

Newsletter

Support for the Workload License Charges (WLC) Pricing Model

This document describes recent RMF enhancements related to the Workload License Charges (WLC) pricing model.

Introduction

This section is a very short introduction into the Workload License Charges (WLC) pricing model. For more detailed information about WLC, please refer to www.ibm.com/servers/eserver/zseries/swprice/wlc.html. If you are interested in RMF specific information only, start with the section RMF Postprocessor Partition Data Report.

Workload License Charges

Prior to z/OS, IBM software products running on OS/390 were typically priced based on the computing capacity of the Central Processor Complex (CPC) on which the software was running. With z/OS running on a zSeries 900, the new concept of Workload Licensed Charges (WLC) is used to manage the system. There are two categories of products under WLC.

Variable Workload License Charge (VWLC) products

The costs are based on the capacity defined for the product (less than the total CPC capacity).

LPAR 1	LPAR 2	LPAR 3	LPAR 4
40 MSUs	120 MSUs	100 MSUs	60 MSUs
z/OS	z/OS	z/OS	z/OS
CICS	SAP R3	WebSphere	DB2
DB2			

In the figure above, you can see z/OS WebSphere is charged with 100 MSUs although the total CPC has a capacity of 320 MSUs.

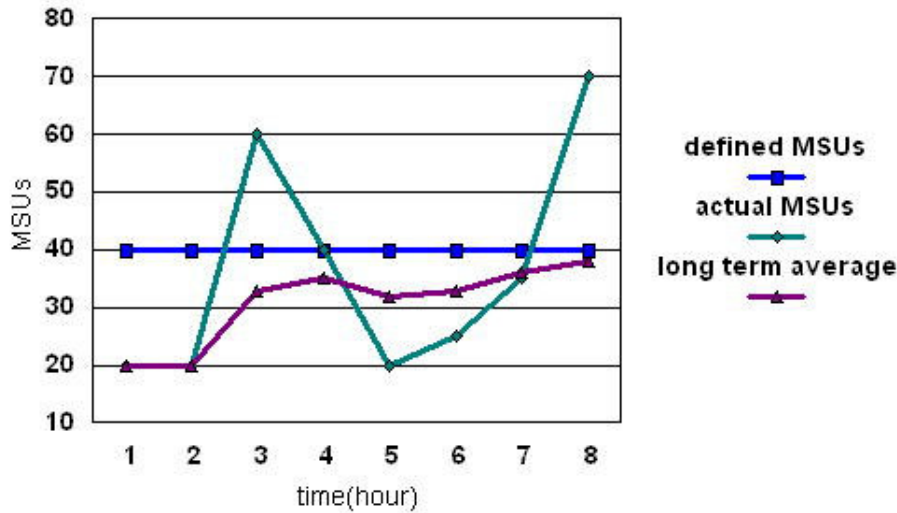
Flat Workload License Charge (FWLC) products

The costs for these products are a flat rate, independent of the size of the CPC on which they run.

LPAR Resource Management

z/OS manages workloads to LPAR defined capacities, based on a four-hour rolling average. A workload can use more than an LPAR's defined capacity, as long as the average workload during the four-hour period does not exceed the LPAR's defined capacity.

