# z/OS 3.1 IBM Education Assistant

Solution Name:  SYSEVENT MEMORY

Solution Element(s):  z/OS WLM

July 2023

# Agenda

- Trademarks
- Objectives
- Overview
- Usage & Invocation
- Interactions & Dependencies
- Upgrade & Coexistence Considerations
- Installation & Configuration
- Summary
- Appendix

# Trademarks

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

# Objectives

- The SYSEVENT macro provides the interface to the system resource manager (SRM).
- Using SYSEVENT mnemonics, you can:
  - Notify SRM of an event
  - Ask SRM to perform a specific function
  - Retrieve data
- This initiative provides a new MEMORY mnemonic which returns comprehensive memory metrics including available and used memory as well as memory shortage flags. It provides information about the real (system) memory, auxiliary memory, dedicated memory and about memory pools.
- MEMORY provides additional memory related data compared to the STGTEST option – it returns additional data about the real memory, memory pools, auxiliary memory and dedicated memory. See slide 9 for more details.
- The documentation will be in the “z/OS MVS Authorized Assembler Services Reference”.

# Overview

- Who (Audience)
  - z/OS Application Developer
- What (Solution)
  - The SYSEVENT MEMORY allows the user to retrieve comprehensive memory metrics including available and used memory as well as memory shortage flags. It provides information about the real (system) memory, auxiliary memory, dedicated memory and about memory pools.
- Wow (Benefit / Value, Need Addressed)
  - This allows application developers to retrieve used and available memory (real system memory, memory pool related memory, auxiliary memory and dedicated memory) in order to determine how much memory can be allocated without causing a negative impact to the system.

# Usage & Invocation (1)

SYSEVENT MEMORY allows two parameters:

- Entry
  - SVC: callers are APF authorized
  - BRANCH: callers are in supervisor state and PSW key 0 – 7
  - UNAUTHPC: callers are in problem state and PSW key 8 – 15
- TYPE
  - 0: return data for the system and the memory pool the caller belongs to
  - 1: return data for the system and all memory pools

Additionally:

- Pointer to parameter list (in R1)
- Return code (in R15)

# Usage & Invocation (2)

## SYSEVENT MEMORY is called with a parameter list:

- The pointer to the parameter list which is mapped by the IRAMEMRY mapping macro.

- Option 1: For a first all, create a parameter list based on the “Mem_Header” declaration.
  In this case you expect rc=8 and Mem_Header.Mem_InOut.Mem_Length set to the required parameter list size to retrieve the response. Option 2 would be the next call.

- Option 2: Create a parameter list that can store all the data, like returned above - or:
  - Mem_Header + max. 2 * Mem_Real_Section + Mem_Aux_Section + Mem_Ded_Section
    (if TYPE = 0)
    IRAMEMRY contains this value in the constant “Mem_Size_Type0”
  - Mem_Header + max. 65 * Mem_Real_Section + Mem_Aux_Section + Mem_Ded_Section
    (if TYPE = 1)
    IRAMEMRY contains this value in the constant “Mem_Size_Type1

  In this case you expect rc=0 and the parameter list populated.

# Usage & Invocation (3)

## SYSEVENT MEMORY return values (defined in IRAMEMRY):

- Real Memory
  - Memory shortages
  - Available memory to allocate – with no impact, some impact and more impact to the overall system performance
  - Used memory
- Memory Pool Memory
  - Memory shortage
  - Used and available memory within the memory pool
- Auxiliary Memory
  - Memory shortage
  - Used and available DASD and flash (SCM) memory
- Dedicated Memory
  - Used and available dedicated memory

# Usage & Invocation (4)

MEMORY provides additional memory related data compared to the STGTEST option – it returns additional data about the real memory, memory pools, auxiliary memory and dedicated memory.

When you migrate from using the STGTEST option to using the MEMORY option, please find below the fields from the MEMORY parameter list that replace the STGTEST values:

| STGTEST | MEMORY |
|---|---|
| Value 1 | Mem_Real.Mem_Real_Pageable.Mem_Real_Page_Available |
| Value 2 | Mem_Real.Mem_Real_Pageable.Mem_Real_Page_MoreImpact |
| Value 3<br>(same as value 2) | (see Value 2) |

# Interactions & Dependencies

- None

# Upgrade & Coexistence Considerations

- None

# Installation & Configuration

- Is part of z/OS 3.1

# Summary

- This initiative provides a new MEMORY mnemonic which returns comprehensive memory metrics including available and used memory as well as memory shortage flags. It provides information about the real (system) memory, auxiliary memory, dedicated memory and about memory pools.

# Appendix

- The new SYSEVENT will be described in the “z/OS MVS Authorized Assembler Services Reference”.
- The new IRAMEMRY macro will be available in SYS1.MACLIB. The macro is listed in the following pages.

