A Brief Tour of RMF Monitor III & Related MXG Support

Midwest CMG

April 23, 2013

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CMG Computer Measurement Group

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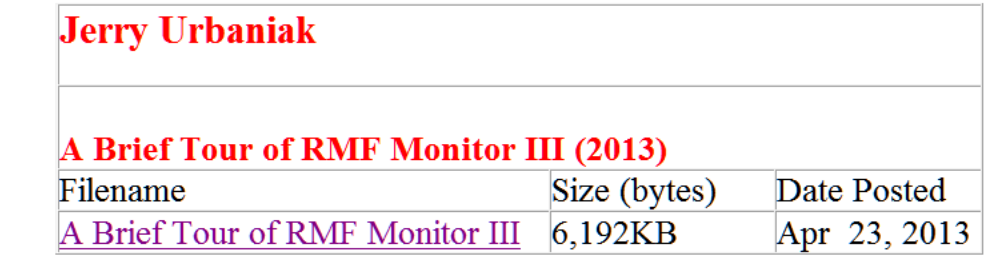
- Go to URL: http://www.mxg.com/downloads/#Urbaniak

- Click on the link “A Brief Tour…”



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Agenda

- Overview of RMF
- Setup of RMF Monitor III
- Operation of RMF Monitor III
- Design of RMF Monitor III
- Reporting with RMF Monitor III
- MXG Support for RMF Monitor III

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Agenda
What Is Not Included

- This is why the word “Brief” is in the title
- All RMF Monitor III Reports (59 IBM / 6 User)
- Full performance Tuning Tutorial using RMF III
- Setup/usage of RMF III Exception Reporting (WFEX)
- Workstation based extensions
- Contents of all MXG RMF III files
- MXG Based RMF III reporting
- Possible subjects for future MCMG meetings??

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What Is RMF?

- **R**esource **M**easurement **F**acility (not Management)
- Optional licensed IBM Program Product
- Monitor and data collector for z/OS (originally)*
- Supports performance analysis and capacity planning
- RMF both gathers and reports data
- Product number 5694-A01 (part of z/OS)
- FMIDs:

1.13	HRM7780	1.12	HRM7770
1.11	HRM7760	1.10	HRM7750
1.9	HRM7740	1.8	HRM7730

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***** A new feature called **RMF XP** available with z/OS 1.12 and up extends RMF support to other platforms

What Is RMF? (more)

- Has 3 Monitor components: **I, II**, and **III**
- Other components include:

  RMF Postprocessor (PP)

  RMF Spreadsheet Reporter

  RMF Sysplex Data Server (SDS)

  RMF Distributed Data Server (DDS)

  RMF Performance Monitoring (PM)

  RMF Client/Server Enabling (CS)

  RMF Cross Platform (XP) (new in 2011)

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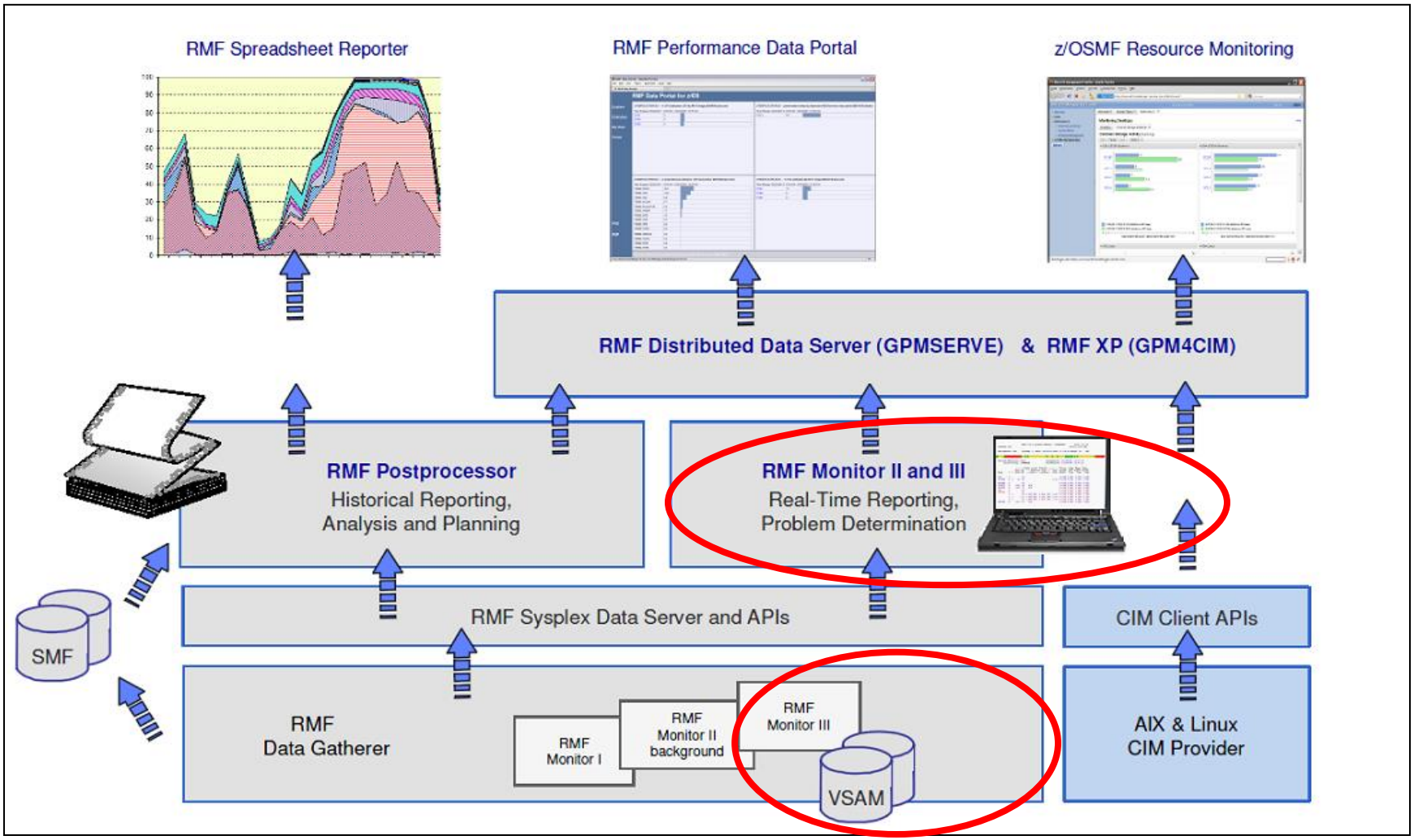
RMF Monitor History *

Year	Event
1974	1st MVS Release w Measurement Facility 1 (MF1)
1976	MVS V3R8 has RMF as optional priced feature
1977	RMF Monitor II is added to RMF
1988	RMF Monitor III is added to RMF

- RMF has continuously evolved with new technology
- RMF is a well established 35+ year old successful tool for capacity planning & performance measurement

* Thanks to Harald Bender, IBM RMF Development

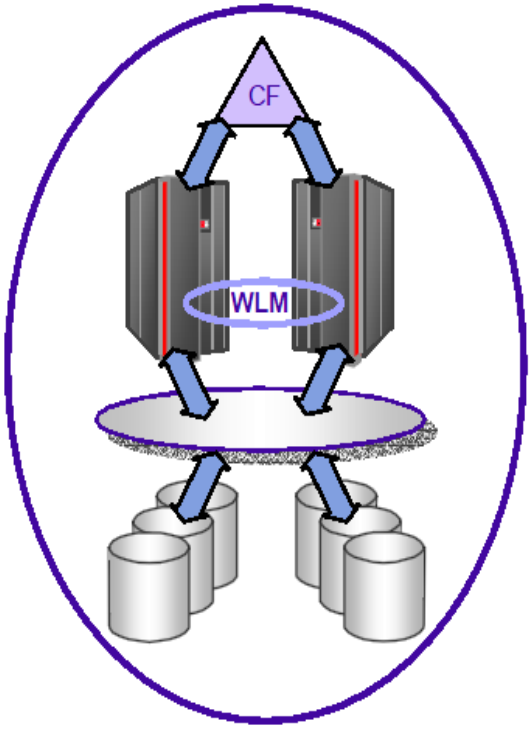
RMF Product Overview *



* From IBM SHARE Presentation ***"RMF – The Latest and the Greatest"*** (October 2011)

RMF Monitor III Purpose *

- 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



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* From IBM Presentation ***"RMF Monitor III – Concepts and Features"*** (January 2004)

RMF Monitor III
Typical Uses

- Job and Enclave degradation studies
- Short term LPAR and/or CEC CPU Utilization
- I/O performance and delay analysis
- Memory usage and orphaned storage
- Workflow and Performance Index (PI) analysis
- Disk cache usage
- System exception condition monitoring

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RMF Monitor Comparison

Monitor	I	II	III
Typical Usage	Historical	Real Time Snapshots	Real Time Intervals
Usage w MXG Support	Historical	Historical	Historical
Data Recording	Optional	Optional	Optional
Record Output Types	SMF Type 70-78	SMF Type 79	SMF Type 7x / VSAM
Accessible through ISPF	Yes – but no online reports	Yes – with online reports	Yes – with online reports
Delay Analysis Supported	No	No	Yes
Cursor Sensitive Navigation	No	No	Yes
Sysplex Wide Reporting	Yes	No	Yes
Exception Reporting	Yes	No	Yes

RMF Data Recording/Reporting *

Table 3. Activities that RMF Monitors and SMF Record Types

Gathering				Activity	Reporting			
Short-term Mon III		Snapshot Mon II	Long-term Mon I		Interactive Mon III	Snapshot Mon II	Real-time Mon I	Long-term Post-processor
SMF	VSAM	SMF	SMF					
	*	79.1/2/5		Address space	*	*		*
	*		74.5	Cache	*			*
	*	79.12	73	Channel path	*	*	*	*
74.4	*			Coupling facility	*			*
			70.2	Cryptographic hardware			*	*
	*	79.9	74.1	Device	*	*	*	*
	*			Enclave	*			
	*	79.7	77	Enqueue	*	*	*	*
			74.8	Enterprise Storage Server (ESS)				*
			74.7	FICON director				*
		79.15		IRLM long locks		*		
	*	79.14	78.3	I/O queuing	*	*	*	*
		79.11	75	Page data set		*	*	*
		79.4	71	Paging		*	*	*
	*	79.3	70.1	Processor	*	*	*	*
		79.6		Reserve		*		*
72.5				Serialization Delay				*
72.2/4	*	79.3		Storage	*	*		*
			76	System counters			*	*
74.3/6	*			UNIX	*	*		*
	*		78.2	Virtual storage	*		*	*
	*		72.3	Workload Service classes and report classes	*			*
74.2	*			XCF	*			*

* From IBM *"z/OS V1R13 RMF User's Guide"* SC33-7990-19 (June 2011)

RMF Data Recording Paging Measurements

- RMF III **STORR** (SR) command does provide Paging volumes and Paging I/O statistics (but not Paging rates or datasets)
- Clarification of prior chart

```
                        RMF V1R13  Storage Resource Delays        Line 1 of 10
Command ===>                                                  Scroll ===> PAGE

Samples: 100     System: S0W1  Date: 09/13/12  Time: 10.21.40  Range: 100   Sec

--------------------------- Central Storage Summary ---------------------------
-------------- % Frames ----------------    Frames  System
NUC   SQA   CSA   LPA   ACTV   IDLE   AVAIL SHR    Online   UIC
  1     1     2     2     54      1      35   1    262139   65535

----------------------------- Page/Swap Activity ------------------------------
Volume DEV      CU           ACT CON DSC PND Pend     SPACE   - AVG Active Users-
Serial Type     Type     PAV  %   %   %   %  Reasons  TYPE    TOTL LOCL SWAP COMM

VPPAGG 33909    2107           0   0   0   0 None     LOCL     0.0  0.0  0.0  0.0
VPPAGH 33909    2107           0   0   0   0 None     LOCL     0.0  0.0  0.0  0.0
VPPAGI 33909    2107           0   0   0   0 None     COMM     0.0  0.0  0.0  0.0
VPPAGD 33909    2107           0   0   0   0 None     LOCL     0.0  0.0  0.0  0.0
VPPAGE 33909    2105           0   0   0   0 None     LOCL     0.0  0.0  0.0  0.0
VPPAGF 33909    2107           0   0   0   0 None     LOCL     0.0  0.0  0.0  0.0
VPPAGA 33909    2107           0   0   0   0 None     LOCL     0.0  0.0  0.0  0.0
                                                      PLPA     0.0  0.0  0.0  0.0
VPPAGB 33903    2105           0   0   0   0 None     LOCL     0.0  0.0  0.0  0.0
VPPAGC 33903    2105           0   0   0   0 None     LOCL     0.0  0.0  0.0  0.0
```

Agenda

- Overview of RMF ✔
- Setup of RMF Monitor III
- Operation of RMF Monitor III
- Design of RMF Monitor III
- Reporting with RMF Monitor III
- MXG Support for RMF Monitor III

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RMF Monitor III Setup

1. RMF Monitor I must be installed and setup ✔
2. Define 1 or more VSAM data sets
3. Ensure Common Storage tracking in **DIAGxx** PARMLIB member active
4. Tailor member **ERBRMF04** (or a copy) in PARMLIB with RMF III options

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Defining RMF III VSAM Files

- **Optional** – if none in-storage buffer wraps when full
- RMF III VSAM files are required for MXG PDB build
- 100 maximum allowed per LPAR
- Use **ERBVSDEF** REXX EXEC shipped in SYS1.SERBCLS
- May define under either TSO ISPF or in batch

Tip: Imbed SMF Id in data set name to identify owning LPAR. Practically required in a large Sysplex.

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Defining RMF III VSAM Files (more)

- **ERBVSDEF Syntax**

  ERBVSDEF 'vsam_dsn' VSAMVOL(volume) TRACKS(num_tracks)

  where:

- **vsam_dsn** is the name of the Monitor III VSAM data set to be allocated (in single quotes)
- **volume** is the volume on which the VSAM data set is to be allocated. This parameter is required for systems or volumes for which SMS is not active.
- **num_tracks** is the primary extent of the VSAM data set (optional with a default of 150 tracks)

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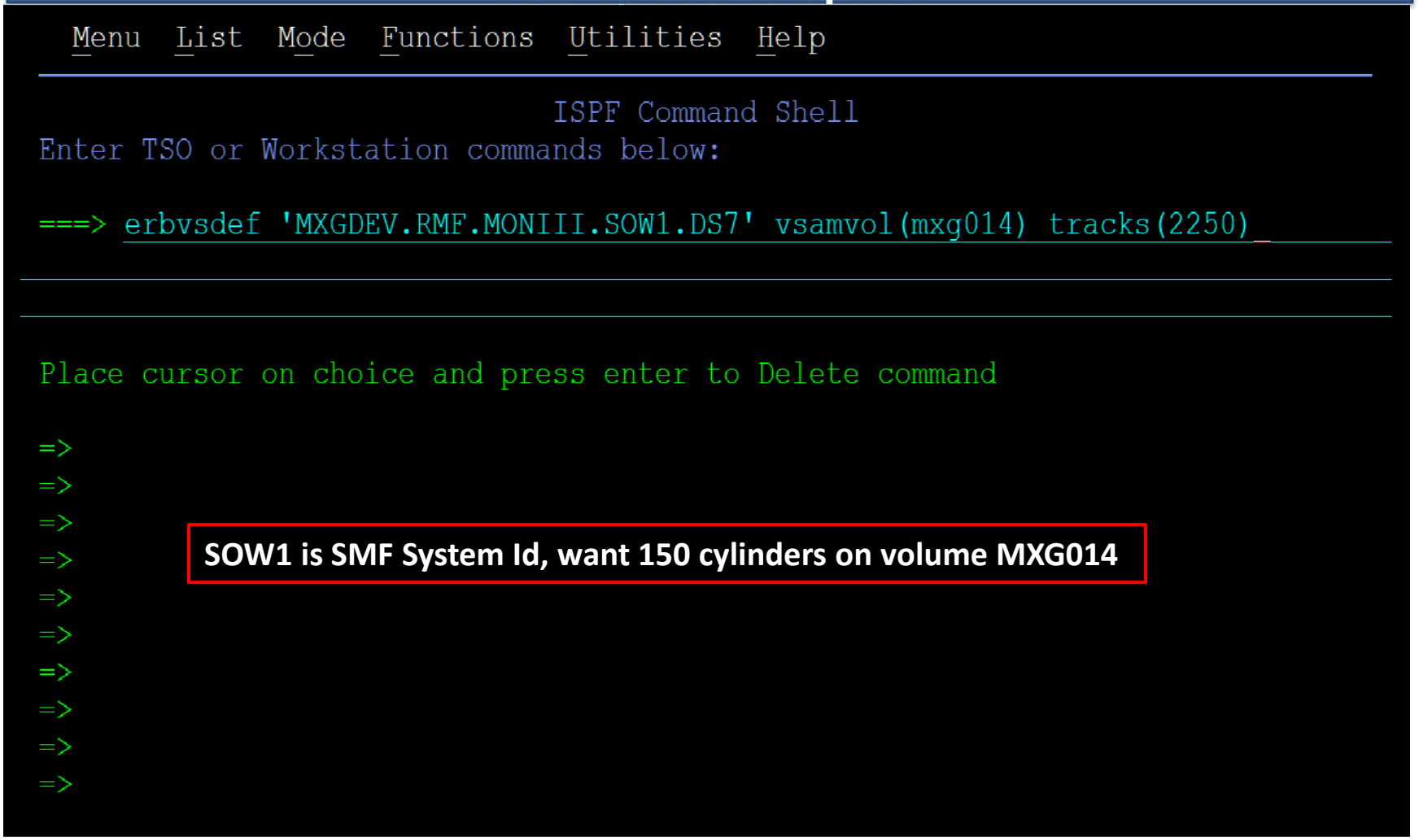
Tip: 150 tracks is likely way too small for most active z/OS environments

Defining RMF III VSAM Files
ISPF Example



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Defining RMF III VSAM Files
ISPF Example (more)

```
  Menu  List  Mode  Functions  Utilities  Help
 ------------------------------------------------------------------------------
                                ISPF Command Shell
 Enter TSO or Workstation commands below:

 ===> erbvsdef 'MXGDEV.RMF.MONIII.SOW1.DS7' vsamvol(mxg014) tracks(2250)
 ------------------------------------------------------------------------------
 ------------------------------------------------------------------------------

 Place cursor on choice and press enter to Delete command

 =>
 =>
 =>
 =>
 =>
 =>
 =>
 =>
 =>
 =>
VSAM dataset 'MXGDEV.RMF.MONIII.SOW1.DS7' successfully allocated.
***
```

Successfully allocated on volume MXG014

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Defining RMF III VSAM Files
Batch Example

```
 File  Edit  Edit_Settings  Menu  Utilities  Compilers  Test  Help
EDIT       MXGJU.ISPF.CNTL(ALLOCRM3) - 01.02               Columns 00001 00080
Command ===> _                                               Scroll ===> PAGE
****** ******************************** Top of Data ********************************
000001 //MXGJURM3 JOB (MXG),'URBANIAK',TIME=10,CLASS=A,
000002 // NOTIFY=&SYSUID,REGION=300M,MSGCLASS=T
000003 //ALLOC   EXEC PGM=IKJEFT01
000004 //SYSPROC  DD DISP=SHR,DSN=SYS1.SERBCLS
000005 //SYSTSPRT DD SYSOUT=*
000006 //SYSTSIN  DD *
000007  ERBVSDEF 'MXGDEV.RMF.MONIII.SYSA.DS01'  TRACKS(2250)
000008  ERBVSDEF 'MXGDEV.RMF.MONIII.SYSA.DS02'  TRACKS(2250)
000009  ERBVSDEF 'MXGDEV.RMF.MONIII.SYSA.DS03'  TRACKS(2250)
000010  ERBVSDEF 'MXGDEV.RMF.MONIII.SYSA.DS04'  TRACKS(2250)
000011  ERBVSDEF 'MXGDEV.RMF.MONIII.SYSA.DS05'  TRACKS(2250)
000012  ERBVSDEF 'MXGDEV.RMF.MONIII.SYSA.DS06'  TRACKS(2250)
000013  ERBVSDEF 'MXGDEV.RMF.MONIII.SYSA.DS07'  TRACKS(2250)
000014  ERBVSDEF 'MXGDEV.RMF.MONIII.SYSA.DS08'  TRACKS(2250)
000015  ERBVSDEF 'MXGDEV.RMF.MONIII.SYSA.DS09'  TRACKS(2250)
000016  ERBVSDEF 'MXGDEV.RMF.MONIII.SYSA.DS10'  TRACKS(2250)
000017 /*
****** ******************************* Bottom of Data ********************************
```

Must use TSO TMP IKJEFT01

SYSPROC DD defines Clist Library

- **SYSA is SMF System Id**
- **10 RMF III data sets wanted**
- **Assume SMS active so no volser required**

Defining RMF III VSAM Files Batch Example (more)

```
READY
 ERBVSDEF 'MXGDEV.RMF.MONIII.SYSA.DS01'  TRACKS(2250)
VSAM dataset 'MXGDEV.RMF.MONIII.SYSA.DS01' successfully allocated.
READY
 ERBVSDEF 'MXGDEV.RMF.MONIII.SYSA.DS02'  TRACKS(2250)
VSAM dataset 'MXGDEV.RMF.MONIII.SYSA.DS02' successfully allocated.
READY
 ERBVSDEF 'MXGDEV.RMF.MONIII.SYSA.DS03'  TRACKS(2250)
VSAM dataset 'MXGDEV.RMF.MONIII.SYSA.DS03' successfully allocated.
READY
 ERBVSDEF 'MXGDEV.RMF.MONIII.SYSA.DS04'  TRACKS(2250)
VSAM dataset 'MXGDEV.RMF.MONIII.SYSA.DS04' successfully allocated.
READY
 ERBVSDEF 'MXGDEV.RMF.MONIII.SYSA.DS05'  TRACKS(2250)
VSAM dataset 'MXGDEV.RMF.MONIII.SYSA.DS05' successfully allocated.
READY
 ERBVSDEF 'MXGDEV.RMF.MONIII.SYSA.DS06'  TRACKS(2250)
VSAM dataset 'MXGDEV.RMF.MONIII.SYSA.DS06' successfully allocated.
READY
 ERBVSDEF 'MXGDEV.RMF.MONIII.SYSA.DS07'  TRACKS(2250)
VSAM dataset 'MXGDEV.RMF.MONIII.SYSA.DS07' successfully allocated.
READY
```

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Excerpt of successful batch allocation from SYSTSPRT DD

What ERBVSDEF Does

- Invokes IDCAMS utility **DEFINE CLUSTER** command
- Creates VSAM **R**elative **R**ecord **D**ata **S**et (**RRDS**)
- **AVGLRECL** and **MAXLRECL** is set to 32752
- **CISIZE** (Control Interval Size) is set to 32768
- RMF Monitor III expects these file attributes
- More on data set sizing is discussed later

Tip: 2250 tracks (150 cylinders) is a suggested starting size for an active LPAR or half that for a "sandbox" LPAR

Note: We will see later why **AVGLRECL** and **MAXLRECL** = 32752 has a role in RMF III data set sizing.

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Ensure Common Storage Tracking

- RMF III **STORC** (SC) command requires a certain PARMLIB setting for complete results
- **DIAGxx** member in PARMLIB should have:

  VSM TRACK CSA(ON) SQA(ON)
- Default **DIAG01** member has this setting
- Check with your system programmer if in doubt

Tip: If VSM common storage tracking is inactive, one of the RMF III messages **ERB617I, ERB618I**, or **ERB619I** will indicate that the report can be incomplete for some jobs

Tailoring member ERBRMF04

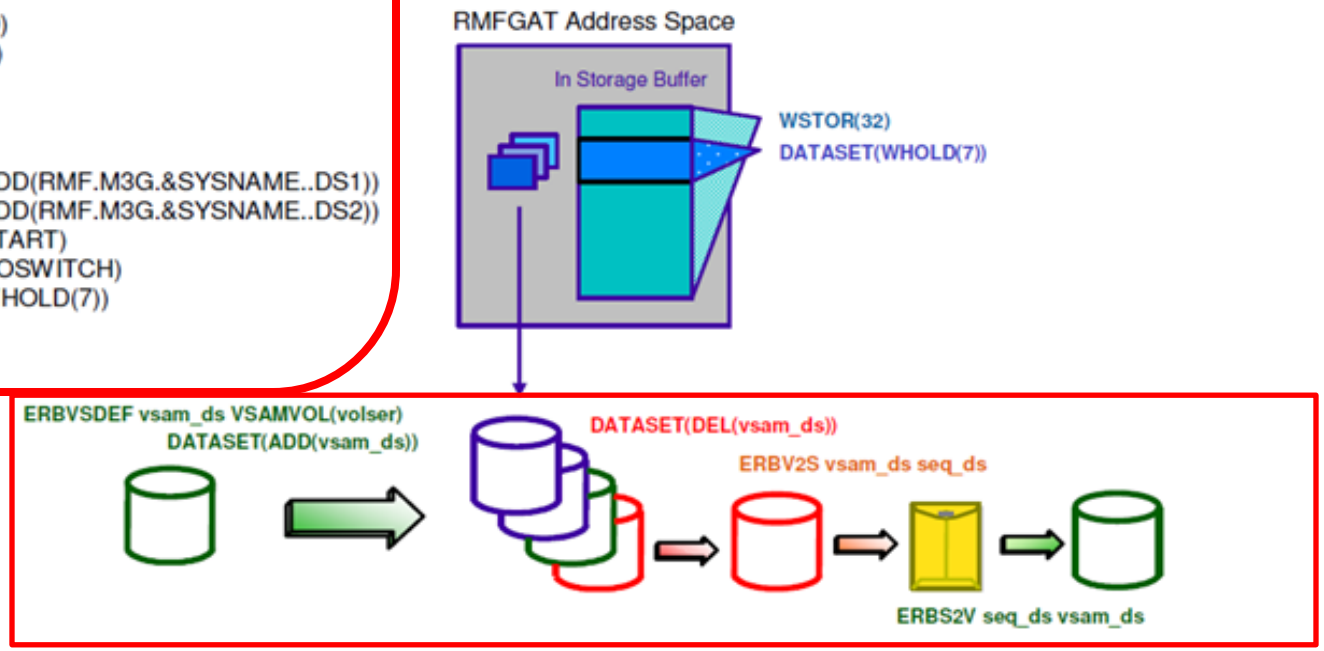
- This is the default member for RMF Monitor III at startup
- One approach:
  - Copy **ERBRMF04** to earlier data set in PARMLIB concatenation
  - Leave original IBM **ERBRMF04** member in SYS1.PARMLIB as a fallback
- Or clone **ERBRMF04** as **ERBRMF**xx and go on from there (but will require **MEMBER** option override at start up)

Tip: Document **ALL** of your settings in the member as comments

Tip: Consider having a log as comments in the member of who changed what, when, and why

RMF III Parameters
Data Gathering *

1. Measurements
   - IOSUB
   - CFDETAIL
   - CACHE
   - VSAMRLS
   - OPD
   - HFSNAME
   - zFS
   - SGSPACE
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. Buffer
   - WSTOR(32)



* From IBM Presentation ***"RMF Technical Overview"*** (March 2010)

RMF III Options – Measurement
IOSUB

- **IOSUB / NOIOSUB**
  specifies collection of data about the I/O subsystem configuration
- When active I/O-queuing and channel-path activities are stored
- Default: **IOSUB**
- Recommend: **IOSUB** for I/O tuning analysis
- RMF Monitor III commands **CHANNEL** (CHAN,CH) and **IOQUEUE** (IOQ,IQ) require **IOSUB** option to function
- Choice of **NOIOSUB** will affect the contents of an MXG RMF III PDB as the **ZRBCPD** file will have no observations

Note: Slash "/" between parms indicate alternate codings
Note: Items in parentheses after a command are alternate abbreviations

RMF III Options – Measurement CFDETAIL

- **CFDETAIL / NOCFDETAIL**
  specifies collection of detailed Coupling Facility (CF) activity
- When active, detail data about activities in the structures (LIST, LOCK, and CACHE) of the Coupling Facility is stored
- Data can be viewed in the Coupling Facility Activity report invoked by RMF III Reporter **CFACT** command
- Default: **CFDETAIL**
- Recommend: **CFDETAIL** for full Coupling Facility analysis
- RMF Monitor III command **CFACT** (CA) requires **CFDETAIL** for full function

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RMF III Options – Measurement CFDETAIL (more)

- Choice of **NOCFDETAIL** will affect the contents of an MXG RMF III PDB as the **ZRBCFC** file will have no observations since no CF connection data is available
- By design RMF III only collects **CFDETAIL** from only one LPAR in the Sysplex called the **master gatherer**
- The **master gatherer** will be an LPAR with RMF III active and at the highest z/OS release

Tip: Master gatherer selection is **NOT** under user control without extensive manual intervention (see RMF User's Guide).

All Sysplex LPARs should be either **CFDETAIL** or **NOCFDETAIL**.

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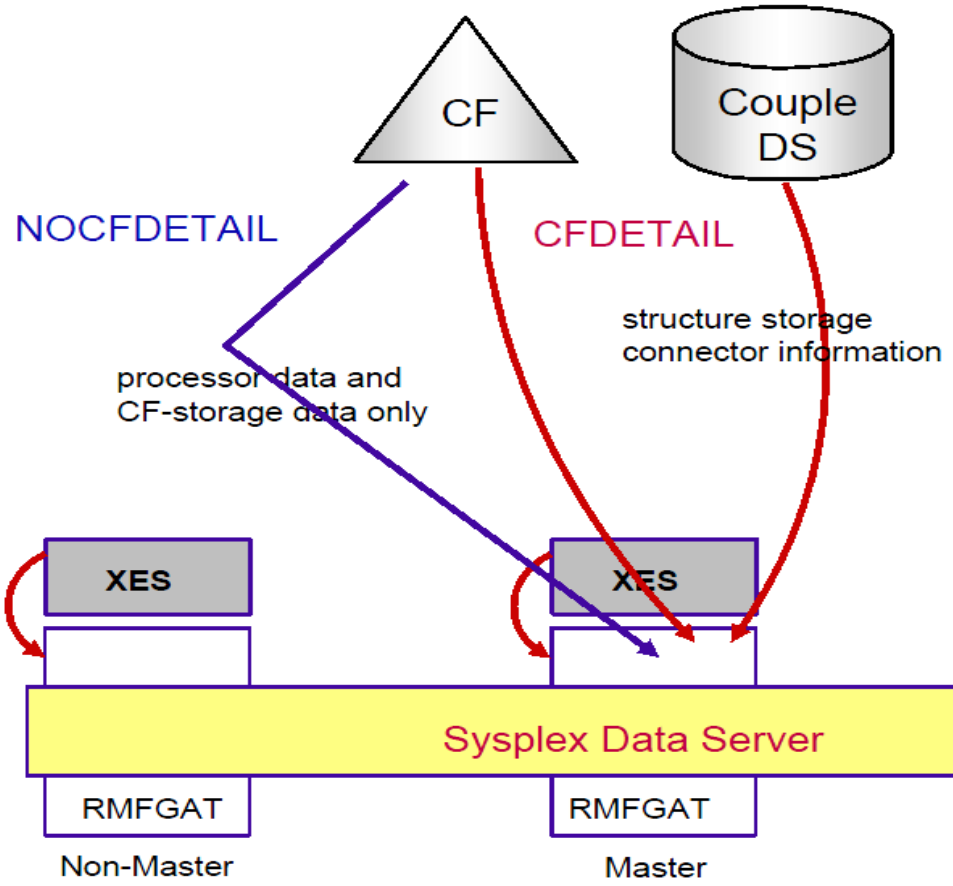
RMF III Options – Measurement CFDETAIL (more) *



XES is Cross System Extended Services: a z/OS component that provides sysplex services that applications and subsystems use to share data held in the CF

Tip: The choice of **CFDETAIL / NOCFDETAIL** affects the contents of the RMF III MXG PDB. RMF Monitor III selects the Master Gatherer LPAR!

* From IBM Presentation ***"RMF Monitor III – Concepts and Features"*** (January 2004)

RMF III Options – Measurement
CACHE

- **CACHE / CACHE(SSID(….)) / NOCACHE**

  specifies collection of data about caching
- When active, cache controller data is gathered by individual device address
- Separate multiple Subsystem Ids (SSIDs) with commas
- Default: **CACHE**
- Recommend: **CACHE** for caching performance analysis. Use **CACHE** with **SSID** if only some controllers of interest. Or if all subsystems are not shared among LPARs.
- RMF Monitor III commands **CACHDET** (CAD) and **CACHSUM** (CAS) require the **CACHE** option to function

Tip: Use z/OS **DEVSERV** command **DS QD** to display SSIDs by volume.

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RMF III Options – Measurement
CACHE (more)

Tip: There is no indication of which system in the Sysplex initiates a recorded event. So data can be gathered on **any system** sharing the cached devices.

Tip: To avoid unnecessary high CPU utilization and duplicated data, you should usually gather cache activity data **on 1 system only**. Pick an LPAR that is not CPU stressed and has high uptime if possible.

- To protect against data loss if the **CACHE** recording LPAR becomes inactive, some installations like to enable **CACHE** on 2 systems. Of course, this will create duplicate data!

Tip: Consider that you can always dynamically enable the **CACHE** option on another LPAR with the command **F RMF, F III, CACHE**. That could be part of an automated shutdown script for the LPAR that normally tracks **CACHE**.

RMF III Options – Measurement VSAMRLS

- **VSAMRLS / VSAMRLS(ADD(dsname mask)) / VSAMRLS(DEL(dsname mask)) / NOVSAMRLS**

  specifies collection of VSAM RLS (Record Level Sharing) data
- Up to 25 dsname masks may be active at one time using **ADD** keyword
- **DEL** keyword option used to dynamically stop tracking for a dsname mask
- Default: **VSAMRLS**
- Recommend: Use **VSAMRLS** only if RLS is active, otherwise **NOVSAMRLS.** Use **ADD** with dsname masking if only some RLS data sets are of performance interest to reduce overhead.
- RMF Monitor III commands **RLSDS** (RLD) **, RLSLRU** (RLL), and **RLSSC** (RLS) require the **VSAMRLS** option to function

RMF III Options – Measurement
OPD

- **OPD / NOOPD**
  specifies collection of OMVS Process data
- Default: **OPD**
- Recommend: **OPD** for OMVS performance tracking
- RMF Monitor III command **OPD** requires the **OPD** option to function
- Choice of **NOOPD** will affect the contents of an MXG RMF III PDB as the **ZRBOPD** file will have no observations

RMF III Options – Measurement HFSNAME

- **HFSNAME(ADD(file system name)) / HFSNAME(DEL(file system name))**
  when active records statistics for UNIX Hierarchical File System names
- **DEL** keyword option used to dynamically stop tracking for a file system
- Default: None – inactive
- Recommend: **HFSNAME(ADD(file system name))** only if certain HFS file systems are of performance interest. Otherwise, omit to reduce overhead.

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RMF III Options – Measurement
ZFS

- **ZFS / NOZFS**
  specifies collection of zFS file activity.
- Default: **ZFS**
- Recommend: **ZFS** only if zFS file activity is of performance interest. Otherwise use **NOZFS** to reduce overhead. No masking available. This is an all or nothing choice.
- RMF Monitor III commands **ZFSACT** (ZFSA) and **ZFSSUM** (ZFSS) require **ZFS** option to function
- Can turn on/off dynamically with **MODIFY** command as needed

RMF III Options – Measurement SGSPACE

- **NOSGSPACE /**
  SGSPACE(ADD(storage group name,…)) /
  SGSPACE(DEL(storage group name,…))
  specifies collection of storage group space and monitoring of disk space.
- Up to 25 storage groups may be active at one time using **ADD** keyword
- Storage groups over 25 are ignored
- Storage group names may have a maximum of 30 characters each
- Separate multiple groups with commas or repeat keyword **SGSPACE(ADD**
- **DEL** keyword option used to dynamically stop tracking for a storage group
- Default: **NOSGSPACE**

RMF III Options – Measurement SGSPACE (more)

- Recommend: **SGSPACE** only if space tracking by MINTIME intervals for fine granularity is required. Otherwise, use **NOSGSPACE.**
- RMF Monitor III commands **SPACED** (SPD) and **SPACEG** (SPG) require the **SGSPACE** option to function
- MXG RMF III PDB **ZRBSPG** file will have no observations if **NOSGSPACE** option is in effect on all LPARs

Tip: There are other disk space monitoring approaches based on longer time intervals with likely less total overhead. One possibility is SMS DCOLLECT.

Tip: To avoid unnecessary high CPU utilization and duplicated data, you should gather activity for a specific storage group **on 1 system only**. Pick an LPAR that is not CPU stressed with high uptime if possible.

RMF III Options – Measurement SGSPACE (more)

Tip: Be very careful with storage group names in the **SGSPACE** option.

If you misspell one at RMF III startup you will get:

ERB329I III: ONE OR MORE STORAGE GROUP NAMES ARE NOT DEFINED IN SMS.

If you have a capability to alert for messages this is probably one to look for.

Later MXG will not be able to process the corresponding **ERBSPGG3** (SPG) table in a PDB build because RMF III flags it as being an "**Internal Problem"**.

IBM development has indicated that the SPG table data in this case is unusable.

The MXG **ASMRMFV** utility will warn if it encounters this condition with message **RMFV035E** (MXG V30.30 and up). **But any SPG table data is discarded.**

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RMF III Options – Measurement
LOCK

- **LOCK / NOLOCK**
  specifies collection of data on spin locks and suspend locks
- Default: **NOLOCK**
- Recommend: **NOLOCK** unless locking problems are noticed. Then use **LOCK** for investigation. **LOCK** probably not needed for routine sustained use due to potential overhead.
- RMF Monitor III commands **LOCKSP** (LSP) and **LOCKSU** (LSU) require **LOCK** option to function
- Can turn on/off dynamically with **MODIFY** command as needed

RMF III Options – Measurement RESOURCE

- **RESOURCE(*JES2,parm) / RESOURCE(*JES3,parm)** specifies the job entry subsystem (JES) resource from which an address space requests service. Code **parm** if your installation has chosen a name other than JES2 or JES3.
- Default: **RESOURCE(*JES2,JES2).**
- Recommend: Code if you are using **JES3** or a **JES2** job entry subsystem with a non-standard name
- RMF Monitor III commands **JES** (JD) and **JESJ** (JJ) require correct specification of **RESOURCE** option for proper function

RMF III Options – Timing
CYCLE

- **CYCLE(nnnn)**
  specifies length of a cycle at the end of which RMF samples data, where **nnnn** is the length in milliseconds
- Range: **50-9999**
- Values below 50 forced to 50 and values above 9999 forced to 9999
- Default: **CYCLE(1000)** = 1 second
- Recommend: **CYCLE(1000)** per IBM RMF User's Guide

Tip: Decreasing the **CYCLE** value to less than 1 second brings little gain in the quality of the statistics produced, compared to the following adverse effects on performance:

- Increasing the amount of processor time needed to sample data
- Causing RMF to fill the wrap-around in-storage buffer more quickly

RMF III Options – Timing
MINTIME

- **MINTIME(nnn)**
  specifies length of an RMF III time interval as **nnn** seconds
- At the end of a **MINTIME** interval, the data gatherer combines all samples it has gathered into a set of samples
- If **DATASET(START)** is in effect the **MINTIME** sample set is output to a VSAM file
- Otherwise, the sample set in the in-storage buffer is eventually overwritten and lost
- **MINTIME** is the smallest time interval that RMF III Reporter can display in a report hence the name

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RMF III Options – Timing
MINTIME (more)

- RMF III reports can be requested with ranges only in multiples of **MINTIME**
- Range: **10-999** seconds
- Values below 10 forced to 10 and values above 999 forced to 999.
- Default: **MINTIME(100)**
- Will discuss later how **MINTIME** value affects number of VSAM data sets needed
- Recommend: **MINTIME(60)** as it facilitates time series plots and graphs when using PDB data. Or at least a multiple of 60. Other values that do not divide evenly into 3600 will effect **SYNC**ing.

RMF III Options – Timing
MINTIME (more)

- The following events will cause RMF III to shorten a **MINTIME** interval:
  - A Service Policy switch
  - A System IPL
  - A change in the **CYCLE** time
- RMF III cannot combine data that was collected using different gathering options
- So the reporting range will be adjusted to start where the change occurred

RMF III Options – Timing
MINTIME (more)

Tip: Use the same **MINTIME** value for all systems in the Sysplex to enable accurate and correct Sysplex reporting.

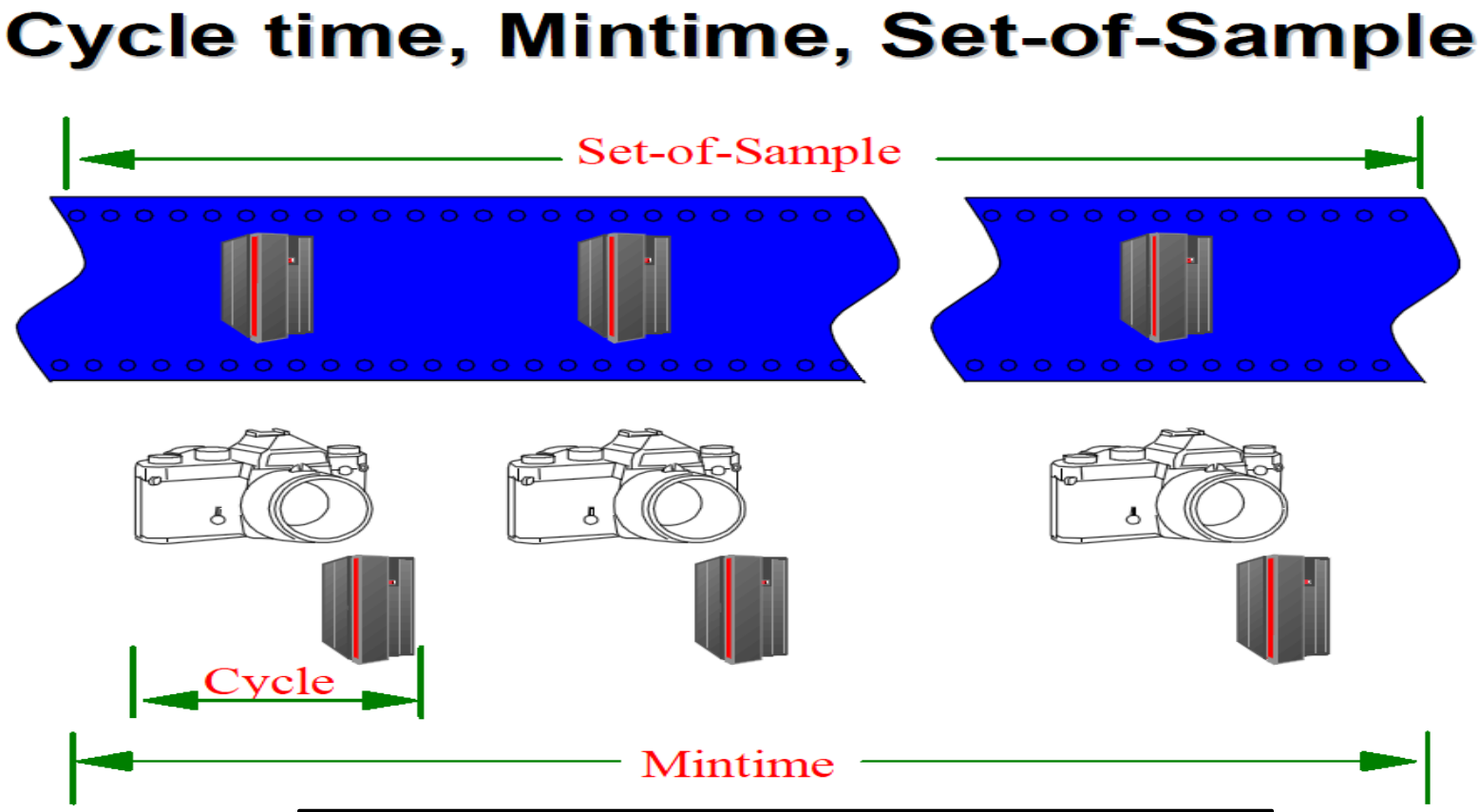
Tip: Decreasing the **MINTIME** value to less than 60 seconds will have the following adverse performance impacts:

- Cause RMF to fill wrap-around in-storage buffer more quickly
- Use more space in the user-defined VSAM data sets
- Increase elapsed and CPU time for an MXG RMF III PDB build

Tip: MINTIME(10) NOT recommended for routine sustained use.

Tip: For performance timings less than 10 seconds in duration use another monitor such as RMF Monitor II (1 second minimum interval) or a transaction based monitor.

RMF III Options – Timing
CYCLE vs. MINTIME *



System sample snapshot taken every **CYCLE** time
Set of samples output every **MINTIME** interval

* From IBM SHARE Presentation ***"z/OS RMF Monitor III Overview"*** (August 2005)

RMF III Options – Timing
STOP

- **NOSTOP / STOP(nnnnn) / STOP(nnnH) / STOP(nnnnnM)**
  specifies the desired duration for the data gatherer session in minutes (**M**) or hours (**H**)
- If **M** and **H** are both omitted RMF III assumes **M**
- **NOSTOP** means that only the session or system command STOP can end the session
- Range: **1M-10080M** (1 week) **or 1H – 168H** (1 week). Values below 1 forced to 1 and values above 999 forced to 999.
- Default: **NOSTOP**
- Recommend: **NOSTOP** to avoid missing data. **STOP** may be appropriate for a testing period of known length, but is not recommended for routine sustained use.

Tip: Use **NOSTOP** for all systems in the Sysplex to enable accurate and continuous Sysplex reporting.

