



RMF Development Edition

z/OS Resource Measurement Facility



The Latest and Greatest: z/OS V2R1

September, 4th 2013

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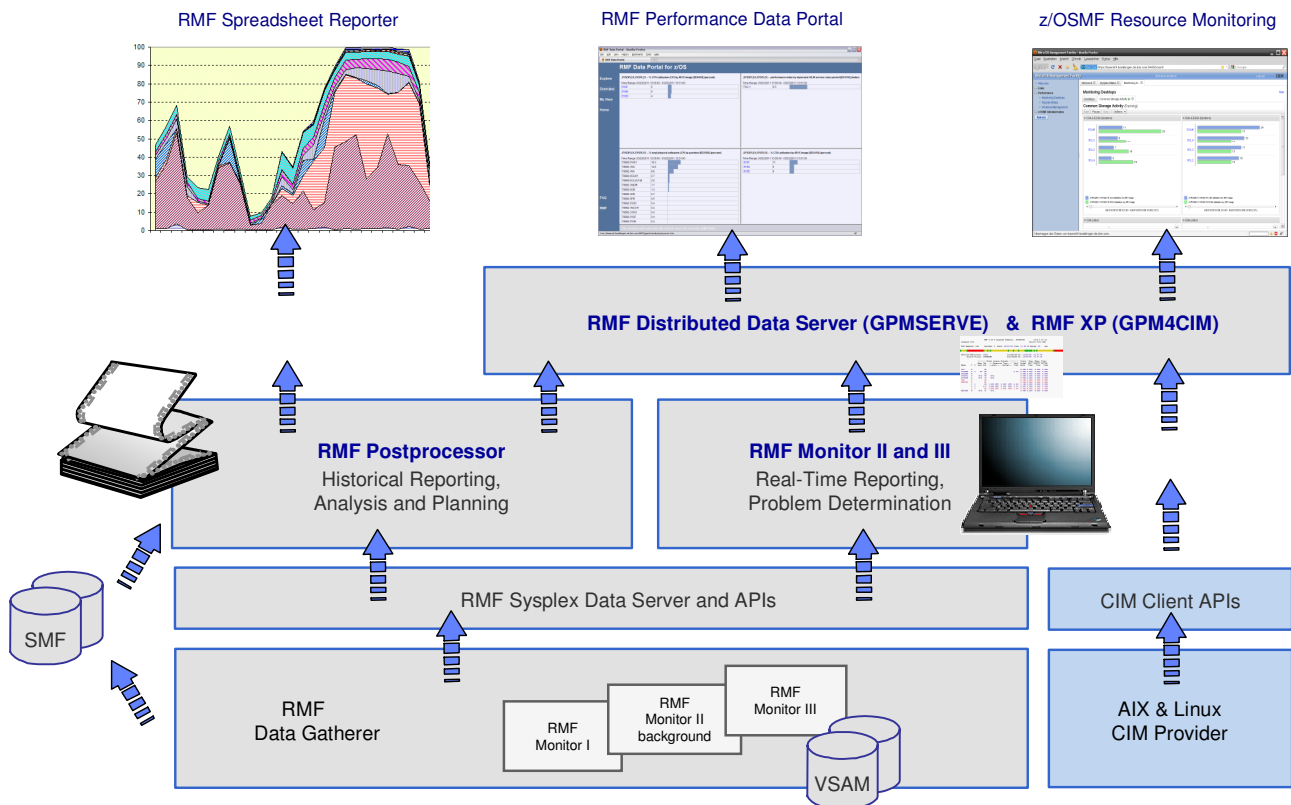
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RMF Product Overview



- 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). Beginning 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.
- Since 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.

z/OS V2R1 RMF Content at a Glance

- **IBM zEnterprise EC12 Support**
 - ▶ Statistics for Flash Memory and Pageable Large Pages
 - ▶ Support of I/O Interrupt Delay Time Facility
 - ▶ Extended Infiniband Link Reporting
 - ▶ Support of Crypto Express4 Card
 - ▶ Warning Track Interruption Facility Statistics
- **Exploitation of System z Integrated Information Processors**
 - ▶ zIIP Usage Option for Monitor III Gatherer
- **Postprocessor XML formatted Reports**
 - ▶ Transition to XML Format almost complete
 - ▶ Advanced Sorting and Filtering Capabilities
- **RMF XP Enhancements**
 - ▶ Performance Monitoring of Windows Images
 - ▶ SMF Type 104 Recording for all Platforms
- **z/OSMF Resource Monitoring**
 - ▶ Context sensitive Application Linkage to WLM
 - ▶ Windows Support



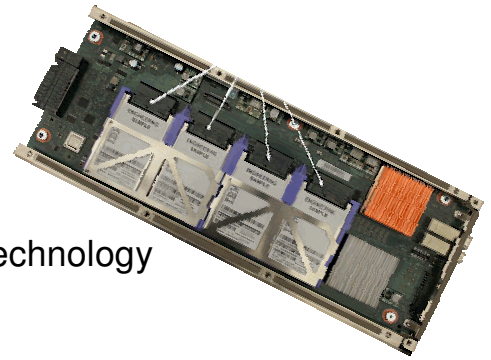
In accordance with the availability of new z/OS releases and new hardware functionality, the capabilities of RMF are enhanced consecutively

- Together with the new zEnterprise EC12 servers RMF provides the following support:
 - Usage statistics for Pageable Large Pages and Storage Class Memory in various RMF Postprocessor, Monitor II and Monitor III reports.
 - Reporting of new I/O Interrupt Delay Time
 - Additional channel path information for channel paths of type CIB or CFP
 - Support of Crypto Express4 Card and the Warning-Track-Interruption-Facility
- With z/OS V2R1 RMF, the Monitor III Data Gatherer (RMFGAT) can partially offload work to zIIP processors
- Starting with z/OS V1R11, a subset of RMF Postprocessor reports can 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
- RMF for z/OS V2R1 completed the work on enabling Postprocessor reports for XML format output and provides sorting and filtering capabilities when the XML report is displayed in a web browser.
- 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.
 - z/OS V2R1 enhancements :
 - Support to collect and display performance data from Windows images running on system x.
 - Persistent recording of cross platform performance data in the new SMF record type 104.
- zIOSMF Resource Monitoring enhancements:
 - Context sensitive Application Linkage to z/OSMF WLM plugin
 - Display new Windows performance data collected by RMF XP

zEC12 – Flash Express

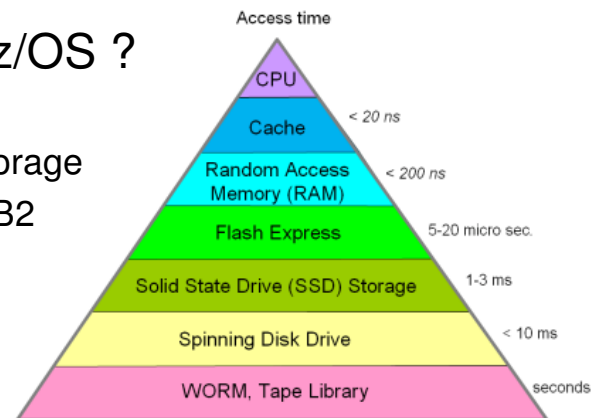
What is Flash Express?

- ▶ New memory hierarchie of the zSeries family
- ▶ Delivers tier within the fast Solid State Drive (SSD) technology
- ▶ Also denoted as Storage Class Memory (SCM)
- ▶ Integrated on PCI Express attached RAID 10 Cards
 - ⇒ Packaged as two card pair
 - ⇒ Each card holds 1.4 TB of memory per mirrored card pair
 - ⇒ Maximum value of four card pairs delivers up to 5.6 TB of memory



How is Flash Express exploited by z/OS ?

- ▶ Designed for improved paging performance
- ▶ Compelling addition to traditional auxilliary storage
- ▶ Supports Pageable Large Pages, e.g. with DB2 and Java workloads
- ▶ Eliminates delays from SVC or standalone dump processing

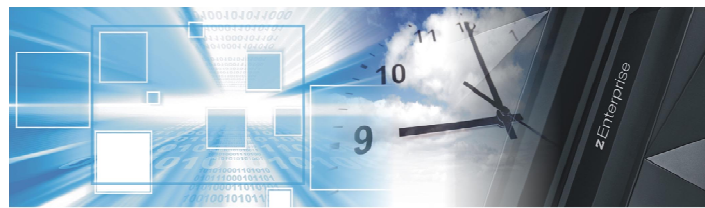


- The Flash Express feature (FC 0402) of IBM zEnterprise EC12 (zEC12) server is a new memory hierarchie of the zSeries family
- It consists of non - volatile storage using solid state devices on a PCIe card form factor.
- Flash Express implements a new tier of memory, called Storage Class Memory (SCM).
- Flash Express Cards are installed in pairs, which provides mirrored data to ensure a high level of availability and redundancy.
- In each Flash Express card, the data is stored in four solid-state disks in a RAID configuration. If a solid-state disk fails, the data are reconstructed dynamically. The cards in a pair mirror each other over a pair of cables, in a RAID 10 configuration. If either card fails, the data is available on the other card.
- Each Flash Express card has a capacity of 1.4 TB of usable storage.
- A maximum of four pairs of cards can be installed on a zEC12, for a maximum capacity of 5.6 TB of storage.
- Flash Memory is assigned to partitions like Main Memory from the allocation panel on the zEC12 Service Element (SE)
- z/OS can use Flash Express storage as Storage Class Memory (SCM) for paging.
- Flash Express helps to improve paging performance since page access time from Flash Express is faster than from DASD devices.
- The z/OS paging subsystem can work with a mix of Flash Express storage and External Disk.
- z/OS detects whether Flash Express storage is assigned to the LPAR and will try to page to Flash Express before using paging datasets on DASD.
- In combination with the new pageable 1MB pages, Flash Express helps to improve the performance of DB2 and Java workloads.
- Latency delays in SVC or standalone dump processing caused by page - ins from DASD can be significantly reduced by Flash Express.

zEC12 – Flash Memory & Pageable Large Pages RMF Support



- ▶ New Storage Class Memory (SCM) statistics in
 - ⇒ RMF Postprocessor Paging Activity report
 - ⇒ RMF Postprocessor Page Data Set Activity (PAGESP) report
 - ⇒ RMF Monitor II Page Data Set Activity (PGSP) report
- ▶ New statistics for Pageable Large Pages in
 - ⇒ RMF Postprocessor Paging Activity report
 - ⇒ RMF Postprocessor Virtual Storage Activity (VSTOR) report
 - ⇒ RMF Monitor III Storage Memory Objects (STORM) report



- RSM web deliverable (FMID JBB778H) exploits the new flash memory by introducing a new tier of memory called Storage Class Memory (SCM) that is used by the paging subsystem.
- In addition to support for the existing large (1 MB) pages and frames, zEC12 supports **pageable** large pages when SCM is configured and allocated to z/OS.
- With RMF new function APAR OA38660, RMF provides the SCM and Pageable Large Pages support for z/OS 1.13
- The support enhances RMF Postprocessor, Monitor II and Monitor III reports with various new statistics for SCM and pageable large pages.

zEC12 – Flash Memory & Pageable Large Pages

⇒ New SCM statistics in the FRAMES AND SLOT COUNTS section of the RMF Postprocessor Paging Activity report

The number of shared pages backed on SCM

SHARED FRAMES	TOTAL SLOTS	CENTRAL STORAGE		FIXED TOT	FIXED BEL	AUX DASD	AUX SCM
MIN	7,937	44	30	0	13	0	
MAX	7,937	44	30	0	13	0	
AVG	7,937	44	30	0	13	0	
LOCAL PAGE DATA SET SLOTS	TOTAL	AVAILABLE	BAD	NON-VIO	VIO		
MIN	5,399,997	4,269,302	0	1,128,251	0		
MAX	5,399,997	4,271,746	0	1,130,695	0		
AVG	5,399,997	4,269,838	0	1,130,159	0		
SCM PAGING BLOCKS	TOTAL	AVAILABLE	BAD	IN-USE			
MIN	0	0	0	0			
MAX	0	0	0	0			
AVG	0	0	0	0			

System wide statistics of 4K SCM paging blocks as: Total, Available, Unavailable and Used 4K blocks

- The Frame and Slot Counts section of the RMF Postprocessor Paging Activity report is enhanced to report a new SCM Paging Block with statistics about the system wide usage of SCM.
- If SCM is not available the SCM Paging Block section is not shown.
- The SHARED FRAMES statistics are extended with a new metric to display the number of shared pages that are backed on SCM.

zEC12 – Flash Memory & Pageable Large Pages...

⇒ New SCM and Large Pages statistics in the MEMORY OBJECTS section of the RMF Postprocessor Paging Activity report

P A G I N G A C T I V I T Y

OPT = IEAOPT00 LFAREA SIZE = 209715200 MEMORY OBJECTS AND HIGH VIRTUAL STORAGE FRAMES

MEMORY OBJECTS	COMMON	SHARED	1 MB
MIN	53	1	1
MAX	56	1	4
AVG	54	1	2

System wide usage of Large Frame Area (Fixed Frames) and Pageable Large Frames

1 MB FRAMES	FIXED			PAGEABLE		
	TOTAL	AVAILABLE	IN-USE	TOTAL	AVAILABLE	IN-USE
MIN	200	80	30	560	496	57
MAX	200	170	120	560	503	64
AVG	200	136	64	560	501	59

HIGH SHARED FRAMES	TOTAL	CENTRAL STORAGE	AUX DASD	AUX SCM
MIN	136902.1M	206	0	0
MAX	136902.1M	206	0	0
AVG	136902.1M	206	0	0

Size of high virtual shared and common area in units of 4KB pages

HIGH COMMON FRAMES	TOTAL	AUX DASD	AUX SCM
MIN	17301504	0	0
MAX	17301504	0	0
AVG	17301504	0	0

Number of auxiliary storage slots used for high virtual common and shared memory pages that are backed on SCM storage

- The Memory Objects and High Virtual Storage Frames section of the Postprocessor Paging Activity report now shows values for both fixed and pageable 1 MB frames
- New statistics for High Shared and High Common Frames:
 - TOTAL: Size of high virtual shared and common area in units of 4 KB pages.
 - AUX SCM: Number of auxiliary storage slots used for high virtual shared and common pages that are backed on SCM storage.
- The number of auxiliary storage slots on DASD are added to complement the new information on frames and page data set slots for SCM data blocks.

zEC12 – Flash Memory & Pageable Large Pages...

⇒ New SCM statistics RMF Postprocessor Page Data Set Activity report

PAGE DATA SET ACTIVITY															
z/OS V1R13				SYSTEM ID TRX2				DATE 03/10/2012 TIME 13.00.00			INTERVAL 15.00.012 CYCLE 1.000 SECONDS				
NUMBER OF SAMPLES =		900		PAGE DATA SET AND SCM USAGE											
PAGE SPACE	VOLUME	DEV	DEVICE	SLOTS	----	SLOTS USED	---	BAD	%	PAGE			V		
TYPE	SERIAL	NUM	TYPE	ALLOC	MIN	MAX	AVG	SLOTS	IN	TRANS	NUMBER	PAGES	I	DATA SET NAME	
LOCAL	TRX2P1	D506	33903	593999	0	0	0	0	0.00	0.000	0	0	0	Y	PAGE.VTRX2P1.LOCAL1
PLPA	TRX2PP	D406	33903	71999	16851	16851	16851	0	0.00	0.000	0	0	0	0	PAGE.VTRX2PP.PLPA
COMMON	TRX2PP	D406	33903	35999	34	34	34	0	0.00	0.000	0	0	0	0	PAGE.VTRX2PP.COMMON
SCM	N/A	N/A	N/A	131072	43151	43151	43151	0	0.00	0.000	0	0	0	0	N/A

System wide statistics of
4K SCM paging block usage and
SCM paging activity

- The Postprocessor Page Data Set Activity report displays SCM Paging Block information for page data set of type SCM.

zEC12 – Flash Memory & Pageable Large Pages...

⇒ Statistics for Fixed Large Memory Objects in RMF Postprocessor Virtual Storage Activity report

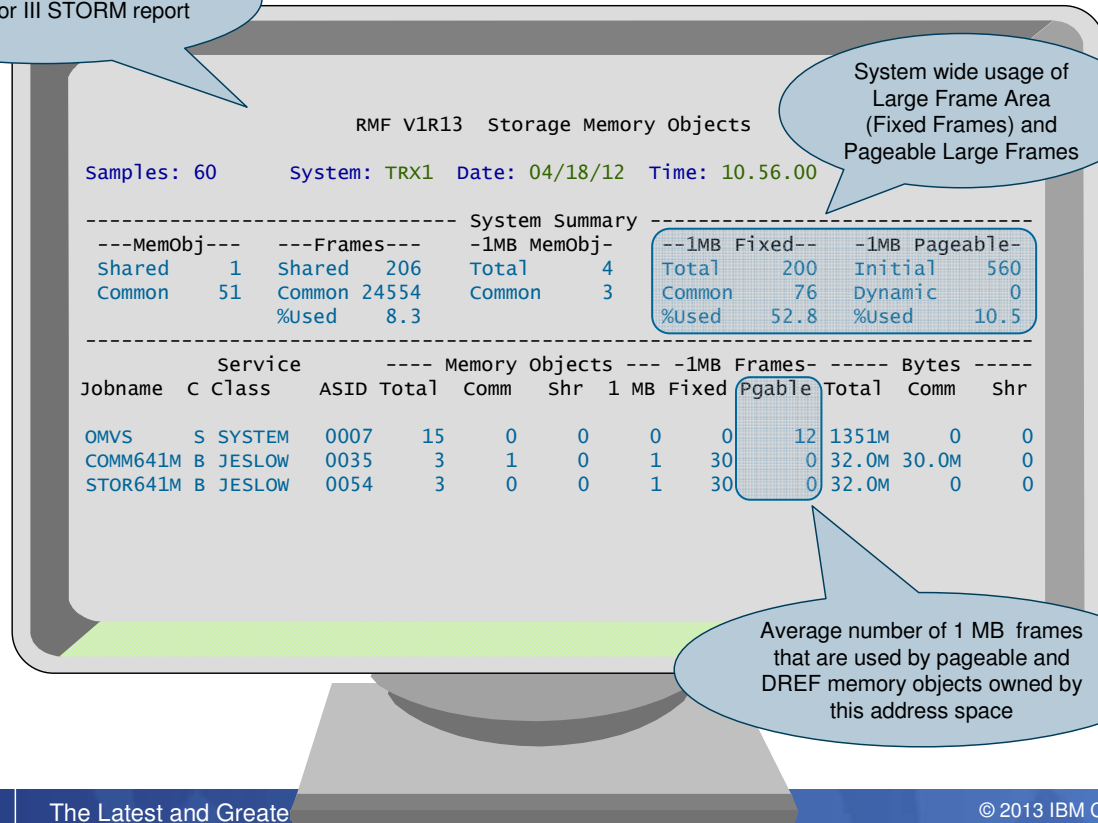
V I R T U A L S T O R A G E A C T I V I T Y						
z/OS V2R1	SYSTEM ID SYS3		DATE 11/25/2011		PAGE 4	
	RPT VERSION V2R1 RMF		TIME 05.30.00		INTERVAL 14.59.996	
					CYCLE 1.000 SECONDS	
PRIVATE AREA DETAIL						
JOB NAME - JES2	MEMORY LIMIT - 20000M					
...						
MEMORY ALLOCATION IN HIGH VIRTUAL MEMORY (ABOVE 2GB)						
BYTES	MIN	MAX	AVG	PEAK		
PRIVATE	1.823T	05.31.52 22.41T	05.50.36 11.51T	131.8T		
SHARED	485.1M	05.31.52 1822M	05.58.15 552.2M	1.333T		
COMMON	885.1M	05.31.52 1.22M	05.56.15 1.2T	1.927T		
MEMORY OBJECTS						
PRIVATE	80	05.31.52 160	05.35.52 110			
SHARED	20	05.31.52 70	05.35.52 23			
COMMON	30	05.31.52 60	05.35.52 44			
1 MB	20	05.31.52 70	05.35.52 25			
FRAMES (1 MB)						
FIXED	4	05.31.52 26	05.35.52 21			
PAGEABLE	4	05.31.52 26	05.35.52 21			

Decomposition into
Fixed and Pageable Large Pages

- The Private Area Detail section of the RMF Postprocessor VSTOR report displays the MIN, MAX, and AVG values for the number of 1 MB frames that are used by **FIXED** and **PAGEABLE** memory objects that are owned by the reported address space.
- The PAGEABLE value also includes 1 MB frames that are used by DREF memory objects.

zEC12 – Flash Memory & Pageable Large Pages...

