



RMF Development Edition

z/OS Resource Measurement Facility

RMF Monitor III - Concepts and Features



Agenda

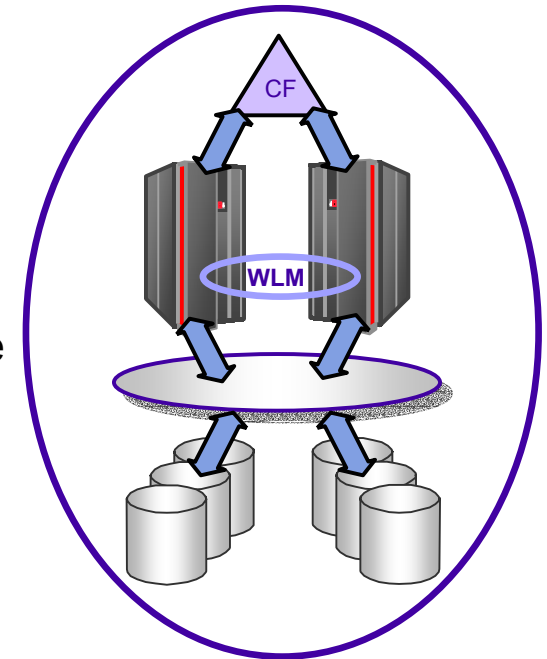


- Introduction
 - ▶ Terms and Concepts
 - ▶ Data Gatherer and Reporter
- Performance Monitoring
 - ▶ Workflow / Exception Monitoring
 - ▶ Using Monitor II and Monitor III Together
- Monitor III in a Sysplex
 - ▶ Goal Mode
 - ▶ Coupling Facility
- RMF PM Workstation Frontend
 - ▶ PerfDesks
 - ▶ Resources and Metrics
- Hints and Tips

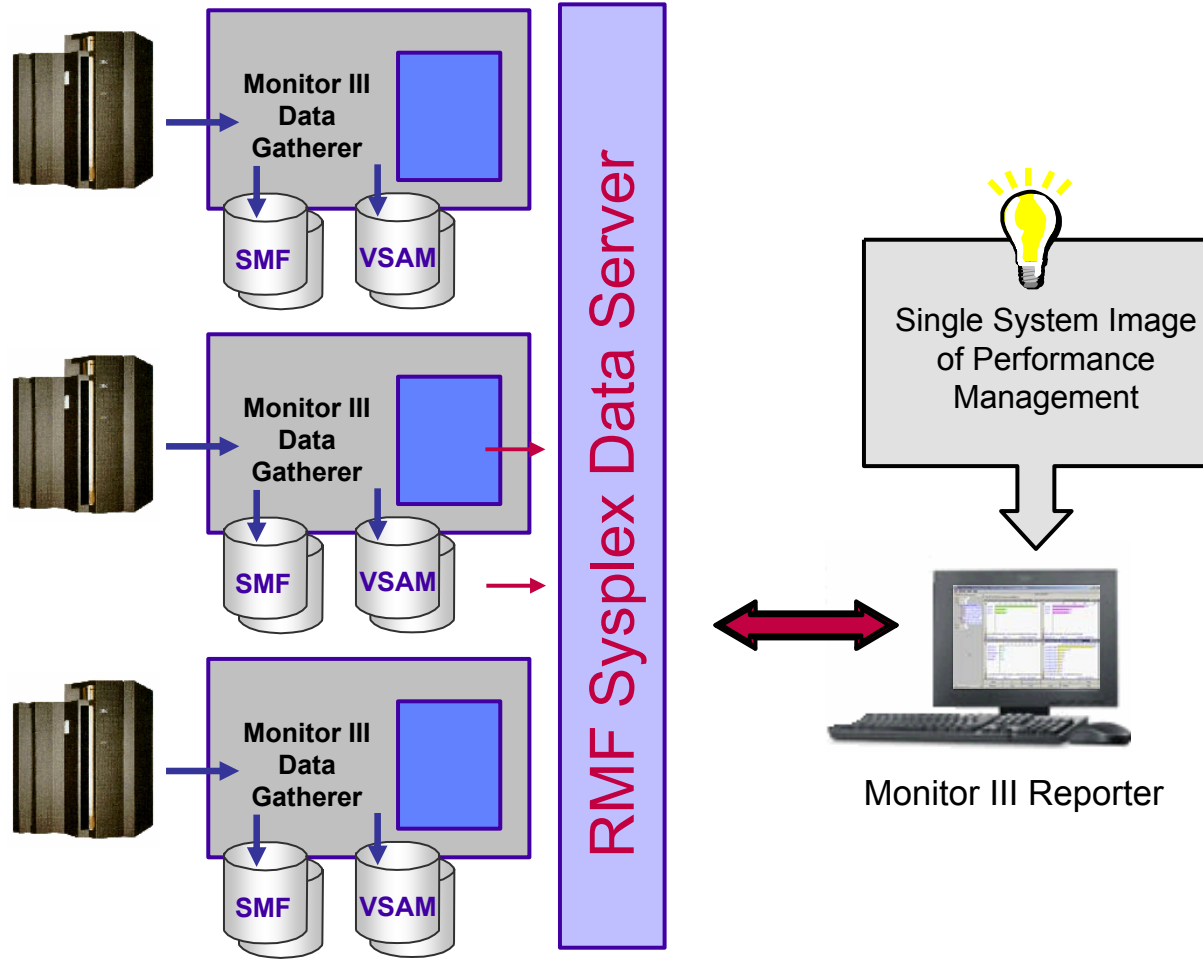
Monitor III Scope



- **monitor the System / Sysplex to**
 - ▶ ensure that all systems run without performance problems
 - ▶ identify exceptional system conditions
 - ▶ control the availability of your system resources
- **analyze performance problems by**
 - ▶ identifying jobs that are delayed and the reason for the delay
 - ▶ identifying the resources associated with the delays
 - ▶ identifying resources with exceptional utilization
- **supervise your goal attainment level**



Monitor III Topology



Controlling the Data Gatherer



Measurements

- IOSUB
- CFDETAIL
- CACHE
- VSAMRLS
- OPD
- HFSNAME

Timing

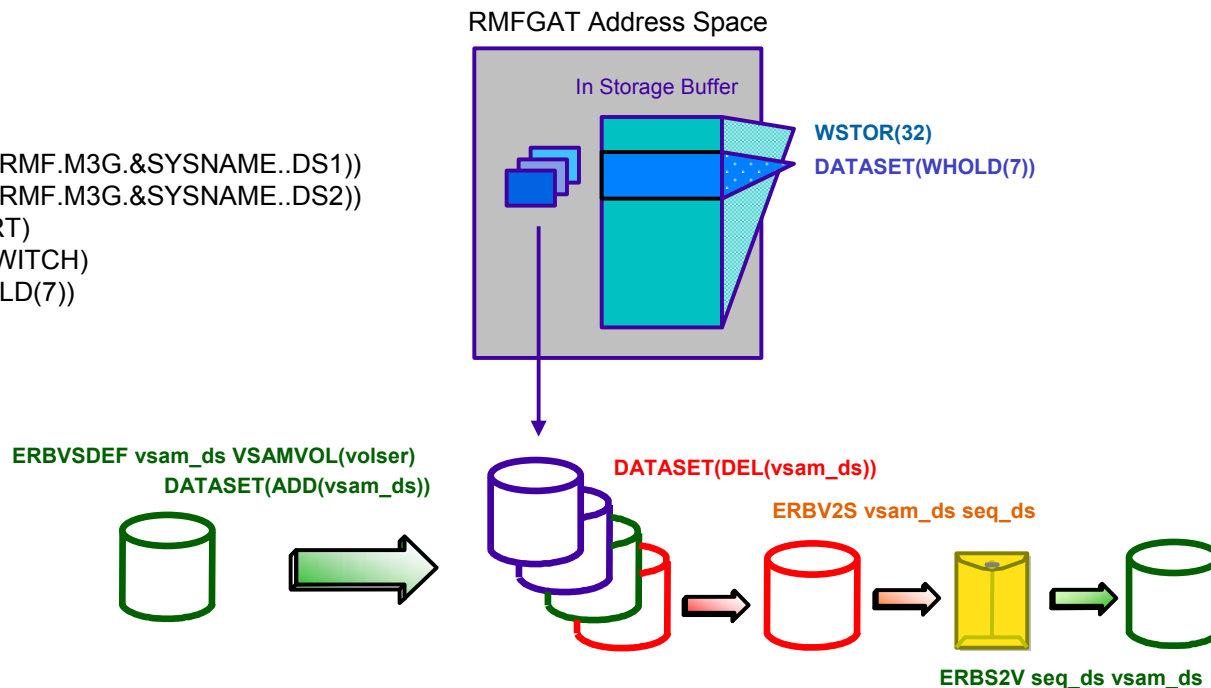
- CYCLE(1000)
- MINTIME(60)
- NOSTOP
- SYNC(00)

Recording

- DATASET(ADD(RMF.M3G.&SYSNAME..DS1))
- DATASET(ADD(RMF.M3G.&SYSNAME..DS2))
- DATASET(START)
- DATASET(NOSWITCH)
- DATASET(WHOLD(7))

Buffer

- WSTOR(32)



Data Gathering Methods

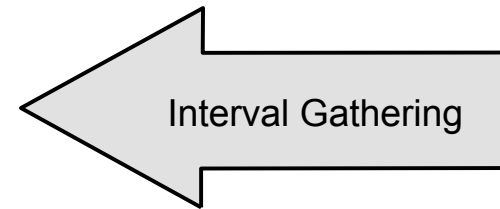


➔ exact measurement counts

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

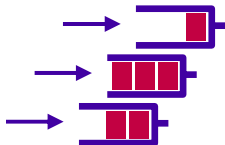


eg. CPU seconds, device connect time...

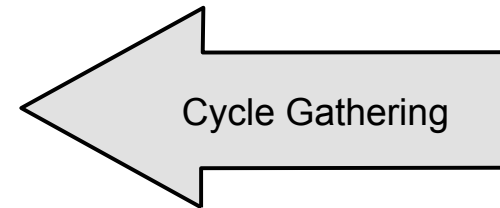


➔ sampling counts

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

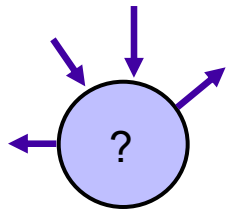
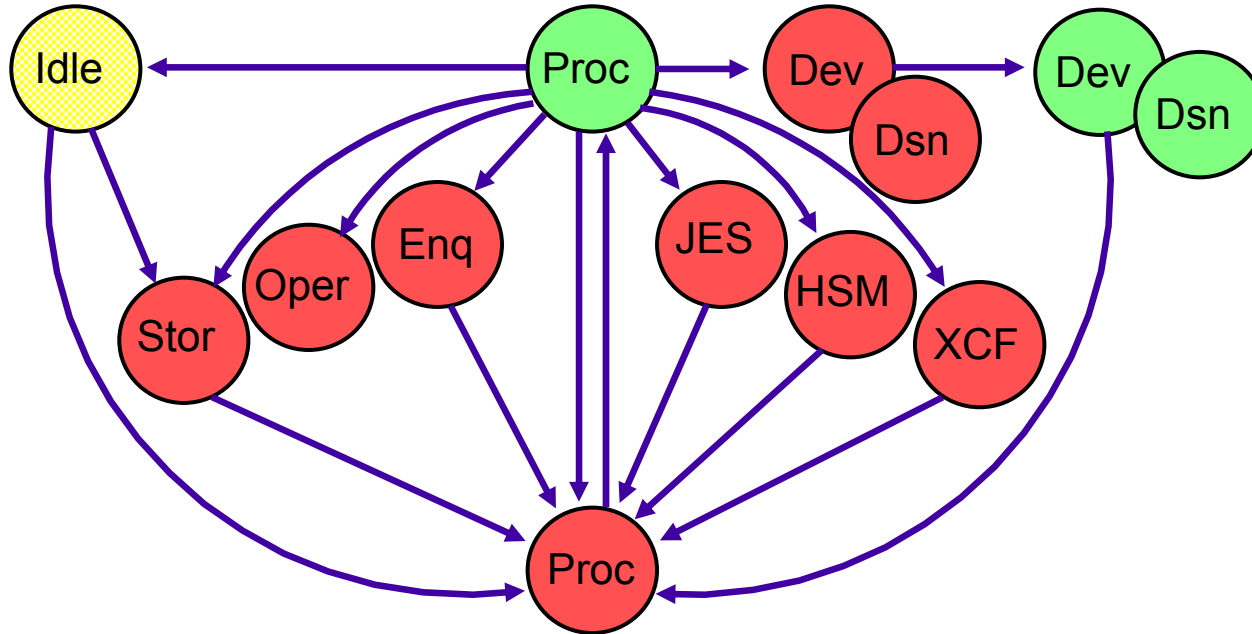


eg. queue counts, frame counts...





