z/OS Resource Measurement Facility - RMF Overview and Update

zSTSU – November 17, 2004
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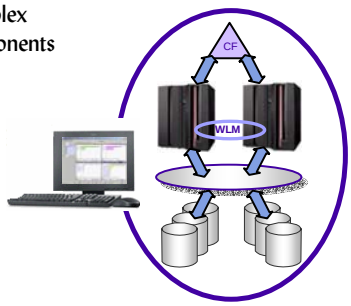
Agenda

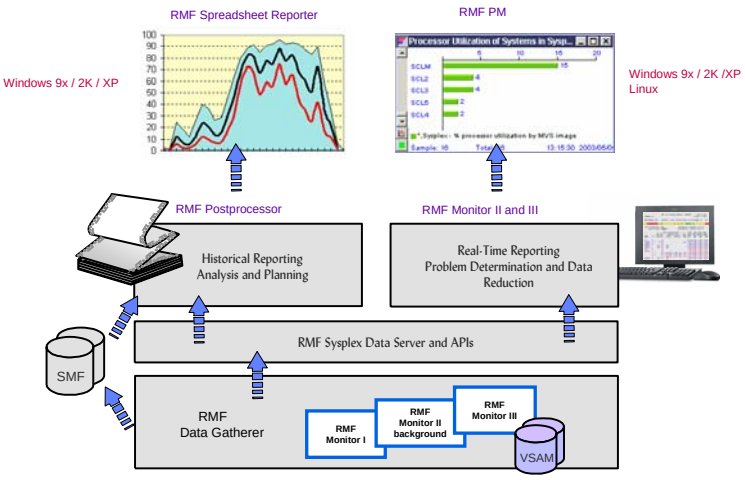
- Product Structure
- Updates
- zSeries new hardware support
  - zAAP support
  - ESS new support
- z/OS Base software + Parallel Sysplex
  - CF report
  - WLM new reporting
  - MISC
- Support for Open Standards
  - RMF data in Web Browser
  - RMF PM Java Webstart
- Linux Performance Monitor
- Usability Enhancements
  - msys for Setup Expoiltation
  - RMF Spreadsheet Reporter Java Edition

RMF Highlights

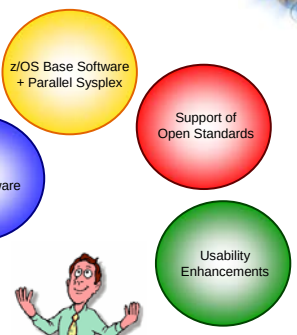
- Single Point of Control for the Enterprise
- State of the Art graphical Workstation Frontends
- Extensive Support for all Components of a Parallel Sysplex
  - Coupling Facilities
  - Shared DASD
  - Workload Manager
- Single System Image View for Parallel Sysplex
- First Day Support of new Hardware Components
- Outstanding Reliability



RMF Product Structure



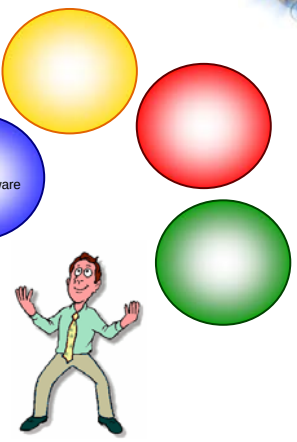
RMF Focus Areas



Our Mission:
First Day Hardware & Software Support

RMF Enhancements

- zSeries Application Assist Processors
  - Monitoring Java based Work
  - Identify Processor Contention
- Extended ESS Reporting
  - Link Performance Statistics
- z990 Exploitation
  - Initial Command Response Time
  - Channel Subsystem Delay Time
  - Control Unit Busy Delay
  - Multiple Channel Sets
- Cryptographic Coprocessors
  - Monitoring Processor Utilization
  - Workload based Using/Delay Information



zAAP: Overview

- zSeries Application Assist Processors (zAAPs) are attractively priced zSeries processors limited to execute z/OS Java workload
- zAAPs are currently available for z990 and z890 servers, running z/OS or z/OS.e operating system
- zAAPs can only assist general purpose CP processors to execute Java workload. They can do nothing on their own, and they cannot execute traditional z/OS workloads. Therefore, IBM does not impose software charges on zAAP capacity
- During development, zAAPs were first called IFAs – Integrated Facilities for Applications; you'll see this name in RMF reports
- In order to use zAAPs, you need z/OS 1.6, IBM SDK for z/OS Java 2 Technology Edition 1.4, and for WAS workload WebSphere Version 5.1
- Default settings for zAAPs allow Java workload to run on ordinary CP processors as well, but with discretionary priority ("crossover")

zAAP: Support in z/OS RMF

- RMF supports IFA processors by extending the
  - Postprocessor CPU activity report
  - Postprocessor Workload report
  - Monitor III Enclave report
- In detail…
  - RMF distinguishes between standard CP and IFA processors where necessary
  - Collects and reports about IFA service times
  - Collects and reports about IFA using and delay states for service class and report class periods
- Following SMF record types are extended
  - SMF record 70 subtype 1 (CPU activity)
  - SMF record 72 subtype 3 (Workload activity)
  - SMF record 79 subtype 1 and 2 (Address space state and resource data)

➡ This support will be shipped as SPE (APARs OA05371, OA07950)

➡ PTFs will be available for z/OS V1R5 RMF

zAAP: Monitor I CPU Report

```
                                C P U   A C T I V I T Y

           z/OS V1R6                SYSTEM ID WEBD            START 07/28/2004-17.10.00  INTERVAL 000.10.00
                                    RPT VERSION V1R5 RMF      END   07/28/2004-17.20.00  CYCLE 1.000 SECONDS
CPU  2084   MODEL  304

---CPU---  ONLINE TIME   LPAR BUSY      MVS BUSY      CPU SERIAL  I/O TOTAL          % I/O INTERRUPTS
NUM  TYPE  PERCENTAGE    TIME PERC      TIME PERC     NUMBER      INTERRUPT RATE     HANDLED VIA TPI

 0   CP    100.00         99.65          99.67         01911C       1.97              18.66
 1   CP    100.00         99.62          99.64         01911C       1.79              19.72
 2   CP    100.00         99.58          99.60         01911C       1.50              21.29
 3   CP    100.00         99.53          99.54         01911C       3492               1.04
CP   TOTAL/AVERAGE        99.60          99.61                      3497               1.07

 4   IFA   100.00         66.31          66.17         01911C
 5   IFA   100.00         59.49          59.36         01911C
 6   IFA   100.00         49.32          49.22         01911C
 7   IFA   100.00         38.91          38.83         01911C
IFA  AVERAGE              53.51          53.40
```

NEW !

- CPU section is grouped per processor type
- New type column indicates whether the processor belongs to the pool of CPs of IFAs
- The I/O related columns are only available for CPs, not for IFAs
- A TOTAL/AVERAGE line is printed per processor pool

zAAP: Monitor I Partition Data Report

```
                                P A R T I T I O N   D A T A   R E P O R T

           z/OS V1R6                SYSTEM ID WEBD            START 07/28/2004-17.10.00  INTERVAL 000.10.00
                                    RPT VERSION V1R5 RMF      END   07/28/2004-17.20.00  CYCLE 1.000 SECONDS

MVS PARTITION NAME                    LP1                   NUMBER OF PHYSICAL PROCESSORS          16
IMAGE CAPACITY                        167                                 CP                        8
NUMBER OF CONFIGURED PARTITIONS         6                                 ICF                       8
WAIT COMPLETION                        NO
DISPATCH INTERVAL                 DYNAMIC

--------- PARTITION DATA ----------------  -- LOGICAL PARTITION PROCESSOR DATA --   -- AVERAGE PROCESSOR UTILIZATION PERCENTAGES --
                  ----MSU----  -CAPPING--  PROCESSOR-  ----DISPATCH TIME DATA----   LOGICAL PROCESSORS  --- PHYSICAL PROCESSORS ---
NAME       S   WGT  DEF   ACT  DEF   WLM%  NUM   TYPE   EFFECTIVE       TOTAL      EFFECTIVE    TOTAL  LPAR MGMT  EFFECTIVE  TOTAL
LP1        A    50    0   167  NO     0.0    5   CP    00.29.26.356  00.29.27.505      99.94   100.0       0.02      31.23  31.25
LP2        A    50    0    33  NO     0.0    1   CP    00.05.53.443  00.05.53.501      99.98   100.0       0.00       6.25   6.25
LP4        A    50    0   268  NO     0.0    8   CP    00.47.08.000  00.47.08.008      100.0   100.0       0.00      50.00  50.00
*PHYSICAL*                                                            00.00.00.237                          0.00                0.00
                                                                     ------------  ------------                ------     ------ ------
  TOTAL                                                              01.22.27.801  01.22.29.251                0.03      87.48  87.50

ICF2       A    75                         8   ICF   00.04.53.443  00.04.53.501      99.98   100.0       0.00       6.25   6.25
IFL4       A    25                         3   ICF   00.24.08.000  00.24.08.008      100.0   100.0       0.00      50.00  50.00
LP1        A    50                         6   ICF   00.09.26.356  00.09.27.505      99.94   100.0       0.02      31.23  31.25
*PHYSICAL*                                                            00.00.00.237                          0.00                0.00
                                                                     ------------  ------------                ------     ------ ------
  TOTAL                                                              01.22.27.801  01.22.29.251                0.03      87.48  87.50
```

