How to Determine the Amount of Memory Used By the System Firmware From the IBM i Command Line

On a Hardware Management Console (HMC) managed system or VIOS-managed system you can use the following command-line interface (CLI) commands to determine the amount of memory that is currently allocated (reserved) to the System Firmware (Hypervisor). (Note that all the values used in this document are expressed in megabytes.)

HMC

```
hscpe:/home/hscpe:> lshwres -r mem -m 8233-E8B*10086EP --level sys -F
sys_firmware_mem --header
sys_firmware_mem
6880
```

VIOS

```
padmin:/home/padmin:> lshwres -r mem -m 7998-61X*061632A --level sys -F
sys_firmware_mem --header
sys_firmware_mem
1280
```

On a VPM-managed system there is no command to determine the amount of memory that is currently allocated (reserved) to the System Firmware (Hypervisor). Something that could work is to do some math using SST and subtracting the result from the total amount of memory installed returned by DSPHDWRSC TYPE(*PRC).

VPM

Follow these steps:

1. Run the DSPHDWRSC TYPE(*PRC) command . You will get the Display Processor Resources panel (Figure 1).

```
                          Display Processor Resources
                                                                 System:
XXXXXXXX
 Type options, press Enter.
   7=Display resource detail

 Opt  Resource        Type-model  Status               Text
  _   CEC01            9409-E8A   Operational          Main Card Enclosure
  _   PN01             296C       Operational          System Control Panel
  _   MP01             53E1       Operational          System Processor Card
  _   MP02             53E1       Operational          System Processor Card
  _   MP03             53E1       Operational          System Processor Card
  _   MP04             53E1       Operational          System Processor Card
  _   PV01             52AE       Operational          Processor Capacity
Card
  _   SP01             28A3       Operational          Service Processor
Card
  _   BCC01                       Operational          Bus Adapter
  _   BCC02             28A3       Operational          Bus Adapter
  _   BCC03             28A3       Operational          Bus Adapter
  _   BCC04             28A3       Operational          Bus Adapter
  _   BCC05             28A3       Operational          Bus Adapter
  _   BCC06             28A3       Operational          Bus Adapter
  _   BCC07             28A3       Operational          Bus Adapter

More...
 F3=Exit   F5=Refresh   F6=Print   F12=Cancel
```

Figure 1. Display Processor Resources panel

2. Page down until you see the Main Storage Card Resources panel (Figure 2).

```
                      Display Processor Resources
                                                              System:
XXXXXXXX
 Type options, press Enter.
   7=Display resource detail

 Opt  Resource        Type-model  Status               Text
  _   BCC08            28A3       Operational          Bus Adapter
  _   BCC09            28A3       Operational          Bus Adapter
  _     MS01           31AA       Operational          1024MB Main Storage
Car
  _     MS02           31AA       Operational          1024MB Main Storage
Car
  _     MS03           31AA       Operational          1024MB Main Storage
Car
  _     MS04           31AA       Operational          1024MB Main Storage
Car
  _     MS05           31AA       Operational          1024MB Main Storage
Car
  _     MS06           31AA       Operational          1024MB Main Storage
Car
  _     MS07           31AA       Operational          1024MB Main Storage
Car
  _     MS08           31AA       Operational          1024MB Main Storage
Car
  _   BC01             28A3       Operational          HSL I/O Bridge
  _   BC02             28A3       Operational          HSL I/O Bridge



Bottom
 F3=Exit   F5=Refresh   F6=Print   F12=Cancel
```

Figure 2. Main Storage Card Resources panel

Calculate the total amount of memory installed by adding the memory capacity of each card. Write down the result.

3. Start the System Service Tools (STRSST), select option 5 (Work with system partitions), and press Enter. You will see the Work with System Partitions panel (Figure 3).

```
                          Work with System Partitions
                                                              System:
XXXXXXXX
 Attention:  Incorrect use of this utility can cause damage
 to data in this system.  See service documentation.

   Number of partitions  . . . . . :  4
   Partition release . . . . . . . :  V7R1M0

   Partition identifier  . . . . . :  1
   Partition name  . . . . . . . . :  ZD8AP1    *

 Select one of the following:


      2. Work with partition status
      3. Work with partition configuration
      4. Clear configuration data
      5. Create a new partition

 Selection
      _

 F3=Exit   F12=Cancel
```