States of a Job



Unknown

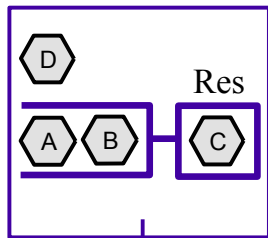
$$\text{Using(\%)} = \frac{\text{using samples}}{\text{number of samples}} \times 100$$

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

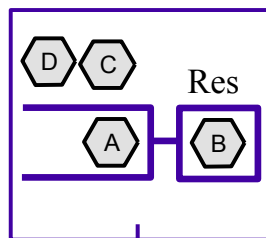
$$\text{Workflow (\%)} = \frac{\text{using samples}}{\text{using samples} + \text{delay samples}} \times 100$$



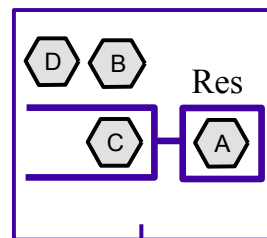
Example: Using and Delay



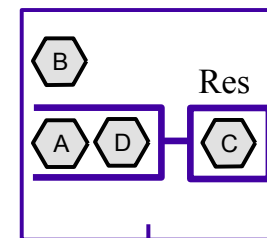
Job	I	U	D	Why
A			*	C
B			*	C
C		*		
D	*			



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

Job Delay Reporting



RMF V1R2 Delay Report Line 1 of 326

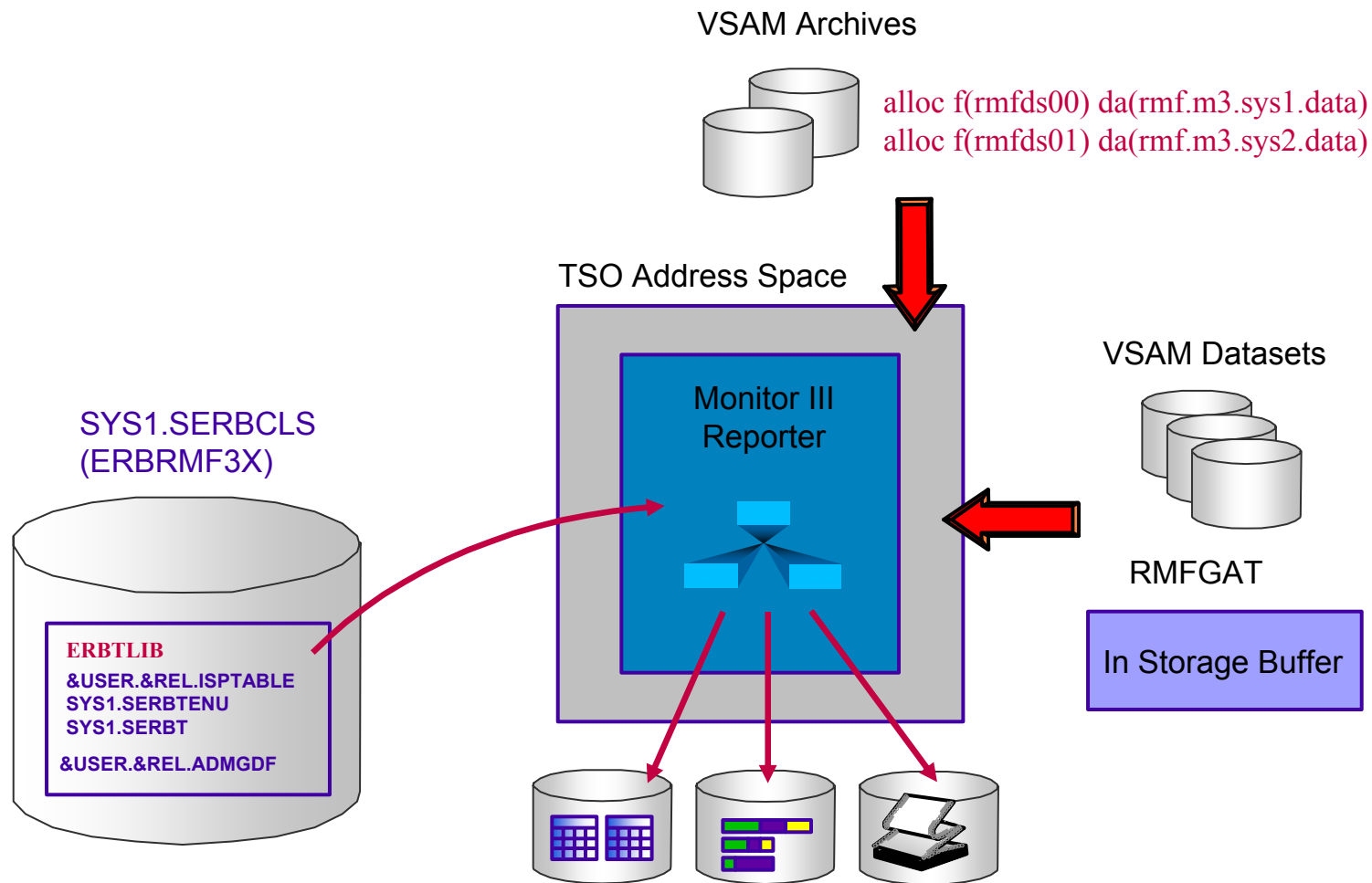
Samples: 100 System: AQTS Date: 07/18/02 Time: 06.28.20 Range: 100 S

Name	Service	WFL	USG	DLY	IDL	UKN	---- % Delayed for ----					Primary	
	CX Class	Cr	%	%	%	%	PRC	DEV	STR	SUB	OPR	ENQ	Reason
SUSANK	T TSOPRIME		0	0	100	0	0	0	0	100	0	0	HSM
CONSOLE	S SYSTEM		0	0	15	0	85	0	0	0	15	0	Message
RRSSERVQ	B WLMSHORT		0	0	1	0	1	0	0	1	0	0	JES
BHBE	T TSOPRIME		40	4	6	90	0	6	0	0	0	0	JHUGO
MORABIT	T TSOPRIME		41	37	56	0	7	0	56	0	0	0	COMPK5
RONDA2A	B COMBUILD		42	29	42	0	29	1	41	0	0	0	COMPK5
D24JAP1	T TSOPRIME		49	22	23	56	0	0	23	0	0	0	PRIPK5
RRSSERVQ	B WLMSHORT		50	2	2	0	0	0	2	0	0	0	SPOL1J
GRSARTSQ	B WLMSHORT		50	1	1	0	0	0	0	0	1	0	JES
RRSSERVQ	B WLMSHORT		50	1	1	0	0	0	0	0	1	0	JES
CATALOG	S SYSTEM		63	57	39	0	12	0	39	0	0	0	MCATTS
ANFWPROC	SO SYSSTC		67	2	1	0	2	0	1	0	0	0	SPOL1J
GRSARTSQ	B WLMSHORT		71	5	2	0	0	0	1	0	1	0	SPOL1J
SMFDRS	S STCMED		71	5	2	0	93	0	0	0	0	2	SYSZVDS
JES2	S SYSSTC		73	16	6	0	79	0	6	0	0	0	SPOL1J
GRSARTSQ	B WLMSHORT		80	4	1	0	0	0	0	0	1	0	JES
ARTXESQ	B WLMSHORT		80	4	1	0	0	0	1	0	0	0	SPOL1L
DFRMM	S SYSSTC		83	81	18	0	1	0	18	0	0	0	SL3061

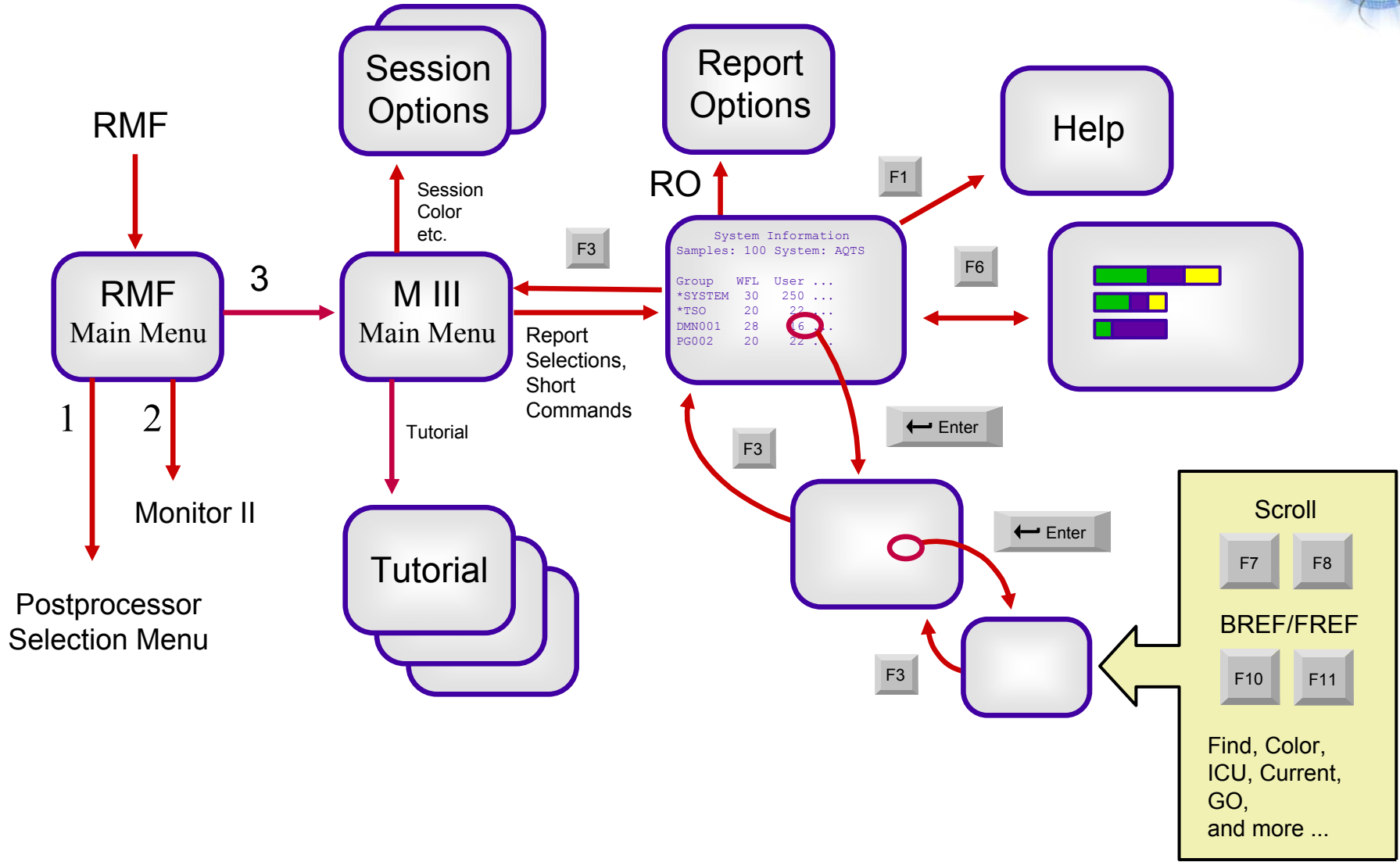
Address Space Performance at a Glance !

