.

## P

**parallel.** During conversion, when you install DFSMSrmm concurrently with an existing media management system, it is called running in parallel.

**partitioned data set (PDS).** A data set on direct access storage that is divided into partitions, called members, each of which can contain a program, part of a program, or data.

**PDS.** Partitioned data set.

**permanent data set.** A user-named data set that is normally retained for longer than the duration of a job or interactive session. Contrast with *temporary data set*.

**PF.** Program function key.

**physical stacked volume.** See *stacked volume*.

**physical volume.** A volume that has a one-to-one association with physical tape media and which is used directly by MVS applications. It may reside in an automated tape library dataserver or be kept on shelf storage either at vault sites or within the data center where it can be mounted on stand-alone tape drives.

**pool.** A group of shelf locations in the removable media library whose rack numbers share a common prefix. The shelf locations are logically grouped so that the volumes stored there are easier to find and use.

**pool ID.** The identifier for a pool. You define pool IDs in parmlib member EDGRMMxx.

**pooling.** The process of arranging shelf locations in the removable media library into logical groups.

**pool storage group.** A type of storage group that contains system-managed DASD volumes. Pool storage groups allow groups of volumes to be managed as a single entity. See also *storage group*.

**port.** (1) An access point for data entry or exit. (2) A receptacle on a device to which a cable for another device is attached.

**primary space allocation.** Amount of space requested by a user for a data set when it is created. Contrast with *secondary space allocation*.

**primary storage.** A DASD volume available to users for data allocation. The volumes in primary storage are called primary volumes. See also *storage hierarchy*. Contrast with *migration level 1, migration level 2*.

**primary vital record specification.** The first retention and movement policy that DFSMSrmm matches to a data set and volume used for disaster recovery and vital record purposes. See also vital record specification and secondary vital record specification.

**private tape volume.** A volume assigned to specific individuals or functions.

**protect mode.** In protect mode, DFSMSrmm validates all volume requests.

| **provider.** See CIM provider.

**pseudo-generation data group.** A collection of data sets, using the same data set name pattern, to be managed like a generation data group. The ¬ masking character is used in DFSMSrmm to identify the characters in the pattern that change with each generation.

**PSW.** Program status word.

**PTF.** Program temporary fix.

**pull list.** A list of scratch volumes to be pulled from the library for use.

**PUT.** Program update tape.

## R

**RACF.** Resource Access Control Facility.

**rack number.** A six-character identifier that corresponds to a specific volume's shelf location in the installation's removable media library, and is the identifier used on the external label of the volume to identify it. The rack number identifies the pool and the external volume serial number for a volume residing in an automated tape library dataserver. The rack number identifies the pool, the external volume serial, and shelf location number for a volume not residing in an automated tape library dataserver. The rack number is not written by the tape drive. It exists as an entry in the DFSMSrmm control data set and on the external label of the tape. See also *shelf location.*

**rack pool.** A group of shelves that contains volumes that are generally read-only.

**ready to scratch.** This describes the condition where a volume is eligible for scratch processing while it resides in a storage location. Since no other release actions are required, the volume can be returned to scratch directly from the storage location.

**recording format.** For a tape volume, the format of the data on the tape; for example, 18 tracks or 36 tracks.

**record-only mode.** The operating mode where DFSMSrmm records information about volumes as you use them, but does not validate or reject volumes.

**recovery.** The process of rebuilding data after it has been damaged or destroyed, often by using a backup copy of the data or by reapplying transactions recorded in a journal.

**relative start generation.** Relative start generation zero is the latest generation of a tape. Relative start generation -1 is the previous generation of that tape. Relative start generation -2 is the generation before the previous one.

**REMOTE.** A DFSMSrmm built-in storage location ID. See also *built-in storage location*.

**removable media.** See also *volume*.

**removable media library.** The volumes that are available for immediate use, and the shelves where they could reside.

**report.** Data that has been selected and extracted according to the reporting tool, the type of report desired, and the formatting criteria.

**reporting tool.** A REXX exec that builds control statements to enable you to create reports using a reporting utility.

**report type.** A data source and how it is mapped.

**Resource Access Control Facility (RACF).** An IBM licensed program that provides for access control by identifying and verifying the users to the system; authorizing access to protected resources; logging the detected unauthorized attempts to enter the system; and logging the detected accesses to protected resources.

**Resource Group.** A collection of structured fields that describe the attributes of a resource such as a volume.

**Restructured Extended Executor (REXX) Language.** A general-purpose, high-level programming language, particularly suitable for EXEC procedures or programs for personal computing.

