

| RMF Development Edition

# z/OS Resource Measurement Facility

| RMF Technical Overview



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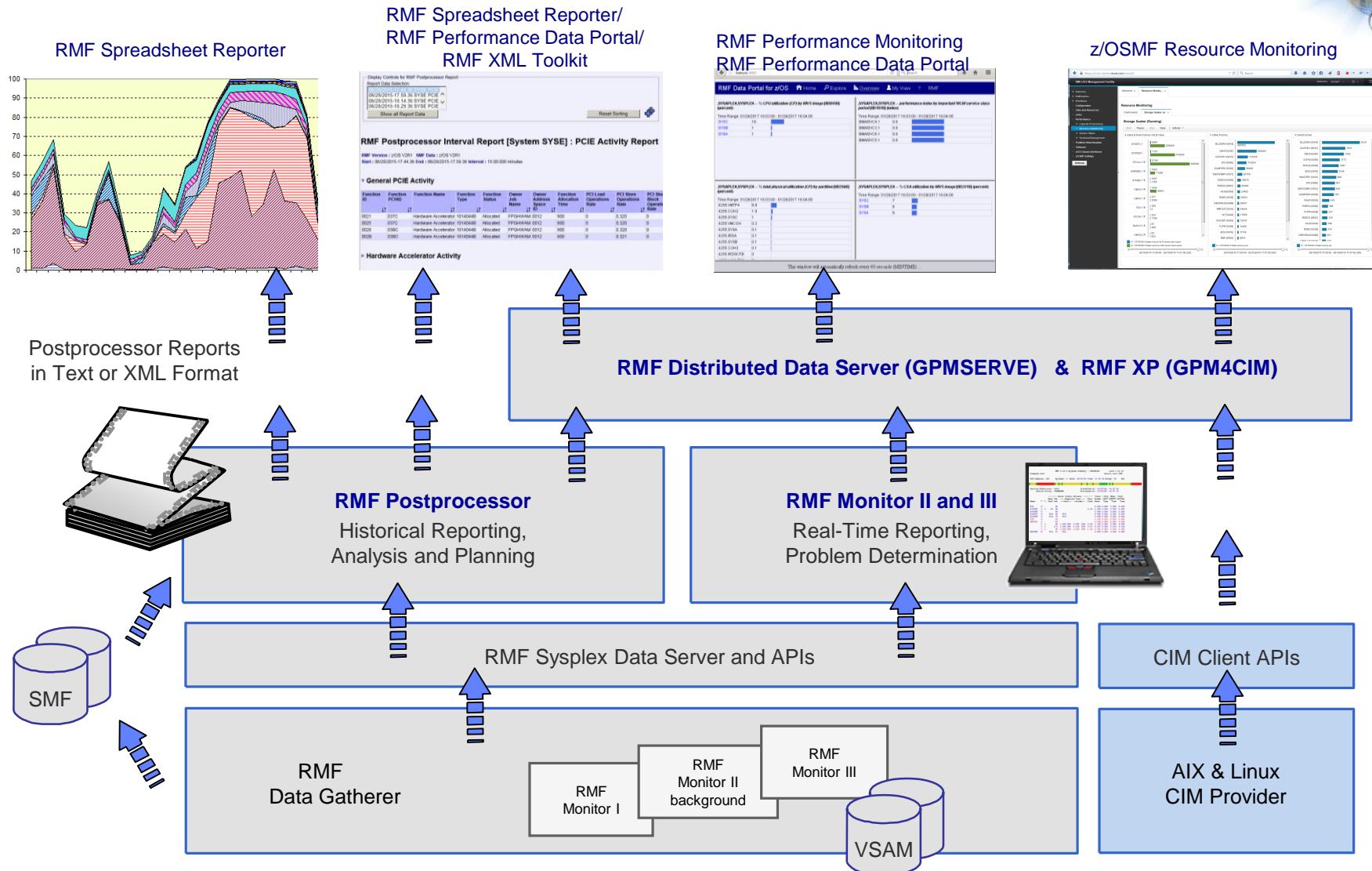
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# Agenda



- 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

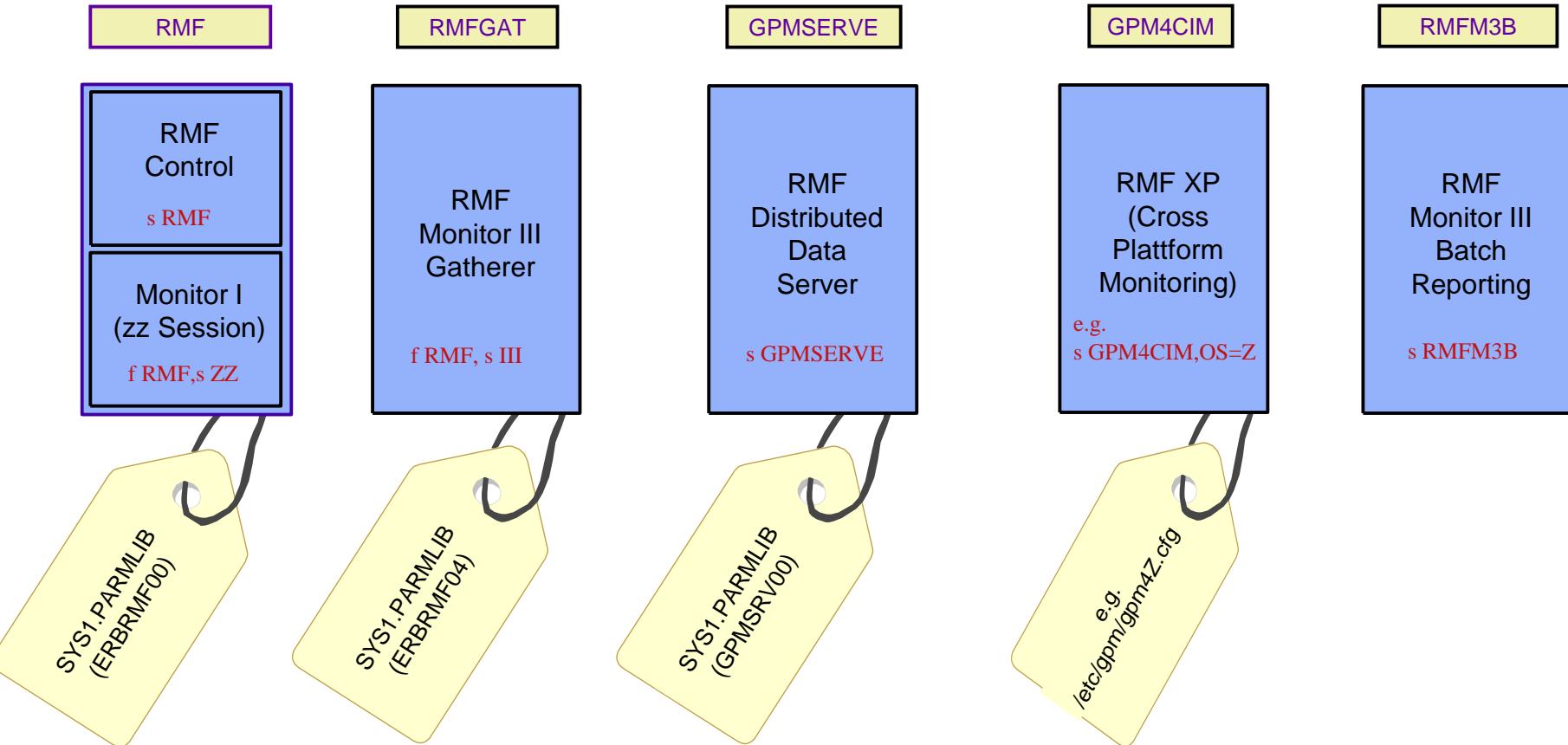
# RMF Product Overview



# RMF Address Spaces / Procedures



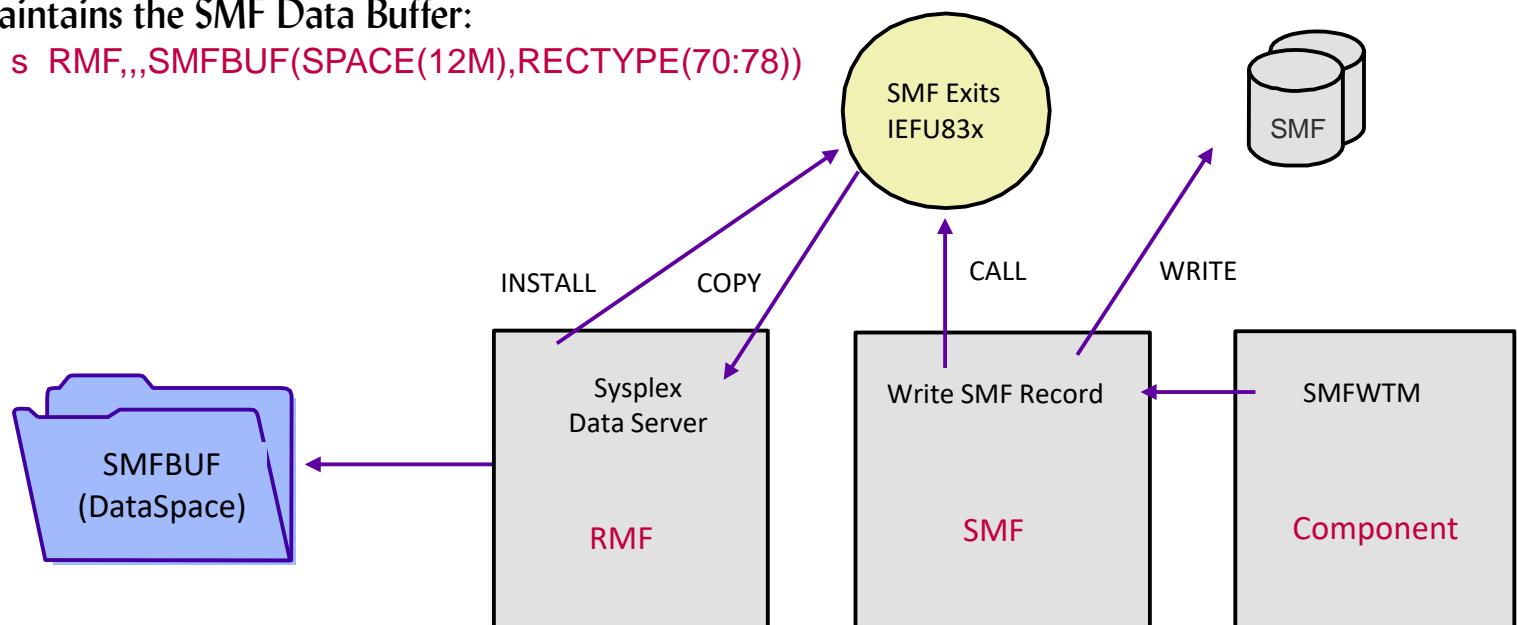
Procedures located SYS1.PROCLIB:



# 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

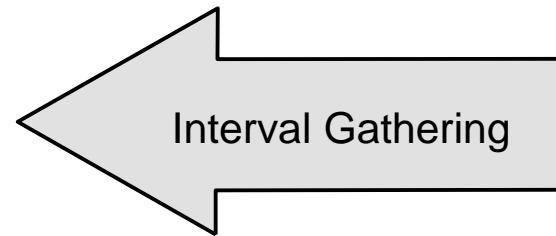


## exact measurement counts

- ▶ pick up consecutive counters
- ▶ calculating the difference at the end of an interval

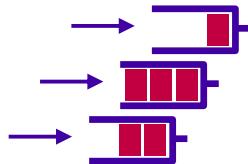


eg. CPU seconds, device connect time...

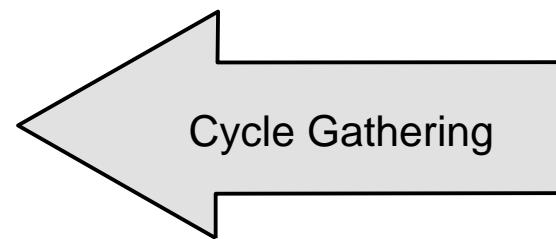


## sampling counts

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



eg. queue counts, frame counts...



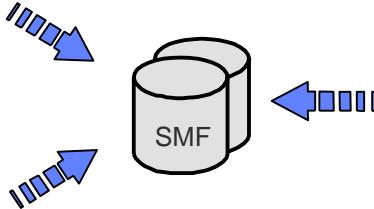
# Monitor I Data Gathering



SYS1.PARMLIB  
(ERBRMF00)

## 1. 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	EADM

## 2. Timing

- ▶ CYCLE(1000)
- ▶ NOSTOP
- ▶ SYNC(SMF)

## 3. Reporting / Recording

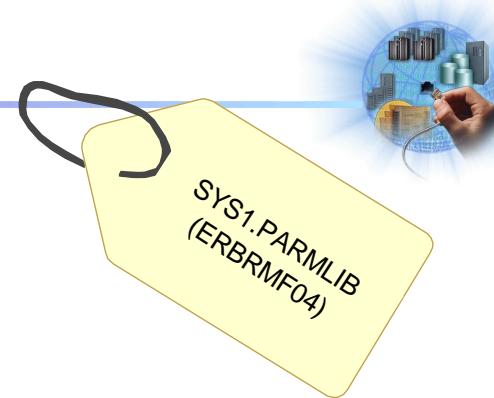
- ▶ RECORD
- ▶ REPORT(REALTIME)
- ▶ SYSOUT(A)

## 4. User Exits

- ▶ NOEXITS

gathered by  
Monitor III

# Monitor III Data Gathering



## 1. Measurements

- ▶ IOSUB
- ▶ CFDETAIL
- ▶ CACHE
- ▶ CRYPTO
- ▶ VSAMRLS
- ▶ OPD
- ▶ HFSNAME
- ▶ zFS
- ▶ SGSPACE
- ▶ LOCK
- ▶ PCIE
- ▶ EADM

## 2. Timing

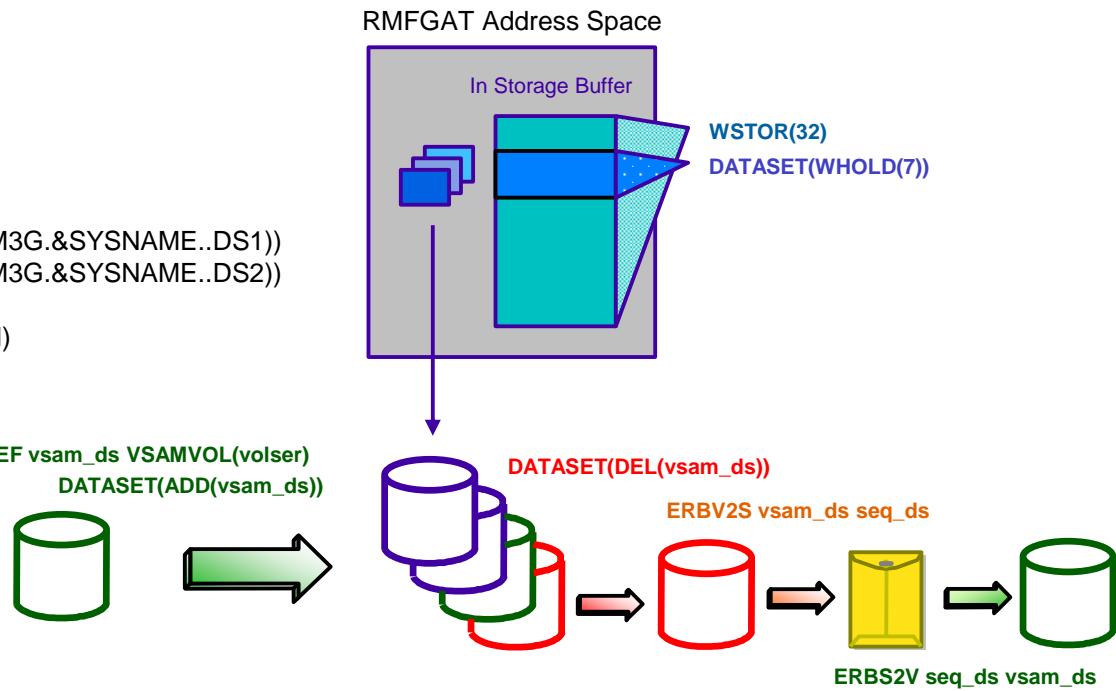
- ▶ CYCLE(1000)
- ▶ MINTIME(60)
- ▶ NOSTOP
- ▶ SYNC(00)

## 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(128) **ERBVDEF vsam\_ds VSAMVOL(volser)**
- ▶ 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 */
```

A blue callout bubble points from the word "ZIIPUSE" in the code to a text box containing the text "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

Session C - [32 x 80]

File Edit View Communication Actions Window Help

Host: tn3270.de.ibm.com Port: 23 LU Name: Disconnect

RMF V2R1 Enclave Report Line 1 of 2  
Command ==> \_ Scroll ==> CSR

Samples: 120 System: TRX1 Date: 06/05/13 Time: 12.09.00 Range: 120 Sec

Current op RMF Enclave Details

Enclave Details for enclave ENC00001 with token 00000034 00000006  
Press Enter to return to the Report panel.

\*SUMMARY  
ENC00001

	- CPU Time --			- zAAP Time -			- zIIP Time -				
Total	1327	Total	0.000	Total	1327	Delta	1.067	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	0.0 0.0 0.0 0.0	0.0	100					

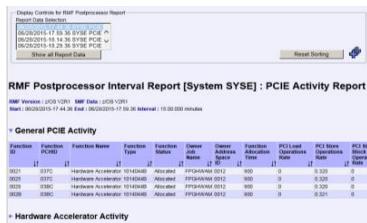
- In case the zIIP processor is activated dynamically by the CONFIG CPU(xx),ONLINE command, RMFGAT can exploit this processor starting with the next MINTIME
- Installations without Coupling Facilities (e.g. Monoplex) won't see RMFGAT zIIP activity

# RMF Distributed Data Server



- DDS provides the interface to RMF Monitor III and RMF Postprocessor data
  - Just one single DDS instance is needed per Sysplex
  - Has Sysplex-wide scope

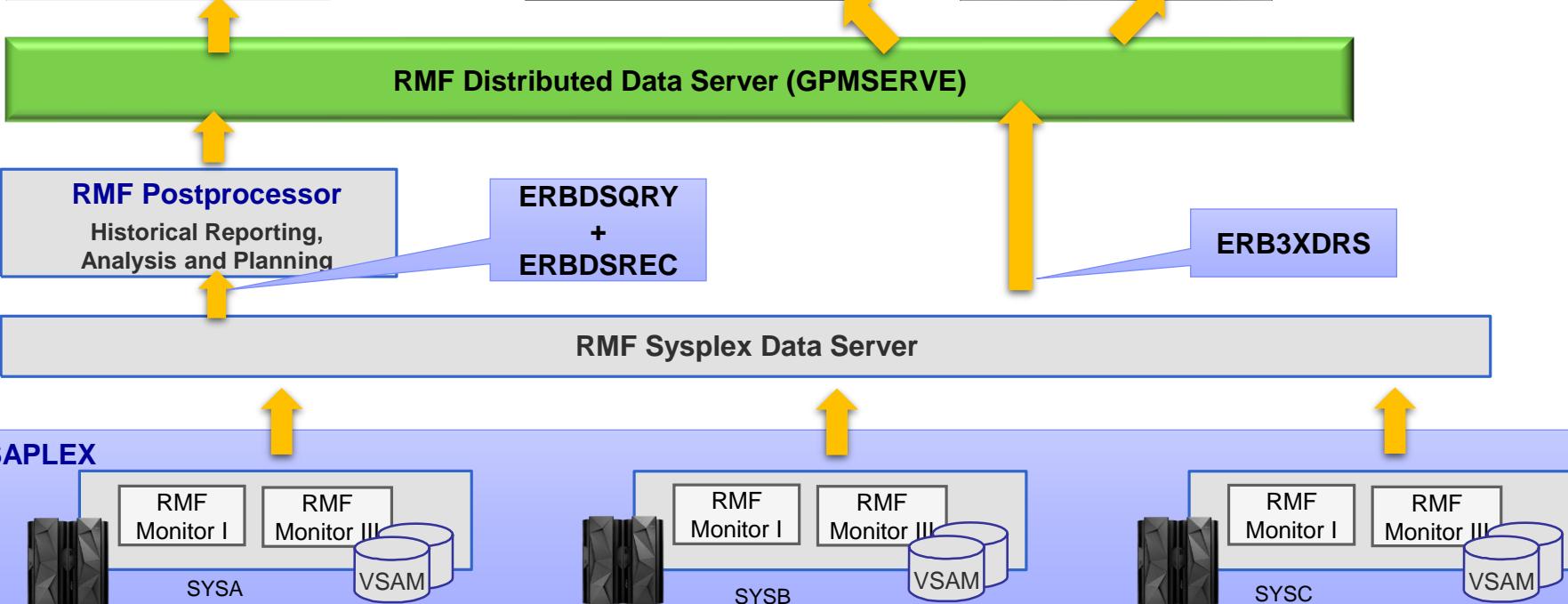
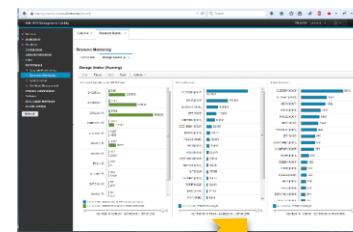
## RMF Data Portal for z/OS



## RMF Data Portal for z/OS



## **z/OSMF Resource Monitoring**



# DDS Invocation