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

Session Setup

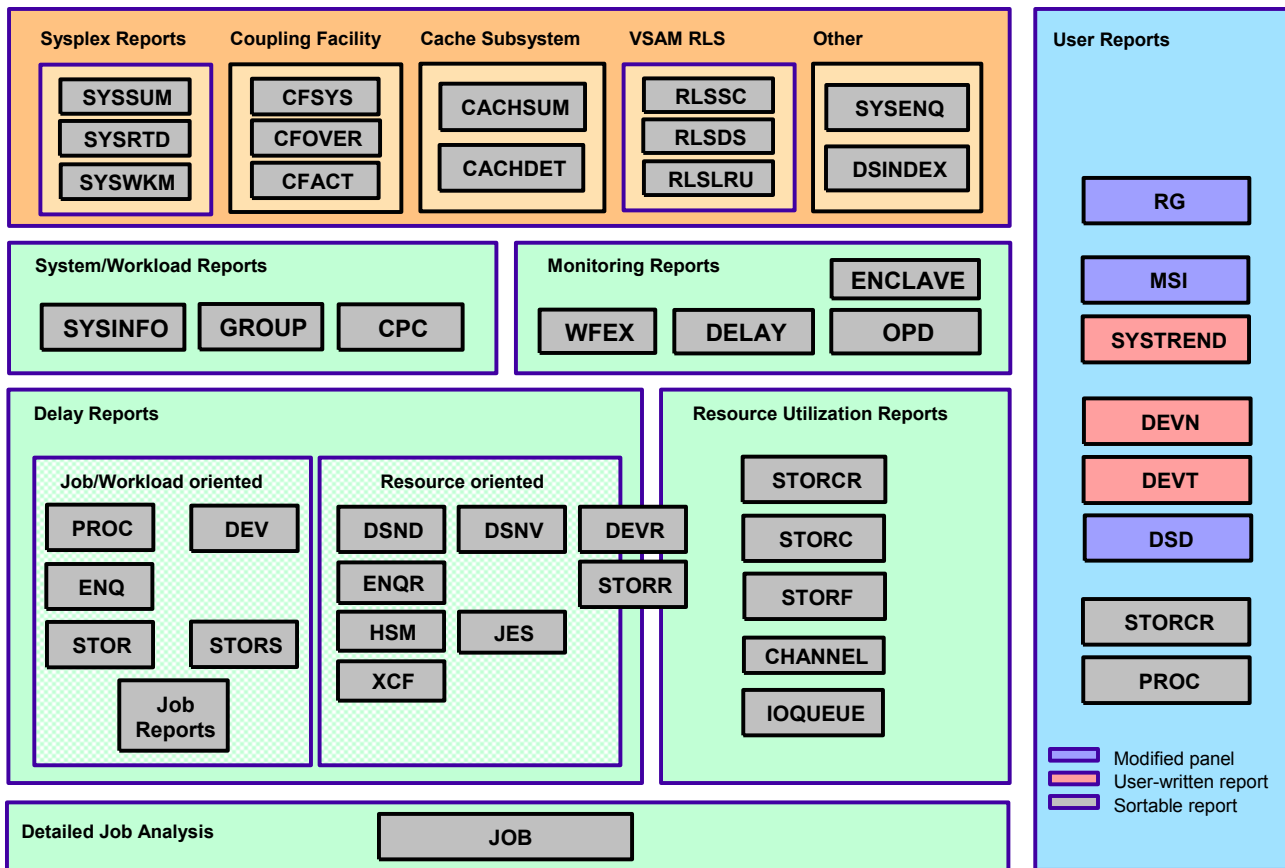


Reporter Usage





Report Overview

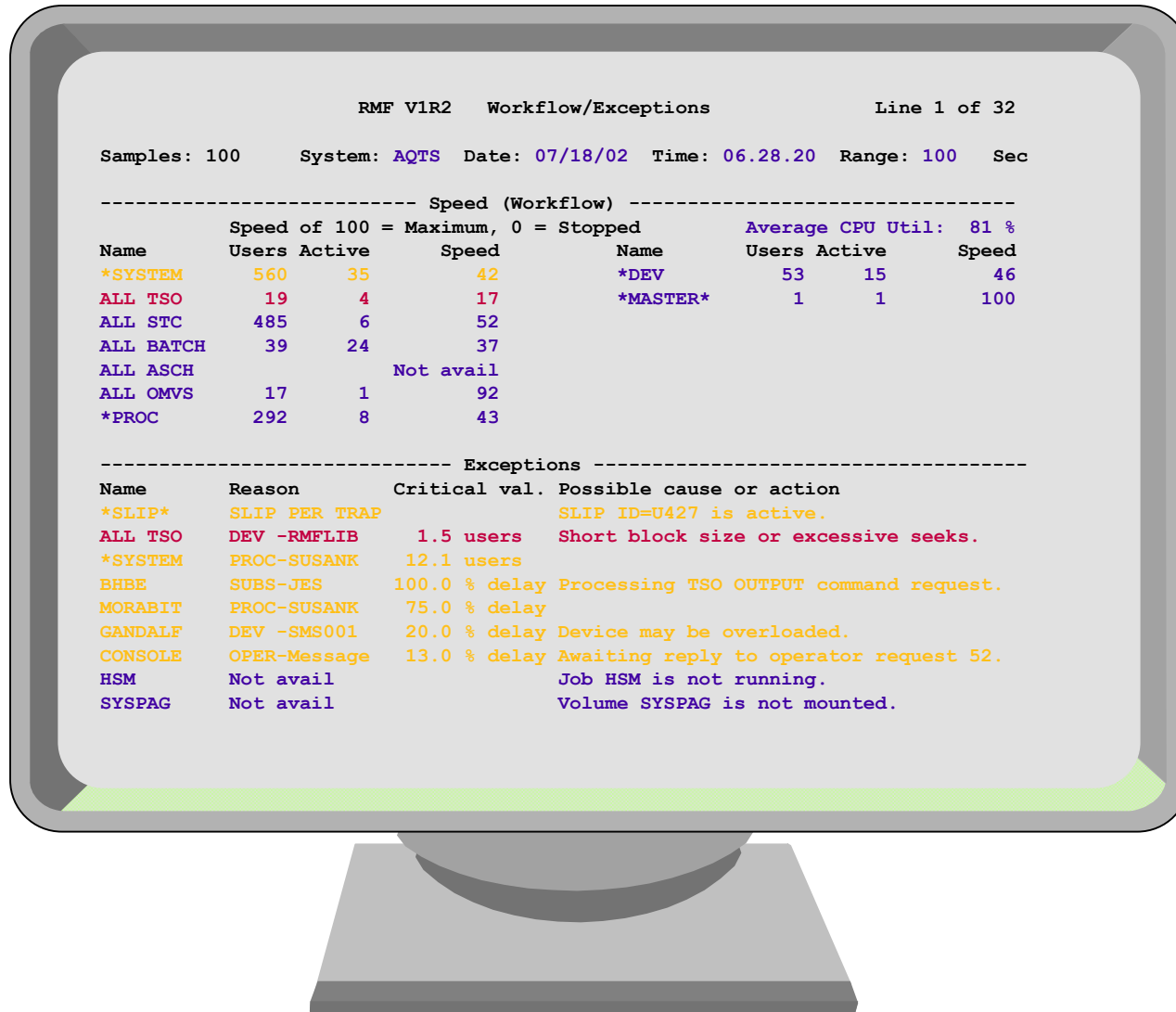


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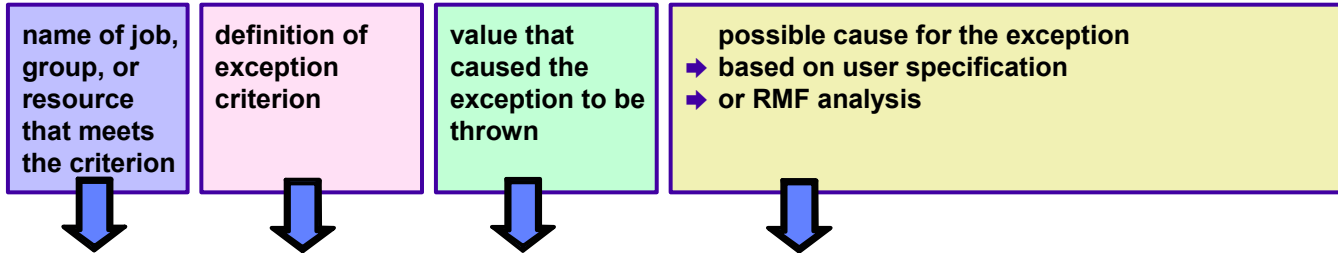
Workflow / Exceptions



- Workflow and Exceptions Overview
- Intended for continuous Monitoring
- Predefined Set of Exception Criteria

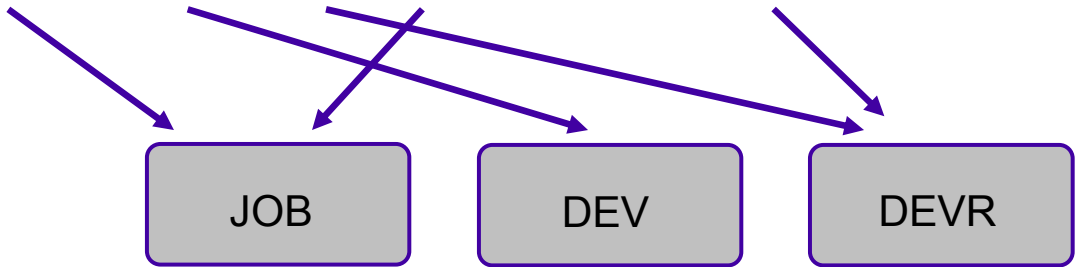


Usage of Exception Data



----- Exceptions -----

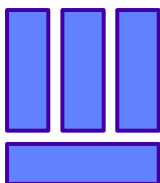
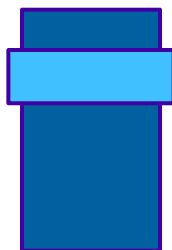
Name	Reason	Critical val.	Possible cause or action
SLIP	SLIP PER TRAP		SLIP ID=U427 is active.
ALL TSO	DEV -RMFLIB	1.5 users	Short block size or excessive seeks.
*SYSTEM	PROC-SUSANK	12.1 users	
BHBE	SUBS-JES	100.0 % delay	Processing TSO OUTPUT command request.
MORABIT	PROC-SUSANK	75.0 % delay	
GANDALF	DEV -SMS001	20.0 % delay	Device may be overloaded.