Figure 3. Work with System Partitions panel

4. Select option 3 (Work with partition configuration) and press Enter. You will see the Work with Partition Configuration panel (Figure 4).

```
                        Work with Partition Configuration
                                                              System:   XXXXXXX
Available processor units . . . . :    2.70
Available memory (MB) . . . . . . :  672
Memory region size (MB) . . . . . :  32

Type option, press Enter.
  1=Display  2=Change  9=Delete

                                                                        Virtual
     Partition     ---------Processor----------     Memory             Ethernet ID
Opt  ID  Name      Total   Units  Uncap  Weight       (MB)  WLM  1  2  3  4
 _    1  ZD8AP1        1    1.00    1    Med          2048   2   1  2  2  2
 _    2  XPF71         1    0.10    1    Med          2048   2   3  2  2  2
 _    3  XPF61         1    0.10    1    Med          1536   2   3  2  2  2
 _    4  IBMIDEMO      1    0.10    1    Med          1024   2   3  2  2  2









F3=Exit   F5=Refresh   F11=Work with partition status   F12=Cancel
```

Figure 4. Work with Partition Configuration panel

Calculate the total amount of memory available for partitions by adding the available memory and the memory allocated to each partition. Write down the result.

5. Press F16, F3, and Enter to exit SST.

6. Do the math: Subtract the value obtained in step 4 from the value obtained in step 2:

```
(1024*8) - (672+2048+2048+1536+1024) = 864
```

Fortunately, there is an easier, faster, accurate way to determine the amount of memory that is currently allocated (reserved) to the System Firmware (Hypervisor) through the invocation of the ILE builtin _MATMATR1 (MATMATR MI instruction).

Example program that uses the MATMATR instruction to retrieve the amount of memory currently allocated to the System Firmware

The following program demonstrates how to use the selection value X'01E0' of the MATMATR instruction to determine the amount of memory allocated (reserved) to the System Firmware (Hipervisor):

```
BEGIN:      PGM
            DCL        VAR(&MATMATR) TYPE(*CHAR) LEN(121)
            DCL        VAR(&BYTESIN) TYPE(*CHAR) STG(*DEFINED) +
                         LEN(4) DEFVAR(&MATMATR)
            DCL        VAR(&BYTESOUT) TYPE(*CHAR) STG(*DEFINED) +
                         LEN(4) DEFVAR(&MATMATR 5)
            DCL        VAR(&SYSFMWMEM) TYPE(*CHAR) STG(*DEFINED) +
```

```
                    LEN(4) DEFVAR(&MATMATR 81)
            DCL     VAR(&DSPFMWMEM) TYPE(*CHAR) LEN(10)
/* */
            DCL     VAR(&MSGID) TYPE(*CHAR) LEN(7) VALUE('CPF9898')
            DCL     VAR(&MSGF) TYPE(*CHAR) LEN(10) VALUE('QCPFMSG')
            DCL     VAR(&MSGFLIB) TYPE(*CHAR) LEN(10) +
                      VALUE('*LIBL')
            DCL     VAR(&MSGDTA) TYPE(*CHAR) LEN(512)
            DCL     VAR(&MSGTYPE) TYPE(*CHAR) LEN(10) +
                      VALUE('*COMP')
/* */
            DCL     VAR(&SCLEN) TYPE(*DEC) LEN(3 0) VALUE(10)
            DCL     VAR(&SCSTART) TYPE(*DEC) LEN(3 0) VALUE(1)
            DCL     VAR(&SCPATTERN) TYPE(*CHAR) LEN(1) VALUE('0')
            DCL     VAR(&SCPATTERNL) TYPE(*DEC) LEN(3 0) VALUE(1)
            DCL     VAR(&SCTRANSC) TYPE(*CHAR) LEN(1) VALUE('0')
            DCL     VAR(&SCTRIMC) TYPE(*CHAR) LEN(1) VALUE('1')
            DCL     VAR(&SCWILCARD) TYPE(*CHAR) LEN(1) VALUE(' ')
            DCL     VAR(&SCPOS) TYPE(*DEC) LEN(3 0)
            DCL     VAR(&SCFROM) TYPE(*DEC) LEN(3 0)
            DCL     VAR(&SCQTY) TYPE(*DEC) LEN(3 0)
/* */
            MONMSG  MSGID(CPC0000 CPD0000 CPF0000 MCH0000) +
                      EXEC(GOTO CMDLBL(ERROR))
/* */
            CHGVAR  VAR(%BIN(&BYTESIN)) VALUE(121)
            CALLPRC PRC('_MATMATR1') PARM((&MATMATR *BYREF) +
                      (X'01E0' *BYREF))
            CHGVAR  VAR(&DSPFMWMEM) VALUE(%BIN(&SYSFMWMEM 1 4))
/* */
 EDIT:      CALL    PGM(QCLSCAN) PARM(&DSPFMWMEM &SCLEN &SCSTART +
                      &SCPATTERN &SCPATTERNL &SCTRANSC &SCTRIMC +
                      &SCWILCARD &SCPOS)
            IF      COND(&SCPOS > 0 & &SCPOS < &SCLEN & &SCPOS = +
                      &SCSTART) THEN(DO)
            CHGVAR  VAR(%SST(&DSPFMWMEM &SCPOS 1)) VALUE(' ')
            CHGVAR  VAR(&SCFROM) VALUE(&SCPOS)
            CHGVAR  VAR(&SCSTART) VALUE(&SCSTART + 1)
            GOTO    CMDLBL(EDIT)
            ENDDO
            CHGVAR  VAR(&SCQTY) VALUE(&SCLEN - &SCSTART + 1)
            CHGVAR  VAR(&DSPFMWMEM) VALUE(%SST(&DSPFMWMEM +
                      &SCSTART &SCQTY))
/* */
            CHGVAR  VAR(&MSGDTA) VALUE('System Firmware Memory +
                      (in megabytes): ' |> &DSPFMWMEM)
            GOTO    CMDLBL(END)
/* */
 ERROR:     RCVMSG  MSGTYPE(*EXCP) RMV(*YES) MSGDTA(&MSGDTA) +
                      MSGID(&MSGID) MSGF(&MSGF) MSGFLIB(&MSGFLIB)
            CHGVAR  VAR(&MSGTYPE) VALUE('*ESCAPE')
/* */
 END:       SNDPGMMSG MSGID(&MSGID) MSGF(&MSGFLIB/&MSGF) +
                      MSGDTA(&MSGDTA) MSGTYPE(&MSGTYPE)
            ENDPGM
```