Actual MSUs and long term rolling average



RMF Postprocessor Partition Data Report

If you require data that is related to software pricing for long-term performance measurement, use the Partition Data Report section in the RMF CPU Activity Report. This report has been extended by SW pricing related data MSU DEF, MSU ACT and WLM CAPPING % (percentage of time when WLM capped the partition). It is invoked by REPORTS (CPU) :

```

PARTITION DATA REPORT

z/OS V1R2                SYSTEM ID SYSF          START 12/07/2001-12.05.00  INTERVAL 000.59.59
RPT VERSION V1R2 RMF    END    12/07/2001-13.05.00  CYCLE 1.000 SECONDS

MVS PARTITION NAME      SYSF
IMAGE CAPACITY          50
NUMBER OF CONFIGURED PARTITIONS 15
NUMBER OF PHYSICAL PROCESSORS 8
  CP                     7
  ICF                    1

WAIT COMPLETION         MIX
DISPATCH INTERVAL     DYNAMIC

----- PARTITION DATA -----
NAME S WGT DEF ACT DEF WLM%  NUM TYPE  EFFECTIVE  TOTAL  LOGICAL  PHYSICAL
-----MSU----- -CAPPING-- PROCESSOR-  -----DISPATCH TIME DATA----- EFFECTIVE  TOTAL  LPAR MGMT  EFFECTIVE  TOTAL
VMA  A 200 0 7 NO 0.0 7 CP 00.12.09.017 00.13.30.675 2.89 3.22 0.32 2.89 3.22
SYSA A 100 0 6 NO 0.0 5 CP 00.09.48.481 00.10.27.122 3.27 3.48 0.15 2.34 2.49
SYSB A 50 0 5 NO 0.0 5 CP 00.08.21.036 00.09.04.989 2.78 3.03 0.17 1.99 2.16
SYSC A 50 0 4 NO 0.0 5 CP 00.06.17.683 00.06.53.692 2.10 2.30 0.14 1.50 1.64
SYSD A 32 0 29 NO 0.0 3.8 CP 00.53.54.897 00.54.13.253 23.34 23.47 0.07 12.84 12.91
SYSE A 57 45 57 NO 0.0 4.0 CP 01.46.45.812 01.47.22.740 44.49 44.74 0.15 25.42 25.57
SYSF A 60 50 74 NO 0.0 5.0 CP 02.20.16.068 02.20.59.620 46.76 47.00 0.17 33.40 33.57
KEY3 A 50 0 2 NO 0.0 5 CP 00.03.01.696 00.03.38.821 1.01 1.22 0.15 0.72 0.87
KEY4 A 50 0 2 NO 0.0 5 CP 00.03.06.431 00.03.44.484 1.04 1.25 0.15 0.74 0.89
CIM7 A 50 0 2 NO 0.0 3 CP 00.02.18.103 00.03.00.222 1.28 1.67 0.17 0.55 0.72
CIM8 A 50 0 1 NO 0.0 3 CP 00.01.57.792 00.02.35.459 1.09 1.44 0.15 0.47 0.62
CFD  A 50 0 0 NO 0.0 2 CP 00.00.24.052 00.00.31.195 0.33 0.43 0.03 0.10 0.12
CFF  A 20 0 1 NO 0.0 2 CP 00.02.07.596 00.02.16.216 1.77 1.89 0.03 0.51 0.54
*PHYSICAL*
TOTAL 05.50.28.671 06.36.01.290 10.84 83.45 94.29

CF1  A 10 0 32 NO 0.0 2 *** 00.59.59.334 01.00.00.462 49.99 50.01 0.03 99.98 100.0
*PHYSICAL*
TOTAL 00.59.59.334 01.00.03.978 0.10 0.10 0.10

CFE  D
  
```

RMF Monitor III CPC Capacity Report

The new Monitor III CPC Capacity Report provides the capability to monitor online software pricing related values as well as LPAR CPU values for all logical partitions in the CPC.

WLM LPAR CPU management allows pricing based on partition capacity. By a new method called 'soft cap,' WLM ensures that the average CPU consumption of a partition does not exceed a defined capacity value (in millions of unweighted CPU service units per hour - MSU/h) over a defined period of time.

WLM allows the actual workload to rise above the defined MSU limit but takes care that the 4 hour rolling average stays below. This is done by dynamically turning capping on and off. Prerequisites are uncapped LPARs with shared CPs.

With this new report you can compare the defined capacity limits against the actual MSU consumption for all partitions of the CPC. In addition, the report contains MSU information related to the last 4 hours, for the partition RMF is running in. WLM Capping % shows you how often WLM has soft capped the partition.

