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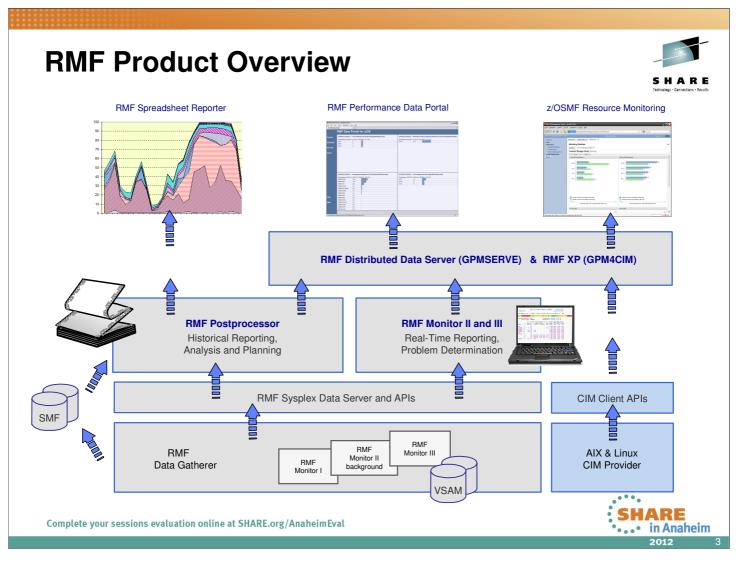
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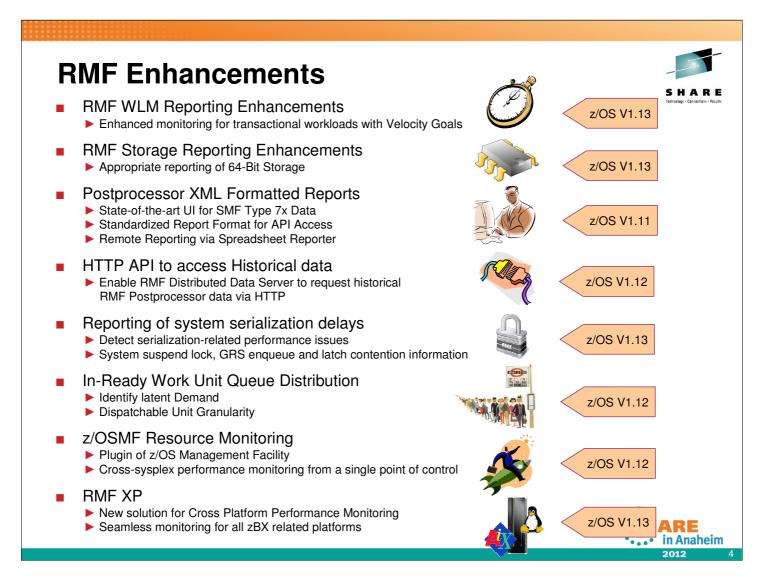
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- z/OS Resource Measurement Facility (RMF) is an optional priced feature of z/OS. It supports installations in performance analysis, capacity planning, and problem determination. For these disciplines, different kinds of data collectors are needed:
  - Monitor I long term data collector for all types of resources and workloads. The SMF data collected by Monitor I is mostly used for capacity planning and performance analysis
  - Monitor II snap shot data collector for address space states and resource usage. A subset of Monitor II data is also displayed by the IBM SDSF product
  - Monitor III short-term data collector for problem determination, workflow delay monitoring and goal attainment supervision.
     This data is also used by the RMF PM Java Client and the RMF Monitor III Data Portal
- Data collected by all three gatherers can be saved persistently for later reporting (SMF records or Monitor III VSAM datasets)
- While Monitor II and Monitor III are realtime reporters, the RMF Postprocessor is the historical reporting function for Monitor I data
- One of the key components for the sysplex wide access of Monitor III data is the RMF Distributed Data Server (DDS). With RMF for z/OS 1.12, DDS supports HTTP requests to retrieve RMF Postprocessor data from a selection of RMF Postprocessor reports. Since the requested data are returned as XML document, a web browser can act as Data Portal to RMF Postprocessor data.
- With z/OS 1.12 there's another exploiter of the RMF DDS data: The z/OSMF Resource Monitoring plugin of the z/OS Management Facility.
- RMF for z/OS 1.13 enhances the DDS layer with a new component:
  - RMF XP is the new solution for Cross Platform Performance Monitoring
  - Provides a seamless performance monitoring for all operating systems running on the IBM zEnterprise Bladecenter Extension.



In accordance with the availability of new z/OS releases and new hardware functionality, the capabilities of RMF are enhanced consecutively

- Starting with z/OS V1.13, WLM reporting is enhanced to provide response time distributions also for workloads with an execution velocity goal
  - RMF for z/OS 1.13 exploits the new response time distribution data
- Layout and contents of RMF Postprocessor Paging activity report are changed to provide an appropriate reporting of the 64-Bit storage world on today's systems
- As an alternative to the standard text format, Postprocessor reports can now be generated in XML format. The new format provides:
  - Browser based, state-of-the-art display of SMF Type 7x data
  - · Standardized format for access to performance data via XML parsing
- The RMF Distributed Data Server (DDS) is extended by the capability to grant instant and easy access to RMF long-term historical data by using HTTP and XML.
- With the increasing workload on z/OS systems, resource contention can become more and more a factor that impacts the overall performance.
  - RMF for z/OS 1,13 collects and reports System suspend lock, GRS enqueue and latch contention data
- · The in-ready queue distribution is now reported on work unit granularity
- z/OS Resource Monitoring is a new plugin of the z/OS Management Facility. The Web browser based user interface allows a cross-sysplex performance monitoring from a single point of control:
  - Enterprise-wide health check of all z/OS sysplexes.
  - Performance monitoring with graphically display of RMF Monitor III metrics as well as Linux metrics by means of customizable views.
- RMF XP is the new solution for Cross Platform Performance Monitoring
  - Provides a seamless performance monitoring for all operating systems running on the IBM zEnterprise Bladecenter Extension.

# RMF WLM Reporting Enhancements

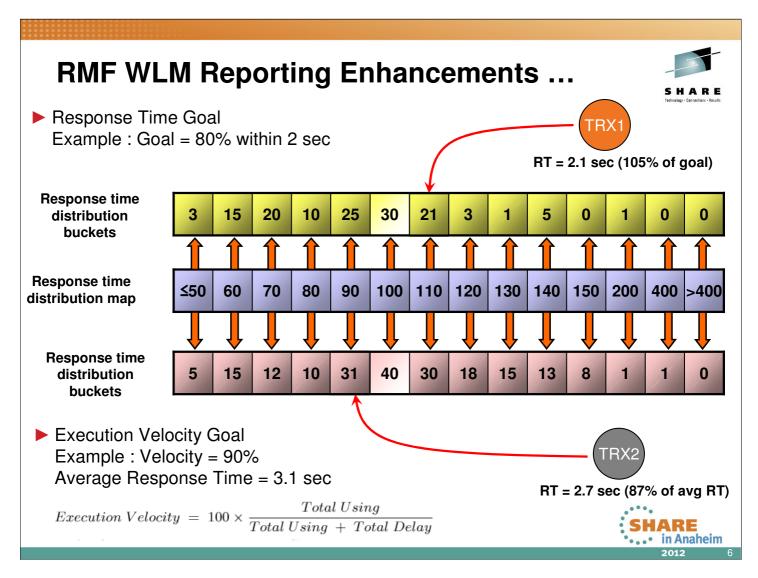


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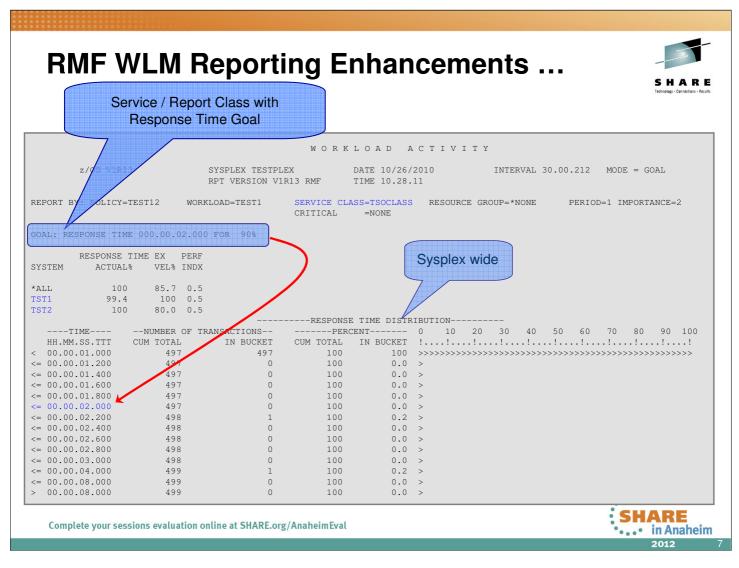
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- Currently WLM reporting does not provide a response time distribution (ended transactions) for workloads with velocity goals
- But it is desirable to have a response time distribution for all transactional workloads, even if they have a velocity goal
  - · More data to analyze workload behavior and to detect problems
  - · Better support for migration of goal definitions to response time goals
- With z/OS V1.13 the WLM IWMRCOLL interface provides response time distribution data for service class periods with an execution velocity goal
- RMF for z/OS 1.13 exploits the new IWMRCOLL data:
  - RMF Monitor I data gatherer collects the new response time information in SMF 72 subtype 3 record
  - RMF Postprocessor Workload Activity report (WLMGL) displays
    - · Response time distribution for response time and execution velocity goals
    - One merged distribution for workloads with response time goals per sysplex
    - One distribution for workloads with execution velocity goals per system in sysplex

- Today, WLM reports response time distributions for workloads with a response time goal in the IWMWRCAA answer area of IWMRCOLL interface
- Starting with z/OS V1.13, WLM reporting is enhanced to provide response time distributions also for workloads with an execution velocity goal
- RMF for z/OS 1.13 exploits the new response time distribution data for transactions with an execution velocity goal:
  - RMF Monitor I collects the new interface data in the SMF 72.3 records. The Service/Report Class Period Data section of the SMF 72.3 record is extended with new fields.
  - RMF Postprocessor (PP) Workload Activity report (WLMGL) now reports response time distributions for response time and execution velocity goals:
    - The response time distribution for service/report class periods with a response time goal is a **sysplex-wide view** with the combined SMF72.3 data from all systems in the sysplex
    - For service/report class periods with excecution velocity goals, there is one response time distribution per system in the sysplex.
  - The RMF PP **WLMGL** report option is enhanced with the new suboption **RTD**|**NORTD** that can be used to display/suppress the response time distribution section in the workload activity report:
    - The suboption can be specified together with suboptions SCPER and RCPER
    - It is ignored if specified together with other suboptions than SCPER and RCPER
    - Default: RTD
    - Example: SYSRPTS(WLMGL(SCPER(VEL90I1,VEL90I3),NORTD))
      - -> Creates RMF PP WLMGL report for service classes VEL90I1 and VEL90I3 without response time distribution section
  - The new response time distribution for service/report class periods with execution velocity goal helps the customer to obtain better analysis data and to migrate their goal definitions to a meaningful response time goal.



- For each service/report class period, WLM maintains 14 response time distribution buckets with the number of transactions that completed within a particular time.
- · Workloads with response time goals:
  - · Distribution is built around response time goal as defined in WLM service definition
  - The response time goal for the service class period is split into 14 response time buckets where:
    - bucket 1 covers the gap from 0 to half the goal
    - buckets 2 to 11 cover the gap between half the goal to 1.5 times the goal evenly divided
    - · bucket 12 covers two times the goal
    - · bucket 13 covers four times the goal
    - bucket 14 covers the gap from four times the goal to infinity
- · Workloads with execution velocity goal
  - · Distribution is built around average response time as measured by WLM
  - The *average of all response times (midpoint)* for the service/report class period is split into 14 response time buckets where:
    - bucket 1 covers the gap from 0 to half the midpoint
    - buckets 2 to 11 cover the gap between half to 1.5 times the midpoint evenly divided
    - bucket 12 covers two times the midpoint
    - · bucket 13 covers four times the midpoint
    - · bucket 14 covers the gap from four times the midpoint to infinity



### Service / Report Class with Response Time Goal:

• The response time distribution in the RMF PP WLMGL report is a sysplex-wide view created by merging the SMF 72.3 data from all systems in a sysplex.

#### **RMF WLM Reporting Enhancements ...** Service / Report Class with **Execution Velocity Goal** WORKLOAD ACTIVITY z/OS SYSPLEX TESTPLEX DATE 10/26/2010 INTERVAL 30.00.212 MODE = GOAL RPT VERSION V1R13 RMF TIME 10.28.11 SERVICE CLASS=VEL9012 RESOURCE GROUP=\*NONE REPORT BY OLICY=VICOM2 WORKLOAD=VICOM PERIOD=1 IMPORTANCE=2 CRITICAL =NONE VELOCITY MIGRATION: I/O MGMT 96.0% GOAL: EXECUTION VELOCITY 90.0% INIT MGMT 44.9% RESPONSE TIME EX PERF Number of Measurement SYSTEM VEL% INDX midpoint changes Interval 96.0 0.9 \*ALL --N/A--95.3 0.9 TST2 96.7 0.9 DISTRIBUTIONS -RESPONSE TIME SYSTEM: TST1 -----INTERVAL: 15.49.248 -MRT CHANGES : -INTERVAL: 17.01.121 ----CHANGES SYSTEM: TST2 -MRT 1 ----1 ----NUMBER OF TRANSA HH.MM.SS.TTT CUM TOTAL BUCKET CUM TOTAL IN BUCKET HH.MM.SS.TTT CUM TOTAL CUM TOTAL IN BUCKET 00.00.05.308 00.00.03.871 9 45 29.4 00.00.05.419 47.1 8 4.4 4.4 48 90 58.8 38.3 4.6 <= 00.00.06.96 <= 00.00.07.742 <= 00.00.10.617 87 47.5 00.00.08.516 00.00.11.678 61.7 00.00.13.802 00.00.10.064 65.0 00.00.10.838 41 87.4 22.4 00.00.11.613 00.00.42.468 00.00.30.968 183 SHARE SHANL in Anaheim Ú Complete your sessions evaluation online at SHARE.org/AnaheimEval

### Service / Report Class with Execution Velocity Goal:

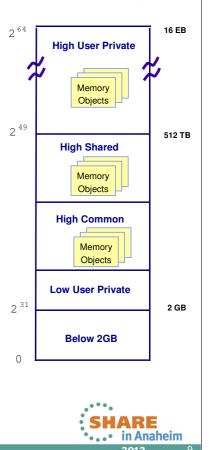
- The RMF PP WLMGL report displays one response time distribution per system.
- Response time distribution is build around the average response time measured by WLM.
- Average repsonse time is calculated from the response time of ended transactions on the system.