RMF III Options – Timing
SYNC

- **SYNC(0M) / SYNC(nn) / SYNC(nnM) / NOSYNC** specifies how the **MINTIME** interval is to be synchronized with the hour in minutes (M)
- If **M** is omitted RMF III assumes **M**
- With **NOSYNC** all intervals have the same length
- Range: **0-59** minutes
- If nn is not in this range, RMF III forces **0**
- Default: **SYNC(0M)** – synchronize with the hour
- This option is required to generate Sysplex reports
- Recommend: **SYNC(0M)** for reporting consistency

RMF III Options – Timing
SYNC (more)

- RMF synchronizes the starting time of a set of samples by calculating how many sets of samples will fit in the time range up to the first synchronization point
- This might mean that the **MINTIME** interval before the synchronization point is shortened
- Sets of samples will NOT synchronize correctly if **MINTIME** does not evenly divide into 3600
- Per IBM RMF Development the **RMF User's Guide** incorrectly states that sets of samples remain synchronized only when the **MINTIME** value is a factor of 60

Tip: Use the same **SYNC** setting for all systems in the Sysplex to enable correct Sysplex reporting.

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RMF III Options – Recording DATASET

- **DATASET(START) / DATASET(STOP)**
  specifies whether VSAM data set recording in active or not
- Default: **DATASET(STOP)** – no recording
- Recommend: **DATASET(START)** to save RMF III data to VSAM data sets. Otherwise data is lost when the in-storage buffer fills and wraps.
- No point in defining VSAM data sets if **DATASET(STOP)** in effect
- **DATASET** may be abbreviated as **DS**

Tip: Use the **DATASET(START)** setting for all systems in the Sysplex to enable correct Sysplex reporting and avoid data loss

RMF III Options – Recording DATASET (more)

- **DATASET(SWITCH) / DATASET(NOSWITCH)** specifies RMF Monitor III selection of a data set for recording sampled data
- Default: **DATASET(NOSWITCH)**
- **NOSWITCH** only effective when specified at RMF III startup
- **MODIFY** ignored if **SWITCH** to **NOSWITCH** attempted later
- **MODIFY** from **NOSWITCH** to **SWITCH** later is allowed
- **Q:** So what's the difference?
- **A:** See next slide

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RMF III Options – Recording DATASET (more)

- If **DATASET(SWITCH)** is in effect VSAM data set selection process is:

  1) RMF searches for an empty data set to record samples

  2) If there are no empty data sets, RMF reuses the data set with the oldest data

- If **DATASET(NOSWITCH)** is in effect VSAM data set selection process is:

  1) RMF searches for the data set with the most recent data and records samples if the data set is not full

  2) If the data set with the most recent data is full, RMF searches for an empty data set to record samples

  3) If there are no empty data sets, RMF reuses the data set with the oldest data

- Recommend: **DATASET(NOSWITCH)** for best use of RMF III disk space

RMF III Options – Recording DATASET (more)

- **DATASET(ADD(dsname,…)) / DATASET(DEL(dsname,…))** specifies 1 or more RMF Monitor III VSAM data sets previously defined to be logically added or deleted dynamically
- **DEL** keyword option used to dynamically and logically remove a data set from RMF III usage. The data set is NOT physically deleted.
- **ADD** keyword does NOT define the data set, use **ERBVSDEF** first
- Multiple data sets may appear in **ADD** or **DEL** separated by commas
- Default: None
- Recommend**:** At least enough data sets to span a weekend so that performance issues from Friday can still be researched on Monday

TIP: The data set name(s) in either the **ADD** or **DEL** keywords must match an existing RMF III VSAM data set name to avoid an error

TIP: The maximum number of RMF III data sets for any LPAR is **100**

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RMF III Options – Buffering
WSTOR

- **WSTOR(nnn)**
  specifies in Megabytes (MB) the maximum size of the RMF Monitor III local storage buffer for the data gatherer. If the value exceeds the maximum GETMAIN size for the system that value is used instead.
- Range: **4-999** with values below 4 forced to 4 or values above 999 forced to 999.
- Default: **WSTOR(32)**
- Recommend: Default usually adequate for typical use. This size buffer will hold about 1,000 RMF III 32K VSAM records. RMF III Reporter response is slightly better when data is found in the local storage buffer instead of reading from disk data sets. Raise only in small increments and with care to avoid memory paging issues.

Tip: Use the same **WSTOR** value for all systems in the Sysplex for response consistency.

Tip: WSTOR can **NOT** be modified dynamically after RMF III session started.

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RMF III Options – Buffering
WHOLD

- **DATASET(WHOLD(nnn))**
  specifies in Megabytes (MB) a storage value that controls page releases in the RMF local storage buffer
- Range: **1-999**
- Values below 1 forced to 1 and values above 999 forced to 999
- Default: **DATASET(WHOLD(7))**
- The **WHOLD** value lets RMF III hold a copy in its buffer of nnn Megabytes of storage containing data already copied to the data set
- After this value is exceeded, RMF III begins to page release the storage in the buffer containing the duplicate data.

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RMF III Options – Buffering
WHOLD (more)

- A page release discards the current & former copies of a page that are on central, expanded, or auxiliary storage, so that the page will not be read in before it is reused for new data
- When the data in the local storage buffer has been copied to the data set and the storage amount exceeds the **WHOLD** value, the storage with duplicate data in the buffer becomes eligible for page release
- Recommend: Consider setting **WHOLD = WSTOR** if paging not an issue

Tip: Use the same **DATASET(WHOLD(n))** value for all systems in the Sysplex for paging consistency .

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RMF III Options – Buffering
WHOLD & WSTOR

- **DATASET(WHOLD(nnn))** and **WSTOR(nnn)** work together to control page space needed for the local storage buffer
- If **WHOLD** is smaller than **WSTOR**:
  - Page releases can occur before RMF uses all the storage in the local storage buffer
  - When you turn data set recording off, the local storage buffer size assumes the **WSTOR** value
- If **WHOLD** is equal to or greater than **WSTOR**:
  - Page releases occur once the **WSTOR** value is exceeded and RMF begins to wrap around the buffer
- Recommend: The defaults are decades old. If memory is not severely constrained consider setting **DATASET(WHOLD(32))** and **WSTOR(32)** to reduce page release frequency & allow access to more data in storage buffer for better RMF III Reporter performance.

RMF III Options – Other
MEMBER

- **MEMBER(xx,….)**
  specifies 1-5 PARMLIB members that contain Monitor III gatherer options for the session
- This option is used in RMF III start up command when the default member is **NOT** desired
- Each member is represented by a 2 character alphameric value, to which RMF adds to the prefix **ERBRMF** to form the member name
- Range: **AA-99**
- When multiple members used, they must be separated by commas

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RMF III Options – Other
MEMBER (more)

- When multiple members contain the same option, the **leftmost** member (not the last member) takes precedence
- Default: **MEMBER(04) –** use **ERBRMF04** member
- Only valid in a **MODIFY** command, not in a PARMLIB member
- Recommend: Default member **04** suffix can be adequate for typical use in smaller shops. But using a unique member for each LPAR or Sysplex is a popular approach in larger installations.
- Use the **MEMBER** precedence behavior to advantage for single LPAR RMF III parameters such as **CACHE**

RMF III Options – Other MEMBER (more)

- How??
- Code **NOCACHE** into your standard RMF III member for example **ERBRMFST** (or whatever name(s) you choose)
- Create a new RMF III member **ERBRMFCA** that contains only the **CACHE** parameter
- When starting RMF III on the LPAR chosen for **CACHE** data collection, specify that member first to override **NOCACHE** in the standard member(s)
- Example: **F RMF, S III,MEMBER(CA,ST)**
  will override **NOCACHE** in **ERBRMFST** and **CACHE** will be effect for that LPAR
- Other LPARs just use **F RMF, S III,MEMBER(ST)** to start RMF III

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RMF III Options – Other
SYSOUT

- **SYSOUT(class)**
  specifies the SYSOUT class for messages generated by the data gatherer
- Range: **A-9**
- Default: **A**
- Recommend: Default often adequate for typical use, but may want to change to a Held **SYSOUT** class for auditing purposes

Tip: SYSOUT can **NOT** be modified dynamically after an RMF III session is started

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RMF III Options – Other OPTIONS

- **NOPTIONS / OPTIONS / NOPTNS / OPTNS**
  specifies whether or not an option list for the RMF Monitor III session is to be shown at the operator console at the start of the session
- When **OPTIONS** is in effect each RMF III option value is displayed with the source of the option
- Operator is asked to confirm options with reply **GO** to message **ERB306D**
- **OPTIONS** sources shown are:

COMMAND	A **START** or **MODIFY** command.
DEFAULT	Program default
EXEC	JCL statement in **RMFGAT** cataloged procedure (PARM field)
CHANGED	RMF III changed a conflicting option, look for a related message
MEMBER	Option was from a PARMLIB member
REPLY	Option from operator reply to message **ERB306D**

RMF III Options – Other OPTIONS (more)

- Default: **NOOPTIONS**
- Recommend: Use **OPTIONS** when testing RMF III option changes. Or if system automation available to auto reply to message **ERB306D** with **'GO'** then to get an immediate audit trail at start up. Otherwise take default of **NOOPTIONS**.

Tip: RMF III options can be displayed at any time during the RMF III session with the command **F RMF, D III.**

Use system automation to control timing and frequency of displays.

RMF III Options
Distributed ERBRMF04

```
/*******************************************************************/
/* NAME:        ERBRMF04                                           */
/*                                                                 */
/* DESCRIPTION: PARMLIB MEMBER WITH RMF MONITOR III GATHERER OPTIONS */
/*              (ALL OPTIONS ARE SET TO DEFAULTS)                  */
/*                                                                 */
                                    .
                                    .
                                    .
/*******************************************************************/
  CYCLE(1000)                /* SAMPLE EVERY SECOND (1000 MSEC)     */
  DATASET(STOP)              /* NO DATASET SUPPORT                  */
  DATASET(NOSWITCH)          /* APPEND TO LAST NON-FULL DATASET     */
  DATASET(WHOLD(7))          /* CONTROLS BUFFER PAGES IN STORAGE    */
  MINTIME(100)               /* LENGTH OF MINTIME                   */
NOOPTIONS                    /* DO NOT DISPLAY OPTIONS              */
  RESOURCE(*JES2,JES2)       /* SPECIFIES JES STARTED TASK NAME     */
NOSTOP                       /* RUN UNTIL OPERATOR ISSUES STOP      */
  SYNC(00)                   /* MINTIME SYNCHRONIZATION             */
  SYSOUT(A)                  /* MESSAGES TO SYSOUT CLASS A          */
  WSTOR(32)                  /* SIZE OF INSTORAGE BUFFER (IN MB)    */
  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 */
  ZFS                        /* ZFS DATA GATHERING                  */
NOSGSPACE                    /* NO STORAGE GROUP SPACE GATHERING    */
NOLOCK                       /* NO LOCK DATA GATHERING              */
```

← Change to START

← Change ??

← Change if JES3

← Only on 1 LPAR

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This member has NO data set recording active and is set for JES2

RMF III Options
Sample 1

```
/*************************************************************************/
/* ERBRMF99 USED FOR RMF III DATA GATHERER ON EACH SYSTEM ID             */
/* CHANGED: 03/31/09 ADDED 22 MORE DATASETS (45-66)---JTR                */
/* CHANGED: 12/06/08 ADDED 22 MORE DATASETS (23-44)---JTR                */
/*************************************************************************/
DS(START)                                  /* D.S. RECORDING             */
DS(ADD(VSYS.RMFIII.&SYSNAME..DATA01))      /* VSAM DS1                   */
DS(ADD(VSYS.RMFIII.&SYSNAME..DATA02))      /* VSAM DS2                   */
DS(ADD(VSYS.RMFIII.&SYSNAME..DATA03))      /* VSAM DS3                   */
                                  .
                                  .
                                  .
DS(ADD(VSYS.RMFIII.&SYSNAME..DATA65))      /* VSAM DS65                  */
DS(ADD(VSYS.RMFIII.&SYSNAME..DATA66))      /* VSAM DS66                  */
DS(NOSWITCH)                       /* DO NOT REUSE UNLESS ALL D.S. FULL   */
MINTIME(60)                        /* 1 MINUTE INTERVAL                   */
SYNC(15M)                          /* SYNCHRONIZE ON 15M INTERVALS        */
SYSOUT(T)                          /* SYSOUT FOR MESSAGES TO CLASS T      */
```

Tip: System Symbol **&SYSNAME** adds system name to RMF III data set name. Allows use of a common RMF III options PARMLIB member across LPARs.

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RMF III Options
Sample 2

```
 CYCLE(1000)                  /* SAMPLE EVERY SECOND (1000 MSEC)     */
  DATASET(START)              /*    DATASET SUPPORT ACTIVE           */
  DATASET(ADD(MXGDEV.RMF.MONIII.SOW1.DS1))
  DATASET(ADD(MXGDEV.RMF.MONIII.SOW1.DS2))
  DATASET(ADD(MXGDEV.RMF.MONIII.SOW1.DS3))
  DATASET(NOSWITCH)           /* APPEND TO LAST NON-FULL DATASET     */
  DATASET(WHOLD(7))           /* CONTROLS BUFFER PAGES IN STORAGE    */
  MINTIME(100)                /* LENGTH OF MINTIME                   */
NOOPTIONS                     /* DO NOT DISPLAY OPTIONS              */
  RESOURCE(*JES2,JES2)        /* SPECIFIES JES STARTED TASK NAME     */
NOSTOP                        /* RUN UNTIL OPERATOR ISSUES STOP      */
  SYNC(00)                    /* MINTIME SYNCHRONIZATION             */
  SYSOUT(A)                   /* MESSAGES TO SYSOUT CLASS A          */
  WSTOR(32)                   /* SIZE OF INSTORAGE BUFFER (IN MB)    */
  IOSUB                       /* I/O SUBSYSTEM GATHERING ACTIVE      */
  CFDETAIL                    /* COUPLING FACILITY DETAILS           */
  CACHE                       /* ACTIVATE CACHE GATHERING            */
NOVSAMRLS                     /* NO VSAM RLS GATHERING               */
  OPD                         /* ACTIVATE OMVS PROCESS DATA GATHERING*/
  ZFS                         /* ACTIVATE ZFS DATA GATHERING         */
  SGSPACE(ADD(SG1))           /* STORAGE GROUP SPACE GATHERING       */
  SGSPACE(ADD(MXGDEVSG))      /* STORAGE GROUP SPACE GATHERING       */
  SGSPACE(ADD(MXGRSVSG))      /* STORAGE GROUP SPACE GATHERING       */
  SGSPACE(ADD(DBAGSG))        /* STORAGE GROUP SPACE GATHERING       */
NOLOCK                        /* NO LOCK DATA GATHERING              */
```

This sample shows how **SGSPACE** might be used

RMF Monitor III Setup

1. RMF Monitor I must be installed and setup ✔
2. Define one or more VSAM data sets (100 maximum) ✔
3. Ensure Common Storage tracking in **DIAGxx** PARMLIB member ✔
4. Tailor member **ERBRMF04** in PARMLIB with RMF III options ✔

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Agenda

- Overview of RMF ✔
- Setup of RMF Monitor III ✔
- Operation of RMF Monitor III
- Design of RMF Monitor III
- Reporting with RMF Monitor III
- MXG Support for RMF Monitor III

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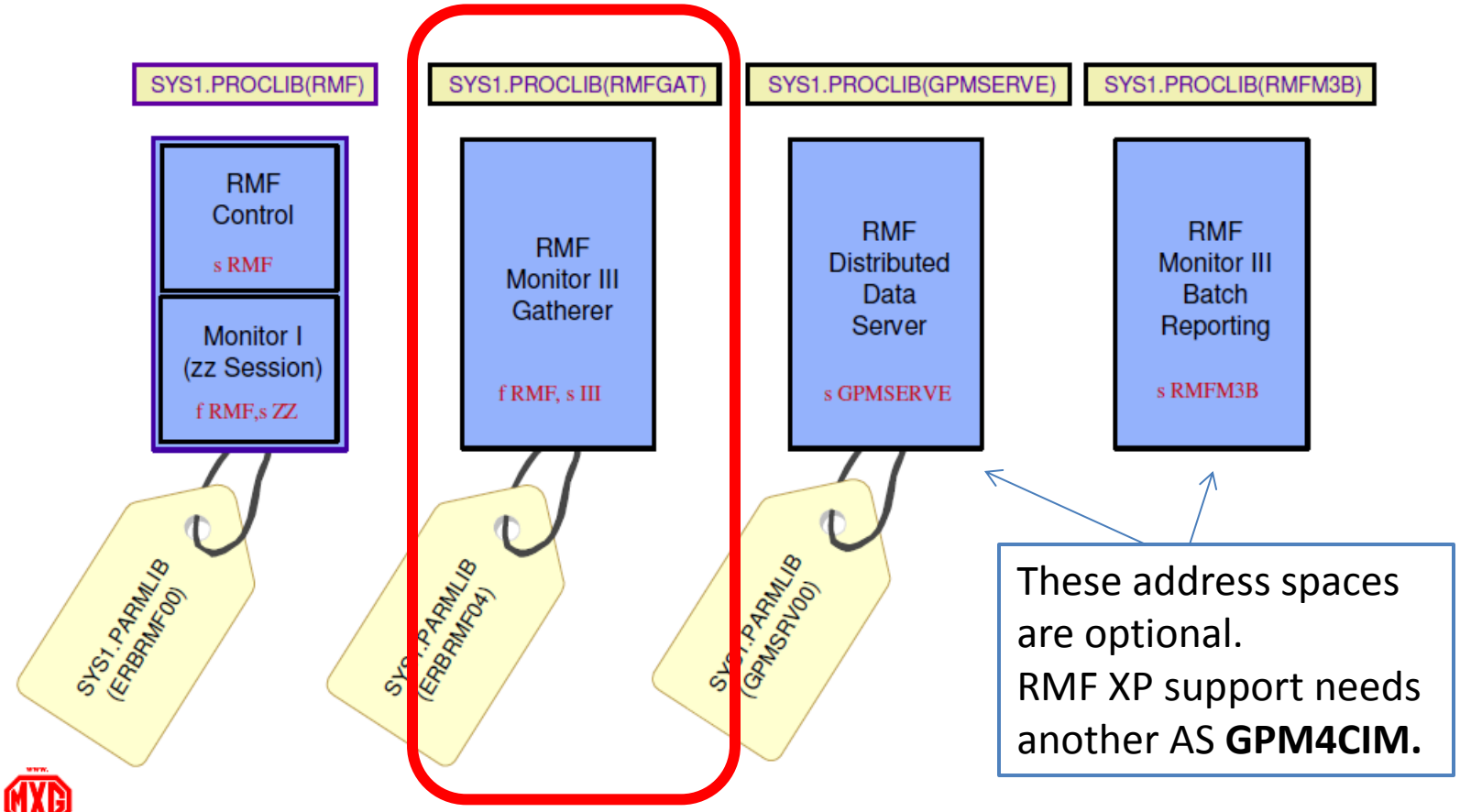
RMF Monitor III Operation Overview *

RMF Address Spaces



* From IBM Presentation ***"RMF Technical Overview"*** (March 2010)

RMF Monitor III Operation Start

- RMF Monitor I must be **START**ed first (with 1 exception)
- Use z/OS **MODIFY** command (abbreviated **F**) to start RMF III. **S** is abbreviation for **START** command.
- Command is: **MODIFY RMF, START III,options**
- Abbreviates to: **F RMF,S III,options**
- Tells RMF Monitor I to start up RMF Monitor III
- **III** is always the RMF III session id
- Invokes **RMFGAT** JCL procedure

Tip: If using an SDSF then prefix command with **'/'** character or use prefix character for equivalent product

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RMF Monitor III Operation
Start Examples

```
S0W1      2012215  14:21:40.95             -F RMF,S III
S0W1      2012215  14:21:41.02  STC04046   ERB115I START RMFGAT MONITOR III SESSION III
S0W1      2012215  14:21:42.13  STC04047   ERB105I III: DATA GATHERER ACTIVE
S0W1      2012215  14:21:42.13  STC04046   ERB100I III: ACTIVE
S0W1      2012215  14:21:42.21  STC04047   ERB425I III: UNABLE TO GATHER RESOURCE HSM
S0W1      2012215  14:21:45.20  STC04047   ERB821I III: 003 OUT OF 003 MONITOR III DATA SET(S) ARE USABLE
S0W1      2012215  14:21:45.20  STC04047   ERB813I III: ACTIVE MONITOR III DATA SET IS NOW 'MXGDEV.RMF.MONIII.SOW1.DS1'
```

Above: Basic Monitor III Start w 3 VSAM files defined & in use, HSM was not active

```
S0W1      2012215  15:10:55.53             -MODIFY RMF,START III,CYCLE(2000),MINTIME(300)
S0W1      2012215  15:10:55.57  STC04046   ERB115I START RMFGAT MONITOR III SESSION III
S0W1      2012215  15:10:56.56  STC04048   ERB105I III: DATA GATHERER ACTIVE
S0W1      2012215  15:10:56.57  STC04046   ERB100I III: ACTIVE
S0W1      2012215  15:10:56.64  STC04048   ERB425I III: UNABLE TO GATHER RESOURCE HSM
S0W1      2012215  15:10:59.64  STC04048   ERB821I III: 003 OUT OF 003 MONITOR III DATA SET(S) ARE USABLE
S0W1      2012215  15:10:59.64  STC04048   ERB813I III: ACTIVE MONITOR III DATA SET IS NOW 'MXGDEV.RMF.MONIII.SOW1.DS1'
```

Above: Start Monitor III with overriding options for **CYCLE** and **MINTIME**

RMF Monitor III Operation
Start Examples (more)

```
S0W1      2012215  15:21:55.80            -F RMF,S III,MEMBER(JU)
S0W1      2012215  15:21:55.81  STC04046   ERB115I START RMFGAT MONITOR III SESSION III
S0W1      2012215  15:21:56.82  STC04051   ERB105I III: DATA GATHERER ACTIVE
S0W1      2012215  15:21:56.82  STC04046   ERB100I III: ACTIVE
S0W1      2012215  15:21:56.91  STC04051   ERB425I III: UNABLE TO GATHER RESOURCE HSM
S0W1      2012215  15:21:59.93  STC04051   ERB821I III: 003 OUT OF 003 MONITOR III DATA SET(S) ARE USABLE
S0W1      2012215  15:21:59.93  STC04051   ERB813I III: ACTIVE MONITOR III DATA SET IS NOW 'MXGDEV.RMF.MONIII.SOW1.DS1'
```

Above: Start Monitor III using **MEMBER ERBRMFJU**
Tip: Must use this format if cloning **ERBRMF04** to your own member

```
S0W1      2012215  15:36:53.92            -f rmf,s iii,mintime(30),cycle(500),member(ju)
S0W1      2012215  15:36:53.95  STC04046   ERB115I START RMFGAT MONITOR III SESSION III
S0W1      2012215  15:36:54.81  STC04054   ERB105I III: DATA GATHERER ACTIVE
S0W1      2012215  15:36:54.81  STC04046   ERB100I III: ACTIVE
S0W1      2012215  15:36:54.89  STC04054   ERB425I III: UNABLE TO GATHER RESOURCE HSM
S0W1      2012215  15:36:57.88  STC04054   ERB821I III: 003 OUT OF 003 MONITOR III DATA SET(S) ARE USABLE
S0W1      2012215  15:36:57.89  STC04054   ERB813I III: ACTIVE MONITOR III DATA SET IS NOW 'MXGDEV.RMF.MONIII.SOW1.DS1'
```

Above: Start Monitor III with **EBRRMFJU MEMBER** and options overrides
Tip: Option overrides may precede or follow **MEMBER** parm

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RMF Monitor III Operation Display

- Use z/OS **MODIFY** command (abbreviated **F**) to contact RMF Monitor I. **D** is abbreviation for **DISPLAY** command for RMF Monitor III.
- Command is: **MODIFY RMF, DISPLAY III**
- Abbreviates to: **F RMF,D III**
- Tells RMF Monitor I to ask RMF Monitor III for display
- **III** is always the RMF III session id

Tip: This is a highly recommended command to verify RMF III option changes or to audit status after an IPL

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RMF Monitor III Operation Display Example

```
S0W1      2012215  15:40:14.20            -F RMF,D III
S0W1      2012215  15:40:14.20  STC04046  ERB305I III: PARAMETERS
S0W1      2012215  15:40:14.20  STC04046  ERB305I III:   NOLOCK  -- MEMBER
S0W1      2012215  15:40:14.20  STC04046  ERB305I III:   SGSPACE(ADD(DBAGSG))  -- MEMBER
S0W1      2012215  15:40:14.20  STC04046  ERB305I III:   SGSPACE(ADD(MXGRSVSG))  -- MEMBER
S0W1      2012215  15:40:14.20  STC04046  ERB305I III:   SGSPACE(ADD(MXGDEVSG))  -- MEMBER
S0W1      2012215  15:40:14.20  STC04046  ERB305I III:   SGSPACE(ADD(SG1))  -- MEMBER
S0W1      2012215  15:40:14.20  STC04046  ERB305I III:   ZFS  -- MEMBER
S0W1      2012215  15:40:14.20  STC04046  ERB305I III:   OPD  -- MEMBER
S0W1      2012215  15:40:14.20  STC04046  ERB305I III:   NOVSAMRLS  -- MEMBER
S0W1      2012215  15:40:14.20  STC04046  ERB305I III:   CACHE  -- MEMBER
S0W1      2012215  15:40:14.20  STC04046  ERB305I III:   CFDETAIL  -- MEMBER
S0W1      2012215  15:40:14.20  STC04046  ERB305I III:   IOSUB  -- MEMBER
S0W1      2012215  15:40:14.20  STC04046  ERB305I III:   WSTOR(32)  -- MEMBER
S0W1      2012215  15:40:14.20  STC04046  ERB305I III:   SYSOUT(A)  -- MEMBER
S0W1      2012215  15:40:14.20  STC04046  ERB305I III:   SYNC(00)  -- MEMBER
S0W1      2012215  15:40:14.20  STC04046  ERB305I III:   NOSTOP  -- MEMBER
S0W1      2012215  15:40:14.20  STC04046  ERB305I III:   RESOURCE(*JES2,JES2)  -- MEMBER
S0W1      2012215  15:40:14.20  STC04046  ERB305I III:   NOOPTIONS  -- MEMBER
S0W1      2012215  15:40:14.20  STC04046  ERB305I III:   DATASET(WHOLD(7))  -- MEMBER
S0W1      2012215  15:40:14.20  STC04046  ERB305I III:   DATASET(NOSWITCH)  -- MEMBER
S0W1      2012215  15:40:14.21  STC04046  ERB305I III:   DATASET(ADD(MXGDEV.RMF.MONIII.SOW1.DS3))  -- MEMBER
S0W1      2012215  15:40:14.21  STC04046  ERB305I III:   DATASET(ADD(MXGDEV.RMF.MONIII.SOW1.DS2))  -- MEMBER
S0W1      2012215  15:40:14.21  STC04046  ERB305I III:   DATASET(ADD(MXGDEV.RMF.MONIII.SOW1.DS1))  -- MEMBER
S0W1      2012215  15:40:14.21  STC04046  ERB305I III:   DATASET(START)  -- MEMBER
S0W1      2012215  15:40:14.21  STC04046  ERB305I III:   MEMBER(JU)  -- COMMAND
S0W1      2012215  15:40:14.21  STC04046  ERB305I III:   CYCLE(500)  -- COMMAND
S0W1      2012215  15:40:14.21  STC04046  ERB305I III:   MINTIME(30)  -- COMMAND
```

Option Sources

COMMAND: START or MODIFY command
DEFAULT: RMF III program default
EXEC: PARM field in RMFGAT EXEC statement
CHANGED: RMF III changed conflicting option, look for related message
MEMBER: Option was from PARMLIB member
REPLY: Option from operator reply to message **ERB306D**

Above: Display Monitor III command shows option overrides from last **START** command example

RMF Monitor III Operation Modify

- Use z/OS **MODIFY** command (abbreviated **F**) to contact RMF Monitor I and RMF Monitor III.
- Command is: **MODIFY RMF, MODIFY III,options**
- Abbreviates to: **F RMF,F III, options**
- Tells RMF Monitor I to send RMF Monitor III modification(s)
- **III** is always the RMF III session id
- If **OPTIONS** in effect, RMF III displays all options and requires **GO** reply to message **ERB306D**
- Otherwise **MODIFY** completes with no operator intervention.

Tip: Most but not all RMF III options can be dynamically modified.
Some exceptions are **WSTOR** and **SYSOUT.**

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RMF Monitor III Operation Modify Examples

```
S0W1      2012215  15:50:50.29            -F RMF,F III,MINTIME(60),CYCLE(1000)
S0W1      2012215  15:50:50.29  STC04046  ERB104I III: MODIFIED
```

Above: Modify Monitor III command with option changes

```
S0W1      2012215  15:51:20.43            -F RMF,D III
S0W1      2012215  15:51:20.43  STC04046  ERB305I III: PARAMETERS
                                                    .
                                                    .
                                                    .
S0W1      2012215  15:51:20.43  STC04046  ERB305I III:   DATASET(ADD(MXGDEV.RMF.MONIII.SOW1.DS3))   -- MEMBER
S0W1      2012215  15:51:20.43  STC04046  ERB305I III:   DATASET(ADD(MXGDEV.RMF.MONIII.SOW1.DS2))   -- MEMBER
S0W1      2012215  15:51:20.43  STC04046  ERB305I III:   DATASET(ADD(MXGDEV.RMF.MONIII.SOW1.DS1))   -- MEMBER
S0W1      2012215  15:51:20.44  STC04046  ERB305I III:   DATASET(START)   -- MEMBER
S0W1      2012215  15:51:20.44  STC04046  ERB305I III:   MEMBER(JU)   -- COMMAND
S0W1      2012215  15:51:20.44  STC04046  ERB305I III:   CYCLE(1000)   -- COMMAND
S0W1      2012215  15:51:20.44  STC04046  ERB305I III:   MINTIME(60)   -- COMMAND
```

Above: Display Monitor III command shows **CYCLE** and **MINTIME** options changed

RMF Monitor III Operation
Modify Examples (more)

```
S0W1      2012215  16:00:49.50            -F rmf,f III,dataset(add(MXGDEV.RMF.MONIII.SOW1.DS4))
S0W1      2012215  16:00:49.50  STC04046   ERB104I III: MODIFIED
```

Above: Modify Monitor III command with **DATASET ADD** (after **ERBVSDEF** define)
Tip: Do not forget to update your **ERBRMFxx** member to add new data set

```
S0W1      2012215  16:02:19.46            -F RMF,D III
S0W1      2012215  16:02:19.46  STC04046   ERB305I III: PARAMETERS
                                                      .
                                                      .
                                                      .
S0W1      2012215  16:02:19.47  STC04046   ERB305I III:   DATASET(ADD(MXGDEV.RMF.MONIII.SOW1.DS4))  -- COMMAND
S0W1      2012215  16:02:19.47  STC04046   ERB305I III:   DATASET(ADD(MXGDEV.RMF.MONIII.SOW1.DS3))  -- MEMBER
S0W1      2012215  16:02:19.47  STC04046   ERB305I III:   DATASET(ADD(MXGDEV.RMF.MONIII.SOW1.DS2))  -- MEMBER
S0W1      2012215  16:02:19.47  STC04046   ERB305I III:   DATASET(ADD(MXGDEV.RMF.MONIII.SOW1.DS1))  -- MEMBER
S0W1      2012215  16:02:19.47  STC04046   ERB305I III:   DATASET(START)  -- MEMBER
S0W1      2012215  16:02:19.47  STC04046   ERB305I III:   MEMBER(JU)  -- COMMAND
S0W1      2012215  16:02:19.47  STC04046   ERB305I III:   CYCLE(1000)  -- COMMAND
S0W1      2012215  16:02:19.47  STC04046   ERB305I III:   MINTIME(60)  -- COMMAND
```

Above: Display Monitor III command shows data set added by **MODIFY** command

RMF Monitor III Operation
Modify with MEMBER(xx)

- Unlike the **START** command separate RMF III options in a **MODIFY** do **NOT** override the **MEMBER** values
- If you specify **MEMBER(xx)** in a **MODIFY**
- And you specify other separate options in addition
- Then any of the same options in the member **OVERRIDE** the separate options
- Example:

F RMF,F III,MINTIME(60),CYCLE(2000),MEMBER(04)

will **NOT** change **MINTIME** or **CYCLE** because **ERBRMF04** contains **MINTIME(100)** and **CYCLE(1000)** and these will be the resulting values

Tip: If you need to change a lot of options at once, clone a temporary member with those options changed and use that member in the **MODIFY**

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RMF Monitor III Operation Stop

- Use z/OS **MODIFY** command (abbreviated **F**) to stop RMF III. **P** is abbreviation for **STOP**.
- Command is: **MODIFY RMF, STOP III**
- Abbreviates to: **F RMF,P III**
- Tells RMF Monitor I to stop RMF Monitor III
- **III** is always the RMF III session id
- Most commonly used when preparing for an IPL usually followed by command to stop RMF Monitor I

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RMF Monitor III Operation
Stop Example

```
S0W1      2012215  16:09:23.19                -F RMF,P III
S0W1      2012215  16:09:24.43  STC04054    ERB803I III: MONITOR III DATA SET SUPPORT TERMINATED
S0W1      2012215  16:09:24.44  STC04046    ERB102I III: TERMINATED
```

Above: Stop Monitor III command

Tip: Message **ERB803I** means you were recording to VSAM data sets but are no longer.

Can also appear if an RMF III Abend occurs. Recording can be lost but RMF III stays up!

RMF Monitor III Operation Utilities

- 3 useful REXX Procedures from IBM for RMF III users:

  ERBVSDEF allocates RMF III data set (discussed)

  ERBV2S creates VSAM to sequential data set copy

  ERBS2V loads sequential data set back to VSAM

- **ERBV2S** is used to send an RMF III data set to IBM or MXG for problem investigation or to transmit a portable copy of RMF III data within your organization
- **ERBS2V** is used to reload a previously sent RMF III data set for analysis

Tip: ERBV2S / ERBS2V is a useful tandem with **Archival Data Sets** feature (discussed later)

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RMF Monitor III Operation Utilities – ERBV2S

- **ERBV2S** (V2S = VSAM to Sequential) has this syntax:

  ERBV2S 'vsam_dsn' 'seq_dsn' TRACKS(num_tracks)

  where:

- **vsam_dsn** is the name of the Monitor III VSAM data set (in single quotes)
- **seq_dsn** is the name of the sequential data set to be created (in single quotes)
- If this parameter is specified as *, **ERBV2S** creates a data set name according to the following rules:
  - The suffix **SEQ** is appended to the input data set name
  - The first qualifier is replaced by the user's dsname prefix
- **num_tracks** is the size of the primary extent of the sequential output data set. It is **optional** and the default is 250 tracks. Any unused space is released after REPRO.

Tip: The default secondary allocation for the output file is also **250 tracks.**

RMF Monitor III Operation Utilities – ERBS2V

- **ERBS2V** (S2V = Sequential to VSAM) has this syntax:

  ERBS2V 'seq_dsn' 'vsam_dsn' VSAMVOL(volume) TRACKS(num_tracks)

  where:

- **seq_dsn** is the name of the sequential input data set that contains unloaded Monitor III VSAM data (in single quotes)
- **vsam_dsn** is the name of the Monitor III VSAM data set to be created (in single quotes)
- **volume** is the name of the volume on which the VSAM data set is to be allocated. The parameter is **optional.** If this parameter is omitted, the VSAM data set is allocated on the same volume as the input sequential data set **seq_dsn.**
- **num_tracks** is the size of the primary extent of the VSAM output data set. This parameter is **optional.** If this parameter is omitted, the allocated space of the sequential input data set **seq_dsn** will be used.

RMF Monitor III Operation Using Archival Files

- RMF III data sets do not have to be from active RMF III sessions to be used for reporting!
- Must pre-allocate **before** RMF III Reporter invoked
- Use this TSO command from ISPF option 6:

  ALLOC FI(RMFDSnn) DA('vsam_dsname') SHR

- Can allocate more than one data set, but first must start with DDNAME **RMFDS00** and continue in ascending sequence with **NO gaps** in the DDNAME numbering
- For example, if you need to allocate 3 data sets, the DDNAMEs would be **RMFDS00, RMFDS01,** and **RMFDS02**
- Maximum is 100 data sets **RMFDS00-RMFDS99**

RMF Monitor III Operation Using Archival Files (more)

Tip: You can pre-allocate only VSAM data sets which do not belong to an active Monitor III Gatherer session

Tip: If you want Sysplex reports you must allocate **ALL** the RMF III data sets from the Sysplex for the same time frame of interest

Tip: You can use either active session files or archival files with RMF III Reporter **but NOT both**. If an **RMFDS00** file is allocated RMF III Reporter will ignore the active session files.

Tip: You do NOT need to start RMF Monitor I when using pre-allocated data sets. You can go right into RMF III Reporter from ISPF. **This is the 1 exception noted earlier.**

Tip: Access of archival RMF III files with an RMF III version that is significantly mismatched with the original RMF III data collector version **may fail** with error messages or even possibly abends

Agenda

- Overview of RMF ✔
- Setup of RMF Monitor III ✔
- Operation of RMF Monitor III ✔
- Design of RMF Monitor III
- Reporting with RMF Monitor III
- MXG Support for RMF Monitor III

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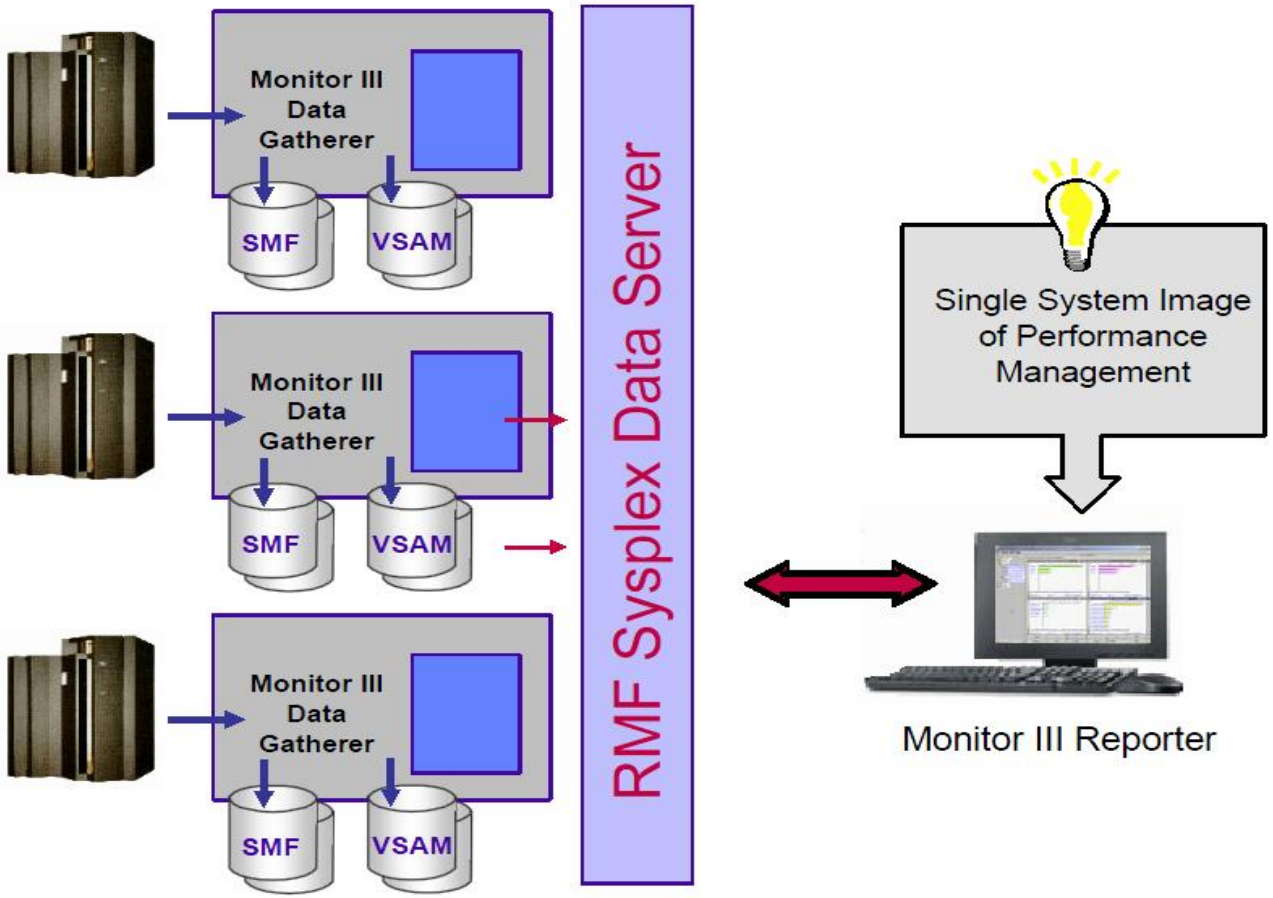
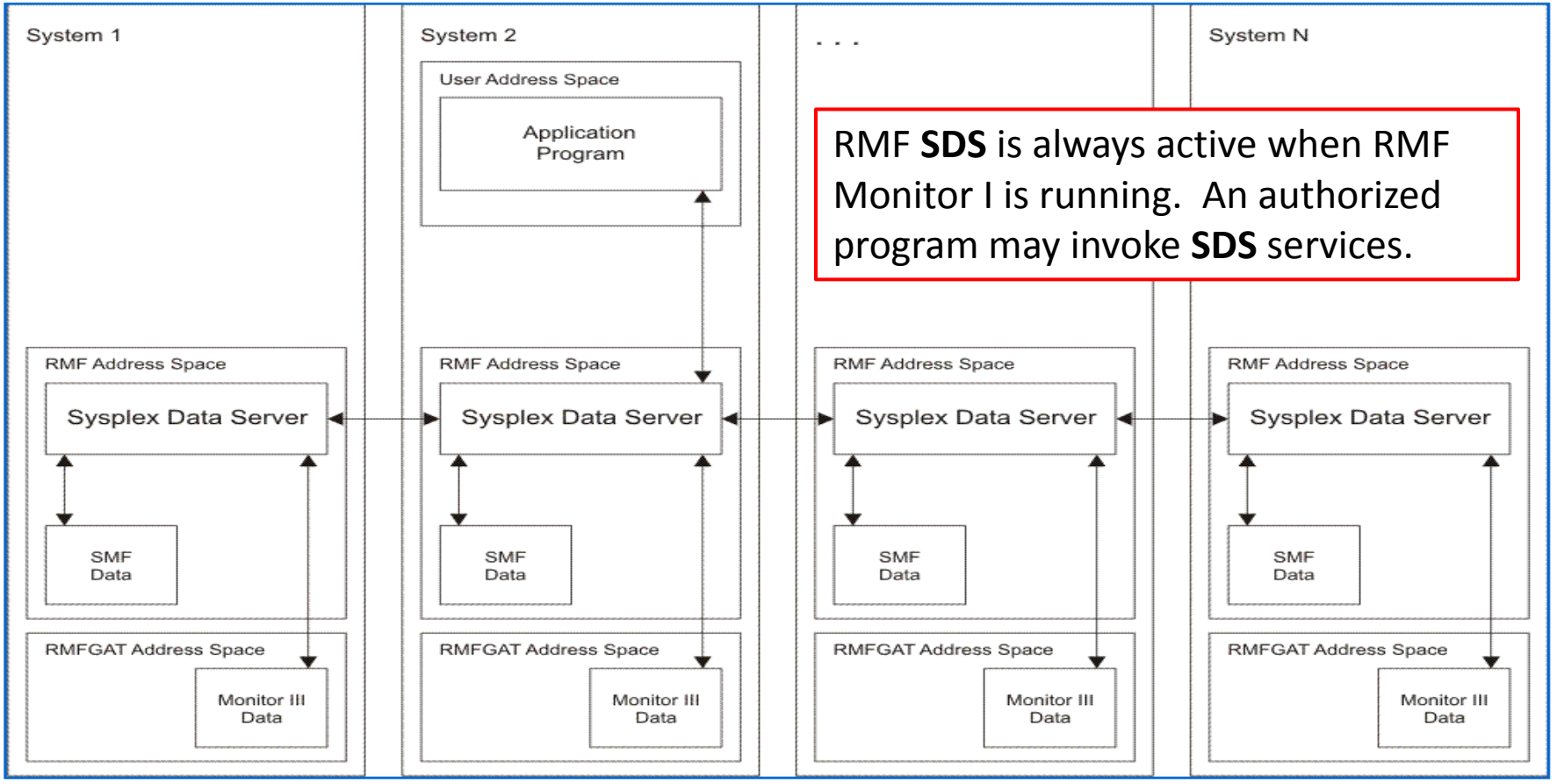
RMF Monitor III Design Topology *



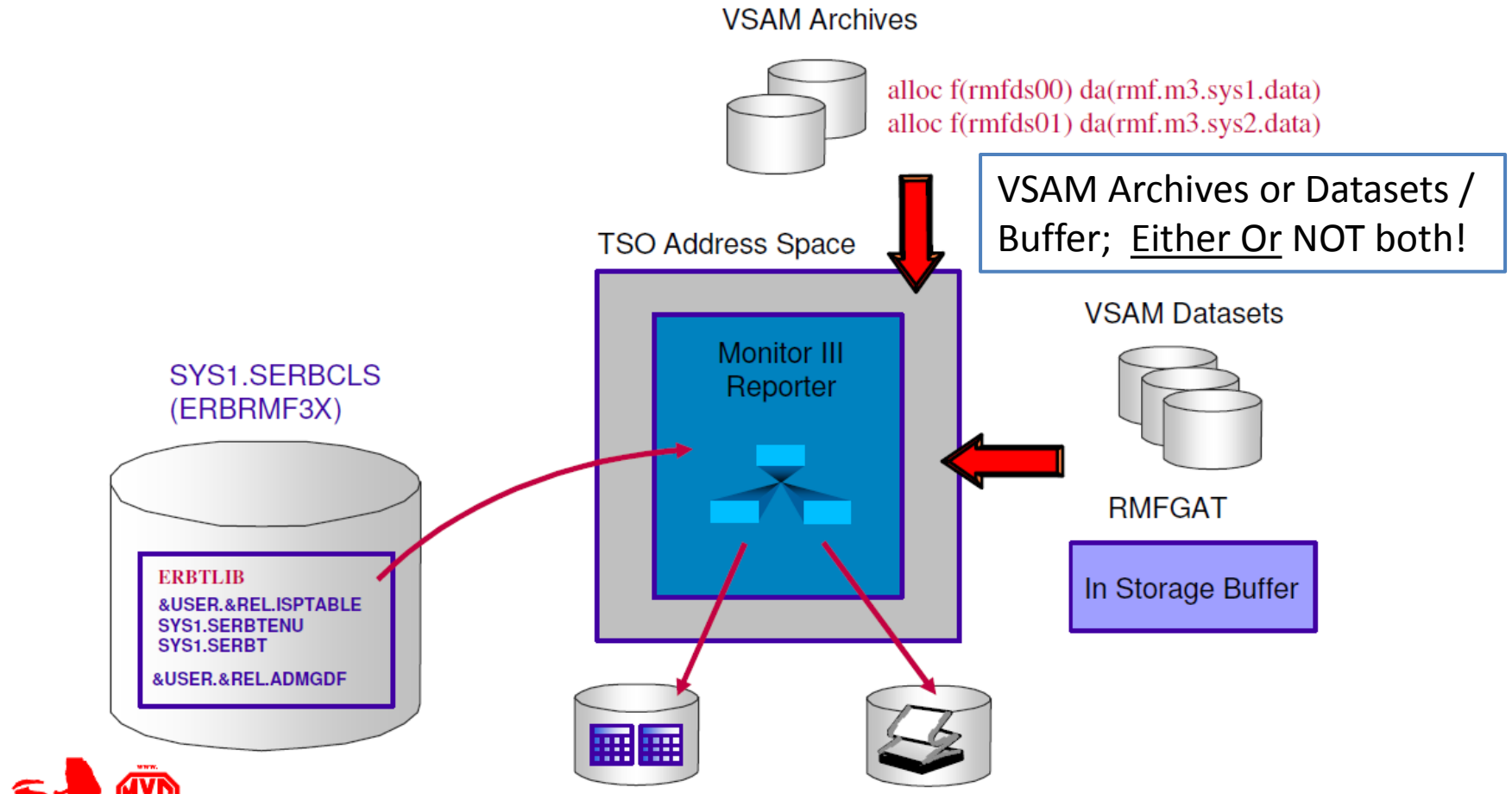
* From IBM Presentation ***"RMF Monitor III – Concepts and Features"*** (January 2004)

RMF Monitor III Design
Sysplex Data Server (SDS) *



* From IBM manual *"z/OS V1R13 RMF User's Guide"* SC33-7990-19 (June 2011)

RMF Monitor III Design
Report Session Overview *



* From IBM Presentation ***"RMF Technical Overview"*** (March 2010)

RMF Monitor III Design
Data Gathering Methods *

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

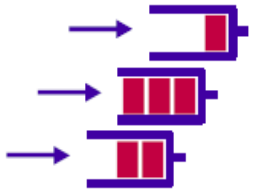
eg. CPU seconds, device connect time...