New Large Page statistics in RMF Monitor III STORM report



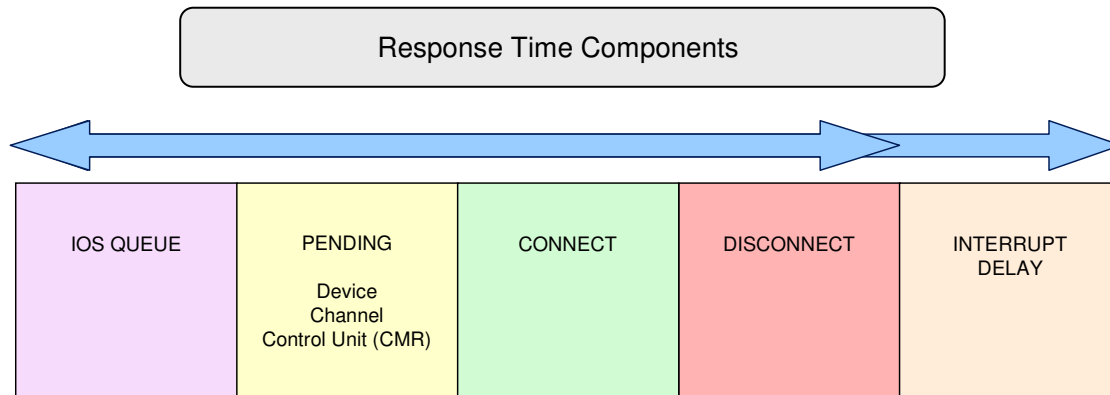
New and changed System Summary fields in Monitor III Storage Memory Objects (STORM) report:

Frames	%Used	Percentage of high virtual common storage used by the system.
1MB MemObj	Common	Average number of fixed memory objects that are allocated in high virtual common storage and can be backed in 1 MB frames. This value includes the memory objects that cannot be attributed to an address space.
1MB Fixed	Total	Total number of 1 MB frames that can be used by fixed memory objects. This value is equal to the size of the Large Frame Area in megabytes.
	Common	Average number of 1 MB high virtual common memory pages fixed in central storage. This value includes the pages that cannot be attributed to an address space or have not been freed during address space termination.
	%Used	Percentage of 1 MB frames that are used by fixed memory objects in the Large Frame Area regardless of whether the frames are actually used for 1 MB pages or used to satisfy 4K page requests on a constraint system.
1MB Pgable	Initial	Number of 1 MB frames that can be used by pageable and DREF memory objects. This value is calculated by the system at IPL time.
	Dynamic	Average number of 1 MB frames in the LFAREA that were used to satisfy 1 MB pageable page requests.
	%Used	Percentage of 1 MB frames that are used by pageable and DREF memory objects, regardless of whether the frames are actually used for 1 MB pages or used to satisfy 4K space requests on a constrained system.

New and changed Address Space related fields:

1MB Frames	Fixed	Average number of 1 MB frames in the Large Frame Area owned by this address space. Frames that are used to satisfy 4K space requests on a constrained system are not included.
	Pgable	Average number of 1 MB frames that are used by pageable and DREF memory objects owned by this address space. Pageable memory objects that have been fixed after allocation, are also included. Frames that are either used by common 1 MB pages or to satisfy 4K space requests on a constrained system are not included.

zEC12 – I/O Interrupt Delay Time



- ▶ Interrupt Delay time measures the time between when the I/O completes and z/OS issues the TSCH instruction to retrieve the results.
- ▶ How long does it take for z/OS to see and process the interrupt after I/O completes ?

- The response time that is reported for a device is the sum of IOS QUEUE time, PENDING time, CONNECT time and DISCONNECT time.
- However, there is another response time component that was not measured and reported but impacts the overall I/O response time as seen by the application:
 - ⇒ The I/O Interrupt Delay time
- Interrupt Delay time is the time between when the I/O completes and z/OS issues the TSCH instruction to retrieve the results. In other words:
How long does it take for z/OS to see and process the interrupt after I/O completes ?

zEC12 – I/O Interrupt Delay Time



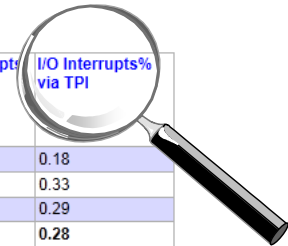
- ▶ I/O interrupt delay time (aka I/O elongation) occurs when an I/O is delayed due to
 - 🚫 a non-dispatched LPAR
 - 🚫 the lack of an interrupt enabled CP
- ▶ I/O interrupt delay time is NOT included in the I/O response time
- ▶ I/O interrupt delay time could NOT be measured in the past
- ▶ High ratios of interrupts handled via TPI (Test Pending Interrupt) are an indicator for significant I/O elongation



▼ CPU Activity

CPU : 2817 Model : 729 H/W Model : M32 Sequence Code : 0000000000E3206 HiperDispatch : NO
 CPC Capacity : 2780 Change Reason : NONE

CPU Number	CPU Type	Time% Online	Time% LPAR Busy	Time% MVS Busy	Time% Parked	LOG PROC Share%	HiperDispatch Priority	I/O Interrupts Rate	I/O Interrupts% via TPI
0	CP	100.00	1.60	1.57	-----	31.9		1.87	0.18
1	CP	100.00	1.14	1.12	-----	31.9		2.69	0.33
2	CP	100.00	0.85	0.83	-----	31.9		2.72	0.29
TOTAL/AVERAGE	CP		1.20	1.18		95.7		7.27	0.28



- There are two possible reasons for an I/O interrupt delay:
 - The LPAR is not dispatched
 - There are not enough CPs that are enabled to handle interrupts
- I/O interrupt delay time is NOT included in the total I/O response time as reported by RMF
- In the past I/O interrupt delay time could not even been measured.
- When data transfer is complete on an I/O device, the channel subsystem will attempt to find a CP (idle or busy) that is enabled for interrupts
- After the CP completes processing for an I/O interrupt, it issues a Test Pending Interrupt (TPI) instruction to determine whether there are any further I/O interrupts pending. If yes, the processor proceeds to service that interrupt
- Hence, an interrupt handled via TPI is a **queued** interrupt, that could not be handled instantly by an alternate I/O enabled processor
- Not more than 20-30% should be handled via TPI, otherwise it is time to examine the I/O interrupt delay time

zEC12 – I/O Interrupt Delay Time



- ▶ New field AVG INT DLY in RMF Postprocessor Device Activity report.
- ▶ Caution: Interrupt Delay Time is not included in AVG RESP Time



OA39993

D I R E C T A C C E S S D E V I C E A C T I V I T Y															
z/OS V1R13			SYSTEM ID TRX2				DATE 11/23/2011			INTERVAL 14.59.998					
			RPT VERSION V1R13 RMF				TIME 12.30.00			CYCLE 1.000 SECONDS					
TOTAL SAMPLES =		900	IODF = 01		CR-DATE: 11/15/2011			CR-TIME: 07.33.54			ACT: POR				
STORAGE GROUP	DEV NUM	DEVICE TYPE	NUMBER OF CYL	VOLUME SERIAL	PAV	LCU	ACTIVITY RATE	AVG RESP TIME	AVG IOSQ	AVG CMR	AVG DB	AVG INT DLY	AVG PEND TIME	AVG DISC TIME	AVG CONN TIME
XTEST	2208	33903	3339	TRXSX9	1	0032	0.001	.384	.000	.128	.000	.123	.256	.000	.128
XTEST	2209	33903	3339	TRXSXA	1	0032	0.001	.256	.000	.000	.000	.135	.256	.000	.000
	220A	33909	10017	TRXT01	1	0032	0.000	.000	.000	.000	.000	.000	.000	.000	.000
	220B	33909	10017	TRXT02	1	0032	0.000	.000	.000	.000	.000	.000	.000	.000	.000

- z/OS V1.12 and V1.13 RMF is extended to report the interrupt delay time measurement for devices attached to the IBM zEnterprise EC12 server.
- Support available with new function APAR OA39993
- New Interrupt Delay Time reported in RMF Postprocessor Device Activity report:

AVG INT DLY: The average interrupt delay time in units of milliseconds encountered for I/O requests to this device.
For each I/O request, the time is measured from when the I/O operation is complete to when the operating system begins to process the status.

zEC12 – Enhanced CF Link Reporting

- ▶ In a System z environment different types of coupling links can be used to connect a Coupling Facility (CF) to the operating system.
- ▶ Each coupling link type has effect on link performance, response times and coupling overheads.
- ▶ For configurations covering large distances, the time spent on the link can be the largest part of the response time.



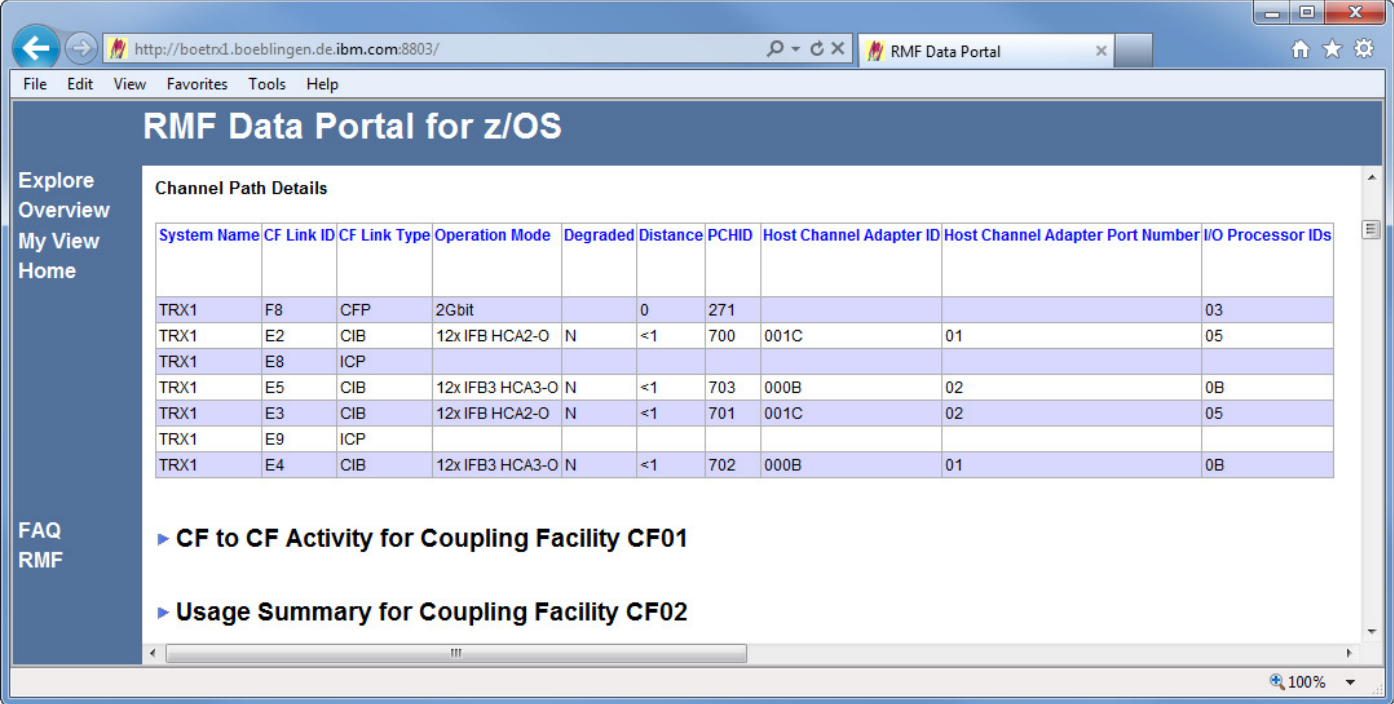
Type	Description	CHPID Type	Link Rate	Distance
ISC-3	InterSystem Channel-3	CFP (CF Peer)	2 Gbps	10 km unrepeated (6.2 miles) 100 km repeated
PSIFB	12x IB-DDR Parallel Sysplex InfiniBand 12x IB-SDR Parallel Sysplex InfiniBand	CIB (Coupling over Infiniband)	6 Gbps 3 Gbps (When connected to a System z9 EC or System z9 BC)	150 meters (492 feet)
PSIFB-LR	1x IB-SDR Parallel Sysplex InfiniBand – Long Reach Double data rate (1 x IB-DDR) is supported if connected to a System z qualified DWDM supporting DDR.	CIB (Coupling over Infiniband)	2.5 Gbps 5.0 Gbps	10 km unrepeated (6.2.miles) 100 km repeated
IC	Internal Coupling Channel	ICP (Internal CF Peer)	Internal speeds	n/a

- With system z, different types of coupling links can be used to connect a Coupling Facility (CF) to an operating system. Each coupling link type has effect on link performance, response times and coupling overheads.
- For configurations covering large distances, the time spent on the link can be the largest part of the response time. The table gives an overview of the current types of coupling links supported by system z.
- With new function APAR OA37826 the Postprocessor Coupling Facility Activity report and Monitor III CFSYS report are enhanced to display additional channel path information for channel paths of type CIB or CFP.
- The RMF support is available for z/OS V1.12 and V1.13 RMF

zEC12 – Enhanced CF Link Reporting

RMF Postprocessor Coupling Facility Activity Report:

⇒ New CHANNEL PATH DETAILS in Subchannel Activity Section



The screenshot shows the RMF Data Portal for z/OS. The main content area displays a table titled "Channel Path Details" with the following data:

System Name	CF Link ID	CF Link Type	Operation Mode	Degraded	Distance	PCHID	Host Channel Adapter ID	Host Channel Adapter Port Number	I/O Processor IDs
TRX1	F8	CFP	2Gbit		0	271			03
TRX1	E2	CIB	12x IFB HCA2-O	N	<1	700	001C	01	05
TRX1	E8	ICP							
TRX1	E5	CIB	12x IFB3 HCA3-O	N	<1	703	000B	02	0B
TRX1	E3	CIB	12x IFB HCA2-O	N	<1	701	001C	02	05
TRX1	E9	ICP							
TRX1	E4	CIB	12x IFB3 HCA3-O	N	<1	702	000B	01	0B

Below the table, there are two expandable sections:

- ▶ **CF to CF Activity for Coupling Facility CF01**
- ▶ **Usage Summary for Coupling Facility CF02**

- New function APAR OA37826 adds a new CHANNEL PATH DETAILS section to the Subchannel Activity and CF To CF Activity sections of the RMF Postprocessor Coupling Facility Activity report.
- The enhanced subchannel reporting function is provided by the zEnterprise EC12 (zEC12) processor for CF link types CIB or CFP and require the following prerequisites:
 - To report or display the additional channel path information for directly-connected CFs, z/OS must be running on a zEC12 processor.
 - To report or display the additional channel path information for remotely-connected CFs, the directly-connected CF must be running on a zEC12 processor (CFLEVEL 18 or higher).
- For a full exploitation of this new support in a sysplex environment it is necessary to install this APAR on all systems of the sysplex.

OPERATION MODE: Channel path operation mode. It describes the data rate, bandwidth, protocol and adapter type of the channel path.

Data rates for CFP channels paths:

- 1GBIT - 1.0625 Gbit/sec
- 2GBIT - 2.125 Gbit/sec

Bandwidth for CIB channels paths:

- 1x - single bandwidth
- 12x - twelve-fold bandwidth

Protocol for CIB channels paths:

- IFB or IFB3

Adapter types for CIB channels paths:

- HCA-O, HCA-O LR, HCA3-O or HCA3-O LR

Unknown operation mode:

- UNKNOWN

zEC12 – Enhanced CF Link Reporting...

RMF Postprocessor Coupling Facility Activity Report:

⇒ New CHANNEL PATH DETAILS in CF to CF Activity Section

COUPLING FACILITY NAME = X5CFP87												
CF TO CF ACTIVITY												
PEER CF	# REQ TOTAL AVG/SEC	-- CF LINKS --		REQUESTS				# REQ	# REQ			
		TYPE	USE	# REQ	-SERVICE AVG	TIME(MIC) STD_DEV						
X5CFH89	243089 270.1	CFP	2	SYNC	243089	18.6	4.9	SYNC	0	0.0	0.0	0.0
X5CFR89	34647K 38497	CIB	6	SYNC	34647K	12.4	4.0	SYNC	83	8.4	9.0	0.0

CHANNEL PATH DETAILS						
PEER CF	ID	TYPE	OPERATION MODE	DEGRADED	DISTANCE	
X5CFH89	02	CFP	2GBIT		0	
	03	CFP	2GBIT		0	
X5CFR89	D0	CIB	12X IFB HCA3-0	N	<1	
	D1	CIB	12X IFB HCA3-0	N	<1	
	D2	CIB	12X IFB HCA3-0	N	<1	
	D3	CIB	12X IFB HCA3-0	N	<1	
	E0	CIB	12X IFB3 HCA3-0	Y	<1	
E1	CIB	12X IFB3 HCA3-0	Y	<1		

Channel path details for
CF to CF links
of type CIB or CFP:

- Operation mode
- Degraded status
- Link distance

DEGRADED:

Character **Y** in this column indicates that the channel path is operating at reduced capacity (degraded) or not operating at all.

DISTANCE:

Estimated distance in kilometer. The value is calculated as follows:

Average round-trip path time in microseconds

$$\frac{\text{Average round-trip path time in microseconds}}{10 \text{ microseconds / kilometer}}$$

The value '<1' means that the estimated distance is below one kilometer.

A value of zero means that the time was not measured.

PCHID:

Physical channel ID.

HCA ID:

The hexadecimal host channel adapter ID.

HCA PORT:

The hexadecimal host channel adapter port number.

IOP IDS:

The hexadecimal identifiers of I/O processors (System Assist Processors) to which the channel path is accessible.

zEC12 – Enhanced CF Link Reporting...

RMF Monitor III CFSYS Report:
Channel Paths Details Pop-up

RMF Coupling Facility - Subchannels and Paths

Press Enter to return to the Report panel.