Exception Criteria (Examples)



COMM%
CSA%
ESQO%
HIPR%
JCSA%
JECS%
JESQ%
SCSA%
SECS%
SESQ%
SQA%
SQAQO%
TSQAQO
VIO%
XMEM%



HSM%
JES%
SUBS%
XCF%

CPU%
CPUS%
PROC%
RATE
USGP%



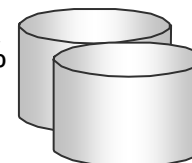
AAU
AAUS
ADU
AAU
AVAIL



ASTO% ONLF%
ISTO% ONLXF%
LOCL% STOR%
LPA% SWAP%
OUTR%

DLY%
USG%
WFL%

DEV%
USGD%



ENQ%



MNT%
MSG%
OPER%



Criteria set 1				Criteria set 2			
Name	<>	Yel	Red	Name	<>	Yel	Red
WFL%	<	20		WFL%	<		12
ADU	>	2		or ADU	>		2
_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____

Exception Specification



WFEX Options (RO)



Class	====>	JOB
Qualifier	====>	RMFGAT
Indicator	====>	EX-ANY
Label	====>	
Alert	====>	
Text	====>	

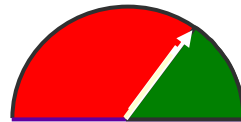
■ Object

- Class
- Qualifier

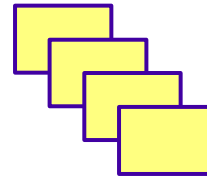
e.g. specify: Class JOB, Qualifier RMFGAT

■ Exception Indication

- Indicator Type



WF



EX-ANY



EX-AVG



EX-GROUP

not found

EX-UNAVAIL

■ Object Name (optional)

- Label

e.g. MONITOR3

■ Alert (optional)

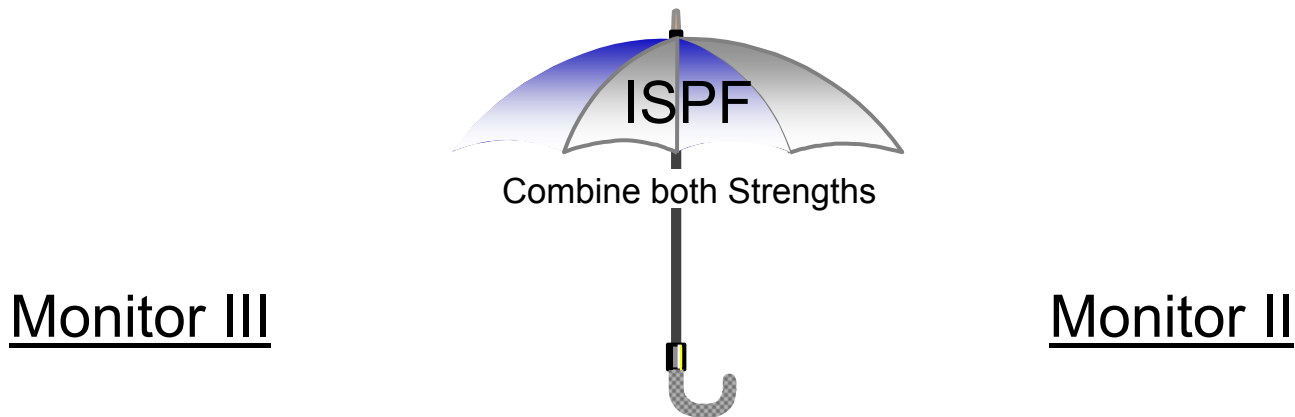
- Alert Type

e.g. Blink or Beep

■ Reason

- Text

Monitor III and Monitor II



■ Delay Reporting

- ▶ identify the major system delays
- ▶ identify the impacted jobs

■ Workflow Reporting

- ▶ continuously supervise selected workflows

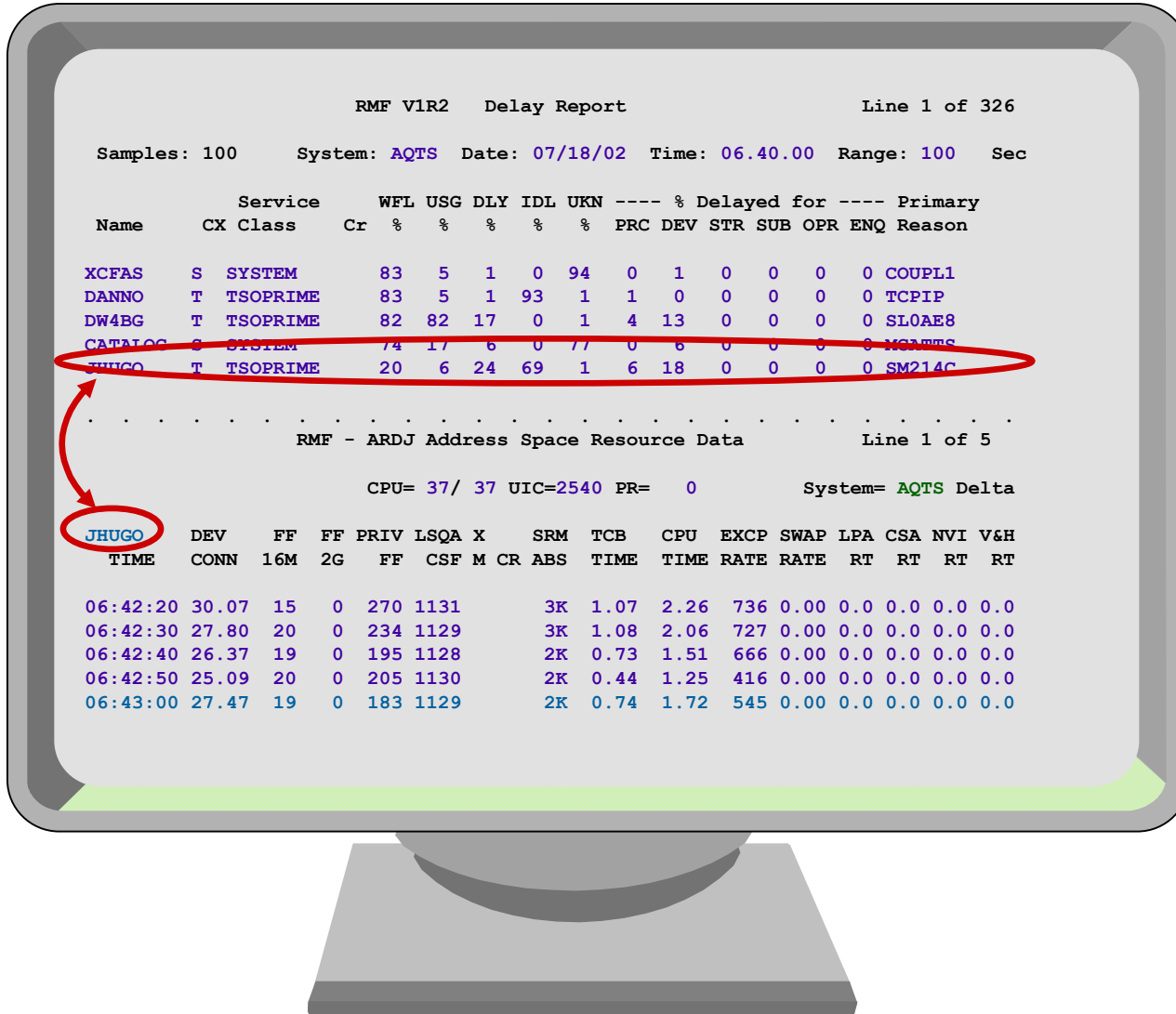
■ Exception Reporting

- ▶ identify critical situations

■ Snapshot Reporting

- ▶ monitor resource consumption
- ▶ identify system bottlenecks
- ▶ track down system problems
- ▶ trace jobs which use the system intensively

