| Listing specific audit controls                      | 30 |
| Auditing for z/OS UNIX System Services               | 31 |
| Classes that control auditing for z/OS UNIX System Services | 31 |
| Auditable events                                     | 34 |
| Commands                                             | 34 |
| Audit options for file and directory levels          | 35 |
| Auditing for superuser authority in the UNIXPRIV class | 35 |
| Auditing for the RACF remote sharing facility (RRSF)  | 37 |
| RACF MVS operator commands for RRSF                 | 37 |
| Directed commands for RRSF                          | 38 |
| Automatically directed commands for RRSF             | 39 |
| Automatically directed application updates for RRSF  | 39 |
| Automatically directed passwords for RRSF            | 40 |
| The RACLINK command                                  | 41 |
| Auditing for the RACF/DB2 external security module   | 43 |
| Checking DB2 authorization                           | 43 |
| Using the log string (LOGSTR) data                  | 45 |
| Examples for setting audit controls for DB2          | 46 |
| Auditing security events for other components        | 47 |

**Chapter 3. The RACF SMF data unload utility**

<p>| Operational considerations                          | 49 |
| Using IRRADU00                                       | 49 |
| IRRADU00 example                                     | 51 |
| IRRADU00 output                                      | 52 |
| Using output from the RACF SMF data unload utility   | 52 |
| Sort/Merge programs                                  | 52 |
| Relational databases                                 | 52 |
| XML                                                   | 53 |
| Using the DFSORT ICETOOL to create reports          | 53 |
| The report format                                    | 53 |
| The record selection criteria                       | 54 |
| Using the RACFICE PROC to generate reports          | 54 |
| Reports based on the SMF data unload utility (IRRADU00) | 55 |
| Creating customized reports                          | 57 |
| Using the RACF SMF data unload utility output with DB2 | 58 |
| Steps for using IRRADU00 output with DB2             | 58 |
| Creating a DB2 database for unloaded RACF SMF data   | 59 |
| Creating a DB2 table space                           | 59 |
| Creating the DB2 tables                              | 59 |
| Loading the DB2 tables                               | 60 |
| Reorganizing the unloaded RACF SMF data in the DB2 database | 62 |
| Creating optimization statistics for the DB2 database | 62 |
| Deleting data from the DB2 database                  | 62 |
| DB2 table names                                       | 62 |
| Using the RACF SMF data unload utility to generate XML documents | 65 |
| XML overview                                          | 65 |
| Producing XML output                                 | 66 |
| How the XML tag names are derived                    | 67 |
| Viewing and working with XML audit reports           | 69 |
| Event code qualifiers                                 | 69 |
| Event 1(1): JOB INITIATION/TSO LOGON/TSO LOGOFF      | 69 |
| Event 2(2): RESOURCE ACCESS                          | 73 |
| Event 3(3): ADDVOL/CHGVOL                             | 75 |
| Event 4(4): RENAME RESOURCE                          | 76 |
| Event 5(5): DELETE RESOURCE                          | 78 |</p>
<table>
<thead>
<tr>
<th>Phase 1</th>
<th>123</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase 2</td>
<td>123</td>
</tr>
<tr>
<td>Phase 3</td>
<td>124</td>
</tr>
<tr>
<td>RACF report writer command and subcommands</td>
<td>125</td>
</tr>
<tr>
<td>Planning considerations</td>
<td>126</td>
</tr>
<tr>
<td>The RACF report writer and the SMF input data set</td>
<td>126</td>
</tr>
<tr>
<td>RACF report writer return codes</td>
<td>129</td>
</tr>
<tr>
<td>Useful hints</td>
<td>129</td>
</tr>
<tr>
<td>RACFRW command</td>
<td>130</td>
</tr>
<tr>
<td>RACFRW subcommands</td>
<td>132</td>
</tr>
<tr>
<td>SELECT subcommand</td>
<td>132</td>
</tr>
<tr>
<td>EVENT subcommand</td>
<td>139</td>
</tr>
<tr>
<td>LIST subcommand</td>
<td>142</td>
</tr>
<tr>
<td>SUMMARY subcommand</td>
<td>144</td>
</tr>
<tr>
<td>END subcommand</td>
<td>145</td>
</tr>
<tr>
<td>Using the RACF report writer</td>
<td>146</td>
</tr>
<tr>
<td>Monitoring password violation levels</td>
<td>146</td>
</tr>
<tr>
<td>Monitoring access attempts in WARNING mode</td>
<td>147</td>
</tr>
<tr>
<td>Monitoring access violations</td>
<td>148</td>
</tr>
<tr>
<td>Monitoring the use of RACF commands</td>
<td>148</td>
</tr>
<tr>
<td>Monitoring specific users</td>
<td>149</td>
</tr>
<tr>
<td>Monitoring SPECIAL users</td>
<td>149</td>
</tr>
<tr>
<td>Monitoring OPERATIONS users</td>
<td>150</td>
</tr>
<tr>
<td>Monitoring failed accesses to resources protected by a security level</td>
<td>150</td>
</tr>
<tr>
<td>Monitoring accesses to resources protected by a security label</td>
<td>151</td>
</tr>
<tr>
<td>RACF report writer examples</td>
<td>151</td>
</tr>
<tr>
<td>Example 1—Obtaining a report for all RACF SMF records</td>
<td>151</td>
</tr>
<tr>
<td>Example 2—Obtaining a report for all MVS jobs run by users not defined to RACF</td>
<td>151</td>
</tr>
<tr>
<td>Example 3—Obtaining a report for data set violations</td>
<td>152</td>
</tr>
<tr>
<td>Example 4—Obtaining a report for data set activity by job, system, and user</td>
<td>152</td>
</tr>
<tr>
<td>Example 5—Obtaining multiple reports the wrong way</td>
<td>152</td>
</tr>
<tr>
<td>Example 6—Obtaining multiple reports the right way</td>
<td>153</td>
</tr>
<tr>
<td>Sample reports</td>
<td>154</td>
</tr>
<tr>
<td>Merging SMF records produced by RACF for z/VM with SMF records produced by RACF for MVS</td>
<td>174</td>
</tr>
</tbody>
</table>

**Appendix B. XML Schema**

**Appendix C. Accessibility**

Using assistive technologies

Keyboard navigation of the user interface.

z/OS information.

**Notices**

Policy for unsupported hardware

Trademarks.

**Index**
Figures

1. Sample ISPF panel for RACF ....................................... 6
2. GLOBALAUDIT Operand on the ALTDSD Command .................. 29
3. JCL to Invoke the RACF SMF data unload utility ................... 51
4. DFSORT’s ICETOOL Utility ........................................... 53
5. Member SELU: Selected User Report report format statements ...... 54
6. Member SELUCNTL: Selected User Report record selection statements ........................................................................................................... 54
7. Report for all IRRADU00 Records Associated with a Specific User ID ................................................................................................................. 55
8. Customized Record Selection Criteria .................................... 57
9. Customized Report Format ............................................... 57
10. Customized Report JCL .................................................... 58
11. Sample SQL Utility Statements Defining a Table Space .............. 59
12. Sample SQL Utility Statements Creating a Table .................... 60
13. DB2 Utility Statements Required to Load the Tables ............... 61
14. DB2 Utility Statements Required to Delete the Group Records .......... 62
15. Specifying DSMON JCL .................................................... 94
16. Reports produced by DSMON .......................................... 98
17. Sample System Report .................................................... 100
18. Sample Group Tree Report .............................................. 101
19. Sample Program Properties Table Report .......................... 103
20. Sample RACF Authorized Caller Table Report ..................... 104
21. Class Descriptor Table Report .......................................... 106
22. Sample RACF Exit Report ............................................... 107
23. Sample RACF Global Access Checking Table Report .............. 109
24. Sample RACF Started Procedures Table Report (ICHRIN03) ....... 111
25. Sample RACF Started Procedures Table Report (STARTED Class Active) ........................................................................................................... 112
26. Selected User Attribute Report .......................................... 114
27. Selected User Attribute Summary Report ............................ 115
28. Sample Selected Data Sets Report ..................................... 119
29. RACF Report Writer Overview ......................................... 122
30. JCL for Dumping SMF Records and Running the Report Writer as a Batch Job ........................................................................................................... 127
31. Key to Symbols in Command Definitions .............................. 130
32. Summary Activity Report from SMF .................................. 155
33. Standard Header Page .................................................... 156
34. General Summary Report ............................................... 159
35. Listing of Status Records ................................................. 160
36. Listing of Process Records ............................................... 161
37. Short User Summary Report ............................................. 162
38. Short Group Summary Report ........................................... 162
39. Short Resource Summary Report ....................................... 163
40. Short Command Summary Report ...................................... 164
41. Short Event Summary Report ............................................ 165
42. Short Owner Summary Report .......................................... 166
43. User by Resource Summary Report .................................... 166
44. Group by Resource Summary Report .................................. 167
45. Resource by User Summary Report .................................... 167
46. Resource by Group Summary Report .................................. 168
47. Resource by Event Summary Report ................................... 169
48. Event by Resource Summary Report ................................... 170
49. Command by User Summary Report .................................. 171
50. Command by Group Summary Report ................................ 172
51. Command by Resource Summary Report ............................ 173
52. Owner by Resource Summary Report .................................. 174
# Tables

1. How RACF Simulates DB2 Authorization Checking ........................................... 44
2. LOGSTR Data ........................................................................................................ 45
3. ICETOOL Reports from IRRADU00 Output .......................................................... 55
4. Correlation of DB2 Table Names and Record Types ........................................... 62
5. XML naming exceptions ....................................................................................... 68
6. XML interpretation of special characters example .............................................. 68
7. XML special characters substitutions ................................................................. 68
8. Audit Function Codes for z/OS UNIX System Services ....................................... 90
9. Reports Specified by the FUNCTION Control Statement ................................. 96
10. Reports Specified by the USEROPT Control Statement ................................. 97
11. Summary of RACFRW Command and Its Operands ........................................ 125
12. Summary of RACFRW Subcommands ............................................................ 125
About this document

This document supports z/OS (5694-A01) and contains information about the Resource Access Control Facility (RACF), which is part of the Security Server. The Security Server works in conjunction with these components:

- Integrated Security Services components
- Open Cryptographic Enhanced Plug-Ins
- PKI Services
- Resource Access Control Facility (RACF)
- z/OS Firewall Technologies
- z/OS LDAP Server
- z/OS Security Server Network Authentication Service

Note that some of the components referenced are not part of Security Server but are included in other z/OS packages.

This document describes the role of the RACF auditor and explains the auditing tools that RACF provides. Reports on system and resource use can provide the auditor with information about the basic system-security environment of an installation.

If you need specific information about using RACF on z/VM systems, refer to the RACF Version 1 documentation. Information describing how to use RACF in a shared database environment with z/OS and z/VM systems (for example, shared database function and templates in support of database unload) remains in RACF documentation.

Intended audience

This document is intended for those individuals defined as RACF auditors (persons who have the AUDITOR or group-AUDITOR user attribute).

You should be familiar with both RACF and z/OS, or z/OS and z/VM if you are running RACF on two or more systems that share the same RACF database.

How to use this document

This document provides detailed information about the RACF SMF data unload utility, which allows you to create a sequential file from the security relevant audit data. Also, chapters cover the RACF report writer, the data security monitor (DSMON), and optional audit controls for tracking RACF events.

Where to find more information

Where necessary, this document references information in other documents. For complete titles and order numbers for all elements of z/OS®, see \textit{z/OS Information Roadmap}.

Softcopy documents

The RACF® library is available on the following CD-ROM, DVD, and online library collections, in both BookManager® and Portable Document Format (PDF) files. The
collections include Softcopy Reader, which is a program that enables you to view the BookManager files. You can view or print the PDF files with an Adobe® Reader.

**SK3T-4269  z/OS Version 1 Release 11 Collection**
This collection contains the documents for z/OS Version 1 Release 11, on CD-ROM discs.

**SK3T-4271  z/OS Version 1 Release 11 and Software Products DVD Collection**
This collection contains the documents for z/OS Version 1 Release 11 and the libraries for multiple releases of more than 400 z/OS-related software products, on two DVDs.

**SK3T-4272  z/OS Security Server RACF Collection**
This softcopy collection kit contains the Security Server library for z/OS for multiple releases in both BookManager and Portable Document Format (PDF) formats. It also contains z/OS software product documents that contain substantial RACF information. This collection does not contain licensed documents.

**SK3T-7876  IBM eServer™ zSeries Redbooks Collection**
This softcopy collection contains a set of documents called IBM® Redbooks® that pertain to zSeries® subject areas ranging from e-business application development and enablement to hardware, networking, Linux®, solutions, security, Parallel Sysplex® and many others.

**SK2T-2177  IBM Redbooks S/390 Collection**
This softcopy collection contains a set of documents called IBM Redbooks that pertain to S/390® subject areas ranging from application development and enablement to hardware, networking, security, Parallel Sysplex and many others.

### RACF courses

The following RACF classroom courses are available in the United States:

**H3917  Basics of z/OS RACF Administration**

**H3927  Effective RACF Administration**

**ES885  Exploiting the Advanced Features of RACF**

**ES840  Implementing RACF Security for CICS®**

IBM provides a variety of educational offerings for RACF. For more information about classroom courses and other offerings, do any of the following:

- See your IBM representative
- Call 1-800-IBM-TEACh (1-800-426-8322)

### IBM systems center publications

IBM systems centers produce documents known as IBM Redbooks® that can help you set up and use RACF. These documents have not been subjected to any formal review nor have they been checked for technical accuracy, but they represent current product understanding (at the time of their publication) and provide valuable information on a wide range of RACF topics. They are not shipped with RACF; you must order them separately. A selected list of these documents follows. Other documents are available, but they are not included in this list, either
because the information they present has been incorporated into IBM product manuals or because their technical content is outdated.

**Other sources of information**

IBM provides customer-accessible discussion areas where RACF may be discussed by customer and IBM participants. Other information is also available through the Internet.

**IBM discussion areas**

IBM provides ibm.servers.mvs.racf newsgroup for discussion of RACF-related topics. You can find this newsgroup on news (NNTP) server news.software.ibm.com using your favorite news reader client.

**Internet sources**

The following resources are available through the Internet to provide additional information about the RACF library and other security-related topics:

- **Online library**
  To view and print online versions of the z/OS publications, use this address: http://www.ibm.com/systems/z/os/zos/bkserv/

- **Redbooks**
  The documents known as IBM Redbooks that are produced by the International Technical Support Organization (ITSO) are available at the following address: http://www.redbooks.ibm.com

- **Enterprise systems security**
  For more information about security on the S/390 platform, OS/390®, and z/OS, including the elements that comprise the Security Server, use this address: http://www.ibm.com/systems/z/advantages/security/

- **RACF home page**
  You can visit the RACF home page on the World Wide Web using this address: http://www.ibm.com/servers/eserver/zseries/zos/racf/

- **RACF-L discussion list**
  Customers and IBM participants may also discuss RACF on the RACF-L discussion list. RACF-L is not operated or sponsored by IBM; it is run by the University of Georgia.

  To subscribe to the RACF-L discussion and receive postings, send a note to: listserv@listserv.uga.edu

  Include the following line in the body of the note, substituting your first name and last name as indicated:

  subscribe racf-l first_name last_name
To post a question or response to RACF-L, send a note, including an appropriate Subject: line, to:
racf-l@listserv.uga.edu

- **Sample code**
  You can get sample code, internally-developed tools, and exits to help you use RACF. This code works in our environment, at the time we make it available, but is not officially supported. Each tool or sample has a README file that describes the tool or sample and any restrictions on its use.

  To access this code from a Web browser, go to the [RACF home page](http://www.ibm.com/servers/eserver/zseries/zos/racf/) and select the “Downloads” topic from the navigation bar, or go to [ftp.software.ibm.com](ftp.software.ibm.com) through anonymous FTP. The code is also available from ftp.software.ibm.com through anonymous FTP.

  To get access:
  1. Log in as user `anonymous`.
  2. Change the directory, as follows, to find the subdirectories that contain the sample code or tool you want to download:

     ```
     cd eserver/zseries/zos/racf/
     ```

  An announcement will be posted on the RACF-L discussion list and on newsgroup `ibm.servers.mvs.racf` whenever something is added.

**Note**: Some Web browsers and some FTP clients (especially those using a graphical interface) might have problems using ftp.software.ibm.com because of inconsistencies in the way they implement the FTP protocols. If you have problems, you can try the following:

- Try to get access by using a Web browser and the links from the [RACF home page](http://www.ibm.com/servers/eserver/zseries/zos/racf/).
- Use a different FTP client. If necessary, use a client that is based on command line interfaces instead of graphical interfaces.
- If your FTP client has configuration parameters for the type of remote system, configure it as `UNIX®` instead of `MVS™`.

**Restrictions**
Because the sample code and tools are not officially supported,
- There are no guaranteed enhancements.
- No APARs can be accepted.

---

**The z/OS Basic Skills Information Center**

The z/OS Basic Skills Information Center is a Web-based information resource intended to help users learn the basic concepts of z/OS, the operating system that runs most of the IBM mainframe computers in use today. The Information Center is designed to introduce a new generation of Information Technology professionals to basic concepts and help them prepare for a career as a z/OS professional, such as a z/OS system programmer.

Specifically, the z/OS Basic Skills Information Center is intended to achieve the following objectives:

- Provide basic education and information about z/OS without charge
- Shorten the time it takes for people to become productive on the mainframe
- Make it easier for new people to learn z/OS.
To access the z/OS Basic Skills Information Center, open your Web browser to the following Web site, which is available to all users (no login required):

http://publib.boulder.ibm.com/infocenter/zos/basics/index.jsp

To request copies of IBM publications

Direct your request for copies of any IBM publication to your IBM representative or to the IBM branch office serving your locality.

There is also a toll-free customer support number (1-800-879-2755) available Monday through Friday from 8:30 a.m. through 5:00 p.m. Eastern Time. You can use this number to:

- Order or inquire about IBM publications
- Resolve any software manufacturing or delivery concerns
- Activate the program reorder form to provide faster and more convenient ordering of software updates
Summary of changes

Summary of changes
for SA22-7684-11
z/OS Version 1 Release 11


Updated information
• New event code qualifiers added in “Event code qualifiers” on page 69.
• Additional clarification about the RACF database unload utility added to “Using the RACF database unload utility program (IRRDBU00)” on page 7.

You may notice changes in the style and structure of some content in this document—for example, headings that use uppercase for the first letter of initial words only, and procedures that have a different look and format. The changes are ongoing improvements to the consistency and retrievability of information in our documents.

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.

Summary of changes
for SA22-7684-10
z/OS Version 1 Release 10


Updated information
• Information supporting custom fields has been added. The list of exits at 13 has been updated to include the new exit for custom fields. Also, see “RACF exits report” on page 107 for details concerning custom fields and the RACF exits report.

You may notice changes in the style and structure of some content in this document—for example, headings that use uppercase for the first letter of initial words only, and procedures that have a different look and format. The changes are ongoing improvements to the consistency and retrievability of information in our documents.

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.

Summary of changes
for SA22-7684-09
z/OS Version 1 Release 9

This document contains information previously presented in z/OS Security Server RACF Auditor’s Guide, SA22-7684-08, which supports z/OS Version 1 Release 8.
Updated information

- Information added for the new SMF dump utility, IFASMFDL. For more information, see Chapter 3, “The RACF SMF data unload utility,” on page 49.
- New event codes 84 and 85 have been added. For more information, see “Event code qualifiers” on page 69.

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.

Summary of changes
for SA22-7684-08
z/OS Version 1 Release 8


Updated information

- The term "pass phrase" has been changed to "password phrase".
- The XML Schema example has been updated. See Appendix B, “XML Schema,” on page 175 for the updated example.

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.

Summary of changes
for SA22-7684-07
z/OS Version 1 Release 8

This document contains information previously presented in z/OS Security Server RACF Auditor’s Guide, SA22-7684-06, which supports z/OS Version 1 Release 7. The following summarizes the changes to that information.

New information

- Auditing examples have been updated to include pass phrase changes. For more information, see “Examples for setting audit controls using SETROPTS” on page 26.
- Added the pass phrase to the exit routine list. For more information, see “Using the RACF report writer” on page 8. For the list of exit routines, see “Conducting the audit” on page 9.
- Added new pass phrase event code qualifier. For more information, see “Event code qualifiers” on page 69.

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.
Chapter 1. The RACF auditor

RACF is a flexible security tool. It allows you to set your own security objectives and use RACF to help achieve those objectives in a way that best meets your installation’s needs.

Although installations might have slightly different security needs, certain RACF user roles or tasks are common to all users. At any installation, different users have different levels of responsibility for security or different needs to access resources. Some people might have extensive responsibility for security, whereas others might have little or none; some users might require almost unlimited access to resources, whereas others might need only limited access, and some might be barred from entering the system at all.

The primary means of defining a user’s responsibility for security is the RACF user attribute. A user attribute is a part of the RACF definition of what an installation allows a particular user to do. The SPECIAL attribute, for example, is normally assigned to the RACF security administrator; a SPECIAL user can execute any RACF command except those reserved for a user with the AUDITOR attribute.

This separation of powers is necessary because it is the security administrator’s job to establish RACF controls; it is the auditor’s job to test the adequacy and effectiveness of these controls. In this sense, your job as the auditor is very similar to the job of a financial auditor in a bank.

AUDITOR and group-AUDITOR attribute

Once a SPECIAL user assigns the AUDITOR user attribute to you, your responsibility is to verify that RACF is meeting your installation’s security goals. As a RACF auditor, your job is essentially the same, regardless of whether you have the AUDITOR attribute (with responsibility for checking RACF controls on a user, or system-wide, level) or the group-AUDITOR attribute (with responsibility for checking RACF controls for a group and its subgroups). Whereas a user with the group-AUDITOR attribute can only monitor the users and resources owned by a specific group and its subgroups, the responsibility is so much like that of a user with the AUDITOR attribute that this document applies to both and notes any specific differences.

Access control and accountability

As the auditor, you are responsible for checking that RACF is meeting the installation’s needs for access control and accountability. Access control means that you can control user accesses to resources and verify that the accesses allowed are appropriate to the particular resource. For example, you might question why a tape librarian had access to a payroll data set. The auditor needs to verify that an installation has a way to maintain accountability. Accountability means that you can trace activities on the protected system to a particular person. Normally, several people should not share a user ID. A user ID can be shared by people who use a digital certificate to identify and authenticate themselves. In this case, accountability is maintained because each person’s unique X500 name will be audited in addition to the shared user ID.
Attention

If the person responsible for setting or resetting passwords uses the NOEXPIRED keyword of the ALTUSER command to set a new, unexpired password for a user, you might experience problems maintaining accountability. For example, an administrator might reset an expired password with the following command:

```
ALTUSER VIOLA PASSWORD(ME51NOW)
```

When VIOLA uses the password for the first time, RACF forces her to change it. After she changes the password, only VIOLA knows the new password, which provides reasonable assurance that the audit record indicates that VIOLA performed some action.

However, the administrator might issue:

```
ALTUSER VIOLA PASSWORD(ME51NOW) NOEXPIRED
```

VIOLA gets an unexpired password and does not need to change it, which means that the administrator and VIOLA both know the password. Although an audit record written by the ALTUSER command indicates whether NOEXPIRED was specified, there is no assurance that an audit event with VIOLA in the record occurred because of something VIOLA did. You need to consider the possibility that the administrator performed the action that caused RACF to write the audit record.

To help you to audit access control and accountability, RACF provides:

- Logging routines that record the information you require
- Audit control functions that enable you to specify the information RACF is to record (or log)
- The RACF SMF data unload utility, which converts SMF records into formats which can be used by a relational database manager, such as an XML version which can be easily viewed by a web browser
- The DFSORT ICETOOL, which generates reports from RACF SMF data unload utility information and RACF database unload utility information
- The data security monitor (DSMON), which generates reports containing information about the security environment for MVS
- The RACF report writer, which generates tailored reports based on the information you have directed RACF to log

To specify the audit control functions, use either the RACF ISPF panels or the RACF commands to direct RACF to log any events relevant to your installation’s data security program.

After RACF has logged security events, you can analyze this log by:

- Loading the records produced by the RACF SMF data unload utility into a relational database manager for analysis.
- Creating XML output of the report and viewing the results in a web browser. This report can also be customized by the use of an XSLT stylesheet file.
- Invoking the RACF report writer to print out the data RACF has logged and use the reports to identify possible security violations or weaknesses in the security mechanism.
The data security monitor (DSMON) generates a set of reports that lets you audit the current status of the data security environment. You can use the information in the reports to compare the actual system characteristics and resource protection levels with the installation’s requirements. If the installation has not defined DSMON as a controlled program, you must have the AUDITOR attribute to run DSMON. If DSMON can be run as a controlled program, you must have at least READ access to the DSMON resource in the PROGRAM class. For more information, see Chapter 4, “The data security monitor (DSMON).”

Logging

Logging—the recording of data about specific events—is the key to auditing the use of RACF at your installation. You must ensure that RACF logs the information you need. RACF uses the system management facilities (SMF) to log data about various RACF events. RACF writes SMF records to an SMF data set or log stream.

Things to Consider

- Each additional logging activity that you specify increases RACF and SMF processing and, as a result, might affect RACF performance.
- When RACF is enabled for sysplex communication, RACF logs the use of commands only for the system from which the command originated (if auditing has been turned on), even though some commands are propagated to the other members in the RACF sysplex data sharing group.
- When you are sharing a RACF database among two or more systems, you need to run the logging and reporting utilities from the highest level system.

RACF always logs information about certain events because knowing about these events is essential to an effective data-security mechanism. The events that RACF always logs are:

- Every use of the RVARY or SETROPTS command.
  If you are using the RACF subsystem on MVS and issue RVARY as an MVS operator command, the job name information is propagated in the SMF record. This distinguishes it from an RVARY command issued from a TSO session.
- Every time a RACROUTE REQUEST=VERIFY request fails or an initACEE fails because a certificate is unknown or not trusted.
- Every time a distributed identity is unknown.
- Every time the console operator grants access to a resource as part of the failsoft processing performed when RACF is inactive.
• When a user not defined as a z/OS UNIX System Services user tries to dub a process
• When an unauthorized user tries to mount or unmount the file system
• When a user successfully sets or resets his write-down mode, or fails attempting to do so because the user does not have the write-down privilege
• Other components may also cause security events to be logged

For more details on z/OS UNIX System Services events for which audit records are always written, refer to z/OS UNIX System Services Planning.

RACF never logs some events, because knowing about these events is not essential to effective data security. RACF never logs any use of the following RACF commands: LISTDSD, LISTGRP, LISTUSER, RLSTR, and SEARCH.

In addition, RACF can optionally log other events. Optional logging is under the control of either a resource-profile owner or the auditor.

**Owner-controlled logging**

Owners of resources can specify, in the resource profile, what types of accesses to log (successes, failures, or both) and what level of access to log (READ, UPDATE, CONTROL, or ALTER). Owners can also specify that no logging is to occur for an access that is a success or failure. Owner-controlled logging is not directly under your control, but you should verify that resource owners request a level of logging that is consistent with the sensitivity of the resource. Furthermore, your installation can use three methods to override the logging that an owner specifies in the resource profile.

1. First, you can suppress auditing for all resources in a specific class by specifying LOGOPTIONS(NEVER(class-name)) on the SETROPTS command. Likewise, you can activate auditing for all access attempts for all resources in a specific class by specifying LOGOPTIONS(ALWAYS(class-name)). See "Activating auditing for access attempts by class" on page 21.

2. Second, if you have the AUDITOR attribute, you can specify additional logging that supersedes the owner’s logging specification for a specific resource by adding audit controls to the resource profile. Note that you cannot change the owner’s logging specifications for a specific resource profile, only add to them. You can do this for specific resource profiles by specifying the GLOBALAUDIT operand on the ALTDSD or RALTER command. The use of these controls is described in "Data set controls" on page 29 and "General resource controls" on page 29.

3. Third, for resources that have their authority checked by RACROUTE REQUEST=AUTH, your installation can bypass a profile owner’s logging specification by using the RACROUTE REQUEST=AUTH postprocessing exit routine. This exit routine can, for certain accesses, specify unconditional logging or unconditionally suppress logging. For example,
   • An installation might use the exit routine to specify unconditional logging for accesses to a highly classified resource.
   • An installation might suppress logging when the exit routine recognizes READ access to common system resources, such as SYS1.MACLIB.

You should be aware of any such exit-routine specifications. For more information on using exit routines, see z/OS Security Server RACF System Programmer’s Guide.
Note to z/OS UNIX System Services Users

Owner-controlled logging for z/OS UNIX files is specified in the file security packet (FSP) instead of a profile. The access levels are different and logging is set with the chaudit command. For more information about this command, see z/OS UNIX System Services User’s Guide.

Auditor-controlled logging

You can direct RACF to log additional events. These events are:

- Changes to any RACF profiles
- All RACF commands issued by users who either had the SPECIAL attribute, or gained authority to issue the command because they had the group-SPECIAL attribute
- All unauthorized attempts to use RACF commands
- All RACF-related activities of specific users
- All accesses to resources (data sets and general resources) that RACF allows because the user has the OPERATIONS or group-OPERATIONS attribute
- All accesses to specific data sets
- All accesses to specific general resources
- All accesses to resources protected by specific profiles in the SECLABEL class
- All accesses to a specified class of resources at an access level indicated on the LOGOPTIONS keyword of the SETROPTS command
- Selected events in related APPC/MVS transactions
- z/OS UNIX System Services events. See Chapter 3, “The RACF SMF data unload utility,” on page 49 for event codes and a table of event code qualifiers.

You can identify which of these events apply to your installation’s security goals and use audit controls to direct RACF to log the events you require.

Choosing between Using RACF TSO Commands and ISPF Panels

In general, you can perform the same RACF functions using RACF TSO commands and ISPF panels.

The RACF TSO commands provide the following advantages:

- Entering commands can be faster than displaying many panels in sequence.
- Using commands from the documented examples is more straightforward. (The examples in the RACF documents are generally command examples.)
- Getting online help for RACF TSO commands

You can get online help for the RACF TSO commands documented in z/OS Security Server RACF Command Language Reference.

- To see online help for the PERMIT command, for example, enter:
  HELP PERMIT
- To limit the information displayed, specify operands on the HELP command. For example, to see only the syntax of the PERMIT command, enter:
  HELP PERMIT SYNTAX

Restriction: TSO online help is not available when RACF commands are entered as RACF operator commands.

- Getting message ID information
If a RACF TSO command fails, you will receive a message. If you do not get a message ID, enter:

PROFILE MSGID

Reenter the RACF TSO command that failed. The message appears with the message ID. See z/OS Security Server RACF Messages and Codes for help if the message ID starts with ICH or IRR.

Restriction: PROFILE MSGID cannot be entered as a RACF operator command.

The ISPF panels provide the following advantages:

- When you use the panels, you avoid having to memorize a command and type it correctly. Panels can be especially useful if the command is complex or you perform a task infrequently.
- ISPF creates in the ISPF log a summary record of the work that you do. Unless you use the TSO session manager, the RACF commands do not create such a record.
- From the panels, you can press the HELP key to display brief descriptions of the fields on the panels.
- The options chosen when installing the RACF panels determine whether output (for example, profile listings, search results, and RACF options) is displayed in a scrollable form.
- The ISPF panels for working with password rules allow you to enter all of the password rules on one panel. Figure 1 shows one of these panels.
- When you use the ISPF panels to update a custom field definition in the CFDEF segment, the current values are displayed. You can then overtype the values to make changes.
- When you use the ISPF panels to add, update, or delete custom field information (CSDATA segment fields) in a user or group profile, the panels are primed with the custom field names and values. You can then make additions, changes, and deletions.

RACF - SET PASSWORD FORMAT RULES

<table>
<thead>
<tr>
<th>COMMAND ====&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enter PASSWORD FORMAT RULES:</td>
</tr>
<tr>
<td>MINIMUM</td>
</tr>
<tr>
<td>LENGTH</td>
</tr>
<tr>
<td>RULE 1:</td>
</tr>
<tr>
<td>RULE 2:</td>
</tr>
<tr>
<td>RULE 3:</td>
</tr>
<tr>
<td>RULE 4:</td>
</tr>
<tr>
<td>RULE 5:</td>
</tr>
<tr>
<td>RULE 6:</td>
</tr>
<tr>
<td>RULE 7:</td>
</tr>
<tr>
<td>RULE 8:</td>
</tr>
</tbody>
</table>

To cancel an existing rule, enter NO for MINIMUM LENGTH.

To specify FORMAT, use the following codes for each character position:

- * = Any Character
- $ = National
- V = Vowel
- N = Numeric
- C = Consonant
- A = Alphabetic
- M = Mixed Vowel
- m = Mixed Numeric
- c = Mixed Consonant
- L = Alphanumeric
- W = No Vowel

Figure 1. Sample ISPF panel for RACF
Using the RACF cross-reference utility program (IRRUT100)

If you have the AUDITOR or SPECIAL attribute, you can use the RACF cross-reference utility to find and list occurrences of a user ID or group name in the RACF database.

If you have the group-AUDITOR or group-SPECIAL attribute, you can use these utilities only for a user ID or group that is within your scope of authority.

You can also process your profile or profiles that you own.

Remember
Before using the RACF cross-reference utility, you should consult with your RACF system programmer. You may need to find out:

- How to run the utility
- When to run the utility to reduce its impact on system operations

For more information on using this utility, see z/OS Security Server RACF System Programmer’s Guide

Using the RACF database unload utility program (IRRDBU00)

You can also use the RACF database unload utility to provide flexibility in analyzing RACF profile information. The output from this utility is a sequential file that is a relational representation of a RACF database.

If the output is loaded into a database management system (such as DB2*), you can issue your own queries. For example:

- You can find and list occurrences of a user ID or group name in the RACF database
- You can list members of a group by name rather than user ID
- You can list the last recorded date and time that a RACROUTE REQUEST=VERIFY request was issued for a user.

A user with the SPECIAL attribute can request that RACF record statistics during RACROUTE REQUEST=VERIFY processing. REQUEST=VERIFY is issued when a user is logging on to a system or a batch job is entering a system as well as when RACF does such work as a directed command, application update, or password change on behalf of the user. See z/OS Security Server RACF Security Administrator’s Guide for more information about recording RACROUTE REQUEST=VERIFY statistics.

Before using the RACF database unload utility, you should consult with your RACF system programmer. You may need to find out how to run the utility. Your input database must be in the correct format and you must have UPDATE authority to it.

For more information on running this utility, see z/OS Security Server RACF Macros and Interfaces and z/OS Security Server RACF Security Administrator’s Guide. For information on using this utility with DB2, see z/OS Security Server RACF Security Administrator’s Guide.
Using the RACF SMF data unload utility program (IRRADU00)

The RACF SMF data unload utility program is the recommended utility for processing RACF audit records. With it, you can create a sequential file from the security relevant audit data. You can use the sequential file in several ways. You can:

- View the file directly
- Use the file as input for installation-written programs
- Manipulate the file with sort/merge utilities
- Browse an XML–formatted output

You can also upload the file to a database manager (for example, DB2) to process complex inquiries and create installation-tailored reports.

For details on the RACF SMF data unload utility program, see Chapter 3.

Using the DFSORT ICETOOL

IBM’s DFSORT product provides a reporting facility called ICETOOL. RACF provides a collection of reports in IRRICE, a member in SYS1.SAMPLIB, which you can use to create your own reports. IRRICE uses DFSORT statements for the selection criteria and ICETOOL statements for the report format for all the reports. The IEBUPDTE utility processes the IRRICE member and creates a partitioned data set that contains the report formats and record selection criteria.

If you want to use the ICETOOL to create RACF reports, you must:

- Be sure you have the IBM’s DFSORT product or its equivalent installed on your system
- Unpack the DFSORT ICETOOL control statements that are supplied by RACF
- Customize the DFSORT ICETOOL control statements supplied by RACF to produce the reports you need

See “Using the DFSORT ICETOOL to create reports” on page 53 for a detailed description of the DFSORT ICETOOL and the IRRICE member.

Using the RACF report writer

The profile listings the RACF commands provide can help you to verify the audit controls that exist at any particular time. The RACF report writer helps you to monitor RACF-related activity during system operation and to verify that these activities are consistent with your installation’s security goals. It provides printed reports based on the data your audit controls directed RACF to log.

The report writer makes use of certain system management facility (SMF) records to obtain information. You can control the selection of these records and the format and type of report that the report writer produces through the use of the RACFRW command and its subcommands.

However, the report writer supports audit records for RACF release 1.9.2 and earlier. It does not support most of the audit records introduced in the RACF Version 2 releases or as part of the z/OS releases.

See Appendix A, “The RACF report writer,” on page 121 for a detailed description of the report writer, the RACFRW command, and samples of the available reports.
Conducting the audit

Asking the right questions is an essential part of any audit, including an audit of your own RACF-protected installation or a review of another installation. In such a review or audit, your principal review objectives are:

1. Judge how effectively RACF has been implemented to handle security at the installation.
2. Identify any security exposures.
3. Recommend ways to improve the system.

To accomplish these objectives, you need to understand your installation and its security requirements. To obtain the information, you can interview a few key people such as the security administrator, the system programmer responsible for installing and implementing RACF, and a senior member of the system support group. Asking the right questions of the right people can help you in your audit.

One way to deal with the mass of information used for an audit is to divide it into categories: preliminary information, system information, and RACF information. The rest of this chapter uses these categories to identify blocks of information you need or questions you might ask. Not all of the suggestions apply at any one installation; any particular installation may require additional investigation. Treat these suggestions as a starting point, then tailor and expand your audit to fit the conditions that exist.

When you are conducting an audit, you should obtain current installation reports from the data security monitor (DSMON). These reports are helpful in answering a number of your questions. You can also use the DSMON reports to verify that the actual status of various security mechanisms is what you and the installation expect. DSMON is described in Chapter 4, “The data security monitor (DSMON),” on page 93.

Preliminary information

Before conducting an audit, you should establish preliminary information concerning the type, size, and complexity of your installation. The following questions should help you get started.

1. What are the processor complexes and their associated system control programs (SCPs), as well as the release and level of RACF for each? You can use the DSMON reports to answer this particular question.
2. For each processor complex, what are the subsystems—such as TSO/E, IMS/ESA, CICS/ESA—protected by RACF (including the release and level of each)? List them.
3. Are processor complexes linked (for example, by NJE, RSCS, JES2, or JES3)?
4. Is DASD shared between systems? What type of data is shared?
5. Do you have dial-up lines?
6. Explain briefly the classification system.
7. What is the highest classification of data processed and/or transmitted?
8. Will you be using z/OS UNIX System Services?

System information

An operating system should have integrity; that is, it should prevent one program from interfering with or modifying the execution of another system or user program unless the interference is authorized. To increase your awareness of potential
security problems, read related MVS documentation that provide overview information and describe system features that promote security. A list of the related documentation is provided in the preface of this document.

**Basic system**

Use the following questions to help establish foundation information concerning your system.

1. What is the operating system version and release level and PTF level (PUT tape)? You can use the DSMON reports to answer this particular question.
2. How many local modifications have been applied (excluding exit routines)?
3. What are the main areas and/or functions modified?
4. Are the systems the same on all processor complexes?
5. What user-written SVC routines does the system include and what is their purpose?
6. What exit routines are in the system and what is their purpose? Could these exit routines affect RACF protection? Some examples of subsystems or components that can have exit routines are:
   - SMF
   - TSO/E
   - JES
   - Job management

**Authorization**

Use the following questions to determine current system authorization.

1. What are the entries in the program properties table (PPT) that automatically bypass password protection? You can use the DSMON reports to answer this particular question.
2. Which started procedures have the trusted or privileged attribute? You can use the DSMON reports to answer this particular question.
3. What are the authorized libraries?
   - In your PARMLIB concatenation (IEAAPFxx)? You can use the DSMON reports to answer this particular question.
   - In your PARMLIB concatenation (LNKLSTxx)? You can use the DSMON reports to answer this particular question.
   - In your PARMLIB concatenation (IEALPAxx)?
   - In your PARMLIB concatenation (LPALSTxx)?

   **Note:** You can find your PARMLIB concatenation with an MVS operator command or you can use the RACF_SENSITIVE_RESOURCES health check which reports on the concatenated PARMLIB data sets.
4. Other than standard IBM programs, what programs require authorization in these libraries?
5. What are the commands and programs that can be executed in the foreground as Authorized Program Facility (APF)-authorized (CSECTs IKJEFT2 and IKJEFT2E in module IKJEFT01 or IKJTABLS, or SYS1.PARMLIB member IKJTSO00, depending on your release of TSO)?
6. Is the list of authorized programs and commands reasonable and consistent with the installation’s security goals? You can use the DSMON reports to answer this particular question.
7. How are changes and additions to the authorized libraries controlled? Who authorizes changes?
**System protection**

Use the following questions to determine current system protection.

1. How are changes to the system controlled and documented?
2. How are the system libraries (including page data sets, dump data sets, JES spool and checkpoint data sets, and SMP data sets) protected? Who can access these libraries?
3. What libraries have a universal access of READ? You can use the DSMON reports to answer this particular question.
4. What libraries have a universal access of UPDATE or higher? You can use the DSMON reports to answer this particular question.
5. What libraries have a universal access of EXECUTE? You can use the DSMON reports to answer this particular question.
6. Are the DLIB data sets also protected? You can use the DSMON reports to answer this particular question.
7. Are all the catalogs protected? You can use the DSMON reports to answer this particular question.
8. Are key security items, (such as RACF databases, SYS1.UADS, password data, cipher key file, SMF data, source and load modules for RACF exit routines, and SMF routines) all identified and protected? You can use the DSMON reports to answer this particular question.
9. If JES3 is installed, is the use of dynamic support program (DSP) controlled (including utilities such as tape-to-tape and tape-to-print)?

**Miscellaneous**

The following questions do not fall into any of the preceding categories; however, the information gained from the answers could be useful when conducting an audit.

1. Can bypass label processing (BLP) be used? If yes, how is it controlled?
2. Is OS password protection used? If yes, why?
3. If dial-up terminals are used, how is unauthorized use prevented?
4. Is full SMF recording in use? If not, what is excluded either by options or exit routine code?
5. What is the wait limit that causes a terminal to be logged off?
6. How far back do system backup dumps go?
7. Are all IPLs logged and the reasons reported?
8. Is all time on the system accounted for?
9. Is it possible to detect if the system has been loaded without RACF? You can use the DSMON reports to answer this particular question.
10. How is the use of RACF commands controlled?

**RACF implementation**

Installing RACF does not necessarily mean that the RACF security facilities were correctly implemented and are being correctly maintained. (For more information about implementing RACF, see [z/OS Security Server RACF Security Administrator's Guide](#).

**Protection plan**

Use the following questions to determine what resources your installation is currently protecting.

1. How many RACF users and groups do you have? All or part of this question can be answered by using the DSMON reports.
2. Do you have any non-RACF users? If so, why?

3. Which of the following resources are RACF-protected, what proportion of each is protected, and how is it decided which to protect? All or part of this question can be answered by manipulating the output of the RACF database unload utility.
   - DASD data sets
   - Tape data sets
   - Nodes
   - Terminals
   - IMS/ESA
   - CICS/ESA
   - DB2 resources
   - Programs
   - Surrogate user IDs
   - TSO procedures
   - TSO account numbers
   - Unit record devices
   - Graphics devices
   - TP devices
   - Operator commands
   - VTAM applications
   - JES writers
   - JES SYSEX and SYSOUT data sets
   - Job names
   - JES input devices
   - MCS consoles
   - Temporary data sets
   - Hiperbatch
   - User IDs that cannot be propagated
   - TSO message transmission
   - Key resources unique to the installation
   - z/OS UNIX System Services resources

4. How does the installation ensure that appropriate protection is maintained?

5. What protection is available for resources not protected by RACF?

6. Is the protection policy reasonable?

**Usage**

Use the following questions to determine how RACF is currently being implemented.

1. Which user IDs (including started tasks) have any of the following privileged attributes or authorities? Why? You can use the IRRICE reports or DSMON reports to answer this particular question.
   - SPECIAL and group-SPECIAL
   - OPERATIONS and group-OPERATIONS
   - AUDITOR and group-AUDITOR
   - CLAUTH
   - JOIN
   - CONNECT
   - GRPACC

2. How is the granting of these privileges controlled?

3. Are user IDs shared? If so, why, and how is accountability maintained? Is the RESTRICTED attribute used to limit the resource access of the shared user IDs?

4. Is the default for UACC always NONE? If not, why?
All or part of this question can be answered by manipulating the output of the RACF database unload utility or by using the sample reports contained in the IRRICE member of SYS1.SAMPLIB.

5. How are password qualities complied with? Do you use, for example, password length, nature (alphabetic, alphanumeric, no vowels), repetition, or change frequency?

6. What RACF information, such as the following, is logged to SMF?
   - Command violations
   - Changes to profiles
   - Accesses to specific resources
   - Actions of SPECIAL and group-SPECIAL users
   - Actions of OPERATIONS and group-OPERATIONS users

7. Who decides what resource-access information is to be collected? On what criteria?

8. What RACF statistics are collected?

9. What are the access rules when RACF is inactive or unavailable, such as stopping production, performing repair work only, or allowing selected jobs and applications to run?

10. Is WARNING mode active, entirely or partially? Are there non-WARNING mode resources?

   All or part of this question can be answered by manipulating the output of the RACF database unload utility.

11. Do access lists contain groups rather than individuals?

12. How is the authority to run production work handled? Does the job submitter have access to production data? If so, how are the profiles deleted?

13. How is RACF protection handled in disaster-recovery plans?

14. Describe any operational or usage problems for which the installation cannot currently determine a solution.

15. Do you need to delete tape profiles before using tape volumes again?

16. Is DASDVOL authorization used instead of the OPERATIONS user attribute?

**Technical**

The following questions provide technical orientation.

1. What RACF exit routines are used, and what functions do they perform? The following list identifies the exits. You can use the DSMON reports to answer this particular question.

<table>
<thead>
<tr>
<th>Exit Routine</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICHDEX01</td>
<td>password authentication</td>
</tr>
<tr>
<td>ICHDEX11</td>
<td>password authentication</td>
</tr>
<tr>
<td>ICHR0X01</td>
<td>RACROUTE REQUEST=VERIFY preprocessing</td>
</tr>
<tr>
<td>ICHR0X02</td>
<td>RACROUTE REQUEST=VERIFY postprocessing</td>
</tr>
<tr>
<td>ICHR0X01</td>
<td>RACROUTE REQUEST=AUTH preprocessing</td>
</tr>
<tr>
<td>ICHR0X02</td>
<td>RACROUTE REQUEST=AUTH postprocessing</td>
</tr>
<tr>
<td>ICHR0X01</td>
<td>RACROUTE REQUEST=DEFINE preprocessing</td>
</tr>
<tr>
<td>ICHR0X02</td>
<td>RACROUTE REQUEST=DEFINE postprocessing</td>
</tr>
<tr>
<td>ICHCMX00</td>
<td>command preprocessing</td>
</tr>
<tr>
<td>ICHCMX00</td>
<td>command preprocessing</td>
</tr>
<tr>
<td>ICHRFX01</td>
<td>RACROUTE REQUEST=FASTAUTH preprocessing</td>
</tr>
<tr>
<td>ICHRFX02</td>
<td>RACROUTE REQUEST=FASTAUTH postprocessing</td>
</tr>
<tr>
<td>ICHRFX03</td>
<td>RACROUTE REQUEST=FASTAUTH preprocessing</td>
</tr>
<tr>
<td>ICHRFX04</td>
<td>RACROUTE REQUEST=FASTAUTH postprocessing</td>
</tr>
</tbody>
</table>
Administration control

The following questions provide information concerning how RACF is administered at your installation.

1. Who is responsible for the administration of RACF? You can use the DSMON reports to answer this particular question.
2. Who is responsible for the technical aspects of RACF?
3. Are data owners identified?
4. Do data owners classify their data?
5. Is the degree of protection provided by the installation based on the owner classification?
6. Are there written and approved procedures for RACF administration?
7. Does the installation maintain written records of requests for changes to RACF protection and the resulting actions taken?

8. How are users and groups administered? How are additions, deletions, changes, connections, and authorities handled?

9. How is the authority to protect resources and grant access checked and handled?

10. How is the granting of temporary authorities handled? Can users issue PERMIT/CONNECT for temporary access, or are there privileged attributes available for emergency use?

11. How is password distribution handled?

12. How are lost passwords handled?

13. Is additional verification required for users with privileged attributes? Are these users restricted to particular terminals?

14. Is there an emergency user ID with the SPECIAL attribute available for use when no other SPECIAL user ID can be used? If so, how does the installation protect the user ID and its password? You can use the DSMON reports to answer this particular question.

15. Is the auditor a different person from the RACF security administrator? What are the responsibilities of the auditor? You can use the DSMON reports to answer this particular question.

16. Is there any user education available?

17. Are there any entries in the authorized caller table? If so, why are they there and are they adequately protected?

**Management control**

The following questions address management control.

1. What reports are available to users, owners, and installation management to ensure that the system is not being misused? Examples are reports that identify violation attempts, unauthorized access attempts, and unauthorized use of commands and privileges.

2. How frequently are reports produced, and who sees them?

3. If a security violation occurs, what follow-up action does the installation take?

4. Is the installation using DSMON reports to monitor the basic system security environment? If not, why isn’t it?
Chapter 2. Setting audit controls

Audit controls are special RACF functions that RACF allows only the auditor to perform. To preserve the checks and balances necessary to an effective security mechanism, not even the security administrator with the SPECIAL attribute can execute auditor functions. Therefore, you should ensure that SPECIAL users do not also have the AUDITOR attribute.

<table>
<thead>
<tr>
<th>General audit control</th>
<th>You can use:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Auditing options specified on the SETROPTS (set RACF options) command</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Specific audit controls</th>
<th>You can specify:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• All RACF related activities of specific users</td>
</tr>
<tr>
<td></td>
<td>• Attempts to access data sets protected by specific profiles</td>
</tr>
<tr>
<td></td>
<td>• Attempts to access general resources (such as terminals) that are protected by specific profiles</td>
</tr>
</tbody>
</table>

Some audit controls are product-specific. Refer to the appropriate product documentation for setting these audit controls.

General audit controls

You specify general (system-wide) audit controls on either the SETROPTS command or the SET AUDIT OPTIONS ISPF panel. General audit controls direct RACF to log (or not to log) certain security-relevant events, such as the activities of OPERATIONS or group-OPERATIONS users, RACF command violations, and attempts to access RACF-protected resources.

To specify the general audit controls, you must have the AUDITOR attribute. After you have initially established your controls or modified existing controls, it is a good practice to list the current options to verify that the controls are correct.