- IFA processors are reported within the ICF processor pool
- Identify IFA processor type by matching partition name and weighting factors

zAAP: Monitor I Workload Activity Report

- The Resource Consumption section of the WLMGL report is extended by following IFA related fields:
  - IFA — IFA service time in seconds
  - APPL% IFA — Percentage of CPU time on IFA processors used by IFA transactions
  - APPL% IFACP — Percentage of CPU time used by IFA transactions executed on regular CPs
- The meaning of APPL% changes. It is the percentage of CPU time used by transactions running on standard CPs. Thus, the field is renamed from APPL% to APPL% CP
  - APPL% CP = (TCB + SRB + RCT + IIT + HST – IFA) x 100 / interval length
- TCB is the task control block time spent on regular CPs as well as IFA processors
- If no IFAs configured, N/A is shown for the new values. Exception: when the JVM runtime option –Xifa:force has been specified, then potential amount of IFA work appears as APPL% IFACP

```
                                W O R K L O A D   A C T I V I T Y                                    PAGE   1
      z/OS V1R6              SYSPLEX WEBDB2            START 07/28/2004-17.10.00 INTERVAL 000.10.00   MODE = GOAL
                             RPT VERSION V1R5 RMF      END   07/28/2004-17.20.00

                                      POLICY ACTIVATION DATE/TIME 06/22/2004 18.03.15

------------------------------------------------------------------------------------------------------ SERVICE CLASS PERIODS

REPORT BY: POLICY=CRWW      WORKLOAD=PERFWKLD   SERVICE CLASS=CBSRV      RESOURCE GROUP=*NONE      PERIOD=1 IMPORTANCE=2
                                                  CRITICAL     =NONE

TRANSACTIONS    TRANS.-TIME  HHH.MM.SS.TTT   --DASD I/O--   ---SERVICE----   --SERVICE TIMES--   PAGE-IN RATES    ----STORAGE----
AVG      23.19  ACTUAL                 16   SSCHRT   0.2   IOC         0    TCB          2735.5   SINGLE     0.0   AVG        0.00
MPL      23.19  EXECUTION               9   RESP     1.1   CPU     53508K   SRB             0.0   BLOCK      0.0   TOTAL      0.00
ENDED 1402546   QUEUED                  6   CONN     0.7   MSO         0    RCT             0.0   SHARED     0.0   CENTRAL    0.00
END/S 2337.58   R/S AFFINITY            0   DISC     0.3   SRB         0    IIT             0.0   HSP        0.0   EXPAND     0.00
#SWAPS       0  INELIGIBLE              0   Q+PEND   0.1   TOT     53508K   HST             0.0   HSP MISS   0.0
EXCTD        0  CONVERSION              0   IOSQ     0.0   /SEC     8918    IFA          1050.8   EXP SNGL   0.0   SHARED     0.00
AVG ENC 23.19   STD DEV                24                                  APPL% CP      280.8   EXP BLK    0.0
REM ENC  0.00                                             ABSRPTN  38[illegible]   APPL% IFACP     3.1   EXP SHR    0.0
MS ENC   0.00                                             TRX SERV 38[illegible]   APPL% IFA     175.1
```


zAAP: Monitor I Workload Activity Report…

- The Goal and Actuals section of the WLMGL report is changed
  - The USING% block is extended by IFA USING
  - IFA delays may appear in the EXECUTION DELAY% block if among the highest contributors to the TOT delay samples
  - To gain more space in this report section, the GOAL is now formatted in a separate line above

```
GOAL: RESPONSE TIME 000.00.00.250 FOR  80%

        RESPONSE TIME EX   PERF  AVG    -- USING% --- ---------- EXECUTION DELAYS % --------- ---DLY%-- -CRYPTO%- ---CNT%--    %
SYSTEM      ACTUAL%    VEL% INDX ADRSP    CPU  IFA  I/O  TOT  CPU  IFA  I/O  AUX  AUX SWIN      UNKN IDLE  USG  DLY  USG  DLY QUIE
                                                                            VIO PRIV

*ALL           100     31.8  1.1   5.7    3.6  2.2  2.6 13.4  8.5  4.3  0.3  0.2  0.1  0.1      58.1 22.7  1.1  3.1  0.0  0.0  0.0
WEB1           100     30.5  1.3   2.1    1.5  2.1  2.3 13.5  9.0  4.2  0.2  0.1  0.0  0.1      60.3 20.5  0.2  1.1  0.0  0.0  0.0
WEB2           100     49.4  1.0   1.9    1.1  2.0  3.1  6.8  1.8  4.3  0.3  0.1  0.0  0.0      63.1 24.0  1.4  4.1  0.0  0.0  0.0
WEB4           100     24.1  1.0   1.8    1.1  2.3  2.3 10.1 14.8  4.3  0.3  0.1  0.4  0.1      50.3 23.7  0.3  0.3  0.0  0.0  0.0
```

zAAP: Overview Control Statements

- APPLIFA — percentage IFA application execution time
- APPLIFCP — percentage IFA on CP application execution time
- CPUIBSY — percentage IFA processor busy
- MVSIBSY — percentage MVS busy for IFAs
- IFASEC — IFA service time
- IFANSEC — IFA service time (normalized)
- IFACPSEC — IFA service time spent on CPs
- IFAUSGP — percentage IFA using
- IFCUSGP — percentage IFA on CP using
- IFADLYP — percentage IFA delay
- NUMIFA — number of IFA processors

```
OVW(CPUIBUSY(CPUIBSY))
OVW(ISECCBS(IFASEC(S.CBSRV.1)))
OVW(ICPSCBS(IFACPSEC(S.CBSRV.1)))
OVW(APPLCBS(APPLPER(S.CBSRV.1)))
OVW(IAPPCBS(APPLIFA(S.CBSRV.1)))
OVW(ICPACBS(APPLIFCP(S.CBSRV.1)))
OVW(IUSGCBS(IFAUSGP(S.CBSRV.1)))
OVW(ICPUCBS(IFCUSGP(S.CBSRV.1)))
OVW(IDLYCBS(IFADLYP(S.CBSRV.1)))
```

```
                                   R M F   O V E R V I E W   R E P O R T

           z/OS  V1R6               SYSTEM ID WEBD            START 07/28/2004-17.10.00  INTERVAL 00.07.05
                                    RPT VERSION V1R5 RMF      END   07/28/2004-17.40.00  CYCLE 1.000 SECONDS

NUMBER OF INTERVALS 4             TOTAL LENGTH OF INTERVALS 00.40.00

DATE    TIME    INT    CPUIBUSY   ISECCBS   ICPSCBS   APPLCBS   IAPPCBS   ICPACBS   IUSGCBS   ICPUCBS   IDLYCBS
MM/DD HH.MM.SS MM.SS

07/28 17.10.00 10.00       53.5    1050.8      18.6     280.8     175.1       3.1       2.5       0.0       0.8
07/28 17.20.00 10.00       48.1     925.7      18.9     268.6     154.3       3.1       2.0       0.0       0.8
07/28 17.30.00 09.59        8.8     162.4       2.0      70.8      27.1       0.3       0.1       0.0       0.0
07/28 17.40.00 10.00        5.0      86.8       1.2      40.6      14.5       0.2       0.0       0.0       0.0
```


zAAP: Monitor III Adaptations

- Existing CPU utilization values in SYSINFO report (CPU Util%, MVS Util%, Appl%, EAppl%) do not consider processor time spent on IFAs
- Processor Using and Delay samples consider regular CPs and IFA processors
- IFA using and delay included in Using%, Delay% and Workflow%
- ExecVelocity% in SYSSUM report contains IFA using and delay samples
- Minor changes only in SYSINFO and ENCLAVE report

zAAP: Monitor III SYSINFO Report

Partition Name and Number of IFA Processors

Utilization of IFA Processor Pool

```
                    RMF V1R5   System Informati
Samples: 60      System: WEBD  Date: 07/28/04  Time:                  Sec

Partition:    LP1     2084 Model 304          Appl%:        24  Policy: CRWW
CPs Online:   4.0     Avg CPU Util%:   99     EAppl%:       95  Date:   06/22/04
IFAs Online:  4.0     Avg MVS Util%:   99     Appl% IFA:    46  Time:   18.03.15

Group     T WFL --Users--  RESP TRANS -AVG USG-   -Average Number Delayed For -
             %   TOT  ACT  Time  /SEC PROC  DEV   PROC  DEV STOR SUBS OPER  ENQ

*SYSTEM      38   81    3        0.10  5.7  0.9   10.8  0.1  0.0  0.0  0.0  0.0
*TSO               3    0        0.10  0.0  0.0    0.0  0.0  0.0  0.0  0.0  0.0
*BATCH             0    0        0.00  0.0  0.0    0.0  0.0  0.0  0.0  0.0  0.0
*STC         61   53    3        0.00  1.5  0.9    1.5  0.1  0.0  0.0  0.0  0.0
*ASCH              0    0        0.00  0.0  0.0    0.0  0.0  0.0  0.0  0.0  0.0
*OMVS              2    0        0.00  0.0  0.0    0.0  0.0  0.0  0.0  0.0  0.0
*ENCLAVE     31   23  N/A         N/A  4.2  N/A    9.4  N/A  0.0  N/A  N/A  N/A
PERFWKLD  W  32   37    0  .018 2,256  4.3  0.1    9.4  0.0  0.0  0.0  0.0  0.0
CBSRV     S  31   23    0  .017 2,255  4.2  0.0    9.4  0.0  0.0  0.0  0.0  0.0
```

