RMF Development Edition

z/OS
Resource Measurement Facility

RMF Technical Overview

January 2018

Trademarks

The following are trademarks of the International Business Machines Corporation in the United States, other countries, or both.

Not all common law marks used by IBM are listed on this page. Failure of a mark to appear does not mean that IBM does not use the mark nor does it mean that the product is not actively marketed or is not significant within its relevant market.

Those trademarks followed by ® are registered trademarks of IBM in the United States; all others are trademarks or common law marks of IBM in the United States.

For a more complete list of IBM Trademarks, see www.ibm.com/legal/copytrade.shtml:

*BladeCenter®, CICS®, DataPower®, DB2®, e business(logo)®, ESCON, eServer, FICON®, IBM®, IBM (logo)®, IMS, MVS, OS/390®, POWER6®, POWER6+, POWER7®, Power Architecture®, PowerVM®, PureFlex, PureSystems, S/390®, ServerProven®, Sysplex Timer®, System p®, System p5, System x®, z Systems®, System z9®, System z10®, WebSphere®, X-Architecture®, z13™, z13s ™, z14 ™, z Systems™, z9®, z10, z/Architecture®, z/OS®, z/VM®, z/VSE®, zEnterprise®, zSeries®, IBM Z ®

The following are trademarks or registered trademarks of other companies.

Adobe, the Adobe logo, PostScript, and the PostScript logo are either registered trademarks or trademarks of Adobe Systems Incorporated in the United States, and/or other countries.
Cell Broadband Engine is a trademark of Sony Computer Entertainment, Inc. in the United States, other countries, or both and is used under license therefrom.
Java and all Java-based trademarks are trademarks of Sun Microsystems, Inc. in the United States, other countries, or both.
Microsoft, Windows, Windows NT, and the Windows logo are trademarks of Microsoft Corporation in the United States, other countries, or both.
Intel, Intel logo, Intel Inside, Intel Inside logo, Intel Centrino, Intel Centrino logo, Celeron, Intel Xeon, Intel SpeedStep, Itanium, and Pentium are trademarks or registered trademarks of Intel Corporation or its subsidiaries in the United States and other countries.
UNIX is a registered trademark of The Open Group in the United States and other countries.
Linux is a registered trademark of Linus Torvalds in the United States, other countries, or both.
ITIL is a registered trademark, and a registered community trademark of the Office of Government Commerce, and is registered in the U.S. Patent and Trademark Office.
IT Infrastructure Library is a registered trademark of the Central Computer and Telecommunications Agency, which is now part of the Office of Government Commerce.

* All other products may be trademarks or registered trademarks of their respective companies.

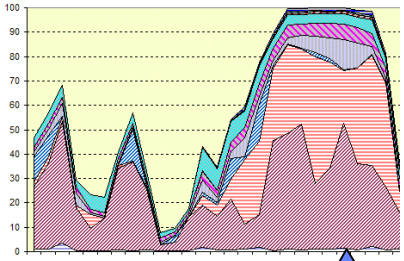
Notes:
Performance is in Internal Throughput Rate (ITR) ratio based on measurements and projections using standard IBM benchmarks in a controlled environment. The actual throughput that any user will experience will vary depending upon considerations such as the amount of multiprogramming in the user's job stream, the I/O configuration, the storage configuration, and the workload processed. Therefore, no assurance can be given that an individual user will achieve throughput improvements equivalent to the performance ratios stated here.
IBM hardware products are manufactured Sync new parts, or new and serviceable used parts. Regardless, our warranty terms apply.
All customer examples cited or described in this presentation are presented as illustrations of the manner in which some customers have used IBM products and the results they may have achieved. Actual environmental costs and performance characteristics will vary depending on individual customer configurations and conditions.
This publication was produced in the United States. IBM may not offer the products, services or features discussed in this document in other countries, and the information may be subject to change without notice. Consult your local IBM business contact for information on the product or services available in your area.
All statements regarding IBM's future direction and intent are subject to change or withdrawal without notice, and represent goals and objectives only.
Information about non-IBM products is obtained Sync the manufacturers of those products or their published announcements. IBM has not tested those products and cannot confirm the performance, compatibility, or any other claims related to non-IBM products. Questions on the capabilities of non-IBM products should be addressed to the suppliers of those products.
Prices subject to change without notice. Contact your IBM representative or Business Partner for the most current pricing in your geography.

Agenda

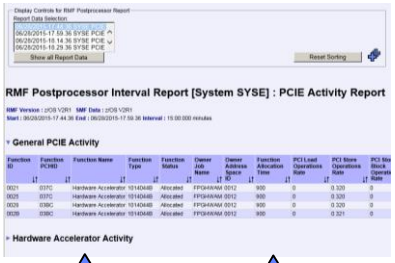
- Product Structure
- Address Spaces
- Controlling the Data Gatherers
- Historical Reporting
  - Postprocessor
  - Spreadsheet Reporter
  - XML Toolkit
- Realtime Reporting
  - Monitor III
  - Monitor II
  - WTO Alerts
  - Data Portal
  - z/OSMF RM / RMF Performance Monitoring
- RMF Performance Data APIs

RMF Product Overview

RMF Spreadsheet Reporter

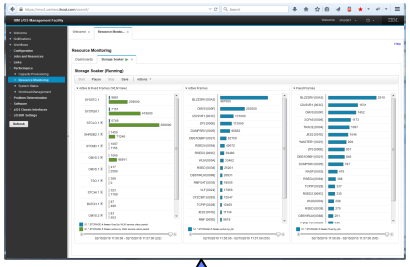


RMF Spreadsheet Reporter/
RMF Performance Data Portal/
RMF XML Toolkit

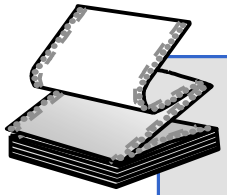


RMF Performance Data Portal

z/OSMF Resource Monitoring



Postprocessor Reports
in Text or XML Format



RMF Distributed Data Server (GPMSERVE) & RMF XP (GPM4CIM)

RMF Postprocessor
Historical Reporting,
Analysis and Planning

RMF Monitor II and III
Real-Time Reporting,
Problem Determination

SMF

RMF Sysplex Data Server and APIs

CIM Client APIs

RMF
Data Gatherer

RMF
Monitor I

RMF
Monitor II
background

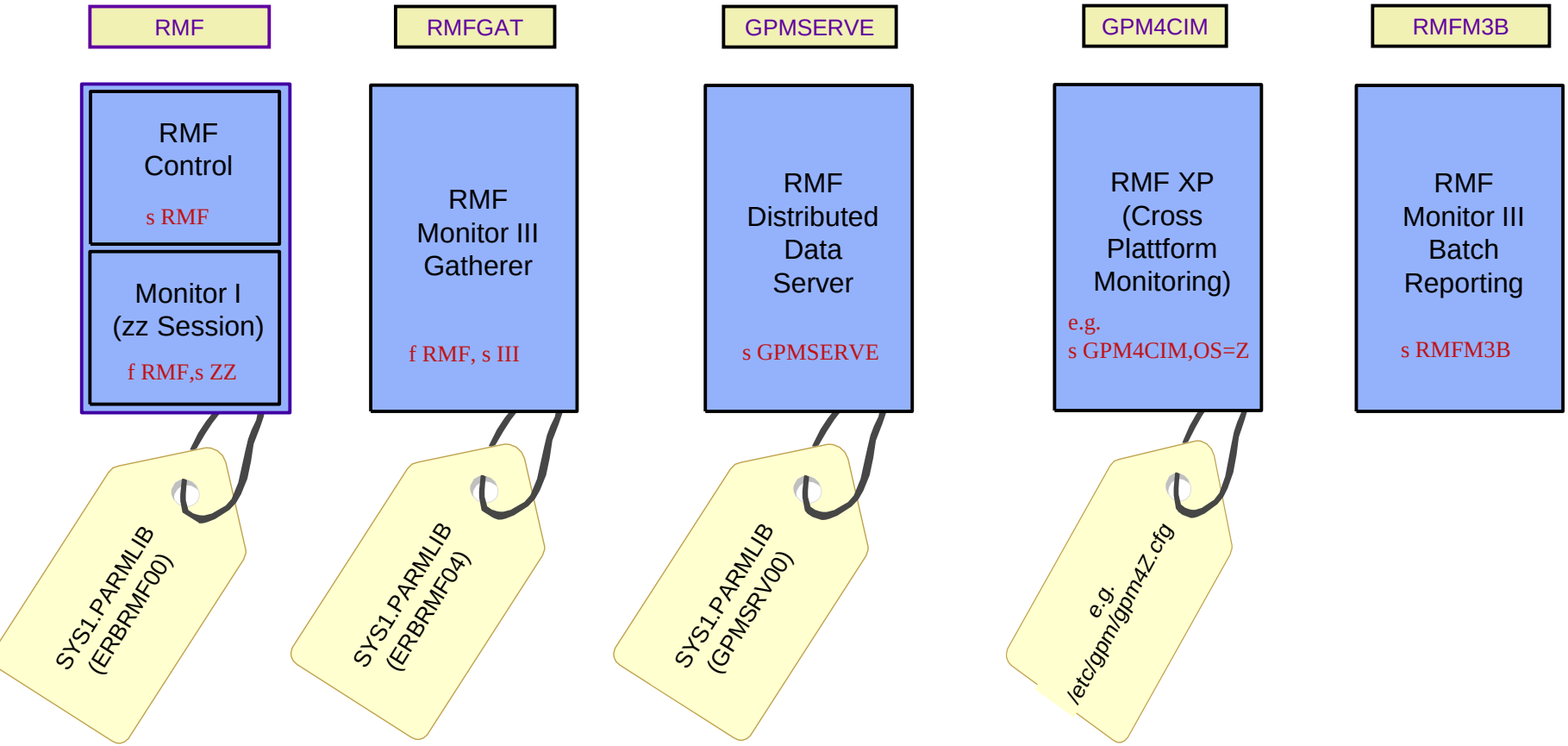
RMF
Monitor III

VSAM

AIX & Linux
CIM Provider

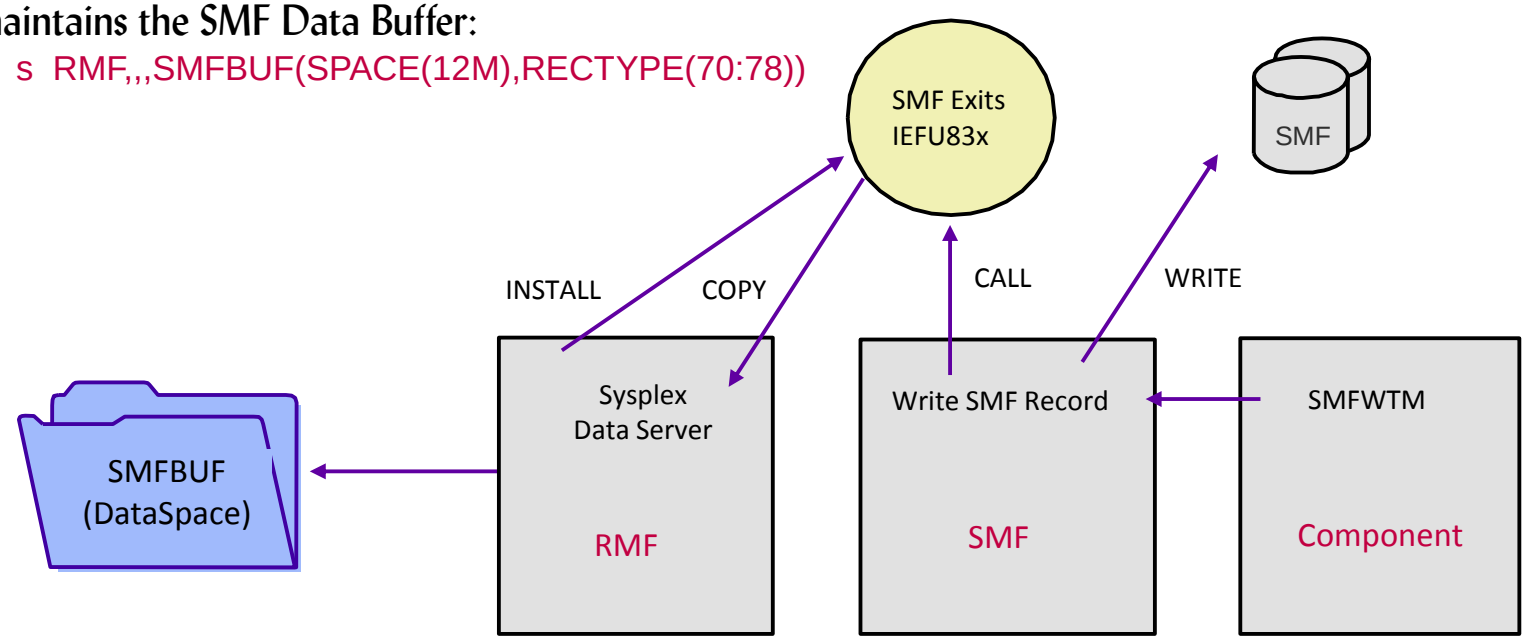
RMF Address Spaces / Procedures

Procedures located SYS1.PROCLIB:



RMF Control Address Space

- keeps Configuration Tables and other Control Information
- provides the Command Interface to set of modify Options:
  f RMF,f ZZ,MEMBER(99)
- maintains the SMF Data Buffer:
  s RMF,,,SMFBUF(SPACE(12M),RECTYPE(70:78))



all SMF Record Types can be maintained by the RMF Sysplex Data Server !

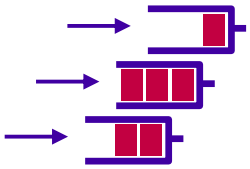
Data Gathering Methods

- exact measurement counts
  - pick up consecutive counters
  - calculating the difference at the end of an interval

eg. CPU seconds, device connect time...

Interval Gathering

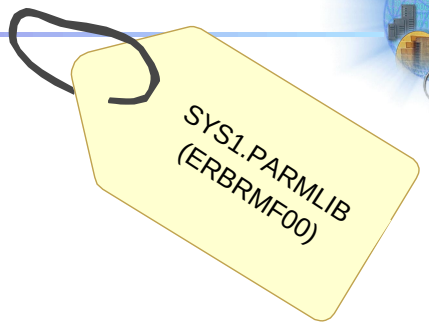
- sampling counts
  - inspect variable counters continuously
  - building the average at the end of an interval



eg. queue counts, frame counts...

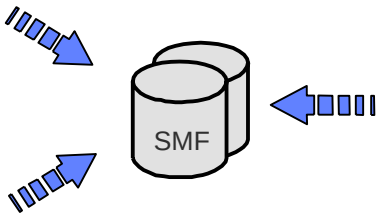
Cycle Gathering

Monitor I Data Gathering



Measurements

- CACHE SMF 74.5
- CHANNEL SMF 73
- CPU SMF 70.1
- CRYPTO SMF 70.2
- DEVICE SMF 74.1
- ENQ SMF 77
- IOQ SMF 78.3
- FCD SMF 74.7
- ESS SMF 74.8
- PAGESP SMF 75
- PAGING SMF 71
- TRACE SMF 76
- VSTOR SMF 78.2
- WKLD SMF 72.3

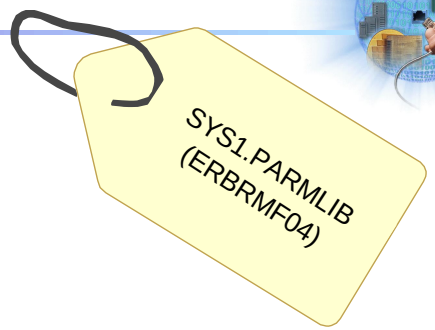


SMF 72.5	SDELAY
SMF 74.2	XCF
SMF 74.3	OMVS
SMF 74.4	CF
SMF 74.6	HFS
SMF 74.9	PCIE
SMF 74.10	SCM

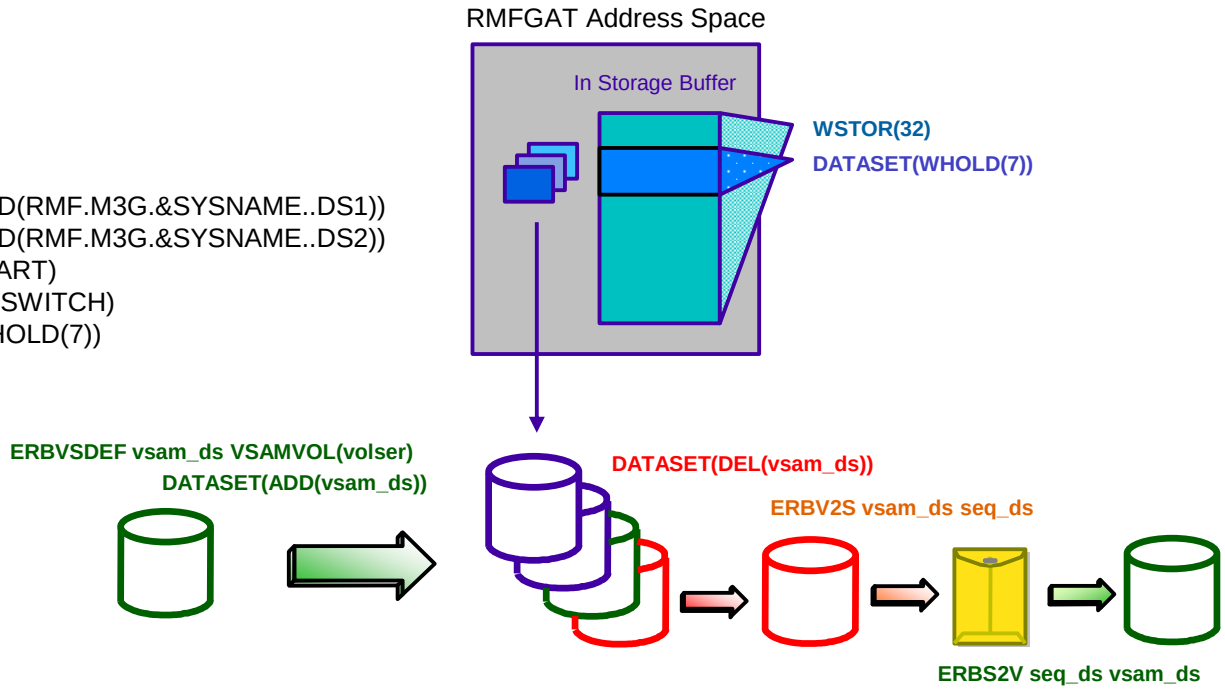
gathered by Monitor III

2. Timing
   - CYCLE(1000)
   - NOSTOP
   - SYNC(SMF)
3. Reporting / Recording
   - RECORD
   - REPORT(REALTIME)
   - SYSOUT(A)
4. User Exits
   - NOEXITS

Monitor III Data Gathering



1. Measurements
   - IOSUB
   - CFDETAIL
   - CACHE
   - VSAMRLS
   - OPD
   - HFSNAME
   - zFS
   - SGSPACE
   - LOCK
   - PCIE
   - SCM
2. Timing
   - CYCLE(1000)
   - MINTIME(60)
   - NOSTOP
   - SYNC(00)
3. Recording
   - DATASET(ADD(RMF.M3G.&SYSNAME..DS1))
   - DATASET(ADD(RMF.M3G.&SYSNAME..DS2))
   - DATASET(START)
   - DATASET(NOSWITCH)
   - DATASET(WHOLD(7))
4. Other Controls
   - WSTOR(32)
   - ZIIPUSE
   - MASTER



Monitor III Data Gathering 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

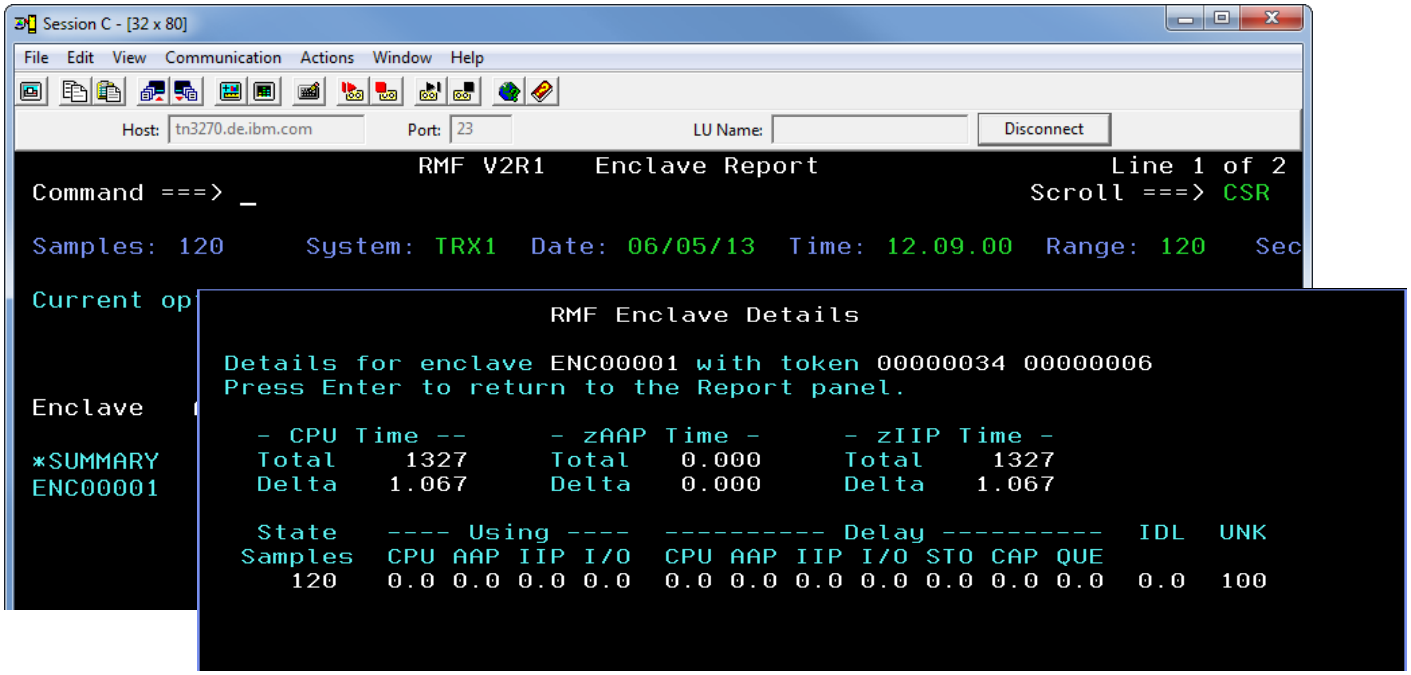
```
SYNC(00)                /* MINTIME SYNCHRONIZATION                */
SYSOUT(A)               /* MESSAGES TO SYSOUT CLASS A             */
WSTOR(32)               /* SIZE OF INSTORAGE BUFFER (IN MB)       */
ZIIPUSE                 /* PARTIAL USE OF zIIP ENGINES            */
IOSUB                   /* 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

Monitor III Data Gathering 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



- 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 RMFGAT zIIP activity

RMF Distributed Data Server

TCP/IP

GPMSERVE
(RMF Distributed Data Server)

RMF Sysplex Data Server (ERB3XDRS Service)

RMF M III Data Gatherer

RMF M III Data Gatherer

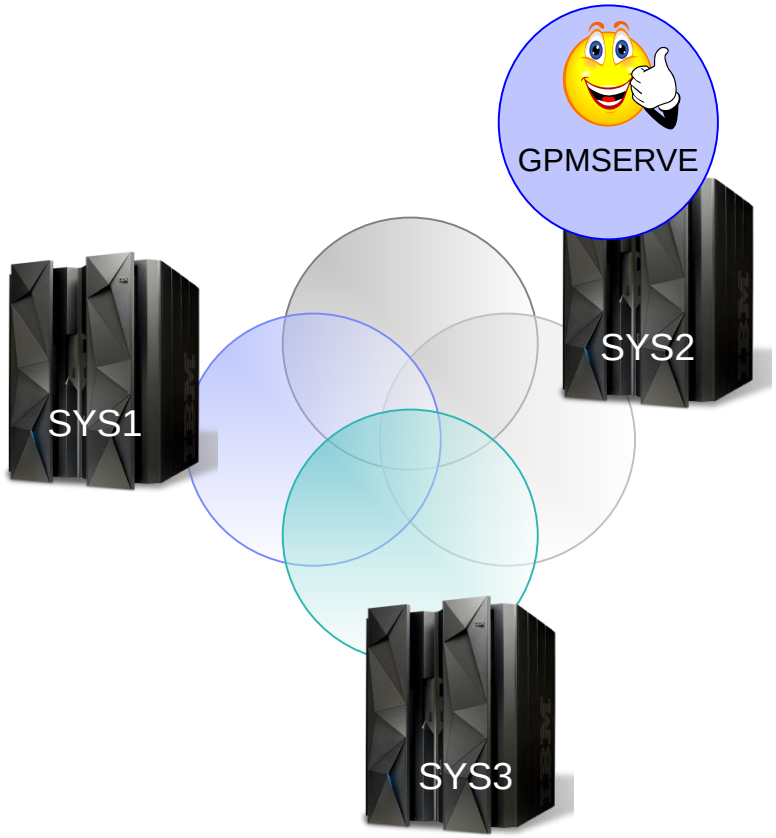
RMF M III Data Gatherer

- has Sysplex-wide scope
- exploited by RMF PM, Monitor III Data Portal, CIM Provider
- talks XML over HTTP
- no configuration needed!
- just enter `S GPMSERVE` or `F RMF,DDS` on one image of the Sysplex

DDS High Availability

- RMF DDS option allows a sysplex-wide DDS management
- When the RMF initialization is complete and DDS option was specified, DDS is started automatically on the best suited system of the Sysplex
- The system running DDS has to be determined according to following rules:
  - Monitor III Gatherer active
  - Highest RMF Release
  - SMF Buffer active
  - Monitor III MASTER option specified

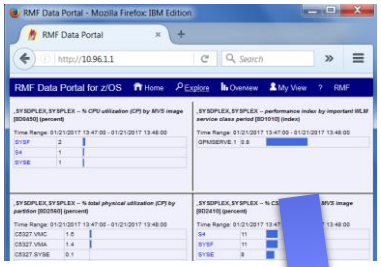
- Following possibilities to specify DDS option:
  1. Start command: START RMF,,,DDS
  2. Modify command: MODIFY RMF,DDS
  3. Procedure parm:

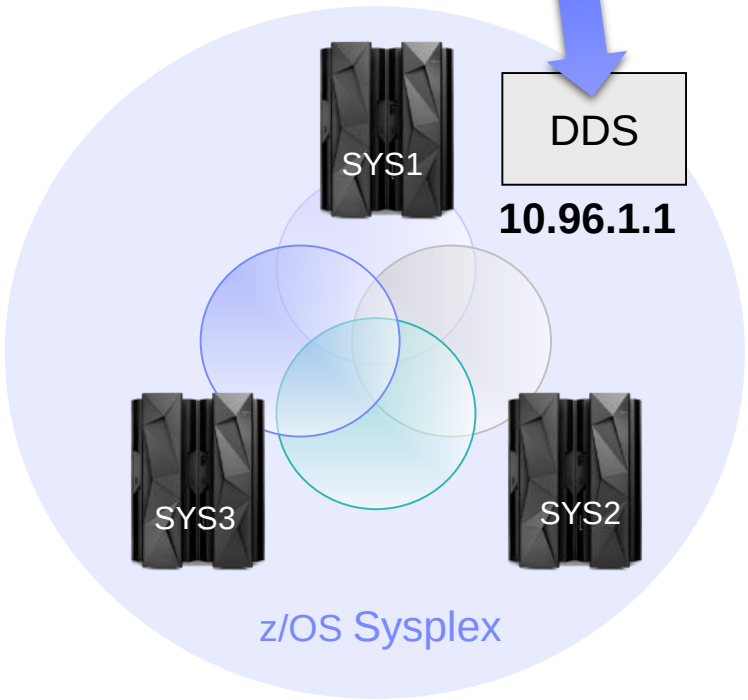