Details for System : TRX1
Coupling Facility : CF01

Subchannels Generated : 149
In Use : 49
Max : 49

Channel Path Details:

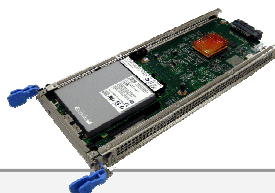
ID	Type	Operation	Mode	Deg	Distance	PCHID	---HCA---	ID	Port	--IOP IDs--
E2	CIB	12x IFB	HCA2-0	N	<1	0700	001C	01	05	
E3	CIB	12x IFB	HCA2-0	N	<1	0701	001C	02	05	
E4	CIB	12x IFB3	HCA3-0	N	<1	0702	000B	01	0B	
E5	CIB	12x IFB3	HCA3-0	N	<1	0703	000B	02	0B	
E8	ICP									
E9	ICP									
F8	CFP	2Gbit			0	0271			03	

More: +

Scrollable List
of all available Channel Paths
to Coupling Facility

- The 'Subchannels and Paths' pop-up panel of the RMF Monitor III Coupling Facility Systems Report (CFSYS) report is modified to show a scrollable list of all channel paths that are available to the reported coupling facility.

zEC12 - Support of Crypto Express4 Card



CRYPTO HARDWARE ACTIVITY

z/OS V1R13

SYSTEM ID SYSF
RPT VERSION V1R13 RMF

DATE 11/29/2011
TIME 16.00.00

All measurements available for Crypto Express4 Card

----- CRYPTOGRAPHIC COPROCESSOR -----

----- TOTAL -----					KEY-GEN
TYPE	ID	RATE	EXEC TIME	UTIL%	RATE
CEX2C	0	0.00	0.000	0.0	0.00
	1	2.16	295.9	63.9	2.14
CEX3C	2	0.00	0.000	0.0	0.00
CEX4C	4	2.15	227.8	48.9	2.15

----- CRYPTOGRAPHIC ACCELERATOR -----

----- TOTAL -----				-- ME-FORMAT RSA OPERATIONS --				-- CRT-FORMAT RSA OPERATIONS --			
TYPE	ID	RATE	EXEC TIME	UTIL%	KEY	RATE	EXEC TIME	UTIL%	RATE	EXEC TIME	UTIL%
CEX2A	3	766.9	0.434	33.3	1024	362.4	0.521	18.9	369.5	0.183	6.8
					2048	0.00	0.000	0.0	34.99	2.175	7.6
CEX4A	5	998.9	0.365	36.5	1024	246.4	0.534	13.2	554.3	0.205	11.3
					2048	0.00	0.000	0.0	83.16	0.689	5.7
					4096	0.00	0.000	0.0	115.1	0.547	6.3

----- ICSF SERVICES -----

----- ENCRYPTION -----			----- DECRYPTION -----			----- MAC -----		----- HASH -----		----- PIN -----		
RATE	SDES	TDES	AES	SDES	TDES	AES	GENERATE	VERIFY	SHA-256	SHA-512	TRANSLATE	VERIFY
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SIZE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00

- RMF new function APAR OA37016 introduces the RMF support of the Crypto Express4S feature on the zEC12
- In detail, RMF collects and reports performance measurements for operations executed on Crypto Express4S co-processors (CEX4C) and accelerators (CEX4A).
- CEX4C measurements are stored in the Cryptographic Coprocessor data section and CEX4A measurements are stored in the Cryptographic Accelerator data section of SMF record 70 subtype 2.
- The Postprocessor Crypto Activity report provides CEX4C measurements in the CRYPTOGRAPHIC COPROCESSOR section and CEX4A measurements in the CRYPTOGRAPHIC ACCELERATOR section.
- The RMF support is available for z/OS V1.10 and above

zEC12 - Warning Track Interruption Facility Statistics

- ▶ In a PR/SM™ environment the LPAR hypervisor assigns physical engines to logical engines accordingly to the weighting factors of the partitions.
- ▶ Once the time slice for a logical engine is expired the currently executing work is suspended until a physical engine is assigned to the logical engine again.
- ▶ The Warning Track Interruption Facility notifies the operating system that PR/SM™ will undispach a certain logical processor within the next 50 microseconds (grace period).
- ▶ z/OS is now able to save status for the running unit of work and re-dispatch the work unit on a different logical processor within the grace period.
- ▶ z/OS now signals to PR/SM via Diagnose x'9C' that the logical processor can be un-dispatched.
- ▶ Warning Track processing is only supported in HyperDispatch=YES environments.
- ▶ A high benefit can be achieved for Low Share processors which might be parked by WLM.

zEC12 - Warning Track Interruption Facility Statistics...

- ▶ RMF keeps track of the number of times PR/SM issued a warning-track interruption to a logical processor and z/OS was able/unable to return the logical processor within the grace period.
- ▶ RMF measures the amount of time in microseconds that a processor was yielded to PR/SM due to Warning-track processing.

SMF record type 70 subtype 1 (CPU Activity) – CPU data section				
Offset	Name	Length	Format	Description
80 x50	SMF70WTS	4	Binary	The number of times PR/SM issued a warning-track interruption to a logical processor and z/OS was able to return the logical processor within the grace period.
84 x54	SMF70WTU	4	Binary	The number of times PR/SM issued a warning-track interruption to a logical processor and z/OS was unable to return the logical processor within the grace period.
88 x58	SMF70WTI	4	Binary	Amount of time in microseconds that a logical processor was yielded to PR/SM due to Warning Track processing.



RMF Postprocessor Overview Conditions		
Name	Qualifier	Description
WTRKCP (WTRKAAP) (WTRKIIP)	cpu-id	The percentage of times PR/SM issued a warning-track interruption to a processor and z/OS was able to return it to PR/SM within the grace period.
WTRKTCP (WTRKTAAP) (WTRKTIIP)	cpu-id	Time in microseconds that a purpose processor was yielded to PR/SM due to Warning Track processing.

- With new function APAR OA37803 RMF supports the Warning-Track-Interruption-Facility on zEC12.
- The CPU Data Section of SMF Record 70 Subtype 1 is enhanced with new warning track statistics.
- A set of new Overview/Exception Conditions can be used to report the new measurements.
- The RMF support is available for z/OS V1.12 and V1.13 RMF.

RMF Monitor III zIIP Exploitation

- ▶ With z/OS V2R1 RMF, the Monitor III Data Gatherer (RMFGAT) can partially offload work to zIIP processors
- ▶ By default the RMF Monitor III Data Gatherer (RMFGAT) is enabled for zIIP exploitation
- ▶ When at least one zIIP processor is online for an LPAR, RMFGAT is partially offloading work to this processor without any further user interaction
- ▶ The RMFGAT zIIP exploitation can be controlled initially by means of the new Monitor III parmlib option ZIIPUSE

```

SYNC(00)          /* MINTIME SYNCHRONIZATION          */
SYSOUT(A)         /* MESSAGES TO SYSOUT CLASS A      */
WSTOR(32)        /* SIZE OF INSTORAGE BUFFER (IN MB) */
ZIIPUSE          /* PARTIAL USE OF zIIP ENGINES     */
IOSUB            /* I/O SUBSYSTEM GATHERING ACTIVE  */
CFDETAIL         /* COUPLING FACILITY DETAILS       */
CACHE            /* ACTIVATE CACHE GATHERING        */
VSAMRLS         /* ACTIVATE VSAM RLS GATHERING     */
OPD              /* ACTIVATE OMVS PROCESS DATA GATHERING */
  
```



New Option
ZIIPUSE

- ▶ The RMFGAT zIIP exploitation can be activated/deactivated dynamically by means of the following command: F RMF,F III,ZIIPUSE/NOZIIPUSE

- The RMF Monitor III data gatherer (RMFGAT) has been entitled to partially run on IBM System z Integrated Information Processors (zIIPs).
- A new Monitor III gatherer option ZIIPUSE/NOZIIPUSE is introduced to determine whether the RMFGAT address space is eligible for zIIP exploitation.

RMF Monitor III zIIP Exploitation...

- ▶ When at least one zIIP processor is recognized by the Monitor III gatherer, RMFGAT will schedule an Enclave SRB and offloads the Coupling Facility gathering to the zIIP processor

The screenshot shows a terminal window titled 'Session C - [32 x 80]' displaying an RMF V2R1 Enclave Report. The report includes a pop-up window titled 'RMF Enclave Details' for enclave ENC00001. The details show that CPU time (1327) and zIIP time (1327) are equal, indicating that the CPU time has been offloaded to the zIIP processor. The report also shows system information: System: TRX1, Date: 06/05/13, Time: 12.09.00, Range: 120.

```

RMF V2R1 Enclave Report
Line 1 of 2
Scroll ==> CSR
Command ==> _
Samples: 120 System: TRX1 Date: 06/05/13 Time: 12.09.00 Range: 120 Sec
Cur
RMF Enclave Details
Details for enclave ENC00001 with token 00000034 00000006
Press Enter to return to the Report panel.
Enc
- CPU Time --      - zAAP Time -      - zIIP Time -
Total      1327      Total      0.000      Total      1327
Delta      1.067      Delta      0.000      Delta      1.067

State  ---- Using ----  ----- Delay -----  IDL  UNK
Samples CPU AAP IIP I/O  CPU AAP IIP I/O STO CAP QUE
120      0.0 0.0 0.0 0.0  0.0 0.0 0.0 0.0 0.0 0.0 0.0  0.0 100
  
```

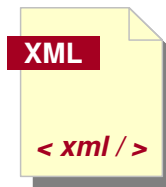
- ▶ In case the zIIP processor is activated dynamically by the CONFIG CPU(xx),ONLINE command, RMFGAT can exploit this processor starting with the next MINTIME
- ▶ Installations without Coupling Facilities (e.g. Monoplex) won't see significant RMFGAT zIIP activity

- When at least one zIIP processor is recognized by the Monitor III gatherer, RMFGAT will schedule an Enclave SRB and offloads the RMF Coupling Facility data gathering to the zIIP processor.
- The Enclave will be displayed in RMF Monitor III Enclave report. In the Enclave Details pop-up panel you will see the RMFGAT CPU time offloaded to zIIP.
- If the zIIP will be taken online dynamically, it will be recognized by RMFGAT and the zIIP will be exploited with the start of the next Monitor III Mintime.
- When no zIIPs are online, RMFGAT will neither create an enclave nor schedule any zIIP eligible SRB work. That means, no zIIP time on CP will appear in any performance reports.
- Since RMFGAT only offloads the Coupling Facility data gathering, installations without Coupling Facilities will not benefit from the zIIP exploitation.

Postprocessor XML Formatted Reports

Rationale:

- ▶ RMF Postprocessor reports are limited to a page width of 132 characters
- ▶ No state-of-the-art display capability of Postprocessor reports
- ▶ No easy access to RMF Postprocessor data for application programs
 - ⇒ cumbersome to parse the text output
 - ⇒ each report has its own layout



RMF Postprocessor reports can now be generated in XML Format

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

- The standard text output was limited 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 today's 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...

z/OS V1R11 RMF	z/OS V1R12 RMF	z/OS V1R13 RMF	z/OS V2R1 RMF
CPU Activity CRYPTO Activity FICON Director Activity ESS Disk Systems Activity OMVS Kernel Activity report OVERVIEW Report	DEVICE Activity WORKLOAD Activity	PAGING Activity SDELAY (XML only)	CACHE Subsystem Activity CF Activity CHANNEL Path Activity ENQUEUE Activity HFS Statistics IOQ Activity PAGESP Activity SDEVICE Activity report VSTOR Activity XCF Activity

- ▶ Summary and Exception reports as well as interval reports based on data collected by a Monitor II background session are not available in XML format
- ▶ The XML format is the preferred RMF Postprocessor Report format for the future
- ▶ The XML Format supersedes the Text format. New Reports might not be implemented in Text format

- It was RMF's objective to introduce the XML format for the majority of Postprocessor reports during the past releases. This work is now completed with RMF for z/OS V2.1.
- 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 Hardware 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 first sysplex report:
 - DEVICE Activity report (single-system report)
 - WLMGL Workload Activity report (sysplex report)
- z/OS 1.13 added the PAGING Activity report and the Serialization Delay report (SDELAY) which was the first report that is only available in XML format. Now with z/OS 2.1, the list of available reports is completed with:
 - CACHE Subsystem Activity report
 - CF Coupling Facility Activity report
 - CHANnel Path Activity report
 - ENQueue Activity report
 - HFS Hierarchical File System report
 - IOQ I/O Queuing Activity report
 - PAGESP Page Data Set Activity report
 - SDEVICE Shared Device Activity report
 - VSTOR Virtual Storage Activity report
 - XCF Cross-System Coupling Activity report

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.

- 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) , XPOVWRPT (for Overview reports) and/or XPXSRPTS (for sysplex-wide 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 the user specifies the PPXSRPTS ddname for cumulative text output together with XPXSRPTS, no XML output is generated.
 - If single-system reports are requested on the REPORTS control statement which are not XML enabled and the DD card XPRPTS is defined, no output is generated for them.

HTTP API to access Postprocessor XML Reports

- ▶ Web browser can be used as Postprocessor Data Portal
- ▶ All RMF Postprocessor XML formatted reports supported
- ▶ Application programs can use Distributed Data Server (DDS) HTTP API to retrieve RMF Postprocessor XML reports



http://boesysf:8803/gpm/rmfp.xml?reports="CPU"&date=20100702,20100702 - Microsoft Internet Explorer

RMF Postprocessor Interval Report [SYSD] : CPU Activity Report

z/OS V1R10 Start: 07/02/2010-11.45.00 Interval: 14:59:999 minutes
 V1R12 RMF End: 07/02/2010-12.00.00 Cycle: 1000 milliseconds

CPU ACTIVITY

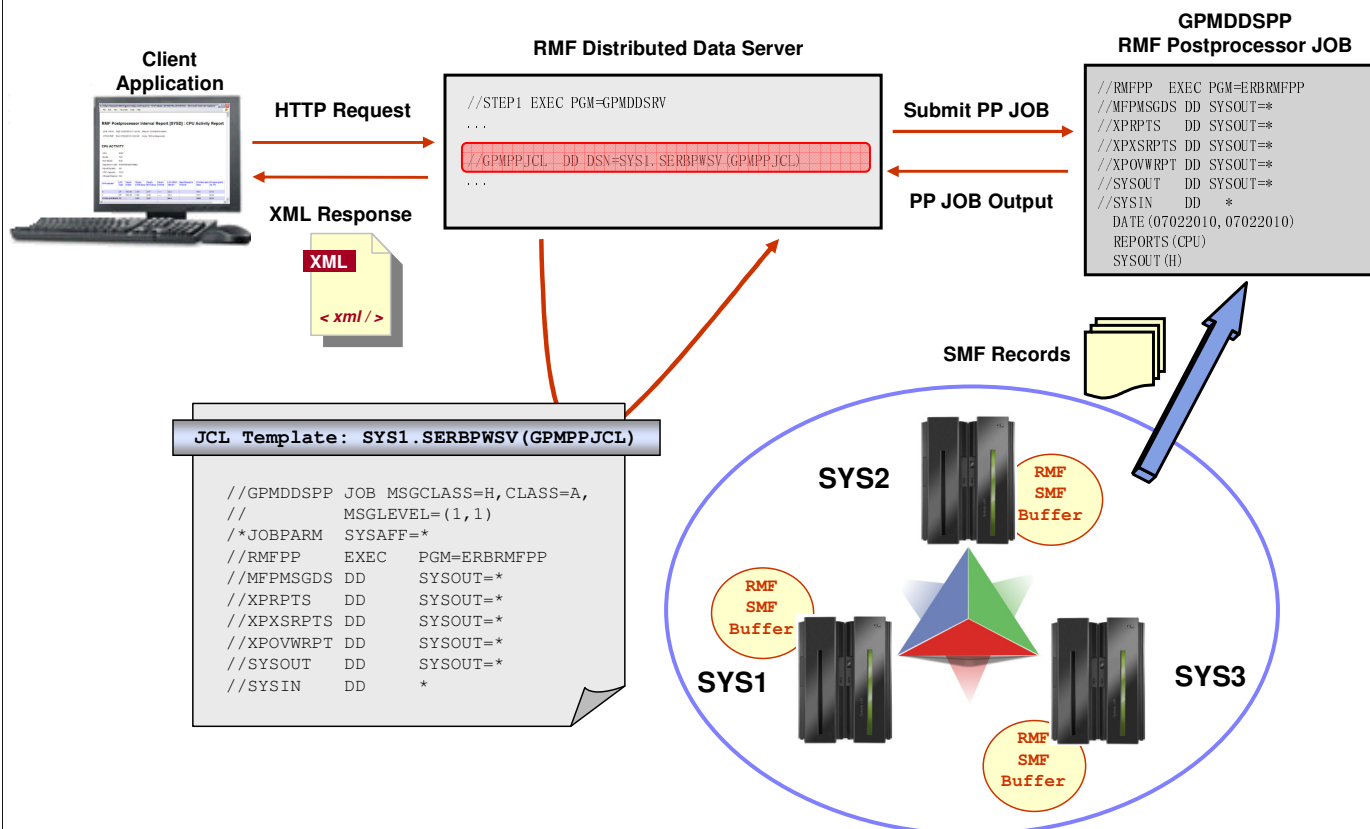
CPU 2097
 Model 722
 HW Model E40
 Sequence Code 0000000000070B82
 HiperDispatch NO
 CPC Capacity 1631
 Change Reason N/A

CPU Number	CPU Type	Time% Online	Time% LPAR Busy	Time% MVS Busy	Time% Parked	LOG PROC Share%	HiperDispatch Priority	I/O Interrupts Rate	I/O Interrupts% via TPI
0	CP	100.00	3.50	3.47	-----	32.2		4.61	0.19
1	CP	100.00	3.52	3.48	-----	32.2		5.07	0.46
TOTAL/AVERAGE CP			3.51	3.47		64.4		9.68	0.33



- 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.

HTTP API to access Historical Data...



- To get access to RMF Postprocessor data provided by the DDS, the GPMSSERVE started task is extended with an additional DD card:

```
//GMPPJCL DD DISP=SHR,DSN=SYS1.SERBPWSV(GMPPJCL)
```
- 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(GMPPJCL).
- You must adapt or replace the GMPPJCL 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 GMPPJCL ddname.
- The dataset or the member specified in the GMPPJCL 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.

Postprocessor XML Formatted Reports...

The screenshot shows the RMF Data Portal for z/OS web interface. The page title is "RMF Data Portal for z/OS" and the URL is "http://boeysf:8803/". The navigation menu includes "Home", "Explore", "Overview", "My View", and "RMF". The main content area displays "Welcome, you are connected to: ,SYSDPLEX,SYSPLEX". Below this is the "RMF Monitor III Data" section, which contains a table with columns for "Icon", "Resource", "Metrics", and "Attributes". A callout bubble labeled "Enhanced GUI" points to the "Metrics" and "Attributes" columns. The "RMF Postprocessor Reports" section is below, featuring a "Reports:" section with radio buttons for various report types (CACHE, CHAN, CPU, CRYPTO, DEVICE, ENQ, ESS, FCD, HFS, IOQ, OMVS, PAGESP, PAGING, PCIE, SDELAY, VSTOR, XCF, CF, SDEVICE, WLMGL). Below this is the "Filter Options:" section with input fields for "Date(Start,End)", "Type" (set to "SUBSYS"), "SysID", "Time of Day", "Duration", "SUMMARY", "SSID", and "EXSSID". A callout bubble labeled "Extended Filtering Options" points to the "SUMMARY" checkbox and the "SSID" input field. A "Show Report" button is located at the bottom of the filter options.