# RMF Storage Reporting Enhancements 🔬

## Rationale

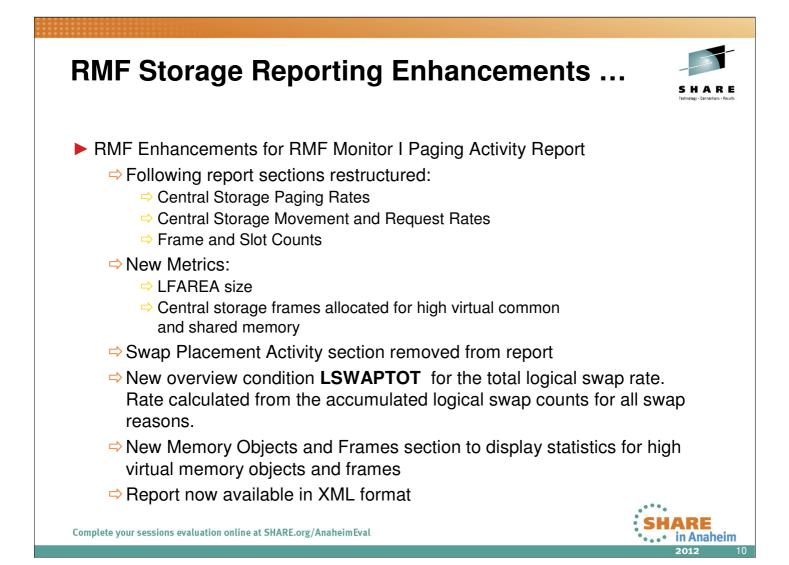
- Structure and metrics in RMF PP Paging Activity report no longer appropriate to present today's system memory in a 64-Bit world:
  - Expanded Storage section removed but layout not adapted
  - Metrics for Physical swapping to auxiliary storage and expanded storage obsolete
  - ⇒ Increased number of metrics for high virtual storage:
    - Memory Objects in high virtual common, shared or private storage
    - Large Pages (1MB) for high private and common storage

# RMF Postprocessor Paging Activity report restructured and enhanced



Several reasons to restructure the RMF Postprocessor Paging Activity

- Section with expanded storage data was removed from the report, but layout not adapted.
- Beginning with z/OS 1.8, physical swapping of address spaces to AUX is no longer done so that the physical swap
  metrics are obsolete
- Current report layout does not allow a proper reporting of an increasing number of metrics for high virtual memory.



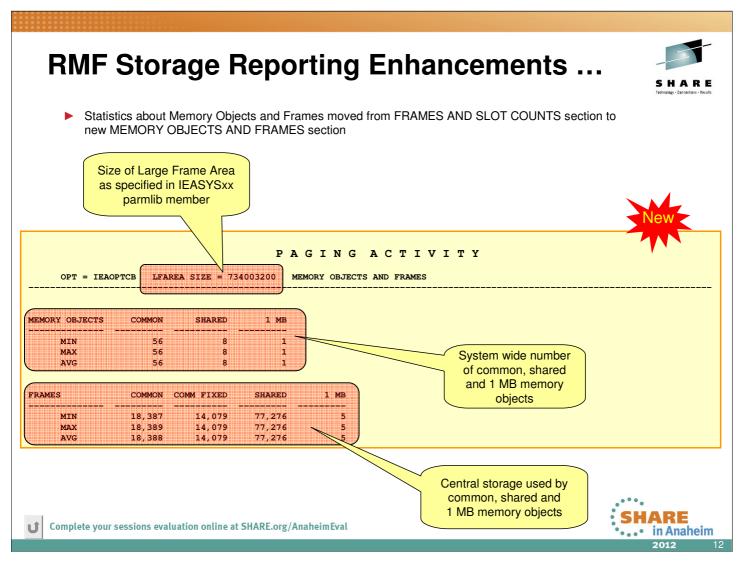
- RMF Postprocessor Paging Activity report restructured and enhanced:
  - Report sections restructured:
    - ⇒Central Storage Paging Rates
    - ⇒Central Storage Movement and Request Rates
    - ⇒Frame and Slot Counts
  - New metrics for 64-Bit storage:
    - ⇒Size of large frame area (LFAREA)
    - ⇒Central storage frames for memory objects in high virtual common and shared storage.
  - The Swap Placement Activity section is no longer provided.
    - Related overview conditions are not supported when data for z/OS V1R13 or later is processed.
    - As replacement of **logical swap** statistics. RMF provides the new overview condition **LSWAPTOT** to report the accumulated number of all logical swaps.
  - New Memory Objects and Frames section with statistics about high virtual memory objects and frames.
  - Paging Activity report now available in XML format.

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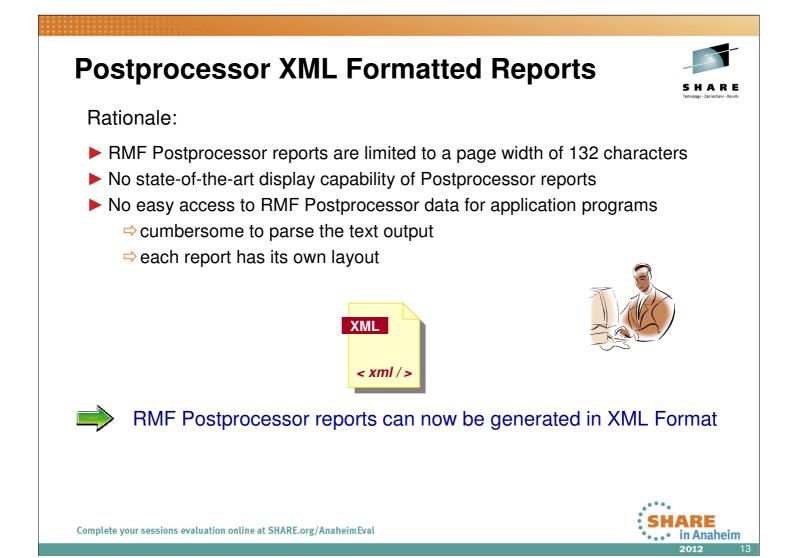
## **RMF Storage Reporting Enhancements ...**

Section headers and PAGING ACTIVITY Frames allocated for MIN/MAX/AVG high virtual shared columns now FRAME AND SLOT COUNTS and common memory displayed as rows PAGING ACTIVITY FRAME AND SLOT COUNTS (181 SAMPLES) CENTRAL STORAGE FRAMES TOTAL AVAILABLE LPA CSA LSOA REGIONS+SWA HV SHARED HV COMMON SOA MIN 7,864,316 2,751,600 20,217 6,429 16,601 104,493 4,776,978 77,276 18,387 105,735 MAX 7,864,316 2,840,625 20,636 6,438 16,636 4,865,152 77,276 18,389 7,864,316 AVG 2,784,680 105,347 4,832,283 20,465 6,434 16,620 77,276 18,388 FIXED FRAMES TOTAL NUCLEUS SQA LPA CSA LSQA REGIONS+SWA <16 MB 16MB-2GB 319,129 2,821 18,735 81 15,952 28,812 252,349 56 27,791 MIN 324,274 2,821 81 15,952 29,482 257,151 28,857 MAX 19,154 71 AVG 320,866 2,821 18,982 81 15,952 29,314 253,715 56 28,313 SHARED FRAMES TOTAL SLOTS CENTRAL STORAGE FIXED TOT FIXED BEL AUX DASD 72,227 MIN 81,456 51 0 0 MAX 81,476 72,247 51 0 0 81,460 72,231 51 0 0 AVG LOCAL PAGE DATA SET SLOTS TOTAL AVAILABLE BAD NON-VIO vio MTN 5,399,997 5,399,619 0 20 0 мах 5,399,997 5,399,977 0 378 0 AVG 5,399,997 5,399,654 0 343 0 COMMON FIXED RE 1 MB Anaheim

- Layout of the Postprocessor Paging Activity report is changed to display the section headers and MIN/MAX/AVG columns as rows.
- The screenshot shows the new layout of the FRAME AND SLOT COUNTS section.
- CENTRAL STORAGE FRAMES statistics are enhanced with new metrics ,HV SHARED' and ,HV COMMON':
  - HV SHARED: MIN, MAX and AVG number of frames allocated for high virtual shared memory
  - HV COMMON: MIN, MAX and AVG number of frames allocated for high virtual common memory



- All usage statistics for Memory Objects and Frames are moved from FRAME AND SLOT COUNTS section to new MEMORY
   OBJECTS AND FRAMES section:
  - MEMORY OBJECTS:
    - Number of high virtual COMMON memory objects,
    - Number of high virtual SHARED memory objects and
    - Number of LARGE memory objects (memory object backed by 1 Megabyte Page Frames )
  - FRAMES:
    - Number of high virtual COMMON memory 4K frames that are backed in central storage,
    - Number of high virtual COMMON memory 4K frames that are FIXED in central storage,
    - Number of high virtual SHARED memory 4K frames that are backed in central storage
    - Number of 1 MB frames that are backed in central storage
- The size of the large frame area (as defined by LFAREA parm in IEASYSxx parmlib member) is displayed in the section header.



In the past, users of the RMF Postprocessor had to struggle with a couple of shortcomings:

- The standard text output was limited to to a width of 132 characters. Therefore some reports appeared somehow squeezed. This applies in particular to Overview Reports with a high number of OVW conditions
- The basic text format didn't exploit todays presentation capabilities like resizing windows, scrolling back and forth etc.
- Depending on the report type, the report layouts were quite different. Hence, API programs need to supply specific logic in order to extract metrics out of the reports

Starting with z/OS V1R11 RMF, the Postprocessor is able to generate a subset of the reports alternatively in XML format

## **Postprocessor XML Formatted Reports** The following single-system reports are available in XML format (both Interval and Duration reports) ⇒ CPU Activity report (including Partition Data, LPAR Cluster and Group Capacity reports) CRYPTO Activity report FICON Director Activity report OMVS Kernel Activity report ⇒ESS Disk Systems Activity report ⇒ DEVICE Activity report z/OS 1.12 ⇒ PAGING Activity report z/OS 1.13 Serialization Delay report (SDELAY) With z/OS 1.12, the first sysplex report is available in XML format z/OS 1.12 ⇒Workload Activity report (WLMGL) Overview reports are also available in XML format • Summary and Exception reports are not available in XML format Interval reports based on data collected during a Monitor II background session • are not available in XML format

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- It is RMF's objective to introduce the XML format for the majority of Postprocessor reports over the next releases.
- With the first stage in RMF for z/OS 1.11, those reports have been selected where no similar Monitor III report is available – since Monitor III reports are already XML enabled by means of the Data Portal. These are the following Postprocessor single-system reports:
  - CPU Activity report
  - CRYPTO Activity report
  - FICON Director Activity report
  - OMVS Kernel Activity report,
  - ESS Disk Systems Activity report
- In addition, Postprocessor Overview reports belong also to the first stage since multiple Overview conditions have caused nasty line-feeds in the old text format
- RMF for z/OS 1.12 extends the list of Postprocessor XML reports with another single-system report and the frist sysplex report:
  - Device Activity report (single-system report)
  - Workload Activity report (sysplex report)
- $\bullet$  With RMF for z/OS 1.13 the next two Postprocessor single-system reports are XML enabled:
  - Paging Activity report
  - Serialization Delay report (SDELAY)
- The SDELAY report is the first report that is only available in XML format

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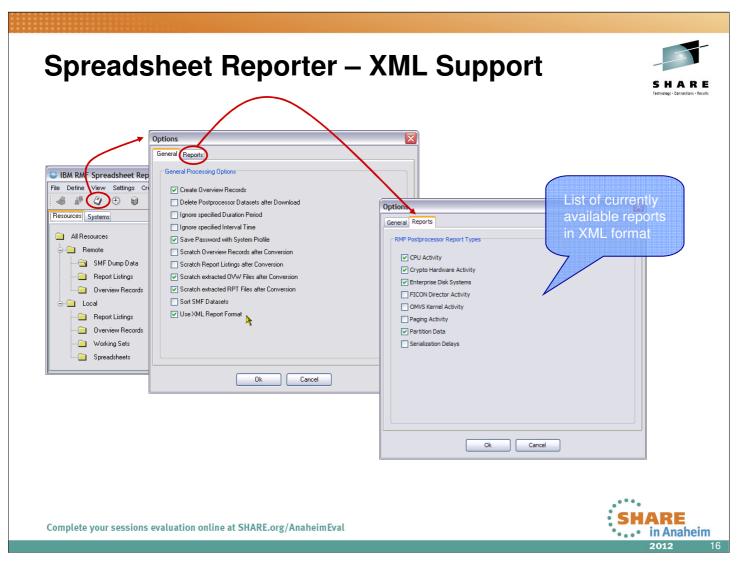
## **Postprocessor XML Formatted Reports**



- The generation of Postprocessor reports in XML format is controlled by the new ddnames XPRPTS, XPXSRPTS and XPOVWRPT
- If the XML output is routed to permanent data sets rather than to SYSOUT, define the data set with RECFM=VB and LRECL between 256 and 8192. Specify an appropriate BLKSIZE.

ddname	Contents	Allocations	Notes
XPRPTS	Combined single-system report in XML format	One ddname for one data set to contain all single system reports for each interval during the session.	There is no dynamic allocation of this ddname, you have to define it explicitly if you want to get all reports in XML format into one data set or output class. If you define this ddname, no MFRnnnnn files are created. If you define this ddname and PPRPTS, no XML output in file XPRPTS is created.
XPOVWRPT	Combined Overview report in XML format	One ddname for one data set to contain all overview reports for each system included in the input data.	There is no dynamic allocation of this ddname, you have to define it explicitly if you want to get all overview reports in XML format into one data set or output class. If you define this ddname, no PPORPnnn files are created.
XPXSRPTS	Combined sysplex-wide report in XML format	One ddname for one data set to contain all sysplex reports for each interval included in the input data.	There is no dynamic allocation of this ddname, you have to define it explicitly if you want to get all reports in XML format into one data set or output class. If you define this ddname, no MFRnnnnn files are created. If you define this ddname and PPXSRPTS, no XML output in file XPXSRPTS is created.