```
//RMF       PROC
//IEFPROC   EXEC PGM=ERBMFMFC,REGION=32M,TIME=1440,
//          PARM='DDS'
```

DDS High Availability

- ✓ Applications can use Dynamic Virtual IP Address (dynamic VIPA) to contact a DDS running on any sysplex system





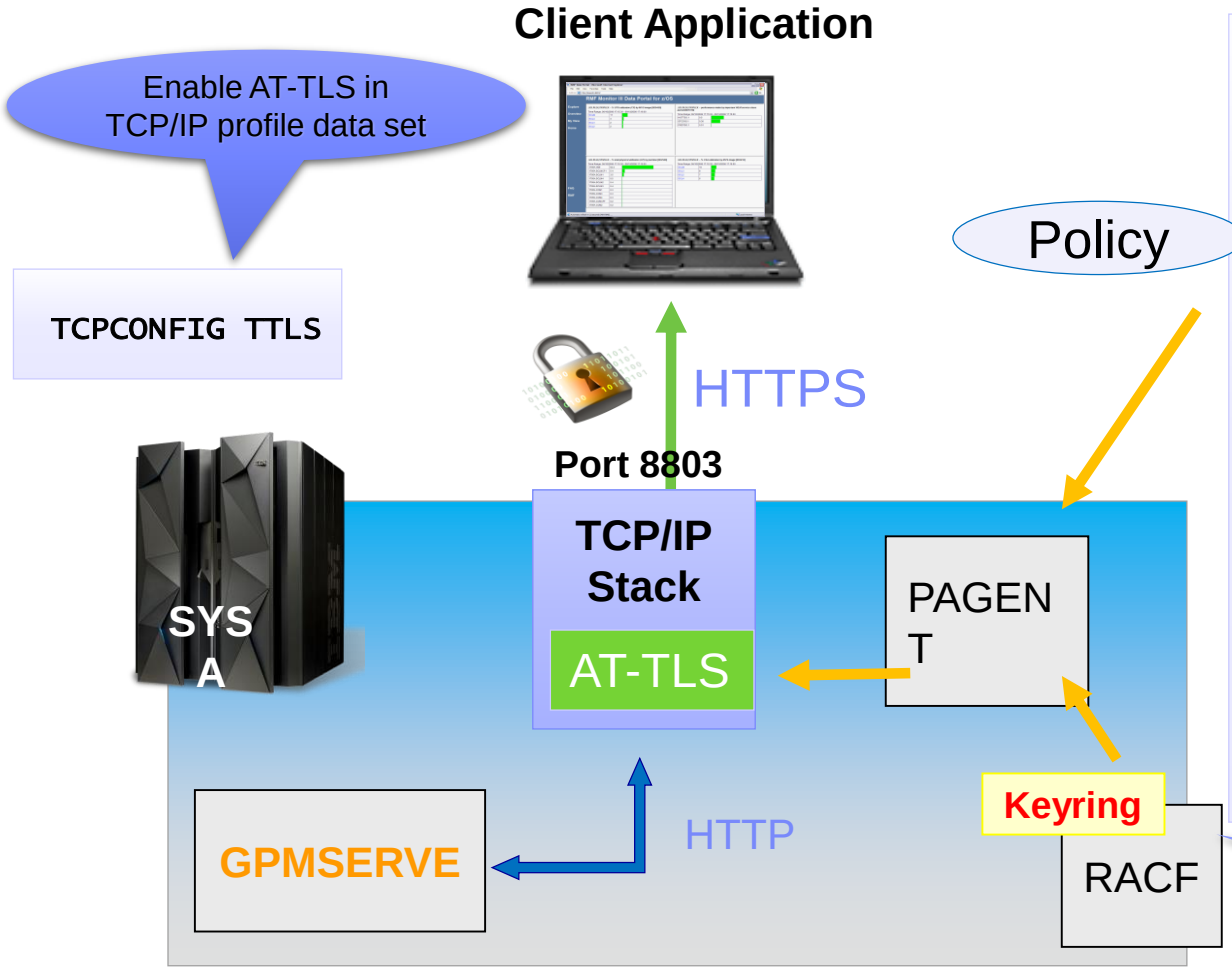
Create Dynamic VIPA

```
//GPMSERVE PROC MEMBER=00,VIPA='10.96.1.1'
//TCPDVP   EXEC PGM=MODDVIPA,
//         PARM='/-p TCPIP -c &VIPA'
//STEP1    EXEC PGM=GPMDDSRV,REGION=128M,TIME=1440,
//         PARM='TRAP(ON)/&MEMBER'
//*
//GPMINI   DD   DISP=SHR,DSN=SYS1.SERBPWSV(GPMINI)
//GPMHTC   DD   DISP=SHR,DSN=SYS1.SERBPWSV(GPMHTC)
//GPMPPJCL DD   DISP=SHR,DSN=SYS1.SERBPWSV(GPMPPJCL)
//CEEDUMP  DD   DUMMY
//SYSPRINT DD   DUMMY
//SYSOUT   DD   DUMMY
//TCPDVP   EXEC PGM=MODDVIPA,
//         PARM='/-p TCPIP -d &VIPA'
//         PEND
```

Delete Dynamic VIPA

DDS and HTTPS

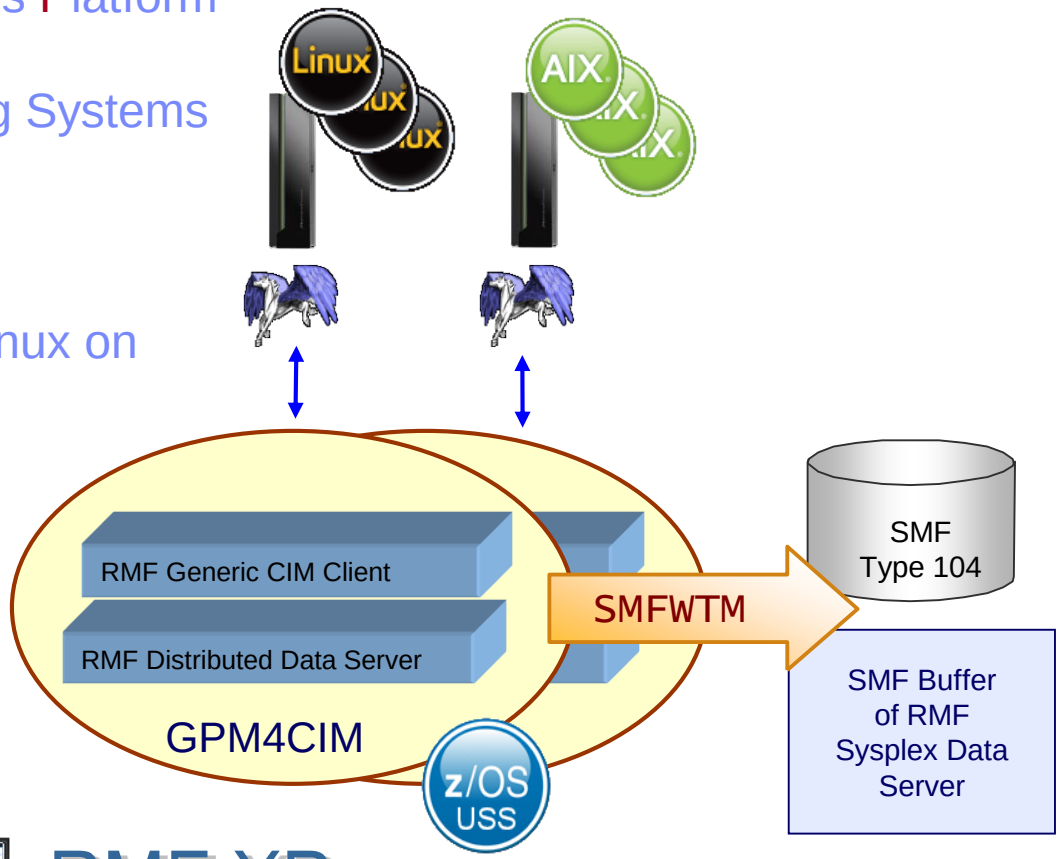
- Use AT-TLS (Application Transparent – Transport Layer Security), part of Communication Server




```
# RMF DISTRIBUTED DATA SERVER RULE
TTLSRule                          DDS
{
  LocalPortRange                  8803
  Jobname
GPMSRERVE
  Direction
Inbound
  TTLSGroupActionRef              DDSGRP
  TTLSEnvironmentActionRef        DDSENV
}
TTLSGroupAction                   DDSGRP
{
  TTLSEnabled                     On
}
TTLSEnvironmentAction             DDSENV
{
  HandshakeRole                   Server
  TTLSKeyringParms
  {
    Keyring                       BOERMF
  }
}
```

RMF XP

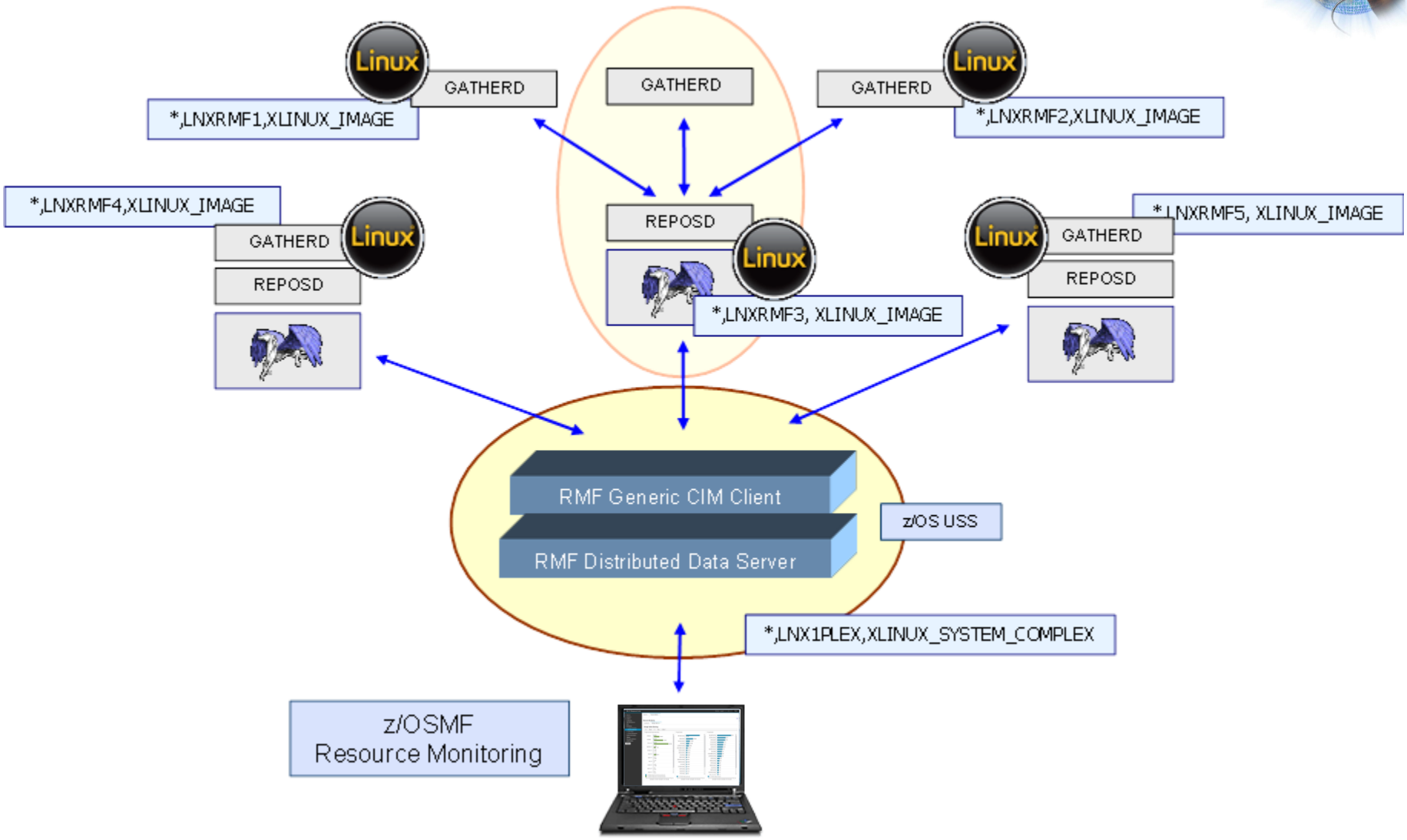
- RMF XP is the solution for Cross Platform Performance Monitoring
- RMF XP supports the Operating Systems running on
  - x Blades
  - p Blades
- In addition RMF XP supports Linux on System z
  - LPAR Mode
  - VM Guest Mode
- RMF XP can be configured to write SMF records SMF records



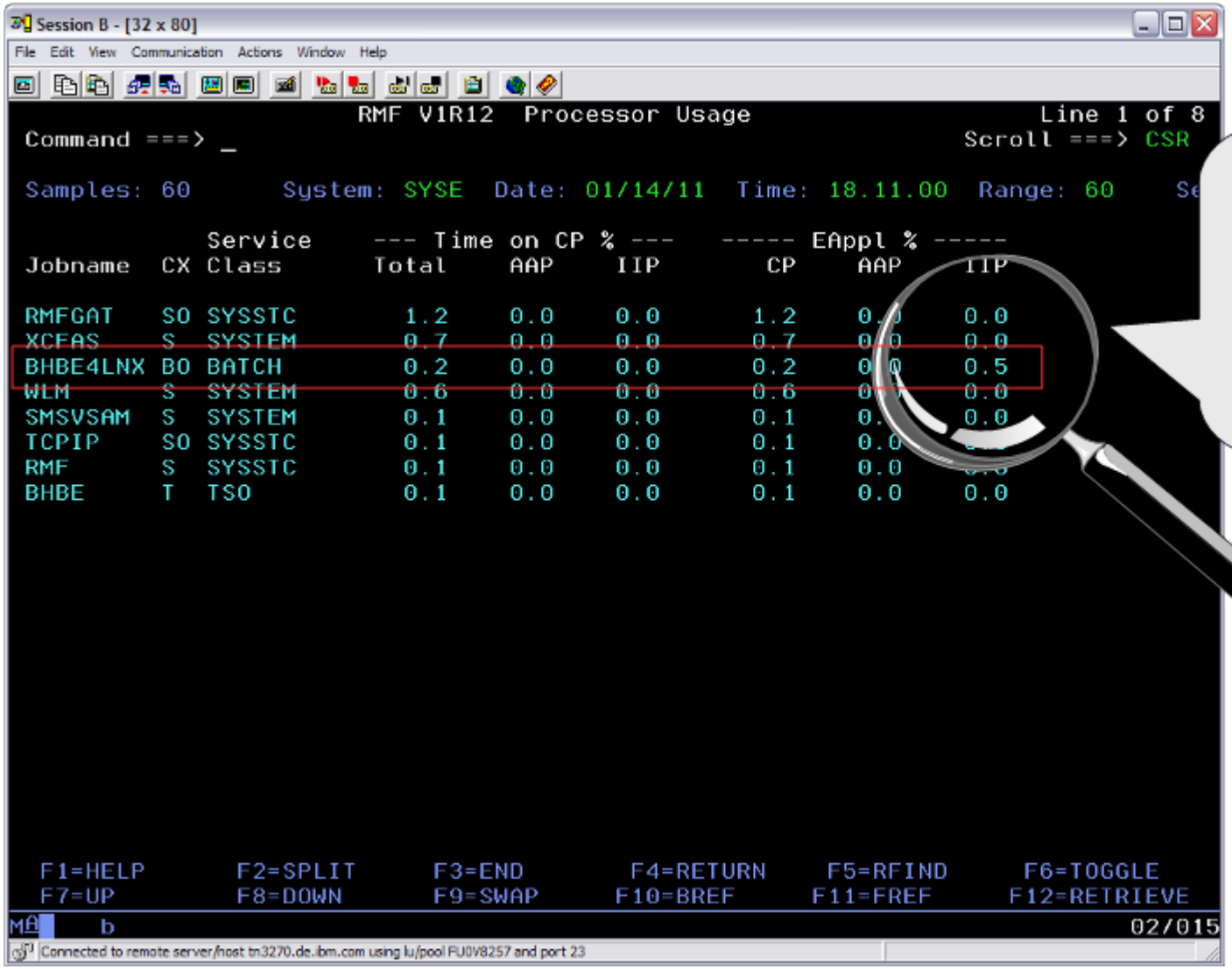
z/OSMF Resource Monitoring

RMF XP

RMF XP – eg. Linux Data Collection



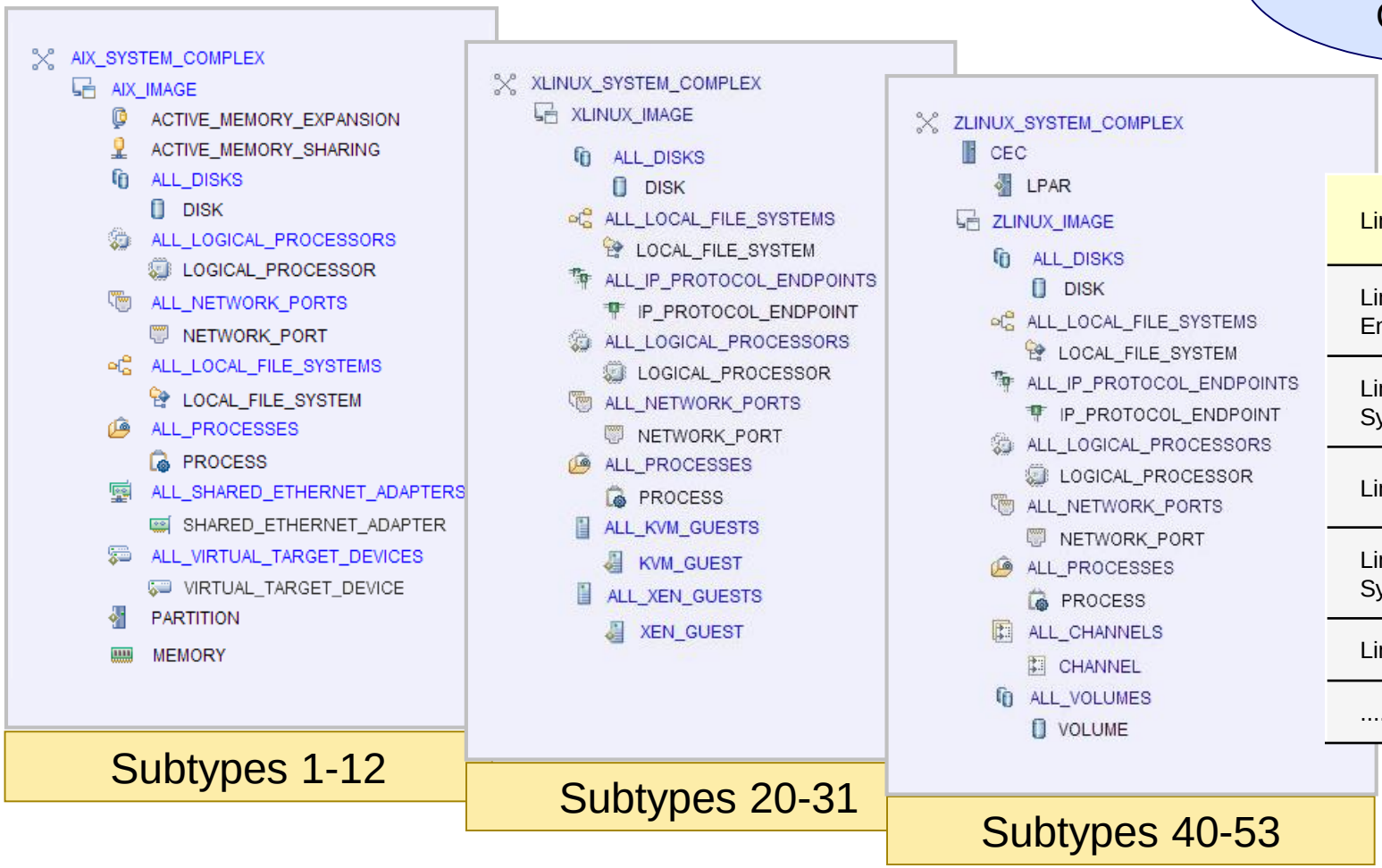
RMF XP – zIIP Exploitation



In our IBM test environment, we have observed that up to 70% of the CPU consumption was offloaded to zIIP engines

RMF XP and SMF Records

One Subtype per Metric Category



Subtypes 1-12

Subtypes 20-31

Subtypes 40-53

Linux on System z	S T
Linux_IPProtocol Endpoint	40
Linux_LocalFile System	41
Linux_NetworkPort	42
Linux_Operating System	43
Linux_Processor	44
....	

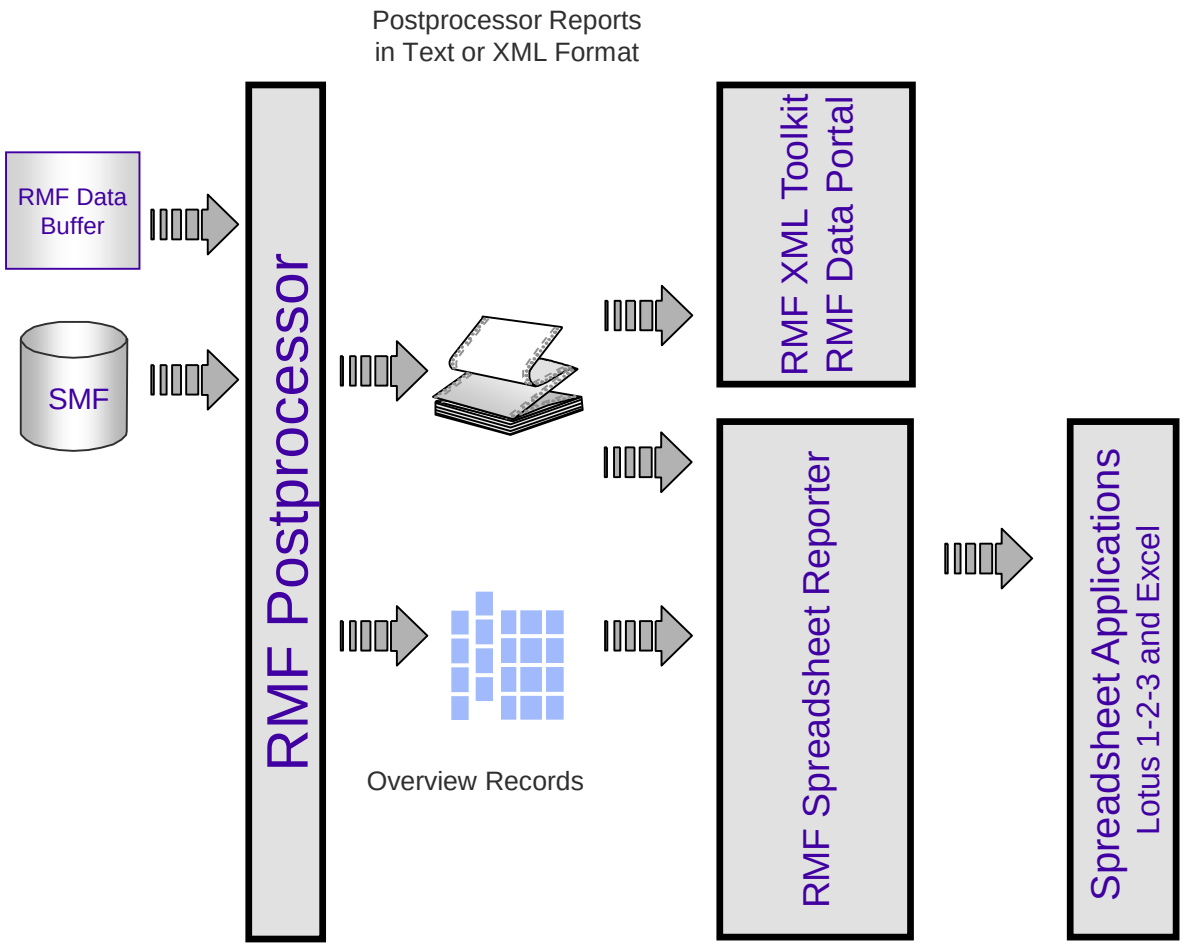
Historical Reporting

Activities measured by Monitor I

- Cache Subsystem
- Channel Path
- CPU / Crypto
- Device
- Enqueue
- Ficon Director
- I/O Queuing
- Page/Swap Data Set
- Paging
- Trace
- Virtual Storage
- Workload

Activities measured by Monitor III

- XCF
- OMVS
- Coupling Facility
- HFS
- SCM
- PCIE
- SDELAY



Postprocessor: Preparing SMF Data

```
//SMFDUMP  EXEC  PGM=IFASMFDP
//IDD1     DD    DISP=SHR,DSN=<input_smfdata_system1>
//IDD2     DD    DISP=SHR,DSN=<input_smfdata_system2>
//SMFDATA  DD    DISP=(NEW,PASS),SPACE=(CYL,(10,10),RLSE),
//         UNIT=SYSDA,DCB=(RECFM=VBS,LRECL=32760,BLKSIZE=0)
//SYSIN DD *
  INDD(IDD1,OPTIONS(DUMP))
  INDD(IDD2,OPTIONS(DUMP))
  OUTDD(SMFDATA,TYPE(70:78))
```

- SMF data is kept in VSAM datasets
- Postprocessor requires sequential format
- use SMF dump utility IFASMFDP to unload the data
- usuallly GDGs are the prefered target:
  - RMF.SMFDATA.SYSNAME(0)
  - RMF.SMFDATA.SYSNAME(-1)

```
//RMFSORT  EXEC  PGM=SORT
//SORTIN   DD    DISP=SHR,DSN=<input_smfdata_system1>
//         DD    DISP=SHR,DSN=<input_smfdata_system2>
//SYSIN    DD   *
  SORT FIELDS=(11,4,CH,A,7,4,CH,A),EQUALS
  MODS E15=(ERBPPE15,36000,,N),E35=(ERBPPE35,3000,,N)
```

- SMF reords must be sorted by date and time
- SORT step is required for sysplex-wide reporting
  - Workload Activity Report
  - Coupling Facility Report
  - Shared DASD Report

Postprocessor: Preparing SMF Data

Or use SMF Log-streams and IFASMFDL instead of IFASMFDP

```
//SMFDUMP  EXEC  PGM=IFASMFDL
//OUTDD1  DD DISP=(NEW,CATLG),UNIT=SYSDA,SPACE=(CYL,(500,50),RLSE),
//          DCB=(LRECL=32760,RECFM=VBS,BLKSIZE=0),
//          DSN=SMFDATA.OUTPUT.SYSF
//SYSIN DD *
  LSNAME(IFASMF.PERF.SYSDPLEX,OPTIONS(DUMP))
  OUTDD(OUTDD1,TYPE(70:79),START(1200),END(1300))
  SID(SYSF)
```

Or much smarter – access SMF Log-streams via IFASEXIT