- CPU%, MVS%, Appl%, EAppl% are exclusively related to CPs as before

zAAP: Monitor III Enclave Report

```
                  RMF Enclave Classification Data

The following details are available for enclav
Press Enter to return to the Report panel.

 Detailed Performance Statistics:

 - CPU Time -   ------------ Execution States ------------
 Total    6448  #STS   -- Using --  -------- Delay --------  IDL  UNK
 Delta   20.52         CPU IFA I/O  CPU IFA I/O STO CAP QUE
                 60     12 4.0 0.0   38 6.0 0.0 0.0 0.0 0.0  0.0  0.0

 Classification Attributes:

                                                        More:     +
  Subsystem Type: SAP    Owner: ICLIFSP2   System: POH2
  Accounting Information . . :
```

Samples for zAAP related Using and Delay States

- The Enclave Details pop-up panel is extended by IFA using and delay samples
- The total and delta enclave CPU time values include CPU time for IFA processors

ESS 2105: Extensions in z/OS RMF

- Monitor I Gathering
  - New option ESS | NOESS
  - New SMF Type 74-8 record for ESS statistics
- Monitor I / Postprocessor Reporting
  - New suboption ESS | NOESS for Postprocessor REPORTS option
  - ESS Report provides link performance statistics per ESS adapter
    - Helps to understand the external link usage of an ESS
    - Supports capacity planning of PPRC link

➡ This support will be shipped as SPE (APAR OA04877)

➡ PTFs will be available for z/OS V1R2 RMF and above

ESS 2105: ESS Activity Report

Link performance statistics per ESS adapter
- SCSI I/O
- PPRC I/O

```
                              E S S   L I N K   S T A T I S T I C S

          z/OS V1R3              SYSTEM ID VSL1              DATE 04/13/2004                    PAGE    999
                            CONVERTED TO z/OS V1R5 RMF       TIME 10.15.00                 1.000 SECONDS

SERIAL NUMBER 0000022399   TYPE-MODEL    2105-800       CDATE  04/13/2004      CTIME 10.15.00      CINT  05.00

------ADAPTER------   --LINK TYPE--       BYTES      BYTES          OPERATIONS      RESP TIME         I/O
SAID  TYPE                                 /SEC      /OPERATION      /SEC           /OPERATION        INTENSITY

0004  FIBRE 2Gb       SCSI READ           162.1K      13.7K           11.8             0.3               3.9
                      SCSI WRITE            2.4M      26.5K           92.5             0.8              76.2
                                                                                                       ------
                                                                                                         80.1

0024  FIBRE 2Gb       SCSI READ           156.0K      13.9K           11.2             0.3               3.6
                      SCSI WRITE            2.5M      26.5K           93.2             0.8              76.8
                                                                                                       ------
                                                                                                         80.4

0088  FIBRE 2Gb       PPRC SEND             8.5M      50.4K          169.2            16.1            2729.9
                      PPRC RECEIVE          0.0        0.0            0.0             0.0               0.0
                                                                                                       ------
                                                                                                       2729.9
```

Z990 Exploitation

- Channel Subsystem Delay Time (CSS), Command Response Time (CMR) and Average Control Unit Busy Time (CUB) added to
  - Monitor I / Postprocessor I/O Queuing Activity Report
  - Monitor II I/O Queuing Activity Report
  - Monitor III I/O Queuing Activity Report
- New Overview Control Statements
  - IOCSS
  - IOCMR
  - IOCBT
- Switch Busy Count summation not reported, but added to
  - SMF Record 78 Subtype 3
  - SMF Record 79 Subtype 14

z990 Exploitation...

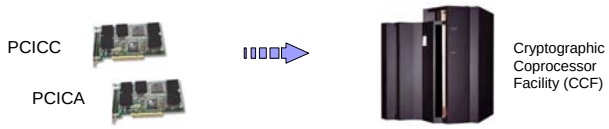
```
                              I/O   Q U E U I N G   A C T I V I T Y
                                                                                          PAGE    1
          z/OS V1R5                SYSTEM ID SYSF          DATE 02/27/2003          INTERVAL 04.59.955
                                   RPT VERSION V1R5 RMF    TIME 12.05.00            CYCLE 1.000 SECONDS

TOTAL SAMPLES =    300   IODF = 01   CR-DATE: 01/21/2003   CR-TIME: 12.29.40     ACT: ACTIVATE

       - INITIATIVE QUEUE -   ------- IOP UTILIZATION -------   -- % I/O REQUESTS RETRIED --   -------- RETRIES / SSCH ---------
IOP      ACTIVITY    AVG Q    % IOP   I/O START   INTERRUPT         CP    DP    CU    DV             CP     DP     CU     DV
           RATE      LNGTH    BUSY      RATE                             BUSY  BUSY  BUSY     ALL   BUSY   BUSY   BUSY   BUSY

 00      503.132     0.05     3.64    503.0                             0.6   0.0   0.0     2.02   2.00                 0.00
 01      123.609     0.00     1.92    123.58                      .7    0.8   0.0   0.0     6.42   6.                   0.00

SYS      626.740     0.04     2.78    626.611     649.744    74.   73.6   0.7   0.0   0.0     2.89   2.86          .00    0.00

                                                             AVG   AVG                DELAY  AVG
LCU    CONTROL UNITS    DCM GROUP   CHAN     CHPID   % DP   % CU   CUB   CMR   CONTENTION    Q     CSS
                       MIN MAX DEF  PATHS    TAKEN   BUSY   BUSY   DLY   DLY      RATE     LNGTH   DLY

0031   400A                           11     0.573    0.00  0.00   0.0   1.2
       400B                           20     0.583   28.16  0.41   1.0   0.1
                        2   2   2            2.447   10.90  0.24   0.0   0.0
                                       *     3.604   12.79  0.24   0.0   0.2      0.000     0.00   0.2

0032   440A                           11     0.013    0.00  0.00   0.0   0.1
       440B                           20     0.027   33.33  0.00   0.0   1.2
                        0   0   2            0.000    0.00  0.00   1.0   0.1
                                       *     0.040   25.00  0.00   0.0   0.0      0.000     0.00   0.1
```

New:
- AVG CUB DLY
- AVG CMR DLY

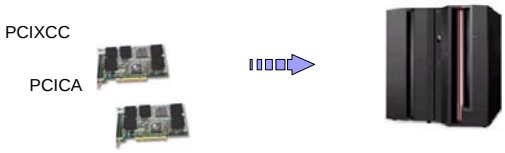
New:
AVG CSS DLY

Cryptographic Coprocessors

Cryptographic Hardware on G5/G6, z800 and z900



Cryptographic Hardware on z990



Cryptographic Coprocessors...