The RMF Data Portal for z/OS allows to generate and display and RMF Postprocessor XML report:

- When you click the *Explore* button on the welcome screen, the Data Portal displays a list of Postprocessor XML enabled reports.
- The selection of a Postprocessor report triggers an HTTP request that will retrieve, format and display the Postprocessor report in the web browser

With RMF for z/OS 2.1 the GUI of the RMF Data Portal for z/OS was enhanced:

- For each Postprocessor report type you can now specify additional options that will be used as Postprocessor report control statements.
- These options allow to filter the generated Postprocessor XML report, so that the amount of XML output can be reduced.
- This helps to improve the performance to generate and display a Postprocessor XML report in the RMF Data Portal for z/OS.

Postprocessor XML Formatted Reports...

The screenshot shows the RMF Data Portal for z/OS interface in a Windows Internet Explorer browser. The page title is "RMF Data Portal for z/OS". The navigation bar includes "Home", "Explore", "Overview", "My View", and "RMF".

Report Data Selection: A dropdown menu is open, showing four intervals: "07/11/2013-15:29:36 SYSE", "07/11/2013-15:29:36 S4", "07/11/2013-15:30:10 SYSF", and "07/11/2013-15:44:36 SYSE". A callout bubble labeled "Select Intervals" points to this menu. Below the menu are buttons for "Show all Report Data" and "Reset Sorting".

RMF Postprocessor Interval Report [System SYSE] : CPU Activity Report

RMF Version : z/OS V2R1 SMF Data : z/OS V1R13
 Start : 07/11/2013-15:29:36 End : 07/11/2013-15:44:36 Interval : 15:00:000 minutes Cycle : 1000 milliseconds

▼ CPU Activity

CPU : 2817 Model : 729 H/W Model : M32 Sequence Code : 0000000000E3206 HiperDispatch : YES CPC Capacity : 2780 Change Reason : NONE

CPU Number	CPU Type	Time% Online	Time% LPAR Busy	Time% MVS Busy	Time% Parked	LOG PROC Share%	HiperDispatch Priority	I/O Interrupts Rate	I/O Interrupts% via TPI
0	CP	100.00	2.45	2.39	0.00	53.4	MED	11.13	4.56
1	CP	100.00	0.00	-----	100.00	0.0	LOW	0.00	0.00
2	CP	100.00	0.26	0.26	0.00	0.0	LOW	0.00	0.00
TOTAL/AVERAGE CP		0.90	1.32		53.4			11.13	4.56
4	IIP	100.00	0.00	0.00	0.00	18.7	MED		
TOTAL/AVERAGE IIP		0.00	0.00		18.7				

System Address Space Analysis

Type	Number of Address Spaces: MIN	Number of Address Spaces: MAX	Number of Address Spaces: AVG
IN Queue	57	60	57.2
IN READY Queue	0	1	0.0
OUT READY Queue	0	0	0.0
OUT WAIT Queue	0	0	0.0
LOGICAL OUT READY Queue	0	0	0.0

A callout bubble labeled "Expand/Collapse Sections" points to the expand/collapse icon on the right side of the CPU Activity section.

The new stylesheets and JAVA script code, used to format and display the Postprocessor XML report in the web browser introduces new functionality that helps to analyse the RMF performance data:

- You can now select a single report interval or a set of report intervals to focus on the RMF performance data for specific report interval(s).
- You can expand/collapse report section(s) so that it's easier to get an overview about the reported data.

Postprocessor XML Formatted Reports...




The RMF Data Portal is currently limited to the SMF Buffer of the RMF Sysplex Data Server.
No SMF Dump Data Sets can be specified

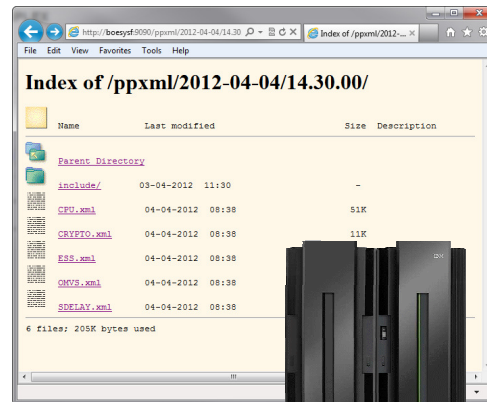
```
//SHARAnnX JOB (DE03141, ), 'SHARAnn', CLASS=A, USER=SHARAnn,
//          MSGCLASS=H, MSGLEVEL=(1, 1), NOTIFY=SHARAnn
//*
//XMLPP    PROC REPORT=
//RMFPP    EXEC PGM=ERBRMFPP, COND=(4, LT, GETSMF)
//MFPINPUT DD DISP=(OLD, PASS), DSN=*.RMFSORT.SORTOUT
//MFPMSGDS DD SYSOUT=*
//XPRPTS   DD PATH='/sharelab/sharann/xmlpp/&REPORT..xml',
//          PATHOPTS=(OWRONLY, OCREAT, OTRUNC),
//          PATHMODE=(SIRUSR, SIWUSR, SIRGRP), FILEDATA=TEXT
//XPXSRPTS DD PATH='/sharelab/sharann/xmlpp/&REPORT..xml',
//          PATHOPTS=(OWRONLY, OCREAT, OTRUNC),
//          PATHMODE=(SIRUSR, SIWUSR, SIRGRP), FILEDATA=TEXT
//          PEND
//PPCPU    EXEC PROC=XMLPP, REPORT=CPU
//RMFPP.SYSIN DD *
//          REPORTS(CPU)
//PPWLMGL  EXEC PROC=XMLPP, REPORT=WLMGL
//RMFPP.SYSIN DD *
//          SYSRPTS(WLMGL(SCPER, POLICY))
//
```

Execute the Postprocessor JCL
and redirect the output to any
HFS directory

- The RMF Postprocessor report generation via the RMF Data Portal for z/OS is currently limited to the SMF records in the SMF Buffer of the RMF Sysplex Data Server since no SMF Dump Data Sets can be specified in the HTTP request for the Postprocessor API.
- However, you can use an RMF Postprocessor JOB to generate an XML report from any SMF source and redirect the XML output to a permanent file in the USS filesystem.
- Now that you have generated a report, there are multiple ways to view the XML output:
 - Transfer the XML file in ASCII mode to your windows workstation and use the RMF Postprocessor XML Toolkit to display the report in your web browser as an HTML document.
 - Or, if you don't want to transfer the XML report to your workstation, you can think about using an SMB Server to map the USS directory tree to a network drive or you can setup an HTTP server that runs on z/OS and allows to view the XML reports in the USS directory.

Postprocessor XML Report Access via IBM HTTP Server

 RMF Postprocessor Reports: Everywhere and Anytime



- ✓ Instant Access to all Reports
- ✓ No Maintenance of raw Data Archives

- Since the reports are pure XML, an arbitrary web browser is perfectly suited to display the reports in a state-of-the art fashion.
- Once you have created a USS directory with XML reports by means of a Postprocessor job, you can use the IBM HTTP Server instantly as gateway.
- The reports can remain in the USS directory of your z/OS system and you can forget about cumbersome downloads.
- Once the HTTP server setup is done by means of a few entries in the servers configuration file (httpd.conf), you can easily navigate within the USS directory structure.
- If you select the report of your choice, it will be displayed instantly in the browser window.

RMF XP Enhancements

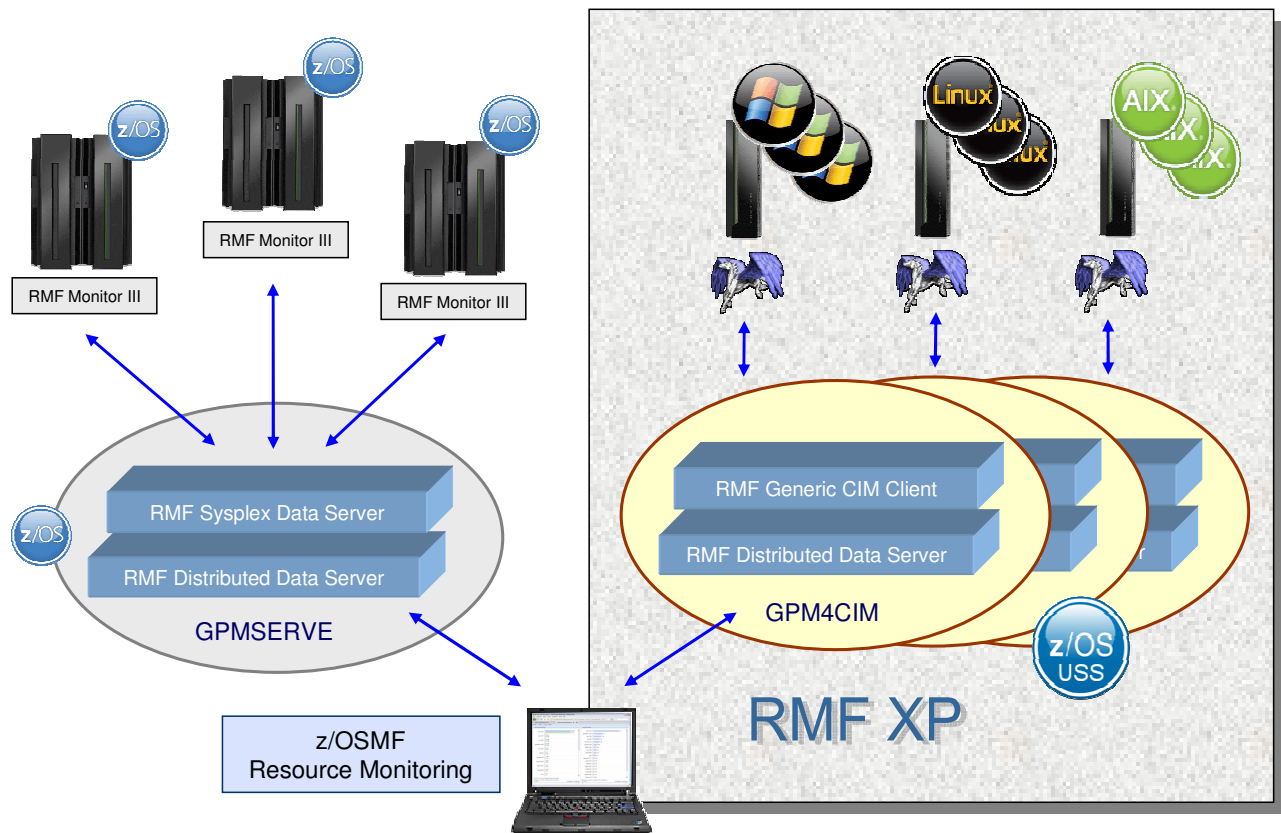
- ▶ RMF **XP** is the solution for **Cross Platform Performance Monitoring**
- ▶ RMF **XP** supports the Operating Systems running on
 - ▶ **x** Blades
 - ▶ **p** Blades



- ▶ In addition RMF XP supports Linux on System z
 - ▶ LPAR Mode
 - ▶ VM Guest Mode

- 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
 - Windows on System x (New with z/OS 2.1)
- In addition, Linux on System z is supported as well

RMF XP – Component Overview



- The core component of RMF XP is the GPM4CIM started task.
- Similar to the existing Distributed Data Server for z/OS (aka GPM4CIM) the GPM4CIM started task can receive HTTP requests and sends back responses in terms of structured XML documents.
- Since the GPM4CIM started task runs in the z/OS Unix System Services (USS) environment, at least one z/OS system is needed to utilize the RMF XP component.
- With z/OS V2R1, RMF XP uses the CIM client API to collect performance data from Windows systems in the same way it is used for AIX or Linux systems.

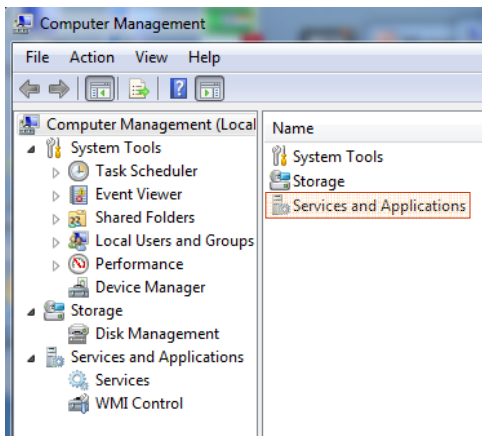
ISD Platform Agent for Windows

Components on the Windows Endpoints:

- ✓ CIM Server (Pegasus Port for Windows)
- ✓ CIM Provider
- ✓ Performance Data Collector

All Components are included in the IBM Systems Director Platform Agent for Windows

- ▶ The Package can be downloaded as installable image from the following URL:
<http://www.ibm.com/systems/software/director/downloads/agents.html>
- ▶ When the installation is complete, check if the following services have been started:



IBM CIM Listener Service	CIM Listene...	Started
IBM Command Line Trace	Enables co...	
IBM Platform Agent Watchdog Service	Watchdog S...	Started
IBM SLP Attributes Service	SLP Attribut...	Started
IBM SLP SA	IBM SLP Ser...	Started
IBM Standard Asset Manager Service		Started
IBM Windows Gatherer Service		Started
IBM Windows Repository Service		Started
IBM WMI+A Service	WMI CIM S...	Started

- The RMF XP support for the Windows operating system requires the following components on the windows endpoints:
 - CIM Server (The Open Pegasus CIM server)
 - CIM Provider
 - Performance Data Collector
- These components are included in the IBM Systems Director (ISD) Platform Agent for Windows. You will find more information about the ISD Platform Agent for Windows in the publications for „IBM Systems Director v6.3.2“
- A no-charge version of the ISD agent is available from the following website:
<http://www.ibm.com/systems/software/director/downloads/agents.html>

RMF XP Windows Support – 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
 - ▶ **S GPM4CIM.GPM4W,OS=W**

```
//GPM4CIM PROC OS=W
//STEP1 EXEC PGM=BPXBATCH,TIME=NOLIMIT,REGION=0M,
// 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
```

- To start the GPM4CIM server, RMF provides procedure GPM4CIM as a member in SYS1.PROCLIB, which you can modify according to your needs.
- The cfg parameter in the PARM statement points to the GPM4CIM configuration file.
- Since one instance of GPM4CIM is needed per platform, no unique configuration file is used. Hence, different configuration files are supplied by means of the OS variable which denotes the following target platforms:
 - A AIX on system p
 - X Linux on system x
 - Z Linux on system z
 - W Windows on system x

RMF XP Windows Support – Configuration

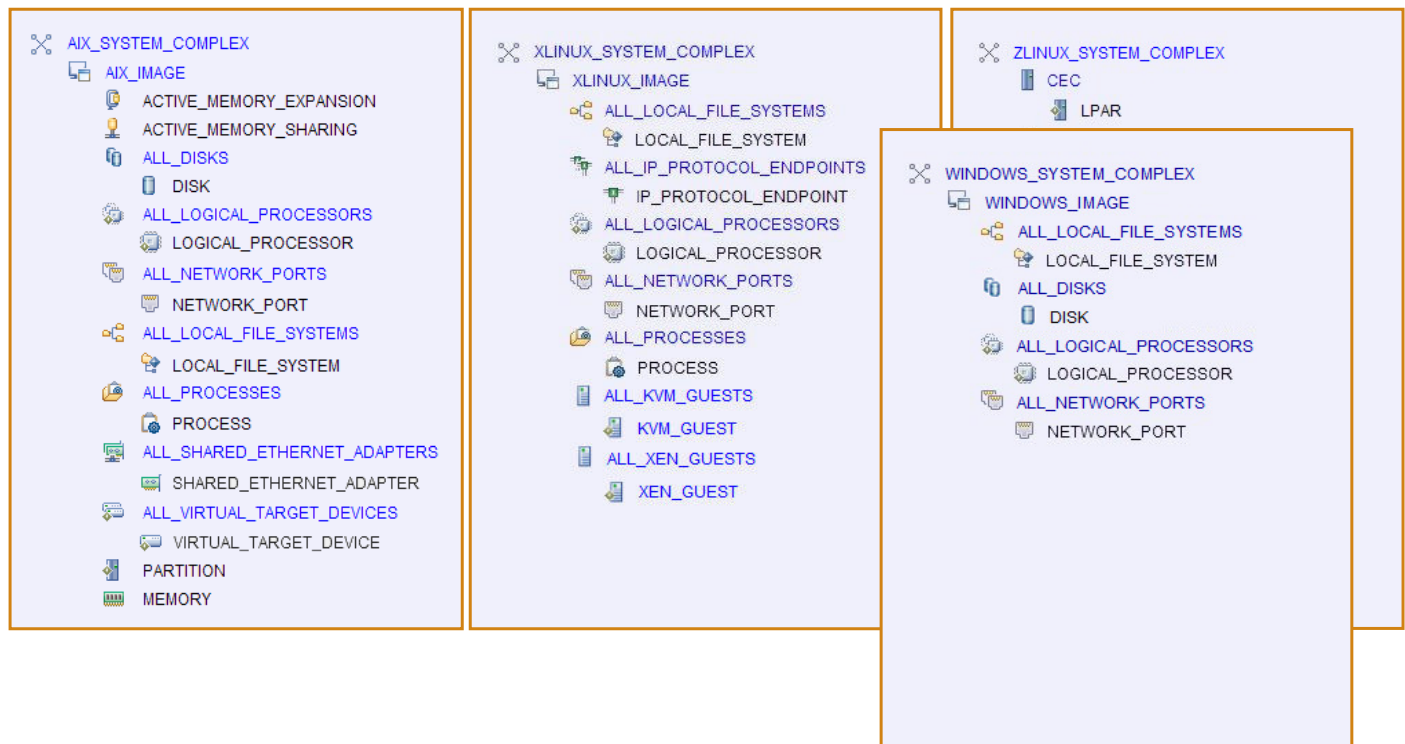
```
//GPM4CIM PROC OS=A
//STEP1 EXEC PGM=BPXBATCH,TIME=NOLIMIT,REGION=0M,
// PARM='PGM /usr/lpp/gpm/bin/gpm4cim cfg=/etc/gp /gpm4&OS..cfg'
//STDENV DD PATH='/etc/gpm/gpm4cim.env'
//STDOUT DD PATH='/var/gpm/logs/gpm4cim&OS..out',
// PATHOPTS=(OWRONLY,OCREAT,OTRUNC),
// PATHMODE=(SIRUSR,SIWUSR,SIRGRP)
//STDERR DD PATH='/var/gpm/logs/gpm4cim&OS..trc',
// PATHOPTS=(OWRONLY,OCREAT,OTRUNC),
// PATHMODE=(SIRUSR,SIWUSR,SIRGRP)
//SYSPRINT DD SYSOUT=*
//SYSOUT DD SYSOUT=*
// PEND
```



```
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. */
INTERVAL(300) /* Length of the monitoring interval */
WIN_COMPLEX(WIN7PLEX) /* Name of system complex */
WIN_IMAGE(w7rmf1.boeb1ingen.de.ibm.com:5988) /* Hostname of member */
WIN_IMAGE(w7rmf2.boeb1ingen.de.ibm.com:5988) /* Hostname of member */
```

- The GPM4CIM parameters are supplied with the platform specific configuration files /etc/gpm/gpm4[A|X|Z|W].cfg.
- This allows to run one separate GPM4CIM instance per platform.
- As a matter of course, multiple instances of GPM4CIM can be started for the same platform as well. In this case a dedicated copy of the configuration file should be provided per instance.
- The following configuration parameters are specifically for GPM4CIM:
 - AIX_COMPLEX | LNX_COMPLEX | LNZ_COMPLEX | WIN_COMPLEX:
 - Specifies an arbitrary name for the system complex.
 - AIX_IMAGE | LNX_IMAGE | LNZ_IMAGE | WIN_IMAGE:
 - Hostname or IP-address of one or more images running the specified operating system.
- Due to different resource models all images within the same complex must run the same operating system.