# Appendix: IRAMEMRY – Mem_Header

| OFF DEC | OFF HEX | TYPE | LEN | NAME (DIM) | DESCRIPTION |
|---|---|---|---|---|---|
| 0 | (0) | STRUCTURE | 64 | MEM_HEADER | |
| 0 | (0) | CHARACTER | 16 | MEM_INOUT | |
| 0 | (0) | CHARACTER | 8 | MEM_ID | Eyecatcher IRAMEMRY |
| 8 | (8) | UNSIGNED | 4 | MEM_LENGTH | (In) Length of parameter list. If SYSEVENT returns with RC=8, this field contains the required length |
| 12 | (C) | CHARACTER | 4 | * | Reserved |
| 16 | (10) | CHARACTER | 48 | MEM_OUT | |
| 16 | (10) | UNSIGNED | 2 | MEM_HDR_LENGTH | Length of this section |
| 18 | (12) | UNSIGNED | 1 | MEM_VERSION | Version |
| 19 | (13) | CHARACTER | 5 | * | Reserved |
| 24 | (18) | CHARACTER | 8 | MEM_REAL | |
| 24 | (18) | UNSIGNED | 4 | MEM_REAL_OFFSET | Offset to the Real Memory Section |
| 28 | (1C) | UNSIGNED | 2 | MEM_REAL_LENGTH | Length of the Real Memory Section |
| 30 | (1E) | UNSIGNED | 2 | MEM_REAL_COUNT | Number of Real Memory sections. First section is the system memory, the following sections the memory pool related sections |
| 32 | (20) | CHARACTER | 8 | MEM_AUX | |
| 32 | (20) | UNSIGNED | 4 | MEM_AUX_OFFSET | Offset to the AUX Memory Section |
| 36 | (24) | UNSIGNED | 2 | MEM_AUX_LENGTH | Length of the AUX Memory Section |
| 38 | (26) | UNSIGNED | 2 | MEM_AUX_COUNT | Number of Aux Memory sections (currently 1) |
| 40 | (28) | CHARACTER | 8 | MEM_DED | |
| 40 | (28) | UNSIGNED | 4 | MEM_DED_OFFSET | Offset to the Dedicated Memory Section |
| 44 | (2C) | UNSIGNED | 2 | MEM_DED_LENGTH | Length of the Dedicated Memory Section |
| 46 | (2E) | UNSIGNED | 2 | MEM_DED_COUNT | Number of Dedicated Memory sections (currently 1) |
| 48 | (30) | CHARACTER | 16 | * | Reserved |
| 64 | (40) | CHARACTER | 0 | * | |

# Appendix: IRAMEMRY – Mem_Real_Section

```
OFF   OFF
DEC   HEX   TYPE        LEN  NAME (DIM)      DESCRIPTION
====  ====  ========== ===  ============== ==========================
   0   (0)  STRUCTURE   80  MEM_REAL_SECTION
   0   (0)  CHARACTER    8   MEM_REAL_NAME Contains SYSTEM or the MEMPOOL
                                           name
   8   (8)  BIT(8)       1   MEM_REAL_TYPE
            1... ....         MEM_REAL_TYPE_SYSTEM
                                           If on, this is a
                                           System view
            .1.. ....         MEM_REAL_TYPE_MEMPOOL
                                           If on, this is a
                                           Memory Pool view
            ..11 1111             *       Reserved
   9   (9)  BIT(8)       1   MEM_REAL_FLAGS
            1... ....         MEM_REAL_FLAGS_B16SHORTAGE
                                           Below 16
                                           Shortage - Only set when
                                           Type=SYSTEM
            .1.. ....         MEM_REAL_FLAGS_B2GSHORTAGE
                                           Between 2G
                                           Shortage - Only set when
                                           Type=SYSTEM
            ..1. ....         MEM_REAL_FLAGS_DREFSHORTAGE
                                           DREF Shortage -
                                           Only set when Type=SYSTEM
            ...1 ....         MEM_REAL_FLAGS_TOTSHORTAGE
                                           Total Real
                                           Shortage - Only set when
                                           Type=SYSTEM
            .... 11..         *        Reserved
            .... ..1.         MEM_REAL_FLAGS_MEMSHORTAGE
                                           Memory Pool
                                           Shortage - Only set when
                                           Type=MEMPOOL
            .... ...1         *           Reserved
  10   (A)  CHARACTER    6   *           Reserved
  16   (10) CHARACTER   32   MEM_REAL_PAGEABLE
  16   (10) SIGNED       8    MEM_REAL_PAGE_AVAILABLE
                                           Available memory
                                           and when obtained nearly no
                                           impact to the throughput of
                                           the system
  24   (18) SIGNED       8    MEM_REAL_PAGE_SOMEIMPACT
                                           When obtained
                                           there is some impact to the
                                           throughput of the system
  32   (20) SIGNED       8    MEM_REAL_PAGE_MOREIMPACT
                                           When obtained
                                           there is noticeable impact to
                                           the throughput of the system
  40   (28) SIGNED       8    MEM_REAL_PAGE_USED
                                           Amount of memory
                                           currently in use
  48   (30) CHARACTER   16   MEM_REAL_FIXED
  48   (30) SIGNED       8    MEM_REAL_FIXED_AVAILABLE
                                           Amount of
                                           memory an application can fix,
                                           without running into a
                                           pageable memory shortage
  56   (38) SIGNED       8    MEM_REAL_FIXED_USED
                                           Amount of memory
                                           currently fixed in the system
  64   (40) CHARACTER   16   MEM_REAL_2G
  64   (40) SIGNED       8    MEM_REAL_2G_AVAILABLE
                                           Amount of 2G
                                           frames available in the system
  72   (48) SIGNED       8    MEM_REAL_2G_USED
                                           Amount of 2G frames
                                           currently in use
  80   (50) CHARACTER    0   *
```