```
//GPMERVE PROC MEMBER=00
//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)
//GMPPJCL    DD    DISP=SHR,DSN=SYS1.SERBPWSV(GMPPJCL)
//CEEDUMP    DD    DUMMY
//SYSPRINT   DD    DUMMY
//SYSOUT     DD    DUMMY
//                PEND
```

GPMERVE  
procedure in  
SYS1.PROCLIB

Change to SYSOUT=\*> or  
dataset if DDS trace is active

SYS1.PARMLIB (GPMRV00)	SYS1.SERBPWSV (GPMINI)	SYS1.SERBPWSV (GPMHTC)	SYS1.SERBPWSV (GMPPJCL)
---------------------------	---------------------------	---------------------------	----------------------------

- |               |                        |                     |                                      |
|---------------|------------------------|---------------------|--------------------------------------|
| ✓ Options     | ✓ Resource definitions | ✓ HTML pages        | ✓ JCL template for Postprocessor JOB |
| • # sessions  | ✓ Metric definitions   | ✓ Help descriptions |                                      |
| • port number |                        | ✓ XSL stylesheets   |                                      |
| • security    |                        | ✓ Icons             |                                      |
| • ....        |                        | ✓ .....             |                                      |

# DDS Invocation



## To start the DDS manually :

- S GPMERVE  
+GPM060I RMF DISTRIBUTED DATA SERVER READY FOR COMMANDS

- D A, GPMERVE  
CNZ4106I 15.58.14 DISPLAY ACTIVITY 858

JOBS	M/S	TS	USERS	SYSAS	INITS	ACTIVE/MAX	VTAM	OAS
00009	00027		00001	00043	00097	00001	/00125	00019
GPMERVE	GPMERVE	STEP1		NSW	SO	A=00AA	PER=NO	SMC=000
						PGN=N/A	DMN=N/A	AFF=NONE
						CT=000.094S	ET=002.706S	
						WUID=STC07366	USERID=RMF	
						WKL=SYSTEM	SCL=SYSSTC	P=1
						RGP=N/A	SRVR=NO	QSC=NO
						ADDR SPACE	ASTE=3FB0CA80	

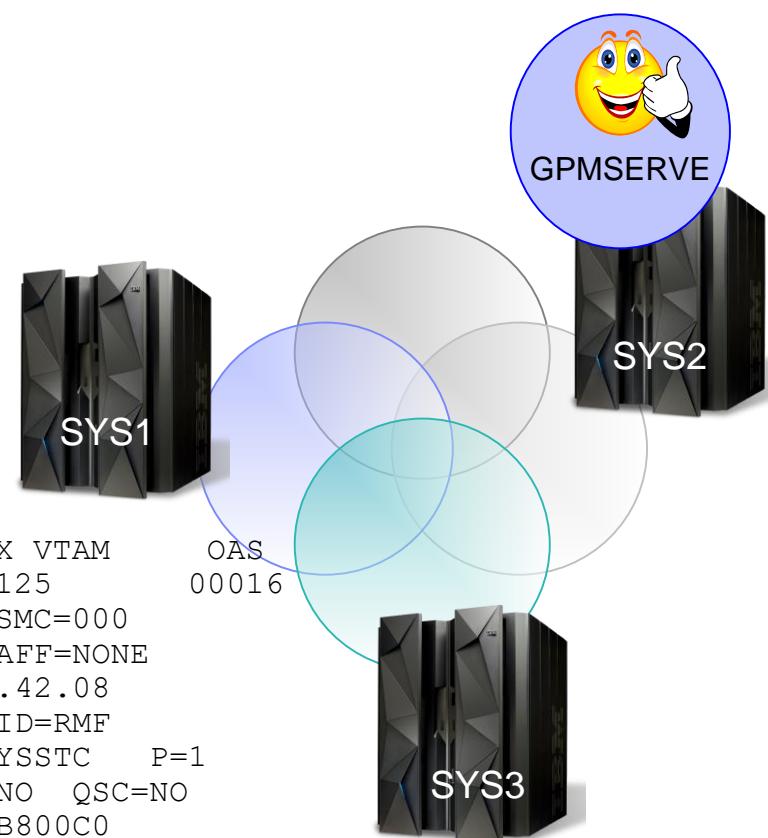
# DDS High Availability



- 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'
```

```
• D A,GPMERVE.RMFDDS01
CNZ4106I 14.19.39 DISPLAY ACTIVITY 036
JOBS      M/S      TS  USERS      SYSAS      INITS      ACTIVE/MAX VTAM
00004     00028    00005     00040     00045     00005/00125
GPMERVE  RMFDDS01 STEP1      NSW      SO      A=0043     PER=NO      SMC=000
                                         PGN=N/A      DMN=N/A      AFF=None
                                         CT=012.626S   ET=05.42.08
                                         WUID=STC08058  USERID=RMF
                                         WKL=SYSTEM     SCL=SYSSTC    P=1
                                         RGP=N/A       SRVR=NO      QSC=NO
                                         ADDR SPACE ASTE=3FB800C0
```



# DDS High Availability

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



Welcome Sysplex Status

Add Entry

Resource name: PRODPLEX

Host name or IP address: 10.96.1.1

Port: 8803

Operating system: z/OS

OK Cancel

**RMF Data Portal - Mozilla Firefox IBM Edition**

RMF Data Portal for z/OS

SYSPLEX, SYSPLEX – N CPU utilization (CP) by RMF usage period[00400] (percent)

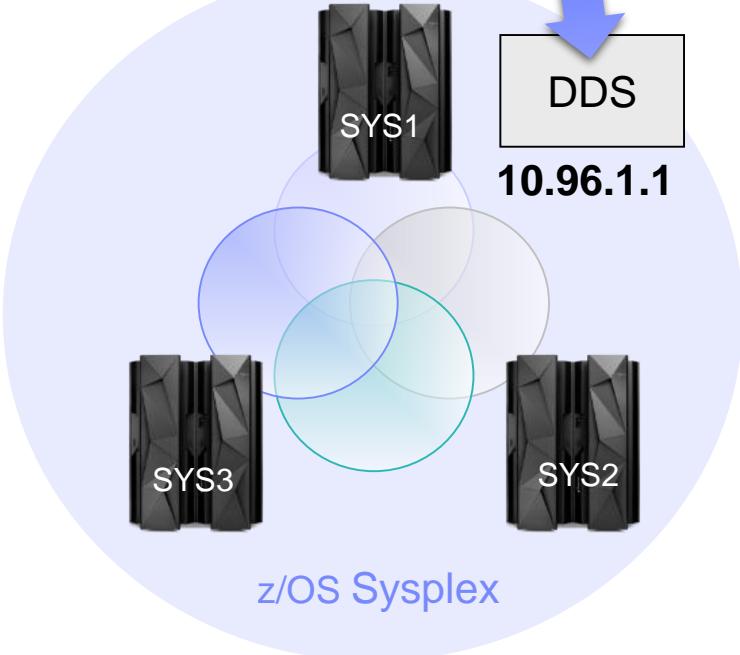
SYSPLEX, SYSPLEX – performance index by important WLM service class period [00400] (index)

SYSPLEX, SYSPLEX – N total physical utilization (CP) by partition [00200] (percent)

SYSPLEX, SYSPLEX – N CSA utilization [00200] (percent)

z/OSMF RM  
RMF Data Portal

Create  
Dynamic VIPA



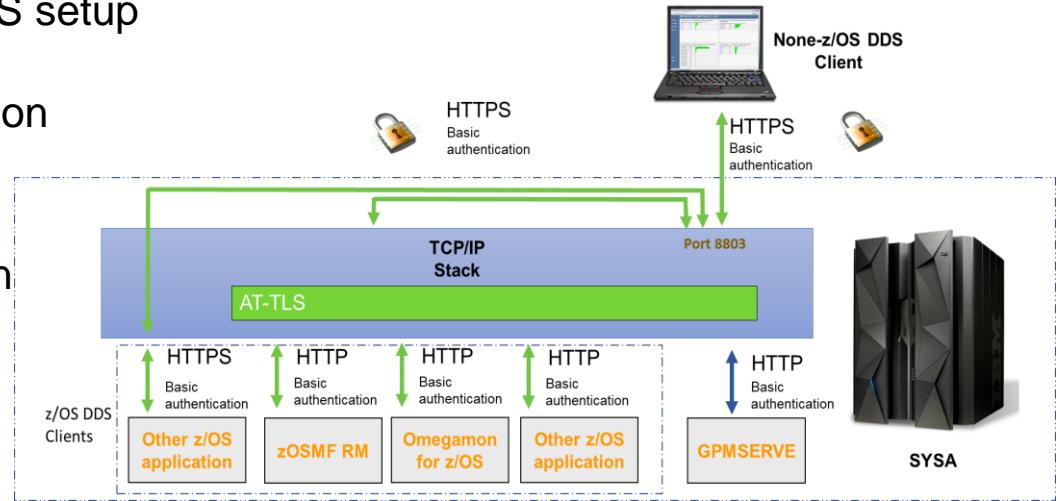
```
//GPMERVE PROC MEMBER=00,VIPA='10.96.1.1'
//TCPDV P EXEC PGM=MODDVIPA,
//          PARM='/-p TCPIP -c &VIPA'
//STEP1   EXEC PGM=GPMDDSRV,REGION=128M,TIME=1440,
//          PARM='TRAP(ON)/&MEMBER'
///*
//GPMINI  DD DISP=SHR,DSN=SYS1.SERBPWSV(GPMINI)
//GPMHTC  DD DISP=SHR,DSN=SYS1.SERBPWSV(GPMHTC)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

Delete  
Dynamic VIPA

# DDS and HTTPS



- Per default DDS will only accept HTTPS communication requests.
- DDS HTTPS support requires AT-TLS setup
- New DDS Parmlib option HTTPS
  - Specifies if a secure DDS connection via AT-TLS is required
  - If **ATTLS** is specified, DDS verifies that the incoming HTTP connection is secured by an AT-TLS setup. If the incoming connection is not secured by an AT-TLS setup, the connection is refused.
  - If **NO** is specified, no further checks are done by DDS. In this case, communication with the DDS can either be via HTTP or via HTTPS secured by AT-TLS.

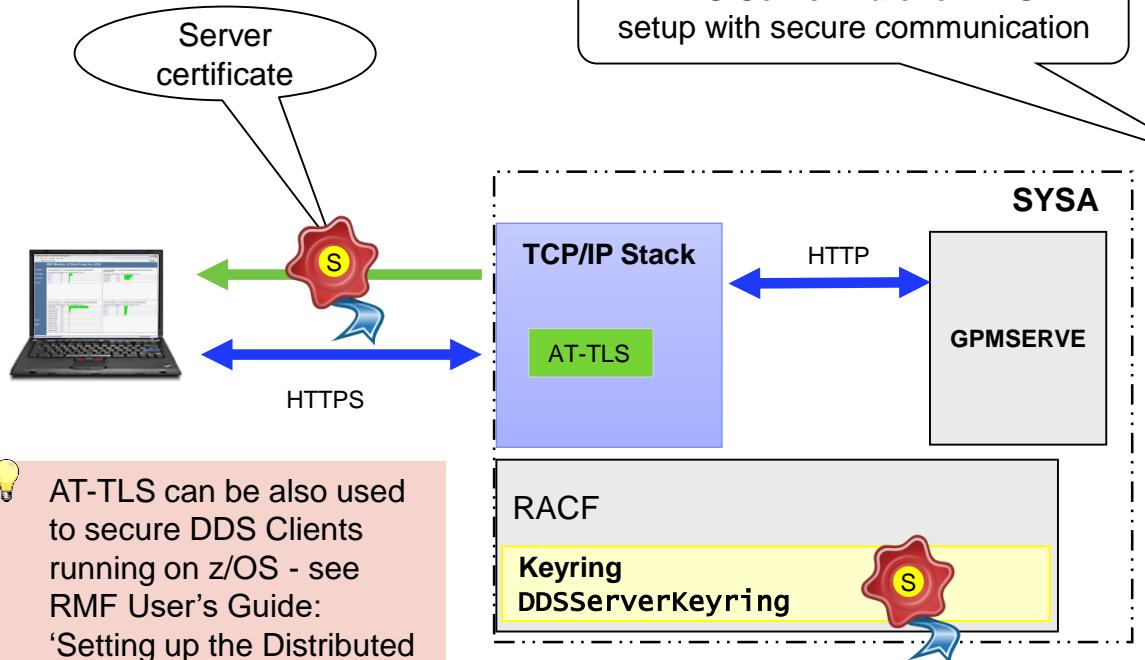


Default:            HTTPS(ATTLS)  
 Example:          HTTPS(ATTLS)



For information on how to set up secure DDS communication refer to RMF User's Guide:  
 'Setting up the Distributed Data Server for z/OS'

# DDS and HTTPS



**💡** AT-TLS can be also used to secure DDS Clients running on z/OS - see RMF User's Guide: 'Setting up the Distributed Data Server for z/OS'

```
# RMF Distributed Data Server Rule
TTLSRule
DDSServerRule
{
  LocalPortRange
  Jobname
  Direction
  Priority
  TTLSGroupActionRef
  DDSServerGRP
  TTLSEnvironmentActionRef
  DDSServerENV
}
TTLSGroupAction
DDSServerGRP
{
  TTLSEnabled
  Trace
}
TTLSEnvironmentAction
DDSServerENV
{
  HandshakeRole
  TTLSKeyringParms
  {
    Keyring
    DDSServerKeyring
  }
  TTLSEnvironmentAdvancedParms
  {
    ServerCertificateLabel      RMFDDS
  }
}
```

8803  
GPMERVE  
Inbound  
1

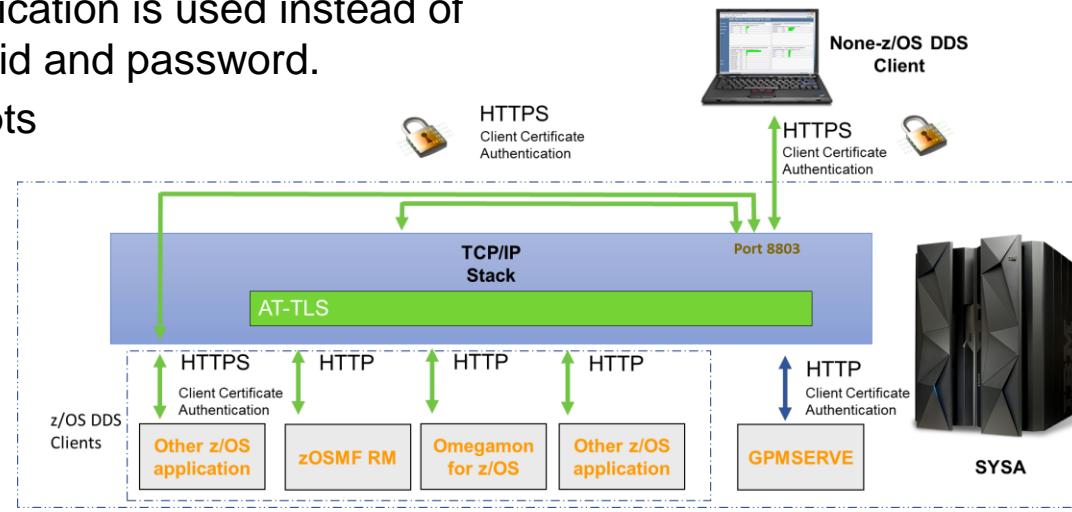
On  
1

Server

# DDS and Client Certificate Authentication



- DDS enhanced to support secure communication with client certificate authentication using AT-TLS.
- New DDS Parmlib option **CLIENT\_CERT**
  - Specifies if client certificate authentication is used instead of HTTP Basic Authentication via userid and password.
  - If **ACCEPT** is specified, DDS accepts incoming HTTP connections, takes the user ID from an AT-TLS provided client certificate and bypass user ID/password authentication.  
If the incoming HTTP connection does not supply a client certificate that is associated with a user ID, user ID/password authentication is performed.
  - If **NONE** is specified, no further checks are done.



**CLIENT\_CERT(ACCEPT)** can be used to support DDS data exploiter running on z/OS with a protected userid (for example, OMEGAMON z/OS agent)

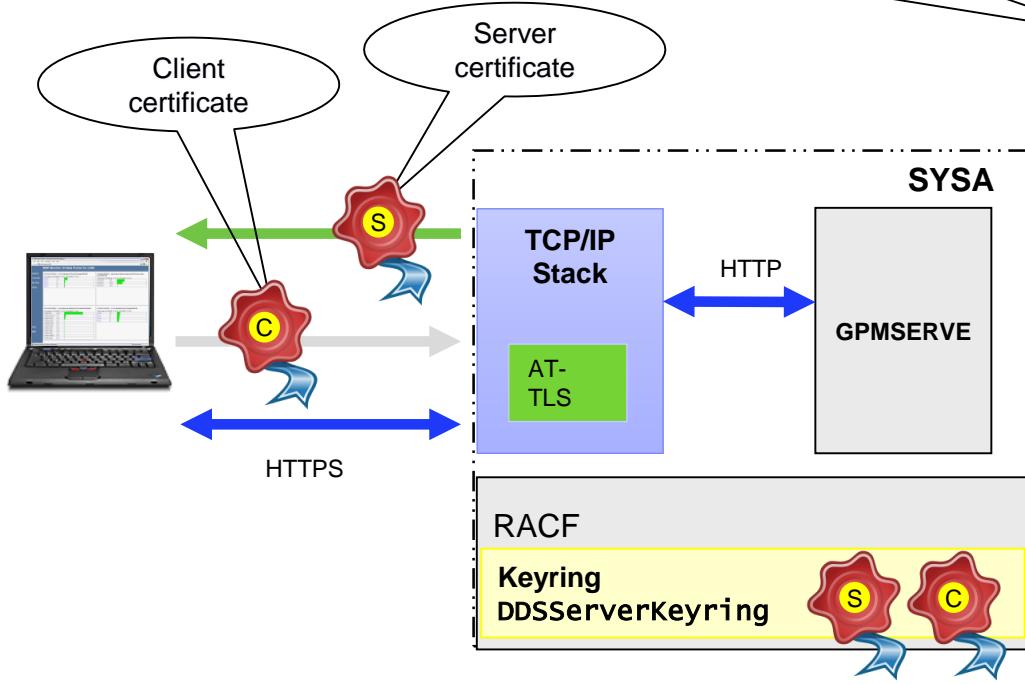
Default: **CLIENT\_CERT(NONE)**

Example: **CLIENT\_CERT(ACCEPT)**

# DDS and Client Certificate Authentication



**AT-TLS Server Rule for DDS setup with secure communication and Client Certificate Authentication**



```
# RMF Distributed Data Server Rule
TTLSRule
DDSServerClientCertRule
{
  LocalPortRange          8803
  Jobname                 GPMERVE
  RemoteAddr               1.0.0.0
  Direction                Inbound
  TTLSGroupActionRef      DDSServerClientCertGRP
  TTLSEnvironmentActionRef DSserverClientCertENV
  Priority                  2
}

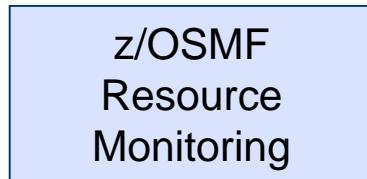
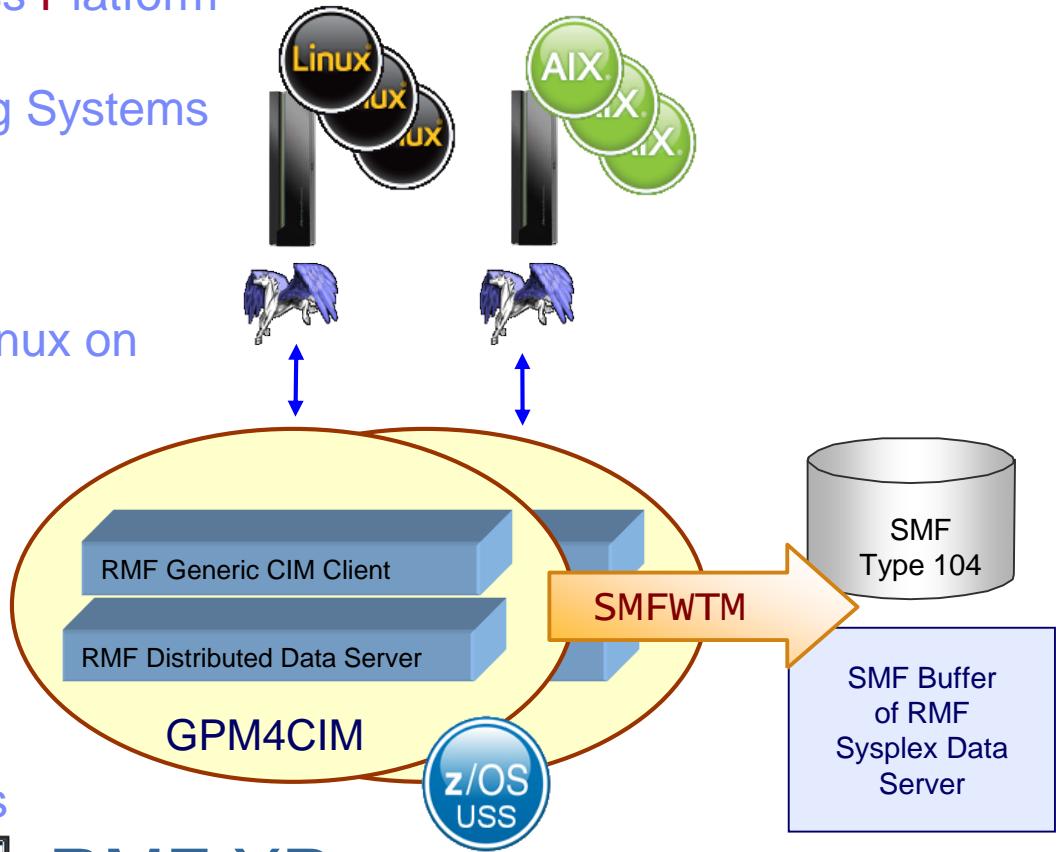
TTLSGroupAction
DDSServerClientCertGRP
{
  TTLSEnabled            On
  Trace                   1
}