RMF XP Windows Support – Resource Model



- 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.
- The RMF XP support for the Windows operating system adds another resource model with the WINDOWS_SYSTEM_COMPLEX as top level resource of the resource tree.

RMF XP Windows Support – Data Portal (Resource Tree)

The screenshots illustrate the navigation through the RMF Performance Data Portal. The top-left window shows the main portal with a table of resources. The top-right window shows the 'Children of: ,WINPLEX,WINDOWS_SYSTEM_COMPLEX' view. The bottom-left window shows the 'Children of: IBM-UO01LB3251E,*_ALL_DISKS' view. The bottom-right window shows the 'Children of: ,IBM-UO01LB3251E,WINDOWS_IMAGE' view.

RMF Performance Data Portal - Main View

Welcome, you are connected to: ,WINPLEX,WINDOWS_SYSTEM_COMPLEX

Icon	Resource	Metrics	Attributes	Res-Type
	,WINPLEX,WINDOWS_SYSTEM_COMPLEX	Metrics	N/A	

RMF-DDS-Server GPM4CIM - | Quality Level: 3100

RMF Performance Data Portal - Children of: ,WINPLEX,WINDOWS_SYSTEM_COMPLEX

Icon	Resource	Metrics	Attributes	Res-Type
	.BR9MFNPM,WINDOWS_IMAGE	Metrics	N/A	WINDOWS_IMAGE
	JBM-GOEBU66ACK1,WINDOWS_IMAGE	Metrics	N/A	WINDOWS_IMAGE
	JBM-UO01LB3251E,WINDOWS_IMAGE	Metrics	N/A	WINDOWS_IMAGE
	Imcc-12,WINDOWS_IMAGE	Metrics	N/A	WINDOWS_IMAGE

RMF Performance Data Portal - Children of: IBM-UO01LB3251E,*_ALL_DISKS

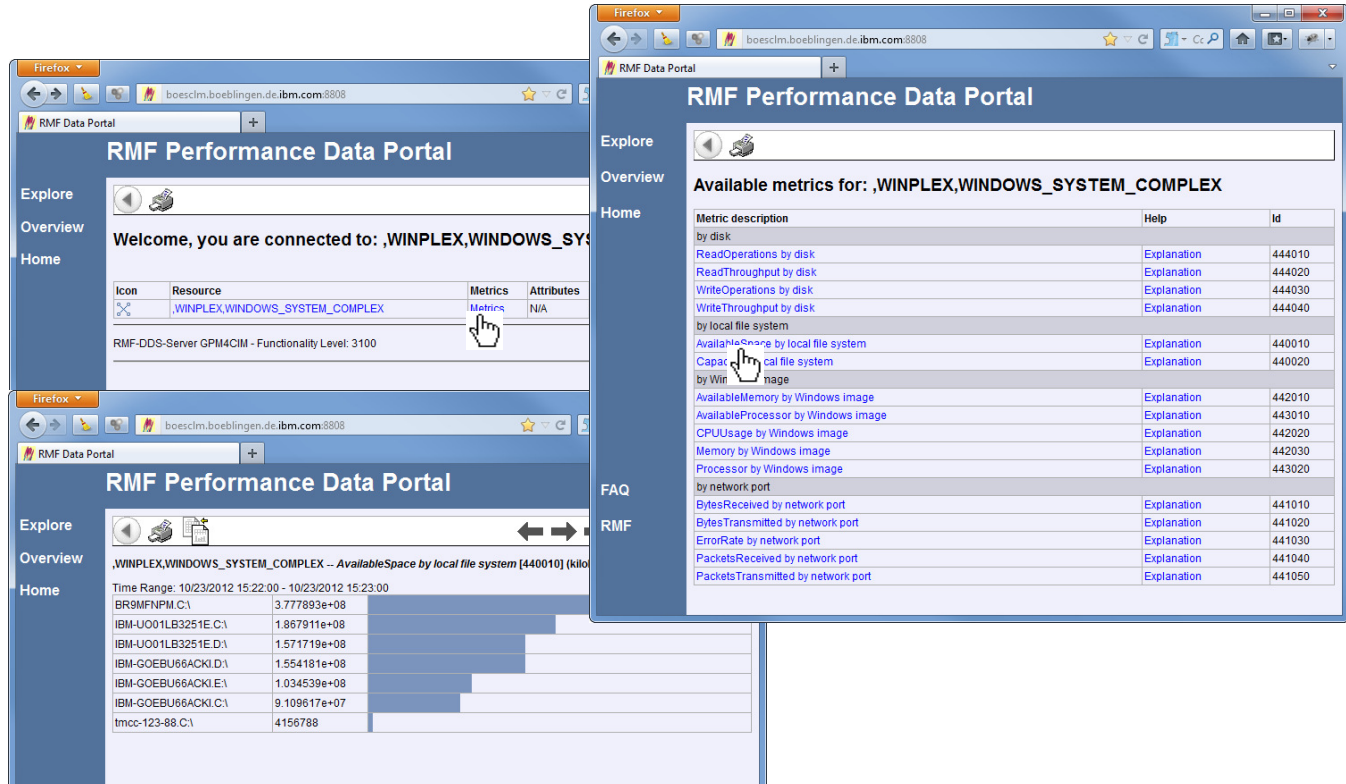
Icon	Resource	Metrics	Attributes	Res-Type
	IBM-UO01LB3251E,C:_DISK	Metrics	N/A	DISK
	IBM-UO01LB3251E,D:_DISK	Metrics	N/A	DISK
	IBM-UO01LB3251E,_Total.DISK	Metrics	N/A	DISK

RMF Performance Data Portal - Children of: ,IBM-UO01LB3251E,WINDOWS_IMAGE

Icon	Resource	Metrics	Attributes	Res-Type
	IBM-UO01LB3251E,*_ALL_DISKS	Metrics	N/A	ALL_DISKS
	IBM-UO01LB3251E,*_NETWORK_PORTS	Metrics	N/A	ALL_NETWORK_PORTS
	IBM-UO01LB3251E,*_LOCAL_FILE_SYSTEMS	Metrics	N/A	ALL_LOCAL_FILE_SYSTEMS
	IBM-UO01LB3251E,*_LOGICAL_PROCESSOR	Metrics	N/A	LOGICAL_PROCESSOR

- Once you connect with a web browser to GPM4CIM, the System Complex appears as top level resource.
- Now you can navigate through the resource tree by simply clicking on every individual resource which is marked as hyperlink.

RMF XP Windows Support – Data Portal (Metrics)

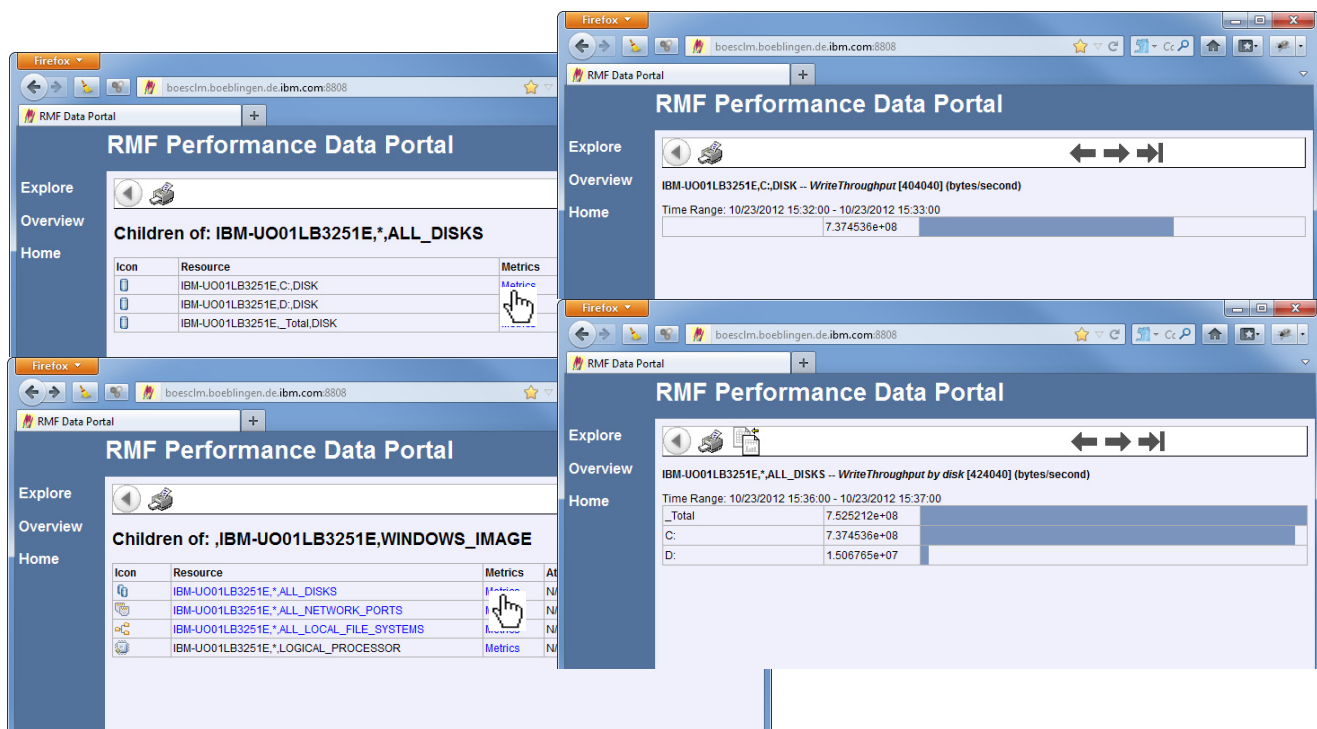


The screenshot displays the RMF Performance Data Portal interface. The main window shows the 'RMF Performance Data Portal' title and a navigation sidebar with 'Explore', 'Overview', and 'Home' sections. The 'Home' section displays a table of resources with columns for 'Icon', 'Resource', 'Metrics', and 'Attributes'. A hand cursor is pointing at the 'Metrics' column for the resource '.WINPLEX,WINDOWS_SYSTEM_COMPLEX'. A secondary window is overlaid on top, showing the 'Available metrics for: ,WINPLEX,WINDOWS_SYSTEM_COMPLEX' list. This list is organized into categories: 'by disk', 'by local file system', 'by Windows image', and 'by network port'. Each metric entry includes a description, an 'Explanation' link, and an 'Id' value.

Metric description	Help	Id
by disk		
ReadOperations by disk	Explanation	444010
ReadThroughput by disk	Explanation	444020
WriteOperations by disk	Explanation	444030
WriteThroughput by disk	Explanation	444040
by local file system		
AvailableSpace by local file system	Explanation	440010
Capacity by local file system	Explanation	440020
by Windows image		
AvailableMemory by Windows image	Explanation	442010
AvailableProcessor by Windows image	Explanation	443010
CPUUsage by Windows image	Explanation	442020
Memory by Windows image	Explanation	442030
Processor by Windows image	Explanation	443020
by network port		
BytesReceived by network port	Explanation	441010
BytesTransmitted by network port	Explanation	441020
ErrorRate by network port	Explanation	441030
PacketsReceived by network port	Explanation	441040
PacketsTransmitted by network port	Explanation	441050

- When you click on the metrics column for a resource, the list of metrics that are applicable for this resource is displayed.
- Once you select a certain metric from this list, the metric value(s) for the current interval are displayed instantly.

RMF XP Windows Support – Data Portal (Metrics Values)



The image displays four overlapping screenshots of the RMF Performance Data Portal interface, showing different views and data tables.

Top Left Screenshot: Shows the "RMF Performance Data Portal" with a table of children for the resource "IBM-UO01LB3251E,*ALL_DISKS".

Icon	Resource	Metrics
	IBM-UO01LB3251E.C.DISK	WriteThroughput [404040] (bytes/second)
	IBM-UO01LB3251E.D.DISK	
	IBM-UO01LB3251E_Total.DISK	

Top Right Screenshot: Shows the "RMF Performance Data Portal" with a table of children for the resource "IBM-UO01LB3251E,*ALL_DISKS - WriteThroughput by disk [424040] (bytes/second)".

Resource	Value
_Total	7.374536e+08

Bottom Left Screenshot: Shows the "RMF Performance Data Portal" with a table of children for the resource "IBM-UO01LB3251E,WINDOWS_IMAGE".

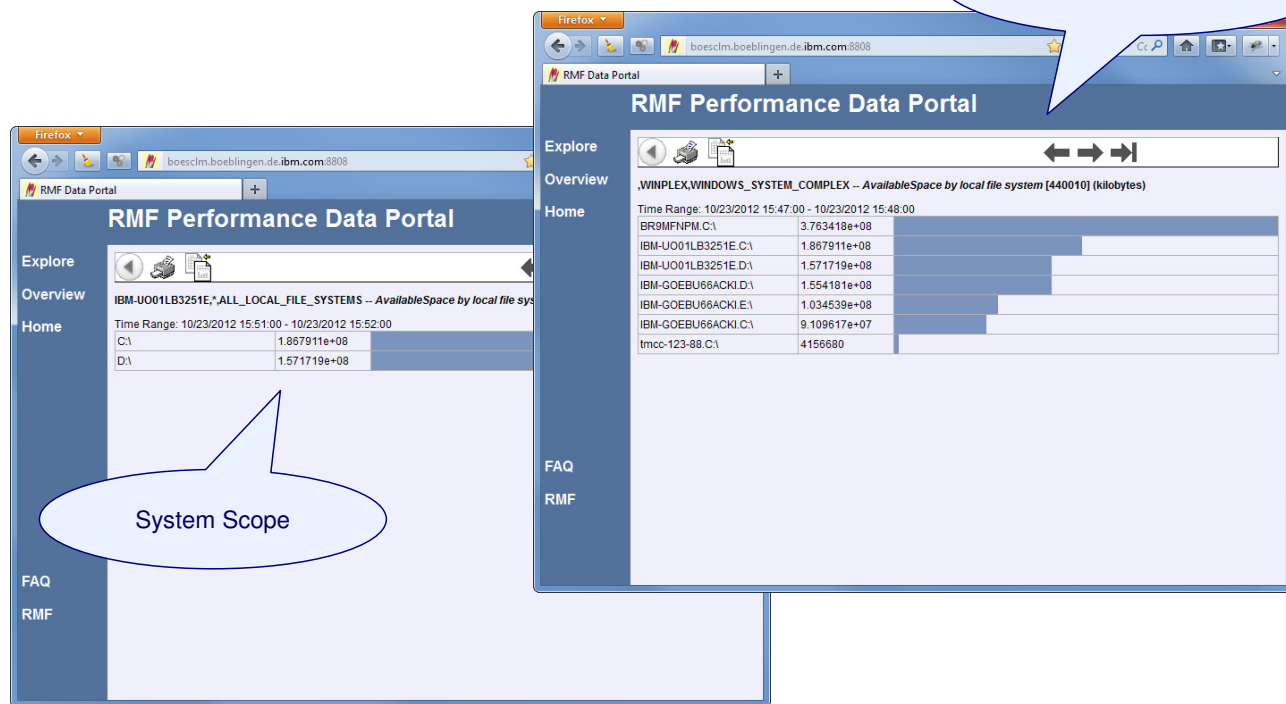
Icon	Resource	Metrics	At
	IBM-UO01LB3251E,*ALL_DISKS	WriteThroughput [404040] (bytes/second)	NI
	IBM-UO01LB3251E,*ALL_NETWORK_PORTS		NI
	IBM-UO01LB3251E,*ALL_LOCAL_FILE_SYSTEMS		NI
	IBM-UO01LB3251E,*LOGICAL_PROCESSOR	LogicalProcessor [404040] (bytes/second)	NI

Bottom Right Screenshot: Shows the "RMF Performance Data Portal" with a table of children for the resource "IBM-UO01LB3251E,*ALL_DISKS - WriteThroughput by disk [424040] (bytes/second)".

Resource	Value
_Total	7.525212e+08
C:	7.374536e+08
D:	1.506765e+07

- Basically we distinguish two types of metrics:
 - Single valued metrics, which consist of just one value in terms of a string
 - List valued metrics, which consist of a list of name/value pairs
- As a matter of course, a certain value should be identical for the same resource, regardless whether it is represented as single value or as part of a list

RMF XP Windows Support – Data Portal (Metrics Scope)



System Scope

System Complex Scope

RMF Performance Data Portal

Explore Overview Home

IBM-UO01LB3251E,*ALL_LOCAL_FILE_SYSTEMS -- AvailableSpace by local file system

Time Range: 10/23/2012 15:51:00 - 10/23/2012 15:52:00

C:\	1.867911e+08	
D:\	1.571719e+08	

FAQ RMF

RMF Performance Data Portal

Explore Overview Home

.WINPLEX,WINDOWS_SYSTEM_COMPLEX -- AvailableSpace by local file system [440010] (kilobytes)

Time Range: 10/23/2012 15:47:00 - 10/23/2012 15:48:00

BR9MFNPM.C:\	3.763418e+08	
IBM-UO01LB3251E.C:\	1.867911e+08	
IBM-UO01LB3251E.D:\	1.571719e+08	
IBM-GOEBU66ACKI.D:\	1.554181e+08	
IBM-GOEBU66ACKI.E:\	1.034539e+08	
IBM-GOEBU66ACKI.C:\	9.109617e+07	
tmcc-123-88.C:\	4156680	

FAQ RMF

- All metrics are promoted to the System Complex as top-level resource.
- Once a metric is selected from this context, all resource names are prefixed with the system name in order to ensure that a certain resource can be identified uniquely within the System Complex.