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- The request for XML output from the RMF Postprocessor is triggered by means of the existence of a DD card for XPRPTS (for single-system reports) and/or XPOVWRPT (for Overview reports) in the JCL for the Postprocessor job.
- If one of these DD statements are defined in the JCL, then XML output will be generated.
- The following rules apply if requests for text and XML are given simultaneously:
  - If the user specifies a DD card for cumulative text output, i.e. PPRPTS, as well as XPRPTS, then only text output will be generated into PPRPTS and no XML is produced.
  - If single-system reports are requested on the REPORTS control statement which are not XML enabled yet and the DD card XPRPTS is defined, no output is generated for them.
- Beginning with RMF for z/OS 1.12 the new ddname XPXSRPTS was introduced to support XML formated Postprocessor sysplex report.
- For the XPXSRPTS ddname similar rules apply as for XPRTS, that is:
  - If the user specifies the PPXSRPTS ddname for cumulative text output together with XPXSRPTS, no XML output is generated.
  - If sysplex reports other than the WLMGL report are specified in the SYSRPTS control statement, no output is generated.



- The RMF Spreadsheet Reporter provides built-in support for the new Postprocessor XML formatted reports
- You can request the new XML format by means of the general option "Use XML Report Format". This will cause the following results:
  - The report selection list on the Options dialogs Reports tab displays just the report types which can be generated in XML format
  - Under the cover, the generated JCL will contain the new DD names for the XML format (XPRPTS and XPOVWRPT)
  - The default filetype for local report listings changes from .lis to .xml

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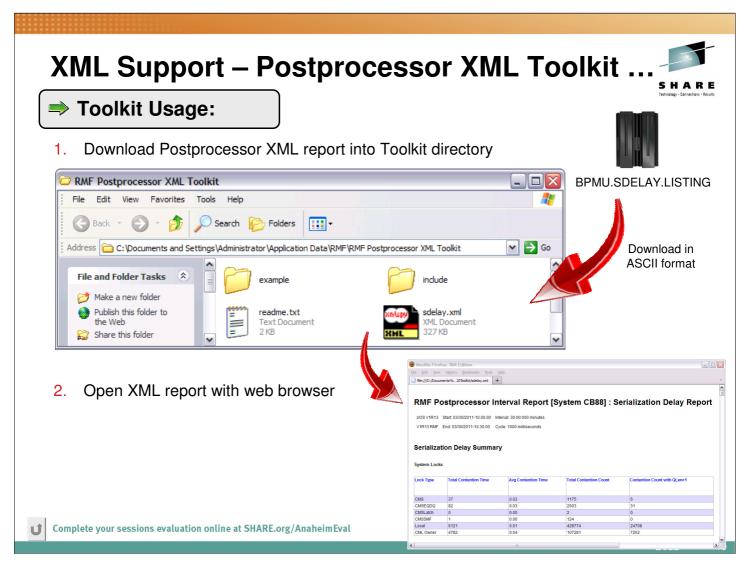
- The new XML formatted reports can be instantly displayed within the Spreadheet Reporter environment
- Once a listing is associated with the filtype xml the View action opens a browser window with the formatted report
- · Report headers are displayed as name/value pairs while the report body is arranged in tabular format
- Internally the XML is visualized by means of the following stylesheets which are located in the Spreadsheet Reporters *Listing* directory:
  - ddsml-pp.xsl
  - ddsml.css

#### XML Support – Postprocessor XML Toolkit New Postprocessor XML Toolkit shipped with RMF for z/OS 1.13 Simplifies display of RMF Postprocessor XML reports in a web browser Toolkit Installation: SYS1.SERBPWSV Download member ERBXMLTK as binary file erbxmltk.msi 1. 18 IBM RMF Postprocessor XML Toolkit - InstallShield Wizard Install MSI Package 2. erbxmltk.msi 4 ndows Installer Package 2.987 KB **Default Installation** Directory ⇒ XSL stylesheet files R Pe tprocessor XML Toolkit ⇒ Java script file File View Favorites Tools Help ⇒ Bitmap files -A), Search Polders B Go Addre C:\Documents and Settings\Administrator\Application Data\RMF\RMF Postprocessor XML Tool File and Folder Tasks include example Make a new folder 1 Publish this folder to Sample.xml readme.txt the Web Text Document 2 KB Share this folder Sample PP XML report ARE in Anaheim ¥ 2012

- RMF for z/OS 1.13 includes the new *Postprocessor XML Toolkit* which assists you in browsing Postprocessor XML reports with your internet browser. The reports are formatted by use of RMF XSL stylesheets.
- Toolkit installation:
  - The Postprocessor XML Toolkit is part of the RMF product. The application files and installation utility of the Postprocessor XML Toolkit are provided in member ERBXMLTK of the host distribution library SERBPWSV. Download this member as binary file **erbxmltk.msi.**
  - Install the MSI package using the Windows Installer, either by double-clicking on the MSI package file or by issuing the command: msiexec /package erbxmltk.msi [/qn]

The Windows Installer guides you through the installation.

- Specify the directory where to install the Postprocessor XML Toolkit. The default, for example for Windows XP, is: C:\Documents and Settings\\_userid\_\Application Data\RMF\RMF Postprocessor XML Toolkit
- The Postprocessor XML Toolkit is installed into program group IBM RMF Performance Management.
- The installation process extracts all files necessary to format and display the XML reports (e.g. XSL stylesheet, JAVA script and Bitmap files) to the toolkit directory.
- Furthermore, in the toolkit directory, you find hints and tips on how to exploit the produced reports in XML output format.



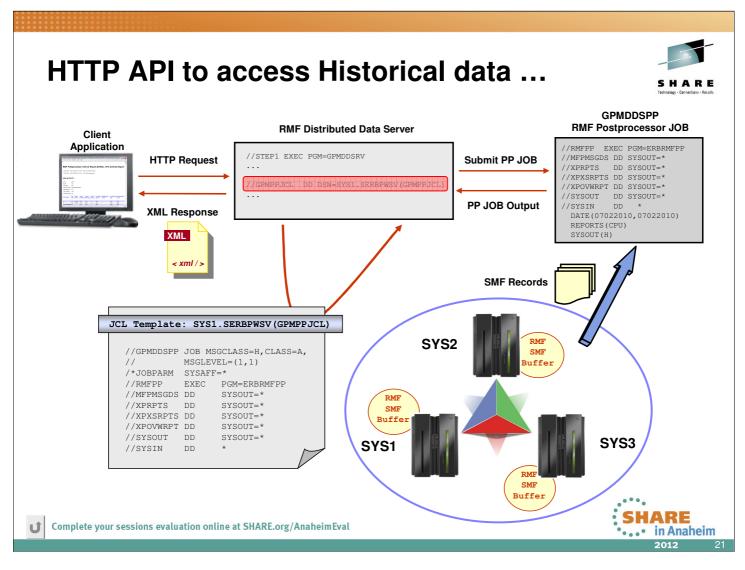
- Toolkit usage:
  - To view an XML Postprocessor report:
    - 1. Run RMF Postprocessor JOB and direct the XML output (DDNAMES: XPRPTS, XPOVWRPT or XPXSRPTS) to a data set.
    - 2. Download the XML output data set into the Postprocessor XML Toolkit directory on your workstation with file extension .xml.

Ensure to download the data set containing the XML output of the Postprocessor reports in ASCII format to the Postprocessor XML Toolkit directory.

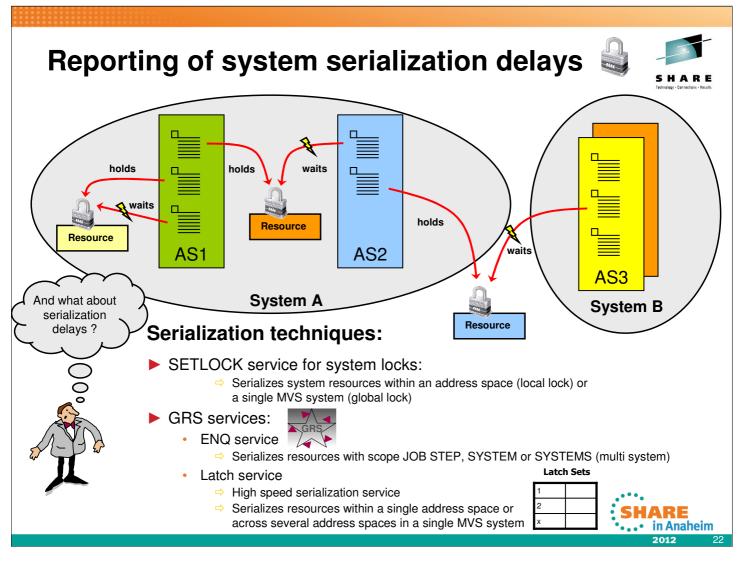
- 3. Open the XML Postprocessor reports within the Postprocessor XML Toolkit with your internet browser
- XML formatting details:
  - The stylesheet files that are required to format the report are available in a subdirectory of the Postprocessor XML Toolkit
  - · The created Postprocessor reports in XML output format contain a link to the stylesheet in this subdirectory
  - When you open the XML Postprocessor reports within the Postprocessor XML Toolkit with your internet browser, the RMF stylesheet transforms the report into an HTML document.
- Check the example subdirectory of the Postprocessor XML Toolkit. There you find more information on how to exploit RMF Postprocessor XML reports. You also find an example for an RMF Postprocessor realtime reporting setup with sysplex wide scope.

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- In most installations, the access to historical data is needed for in depth performance analysis. This allows to keep track whether a critical situation has been persistent or not.
- The existing HTTP API of the RMF Distributed Data Server (DDS) already provides a sysplex-wide access of the data collected by RMF Monitor III. With RMF for z/OS 1.12 this API is extended by the capability to grant instant and easy access to RMF long-term historical data as reported by the RMF Postprocessor.
- Application programs can exploit the extended DDS HTTP API by sending standard URL requests for historical RMF Postprocessor data to the DDS.
- Since DDS returns the requested data as XML document, a web browser can act as an RMF Postprocessor Data Portal to access historical RMF data which is generated by the RMF Postprocessor in XML format.



- To get access to RMF Postprocessor data provided by the DDS, the GPMSERVE started task is extended with an additional DD card:
- //GPMPPJCL DD DISP=SHR,DSN=SYS1.SERBPWSV(GPMPPJCL)
- This DD statement points to a JCL template which contains all JCL statements necessary to start a Postprocessor job from the RMF Distributed Data Server. The JCL template is stored in SYS1.SERBPWSV(GPMPPJCL).
- You must adapt or replace the GPMPPJCL member to suit your installation, ensuring that the DDS is able to run RMF Postprocessor jobs. If you do not want to request Postprocessor data with the DDS, you can omit the GPMPPJCL ddname.
- The dataset or the member specified in the GPMPPJCL DD card can be replaced with private ones containing the JCL template for running RMF Postprocessor from the DDS.
- The JCL template that is used by DDS to start the Postprocessor JOB does not contain any Postprocessor control statements. These will be dynamically created by DDS depending on the HTTP request parameters.
- For a detailed description of the DDS HTTP API please refer to the z/OS RMF Programmer's Guide.
- · Notes:
  - The Postprocessor API functionality is only available with JES2 installed.
  - The DD card specifications for the XML output datasets must not be changed. To be able to retrieve the Postprocessor output, DDS needs these SYSOUT data sets to reside on spool.



- There are various techniques to serialize access to resources. These techniques serialize the resources between work units running in the same address space, in different address spaces on the same system and in address spaces on multiple systems. Here is a quick overview of serialization techniques:
- · SETLOCK service for system locks
  - Two categories:
    - · Global locks -- protect serially reusable resources related to more than one address space (CPU and CMS locks)
    - Local locks -- protect the resources assigned to a particular address space. When the local lock is held for an
      address space, the owner of the lock has the right to manipulate the queues and control blocks associated with that
      address space. (CML and LOCAL locks)
  - · Lock types:
    - CPU (processor lock) -- serializes on the processor level, providing system-recognized disablement.
    - CMS (general cross memory services lock) -- serializes on more than one address space where this serialization is not provided by one or more of the other global locks.
    - CML (cross memory local lock) -- serializes resources in an address space other than the home address space.
    - Local storage lock (LOCAL) -- serializes functions and storage used by the local supervisor within an address space. There is one lock for each address space.
- · GRS provides two sets of system serialization services:
  - GRS ENQ service allows to serialize an abstract resource within the scope of a JOB STEP, SYSTEM or multi-system
    complex (GRS Complex). The GRS complex is usually equal to the sysplex but it does not have to be.
  - The GRS latch services provide a high speed serialization service for authorized callers. Latch services know nothing of the intended scope. Scoping is completely controlled by the user. It uses user provided storage to manage a lock/latch table that is indexed by a user defined lock/latch number. GRS latch is also widely used. Very big users are USS, Logger, RRS, MVS, etc... Compared to GRS ENQ,the GRS latch services have a significant shorter instruction path so that it's a fast technique to serialize resources within a single address space or across several address spaces in a single MVS system with a minimal overhead.
- With the increased number of systems and workload, resource contention can become more and more a factor that impacts the overall performance. However, it may be difficult to detect and debug performance problems due to resource contention since system dumps or traditional performance reports may not be adequate tools to identify the address space that is causing a contention.

### •

## Reporting of system serialization delays ...



in Anaheim

- RMF for z/OS 1.13 collects and displays system-wide contention information and contention information on address space level
- Reported in new RMF Postprocessor (PP) Serialization Delay Report
- Data about following lock types collected and reported:
  - o System Suspend lock types:
    - o CMS
    - O CMSEQDQ
    - CMSLatch
    - CMSSMF
    - o LOCAL
    - CML Lock Owner and
    - CML Lock Requestor
  - o GRS lock types:
    - GRS Latch locks
    - GRS Enqueue Step
    - o GRS Enqueue System and
    - o GRS Enqueue Systems locks

New Serialization Delay Report helps the customer to analyze performance problems due to resource contention situations

- Beginning with z/OS 1.13, RMF collects the following serialization delay data:
  - System suspend lock contention information
  - GRS enqueue and latch performance statistics
- The data is reported in the new RMF PP Serialization Delay report (SDELAY) as a system-wide summary and on address space level.