TTLSEnvironmentAction
{
  HandshakeRole           ServerwithClientAuth
  TTLSKeyringParms
  {
    Keyring
  }
  TTLSEnvironmentAdvancedParms
  {
    ClientAuthType        SAFCheck
    ServerCertificateLabel 20
    RMFDDS
  }
}
```

# RMF XP



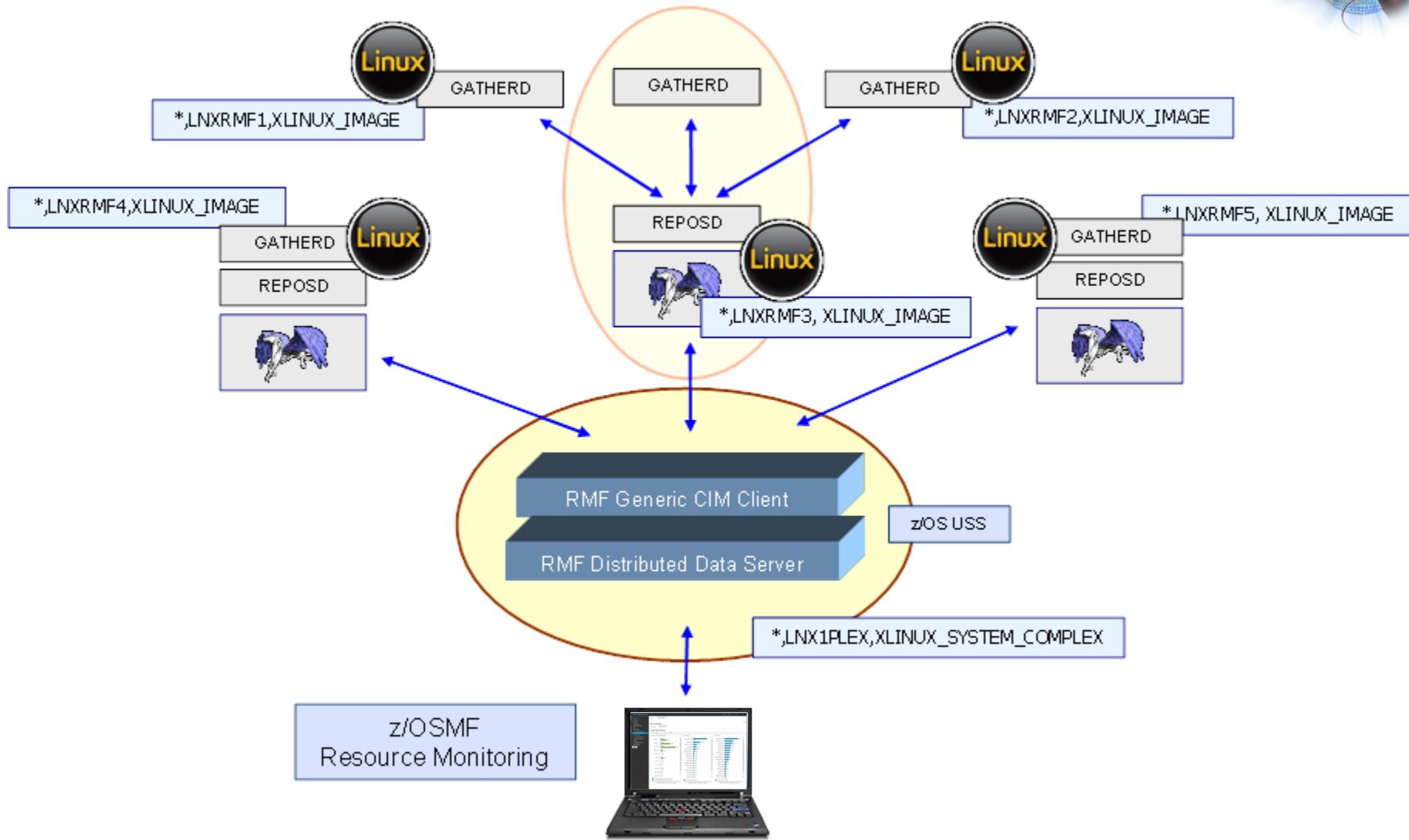
- ▶ RMF XP is the solution for **Cross Platform** Performance Monitoring
- ▶ RMF XP supports the Operating Systems running on
  - ▶ x Blades
  - ▶ p Blades
- ▶ In addition RMF XP supports Linux on System z
  - ▶ LPAR Mode
  - ▶ VM Guest Mode
- ▶ Based on performance metrics provider shipped with the cimserver
- ▶ RMF XP can be configured to write SMF records SMF records



## RMF XP

With RHEL 8 and SLES 15 performance metric provider are no included in the Linux distribution

# RMF XP – eg. Linux Data Collection



# RMF XP – zIIP Exploitation



```
Session B - [32 x 80]
File Edit View Communication Actions Window Help
RMF V1R12 Processor Usage Line 1 of 8
Command ===> _
Samples: 60 System: SYSE Date: 01/14/11 Time: 18.11.00 Range: 60 Se
Service --- Time on CP % --- ----- EAppl % -----
Jobname CX Class Total AAP IIP CP AAP IIP
RMFGAT S0 SYSSTC 1.2 0.0 0.0 1.2 0.0 0.0
XCFAS S SYSTEM 0.7 0.0 0.0 0.7 0.0 0.0
BHBE4LNX B0 BATCH 0.2 0.0 0.0 0.2 0.0 0.5
WLM S SYSTEM 0.6 0.0 0.0 0.6 0.0 0.0
SMSVSAM S SYSTEM 0.1 0.0 0.0 0.1 0.0 0.0
TCPIP S0 SYSSTC 0.1 0.0 0.0 0.1 0.0 0.0
RMF S SYSSTC 0.1 0.0 0.0 0.1 0.0 0.0
BHBE T TSO 0.1 0.0 0.0 0.1 0.0 0.0
F1=HELP F2=SPLIT F3=END F4=RETURN F5=RFIND F6=TOGGLE
F7=UP F8=DOWN F9=SWAP F10=BREF F11=FREF F12=RETRIEVE
MA b 02/015
Connected to remote server/host tn3270.de.ibm.com using lu/pool PU0V8257 and port 23
```

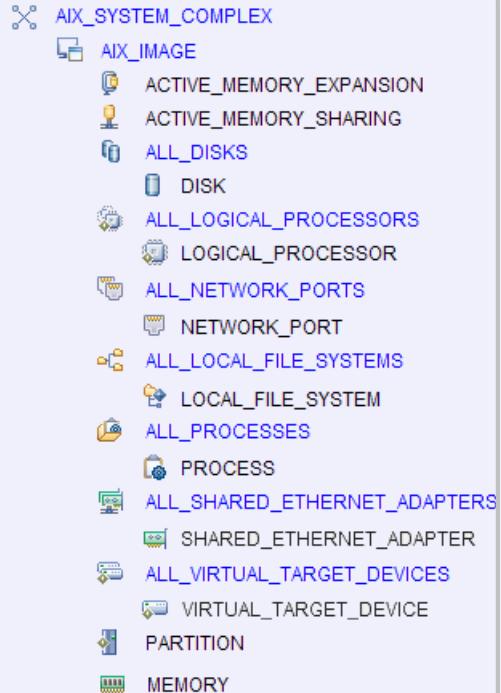
In our IBM test environment, we have observed that up to 70% of the CPU consumption was offloaded to zIIP engines



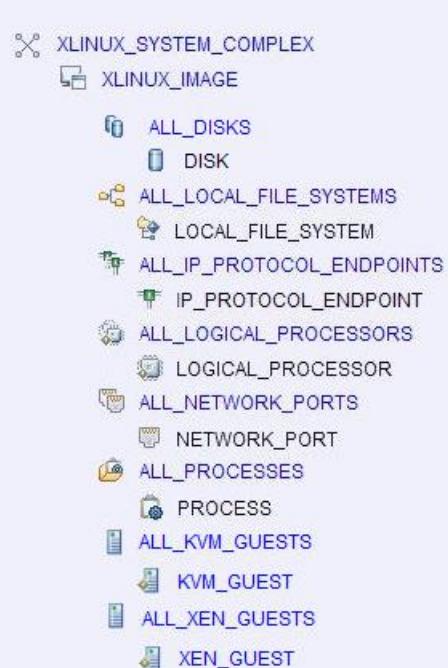
# RMF XP and SMF Records



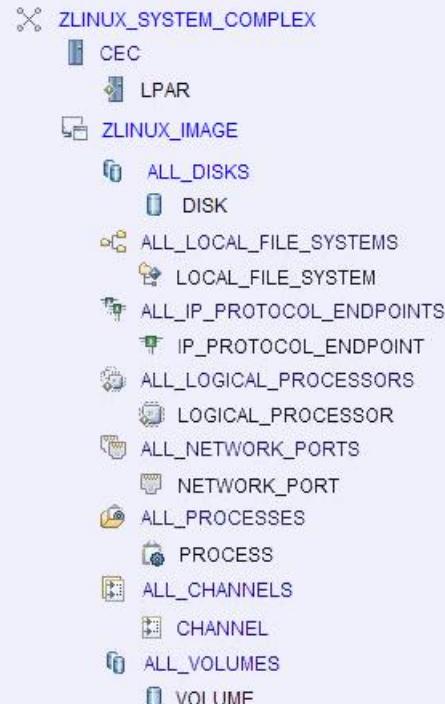
One Subtype  
per Metric  
Category



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

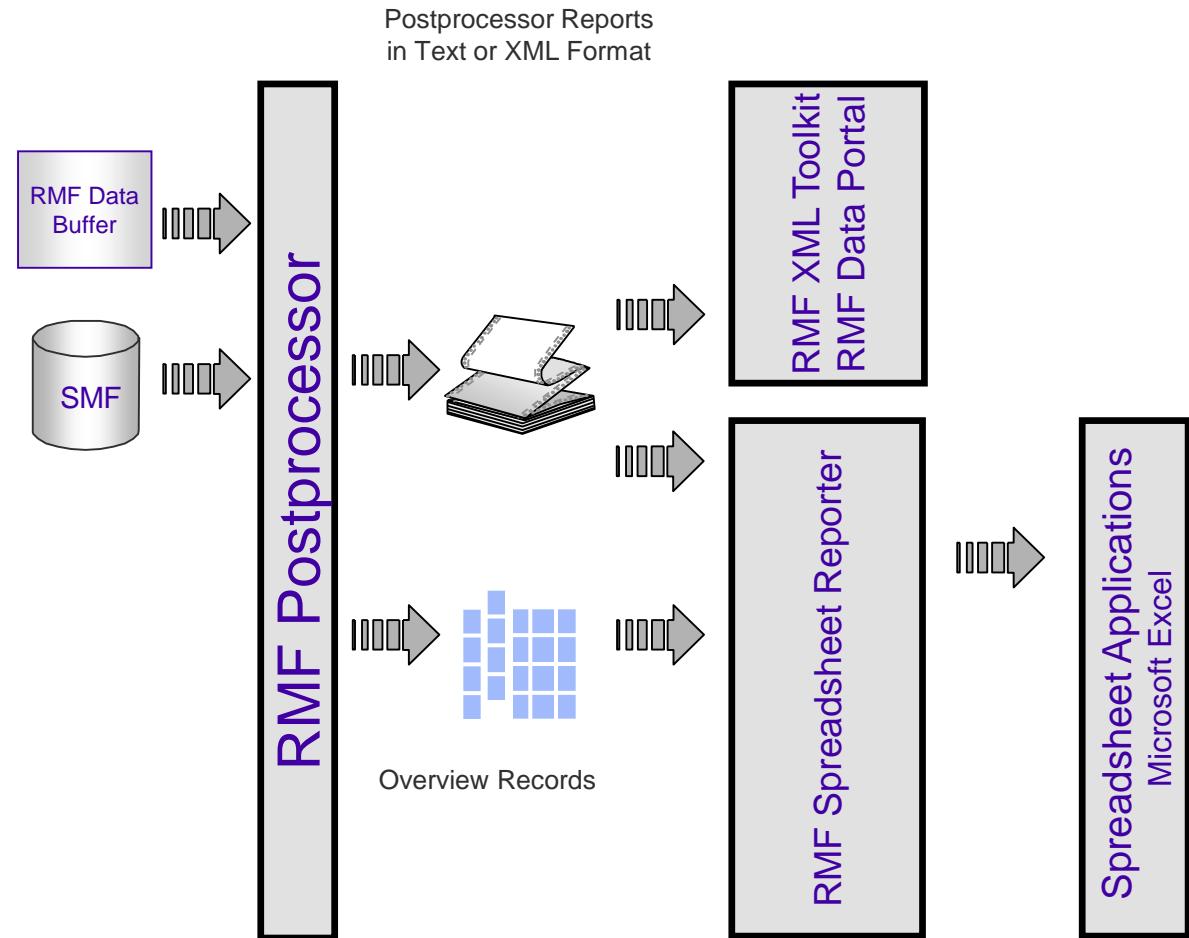


## Activities measured by Monitor I

- ▶ 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
- ▶ EADM
- ▶ PCIE
- ▶ SDELAY



# Postprocessor: Preparing SMF Data



```
//SMFDUMP EXEC PGM=IFASMFDP
//ID1 DD DISP=SHR,DSN=<input_smfdata_system1>
//ID2 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(ID1,OPTIONS(DUMP))
  INDD(ID2,OPTIONS(DUMP))
  OUTDD(SMFDATA,TYPE(70:78))
```

```
//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 data is kept in VSAM datasets
- Postprocessor requires sequential format
- use SMF dump utility IFASMFDP to unload the data
- usually GDGs are the preferred target:

- ▶ RMF.SMFDATA.SYSNAME(0)
- ▶ RMF.SMFDATA.SYSNAME(-1)

- SMF records 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 IFASMFSDL instead of IFASMFDP

```
//SMFDUMP EXEC PGM=IFASMFSDL
//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.SYSPLEX,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
//MFPMMSGDS 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
//PXRPTS 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
- ▶ MFPIINPUT 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

JCL can be generated by ISPF Application or Spreadsheet Reporter

```
//RMFPP      EXEC PGM=ERBRMFPP
//MFPMSGDS  DD   DISP=SHR, DSN=*.ALLOC.MSG
//MFPIINPUT  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)
```

## ■ Control Statements

- ▶ DATE Start / End Date
- ▶ RTOD Start / End Time
- ▶ DINTV Duration Interval Length
- ▶ REPORTS/ SYSRPTS Report Types
- ▶ OVERVIEW Report or Record
- ▶ OVW Overview Control Statement

# Postprocessor: Standard Reporting



WORKLOAD ACTIVITY										PAGE 55										
z/OS V2R3		SYSPLEX UTCPLXCB			START 08/11/2017-05.15.00 INTERVAL 000.15.00 MODE = GOAL															
CONVERTED TO z/OS V2R3 RMF																				
END 08/11/2017-05.30.00																				
POLICY ACTIVATION DATE/TIME 08/10/2017 09.00.11																				
POLICY=BASEPOL WORKLOAD=OMVS_WLD SERVICE CLASS=OMVSLow RESOURCE GROUP=*NONE PERIOD=2 IMPORTANCE=4																				
CRITICAL =NONE																				
-TRANSACTIONS-- TRANS-TIME HHH.MM.SS.FFFFFFF TRANS-APPL%----CP-IIIPCP/AAPCP-IIP/AAP ---ENCLAVES---																				
AVG	45.77	ACTUAL	4.182240	TOTAL	193.14	0.02	3.77	AVG ENC	0.00											
MPL	45.66	EXECUTION	4.181362	MOBILE	0.00	0.00	0.00	REM ENC	0.00											
ENDED	258	QUEUED	877	CATEGORYA	0.00	0.00	0.00	MS ENC	0.00											
END/S	0.29	R/S AFFIN	0	CATEGORYB	0.00	0.00	0.00													
#SWAPS	1667	INELIGIBLE	0																	
EXCTD	0	CONVERSION	0																	
		STD DEV	30.872936																	
----SERVICE---- SERVICE TIME ---APPL %--- ---PROMOTED-- --DASD I/O--- ----STORAGE---- -PAGE-IN RATES-																				
IOC	27368K	CPU	1782.175	CP	193.18	B1K	0.000	SSCHRT	0.0	AVG	2378.45									
CPU	123211K	SRB	0.400	IIPCP	0.02	ENQ	0.076	RESP	0.0	TOTAL	108596.1									
MSO	0	RCT	0.133	IIP	3.77	CRM	0.000	CONN	0.0	BLOCK	0.0									
SRB	30480	IIT	0.000	AAPCP	0.00	LCK	24.941	DISC	0.0	SHARED	0.0									
TOT	150610K	HST	0.000	AAP	N/A	SUP	0.000	Q+PEND	0.0		HSP									
/SEC	167345	IIP	44.32					IOSQ	0.0											
ABSRPTN	3665	AAP	N/A																	
TRX SERV	3656																			
GOAL: EXECUTION VELOCITY 15.0% VELOCITY MIGRATION 43.3% /O MGMT 43.3% INIT MGMT 43.3%																				

```
//RMFPP EXEC PGM=ERBRMFPP
//SYSIN DD *
SYSRPTS (WLMGL (SCPER) )
SYSOUT (H)
```



# Postprocessor: Standard Reporting



CPU ACTIVITY										PAGE	1			
z/OS V2R3			SYSTEM ID CB8D RPT VERSION V2R3 RMF			DATE 08/11/2017 TIME 05.15.00			INTERVAL 14.59.995 CYCLE 1.000 SECONDS					
-CPU	3906	CPC CAPACITY 6542	SEQUENCE CODE 0000000000EF4C7											
MODEL	750	HIPERDISPATCH=YES												
H/W MODEL	M03	CHANGE REASON=NONE												
0---CPU---			TIME %			--- MT % ---		LOG PROC	--I/O	INTERRUPTS--				
NUM	TYPE	ONLINE	LPAR BUSY	MVS BUSY	PARKED	PROD	UTIL	SHARE %	RATE	% VIA TPI				
0	CP	100.00	67.80	67.80	0.00	100.00	67.80	100.0 HIGH	1662	11.40				
1	CP	100.00	45.96	46.46	0.00	100.00	45.96	63.6 MED	0.00	0.00				
2	CP	100.00	4.57	27.44	83.16	100.00	4.57	0.0 LOW	0.00	0.00				
3	CP	100.00	0.00	-----	100.00	100.00	0.00	0.0 LOW	0.00	0.00				
4	CP	100.00	0.00	-----	100.00	100.00	0.00	0.0 LOW	0.00	0.00				
5	CP	100.00	0.00	-----	100.00	100.00	0.00	0.0 LOW	0.00	0.00				
6	CP	100.00	0.00	-----	100.00	100.00	0.00	0.0 LOW	0.00	0.00				
7	CP	100.00	0.00	-----	100.00	100.00	0.00	0.0 LOW	0.00	0.00				
8	CP	100.00	0.00	-----	100.00	100.00	0.00	0.0 LOW	0.00	0.00				
9	CP	100.00	0.00	-----	100.00	100.00	0.00	0.0 LOW	0.00	0.00				
A	CP	100.00	0.00	-----	100.00	100.00	0.00	0.0 LOW	0.00	0.00				
B	CP	100.00	0.00	-----	100.00	100.00	0.00	0.0 LOW	0.00	0.00				
C	CP	100.00	0.00	-----	100.00	100.00	0.00	0.0 LOW	0.00	0.00				
D	CP	100.00	0.00	-----	100.00	100.00	0.00	0.0 LOW	0.00	0.00				
E	CP	100.00	0.00	-----	100.00	100.00	0.00	0.0 LOW	0.00	0.00				
TOTAL/AVERAGE		7.89	54.83		100.00	7.89	163.6		1662	11.40				
0 F	IIP	100.00	0.28	0.26	0.00	100.00	0.28	29.9 MED						
			0.08	0.00										
10	IIP	100.00	0.03	0.03	0.00	100.00	0.03	0.0 LOW						
			0.02	0.00										
11	IIP	100.00	0.00	-----	100.00	100.00	0.00	0.0 LOW						
				-----	100.00									
12	IIP	100.00	0.00	-----	100.00	100.00	0.00	0.0 LOW						
				-----	100.00									
TOTAL/AVERAGE		0.08	0.10		100.00	0.08	29.9							