```
//RMFPP    EXEC PGM=ERBRMFPP
//MFPMSGDS DD   DISP=SHR,DSN=*.ALLOC.MSG
//MFPINPUT DD  DSN=IFASMF.SYSPLEX.TYPRMF,DISP=SHR,
//          DCB=(RECFM=VB,BLKSIZE=32760,LRECL=32756),
//    SUBSYS=(LOGR,IFASEXIT,'FROM=(2015/348,09:00),TO=(2015/348,12:00),X
//             LOCAL')
//PPRPTS   DD   DISP=SHR,DSN=RMF.INTERVAL.REPORTS
//PXSRPTS  DD   DISP=SHR,DSN=RMF.SYSPLEX.REPORTS
//SYSIN    DD   *
  DATE(04212015,04232015)
  RTOD(0000,2400)
  DINTV(0100)
  REPORTS(ALL)
```

Postprocessor JCL

- DD Names
  - MFPMSGDS Message Output
  - MFPINPUT SMF Input Datasets
  - PPRPTS combined Interval Reports
  - PPSUMnnn Summary Report Output
  - PPXSRPTS Sysplex Report Output
  - PPORPnnn Overview Report Output
  - PPOVWREC Overview Record Output
  - XPRPTS combined Interval Reports in XML Format
  - XPOVWRPT Overview Report Output in XML Format
  - XPXSRPTS Sysplex Report Output in XML Format
- Control Statements
  - DATE Start / End Date
  - RTOD Start / End Time
  - DINTV Duration Interval Length
  - REPORTS Report Types
  - OVERVIEW Report or Record
  - OVW Overview Control Statement

JCL can be generated by ISPF Application or Spreadsheet Reporter

```
//RMFPP     EXEC PGM=ERBRMFPP
//MFPMSGDS  DD   DISP=SHR,DSN=*.ALLOC.MSG
//MFPINPUT  DD   DISP=(OLD,DELETE),DSN=*.RMFSORT.SORTOUT
//PPRPTS    DD   DISP=SHR,DSN=RMF.INTERVAL.REPORTS
//PXSRPTS   DD   DISP=SHR,DSN=RMF.SYSPLEX.REPORTS
//SYSIN     DD   *
  DATE(04212003,04232003)
  RTOD(0000,2400)
  DINTV(0100)
  REPORTS(ALL)
```

Postprocessor: Standard Reporting

```
//RMFPP   EXEC PGM=ERBRMFPP
//SYSIN     DD   *
 DATE(10142015,10142015)
 RTOD(1100,1300)
 REPORTS(CPU)
 SYSRPTS(WLMGL(SCPER))
 SYSOUT(H)
```

C P U A C T I V I T Y

z/OS V1R8 SYSTEM ID SYSD DATE 02/13/2015 INTERVAL 15.00.048
RPT VERSION V1R8 RMF TIME 11.00.00 CYCLE 1.000 SECONDS

CPU 2084 MODEL 314 H/W MODEL B16

---CPU--- NUM	TYPE	ONLINE TIME PERCENTAGE	LPAR BUSY TIME PERC	MVS BUSY TIME PERC	CPU SERIAL NUMBER	I/O TOTAL INTERRUPT RATE	% I/O INTERRUPTS HANDLED VIA TPI
0	CP	100.00	3.23	3.61	066F7A	14.60	0.69
1	CP	100.00	2.77	3.18	066F7A	22.53	0.49
2	CP	100.00	2.58	2.93	066F7A	25.61	0.43
3	CP	100.00	2.54	2.97	066F7A	29.42	0.46
CP	TOTAL/AVERAGE		2.78	3.17		92.16	0.50

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

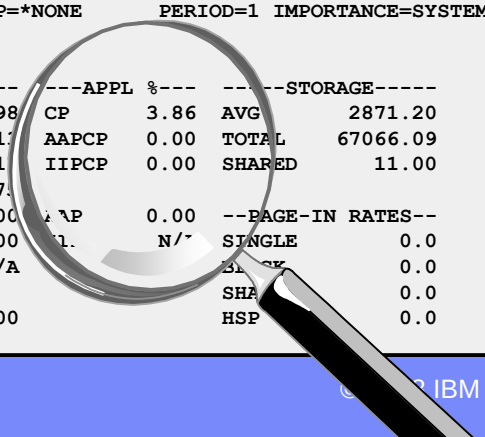
z/OS V1R8 SYSPLEX SYSDPLEX START 02/13/2015-11.00.00 INTERVAL 000.15.00 MODE = GOAL
RPT VERSION V1R8 RMF END 02/13/2015-11.15.00

POLICY ACTIVATION DATE/TIME 02/12/2007 08.43.05

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

REPORT BY: POLICY=DEFAULT WORKLOAD=SYSTEM SERVICE CLASS=SYSTEM RESOURCE GROUP=*NONE PERIOD=1 IMPORTANCE=SYSTEM
CRITICAL =NONE

-TRANSACTIONS-		TRANS-TIME HHH.MM.SS.TTT		--DASD I/O--		---SERVICE----		--SERVICE TIMES--		----APPL %---		-----STORAGE-----	
AVG	23.36	ACTUAL	0	SSCHRT	30.3	IOC	15835	CPU	26.498	CP	3.86	AVG	2871.20
MPL	23.36	EXECUTION	0	RESP	1.1	CPU	5183K	SRB	7.91[illegible]	AAPCP	0.00	TOTAL	67066.09
ENDED	0	QUEUED	0	CONN	0.6	MSO	0	RCT	0.01	IIPCP	0.00	SHARED	11.00
END/S	0.00	R/S AFFIN	0	DISC	0.0	SRB	1548K	IIT	0.27[illegible]				
#SWAPS	106	INELIGIBLE	0	Q+PEND	0.3	TOT	6747K	HST	0.000	AAP	0.00	--PAGE-IN RATES--	
EXCTD	0	CONVERSION	0	IOSQ	0.1	/SEC	7496	AAP	0.000	[illegible]	N/[illegible]	SINGLE	0.0
AVG ENC	0.00	STD DEV	0					IIP	N/A			[illegible]	0.0
REM ENC	0.00					ABSRPTN	321					SHA[illegible]	0.0
MS ENC	0.00					TRX SERV	321	PROMOTED	0.000			HSP	0.0



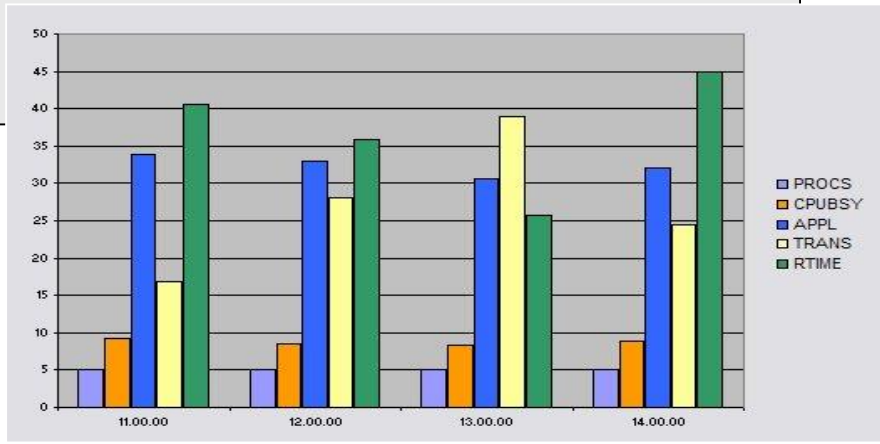
Postprocessor: Overview Reporting

```
OVERVIEW(RECORD,REPORT)
OVW(PROCS(NUMPROC))
OVW(CPUBSY(CPUBSY))
OVW(APPL(APPLPER(POLICY)))
OVW(TRANS(TRANS(POLICY)))
OVW(RTIME(RTIME(POLICY)))
DINTV(0100)
```

(via Spreadsheet Reporter)

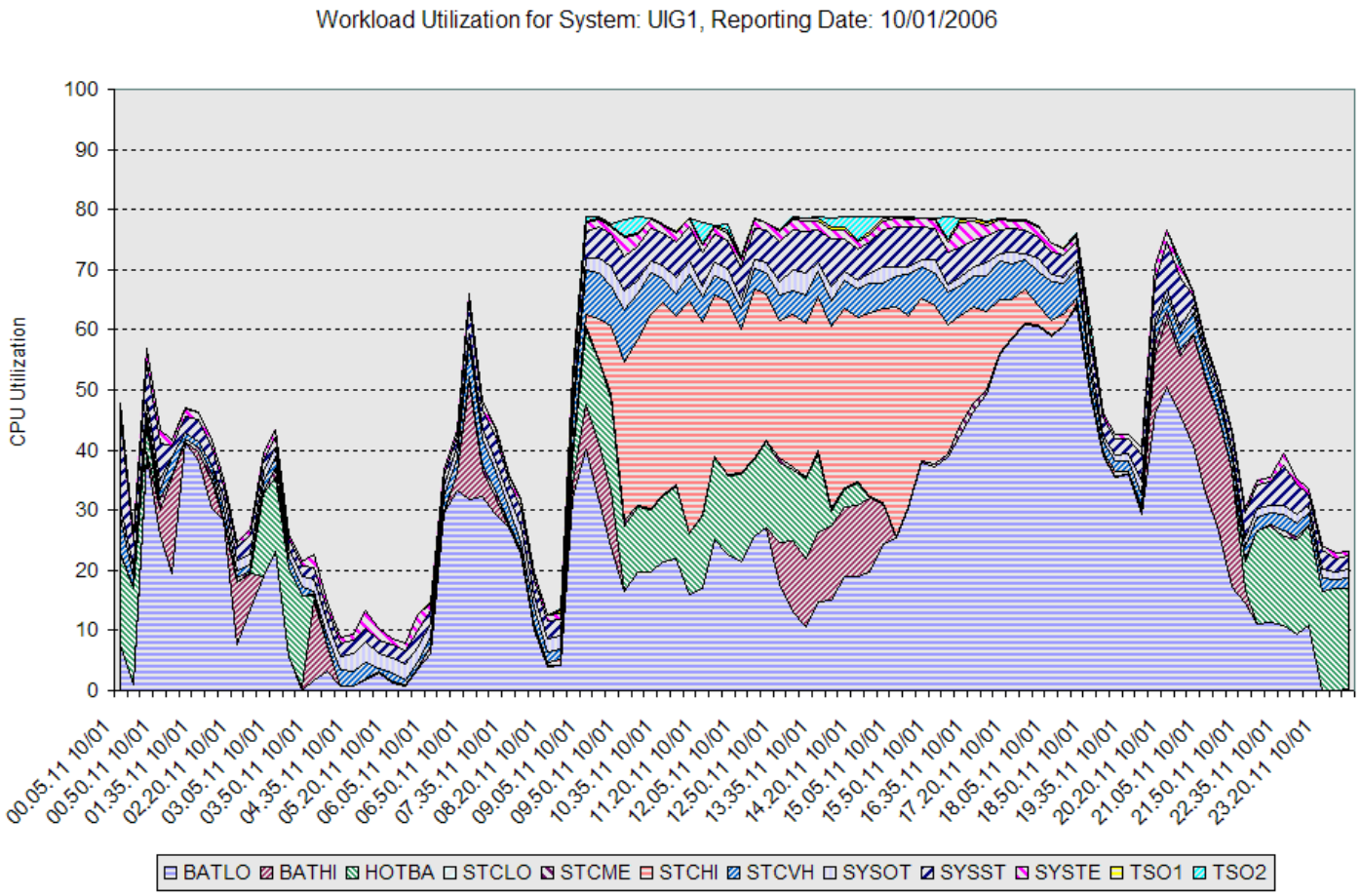
```
                                   R M F   O V E R V I E W   R E P O R T

          z/OS  V1R8                SYSTEM ID SYSF            START 08/07/2015-11.00.00  INTERVAL 01.00.00
                                    RPT VERSION V1R8 RMF      END   08/07/2015-15.00.00  CYCLE 1.000 SECONDS

NUMBER OF INTERVALS 4             TOTAL LENGTH OF INTERVALS 04.00.00

DATE     TIME      INT            PROCS     CPUBSY      APPL      TRANS     RTIME
MM/DD HH.MM.SS HH.MM.SS
08/07 11.00.00 01.00.00            5.0       9.2        33.9       16.8     40.56
08/07 12.00.00 01.00.00            5.0       8.5        33.0
08/07 11.00.00 01.00.00            5.0       8.3        30.6
08/07 12.00.00 01.00.00            5.0       8.8        24.5
```

Format of the **INTERVAL** column changes from **MM.SS** to **HH.MM.SS**



RMF Spreadsheet Reporter

- converts SMF Data to Spreadsheet Format
- creates graphical Views for Trend Analysis
- can be downloaded from the RMF Homepage



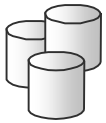
RMF Spreadsheet Reporter

SMF Dump Data

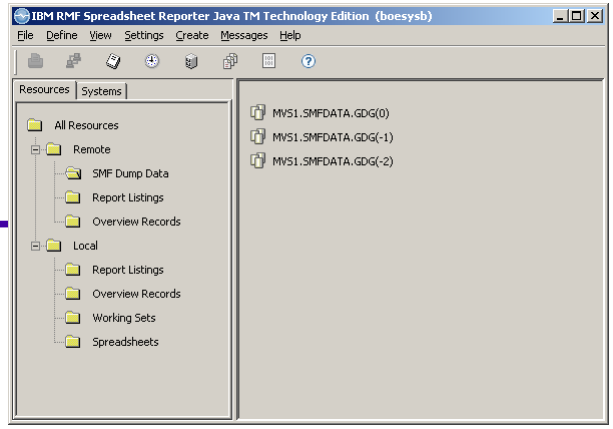
collect

Report Listings

Overview Records



download



Report Listings

Overview Records

XML Reports

generate

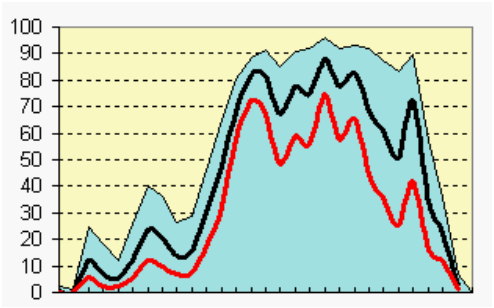
Web Browser

Working Sets

display

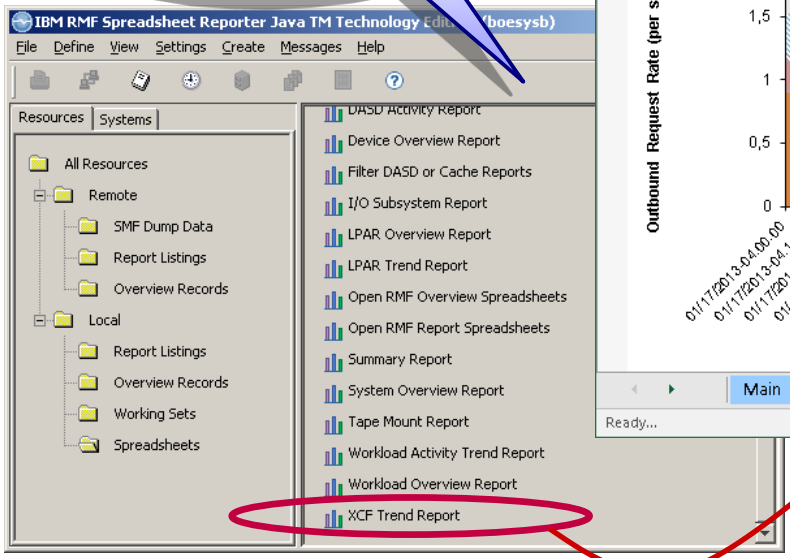
Spreadsheet

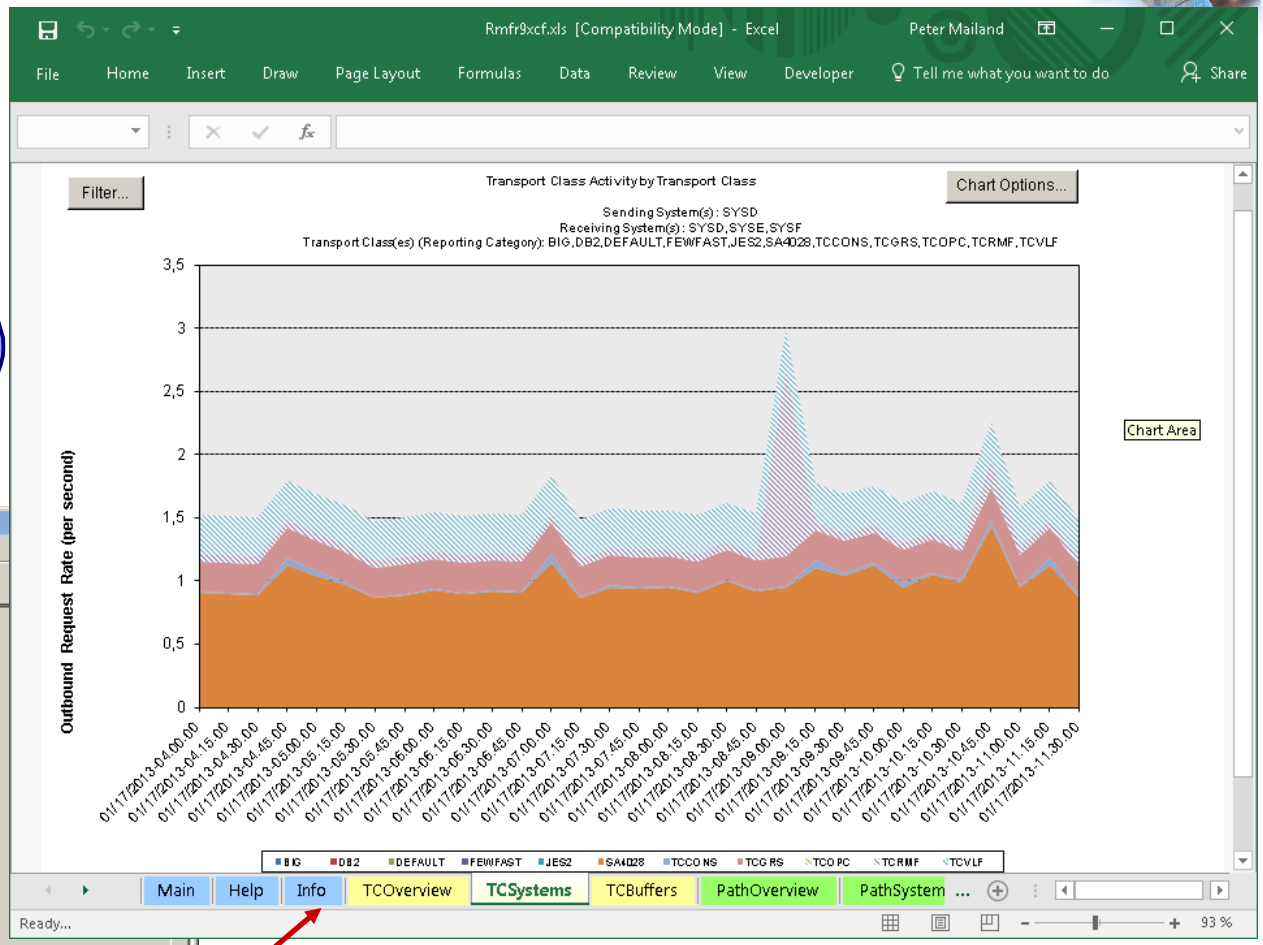
CPU Contention: System SYSA



RMF Spreadsheet Reporter

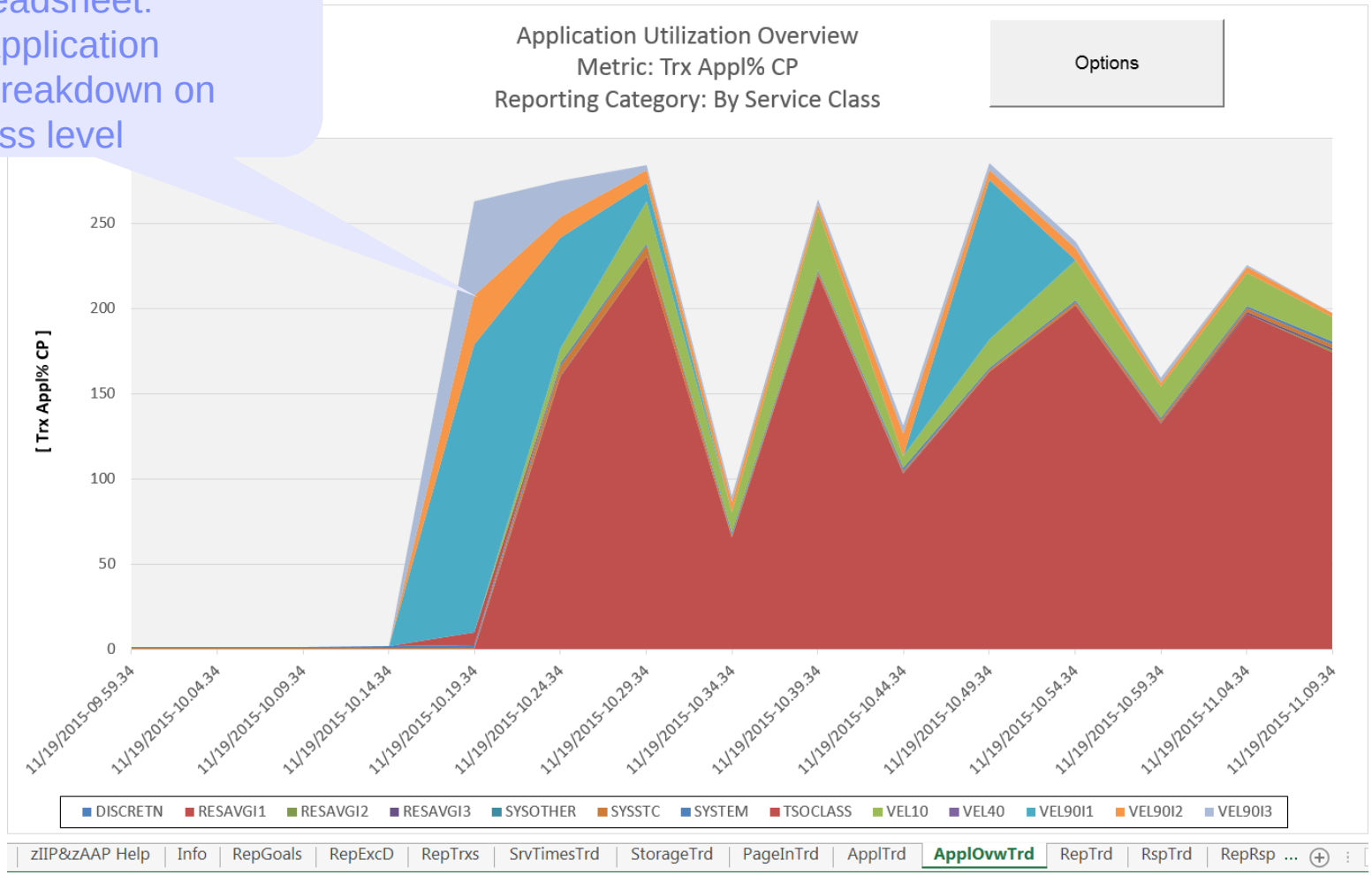
Macros
for all Types of
Performance relevant
Areas !! (based on reports
or overview records)





RMF Spreadsheet Reporter

Eg Workload Activity Trend Report Spreadsheet: Graphical Application Utilization breakdown on Service Class level

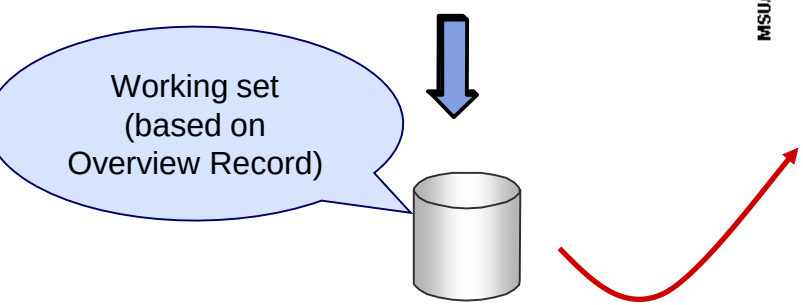


RMF Spreadsheet Reporter

- Use overview control statements to create a working set and load the data into the generic RMF Overview Report spreadsheet, which offers a bunch of chart !

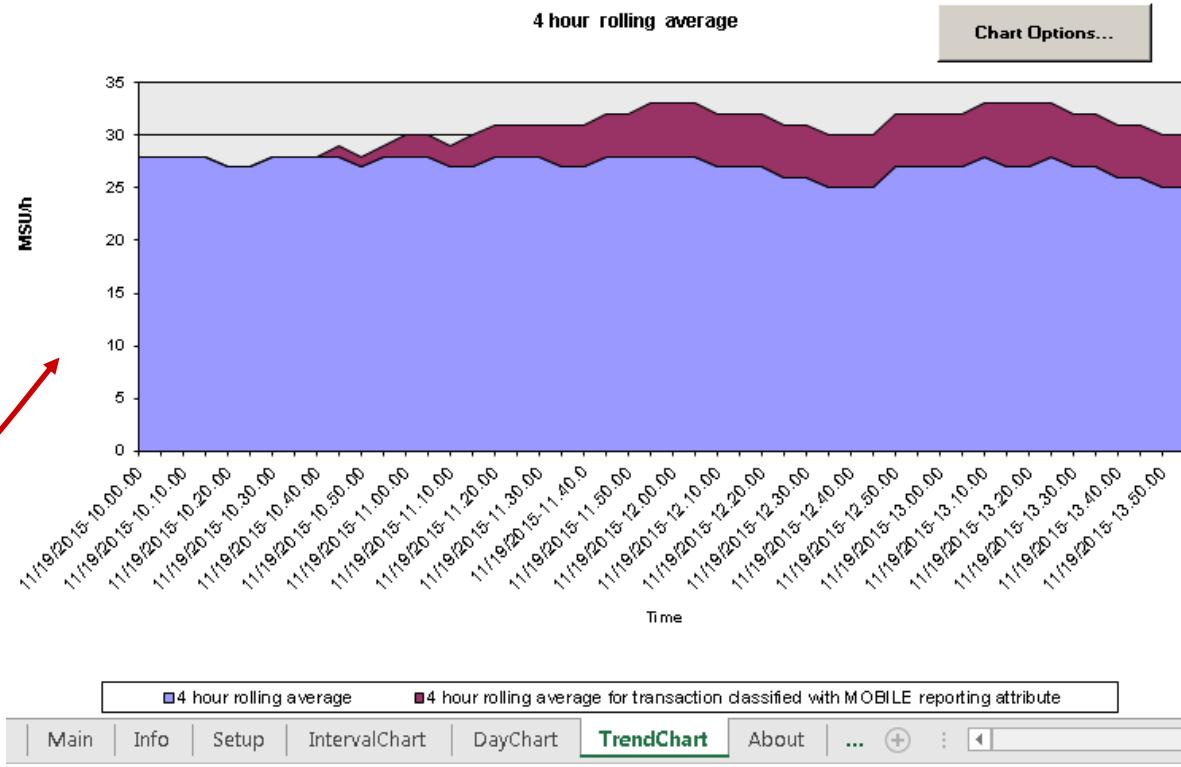
Overview Conditions:

```
OVW(4HRA(LACS))
OVW(MOB4HRA(LACSM))
```



DATE	TIME	INT	4HRA	MOB4HRA
MM/DD	HH.MM.SS	HH.MM.SS		
11/19	10.00.00	00.05.00	28	0
11/19	10.05.00	00.05.00	28	0
11/19	10.10.00	00.05.00	28	0
11/19	10.15.00	00.05.00	28	0
11/19	10.20.00	00.05.00	27	0
11/19	10.25.00	00.05.00	27	0

…



RMF Postprocessor Reports in XML Format

- The generation of Postprocessor reports in XML format is controlled by the ddnames XPRPTS, XPXSRPTS and XPOVWRPT
- Either use SYSOUT class or data sets as output (RECFM=VB, LRECL between 256 and 8192)