Interval Gathering

At **MINTIME**

Quality of exact measurement counts is not improved when **CYCLE** is reduced

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



eg. queue counts, frame counts...

Cycle Gathering

At **CYCLE**

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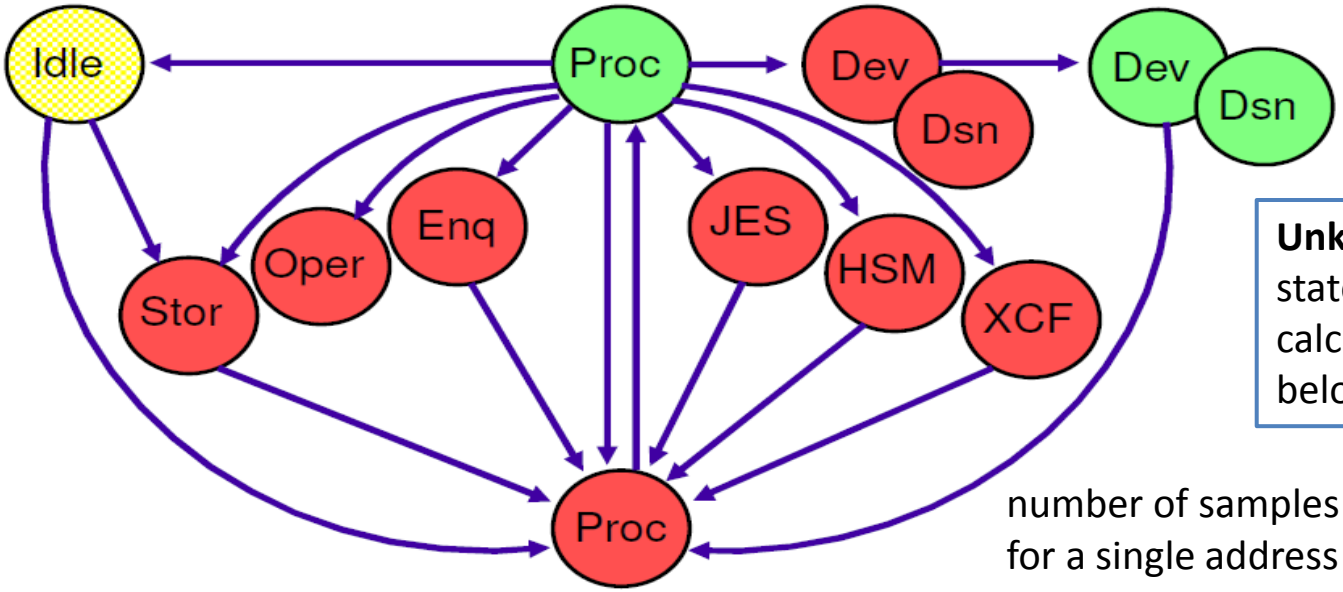
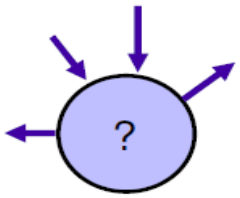
* From IBM Presentation ***"RMF Technical Overview"*** (March 2010)

RMF Monitor III Design
States of a Job *



Unknown / Idle states not part of calculations below

number of samples = **MINTIME / CYCLE** for a single address space



Unknown

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

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

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

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* From IBM Presentation ***"RMF Technical Overview"*** (March 2010)

RMF Monitor III Design
States of a Job – Possible States*

- Possible states for an address space in a sample are:
  - Delayed for:

    Processor, Storage, Device, Enqueue, Operator, JES, HSM, or **XCF** (8 possible states and may be multiple)

  - Using :

    Processor or **Device** (2 possible states and may be both)

  - **Idle** (timer wait or terminal input wait)
  - **Unknown** (e.g. using an unmonitored waiting mechanism)

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* From IBM Presentation ***"RMF Technical Overview"*** (March 2010)

RMF Monitor III Design
States of a Job – Unknown State*

- Since not all address spaces can be sampled at every cycle (per IBM documentation), the remaining states are counted as **Unknown**
- Possible reasons for **Unknown** are:
  - The address space is delayed for unmonitored resource (other than DASD or Tape)
  - The address space is using an unmonitored waiting mechanism (most Started Tasks)
  - Statistical reasons (?)

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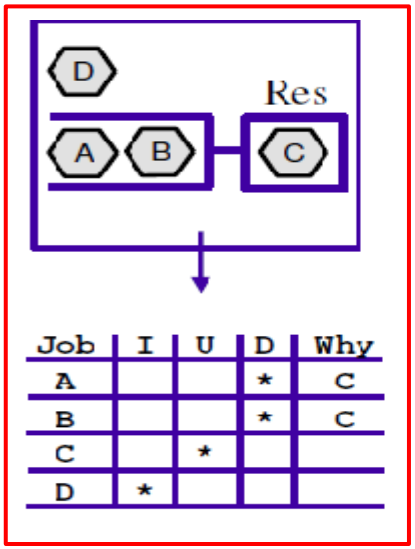
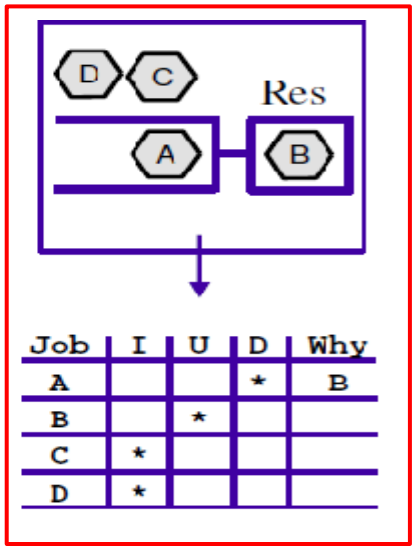
* From IBM Presentation ***"RMF Technical Overview"*** (March 2010)

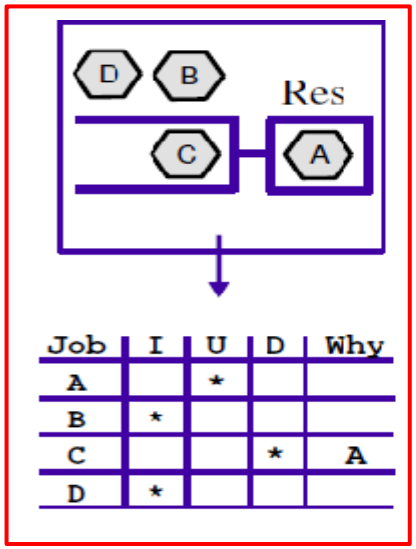
RMF Monitor III Design
Using & Delay Example *



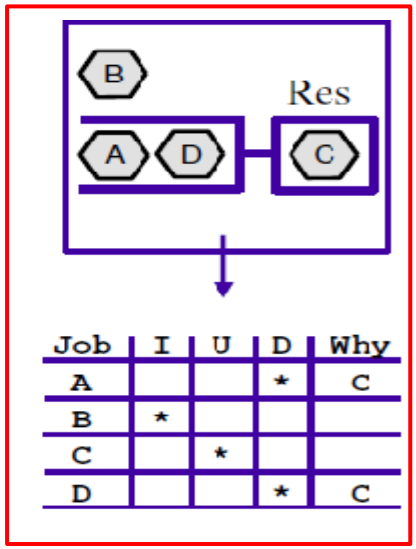
Job	I	U	D	Why
A			*	C
B			*	C
C		*		
D	*			



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

* From IBM Presentation “RMF Technical Overview” (March 2010)

RMF Monitor III Design
Using & Delay Example (more) *

- This example helps to understand what is calculated & reported by RMF Monitor III
- 4 second Range <u>not actually possible</u>, lowest **MINTIME** is 10 seconds
- From the jobs perspective:
  - Job A: 1x Using(25%) 3x Delayed(75%) 0x Idle(0%) Workflow: 1/4 = 25%
  - Job B: 1x Using(25%) 1x Delayed(25%) 2x Idle(50%) Workflow: 1/2 = 50%
  - Job C: 2x Using(50%) 1x Delayed(25%) 1x Idle(25%) Workflow: 2/3 = 66%
  - Job D: 0x Using(0%) 1x Delayed(25%) 3x Idle(75%) Workflow: 0/1 = 0%
- From the resource perspective:
  - 4x using, 6x delay

    Workflow = 4/10 = 40 %

    Average Delayed User (ADU): 6/4 = 1.5

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* From IBM Presentation ***"RMF Technical Overview"*** (March 2010)

RMF Monitor III Design
Using Samples - Details *

- The use of a certain resource by an address space can vary from **0% to 100%:**
  - **0%** indicates no use of the resource during the report interval
  - **100%** indicates that the address space was found using the resource in every sample during that period
- In calculating **Using**, Monitor III counts an address space as using a resource even if the address space is also delayed for the **identical resource**
- For example, if a job has 4 ready tasks in its address space, and 1 task is using the processor while 3 tasks are simultaneously delayed for the processor, Monitor III considers this address space to have a **Using count of 1 and a Delay count of 1**
- **PROC** and **DEV Using** can add up to more than the overall **Using** percentage, with the **maximum being 200 %**

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* From IBM manual ***"z/OS V1R13.0 RMF Report Analysis"*** SC33-7991-19 (June 2011)

RMF Monitor III Design
Using Samples – Details (more) *

- Using Samples **PROC**:
  - The number of address spaces found using 1 or more processors (which can be standard CPs (aka general purpose processors) or special purpose processors)
  - If the **processor running Monitor III** has other ready work to do (any ready SRB, interrupted ready task, asynchronous exit routine, or TCB is on the dispatching queue), then it looks for the first address space having a unit of work on the dispatching queue that is not already using another processor
  - Then the number of samples is incremented by 1 for the address space having the first dispatchable unit of work according to the dispatcher sequence search order
  - The processor running Monitor III is not counted as a processor in use if there is no other ready work to do

* From IBM manual ***"z/OS V1R13.0 RMF Report Analysis"*** SC33-7991-19 (June 2011)

RMF Monitor III Design
Using Samples – Details (more)*

- Using Samples **DEV:**
  - The number of address spaces found using 1 or more devices
  - An address space is considered using 1 or more devices when it issues an I/O request
  - However, because the channel subsystem accepts an I/O request whether the device, control unit or both are busy or not, the requests might or might not be delayed (queued) in the channel
  - Therefore, the **Using** requestors for devices might also contain an unknown amount of delay. Consider this delay when interpreting the **Workflow** value.

Tip: In other words, even with a **Workflow** of **100%** a device could still be having delays within the I/O subsystem itself

* From IBM manual ***"z/OS V1R13.0 RMF Report Analysis"*** SC33-7991-19 (June 2011)

RMF Monitor III Design
Delay Samples – Details *

- Delay Samples **PROC**:
  - The number of address spaces found waiting for a processor (which can be general purpose or special purpose processors)
  - An address space is considered waiting for a processor when the address space has at least 1 ready unit of work that is not dispatched
  - Primary source fields referenced in this calculation are the same as those used for **PROC Using** samples

* From IBM manual ***"z/OS V1R13.0 RMF Report Analysis"*** SC33-7991-19 (June 2011)

RMF Monitor III Design
Delay Samples – Details (more) *

- Delay Samples **DEV**:
  - The number of address spaces found waiting for a measured device
  - An address space is considered to be waiting for a measured device when at least 1 queue element in the I/O queue for the device identifies the address space as the issuer of the I/O request but the request is not active
  - I/O requests queued in the channel for devices are considered to be using the device, and therefore an unknown amount of delay is missing from the delayed requestor count for devices

* From IBM manual ***"z/OS V1R13.0 RMF Report Analysis"*** SC33-7991-19 (June 2011)

RMF Monitor III Design
Delay Samples – Details (more) *

- Delay Samples **ENQ**:
  - The number of address spaces found waiting for serially reusable resource
- Delay Samples **HSM**:
  - The number of address spaces found waiting for an HSM service
- Delay Sample **JES**:
  - The number of address spaces found waiting for a JES service (JES2 or JES3)
- Delay Samples **OPR:**
  - The number of address spaces found waiting for operator interventions

* From IBM manual ***"z/OS V1R13.0 RMF Report Analysis"*** SC33-7991-19 (June 2011)

RMF Monitor III Design
Delay Samples – Details (more) *

- Delay Samples **STR**:
  - The number of address spaces found waiting for storage operations
- Delay Samples **XCF:**
  - The number of address spaces found waiting for an XCF path

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* From IBM manual ***"z/OS V1R13.0 RMF Report Analysis"*** SC33-7991-19 (June 2011)

RMF Monitor III Design
Workflow Details *

- The **Workflow** of an address space represents how a job uses system resources & the speed at which the job moves through the system in relation to the maximum average speed at which the job could move through the system
- The speed at which the system performs the work of 1 job depends on the simultaneous work requested by other jobs
- A value from **0%** to **100%** indicates the workflow within the report interval
- A low **Workflow** value indicates that a job has few of the resources it needs and is contending with other jobs for system resources
- A high **Workflow** value indicates that a job has all the resources it needs to execute, & that it is moving through the system at a relatively high speed

Tip: A low **Workflow** might be perfectly acceptable and expected for Discretionary or low Importance work

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* From IBM manual ***"z/OS V1R13.0 RMF Report Analysis"*** SC33-7991-19 (June 2011)

RMF Monitor III Design
Workflow Details (more) *

- For example, a job that would take 4 minutes to execute if all the resources it needed were available, would have a workflow of 25% if it took 16 minutes to execute
- The following formula defines the **Workflow** of a **single** address space:

Single Address Space

$$\text{Workflow (\%)} = \frac{\text{\# Using Samples}}{\text{\# Using Samples + \# Delay Samples}} * 100$$

- A job can be using 1 resource & delayed for another at the same sample, or delayed for more than 1 resource at a time, or using more than 1 resource

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* From IBM manual ***"z/OS V1R13.0 RMF Report Analysis"*** SC33-7991-19 (June 2011)

RMF Monitor III Design
Workflow Details (more) *

- The maximum counts per sample for one address space is:

  2 **Usings** (PROC and DEV) and 8 **Delays** (1 for each resource)

Example

A job was found to be delayed or productive 75 times. The job was found to be using the processor 5 times and a device 10 times. The job was also found delayed for the processor 15 times, for a device 20 times and for an enqueued resource 25 times. The Workflow (%) of the job would be:

$$\text{Workflow (\%)} = \frac{5 + 10}{(5 + 10) + (15 + 20 + 25)} * 100 = 20\%$$

* From IBM manual ***"z/OS V1R13.0 RMF Report Analysis"*** SC33-7991-19 (June 2011)

RMF Monitor III Design
Workflow Details (more) *

- The following formula defines the workflow of a ***group*** of address spaces
- The sums represent the values for all address spaces in the group

The following formula defines the workflow of a *group* of address spaces:

Group of Address Spaces

$$\text{Workflow (\%)} = \frac{\text{\&sum. Using Samples}}{\text{\&sum. Using Samples + \&sum. Delay Samples}} * 100$$

Note: The sums represent the values for all address spaces in the group.

* From IBM manual ***"z/OS V1R13.0 RMF Report Analysis"*** SC33-7991-19 (June 2011)

RMF Monitor III Design
Execution Velocity Details *

- The **Execution Velocity** is a measure of how fast work is running compared to ideal conditions without delays
- The formula is:

Execution Velocity

$$\text{Execution Velocity (\%)} = \frac{\text{\# Using samples}}{\text{\# Using Samples + \# Delay Samples}} * 100$$

- Looks and sounds the same as the formula for Workflow!
- Do not confuse these two similar measures

* From IBM manual *"z/OS V1R13.0 RMF Report Analysis"* SC33-7991-19 (June 2011)

RMF Monitor III Design
Execution Velocity Details (more) *

- Although the formula for **Execution Velocity** & **Workflow** are similar, the resulting value is calculated in a slightly different way
- For the **Execution Velocity** calculation, only processor, storage, and DASD device delays are considered
- These are the resources which are under control of WLM
- The **Workflow** calculation reflects all system components (for example, tape activities or delays caused by tape mounts or HSM)
- This can lead to having different numbers for these fields in the report for the same address spaces
- **Execution Velocity** can be used to define a goal to WLM, but NOT **Workflow**

* From IBM Redbook **"Effective zSeries Performance Monitoring Using Resource Measurement Facility"** SG24-6645-00 (April 2005)

RMF Monitor III Design
Indexes

- Sizing an RMF III data set correctly is a balancing act between exhausting sample indexes and disk space
- An incorrectly sized RMF III VSAM file will not damage RMF III data or z/OS functionality
- But inefficiency due to unused disk space or extra CPU overhead can result
- VSAM RRDS are NOT indexed
  (as supported by the access method)
- Yet RMF III does use indexing in its internal design

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RMF Monitor III Design
Indexes (more) *

- The Data Set Header (**DSH**) table (formally documented as the **ERBDSIG3** table) is the first record in every RMF III VSAM data set
- The data for each **MINTIME** set of samples will usually span multiple physical records because the sample data can easily exceed the 32752 byte logical record length for a busy LPAR
- In the example below, the RMF III sample set data for **MINTIME** 2 starts in physical record 3 and continues into physical record 4

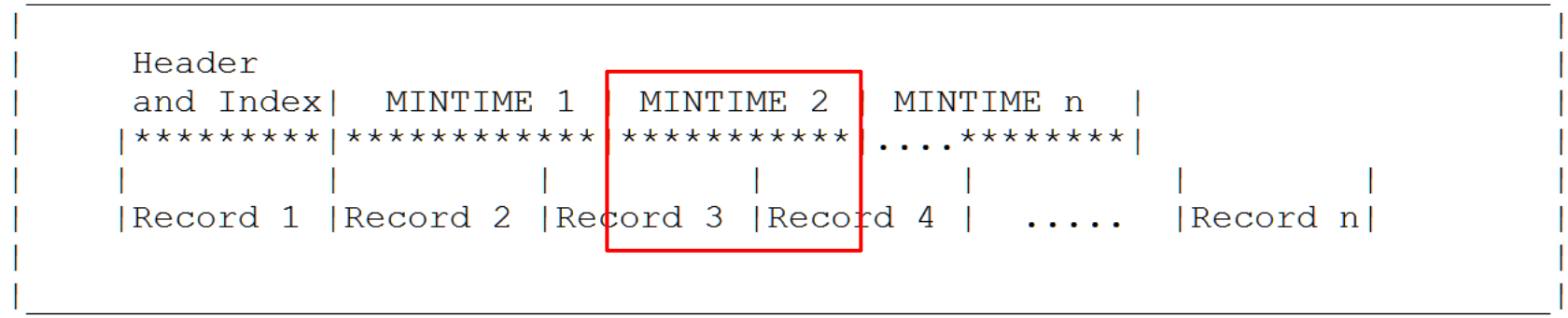

Figure 53. Monitor III Data Set Record

* Figure 53 from *"z/OS V1R13.0 RMF Programmer's Guide"* SC33-7994-14 (June 2011)

RMF Monitor III Design
Indexes (more)

- **Q:** Why even care about index details of RMF Monitor III?
- **A:** Because this design impacts efficient sizing of your RMF III VSAM data sets
- There are only so many indexes that fit into a **DSH** record
- RMF III does **NOT** add more indexes for larger data sets
  or reduce them for smaller data sets
- There is always only one **DSH** table (1 record) per RMF III VSAM data set
- There is always only a fixed number of indexes available for each RMF III data set no matter how small or how large
- But the amount of data in each **MINTIME** interval sample set can vary greatly for each LPAR and even by time of day within LPAR

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RMF Monitor III Design
Indexes (more)

- **Q:** But why does RMF III need indexes in the first place?
- **A:** So the RMF III Reporter can locate where the data for each **MINTIME** set of samples starts
- **Q:** How does that work?
- **A:** Each **MINTIME** interval has its own index
- Each 28 byte index entry contains:
  - the time stamp for the start of the **MINTIME** interval
  - the byte offset from the start of the RMF III data set to where that **MINTIME** interval sample set begins

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RMF Monitor III Design
Indexes (more)

- **Q:** So how many indexes are there?
- Recall that the **AVGLRECL** and **MAXLRECL** for these files is **32,752** as created by **ERBVSDEF**
- The **DSH** itself has an internal header that takes up **256 bytes**
- That leaves **32,752 – 256 = 32,496** bytes left for indexes
- RMF III saves your current WLM Service Policy after VSAM open and also when a Service Policy changes in the **ERBSVPG3** (aka SVP) table
- Each Policy change uses another Policy Index

RMF Monitor III Design
Indexes (more)

- **50 policy indexes** are always reserved for the WLM Service Policy table to locate the current active SVP data when reporting from an RMF III data set
- An index whether for a service policy or a sample set is 28 bytes in length
- So **50 policy indexes x 28 bytes per index = 1,400 bytes** reserved for Service Policy indexes
- So the amount of space left for sample set indexes is:
  32,496 – 1,400 = 31,096 bytes
- Divide those remaining bytes by 28 bytes per index, then we have:
  31,096 bytes / 28 bytes per index = 1,110 (dropping fractional remainder)
- **A:** So there are always and only **1110 sample set indexes** for each RMF III data set

RMF Monitor III Design
Indexes (more)

- **Q:** So how does this affect my RMF III VSAM data set space allocation?
- **Situation 1: Run out of sample set indexes before disk space in the file.** The rest of the file is dead space that RMF III cannot use. It must close the file and open the next file to continue recording (less common).
- **Situation 2: Run out of disk space before sample set indexes.** RMF III must again close the file and open the next. This is an unnecessary increase in CPU overhead for Close / Open if a lot of indexes still remain unused (more common).
- Ideally, you want to run out of disk space and indexes for an RMF III data set about the same time

RMF Monitor III Design
Index Time Capacity by MINTIME

- Assuming continuous RMF III recording with a constant **MINTIME** option following is the amount of time that can be covered in a data set before the 1110 sample indexes are exhausted:

MINTIME Default

MINTIME (Secs)	**10**	**20**	**30**	**60**	**90**	**100**	**120**	**180**	**300**
TIME SPAN (Hrs)	3.08	6.17	9.25	18.50	27.75	30.83	37.00	55.50	92.50

- Smaller **MINTIME**s not only raise RMF III CPU overhead for more frequent output, but require more data sets (and so more disk space) to span an equivalent period such as a few days
- But while larger **MINTIME**s conserve disk space, they make the interval data more coarse and less useful to pinpoint a performance or usage issue, so the choice of **MINTIME** is a compromise

RMF Monitor III Design
Index Time Capacity Examples

- Example 1: If you wanted to span 4 days (96 hours) to include Friday – Monday over a weekend with **MINTIME(60)** you will need at least **96 / 18.50 = 5.2** RMF III data sets (round up to 6) just because of index usage

MINTIME default

MINTIME (Secs)	**10**	**20**	**30**	**60**	**90**	**100**	**120**	**180**	**300**
TIME SPAN (Hrs)	3.08	6.17	9.25	18.50	27.75	30.83	37.00	55.50	92.50

- Example 2: To span the same 4 days (96 hours) with **MINTIME(30)** you will need at least **96 / 9.25 = 10.4** RMF III data sets (round up to 11) just because of index usage

- Example 3: To span the same 4 days (96 hours) with **MINTIME(100)** you will need at least **96 / 30.83 = 3.1** RMF III data sets (round up to 4) just because of index usage

- Formula is: (**MINTIME** secs * 1110) / 3600 secs/hour = Time Span in Hours

- These examples only consider index usage NOT disk space required and also assume **DATASET(NOSWITCH)** is in effect

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RMF Monitor III Design
Maximum Index Time Capacity by MINTIME

- Assuming continuous RMF III recording with a constant **MINTIME** option following is the amount of time that can be covered before the 1110 sample indexes are exhausted with the maximum 100 data sets per LPAR active:

MINTIME default

MINTIME (Secs)	**10**	**20**	**30**	**60**	**90**	**100**	**120**	**180**	**300**
TIME SPAN (Hrs)	308	616	925	1850	2775	3083	3700	5550	9250
TIME SPAN (Wks)	1.83	3.67	5.51	11.01	16.52	18.35	22.02	33.03	55.06

- **Conclusion:** The fixed number of RMF III indexes in one data set should not be a constraint for most installations as long as they can afford the disk space to span the recording time desired

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RMF Monitor III Design
File Sizing

- **Q:** But how much space do I need for each file?
- **A:** It is very difficult to estimate in advance because of the variety of RMF III options and workload variability in address spaces, enclaves, devices, enqueues, processors, and so on in any LPAR that all affect **MINTIME** sample set sizes
- So one approach is to check on the current status of your RMF files and increase or decrease size as needed based on actual use of indexes and disk space
- There are 2 methods (at least) for this feedback style determination:
  - Method 1: Use the RMF III Reporter **DSINDEX** Sysplex report
  - Method 2: Run the **ASMRMFV** MXG utility program with **SIZE** option

RMF Monitor III Design
File Sizing – Method 1 *

- This method assumes a constant **MINTIME** value for each RMF III data set and that **DATASET(NOSWITCH)** is in effect
- **Method 1** steps:
  1. Enter **S** from the RMF III Primary Menu for Sysplex reports
  2. From the Sysplex Primary Menu Enter **D** for **DSINDEX** Report
  3. Find the time spanned in seconds for each non-active RMF III data set
  4. Divide the time span by the **MINTIME** value to get the number of indexes used
  5. If the result is a lot less than 1110, the data set is too small resulting in too frequent data set switches
  6. If the result is 90-98% of 1110, the data set is optimally sized
  7. If the result is near or exactly 1110, the data set is probably too large and there is likely disk "**Dead Space"**

* This technique is from IBM ***"Effective zSeries Performance Monitoring Using Resource Measurement Facility"*** Redbook SG24-6645-00 (April 2005)

RMF Monitor III Design
File Sizing – Method 1 Example

```
                        RMF V1R13  Data Index - SVSCPLEX          Line 1 of 8
Command ===> _                                                 Scroll ===> PAGE

Samples: 60      System: SOW1  Date: 08/06/12  Time: 11.33.00  Range: 60    Sec

        ----Begin/End----
System --Date-- --Time-- -DDNAME- ---------------Data Set Name---------------

SOW1   08/06/12 05.29.00 SYS00091 MXGDEV.RMF.MONIII.SOW1.DS1
                07.36.00
SOW1   08/06/12 07.36.00 SYS00089 MXGDEV.RMF.MONIII.SOW1.DS3
                09.43.00
SOW1   08/06/12 09.43.00 SYS00092 MXGDEV.RMF.MONIII.SOW1.DS2
                11.36.00             * * *      Currently active      * * *
SOW1   08/06/12 09.27.00
                11.36.00             * * *      In-storage buffer     * * *
```

Data set **MXGDEV.RMF.MONIII.SOW1.DS1** spans 127 minutes from 05:29 to 07:36. With **MINTIME(60)** this means 127 sample indexes were used and that is way less than 1110.
This data set could be enlarged by **(1110 – 127) / 1110** or 88% !!

RMF Monitor III Design
File Sizing – Method 1 Drawbacks

- Method 1 works but:
  - Requires **DATASET(NOSWITCH)** for best accuracy
  - Is manual & could be a lot of effort for large installations with many RMF III data sets
  - The calculation of the time span covered divided by **MINTIME** is error prone (time differential must be converted to seconds)
  - You need to know what **MINTIME** value was in effect for each data set (a problem if changed often)
  - Not easy to repeat in the future and there could be more RMF III data sets

RMF Monitor III Design
File Sizing – Method 2

- **Method 2** steps (assumes license of MXG and IBM HLASM):
  1. Assemble & link-edit the **ASMRMFV** utility program into an MXG Load Library (one time effort for each MXG release)
  2. Set up JCL and run **ASMRMFV** with the **PARM=SIZE** option with Clist or Direct JCL methods (explained later)
  3. Output shows the sample indexes used and percentage used for each RMF III data set
  4. Output shows the disk space used and percentage used for each RMF III data set
  5. Rerun any time to check index and space usage – no MXG PDB build required

Tip: Need MXG V30.08 or higher to use ASMRMFV **PARM=SIZE**

RMF Monitor III Design
File Sizing – Method 2 Example 1

- Assume 3 RMF III Monitor VSAM data sets of interest:

  MXGDEV.RMF.MONIII.SOW1.DS1,

  MXGDEV.RMF.MONIII.SOW1.DS2,

  MXGDEV.RMF.MONIII.SOW1.DS3

- Example JCL to run **ASMRMFV** with Direct JCL method:

```
//MYJOB    JOB ….
//REPORT   EXEC PGM=ASMRMFV,PARM=SIZE
//STEPLIB   DD  DISP=SHR,DSN=MXG.V3102.LOADLIB
//SYSPRINT DD   SYSOUT=*
//RMFV0001 DD   DISP=SHR,DSN=MXGDEV.RMF.MONIII.SOW1.DS1
//RMFV0002 DD   DISP=SHR,DSN=MXGDEV.RMF.MONIII.SOW1.DS2
//RMFV0003 DD   DISP=SHR,DSN=MXGDEV.RMF.MONIII.SOW1.DS3
```

Tip: DDNAMEs for RMF III VSAM data sets just have to begin with **RMFV** with any allowed DDNAME characters following

RMF Monitor III Design
File Sizing – Method 2 Example 1 (more)

```
RMFV008I  INPUT   :  DDNAME=RMFV0001   DSNAME=MXGDEV.RMF.MONIII.SOW1.DS1              1ST VOL=MXG014
RMFV009I  ORIGIN  :  SYSPLEX=SVSCPLEX  SYSID=SOW1
RMFV028I  INDEXES :  SAMPLE:  USED=   33  MAX= 1110  PCT=   2.97%  LIMIT= 100.00% / POLICY:  USED=  1  MAX= 50  PCT=   2.00%
RMFV030I  SPACE EF:  HARBA=             7,208,960  HURBA=             2,162,688  AVAIL=             5,046,272
RMFV031I  SPACE EF:  USED  :  PCT=  30.00% / AVAIL :  PCT=  70.00%
```

- **MXGDEV.RMF.MONIII.SOW1.DS1** was active so 70% of disk space is available (RMFV031I) and only 33 indexes or about 3% are used (RMFV028I)
- Can only deduce as active by pure inspection if using **DATASET(NOSWITCH)** and know that RMF III is currently active on the LPAR
- Otherwise just use **DSINDEX** command to verify active data set(s)

Tip: Need MXG V30.08 or higher to use ASMRMFV **PARM=SIZE**

RMF Monitor III Design
File Sizing – Method 2 Example 1 (more)

```
RMFV008I  INPUT   :  DDNAME=RMFV0002   DSNAME=MXGDEV.RMF.MONIII.SOW1.DS2              1ST VOL=MXG014
RMFV009I  ORIGIN  :  SYSPLEX=SVSCPLEX  SYSID=SOW1
RMFV028I  INDEXES :  SAMPLE:  USED=  127  MAX= 1110  PCT=  11.44%  LIMIT= 100.00% / POLICY:  USED=  1  MAX= 50  PCT=   2.00%
RMFV030I  SPACE EF:  HARBA=              7,208,960  HURBA=              7,208,960  AVAIL=                    0
RMFV031I  SPACE EF:  USED  :  PCT= 100.00% / AVAIL :  PCT=   0.00%
```

```
RMFV008I  INPUT   :  DDNAME=RMFV0003   DSNAME=MXGDEV.RMF.MONIII.SOW1.DS3              1ST VOL=MXG014
RMFV009I  ORIGIN  :  SYSPLEX=SVSCPLEX  SYSID=SOW1
RMFV028I  INDEXES :  SAMPLE:  USED=  127  MAX= 1110  PCT=  11.44%  LIMIT= 100.00% / POLICY:  USED=  1  MAX= 50  PCT=   2.00%
RMFV030I  SPACE EF:  HARBA=              7,208,960  HURBA=              7,208,960  AVAIL=                    0
RMFV031I  SPACE EF:  USED  :  PCT= 100.00% / AVAIL :  PCT=   0.00%
```

Above are excerpted lines of **ASMRMFV** output

RMF Monitor III Design
File Sizing – Method 2 Example 1 (more)

- **MXGDEV.RMF.MONIII.SOW1.DS2** and **MXGDEV.RMF.MONIII.SOW1.DS3**

  have used all available disk space, but each only used 127 or **11.44%** of 1110 maximum sample indexes (RMFV031I)
- So in this situation <u>disk space is the limiting factor</u>
- The data set allocation could be increased by about 88% for better index use and less frequent data set switching
- **Example:** If these data sets were 10 cylinders (150 tracks), then divide 150 tracks / **.1144** = 1311 tracks (rounded down) or 87 cylinders for a new more efficient data set size allocation

RMF Monitor III Design
File Sizing – Method 2 Example 2

```
RMFV008I  INPUT  : DDNAME=RMFV0001  DSNAME=MXGDEV.RMF.MONIII.TEMPSF.DS01          1ST VOL=MXG002
RMFV009I  ORIGIN : SYSPLEX=PRDPLEX  SYSID=PRD3
RMFV028I  INDEXES : SAMPLE: USED= 1110  MAX= 1110  PCT= 100.00% LIMIT= 100.00% / POLICY: USED=  1 MAX= 50 PCT=  2.00%
RMFV029W **WARNING: DDNAME=RMFV0001  DSNAME=MXGDEV.RMF.MONIII.TEMPSF.DS01          HAS POSSIBLE DEAD SPACE**
RMFV030I  SPACE EF: HARBA=         1,153,433,600  HURBA=         779,288,576 AVAIL=         374,145,024
RMFV031I  SPACE EF: USED  : PCT=  67.56% / AVAIL : PCT=  32.44%
```

Excerpted lines of **ASMRMFV** output

Sample Set Indexes are exhausted!

350+ MB of dead space are wasted

RMF Monitor III Design
File Sizing – Method 2 Example 2

- All 1110 sample indexes have been exhausted (RMFV028I), but the only **67.56%** of the very large RMF III data set space has actually been used. **32.44%** remains available and is wasted (RMFV031I).
- **ASMRMFV** warning message **RMFV029W** indicates a likely **DEAD SPACE** condition exists (and issues Return Code =4)
- So in this situation sample set indexes are the limiting factor
- The disk allocation could be reduced by about 32% to eliminate the unusable space and reclaim about 356 MB

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RMF Monitor III Design
File Sizing – Method 2 Drawbacks

- **Method 2** works but:
  - Requires installation of **ASMRMFV** utility
  - Need setup of **ASMRMFV** run JCL to examine all VSAM RMF III data sets of interest
  - Still need to review output
- However, once this job is setup it is easy to repeat in the future even if more VSAM files are added. Only need to add more DD statements.
- **ASMRMFV** is required anyway to build an RMF III PDB

RMF Monitor III Design
File Sizing – Last Words

Tip: Large active LPARs are good candidates for large RMF III VSAM data sets because each **MINTIME** sample set contains a lot of data. These tend to fill the data set before exhausting indexes.

Tip: Small "sandbox" LPARs should **NOT** use large RMF III VSAM sets because each small **MINTIME** sample set will still use an index, but relatively little disk space. These tend to exhaust the indexes before filling the data set.

Tip: From an efficiency viewpoint for large active LPARs usually you are better off with fewer larger RMF III files than a lot of smaller ones

Agenda

- Overview of RMF ✔
- Setup of RMF Monitor III ✔
- Operation of RMF Monitor III ✔
- Design of RMF Monitor III ✔
- Reporting with RMF Monitor III
- MXG Support for RMF Monitor III

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RMF Monitor III Reporter Reports & Features*

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

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

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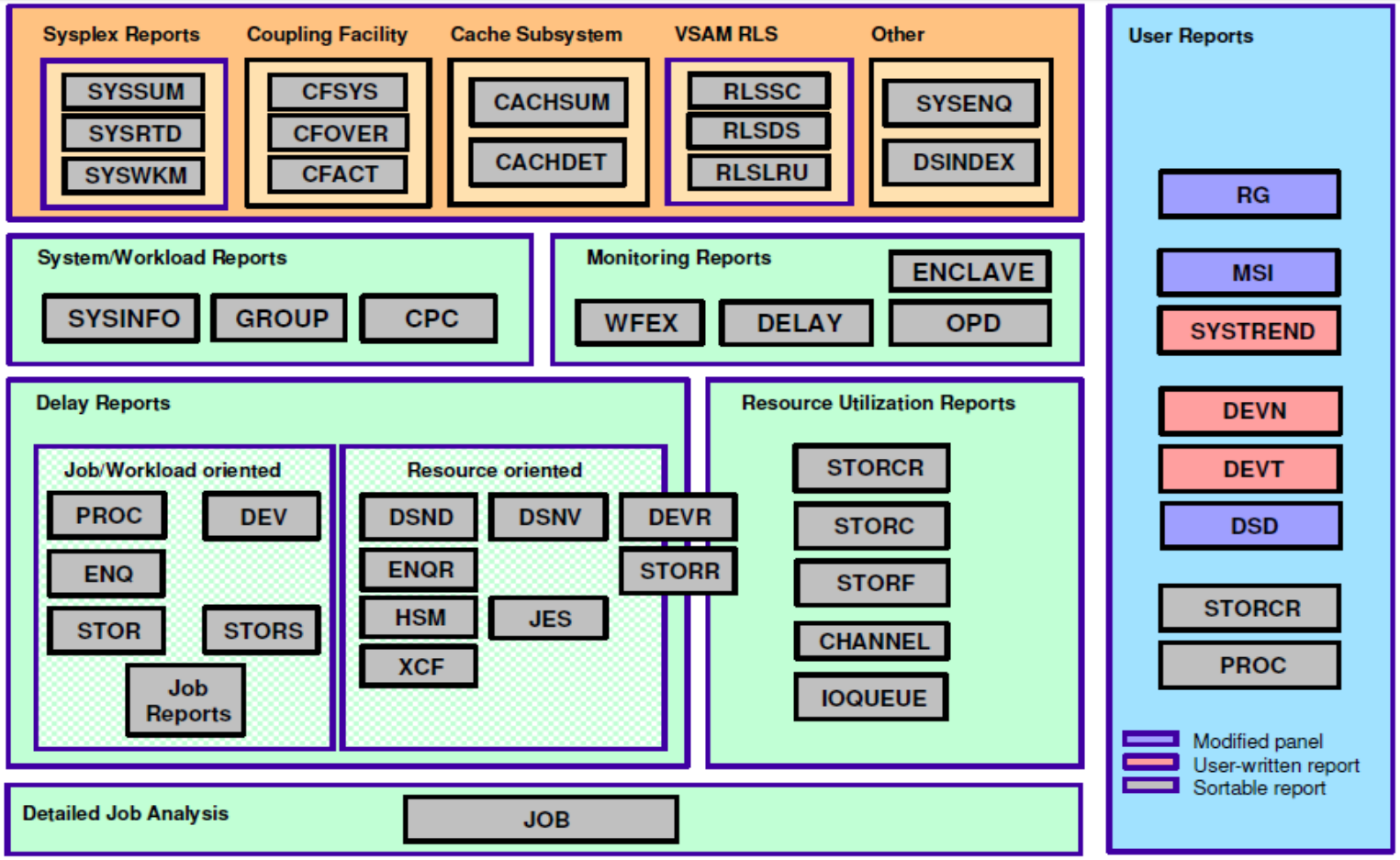
* From IBM Presentation ***"RMF Technical Overview"*** (March 2010)

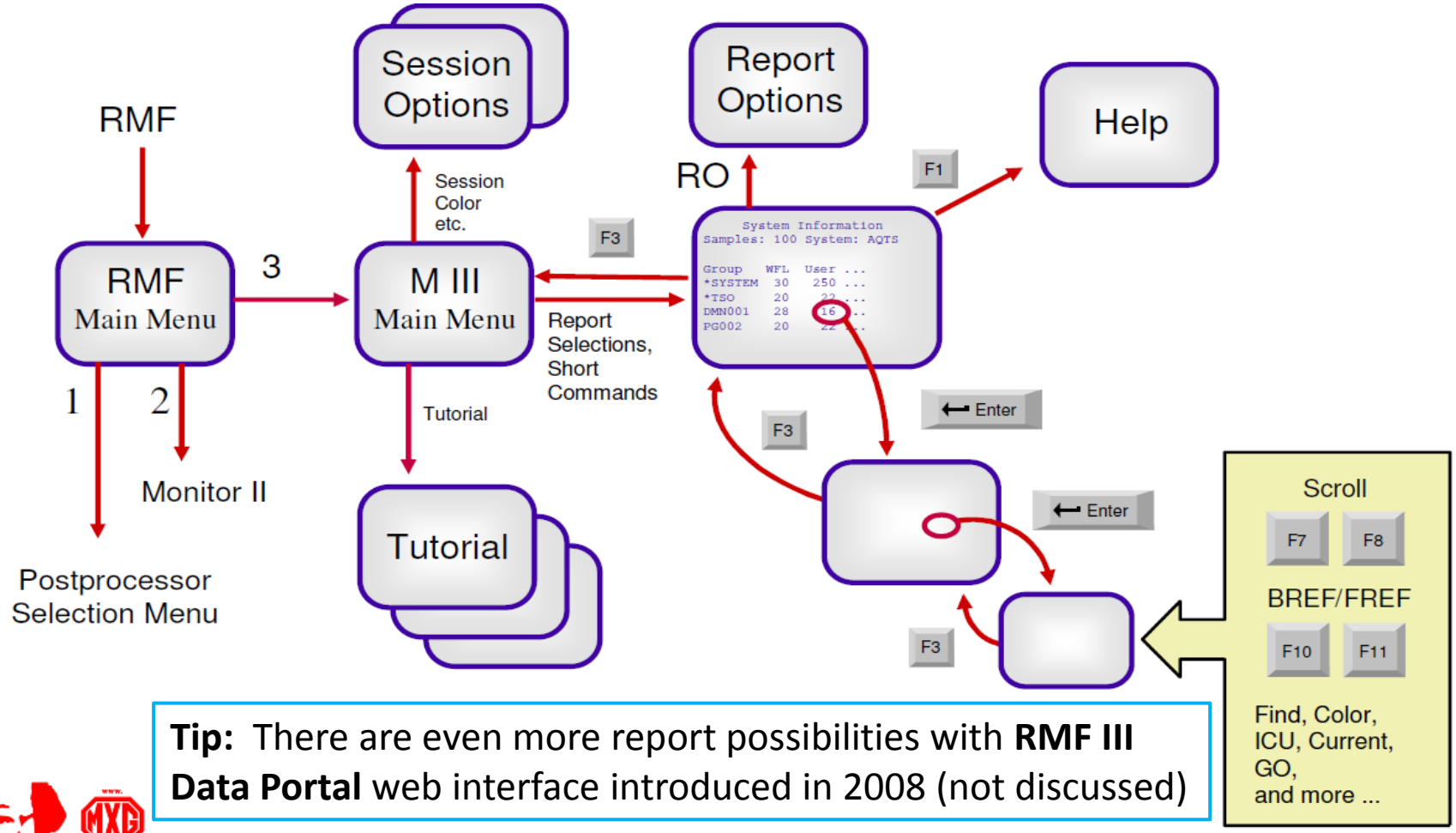
RMF Monitor III Reporter
Reports by Category*