```
//RMFPP EXEC PGM=ERBRMFPP
//SYSIN DD *
REPORTS(CPU)
SYSOUT(H)
```



# Postprocessor: Overview Reporting



OVERVIEW (RECORD , REPORT)

OVW (PROCS (NUMPROC ))

OVW (CPUBSY (CPUBSY ))

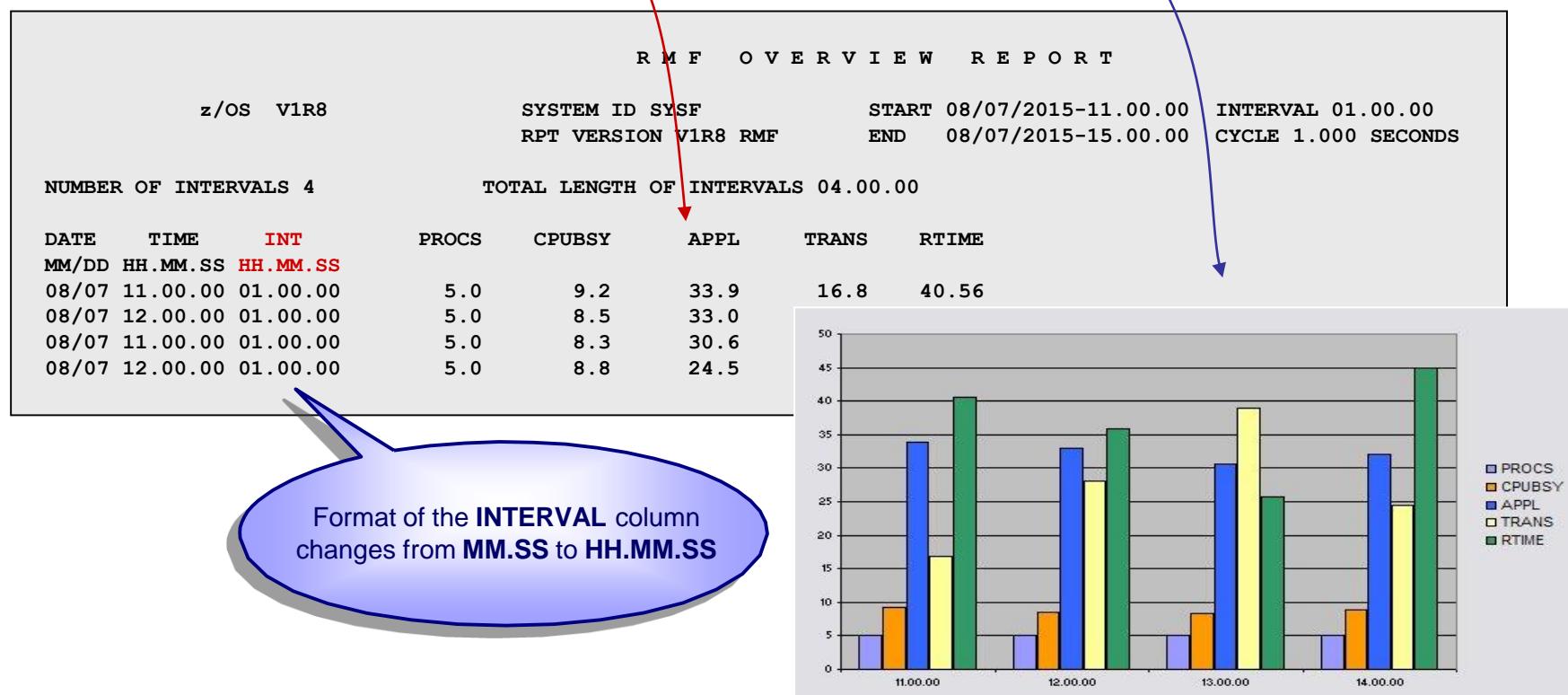
OVW (APPL (APPLPER (S . OMVSLOW . 1 )))

OVW (TRANS (TRANS (S . OMVSLOW . 1 )))

OVW (RTIME (RTIME (S . OMVSLOW . 1 )))

DINTV (0100)

(via Spreadsheet Reporter)

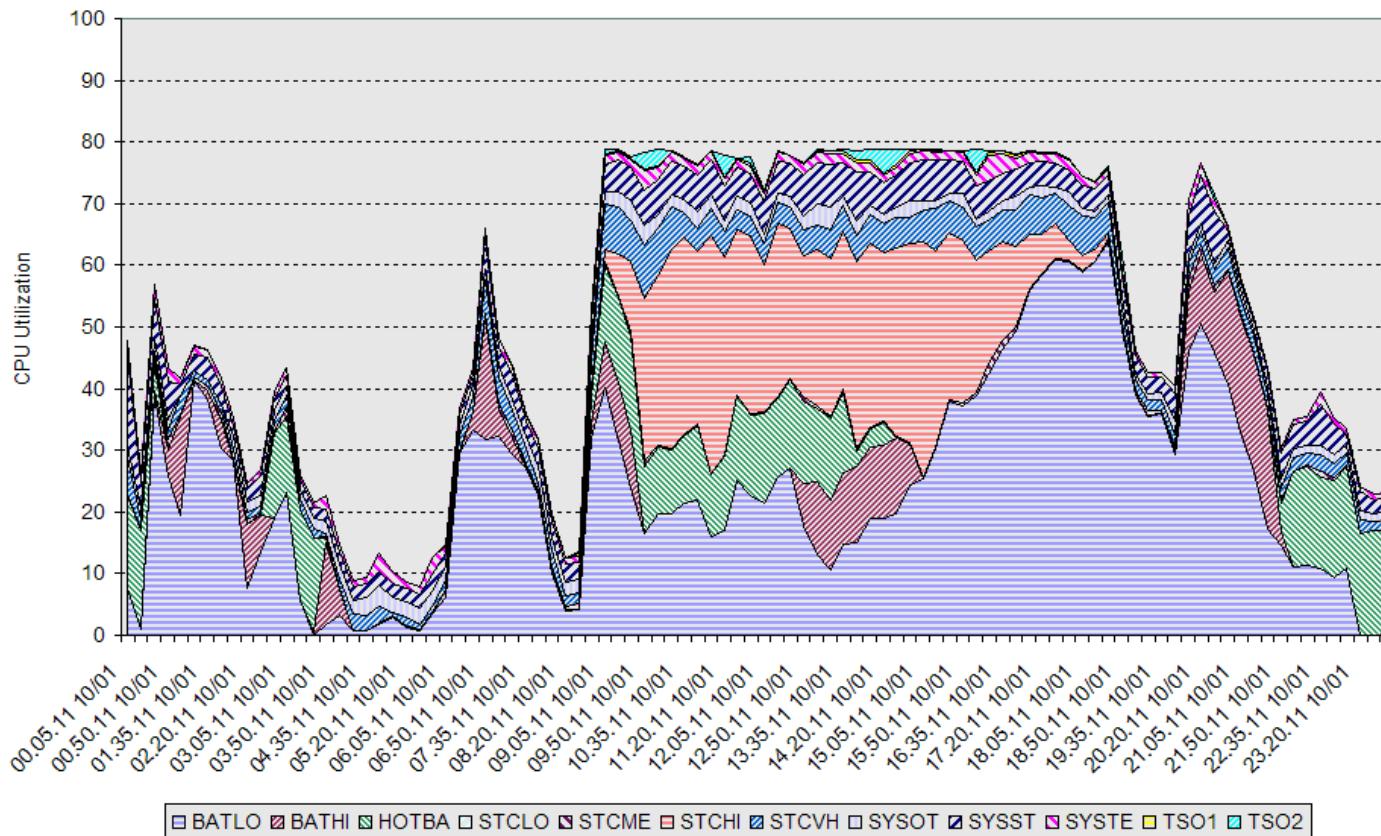


# RMF Spreadsheet Reporter

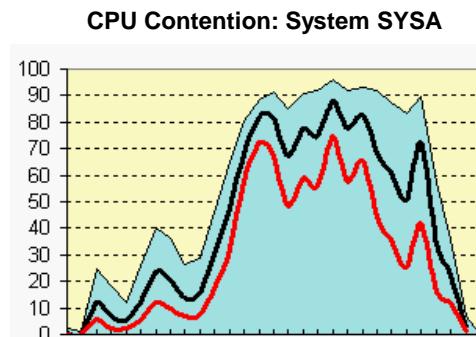
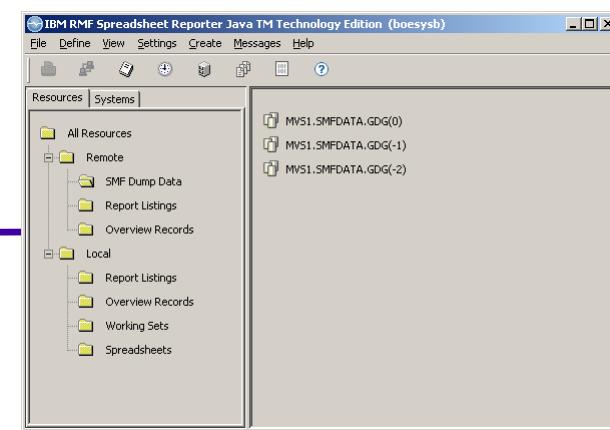
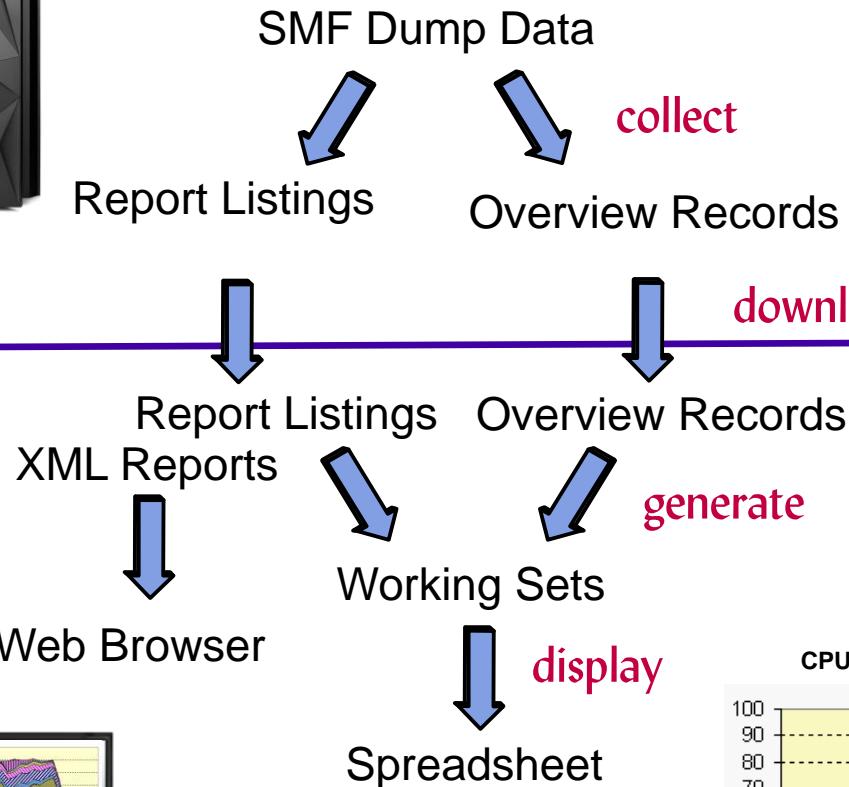


- ▶ converts SMF Data to Spreadsheet Format
- ▶ creates graphical Views for Trend Analysis
- ▶ can be downloaded from the RMF Homepage

Workload Utilization for System: UIG1, Reporting Date: 10/01/2006



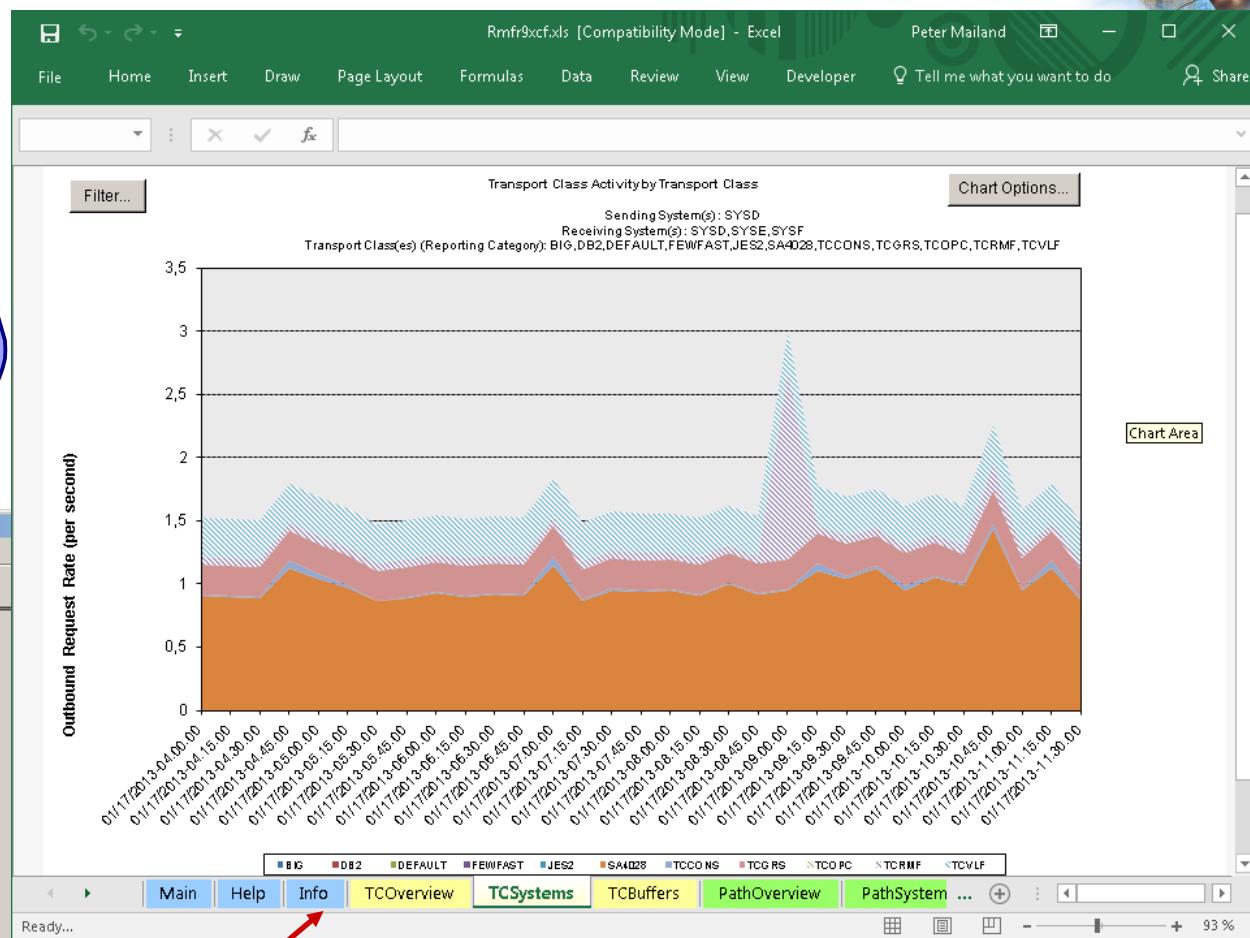
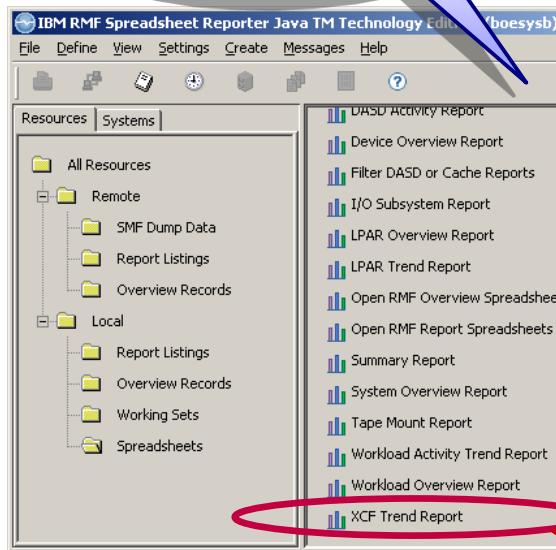
# RMF Spreadsheet Reporter



# RMF Spreadsheet Reporter



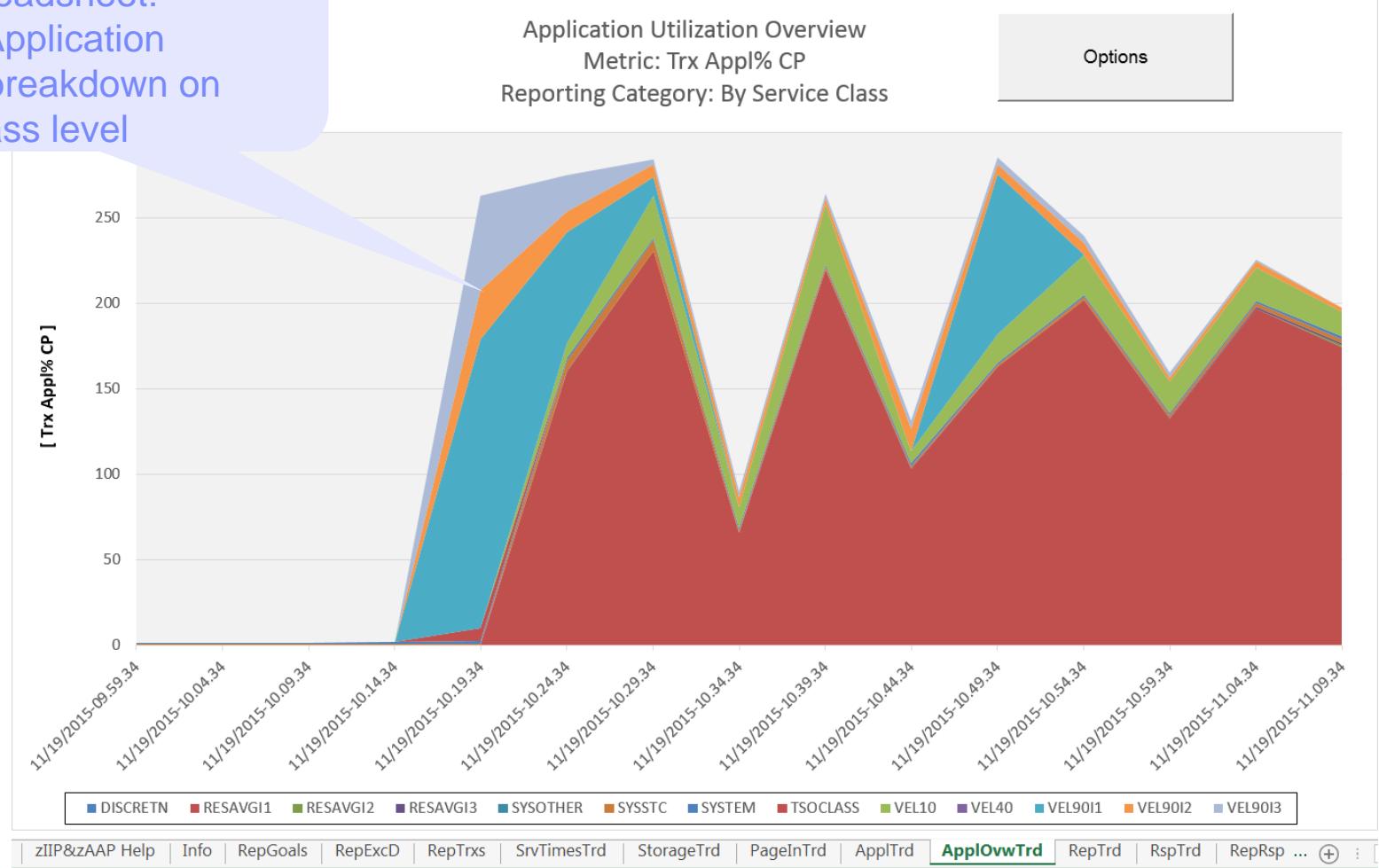
Macros  
for all Types of  
Performance relevant  
Areas !! (based on reports  
or overview records)



# RMF Spreadsheet Reporter



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



# RMF Spreadsheet Reporter

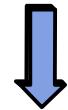


- Use overview control statements to create a working set and load the data into the generic RMF Overview Report spreadsheet, which offers a bunch of chart !

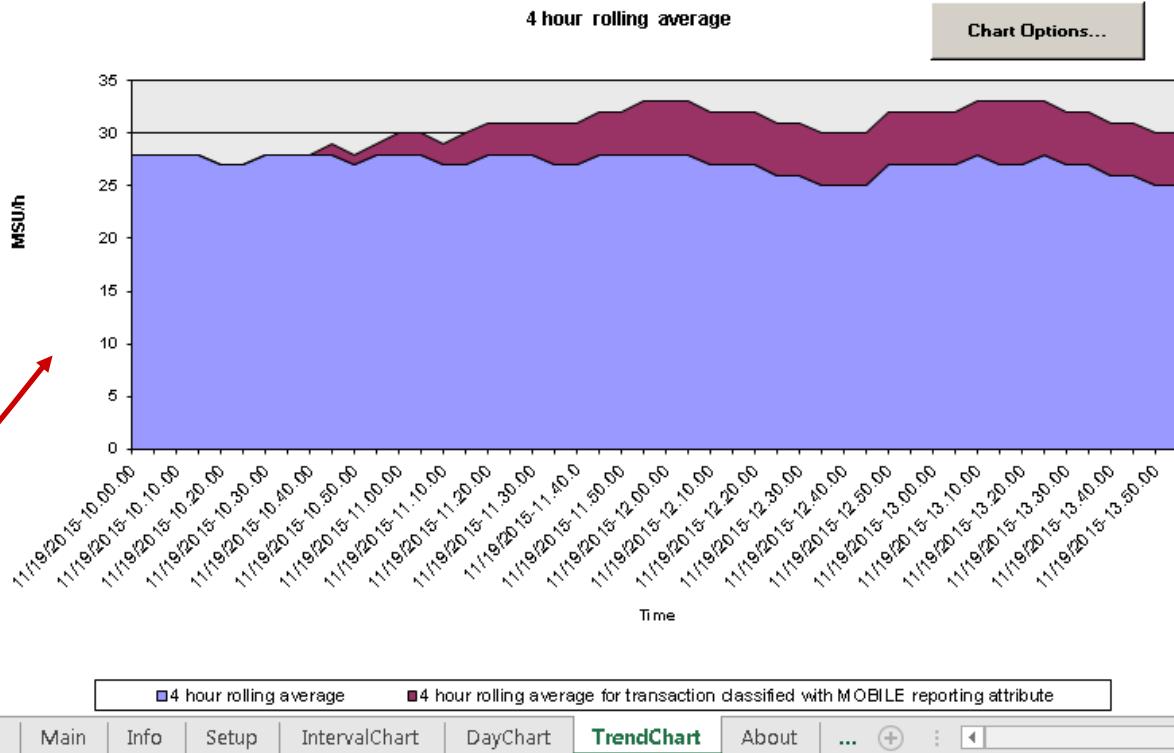
## Overview Conditions:

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

Working set  
(based on  
Overview Record)



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)