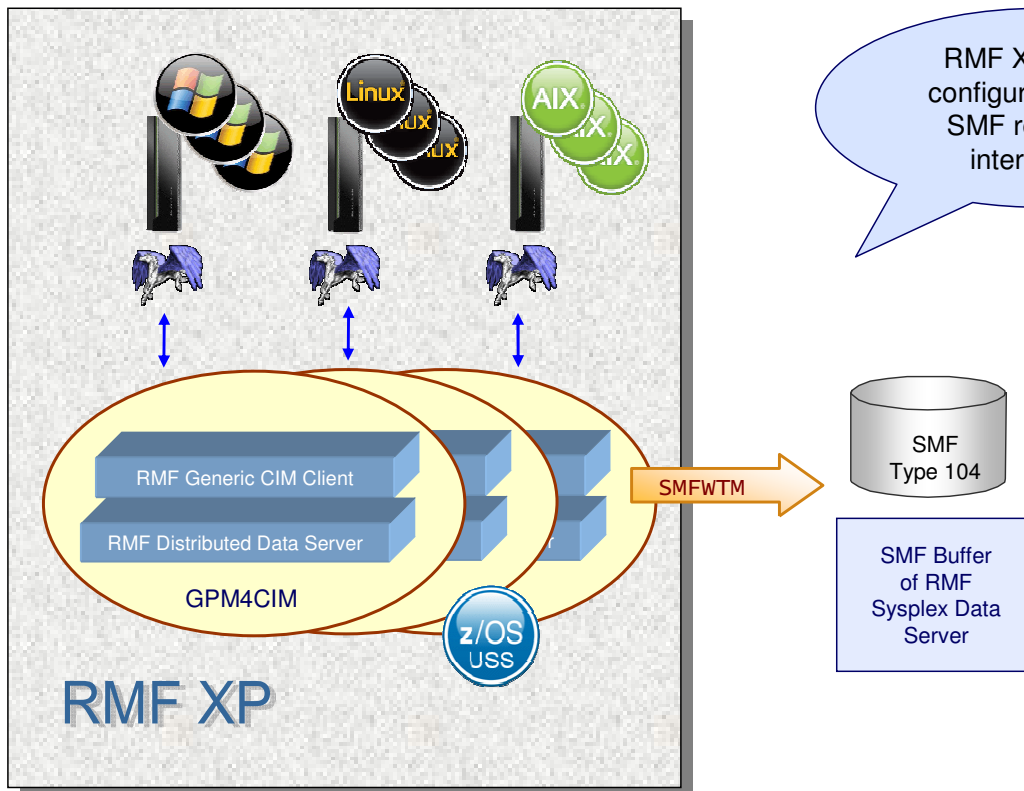
RMF XP – SMF Recording Facility

Rationale

- ▶ Data source for after the facts analysis and accounting
- ▶ SMF records are the reliable standard on z/OS for decades
- ▶ One consistent repository for z/OS and distributed platforms
- ▶ Manage z/OS AND distributed platforms from z/OS
- ▶ Well-proven SMF postprocessing tools are already in place
- ▶ RMF infrastructure can be reused in terms of the RMF Sysplex Dataserver

- RMF Cross Platform Monitoring (RMF XP), introduced with z/OS V1R13 RMF, provides an integrated performance monitoring solution for heterogeneous operating systems running on IBM system z or zBX hardware
- The GPM4CIM server collects the data from the remote AIX, Linux and Windows systems by means of the standard CIM client API.
- However, beyond of the online monitoring capabilities for the new platforms, there was no possibility to store the data persistently for later reporting.
- Especially for z/OS customers, SMF records are the standard repository for all kinds of long term measurement and event data.
- With z/OS V2R1 the RMF GPM4CIM component is extended with the new SMF persistence capability as an additional vehicle for long-term performance analysis and capacity planning.

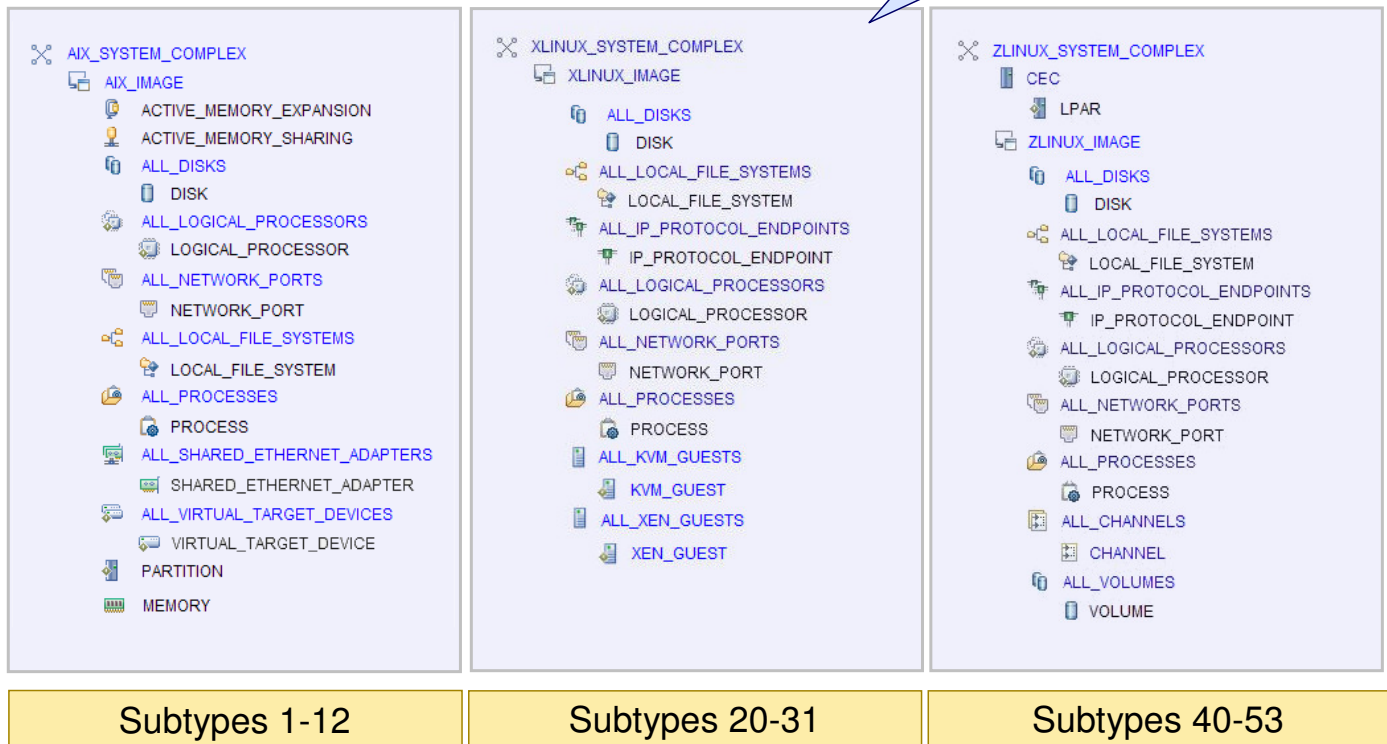
RMF XP & SMF Records



- Performance data collected from the distributed operating systems can be written to the new SMF Record Type 104 (x'68').
- The new SMF Record Type 104 is written to the currently active SMF Dataset of the z/OS system running the GPM4CIM started task.
- Alternatively a copy of the SMF record image can be written to the SMF Buffer of the RMF Sysplex Data Server. This alternative is not an RMF XP capability, it just exploits existing RMF infrastructure.

RMF XP & SMF Records

One Subtype
per Metric Category



- The type 104 SMF record – *RMF Distributed Platform Performance Data* – serves as a container for all measurement data of non z/OS platforms.
- For each platform, the system writes the following range of subtypes:
 - Subtype 1-12 AIX on System p performance data
 - Subtype 20-31 Linux on System x performance data
 - Subtype 40-53: Linux on System z performance data
 - Subtype 60-64: Windows on System x performance data

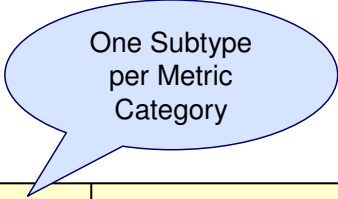
RMF XP & SMF Records

- ✂ WINDOWS_SYSTEM_COMPLEX
 - 📁 WINDOWS_IMAGE
 - 🧠 LOGICAL_PROCESSOR
 - 📁 ALL_LOCAL_FILE_SYSTEMS
 - 📁 LOCAL_FILE_SYSTEM
 - 📁 ALL_DISKS
 - 📁 DISK
 - 📁 ALL_NETWORK_PORTS
 - 📁 NETWORK_PORT

One Subtype
per Metric Category

Subtypes 60-64

RMF XP & SMF Records



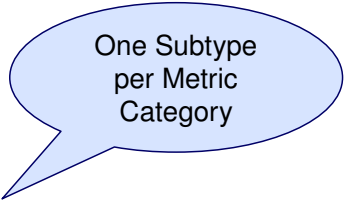
One Subtype
per Metric
Category

AIX on System p	ST	Linux on System x	ST	Linux on System z	ST
AIX_ActiveMemoryExpansion	1	Linux_IPProtocolEndpoint	20	Linux_IPProtocolEndpoint	40
AIX_Processor	2	Linux_LocalFileSystem	21	Linux_LocalFileSystem	41
AIX_ComputerSystem	3	Linux_NetworkPort	22	Linux_NetworkPort	42
AIX_Disk	4	Linux_OperatingSystem	23	Linux_OperatingSystem	43
AIX_NetworkPort	5	Linux_Processor	24	Linux_Processor	44
AIX_FileSystem	6	Linux_UnixProcess	25	Linux_UnixProcess	45
AIX_Memory	7	Linux_Storage	26	Linux_Storage	46
AIX_OperatingSystem	8	Linux_KVM	30	Linux_zCEC	50
AIX_Process	9	Linux_Xen	31	Linux_zLPAR	51
AIX_SharedEthernetAdapter	10			Linux_zChannel	52
AIX_ActiveMemorySharing	11			Linux_zECKD	53
AIX_VirtualTargetDevice	12				

- One specific subtype is used to collect one individual CIM metric category according to the CIM data model on the affected platform.
- The CIM metric category, in return, is mapped to the resource models used by RMF XP on the supported platforms. For example, metrics from the CIM metric category AIX_ActiveMemoryExpansion are related to metrics from the ACTIVE_MEMORY_EXPANSION resource used by RMF XP for AIX on System p.
- You will find a complete mapping of CIM Metric Categories to RMF XP Resource Types in the description of the SMF 104 record in the ,z/OS V2R1.0 MVS System Management Facilities (SMF)' book.

RMF XP & SMF Records

Windows on System x	ST
Windows_LocalFileSystem	60
Windows_NetworkPort	61
Windows_OperatingSystem	62
Windows_Processor	63
Windows_Storage	64



One Subtype
per Metric
Category

RMF XP & SMF Records

Offsets	Name	Length	Format	Description												
Common header for SMF record type 104																
0	0 SMF104LEN	2	binary	Record length. This field and the next field (total of four bytes) form the RDW (record descriptor word).												
2	2 SMF104SEG	2	binary	Segment descriptor (see record length field).												
4	4 SMF104FLG	1	binary	System indicator: <table border="0"> <tr> <td>Bit</td> <td>Meaning When Set</td> </tr> <tr> <td>0</td> <td>New record format</td> </tr> <tr> <td>1</td> <td>Subtypes used</td> </tr> <tr> <td>2</td> <td>Reserved</td> </tr> <tr> <td>3-6</td> <td>Version indicators*</td> </tr> <tr> <td>7</td> <td>System is running in PR/SM mode</td> </tr> </table>	Bit	Meaning When Set	0	New record format	1	Subtypes used	2	Reserved	3-6	Version indicators*	7	System is running in PR/SM mode
Bit	Meaning When Set															
0	New record format															
1	Subtypes used															
2	Reserved															
3-6	Version indicators*															
7	System is running in PR/SM mode															
5	5 SMF104RTY	1	binary	Record type 104 (X'68').												
6	6 SMF104TME	4	binary	Time since midnight, in hundredths of a second, that the record was moved into the SMF buffer.												
10	A SMF104DTE	4	packed	Date when the record was moved into the SMF buffer, in the form <i>0cyydddF</i> .												
14	E SMF104SID	4	EBCDIC	System identification (from the SMFPRMxx SID parameter).												
18	12 SMF104SSI	4	EBCDIC	Subsystem identification (GPM).												
22	16 SMF104STY	2	binary	Record subtype.												
24	18 SMF104TRN	2	binary	Number of triplets in this record. A triplet is a set of three SMF fields (offset/length/number values) that defines a section of the record. The offset is the offset from the RDW.												
26	1A	2		Reserved.												
28	1C SMF104PRS	4	binary	Offset to RMF XP product section from the RDW.												
32	20 SMF104PRL	2	binary	Length of RMF XP product section.												
34	22 SMF104PRN	2	binary	Number of RMF XP product sections.												
Header extension for all subtypes																
36	24 SMF104ICS	4	binary	Offset to image control section from the RDW.												
40	28 SMF104ICL	2	binary	Length of image control section.												
42	2A SMF104ICN	2	binary	Number of image control sections.												
44	2C SMF104MES	4	binary	Offset to metric section from the RDW.												
48	30 SMF104MEL	2	binary	Length of metric section.												
50	32 SMF104MEN	2	binary	Total number of metric sections.												

SMF Header with common Layout

- GPM4CIM writes one SMF record subtype per interval. That means that one subtype contains the performance data for all systems where GPM4CIM is connected to.
- Control sections will be provided to allow exploiters of the SMF records to assign the performance data to the appropriate systems.
- The structure of the SMF record type 104 follows the general guidelines for SMF records including the common header.
- All sections can be addressed by means of so called triplets, where a triplet describes individual sections with offset, length and number.
- This allows to extract data from the new SMF record with standard SMF postprocessing tools.

RMF XP & SMF Records

RMF
Product Section
with common Layout

Offsets	Name	Length	Format	Description
0	0 SMF104MFV	2	packed	RMF version number.
2	2 SMF104PRD	8	EBCDIC	Product name (<i>RMF XP</i>).
10	A SMF104IST	4	packed	Time that the RMF XP measurement interval started, in the form <i>0hhmmssF</i> , where <i>hh</i> is the hours, <i>mm</i> is the minutes, <i>ss</i> is the seconds, and <i>F</i> is the sign.
14	E SMF104DAT	4	packed	Date when the RMF measurement interval started, in the form <i>0cyydddF</i> .
18	12 SMF104INT	4	packed	Duration of RMF measurement interval, in the form <i>mmsstttF</i> , where <i>mm</i> is the minutes, <i>ss</i> is the seconds, <i>ttt</i> is the milliseconds, and <i>F</i> is the sign. The end of the measurement interval is the sum of the recorded start time and this field.
22	16 SMF104LGO	8	binary	Offset GMT to local time (STCK format).
30	1E	2		Reserved.
32	20 SMF104XPL	2	binary	RMF XP functionality level.
34	12 SMF104CPX	24	EBCDIC	System complex name, specified with the COMPLEX parameter in the <i>cfg4AIXIZ</i> configuration file.
58	3A SMF104OSL	8	EBCDIC	Operating system label served by RMF XP (AIX or LINUX).
66	42 SMF104PLT	2	binary	Platform type served by RMF XP: 0 System p 1 System x 2 System z
68	44 SMF104MVS	8	EBCDIC	z/OS software level for the current system (consists of an acronym and the version, release, and modification level - <i>ZVvrrmm</i>).
76	4C SMF104XNM	8	EBCDIC	Sysplex name of the current sysplex as defined in parmlib member COUPLExx.
84	54 SMF104SNM	8	EBCDIC	System name for the current system as defined in parmlib member IEASYSxx SYSNAME parameter.

- The SMF 104 RMF Product Section is slightly different from the SMF 70-79 records since a subset of information is not available for the new platforms (e.g. cycle length, sample number).
- On the other hand, the SMF 104 RMF Product Section contains information which is not available in a z/OS environment (e.g. SMF104CPX, SMF104OSL, SMF104PLT).

RMF XP & SMF Records

Offsets	Name	Length	Format	Description
0	0 SMF104MIM	64	EBCDIC	Name of this monitored image, extracted from the CIM metrics collection.
64	40 SMF104TIM	14	EBCDIC	Timestamp in the format <i>yyyymmddhhmmss</i> , extracted from the CIM metrics collection.
78	4E SMF104DUR	14	EBCDIC	Interval duration in the format <i>yyyymmddhhmmss</i> , extracted from the CIM metrics collection.
92	5C SMF104CIM	64	EBCDIC	Name of the image where the CIM server is running, specified with the IMAGE parameter in the <i>cfg4AIXIZ</i> configuration file.
156	9C SMF104OST	4	EBCDIC	Operating system type where the CIM server is running, extracted from the OSType attribute of the CIM_Operating_System instance: 9 AIX 36 Linux
160	A0 SMF104OSV	64	EBCDIC	Operating system version where the CIM server is running, extracted from the version attribute of the CIM_Operating_System instance.
224	E0 SMF104CTZ	4	EBCDIC	Current time zone, extracted from the CurrentTimeZone attribute of the CIM_Operating_System instance. This value represents the GMT offset in minutes.
228	E4 SMF104MIND	2	binary	Index of first metric section associated with this monitored image.
230	E6 SMF104MNUM	2	binary	Number of metric sections associated with this monitored image.



Image Control Section

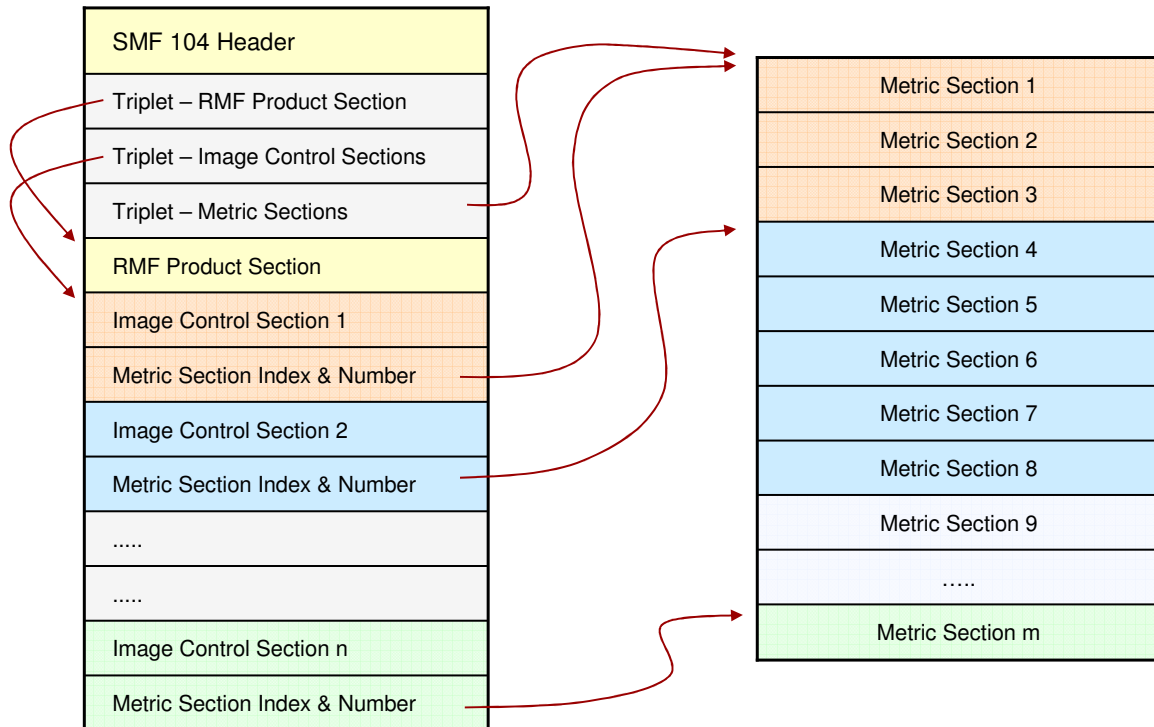
Offsets	Name	Length	Format	Description
0	0 R10406MNAME	64	EBCDIC	Name of measured element, extracted from the MeasuredElementName attribute of the CIM_BaseMetricValue instance.
64	40 R10406AS	8	floating	Available space for this filesystem in megabytes. (AvailableSpace)
72	48 R10406TS	8	floating	Total space for this filesystem in megabytes. (TotalSpace)
80	50 R10406US	8	floating	Used space for this filesystem in megabytes. (UsedSpace)



Metric Section

- The SMF Type 104 Record contains performance data that has been collected from one or more systems resp. images.
- There is one image control section per image. Beyond general information (e.g. time stamps) the image control section describes the corresponding metric sections with the measured elements and their metric values.