### Reporting of system serialization delays ... Contention data collected by RMF Monitor III and stored in new SMF 72 subtype 5 record Data gathering controlled by setting in SMF Parmlib member SMFPRMxx Use TYPE/NOTYPE in Parmlib member to enable/disable data collection New RMF Postprocessor (PP) Serialization Delay Report: New suboption SDELAY | NOSDELAY for Postprocessor REPORTS option • Options Only available in XML format General Reports XML report can be created and displayed RMF Postprocessor Report Types via RMF Spreadsheet Reporter CPU Activity via RMF Data Portal for z/OS Crypto Hardware Activity 📃 Enterprise Disk Syster via RMF PP Job & Postprocessor XML Toolkit FICON Director Activity OMVS Kernel Activity **RMF Data Portal for z/OS** Paging Activity Partition Data SMF Records Explore 13 Overview My View from any source Welcome, you are connected to: ,SYSDPLEX,SYSPLEX RMF Monitor III Data: Resource Metrics Attributes Res-Type ,SYSDPLEX,SYSPLEX SYSPLE) FAQ RMF Cancel Ok RMF Postprocessor Reports: SMF Records SHARE •...• in Anaheim from SMF Buffer CACHE CHAN CPU CRYPTO DEVICE ENQ ESS FCD HFS IOQ OMVS PAGE 2012

- The serialization delay data is collected by RMF Monitor III and stored in the new SMF 72 subtype 5.
- There is no RMF data gathering option. Data gathering is controlled by the SMF 72-5 setting in the active SMF parmlib member ERBSMFxx. Use TYPE/NOTYPE in the SMFPRMxx parmlib member to enable/disable the data gathering.
- Specify suboption SDELAY in the RMF Postprocessor REPORTS control statement to create the new **Postprocessor Serialization Delay** report.
- The Serialization Delay report is the first Postprocessor report that is only available in XML format.
- · XML report can be created and displayed
  - via RMF Data Portal (SMF data from SMF buffer only)
  - via Spreadsheet Reporter (any SMF source)
- There is another option to display the SDELAY report in a web browser:
  - Download the XML output created by the RMF Postprocssor JOB to the toolkit directory provided with the RMF Postprocessor XML Toolkit
  - · Open the report in the toolkit directory with your web browser.

	schlocessor in	terval Report [Sy	/stem CB88] : Se	rialization Delay Report	
	Start: 03/30/2011-10.00.00 Inte End: 03/30/2011-10.30.00 Cy		System wide summary of serialization delays		
Serializati System Locks	ion Delay Summary				
Lock Type	Total Contention Time	Avg Contention Time	Total Contention Count	Contention Count with QLen>1	
CMS	37	0.03	1175	6	
CMSEQDQ	82	0.03	2603	31	
CMSLatch	0	0.00	2	0	
CMSSMF	1	0.00	124	0	
Local	6121	0.01	428774	24708	
	4782	0.04	107281	7252	
CML Owner					

- Total and average contention time in milliseconds
- Number of times a work unit was suspended
- Number of times a unit of work was suspended and there was at least one other unit of work suspended for the same lock.



• The *Serialization Delay report* consists of two sections:

- The Serialization Delay Summary section
- The Serialization Delay Details section
- The *Serialization Delay Summary* section contains system-wide summary data for all address spaces and is divided into three subsections:
  - The *System Locks* subsection displays summary data for system suspend locks.
  - The GRS Latch subsection displays summary data about GRS latches.
  - The GRS Enqueue subsection displays summary data about GRS enqueue requests.
- The screenshot shows the System Locks subsection

• Lock Type:	CMS CMSEQDQ CMSLatch CMSSMF Local CML Owner	CMS lock CMS Enqueue/Dequeue lock CMS Latch lock CMS SMF lock LOCAL lock CML lock owner
Total Contention Time	The total amoun by a lock of the i	t of time in milliseconds that a unit of work was suspended ndicated type.
Avg Contention Time	•	ount of time in milliseconds that a unit of work was lock of the indicated type.
Total Contention Count	The total numbe the indicated typ	r of times that a unit of work was suspended by a lock of e.
Contention Count with QLen>1		r of times that a unit of work was suspended by a lock of the indicated was already at least one other unit of work suspended for the lock ength $> 1$ ).

		·······································	. Jysten	n Summary	
RMF Po	ostprocessor Inf	erval Report [S	/stem CB88] : Seria	alization Delay Report	SHA Technology - Con
z/OS V1R13	Start: 03/30/2011-10.00.00 Inte	erval: 30:00:000 minutes			
V1R13 RMF	End: 03/30/2011-10.30.00 Cy	cle: 1000 milliseconds		To sort a column,	
				simply click on the	
Serializat	tion Delay Summary	1		column header.	
System Lock	s				
Lock Type	Total Contention Time	Avg Contention Time	Total Contention Count	Contention Count with QLen>1	
Local	6121	0.01	428774	24708	
CML Owner	4782	0.04	107281	7252	
CMSEQDQ	82	0.03	2603	31	
CMS	37	0.03	1175	6	
CMSSMF	1	0.00	124	0	
CMSLatch	0	0.00	2	0	

- Sort capability. Just click on a column header of your choice and the report is sorted according to the values of the selected column
- The color of this column turns to yellow to indicate the currently active sort criteria
- By default, the sort order is descending. A second click on the column header switches to ascending sort order



- The XSL stylesheet and JAVA script files provided within the RMF Spreadsheet reporter or RMF Postprocessor XML Toolkit allows to format and display the Serialization Delay report with a web browser.
- Each column of the report can be used as sort criteria to sort the report section:
  - Just click on a column header of your choice and the report is sorted according to the values of the selected column
  - · The color of this column turns to yellow to indicate the currently active sort criteria
  - By default, the sort order is descending. A second click on the column header switches to ascending sort order

#### Serialization delays: System Summary ... GRS Latch GRS Mode: STAR **GRS Mode: STAR/RING** Avg Contention Time Total Contention Time Std Dev of Contention Time Total Contention Count GRS Latch Set Creat 16160 9.61 83 1680 Enqueue Summary **GRS Enqueue** by Scope GRS Mode: STAF al Co Avg Contention Time Std Dev of Contention Time Total Request Coun otal Contention Cou 334632 15117 GRS Enqueue Step 463954 30 68 GRS Enqueue System 39482 22 331 686069 1730

121152

6396

- System wide summary of GRS Latch and ENQ requests
- Statistics reported for Latch and ENQ requests:

21

- Total and average contention time in milliseconds
- The standard deviation of the total contention time in milliseconds

145

- The total number of suspended requests.
- Additional statistics reported for GRS ENQ requests:
  - The scope of an ENQ request (STEP, SYSTEM, SYSTEMS)
  - The total number of GRS ENQ requests

Complete your sessions evaluation online at SHARE.org/AnaheimEval

GRS Enqueue Systems 139118



GRS Latch section: Contains summary data about GRS latches for all address spaces:

- GRS Mode The operation mode of GRS: NONE, RING or STAR
  Total Contention Time The total amount of time in milliseconds that latch obtain requests were suspended.
  Avg Contention Time The average amount of time in milliseconds that latch obtain requests were suspended.
  Std Dev of Contention Time The standard deviation of the total contention time in milliseconds.
  Total Contention Count The total number of suspended latch obtain requests.
- · GRS Mode The operation mode of GRS: NONE, RING or STAR Scope The scope of an GRS enqueue request: STEP, SYSTEM or SYSTEMS One line is displayed for requests of a certain scope. · Total Contention Time The total amount of time in milliseconds that the GRS ENQ requests with the specified Scope were suspended. Avg Contention Time The average amount of time in milliseconds that the GRS ENQ requests with the specified Scope were suspended. The standard deviation of the Total Contention Time in milliseconds. Std Dev of Contention Time Total Request Count The total number of GRS ENQ requests with the specified Scope. · Total Contention Count The total number of GRS ENQ requests with the specified *Scope* that were suspended.

### •

## Serialization delays: CMS Lock Details



Service Class		CMS - Total	CMS Ave		CMS -				CMSEQDQ				CMSLatch				
ame Name	Period	Contention Time	Contention	Contention	Contention Count with	- Total	Contention	- Total	- Contention Count with	- Total Contention	Contention	CMSLatch - Total Contention	- Contention Count with	Total	Avg Contention	Contention	Contention
04 TSOHK	Н 2	13	0.03	340	1	14	0.03	414	1					0	0.00	4	0
42 TSOLC	V 2	8	0.02	279	0	5	0.01	335	4					0	0.00	4	0
49 TSOLC	V 2	4	0.02	138	2	9	0.03	259	2								
34 TSOLC	V 2	2	0.02	77	1	8	0.01	439	8					0	0.00	3	0
A21 STCHI	1													0	0.00	31	0
A22 STCHI	1													0	0.00	21	0
	42 TSOLOV 49 TSOLOV 34 TSOLOV 3A21 STCHI 3A22 STCHI	42TSOLOW249TSOLOW234TSOLOW23A21STCHI1	42         TSOLOW         2         8           49         TSOLOW         2         4           34         TSOLOW         2         2           341         TSOLOW         2         2           3421         STCHI         1         1           3422         STCHI         1         1	42         TSOLOW         2         8         0.02           49         TSOLOW         2         4         0.02           34         TSOLOW         2         2         0.02           34/3         TSOLOW         2         2         0.02           34/3         TSOLIN         1         1           MA21         STCHI         1         1	42         TSOLOW         2         8         0.02         279           49         TSOLOW         2         0.02         138           34         TSOLOW         2         0.02         77           343         TSOLOW         2         0.02         77           343         TSCHW         2         0.02         77           3421         STCHI         1         0         0	42         TSOLOW 2         8         0.02         279         0           49         TSOLOW 2         4         0.02         138         2           34         TSOLOW 2         2         0.02         77         1           A21         STCHI         1         1         1         1	42         TSOLOW         2         8         0.02         279         0         5           49         TSOLOW         2         4         0.02         138         2         9           34         TSOLOW         2         2         0.02         77         1         8           34/1 TSOLH         1         1         1         1         1         1         1           VA22 STCHI         1         <	42         TSOLOW         2         8         0.02         279         0         5         0.01           49         TSOLOW         2         4         0.02         138         2         9         0.03           34         TSOLOW         2         2         0.02         77         1         8         0.01           341         TSOLOW         2         2         0.02         77         1         8         0.01           342         STCHI         1         4         1         4         1         4         1         4         1         4         1         4         1         4         1         4         1         4         1         4         1         4         1         4         1         4         1         4         1         4         1         4         1         4         1         1         4         1 <th1< th="">         1         1         <th1< th=""></th1<></th1<>	42         TSOLOW         2         8         0.02         279         0         5         0.01         335           49         TSOLOW         2         4         0.02         138         2         9         0.03         259           34         TSOLOW         2         2         0.02         77         1         8         0.01         439           X21 <stchi< td="">         1         4</stchi<>	42       TSOLOW 2       8       0.02       279       0       5       0.01       335       4         49       TSOLOW 2       4       0.02       138       2       9       0.03       259       2         34       TSOLOW 2       2       0.02       77       1       8       0.01       439       8         MA21       STCHI       1	42       TSOLOW 2       8       0.02       279       0       5       0.01       335       4         49       TSOLOW 2       4       0.02       138       2       9       0.03       259       2         34       TSOLOW 2       2       0.02       77       1       8       0.01       439       8         VA21       STCHI       1	42       TSOLOW 2       8       0.02       279       0       5       0.01       335       4       4         49       TSOLOW 2       4       0.02       138       2       9       0.03       259       2       2         34       TSOLOW 2       2       0.02       77       1       8       0.01       439       8         VA21       STCHI       1	42       TSOLOW 2       8       0.02       279       0       5       0.01       335       4       4       4       1       4       1       1       1       1       3       3       5       4       4       1	42       TSOLOW 2       8       0.02       279       0       5       0.01       335       4       4       1       1         49       TSOLOW 2       4       0.02       138       2       9       0.03       259       2       1 <td>42       TSOLOW 2       8       0.02       279       0       5       0.01       335       4       0       0         49       TSOLOW 2       4       0.02       138       2       9       0.03       259       2       0       0       0         34       TSOLOW 2       2       0.02       77       1       8       0.01       439       8       0       0         X421 STCHI       1       4       0       1       6       0       0       0         X422 STCHI       1       4       6       6       0       0       0</td> <td>42       TSOLOW 2       8       0.02       279       0       5       0.01       335       4       0       0       0.00         49       TSOLOW 2       4       0.02       138       2       9       0.03       259       2       0       0       0       0.00         49       TSOLOW 2       2       0.02       177       1       8       0.01       439       8       0       0       0.00         A21       STCHI       1       4       0       1       8       0       0       0.00       0.00         MA22       STCHI       1       4       4       6       6       0       0.00</td> <td>42       TSOLOW 2       8       0.02       279       0       5       0.01       335       4       0       0       0.00       4         49       TSOLOW 2       4       0.02       138       2       9       0.03       259       2       0       0       0.00       3         34       TSOLOW 2       2       0.02       77       1       8       0.1       439       8       0       0       0.00       3         A21       STCHI       1       6       6       6       0       0.00       31</td>	42       TSOLOW 2       8       0.02       279       0       5       0.01       335       4       0       0         49       TSOLOW 2       4       0.02       138       2       9       0.03       259       2       0       0       0         34       TSOLOW 2       2       0.02       77       1       8       0.01       439       8       0       0         X421 STCHI       1       4       0       1       6       0       0       0         X422 STCHI       1       4       6       6       0       0       0	42       TSOLOW 2       8       0.02       279       0       5       0.01       335       4       0       0       0.00         49       TSOLOW 2       4       0.02       138       2       9       0.03       259       2       0       0       0       0.00         49       TSOLOW 2       2       0.02       177       1       8       0.01       439       8       0       0       0.00         A21       STCHI       1       4       0       1       8       0       0       0.00       0.00         MA22       STCHI       1       4       4       6       6       0       0.00	42       TSOLOW 2       8       0.02       279       0       5       0.01       335       4       0       0       0.00       4         49       TSOLOW 2       4       0.02       138       2       9       0.03       259       2       0       0       0.00       3         34       TSOLOW 2       2       0.02       77       1       8       0.1       439       8       0       0       0.00       3         A21       STCHI       1       6       6       6       0       0.00       31

- Serialization details on address space level for CMS lock types:
  - CMS Lock
  - CMS EnqueueDequeue Lock
  - CMS Latch Lock
  - CMS SMF Lock

### • Contention data for work unit(s) running in the reported address space:

- · Total and average contention time in milliseconds
- · Number of times a work unit was suspended
- Number of times a unit of work was suspended and there was at least one other unit of work suspended for the same lock.



• The Serialization Delay Details section provides the following information in four subsections:

- The CMS Lock Details subsection contains detail data about CMS/CMSEQDQ/CMSLatch/CMSSMF locks per address space.
- The CML and LOCAL Lock Details subsection contains detail data about CML and LOCAL locks per address space.
- The GRS Latch Details subsection contains detail data about GRS latches.
- The GRS Enqueue Details subsection contains detail data about GRS enqueue requests.

Note: For each lock type, a maximum of the top twenty address spaces with the longest contention times are reported.

CMS Lock Details section: Detail data about CMS/CMSEQDQ/CMSLatch/CMSSMF locks per address space

Address Space ID	The hexadecimal address space identifier (ASID) of the job for which lock data was collected.
• Jobname	The name of the job.
<ul> <li>Service Class Name</li> </ul>	The name of the service class that the job has been running in.
<ul> <li>Service Class Period</li> </ul>	The service class period that the job has been running in.
Total Contention Time	The total amount of time in milliseconds that a unit of work of the indicated address space was suspended on the respective lock type.
Avg Contention Time	The average amount of time in milliseconds that a unit of work of the indicated address space was suspended on the respective lock type.
Total Contention Count	The number of times that a unit of work of the indicated address space was suspended on the respective lock type.
Contention Count with QLen>1	The number of times that a unit of work of the indicated address space was suspended on the respective lock type when there was already at least one other unit of work suspended for the lock.

