IBM Education Assistance for z/OS V2R2

Item: RMF Support for Large Page Enhancements
Element/Component: RMF

Agenda

- Trademarks

- Presentation Objectives

- Overview

- Usage & Invocation

- Interactions & Dependencies

- Presentation Summary

- Appendix

Trademarks

- See url http://www.ibm.com/legal/copytrade.shtml for a list of trademarks.

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Presentation Objectives

- Purpose and usage of RMF z/OS V2R2 Large Page Enhancements
  - Support of Shared Pageable Large Pages
    - RMF Monitor I Data in SMF 71
    - RMF Monitor I Paging Activity Report (PAGING) and Overview Conditions
    - RMF Monitor I Data in SMF 78-2
    - RMF Monitor I Virtual Storage Activity Report (VSTOR)
    - RMF Monitor III STORM Report
  - Customer requirements to provide data in SMF 71
    - Enhance SMF records to provide values for high virtual common storage defined and allocated
    - Include LFAREA 1M to 4K conversion counts in SMF Type 71 records
    - Usage of pageable large area by 1MB pageable large pages

Overview (1/2)

- Problem Statement / Need Addressed
    - With z/OS V2R2, RSM supports **Shared** Pageable Large Pages. (Common and Private Pageable Large Pages support exists.)
    - Shared Pageable Large Pages (SPLP) is a virtual storage concept to allow large pages (1 MB) in high virtual storage (64-bit storage) be shared between address spaces.
    - User's need to know the memory utilization of the system. With the introduction of SPLP, user's need to know how many memory objects are allocated, how much central storage is used for high virtual shared memory, and whether the virtual storage is backed by standard frames (4 KB) or large frames (1 MB).

- Solution
    - Report on Shared Pageable Large Pages in existing reports
        - Postprocessor: Paging Activity Report (PAGING), Virtual Storage Activity Report (VSTOR)
        - Monitor III: STORM
    - Enhance existing report fields for 64-bit storage (private or common) with shared storage counts → represent the overall high virtual storage
    - Update documentation of existing reports → clarify 31-bit/64-bit & private/common/shared

- Benefit / Value
    - Provide detailed information on memory objects and of large frame utilization.

Overview (2/2)

- Problem Statement / Need Addressed
    - Enhance SMF records to provide values for high virtual common storage defined and allocated
    - Include LFAREA 1M to 4K conversion counts in SMF Type 71 records
    - Usage of pageable large area by 1MB pageable large pages

- Solution
    - Provide total number of high virtual common pages in SMF71C1M (min), SMF71C1X (max), SMF71C1A (avg).
    Provide number of high virtual common pages in-use in SMF71CPM (min), SMF71CPX (max), SMF71CPA (avg).
    - Provide number of 1 MB fixed frames used on behalf of 4K page requests in SMF714KM (min), SMF714KX (max), SMF714KA (avg).
    - Provide number of 1 MB pageable pages backed by 1 MB pageable frames in SMF71PLM (min), SMF71PLX (max), SMF71PLA (avg).

- Benefit / Value
    - Data requested by customers is made available in SMF records and can be used by customers for further analysis.