If you have the AUDITOR attribute, you can specify these SETROPTS operands or request the function on the corresponding panel:

- APPLAUDIT and NOAPPLAUDIT
- AUDIT and NOAUDIT
- CMDVIOL and NOCMDVIOL
- LIST
- LOGOPTIONS
- OPERAUDIT and NOOPERAUDIT
- REFRESH GENERIC
- REFRESH RACLIST
- SAUDIT and NOSAUDIT
- SECLABELAUDIT and NOSECLABELAUDIT
- SECLEVELAUDIT and NOSECLEVELAUDIT

If you have the group-AUDITOR attribute, you can use only the LIST and REFRESH GENERIC operands.

Logging RACF commands and DEFINE requests

If you have the AUDITOR attribute, you can specify the classes for which RACF logs all detected accesses to the RACF database through RACF commands and DEFINE requests. You can specify this option with the AUDIT operand on the
SETROPTS command; it becomes effective immediately. The following example specifies that you want RACF to log RACF commands and DEFINE requests for users, groups, data sets, and the TERMINAL general-resource classes.

```
SETROPTS AUDIT(USER GROUP DATASET TERMINAL)
```

If you specify AUDIT(*), RACF logs RACF command and DEFINE request activity for all classes.

If you want to log any change in RACF protection for IMS, enter:

```
SETROPTS AUDIT(IMS)
```

The following table shows the events that SETROPTS AUDIT(class) affects:

<table>
<thead>
<tr>
<th>User</th>
<th>Group</th>
<th>Data set</th>
<th>Classes in the CDT</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADDUSER</td>
<td>ADGROUP</td>
<td>ADDSD</td>
<td>PERMIT</td>
</tr>
<tr>
<td>ALTUSER</td>
<td>ALTGROUP</td>
<td>ALTDSD</td>
<td>DEFINE Request</td>
</tr>
<tr>
<td>CONNECT</td>
<td>CONNECT</td>
<td>DELDSD</td>
<td>RALTER</td>
</tr>
<tr>
<td>DELUSER</td>
<td>DELGROUP</td>
<td>PERMIT</td>
<td>RDEFINE</td>
</tr>
<tr>
<td>getUMAP</td>
<td>getGMAP</td>
<td>DEFINE Request</td>
<td>RDELETE</td>
</tr>
<tr>
<td>initACEE registration / deregistration</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PASSWORD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RACDCERT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RACLINK</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RACMAP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>REMOVE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R_pkiserv</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VERIFY</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

If you have the AUDITOR attribute, you can also specify the NOAUDIT operand on the SETROPTS command and identify the class or classes for which you do not want RACF to log RACF command and DEFINE requests. If you specify NOAUDIT(*), RACF does not log RACF commands and DEFINE requests for any class.

NOAUDIT(*) is in effect at RACF initialization.

**Note:** If you have the AUDITOR attribute, you can specify with the UAUDIT operand on the ALTUSER command that you want RACF to log all:

- RACROUTE REQUEST=AUTH and RACROUTE REQUEST=FASTAUTH requests that are eligible for logging
- RACROUTE REQUEST=DEFINE requests issued for the user

All RACF commands issued by the user are logged, except for listing operations such as LISTGRP and LISTUSER, which do not perform logging.

**Bypassing logging of activity of users with the SPECIAL attribute**

If you have the AUDITOR attribute, you can request that RACF bypass logging of all RACF commands and the AUTH and DEFINE requests issued by users with the SPECIAL or group-SPECIAL attribute. You can specify this option with the NOSAUDIT operand on the SETROPTS command as shown in the following example:
If you have the AUDITOR attribute, you can also specify the SAUDIT operand on the SETROPTS command, to indicate that you want RACF to log the command and request activity (except LISTDSD, LISTGRP, LISTUSER, RLIST, and SEARCH, which are never logged) of users with the SPECIAL or group-SPECIAL attribute.

Note: If you are concerned only with how SPECIAL users change profiles, you do not need to specify SAUDIT if AUDIT(*) is in effect.

SAUDIT is in effect at RACF initialization.

Logging the activities of users with the OPERATIONS attribute

If you have the AUDITOR attribute, you can audit all accesses to resources granted because the user has the OPERATIONS or group-OPERATIONS attribute, by using the OPERAUDIT operand on the SETROPTS command. The following example shows how to specify this option.

SETROPTS OPERAUDIT

If you specify OPERAUDIT, RACF logs all accesses to RACF-protected resources granted because the user has the OPERATIONS or group-OPERATIONS attribute, and all uses of the ADDSD, and RDEFINE commands allowed because a user has the OPERATIONS or group-OPERATIONS attribute.

Note: Some programs that call RACF functions such as RACROUTE REQUEST=AUTH and RACROUTE REQUEST=DEFINE can request that RACF perform no logging. Thus, if an OPERATIONS or group-operations user accesses a protected resource through such a program, RACF does not log the access even if you request OPERAUDIT.

OPERAUDIT overrides the audit field of data set, file, directory and general resource profiles. OPERAUDIT does not affect any auditing requested by the GLOBALAUDIT operand on the RACF commands.

If you have the AUDITOR attribute, you can also specify NOOPERAUDIT. NOOPERAUDIT does no special auditing of users with the OPERATIONS or group-OPERATIONS attribute.

NOOPERAUDIT is in effect at RACF initialization.

Logging and bypassing RACF command violations

A violation can occur because RACF does not authorize a user to modify a particular profile or to enter a particular operand on a command.

If you have the AUDITOR attribute, you can specify the CMDVIOL operand on the SETROPTS command. This operand tells RACF to log all command violations (except for LISTDSD, LISTGRP, LISTUSER, RLIST, and SEARCH, which are never logged).

Note: Specifying CMDVIOL causes RACF to log all the command violations that it detects. You can then use the RACF report writer to produce a printed audit trail of command violations. You can determine how many command violations are occurring and which users are causing the violations. A significant number of command violations, especially when RACF is first
installed, may indicate the need for more user education. The report can also help you to identify any specific users who are persistently trying to alter profiles without the proper authority.

CMDVIOL is in effect at RACF initialization.

If you have the AUDITOR attribute, you can request that RACF bypass logging of all violations detected by RACF commands (except RVARY and SETROPTS, which are always logged) during RACF command processing. You can specify this option with the NOCMDVIOL operand on the SETROPTS command as shown in the following example:

```
SETROPTS NOCMDVIOL
```

### Activating auditing for security levels

If you have the AUDITOR attribute, you can activate auditing of access attempts to all RACF-protected resources. To activate this option, specify the SECLEVELAUDIT operand with an installation-defined security level name on the SETROPTS command. Auditing is done if the profile protecting a resource is equal to or greater than the security level you specify on the SECLEVELAUDIT operand.

**Notes:**

1. You can only specify a security level name defined by your installation in the SECLEVEL profile in the SECDATA class. If you specify a security level that is not in the SECLEVEL profile for the SECDATA class, RACF ignores the operand and does no logging.
2. The SECDATA class must be active if you want RACF to perform security level control.

The following example shows how to activate auditing based on the security level CONFIDENTIAL. (This example assumes that the installation has defined the level CONFIDENTIAL in the SECLEVEL profile.)

```
SETROPTS SECLEVELAUDIT(CONFIDENTIAL)
```

When you specify a security level, RACF audits all attempts to access resources with the specified security level and higher. This option allows your installation to audit access attempts to a RACF-protected resource, based on the sensitivity of the resource, as determined by the installation. If you do not specify a security level, RACF audits all access attempts to all resources for which your installation has defined a security level (SECLEVEL).

**Notes:**

1. If a program issues an AUTH or DEFINE request and specifies that RACF should not perform any logging, RACF does not log the event even if you request logging.
2. When RACF grants access to a resource because of an entry in the global access checking table, RACF does not log the event even if you request logging.

If you have the AUDITOR attribute, you can also deactivate auditing of access attempts to RACF-protected resources based on installation-defined security levels. To deactivate this option, specify the NOSECLEVELAUDIT operand on the SETROPTS command.

NOSECLEVELAUDIT is in effect at RACF initialization.
Activating auditing for access attempts by class

If you have the AUDITOR attribute, you can audit attempts to access resources in specified classes according to the option selected. You can specify the DATASET class and any active classes in the class descriptor table. The resources need not have profiles created in order for the auditing to occur.

The following command specifies that auditing be done for all attempts to access the TERMINAL class.

```
SETROPTS LOGOPTIONS(ALWAYS(TERMINAL))
```

In this case, auditing is done every time a user logs on at any terminal on the system, whether that terminal is protected by a profile or not, and whether that profile specifies auditing or not.

You can specify that auditing be done for the following conditions:

- **ALWAYS**
  All attempts to access resources protected by the class are audited.

- **NEVER**
  No attempts to access resources protected by the class are audited. (All auditing is suppressed.)

- **SUCCESSES**
  All successful attempts to access resources protected by the class are audited.

- **FAILURES**
  All failed attempts to access resources protected by the class are audited.

- **DEFAULT**
  Auditing is controlled by the profile protecting the resource, if a profile exists. You can specify DEFAULT for all classes by specifying an asterisk (*) with DEFAULT.

**Notes:**

1. The SUCCESSES and FAILURES operands result in auditing in addition to any auditing specified in profiles in the class. In contrast, the ALWAYS and NEVER operands override any auditing specified in profiles in the class.
2. If LOG=NONE is specified on a RACROUTE REQUEST=AUTH, it takes precedence and auditing is not performed.
3. When RACF grants access to a resource because of an entry in the global access checking table, RACF does not log the event even if you request logging.
4. If authority checking is performed with a RACROUTE REQUEST=FASTAUTH request, auditing is not affected by a SETROPTS LOGOPTIONS command.

LOGOPTIONS(DEFAULT(*)) is in effect at RACF initialization.

If your installation has specified SETROPTS LOGOPTIONS for any number of classes and you want this reset, specify LOGOPTIONS(DEFAULT(*)) on the SETROPTS command.
Activating auditing for security labels

If you have the AUDITOR attribute, you can audit all attempts to access resources whose profiles have a security label specified. The auditing that is done is specified in the SECLABEL profile that defines the security label. To do this, specify the SETROPTS command as follows:

```
SETROPTS SECLABELAUDIT
```

When SECLABELAUDIT is in effect, the SECLABEL profiles for which RAclist processing has been done enhance the auditing specified in resource profiles. For example, if the security label EAGLE has been defined by the installation and a resource with security label EAGLE is accessed, when a user with security label EAGLE logs on, RACF records the event if either:

- The in-storage copy of the SECLABEL profile named EAGLE requires it, or
- The profile protecting the resource requires it.

For example, to audit all failed accesses to resources with a security label of EAGLE, the installation should issue the following command:

```
RALTER SECLABEL EAGLE AUDIT(FAILURES(READ))
```

After this command has been issued, a DATASET profile that has a security label of EAGLE, but no auditing specified, will have failed access attempts audited due to the security label auditing specified.

**Note:** A value of NONE in the SECLABEL profile does not suppress auditing; auditing is determined by other auditing specifications (such as the resource profile).

NOSECLABELAUDIT is in effect at RACF initialization.

If your installation has specified SETROPTS SECLABELAUDIT, additional auditing is done based on SECLABEL profiles. This option can be reset to the default by specifying NOSECLABELAUDIT on the SETROPTS command. The auditing options in the SECLABEL profiles do not have to be changed, however, because NOSECLABELAUDIT causes the audit options to be ignored.

The SECLABELAUDIT function applies whenever resources are accessed or defined, and includes accessing and defining z/OS UNIX files and directories. SECLABELAUDIT is checked during the following operations:

- `RACROUTE REQUEST=AUTH`
- `RACROUTE REQUEST=FASTAUTH`
- `RACROUTE REQUEST=DEFINE`

Additionally, SECLABELAUDIT is checked during the following file and directory operations:

- `ck_access`
- `ck_IPC_access`
- `ck_owner_two_files`
- `make_FSP`
- `make_ISP`
- `ck_process_owner`
- `R_ptrace`
Note that auditing is determined not only by the security label of a resource, but also of the user. Therefore, if a resource's security label does not request auditing, but a user has a security label which does request auditing, auditing will be performed.

When auditing security labels with the SECLABELAUDIT function, SMF audit records are written, thus requiring a high amount of system overhead. It is advised that auditing not be turned on for every security label in the system. Only those security labels with specific auditing requirements, as defined by the installation, should be audited.

Auditing for APPC/MVS

There are several considerations associated with APPC/MVS auditing:

- Auditing user verification requests as transactions enter the system and complete
- Auditing the use of a particular APPC/MVS transaction program
- Determining the relationship between the audit records created during the execution of APPC/MVS transactions

User verification requests

There are two alternatives used in APPC/MVS that affect how auditing is performed. The alternative in effect is determined by the level of conversation security established between a pair of LUs. With either alternative, you can request a pair of audit records that mark the creation and deletion of a user's security environment.

1. One alternative uses a concept known as persistent verification (PV). When PV is used, the security environment for a user is created when the user's first transaction request enters the system. The security environment persists over multiple transactions before being deleted.
   - In terms of audit records for user verification, a user is audited twice at the most:
     - First, when the user begins work on the system
     - Next, when the user signs off, regardless of how many transactions are submitted.

2. In the other alternative (non-PV), the user's security environment is created and deleted for each transaction the user requests.
   - In terms of audit records for user verification, every transaction a user submits may be audited. This can potentially produce a large volume of SMF records.

With either alternative, the audit records marking the creation and deletion of the security environment contain a common audit key that links the audit records together.

With either alternative, the auditing is controlled with the APPL profile and the APPLAUDIT operand of the SETROPTS command. See "Activating APPC/MVS auditing" on page 24.

Transaction program auditing

Auditing of resource access attempts is done as part of day-to-day operations set up by the auditor or profile-owner for your installation. This existing auditing also occurs for transaction programs, but with a slight difference in audit records.

The audit records created by a transaction program contain an audit key that can be used to link audit records together.
In the case of persistent verification (where user verification is audited only twice—at signon and signoff), the audit key links records to a particular user. In the case of non-PV, the audit key links records created for a single transaction request.

**Relationship of APPC/MVS audit records**
Audit records created for users and transaction programs may be linked by a common key. All APPC/MVS audit records contain an 8-byte key that may be used to link the beginning and ending records together.

**Activating APPC/MVS auditing**
APPLAUDIT is a RACF option that allows user verification auditing to occur at the beginning and ending of a user’s transaction processing work. Activating this auditing requires two steps:
1. You must specify the APPLAUDIT operand on the SETROPTS command.
2. You must request auditing for the APPL profile associated with an APPC/MVS LU.

Issue the following command:
```
SETROPTS APPLAUDIT
```

In addition to setting APPLAUDIT on, you must also request auditing for the APPL profile.

For example, you could issue the following command:
```
RALTER APPL profile-name GLOBALAUDIT(ALL)
```

where `profile-name` is the name of the APPC/MVS LU.

**Note:** The security administrator must have previously activated the APPL class, defined the APPL profile, and issued a SETROPTS RACLST for the class.

To turn on auditing for the profile in the APPL class, use any of the following operands on the RALTER command:
- `AUDIT(ALL)`
- `AUDIT(SUCCESS)`
- `AUDIT(FAILURE)`
- `GLOBALAUDIT(ALL)`
- `GLOBALAUDIT(SUCCESS)`
- `GLOBALAUDIT(FAILURE)`

**Note:** Remember to issue a SETROPTS RACLST REFRESH for the APPL class.

**Deactivating APPC/MVS auditing**
To disable auditing of APPC transactions, users with the AUDITOR attribute should specify the SETROPTS command as follows:
```
SETROPTS NOAPPLAUDIT
```

NOAPPLAUDIT is in effect at RACF initialization.

**Refreshing profiles**
You can use the SETROPTS command to refresh profiles. This includes refreshing:
- In-storage generic profiles
Profiles processed by SETROPTS RACLIST
- The global access table
- The program access table
- Shared systems

Refreshing in-storage generic profiles
You may want to use GENERIC REFRESH after changing the logging options in a generic profile that protects a specific data set, as described in "Specific audit controls" on page 28. However, extensive use of GENERIC REFRESH can adversely affect system performance.

You can refresh in-storage generic profiles by specifying both the GENERIC and REFRESH operands on the SETROPTS command. When you specify both GENERIC and REFRESH, you also specify one or more classes for which you want RACF to refresh in-storage generic profiles. This causes all the in-storage generic profiles within the specified general resource class (except those in the global access checking table) to be replaced with new copies from the RACF database. The following example shows how to refresh in-storage generic profiles for the DATASET and TERMINAL classes:

```
SETROPTS GENERIC(DATASET TERMINAL) REFRESH
```

Note that you must issue this command each time you want RACF to perform the refresh process.

If you specify GENERIC(*), RACF refreshes profile lists for the DATASET class and all active classes in the except group resource classes (such as GTERMINL and GDASDVOL). When you initiate the refresh procedure, RACF sets an indicator in the RACF communication vector table for the class(es) that you specified. After the indicator is set, RACF refreshes the profile lists the next time it invokes the generic-profile search routine.

If you specify NOGENERIC on the SETROPTS command, RACF stops using in-storage generic profile lists but does not immediately delete them. RACF deletes the profile lists at the end of the job or TSO session, or when you again specify GENERIC. When you specify GENERIC, RACF rebuilds the profile lists. (If SETROPTS GENLIST has been used on your system, a copy of the generic profiles for the resource resides in common storage. You can also use REFRESH GENERIC to refresh these in-storage generic profiles.)

For classes RACLISTed by either the SETROPTS RACLIST command or RACROUTE REQUEST=LIST, generic as well as discrete profiles for the class must be refreshed. This process is described in the next section.

Refreshing RACLISTed profiles
If SETROPTS RACLIST has been used on your system, copies of the discrete and generic profiles for any resource within a general resource class reside in a data space and can be shared among users. SETR RACLIST(classname) REFRESH causes the data space to be replaced with another data space containing new copies of the discrete and generic profiles from the RACF database.

If SETROPTS RACLIST has been issued for a general resource class and you change the logging options for a general resource profile in the class, you may want to use the REFRESH option to refresh the profile.
The following example shows how to refresh SETROPTS RACLIST processing for the DASD VOL and TERMINAL classes.

```
SETROPTS RACLIST(DASD VOL TERMINAL) REFRESH
```

The RACROUTE REQUEST=FASTAUTH service routine works with in-storage profiles RACLISTed by the RACROUTE REQUEST=LIST macro with ENVIR=CREATE specified. In order to refresh those profiles, the application must delete them by using RACROUTE REQUEST=LIST,ENVIR=DELETE and then recreate them using RACROUTE REQUEST=LIST,ENVIR=CREATE again. However, if the GLOBAL=YES parameter is specified, a refresh is accomplished with SETR RACLIST(classname) REFRESH.

**SETROPTS REFRESH processing on shared systems**

If RACF is enabled for sysplex communication, the refresh operation for SETROPTS processing is propagated to all members of the RACF sysplex data sharing group.

Otherwise, the command applies only to the system (z/VM or MVS) on which you issue the SETROPTS command. If your installation has two or more systems sharing a RACF database, you must issue the SETROPTS command on all systems to have the refresh done on all systems.

However, if you do not perform a refresh (issue the SETROPTS command with the REFRESH option) on a system sharing a RACF database and that system needs to re-IPL, the refresh takes effect on that system when re-IPL is performed.

When you issue a SETROPTS REFRESH command, or one of the propagated RVARY commands (ACTIVE, INACTIVE, DATASHARE, NODATASHARE, SWITCH) from one member of a RACF sysplex data sharing group, the request is audited only on the system from which you issue the command, and only if auditing has been selected for that system. The request is not audited on the peer member systems (regardless of whether auditing has been selected).

For more details on SETROPTS commands that are propagated to all members of the RACF sysplex data sharing group, refer to [z/OS Security Server RACF Command Language Reference](#).

**Examples for setting audit controls using SETROPTS**

The following examples show how to set system-wide audit controls by using the SETROPTS command.

**Note:** If you wish to list the current system-wide audit controls set with the SETROPTS command, enter:

```
SETROPTS LIST
```

You can also use the LIST operand on the SETROPTS command; for example:

```
SETROPTS SAUDIT LIST
```

**Example 1**

To log any changes to the profiles in the USER, GROUP, DATASET, and DASD VOL classes, enter:

```
SETROPTS AUDIT(USER,GROUP,DATASET,DASD VOL)
```
Example 2
To log RACF commands issued by SPECIAL and group-SPECIAL users, enter:
SETROPTS SAUDIT

Example 3
To log all accesses to resources that users make as a result of the OPERATIONS attribute, enter:
SETROPTS OPERAUDIT

Example 4
To log all successful password changes (including password phrase changes), enter:
SETROPTS AUDIT(USER)

Example 5
To log all RACF command violations, enter:
SETROPTS CMDVIOL

Example 6
To log all attempts to access any resource with a security level of confidential or higher enter:
SETROPTS SECLEVELAUDIT(CONFIDENTIAL)

Example 7
To refresh the in-storage, generic data set profiles, enter:
SETROPTS REFRESH GENERIC(DATASET)

Note: You can combine these six examples into a single SETROPTS command by entering:
SETROPTS AUDIT(USER,GROUP,DATASET,DASDVOL)
SAUDIT OPERAUDIT CMDVIOL SECLEVELAUDIT(CONFIDENTIAL)
REFRESH GENERIC(DATASET)

Example 8
To refresh the in-storage profiles for terminals when SETROPTS RACLIST has been used for the terminal class, enter:
SETROPTS REFRESH RACLIST(TERMINAL)

Example 9
To log all device access checking for communication, unit record, and graphics devices, enter:
SETROPTS LOGOPTIONS(ALWAYS(DEVICES))

Example 10
To log all operator commands that are protected by profiles in the OPERCMDS class, enter:
SETROPTS LOGOPTIONS(ALWAYS(OPERCMDS))

Example 11
To enable the use of SECLABEL profiles to determine the desired level of auditing, enter:
SETROPTS SECLABELAUDIT

Example 12
To audit APPC transactions, enter:
SETROPTS APPLAUDIT
RALTER APPL profile-name AUDIT

where profile-name is the name of the APPC/MVS LU name.

Example 13 (z/OS UNIX System Services)

To log all failing directory searches and access checks for read/write access to directories, enter:
SETROPTS LOGOPTIONS(FAILURES(DIRSRCH,DIRACC))

Example 14 (z/OS UNIX System Services)

To control auditing of the successful creation and deletion of file system objects and dubbing and undubbing of processes, enter:
SETROPTS AUDIT(FSOBJ,PROCESS)

Specific audit controls

Specific audit controls enable you to log the following:
- All RACF-related activities for specific users
- Attempts to access specific data sets
- Attempts to access specific general resources
- Attempts to access resources protected by a security label

You can also list the complete contents of all profiles, including the owner-specified and auditor-specified logging options for resources.

If you have the AUDITOR attribute, you can set specific controls for any user, data set, or general resource, and list the contents of any profile. If you have the group-AUDITOR attribute, you can set controls and list profile contents only for those users, data sets, and general resources owned by the group in which you have the attribute, and any subgroup of that group.

User controls

You can use the UAUDIT or NOUAUDIT operand on the ALTUSER command, or request the corresponding functions on the AUDIT USER panel, to log all RACF-related activities for a specific user. When you set this control, RACF logs the following events:
- All RACF commands that the user issues
- All additions, changes, or deletions that the user makes to the RACF profiles
- All attempts that the user makes to access RACF-protected resources, except those authorized by global access checking

In general, you would probably not request user audit-logging as a matter of course, but it is useful in special situations. For example, you can specify user-audit logging if you suspect, based on other indicators such as command violations, that a particular user may be misusing the system or persistently trying to access or delete resources outside the user’s control. Examples of the type of event that might indicate misuse of the system are either unauthorized attempts to modify a critical system resource (such as a PARMLIB data set) or a highly classified user resource (like payroll or business-planning data).
Example
To use the UAUDIT operand on the ALTUSER command to audit the person whose
user ID is SMITH, enter:
ALTUSER SMITH UAUDIT

Data set controls
If owner controlled logging does not provide enough information for your audit, you
can use the GLOBALAUDIT operand on the ALTDSD command or request the
corresponding function on the AUDIT DATA SET ACCESS panel, in addition to the
owner-specified logging values, to log user accesses to data sets.

GLOBALAUDIT allows you to specify logging for different kinds of attempts that
users make to access resources at a given access level. With GLOBALAUDIT, you
can log successful accesses, failed accesses, or both to a given resource and
specify READ, UPDATE, CONTROL, or ALTER for the access level to the resource.

Figure 2 summarizes the GLOBALAUDIT operand for ALTDSD and what you are
able to specify for logging. (For a complete description of the ALTDSD command
and its operands, see z/OS Security Server RACF Command Language
Reference)

ALTDSD [ GLOBALAUDIT ( [ {{ SUCCESS } } ] [ {{ FAILURES } } ] ) ]

Figure 2. GLOBALAUDIT Operand on the ALTDSD Command

Note: Some authorized programs that call RACF to perform authority checking can
request that RACF perform no logging. Therefore, if you request
GLOBALAUDIT auditing for an access attempt made through such a
program, RACF does not log the event.

As with the other specific controls, you do not audit accesses to most data sets, as
a general rule. Therefore, GLOBALAUDIT(NONE) is the default for the operand.
After you complete your audit of the data set, it is good practice to restore the
default. When GLOBALAUDIT(NONE) is in effect, RACF logs accesses to the data
set only as specified by the resource owner.

Example 1
To use the GLOBALAUDIT operand of the ALTDSD command to direct RACF to log
all accesses to data set JIM.MEMO.TEXT, enter:
ALTDSD 'JIM.MEMO.TEXT' GLOBALAUDIT(ALL(READ))

Example 2
To use the GLOBALAUDIT operand of the ALTDSD command to direct RACF to log
all failed accesses, all successful updates, and any scratch of data set A.B.C, enter:
ALTDSD 'A.B.C' GLOBALAUDIT(FAILURES(READ) SUCCESS(UPDATE))

General resource controls
You can use the GLOBALAUDIT operand on the RALTER command or request the
corresponding function on the the AUDIT GENERAL RESOURCES ACCESS panel
to log user accesses to a specific general resource. Because the audit level that you
specify on GLOBALAUDIT overrides the level the resource owner specified in the
profile, you use it when the logging specified in the profile does not produce enough
information for your needs.
When you set audit controls for a general resource, you specify what information RACF is to log—the result of the access attempt—and when RACF is to log the information—the level of access. Figure 2 on page 29 shows the various valid combinations of what to log and when to log it.

As with the other specific controls, you would not audit accesses to most general resources as a general rule. Therefore, GLOBALAUDIT(NONE) is the default for the operand. After you complete your audit of the general resource, it is good practice to restore the default. When GLOBALAUDIT(NONE) is in effect, RACF logs accesses to the resource as specified in the profile.

**Example**  
To use the RALTER command to specify auditing of all events for a tape volume NR1234, enter:

```
RALTER TAPEVOL NR1234 GLOBALAUDIT(ALL(READ))
```

**Listing specific audit controls**  
RACF provides commands and corresponding ISPF panels that allow RACF users, depending on their authority or attributes, to examine the contents of RACF profiles. You, as auditor, can list the contents of all the RACF profiles (or all the profiles within the scope of your group if you are a group-AUDITOR). You can find a complete description of each of the commands, including sample output, in the z/OS Security Server RACF Command Language Reference.

The commands and the functions related to auditing are:

- **LISTDS**  
  This lists the contents of data set profiles. If you have the AUDITOR attribute, you can list all profiles; if you have the group-AUDITOR attribute, you can list only those profiles within the scope of your group and its subgroups.

- **LISTGRP**  
  This lists the contents of group profiles. While the output does not contain any information directly related to specific audit controls, it does include information about the group structure and each user's authority within the group. This information may be useful to you. If you have the AUDITOR attribute, you can list all group profiles; if you have the group-AUDITOR attribute, you can list only the profiles within the scope of your group and its subgroups. This will not list all users in a universal group.

- **LISTUSER**  
  This lists the contents of user profiles. If you have the AUDITOR attribute, you can list all user profiles; if you have the group-AUDITOR attribute, you can list only those profiles within the scope of your group and its subgroups.

- **RLIST**  
  This lists the contents of general resource profiles. If you have the AUDITOR attribute, you can list all resource profiles; if you have the group-AUDITOR attribute, you can list only those profiles within the scope of your group and its subgroups.

**Example**  
To list the complete profile for data set `JIM.MEMO.TEXT`, enter:

```
LISTDS D('JIM.MEMO.TEXT') ALL
```

**Note**: If no discrete profile exists for data set `JIM.MEMO.TEXT`, a generic profile may protect the data set. To list any such generic profile, enter:
Auditing for z/OS UNIX System Services

RACF writes audit records for the z/OS UNIX System Services auditable events in SMF type 80 records. The following classes are defined to control auditing:

- DIRSRCH
- DIRACC
- FSOBJ
- FSSEC
- IPCOBJ
- PROCESS
- PROCACT

The classes are in the class descriptor table (ICHRRCDX). No profiles can be defined in these classes. They are for audit purposes only. These classes do not need to be active to be used to control z/OS UNIX System Services auditing. Activating the classes has no effect on auditing or authorization checking, except for the FSSEC class, which enables the use of ACLs in authorization checking.

You can use profiles in the UNIXPRIV class to audit certain superuser functions. For more information on this z/OS UNIX System Services class, see “Auditing for superuser authority in the UNIXPRIV class” on page 35.

Classes that control auditing for z/OS UNIX System Services

Each of the classes controls auditing for z/OS UNIX System Services in a particular way. The descriptions that follow define the type of auditing each class controls and include:

- The audit event types that it controls
- The RACF callable services that write the audit record
- The z/OS UNIX services that can cause the event

The classes are:

**DIRSRCH**

Controls auditing of directory searches:

**Audit event type:**

28

**RACF callable service:**

ck_access

**z/OS UNIX services:**

chaudit, chdir, chmod, chmount, chmountsetuid, chown, getcwd, ioctl, lstat, link, mkdir, mknod, mount, mountsetuid, open, opendir, pathconf, readlink, rename, rmdir, stat, symlink, ttyname, unlink, unmount, unmountsetu, utime, chattr, vsetattr, vcreate, vmakedir, vlink, vremovdir, vremove, vrename, vsymlink, vresolvepn, vlookup, exec(indirectly via an open)

**DIRACC**

Controls auditing for access checks for read/write access to directories:

**Audit event types:**

29, 64
**RACF callable service:**
ck_access, ck_owner_two_files

**z/OS UNIX services:**
chmount, chmountsetuid, getcwd, ioctl, link, mkdir, mknod, mount, mountsetuid, open(new file), opendir, remove, rename, rmdir, symlink, ttyname, unlink, umount, umountsetuid, vlink, vmakedir, vcreate, vrename, vremovedir, vsymlink, vremove, vreaddir, utime(a directory)

**FSOBJ**
Controls auditing for all access checks for file system objects except directory searches via SETROPTS LOGOPTIONS and controls auditing of creation and deletion of file system objects via SETROPTS AUDIT (see note below).

For object access:

**Audit event types:**
30, 56

**RACF callable service:**
ck_access

**z/OS UNIX services:**
link, vlink, open, quiescesetu, unquiescesu, vreadwrite, utime, quiesce, unquiesce, exec(indirectly via an open)

For object create and delete or name change:

**Audit event types:**
32, 41, 42, 43, 44, 45, 47, 48, 53, 54, 55, 64

**RACF callable service:**
ck_owner_two_files, ckpriv, makeFSP, R_audit

**z/OS UNIX services:**
chdir, chmount, chmountsetuid, link, mkdir, mknod, mount, mountsetuid, open(new file), remove, rename, rmdir, symlink, unlink, unmount, umountsetuid, vlink, vmakedir, vcreate, vrename, vremovedir, vsymlink

**Note:** Chdir, symlink, and vsymlink are included to make it possible to re-create from the audit records the full path name you are using when accessing files. Services other than those listed above will be audited with audit event type 42 or 43.

**FSSEC**
Controls auditing for changes to the security data (FSP and ACL) for file system objects:

**Audit event types:**
31, 33, 34, 35, 75, 76, 77

**RACF callable services:**
R_chaudit, R_chmod, R_chown, clear_setid, R_setfacl, R_setfsecl

**z/OS UNIX services:**
chaudit, chmod, chown, fchaudit, fchmod, fchown, write, chattr, fchattr, setfacl, vsetattr, vreadwrite
Note: Event type 75, SETFAACL, has a separate audit record created for each ACL entry which is added, modified, or deleted.

IPCOBJ

Specifies auditing options for IPC accesses. For access control and for z/OS UNIX user identifier (UID), z/OS UNIX group identifier (GID), and mode changes, use SETROPTS LOGOPTIONS. For object create and delete, use SETROPTS AUDIT (see note below).

For access control or UID, GID, or mode changes:

Audit event types:
60, 62

RACF callable services:
ck_IPC_access, R_IPC_ctl

z/OS UNIX services:
msgctl, msgget, msgsnd, msgrcv, semctl, semget, semop, shmat, shmctl, shmget, w_getipc

For object create and delete or for remove ID:

Audit event types:
61, 62

RACF callable services:
makeISP, R_IPC_ctl

z/OS UNIX services:
msgctl, msgget, semctl, semget, shmctl, shmget

PROCESS

Controls auditing of changes to the UIDs and GIDs of processes and changing of the Osigset action, thread limit, and other privileged operations via the SETROPTS LOGOPTIONS, and controls auditing of dubbing, undubbing, and server registration of processes via SETROPTS AUDIT (see note below).

For UID/GID, Osigset and thread limit changes, and other privileged operations:

Audit event types:
36, 49, 50, 51, 52, 57, 63

RACF callable services:
R_exec, R_setuid, R_setgid, R_seteuid, R_setegid, ck_priv

z/OS UNIX services:
_console, exec, __login, server_init, setuid, setgid, seteuid, setegid, shutdown_reg, sigaction, spawn, swap services, thlmt, WLMC

For process dubbing, undubbing, and registration:

Audit event types:
38, 39, 57

Note: Unsuccessful process dubs (38 events) are always audited.

RACF callable services:
initUSP, delete_USP, ck_priv
z/OS UNIX services:
  first syscall for a process, dub, _exit, undub, vregister

PROCACT
  Controls auditing of functions that look at data from or effect other processes:
  
  **Audit event types:**
  37, 40, 46, 58, 65

RACF callable services:
  ck_process_owner, R_ptrace

z/OS UNIX services:
  getpsent, kill, ptrace, recv, recvmsg, sendmsg

Audit records are written for getpsent only during the following configuration: SETROPTS LOGOPTIONS (ALWAYS).

Note on using SETROPTS AUDIT: For the services listed whose auditing is controlled by SETROPTS AUDIT, all successful requests are audited. Failures for these services are audited by the authority check that actually failed (for example, an access check to a FACILITY class profile, or an access check controlled by the FSOBJ or DIRACC classes). To audit these, use LOGOPTIONS(FAILURES) for the appropriate classes.

**Note to Readers**
Audit records are always written when:

- A user who is not defined as a z/OS UNIX System Services user tries to dub a process
- A user dubs a process using the default UID, which is established by the administrator using the FACILITY class profile named BPX.DEFAULT.USER
- An unauthorized user tries to mount or unmount a file system

There is no option to turn off these audit records.

For more details on z/OS UNIX System Services events for which audit records are always written, refer to [z/OS UNIX System Services Planning](#).

### Auditable events

RACF writes audit records for the z/OS UNIX System Services auditable events in SMF type 80 records. File owners and auditors can establish separate sets of auditing rules, and can also specify auditing for each file and directory. For more information on these event codes, see [z/OS Security Server RACF Macros and Interfaces](#).

### Commands

You can control auditing by using the existing SETROPTS LOGOPTIONS and SETROPTS AUDIT.

Use SETROPTS LOGOPTIONS to specify logging options for all the classes associated with z/OS UNIX System Services:

- DIRSRCH: Directory searches
- DIRACC: Access checks for read/write accesses to directories
- FSOBJ: Access checks for files and directories
• FSSEC: Changes to file system security
• IPCOBJ: Access checks for objects and changes to UIDs, GIDs, and modes
• PROCESS: Changes to UIDs and GIDs of processes and to privileged operations requiring superuser authority
• PROCACT: Functions that look at data from other processes or effect other processes

Here is an example:

SETROPTS LOGOPTIONS(FAILURES(DIRSRCH,DIRACC))

In addition, you can use the SETROPTS AUDIT option to control auditing for the FSOBJ, IPCOBJ, and the PROCESS classes.
• FSOBJ: Successful creation and deletion of file system objects
• IPCOBJ: Successful creation and deletion of objects (message queues, semaphores, and shared memory segments)
• PROCESS: Successful dubbing or undubbing of a process

Here is an example:

SETROPTS AUDIT(FSOBJ,PROCESS)

Audit options for file and directory levels
The following audit options for file and directory levels are stored inside the HFS along with the file permission bits:
• don’t_audit
• audit_access_allowed
• audit_access_failed
• audit_all_access

A directory is just a special-purpose file. When a file or a directory is created, default audit options are assigned. Different defaults are set for users and auditors. The same audit option is used no matter what kind of access is attempted (read, write, or execute).

When a file is created, these are the default audit options:
• User audit options: for all access types, audit_access_failed
• Auditor audit options: for all access types, don’t_audit

To change the audit options, you must use chaudit, a z/OS UNIX System Services Shell and Utilities feature. For complete information on this command, see z/OS UNIX System Services Command Reference. There are restrictions on who can change these options.
• For user audit options, you must be the owner of the file.
• For auditor audit options, you must have the RACF AUDITOR attribute. You can then change the auditor audit options for any file in the file system.

The default file-level audit options control the auditing of directory and file accesses. These defaults are only used for a particular class (DIRSRCH, DIRACC, or FSOBJ) if SETROPTS LOGOPTIONS(DEFAULT(class)) has been issued for that class.

Auditing for superuser authority in the UNIXPRIV class
If you use profiles in the UNIXPRIV class to control superuser authorities, you can use the same profiles for auditing.
UNIXPRIV

Controls auditing of superuser authorities:

Audit event type:

2

RACF callable services:

ck_access, ck_owner_two_files, ck_priv, ck_process_owner,
R_chown, R_IPC_ctl, R_ptrace, R_chmod

z/OS UNIX services:

chmod, chmount, chmountsetuid, chown, getpsent, kill, link, mkdir,
mount, mountsetuid, nice, open, opendir, pfsctl, ptrace, quiesce,
quiescesetu, readdir, realpath, rename, rmdir, setpriority, stat,
symlink, unlink, unmount, unmountsetu, unquiesce, unquiescesu,
vregister

RACF logs successful attempts to use superuser authorities. If you want to check
the use of superuser authority for specific resources, you can audit successful uses
of the UNIXPRIV profiles. RACF logs failed attempts to use SHARED.IDS in the
UNIXPRIV class. For other UNIXPRIV resources, no audit record is written to show
authorization failures in the UNIXPRIV class.

For example, to audit the successful uses of the kill() function, granted by the
SUPERUSER.PROCESS.KILL profile, set the audit options as follows:

RALTER UNIXPRIV SUPERUSER.PROCESS.KILL AUDIT(SUCCESS(READ))

LOG=NOFAIL is specified on all authorization checks in the UNIXPRIV class,
except for SHARED.IDS. Therefore, RACF does not log failures, even when you
specify AUDIT(FAILURES) or AUDIT(ALL) in the profile. RACF also ignores any
SETROPTS LOGOPTIONS settings in the UNIXPRIV class because the
RACROUTE REQUEST=FASTAUTH request performs all authorization checks in
that class.

It is possible to see multiple audit records for the same operation, as described in
the following example:

1. You are auditing successful uses of the SUPERUSER.PROCESS.KILL profile.
2. You also issued the SETROPTS LOGOPTIONS(SUCCESSES(PROCACT)) command to
   audit success in the PROCACT class.

   Note: This is not recommended because of the large number of audit records it
could produce.

3. User LAURIE has UID 40 and READ access to the SUPERUSER.PROCESS.KILL
   profile in the UNIXPRIV class.
4. User LAURIE issued the kill() function for another user's process.

The kill() function succeeds and RACF writes two audit records as a result of:

• Auditing for the PROCACT class
• A RACROUTE REQUEST=FASTAUTH call in the UNIXPRIV class

For more information on the UNIXPRIV class, see z/OS Security Server RACF
Security Administrator's Guide
Auditing for the RACF remote sharing facility (RRSF)

The RACF remote sharing facility (RRSF) allows you to administer and maintain RACF databases that are distributed throughout the enterprise. It helps to ensure that data integrity is kept across system or network failures and delays. It lets you know when key events have occurred and returns output to view at your convenience.

RRSF uses the RACF subsystem address space. The address space supports a library that contains information needed by the remote sharing facility. For more information, see [z/OS Security Server RACF Security Administrator’s Guide](https://www.ibm.com) and [z/OS Security Server RACF System Programmer’s Guide](https://www.ibm.com).

RACF MVS operator commands for RRSF

The following RACF MVS operator commands can be used to control the RRSF function:

- **SET**
  A RACF command that establishes operational characteristics for RRSF. It also has a list capability that provides a summary of the information related to the RRSF node that the command runs on.

- **TARGET**
  A RACF command that defines, to the logical node being configured, the communication attributes and associated information for RRSF nodes with which it can potentially communicate. It also has a list capability that provides a list of attributes associated with each of the target nodes defined to the RRSF node.

- **STOP**
  A RACF command that stops the RACF subsystem address space without losing any requests that may be waiting for completion.

- **RESTART**
  A RACF command that restarts RRSF subtasks in the RACF subsystem address space.

For more information on these commands, including issuing options, refer to [z/OS Security Server RACF Command Language Reference](https://www.ibm.com).

The SET and TARGET commands generate SMF records, depending on where these commands are issued. If these commands are issued from the operator console and the auditing attributes have been defined in the OPERCMDS profile that covers the command, auditing takes place accordingly. If, however, the SET and TARGET commands are issued from the RACF parameter library, either because of RRSF initialization during RACF subsystem address space initialization or because of a SET command with the INCLUDE keyword specified, authorization to individual commands is not checked and no auditing occurs.

RRCF also writes audit records for the STOP and RESTART commands, if auditing attributes have been defined in the OPERCMDS profile for the command.

As with all operator commands protected by an OPERCMDS profile, if an SMF record is cut, the command—up to 255 characters—is included in the audit record.
Directed commands for RRSF

The AT and ONLYAT keywords are used to direct specific RACF commands to run in the RACF subsystem address space on the specified local or remote RRSF node, under the authorization of the specified user ID.

- **AT**
  
  A keyword used to direct specific RACF commands to run at a specified target node in the RACF subsystem address space under the authority of a specified user ID. When using the AT keyword, automatic command direction can occur from the target node. For example, if the RACF command was sent from node A to node B and automatic command direction is enabled between node B and node C, the command also takes effect on node C.

  The AT keyword is controlled by profiles in the RRSFDATA class. In order for an authorization check to be audited, the audit attributes must be set in the general resource profile in the RRSFDATA class. In this case, the SMF record is generated on the issuing node. If the profile does not exist, the command fails and no auditing occurs.

  Audit records produced from the authorization check include a LOGSTR relocate section that contains a copy of the command image. The LOGSTR is limited to a length of 255 characters. Longer strings may be truncated. The following command keywords are suppressed in the LOGSTR data:

<table>
<thead>
<tr>
<th>Command</th>
<th>Keyword(Field)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADDUSER</td>
<td>PASSWORD()</td>
</tr>
<tr>
<td></td>
<td>PHRASE()</td>
</tr>
<tr>
<td>ALTUSER</td>
<td>PASSWORD()</td>
</tr>
<tr>
<td></td>
<td>PHRASE()</td>
</tr>
<tr>
<td>PASSWORD</td>
<td>PASSWORD()</td>
</tr>
<tr>
<td>RDEFINE</td>
<td>SESSION(SESSKEY())</td>
</tr>
<tr>
<td></td>
<td>SSIGNON(KEYMASKED())</td>
</tr>
<tr>
<td></td>
<td>SSIGNON(KEYENCRYPTED())</td>
</tr>
<tr>
<td>SETROPTS</td>
<td>RVARYPW(SWITCH())</td>
</tr>
<tr>
<td></td>
<td>RVARYPW(STATUS())</td>
</tr>
</tbody>
</table>

  For more information on the RRSFDATA class, see "z/OS Security Server RACF Security Administrator's Guide".

- **ONLYAT**
  
  A keyword used to fix an “out of sync” condition between RACF databases in the RRSF network. It works much like the AT keyword, but automatic command direction does not occur on the target node. No auditing occurs on the issuing node from failures or successes, regardless of audit settings such as SETROPTS SAUDIT or ALTUSER UAUDIT. However, auditing still occurs on the target system. To use the ONLYAT keyword, you must have the SPECIAL attribute.

  For more information on these commands, refer to "z/OS Security Server RACF Command Language Reference".

After the command has passed authorization checking for command direction, the command is sent to the target system. Records cut on the target system automatically include, in the audit record, information to reflect command direction. The issuing node and user ID is added to the SMF record by including a type 44 relocate section whenever the command is directed. Since this relocate section is generally used for segments, a dummy segment name of CMDSRC (command source) is used. The type 44 relocate section format is as follows:
This additional information is added to the audit record that gets generated on the target system. Auditing is based on the same criteria as if the command had been issued on the target system. No command auditing takes place on the issuing system.

If commands run in the RACF subsystem address space, the SMF80JBN is filled in with the subsystem name. SMF80UID contains the user ID under whose authority the command is running.

**Automatically directed commands for RRSF**

Automatic command direction is designed primarily to ensure that RACF profiles remain synchronized between two or more remote nodes with respect to RACF TSO commands. It is similar to command direction in the following ways:

- Like directed commands using the AT keyword, automatically directed commands are controlled by profiles in the RRSFDATA class. An audit record produced from this authority check contains a LOGSTR relocate section.
- Like command direction, the command is sent to the target node after it passes authorization checking. All records produced on the target node contain a type 44 relocate section, which identifies the source of the command.

See [Directed commands for RRSF](#) for detailed information on the LOGSTR and type 44 relocate sections. For information on the RRSFDATA class, see [z/OS Security Server RACF Security Administrator’s Guide](#).

**Automatically directed application updates for RRSF**

Automatic direction of application updates is designed primarily to ensure that RACF profiles remain synchronized between two or more nodes with respect to application updates. It is similar to command direction in the following ways:

- Like directed commands using the AT keyword, automatically directed application updates are controlled by profiles in the RRSFDATA class. An audit record produced from this authority check contains a LOGSTR relocate section. This authority check is only done on the originating node prior to propagation. Any corresponding SMF records are only created on the originating node.

On the RACROUTE REQUEST=AUTH application update for the RRSFDATA class, the LOGSTR parameter is specified to describe the application update. The LOGSTR parameter contains:

```
request FOR CLASS class-name, PROFILE profile-name:
APPLICATION UPDATE PROPAGATION ATTEMPTED
```

Since the maximum LOGSTR length is 255, this information may be truncated if the profile name is very long. The possible values of request are:

- RACROUTE REQUEST=DEFINE TYPE=CHGVOL
– RACROUTE REQUEST=DEFINE TYPE=ADDVOL
– RACROUTE REQUEST=DEFINE TYPE=DELETE
– RACROUTE REQUEST=DEFINE TYPE=DEFINE
– RACROUTE REQUEST=DEFINE TYPE=DEFINE,NEWNAME
– RACROUTE REQUEST=EXTRACT
– ICHEINTY ALTER OPERATION
– ICHEINTY ADD OPERATION
– ICHEINTY DELETE OPERATION
– ICHEINTY DELETEA OPERATION
– ICHEINTY RENAME OPERATION

For information on the RRSFDATA class, see z/OS Security Server RACF
Security Administrator’s Guide.

Like command direction, the application update is sent to the target node after it
passes authorization checking. No auditing is done for RACROUTE
REQUEST=EXTRACT and ICHEINTY requests on the system on which they run.
Auditing is done for RACROUTE REQUEST=DEFINE requests. Records cut on
the target system automatically include, in the audit record, information to reflect
an automatically directed application update. The issuing node and user ID is
added to the SMF record by including a type 44 relocate section whenever a
RACROUTE REQUEST=DEFINE application update has been automatically
directed. Since this relocate section is generally used for segments, a dummy
segment name of APPLSRC (application source) is used. The type 44 relocate
section format is as follows:

<table>
<thead>
<tr>
<th>Byte</th>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Byte 1</td>
<td>Bit string</td>
<td>Not used</td>
</tr>
<tr>
<td>Byte 2-9</td>
<td>Name of segment</td>
<td>APPLSRC</td>
</tr>
<tr>
<td>Byte 10</td>
<td>Length of subkeyword</td>
<td>15</td>
</tr>
<tr>
<td>Byte 11-25</td>
<td>Subkeyword</td>
<td>ORIGINATED_FROM</td>
</tr>
<tr>
<td>Variable length</td>
<td>Origination data</td>
<td>node.userid,DIRECTED_AUTOMATICALLY</td>
</tr>
</tbody>
</table>

This additional information is added to the audit record that gets generated on
the target system. Auditing is based on the same criteria as if the application
update had been issued on the target system.

**Automatically directed passwords for RRSF**

Automatic password direction is designed primarily to ensure that RACF user
profiles remain synchronized between two or more remote nodes with respect to
RACF passwords. There is no need to establish RACLINK PEER PWSYNC
associations.

Like directed commands using the AT keyword, automatically directed passwords
are controlled by profiles in the RRSFDATA class on the issuing node. Audit records
contain a LOGSTR relocate section only for password changes resulting from a
RACF command and do not contain the new password. Automatically directed
passwords are not audited on the target node.

RACF considers password changes resulting from the ADDUSER, ALTUSER, or
PASSWORD command to be automatically directed commands and can be audited.
on the target node like other commands. Password changes resulting from a logon or from RACROUTE or ICHEINTY calls are not audited on the target node.

The RACLINK command

The RACLINK command is a RACF TSO command used to:

- Define, approve, and undefine user ID associations
- Enable password synchronization between pairs of user IDs
- List information related to user ID associations

The DEFINE keyword used with the RACLINK command allows two user IDs to form a user ID association. A user ID association enables RACF users to take advantage of command direction and password synchronization.

Several user IDs are involved in RACLINK processing. These are:

**Issuing user ID**
is the user who issues the RACLINK command from the source system.

**Source user ID**
is the user on the source system for whom an association is created.

**Target user ID**
is the user on the target system for whom an association is created.

**Authorization user ID**
is the user on the target system used by the authority checking program for processing the RACLINK request. For information on the associated list used to determine the authorization user ID, see [z/OS Security Server RACF Security Administrator’s Guide](#).

There are three potential phases for RACLINK commands. Each phase uses event code 59, which is described in [z/OS Security Server RACF Macros and Interfaces](#).