# Appendix: IRAMEMRY – Mem_Aux_Section

```
OFF   Off
DEC   HEX   TYPE        LEN  NAME (DIM)      DESCRIPTION
====  ====  ========== ===  ============== ==========================
   0   (0)  STRUCTURE    64  MEM_AUX_SECTION
   0   (0)  CHARACTER     8   MEM_AUX_NAME
   8   (8)  BIT(8)        1   MEM_AUX_FLAGS
            1... ....          MEM_AUX_FLAGS_WARNING
                               ASM Warning level
            .1.. ....          MEM_AUX_FLAGS_APPLWARNING
                               ASM Appl Warning
            ..1. ....          MEM_AUX_FLAGS_SHORTAGE
                               ASM 1st level
                               shortage
            ...1 ....          MEM_AUX_FLAGS_CRITICALSHORTAGE
                               ASM 2nd
                               level shortage
            .... 1111          *             Reserved
   9   (9)  CHARACTER     7   *             Reserved
  16  (10)  CHARACTER    16   MEM_AUX_SCM
  16  (10)  SIGNED        8    MEM_AUX_SCM_AVAILABLE
                               50% of the first
                               aux level threshold of the
                               total number of 4K SCM blocks
                               available to ASM minus used
                               blocks
  24  (18)  SIGNED        8    MEM_AUX_SCM_USED
                               Number of used SCM
                               blocks
  32  (20)  CHARACTER    16   MEM_AUX_DASD
  32  (20)  SIGNED        8    MEM_AUX_DASD_AVAILABLE
                               50% of the first
                               aux of the total local slots
                               in all open local page data
                               sets minus used blocks
  40  (28)  SIGNED        8    MEM_AUX_DASD_USED
                               Count of total used
                               local slots
  48  (30)  CHARACTER    16   MEM_AUX_TOTAL
  48  (30)  SIGNED        8    MEM_AUX_TOTAL_AVAILABLE
                               Total number of
                               SCM plus local slots
  56  (38)  SIGNED        8    MEM_AUX_TOTAL_USED
                               Count of SCM and
                               local used slots
  64  (40)  CHARACTER     0   *
```

# Appendix: IRAMEMRY – Mem_Ded_Section

```
OFF   Off
DEC   HEX   TYPE        LEN  NAME (DIM)      DESCRIPTION
====  ====  ========== ===  ============== ==========================
   0   (0)  STRUCTURE   64  MEM_DED_SECTION
   0   (0)  CHARACTER    8   MEM_DED_NAME
   8   (8)  CHARACTER   16   MEM_DED_2G
   8   (8)  SIGNED       8    MEM_DED_2G_AVAILABLE
                                        Number of Dedicated
                                        Memory frames available for
                                        use as 2G units
  16  (10)  SIGNED       8    MEM_DED_2G_USED
                                        Number of Dedicated
                                        Memory frames in use backing
                                        2G Fixed memory
  24  (18)  CHARACTER   24   MEM_DED_1M
  24  (18)  SIGNED       8    MEM_DED_1M_AVAILABLE
                                        Number of Dedicated
                                        Memory frames available for
                                        use as 1M units
  32  (20)  SIGNED       8    MEM_DED_1M_USED
                                        Number of Dedicated
                                        Memory 1M frames in use
                                        backing fixed 1M memory
  40  (28)  SIGNED       8    MEM_DED_1M_USED_PAGEABLE
                                        Number of
                                        Dedicated Memory 1M frames in
                                        use backing pageable 1M
  48  (30)  CHARACTER   16   MEM_DED_4K
  48  (30)  SIGNED       8    MEM_DED_4K_AVAILABLE
                                        Number of Dedicated
                                        Memory frames available for
                                        use as 4K units
  56  (38)  SIGNED       8    MEM_DED_4K_USED
                                        Number of Dedicated
                                        Memory 4K frames in use
                                        backing 4k memory
  64  (40)  CHARACTER    0   *
```