RMF XP & SMF Records



- All image control sections are located consecutively right behind the RMF product section.
- In the same way, all metric sections are following right behind the last image control section.
- The metric section index and number within the image control section allows to identify the metric sections belonging to a certain image.
- Since one SMF record is limited to the length of 32756 bytes, an individual record can be splitted and not all metric sections for a certain image might be located in the same record.
- However, in any case, one single record is self-containing: that means, a meaningful report can be produced just by using one single record. There is no need to combine multiple records from the same subtype for reporting purposes.

RMF XP & SMF Records

RMF ERBSCAN
Utility maps all
Sections of the SMF
Type 104 record

```
-> AIX Image Control Section (2)
=====
```

```
#1: +0000: 97F69994 86F10000 00000000 00000000 *p6rmf1      *
    +0010: 00000000 00000000 00000000 00000000 *              *
    +0020: 00000000 00000000 00000000 00000000 *              *
    +0030: 00000000 00000000 00000000 00000000 *              *
    +0040: F2F0F1F1 F0F9F0F8 F1F6F2F7 F0F3F0F0 *2011090816270300*
    +0050: F0F0F0F0 F0F0F0F0 F0F1F0F1 97F69994 *000000000101p6rm*
    +0060: 86F14882 96858293 89958785 95488485 *f1.boeblingen.de*
    +0070: 48898294 48839694 00000000 00000000 *.ibm.com      *
    +0080: 00000000 00000000 00000000 00000000 *              *
    +0090: 00000000 00000000 00000000 F9000000 *              9  *
    +00A0: F64BF14B F04BF000 00000000 00000000 *6.1.0.0      *
    +00B0: 00000000 00000000 00000000 00000000 *              *
    +00C0: 00000000 00000000 00000000 00000000 *              *
    +00D0: 00000000 00000000 00000000 00000000 *              *
    +00E0: F6F00000 00000002                *60          *
```

```
-> Image name      : p6rmf1
-> Operating system : 6.1.0.0
-> First metric sec. : #1
-> Number of metrics : 2
```

```
-> AIX_ProcessorMetrics (4)
=====
```

```
#1: +0000: 8397A4F0 00000000 00000000 00000000 *cpu0        *
    +0010: 00000000 00000000 00000000 00000000 *              *
    +0020: 00000000 00000000 00000000 00000000 *              *
    +0030: 00000000 00000000 00000000 00000000 *              *
    +0040: 414C5441 355475A3 425F383E 425AEE63 * <è  èÏtâ^  â!ÓÃ*
    +0050: 412E1298 88F861A6 411E41B3 28B6D86F * qh8/w  ·  ¶Q? *
    +0060: 3F28064E A3A70EA2                * +tx s      *
```

```
-> Measured element : cpu0
-> List of values   :
    '414C5441355475A3'X  4.77057000
    '425F383E425AEE63'X  95.2196999
    '412E129888F861A6'X  2.87954000
    '411E41B328B6D86F'X  1.89104000
    '3F28064EA3A70EA2'X  0.00977164000
```

- The RMF utility ERBSCAN has been extended to support the new SMF type 104
- Beyond the header sections, the content of the image sections as well as the metric sections is displayed in hex and in character format.
- The individual metric values are stored in double floating point format. ERBSCAN translates all the values to the decimal format and displays it right behind the hexdump section.

RMF XP & SMF Records

```
//GPM4CIM PROC OS=A
//STEP1 EXEC PGM=BPXBATCH,TIME=NOLIMIT,REGION=0M,
// PARM='PGM /usr/lpp/gpm/bin/gpm4cim cfg=/etc/gp /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
```



```
MAXSESSIONS_HTTP(20) /* MaxNo of concurrent
HTTP_PORT(8805) /* Port number for HT
HTTP_ALLOW(*) /* Mask for hosts tha
HTTP_NOAUTH(*) /* No server can acces
INTERVAL(300) /* Length of the mon
AIX_COMPLEX(WEBPLEX) /* Name of system complex
AIX_IMAGE(p6rmf1.boeb1ingen.de.ibm.com:5988) /* Hostname of member */
AIX_IMAGE(p6rmf2.boeb1ingen.de.ibm.com:5988) /* */
RECORD /* Write SMF Records */
```

New global Option:
RECORD / NORECORD
Default: NORECORD

- 💡 Change RECORD Option dynamically: F GPM4CIM, RECORD/NORECORD
- ✓ GPM253I SMF RECORDING IS NOW ON/OFF

- A new option RECORD/NORECORD within the RMF XP configuration file (`/etc/gpm/gpm4[A|X|Z|W].cfg`) is introduced to specify that the GPM4CIM server writes SMF type 104 records
- The scope of this option is global, this means that the option is applied to all supported subtypes.
- Of course, SMF recording can also be enabled or disabled with a MODIFY command:

```
F GPM4CIM,[NO]RECORD.
```

- Once the RECORD parameter is set to on, SMF 104 records are written frequently and the completion of an interval is indicated by new message:

```
GPM280I RMF XP INTERVAL PROCESSING FOR name COMPLETE
```

RMF XP & SMF Records

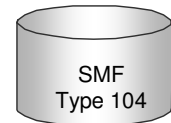
```

ACTIVE                               /* ACTIVE SMF RECORDING*/
DSNAME(SYS1.&SYSNAME..MAN1,
        SYS1.&SYSNAME..MAN2,
        SYS1.&SYSNAME..MAN3)
MAXDORM(3000)                         /* WRITE AN IDLE BUFFER AFTER
MEMLIMIT(20000M)                       /* MEMLIMIT ABOVE THE BAR BHL
STATUS(010000)                         /* WRITE SMF STATS AFTER 1 HOUR
JWT(0900)                               /* 522 AFTER 15 HOURS
SID(&SMFID)                             /* SYSTEM ID IS SYSBLD
LISTDSN                                /* LIST DATA SET STATUS AT IPL
INTVAL(15)
SYNCVAL(00)
SYS(TYPE(30,42,70:79,103,104(1:12,20:31,40:53,60:64),108),
     EXITS(IEFU83,IEFU84,IEFU85,IEFACTRT,IEFUJV,IEFUSI,
          IEFUJP,IEFUSO,IEFUJI,IEFUTL,IEFU29,IEFUAV),
     INTERVAL(SMF,SYNC),NODETAIL)

```

Control SMF Recording on Subtype Level via SMFPRMxx Parmlib Member

SMFWTM



```

//RMF   PROC
//IEFPROC EXEC PGM=ERBMFMFC,REGION=32M,TIME=1440,
//      PARM='SMFBUF(RECTYPE(30,70:79,104(1:12,20:31,40:53,60:64)))'

```

SMFWTM

SMF Buffer of RMF Sysplex Data Server



Control SMF Buffering on Subtype Level via RMF and SMFBUF Parameter

- Use the SMF built-in facilities in order to control the SMF 104 recording on subtype level. You can dynamically switch on or off SMF recording for a specific subtype by changing the active SMFPRMxx parmlib member. For example:

```
SYS(TYPE(30,42,70:79,103,104(1:12,20:31,40:53,60:64),108),...
```
- The capability to receive and hold real-time copies of SMF records in the in-storage SMF buffer of the RMF Sysplex Data Server is a standard feature of RMF. To use this feature, modify the PARM statement of the RMF procedure to include SMF type 104.

z/OSMF Application Linking (Resource Monitoring & WLM)

- ▶ The definitions of Workload Management determine the performance behavior of the systems.
- ▶ Resource Monitoring visualizes the performance behavior.
- ▶ Link z/OSMF WLM and RM to each other:
 - ⇒ When you work with WLM service definitions:
Jump to Resource Monitoring to visualize the resulting performance.
 - ⇒ When you detect abnormal metric values in Resource Monitoring:
Jump to Workload Management to look at the service definition.
- ▶ Performance metrics can be viewed more easily in context with the active service definition/policy and vice versa.

- The new z/OSMF Application Linking allows to link the following tasks of the Performance category to each other in context:
 - The z/OSMF Workload Management task, which allows you to define, manage, install and activate your WLM service definitions and policies.
 - The z/OSMF System Status, which provides a quick performance status overview of all the sysplexes in your data center.
 - The z/OSMF Resource Monitoring task, which allows you to define monitoring dashboards that show performance results in detailed bar charts.
- z/OSMF Application Linking support is available for z/OS 1.13 with the following new function APARs:
 - PM74502 (z/OSMF Base)
 - PM74508 (Resource Monitoring)
 - PM74517 (WLM)
 - PM74925 (WLM)
- The following foils show examples of links between the z/OSMF WLM and Resource Monitoring plug-ins.

From WLM Status to RM System Status

Welcome x Workload Man... x

Workload Management Help

Overview WLM Status x

WLM Status for Sysplex ZMF1PLEX from System ZMF2

Active Service Policy [\(View performance of active policy\)](#)

Name: STANDARD
 Description: BB default policy 1
 Activated: Jan 29, 2013 3:14:59 PM GMT
 Activated by: jbau from system ZMF2
 Related service definition: DEFAULT
 Functionality level: 4
 Installed: Jan 29, 2013 3:14:59 PM GMT
 Installed by: jbau from system ZMF2

Systems [\(View performance of systems\)](#)

Actions Search

Name	Used Service Policy	Activated (GMT)	WLM Status	GPMP Status	WLM Version Level	CD Level
Filter	Filter	Filter	Filter	Filter	Filter	Filter
ZMF1	STANDARD	Jan 29, 2013 3:14:59 PM	Active	Unavailable		
ZMF2	STANDARD	Jan 29, 2013 3:14:59 PM	Active	Unavailable	25	3
ZMF3	STANDARD	Jan 29, 2013 3:14:59 PM	Active	Unavailable		
ZMF4	STANDARD	Jan 29, 2013 3:14:59 PM	Active	Unavailable		
ZMF5	STANDARD	Jan 29, 2013 3:14:59 PM	Active	Unavailable		

Total: 5

Installed Service Definition

Name: DEFAULT
 Description: BB default WLM policy - test
 Installed: Jan 29, 2013 3:14:59 PM GMT
 Installed by: jbau from system ZMF2

Automatic refresh Last refresh: Jan 30, 2013 11:13:10 AM local time (Jan 30, 2013 10:13:10 AM GMT)

- By linking the Workload Management task and the System Status task of the z/OSMF Resource Monitoring plug-in, you can open the System Status task from the Workload Management task and view the status of the sysplex.
- From System Status task you can open the Workload Management task and view the active service definition, active service policy or WLM status.

RM System Status

Welcome x Workload Man... x System Status x

[Help](#)

System Status

Use this page to quickly assess the performance of the workloads running on the sysplexes in your installation. You can also use this page to define the target systems for the sysplexes and AIX or Linux system complexes that you want to monitor in the Resource Monitoring task.

Resources

Resource	System Type	Connectivity	Performance Index Status	Related Service Definition	Active WLM Policy
Filter	Filter	Filter	Filter	Filter	Filter
<input checked="" type="checkbox"/> LOCALPLEX	z/OS	Connected	⚠️ PI > 1 for unimportant periods	DEFAULT	STANDARD
<input type="checkbox"/> SCLMPLEX	z/OS	Connected	✅ PI <= 1 for all periods	Default	STANDARD
<input type="checkbox"/> SYSPLEX	z/OS	Connected	✅ PI <= 1 for all periods	SYSTES2	STANDARD
<input type="checkbox"/> IRDPLEX	z/OS	Error			

Total: 4, Selected: 1

[Refresh](#) Last refresh: Jan 30, 2013 11:18:00 AM local time (Jan 30, 2013 10:18:00 AM GMT)

Automatic refresh

From RM System Status

Welcome x Workload Man... x System Status x Help

System Status

Use this page to quickly assess the performance of the workloads running on the sysplexes in your installation. You can also use this page to define the target systems for the sysplexes and AIX or Linux system complexes that you want to monitor in the Resource Monitoring task.

Resources

Resource	System Type	Connectivity	Performance Index Status	Related Service Definition	Active WLM Policy
Filter	Filter	Filter	Filter	Filter	Filter
<input checked="" type="checkbox"/> LOCALPLEX	z/OS	Connected	⚠️ PI > 1 for unimportant periods	DEFAULT	STANDARD
<input type="checkbox"/> SCLMPLEX		Connected	✅ PI <= 1 for all periods	Default	STANDARD
<input type="checkbox"/> SYSPLEX			✅ PI <= 1 for all periods	SYSTES2	STANDARD
<input type="checkbox"/> IRDPLEX	z/OS				

- Modify Entry
- Remove Entry
- View**
 - Performance Index Details
 - Active WLM Service Definition
 - Active WLM Policy
 - WLM Status

Total: 4, Selected: 1

Last refresh: Jan 30, 2013 11:20:04 AM local time (Jan 30, 2013 10:20:04 AM GMT)

Automatic refresh

From RM System Status

Welcome x Workload Man... x System Status x Help

System Status

Use this page to quickly assess the performance of the workloads running on the sysplexes in your installation. You can also use this page to define the target systems for the sysplexes and AIX or Linux system complexes that you want to monitor in the Resource Monitoring task.

Resources

Resource	System Type	Connectivity	Performance Index Status	Related Service Definition	Active WLM Policy
<input checked="" type="checkbox"/> LOCALPLEX	z/OS	Connected	⚠️ PI > 1 for unimportant periods	DEFAULT	STANDARD
<input type="checkbox"/> SCLMPLEX		Connected	✅ PI ≤ 1 for a periods	Default	STANDARD
<input type="checkbox"/> SYSPLEX			✅ PI ≤ 1 for a periods	SYSTES2	STANDARD
<input type="checkbox"/> IRDPLEX	z/OS				

Actions ▼
 Modify Entry
 Remove Entry
 View → Performance Index Details
 Active WLM Service Definition
 Active WLM Policy
 WLM Status

Resource Monitoring

Dashboards Performance Index - LOCALPLEX ▶ x

Performance Index - LOCALPLEX (Running)

Start Pause Save Actions ▼

Important Service Class Periods	Service Class Periods
PRDTSO.1 0	STCCMD.1 0.67
	PRDTSO.1 0

Total: 4, Selected: 1

Refresh Last refresh: Jan 30, 2013 11:20:04 AM local time (Jan 30, 2013 10:20:04 AM GMT)

Automatic refresh

From RM System Status

Welcome x Workload Man... x System Status x Help

System Status

Use this page to quickly assess the performance of the workloads running on the sysplexes in your installation. You can also use this page to define the target systems for the sysplexes and AIX or Linux system complexes that you want to monitor in the Resource Monitoring task.

Resources

Resource	System Type	Connectivity	Performance Index Status	Related Service Definition	Active WLM Policy
<input checked="" type="checkbox"/> LOCALPLEX	z/OS	Connected	⚠️ PI > 1 for unimportant periods	DEFAULT	STANDARD
<input type="checkbox"/> SCLMPLEX		Connected	✅ PI <= 1 for all periods	Default	STANDARD
<input type="checkbox"/> SYSPLEX			✅ PI <= 1 for all periods	SYS TES2	STANDARD
<input type="checkbox"/> IRDPLEX	z/OS				

Resource Monitoring

Dashboards: Performance Index LOCALPLEX

Workload Management

Overview | WLM Status x | View DEFAULT x

This service definition is installed and policy STANDARD is active

Service Definition Details

Service definition name:
DEFAULT

Description:
BB default WLM policy - test

Functionality level:
004

Total: 4, Selected: 1

Last refresh: Jan 30, 2013 11:20:04 AM local time (Jan 30, 2013 10:20:04 AM GMT)

Automatic refresh

From RM System Status

Welcome x Workload Man... x System Status x Help

System Status

Use this page to quickly assess the performance of the workloads running on the sysplexes in your installation. You can also use this page to define the target systems for the sysplexes and AIX or Linux system complexes that you want to monitor in the Resource Monitoring task.

Resources

Resource	System Type	Connectivity	Performance Index Status	Related Service Definition	Active WLM Policy
<input checked="" type="checkbox"/> LOCALPLEX	z/OS	Connected	⚠️ PI > 1 for unimportant periods	DEFAULT	STANDARD
<input type="checkbox"/> SCLMPLEX		Connected	✅ PI <= 1 for all periods	Default	STANDARD
<input type="checkbox"/> SYSPLEX			✅ PI <= 1 for all periods	SYSTEMS2	STANDARD
<input type="checkbox"/> IRDPLEX	z/OS				

Actions: Modify Entry, Remove Entry, View

View dropdown: Performance Index Details, Active WLM Service Definition, Active WLM Policy, WLM Status

Total: 4, Selected: 1

Refresh Last refresh: Jan 30, 2013 11:20:04 AM local time (Jan 30, 2013 10:20:04 AM) Automatic refresh

Resource Monitoring

Workload Management

Overview WLM Status x View DEFAULT x

Service Policies > Properties This service definition is installed and policy STANDARD is active

Properties for Active Service Policy

Service policy name: STANDARD Description: BB default policy 1

Service Class Overrides Resource Group Overrides

Service Class	Period	Importance	Duration	Goal Type	Resp Goal
Filter	Filter	Filter	Filter	Filter	Filter

From RM System Status

Welcome x Workload Man... x System Status x Help

System Status

Use this page to quickly assess the performance of the workloads running on the sysplexes in your installation. You can also use this page to define the target systems for the sysplexes and AIX or Linux system complexes that you want to monitor in the Resource Monitoring task.

Resources

Actions

Resource	System Type	Connectivity	Performance Index Status	Related Service Definition	Active WLM Policy
<small>Filter</small>	<small>Filter</small>	<small>Filter</small>	<small>Filter</small>	<small>Filter</small>	<small>Filter</small>
<input checked="" type="checkbox"/> LOCALPLEX	z/OS	Connected	⚠ PI > 1 for unimportant periods	DEFAULT	STANDARD
<input type="checkbox"/> SCLMPLEX		Connected	✅ PI <= 1 for all periods	Default	STANDARD
<input type="checkbox"/> SYSPLEX			✅ PI <= 1 for all periods	SYSTES2	STANDARD
<input type="checkbox"/> IRDPLEX	z/OS				

Resource Monitoring

Workload Management

Workload Management

Overview WLM Status x View DEFAULT x

WLM Status for Sysplex ZMF1PLEX from System ZMF2

Active Service Policy (View performance of active policy)

Name: STANDARD
 Description: BB default policy 1
 Activated: Jan 29, 2013 3:14:59 PM GMT
 Activated by: jbau from system ZMF2
 Related service definition: DEFAULT
 Functionality level: 4
 Installed: Jan 29, 2013 3:14:59 PM GMT
 Installed by: jbau from system ZMF2

Res Goal Filter

Total: 4, Selected: 1

Last refresh: Jan 30, 2013 11:20:04 AM local time (Jan 30, 2013 10:20:04 AM)

Automatic refresh

From WLM to RM Dashboard (Service Classes)

Welcome x Workload Man... x

Workload Management Help

Overview WLM Status x

WLM Status for Sysplex ZMF1PLEX from System ZMF2

Active Service Policy [\(View performance of active policy\)](#)

Name: STANDARD
 Description: BB default policy 1
 Activated: Jan 29, 2013 3:14:59 PM GMT
 Activated by: jbau from system ZMF2
 Related service definition: DEFAULT
 Functionality level: 4
 Installed: Jan 29, 2013 3:14:59 PM GMT
 Installed by: jbau from system ZMF2

Systems [\(View performance of systems\)](#)

Name	Used Service Policy	Activated (GMT)	WLM Status	GPMP Status	WLM Version Level	CD Level
Filter	Filter	Filter	Filter	Filter	Filter	Filter
ZMF1	STANDARD	Jan 29, 2013 3:14:59 PM	Active	Unavailable		
ZMF2	STANDARD	Jan 29, 2013 3:14:59 PM	Active	Unavailable	25	3
ZMF3	STANDARD	Jan 29, 2013 3:14:59 PM	Active	Unavailable		
ZMF4	STANDARD	Jan 29, 2013 3:14:59 PM	Active	Unavailable		
ZMF5	STANDARD	Jan 29, 2013 3:14:59 PM	Active	Unavailable		

Total: 5

Installed Service Definition

Name: DEFAULT
 Description: BB default WLM policy - test
 Installed: Jan 29, 2013 3:14:59 PM GMT
 Installed by: jbau from system ZMF2

Automatic refresh Last refresh: Jan 30, 2013 11:13:10 AM local time (Jan 30, 2013 10:13:10 AM GMT)

- By linking the Workload Management task and the Resource Monitoring task, you can open dashboards with performance metrics for service classes, workloads and report classes from within the Workload Management task.
- From a Resource Monitoring dashboard with performance metrics for service classes, workloads and report classes you can open the corresponding information in the WLM service definition.