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Usage & Invocation – Monitor I Paging Activity Report Changes Frame and Slot Counts Section

```
                            P A G I N G   A C T I V I T Y
                                                                              PAGE    2
           z/OS V2R2              SYSTEM ID RMFA          DATE 02/17/2015        INTERVAL 15.00.000
                                  RPT VERSION V2R2 RMF    TIME 14.15.00         CYCLE 1.000 SECONDS


OPT = IEAOPT00    LFAREA SIZE = 134217728   CENTRAL STORAGE MOVEMENT AND REQUEST RATES - IN PAGES PER SECOND
-------------------------------------------------------------------------------------------------------------
SYSTEM UIC: MIN =   3322    MAX =   3501    AVG =   3411
[...]
                                    FRAME AND SLOT COUNTS
-------------------------------------------------------------------------------------------------------------
(90 SAMPLES)

CENTRAL STORAGE FRAMES      TOTAL    AVAILABLE       SQA         LPA         CSA        LSQA   REGIONS+SWA  HV SHARED  HV COMMON
----------------------   ---------  ---------   ---------   ---------   ---------   ---------  -----------  ---------  ---------
       MIN               753,792    462,840        5,561      18,898       5,683      14,928     166,298        225     16,479
       MAX               753,792    536,690        5,561      18,980       5,688      15,070     194,615     45,689     16,479
       AVG               753,792    517,708        5,561      18,908       5,686      14,982     176,192      9,413     16,479

FIXED FRAMES                TOTAL    NUCLEUS         SQA         LPA         CSA        LSQA   REGIONS+SWA   <16 MB    16MB-2GB
----------------------   ---------  ---------   ---------   ---------   ---------   ---------  -----------  ---------  ---------
       MIN                37,943      3,156        4,969          67      14,944       8,876       5,931         25     10,519
       MAX                58,057      3,156        4,969          67      14,944       8,939      25,982         25     30,396
       AVG                45,722      3,156        4,969          67      14,944       8,899      13,687         25     18,203

SHARED FRAMES / SLOTS       TOTAL            CENTRAL STORAGE  FIXED TOT   FIXED BEL     HV 1M       HV 4K     AUX DASD   AUX SCM
----------------------   ---------  ---------  ---------   ---------   ---------   ---------  -----------  ---------  ---------
       MIN                 2,958                   2,664          24           0           0           1          0          0
       MAX             8,391,566                  38,164          24           0         100       9,901          0          0
       AVG             3,068,030                   8,284          24           0           8       3,647          0          0

LOCAL PAGE DATA SET SLOTS   TOTAL    AVAILABLE       BAD      NON-VIO        VIO
------------------------ ---------  ---------   ---------   ---------   ---------
       MIN             1,802,699  1,802,699          0           0           0
       MAX             1,802,699  1,802,699          0           0           0
       AVG             1,802,699  1,802,699          0           0           0

SCM PAGING BLOCKS           TOTAL    AVAILABLE       BAD      IN-USE
----------------------   ---------  ---------   ---------   ---------
       MIN               131,072    115,090          0      15,982
       MAX               131,072    115,090          0      15,982
       AVG               131,072    115,090          0      15,982
```

Usage & Invocation – Monitor I Paging Activity Report Changes Frame and Slot Counts Section

- Description of new report fields:

Field Heading	Meaning
...	
■ SHARED FRAMES / SLOTS ■ ■ ■ ■ ■ ■	**TOTAL** The total number of central storage frames and auxiliary slots that are in-use by shared pages. **CENTRAL STORAGE** The total number of central storage frames that are in-use by shared pages. **FIXED TOT** The number of central storage frames that are in-use by shared fixed pages **allocated below the 2 GB bar.** **Note: High virtual shared storage cannot be fixed.** **FIXED BEL** The number of central storage frames that are in-use by shared fixed pages allocated below 16 megabytes. **HV 1M** **The number of central storage frames that are in-use by shared high virtual 1 MB pages.** **HV 4K** **The number of central storage frames that are in-use by shared high virtual 4K pages.** **AUX DASD** The number of shared pages backed on DASD. **AUX SCM** The number of shared pages backed on Storage Class Memory (SCM). **Note:** AUX DASD and AUX SCM are also called auxiliary storage slots.
■ ...	

- Note: Data of previous releases gets printed with the original column layout, i.e., "AUX DASD" right beneath "FIXED BEL".