**retention date.** Retention date can be the date that a data set or volume is retained by a vital record specification or the date of the inventory management run when the data set or volume is no longer retained by a vital record specification.

**retention period.** The time for which DFSMSrmm retains a volume or data set before considering it for release. You can retain a data set or volume as part of disaster recovery or vital records management. You set a retention period through a vital record specification that overrides a data set's expiration date.

**retention type.** The types of retention for which DFSMSrmm retains a volume or data set before considering it for release. The retention types for data sets are BYDAYSCYCLE, CYCLES, DAYS, EXTRADAYS, LASTREFERENCEDAYS, UNTILEXPIRED, and WHILECATALOG. The retention types for volumes are DAYS and CYCLE.

**REXX.** Restructured Extended Executor Language.

**RMF.** Resource Measurement Facility.

**RMM client.** An instance of the DFSMSrmm subsystem running on a system that has no direct attachment to the DASD containing the DFSMSrmm control data set. The RMM client system uses TCP/IP to request the DFSMSrmm server to perform I/O to the DFSMSrmm control data set.

**RMM complex (RMMplex).** One or more MVS images that share a common DFSMSrmm control data set.

**RMM server.** An instance of the DFSMSrmm subsystem running on a system that has direct attachment to the DASD containing the DFSMSrmm control data set. The RMM server system uses TCP/IP to receive requests from a DFSMSrmm client to perform I/O to the DFSMSrmm control data set.

**RMODE.** Residence mode.

## S

**SAF.** System Authorization Facility.

**scratch.** The status of a tape volume that is available for general use, because the data on it is incorrect or is no longer needed. You request a scratch volume when you omit the volume serial number on a request for a tape volume mount.

**scratch pool.** The collection of tape volumes from which requests for scratch tapes can be satisfied. Contrast with *rack pool*.

**scratch processing.** The process for returning a volume to scratch status once it is no longer in use and has no outstanding release actions pending.

**scratch tape.** See *scratch volume*.

**scratch volume.** A tape volume that contains expired data only. See *scratch*.

**SDB.** Structured database.

**SDSF.** Spool display and search facility.

**secondary space allocation.** Amount of additional space requested by the user for a data set when primary space is full. Contrast with *primary space allocation*.

**secondary vital record specification.** The second retention and movement policy that DFSMSrmm matches to a data set and volume used for disaster recovery and vital records purposes. See also vital record specification and primary vital record specification.

**server.** (1) A functional unit that provides shared services to workstations over a network; for example, a file server, a print server, a mail server. (2) On a network, the computer that contains the data or provides the facilities to be accessed by other computers in the network. (3) A program that handles protocol, queuing, routing, and other tasks necessary for data transfer between devices in a computer system.

**SFI.** Structured field introducer.

**shelf.** A place for storing removable media, such as tape and optical volumes, when they are not being written to or read.

**shelf location.** A single space on a shelf for storage of removable media. DFSMSrmm defines a shelf location in the removable media library by a rack number, and a shelf location in a storage location by a bin number. See also *rack number* and *bin number.*

**shelf-management.** Is the function provided to manage the placement of volumes in individual slots in a location. Shelf-management is provided for the removable media library using rack numbers. For storage locations it is optional as defined by the LOCDEF options in parmlib and uses bin numbers.

**shelf-resident volume.** A volume that resides in a non-system-managed tape library.

**shelf space.** See *shelf*.

**SL.** Standard label.

**slot.** See *shelf location*.

**SMF.** System management facility.

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

| **SNIA.** Storage Networking Industry Association.

**SSI.** Subsystem interface.

**stacked volume.** A volume that has a one-to-one association with physical tape media and which is used in a virtual tape server to store logical volumes. A stacked volume is not used by MVS applications but by the virtual tape server and its associated utilities. It may be removed from a virtual tape server to allow transportation of logical volumes to a vault or to another virtual tape server.

**standard label.** An IBM standard tape label.

**standard output.** The output produced by the DFSMSrmm application programming interface when you specify OUTPUT=LINES or EXPAND=NO with OUTPUT=FIELDS.

**storage administrator.** A person in the data processing center who is responsible for defining, implementing, and maintaining storage management policies.

**storage class.** A collection of storage attributes that identify performance goals and availability requirements, defined by the storage administrator, used to select a device that can meet those goals and requirements.

**storage group.** A collection of storage volumes and attributes, defined by the storage administrator. The collections can be a group of DASD volumes or tape volumes, or a group of DASD volumes and optical volumes treated as a single object storage hierarchy.