Note: Only 45 out of 65 possible reports shown here

* From IBM Presentation ***"RMF Technical Overview"*** (March 2010)

RMF Monitor III Reporter Overview *



Tip: There are even more report possibilities with **RMF III Data Portal** web interface introduced in 2008 (not discussed)

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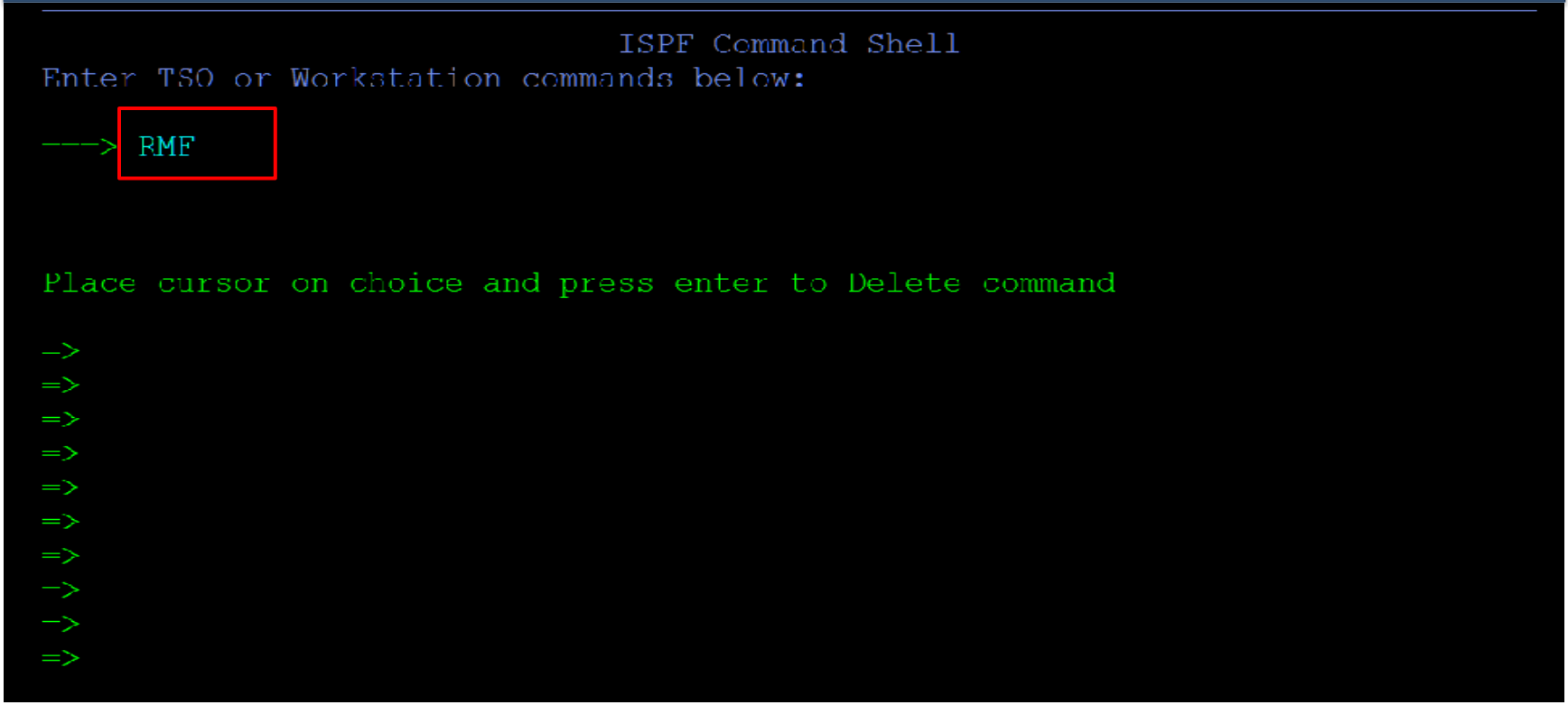
* From IBM Presentation ***"RMF Technical Overview"*** (March 2010)

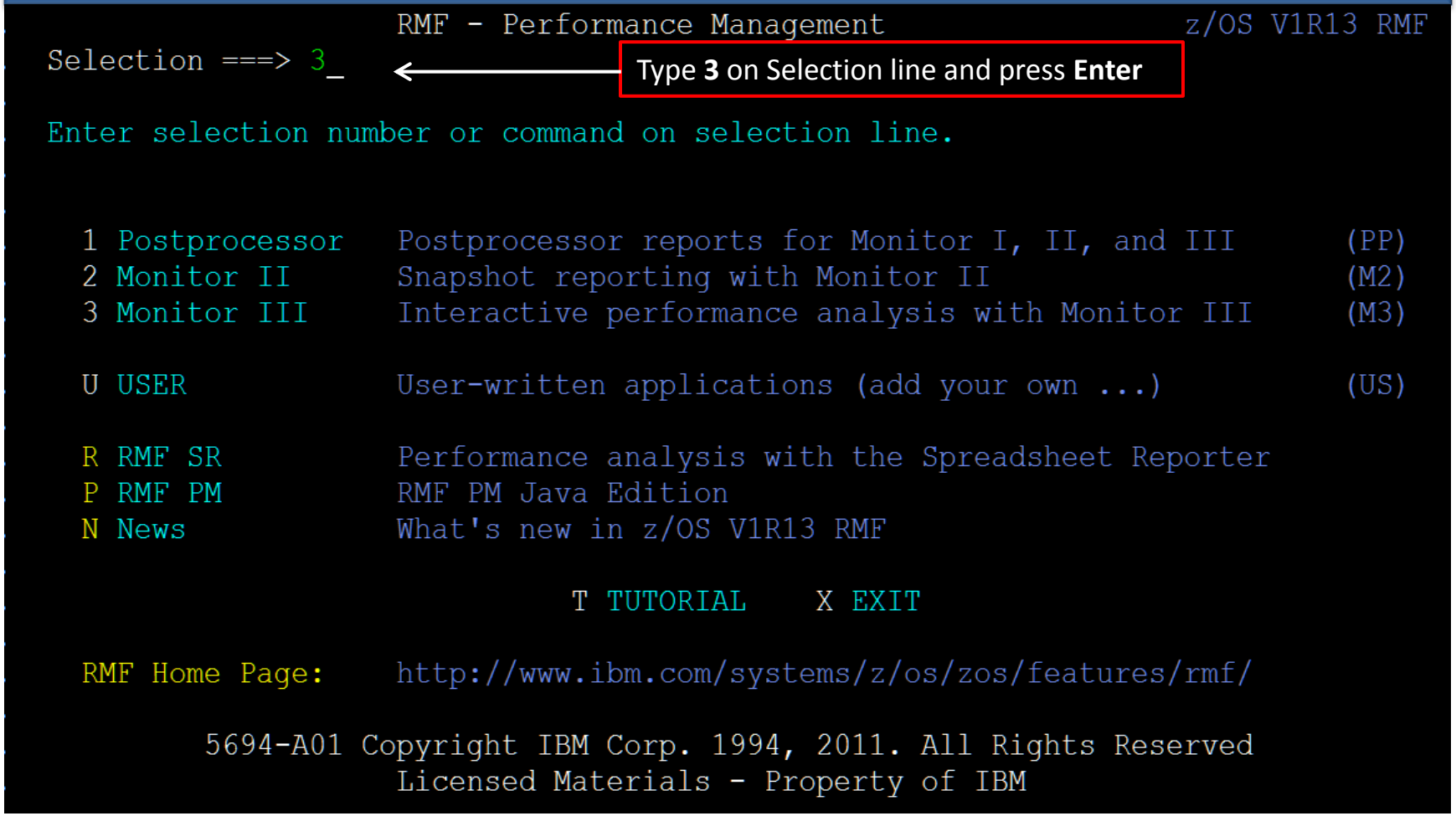
RMF Monitor III Reporter
Entry Step 1



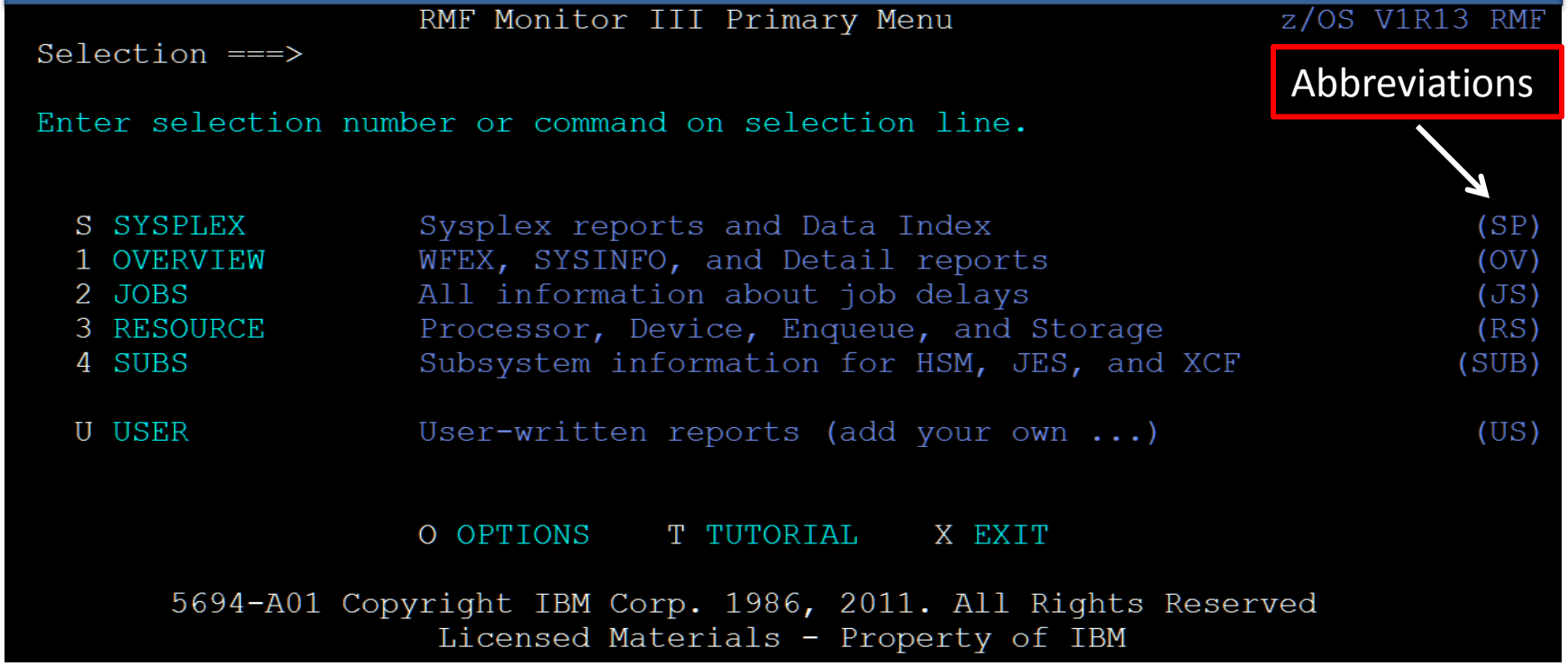
From ISPF Option 6

Tip: Your shop may have a tailored an ISPF Menu Panel for RMF access

RMF Monitor III Reporter
Entry Step 2



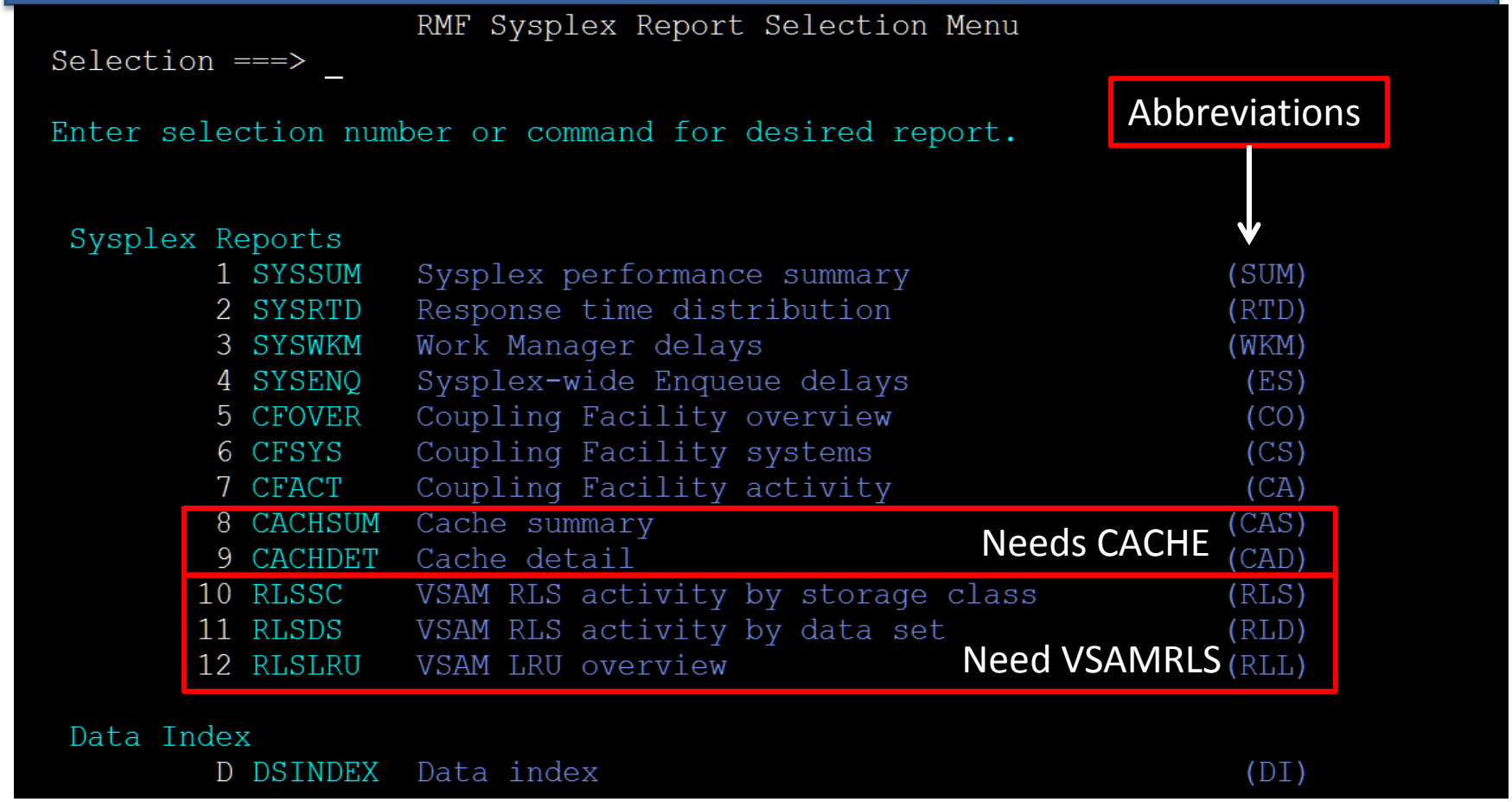
RMF Monitor III Reporter Primary Menu



This **RMF III Primary Menu** display indicates Reporter access is complete. We will examine each of these first level sub-menus (**S, 1, 2, 3, 4, U, O, T**). Items in parentheses on right side are allowed menu abbreviations. For example, **JS** for **JOBS.**

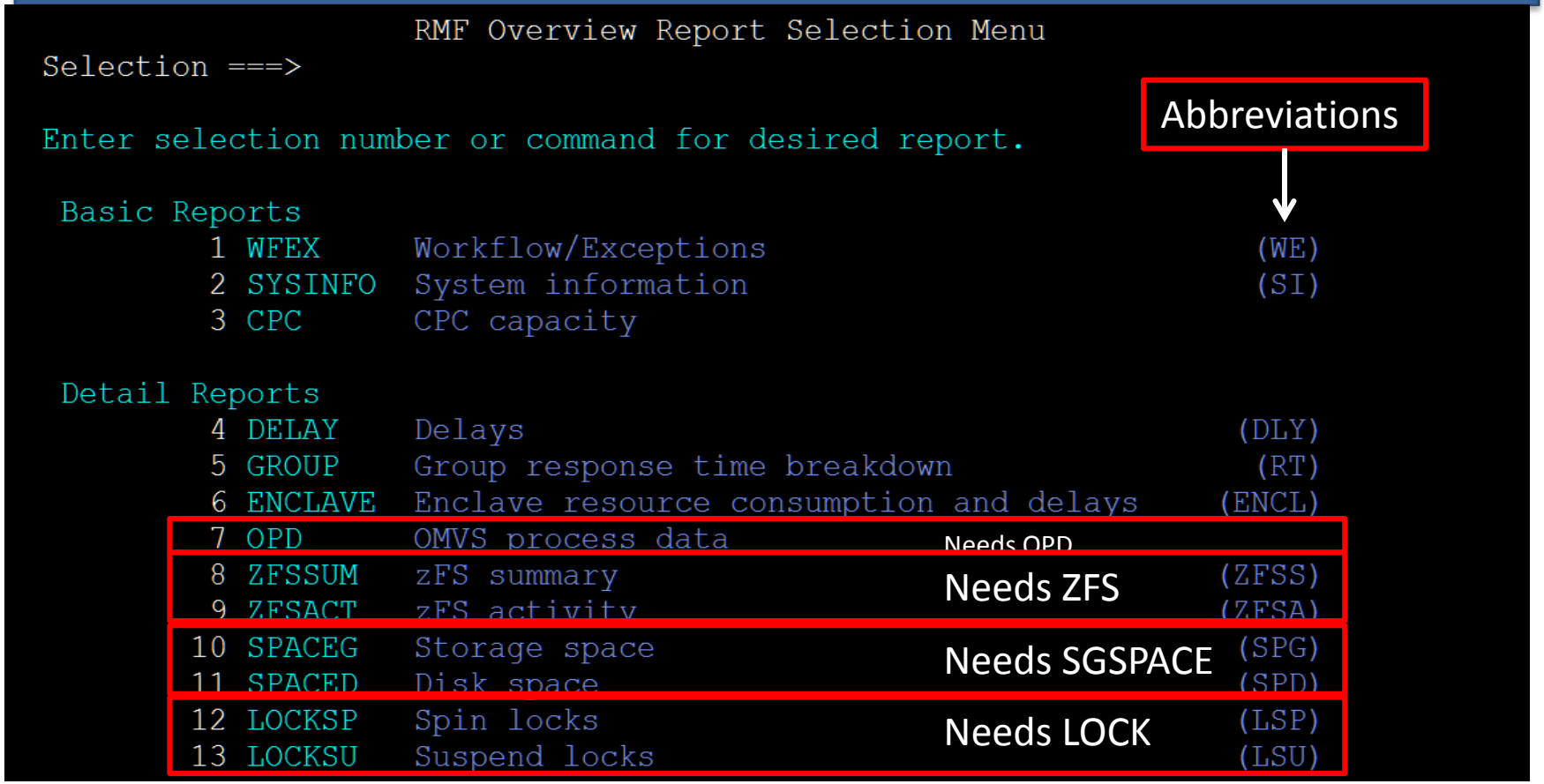
Tip: As a shortcut type **RMFWDM** or **RMF MON3** on ISPF option 6 to get here direct.

RMF Monitor III Reporter
Sysplex Report Menu



From Primary Menu Option **S** or type **SYSPLEX** or **SP** (14 reports available).
Opt 8-9 require **CACHE** option on 1 LPAR, Opt 10-12 require **VSAMRLS** option.
Tip: MINTIME, CYCLE, & **SYNC** should be same on all Sysplex members for best results.

RMF Monitor III Reporter
Overview Report Menu



From Primary Menu Option type **1** or type **OVERVIEW** or **OV**
(13 reports available). Opt 7 requires **OPD** option, Opt 8-9 requires **ZFS** option
Opt 10-11 requires **SGSPACE** option, Opt 12-13 requires **LOCK** option.

RMF Monitor III Reporter
Job Report Menu

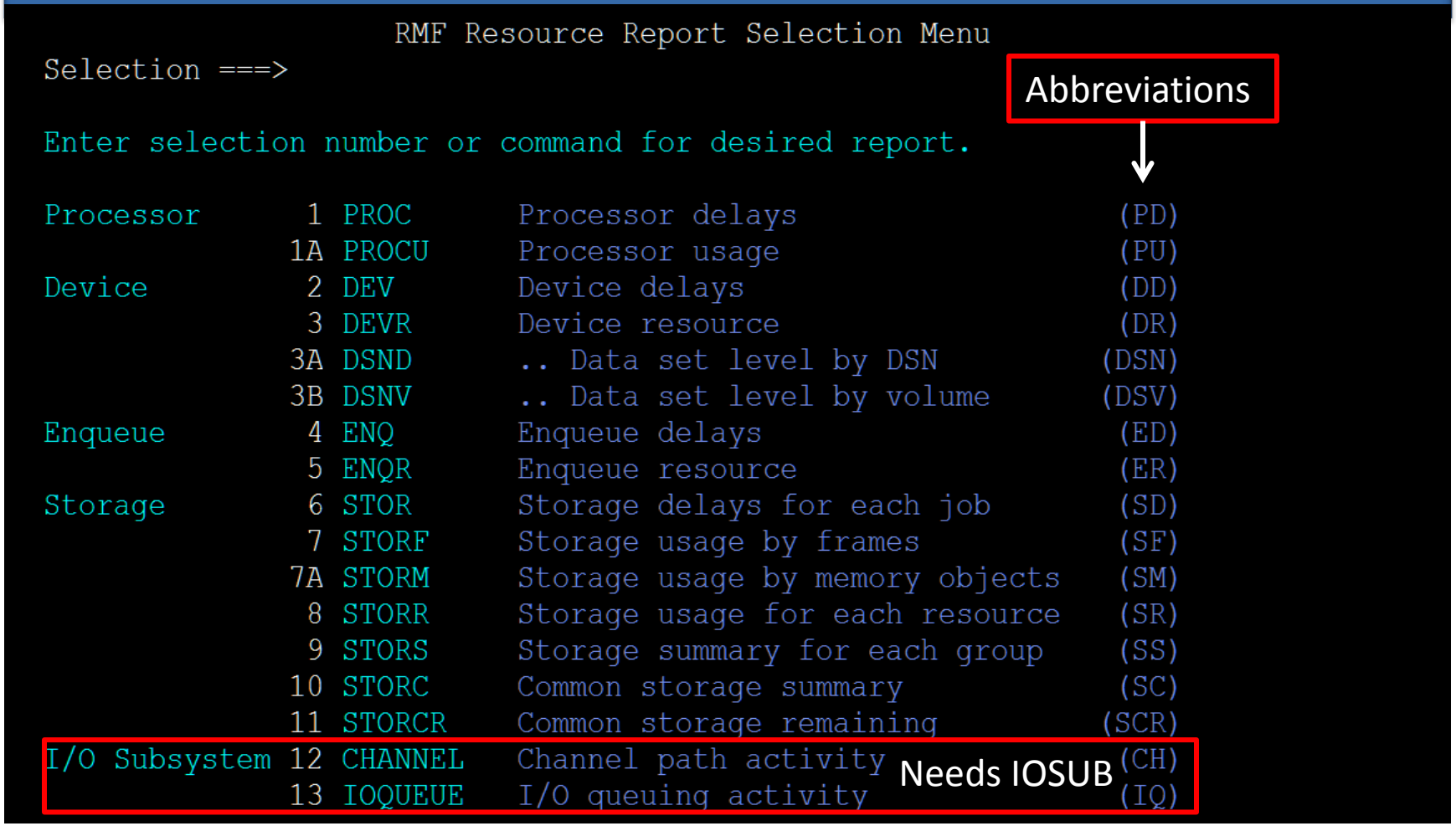
```
                    RMF Job Report Selection Menu
Selection ===>

Enter selection number or command and jobname for desired job report.

  Jobname ===> YOURJOB_

  1 DEVJ            Delay caused by devices                          (DVJ)
 1A DSNJ            .. Data set level                                (DSJ)
  2 ENQJ            Delay caused by ENQ                               (EJ)
  3 HSMJ            Delay caused by HSM                               (HJ)
  4 JESJ            Delay caused by JES                               (JJ)
  5 JOB             Delay caused by primary reason                 (DELAYJ)
  6 MNTJ            Delay caused by volume mount                     (MTJ)
  7 MSGJ            Delay caused by operator reply                   (MSJ)
  8 PROCJ           Delay caused by processor                         (PJ)
  9 QSCJ            Delay caused by QUIESCE via RESET command        (QJ)
 10 STORJ           Delay caused by storage                           (SJ)
 11 XCFJ            Delay caused by XCF                               (XJ)

These reports can also be selected by placing the cursor on the
corresponding delay reason column of the DELAY or JOB reports and
pressing ENTER or by using the commands from any panel.
```

Abbreviations

Needs HSM Active

From Primary Menu Option **2** or type **JOBS** or **JS** (12 reports available).
Opt 3 (HSMJ) requires HSM active on this LPAR.

RMF Monitor III Reporter
Resource Report Menu



From Primary Menu Option **3** or type **RESOURCE** or **RS** (17 reports available).
Opt 12-13 requires **IOSUB** option.

RMF Monitor III Reporter
Subsystem Report Menu

```
                RMF Subsystem Report Selection Menu
Selection ===> _

Enter selection number or command for desired subsystem report.

 1 HSM          Hierarchical Storage Manager delays  Needs HSM Active (HD)
 2 JES          Job Entry Subsystem delays           Needs valid RESOURCE (JD)
 3 XCF          Cross System Coupling Facility delays                     (XD)
```

Abbreviations

From Primary Menu Option **4** or type **SUBS** or **SUB** (3 reports available).
Opt 1 requires HSM active, Opt 2 requires correct **RESOURCE** option.

Tip: **You are NOT restricted to only using these menus.** You can just enter the command (or abbreviation) on any **Selection** or **Command** line.

Tip: Some commands have parameters so **RO** (Report Options) command is not always needed to subset display.

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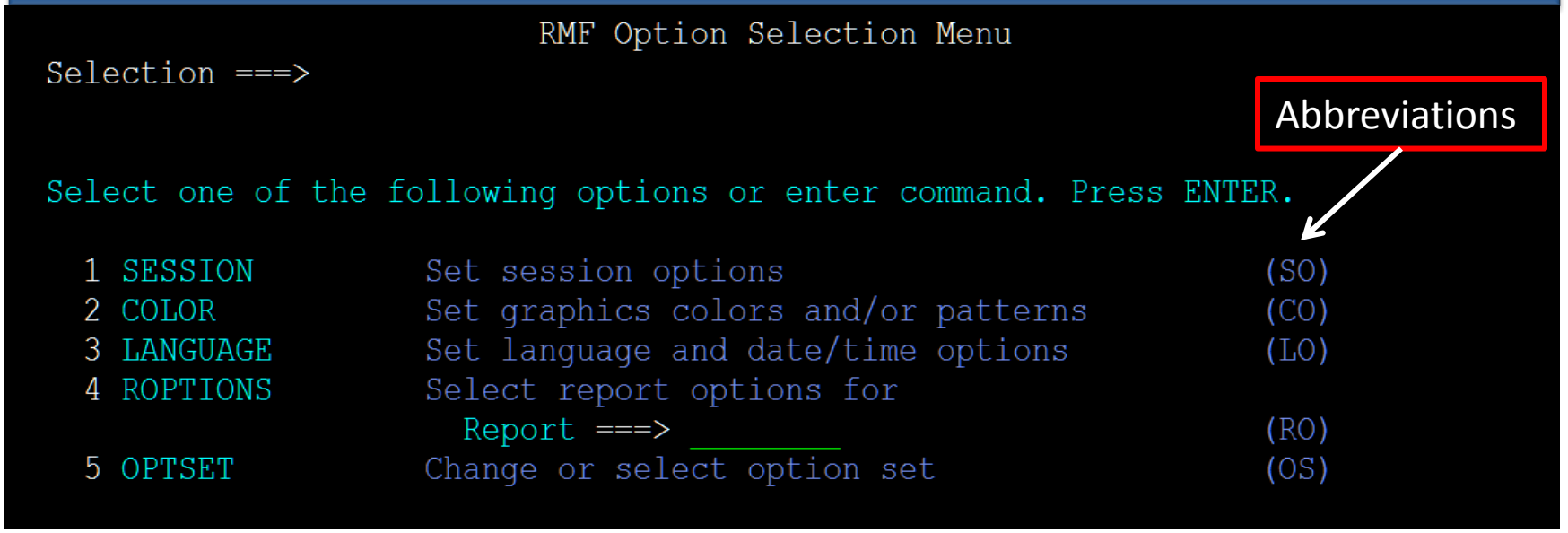
RMF Monitor III Reporter
User Report Menu

```
                    RMF User-written Report Selection Menu
Selection ===> _

Enter selection number or command for desired report.


  1 MSI              Migration SYSINFO including Execution Velocity
  2 DSD              Detailed Storage Delays
  3 RG               Resource Group Data

Device Reports
 DA DEVN             Device Activity
 DT DEVT             Device Trend
                     Device    => ______

System Reports
 ST SYSTREND         System and Workload Trend
                     Workload => ________
```

From Primary Menu Option **U** or type **USER** or **US** (6 reports available).

Tip: This menu often overlooked.
Report **DA** very useful for I/O performance and will discuss in detail.

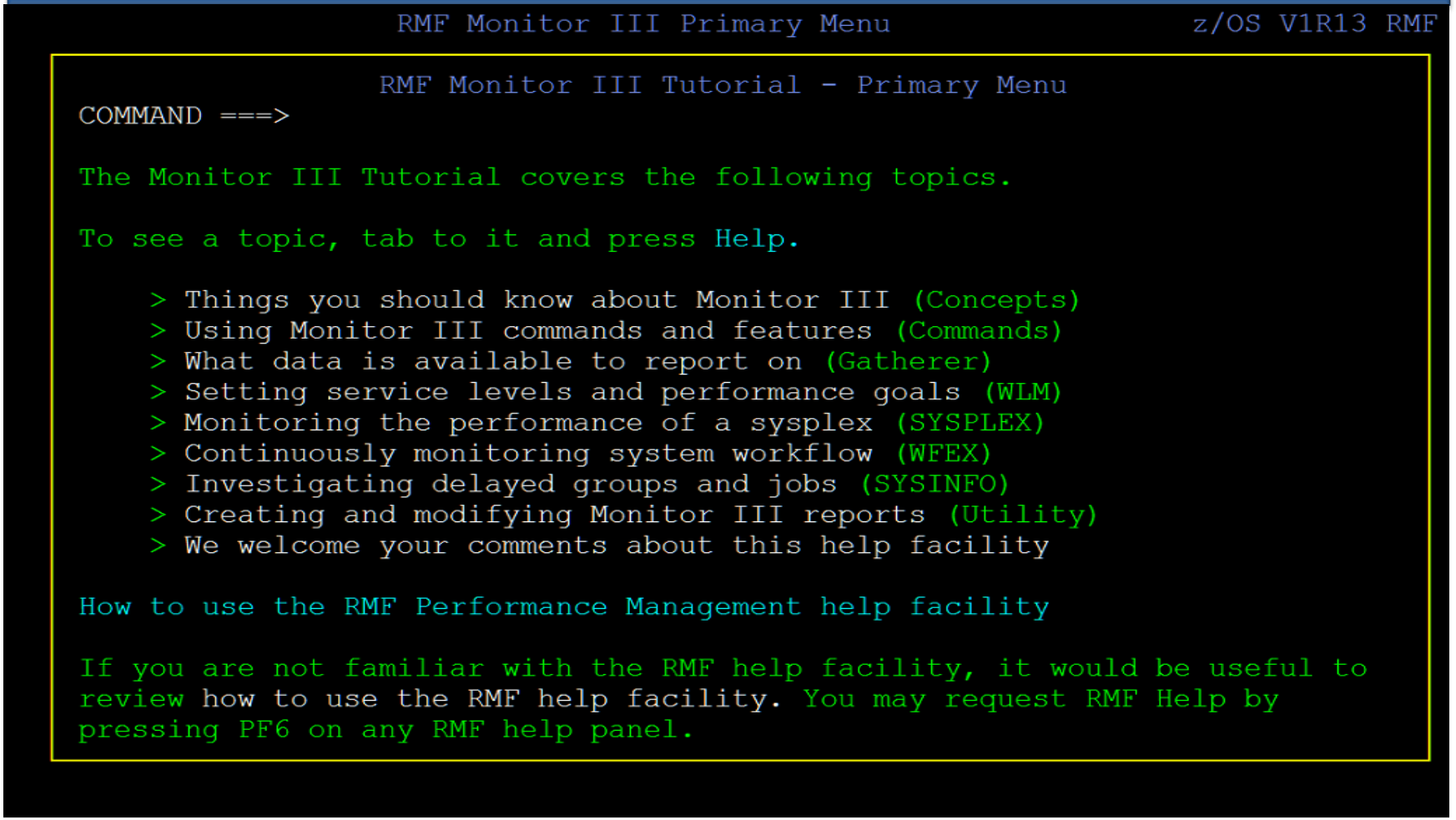
RMF Monitor III Reporter
Session Options Menu



From Primary Menu Option **O** or type **OPTIONS**.
Session options are remembered for the next RMF III Reporter session and **includes ANY Report Options (RO) that you change**. **They are "sticky".**

Tip: You can create, change, or delete sets of session options for different situations using option **5** or type **OPTSET**.

RMF Monitor III Reporter
Tutorial Primary Menu



From Primary Menu Option type **T** or **Tutorial**

RMF Monitor III Reporter
Single System Report Header *

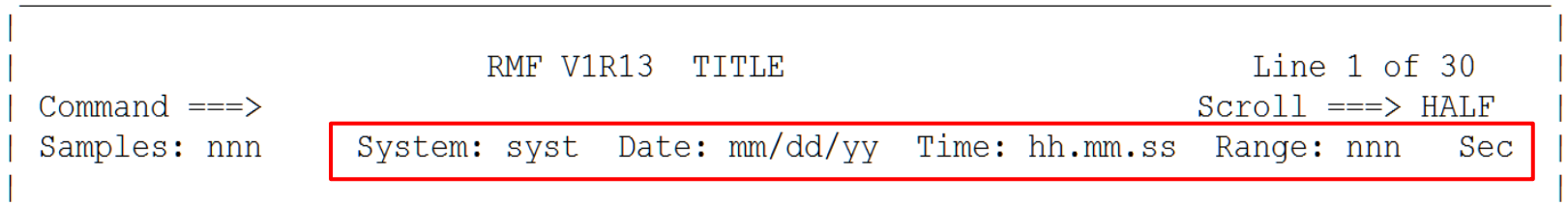


Figure 3. Header of Monitor III Single-System Reports

Table 5. Monitor III Heading Information

Heading	Definition
Report title	The type of measurement data
Date/Time	The starting date and time for the first set of samples included in the report.
Range	The length of time (in seconds) during which samples were gathered, starting with the time specified in the Time field.

Tip: Use **LANGUAGE** Session Option for Date/Time format control

* Figure 3 and Table 5 from ***"z/OS V1R13.0 RMF Report Analysis"*** SC33-7991-19 (June 2011)

RMF Monitor III Reporter
Language Options

```
                              RMF Language Options
Command ===>


Change or verify parameters. Press END to save and end.

  Date Format      ===> MDY       Order for input and output
                                  Month (M), Day (D), and Year (Y)
  Date Separator   ===> /         Date separator for output (/ or . or -)
  Time Separator   ===> .         Time separator for output (. or - or :)
  Decimal Point    ===> .         Decimal point in output   (. or ,)
```

Can format Date / Time in several different ways!

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RMF Monitor III Reporter
Single System Report Header (more)

- **System, Date**, **Time,** and **Range** fields are all over-typeable by the user to change the report selection with these considerations:
  - **System** must be an LPAR being monitored by RMF III
  - **Date** and **Time** must be contained either in an RMF III Data Set or in the In-Storage Buffer (RMF III will advise if not)
  - **Range** cannot be less than the **MINTIME** for the **System** selected and if so is forced to the **MINTIME** value
  - **Range** must be multiple of **MINTIME**, if not is rounded up to next multiple. For example, if **MINTIME** is **60** and **Range** is set to **61 Range** becomes **120**.
  - **Range** is specified as nnnn or nnnn**S** or nnn**M** where **S** indicates seconds and **M** indicates minutes
  - If neither **S** or **M** specified the unit default is seconds
  - The maximum allowed **Range** value is **9999 seconds or 166 minutes**

RMF Monitor III Reporter
Single System Report Header (more)

Tip: A **Range** setting of **0** or **0S** or **0M** sets the range to the **MINTIME** value

Tip: The **CURRENT** command (abbreviation **CU**) shows the most up to date interval

Tip: Using a large **Range** value increases CPU time used by the RMF III Reporter. Expect report response to be longer in this case.

Tip: Use **BREF** (PFK 10) and **FREF** (PFK 11) commands to move easily backward or forward in time by **Range** sized time intervals

Tip: If you receive a "Report unavailable" message and you are sure the data is present in the RMF data sets either LOGON again with a larger TSO **REGION** value or decrease the **Range** value

RMF Monitor III Reporter
Unavailable Data Example

```
                    RMF V1R13  Delay Report
Command ===>                                                  Scroll ===> PAGE

Samples: 0       System: S0W1  Date: 09/13/12  Time: 13.15.00  Range: 60    Sec

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

Data available only from 09/13/12 05.46.40 to 09/13/12 13.15.00.
```

Tip: Usually occurs when using **FREF** or **BREF** commands .
If unexpected, use **DI** command to check RMF III data set inventory.

RMF Monitor III Reporter Commands

- The complete RMF III command list has 59 IBM commands and 6 user written commands for a total of 65 (as of z/OS 1.13)
- Type in **COMMANDS** on an RMF III Command or Selection line to enter the tutorial for commands
- Other IBM sources on RMF III commands are:

  "z/OS V1R13.0 RMF Reference Summary" SX33-9033-05 (June 2011)

  "z/OS V1R13.0 RMF Report Analysis" SC33-7991-19 (June 2011)

  "z/OS V1R13.0 RMF User's Guide" SC33-7990-13 (June 2011)
- Or see the equivalent RMF manual for lower level z/OS releases
- Manuals by z/OS release are listed at end of this presentation under **Documentation**

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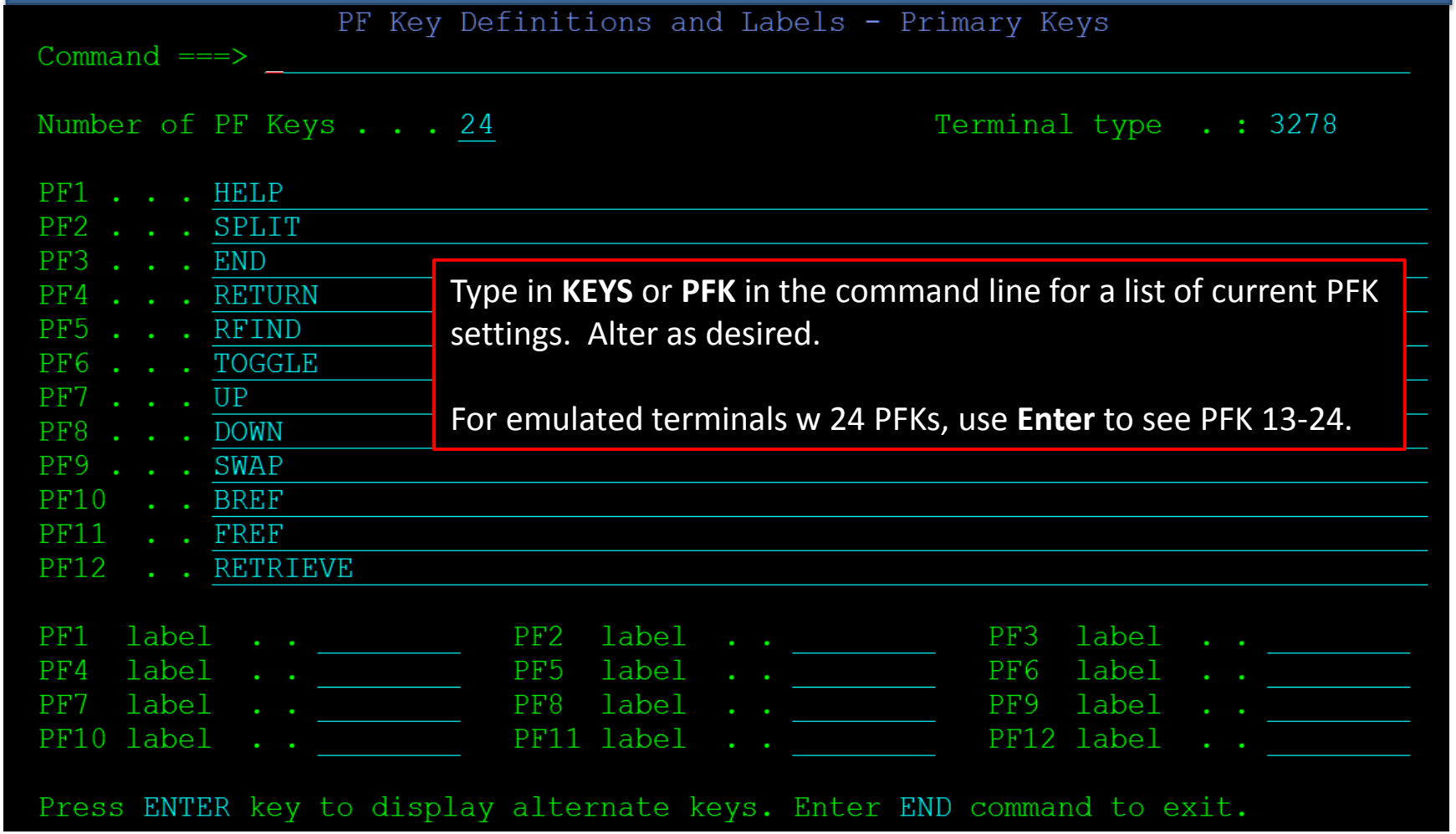
Tip: The underlined Internet links under **Documentation** are active when this presentation is viewed as a slide show and may be clicked

RMF Monitor III Reporter
Program Function Keys



Type in **KEYS** or **PFK** in the command line for a list of current PFK settings. Alter as desired.

For emulated terminals w 24 PFKs, use **Enter** to see PFK 13-24.

RMF Monitor III Reporter
STOP / GO Mode

- **STOP** Mode is the default and allows full manual entry of commands as needed
- **GO** Mode first resets to the Range setting from the current Session Options
- The current report is automatically issued every Range interval
- Type in **GO** on command line to turn on
- **NO RMF III commands** may be issued in **GO** mode
- Use **PA1** or **ATTN** key (as mapped to keyboard) to exit **GO** mode
- There is no **STOP** command to exit **GO** mode
- Not allowed when using archival RMF III data sets

Tip: Sometimes useful when tracking a specific report and/or job over real time, but can be more inhibiting than helpful

RMF Monitor III Reporter
HARDCOPY

- Abbreviation is **HC**
- **HC ON** activates continuous hardcopy for output from all commands
- **HC OFF** deactivates continuous hardcopy for output from all commands
- **HC SCREEN** just prints current screen to hardcopy but only just what is on the screen
- **HC REPORT** just prints current report to hardcopy even if spans multiple frames
- Output is to sysout class or data set from current Session Options
- Can specify data set for **HARDCOPY** output in Session Options but must pre-allocate and have **RECFM=VBA, LRECL=137** attributes

Tip: Sometimes useful when tracking specific reports and/or jobs over several **MINTIME** intervals, but volume can become overwhelming

RMF Monitor III Reporter
Session Options

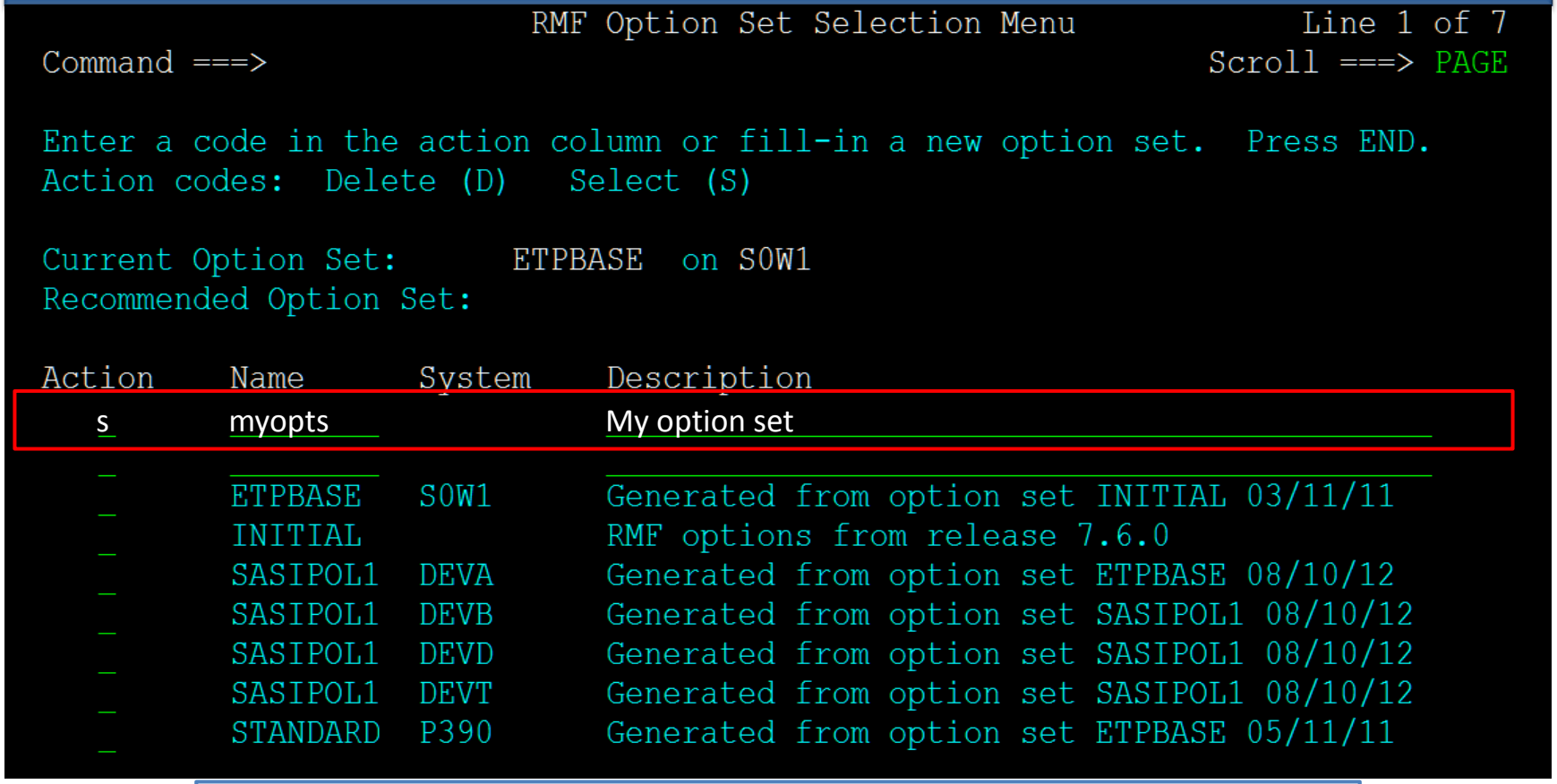
```
                          RMF Session Options
Command ===>

Current option set: ETPBASE  on S0W1
Change or verify parameters. Press END to save and end.

  Mode             ===> STOP       Initial mode (STOP GO)
  First Screen     ===> PRIMARY    Initial screen selection (ex: PRIMARY)
  Refresh          ===> 100        Refresh period (in seconds)
  Range            ===> 10S        Time range 10-9999 sec   (ex: 100S, 100)
                                               1-166 min    (ex: 2M)
  Time Limit       ===> NONE       Time limit or NONE
                                               1-999 min    (ex: 10M)
                                               1-128 hours  (ex:  1H)
  Hardcopy         ===> OFF        Hardcopy mode (ON OFF)   (ex: ON)
  SYSOUT           ===> A          Class for printed output (ex: A)
  Output Data Set  ===>
                                   Data set for hardcopy (Overrides SYSOUT)
  Report Format    ===> TABULAR    (GRAPHIC TABULAR)        (ex: GRAPHIC)
  Customization    ===> YES        Automatically tailor WFEX report (YES NO)
  Input Data Set   ===> 'SYS1.PARMLIB'
                                   Data set for customization (COMPAT mode only)
```

Refresh is how often to update **GO** Mode screen
Time Limit is how long **GO** mode should run

RMF Monitor III Reporter
Option Set Selection



From Option **5** from Option Set Selection Menu or type **OPTSET** or **OS**.
A set includes all options for **SESSION, COLOR, LANGUAGE**, and **REPORT.**
The default option set from IBM is called **INITIAL.**
Type **S** and **Name/Description** on 1st line to create a new option set.

