z/OS 2.4 IBM Education Assistance

Combined SMF Education for:

SMFLIMxx Assembler Exits Support

SMF Subtype Reporting

SMF Enhancements

z/OS 2.4 IBM Education Assistance

SMFLIMxx Assembler Exits Support

Element(s)/Component(s): MVS BCP SMF

Agenda

- Trademarks
- Session Objectives
- Overview
- Usage & Invocation
- Interactions & Dependencies
- Migration & Coexistence Considerations
- Session Summary
- Appendix

Trademarks

- See url http://www.ibm.com/legal/copytrade.shtml for a list of trademarks.
- Additional Trademarks: None.

Session Objectives

- In z/OS 2.2, SMFLIMxx support was introduced to alleviate the need to have a IEFUSI installation exit.
  - Many suggestions have been made for additional keywords since this was introduced.
- This session describes additional functionality added to SMFLIMxx in z/OS 2.4.

Overview

- Who (Audience)
  - System Programmers
- What (Solution)
  - Support new filters and attributes in the SMFLIMxx Parmlib member.
- Wow (Benefit / Value, Need Addressed)
  - More functionality in SMFLIMxx will alleviate decisions that can only be made via the IEFUSI exit today.

Usage & Invocation

- SMFLIMxx is implemented as a ordered set rules, made up of filters and attributes, in the form of:

  REGION {filters} {attributes}

- Each filter describes the cases when the rule should be applied (for example, the jobs where the rule applies.)
- Each attribute describes the actions that are to be taken when the rule is applied (for example, apply a specific MEMLIMIT value.)
- One or more rules may be applied to a specific job or job step.
  - For example, the SMFLIMxx member may start with a generic rule that sets some basic defaults, and be followed by specific rules that override some or all of those defaults in certain cases.

Usage & Invocation – Filters

- Three new filters are added:
  - REQREGION
  - REQMEMLIMIT
  - SAFCHECK
- These filters, like the existing SMFLIMxx filters, can be used independently, or in conjunction with other filters.
  - When multiple filters are specified, all of the filters must match for the rule to be applied. If any filter does not match, the rule is not applied.

Usage & Invocation – REQREGION filter

- The REQREGION filter lists a REGION value, or a range of values, that correspond to the REGION used by the jobstep, whether explicitly specified in the JCL or obtained from JES as a default.
  - If one value is specified, for example: REQREGION(4M)
    then the REGION must be exactly 4M (or an equivalent value such as 4096K.)
  - If two values are specified, for example: REQREGION(4M,5M)
    then the REGION must be at least 4M and not larger than 5M. (In other words, 4M <= REGION <= 5M.)
  - If the job uses REGIONX instead of REGION, the second REGIONX value will be used for comparison. No separate filter is provided for REGIONX.
  - 0M and 0K are supported as either a low or high value.

Usage & Invocation – REQMEMLIMIT filter

- The REQMEMLIMIT filter is similar to REQREGION, but used for the MEMLIMIT value that is explicitly specified or obtained as a default.
  - If one value is specified, for example MEMLIMIT(1G), then the MEMLIMIT must be exactly 1G (or an equivalent value such as 1024M.)
  - If two values are specified, for example: MEMLIMIT(1G,2G) then the MEMLIMIT must be at least 1G and not larger than 2G. (In other words, 1G <= MEMLIMIT <= 2G.)
  - NOLIMIT is supported as either a low or high value.
    - Unlike REGION, MEMLIMIT=0M means that the step is not allowed to use virtual storage above the bar.