```
1 <?xml version="1.0" encoding="UTF-8"?>
2 <?xml-stylesheet type="text/xsl" href="include/ddsml-pp.xsl"?>
3 <ddsml xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
4   xsi:noNamespaceSchemaLocation="include/ddsml.xsd">
5 <server>
6 <name>RMF-DDS-Server</name>
7 <version>ZOSV2R2</version>
8 <functionality>3202</functionality>
9 <platform>z/OS</platform>
10 </server>
11 <postprocessor><metric id="PCIE"><description>PCIE Activity Report</description><type>I</type>
12 </resource><time-data><display-start locale="en-us">09/28/2015-15.44.35</display-start>
13 <segment id="1"><name>General PCIE Activity</name>
14 <part id="2">
15 <table id="3">
16 <column-headers><col type="T">Function ID</col><col type="T">Function PCHID</col><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...
17 <col type="N">Packets Transmitted Rate</col><col type="N">Work Units Processed Rate</col>
18 <row refno="1"><col>0021</col><col>037C</col><col>Hardware Accelerator</col><col>101404</col><col>0</col><col></col><col></col><col></col></row>
19 <row refno="2"><col>0025</col><col>037C</col><col>Hardware Accelerator</col><col>101404</col><col>0</col><col></col><col></col><col></col></row>
20 <row refno="3"><col>0028</col><col>03BC</col><col>Hardware Accelerator</col><col>101404</col><col>0</col><col></col><col></col><col></col></row>
21 <row refno="4"><col>002B</col><col>03BC</col><col>Hardware Accelerator</col><col>101404</col><col>0</col><col></col><col></col><col></col></row>
22 </table></part></segment>
```

# RMF XML Toolkit



Simplifies display of RMF Postprocessor XML reports in a web browser

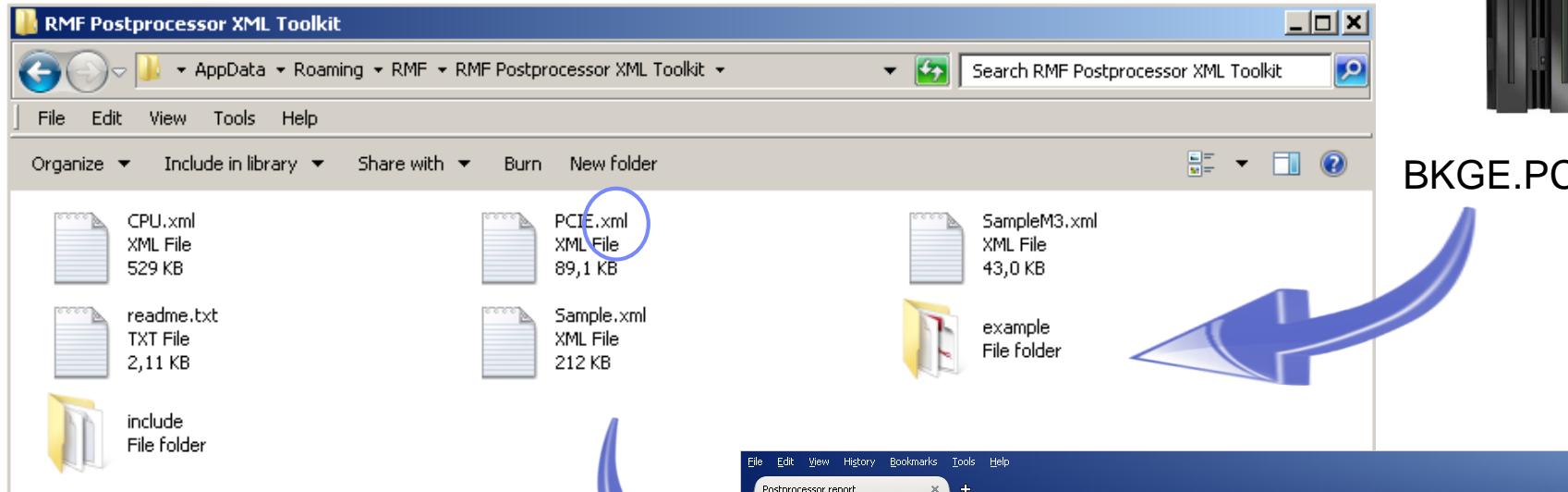
1. Download member SYS1.SERBPWSV(ERBXMLTK) as binary file erbxmltk.msi or get it from the RMF Homepage
2. Install MSI Package

The screenshot shows the Windows File Explorer interface with the following details:

- Default Installation Directory:** A callout points to the address bar showing the path: AppData \ Roaming \ RMF \ RMF Postprocessor XML Toolkit.
- Installed Files:** The contents of the toolkit directory include:
  - SampleM3.xml (XML File, 43,0 KB)
  - readme.txt (TXT File, 2,11 KB)
  - include (File folder)
  - Sample.xml (XML File, 212 KB)
- Associated Files:** A callout points to the right side of the window, listing:
  - ⇒ XSL stylesheet files
  - ⇒ Java script file
  - ⇒ Bitmap files
- Sample XML reports (PP, M3):** A callout points to the SampleM3.xml file.

# RMF XML Toolkit

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



2. Open XML report with web browser

**RMF Postprocessor Interval Report [System SYSE] : PCIE Activity Report**

RMF Version : z/OS V2R2 SMF Data : z/OS V2R2  
Start : 09/28/2015-15.44.35 End : 09/28/2015-15.59.34 Interval : 15:00:00 minutes

**General PCIE Activity**

Function ID	Function PCHID	Function Name	Function Type	Function Status	Owner Job Name	Owner Address Space ID	Function Allocation Time	PCI Load Operations Rate	PCI Store Operations Rate	PCI Store Block Operations Rate	PCI Store Translat. Operat. Rate	Refresh Translat. Operat. Rate
0021	037C	Hardware Accelerator	1014044B	Allocated	FPGHWAM	0012	900	0	0.003	0	0.196	
0025	037C	Hardware Accelerator	1014044B	Allocated	FPGHWAM	0012	900	0	0.003	0	0.196	
0028	039C	Hardware Accelerator	1014044B	Allocated	FPGHWAM	0012	900	0	0.003	0	0.196	

# RMF Spreadsheet Reporter – XML Support



The screenshot shows the IBM RMF Spreadsheet Reporter interface. On the left is the main window with a menu bar (File, Define, View, Settings, Create) and toolbars. Below the menu is a toolbar with icons for file operations. The main area displays a tree view of resources under 'Resources' and 'Systems'. A red arrow points from the top-left towards the 'Reports' tab of the first options dialog.

**Options Dialog (Top Left):**

General		Reports
General Processing Options		
<input checked="" type="checkbox"/> Create Overview Records		
<input type="checkbox"/> Delete Postprocessor Datasets after Download		
<input type="checkbox"/> Ignore specified Duration Period		
<input checked="" type="checkbox"/> Ignore specified Interval Time		
<input checked="" type="checkbox"/> Save Password with System Profile		
<input type="checkbox"/> Scratch Overview Records after Conversion		
<input type="checkbox"/> Scratch Report Listings after Conversion		
<input checked="" type="checkbox"/> Scratch extracted OVV Files after Conversion		
<input checked="" type="checkbox"/> Scratch extracted RPT Files after Conversion		
<input checked="" type="checkbox"/> Sort SMF Datasets		
<input checked="" type="checkbox"/> Use XML Report Format		

**Options Dialog (Bottom Right):**

General		Reports
RMF Postprocessor Report Types		
<input type="checkbox"/>	Cache Subsystem Activity	<input checked="" type="checkbox"/> PCIE Activity
<input type="checkbox"/>	Channel Path Activity	<input checked="" type="checkbox"/> Storage Class Memory Activity
<input type="checkbox"/>	Coupling Facility Activity	<input checked="" type="checkbox"/> Serialization Delays
<input checked="" type="checkbox"/>	CPU Activity	<input type="checkbox"/> Shared DASD Device Activity
<input checked="" type="checkbox"/>	Crypto Hardware Activity	<input type="checkbox"/> Shared TAPE Device Activity
<input type="checkbox"/>	DASD Device Activity	<input type="checkbox"/> TAPE Device Activity
<input type="checkbox"/>	Enqueue Activity	<input type="checkbox"/> Virtual Storage Activity
<input type="checkbox"/>	Enterprise Disk Systems	<input type="checkbox"/> Workload Activity (Report Classes)
<input type="checkbox"/>	FICON Director Activity	<input type="checkbox"/> Workload Activity (Service Classes)
<input type="checkbox"/>	HFS Statistics	<input checked="" type="checkbox"/> XCF Activity
<input type="checkbox"/>	I/O Queuing Activity	
<input type="checkbox"/>	OMVS Kernel Activity	
<input type="checkbox"/>	Page Data Set Activity	
<input checked="" type="checkbox"/>	Paging Activity	

A blue callout bubble points to the 'Reports' tab of the second dialog, containing the text: "List of currently available reports in XML format".

# RMF Spreadsheet Reporter – XML Support

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

The image shows two windows illustrating the RMF Spreadsheet Reporter process.