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RMF Monitor III Reporter
RESET / CANCEL Commands *

- To ensure the RMF default settings for option panels are in effect, enter **RESET** on the command line or the respective panel
- **RESET** reestablishes RMF Monitor III default settings
- Because there is no default value for jobname, the **RESET** command is not valid on the Job Report Options or User command panels
- Use **CANCEL** on the command line if you have made changes and wish to return to the values that were originally on the panel when you first entered the screen
- **CANCEL** cancels all changes you have made except for Date, Time, and Range fields
- **CANCEL** does not work on the Job Report Options panel or User command panels

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* From IBM manual ***"z/OS V1R13 RMF User's Guide"*** SC33-7990-19 (June 2011)

RMF Monitor III Reporter
Sysplex Report Header *

```
                        RMF V1R13  TITLE - SYSPLEXN              Line 1 of 30
 Command ===>                                                   Scroll ===> HALF
 WLM Samples:    nnn    Systems: n Date: mm/dd/yy Time: hh.mm.ss Range: nnn    Sec
```

Figure 4. Header of Monitor III Sysplex Reports

- A Sysplex report header is similar to a Single System report header
- **Date**, **Time**, and **Range** only are over-typeable
- **WLM Samples** count is the average over the **MINTIME** samples from contributing systems
- **Systems** are the number of Sysplex LPARs contributing to the report and should equal the number of active z/OS LPARs in the Sysplex
- If not, get a message **Not All Systems Included in Report**, use HELP to find missing systems
- **SYSPLEXN** in the title is the name of the Sysplex

* Figure 4 from ***"z/OS V1R13.0 RMF Report Analysis"*** SC33-7991-19 (June 2011)

RMF Monitor III Reporter
Sysplex Summary Report – Missing LPARs

```
                    RMF V1R13  Sysplex Summary - DEVAPLEX          Line 1 of 1
Command ===>                                                   Scroll ===> DATA

WLM Samples: 240     Systems: 1  Date: 09/14/12 Time: 00.14.00 Range: 60    Sec

                      >>>>>>>>|||||||||||||||||<<<<<<<<

Service Definition: SASI0001              Installed at: 08/03/12, 11.01.44
     Active Policy: SASIPOL1              Activated at: 08/03/12, 11.01.54

               ------- Goals versus Actuals --------  Trans --Avg. Resp. Time-
               Exec Vel  --- Response Time ---  Perf  Ended  WAIT EXECUT ACTUAL
Name     T  I  Goal Act  ---Goal--- --Actual--  Indx  Rate   Time   Time   Time

SYSSTC   S      N/A 100    N/A                        0.000 0.000  0.000  0.000



Only   1 out of   4 systems included in the report.
Additional messages are added to the HELP panel. Press HELP to get a list.
```

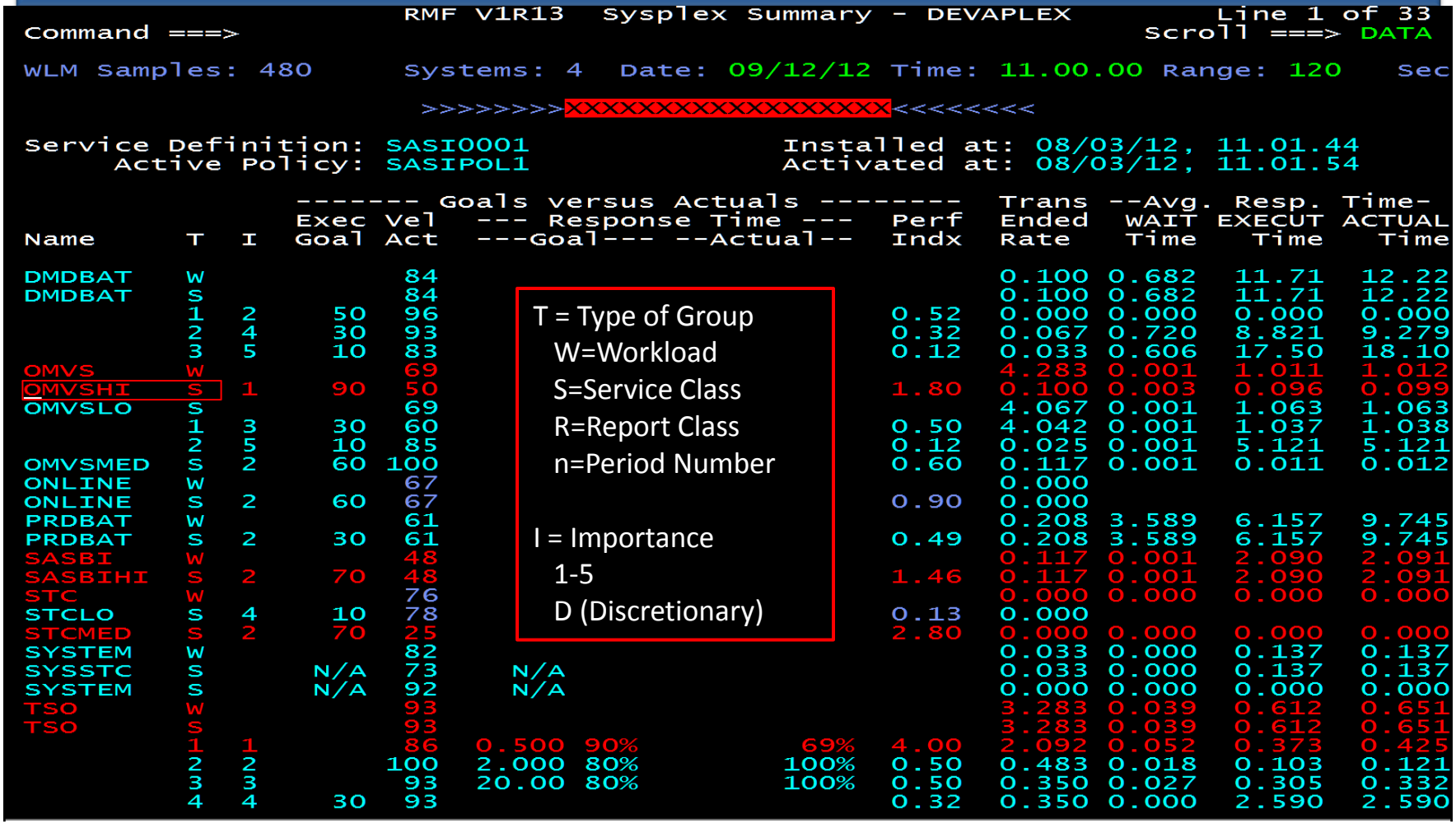
Use **PFK1** (HELP) to find out what systems are missing

RMF Monitor III Reporter
Sysplex Summary Report – Missing LPARs (more)

```
                    RMF V1R13  Sysplex Summary - DEVAPLEX          Line 1 of 1

                                Message - ERB844I
COMMAND ===>
                                                                    More:     +
Only   1      out of   4      systems included in the report

Explanation: Not all systems returned data that can be used by the report.
The systems not included are:

o   DEVB, DEVA, DEVD

o

o

o

o

Possible reasons are:

o   The gatherer is not running on a system.
```

Use **PFK8** (DOWN) or press **Enter** to see rest of HELP message.
Tip: Can get this using **Archival Files** if time requested not available in all of the files.

RMF Monitor III Reporter
Sysplex Summary Report



```
                    RMF V1R13  Sysplex Summary - DEVAPLEX          Line 1 of 33
Command ===>                                                    Scroll ===> DATA

WLM Samples: 480      Systems: 4  Date: 09/12/12 Time: 11.00.00 Range: 120   Sec

                      >>>>>>>>XXXXXXXXXXXXXXXXXX<<<<<<<<

Service Definition: SASI0001                 Installed at: 08/03/12, 11.01.44
     Active Policy: SASIPOL1                 Activated at: 08/03/12, 11.01.54

                 ------- Goals versus Actuals --------   Trans --Avg. Resp. Time-
                 Exec Vel  --- Response Time ---   Perf   Ended  WAIT EXECUT ACTUAL
Name      T   I  Goal Act  ---Goal--- --Actual--   Indx   Rate   Time   Time   Time

DMDBAT    W            84                                 0.100 0.682  11.71  12.22
DMDBAT    S            84                                 0.100 0.682  11.71  12.22
          1   2    50  96                           0.52  0.000 0.000  0.000  0.000
          2   4    30  93                           0.32  0.067 0.720  8.821  9.279
          3   5    10  83                           0.12  0.033 0.606  17.50  18.10
OMVS      W            69                                 4.283 0.001  1.011  1.012
OMVSHI    S   1    90  50                           1.80  0.100 0.003  0.096  0.099
OMVSLO    S            69                                 4.067 0.001  1.063  1.063
          1   3    30  60                           0.50  4.042 0.001  1.037  1.038
          2   5    10  85                           0.12  0.025 0.001  5.121  5.121
OMVSMED   S   2    60 100                           0.60  0.117 0.001  0.011  0.012
ONLINE    W            67                                 0.000
ONLINE    S   2    60  67                           0.90  0.000
PRDBAT    W            61                                 0.208 3.589  6.157  9.745
PRDBAT    S   2    30  61                           0.49  0.208 3.589  6.157  9.745
SASBI     W            48                                 0.117 0.001  2.090  2.091
SASBIHI   S   2    70  48                           1.46  0.117 0.001  2.090  2.091
STC       W            76                                 0.000 0.000  0.000  0.000
STCLO     S   4    10  78                           0.13  0.000
STCMED    S   2    70  25                           2.80  0.000 0.000  0.000  0.000
SYSTEM    W            82                                 0.033 0.000  0.137  0.137
SYSSTC    S       N/A  73    N/A                          0.033 0.000  0.137  0.137
SYSTEM    S       N/A  92    N/A                          0.000 0.000  0.000  0.000
TSO       W            93                                 3.283 0.039  0.612  0.651
TSO       S            93                                 3.283 0.039  0.612  0.651
          1   1        86  0.500 90%         69%   4.00  2.092 0.052  0.373  0.425
          2   2       100  2.000 80%        100%   0.50  0.483 0.018  0.103  0.121
          3   3        93  20.00 80%        100%   0.50  0.350 0.027  0.305  0.332
          4   4    30  93                           0.32  0.350 0.000  2.590  2.590
```

T = Type of Group
- W=Workload
- S=Service Class
- R=Report Class
- n=Period Number

I = Importance
- 1-5
- D (Discretionary)

From Sysplex Report Selection Menu Option **1** or type **SUM** or **SYSSUM** or any Command/Selection line. **Perf Indx** LE 1 means Goal met, over 1 Goal exceeded.

RMF Monitor III Reporter
Response Time Distribution Report

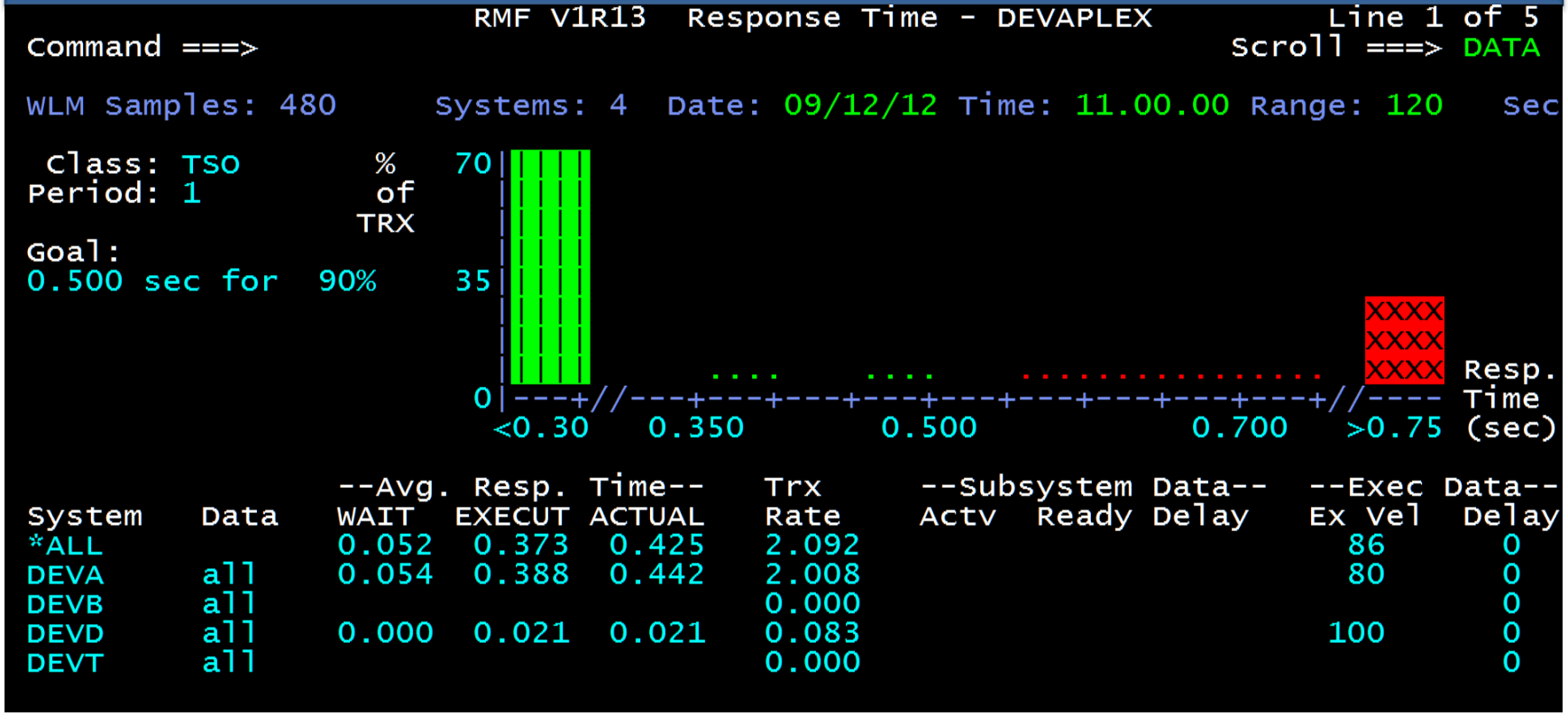
```
                        RMF V1R13  Response Time - DEVAPLEX          Line 1 of 5
Command ===>                                                  Scroll ===> DATA

WLM Samples: 480     Systems: 4  Date: 09/12/12 Time: 11.00.00 Range: 120   Sec

 Class: OMVSHI
Period: 1

           No response time distribution values available,
           because there was no response time goal specified
           for this service class period.
```

System	Data	--Avg. Resp. Time-- WAIT	EXECUT	ACTUAL	Trx Rate	--Subsystem Data-- Actv	Ready	Delay	--Exec Data-- Ex Vel	Delay
*ALL		0.003	0.096	0.099	0.100				50	0
DEVA	all	0.000	0.109	0.109	0.050				100	0
DEVB	all	0.001	0.023	0.024	0.033					0
DEVD	all	0.033	0.350	0.383	0.008				0	0
DEVT	all	0.000	0.058	0.058	0.008					0

Cursor selected **OMVSHI** Service Class from **Sysplex Summary Report** to get this **Response Time Distribution Report**

Tip: Can also enter **SYSRTD** or **RTD** from any Command/Selection line followed by a Service Class or Report Class to get this report direct. For example, **RTD OMVSHI**.

RMF Monitor III Reporter
Response Time Distribution Report (more)



Cursor selected **TSO Period 1** from **Sysplex Summary Report**. This period does have a Response Goal.

Tip: Can also enter **SYSRTD** or **RTD** from any **Command** or **Selection** line followed by a Service Class or Report Class to get this report direct. For example, **RTD TSO.**

RMF Monitor III Reporter
DSINDEX Report - Example 1

```
                        RMF V1R13  Data Index - SVSCPLEX          Line 1 of 8
Command ===>                                                  Scroll ===> PAGE

Samples: 100     System: S0W1  Date: 09/12/12  Time: 11.10.00  Range: 100   Sec

       ----Begin/End----
System --Date-- --Time-- -DDNAME- ---------------Data Set Name---------------

S0W1   09/12/12 02.33.20 SYS00031 MXGDEV.RMF.MONIII.SOW1.DS1
                05.58.20
S0W1   09/12/12 05.58.20 SYS00029 MXGDEV.RMF.MONIII.SOW1.DS3
                09.23.20
S0W1   09/12/12 09.23.20 SYS00032 MXGDEV.RMF.MONIII.SOW1.DS2
                11.20.00            * * *     Currently active      * * *
S0W1   09/12/12 08.00.00
                11.20.00            * * *     In-storage buffer     * * *
```

From Sysplex Primary Menu Option type **D, DI,** or **DSINDEX.**
Shows RMF III data sets available on Sysplex and active files for each LPAR.

Tip: Can be used to validate that owned RMF III data sets for each LPAR are as expected or confirm that **RMFDS**nn archival data sets are allocated as intended.

Tip: Use **RO** (Report Option) command to change how these are displayed.

RMF Monitor III Reporter
DSINDEX Report - RO

```
                        RMF Data Index Options
Command ===>

Change or verify parameters. Press END to save and end.

   DDNAMES/DSNAMES  ==> YES      Include DDNAMES / DSNAMES information (YES NO)
   Sort Order       ==> DESCEND  Sort data set names (ASCEND DESCEND)
```

- The **DDNAMES/DSNAMES** Report Option (**RO**) determines the amount of information that will be displayed
- **YES** gives a more detailed Data Index. It contains, at a data-set level, the data that is used on other RMF reports. You can see if there are any specific problems with the available data. This is the default.
- **NO** gives you a condensed version of the Data Index. You can see what systems are available for reporting rather than the actual data that is available.

RMF Monitor III Reporter
DSINDEX Report – Example 2

```
                        RMF V1R13  Data Index - SVSCPLEX          Line 1 of 1
Command ===>                                                   Scroll ===> PAGE

Samples: 100     System: S0W1  Date: 09/12/12  Time: 11.10.00  Range: 100   Sec

       ------Begin------          -------End-------
System --Date-- --Time--          --Date-- --Time--

S0W1   09/12/12 02.33.20          09/12/12 11.15.00
```

With **DDNAMES/DSNAME** set to **NO** get 1 line per LPAR with time range of data.
Tip: Most useful for Sysplexes with many LPARs to avoid congestion and scrolling.

RMF Monitor III Reporter
DSINDEX Report – RO (more)

```
                        RMF Data Index Options
Command ===>

Change or verify parameters. Press END to save and end.

   DDNAMES/DSNAMES  ==> YES      Include DDNAMES / DSNAMES information (YES NO)
   Sort Order       ==> DESCEND  Sort data set names (ASCEND DESCEND)
```

- The entire Data Index is first sorted by system ID
- The **Sort Order** option allows you to change the sorting of the individual data entries for each system ID
- **ASCEND** causes the entries in the Data Index to be sorted with the oldest data at the top of the individual system lists
- **DESCEND** causes the entries in the Data Index to be sorted with the latest data first for each system

RMF Monitor III Reporter
DSINDEX Report – Example 3

```
                        RMF V1R13  Data Index - SVSCPLEX          Line 1 of 8
Command ===> _                                                 Scroll ===> PAGE

Samples: 100     System: S0W1  Date: 09/12/12  Time: 11.10.00  Range: 100   Sec

       ----Begin/End----
System --Date-- --Time-- -DDNAME- ---------------Data Set Name----------------

S0W1   09/12/12 07.51.40
                11.11.40              * * *      In-storage buffer     * * *
S0W1   09/12/12 09.23.20 SYS00032 MXGDEV.RMF.MONIII.S0W1.DS2
                11.11.40              * * *      Currently active      * * *
S0W1   09/12/12 05.58.20 SYS00029 MXGDEV.RMF.MONIII.S0W1.DS3
                09.23.20
S0W1   09/12/12 02.33.20 SYS00031 MXGDEV.RMF.MONIII.S0W1.DS1
                05.58.20
```

With **DDNAMES/DSNAMES** set to **YES** and **Sort Order** set to **DESCEND** newest data is listed first.

Tip: If you do NOT see your RMF III VSAM data set(s) in the **DSINDEX** report, then RMF Monitor III does not know about them and will NOT record to them.
Check your **ERBRMFxx** member **DATASET** options or use **F RMF,D III** command in this case.

RMF Monitor III Reporter
CPC Report

```
                        RMF V1R13  CPC Capacity                  Line 1 of 16
Command ===>                                                  Scroll ===> PAGE

Samples: 120      System: DEVA  Date: 08/03/12  Time: 12.12.00  Range: 120   Sec

Partition:   DEVA         2817 Model 706
CPC Capacity:     766     Weight % of Max: ****   4h Avg:   389   Group:   N/A
Image Capacity:   766     WLM Capping %:    0.0   4h Max:   755   Limit:   N/A

Partition  --- MSU ---   Cap  Proc     Logical Util %    - Physical Util % -
             Def   Act   Def   Num     Effect   Total   LPAR  Effect  Total

*CP                       12.0                          0.4    99.6    100
DEVA           0   756   NO    6.0       98.6    98.7    0.0    98.6   98.7
DEVB           0     2   NO    2.0        0.7     0.8    0.0     0.2    0.3
DEVT           0     1   NO    2.0        0.5     0.6    0.0     0.2    0.2
VM01           0     5   NO    2.0        1.6     1.8    0.1     0.5    0.6
PHYSICAL                                                 0.3            0.3

*ICF                       1.0                          0.0     100    100
CF01                       1.0        100     100       0.0     100    100
PHYSICAL                                                 0.0            0.0

*IIP                       4.0                          0.1     0.0    0.2
DEVA                  NO   2.0        0.0     0.0       0.0     0.0    0.0
DEVT                  NO   1.0        0.0     0.0       0.0     0.0    0.0
VM01                  NO   1.0        0.0     0.1       0.0     0.0    0.0
PHYSICAL                                                 0.1            0.1
```

From Overview Menu Option **3** or type **CPC.** Shows all LPARs on the CEC. This particular CEC has no ZAAPs. Shows **Logical/Physical Utilization %** by engine type by LPAR and overall **Physical Util %** for the CEC. **Proc Num**=Logical Processors. There is no **RO** (Report Option) command for this report.

Tip: Switch to another CEC in this Sysplex by typing an SMF SYSID from that CEC by **System:**

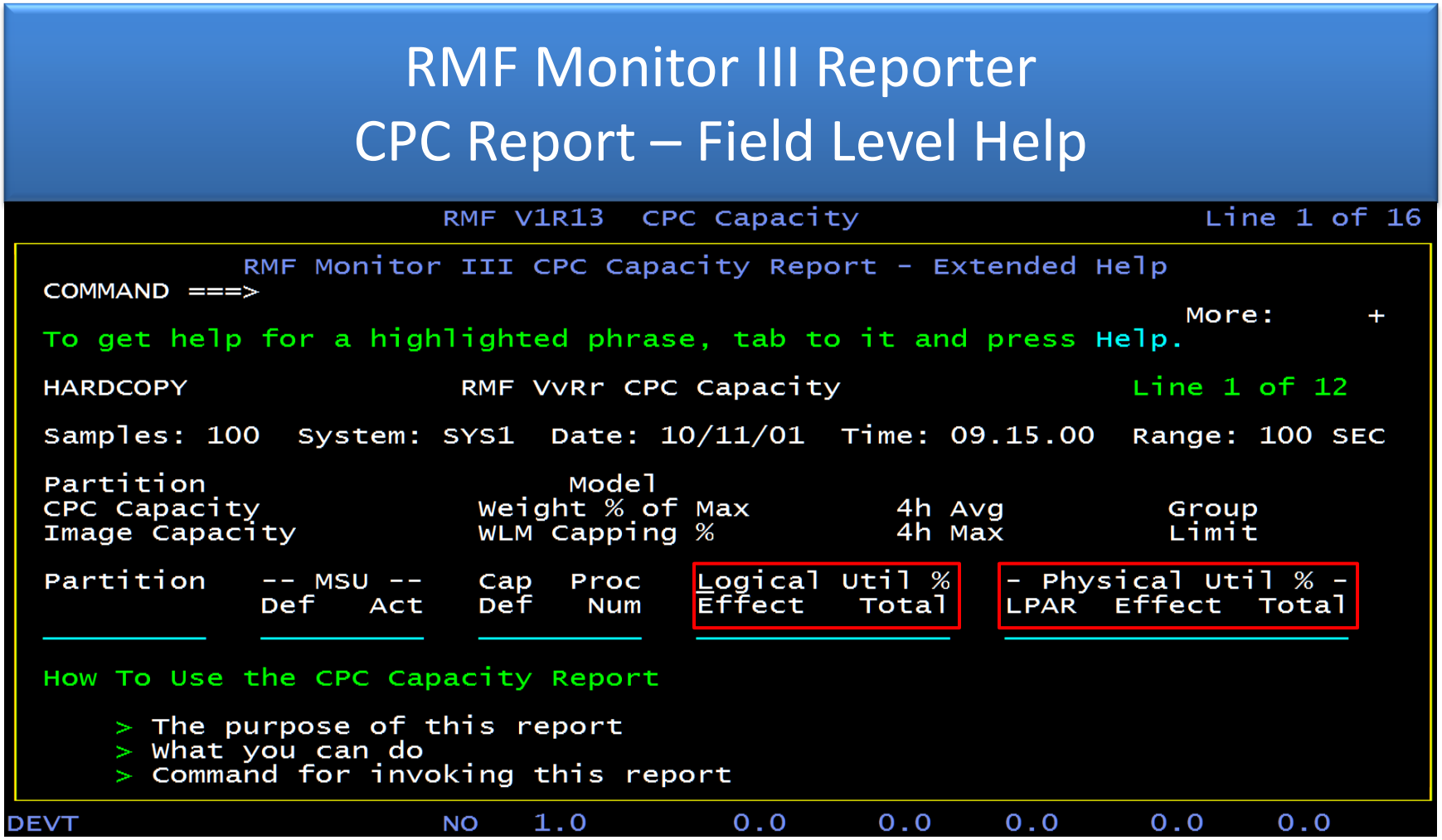
RMF Monitor III Reporter
CPC Report (more)

- Note that even **non – z/OS LPARs** are shown which can be very useful
- **Logical Processor Utilization** is based on the number of online logical processors defined to the LPAR and total uptime. Shows CPU usage from LPAR "point of view".
- **Physical Processor Utilization** is based on the number of online physical processors and the length of the **Range** value. Shows CPU usage from CEC "point of view".

Tip: CPC report can NOT be run from under z/OS as a z/VM Guest

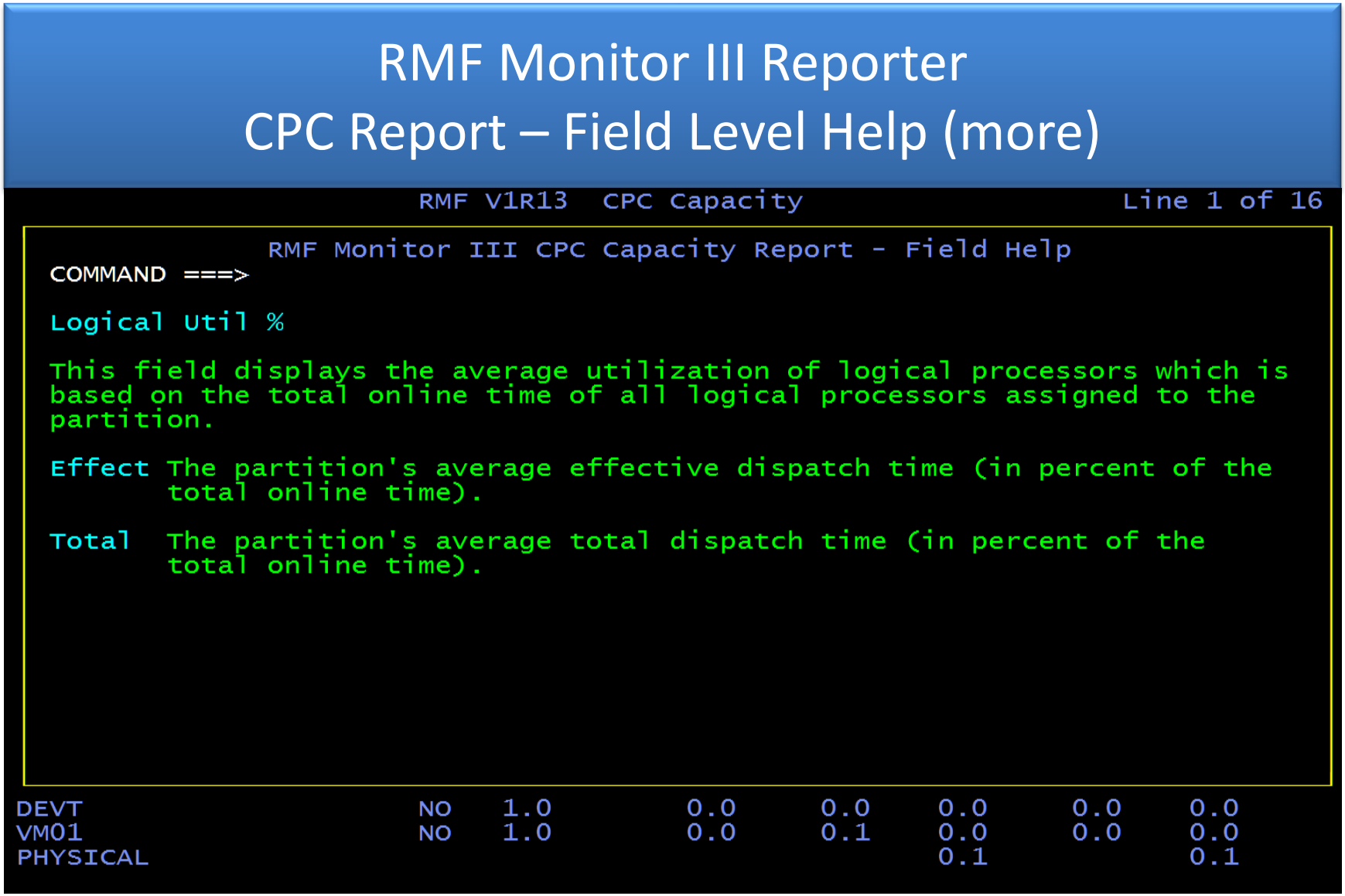
Merrill Consultants

RMF Monitor III Reporter
CPC Report – Field Level Help



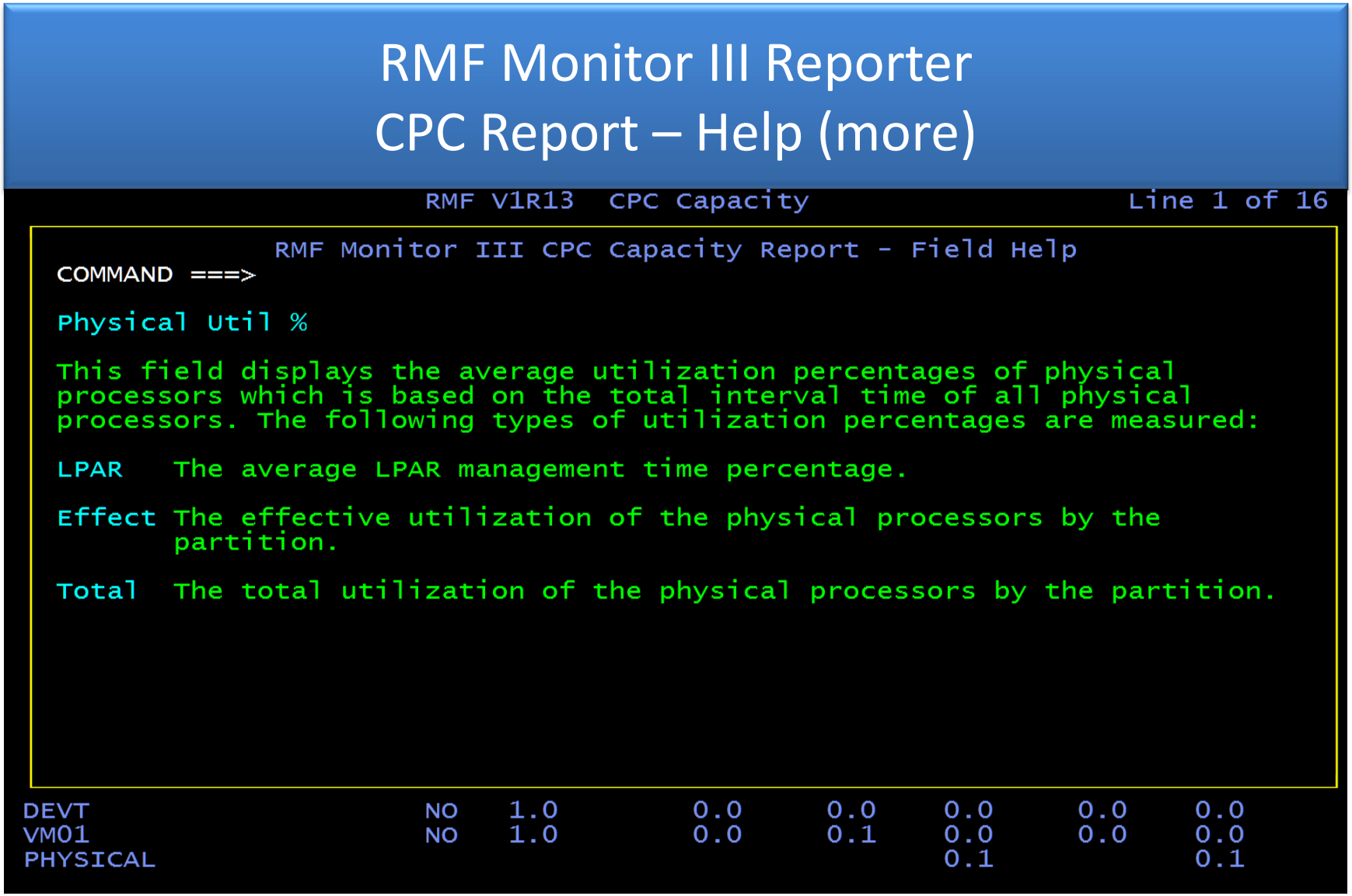
Using **PFK1** brings up this pop-up panel,
then **Tab** to **Logical Util %** and press **PFK1** again

RMF Monitor III Reporter
CPC Report – Field Level Help (more)



Explanation of **Logical Util % Effective** and **Total** is displayed, then use **PFK3** to get back to CPC report

RMF Monitor III Reporter
CPC Report – Help (more)



Repeat process to get explanation of **Physical Util % LPAR, Effective,** and **Total**, then use **PFK3** to get back to CPC report

RMF Monitor III Reporter
CPC Report – Contents Documentation *

Table 17. Fields in the CPC Capacity Report	
Field Heading	**Meaning**
All MSU-related values are measured in MSU/h (millions of service units per hour).	
Values for the partition which requested the report	
Partition	Partition name.
Processor/Model	Processor family and model number of the measured system.
CPC Capacity	Effective processor capacity available to the central processor complex (CPC), measured in MSU/h.
Image Capacity	Processor capacity available to the z/OS image (partition) which requested the report, measured in MSU/h. The field is calculated as minimum of the following capacities: ° the capacity based on the partition's logical CP configuration ° the defined capacity limit of the partition, if available (image softcap) ° the capacity limit of the related WLM capacity group, if the partition belongs to a capacity group.
Weight % of Max	Average weighting factor in relation to the maximum defined weighting factor for this partition. With 'Initial Capping ON', which the operator can set on the Hardware Management Console, this value is not available and therefore, this field shows '****' in this case.
WLM Capping %	Percentage of time when WLM capped the partition because the four-hours average MSU value exceeds the defined capacity limit.
4h Avg	Average value of consumed MSU/h during the last four hours.
4h Max	Maximum value of consumed MSUs during the last 4 hours (retrieved from 48 sample intervals of five minutes). This value can be greater than the defined capacity.
Group	Name of the partition's capacity group. If the partition does not belong to a capacity group, **N/A** is displayed.
Limit	Capacity limit (in MSUs) defined for the partition's capacity group. An '*' following the limit value indicates that this partition started to be a member of this capacity group less than four hours ago. Therefore, its capacity management is still performed according to its 4 hour rolling average limitations and not yet according to the group capacity limit.

* Table 17 from ***"z/OS V1R13.0 RMF Report Analysis"*** SC33-7991-19 (June 2011)

RMF Monitor III Reporter
CPC Report – Contents Documentation (more) *

Values for all configured partitions grouped by general and special purpose processor types	
Partition	Partition name. **Notes:** 1. Partitions identified by the name PHYSICAL are not configured partitions. Data reported in these lines includes the time during which a physical CPU was busy, but the time could not be attributed to a specific logical partition. 2. The summary lines (for example, *CP or *ICF) show the total percentages for the indicated processor type. 3. Starting with z9 processors, IFLs (Integrated Facility for Linux) and zAAPs are reported separately and no longer as ICFs (Internal Coupling Facility).
MSU	Millions of unweighted CPU service units per hour: **Def** Defined MSU capacity limit for the partition. **Act** Actual MSU consumption. These values are only provided for general purpose processors.
Cap Def	The capping option of the partition: YES or NO. This field indicates whether the operator has set 'Initial Capping ON' in the logical partition controls on the Hardware Management Console (HMC) for the partition.
Proc Num	The number of logical processors which were online during the reporting interval.

* Table 17 from ***"z/OS V1R13.0 RMF Report Analysis"*** SC33-7991-19 (June 2011)

RMF Monitor III Reporter
CPC Report – Contents Documentation (more) *

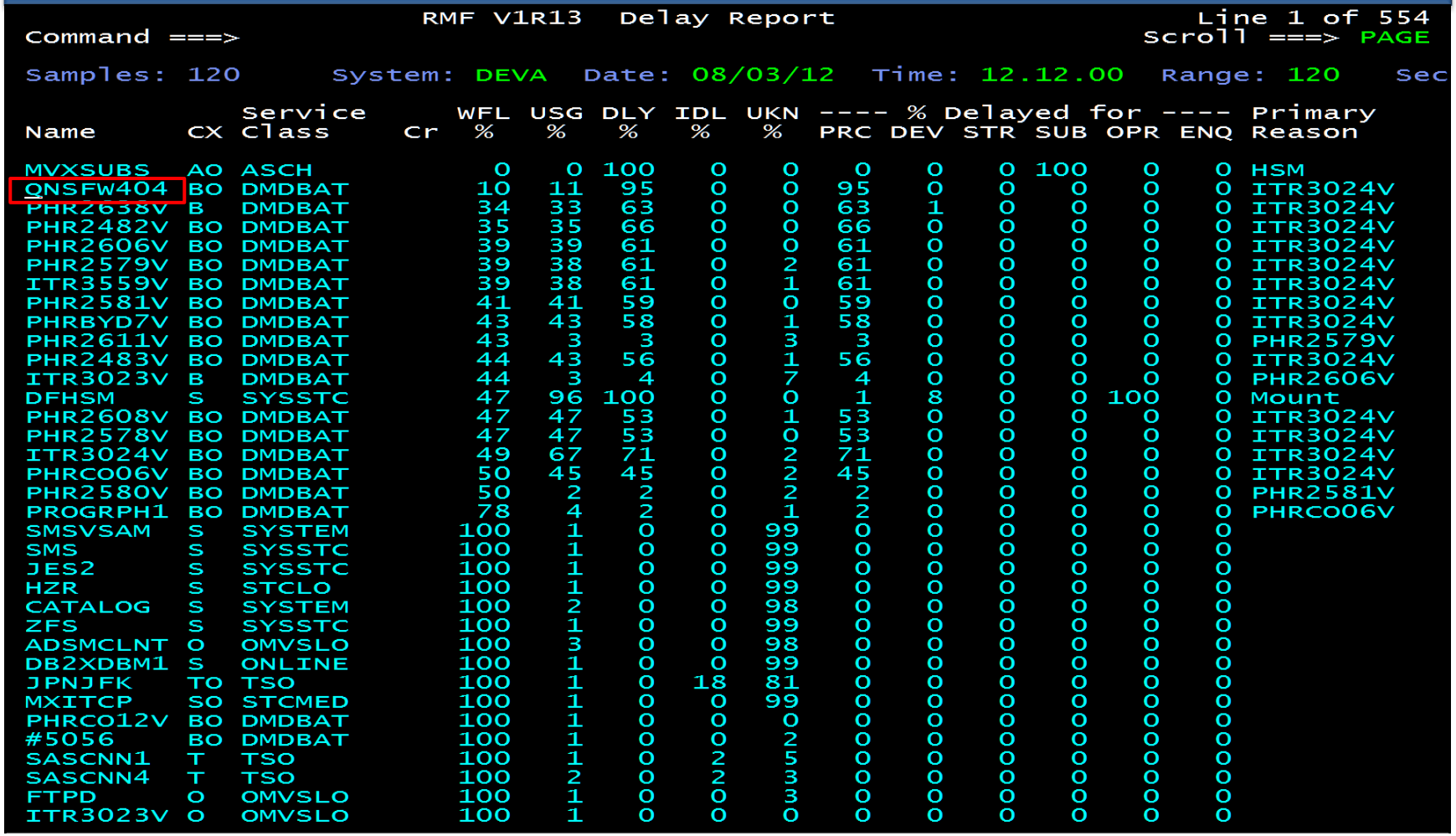
Average Processor Utilization Percentages.

- The average utilization of logical processors is based on the total online time of all logical processors assigned to the partition.
- The average utilization of physical processors is based on the total interval time of all physical processors.

Logical Util % - Effect	The average partition effective dispatch time percentage. Effective Dispatch Time ------------------------ *100 &sum. Online Times
Logical Util % - Total	The average partition total dispatch time percentage. Total Dispatch Time -------------------- *100 &sum. Online Times
Physical Util % - LPAR	The average LPAR management time percentage. Total Dispatch Time - Effective Dispatch Time -- *100 # Physical Processors * Range Time The calculation for the PHYSICAL partition is: Time PHYSICAL ---------------------------------- * 100 # Physical Processors * Range Time Time PHYSICAL is the time that could not be attributed to a specific logical partition but was used by PR/SM to control the physical processor (LPAR management time).
Physical Util % - Effect	The effective utilization of the physical processor resource by the partition. Effective Dispatch Time ---------------------------------- *100 # Physical Processors * Range Time
Physical Util % - Total	The total utilization of the physical processor resource by the partition. Total Dispatch Time ---------------------------------- *100 # Physical Processors * Range Time The Total Dispatch Time for the PHYSICAL partition includes the time during which a physical CPU was busy, but the time could not be attributed to a specific logical partition. This time includes the time PR/SM was controlling the physical processor (LPAR management time), as well as any other time the processor was busy for any reason such as managing coupling facility traffic.