The CPC Capacity Report consists of two subsections:

```

RMF V1R2   CPC Capacity                               Line 1 of 21
Command ==>                               Scroll ==> CSR

Samples: 29      System: SYSF   Date: 12/07/01   Time: 12.54.30   Range: 30      Sec

Partition:  SYSF           2064 Model 107
CPC Capacity:  253   Weight % of Max: 62.0      4h MSU Average:   33
Image Capacity:  50   WLM Capping %:  0.0      4h MSU Maximum:  76

Partition --- MSU --- Cap Proc   Logical Util % - Physical Util % -
            Def  Act  Def  Num   Effect  Total   LPAR  Effect  Total

*CP
CFD          0    0  NO   2.0    0.3    0.4    0.0    0.1    0.1
CFF          0    1  NO   2.0    1.6    1.8    0.0    0.5    0.5
CF1          0    0  NO   1.0    0.1    0.1    0.0    0.0    0.0
CIM7         0    2  NO   3.0    1.3    1.6    0.2    0.5    0.7
CIM8         0    1  NO   3.0    1.1    1.5    0.2    0.5    0.6
KEY3         0    2  NO   5.0    1.0    1.2    0.1    0.7    0.9
KEY4         0    2  NO   5.0    1.1    1.3    0.2    0.8    0.9
SYSA         0    5  NO   5.0    3.1    3.3    0.2    2.2    2.4
SYSB         0    5  NO   5.0    2.8    3.1    0.2    2.0    2.2
SYSC         0    4  NO   5.0    2.1    2.3    0.1    1.5    1.6
SYSD         0   29  NO   4.0   22.5   22.6    0.1   12.9   12.9
SYSE        45   54  NO   4.0   42.5   42.8    0.1   24.3   24.5
SYSF        50   75  NO   5.0   47.2   47.4    0.2   33.7   33.9
VMA          0    7  NO   7.0    2.8    3.1    0.3    2.8    3.1
PHYSICAL                                8.9                                8.9

*ICF
CF1          0   32    1.0   100   100    0.1   100   100
PHYSICAL                                0.1                                0.1

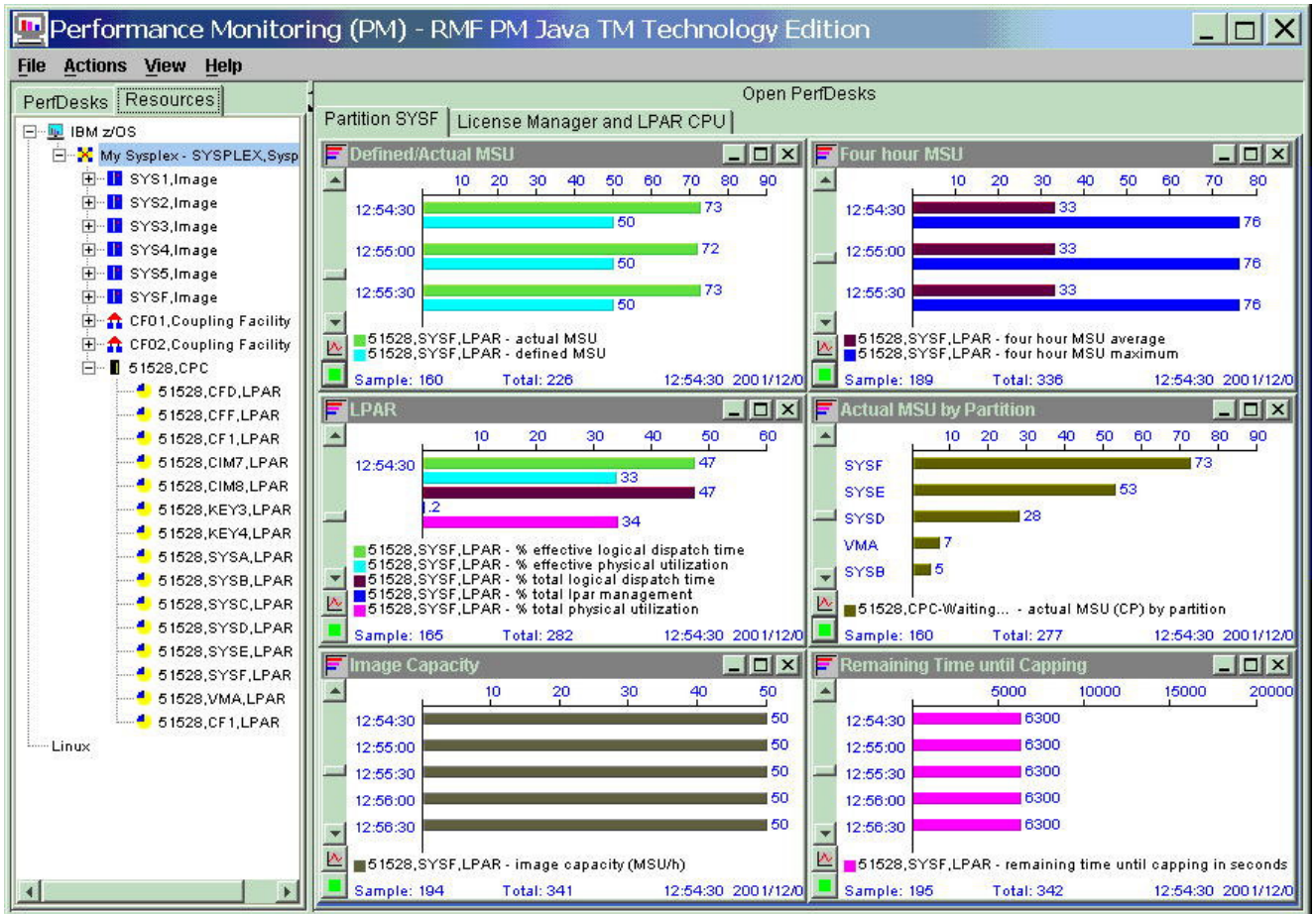
```