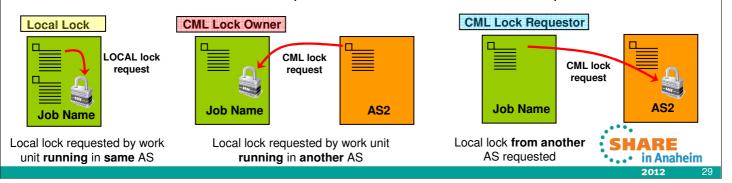
## Serialization delays: CML and Local Lock Details



CML and Local Lock Details

Address Space ID	Job Name	Service Class Name	Service Class	Total Contention	CML Lock Owner - Avg Contention Time	Owner - Total	Contention Count with	- Total	- Avg	Local Lock - Total Contention	Contention Count with	Requestor - Total Contention	Requestor - Avg Contention	CML Lock Requestor - Total Contention	
000B	CONSOLE	SYSTEM	1	3323	0.06	47817	6032	698	0.05	12190	2675				
0018	IXGLOGR	SYSTEM	1	0	0.00	2	0	584	0.07	7593	122				
0113	T015004	TSOHIGH	2					542	0.03	16860	46	77	0.01	4765	81
0059	CATALOG	SYSTEM	1	44	0.01	2877	241	418	0.01	32046	1923				
0050	NFSCLNTC	SYSSTC	1	1212	0.02	41616	624	309	0.03	10152	338				
004D	NETVIEW	SYSSTC	1									797	0.07	10638	1181
0047	AUTOEMCS	STCLOW	1									776	0.07	11064	1243
00F4	T016030	TSOLOW	2									48	0.02	1708	28
00F6	T016082	TSOLOW	1									47	0.02	1605	30

- Serialization details on address space level for local locks
- Contention data for LOCAL lock requests and two views of CML lock requests:



CML and LOCAL Lock Details section: Delays on address space level for local locks

### CML Lock Owner :

Total Contention Time	The total amount of time in milliseconds that a unit of work from another address space was suspended when requesting the local lock of the indicated address space.
Avg Contention Time	The average amount of time in milliseconds that a unit of work from another address space was suspended when requesting the local lock of the indicated address space.
Total Contention Count	The number of times that a unit of work from another address space was suspended when requesting the local lock of the indicated address space.
Contention Count with QLen>1	The number of times that a unit of work from another address space was suspended when requesting the local lock of the indicated address space and there was already at least one other unit of work waiting for this lock.
Local Lock:	
Total Contention Time	The total amount of time in milliseconds that a unit of work of the indicated address space was suspended on a local lock.
Avg Contention Time	The average amount of time in milliseconds that a unit of work of the indicated address space was suspended on a local lock.
Total Contention Count	The number of times that a unit of work of the indicated address space was suspended on a local lock.
Contention Count with QLen>1	The number of times that a unit of work of the indicated address space was suspended on a local lock when there was already at least one other unit of work suspended.
CML Lock Requestor:	
Total Contention Time	The total amount of time in milliseconds that a unit of work of the indicated address space was suspended when requesting the local lock of another address space.
Avg Contention Time	The average amount of time in milliseconds that a unit of work of the indicated address space was suspended when requesting the local lock of another address space.
Total Contention Count	The number of times that a unit of work from this address space was suspended when requesting the local lock of another address space.
Contention Count with QLen>1	The number of times that a unit of work from this address space was suspended when requesting the local lock of another address space and there was already at least one other unit of work waiting for that lock.

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## Serialization delays: GRS Latch Details



Latch Sets

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### **GRS** Latch Details

### GRS Mode: STAR

Address Space ID		Service Class Name	Service Class Period	Latch Set Creator - Total Contention Time	Latch Set Creator - Avg Contention Time		Latch Set Creator - Total Contention Count	Latch Requestor - Total Contention Time	Requestor - Avg Contention	Latch Requestor - Std Dev Contention	Latch Requestor - Total Contention Count
0059	CATALOG	SYSTEM	1	11169	22	36	502	11169	22	36	502
0051	PFA	STCLOW	1	3264	3264		1	3264	3264		1
0018	IXGLOGR	SYSTEM	1	1672	1.81	16	921	5	1.25	1.12	4
0010	OMVS	SYSTEM	1	26	0.11	0.20	223				
0043	RRS	STCHI	1	20	20		1	20	20		1
000C	WLM	SYSTEM	1	5	0.31	0.31	16	5	0.33	0.15	15
00D8	CICS3A21	STCHI	1					856	1.90	15	449
00D4	CICS3A23	STCHI	1					519	2.22	19	233
00D6	CICS3A22	STCHI	1					289	1.24	13	233

Serialization details on address space level for GRS Latch obtain requests

- Two views of GRS Latch obtain requests:
  - Latch Set Creator statistics:
    - ➡ Latch obtain requests against latch sets created by this address space
  - Latch Requestor statistics:
    - Latch obtain requests issued from this address space
- Reported statistics:
  - Total and average contention time in milliseconds
  - Standard deviation of the total contention time.
  - · Number of times a latch obtain request was suspended

GRS Latch Details section: Detail data about GRS latches on address space level

Latch Set Creator: Latch Set Requestor:	Statistics for latch obtain requests <i>against latch sets created by this address space</i> Statistics for latch obtain requests <i>issued from this address space</i> :
<ul> <li>Total Contention Time</li> </ul>	The amount of contention time in milliseconds that was caused by latch obtain requests.
Avg Contention Time	The average amount of contention time in milliseconds that was caused by latch obtain requests.
<ul> <li>Std Dev of Contention Time</li> </ul>	The standard deviation of the total contention time.

Total Contention Count
 The number of times a latch obtain request was suspended.

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## Serialization delays: GRS Enqueue Details



### GRS Enqueue Details

Address Space ID		Class	Service	- Total Contention	- Avg Contention	Contention	STEP - Request	-	ENQ SYSTEM - Total Contention Time	SYSTEM - Avg Contention	SYSTEM - Std Dev Contention	Request	ENQ SYSTEM - Contention	SYSTEMS -	SYSTEMS - Avg	ENQ SYSTEMS - Std Dev Contention Time	SYSTEMS - Request	ENQ SYSTEMS - Contention Count
0059	CATALOG	SYSTEM	1	461440	30	68	136473	14975	541	6.07	13	97894	89	132295	21	147	98760	6033
004A	PFA7	OMVSLOW	2	1808	62	164	42	29										
011A	T015161	TSOLOW	1						10411	5205	69	8968	2					
0108	T015083	TSOLOW	1						10397	5198	86	5133	2					
0100	T015200	TSOLOW	1						5229	2614	3695	6523	2	24	4.80	3.35	134	5
0054	SMS	SYSSTC	1						1019	56	103	727	18	89	4.45	2.80	354	20
8000	SMSPDSE	SYSTEM	1						734	1.02	0.55	1297	717					
0104	T015149	TSOLOW	2						59	6.55	5.57	75473	9	83	4.61	2.09	2461	18
0113	T015004	TSOHIGH	2						58	4.14	3.01	164026	14	181	4.30	3.88	2191	42
00FC	T016094	TSOLOW	2											16	8.00	4.36	67	2

- Serialization details on address space level for GRS ENQ requests
  - Grouped by GRS ENQ request scope: Step, System and Systems
    - Total and average contention time in milliseconds
    - Standard deviation of the total contention time.
    - Total number of GRS ENQ requests
    - Number of times a GRS ENQ request was suspended

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GRS Enqueue Details section: Detail data about GRS enqueue requestson on address space level

Grouped by enqueue scopes: STEP, SYSTEM and SYSTEMS

Total Contention Time	The total amount of contention time in milliseconds that was caused by GRS ENQ requests of the indicated scope for this address space.
Avg Contention Time	The average amount of contention time in milliseconds that was caused by GRS ENQ requests of the indicated scope for this address space.
Std Dev of Contention Time	The standard deviation of the total contention time in milliseconds for GRS ENQ requests of the indicated scope for this address space.
Request Count	The total number of GRS ENQ requests of the indicated scope for this address space.
Contention Count	The total number of GRS ENQ requests of the indicated scope that were suspended for this address space.

# **Work Unit Queue Distribution**



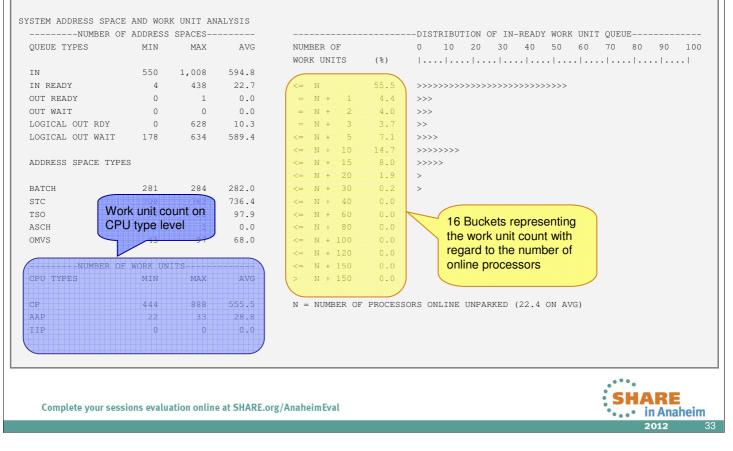
- Problem
  - RMF reporting for CPU contention was based on address spaces level
  - Did not consider multiple work units (WEBs) within one address space
  - Performance analysts need statistics about the CPU contention on WEB granularity
- Solution
  - The RMF CPU Activity reporting is enhanced
- Benefit
  - The enhanced CPU Activity reporting helps the customer to obtain information about the In-Ready distribution based on WEBs and the number of work units per CPU type



- In the past, RMF has reported the number of address spaces waiting for or using a CPU (see In-ready statistics within the System Address Space Analysis of the Postprocessor CPU Activity report). However, with more than one task per address space, this does not really reflect the demand for CPU. Performance analysts need to know how many work units (WEBs) are running or waiting for a CPU.
- For this reason the CPU Activity report has been extended and new Overview Conditions have been implemented.

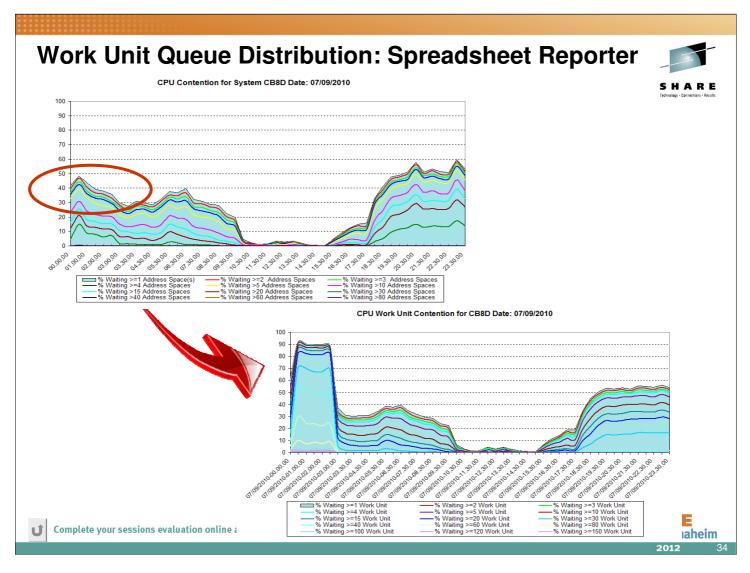
## Work Unit Queue Distribution: Monitor I CPU Report





The SYSTEM ADDRESS SPACE section of the Monitor I CPU Activity Report has been changed as follows:

- · The In-Ready Queue Distribution is now based on the real number of dispatchable work units
  - We display 16 buckets of ascending queue lengths with regard to the number of actual online processors when the sample was taken
  - · This allows to detect latent demand for the processor resource and to distinguish uncritical spikes from severe shortages
  - · The number of work units within the buckets includes standard CPs as well as specialty engines
- The new NUMBER OF WORK UNITS statistics allow to determine the CPU demand on processor type level
  - · The MIN, MAX and AVG queue lenghts are shown for CPs, AAPs and IIPs



• The new **OneWebCont** sheet in the System Overview Spreadsheet of the RMF Spreadsheet Reporter allows to analyze cpu contention on work unit granularity.



- Manages z/OS from z/OS
- Browser communicates with z/OSMF via secure connection, anywhere, anytime

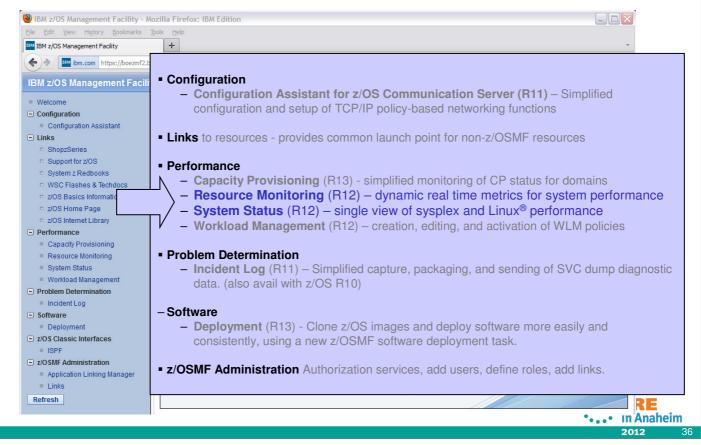


- IBM z/OS Management Facility (z/OSMF), a new zero priced product, will simplify, optimize and modernize the z/OS **system programmer** experience starting in V1R11 with problem data management and TCP/IP Policy based configuration. With z/OS V1R12 the Workload Management and the Resource Monitoring Application have been added
- z/OSMF will deliver solutions in a task oriented, Web browser based user interface with integrated user assistance. And
  z/OSMF will make the day to day operations and administration of the mainframe z/OS systems easier to manage for both new
  and experienced system programmers. The focus is to help improve system programmer productivity, and make the functions
  easier to understand and use
- This chart explains the structure for z/OSMF and how it fits into the z/OS environment.
- z/OSMF is on the right hand side and it manages z/OS from z/OS itself. It is not an external application, nor does it have an
  external client. z/OSMF is an application on z/OS with direct access to z/OS data and information, and it has a browser
  interface from the workstation. z/OSMF contains the GUIs and the application code. Everything is installed on the z/OS server
  and there are no client side install requirements.
- In the middle of the screen is a workstation with a browser and it communicates with z/OSMF via HTTP(s). z/OSMF is a Web 2.0 based solution. It incorporates a browser interface that communicates with the z/OS system. The browser can be anywhere... in the data center ... or around the world. You just need a secure connection.
- And on the left is a screen capture of the z/OSMF welcome page once you log into z/OSMF.