Usage & Invocation – SAFCHECK filter

- The SAFCHECK filter lists a SAF resource name that determines if a rule should be applied.
  - This is a installation-defined resource name in the FACILITY class.
  - READ access is required. If the user associated with the job or jobstep has READ access, the rule may applied if all of the other filters match. If the user does not have READ access, the rule will not be applied.
- Example:
  - In SMFLIMxx, the following rule is provided:
    REGION SAFCHECK(MY.MEMLIMIT.NOLIMIT) MEMLIMIT(NOLIMIT)
  - Assume we have two users, USER1 and USER2, and the following commands were issued:
    SETROPTS GENERIC(FACILITY)
    RDEFINE FACILITY MY.MEMLIMIT.NOLIMIT UACC(NONE)
    PERMIT MY.MEMLIMIT.NOLIMIT CLASS(FACILITY) ID(USER1) ACC(READ)
    SETROPTS RACLIST(FACILITY) REFRESH
  - USER1 will have the SMFLIMxx rule applied, and so will have MEMLIMIT(NOLIMIT) in effect. USER2 will not have the rule applied.

Usage & Invocation – Attributes

- Three new attributes are added:
  - DSLIMITNUM
  - DSLIMITSIZE
  - JOBMSG
- These attributes, like the existing SMFLIMxx attributes, can be used independently, or in conjunction with other attributes.

Usage & Invocation – DSLIMITNUM

- The DSLIMITNUM attribute will allow the installation to set the maximum number of data spaces for an address space.
  - This corresponds to IEFUSI parameter Word 7, subword 3.
- The maximum number is 4294967295 (4G-1.)
  - It must be specified as an explicit number – modifiers such as M and G are not supported.
  - Example: DSLIMITNUM(100) would indicate that the address space may create no more than 100 data spaces.

Usage & Invocation – DSLIMITSIZE

- The DSLIMITSIZE attribute will allow the installation to set the maximum combined size of all data spaces for an address space.
  - This corresponds to IEFUSI parameter Word 7, subword 2.
- The value is specified as 1-5 digits, followed by a modifier of T (terabytes), G (gigabytes), or M (megabytes).
  - For example: DSLIMITSIZE(1T).
  - Maximum supported size is $(2^{24}-1)$ megabytes, or approximately 16T-1.

Usage & Invocation – JOBMSG

- The JOBMSG attribute controls whether the IEF043I message will be issued to the joblog when SMFLIM processing applies a set of rules to a job.
  - JOBMSG(ISSUE) is the default, and causes the IEF043I message to be issued just as today.
  - JOBMSG(SUPPRESS) causes the IEF043I message to be suppressed.
    - When SMFLIM causes the job to be canceled because a matching rule specified EXECUTE(CANCEL) or EXECUTE(CANCELFROMIEFUSI), IEF043I will be issued even if JOBMSG(SUPPRESS) is in effect.

Usage & Invocation – D SMFLIM command

- No new keywords are added to the DISPLAY SMFLIM command.
  - DISPLAY SMFLIM only supports a subset of the SMFLIMxx filters. None of the new filters are added to the command at this time.
- The DISPLAY SMFLIM output message, IFA900I, is updated to include the new attributes and filters if they are part of the SMFLIM rules that are displayed.

Interactions & Dependencies

- To exploit this item, all systems in the Sysplex must be at the new z/OS level: No

- Software Dependencies
  - None.
- Hardware Dependencies
  - None.
- Exploiters
  - None.

Migration & Coexistence Considerations

- No toleration/coexistence APARs needed.
- The new filters and attributes are only supported on z/OS 2.4.
  - If you have a common SMFLIMxx member that is used on systems that are not at z/OS 2.4, the suggestion is any rules that require the new keyword code should be coded as separate rules.
    - On prior releases, any unrecognized keywords in a rule will cause the rule to be rejected with a syntax error, but other rules will still be processed.
    - Remember that rules are “additive.” Multiple rules can apply different attributes to a single job or job step, so you can have a rule that only applies the old attributes that can be processed on any system, and a separate rule that applies the new attributes that only works on z/OS 2.4.
  - You may also find it useful to use the SYSNAME filter to restrict rules that use the new keywords.

Session Summary

- SMFLIMxx now supports several new attribute and filter keywords for z/OS 2.4.