Usage & Invocation – Monitor I Paging Activity Report Changes Memory Objects and High Virtual Storage Frames Section

```
                                  P A G I N G   A C T I V I T Y
                                                                                        PAGE     3
           z/OS V2R2                   SYSTEM ID RMFA              DATE 02/17/2015       INTERVAL 02.00.000
                                       RPT VERSION V2R2 RMF        TIME 14.15.00        CYCLE 1.000 SECONDS


OPT = IEAOPT00   LFAREA SIZE = 134217728   MEMORY OBJECTS AND HIGH VIRTUAL STORAGE FRAMES
----------------------------------------------------------------------------------------------------------------

MEMORY OBJECTS         COMMON     FIXED 1M      SHARED    SHARED 1M
-----------------     ---------   ---------    ---------  ---------
       MIN                70          0            1           0
       MAX                70          0           17          16
       AVG                70          0            7           6


1 MB FRAMES           ----------- FIXED -----------    ----------- PAGEABLE ----------
-----------------      TOTAL   AVAILABLE     IN-USE      TOTAL   AVAILABLE     IN-USE
       MIN               128       0            3          256       0          256
       MAX               128      125          128         256       0          256
       AVG               128      113           15         256       0          256


HIGH SHARED FRAMES      TOTAL       CENTRAL STORAGE   BACKED 1M                          AUX DASD    AUX SCM
-----------------     ---------     ---------------   ---------                          ---------   ---------
       MIN            136902.1M               225         0                                  0           0
       MAX            136902.1M            45,689       100                                  0           0
       AVG            136902.1M             9,413         8                                  0           0

HIGH COMMON FRAMES      TOTAL       CENTRAL STORAGE   BACKED 1M       FIXED    FIXED 1M  AUX DASD    AUX SCM
-----------------     ---------     ---------------   ---------     ---------  --------- ---------   ---------
       MIN            17301504             16,479         0           8,894        0         0           0
       MAX            17301504             16,479         0           8,894        0         0           0
       AVG            17301504             16,479         0           8,894        0         0           0
```

- In block MEMORY OBJECTS, column "1 MB" got renamed to "FIXED 1M" to clarify the meaning. The order of columns "FIXED 1M" and "SHARED" got switched in order to group column "SHARED" with column "SHARED 1M".
- In block HIGH SHARED FRAMES, column "BACKED 1M" got added.
- In block HIGH COMMON FRAMES, column "BACKED 1M" got added. Column "FIXED 4K" got changed to "FIXED" and reports 4K and 1M pages (in units of 4K). Column "FIXED 1M" got added.

Usage & Invocation – Monitor I Paging Activity Report Changes Memory Objects and High Virtual Storage Frames Section

▪ Description of new and changed report fields (1/2):

Field Heading	Meaning
MEMORY OBJECTS	**COMMON** Number of memory objects allocated in the high virtual common storage of the system. **FIXED 1M** Number of fixed memory objects that are allocated in the system and can be backed in 1 MB frames. **SHARED** Number of memory objects allocated in the high virtual shared storage of the system. **SHARED 1M** **Number of shared memory objects that are allocated in the system and can be backed in 1 MB frames.**
HIGH SHARED FRAMES	**TOTAL** Size of high virtual shared area in units of 4 KB pages. **CENTRAL STORAGE** Number of pages from high virtual shared storage that are backed in central storage (in units of 4 KB). **BACKED 1M** **Number of high virtual shared memory 1 MB pages that are backed in central storage** **AUX DASD** Number of auxiliary storage slots used for high virtual shared pages that are backed on DASD. **AUX SCM** Number of auxiliary storage slots used for high virtual shared pages that are backed on SCM storage.

▪ Note: Data of previous releases gets printed with the original column layout.

Usage & Invocation – Monitor I Paging Activity Report Changes Memory Objects and High Virtual Storage Frames Section

- Description of new and changed report fields (2/2):

Field Heading	Meaning

HIGH COMMON FRAMES	**TOTAL** Size of high virtual common area in units of 4 KB pages.
	CENTRAL STORAGE
	    Number of pages from high virtual common storage that are backed in central storage (in units of 4 KB).
	BACKED 1M
	    Number of high virtual common memory 1 MB pages that are backed in central storage
	FIXED Number of pages from high virtual common storage that are fixed in central storage (in units of 4K).
	FIXED 1M **Number of high virtual common memory 1 MB pages that are fixed in central storage**
	AUX DASD Number of auxiliary storage slots used for high virtual shared pages that are backed on DASD.
	AUX SCM Number of auxiliary storage slots used for high virtual shared pages that are backed on SCM storage.