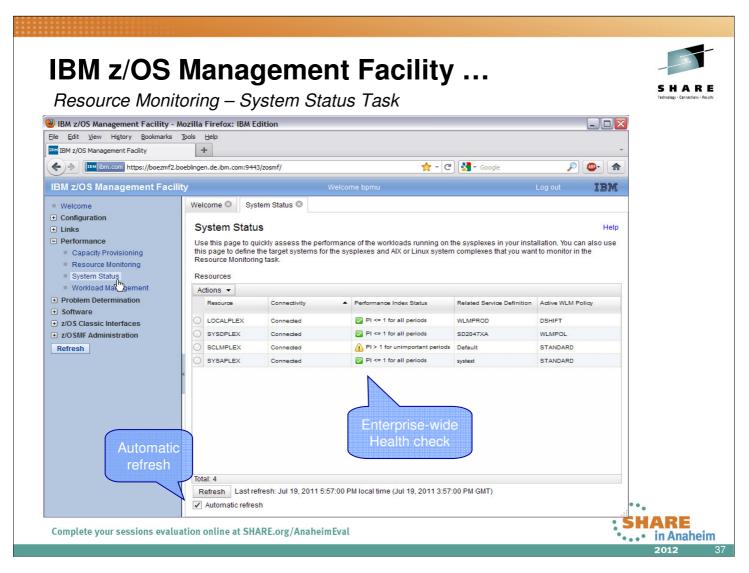
# IBM z/OS Management Facility ...







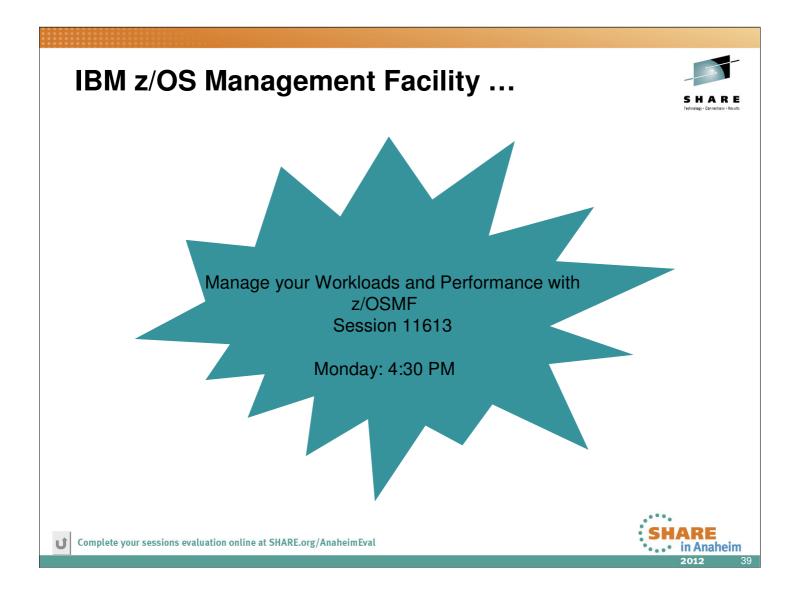
- Once you've logged in , this screen shows you the full scope of what z/OSMF provides in this first release. And really the first user that logs in as a z/OSMF administrator. So when z/OSMF is first set up, always the first ID is that of an administrator that is a requirement for setup. And the reason for this it allows the first person to get in and to add and enable others.
- z/OSMF offers the following system management tasks:
- Configuration category: Simplified configuration and setup of TCP/IP policy-based networking functions
- Links category:
  - This is like 'My favorites' Provides common launch point for accessing resources beyond the IBM z/OS Management Facility.
  - Some links are pre-defined in the product.
  - The administrators can define additional links to share commonly used resources for their installation.
- With z/OSMF R12 you can add 'links' and launch points to anywhere in the left hand navbar and not just the "Links" category. You can customize /OSMF.
   Performance category
  - Capacity Provisioning (R13) simplified monitoring o z/OS Capacity Provisioning status (monitoring only, not management) as a reminder z/OS Capacity Provisioning is part of the base of z/OS and can automate System z On/Off Capacity on Demand.
  - The z/OSMF Resource Monitoring plugin allows cross-sysplex performance monitoring from a single point of control. From the z/OSMF task tree, you can select the following subtasks:
    - The System Status task provides an enterprise-wide health check of all z/OS sysplexes.
    - For further analysis, the Resource Monitoring task can graphically display RMF Monitor III metrics as well as Linux metrics by means of customizable views.
  - Workload Manager Policy Editor -- Facilitate the creation and editing of WLM service definitions, installation of WLM service definitions, and activation of WLM service policies
- Under the Problem Determination category on the navigation bar, you will find the Incident Log task.
  - This will help all system programmers with problem data management tasks, providing experienced teams with procedural advantages through an incident log summary and detail views of z/OS dump incidents. The Incident Log provides a consolidated list of SVC Dump related problems, along with details and diagnostic data captured with each incident. It also facilitates sending the data for further diagnostics.
- Task is updated to include support for adding comments, the ability to attach user-defined data, and use of encrypted parallel FTP for sending data to IBM.
   <u>Software</u> category
- Deployment (R13) Clone z/OS images and deploy software more easily and consistently, using a new z/OSMF software deployment task.
- <u>z/OSMF Administration</u> category
  - · Provides Authorization services for the administrator
  - · Allows Dynamic addition of links to non-z/OSMF resources

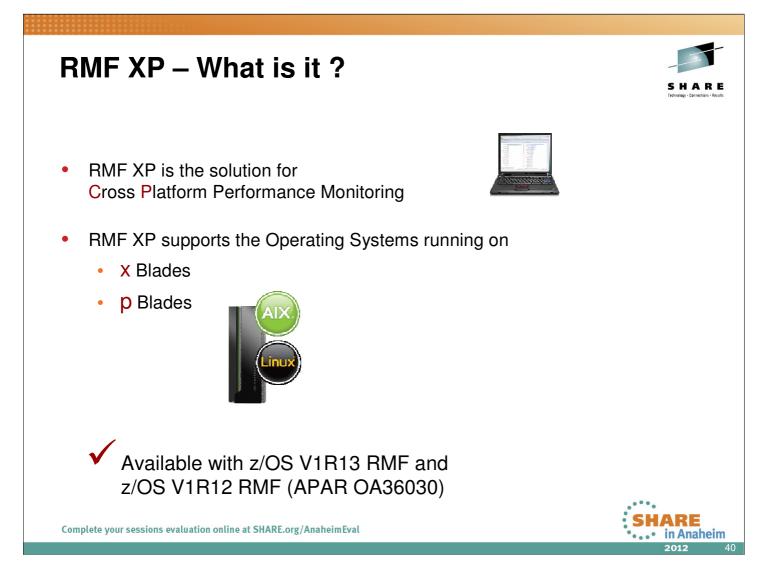


- The starting point for the monitoring is the *System Status* task. This task provides a comfortable way to assess the health status of all systems in your installation at a glance.
- The table contains the list of z/OS sysplexes and Linux images. You can add, modify and delete items in the table using the *Actions* menu.
- When you start the task for the first time, one default entry is provided as *LOCALPLEX* that points to the DDS in the sysplex in which z/OSMF is running. If you have a running DDS in this sysplex the *System Status* task detects it automatically without requiring an explicit declaration of its host name or IP address. Also, the *System Status* task can automatically detect the DDS movement within the sysplex during the z/OSMF session.
- In addition to the LOCALPLEX you can add all target sysplexes you want to monitor to the table. Now let's explore the column output as shown in the chart:
  - The PI-Status column gives you a red-yellow-green indicator for the sysplex health. This indicator is based on the WLM service class period goals and actuals.
  - If all service class periods on the system are meeting their goals (that is, have a *performance index* (PI) of less than or equal to 1), the PI Status is green.
  - If service classes with importance of 3, 4, and 5 with the PI greater than 1 are detected, the indicator is yellow.
  - If at least one important service class (that is, importance of 1 or 2) misses the WLM goal, the indicator is red
- In this case it becomes essential to figure out the reasons by drilling down into the details on the respective sysplex. This can be done within the *Resource Monitoring* task.

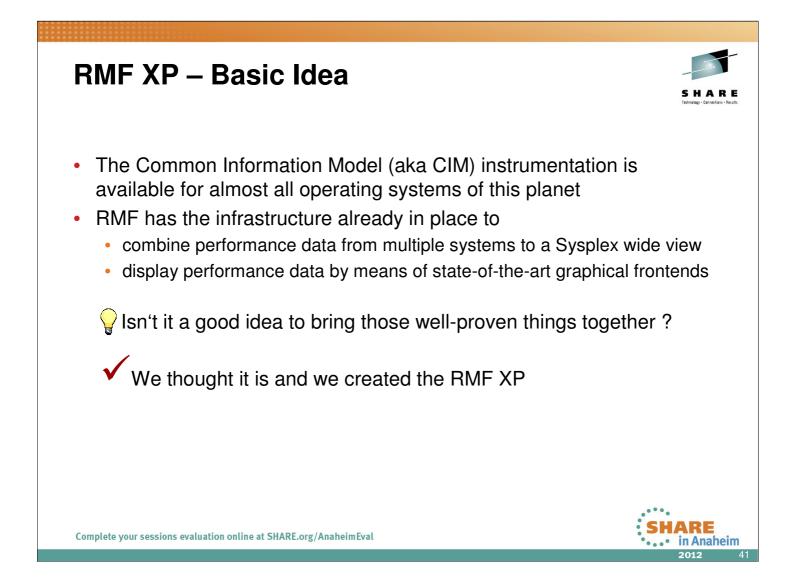
### IBM z/OS Management Facility ... Resource Monitoring – Monitoring Dasboards IBM z/OS Management Facility - Mozilla Figefox: IBM Edition - **-** × File Edit View History Bookmarks Tools Help IBM z/OS Management Facility + Imm ibm.com https://boezmf2.boeblingen.de.ibm.com:9443/zosmf 🚖 - ੴ 🛃 -@• 🏦 IBM Welcome 🛛 Resource Mon... 🕄 Welcome Configuration • Links Resource Monitoring Help Performance Dashboards CPU & Workload Activity 🍉 🛇 Capacity Provisioning CPU & Workload Activity (Running) = Resource Monitoring System Status Start Pause Save Actions -Workload Management ▼ CPU Consumption Problem Determination Software 75 SCLM.SA#PRDB1 31.7 IRLM.1 z/OS Classic Interfaces [0069] 31 0 z/OSMF Administration SCL2.RMFGAT 50 1 STCI 0 1 Refresh [0058] Metric SCLM.RMEGAT 40 1 OMVSKERN.1 [0070] 40 SCLM.NET [0073] BATCHMED 1 40 SCL4.RMFGAT 0.9 BATCHHL1 [0039] 40 SCI 3 RMEGAT 0.8 STCCMD.1 [0036] SCL3.XCFAS 0.5 STCSYS 1 100061 0.4 SCLM.XCFAS OMVS 1 [0006] 0.4 OF 1 SCLM.WLM [000C] SCI MPLEY SYSPLEY SCI MPLEY SYSPLEY % as SCLMPLEX, SYSPLEX exe SCLMPLEX, SYSPLEX % appl (TCB + SRB) by jo ution velocity by WLM service class pe 07/19/2011 21:16:00 - 07/19/2011 21:16:30 (8/8) 07/19/2011 21:16:00 - 07/19/2011 21:16:30 (8/8) S HARE in Anaheim 2012

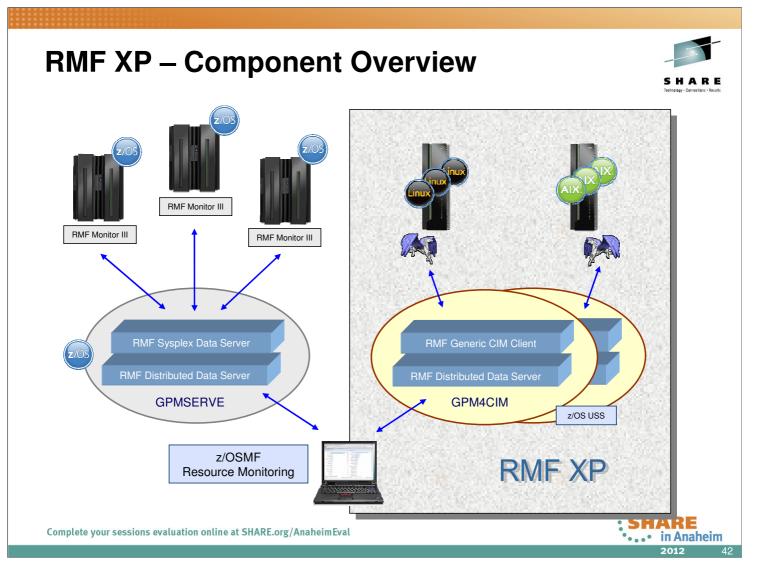
- The *Resource Monitoring* task allows you to monitor the performance of the z/OS sysplexes, AIX system complexes (System p), Linux system complexes (System z and System x) in your environment. The performance data is displayed in so called *Monitoring Dashboards*.
- A *Monitoring Dashboard* is a customizable view containing different performance metrics that you can group and arrange flexibly.
- $\bullet$  You can create and save your own dashboards or open and modify the predefined dashboards that are with the task in z/OSMF.
- · When you start a Monitoring Dashboard it begins retrieving the online data from the DDS periodically.
- · By default, the most current snapshot is displayed
- · It's possible to browse through the data collected since the start of the current session.
- A dashboard contains multiple metric groups; their size and column count are adjustable. You add one or multiple metrics to each group.
- Now let's create a new *Monitoring Dashboard*. Suppose, you want to inspect the common storage usage and identify jobs with the highest storage consumption.
  - To do this, you can create a new dashboard using the drop down menu on the Dashboards tab. You can now add a metric you want to monitor to the dashboard by using the "Add Metric" dialog.
  - The first thing you need to select in this dialog is a resource you're interested in. The resources are presented in a tree structure.
  - Starting with the sysplex as top level resource, you can drill down into the contained resources, for example, the MVS
    images or coupling facilities.
  - Once you select a resource (for example, storage on a system), you can select a performance metric that you want to monitor.
  - The metrics of the selected resource are also presented in a tree. For a better navigation, you can use the quick-filter feature.
- Resource Monitoring provides sophisticated filtering capabilities:
  - Suppose you select the metric % CSA utilization by job, which will list all the jobs active on the system and their CSA consumption in %.
  - Because the number of jobs in the system can be pretty high, you can specify filters and work scopes: that is, display only jobs that match a certain name pattern, belong to a specific WLM service class, or meet a threshold value.