The phases are:

**Phase 1: Local issuance of the RACLINK command**
In phase 1, auditing is based on the auditing criteria of the issuing user ID. Auditing can be set up for both DEFINE and PWSYNC keywords.

**Phase 2: Processing on the target node**
In phase 2, auditing is based on the auditing criteria of the authorization user ID. If no user ID in the associated list is found to have the appropriate authorization, auditing is based on the auditing criteria of the target user ID.

**Phase 3: Response from the target node**
Phase 3 occurs only with the DEFINE keyword. If no error is detected, auditing is based on the issuing user ID. This allows you to determine what took place on the target system without having to login to the target system to view the SMF records. These audit records get cut on the issuing node based on the auditing criteria of the issuing user ID.

Although phases 2 and 3 aren’t commands, SMF records are generated as if they were. For phase 2, auditing is based on either the authorization user ID or the target user ID, as if a command had been issued. For phase 3, auditing is based on the issuing user ID.

As with directed commands, the DEFINE and PWSYNC parameters of the RACLINK command are controlled by profiles in the RRSFDATA class. Auditing for this authorization check occurs on the issuing system and is determined by the
auditing attributes in the RRSFDATA class profiles. If either the DEFINE or PWSYNC keyword is specified and the corresponding profile does not exist, the command fails and no auditing takes place.

To better understand this process, see the examples that follow.

**Example 1**
In this example, user JAMES on node NODEA has the SPECIAL attribute and SETROPTS SAUDIT is in effect. On node NODEA, the following RRSFDATA profiles exist, each with UACC(READ) and AUDIT(SUCCESS):

- RACLINK.DEFINE.NODEB
- RACLINK.PWSYNC.NODEB

On node NODEB, user JIM has JIMSPW as a password, has the SPECIAL attribute, and SETROPTS SAUDIT is in effect.

- **Phase 1**
  - When JAMES issues:
    ```
    RACLINK DEFINE(NODEB.JIM/JIMSPW) PWSYNC
    ```
  - 1. Two separate audit records are produced (one for the RACLINK DEFINE in general and the second for the PWSYNC). These records are produced because user ID JAMES passed both authority checks by having UACC(READ) and AUDIT(SUCCESS) set in each of the profiles. The LOGSTR data in each contains a copy of the command image, up to a maximum of 255 characters.
  - 2. Authority checking has passed, so there can also be an SMF record based on the local issuance of RACLINK (event code 59). Because JAMES has the SPECIAL attribute and SETROPTS SAUDIT is in effect, this third audit record is produced with event code qualifier 0.

- **Phase 2**
  - On node NODEB the TARGET PROCESSING phase begins with checking the supplied password for JIM (in this case, JIMSPW is correct).
  - Auditing takes place on the target user ID, JIM, because JIM has the SPECIAL attribute and the target node (NODEB) has SETROPTS SAUDIT in effect. This record, cut for RACLINK (event code 59, qualifier 0), is the fourth audit record to be produced, although it is the first record cut on node NODEB.

- **Phase 3**
  - On node NODEA, a fifth audit record is produced (event code 59, qualifier 0) for the final phase because JAMES has the SPECIAL attribute and SAUDIT in still in effect for the issuing node (NODEA).

**Example 2**
For this example, assume that Example 1 has completed successfully.

- **Phase 1**
  - User JAMES on node NODEA issues:
    ```
    RACLINK ID(MARY) DEFINE(NODEB.MARY) PWSYNC
    ```
  - As in phase 1 of example 1, the authorization checking on SPECIAL user JAMES yields two SMF records, and a RACLINK record is produced. A significant difference in the event code 59 record is that while JAMES is still the issuing user ID, MARY is the source user ID.

- **Phase 2**
  - In this phase, target processing uses JAMES' association with JIM. This means that although MARY (on NODEB) is the target user ID, JIM is the authorization
ID. Therefore, auditing is based on JIM. Because JIM has the SPECIAL attribute and SETROPTS SAUDIT is in effect on NODEB, an event code 59 record (qualifier 0) is produced. This indicates that the association has been established successfully.

- Phase 3
  As in example 1, auditing for this phase is based on JAMES. The issuing user ID is JAMES, the source user ID is MARY (from NODEA), the target user ID is MARY (from NODEB), and there exists an authorization user ID, JAMES.
  An event code 59 record, which contains this data, is produced because JAMES has the SPECIAL attribute and SAUDIT is still in effect on the issuing node (NODEA).

**Auditing for the RACF/DB2 external security module**

The RACF/DB2 external security module allows you to use RACF resource profiles to check authorization for DB2 privileges and authorities. With these profiles, which represent the various DB2 privileges, you can use the RACF auditing tools to extract the information you need.

You can use the SMF data unload utility or the RACF report writer to extract and format the SMF records. When the RACF/DB2 external security module uses a RACROUTE REQUEST=FASTAUTH request to create an audit record, the record contains log string data that includes additional diagnosis information described in “Using the log string (LOGSTR) data” on page 45. You can use the log string information to link DB2 trace record IFCID 314 and a corresponding RACF SMF record.

**Restriction**

This topic contains information about using RACF with DB2 Version 7, and earlier DB2 versions. For information about using RACF with DB2 Version 8, and later DB2 versions, see [DB2 RACF Access Control Module Guide](http://www.ibm.com/support/docview.wss?rs=769&uid=swg27041838).

In addition, you can use the information found in messages IRR908I through IRR913I to help you understand how the RACF/DB2 external security module is set up for a particular subsystem. These messages identify the:

- Version and length of the RACF/DB2 external security module
- Name of the subsystem or group attach name
- FMID or APAR number associated with the module
- Customization options used for the module
- Classes that the module is trying to use
- Classes for which a RACROUTE request was successful
- &ERROROPT specifies the correct action to be taken for DB2 initialization and authorization errors.

**Note:** The system programmer sets these options. For detailed information, see [z/OS Security Server RACF System Programmer’s Guide](http://www.ibm.com/support/docview.wss?rs=769&uid=swg21681250).

**Checking DB2 authorization**

When you use the RACF/DB2 external security module to check authorization, RACF simulates DB2 authorization. Each DB2 SQL statement, command, or utility specifies a particular set of privileges and authorities. The RACF/DB2 external...
security module checks the RACF profiles that correspond to each set.

Table 1. How RACF Simulates DB2 Authorization Checking

<table>
<thead>
<tr>
<th>In DB2:</th>
<th>Maps to in RACF:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Object types</td>
<td>Class names</td>
</tr>
<tr>
<td>Privileges</td>
<td>Profile names</td>
</tr>
<tr>
<td>Authorities</td>
<td>Administrative authority profile names</td>
</tr>
<tr>
<td>Privilege sets</td>
<td>Profile checking</td>
</tr>
</tbody>
</table>

Note: When an input ACEE (XAPPLACEE) is not provided, the RACF/DB2 external security module returns the authority checking responsibility to DB2. For more information, see DB2 Administration Guide. For details on authority checking with the RACF/DB2 external security module, see z/OS Security Server RACF Security Administrator's Guide.

Example of profile checking

DB2 privilege sets map to RACF profile checking. This example describes RACF profile checking for the SELECT statement.

When RACF checks authorization, the requestor must own the object or have read access to one of the following profiles:

Class  Profile Type

MDSNTB  subsystem.table-name.SELECT
    (gives access to the table)

DSNADM  subsystem.database-name.DBADM
    (gives access to the database that holds the table)

DSNADM  subsystem.SYSCTRL
    (bypassed for user tables)

DSNADM  subsystem.SYSADM

RACF produces an SMF record for a failure only after checking the entire list of profiles and the requestor fails to meet any of the requirements. RACF does not produce an audit record if:

- The requestor meets any of the requirements and access is granted
- The RACF/DB2 external security module returns the authority checking responsibility to DB2

An audit record is produced for the first resource that has auditing indicated by the covering profile and receives a return code of 8.

RACF produces an SMF record for a success when the requestor indicates that should be performed.

For a description of the RACF classes, see z/OS Security Server RACF System Programmer's Guide.
Using the log string (LOGSTR) data

The log string data consists of information that can help you audit DB2 successfully. DB2 uses the XAPL parameter list (DSNDXAPL macro) to pass the log string information to the RACF/DB2 external security module. The "LOGSTR=" parameter of the RACROUTE REQUEST=FASTAUTH request contains the input portion of XAPL and does the following:

- Identifies the RACF/DB2 external security module request that caused RACF to create the audit record. The RACF profile causing the audit record to be cut could be a profile that provides a DB2 administrative authority and might not identify the specific DB2 resource being accessed. The LOGSTR data contains values from the XAPL parameter list that are necessary to identify that unique request from the RACF/DB2 external security module.
- Links RACF SMF 80 records with DB2 IFCID 314 records. Each invocation of the RACF/DB2 external security module might produce an SMF 80 record. DB2 might produce a DB2 IFCID 314 record in addition to the SMF 80 records cut by RACF. You can determine that the records were cut for the same RACF/DB2 external security module request if the LOGSTR_TIME and LOGSTR_USER values in the SMF 80 record match the XAPLSTCK and XAPLUCHK values in the IFCID 314 request. The RACF/DB2 external security module uses these time and user values created from the LOGSTR data to link the RACF and DB2 information.

The LOGSTR data includes the following ordered information. A blank space separates each field, as indicated in the table.

Table 2. LOGSTR Data

<table>
<thead>
<tr>
<th>Log string data</th>
<th>Length</th>
<th>XAPL Field Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOGSTR_DATA</td>
<td>DS 0CL241</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LOGSTR_TIME</td>
<td>DS CL8</td>
<td>XAPLSTCK</td>
<td>Time</td>
</tr>
<tr>
<td></td>
<td>DS CL1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LOGSTR_USER</td>
<td>DS CL8</td>
<td>XAPLUCHK</td>
<td>User</td>
</tr>
<tr>
<td></td>
<td>DS CL1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LOGSTR_SUBSYSTEM</td>
<td>DS CL4</td>
<td>XAPLGPAT</td>
<td>Subsystem/DB2 group attach name</td>
</tr>
<tr>
<td></td>
<td>DS CL1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LOGSTR_OBJTYPE</td>
<td>DS CL1</td>
<td>XAPLTYPE</td>
<td>Object type</td>
</tr>
<tr>
<td></td>
<td>DS CL1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LOGSTR_FLAGS</td>
<td>DS 0CL16</td>
<td>XAPLFLG1</td>
<td>Flags: The flags in this field are declared as</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>BL1. It is translated to CL16 in the LOGSTR data field, containing one character for each bit</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>and a blank space between each one.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• If the bit is on, &quot;Y&quot; is inserted</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• If the bit is off, &quot;N&quot; is inserted</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Reserved bits are left blank</td>
</tr>
<tr>
<td>LOGSTR_SECNDRY_ID</td>
<td>DS CL1</td>
<td></td>
<td>Secondary ID (Y/N)</td>
</tr>
<tr>
<td></td>
<td>DS CL1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LOGSTR_USERTAB</td>
<td>DS CL1</td>
<td></td>
<td>User table (Y/N)</td>
</tr>
<tr>
<td></td>
<td>DS CL13</td>
<td>Reserved (blank)</td>
<td></td>
</tr>
<tr>
<td>LOGSTR_OBJNAME</td>
<td>DS CL20</td>
<td>XAPLOBJN</td>
<td>Object name</td>
</tr>
<tr>
<td></td>
<td>DS CL1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 2. LOGSTR Data (continued)

<table>
<thead>
<tr>
<th>Log string data</th>
<th>Length</th>
<th>XAPL Field Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOGSTR_OBJOWNER</td>
<td>DS CL20</td>
<td>XAPLOWNQ</td>
<td>Object owner or qualifier</td>
</tr>
<tr>
<td></td>
<td>DS CL1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LOGSTR_REL1</td>
<td>DS CL20</td>
<td>XAPLREL1</td>
<td>Related information 1</td>
</tr>
<tr>
<td></td>
<td>DS CL1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LOGSTR_REL2</td>
<td>DS CL20</td>
<td>XAPLREL2</td>
<td>Related information 2: This is the first 20 bytes of the XAPLREL2 field.</td>
</tr>
<tr>
<td></td>
<td>DS CL1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LOGSTR_PRIV</td>
<td>DS CL3</td>
<td>XAPLPRIV</td>
<td>Privilege</td>
</tr>
<tr>
<td></td>
<td>DS CL1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LOGSTR_SOURCE</td>
<td>DS CL1</td>
<td>XAPLFROM</td>
<td>Source of the request</td>
</tr>
<tr>
<td></td>
<td>DS CL1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LOGSTR_CLASS</td>
<td>DS CL8</td>
<td></td>
<td>Class name</td>
</tr>
<tr>
<td></td>
<td>DS CL1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LOGSTR_ENTY</td>
<td>DS CL100</td>
<td></td>
<td>Entity name: This is the first resource checked for a specific request.</td>
</tr>
</tbody>
</table>

Examples for setting audit controls for DB2

The RACF/DB2 external security module attempts to produce an audit record after checking the list of profiles.

**Example 1**

In this example, user SIVLE wants to use the DB2 SELECT statement to retrieve table CADDY, which is in database DSNDB04, from DB2 subsystem CARS.

1. Does SIVLE own the table?
   
   Because SIVLE does not own the table, the table name qualifier passed from DB2 does not match the user ID. In this case, RACF does not check a profile, so no audit record is written.

2. Does SIVLE have SELECT authority?
   
   RACF checks CARS.CADDY.SELECT in class MDSNTB. SIVLE does not have SELECT authority. If SIVLE doesn’t meet any of the other requirements, this is the “first failing resource.”

3. Does SIVLE have database administrator authority?
   
   RACF checks CARS.DSNDB04.DBADM in class DSNADM. SIVLE does not have this authority.

4. Does SIVLE have system administrator authority?
   
   RACF checks CARS.SYSADM in class DSNADM. SIVLE does not have this authority.

Because SIVLE has none of the correct authorities, RACF produces SMF records relating to the first failure it encountered. Although SIVLE didn’t own the table, no profiles were checked and failures were not audited. Therefore, the first failing resource is CARS.CADDY.SELECT. RACF produces an audit record for this resource and identifies it in message ICH408I. The data is contained in the LOGSTR information and can be used in a report.
Example 2
In this example, user SIVLE issues a START PROCEDURE TUNEUP request for DB2 subsystem CARS.

1. Does SIVLE have SYSOPR authority?
   RACF checks CARS.SYSOPR in class DSNADM. SIVLE does not have SYSOPR authority.

2. Does SIVLE have system administrator authority?
   RACF checks CARS.SYSADM in class DSNADM. SIVLE does not have this authority.

Because SIVLE has none of the correct authorities, RACF produces SMF records relating to the failure. The failure record is cut for resource CARS.SYSOPR, which was the first failing resource. The LOGSTR information can help you to determine what SIVLE wanted to do. It includes the object type, object name, and privilege, which you can use in a report.

Auditing security events for other components
It’s possible to set audit controls for other components using RACF commands, such as EIM. For more details see z/OS Integrated Security Services EIM Guide and Reference.
Chapter 3. The RACF SMF data unload utility

RACF audit data is a record of an installation’s security relevant events. This data is used to verify the effectiveness of an installation’s security policy, determine whether the installation’s security objectives are being met, and identify unexpected security relevant events.

The RACF SMF data unload utility (IRRADU00) enables installations to create a sequential file from the security relevant audit data. The sequential file can be used in several ways: viewed directly, used as input for installation-written programs, manipulated with sort/merge utilities, output to an XML-formatted file for viewing on a web browser, or uploaded to a database manager (for example, DB2) to process complex inquiries and create installation-tailored reports. It is not intended to be used directly as input to RACF commands.

Operational considerations

IRRADU00 processes these types of SMF records:

**Type 30**
- Job initiation - Subtype 1 (Job initiation) and subtype 5 (Job termination)

**Type 80**
- Resource access - No subtypes in record

**Type 81**
- RACF initialization - No subtypes in record

**Type 83**
- Subtype 1, Data sets affected by a security label change
- Subtype 2, EIM
- Subtype 3 , LDAP
- Subtype 4, Remote audit
- Subtype 5, WebSphere
- Subtype 6, TKLM

To correlate the RACF audit data with the data unloaded by IRRADU00, see the description of the SMF records contained in [z/OS Security Server RACF Macros and Interfaces](link). For more details about working with subtype 3 LDAP audit records, see [IBM Tivoli Directory Server Administration and Use for z/OS](link).

Using IRRADU00

The RACF SMF data unload utility uses the SMF Dump Utilities (IFASMFDP or IFASMFDL) as the “driver” module to control its invocation. The RACF SMF data unload utility is invoked as USER2 and USER3 exits to IFASMFDP or IFASMFDL. To request RACF SMF data unload utility processing, enter the names of the RACF SMF data unload utility modules (IRRADU00 and IRRADU86) in the SYSIN data stream for IFASMFDP or IFASMFDL.

The following job control statements are necessary for executing IRRADU00:

**JOB** Initiates the job.

**EXEC** Specifies the program name (PGM=IFASMFDP or PGM=IFASMFDL) or, if the job control statements are in a procedure library, the procedure name.
SYSPRINT DD
Defines a sequential message data set for the messages produced by IFASMFDP or IFASMFDL.

SYSIN DD
Defines a sequential input data set for the SMF Dump Utility control statements. These statements must include the USER2 (IRRADU00) and USER3 (IRRADU86) statements for invoking the RACF SMF data unload utility. Additional IFASMFDP or IFASMFDL control statements can be used to select records based on date, time, and SMF system ID. IFASMFDP and IFASMFDL use defaults for control parameters that are allowed to default. In particular, the default value for the OPTIONS parameter is ALL, which causes the input data set to be reset so that it can be reused. See z/OS MVS System Management Facilities (SMF) for information on overriding defaults.

Note: IRRADU00 is called once for each IFASMFDP OUTDD or IFASMFDL OUTDD control statement that meets the specified selection criteria. This might result in multiple calls for the same SMF record, causing that record to appear more than once in the SMF unload output.

ADUPRINT DD
Defines a sequential message data set for the messages produced by the RACF SMF data unload utility.

DUMPIN DD
Defines the input SMF data stream. Note that ddname DUMPIN can be changed by the control statements that are contained in the SYSIN data stream.

DUMPOUT DD
Defines the output SMF data stream. After the RACF SMF data unload utility processes a record, it returns control to IFASMFDP or IFASMFDL and tells these utilities to continue its processing of the record. This causes IFASMFDP or IFASMFDL to write the record to DUMPOUT. If you do not want to retain these records, allocate DUMPOUT to DUMMY. Note that ddname DUMPOUT can be changed by the control statements that are contained in the SYSIN data stream.

OUTDD DD
Defines the single sequential output data set. The output of IRRADU00 is a set of variable length records. This data set must be allocated as a variable length data set, with a logical record length (LRECL) of at least 8192. If a shorter LRECL is supplied, IRRADU00 changes the LRECL to 8192. IRRADU00 also changes the block size of the data set to be at least four more than the LRECL, unless the block size was set to zero to allow the system to choose the best block size.

XMLFORM DD
Creates an easily readable form of the report in XML. Each data tag appears on its own line. This file can be easily read in any editor, as well as displayed in a web browser. This data set must be allocated as a variable length data set, with a logical record length (LRECL) of at least 8192. If a shorter LRECL is supplied, IRRADU00 changes the LRECL to 8192. IRRADU00 also changes the block size of the data set to be at least four more than the LRECL, unless the block size was set to zero to allow the system to choose the best block size.
XMLOUT DD

Creates a compressed form of the report in XML. The resulting XML file will be small in filesize but will not be as easily readable as the output obtained by specifying XMLFORM DD. This data set must be allocated as a variable length data set, with a logical record length (LRECL) of at least 8192. If a shorter LRECL is supplied, IRRADU00 changes the LRECL to 8192. IRRADU00 also changes the block size of the data set to be at least four more than the LRECL, unless the block size was set to zero to allow the system to choose the best block size.

The output type generated is dependant on the statements incorporated in the JCL. Whichever output type is coded in the JCL is the only type that will be generated, according to the following rules:

• Is XMLFORM DD specified in the JCL? If so, that is the only output written
• If that is not specified, is XMLOUT DD specified in the JCL? If so, that is the only output written
• If that is not specified, is OUTDD DD specified in the JCL? If so, that is the only output written
• If none of these types are specified in the JCL, the utility issues message IRR67522I Open failed for OUTDD

If more than one DDname is placed in the JCL, the above order (XMLFORM, XMLOUT, OUTDD) is used to see which one is created. The actual order of DD statements in the JCL is irrelevant.

After the RACF SMF data unload utility has processed a record, control is returned to IFASMFDP or IFASMFDL, which writes the record to the ddname that was specified in the IFASMFDP SYSIN or IFASMFDL SYSIN control statement.

IRRADU00 example

Figure 3 shows an example of JCL to execute the RACF SMF data unload utility. The SMF dump utility (IFASMFDP or IFASMFDL) is used to select records based on the date, time, and SMF system identifier.

Due to restrictions of the SMF dump utilities, IRRADU00 and IRRADU86 must reside in an APF-authorized library. For more information on the SMF dump utilities, see z/OS MVS System Management Facilities (SMF).

```//SMFUNLD JOB,'SMF DATA UNLOAD', // MSGLEVEL=(1,1) //SMFDUMP EXEC PGM=IFASMFDP //SYSPRINT DD SYSOUT=A //ADUPRINT DD SYSOUT=A //OUTDD DD DISP=SHR,DSN=USER01.RACF.IRRADU00 //SMFDATA DD DISP=SHR,DSN=USER01.RACF.SMFDATA //SMFOUT DD DUMMY //SYSIN DD * INDD(SMFDATA,OPTIONS(DUMP)) OUTDD(SMFOUT,TYPE(000:255)) ABEND(NORETRY) USER2(IRRADU00) USER3(IRRADU86) /* Figure 3. JCL to Invoke the RACF SMF data unload utility```
IRRADU00 output

The RACF SMF data unload utility processes every type 80, 81, and 83 SMF record and every job initiation type 30 record that is selected for processing by the SMF dump utilities, IFASMFDP or IFASMFDL. All of the records are written to a sequential file. For details on the format and content of the records created, see z/OS Security Server RACF Macros and Interfaces.

Sample DB2 statements, data definition language statements, load utility statements, and queries are provided in SYS1.SAMPLIB. The members are named IRRADULD, IRRADUTB, and IRRADUQR.

Sample DFSORT and ICETOOL statements are provided in SYS1.SAMPLIB. The member is named IRRICE.

XML samples can be obtained online at the RACF website. For more details, see “Internet sources” on page xiii and “Using the RACF SMF data unload utility to generate XML documents” on page 65.

Using output from the RACF SMF data unload utility

The output file from the RACF SMF data unload utility can be:

- Viewed directly
- Used as input to your own programs
- Manipulated with sort/merge utilities
- Used as input to a database management system so you can produce reports tailored to your requirements
- Viewed using a web browser

Note: The output file is not intended to be used directly as input to RACF commands.

For audit records created for RACF commands, the exact order and format of the unloaded keywords and operands from the commands are not part of the programming interface. They are contained in fields with names ending in _SPECIFIED, _IGNORED, and _FAILED.

Sort/Merge programs

The RACF SMF data unload utility processes all of the type 80, 81, and 83 SMF records, and all of the job initiation type 30 records that are in the input data stream. If you want a subset of the output records, you can use a standard utility such as DFSORT to select them. For example, the following DFSORT control statements select all the job initiation records. All other record types are excluded.

```
SORT FIELDS=(5,8,CH,A)
INCLUDE COND=(5,8,CH,EQ,'C'JOBINIT ')
OPTION VLSHRT
```

For more information on using the DFSORT ICETOOL with the RACF SMF data unload utility, see “Using the DFSORT ICETOOL to create reports” on page 53.

Relational databases

You can use the power of a relational database management system (DBMS), such as DB2, to process the RACF SMF data records. Refer to the following section for details.
RACF SMF data records can be output as XML and then viewed using a web browser. This can give you a better view of the data as well as use colors to differentiate information. For more details, see "Using the RACF SMF data unload utility to generate XML documents" on page 65.

Using the DFSORT ICETOOL to create reports

IBM’s DFSORT product provides a reporting facility called ICETOOL.

RACF makes it easy for you to create ICETOOL reports by using the RACFICE PROC, a procedure contained in the IRRICE member of SYS1.SAMPLIB. IRRICE uses DFSORT statements for the selection criteria and ICETOOL statements for the report format for all the reports. The IEBUPDTE utility processes the IRRICE member and creates a data set that contains the report formats and record selection criteria.

Each report consists of these two members of this PDS:
- The report format
- The record selection criteria

The report format

The report format has a 1-4 character name (for example, SELU) that is a member name in the partitioned data set created by the IEBUPDTE utility. The ICETOOL statements control the report format and record summary information, such as SORT, COPY, DISPLAY, and OCCURS statements. An example of a report format...
member is shown in Figure 5. This is the report format member SELU, which is the report format for the "Selected User" report. See z/OS DFSORT Application Programming Guide for the complete details of the DFSORT statements.

The record selection criteria

The record selection criteria has a name consisting of the report member name followed by CNTL (e.g. SELUCNTL). Record selection is performed using DFSORT control statements, such as SORT and INCLUDE. An example of a record selection member is shown in Figure 6. This is the report selection member SELUCNTL, which is the selection criteria for the "Selected User" report.

You can find a list of IRRADU00 reports in "Reports based on the SMF data unload utility (IRRADU00)" on page 55.

You can find a list of IRRDBU00 reports in z/OS Security Server RACF Security Administrator's Guide.

Using the RACFICE PROC to generate reports

You can invoke the ICETOOL utility with the RACFICE PROC. This procedure, which is contained in the IRRICE member of SYS1.SAMPLIB, simplifies the JCL required to execute reports and contains JCL symbolic variables that represent the input to the RACFICE PROC. These variables are:

DBUDATA
Output of IRRDBU00 that is being used as input to the RACFICE PROC

ADUDATA
Output of IRRADU00 that is being used as input to the RACFICE PROC
You don't need to specify each of these variables every time you execute the RACFICE PROC. For example, if you specify the default IRRDBU00 and IRRADU00 data sets in the RACFICE PROC, you create a report (shown in Figure 7) that lists all of the audit records for a specific user with the JCL:

```
//jobname JOB Job card...
//stepname EXEC RACFICE,REPORT=SELU
```

If the default IRRDBU00 or IRRADU00 data sets are not correct, you can override them. For example, if the IRRDBU00 output is in the data set USER01.TEST.IRRDBU00 and the IRRADU00 output is in the data set USER01.TEST.IRRADU00, you should enter:

```
//jobname JOB Job card...
// SET ADUDATA=USER01.TEST.IRRADU00
// SET DBUDATA=USER01.TEST.IRRDBU00
//stepname EXEC RACFICE,REPORT=SELU
```

### Reports based on the SMF data unload utility (IRRADU00)

The following reports are based on the output of IRRADU00. You can find a sample of each report in SYS1.SAMPLIB.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACD$</td>
<td>Users who are using automatic command direction</td>
<td>Identifies users who are using the RACF remote sharing facility for automatic command direction</td>
</tr>
<tr>
<td>CADU</td>
<td>Count of the IRRADU00 records</td>
<td>Shows the number of SMF-recorded events</td>
</tr>
<tr>
<td>CCMD</td>
<td>Count of commands issued (by user)</td>
<td>Shows the command activity for a specific user</td>
</tr>
<tr>
<td>ECD$</td>
<td>Users who are directing commands explicitly</td>
<td>Identifies users who are using the RACF remote sharing facility to explicitly direct commands by specifying “AT(node.user_ID)”</td>
</tr>
<tr>
<td>LOGB</td>
<td>Users who log on with LOGON BY, a VM facility</td>
<td>Identifies users who are logging on as other users</td>
</tr>
<tr>
<td>Name</td>
<td>Description</td>
<td>Value</td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
<td>-------</td>
</tr>
<tr>
<td>LOGF</td>
<td>Users with excessive incorrect passwords</td>
<td>Identifies users who have exceeded a “bad password” threshold. This threshold is independent of the SETROPTS PASSWORD(REVOKE(nn)) value.</td>
</tr>
<tr>
<td>OPER</td>
<td>Accesses allowed because the user has OPERATIONS</td>
<td>Identifies users with the OPERATIONS attribute.</td>
</tr>
<tr>
<td>PWD$</td>
<td>Users who are using password synchronization</td>
<td>Identifies users who are using the RACF remote sharing facility.</td>
</tr>
<tr>
<td>RAACL</td>
<td>RACLK audit records</td>
<td>Identifies users who are using the RACF remote sharing facility.</td>
</tr>
<tr>
<td>RINC</td>
<td>RACF class initialization information</td>
<td>Shows the status of RACF classes at RACF initialization.</td>
</tr>
<tr>
<td>SELU</td>
<td>All audit records for a specific user</td>
<td>Reports on all audited events for a user.</td>
</tr>
<tr>
<td>SPEC</td>
<td>Accesses allowed because the user has SPECIAL</td>
<td>Identifies users with the SPECIAL attribute.</td>
</tr>
<tr>
<td>TRMF</td>
<td>Excessive incorrect passwords from terminals</td>
<td>Identifies intruders who are attempting to guess passwords but are moving from one ID to another to avoid the revocation of user IDs.</td>
</tr>
<tr>
<td>VIOL</td>
<td>Access violations</td>
<td>Identifies failed events.</td>
</tr>
<tr>
<td>WARN</td>
<td>Accesses allowed due to WARNING mode profiles</td>
<td>Identifies events that are allowed but which you might want to prevent in the future.</td>
</tr>
</tbody>
</table>
Creating customized reports

You can create your own reports using the RACFICE PROC by following these steps:

1. Identify the records that you want for the report.
   a. Define the DFSORT statements for the record selection criteria.
   b. Place them in the RACFICE data set with a unique member name consisting of a 1-4 character report identifier followed by CNTL.

   If there is an existing RACFICE report that has similar selection criteria, use it as a model. For example, if you want to report all the access records created when users PATTY, MAXINE, and LAVERNE accessed resources, you need to create DFSORT selection statements that look like Figure 8 and store them in your RACFICE report data set as the PMLCNTL member.

   ![Figure 8. Customized Record Selection Criteria.](image)

   INCLUDE COND=(63,8,CH,EQ,C'PATTY',OR,
                   63,8,CH,EQ,C'MAXINE',OR,
                   63,8,CH,EQ,C'LAVERNE')
   OPTION VLSHRT

   Note the similarity of this record selection criteria to the “Selected User” record selection criteria shown in Figure 6 on page 54.

   For complete details of the DFSORT statements, see DFSORT Application Programming Guide.

2. Identify the report format you want to use.
   a. Define the ICETOOL statements for the report format.
   b. Place them in the RACFICE data set with a 1-4 character report identifier that you chose.

   If there is an existing RACFICE report that has similar report format, use it as a model. For example, if you wanted your report to contain the user ID, job name, date, time, and status of the access you could use the ICETOOL report statements shown in Figure 9 and store them in your RACFICE report data set as the PML member.

   ![Figure 9. Customized Report Format](image)

   COPY FROM(ADUDATA) TO(TEMP0001) USING(RACF)
   DISPLAY FROM(TEMP0001) LIST(PRINT) -
   PAGE -
   TITLE('Patty, Maxine, and Laverne''s Accesses')- DATE(YMD/) -
   TIME(12:) -
   BLANK -
   ON(63,8,CH) HEADER('User ID') -
   ON(5,8,CH) HEADER('Event') -
   ON(12,8,CH) HEADER('Qualifier') -
   ON(23,8,CH) HEADER('Time') -
   ON(32,8,CH) HEADER('Date') -
   ON(184,8,CH) HEADER('Job Name')

   Note the similarity of this report format to the “Selected User” report format shown in Figure 5 on page 54.

   For complete details on the ICETOOL statements, see DFSORT Application Programming Guide.

3. Update the report JCL to invoke the RACFICE PROC with the 1-4 character report identifier you chose, as shown in Figure 10 on page 58.
Using the RACF SMF data unload utility output with DB2

The records produced by the RACF SMF data unload utility are designed to be processed by the DB2 load utility or its equivalent. The definition and control statements for a DB2 utilization of the output, all of which are contained in SYS1.SAMPLIB, are as follows:

- Sample data definition language (DDL) statements to define the relational presentation of the audit information and sample DB2 definitions which perform database and index creation. These are in member IRRADUTB.
- Sample control statements for the DB2 load utility that map the output from the RACF SMF data unload utility. These are in member IRRADULD.
- Sample structured query language (SQL) queries that demonstrate useful inquiries that can be made. These are in member IRRADUQR.

For complete information on DB2, see:

- DB2 for MVS/ESA Administration Guide
- DB2 for MVS/ESA SQL Reference
- DB2 for MVS/ESA What's New

Steps for using IRRADU00 output with DB2

To create and manage a DB2 database that contains the output from the RACF SMF data unload utility, you must:

1. Create one or more DB2 databases.
2. Create one or more DB2 table spaces.
3. Create DB2 tables.
4. Load data into the tables.
5. Reorganize the data in the tables (optional).
7. Delete table data (optional).

The first three steps are the initial setup of the database. These steps are required only once, when you first initialize the data manager. After the tables are established, you can import into the DB2 database continuously over a period of time. For example, you can load several days' worth of data before you decide to run the report. This is left up to the installation. At any time, you can delete your current table data. In this case, you reload and reorganize your tables. Also, by using DB2, you can create any required performance statistics at any time.

These steps are similar to those performed when using the RACF database unload utility (IRRDBU00), which is described in z/OS Security Server RACF Security Administrator's Guide. Information on the contents of the records produced by RACF SMF data unload utility is in z/OS Security Server RACF Macros and Interfaces.

The following sections show examples of the DB2 utility input for each of the steps listed above.
Creating a DB2 database for unloaded RACF SMF data

A DB2 database names a collection of table spaces. The following SQL statement creates a DB2 database for the output of the RACF SMF data unload utility:

```sql
CREATE DATABASE databasename
```

where `.databasename` is supplied by the user.

Creating a DB2 table space

A table space is one or more data sets in which one or more tables are stored. Figure 11 contains examples of SQL statements that create a table space. There are other methods of allocating a table space. For details, see the DB2 documentation.

```sql
CREATE TABLESPACE tablespacename IN databasename
  LOCKSIZE TABLESPACE
  SEGSIZE 4
  PCTFREE 0
  BUFFERPOOL BP32K
  USING STOGROUP storagegroup
    PRIQTY 20000
    SECQTY 500
    CLOSE NO
;  
```

*Figure 11. Sample SQL Utility Statements Defining a Table Space*

The user must supply the name of the table space (`tablespacename`) and the storage group (`storagegroup`). The sample shows a value of 4 for SEGSIZE, 20000 for PRIQTY, and 500 for SECQTY.

Member IRRADUTB in SYS1.SAMPLIB contains statements that create a table space. The sample in IRRADUTB puts all of the tables into one table space. The sample also suggests using a segment size, because segmented table spaces improve performance. You may want to define your own table spaces rather than use table spaces that are defined by the storage group.

You have a number of other options, such as the number of table spaces to use, the type of spaces, and the security for the data. You may want to keep the number of tables per table space fairly small for better performance, and you may want to consider putting the larger tables into separate table spaces.

Creating the DB2 tables

After the database and the table space are created, SQL statements that define the tables are executed. Figure 11 contains an example of the SQL statements that are required to create a table for the job initiation records created by the RACF SMF data unload utility.

Member IRRADUTB in SYS1.SAMPLIB contains examples that create separate tables for each record type that is produced by the RACF SMF data unload utility. The user must supply the user ID (`userid`).
Loading the DB2 tables

Figure 13 on page 61 shows the statements that are required to load the job initiation records. The IRRADULD member of SYS1.SAMPLIB contains statements that load all of the record types produced by the RACF SMF data unload utility. You can choose not to load some of the tables.

```
CREATE TABLE userid.JOBINIT (  
  INIT_EVENT_TYPE CHAR(8),  
  INIT_EVENT_QUAL CHAR(8),  
  INIT_TIME_WRITTEN TIME,  
  INIT_DATE_WRITTEN DATE,  
  INIT_SYSTEM_SMFID CHAR(4),  
  INIT_VIOLATION CHAR(1),  
  INIT_USER_NDFND CHAR(1),  
  INIT_USER_WARNING CHAR(1),  
  INIT_EVT_USER_ID CHAR(8),  
  INIT_EVT_GRP_ID CHAR(8),  
  INIT_AUTH_NORMAL CHAR(1),  
  INIT_AUTH_SPECIAL CHAR(1),  
  INIT_AUTH_OPER CHAR(1),  
  INIT_AUTH_AUDIT CHAR(1),  
  INIT_AUTH_EXIT CHAR(1),  
  INIT_AUTH_FAILSFT CHAR(1),  
  INIT_AUTH_BYPASS CHAR(1),  
  INIT_AUTH_TRUSTED CHAR(1),  
  INIT_LOG_CLASS CHAR(1),  
  INIT_LOG_USER CHAR(1),  
  INIT_LOG_SPECIAL CHAR(1),  
  .  
  .  
  .  
  INIT_UTK_SECL CHAR(8),  
  INIT_UTK_EXECNODE CHAR(8),  
  INIT_UTK_SUSER_ID CHAR(8),  
  INIT_UTK_SNODE CHAR(8),  
  INIT_UTK_SGRP_ID CHAR(8),  
  INIT_UTK_SPOE CHAR(8),  
  INIT_UTK_SPCCLASS CHAR(8),  
  INIT_UTK_USER_ID CHAR(8),  
  INIT_UTK_GRP_ID CHAR(8),  
  INIT_UTK_DFT_GRP CHAR(1),  
  INIT_UTK_DFT_SECL CHAR(1),  
  INIT_APPC_LINK CHAR(16),  
  INIT_UTK_NETW CHAR(8),  
  INIT_RES_NAME VARCHAR(255),  
  INIT_CLASS CHAR(8),  
  INIT_X500_SUBJECT VARCHAR(255),  
  INIT_X500_ISSUER VARCHAR(255),  
  INIT_SVRSSEQL CHAR(8),  
  INIT_SVRS_PENAME CHAR(64),  
  INIT_CTX_USER VARCHAR(510),  
  INIT_CTX_REG VARCHAR(255),  
  INIT_CTX_HOST CHAR(128),  
  INIT_CTX_MECH CHAR(16)  
) IN databasename.tablespacename
```

Figure 12. Sample SQL Utility Statements Creating a Table
LOAD DATA INDDN ddname RESUME YES LOG NO
INTO TABLE userid.JOBINIT
WHEN(1:8)= 'JOBINIT'
  INIT_EVENT_TYPE POSITION(1:8) CHAR(8),
  INIT_EVENT_QUAL POSITION(10:17) CHAR(8),
  INIT_TIME_WRITTEN POSITION(19:26) TIME EXTERNAL(8),
  INIT_DATE_WRITTEN POSITION(28:37) DATE EXTERNAL(10),
  INIT_SYSTEM_SMFID POSITION(39:42) CHAR(4),
  INIT_VIOLATION POSITION(44:44) CHAR(1),
  INIT_USER_NDFND POSITION(49:49) CHAR(1),
  INIT_USER_WARNING POSITION(54:54) CHAR(1),
  INIT_EVT_USER_ID POSITION(59:66) CHAR(8),
  INIT_EVT_GRP_ID POSITION(68:75) CHAR(8),
  
  INIT_AUTH_OMVSSU POSITION(258:258) CHAR(1),
  INIT_AUTH_OMVSSYS POSITION(263:263) CHAR(1),
  INIT_USR_SECL POSITION(268:275) CHAR(8),
  INIT_RACF_VERSION POSITION(277:280) CHAR(4),
  INIT_APPL POSITION(282:289) CHAR(8),
  INIT_LOGSTR POSITION(291:1022) VARCHAR(255),
  INIT_BAD_JOBNAME POSITION(547:554) CHAR(8),
  INIT_USER_NAME POSITION(556:575) CHAR(20),
  INIT_UTK_ENCR POSITION(577:577) CHAR(1),
  INIT_UTK_PRE19 POSITION(582:582) CHAR(1),
  INIT_UTK_VERPROF POSITION(587:587) CHAR(1),
  INIT_UTK_NJEUNUSR POSITION(592:592) CHAR(1),
  INIT_UTK_LOGUSR POSITION(597:597) CHAR(1),
  INIT_UTK_SPECIAL POSITION(602:602) CHAR(1),
  INIT_UTK_DEFAULT POSITION(607:607) CHAR(1),
  INIT_UTK_UNKNUSR POSITION(612:612) CHAR(1),
  INIT_UTK_ERROR POSITION(617:617) CHAR(1),
  INIT_UTK_TRUSTED POSITION(622:622) CHAR(1),
  INIT_UTK_SESTYPE POSITION(627:634) CHAR(8),
  INIT_UTK_SURROGAT POSITION(636:636) CHAR(1),
  INIT_UTK_REMOTE POSITION(641:641) CHAR(1),
  INIT_UTK_PRIV POSITION(646:646) CHAR(1),
  INIT_UTK_SECL POSITION(651:658) CHAR(8),
  INIT_UTK_EXECONODE POSITION(660:667) CHAR(8),
  INIT_UTK_SUSER_ID POSITION(669:676) CHAR(8),
  INIT_UTK_SNODE POSITION(678:685) CHAR(8),
  INIT_UTK_SGRP_ID POSITION(687:694) CHAR(8),
  INIT_UTK_SPOE POSITION(696:703) CHAR(8),
  INIT_UTK_SPCLASS POSITION(705:712) CHAR(8),
  INIT_UTK_USER_ID POSITION(714:721) CHAR(8),
  INIT_UTK_GRP_ID POSITION(723:730) CHAR(8),
  INIT_UTK_DFT_GRP POSITION(732:732) CHAR(1),
  INIT_UTK_DFT_SECL POSITION(737:737) CHAR(1),
  INIT_APPC_LINK POSITION(742:757) CHAR(16),
  INIT_CTX_USER POSITION(759:766) CHAR(8),
  INIT_CTX_REG POSITION(768:1022) VARCHAR(255),
  INIT_CTX_HOST POSITION(786:2513) CHAR(128),
  INIT_CTX_MECH POSITION(2515:2530) CHAR(16)

Figure 13. DB2 Utility Statements Required to Load the Tables
Reorganizing the unloaded RACF SMF data in the DB2 database

Queries are processed faster if they are performed against an organized database. The DB2 utility statement required to reorganize the database is:

```
REORG TABLESPACE databasename.tablespacename
```

Creating optimization statistics for the DB2 database

Queries are processed faster if they are performed against an organized database for which DB2 has collected performance statistics. The DB2 utility statement required to create these statistics is:

```
RUNSTATS TABLESPACE databasename.tablespacename
```

Deleting data from the DB2 database

Before you reload the database with new data, you should archive the SMF flat files for future reference, and then delete the old data. Deleting the data can be done in several ways:

1. Use the DROP TABLE statement for each table you want to delete.
2. Use the DROP TABLESPACE statement for each table space.
3. Delete all of the records in each table.

Figure 14 shows the sample SQL statements that delete the group record data from the tables.

```
DELETE FROM userid.JOBINIT;
DELETE FROM userid.ACCESS;
DELETE FROM userid.ADDVOL;
DELETE FROM userid.RENAMEDS;
DELETE FROM userid.DELRES;
```

**Figure 14. DB2 Utility Statements Required to Delete the Group Records**

DB2 table names

Member IRRADULD in SYS1.SAMPLIB creates DB2 tables for each record type. Table 4 provides a useful reference of record type, record name, and DB2 table name.

**Table 4. Correlation of DB2 Table Names and Record Types**

<table>
<thead>
<tr>
<th>DB2 Table Name</th>
<th>Column Prefix</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>JOBINIT</td>
<td>INIT</td>
<td>Job initiation</td>
</tr>
<tr>
<td>ACCESS</td>
<td>ACC</td>
<td>Resource access, other than file or directory</td>
</tr>
<tr>
<td>ADDVOL</td>
<td>ADV</td>
<td>ADDVOL/CHGVOL</td>
</tr>
<tr>
<td>RENAMEDS</td>
<td>REN</td>
<td>Rename data set</td>
</tr>
<tr>
<td>DELRES</td>
<td>DELR</td>
<td>Delete resource</td>
</tr>
<tr>
<td>DELVOL</td>
<td>DELV</td>
<td>Delete volume</td>
</tr>
<tr>
<td>DEFINE</td>
<td>DEF</td>
<td>Define resource</td>
</tr>
<tr>
<td>ADDSD</td>
<td>AD</td>
<td>ADDSD command</td>
</tr>
<tr>
<td>ADDGROUP</td>
<td>AG</td>
<td>ADDGROUP command</td>
</tr>
<tr>
<td>ADDUSER</td>
<td>AU</td>
<td>ADDUSER command</td>
</tr>
<tr>
<td>ALTDSD</td>
<td>ALD</td>
<td>ALTDSD command</td>
</tr>
<tr>
<td>ALTGROUP</td>
<td>ALG</td>
<td>ALTGROUP command</td>
</tr>
</tbody>
</table>
Table 4. Correlation of DB2 Table Names and Record Types (continued)

<table>
<thead>
<tr>
<th>DB2 Table Name</th>
<th>Column Prefix</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALTUSER</td>
<td>ALU</td>
<td>ALTUSER command</td>
</tr>
<tr>
<td>CONNECT</td>
<td>CON</td>
<td>CONNECT command</td>
</tr>
<tr>
<td>DELDSD</td>
<td>DELD</td>
<td>DELDSD command</td>
</tr>
<tr>
<td>DELGROUP</td>
<td>DELG</td>
<td>DELGROUP command</td>
</tr>
<tr>
<td>DELUSER</td>
<td>DELU</td>
<td>DELUSER command</td>
</tr>
<tr>
<td>PASSWORD</td>
<td>PWD</td>
<td>PASSWORD command</td>
</tr>
<tr>
<td>PERMIT</td>
<td>PERM</td>
<td>PERMIT command</td>
</tr>
<tr>
<td>RALTER</td>
<td>RALT</td>
<td>RALTER command</td>
</tr>
<tr>
<td>RDEFINE</td>
<td>RDEF</td>
<td>RDEFINE command</td>
</tr>
<tr>
<td>RDELETE</td>
<td>RDEL</td>
<td>RDELETE command</td>
</tr>
<tr>
<td>REMOVE</td>
<td>REM</td>
<td>REMOVE command</td>
</tr>
<tr>
<td>SETROPTS</td>
<td>SETR</td>
<td>SETROPTS command</td>
</tr>
<tr>
<td>RVARY</td>
<td>RVAR</td>
<td>RVARY command</td>
</tr>
<tr>
<td>APPCLU</td>
<td>APPC</td>
<td>APPC session</td>
</tr>
<tr>
<td>GENERAL</td>
<td>GEN</td>
<td>General purpose</td>
</tr>
<tr>
<td>DIRSRCH</td>
<td>DSCH</td>
<td>Directory search</td>
</tr>
<tr>
<td>DACCESS</td>
<td>DACC</td>
<td>Check access to a directory</td>
</tr>
<tr>
<td>FACCESS</td>
<td>FACC</td>
<td>Check access to file</td>
</tr>
<tr>
<td>CHAUDIT</td>
<td>CAUD</td>
<td>Change audit options</td>
</tr>
<tr>
<td>CHDIR</td>
<td>CDIR</td>
<td>Change current directory</td>
</tr>
<tr>
<td>CHMOD</td>
<td>CMOD</td>
<td>Change file mode</td>
</tr>
<tr>
<td>CHOWN</td>
<td>COWN</td>
<td>Change file ownership</td>
</tr>
<tr>
<td>CLRSETID</td>
<td>CSID</td>
<td>Clear SETID bits for a file</td>
</tr>
<tr>
<td>EXESETID</td>
<td>ESID</td>
<td>EXEC with SETUID/SETGID</td>
</tr>
<tr>
<td>GETPSENT</td>
<td>GPST</td>
<td>Get z/OS UNIX process entry</td>
</tr>
<tr>
<td>INITOEDP</td>
<td>IOEP</td>
<td>Initialize z/OS UNIX process</td>
</tr>
<tr>
<td>TERMOEDP</td>
<td>TOEP</td>
<td>z/OS UNIX process complete</td>
</tr>
<tr>
<td>KILL</td>
<td>KILL</td>
<td>Terminate a process</td>
</tr>
<tr>
<td>LINK</td>
<td>LINK</td>
<td>LINK</td>
</tr>
<tr>
<td>MKDIR</td>
<td>MDIR</td>
<td>Make directory</td>
</tr>
<tr>
<td>MKNOD</td>
<td>MNOD</td>
<td>Make node</td>
</tr>
<tr>
<td>MNTFSYS</td>
<td>MFS</td>
<td>Mount a file system</td>
</tr>
<tr>
<td>OPENFILE</td>
<td>OPEN</td>
<td>Open a new file</td>
</tr>
<tr>
<td>PTRACE</td>
<td>PTRC</td>
<td>PTRACE authority checking</td>
</tr>
<tr>
<td>RENAMEF</td>
<td>RENF</td>
<td>Rename file</td>
</tr>
<tr>
<td>RMDIR</td>
<td>RDIR</td>
<td>Remove directory</td>
</tr>
<tr>
<td>SETEGID</td>
<td>SEGI</td>
<td>Set effective GID</td>
</tr>
<tr>
<td>SETEUID</td>
<td>SEUI</td>
<td>Set effective UID</td>
</tr>
<tr>
<td>SETGID</td>
<td>SGI</td>
<td>Set GID</td>
</tr>
<tr>
<td>SETUID</td>
<td>SUI</td>
<td>Set UID</td>
</tr>
<tr>
<td>DB2 Table Name</td>
<td>Column Prefix</td>
<td>Description</td>
</tr>
<tr>
<td>---------------</td>
<td>---------------</td>
<td>-------------</td>
</tr>
<tr>
<td>SYMLINK</td>
<td>SYML</td>
<td>SYMLINK</td>
</tr>
<tr>
<td>UNLINK</td>
<td>UNL</td>
<td>UNLINK</td>
</tr>
<tr>
<td>UMNTFSYS</td>
<td>UFS</td>
<td>Unmount file system</td>
</tr>
<tr>
<td>CHKOWN</td>
<td>CFOW</td>
<td>Check file owner</td>
</tr>
<tr>
<td>CHKPRIV</td>
<td>CPRV</td>
<td>Check z/OS UNIX privilege</td>
</tr>
<tr>
<td>OPENSTTY</td>
<td>OPTY</td>
<td>Open slave TTY</td>
</tr>
<tr>
<td>RACLINK</td>
<td>RACL</td>
<td>RACLINK command</td>
</tr>
<tr>
<td>IPCCHK</td>
<td>ICHK</td>
<td>Check IPC access</td>
</tr>
<tr>
<td>IPCGET</td>
<td>IGET</td>
<td>Make ISP</td>
</tr>
<tr>
<td>IPCCTL</td>
<td>ICTL</td>
<td>R_IPC control</td>
</tr>
<tr>
<td>SETGROUP</td>
<td>SETG</td>
<td>Set group</td>
</tr>
<tr>
<td>CKOWN2</td>
<td>CKO2</td>
<td>Check owner two files</td>
</tr>
<tr>
<td>ACCR</td>
<td>ACCR</td>
<td>Access rights passed</td>
</tr>
<tr>
<td>RACDCERT</td>
<td>RACD</td>
<td>RACDCERT command</td>
</tr>
<tr>
<td>RACFINIT</td>
<td>RINI</td>
<td>RACF initialization data</td>
</tr>
<tr>
<td>CLASNAME</td>
<td>RINC</td>
<td>RACF class data</td>
</tr>
<tr>
<td>DSNSAFF</td>
<td>DSAF</td>
<td>Data sets affected by a security label change</td>
</tr>
<tr>
<td>INITACEE</td>
<td>INTA</td>
<td>initACEE functions</td>
</tr>
<tr>
<td>KTICKET</td>
<td>KTKT</td>
<td>Kerberos ticket</td>
</tr>
<tr>
<td>PDACCESS</td>
<td>PDAC</td>
<td>Policy Director Access Control Decision</td>
</tr>
<tr>
<td>PKIDPUBR</td>
<td>PKDP</td>
<td>CRL Publication</td>
</tr>
<tr>
<td>RPKIGENC</td>
<td>RPKG</td>
<td>R_PKIServ GENCERT</td>
</tr>
<tr>
<td>RPKIEXPT</td>
<td>RPKE</td>
<td>R_PKIServ EXPORT</td>
</tr>
<tr>
<td>RPKIREAD</td>
<td>RPKR</td>
<td>R_PKIServ Read Data</td>
</tr>
<tr>
<td>RPKISCEP</td>
<td>RPKS</td>
<td>R_PKIServ SCEP Request</td>
</tr>
<tr>
<td>RPKIUUPDR</td>
<td>RPKU</td>
<td>R_PKIServ Update Request</td>
</tr>
<tr>
<td>RPKIUUPDC</td>
<td>RPKC</td>
<td>R_PKIServ Update Certificate</td>
</tr>
<tr>
<td>SETFACL</td>
<td>SACL</td>
<td>R_Setfacl SETFACL</td>
</tr>
<tr>
<td>DELFACL</td>
<td>DACL</td>
<td>R_Setfacl DELFACL</td>
</tr>
<tr>
<td>SETFSECL</td>
<td>SSCL</td>
<td>R_setfsecl Set file security label</td>
</tr>
<tr>
<td>WRITEDWN</td>
<td>WDWN</td>
<td>R_writepriv Set writedown privilege</td>
</tr>
<tr>
<td>RPKIRESP</td>
<td>RPOK</td>
<td>R_PKIServ Respond</td>
</tr>
<tr>
<td>PTCREATE</td>
<td>PTCR</td>
<td>PassTicket Creation</td>
</tr>
<tr>
<td>PTEVAL</td>
<td>PTEV</td>
<td>PassTicket Evaluation</td>
</tr>
<tr>
<td>RDATAUPD</td>
<td>RPUT</td>
<td>R_Dataib</td>
</tr>
<tr>
<td>PKIAURNW</td>
<td>PKRN</td>
<td>PKI AutoRenew</td>
</tr>
<tr>
<td>PGMVERYF</td>
<td>PGMV</td>
<td>R_PgmSignVer</td>
</tr>
<tr>
<td>RACMAP</td>
<td>RACM</td>
<td>RACMAP command</td>
</tr>
</tbody>
</table>
### Table 4. Correlation of DB2 Table Names and Record Types (continued)

<table>
<thead>
<tr>
<th>DB2 Table Name</th>
<th>Column Prefix</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUTOPROF</td>
<td>AUTO</td>
<td>getUMAP/getGMAP automatic profile update</td>
</tr>
<tr>
<td>RPKIQREC</td>
<td>RPKQ</td>
<td>R_PKIServe QRECOVER</td>
</tr>
</tbody>
</table>

### Using the RACF SMF data unload utility to generate XML documents

The records produced by the SMF data unload utility can be formatted as an Extensible Markup Language (XML) document. XML has many advantages over the usual tabular-style data, such as the many applications that can use XML as a format for reading and writing of data. The benefits of XML include:

- A better view of the data. Instead of the tabular format which may be difficult to focus in on the information you’re looking for, the XML audit report formats the data for ease of reading and retrieval.
- The display can include different fonts, text emphasis (bold, italic) as well as different colors to differentiate information.
- A complete set of data for each field. The tabular data is limited by space and can be truncated. XML does not have this restriction.
- A view of the audit data that can be tailored to your environment.

### XML overview

XML is a flexible language which allows you to tag data and have it displayed in a variety of ways. Many software applications read and write XML data, both in enterprise computing and consumer applications. Therefore, an auditing report using XML can be distributed and analyzed on multiple platforms and operating systems. For more information on XML, see [http://www.ibm.com/servers/eserver/zseries/software/xml/](http://www.ibm.com/servers/eserver/zseries/software/xml/). For hints and tips on XML, see [http://www.ibm.com/developerworks/xml/library/x-tips.html](http://www.ibm.com/developerworks/xml/library/x-tips.html).

An XML document which contains the audit report looks like this:

```xml
<?xml version='1.0'?>
<securityEventLog xmlns='http://www.ibm.com/xmlns/zOS/IRRSchema'>
  <rdf:Description rdf:about=''
    xmlns:rdf='http://www.w3.org/1999/02/22-rdf-syntax-ns#'
    xmlns:dc='http://purl.org/dc/elements/1.1/'
    xmlns:z='http://www.ibm.com/xmlns/zOS'>
    <dc:creator>
      <z:application>SMF Unload</z:application>
      <z:product>z/OS Security Server RACF</z:product>
      <z:fmid>HRF7720</z:fmid>
    </dc:creator>
    <dc:language>en</dc:language>
  </rdf:Description>

  <event>
    <eventType>*CONNECT</eventType>
    <eventQual>SUCCESS</eventQual>
    <timeWritten>02:03:01.23</timeWritten>
    <dateWritten>2004-03-28</dateWritten>
    <systemSmfid>SYSA</systemSmfid>
    <productName>Enterprise Identity Mapping</productName>
    <prodFmid>HRF7720</prodFmid>
    <details xmlns:d='http://www.ibm.com/xmlns/zOS/EIMSchema'>
```

Chapter 3. The RACF SMF data unload utility  65
Producing XML output

You can have SMF Unload create an XML document by including only one of the following DD names in your IFASMFDP job:

- XMLOUT DD creates a compressed form of the XML document
- XMLFORM DD creates a more readable form of the XML document.
Whichever output type is coded in the JCL is the only type that will be generated. For instance:

- If XMLFORM DD is specified in the JCL, then only the expanded, more readable XML output is written.
- If XMLOUT DD is specified in the JCL, then only the compressed XML output type is written.
- If OUTDD DD is specified in the JCL, then this is the only output type written (this is the traditional tabular non-xml form).
- If none of these types are specified in the JCL, the utility issues message IRR67522I Open failed for OUTDD.

If more than one DDname is placed in the JCL, the above order (XMLFORM, XMLOUT, OUTDD) is used to see which one is created. The actual order of DD statements in the JCL is irrelevant.

For example:

```
//SMFDUMP EXEC PGM=IFASMFDP
//SYSPRINT DD SYSOUT=A
//ADUPRINT DD SYSOUT=A
//XMLOUT DD DISP=SHR,DSN=USER01.RACF.SMF.XMLOUT
//SMFDATA DD DISP=SHR,DSN=USER01.RACF.SMFDATA
//SMFOUT DD DUMMY
//SYSIN DD *
  INDD(SMFDATA,OPTIONS(DUMP))
  OUTDD(SMFOUT, TYPE(30(1,5),80:83))
  ABEND(NORETRY)
  USER2(IRRADU00)
  USER3(IRRADU86)
```

This job creates a compressed form of the XML document in a dataset that already exists. You can think of this as "raw output", since it’s the most basic form of the XML document. While this report takes up the least space, it is not well-suited for reading due to its limited line wrapping and tag justification. In the document, the tags and information are often comprised of one long line in an effort to save space. A more readable form of the report can be created using the XMLFORM DD statement. The output from this would include better line wrapping, and the tags would be justified so that they begin on new lines when necessary. It’s a more readable form but takes up more space.

How the XML tag names are derived

The names of the tags and the syntax of the tags are defined by XML schema document. The schema can be used to validate the data contained in an XML document. The tags appear in the order described by the schema documents. The schema document for RACF can be found in Sys1.Samplib(IRRSCHEM).

In general, the tag names used in RACF are derived from the corresponding DB2 field names. The rules for converting a field name to a tag name are:

1. Remove the column name and the first underscore ("_") from the field name.
2. Capitalize the first letter after each of the remaining underscores in the name. The rest of the characters should be lowercase.
3. Remove the underscores from the name.
The exceptions to this methodology are as follows:

Table 5. XML naming exceptions

<table>
<thead>
<tr>
<th>DB2 Field Name</th>
<th>XML Tag Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>RINI_TERM</td>
<td>riniTerm</td>
</tr>
<tr>
<td>SECL_LINK</td>
<td>eventLink</td>
</tr>
<tr>
<td>CAUD_REQUEST_WRITE</td>
<td>caudRequestWrite</td>
</tr>
<tr>
<td>CAUD_REQUEST_READ</td>
<td>caudRequestRead</td>
</tr>
<tr>
<td>CAUD_REQUEST_EXEC</td>
<td>caudRequestExec</td>
</tr>
<tr>
<td>SSCL_OLDSECL</td>
<td>oldSecl</td>
</tr>
<tr>
<td>&lt;col&gt;logstring</td>
<td>logstr</td>
</tr>
<tr>
<td>KTKT_PRINCIPAL</td>
<td>kerbPrincipal</td>
</tr>
<tr>
<td>PDAC_PRINCIPAL</td>
<td>pdasPrincipal</td>
</tr>
<tr>
<td>any field with RESERVED in the name</td>
<td>Note: no XML tag</td>
</tr>
<tr>
<td>ACC_NAME</td>
<td>profileName</td>
</tr>
<tr>
<td>APPC_NAME</td>
<td>profileName</td>
</tr>
</tbody>
</table>

XML interprets certain characters as having a special meaning, such as "<" and ">". If a value contains one of these special characters, which are listed in Table 7, SMF Unload replaces the value with an “entity reference” so that it won't be misinterpreted by an XML parser. Here's an example:

Table 6. XML interpretation of special characters example

<table>
<thead>
<tr>
<th>Before Value</th>
<th>After Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;subjectDN&gt;cn=John,ou=Smith &amp; Sons,c=us&lt;/subjectDN&gt;</td>
<td>&lt;subjectDN&gt;cn=John,ou=Smith &amp; Sons,c=us&lt;/subjectDN&gt;</td>
</tr>
</tbody>
</table>

The special characters are:

Table 7. XML special characters substitutions

<table>
<thead>
<tr>
<th>Character</th>
<th>Substitution symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;</td>
<td>&lt;</td>
</tr>
<tr>
<td>&amp;</td>
<td>&amp;</td>
</tr>
<tr>
<td>&gt;</td>
<td>&gt;</td>
</tr>
<tr>
<td>&quot;</td>
<td>&quot;</td>
</tr>
<tr>
<td>'</td>
<td>'</td>
</tr>
</tbody>
</table>

It is possible for a single element or value in the XMLOUT or XMLFORM to cause the length of a record to exceed the maximum 8K limit. SMF Unload will break the line into two. If the line break would naturally occur in the middle of a tag or entity reference, SMF Unload splits the line before or after the tag or entity reference so that the tag or entity reference is not broken. What this means is that the data value may include a carriage return or line feed that wasn’t originally part of the value. It’s up to the application processing the document to detect this condition and concatenate the two lines before passing the element to an XML parser.
Viewing and working with XML audit reports

On z/OS, you can process the document using the IBM XML Toolkit for z/OS. The XML can be used in the following ways:

- Viewed using the ISPF edit function
- Viewed using an XML-capable web browser
- Converted to HTML using a style sheet
- Processed by an XML parser and processor

On other systems, such as personal computers and workstations, the audit report can be viewed using an XML-capable web browser. Many browsers available today have the ability to correctly parse and render XML documents. Therefore, once the audit report is on that system, you can read it as easily as any other web document. Simply bring up a listing of the files and single- or double-click the file to open it in the browser window. The platform documentation can help you discover which applications are able to parse and display XML files.

One thing to note is that to use the XML file on a personal computer, you must first alter the EBCDIC encoding line at the top of the file:

```xml
<?xml version='1.0' encoding='ebcdic-cp-us' ?>
```

So that it looks like the following:

```xml
<?xml version='1.0' encoding='ISO8859-1' ?>
```

Event code qualifiers

The RACF event code (found in the SMF80EVT field of the SMF record) and the RACF event code qualifier (found in the SMF80EVQ field of the SMF record) are determined during RACF processing. The following sections explain the meaning of each qualifier code by event.

You may also see event codes for another component, such as EIM. The data in the audit record identifies the component. See the component’s documentation for details.

Event 1( 1): JOB INITIATION/TSO LOGON/TSO LOGOFF

This event is logged by RACROUTE REQUEST=VERIFY and RACROUTE REQUEST=VERIFYX. Installation exit ICHRXX02 can change the return code of the RACROUTE REQUEST=VERIFY or RACROUTE REQUEST=VERIFYX request to any value. The return code significantly influences the corresponding audit record’s event code 1 qualifier. You should be familiar with any ICHRXX02 processing in effect for your installation. See z/OS Security Server RACF System Programmer’s Guide for details.

For this event, code qualifiers 0 and 8 do not exist as type 80 records. They are contained in the unloaded records from the RACF SMF data unload utility (IRRADU00) and as reports and reformatted records from the RACF report writer (RACFRW).

The explanations of the event code qualifiers for Event 1 are:

- **0(0) SUCCESSFUL INITIATION** The job began successfully.
- **1(1) INVALID PASSWORD** The password specified on the job card or at logon is incorrect.
2(2) INVALID GROUP  The user tried to log on or to initiate a job using a group that the user is not a member of.

3(3) INVALID OIDCARD  Operator identification cards are used at the installation, and the data received from the one used does not match that of the user’s profile.

4(4) INVALID TERMINAL/CONSOLE  The user is not authorized to the port of entry (POE). There are four kinds of POEs, each with its own profile class: APPCPORT, CONSOLE, JESINPUT, and TERMINAL. One of the following occurred:
   • The port of entry is active but the user is not authorized.
   • The user is denied access because of conditional days/times in the user profile.
   • The user is denied access because of conditional days/times in the class profile (TERMINAL class only).

5(5) INVALID APPLICATION  The APPL class is active, and the user is trying to log on to an application without authorization.

6(6) REVOKED USER ID ATTEMPTING ACCESS  The user ID specified on the logon or job card has been revoked. One of the following occurred:
   • The installation-defined limit of password attempts was reached at an earlier time.
   • The inactive interval was reached.
   • The revoke date in the user’s profile is in effect.
   • The RACF administrator revoked the user ID.

   The RACF administrator must reset the user ID before the user can log on again.

7(7) USER ID AUTOMATICALLY REVOKED  The user ID has been automatically revoked. The installation-defined limit of password and password phrase attempts was reached.

8(8) SUCCESSFUL TERMINATION  The job completed successfully.

9(9) UNDEFINED USER ID  The user ID specified on the job card or at logon is not defined to the RACF database.

10(A) INSUFFICIENT SECURITY LABEL AUTHORITY  One of the following occurred:
   • SETROPTS MLS FAILURES is in effect and the user’s security label does not dominate the submitter’s security label. Two exceptions are explained under Qualifier 20.
   • SETROPTS MLACTIVE FAILURES is in effect and the job card/logon attempt does not specify a valid security label. One exception is explained under Qualifier 21.

11(B) NOT AUTHORIZED TO SECURITY LABEL  The user is not authorized to the security label specified. One exception is explained under Qualifier 22.

12(C) SUCCESSFUL RACINIT INITIATION  The job or user was verified.

13(D) SUCCESSFUL RACINIT DELETE  The job completed or the user logged off.

14(E) SYSTEM NOW REQUIRES MORE AUTHORITY  SETROPTS MLQUIET is in effect. If this is a user verification, the user is not a console operator and
does not have the SPECIAL attribute. If this is a job verification, the job is not part of the trusted computing base (TCB). The verification fails.

15(F)  REMOTE JOB ENTRY—JOB NOT AUTHORIZED The submitting node is not authorized to the system; a NODES profile prevents remote job entry. The profile has the format 'submit_node.RUSER.userid' and has a UACC of NONE.

**Surrogate Function Qualifiers:**

Qualifiers 16, 17, and 18 involve the use of the surrogate function, and occur if any of the following conditions is met:

- The SURROGAT class is active.
- General resource profiles of the SURROGAT class are defined for the job card’s user ID, and the user ID submitting the job is permitted to the profile with at least READ access.
- The submitter is authorized to the security label of the job.

For more information, see z/OS Security Server RACF Security Administrator’s Guide.

16(10)  SURROGATE CLASS IS INACTIVE The SURROGATE class is inactive. The job card has a user ID that is different from the submitter’s user ID, and there is no password specified.

17(11)  SUBMITTER IS NOT AUTHORIZED BY USER The SURROGATE class is active. Either there is no SURROGATE profile for the job card’s user ID, or the submitter’s user ID is not permitted to the profile.

18(12)  SUBMITTER IS NOT AUTHORIZED TO SECURITY LABEL The SECLABEL class is active and there is a security label on the job card. The submitter is not authorized to the security label specified on the job card.

19(13)  USER IS NOT AUTHORIZED TO JOB The JESJOBS class is active, and the user is not authorized to the jobname.

20(14)  WARNING—INSUFFICIENT SECURITY LABEL AUTHORITY One of the following occurred:

- SETROPTS MLS WARNING is in effect and the security label on the job card does not dominate the submitter’s security label.
- SETROPTS MLS FAILURES is in effect, the user’s security label does not dominate the submitter’s, and the user has the SPECIAL attribute.
- SETROPTS MLS FAILURES and SETROPTS COMPATMODE are in effect, the user’s security label does not dominate the submitter’s, and the submitter’s or the job owner’s security label is the default.

The verification does not fail.

21(15)  WARNING—SECURITY LABEL MISSING FROM JOB, USER, OR PROFILE One of the following occurred:

- MLACTIVE WARNING is in effect, and the job card or logon attempt did not specify a valid security label.
- MLACTIVE FAILURES is in effect, the user has the SPECIAL attribute, and a valid security label is not specified.

The verification does not fail.

22(16)  WARNING—NOT AUTHORIZED TO SECURITY LABEL The user has the
SPECIAL attribute, the security label is SYSHIGH, and the user does not have authority to it. The verification does not fail.

23(17) SECURITY LABELS NOT COMPATIBLE SETROPTS MLS is not active, the submitter’s user ID is different from the user ID on the job card, and the submitter’s and the user’s security labels are disjoint (neither one dominates the other).

One exception is listed under Qualifier 24.

24(18) WARNING—SECURITY LABELS NOT COMPATIBLE SETROPTS MLS is not active, the submitter’s user ID is different from the user ID on the job card, the submitter’s and user’s security labels are disjoint, SETROPTS COMPATMODE is in effect, and the submitter’s or user’s security label is the default. The verification does not fail.

25(19) CURRENT PASSWORD HAS EXPIRED The user’s password has expired for one of the following reasons:
   • The installation specification in SETROPTS PASSWORD INTERVAL command
   • Creation of the password in the ADDUSER command
   • Alteration of the password with the ALTUSER PASSWORD command

26(1A) INVALID NEW PASSWORD The new password specified may be incorrect because:
   • It is all blanks.
   • The characters are not all alphanumeric.
   • The characters do not match the installation’s password syntax rules (set by the SETROPTS PASSWORD command).
   • It is the same as a past password (the extent of the past history determined by the SETROPTS PASSWORD HISTORY command).
   • It is marked invalid by the installation’s password exit.
   • It is too soon to change the password (as determined by the SETROPTS PASSWORD MINCHANGE command).

27(1B) VERIFICATION FAILED BY INSTALLATION The installation exit ICHRIX01 or ICHRIX02 failed the request.

28(1C) GROUP ACCESS HAS BEEN REVOKED The user’s membership to the group specified has been revoked.

29(1D) OIDCARD IS REQUIRED An OIDCARD is required by the installation but none was given.

30(1E) NETWORK JOB ENTRY—JOB NOT AUTHORIZED For session types of NJE SYSOUT or NJE BATCH, the verification fails because one of the following occurred:
   • The user, group, or security label requirements in the NODES profiles were not met.
   • The submitter’s node is not valid.
   • The reverify check failed.

See z/OS Security Server RACF Security Administrator’s Guide for details on NJE.
31(1F)  WARNING—UNKNOWN USER FROM TRUSTED NODE PROPAGATED
The combination of having a trusted node submit a job with the undefined
user ID warrants this logging. The verification does not fail.

For an NJE BATCH job, the submitting user is the NJE undefined user ID.
The default NJE undefined user ID is eight question marks (?????????),
unless it was changed with the SETROPTS JES NJEUSERID command.
The submitting node is trusted (its best-fit NODES profile on the receiving
node's system has a UACC of at least UPDATE). This profile allows
propagation of submitters; however, the undefined user ID does not
propagate.

32(20)  SUCCESSFUL INITIATION USING PASSTICKET Logon was achieved
using a PassTicket.

33(21)  ATTEMPTED REPLAY OF PASSTICKET Logon was rejected because of
attempted replay of a PassTicket.

34(22)  CLIENT SECURITY LABEL NOT EQUIVALENT TO SERVER'S Logon was
rejected because security labels are not equivalent.

35(23)  USER AUTOMATICALLY REVOLED DUE TO INACTIVITY A user has not
logged on, submitted a job or accessed the system for so long that the user
ID has become inactive. RACF prevents the user from accessing the
system.

36(24)  PASS PHRASE IS NOT VALID A user attempted to access the system
specifying a password phrase that is not valid or specifying a password
phrase for a protected user ID. RACF prevents the user from accessing the
system.

37(25)  NEW PASS PHRASE IS NOT VALID Logon was rejected because the new
password phrase is not valid.

38(26)  CURRENT PASS PHRASE HAS EXPIRED Logon was rejected because
the current password phrase has expired.

39(27)  NO RACF USER ID FOUND FOR DISTRIBUTED IDENTITY Logon was
rejected because no RACF user ID was found for the distributed identity.

Event 2( 2): RESOURCE ACCESS
This event is logged by RACROUTE REQUEST=AUTH, RACROUTE
REQUEST=DIRAUTH and RACROUTE REQUEST=FASTAUTH.

The explanations of the event code qualifiers for Event 2 are:

0(0)  SUCCESSFUL ACCESS The user has authorization to the resource.

1(1)  INSUFFICIENT AUTHORITY The user does not have authorization to the
resource.

2(2)  PROFILE NOT FOUND—RACFIND SPECIFIED ON MACRO If the request
is AUTH, the RACFIND keyword equaled YES on the authorization request,
specifying that a discrete profile should exist for the resource. No discrete
or generic RACF protection was found.

If the request is FASTAUTH, the program is not controlled and the PADS
data sets are open.

3(3)  ACCESS PERMITTED DUE TO WARNING The user does not have proper
authority to the resource. However, the resource's profile has the
WARNING option and allows the access.
**Exceptions**

- PROGRAM class profiles cannot use the WARNING option.
- RAclist profiles use the WARNING option only if they are RAclist by SETROPTS or a RACROUTE REQUEST=LIST that specifies RELEASE=1.8 or later.

**4(4) FAILED DUE TO PROTECTALL**

SETROPTS PROTECTALL FAILURES is in effect, and the data set has not been protected by a discrete or generic profile.

**Exceptions**

- A privileged user bypasses this checking (no auditing done).
- A trusted user bypasses the checking, but can be audited with the SETROPTS LOGOPTIONS command.
- A user with the SPECIAL attribute gets a warning (see Qualifier 5).
- A system-generated temporary data set does not require protection.

**5(5) WARNING ISSUED DUE TO PROTECTALL**

SETROPTS PROTECTALL WARNING is in effect, and the data set has not been protected by a discrete or generic profile. The authorization request does not fail.

The exceptions in Qualifier 4 also apply.

**6(6) INSUFFICIENT CATEGORY/SECLEVEL**

The installation uses categories or security levels as separate entities. One of the following occurred:

- The user’s SECLEVEL is less than the SECLEVEL of the resource.
- The user is not a member of every CATEGORY associated with the resource.

**7(7) INSUFFICIENT SECURITY LABEL AUTHORITY**

The SECLABEL class is active and one of the following occurred:

- The user’s security label does not dominate the resource’s.
- The user does not have a security label, but the resource does.
- SETROPTS MLACTIVE FAILURES is in effect, and either the user or the resource is missing a security label. One exception is explained in Qualifier 8.
- The resource’s class requires reverse domination checking, and the resource’s security label does not dominate the user’s.
- SETROPTS MLS FAILURES is in effect; the user’s security label does not equal the resource’s, and the requested access is UPDATE or CONTROL. One exception is explained under Qualifier 9.

**8(8) SECURITY LABEL MISSING FROM JOB, USER OR PROFILE**

One of the following occurred:

- SETROPTS MLACTIVE WARNING is in effect, the SECLABEL class is active, and either the resource or user is missing a security label.
- SETROPTS MLACTIVE FAILURES is in effect, the user has the SPECIAL attribute, and either the resource or the user is missing a security label.
9(9) **WARNING—INSUFFICIENT SECURITY LABEL AUTHORITY** One of the following occurred:

- The SECLABEL class is active, SETROPTS MLS WARNING is in effect, the user’s security label does not equal the resource’s security label, and the requested access is UPDATE or CONTROL.
- SETROPTS MLS FAILURES is in effect, the user’s security label does not equal the resource’s security label, the requested access is UPDATE or CONTROL, and the user has the SPECIAL attribute.

10(A) **WARNING—DATA SET NOT CATALOGED** SETROPTS CATDSNS WARNING is in effect. The data set being accessed cannot be cataloged. See the *z/OS Security Server RACF Command Language Reference* for more information.

11(B) **DATA SET NOT CATALOGED** SETROPTS CATDSNS FAILURES is in effect. The data set being accessed cannot be cataloged. If the user has the SPECIAL attribute, only a warning is issued (see Qualifier 10). See the *z/OS Security Server RACF Command Language Reference* for more information.

12(C) **PROFILE NOT FOUND—REQUIRED FOR AUTHORITY CHECKING** A profile was not found for the general resource, and that resource’s class has a default return code greater than 4. The authorization request fails.

13(D) **WARNING—INSUFFICIENT CATEGORY/SECLEVEL** The installation uses categories or security levels as separate entities. One of the following occurred:

- The user’s SECLEVEL is less than the SECLEVEL of the resource.
- The user is not a member of every CATEGORY associated with the resource.

The resource profile has the WARNING option, so access is given.

**Exceptions**

- PROGRAM class profiles cannot use the WARNING option.
- RA CLISTed profiles can use the WARNING option only if they are RA CLISTed by SETROPTS or a RACF 1.8 (or later) RACROUTE REQUEST=LIST.

14(E) **WARNING—NON-MAIN EXECUTION ENVIRONMENT** Non-MAIN execution environment was detected while in ENHANCED PGMSECURITY mode. Conditional access for Program Access to Data Sets (PADS) or access to EXECUTE-controlled program is temporarily allowed.

15(F) **CONDITIONAL ACCESS ALLOWED VIA BASIC MODE PROGRAM** Conditional access for Program Access to Data Sets (PADS) or access to EXECUTE-controlled program is allowed through the BASIC mode program while in ENHANCED PGMSECURITY mode.

**Event 3( 3): ADDVOL/CHGVOL**

This event refers to RACROUTE REQUEST=DEFINE,TYPE=ADDVOL and RACROUTE REQUEST=DEFINE,TYPE=CHGVOL.

The explanations of the event code qualifiers for Event 3 are:
0(0) SUCCESSFUL PROCESSING OF NEW VOLUME One of the following occurred:
   • The user has proper administrative authority to the DATASET profile; in
     the case of tape data sets with TAPEVOL active, the user also had
     administrative authority to the TAPEVOL profile.
   • SETROPTS MLS WARNING is in effect, the TAPEVOL class is active, a
     TAPEVOL profile exists, and the user’s security label does not equal the
     resource’s.
   • SETROPTS MLACTIVE WARNING is in effect, the TAPEVOL class is
     active, and no TAPEVOL profile exists for the volume.

1(1) INSUFFICIENT AUTHORITY The user did not have administrative authority
   to the DATASET profile, or, in the case of tape data sets, the TAPEVOL
   class is active and the user did not have administrative authority to the
   TAPEVOL profile.

2(2) INSUFFICIENT SECURITY LABEL AUTHORITY The SECLABEL class is
   active, the data set is a tape data set, the TAPEVOL class is active, and the
   user’s security label does not dominate the security label found in the
   TAPEVOL profile.

3(3) LESS SPECIFIC PROFILE EXISTS WITH DIFFERENT SECURITY LABEL
   The SECLABEL class is active, SETROPTS MLSTABLE is in effect, a less
   specific generic profile exists that does not have the same security label,
   the data set is a tape data set, and the TAPEVOL class is active. Changing
   the volume would change the TAPEVOL profile’s security label, violating
   SETROPTS MLSTABLE rules.

   Exception
   If SETROPTS MLQUIET is also in effect and the user has the
   SPECIAL attribute, the request does not fail and this event is not
   logged.

Event 4( 4): RENAME RESOURCE

   This event is based on RACROUTE
   REQUEST=DEFINE,TYPE=DEFINE,NEWNAME or RACROUTE
   REQUEST=DEFINE,TYPE=DEFINE,NEWNAMEX.

   The explanations of the event code qualifiers for Event 4 are:

   0(0) SUCCESSFUL RENAME One of the following occurred:
       • The user has sufficient authority to rename the resource.
       • The SECLABEL class is active, SETROPTS MLACTIVE WARNING is in
         effect, and the user or the resource does not have a security label.

   1(1) INVALID GROUP The resource to be renamed is a data set, and the
       high-level qualifier of the new data set is not a valid group or user ID.

   2(2) USER NOT IN GROUP The resource is a data set, RACFIND is not set to
       NO, the high-level qualifier of the new data set name is a group, and the
       user does not belong to that group.

   3(3) INSUFFICIENT AUTHORITY One of the following occurred:
       • SETROPTS GENERICOWNER is in effect, and renaming the profile
         would violate GENERICOWNER rules.
• The resource is a data set, and the high-level qualifier is a group or user ID. The user is not authorized to create a new data set by the generic profile protecting the new name, and the high-level qualifier of the new data set name is beyond the scope of the user.
• The resource is an SFS file or directory, and the second qualifier is a user ID. The user is not authorized to create a new file or directory by the generic profile protecting the new name, and the second qualifier of the new file or directory name is beyond the scope of the user.


4(4) RESOURCE NAME ALREADY DEFINED The requested new name already has a discrete profile defined. The return code of the RENAME is 4.

5(5) USER NOT DEFINED TO RACF The installation's naming convention routine has indicated that the high-level qualifier is a user ID that is not defined to RACF. One of the following occurred:
• RACFIND is not set to NO.
• The resource is protected by a generic or global profile, and the user does not have ALTER access to it.

6(6) RESOURCE NOT PROTECTED SETROPTS PROTECTALL FAILURES is in effect, and the new data set name is not protected by a profile.

7(7) WARNING—RESOURCE NOT PROTECTED SETROPTS PROTECTALL WARNINGS is in effect, and the new data set name is not protected by a profile.

The RENAME is allowed.

8(8) USER IN SECOND QUALIFIER IS NOT RACF DEFINED The second qualifier of the new name is not a valid user ID.

9(9) LESS SPECIFIC PROFILE EXISTS WITH DIFFERENT SECURITY LABEL
The SECLABEL class is active, SETROPTS MLSTABLE is in effect, and there is a less specific generic profile existing for the new name with a different security label. Renaming this resource would violate SETROPTS MLSTABLE rules.

10(A) INSUFFICIENT SECURITY LABEL AUTHORITY The SECLABEL class is active, SETROPTS MLS FAILURES is in effect, and the user is not authorized to the security label of the resource to be renamed.

11(B) RESOURCE NOT PROTECTED BY SECURITY LABEL The SECLABEL class is active, SETROPTS MLS FAILURES is in effect, and the profile covering the old resource name does not have a security label.

12(C) NEW NAME NOT PROTECTED BY SECURITY LABEL The SECLABEL class is active, SETROPTS MLS FAILURES is in effect, and the profile that would cover the new resource name does not have a security label.

13(D) NEW SECURITY LABEL MUST DOMINATE OLD SECURITY LABEL The SECLABEL class is active, SETROPTS MLS FAILURES is in effect, and the security label of the profile covering the new resource name does not dominate the security label of the profile covering the old resource name.

14(E) INSUFFICIENT SECURITY LABEL AUTHORITY The SECLABEL class is active, SETROPTS MLS WARNING is in effect, and the user is not authorized to the security label of the profile. The RENAME is allowed.

15(F) WARNING—RESOURCE NOT PROTECTED BY SECURITY LABEL The
SECLABEL class is active, SETROPTS MLS WARNING is in effect, and the profile covering the old resource name does not have a security label. The RENAME is allowed.

16(10) WARNING—NEW NAME NOT PROTECTED BY SECURITY LABEL The SECLABEL class is active, SETROPTS MLS WARNING is in effect, and the profile that would cover the new resource name does not have a security label. The RENAME is allowed.

17(11) WARNING—NEW SECURITY LABEL MUST DOMINATE OLD SECURITY LABEL The SECLABEL class is active, SETROPTS MLS WARNING is in effect, and the security label of the profile covering the new resource name does not dominate the security label of the profile covering the old resource name. The RENAME does not fail.

**Event 5( 5): DELETE RESOURCE**

This event is based on RACROUTE REQUEST=DEFINE,TYPE=DELETE.

The explanations of the event code qualifiers for Event 5 are:

0(0) SUCCESSFUL SCRATCH The resource profile was deleted.

1(1) RESOURCE NOT FOUND The resource profile was not found.

2(2) INVALID VOLUME The class is DATASET, and the data set does not reside on the volume specified.

**Event 6( 6): DELETE ONE VOLUME OF A MULTIVOLUME RESOURCE**

This event is based on RACROUTE REQUEST=DEFINE,TYPE=DELETE.

The explanations of the event code qualifiers for Event 6 are:

0(0) SUCCESSFUL DELETION The volume was successfully deleted from the DATASET profile.

**Event 7( 7): DEFINE RESOURCE**

This event is based on RACROUTE REQUEST=DEFINE,TYPE=DEFINE.

The explanations of the event code qualifiers for Event 7 are:

0(0) SUCCESSFUL DEFINITION

- The user had sufficient authority to define the resource.
- The SECLABEL class is active, SETROPTS MLACTIVE WARNING is in effect, and the user or the resource does not have a security label.

1(1) GROUP UNDEFINED The resource to be defined is a data set, and the high-level qualifier is not a valid group or user ID.

2(2) USER NOT IN GROUP The resource is a data set, RACFIND is not set to NO, the high-level qualifier is a group, and the user does not belong to that group.

3(3) INSUFFICIENT AUTHORITY One of the following occurred:

- SETROPTS GENERICOWNER is in effect and defining the profile would violate GENERICOWNER rules.
- For general resources, the user is not authorized to define profiles in the class.
The resource is a data set, and the high-level qualifier of the resource is a group or user ID. The user is not authorized to create a new data set by the generic profile protecting the new name, and the high-level qualifier of the new data set name is beyond the scope of the user.

The resource is an SFS file or directory, and the second qualifier is a user ID. The user is not authorized to create a new file or directory by the generic profile protecting the new name, and the second qualifier of the new file or directory name is beyond the scope of the user.


4(4) RESOURCE NAME ALREADY DEFINED The requested name already has a discrete profile defined. The return code of the DEFINE is 4.

5(5) USER NOT DEFINED TO RACF The installation’s naming convention routine has indicated that the high-level qualifier is a user ID that is not defined to RACF. One of the following occurred:

- RACFIND is not set to NO.
- The resource is protected by a generic or global profile, and the user does not have ALTER access to it.

6(6) RESOURCE NOT PROTECTED SETROPTS PROTECTALL FAILURES is in effect, and the data set to be defined will not be protected by a profile.

7(7) WARNING—RESOURCE NOT PROTECTED SETROPTS PROTECTALL WARNINGS is in effect, and the data set to be defined will not be protected by a profile. The DEFINE is allowed.

8(8) WARNING—SECURITY LABEL MISSING FROM JOB, USER, OR PROFILE The SECLABEL and TAPEVOL classes are active. SETROPTS MLACTIVE WARNING is in effect, and the TAPEVOL profile is without a security label. The DEFINE is allowed.

9(9) INSUFFICIENT SECURITY LABEL AUTHORITY The SECLABEL and TAPEVOL classes are active. SETROPTS MLS WARNING is in effect, and the user’s security label does not dominate the one found in the TAPEVOL profile.

The DEFINE is allowed.

10(A) USER IN SECOND QUALIFIER IS NOT RACF-DEFINED The second qualifier of the name is not a valid user ID.

11(B) INSUFFICIENT SECURITY LABEL AUTHORITY The SECLABEL class is active, and one of the following occurred:

- SETROPTS MLACTIVE FAILURES is in effect, and the user is missing a security label.
- SETROPTS MLACTIVE FAILURES is in effect, and the resource is missing a security label.
- The user’s security label does not dominate the resource’s.
- SETROPTS MLS FAILURES is in effect, and the user’s security label does not equal the resource’s.

12(C) LESS SPECIFIC PROFILE EXISTS WITH A DIFFERENT SECURITY LABEL The SECLABEL class is active, SETROPTS MLSTABLE is in effect, and there is a less specific generic profile existing for the name with a different security label.

Defining this resource would violate SETROPTS MLSTABLE rules.
Event 8(8)–25(19): COMMANDS

Events 8 through 25 apply to the RACF commands. The following qualifier codes are used for each event:

0(0) NO VIOLATIONS DETECTED The RACF command was issued successfully. This qualifier applies to all RACF commands.

1(1) INSUFFICIENT AUTHORITY The user did not have the authority to issue the RACF command. This qualifier applies to all RACF commands.

2(2) KEYWORD VIOLATIONS DETECTED The user had the authority to issue the RACF command, but not to all the keywords that were specified. Keywords that the user is not authorized to use are ignored. For example, a user with the SPECIAL attribute but without the AUDITOR attribute can issue the ALTUSER command, but not with the GLOBALAUDIT keyword. This qualifier applies to all RACF commands.

3(3) SUCCESSFUL LISTING OF DATASETS This logs the successful use of LISTDSD DSNS.

4(4) SYSTEM ERROR IN LISTING OF DATA SETS This logs an error in attempting LISTDSD DSNS.

Notes:
1. When the SETROPTS command is issued with a keyword that contains an asterisk (*), the asterisk is displayed in the output. For example, if you issue the command SETROPTS AUDIT(*), the output contains AUDIT(*).
2. When the SETROPTS command is issued with a keyword that lists more than ten classes, the output lists the first ten classes and displays the remaining number as an ellipsis. For example, if you issue the command SETROPTS CLASSACT(class1 class2 class3 class4 class5 class6 class7 class8 class9 class10 class11 class12), the output appears as CLASSACT(class1 class2 class3 class4 class5 class6 class7 class8 class9 class10 ...(00002)).
3. When the RVARY command is issued, the DATASET keyword lists the names of as many RACF databases as can fit in the 1024 character output. The remainder are shown as an ellipsis (...(nnnm)).
4. When the RVARY command is issued with the NOCLASSACT(*) keyword or with more than ten classes specified, the output lists the first ten classes. The remaining classes are shown as an ellipsis.

Event 26(1A): APPCLU

This event is logged by RACROUTE REQUEST=AUDIT, EVENT='APPCLU'. This event applies to establishing a session between two logical units (referred to as the local LU and the partner LU) in accordance with the System Network Architecture (SNA). VTAM and CICS call RACF for security information stored in general resource profiles in the APPCLU class.

Each profile contains an 8-byte session key that is used in verification; the two LUs must have corresponding profiles with identical keys so that the handshaking of encrypted data is successful.

The explanations of the event code qualifiers for Event 26 are:

0(0) PARTNER VERIFICATION WAS SUCCESSFUL The handshaking was successful. The LUs established a connection.

1(1) SESSION ESTABLISHED WITHOUT VERIFICATION No handshaking was
done, but the LUs were still allowed to establish a connection, with the
knowledge that the partners were not verified.

2(2) **LOCAL LU KEY WILL EXPIRE IN 5 DAYS OR LESS** The handshaking
was successful; this qualifier was set to tell users when the local LU's
session key would expire.

3(3) **PARTNER LU ACCESS HAS BEEN REVOKED** Too many unsuccessful
attempts were made at matching the session key.

4(4) **PARTNER LU KEY DOES NOT MATCH THIS LU KEY** An attempt was
made to establish a session, but the session keys did not match. For
example, the two sets of identical data encrypted with the two keys did not
match.

5(5) **SESSION TERMINATED FOR SECURITY REASONS** One or both of the
APPCLU profiles involved have the keyword LOCK specified in their
session information, preventing any connections from being made. This
keyword enables the security administrator to temporarily prevent specific
connections without deleting any profiles.

6(6) **REQUIRED SESSION KEY NOT DEFINED** The local LU had
VERIFY=REQUIRED coded on its APPL statement, indicating that session
level verification must be used on all sessions with the LU. One of the
following occurred:
- The local LU is the primary LU and no password was defined in RACF
  for the LU pair.
- The partner LU is the primary LU, but the bind it sent to the local LU did
  not contain random data (which would indicate that the partner is using
  session level verification also).

7(7) **POSSIBLE SECURITY ATTACK BY PARTNER LU** The local LU sent out a
random number to another LU as part of the handshaking process of
establishing a session. That same number then came in from a third LU for
the local LU to encrypt. It is a coincidence that the same number is chosen;
the number is 64 bits of random data.

It may be that an unauthorized user is attempting to steal the encrypted
response.

8(8) **SESSION KEY NOT DEFINED FOR PARTNER LU** The local LU had
VERIFY=OPTIONAL coded on its APPL statement. There was a password
defined in the local LU's RACF profile for the LU-LU pair, indicating that
session level verification should be used on all sessions between the two
LUs. However, the partner LU tried to start a session without using session
level verification.

9(9) **SESSION KEY NOT DEFINED FOR THIS LU** The local LU had
VERIFY=OPTIONAL coded on its APPL statement. No password was
defined in the local LU's RACF profile for the LU-LU pair, indicating that
session level verification may not be used to establish sessions with this
LU. However, the partner LU tried to establish a session using session level
verification.

10(A) **SNA SECURITY-RELATED PROTOCOL ERROR** The LU trying to establish
a connection is not responding correctly according to the handshaking
protocol.

11(B) **PROFILE CHANGE DURING VERIFICATION** The handshaking was
attempted, but it is evident that one of the LU's profiles (specifically the session key) changed in the middle of the handshaking, making its success impossible.

**12(C) EXPIRED SESSION KEY** The session key in one or both of the APPCLU profiles has expired.

**Event 27(1B): GENERAL AUDITING**

This event is logged by RACROUTE REQUEST=AUDIT,EVENT='GENERAL’. RACF does not make any authority checks for this event.

The explanations of the event code qualifiers for Event 27 are:

**0 - 99 GENERAL AUDIT RECORD WRITTEN**

Qualifiers 0 to 99 can be used for Event 27. These qualifiers are installation defined.

**Event 28(1C)–58(3A): z/OS UNIX EVENT TYPES**

Events 28 through 58 apply to z/OS UNIX. The following qualifier codes are used for each event:

**28(1C) DIRECTORY SEARCH**

- **0(0) Access allowed**
- **1(1) Not authorized to search directory**
- **2(2) Security label failure**

**29(1D) CHECK ACCESS TO DIRECTORY**

- **0(0) Access allowed**
- **1(1) Caller does not have requested access authority**
- **2(2) Security label failure**

**30(1E) CHECK ACCESS TO FILE**

- **0(0) Access allowed**
- **1(1) Caller does not have requested access authority**
- **2(2) Security label failure**

**31(1F) CHAUDIT**

- **0(0) File’s audit options changed**
- **1(1) Caller does not have authority to change user audit options of specified file**
- **2(2) Caller does not have authority to change auditor audit options**
- **3(3) Security label failure**

**32(20) CHDIR**

- **0(0) Current working directory changed**
- *** Failures logged as directory search event types**

**33(21) CHMOD**

- **0(0) File’s mode changed**
1(1) Caller does not have authority to change mode of specified file
2(2) Security label failure

34(22) CHOWN
0(0) File's owner or group owner changed
1(1) Caller does not have authority to change owner or group owner of specified file
2(2) Security label failure

35(23) CLEAR SETID BITS FOR FILE
0(0) S_ISUID, S_ISGID, and S_ISVTX bits changed to zero (write)
   No failure cases

36(24) EXEC WITH SETUID/SETGID
0(0) Successful change of UIDs and GIDs
   No failure cases

37(25) GETPSENV
0(0) Access allowed
1(1) Not authorized to access specified process

38(26) INITIALIZE z/OS UNIX PROCESS (DUB)
0(0) z/OS UNIX process successfully initiated
1(1) User not defined as a z/OS UNIX user (no user profile or no OMVS segment)
2(2) User incompletely defined as a z/OS UNIX user (no UID in user profile)
3(3) User's current group has no GID

39(27) z/OS UNIX PROCESS COMPLETION (UNDUB)
0(0) Process completed
   No failure cases

40(28) KILL
0(0) Access allowed
1(1) Not authorized to access specified process
2(2) Security label failure

41(29) LINK
0(0) New link created
   * Failures logged as directory search or check access event types

42(2A) MKDIR
0(0) Directory successfully created
   * Failures logged as directory search or check access event types
43(2B) MKNOD
0(0) Successful creation of a node
* Failures logged as directory search or check access event types

44(2C) MOUNT FILE SYSTEM
0(0) Successful mount
* Failures logged as ck_priv event type

45(2D) OPEN (NEW FILE)
0(0) File successfully created
* Failures logged as directory search or check access event types

46(2E) PTRACE
0(0) Access allowed
1(1) Not authorized to access specified process
2(2) Security label failure

47(2F) RENAME
0(0) Rename successful
* Failures logged as directory search or check access event types

48(30) RMDIR
0(0) Successful rmdir
* Failures logged as directory search or check access event types

49(31) SETEGID
0(0) Successful change of effective GID
1(1) Not authorized to setegid

50(32) SETEUID
0(0) Successful change of effective UID
1(1) Not authorized to seteuid

51(33) SETGID
0(0) Successful change of GIDs
1(1) Not authorized to setgid

52(34) SETUID
0(0) Successful change of UIDs
1(1) Not authorized to setuid

53(35) SYMLINK
0(0) Successful symlink
* Failures logged as directory search or check access event types
Event 59(3B): RACLINK EVENT TYPES
The explanations of the event code qualifiers for Event 59 are:

0(0) No violation detected
1(1) Insufficient authority
2(2) Keyword violation detected
3(3) Association already defined
4(4) Association already approved
5(5) Association does not match
6(6) Association does not exist
7(7) Invalid password or revoked user ID

Event 60(3C)–62(3E): z/OS UNIX XPG4 EVENT TYPES

60(3C) CHECK IPC ACCESS
0(0) Access allowed
1(1) Caller does not have requested access authority
2(2) Security label failure

61(3D) MAKE ISP
0(0) Successful creation of ISP
1(1) Security label failure

62(3E) R_IPC CONTROL
0(0) Access allowed
1(1) Caller does not have requested access authority
2(2) Security label failure

Event 63(3F): z/OS UNIX SETGROUPS EVENT TYPE
0(0) Successful
1(1) Not authorized

Event 64(40): X/OPEN SINGLE UNIX SPECIFICATION EVENT TYPES
64(40) CHECK OWNER TWO FILES
0(0) User is the owner
1(1) User is not the owner
2(2) Security label failure

Event 65(41): z/OS UNIX PASSING OF ACCESS RIGHTS EVENT TYPES
65(41) R_AUDIT
0(0) Successful r_audit
1(1) Successful r_audit
No failure cases

Event 66(42)–67(43): CERTIFICATE EVENT TYPES
66(42) RACDCERT
0(0) No violation detected
1(1) Insufficient authority

67(43) initACEE
0(0) Successful certificate registration
1(1) Successful certificate deregistration
2(2) Insufficient authority to register a certificate
3(3) Insufficient authority to deregister a certificate
4(4) No user ID found for certificate
5(5) Certificate is not trusted
6(6) Successful CERTAUTH certificate registration
7(7) Insufficient authority to register the CERTAUTH certificate
8(8) Client security label not equivalent to server’s
9(9) Invalid use of reserved user ID
10(A) No RACF userID found for distributed identity

Event 68(44): GRANT OF INITIAL KERBEROS TICKET
68(44) Kerberos
0(0) Success
1(1) Failure
### Event 69(45): R_PKIServ GENCERT

<table>
<thead>
<tr>
<th>Event Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0(0)</td>
<td>Successful GENCERT request</td>
</tr>
<tr>
<td>1(1)</td>
<td>Insufficient authority for GENCERT</td>
</tr>
<tr>
<td>2(2)</td>
<td>Successful REQCERT request</td>
</tr>
<tr>
<td>3(3)</td>
<td>Insufficient authority for REQCERT</td>
</tr>
<tr>
<td>4(4)</td>
<td>Successful GENRENEW request</td>
</tr>
<tr>
<td>5(5)</td>
<td>Insufficient authority for GENRENEW</td>
</tr>
<tr>
<td>6(6)</td>
<td>Successful REQRENEW request</td>
</tr>
<tr>
<td>7(7)</td>
<td>Insufficient authority for REQRENEW</td>
</tr>
<tr>
<td>8(8)</td>
<td>Successful PREREGISTER request</td>
</tr>
<tr>
<td>9(9)</td>
<td>Insufficient authority for PREREGISTER</td>
</tr>
</tbody>
</table>

### Event 70(46): R_PKIServ EXPORT

<table>
<thead>
<tr>
<th>Event Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0(0)</td>
<td>Successful certificate EXPORT request</td>
</tr>
<tr>
<td>1(1)</td>
<td>Unsuccessful certificate EXPORT request due to insufficient authority</td>
</tr>
<tr>
<td>2(2)</td>
<td>Incorrect pass phrase specified for EXPORT</td>
</tr>
</tbody>
</table>

### Event 71(47): POLICY DIRECTOR ACCESS CONTROL DECISION

This event is reserved for use by Policy Director Authorization Services.

<table>
<thead>
<tr>
<th>Event Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0(0)</td>
<td>Authorized</td>
</tr>
<tr>
<td>1(1)</td>
<td>Not authorized but permitted because of warning mode</td>
</tr>
<tr>
<td>2(2)</td>
<td>Not authorized due to insufficient traverse authority but permitted because of warning mode</td>
</tr>
<tr>
<td>3(3)</td>
<td>Not authorized due to time-of-day check but permitted because of warning mode</td>
</tr>
<tr>
<td>4(4)</td>
<td>Not authorized</td>
</tr>
<tr>
<td>5(5)</td>
<td>Not authorized due to insufficient traverse authority</td>
</tr>
<tr>
<td>6(6)</td>
<td>Not authorized due to time-of-day check</td>
</tr>
</tbody>
</table>

### Event 72(48): R_PKIServ QUERY

<table>
<thead>
<tr>
<th>Event Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0(0)</td>
<td>Successful admin QUERY or DETAILS request</td>
</tr>
<tr>
<td>1(1)</td>
<td>Insufficient authority for admin QUERY or DETAILS</td>
</tr>
<tr>
<td>2(2)</td>
<td>Successful VERIFY request</td>
</tr>
<tr>
<td>3(3)</td>
<td>Insufficient authority for VERIFY</td>
</tr>
</tbody>
</table>
Incorrect VERIFY certificate, no record found for this certificate

Event 73(49): R_PKIServ UPDATEREQ

Successful admin UPDATEREQ request
Insufficient authority for admin UPDATEREQ

Event 74(4A): R_PKIServ UPDATECERT

Successful admin UPDATECERT request
Insufficient authority for admin UPDATECERT
Successful REVOKE request
Insufficient authority for REVOKE

Event 75(4B): CHANGE FILE ACL

ACL entry added, changed, or deleted
Caller does not have authority to change ACL of specified file
Security label failure

Event 76(4C): REMOVE FILE ACL

Entire ACL deleted
Caller does not have authority to remove ACL of specified file
Security label failure

Event 77(4D): SET FILE SECURITY LABEL

Security label change
Not authorized to change security label

Event 78(4E): SET WRITE-DOWN PRIVILEGE

Requested function successful
Not authorized to IRR.WRITEDOWN.BYUSER

Event 79(4F): CRL PUBLICATION

Successful publication of revocation information
Event 80(50): R_PKIServ RESPOND
80(50)  RPKIRESP
0  Successful RESPOND request
1  Insufficient authority for RESPOND

Event 81(51): PassTicket Evaluation
81
0  Successful request
1  Request failed

Event 82(52): PassTicket Generation
82
0  Successful generation
1  Generation request failed

Event 83(53): R_PKIServ SCEPREQ
83(53)  RPKISCEP
0  Successful AutoApprove PKCSReq request
1  Successful AdminApprove PKCSReq request
2  Successful GetCertInitial request
3  Rejected PKCSReq or GetCertInitial request
4  Incorrect SCEP transaction ID specified for GetCertInitial
5  Insufficient authority for SCEPREQ

Event 84(54): R_Datalib RDATAUPD
84(54)  RDATAUPD
0  Successful NewRing
1  Not authorized to call NewRing
2  Successful DataPut
3  Not authorized to call DataPut
4  Successful DataRemove
5  Not authorized to call DataRemove
6  Successful DelRing
7  Not authorized to call DelRing

Event 85(55): PKIAURNW
85(55)  PKIAURNW
0  Successful autoRenew
Event 86(56): R_PgmSignVer

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Successful signature verification</td>
</tr>
<tr>
<td>1</td>
<td>Signature appears valid but root CA certificate not trusted</td>
</tr>
<tr>
<td>2</td>
<td>Module signature failed verification</td>
</tr>
<tr>
<td>3</td>
<td>Module certificate chain incorrect</td>
</tr>
<tr>
<td>4</td>
<td>Signature required but module not signed</td>
</tr>
<tr>
<td>5</td>
<td>Signature required but signature has been removed</td>
</tr>
<tr>
<td>6</td>
<td>Program verification module not loaded. Program verification was not available when attempt was made to load this program.</td>
</tr>
<tr>
<td>7</td>
<td>The Algorithmic self test failed while verifying the program verification module.</td>
</tr>
</tbody>
</table>

Event 87(57): RACMAP

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0(0)</td>
<td>No violation detected</td>
</tr>
<tr>
<td>1(1)</td>
<td>Insufficient authority (no update to RACF database)</td>
</tr>
</tbody>
</table>

Event 88(58): AUTOPROF

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Successful profile modification</td>
</tr>
</tbody>
</table>

Event 89(59): RPKIQREC

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Successful user QRECOVER request</td>
</tr>
<tr>
<td>1</td>
<td>Insufficient authority for user QRECOVER</td>
</tr>
</tbody>
</table>

Audit function codes for z/OS UNIX System Services

<table>
<thead>
<tr>
<th>Code</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>AFC.ACCESS</td>
<td>check file accessibility</td>
</tr>
<tr>
<td>2</td>
<td>AFC_CHAUDIT_U</td>
<td>change user audit options</td>
</tr>
<tr>
<td>3</td>
<td>AFC_CHDIR</td>
<td>change current working directory</td>
</tr>
<tr>
<td>4</td>
<td>AFC_CHMOD</td>
<td>change file modes</td>
</tr>
<tr>
<td>5</td>
<td>AFC_CHOWN</td>
<td>change owner and group of file</td>
</tr>
<tr>
<td>6</td>
<td>AFC_DUB</td>
<td>initialize a process</td>
</tr>
<tr>
<td>7</td>
<td>AFC_EXEC</td>
<td>execute with new jobname</td>
</tr>
<tr>
<td>8</td>
<td>AFC_FCHAUDIT_U</td>
<td>change user audit options when file is open</td>
</tr>
<tr>
<td>9</td>
<td>AFC_FCHMOD</td>
<td>change file modes when file is open</td>
</tr>
<tr>
<td>10</td>
<td>AFC_FCHOWN</td>
<td>change owner and group of file when open</td>
</tr>
<tr>
<td>11</td>
<td>AFC_GETCWD</td>
<td>get current working directory</td>
</tr>
<tr>
<td>12</td>
<td>AFC_GETPSEN</td>
<td>get process entry</td>
</tr>
<tr>
<td>13</td>
<td>AFC_KILL</td>
<td>signal a process</td>
</tr>
<tr>
<td>14</td>
<td>AFC_LINK</td>
<td>link to a file</td>
</tr>
</tbody>
</table>
Table 8. Audit Function Codes for z/OS UNIX System Services (continued)

<table>
<thead>
<tr>
<th>Code</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>AFC_LSTAT</td>
<td>get file status - don’t resolve ending symlink</td>
</tr>
<tr>
<td>16</td>
<td>AFC_MKDIR</td>
<td>make a directory</td>
</tr>
<tr>
<td>17</td>
<td>AFC_MKNOD</td>
<td>make a file node</td>
</tr>
<tr>
<td>18</td>
<td>AFC_MOUNT</td>
<td>mount a file system (nosetuid)</td>
</tr>
<tr>
<td>19</td>
<td>AFC_OPEN</td>
<td>open a file</td>
</tr>
<tr>
<td>20</td>
<td>AFC_OPENDIR</td>
<td>open a directory</td>
</tr>
<tr>
<td>21</td>
<td>AFC_PATHCONF</td>
<td>get configurable path name variables</td>
</tr>
<tr>
<td>22</td>
<td>AFC_PTRACE</td>
<td>debug a process</td>
</tr>
<tr>
<td>23</td>
<td>AFC_READLINK</td>
<td>read a symbolic link</td>
</tr>
<tr>
<td>24</td>
<td>AFC_RENAME</td>
<td>rename a file</td>
</tr>
<tr>
<td>25</td>
<td>AFC_RMDIR</td>
<td>remove a directory</td>
</tr>
<tr>
<td>26</td>
<td>AFC_SETEGID</td>
<td>set effective GID</td>
</tr>
<tr>
<td>27</td>
<td>AFC_SETUID</td>
<td>set effective UID</td>
</tr>
<tr>
<td>28</td>
<td>AFC_SETGID</td>
<td>set real and/or effective GID</td>
</tr>
<tr>
<td>29</td>
<td>AFC_SETUID</td>
<td>set real and/or effective UID</td>
</tr>
<tr>
<td>30</td>
<td>AFC_STAT</td>
<td>get file status</td>
</tr>
<tr>
<td>31</td>
<td>AFC_SYMLINK</td>
<td>create a symbolic link</td>
</tr>
<tr>
<td>32</td>
<td>AFC_UNLINK</td>
<td>remove directory entries (delete a file)</td>
</tr>
<tr>
<td>33</td>
<td>AFC_UNMOUNT</td>
<td>unmount a file system (nosetuid)</td>
</tr>
<tr>
<td>34</td>
<td>AFC_UTIME</td>
<td>set file access/modification times</td>
</tr>
<tr>
<td>35</td>
<td>AFC_UNDUB_EXIT</td>
<td>terminate a process</td>
</tr>
<tr>
<td>36</td>
<td>AFC_WRITE</td>
<td>write to a file (clear setid bits)</td>
</tr>
<tr>
<td>37</td>
<td>AFC_CHAUDIT_A</td>
<td>change auditor audit options</td>
</tr>
<tr>
<td>38</td>
<td>AFC_FCHAUDIT_A</td>
<td>change auditor audit options when file is open</td>
</tr>
<tr>
<td>39</td>
<td>AFC_LOOKUP</td>
<td>path name resolution</td>
</tr>
<tr>
<td>40</td>
<td>AFC_TTYNAME</td>
<td>get pathname of terminal</td>
</tr>
<tr>
<td>41</td>
<td>AFC_IOCTL</td>
<td>get path name</td>
</tr>
<tr>
<td>42</td>
<td>AFC_GETMNT</td>
<td>get mount entry</td>
</tr>
<tr>
<td>43</td>
<td>AFC_QUIESCE</td>
<td>quiesce a file system (nosetuid)</td>
</tr>
<tr>
<td>44</td>
<td>AFC_UNQUIESCE</td>
<td>unquiesce a file system (nosetuid)</td>
</tr>
<tr>
<td>45</td>
<td>AFC_VREGISTER</td>
<td>server registration, v_reg</td>
</tr>
<tr>
<td>46</td>
<td>AFC_VRESOLVEVPN</td>
<td>server resolve path name, v_rpn</td>
</tr>
<tr>
<td>47</td>
<td>AFC_VLOOKUP</td>
<td>server lookup, v_lookup</td>
</tr>
<tr>
<td>48</td>
<td>AFC_VREADWRITE</td>
<td>server read write, v_rdwr</td>
</tr>
<tr>
<td>49</td>
<td>AFC_VREADDIR</td>
<td>server read directory, v_reddir</td>
</tr>
<tr>
<td>50</td>
<td>AFC_SIGACTION</td>
<td>change Osigset action</td>
</tr>
<tr>
<td>51</td>
<td>AFC_VCREATE</td>
<td>server create, v_create</td>
</tr>
<tr>
<td>52</td>
<td>AFC_VMAKEDIR</td>
<td>server make directory, v_mkdir</td>
</tr>
<tr>
<td>53</td>
<td>AFC_VSYMLINK</td>
<td>server symbolic link, v_symlink</td>
</tr>
<tr>
<td>54</td>
<td>AFC_VSETATTR</td>
<td>server file attributes, v_setattr</td>
</tr>
<tr>
<td>55</td>
<td>AFC_VLINK</td>
<td>server link, v_link</td>
</tr>
<tr>
<td>56</td>
<td>AFC_VREMOVEDIR</td>
<td>server remove directory, v_rmdir</td>
</tr>
<tr>
<td>57</td>
<td>AFC_VREMOVE</td>
<td>server remove, v_remove</td>
</tr>
<tr>
<td>58</td>
<td>AFC_VRENAME</td>
<td>server rename, v_rename</td>
</tr>
<tr>
<td>59</td>
<td>AFC_CHATTR</td>
<td>change file attributes</td>
</tr>
<tr>
<td>60</td>
<td>AFC_FCHATTR</td>
<td>change file attributes when file is open</td>
</tr>
<tr>
<td>61</td>
<td>AFC_THLMT</td>
<td>set thread limit</td>
</tr>
<tr>
<td>62</td>
<td>AFC_MSGCTL</td>
<td>message control</td>
</tr>
<tr>
<td>63</td>
<td>AFC_MSGGET</td>
<td>get message queue</td>
</tr>
<tr>
<td>64</td>
<td>AFC_MSGRCV</td>
<td>message receive</td>
</tr>
<tr>
<td>65</td>
<td>AFC_MSGSND</td>
<td>message send</td>
</tr>
<tr>
<td>66</td>
<td>AFC_SEMCTL</td>
<td>semaphore control</td>
</tr>
<tr>
<td>67</td>
<td>AFC_SEMGET</td>
<td>get set of semaphores</td>
</tr>
</tbody>
</table>

Chapter 3. The RACF SMF data unload utility 91
<table>
<thead>
<tr>
<th>Code</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>68</td>
<td>AFC_SEMOP</td>
<td>semaphore operations</td>
</tr>
<tr>
<td>69</td>
<td>AFC_SHMAT</td>
<td>shared memory attach</td>
</tr>
<tr>
<td>70</td>
<td>AFC_SHMCTL</td>
<td>shared memory control</td>
</tr>
<tr>
<td>71</td>
<td>AFC_SETREUID</td>
<td>set real and/or effective UID</td>
</tr>
<tr>
<td>72</td>
<td>AFC_SHMGET</td>
<td>shared memory get</td>
</tr>
<tr>
<td>73</td>
<td>AFC_WGETIPC</td>
<td>query IPC status</td>
</tr>
<tr>
<td>74</td>
<td>AFC_REMOVE</td>
<td>remove</td>
</tr>
<tr>
<td>75</td>
<td>AFC_SET_MODE</td>
<td>set mode</td>
</tr>
<tr>
<td>76</td>
<td>AFC_SET_MSGQOB</td>
<td>set max bytes for msg queue</td>
</tr>
<tr>
<td>77</td>
<td>AFC_SET_GID</td>
<td>set supplementary groups</td>
</tr>
<tr>
<td>78</td>
<td>AFC_PASSWORD</td>
<td>verify password</td>
</tr>
<tr>
<td>79</td>
<td>AFC_LCHOWN</td>
<td>change owner and group of a symbolic link</td>
</tr>
<tr>
<td>80</td>
<td>AFC_TRUNCATE</td>
<td>truncate a file</td>
</tr>
<tr>
<td>81</td>
<td>AFC_PFSCTL</td>
<td>control function for the physical file system</td>
</tr>
<tr>
<td>82</td>
<td>AFC_SETRLIMIT</td>
<td>set maximum resource consumption</td>
</tr>
<tr>
<td>83</td>
<td>AFC_SETPRIORITY</td>
<td>set process scheduling priority</td>
</tr>
<tr>
<td>84</td>
<td>AFC_NICE</td>
<td>change priority of a process</td>
</tr>
<tr>
<td>85</td>
<td>AFC_SETREGID</td>
<td>set real and effective GID</td>
</tr>
<tr>
<td>86</td>
<td>AFC_WRITEV</td>
<td>write on a file</td>
</tr>
<tr>
<td>87</td>
<td>AFC_FCHDIR</td>
<td>change working directory</td>
</tr>
<tr>
<td>88</td>
<td>AFC_CHROOT</td>
<td>change root directory</td>
</tr>
<tr>
<td>89</td>
<td>AFC_REALPATH</td>
<td>resolve path name</td>
</tr>
<tr>
<td>90</td>
<td>AFC_STATVFS</td>
<td>get file system information</td>
</tr>
<tr>
<td>91</td>
<td>AFC_BIND</td>
<td>bind a name to a socket</td>
</tr>
<tr>
<td>92</td>
<td>AFC_SOCKET</td>
<td>create an endpoint for communication</td>
</tr>
<tr>
<td>93</td>
<td>AFC_THREAD_SEC</td>
<td>thread level security</td>
</tr>
<tr>
<td>94</td>
<td>AFC_AUTHCHECK</td>
<td>authority check</td>
</tr>
<tr>
<td>95</td>
<td>AFC_ACC_SEND</td>
<td>send access rights</td>
</tr>
<tr>
<td>96</td>
<td>AFC_ACC_RECV</td>
<td>receive access rights</td>
</tr>
<tr>
<td>97</td>
<td>AFC_ACC_DISC</td>
<td>discard access rights</td>
</tr>
<tr>
<td>98</td>
<td>AFC_NEWGRP</td>
<td>newgrp shell utility</td>
</tr>
<tr>
<td>99</td>
<td>AFC_CONSOLE</td>
<td>console communication service</td>
</tr>
<tr>
<td>100</td>
<td>AFC_SERV_INIT</td>
<td>WLM service</td>
</tr>
<tr>
<td>101</td>
<td>AFC_SPAWN</td>
<td>spawn with user ID</td>
</tr>
<tr>
<td>102</td>
<td>AFC_SWAP_SERV</td>
<td>swap services</td>
</tr>
<tr>
<td>103</td>
<td>AFC_WLMC</td>
<td>WLM C and C++</td>
</tr>
<tr>
<td>104</td>
<td>AFC_LOGIN</td>
<td>__login system call</td>
</tr>
<tr>
<td>105</td>
<td>AFC_MOUNT_SETUID</td>
<td>mount a file system (setuid)</td>
</tr>
<tr>
<td>106</td>
<td>AFC_UNMOUNT_SETUID</td>
<td>unmount a file system (setuid)</td>
</tr>
<tr>
<td>107</td>
<td>AFC_QUIESCE_SETUID</td>
<td>quiesce a file system (setuid)</td>
</tr>
<tr>
<td>108</td>
<td>AFC_UNQUIESCE_SETUID</td>
<td>unquiesce a file system (setuid)</td>
</tr>
<tr>
<td>109</td>
<td>AFC_CHMOUNT</td>
<td>change mount point of a file system</td>
</tr>
<tr>
<td>110</td>
<td>AFC_CHMOUNT_SETUID</td>
<td>change mount point of a file system (setuid)</td>
</tr>
<tr>
<td>111</td>
<td>AFC_SETFACL</td>
<td>add, alter, or delete an access control list</td>
</tr>
<tr>
<td>112</td>
<td>AFC_SHUTDOWN_REG</td>
<td>shutdown registration</td>
</tr>
<tr>
<td>113</td>
<td>AFC_EACCESS</td>
<td>check effective access</td>
</tr>
<tr>
<td>114</td>
<td>AFC_SETFSECL</td>
<td>Set file security label</td>
</tr>
<tr>
<td>115</td>
<td>AFC_POE</td>
<td>Provide port of entry identifier</td>
</tr>
<tr>
<td>116</td>
<td>AFC_LCHATTR</td>
<td>Change file attributes</td>
</tr>
<tr>
<td>117</td>
<td>AFC_UNAVAILABLE</td>
<td>AFC unavailable</td>
</tr>
<tr>
<td>118</td>
<td>AFC_ENDOF_TAB</td>
<td>end of table</td>
</tr>
</tbody>
</table>
Chapter 4. The data security monitor (DSMON)

RACF enables you to protect resources, but the protection is only as good as the implementation. You need a way to verify that the security mechanisms actually in effect are the ones intended. DSMON helps provide this information.

DSMON is a program that produces reports on the status of the security environment at your installation and, in particular, on the status of resources that RACF controls. You can use the reports to audit the current status of your installation’s system security environment by comparing the actual system characteristics and resource protection levels with the intended characteristics and levels. You can also control the reporting that DSMON does by specifying control statements that request certain functions for user input.

The DSMON program

The data security monitor (DSMON) is a program that normally runs while RACF is active.

To run the DSMON program, you must have one of the following:
• The AUDITOR attribute
• At least EXECUTE or READ authority to the DSMON resource in the PROGRAM class if you have the program protected. You need AUDITOR authority if you do not have the program protected.

READ access authority may be required by other programs if DSMON runs in a TSO environment.

You can specify DSMON control statements to produce the reports you want and control the number of lines per page for each report. The output from DSMON consists of a message data set and an output data set for the reports.

Notes:
1. To find out if DSMON is a controlled program at your MVS installation, contact your RACF security administrator.
2. If your installation has a RACF database that is shared by MVS and z/VM and you want to obtain reports for both systems, you must run DSMON on the MVS system.
3. If you run DSMON while RACF is inactive, DSMON produces only the system report.

How to run DSMON

DSMON runs as an authorized program facility (APF)-authorized batch program. DSMON can also be run on TSO if IKJTSO00 is configured correctly; it can reside in any PARMLIB data set.

To invoke DSMON, you can use the sample job control language (JCL) statements in Figure 15 on page 94. A SYSIN DD statement lets you specify DSMON control statements that can perform selected DSMON functions for specified user input. The words that appear in lowercase are parameters that you can change.
SYSPRINT
Defines the sequential message data set (for example, SYSOUT) for status
and error messages. SYSPRINT has a variable block (VB) format; block
size, if specified, must be 137 (LRECL of 133 plus 4 for the block length) or
greater.

SYSUT2
Defines the output listing data set (for example, SYSOUT) for the printed
reports that DSMON generates. SYSUT2 has a fixed block (FB) format;
block size, if specified, must be a multiple of 133.

SYSIN
Defines the control data set that contains DSMON control statements.
SYSIN is required if you want to select specific DSMON functions. The
control data set can be one of the following:
• A data set defined as in-stream data
• A data set defined as a sequential data set
• A data set defined as a member of a partitioned data set

Block size, if specified, must be a multiple of 80.
If you do not specify SYSIN, all DSMON functions except USRDSN are
performed. (The USRDSN function requires you to specify a list of user
data sets on the USEROPT control statement.)

DSMON control statements
The three DSMON control statements that allow you to control DSMON reporting
are:
• LINECOUNT
• FUNCTION
• USEROPT

Define these statements as part of the SYSIN DD statement in the JCL (see
Figure 15).

Entering DSMON control statements
DSMON control statements can be entered in any order, one per input line, using
columns 1 through 72. You can enter uppercase or lowercase characters. Use
commas or blanks to separate list items in each DSMON statement.

You can include comments by entering a /* beginning in column 1. If you want to
continue a control statement on a following line, break the statement at any place a
blank or comma is allowed and insert a blank followed by a trailing hyphen (-)
before you continue to the next line. For example:

/* Start of user data sets
USEROPT USRDSN jim.memo.text vol=8VOL03 -
    jim.report.script

The DSMON control statements are:
LINECOUNT number
specifies the number of lines per page for reports. The valid values for number
are 0 or a number in the range of 40 through 99. A value of 0 indicates that a
page break occurs only at the start of a new report. If you do not specify
LINECOUNT, the default is 55 lines per page. If you specify more than one
LINECOUNT statement, RACF uses only the last one.

Note: The LINECOUNT statement controls the number of lines per page for
the SYSUT2 data set. It does not affect the number of lines per page for
the SYSPRINT message data set, fixed at 55 lines per page.

FUNCTION function-name
specifies the DSMON function or functions you want to include.

The default is ALL, which causes DSMON to generate all reports except
USRDSN. For a complete description of the DSMON reports specified for
function-name, see “Functions DSMON uses” on page 96.

USEROPT function-name user-input
defines user input to be processed by the function you specify. Function-name
specifies the function to process the user-input; user-input specifies the actual
input you want processed. The valid functions you can specify for
function-name on the USEROPT control statement are:
- USRDSN
- RACGRP

Be sure to use one USEROPT control statement for each valid function you
want to process the specified input.

USEROPT control statement

USEROPT and USRDSN: Specifying USRDSN with USEROPT causes DSMON
to list the RACF protected status of the selected user data set or sets. To obtain
information processed by USRDSN, specify USEROPT followed by one or more
blanks, then followed by USRDSN and the data set name and volume or both for
which you want information.

For example, if you want to specify a cataloged data set, use the full data set name
after USRDSN:

USEROPT USRDSN jim.memo.text

If you want to specify an uncataloged data set, use the full data set name and
volume:

USEROPT USRDSN jim.memo.text VOL=volser

You can use the USRDSN option with other DSMON functions. For example, the
following specifies that all other functions in addition to USRDSN are to be
performed:

FUNCTION ALL
USEROPT USRDSN jim.memo.text VOL=volser

Note that FUNCTION ALL is the default; if you omit it, DSMON produces all reports.
The following specifies that only the USRDSN function is to be performed on the
specified data set:

FUNCTION USRDSN
USEROPT USRDSN jim.memo.text

In the next example, USRDSN is specified for a list of data sets:
FUNCTION USRDSN
USEROPT USRDSN jim.memo.text -
    VOL=VOL03 jim.test.obj -
        jim.racf.cntl jim.racf.clist

Note: The VOL keyword does not apply for SMS.

**USEROPT and RACGRP:** Specifying RACGRP with USEROPT causes DSMON to list the group tree and its levels for any specified RACF group name. The following specifies RACGRP for FUNCTION and the RACF group “payroll” (for which all subordinate groups are to be retrieved) for USEROPT RACGRP:

FUNCTION RACGRP
USEROPT RACGRP payroll

If you specify SYS1 for USEROPT RACGRP, DSMON lists all group names in the system. If you want all DSMON reports but do not specify USEROPT RACGRP, SYS1 is the default group name for the RACF group tree report. You can, of course, specify any RACF-defined group. For more information on the DSMON report RACGRP produces, see "Group tree report" on page 101.

**USEROPT considerations:** A JCL REGION= keyword may limit the number of USEROPT control statements that can be specified. If a large number of USEROPT statements are specified, increase the REGION= keyword value accordingly. Users may also run a multistep job if increasing the region size is unsuccessful.

### Functions DSMON uses

DSMON generates different kinds of reports that you can specify on the FUNCTION or USEROPT control statements. After completing each function on the control statement (except for the system report), DSMON issues a message to SYSPRINT stating whether the report executed successfully or unsuccessfully.

If the report ended unsuccessfully, DSMON issues an error code that indicates the cause of the failure. In most cases, DSMON continues processing with the next control statement.

Table 9 summarizes the DSMON reports that are generated when you use the FUNCTION control statement. Table 10 on page 97 summarizes the DSMON reports that are generated when you use the USEROPT control statement. You can specify the kind of report you want by modifying function name on each control statement. Both tables list the type of report produced and the information (or checks) each report provides.

#### Table 9. Reports Specified by the FUNCTION Control Statement

<table>
<thead>
<tr>
<th>Function-name</th>
<th>Type of Report</th>
<th>Information Provided</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYSTEM</td>
<td>System Report</td>
<td>1. Identification number of the processor complex</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Model number of the processor complex</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Name, version, and release number of the operating system</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. System residence volume</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5. System identifier used by the System Management Facilities</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6. RACF version and release number and whether RACF is active</td>
</tr>
</tbody>
</table>
Table 9. Reports Specified by the FUNCTION Control Statement (continued)

<table>
<thead>
<tr>
<th>Function-name</th>
<th>Type of Report</th>
<th>Information Provided</th>
</tr>
</thead>
<tbody>
<tr>
<td>RACGRP</td>
<td>Group Tree Report (also used with USEROPT; Table 10)</td>
<td>Group name and level in hierarchy for entire system</td>
</tr>
<tr>
<td>SYSPPT</td>
<td>Program Properties Table Report</td>
<td>All information (see sample report)</td>
</tr>
<tr>
<td>RACAUT</td>
<td>RACF Authorized Caller Table Report</td>
<td>All information (see sample report)</td>
</tr>
<tr>
<td>RACCDT</td>
<td>RACF Class Descriptor Table Report</td>
<td>All information (see sample report)</td>
</tr>
<tr>
<td>RACEXT</td>
<td>RACF Exits Report</td>
<td>All information (see sample report)</td>
</tr>
<tr>
<td>RACGAC</td>
<td>RACF Global Access Table Report</td>
<td>All information (see sample report)</td>
</tr>
<tr>
<td>RACSPT</td>
<td>RACF Started Procedures Table Report</td>
<td>All information (see sample report)</td>
</tr>
<tr>
<td>RACUSR</td>
<td>Selected User Attribute Report and Selected User Attribute Summary Report</td>
<td>All information (see sample reports)</td>
</tr>
<tr>
<td>SYSLNK</td>
<td>Selected Data Sets Report</td>
<td>All LNKLSTxx data set members of the SYS1.PARMLIB library</td>
</tr>
<tr>
<td>SYSAPF</td>
<td>Current Link List Data Set Report</td>
<td>Authorized program facility (APF) libraries</td>
</tr>
<tr>
<td>SYSCAT</td>
<td>Selected Data Sets Report</td>
<td>Master catalog and all user catalogs. Requires additional authorization to obtain information on user catalogs. <strong>Note:</strong> If you have a FACILITY class profile that protects SYSCAT resource ICHDSM00.SYSCAT and you do not have READ access, DSMON suppresses the user catalog listing and issues message ICH66134I, notifying you of the insufficient authorities</td>
</tr>
<tr>
<td>RACDST</td>
<td>Selected Data Sets Report</td>
<td>Primary and backup RACF databases</td>
</tr>
<tr>
<td>SYSSDS</td>
<td>Selected Data Sets Report</td>
<td>Selected system data sets</td>
</tr>
<tr>
<td>USRDSN</td>
<td>Selected Data Sets Report (used with USEROPT; Table 10)</td>
<td>Selected user data sets</td>
</tr>
</tbody>
</table>

Table 10. Reports Specified by the USEROPT Control Statement

<table>
<thead>
<tr>
<th>Function-name</th>
<th>Type of Report</th>
<th>Information Provided</th>
</tr>
</thead>
<tbody>
<tr>
<td>USRDSN</td>
<td>Selected User Data Sets Report</td>
<td>Selected user data sets</td>
</tr>
<tr>
<td>RACGRP</td>
<td>Group Tree Report</td>
<td>Group name and level in hierarchy for user-specified group</td>
</tr>
</tbody>
</table>
DSMON reports

DSMON produces the following reports:

- System Report
- Group Tree Report
- Program Properties Table Report
- RACF Authorized Caller Table Report
- RACF Class Descriptor Table Report
- RACF Exits Report
- RACF Global Access Checking Table Report
- RACF Started Procedures Table Report
- RACF User Attribute Report
- RACF User Attribute Summary Report
- Selected Data Sets Reports

Figure 16. Reports produced by DSMON

Note: Producing the group tree report or the selected user attribute report and selected user attribute summary report can have an impact on system performance. Depending on the size of and load on your RACF databases, you should consider running these DSMON reports during slack time.

The information in the DSMON reports answers many of your audit questions. (See "Conducting the audit" on page 9.)
System report

The system report contains:

- The identification number and model of the processor complex
- The name, version, and release of the operating system
- The serial number of the system residence volume
- The system identifier (SMF-ID) that SMF uses

The report also specifies the RACF version and release number and whether RACF is active. If RACF is inactive, either because it was not activated at IPL or because it has been deactivated by the RVARY command, DSMON prints a message.

You can use the system report to verify that the system has the expected hardware and software. In addition, you can verify the status of RACF.

**Note:** DSMON always produces the system report. However, if RACF is not installed and active, DSMON produces only the system report and then stops.

**Column headings**

The report contains the following information:

**CPU-ID**

is the identification number of the processor complex on which the system is running.

**CPU MODEL**

is the model number of the processor complex.

**OPERATING SYSTEM/LEVEL**

specifies the name, version and release of the operating system, the product FMID for the operating system, and the installation's personalized name, if the information is present in the communications vector table (CVT).

**SYSTEM RESIDENCE VOLUME**

specifies the serial number of the volume on which the system resides.

**SMF-ID**

is the system identifier that the system management facilities (SMF) uses when creating log records.

**Report messages**

The following messages may appear at the end of the report:

---

**RACF FMID HRFnnnn IS ACTIVE**

**Explanation:** The specified FMID of RACF is active. In most cases, this is the message that appears on the report.

**RACF FMID HRFnnnn HAS BEEN DEACTIVATED**

**Explanation:** The specified FMID of RACF has been deactivated by the RVARY command; this situation is normally temporary.

**RACF FMID HRFnnnn IS INACTIVE**

**Explanation:** The specified FMID of RACF was not activated during initial program load (IPL).

**RACF IS NOT INSTALLED**

**Explanation:** DSMON cannot locate the RACF communications vector table (RCVT), indicating that RACF has not been installed.

**Note:** Under normal circumstances, this message should not appear. If it does, notify your RACF security administrator or your installation manager.
**Note:** Under normal circumstances, this message should not appear. If it does, notify your RACF security administrator or your installation manager.

---

**SYSTEM REPORT**

<table>
<thead>
<tr>
<th>CPU-ID</th>
<th>111606</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU MODEL</td>
<td>2064</td>
</tr>
<tr>
<td>OPERATING SYSTEM/LEVEL</td>
<td>z/OS 1.2.0</td>
</tr>
<tr>
<td>SYSTEM RESIDENCE VOLUME</td>
<td>DR250B</td>
</tr>
<tr>
<td>SMF-ID</td>
<td>IM13</td>
</tr>
<tr>
<td>RACF FMID</td>
<td>HRF7705 IS ACTIVE</td>
</tr>
</tbody>
</table>

*Figure 17. Sample System Report*
Group tree report

The group tree report lists all subgroups for the SYS1 group and continues to list subgroups for those subgroups on down the group tree. Alternately, if a user-specified group name is specified for the USEROPT control statement, the report lists all subgroups for that user-supplied group. The report provides the owner’s name for each group, if the owner is not the superior group.

You can use the group tree report to examine the overall RACF group structure for your system. You can also determine how the group related attributes (group—SPECIAL, group OPERATIONS, and group AUDITOR) for users associated with each subgroup are related. In this way, you can decide whether the group authorities are structured effectively for your system.

Column Headings

LEVEL
Starting with the highest requested group, the group level number that indicates the relative nesting level of the group or subgroup within the requested group tree. SYS1 is always 1; the groups with SYS1 as their superior group are 2, and so on down the group tree.

GROUP
is the name of the RACF-defined group.

(OWNER)
is the name of the owner of the group. This name is listed only if the owner is not the superior group.

Report Messages

An arrow (===>) in the report indicates that the information has overflowed the right margin. The missing information appears after the main body of the report is printed. The characters -----CONTINUATION----- appear before the overflowed information, and the discontinued level number, group, and owner name (if the name is not the same as that of the superior group) appear in the left margin.

<table>
<thead>
<tr>
<th>LEVEL</th>
<th>GROUP</th>
<th>(OWNER)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SYS1</td>
<td>IBMUSER</td>
</tr>
<tr>
<td>2</td>
<td>SYSPROG</td>
<td>IBMUSER</td>
</tr>
<tr>
<td>2</td>
<td>RACFADMN</td>
<td>IBMUSER</td>
</tr>
</tbody>
</table>

Figure 18. Sample Group Tree Report
Program properties table report

The program properties table report lists all the programs in the program properties table (PPT). The report also indicates whether each program is authorized to bypass password protection and whether it runs in a system key. The programs shown in this report may be able to bypass password protection for password protected data sets and thus also bypass all RACF protection for RACF-protected resources.

You can use the program properties table report to verify that only those programs that should be authorized to bypass password protection are, in fact, able to do so. Such programs are normally communication and database control programs, or other system control programs. You can also verify that only those programs that need to run in a system key are authorized to do so.

Column Headings

PROGRAM NAME

is the name of the program, as defined in the PPT.

BYPASS PASSWORD PROTECTION

indicates whether the program is authorized to bypass password protection checking when accessing RACF-protected or password-protected data sets. The value is either YES or NO.

SYSTEM KEY

indicates whether the program is authorized to run in a system key (keys 0-7) and is thus able to bypass system security controls. The value is either YES or NO.

Report Messages

The following message may appear below the report column headings:

NO ENTRIES IN PROGRAM PROPERTIES TABLE

Explanation: There are no entries in the program properties table. This message indicates an abnormal condition because the program properties table should contain several entries that were supplied by IBM.
<table>
<thead>
<tr>
<th>PROGRAM NAME</th>
<th>BYPASS PASSWORD PROTECTION</th>
<th>SYSTEM PROPERTIES</th>
<th>TABLE REPORT</th>
</tr>
</thead>
<tbody>
<tr>
<td>IEDQTCAM</td>
<td>NO</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>ISTINM01</td>
<td>YES</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>IKTCA500</td>
<td>NO</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>AHLGTF</td>
<td>NO</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>HHLGTF</td>
<td>NO</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>IHLGTF</td>
<td>NO</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>IEFIIC</td>
<td>NO</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>IEEEMB60</td>
<td>YES</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>IEEVMNT2</td>
<td>NO</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>IASXNR00</td>
<td>NO</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>CSVVFCRE</td>
<td>NO</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>HASJES20</td>
<td>YES</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>DFSMVRC0</td>
<td>NO</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>IATINTK</td>
<td>YES</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>DXRRLM00</td>
<td>NO</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>APSPPIEP</td>
<td>NO</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>AKPCSIEP</td>
<td>NO</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>IATINTKF</td>
<td>YES</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>DSNYASCPC</td>
<td>NO</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>DSNUTILB</td>
<td>NO</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>IEAVTDSV</td>
<td>YES</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>IFASMF</td>
<td>NO</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>CSVLLCREE</td>
<td>YES</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>AVFMNBLD</td>
<td>NO</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>ERBMFMFC</td>
<td>NO</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>ERBSMFC</td>
<td>NO</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>IGGOCLX0</td>
<td>NO</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>IGDSI101</td>
<td>YES</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>COFMNIT</td>
<td>YES</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>COFMSISO</td>
<td>NO</td>
<td>YES</td>
<td></td>
</tr>
</tbody>
</table>

*Figure 19. Sample Program Properties Table Report*
RACF authorized caller table report

The RACF authorized caller table report lists the names of all programs in the RACF authorized caller table. The report also indicates whether each program is authorized to issue a VERIFY (RACINIT) request (which performs user verification) or a LIST (RACLST) request (which loads profiles into main storage), or both.

You can use this report to verify that only those programs authorized to modify an access control environment element (ACEE) are able to issue a VERIFY request. This verification is a particularly important security requirement because the ACEE contains a description of the current user. This description includes the user ID, the current connect group, the user attributes, and the group authorities. A program that is authorized to issue a VERIFY request can alter the ACEE to simulate any user ID.

You can also use the report to verify that only those programs authorized to access any profile on the RACF data set are able to issue a LIST request. Because profiles contain complete descriptions of the characteristics associated with RACF-defined entities, you must carefully control access to them.

Note: IBM does not recommend using the RACF authorized caller table.

Column Headings

MODULE NAME

is the name of the program module as it is defined in the RACF authorized caller table.

RACINIT AUTHORIZED

indicates whether the module is authorized to issue a VERIFY request. The value is either YES or NO.

RACLST AUTHORIZED

indicates whether the module is authorized to issue a LIST request. The value is either YES or NO.

Report Messages

The following message may appear below the report column headings:

<table>
<thead>
<tr>
<th>NO ENTRIES IN RACF AUTHORIZED CALLER TABLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explanation: There are no entries in the RACF authorized caller table. This message does not indicate an error condition. When RACF is initially installed, for example, the RACF authorized caller table normally contains no entries.</td>
</tr>
</tbody>
</table>
RACF class descriptor table report

The class descriptor table report lists class name and status for all general resource classes in the class descriptor table, as well as information about auditing activity, statistics, the activity of OPERATIONS users, and the universal access authority (UACC).

You can use the class descriptor table report to determine the resource classes defined to RACF for your system. In this way, you can obtain information about the protection status of any resource in the class descriptor table.

Column Headings

**CLASS NAME**
- is the class name found in the RACF class descriptor table. The dynamic classes are noted with a “(D)” after the class name.

**STATUS**
- indicates whether the class is active or inactive.

**AUDITING**
- indicates whether there is auditing for the class. The value is either YES or NO.

**STATISTICS**
- indicates whether RACF is gathering statistics for the class. The value is either YES or NO.

**DEFAULT UACC**
- indicates that the default UACC defined for the class in the class descriptor table. RACF uses this UACC for profiles defined to the class, unless the UACC operand is specified on the RDEFINE command that writes the profile.
  - The following values may appear:
    - **ALTER**
      - For discrete profiles, ALTER indicates that, by default, all users have control over the resource and the resource profile and can authorize other users or groups (or both) to access the resource.
      - For generic profiles, ALTER indicates that, by default, all users have control over the resource and can allocate data sets protected by the generic profile. Only the profile owner has full control over the resource profile.
    - **CONTROL** indicates that, by default, all users have access authority to update, insert, or delete records in the VSAM data set and perform other operations as if the data set password were supplied.
    - **UPDATE** indicates that, by default, all users can access the resource for both reading and writing.
    - **READ** indicates that, by default, all users can access the resource for reading only.
    - **NONE** indicates that, by default, users cannot access the resource.
    - **ACEE** indicates that the UACC is taken from the accessor environment element (ACEE).

**OPERATIONS**
- indicates whether RACF is to use the OPERATIONS attribute authority during authorization checking. A value of YES indicates RACF performs authorization checking; a value of NO indicates it does not.

Report Messages
The following message may appear below the report column headings:

<table>
<thead>
<tr>
<th>CLASS NAME</th>
<th>DEFAULT OPERATIONS</th>
<th>STATUS</th>
<th>AUDITING</th>
<th>STATISTICS</th>
<th>UACC</th>
<th>ALLOWED</th>
</tr>
</thead>
<tbody>
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<td>$CAMP (D)</td>
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</tr>
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</tr>
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<td>APPL</td>
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<td>NO</td>
</tr>
<tr>
<td>DASDVOL</td>
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<td>NO</td>
<td>NO</td>
<td>ACEE</td>
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<td>YES</td>
</tr>
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<td>NO</td>
<td>NO</td>
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</tr>
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<td>ACEE</td>
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<td>NO</td>
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<td>NO</td>
<td>ACEE</td>
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<td>TCICSTRN</td>
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<td>NO</td>
<td>ACEE</td>
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<td>NO</td>
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<td>NO</td>
</tr>
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<td>NO</td>
<td>NONE</td>
<td>NO</td>
<td>NO</td>
</tr>
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<td>NONE</td>
<td>YES</td>
<td>YES</td>
</tr>
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<td>NO</td>
<td>NO</td>
<td>NONE</td>
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<td>YES</td>
</tr>
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<td>NO</td>
<td>NO</td>
<td>NONE</td>
<td>YES</td>
<td>YES</td>
</tr>
</tbody>
</table>

Note: DSMON generates its RACF Class Descriptor Table report listing classes from both the static and dynamic class descriptor tables. The dynamic classes will be noted with a "(D)" after the class name in the first column of the report. Also note that the classes are listed in alphabetical order.
RACF exits report

The RACF exits report lists the names of all the installation-defined RACF exit routines and specifies the size of each exit routine module. For RACF's static exits, DSMON prints an error message if the RACF communications vector table (RCVT), which contains the address of each RACF exit routine module, indicates that an exit routine module should exist but the module cannot be loaded, or the entry address does not correspond with the address specified in the RCVT.

You can use this report to verify that the only active exit routines are those that your installation has defined. The existence of any other exit routines may indicate a system security exposure, because RACF exit routines could be used to bypass RACF security checking. Similarly, if the length of an exit routine module differs from the length of the module your installation defined, the module may have unauthorized modifications.

**Note:** For the dynamic exits IRREVX01 and IRRVAF01, note that these are the exit names, not necessarily the module names associated with the exit. MVS dynamic exit service supports multiple exit routines for a single exit point. The DSMON exits report lists IRREVX01 or IRRVAF01 when at least one active exit routine is defined at the time the report is created. The report will not include any routine names or sizes, listing the length of IRREVX01 and IRRVAF01 as NA (not available).

See [z/OS MVS Programming: Authorized Assembler Services Reference](http://www.ibm.com/support/docview.wss?rs=1800&context=HIP& docnumber=GH01-8327) for information on the dynamic exit service CSVDYNEX macro which is used by RACF to define and query its dynamic exits. See [z/OS MVS System Commands](http://www.ibm.com/support/docview.wss?rs=1800&context=HIP&docnumber=GH01-8340) for information on the DISPLAY command's support of dynamic exits. The MVS DISPLAY command can be used to find the names of the modules associated with the exits. Additionally see the exit chapter in [z/OS Security Server RACF System Programmer’s Guide](http://www.ibm.com/support/docview.wss?rs=1800&context=HIP&docnumber=GH01-8317) for information on IRREVX01 and IRRVAF01.

**Column Headings**

<table>
<thead>
<tr>
<th>EXIT MODULE NAME</th>
<th>MODULE LENGTH</th>
</tr>
</thead>
</table>

**Report Messages**

The following message may appear below the report column headings:

---

**NO RACF EXITS ARE ACTIVE**

**Explanation:** There are no active RACF exit routines.

---

**R A C F  E X I T S  R E P O R T**

Figure 22. Sample RACF Exits Report
RACF global access checking table report

The global access checking table report lists all entries in the global access checking table. Each entry consists of a resource name and its associated global access checking authority level.

Also, you can use the global access checking table report to determine whether protection for a sensitive resource is adequate. By examining the global access information for an entry, you can discover whether the global access authority level provides the right security for the resource.

Column Headings

CLASS NAME
is the class name found in the global access checking table.

ENTRY NAME
is the entry name or names defined in each class. If the GLOBAL class is inactive, GLOBAL INACTIVE appears in this column. If the GLOBAL class is active but no members are defined for the class, NO ENTRIES appears in the column.

ACCESS LEVEL
specifies the global access checking authority level for the entry.

Report Messages

The following message may appear below the report column headings:

GLOBAL INACTIVE
Explanation: There are no entries in the RACF global access checking table. This message does not indicate an error condition. When RACF is initially installed, for example, the RACF global access checking table normally contains no entries.
<table>
<thead>
<tr>
<th>CLASS</th>
<th>ACCESS LEVEL</th>
<th>RACF GLOBAL ACCESS ENTRY NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATASET</td>
<td>--</td>
<td>GLOBAL INACTIVE --</td>
</tr>
<tr>
<td>RVARSMBR</td>
<td>--</td>
<td>GLOBAL INACTIVE --</td>
</tr>
<tr>
<td>SECLABEL</td>
<td>--</td>
<td>GLOBAL INACTIVE --</td>
</tr>
<tr>
<td>DASDVOL</td>
<td>--</td>
<td>GLOBAL INACTIVE --</td>
</tr>
<tr>
<td>TAPEVOL</td>
<td>--</td>
<td>GLOBAL INACTIVE --</td>
</tr>
<tr>
<td>TERMINAL</td>
<td>--</td>
<td>GLOBAL INACTIVE --</td>
</tr>
<tr>
<td>APPL</td>
<td>--</td>
<td>GLOBAL INACTIVE --</td>
</tr>
<tr>
<td>TIMS</td>
<td>--</td>
<td>GLOBAL INACTIVE --</td>
</tr>
<tr>
<td>AIMS</td>
<td>--</td>
<td>GLOBAL INACTIVE --</td>
</tr>
<tr>
<td>TCIICSTRN</td>
<td>--</td>
<td>GLOBAL INACTIVE --</td>
</tr>
<tr>
<td>PCICSPSB</td>
<td>--</td>
<td>GLOBAL INACTIVE --</td>
</tr>
<tr>
<td>GMBR</td>
<td>--</td>
<td>GLOBAL INACTIVE --</td>
</tr>
<tr>
<td>DSNR</td>
<td>--</td>
<td>GLOBAL INACTIVE --</td>
</tr>
<tr>
<td>FACILITY</td>
<td>--</td>
<td>GLOBAL INACTIVE --</td>
</tr>
<tr>
<td>VMMDISK</td>
<td>--</td>
<td>GLOBAL INACTIVE --</td>
</tr>
<tr>
<td>VMRDR</td>
<td>--</td>
<td>GLOBAL INACTIVE --</td>
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<tr>
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<td>GLOBAL INACTIVE --</td>
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<td>VMNODE</td>
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<td>GLOBAL INACTIVE --</td>
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<tr>
<td>VMATCH</td>
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<td>GLOBAL INACTIVE --</td>
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<tr>
<td>SCDMBR</td>
<td>--</td>
<td>GLOBAL INACTIVE --</td>
</tr>
<tr>
<td>FCICSFCT</td>
<td>--</td>
<td>GLOBAL INACTIVE --</td>
</tr>
<tr>
<td>JCIICSJCT</td>
<td>--</td>
<td>GLOBAL INACTIVE --</td>
</tr>
<tr>
<td>DCICSDCT</td>
<td>--</td>
<td>GLOBAL INACTIVE --</td>
</tr>
<tr>
<td>SCICSTST</td>
<td>--</td>
<td>GLOBAL INACTIVE --</td>
</tr>
</tbody>
</table>

Figure 23. Sample RACF Global Access Checking Table Report
RACF started procedures table reports

The status of the STARTED class determines the started procedures table reports that get generated. If the STARTED class is not active, the report is created using the installation replaceable load module, ICHRIN03, as shown in Figure 24 on page 111. If the STARTED class is active, two reports are generated. Along with the report generated for the installation replaceable load module, ICHRIN03, a second report is created using the STARTED class profiles. An example of this second report is shown in Figure 25 on page 112.

The started procedures table report lists each entry in the started procedures table. Each entry contains the procedure name, user identification, the group name associated with the procedure, the privileged status, and the trusted status. If the STARTED class is active, the report that gets generated also shows the job name associated with the procedure and the TRACE attribute.

In order for the started procedures table report to show your installation's currently active profiles, you should issue:

```
SETR RACLIST(STARTED) REFRESH
```

before running the report. Be aware that this command could cause some disruption if profiles are being changed on the system at the exact time the command is issued.

Using STARTED class profiles allows you to dynamically change the table entries without having to re-IPL. For more details, refer to z/OS Security Server RACF Security Administrator’s Guide.

You can use the started procedures table report to determine which started procedures are defined to RACF and which RACF user IDs and groups they will use. RACF user IDs associated with the started procedure can access RACF-protected resources. Therefore, you can check the information in the RACF started procedures table to determine which users and groups are associated with the started procedure that RACF recognizes, and determine whether those users are privileged or trusted.

You can also use the report to determine which started procedures are privileged or trusted. If the started procedure has the PRIVILEGED attribute, it can bypass all RACROUTE REQUEST=AUTH and REQUEST=FASTAUTH processing, including the security classification checks, and can therefore affect the overall security of the system. TRUSTED means the same as PRIVILEGED, except that auditing can be requested by using the SETROPTS LOGOPTIONS command or the UAUDIT operand on the ALTUSER command.

Column Headings

PROCEDURE NAME
- is the procedure name, or an asterisk ("**") for a generic entry.

ASSOCIATED USER
- is the RACF user identification associated with the procedure. An equal sign ("=") indicates that the procedure name is used for the RACF user identification.

ASSOCIATED GROUP
- specifies the RACF group associated with the procedure. An equal sign ("=") indicates that the procedure name is used for the RACF group name.
PRIVILEGED
indicates whether the procedure has the privileged attribute. A value of YES indicates that the procedure has the attribute; a value of NO indicates it does not.

TRUSTED
indicates whether the procedure has the trusted attribute. A value of YES indicates that the procedure has the attribute; a value of NO indicates it does not.

TRACE
indicates whether the STARTED class profile has trace activated. If the attribute is activated, then when the started task is initiated, RACF issues message IRR812I to the operator to record the activity.

Report Messages

No messages appear at the end of this report.

---

Figure 24. Sample RACF Started Procedures Table Report (ICHRIN03)
### RACF Started Procedures Table Report

**FROM PROFILES IN THE STARTED CLASS:**

<table>
<thead>
<tr>
<th>PROFILE NAME</th>
<th>ASSOCIATED NAME</th>
<th>ASSOCIATED GROUP</th>
<th>PRIVILEGED</th>
<th>TRUSTED</th>
<th>TRACE</th>
</tr>
</thead>
<tbody>
<tr>
<td>CICS.REGIONA</td>
<td>CICSA</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>CICS.REGIONB</td>
<td>CICSB</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>NOSTDATA.NOSTDATA</td>
<td>-STDATA NOT SPECIFIED, ICHRIN03 WILL BE USED-</td>
<td>-USER NOT SPECIFIED, ICHRIN03 WILL BE USED-</td>
<td>-MEMBER STCGRP NO NO</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>NOUSER.JOBX</td>
<td>STCUSR</td>
<td>SYS1</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>ANETVIEW.* (G)</td>
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</tr>
<tr>
<td>APPLC.* (G)</td>
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</tr>
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</tr>
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</tr>
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<td>NO</td>
</tr>
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<td>NO</td>
</tr>
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<td>NO</td>
<td>NO</td>
</tr>
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<td>SY51</td>
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<td>NO</td>
</tr>
<tr>
<td>IEEVMPCR.* (G)</td>
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<td>SY51</td>
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<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>IRRDPTAB.* (G)</td>
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<td>NO</td>
</tr>
<tr>
<td>JES2.* (G)</td>
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<td>YES</td>
<td>NO</td>
</tr>
<tr>
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<td>NO</td>
</tr>
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<td>NO</td>
</tr>
<tr>
<td>NETVFCT.* (G)</td>
<td>STCUSR</td>
<td>SY51</td>
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<td>NO</td>
<td>NO</td>
</tr>
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<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>NETVREL2.* (G)</td>
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<td>SY51</td>
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<td>NO</td>
<td>NO</td>
</tr>
<tr>
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<td>SY51</td>
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<td>NO</td>
<td>NO</td>
</tr>
<tr>
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<td>NO</td>
<td>NO</td>
</tr>
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</tr>
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</tr>
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</tr>
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<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>RSFK.* (G)</td>
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<td>NO</td>
<td>NO</td>
</tr>
<tr>
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<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>RUNJOB.* (G)</td>
<td>STCUSR</td>
<td>SY51</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
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<td>SECLNLD.* (G)</td>
<td>SECLNLD</td>
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</tr>
<tr>
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<td>SY51</td>
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<td>NO</td>
</tr>
<tr>
<td>SMF.* (G)</td>
<td>STCUSR</td>
<td>SY51</td>
<td>NO</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>TCAE.* (G)</td>
<td>STCUSR</td>
<td>SY51</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>TSOCMD.* (G)</td>
<td>STCUSR</td>
<td>SY51</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>TSOICMD.* (G)</td>
<td>STCUSR</td>
<td>SY51</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>VLF.* (G)</td>
<td>STCUSR</td>
<td>SY51</td>
<td>NO</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>VTAM.* (G)</td>
<td>STCUSR</td>
<td>SY51</td>
<td>NO</td>
<td>YES</td>
<td>NO</td>
</tr>
</tbody>
</table>
** (G)         | =MEMBER STCGRP  | NO               | NO         | YES    | YES   |

*Figure 25. Sample RACF Started Procedures Table Report (STARTED Class Active)*
Selected user attribute report

The selected user attribute report lists all RACF users with the SPECIAL, OPERATIONS, AUDITOR, or REVOKE attribute and indicates whether a user possesses the attribute on a system (user) or group level.

You can use the selected user attribute report to verify that only those users who need to be authorized to perform certain functions have been assigned the corresponding attribute.

Column Headings

USERID
is the user’s system identifier.

ATTRIBUTE TYPE
identifies each attribute and indicates whether the user has the attribute on a system (user) or a group level. SYSTEM indicates the user has that attribute on a system level, or at all times. GROUP indicates user has the attribute only within one or more of the groups to which the user is connected. If neither SYSTEM nor GROUP appears, the user does not possess that attribute on either level.

If a user has one or more attributes on a group level, you can determine the names of the corresponding group or groups through the LISTUSER command or the “User Services” panel.

The report lists the following attribute types:

SPECIAL
gives the user complete control over all the RACF profiles in the RACF database and authority to issue all RACF commands, except those reserved for the auditor’s use.

OPERATIONS
gives the user authority to perform maintenance operations and provides full authority to access RACF-protected DASD data sets and certain resource classes.

AUDITOR
gives the user complete authority to audit security controls and the use of system resources.

REVOKE
prevents, on a system level, a RACF-defined user from entering the system at all. On a group level, a user can enter the system but cannot use any group authorities associated with the group, or access data sets using that group’s authority.

Note: When REVOKE is specified with a future date, the status change does not occur until the specified date. Until that date, the report does not list the user as revoked.

For more information on each attribute, especially at the group level, see [z/OS Security Server RACF Security Administrator’s Guide](#).

ASSOCIATIONS
are the characteristics of the user ID association. The report lists the following associations:

NODE.USERID
is the node (local or remote) and user ID of the associated user
PASSWORD SYNC
tells whether password synchronization has been requested between the
listed user and associate user

ASSOCIATION TYPE
describes the type of association, the status of the user ID association, or
both

Report Messages

The following message may appear below the report column headings:

<table>
<thead>
<tr>
<th>NO SELECTED USERS FOUND</th>
</tr>
</thead>
</table>

Explanation: There are no users with the SPECIAL, OPERATIONS, AUDITOR, or REVOKE attributes on
either a system or group level.

Note: Under normal circumstances, this message should not appear. At least one user should have

```
SELECTED USER ATTRIBUTE REPORT

USERID ----------------- ATTRIBUTE TYPE ---------------- ------------- ASSOCIATIONS --------
SPECIAL OPERATIONS AUDITOR REVOKE NODE.USERID PASSWORD ASSOCIATION SYNC TYPE
-----------------------------------------------------------------------------------------------
JPETUSR SYSTEM SYSTEM SYSTEM

Figure 26. Selected User Attribute Report
```
**Selected user attribute summary report**

The selected user attribute summary report shows totals for installation-defined users and for users with the SPECIAL, OPERATIONS, AUDITOR, and REVOKE attribute at both the system and the group level. You can use the summary report to verify that the number of users with each of the selected attributes, on either a system or a group level, is the number your installation wants.

**Note:** The selected user attribute summary report is produced automatically after the selected user attribute report; it cannot be requested separately.

**Column Headings**

**TOTAL DEFINED USERS**

is the number of users defined by your installation.

**TOTAL SELECTED ATTRIBUTE USERS**

is the number of users with each of the four selected attributes (SPECIAL, OPERATIONS, AUDITOR, and REVOKE) at both the system and group level.

**Report Messages**

No messages appear at the end of this report.

<table>
<thead>
<tr>
<th>Attribute Basis</th>
<th>SPECIAL</th>
<th>OPERATIONS</th>
<th>AUDITOR</th>
<th>REVOKE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYSTEM</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>GROUP</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

*Figure 27. Selected User Attribute Summary Report*
Selected data sets reports

The selected data sets report lists all the data sets, including the RACF database or databases, that meet one or more of the selection criteria that DSMON uses. For each selected data set, the report specifies the serial number of the volume on which the data set resides, the selection criterion, whether the data set is RACF-indicated or RACF-protected, and the universal access authority (UACC) for the data set. If a data set or RACF database meets more than one selection criterion, there is a separate entry for each criterion.

You can use the selected data sets report to determine which system and RACF data sets are protected by RACF and which are not. You can also check to learn whether the UACC associated with each of the data sets is compatible with the resource access control requirements of your installation.

Column Headings

**DATA SET NAME**
is the name of the data set.

**VOLUME SERIAL**
is the serial number of the direct access volume on which the data set resides. If the data set is not cataloged, this column is blank.

**SELECTION CRITERION**
is the criterion that was used to select the data set for the report.

The following entries may appear:

**LNKLST**
The data set is part of the LNKLST concatenation (which is SYS1.LINKLIB and any data sets concatenated to SYS1.LINKLIB through the use of the LNKLSTxx member of SYS1.PARMLIB) for this IPL.

**APF**
specifies that the data set is an APF-authorized library.

For information on defining the format and contents of the list of APF-authorized libraries used by MVS, refer to [z/OS MVS Initialization and Tuning Reference](https://www.ibm.com/docs/en/zos-systems-management/2.3.0#apf).

**Notes:**

1. Depending on your APF list definition, the list of APF-authorized libraries may be incomplete in the Selected Data Sets report generated by the FUNCTION ALL or FUNCTION SYSAPF control statements. Only APF-authorized libraries contained in the IEAAPFxx or PROGxx members of SYS1.PARMLIB, or specified by the MVS SETPROG operator command, are reflected in the report. APF-specification members can come from any member of PARMLIB, or from a command which dynamically adds APF data sets. Therefore, LPA, MLPA, and FLPA authorized libraries that are not defined in the APF LIST are not flagged as APF.

2. Perform one of the following options to include all APF-authorized libraries in the Selected Data Sets report.

   - Define all your LPA, MLPA, and FLPA libraries in the applicable IEAAPFxx or PROGxx members of SYS1.PARMLIB. This allows MVS to recognize them as APF-authorized at all times.
• Use the FUNCTION USRDSN and USEROPT USRDSN control statements and specify the APF-authorized libraries that are not defined in the APF List. With this option, USRDSN is the SELECTION CRITERION field,

• If the APF-authorized library is part of the LNKLIST concatenation, specify either FUNCTION ALL or FUNCTION SYSLNK. In this case, the SELECTION CRITERION field contains LNKLIST-APF.

**LNKLST-APF**
- specifies that the data set is a linklist data set that is also an APF authorized library.

**MASTER CATALOG**
- indicates that the data set is the MVS master catalog.

**USER CATALOG**
- indicates that the data set is a user catalog.

**RACF PRIMARY**
- indicates that the data set is a primary RACF database, containing RACF access control information. This information includes user, group, data set, and general-resource profiles.

**RACF BACKUP**
- indicates that the data set is a backup or recovery RACF database.

**SYSTEM**
- indicates that the data set is one of the following system data sets:
  - SYS1.CMDLIB
  - SYS1.LINKLIB
  - SYS1.LPALIB
  - SYS1.NUCLEUS
  - SYS1.PARMLIB
  - SYS1.PROCLIB
  - SYS1.SVCLIB
  - SYS1.UADS

**USRDSN**
- is the user data set specified on the USEROPT control statement.

**RACF INDICATED**
- indicates whether the data set is RACF-indicated.

The following entries may appear:

**YES**
- indicates that the RACF indicator for the data set is on.

**NO**
- indicates that the RACF indicator for the data set is off. RACF will not check for a discrete profile.

**N.C.**
- indicates that the data set is not listed (cataloged) in the master catalog.

**N.M.**
- indicates that the DASD volume on which the data set resides is not mounted or has been dynamically deleted.

**N.F.**
- indicates DSMON cannot find the data set on the specified volume. For APF data sets, this may indicate a security exposure that should be investigated and corrected.
**RACF PROTECTED**
indicates whether the data set has a RACF profile. The following entries may appear:

**YES**  
indicates that the data set has a discrete or generic profile. If the RACF indicator for the data set is off, the data set is protected by a generic profile.

**NO**  
indicates that no profile exists for the data set. The data set is not protected in any way by RACF.

**Notes:**
1. An error condition exists when the RACF indicator for a data set is on but no profile exists for the data set. The data set is not accessible until the condition is corrected.
2. For a data set profile that has WARNING set, RACF issues a warning message, but permits access to the data set. Thus, although the data set has a RACF profile and is indicated as RACF-protected in the report (YES), it can nevertheless be accessed and is not really protected. You may want to list the contents of the data set profile (through the LISTDSD command) to see whether WARNING is set.

**UACC**
is the data set's universal access authority (UACC), if it is defined. The UACC is the default access authority that specifies how the data set can be accessed by users or groups not in the access list of the data set's RACF profile.

**Note:** The UACC does not necessarily indicate the actual authority that a user has to access the data set. The global access checking table may contain an entry applicable to the data set, or the user may be on the access list, if the data set has a discrete profile.

The following universal access authorities may appear:

**ALTER**  
For a data set that is protected by a discrete profile, ALTER allows all users to read, update, or delete the data set.

**CONTROL**  
For VSAM (virtual storage access method) data sets, CONTROL provides all users with the same authority that is provided with the VSAM CONTROL password; that is, authority to perform control interval access (access to individual VSAM data blocks), and to retrieve, update, insert, or delete records in the specified data set.

For non-VSAM data sets, CONTROL is equivalent to UPDATE.

**UPDATE**  
allows all users to read or update the data set. UPDATE does not, however, authorize a user to delete the data set.

**READ**  
allows all users to access the data set for reading or copying only.

**NONE**  
does not allow users to access the data set.

**Report Messages**

The following message may appear below the report column headings:
NO SELECTED DATA SETS FOUND

Explanation: DSMON did not find any data sets meeting the criteria.

Note: Under normal circumstances, this message should not appear. If it does, notify your RACF security administrator or installation manager.

<table>
<thead>
<tr>
<th>DATA SET NAME</th>
<th>VOLUME SERIAL</th>
<th>DATA SELECTION CRITERION</th>
<th>SETS RACF INDICATED</th>
<th>RACF PROTECTED</th>
<th>RACF UACC</th>
</tr>
</thead>
<tbody>
<tr>
<td>CATALOG.AOCSMP.USERCAT</td>
<td>D94HV2</td>
<td>USER CATALOG</td>
<td>N.M.</td>
<td>YES</td>
<td>UPDATE</td>
</tr>
<tr>
<td>CATALOG.CICSCAT</td>
<td>DB3CL2</td>
<td>USER CATALOG</td>
<td>NO</td>
<td>YES</td>
<td>NONE</td>
</tr>
<tr>
<td>CATALOG.CICSDCT</td>
<td>DB3HW1</td>
<td>USER CATALOG</td>
<td>NO</td>
<td>YES</td>
<td>NONE</td>
</tr>
<tr>
<td>CATALOG.CMNA00</td>
<td>CMNA00</td>
<td>USER CATALOG</td>
<td>N.M.</td>
<td>YES</td>
<td>NONE</td>
</tr>
<tr>
<td>CICS.CURRENT.SDFHAUTH</td>
<td>DB2LD1</td>
<td>APF</td>
<td>NO</td>
<td>YES</td>
<td>NONE</td>
</tr>
<tr>
<td>CICS.CURRENT.SDFHEXCI</td>
<td>DB2LD1</td>
<td>APF</td>
<td>NO</td>
<td>YES</td>
<td>READ</td>
</tr>
<tr>
<td>CICS.CURRENT.SEYUAUTH</td>
<td>DB2LD1</td>
<td>APF</td>
<td>NO</td>
<td>YES</td>
<td>NONE</td>
</tr>
<tr>
<td>CICS.NEW.SDFHAUTH</td>
<td>DB2LD1</td>
<td>APF</td>
<td>NO</td>
<td>YES</td>
<td>NONE</td>
</tr>
<tr>
<td>CICSCAT.USERCAT</td>
<td>CIC330</td>
<td>USER CATALOG</td>
<td>N.M.</td>
<td>NO</td>
<td>READ</td>
</tr>
<tr>
<td>DB2L.DSNSEXIT</td>
<td>SM5066</td>
<td>APF</td>
<td>NO</td>
<td>YES</td>
<td>READ</td>
</tr>
<tr>
<td>DB2.DB2L.DB2PM.SDGOLOAD</td>
<td>DB2LS2</td>
<td>APF</td>
<td>NO</td>
<td>YES</td>
<td>READ</td>
</tr>
<tr>
<td>DB2.DB2M.DB2PM.SDGOLOAD</td>
<td>DB2S01</td>
<td>APF</td>
<td>NO</td>
<td>YES</td>
<td>READ</td>
</tr>
<tr>
<td>DB2.LOCAL.LOADLIB</td>
<td>DB2LS0</td>
<td>APF</td>
<td>NO</td>
<td>YES</td>
<td>READ</td>
</tr>
<tr>
<td>DB2.USER.CATALOG</td>
<td>DB2PRD</td>
<td>USER CATALOG</td>
<td>NO</td>
<td>YES</td>
<td>NONE</td>
</tr>
<tr>
<td>DB2L.DSNSEXIT</td>
<td>DB2LS1</td>
<td>APF</td>
<td>NO</td>
<td>YES</td>
<td>READ</td>
</tr>
<tr>
<td>DB2M.DSNSEXIT</td>
<td>DB2M50</td>
<td>APF</td>
<td>NO</td>
<td>YES</td>
<td>READ</td>
</tr>
<tr>
<td>LINKLIST.DB2L.DSNLINK</td>
<td>DB2LS1</td>
<td>APF</td>
<td>NO</td>
<td>YES</td>
<td>READ</td>
</tr>
<tr>
<td>LINKLIST.DB2L.DSNLOAD</td>
<td>DB2LS1</td>
<td>APF</td>
<td>NO</td>
<td>YES</td>
<td>READ</td>
</tr>
<tr>
<td>LINKLIST.DB2M.DSNLINK</td>
<td>DB2M50</td>
<td>APF</td>
<td>NO</td>
<td>YES</td>
<td>READ</td>
</tr>
<tr>
<td>LINKLIST.DB2M.DSNLOAD</td>
<td>DB2M50</td>
<td>APF</td>
<td>NO</td>
<td>YES</td>
<td>READ</td>
</tr>
<tr>
<td>LINKLIST.DB2PM.SDGOLOAD</td>
<td>DB2M50</td>
<td>APF</td>
<td>NO</td>
<td>YES</td>
<td>READ</td>
</tr>
<tr>
<td>NCPI.SSPLIB</td>
<td>TPPAK2</td>
<td>APF</td>
<td>NO</td>
<td>YES</td>
<td>READ</td>
</tr>
<tr>
<td>NETVIEW.NETVIEW.USERLINK</td>
<td>TPPAK5</td>
<td>APF</td>
<td>NO</td>
<td>YES</td>
<td>NONE</td>
</tr>
<tr>
<td>NETWORK.ANOMVS.USERLINK</td>
<td>TPPAK5</td>
<td>APF</td>
<td>NO</td>
<td>YES</td>
<td>READ</td>
</tr>
<tr>
<td>POSIX.CBC.OSV1R2M0.USERCAT</td>
<td>BPRXL</td>
<td>USER CATALOG</td>
<td>NO</td>
<td>YES</td>
<td>NONE</td>
</tr>
<tr>
<td>SYS1.ACCOUNT</td>
<td>PPP002</td>
<td>APF</td>
<td>YES</td>
<td>YES</td>
<td>READ</td>
</tr>
<tr>
<td>SYS1.AUTHLIB</td>
<td>PPP002</td>
<td>APF</td>
<td>YES</td>
<td>YES</td>
<td>READ</td>
</tr>
<tr>
<td>SYS1.CEE.SCEELKED</td>
<td>PRIPK3</td>
<td>APF</td>
<td>NO</td>
<td>YES</td>
<td>READ</td>
</tr>
<tr>
<td>SYS1.CEE.SCEERUN</td>
<td>PRIPK3</td>
<td>APF</td>
<td>NO</td>
<td>YES</td>
<td>READ</td>
</tr>
<tr>
<td>SYS1.CICS410.LINKLIB</td>
<td>DB2LD1</td>
<td>APF</td>
<td>NO</td>
<td>YES</td>
<td>NONE</td>
</tr>
<tr>
<td>SYS1.CICS410.LPALIB</td>
<td>DB2LD1</td>
<td>APF</td>
<td>NO</td>
<td>YES</td>
<td>NONE</td>
</tr>
<tr>
<td>SYS1.CMDLIB</td>
<td>PRIPK3</td>
<td>APF</td>
<td>NO</td>
<td>YES</td>
<td>READ</td>
</tr>
</tbody>
</table>

Figure 28. Sample Selected Data Sets Report
Appendix A. The RACF report writer

Attention
The report writer is no longer the recommended utility for processing RACF audit records. The RACF SMF data unload utility is the preferred reporting utility. The report writer does not support all of the audit records introduced after RACF 1.9.2. Refer to Chapter 3, “The RACF SMF data unload utility,” on page 49, for more details.

The RACF report writer (RACFRW) uses SMF dates in the form yyddd. If you attempt to select a date range of records with a starting date that occurs before January 1, 2000 (for example, 99364) and the ending date occurs on or after January 1, 2000 (for example, 00002) the report writer will reject your request as it will consider the year 00 as coming before the year 99. Similarly, when sorting records by date, the report writer will treat 00 as coming before 99. IBM does not intend to enhance the RACF report writer to recognize this condition and to process the records differently, as IBM has stabilized RACFRW and will not make functional improvements to it. Other than this problem with record ordering, which should only occur if the input file has records both before and after January 1, 2000, RACFRW should properly process records with dates after January 1, 2000, if it would have handled those records if they had contained earlier dates.

A successful security mechanism requires that appropriate personnel, particularly the auditor and the security administrator, be able to assess the implementation of the security mechanism and the use of the resources it protects. The RACF report writer provides a wide range of reports that enable you to monitor and verify the use of the system and resources.

The RACF report writer lists the contents of system management facilities (SMF) records in a format that is easy to read. SMF records reside in the SMF data file. You can also tailor the reports to select specific SMF records that contain certain kinds of RACF information. With the RACF report writer, you can obtain:

- Reports that describe attempts to access a particular RACF-protected resource in terms of user name, user identity, number and type of successful accesses, and number and type of attempted security violations.
- Reports that describe user and group activity.
- Reports that summarize system use and resource use.

How the RACF report writer operates
The RACF report writer consists of three phases:
- Command and subcommand processing
- Record selection
- Report generation

See Figure 29 on page 122 for an overview of the RACF report writer. The figure also shows the replaceable module, ICHRSMFI, for the RACF report writer, and the RACF report writer installation-wide exit, ICHRSMFE.

ICHRSMFI is a nonexecutable module that contains default values for the RACF report writer sort parameters, dynamic-allocation parameters, and processing
options. See z/OS Security Server RACF System Programmer's Guide for a description of the contents of the module and an explanation of how to modify the module if necessary.

ICHRSMFE is an installation-wide exit that the RACF report writer calls during the record selection phase. The exit allows you to add functions such as the following to the RACF report writer:

- Create additional selection and or rejection criteria (or both) for records that the RACF report writer processes
- Modify naming conventions in records that the RACF report writer processes
- Add other reports to those that the RACF report writer provides.

Detailed information about coding the ICHRSMFE exit routine appears in z/OS Security Server RACF System Programmer’s Guide.

Figure 29. RACF Report Writer Overview
Phase 1

Command and subcommand processing

The first phase, command and subcommand processing, starts when you enter the TSO command RACFRW or run the report writer as a batch job. As a command, RACFRW invokes the RACF report writer through the terminal monitor program (TMP) and places you in subcommand mode. In subcommand mode, you can enter the RACF report writer subcommands SELECT, EVENT, LIST, SUMMARY, and END. When the RACF report writer is invoked from a batch job, the batch job invokes the TMP through a job step in the JCL, and RACFRW commands and subcommands can be specified as data in stream to the job. See “The RACF report writer and the SMF input data set” on page 126.

Briefly, the SELECT and EVENT subcommands specify which of the input records the RACF report writer selects and uses to generate the reports. You can then produce those reports by using the LIST subcommand to format and print a listing of each SMF record you select and the SUMMARY subcommand to format and print a summary listing of the SMF records. After entering all the subcommands you need, enter the END subcommand. END terminates subcommand mode and the first processing phase.

Note: Pressing PA1 or the attention key at any time during this first phase terminates the RACF report writer immediately and returns control to the TMP.

Phase 2

Record selection

During the second phase, record selection, the RACF report writer compares each record from the input file—the SMF records—against the criteria you specify on the SELECT and EVENT subcommands. The RACF report writer accepts as input only RACF-related SMF records. These are process records (SMF type 20, 30, 80, and 83) and status records (SMF type 81). In addition, the report writer generates a “fake” type 81 record for every SMF type 80 record that results from a SETROPTS or RVARY command.

For a description of SMF record types 20 and 30, see z/OS MVS System Management Facilities (SMF). For a description of SMF record types 80, 81, and 83, see z/OS Security Server RACF Macros and Interfaces.

Notes:

1. The SMF type 81 record contains “UCB” instead of an EBCDIC device name if the master RACF primary database is on a device with an address greater than X’FFF’. When the RACF report writer formats the type 81 record, this information is displayed for you to see.

2. The SMF type 83 subtype 1 record is generated when SETROPTS MLACTIVE is in effect and a RACF command (ALTDSD, ADDSD, DELDSD) has changed the security label in a profile. The record contains the names of the catalogued data sets affected by the security-label change. A link value is contained in both the SMF type 80 record for the RACF command and the SMF type 83 subtype 1 record. The link value is used to connect the list of data set names affected by the security-label change with the RACF command that caused the change. The text in the report-writer output is “LINK=numeric value”.

Appendix A. The RACF report writer
If there are migrated items in the list, and the migration facility is unavailable at the time the command is issued, the following messages will be printed after the items:

** Unable to verify this
** migrated item (1)

The number in parentheses denotes diagnostic information used by IBM support.

For more information on using the LISTDSD command, refer to z/OS Security Server RACF Command Language Reference.

If you do not specify any SELECT or EVENT subcommands, the RACF report writer selects all of the records from the input file for further processing. If you specify options that limit your report, only limited information is saved.

**Record reformatting**

To sort and print the SMF input records, the RACF report writer must reformat them. The report writer allocates an in-storage buffer for reformatting, using it on each SMF record being processed. The size of this buffer is determined by the WRKLRECL field in the installation-replaceable module ICHRSMFI unless LRECL is specified on SORTIN DD. The LRECL value in the SORTIN DD statement overrides the WRKLRECL statement used by RACFRW.

The report writer makes sure that the buffer is large enough for the base section of the SMF record. However, it does not guarantee that the relocate sections of the SMF record will fit.

In the report writer output, the process records that do not fit into the buffer are noted as truncated. The status records that do not fit will be noted as bypassed. The WRKLRECL default is 4096.

The RACF report writer copies the reformatted records to a work data set. You can save this work data set and use the reformatted records as input to a later run of the RACF report writer.

If the input consists of records previously saved using the report writer, those records are already reformatted. The RACF report writer skips the reformatting step for those records. Operands on the RACFRW command specify whether or not the RACF report writer is to reformat the input records and whether or not the work data set is to be saved for subsequent runs of the RACF report writer.

When the RACF report writer has compared all the input records against the selection criteria and, if necessary, has reformatted the selected records and copied them to a work data set the second processing phase is complete.

**Phase 3**

**Report generation**

During the third phase, report generation, the RACF report writer generates the reports that you request with the LIST and SUMMARY subcommands. It uses as input only the records from the work data set. The RACF report writer always produces a header page with a list of the subcommands that you have entered and describes the meanings of values for such activities as job initiation, TSO logon, resource access, and use of RACF commands that appear in the reports. The other
reports depend on operands you have specified, but the RACF report writer always produces the reports you request according to a specific order. See the examples at the end of this chapter.

If you want a general summary report of overall system activity related to RACF, you can specify the GENSUM operand on the RACFRW command. The RACF report writer:

1. Collects the data for the general summary report during the record selection phase (see “Phase 2” on page 123) and prints it before any other reports during phase 3.
2. Produces reports for the LIST subcommand and lists all SMF records from the work data set in the sequence that you specified.
3. Produces a separate summary report of the SMF records for each SUMMARY subcommand you enter with a RACFRW command. Depending on the subcommand you enter, the report contains records by group, resource, command, RACF event, or owner activity.

Sample reports produced by GENSUM, LIST, and SUMMARY are shown in the section “Sample reports” on page 154. When it has completed the last report, the RACF report writer terminates and returns control to the TMP.

### RACF report writer command and subcommands

The following tables summarize the main RACFRW command operands and subcommands that control report writer processing:

#### Table 11. Summary of RACFRW Command and Its Operands

<table>
<thead>
<tr>
<th>Operand</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEN lower</td>
<td>Produces a general summary report of system activity related to RACF</td>
</tr>
<tr>
<td>NOGEN lower</td>
<td>Produces no general summary report</td>
</tr>
<tr>
<td>FORMAT</td>
<td>Specifies that SMF records are to be formatted for use by the report writer</td>
</tr>
<tr>
<td>NOFORMAT</td>
<td>Specifies that the input SMF records are already formatted for use by the report writer; no reformatting is necessary</td>
</tr>
<tr>
<td>SAVE lower</td>
<td>Saves the reformatted records on a work data set. Only those records that satisfy the specified SELECT/EVENT criteria are saved</td>
</tr>
</tbody>
</table>

#### Table 12. Summary of RACFRW Subcommands

<table>
<thead>
<tr>
<th>Subcommand</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>SELECT</td>
<td>Specifies which SMF records to choose from the input file for report writer processing</td>
</tr>
<tr>
<td>EVENT</td>
<td>Specifies further which SMF records to choose from the input file; for the report writer to process these records, each record must meet the criteria</td>
</tr>
<tr>
<td>LIST lower</td>
<td>Specifies that the report writer is to list each record that is processed by SELECT/EVENT groups</td>
</tr>
<tr>
<td>SUMMARY</td>
<td>Specifies that the report writer is to print summary reports for records processed by SELECT/EVENT groups</td>
</tr>
<tr>
<td>END lower</td>
<td>Terminates subcommand processing</td>
</tr>
</tbody>
</table>

Appendix A. The RACF report writer 125
Planning considerations

To use the RACF report writer at your installation, you must have:

- The DFSORT IBM Program Product (Program Number 5740-SM1), or equivalent.
- An output device that can handle 133 character lines.

The RACF report writer and the SMF input data set

The input data set to the RACF report writer consists of the following SMF record types:

20 Job initiation
30 Common address work data
80 RACF processing
81 RACF initialization
83 RACF processing

Attention

Even though some commands use the relocate 44 section of the record, the output of these records is not consistent. The RACF SMF data unload utility is the preferred reporting utility.

SMF records

Records from the SMF data set or log stream must first be dumped to a data set that RACF can use as input. If you have access to the SMF data set or log stream, you can use the SMF dump program (IFASMFDP or IFASMFDL) to dump the SMF records. (If your installation does not allow you to access the SMF data set or log stream, see your SMF system programmer to find out how you can obtain the SMF records as input to the RACF report writer.)

Running the report writer as a batch job

For large SMF data sets, you should run the report writer as part of a batch job. The following JCL is an example of how to dump the SMF records to a temporary data set and run the report writer as a batch job.

In Figure 30 on page 127, the SMF dump program IFASMFDP dumps record types 20, 30, 80, 81, and 83 from an SMF data set (SYS1.MANA) to a temporary data set (QSAMOUT DD) for use by the report writer.
You can specify options for IFASMFDP on the SYSIN INDD statement, and the selection criteria for the SMF records on the SYSIN OUTDD statement. You can also specify the start and end date for the dump program in Julian format (YYDDD) on SYSIN DATE and the system identification on SYSIN SID.

For more information about IFASMFDP and the SMF dump options, as well as outputting log stream output using IFASMFDL, see *Z/OS MVS System Management Facilities (SMF)*.

RACFRW then uses the temporary data set QSAMOUT as input defined on the RSMFIN DD statement, and you can specify the report-writer command and subcommands as in-stream data to SYSTSIN DD.

Running the report writer using the RACFRW command

You can also run the RACF report writer as a TSO command. In TSO ready mode enter *RACFRW*. RACF places you in subcommand mode, and you can enter the report writer subcommands (SELECT, EVENT, LIST, SUMMARY, and END).

If you run the report writer as a TSO command, you must pre-allocate the data set that contains the selected SMF records as RSMFIN and use it as input to the report writer command and subcommands. See "Pre-allocating data sets" on page 128 for more information about pre-allocating data sets for the report writer.
Pre-allocating data sets
If you run the report writer as a TSO command, pre-allocate the data sets required by the RACF report writer using the following ddnames:

**RSMFIN**
The input data set or sets. Note, however, that if you enter the DATASET operand on the RACFRW command, the RACF report writer assigns a system-generated DD name to this input data set and ignores RSMFIN. If you neither pre-allocate the input data set nor specify the DATASET operand, the RACF report writer issues message ICH64305I, and terminates immediately.

**SYS PRINT**
The output data set. If you do not pre-allocate this output data set, the RACF report writer allocates this data set to a SYSOUT data set (which goes to the terminal on which you are entering the commands and subcommands).

**SORT IN**
The work data set. If you enter the SAVE operand on the RACFRW command, the RACF report writer assigns SORTIN to the work data set that you specify in the SAVE operand. If you pre-allocate the work data set or specify the SAVE operand, the RACF report writer saves this work data set for future use; otherwise, it allocates the work data set to a temporary data set and deletes it at job termination. See the SAVE and FORMAT/NOFORMAT options described in "RACFRW command" on page 130.

If the logical record length is specified, it overrides the WRKLRECL field in the installation-replaceable ICHRSMFI module. The default value of WRKLRECL is 4096. If the logical record length you specify is not large enough to hold the largest SMF record from RSMFIN, the report writer truncates the record, losing some of the information for the record's output.

**SORT LIB**
The system library that contains the SORT/MERGE load modules. If you do not pre-allocate this system library, the RACF report writer allocates it to the sort data set named in SORTDSN in ICHRSMFI. Initially, the name in SORTDSN is SYS1.SORTLIB.

**SORT DDDNM**
The SORT/MERGE messages. The RACF report writer allocates these messages to the data set named in SORTDDNM in ICHRSMFI. If you do not pre-allocate these messages, they go to the terminal on which you are entering the commands and subcommands, because the initial name in SORTDDNM is SYSOUT.

**SORT WK xx**
The SORT/MERGE work file(s), named SORTWK01 to SORTWKnn. If you do not pre-allocate these files, dynamic allocation occurs, using the dynamic allocation parameter specified in SORTDYN in ICHRSMFI. Initially, SORTDYN contains ‘DYNALLOC=3350’.

Note that any data set that you pre-allocate remains allocated after the RACF report writer terminates, while any data set allocated by the RACF report writer is deallocated before termination.
RACF report writer return codes

After completing, the RACF report writer returns control to the terminal monitor program (TMP) with a return code in register 15.

The following are possible return codes:

<table>
<thead>
<tr>
<th>Return Code</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>The report writer has terminated normally.</td>
</tr>
<tr>
<td>12</td>
<td>The report writer has not terminated successfully for one of the following reasons:</td>
</tr>
<tr>
<td></td>
<td>• It could not dynamically allocate any needed resource that was not pre-allocated by the user</td>
</tr>
<tr>
<td></td>
<td>• It could not open any needed resource</td>
</tr>
<tr>
<td></td>
<td>• It received a nonzero return code from a service routine that it has invoked</td>
</tr>
<tr>
<td></td>
<td>• It received a nonzero return code from the SORT/MERGE routines.</td>
</tr>
</tbody>
</table>

If you receive a return code of 12, check to see whether any error messages were issued when you invoked the report writer.

• If you receive a return code of 12 when the report writer is running in batch, check that the job statement in the JCL specifies MSGLEVEL=(1,1).
• If you receive a return code of 12 when you invoke the report writer from a TSO terminal, make sure the following option is included in your user profile:

```
profile wtmpmsg msgid
```

For more information on report writer error messages, see "z/OS Security Server RACF Messages and Codes".

Useful hints

When you use the RACF report writer, consider the following:

• You must use the SMF dump program, IFASMFDP, to dump the SMF data set, which is a VSAM data set, into a QSAM data set, which is what the RACF report writer requires. For additional information on IFASMFDP, see "z/OS MVS System Management Facilities (SMF)".
• In an installation using RACF to protect multiple systems, each system writes RACF-generated SMF records to a different data set. You can concatenate all of these data sets into a single data set for input to the RACF report writer. Later, should you have to separate the information based on the identifier of the system that generated it, you could use the SYSID operand on either the LIST or the SELECT subcommand.
• By using the SELECT and EVENT subcommands, you can retrieve individual SMF records of interest for display at a TSO terminal (display screen).
• If your SMF file is large or resides on multiple tape volumes, you may consider specifying the SAVE operand for the work data set that you create. This action reduces the amount of time and number of devices you need, should you need to use this work data set again to produce additional reports. Note that by using SELECT and EVENT subcommands, you can create and save a subset of a work data set that you saved in a previous run of the RACF report writer.
• Your system programmer can provide special SMF record selection and tailoring by using the RACF report-writer exit routine ICHRSMFE. For more information, see "z/OS Security Server RACF System Programmer's Guide".
• The RACF report writer runs as a postprocessor of RACF and does not interfere with normal RACF processing.

**RACFRW command**

This section shows the function and syntax of the RACF report writer command (RACFRW) and subcommands (SELECT, EVENT, LIST, SUMMARY, and END). The command and subcommands are not listed alphabetically, but in the order in which you are likely to enter them. This order is: RACFRW, SELECT, EVENT, LIST, SUMMARY, and END.

The following key defines the symbols used to represent the syntax of the command and subcommands:

- **UPPERCASE**
  - characters must appear as shown

- **lowercase**
  - characters indicate that the user supplies the information

- **list...**
  - indicates that the item can be listed more than once

- **{}**
  - group alternative items; you can only specify one item

- **[]**
  - indicates an optional item that you can specify

- **KEYWORD**
  - indicates the default when no item is specified

*Figure 31. Key to Symbols in Command Definitions*

The TSO command RACFRW invokes the RACF report writer. After you enter the RACFRW command, TSO places you in subcommand mode and prompts you to enter the RACF report-writer subcommands until you enter the END subcommand.

On the RACFRW command, you can specify the source and disposition of input records, the data to be passed to the installation-wide exit routine (ICHRSMFE), whether or not the RACF report writer is to reformat the input records, and whether or not the RACF report writer is to print a general summary report. (See z/OS Security Server RACF System Programmer's Guide for further information about the installation-wide exit ICHRSMFE.)
The Syntax of the RACFRW Command:

```
RACFRW [TITLE('q-string')]
   [DATA('q-string')]
   [{FORMAT }]
   [{NOFORMAT}]
   [{DSNAME }] (name-list...)
   [{DATASET}]
   [SAVE(name)]
   [LINECNT( { 60 } ) ]
      [ {number} ]
   [{GENSUM }]
   [{NOGENSUM}]
```

**TITLE('q-string')**

specifies a string of up to 132 characters, enclosed in single quotation marks, to
be used as a default heading for the report pages, if the TITLE operand on
either the SUMMARY or LIST subcommand does not specify a unique report
heading for a requested report.

**DATA('q-string')**

specifies a string of up to 256 characters of data, enclosed in single quotation
marks, to be passed to the installation-wide exit routine (ICHRSMFE).

**FORMAT**

specifies that the RACF SMF records used as input to the RACF report writer
must be reformatted (from the way they appear in the SMF records) before
processing. For additional information about the reformatted records, see [z/OS
Security Server RACF System Programmer's Guide](#). FORMAT implies that the
RACF report writer has not previously processed the input records. FORMAT is
the default value.

**NOFORMAT**

specifies that the RACF SMF records used as input to the RACF report writer
are already reformatted and suitable for processing. NOFORMAT implies that
the input records have been processed previously by the RACF report writer
and saved. You can save input records by specifying the SAVE operand.

**Note:** Specifying FORMAT for a data set that is already reformatted or
specifying NOFORMAT for a data set that is not already reformatted can
cause unpredictable results.

If report-writer input is from SMF, records are not reformatted. If input is a file
saved from a previous report-writer run, records are reformatted.
Restriction
If records have been reformatted and saved using the SAVE operand on one release of RACF report writer, the same release must be used to process the saved reformatted records. For example, RACF 1.9 reformatted records must be processed with RACF 1.9. SMF records from previous RACF releases, however, are supported. If you want to process SMF data from previous releases, archive the original SMF records rather than the reformatted records.

**DSNAME(name-list...) or DATASET(name-list...)**
specifies the name of one or more cataloged data sets to be concatenated and used as input to the RACF report writer. If you omit this operand, the RACF report writer uses as input the data set you have pre-allocated to the RSMFIN DD name. For more information on preallocating RSMFIN, see "Pre-allocating data sets" on page 128.

**SAVE(name)**
specifies the name of a sequential data set to be assigned to the work data set that is to contain the selected, reformatted RACF SMF records. If this ‘name’ data set is new, the RACF report writer allocates and catalogs it. If this ‘name’ data set is old, the RACF report writer replaces the data currently in the data set with the new data and keeps the data set. You can use this saved work-data set as input to a later run of the RACF report writer.

If you omit this operand and have not pre-allocated a SORTIN DD name, the work-data set is deleted at job termination.

**LINECNT(number)**
specifies the maximum number of lines to be written before ejecting to a new page. The minimum number that you can specify is 20. If you specify a number lower than 20, LINECNT defaults to 20. If you omit this operand, LINECNT defaults to 60.

**GENSUM**
specifies that a general summary report is to be printed. This report contains various statistics about all the RACF SMF records processed, such as total JOB/LOGON attempts, successes, and violations, total resource accesses, successes, and violations, and a breakdown of JOB/LOGON and resource access violations by hour.

**NOGENSUM**
specifies that a general summary report is not to be printed. NOGENSUM is the default value.

**RACFRW subcommands**
When you invoke RACFRW as a TSO command, you are placed in subcommand mode. You can then enter subcommands to select the records and the format for the reports.

**SELECT subcommand**
The SELECT subcommand allows you to choose specific records from the input file containing the RACF SMF records. The RACF report writer reformats these selected records, if necessary, and copies them to an MVS work-data set. Although all input records are used for the general summary report, the RACF report writer...
can list and generate summary reports for only the records that are indicated on the
SELECT subcommand. The SELECT subcommand determines which records get
processed.

**Note:** RACF reports are only as good as the SMF records used as input to them.
You need to carefully consider your installation's needs when selecting audit
options and be sure the report writer has enough data to make useful
reports.

**SELECT/EVENT groups**

SELECT and EVENT subcommands provide a way to tailor RACF report-writer
output. It is easier for you to review a few, selected reports than to examine all the
data at once. SELECT and EVENT commands work together to restrict the SMF
records that the report writer uses for input. You can run the report writer several
times on the same SMF data using different SELECT and EVENT criteria to obtain
several reports on specific topics. You can issue SELECT subcommand separately
or with EVENT subcommands to form what is called a SELECT/EVENT group.

For each run of the report writer, you can specify zero or more SELECT/EVENT
groups. Each group consists of a SELECT subcommand followed by zero or more
EVENT subcommands. A second SELECT subcommand indicates the beginning of
another group.

For an SMF record to be used in a RACF report, it must meet the criteria of at least
one of the SELECT/EVENT groups. The SMF record must meet all the criteria of
the SELECT subcommand plus all the criteria of at least one of the EVENT
subcommands in that group.

A SELECT/EVENT group must begin with a SELECT subcommand, even if it is a
SELECT subcommand with no operands. You can then follow this subcommand
with up to 49 EVENT subcommands that specify additional selection criteria for that
group. If you do not specify an EVENT subcommand, **RACF uses only the criteria**
from the SELECT subcommand. See "EVENT subcommand" on page 139 for more
information.

If you specify multiple SELECT subcommands or SELECT/EVENT groups or both,
you can specify the groups in any order. The listing and summary reports that you
request, however, will reflect **all** the records that have been selected by **all** the
groups, not just the records selected by one particular SELECT/EVENT group. If
you do not issue any SELECT subcommands or SELECT/EVENT groups, **all** the
RACF SMF records from the input file are selected.

The RACF report writer can process a maximum of 50 SELECT and EVENT
subcommands. If you enter more than 50, TSO accepts only the first 50, then
prompts you to enter a subcommand other than SELECT or EVENT.

The following example produces a listing of all unsuccessful logons and all
successful SETROPTS commands.

```
RACFRW
SELECT VIOLATIONS
EVENT LOGON
SELECT SUCCESSES
EVENT SETROPTS
LIST
END
```
The next example provides a listing of every unsuccessful RACF event (logons, accesses, SVCs, commands) plus successful logons and successful SETROPTS commands.

```
RACFRW
SELECT VIOLATIONS
SELECT SUCCESSES
EVENT LOGON
EVENT SETROPTS
LIST
END
```

The following example results in a listing of every RACF-related SMF record.