- New Monitor I / Postprocessor Report
- New Overview / Exception Conditions
- New SMF Record 70, Subtype 2

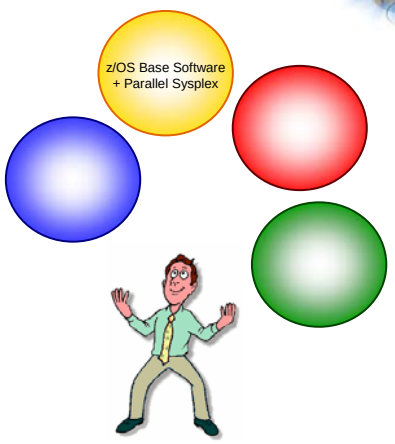
```
                                C R Y P T O   H A R D W A R E   A C T I V I T Y

           z/OS V1R5                SYSTEM ID SYS1              DATE 02/24/2003         INTERVAL 60.00.378
                                    RPT VERSION V1R5            TIME 09.00.00           CYCLE 1.000 SECONDS


-------- CRYPTOGRAPHIC COPROCESSOR -------
          ------ TOTAL --------  KEY-GEN
TYPE   ID   RATE  EXEC TIME UTIL%   RATE
PCIXCC  0   0.00      0.0     0.0   0.00
        1   0.01     3205    32.1   0.01
        6  83.44      1.1     8.8   0.00
        7   0.00      0.0     0.0   0.00

-------- CRYPTOGRAPHIC ACCELERATOR ----------------------------------------------------------------------------------------
           -------- TOTAL -------  ------- ME(1024) -----  ----- ME(2048)  -----  ------ CRT(1024) -----  ------ CRT(2048) -----
TYPE   ID   RATE  EXEC TIME UTIL%   RATE  EXEC TIME UTIL%   RATE EXEC TIME UTIL%   RATE  EXEC TIME UTIL%   RATE  EXEC TIME UTIL%
PCICA   8 165.2      1.3    21.5  107.1      1.1    11.8      0       0       0   58.1         1.7   9.7      0        0       0
PCICA   9   2.4M     1.8    48.6      0        0       0      0       0       0      0           0     0    2.4M     1.8    48.6

-------- ICSF SERVICES EXECUTED ON PCIXCC ---------------------------------------------------
        DES ENCRYPTION    DES DECRYPTION    ----- MAC ------      - HASH -    ------ PIN -----
        SINGLE  TRIPLE    SINGLE  TRIPLE    GENERATE  VERIFY                 TRANSLATE VERIFY
RATE      4975K  497.5     12438    1244K     12438    4975K     497.5          1244K   1346
SIZE       0.75    100K     10.00     0.01      10.00    0.01     10000
```

Cryptographic Coprocessors...

```
                                W O R K L O A D   A C T I V I T Y

      z/OS V1R5              SYSPLEX RMFPLEX           START 09/22/2003-07.00.00 INTERVAL 001.00.00   MODE = GOAL
                                                       END   09/22/2003-08.00.00

                                    POLICY ACTIVATION DATE/TIME 07/31/2002 15.55.20

REPORT BY: POLICY=DAILY      WORKLOAD=PRODUCTN   SERVICE CLASS=BATCHLOW   RESOURCE GROUP=REGBATCH   PERIOD=2 IMPORTANCE=2

TRANSACTIONS    TRANS.-TIME  HHH.MM.SS.TTT   --DASD I/O--   ---SERVICE----   --SERVICE RATES--   PAGE-IN RATES    ----STORAGE----
AVG      0.34   ACTUAL              3.487   SSCHRT   0.4   IOC       251    ABSRPTN        25   SINGLE     7.1   AVG      362.54
MPL      0.34   EXECUTION           3.484   RESP     5.2   CPU      1025    TRX SERV       25   BLOCK      0.0   TOTAL    123.50
ENDED       9   QUEUED                 3   CONN     3.1   MSO         0    TCB           0.5   SHARED     0.0   CENTRAL  111.52
END/S    0.06   R/S AFFINITY           0   DISC     1.6   SRB        13    SRB           0.0   HSP        0.0   EXPAND    11.97
#SWAPS     12   INELIGIBLE             0   Q+PEND   0.5   TOT      1289    RCT           0.0   HSP MISS   0.0
EXCTD       0   CONVERSION             0   IOSQ     0.0   /SEC        8    IIT           0.0   EXP SNGL   4.9   SHARED     0.00
AVG ENC  0.00   STD DEV             4.369                                  HST           0.0   EXP BLK    0.0
REM ENC  0.00                                                              APPL %        0.3   EXP SHR    0.0
MS ENC   0.00

VELOCITY MIGRATION:   I/O MGMT   9.1%    INIT MGMT  9.1%

        ---RESPONSE TIME---  EX   PERF  AVG    --USING%- ---------- EXECUTION DELAYS % --------- ---LY%-- -CRYPTO%- ---CNT%--    %
        HH.MM.SS.TTT         VEL  INDX ADRSP    CPU  I/O  TOT  I/O  CPU  MPL                   UNK  IDLE  USG  DLY  USG  DLY  QUIE
GOAL                        50.0%
ACTUALS
*ALL                         6.5%  4.9   4.4    5.4 37.4 38.2 22.3 16.6  0.3                    5 83.9  6.8 11.4  0.8  2.4   0.0
SYSA                         9.1%  5.5   1.9    7.5 46.7 40.5 27.3 13.1  0.1                    9 72.2  5.1 12.2  0.1  2.2   0.0
SYSB                         3.8%  4.2   2.5    3.3 28.0 35.8 17.3 18.1  0.4                   1 7  5  8.4 10.5  1.5  2.6   0.0
```


RMF Enhancements...

- Coupling Facility Reporting
  - Monitoring System-Managed Duplexing
  - Identify Coupling Facility Link Types
- WLM Enhancements
  - Report Class Periods
  - Workload License Charges
  - Enqueue Contention Reporting
- Miscellaneous
  - Storage Reporting Enhancements
  - 64 Bit API for Sysplex Data Services
  - RMF and Multilevel Security



Coupling Facility Duplexing

```
                C O U P L I N G   F A C I L I T Y   A C T I V I T Y

       z/OS V1R2              SYSPLEX RMFPLEX2           DATE 02/20/2001
                              RPT VERSION V1R2 RMF       TIME 14.29.00
-------------------------------------------------------------------------------
 COUPLING FACILITY NAME = CF01
 TOTAL SAMPLES(AVG) =  59  (MAX) =  59  (MIN) =  59
-------------------------------------------------------------------------------
                                                 USAGE  SUMMARY
-------------------------------------------------------------------------------
 STRUCTURE SUMMARY
-------------------------------------------------------------------------------

       STRUCTURE                    ALLOC      CF            #
TYPE   NAME              STATUS CHG  SIZE       STORAGE      REQ

CACHE  DSNDB1G_GBP0      ACTIVE       21M          0.5     1893
                         PRIM
       DSNDB1G_GBP4      ACTIVE       39M          1.0     6089
                         SEC
```

Identify duplexed Structures

New Delay Reasons:
- peer subchannel wait contention
- waiting for peer completion

```
                                COUPLING  FACILITY  STRUCTURE  ACTIVITY

STRUCTURE NAME = DSNDB1G_GBP0      TYPE = CACHE              STATUS = ACTIVE PRIMARY
          # REQ     ------------- REQUESTS -------------   ------------- DELAYED REQUESTS ------------
SYSTEM    TOTAL              #     % OF  -SERV TIME(MIC)-    REASON     #    % OF  ---- AVG TIME(MIC) ----
NAME      AVG/SEC          REQ     ALL     AVG   STD_DEV             REQ    REQ   /DEL    STD_DEV   /ALL

RMF1       8621    SYNC     89     0.3   101.9     34.6    NO SCH     1    0.1   82.2      111.3    0.1
           4.79    ASYNC  8532    26.3   376.4    355.6    PR WT      4    0.1  285.8      440.2    0.2
                   CHNGD     0     0.0   INCLUDED IN ASYNC  PR CMP   320    0.3   46.5      345.4    0.4
                                                           DUMP       0    0.0    0.0        0.0    0.0
```

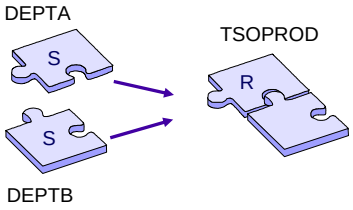

WLM Report Class Periods

- Monitor I
  - WLMGL Report (Option RCPER)
  - Overview Criteria
- Monitor III
  - SYSSUM SYSINFO STORS (one Line per Period)
  - SYSRTD SYSWKM GROUP (for selected Period)

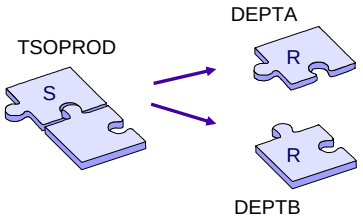
```
                    RMF V1R2 Sysplex

WLM Samples: 480     Systems: 5  Date:

                      >>>>>>>>|||||||

Service Definition: SLA2001
     Active Policy: WORKDAYS

               ------- Goals versus Ac
               Exec Vel  --- Response
Name     T  I  Goal Act  ---Goal--- --

SYSTEM   W           60
SYSTEM   S      N/A  42    N/A
DEPTALL  W           78
DEPTA    R           65
         1           75    1.000 95%        100%  0.50
         2           55    2.000 90%         92%  0.80
```

```
                        RMF V1R2 Response Time
Command ===>

WLM Samples: 480     Systems: 5  Date: 03/13/01

 Class: DEPTA      %  100||||
Period: 1          of    ||||
                   TRX   ||||
Goal:                    ||||
1.000 sec for  95%    50||||
                         ||||
                         ||||
                         ||||
                        0|---+//---+---+---+---+
                          <0.60   0.700       1.0

                  --Avg. Resp. Time--    Trx
System   Data     WAIT  EXECUT ACTUAL    Rate
*ALL              0.000  0.002  0.002    0.017
SYSF     none
SYS1     all                            0.000
SYS2     all     0.000  0.002  0.002    0.017
```

WLM Report Class Periods...