Monitor III and Monitor II



Job JHUGO's delay situation during the last Monitor III interval

- ➔ Starttime: 06.40.00
- ➔ Duration: 100s
- ➔ Endtime: 06.41.40



Job JHUGO's actual resource consumption tracked by Monitor II

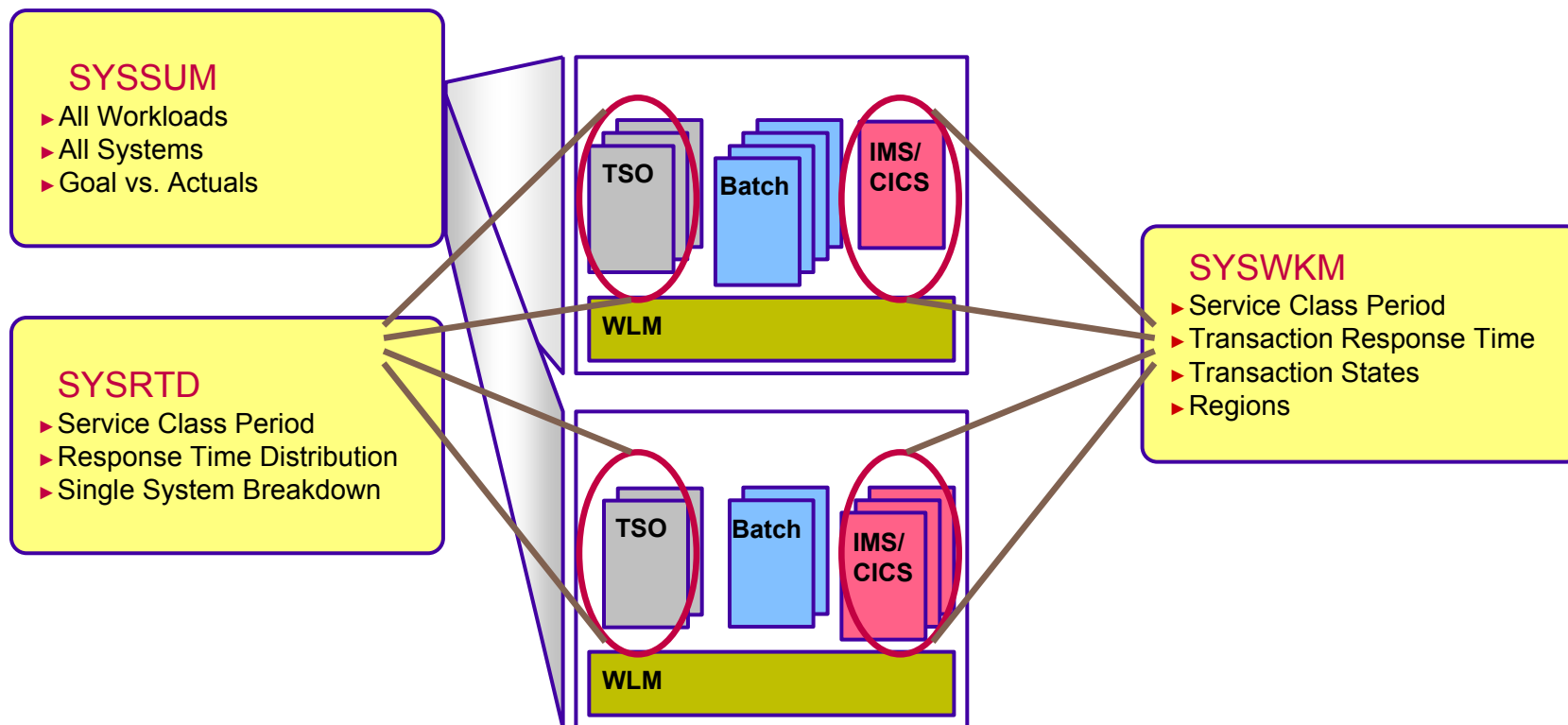
- ➔ 10s intervals
- ➔ Delta mode

Agenda

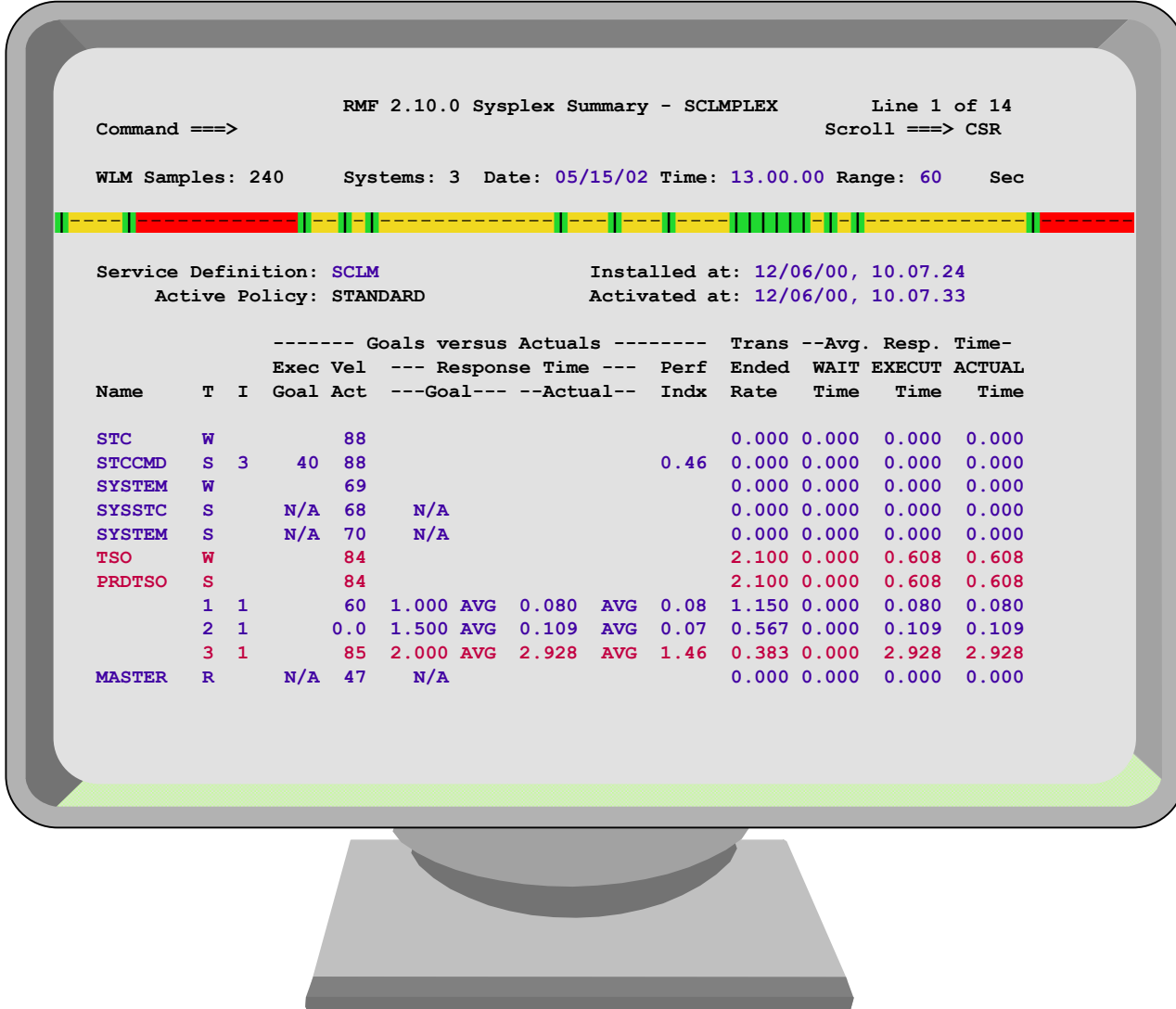


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Sysplex: Goal Mode Reporting



Sysplex Summary Report



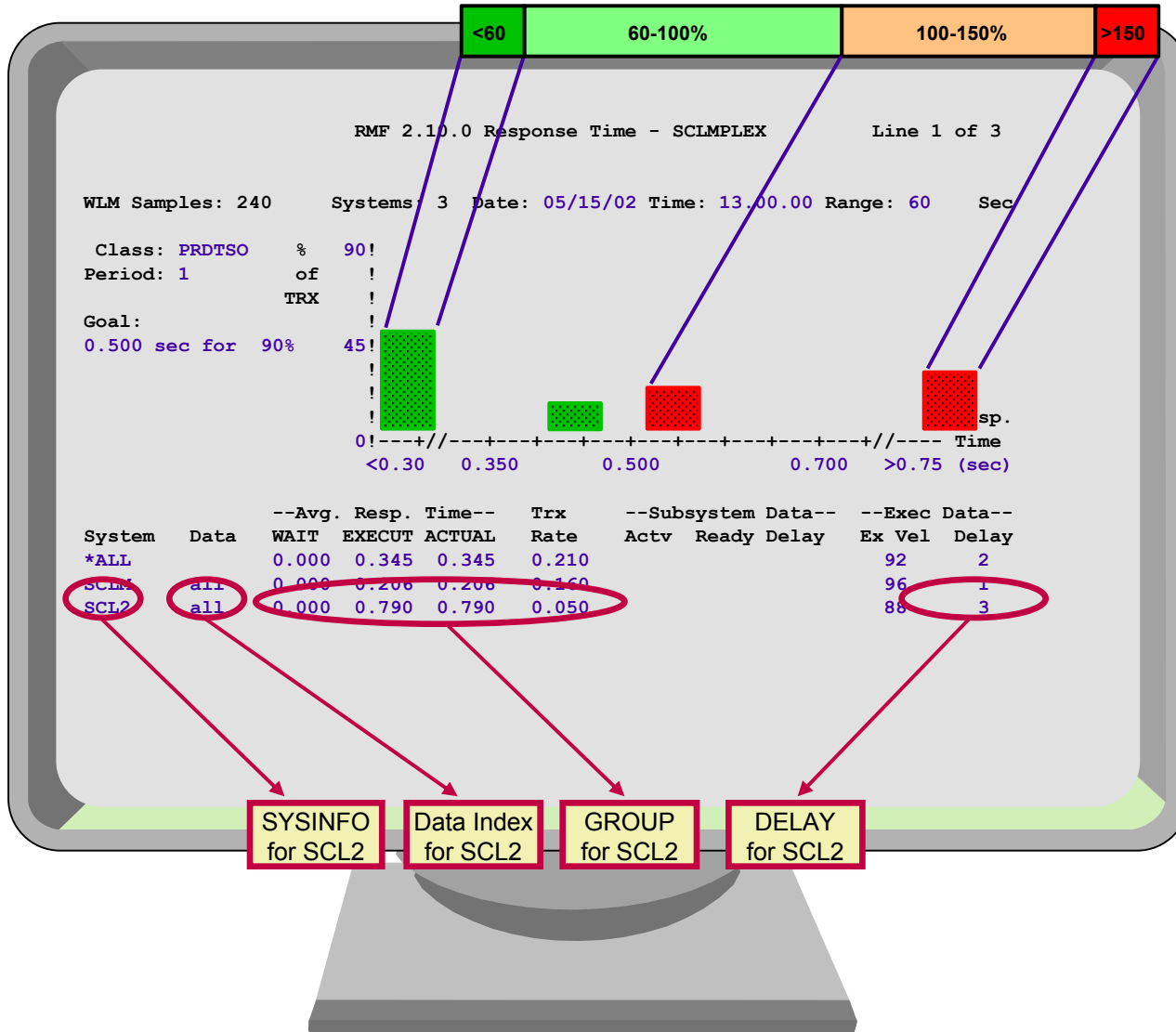
Sysplex Performance at a Glance !

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

Importance = 1

Importance > 1

Response Time Distribution Report



- use system breakdown to
- ▶ identify the system which hurts overall performance most
 - ▶ as a starting point for detailed system performance analysis

Work Manager Delay Report



```

RMF 2.10.0 Work Manager Delays - SCLMPLEX           Line 1 of 3
Command ==>                                         Scroll ==> CSR

WLM Samples: 240   Systems: 3   Date: 05/15/02   Time: 13.00.00   Range: 60   Sec

Class: CICSHIGH   Period: 1           Avg. Resp. time: 0.330 sec for 2418 TRX.
Goal: 0.400 sec for 80%               Avg. Exec. time: 0.214 sec for 1822 TRX.
Actual: 0.400 sec for 86%              Abnormally ended: 0 TRX.

Sub P -----Response time breakdown (in %)----- -Switched--
Type  Tot  Act  Rdy  Idle -----Delayed by----- Time (%)
                I/O  LOCK  MISC  PROD  CONV                LOC  SYS  REM

CICS B   84   9   0   0  65   5   5   0   0                0   0   0
CICS X   43   4   8   0  18   4   4   3   2                0   0   0

----- Address Spaces Serving this Service Class CICSHIGH -----
Jobname  M ASID System  Serv-Class Service Proc-Usq I/O-Usq  Veloc  Capp  Quies

CICST1   95  SCLM  CICSTOR   100    6.4    2.3    12    0    0
CICST2   84  SCLM  CICSTOR   100    3.7    0      54    0    0
CICSA1   53  SCLM  CICSAOR   100   12.5    0      33    0    0

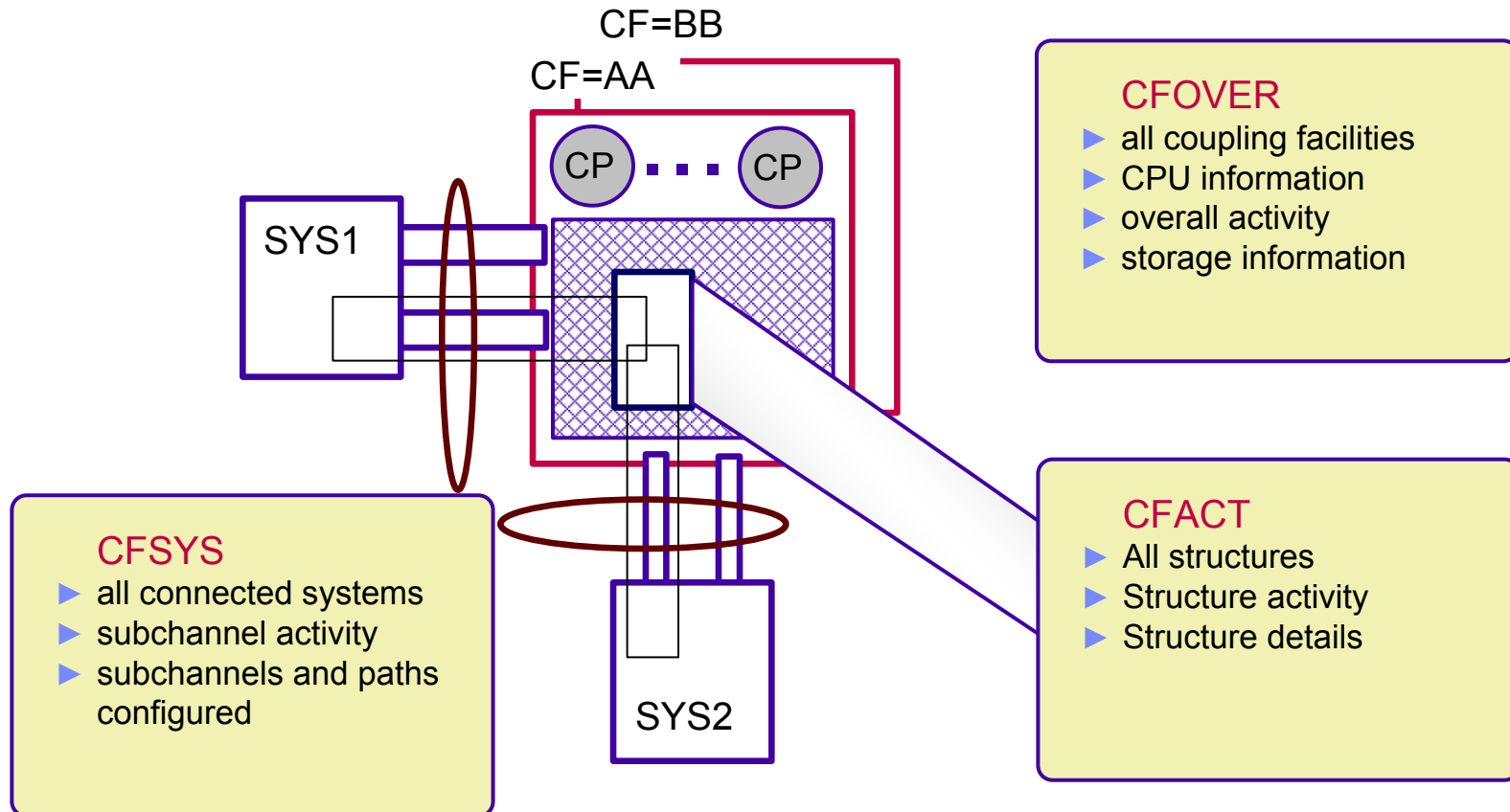
```