* Table 17 from ***"z/OS V1R13.0 RMF Report Analysis"*** SC33-7991-19 (June 2011)

RMF Monitor III Reporter
DELAY Report



RMF V1R13 Delay Report — Line 1 of 554
Command ===> — Scroll ===> PAGE

Samples: 120 System: DEVA Date: 08/03/12 Time: 12.12.00 Range: 120 Sec

Name	CX	Service Class	Cr	WFL %	USG %	DLY %	IDL %	UKN %	% Delayed for PRC	DEV	STR	SUB	OPR	ENQ	Primary Reason
MVXSUBS	AO	ASCH		0	0	100	0	0	0	0	0	100	0	0	HSM
QNSFW404	BO	DMDBAT		10	11	95	0	0	95	0	0	0	0	0	ITR3024V
PHR2638V	B	DMDBAT		34	33	63	0	0	63	1	0	0	0	0	ITR3024V
PHR2482V	BO	DMDBAT		35	35	66	0	0	66	0	0	0	0	0	ITR3024V
PHR2606V	BO	DMDBAT		39	39	61	0	0	61	0	0	0	0	0	ITR3024V
PHR2579V	BO	DMDBAT		39	38	61	0	2	61	0	0	0	0	0	ITR3024V
ITR3559V	BO	DMDBAT		39	38	61	0	1	61	0	0	0	0	0	ITR3024V
PHR2581V	BO	DMDBAT		41	41	59	0	0	59	0	0	0	0	0	ITR3024V
PHRBYD7V	BO	DMDBAT		43	43	58	0	1	58	0	0	0	0	0	ITR3024V
PHR2611V	BO	DMDBAT		43	3	3	0	3	3	0	0	0	0	0	PHR2579V
PHR2483V	BO	DMDBAT		44	43	56	0	1	56	0	0	0	0	0	ITR3024V
ITR3023V	B	DMDBAT		44	3	4	0	7	4	0	0	0	0	0	PHR2606V
DFHSM	S	SYSSTC		47	96	100	0	0	1	8	0	0	100	0	Mount
PHR2608V	BO	DMDBAT		47	47	53	0	1	53	0	0	0	0	0	ITR3024V
PHR2578V	BO	DMDBAT		47	47	53	0	0	53	0	0	0	0	0	ITR3024V
ITR3024V	BO	DMDBAT		49	67	71	0	2	71	0	0	0	0	0	ITR3024V
PHRC006V	BO	DMDBAT		50	45	45	0	2	45	0	0	0	0	0	ITR3024V
PHR2580V	BO	DMDBAT		50	2	2	0	2	2	0	0	0	0	0	PHR2581V
PROGRPH1	BO	DMDBAT		78	4	2	0	1	2	0	0	0	0	0	PHRC006V
SMSVSAM	S	SYSTEM		100	1	0	0	99	0	0	0	0	0	0	
SMS	S	SYSSTC		100	1	0	0	99	0	0	0	0	0	0	
JES2	S	SYSSTC		100	1	0	0	99	0	0	0	0	0	0	
HZR	S	STCLO		100	1	0	0	99	0	0	0	0	0	0	
CATALOG	S	SYSTEM		100	2	0	0	98	0	0	0	0	0	0	
ZFS	S	SYSSTC		100	1	0	0	99	0	0	0	0	0	0	
ADSMCLNT	O	OMVSLO		100	3	0	0	98	0	0	0	0	0	0	
DB2XDBM1	S	ONLINE		100	1	0	0	99	0	0	0	0	0	0	
JPNJFK	TO	TSO		100	1	0	18	81	0	0	0	0	0	0	
MXITCP	SO	STCMED		100	1	0	0	99	0	0	0	0	0	0	
PHRC012V	BO	DMDBAT		100	1	0	0	0	0	0	0	0	0	0	
#5056	BO	DMDBAT		100	1	0	0	2	0	0	0	0	0	0	
SASCNN1	T	TSO		100	1	0	2	5	0	0	0	0	0	0	
SASCNN4	T	TSO		100	2	0	2	3	0	0	0	0	0	0	
FTPD	O	OMVSLO		100	1	0	0	3	0	0	0	0	0	0	
ITR3023V	O	OMVSLO		100	1	0	0	0	0	0	0	0	0	0	

From Overview Menu Option **4** or type **DELAY, DEL, DLY,** or **DL** from any Selection / Command line. **Tip:** Cursor select a **Name** to get more details for that address space.

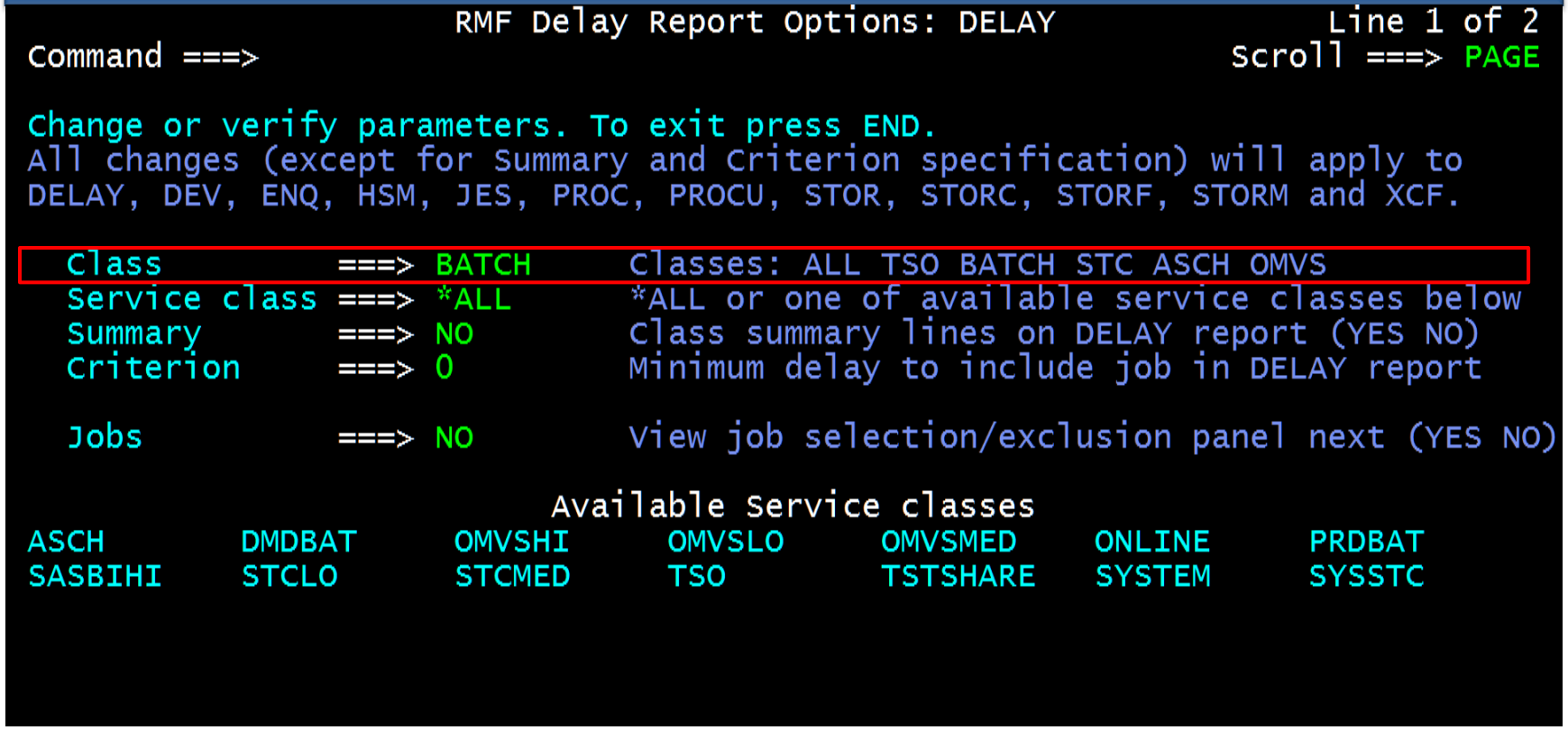
RMF Monitor III Reporter
Job DELAY Report after Cursor Select

```
                          RMF V1R13  Job Delays                    Line 1 of 1
Command ===>                                                  Scroll ===> PAGE

Samples: 120      System: DEVA  Date: 08/03/12  Time: 12.12.00  Range: 120   Sec

Job: QNSFW404      Primary delay: Job is waiting to use the processor.

Probable causes: 1) Job PHR2578V may be looping.
                 2) Higher priority work is using the system.
                 3) Improperly tuned dispatching priorities.

------------------------- Jobs Holding the Processor --------------------------
Job:          ITR3024V          Job:          PHR2578V          Job:          PHRCO06V
Holding:           64%          Holding:           46%          Holding:           45%
PROC Using:        67%          PROC Using:        47%          PROC Using:        45%
DEV Using:          1%          DEV Using:          0%          DEV Using:          1%
------------------------- Job Performance Summary -----------------------------
        Service          WFL -Using%- DLY IDL UKN ---- % Delayed for ---- Primary
CX ASID Class     P Cr    %   PRC DEV  %   %   %  PRC DEV STR SUB OPR ENQ Reason
BO 0478 DMDBAT    3       10    5   6  95   0   0  95   0   0   0   0   0 ITR3024V
```

Holding: The % of time holding job used the processor while delayed job was waiting for the processor
PROC Using: The % of time the holding job spent using the processor
DEV Using: The % of time the holding job spent using a DASD, tape, or MSC volume
When **PROC Using %** & **PROC Delay %** (not shown) = 100% for a job highlights indicate possible loop

Tip: Cursor select a **Job** to get more details for that address space
Tip: Cursor select is available also for other data fields

RMF Monitor III Reporter
Report Options (RO) for DELAY Report



As an example, let's type in **BATCH** next to Class and use **PFK3** to return to the **DELAY** report.
Note: This **RO** change impacts many reports!

RMF Monitor III Reporter
DELAY Report after BATCH Class Option on

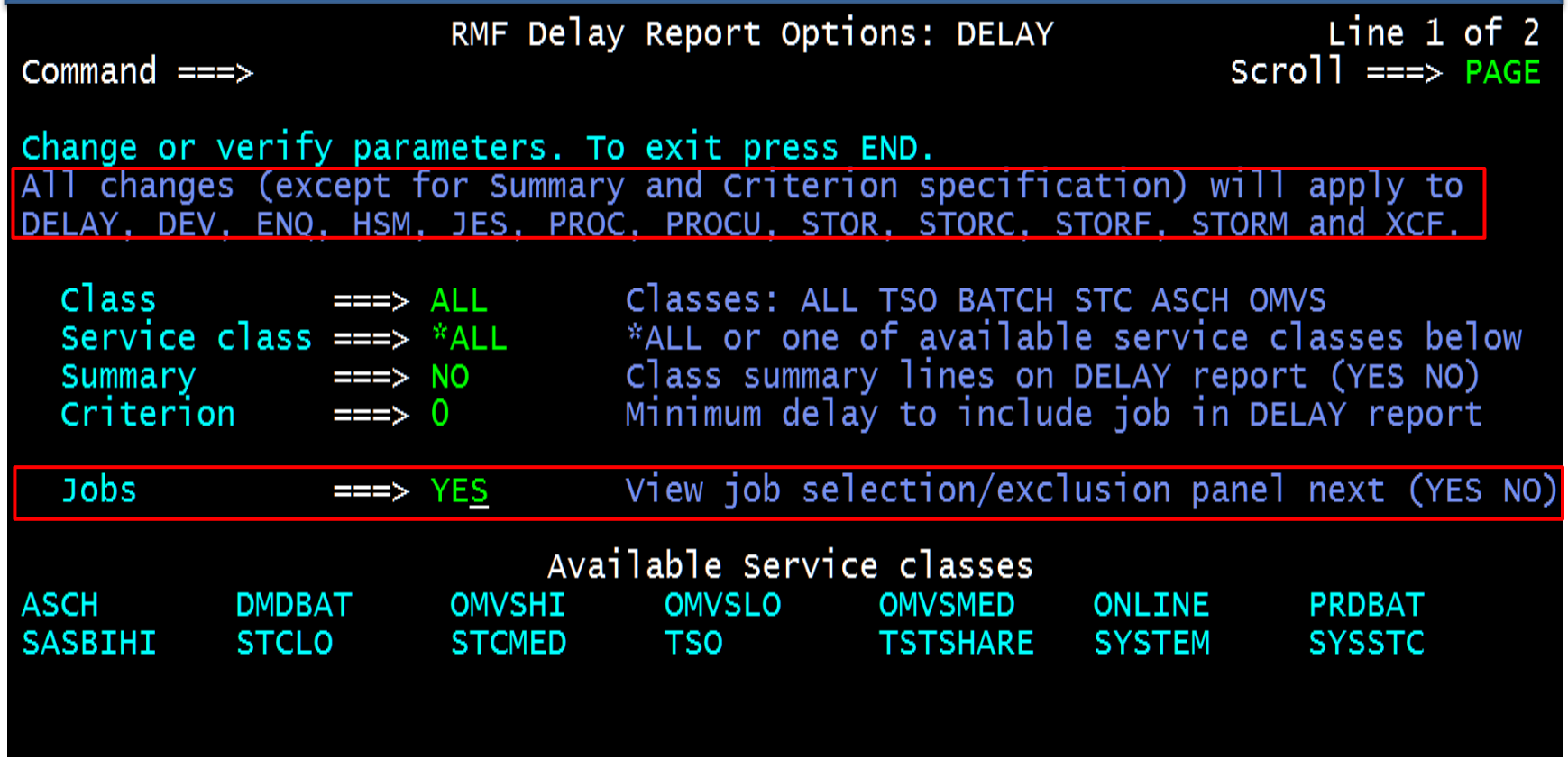
```
                              RMF V1R13  Delay Report                    Line 1 of 23
Command ===>                                                          Scroll ===> PAGE

Samples: 120      System: DEVA  Date: 08/03/12  Time: 12.12.00  Range: 120    Sec

                 Service      WFL  USG  DLY  IDL  UKN ---- % Delayed for ----  Primary
Name      CX     Class    Cr   %    %    %    %    %  PRC DEV STR SUB OPR ENQ  Reason
QNSFW404  BO     DMDBAT        10   11   95    0    0   95   0   0   0   0   0  ITR3024V
PHR2638V  B      DMDBAT        34   33   63    0    0   63   1   0   0   0   0  ITR3024V
PHR2482V  BO     DMDBAT        35   35   66    0    0   66   0   0   0   0   0  ITR3024V
PHR2606V  BO     DMDBAT        39   39   61    0    0   61   0   0   0   0   0  ITR3024V
PHR2579V  BO     DMDBAT        39   38   61    0    2   61   0   0   0   0   0  ITR3024V
ITR3559V  BO     DMDBAT        39   38   61    0    1   61   0   0   0   0   0  ITR3024V
PHR2581V  BO     DMDBAT        41   41   59    0    0   59   0   0   0   0   0  ITR3024V
PHRBYD7V  BO     DMDBAT        43   43   58    0    1   58   0   0   0   0   0  ITR3024V
PHR2611V  BO     DMDBAT        43    3    3    0    3    3   0   0   0   0   0  PHR2579V
PHR2483V  BO     DMDBAT        44   43   56    0    1   56   0   0   0   0   0  ITR3024V
ITR3023V  B      DMDBAT        44    3    4    0    7    4   0   0   0   0   0  PHR2606V
PHR2608V  BO     DMDBAT        47   47   53    0    1   53   0   0   0   0   0  ITR3024V
PHR2578V  BO     DMDBAT        47   47   53    0    0   53   0   0   0   0   0  ITR3024V
ITR3024V  BO     DMDBAT        49   67   71    0    2   71   0   0   0   0   0  ITR3024V
PHRCO06V  BO     DMDBAT        50   45   45    0    2   45   0   0   0   0   0  ITR3024V
PHR2580V  BO     DMDBAT        50    2    2    0    2    2   0   0   0   0   0  PHR2581V
PROGRPH1  BO     DMDBAT        78    4    2    0    1    2   0   0   0   0   0  PHRCO06V
PHRCO12V  BO     DMDBAT       100    1    0    0    0    0   0   0   0   0   0
#5056     BO     DMDBAT       100    1    0    0    2    0   0   0   0   0   0
CON3864V  BO     DMDBAT             0    0   50   50    0   0   0   0   0   0
D0616808  BO     PRDBAT             0    0    0   58    0   0   0   0   0   0
BD001D46  BO     DMDBAT             0    0    0  100    0   0   0   0   0   0
BD001D51  BO     DMDBAT             0    0    0  100    0   0   0   0   0   0
```

Now we only see **BATCH** jobs and we could again cursor select job **QNSFW404**

```
Changed option(s) now in effect.
```

Tip: Remember **RO** changes carry over across RMF III Reporter sessions!
"now in effect" means you **CHANGED** the current option set!

RMF Monitor III Reporter
Report Options (RO) for DELAY Report (more)



As another example using **RO**, change **CLASS** back to **ALL** and then type in **YES** next to **Jobs** and press **Enter**

Note: RO changes made here affect **multiple** reports!!

RMF Monitor III Reporter
Report Options (RO) for DELAY Report (more)

```
                        RMF Delay Report Options: DELAY                 Line 1 of 82
Command ===>                                                  Scroll ===> PAGE

Select (S), exclude (X), or fill-in jobs for report. Press END.

Sel  Jobname     Sel  Jobname     Sel  Jobname     Sel  Jobname     Sel  Jobname
---  --------    ---  --------    ---  --------    ---  --------    ---  --------
S    *ALL        *MASTER*         ###0143          ###0188          #5056
     ADABAS      ADSMCLNT         ALLOCAS          ANTAS000         ANTMAIN
     APPC        ASCH             ASCHINT          AXR              AXR01
     AXR02       AXR03            AXR04            BCI2ACNT         BCI2AFDS
     BCI2AOBJ    BCI2AOL1         BCI2AOMR         BCI2ASHR         BCI5INS1
     BCI5INS2    BCI5INS3         BCI5INS4         BCI5INS5         BCI5INS6
     BCI5INS7    BCI5INS9         BCI5SRV          BCI8INS          BCI8INS1
     BCI8INS2    BCI8INS3         BCI8INS6         BD001D46         BD001D51
     BLDMON      BPXAS            BPXOINIT         CATALOG          CEA
     CICSMW31    CICSRPM          CICSRP1          CICSRP2          CICSRP4
     CICSRP6     CONSOLE          CON3864V         CPDICNT1         CPDIOBJ1
     CPDIOLA1    CPDIOMR1         CPDISHR1         CPDITAB1         CPDJCNT1
     CPDJOBJ1    CPDJOLA1         CPDJOMR1         CPDJSHR1         CPDJTAB1
     CPDKCNT1    CPDKFDS1         CPDKOBJ1         CPDKOLA1         CPDKOMR1
     CPDKSHR1    CPDLCNT1         CPDLOBJ1         CPDLOLA1         CPDLOMR1
     CPDLSHR1    CPDLTAB1         CPDNCNT1         CPDNFDS1         CPDNOBJ1
     CPDNOLA1    CPDNOMR1         CPDNSHR1         CPDOBJDB         CPDOBJDC
     CPDOBJDD    CPDOBJ01         CPDOMRDB         CPDOMRDC         CPDOMRDD
     CPDPCNT1    CPDPFDS1         CPDPOBJ1         CPDPOLA1         CPDPOMR1
     CPDPSHR1    CPDQCNT1         CPDQFDS1         CPDQOBJ1         CPDQOLA1
     CPDQOMR1    CPDQSHR1         CPDRCNT1         CPDRFDS1         CPDROBJ1
     CPDROLA1    CPDROMR1         CPDRSHR1         CPDSHR01         CPDSP802
     CPDSP9T1    CRON5            CSF              CYFRAS           CYFRAS1
     CYFRAS2     CYFRAS3          CYFRAS4          CYFRAS5          CYFRAS6
     CYFRAS7     CYFRAS8          CYFRAS9          DB2DBM1          DB2DIST
     DB2MSTR     DB2XDBM1         DB2XDIST         DB2XMSTR         DETSDS
     DETSDS1     DETSDS2          DETSDS24         DETSDS4          DETSDS5
     DETSDS6     DETSDS7          DETSDS8          DETSDS9          DEVMAN
     DFHSM       DFRMM            DFS              DIF              DLF
     DOHAIG      DUMPSRV          D0616808         EPWFFST          ERHORT
     ETCINIT6    FSMAPA           FSMMQ32          FSMOSEPA         FSMOSEPB
     FSMOSETA    FSMOSETB         FSMOSE1A         FSMOSE1B         FSMQAC2A
     FSMQAC2B    FSMRQ31          FSMR3D           FSMR3DM          FSMR3PPA
     FSMR3QM     FSMR3QTA         FSMR3QTB         FSMR32DA         FTPD
     FTPD1       GRS              HIS              HWIBCPII         HZR
```

We get **82 lines** of Jobs to select from!! Note that ***ALL** is selected

RMF Monitor III Reporter
Report Options (RO) for DELAY Report (more)

```
                        RMF Delay Report Options: DELAY                 Line 1 of 82
Command ===>                                                  Scroll ===> PAGE

Select (S), exclude (X), or fill-in jobs for report. Press END.

Sel  Jobname     Sel  Jobname     Sel  Jobname     Sel  Jobname     Sel  Jobname
 s   PHR*_____
     _____
 x   *ALL
     ADABAS       ADSMCLNT         ALLOCAS          ANTAS000         ANTMAIN
     APPC         ASCH             ASCHINT          AXR              AXR01
     AXR02        AXR03            AXR04            BCI2ACNT         BCI2AFDS
     BCI2AOBJ     BCI2AOL1         BCI2AOMR         BCI2ASHR         BCI5INS1
     BCI5INS2     BCI5INS3         BCI5INS4         BCI5INS5         BCI5INS6
     BCI5INS7     BCI5INS9         BCI5SRV          BCI8INS          BCI8INS1
     BCI8INS2     BCI8INS3         BCI8INS6         BD001D46         BD001D51
     BLDMON       BPXAS            BPXOINIT         CATALOG          CEA
     CICSMW31     CICSRPM          CICSRP1          CICSRP2          CICSRP4
     CICSRP6      CONSOLE          CON3864V         CPDICNT1         CPDIOBJ1
     CPDIOLA1     CPDIOMR1         CPDISHR1         CPDITAB1         CPDJCNT1
     CPDJOBJ1     CPDJOLA1         CPDJOMR1         CPDJSHR1         CPDJTAB1
     CPDKCNT1     CPDKFDS1         CPDKOBJ1         CPDKOLA1         CPDKOMR1
     CPDKSHR1     CPDLCNT1         CPDLOBJ1         CPDLOLA1         CPDLOMR1
     CPDLSHR1     CPDLTAB1         CPDNCNT1         CPDNFDS1         CPDNOBJ1
     CPDNOLA1     CPDNOMR1         CPDNSHR1         CPDOBJDB         CPDOBJDC
     CPDOBJDD     CPDOBJO1         CPDOMRDB         CPDOMRDC         CPDOMRDD
     CPDPCNT1     CPDPFDS1         CPDPOBJ1         CPDPOLA1         CPDPOMR1
     CPDPSHR1     CPDQCNT1         CPDQFDS1         CPDQOBJ1         CPDQOLA1
     CPDQOMR1     CPDQSHR1         CPDRCNT1         CPDRFDS1         CPDROBJ1
     CPDROLA1     CPDROMR1         CPDRSHR1         CPDSHR01         CPDSP802
     CPDSP9T1     CRON5            CSF              CYFRAS           CYFRAS1
     CYFRAS2      CYFRAS3          CYFRAS4          CYFRAS5          CYFRAS6
     CYFRAS7      CYFRAS8          CYFRAS9          DB2DBM1          DB2DIST
     DB2MSTR      DB2XDBM1         DB2XDIST         DB2XMSTR         DETSDS
     DETSDS1      DETSDS2          DETSDS24         DETSDS4          DETSDS5
     DETSDS6      DETSDS7          DETSDS8          DETSDS9          DEVMAN
     DFHSM        DFRMM            DFS              DIF              DLF
     DOHAIG       DUMPSRV          D0616808         EPWFFST          ERHORT
     ETCINIT6     FSMAPA           FSMMQ32          FSMOSEPA         FSMOSEPB
     FSMOSETA     FSMOSETB         FSMOSE1A         FSMOSE1B         FSMQAC2A
     FSMQAC2B     FSMRQ31          FSMR3D           FSMR3DM          FSMR3PPA
     FSMR3QM      FSMR3QTA         FSMR3QTB         FSMR32DA         FTPD
     FTPD1        GRS              HIS              HWIBCPII         HZR
```

Let's just look at Jobs that start with **'PHR'** by adding a wild card character '*'
Tip: Must use **'X'** to exclude ***ALL** entry, otherwise get all jobs selected again!
Blanking not allowed for ***ALL** selection.

RMF Monitor III Reporter
DELAY Report after Wildcard Job Selection

```
                    RMF V1R13  Delay Report                          Line 1 of 13
Command ===> _                                                  Scroll ===> PAGE

Samples: 120     System: DEVA  Date: 08/03/12  Time: 12.12.00  Range: 120   Sec

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

PHR2638V  B  DMDBAT        34  33  63   0   0  63   1   0   0   0   0 ITR3024V
PHR2482V  BO DMDBAT        35  35  66   0   0  66   0   0   0   0   0 ITR3024V
PHR2606V  BO DMDBAT        39  39  61   0   0  61   0   0   0   0   0 ITR3024V
PHR2579V  BO DMDBAT        39  38  61   0   2  61   0   0   0   0   0 ITR3024V
PHR2581V  BO DMDBAT        41  41  59   0   0  59   0   0   0   0   0 ITR3024V
PHRBYD7V  BO DMDBAT        43  43  58   0   1  58   0   0   0   0   0 ITR3024V
PHR2611V  BO DMDBAT        43   3   3   0   3   3   0   0   0   0   0 PHR2579V
PHR2483V  BO DMDBAT        44  43  56   0   1  56   0   0   0   0   0 ITR3024V
PHR2608V  BO DMDBAT        47  47  53   0   1  53   0   0   0   0   0 ITR3024V
PHR2578V  BO DMDBAT        47  47  53   0   0  53   0   0   0   0   0 ITR3024V
PHRCO06V  BO DMDBAT        50  45  45   0   2  45   0   0   0   0   0 ITR3024V
PHR2580V  BO DMDBAT        50   2   2   0   2   2   0   0   0   0   0 PHR2581V
PHRCO12V  BO DMDBAT       100   1   0   0   0   0   0   0   0   0   0
```

Now we only see jobs that start with **'PHR'.**

Tip: Do not forget to change RO options back later to see all jobs or different jobs.
If you exit the RMF III Reporter and come back a week later these filters will STILL be active!

```
Changed option(s) now in effect.
```

Merrill Consultants

RMF Monitor III Reporter
Processor Delay (PROC) Report

RMF V1R13 Processor Delays — Line 1 of 17
Command ===> — Scroll ===> PAGE

Samples: 120 System: DEVA Date: 08/03/12 Time: 12.12.00 Range: 120 Sec

Jobname	CX	Service Class	CPU Type	DLY %	USG %	EAppl %	Holding Job(s) %	Name	%	Name	%	Name
QNSFW404	BO	DMDBAT	CP	95	5	2.4	64	ITR3024V	46	PHR2578V	45	PHRCO06V
ITR3024V	BO	DMDBAT	CP	71	67	131.2	56	ITR3024V	35	PHRCO06V	32	PHR2578V
PHR2482V	BO	DMDBAT	CP	66	35	40.7	48	ITR3024V	35	PHRCO06V	33	PHR2578V
PHR2638V	B	DMDBAT	CP	63	33	37.3	46	ITR3024V	35	PHRCO06V	32	PHR2608V
PHR2606V	BO	DMDBAT	CP	61	39	38.4	45	ITR3024V	33	PHR2608V	29	PHR2578V
ITR3559V	BO	DMDBAT	CP	61	38	40.6	48	ITR3024V	29	PHR2608V	28	PHR2578V
PHR2579V	BO	DMDBAT	CP	61	38	40.6	43	ITR3024V	32	PHR2608V	31	PHRCO06V
PHR2581V	BO	DMDBAT	CP	59	41	40.6	44	ITR3024V	30	PHR2578V	28	PHR2483V
PHRBYD7V	BO	DMDBAT	CP	58	43	40.7	46	ITR3024V	32	PHRCO06V	28	PHR2483V
PHR2483V	BO	DMDBAT	CP	56	43	40.6	39	ITR3024V	29	PHR2608V	28	PHR2578V
PHR2578V	BO	DMDBAT	CP	53	47	40.7	39	ITR3024V	32	PHR2608V	27	PHRCO06V
PHR2608V	BO	DMDBAT	CP	53	47	40.7	36	ITR3024V	31	PHR2578V	28	PHRCO06V
PHRCO06V	BO	DMDBAT	CP	45	45	35.2	35	ITR3024V	23	PHR2608V	23	PHR2578V
ITR3023V	B	DMDBAT	CP	4	2	1.8	4	PHR2606V	3	ITR3559V	3	PHR2581V
PHR2611V	BO	DMDBAT	CP	3	3	2.8	3	PHR2579V	3	PHR2482V	3	PHRBYD7V
PHR2580V	BO	DMDBAT	CP	2	2	0.9	2	PHR2581V	2	PHR2606V	1	PHR2611V
PROGRPH1	BO	DMDBAT	CP	2	2	0.8	2	PHRCO06V	2	PHR2483V	2	ITR3559V

Eappl %: % of CPU time on the type of processor indicated in column **CPU Type** as TCB time + global and local SRB time + preemptable or client SRB time +enclave CPU time consumed within this address space. This is a measured value and, because a multi-tasking job can use more than one processor at a time, its maximum value is 100 times the number of logical processors you have.

Tip: Cursor select a **Job** to get more details for that address space with **Job Delay** report (already shown earlier)

Merrill Consultants

RMF Monitor III Reporter
Processor Usage (PROCU) Report

```
                        RMF V1R13  Processor Usage                  Line 1 of 17
Command ===> _                                                   Scroll ===> PAGE

Samples: 120     System: DEVA  Date: 08/03/12  Time: 12.12.00  Range: 120   Sec

            Service     --- Time on CP % ---    ----- EAppl % -----
Jobname  CX Class       Total    AAP    IIP       CP    AAP    IIP

ITR3024V BO DMDBAT      131.2    0.0    0.0    131.2           0.0
PHR2482V BO DMDBAT       40.7    0.0    0.0     40.7           0.0
PHRBYD7V BO DMDBAT       40.7    0.0    0.0     40.7           0.0
PHR2608V BO DMDBAT       40.7    0.0    0.0     40.7           0.0
PHR2578V BO DMDBAT       40.7    0.0    0.0     40.7           0.0
PHR2581V BO DMDBAT       40.6    0.0    0.0     40.6           0.0
PHR2579V BO DMDBAT       40.6    0.0    0.0     40.6           0.0
PHR2483V BO DMDBAT       40.6    0.0    0.0     40.6           0.0
ITR3559V BO DMDBAT       40.6    0.0    0.0     40.6           0.0
PHR2606V BO DMDBAT       38.4    0.0    0.0     38.4           0.0
PHR2638V B  DMDBAT       37.3    0.0    0.0     37.3           0.0
PHRCO06V BO DMDBAT       35.2    0.0    0.0     35.2           0.0
PHR2611V BO DMDBAT        2.8    0.0    0.0      2.8           0.0
QNSFW404 BO DMDBAT        2.4    0.0    0.0      2.4           0.0
ITR3023V B  DMDBAT        1.8    0.0    0.0      1.8           0.0
PHR2580V BO DMDBAT        0.9    0.0    0.0      0.9           0.0
PROGRPH1 BO DMDBAT        0.8    0.0    0.0      0.8           0.0
```

Type **PROCU** or **PU** to get this report from any **Command** or **Selection** line.

Tip: Cursor select a **Job** to get more details for that address space with **Job Delay** report (already shown earlier)

RMF Monitor III Reporter
Processor Usage (PROCU) Report * (more)

- **Time on CP %:**
  - **Total** Percentage of CPU time spent on general purpose processors as sum of TCB time, global and local SRB time, and preemptable or client SRB time consumed on behalf of this address space
  - **AAP** Percentage of CPU time on general purpose processors by this address space which was used by zAAP eligible work. This is a subset of the **Total** percentage.
  - **IIP** Percentage of CPU time on general purpose processors by this address space which was used by zIIP eligible work. This is a subset of the **Total** percentage.

* From ***"z/OS V1R13.0 RMF Report Analysis"*** SC33-7991-19 (June 2011)

RMF Monitor III Reporter
Processor Usage (PROCU) Report * (more)

- **Eappl %:**
  - **CP** Percentage of CPU time on general purpose processors (CPs) as sum of TCB time, global and local SRB time, preemptable or client SRB time, and enclave CPU time consumed within this address space.
  - **AAP** Percentage of CPU time consumed on zAAPs within this address space.
  - **IIP** Percentage of CPU time consumed on zIIPs within this address space.
  - **Eappl %** shows CPU utilization based on uniprocessor capacity. This means that the value can exceed 100% in systems with more than one processor. To get the system utilization, this value has to be divided by the number of processors.

* From ***"z/OS V1R13.0 RMF Report Analysis"*** SC33-7991-19 (June 2011)

RMF Monitor III Reporter
Processor Usage (PROCU) Report – RO Option

```
                    RMF Delay Report Options: PROCU              Line 1 of 1
Command ===>                                                Scroll ===> PAGE

Change or verify parameters. To exit press END.
Changes will apply to DELAY, DEV, ENQ, HSM, JES, PROC, PROCU, STOR, STORC,
STORF, STORM, and XCF.

  Class         ===> BATCH     Classes: ALL TSO BATCH STC ASCH OMVS
  Service class ===> *ALL      *ALL or one of available service classes below

  Jobs          ===> NO        View job selection/exclusion panel next (YES NO)

                          Available Service classes

DMDBAT     PRDBAT
```

Note: RO changes made here affect **multiple** reports!!

RMF Monitor III Reporter
Device Activity (DA) Report

```
                          RMF V1R13  Device Activity                 Line 1 of 37
Command ===>                                                   Scroll ===> PAGE

Samples: 120     System: DEVA  Date: 08/03/12  Time: 15.48.00  Range: 120   Sec

Devices reported:     ALL
Report is sorted by: Jobs, DEL

-- Device Identification -- S  -- Activity -- ACT CON DSC - Pending - - Jobs -
VolSer Num  Type    CU         Rate RspT IosQ  %   %   %   %  Rsn. %  USG  DEL

SDS013 8318 33909  2107      S 5564 .001 .000  87  71   0  16 CMR    4  4.4  0.2
DEVB01 832E 33909  2107      S  766 .000 .000  22  11   0  11 CMR    3  0.2  0.1
SDS002 810D 33909  2107      S  120 .001 .000   7   4   1   2 CMR    1  0.1  0.0
SCRD02 870C 33909  2107      S  404 .000 .000  16  10   0   6 CMR    1  0.1  0.0
SDST04 852D 33909  2107      S  426 .000 .000  14   9   0   5 CMR    1  0.1  0.0
SCRD01 813B 33909  2107      S  350 .000 .000  13   8   0   5 CMR    1  0.1  0.0
R1DDA1 8228 33909  2107      S  159 .001 .000  18  15   0   3 CMR    1  0.2  0.0
SDS010 860D 33909  2107      S  296 .001 .000  28  23   1   4 CMR    1  0.4  0.0
SDS008 850D 33909  2107      S 35.1 .000 .000   2   1   0   1                0.0  0.0
ZFS087 8304 3390A  2107      S 21.8 .005 .000   9   0   9   0                0.1  0.0
SDST01 802E 33909  2107      S  508 .000 .000  18  11   0   7 CMR    1  0.1  0.0
USRD02 8119 33909  2107      S  536 .001 .000  35  25   1   9 CMR    2  0.3  0.0
SMSD03 842A 33909  2107      S  525 .001 .000  32  25   0   7 CMR    2  0.5  0.0
SDS003 820C 33909  2107      S  966 .001 .000  54  39   0  15 CMR    4  0.7  0.0
JESD03 8028 33909  2107      S  504 .000 .000  17   9   0   8 CMR    3  0.1  0.0
MV0339 0489 3590L             S  424 .001 .000  54  45   0   9 CMR    5  0.5  0.0
```

From User Primary Menu Option type **DA** or **DEVN** or any **Command** or **Selection** line

Tip: Cursor select for **VolSer** or **Num** masking by positioning within string

Tip: Cursor select sort for **Rate, RspT, IosQ** by position on any column data

Tip: Does NOT have **RO** Report Option support. Next: Cursor select a **VolSer** item.

RMF Monitor III Reporter
Device Activity Report (Selected by VolSer mask)

```
                          RMF V1R13  Device Activity                Line 1 of 11
Command ===>                                                  Scroll ===> PAGE

Samples: 120     System: DEVA   Date: 08/03/12  Time: 15.48.00  Range: 120   Sec

Devices reported:     VolSer = SDS* only
Report is sorted by: Jobs, DEL

-- Device Identification -- S  -- Activity -- ACT CON DSC - Pending - - Jobs -
VolSer Num  Type    CU          Rate RspT IosQ  %   %   %   %  Rsn. %  USG  DEL

SDS013 8318 33909  2107      S  5564 .001 .000  87  71   0  16 CMR   4  4.4  0.2
SDS004 820D 33909  2107      S  52.9 .001 .000   3   2   0   1            0.0  0.0
SDS006 830E 33909  2107      S   101 .001 .000   6   3   1   2 CMR   1  0.0  0.0
SDST03 842D 33909  2107      S   495 .000 .000  16  10   0   6 CMR   1  0.1  0.0
SDS002 810D 33909  2107      S   120 .001 .000   7   4   1   2 CMR   1  0.1  0.0
SDST04 852D 33909  2107      S   426 .000 .000  14   9   0   5 CMR   1  0.1  0.0
SDS010 860D 33909  2107      S   296 .001 .000  28  23   1   4 CMR   1  0.4  0.0
SDS008 850D 33909  2107      S  35.1 .000 .000   2   1   0   1            0.0  0.0
SDST01 802E 33909  2107      S   508 .000 .000  18  11   0   7 CMR   1  0.1  0.0
SDS003 820C 33909  2107      S   966 .001 .000  54  39   0  15 CMR   4  0.7  0.0
SDST02 812E 33909  2107      S   687 .000 .000  23  15   0   8 CMR   1  0.2  0.0
```

Placed cursor under 2nd **"S"** in SDS volser, pressed enter, & selected only volsers with **SDS***.
Note **VolSer = SDS* only** above shows masking in effect. To get back to prior screen place cursor under any last volser character, for example the **"3"** in **SDS013** and press enter.
Next: Cursor select one value in **Rate** column.

Tip: Overtype **System:** with SMF ID to see same devices on another LPAR.
Tip: Can also select data with Device **Num** masking with cursor select.

RMF Monitor III Reporter
Device Activity Report (Sorted by Activity Rate)

```
                          RMF V1R13  Device Activity                Line 1 of 11
Command ===>                                                   Scroll ===> PAGE

Samples: 120     System: DEVA  Date: 08/03/12  Time: 15.48.00  Range: 120   Sec

Devices reported:     VolSer = SDS* only
Report is sorted by: Activity, Rate

-- Device Identification -- S  -- Activity -- ACT CON DSC - Pending - - Jobs -
VolSer Num  Type    CU        Rate RspT IosQ  %   %   %   %  Rsn. %  USG  DEL

SDS013 8318 33909  2107     S  5564 .001 .000  87  71   0  16 CMR   4  4.4  0.2
SDS003 820C 33909  2107     S   966 .001 .000  54  39   0  15 CMR   4  0.7  0.0
SDST02 812E 33909  2107     S   687 .000 .000  23  15   0   8 CMR   1  0.2  0.0
SDST01 802E 33909  2107     S   508 .000 .000  18  11   0   7 CMR   1  0.1  0.0
SDST03 842D 33909  2107     S   495 .000 .000  16  10   0   6 CMR   1  0.1  0.0
SDST04 852D 33909  2107     S   426 .000 .000  14   9   0   5 CMR   1  0.1  0.0
SDS010 860D 33909  2107     S   296 .001 .000  28  23   1   4 CMR   1  0.4  0.0
SDS002 810D 33909  2107     S   120 .001 .000   7   4   1   2 CMR   1  0.1  0.0
SDS006 830E 33909  2107     S   101 .001 .000   6   3   1   2 CMR   1  0.0  0.0
SDS004 820D 33909  2107     S  52.9 .001 .000   3   2   0   1             0.0  0.0
SDS008 850D 33909  2107     S  35.1 .000 .000   2   1   0   1             0.0  0.0
```

Placed cursor under **any number** in **Rate** column**,** pressed Enter, & sorted by Descending Rate. Note change in **Report is sorted by**. Next: Cursor select one value in **RspT** column.

Tip: Use **PFK1** (HELP) to get column descriptions

RMF Monitor III Reporter
Device Activity Report (Sorted by Response Time)

```
                          RMF V1R13  Device Activity                Line 1 of 11
Command ===>                                                    Scroll ===> PAGE

Samples: 120     System: DEVA  Date: 08/03/12  Time: 15.48.00  Range: 120   Sec

Devices reported:     VolSer = SDS* only
Report is sorted by: Activity, RspT

-- Device Identification -- S  -- Activity -- ACT CON DSC - Pending - - Jobs -
VolSer Num  Type    CU        Rate RspT IosQ  %   %   %   %  Rsn. %  USG  DEL

SDS004 820D 33909  2107     S  52.9 .001 .000   3   2   0   1          0.0  0.0
SDS006 830E 33909  2107     S   101 .001 .000   6   3   1   2 CMR   1  0.0  0.0
SDS002 810D 33909  2107     S   120 .001 .000   7   4   1   2 CMR   1  0.1  0.0
SDS010 860D 33909  2107     S   296 .001 .000  28  23   1   4 CMR   1  0.4  0.0
SDS003 820C 33909  2107     S   966 .001 .000  54  39   0  15 CMR   4  0.7  0.0
SDS013 8318 33909  2107     S  5564 .001 .000  87  71   0  16 CMR   4  4.4  0.2
SDST03 842D 33909  2107     S   495 .000 .000  16  10   0   6 CMR   1  0.1  0.0
SDST04 852D 33909  2107     S   426 .000 .000  14   9   0   5 CMR   1  0.1  0.0
SDS008 850D 33909  2107     S  35.1 .000 .000   2   1   0   1          0.0  0.0
SDST01 802E 33909  2107     S   508 .000 .000  18  11   0   7 CMR   1  0.1  0.0
SDST02 812E 33909  2107     S   687 .000 .000  23  15   0   8 CMR   1  0.2  0.0
```

Placed cursor under **<u>any number</u>** in **RspT** column**,** pressed **Enter**, & sorted by Descending Response Time. Response Time is in units of seconds.
Next: Cursor select 1st **VolSer** character in **SDS013** volume serial.

RMF Monitor III Reporter
Device Activity Trend (DT) Report

```
                          RMF V1R13  SDS013   Activity Trend          Line 1 of 20
Command ===>                                                    Scroll ===> PAGE

Samples: 108      System: DEVA  Date: 08/03/12  Time: 15.48.00  Range: 120   Sec

     VolSer:   SDS013     Number: 8318 Type and CU-Type: 33909  2107
     Latest:   08/03/12 at 15.48.00   Range/Line:        60 Sec
     Earliest: 08/03/12 at 15.14.00   Total Range:     2160 Sec   00.36.00

Time      S   --- Activity ---   ACT CON DSC - Pending -   --- User ---    WFL
              Rate   RspT   IosQ    %   %   %   %  Rsn. %   USG   DEL   TOT   %

15.48.00  S   5564   .001   .000   87  71   0  16 CMR    4   4.4   0.2   4.6  95
15.46.00  S   5758   .001   .000   98  80   0  18 CMR    5   4.8   0.2   5.0  96
15.45.00  S   4155   .001   .000   68  55   0  13 CMR    2   5.9   0.3   6.2  95
15.44.00  S   2267   .001   .000   89  73   0  16 CMR    1   2.5   0.1   2.6  95
15.42.00  S   1739   .001   .000   80  65   0  15             0.9   0.0   0.9  97
15.40.00  S   1012   .001   .000   55  45   0  10             0.6   0.0   0.6  96
15.38.00  S   3664   .001   .000   93  77   0  16 CMR    1   2.0   0.1   2.1  96
15.36.00  S   1483   .001   .000   65  53   0  12             0.8   0.0   0.8  95
15.34.00  S   1336   .001   .000   62  50   0  12             0.7   0.0   0.7  94
15.32.00  S   1409   .001   .000   60  49   0  11             0.8   0.0   0.8  96
15.30.00  S    714   .001   .000   34  27   0   7             0.3   0.0   0.3  95
15.28.00  S    676   .001   .000   30  24   0   6             0.3   0.0   0.3  95
15.26.00  S    804   .000   .000   29  23   0   6             0.4   0.0   0.4  91
15.24.00  S   1297   .001   .000   56  45   0  11             0.6   0.0   0.6  95
15.22.00  S   1207   .001   .000   58  46   0  12             0.7   0.0   0.7  95
```

Placed cursor under **1st Volser character** , pressed enter, and got this **Device Activity Trend** report. For example, selected volume **SDS013.**

Tip: Can also access this report direct with **DT** or **DEVT** typed from any Command/Selection line followed by volser or device number. Next: Cursor select **Rate** column.