Appendix

- Reference material:
  - z/OS MVS Initialization and Tuning Reference SA23-1380
    - The SMFLIMxx Parmlib member describes the new keywords.
  - z/OS MVS Installation Exits SA23-1381
    - Describes the IEFUSI exit and parameters.
  - z/OS MVS System Messages, Vol. 8 SA38-0675
    - Describes the IEF043I and IFA900I messages.

z/OS 2.4 IBM Education Assistance

SMF Subtype Reporting

BCP MVS SMF

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- Additional Trademarks: None.

Session Objectives

- This session will cover the new option available for the SMF dump utilities that report summary information by record type and subtype.

Overview

- Who (Audience)
  - System programmer or other users of the IFASMFDL or IFASMFDP dump utilities.
- What (Solution)
  - The dump utilities will optionally list records by type and subtype in the summary report.
- Wow (Benefit / Value, Need Addressed)
  - This allows finer granularity of information by record type and subtype without performing separate analysis of dumped SMF records.

Usage & Invocation

- The SMF dump utilities, IFASMFDP and IFASMFDL, produce a "Summary Activity Report" that lists a summary of the data read and written by the utility.
  - This report traditionally only shows the summary by record type.
  - A new option has been introduced to produce the summary by record type and subtype.
    - REPORTOPTS(SUBTYPE) indicates to include subtype information in the summary report.
    - REPORTOPTS(NOSUBTYPE) indicates to only include type information in the summary report. (This is the same report format as in prior releases of z/OS.)
  - Default behavior is REPORTOPTS(NOSUBTYPE) to produce the summary by record type for compatibility with programs that read the summary report.

Usage & Invocation – Sample JCL

- Sample job step:

```
//DUMPMAN  EXEC PGM=IFASMFDP
//DUMPIN   DD  DSN=SYS1.MANA,DISP=SHR
//OUT30    DD  DSN=DUMP.DATA.SET,DISP=OLD
//SYSPRINT DD  SYSOUT=A
//DUMPOUT  DD  DUMMY
//SYSIN    DD  *
 INDD(DUMPIN,OPTIONS(ALL))
 OUTDD(OUT30,TYPE(1:2047))
 REPORTOPTS(SUBTYPE)
/*
```

Usage & Invocation

- The new summary report format will show records organized by record type and subtype.
  - Records that do not have subtypes will have ‘-’ listed as the subtype.
- Both formats include the same data (number of records read and written, average length, etc.)
- This new summary report format does not aggregate or summarize records by type.

Usage & Invocation – Sample output

Sample report:

SUMMARY ACTIVITY REPORT

START DATE-TIME 02/23/2019-15:51:09 END DATE-TIME 02/23/2019-15:51:16

RECORD TYPE / SUBTYPE	RECORDS READ	PERCENT OF TOTAL	AVG. RECORD LENGTH	MIN. RECORD LENGTH	MAX. RECORD LENGTH	RECORDS WRITTEN
2 / -	0					1
3 / -	0					1
30 / 1	1	16.67 %	480.00	480	480	1
30 / 3	2	33.33 %	1,375.00	1,360	1,390	2
30 / 4	2	33.33 %	1,375.00	1,360	1,390	2
30 / 5	1	16.67 %	1,450.00	1,450	1,450	1
TOTAL	6	100 %	1,238.33	480	1,450	8

NUMBER OF RECORDS IN ERROR 0

Usage & Invocation – Digital Signatures

- SMF will include information about digital signatures in the summary report as it has in prior releases.
  - When using the IFASMFDL dump program:
    - Signature information will be read with the corresponding record type.
    - When using the NOSIGSTRIP option to preserve signature information, that signature information will be written as SMF type 2 subtype 1 or subtype 2 records.
    - For example, signature information for SMF type 30 subtype 1 records will be included under SMF type 30 subtype 1 records read but included as SMF type 2 subtype 1 or subtype 2 records written.
  - When using the IFASMFDP dump program:
    - Signature information will be read as SMF type 2 subtype 1 or subtype 2 records.
    - When using the NOSIGSTRIP option to preserve signature information, that signature information will also be written as SMF type 2 subtype 1 or subtype 2 records.