provides information about transactions serviced by a 'transaction' service class associated with the CICS or IMS subsystems

1. **response time breakdown by**
 - ▶ subsystem phase
 - ▶ transaction state
2. **address spaces serving this service class**
 - ▶ system identification
 - ▶ basic server health indication

Coupling Facility Online



CF Structure Activity Report



```

RMF 2.10.0 CF Activity      - SCLMPLEX      Line 1 of 70
Command ==>                Scroll ==> CSR

Samples: 60      Systems: 4      Date: 05/15/02      Time: 13.00.00      Range: 60      Sec

CF: ALL
Type ST System      --- Sync ---      ----- Async -----
                Rate  Avg      Rate  Avg  Chng  Del
Structure Name                Serv      %      %

IXCPLEX_PATH3  LIST      *ALL      0.0   0      5.5  615  0.0  0.0
                SCLM      0.0   0      3.1  560  0.0  0.0
                SCL2      0.0   0      0.8  575  0.0  0.0
  
```

```

IXCPLEX_PATH4  LIST

JES2CKPT1     LIST
  
```

RMF Coupling Facility - Structure Details

```

List Structure      : JES2CKPT1
Coupling Facility   : CF01
System              : SCLM

Structure Size      : 6144K  Connection Name : JES2_SCLM
List entries        Total : 1365  Jobname         : JES2
                   Current : 632   Status          : ACTIVE
Data Elements       Total : 1346  ASID            : 39
                   Current : 632   CF Level        : 0
Lock Entries        Total : 2
                   Current : 0
Contention          (%)   : 0.0
  
```

```

Press Enter to return to the Report panel.
If data is missing, see Help panel.
  
```

■ provides list of structures by structure type

- ▶ Cache structures
- ▶ List structures
- ▶ Lock structures

■ structure usage by system and overall

- ▶ Synchronous requests
- ▶ Asynchronous requests
- ▶ Service times
- ▶ Delay percentage

■ structure-specific details

- ▶ Lock contention or
- ▶ Cache statistics

■ structure size (maximum and current)

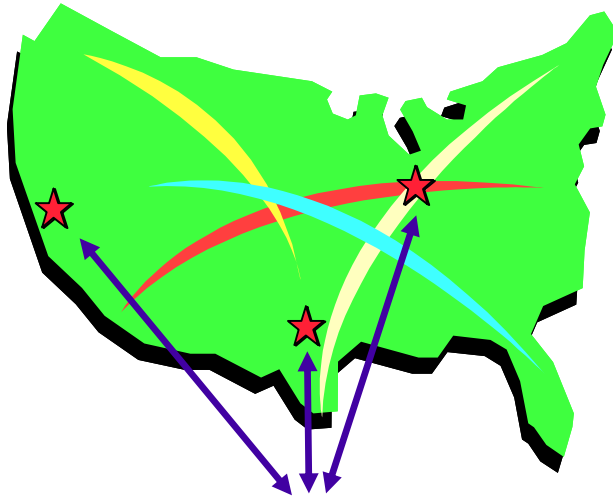
■ connected address space at end of Mintime

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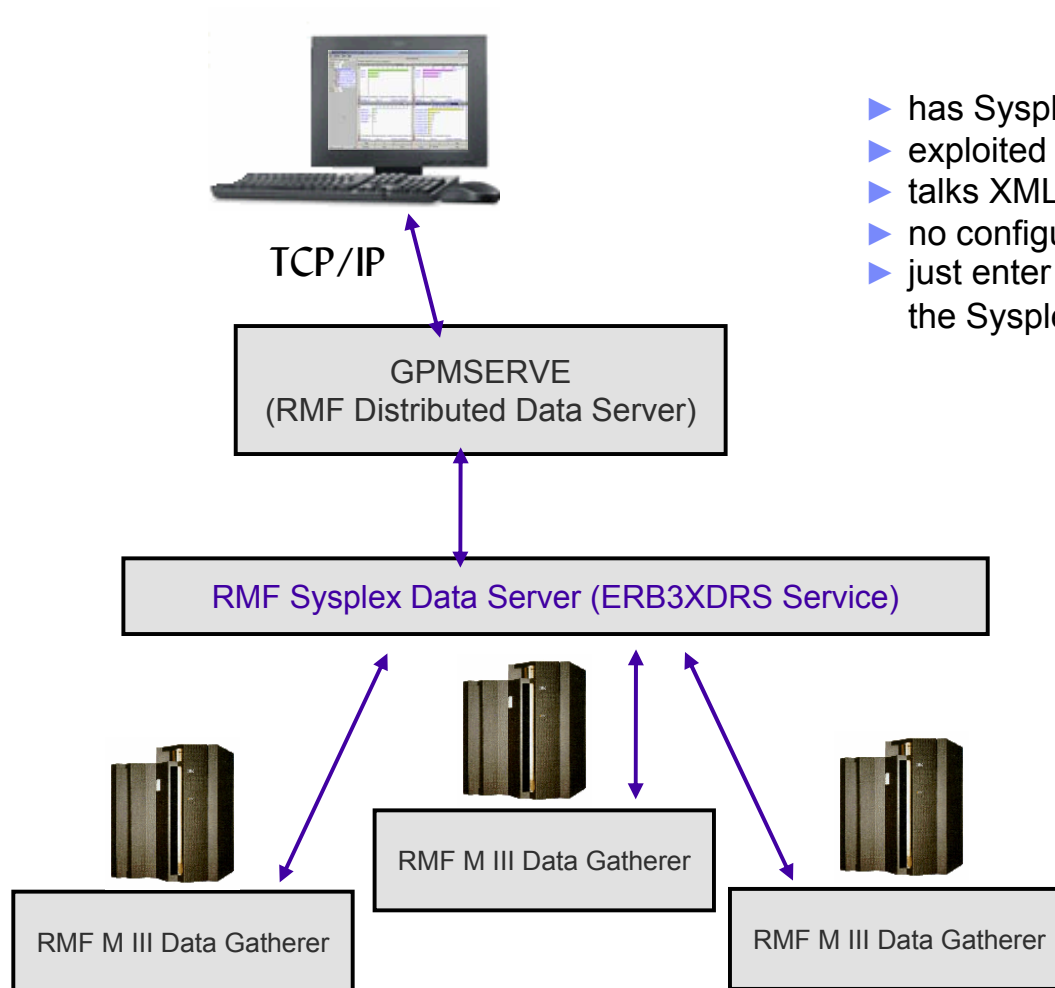
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RMF Performance Monitoring



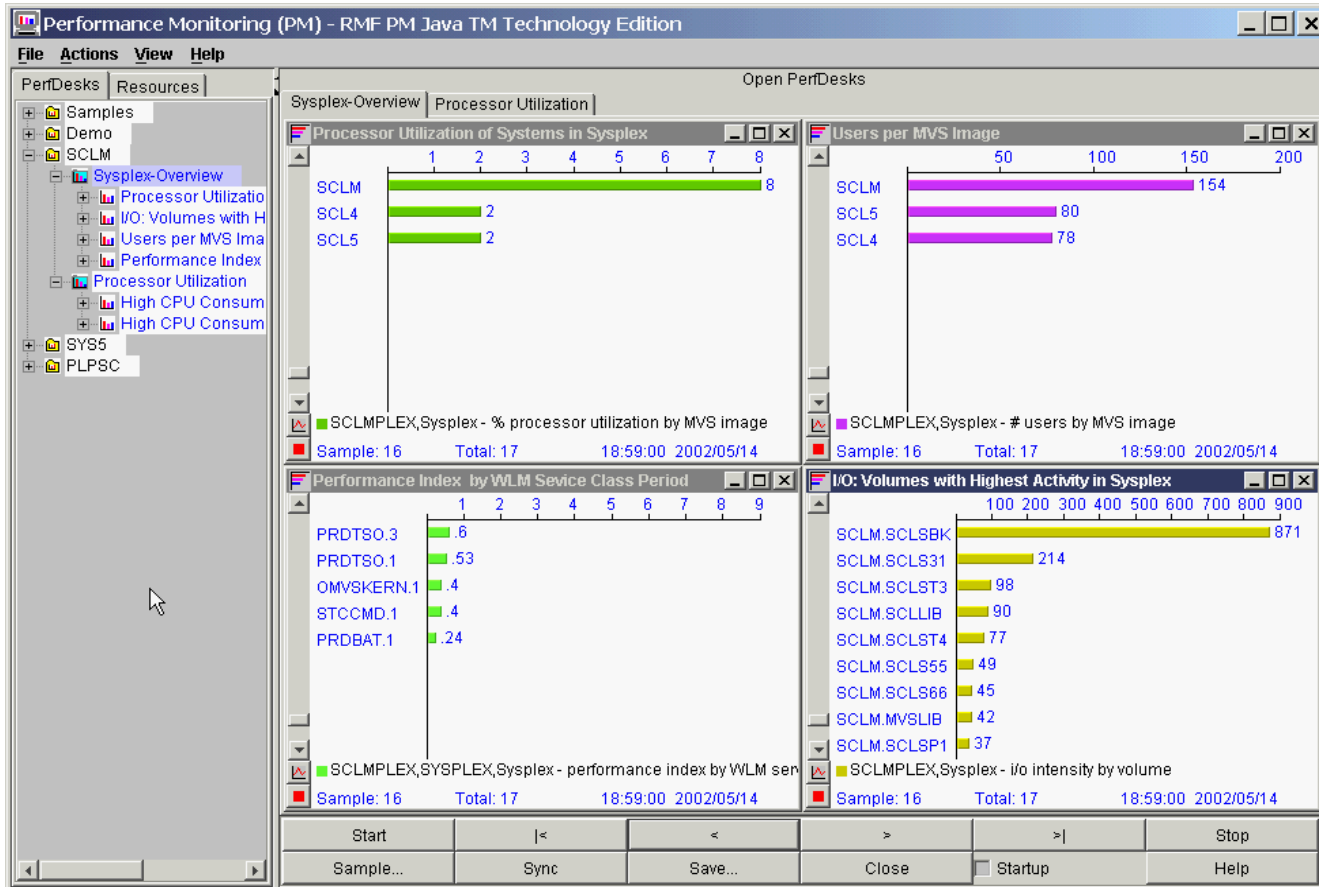
- ▶ Enterprise-wide performance monitoring of z/OS hosts
- ▶ Platform independent Java Edition
- ▶ Linux gathering support
- ▶ Graphical user interface
- ▶ Flexible definition of data
- ▶ Persistent definition of views
- ▶ Powerful data reduction
- ▶ Analysis support