RMF Monitor III Reporter
Device Resource Delays (DEVR) Report

```
                    RMF V1R13  Device Resource Delays          Line 1 of 202
Command ===>                                                  Scroll ===> PAGE

Samples: 120     System: DEVA  Date: 08/03/12  Time: 15.48.00  Range: 120   Sec

Volume S/    Act   Resp  ACT CON DSC PND %,   DEV/CU                 Service  USG DLY
  /Num PAV   Rate  Time   %   %   %  Reasons  Type     Jobname  C Class     %   %

SDS013 S     5564  0.8    87  71   0 PND  16 33909    GMXSLI2F B DMDBAT    19   1
  8318 5.4H                        CMR   4 2107     GMXSLI1F B DMDBAT    14   1
                                                    GMXTPL1  B DMDBAT     8   1
                                                    GMXSOL01 B DMDBAT     6   1
                                                    GMXBUG67 B DMDBAT     5   1
                                                    GMXKR23V B DMDBAT     4   1
                                                    GMXSTP01 B DMDBAT     4   1
                                                    GMXLAP12 B DMDBAT     4   1
                                                    NLINP1   B DMDBAT     4   1
                                                    GMXSTP05 B DMDBAT     3   1
                                                    NLI0011E B DMDBAT     3   1
                                                    GMXKR21V B DMDBAT     3   1
                                                    GMXZALH4 B DMDBAT     3   1
                                                    NLINP2   B DMDBAT     3   1
                                                    GMXKR14V B DMDBAT     2   1
                                                    GMXSTP02 B DMDBAT     2   1
                                                    GMXLAP06 B DMDBAT     2   1
                                                    GMXZALXX B DMDBAT     2   1
                                                    GMXLAP31 B DMDBAT     2   1
```

Placed cursor under **Rate,** pressed enter, and got this **Device Resource Delays** report. For example, selected **Rate 5564.** **Tip:** Can also access this report direct with **DEVR, DR,** or **DVR** typed from any **Command** or **Selection** line followed by volser.
Next: Cursor select **Volume.**

RMF Monitor III Reporter
Data Set Delays by Volume (DSNV) Report

```
                    RMF V1R13  Data Set Delays - Volume          Line 1 of 299
Command ===>                                                  Scroll ===> PAGE

Samples: 120     System: DEVA  Date: 08/03/12  Time: 15.48.00  Range: 120   Sec

--------------------------- Volume SDS013 Device Data ---------------------------
Number:     8318         Active:      87%        Pending:    16%      Average Users
Device:     33909        Connect:     71%        Delay DB:    0%          Delayed
Shared:     Yes          Disconnect:   0%        Delay CM:    4%            0.2
PAV:        5.4H
--------------- Data Set Name ---------------    Jobname   ASID  DUSG% DDLY%
TDI.MVA.V930M2.LIBRARY                          GMXSLI2F  0312     17     1
                                                GMXSLI1F  0560     14     1
                                                GMXBUG67  0501      5     1
                                                GMXSOL01  0424      5     1
                                                GMXSTP01  0362      4     1
                                                GMXKR23V  0580      3     1
                                                GMXLAP12  0325      3     1
                                                NLINP1    0560      3     1
                                                GMXSTP05  0598      3     1
                                                GMXKR14V  0352      2     1
                                                GMXKR21V  0610      2     1
                                                GMXZALXX  0629      2     1
                                                GMXSTP02  0325      1     1
                                                GMXLAP31  0629      1     1
                                                GMXZALH4  0610      1     1
                                                NLISG16F  0629      1     1
```

Placed cursor under Volume **SDS013,** pressed enter, and got this **Data Sets Delays by Volume** report. **Tip:** Can also access this report direct with **DSNV** or **DSV** typed from any **Command** or **Selection** line followed by volser. For example, **DSNV SDS013**.

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RMF Monitor III Reporter
Data Set Delays by Volume (DSNV) Report (more)

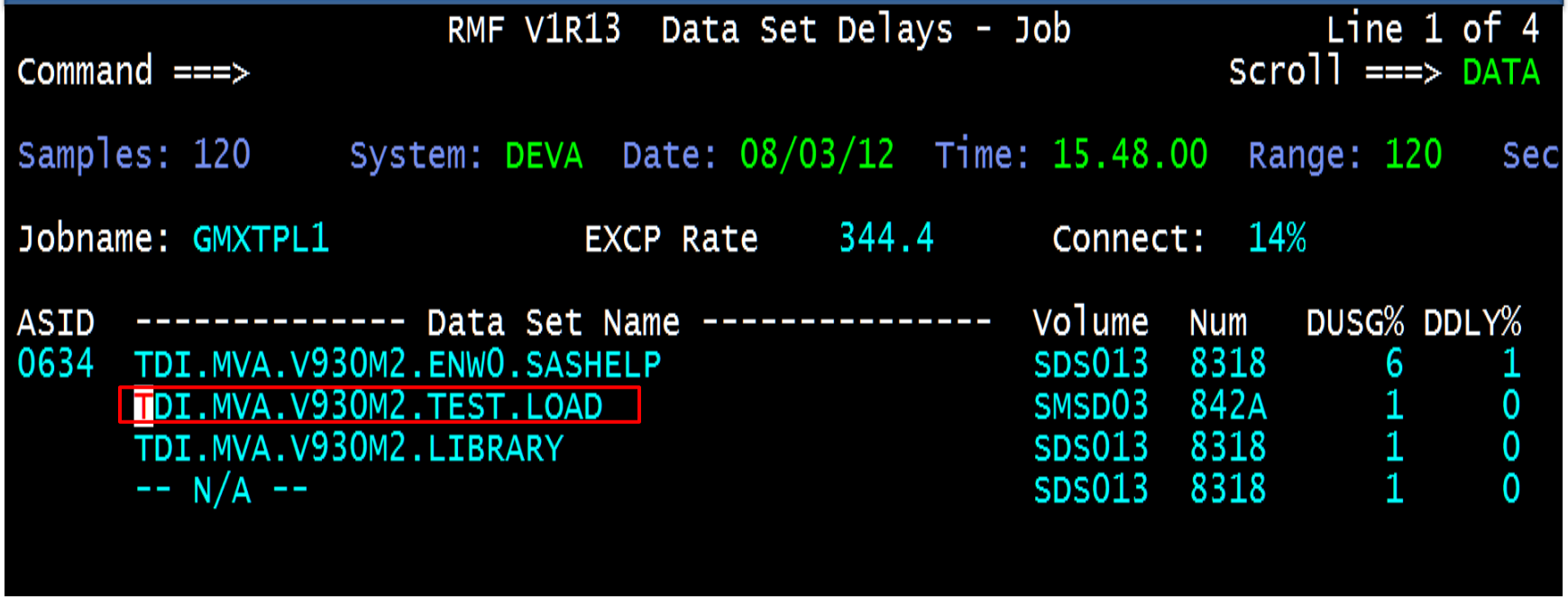
```
                    RMF V1R13  Data Set Delays - Volume       Line 177 of 299
Command ===>                                                 Scroll ===> PAGE

Samples: 120     System: DEVA  Date: 08/03/12  Time: 15.48.00  Range: 120   Sec

--------------------------- Volume SDS013 Device Data ---------------------------
Number:     8318          Active:      87%        Pending:    16%     Average Users
Device:     33909         Connect:     71%        Delay DB:    0%         Delayed
Shared:     Yes           Disconnect:   0%        Delay CM:    4%           0.2
PAV:        5.4H
-------------- Data Set Name ---------------    Jobname   ASID  DUSG% DDLY%
                                                TKSQCRJ1  0434      1     0
                                                NLI0014V  0312      1     0
                                                NLISG18F  0281      1     0
                                                NLISG19F  0490      1     0
                                                NLI0016V  0419      1     0
TDI.MVA.V930M2.ENW0.SASHELP                     GMXTPL1   0634      6     1
                                                GMXLAP06  0501      1     1
                                                #1070     0490      0     1
                                                NLINP2    0490      0     1
                                                GMXODS1   0380      3     0
                                                GMXSLI2F  0312      2     0
                                                GMXSTP03  0482      2     0
                                                GMXLAP07  0262      2     0
                                                GMXZALO1  0469      2     0
                                                GMXLAP24  0433      2     0
                                                GMXZALH4  0610      2     0
```

Scroll down and see every data set in use on this volume by job for this LPAR.
Connect % flagged if GT 40. Flags for Pending & Disconnnect also possible.
Next: Cursor select a **Jobname.**

RMF Monitor III Reporter
Data Set Delays by Job (DSNJ) Report



Placed cursor under Job **GMXTPL1,** pressed enter, and got this **Data Sets Delays by Job** report.
Next: Cursor select a data set name.

Tip: Can also access this report direct with **DSNJ** or **DSJ** typed from any **Command** or **Selection** line followed by jobname. For example, **DSNJ GMXTPL1**.

RMF Monitor III Reporter
Data Set Delays by Job (DSNJ) Report

```
                    RMF V1R13  Data Set Delays                    Line 1 of 29
Command ===> _                                                  Scroll ===> DATA

Samples: 120      System: DEVA  Date: 08/03/12  Time: 15.48.00  Range: 120    Sec

Input Data Set Name: TDI.MVA.V930M2.TEST.LOAD

--------------- Data Set Name ---------------- Volume  Jobname   ASID DUSG% DDLY%
TDI.MVA.V930M2.TEST.LOAD                       SMSD03  GMXSLI2F  0312     3     1
                                                       GMXKR19V  0629     0     1
                                                       GMXBUG78  0351     1     0
                                                       GMXBUG80  0338     1     0
                                                       GMXKR16V  0469     1     0
                                                       GMXKR21V  0610     1     0
                                                       GMXLAP04  0380     1     0
                                                       GMXSTP01  0362     1     0
                                                       GMXBUG95  0498     1     0
                                                       GMXSLI1F  0560     1     0
                                                       GMXLAP14  0550     1     0
                                                       GMXTPL1   0634     1     0
                                                       GMXZALXX  0629     1     0
                                                       GMXLAP16  0379     1     0
                                                       GMXZALH7  0415     1     0
                                                       GMXLAP28  0127     1     0
                                                       GMXLAP31  0629     1     0
                                                       #20401    0392     1     0
                                                       X12FCST3  0598     1     0
                                                       #8358     0501     1     0
                                                       NLINBAS1  0560     1     0
                                                       NLI0008E  0281     1     0
                                                       NLI0012E  0598     1     0
                                                       #22927    0550     1     0
                                                       NLINP2    0490     1     0
                                                       NLINX     0351     1     0
                                                       NLISG17F  0605     1     0
                                                       NLINPQS1  0317     1     0
                                                       NLINMOR3  0398     1     0
```

Placed cursor under Data Set Name **TDI.MVA.V930M2.TEST.LOAD,** pressed enter, and got this **Data Sets Delays by Dataset** report.

Tip: Can also access this report direct with **DSND** or **DSN** typed from any **Command** or **Selection** line followed by data set. For example, **DSND TDI.MVA.V930M2.TEST.LOAD**

RMF Monitor III Reporter
Device Activity Report (Selected by Device Number mask)

```
                        RMF V1R13  Device Activity                Line 1 of 6
Command ===>                                                  Scroll ===> PAGE

Samples: 120     System: DEVA  Date: 08/03/12  Time: 15.48.00  Range: 120   Sec

Devices reported:   NUM = 83* only
Report is sorted by: Activity, RspT

-- Device Identification -- S  -- Activity -- ACT CON DSC - Pending - - Jobs -
VolSer Num  Type    CU         Rate RspT IosQ  %   %   %   %  Rsn. %  USG  DEL

ZFS087 8304 3390A  2107     S  21.8 .005 .000   9   0   9   0          0.1  0.0
SDS006 830E 33909  2107     S   101 .001 .000   6   3   1   2 CMR    1 0.0  0.0
SDS013 8318 33909  2107     S  5564 .001 .000  87  71   0  16 CMR    4 4.4  0.2
ZFSS15 8300 3390A  2107     S  28.3 .000 .000   1   1   0   0          0.0  0.0
JESD04 8327 33909  2107     S   538 .000 .000  19  10   0   9 CMR    3 0.1  0.0
DEVB01 832E 33909  2107     S   766 .000 .000  22  11   0  11 CMR    3 0.2  0.1
```

Placed cursor under **device number "83"** pressed enter, & selected only device numbers with **83***. Note **Num = 83* only** above shows device number masking in effect.

RMF Monitor III Reporter
Common Storage Report (STORC)

```
                        RMF V1R13  Common Storage                 Line 1 of 23
Command ===> _                                                  Scroll ===> PAGE

Samples: 120     System: DEVA  Date: 08/04/12  Time: 11.06.00  Range: 120   Sec

                                        ---- Percent ----    ------- Amount --------
System Information                      CSA ECSA SQA ESQA      CSA   ECSA    SQA  ESQA
 IPL Definitions                                             3912K  372M 1316K   59M
 Peak Allocation Values                  22   47  65   95     854K  174M  860K   56M
 Average CSA to SQA Conversion            0    0              0     0
 Average Use Summary                     21   42  36   88     825K  156M  473K   52M
 Available at End of Range               79   58  64   12    3086K  216M  843K 7254K

 Unalloc Common Area: 3740K

                 Service        ELAP  -- Percent Used -    ----- Amount Used -----
Jobname  Act C   Class    ASID  Time  CSA ECSA SQA ESQA      CSA   ECSA    SQA  ESQA
%MVS                                    4    8  31   47    137K   31M  412K   28M
%REMAIN                                 2   12   0    0   91552   43M  2832 41944
CON3517V     B  DMDBAT   0606   1.3H   0    0   0    0       0     0     0   272
SHC2SAER     B  DMDBAT   0535   5.6M   0    0   0    0       0     0     0   272
CON3575V     B  DMDBAT   0474   2.7M   0    0   0    0       0     0     0   272
CON3905V     B  DMDBAT   0464  15.4M   0    0   0    0       0     0     0   272
SHC2NMS1     B  DMDBAT   0507   2.4M   0    0   0    0       0     0     0   174
SM3121V   N  B  DMDBAT   0574  10.5M   0    0   0    0       0     0     0   124
SM3124V      B  DMDBAT   0506  10.7M   0    0   0    0       0     0     0   144
D2VBY007     B  DMDBAT   0454  18.9H   0    0   0    0       0     0     0   144
```

From Resource Report Menu Option **10** or type **STORC** or **SC** on any Command /Selection line.
%MVS is common storage requested using GETMAIN by z/OS.
%REMAIN is common storage not released by ended jobs.

RMF Monitor III Reporter
Common Storage Remaining Report

```
                        RMF V1R13  Common Storage Remaining        Line 1 of 304
Command ===>                                                    Scroll ===> PAGE

Samples: 120      System: DEVA  Date: 08/04/12  Time: 11.06.00  Range: 120   Sec

                                          Amount of Common Storage
                         Job Ended       Not Released at End of Job
Jobname      ID        Date      Time        CSA  ECSA   SQA  ESQA

%REMAIN                                   91552   43M  2832 41944
LOADLPAW J0793846  08/02/12  16.09.16        0   17M     0     0
LOADLPA1 J0792308  08/02/12  14.04.39        0   16M     0     0
LOADLPA1 J0638734  07/26/12  17.53.08        0 9856K     0     0
CAS9     S0558573  07/21/12  10.53.48    62272 75488   832  9208
PRODMU   S0558570  07/27/12  19.30.16    12104     0     0     0
DFHSM    S0558435  07/21/12  11.48.51        0    32  1328     0
WXZDSA12 J0813107  08/03/12  15.11.41     1872     0     0     0
WXZDSA12 J0812832  08/03/12  15.03.01     1872     0     0     0
WXZDSA12 J0810222  08/03/12  13.42.20     1872     0     0     0
WXZDSA12 J0807733  08/03/12  12.54.28     1872     0     0     0
WXZDSA12 J0806237  08/03/12  11.21.22     1872     0     0     0
WXZDSA12 J0805514  08/03/12  11.01.48     1872     0     0     0
WXZDSA12 J0804195  08/03/12  09.57.19     1872     0     0     0
WXZDSA12 J0590239  07/24/12  08.22.11     1872     0     0     0
WXZDSA12 J0568794  07/23/12  08.21.55     1872     0     0     0
DBID20   T0686446  07/27/12  09.52.15        0  160K     0     0
IRRDPTAB S0558420  07/21/12  10.51.52        0 99392     0     0
```

Cursor selected **%REMAIN** to view possible storage leaks with this Common Storage Remaining report. Use **STORCR** (SCR) command for direct access.

Tip: Some products intentionally reserve Common Storage during startup.

RMF Monitor III Reporter
Report Options (RO) for Common Storage Report

```
                        RMF STORC Report Options                  Line 1 of 1
Command ===>                                                  Scroll ===> PAGE

Change or verify parameters. To exit press END.
All changes (except for Summary and Threshold specification) will apply to
DELAY, DEV, ENQ, HSM, JES, PROC, PROCU, STOR, STORC, STORF, STORM, and XCF.

  Class          ===> ALL       Classes: ALL TSO BATCH STC ASCH OMVS
  Service class  ===> *ALL      *ALL or one of available service classes below
  Summary        ===> NO        Class summary lines on STORC Report (YES NO)
  Threshold      ===> 0         Minimum common storage use value (%) to
                                   include job in STORC report
  Jobs           ===> NO        View job selection/exclusion panel next (YES NO)

                             Available Service classes
SRVHIM      STCLOM      STCMDM      TSO01       SYSTEM      SYSSTC
```

Type **RO** on **STORC** command line to get these options.

Tip: As noted earlier must set **DIAGxx** member for full benefit of this report.

RMF III Reporter Suggestions

- Try every report – you can not break anything as this is a read only process
- Use **HELP** (PFK1) or ***RMF Report Analysis*** manual (more complete) to find out what the headings mean
- Try the **RO** Report Option command with each report to filter and sort the data
- Don't forget you can enter **OPTSET** and select **INITIAL** to return to the distributed state of Report Options or use **RESET/CANCEL** commands
- Try cursor select on all the report columns to find out which ones support it and what you get
- Understand how you can "drill down" into the data
- Use the **Range** parameter to summarize data
- The more you use RMF III Reporter the more proficient you will become
- Do not wait for a performance problem to occur to learn RMF III Reporter

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Agenda

- Overview of RMF ✔
- Setup of RMF Monitor III ✔
- Operation of RMF Monitor III ✔
- Design of RMF Monitor III ✔
- Reporting with RMF Monitor III ✔
- MXG Support for RMF Monitor III

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RMF Monitor III & MXG Support Overview

- MXG support to build a SAS Performance Data Base (PDB) from RMF Monitor III data is available since 1995
- An RMF III PDB build is a 2 step process to transform data from 1 to many input RMF III VSAM data sets into a output SAS data base suitable as a report data repository
- This support has been continually enhanced to improve the content, quality, and usefulness of the PDB data as well as to upgrade the process itself that builds the PDB

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RMF Monitor III & MXG Support Rationale

- **Q:** Since there are already so many useful and interactive reports from the RMF Monitor III Reporter – why bother to build a Performance Data Base (PDB) at all?
- **A:** Some reasons:
  - Study trends over longer time spans than RMF III Range allows (166 minutes maximum)
  - More easily see Using or Delay patterns for specific Jobs, Enclaves, or Devices
  - Combine and sort RMF III data in creative ways that are the most meaningful for your installation and business
  - Create concise delay or activity based reports tailored for management decision makers with plots or graphs
  - Leverage the full power of SAS statistics for analysis

RMF Monitor III & MXG Support
Possible Uses for PDB Data

- Plot delays by type or activity over time for:
  jobs, enclaves, workloads, & service classes
- Analyze I/O performance by:
  I/O rate, Response Time, time of day, LPAR & so on
- Show LPAR and CEC Utilization by:
  engine type, time of day, & so on
- Display memory usage over time and determine who are the largest users

Tip: RMF Monitor III **MINTIME** intervals are usually a lot shorter than RMF Monitor I intervals giving a finer granularity of data

RMF Monitor III & MXG Support
PDB Building

- RMF III PDB builds can be ad hoc or a scheduled production activity
- You can even build a PDB from active RMF III data from the current day without waiting a dumping collection process as with SMF
- The two PDB build steps are
  1. Run assembler based utility **ASMRMFV** with 1 to many RMF III VSAM data sets as input creating a single sequential file RMFBSAM as output
  2. Then run a SAS step to build the PDB with the RMFBSAM output of **ASMRMFV** as input

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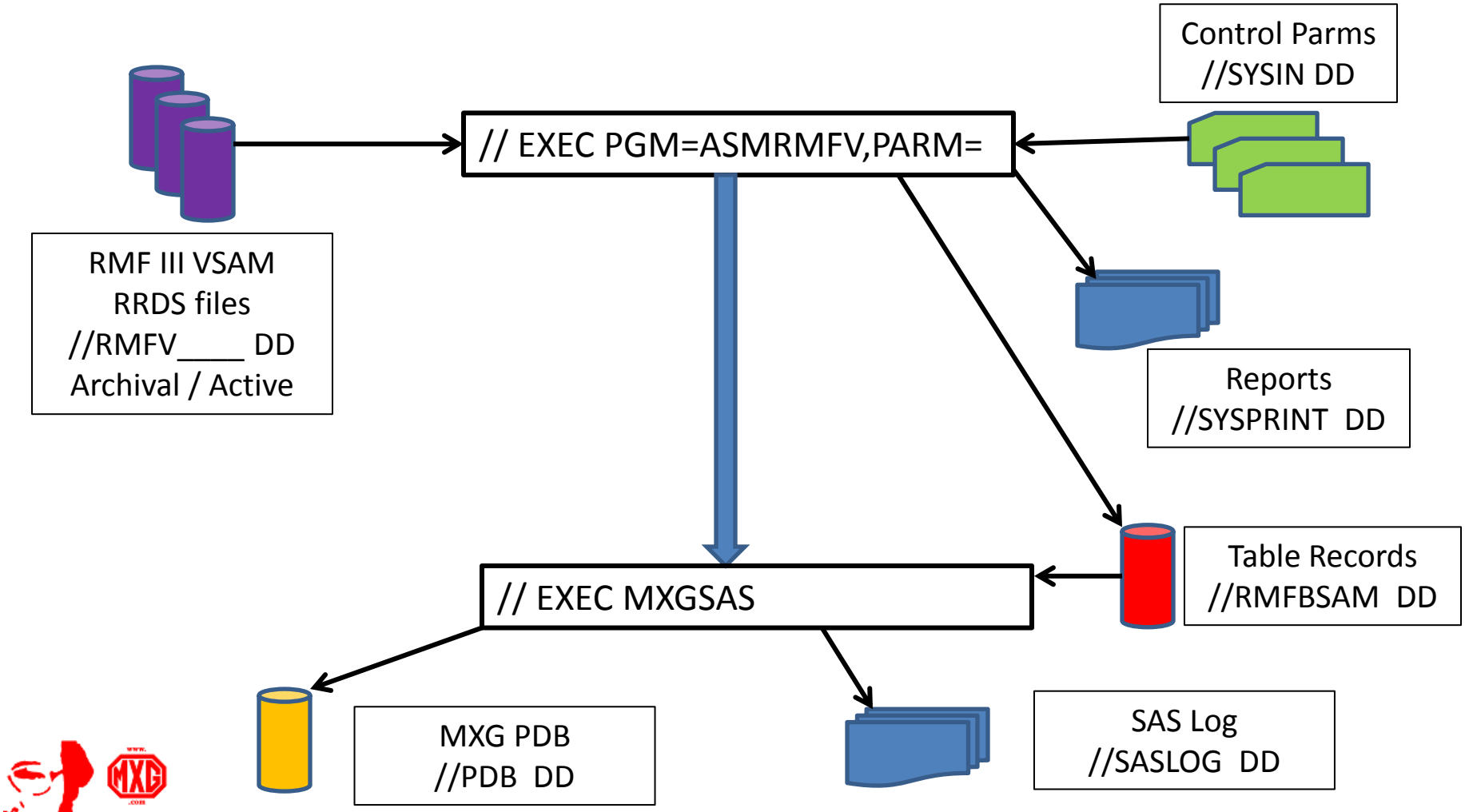
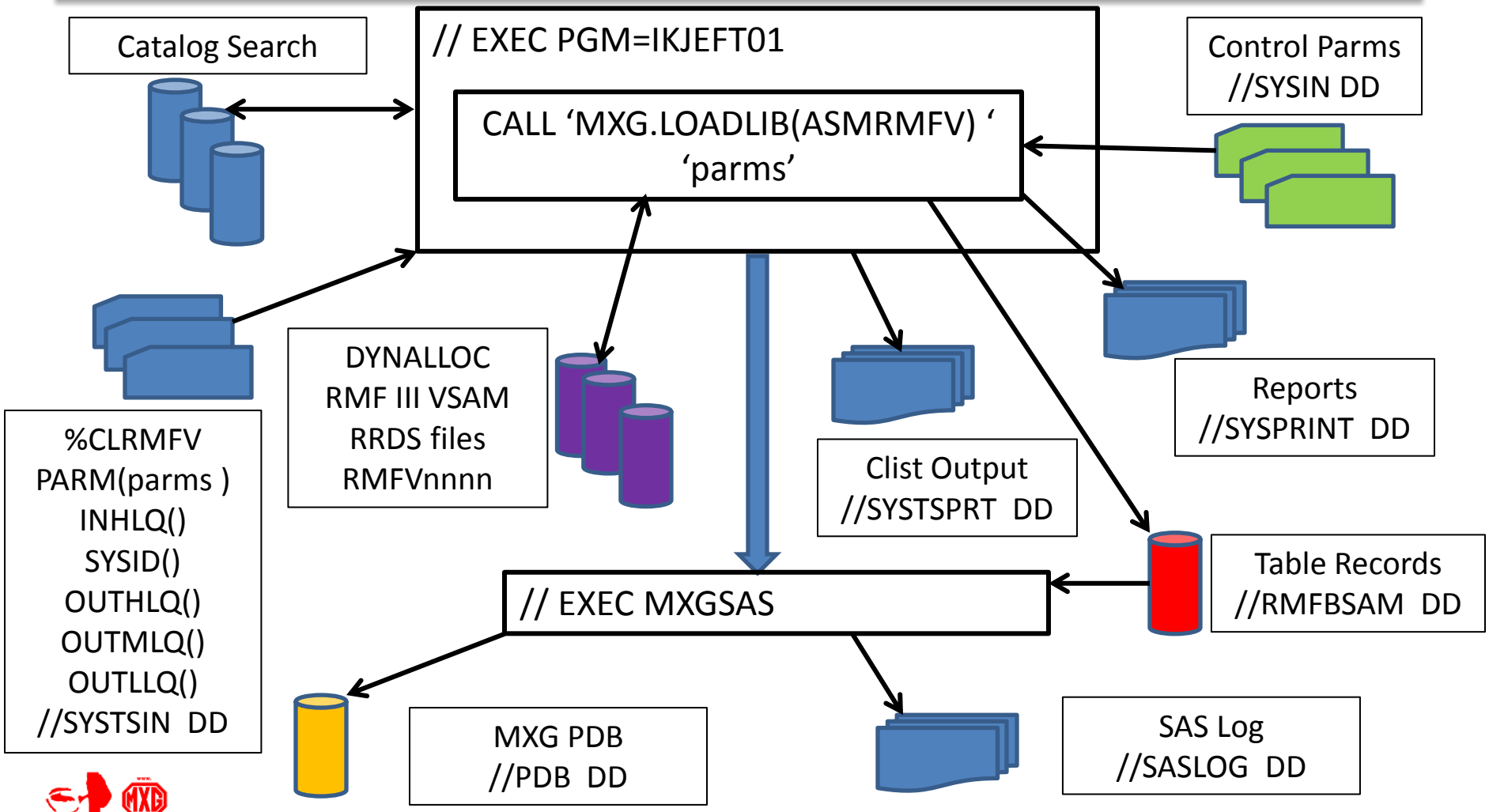
RMF Monitor III & MXG Support
PDB Building Overview – Direct JCL Method



RMF Monitor III & MXG Support
PDB Building Overview – Clist Method



Tip: CLRMFV needs **SYSID imbedded** as a level in the data set name

RMF Monitor III & MXG Support
PDB Building (more)

- **Q:** Why is a separate utility step needed?

  Can't SAS just read the RMF III VSAM files directly?
- **A:** The short answer is **no**
- As discussed earlier RMF III **MINTIME** data sample sets can actually span several physical records
- SAS cannot handle this condition as it does not know where one **MINTIME** sample ends and the next begins
- And nearly all of the data in a **MINTIME** sample is compressed according to a proprietary IBM algorithm
- Since RMF III streams output over multiple output files over several days (usually) there is also a need to subset the data by date/time and not input every possible RMF III file into every PDB build

RMF Monitor III & MXG Support
PDB Building (more)

- Any valid RMF III VSAM data set can be used to build an MXG PDB
- It does not have to be owned by an active RMF III session
- MXG will handle mixed version RMF III input files just fine, but not all SAS file variables may be populated for back-level RMF III data

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RMF Monitor III & MXG Support
PDB Building – ASMRMFV Functions

- Constructs each **MINTIME** sample set from multiple physical records
- Decompresses the sample sets using IBM service routine **ERBR3DEC**
- Supports user filters for date/time and RMF III table types selection
- Supports JCL **EXEC** statement **PARM=** fields and/or **SYSIN DD** statement or a Clist **PARM()** keyword for parm inputs
- Blocks table output up to 32K when feasible so that multiple entries for a particular RMF III table appear in the same sequential output record for I/O efficiency and performance
- Provides statistics on both RMF III data set size and index usage (already discussed) for assistance with proper data set sizing
- Rejects and bypasses input data sets that are **not VSAM RRDS** and also warns if the **CISIZE** and/or **LRECL** are not as expected

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RMF Monitor III & MXG Support
PDB Building – TYPERMFV / TYPSRMFV

- These are 2 alternative SAS source members that appear in a SAS **%INCLUDE SOURCLIB(....);** statement in the 2nd step of the PDB build process
- Member **TYPERMFV** outputs SAS data in the input order received while member **TYPSRMFV** sorts the output first removing possible duplicates before output
- Both of these members invoke MXG source member **VMACRMFV** for the actual RMF III PDB build logic
- **VMACRMFV** is sensitive to the input RMF III release in the data and PDB variables not applicable to a particular release will be set to missing
- When certain RMF III options are inactive then some PDB variables may be missing or there may even be zero observations for entire output files (more on this later)

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Tip: Use **OPTIONS='USER=PDB'** in JCL EXEC statement with **TYPERMFV** to create a permanent PDB

RMF Monitor III & MXG Support
PDB Building – ASMRMFV / VMACRMFV Dependency

- **ASMRMFV** output works in close coordination with SAS member **VMACRMFV** input at any particular MXG release level
- If a back level **ASMRMFV** is used with a current **VMACRMFV** in a PDB build some maintenance fixes and/or enhancements may not appear the output PDB as intended
- **Recommendation:** (Strong) **Always re-assemble and re-link ASMRMFV when installing a new MXG release**
- Mismatched levels are not usually fatal to the PDB build but the value of the maintenance is not realized and old problems may continue to appear

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RMF Monitor III & MXG Support
PDB Building – RMF III VSAM DD statements

- **Q:** How many RMFV____ VSAM DD statements can I have as input to **ASMRMFV?**
- **A:** It depends on the **TIOT SIZE(**nn**)** parameter in the **ALLOC**xx member in **SYS1.PARMLIB** for the LPAR
- nn specifies in Kilobytes for the size of the **Task Input / Output Table (TIOT)**
- Range: 16-64
- Default: 32

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RMF Monitor III & MXG Support
PDB Building – RMF III VSAM DD statements (more)

- Relationship between **TIOT** size & maximum number of DDs allowed *:

SIZE Value Dec	(Hex)	Size of TIOT	Maximum number of single Unit DDs allowed	Maximum number of DDs allowed when every DD requests the maximum number of units (59)
16	10	16384 (16K)	816	64
17	11	17408 (17K)	867	68
24	18	24576 (24K)	1225	97
25	19	25600 (25K)	1277	101
Default => 32	**20**	**32768 (32K)**	**1635**	**129**
40	28	40960 (40K)	2045	162
48	30	49152 (48K)	2454	194
56	38	57344 (56K)	2864	227
64	40	65536 (64K)	3273	259

Note: TIOT default size would allow 16 LPARs at maximum 100 RMF III VSAM data sets each or maximum size allows 32 LPARs of 100 VSAM data sets each (single volume)

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* From IBM Manual **"z/OS V1R13.0 MVS Initialization and Tuning Reference"** (SA22-7592-24)

RMF Monitor III & MXG Support
PDB Building – RMF III VSAM DD statements (more)

- Reduce limit to allow for DDs for **STEPLIB, SYSPRINT, RMFBSAM**, and perhaps **SYSIN**
- When using the Clist method code **DYNAMNBR=** on the **EXEC** statement for the estimated number of RMF III VSAM files that will be found by search
- **DYNAMNBR=** cannot exceed the DD limit according to **TIOT** SIZE(nn) for the LPAR (minus reductions)
- If needing more VSAM DDs than the LPAR limit, consider running **ASMRMFV** in two steps, then concatenate both RMFBSAM files into the final PDB build step

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RMF Monitor III & MXG Support
PDB Building – Using Archival RMFBSAM files

- **NOT RECOMMENDED!**
- If a back level **RMFBSAM** data is input to a current **VMACRMFV** for a PDB build missing values and even abends are possible
- Downward compatibility is a goal, but not every old version of ASMRMFV RMFBSAM data can be tested with new levels of VMACRMFV
- RMFBSAM is a temporary work file not intended to be retained for future uses
- Instead build the PDB from archival RMF III VSAM files
- Can also use RMF III archival reporting with these
- May not even need the PDB for the investigation

RMF Monitor III & MXG Support
PDB Building – EXZRBxxx Output Exits

- These are user tailorable SAS output exits called from the VMACRMFV program during the build to filter the observations to **ZRB**xxx datasets
- For most RMF III tables record entries are **blocked** to reduce I/Os, disk space, elapsed time, and CPU time processing the RMFBSAM file
- This means there are multiple data entries per each input record
- For example, in **DVT** records there is one entry for each device
- This affects your coding design in these exits
- Cannot use these constructs to subset unblocked output data as before:

  IF something;

  IF something **THEN DELETE**;

  IF something **THEN RETURN;**

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RMF Monitor III & MXG Support
PDB Building – EXZRBxxx Output Exits (more)

- Why??
- These statements tell SAS you are **done** with the input record
- When **IF** something; is **NOT TRUE**
- Or when the **DELETE** or **RETURN** is executed
- All the rest of the subsequent table entries are **NEVER read**
- Instead use:

```
IF something THEN DO;
    OUTPUT _Wdddddd;
    END;
```

- **_Wdddddd** is the SAS macro name for the output file
- For example, for the DVT file it is **_WZRBDVT**

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RMF Monitor III & MXG Support
PDB Building – EXZRBxxx Output Exits (more)

- All these files have blocked table input as of **MXG V31.02**:

RMF III Table	Output Exit
ASI	EXZRBASI
CPC	EXZRBLCP
CPD	EXZRBCPD
CSR	EXZRBCSR
DVT	EXZRBDVT
ENC	EXZRBENC
ENT	EXZRBENT
OPD	EXZRBOPD
RED	EXZRBRED
SHD	EXZRBSHD
SPG	EXZRBSPG
UWD	EXZRBUWD

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RMF Monitor III & MXG Support
PDB Building – Installing ASMRMFV

- This effort is **only required once for each new release** of MXG being installed
- **Q:** Do I need to know assembler to install **ASMRMFV**?
- **A: No** assembler expertise is required or expected
- Only a few basic modifications are needed to the sample member **JCLASM3** in the MXG SOURCLIB
- **ASMRMFV** does not require APF authorization nor residence in any APF authorized library as no APF services are used

Tip: Do not be intimidated by this install.
Consider and use **ASMRMFV** as a utility program as you would any other.

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RMF Monitor III & MXG Support
PDB Building – Installing ASMRMFV (more)

1. Allocate an empty MXG load library PDS (or PDSE) such as **MXG.Vnnnn.LOADLIB**. A few cylinders and directory blocks should be sufficient. You can use the same load library for any other MXG assembler based programs or exits.
2. Copy sample member **JCLASM3** from MXG SOURCLIB into a library of your choice (MXG MODSOURC suggested) and modify as follows:
   - Set the **ASM.SYSIN** data set name to your MXG SOURCLIB data set
   - Set the **SYSLMOD** data set name to your new MXG load library above
3. Add a **JOB** statement to the front using your installation standards
4. Submit the batch job and at end review that **Condition Code 0000** appears for both assembly and link-edit steps
5. If not, simply contact MXG Technical Support at support@mxg.com

RMF Monitor III & MXG Support
PDB Building – JCLASM3 member

```
//ASM EXEC PGM=ASMA90,
//  PARM='DECK,NOOBJ,XREF(SHORT),NOUSING'
//*
//SYSPRINT DD SYSOUT=*
//SYSLIB   DD DSN=SYS1.MACLIB,DISP=SHR
//         DD DSN=SYS1.MODGEN,DISP=SHR    <- Tip: ASMRMFV at V30.03 and up requires SYS1.MODGEN as shown
//SYSUT1   DD UNIT=SYSDA,SPACE=(CYL,(5,1),,CONTIG)
//SYSPUNCH DD DSN=&&OBJ,DISP=(NEW,PASS,DELETE),
//            UNIT=SYSDA,SPACE=(CYL,(1,1),RLSE),
//            DCB=(RECFM=FB,BLKSIZE=3120,LRECL=80)
//*
//*  CHANGE THE lower case DSN BELOW TO YOUR MXG SOURCLIB             */
//ASM.SYSIN DD DISP=SHR,DSN=your.mxg.sourclib(ASMRMFV)  <==CHANGE DSN
//LKED EXEC PGM=IEWBLINK,
//            PARM='XREF,LIST',
//            COND=(0,NE,ASM)            <- Tip: Must NOT link unless ASM has COND CODE 0000
//SYSPRINT DD SYSOUT=*
//SYSUT1   DD UNIT=SYSDA,SPACE=(CYL,(1,1))
//*
//*  CHANGE THE lower case DSN BELOW TO YOUR MXG LOADLIB              */
//SYSLMOD  DD DISP=SHR,
//            DSN=your.mxg.load.library(ASMRMFV)       <==CHANGE DSN
//SYSLIN DD DISP=(OLD,DELETE),DSN=&&OBJ
```

Excerpted – leading comments from sample not shown

Tip: If you have not assembled / linked ASMRMFV in a while note that **SYS1.MODGEN** is now required for SYSLIB since V30.03 and update your JCL.

RMF Monitor III & MXG Support
RMF III Tables Supported (as of V31.02)

IBM Table Name	IBM Description	MXG Short Name
ERBASIG3	Address Space Identification Table	ASI
ERBCFIG3	Coupling Facility Information Table	CFI
ERBCPCDB	CPC Data Control Block	CPC
ERBCPDG3	Channel Data Table	CPD
ERBCPUG3	Processor Data Control Block	CPU
ERBCSRG3	Common Storage Remaining Table	CSR
ERBDSIG3	Data Set Header and Index	DSH
ERBDVTG3	Device Table	DVT
ERBENCG3	Enclave Data Table	ENC
ERBENTG3	Enqueue Name Table	ENT
ERBGEIG3	General Information Table	GEI

Tip: Most tables are selectable during a PDB build using the MXG short name as an **ASMRMFV** PARM. The default is **ALL.**

RMF Monitor III & MXG Support
RMF III Tables Supported (more)

IBM Table Name	Description	MXG Short Name
ERBOPDG3	OMVS Process Data Table	OPD
ERBPGPER	Performance Group Period Table (obsolete)	PGP
ERBRCDG3	Resource Collection Data	RCD
ERBREDG3	Resource Data Record	RED
ERBSHDG3	Sample Header	SHD
ERBSPGG3	Storage Group and Volume Data	SPG
ERBSSHG3	MINTIME Set of Samples Header	SSH
ERBSVPG3	Service Policy	SVP
ERBUWDG3	USE/WAIT Record	UWD

Most tables can appear in every **MINTIME** sample set interval

Tip: PGP Table not created when LPAR in **Goal Mode** and **is disabled** in PDB processing by default

RMF Monitor III & MXG Support
PDB Building – Examples Assumptions

- These examples assume 3 LPARs with SMF ids **SYSA, SYSB**, and **SYSC** each with 3 RMF III VSAM data sets
- Assume these data set names have the pattern:

VSYS.RMFIII.smfid.DSn

where n is 1 to 3 and smfid is an SMF id as noted above

- The MXG Load library is **MXG.V3102.LOADLIB**
- The output ASMRMFV file is **MXG.RMFIII.OUT**
- The MXG output PDB name is **MXG.RMFIII.PDB**
- The MXG JCL procedure is **MXGSAS**

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RMF Monitor III & MXG Support
PDB Building – Examples & ASMRMFV

- There are two methods available to run an **ASMRMFV** step:

1. Direct JCL method requires coding every RMF III VSAM data set as a DD statement, but has less overhead
2. Batch **CLRMFV** Clist method searches catalogs to find the RMF III VSAM data sets using a pattern you provide, but has more overhead

- Examples show both methods for comparison
- DDNAMEs for Direct JCL method must begin with **RMFV** followed by any legal DDNAME characters

RMF Monitor III & MXG Support
PDB Building – Example 1A
All RMF III Dates, Times, & Tables

```
//MYJOB  JOB ....
//DECOMP EXEC PGM=ASMRMFV                          ← Start of RMF III data decompress step
//STEPLIB DD  DISP=SHR,DSN=MXG.V3102.LOADLIB       ← Library where ASMRMFV was installed
//SYSPRINT DD SYSOUT=*
//RMFV0001 DD DISP=SHR,DSN=VSYS.RMFIII.SYSA.DS1
//RMFV0002 DD DISP=SHR,DSN=VSYS.RMFIII.SYSA.DS2
//RMFV0003 DD DISP=SHR,DSN=VSYS.RMFIII.SYSA.DS3
//RMFV0004 DD DISP=SHR,DSN=VSYS.RMFIII.SYSB.DS1   ← RMF III VSAM Data Sets
//RMFV0005 DD DISP=SHR,DSN=VSYS.RMFIII.SYSB.DS2
//RMFV0006 DD DISP=SHR,DSN=VSYS.RMFIII.SYSB.DS3
//RMFV0007 DD DISP=SHR,DSN=VSYS.RMFIII.SYSC.DS1
//RMFV0008 DD DISP=SHR,DSN=VSYS.RMFIII.SYSC.DS2
//RMFV0009 DD DISP=SHR,DSN=VSYS.RMFIII.SYSC.DS3
//RMFBSAM  DD DISP=(NEW,CATLG),UNIT=SYSDA,         ← ASMRMFV Output file
//  SPACE=(CYL,(100,100),RLSE),DSN=MXG.RMFIII.OUTPUT
//SYSIN    DD DUMMY
//BUILD    EXEC MXGSAS,COND=(4,LT)                 ← Start of build PDB step
//RMFBSAM  DD DISP=SHR,DSN=MXG.RMFIII.OUTPUT       ← Input file from ASMRMFV
//PDB      DD DISP=(NEW,CATLG),UNIT=SYSDA,         ← Output MXG PDB
//   SPACE=(CYL,(100,100)),DSN=MXG.RMFIII.PDB
//SYSIN DD *
%INCLUDE SOURCLIB(TYPSRMFV);                       ← Alternate: %INCLUDE SOURCLIB(TYPERMFV);
/*
```

ASMRMFV direct JCL invocation method.
No ASMRMFV **PARM=** field or **SYSIN DD** data.

RMF Monitor III & MXG Support
PDB Building – Example 1B
All RMF III Dates, Times, & Tables

```
//MYJOB  JOB ....
//DECOMP EXEC PGM=IKJEFT01,DYNAMNBR=9          ← Start of RMF III data decompress step
//SYSPROC  DD DISP=SHR,DSN=MXG.V3102.SOURCLIB  ← Location of CLRMFV Clist
//SYSPRINT DD SYSOUT=*
//SYSTSIN  DD *
  %CLRMFV -
  INHLQ('VSYS.RMFIII.') -                    ← High level qualifier for RMF III dsets
  OUTHLQ('MXG') -                            ← High level qualifier for output data set
  OUTMLQ('RMFIII') -                         ← Mid level qualifier for output data set
  OUTLLQ('OUTPUT') -                         ← Low level qualifier for output data set
  PGMLIB('MXG.V3102.LOADLIB') -              ← Library where ASMRMFV was installed
  SYSID('SYSA' 'SYSB' 'SYSC') -              ← SMF Sysids to be processed
  SPACE('100,100')                           ← Space allocation for output file
/*
//BUILD    EXEC MXGSAS,COND=(4,LT)           ←  Start of build PDB step
//RMFBSAM  DD DISP=SHR,DSN=MXG.RMFIII.OUTPUT ←  Input file from ASMRMFV
//PDB      DD DISP=(NEW,CATLG),UNIT=SYSDA,   ←  Output MXG PDB
//  SPACE=(CYL,(100,100)),DSN=MXG.RMFIII.PDB
//SYSIN DD *
%INCLUDE SOURCLIB(TYPSRMFV);                 ← Alternate: %INCLUDE SOURCLIB(TYPERMFV);
/*
```

Estimate DYNAMNBR= for number VSAM files expected

ASMRMFV CLRMFV Clist invocation method with no **PARM()** keyword.
Clist lines ending with **–** indicate continuation. Searches for VSAM data sets named **VSYS.RMFIII.SYSA.*. VSYS.RMFIII.SYSB.*, VSYS.RMFIII.SYSC.*** in catalog.
DYNAMNBR should be equal to at least the number of VSAM data sets.