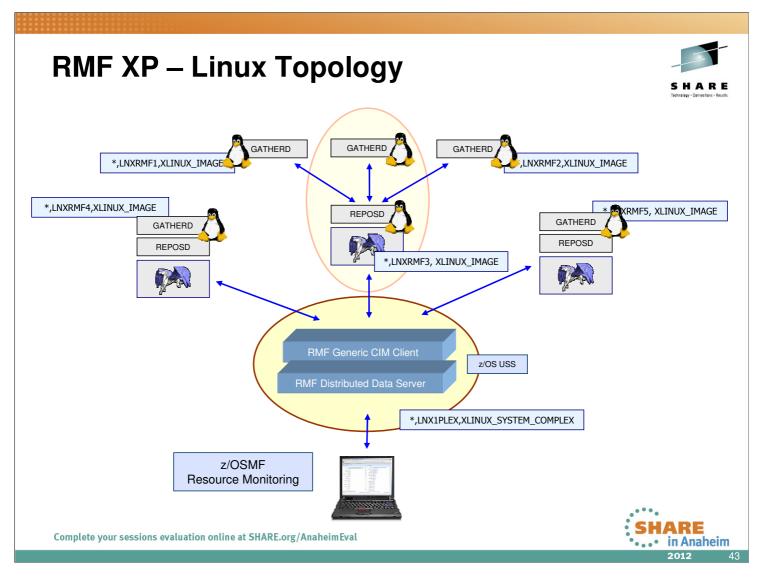


- RMF XP is the new solution to monitor the performance of heterogeneous environments. RMF XP supports the operating systems running on the IBM zEnterprise Bladecenter Extension:
  - AIX on System p
  - Linux on System x
- In addition, Linux on System z is supported as well

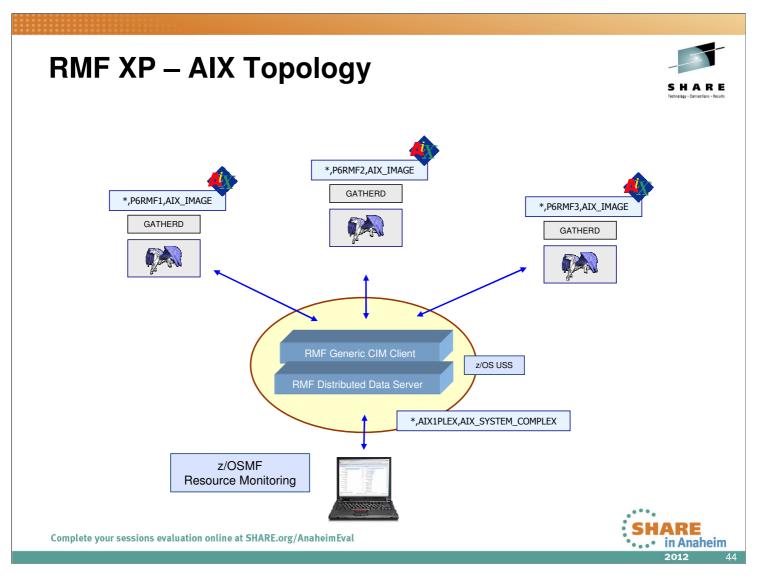




- What are the components of the new RMF XP function?
- The RMF Distributed Data Server (aka DDS) consists of two main functional entities:
  - · The comunication layer to the client
  - · The interface layer to the data collection backend
- For RMF XP, the existing DDS communication layer remains unchanged
- In contrast to the z/OS data collection which exploits the RMF Sysplex Data Server API's, RMF XP uses the standard CIM API's to collect the performance data from the remote Linux and AIX systems



- The topology for the Linux data collection slightly differs from the AIX topology:
- · On each individual enpoint, a performance data collector is needed in terms of a component called GATHERD
- The collector stores his data to a central repository which is managed by the REPOSD component.
- RMF XP can interact with this component by means of a CIM provider interface.
- · Result: just one connection to a CIM server is needed to retrieve performance data from multiple Linux images



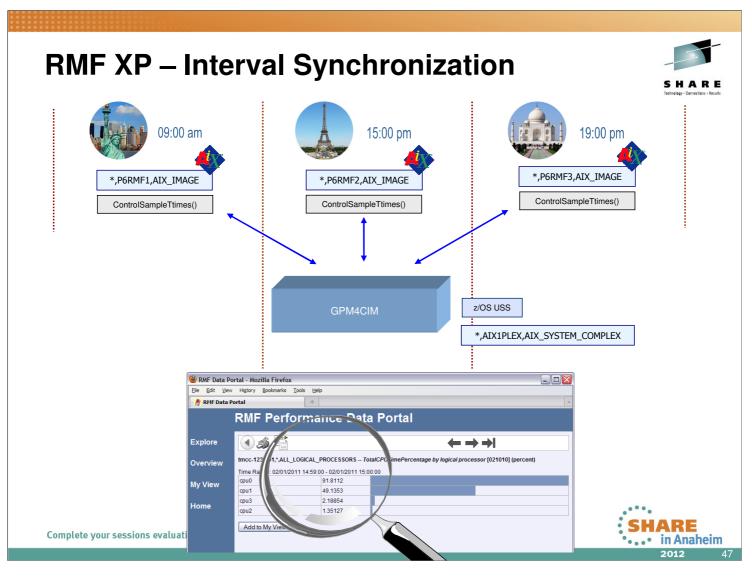
- In contrast to Linux, the concept of a repository node does not exist for the AIX operating system
- · Hence, RMF XP builds up a seperate connection to each individual endpoint

## **RMF XP - Invocation** Started Task: SYS1.PROCLIB(GPM4CIM) • Runs in USS Environment via BPXBATCH • Multiple instances can run in parallel: one STC per platform • • S GPM4CIM.GPM4A,OS=A S GPM4CIM.GPM4X,OS=X • • S GPM4CIM.GPM4Z,OS=Z //GPM4CIM PROC OS=X //STEP1 EXEC PGM=BPXBATCH, TIME=NOLIMIT, REGION=OM, 11 PARM='PGM /usr/lpp/gpm/bin/gpm4cim cfg=/etc/gpm/gpm4&OS..cfg' //STDENV DD PATH='/etc/gpm/gpm4cim.env' //STDOUT DD PATH='/var/gpm/logs/gpm4cim&Os.out', PATHOPTS=(OWRONLY,OCREAT,OTRUNC), // // PATHMODE=(SIRUSR,SIWUSR,SIRGRP) //STDERR DD PATH='/var/gpm/logs/gpm4cim&OS..trc', || || PATHOPTS=(OWRONLY, OCREAT, OTRUNC), PATHMODE=(SIRUSR, SIWUSR, SIRGRP) //SYSPRINT DD SYSOUT=\* //SYSOUT DD SYSOUT=\* // PEND HARE Complete your sessions evaluation online at SHARE.org/AnaheimEval in Anaheim 2012

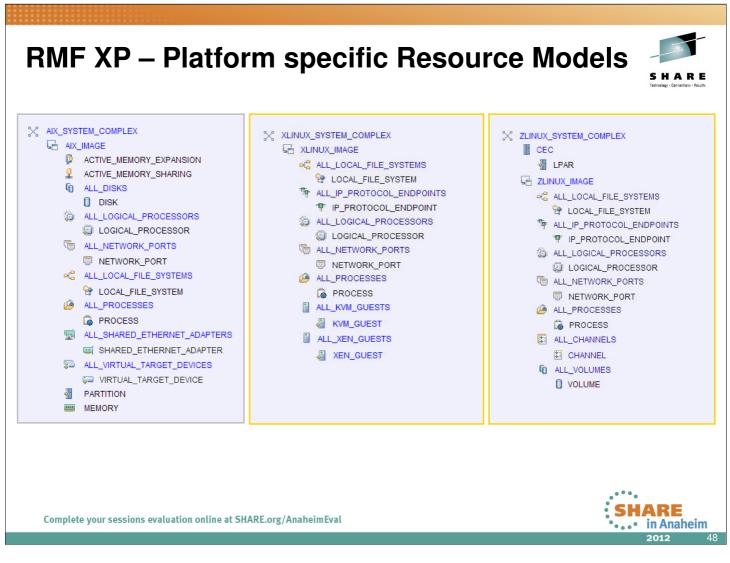
- To start RMF XP, use the new proclib member GPM4CIM
- The gpm4cim executable runs in the Unix System Services environment and receives control from the BPXBATCH utility
- One GPM4CIM instance is needed per platform type

### **RMF XP - Configuration Definition** //GPM4CIM PROC OS=A EXEC PGM=BPXBATCH, TIME=NOLIMIT, REGION=OM, //STEP1 // PARM='PGM /usr/lpp/gpm/bin/gpm4cim cfg=/etc/gp /gpm4&OS..cfg DD PATH='/etc/gpm/gpm4cim.env' //STDENV PATH='/var/gpm/logs/gpm4cim&OS..out', //STDOUT DD PATHOPTS=(OWRONLY,OCREAT,OTRUNC), // PATHMODE=(SIRUSR,SIWUSR,SIRGRP) 11 //STDERR DD PATH='/var/gpm/logs/gpm4cim&OS..trc', PATHOPTS=(OWRONLY, OCREAT, OTRUNC), 11 PATHMODE=(SIRUSR,SIWUSR,SIRGRP) // //SYSPRINT DD SYSOUT=\* SYSOUT=\* //SYSOUT DD // PEND MAXSESSIONS\_HTTP(20) /\* MaxNo of concurrent HTTP requests \*/ HTTP PORT(8805)/\* Port number for HTTP requests \*/ HTTP\_ALLOW(\*) /\* Mask for hosts that are allowed \*/ HTTP\_NOAUTH(\*) /\* No server can access without auth.\*/ /\* Length of the monitoring interval \*/ INTERVAL(300) /\* Name of system complex \*/ AIX\_COMPLEX(WEBPLEX) AIX\_IMAGE(p6rmf1.boeblingen.de.ibm.com:5988) /\* Hostname of member \*/ AIX\_IMAGE(p6rmf2.boeblingen.de.ibm.com:5988) IARE Complete your sessions evaluation online at SHARE.org/AnaheimEval in Anaheim 2012

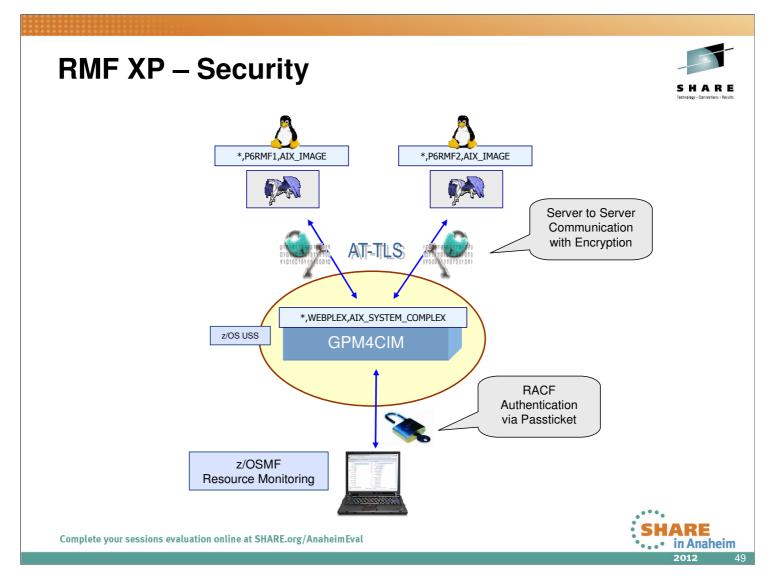
- RMF XP is almost an out-of-the-box function
- Just supply the following parameters:
  - · Complex name (can be any string)
  - · Image names (must be valid host names or ip addresses)
  - Interval length (optional parameter, default = 300 sec
- Even though the minimum interval length can be set to 60 seconds, it is recommended to choose longer intervals in order to prevent too much resource consumption



- · For the AIX operating system the remote CIM API allows to
  - · Start the data collection at a certain point in time
  - · Set a common collection interval for all monitored endpoints
- RMF XP synchronizes the interval
  - On a one minute boundary if the interval is < 5 minutes
  - On a five minute boundary if the interval is > 5 minutes
- · For the Linux operating system it is the responsibility of the system administratior to
  - · Start the data collection on the monitored enpoints synchronously
  - · Set the data collection interval on all endpoints accordingly to the RMF XP interrval length



- If we could follow the pure nature of CIM, resources and metrics are common in a computing environment, regardless of the
  operating system.
- However, the reality looks a bit different. We have to deal with lots of platform specific extensions of the resource model.
- That's why we decided to supply one GPM4CIM instance per operating system type.