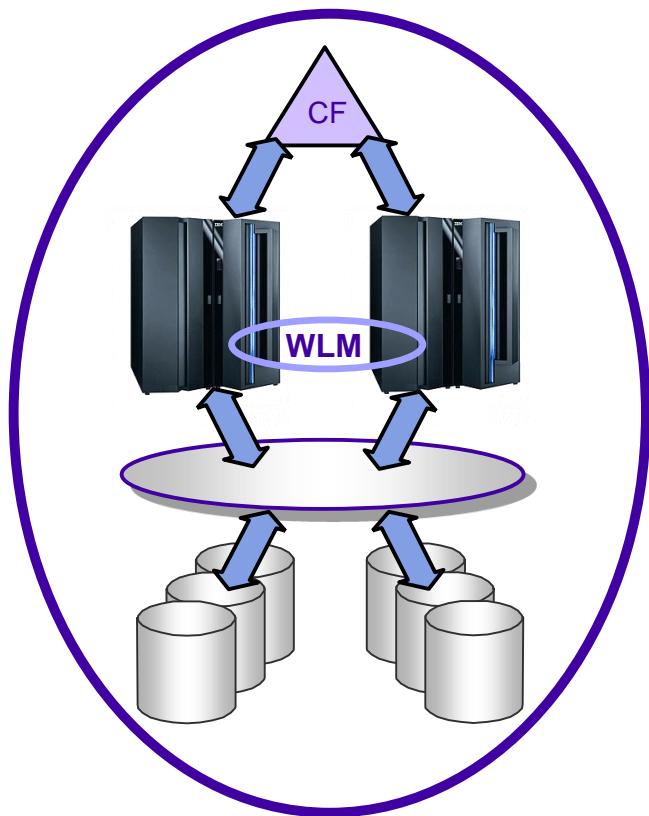
**Left Window:** The title bar reads "IBM RMF Spreadsheet Reporter Java TM Technology Edition (boesysc)". The menu bar includes File, Define, View, Settings, Create, Messages, and Help. The toolbar contains icons for New, Open, Save, Print, and Help. The left pane shows a tree view of resources under "Resources" and "Systems". The "Remote" section contains "All Resources", "SMF Dump Data", "Report Listings", and "Overview Records". The "Local" section contains "Report Listings", "Overview Records", "Working Sets", and "Spreadsheets". The right pane lists files: "Sample.ls", "Sample.xml", "V2R1\_CF.xml", and "WLMGL V2R2.xml". A context menu is open over "WLMGL V2R2.xml" with options: Start, View, New, Rename, Delete, and Properties. A red arrow points from this menu towards the right window.

**Right Window:** The title bar reads "Postprocessor report". The menu bar includes File, Edit, View, History, Bookmarks, Tools, and Help. Below the menu is a message "Postprocessor report". The main area displays "Display Controls for RMF Postprocessor Report" and "Report Data Selection". A dropdown menu shows four entries: "09/28/2015-15.44.35 SYSE PCIE", "09/28/2015-15.44.35 S4 PCIE", "09/28/2015-15.59.35 SYSE PCIE", and "09/28/2015-15.59.35 S4 PCIE". A button "Show all Report Data" is below the dropdown. Below this, the title "RMF Postprocessor Interval Report [System S]" is displayed. The report details: "RMF Version : z/OS V2R2", "SMF Data : z/OS V2R2", "Start : 09/28/2015-15.44.35", "End : 09/28/2015-15.59.34", and "Interval : 15:00:00 minutes". Two sections are shown: "General PCIE Activity" and "Hardware Accelerator Activity". The "General PCIE Activity" table has columns: Function ID, Function PCHID, Function Name, Function Type, Function Status, Owner Job Name, and Owner Address Space ID. The data rows are:

Function ID	Function PCHID	Function Name	Function Type	Function Status	Owner Job Name	Owner Address Space ID
0021	037C	Hardware Accelerator	1014044B	Allocated	FPGHWAM	0012
0025	037C	Hardware Accelerator	1014044B	Allocated	FPGHWAM	0012
0028	03BC	Hardware Accelerator	1014044B	Allocated	FPGHWAM	0012
002B	03BC	Hardware Accelerator	1014044B	Allocated	FPGHWAM	0012

The "Hardware Accelerator Activity" section is currently collapsed.

# Realtime Reporting



- covers all Sysplex related aspects
  - ▶ 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
  - ▶ zOSMF RM / Data Portal / RMF PM
    - ▶ 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



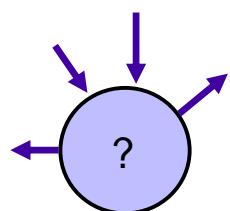
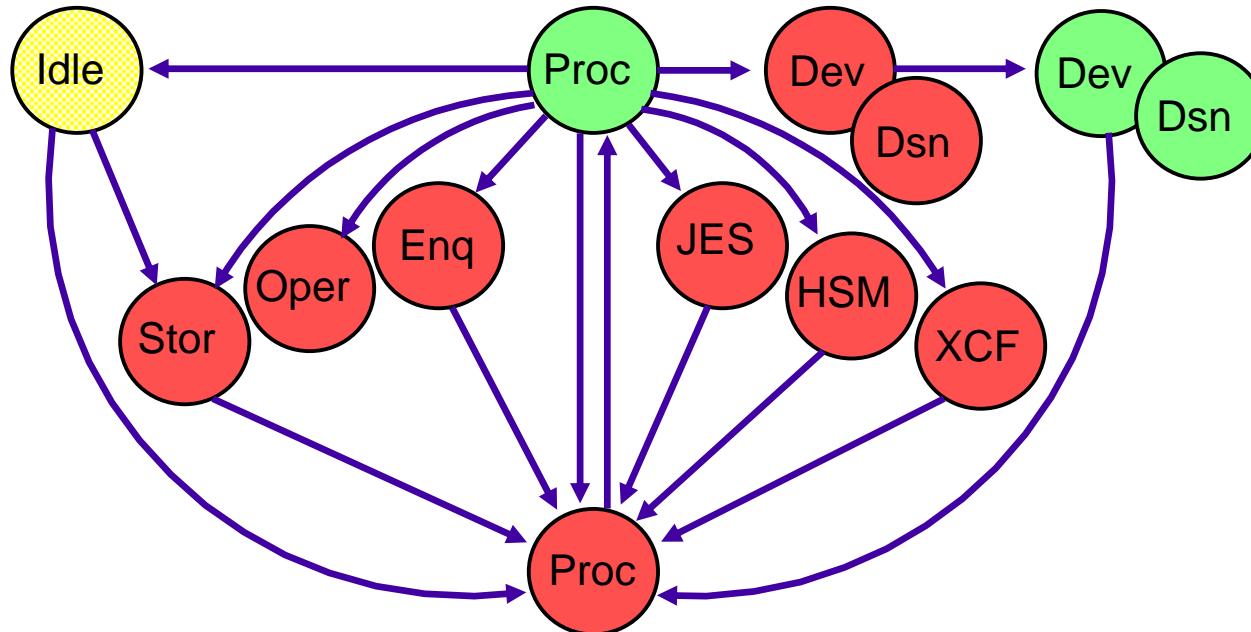
## Monitor III Activity Monitoring

- 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



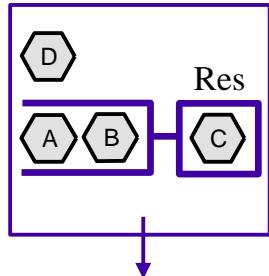
Unknown

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

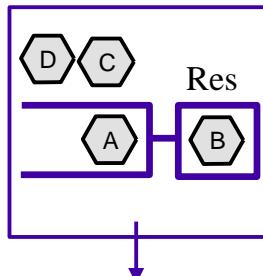
$$\text{Delay}(\%) = \frac{\text{delay samples}}{\text{number of samples}} \times 100 = 33\%$$

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

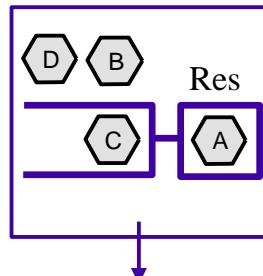
# Example: Using and Delay



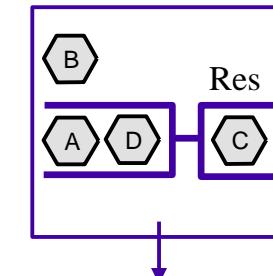
Job	I	U	D	Why
A			*	C
B			*	C
C	*			
D	*			



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

Jobname	WFL	USG	DLY	IDL	Primary	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

Resource	WFL	ADU	Jobname	USG	DLY	Reason
	%			%	%	
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					
Name	CX	Service Class	Cr	WFL			USG			DLY			IDL			UKN			----- % Delayed for ----- Primary Reason	
				%	%	%	%	%	%	PRC	DEV	STR	SUB	OPR	ENQ	Reason				
SUSANK	T	TSOPRIME		0	0	100	0	0	0	0	0	0	0	100	0	0	HSM			
CONSOLE	S	SYSTEM		0	0	15	0	85	0	0	0	0	0	0	15	0	Message			
RRSSERVQ	B	WLMSHORT		0	0	1	0	1	0	0	0	0	0	1	0	0	JES			
BHBE	T	TSOPRIME		40	4	6	90	0	6	0	0	0	0	0	0	0	JHUGO			
MORABIT	T	TSOPRIME		41	37	56	0	7	0	56	0	0	0	0	0	0	COMPK5			
RONDA2A	B	COMBUILD		42	29	42	0	29	1	41	0	0	0	0	0	0	COMPK5			
D24JAPI	T	TSOPRIME		49	22	23	56	0	0	23	0	0	0	0	0	0	PRIPK5			
RRSSERVQ	B	WLMSHORT		50	2	2	0	0	0	2	0	0	0	0	0	0	SPOL1J			
GRSARTSQ	B	WLMSHORT		50	1	1	0	0	0	0	0	0	1	0	0	0	JES			
RRSSERVQ	B	WLMSHORT		50	1	1	0	0	0	0	0	0	1	0	0	0	JES			
CATALOG	S	SYSTEM		63	57	39	0	12	0	39	0	0	0	0	0	0	MCATTS			
ANFWPROC	SO	SYSSTC		67	2	1	0	2	0	1	0	0	0	0	0	0	SPOL1J			
GRSARTSQ	B	WLMSHORT		71	5	2	0	0	0	1	0	1	0	0	0	0	SPOL1J			
SMFDTRS	S	STCMED		71	5	2	0	93	0	0	0	0	0	0	2	0	SYSZVVDS			
JES2	S	SYSSTC		73	16	6	0	79	0	6	0	0	0	0	0	0	SPOL1J			
GRSARTSQ	B	WLMSHORT		80	4	1	0	0	0	0	0	0	1	0	0	0	JES			
ARTXESQ	B	WLMSHORT		80	4	1	0	0	0	1	0	0	0	0	0	0	SPOL1L			
DFRMM	S	SYSSTC		83	81	18	0	1	0	18	0	0	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 ---		--- CPU ---		- Storage -		----- QScan -----		
		Conn	EXCP	Total	TCB	Total	Fixed	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 Sensitivity

# WLM: Goal Achievement



## Performance Index

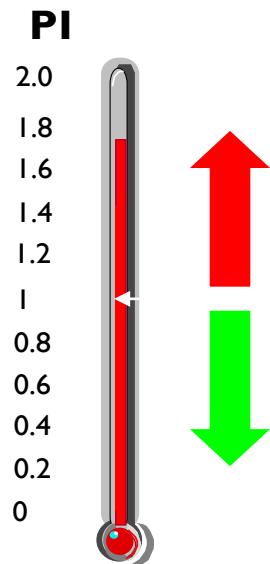
< 1: Goal is overachieved

Service Class might not need all of its resources

= 1: Goal achieved

> 1: Goal not achieved

Service Class may need additional resources



$$\text{Response Time Goal} : PI = \frac{\text{Actual Achieved Response Time}}{\text{Response Time Goal}}$$

$$\text{Execution Velocity Goal} : PI = \frac{\text{Execution Velocity Goal}}{\text{Actual Achieved Execution Velocity}}$$

# 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

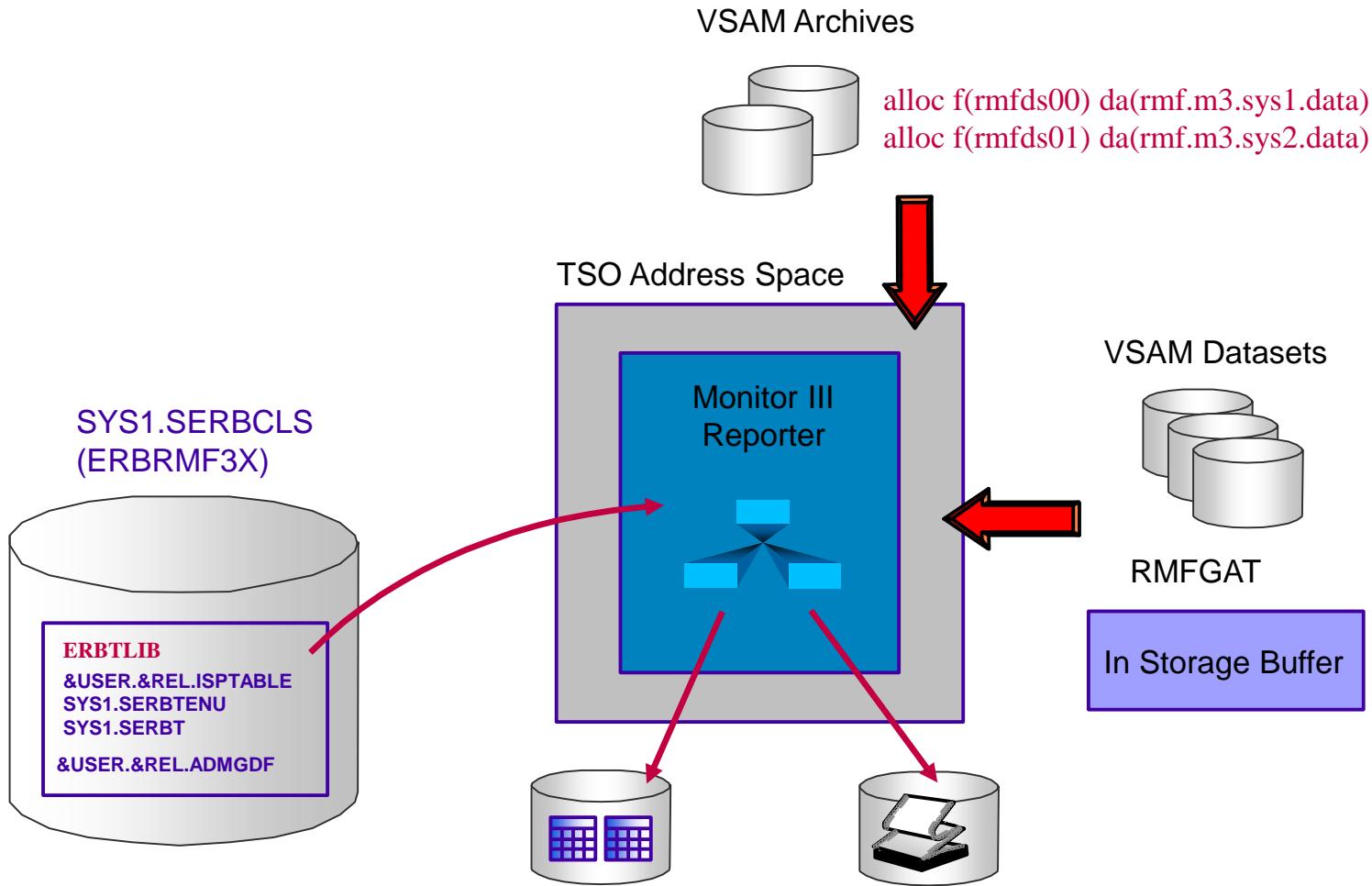
Service Definition: SCLM Installed at: 12/06/00, 10.00.24  
Active Policy: STANDARD Activated at: 12/06/00, 10.07.3

----- Goals versus Actuals -----										Trans	--Avg.	Resp	
Name	T	I	Goal	Act	---Goal---	---Actual--	Perf	Ended	WAIT	EXE			
							Idx	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	0.000	

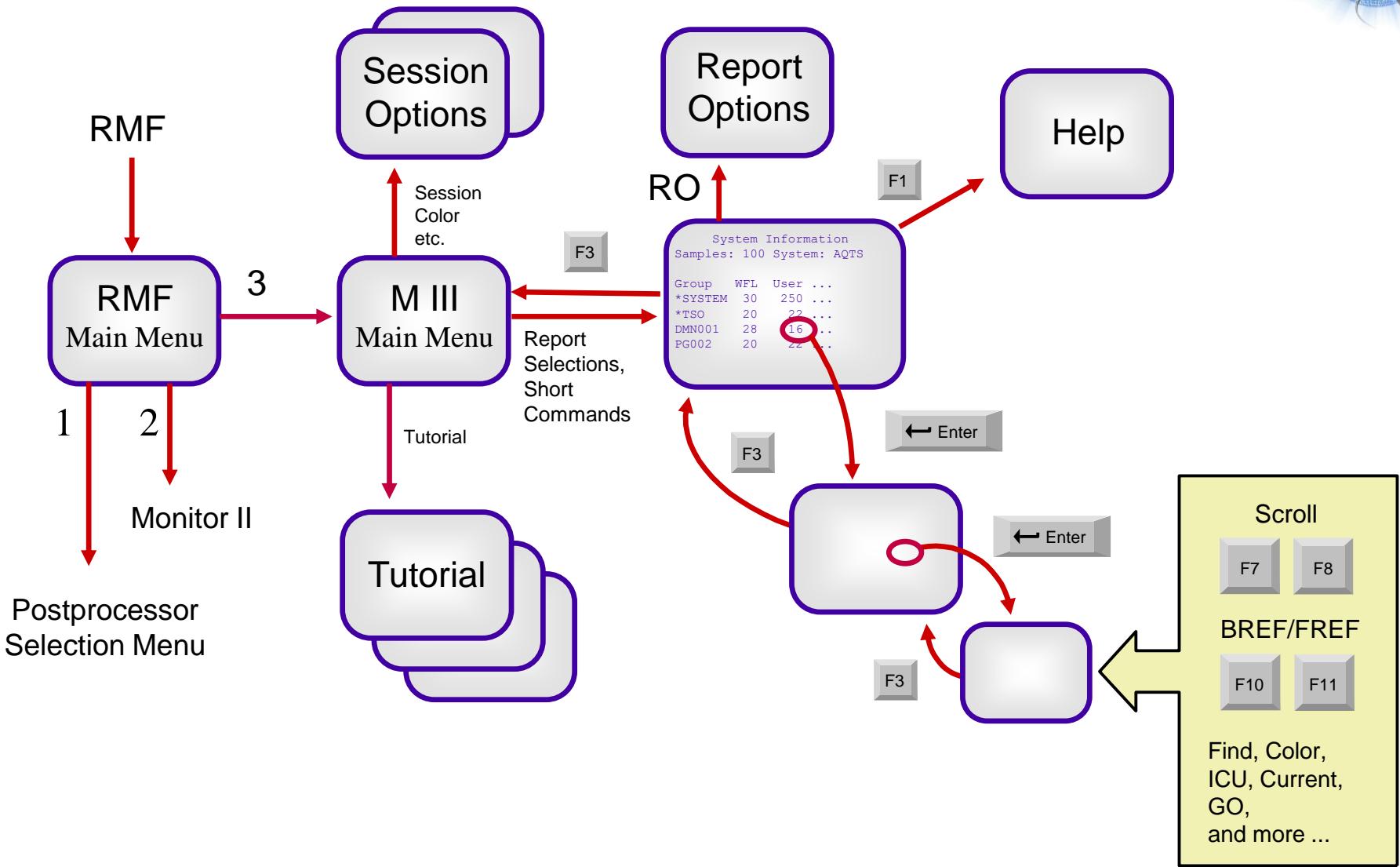
## Sysplex Performance at a Glance !

- ▶ 80 Intervals in GO Mode
- ▶ colored Indication for PI > 1
- Importance = 1+2**
- Importance > 2**

# Monitor III: Session Setup



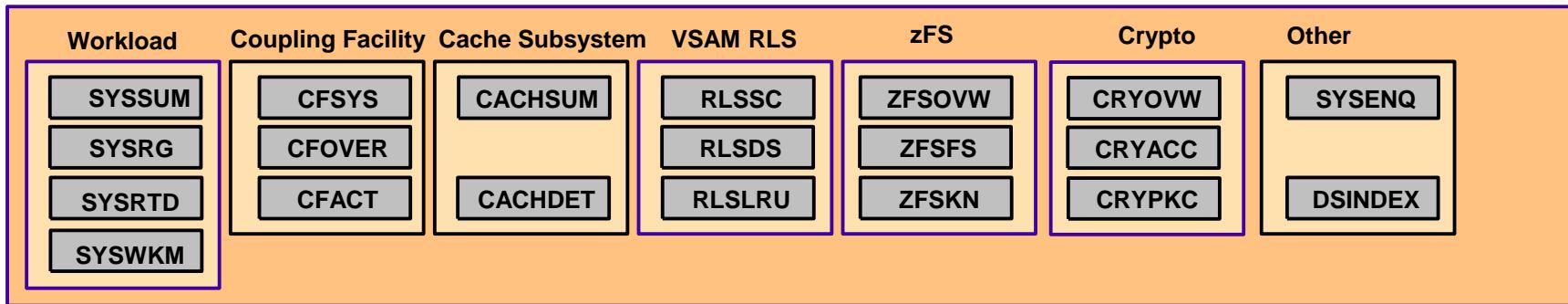
# Monitor III Reporter Usage



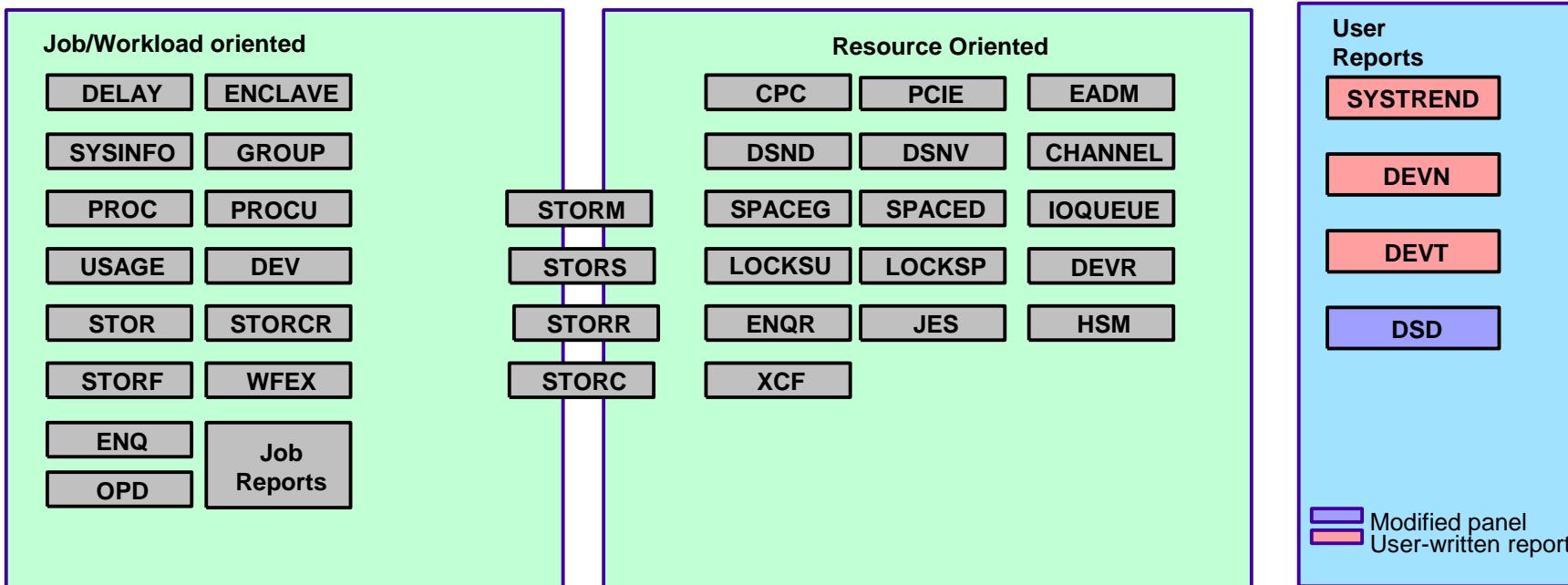
# Monitor III Report Overview



## Sysplex Reports



## System Reports

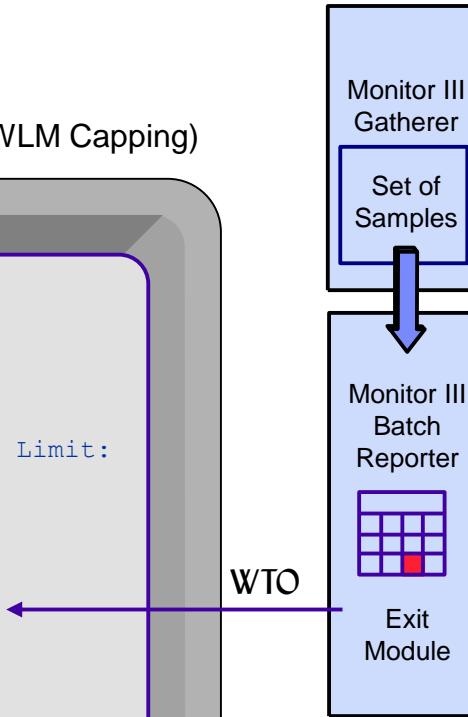


# Monitor III: Setup for WTO's



- 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
```