Interactions & Dependencies

- To exploit this item, all systems in the Sysplex must be at the new z/OS level: No

- Software Dependencies
  - None.
- Hardware Dependencies
  - None.
- Exploiters
  - None.

Session Summary

- The IFASMFDP and IFASMFDL dump utility programs support a new summary activity report format that includes data by record type and subtype. By default, the report format only includes data by record type.

Appendix

- Reference material:
  - z/OS MVS System Management Facilities (SMF) SA38-0667
    - This describes the IFASMFDP and IFASMFDL utilities, parameters, and reports.

z/OS 2.4 IBM Education Assistance

Pricing - SMF Enhancements

MVS BCP SMF

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- Additional Trademarks: None.

Session Objectives

- In z/OS 2.4, several enhancements have been introduced around the IFAUSAGE service and SMF type 89 records. This session will describe these enhancements.

Overview

- Who (Audience)
  - System Programmers and Application Developers
- What (Solution)
  - The IFAUSAGE service is updated to support invocation from additional environments.
  - SMF record type 89 will contain additional data related to Tenant Resource Groups.
- Wow (Benefit / Value, Need Addressed)
  - These changes will allow broader use of the IFAUSAGE service and will also allow for additional metrics to be recorded in the SMF type 89 records for use with the SCRT tool.

Usage & Invocation – IFAUSAGE AMODE 64

- The IFAUSAGE service now supports invocation in AMODE 64, in addition to AMODE 31.
  - The calling program must invoke SYSSTATE AMODE64=YES before calling the IFAUSAGE assembler macro in AMODE 64.
  - Many of the parameters can be used in AMODE 31 or 64, but several of the parameters have a separate 64-bit version which must be used when calling in AMODE 64.
    - The 64-bit keywords must be used when calling in AMODE 64, even if the storage area that is passed is in 31-bit storage.
    - Likewise, the original 31-bit keywords must be used by AMODE 31 callers.
    - The macro will issue an MNOTE and fail the assembly if the wrong keywords are used for the environment.

Usage & Invocation – IFAUSAGE AMODE 64

- 31 and 64 bit keyword comparison

New Keyword (AMODE 64)	Existing Keyword (AMODE 31)	Request type(s)
PRTOKEN64	PRTOKEN	Register, Deregister, FunctionBegin, FunctionEnd, FunctionData
BEGTIME64	BEGTIME	FunctionBegin
ENDTIME64	ENDTIME	Deregister, FunctionEnd
ENDDATA64	ENDDATA	Deregister, FunctionEnd
CURRENTDATA64	CURRENTDATA	FunctionData
DATA64	DATA	FunctionData

Usage & Invocation – Unauthorized IFAUSAGE

- The IFAUSAGE service has limited support for unauthorized callers.
  - Authorized callers have access to all of the IFAUSAGE functions.
  - Unauthorized callers:
    - Can issue IFAUSAGE REQUEST=REGISTER and REQUEST=STATUS
    - Cannot use LINKAGE=BRANCH
    - Limited to 2 registrations per domain and scope.
    - Tracked separately in the SMF type 89 subtype 1 records, even for the same product information.
- In z/OS 2.4, we are adding a new keyword, UNAUTHSERV=LEVEL1, for use by unauthorized callers.
  - Only used with REQUEST=REGISTER.
  - A SAF check is made to determine if the application can register.
  - Successful registration allows the application to use the other IFAUSAGE REQUEST types.
  - Does not support LINKAGE=BRANCH.
  - Limited to 32 registrations per domain and scope (and are separate from the 2 unauthorized registrations.)
  - Tracked separately in the SMF type 89 subtype 1 records from the authorized registrations and the unauthorized registrations that do not specify UNAUTHSERV=LEVEL1.