✓Heterogeneous Relation
- Goals: Undefined
- Periods: Derived from Service Classes
- Values: TSOPROD.1 = DEPTA.1 + DEPTB.1



✓Homogeneous Relation
- Goals: Derived from Service Class
- Periods: Derived from Service Class
- Values: DEPTA.1, DEPTB.1

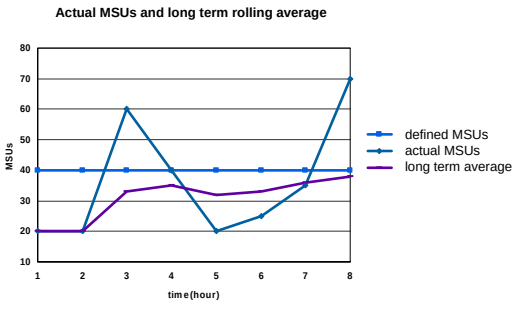
Workload License Charges

- Sum of Defined Capacity as Basis for Charge
- Ability to handle Workload Spikes

2064-114

LPAR 1	LPAR 2	LPAR 3
40 MSUs CICS z/OS	220 MSUs CICS z/OS	150 MSUs DB2 z/OS

z/OS is priced based on 410 MSUs
DB2 is priced based on 150 MSUs
CICS is priced based on 260 MSUs



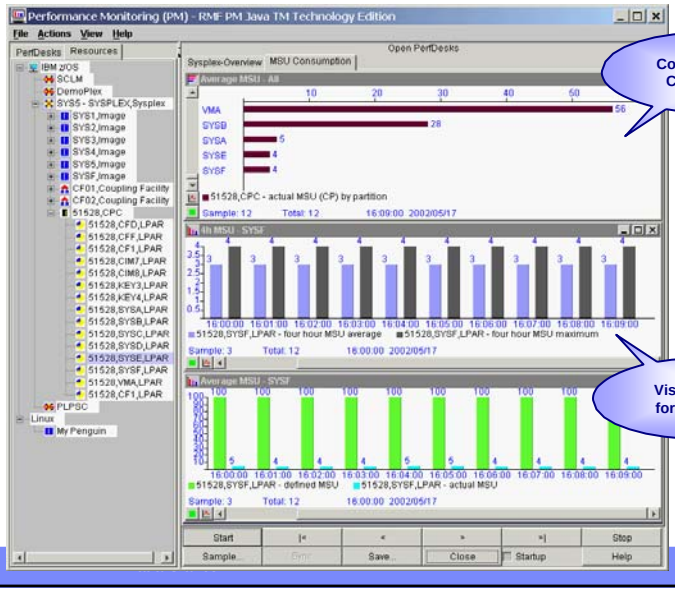
Workload License Charges...

- License Manager related Data for the local Partition
  - WLM Weighting and Capping
  - WLM long-term MSU consumption
- CPU Utilization for all Partitions
  - Logical Processors
  - Physical Processors

```
                    RMF V1R2   CPC Capacity

Samples: 59      System: RMF2  Date: 11/29/00  Time: 06.16.00  Range: 60    sec

 Partition: SYS2         2064 Model 114
 CPC capacity:   410     Weight % of Max: 14.2      4h MSU Average:     32
 Image capacity:  40     WLM Capping %:    5.4      4h MSU Maximum:     62

 Partition  --- MSU ---   Cap  Proc   Logical Util %    - Physical Util % -
               Def   Act  Def   Num   Effect   Total   LPAR  Effect  Total
 *CP                                                   1.1    16.0   17.1
  DOM1         200   182  YES   2.3     11.2    12.1   0.4     2.4    2.8
  RMF1         150   129   NO   8.2      9.3     9.8   0.1     9.2    9.3
  RMF2          40    25   NO   2.1     11.5    12.4   0.2     2.6    2.8
  RMF3           0     0  YES     2      8.8     9.3   0.3     1.8    2.1
  PHYSICAL                                             0.1            0.1

 *ICF                                                  0.1    99.9    100
  CF1            0    32        1.0     99.9    99.9   0.0    99.9   99.9
  PHYSICAL                                             0.1            0.1
```

CEC wide View like M I Partition Data Report

Workload License Charges...



Combines Data to CEC wide View

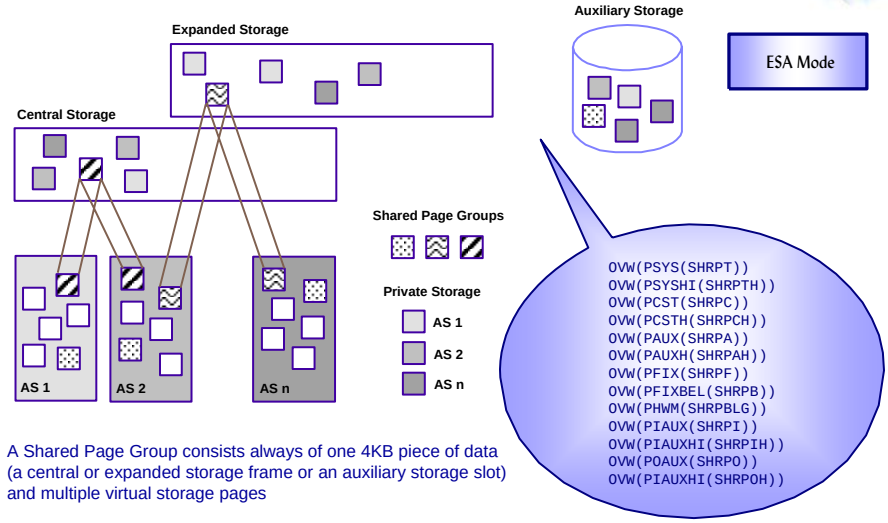
Visualize Trends for one Partition

Enqueue Contention Reporting

```
                                W O R K L O A D   A C T I V I T Y

       z/OS V1R5              SYSPLEX RMFPLEX           START 09/22/2003-07.00.00 INTERVAL 001.00.00   MODE = GOAL
                                                        END   09/22/2003-08.00.00

VELOCITY MIGRATION:   I/O MGMT   9.1%    INIT MGMT  9.1%

        ---RESPONSE TIME---  EX   PERF  AVG   --USING%- ---------- EXECUTION DELAYS % --------- ---DLY%-- -CRYPTO%  ---CNT%--    %
        HH.MM.SS.TTT         VEL  INDX ADRSP   CPU  I/O  TOT  I/O  CPU  MPL                    UNKN IDLE  USG  DLY  USG  DLY QUIE
GOAL                        50.0%
ACTUALS
*ALL                         6.5%  4.9   4.4   5.4 37.4 38.2 22.3 16.6  0.3                    3.6 83.9  6.8  1.4  0.8  2.4  0.0
SYSA                         9.1%  5.5   1.9   7.5 46.7 40.5 27.3 13.1  0.1                    5.9 92.2  5.3  2.2  0.1  2.2  0.0
SYSB                         3.8%  4.2   2.5   3.3 28.0 35.8 17.3 18.1  0.4                    1.2 75.5  8.4  0.5  1.5  2.6  0.0
```

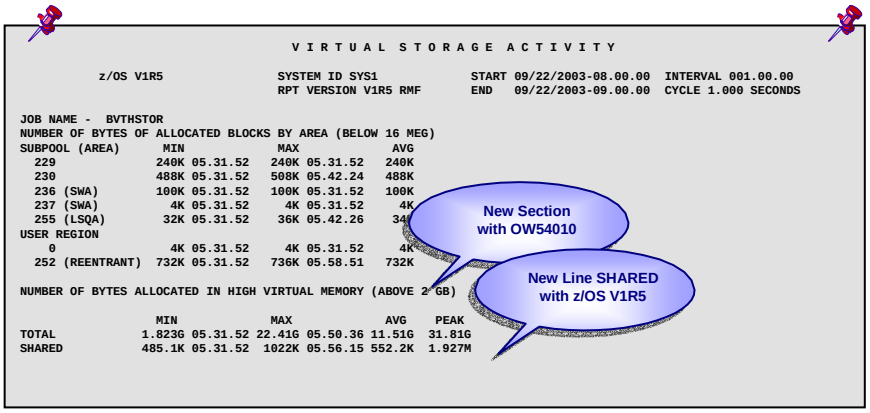
- RMF collects and reports about enqueue contention using and delay samples
  - Resource Contention Using and Delay report samples are included in SMF record 72 subtype 3
  - The WLMGL Workload Activity report is extended to provide the Contention Using and Delay States in the Goals vs. Actual section
  - Overview Conditions are provided for the new using and delay state: RCUSGP and RCDLYP
- This allows to understand when work is being delayed by resource contention, and to what degree