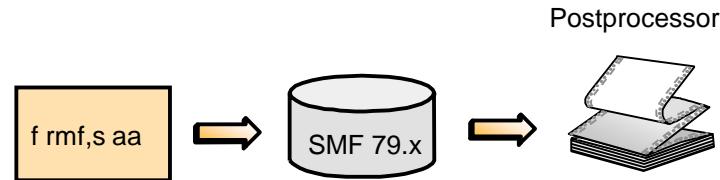


- Sample Exits provided for:
- ▶ Workflow Exception Report
  - ▶ Sysinfo Report
  - ▶ CPC Capacity Report

# 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

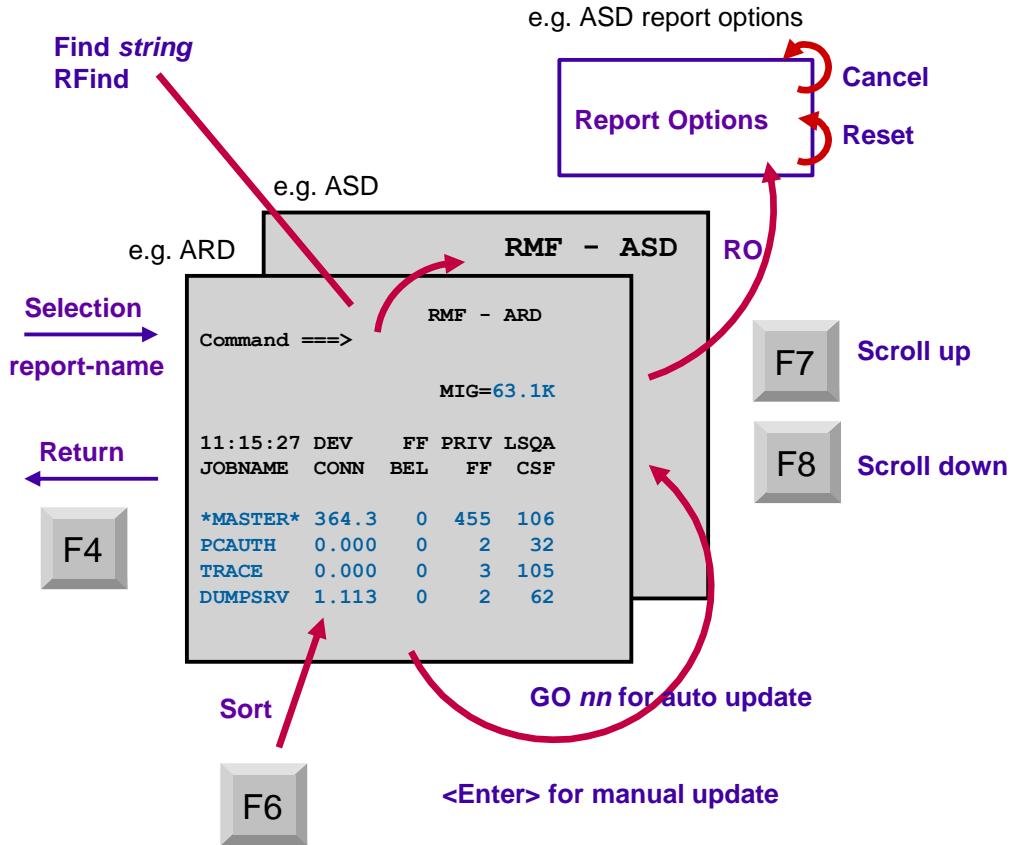
```
RMF
Selection ===>
Enter selection number or command

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 ==>		CPU= 45/ 30 UIC=2540 PR= 0 System= SCLM Total											Scroll ==> PAGE			
JOBNAME	CONN	16M	FF	PRV	LSQA	LSQA	X	SRM	TCB	CPU	EXCP	SWAP	LPA	CSA	NVI	V&H
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

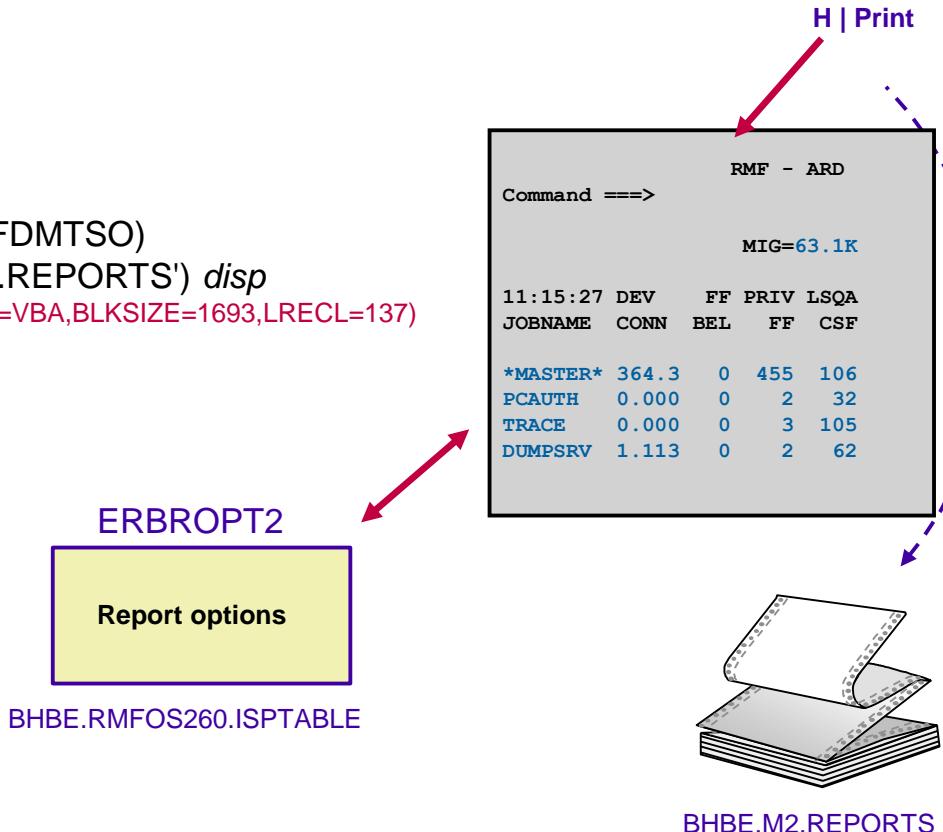
	CPU= 3/ 1 UIC= 65K PR= 0	System= SYSE Total
OPT: P0	Time: 02/05/16 12:30:01	
-- Parameter --	-- Default --	Value -- Unit ----- Description -----
ABNORMALTERM	Yes	Yes Y/N Abnormal terminations in routing
ABSMSUCAPPING	No	Yes Y/N Absolute, permanent MSU capping
BLWLINTHD	20	20 sec Time blocked work waits 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

RMF - ARDJ Address Space Resou									
Command ===>									
CPU= 19/ 19 UIC=2540									
<b>BHOL</b>									
TIME	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	

All resources or jobs at a specific point in time

RMF - ARD Address Space Resour									
Command ===>									
CPU= 9/ 8 UIC=2540									
13:20:26									
JOBNAME	DEV	FF	PRIV	LSQA	LSQA	X	SRM	TCB	
TIME	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

Use AT-TLS to enable secure communication with the DDS via HTTPS.  
With V2R4 the DDS default parmlib option HTTPS(ATTLS) enforces AT-TLS setup for the DDS



The screenshot shows the RMF Data Portal for z/OS running in a browser window. The title bar reads "RMF Data Portal". The address bar shows "https://boesysf:8803". The main content area displays a collage of images related to data processing and visualization, including binary code, a bar chart, and a smiling person. Below this is a section titled "Important notes:" with a bulleted list of requirements for using the application. At the bottom, there is footer text about the server configuration and legal disclaimers.

Important notes:

- When using this application you will be prompted to login to the Sysplex with a valid userid and password.
- This application requires Javascript to be enabled
- For some functions (such as "My View") you must allow your browser to store cookies.
- This application has been successfully tested with:
  - Microsoft Internet Explorer Version 11 for Windows
  - The Mozilla Suite or Firefox Browser Version ESR 60 from [www.mozilla.org](http://www.mozilla.org) for various platforms.

Server running on: Sysplex: SYSDPLEX, SMF-Id: SYSF, System Name: SYSF, OS Type+Version: z/OS 2.4.0 SP7.2.4  
Trademarks: z/OS, z/Series, and RMF are trademarks of the IBM Corporation. Windows and Internet Explorer are trademarks of the Microsoft Corporation. Linux is a registered trademark of Linus Torvalds. Mozilla and Firefox are trademarks of the Mozilla Foundation.

The RMF Data Portal for z/OS is sample code created by IBM Corporation. This sample code is not part of any standard IBM product and is provided to you solely for the purpose of assisting you in the development of your applications.  
The code is provided "AS IS", without warranty of any kind. IBM shall not be liable for any damages arising out of your use of such sample code, even if you have been advised of the possibility of such damage.



# RMF Monitor III Data Portal - The Resource Model



Sysplex

MVS Image

I/O Subsystem

All SSIDs

SSID

All LCUs

LCU

All Channels

Channel

All Volumes

Volume

Crypto

Crypto Card

PCIE

PCIE Function

SCM

SCM Card

ZFS

Aggregate

Processor

Storage

Auxiliary Storage

Central Storage

CSA, SQA, ECSA, SQA

Enqueue

Operator

Subsystems

JES, XCF, HSM

Coupling Facility

CF Structure

....

...cont...

WLM Active Policy

ALL WLM Workloads

WLM Workload

WLM Service Class

WLM SC Period

ALL WLM Report Classes

WLM Report Class

WLM RC Period

ALL WLM Resource Groups

WLM Resource Group

CPC

LPAR

→ The Sysplex is the top-level resource

**RMF Data Portal for z/OS**

Welcome, you are connected to: ,SYSAPLEX,SYSPLEX

**RMF Monitor III Data:**

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

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
	,BASEPOL,WLM_ACTIVE_POLICY	Metrics	Show	WLM_ACTIVE_POLI
	,4255,CPC	Metrics	Show	CPC

# RMF Monitor III Data Portal - The Resource Model



Resource specific actions:

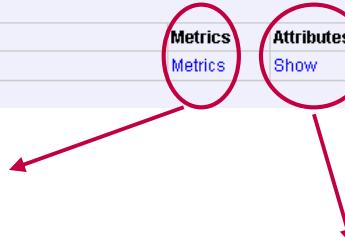
- ▶ List metrics
- ▶ Show attributes

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	<a href="#">Metrics</a>	<a href="#">Show</a>	SYSPLEX



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

## Full RMF Reports:

CACHDET	CACHSUM	CFACT	CFOVER	CFSYS	SPACED	SPACEG	SYSSUM	XCFGROUP	XCFOWW	XCFPATH
XCFSYS	ZFSFS	ZFSKN	ZFSOWW							

## Available metrics for: ,SYSAPLEX,SYSPLEX

Metric description	Help	Id
% delay	<a href="#">Explanation</a>	8D0160
% delay for enqueue	<a href="#">Explanation</a>	8D1A20
% delay for I/O	<a href="#">Explanation</a>	8D1A80
% delay for operator	<a href="#">Explanation</a>	8D1AE0
% delay for processor	<a href="#">Explanation</a>	8D1B40
% delay for storage	<a href="#">Explanation</a>	8D1BA0
% delay for swsub	<a href="#">Explanation</a>	8D1C00

RMF Data Portal for z/OS    Home    Explore    Overview

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	SYSPLEX

# 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	XCFOWW	XCFPATH
XCFSYS	ZFSFS	ZFSKN	ZFSOWW							

**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		
<b># users</b>		
max user request rate		

**Get metric help**

**click Add to My View for Persistence**

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 Metric from List

# 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

,SYSPLEX,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 [8D00D50] (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

**Manage Metrics in My View**

Select	Origin	Resource	Metric Id
<input checked="" type="checkbox"/>	(1) My View	,SYSAPLEX,SYSPLEX	8D0090
<input checked="" type="checkbox"/>	(2) My View	SYSC,30,CHANNEL_PATH	8D0080
<input checked="" type="checkbox"/>	(3) Added (New)	,SYSAPLEX,SYSPLEX	8D00D50

OK CANCEL HELP

My View definitions are stored persistently

Welcome, you are connected to:

**RMF Monitor III Data:**

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

,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

,SYSAPLEX,SYSPLEX -- % total utilization [8D0080] (percent)

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

0.7
-----

,SYSAPLEX,SYSPLEX -- # users [8D00D50] (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)



Scrollable and  
resizable!

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	<a href="#">Metrics</a>	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	<a href="#">Metrics</a>	Show	MVS_IMAGE
	,SYSC,MVS_IMAGE	<a href="#">Metrics</a>	Show	MVS_IMAGE
	,SYSA,MVS_IMAGE	<a href="#">Metrics</a>	Show	MVS_IMAGE
	,CF01,COUPLING_FACILITY	<a href="#">Metrics</a>	Show	COUPLING_FACILITY
	,CF02,COUPLING_FACILITY	<a href="#">Metrics</a>	Show	COUPLING_FACILITY
	,4255,CPC	<a href="#">Metrics</a>	Show	CPC

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

**Full RMF Reports:**

CACHDET	CACHSUM	CFACT	CFOVER	CFSYS	SPACED	SPACEG	SYSSUM	XCFGROUP	XCFOWM
XCFSYS	ZFSFS	ZFSKN	ZFSOWW						

**Available metrics for: ,SYSAPLEX,SYSPLEX**

Metric description	Help
% delay	<a href="#">Explanation</a>
% delay for enqueue	<a href="#">Explanation</a>
% delay for i/o	<a href="#">Explanation</a>
% delay for operator	<a href="#">Explanation</a>

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	<a href="#">Explanation</a>	8D0160
% idle	<a href="#">Explanation</a>	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 description  
% delay  
% idle

[Select MIII Report](#)

Help  
Explanation  
Explanation

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
RMFOAT	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...



Timing adjustments:

- step backward, forward
  - jump to current time
  - key in a time stamp
  - use GO mode

Sort: Ascending or Descending

Fly over help!

RMF Report [,SYSC,MVS\_IMAGE] : USAGE (Job Oriented Usage)

Time Range: 01/26/2017 15:32:00 - 01/26/2017 15:33:00

Jobname	ASID (dec)	ASID	Period	Dispatching Priority	Transaction Active Time	Transaction Resident Time	Transaction Count	Total Frames	Fixed Frames	Fixed Frame High
FPGHWAM	0018	The address space id of a Job, TSO Userid, started task or USS address space. Unless otherwise indicated RMF displays the ASID number in decimal and not in hexadecimal notation.	FF	FF	117:08:53	117:08:53	1	16968	16552	1650
XCFAS	0008		FF	FF	117:08:53	117:08:53	1	7047	2723	115
*MASTER*	0001		FF	FF	117:09:33	117:09:33	1	6632	1351	
JES2	0054		FE	FE	117:07:55	117:07:55	1	9364	1042	
TRACE	0004		FF	FF	117:09:33	117:09:33	1	871	835	
TCPIP	0133	SU SYSSTC 1	FE	FE	117:07:26	117:07:26	1	14435	673	
			--	--	--	--	--	32245	504	462

# RMF Data Portal: Postprocessor Reports in XML Format



RMF Data Portal for z/OS   [Home](#)   [Explore](#)   [Overview](#)   [My View](#)   ?   RMF

Welcome, you are connected to: ,SYSAPLEX,SYSPLEX

RMF Monitor III Data:

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

RMF Postprocessor Reports:

Reports:

CACHE    CHAN    CPU    CRYPTO    DEVICE    ENQ    ESS    FCD    HFS    IOQ    OMVS    PAGESP    PAGING    PCIE    SCM    SDELAY    VSTOR    XCF  
 CF    SDEVICE    WLMGL  
 OVW

Filter Options:

Date(Start,End)  Type   
SysID  SUMMARY   
Time of Day  SSID   
Duration  EXSSID

Job Handling:

Timeout  SMF data   
Purge job output  Sort SMF   
Show Report

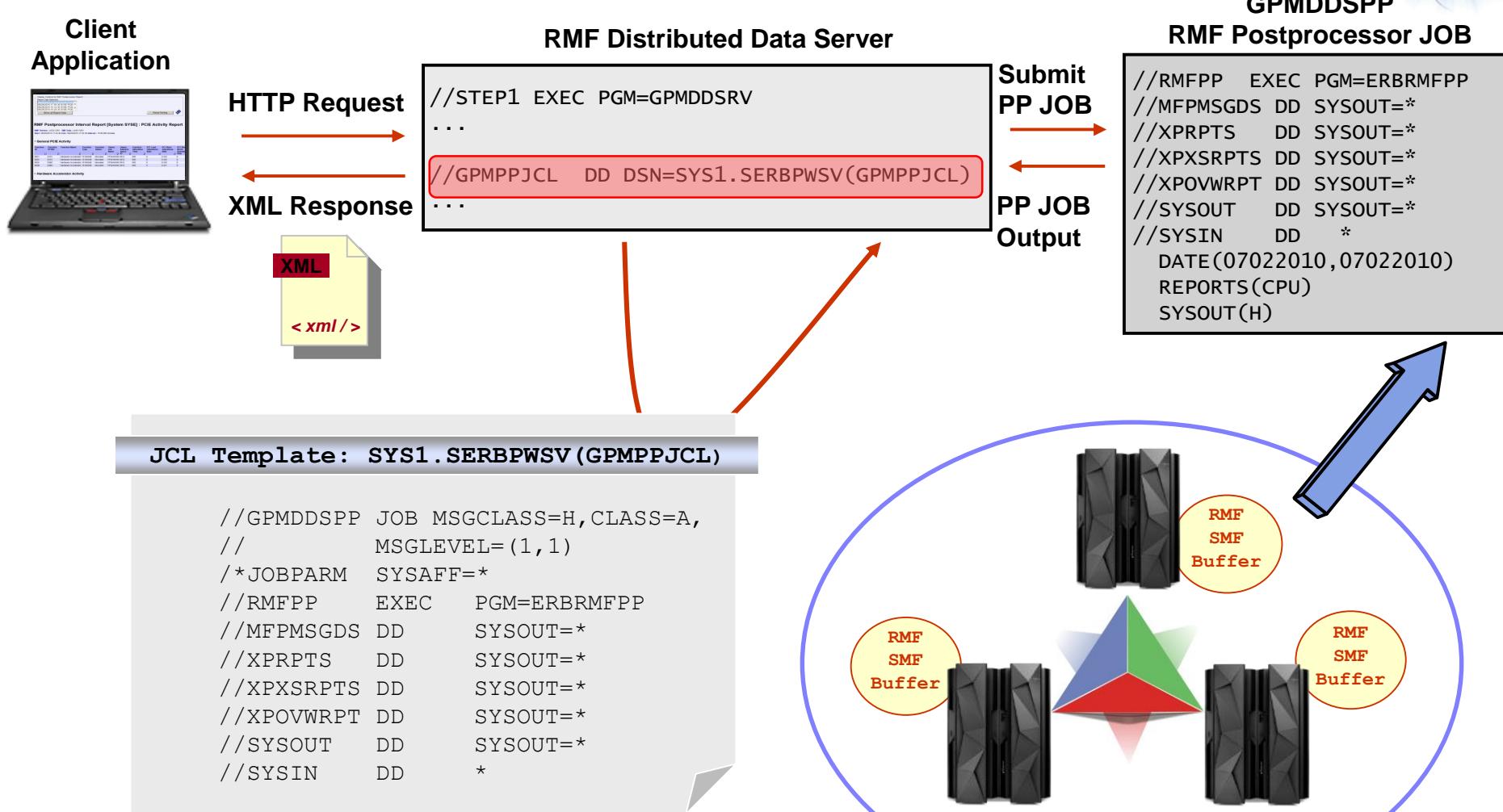
1. Select RMF Postprocessor Report

2. Specify Filter Options

3. Specify SMF INPUT and JOB handling

4. Generate Report

# RMF Data Portal: Postprocessor Reports in XML Format



# RMF Data Portal: Postprocessor Reports in XML Format



RMF Data Portal for z/OS    [Home](#)    [Explore](#)    [Overview](#)    [My View](#)    ?    RMF

Display Controls for RMF Postprocessor Report

Report Data Selection:

09/25/2018-15.29.33 SYSA CPU

09/25/2018-15.44.33 SYSA CPU

09/25/2018-15.59.33 SYSA CPU

09/25/2018-16.14.33 SYSA CPU

Show all Report Data

Select intervals

Reset Sorting

▶ SMF Data

▶ RMF Postprocessor Messages

Expand & collapse sections

Sort columns

**RMF Postprocessor Interval Report [System SYSA] : CPU Activity Report**

RMF Version : z/OS V2R3   SMF Data : z/OS V2R3  
 Start : 09/25/2018-15.29.33 End : 09/25/2018-15.44.33 Interval : 14:59:999 minutes Cycle : 1000 milliseconds

▼ CPU Activity

CPU	: 2827	Model	: 733	H/W Model	: H43	Sequence Code	: 0000000000004255	HiperDispatch	: YES	CPC Capacity	: 3760	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		0.87		0.85		0.00		66.9		MED		24.91		0.23	
1		CP		100.00		0.77		0.75		0.00		66.9		MED		26.44		0.10	
2		CP		100.00		0.00		----		100.00		0.0		LOW		0.00		0.00	
<b>TOTAL/AVERAGE</b>		<b>CP</b>				<b>0.54</b>		<b>0.80</b>				<b>133.8</b>				<b>51.36</b>		<b>0.16</b>	
3		IIP		100.00		0.00		0.00		0.00		20.4		MED					
<b>TOTAL/AVERAGE</b>		<b>IIP</b>				<b>0.00</b>		<b>0.00</b>				<b>20.4</b>							

# z/OSMF RM



IBM z/OS Management Facility

Welcome shara01 | ? | IBM.

System Status

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, Linux or Windows system complexes that you want to monitor in the Resource Monitoring task.

Resources

Actions ▾

No filter applied

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

Total: 1 Selected: 0

Refresh Last refresh: Feb 15, 2016, 4:30:54 PM local time (Feb 15, 2016, 3:30:54 PM GMT)

Automatic refresh

Use the automatically detected system or define your own!

IBM z/OS Management Facility

Welcome

- Welcome
- Notifications
- Workflows
- ▶ Configuration
- ▶ Jobs and Resources
- ▼ Links
  - ShopzSeries
  - Support for z/OS
  - System z Redbooks