RMF Distributed Data Server

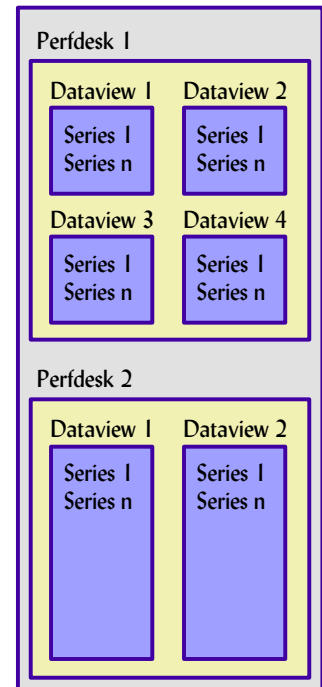


- ▶ has Sysplex-wide scope
- ▶ exploited by RMF PM, RMF LDAP Backend
- ▶ talks XML over HTTP
- ▶ no configuration needed!
- ▶ just enter `S GPMSEVERE` on one image in the Sysplex

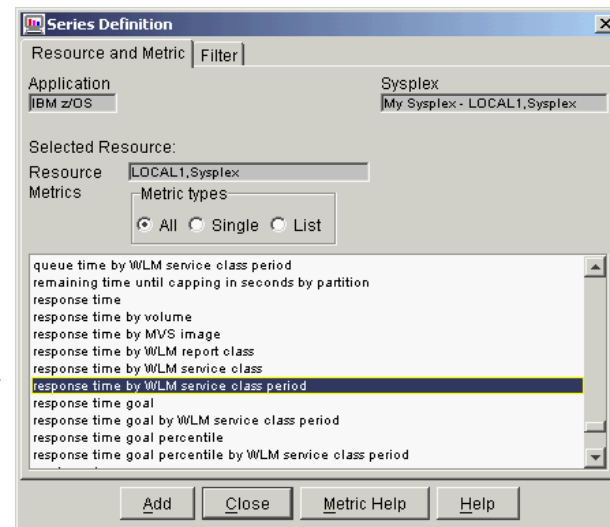
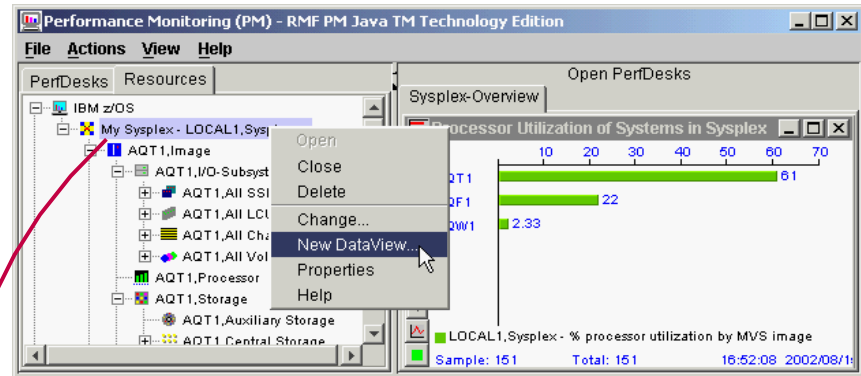
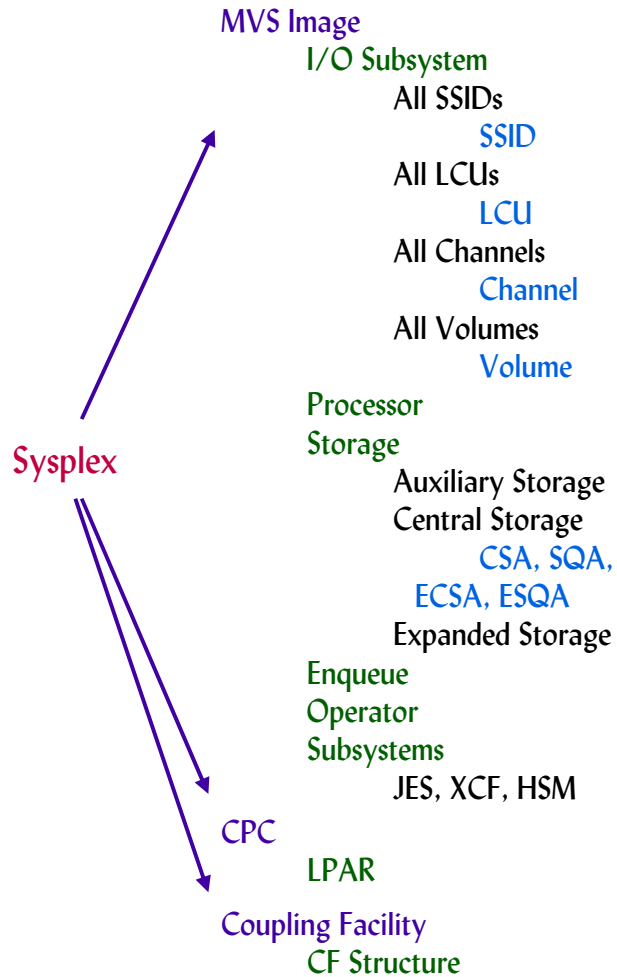
RMF PM: PerfDesk Concept



Perfdesk Folder



RMF PM: Resources and Metrics



RMF PM: Intelligent Analysis



- ▶ data views with click-sensitive bars
- ▶ brings up predefined Analysis PerfDesks

The screenshot displays the RMF PM Java TM Technology Edition Performance Monitoring (PM) interface. The main window is titled "Performance Monitoring (PM) - RMF PM Java TM Technology Edition" and features a menu bar with "File", "Actions", "View", and "Help".

The interface is divided into several panes:

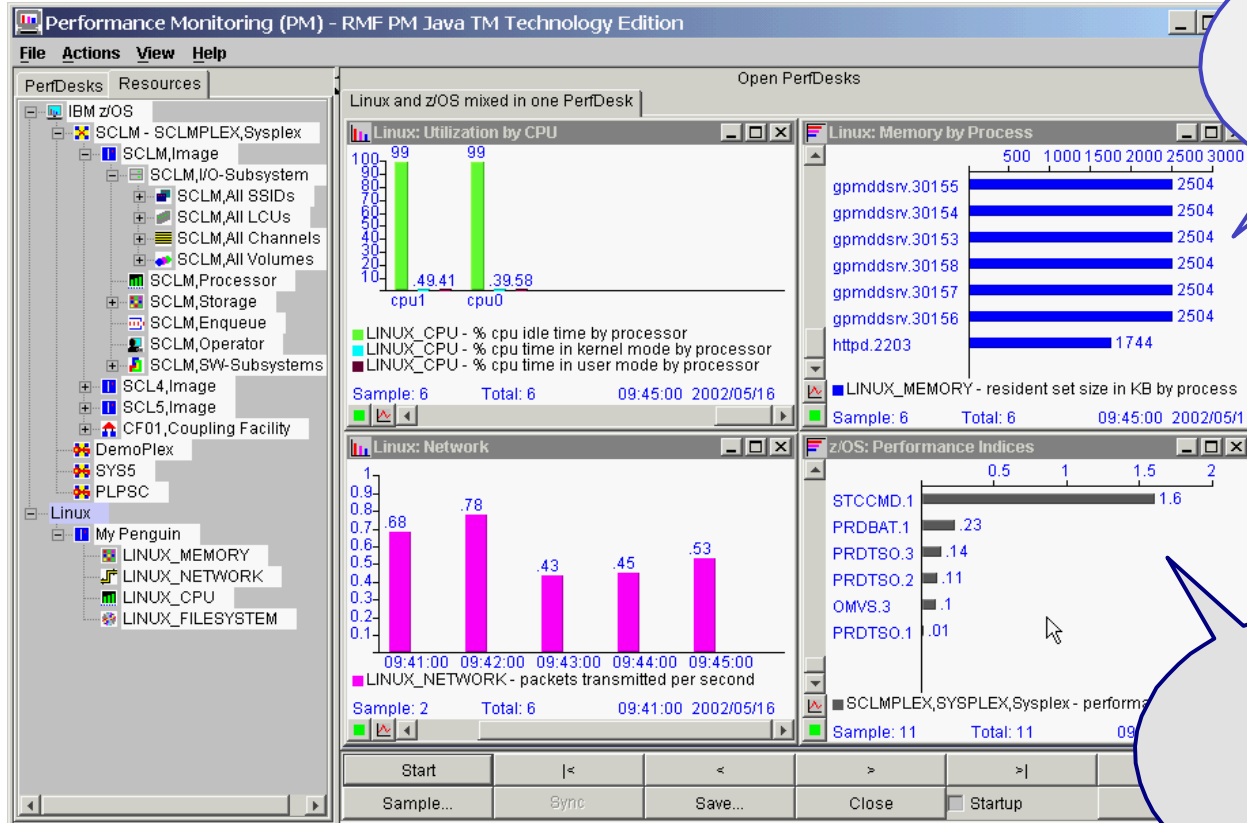
- Left Pane:** A tree view showing the resource hierarchy under "IBM z/OS", including "SCLM - SCLMPLEX, Sysplex", "DemoPlex", "SYS5", "PLPSC - MCLXCF01, Sysplex", and "Linux".
- Central Pane:** Displays multiple performance charts. The top chart, "Performance Index of Most Important Workload", shows a bar chart with values ranging from 0.45 to 2.4. A context menu is open over the bar for "OMVSTASK.1" (value 2.4), with options: "Analysis...", "Find highest", "Find lowest", "Series Settings...", "Remove Series...", and "Color chooser...". Below this is a "Users per MVS Image" chart showing values of 687 for AQFT and 564 for AQTS. The bottom chart shows "Processor Utilization" for AQFT and AQTS.
- Right Pane:** A list of analysis types for "MCLXCF01, Sysplex". The selected type is "MCLXCF01, Sysplex - Response Time by MVS Image".

An "RMF PM Analysis in PLPSC" dialog box is overlaid on the right, showing the following details:

- Resource:** MCLXCF01, Sysplex
- Work scope:** (empty)
- Metric:** performance index by important WLM service class period
- Value:** 2.40
- Name:** OMVSTASK.1
- Sample Time:** 2002/05/14 14:30:00
- Analysis type:** MCLXCF01, Sysplex - Response Time by MVS Image
- Options:** Close previous PerfDesk(s)

At the bottom of the main window, there is a control bar with buttons: "Start", "<", "<<", ">>", ">", "Stop", "Sample...", "Sync", "Save...", "Close", "Startup", and "Help".