```
<?xml version="1.0" encoding="UTF-8"?>
<?xml-stylesheet type="text/xsl" href="include/ddsml-pp.xsl"?>
<ddsml xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
       xsi:noNamespaceSchemaLocation="include/ddsml.xsd">
<server>
<name>RMF-DDS-Server</name>
<version>ZOSV2R2</version>
<functionality>3202</functionality>
<platform>z/OS</platform>
</server>
<postprocessor><metric id="PCIE"><description>PCIE Activity Report</description><type>I
</resource><time-data><display-start locale="en-us">09/28/2015-15.44.35</display-start>
<segment id="1"><name>General PCIE Activity</name>
<part id="2">
<table id="3">
<column-headers><col type="T">Function ID</col><col type="T">Function PCHID</col><col ty
<col type="T">Owner Address Space ID</col><col type="N">Function Allocation Time</col><
<col type="N">Refresh PCI Translations Operations Rate</col><col type="N">DMA Address S
<col type="N">Packets Transmitted Rate</col><col type="N">Work Units Processed Rate</co
<row refno="1"><col>0021</col><col>037C</col><col>Hardware Accelerator</col><col>101404
<col>0</col><col/><col/><col/><col/></row>
<row refno="2"><col>0025</col><col>037C</col><col>Hardware Accelerator</col><col>101404
<col>0</col><col/><col/><col/><col/></row>
<row refno="3"><col>0028</col><col>03BC</col><col>Hardware Accelerator</col><col>101404
<col>0</col><col/><col/><col/><col/></row>
<row refno="4"><col>002B</col><col>03BC</col><col>Hardware Accelerator</col><col>101404
<col>0</col><col/><col/><col/><col/></row>
</table></part></segment>
```

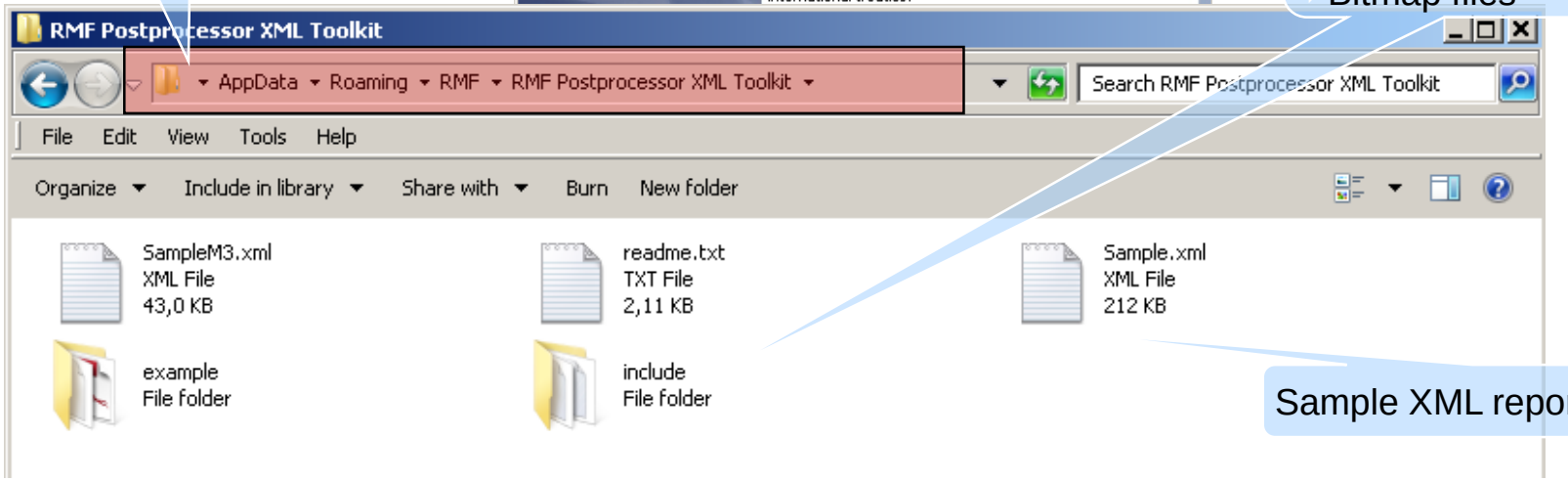
RMF XML Tookit

Simplifies display of RMF Postprocessor XML reports in a web browser

1. Download member SYS1.SERBPWSV(ERBXMLTK) as binary file erbxmltk.msi or get it from the RMF Homepage
2. Install MSI Package

Default Installation Directory

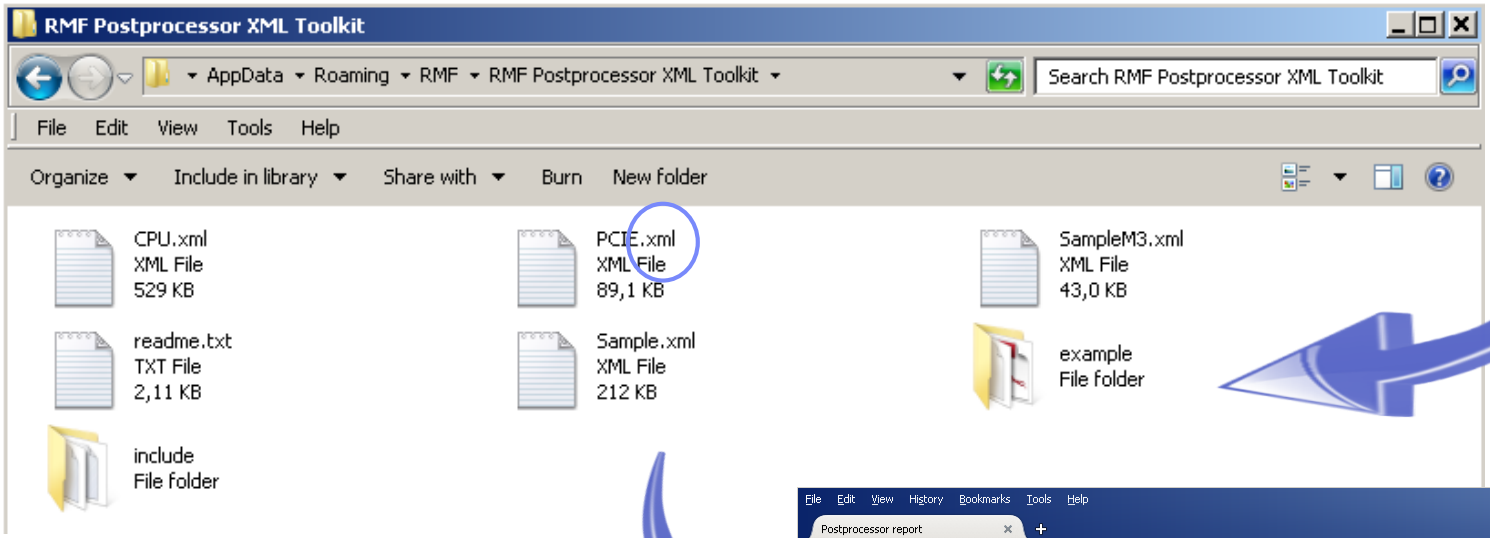
- XSL stylesheet files
- Java script file
- Bitmap files



Sample XML reports (PP, M3)

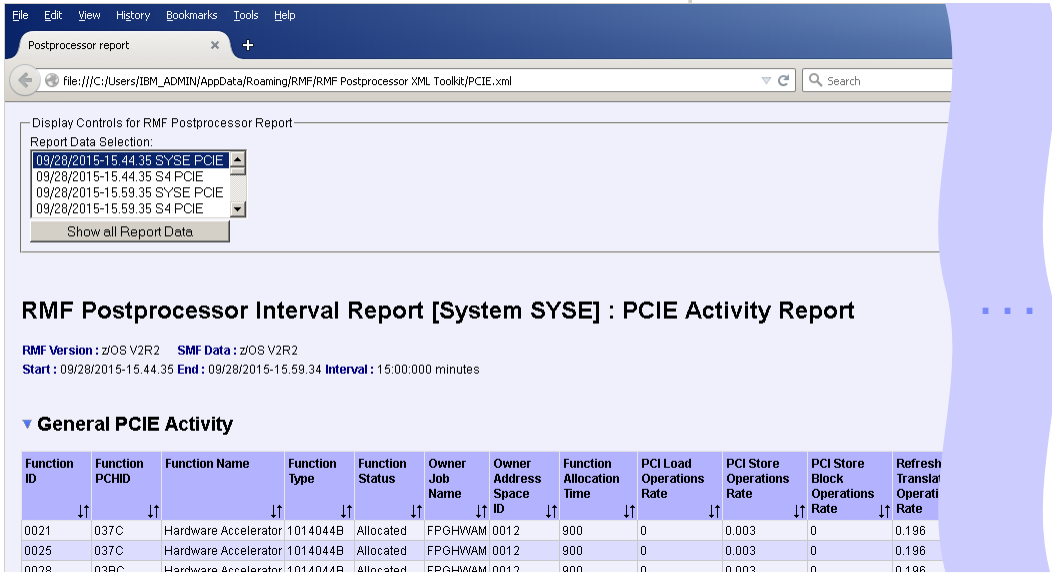
RMF XML Tookit

1. Download Postprocessor XML report into Toolkit directory (ASCII format)

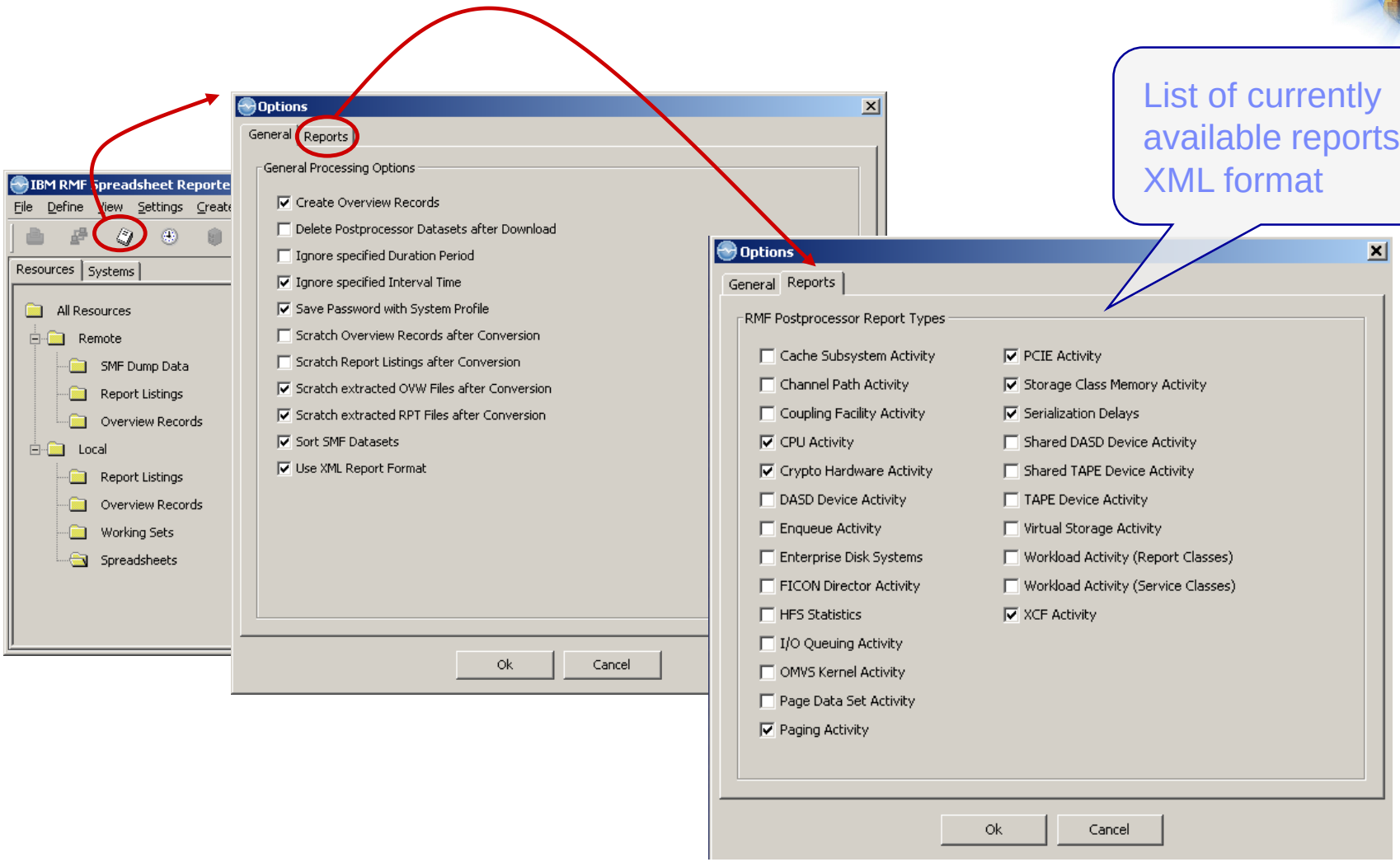


BKGE.PCIE.XML

2. Open XML report with web browser

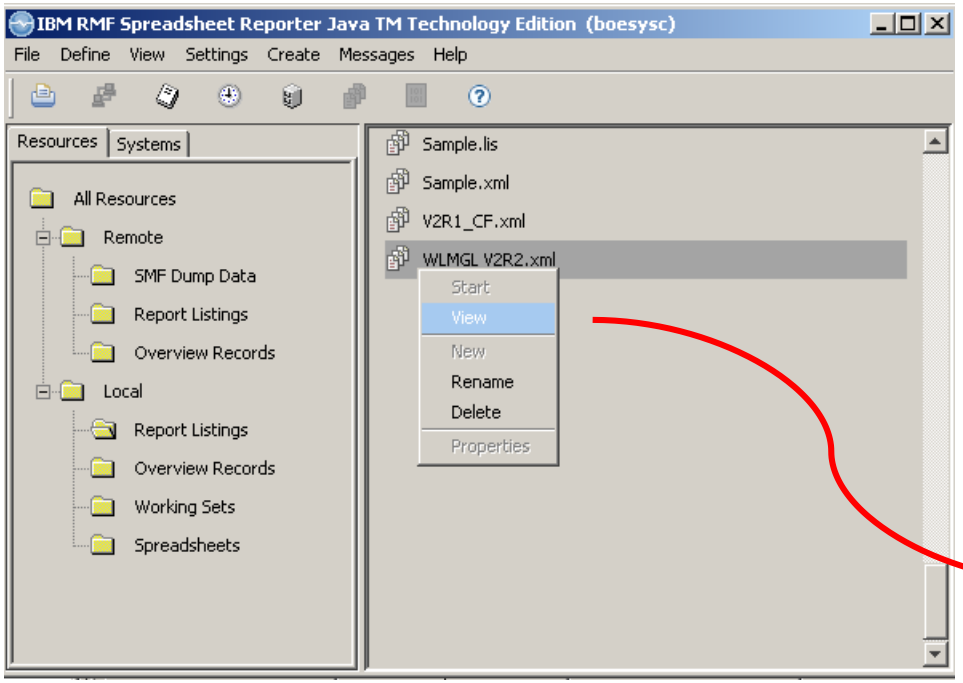


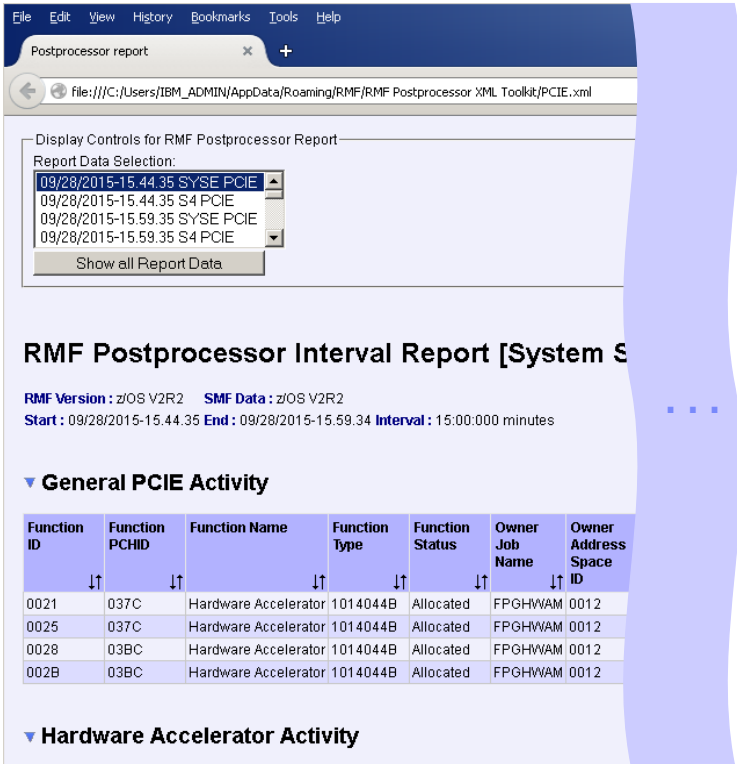
RMF Spreadsheet Reporter – XML Support



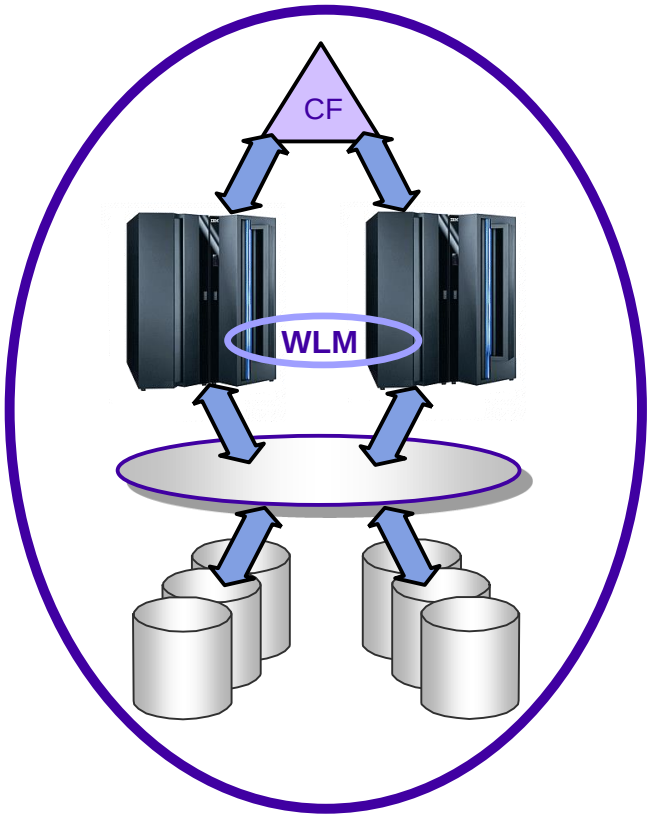
RMF Spreadsheet Reporter – XML Support

1. Create an Postprocessor Report in XML format based on SMF Dump Data or the RMF SMFBUFFER by using Create->Report Listing





Realtime Reporting



- covers all Sysplex related aspects
- two monitors and a workstation extension
  - Monitor III, best suited for
    - short-term, real-time and historical reporting
    - online performance analysis
    - goal attainment supervision
    - sysplex-wide and single-system reporting
    - monitoring of exceptional conditions
  - Monitor II, best suited for
    - snapshot reporting
    - single job and resource monitoring
  - RMF PM / Data Portal
    - enterprise-wide reporting of z/OS systems
    - based on RMF Monitor III data

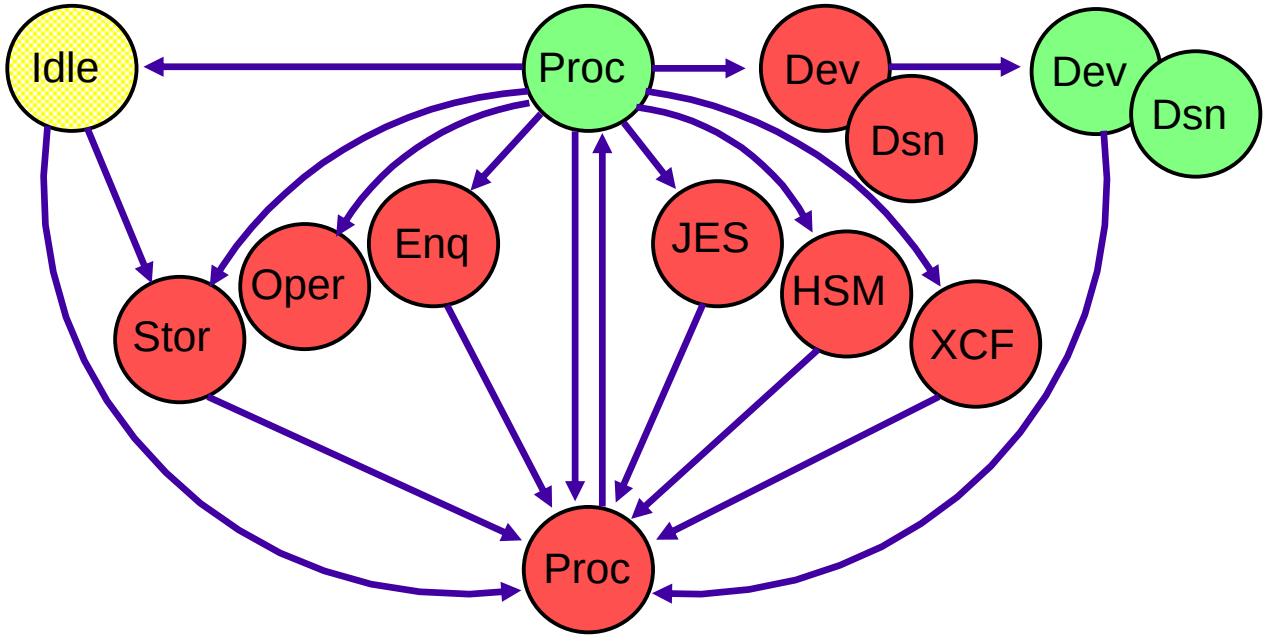
Monitor III Reporting

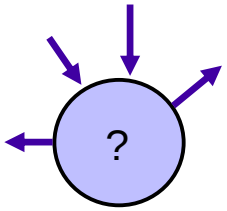
Monitor III Delay Monitoring
- Processor
- Storage
- Device
- Enqueue
- Operator
  - Message
  - Tape Mount
- Subsystem
  - HSM - JES - XCF

Monitor III Activity Monitoring
- Common Storage
- Page/Swap Data Sets
- Storage Frames
- Device
- Data Set Level by Job and Volume
- Cache
- Coupling Facility
- Goal Attainment
- VSAM RLS
- UNIX System Services
- Enclaves
- zFS
- Diskspace
- Spin/Suspend Locks
- Job Resource Consumption

Monitor III Features
- Cursor-Sensitive Navigation
- Workflow/Exceptions Monitoring
- Automatic Customization
- Support of WTO Messages
- Continuous Monitoring
- Hardcopy Reports
- On-Line Tutorial
- On-Line Help
- Adaptive Reports
- User Reports
- Sysplex-wide Reports
- Remote Reporting

States of a Job





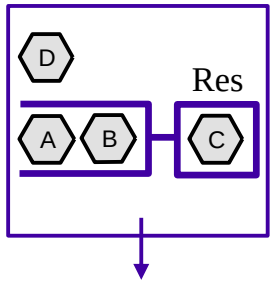
Unknown

$$\text{Using(\%)} = \frac{\text{using samples}}{\text{number of samples}} \times 100 = 50\%$$

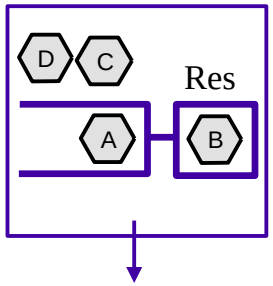
$$\text{Delay(\%)} = \frac{\text{delay samples}}{\text{number of samples}} \times 100 = 33\%$$

$$\text{Workflow (\%)} = \frac{\text{using samples}}{\text{using samples} + \text{delay samples}} \times 100 = 60\%$$

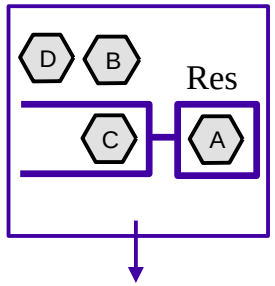
Example: Using and Delay



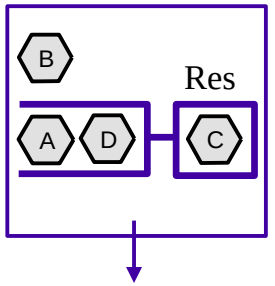
Job	I	U	D	Why
A			*	C
B			*	C
C		*		
D	*			



Job	I	U	D	Why
A			*	B
B		*		
C	*			
D	*			



Job	I	U	D	Why
A		*		
B	*			
C			*	A
D	*			



Job	I	U	D	Why
A			*	C
B	*			
C		*		
D			*	C

```
      RMF Monitor III Delay Report

Samples: 4  Time: 06.28.20 Range: 4 Sec

                WFL USG DLY IDL Primary
Jobname          %   %   %   %  Reason

  A             25  25  75   0    C
  B             50  25  25  50    C
  C             66  50  25  25    A
  D              0   0  25  75    C
```

```
 RMF Monitor III Resource Delay Report

Samples: 4  Time: 06.28.20 Range: 4 Sec

          WFL  ADU  Jobname USG DLY Reason
Resource   %                  %   %

  Res     40  1.5    A     25  75    C
                     B     25  25    C
                     C     50  25    A
                     D      0  25    C
```

Monitor III: Job Delays

```
RMF V2R2   Delay Report                          Line 1 of 326

Samples: 100     System: AQTS  Date: 07/18/15  Time: 06.28.20  Range: 1

              Service      WFL USG DLY IDL UKN ---- % Delayed for ---- Prim
Name      CX  Class     Cr  %   %   %   %   %  PRC DEV STR SUB OPR ENQ Reason

SUSANK    T   TSOPRIME      0   0 100   0   0   0   0   0 100   0   0 HSM
CONSOLE   S   SYSTEM        0   0  15   0  85   0   0   0   0  15   0 Message
RRSSERVQ  B   WLMSHORT      0   0   1   0   1   0   0   0   1   0   0 JES
BHBE      T   TSOPRIME     40   4   6  90   0   6   0   0   0   0   0 JHUGO
MORABIT   T   TSOPRIME     41  37  56   0   7   0  56   0   0   0   0 COMPK5
RONDA2A   B   COMBUILD     42  29  42   0  29   1  41   0   0   0   0 COMPK5
D24JAP1   T   TSOPRIME     49  22  23  56   0   0  23   0   0   0   0 PRIPK5
RRSSERVQ  B   WLMSHORT     50   2   2   0   0   0   2   0   0   0   0 SPOL1J
GRSARTSQ  B   WLMSHORT     50   1   1   0   0   0   0   0   1   0   0 JES
RRSSERVQ  B   WLMSHORT     50   1   1   0   0   0   0   0   1   0   0 JES
CATALOG   S   SYSTEM        63  57  39   0  12   0  39   0   0   0   0 MCATTS
ANFWPROC  SO  SYSSTC       67   2   1   0   2   0   1   0   0   0   0 SPOL1J
GRSARTSQ  B   WLMSHORT     71   5   2   0   0   0   1   0   1   0   0 SPOL1J
SMFDRS    S   STCMED       71   5   2   0  93   0   0   0   0   0   2 SYSZVVDS
JES2      S   SYSSTC       73  16   6   0  79   0   6   0   0   0   0 SPOL1J
GRSARTSQ  B   WLMSHORT     80   4   1   0   0   0   0   0   1   0   0 JES
ARTXESQ   B   WLMSHORT     80   4   1   0   0   0   1   0   0   0   0 SPOL1L
DFRMM     S   SYSSTC       83  81  18   0   1   0  18   0   0   0   0 SL3061
```

Address Space
Performance at a Glance !

- sorted by ascending Workflow
- Delay Type Breakdown
- Delay Reason Information

Monitor III: Usage Report

Identify Top Resource Consumers at a Glance

RMF V2R2 Job Oriented Usage

Samples: 60 System: TRX1 Date: 04/18/15 Time: 10.56.00 Range: 60 Sec

Jobname	Service CX	Class	--- I/O --- Conn	EXCP	--- CPU --- Total	TCB	- Storage - Total	Fixed	----- QScan ---- Total	Resct	Time
XCFAS	S	SYSTEM	0.446	1.97	0.25	0.11	7754	2384	0	0.0	0
MASTER	S	SYSTEM	0.042	0.00	0.02	0.00	6323	1107	0	0.0	0
SMF	S	SYSTEM	0.028	0.00	0.00	0.00	900	210	0	0.0	0
CATALOG	S	SYSTEM	0.027	0.17	0.03	0.03	1824	228	0	0.0	0
GRS	S	SYSTEM	0.020	0.00	0.01	0.01	14136	451	0	0.0	0
JES2	S	SYSSTC	0.010	0.38	0.03	0.02	9277	1041	0	0.0	0
NET	S	SYSSTC	0.010	0.00	0.01	0.00	3050	138	0	0.0	0
DFSZFS	S	SYSSTC	0.008	0.60	0.00	0.00	30660	499	0	0.0	0
OMVS	S	SYSTEM	0.006	0.17	0.00	0.00	16098	356	0	0.0	0
SMS	S	SYSSTC	0.004	0.93	0.00	0.00	548	89	0	0.0	0
PAGENT	SO	SYSSTC	0.003	9.45	0.01	0.01	2978	18072	0	0.0	0
HZSPROC	SO	SYSSTC	0.000	0.00	0.00	0.00	5125	183	0	0.0	0

DELAYJ | Filter | DEV | PROCU | STORF

Cursor Sensitivty

Monitor III: Goal Attainment