**storage location.** A location physically separate from the removable media library where volumes are stored for disaster recovery, backup, and vital records management.

**(storage) location dominance.** The priority used by DFSMSrmm to decide where to move a volume within the removable media library during vital record specification processing. It covers all the locations; SHELF, storage locations, and system-managed tape libraries.

**storage location management processing.** The process of inventory management that assigns a shelf location to volumes that have moved as a result of vital record processing. See also *vital record processing.*

**stripe.** In DFSMS, the portion of a striped data set, such as an extended format data set, that resides on one volume. The records in that portion are not always logically consecutive. The system distributes records among the stripes such that the volumes can be read from or written to simultaneously to gain better performance. Whether it is striped is not apparent to the application program.

**striping.** A software implementation of a disk array that distributes a data set across multiple volumes to improve performance.

**structured field.** Output from the DFSMSrmm application programming interface consisting of a Structured Field Introducer and output data.

**structured field introducer (SFI).** An 8-byte entity that either introduces the beginning of a group of data or introduces output data that immediately follows the introducer.

**subsystem.** A special MVS task that provides services and functions to other MVS users. Requests for service are made to the subsystem through a standard MVS facility known as the subsystem interface (SSI). Standard MVS subsystems are the master subsystem and the job entry subsystems JES2 and JES3.

**subsystem interface (SSI).** The means by which system routines request services of the master subsystem, a job entry subsystem, or other subsystems defined to the subsystem interface.

**SUL.** IBM standard and user header or trailer label.

**SVC.** Supervisor call.

**system-managed storage.** Storage managed by the Storage Management Subsystem. SMS attempts to deliver required services for availability, performance, and space to applications. See also *system-managed storage environment*.

**system-managed tape library.** A collection of tape volumes and tape devices, defined in the tape configuration database. A system-managed tape library can be automated or manual. See also *tape library.*

**system-managed volume.** A DASD, optical, or tape volume that belongs to a storage group. Contrast with *DFSMShsm-managed volume, DFSMSrmm-managed volume*.

**system programmer.** A programmer who plans, generates, maintains, extends, and controls the use of an operating system and applications with the aim of improving overall productivity of an installation.

## T

**tape configuration database (TCDB).** One or more volume catalogs used to maintain records of system-managed tape libraries and tape volumes.

**tape librarian.** The person who manages the tape library. This person is a specialized storage administrator.

**tape library.** A set of equipment and facilities that support an installation's tape environment. This can include tape storage racks, a set of tape drives, and a set of related tape volumes mounted on those drives. See also *system-managed tape library, automated tape library data server*.

**Tape Library Control System (TLCS).** IBM program offering 5785-EAW. DFSMSrmm replaces TLCS.

**tape library dataserver.** A hardware device that maintains the tape inventory that is associated with a set of tape drives. An automated tape library dataserver also manages the mounting, removal, and storage of tapes. An automated tape library dataserver that supports system-managed storage of tape volumes. The IBM automated tape library dataservers include the IBM 3494 Tape Library Dataserver and the IBM 3495 Tape Library Dataserver.

**tape storage group.** A type of storage group that contains system-managed private tape volumes. The tape storage group definition specifies the system-managed tape libraries that can contain tape volumes. See also *storage group*.

**tape subsystem.** A magnetic tape subsystem consisting of a controller and devices, which allows for the storage of user data on tape cartridges. Examples of tape subsystems include the IBM 3490 and 3490E Magnetic Tape Subsystems.

**tape volume.** A tape volume is the recording space on a single tape cartridge or reel. See also *volume*.

**TCDB.** Tape configuration database.

**temporary data set.** An uncataloged data set whose name begins with & or &&, that is normally used only for the duration of a job or interactive session. Contrast with *permanent data set*.

**tera (T).** The information-industry meaning depends upon the context:

1. T = 1 099 511 627 776($2^{40}$) for real and virtual storage.
2. T = 1 000 000 000 000 for disk storage capacity (for example, 4 TB of DASD storage).
3. T = 1 000 000 000 000 for transmission rates.

**TLCS.** Tape Library Control System.

**Transmission Control Protocol (TCP).** A stream communication protocol that includes error recovery and flow control.

**Transmission Control Protocol/Internet Protocol (TCP/IP).** The two fundamental protocols of the Internet protocol suite. The abbreviation TCP/IP is frequently used to refer to this protocol suite. TCP/IP provides for the reliable transfer of data, while IP transmits the data through the network in the form of datagrams. Users can send mail, transfer files across the network, or execute commands on other systems.