Storage Reporting Enhancements



A Shared Page Group consists always of one 4KB piece of data (a central or expanded storage frame or an auxiliary storage slot) and multiple virtual storage pages

Storage Reporting Enhancements...



```
                                V I R T U A L  S T O R A G E  A C T I V I T Y

          z/OS V1R5               SYSTEM ID SYS1            START 09/22/2003-08.00.00  INTERVAL 001.00.00
                                  RPT VERSION V1R5 RMF      END   09/22/2003-09.00.00  CYCLE 1.000 SECONDS

JOB NAME -  BVTHSTOR
NUMBER OF BYTES OF ALLOCATED BLOCKS BY AREA (BELOW 16 MEG)
SUBPOOL (AREA)      MIN             MAX             AVG
  229             240K 05.31.52   240K 05.31.52   240K
  230             488K 05.31.52   508K 05.42.24   488K
  236 (SWA)       100K 05.31.52   100K 05.31.52   100K
  237 (SWA)         4K 05.31.52     4K 05.31.52     4K
  255 (LSQA)       32K 05.31.52    36K 05.42.26    34K
USER REGION
    0               4K 05.31.52     4K 05.31.52     4K
  252 (REENTRANT)  732K 05.31.52   736K 05.58.51   732K

NUMBER OF BYTES ALLOCATED IN HIGH VIRTUAL MEMORY (ABOVE 2 GB)

                  MIN             MAX             AVG    PEAK
TOTAL           1.823G 05.31.52 22.41G 05.50.36 11.51G  31.81G
SHARED          485.1K 05.31.52  1022K 05.56.15 552.2K  1.927M
```

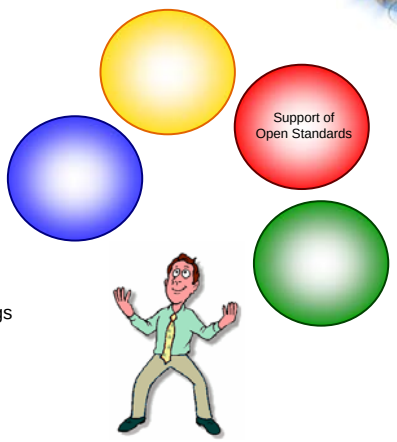
New Section with OW54010

New Line SHARED with z/OS V1R5

RMF and Multilevel Security

- Monitor II SMF type 79 records and Monitor III set-of-samples data might contain data set names. This data is accessible by RMF Sysplex Data Services which did not require an authorized caller
- New profiles in the RACF FACILITY class are introduced to protect Monitor II and Monitor III data
  - Monitor II data: Module ERB2XDGS checks profile ERBSDS.MON2DATA
  - Monitor III data: Module ERB3XDRS checks profile ERBSDS.MON3DATA
- Conservative protection:
  - Access to the data is granted if discrete profiles or the generic profile ERBSDS.* are not found (in contrast to the existing SMF data protection with profile ERBSDS.SMFDATA)
  - Checking is omitted if the calling module is loaded from an APF authorized library
- RACF command example:
  - RDEFINE FACILITY *ERBSDS.MON3DATA* UACC(NONE)
  - PERMIT *ERBSDS.MON3DATA* CLASS(FACILITY) ID(*IBMUSER*) ACC(READ)

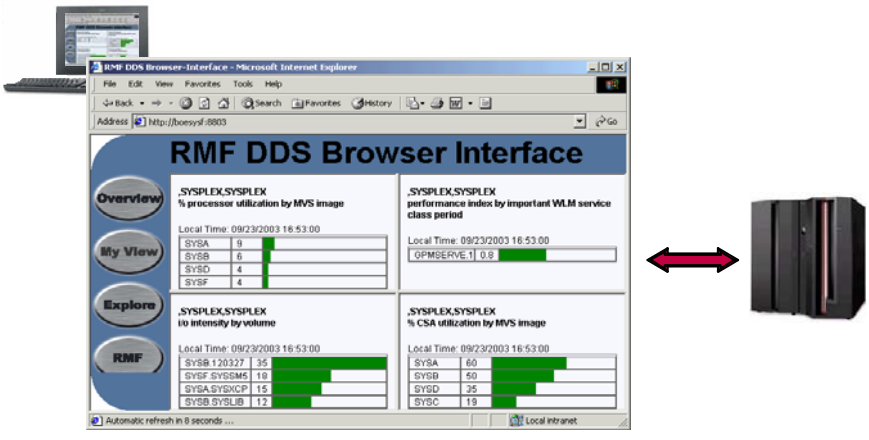
RMF Enhancements...



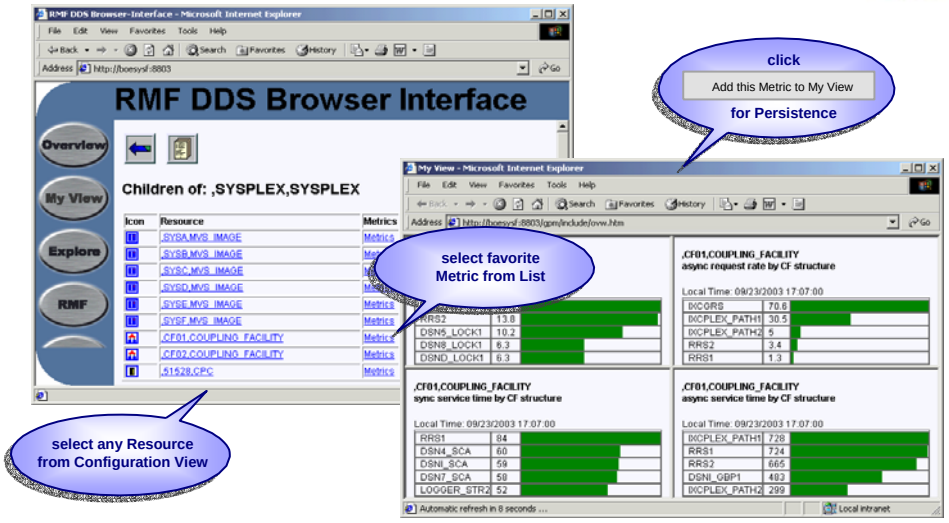
- RMF Data in a Web Browser
  - Instant Access to z/OS Performance Data
  - Definition of individual Views
- RMF PM Java Webstart
  - Immediate Startup without Installation
  - Automatic Version Control
  - Separation of Application and Personal Settings
- Linux Performance Monitoring
  - RMF PM for Linux (IBM zSeries and Intel x86)

RMF Data in a Web Browser

- direct connection to the RMF Distributed Data Server
- just specify http://<hostname>:8803
- all resources and metrics supported (same than RMF PM)



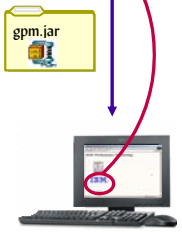
RMF Data in a Web Browser...



RMF PM Java Webstart

Launch RMF PM from the Browser

Webstart Technology:
- no client installation needed
- download from server with first launch
- automatic extraction
- fast execution from local disk
- version control



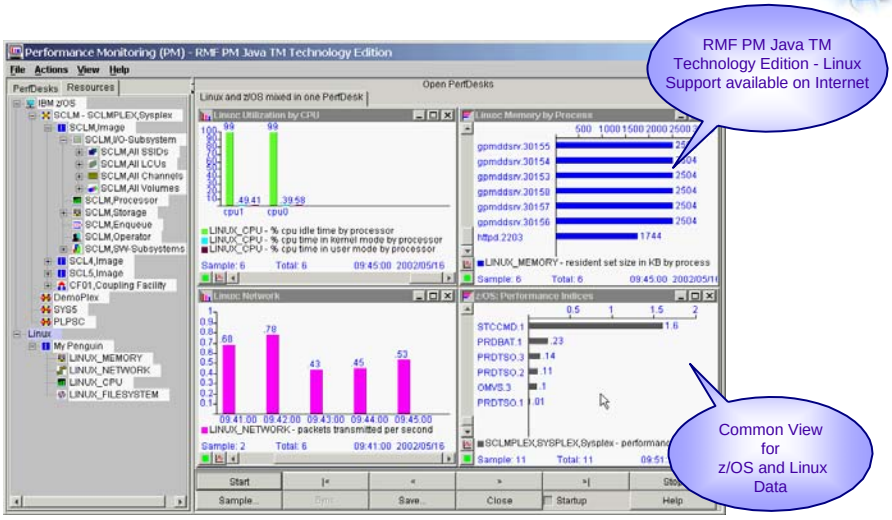
C:\Program Files\IBM HTTP Server\htdocs\gpm
- gpm.jnlp
- gpm.gif
- gpm.jar

Linux Performance Monitoring

RMF PM goes Linux

- Advanced Features for Linux
  - Historical Data Collection
  - Flexible Report Definitions
  - Persistent Views
  - Trend Reports
  - Spreadsheet Export
- LPAR Data via z/OS Partition
- Integration with z/VM Performance Toolkit (FCON)

Linux Performance Monitoring...