- Note: Data of previous releases gets printed with the original column layout.

# Usage & Invocation – New Overview Conditions (based on SMF 71)

Condition	Condition Name	Qualifier	Source	Algorithm
Average number of shared memory objects that are allocated in the system and can be backed in 1 MB frames	SMO1MA	none	SMF71S2A	Value or comparison
Average number of high virtual shared memory 4K pages that are backed in central storage	SFR4KA	none	SMF71S3A	Value or comparison
Average number of high virtual shared memory 1 MB pages that are backed in central storage	SFR1MA	none	SMF71S4A	Value or comparison
Average number of high virtual common memory 1 MB pages that are backed in central storage	CFR1MA	none	SMF71C3A	Value or comparison
Average number of high virtual common memory 1 MB pages that are fixed in central storage	CFFR1MA	none	SMF71C2A	Value or comparison

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Usage & Invocation – New Fields in SMF Record 71 (1/3)
→ Related to High Virtual Shared Memory

Offsets	Name	Length	Format	Description
1528 5F8	SMF71S1A	8	floating	[...]
1536 600	*--*	*72*	*--*	*Reserved*
1536 600	**SMF71S2M**	**8**	**floating**	**Minimum number of shared memory objects that are allocated in the system and can be backed in 1 MB frames**
1544 608	**SMF71S2X**	**8**	**floating**	**Maximum number of shared memory objects that are allocated in the system and can be backed in 1 MB frames**
1552 610	**SMF71S2A**	**8**	**floating**	**Average number of shared memory objects that are allocated in the system and can be backed in 1 MB frames**
1560 618	**SMF71S3M**	**8**	**floating**	**Minimum number of frames in use for shared high virtual 4K pages**
1568 620	**SMF71S3X**	**8**	**floating**	**Maximum number of frames in use for shared high virtual 4K pages**
1576 628	**SMF71S3A**	**8**	**floating**	**Average number of frames in use for shared high virtual 4K pages**
1584 630	**SMF71S4M**	**8**	**floating**	**Minimum number of high virtual shared memory 1 MB pages backed in central storage**
1592 638	**SMF71S4X**	**8**	**floating**	**Maximum number of high virtual shared memory 1 MB pages backed in central storage**
1600 640	**SMF71S4A**	**8**	**floating**	**Average number of high virtual shared memory 1 MB pages backed in central storage**
1608 648	SMF71S5M	8	floating	[...]
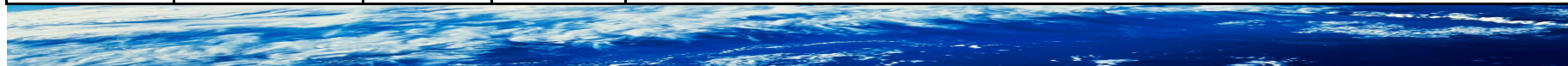
Usage & Invocation – New Fields in SMF Record 71 (2/3) → Related to High Virtual Common Memory

Offsets	Name	Length	Format	Description
...				
1672 688	SMF71C1A	8	floating	[...]
1680 690	*--*	*48*	*--*	*Reserved*
1680 690	**SMF71C2M**	**8**	**floating**	**Minimum number of high virtual common memory 1 MB fixed pages**
1688 698	**SMF71C2X**	**8**	**floating**	**Maximum number of high virtual common memory 1 MB fixed pages**
1696 6A0	**SMF71C2A**	**8**	**floating**	**Average number of high virtual common memory 1 MB fixed pages**
1704 6A8	**SMF71C3M**	**8**	**floating**	**Minimum number of high virtual common memory 1 MB pages backed in central storage**
1712 6B0	**SMF71C3X**	**8**	**floating**	**Maximum number of high virtual common memory 1 MB pages backed in central storage**
1720 6B8	**SMF71C3A**	**8**	**floating**	**Average number of high virtual common memory 1 MB pages backed in central storage**
1728 6C0	SMF71C4M	8	floating	[...]
...				