- Encryption for the communication between GPM4CIM and the endpoints can be configured via AT-TLS on the z/OS outbound side
- For the communication between the client and GPM4CIM authentication can be configured via userid and password or passtickets

RMF X	P - zll	Р Ехр	loitatio	on		S H A I Tetnalay - Canetian
	munication Actions Window	Help				Up to 70%
Command = Samples:	==>	RMF V1R12 Pro	cessor Usage 01/14/11 Tim		Line 1 of 8 Scroll ===> CSR Range: 60 Sec	CPU utilization can be
	SO SYSSTC S SYSTEM	Time on C Total AAP 1.2 0.0 0.7 0.0 0.2 0.0		P AAP I 2 0 0 0 7 0 0 0	D.0 0.0 0.5	offloaded to zIIPs !
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omplete your sessio		nusing lu/pool FUOV8257 and port				SHARE

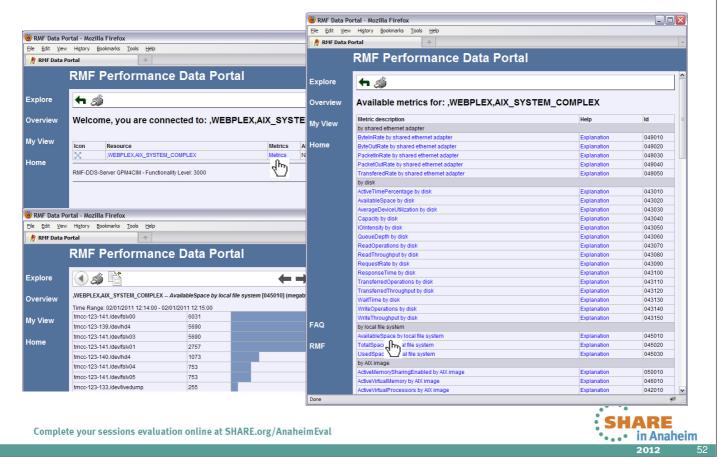
- Talking to lots of images and collect lots of performance metrics is not for free. It can become costly!
- · However, RMF XP can exploit zIIP specialty engines for the CIM based data collection
- In our test environment, we have observed that approximately 70% of the CPU consumption can be offloaded to zIIP engines

#### **RMF XP – Resource Tree** SHARE 🕹 RMF Data Portal - Mozilla Firefox \_ 🗆 🛛 Ele Edit View Higtory Bookmarks Tools Help 🎢 RMF Data Portal **RMF Performance Data Portal** 🕹 RMF Data Portal - Mozilla Firefox Ele Edit View Higtory Bookmarks Tools Help Explore 🕈 📣 🎢 RMF Data Portal **RMF Performance Data Portal** Overview Children of: ,WEBPLEX,AIX\_SYSTEM\_COMPLEX Resource Metrics Attributes Res-Type Icon Mv View Explore **h** 🗳 5 ,tmcc-123-131,AIX\_IMAGE Metrics N/A AIX\_IMAGE .tmcc-123-133,AIX IMAGE Metrics AIX IMAGE N/A Overview Welcome, you are connected to: ,WEBPLEX,AIX\_SYST Home Metrics tmcc-123-139,AIX\_IMAGE N/A AIX\_IMAGE tmcc-123-140,AIX IMAGE Metrics N/A AIX IMAGE Metrics My View cc-123-141,AIX\_IMAGE N/A AIX\_IMAGE Metrics lcon Resource (h) WEBPLEX,AIX\_SYSTEM\_COMPLEX Metrics Home RMF-DDS-Server GPM4CIM - 1 ality Level: 3000 🕹 RMF Data Portal - Mozilla Firefox \_ 🗆 🛛 Eile Edit View Higtory Bookmarks Tools Help 🎢 RMF Data Portal **RMF Performance Data Portal** 🕲 RMF Data Portal - Mozilla Firefox Elle Edit View Higtory Bookmarks Tools Help Explore 🕈 🇳 🎢 RMF Data Portal **RMF Performance Data Portal** Overview Children of: ,tmcc-123-141,AIX\_IMAGE Metrics Attributes Res-Type Metrics N/A ACTIVE\_MEMORY\_EXPANSION Metrics N/A ACTIVE\_MEMORY\_SHARING Icon Resource 🕈 📣 My View Explore tmcc-123-141,\*,ACTIVE\_MEMORY\_EXPANSION Ç Imcc-123-141, ^ACTIVE\_MEMORY\_EXPANSION Imcc-123-141, ^ACTIVE\_MEMORY\_EXPANSION Imcc-123-141, ^ALL\_UNG Imcc-123-141, ^ALL\_UNG Imcc-123-141, ^ALL\_UNG Imcc-123-141, ^ALL\_UNG Imcc-123-141, ^ALL\_VIRTUNA Imcc-123-141, ^ALL\_VIRTUNA Imcc-123-141, ^ALL\_VIRTUNA Imcc-123-141, ^ALL\_VIRTUNA Imcc-123-141, ^ARTHION Overview Children of: tmcc-123-141,\*,ALL\_NETWORK\_PORTS Home <u>م</u> Metrics N/A ALL\_DISKS Metrics N/A ALL\_LOGICAL\_PROCESSORS lcon Resource Metrics My View Metrics N/A ALL\_NETWORK\_PORTS Metrics tmcc-123-141.en0.NETWORK\_PORT Metrics N/A ALL\_LOCAL\_FILE\_SYSTEMS tmcc-123-141,en1,NETWORK\_PORT Metrics Home Metrics N/A Metrics N/A ALL\_PROCESSES tmcc-123-141.lo0.NETWORK PORT Metrics ALL\_SHARED\_ETHERNET\_ADAPTERS tmcc-123-141,sit0,NETWORK\_PORT Metrics ALL\_VIRTUAL\_TARGET\_DEVICES PARTITION Metrics N/A Metrics N/A tmcc-123-141,\*,PARTITION ..... tmcc-123-141.\*.MEMORY Metrics N/A MEMORY : SMAKE ... in Anaheim Complete your sessions evaluation online at SHARE.org/AnaheimEval **2012** 51

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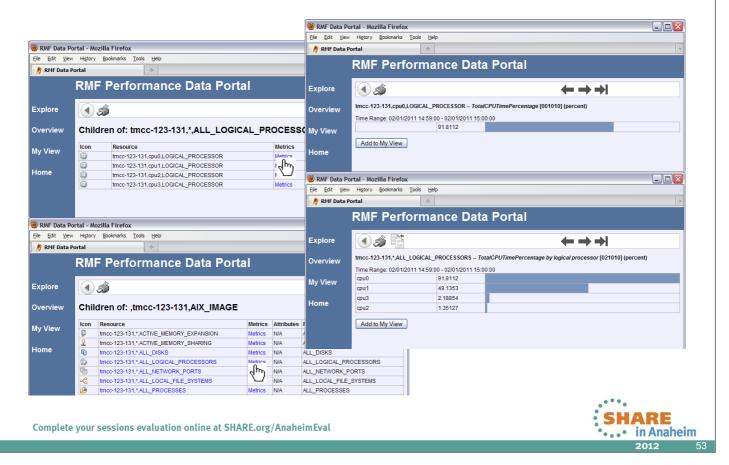
## **RMF XP – Metrics**



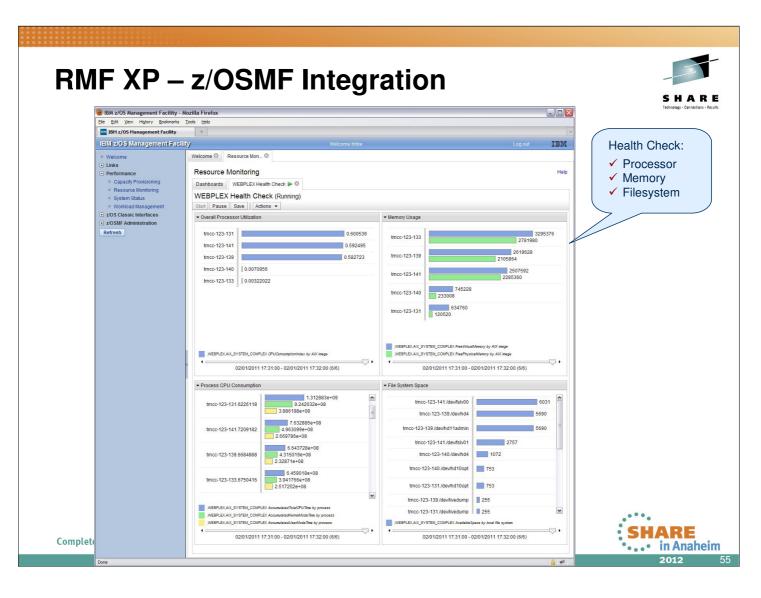


# **RMF XP – Metric Values**





### **RMF XP – Metric Scope** System Complex Scope 😻 RMF Data Portal - Mozilla Firefox Eile Edit View Higtory Bookmarks Tools Help 🎢 RMF Data Portal **RMF Performance Data Portal** 👻 RMF Data Portal - Mozilla Firefox Ele Edit View Higtory Bookmarks Tools Help 🎢 RMF Data Portal Explore ٩ 🗳 🌔 $\leftarrow \rightarrow \rightarrow$ **RMF Performance Data Portal** WEBPLEX,AIX\_SYSTEM\_COMPLEX -- BytesReceived by network port [044010] (bytes) Overview Time Range: 02/01/2011 15:42:00 - 02/01/2011 15:43:00 🕢 🗳 📑 Hy View tmcc-123-139.en0 2571 1085 Explore tmcc-123-139.100 tmcc-123-139,\*,ALL\_NETWORK\_PORTS -- BytesReceived by network port [024010] (bytes) Overview tmcc-123-140.en1 948 Home Time Range: 02/01/2011 15:42:00 - 02/01/2011 15:43:00 tmcc-123-141.en0 840 en0 2571 tmcc-123-131.en1 812 My View 100 1085 tmcc-123-140.en0 658 en1 196 tmcc-123-131.lo0 572 Home sit0 0 tmcc-123-141.lo0 426 tmcc-123-139.en1 196 Add to My View tmcc-123-133.lo0 142 tmcc-123-140.lo0 68 tmcc-123-133.en1 60 tmcc-123-141.en1 60 tmcc-123-139.sit0 tmcc-123-141.sit0 0 0 tmcc-123-131.en0 tmcc-123-131.sit0 System Scope tmcc-123-133.sit0 0 tmcc-123-140.sit0 0 tmcc-123-133.en0 0 Add to My View RMF -Done SHARE in Anaheim Complete your sessions evaluation online at SHARE.org/AnaheimEval 2012 54



- The new RMF XP capabilities are completely applicable in the z/OSMF Resource Monitoring plugin
- Hence, you are able to monitor seamlessly all the systems within your enterprise, independent of the operating system type
- In a short time frame you can take advantage of the various capabilities of z/OSMF Resource Monitoring:
  - One workstation as single point of control
  - · Dashboards with state-of-the-art graphical views
  - Maximum flexibility with user defined dashboards
  - Powerful data reduction and filtering

# **RMF XP - Summary**

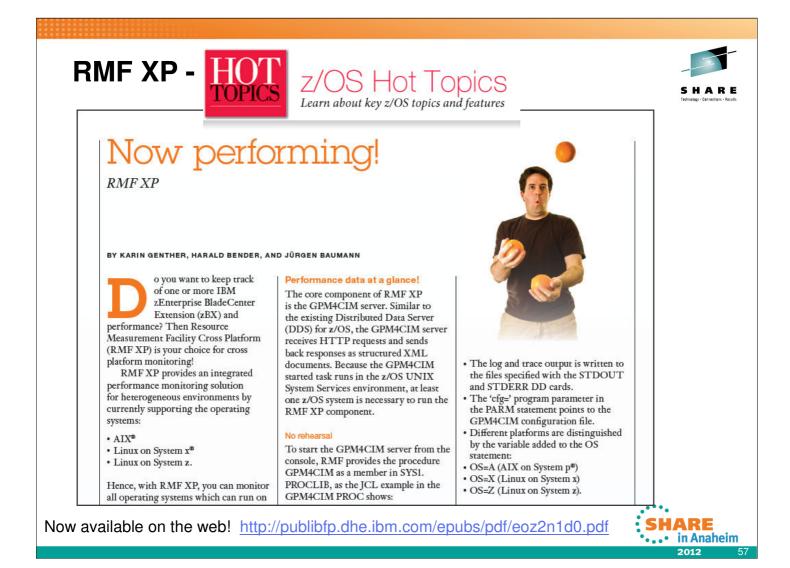
- Seamless performance monitoring solution for z/OS and distributed platforms
- z/OS as management platform for distributed environments
- Easy to setup, almost no customization needed
- Two graphical frontends
  - Instant access via web browser
  - z/OSMF with advanced capabilities
- Available with z/OS V1R13 RMF and z/OS V1R12 RMF (APAR OA36030)

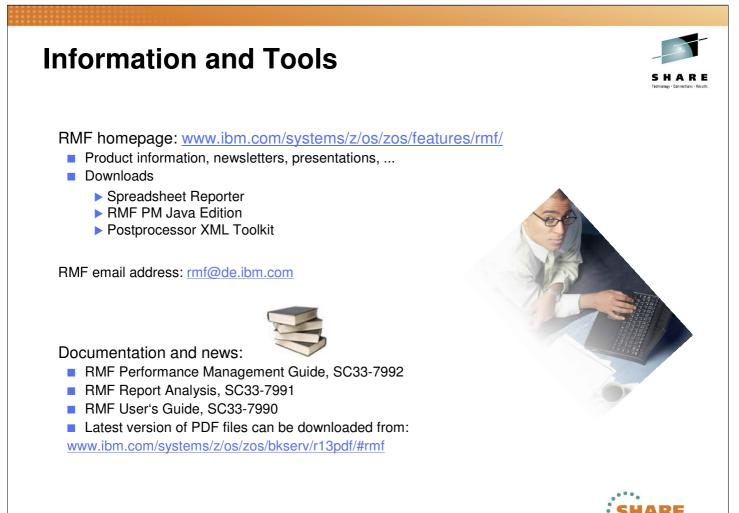
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- · Alltogether, RMF XP provides a seamless, cross-plattform performance monitoring solution
- The new function strengthens the z/OS platform as monitoring platform to control distributed environments
- RMF XP works out-of-the box, in a couple of minutes everything is up-and-running
- The end-user has the choice between two graphical, state-of-the-art workstation frontends
- Approximately 70% of the CPU consumption can be offloaded to zIIP engines. This helps to reduce costs significantly.

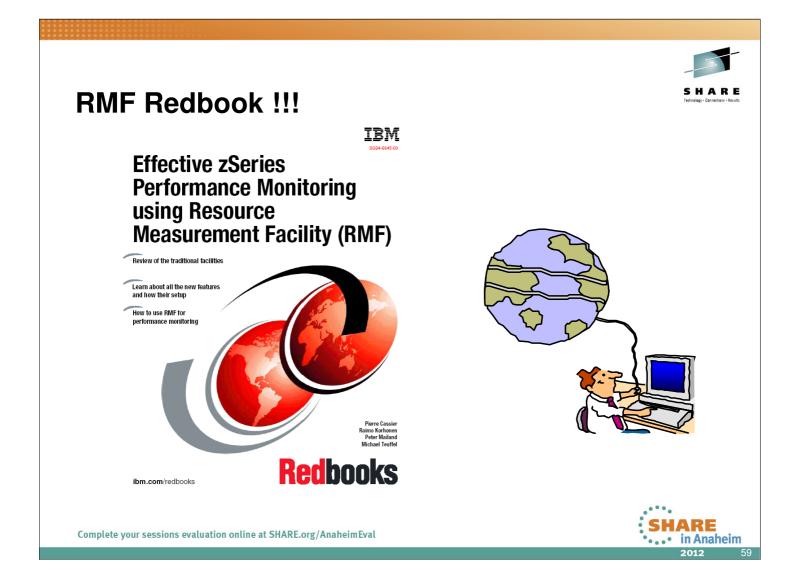






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# **Appendix: Function Reference**



Function	Availability
RMF WLM Reporting Enhancements	z/OS 1.13 RMF
RMF Storage Reporting Enhancements	z/OS 1.13 RMF
Postprocessor XML Formatted Reports	z/OS 1.11 RMF
HTTP API to access Historical data	z/OS 1.12 RMF
Reporting of system serialization delays	z/OS 1.13 RMF
In-Ready Work Unit Queue Distribution	z/OS 1.12 RMF
IBM z/OS Management Facility: Resource Monitoring Plugin	z/OS 1.12 zOSMF
RMF XP	z/OS 1.13 RMF z/OS 1.12 RMF (APAR OA36030)

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