RMF Monitor III & MXG Support
PDB Building – Example 2A
All RMF III Tables Yesterday Only

```
//MYJOB  JOB ....
//DECOMP EXEC PGM=ASMRMFV,PARM='FD=*-1,TD=*-1'  ← FROMDATE and TODATE parms set to yesterday
//STEPLIB DD  DISP=SHR,DSN=MXG.V3102.LOADLIB    ← Library where ASMRMFV was installed
//SYSPRINT DD SYSOUT=*
//RMFV0001 DD DISP=SHR,DSN=VSYS.RMFIII.SYSA.DS1
//RMFV0002 DD DISP=SHR,DSN=VSYS.RMFIII.SYSA.DS2
//RMFV0003 DD DISP=SHR,DSN=VSYS.RMFIII.SYSA.DS3
//RMFV0004 DD DISP=SHR,DSN=VSYS.RMFIII.SYSB.DS1
//RMFV0005 DD DISP=SHR,DSN=VSYS.RMFIII.SYSB.DS2
//RMFV0006 DD DISP=SHR,DSN=VSYS.RMFIII.SYSB.DS3
//RMFV0007 DD DISP=SHR,DSN=VSYS.RMFIII.SYSC.DS1
//RMFV0008 DD DISP=SHR,DSN=VSYS.RMFIII.SYSC.DS2
//RMFV0009 DD DISP=SHR,DSN=VSYS.RMFIII.SYSC.DS3
//RMFBSAM  DD DISP=(NEW,CATLG),UNIT=SYSDA,     ← ASMRMFV Output file
// SPACE=(CYL,(100,100),RLSE),DSN=MXG.RMFIII.OUTPUT
//SYSIN    DD DUMMY
//BUILD    EXEC MXGSAS,COND=(4,LT)             ← Start of build PDB step
//RMFBSAM  DD DISP=SHR,DSN=MXG.RMFIII.OUTPUT   ← Input file from ASMRMFV
//PDB      DD DISP=(NEW,CATLG),UNIT=SYSDA,     ← Output MXG PDB
//  SPACE=(CYL,(100,100)),DSN=MXG.RMFIII.PDB
//SYSIN DD *
%INCLUDE SOURCLIB(TYPSRMFV);                   ← Alternate: %INCLUDE SOURCLIB(TYPERMFV);
/*
```

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ASMRMFV direct JCL invocation method with EXEC **PARM=** field.
Parms could have followed **SYSIN DD** * instead.

RMF Monitor III & MXG Support
PDB Building – Example 2B
All RMF III Tables Yesterday Only

```
//MYJOB  JOB ....
//DECOMP EXEC PGM=IKJEFT01,DYNAMNBR=9          ← Start of RMF III data decompress step
//SYSPROC  DD DISP=SHR,DSN=MXG.V3102.SOURCLIB  ← Location of CLRMFV Clist
//SYSPRINT DD SYSOUT=*
//SYSTSIN  DD *
  %CLRMFV -
  INHLQ('VSYS.RMFIII.') -                     ← High level qualifier for RMF III dsets
  PARM('FD=*-1,TD=*-1') -                     ← FROMDATE/TODATE Yesterday only
  OUTHLQ('MXG') -                             ← High level qualifier for output data set
  OUTMLQ('RMFIII') -                          ← Mid level qualifier for output data set
  OUTLLQ('OUTPUT') -                          ← Low level qualifier for output data set
  PGMLIB('MXG.V3102.LOADLIB') -               ← Library where ASMRMFV was installed
  SYSID('SYSA' 'SYSB' 'SYSC') -               ← SMF Sysids to be processed
  SPACE('100,100')                            ← Space allocation for output file
/*
//BUILD    EXEC MXGSAS,COND=(4,LT)            ←  Start of build PDB step
//RMFBSAM  DD DISP=SHR,DSN=MXG.RMFIII.OUTPUT  ←  Input file from ASMRMFV
//PDB      DD DISP=(NEW,CATLG),UNIT=SYSDA,    ←  Output MXG PDB
//  SPACE=(CYL,(100,100)),DSN=MXG.RMFIII.PDB
//SYSIN DD *
%INCLUDE SOURCLIB(TYPSRMFV);                  ← Alternate: %INCLUDE SOURCLIB(TYPERMFV);
/*
```

ASMRMFV CLRMFV Clist invocation method with **PARM()** keyword.
Clist lines ending with **–** indicate continuation. Searches for VSAM data sets named **VSYS.RMFIII.SYSA.*, VSYS.RMFIII.SYSB.*, VSYS.RMFIII.SYSC.*** in catalog.
DYNAMNBR should be equal to at least the number of VSAM data sets.

RMF Monitor III & MXG Support
PDB Building – Example 3A
ASI, CPU, ENC RMF III Tables Yesterday Only

```
//MYJOB  JOB ....
//DECOMP EXEC PGM=ASMRMFV,
//  PARM='FD=*-1,TD=*-1,ASI,CPU,ENC'          ← Select ASI, CPU, ENC Tables only
//STEPLIB DD  DISP=SHR,DSN=MXG.V3102.LOADLIB  ← Library where ASMRMFV was installed
//SYSPRINT DD SYSOUT=*
//RMFV0001 DD DISP=SHR,DSN=VSYS.RMFIII.SYSA.DS1
//RMFV0002 DD DISP=SHR,DSN=VSYS.RMFIII.SYSA.DS2
//RMFV0003 DD DISP=SHR,DSN=VSYS.RMFIII.SYSA.DS3
//RMFV0004 DD DISP=SHR,DSN=VSYS.RMFIII.SYSB.DS1
//RMFV0005 DD DISP=SHR,DSN=VSYS.RMFIII.SYSB.DS2
//RMFV0006 DD DISP=SHR,DSN=VSYS.RMFIII.SYSB.DS3
//RMFV0007 DD DISP=SHR,DSN=VSYS.RMFIII.SYSC.DS1
//RMFV0008 DD DISP=SHR,DSN=VSYS.RMFIII.SYSC.DS2
//RMFV0009 DD DISP=SHR,DSN=VSYS.RMFIII.SYSC.DS3
//RMFBSAM  DD DISP=(NEW,CATLG),UNIT=SYSDA,    ← ASMRMFV Output file
// SPACE=(CYL,(100,100),RLSE),DSN=MXG.RMFIII.OUTPUT
//SYSIN    DD DUMMY
//BUILD    EXEC MXGSAS,COND=(4,LT)            ← Start of build PDB step
//RMFBSAM  DD DISP=SHR,DSN=MXG.RMFIII.OUTPUT  ← Input file from ASMRMFV
//PDB      DD DISP=(NEW,CATLG),UNIT=SYSDA,    ← Output MXG PDB
//  SPACE=(CYL,(100,100)),DSN=MXG.RMFIII.PDB
//SYSIN DD *
%INCLUDE SOURCLIB(TYPSRMFV);                  ← Alternate: %INCLUDE SOURCLIB(TYPERMFV);
/*
```

ASMRMFV direct JCL invocation method with EXEC **PARM=** field.
Parms could have followed **//SYSIN DD *** instead.

RMF Monitor III & MXG Support
PDB Building – Example 3B
ASI, CPU, ENC Tables Yesterday Only

```
//MYJOB  JOB ....
//DECOMP EXEC PGM=IKJEFT01,DYNAMNBR=9          ← Start of RMF III data decompress step
//SYSPROC  DD DISP=SHR,DSN=MXG.V3102.SOURCLIB  ← Location of CLRMFV Clist
//SYSPRINT DD SYSOUT=*
//SYSTSIN  DD *
  %CLRMFV -
  INHLQ('VSYS.RMFIII.') -                      ← High level qualifier for RMF III dsets
  PARM('FD=*-1,TD=*-1,ASI,CPU,ENC') -          ← Select only ASI, CPU, ENC tables
  OUTHLQ('MXG') -                              ← High level qualifier for output data set
  OUTMLQ('RMFIII') -                           ← Mid level qualifier for output data set
  OUTLLQ('OUTPUT') -                           ← Low level qualifier for output data set
  PGMLIB('MXG.V3102.LOADLIB') -                ← Library where ASMRMFV was installed
  SYSID('SYSA' 'SYSB' 'SYSC') -                ← SMF Sysids to be processed
  SPACE('100,100')                             ← Space allocation for output file
/*
//BUILD    EXEC MXGSAS,COND=(4,LT)             ←  Start of build PDB step
//RMFBSAM  DD DISP=SHR,DSN=MXG.RMFIII.OUTPUT   ←  Input file from ASMRMFV
//PDB      DD DISP=(NEW,CATLG),UNIT=SYSDA,     ←  Output MXG PDB
//   SPACE=(CYL,(100,100)),DSN=MXG.RMFIII.PDB
//SYSIN DD *
%INCLUDE SOURCLIB(TYPSRMFV);                   ← Alternate: %INCLUDE SOURCLIB(TYPERMFV);
/*
```

ASMRMFV CLRMFV Clist invocation method with **PARM()** keyword.
Clist lines ending with **–** indicate continuation. Searches for VSAM data sets named **VSYS.RMFIII.SYSA.*, VSYS.RMFIII.SYSB.*, SYS.RMFIII.SYSC.*** in catalog.
DYNAMNBR should be equal to at least the number of VSAM data sets.

RMF Monitor III & MXG Support
ASMRMFV Sample Output - Intro

```
RMFV000I  VERSION :  *** ASMRMFV MXG 31.062 2013.094 *** ASSEMBLED ON 20130412 (04/12/13) AT 15.04
RMFV000I  VERSION :  BY HIGH LEVEL ASSEMBLER 1.6.0 UNDER z/OS 01.13.00 IN JOB MXGJUASM STEP ASMCL
RMFV001I  CURRENT :  DATE=2013.102  TIME=15:05:04.333699  IN LOCAL TIME
RMFV001I  CURRENT :  SYSPLEX=SVSCPLEX  SYSID=S0W1  OS=z/OS 01.13.00  FMID=JBB778H   CP=SP7.1.3
RMFV001I  CURRENT :  PGM=ASMRMFEL    STEPNUM=   2  JOBID=JOB00458    JOB=MXGJUNEW   STEP=DECOMP
================================================================================================================================
RMFV008I  INPUT   :  DDNAME=SYSIN      DSNAME=MXGJU.MXGJUNEW.JOB00458.D0000101.?          1ST VOL=       CRDATE=2013.102
RMFV002I  SYSIN   :   /* THIS IS A TEST OF SYSIN DATA RECORD COUNTING */
RMFV002I  SYSIN   :  * THIS IS A SECOND COMMENT LINE
RMFV002I  SYSIN   :  *** END OF DATA ***  RECORDS READ =     2
RMFV006I  FILTERS :  FROMDATE=2000.001  FROMTIME=00:00:00.000000
RMFV006I  FILTERS :    TODATE=2042.259    TOTIME=23:59:59.999999
RMFV006I  FILTERS :  NOZEROASI  NOZERODVT  NOZEROENC
================================================================================================================================
RMFV008I  OUTPUT  :  DDNAME=RMFBSAM    DSNAME=MXGDEV.MXGJU.RMFNEW.ALL.RMFIII              1ST VOL=MXG013  CRDATE=2012.292
```

VERSION: shows ASMRMFV assembly environment
CURRENT: shows ASMRMFV execution environment
INPUT: shows SYSIN input file information
SYSIN: shows contents of SYSIN file
FILTERS: shows input data filters in effect
OUTPUT: shows output file information

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RMF Monitor III & MXG Support
ASMRMFV Sample Output – An RMF III data set

```
RMFV008I  INPUT   :  DDNAME=RMFV0009   DSNAME=MXGDEV.RMF.MONIII.SOW1.DS1                  1ST VOL=MXG014
RMFV034I  INPUT   :  LAST OPEN        DATE=2013.069  TIME=00:15:00.533939  IN LOCAL TIME
RMFV009I  ORIGIN  :  SYSPLEX=SVSCPLEX  SYSID=SOW1
RMFV028I  INDEXES :  SAMPLE:  USED=   40  MAX= 1110  PCT=   3.60%  LIMIT= 100.00% / POLICY:  USED=  1  MAX= 50  PCT=   2.00%
RMFV030I  SPACE EF:  HARBA=               7,208,960  HURBA=              5,046,272  AVAIL=              2,162,688
RMFV031I  SPACE EF:  USED  :  PCT=  70.00% / AVAIL : PCT=  30.00%
RMFV012I  RANGE   :  FIRST SAMPLE BEGIN DATE=2013.068  TIME=23:00:00.000000
RMFV012I  RANGE   :  LAST  SAMPLE END   DATE=2013.069  TIME=09:00:00.000000
RMFV013I  SELECTED:  FIRST SAMPLE BEGIN DATE=2013.068  TIME=23:00:00.000000
RMFV013I  SELECTED:  LAST  SAMPLE END   DATE=2013.069  TIME=09:00:00.000000
RMFV101I  INPUT   :  *** END OF DATA ***  DDNAME=RMFV0009  VSAM RECORDS READ =        189
RMFV103I  SAMPLES :  FILTERED  =                  0  DECOMPRESSED =               40
RMFV104I  BYTES   :  READ      =          6,190,128  DECOMPRESSED =       351,216,640
RMFV104I  BYTES   :  OUTPUT    =         13,013,770  FILTERED     =            63,680  SKIPPED     =                0
```

INPUT: Input RMF Monitor III VSAM file information
ORIGIN: Source of input RMF III Monitor data
INDEXES: Sample set & service policy index usage (count / %)
SPACE: Disk space usage of VSAM data set (bytes / %)
RANGE: Begin/end time span of data found in VSAM data set

RMF Monitor III & MXG Support
ASMRMFV Sample Output – An RMF III data set (more)

RMFV105I TABLE	SELECT	TABLES READ	DATA ACTION	RECORDS COUNT	ENTRIES COUNT	LRECL MIN	LRECL MAX	LRECL AVG	BYTES WRITTEN
MXG		0	OUTPUT	0	0				0
DSH		1	OUTPUT	1	40	32756	32756	32756	32,756
SSH		40	OUTPUT	40	40	372	372	372	14,880
ASIX	Y	40	OUTPUT	82	2,231	1132	31820	29855	2,448,128
ASIX			FILTER	40	40				0
CFI	Y	40	OUTPUT	40	40	88	88	88	3,520
CPC	Y	40	OUTPUT	0	0				0
CPD	Y	40	OUTPUT	80	10,240	180	32692	16436	1,314,880
CPU	Y	40	OUTPUT	40	40	900	900	900	36,000
CSR	Y	40	OUTPUT	40	320	420	420	420	16,800
DVT	Y	40	OUTPUT	40	8,840	30960	30960	30960	1,238,400
DVT			FILTER	40	40				0
ENCX	Y	40	OUTPUT	120	360	1236	4644	3508	420,960
ENCX			FILTER	120	0				0

SELECT	**Y / N** for user RMF III table selection status
TABLES READ	Count of RMF III input for that table type
DATA ACTION	Either **OUTPUT / FILTER / SKIP**
RECORDS COUNT	Number of logical records output
ENTRIES COUNT	Number of logical table entries in output
LRECL MIN/MAX	Smallest/largest variable length record output
LRECL AVG	Average variable length record output **(new in V31.02**)
BYTES WRITTEN	Total bytes output for table (QSAM BDWs not included)

RMF Monitor III & MXG Support
ASMRMFV Sample Output – An RMF III data set (more)

RMFV105I	ENT	Y	40	OUTPUT	0	0				0
RMFV105I	GEI	Y	40	OUTPUT	40	40	580	580	580	23,200
RMFV105I	OPD	Y	40	OUTPUT	40	600	2524	2524	2524	100,960
RMFV105I	RCDX	Y	40	OUTPUT	1,320	1,320	228	616	497	656,160
RMFV105I	RED	Y	360,000	OUTPUT	36,000	360,000	132	132	132	4,752,000
RMFV105I	SHD	Y	36,000	OUTPUT	80	36,000	10468	32740	21604	1,728,320
RMFV105I	SPG	Y	40	OUTPUT	160	1,000	164	404	242	38,720
RMFV105I	SVP	Y	1	OUTPUT	1	61	4872	4872	4872	4,872
RMFV105I	UWDX	Y	2,727	OUTPUT	1,528	2,727	64	1504	120	183,214
RMFV105I	=====	======	==========	======	==========	==========	=====	=====	=====	==================
RMFV105I	ALL		399,289	OUTPUT	39,652	423,899	64	32756	328	13,013,770
RMFV105I	ALL			FILTER	200	80				0
RMFV105I	ALL			SKIP	0	0				0

"ALL" table is summary for all Tables for this RMF III data set only.

ASMRMFV also produces a summary for **ALL** data sets at the end of processing with a similar format.

RMF Monitor III & MXG Support
PDB Files Created (as of V31.01)

SAS File Name	Content	SAS Variables	Option for Full Content
ZRBASI	RMFIII ASID TABLE	169	
ZRBASM	ASMRMFV STATISTICS *	49	
ZRBBDSIH	RMFIII DATASET HDR & INDEX	27	
ZRBCFC	RMFIII ZRBCFI CF CONNECTIONS	21	CFDETAIL
ZRBCFI	RMFIII COUPLING FACILITY	105	
ZRBCPD	RMFIII CHANNEL PATH DATA TABLE	53	IOSUB
ZRBCPU	RMFIII PROCESSOR DATA CONTROL	162	
ZRBCSR	RMFIII COMMON STORAGE REMAINING	19	DIAGxx member
ZRBDVT	RMFIII DEVICE TABLE	63	
ZRBENC	RMFIII ENCLAVE DATA TABLE	113	**Use V31.01 & up**
ZRBENT	RMFIII ENQUEUE NAME TABLE	15	

* Not based on RMF Monitor III table data – built internally by MXG

RMF Monitor III & MXG Support
PDB Files Created (as of V31.01) (more)

SAS File Name	Content	SAS Variables	Option for Full Content
ZRBGEI	RMFIII GENERAL INFOR TABLE	96	
ZRBLCP	RMFIII LOGICAL PROCESSOR DATA	34	
ZRBOPD	RMFIII OMVS PROCESS DATA	30	OPD
ZRBPGP	RMFIII PERFORMANCE GROUP PERIOD	17	Always 0 obs *
ZRBRCDB	RMFIII RESPONSE TIME BUCKETS	38	
ZRBRCDD	RMFIII SUBSYSTEM DELAY	65	
ZRBRCDP	RMFIII PERIOD-ARCHAIC	37	Always 0 obs **
ZRBRCDR	RMFIII REPORT CLASS	70	
ZRBRCDS	RMFIII SERVICE CLASS	81	
ZRBRCDT	RMFIII RESPTIME SERVICE CLASSES	93	
ZRBRCDX	RMFIII RESPTIME REPORTNG CLASSES	62	

* Obsolete file in Goal Mode ** Archaic file

RMF Monitor III & MXG Support
PDB Files Created (as of V31.01) (more)

SAS File Name	Content	SAS Variables	Option for Full Content
ZRBRED	RMFIII RESOURCE RECORD	16	Always 0 obs *
ZRBSHD	RMFIII SAMPLE HEADER	18	Always 0 obs *
ZRBSPG	RMFIII STORAGE GROUP/VOLUME DATA	22	SGSPACE
ZRBSSH	RMFIII MNTME SET SAMPLES HDR	36	
ZRBSVPC	RMFIII SERVPOLICY SRVCLASS DEFN	19	SVP LE 32K
ZRBSVPG	RMFIII SERVPOLICY RESOURCE GROUP	15	SVP LE 32K
ZRBSVPP	RMFIII SERVICE POLICY	33	SVP LE 32K
ZRBSVPR	RMFIII SERVPOLICY REPORT CL DEFN	12	SVP LE 32K
ZRBSVPW	RMFIII SERVPOLICY WORKLOAD DEFN	12	SVP LE 32K
ZRBSVPZ	RMFIII SERVPOLCY SRVCLASS PERIOD	17	SVP LE 32K

* Output currently suppressed until future need arises

RMF Monitor III & MXG Support
PDB Files Created (as of V31.01) (more)

SAS File Name	Content	SAS Variables	Option for Full Content
ZRBUWDEV	RMFIII USE/WAIT DEV RECORD *	12	
ZRBUWENQ	RMFIII USE/WAIT ENQ RECORD *	16	
ZRBUWHSM	RMFIII USE/WAIT HSM RECORD *	13	
ZRBUWJES	RMFIII USE/WAIT JES RECORD *	13	
ZRBUWMNT	RMFIII USE/WAIT MNT RECORD *	12	
ZRBUWMSG	RMFIII USE/WAIT MSG RECORD *	12	
ZRBUWSTO	RMFIII USE/WAIT STO RECORD *	13	
ZRBUWXCF	RMFIII USE/WAIT XCF RECORD *	23	**V30.30 and up**

Must use **%INCLUDE SOURCLIB(TYPSRMFV);** with UWD table records to eliminate natural duplicates.

Do NOT use **%INCLUDE SOURCLIB(TYPERMFV); with UWD records.**

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RMF Monitor III & MXG Support
File Contents – ZRBASI (1 of 5)

ALPHABETIC LIST OF VARIABLES AND ATTRIBUTES

#	VARIABLE	TYPE	LEN	FORMAT	LABEL
2	ASIACOM	NUM	5		COMMON*PAGING
3	ASIACT	NUM	5	5.1	PCT WHEN*ACTIVE*USING OR*DELAYED
4	ASIACTHF	NUM	5		ASIDS*ACTIVE AND*HOLDING STORAGE
5	ASIAHSP	NUM	5		HIPERSPACE*DELAY
6	ASIAPRV	NUM	5		PRIVATE*PAGING
7	ASIASINR	NUM	5		ASID*NUMBER
8	ASIASSTA	NUM	5		ADDITIONAL*SRB*TIME
9	ASIASWA	NUM	5		SWAPPING
10	ASIAUXSC	NUM	5		NUMBER OF*AUXILIARY*SLOTS
11	ASIAVIO	NUM	5		VIO*PAGING
12	ASIAXM	NUM	5		CROSS*MEMORY*DELAY
13	ASICCAP	NUM	5		RESOURCE*CAPPING*DELAY
14	ASICDE	CHAR	32		SERVICE*CLASS*DESCRIPTION
15	ASICGI	NUM	5		RESOURCE*GROUP*INDEX
16	ASICNM	CHAR	8		SERVICE*CLASS*NAME
17	ASICPN	NUM	5		NUMBER*SERVICE CLASS*PERIODS
18	ASICPO	NUM	5		OFFSET*SERVICE CLASS*PERIOD ENTRIES
19	ASICPTA	NUM	5	TIME12.2	ACCUMULATED*CPU*TIME
20	ASICPUC	NUM	5		CPU*CAPPING*DELAY
21	ASICPUTA	NUM	5	TIME12.2	TOTAL*TCB+SRB*TIME
22	ASICQASC	NUM	5		SQA*SAMPLE*COUNT
23	ASICQUI	NUM	5		QUIESCE*DELAY
24	ASICRC	NUM	5		NUMBER PERIODS*RESP TIME*GOALS
25	ASICRN	CHAR	8		RESOURCE GROUP*NAME FOR*SERVICE CLASS
26	ASICSAA	NUM	5	MGBYTES.	CSA*ALLOCATION
27	ASICSASC	NUM	5		CSA*SAMPLE*COUNT
28	ASICUSE	NUM	5		CPU*USING
29	ASICWI	NUM	5		WORKLOAD*INDEX
30	ASICWN	CHAR	8		WORKLOAD NAME*FOR*SERVICE CLASS
31	ASIDCTIA	NUM	5	TIME12.2	TOTAL*CHANNEL CONNECT*TIME
32	ASIDIV	NUM	5	MGBYTES.	STORAGE*FOR*DIV
33	ASIDIVCT	NUM	5		NUMBER OF*DIV INVOCATIONS
34	ASIDMN	NUM	5		WAS*DOMAIN*NOW*MISSING
36	ASIDTOT	NUM	5	MGBYTES.	JOB TOTAL*VIRTUAL*STORAGE

The data rich ZRBASI file has 169 variables in all

RMF Monitor III & MXG Support
File Contents – ZRBASI (2 of 5)

37	ASIECSAA	NUM	5	MGBYTES.	ECSA*ALLOCATION
38	ASIENIDX	NUM	5		INDEX*OF THIS*TABLE ENTRY
39	ASIESCT	NUM	5		LONG*SWAPS*TO ESTORE
40	ASIESF	NUM	5	MGBYTES.	AVERAGE*ESTORE*FOR SWAPPED IN
41	ASIESFI	NUM	5	MGBYTES.	AVERAGE*ESTORE*FOR IDLE USERS
42	ASIESQAA	NUM	5	MGBYTES.	ESQA*ALLOCATION
43	ASIFIXA	NUM	5	MGBYTES.	AVERAGE*FIXED*STORAGE
44	ASIFLAG1	CHAR	1	$HEX2.	JOB*FLAGS
45	ASIFLAG2	CHAR	1	$HEX2.	COMMON*STORAGE*FLAGS
46	ASIFMCT	NUM	5	MGBYTES.	AVERAGE*CSTORE FOR*SWAPPED IN USERS
47	ASIFMCTI	NUM	5	MGBYTES.	AVERAGE*CSTORE FOR*IDLE USERS
48	ASIGASPD	NUM	5		SINGLE STATE*SAMPLES DELAYED*FOR SSPAGE
49	ASIGDE	CHAR	32		RESOURCE*GROUP*DESCRIPTION
50	ASIGLT	CHAR	1	$HEX2.	RESOURCE*GROUP*INDICATORS
51	ASIGMN	NUM	5		MINIMUM*CAPACITY*UNWEIGHTED*CPU SU_SEC
52	ASIGMX	NUM	5		MAXIMUM*CAPACITY*UNWEIGHTED*CPU SU_CEC
53	ASIGNM	CHAR	8		RESOURCE*GROUP*NAME
54	ASIGSPPI	NUM	5		SHARED*PAGE-INS*FROM AUX STORE
55	ASIHVCBY	NUM	5	MGBYTES.	COMMON*STORAGE*BYTES*ALLOCATED
56	ASIHVCOM	NUM	5		64-BIT*COMMON*MEMOBJ*ALLOCATED
57	ASIHVVBY	NUM	5	MGBYTES.	HWM*64-BIT*COMMON*BYTES*ALLOCATED
59	ASIIDLE	NUM	5	5.1	PCT WHEN*JOB*WAS IDLE
60	ASIIFATA	NUM	5	TIME12.2	ACCUMULATED*IFA*TIME
61	ASIIOCNT	NUM	5		I/O*COUNT*FROM*ASCBIOSC
62	ASIIPCTA	NUM	5	TIME12.2	ACCUMULATED*IFA*ON CP*TIME
63	ASIJCLAS	CHAR	8		JOB*CLASS*FROM OUCBCLS
64	ASIJESID	CHAR	8		JES*ID
65	ASIJLCYL	NUM	5		TIME OFFSET*WHEN LAST*FOUND
66	ASIJOBNA	CHAR	8		JOBNAME*FOR THIS*ASID
67	ASIJOBST	NUM	8	DATETIME21.2	JOB*SELECTION*TIMESTAMP*(GMT)
68	ASILMEMO	NUM	5		MEMORY*OBJECTS*ALLOCATED
58	ASILPGSZ	NUM	5	MGBYTES.	LARGE PAGE*BYTES BACKED*IN REAL STORE
69	ASILSCF	NUM	5		SUM OF*CSTORE SAMPS*LOG SWAPPED*USER
70	ASILSCT	NUM	5		LONG*LOGICAL*SWAPS

The data rich ZRBASI file has 169 variables in all

RMF Monitor III & MXG Support
File Contents – ZRBASI (3 of 5)

71	ASILSEF	NUM	5		SUM OF*ESTORE SAMPS*LOG SWAPPED*USER
72	ASILSSA	NUM	5	5.1	PCT WHEN*LOGICALLY*SWAPPED
73	ASILVABY	NUM	5	MGBYTES.	PRIVATE*MEMOBJ*BYTES*ALLOCATED
77	ASILVMEM	NUM	5		ADDRESS*SPACE*LIMIT*IN MB
74	ASILVNMO	NUM	5		PRIVATE*MEMOBJ*ALLOCATED
75	ASILVSBY	NUM	5	MGBYTES.	SHARED*MEMOBJ*BYTES*ALLOCATED
76	ASILVSHR	NUM	5		SHARED*MEMOBJ*ALLOCATED
78	ASIMCDLY	NUM	5		MULTI STATE*PROCESSOR*DELAY*PCT
79	ASIMCUSE	NUM	5		MULTI STATE*PROCESSOR*USING*PCT
80	ASIMSTS	CHAR	1	$HEX2.	MISCELLANEOUS*STATES
81	ASINPG	NUM	5		CONTROL*PERFORMANCE*GROUP
82	ASIOIOU	NUM	5		MULTI-STATE*I/O USING*SAMPLES
83	ASIORAW	NUM	5	5.1	PCT WHEN*APPC WAIT*SWAP
84	ASIORDW	NUM	5	5.1	PCT WHEN*DETECTED*WAIT*SWAP
85	ASIOREPL	NUM	5		OUTSTANDING*REPLIES
86	ASIOREX	NUM	5	5.1	PCT WHEN*EXCHANGE*SWAP
87	ASIORIC	NUM	5	5.1	PCT WHEN*IMPROVE*CPU USAGE*SWAP
88	ASIORIP	NUM	5	5.1	PCT WHEN*IMPROVE*SYS PAGING*SWAP
89	ASIORIW	NUM	5	5.1	PCT WHEN*OMVS*INPUT SWAP
90	ASIORLW	NUM	5	5.1	PCT WHEN*LONG*WAIT
91	ASIORMR	NUM	5	5.1	PCT WHEN*MAKE ROOM*SWAP
92	ASIORNQ	NUM	5	5.1	PCT WHEN*ENQUEUE*SWAP
93	ASIOROW	NUM	5	5.1	PCT WHEN*OMVS*OUTPUT SWAP
94	ASIORRQ	NUM	5	5.1	PCT WHEN*REQUESTED*SWAP
95	ASIORRS	NUM	5	5.1	PCT WHEN*REAL STOR*SHORTAGE*SWAP
113	ASIORSR	NUM	5		STOR/OUTR*DELAY*SAMPLES
96	ASIORTI	NUM	5	5.1	PCT WHEN*TERMINAL*INPUT WAIT*SWAP
97	ASIORTO	NUM	5	5.1	PCT WHEN*TERMINAL*OUTPUT WAIT*SWAP
98	ASIORTS	NUM	5	5.1	PCT WHEN*TRANSITION*SWAP
99	ASIORUS	NUM	5	5.1	PCT WHEN*UNILATERAL*SWAP
100	ASIORXS	NUM	5	5.1	PCT WHEN*AUX STOR*SHORTAGE*SWAP
101	ASIOTOTU	NUM	5		MULTI-STATE*USING*SAMPLES
102	ASIPAGES	NUM	5	5.1	PCT WHEN*DELAYED*BY PAGE-INS
35	ASIPER	NUM	5		PERIOD
103	ASIPHTMA	NUM	5	TIME12.2	PREEMTEABLE*CLASS*SRB*TIME
104	ASIPHTZA	NUM	5	TIME12.2	PREEMPTABLE*SRB*FOR ZAAPS
105	ASIPHTZI	NUM	5	TIME12.2	PREEMPTABLE*SRB*FOR ZIIPS
106	ASIPINA	NUM	5		PAGE-IN*COUNTS

The data rich ZRBASI file has 169 variables in all

RMF Monitor III & MXG Support
File Contents – ZRBASI (4 of 5)

107	ASIPINES	NUM	5		EXPANDED*STORAGE*PAGEIN*COUNT
108	ASIPREVI	NUM	5		INDEX OF*PREVIOUS ENTRY*FOR SAME ASID
109	ASIPSCT	NUM	5		LONG*PHYSICAL*SWAPS
110	ASIPSEF	NUM	5		SUM OF*ESTORE SAMPS*SWAPPED*USER
111	ASIPSSA	NUM	5	5.1	PCT WHEN*PHYSICAL*SWAPPED
112	ASIRCLX	NUM	5		REPORT*CLASS*LIST*INDEX
114	ASIRDE	CHAR	32		REPORT*CLASS*DESCRIPTION
115	ASIRNM	CHAR	8		REPORT*CLASS*NAME
116	ASISDCCP	NUM	5		PCT*DELAYED*BY CP*PROCESSOR
117	ASISDCDV	NUM	5	5.1	PCT WHEN*DELAYED*BY DEVICE
118	ASISDCEN	NUM	5	5.1	PCT WHEN*DELAYED*BY ENQ
119	ASISDCHS	NUM	5	5.1	PCT WHEN*DELAYED*BY HSM
120	ASISDCIF	NUM	5		PCT*SAMPLES*DELAYED*BY IFA*PROCESSOR
121	ASISDCJE	NUM	5	5.1	PCT WHEN*DELAYED*BY JES
122	ASISDCMS	NUM	5	5.1	PCT WHEN*DELAYED*BY OPER MSG
123	ASISDCMT	NUM	5	5.1	PCT WHEN*DELAYED*BY OPER MOUNT
124	ASISDCOP	NUM	5	5.1	PCT WHEN*DELAYED*BY OPER
125	ASISDCPR	NUM	5	5.1	PCT WHEN*DELAYED*BY PROCESSOR
126	ASISDCSP	NUM	5		PCT SINGLE STATE*SAMPLES*DELAYED*BY ZIIP
127	ASISDCST	NUM	5	5.1	PCT WHEN*DELAYED*BY STORAGE
128	ASISDCSU	NUM	5	5.1	PCT WHEN*DELAYED*BY SUBS
129	ASISDCXC	NUM	5		SINGLE STATE*DLYED BY XCF*PART OF SUBS
130	ASISMPCT	NUM	5		NUMBER OF*VALID*SAMPLES*THIS ASID
131	ASISPVLC	NUM	5		SHARED*PAGE*VALIDATIONS
132	ASISQAA	NUM	5	MGBYTES.	SQA*ALLOCATION
133	ASISRBTA	NUM	5	TIME12.2	TOTAL*ACCUMULATED*SRB TIME
134	ASISRVO	NUM	5		OFFSET FM SC SERVED TO CORRES ROW
135	ASISUCCP	NUM	5		PCT SINGLE STATE*SAMPLES*USING*CP
136	ASISUCDV	NUM	5	5.1	PCT WHEN*USING*DEVICE
137	ASISUCIC	NUM	5		PCT*SAMPLES*USING*IFA*ON CP
138	ASISUCIF	NUM	5		PCT*SAMPLES*USING*IFA*ON IFA
139	ASISUCPR	NUM	5	5.1	PCT WHEN*USING*PROCESSOR
140	ASISUCSC	NUM	5		PCT SNGL STATE*SAMPLES*USING*ZIIP*ON CP
141	ASISUCSP	NUM	5		PCT SNGL STATE*SAMPLES*USING*ZIIP

The data rich ZRBASI file has 169 variables in all

RMF Monitor III & MXG Support
File Contents – ZRBASI (5 of 5)

142	ASISUSEN	NUM	5	5.1	PCT WHEN*SINGLE STATE*USING
143	ASISVINR	NUM	5		SHARED*PAGES IN*CSTORE
144	ASISWAIN	NUM	5	5.1	PCT WHEN*DELAYED*ANY RESOURCE
145	ASISWAP	NUM	5	5.1	PCT WHEN*WHEN*JOB SWAPPED OUT
146	ASISWAPI	NUM	5		ASIDS*SWAPPED IN*(NOT LS*NOT PS)
147	ASISWAPS	NUM	5	5.1	PCT WHEN*DELAYED*BY SWAP-INS
148	ASISWAR	NUM	5	5.1	PCT WHEN*SWAPPED OUT READY
149	ASITET	NUM	5	TIME12.2	TRANSACTION*ELAPSED*TIME
150	ASITIIP	NUM	5	TIME12.2	ACCUMULATED*ZIIP*TIME
151	ASITIIPC	NUM	5	TIME12.2	ACCUMULATED*ZIIP*ON CP*TIME
152	ASITOTD	NUM	5		TOTAL DELAYS*FOR CALC*EXEC VELOCITY
153	ASITOTSV	NUM	5		SHARED*PAGE*VIEWS
154	ASITRCA	NUM	5		TOTAL*NUMBER OF*TRANSACTIONS
155	ASIUKN	NUM	5	5.1	PCT WHEN*STATUS UNKNOWN
156	ASIUNKN	NUM	5		UNKNOWN*COUNT FOR*CALC OF*EXEC VELOCITY
157	ASIVECTA	NUM	5		TOTAL VECTOR*PROCESSOR*TIME
158	ASIVERG3	CHAR	1	$HEX2.	ASIG3*CONTROL*BLOCK*VERSION
159	ASIWDE	CHAR	32		WORKLOAD*DESCRIPTION
160	ASIWNM	CHAR	8		WORKLOAD*NAME
169	SHIFT	CHAR	1		SHIFT*OF*START
161	SSHGOMNT	NUM	5		GATHERER*MINTIME*OPTION
162	SSHRMFVN	CHAR	3		RMF*VERSION*NUMBER
163	SSHSMPNR	NUM	5		NUMBER*OF VALID*MINTIME*SAMPLES
164	SSHTIBEG	NUM	8	DATETIME21.2	BEGIN TIME*FOR THIS*SET OF SAMPLES
165	SSHTIEND	NUM	8	DATETIME21.2	END TIME*FOR THIS*SET OF SAMPLES
166	SYSPLEX	CHAR	8		SYSPLEX*NAME*FROM*COUPLEXX
167	SYSTEM	CHAR	4		SYSTEM*ID
168	TYPETASK	CHAR	4		TYPE*OF*TASK
1	ZDATE	NUM	4	DATE9.	ZEE DATE*ZEE OBS*WAS CREATED

The data rich ZRBASI file has 169 variables in all

ASMRMFV
Parameters as of MXG V31.02

Input RMF III Table Selection:

Inclusive: **ALL**, ASI, CFI, CPC, CPD, CPU, CSR, DVT, ENC, ENT, GEI, PGP, OPD, RCD, RED, SHD, SPG, SVP, UWD

Exclusive: NONE, NOASI, NOCFI, NOCPC, NOCPD, NOCPU, NOCSR, NODVT, NOENC, NOENT, NOGEI, NOPGP, NOOPD, NORCD, NORED, NOSHD, NOSPG, NOSVP, NOUWD

Date/Time Selection: FROMTIME=**0000**, TOTIME=**2359**, FROMDATE=**2000001**, TODATE=**2042259**

Time Formats: FROMTIME/TOTIME=HHMM or HMM or MM or M

Date Formats: FROMDATE/TODATE=YESTERDAY or TODAY
FROMDATE/TODATE=YYYYDDD or YYYDDD or YYDDD or YDDD or DDD or DD or D
FROMDATE/TODATE=* or *-N or *-NN or -N or -NN

Defaults shown with **red bold and underline**
Tip: Parms supplied from **EXEC PARM=** field, **SYSIN DD**, or **CLIST PARM()** keyword
Tip: Most parameters have short abbreviations (see program source)
Tip: Instead of **Noxxx** keyword can use leading **–** sign. For example, **-DVT**

ASMRMFV
Parameters as of MXG V31.02 (more)

Report Control:

Inclusive: BUFFERS, **BYTES**, **DETAIL**, **INDEXES**, POLICY, **SPACE**, WTO, **ZEROPRT**
Exclusive: **NOBUFFERS**, NOBYTES, NODETAIL, NOINDEXES, **NOPOLICY**, NOSPACE, **NOWTO**, NOZEROPRT

Output Data Control:

Inclusive: **ASIX**, **CFALL**, ZEROASI, ZERODVT, **ENCX**, ZEROENC
Exclusive: NOASIX, CFMASTER, **NOZEROASI**, **NOZERODVT**, NOENCX, **NOZEROENC**

Input Data Control:

Inclusive: **ABREAD** (New with V30.06)
Exclusive: NOABREAD (New with V30.06)

Defaults shown with **red bold and underline**
Tip: Parms supplied from **EXEC PARM=** field, **SYSIN DD**, or **CLIST PARM()** keyword
Tip: Most parameters have short abbreviations

RMF Monitor III & MXG Support
Getting Help

- Email: support@mxg.com
- Phone: **(214) 351-1966**
- Reported problems are sometimes due to running a back level **ASMRMFV, VMACRMFV,** or both. We will advise if your issue is likely corrected by the current level.
- If the problem is new, we will provide a fix or bypass as soon as possible usually within a day or two
- In some cases we may ask for transmission of your RMF III VSAM file, but please do not send until requested. Instructions will be provided how to do this.

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Agenda

- Overview of RMF ✔
- Setup of RMF Monitor III ✔
- Operation of RMF Monitor III ✔
- Design of RMF Monitor III ✔
- Reporting with RMF Monitor III ✔
- MXG Support for RMF Monitor III ✔

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Questions

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Documentation

- Any underlined blue text is an active Internet link (as of this presentation date)
- Click on the link while in PowerPoint Slide Show mode to access the document

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Documentation
MXG General

- MXG Web Site: http://www.mxg.com/
- MXG FAQ / Administration: Link
- MXG Tech Support: Link
- MXG Changes: Link
- MXG Code Sharks: Link
- MXG-L List Server: Link
- MXG Downloads: Link
- MXG Software Download Request: Link
- MXG Ship Current Version: Link
- MXG Product Info: Link
- MXG Contacts: Link
- MXG Links: Link

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Documentation
MXG RMF III

- All source members noted below are found in the MXG SOURCLIB library installed with your release
- See comments in member **ASMRMFV** for parameters and usage documentation for this program in MXG SOURCLIB
- See member **DOCLRMFV** for documentation on the **CLRMFV** Clist optionally used with **ASMRMFV**
- Also see member **ADOCRMFV** for more documentation on RMF III support
- Member **JCLASM3** has sample JCL to install **ASMRMFV**

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Documentation
IBM General RMF

- The IBM RMF Home Page is at:

  http://www-03.ibm.com/systems/z/os/zos/features/rmf/
- The "Newsletters" and "Resources" tabs have links to RMF Presentations and current z/OS Manuals
- A must see RMF Redbook is:
  "***Effective zSeries Performance Monitoring Using Resource Measurement Facility"*** SG24-6645-00 downloadable from:

  http://www.redbooks.ibm.com/abstracts/sg246645.html
- Another valuable performance Redbook is:

  "ABCs of z/OS System Programming Volume 11" SG24-6327-01 (December 2010) downloadable from:
  http://www.redbooks.ibm.com/abstracts/sg246327.html

Documentation
IBM RMF Presentations

- ***"RMF - The Latest and Greatest"*** (October 2011) for z/OS 1.12 and z/OS 1.13: Link
- ***"RMF Technical Overview"*** (March 2010): Link
- ***"RMF - The Latest and Greatest"*** (September 2010) for z/OS 1.11 and z/OS 1.12: Link
- ***"RMF - The Latest and Greatest"*** (October 2008) for z/OS 1.9 and z/OS 1.10: Link
- ***"RMF at a Glance"*** (January 2004) : Link
- ***"RMF Monitor III – Concepts and Features"*** (January 2004): Link
- ***"RMF Monitor III Data Portal"*** (November 2008) : Link

Tip: These presentations all have sections that discuss RMF Monitor III in particular

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Documentation
IBM RMF for z/OS 1.13

Order Number	Title	PDF (MB)	Book (MB)
SC33-7993-13	z/OS RMF Messages and Codes	0.81	0.43
SC33-7992-10	z/OS RMF Performance Management Guide	1.55	5.98
SC33-7990-19	z/OS RMF User's Guide	3.94	11.70
SC33-7991-19	z/OS RMF Report Analysis	3.19	3.19
SX33-9033-05	z/OS RMF Reference Summary	0.21	0.09
SC33-7994-14	z/OS RMF Programmer's Guide	2.66	1.99

Documentation
IBM RMF for z/OS 1.12

Order number	Title	PDF (MB)	BOOK (MB)
SX33-9033-04	z/OS V1R8.0-V1R12.0 Resource Measurement Facility (RMF) Reference Summary	0.19	0.06
SC33-7993-12	z/OS V1R12.0 Resource Measurement Facility (RMF) Messages and Codes	0.77	0.40
SC33-7992-10	z/OS V1R12.0 Resource Measurement Facility (RMF) Performance Management Guide	1.48	5.70
SC33-7994-13	z/OS V1R12.0 Resource Measurement Facility (RMF) Programmer's Guide	2.51	1.66
SC33-7991-18	z/OS V1R12.0 Resource Measurement Facility (RMF) Report Analysis	2.90	1.21
SC33-7990-18	z/OS V1R12.0 Resource Measurement Facility (RMF) User's Guide	3.20	10.90

Documentation
IBM RMF for z/OS 1.11

Order number	Title	PDF (MB)	BOOK (MB)
SX33-9033-03	z/OS V1R8.0-V1R11.0 Resource Measurement Facility (RMF) Reference Summary	0.27	0.07
SC33-7993-11	z/OS V1R11.0 Resource Measurement Facility (RMF) Messages and Codes	0.55	0.40
SC33-7992-09	z/OS V1R11.0 Resource Measurement Facility (RMF) Performance Management Guide	1.22	5.71
SC33-7994-11	z/OS V1R11.0 Resource Measurement Facility (RMF) Programmer's Guide	1.95	1.29
SC33-7991-16	z/OS V1R11.0 Resource Measurement Facility (RMF) Report Analysis	2.27	1.21
SC33-7990-16	z/OS V1R11.0 Resource Measurement Facility (RMF) User's Guide	2.53	9.2

Documentation
IBM RMF for z/OS 1.10

Order number	Title	File size (MB)
SX33-9033-03	z/OS V1R8.0-V1R10.0 Resource Measurement Facility (RMF) Reference Summary	0.28
SC33-7993-10	z/OS V1R10.0 Resource Measurement Facility (RMF) Messages and Codes	1.69
SC33-7992-08	z/OS V1R10.0 Resource Measurement Facility (RMF) Performance Management Guide	2.29
SC33-7994-10	z/OS V1R10.0 Resource Measurement Facility (RMF) Programmer's Guide	4.08
SC33-7991-15	z/OS V1R10.0 Resource Measurement Facility (RMF) Report Analysis	5.94
SC33-7990-15	z/OS V1R10.0 Resource Measurement Facility (RMF) User's Guide	4.65

Documentation
IBM RMF for z/OS 1.9

Order number	Title	File size (MB)
SX33-9033-03	z/OS V1R8.0-V1R9.0 Resource Measurement Facility (RMF) Reference Summary	0.28
SC33-7993-09	z/OS V1R9.0 Resource Measurement Facility (RMF) Messages and Codes	1.99
SC33-7992-07	z/OS V1R9.0 Resource Measurement Facility (RMF) Performance Management Guide	2.58
SC33-7994-09	z/OS V1R9.0 Resource Measurement Facility (RMF) Programmer's Guide	4.91
SC33-7991-13	z/OS V1R9.0 Resource Measurement Facility (RMF) Report Analysis	6.85
SC33-7990-13	z/OS V1R9.0 Resource Measurement Facility (RMF) User's Guide	5.32

Thanks !!!

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