```
RMF V2R2   Sysplex Summary - SCLMPLEX        Line 1 of 14
Command ===>                                          Scroll ===> CSR

WLM Samples: 240     Systems: 3  Date: 05/15/15 Time: 13.00.00 Range: 60    Sec
```

```
Service Definition: SCLM                  Installed at: 12/06/00, 10.0  24
     Active Policy: STANDARD              Activated at: 12/06/00, 10.07  2

                ------- Goals versus Actuals --------  Trans --Avg. Resp
                Exec Vel  --- Response Time ---  Perf  Ended  WAIT EXE
Name      T  I  Goal Act  ---Goal--- --Actual--  Indx  Rate   Time
STC       W           88                                0.000 0.000
STCCMD    S  3    40  88                           0.46 0.000 0.000
SYSTEM    W           69                                0.000 0.000
SYSSTC    S      N/A  68    N/A                         0.000 0.000
SYSTEM    S      N/A  70    N/A                         0.000 0.000  0
TSO       W           84                                2.100 0.000  0.6
PRDTSO    S           84                                2.100 0.000  0.608
          1  1        60  1.000 AVG  0.080  AVG  0.08  1.150 0.000  0.080  0.0
          2  1       0.0  1.500 AVG  0.109  AVG  0.07  0.567 0.000  0.109  0.109
          3  1        85  2.000 AVG  2.928  AVG  1.46  0.383 0.000  2.928  2.928
MASTER    R      N/A  47    N/A                         0.000 0.000  0.000  0.000
```

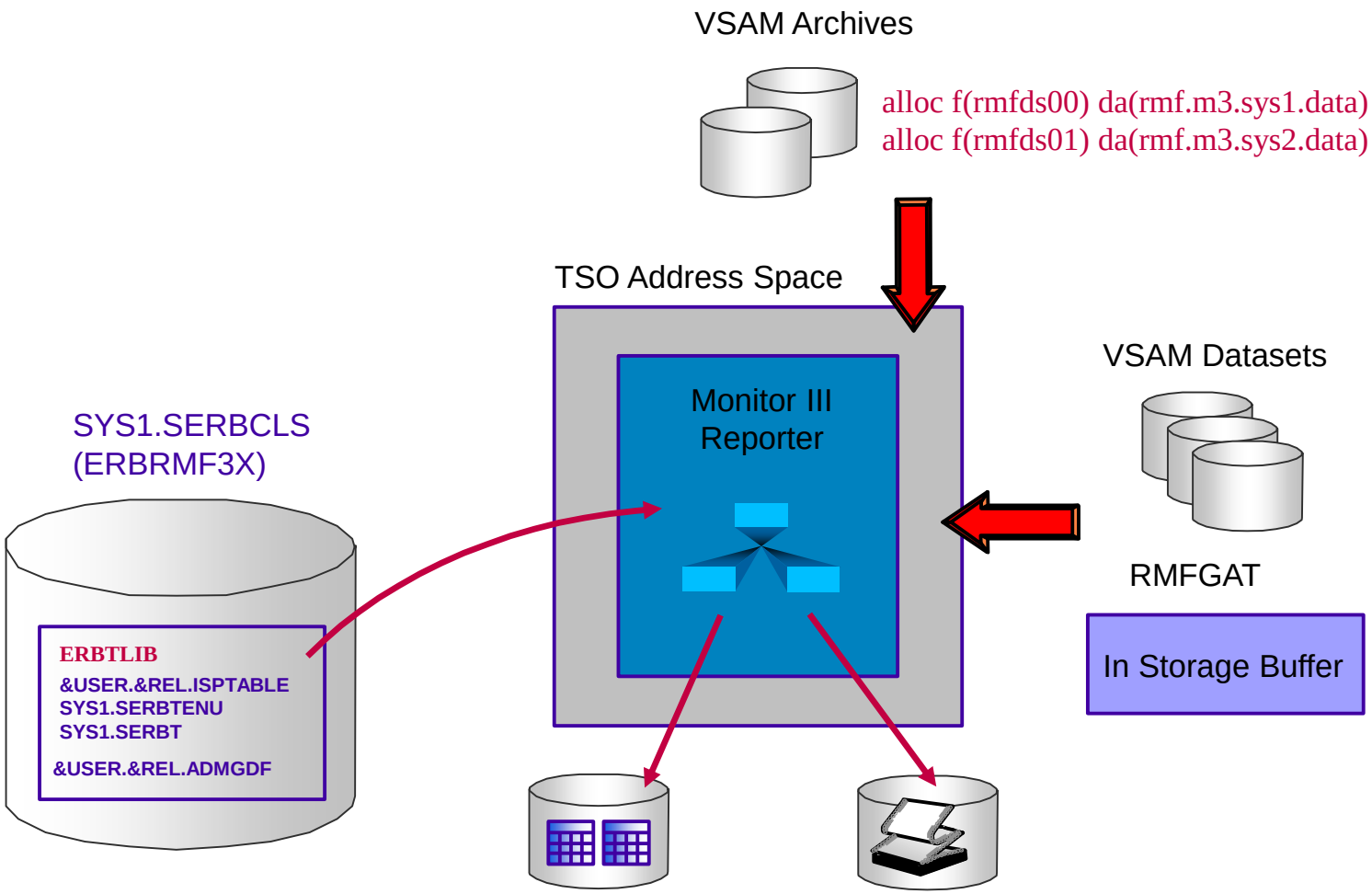
Sysplex Performance at a Glance !

- 80 Intervals in GO Mode
- colored Indication for PI > 1

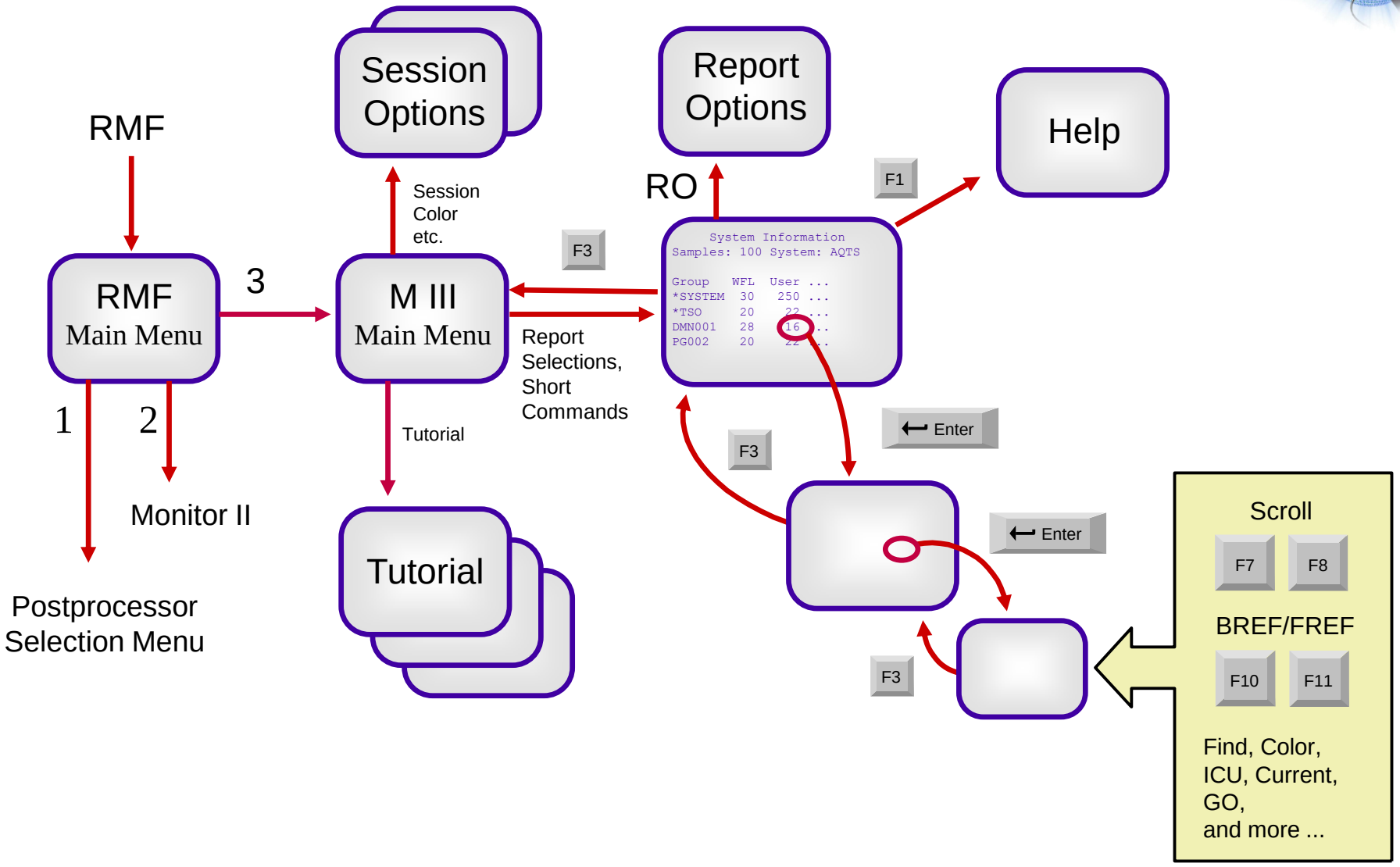
Importance = 1+2

Importance > 2

Monitor III: Session Setup



Monitor III Reporter Usage



Monitor III Report Overview

Sysplex Reports

Workload	Coupling Facility	Cache Subsystem	VSAM RLS	zFS	Other
SYSSUM	CFSYS	CACHSUM	RLSSC	ZFSOVW	SYSENQ
SYSRTD	CFOVER		RLSDS	ZFSFS	
SYSWKM	CFACT	CACHDET	RLSLRU	ZFSKN	DSINDEX

System Reports

Job/Workload oriented

DELAY	ENCLAVE
SYSINFO	GROUP
PROC	PROCU
USAGE	DEV
STOR	STORCR
STORF	WFEX
ENQ	Job Reports
OPD	

STORM
STORS
STORR
STORC

Resource Oriented

CPC	PCIE	SCM
DSND	DSNV	CHANNEL
SPACEG	SPACED	IOQUEUE
LOCKSU	LOCKSP	DEVR
ENQR	JES	HSM
XCF		

User Reports

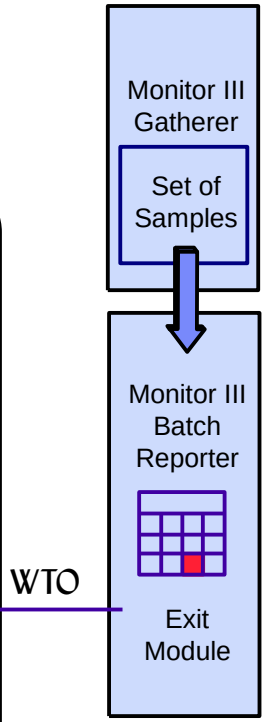
- RG
- MSI
- SYSTREND
- DEVN
- DEVT
- DSD

Modified panel
User-written report

Monitor III: Setup for WTO's

- Monitor III Batch Address Space creates Reporting Tables
- Thresholds can be defined via
  - Workflow Exception Options Dialog
  - Reporter Phase Exit Module
- Console Message is generated by Exit Module (e.g. WLM Capping)

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

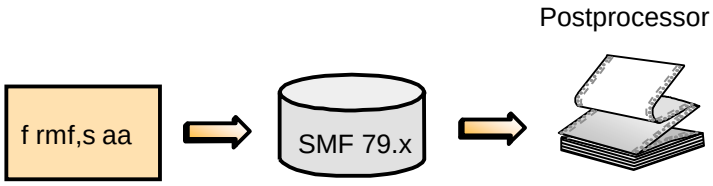


Sample Exits provided for:

- Workflow Exception Report
- Sysinfo Report
- CPC Capacity Report

Monitor II: Overview

- Monitor II is a Snapshot Reporter
  - collects the status of system resources (CPU, devices, paging activity, ...)
  - collects the status of address spaces (resource usage, state information)
- use Monitor II to
  - continuously monitor resource usage
  - determine the state of any address space in the system
  - track CPU usage of problem address spaces
  - collect supplemental information when analyzing performance problems with Monitor III
- choose Background Session
  - to collect SMF records for archiving and later postprocessing
  - to automate snapshot reporting
- choose Display Session
  - for immediate feedback
  - for online analysis



Monitor II Reporting

Activities measured by Monitor II:

- Address Space Data
  - Resource
  - State
  - SRM
- Channel Path
- Device
- I/O Queuing
- Enqueue
- HFS
- IRLM Long Locks
- Paging
- Page/Swap Data Set
- SRM Resource Data
- Sysplex Data Server
- Library Display
- OPT Settings

- for most comfortable usage
- supports sorting and finding
- started from TSO READY or from RMF main menu

- don't use it anymore!

Monitor II Commands

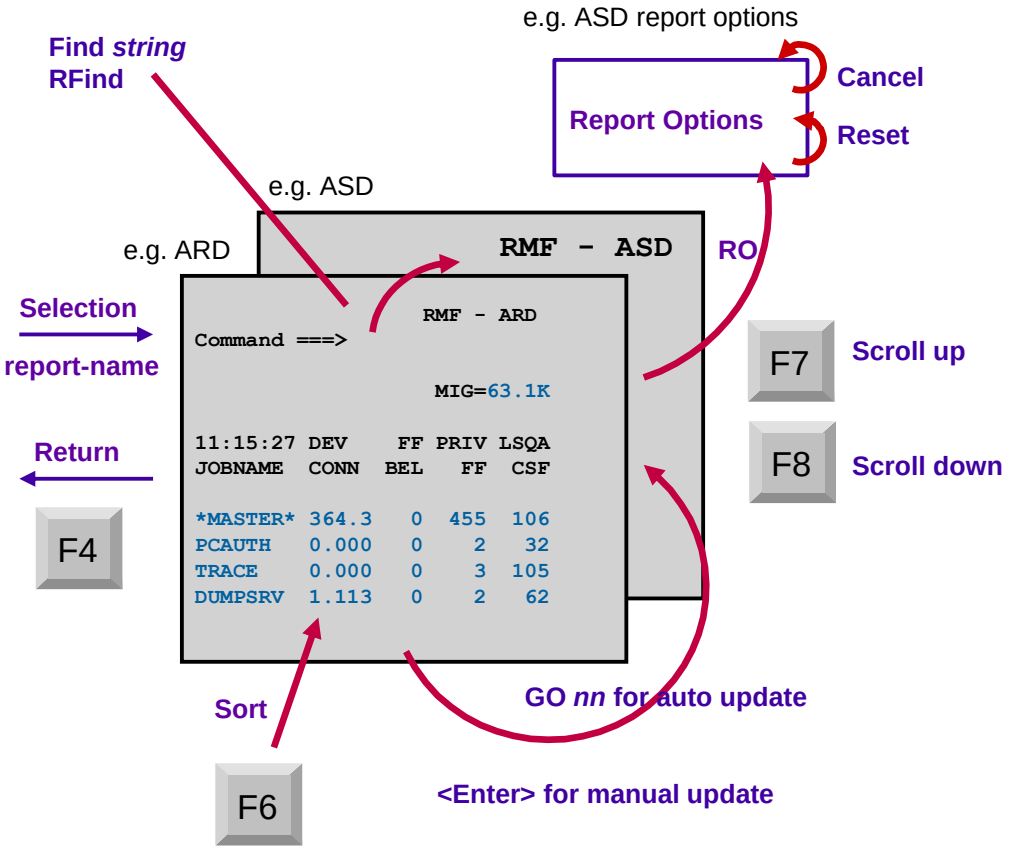
TSO-Command: RMF MON2

Monitor II Primary Menu

```
                RMF
Selection ===>

Enter selection number or command


  1 Address Spaces
  2 I/O Subsystem
  3 Resource

  L Library Lists
  U User
```

Other commands:

H	Prints all reports
D	Delta-mode
Print	Prints current screen
Sys	Remote reporting
Keys	View/Assign PF-keys



Monitor II: ARD Report

```
                    RMF - ARD Address Space Resource Data          Line 1 of 48
 Command ===>                                                    Scroll ===> PAGE

                          CPU= 45/ 30 UIC=2540 PR=   0          System= SCLM Total

 16:04:11 DEV    FF PRV LSQA LSQA X    SRM  TCB   CPU  EXCP SWAP LPA CSA NVI V&H
 JOBNAME  CONN  16M  FF  CSF  ESF M CR ABS  TIME  TIME RATE RATE  RT  RT  RT  RT
HSM      79920   1   4  136    6      0.0  8508 10575 0.01 0.00 0.0 0.0 0.0 0.0
ANTMAIN  28880   2  23  160   12 X    0.0 360.2 427.7 0.00 0.00 0.0 0.0 0.0 0.0
*MASTER*  8616   0 731  102   18      0.0 296.6  2652 0.04 0.00 0.0 0.0 0.0 0.0
XCFAS     4485   0  2K 1059  459 X    0.0 409.7 796.5 2.41 0.00 0.0 0.0 0.0 0.0
IOSAS     3774   0  29  109   10 X    0.0 46.07 46.89 0.02 0.00 0.0 0.0 0.0 0.0
RMFGAT    3144   1  20   65    6 X    0.0  5160  5236 0.67 0.00 0.0 0.0 0.0 0.0
JES2      773.4  9  66  185   43      0.0 360.8 455.3 2.19 0.00 0.0 0.0 0.0 0.0
SMSVSAM   771.2  1 205  764   85 X    0.0 434.8 550.2 1.55 0.00 0.0 0.0 0.0 0.0
SMS       697.1  0   2   53   12 X    0.0 166.1 174.2 2.88 0.00 0.0 0.0 0.0 0.0
OMVS      548.4  5 131  630   60 X    0.0 85.77 103.0 0.00 0.00 0.0 0.0 0.0 0.0
CATALOG   376.5  0   2  234    1 X    0.0 111.7 117.4 0.21 0.00 0.0 0.0 0.0 0.0
HSMMON    81.79  0   3   53    9      0.0 99.15 101.8 0.19 0.00 0.0 0.0 0.0 0.0
NET       66.93  0  36   79   67 X    0.0 771.0  1556 0.00 0.00 0.0 0.0 0.0 0.0
SMF       52.73  0   2   56    8 X    0.0  0.20  3.70 0.00 0.00 0.0 0.0 0.0 0.0
LLA       27.73  0  40   67   14 X    0.0  3.65  4.09 0.06 0.00 0.0 0.0 0.0 0.0
NETVSCLM 24.02   1   5  148   31 X    0.0 115.1 125.9 0.00 0.00 0.0 0.0 0.0 0.0
IXGLOGR  23.65   0   5   87   48 X    0.0 38.28 45.04 0.00 0.00 0.0 0.0 0.0 0.0
```

Address Space Resource Consumption at a Glance !

- I/O Activity
- Frame Counts
- CPU Time

all Table Reports are sortable !

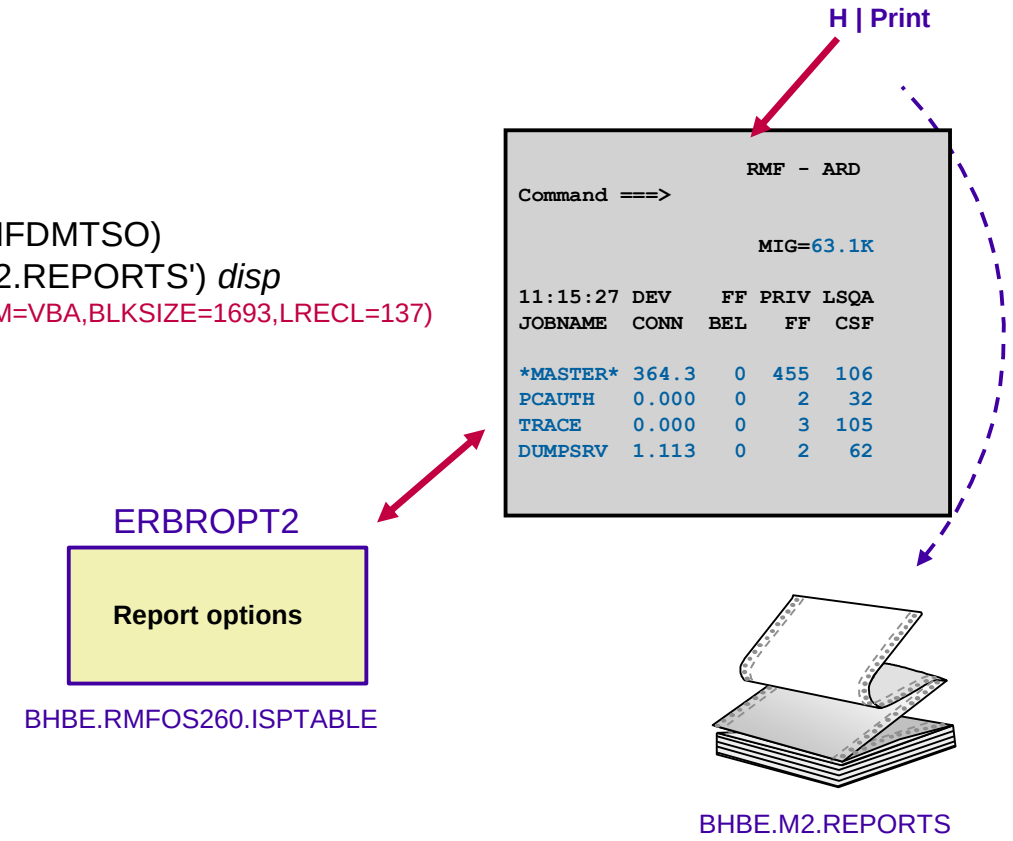
Monitor II: OPT Report

```
RMF - OPT Settings                          Line 1 of 37

                        CPU=  3/  1 UIC= 65K PR=   0        System= SYSE Total

OPT: P0            Time: 02/05/16 12:30:01
-- Parameter --  - Default - -- Value -- Unit ---------- Description ----------

ABNORMALTERM             Yes          Yes Y/N  Abnormal terminations in routing
ABSMSUCAPPING             No          Yes Y/N  Absolute, permanent MSU capping
BLWLINTHD                 20           20 sec  Time blocked work waits for help
BLWLTRPCT                  5            5 0/00 CPU cap. to promote blocked work
CCCAWMT                 3200         3200 usec Alternate wait management time
CCCSIGUR                  45           24 msec Min. mean-time-to-wait threshold
CNTCLIST                  No           No Y/N  Clist commands count individually
CPENABLE           10,30|0,0        10,30 %    Threshold for TPI (low,high)
DVIO                     Yes          Yes Y/N  Directed VIO is active
ERV                      500       500/CB SU   Enqueue residency CPU Service/DP
FULLPRESYSTEM             No           No Y/N  System AS can preempt other work
HIPERDISPATCH            Yes          Yes Y/N  Hiperdispatch is desired/active
IFAHONORPRIORITY         Yes          Yes Y/N  Allows CPs to help zAAPs
IIPHONORPRIORITY         Yes          Yes Y/N  Allows CPs to help zIIPs
INITIMP                    0         0/FE #    INITIMP value/DP for initiators
IRA405I            70,50,50     70,50,50 %    Fixed storage of <16M,16M-2G,tot
MANAGENONENCLAVE          No           No Y/N  Manage non-enclave work
MAXPROMOTETIME             6            6 *10s Holder allowed to run promoted
MCCAFCTH             400,800   3866,7732 #    Threshold for storage (low,ok)
MCCFXEPR                  92           92 %    Fixed storage threshold < 16 MB
MCCFXTPR                  80           80 %    Fixed online storage threshold
MT_CP_MODE                 1            1 #    MT CP mode
```

Display current setting of IEAOPTxx parmlib parameter

Monitor II Session Setup

1. ALLOC F(RMFDMTSO)
   DA('BHBE.M2.REPORTS') *disp*
   DCB=(RECFM=VBA,BLKSIZE=1693,LRECL=137)
2. RMF MON2



Monitor II Display Modes

Specific resource or job, e.g. job BHOL

All resources or jobs at a specific point in time

```
                    RMF - ARDJ Address Space Resou
Command ===>

                              CPU= 19/ 19 UIC=2540

BHOL      DEV     FF PRIV LSQA LSQA X SRM   TCB
  TIME    CONN   BEL   FF  CSF  ESF M ABS   TIME

13:16:46 16.87    3    3   79    0    65K   7.20
13:16:47 16.88    3    3   79    0    65K   7.20
13:16:48 16.89    3    3   79    0    65K   7.20
13:16:49 16.90    3    3   79    0    65K   7.21
13:16:50 16.91    3    3   79    0    65K   7.21
13:16:51 16.92    3    3   79    0    65K   7.21
13:16:52 16.93    3    3   79    0    65K   7.22
13:16:53 16.94    3    3   79    0    65K   7.22
13:16:54 16.95    3    3   79    0    65K   7.22
```