  - WSC Flashes & Techdocs
  - z/OS Basics Information Center
  - z/OS Home Page
  - z/OS Internet Library
- ▼ Performance
  - Capacity Provisioning
  - Resource Monitoring
  - System Status
  - Workload Management
- ▶ Problem Determination
- ▼ Software
  - Software Management
- ▼ z/OS Classic Interfaces
  - ISPF
- ▶ z/OSMF Settings

Refresh

# z/OSMF RM

The screenshot shows the IBM z/OS Management Facility web interface. The left sidebar contains a navigation menu with sections like Welcome, Notifications, Workflows, Configuration, Jobs and Resources, Links, Performance, Problem Determination, Software, z/OS Classic Interfaces, and z/OSMF Settings. The 'System Status' link under 'Performance' is highlighted. The main content area shows the 'System Status' tab selected. Below it, a 'Add Entry' form is displayed with fields for 'Resource name' (MVS1), 'Host name or IP address' (mvs1.ibm.com), and 'Target system type'. The 'Target system type' dropdown menu is open, showing options: z/OS (GPM4CIM) (selected), z/OS (GPM4CIM), AIX (GPM4CIM), Linux on System x (GPM4CIM), and Linux on System z (GPM4CIM). A blue callout bubble points to the 'z/OS (GPM4CIM)' option with the text: "Monitor your z System but also your AIX, Linux on System z and Linux on System via via GPM4CIM".



# z/OSMF RM



The screenshot shows the IBM z/OS Management Facility interface. The left sidebar contains a navigation menu with sections like Welcome, Notifications, Workflows, Configuration, Jobs and Resources, Links, Performance, Resource Monitoring (which is selected), Problem Determination, Software, z/OS Classic Interfaces, and z/OSMF Settings. A Refresh button is also present. The main area is titled 'Resource Monitoring' and displays a 'Dashboards' section. It includes a table with columns for Actions, Name, and Filter. The table lists various metrics: Name (Filter, Common Storage Activity, Coupling Facility Overview, Execution Velocity, General Activity, Overall Image Activity, Performance Index, Response Time, Using & Delays, XCF Activity). A blue callout bubble points to the 'Name' column with the text 'Use Actions to create your own dashboard!'. Another blue callout bubble points to the 'Filter' link with the text 'Set of predefined dashboards'. At the bottom of the table, it says 'Total: 9 Selected: 0'. A Refresh button and a status message 'Last refresh: Feb 15, 2016, 4:41:35 PM local time (Feb 15, 2016, 3:41:35 PM GMT)' are at the bottom.

# z/OSMF RM



Dashboard with multiple metric groups

The screenshot shows the IBM z/OS Management Facility interface with the 'Resource Monitoring' section selected. The left sidebar includes links for Welcome, Notifications, Workflows, Configuration, Jobs and Resources, Links, Performance, Capacity Provisioning, Resource Monitoring, System Status, Workload Management, Problem Determination, Software, z/OS Classic Interfaces, and z/OSMF Settings. A 'Refresh' button is also present. The main content area displays three panels: 'Active & Fixed Frames (WLM View)', 'Active Frames', and 'Fixed Frames'. Each panel contains a horizontal bar chart with numerical values. A callout bubble points to the top center of the dashboard area, containing the text 'Dashboard with multiple metric groups'.

Panel	Metric Group	Value
Active & Fixed Frames (WLM View)	S1.*.STORAGE # frames fixed by WLM service class period	9981
	S1.*.STORAGE # frames active by WLM service class period	239000
	S1.*.STORAGE # frames fixed by WLM service class period	7161
	S1.*.STORAGE # frames active by WLM service class period	419000
	S1.*.STORAGE # frames fixed by WLM service class period	5749
	S1.*.STORAGE # frames active by WLM service class period	668000
	S1.*.STORAGE # frames fixed by WLM service class period	1450
	S1.*.STORAGE # frames active by WLM service class period	71240
	S1.*.STORAGE # frames fixed by WLM service class period	1097
	S1.*.STORAGE # frames active by WLM service class period	1156
	S1.*.STORAGE # frames fixed by WLM service class period	1065
	S1.*.STORAGE # frames active by WLM service class period	98911
	S1.*.STORAGE # frames fixed by WLM service class period	417
	S1.*.STORAGE # frames active by WLM service class period	2580
	S1.*.STORAGE # frames fixed by WLM service class period	369
S1.*.STORAGE # frames active by WLM service class period	0	
S1.*.STORAGE # frames fixed by WLM service class period	323	
S1.*.STORAGE # frames active by WLM service class period	1789	
S1.*.STORAGE # frames fixed by WLM service class period	87	
S1.*.STORAGE # frames active by WLM service class period	499	
S1.*.STORAGE # frames fixed by WLM service class period	83	
S1.*.STORAGE # frames active by WLM service class period	553	
S1.*.STORAGE # frames fixed by WLM service class period		
S1.*.STORAGE # frames active by WLM service class period		
02/15/2016 11:56:00 - 02/15/2016 11:57:00 (2/2)		
S1.*.STORAGE # frames active by job		
S1.*.STORAGE # frames fixed by job		
02/15/2016 11:56:00 - 02/15/2016 11:57:00 (5/5)		
02/15/2016 11:56:00 - 02/15/2016 11:57:00 (5/5)		

Panel	Metric Group	Value	
Active Frames	BLZZSRV [00A3]	487000	
	OMVS [000F]	252000	
	IZUSVR1 [003C]	131000	
	ZFS [000E]	113000	
	DUMPSRV [0005]	96862	
	DBS1DBM1 [0021]	62159	
	RSED4 [0094]	40072	
	RSED2 [009C]	39480	
	WLM [000A]	33462	
	RSED [0038]	25201	
	DBS1IRLM [0088]	20831	
	RMFGAT [0035]	18505	
	VLF [0024]	17956	
	CFZCIM1 [0093]	15547	
	TCPPIP [0028]	12400	
	JES2 [001E]	11134	
	RMF [009D]	9819	
	S1.*.STORAGE # frames active by job		
	S1.*.STORAGE # frames fixed by job		
	02/15/2016 11:56:00 - 02/15/2016 11:57:00 (5/5)		

Panel	Metric Group	Value	
Fixed Frames	BLZZSRV [00A3]	2510	
	IZUSVR1 [003C]	1531	
	OMVS [000F]	1452	
	XCFAS [0006]	1173	
	TRACE [0004]	1097	
	JES2 [001E]	1046	
	*MASTER* [0001]	929	
	ZFS [000E]	851	
	DBS1DBM1 [0021]	846	
	DUMPSRV [0005]	787	
	RASP [0003]	476	
	RSED4 [0094]	388	
	TCPPIP [0028]	337	
	RSED2 [009C]	335	
	WLM [000A]	298	
	RSED [0038]	270	
	DBS1IRLM [0088]	251	
	CATA [000001]	245	
	S1.*.STORAGE # frames active by job		
	S1.*.STORAGE # frames fixed by job		
	02/15/2016 11:56:00 - 02/15/2016 11:57:00 (5/5)		

# z/OSMF RM



Screenshot of the IBM z/OS Management Facility (z/OSMF) Resource Monitoring interface. The URL in the browser is <https://mvs1.centers.ihost.com/zosmf/>.

The left sidebar shows navigation links including Welcome, Notifications, Workflows, Configuration, Jobs and Resources, Links, Performance (Capacity Provisioning, Resource Monitoring selected), System Status, Workload Management, Problem Determination, Software, z/OS Classic Interfaces, and z/OSMF Settings. A Refresh button is also present.

The main window title is "Resource Monitoring" under "Storage Soaker". The sub-section "Active & Fixed Frames (WLM View)" is selected. The "Metric groups:" dropdown menu lists "Active & Fixed Frames (WLM View)", "Active Frames", and "Fixed Frames", with "Active & Fixed Frames (WLM View)" currently selected.

The "Timeframe:" section shows "Condition: Past", "Amount: 2", and "Unit: Hours".

The "Data sample range:" section has two options: "Use the default range" (radio button) and "Specify the range in seconds:" (radio button selected, value "600" entered). A blue callout bubble points to the "Specify the range in seconds:" input field with the text "Retrieve historical data !".

At the bottom are buttons for "OK", "Restore Defaults", "Cancel", and "Help". To the right of the main window, there is a vertical bar with several numerical values: 2510, 1531, 1452, 173, 97, and 46. At the bottom of the vertical bar, it says "016 11:57:00 (5/5)".

# z/OSMF RM

The screenshot shows the IBM z/OS Management Facility (z/OSMF) Resource Monitoring interface. The left sidebar menu is expanded to show the 'Performance' section, with 'Resource Monitoring' selected. The main panel displays the 'Export Dashboard' configuration screen. The steps are outlined as follows:

- Step1: Select Scope and Intervals**: A sub-section under 'Export Dashboard'.
- Step2: Select Metrics and Resources**: A sub-section under 'Export Dashboard'.

The 'Scope of Data to Export' section contains the following configuration:

- Metric group:** Active & Fixed Frames (WLM View)
- Range of Intervals to Export**:
  - Start time of first interval:** 02/16/2016 02:00:45
  - End time of last interval:** 02/16/2016 09:26:00

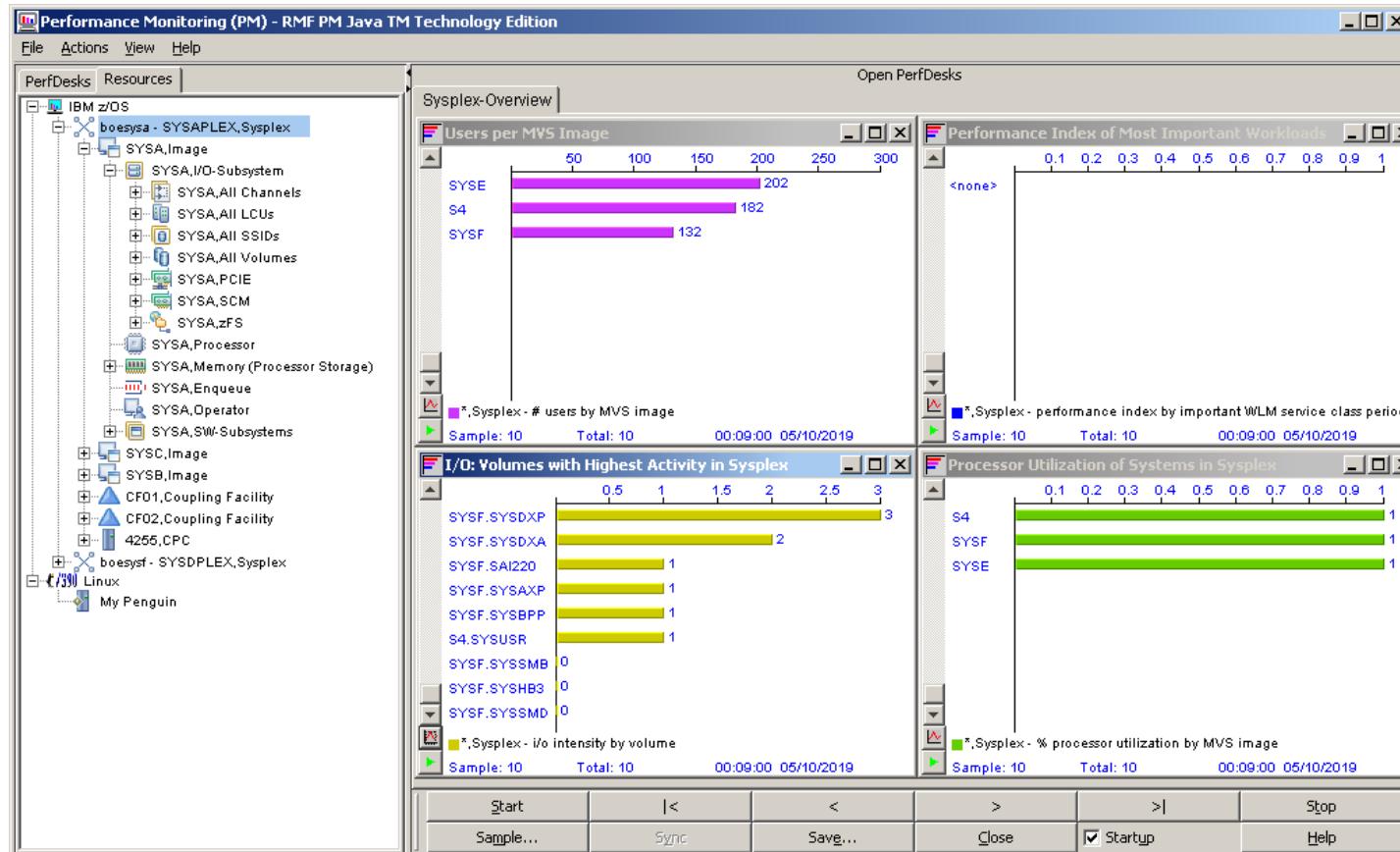
At the bottom of the screen are buttons for navigation: '< Back', 'Next >', 'Finish', and 'Cancel'. A large blue callout bubble with the text "Export data to CSV" points to the 'Finish' button.



# RMF Performance Monitoring



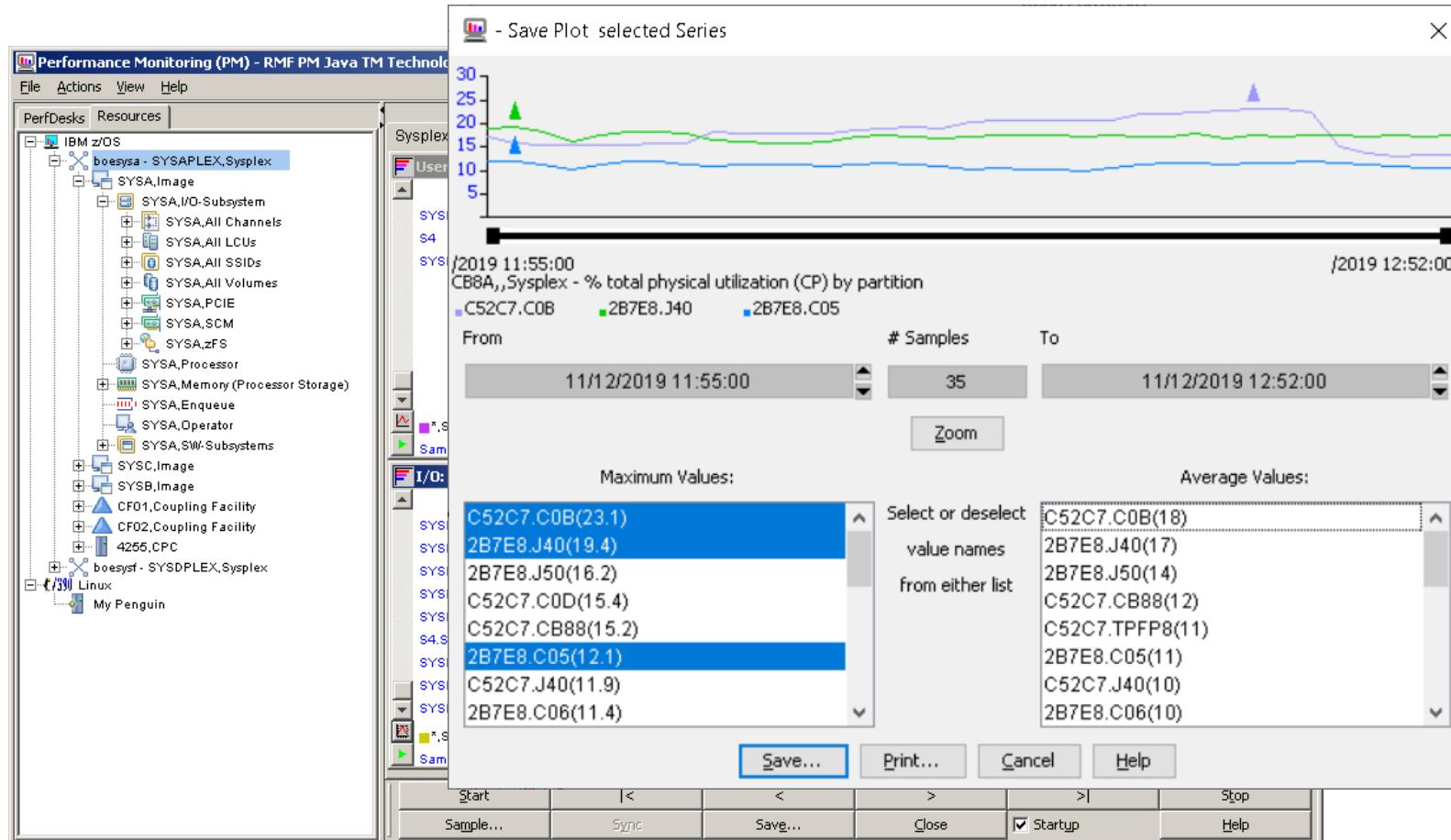
- Windows Workstation client for retrieving RMF Monitor III performance data
- RMF PM supports secure communication via HTTPS with the RMF DDS
- Available from the RMF FTP site or SYS1.SERBPWSV(GPMWINV2)



# RMF Performance Monitoring



- ▶ Use the “Save Plot” function for:
  - ▶ Quick graphical overview
  - ▶ Export the data into CSV file format



# RMF Performance Data API's

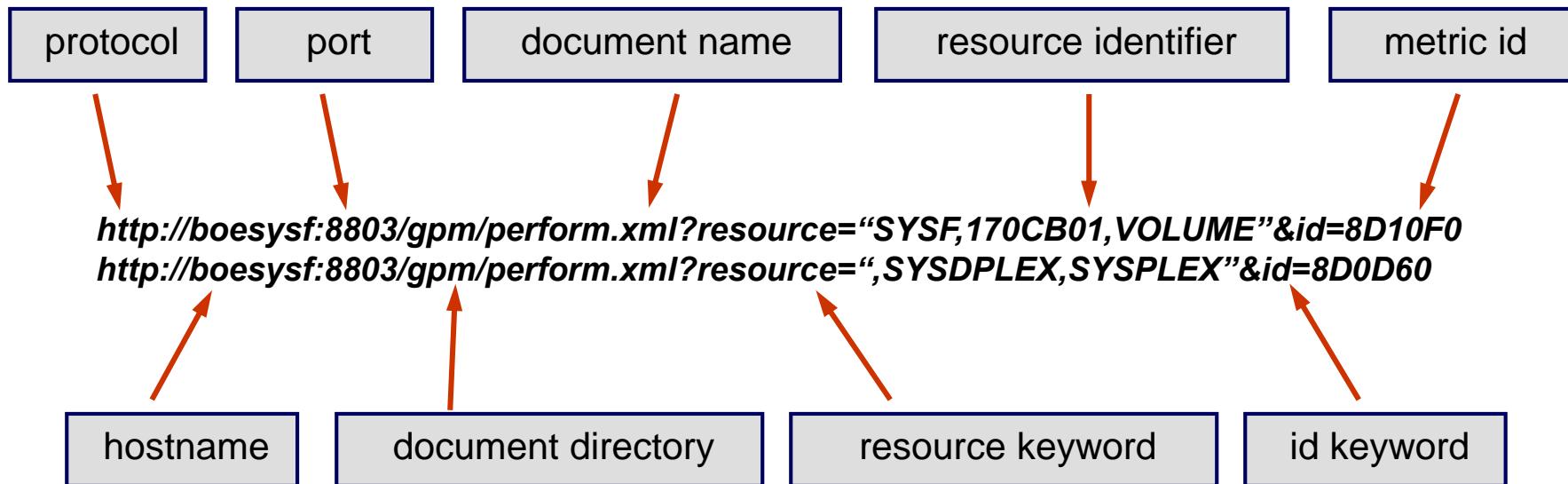


- ERBSMFI - Monitor II Data (SMF Type 79)
- RMF Sysplex Data Server (SDS)
  - ▶ SMF Data: ERBDSQRY, ERBDSREC
  - ▶ Monitor III Data: ERB3XDRS
  - ▶ Monitor II Data: ERB2XDGS
- RMF Distributed Data Server HTTP API

# 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

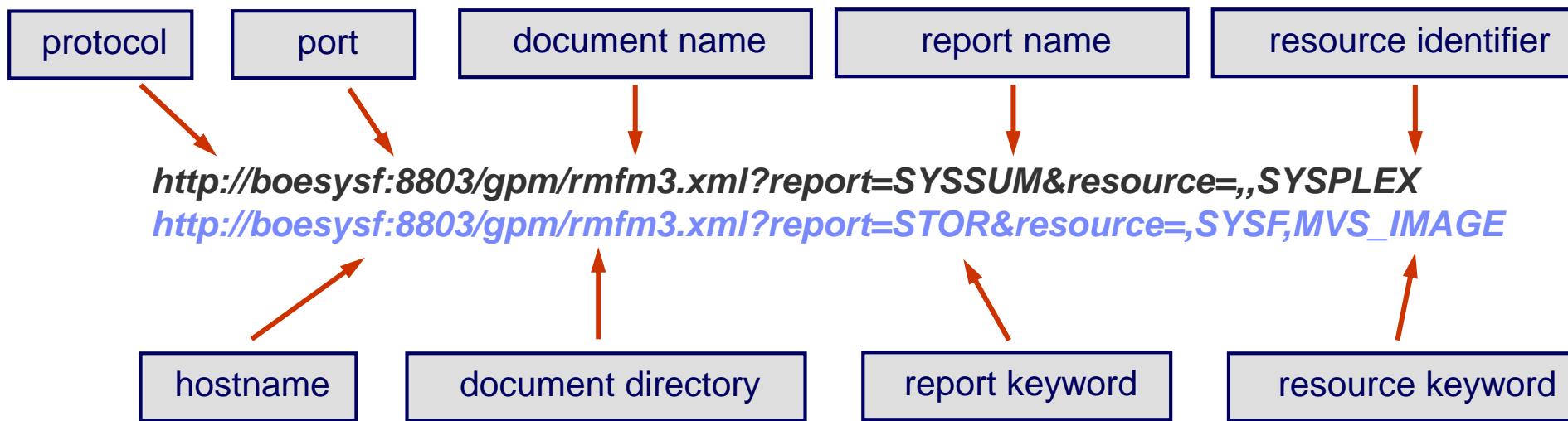


- |   |  |
|---|--|
| <ul style="list-style-type: none"> <li>▶ contained.xml</li> <li>▶ listmetrics.xml</li> <li>▶ details.xml</li> <li>▶ perform.xml</li> <li>▶ rfm3.xml</li> <li>▶ rmfpp.xml</li> </ul> | <p>returns the contained resources</p> <p>returns the list of associated metrics</p> <p>returns the properties of the resource</p> <p>returns the metric specified by the id parameter</p> <p>returns RMF Monitor III Reports</p> <p>returns RMF Postprocessor Reports</p> |
|---|--|

# 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**

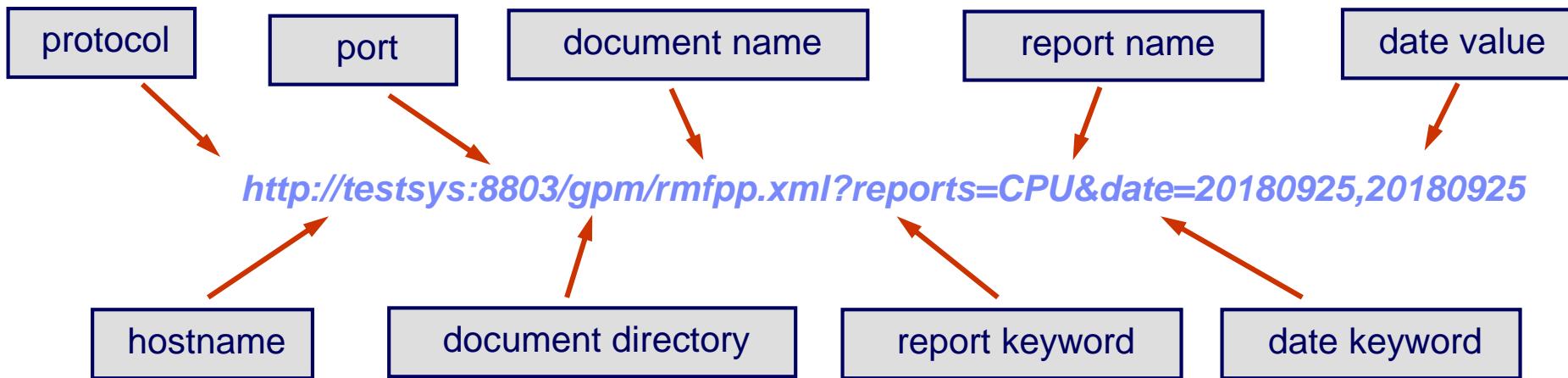


- Reports assigned to SYSPLEX resource:  
*CACHDET, CACHSUM, CFACT, CFOVER, CFSYS, SPACEG, SPACED, CRYOVW, SYSSUM, XCFGROUP, XCFOVW, XCFPATH, XCFSYS, ZFSFS, ZFSKN, ZFSOVW*
  - Reports assigned to MVS\_IMAGE resource:  
*CHANNEL, CPC, DELAY, DEV, DEVR, DSND, ENCLAVE, ENQ, HSM, JES, IOQ, LOCKSP, LOCKSU, OPD, PCIE, PROC, PROCU, EADM, 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
sortsmf	indication if sorting of SMF data is necessary
smfdata	<i>list of SMF input data</i>
joboutdel	<i>indication if job output is to be deleted after being processed successfully</i>

# 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



- Website <https://github.com/IBM/IBM-Z-zOS/tree/master/zOS-RMF> with product information, newsletters, presentations, ...
- Downloads from <ftp://public.dhe.ibm.com/eserver/zseries/zos/rmf/>
  - Spreadsheet Reporter
  - Postprocessor XML Toolkit
  - RMF Performance Monitor

## Documentation:

- z/OS RMF Data Gatherer Programmer's Guide, GC27-4935
  - z/OS RMF Data Gatherer User's Guide, SC27-4934
  - z/OS RMF Report Analysis, SC34-2665
  - z/OS RMF Reporter Programmer's Guide, GC27-4937
  - z/OS RMF Reporter User's Guide, SC27-4936
- 
- Latest version of PDF files can be downloaded from:  
<https://www-01.ibm.com/servers/resourcelink/svc00100.nsf/pages/zOSV2R4RmfPublications?OpenDocument>



# RMF Redbook



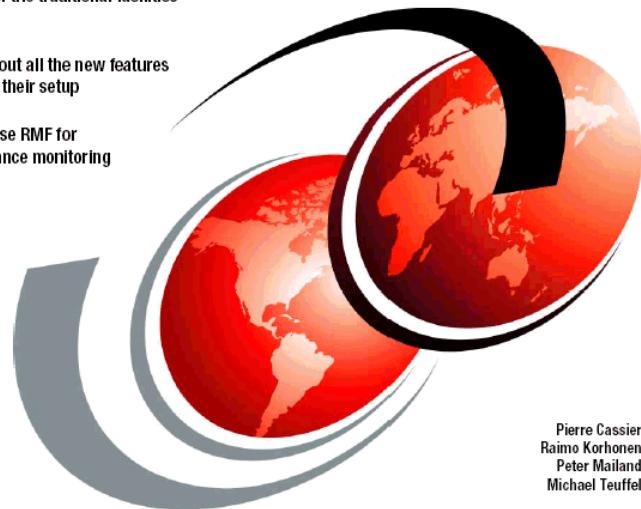
## Effective zSeries Performance Monitoring using Resource Measurement Facility (RMF)

IBM  
SG24-6645-00

Review of the traditional facilities

Learn about all the new features  
and how their setup

How to use RMF for  
performance monitoring



Pierre Cassier  
Raimo Korhonen  
Peter Mailand  
Michael Teuffel

# Redbooks

[ibm.com/redbooks](http://ibm.com/redbooks)

RMF Redbook: SG24-6645-00  
Effective zSeries Performance Monitoring Using  
Resource Measurement Facility

<http://www.redbooks.ibm.com/abstracts/sg246645.html>