Linux Performance Monitoring



RMF PM Java TM Technology Edition - Linux support (*beta*) available on Internet

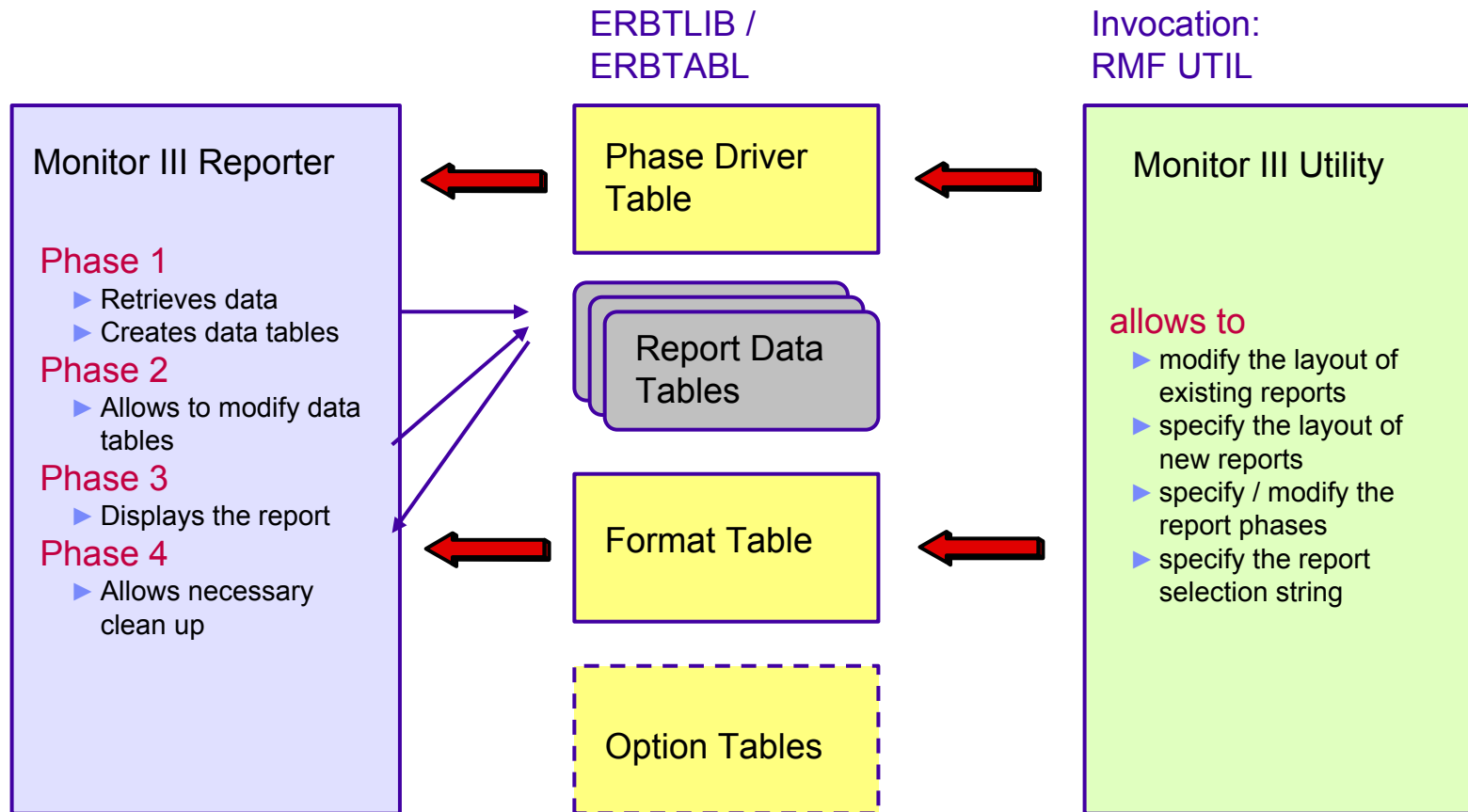
Common View for z/OS and Linux Data

Agenda

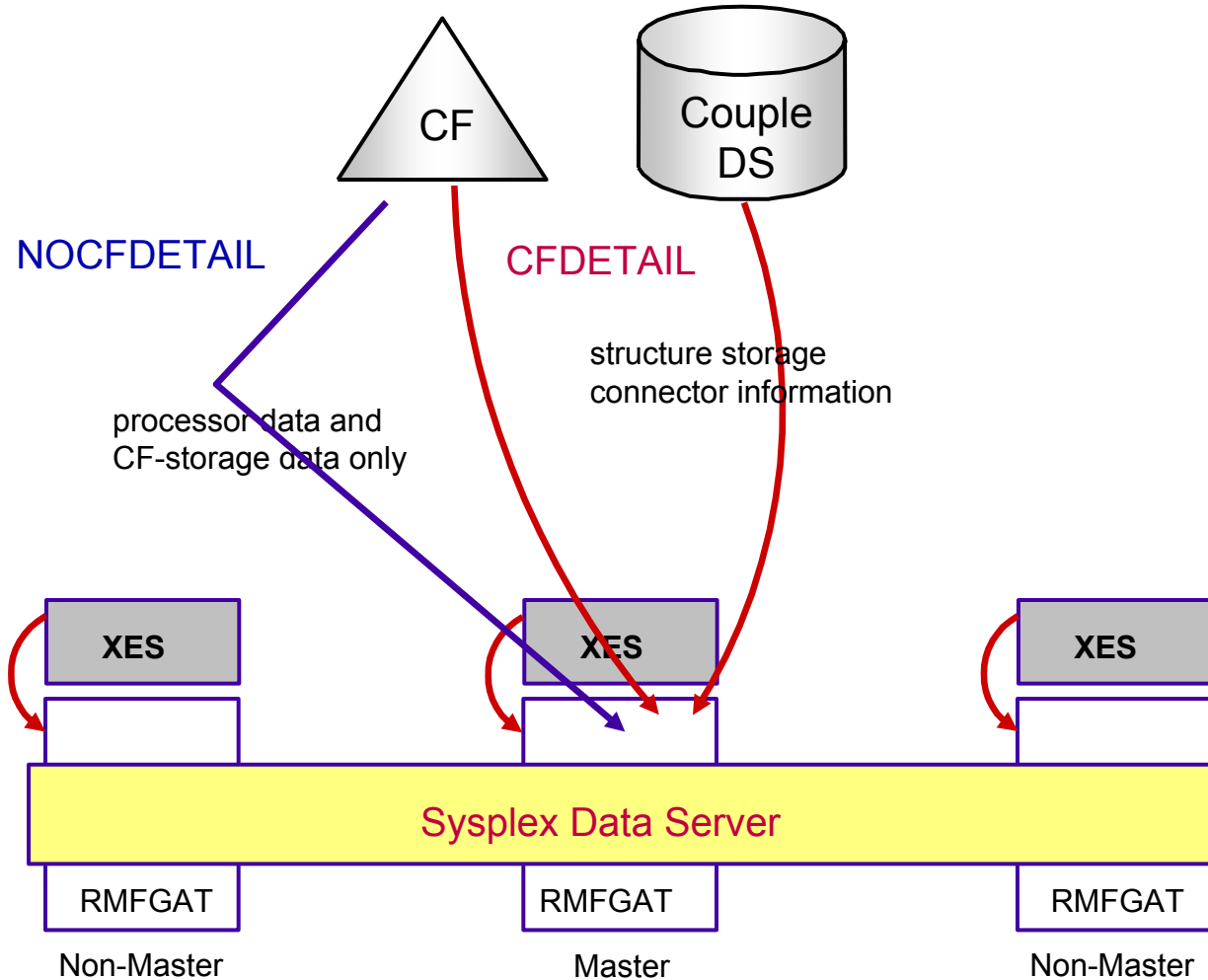


- Introduction
 - ▶ Terms and Concepts
 - ▶ Data Gatherer and Reporter
- Performance Monitoring
 - ▶ Workflow / Exception Monitoring
 - ▶ Using Monitor II and Monitor III Together
- Monitor III in a Sysplex
 - ▶ Goal Mode
 - ▶ Coupling Facility
- RMF PM Workstation Frontend
 - ▶ PerfDesks
 - ▶ Resources and Metrics
- Hints and Tips

Modify Reports



CF Master Gatherer



Generalizing Parmlib Members



- **useful**
 - ▶ to have system-unique settings
 - ▶ to reduce administrative efforts
- **make use of symbolic names**
 - ▶ on IPL, static symbols resolve to a user-specified or system-specified value
 - ▶ predefined symbols are e.g.
 - `&SYSNAME`, the 8-character system name
 - `&SYSCLONE`, the last 2 non-blank characters in the system name
 - ▶ user-symbols can be defined
- **symbolic names can be used in any RMF parmlib member**
 - ▶ e.g. to ensure that different VSAM datasets are used by RMFGAT on each system in the sysplex
 - ▶ options in ERBRMFxx
 - `Dataset(Start)`
 - `Dataset(ADD(RMF.&SYSNAME.M3.DS01))`
 - `Dataset(ADD(RMF.&SYSNAME.M3.DS02))`

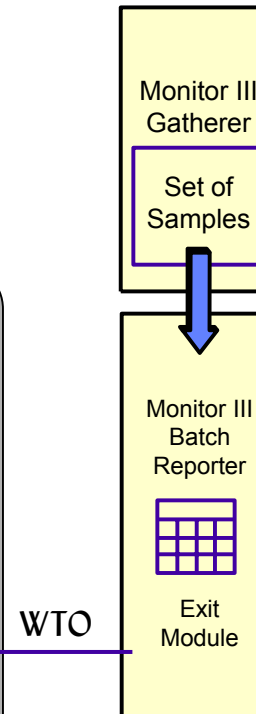
Setup for WTO's



- 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
IEF125I BMGU - LOGGED ON - TIME=12.39.40
  
```



Sample Exits provided for:

- ▶ Workflow Exception Report
- ▶ Sysinfo Report
- ▶ CPC Capacity Report

Monitor III Data in a Browser



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

RMF DDS Browser Interface

Address: <http://plpsc.pok.ibm.com:8803>

Overview

Explore

RMF

Home

,MCLXCF01,SYSPLEX
% processor utilization by MVS image

Local Time: 05/02/2003 04:36:40

AQTS	6	<div style="width: 100%;"></div>
AQFT	1	<div style="width: 100%;"></div>

,MCLXCF01,SYSPLEX
performance index by important WLM service class period

Local Time: 05/02/2003 04:36:40

TSOPRIME.2	1.5	<div style="width: 100%;"></div>
OMVS.1	1.1	<div style="width: 100%;"></div>
TSOPRIME.3	0.6	<div style="width: 100%;"></div>
TSOPRIME.1	0.5	<div style="width: 100%;"></div>

,MCLXCF01,SYSPLEX
i/o intensity by volume

Local Time: 05/02/2003 04:36:40

AQTS.SL13BC	3995	<div style="width: 100%;"></div>
AQTS.SL13BD	3945	<div style="width: 100%;"></div>
AQTS.SL13BA	3760	<div style="width: 100%;"></div>
AQTS.ZCS13X	1570	<div style="width: 100%;"></div>
AQTS.ZWK12X	1377	<div style="width: 100%;"></div>

,MCLXCF01,SYSPLEX
% CSA utilization by MVS image

Local Time: 05/02/2003 04:36:40

AQTS	32	<div style="width: 100%;"></div>
AQFT	30	<div style="width: 100%;"></div>

Waiting 30 seconds until automatic refresh ...

Internet



Information and Tools



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

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

RMF email address: rmf@de.ibm.com

Documentation and news

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

www.ibm.com/servers/eserver/zseries/zos/bkserv/r4pdf/rmf.html