The report header section offers MSU related values (measured in MSUs/hour) within the scope of the partition that requested the report (home partition), as well as the processor type and model, e.g. the CPU capacity available to the CPC (CPC Capacity), the CPU capacity available to the MVS image (Image Capacity) and the MSU average and maximum values during the last 4 hours. Note that the maximum value can be greater than the defined capacity for the requesting partition. The WLM Capping % value denotes the percentage of time when WLM capped the partition because the 4 hour MSU value exceeds the defined capacity limit.

The partition data subsection displays information for all partitions belonging to the CPC, grouped by partitions related to CP processors and those related to ICF and IFL processors. The partition identified by the name PHYSICAL is not a configured partition. Data reported in this line include all of the uncaptured time which was used by LPAR but could not be attributed to a specific logical partition. Besides the capacity-related fields (MSU Def/Act) you get information about the processor utilization.

RMF PM Java™ Client

The RMF PM Java™ Client has been enhanced to support the software pricing related metrics.

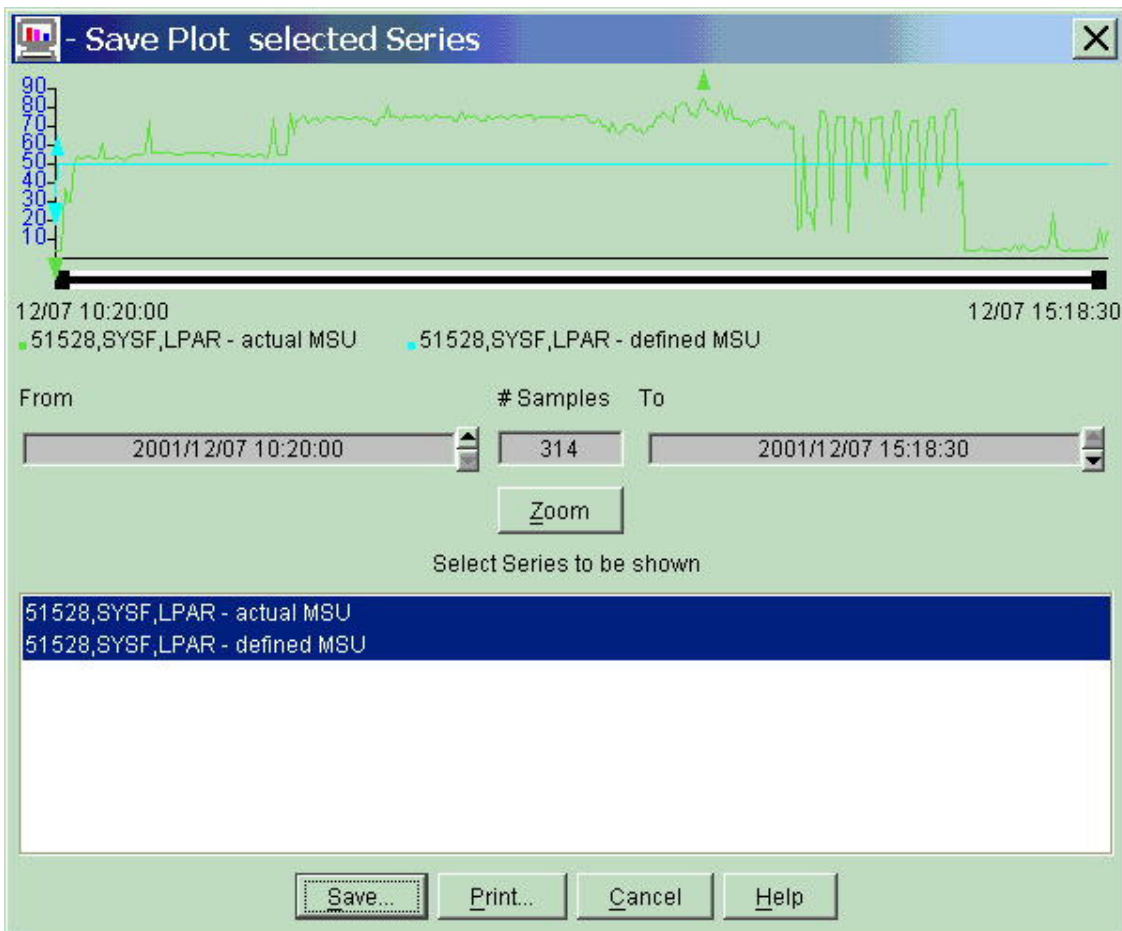


With the installation of PTF UW99366 for z/OS 1.2 (APAR OW49807), there is a new resource called CPC under the SYSPLEX resource.

Under the CPC resource you can find the logical partitions (LPARs) of the CPC.