```
RACFRW
LIST
END
```

**Note:** Use a comma to separate items in a list of operands for SELECT or EVENT. If you must continue items in a list on another line, use the standard TSO continuation, as in the following example:

```
SELECT DATE(89195:89197) TIME(010000:120000) USER(user1,user2,+ user3,user4,user5)
```

See the syntax of the SELECT and EVENT subcommands for those operands that allow you to specify lists of items.
The syntax of the SELECT subcommand:

\[
\begin{align*}
\text{SEL} & \quad \text{(SELECT)} \quad \text{[DATE} \quad \{(\text{begin-number:end-number})\} \text{]} \\
& \quad \text{(SEL)} \quad \{(\text{number-list...})\} \\
& \quad \text{[TIME} \quad \{(\text{begin-number:end-number})\} \text{]} \\
& \quad \{(\text{number-list...})\} \\
& \quad \{\text{VIOLATIONS}\} \\
& \quad \{\text{SUCCESSES}\} \\
& \quad \{\text{WARNINGS}\} \\
& \quad \{\text{USER}(\text{name-list...})\} \\
& \quad \{\text{NOUSER}\} \\
& \quad \{\text{JOB}(\text{name-list...})\} \\
& \quad \{\text{NOJOB}\} \\
& \quad \{\text{OWNER}(\text{name-list...})\} \\
& \quad \{\text{NOOWNER}\} \\
& \quad \{\text{GROUP}(\text{name-list...})\} \\
& \quad \{\text{STEP}(\text{name-list...})\} \\
& \quad \{\text{STATUS}\} \\
& \quad \{\text{PROCESS}\} \\
& \quad \{\text{SYSID}(\text{value-list...})\} \\
& \quad \{\text{AUTHORITY}[\text{[NORMAL]}[\text{SPECIAL]}]\} \\
& \quad \{\text{[OPERATIONS]}[\text{AUDITOR}]\} \\
& \quad \{\text{[EXIT]}[\text{FAILSOFT}]\} \\
& \quad \{\text{[BYPASSED]}[\text{TRUSTED}]\} \\
& \quad \{\text{REASON}[\text{[CLASS]}[\text{USER}][\text{SPECIAL}]]\} \\
& \quad \{\text{[RESOURCE]}[\text{RACINIT}]\} \\
& \quad \{\text{[COMMAND]}[\text{CMDVIOL}][\text{AUDITOR}]\} \\
& \quad \{\text{[SECAUDIT]}[\text{VMAUDIT}]\} \\
& \quad \{\text{[SECLABELAUDIT]}[\text{LOGOPTIONS}]\} \\
& \quad \{\text{[COMPATMODE]}[\text{APPLAUDIT}]\} \\
& \quad \{\text{TERMINAL}(\text{name-list...})\}
\end{align*}
\]

**DATE(begin-number:end-number) or DATE(number-list...)**
 specifies a range (in ascending order) or a list of dates in the form YYDDD that are to be selected for further processing.

**TIME(begin-number:end-number) or TIME(number-list...)**
 specifies a range (in ascending order) or a list of times in the form HHMMSS that are to be selected for further processing.

**VIOLATIONS**
 specifies that only records identifying security violations are to be selected for further processing. This field applies to PROCESS records only.

**SUCCESSES**
 specifies that only records identifying successful access attempts are to be selected for further processing. SUCCESSES applies to PROCESS records only.
WARNINGS
specifies that only records for which a warning message was issued are to be selected for further processing. This field applies to PROCESS records only.

If you do not specify VIOLATIONS, SUCCESSES, or WARNINGS, none of these is used as a selection criterion.

USER(name-list...)
specifies a list of user IDs that are to be selected for further processing. USER applies to PROCESS records only. If you omit both the USER and NOUSER operands, the RACF report writer selects all records containing user IDs. (See Notes 1 and 2 on page 139.)

NOUSER
specifies that:
• Records containing user IDs are not to be selected for further processing
• Records containing undefined users are selected. You can use the list to define those user IDs if you wish.

If you omit both the USER and NOUSER operands, the RACF report writer selects all records containing user IDs. If you specify both the NOUSER and NOJOB operands, the RACF report writer ignores both operands. (See Notes 1 and 2 on page 139.)

JOB(name-list...)
specifies a list of job names that are to be selected for further processing. JOB applies to PROCESS records only. If you omit both the JOB and NOJOB operands, the RACF report writer selects all records containing job names. (See Note 1 on page 138)

NOJOB
specifies that records that contain job names are not to be selected for further processing. If you omit both the JOB and NOJOB operands, the RACF report writer selects all records containing job names. If you specify both the NOUSER and NOJOB operands, the RACF report writer ignores both operands. (See Note 1 on page 138)

OWNER(name-list...)
specifies a list of resource owner names that are to be selected for further processing. OWNER applies to PROCESS records only. If you omit both the OWNER and NOOWNER operands, owner is not a selection criterion.

NOOWNER
specifies that records that contain resource owner names are not to be selected for further processing. If you omit both the OWNER and NOOWNER operands, owner is not a selection criterion.

GROUP(name-list...)
specifies a list of group names that are to be selected for further processing. GROUP applies to PROCESS records only. (See Note 1 on page 138)

STEP(name-list...)
specifies a list of step names that are to be selected for further processing. STEP applies to PROCESS records only. (See Note 1 on page 138)

STATUS
specifies that only STATUS records are to be selected for further processing. STATUS records are RACF SMF record types 80 (generated by the SETROPTS or RVARY command) and 81.
PROCESS
specifies that only SMF record types 20, 30, 80, and 83 are to be selected for further processing.

SYSID(value-list...)
specifies a list of system identifiers that are to be selected for further processing.

AUTHORITY(type...)
specifies a list of authority types that are to be selected for further processing. AUTHORITY applies to PROCESS records only. Type can be any of the following:

SPECIAL
Selects records produced because the user had the SPECIAL or group-SPECIAL attribute

OPERATIONS
Selects records produced when access was granted because the user had the OPERATIONS or group-OPERATIONS attribute

AUDITOR
Selects records produced because the user had the AUDITOR or group-AUDITOR attribute

EXIT
Selects records produced when access was granted by an installation-wide exit routine

NORMAL
Selects records produced when access was granted for a reason other than those already listed (for example, when the user had sufficient access authority)

FAILSOFT
Selects records produced when failsoft processing was in effect

BYPASSED
Selects records produced because of accesses in which RACF authority checking was bypassed because BYPASS was specified on the user ID

TRUSTED
Selects records produced when access was granted because the user had the trusted attribute.

REASON(value...)
specifies the reasons for logging the records that are to be selected for further processing. The REASON operand applies to PROCESS records only. Its value can be any of the following:

CLASS
Selects records produced because auditing of profile changes was in effect for a particular class. This record was produced because SETROPTS AUDIT was in effect.

USER
Selects records produced because auditing was in effect for the specific users. This record was produced because UAUDIT was specified for the user.

SPECIAL
Selects records produced because:

- SETROPTS SAUDIT is in effect, which produces records for RACF commands requiring SPECIAL or group-SPECIAL authority.
SETROPTS OPERAUDIT is in effect, which produces records for resource accesses requiring OPERATIONS or group-OPERATIONS authority.

If both SAUDIT and OPERAUDIT are in effect, records for both are selected. If neither one is in effect, no records are selected.

RESOURCE
Selects records produced because auditing was in effect for the specific resource or because a RACHECK installation-wide exit routine requested auditing. (See Note 3 on page 139.)

RACINIT
Selects records produced by a RACINIT request.

COMMAND
Selects records produced by commands that are always logged.

CMDVIOL
Selects records produced because auditing of command violations was in effect. This record was produced because SETROPTS CMDVIOL was in effect.

AUDITOR
Selects records produced because auditing of the specific resource was in effect. This record was produced because GLOBALAUDIT was specified in the profile. (See Note 3 on page 139.)

SECAUDIT
Selects records produced because auditing of resources according to SECLEVEL was in effect. This record was produced because SETROPTS SECLEVELAUDIT was in effect.

VMAUDIT
Selects records produced because auditing of specific z/VM events was in effect. This record has meaning only if you are sharing a database with a z/VM system.

SECLABELAUDIT
Selects records produced because auditing of resources according to security label was in effect.

LOGOPTIONS
Selects records produced because LOGOPTIONS auditing was in effect for a particular class.

COMPATMODE
Selects records produced because SETROPTS COMPATMODE was in effect.

APPLAUDIT
Selects records produced because SETROPTS APPLAUDIT was in effect.

TERMINAL(name-list...)
specifies a list of terminal IDs that are to be selected for further processing. TERMINAL applies to PROCESS records only.

Notes:
1. Users who are not defined to RACF do not have a RACF user ID. Furthermore, they cannot connect to RACF. For this reason, the RACF SMF records associated with these MVS users contain the job name in place of the user ID and the step name in place of the group name.
Specifying SELECT USER(USERA) selects records for USERA as well as all records that have a job name in place of a user ID. If records for USERA only are desired, specify:

```
SELECT USER(USERA) NOJOB
```

Similarly, specifying SELECT GROUP(GROUPA) selects records for GROUPA, as well as records that have a step name in place of a group name. If records for GROUPA only are desired, specify:

```
SELECT GROUP(GROUPA) STEP(any-name)
```

There is no NOSTEP parameter.

2. If the user name is available in the relocate section of SMF record type 80, RACF includes it in both the PROCESS records listing and the SUMMARY reports.

3. The RACF report writer can select a record because of either RESOURCE or AUDITOR or both RESOURCE and AUDITOR.

**EVENT subcommand**

The EVENT subcommand allows you to specify selection criteria related to particular RACF events. For a record to be selected for further processing by the RACF report writer, it must satisfy all the selection criteria that you specify on this EVENT subcommand.

You can use the EVENT subcommand only with a SELECT subcommand in a SELECT/EVENT group. With the EVENT subcommand, you can create a subset of the records that have already met the selection criteria specified on the SELECT subcommand. ("SELECT subcommand" on page 132 describes SELECT/EVENT groups in more detail.)

The EVENT subcommand applies to PROCESS records only.

Keep in mind that the report is compiled by the number of records processed, which is determined by the SELECT subcommand, not just the records listed, which is determined by the EVENT subcommand. Therefore, it's possible for a report to have record totals in it that do not match the number of records for which you've set the criteria. The report totals will list all the records it processed in creating the report.
The syntax of the EVENT subcommand:

```
[EVENT] event-name
[EV ]
  [EVQUAL(value-list...)]
  [CLASS(name-list...)]
  [NAME(name-list...)]
  [DSQUAL(name-list...)]
  [INTENT([ALTER] [CONTROL] [UPDATE]]
   [READ] [NONE]
  )
  [ALLOWED([ALTER] [CONTROL] [UPDATE]]
   [READ] [NONE]
  )
  [NEWNAME(name-list...)]
  [NEWDQUAL(name-list...)]
  [begin-number:end-number]
  [LEVEL({ } )]
  [number-list...]
```

**event-name**

specifies one of the following valid event names:

- **LOGON**  TSO logon or batch job initiation
- **ACCESS**  Access to a RACF-protected resource
- **ADDVOL**  Add a volume to a multivolume data set or tape volume set
- **RENAME**  Rename a data set, SFS file, or SFS directory
- **DELETE**  Delete a resource
- **DELVOL**  Delete one volume of a multivolume data set or tape volume set
- **DEFINE**  Define a resource
- **ALLSVC**  All of the preceding functions (ACCESS, ADDVOL, RENAME, DELETE, DELVOL, and DEFINE)
- **ADDSD**  ADDSD command
- **ADDGROUP**  ADDGROUP command
- **ADDUSER**  ADDUSER command
- **ALTDSD**  ALTDSD command
- **ALTGROUP**  ALTGROUP command
- **ALTUSER**  ALTUSER command
- **CONNECT**  CONNECT command
- **DELDSD**  DELDSD command
- **DELGROUP**  DELGROUP command
- **DELUSER**  DELUSER command
- **PASSWORD**  PASSWORD command
- **PERMIT**  PERMIT command
- **RALTER**  RALTER command
- **RDEFINE**  RDEFINE command
- **RDELETE**  RDELETE command
- **REMOVE**  REMOVE command
- **RVARY**  RVARY command
- **SETROPTS**  SETROPTS command
ALLCOMMAND
All of the preceding RACF commands (ADDSD through SETROPTS)
APPCLU
Partner LU verification through use of APPCLU profile.
GENERAL
General purpose auditing

Not all of the EVENT subcommand operands are valid with certain event names.

EVQUAL(value-list...)
specifies a list of event qualifiers to be selected.

CLASS(class-name...)
specifies a list of resource class names to be selected. Only the DATASET class and class names found in the class descriptor table are valid.

NAME(name-list...)
specifies a list of resource names to be selected. In the NAME field, you must specify a fully qualified data set name, not a profile name for RACF SVC events (ACCESS, ADDVOL, RENAME, DELETE, DELVOL, DEFINE, ALLSVC). On the other hand, you must specify a profile name, not a fully qualified data set name, in the NAME field for RACF command events (ADDSD, ALTDS, DLDSD, PERMIT, RALTER, RDEFINE, RDELETE, ALLCOMMAND).

To select specific data sets, you must specify fully qualified dataset names in the ‘name-list’. Also, if a dataset has been renamed and you want to use this operand to select the old dataset name, you must specify the fully qualified, old data set name in the ‘name-list’. This operand is not valid with the LOGON event name. You can specify generic names if you are looking for commands issued against that profile.

DSQUAL(name-list...)
specifies a list of dataset qualifiers to be selected. Valid dataset qualifiers are any user IDs or group names used as the high-level qualifier of a dataset name or any qualifiers supplied by the ICHRSMFE installation-wide exit routine. If a data set has been renamed and you want to use this operand to select the old dataset name, you must specify the qualifier of the old dataset name in the ‘name-list’.

To obtain records that are pertinent solely to the dataset class, you must also specify CLASS(DATASET); otherwise, you receive records for all valid classes.

INTENT
specifies a list of intended access authorities to be selected. An intended access authority is the minimum authority needed by a user to access a particular resource (not the actual authority held by the user). The valid intended access authorities are ALTER, CONTROL, UPDATE, READ, and NONE. The INTENT operand is valid only with the ACCESS event name.

ALLOWED
specifies a list of allowed access authorities to be selected. An allowed access authority is the actual authority held by the user requesting access to a particular resource (not the minimum authority needed by the user to access that resource). The valid, allowed access authorities are ALTER, CONTROL, UPDATE, READ, and NONE. The ALLOWED operand is valid only with either the ACCESS or the ADDVOL event names.

NEWNAME(name-list...)
specifies a list of new, fully qualified resource names to be selected. This operand is valid only with the RENAME event name.
NEWDSQUAL(name-list...)  
  specifies a list of qualifiers for new dataset or generic names to be selected.  
  Valid qualifiers are any user IDs or group names used as the high-level qualifier  
  of a dataset name or any qualifiers supplied by the ICHRSMFE installation-wide  
  exit routine. This operand is valid only with the RENAME event name.

LEVEL(begin-number:end-number) or LEVEL(number-list)  
  specifies a range (in ascending order) or a list of resource levels to be selected.  
  The meaning of the level indicator is set by your installation with the ADDSD,  
  ALTDSD, RDEFINE, and RALTER commands. See z/OS Security Server RACF  
  Command Language Reference for more information about the LEVEL operand.

**LIST subcommand**

The LIST subcommand formats and prints a listing of each individual RACF SMF  
record (both PROCESS and STATUS) that passes the selection criteria specified on  
the SELECT and EVENT subcommands. On the LIST subcommand, you can  
specify the title, sort sequence, and format control for the listing. The RACF report  
writer processes only one LIST subcommand at a time; if you enter more than one,  
the RACF report writer recognizes only the last LIST subcommand that you have  
entered. (The RACF report writer does all processing after you enter the END  
command.)

If you want to execute a LIST subcommand more than once to produce your  
reports, you must run the report writer each time. If you use the same selection  
criteria for each LIST subcommand you run, use the SAVE operand on RACFRW to  
specify the work-data set that is to contain the selected, reformatted SMF records.  
In this way, you can avoid unnecessary processing each time you run the report  
writer.

---

The syntax of the LIST subcommand:

```
{LIST} [TITLE('q-string')]
[ L ]

[SORT( [DATE] [TIME] [SYSID] ]
[ [ USER] [GROUP] [EVENT] ]
[ [ EVQUAL] [TYPE] [NAME] ]
[ [ CLASS] [TERMINAL] [JOBID] ]
[ [ OWNER] [SECLABEL] ]
[ [APPLAUDIT]] ]

[ {ASCEND} ]
[ {DESCEND}] ]

[NEWPAGE]
```

**TITLE('q-string')**

specifies a string of up to 132 characters, enclosed in single quotation marks, to  
be used as the heading for each page of this particular listing. If you omit this  
operand but specify a default heading in the TITLE operand of the RACFRW  
command, the default heading appears on each page of the listing. If you omit  
both this operand and the RACFRW TITLE operand, no heading at all appears  
on the listing.

**SORT(field-list)**

specifies the fields of the input record (a reformatted RACF SMF record) that  
are to be used for sorting. If you specify the LIST subcommand without  
specifying the SORT operand, the RACF report writer sorts the records by
RCDTYPE, at offset 5(5) in the reformatted SMF record, with STATUS records preceding PROCESS records. If you specify SORT operand values, the records are then further sorted within the STATUS and PROCESS groups by the fields that you specify on the SORT operand.

The sequence in which you specify the SORT operands determines the sequence in which the RACF report writer sorts the records. For example, specifying SORT(OWNER GROUP USER DATE TIME) causes the RACF report writer to sort according to the profile owner first, then the group name, then the user name. If you omit the SORT operand, the order in which the records were written to SMF is not necessarily the order in which the records appear in the output listing, unless you have specified EQUALS in the SORTEQU field of the installation-replaceable module (ICHRSMFI).

The following table describes the operands you can use to select a sort sequence. Even though these operands apply only to process records, specifying them does not affect the order of status records.

<table>
<thead>
<tr>
<th>OPERAND</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATE</td>
<td>Julian date (YYDDDF) that the job entered the system</td>
</tr>
<tr>
<td>TIME</td>
<td>Time of day (HHMMSSTH)</td>
</tr>
<tr>
<td>SYSID</td>
<td>System identifier</td>
</tr>
<tr>
<td>USER</td>
<td>User (job) names</td>
</tr>
<tr>
<td>GROUP</td>
<td>Group (step) names</td>
</tr>
<tr>
<td>EVENT</td>
<td>Security-event codes</td>
</tr>
<tr>
<td>EVQUAL</td>
<td>Security-event code qualifiers</td>
</tr>
<tr>
<td>TYPE</td>
<td>Event types: 1 = JOB/LOGON events 2 = SVC events 3 = command events</td>
</tr>
<tr>
<td>NAME</td>
<td>Names of resources within event types: user ID for JOB/LOGON events RESOURCE NAME for SVC and command events</td>
</tr>
<tr>
<td>CLASS</td>
<td>Resource class names</td>
</tr>
<tr>
<td>TERMINAL</td>
<td>Terminal ID</td>
</tr>
<tr>
<td>JOBID</td>
<td>Job ID from SMF job management record</td>
</tr>
<tr>
<td>OWNER</td>
<td>Owner of the resource</td>
</tr>
<tr>
<td>SECLABEL</td>
<td>Security label</td>
</tr>
<tr>
<td>APPLAUDIT</td>
<td>APPLAUDIT key 8-byte key linking records of APPC/MVS transactions</td>
</tr>
</tbody>
</table>

**ASCEND**

specifies that the fields identified by the DATE and TIME operands are to be sorted in ascending order. If you omit the DATE and TIME operands, this operand is ignored.

ASCEND is the default value.

**DESCEND**

specifies that the fields identified by the DATE and TIME operands are to be sorted in descending order. If you omit both the DATE and TIME operands, this operand is ignored.

**NEWPAGE**

specifies that the listing is to start printing on a new page whenever the value in the major (first) sort field changes. If you omit the SORT operand, this operand is ignored.
**SUMMARY subcommand**

The SUMMARY subcommand causes the RACF report writer to format and print reports that summarize the information in the RACF SMF records that meet the selection criteria on the SELECT and EVENT subcommands.

Using the SUMMARY subcommand, you can request reports that summarize the following:
- Group activity
- User activity
- Resource activity
- Security-event activity
- RACF command activity
- Owner activity
- Group activity broken down by resource
- User activity broken down by resource
- Resource activity broken down by user
- Resource activity broken down by group
- Resource activity broken down by security event
- Security event activity broken down by resource
- RACF command activity broken down by user
- RACF command activity broken down by group
- RACF command activity broken down by resource
- Owner activity broken down by resource.

On a SUMMARY subcommand, you can specify only one of the activities mentioned in the preceding list. You can, however, enter as many as 16 different SUMMARY subcommands for each RACFRW command. You can thus request reports of all possible activities in one run of the RACF report writer. (Note that, if you accidentally enter more than one SUMMARY subcommand for the same type of activity, it does not cause an error; the RACF report writer recognizes only the last one.) The order in which you enter the SUMMARY subcommands is the order in which the summary reports are printed.

---

**The syntax of the SUMMARY subcommand:**

```
{SUMMARY} name1 [BY(name2)]
{SUM }

[ {VIOLATIONS} ]
[ {SUCCESSES } ]
[ {WARNINGS } ]

[NEWPAGE]
[TITLE('q-string')]
```

*name1*
specifies the major field on which information is to be grouped and summarized. The valid values for name1 are: GROUP, USER, RESOURCE, EVENT, COMMAND, and OWNER.

*BY(name2)*
specifies a minor field within the major field on which information is to be grouped and summarized also. The valid values for name2 are: GROUP, USER, RESOURCE, and EVENT.
Note: Only the following single name and name1 [BY(name2)] combinations are valid:

- GROUP RESOURCE BY(USER)
- USER RESOURCE BY(GROUP)
- RESOURCE RESOURCE BY(EVENT)
- EVENT EVENT BY(RESOURCE)
- COMMAND COMMAND BY(USER)
- OWNER COMMAND BY(RESOURCE)
- GROUP BY(RESOURCE) COMMAND BY(GROUP)
- USER BY(RESOURCE) OWNER BY(RESOURCE)

VIOLATIONS specifies that only information about access violations is to be included in the summary.

SUCCESSES specifies that only information about successful access attempts is to be included in the summary. If you omit VIOLATIONS, SUCCESSES, and WARNING, the summary includes information for both access violations and successful access attempts.

WARNINGS specifies that only accesses that were successful only because WARNING mode was in effect are to be included in the summary. The information appears under the WARNINGS heading.

If you do not specify VIOLATIONS, SUCCESSES, or WARNINGS, the report summarizes all access attempts.

NEWPAGE specifies that the summary report is to start printing on a new page whenever the value in name1 changes. NEWPAGE is valid only when BY(name2) is specified.

TITLE('q-string') specifies a string of up to 132 characters, enclosed in single quotation marks, to be used as the heading for each page of this particular summary report. If you omit this operand but specify a default heading in the TITLE operand of the RACFRW command, the default heading appears on each page of the summary report. If you omit both this operand and the RACFRW TITLE operand, no heading at all appears on the summary report.

END subcommand
The END subcommand terminates subcommand mode. All report-generation processing is done after you enter the END subcommand.

The syntax of the END subcommand:

```
END
```
Using the RACF report writer

Because of variations from one installation to another, it is not possible to identify all of the ways an auditor might use the RACF report writer. The following list, however, identifies some possibilities:

- "Monitoring password violation levels" on page 146
- "Monitoring access attempts in WARNING mode" on page 147
- "Monitoring access violations" on page 148
- "Monitoring the use of RACF commands" on page 148
- "Monitoring specific users" on page 149
- "Monitoring SPECIAL users" on page 149
- "Monitoring OPERATIONS users" on page 150
- "Monitoring failed accesses to resources protected by a security level" on page 150
- "Monitoring accesses to resources protected by a security label" on page 151

The following detailed descriptions of these tasks include brief examples of the report writer command and subcommands needed for each. (In the examples, lower case entries can be modified to suit the needs of your installation.) For sample reports, see "Sample reports" on page 154.

Monitoring password violation levels

Monitoring password violation levels enables you to:

- Determine how effectively new RACF users are coping with the LOGON process
- Determine if the number of password violations stabilizes over time
- Determine where (at which terminals) these password violations are occurring.

To obtain a report that describes password violations, you can use the following command and subcommands:

```
RACFRW GENSUM...
SELECT PROCESS
EVENT LOGON EVQUAL(1)
LIST ...
END
```

Results

These subcommands create a general summary report and a listing of the selected process records. (See Figure 34 and Figure 36 for samples of the general summary report and listings of selected process records.)

The total number of job or logon violations in the general summary report includes all types of violations (invalid password, invalid group, invalid OIDCARD, and invalid terminal). Because the EVENT subcommand causes the RACF report writer to select only those process records that describe an invalid password, you can use the number of process records selected to determine the percentage of password violations. If, for example, the number of process records selected is 13 and the total number of job or logon attempts is 393, you can compute the percentage of password violations by dividing 13 by 393. In this particular example, the value is 3.3%.

The violation percentage is a useful number to record and track over time. As users become more familiar with using their user ID and password, this percentage should tend to stabilize at a relatively low level.
You can look at the terminal name in the listing of process records to determine where persistent violations are originating. The records selected are record types 20, 30, and 80 (process records) with an event code of 1 for job initiation or TSO logon. (See Figure 33 on page 156 for a list of RACF events and their qualifiers.)

**Monitoring access attempts in WARNING mode**

Your installation may choose to use warning mode during the initial implementation of RACF. During this period, resource profiles contain a warning indicator (specified when the owner creates or later changes the profile). When the warning indicator is set, RACF allows all requesters to access the resource, and, if the requester would not otherwise be allowed access, RACF sends a message to the requester. Logging occurs at the owner-specified access type and level.

If the owner of a resource has specified in the profile one of the following:

- `AUDIT(FAILURE(READ))`
- `AUDIT(ALL(READ))` (or the defaults for these are in effect)

or if you, as auditor, specify one of the following:

- `GLOBALAUDIT (FAILURE(READ))`
- `GLOBALAUDIT (ALL(READ))`

RACF logs each access to the resource, and you can use the RACF report writer to provide a list of the accesses RACF allowed only because the warning indicator was set.

Using the warning indicator can help your installation to migrate gradually to RACF. Checking the requesters and resources in the report-writer listing can enable you to develop access lists without disrupting authorized work and without the immediate need to write and test a RACF exit routine.

As the auditor, however, you must be aware that if your installation sets the warning indicator in a resource profile any requester can access the resource. You should verify that the profile for a highly classified resource (such as payroll or business-planning data) does not contain the warning indicator.

To obtain a list of the profiles in a particular class that have the warning indicator set, you can issue the RACF SEARCH command with the WARNING operand:

```
SEARCH CLASS(class-name) WARNING
```

For example, to list the profiles in the TERMINAL class that contain the warning indicator, enter:

```
SEARCH CLASS(TERMINAL) WARNING
```

To obtain a report of accesses granted only because the warning indicator was set, you can use the following command and subcommands:

```
RACFRW ...
SELECT PROCESS WARNINGS
LIST ...
END
```

**Results**

These subcommands produce a listing of the selected process records. The records selected are those that contain an event code of 2 for resource access and a qualifier from the following table.

<table>
<thead>
<tr>
<th>EVENT NUMBER</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Warning issued because of access.</td>
</tr>
</tbody>
</table>
Warning issued because of PROTECTALL.

Warning issued because of missing security label from job, user, or profile.

Warning issued because of insufficient security label authority.

Warning issued because data set is not catalogued.

Warning issued because of insufficient CATEGORY/SECLLEVEL.

The WARNING indicator is also set in records for the following events: LOGON, RENAME, DEFINE.

Monitoring access violations

When warning mode is in effect, and during normal operation of RACF, it is essential to your job as an auditor that you be able to monitor access violations. RACF detects and logs an access violation when it denies a user access to a resource because that user is not authorized to access the resource. An access violation is, therefore, a symptom that someone either does not understand his or her role as a RACF user or is trying to bypass RACF protection. You can use a report of access violations to identify such users as well as to help your installation identify when it may need to change access lists or universal access codes (UACCs).

You can request the report for data set violations as well as for violations in any of the classes identified in the class descriptor table.

To obtain an access violation report, you can use the following command and subcommands with the resource classes for which you want information:

RACFRW ...
LIST ...
SELECT PROCESS
  EVENT ACCESS EVQUAL(1) CLASS(a valid resource class,...,
      a valid resource class)
  EVENT LOGON EVQUAL(4)
END

Results

These subcommands create a listing of all process records that meet the criteria set in the EVENT subcommands. The EVENT ACCESS subcommand selects all process records that contain access violations for the specified classes (an event code of 2 and an event qualifier of 1). The EVENT LOGON subcommand expands the scope of the report to include all user attempts to log on from a terminal or console the user is not authorized to use (an event code of 1 and an event qualifier of 4).

Monitoring the use of RACF commands

In any installation, the security administrator is probably the most frequent user of RACF commands. Occasionally, users without any privileged attributes may enter ADDSD, PERMIT, or RDEFINE, or another, similar command against one of their resources; however, some users may try to use the whole range of RACF commands. Unless the user is authorized, RACF does not execute the command. Each unauthorized attempt to use a RACF command, however, represents a potential security violation, an event that you should know about. You monitor the use of commands with the command-summary report.
To obtain a command-summary report, you can use the following command and subcommand:

```
RACFRW ...
  SUMMARY COMMAND BY (USER)
END
```

A sample command-by-user summary report appears in Figure 49 on page 171.

If you detect certain users making persistent, unauthorized use of RACF commands, you can extract the details of the commands used and the resources involved. To obtain details of any command violations logged for specific users, use the following command and subcommands:

```
RACFRW ...
SELECT VIOLATIONS USER(userid(s) ...) 
LIST ... 
END 
```

Where `userid(s)` is the ID of the user making unauthorized use of RACF commands. Note that RACF does not automatically log the events that these reports describe. To obtain meaningful data, you must direct RACF to log the activities of specific users or command violations or both. The reports are useful only after RACF has logged the events for the time interval that is meaningful to you. See Monitoring specific users, Monitoring SPECIAL users, and Monitoring OPERATIONS users for related information.

**Monitoring specific users**

If you have directed RACF, either through the UAUDIT operand on the ALTUSER command or the corresponding ISPF panel, to log the RACF-related activities of one or more specific users, you can use the report writer to obtain a listing of the activities of these users.

To obtain a listing of all records RACF has logged because you requested auditing of one or more specific users, you can use the following command and subcommands:

```
RACFRW ...
SELECT PROCESS REASON(USER) ...
LIST ...
END 
```

**Monitoring SPECIAL users**

If you have directed RACF, either through the SAUDIT operand on the SETROPTS command or the corresponding ISPF panel, to log the RACF-related activities of SPECIAL or group-SPECIAL users, you can use the report writer to obtain a listing of the activities of these users.

To obtain a listing of all records RACF has logged because you requested auditing of SPECIAL or group-SPECIAL users or because the command required the SPECIAL or group-SPECIAL attribute and the user had it, you can use the following command and subcommands:

```
RACFRW ...
SELECT PROCESS AUTHORITY(SPECIAL) 
LIST ...
END 
```
Monitoring OPERATIONS users

The OPERATIONS and group-OPERATIONS attributes are very powerful. OPERATIONS allows a user access to almost all resources. Group-OPERATIONS allows a user access to almost all resources within the scope of the group and its subgroups. (The only resources not accessible to the OPERATIONS or group-OPERATIONS user are those that have been explicitly barred by placing the OPERATIONS user in the access list of a resource with an access level of NONE at either the user ID level or the group level.) Therefore, you should carefully monitor the activities of these users to ensure that all accesses to installation resources are for valid reasons.

To obtain a report of the activities of OPERATIONS and group-OPERATIONS users, you can use the following command and subcommand:

```
RACFRW ...
LIST ...
  SELECT PROCESS AUTHORITY(OPERATIONS)
END
```

**Note:** RACF logs the activities of users with the OPERATIONS and group-OPERATIONS attributes if the following are true:

- The SETROPTS OPERAUDIT is in effect.
- The access to the resource was successful because the user had the OPERATIONS or group-OPERATIONS attribute.

Monitoring failed accesses to resources protected by a security level

If you have directed RACF, through the SECLEVELAUDIT operand on the SETROPTS command or on the corresponding ISPF panel, to log accesses to resources that are protected by a security level, you can use the report writer to obtain a listing of any access attempts that have failed because the user did not have the sufficient security classification to access the resource.

When security-level auditing is in effect, RACF logs all attempts to access any resource protected by a given security level (such as “confidential”) or higher. Therefore, you can create a report to list access violations to those protected resources and determine which users are attempting to access sensitive information at your installation.

To obtain a report of unauthorized access attempts to resources with a security-level classification, you can use the following command and subcommands:

```
RACFRW
  SELECT PROCESS REASON(SECAUDIT)
    EVENT ACCESS EVQUAL(6) CLASS(a valid resource class,..., a valid resource class)
LIST
END
```

**Result**

These subcommands create a listing of all process records that have been logged because security-level auditing was in effect (REASON(SECAUDIT)) and meet the criteria set in the EVENT ACCESS subcommand (event code 2). The EVENT subcommand selects all failed attempts (event qualifier 6) to access any resource within the resource class that has a security level equal to or higher than the level specified on the SECLEVELAUDIT operand of the SETROPTS command or on the corresponding ISPF panel.
Monitoring accesses to resources protected by a security label

If you have directed RACF, through the SECLABELAUDIT operand on the SETROPTS command or on the corresponding ISPF panel, to log accesses to resources that are protected by a security label according to the audit options in the SECLABEL profile, you can use the report writer to obtain a listing of all attempts to access the resource.

When the SECLABELAUDIT option is in effect, RACF logs accesses to resources by SECLABEL. Therefore, you can create a report to list attempts to access those protected resources and determine which users are attempting to access sensitive information at your installation.

To obtain a report of attempts to access resources with a security label, you can use the following command and subcommands:

```
RACFRW
  SELECT PROCESS REASON(SECLABELAUDIT)
    EVENT ACCESS
  LIST
END
```

Result
These subcommands create a listing of all process records that have been logged because the security-label auditing option was in effect (REASON(SECLABELAUDIT)) and meet the criteria set in the EVENT subcommand ACCESS (event code 2).

RACF report writer examples

This section gives some examples of how to use the RACF report writer command and subcommands to produce various reports.

The first five examples show how to obtain single reports; however, to create all the reports that you require at your installation, you may need to execute the RACF report writer more than once.

An execution of the RACF report writer consists of the RACFRW command, report definition subcommands, and the END subcommand. Example 5 shows how the report writer executed a series of subcommands to produce multiple reports that you did not intend to produce; example 6 shows how you can correct the subcommands to produce the number of reports you want.

Example 1—Obtaining a report for all RACF SMF records
To obtain a report of all RACF SMF records, listed in the order read from the input file, and a general summary report, showing overall RACF-related system activity, enter:

```
RACFRW TITLE('BIG LISTING') GENSUM
  LIST
END
```

Example 2—Obtaining a report for all MVS jobs run by users not defined to RACF
To obtain a report of all batch jobs that are not associated with RACF or a RACF-defined user, or all jobs run by TSO users, or started tasks not defined to RACF, enter:

```
RACFRW
```
SELECT NOUSER PROCESS
LIST TITLE('JOB LIST REPORT') SORT(USER) NEWPAGE

In the example, RACF selects only those process records that meet the criteria and
sorts by job name.

To obtain a summary of these jobs, enter:

    SUMMARY RESOURCE TITLE('JOB SUMMARY REPORT')
    END

Example 3—Obtaining a report for data set violations

To obtain a report of all violations against data sets owned by USERA (USERA is
the high-level qualifier of the data-set name) in January 1989, sorted in date and
time sequence, enter:

    RACFRW TITLE('USERA DATASETS LIST REPORT')
    SELECT VIOLATIONS DATE(89001:89031)
    EVENT ALLSVC CLASS(DATASET) DSQUAL(USERA)
    EVENT ALLCOMMAND CLASS(DATASET) DSQUAL(USERA)
    LIST SORT(DATE TIME)

To obtain a summary of this activity, enter:

    SUMMARY RESOURCE BY(USER) TITLE('USERA DATA SETS SUMMARY
    REPORT')

Example 4—Obtaining a report for data set activity by job, system, and
user

To obtain a report on data set activity by (a) jobs A and B on system 308A and (b)
users C and D on system 308B, enter:

    RACFRW
    SELECT JOB(A B) NOUSER SYSID(308A)
    EVENT ALLSVC CLASS(DATASET)
    EVENT ALLCOMMAND CLASS(DATASET)
    SELECT USER(C D) NOJOB SYSID(308B)
    EVENT ALLSVC CLASS(DATASET)
    EVENT ALLCOMMAND CLASS(DATASET)
    LIST TITLE('SELECTED DATA SET ACTIVITY REPORT') SORT(SYSID)
    END

Example 5—Obtaining multiple reports the wrong way

Situation
Assume you need to produce the following separate reports:
- A detailed listing of all access violations, sorted by user
- A resource-by-user summary report, with totals for access violations only
- A listing of all successful accesses, sorted by date and time
- A resource-by-user summary report, with totals for successful accesses only.

You must produce these four separate reports because each report is to be
distributed to four different people, each of whom is entitled to see only the
information on one report.

Assume that you enter:

(1) RACFRW
(2) SELECT VIOLATIONS
(3) LIST TITLE('ACCESS VIOLATIONS LIST REPORT') SORT(USER)
Result
Instead of receiving the four desired reports, you receive two reports:

- A list report of all violations and successes, sorted by date and time
- A summary report of resources-by-user, with both violations and successful accesses.

How RACF executed
Here is what happened:

- **RACF record selection**
  You intended to first select, list, and summarize only violations from the SMF input file (statements 2, 3, and 4). Second, you wanted to select, list, and summarize only successful accesses (statements 5, 6, and 7), and finally, you wanted to produce two summary reports, one for access violations and one for access successes (statements 4 and 7).
  However, the RACF report writer does not execute in that sequence. RACF first selects records based on all the SELECT and EVENT subcommands entered between the RACFRW command and the END subcommand. Only after this selection process is complete are any of the requested reports produced. In this example, the RACF report writer checked each record from the input file to see whether it was either an access violation (statement 2) or a successful access (statement 5). Because all of the SMF records met at least one of these conditions, the RACF report writer selected all of the records for further processing.

- **RACF LIST function**
  The RACF report writer next produced a single list report (statement 6). RACF ignored the first LIST subcommand (statement 3) because only one LIST subcommand, the last one entered (statement 6), is valid for each execution of the RACF report writer. The report that was produced listed by date and time all the records selected (both access violations and successful accesses) as specified in statement 6.

- **RACF SUMMARY report**
  Next, the RACF report writer produced a single summary report (statement 7). Because the SUMMARY subcommand in statement 4 is the same as that in statement 7, RACF ignored the first SUMMARY subcommand and produced one summary report. If you enter identical SUMMARY subcommands between RACFRW and END, RACF only uses the last subcommand and produces one summary report.
  Thus, the single summary report for this example produced totals for all the records selected (both access violations and successful accesses).

**Example 6—Obtaining multiple reports the right way**
To produce the four listings that you intended, enter two separate RACFRW commands:

1. RACFRW
   SELECT VIOLATIONS
   ...
LIST TITLE('ACCESS VIOLATIONS LIST REPORT') SORT(USER) SUMMARY RESOURCE BY(USER) TITLE('ACCESS VIOLATIONS SUMMARY REPORT') END

(2) RACFRW SELECT SUCCESSES
LIST TITLE('ACCESS SUCCESS LIST REPORT') SORT(DATE TIME) SUMMARY RESOURCE BY(USER) TITLE('ACCESS SUCCESS SUMMARY REPORT') END

Note: RACF interprets each RACFRW command separately and produces the four reports. To be sure you get the reports you want:

1. If you want to store the results in a GDG data set, use DISP=MOD on your JCL to prevent the results of the second RACFRW operation from writing over the results of the first.

2. After the first SELECT/LIST/SUMMARY subcommands (for RACFRW in statement 1), be sure to enter END.

3. Run the RACFRW command again (statement 2) for the second SELECT/LIST/SUMMARY subcommands and enter END.

Sample reports

This section includes examples of the various reports that you can request the RACF report writer to generate. Review each sample report to determine its usefulness to your particular installation.

The following list summarizes the sample reports and the command or subcommand you issue to request the report:

<table>
<thead>
<tr>
<th>Figure</th>
<th>Report</th>
<th>Command/Subcommand Issued</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-11</td>
<td>Summary Activity Report</td>
<td>From SMF</td>
</tr>
<tr>
<td>4-12</td>
<td>Standard Header Page</td>
<td>Each time you invoke the RACF report writer, it produces a standard header page that lists the subcommands that you entered and describes the meanings of the event and event qualifier values used in the reports.</td>
</tr>
<tr>
<td>4-13</td>
<td>General Summary</td>
<td>RACFRW GENSUM</td>
</tr>
<tr>
<td>4-14</td>
<td>Listing of Status Records (types 80 and 81)</td>
<td>LIST (see Note)</td>
</tr>
<tr>
<td>4-15</td>
<td>Listing of Process Records (types 20, 30, 80 and 83)</td>
<td>LIST (see Note)</td>
</tr>
<tr>
<td>4-16</td>
<td>Short User Summary</td>
<td>SUMMARY USER</td>
</tr>
<tr>
<td>4-17</td>
<td>Short Group Summary</td>
<td>SUMMARY GROUP</td>
</tr>
<tr>
<td>4-18</td>
<td>Short Resource Summary</td>
<td>SUMMARY RESOURCE</td>
</tr>
<tr>
<td>4-19</td>
<td>Short Command Summary</td>
<td>SUMMARY COMMAND</td>
</tr>
<tr>
<td>4-20</td>
<td>Short Event Summary</td>
<td>SUMMARY EVENT</td>
</tr>
<tr>
<td>4-21</td>
<td>Short Owner Summary</td>
<td>SUMMARY OWNER</td>
</tr>
<tr>
<td>4-22</td>
<td>User by Resource Summary</td>
<td>SUMMARY USER BY(RESOURCE)</td>
</tr>
<tr>
<td>4-23</td>
<td>Group by Resource Summary</td>
<td>SUMMARY GROUP BY(RESOURCE)</td>
</tr>
<tr>
<td>4-24</td>
<td>Resource by User Summary</td>
<td>SUMMARY RESOURCE BY(USER)</td>
</tr>
<tr>
<td>4-25</td>
<td>Resource by Group Summary</td>
<td>SUMMARY RESOURCE BY(GROUP)</td>
</tr>
<tr>
<td>4-26</td>
<td>Resource by Event Summary</td>
<td>SUMMARY RESOURCE BY(EVENT)</td>
</tr>
<tr>
<td>Figure</td>
<td>Report</td>
<td>Command/Subcommand Issued</td>
</tr>
<tr>
<td>--------</td>
<td>---------------------------------------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>4-30</td>
<td>Event by Resource Summary</td>
<td>SUMMARY EVENT BY(RESOURCE)</td>
</tr>
<tr>
<td>4-28</td>
<td>Command by User Summary</td>
<td>SUMMARY COMMAND BY(USER)</td>
</tr>
<tr>
<td>4-29</td>
<td>Command by Group Summary</td>
<td>SUMMARY COMMAND BY(GROUP)</td>
</tr>
<tr>
<td>4-30</td>
<td>Command by Resource Summary</td>
<td>SUMMARY COMMAND BY(RESOURCE)</td>
</tr>
<tr>
<td>4-31</td>
<td>Owner by Resource Summary</td>
<td>SUMMARY OWNER BY(RESOURCE)</td>
</tr>
</tbody>
</table>

**Note:** A single LIST subcommand produces both the listing of status records and the listing of process records.

An explanation of the standard header page of the report is given in "Event code qualifiers" on page 69. It documents why the event code qualifiers were set.

**Summary Activity Report**

```
RECORD RECORDS PERCENT AVG. RECORD MIN. RECORD MAX. RECORD RECORDS
TYPE READ OF TOTAL LENGTH LENGTH LENGTH WRITTEN
0 2 .55 % 35.00 35 35 0
2 0 0
3 0 0
4 41 11.33 % 251.48 207 263 0
5 24 6.63 % 143.70 137 144 0
20 52 14.36 % 94.23 91 98 52
30 133 36.74 % 577.61 244 2,174 133
80 108 29.83 % 450.78 80 1,685 108
81 2 .55 % 756.00 756 756 2
TOTAL 362 100 % 402.00 35 2,174 297
NUMBER OF RECORDS IN ERROR 0
```

*Figure 32. Summary Activity Report from SMF*
<table>
<thead>
<tr>
<th>EVENT</th>
<th>MEANING</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>SUCCESSFUL INITIATION</td>
</tr>
<tr>
<td>1</td>
<td>INVALID PASSWORD</td>
</tr>
<tr>
<td>2</td>
<td>INVALID GROUP</td>
</tr>
<tr>
<td>3</td>
<td>INVALID OIDCARD</td>
</tr>
<tr>
<td>4</td>
<td>INVALID TERMINAL/CONSOLE</td>
</tr>
<tr>
<td>5</td>
<td>INVALID APPLICATION</td>
</tr>
<tr>
<td>6</td>
<td>REVOKED USERID ATTEMPTING ACCESS</td>
</tr>
<tr>
<td>7</td>
<td>USERID AUTOMATICALLY REVOKED</td>
</tr>
<tr>
<td>8</td>
<td>SUCCESSFUL TERMINATION</td>
</tr>
<tr>
<td>9</td>
<td>UNDEFINED USERID</td>
</tr>
<tr>
<td>10</td>
<td>INSUFFICIENT SECURITY LABEL AUTHORITY</td>
</tr>
<tr>
<td>11</td>
<td>NOT AUTHORIZED TO SECURITY LABEL</td>
</tr>
<tr>
<td>12</td>
<td>SUCCESSFUL RACINIT INITIATION</td>
</tr>
<tr>
<td>13</td>
<td>SUCCESSFUL RACINIT DELETE</td>
</tr>
<tr>
<td>14</td>
<td>SYSTEM NOW REQUIRES MORE AUTHORITY</td>
</tr>
<tr>
<td>15</td>
<td>REMOTE JOB ENTRY - JOB NOT AUTHORIZED</td>
</tr>
<tr>
<td>16</td>
<td>SURROGAT CLASS IS INACTIVE</td>
</tr>
<tr>
<td>17</td>
<td>SUBMITTER IS NOT AUTHORIZED BY USER</td>
</tr>
<tr>
<td>18</td>
<td>SUBMITTER IS NOT AUTHORIZED TO SECURITY LABEL</td>
</tr>
<tr>
<td>19</td>
<td>USER IS NOT AUTHORIZED TO JOB</td>
</tr>
<tr>
<td>20</td>
<td>WARNING - INSUFFICIENT SECURITY LABEL AUTHORITY</td>
</tr>
<tr>
<td>21</td>
<td>WARNING - SECURITY LABEL MISSING FROM JOB, USER, OR PROFI</td>
</tr>
<tr>
<td>22</td>
<td>WARNING - NOT AUTHORIZED TO SECURITY LABEL</td>
</tr>
<tr>
<td>23</td>
<td>SECURITY LABELS NOT COMPATIBLE</td>
</tr>
<tr>
<td>24</td>
<td>WARNING - SECURITY LABELS NOT COMPATIBLE</td>
</tr>
<tr>
<td>25</td>
<td>CURRENT PASSWORD HAS EXPIRED</td>
</tr>
<tr>
<td>26</td>
<td>INVALID NEW PASSWORD</td>
</tr>
<tr>
<td>27</td>
<td>VERIFICATION FAILED BY INSTALLATION</td>
</tr>
<tr>
<td>28</td>
<td>GROUP ACCESS HAS BEEN REVOKED</td>
</tr>
<tr>
<td>29</td>
<td>OIDCARD IS REQUIRED</td>
</tr>
<tr>
<td>30</td>
<td>NETWORK JOB ENTRY - JOB NOT AUTHORIZED</td>
</tr>
<tr>
<td>31</td>
<td>WARNING - UNKNOWN USER FROM TRUSTED NODE PROPAGATED</td>
</tr>
<tr>
<td>32</td>
<td>SUCCESSFUL INITIATION USING PASTICKET</td>
</tr>
<tr>
<td>33</td>
<td>INDICATES ATTEMPTED REPLAY OF PASTICKET</td>
</tr>
</tbody>
</table>

Figure 33. Standard Header Page (Part 1 of 3)
Figure 33. Standard Header Page (Part 2 of 3)
Figure 33. Standard Header Page (Part 3 of 3)
RACF REPORT - GENERAL SUMMARY

--- STATUS RECORDS ---
READ SELECTED %-SELECTED
49 49 100%

--- PROCESS RECORDS ---
126 126 100%
TOTAL PROCESS RECORDS FOR DEFINED USERS 125 125 99% (OF ALL PROCESS RECORDS)
TOTAL PROCESS RECORDS FOR UNDEFINED USERS 1 1 1% (OF ALL PROCESS RECORDS)

--- JOB / LOGON STATISTICS ---
TOTAL JOB/LOGON/LOGOFF 19
TOTAL JOB/LOGON SUCCESSES 4 21% OF TOTAL ATTEMPTS
TOTAL JOB/LOGON VIOLATIONS 10 53% OF TOTAL ATTEMPTS
TOTAL JOB/LOGON ATTEMPTS BY UNDEFINED USERS 1 5% OF TOTAL ATTEMPTS
TOTAL JOB/LOGON SUCCESSES BY UNDEFINED USERS 0 0% OF TOTAL ATTEMPTS
TOTAL JOB/LOGON VIOLATIONS BY UNDEFINED USERS 1 5% OF TOTAL ATTEMPTS
TOTAL JOB/LOGON SUCCESSFUL TERMINATION 5

TOTAL RESOURCE ACCESSES (ALL EVENTS) 45
TOTAL RESOURCE ACCESS SUCCESSES 44 98% OF TOTAL ACCESSES
TOTAL RESOURCE ACCESS WARNINGS 0 0% OF TOTAL ACCESSES
TOTAL RESOURCE ACCESS VIOLATIONS 1 2% OF TOTAL ACCESSES
TOTAL RESOURCE ACCESSES (ALL EVENTS) BY UNDEFINED USERS 0 0% OF TOTAL ACCESSES
TOTAL RESOURCE ACCESS SUCCESSES BY UNDEFINED USERS 0 0% OF TOTAL ACCESSES
TOTAL RESOURCE ACCESS WARNINGS BY UNDEFINED USERS 0 0% OF TOTAL ACCESSES
TOTAL RESOURCE ACCESS VIOLATIONS BY UNDEFINED USERS 0 0% OF TOTAL ACCESSES
TOTAL RESOURCE ACCESSES USING GENERIC PROFILE 5 11% OF TOTAL ACCESSES
TOTAL RESOURCE ACCESS SUCCESSES USING GENERIC PROFILE 5 11% OF TOTAL ACCESSES
TOTAL RESOURCE ACCESS WARNINGS USING GENERIC PROFILE 0 0% OF TOTAL ACCESSES
TOTAL RESOURCE ACCESS VIOLATIONS USING GENERIC PROFILE 0 0% OF TOTAL ACCESSES

RESOURCE ACCESS VIOLATIONS BY HOUR -
0-1 1-2 2-3 3-4 4-5 5-6 6-7 7-8
0 0 0 0 0 0 0 0
8-9 9-10 10-11 11-12 12-13 13-14 14-15 15-16
0 0 0 0 0 0 0 0
16-17 17-18 18-19 19-20 20-21 21-22 22-23 23-24
0 0 0 0 0 0 0 0

Figure 34. General Summary Report
If the LRECL value specified is too small, the report output shown in Figure 35 contains the report heading and the following text:

**** STATUS RECORD BYPASSED; LRECL TOO SMALL ****

---

**Figure 35. Listing of Status Records**

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Sysid</th>
<th>Misc. Options</th>
<th>Exits</th>
<th>Class</th>
<th>Prot</th>
<th>Stat</th>
<th>Aud</th>
<th>Gen</th>
<th>Gcmd</th>
<th>Globl</th>
<th>Glst</th>
<th>Rlst</th>
<th>Lopt</th>
</tr>
</thead>
<tbody>
<tr>
<td>90.053</td>
<td>13:51:40</td>
<td>RACF REPORT - LISTING OF STATUS RECORDS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>90.053</td>
<td>12:17:41</td>
<td>RI90</td>
<td>ORIGIN: SETROPTS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TERMUACC: READ</td>
<td>USER</td>
<td>NO</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>CMNDVIOL: YES</td>
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<td></td>
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<td></td>
<td></td>
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<tr>
<td>CMDSPEC: YES</td>
<td>RVARSMBR</td>
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<td>NO</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>DFLT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RACINIT: STATS</td>
<td>RACFVARS</td>
<td>YES</td>
<td>NO</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>DFLT</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ADSP: ACTIVE</td>
<td>SECLABEL</td>
<td>YES</td>
<td>NO</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>DFLT</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>REALDSN: NO</td>
<td>DASDVOL</td>
<td>NO</td>
<td>NO</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>DFLT</td>
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</tr>
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<td>JES:</td>
<td>GDASDVOL</td>
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<td>NO</td>
<td>NO</td>
<td>NO</td>
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<tr>
<td>BACHALLRACF</td>
<td>TAPEVOL</td>
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<td>NO</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>DFLT</td>
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<td>XBMALLRACF</td>
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<td>YES</td>
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<td>EARLYVERIFY</td>
<td>TERMINAL</td>
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<td>NO</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
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<td>TAPEDSN: NO</td>
<td>TIMS</td>
<td>NO</td>
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<td>YES</td>
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<td>GIMS</td>
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<td>NO</td>
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<tr>
<td>OPERAUDIT: NO</td>
<td>TCICSTRN</td>
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<td>NO</td>
<td>NO</td>
<td>YES</td>
<td>YES</td>
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<td></td>
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<td></td>
</tr>
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<td>ERASE: YES</td>
<td>GCICSTRN</td>
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<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>DFLT</td>
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</tr>
<tr>
<td>NOSECELEVEL</td>
<td>PCICS(PSB)</td>
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<td>NO</td>
<td>NO</td>
<td>YES</td>
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The LRECL value is obtained from the SORTIN DD statement or the WRKLRECL field in the ICHRSMFI module. See "Record reformating" on page 124 for more details.

Note: For Figure 36
- Token-related information in the report is extracted from the Type 53 relocate sections. The format of these records is documented in *z/OS Security Server RACF Macros and Interfaces*.

- **TOKEN STATUS=(CREATED BY PRE RACF 1.9 CALL)** means that the TOKLT19 bit was set. This bit was set when a token is created and based on a pre-RACF 1.9 ACEE. The bit was on in the UTOKEN that was copied to the SMF record.

- The following text may appear in the report:
  
  **** RECORD TRUNCATED BY RACFRW – INFORMATION LOST ****

  This indicates that the LRECL value on the SORTIN DD statement was too small or that the value of WRKLRECL (in the ICHRSMFI module) was too small. See *Record reformatting* on page 124 for more details.

- When a profile is not found and “BYPASS” was the user ID on RACHECK, the audit record will have the entity name, not the profile name.

### Table: Short User Summary Report

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### Figure 37. Short User Summary Report

### Table: Short Group Summary Report

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### Figure 38. Short Group Summary Report
Note: In this example, the SUCCESS number is shown as 3, while the ALTER column shows 2. This occurred because the report writer also processed other events – in this case DEFINE events. Keep in mind the totals reflect the number of records processed, not just the number listed. Therefore, there may be data recorded in the totals that is not listed specifically in the report itself.
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Figure 40. Short Command Summary Report
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**Figure 41. Short Event Summary Report**
### RACF REPORT - SHORT OWNER SUMMARY

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**ACCUMULATED TOTALS:** 35
**PERCENTAGE OF TOTAL ACCESSES:** 97%

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### Figure 42. Short Owner Summary Report

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### RACF REPORT - USER BY RESOURCE SUMMARY

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**ACCUMULATED TOTALS:** 35
**PERCENTAGE OF TOTAL ACCESSES:** 97%

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### Figure 43. User by Resource Summary Report
### RACF Report - Group by Resource Summary

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**Figure 44. Group by Resource Summary Report**

### RACF Report - Resource by User Summary

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<th>User/Job</th>
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<th>WARNING</th>
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<th>CONTROL</th>
<th>UPDATE</th>
<th>READ</th>
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**Figure 45. Resource by User Summary Report**
### RACF Report - Resource by Group Summary

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**Figure 46. Resource by Group Summary Report**
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<th>OCCURRENCES</th>
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<th>EVENT/QUALIFIER</th>
<th>OCCURRENCES</th>
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</tr>
<tr>
<td>8 - ADDSD COMMAND</td>
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<td>1</td>
<td>19 - PERMIT COMMAND</td>
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Figure 47. Resource by Event Summary Report
### Event by Resource Summary Report

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| Event 7 - Define Resource | 1 | DATASET = RACUSR1.NEW.DS1 |
|                           | 1 | DATASET = RACUSR2.NEW.DS2 |
|                           | 1 | DATASET = RACUSR3.NEW.DS3 |
|                           | 1 | DATASET = RACUSR4.NEW.DS4 |
|                           | 1 | DATASET = RACUSR5.NEW.DS5 |
|                           | 1 | DATASET = RACUSR6.NEW.DS6 |
|                           | 6 | GENERIC PROFILE USED |
|                           | 0 | ACCUMULATED TOTALS - |
|                           | 6 | ACCUMULATED TOTALS - |
|                           | 0 | GENERIC PROFILE USED |
|                           | 0 | ACCUMULATED TOTALS - |

| Event 8 - ADDSD Command | 1 | DATASET = RACUSR1.NEW.DS1 |
|                         | 1 | DATASET = RACUSR1.SMFS23 |
|                         | 1 | DATASET = RACUSR2.NEW.DS2 |
|                         | 1 | DATASET = RACUSR3.NEW.DS3 |
|                         | 1 | DATASET = RACUSR4.NEW.DS4 |
|                         | 1 | DATASET = RACUSR5.NEW.DS5 |
|                         | 1 | DATASET = RACUSR6.NEW.DS6 |
|                         | 7 | GENERIC PROFILE USED |
|                         | 0 | ACCUMULATED TOTALS - |
|                         | 7 | ACCUMULATED TOTALS - |
|                         | 0 | GENERIC PROFILE USED |
### Command by User Summary Report

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<td></td>
<td></td>
<td>21</td>
<td>RACUSR1</td>
<td>MARY BAILEY</td>
</tr>
<tr>
<td></td>
<td>22</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

**Figure 49. Command by User Summary Report**

Appendix A. The RACF report writer 171
<table>
<thead>
<tr>
<th>EVENT</th>
<th>COMMAND</th>
<th>OCCURRING</th>
<th>GROUP</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>ADDSD COMMAND</td>
<td>0</td>
<td>SYS1</td>
</tr>
<tr>
<td></td>
<td>0 - NO VIOLATIONS DETECTED</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>ACCUMULATED TOTALS -</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>10</td>
<td>ADDUSER COMMAND</td>
<td>0</td>
<td>SYS1</td>
</tr>
<tr>
<td></td>
<td>0 - NO VIOLATIONS DETECTED</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>ACCUMULATED TOTALS -</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>1 - INSUFFICIENT AUTHORITY</td>
<td>13</td>
<td>SYS1</td>
</tr>
<tr>
<td></td>
<td>ACCUMULATED TOTALS -</td>
<td>13</td>
<td>20</td>
</tr>
<tr>
<td>13</td>
<td>ALTUSER COMMAND</td>
<td>0</td>
<td>SYS1</td>
</tr>
<tr>
<td></td>
<td>0 - NO VIOLATIONS DETECTED</td>
<td>22</td>
<td>SYS1</td>
</tr>
<tr>
<td></td>
<td>ACCUMULATED TOTALS -</td>
<td>22</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>ACCUMULATED TOTALS -</td>
<td>22</td>
<td>22</td>
</tr>
<tr>
<td>17</td>
<td>DELUSER COMMAND</td>
<td>0</td>
<td>SYS1</td>
</tr>
<tr>
<td></td>
<td>0 - NO VIOLATIONS DETECTED</td>
<td>1</td>
<td>SYS1</td>
</tr>
<tr>
<td></td>
<td>ACCUMULATED TOTALS -</td>
<td>1</td>
<td>1</td>
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<tr>
<td></td>
<td>ACCUMULATED TOTALS -</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>19</td>
<td>PERMIT COMMAND</td>
<td>0</td>
<td>SYS1</td>
</tr>
<tr>
<td></td>
<td>0 - NO VIOLATIONS DETECTED</td>
<td>1</td>
<td>SYS1</td>
</tr>
<tr>
<td></td>
<td>ACCUMULATED TOTALS -</td>
<td>1</td>
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<td>1</td>
</tr>
<tr>
<td>20</td>
<td>RALTER COMMAND</td>
<td>0</td>
<td>SYS1</td>
</tr>
<tr>
<td></td>
<td>0 - NO VIOLATIONS DETECTED</td>
<td>1</td>
<td>SYS1</td>
</tr>
<tr>
<td></td>
<td>ACCUMULATED TOTALS -</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

*Figure 50. Command by Group Summary Report*
<table>
<thead>
<tr>
<th>EVENT</th>
<th>COMMAND</th>
<th>OCCURRENCES</th>
<th>RESOURCES</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>ADDSD</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>PERMIT</td>
<td>0</td>
<td>RACUSR1.SMFS23</td>
</tr>
<tr>
<td>20</td>
<td>RALTER</td>
<td>0</td>
<td>SECDATA = SECLEVEL</td>
</tr>
<tr>
<td>21</td>
<td>RDEFINE</td>
<td>3</td>
<td>SECDATA = SECLEVEL</td>
</tr>
</tbody>
</table>

**Figure 51. Command by Resource Summary Report**
Merging SMF records produced by RACF for z/VM with SMF records produced by RACF for MVS

Although the content of RACF’s audit records is the same in z/VM as it is in MVS, the record format is slightly different. Therefore, if you want to merge the SMF records produced by RACF for z/VM with those produced by RACF for MVS, the z/VM records must be reformatted. For more information, see the specific RACF Auditor’s Guide you use with your z/VM system.
Appendix B. XML Schema

The following is the XML Schema document for RACF, IRRSCHEM.XSD. Since this can change from time to time, you should look at IRRSCHEM in SYS1.SAMPLIB to find the current level of this information.