Usage & Invocation – Unauthorized IFAUSAGE

- SAF check for UNAUTHSERV=LEVEL1:
  - Profile is in CLASS(XFACILIT), requires READ access
  - ENTITYX name format
    - IFAUSAGE.<prodowner>.<prodname>.<prodqual>.<prodid>
    - Fields will be translated to upper case, and special characters (period, ampersand, asterisk, percent, and embedded blanks) will be translated to an underscore
    - Any fields that are all blanks or optional fields that were not provided will not be represented
      - For example, if PRODQUAL was not specified, the name would be IFAUSAGE.<prodowner>.<prodname>.<prodid>
  - If the user does not have access to the resource, the registration will fail.

Usage & Invocation – Unauthorized IFAUSAGE

- Example commands:

```
SETROPTS CLASSACT(XFACILIT)
RDEFINE XFACILIT IFAUSAGE.MYOWNER.MYPROD.** UACC(NONE)
PERMIT IFAUSAGE.MYOWNER.MYPROD.** CLASS(XFACILIT) ID(USER1) ACC(READ)
SETROPTS RACLIST(XFACILIT) REFRESH
```

Usage & Invocation – SMF 89 updates

- SMF type 89 SMF89UD Usage Data Section updates:
  - SMF89UFG is an existing 1-byte field that contains Usage Entry Flags.
    - The first bit (X'80') in this byte is SMF89UUN, which indicates that the IFAUSAGE caller was not authorized. This will be on for regular unauthorized callers as well as callers that use UNAUTHSERV=LEVEL1. This bit is also an existing bit.
    - The third bit (X'20') in this byte is SMF89UUS, which indicates that the IFAUSAGE caller was not authorized but used UNAUTHSERV=LEVEL1 to register. This bit is new in z/OS 2.4.
  - SMF89CountAsTrad is a new 4-byte field that contains the count of active address spaces in a traditional sub-capacity (or non-Tenant Resource Group) workload environment.
  - SMF89CountAsTRG is a new 4-byte field that contains the count of active address spaces in a Tenant Resource Group workload environment.

Usage & Invocation – SMF 89 updates

- SMF type 89 SMF89TRG Tenant Resource Group Data Section Updates:
  - SMF89TRGData is a new 8-byte field that contains product specific resource data.
    - This data is provided by the application using the IFAUSAGE REQUEST=FUNCTIONDATA service.
    - This data is the subset of the product specific resource data that is attributed to the product within the Tenant Resource Group. This corresponds to the SMF89URD field in the SMF89UD section, which contains all of the product specific data attributed to the product.
  - SMF89TRGDataType is a new 1-byte field that describes the data type of the SMF89TRGData field.
    - 0 = No data, 1 = CPU Time in long floating point format, 2 = Binary, 3 = Long floating point.
    - This corresponds to the SMF89URT field in the SMF89UD section, which describes the data type of the SMF89URD field.

Usage & Invocation – SMF 89 updates

- SMF record notes:
  - Before referencing the new fields in the SMF type 89 record, you should ensure that the length of those sections is long enough to contain the new field. Records generated on prior releases will not contain these fields.

Interactions & Dependencies

- To exploit this item, all systems in the Sysplex must be at the new z/OS level: No

- Software Dependencies
  - None.
- Hardware Dependencies
  - None.
- Exploiters
  - None at this time.

Migration & Coexistence Considerations

- No migration or coexistence considerations, but remember that SMF type 89 records generated on prior releases will not contain the new fields described here. If you are processing SMF data generated by systems at prior releases, you need to verify that the length of the section is long enough to contain the new fields before processing that data.

Installation

- As products start exploiting the IFAUSAGE UNAUTHSERV=LEVEL1 support, they should describe how to set up the appropriate SAF profile in their documentation.

Session Summary

- IFAUSAGE has been enhanced in z/OS 2.4 to support additional environments and SMF type 89 records have been enhanced to provide additional information about products that are generating SMF type 89 data.

Appendix

- Reference material:
  - z/OS MVS System Management Facilities (SMF) SA38-0667
    - Describes SMF type 89 fields and the IFAUSAGE interface.