Usage & Invocation – New Fields in SMF Record 71 (3/3) → Customer Requirements

Offsets	Name	Length	Format	Description
...				
1952 7A0	SMF71MCF	4	signed	[...]
1956 7A4	--	4	--	Reserved
1960 7A8	SMF71CPM	8	floating	Minimum number of high virtual common pages in-use
1968 7B0	SMF71CPX	8	floating	Maximum number of high virtual common pages in-use
1976 7B8	SMF71CPA	8	floating	Average number of high virtual common pages in-use
1984 7C0	SMF714KM	8	floating	Minimum number of 1 MB fixed frames used on behalf of 4K page requests
1992 7C8	SMF714KX	8	floating	Maximum number of 1 MB fixed frames used on behalf of 4K page requests
2000 7D0	SMF714KA	8	floating	Average number of 1 MB fixed frames used on behalf of 4K page requests
2008 7D8	SMF71PLM	8	floating	Minimum number of 1 MB pageable pages backed by 1 MB pageable frames
2016 7E0	SMF71PLX	8	floating	Maximum number of 1 MB pageable pages backed by 1 MB pageable frames
2024 7E8	SMF71PLA	8	floating	Average number of 1 MB pageable pages backed by 1 MB pageable frames

Ensure that the following long floating fields are on double word boundary.

Usage & Invocation – Monitor I VSTOR Report Changes
Private Area Detail Section / High Virtual Memory Usage Section

```
                    V I R T U A L   S T O R A G E   A C T I V I T Y
                                                                            PAGE    4
        z/OS V2R2        SYSTEM ID RMFA         DATE 02/17/2015      INTERVAL 02.00.000
                         RPT VERSION V2R2 RMF   TIME 14.15.00        CYCLE 1.000 SECONDS


                           PRIVATE AREA DETAIL


    JOB NAME - TESTJOB1   MEMORY LIMIT - 16384P

    NUMBER OF BYTES OF ALLOCATED BLOCKS BY AREA (BELOW 16 MEG)

    SUBPOOL (AREA)      MIN           MAX           AVG
      230               84K 14.15.00  84K 14.15.00  84K
    [...]

                                HIGH VIRTUAL MEMORY USAGE (ABOVE 2GB)


    BYTES               MIN           MAX           AVG    PEAK
      PRIVATE           10.00M 14.15.00 10.00M 14.15.00 10.00M 10.00M
      SHARED            4.000G 14.15.00 4.000G 14.15.00 4.000G 4.000G
      COMMON            0 14.15.00      0             0      0

    MEMORY OBJECTS
      PRIVATE           8 14.15.00      8 14.15.00    8
      SHARED            2 14.15.00      2 14.15.00    2
      COMMON            0 14.15.00      0             0
      FIXED 1 MB        0 14.15.00      0             0
      SHARED 1 MB       2 14.15.00      2 14.15.00    2

    1 MB FRAMES
      FIXED             0 14.15.00      0             0
      PAGEABLE          0 14.15.00      0             0
```

- Row "SHARED 1 MB" got introduced.
- Row "1 MB" got renamed to "FIXED 1M" to clarify the meaning.
- Formerly, high virtual memory usage was part of the Private Area Detail section. Now it is a separate report section.

Usage & Invocation – Monitor I VSTOR Report Changes
High Virtual Memory Usage Section

▪ Description of new and changed report fields:

Field Heading	Meaning
MEMORY OBJECTS	The MIN, MAX, and AVG values for the number of PRIVATE, SHARED, and COMMON memory objects allocated with the indicated job. Fixed memory objects **and shared memory objects** that are backed in 1 MB frames are also reported if the Enhanced DAT Architecture is supported.