```
                    RMF - ARD Address Space Resour
Command ===>

                              CPU=  9/  8 UIC=2540

13:20:26 DEV     FF PRIV LSQA LSQA X SRM   TCB
JOBNAME  CONN   BEL   FF  CSF  ESF M ABS   TIME

*MASTER* 409.1   0  503  106    0    0.0   34.00 2
PCAUTH   0.000   0    2   32    0 X  0.0    0.00
RASP     0.000   0    4   12    0    0.0    0.00
TRACE    0.000   0    3  105    0 X  0.0    0.00
DUMPSRV  1.113   0    2   62    2    0.0    0.05
XCFAS    273.9   0 1420  749    5 X  0.0   28.64
GRS      0.000   0   40  692    0 X  0.0  241.01 3
SMXC     0.000   0    2   33    0    0.0   30.28
SYSBMAS  0.000   0   41   73    0    0.0    3.94
```

Row Report

- Current status in highlighted line

Table Report

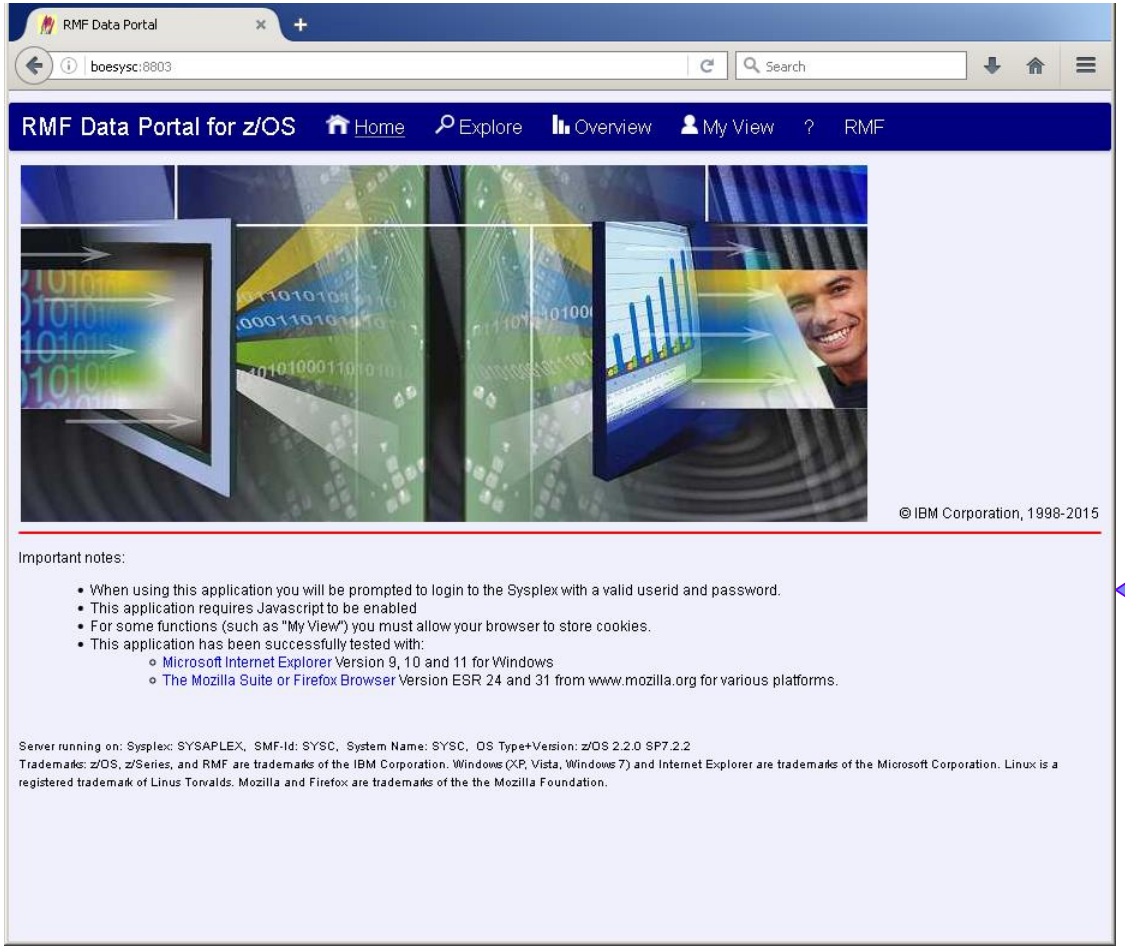
- Current status in whole report

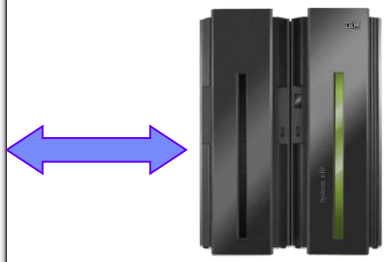
Monitor II Report Overview

Name	Mon I	Row	Explanation
ARD			Address space resource data
ARDJ		Y	
ASD			Address space state data
ASDJ		Y	
ASRM			Address space SRM data
ASRMJ		Y	
CHANNEL			Channel path activity data
DEV	Y		Device activity data
DEVV	Y	Y	
HFS			HFS statistics
ILOCK			IRLM locking data
IOQUEUE	Y		I/O queuing activity data
LLI			Library lists
OPT			IEAOPTxx Settings
PGSP	Y		Page/swap data set activity
SDS			Sysplex data server statistics
SENQ			Enqueue contention
SENQR			Enqueue reserve activity
SPAG		Y	Paging activity
SRCS		Y	Central storage, processor, SRM

RMF Monitor III Data Portal

- direct connection to the RMF Distributed Data Server
- just specify http://<hostname>:8803
- Subset of RMF Monitor III Reports and metrics available



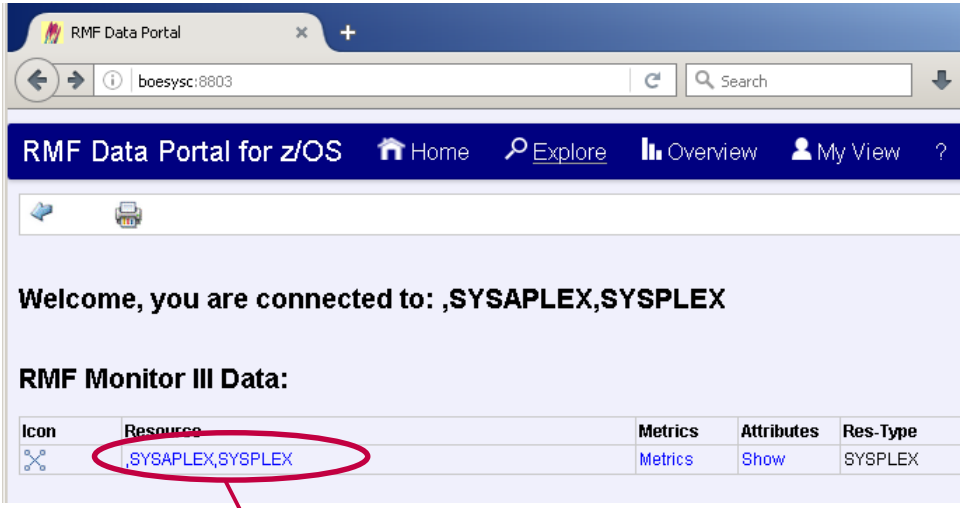


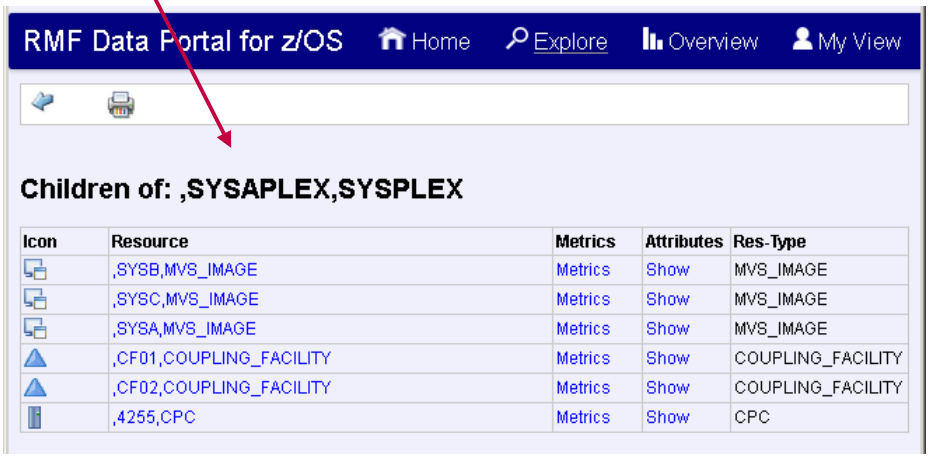
RMF Monitor III Data Portal - The Resource Model

- MVS Image
  - I/O Subsystem
    - All SSIDs
      - SSID
    - All LCUs
      - LCU
    - All Channels
      - Channel
    - All Volumes
      - Volume
    - PCIE
      - PCIE Function
    - SCM
      - SCM Card
    - ZFS
      - Aggregate
  - Processor
  - Storage
    - Auxiliary Storage
    - Central Storage
      - CSA, SQA,ECSA, SQA
  - Enqueue
  - Operator
  - Subsystems
    - JES, XCF, HSM
- CPC
  - LPAR
- Coupling Facility
  - CF Structure

Sysplex

➡ The Sysplex is the top-level resource





RMF Monitor III Data Portal - The Resource Model

Resource specific actions:

- List metrics
- Show attributes

RMF Data Portal for z/OS | Home | Explore | Overview | My View | ?

Welcome, you are connected to: ,SYSAPLEX,SYSPLEX

RMF Monitor III Data:

Icon	Resource	Metrics	Attributes	Res-Type
	,SYSAPLEX,SYSPLEX	Metrics	Show	SYSPLEX

RMF Data Portal for z/OS | Home | Explore | Overview | My View | ?

Full RMF Reports:

CACHDET	CACHSUM	CFACT	CFOVER	CFSYS	SPACED	SPACEG	SYSSUM	XCFGROUP	XCFOVW	XCFPATH
XCFSYS	ZFSFS	ZFSKN	ZFSOVW							

Available metrics for: ,SYSAPLEX,SYSPLEX

Metric description	Help	Id
% delay	Explanation	8D0160
% delay for enqueue	Explanation	8D1A20
% delay for i/o	Explanation	8D1A80
% delay for operator	Explanation	8D1AE0
% delay for processor	Explanation	8D1B40
% delay for storage	Explanation	8D1BA0
% delay for swsub	Explanation	8D1C00

RMF Data Portal for z/OS | Home | Explore | Overview

Attributes of: ,SYSAPLEX,SYSPLEX

Description	Value
Service Definition name	systest
Service Definition installation time	11/09/16, 18.14.03
Name of active WLM service policy	POLICY01
Activation time of WLM service policy	11/09/16, 18.14.10
Sysplex Name	SYSAPLEX

RMF Monitor III Data Portal - The Resource Model

Resource specific actions:

- View a metric

RMF Data Portal for z/OS | Home | Explore | Overview | My View | ?

Full RMF Reports:

CACHDET	CACHSUM	CFACT	CFOVER	CFSYS	SPACED	SPACEG	SYSSUM	XCFGROUP	XCFOVW	XCFPATH
XCFSYS	ZFSFS	ZFSKN	ZFSOVW							

Available metrics for: ,SYSAPLEX,SYSPLEX

Metric description	Help	Id
% delay	Explanation	8D0160
% delay for enqueue	Explanation	8D1A20
% delay for i/o	Explanation	8D1A80
% delay for operator	Explanation	8D1AE0
% delay for processor	Explanation	8D1B40
% delay for storage	Explanation	8D1BA0
% delay for swsub	Explanation	8D1C00
% using	Explanation	8D04A0
% using for i/o		
% using for processor		
% workflow		
% workflow for i/o		
% workflow for processor		
# active users		
# delayed i/o requests		
# users		

Get metric help

click
Add to My View
for Persistence

select
Metric from List

RMF Data Portal for z/OS | Home | Explore | Overview | My View | ?

,SYSAPLEX,SYSPLEX -- # *users* [8D0D50] (count)

Time Range: 01/26/2017 15:13:00 - 01/26/2017 15:14:00

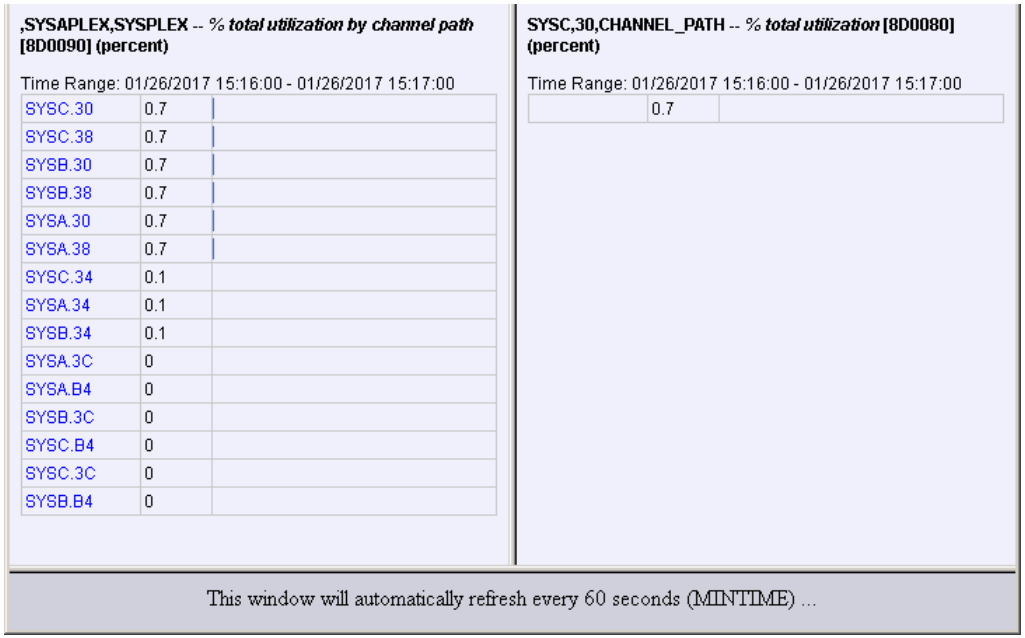
444

Add to My View

RMF Monitor III Data Portal - metrics

Each resource is associated with various metrics
Two basic metric types:

- Single valued metrics - consists of exactly one value
- List valued metrics - is represented by a list of name/value pairs



,SYSAPLEX,SYSPLEX -- % *total utilization by channel path* [8D0090] (percent)

Time Range: 01/26/2017 15:16:00 - 01/26/2017 15:17:00

SYSC.30	0.7	
SYSC.38	0.7	
SYSB.30	0.7	
SYSB.38	0.7	
SYSA.30	0.7	
SYSA.38	0.7	
SYSC.34	0.1	
SYSA.34	0.1	
SYSB.34	0.1	
SYSA.3C	0	
SYSA.B4	0	
SYSB.3C	0	
SYSC.B4	0	
SYSC.3C	0	
SYSB.B4	0	

SYSC,30,CHANNEL_PATH -- % *total utilization* [8D0080] (percent)

Time Range: 01/26/2017 15:16:00 - 01/26/2017 15:17:00

	0.7	

This window will automatically refresh every 60 seconds (MINTIME) ...

RMF Monitor III Data Portal…

RMF Data Portal for z/OS | Home | Explore | Overview | My View

,SYSAPLEX,SYSPLEX -- # *users* [8D0D50] (count)

Time Range: 01/26/2017 15:13:00 - 01/26/2017 15:14:00

	444

Add to My View

select favorite Metric from List

RMF Data Portal for z/OS | Home | Explore | Overview | My View

Manage Metrics in My View

Select	Origin	Resource	Metric Id
☑ (1)	My View	,SYSAPLEX,SYSPLEX	8D0090
☑ (2)	My View	SYSC,30,CHANNEL_PATH	8D0080
☑ (3)	Added (New)	,SYSAPLEX,SYSPLEX	8D0D50

OK | CANCEL | HELP

Manage My View

RMF Data Portal for z/OS | Home | Explore | Overview | My View

Welcome, you are connected to:

RMF Monitor III Data:

Icon	Resource	Metrics	Attributes	Res-Type
	,SYSAPLEX,SYSPLEX	Metrics	Show	SYSPLEX

My View definitions are stored persistently

,SYSAPLEX,SYSPLEX -- % *total utilization by channel path* [8D0090] (percent)

Time Range: 01/26/2017 15:24:00 - 01/26/2017 15:25:00

SYSC.30	0.7
SYSC.38	0.7
SYSB.30	0.7
SYSB.38	0.7
SYSA.30	0.7

SYSC,30,CHANNEL_PATH -- % *total utilization* [8D0080] (percent)

Time Range: 01/26/2017 15:24:00 - 01/26/2017 15:25:00

	0.7

,SYSAPLEX,SYSPLEX -- # *users* [8D0D50] (count)

Time Range: 01/26/2017 15:24:00 - 01/26/2017 15:25:00

	445

This window will automatically refresh every 60 seconds (MINTIME) …

RMF Monitor III Data Portal…

- Sysplex-wide reports and single system reports available via *Metrics* selection
- View full RMF Monitor III Reports (also hidden fields)

RMF Data Portal for z/OS | Home | Explore | Overview | My View | ?

Welcome, you are connected to: ,SYSAPLEX,SYSPLEX

RMF Monitor III Data:

Icon	Resource	Metrics	Attributes	Res-Type
	,SYSAPLEX,SYSPLEX	Metrics	Show	SYSPLEX

RMF Data Portal for z/OS | Home | Explore | Overview | My View

Children of: ,SYSAPLEX,SYSPLEX

Icon	Resource	Metrics	Attributes	Res-Type
	,SYSB,MVS_IMAGE	Metrics	Show	MVS_IMAGE
	,SYSC,MVS_IMAGE	Metrics	Show	MVS_IMAGE
	,SYSA,MVS_IMAGE	Metrics	Show	MVS_IMAGE
	,CF01,COUPLING_FACILITY	Metrics	Show	COUPLING_FACILITY
	,CF02,COUPLING_FACILITY	Metrics	Show	COUPLING_FACILITY
	,4255,CPC	Metrics	Show	CPC

Scrollable and resizable!

RMF Data Portal for z/OS | Home | Explore | Overview | My View

Full RMF Reports:

CACHDET	CACHSUM	CFACT	CFOVER	CFSYS	SPACED	SPACEG	SYSSUM	XCFGROUP	XCFOVW
XCFSYS	ZFSFS	ZFSKN	ZFSOVW						

Available metrics for: ,SYSAPLEX,SYSPLEX

Metric description	Help
% delay	Explanation
% delay for enqueue	Explanation
% delay for i/o	Explanation

RMF Data Portal for z/OS | Home | Explore | Overview | My View

Full RMF Reports:

CHANNEL	CPC	DELAY	DEV	DEVR	DSND	ENCLAVE	ENQ	HSM	JES	IOQ
LOCKSP	LOCKSU	OPD	PCIE	PROC	PROCU	SCM	STOR	STORC	STORCR	STORF
STORM	STORR	STORS	SYSINFO	USAGE	ZFSACT	ZFSSUM				

Available metrics for: ,SYSC,MVS_IMAGE

Metric description	Help	Id
% delay	Explanation	8D0160
% idle	Explanation	8D03E0

RMF Monitor III Data Portal…

RMF Data Portal for z/OS | Home | Explore | Overview | My View

Full RMF Reports:

CHANNEL	CPC	DELAY	DEV	DEVR	DSND	ENCLAVE	ENQ	HSM	JES	IOQ
LOCKSP	LOCKSU	OPD	PCIE	PROC	PROCU	SCM	STOR	STORC	STORCR	STORF
STORM	STORR	STORS	SYSINFO	USAGE	ZFSACT	ZFSSUM				

Available metrics for: ,SYSC,MVS_IMAGE

Metric desc	Help
% delay	Explanation
% idle	Explanation

Select MIII Report

RMF Data Portal for z/OS | Home | Explore | Overview | My View

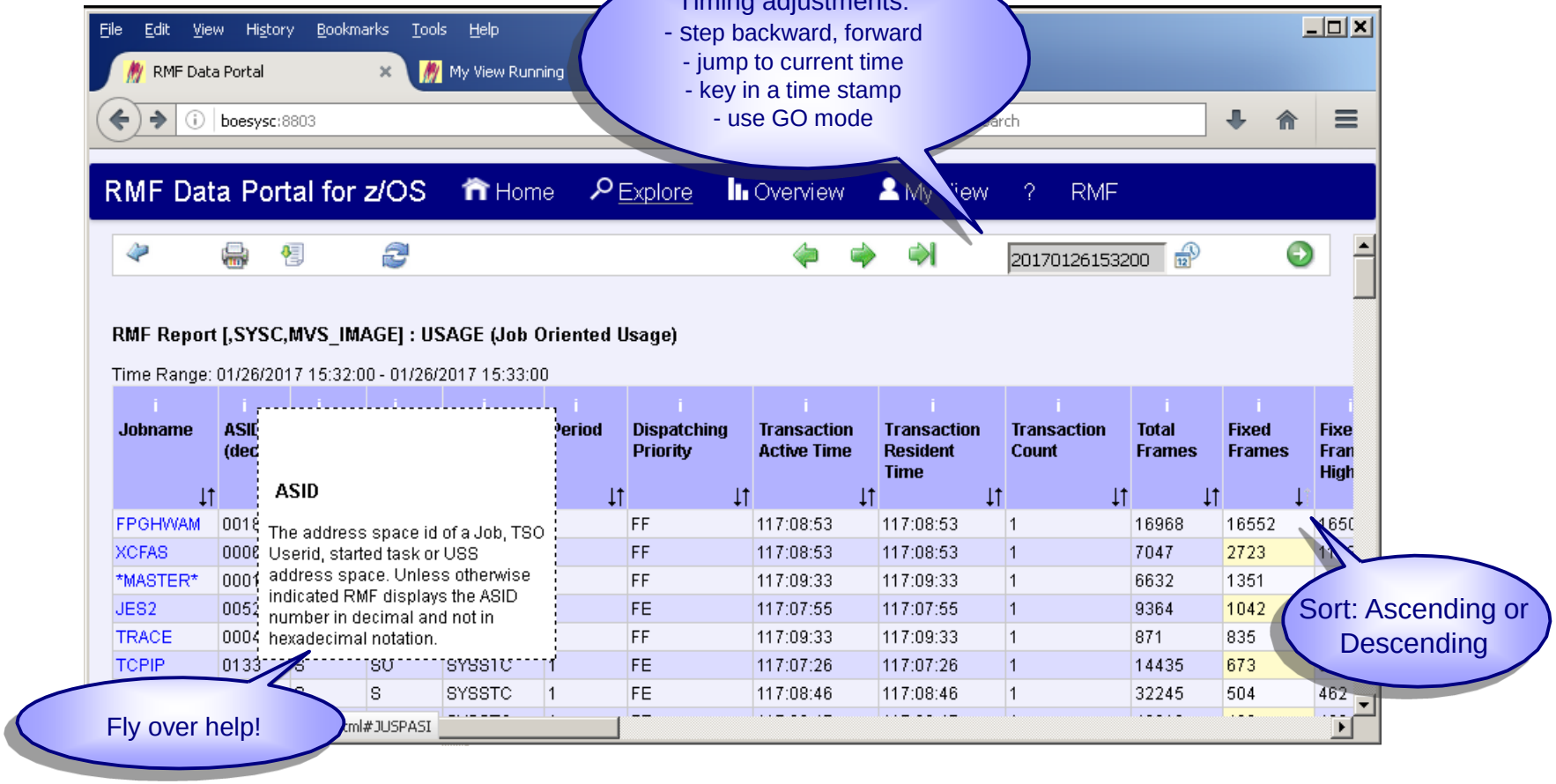
20170126153100

RMF Report [,SYSC,MVS_IMAGE] : USAGE (Job Oriented Usage)

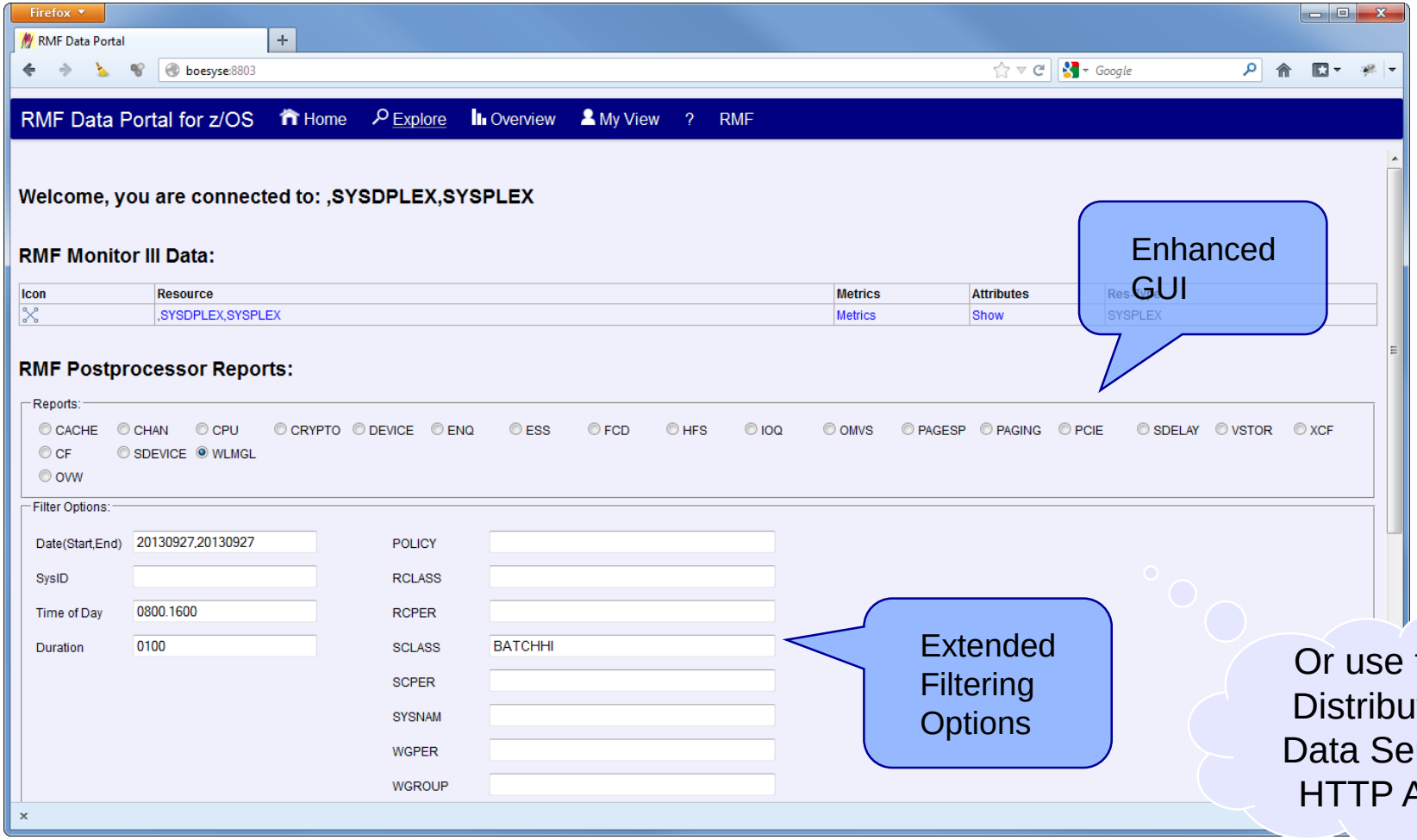
Time Range: 01/26/2017 15:31:00 - 01/26/2017 15:32:00

Jobname	ASID (dec)	Job Class	Job Class Ext	Service Class	Period	Dispatching Priority	Transaction Active Time	Transaction Resident Time
RMFGAT	0114	S	SO	SYSSTC	1	FE	117:06:51	117:06:51
XCFAS	0006	S	S	SYSTEM	1	FF	117:07:53	117:07:53
SMF	0030	S	S	SYSTEM	1	FF	117:07:53	117:07:53
JES2	0052	S	S	SYSSTC	1	FE	117:06:55	117:06:55
MASTER	0001	S	S	SYSTEM	1	FF	117:08:33	117:08:33
CATALOG	0042	S	S	SYSTEM	1	FF	0:30:56	0:30:56
SMS	0024	S	S	SYSSTC	1	FE	117:07:49	117:07:49

RMF Monitor III Data Portal…

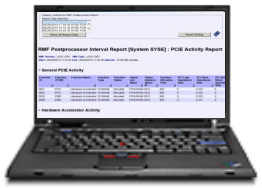


RMF Data Portal: Postprocessor Reports in XML Format



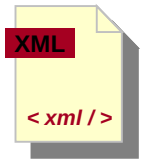
RMF Data Portal: Postprocessor Reports in XML Format

Client Application



HTTP Request

XML Response



RMF Distributed Data Server