RMF Enhancements...

- msys for Setup Exploitation
  - GUI based Customization and Migration
  - Maintain Parmlib Options without Errors
- RMF Spreadsheet Reporter Java Edition
  - One consolidated Application with new GUI
  - Fast Path from SMF Data to graphical Views
  - Batch Facility for all Processing Steps

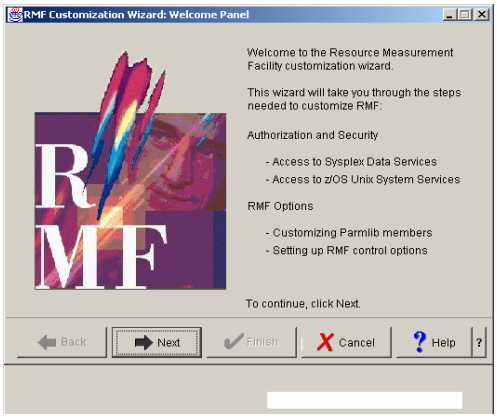
msys for Setup Exploitation

The new RMF msys plug-in helps customers to get RMF up and running quickly:

- The plug-in includes a wizard that guides users through customization and migration tasks
- All RMF Parmlib options are presented self-instructional
  - Knowledge about the correct syntax of session options is no longer necessary
- The plug-in ensures correct and consistent RMF Parmlib members
  - Error messages during initialization of a monitoring session because of conflicting options or incorrectly specified parameters are a matter of the past
- Especially, migrating to the latest release gets quick and easy
  - The plug-in provides a wizard which queries the new options directly without detouring
  - The time consuming task of reviewing the RMF publications about new or changed options becomes obsolete

msys for Setup Exploitation...

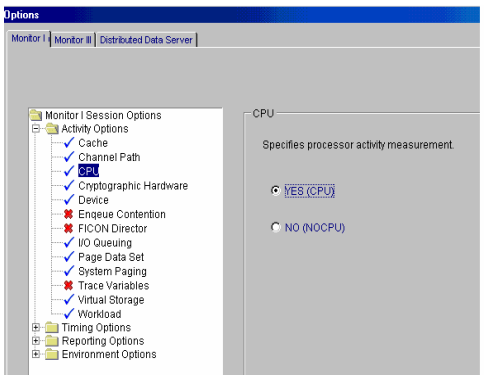
Customize Task



- Covers all tasks concerning:
  - Authorization
  - RACF access permissions
  - Security
  - All options for
    - ✓ Monitor I
    - ✓ Monitor III
    - ✓ DDS
    - ✓ SMFBUF
- MODIFY task uses the same wizard

msys for Setup Exploitation...

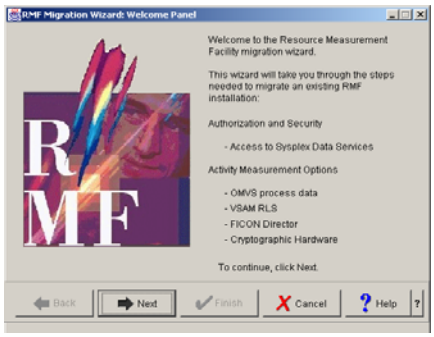
Customize Task: Options



- Wizard displays MON I, MON III and DDS session options in split pane
- Left side is a tree view with all options
- Options in tree view prefixed by ✓or x
  - You see at a glance which option is active and which not
- Right side displays the selected option and allows to change it

msys for Setup Exploitation...

Migrate Task



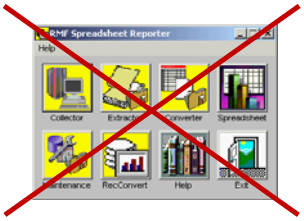
- Migration to z/OS V1R5 RMF:
  - From OS/390 2.10
    z/OS 1.1
  - From z/OS 1.2
    z/OS 1.3
    z/OS 1.4

msys for Setup Exploitation...

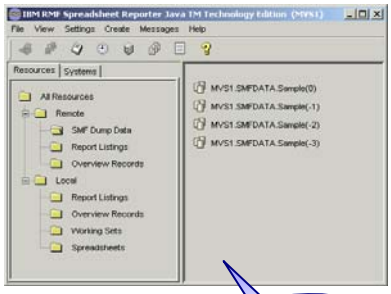
Behind the Panels ...

- Several administrative tasks are done by the plug-in without any user interaction:
  - RMF library authorization
  - Program Property Table (PPT) setup
  - Access to the BPX.DAEMON facility
- What is not done by the RMF plug-in
  - Does not check whether RMF and RMFGAT are part of the WLM service class SYSSTC
  - Cannot activate VSM common storage tracking

RMF Spreadsheet Reporter Java Edition

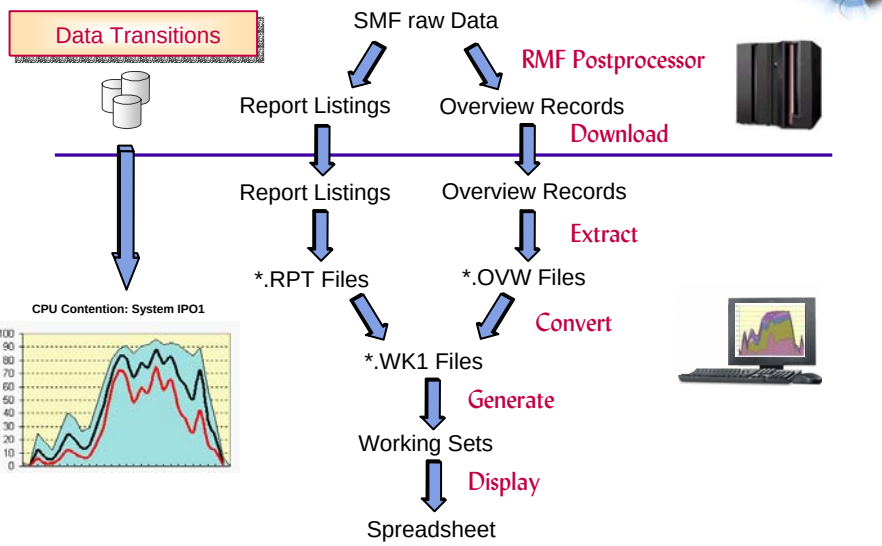


Spreadsheet Reporter Version 4
- unconventional GUI
- isolated Applications
- missing Batch Facility
- multiple Work Steps

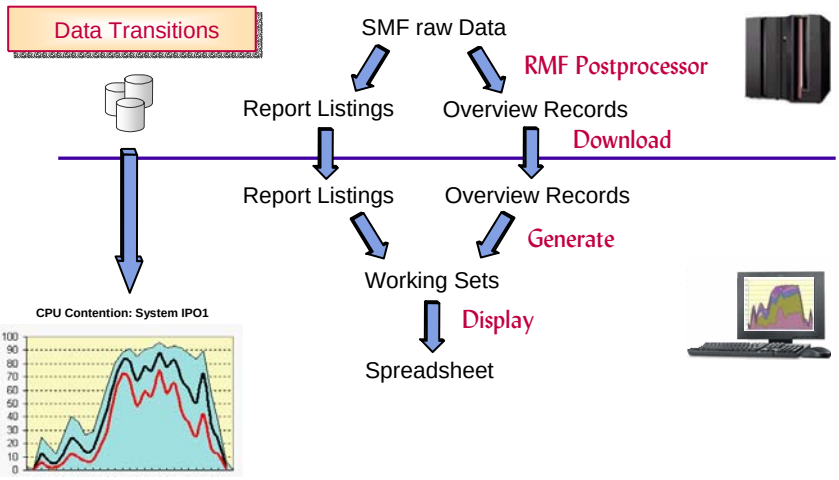


Version 5:
complete new
Java Implementation

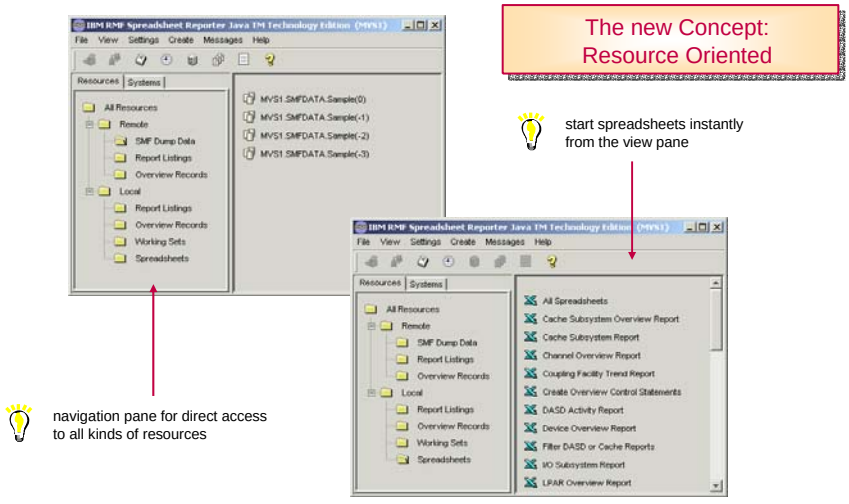
RMF Spreadsheet Reporter Java Edition...