Filename: zOS V2R2 RMF Large Page Enhancements

Usage & Invocation – New Fields in SMF Record 78, Subtype 2

Offsets	Name	Length	Format	Description
...				
656 290	R782LGMO	40	Mixed(3)	Number of **fixed** memory objects that can be backed in 1 MB frames
...				
824 338	**R782LSMO**	**40**	**Mixed(3)**	**Number of shared memory objects that can be backed in 1 MB frames**

Note: The description of R782LGMO got updated to clarify the meaning. The behavior of RMF did not change.

Format "Mixed(3)" has the following byte structure:

Offsets	Name	Length	Format	Description
0 0	VSDCMIN	8	floating	Minimum number high virtual memory objects / frames
8 8	VSDCNTME	4	binary	Time stamp for minimum value
12 C		4		Reserved
16 10	VSDCMAX	8	floating	Maximum number of high virtual memory objects / frames
24 18	VSDCXTME	4	binary	Time stamp for maximum value
28 1C		4		Reserved
32 20	VSDCTOTL	8	floating	Total for all samples (used to calculate the average)

Usage & Invocation – Monitor III STORM Report Changes ISPF Report

```
                        RMF V2R2   Storage Memory Objects           Line 1 of 94
Command ===>                                                    Scroll ===> CSR

Samples: 60      System: RMFA  Date: 02/25/15  Time: 15.34.00  Range: 60    Sec

---------------------------------- System Summary ----------------------------------
---MemObj---     ---Frames---     -1MB MemObj-     --1MB Fixed--    -1MB Pageable-
Shared    2      Shared 23326     Fixed      0     Total    128     Initial    256
Common   71      Common 16903     Shared     1     Common     0     Dynamic     92
                 %Used   10.1     Common     0     %Used   71.5     %Used      100
------------------------------------------------------------------------------------
                 Service      ---- Memory Objects --- -1MB Frames- ----- Bytes -----
Jobname   C Class      ASID Total  Comm   Shr  1 MB  Fixed Pgable Total  Comm    Shr

OMVS      S SYSTEM     0015    64     0     0     0      0     5 1401M     0      0
JES2      S SYSSTC     0045    34     1     0     0      0     0 50.0M 1024K      0
TCPIP     S SYSSTC     0098    19     4     0     0      0     0 2600M 2583M      0
HZSPROC   S STCCMD     0018    16     1     1     0      0     0 8209M 1024K 1024K
RESOLVER  S SYSSTC     0027    14     1     0     0      0     0 15.0M 1024K      0
TN3270    S SYSSTC     0031    13     1     0     0      0     0 1040M 2048K      0
RMF       S SYSSTC     0100    11     7     0     0      0     0 12.0M 7168K      0
TESTJOB1  B BATCHMED   0050    10     1     1     0      0     0 1820M 1024K 1809M
*MASTER*  S SYSTEM     0001     8     5     0     0      0     0 41.0M 38.0M      0
```

The System Summary section got changed this way:
- Field "1MB MemObj – Total" got renamed to "1MB MemObj – Fixed" to clarify the meaning.
- Field "1MB MemObj – Shared" got introduced to report the number of shared 1MB memory objects in the system.

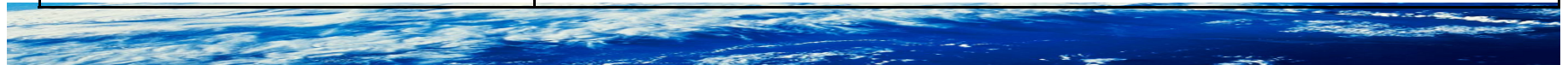# Usage & Invocation – Monitor III STORM Report Changes Report Fields

- New and changed ISPF report fields:

Note: With the introduction of new report fields for shared memory objects, we need to make clear that some existing report fields are about fixed memory objects. Therefore, the labels and descriptions of affected fields got updated.