```xml
<?xml version="1.0" encoding="ebcdic-cp-us" ?>
  elementFormDefault="qualified" attributeFormDefault="unqualified"
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  xmlns="http://www.ibm.com/xmlns/zOS/IRRSchema">
  <!-- PROPRIETARY STATEMENT -->
  <!-- Licensed Materials - Property of IBM -->
  <!-- 5694-A01 Copyright IBM Corp. 2005, 2009 -->
  <!-- STATUS= HRF7760 -->
  <!-- END_OF_PROPRIETARY_STATEMENT -->
  <!-- Name: IRRSCHEM -->
  <xs:element name="IRRSCHEM"/>
  <xs:complexType name="IRRSCHEM">
    <xs:sequence>
      <xs:element name="EVENT_DATE" type="xs:dateTime"/>
      <xs:element name="EVENT_TIME" type="xs:time"/>
      <xs:element name="EVENT_SUB" type="xs:string"/>
      <xs:element name="EVENT_ID" type="xs:integer"/>
      <xs:element name="EVENT_TYPE" type="xs:string"/>
      <xs:element name="EVENT_MODULE" type="xs:string"/>
      <xs:element name="EVENT_REASON" type="xs:string"/>
      <xs:element name="EVENT_COMMENT" type="xs:string"/>
      <xs:element name="EVENT_ADDR1" type="xs:string"/>
      <xs:element name="EVENT_ADDR2" type="xs:string"/>
      <xs:element name="EVENT_ADDR3" type="xs:string"/>
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      <xs:element name="EVENT_ADDR97" type="xs:string"/>
      <xs:element name="EVENT_ADDR98" type="xs:string"/>
      <xs:element name="EVENT_ADDR99" type="xs:string"/>
      <xs:element name="EVENT_ADDR100" type="xs:string"/>
    </xs:sequence>
  </xs:complexType>
</xs:schema>
```

© Copyright IBM Corp. 1994, 2009
<-- DB2 Field XML Tag -->
<-- RINI_TERM riniTerm -->
<-- CAUD_REQUEST_READ caudRequestRead -->
<-- CAUD_REQUEST_WRITE caudRequestWrite -->
<-- CAUD_REQUEST_EXEC caudRequestExec -->
<-- SSCL_OLDSECL oldSecl -->
<-- KTKT_PRINCIPAL kerbPrincipal -->
<-- PDAC_PRINCIPAL pdasPrincipal -->
<-- ACC_NAME profileName -->
<-- APPC_NAME profileName -->
<-- *SECL_LINK eventLink -->
<-- *LOGSTRING logstr -->
<-- *RESERVED** no tag** -->

CHANGE ACTIVITY:

$L0=EIMAD HRF7720 040211 PDMKL1 EIM Auditing @L0A
$P1=EIMAD HRF7720 040517 PDMKL1 MG03855 @P1A
$P2=EIMAD HRF7720 040517 PDMKL1 MG03918 @P2A
$P3=EIMAD HRF7720 040518 PDMKL1 MG03931 @P3A
$P4=EIMAD HRF7720 040524 PDMKL1 MG03878 @P4A
$P5=EIMAD HRF7720 040524 PDMKL1 MG03979 @P5A
$P6=EIMAD HRF7720 040601 PDMKL1 MG03993 @P6A
$P7=EIMAD HRF7720 040608 PDMKL1 MG03929 @P7A
$P8=EIMAD HRF7720 040608 PDMKL1 MG04043 @P8A
$P9=EIMAD HRF7720 040625 PDMKL1 MG04193 @P9A
$L1=PHRS HRF7730 050404 PDAWS1 Pass Phrase Support @L1A
$L2=PKIS7 HRF7730 050503 PDPFW PKIS7 @L2A
$01=OA11912 HRF7720 050524 PDGTM1 Roll-Up APAR OA09052 @01A
$L3=SAFID HRF7730 050524 PDAWS1 SAF Identity Token @L3A
$PA=PKIS7 HRF7730 050914 PDMKL1 Defect MG06085 @PAA
$L4=PKIS9 HRF7740 060606 PDRDC1 PKIS9 @L4A
$L5=SQLROLE HRF7740 060626 PDAWS1 DB2 Support @L5A
$PB=PKCS11 HRF7740 060628 PDJJP1 PKCS11 Support @PBA
$PC=MG07744 HRF7740 060811 PDRDC1 Rename HighTrust @PCA
$L6=CFIELD2 HRF7750 070605 PDAWS1 Custom Field Support @L6A
$L7=PKIS11K HRF7760 080701 PDALF1 PKI Key Generation III @L7A
$L8=FIPS HRF7760 080723 PDXS1 SIGVER support @L8A
$LA=AUTOUID HRF7760 080717 PDXS1 Auto UID/GID @LAA
$PD=MG11385 HRF7760 080826 PDALF1 Defect MG11385 @PDA
$PE=MG11382 HRF7760 080902 PDALF1 Defect MG11382 @PEA
$PF=MG11753 HRF7760 081208 PDAWS1 Defect MG11753 @PFA
$PG=MG12241 HRF7760 090218 PDJCL1 Defect MG12241 @PGA
$PH=MG12336 HRF7760 090311 PDJCL1 Defect MG12336 @PHA

CHANGE DESCRIPTIONS:

A000000-999999 @L0A
C - Updated the length for utkExecnode, utkNetw, utkSess, and utkSesstype. Updated type for timeWritten to include hundredths of a second. Refined definition of tokens. @P1A
A - Added pwdMixed. @P2A
A - Added eventLink. @P3A
C - Customers may change smfUserID so it may not be a RACF userID. Add logRauditx and prodId. @P4A
D - Removed link. @P5A
D - Removed name. @P6A
M - prodName should appear after prodFMID. @P7A
C - Make prodName optional. @P8A
A - Added response and nestPrimary. @P9A
A - Added newPhrExit @L1A
A - Added caDomain @L2A
A - Support for z/OS Multi Level Security

- Roll-Up Common Criteria APAR OA09052 which
<xs:import namespace="http://www.w3.org/1999/02/22-rdf-syntax-ns#" schemaLocation="dcmes-rdf.xsd"/>
<xs:import namespace="http://www.ibm.com/xmlns/zOS/EIMSchema" schemaLocation="irreimsc.xsd"/>

<xs:simpleType name="t_dataset">
  <xs:restriction base="xs:token">
    <xs:pattern value="\S+"/>
    <xs:minLength value="1"/>
    <xs:maxLength value="44"/>
  </xs:restriction>
</xs:simpleType>

<xs:simpleType name="t_date"/>
<xs:restriction base="xs:date">
  <xs:pattern value="\d{1,2}\d{1,2}\d{4}"/>
</xs:restriction>
</xs:simpleType>

<xs:simpleType name="t_dateSlashes">
  <xs:restriction base="xs:string">
    <xs:pattern value="\d{1,2}/\d{1,2}/\d{4}"/>
  </xs:restriction>
</xs:simpleType>

<xs:simpleType name="t_fmid">
  <xs:restriction base="xs:token">
    <xs:pattern value="\S+"/>
    <xs:length value="7"/>
  </xs:restriction>
</xs:simpleType>
<xs:simpleType name="t_string1_8">
  <xs:restriction base="xs:string">
    <xs:minLength value="1"/>
    <xs:maxLength value="8"/>
  </xs:restriction>
</xs:simpleType>

<xs:simpleType name="t_string1_10">
  <xs:restriction base="xs:string">
    <xs:minLength value="1"/>
    <xs:maxLength value="10"/>
  </xs:restriction>
</xs:simpleType>

<xs:simpleType name="t_string1_13">
  <xs:restriction base="xs:string">
    <xs:minLength value="1"/>
    <xs:maxLength value="13"/>
  </xs:restriction>
</xs:simpleType>

<xs:simpleType name="t_string1_16">
  <xs:restriction base="xs:string">
    <xs:minLength value="1"/>
    <xs:maxLength value="16"/>
  </xs:restriction>
</xs:simpleType>

<xs:simpleType name="t_string1_20">
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    <xs:minLength value="1"/>
    <xs:maxLength value="20"/>
  </xs:restriction>
</xs:simpleType>

<xs:simpleType name="t_string1_22">
  <xs:restriction base="xs:string">
    <xs:minLength value="1"/>
    <xs:maxLength value="22"/>
  </xs:restriction>
</xs:simpleType>

<xs:simpleType name="t_string1_30">
  <xs:restriction base="xs:string">
    <xs:length value="30"/>
  </xs:restriction>
</xs:simpleType>

<xs:simpleType name="t_string1_32">
  <xs:restriction base="xs:string">
    <xs:minLength value="1"/>
    <xs:maxLength value="32"/>
  </xs:restriction>
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    <xs:minLength value="1"/>
    <xs:maxLength value="36"/>
  </xs:restriction>
</xs:simpleType>
</xs:restriction>
</xs:simpleType>

<xs:simpleType name="t_string1_256">
  <xs:restriction base="xs:string">
    <xs:minLength value="1"/>
    <xs:maxLength value="256"/>
  </xs:restriction>
</xs:simpleType>

<xs:simpleType name="t_string1_510">
  <xs:restriction base="xs:string">
    <xs:minLength value="1"/>
    <xs:maxLength value="510"/>
  </xs:restriction>
</xs:simpleType>

<xs:simpleType name="t_string1_985">
  <xs:restriction base="xs:string">
    <xs:minLength value="1"/>
    <xs:maxLength value="985"/>
  </xs:restriction>
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<xs:simpleType name="t_string1_1021">
  <xs:restriction base="xs:string">
    <xs:minLength value="1"/>
    <xs:maxLength value="1021"/>
  </xs:restriction>
</xs:simpleType>

<xs:simpleType name="t_string1_1023">
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    <xs:minLength value="1"/>
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  </xs:restriction>
</xs:simpleType>

<xs:simpleType name="t_string1_1024">
  <xs:restriction base="xs:string">
    <xs:minLength value="1"/>
    <xs:maxLength value="1024"/>
  </xs:restriction>
</xs:simpleType>

<xs:simpleType name="t_string1_4000">
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    <xs:minLength value="1"/>
    <xs:maxLength value="4000"/>
  </xs:restriction>
</xs:simpleType>

<xs:simpleType name="t_string1_4096">
  <xs:restriction base="xs:string">
    <xs:minLength value="1"/>
    <xs:maxLength value="4096"/>
  </xs:restriction>
</xs:simpleType>

<xs:simpleType name="t_token3">
  <xs:restriction base="xs:token">
    <xs:pattern value="\S+"/>
    <xs:length value="3"/>
  </xs:restriction>
</xs:simpleType>

<xs:simpleType name="t_token1_3">
<xs:restriction base="xs:token">
  <xs:pattern value="\S+"/>
  <xs:minLength value="1"/>
  <xs:maxLength value="3"/>
</xs:restriction>
</xs:simpleType>

<xs:simpleType name="t_token4">
  <xs:restriction base="xs:token">
    <xs:pattern value="\S+"/>
    <xs:length value="4"/>
  </xs:restriction>
</xs:simpleType>

<xs:simpleType name="t_token1_4">
  <xs:restriction base="xs:token">
    <xs:pattern value="\S+"/>
    <xs:minLength value="1"/>
    <xs:maxLength value="4"/>
  </xs:restriction>
</xs:simpleType>

<xs:simpleType name="t_token5">
  <xs:restriction base="xs:token">
    <xs:pattern value="\S+"/>
    <xs:length value="5"/>
  </xs:restriction>
</xs:simpleType>

<xs:simpleType name="t_token1_6">
  <xs:restriction base="xs:token">
    <xs:pattern value="\S+"/>
    <xs:minLength value="1"/>
    <xs:maxLength value="6"/>
  </xs:restriction>
</xs:simpleType>

<xs:simpleType name="t_token1_7">
  <xs:restriction base="xs:token">
    <xs:pattern value="\S+"/>
    <xs:minLength value="1"/>
    <xs:maxLength value="7"/>
  </xs:restriction>
</xs:simpleType>

<xs:simpleType name="t_token1_8">
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    <xs:pattern value="\S+"/>
    <xs:minLength value="1"/>
    <xs:maxLength value="8"/>
  </xs:restriction>
</xs:simpleType>

<xs:simpleType name="t_token10">
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    <xs:pattern value="\S+"/>
    <xs:length value="10"/>
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</xs:simpleType>

<xs:simpleType name="t_token1_11">
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    <xs:pattern value="\S+"/>
    <xs:minLength value="1"/>
    <xs:maxLength value="11"/>
  </xs:restriction>
</xs:simpleType>
<xs:simpleType name="t_token1_16">
  <xs:restriction base="xs:token">
    <xs:pattern value="[\S+]" />
    <xs:minLength value="1" />
    <xs:maxLength value="16" />
  </xs:restriction>
</xs:simpleType>

<xs:simpleType name="t_token32">
  <xs:restriction base="xs:token">
    <xs:pattern value="[\S+]" />
    <xs:length value="32" />
  </xs:restriction>
</xs:simpleType>

<!- - --------------------------------- - >
<!-- Beginning of the security event log element definitions  -->
<!- - --------------------------------- - >
<xs:element name="securityEventLog">
  <xs:complexType>
    <xs:sequence>
      <!-- meta information about this security event log -->
      <!-- <rdf:Description>...</rdf:Description> -->
      <xs:any namespace="http://www.w3.org/1999/02/22-rdf-syntax-ns#" processContents="strict" />
      <!-- <event>...</event> -->
      <xs:element name="event" minOccurs="1" maxOccurs="unbounded">
        <xs:complexType>
          <xs:sequence>
            <!-- Common elements of all records -->
            <!-- -->
            <xs:element name="eventType" type="t_token1_8" />
            <xs:element name="eventQual" type="t_token1_8" minOccurs="0" maxOccurs="1" />
            <xs:element name="timeWritten" type="t_token1_8" minOccurs="0" maxOccurs="1" />
            <xs:element name="dateWritten" type="t_token1_8" minOccurs="0" maxOccurs="1" />
            <xs:element name="systemSmfid" type="t_token1_4" minOccurs="0" maxOccurs="1" />
            <xs:element name="prodFmid" type="t_token1_8" minOccurs="0" maxOccurs="1" />
            <xs:element name="prodName" type="t_string1_255" minOccurs="0" maxOccurs="1" />
            <xs:element name="details">
              <xs:complexType>
                <xs:choice minOccurs="1" maxOccurs="unbounded">
                  <xs:element name="accessType" type="t_token1_8" />
                  <xs:element name="aceeCompress" type="t_token1_8" />
                  <xs:element name="aceeCompXm" type="t_token1_8" />
                  <xs:element name="aclType" type="t_token1_8" />
                  <xs:element name="action" type="t_string1_16" />
                  <xs:element name="actionCom" type="t_string1_64" />
                  <xs:element name="active" type="t_token1_8" />
                  <xs:element name="addcreator" type="t_token1_8" />
                  <xs:element name="adsp" type="t_token1_8" />
                  <xs:element name="allowedExec" type="t_token1_8" />
                  <xs:element name="allowedRead" type="t_token1_8" />
                  <xs:element name="allowedWrite" type="t_token1_8" />
                  <xs:element name="allCmdExit" type="t_token1_8" />
                  <xs:element name="altDomain" type="t_string1_100" />
                  <xs:element name="altEmail" type="t_string1_100" />
                  <xs:element name="altIp" type="t_string1_64" />
                  <xs:element name="altOther" type="t_string1_1024" />
                </xs:choice>
              </xs:complexType>
            </xs:element>
          </xs:sequence>
        </xs:complexType>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
</xs:element>
Appendix C. 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:

http://www.ibm.com/systems/z/os/zos/bkserv/
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device-related element support remains in the product even after the hardware
devices pass their announced End of Service date. z/OS may continue to service
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Index

A
access attempts
  auditing access attempts to resources with security labels 22
  auditing by class 21
  specifying logging for detected 17
access control 1
accessibility 193
accountability 1
activities of group-OPERATIONS users 17
activities of OPERATIONS users 17
administration control 14
administration, RACF
  classroom courses xii
ALLOWED operand 141
ALTDSO command
  auditing data set accesses 29
  GLOBALAUDIT operand 29
  specifying data set controls 29
ALTER access authority
  in the selected data set report 118
ALTUSER command
  logging RACF-related activities of a user 149
  UAUDIT/NOUAUDIT operand 28
  using when auditing 29
APPC/MVS
  activating auditing 24
  auditing considerations
    relationship of audit records 24
    transaction program auditing 23
  user verification requests 23
  deactivating auditing 24
  listing audit records 24
  persistent verification 23
APPLAUDIT 23, 28
APPLAUDIT key 143
APPLAUDIT operand
  SETROPTS command 23, 24
APPLAUDIT suboperand
  APPLAUDIT suboperand of REASON operand 137
ASCEND operand 143
ASSOCIATION TYPE association
  list of users with 114
associations
  ASSOCIATION TYPE 114
  NODE.USERID 113
  PASSWORD SYNC 114
ASSOCIATIONS column heading
  in the selected user attribute report 113
AT keyword
  auditing 38
  LOGSTR relocate section 38
attribute
  AUDITOR 1, 113
  group AUDITOR 1
  group-OPERATIONS
    logging activities for 19
attribute (continued)
  group-SPECIAL
    bypassing the logging of activities for 18
    logging activities for 19
  OPERATIONS 113
    logging activities for 19
  REVOKE 113
  SPECIAL 1, 113
    bypassing the logging of activities for 18
    logging activities for 19
ATTRIBUTE TYPE column heading
  in the selected user attribute report 113
audit controls
  general audit controls 17
  RACF/DB2 external security module 46
  setting 17
  system-wide 17
AUDIT operand
  SETROPTS command 17
audit tools 1
  audit control functions
  RACF SMF data unload utility 2
  DSMON 2
  logging routines 2
  RACF report writer 2
auditing
  access attempts 21, 22, 27
  access checks 28
  APPC transactions 23, 24, 27
  AT keyword 38
  checking DB2 authorization 43
  directory searches 28
  dubbing and undubbing of processes 28
  file system objects 28
  ONLYAT keyword 38
  RACF remote sharing facility 37, 38, 39, 40, 41
  RACF/DB2 external security module 43
  RRSFDATA class 38, 39, 40
  SECLABEL profiles 27
  z/OS UNIX events 31
auditor
  asking security questions 9
  audit tools provided 1
  auditor-controlled logging 4
  concept of accountability 1
  controlling auditing 3
  general audit controls
    AUDIT/NOAUDIT 17
    CMDVIOL/NOCMDVIOL 17
    LIST 17
    LOGOPTIONS 17
    OPERAUDIT/NOOPERAUDIT 17
    REFRESH GENERIC 17
    SAUDIT/NOSAUDIT 17
    SECLABELAUDIT/NOSECLABELAUDIT 17
    SECLEVELAUDIT/NOSECLEVELAUDIT 17
  group-wide auditor responsibilities 1
  listing specific audit controls 30
auditor (continued)
logging specific events 3
obtaining reports 121
overriding owner-controlled logging
specifying audit controls 4
using the RACROUTE Request=AUTH exit
routine 5
responsibilities 1
setting 17
specific audit controls 28
specifying data set controls 29
system-wide auditor responsibilities 1
use of DSMON 93
use of the warning indicator 147
using RACF report writer 8, 121
verifying owner controlled logging 4
AUDITOR attribute 1
auditing RACF system 1
AUDITOR suboperand of AUTHORITY operand 137
AUDITOR suboperand of REASON operand 137
controlling auditing 17
general audit controls
AUDIT/NOAUDIT 17
CMDVIOL/NOCMDVIOL 17
LIST 17
LOGOPTIONS 17
REFRESH GENERIC 17
SAUDIT/NOSAUDIT 17
SECLABELAUDIT/NOSECLABELAUDIT 17
listing users with 113
needed to run DSMON 93
specifying audit controls 28
AUTH requests 5
AUTHORITY operand
AUDITOR suboperand 137
BYPASSED suboperand 137
EXIT suboperand 137
FAILSOFT suboperand 137
NORMAL suboperand 137
OPERATIONS suboperand 137
SPECIAL suboperand 137
TRUSTED suboperand 137
authorization 10
authorization requests
auditing not done 20, 21
authorized caller table report
See RACF authorized caller table report
automatic command direction 39
automatic password direction 40
automatically directed application updates
auditing 39
automatically directed commands
auditing 39
automatically directed passwords
auditing 40
bypassing
logging of activities for SPECIAL attribute 18
logging of RACF command violations 19
C
class descriptor table report
description 105
sample of 106
use of 105
CLASS operand 141
classroom courses, RACF xii
command and subcommand processing
described 123
END subcommand 123
EVENT subcommand 123
LIST subcommand of RACFRW command 123
RACF report writer 123
RACRPORT EXEC 123
SELECT subcommand 123
SMFMERGE 123
SUMMARY subcommand 123
code direction 38
command syntax description 130
command violations
auditing 27
command-summary report 149
commands
for RRSF 37
operator 37
RESTART 37
SET 37
STOP 37
TARGET 37
COMPATMODE suboperand
COMPATMODE suboperand of REASON
operand 137
CONTROL universal access authority
in the selected data set report 118
control user access 1
controlling auditing 2
controlling logging
by auditor 4
by owner 4
courses about RACF xii
CPU MODEL column heading
in the system report 99
CPU-ID column heading
in the system report 99
D
DATA operand
RACFRW command 131
data security monitor
See DSMON (data security monitor)
data set controls 29
DATA SET NAME column heading
in the selected data set report 116
data sets
specifying control 29

B
BY(name2) operand 144
BYPASS PASSWORD PROTECTION column heading
in the program properties table report 102
data sets report
  See selected data sets report
database, DB2
  for IRRADU00 output  59
DATASET class
  auditing for  17
DATASET operand
  RACFRW command  132
DATE operand  135

DB2
  creating a DB2 table space for IRRADU00 output  59
  creating DB2 tables for IRRADU00 output  59
  creating optimization statistics for the DB2 database  62
  database for IRRADU00 output  59
  DB2 utility statements required to delete the group records  62
  deleting the IRRADU00 data from the DB2 database  62
  loading the DB2 tables for IRRADU00 output  60
  reorganizing the unloaded RACF SMF data in the DB2 database  62
  SQL utility statements creating a table for IRRADU00 output  60
  SQL utility statements defining a table space for IRRADU00 output  59
  table names provided in SYS1.SAMPLIB  62
  using with IRRADU00 output  58
  utility statements required to load the tables with IRRADU00 output  61

DB2 load utility
  sample statements for IRRADU00 output  58
DEFINE request
  logging activity for specified classes  17
DESCEND operand  143

DFSORT
  ICETOOL  8, 53
customizing reports  57
directed commands
  AT keyword  38
  auditing  38
  ONLYAT keyword  38
disability  193

DSMON (data security monitor)  93, 106
class descriptor table report  105
control statements
  LINECOUNT  95
  USEROPT  95
control statements for DSMON functions  94
description  93
functions for generating reports  96
generated by DSMON
  class descriptor table report  105
  started procedures table report  110
global access checking table report  108
  group tree report  101, 110
how to run  93
JCL to run on MVS  93
list of reports produced  98

DSMON (data security monitor) (continued)
  program properties table report  102
  RACF authorized caller table report  104
  RACF exits report  107
  selected data sets report  116
  selected user attribute report  113
  selected user attribute summary report  115
  shared RACF database  93
  system report  99
DSNAME operand
  RACFRW command  132
DSQUAL operand  141

E
END subcommand of RACFRW command
description  145
syntax  146

EVENT subcommand of RACFRW command
  ALLOWED operand  141
  CLASS operand  141
  dependency of SELECT subcommand  139
described  139
  DSQUAL operand  141
  event-name operand  140
event-name operand values listed  141
  EVQUAL operand  141
  INTENT operand  141
  issued with SELECT subcommand  133
  LEVEL operand  142
  monitoring
    access violations  148, 150, 151
    NAME operand  141
    NEWDSQUAL operand  141
    NEWNAME operand  141
    password violation levels  146
    syntax  140
event-name operand  140
events
  logging  3
  EVQUAL operand  141
example  28
DSMON reports  101
EXECUTE access authority
  needed to run DSMON  93
EXIT MODULE NAME column heading in the RACF exits report  107
exits report
  See RACF exits report

F
failsoft processing
  logging  4
FORMAT operand
  RACFRW command  131
FUNCTION control statement
control statements
  FUNCTION  95
DSMON (data security monitor)  95
functions
that DSMON uses to generate reports 96

G
gen general audit controls
how to use 17
gen general resource class
auditing for 17
gen general resource controls 29
GENSUM operand
RACFRW command 132
global access checking
auditing not done 20, 21
global access checking table report
description of 108
use of 108
GLOBALAUDIT operand
possible values to specify 29
specifying data set controls 29
group AUDITOR attribute
list of users with 113
responsibility limits defined 1
GROUP operand 136
group OPERATIONS attribute
list of users with 113
logging activities for 19
monitoring
group OPERATIONS users 150
group REVOKE attribute
list of users with 113
group tree report
description 101
sample of 101
use of 101
group-AUDITOR attribute
gen general audit controls
LIST 17
REFRESH GENERIC 17
restriction for controlling auditing 17
specifying audit controls 28
group-SPECIAL attribute
bypassing the logging of activities for 18
list of users with 113
logging activities for 17, 19
monitoring
group-SPECIAL users 149
groups 30

I
ICETOOL
generating reports 54
IRRADU00 reports 55
RACFICE PROC 54
record selection criteria 54
report
type 55
report format 53
ICHRSMFE exit routine 121
ICHRSMFI module (continued)
SORTEQU field 143
installation access control 1
installation accountability 1
installation exit ICHRSMFE 121
installation-replaceable module ICHRSMFI 121
INTENT operand 141
Interactive System Productivity Facility (ISPF)
program 3
IRRADU00 utility
creating a DB2 database 59
creating a DB2 table space 59
creating optimization statistics for the DB2
database 62
creating the DB2 tables 59
DB2 table names 62
DB2 utility statements required to delete the group
records 62
DB2 utility statements required to load the tables 61
deleting data from the DB2 database 62
description 49
effectively using 52
example 51
loading the DB2 tables 60
operational considerations 49
output 52
reorganizing the unloaded RACF SMF data in the
DB2 database 62
SQL utility statements creating a table 60
SQL utility statements defining a table space 59
steps for using IRRADU00 output with DB2 58
using 49
using output with DB2 58
IRRADULD
member in SYS1.SAMPLIB 58
IRRADUTB
member in SYS1.SAMPLIB 58
IRRDBU00 utility
auditor’s use of 7, 8
IRRICE
member in SYS1.SAMPLIB 8, 53
SMF records 8
IRRUT100 utility
auditor’s use of 7
ISPF panels
advantages 6
compared to RACF TSO commands 6
sample for password rules 6
ISPF program 3

J
JCL (job control language)
for DSMON 93
JOB operand 136

K
key 23
keyboard 193
logging (continued)
  general resource information 30
  LIST requests 104
  obtaining printed reports 8
  owner-controlled logging 4
  profile changes 17
  RACF commands
    issued by group-SPECIAL user 5
    issued by SPECIAL user 5
    violations 5
  RACF commands issued 28
  RACF data in SMF records 8
  RACF-related activities 149
  RACF-related activities of specific users 5
  RACROUTE REQUEST=VERIFY requests 3
  setting audit controls 17
  specific events 3
  system-wide for RACF classes 17
  system-wide RACF command violations 19
  types of accesses 4
  use of RVARY command 3
  use of SETROPTS command 3
  user additions to profiles 28
  user changes to profiles 28
  VERIFY requests 104
LOGOPTIONS operand
  SETROPTS command 21
LOGOPTIONS suboperand
  LOGOPTIONS suboperand of REASON operand 137
LOGSTR
  AT keyword 38
  RACF/DB2 external security module 45
  relocate section 38
  using data 45

M
  mainframe
    education xiv
  management control 15
  messages
    program properties table report 102
    RACF authorized caller table report 104
    RACF exits report 107
    selected data sets report 118
    selected user attribute report 114
    system report 99
  miscellaneous security concerns 11
  modifying resource profile 4
  MODULE LENGTH column heading
    in the RACF exits report 107
  MODULE NAME column heading
    in the RACF authorized caller table report 104
  monitoring
    access attempts
      by security label 151
      by security level 150
    in warning mode 147
    access violations
      UACC 148
monitoring (continued)
  access violations (continued)
    with RACF report writer 148
    with RACFRFW command 150, 151
  OPERATIONS users
    with RACF report writer 150
    with RACFRFW command 150
  password violation levels
    LOGON process 146
  password violation occurrences 146
  password violation stabilization 146
  SPECIAL users
    with RACF report writer 149
    with RACFRFW command 150
  specific users
    with RACF report writer 149
    with RACFRFW command, by specified user 149
  use of RACF commands
    with RACF report writer 148
    with RACFRFW command, by specified user 149
    with RACFRFW command, by users 149

N
NAME operand
  EVENT subcommand of RACFRW command 141
name1 operand
  SUMMARY subcommand of RACFRW command 144
NEWDSQUAL operand
  EVENT subcommand of RACFRW command 141
NEWNAME operand 141
NEWPAGE operand
  LIST subcommand of RACFRW command 143
  SUMMARY subcommand of RACFRW command 145
NOCMDVIOL operand
  SETROPTS command 19
NODE.USERID association
  list of users with 113
NOFORMAT operand
  RACFRW command 131
NOGENSUM operand
  RACFRW command 132
NOJOB operand
  SELECT subcommand of RACFRW command 136
NONE access authority
  in the selected data set report 118
NOOWNER operand 136
NOSAUDIT operand
  SETROPTS command 19
NOUSER operand
  SELECT subcommand of RACFRW command 136

O
ONLYAT keyword
  auditing 38
OPERATING SYSTEM/LEVEL column heading
  in the system report 99

OPERATIONS attribute
  list of users with 113
  logging activities for 19
  monitoring
    OPERATIONS users 150
  OPERATIONS suboperand of AUTHORITY operand 137
OPERATIONS user
  auditing 27
operator commands
  for RRSF 37
  RESTART 37
  SET 37
  STOP 37
  TARGET 37
OPERAUDIT operand
  SETROPTS command 19
  overriding user specification 29
OWNER operand 136
owner-controlled logging
  done by resource owner 4
  listing specific audit controls 30
  overridden by auditor 4
  overriding user specification 29

P
panels
  using 3
password rules
  ISPF panel for 6
PASSWORD SYNC association
  list of users with 114
password violation levels
  calculating percentages 146
  example 146
  monitoring 146
printed reports
  from DSMON 93
  from the RACF report writer 8
  printing reports from DSMON 93
  printing reports from the report writer 8
PROCESS operand
  SELECT subcommand of RACFRW command 136
PROCESS records 123
profiles
  refreshing 24
PROGRAM NAME column heading
  in the program properties table report 102
program properties table report
  description 102
  messages 102
  sample of 103
  use of 102
protection plan 11
publications
  on CD-ROM and DVD xi
  softcopy xi
| RACF             | access control 1 |
|                 | commands         |
|                 | SETROPTS command 17 |
|                 | controlling auditing 2 |
|                 | publications |
|                 | on CD-ROM and DVD xi |
|                 | softcopy xi |
| RACF auditor    | definition of 1 |
| RACF authorized caller table report | description 104 |
|                 | messages 104 |
|                 | use of 104 |
| RACF commands   | ALTUSER command 28, 149 |
|                 | bypassing logging of violations 19 |
|                 | LDIRECT command 30 |
|                 | LFILE command 30 |
|                 | LISTDS command 4, 30 |
|                 | LISTGRP command 4, 30 |
|                 | LISTUSER command 4, 30 |
|                 | logging activity for specified classes 17 |
|                 | RALTER command 30 |
|                 | RLIST command 4, 30 |
|                 | RVARY command 3 |
|                 | SEARCH command 4 |
|                 | SETROPTS command 3, 17 |
|                 | monitoring access to resources with a security label 151 |
|                 | monitoring access to resources with a security level 150 |
|                 | monitoring SPECIAL users 149 |
| RACF database   | sample DDL statements 58 |
| RACF exits report | description 107 |
|                 | messages 107 |
|                 | sample of 107 |
|                 | use of 107 |
| RACF global access table report | sample of 108 |
| RACF implementation/integrity | 9, 11 |
| RACF INDICATED field | in the selected data set report 117 |
| RACF PROTECTED field | in the selected data set report 118 |
| RACF remote sharing facility (RRSF) auditing | 37 |
| RACF report writer | 121, 124 |
|                 | command description 125 |
|                 | compared to RACF commands 8 |
|                 | default values 124 |
|                 | examples 151 |
|                 | installation exit ICHRSMFE 121 |
|                 | installation-replaceable module ICHRSMFI 121 |
|                 | merging RACF for z/VM SMF records with RACF for MVS SMF records 174 |
|                 | monitoring |
|                 | access attempts by security label 151 |

| RACF report writer (continued) monitoring (continued) | access attempts by security level 150 |
|                                                      | access attempts in WARNING mode 147 |
|                                                      | access violations 148 |
|                                                      | OPERATIONS users 150 |
|                                                      | password violation levels 146 |
|                                                      | RACF commands 148 |
|                                                      | SPECIAL users 149 |
|                                                      | specific users 149 |
|                                                      | obtaining reports 121 |
|                                                      | overview 123 |
|                                                      | record selection criteria 133 |
|                                                      | report generation 124 |
|                                                      | report types |
|                                                      | access to RACF-protected resource 121 |
|                                                      | descriptions of group activity 121 |
|                                                      | descriptions of user activity 121 |
|                                                      | summaries of resource use 121 |
|                                                      | summaries of system use 121 |
|                                                      | return codes from 129 |
|                                                      | SMF record types 123 |
|                                                      | SMF records 8 |
|                                                      | subcommand description 125 |
|                                                      | terminal monitor program 125 |
|                                                      | TMP 125 |
|                                                      | use of SMF records 124 |
|                                                      | use of work data set 124 |
|                                                      | using 8 |
|                                                      | warning mode example 147 |
|                                                      | year 2000 121 |
| RACF Report Writer | 121 |
| RACF SMF data unload utility | description 49 |
|                                                      | effectively using 52 |
|                                                      | operational considerations 49 |
| RACF started procedures table report | sample of 111, 112 |
| RACF TSO commands | compared to ISPF panels 5 |
| RACF/DB2 external security module | auditing 43 |
|                                                      | checking authorization 43 |
|                                                      | profile checking 44 |
|                                                      | setting audit controls 46 |
|                                                      | using LOGSTR data 45 |
| RACFICE | generating reports 54 |
|         | IRRADU00 reports 55 |
|         | using 54 |
| RACFRW command | command syntax 125 |
|               | command syntax description 130 |
|               | DATA operand 131 |
|               | default maximum record length 124 |
|               | description 130 |
|               | DSNNAME operand 132 |
|               | END subcommand 145 |
|               | EVENT subcommand 139 |
|               | FORMAT operand 131 |
|               | GENSUM operand 125, 132 |

Index 205
**RACFRW command (continued)**
- **LINECNT operand** 132
- **LIST subcommand of RACFRW command** 142
  - monitoring
    - access violations 148, 150, 151
    - OPERATIONS users 150
    - RACF commands 149
    - RACF commands issued by user 149
    - SPECIAL users 150
  - specific users 149
- **NOFORMAT operand** 131
- **NOGENSUM operand** 132
  - sample reports 154
- **SAVE operand** 132
- **SELECT subcommand** 132
  - subcommand description 125
- **SUMMARY subcommand** 144
  - syntax 130
- **TITLE operand** 131
  - using RACF report writer 8
  - warning mode example 147
- **RACINIT AUTHORIZED column heading**
  - in the RACF authorized caller table report 104
- **RACLINK command**
  - auditing 41, 42
  - examples 42
  - phases 41
- **RACLUST AUTHORIZED column heading**
  - in the RACF authorized caller table report 104
- **RACROUTE REQUEST=VERIFY request** 3
- **RALTER command**
  - GLOBALAUDIT operand 29
  - overriding user specification 29
  - using when auditing 30
- **READ access authority**
  - in the selected data set report 118
  - needed to run DSMON 93
- **REASON operand**
  - AUDITOR suboperand 137
  - CLASS suboperand 137
  - CMDVIOL suboperand 137
  - COMMAND suboperand 137
  - RACINIT suboperand 137
  - RESOURCE suboperand 137
  - SPECIAL suboperand 137
  - USER suboperand 137
- **record selection**
  - RACF report writer 123
  - records
    - PROCESS records 123
    - SMF records 123
    - STATUS records 123
  - **REFRESH GENERIC operands**
    - SETROPTS command 25
  - **REFRESH RACLST operands**
    - SETROPTS command 25
  - refreshing in-storage generic profiles
    - example 27
  - reports
    - access to RACF-protected resource 121
    - customizing 57
- **reports (continued)**
  - descriptions of group activity 121
  - descriptions of user activity 121
  - general summary 159
  - generated by DSMON
    - program properties table report 102
    - RACF authorized caller table report 104
    - RACF exits report 107
    - selected data sets report 116
    - selected user attribute report 113
    - selected user attribute summary report 115
  - system report 99
  - list of summaries from the report writer 144
  - listing of status 160
  - produced by DSMON 98
  - RACFRW sample reports 154
  - standard header page for report writer 158
  - summaries of resource use 121
  - summaries of system use 121
  - summary
    - group activity 162
    - group activity by resource 167
    - owner activity 166
    - owner activity by resource 155, 174
    - RACF command activity 164
    - RACF command activity by group 172
    - RACF command activity by resource 173
    - RACF command activity by user 171
    - resource activity 163
    - resource activity by group 168
    - resource activity by resource 167
    - resource activity by security event 169
    - security event activity 165
    - security event activity by resource 170
    - user activity 162
    - user activity by resource 166
    - using ICETOOL 55, 57
    - using RACFICE 55
  - resource owners
    - controlling logging 4
    - responsibilities of auditors 1
  - return codes
    - from RACF report writer 129
  - **REVOKE attribute**
    - list of users with 113
  - **RLIST command** 4, 30
  - **RRSF (RACF remote sharing facility)**
    - auditing considerations 37
    - automatically directed application updates 39
    - automatically directed commands 39
    - automatically directed passwords 40
    - commands 37
    - directed commands 38
    - operator commands 37
    - RACLINK command 41
      - examples 42
      - phases 41
    - RRSFDATA class 38, 39, 40
    - RRSFDATA class
      - controlling auditing 38, 39, 40
rules
   establishing password syntax
      ISPF panel 6
RVARY command 3

S
sample
   ISPF panel 6
sample reports
   DSMON report
      system report 100
   DSMON reports
      class descriptor table report 106
      group tree report 101
      from the report writer 154
SAUDIT operand
   SETROPTS command 19
SAVE operand
   RACFRW command 132
SEARCH command 4
   listing profiles that have the warning indicator 147
SECAUDIT suboperand
   SECAUDIT suboperand of REASON operand 137
SECLABEL auditing
   related system overhead 23
      using the SECLABELAUDIT function 23
SECLABELAUDIT function
   for auditing security labels 23
   related system overhead 23
SECLABELAUDIT operand
   SETROPTS command 22
SECLABELAUDIT suboperand
   SECLABELAUDIT suboperand of REASON operand 137
SECLEVELAUDIT operand
   SETROPTS command 20
security administrator
   monitoring
      SPECIAL users 149
      SPECIAL attribute 1
      use of RACF commands 148
security label
   auditing access attempts to resources with security labels 22
security level
   auditing access attempts 27
   logging access attempts based on 20
security topics for RACF
   classroom courses  xii
SELECT subcommand of RACFRW command
   (continued)
      monitoring (continued)
         specific users 149
         use of RACF commands 149
NOJOB operand 136
NOOWNER operand 136
NOUSER operand 136
OWNER operand 136
password violation levels 146
PROCESS operand 136
RACFRW command 132
REASON operand 137
restrictions 133
STATUS operand 136
STEP operand 136
SUCCESSES operand 135
syntax 135
SYSID operand 137
TERMINAL operand 138
USER operand 136
VIOATIONS operand 135
warning mode example 147
WARNINGS operand 135
selected data sets report
   description 116
   messages 118
   sample of 119
   use of 116
selected user attribute report
   description 113
   messages 114
   sample of 114
selected user attribute summary report
   description 115
   sample of 115
SELECTION CRITERION column heading
   in the selected data set report 116
SETROPTS command
   AUDIT/NOAUDIT operands 17
   CMDVIOL/NOCMDVIOL operands 17
   examples  26
   LIST operand
      LOGOPTIONS 17
   SECLABELAUDIT/NOSECLABELAUDIT 17
logging use of  3
   monitoring
      access to resources with a security label 151
      access to resources with a security level 150
      group-SPECIAL users 149
      SPECIAL users 149
   operands for auditing 17
   REFRESH GENERIC operands 17, 25
   REFRESH RACLST operand 25
   SAUDIT operand 149
   SAUDIT/NOAUDIT operands 17
   SECLABELAUDIT 151
   SECLEVELAUDIT operand 150
shared RACF database between MVS and z/VM
   considerations when running DSMON  93
shortcut keys 193
SMF data unload utility
see RACF SMF data unload utility 49
SMF data unload, output to XML 65
SMF record
type 44 relocate section 38, 40
SMF records 8
listing contents of 121
merging RACF for z/VM SMF records with RACF for
MVS SMF records 174
PROCESS records 123
RACF report writer 121
STATUS records 123
types
- type 20 123
- type 30 123
- type 80 123
- type 81 123
- type 83 123
used by RACF report writer 123
SMF-ID column heading
in the system report 99
SORT operand 142
SPECIAL attribute 1
bypassing the logging of activities for 18
list of users with 113
logging activities for 19
monitoring
- SPECIAL users 149
- SPECIAL operand of AUTHORITY operand 137
- SPECIAL operand of REASON operand 137
SPECIAL user
auditing 27
specific audit controls
all RACF-related activities for users 28
attempts to access
DASD data sets 28
general resources 28
resources protected by a security label 28
specifying audit controls 4
standard header page for report writer 158
started procedures table report
description 110
use of 110
STATUS operand 136
STATUS records 123
STEP operand 136
SUCCESSES operand 135
SUMMARY subcommand of RACFRW
command 145
summary reports from the report writer 144
SUMMARY subcommand of RACFRW command
BY(name2) operand 144
description 144
monitoring
use of RACF commands 149
name1 operand 144
NEWPAGE operand 145
SUCCESSES operand 145
syntax 144
TITLE operand 145
used with EVENT subcommand 144
SUMMARY subcommand of RACFRW command
(continued)
used with SELECT subcommand 144
VIOLATIONS operand 145
WARNINGS operand 145
SYS1.SAMPLIB data set
IRRADULD 58
IRRADUTB 58
IRRICE 8, 53
sample DB2 mappings 52
sample DFSORT mappings 52
SYSID operand 137
system information 9
SYSTEM KEY column heading
in the program properties table report 102
system report
description 99
messages 99
produced when RACF is inactive 93
sample report 100
using 99
SYSTEM RESIDENCE VOLUME column heading
in the system report 99
system-wide auditor responsibilities 1
T
table space for DB2
creating 59
technical security concerns 13
terminal monitor program 125
TITLE operand 142
RACFRW command 131
SUMMARY subcommand of RACFRW
command 145
TMP (terminal monitor program) 125
TOTAL DEFINED USERS column heading
in the selected attribute summary report 115
TOTAL SELECTED ATTRIBUTE USERS column
heading
in the selected attribute summary report 115
type 20 SMF record 123
type 30 SMF record 123
type 80 SMF record 123
type 81 SMF record 123
type 83 SMF record 123
U
UACC (universal access authority)
monitoring the use of 148
UACC field
in the selected data set report 118
UPDATE universal access authority
in the selected data set report 118
usage of attributes 12
user
auditing 27
user attribute 1
user attribute report
See selected user attribute report
user attribute summary report
   See selected user attribute summary report
user controls
   data set controls 29
   general resource controls 29
   listing specific audit controls 30
   using the ALTUSER command 28
USER operand 136
user responsibilities 1
   auditor’s role (user with AUDITOR attribute) 1
   security administrator’s role (user with SPECIAL attribute) 1
user-controlled logging
   done by resource owner 4
   overridden by auditor 4
   user-written exit routine ICHRSMFE 121
   user-written module ICHRSMFI 121
USERID column heading
   in the selected user attribute report 113
USEROPT control statement
   DSMON (data security monitor) 95
USRDSN field
   in the selected data set report 117

V
VERIFY request
   list of programs authorized to issue 104
   verify user access 1
VIOLATIONS operand 135, 145
VMAUDIT suboperand
   VMAUDIT suboperand of REASON operand 137
VOLUME SERIAL column heading
   in the selected data set report 116

W
warning indicator 147
warning mode
   cautions when using 147
   defined 147
   monitoring access attempts 147
   report example 147
   warning indicator 147
WARNING operand
   SEARCH command 147
WARNINGS operand
   SELECT subcommand of RACFRW command 135
   SUMMARY subcommand of RACFRW command 145
work data set 124

X
XML, obtaining output from SMF data unload 65

Y
year 2000
   RACF report writer 121
Readers’ Comments — We’d Like to Hear from You

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Publication No. SA22-7684-11

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