As in Monitor III CPC report, LPAR CPU data was added. For example, in the LPAR DataView above, you can see metrics like *% effective logical dispatch time*. Please note the partitions monitored could also be z/VM or Linux for zSeries partitions.

The history of actual versus defined MSUs can be visualized by means of the Plot and Save Series dialog:



Of course, the defined MSUs are constant, but adding this series to your DataView makes it easier to compare defined MSUs against actual MSUs. You can see that the actual MSUs are above the defined MSUs for quite a long period of time. At the end, the load goes down to zero.

New Metrics in RMF PM

The following metrics are new in RMF PM

- Resource CPC:
 - actual/ defined MSU (CP/ICF/IFL) by partition
 - capacity (MSU/h)
 - % effective/ total physical utilization (CP/ICF/IFL) by partition
- Resource LPAR:
 - actual/ defined MSU
 - average number of logical processors
 - four hour MSU maximum/ average
 - image capacity (MSU/h)
 - remaining time until capping in seconds
 - % weight of max
 - % WLM capping
 - % effective/ total physical/ logical utilization
 - % total lpar management
- Resource SYSPLEX:
 - actual MSU (CP) by partition
 - four hour MSU average by partition
 - image capacity (MSU/h) by partition
 - remaining time until capping by partition
 - % WLM capping by partition
 - % weight of max by partition
 - % total physical utilization (CP/ICF/IFL) by partition/ CPC

Console Messages for WLM Capping

WLM starts capping and you want to have a console message for it? Sure, you can set up *IBM System Automation for OS/390* or *Tivoli NetView* to react properly to it.