Putting it to work

Follow these instructions from an IBM® i command line:

1. Use the Start Source Entry Utility (STRSEU) command to add a source member called DSPFMWMEM to the QGPL/QCLSRC source physical file:

```
STRSEU SRCFILE(QGPL/QCLSRC) SRCMBR(DSPFMWMEM) TYPE(CLLE) OPTION(2)
TEXT('Display Firmware Memory')
```

2. Paste the CLLE code example for program DSPFMWMEM and save the member.

3. Use the Create Bound CL Program (CRTBNDCL) command to compile the CLLE program DSPFMWMEM into the QGPL library:

```
CRTBNDCL PGM(QGPL/DSPFMWMEM) SRCFILE(QGPL/QCLSRC) OUTPUT(*NONE) USRPRF(*OWNER)
LOG(*NO) ALWRTVSRC(*NO) REPLACE(*YES)
```

How it works

The program DSPFMWMEM uses the ILE builtin _MATMATR1 (MATMATR MI instruction) to determine the amount of memory that is currently allocated (reserved) to the System Firmware (Hypervisor). When you issue the CALL PGM(QGPL/DSPFMWMEM) command to run the program, it sends a completion message with the result.

These were the results obtained after we ran the program on the three systems used when writing this document:

- HMC: System Firmware Memory (in megabytes): 6880.
- VIOS: System Firmware Memory (in megabytes): 1280.
- VPM: System Firmware Memory (in megabytes): 864.

If you compare the values with the ones obtained using the CLI commands (HMC and VIOS) and using DSPHDWRSC and SST, you will see that they match.

For further information about MATMATR MI instruction and the machine interface in general, see the IBM i 7.1 Information Center at the following web pages:

- Materialize Machine Attributes (MATMATR)
  http://publib.boulder.ibm.com/infocenter/iseries/v7r1m0/topic/rzatk/MATMATR.htm
- Machine interface programming
  http://publib.boulder.ibm.com/infocenter/iseries/v7r1m0/topic/apiref/MIpgmg.htm
- IBM i Machine Interface
  http://publib.boulder.ibm.com/infocenter/iseries/v7r1m0/topic/rzatk/mitoc.htm

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This document was created or updated on October 6, 2011.

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