Report Header Field	Meaning
1MB MemObj – **Fixed** ~~Total~~	Average number of fixed memory objects that are allocated in the system and can be backed in 1 MB frames.
1MB MemObj – Shared	**Average number of memory objects that are allocated in high virtual shared storage and can be backed in 1 MB frames.**

- New and changed Data Portal report fields and field descriptions:

Report Header Field	Meaning
1 MB Frames **Fixed** ~~Backed~~	Average number of 1 MB pages **fixed** ~~backed~~ in central storage
1 MB Frames **Fixed** ~~Backed~~ Used %	Percentage 1 MB pages used by **fixed** memory objects
Report Table Field	**Meaning**
MemObjs 1 MB **Fixed**	Average number of **fixed** memory objects allocated with this address space as the owner that can be backed in 1 MB frames
MemObjs 1 MB Shared	**Average number of shared memory objects allocated with this address space as the owner that can be backed in 1 MB frames**
1 MB Frames Fixed	Average number of **fixed** 1 MB pages backed in central storage
Shared HWM	**High water mark for the amount of high virtual shared storage allocated (in bytes)**

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Usage & Invocation – Monitor III STORM Report Changes Tabular report data table ERBSTMT3

- New and changed data table fields:

Name	T	Description of the variable	Report
STMPLMO	N	Average number of **fixed** memory objects allocated with this address space as the owner that can be backed in 1 MB frames	Yes
STMPLSMO	**N**	**Average number of shared memory objects allocated with this address space as the owner that can be backed in 1 MB frames**	**Util**
STMPLFR	N	Average number of **fixed** 1 MB pages backed in central storage owned by this address space	Yes
STMPHCB	N	High water mark for the amount of high virtual common storage allocated **(in bytes)**	Util
STMPHSB	**N**	**High water mark for the amount of high virtual shared storage allocated (in bytes)**	**Util**

Note: With the introduction of new report fields for shared memory objects, we need to make clear that some existing report fields are about fixed memory objects. Therefore, the description of affected fields got updated.

Usage & Invocation – Monitor III STORF Report Changes

- Change field descriptions to clarify that these fields are about fixed memory objects.

- Changed report field labels and descriptions:

Report Table Field	Meaning
1 MB Frames Fixed	Number of 1 MB frames **fixed** ~~backed~~ in central storage
MemObjs 1 MB **Fixed**	Number of **fixed** 1 MB memory objects allocated

-

-

- Tabular report data table ERBSTFT3 – changed field descriptions:

Name	T	Description of the variable	Report
STFPLMO	N	Number of **fixed** 1 MB memory objects allocated	Util
STFPLPR	N	Number of 1 MB frames **fixed** ~~backed~~ in central storage	Util

Interactions & Dependencies

- Hardware Dependencies

    - Enhanced DAT Architecture must be available to support Large Memory Objects and 1 MB frames.

Presentation Summary

- System-wide usage data of Shared Pageable Large Pages is provided by
    - SMF 71 records
    - Postprocessor Paging Activity Report (and Overview Conditions)
    - Monitor III STORM Report, System Summary section
    - RMF Data Portal STORM Report

- Address space related usage data of Shared Pageable Large Pages is provided by
    - SMF 78-2 records
    - Postprocessor Virtual Storage Activity Report (VSTOR), High Virtual Memory Usage section
    - RMF Data Portal STORM Report

- SMF 71 records provide additional high virtual storage management data, as requested by various customer requirements.

Appendix

- RMF homepage: www.ibm.com/systems/z/os/zos/features/rmf/
  - Product information, newsletters, presentations, etc.
  - Downloads
    - Spreadsheet Reporter
    - RMF PM Java Edition

- RMF email address: rmf@de.ibm.com

- Documentation and news
  - *RMF Report Analysis*, SC34-2665
  - *RMF User's Guide*, SC34-2664
  - Latest version of PDF files can be downloaded from:
    - http://www.ibm.com/systems/z/os/zos/bkserv/