```
//STEP1 EXEC PGM=GPMDDSRV
...
//GPMPPJCL  DD DSN=SYS1.SERBPWSV(GPMPPJCL)
...
```

Submit PP JOB

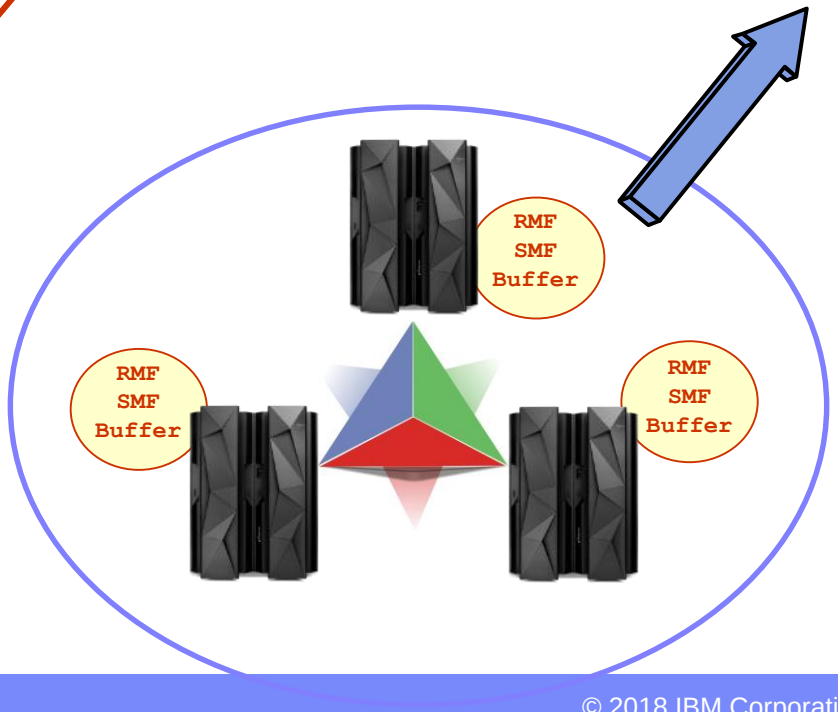
PP JOB Output

GPMDDSPP
RMF Postprocessor JOB

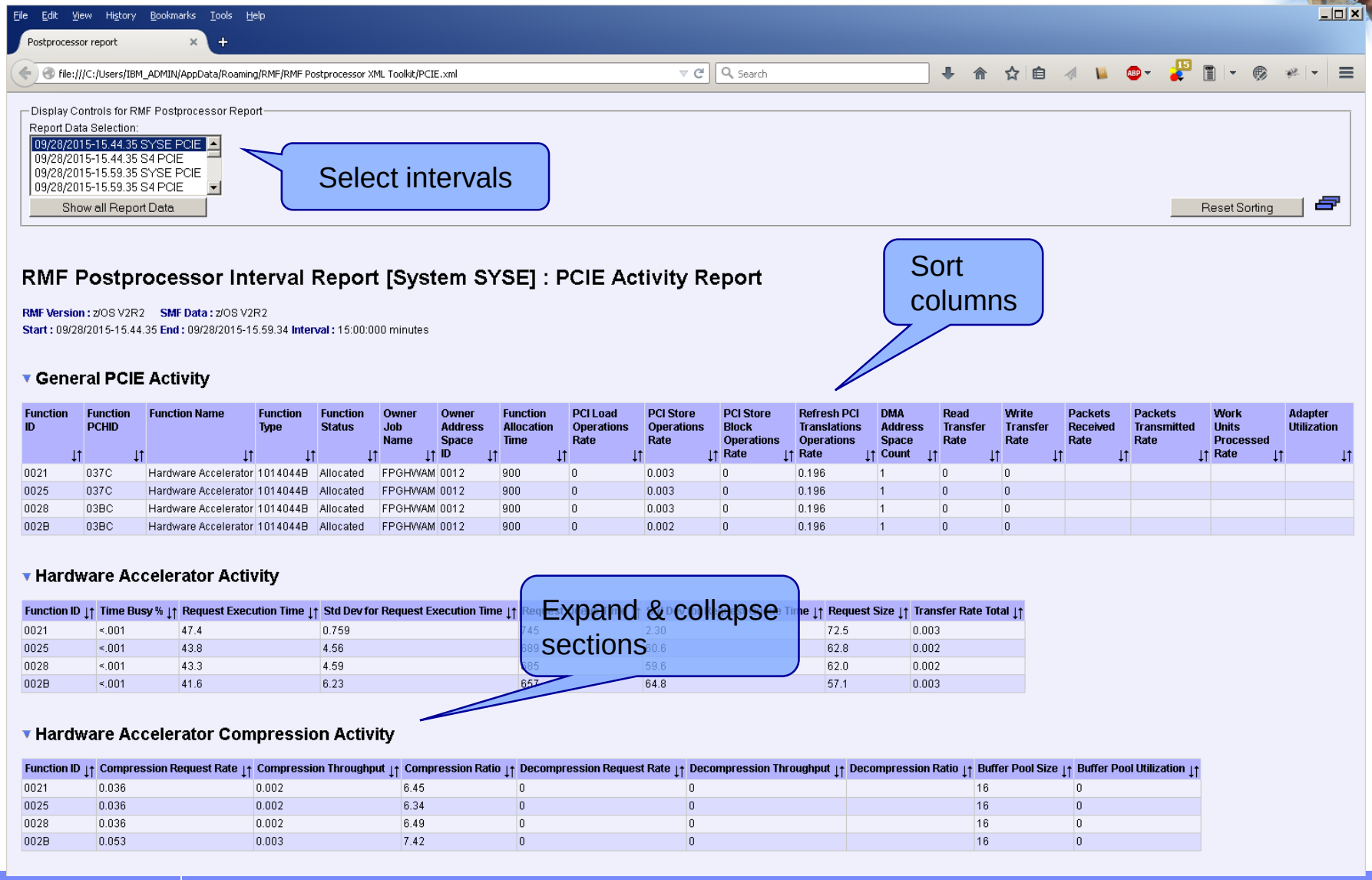
```
//RMFPP   EXEC PGM=ERBRMFPP
//MFPMSGDS DD SYSOUT=*
//XPRPTS   DD SYSOUT=*
//XPXSRPTS DD SYSOUT=*
//XPOVWRPT DD SYSOUT=*
//SYSOUT   DD SYSOUT=*
//SYSIN    DD   *
  DATE(07022010,07022010)
  REPORTS(CPU)
  SYSOUT(H)
```

JCL Template: SYS1.SERBPWSV(GPMPPJCL)

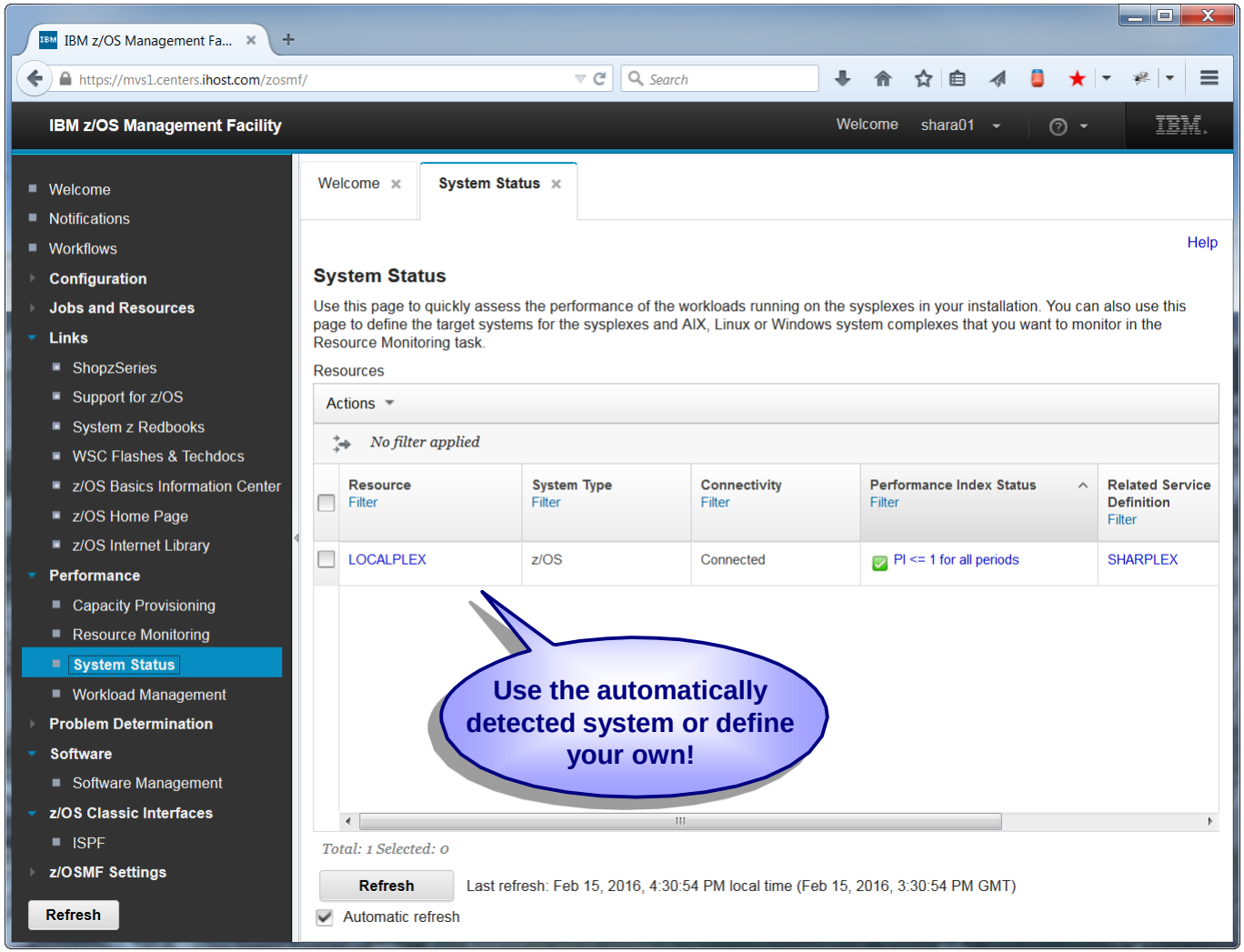
```
//GPMDDSPP JOB MSGCLASS=H,CLASS=A,
//         MSGLEVEL=(1,1)
/*JOBPARM  SYSAFF=*
//RMFPP    EXEC   PGM=ERBRMFPP
//MFPMSGDS DD     SYSOUT=*
//XPRPTS   DD     SYSOUT=*
//XPXSRPTS DD     SYSOUT=*
//XPOVWRPT DD     SYSOUT=*
//SYSOUT   DD     SYSOUT=*
//SYSIN    DD     *
```



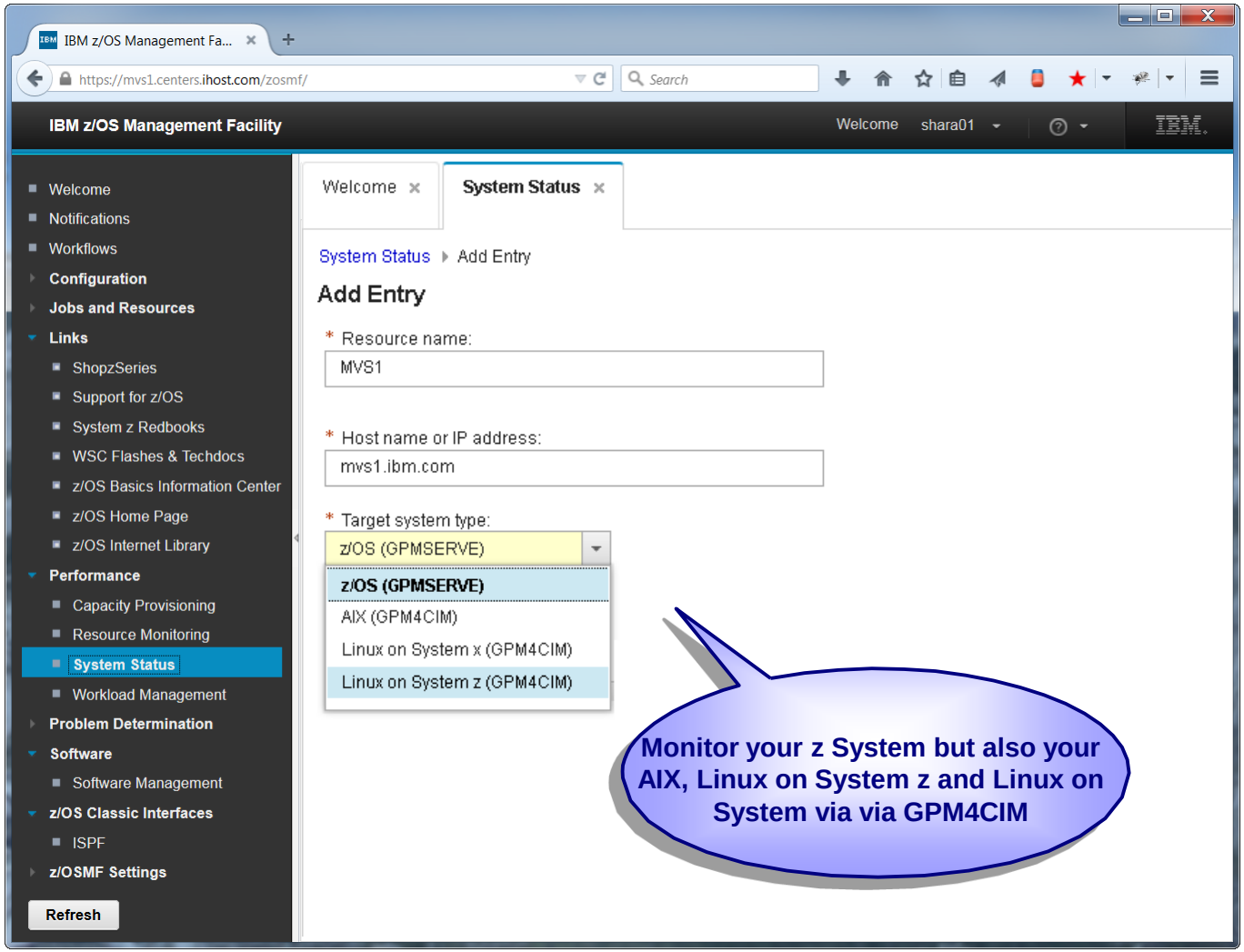
RMF Data Portal: Postprocessor Reports in XML Format



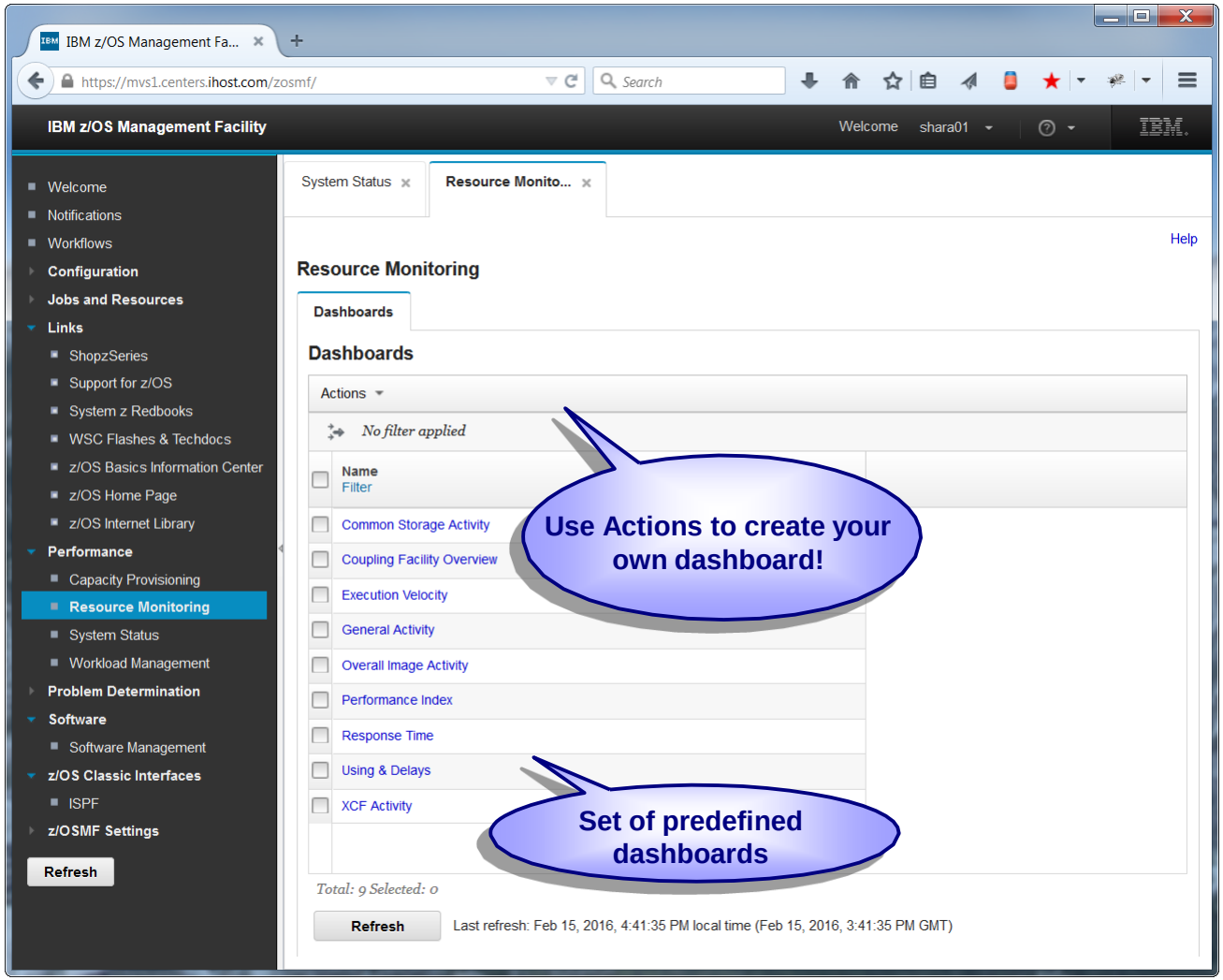
z/OSMF RM



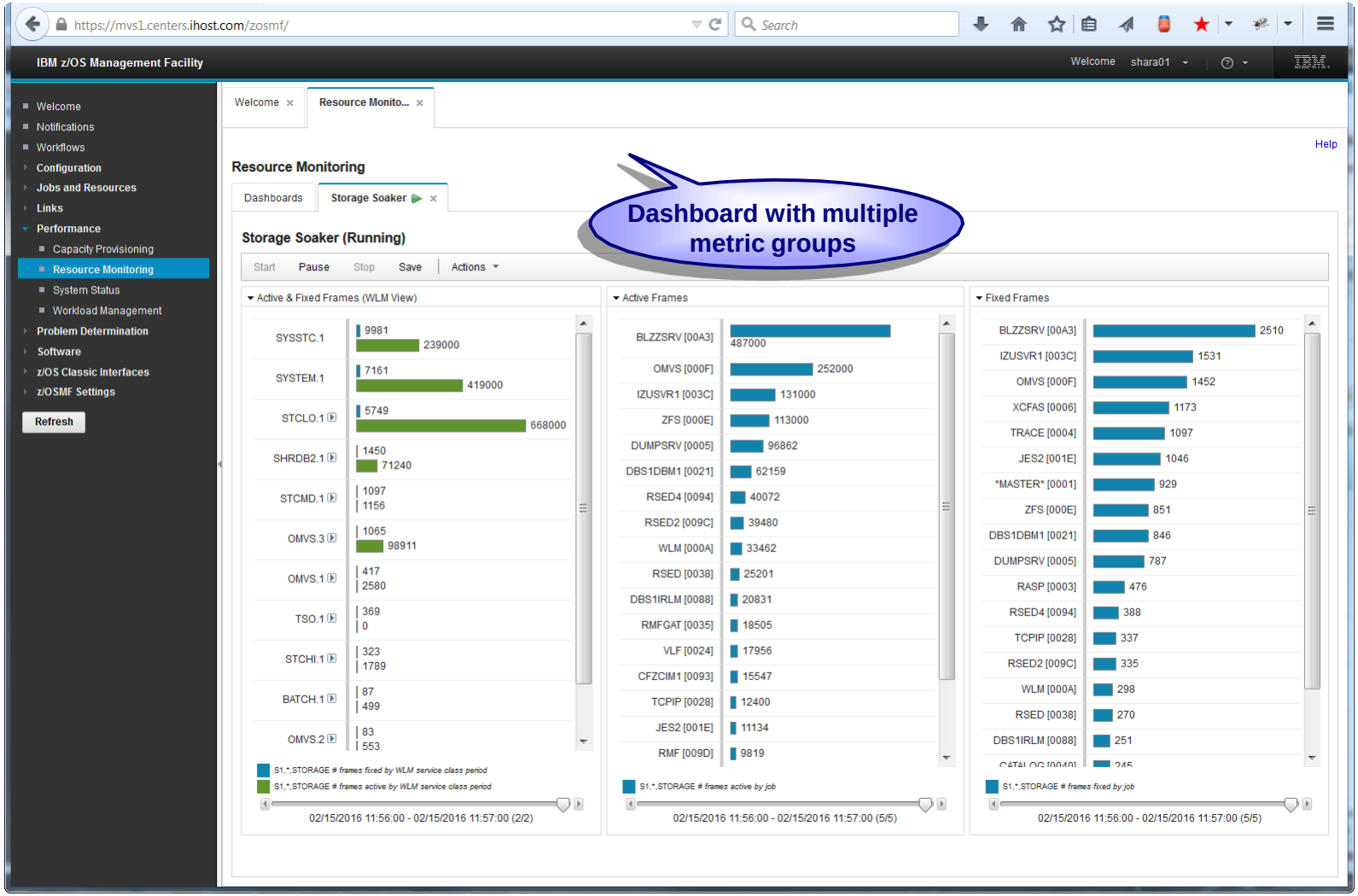
z/OSMF RM



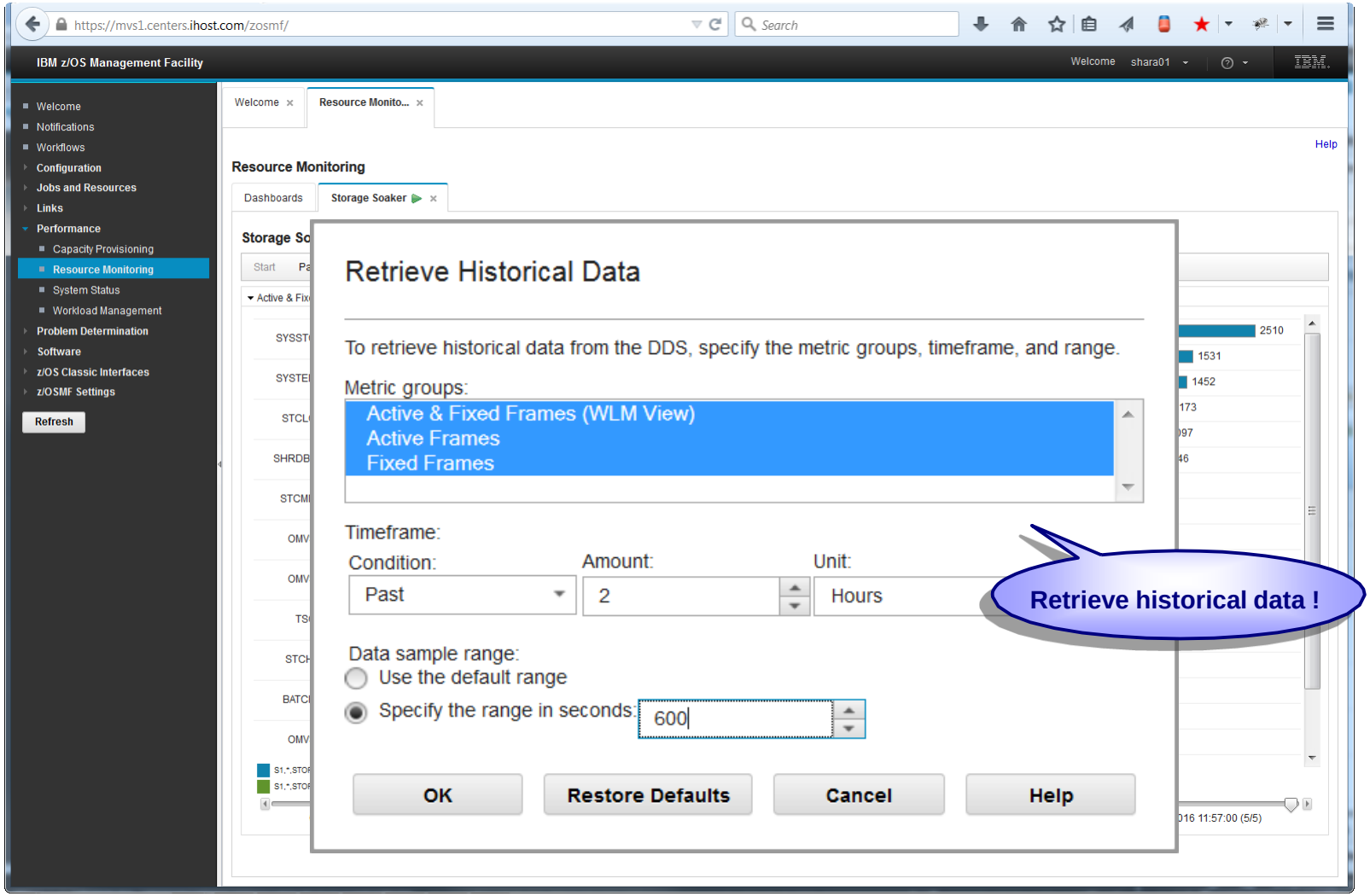
z/OSMF RM



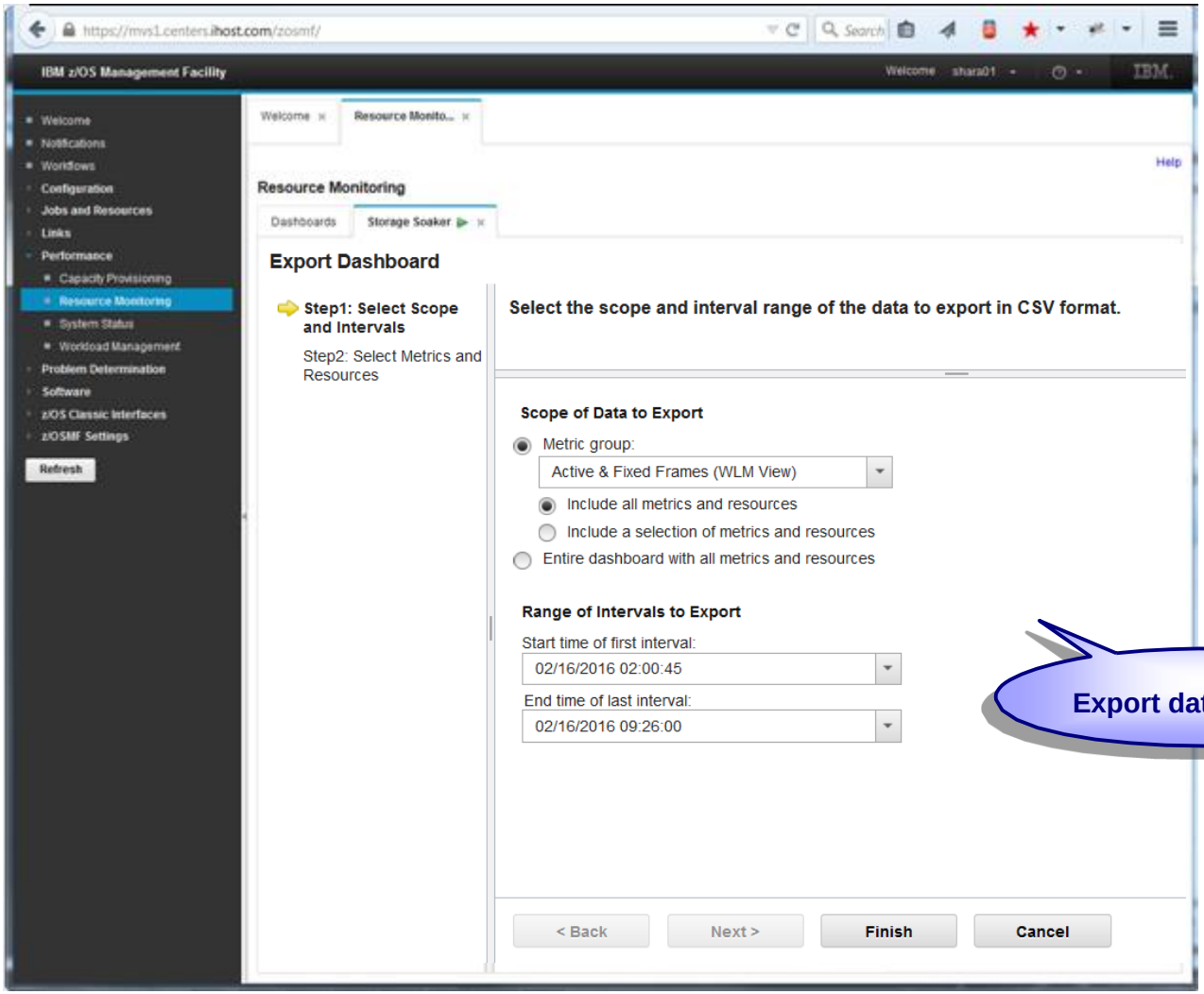
z/OSMF RM



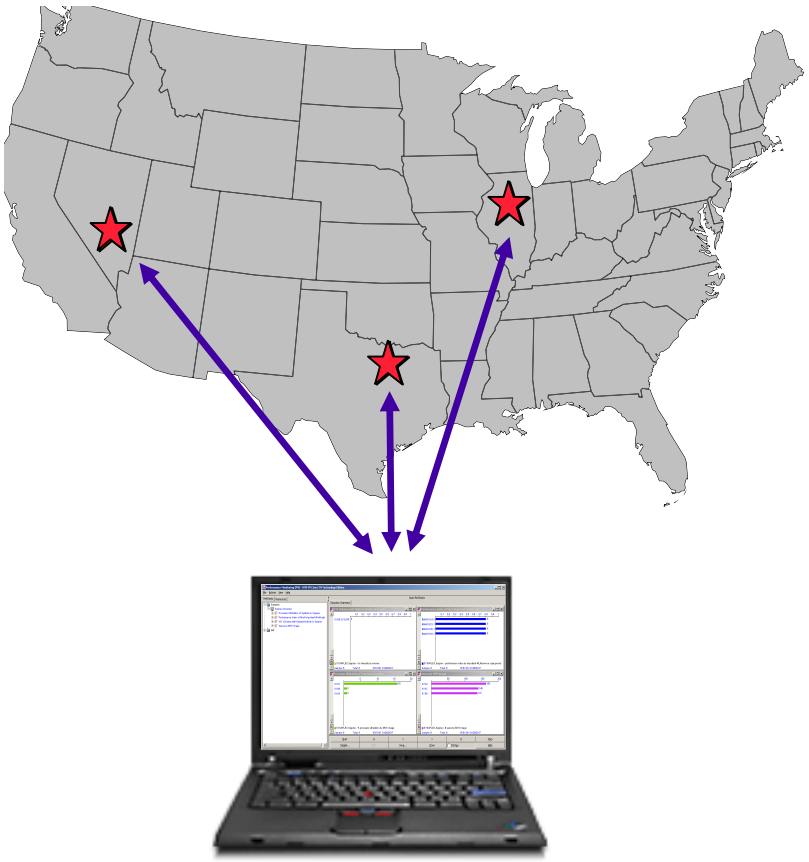
z/OSMF RM



z/OSMF RM

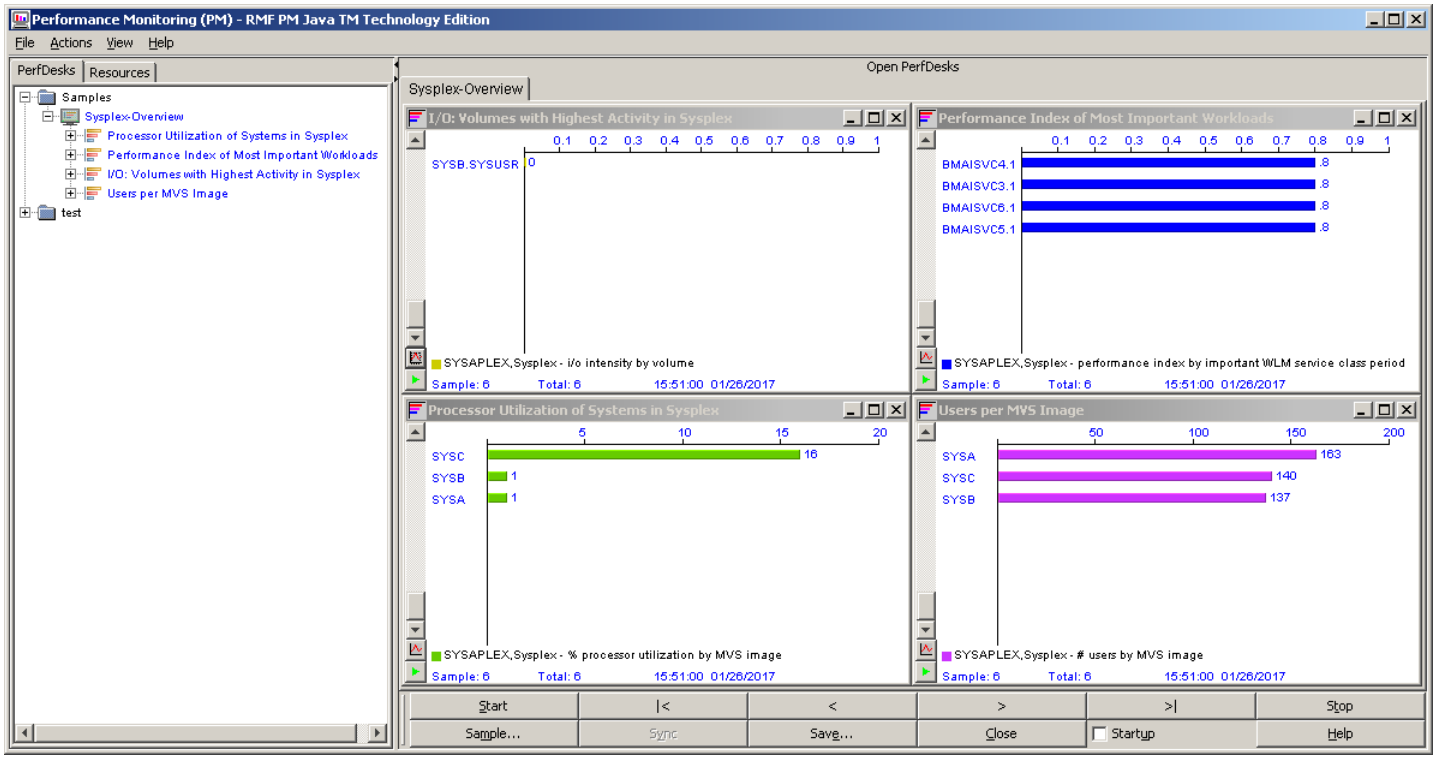


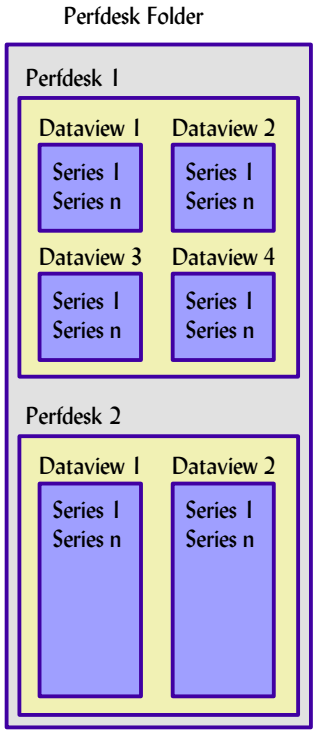
RMF Performance Monitoring



- Enterprise-wide performance monitoring of z/OS hosts
- Platform independent Java Edition
- Linux gathering support
- Graphical user interface
- Flexible definition of data
- Persistent definition of views
- Powerful data reduction
- Analysis support

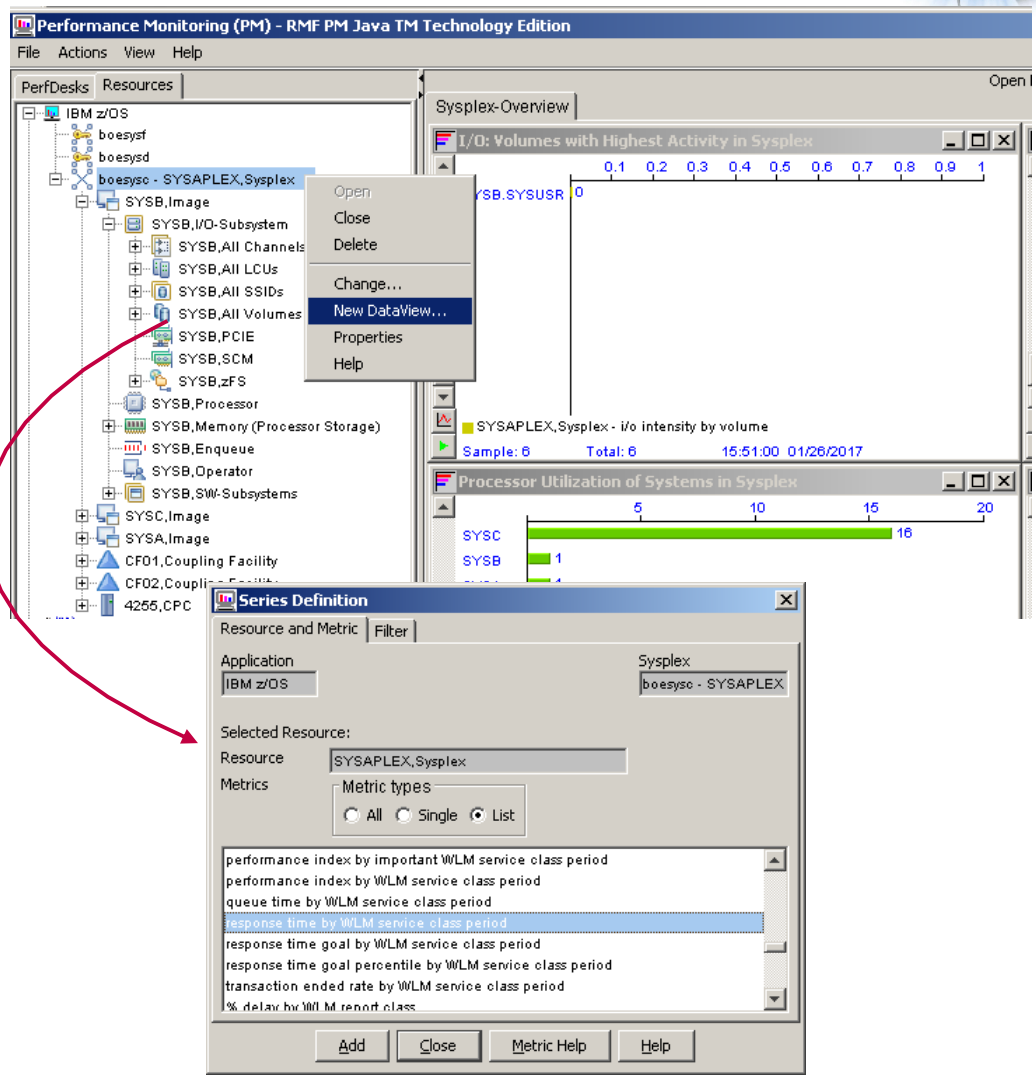
RMF PM: Perfdesk Concept





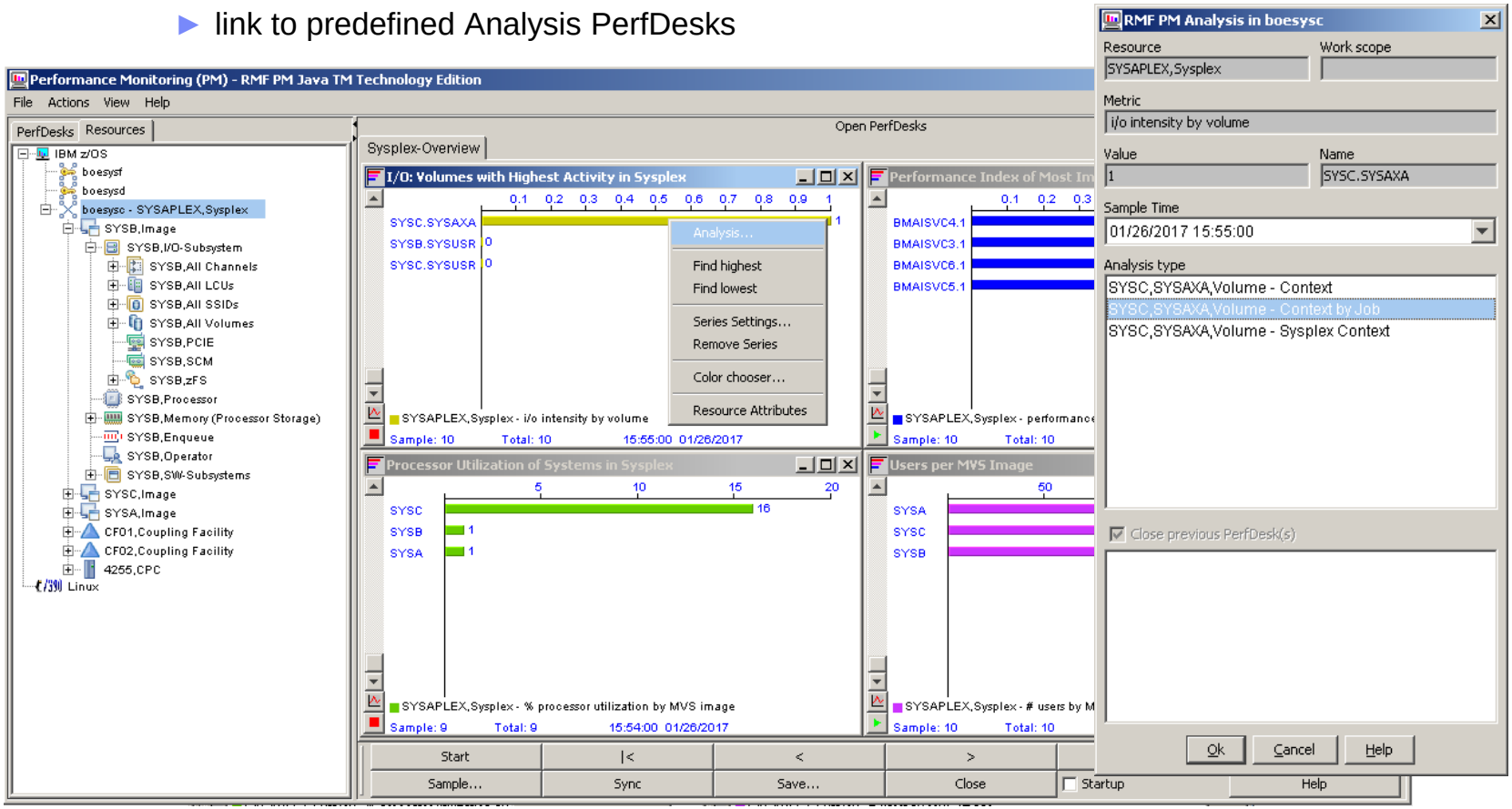
RMF PM: Resources and Metrics

- Sysplex
  - MVS Image
  - I/O Subsystem
    - All SSIDs
      - SSID
    - All LCUs
      - LCU
    - All Channels
      - Channel
    - All Volumes
      - Volume
    - PCIE
      - PCIE Function
    - SCM
      - SCM Card
    - ZFS
      - Aggregate
  - Processor
  - Storage
    - Auxiliary Storage
    - Central Storage
      - CSA, SQA,ECSA, SQA
  - Enqueue
  - Operator
  - Subsystems
    - JES, XCF, HSM
  - CPC
  - LPAR
  - Coupling Facility
    - CF Structure



RMF PM: Intelligent Analysis

- data views with click-sensitve bars
- link to predefined Analysis PerfDesks

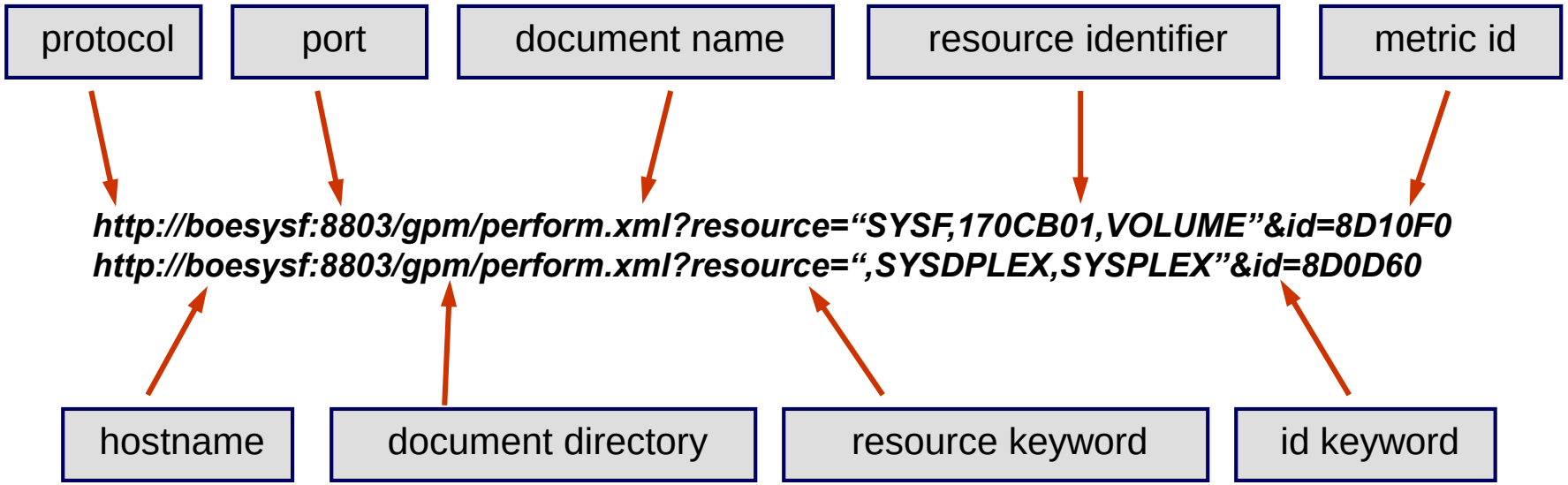


RMF Performance Data API's

- ERBSMFI - Monitor II Data (SMF Type 79)
- RMF Sysplex Data Server (SDS)
  - SMF Data: ERBDSQRY, ERBDSREC
  - Monitor III Data: ERB3XDRS
  - Monitor II Data: ERB2XDGS
- RMF Distributed Data Server HTTP API

RMF Distributed Data Server HTTP API

- RMF Distributed Dataserver responds to standard HTTP requests
- Example: request the single metric response time for volume *170CB01* located in the i/o subsystem of system *SYSF*
  request the list metric number of users MVS Image of sysplex *SYSDPLEX*



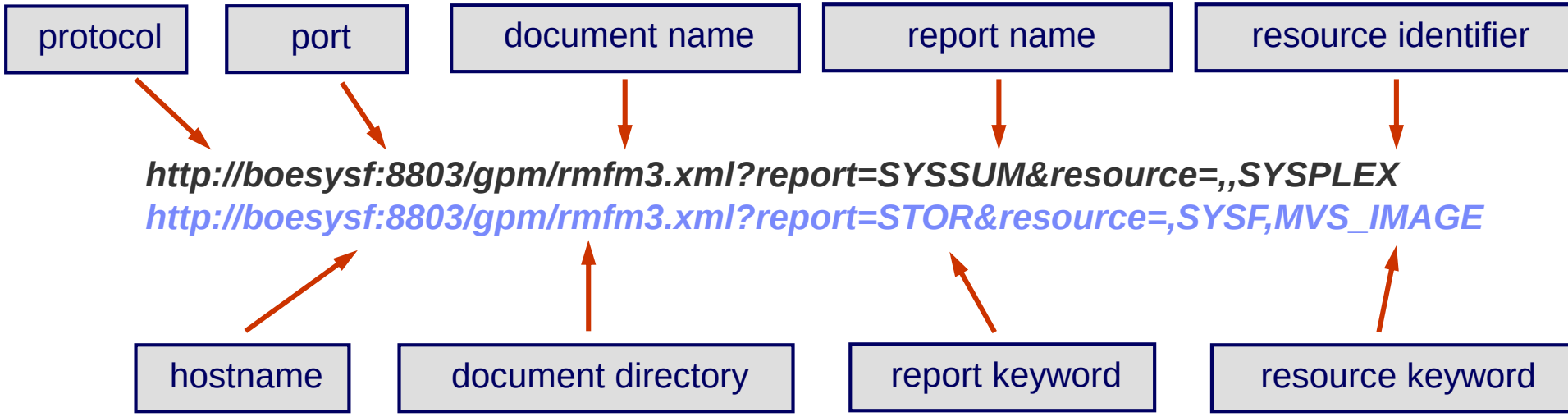
- contained.xml — returns the contained resources
- listmetrics.xml — returns the list of associated metrics
- details.xml — returns the properties of the resource
- perform.xml — returns the metric specified by the id parameter

RMF Distributed Data Server HTTP API

- Can be used to get Sysplex and single system reports, e.g.

  Request the Sysplex Summary report of the resource **SYSPLEX**

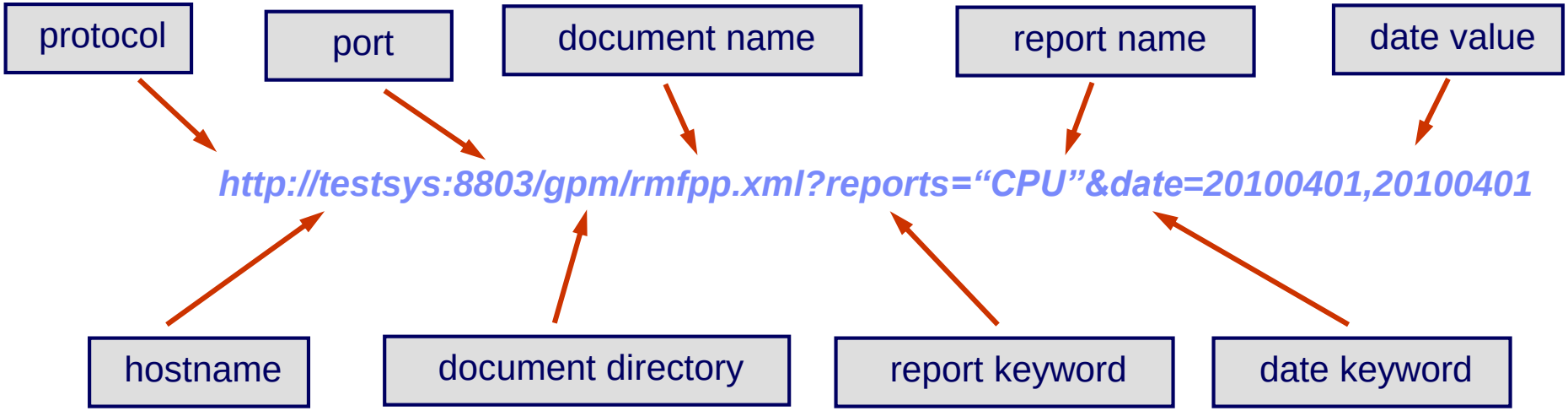
  Request the Storage Delay report of the resource **MVS_IMAGE *SYSF***



- Reports assigned to SYSPLEX resource:
  CACHDET, CACHSUM, CFACT, CFOVER, CFSYS, SPACEG, SPACED, SYSSUM, XCFGROUP, XCFOVW, XCFPATH, XCFSYS
  ZFSFS, ZFSKN, ZFSOVW
- Reports assigned to MVS_IMAGE resource:
  CHANNEL, CPC, DELAY, DEV, DEVR, DSND, ENCLAVE, ENQ, HSM, JES, IOQ, LOCKSP, LOCKSU, OPD, PCIE, PROC, PROC
  SCM, STOR, STORC, STORCR, STORF, STORM, STORR, STORS, SYSINFO, USAGE

RMF Distributed Data Server HTTP API

- A request using XML document name **rmfpp.xml** returns the requested RMF Postprocessor report
- Example: Request a Postprocessor CPU Activity Report



Parameters for Postprocessor requests

&reports	list of Postprocessor report names
&overview	list of control statements for the Overview report
&date	start and end date for the requested Postprocessor report(s)
&duration	interval length for the requested Postprocessor duration report(s)
&timeofday	start and end time of the reporting period
&sysid	system name for single system reports
&timeout	timeout period in seconds for the completion of Postprocessor jobs

RMF Distributed Data Server HTTP API

- RMF Distributed Dataserver returns XML documents
- The requested metric can be extracted from the col tag
- Example: XML document for
  response time for volume 170CB01 of SYSF