This technique for exception-based monitoring is not restricted to WLC related metrics. Please refer to the *RMFCS* chapter in the *RMF User's Guide (SC33-7990)* if you would like to have WTO exceptions for generic Monitor III based performance data.

```
$HASP100 BMAI      ON TSOINRDR
$HASP373 BMAI      STARTED
IEF125I BMAI - LOGGED ON - TIME=12.36.20
+RMF300I 3B: Processing CPC Report...
+RMF301I 3B: Local Partition Capping State:
+RMF303I 3B: Time until Capping (sec):   40 (WTO Limit:  600)
+RMF304I 3B: MSU Consumption of critical LPARs:
+RMF305I 3B: SYS1 :    64 (WTO Limit: 60)
+RMF305I 3B: SYS4 :    48 (WTO Limit: 32)
IEF126I BMAI - LOGGED OFF - TIME=12.38.00
$HASP395 BMAI      ENDED
$HASP250 BMAI      PURGED
+RMF300I 3B: Processing CPC Report...
+RMF301I 3B: Local Partition Capping State:
+RMF302I 3B: WLM Capping %: 24.2 (WTO Limit: 10.0)
+RMF304I 3B: MSU Consumption of critical LPARs:
+RMF305I 3B: SYS1 :    82 (WTO Limit: 60)
+RMF305I 3B: SYS2 :    12 (WTO Limit: 10)
$HASP100 BMGU      ON TSOINRDR
$HASP373 BMGU      STARTED
IEF125I BMGU - LOGGED ON - TIME=12.39.40
```

You can easily setup RMF for WTOs with MSU related Alerts: just use the generic RMF batch feature to direct any Monitor III report metric to the console!

`SYS1.SERBCLS (ERBR3CPC)` works as follows:

- It runs the Monitor III Reporter batch address space and produces the new CPC Capacity Report.
- It extracts the actual WLM Capping % and the remaining time until capping from the report table `ERBCDCT3`.
- It generates a WTO and displays the actual values.

How to set up

- Edit `SYS1.SERBCLS (ERBR3CPC)` and set your variables and thresholds. The default is the `WLM Capping %` variable with a threshold of zero. In other words, you will receive a WTO for all Monitor III mintimes with a capping percentage of greater than zero. Alternatively you can allocate your own data set `HLQ.RMFM3B.SERBCLS` and make the changes in your private copy of `ERBR3CPC`. In this case you should add this data set to the `SYSPROC3` concatenation of the procedure `RMFM3B` in `SYS1.PROCLIB`.
- If you want to adjust the general session options (for example the Monitor III reporting range) or modify the `WFEX` exceptions for your batch session, it is recommended to generate a copy of your Monitor III Report Data Tables for batch: run REXX Procedure `ERBM3BWX` which brings up a Monitor III Reporter session and perform your adjustments. As a result, all Monitor III Data Tables are copied to the data set `HLQ.RMFM3B.ISPTABLE`.

- If you want to work with the Monitor III session defaults, no table copies are needed. In this case you can simply deactivate the references to `HLQ.RMFM3B.ISPTABLE` within `SYS1.PROCLIB(RMFM3B)`.
- Start the RMF Monitor III batch procedure with your personal high level qualifier and the new CPC Capacity Report as selected report:

```
sRMFM3B,HLQ=myUSERID,REPORT=CPC
```

That's all you need to get console messages

Now you will see a console message for each Monitor III mintime containing:

- the actual WLM Capping percentage
- or - if capping is not in effect - the projected number of seconds when WLM is going to cap the partition.

If you want to terminate the WTO generation you can simply stop the RMFM3B address space by means of the Cancel command.

Conclusion

The enhancements in RMF Monitor i and Postprocessor allow you to do long-term monitoring of MSUs consumed by your business workloads. If you want online monitoring or problem drill-down, you can use Monitor III with its frontend RMF PM. In RMF PM, you have the metric *remaining time until capping in seconds by partition*. So you can anticipate capping before it actually takes place. If you want to automatically react on critical performance situations related to software pricing with your automation product of choice, you can generate WTO messages.

Your feedback is important to us

The RMF Newsletter appears on a regular basis. It is one way to keep you informed about the latest news for z/OS RMF. You also should note that the Newsletters and tools such as RMF PM, rmpms for Linux (for S/390 & zSeries), the Spreadsheet Reporter, and more can be [obtained from the RMF home page](#). If you like to comment on 'RMF Newsletters' or if you are interested in other topics contact RMF Development directly. Just send a note to rmf@de.ibm.com.

Oliver Benke 2001-12-19

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