RMF Spreadsheet Reporter Java Edition...



RMF Spreadsheet Reporter Java Edition...

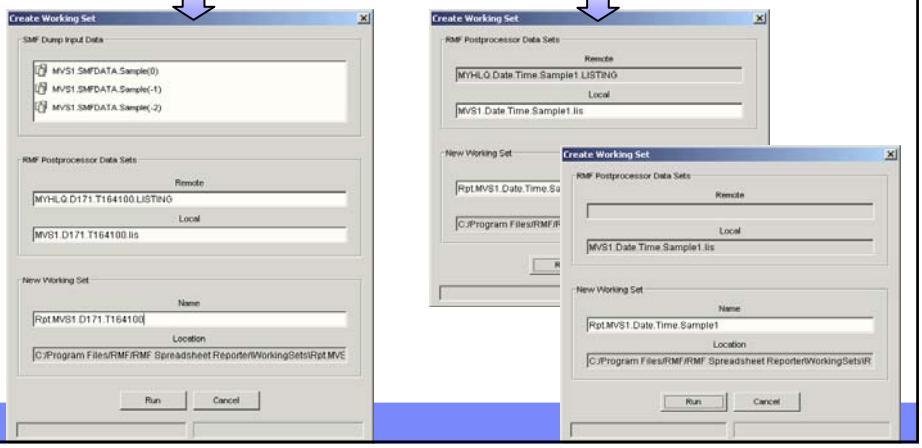


RMF Spreadsheet Reporter Java Edition...

Creation Dialogs: Working Sets

Input:
SMF Dump Data Sets

Input:
Report Listings /
Overview Records

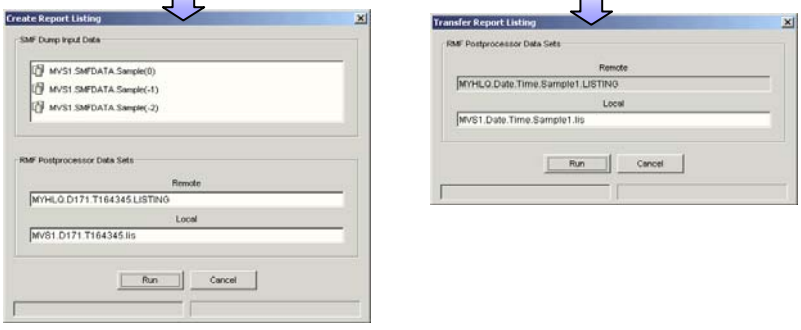


RMF Spreadsheet Reporter Java Edition...

Creation Dialogs: Report Listings / Overview Records

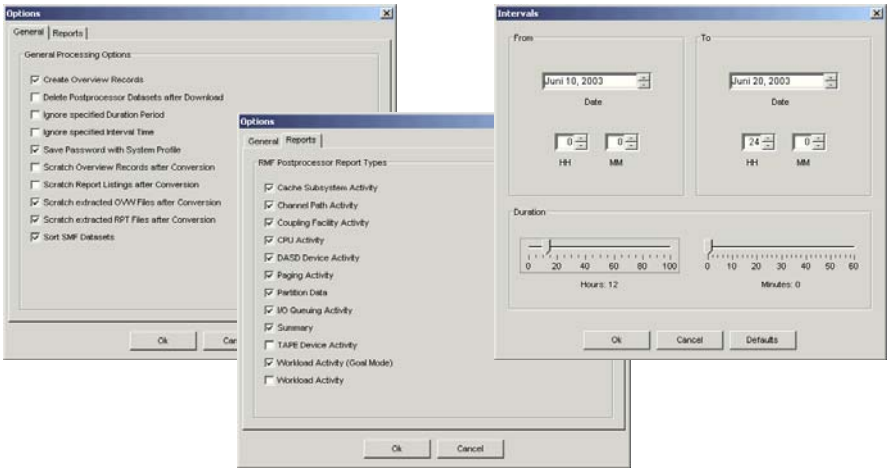
Input:
SMF Dump Data Sets

Input:
Report Listings /
Overview Records



RMF Spreadsheet Reporter Java Edition...

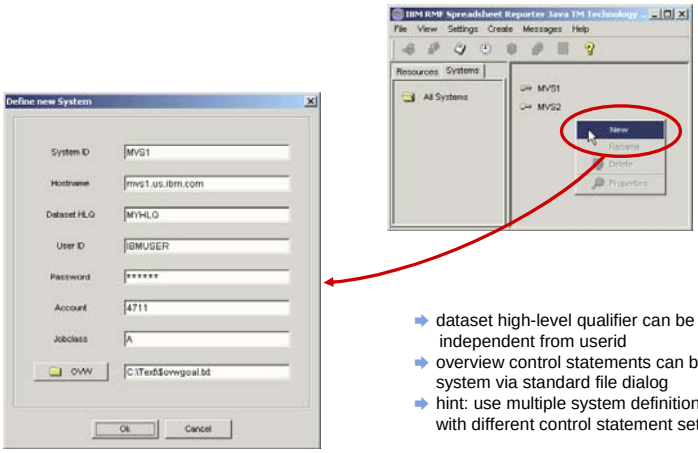
Option Dialogs



Resource Measurement Facility

RMF Spreadsheet Reporter Java Edition...

Option Dialogs



- dataset high-level qualifier can be specified independent from userid
- overview control statements can be attached to a system via standard file dialog
- hint: use multiple system definitions for the work with different control statement sets

RMF at a Glance
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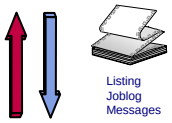
RMF Spreadsheet Reporter Java Edition...

Batch Mode

```
//RMFPP  EXEC PGM=ERBRMFPP
//SYSIN    DD   *
 DATE(10142002,10142002)
 RTOD(1100,1300)
 DINTV(0030)
 REPORTS(CPU)
 SYSRPTS(WLMGL(SCPER))
 SYSOUT(H)
```



Listing
Joblog
Messages

Working Set

All Actions can be performed in Batch Mode

- generate JCL from skeleton file
- send JCL to remote system
- execute RMF Postprocessor
- retrieve JES Joblog
- retrieve Postprocessor messages
- transfer Report Listing
- generate Working Set
- migrate Working Sets from previous Versions

Information and Tools

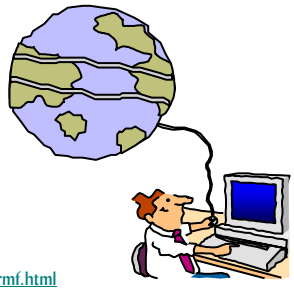
RMF homepage: www.ibm.com/servers/eserver/zseries/zos/rmf/

- ✗ Product information, newsletters, presentations, ...
- ✗ Downloads
  - Spreadsheet Reporter
  - RMF PM Java Edition
  - RMF data collector for Linux

RMF email address: rmf@de.ibm.com

Documentation and news

- ✗ RMF Performance Management Guide, SC33-7992
- ✗ RMF Report Analysis, SC33-7991
- ✗ RMF User's Guide, SC33-7990
- ✗ Latest version of PDF files can be downloaded from: www.ibm.com/servers/eserver/zseries/zos/bkserv/r5pdf/rmf.html



Appendix: Function Reference

Main Function	Feature	Availability
zAAP Reporting		OA05731 OA07950
ESS Link Statistics		OA04877
Z990 Support	Compatibility Exploitation	OW54347 OW56656
Crypto Reporting	PCICC+PCICA CCF PCIXCC	z/OS V1R2 RMF OW49808 OW56656
Coupling Facility Duplexing		z/OS V1R2 RMF
WLM Enhancements	Report Class Periods Workload License Charges Enqueue Contention Reporting	z/OS V1R2 RMF OW49807 z/OS V1R2 RMF
Storage Reporting	Above 2G Shared Pages	OW54010 z/OS V1R2 RMF
64 Bit APIs		z/OS V1R2 RMF

Resource Measurement Facility

Appendix: Function Reference

Main Function	Feature	Availability
Multilevel Security		z/OS V1R2 RMF
RMF Data in Web Browser	Base HTTP Customized Views	z/OS V1R2 RMF OA04291
RMF PM Java Webstart		OA03250
RMF LDAP Integration		z/OS V1R2 RMF
Linux Performance Mon.		RMF Homepage
msys Exploitation		z/OS V1R5 RMF
RMF Spreadsheet Reporter (Java Edition)		z/OS V1R5 RMF