**TSO.** Time Sharing Option.

## U

| **UDDI.** Universal Description, Discovery and
| Integration.

**Until Expired.** Allows the use of vital record specification policies for managing retention in a location as long as the volume expiration date has not been reached.

**use attribute.** (1) The attribute assigned to a DAD volume that controls when the volume can be used to allocate new data sets; use attributes are *public*, *private*, and *storage*. (2) For system-managed tape volumes, use attributes are *scratch* and *private*.

**user volume.** A volume assigned to a user, that can contain any data and can be rewritten as many times as the user wishes until the volume expires.

**using AND.** A method for linking DFSMSrmm vital record specifications to create chains of vital record specifications. DFSMSrmm applies policies in chains using AND only when all the retention criteria are true.

**using NEXT.** A method for linking DFSMSrmm vital record specifications to create chains of vital record specifications. DFSMSrmm applies policies in chains using NEXT one vital record at a time.

## V

**virtual export.** A method of exporting a volume by marking a volume as exported by using the DFSMSrmm subcommands.

**virtual input/output (VIO) storage group.** A type of storage group that allocates data sets to paging storage, which simulates a DASD volume. VIO storage groups do not contain any actual DASD volumes. See also *storage group*.

**virtual tape server (VTS).** This subsystem, integrated into the IBM TotalStorage Enterprise Automated Tape Library (3494) or the IBM TotalStorage Enterprise Automated Tape Library (3495), combines the random access and high performance characteristics of DASD with outboard hierarchical storage management and virtual tape devices and tape volumes.

**vital record group.** A set of data sets with the same name that matches to the same DFSMSrmm vital record specification.

**vital record processing.** The process of inventory management that determines which data sets and volumes DFSMSrmm should retain and whether a volume needs to move. These volumes and data sets have been assigned a vital record specification.

**vital records.** A data set or volume maintained for meeting an externally-imposed retention requirement, such as a legal requirement. Compare with *disaster recovery*.

**vital record specification.** Policies defined to manage the retention and movement of data sets and volumes used for disaster recovery and vital records purposes.

**vital record specification management value.** A one-to-eight character name defined by your installation and used to assign management and retention values to tape data sets. The vital record management value can be any value you chose to create a match between a vital record specification and data sets and volumes in your installation. By matching the vital record specifications to the data set or volumes, DFSMSrmm applies the retention and movement policies you define in the vital record specifications. During inventory management VRSEL processing, DFSMSrmm selects the correct, best matching vital record specification for a tape data set or volume.

**VOLSER.** Volume serial number.

**volume.** The storage space on DASD, tape, or optical devices, which is identified by a volume label. See also *DASD volume*, *logical volume*, *optical volume*, *stacked volume*, and *tape volume*.

**volume catalog.** See *tape configuration database*.

**volume expiration date.** The date the volume should expire based on the highest expiration date of the data sets that reside on the volume.

**volume serial number (VOLSER).** (1) An identification number in a volume label that is assigned when a volume is prepared for use on the system. For standard label volumes, the volume serial number is the VOL1 label of the volume. For no label volumes, the volume serial number is the name the user assigns to the volume. (2) In DFSMSrmm, volume serial numbers do not have to match rack numbers.

| **VNDR.** Vendor name.

**VTS.** Virtual tape server.

| **VWMC.** Volume write mount count.

## W

**warning mode.** The operating mode in which DFSMSrmm validates volumes as you use them, but issues warning messages when it discovers errors instead of rejecting volumes.

**world-wide identifier (WWID).** Often used in z/OS software as the abbreviation for the world-wide unique cartridge identifier (WWCID). See also *world-wide unique cartridge identifier*

**world-wide unique cartridge identifier (WWCID).** A permanent identifier associated with a specific tape cartridge, typically stored on the tape itself and the non-volatile cartridge memory.

**Write Once, Read Many (WORM).** A technology to allow data to be written once to storage media. After that, data is permanent and cannot be altered, but can be read any number of times.

**write-to-operator (WTO).** An optional user-coded service that allows a message to be written to the system console operator informing the operator of errors and unusual system conditions that may need to be corrected.

**WTO.** Write-to-operator.

**WWCID.** See world-wide unique cartridge identifier.

**WWID.** See world-wide identifier.

## X

| **XML.** eXtensible Markup Language.

# Index

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**z/OS**
**DFSMSrmm Application Programming Interface**

**Publication No. SC26-7403-05**

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