RM Dashboard – WLM Service Class Performance

Welcome x Workload Man... x System Status x Resource Mon... x Help

Resource Monitoring

Dashboards WLM Service Class - LOCALPLEX x

WLM Service Class - LOCALPLEX (Running)

Start Pause Save Actions

Performance Index

STCCMD. 1	0.56
HOTTSO. 1	0.5

.LOCALPLEX,SYSplex performance index by WLM service class period

01/30/2013 11:24:00 - 01/30/2013 11:25:00 (3/3)

Execution Velocity

STCCMD. 1	71	40
IRLM. 1	0	75
OMVS. 2	0	20
OMVS. 1	0	30

.LOCALPLEX,SYSplex execution velocity by WLM service class period

.LOCALPLEX,SYSplex execution velocity goal by WLM service class period

01/30/2013 11:24:00 - 01/30/2013 11:25:00 (3/3)

Response Time

HOTTSO. 1	0.015	N/A
TSOODD. 1	0	0.3
TSOODD. 2	0	1.5

Percentile Response Time

HOTTSO. 1	100	95
TSOMED. 2	N/A	90
TSOREG. 2	N/A	an

From RM Dashboard to WLM Service Classes

Welcome x Workload Man... x System Status x Resource Mon... x Help

Resource Monitoring

Dashboards WLM Service Class - LOCALPLEX x

WLM Service Class - LOCALPLEX (Running)

Start Pause Save Actions

Performance Index

STCCMD.1	0.56
HOTTSO.1	0.5

.LOCALPLEX,SYSPLX performance index by WLM service class period

01/30/2013 11:24:00 - 01/30/2013 11:25:00 (3/3)

Execution Velocity

STCCMD.1	71	40
IRLM.1	0	75
OMVS.2	0	20
OMVS.1	0	30

.LOCALPLEX,SYSPLX execution velocity by WLM service class period
.LOCALPLEX,SYSPLX execution velocity goal by WLM service class period

01/30/2013 11:24:00 - 01/30/2013 11:25:00 (3/3)

Response Time

HOTTSO.1	0.015	N/A
TSOODD.1	0	0.3
TSOODD.2	0	1.5

Percentile Response Time

HOTTSO.1	100	95
TSOMED.2	N/A	90
TSOREG.2	N/A	an

WLM Service Classes

Welcome x Workload Man... x System Status x Resource Mon... x

Workload Management Help

Overview WLM Status x View DEFAULT x

This service definition is installed and policy STANDARD is active Notes Switch To

Service Classes

Actions Table view: Tree Search

Name	Period	Importa	Durati	Goal Type	Response Time Goal (hh:mm:ss.ttt)	Percent Goal	Velocity Goal	CPU Critical	Resource Group	Workload
Filter	Filter	Filter	Filter	Filter	Filter	Filter	Filter	Filter	Filter	Filter
<input type="checkbox"/> BATCH1								No		BATCH1
<input type="checkbox"/> BATCH2								No		BATCH2
<input type="checkbox"/> BATCHHI								No		BATCHHI
<input type="checkbox"/> BATCHLOW								No		BATCHLOW
<input type="checkbox"/> BATCHMED								No		BATCHMED
<input type="checkbox"/> BATCHRSP								No		BATCHRSP
<input type="checkbox"/> DISCRET								No		DISCRET
<input checked="" type="checkbox"/> HOTTSO								No	REGTSO	TSO
<input checked="" type="checkbox"/> HOTTSO	1	1		Percentile Response Time	00:00:00.500	95			REGTSO	TSO
<input type="checkbox"/> IRLM								No		IRLM
<input type="checkbox"/> OE								No	REGTSO	OMVS
<input type="checkbox"/> OMVS								No		OMVS
<input type="checkbox"/> OMVSKERN								No		OMVSKERN
<input type="checkbox"/> PRDTSO								No	REGTSO	TSO
<input type="checkbox"/> STCCMD								No	REGSTC	STC
<input type="checkbox"/> STCLO								No	BATCHVEL	STC
<input type="checkbox"/> STCSYS								No	HIGHPRTY	STC
<input type="checkbox"/> STORPROC								No		BATCH
<input type="checkbox"/> TSOVEM								No		BATCH

Total: 62, Selected: 1

From WLM to RM Dashboard (Workloads)

Welcome x Workload Man... x System Status x Resource Mon... x

Workload Management Help

Overview WLM Status x Modify DEFAULT x

This service definition is installed and policy STANDARD is active Notes Switch To v

Workloads

Name	Messages	Last Modified (GMT)	Modified By
Filter	Filter	Filter	Filter
<input type="checkbox"/> *APPC		Mar 30, 2011 2:31:17 PM	debug1
<input type="checkbox"/> *BATCH		Oct 16, 1998 11:58:16 AM	tage
<input type="checkbox"/> *CICS		Oct 16, 1998 11:58:30 AM	tage
<input type="checkbox"/> *OMVS		Oct 16, 1998 12:01:03 PM	tage
<input type="checkbox"/> *STC		Oct 16, 1998 12:01:45 PM	tage
<input checked="" type="checkbox"/> *TSO		Oct 16, 1998 12:01:52 PM	tage

Total: 6, Selected: 1

Reapply Filter and Sort

OK Apply Reset Cancel

RM Dashboard – WLM Workload Performance

Welcome x Workload Man... x System Status x Resource Mon... x Help

Resource Monitoring

Dashboards WLM Service Class - LOCALPLEX x WLM Workload - LOCALPLEX x

WLM Workload - LOCALPLEX (Running)

Start Pause Save Actions

Execution Velocity

STC	100
SYSTEM	90
BATCH	0
OMVS	0
TSO	0

.LOCALPLEX,SYSPLEX execution velocity by WLM workload

01/30/2013 13:47:00 - 01/30/2013 13:48:00 (1/1)

Response Time

SYSTEM	0.019
OMVS	0
BATCH	0
TSO	0
STC	0

.LOCALPLEX,SYSPLEX response time by WLM workload

01/30/2013 13:47:00 - 01/30/2013 13:48:00 (1/1)

Customization and Persistence

The screenshot shows the Resource Monitoring interface with the following data:

Category	Item	Value
Execution Velocity	STC	100
	SYSTEM	97
	BATCH	0
	OMVS	0
	TSO	0
Response Time	SYSTEM	0.017
	SYSTEM	0.016
	OMVS	0
	BATCH	0
	TSO	0

Legend for charts:

- Blue bar: .LOCALPLEX,SYSplex execution velocity by WLM workload
- Green bar: .LOCALPLEX,SYSplex response time by WLM workload
- Green bar: .LOCALPLEX,SYSplex active time by WLM workload

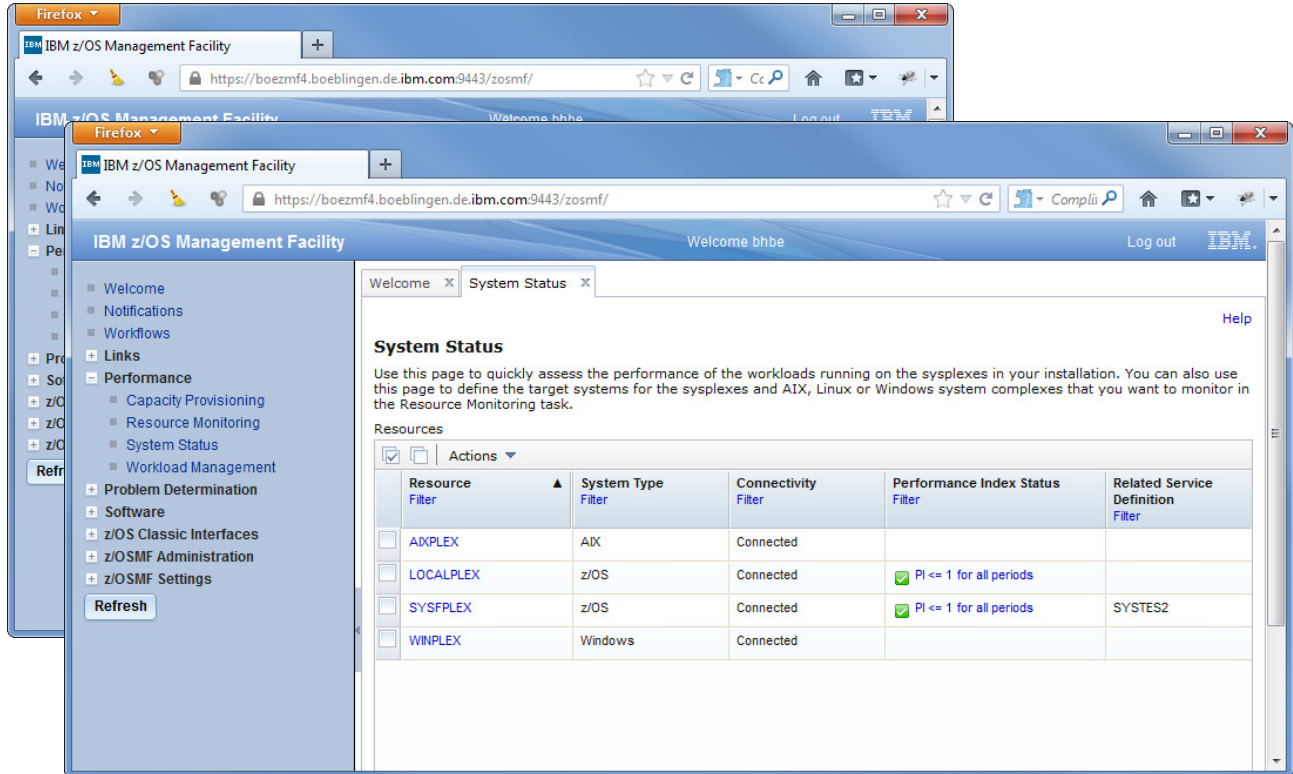
Time range for charts: 01/30/2013 13:50:00 - 01/30/2013 13:51:00 (4/4)

- ⇒ The user can customize dashboards opened by Application Linking and save them to the Dashboards list.
- ⇒ Then the Dashboard can be opened directly in Resource Monitoring using the Dashboards list.
- ⇒ Subsequent application linking events will use the saved dashboard.

Conditions for Application Linking between WLM & RM

- ▶ In the Workload Management task, the *View Performance...* actions and links are only available if the service definition in the *View/Modify* tab is currently activated in the Sysplex.
- ▶ In the System Status task, the WLM related *View* actions (and corresponding links) are only available if the selected resource is the z/OS sysplex where z/OSMF is running in (local sysplex).
- ▶ In a monitoring dashboard, the context menu icon is only visible if the performance data is retrieved from the local sysplex and the chart is related to WLM definitions, i.e.,
 - ⇒ The resources in the chart are WLM service classes, service class periods, report classes, or workloads.
 - ⇒ The metric is filtered by a workscope of a WLM service class, service class period, report class, or workload.
(Example: *% using by MVS image [BATCH,S]*, where *[BATCH,S]* means: filtered by workscope of service class *BATCH*)

Resource Monitoring – Windows Support



The screenshot shows the IBM z/OS Management Facility System Status page. The page title is "System Status" and it includes a "Help" link. The main content area is titled "Resources" and contains a table with the following data:

Resource Filter	System Type Filter	Connectivity Filter	Performance Index Status Filter	Related Service Definition Filter
<input type="checkbox"/> ADPLEX	ADX	Connected		
<input type="checkbox"/> LOCALPLEX	z/OS	Connected	<input checked="" type="checkbox"/> PI <= 1 for all periods	
<input type="checkbox"/> SYSFPLEX	z/OS	Connected	<input checked="" type="checkbox"/> PI <= 1 for all periods	SYSTEMS2
<input type="checkbox"/> WINPLEX	Windows	Connected		

- The Resource Monitoring plugin for z/OSMF V2.1 can exploit the new Windows performance data provided by RMF XP on a z/OS 2.1 system.
- Just define the connection to GPM4CIM with the System Status task.
- The z/OSMF Resource Monitoring will instantly start to retrieve the performance data and displays the connection status in the System Status window.
- You can now use all the Windows performance metrics provided by GPM4CIM when you create a new Monitoring Dashboard.

Resource Monitoring – Windows Support

The screenshot shows the IBM z/OS Management Facility Resource Monitoring interface. The browser window title is "IBM z/OS Management Facility" and the address bar shows the URL "https://boezmf4.boeblingen.de.ibm.com:9443/zosmf/". The page header includes "Welcome bhbe" and "Log out IBM".

The left sidebar contains a navigation menu with the following items:

- Welcome
- Notifications
- Workflows
- Links
- Performance
 - Capacity Provisioning
 - Resource Monitoring
 - System Status
 - Workload Management
- Problem Determination
- Software
- z/OS Classic Interfaces
- z/OSMF Administration
- z/OSMF Settings
- Refresh

The main content area is titled "Resource Monitoring" and features a "Dashboards" section with a "WINPLEX Health Check" dashboard. Below this is an "Add Metric" section with the following configuration:

- Add to metric group: Network Overview
- Selected resource: .xbxrmf4,*_ALL_NETWORK_PORTS
- Selected metric: BytesTransmitted by network port

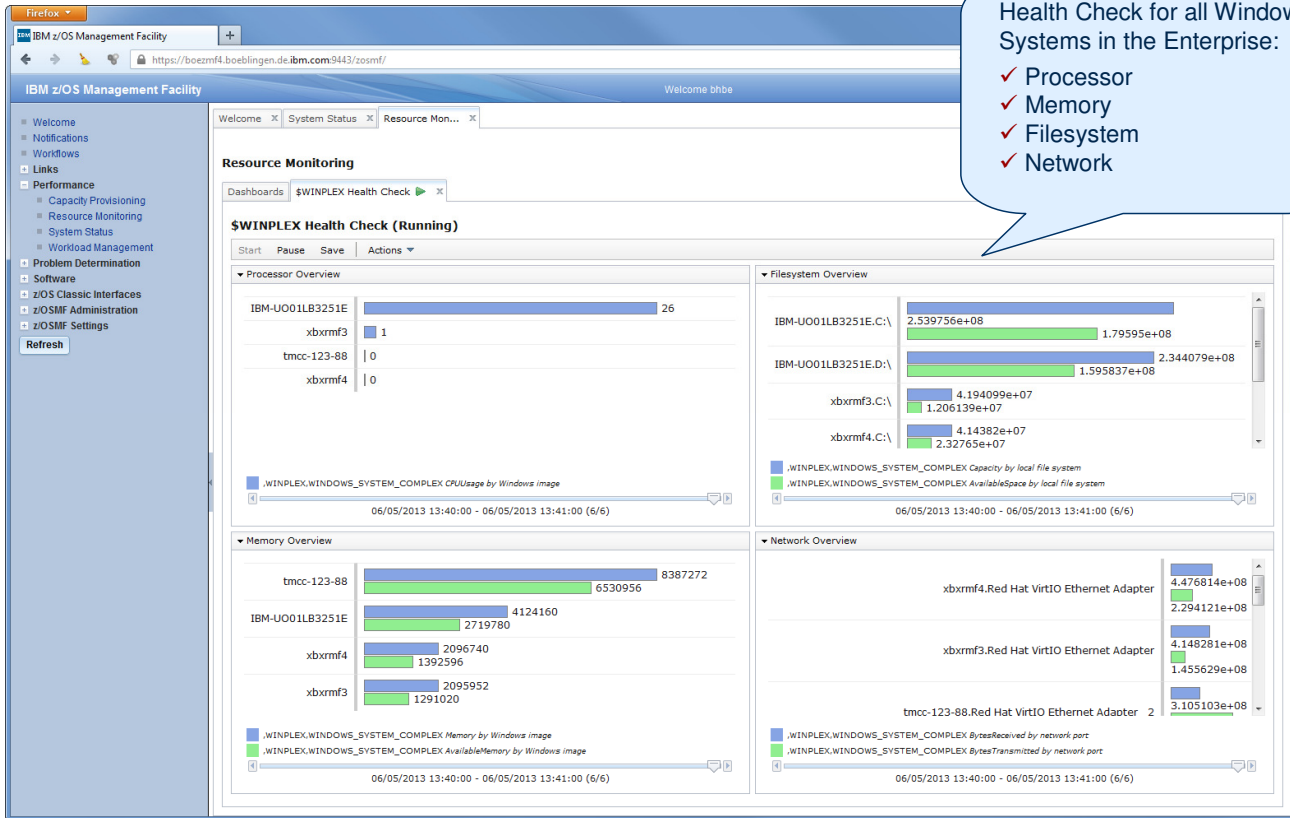
Below the configuration are tabs for "Resource", "Metric", "Filter", and "Work Scope". A "Quick filter" input field is present. The "Available metrics" list includes:

- by network port
 - BytesReceived by network port
 - BytesTransmitted by network port
 - ErrorRate by network port
 - PacketsReceived by network port
 - PacketsTransmitted by network port

Resource Monitoring – Windows Support...

Health Check for all Windows Systems in the Enterprise:

- ✓ Processor
- ✓ Memory
- ✓ Filesystem
- ✓ Network



Information and Tools

RMF homepage: www.ibm.com/systems/z/os/zos/features/rmf/

- Product information, newsletters, presentations, ...
- Downloads
 - ▶ Spreadsheet Reporter
 - ▶ RMF PM Java Edition
 - ▶ Postprocessor XML Toolkit

RMF email address: rmf@de.ibm.com




Users Guide:
New RMF
XP Chapter

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/systems/z/os/zos/bkserv/r13pdf/#rmf



Function Reference

Function	Availability
Storage Class Memory & Pageable Large Pages I/O Interrupt Delay Time IFB Link Reporting Crypto CEX4 Statistics Warning Track Support	APAR OA38660 APAR OA39993 APAR OA37826 APAR OA37016 APAR OA37803 
Exploitation of System z Integrated Information Processors	z/OS 2.1 RMF
Postprocessor XML Formatted Reports	z/OS 1.11 RMF – z/OS 2.1 RMF
z/OSMF Resource Monitoring – Application Linking	z/OS 2.1 RMF
RMF XP Windows Support RMF XP SMF 104 Recording Facility	z/OS 2.1 RMF z/OS 2.1 RMF