```
<?xml version="1.0" encoding="UTF-8"?>
<?xml-stylesheet type="text/xsl" href="/gpm/include/perform.xsl"?>
<ddsml xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
      xsi:noNamespaceSchemaLocation="/gpm/include/ddsml.xsd">
<server>
<name>RMF-DDS-Server</name>
<version>ZOSV1R9</version>
<functionality>2344</functionality>
</server>
<report>
<metric id="8D10F0">
<description>response time</description>
<format>single</format>
<numcols>2</numcols>
</metric>
<resource>
<reslabel>SYSF,170CB01,VOLUME</reslabel>
<restype>VOLUME</restype>
<reslabelurl>SYSF,170CB01,VOLUME</reslabelurl>
</resource>
<time-data>
<local-start>20070321084500</local-start>
<local-end>20070321084600</local-end>
<gatherer-interval unit="seconds">60</gatherer-interval>
</time-data>
<row refno="1" percent="66.6667">
<col></col><col>1.5</col>
</row>
</report>
</ddsml>
```

Sysplex Data Server: Services

- Sysplex-wide access to SMF data
  - ERBDSQRY requests a directory of available SMF data in the sysplex
  - ERBDSREC requests SMF record data in the sysplex
- Sysplex-wide access to Monitor III data
  - ERB3XDRS requests a set_of_samples of Monitor III data
    - ✗ does not require an ISPF and Monitor III reporter environment
    - ✗ provides data reduction features to transfer only the necessary data
- Sysplex-wide access to Monitor II data
  - ERB2XDGS requests Monitor II data according to the specified SMF type 79 subtype
    - ✗ returns Monitor II snapshot data
    - ✗ provides data reduction features like ERB3XDRS

all Services are available as High-Level-Language APIs

Information and Tools

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

- **Product information, newsletters, presentations, ...**
- **Downloads**
  - **Spreadsheet Reporter**
  - **RMF XML Toolkit**

RMF email address: rmf@de.ibm.com

Documentation and news

- **RMF Performance Management Guide, SC33-7992**
- **RMF Report Analysis, SC33-7991**
- **RMF User's Guide, SC33-7990**
- **Latest version of PDF files can be downloaded from:**

  http://www.ibm.com/systems/z/os/zos/bkserv/

RMF Redbook